manual

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How to use the CD-ROM Manual

Getting started with the CD-ROM Manual
For being able to read the CD on your computer you need the Acrobat Reader 3.0, 4.0 or 5.0 program as data reading tool. If this program is not installed on your PC, you will find a free version 5.0 for installation on the Manual CD-ROM. After installation open the program Acrobat Reader and insert the CD-ROM into the drive.

Opening the CD-ROM Manual
On the File menu in the Acrobat Reader klick Open and select your CD-ROM drive. You open the manual by double-klicking the file H.....pdf (H + your machine number). The first page of the manual ‚Schmid Manual' opens on your screen. On the left edge of the screen you see the bookmarks displayed as little triangles or plus sign (Acrobat Reader 3.0 : triangle, Acrobat Reader 4.0 & 5.0: plus sign).

Skimming through the Manual
After calling up the manual with the first page ‚Schmid Manual on the screen, you can get to the following pages by klicking the < > arrow buttons (arrows are in the toolbar at the top of the screen under the menu bar). Thus you can move through the complete manual, also automatically moving to the following chapter. With the |< and <| arrows you skip directly to the first or last page of the manual.

Skipping to Individual Chapters or Subchapters
In order to get to the individual chapters open first the external chapter overview of the Acrobat Reader (not the internal table of contents in the manual). You open the external overview using the first displayed bookmark (little triangle or + sign at the left edge in front of the word ‚manual').
Proceed as following: klick the bookmark at the left edge (triangle), which turns by 90° (or the + sign changes to a – symbol). Then click the ‚page' symbol of the requested subchapter and you will get to the information you were looking for without leafing through the complete manual.
For opening further subchapters klick the bookmarks of the opened chapters (little triangles or + signs). Thus you can branch into further subchapters until no bookmark is displayed any more (end of a subchapter).
With klicking the bookmark again the subchapter closes (it does not close automatically).

Miniature Display (‚Thumbnails')
There is the possibility to have several pages displayed in a miniature overview. Acrobat Reader 3.0 : under the menu ‚display' in the menu bar you find the menu items, ‚bookmark and page' or ‚thumbnails and page'

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for selection. Select ‚thumbnails and page' this time.
Acrobat Reader 4.0 : selection can be made by klicking into the corresponding function field ‚thumbnails' (at the top of the external chapter overview). Acrobat Reader 5.0: on the left edge for selection.

Where to find the Layout drawing of the complete machine?
Go to chapter 7 ‚Layout, Wiring and Piping diagrams'. The first page of the chapter is the layout drawing. You can navigate on the magnified drawing with the 'hand symbol' (also possible in other documents).

How to find a Spare Part: Structure of Spare Part Lists
For having fast access to the spare parts, it is important to understand the structure of the spare parts lists. The spare parts are first separated into the modules of the machine. The chapters follow the order of the module order on the machine. The manual chapter also gives the name of the module as abbreviation (TRK, WSM, etc.). In the layout drawing you find the corresponding module name and module numbers.

Roller plans
At the beginning of each module in the parts list part there is a colored roller plan, marked with VS and the commission number of the machine. If it is a standard conveyor, the roller plans can be found further behind in the module under 'conveyor' and the following pages in black/white (sometimes only marked with the module abbreviation, e.g. E/A/….).

Magnifying Documents for better Reading
With the 'magnifying glass' you can magnify documents for reading (click the magnifying glass and the move into document). Acroabt Reader 4.0 and 5.0: via 'View' menu select menu item 'Zoom to': here you can specify the ideal magnification ratio for the individual document. Other magnification possibilities under 'View' menu. Acrobat Reader 5.0: via the symbol button for varibale magnification (e.g. - 75% +).

Parts List Structure
In order to find a spare part quickly it is important to understand the parts list structure. The spare parts are grouped together according to the modules. In the manual, the modules are listed with abbreviations at the beginning of the parts lists, under 'Spare parts (module overview)'. On the layout drawing you find the abbreviations with the corresponding module numbers. A list with the module abbreviations is in front of the module overview. The tree structure of the CD bookmarks also gives the module number and module numbers.

The parts lists are structured as following:
You move from the higher level, i.e. a complete subassembly, further down to sub-subassemblies until you end up at the individual spare part

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(similar to the ‚tree structure' for subdirectories in a computer program). The components of a certain parts list are documented with drawings, special manuals or further list of parts in the next level below. Spare parts are marked with x.

The number of levels can vary depending on the kind of module or subassembly. See the following example:

1) chapter on the module overlapping components

2) Main chapter (level 1): **parts list of module** subdivided into subassemblies

3) Branching into level 2: **parts list of subassembly** subdivided into sub-subassemblies (indented):
Branching into: drawing of subassembly

4) Branching into level 3: **Parts list of a sub-subassembly** subdivided into components and further sub-subassemblies (indented)

Branching into: drawing of sub-subassembly
Branching into: individual components

5) Branching into level 4: **Parts list of a component** subdivided into individual spare parts and further subassemblies
Branching into: drawing of a component
Branching into: manual of a component
Or: branching into a further sub-sub-subassembly.

If there is a manual supplied for a certain component (especially commercial wares) you find it directly under the corresponding spare parts list. Just turn the pages and you will find it (or via the subchapter ‚Outside supplier manual').

Find Function
Using the Find function you are able to find a catchword in the running text. **This function does not apply to the scanned manuals of commercial wares, but only to the chapters of editorial matter and the parts lists.**
For Acrobat Reader 3.0: Find function is located in the Tools menu. For Acrobat Reader 4.0 and 5.0: Find function is located in the Edit menu. Next to complete catchwords you can also enter only parts of words. The screen displays the first occurrence of the word. With the function ‚Find Again' (in the Tools menu as well) you get to further occurrences

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of the term.

Operating Manuals for Individual Devices and Control Units
Operating Manuals for individual devices and certain control units like flow meter, density meter etc. can be found under the corresponding module in the machine parts lists (‘Spare parts’ at the end of the documentation: the manual is usually behind the corresponding parts list under the heading ‘Outside supplier manual’). General information about certain very special machine functions can be found in chapter 5.2. Process Information. Possible manuals for electric devices in the switching cabinet are at the end of chapter ‘Electric parts list’ under ‘Layout, Wiring and Piping diagrams’.

1. Introduction

1.1 General Introduction

1.1.1 Important Advice

Thank you for your confidence in our company. We assure you that the **SCHMID** machine you received will fulfill all your expectations.
This manual will help you operate the machine and meet your process production requirements. The manual includes all important information for correct operation and maintenance of your **SCHMID** machine. All personnel responsible for transport, assembly and start-up must pay attention in all respects to this information..
Moreover, the manual should be available to the operators and service personnel. It is strongly recommended that they study the manual carefully. The best place to keep the manual is near the machine.
The machines are available in different working widths. All modules may vary in working length independently on working width and the tanks supplied can also vary in volume. Regardless of machine size, all functions of a certain line of machines are the same. For this reason, the machine description does not refer to size and capacity unless there are different design features.
The information, diagrams and illustrations contained in this manual must not be copied, altered or made available to third parties without our approval. This manual, as well as all future technical changes due to further developments, is copyright protected.
In case of operational difficulties, we are pleased to be at your service under the addresses listed in chapter 7 (machine parts lists and diagrams).

1.1.2 Organization of Manual

This manual has been organized so that the desired information can be located easily. The following subjects are covered:

Chapter 1: Important advice, information for the use of this manual as well as limitation of liability.

Chapter 2: Safety Rules. These instructions are completed by corresponding instructions in the functions' descriptions and have to be absolutely observed.

Chapter 3: Detailed infromation about installation and setup of machine. This part includes acceptance of the machine from the shipping company, its assembly up to the test-run.

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Chapter 4: Start-up. In addition to start-up this chapter includes a description of the control system and general trouble-shooting.

Chapter 5: Provides detailed information regarding process operation for various modules and/or machine parts.

Chapter 6: Covers maintenance of various machine parts and assemblies. It includes a preventative maintenance schedule based on machine operating hours.

Chapters 7 & 8: List of machine parts, illustrations and diagrams for ordering spare parts, as well as all required wiring diagrams.

The numerous illustrations contained in this manual help to locate specific machine parts and assemblies. If position numbers of a diagram are mentioned in the text, they are placed in parentheses (POS. X).
Descriptions referring to locations, such as "front," "above," "below," "left," "right," etc., assume you are facing the front (operator) side of the machine.

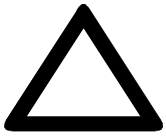
References are made in this manual to avoid duplication of description (see instructions in part xx or see page/part/sheet illustration).

Each paragraph of this manual refers first to the standard machine. Special or added features are referred to at the end of the paragraph. The individual pages of the chapters are numbered consecutively. The respective page number is shown at the bottom of each page at the right side after the chapter number (e.g. E51-21/2 = Page 2 Chapter 5.1).

A prior knowledge of the process used is assumed. This manual is not intended to provide that knowledge.

The manual is complete with documentation provided by sub-suppliers for items such as pumps, heaters, etc. It is suggested that this documentation be kept in its special place in the back of the manual. The following references and warning signs are used in the manual:

1. Introduction



"NOTICE!"
Used to point out special technical features which should be noted by the user.

"ATTENTION!"
Indicates work or operational procedures that must be followed exactly to ensure that the machine is not damaged or destroyed.

"CAUTION!"
Indicates work or operational procedures which must be followed exactly to avoid personal injury and includes "ATTENTION!".

In the interest of responsibility for personal safety and care of the machines, all instructions must be strictly adhered to.

1.1.3 Limitation of Liability

Liability or warranty is void when:

- Instructions outlined in the manual are not followed or only partially followed
- The machine, including accessories, is operated incorrectly
- The machine is not serviced in accordance with the maintenance schedule as outlined in part 6.2
- Spare parts other than those stipulated are used
- Safety devices are not used, are altered, or are removed
- Procedure changes of any kind are made without written approval from the manufacturer
- Raw materials other than those agreed upon are used

1. Introduction

ATTENTION!
The processes described in this manual are without regard to any patent situation. All technical information in this manual was compiled with great care and under strict control. In spite of this, errors cannot be completely excluded.
Gebr. SCHMID therefore advises that neither guaranty nor legal responsibility nor liability can be claimed due to erroneous data. At the same time, we welcome notification of any errors found.

CERTIFICATE

European Institute for the Certification of Management Systems and Personnel
An Institute of the Steinbeis Foundation for Economic Promotion

hereby certifies that the company

Gebr. Schmid GmbH & Co.
Maschinenfabrik
Robert-Bosch-Straße 32-34
D-72250 Freudenstadt

has initiated and adopted a

QUALITY SYSTEM

for the field of application

development, production, assembly, distribution and services of automation- and processequiqment for the Printed Circuit Boards-, Photovoltaic-, Flat Panel Display- and Semiconductor-Industry

which meets the following international standard:

ISO 9001

(identical with DIN EN ISO 9001:2000 and EN ISO 9001:2000)

Validity duration:	16.02.2008
Registration No.:	95 039-04
Re-certification:	17.02.2005

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Bernd Kentner
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Deutscher Akkreditierungs Rat DAR

1.2 Technical Data Sheet

Customer: VEF Radiotehnika RRR
Address: Kurzemes pr. 3 LV 1067 Riga

Machine Type:	Pre-Treatment before Solder Mask
Commission-No.:	25-05-377
Schematic-Layout-No.:	25-18752-4-A1
Wiring-Diagram-No.:	16.018.1078-E0-0
Delivery Date:	Dec 2005

Machine Length	**[mm]:**	6375
Machine Width	**[mm]:**	1450/1175/960
Machine Height	**[mm]:**	1090
Max. Working Width	**[mm]:**	650
Working Height	**[mm]:**	900+/- 15
Working Direction:		Left-Right

Operation Voltage	**[V/Hz]:**	400±10% / 50HZ
Special Voltage	**[V]:**	
Control Voltage	**[V]:**	24 DC
Tot. Connected Power	**[kW]:**	30
Tot. Connected Ampere	**[A]:**	71

Sound Level (measured in accordance with DIN 45635 at a free-standing machine)	**[dB(A)]:**	72

Conveyor Speed	**[m/min]:**	0,2 - 6,0

1. Introduction

1.3 General Description

The micro etching machine is a fully automatic system used to remove oxide film from the copper surfaces of PCBs and roughen the surfaces. The PCBs pass through the machine horizontally during the micro etching process. The entering panel triggers the work process.

The modular construction of a micro etching line typically consists of:

- Input (EM)
- Degreasing (WMTM)
- Rinsing (WTM)
- Micro Etching (WMTM)
- Rinse (WTM)
- Drying (TQS/TQG)
- Runout (AM)
- Separate control cabinet

The control cabinet is located directly next to the line. The transport speed can be infinitely regulated by a potentiometer between 0.2 and 6.0 m/min. and is monitored by a digital display which is included. The line accepts boards with a thickness between 0.2 and 6.0 mm.

The micro etching machine of the ***combi-etch*** type can be completely integrated into any line manufactured by Gebr. SCHMID if the working width is the same. It can be loaded and unloaded by all handling systems produced by Gebr. SCHMID ***(Vacumat)***. Module lengths between 375 and 1375 mm allow for exact fittings according to customer's preference and capacity demands. Additional extensions, modifications and division of the line can be implemented at any time.

The only materials used are PVC with high impact resistance and titanium metal or stainless steel parts. There is no danger of the etching agent crystallizing during stand still periods because the transport system is open in the working area. There are no leaks in the machine and it can be disassembled quickly without tools.

A very high etching precision is achieved due to the use of combined parallel oscillation spray jets with a conical spray or a standing wave. Each spray pipe can be individually adjusted and removed. Each spray assembly has its own large area filter system located outside the machine.
The submersible pumps used in the modules are leakproof and have an impeller wheel fed from both sides with an inlet from above and below. The pumps thus contribute to the best mixing of the etching agent.

1. Introduction

The rinse and tank modules available allow the combination of fresh water, recirculated water and cascade rinsing. Large volume tank modules use the same pumps as the etching module.

Dryers are equipped with slanted suction nozzles above and below the bore holes. There are also squeegee rollers above the conveyor level, vacuum pumps, and air knives. In addition, large dryers have one or more high-powered blowers. The hot air output is thermostatically regulated and therefore can be used for high feeding speeds.

All modules can be delivered in either direction of operation. The following working widths are available:

- **400 mm**
- **650 mm**
- **1320 mm**

1. Introduction

1.4 EC Conformity Declaration

As defined by the EC guide-line machines 98/37/EC,

The design of the machine

Type **Pre-Treatment**

Com.no. **25-05-377**

has been developed, constructed and manufactured according to the EC guide-line 98/37/EEC, in exclusive responsibility of the **Firm Gebr. Schmid GmbH+Co Maschinenfabrik**

The following harmonized norms have been applied

EN 292-1	Safety of machines - basic standards
EN 292-2	Safety of machines - basic standards
EN 294	Safety of machines - safety distances from touching danger areas with the upper extremities
EN 349	Safety of machines - minimum distances in order to prevent that parts of the body are bruised
EN 418	Safety of machines - emergency stops, functional aspects - design instructions
73/23/EWG	Low voltage directive
89/336/EWG	EC directive Electromagnetic Compatiility

The following national norms, guide-lines and specifications have been applied:

- Specifications of the customer
- VDE regulations (German Electricians Association)

A complete technical documentation is available. The safety instructions of the manual for the machine are available

in the original version
in the English version
x in the native language of the user

Gebr. Schmid GmbH + Co.
Maschinenfabrik
Robert-Bosch-Str. 32-34
D-72250 Freudenstadt
Telefon 07441 / 538-0

Freudenstadt, 07.04.2006
Place, Date Signature Information about the undersigned

2. Safety

2. SAFETY AND ACCIDENT PREVENTION

These operating instructions are to be read and followed carefully before unpacking and start-up of the machine.

CAUTION!
This machine/plant is not to be used for any purpose other than that intended. Using it for any other purpose can cause unforeseeable risks. The line is only designed for the operating materials agreed to at time of purchase. The use of any other materials can endanger both personnel and the machine.
The machine/plant must only be used in technically perfect conditon in accordance with its designated use and the instructions set out in the operating manual, and only by safety-conscious persons who are fully aware of the risks involved in operating the machine/plant. Operating the machine/plant within the limits of its designated use also involves complying with the inspection and maintenance directives. Any functional disorders, especially those affecting the safety of the machine/plant, should therefore be rectified immediately.
Never make any modifications, additions or conversions which might affect safety without our written approval. This also applies to the installation and adjustment of safety devices and valves as well as to welding work on load-bearing elements and modifying the software of programmable control systems.

The manufacturer cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user.

2.1 Before Start-Up

- The machine/plant has been built in accordance with the latest state-of-the-art standards and the recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user or third parties, or cause damage to the machine/plant and to other material property.

- Observe all safety instructions and warnings attached to the machine/plant and keep them in clean and readable condition.

- While observing technical procedures, make sure that the machine and the surrounding areas are well lit.

2. Safety

- The personnel must be familiar with the location and operation of showers and fire extinguishers. Do never block the access to these facilities.

- Take care that the control cabinets are placed in sufficient distance to the danger area of the machine. Furthermore the operator should be able to see the machine when standing at the control cabinet.

- In order to guarantee that the sensor system is functioning, take care that boards wetted with chemicals do not pass the sensors.

- Observe the maximum operating temperatures allowed for:

Polyvinylchloride (PVC)	52° C
Polypropylene (PP)	65° C
High grade steel (V2A)	100° C

2.2 During Operation

2.2.1 Production

- Avoid any operational mode which might be prejudical to safety. Before turning on the machine, make sure that all personnel are clear from the line and its units.
  In the event of safety-relevant modifications or changes in the behaviour of the machine/plant during operation, stop the machine/ plant immediately and report the malfunction to the competent authority/person. The red, mushroom type emergency button is to be pressed in case of emergency.

- The machine is to be checked for recognizable external damage and faults at least once every shift. Check all lines, hoses and screwed connections regulary for obvious damage. Any noticeable changes (including any in operating conditions) must be reported to the supervisors immediately.

- No ties, scarves, other loosely fitting clothing, or jewelry which could be caught in the transport system may be worn near the machine/plant.

- All strainers may only be opened when machine has been switched off.

2. Safety

CAUTION!
At no time during the operation of the machine it is allowed to reach into the operating area of the cylinders and rollers. Care is to be taken that no external influences, whether manual intervention or objects in the working area, disturb the flow of movement in the machine.
Wear protective clothing according to accident prevention regulations and the recommendations of professional trade associations.

- The machine/plant are only to be operated when they are completely enclosed and are completely functional. The module cover fitting and sound baffles must always be checked and corrected if necessary. The covers must not be opened or removed during operation. Necessary instructions to this effect must be given to all operating personnel.

CAUTION!
Remember to turn off the machine before removing the cover (main switch must be turned to "OFF").

- Never touch any machine parts which might be hot due to use. The following chart shows possible temperatures on the module surface:

  Steel Module (V2A) up to 70 °C
  Plastic Module (PVC,PP) up to 40° C

- The pipes at the rear and under the machine might also be hot due to use, and may only be touched after a sufficient long cooling-off period.

2.2.2 Adjustment, Maintenance and Repair Work

- In any work concerning the operation, conversion or adjustment of the machine/plant and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the operation instructions and the information on maintenance work. Additionally, the machine is always to be turned off (main switch at "OFF") for:

  ~ Removal of machine covers
  ~ Maintenance and repairs
  ~ Opening control cabinets

- Please take attention that nobody stumbles over the pipes at the rear or under the machines.

2. Safety

- If provided for the regulations, the power supply to parts of machines and plants, on which inspection, maintenance and repair work is to be carried out must be cut off. Before starting any work, check the de-energized parts for the presence of power and ground or short-circuit them in addition to insulating adjacent live parts and elements.

- Necessary work on live parts and elements must be carried out only in the presence of a second person who can cut off the power supply in case of danger by actuating the emergency button or main power switch. Secure the working area with a red-and-white safety chain and a warning sign. Use insulated tools only.

- Maintenance and service for the machine is to be done only by trained maintenance personnel. For its execution, qualified tools and work-shop equipment are absolutely indispensable.

- The module cover safety interlocks may be by-passed for maintenance and service; however, this is only to be performed by the trained maintenance personnel.

- When opening the covers of the modules, take attention that the supports are always correctly fixed. Should a module dispose of two covers, both key-bolts of the inner cover must always be hooked in when the covers are erected.

- Depressurize all system sections and pressure pipes to be removed before carrying out any repair work.

- Carry out welding, flame-cutting and grinding work on the machine/ plant only if this has been expressly authorized, as there may be a risk of explosion and fire. In case of authorized work, it is indispensable to clean the machine/plant and its surroundings from dust and other inflammable substances and make sure that the premises are adequately ventilated. Observe any existing national regulations if work is to be carried out in narrow rooms.

- Please take care that after having exchanged filter elements (filter cartridges etc.) the cover of the respective filter is shut again duly.

CAUTION!
When the oscillation runs and the module cover is opened you must bear in mind that the spray manifold runs under the front module edge. Do absolutely not put anything (neither objects nor hands or fingers) in this area.

2. Safety

- Remember that machine parts can remain warm for a certain amount of time after the machine has been turned off. To avoid damage to the machine/plant, the heater system should be turned off 15 minutes before draining the liquid.
- Service or manual mode: In this mode all electrical units can be turned on and off separately. Safety-technical devices like safety thermostats and dry-run protections remain active. However, aggregates and valves can be turned on which can lead to a dangerous situation. The service mode should only be used by perfectly trained personnel who is familiar with the machine functions. Every wrong manipulation can lead to an accident resp. machine damage.

2.2.3 Finishing Work

- Clean your hands thoroughly after finishing work.Before shutting down the machine for any long period of time, all production liquids are to be removed and the machine is to be thoroughly cleaned.

2.2.4 Changing Place of Operation

- Cut off the external power supply of the machine/plant even if only minor changes of the place are envisaged. Properly reconnect the machine/plant to the supply mains before recommissioning.
- For loading only use lifting gear and tackle of sufficient capacity. Appoint a competent marshaller to assist in the lifting operation. Lift machinery and equipment properly with suitable lifting gear and only in accordance with the operating instructions (fixing points for lifting tackle, etc.).

- Only use suitable means of transport with adequate carrying capacity. Fasten the loads safely using the suitable fixing points. Never workor stand under suspended loads.

- Before or immediately after completion of the loading operations the machine/plant must be secured by means of qualified devices against unintentional changes of position and a corresponding warning sign attached to the machine/plant. Before recommissioning the machine/plant these devices must be properly removed.
- Carefully refit and fasten all parts to be removed for transport purposes before recommissioning the machine/plant.

2. Safety

ATTENTION!
For recommissioning only proceed in accordance with the operating instructions!

2.3 Personnel Qualifications

The following safety measures are to be observed regarding qualifications of personnel:

- Only allow qualified personnel to work on the machines and installations. Remember to observe minimum age requirements. Qualified personnel are those who, on the basis of their training, experience, and instruction, as well as their knowledge of regulations and accident prevention procedures, are capable of operating the machine and recognizing and preventing dangers. Statutory minimum age limits must be observed.

- Establish responsibility for operation, preparation, service and repair.

- Make sure that only responsible personnel work on the machine or are present in the danger areas.

- Allow personnel undergoing training, learning, instruction, or in the framework of general training to work on the machine only under the guidance of experienced personnel.

- Allow work on the electrical system or resources to be performed only by an electrician in accordance with electrical codes or regulations.

- Those in charge of working on the machine must read the instruction manual, especially Chapter 2 of the safety instructions, before beginning to operate the machine. Once the machine is in operation, it is too late! This is especially true for those who only occasionally work on the machine such as maintenance or service personnel.

- Make sure that personnel are aware that the machine is their responsibility. Also, make sure that personnel are advised that it is their obligation to refuse to follow instructions which do not conform to safety regulations, especially instructions given by third parties.

2. Safety

2.4 Use of Operating Materials

- Users are obliged to observe the environment and waste removal laws for their region.

ATTENTION!
Users of this line are responsible for complying with local requirements known to the personnel and, in addition, any necessary supplements which arise due to the functions of the system. Evidence of misuse of operating or waste material should be reported.

In addition, all safety precautions listed in the functional information are to be strictly followed.

2. Safety

Additional Safety Precautions

These safety precautions are valid for the area of the wet processing systems and are to be followed in accordance with the safety data sheet of the chemicals in use.
The following instructions are, in principle, valid for all wet processing systems:

- Do not eat, drink, smoke, or use smokeless tobacco during work. Wash thoroughly before eating and drinking.

- Any escaping steam or gases at the exit end are to be directed to the exhaust system.

CAUTION!
Long periods of breathing the operating and waste vapors (such as resist vapors and solvents) can endanger human life. Regularly monitor the tightness and function of the suction systems.

ATTENTION!
Acids and brine are never to be made up in the machine because the thinning process may cause high temperatures which could damage the machine.

3. Installation

3.1 Assembly Advice

3.1.1 Accepting Goods from the Shipping Company

Confirm acceptance of delivery as being in "perfect condition" only after inspection is complete and no external damage has been found. After unpacking, the delivery is to be checked for any hidden shipping damages such as damage to pipes which might protrude, valves, coverings, etc. Check to make sure that all accessories and spare parts have been included. Check against the list of accessories, etc. Any damage should be reported immediately to the shipping company and the manufacturer. The damage should be confirmed on the bill of lading by the shipping company and a protocol should be drafted. The above is absolutely required for insurance purposes, and in case the buyer has his own insurance.

3.1.2 Delivery and Further Transport

The machines are often sent in parts due to their relatively large size. The sub-assemblies are sent in wooden crates or boxes.

CAUTION!
For loading only use lifting gear and tackle of sufficient capacity.
Appoint a competent marshaller to assist in the lifting operation.
Only use suitable means of transport with adequate carrying capacity.
Fasten the loads safely using the suitable fixing points. Never work or stand under suspended loads.
Before or immediately after completion of the loading operations the machine/plant must be secured by means of qualified devices against unintentional changes of position and a corresponding warning sign attached to the machine/plant. Before commissioning the machine/ plant these devices must be properly removed.

ATTENTION!
Never place the lift directly under the machine or assemblies.
Transport-ing devices or slings are not to touch any part of the machine when lifting to avoid chafing the machine coverings. Make certain that the control cabinet cannot tip when lifted or set down.
To prevent damage to the machine and its parts, it is recommended to transport the machine resp. machine parts in the wooden crates until the place of installation, to set them down gently and to unpack them only then.

3. Installation

The following items are to be observed when the crates are to be lifted by a forklift:

- Parts or pieces which have not been mounted or installed are to be removed first, for instance, pumps, etc.
- The lift may only be placed under the wooden crate or skids when transporting and never under the bottom of the machine or sub-assemblies.
- It is easiest to lift the machine on the side with the widest space between the supporting braces. Care should be taken not to damage the piping.

ATTENTION!
Never lower the machine on protruding parts or unsupported parts to avoid pressure damage to those parts. The machine and its parts must be set down gently to avoid damage, especially to the plastic parts of the machine.

3.1.3 Place of Installation

In addition to reasons of production, the following items must be considered when choosing the location of the installation:

- There must always be sufficient free space around the machine to ensure easy access for cleaning and maintenance. A minimum of 80 cm is recommended.
- Since the machine has a very stable frame, a solid floor is all that is needed for installation. The position chosen must be prepared according to the foundation plan. All supply services must be previously laid and must be ready for installation.

ATTENTION!
Remember that plastic modules can only be installed after they have reached ambient temperature. Remove the crate tops and leave them open until the assemblies have reached room temperature.

3.1.4 Installation Instructions

Should the machine be set up by means of forklifts, the lift must only be placed at the points on which the opposite stickers are put, in order to prevent damages of the machine.

3. Installation

3.2 Assembly of Machines

CAUTION!
During assembly and installation, all accident prevention regulations of the local professional organization and the local codes are to be observed.

Installation of the line should begin with a module that belongs in the middle of the line. A level is placed on the transport system to allow for exact alignment. Adjust the levelling screws at the supporting feet to the required height.
Put sealing paste on the connection area of the next module (pos.1/ fig.1) which will be connected with the preceding module.

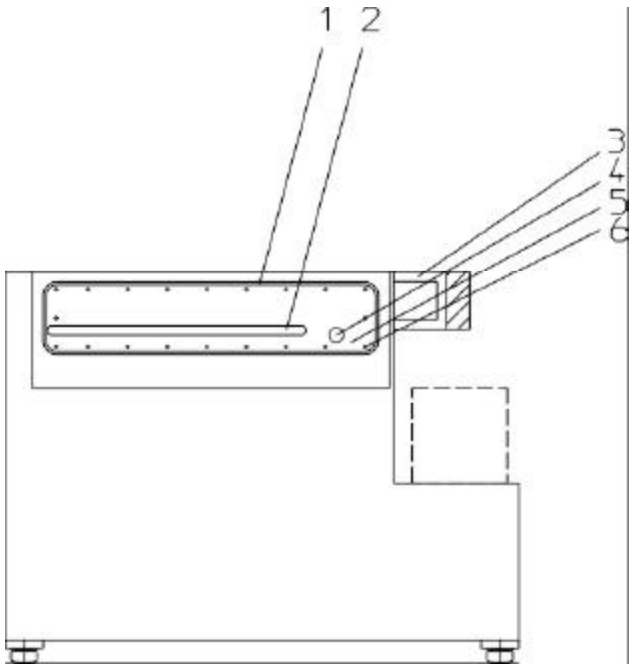

Figure 1:
Module Connection Area (section)

(1) Rubber Type Sealing Rope
(2) Transfer Slot
(3) Cable Channel
(4) Opening for Coupling
(5) Connection Area
(6) Threaded Bolt

The nuts and washers on the threaded bolts (pos.6) are removed. The module to be connected is placed in position with the already aligned module and then level led for correct alignment. Both modules are then bolted together with the nuts and washers previously removed. Conveyor rollers which may hinder access are to be removed. The washers are installed on the corresponding threaded bolts (pos.6) and the hexagonal nuts are screwed on.

3. Installation

The tightening of all nuts should be done in pairs so that the nuts across from each other are each tightened a little at a time until all nuts are completely tightened. The rollers previously removed should now be replaced.
Machines without their own transport drive (fig.2) should now have the connector coupling for drive transfer connected to the corresponding drive shaft of the new module. In order to do this, remove one transfer shaft of the transport system. It is advisable to remove the shorter of the two. The bearing half bushings of this shaft are lifted out after loosening the corresponding hexagonal nuts. Then the shaft can be lifted out.

To fit the connector coupling (pos.1), first remove the front V-ring (pos.2) of the coupling. The connector coupling can now be pushed with a slight screwing action through the respective opening in the module. The V-ring is then replaced and the drive side of the connector coupling is pushed into the corresponding section of the drive shaft which was not removed. Care must be taken that the V-rings fit properly. It may be necessary to adjust the fit of the ring.

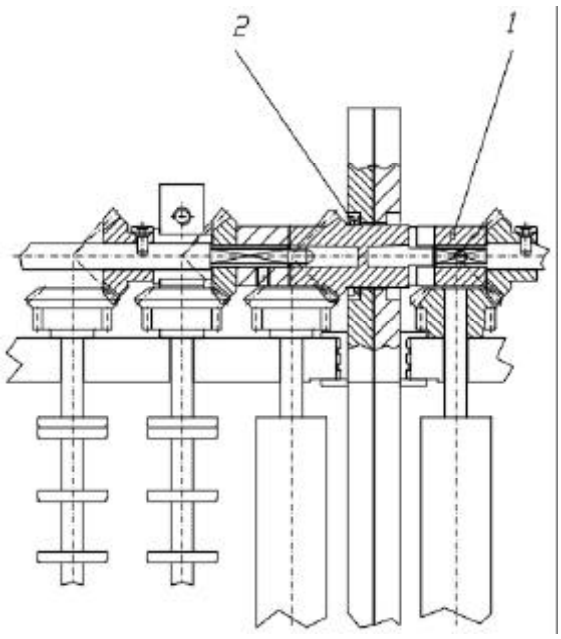

Figure 2:
Transfer of Transport System (Top View)

(1) Connector Coupling

(2) V-Ring

3. Installation

Now the drive shaft which was previously removed must be replaced and it must be turned in such a way that it engages with the connector coupling. The bevel gears of the individual conveyor rolls must be turned so that each bevel gear meshes properly. After the final section of the drive shaft has been re-assembled, the bearing half bushings are re-mounted and the hold down nuts are tightened. The same procedure is followed for further modules.

3. Installation

3.3 Supply Connections of Utilities

Place the control cabinet so that the control devices on the control panel can be seen from the operating side of the machine. At the same time, the machine also can be observed from the control panel. This is especially necessary to insure the safety of people in the danger areas of the line.

The electrical supply wiring to the control cabinet must be installed and connected by the user. The electrical connections are to be performed by a competent electrical expert. All VDE codes as well as local codes, especially regarding safety measures, are to be followed.

ATTENTION!
The machine corresponds to VDE-regulation 0113 (Association of German Electricians) and the machine safety law and is to be installed according to prevailing local regulations. The connecting cables should be installed so they are protected between the control cabinet and the machine. This prevents people from tripping over it and injuring themselves as well as damage to the connecting wires. Never exceed the connected loads given for the machine and listed in chapter 1.2 (Technical Data sheet).

The internal wiring of the machine has been installed complete in each module and must only be connected to the control cabinet when the line assembly is completed. The free ends of the connecting cables are coiled up and fixed to the module. They are ready to be connected. After assembly of the machine, the cable channel covers are removed and the cables are inserted to the control cabinet in accordance with the wiring diagram. After completion, the covers are replaced.

The total connected power of the line is determined by the sum of power required for all individual modules installed. The relevant power data can be found on the electrical diagrams, the machine labels, and in chapter 1.2 (Technical Data sheet).
Connections have been correctly carried out when the pump(s) of the process module reach full pressure. Otherwise, two connecting phases should be interchanged and then reconnected to reverse rotation. In addition, insure that also the rinse module pumps run in the correct direction. To do this, the protection caps can be removed to compare the turning direction of the shaft with the marked direction.

Compressed air supply lines to the machine must be piped and

3. Installation

connected by the user. The pressure must be adjusted to 6 bar*). This must be absolutely checked before the machine is turned on.

ATTENTION!
Compressed-air lines must be laid and fitted properly. Ensure that no connections are interchanged! The fittings, lenghts and quality of the hoses must comply ith the technical requirements.

After having completed the assembly and installation, a test run should be made according to the instructions in chapter 4.2 (Line Start-up).

Machine Visualization for Operation and Observation
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Manual for the Operation of Machinery Visualization Web Factory

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1 Machine Operation

1.1 Getting Started: First Steps to Machine Start

Caution !
A condition for the start-up of the line is that the machine has been duly installed, that the safety relevant requirements are fulfilled, and the fitter responsible for the installation has examined the function of the machine.

All machine tanks, supplying tanks and eventual supplier drums must be filled. Please learn the filling and dosing instructions from chapter 5.2 of the main documentation (process advice).

1.1.1 Preparations

1. Switch on main switch on the switch cabinet.

2. Unlock emergency stop, if set.

   Cooling also works with set emergency stop.
   For operating the heater the emergency stop is to be unlocked.

3. Switch on control voltage (control circuits are being supplied) with 'control on' press button on the switch cabinet.

Control on

Devices (‘Controls’) being programmed in 'interval' device operating mode start running.

Explanation of '**device operating mode**': the preselection of the device operating mode only concerns an individual device on the machine like e.g. a pump, whereas the **machine operating mode** concerns the entire machine.

4. RESET for unlocking of safety thermostats and resetting of error messages. (Press 'RESET' key on the switch cabinet for at least 2 sec.)

When all disturbances have been eliminated all pending errors can be acknowledged with the reset key on the switch cabinet.

The safety thermostats and the frequency converters can only be reset on the switch cabinet. With PLC controlled machines other error messages can also be acknowledged in the visualization via F4 'Reset'.

5. Examination of the preconditions for starting the machine

   a) Is the machine within the period of operation?

   b) Has the end of the heating phase to be waited for ? With PLC control: As long as the machine heats, the machine does not emit an enable signal.

   c) Is compressed air on?

   d) Have the following machines been enabled ?

   e) With PLC control: Has 'maintenance' been switched off after maintenance process (key switch to be set to '0') ?

6. Acknowledge possibly pending errors: Opened covers, dry-run protection, etc.. Pending errors can be seen in the visualization or by means of the red 'disturbance machine' light on the switch cabinet.

Disturbance machine

Pending error messages are deleted with **F4 Reset** or with the RESET key on the switch cabinet.

Error messages of the safety thermostats have to be reset with the reset key on the switch cabinet.

With PLC machines the white coloured light for 'machine enabled' is shining, then.

Machine enabled

1.1.2 How to Set Machine to Readiness for Start (Autom. Readiness for Start)

Either with **F1 Start** or

with START key on the switch cabinet.

Setting the machine to readiness for start: Either by pressing the START key on the switch cabinet or via F1 on the visualization screen.
Then the entire machine (all parts of the line at a time) is set to readiness for start. If no panels are on the machine, the machine will automatically go into Stand-by. If there are panels on the machine, the machine will start running.

All devices (‘Controls’) preselected with device operating mode 'ON' switch on.

Generally it is not possible to set only an individual section of a mulit-section line to readiness of start as they are linked in the PLC program. This function is only available on special request.

1.1.3 Stand-By

When 'machine on' is active and no circuit boards are run through the line anymore, the machine switches to stand-by mode (provided that 'override sensor' or 'override lid safety switch' is not activated). Then the water supplies are closed and the conveyor switched off.

All devices (‘Controls’) for which device operating mode 'stand-by' has been selected switch off.
Devices (‘Controls’) being operated with device operating mode 'ON' continue to run.
Devices (‘Controls’) which are operated with device operating mode 'interval' also continue to run in the interval mode.
This applies for example to modules with heaters where the pumps are normally run in interval operating mode (see chapter 3.3 'submenu controls’ (devices)).

When 'override sensor' or 'override lid safety switch' are activated there is no stand-by function, neither for the machine nor for the operation of the individual units.

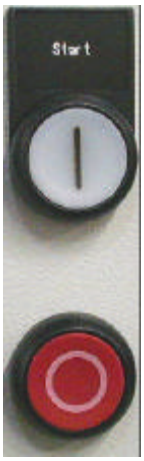
1.1.4 How to Start the Machine

When the line is ready for start the machine starts automatically via the input sensor when the first circuit board runs into the machine.

All devices (‘Controls’) being programmed with ‘Stand-by’ as device operating mode switch on.

1.1.5 How to Stop the Machine (Automatic Stop)

The machine can be stopped either with the STOP button on the switch cabinet or with F2 in the visualization.



or

Option: With some lines having machines linked in series and having separate switch-on function, only that section of the line is stopped via F2 for which the current module page is opened. To stop the entire machine first open the 'summary' page and then switch off all the line sections.

All devices (‘Controls’) preselected with the device operating mode 'ON' switch off.
All devices (‘Controls’) being programmed with the device operating mode 'interval' keep running.

1.2 Machine Operating Modes in Detail

The operating modes for **machines** concern the entire machine. The operating mode for **devices** described in chapter 1.3 concerns individual devices on the machine, the operating mode of which can be separately programmed (=**device operating mode**).

1.2.1 How to Set Machine to Readiness for Start (Autom. Readiness for Start)

Function
Setting the machine to readiness for start means to switch on the machine without having the transport running. The devices (‘Controls’) programmed with 'stand-by' are not running yet. Only the units in device operating mode 'ON' are put into operation.

Setting
How to set the machine to readiness for start: Either press the START key on the switch cabinet or click function key F1 of the visualization menu page. Like this the complete line (all individual sections at a time) are set to readiness for start.

Generally it is not possible to set only an individual section of a multi-section line to readiness of start as they are linked in the PLC program. This function is only available on special request.

1.2.2 How to Stop the Machine (Automatic Stop)

Function
Machine stop: Machine is not ready for start any longer. Conveyor switches off. Devices (‘Controls’) such as pumps are turned off (if programmed in device operating mode 'ON'), except pumps with interval switching preselection. The heater/cooling systems keep running.

Setting
To stop the machine either use visualization F2 or the STOP key at the control cabinet.

1.2.3 'Stand-By' Operating Mode

Function
The machine is equipped with a stand-by function as basic setting.
When the machine is ready for start with 'START' and no circuit boards run through the line, the machine automatically switches to stand-by operating mode **(provided that 'override sensor' or 'override lid safety switch' were not activated).**

Then the water supplies are closed and the conveyor is switched off.

Devices (‘Controls’) for which device operating mode 'stand-by' was selected switch-off.
Devices (‘Controls’) which are run with device operating mode 'ON' keep running.
Devices (‘Controls’) with device operating mode 'interval' continue to run as well (see chapter 3.3, 'submenu units').
This also applies to modules with heaters, for example, where pumps normally are run in interval operating mode.

Setting
Corresponds to the basic setting. Please make sure that 'overriding sensor' is not activated in the 'controls (devices)' menu in the input module

1.2.4 'Override Sensor' Operating Mode

Function
Machine continues to run even if no circuit board is in the machine.

With 'overriding sensor' the sensor at the input is set out of function. Like this the machine can be run in continuous run for test purposes; i.e. the machine continues to run even if no circuit boards are running through the line. By this the stand-by function is invalidated. The units programmed with device operating mode 'stand-by' continue to run as well.

Setting
'ON/OFF' in the input module under 'controls (devices)' menu.

1.2.5 'Override Running Empty' Operating Mode

Function
The machine continues to run, even if an error of the 'empty-run' category has generated. The 'empty-run' function is deactivated. The error, however, is displayed nevertheless.

Setting
With PLC controlled machines setting is done over visualization. This function concerns the transport and is therefore deposited in the first module (input module): 'Controls (devices)' menu. Possible selections: ON/OFF.
With contactor controlled machines: Over key switch on the switch cabinet or switchboard (positions 0 = OFF, 1 = ON).

1.2.6 Operating Mode with Lid Safety Switch (Initial Setting)

Override lid safety switch

key set to position '0'

Function
When the 'override lid safety switch' is switched off (initial setting = 0) the machine works with lid safety control. If a lid is opened the complete machine is stopped immediately. With a multi-section line the sections behind the opened lid section will continue to run.

1.2.7 'Override Lid Safety Switch' Operating Mode: Operation without Lid Safety Control

Override lid safety switch

key set to position '1'

Function
When switching on the 'overriding lid safety switch' (position 1 of the key switch) the lid safety control is switched off and the machine continues to run when lids are opened.

Preconditions for Setting

To allow switching on of 'overriding lid safety control' all lids of the machine or section have to be closed first.

Then the key switch is set to 1 (= overriding). Now the overriding of the lid safety control is active and the lid safety control is switched off.

For safety reasons, however, starting can only performed with closed lids; i.e. the lids are only released when the machine is running.

Setting
Either over key switches on the switch cabinet or on operator console at the machine.
Switching positions: 0 = not activated / 1 = activated

If a line consists of several machine sections (e.g. DES line) a separate key switch for the lid safety device exists for each section. There is no lid safety device for the inspection module.

ATTENTION !
If the lid safety devices are bridged (overriding lid safety device ON = 1) and a lid is opened, the pumps keep running. Therefore, utmost caution is required when opening the module while the pumps are running.

Pumps, which are turned on in the interval or stand-by operating mode at that moment, also keep running with opened lid. After that interval or standby mode has elapsed the pumps remain switched-off and do not start again automatically.
This protects against unexpected starting of the pumps, if works are performed at the opened module.

With 'overriding lid safety device' and opened cover no pump can start automatically.

1.2.8 'Maintenance' Operating Mode

Maintenance

key set to position 1

Function
Now the line status is 'maintenance'. In this condition all devices (‘Controls’) and valves are switched off. In the maintenance operating mode all pumps

and solenoid valves can now be selected individually and operated separately. This can be done in the visualization in the corresponding module by clicking the 'maintenance' menu. A list with the available pumps opens.

In the maintenance operating mode the safety relevant conditions for switching off the pumps remain unchanged (e.g. with the stop functions of the dry-run protection, safety thermostat, filter lid safety device... the corresponding pumps and valves continue to switch off automatically.)

Preconditions for Setting
The line must be stopped in order to reach the 'maintenance' operating mode. The line can be stopped either via the 'machine stop' pressure key on the switch cabinet or via the visualization (F2).

Then the 'maintenance' key switch can be switched on (to 1). Thereafter the 'maintenance' function has to be released with the 'maintenance' function key (F3) in the visualization.

Setting
Setting is done with key switch on the switch cabinet and/or operator console at the machine.
To activate the maintenance mode: Switch position 1 = maintenance active.

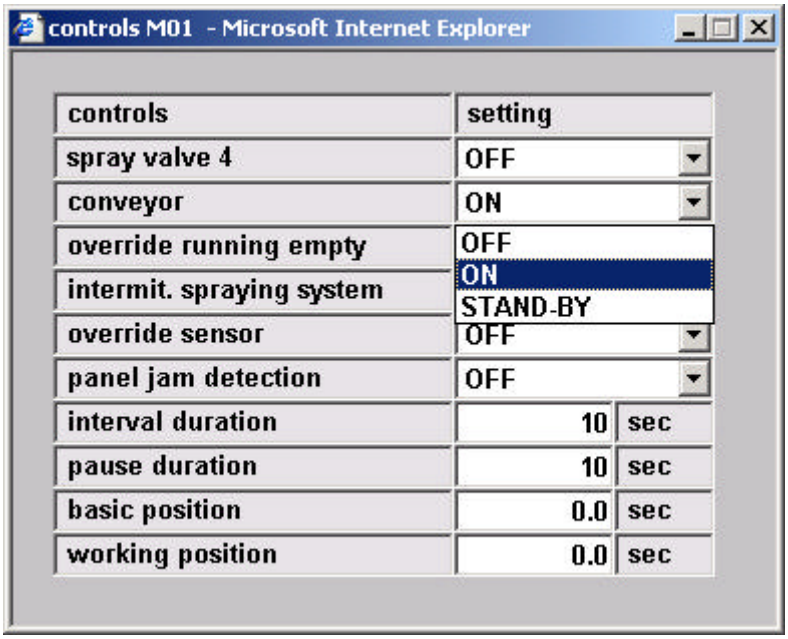
Leaving the Maintenance Operating Mode

Maintenance

Reset the key switch to '0' position.
When leaving the maintenance operating mode all devices (‘Controls’) and valves in the maintenance mode are switched off. i.e. with renewed maintenance operation the devices (‘Controls’) or valves selected last are no longer switched on but have to be selected again.

1.3 Device operating modes

Function
Contrary to the **machine** operating mode (see chapter 1.2) the **device operating mode** applies to one single device of the machine. On the individual modules the devices ('Controls') belonging to the module can be set. This is done with a drop down list field in which the desired operating mode can be set for every device. To do so click the field with the arrow which opens downward then.



Setting
Possible device operating modes of the devices ('Controls'):

OFF: The device (Control) remains switched off.

INTERVAL: device (control) switches on when device is switched on; e.g. heaters and the circulation pumps belonging to them.

ON: With START machine the device (control) switches on. Like this the machine is set to readiness for start. With STOP machine the device (control) switches off.

STAND-BY: The device (control) switches on when machine starts production run (circuit boards run into the machine). Exactly the same way it switches off when the machine is empty. With machine operating mode 'overriding sensor' or 'overriding lid switch device' this device operating mode is set out of function.

2 Function Key Bar

Over the function key bar all machine functions can be reached with a mouse click

2.1 'Machine Start' Function Key F1

F1 starts the machine. When the machine is started the background of the start key turns to green.

2.2 'Machine Stop' Function Key F2

F2 stops the machine (automatic stop). When the machine is stopped the text on the button turns to red.

2.3 'Maintenance' Function Key F3

Maintenance

With maintenance key tilted on the switch cabinet F3 calls for maintenance operation. Then the 'maintenance' menu item is released in the module page and the devices (‘Controls’) present in the module can be switched.

2.4 'Reset' Function Key F4

F4 serves to acknowledge error messages in the software. This corresponds to the acknowledge key (reset) on the switch cabinet. Already solved errors which are still displayed are cleared with the acknowledge function. The safety thermostats and frequency converters can only be reset with the reset key on the switch cabinet.

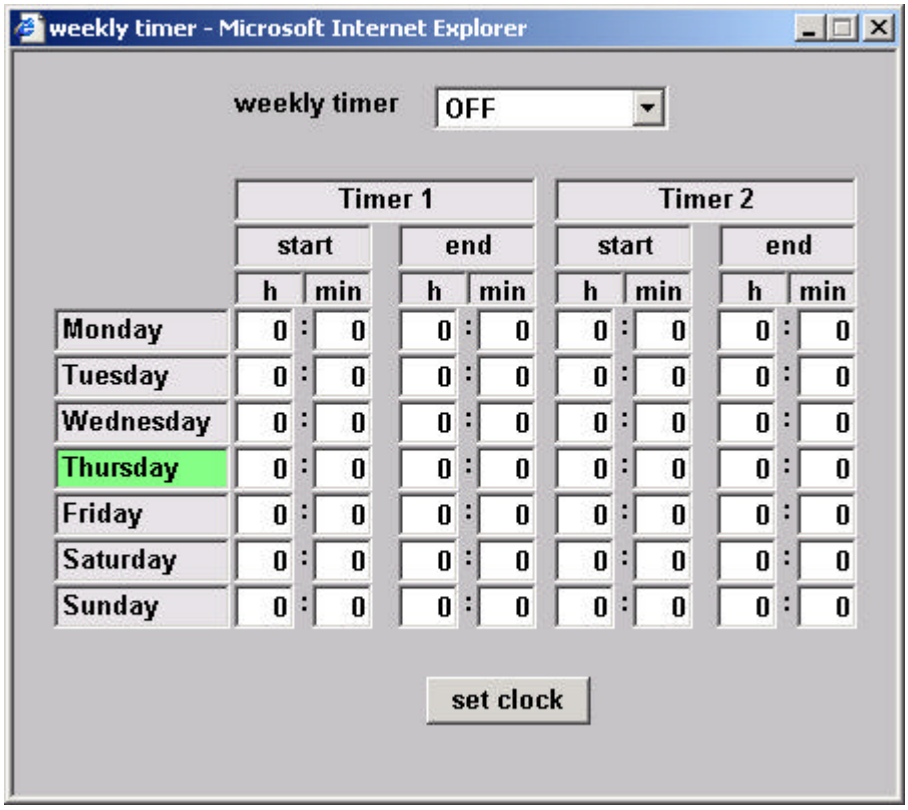
2.5 'Weekly Timer' Function Key F6

Weekly Timer

The machine can be automatically switched on over a weekly timer. Thus the machine can be switched on for heat-up before production starts. Heaters are ready for use when the device is switched on and the machine is within the attended time.

Setting

The menu is called over function key F6 at the lower edge of the screen. Here the switch-on and off times of the weekly timer can be defined. If the start is set for 00:00 and the end for 23:59 the machine will remain in continuous operation.



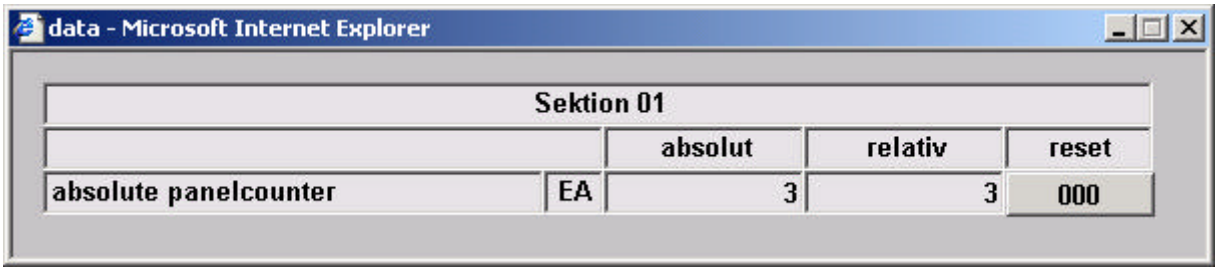
The lower part of the weekly timer display serves for the synchronization of the timers in PLC and PC. By pressing the only button available in the weekly timer display the entered set value is transferred to PC and PLC. Please note that the date format for input of the set value is YY MM DD (year, month, day - international) and not DD MM YY (day, month, year) as is customary in Germany.

2.5.1 Heat-Up Phase

The status 'heat-up phase' is given when the device and the heater are switched on, when the machine (weekly timer) is within the operating time and when the temperature of a module does not exceed the set warning limit. After the heat-up phase the machine is ready for operation immediately.

2.6 'Data' Function Key F7

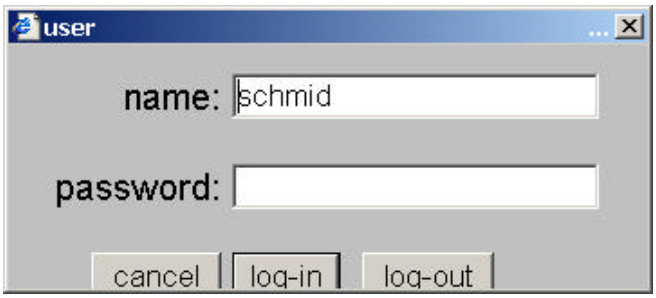
Here production data like 'panel counter' or consumption data can be displayed.



2.7 'User' Function Key F8

User

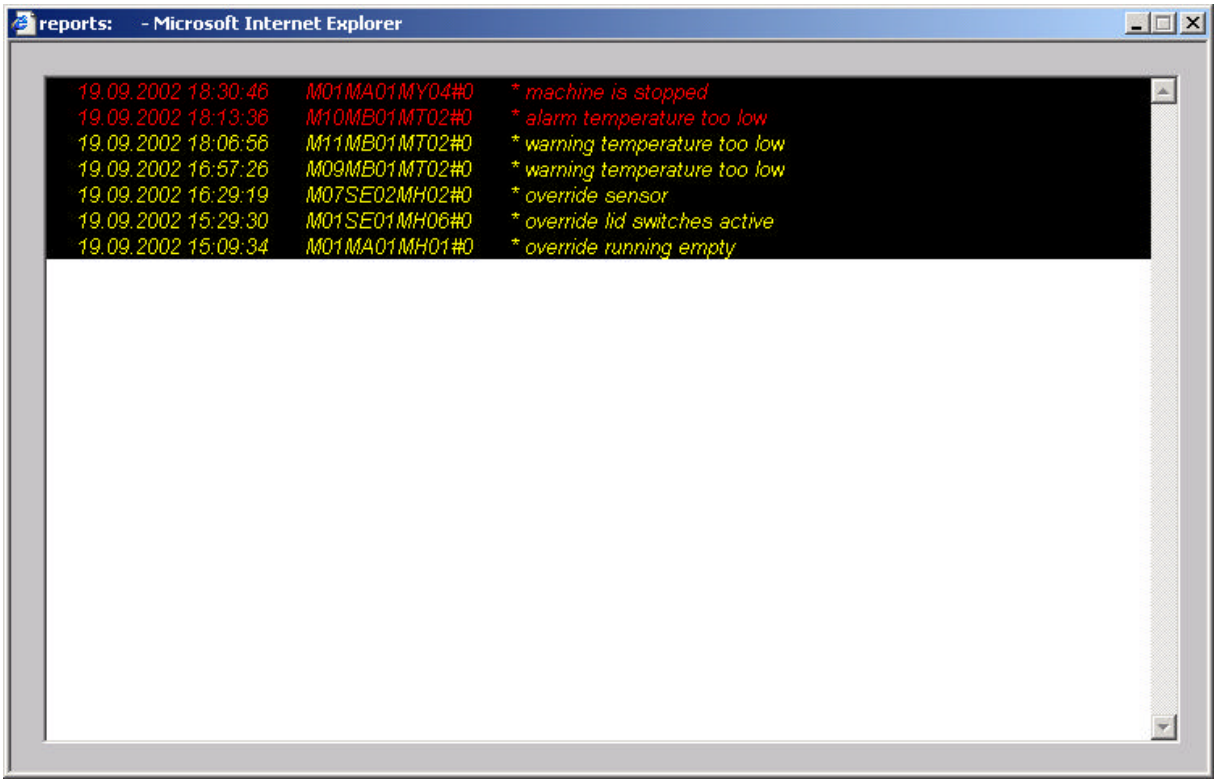
With function F8 'user' the various users filed in the system can be logged in. Log-in is done by entering the user name as well as the password and by clicking the button 'log-in'. The currently logged-in user is entered in the 'name' field when page 'user' is opened.



Definition of new users is described in chapter 4.2.4.
Chapter 4.2.5 explains how special authorities can be granted to individual users.

2.8 'Alarms' Function Key F9

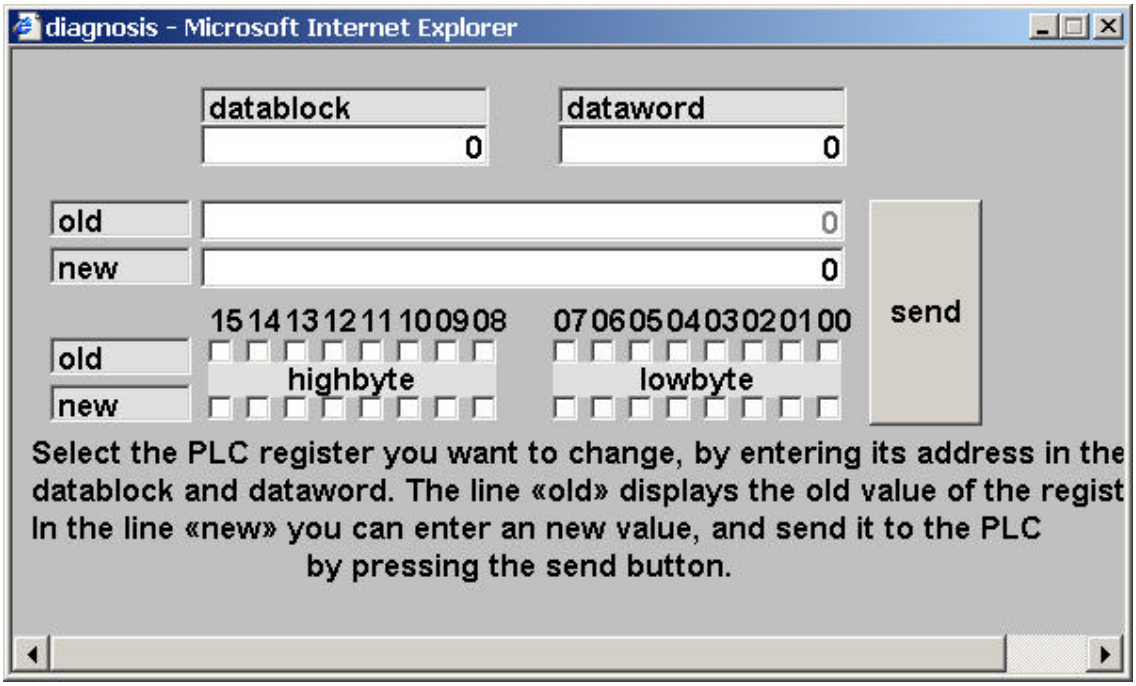
With function F9 the latest accumulated fault messages are displayed. When an error is generated this is shown in red. Acknowledged errors are no longer shown in the alarm list.



All incoming and outgoing alarms are logged in an SQL Server 2000 data base.
Evaluation of the alarm lists at a later date can be done over any external application of data base.

2.9 'Diagnostics' Function Key F10

The F10 key serves to enter into the 'Diagnostics' function. If necessary datawords in datablocks can be changed here in the PLC (balancing of unchangeable PLC parameters):



2.10 Further Functions of the Key Bar

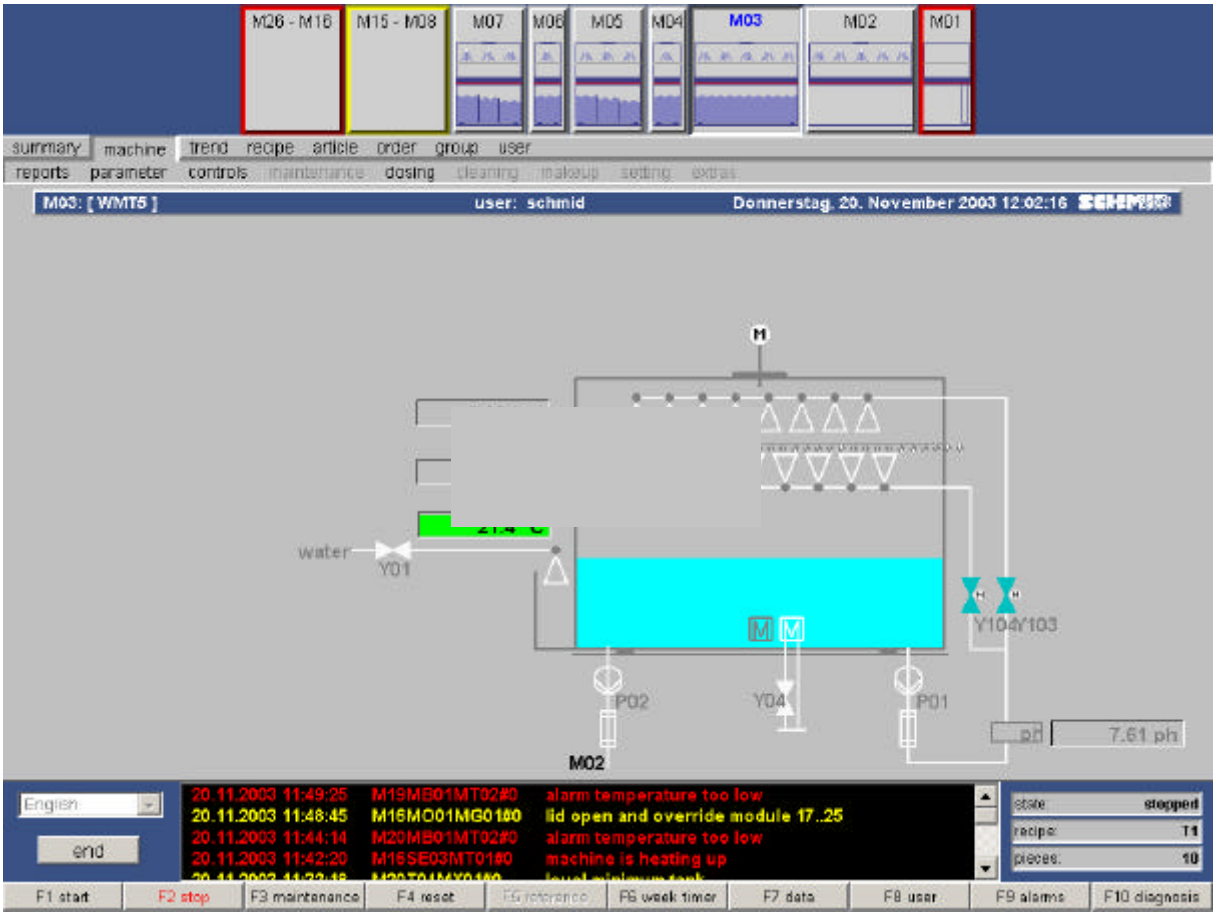
Further to the function keys the key bar also disposes of some fields which indicate the line status.

The 'end' button terminates the visualization and runs down the PC of the line so that the PC can be switched off.

3 Functions of the Visualization

3.1 Basic Elements of the Main Screen

The main screen display is subdivided into the following parts:
- the upper part displays: the module selection bar (1)
- the part below the topmost part displays: the menu bar with the main menus (2)
- line below: submenu bar for selected main menu (3)
- blue line: status line with number and name of the currently selected module (4)
- the part in the middle: module display of the current module (5)
- below the module display: information display (6)
- the lower part: hot key bar (7).



1
2
3
4
5
6
7

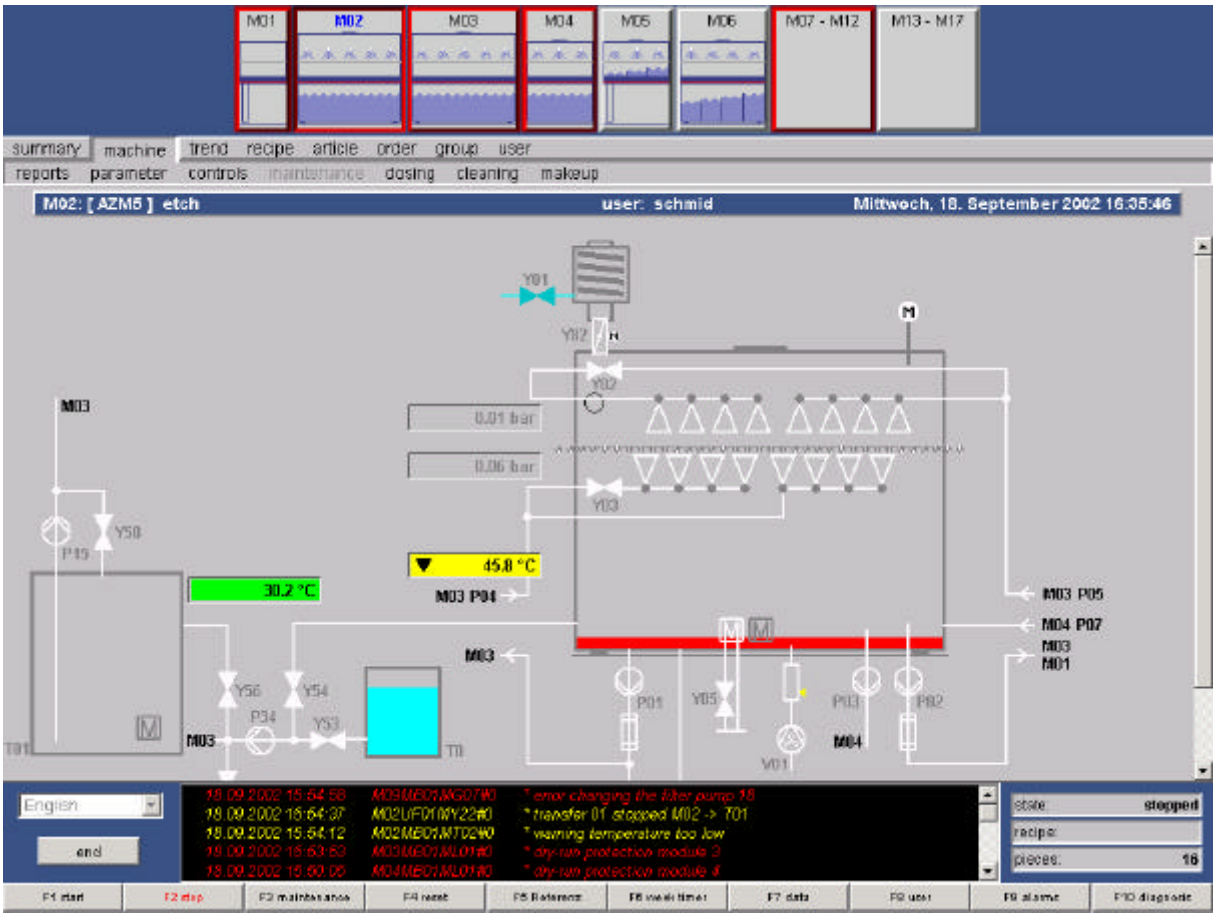
4 Menu Bar for Main Menus

4.1 Module Selection

An error situation in the line is signalled on the module selection bar by a colour change of the respective module (yellow: warning, red: disturbance). By clicking a module on the module selection bar the desired module is displayed in the middle part. By clicking the symbols for another section the modules of the other sections can be reached.

The current actual status of the module is directly displayed on the module page (temperature, pumps active, cooling active, ...).

In general the following applies: 'light blue' represents water, 'green' represents compressed air.
If an error appears the user is guided to the said error. An error caused by an analogue parameter (digit) is displayed by the colour change of the actual value field in the module (warnings yellow, alarms red). An error released by a binary contact (ON or OFF) is displayed on the module page and causes menu option " messages " to change in colour (warnings yellow, alarms red).



Each module page disposes of a menu line (arrow) in the upper range where the settings for the module can be done. Hereafter the subwindows of the module page are explained in detail.

4.2 Summary of the Buttons on the Bar

4.2.1 Summary

With the menu item 'Summary' the basic image of the line can be reached showing individual line parts as buttons. The background colour of the buttons enables an easy identification of the line status: 'red' represents 'pending alarms' and/or 'yellow' represents 'pending warnings'. By clicking the desired button the first module screen of the selected line part is reached.

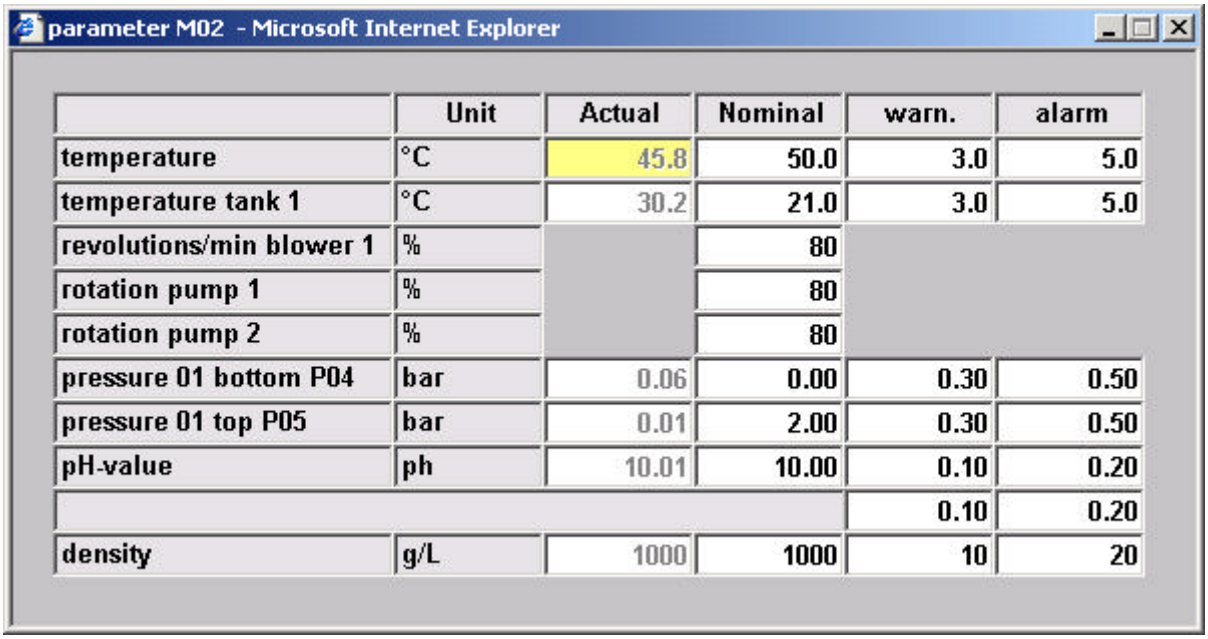
4.2.2 Machine

With item 'Machine' the module screen selected last is opened in the main part of the screen. Has no module been selected yet, the first module screen of the line will be opened.

4.2.2.1 Messages

Machine messages are emitted in the information window. New pending error messages are displayed in normal writing.
Error messages already acknowledged but not yet rectified are shown in italic letters with an asterisk put in front.

4.2.2.2 Parameter:

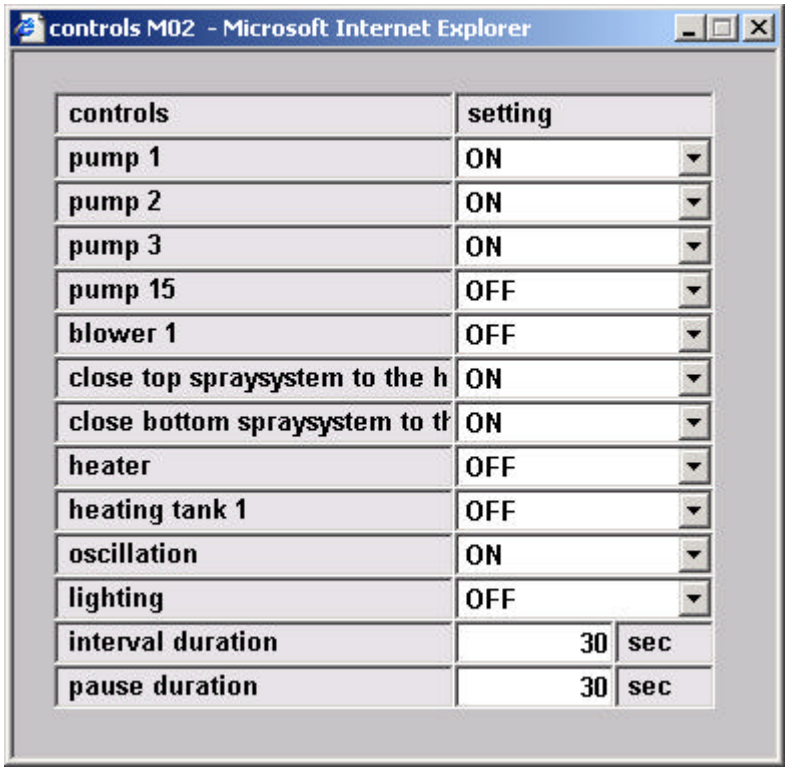


	Unit	Actual	Nominal	warn.	alarm
temperature	°C	45.8	50.0	3.0	5.0
temperature tank 1	°C	30.2	21.0	3.0	5.0
revolutions/min blower 1	%		80		
rotation pump 1	%		80		
rotation pump 2	%		80		
pressure 01 bottom P04	bar	0.06	0.00	0.30	0.50
pressure 01 top P05	bar	0.01	2.00	0.30	0.50
pH-value	ph	10.01	10.00	0.10	0.20
				0.10	0.20
density	g/L	1000	1000	10	20

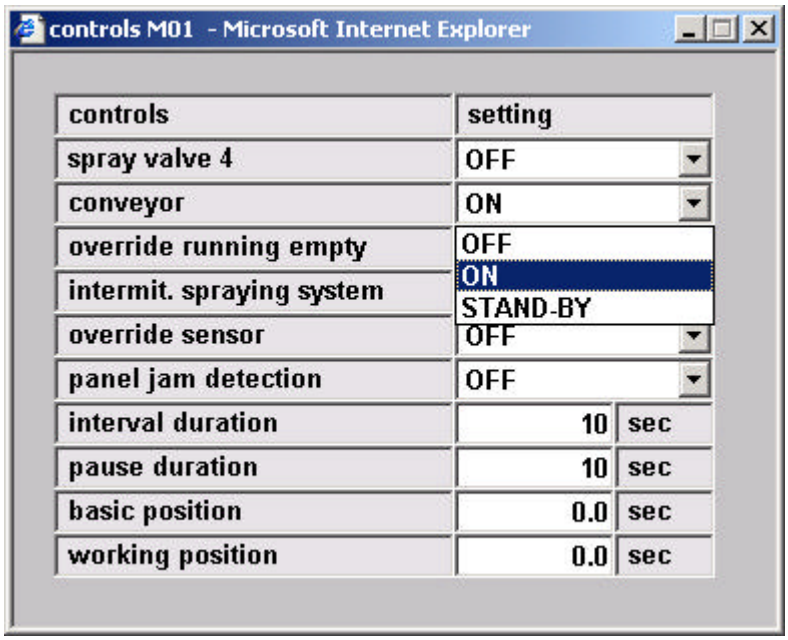
All module-related parameters (set values, warning and alarm limits) are determined here. If a warning for the corresponding analogue value is present the background colour of the 'actual value' field changes to yellow. For alarm display the background colour of the 'actual value' field turns to red.

By clicking the 'nominal value' field to be modified the entry mode is reached. Over the numerical pad of the keyboard a new value is directly entered into the clicked field.

4.2.2.3 Devices (‘Controls’)

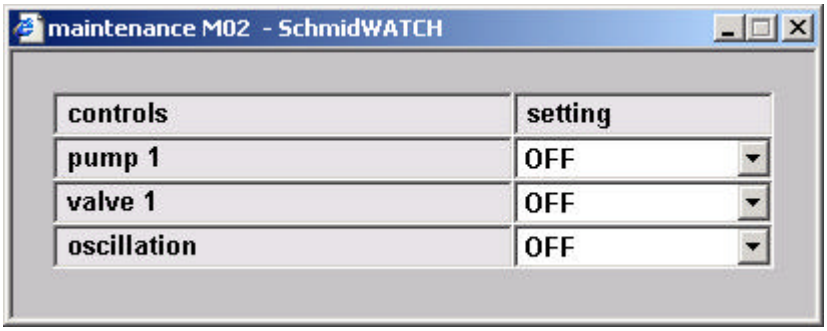


Here the operating mode of the module-related devices (‘Controls’) can be set. This is done with a drop-down report field in which the desired operating mode can be set for every device (control).



4.2.2.4 Maintenance

Here every device (control) at the module can be switched on and off in maintenance mode. In normal operation mode the menu item 'maintenance' is inactive. By switching off the maintenance mode all devices (‘Controls’) switched on during maintenance mode are switched off again.



How to start the maintenance mode:
- Set the key switch on the switch cabinet to 'maintenance'.
- Call maintenance operation with function key F3.

Maintenance

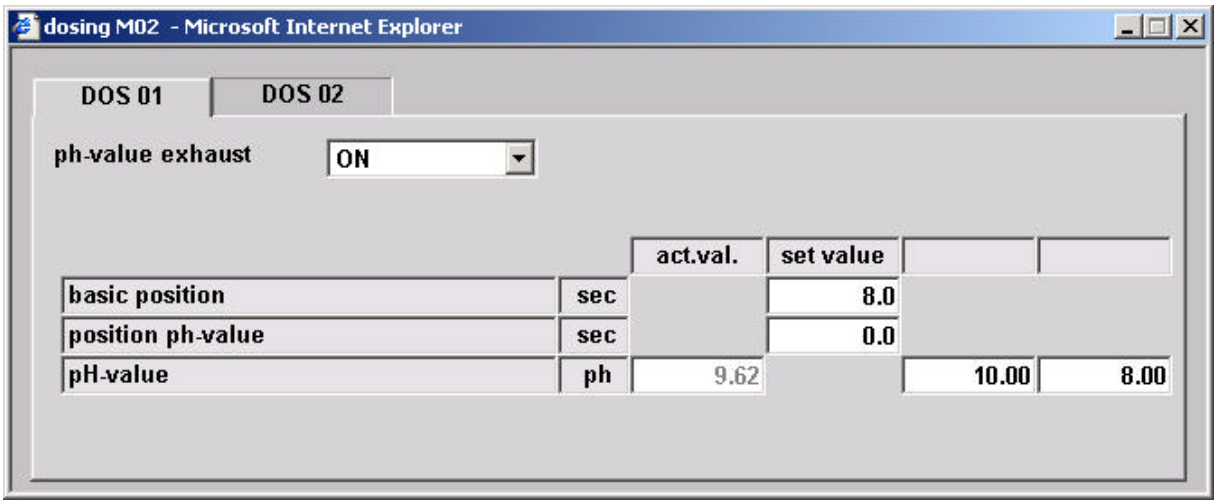
- Submenu item 'Maintenance' is released now (change from grey to black).
- Setting of device: ON/OFF.

Warning :

Only well instructed and experienced personnel is entitled to operate the maintenance mode. Faulty operation might cause a damage of the machine.

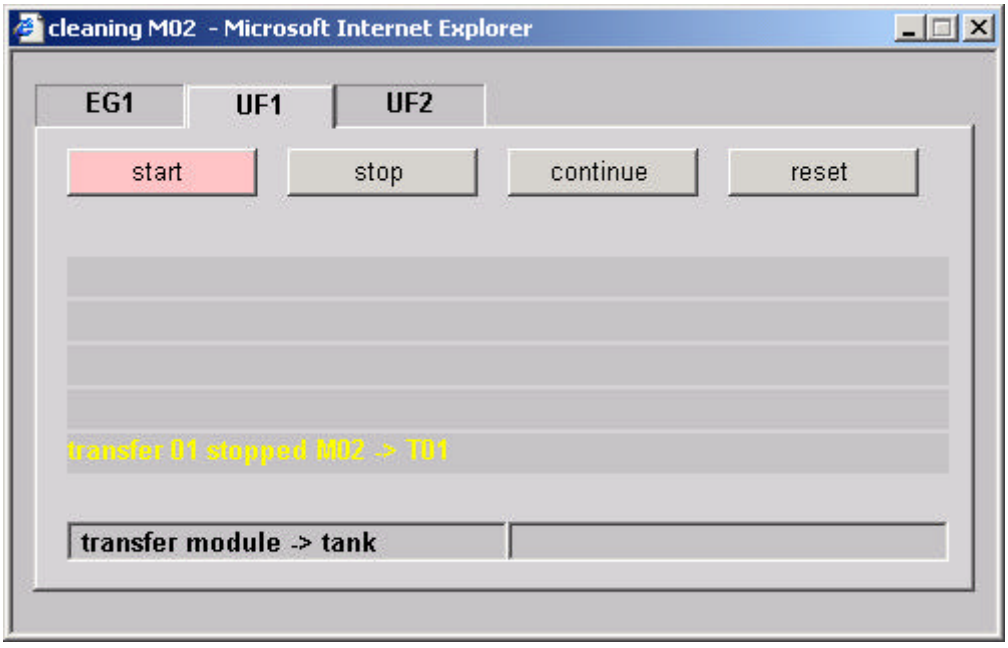
4.2.2.5 Dosing

Parameters for the dosing systems of the module can be entered here if the module disposes of a dosing system. If no dosing is installed in the module this menu item is inactive. Depending on the machine type dosing quantities for manual and automatic dosing and other dosing parameters can be defined here (e.g. produced area by which dosing is to be effected).



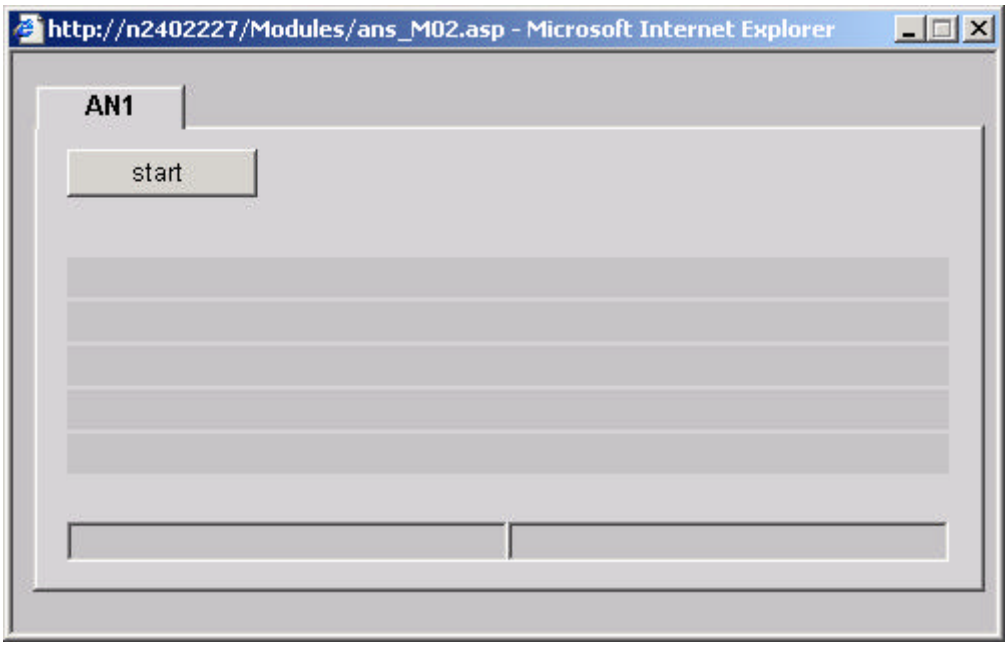
4.2.2.6 Cleaning

If a cleaning cycle is provided for the module it can be started in the secondary window 'cleaning' when the machine is in operating mode 'automatic stopped'. If there is no cleaning function in the module this menu item is inactive. All data related to cleaning are entered here.
For this the module is emptied first (EG1) or the contents filled into a tank (UF1). After cleaning the medium can be pumped back from the tank into the module (UF2). All actions are introduced or interrupted with the 'Start' button and terminated with the 'Stop' button. The 'Continue' button continues the interrupted activity.



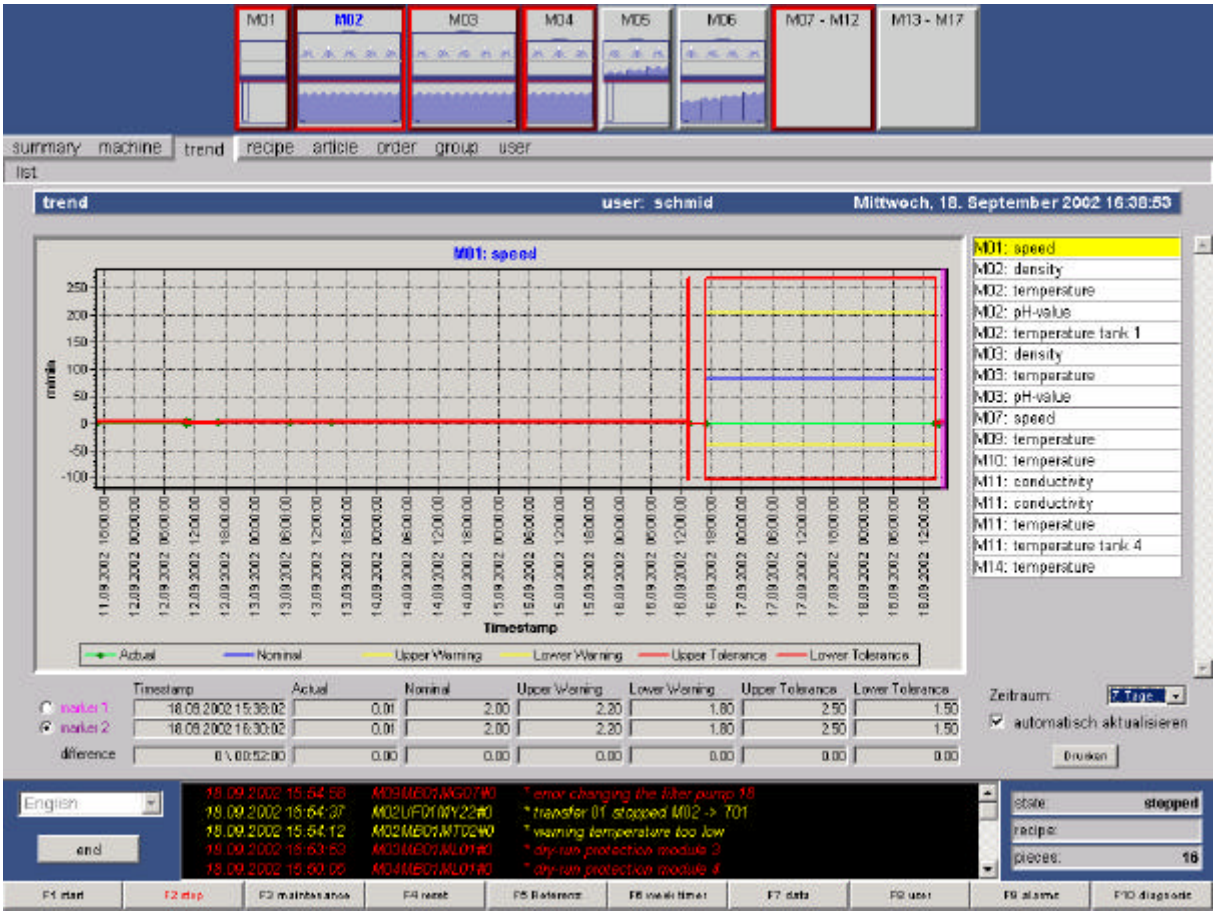
Make-Up

With processing modules this window serves to start the new make-up of baths. For this the machine has to be in operating mode 'automatic stopped'. The new make-up of the medium is started with the 'Start' button.



4.2.3 Trend

In menu item 'Trend' the analogue parameters 'Actual Value' and 'Set Value' of the individual module are displayed over a period of time.
Only those values are recorded which slowly change over a period of time (temperature, redox, conductance, pH-value).

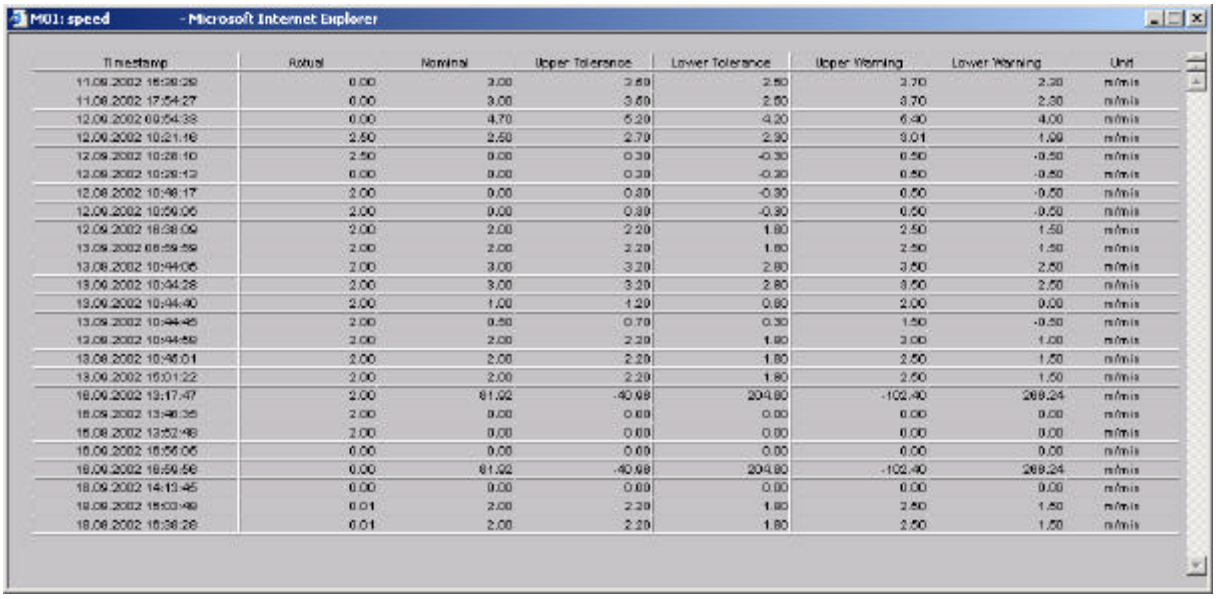


Settings / Selections

- Selection **marker 1** & **marker 2:** By means of the two markers a certain period of time can be statistically evaluated. To do so select marker 1 and place it at the desired position in the trend window. Then select marker 2 and place it at a position later in the trend. The small boxes at the lower edge of the menu page on the right of the marker selection show the deviations between these points.
- **'Period'** drop down menu: The time interval displayed in the trend window
- **'Automatic Update'** of check boxes: The trend is updated in regular intervals
- **'Print'** function button: The trend can be emitted to a printer installed in the operating system.

4.2.3.1 Submenu List

Here the messages are displayed in tabular form.

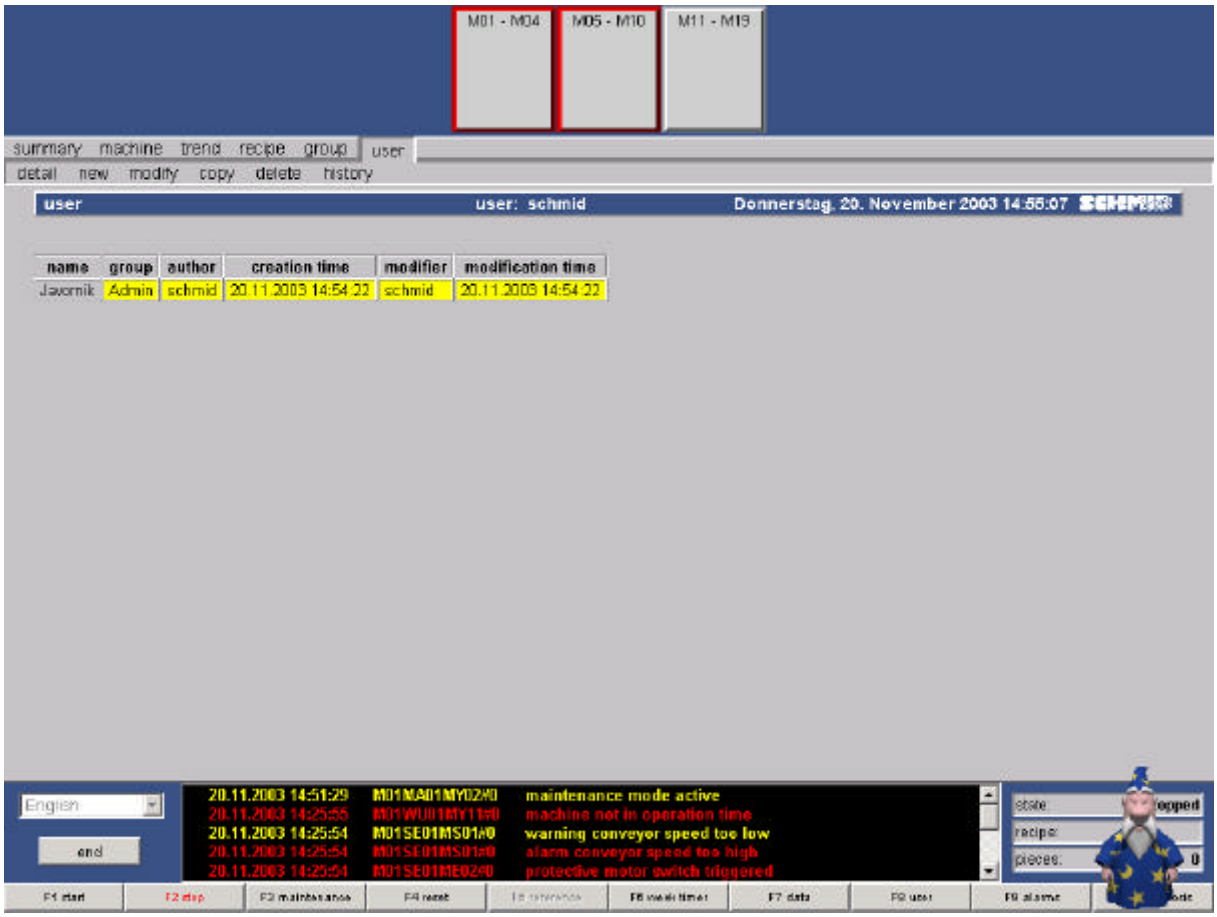


Timestamp	Actual	Nominal	Upper Tolerance	Lower Tolerance	Upper Warning	Lower Warning	Unit
11.09.2002 16:20:29	0.00	3.00	3.69	2.50	3.70	2.30	m/min
11.09.2002 17:54:27	0.00	3.00	3.69	2.50	3.70	2.30	m/min
12.09.2002 09:54:38	0.00	4.70	5.29	4.20	5.40	4.00	m/min
12.09.2002 10:21:16	2.50	2.50	2.79	2.30	3.01	1.99	m/min
12.09.2002 10:28:10	2.50	0.00	0.39	-0.30	0.50	-0.50	m/min
12.09.2002 10:29:12	0.00	0.00	0.39	-0.30	0.50	-0.50	m/min
12.09.2002 10:48:17	2.00	0.00	0.39	-0.30	0.50	-0.50	m/min
12.09.2002 10:59:05	2.00	0.00	0.39	-0.30	0.50	-0.50	m/min
12.09.2002 16:38:09	2.00	2.00	2.29	1.80	2.50	1.50	m/min
13.09.2002 08:59:59	2.00	2.00	2.29	1.80	2.50	1.50	m/min
13.09.2002 10:44:05	2.00	3.00	3.29	2.80	3.50	2.50	m/min
13.09.2002 10:44:28	2.00	3.00	3.29	2.80	3.50	2.50	m/min
13.09.2002 10:44:40	2.00	1.00	1.29	0.80	2.00	0.00	m/min
13.09.2002 10:44:45	2.00	0.50	0.79	0.30	1.50	-0.50	m/min
13.09.2002 10:44:59	2.00	2.00	2.29	1.80	3.00	1.00	m/min
13.09.2002 10:46:01	2.00	2.00	2.29	1.80	2.50	1.50	m/min
13.09.2002 15:01:22	2.00	2.00	2.29	1.80	2.50	1.50	m/min
16.09.2002 13:17:47	2.00	81.02	-40.68	204.80	-102.40	269.24	m/min
16.09.2002 13:48:35	2.00	0.00	0.00	0.00	0.00	0.00	m/min
16.09.2002 13:52:48	2.00	0.00	0.00	0.00	0.00	0.00	m/min
16.09.2002 16:56:06	0.00	0.00	0.00	0.00	0.00	0.00	m/min
16.09.2002 16:59:58	0.00	81.02	-40.68	204.80	-102.40	269.24	m/min
18.09.2002 14:13:45	0.00	0.00	0.00	0.00	0.00	0.00	m/min
18.09.2002 15:03:49	0.01	2.00	2.29	1.80	2.50	1.50	m/min
18.09.2002 16:36:28	0.01	2.00	2.29	1.80	2.50	1.50	m/min

4.2.4 User

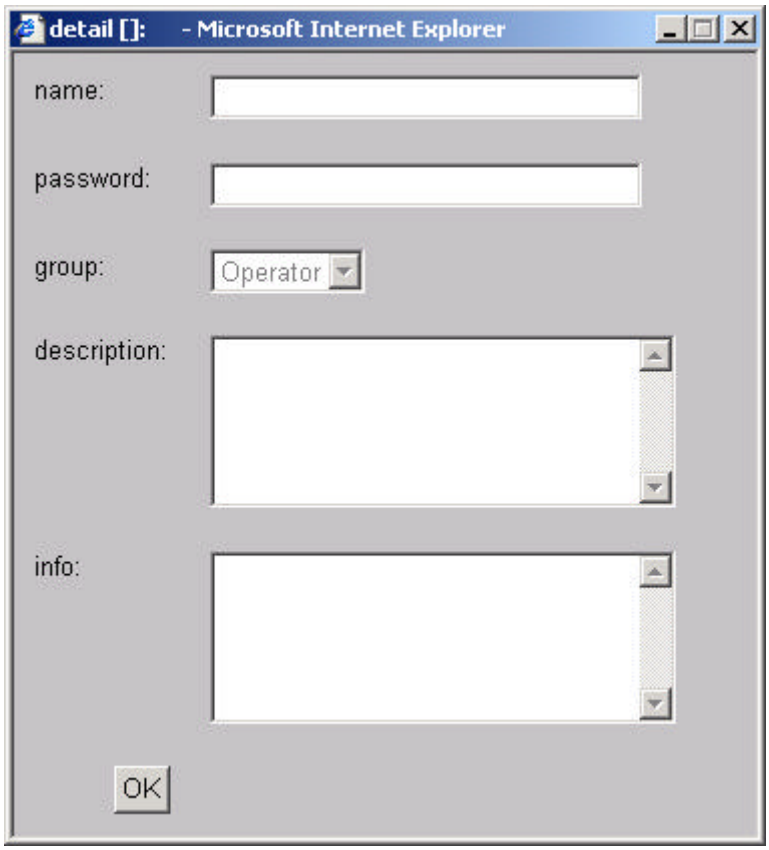
User management of the visualization system can be found in 'User'.

4.2.4.1 Summary



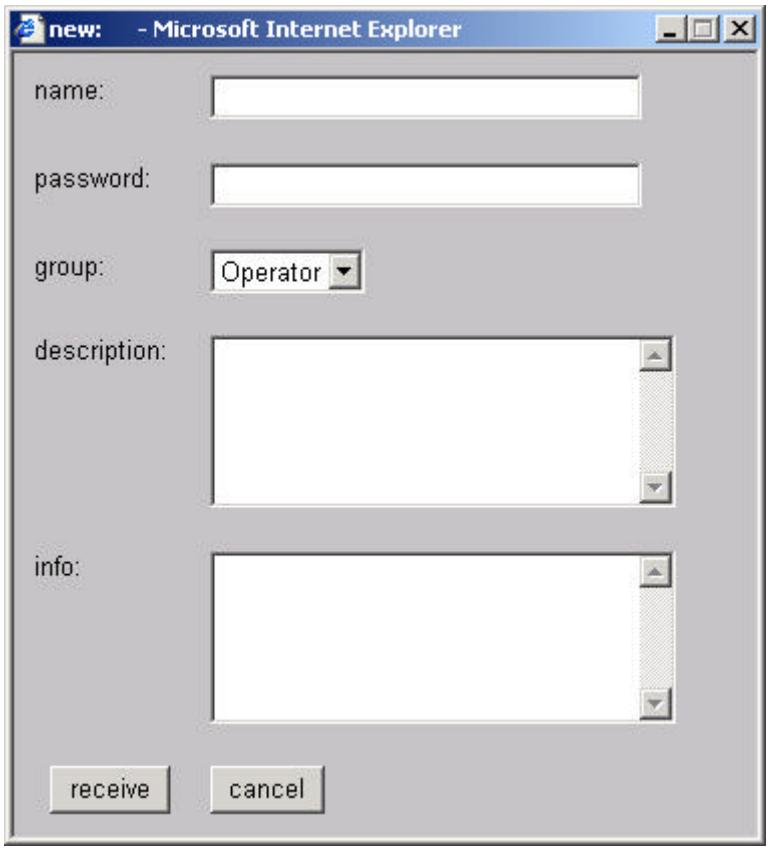
First the summary page with the already existing users opens.

4.2.4.2 Detail



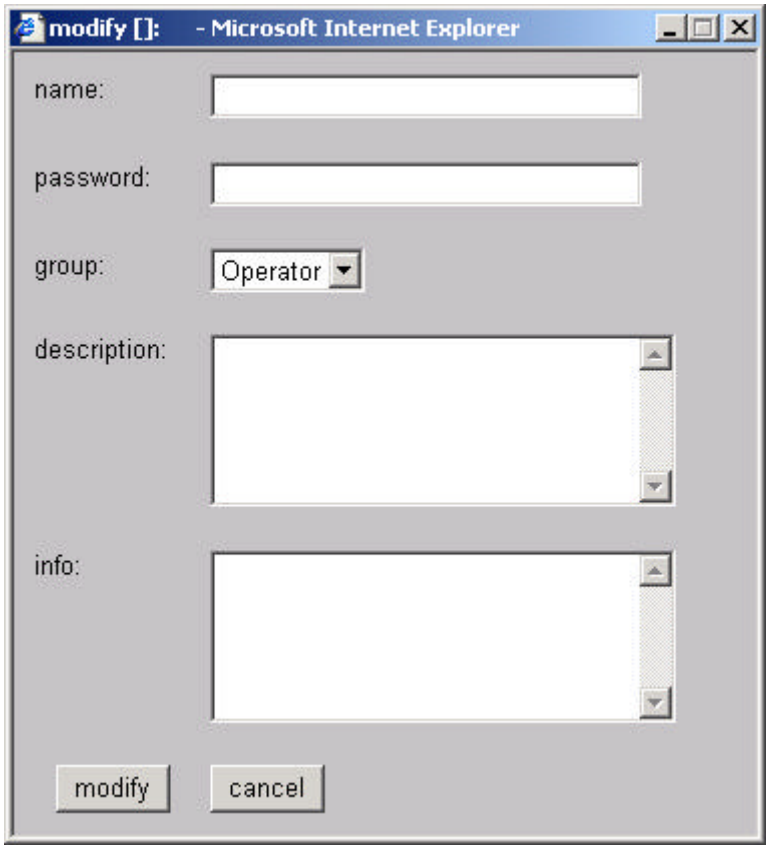
Upon selection of a user the detailed display with additional information ('description' and 'info') is displayed here.

4.2.4.3 New



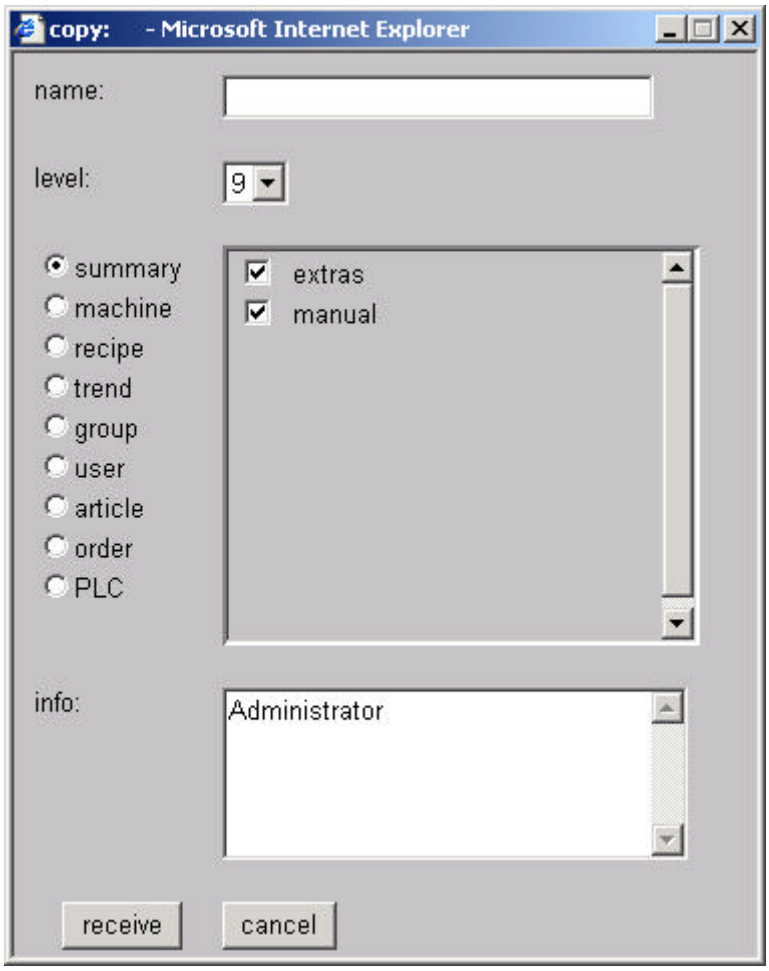
Definition of a new user. It is recommended to enter a password. If the password field remains unfilled the user does not need to enter a password when logging on. Thereafter, accesses are determined in menu item 'Groups'.

4.2.4.4 Modify



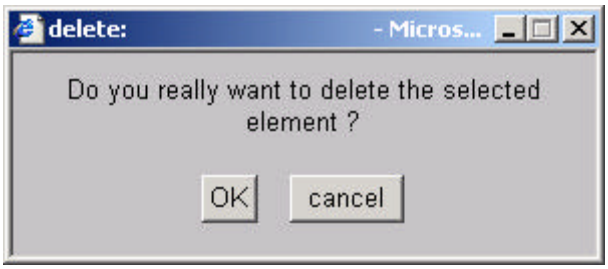
Modification of user data.

4.2.4.5 Copy



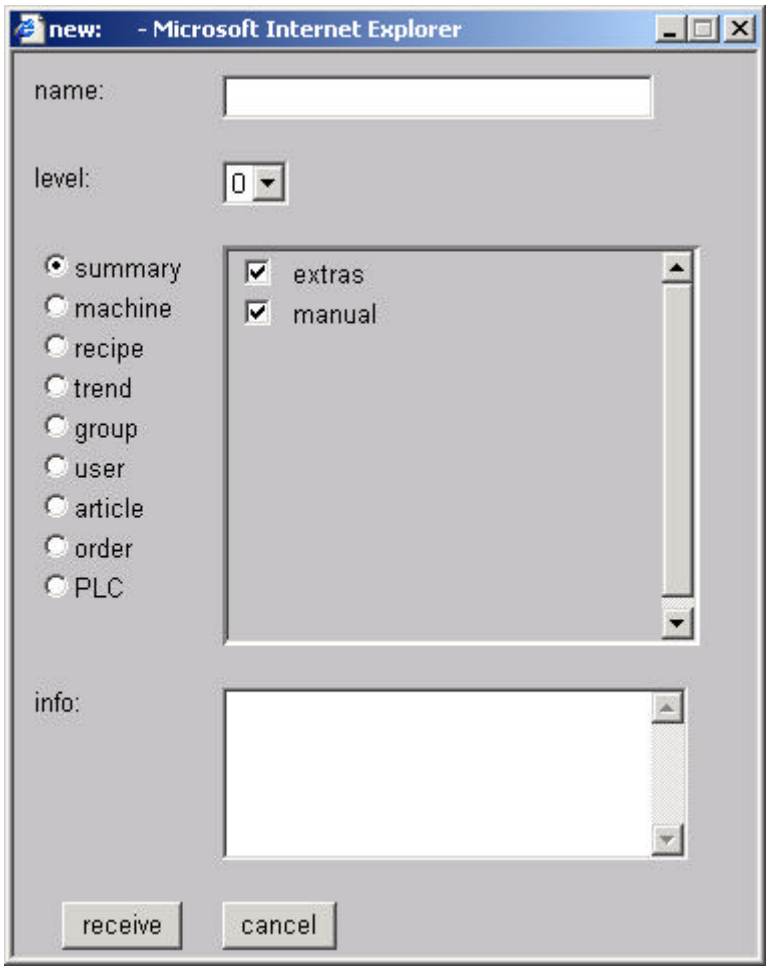
Copying of a user. The password must be overwritten, the copied information can be overwritten. The user accesses are copied as well.

4.2.4.6 Delete



Deleting of one user, including his accesses.

4.2.5 Group



In this menu the accesses for the individual levels can be determined.

The level to be modified is selected by means of a small drop down menu ranging between 1 - 9. Then a name can be entered for this level in the topmost entry field.

The main menu to be changed is selected from the list on the left. The corresponding menu items are displayed in the window on the right.

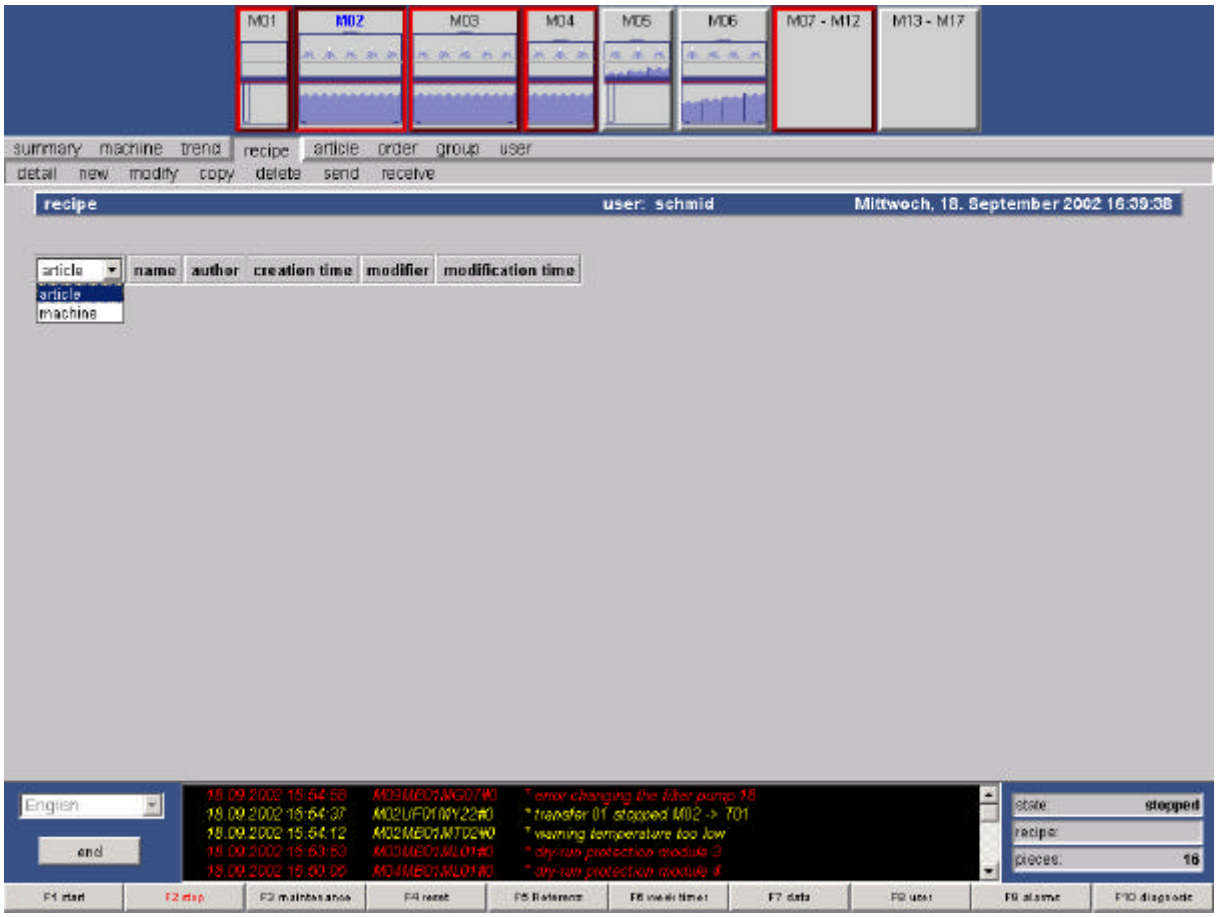
The small box in front of it assigns the release by simply clicking on it. A tick (v) indicates that the menu item has been released for the appropriate user level. If the small box remains unmarked the menu item remains inaccessible for this user level. This is later displayed by a deactivated menu item.

If required a comment can be entered into the info field.

4.2.6 Recipe

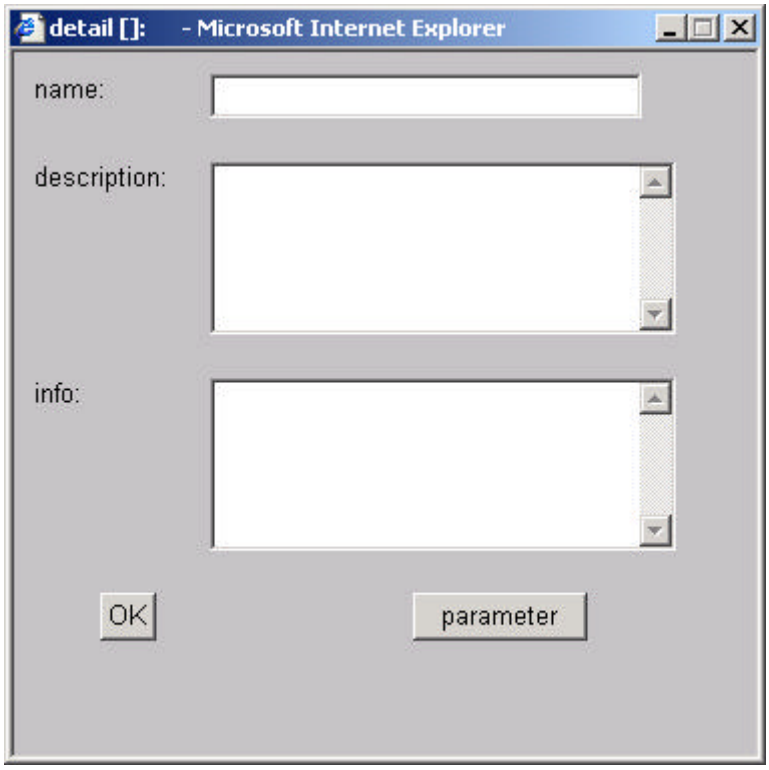
Recipe management of the visualization system can be found in menu item 'Recipe'.

4.2.6.1 Summary



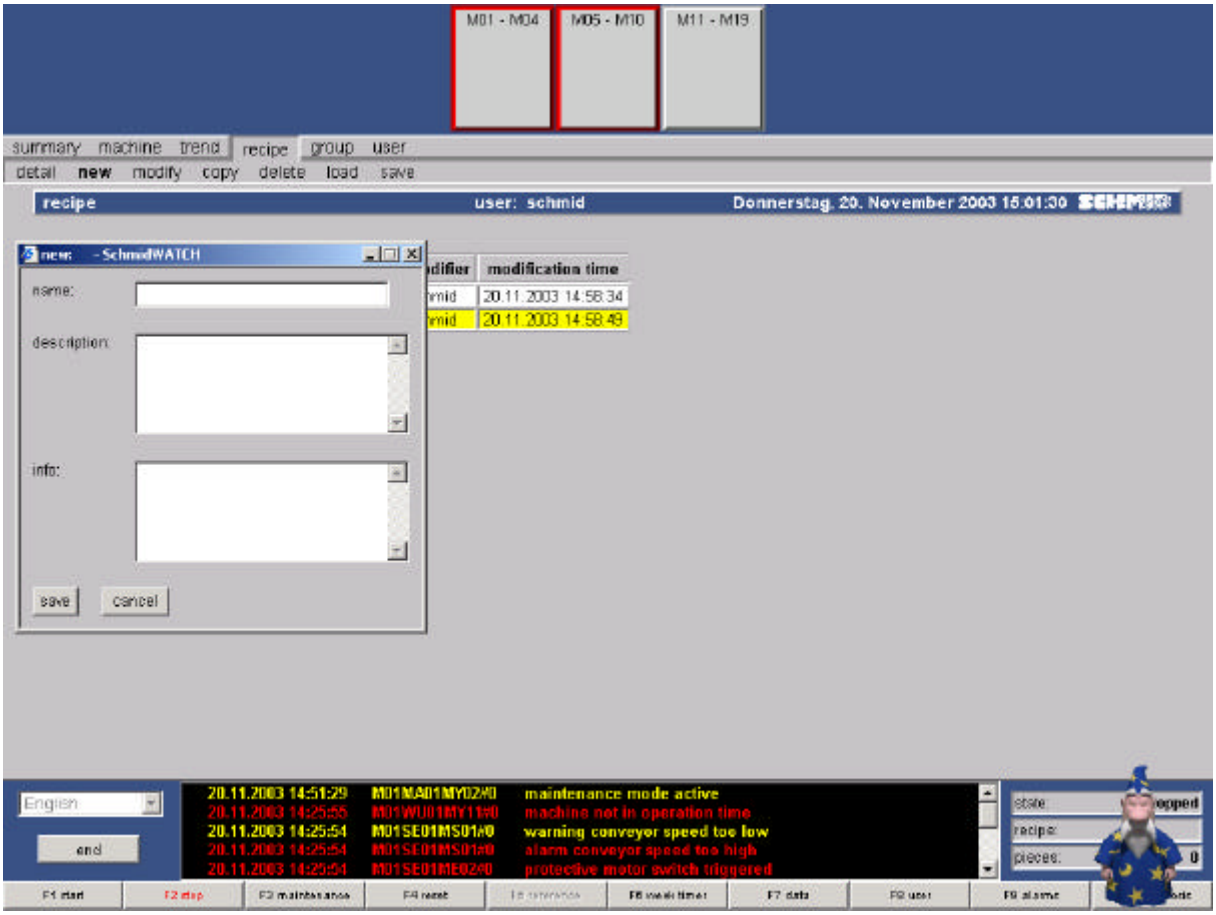
Summary of all existing recipes. The fields 'author' and 'creation time' are entered with the actually logged-on user in the menus 'new', 'copy' and when 'receive'd for the first time. The fields 'modifier' and 'modification time' are entered in the menus 'new', 'modify', 'copy' and 'receive'.

4.2.6.2 Detail



After selection of a recipe the detail display with additional information is displayed.

4.2.6.3 New

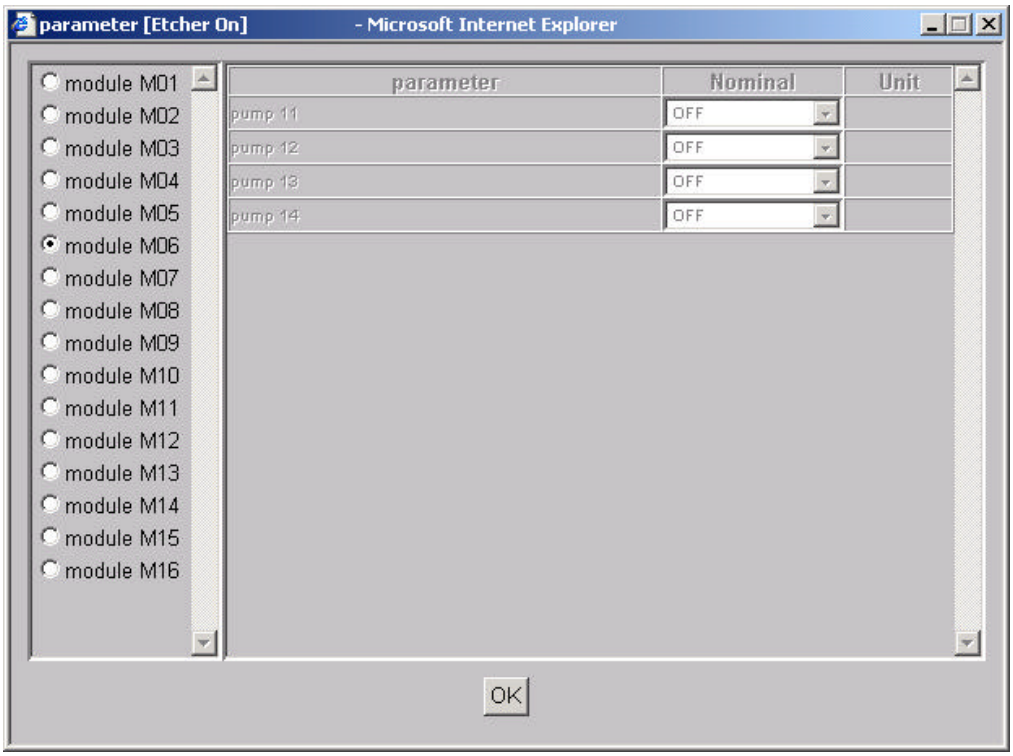


A recipe consists of header data and parameters. With 'new' menu only the header data can be defined. No parameters are defined. With the 'receive' menu header data as well as parameters can be defined.

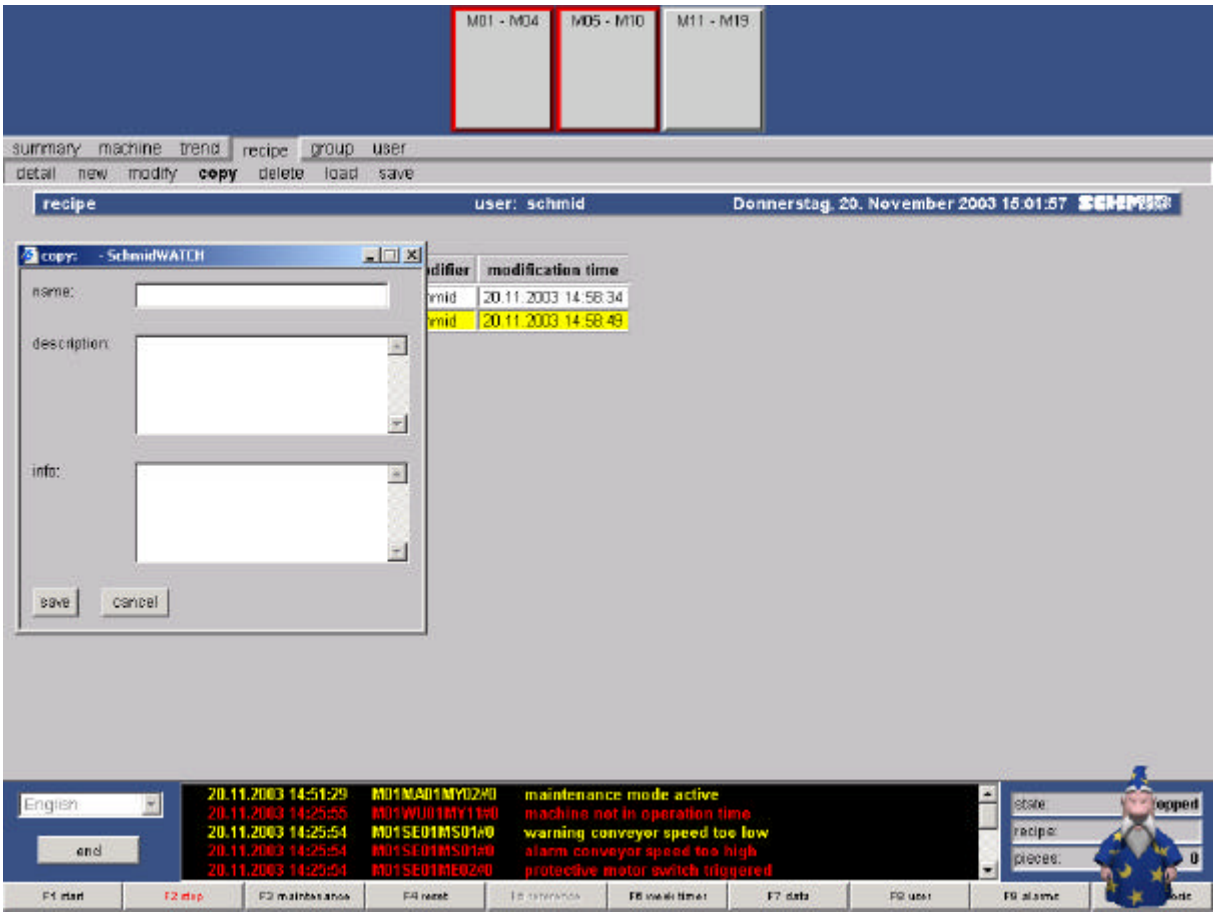
4.2.6.4 Modify

When a recipe gets modified the name cannot be rewritten. To do so the old recipe has to be copied to become a new one. The new recipe, then, can be filed under a new name. Description and info can be modified at will.

Now the parameters of a recipe can also be individually examined and modified in the recipe management. The machine remains unaffected hereof, i.e. now a new recipe can be created while the machine is still operated with the old recipe. For this press the button 'parameter'. The following menu opens:.

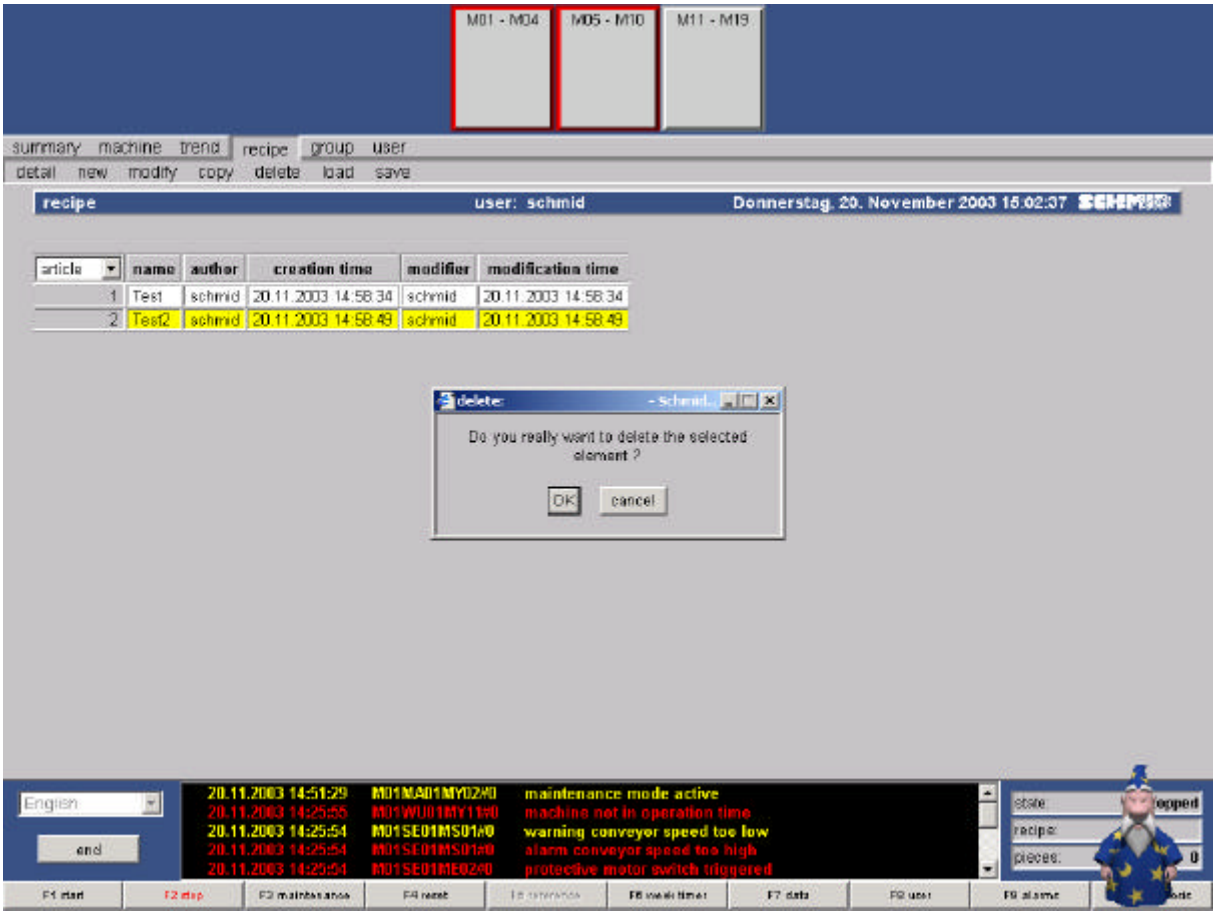


4.2.6.5 Copy



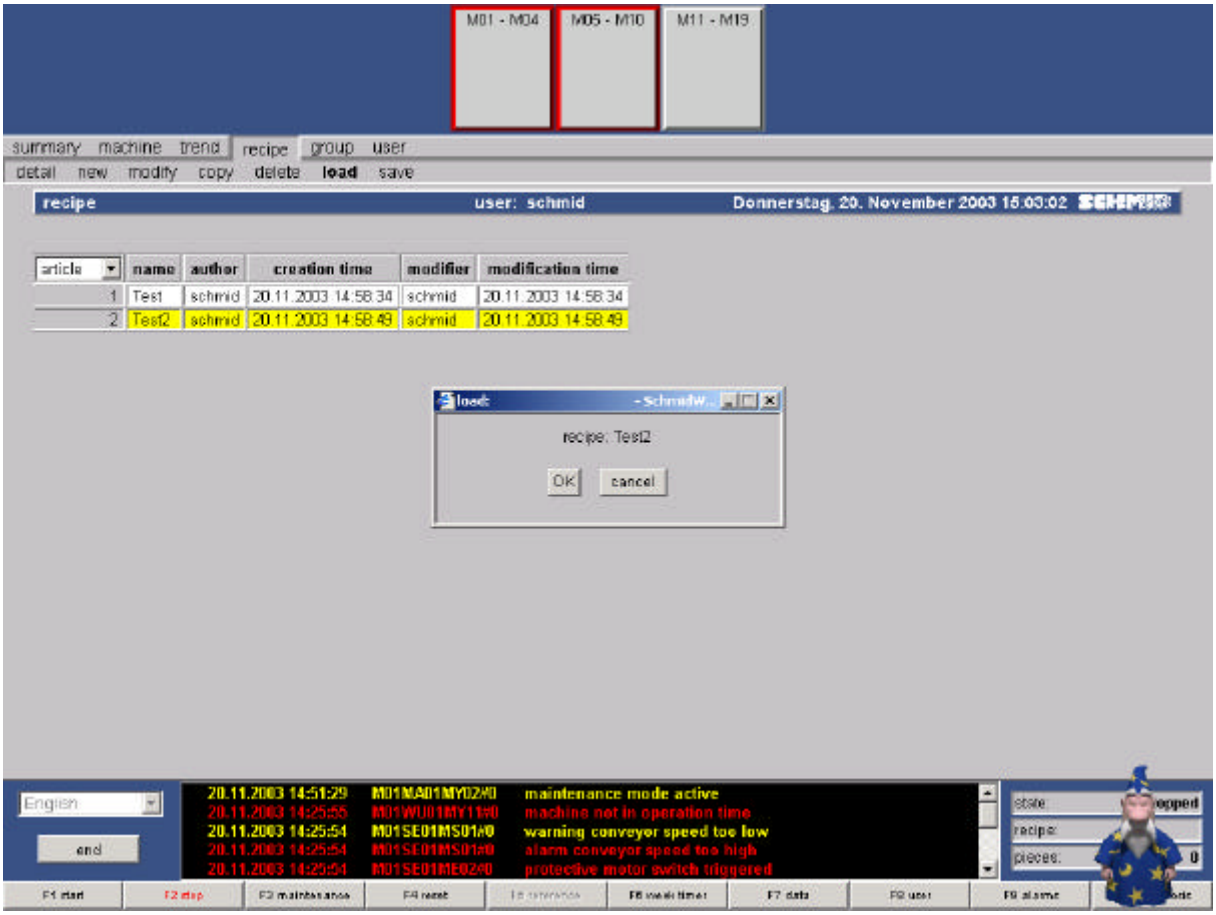
When a recipe gets copied a new name is to be entered. The other header data may be overwritten. The parameters are copied from the original recipe.

4.2.6.6 Delete

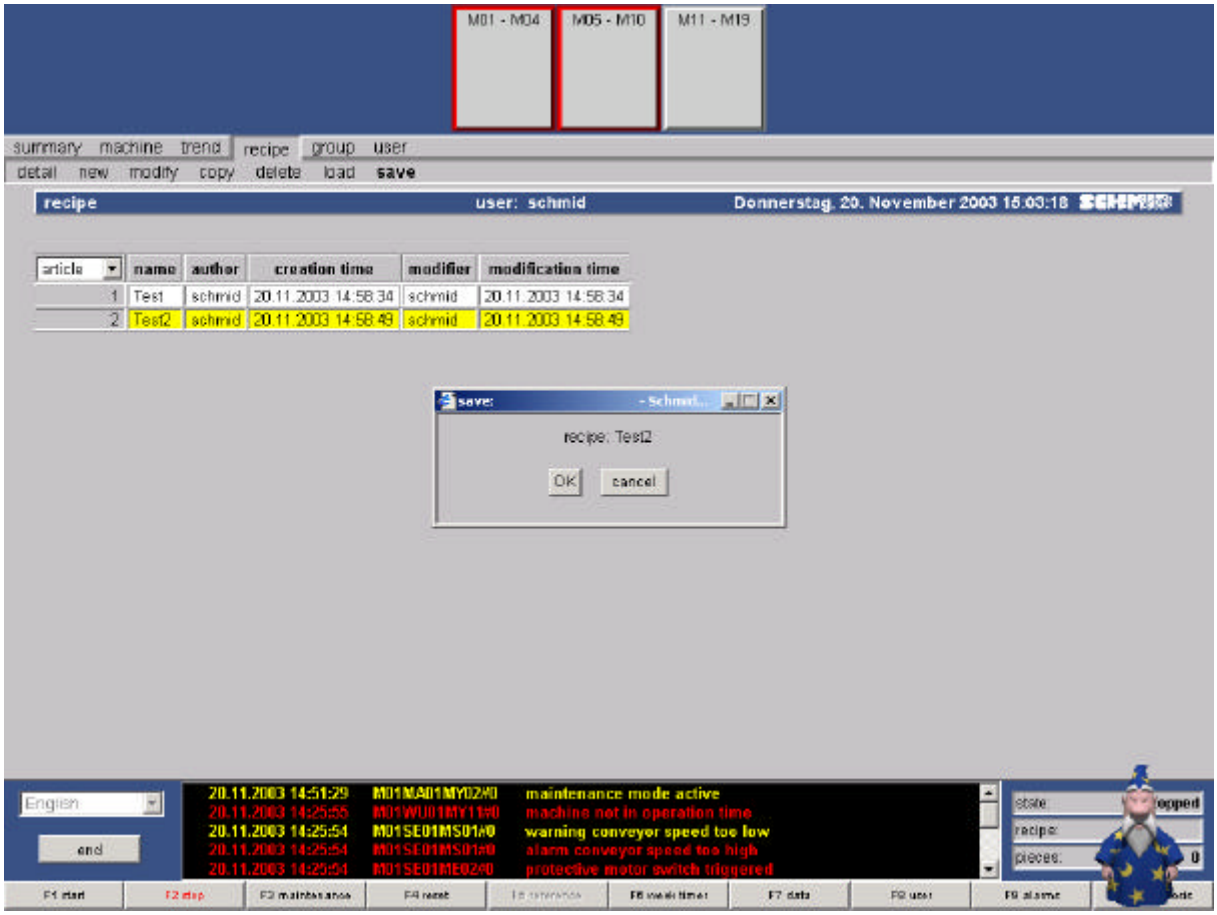


Deleting of the selected recipe is effected only after the confirmation has been acknowledged. Header data as well as the related parameters will be deleted.

4.2.6.7 Load


M01 - M04
M05 - M10
M11 - M19
summary machine trend recipe group user
detail new modify copy delete load save
recipe
user: schmid
Donnerstag, 20. November 2003 15:03:02
article name author creation time modifier modification time
1 Test schmid 20.11.2003 14:58:34 schmid 20.11.2003 14:58:34
2 Test2 schmid 20.11.2003 14:58:49 schmid 20.11.2003 14:58:49
load
recipe: Test2
OK
cancel
English
end
20.11.2003 14:51:29 M01MA01MY02M0 maintenance mode active
20.11.2003 14:25:55 M01WU01MY11M0 machine not in operation time
20.11.2003 14:25:54 M01SE01MS01A0 warning conveyor speed too low
20.11.2003 14:25:54 M01SE01MS01A0 alarm conveyor speed too high
20.11.2003 14:25:54 M01SE01ME02A0 protective motor switch triggered
state
recipe:
pieces:
0
F1 start
F2 stop
F3 maintenance
F4 reset
F6 week timer
F7 data
F8 user
F9 alarms

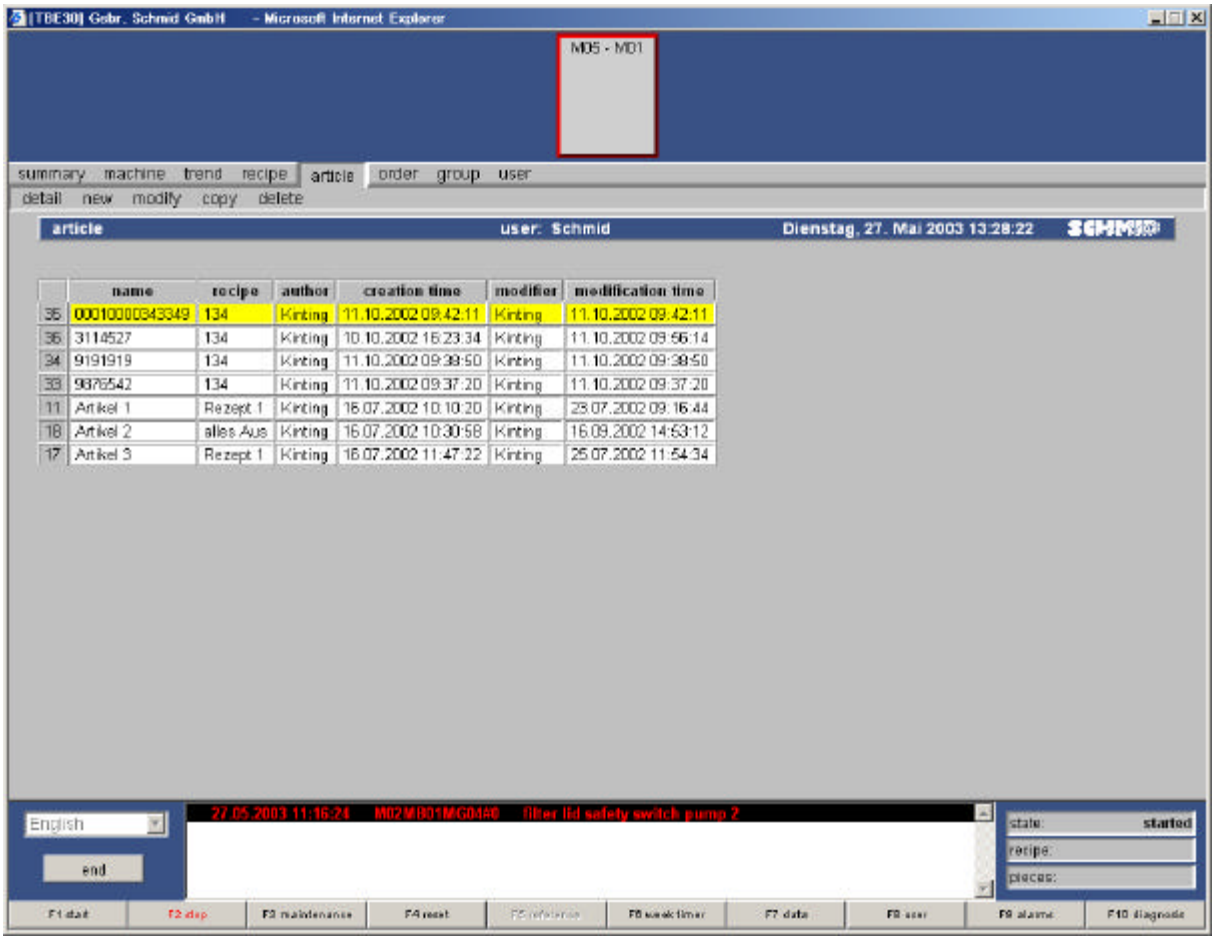
4.2.6.8 Save


M01 - M04
M05 - M10
M11 - M19
summary machine trend recipe group user
detail new modify copy delete load save
recipe
user: schmid
Donnerstag, 20. November 2003 15:03:18
article name author creation time modifier modification time
1 Test schmid 20.11.2003 14:58:34 schmid 20.11.2003 14:58:34
2 Test2 schmid 20.11.2003 14:58:49 schmid 20.11.2003 14:58:49
save:
recipe: Test2
OK
cancel
Englen
end
20.11.2003 14:51:29 M01MA01MY02#0 maintenance mode active
20.11.2003 14:25:55 M01WU01MY11#0 machine not in operation time
20.11.2003 14:25:54 M01SE01MS01#0 warning conveyer speed too low
20.11.2003 14:25:54 M01SE01MS01#0 alarm conveyor speed too high
20.11.2003 14:25:04 M01SE01ME02#0 protective motor switch triggered
state
recipe
pieces
0
F1 start
F2 stop
F3 maintenance
F4 reset
F6 week timer
F7 data
F8 user
F9 alarms

4.2.7 Article (Optional)

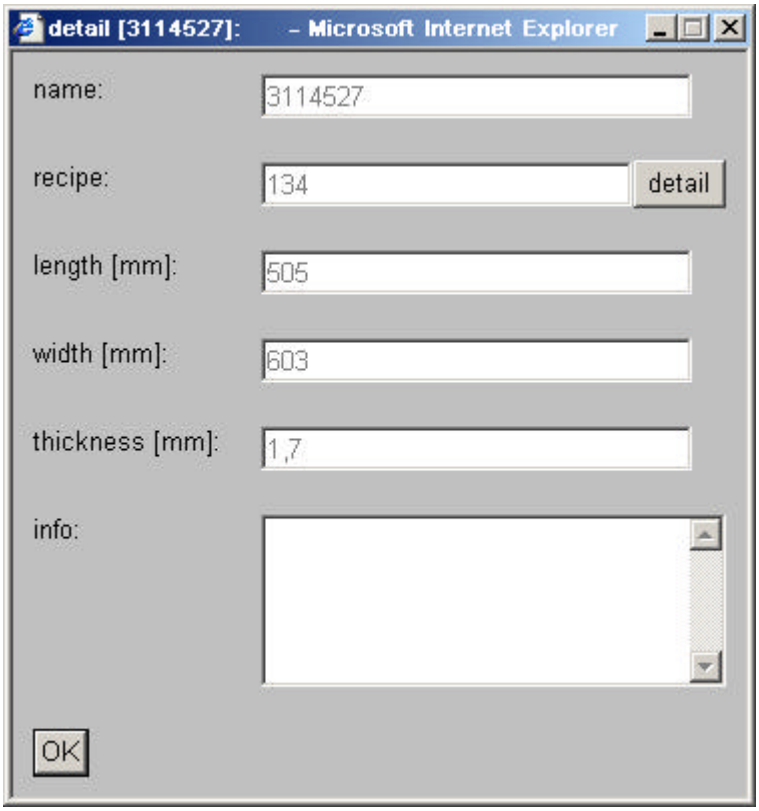
The article management of the visual display system is to be found under the **article** menu item.

4.2.7.1 Overview



Overview of all the existing articles. The **author** and **creation time** fields are entered in the **new** und **copy** menus with the currently logged-on user. The **modifier** and **modification time** fields are entered in the **new**, **modify** and **copy** menus.

4.2.7.2 Detail / New / Modify / Copy



detail: Displaying the detail view with additional information on the selected article.

new: Creating a new article. A **name** (article number) must be entered.

modify: Modifying the data of the selected article.

copy: Copying the data of the selected article. The **name** (article number) of the new article must be entered.

Input fields:

name: Unique designation of this article, normally the article number of the article is entered here.

recipe: Unique designation of the associated recipe with which this article is usually produced. Apart from the detail view, the recipe can be selected from a DropDown list.

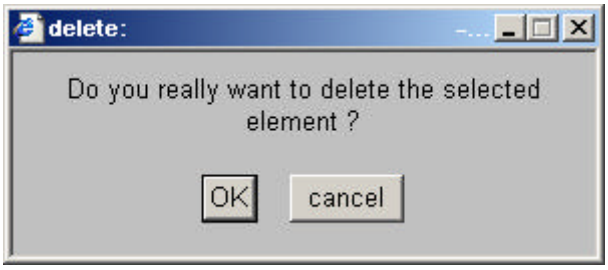
length: Length of a single panel of this article, measured in the transport direction through the machine.

width: Width of a single panel of this article, measured transversely to the transport direction through the machine.

thickness: Thickness of a single panel of this article.

info: General information on this article.

4.2.7.3 Delete

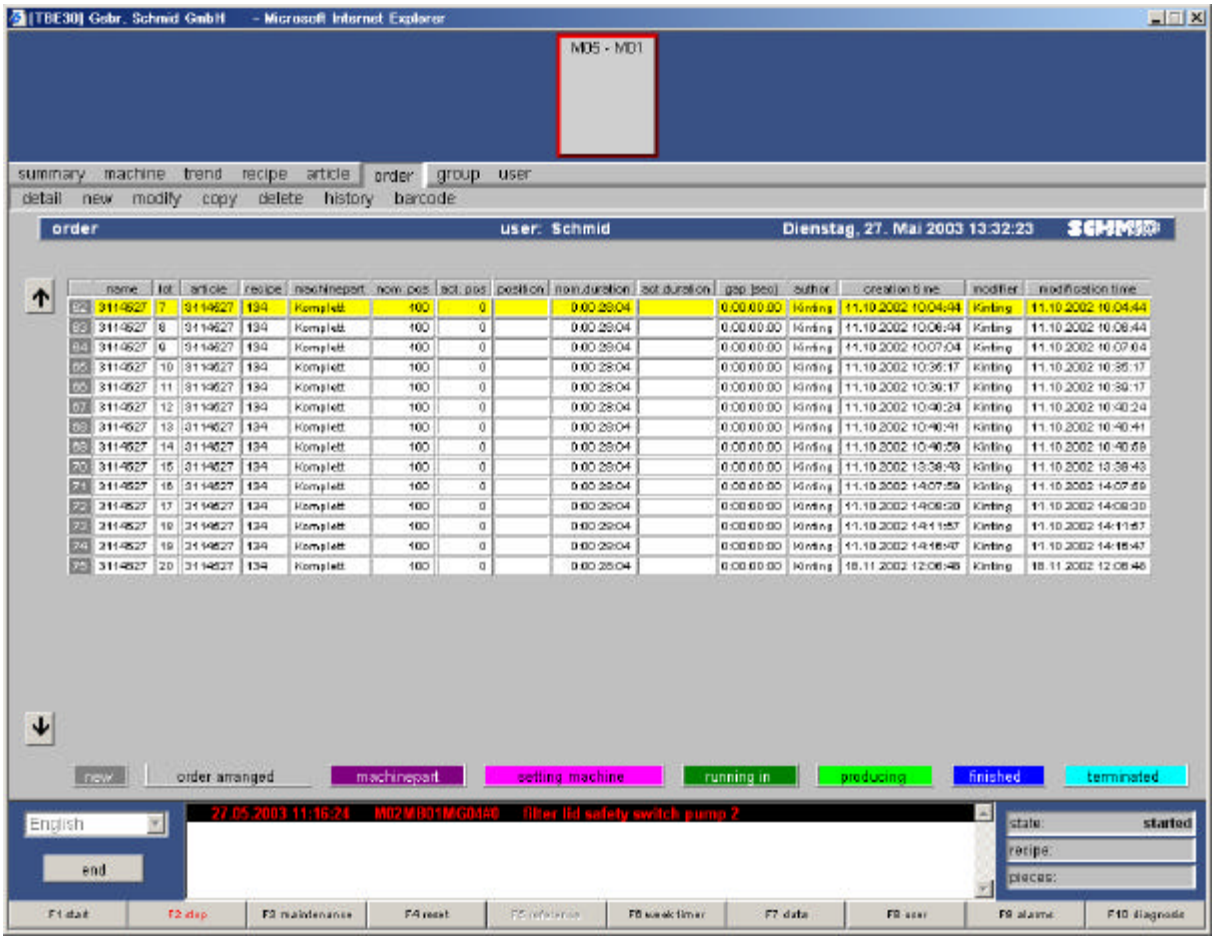


The selected article can be deleted by confirming the verification query.

4.2.8 Order (Optional)

The order management of the visual display system is to be found under the **order** menu item.

4.2.8.1 Overview



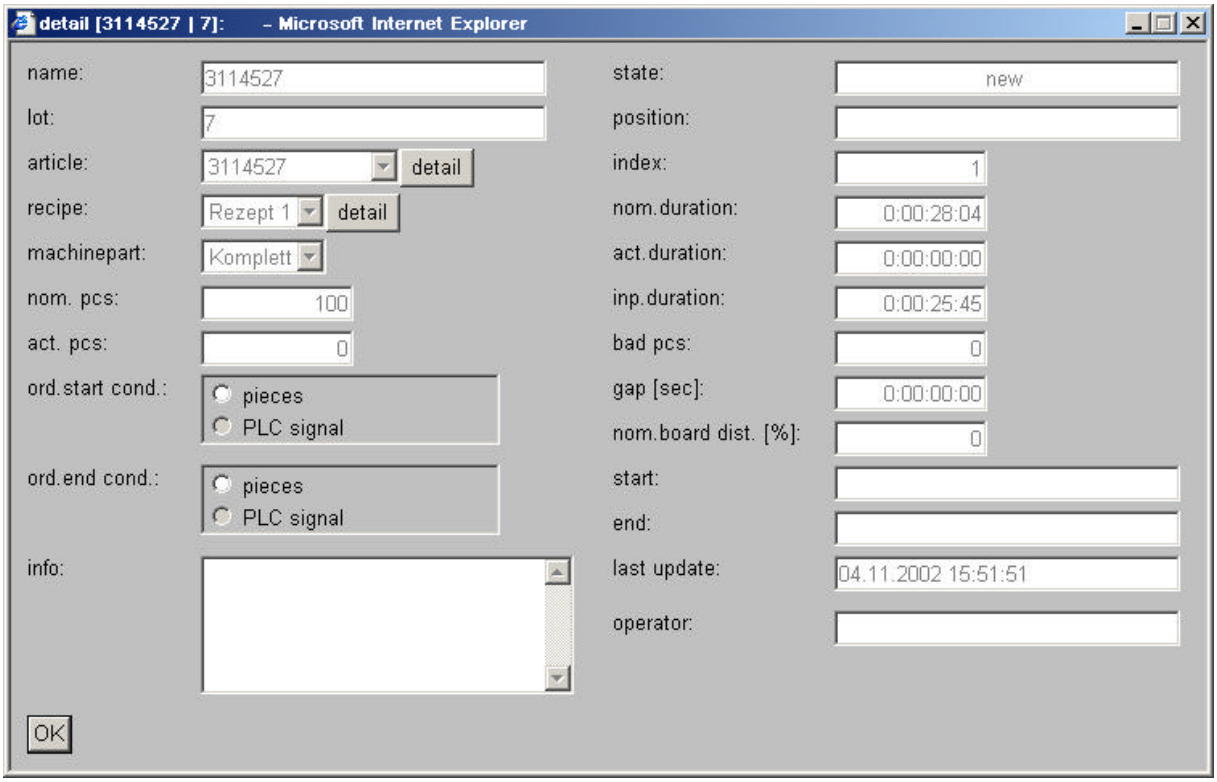
Overview of all orders not yet completed. The **author** and **creation time** fields are entered in the **new** and **copy** menus with the currently logged-on user. The **modifier** and **modification time** fields are entered in the **new**, **modify** and **copy** menus.
The processing of the order selected in the order list can be controlled using the two arrow buttons:

Orders with ***new*** or ***order arranged*** **state** swap lines with the order above. In so doing, gap time and run-time of all orders concerned are re-calculated. If the selected order is the top order with ***new*** state, then the ***order*** is ***arranged***, if it is the top order with ***order arranged*** state then the order is transferred (***machinepart***) to the PLC (in each case without swapping lines). Orders with ***running in*** state are progressed. Orders with ***machinepart***, ***setting machine***, ***producing***, ***finished*** and ***terminated*** state cannot be affected by this button.

Orders with ***new*** or ***order arranged*** **state** swap lines with the order below. In so doing, gap time and run-time of all orders concerned are re-calculated. If the selected order is the bottom order with ***order arranged*** **state**, then the order **state** changes to ***new*** (without swapping lines). Orders with ***machinepart*** **state** or ***setting machine*** are removed from the PLC and change their **state** to ***new***. Orders with ***running in*** **state** are divided into two part orders (split), of which one part order changes to ***producing***

state and one to ***new*** **state**. Orders with ***producing***, ***finished*** and ***terminated*** **state** cannot be affected by this button.

4.2.8.2 Detail / New / Modify / Copy



detail: Displaying the detail view with additional information on the selected order.

new: Creating a new order. A **name** (order number) must be entered.

modify: Modifying the data of the selected order.

copy: Copying the data of the selected order. The **name** (order number) of the new order must be entered.

Input fields:

name: Designation of this order, normally the order number of the article is entered here. Together with the **lot**, **article** and **index** fields, it must provide a unique identification of this order.

lot: Lot number of this order. Together with the **name**, **article** and **index** fields, it must provide a unique identification of this order.

article: Designation of the associated article produced with this order. Apart from the detail view, the article can be selected from a DropDown list. Together with the **name**, **lot** and **index** fields, it must provide a unique identification of this order.

recipe: Unique designation of the associated recipe to be used for this order. Apart from the detail view, the recipe can be selected from a DropDown list. When an article is selected, the respective recipe entered for it in the article management is transferred to this field.

nom. pcs: Nominal pieces of this order.

act. pcs: Actual pieces of this order already produced.

ord.start cond.: When **pieces** is selected, the order is automatically started as soon as the preceding order has been progressed. Any necessary gap between the two orders is however allowed for. When **PLC signal** is selected, the order is started subject to an input condition checked in the PLC program.

ord.end. cond.: When **pieces** is selected, the order is automatically progressed when the actual piece number has reached the nominal piece number. When **PLC signal** is selected, the order is automatically progressed by way of an input condition checked in the PLC program (usually the “cassette empty” signal from the stacker).

info: General information on this order.

state: Current state of this order:

new:	The order was newly created.
order arranged:	The order is in the queue for automatic processing. The sequence of the orders is determined by this queue.
machinepart:	The order was transferred to the PLC.
setting machine:	The PLC has begun to load the recipe of this order on the machine. In so doing, the position of the preceding order in the machine is allowed for.
running in:	The panels of this order are entering the machine.
producing:	All the panels of this order have entered the machine and the entire order is now passing through the machine.
finished:	All the panels of this order have exited the machine, the order has been processed in full.
terminated:	The order is completed.

This field cannot be written to.

position: Current position of the order in the machine. This field cannot be written to.

index: Part order index of this order. This index is automatically assigned when an order is split. Together with the **name**, **lot** and **article** fields it must provide a unique identification of this order. This field cannot be written to.

nom.duration: Calculated total run-time of the order from the first panel entering the machine to the last panel exiting the machine in days : hours : minutes : seconds. This field cannot be written to.

act.duration: Present total run-time of the order since the first panel entered the machine (to the last panel exiting the machine) in days : hours : minutes : seconds. This field cannot be written to.

inp.duration: Calculated run-time of the order from the first panel entering the machine to the last panel entering the machine in days : hours : minutes : seconds. This field cannot be written to.

bad pcs.: Number of panels affected by malfunction possibly detracting from their quality during passage through the machine. This field cannot be written to.

gap: The calculated gap in seconds between the order and the one previously run, which is necessary to be able to duly change over the recipe parameters between the two orders. This field cannot be written to.

nom. board dist.: Calculated distance of the boards at the entry to the machine, as is required for the boards to maintain the set minimum distance in the slowest section of the machine. This field cannot be written to.

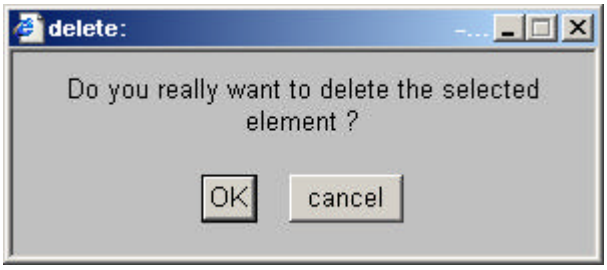
start Time at which the first board of the order entered the machine. This field cannot be written to.

end: Time at which the order was completed. This field cannot be written to.

last update: Time at which the displayed data was last updated. This field cannot be written to.

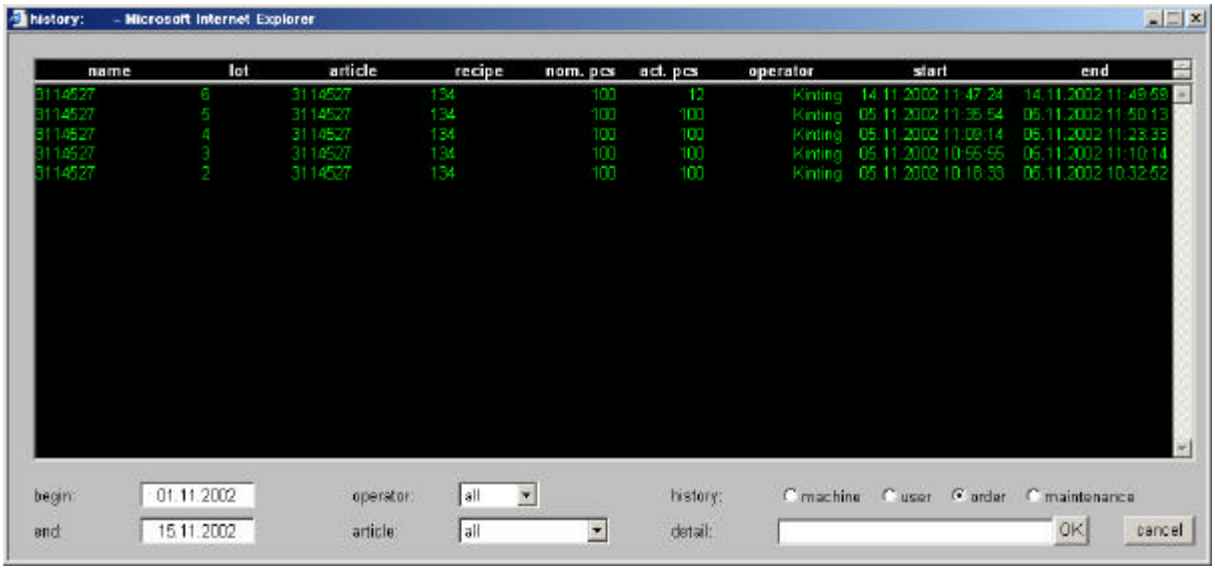
operator: Name of the operator by whom this order was arranged. This field cannot be written to.

4.2.8.3 Delete



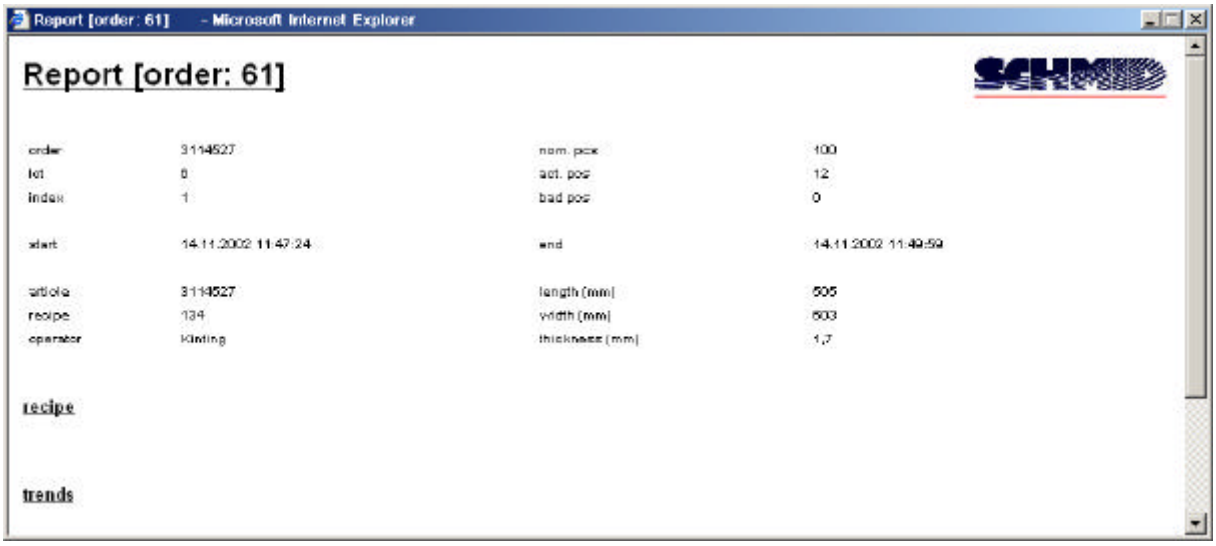
The selected order can be deleted by confirming the verification query. Only orders with new state can be deleted.

4.2.8.4 History



Overview of all completed orders produced in the set period between **begin** and **end**. In addition orders can be filtered out on the basis of the entered **operator**, the produced **article** and the **detail** (order name/order number).

The order report of an order can be opened by a double click on the respective order in the list:



The relevant data of an order is output in formatted form in the order report.

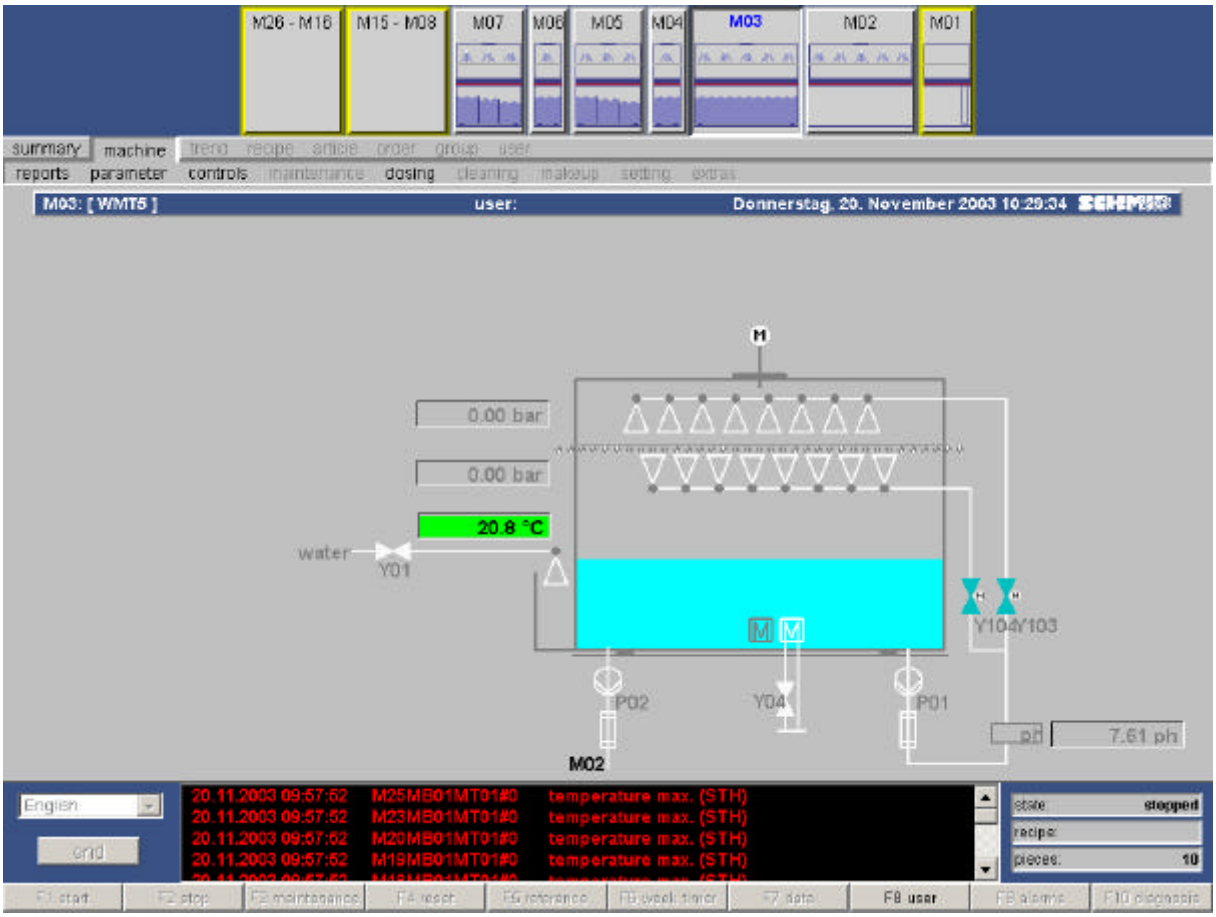
In addition, the important **recipe** data with which this order was produced, all the **trend** data collected during execution of the order and all the **alarms** affecting this order can be displayed and removed from the display by clicking the respective heading.

The order report can be output on a connected printer using a button at the bottom end of the page.

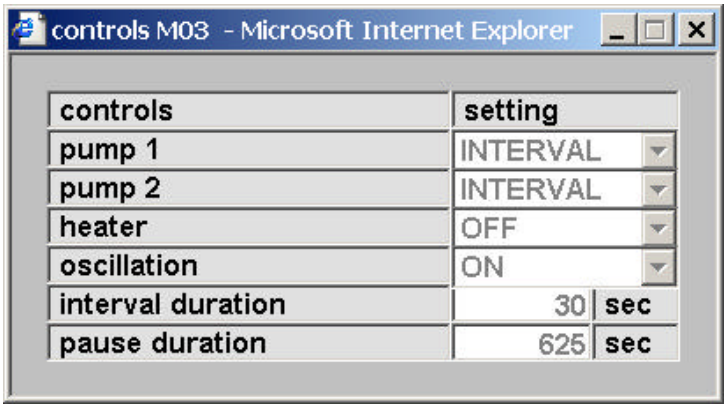
5 Individual Module Types

5.1 Developer

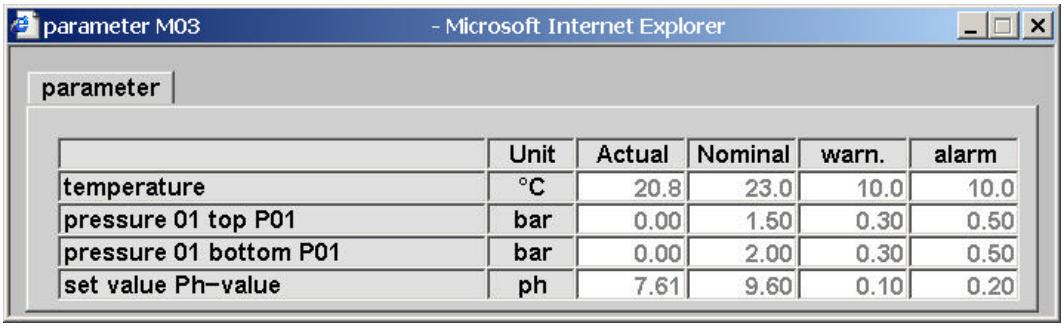
5.1.1 Developer Module



Controls

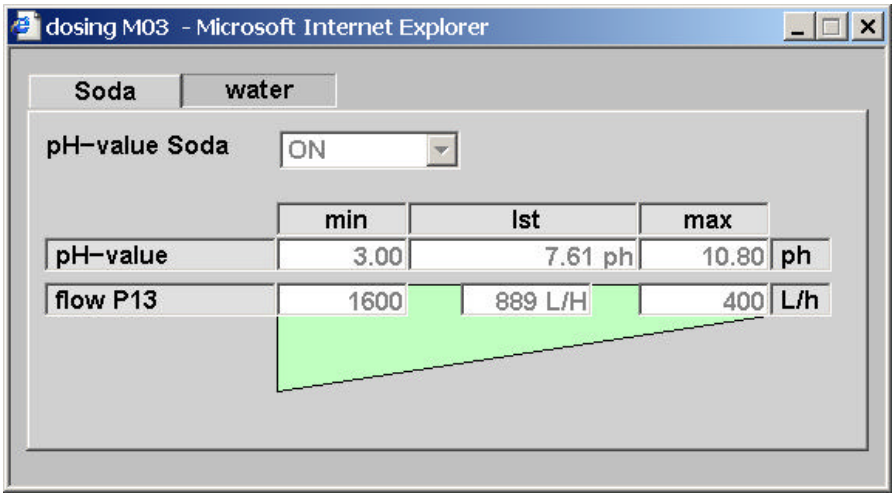


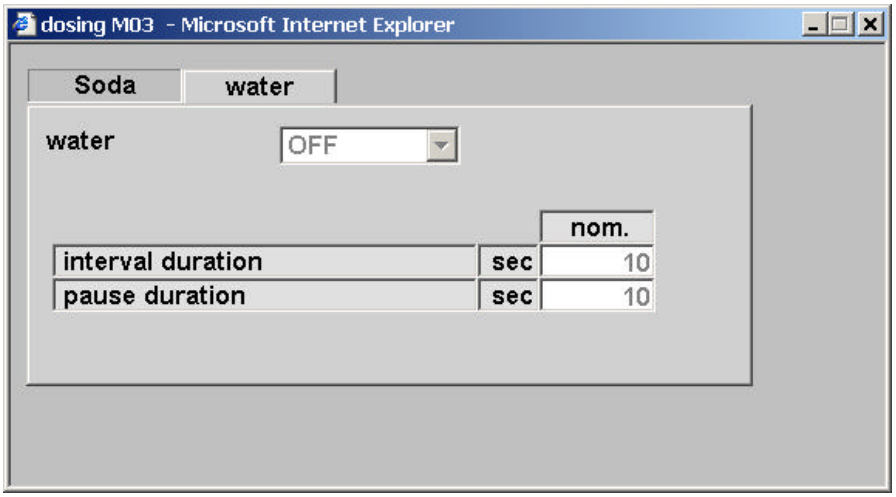
Parameter



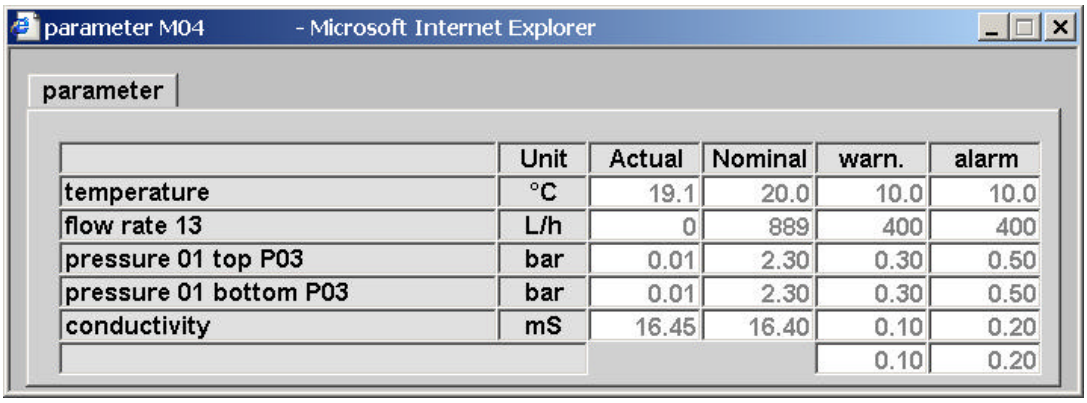
	Unit	Actual	Nominal	warn.	alarm
temperature	°C	20.8	23.0	10.0	10.0
pressure 01 top P01	bar	0.00	1.50	0.30	0.50
pressure 01 bottom P01	bar	0.00	2.00	0.30	0.50
set value Ph-value	ph	7.61	9.60	0.10	0.20

Dosing

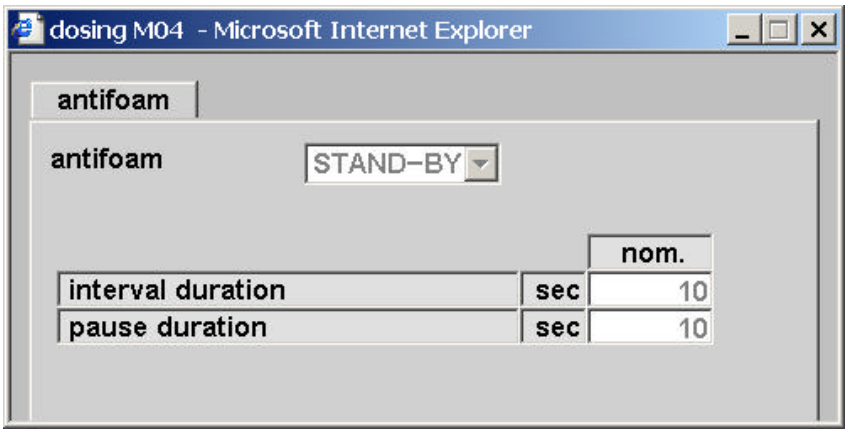




5.1.2 Post Develop Module

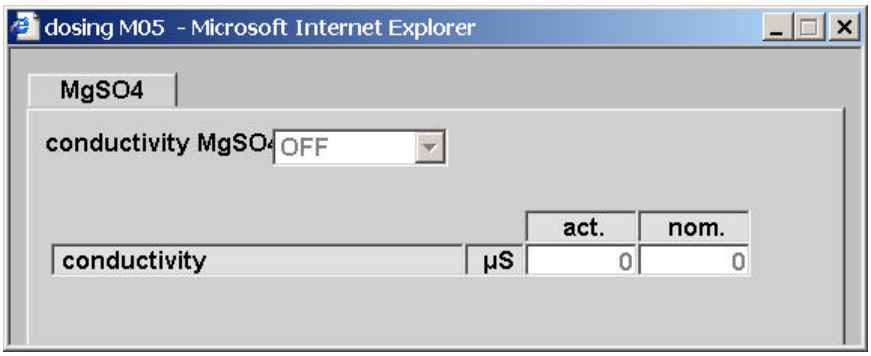


	Unit	Actual	Nominal	warn.	alarm
temperature	°C	19.1	20.0	10.0	10.0
flow rate 13	L/h	0	889	400	400
pressure 01 top P03	bar	0.01	2.30	0.30	0.50
pressure 01 bottom P03	bar	0.01	2.30	0.30	0.50
conductivity	mS	16.45	16.40	0.10	0.20
				0.10	0.20



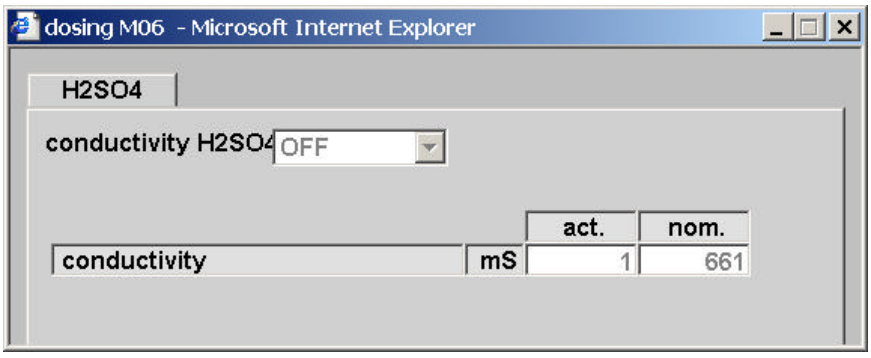
		nom.
interval duration	sec	10
pause duration	sec	10

5.1.3 Cascade Rinse following the Developer Module



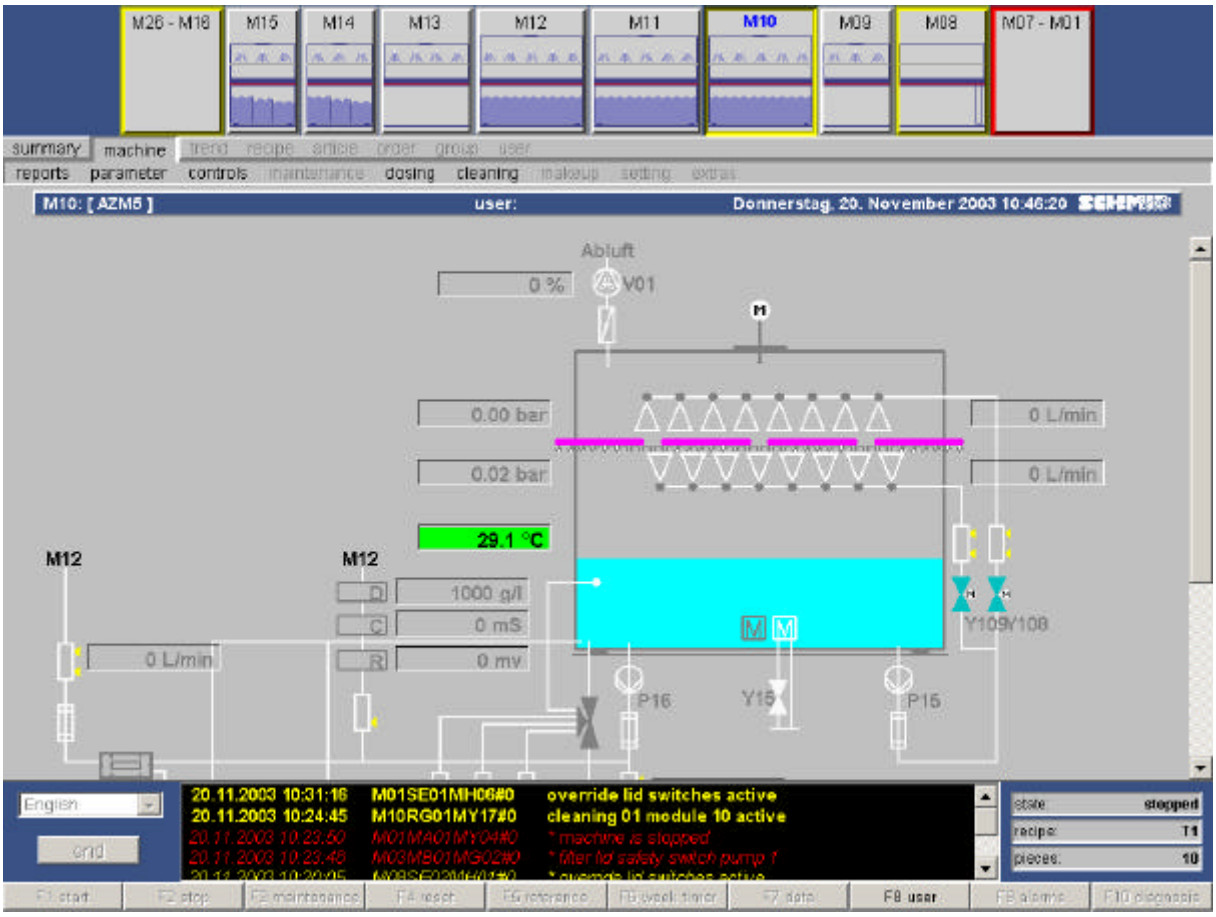
		act.	nom.
conductivity	µS	0	0

5.1.4 Washing Module following Cascade Rinse Module

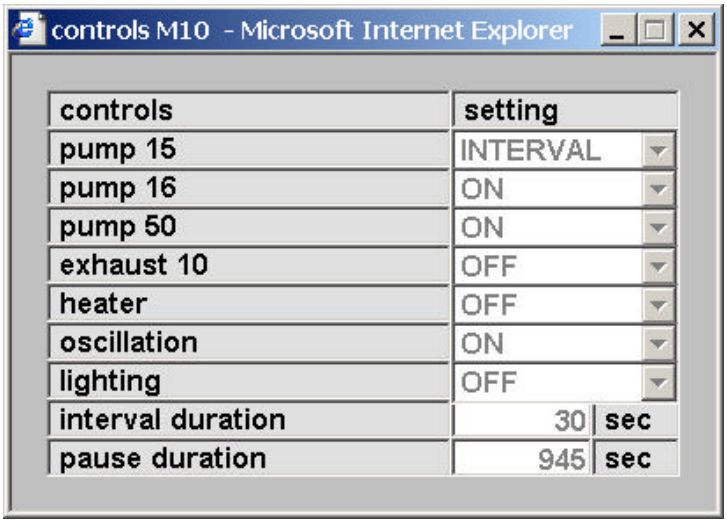


5.2 Etcher

5.2.1 Etching Module

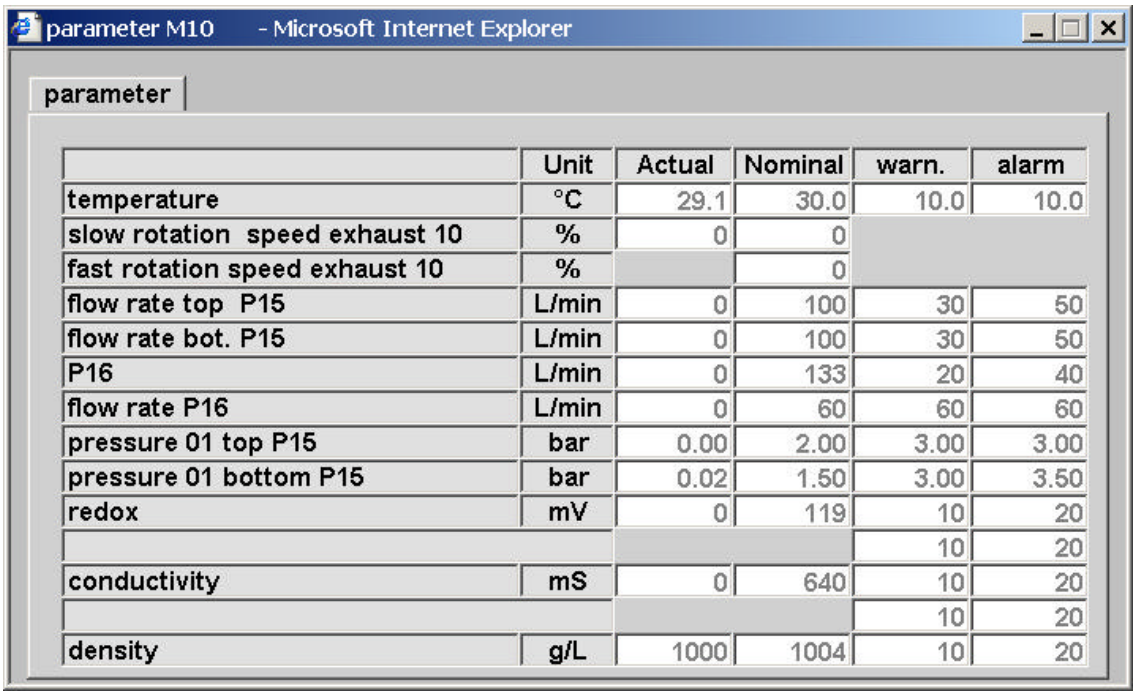


Controls



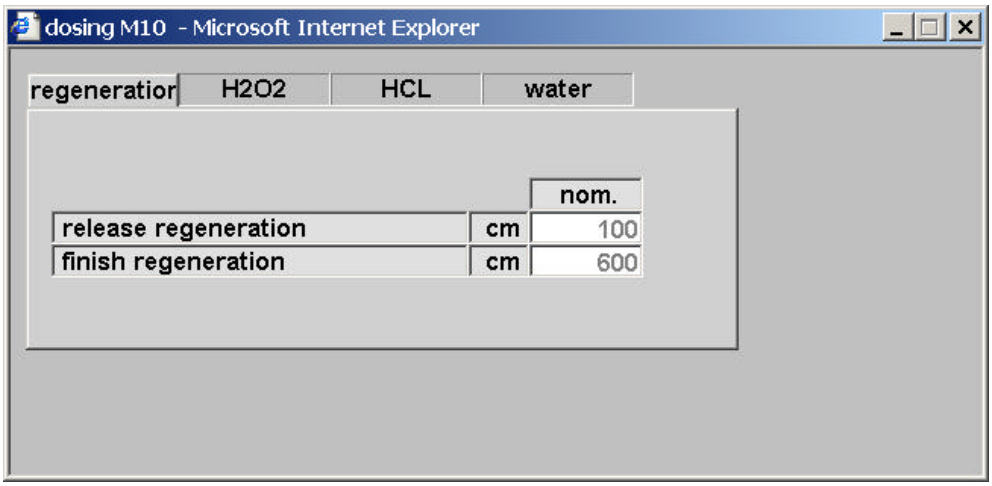
controls	setting	
pump 15	INTERVAL	
pump 16	ON	
pump 50	ON	
exhaust 10	OFF	
heater	OFF	
oscillation	ON	
lighting	OFF	
interval duration	30	sec
pause duration	945	sec

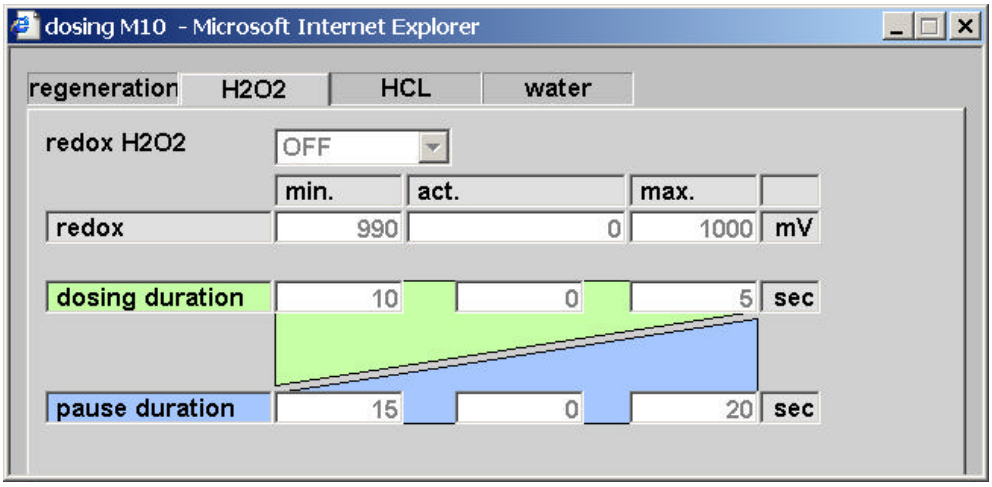
Parameter

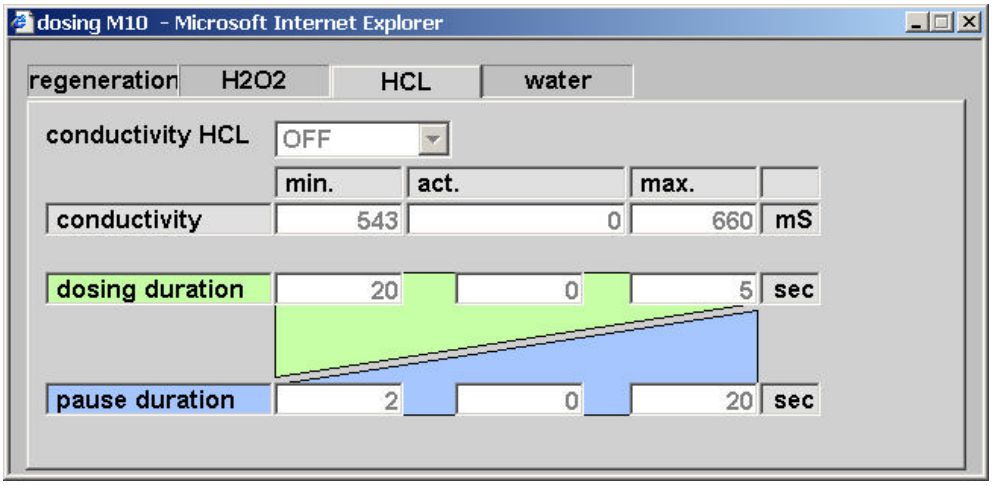


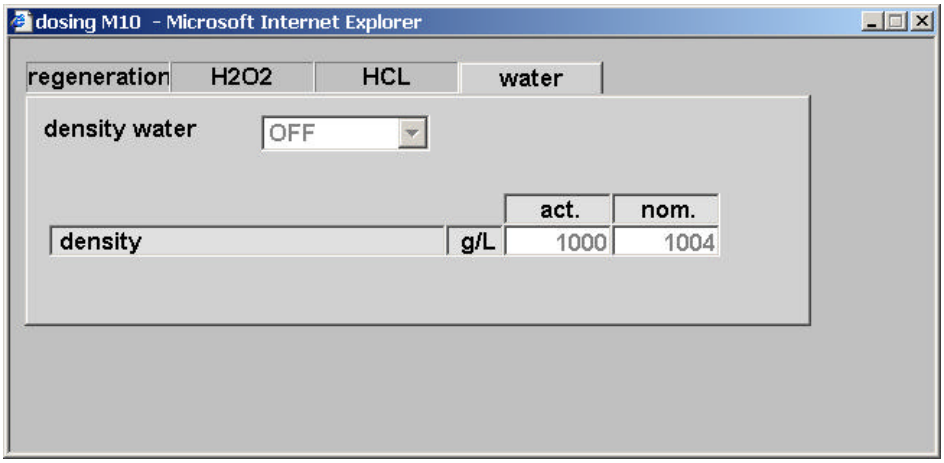
	Unit	Actual	Nominal	warn.	alarm
temperature	°C	29.1	30.0	10.0	10.0
slow rotation speed exhaust 10	%	0	0		
fast rotation speed exhaust 10	%		0		
flow rate top P15	L/min	0	100	30	50
flow rate bot. P15	L/min	0	100	30	50
P16	L/min	0	133	20	40
flow rate P16	L/min	0	60	60	60
pressure 01 top P15	bar	0.00	2.00	3.00	3.00
pressure 01 bottom P15	bar	0.02	1.50	3.00	3.50
redox	mV	0	119	10	20
				10	20
conductivity	mS	0	640	10	20
				10	20
density	g/L	1000	1004	10	20

Dosing

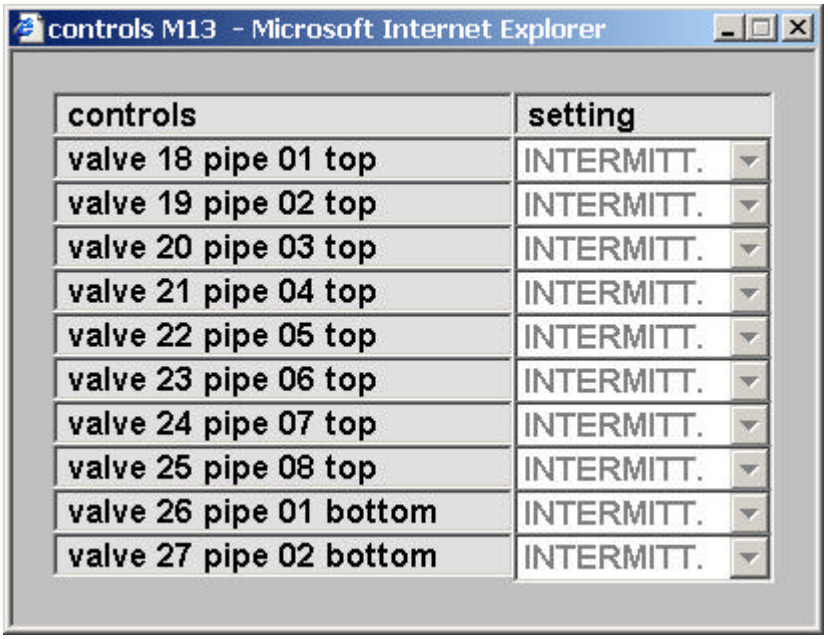

dosing M10 - Microsoft Internet Explorer
regeneration
H2O2
HCL
water
nom.
release regeneration
cm
100
finish regeneration
cm
600

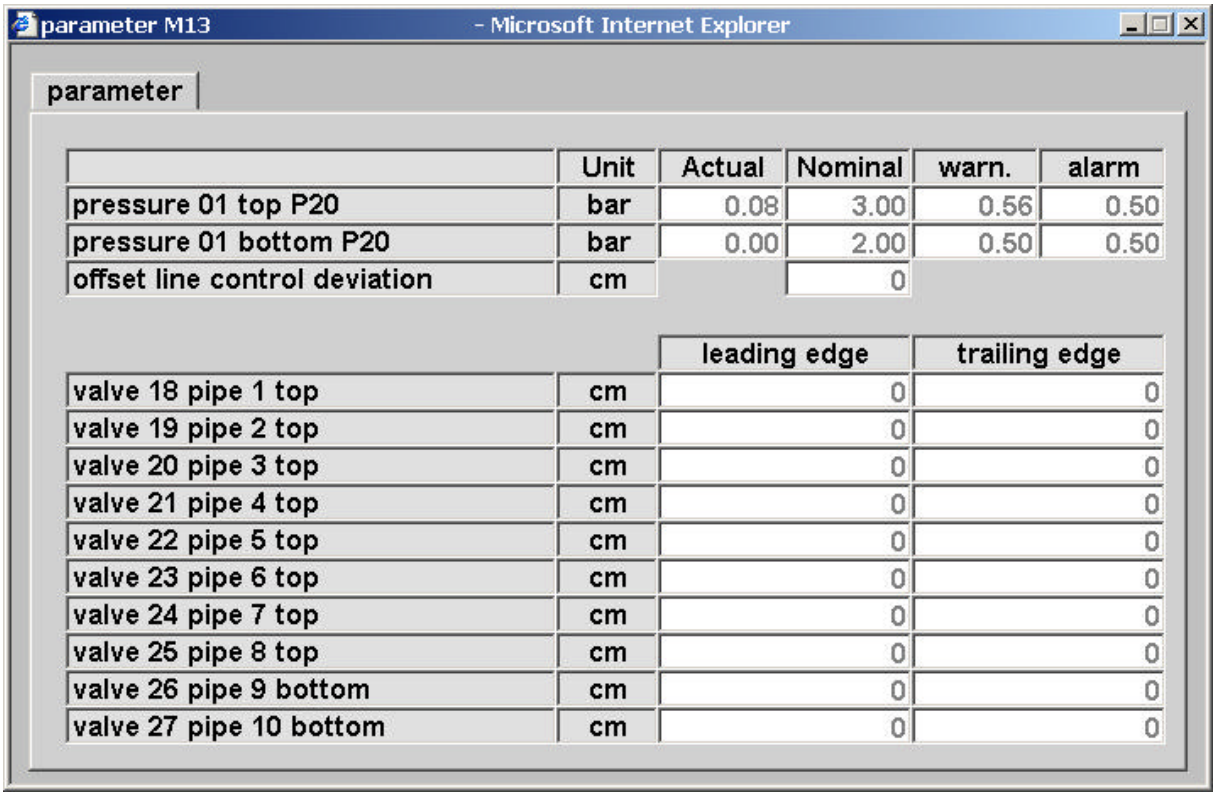

dosing M10 - Microsoft Internet Explorer
regeneration
H2O2
HCL
water
redox H2O2
OFF
min.
act.
max.
redox
990
0
1000
mV
dosing duration
10
0
5
sec
pause duration
15
0
20
sec


dosing M10 - Microsoft Internet Explorer
regeneration
H2O2
HCL
water
conductivity HCL
OFF
min.
act.
max.
conductivity
543
0
660
mS
dosing duration
20
0
5
sec
pause duration
2
0
20
sec



5.2.2 Intermittent Spraying

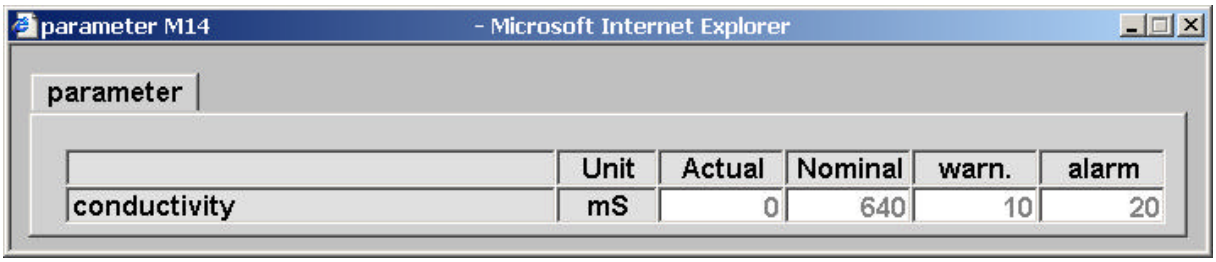




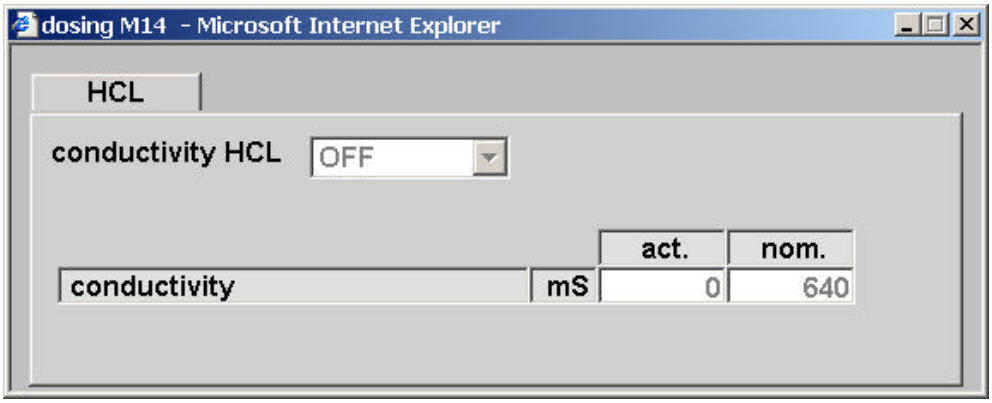
	Unit	Actual	Nominal	warn.	alarm
pressure 01 top P20	bar	0.08	3.00	0.56	0.50
pressure 01 bottom P20	bar	0.00	2.00	0.50	0.50
offset line control deviation	cm		0		

		leading edge	trailing edge
valve 18 pipe 1 top	cm	0	0
valve 19 pipe 2 top	cm	0	0
valve 20 pipe 3 top	cm	0	0
valve 21 pipe 4 top	cm	0	0
valve 22 pipe 5 top	cm	0	0
valve 23 pipe 6 top	cm	0	0
valve 24 pipe 7 top	cm	0	0
valve 25 pipe 8 top	cm	0	0
valve 26 pipe 9 bottom	cm	0	0
valve 27 pipe 10 bottom	cm	0	0

5.2.3 Cascade Rinse following the Etcher



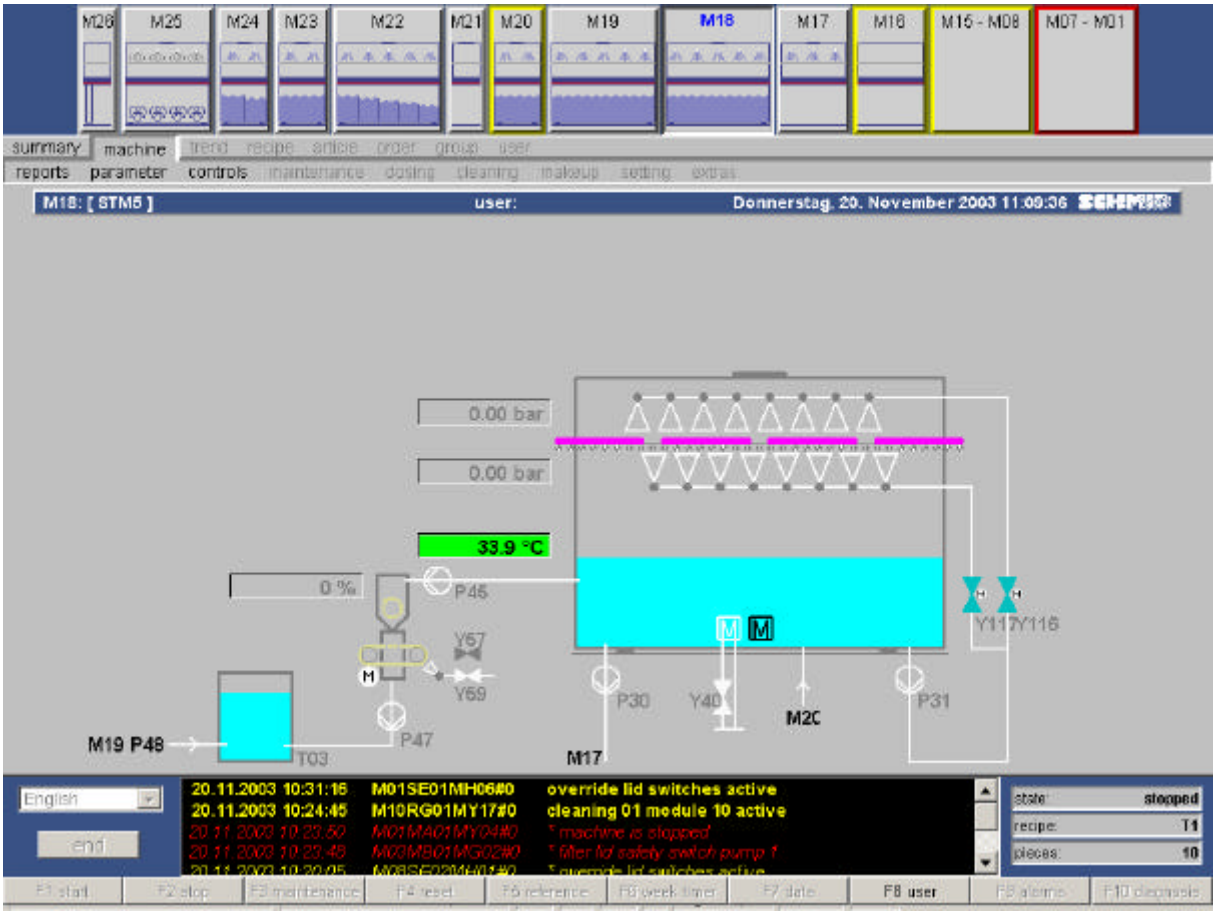
	Unit	Actual	Nominal	warn.	alarm
conductivity	mS	0	640	10	20

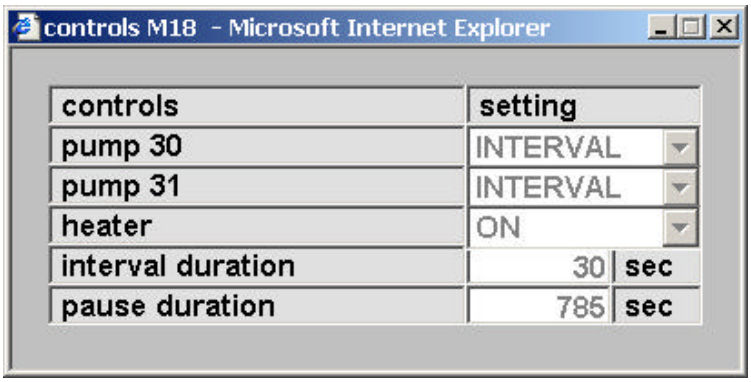


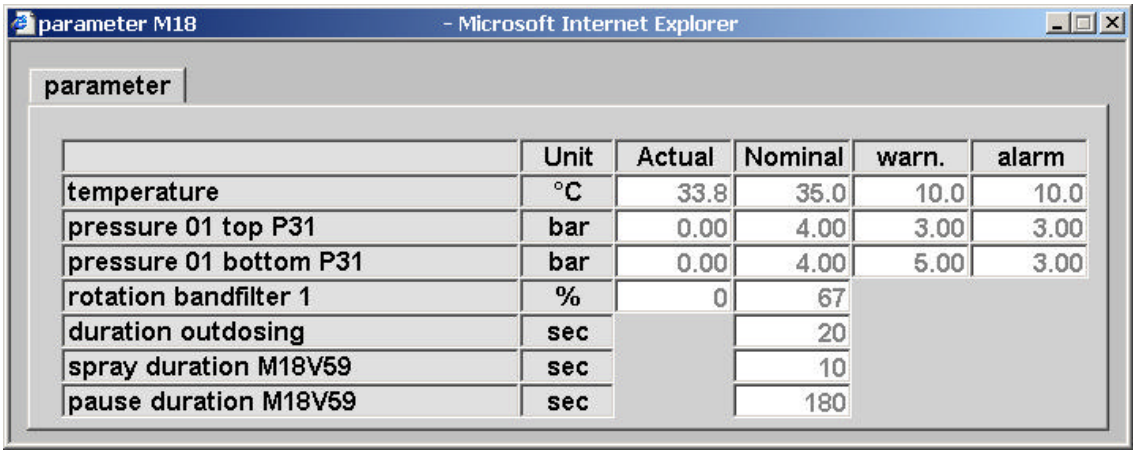
		act.	nom.
conductivity	mS	0	640

5.3 Stripper

5.3.1 Stripping Module

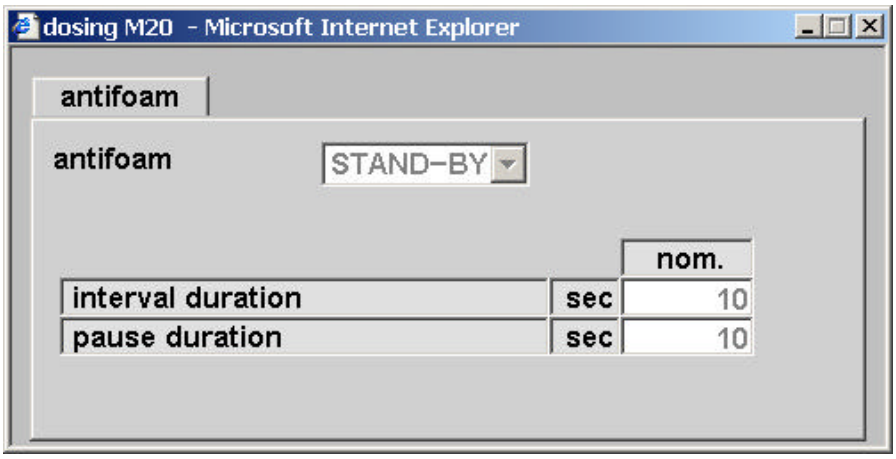






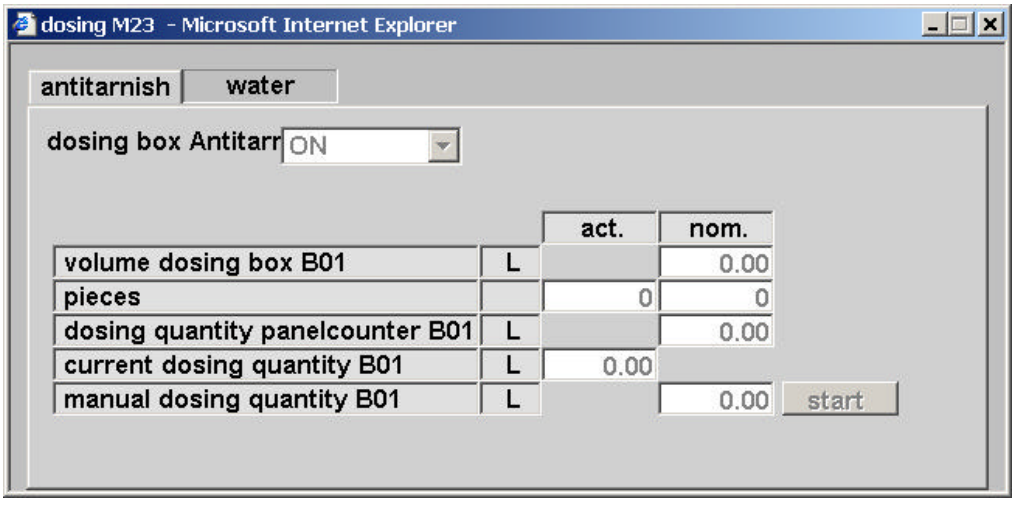
	Unit	Actual	Nominal	warn.	alarm
temperature	°C	33.8	35.0	10.0	10.0
pressure 01 top P31	bar	0.00	4.00	3.00	3.00
pressure 01 bottom P31	bar	0.00	4.00	5.00	3.00
rotation bandfilter 1	%	0	67		
duration outdosing	sec		20		
spray duration M18V59	sec		10		
pause duration M18V59	sec		180		

5.3.2 Post-Stripping Module

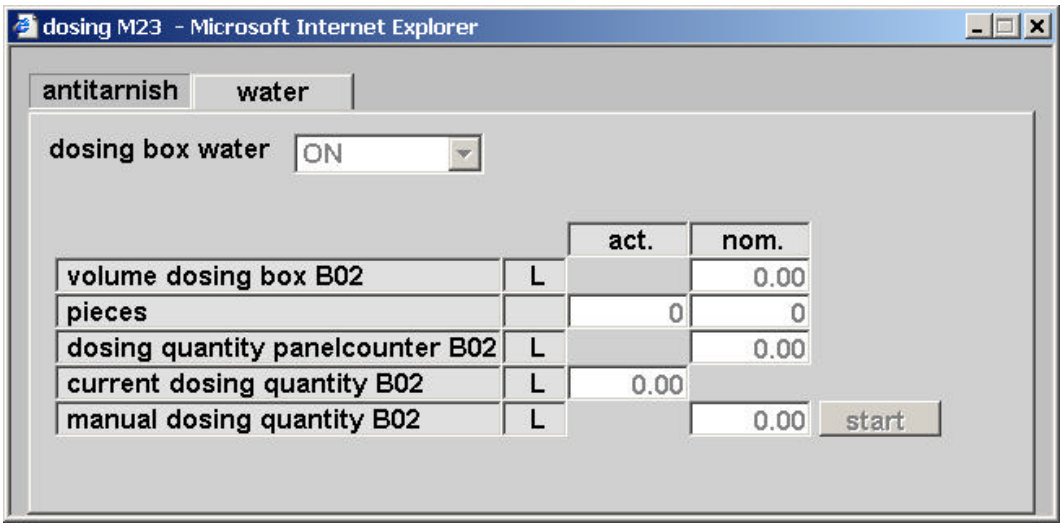


		nom.
interval duration	sec	10
pause duration	sec	10

5.3.3 Antitarnish following the Stripper



		act.	nom.	
volume dosing box B01	L		0.00	
pieces		0	0	
dosing quantity panelcounter B01	L		0.00	
current dosing quantity B01	L	0.00		
manual dosing quantity B01	L		0.00	start



Dosing System (dosing boxes)

The dosing system is installed in order to guarantee firmly adjusted proportions of ingredients of the individual media. The dosing boxes are used for batch dosing (batch dosing = in case of need chemicals are supplied in certain quantities, instead of slow constant dosing). The dosing boxes measure one chemical each according to the recipe for the bath; via a solenoid valve they are simultaneously emptied into the process chamber. Thus an exact proportion of ingredients is ensured.

The dosing boxes can be released in different ways:

- By means of an area calculator: an area calculator at the entry of the machine calculates how many square meters of panels have run-in and reports this figure to the PLC. On the basis hereof dosing is released after a certain (previously determined) quantity. The possibility to dose in cycles is only given in connection with a PLC.

- By means of a level measuring device: If the level of the bath falls under a certain (previously determined) level, dosing is released.

- By means of a redox measuring instrument, a pH measuring instrument, a conductivity control or a density control: These variants control dosing via the redox potential, the pH value, the conductance or the density of the medium. When the bath falls under a certain (previously determined) value dosing is released. This can be done over the PLC as well as over the respective measuring instruments.

- By means of a piece counter: Similar to the area calculator the number of run in panels is noted. After a certain (previously determined) quantity dosing is released. This possibility of dosing in cycles also works without PLC.

The quantity of the chemicals in the dosing boxes is controlled by float switches. The filling height of the boxes can be manually adjusted over these float switches. As an option the float switch can be equipped with a reed contact chain and can report the filling height of the box to a PLC. Directly after dosing the box is filled up again to the nominal level and must run empty during dosing within a certain time, just as the filling must take place within a certain time. Should this time elapse without the float switch having reached its determined position (nominal value or 'zero' position after dosing) an alarm is released.

As an option the feeding pipes into the dosing boxes can be connected with the storage tank by means of a suction lance.

Important:
For references and instructions how to adjust the measuring instruments or the PLC please refer to the process references (chapter 5) and manufacturer's instructions (chapter 7 spare parts lists, in the appropriate module) of the respective devices or the description of machine visualization (chapter 4.1).

6 Error Reports

6.1 Clear Text Display of all Error Reports

Clear text display of all error reports is effected on the PC in the secondary window 'warnings' of the respective module.

6.2 Graphic Display

In the visualization an occurring error is graphically displayed by a colour change in the schematic display of the related module. A 'min. flow' of a flow meter, for example, is marked by a colour change to red for this flow meter. Further the height of bar, representing the flow meter, changes. Thus it can be seen immediately whether a min. or max. flow is concerned.

6.3 Error Reports of Analogue Measuring Values

Analogue measuring values, like temperatures, flows or pressures are viewed in the visualization with their current actual value. When a set warning limit or alarm limit is exceeded resp. fallen below, the actual value is marked by a colour change. Exceeding of the warning deviation is viewed by a colour change to yellow. Exceeding of the alarm deviation is viewed by a colour change into red. An arrow showing to the top or to the bottom indicates whether the values have exceeded or fallen below the warning limits and alarm limits.

6.4 Reactions on Errors

Immediate Stop:
The complete machine is turned-off, the conveyor stands still and all pumps are turned-off. The heaters continue to work.

Empty-Run of the Machine:
In case of error 'empty-run of the machine' the loader is stopped and the entire line is run empty before it is stopped. With such an error the interval operation remains active. The machine can be restarted only after the error has been eliminated and acknowledged. When the key switch 'bypassing empty-run' is active, the machine is not run empty. The error continues to be displayed.

6.5 Error Reports

Protective Motor Switch (PKZ)
When a protective motor switch comes into action the pump switches-off. The error is to be eliminated at the protective motor switch directly. The error has to be acknowledged.

Disturbance Conveyor Control
When the antilock protection of the conveyor comes into action the entire machine stands still and all aggregates are turned-off => immediate stop.

Failure of Control Fuse
Immediate stop of machine.
Check for the cause. Re-lock the fuse in the control cabinet.

No Compressed Air available
Immediate stop of machine with time-variant.

Exhaust does not work
For machines with a flow control in the exhaust, the flow control has to record a flow before the machine gets started. Should this not be the case a malfunction report is generated.

Control Voltage switched-off
This malfunction report reminds the operator that the control voltage is to be switched-on for operation of the machine.

Subsequent Machine is not ready for Operation
For production in automatic mode the subsequent machine has to signal its readiness. Should this not be the case the machine is switched-off and emits a malfunction.

No Operating Time Machine
If the machine is not within the time period programmed in the weekly timer automatic mode cannot be run. If the machine leaves the range of programmed time periods during production in automatic mode the machine is run empty before it stops. A malfunction report is emitted.

Heat-Up Phase Machine
After switching-on the machine via the weekly timer it remains in the operating mode 'heat-up phase' until the lower warning limit for the temperature has been reached with all modules. Before this the machine cannot be switched-on in automatic mode. A malfunction report is emitted.

Lid opened and bypassed Module X
A lid can be opened with bypassed lid safety interlock. But as no pump must be restarted when a lid is opened, those pumps which are run in standby or interval operation are not restarted after they have been switched off once. For this reason a warning report is emitted.

Fault 'Lid opened'
When a module is opened without 'bypassing lid safety interlock' the machine stops immediately and a fault message is emitted.

Bypassing 'Empty-Run'
With error reports of the category 'empty-run' the machine is run empty before it stops. This function can be bypassed by means of a key switch.

Dry-Run Protection Module X
When the dry-run protection comes into action (level too low, no time delay) pump and heater switch off. The error remains stored. Upon elimination of the error cause the error is to be reset by means of the reset key.

Filter Safety Interlock Pump X
When the filter lid safety interlock comes into action the pumps switch off. The error remains stored. Upon elimination of the of the error cause the error is to be reset by means of the reset key.

Max. Temperature (STH)
When a safety thermostat comes into action (when the main switch is on resp. when the temperature set on the safety thermostat is exceeded) heater and pump of the related module are switched off. The safety thermostat can only be unlocked after the temperature has fallen approx. 10° below the set temperature value of the STH. This is to be reset with the pressure key on the switch cabinet.

Min. Level of Immersion Zone
A level switch ensures a sufficient level in the immersion zone. If the level is too low a malfunction report is generated.

Disturbance Dry-Run Protection Ultrasonics
When the dry-run protection comes into action (level too low, no time delay) the US generator switches off. The error remains stored. Upon elimination of the error cause the error is to be reset by means of the reset key.

Error: Valve YXX not closed
As an option the correct position can be monitored by switches on the valves.

Wire Breakage PT100
The temperature sensors of the process modules are monitored for wire breakage. When a sensor or its feeding line is defective this error report is emitted.

Error: U.S. Generator
When this error report is displayed the US generator is to be examined for correct function.

Error: Module brimfull Module X
When this error report is displayed all supply lines are switched off in order to prevent an overflow of the module.

Min. Flow Qty. Pump X (Valve X)
As an option the flow qty. of the feeding lines to the module can be monitored. When the flow is not correct the position of the inlet valves should be examined.

4. Start-Up

4.1 Switching and Operating Controls

4.1.1 Machines with PLC Control and Visualisation

All of the control elements of the line are shown on the switching cabinet layout which can be found at the end of the wiring diagram.

Control elements consist of "on/off" buttons, selector switches or buttons as well as key switches. The white button for "on" is always found above the red "off" button. The white button has a black vertical line, the "off" button a black oval circle. Selector switches are used with different level positions. In order to ensure a certain amount of safety, key switches can only be activated with the corresponding keys.

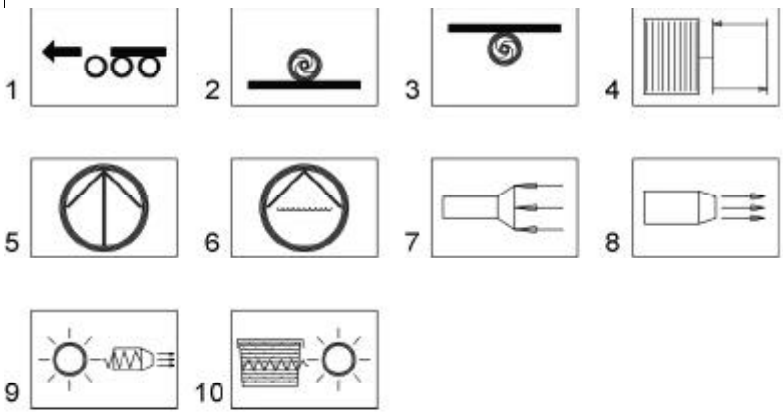
4.1.2 Contactor-Controlled Machines

All of the control elements with text are shown on the switching cabinet layout which can be found at the of the wiring diagram.

On the next page there is a list of the control elements. The symbols show their corresponding functions. These are listed on the switching cabinet layout without designation.

Control elements consist of "on/off" pushbutton keys, selector switches or buttons as well as key switches. The white pushbutton key for "on" is always found above the red "off" pushbutton key. The white ‘on’ pushbutton key has a black vertical line, the "off" pushbutton key a black oval circle. Selector switches are used with different positions. In order to ensure a certain amount of safety, key switches can only be activated with the corresponding keys.

4. Start-Up



Pos.	Control Elements
1	pushbutton key conveyor on/off
2	pushbutton key brushing above on/off
3	pushbutton key brushing below on/off
4	pushbutton key oscillation on/off
5	pushbutton key centrifugal pump on/off
6	pushbutton key high-pressure pump on/off
7	pushbutton key compressor sucking on/off
8	pushbutton key air blowing on/off
9	pushbutton key heating air on/off
10	pushbutton key heating on/off

4. Start-Up

4.2 Line Start-up

CAUTION!
Requirements for starting up the line include proper installation, compliance with technical safety requirements, and complete inspection of all line functions by a service engineer.

1. Unlock emergency switch.
2. Turn on system by using the main switch.
3. Check that the cool water supply is open.
4. Adjust the thermostats to desired bath temperatures.
5. Turn on heating system (Control lamp "heat" must light up).
6 Turn on pumps (Control lamp "pumps" must light up).
7. Wait until the temperature chosen remains constant. Temperatures will rise in the first instance due to pump activity.
8. Turn on oscillation (Control lamp "oscillation" must light up).
9. Turn on transport (Control lamp "transport" must light up).
10. Turn on dryer. When turning on the dryers, make sure that contrary to the flow direction, the hot air blowers must be turned on before the suction fans can be started since these are interlocked with one another.
11. Turn on all other ancillary equipment in the same way.

4. Start-Up

4.3 Troubleshooting

ATTENTION!
Maintenance work can only be performed when the main switch is turned to "off". The main switch must be turned to "off" during any work on the system to prevent the line from being turned on unexpectedly. When maintenance work is performed on the electrical system, make sure that the main supply of current is also disconnected. Maintenance and repairs on the system are to be performed only by trained technicians. In addition, be sure to follow the safety instructions found in **chapter 2**.

The following chart provides information concerning possible malfunctions and their causes and corrections. It does not claim to be complete. We are available under the address listed in **chapter 7.1** (technical customer service) for any malfunctions which cannot be corrected by your maintenance or service personnel.

Chart 1:
Troubleshooting
-to be continued-

Malfunction	Possible Causes	Correction
After turning on the main switch the thermostat does not function	Not plugged in. Corresponding main circuit breaker is defective or switched off. Main line electrical supply is interrupted.	Plug in Turn or replace fuse Repair main supply line
Individual systems fail to start after switches are turned on	Main switch not turn on. Motor protection switch (overload) turned off. Automatic safety switch turned off.	Turn on main switch. Reset motor protection switch. Reset automatic safety switch.

4. Start-Up

Chart 2:
Troubleshooting
-to be continued-

Malfunction	Possible Causes	Correction
Transport system does not start	Safety switch turned off	Turn on safety switch, test the transport system possible dragging, check whether or not carbon brushes of the drive motor should be replaced (remaining length of carbon brushes should be 5mm).
	Roller chain of conveyor drive is defective.	Repair or replace the roller chain.
	Armature / field fuses defective.	Replace fuses.
Oscillation does not function	Safety switch turned off	Turn on safety switch: check oscillation of dragging
Pumps do not switch	Main switch not turned on.	Turn on main switch.
	Motor safety switch turned off (Malfunction lamp lights up).	Turn on motor safety switch.
	Automatic safety control turned off.	Turn on safety control.
	Insufficient liquid in tank.	Add proper liquid.
	Float switch does not function.	Check float and float switch and, if necessary, make operational.
	Shutoff valve closed.	Open shutoff valve.

4. Start-Up

Chart 3:
Troubleshooting
-to be continued-

Malfunction	Possible Causes	Correction
Insufficient spray pressure	Filter clogged.	Clean filter.
	Spray system leaks.	Tighten pipe fittings or replace gaskets.
	Valves in pressure piping are not completly opened.	Open valves completely.
	Appropriate pump turns in wrong direction.	Reverse two phases.
	Insufficient liquid tank.	Add liquid.
Heating system does not function	Safety switch turned off.	Turn on safety switch.
	Temperature regulator is turned off.	Check temperature and verify with thermometer.
	Temperature regulator is defective.	Replace or restart temperature regulator.
Solenoid valve for cooling does not open or close	Temperature regulator is defective.	Replace or restart temperature regulator.
	Water supply to valve is closed.	Open Shutoff valve.
	Insufficient liquid in tank.	Add liquid.
Liquid temperature is too low	Thermostat has been incorrectly adjusted.	Adjust thermostate correctly.
	Overload switch tripped.	Replace overload switch.
	High temperature limit regulator tripped.	Check high temperature limit regulator.
	Heating system is not functioning.	Turn on heating system.
	Cooling system is not functioning.	Turn on cooling system.
	Safety switch tripped.	Turn on safety switch.
	Heating coil is defective.	Replace heating coil.

4. Start-Up

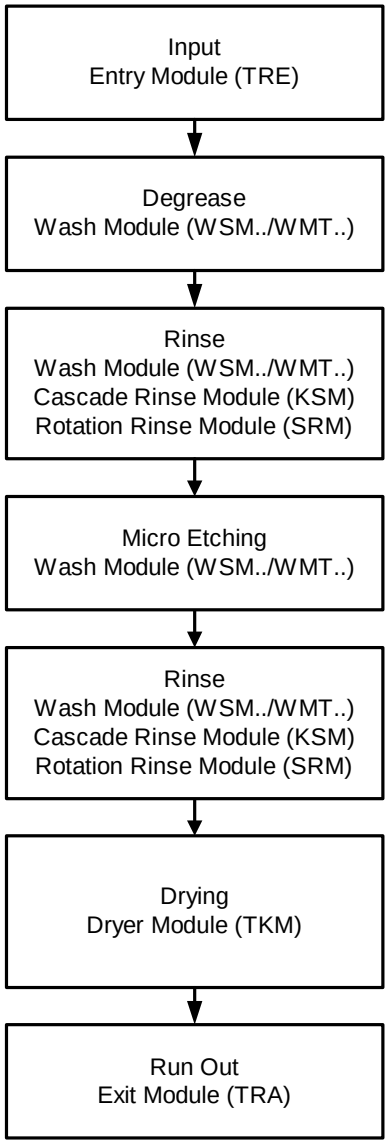
Chart 4:
Troubleshooting

Malfunction	Possible Causes	Correction
Liquid level too high in one tank, control lamp on control Cabinet/ console lights up	Filled above maximum level. Automatic dosage control malfunctions.	Drain excess liquid to correct level. Clean dosage system. Clean dosage line. Check dosage pumps and pipings.
Etching is too strong for panels	Etching time is too long	Increase conveyor speed.
Etching is too weak for panels	Etching time is too short.	Reduce conveyor speed.
Uneven etching	Poor position of spray pipes. Clogged-up nozzles. Pump capacity insufficient. Different spray pressure of upper and lower manifold.	Adjust position of spray pipes. Clean out nozzles See reference for "Insufficient spray pressure" Adjust spraying pressure by adjusting valves in the pressure line

5. Operation

5.1 Process Operation

Illustration 1:
Process Operation Mocro-Etch Machine



5. Operation

The above sequence gives an overview of the standard process for micro etching machines. Each process step can be accomplished in either one or more successive modules with the same functions. In addition, a control module (TRK) for visually controlling the process may be placed at each position for production requirements.

The process begins with the acceptance of panels in the entry module (TRE). Panels are accepted either manually or in combination with handling equipment (***Vacumat***) and fed into the line. The module can be furnished optionally with a sensor bar to guarantee a functional stand-by operation.

The panels are then cleaned chemically in a rinse module to increase the wettability of the copper surface. Thereafter, the etching residue is completely removed in either a rinse module (WSM../WMT...), a cascade rinse module (KSM), or a rotation rinse module (SRM). (For more information in regard to usable rinsing technology, please see the layout drawing and the module description.)

The soldering side of the panel is sprayed with a weak etchant to remove the oxide from the copper surface. Also, the adhesion capability of the copper surface is improved for further coatings. One more rinsing process follows.

Finally, the panels arrive at the dryer module (TKM..) where they are first dried by chamois covered rollers. Further drying techniques are available such as suction, blow off, and hot air drying.

An exit module ends the process where the panels are automatically loaded onto a stacker (***Vacumat***) or can be set up for removal.

Detailed information for each integrated module can be found on the following pages.

5. Operation

Entry Module

Entry modules are manually or automatically loaded with panels and convey these into the following machines automatically.
The entry modules are available in different lengths from TRE1 to TRE5. Larger input modules are equipped with supporting legs.

All entry modules from TRE1 to TRE5 can be equipped with an additional conveyor drive (VS). Also, an exhaust connection in the passage zone to the following module is available for all machines starting with TRE1.

Exit Module

Exit modules transport the panels from the preceding module automatically to the connected machine.
Exit modules are produced in five different versions (TRA1 to TRA5) that are similar in principle, except for the length of the conveyor.
Machines with a longer conveyor are designed with floor support legs.
It is also possible - as for the entry module - to install in the passage zone to the exit module an exhaust connection.
The horizontal conveyor consists mainly of rubber-coated rollers (in the case of exhaust) and shafts with wheels.

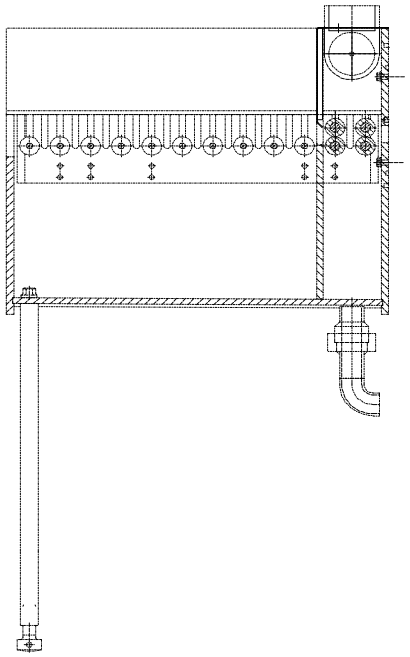
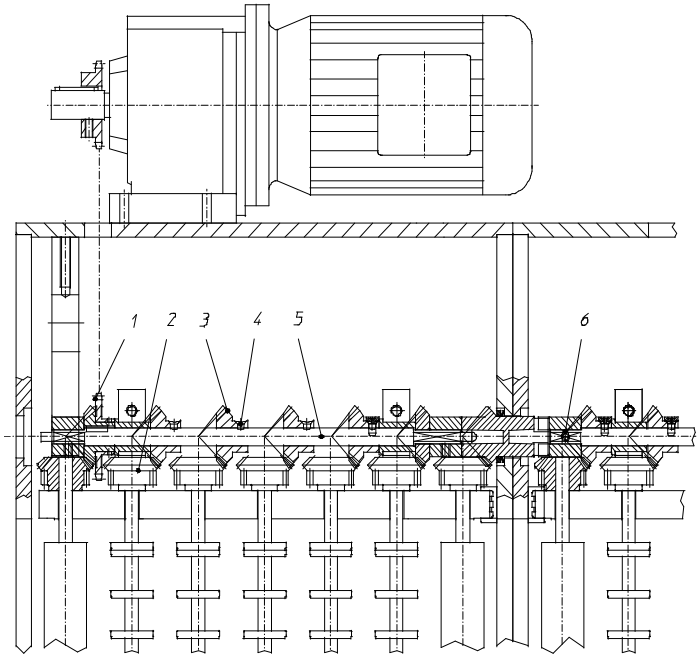


Illustration 1:
Entry-/
Exit Module
TRE2 / TRA2

5. Operation

Illustration 2:
Top view of conveyor

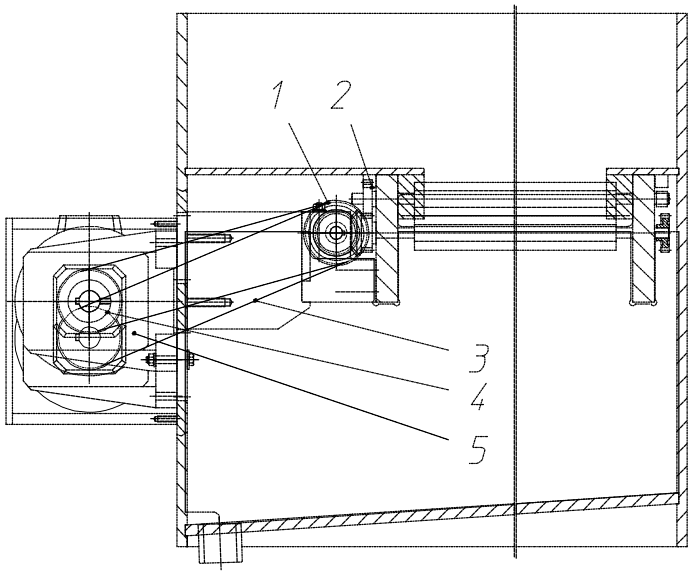


Conveyor Drive

The conveyor drive is powered by DC gear motors or three-pages AC motors with adjustable speed (illustr.3-pos.5). They move the drive shaft (illustr.2-pos.5) via sprockets (illustr.3-pos.1+4) which are linked with a roller chain (illustr.3-pos.3). The sprockets (illustr.2-pos.3) fitted with plug-in clamps (illustr.2-pos.4) on the drive shaft (illustr.2-pos.5) transfer the rotation to the sprockets (illustr.2-pos.2) which are fitted at the transport axes of the shafts and rollers.

5. Operation

Illustration 3:
Section of conveyor



The panels are conveyed either by shafts with transport wheels or solid rollers. In special cases, conveyor belts or special transport shafts may be used instead.
Couplings (illustr.2-pos.6) are used to connect the drive shaft (illustr.2-pos.5) from one module to the drive shaft of the next .

Conveyor systems for thin material are equipped with the double no. of shafts (distance 25 mm) or with clips (innerlayer transport).
Guide fences or guide clips and positioners are fitted at the module bridges where the panels pass from one module to another.

5. Operation

Cascade Rinse Module

The cascade rinse module is used to rinse chemically treated circuit boards. The rinse liquid is water. A high degree of cleanliness is achieved with the arrangement of cascades using only a small amount of water. The number of cascades will depend on the application and the desired board cleanliness and, in addition, on the amount of water used.

Cascade modules are manufactured in sizes KSM2 - KSM5 (2 to 5 rinse zones). Cascade modules can be used in series should the number of cascades not be adequate for a desired application.

The panels are entered into the line horizontally. Rubber covered pinch rolls (illustr.1-pos.2) are located at the entry side of the cascade. Shafts with PVC rollers convey the panel through the spray area. Rubber covered pinch rollers (illustr.1-pos.4) at the cascade exit transport the panels to the next cascade. Two chamois leather covered rolls can be installed at the cascade exit instead of the upper rubber covered roll to increase the squeezing effect.

Spray pipes with flat jet nozzles are mounted above the conveyor line in each cascade (illustr.1-pos.3). Several flow jet nozzles (illustr.1-pos.8) can be mounted optionally below the conveyor line and/or above and below. Both jet pipes are supplied with water from an integral tank (illustr.1-pos.7) by a immersion pump. The upper spray nozzles of the spray pipes (illustr.1-pos.3) are arranged in an angle to avoid a liquid build-up and to guide the rinse water to the sides when mainly wide panels are processed.

Each rinse zone (cascade) consists at least of two separate modules. The cascade is supplied with rinse liquid from the overflow of the following cascade. Therefore, the cleanliness of the rinse liquid decreases against the conveying direction. A return flow from the first module to the process modules serves as compensation for the lost liquid.

Fresh water is supplied via an adjustable flow meter (illustr.1-pos.6) which is connected to the last cascade. It is also possible to supply the last cascade directly with fresh water which eliminates the recirculation pump.

5. Operation

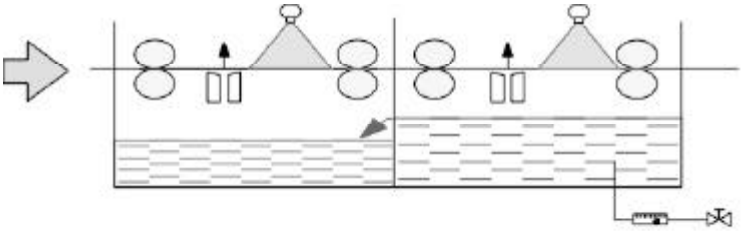


Illustration 1:
Functional Diagram

Cascade Rinse Module

5. Operation

Drying Module

First the drying modules dry the run-in boards mechanically, then by means of compressed air nozzles and suction nozzles and finally with hot air. They are equipped with different drying techniques:

-Drying, squeezing and sucking
-Drying, squeezing and blowing
-Drying, squeezing and fan

These technics either can be installed in various modules standing one behind the other (high conveyor speed), or can be installed in one single module. The functional description is about the single module.

The conveyor system of the drying modules corresponds to the principle of the other modules. However, there are usually EPDM-squeeze roller pairs (illustr.1-item1) in the entry of the drying module. You should take care that the exhaust system is switched on and the dampers (illustr.1-item6) are opened during operation of the dryer. During their passage through the drying module the boards pass a combination of compressed air nozzles and suction nozzles in the section; this combination consists of upper air knife (illustr.1-item 2) and lower suction nozzle (illustr.1-item 3).
The air knife (illustr. 1-item 2) can be pivoted in direction of transport and - by a defind slot gap - creates a permanent air curtain. The height-adjustable suction nozzle (illustr.1-item 3) installed at the bottom is to be adjusted with a 0.2 mm distance to the board surface.

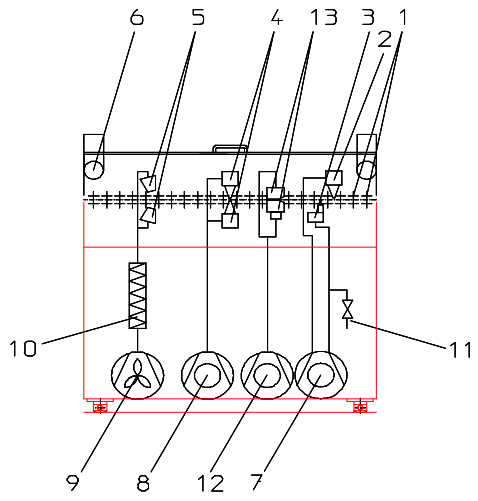


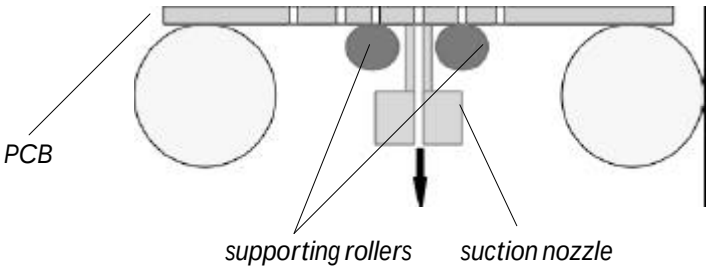
Illustration 1:
Drying Module

5. Operation

Thanks to this combination the drill holes in the boards are blown through and sucked off. The water film on the board surface is removed. Both elements are supplied by the integrated compressor (illustr.1-item 7).

During transport across the suction nozzle (illustr.1.item 3) the distance between board and suction nozzle has to be very narrow in order to produce the maximum effect. In order to vary the suction power of the suction nozzles, the operator can set the vacuum in the suction nozzles on request via valves (illustr.1-item11).

Illustration 2: Suction nozzles supporting rollers



Another version of drying module disposes of a second height-adjustable air knife (TQB, illustr.1-item4) - instead of the bottom suction nozzle.
A further version of drying module disposes of dry-jets which are placed above and below instead of the bottom suction nozzle and the upper airknife. These dry-jets can be supplied individually or in pairs by a blower (illustr.1-items 12 + 13).
It is also possible to install several dry-jets.
Then the boards are run through a warm air zone (illustr.1-item 5) in which the remaining humidity is removed by hot air.
The airknives or dry-jets are connected by a spiral hose via the heating channel (illustr.1-item 10) with the side channel blower (illustr.1-item 9).
The air flow generated by the blower (illustr.1-item 9) is heated considerably by heating rods in the heating channel (illustr.1-item 10), to be widely spread across the boards in the drying chamber. Here the following temperatures are reached:

-combi steel 100 deg. C.
-combi etch 54 deg. C.

An automatically operating thermostat keeps the air temperature on a constant level. The heating cartridges are safeguarded against excess heating by safety thermostates in the distribution box. If, however, a safety thermostat is released and - as a consequence - the max. temperature cannot be reached, this thermostat can only be switched on again at a temperature of 35 deg. C.

5. Operation

All blowers and compressors (illustr.1-item 7-9) may be equipped with filter elements in order to avoid contamination of the boards with particles of dust in the air.

5. Operation

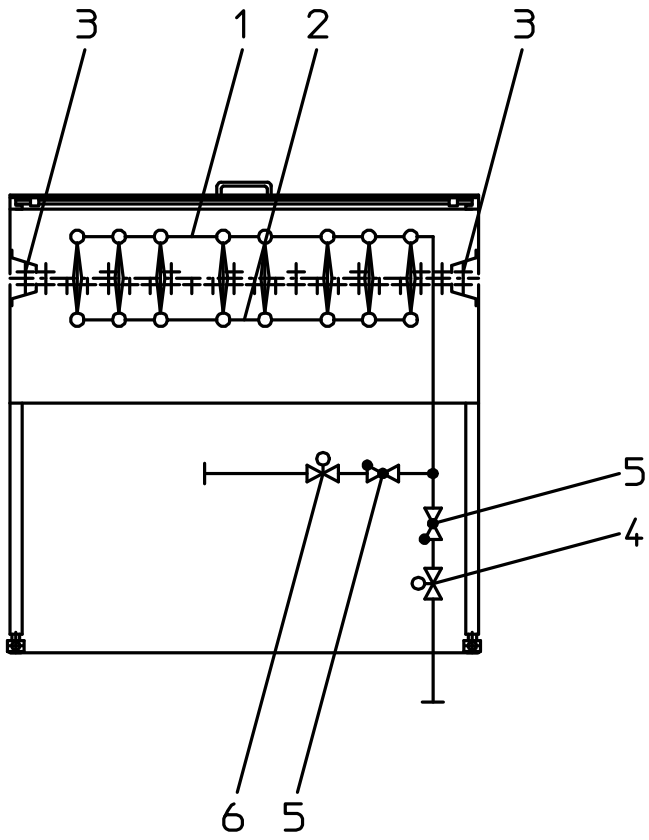
Rinse/Process Module

Rinse modules are universally useable modules which can be utilized for the following processes:

- Fresh water rinsing or flooding
- Grease removal
- Pre- and post-stripping
- Development
- Conditioning
- Etching
- Deposition of chemical copper, direct metal, and chemical tin/lead.

Rinse modules are produced in versions WSM1 to WSM5 (WMT1-WMT5). These modules differentiate only in length, width, and the number of mounted pairs of spray pipes (up to 10 maximum).
The spray pipes are furnished with either slanted or straight mounted flat or cone type spray nozzles. The spray pressure of the upper (dia. 1/ pos. 1) and lower (dia. 1/pos. 2) spray systems are adjustable independently of each other by shut-off valves.

Diagram 1:
Rinse Module WSM4



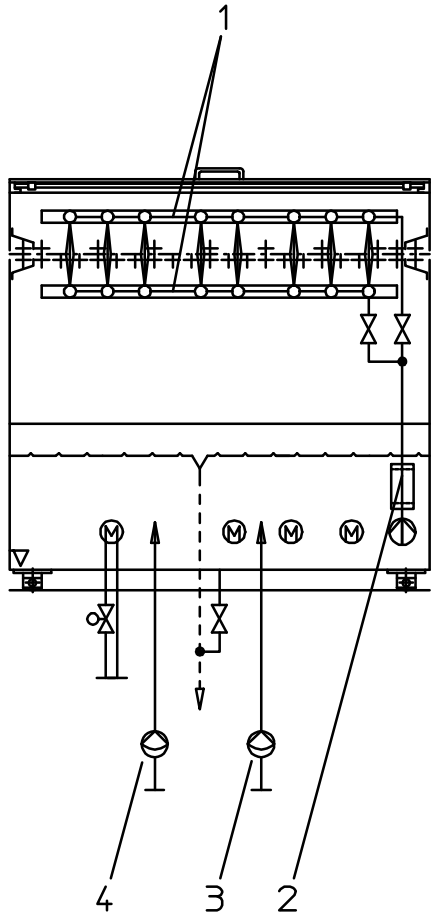
*) 1 bar=10^5 Pa

5. Operation

The spray pipes for rinsing with water are connected to the water supply by corresponding pipes. In this case, the manifold should be connected to a drainage system. If the module is used with brine or acid, the supply line and drain pipe must be connected to the tanks of the respective chemicals.

Cooling water from a preceding chemical process may be used for rinsing if desired. Two water inputs are furnished. The first water input supplies the chilling water for use as rinse water in the case of functioning cooling system.
The second is for fresh water input in case of non-working cooling water system. Two solenoid valves direct the respective rinse water inputs. The solenoid valve (dia. 1/pos. 6) combined with a check valve (dia. 1/ pos. 5) is open when cooling water is available for rinsing. The solenoid valve (dia. 1/pos. 4) for fresh water is then closed. When the cooling system is not functional and no cooling water is available, the rinsing water is lead to the spray manifold by closing the solenoid valve (dia. 1/ pos. 6) and opening the other solenoid valve (dia. 1/pos. 4).

Diagram 2:
Rinse Module
WMT4



*) 1 bar=10^5 Pa

5. Operation

If no cooling water is available or if it is already being used by another rinse module within the line, then only fresh water can be used. The input is regulated by a solenoid valve controlled by a sensor on the module entry. The conveyor drive opens the solenoid valve in the main water supply so that water do not enter into the rinse module if the conveyor drive is not turned on. Two pairs of squeeze rollers (dia. 1/pos. 3) on the entry and exit side of the module minimize loss of water.

The panels are conveyed into the module flat between two rubber-coated rollers. They are further conveyed on shafts with PVC rollers (EPDM-rollers) and then fed into the following module by rubber-coated rollers. During conveying through the module, the panels are sprayed with the corresponding processing liquid at constant pressure from above and below.

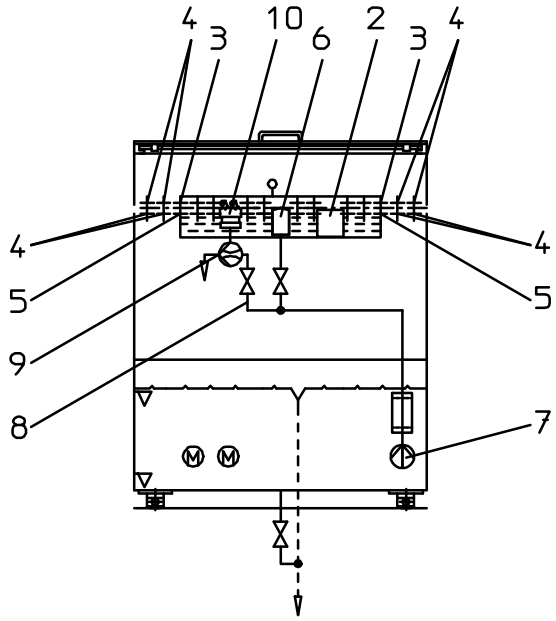
*) 1 bar=10^5 Pa

5. Operation

Modifications

Developing Module (WMT-OS, WSM-OS):
In order to increase the rinsing effects during developing, the liquid flow mechanics are optimized by the use of an oscillating nozzle arrangement
(dia 2/pos.1).
The drive consists of a separate oscillation motor located at the rear of the machine. The dirty developing solution is cleaned in a cartridge type filter (dia. 2/pos. 2). The brine concentrate and the antifoam are fed into the module by dosing pumps (dia. 2/pos. 3+4), which are also located at the rear of the machine.

Diagram 3:
Rinse Module
WMT3



Immersion Zones (-W):

Immersion zones (dia.3/pos.1) are used to achieve a high solution exchange in a calm bath at longer interaction time. It is a modular unit installed underneath the conveyor assembly with a closed trough (dia.3/
pos.1) with input nozzles (dia.3/pos. 6). There are lower and upper squeeze rollers or flaps at entry and exit sides of the trough to prevent leakage (dia.3/pos.3+5). These limitation rollers keep the liquid level, also during opening of the squeeze rollers (dia.3/pos.4) by the in- and outgoing panels.

*) 1 bar=10^5 Pa

5. Operation

The liquid is pumped (pump dia.3/pos.7) from the tank module through nozzles (dia.3/pos.6) located in the trough (dia.3/pos.1). The liquid level should be maintained at 30 mm above the conveyor rollers. A current through the panel holes is created by supplying the liquid from below and therefore improving the liquid mixture.

Ultrasonic (-US):

Ultrasonic oscillation (dia. 3/pos.2) is used in cleaning processes when high adhesive and sticky particles are to be dissolved. In combination with immersion zones (see previous description), the relatively calm bath supports the formation of cavitation bubbles and so reflects the ultrasonic waves from the bath surface. Pressures up to 10,000 bar*) can occur when a cavitation bubble of 0.1 mm radius implodes. At a disintegration time of approximately 5 µs and a frequency of 25 kHz this process can occur 25,000 times a second.
The ultrasonic generators work according to the double-half-wave sonic system with the highest effective performance. They have automatic impedance and performance adjustment, electronic and thermostatic safety circuits, as well as performance monitoring. Further information concerning ultrasonic generators can be found in the instructions included with the machine.

Nozzle Geometry

Double Suction Nozzles (dia. 3/pos.10):

A minus pressure is created by a radiation pump (dia. 3/pos. 9) piped in the bypass (dia. 3/pos. 8) with the filling pump (dia. 3/pos. 7) which draws on the raised liquid level formed by the immersion zone feature. The complete effect of these nozzles is achieved by special sealing flaps (dia. 4) which cover the suction slots. The slots only open in the area of the incoming panel, and therefore achieve maximum suction effect at the bore holes.

*) 1 bar=10^5 Pa

5. Operation

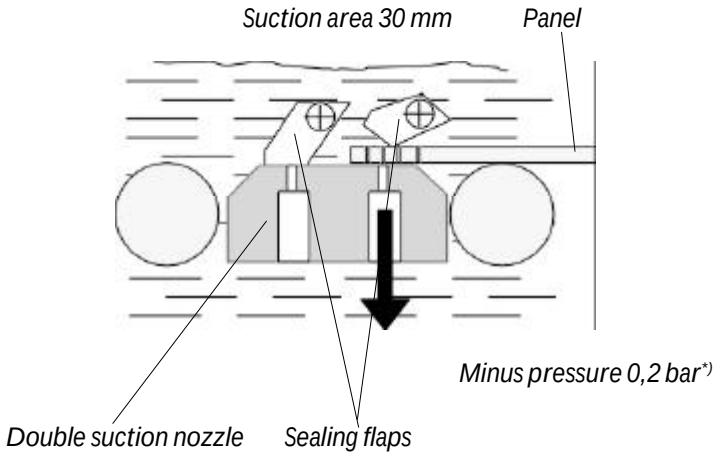


Diagram 4:
Sealing Flaps System and double suction nozzles

*) 1 bar=10^5 Pa

5. Operation

Flow Jet Pipes:

Spray pipes with a large number of flat spray nozzles are located close to each other and close to the conveyor level to achieve an intensive exchange of solvent at the panel surface and in the bore holes.

Diagonally Slotted Nozzles:

These are flow nozzles with diagonally arranged flow slots for repeated processing of each hole during conveying. They can be used in chemical and rinse processes in which an intensive solution exchange and a longer inter-action time is required, even in the smallest bore holes.

Intermittent Spray System:

During the etching process less copper is etched in the middle of the board surface than on the edge of the board, due to puddling. Depending on the board size the deviation ranges between 2 - 5 µm. In order to solve this problem an intermittent spraysystem was developed.

The intermittent spray system consists of a module, disposing of upper spray pipes, only. Each of these spray pipes is individually driven by a solenoid valve. By means of a hand valve and manometer the spray pressure may be adapted according to the requirements.

The spray pipes are equipped with differing numbers of nozzles; these nozzles are symmetrically arranged from the middle towards the sides and staggered from pipe to pipe.
By means of a sensor front edge and rear edge of the board are scanned and the established values are provided to the PLC. Further the conveyor speed is inquired; based on these values the position of the board to the spray pipes is calculated.
On the display resp. PC the turn-on and turn-off position of each spray pipe is entered; i.e. from which position on the board the spraying is started and stopped again.

As the highest copper rise is approximately in the middle of the board, spray pipe no. 1, being equipped with the smallest number of nozzles, is set within a range of approx. 20 % from the middle of the board to the left and to the right; spray pipe no. 2 within a range of 40 %; spray pipe no. 3 within a range of 60 % and spray pipe no. 4 within a range of 80 %.

The setting depends on the board size and has to be established empirically. For various board formats the established values may be stored in the programme.

*) 1 bar=10^5 Pa

5. Operation

There is choice of two module types:

WSM1: Two spray pipes for a conveyor speed ranging from 0.5 - 1.5 m/min

WSM2: Four spray pipes for a conveyor speed ranging from 1.5 - 3.0 m/min

*) 1 bar=10^5 Pa

5. Operation

5.2 Process Advice

ADVICE!

All process modules of the machine, including all tanks, tanks for set-up, holding tanks, and supply tanks, must be cleaned with the appropriate chemicals before they are filled for the first time.

The concentration of the cleaning solutions should not present a corrosion problem for the machine parts. Also, the plastic parts must be resistant to the cleaning solution.

The set-up of the chemicals, depending on the control of the installation, will take place automatically or semi-automatically. Machines with conventional control operate with dosing pumps and timers. The dosing pumps must be calibrated before use. For PLC (SPS) controlled machines, the set-up is accomplished with the use of dosing pumps and analog flow meters. The suppliers of the chemicals issue process instructions which must be followed.

ATTENTION!

The safety instructions, sequence of adding individual components, storage, disposal, etc., must be followed.

The analytical control of bath solutions must be performed according to the instructions from the chemical suppliers and a protocol must be kept. The set-up of the process parameter should follow according to the data provided by the supplier of the chemistry and the equipment; refer to product data sheets.

5.2.1 Etchant

We recommend the use of a good etchant for a correct and economical production. Poor quality etchants can cause contamination and become encrusted on machine surfaces which are very difficult to remove. Also, very often these etchants have a tendency for heavy foam formation which is dangerous for the pump motors.
The temperature of the etchant is a great factor for the etching speed. The following are a few guidelines for the most commonly used etchants:

Ferric chloride	43 to 49°C (110 to 120°F)
Chromic acid	43 to 49°C (110 to 120°F)
Ammonium persulphate	54°C (130°F)

5. Operation

ATTENTION!

An additional cooling system is required for the machine if either ammonium persulphate or chromium-sulfuric acid is used or if aluminum is to be etched because of the exothermic reaction.The concentration of etchants is different and should be selected in accordance with the material of the work pieces. The following is a list of etchants which lists alphabetically the metals and the respective etchants. The specific gravity of the liquids is listed in accordance with the decree for units and measurements of the latest issue of May 8, 1981, in kilograms per cubic meter (kg/m) and also in its decimal definition.

However, the density of acids and galvanic solutions is most commonly measured with a hydrometer calibrated in “Baume” degrees. Therefore, all data of density for etchants is listed in “Baume” degrees. 0°Be equals pure water, 10°Be equals 1.0741 g/cm , and 67°Be equals 1.867 g/cm . In general, n°Be determines a density as follows:

$$? = \frac{144{,}3}{144{,}3 - n}$$

Aluminum and aluminum alloys:
- diluted ferrous chloride 12 to 18°Be with additives
- caustic soda
- solution consisting of 20 to 50% hydrochloric acid, 5% nitric acid and water (nitric acid must be added to the solution to avoid tacking the titanium parts of the machine)

Inconel and Inconel X:
- ferrous chloride 42 to 49°Be, 54°C

Cold rolled steel:
- ferrous chloride 32 to 45°Be
- 10 to 15% nitric acid and 85 to 95% water

Copper and copper alloys (except phosphoric bronze):
- ferrous chloride 32 to 45° Be
- solution consisting of chromic acid 20 to 25%, sulfuricacid 10 to 15%, and the rest is water
- ammonium persulfate in accordance with supplier’s instruction
- cupric chlorid

Copper beryllium
- see copper

5. Operation

Nickel:
- ferrous chloride 30 to 40°Be, 54°C

Rust and acid resistant steels:
- ferrous chloride 42 to 49°Be, 54°C
- ferrous chloride 42°Be, 54°C , and 3% hydrochloric acid
- one part nitric acid, one part hydrochloric acid, and one to two parts water

5.2.2 Spray Pressure

The spray pressures can be adjusted up to the maximum pressure, separate for above and below and independent from each other. Pressure gauges are mounted on the top side of the module to monitor the actual pressure.

5.2.3 Using only half of the etching distance

The etching distance can be halved with this feature. The separate spray pipes can be turned off or on individually via separate ball valves. Two pressure gauges monitor the pressure.

5.2.4 Fine-Line-Etching

An individual adjustable spray pattern across the panel width can be obtained with spray pipes provided parallel to the conveyor direction. These spray pipes can be supplied with etchant separately and independently from each other. A targeted adjustment for each partial system is possible because each spray pipe has its own valve and flowmeter.

5.2.5 Spray Pattern

The spray nozzles can be turned to vary the spray pattern. Therefore, the spray pattern can be adjusted and targeted to the size of the panel.

Short Guide to Conductivity Measuring Instrument: Function and Setting (PLC controlled machine)

Inductive measurement: Measuring instrument MG-000000351-000

Conductive measurement: measuring instrument MG-000000314-000

FOR DETAILS SEE SUPPLIER MANUAL ON CD MANUAL

1.1 Application

The conductivity measuring instrument is employed to preserve the preselected conductivity setpoint value throughout production.
This measurement is used in systems including alk. developers, alk. strippers, acid etchers and acid rinses.

1.2 Function

Soda solution is dosed in a standard developer, caustic soda or caustic potash solution in an alk. stripper, hydrochloric acid in an acid etcher and mainly hydrochloric acid or sulphuric acid in the rinses.
The dosing is initiated if the conductance differs from the setpoint value. The setpoint value has to be reached again within a prescribed time otherwise an alarm is raised.

1.3 Design

Measuring the electric conductivity
The measurement can be made two different ways.

1.3.1. Measuring conductivity by way of electrodes
Alternating voltage is applied in the electrolyte by way of electrodes and the alternating current flowing through the electrolyte is measured. This is a direct measure of the electric conductance of the electrolyte. The geometry of the electrode arrangement (relationship of distance to effective electrode surface) is defined by the cell constant k. Given a known cell constant k, the electric conductivity can be determined by way of the electric conductance. The actual specific conductivity is displayed.

1.3.2. Inductive conductivity measuring system (MG-000000351-000)
In this system the measurement solution, as a liquid conductor, couples two magnetically separated induction coils. The alternating current applied to the first coil is transferred to the second coil proportionally to the electric conductance G of the measurement solution, whereby a linear relationship between conductance G and the output voltage ensues. The specific conductivity can now be determined with the aid of the known cell constant k. Display can be made either in the standardized unit or in “%”.

1.3.3. Conductive conductivity measuring system (MG-000000314-000)
Two electrodes at a fixed distance and of specific area are used for measuring the conductivity. An alternating current is connected to the electrodes. The current measured is in direct relationship to the conductivity of the solution.

1.4 Influence of temperature on the measurement result
Since the conductivity is very dependent on temperature, compensation has to be made so as to give a reading for 20°C. At 20°C the compensation is not effective. A temperature sensor (Pt100) is necessary for the compensation and is already integrated in the measuring instruments.

1.5 Setting

Process	Function	Dosing medium	Set value
Alkaline developer:		sodium carbonate (soda)	12-13 mS/cm
Alkaline stripper:		NaOH or KOH	80-120 mS/cm depending on concentration
Acid etcher:		HCL	420-480 mS/cm
Acid rinse: e.g.	after developer as neutralization	5% H2SO4	205-210 mS/cm
	after stripper as neutralization	5% H2SO4	205-210 mS/cm
	after chemical precleaning as tarnish preventive	5% H2SO4	205-210 mS/cm
	after acid etcher to interrupt the etch process	5-10% HCL	400 –650 mS/cm depending on copper content

Rinse, for controlling the water quality	After pretreatments for absolutely clean panels	H2O	µS range depending on water
	After black oxide	H2O	µS range depending on water

1.6 Calibration

The conductivity measuring instrument is calibrated with air by the manufacturer. No further calibration is carried out at the Schmid works. It is recommended that the customer carries out a subsequent calibration by calibrating the instrument with air (see Bürkert's instructions, in the spare part lists of the respective module).

1.7 Dosage control

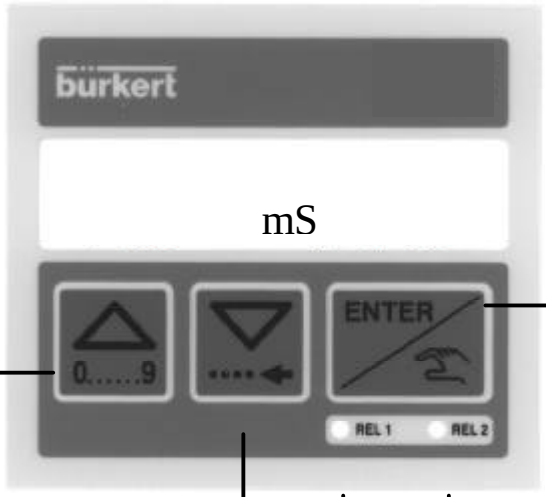
The display device can be connected to the PLC and then controls the dosage by means of the conductivity measured.

Alkaline developer:	Dosing sodium carbonate (soda)	
Alkaline stripper:	Dosing NaOH or KOH	
Acid etcher (CuCl2):	Dosing HCL	
Acid rinse:	after developer as neutralization	dosing H2SO4
	after stripper as neutralization	Dosing H2SO4
	after chemical precleaning as tarnish preventive	Dosing H2SO4
	after acid etchers to interrupt the etch process	Dosing HCL
Rinse:	After pretreatments/final cleaning for absolutely clean panels, for controlling the water quality	Dosing H2O
	After black oxide or alternative processes	Dosing H2O

1.8 Maintenance information

There is no special maintenance required. Attention must nevertheless be paid that the electrodes are clean. Any fouling can be cleaned using solutions with dilute acid content. Avoid any scratching of the electrode surface.

1.9 Fig. Overview of buttons



altering numerical value
menu
0 to 9
scrolling

Select digit,
scrolling

For input and
confirming

items

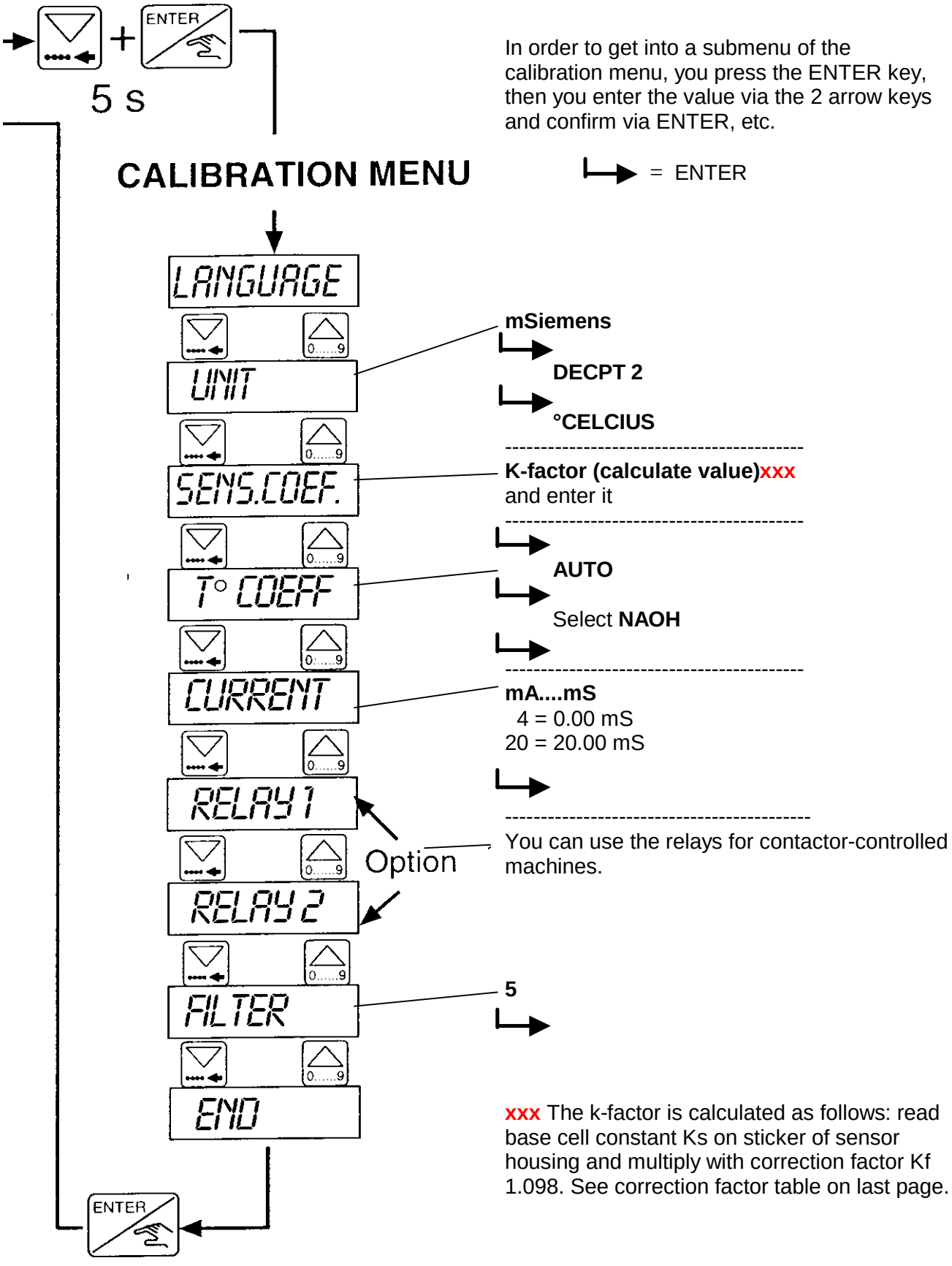
relay 2 (contact ...)

Relay 1 (contact ...)

Short guide to calibration of SCHMID specific conductivity measuring (PLC controlled)

2.1 For Alkaline Developer

To start press 2nd arrow key and ENTER key simultaneously for 5 sec.



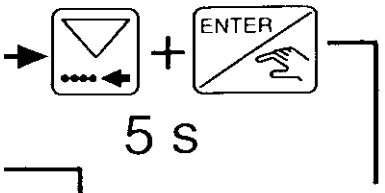
In order to get into a submenu of the calibration menu, you press the ENTER key, then you enter the value via the 2 arrow keys and confirm via ENTER, etc.

↳ = ENTER

xxx The k-factor is calculated as follows: read base cell constant Ks on sticker of sensor housing and multiply with correction factor Kf 1.098. See correction factor table on last page.

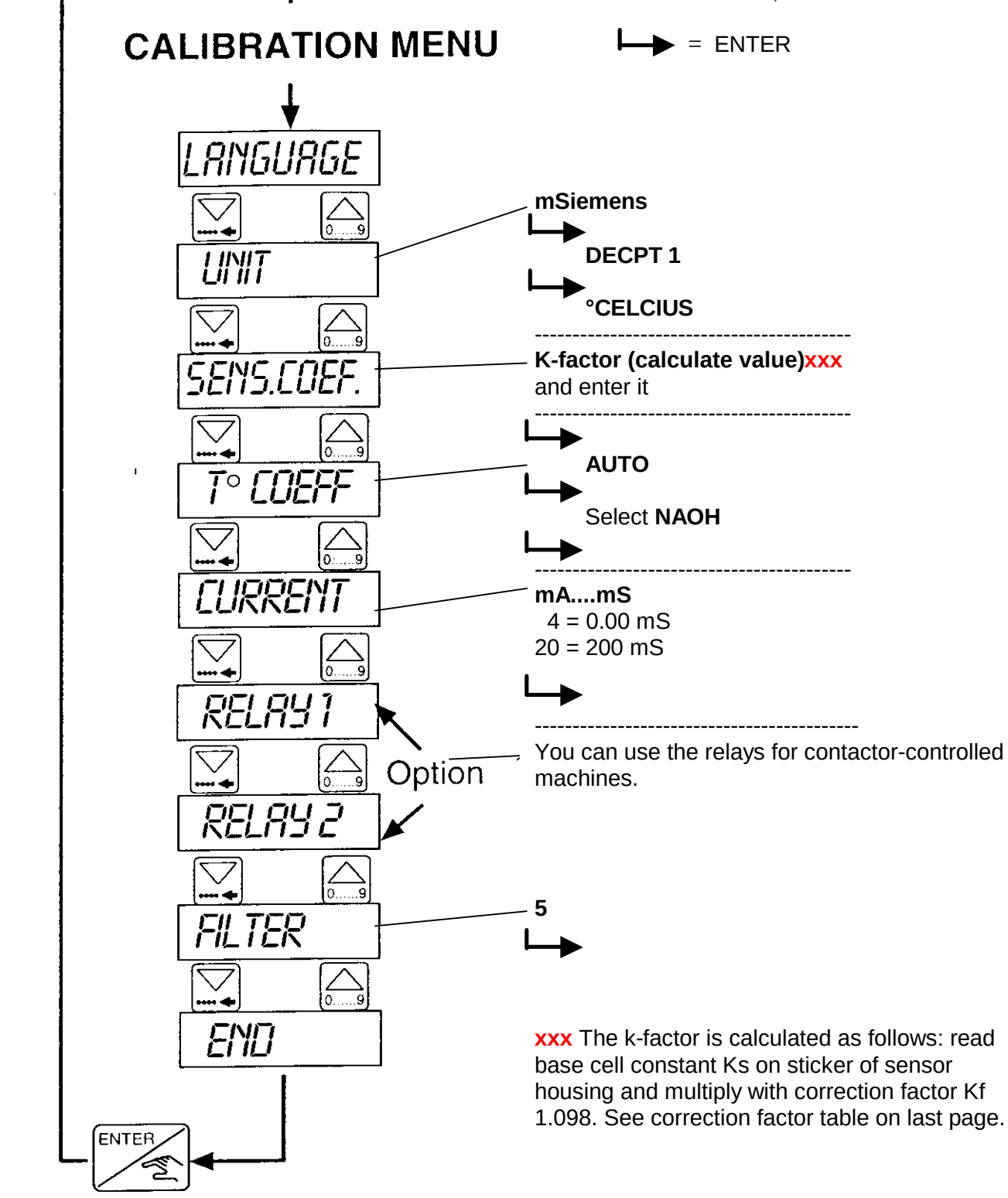
2.2 For Alkaline Stripper

To start press 2nd arrow key and ENTER key simultaneously for 5 sec.



In order to get into a submenu of the calibration menu, you press the ENTER key, then you enter the value via the 2 arrow keys and confirm via ENTER, etc.

↳ = ENTER

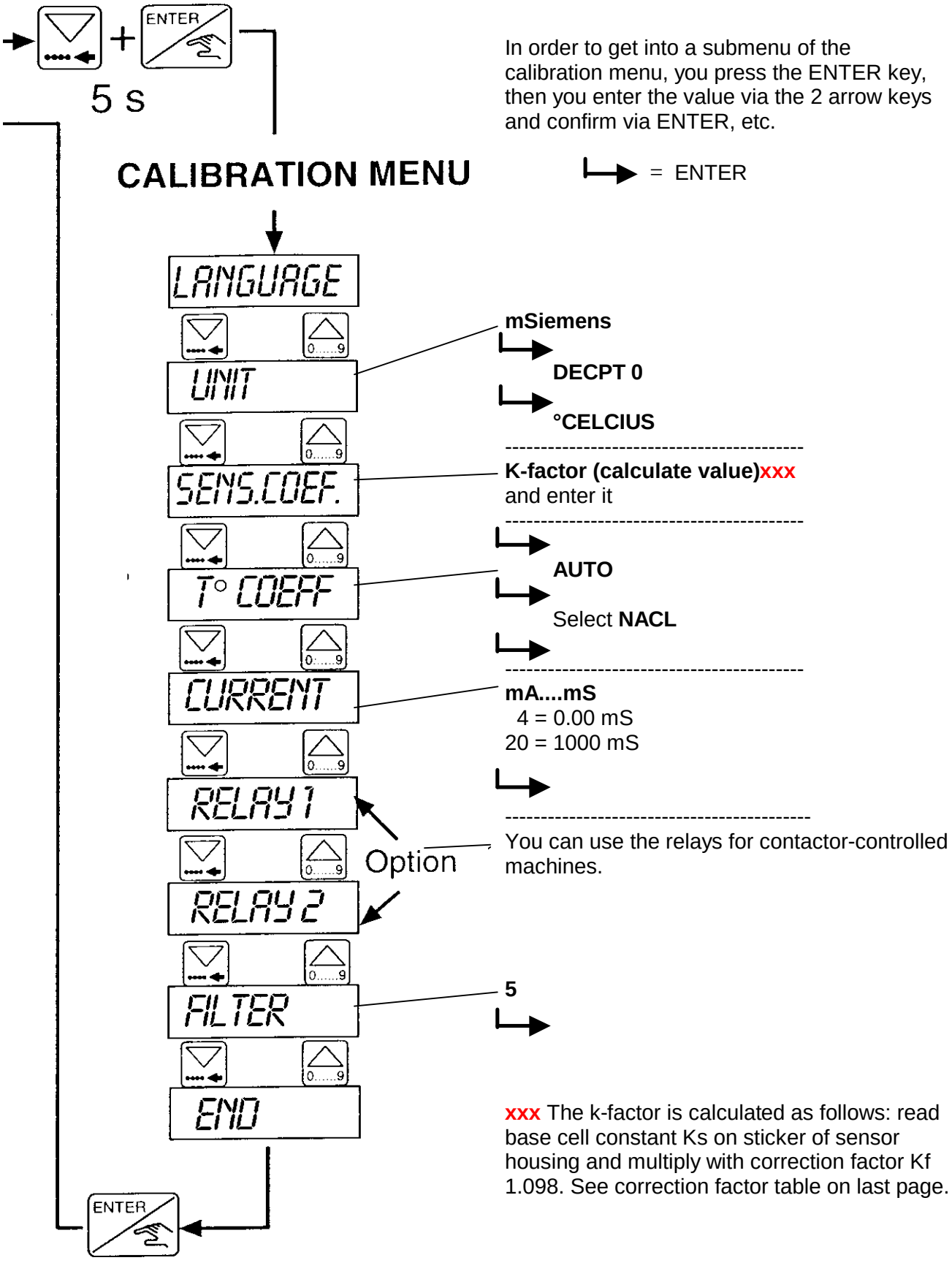


xxx The k-factor is calculated as follows: read base cell constant Ks on sticker of sensor housing and multiply with correction factor Kf 1.098. See correction factor table on last page.

Short guide to calibration of SCHMID specific conductivity measuring (PLC controlled)

2.3 For Acid Etcher with CuCl and FeCl3

To start press 2nd arrow key and ENTER key simultaneously for 5 sec.

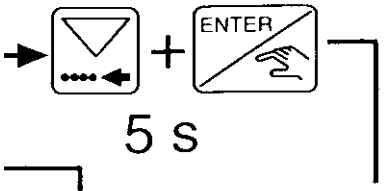


In order to get into a submenu of the calibration menu, you press the ENTER key, then you enter the value via the 2 arrow keys and confirm via ENTER, etc.

xxx The k-factor is calculated as follows: read base cell constant Ks on sticker of sensor housing and multiply with correction factor Kf 1.098. See correction factor table on last page.

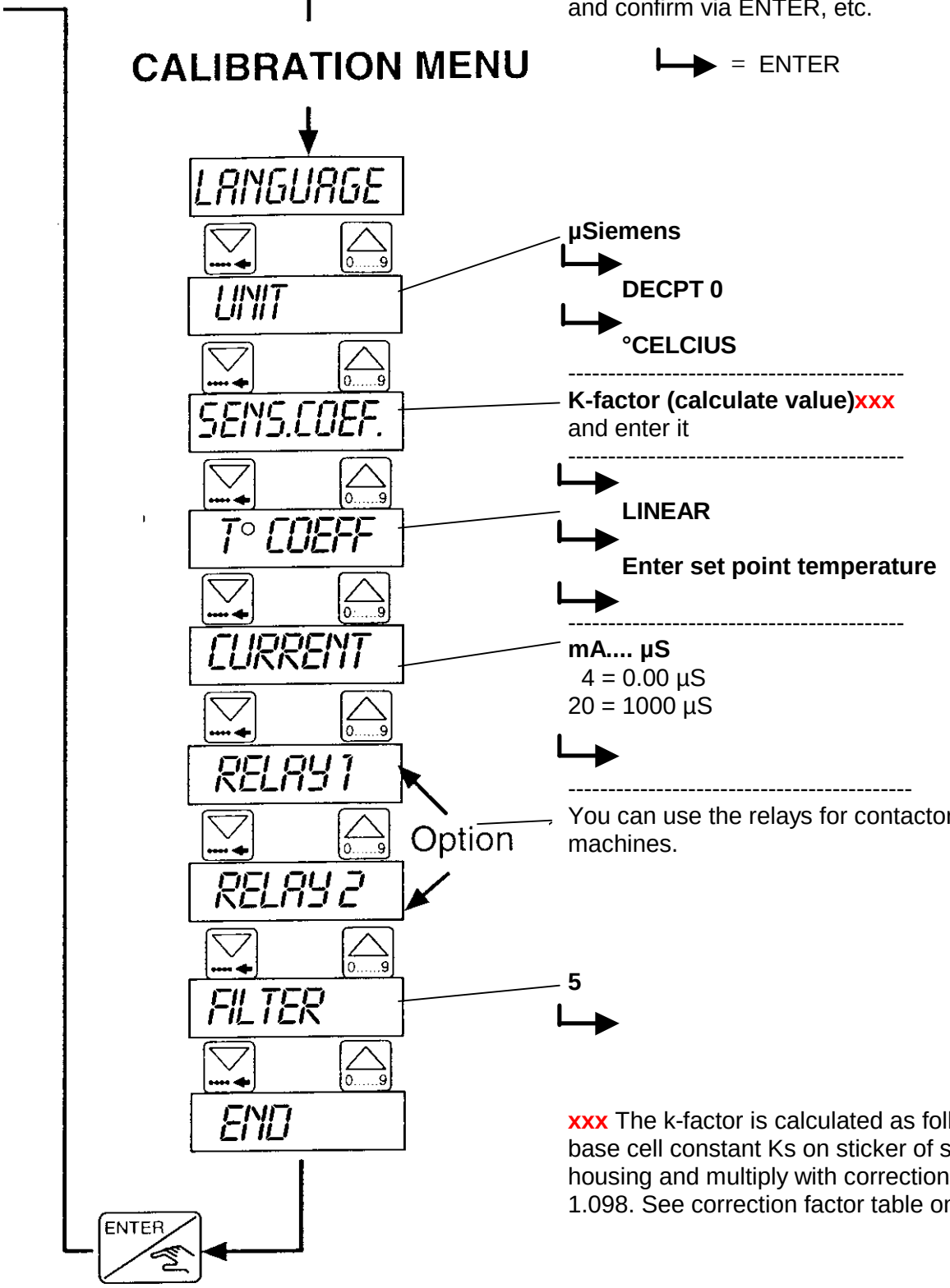
2.4 For DI Water Rinse

To start press 2nd arrow key and ENTER key simultaneously for 5 sec.



In order to get into a submenu of the calibration menu, you press the ENTER key, then you enter the value via the 2 arrow keys and confirm via ENTER, etc.

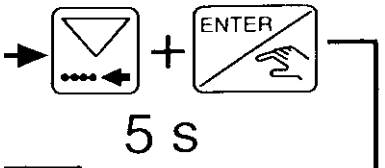
↳ = ENTER



xxx The k-factor is calculated as follows: read base cell constant Ks on sticker of sensor housing and multiply with correction factor Kf 1.098. See correction factor table on last page.

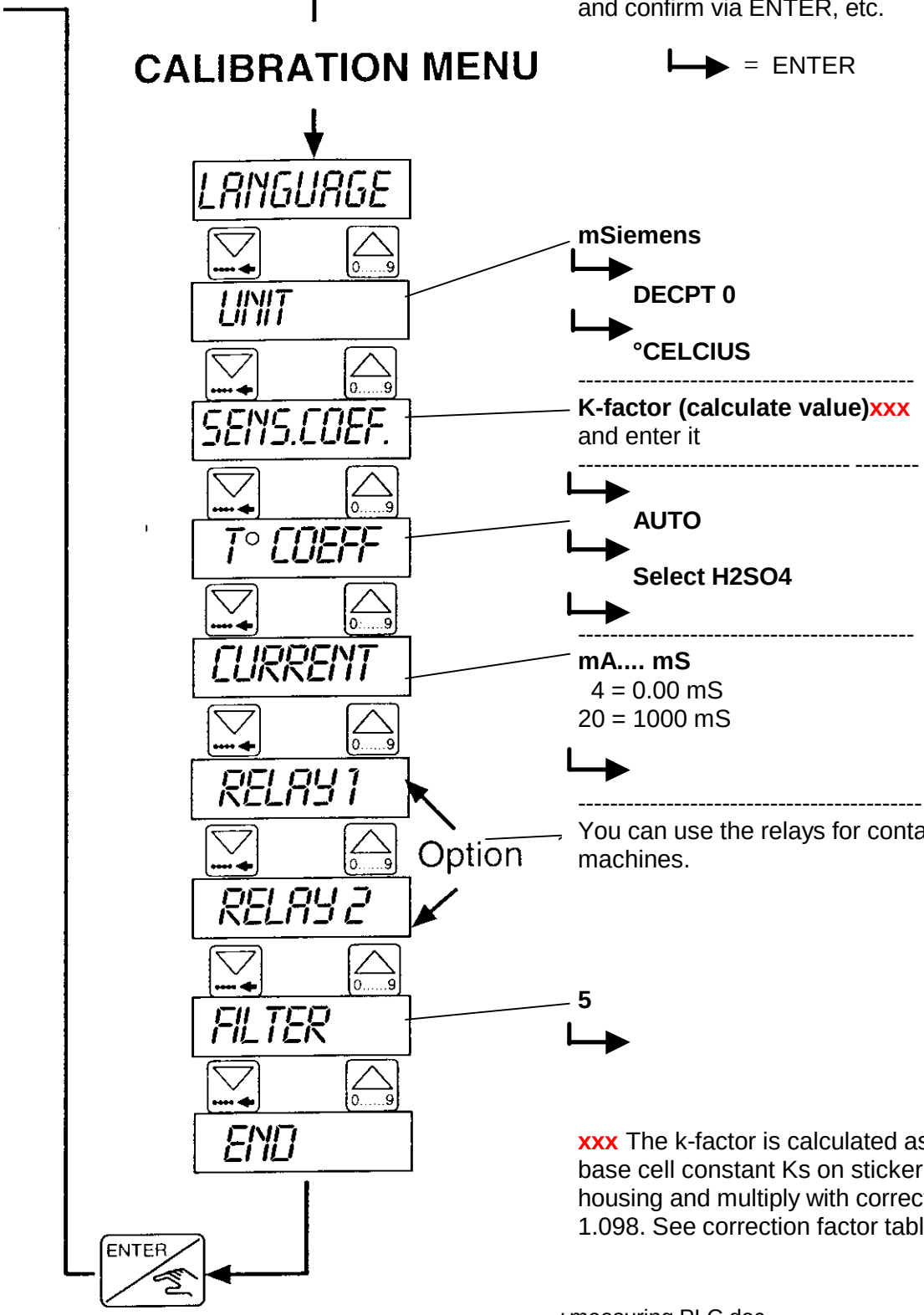
2.5 For Acid Rinse with H2SO4

To start press 2nd arrow key and ENTER key simultaneously for 5 sec.



In order to get into a submenu of the calibration menu, you press the ENTER key, then you enter the value via the 2 arrow keys and confirm via ENTER, etc.

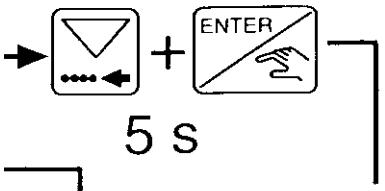
↳ = ENTER



xxx The k-factor is calculated as follows: read base cell constant Ks on sticker of sensor housing and multiply with correction factor Kf 1.098. See correction factor table on last page.

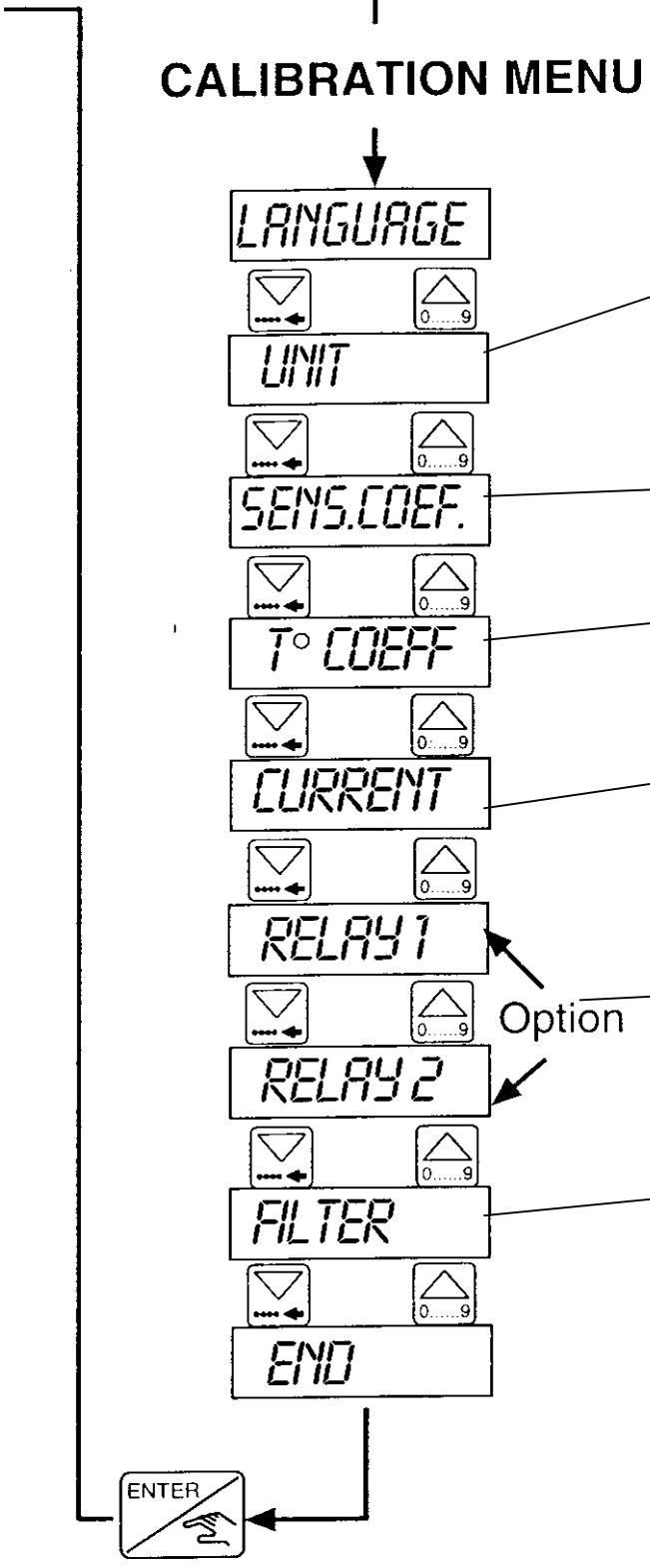
2.6 For Acid Rinse with HCL

To start press 2nd arrow key and ENTER key simultaneously for 5 sec.



In order to get into a submenu of the calibration menu, you press the ENTER key, then you enter the value via the 2 arrow keys and confirm via ENTER, etc.

↳ = ENTER



mSiemens
↳
DECPT 0
↳
°CELCIUS

K-factor (calculate value)xxx
and enter it

↳
AUTO
↳
Select **NACL**
↳

---

mA....mS
4 = 0.00 mS
20 = 1000 mS
↳

Option

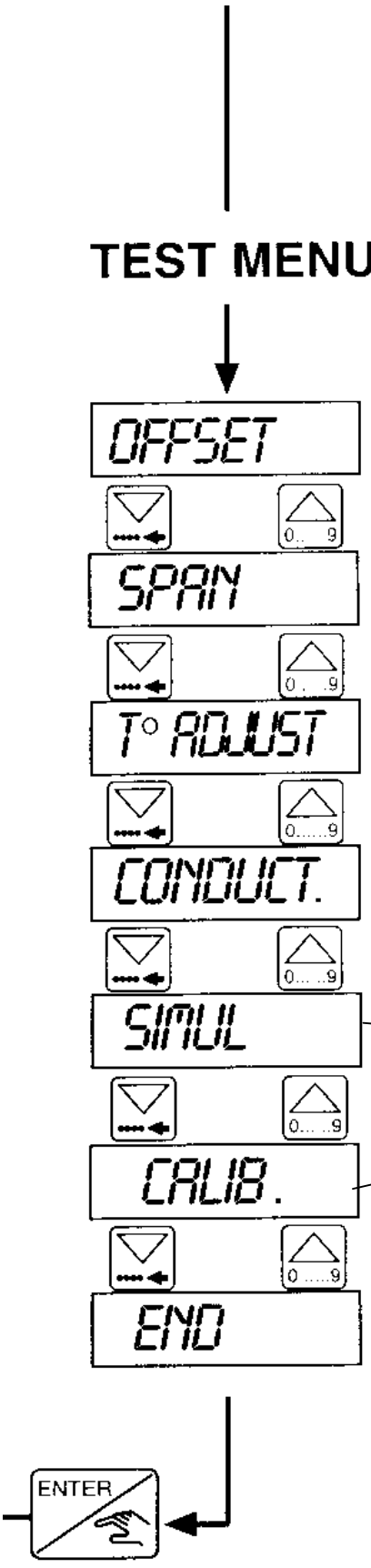
You can use the relays for contactor-controlled machines.

5
↳

xxx The k-factor is calculated as follows: read base cell constant Ks on sticker of sensor housing and multiply with correction factor Kf 1.098. See correction factor table on last page.

2.7 Test Menu

To enter into test menu:
Press the following keys simultaneously: both arrow keys and the ENTER key for five seconds.



enter simulation value in order to test the system without chemistry. The simulation remains active until other menu will be selected.

When the conductivity displayed in the main menu is higher than 10µS/cm, the transmitter with the sensor should be calibrated anew. For this purpose you hold the sensor into the air and select ‘CALIBRATE YES’. The calibration is carried out automatically.

4.4.3 SENSOR COEFFICIENT

4.4.3.1 Initial calculation of the cell constant

The cell constant is a specific value for each sensor depending on the material and diameter of the fitting used. It is calculated by using the following equation:

$$C = C_S \times C_f$$

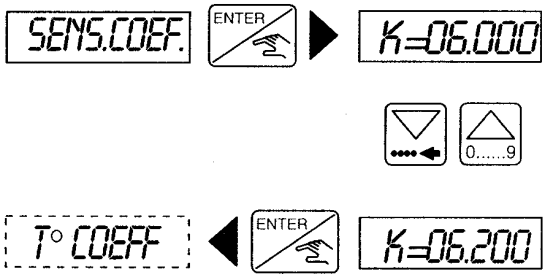
Where :
- C = Sensor coefficient to be calculated and programmed
- C_S = Basic cell constant of the sensor. This value is written on a sticker on the side of the sensor housing or on the cell cable.
- C_f = Correction factor of the fitting used (see table).

Ex

C_S = 6.295

C_f = 0.985 (DN 50 in Brass)

C = 6.295 x 0.985 = **6.200**



Correction Factor Tables for the 8226 Transmitter

Weld Ends Male / Female threaded ports			True union and Solvent spigots		
DN	**Brass**	**Stainless Steel**	**PVDF**	**PP**	**PVC**
32	0.991	0.989	1.113	1.098	1.093
40	0.989	0.989	1.049	1.045	1.045
50	0.985	0.983	1.022	1.021	1.022

Solvent or Fusion spigots					Saddles
DN	**Brass**	**Stainless Steel**	**PVDF**	**PP**	**PVC**
65	--	0.993	1.020	1.019	1.025
80	--	0.995	1.020	1.019	1.022
100	--	0.998	1.019	1.017	1.010

- If a DN fitting > 100 is used which is not listed or a reservoir, a correction factor of 1.000 should be applied.
- For high precison it is recommended that the coefficient of the sensor is recalculated. (See following section).
- For DN 32 with a reduction to DN 15,20 or 25 take the correction factor for DN32.

6. Maintenance

6.1. MAINTENANCE

This maintenance information covers machine parts and devices which are not included in the maintenance plan. All machine parts and devices which do not require regular maintenance are included. It cannot be assumed that all parts listed will be used in the machine delivered.

ATTENTION!
As to the maintenance information for suppliers' parts, please read the suppliers' documentation which is also included in the operation manual.

CAUTION!
Maintenance work may only be carried out when the main switch is turned off. The main switch must be turned to “OFF” during work on the unit to avoid an unintentional start-up of the machine. Before maintenance work is performed on the electrical installation, make sure that there is no current present.
Before the machine is taken out of service for longer periods of time, all production agents must be removed and the machine is to be rinsed and cleaned properly. Maintenance and repair work on the installation are only to be performed by trained technicians.
Furthermore, all rules and regulations of professional trade organizations and local factory codes are to be strictly followed.

ATTENTION!
Never use any sharp objects to clean the machine. Do not use chemicals such as trichloroethane or methylenchloride which dissolve rubber.

6.1.1 Conveyor System

Check regularly for wear. Worn carbon brushes must be replaced in a timely manner. Replacements for carbon brushes should only be purchased from the manufacturer of the motor, since usage of other quality brushes does not guarantee either the quality of operation or the life of the brushes and the commutator. When ordering replacements for carbon brushes, always include the motor model number according to capacity label.
After replacing the carbon brushes a number of times, the commutator is generally so worn that it must be turned down. The turned down commutator must match a polished surface in its degree of roughness. This work requires first class special workshops or preferable the motor should be returned to the manufacturer.

6. Maintenance

A worn commutator can be detected by strong sparks, grooves, and unevenness on the contact surface, as well as excessive wear of carbon brushes. A well worn commutator should have a dark shiny contact surface. Never use sandpaper, etc. on the contact surface. The drive and conveyor shafts of the drive are maintenance free.
In the case of machines with several conveyor drives, the synchronous running of the individual systems should be regularly checked.

6.1.2 Bearings

The motors are usually equipped with roller bearings (DIN 625). The bearings are quality class C2 and are tested for noise. The ball bearing grease used should be acid free, resistant to aging, made of lithium soap, and of a light consistency. The filling is usually adequate for 2-4 years depending on use. Greasing again too soon is not recommended because overfilling can cause wear. If regreasing is necessary, then the old grease remaining is to be removed and the ball bearings should be cleaned. The grease pocket should only be filled to one third with new grease.

6.1.3 Gear Box

Gear box lubrication is specified as follows if no other lubricant is recommended because of extreme usage:

- Cone drive gears use Centoplex (H/O) extra light (made of lithium soap).

  Supplier: Theodor Klueber Co
  Geisenhausener Str. 7
  D-8000 Munich 25
  Germany

- Spur gears use Calypsol D 6024 made of sodium soap

  Supplier: Deutsche Calypsolgesellschaft
  Fringstr. 20-26
  D-4000 Duesseldorf 1
  Germany

Re-lubrication is usually required after approximately two years as long as the operating temperature on the gear box housing measured on the outside does not rise too much above 50° C. The old lubricant should be removed. The filling amount is to be adequate so that all gear teeth are properly lubricated. Too much lubrication can affect the tightness of the gear box.

6. Maintenance

The machine must be turned off (main switch off) before:

- Taking off machine covers
- Maintenance and repair work
- Opening the control cabinet

6.1.4 Control

The programmable memory control is maintenance-free under normal operating conditions and no special requirements of the maintenance and repair personnel are expected. There are, however, a few basic rules to be observed for all electrical maintenance work:

- Changing of assemblies can only be done when current is off

- All input signal transmitter such as limit switches, light sensors, and switches in general can only be disconnected or replaced when current has been turned off. This also applies to all units operating on 24V such as solenoid valves and relay coils.

6. Maintenance

6.1.5 Non-Schmid Aggregates

Please consider the manual from the supplier of the following aggregates:

Description of Aggregates	Supplier
HP-Aggregate	Platz

6. Maintenance

6.2 Preventative Maintenance

6.2.1 During Operation

- Watch for leakage of tubes, flexible tubes, hose connections and flanged joints
- Make sure that all panels in process are handled correctly
- Listen for abnormal working noises

6.2.2 After 8 to 10 Working Hours

- Check all units for correct functioning
- Check filters for deposits and if necessary clean with water and blow out.
- If a bath change is necessary, rinse with water after draining. The machine is to be operated for approximately five (5) minutes with water so that all the pipe lines are also cleaned.
- The machine is to be wiped clean with a wet sponge or chamois cloth when the process is finished.

6.2.3 After 40 to 50 Working Hours

- Check the function of the safety thermostates, the level switches and the lid safety switches.
- Check the motors for correct functioning.
- Check operation of conveyor drive and synchronized speed for operation
- Grease the conveyor roller chain
- Check coating of squeegee rollers for contamination and clean if necessary
- The machine is to be rinsed with water when a crystal building etching agent is used.
- Rinse and clean spray and tank modules with water.
  No solvent should be used
- Clean the screen pipes in the filter housings of the spray pumps on the tank module or on the etching module
- Unscrew clogged nozzles from the spray pipes and clean with compressed air.

Pressure Gauges:
Check the feeding tube and the pressure gauge connection for any leakage and if necessary replace them. Check also the Feeding Tube and the pressure gauge connection for obstruction and if necessary clean them

6. Maintenance

6.2.4 After 150 to 180 Working Hours

- Check all control and operational parts for functioning
- Check to see if a general cleaning of the machine is necessary. This depends on the etching agent used. For example, for a ferric chloride sludge deposit a solution of maximum 5 % hydrochloric acid should be added to the etching module tank.
  Hydrochloric acid can only be used in installations made of PVC or titanium. The machine must then operate for approximately one (1) hour with the etching pumps running. The cleaning solution is then to be drained. Finally the tank is to be filled with water and the machine rinsed again - whereby it should not be heated.
- In case a rotary spray module is built in, the drive chain between the rotary heads must also be checked.
  If the chain must be changed, you must take care that the rotary heads are placed vertical (90°) to each other.

Heating channel in the dryer:
- Cleaning of the heating channel

6.2.5 After 500 Working Hours

- Transport rollers with rubber coating are to be removed and cleaned. Do not use any solvent!
- The chamois covers of the squeegee rollers in the dryer are to be replaced in order to guarantee complete drying of the panels passing through
  Follow these instructions:
  Remove the used cloth from the roller core. Rinse new cloth in warm water. Place the cloth on a clean, flat surface and smooth it out. Put glue on approximately 1/4 of the surface of the roller core. Place the glued part of the core on the table and roll the cloth up. Make sure that the turning direction and drive direction of the roller correspond. The end of the cloth is not to be glued.
- The blower is protected against particles of dust by a filter screen on the suction side. This should be cleaned.

Magnetic Rotatory pump:
- Check the wearing rings and if necessary replace them.

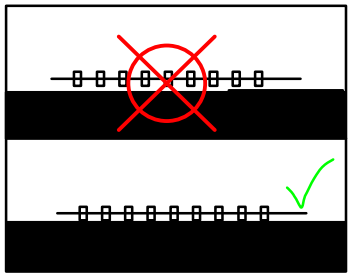
Inserts metal conveyor supports:
- Check the inserts for wear-out and if necessary replace them.

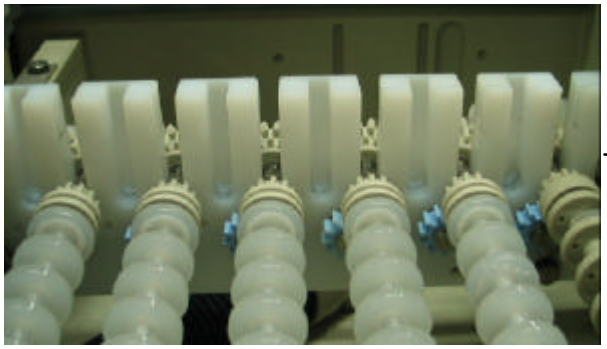
6. Maintenance

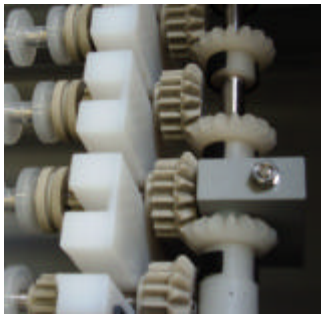
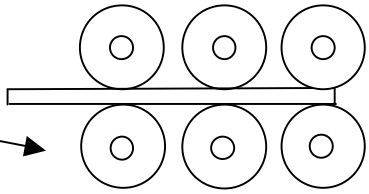
6.2.6 After 2000 Working Hours

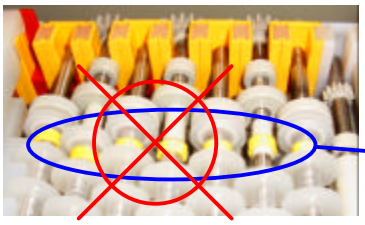
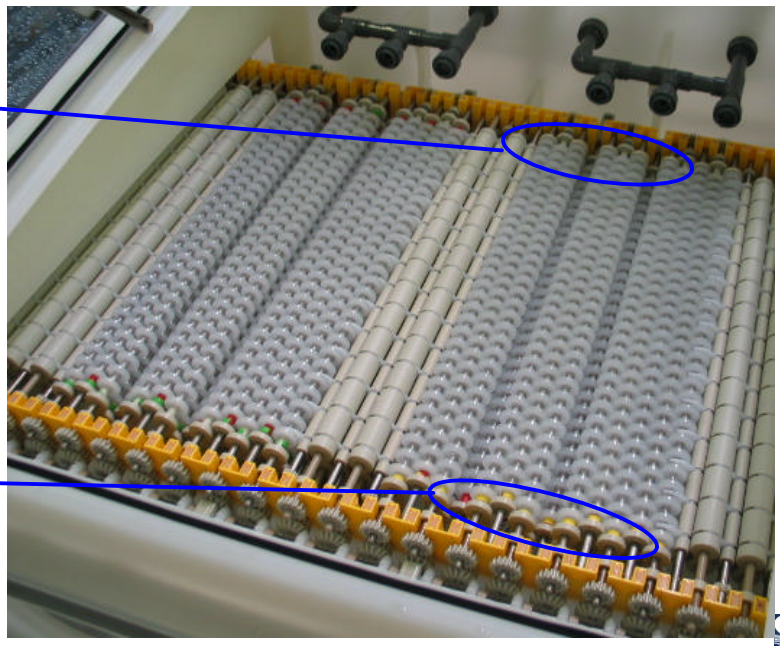
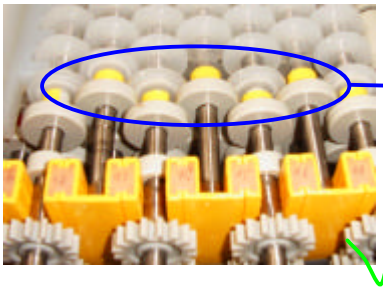
- A general inspection of all units is recommended.
- The drive shaft is carried in a maintenance free bushing which does not require greasing. It should, however, be replaced after approximately 2000 hours of operation.
- Check spray pipe gaskets and if necessary replace. Motor shaft bearings are sealed for life and do not require lubrication.

INSTRUCTIONS FOR CONVEYOR ASSEMBLY
Anweisungen für Einbau des Vorschubs





date 10.03.2005

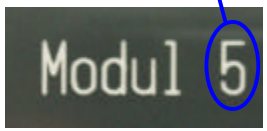
Positioning plan of conveyor

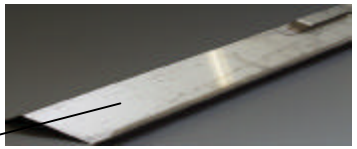
conveyor no. **VS–25–04–528–05**

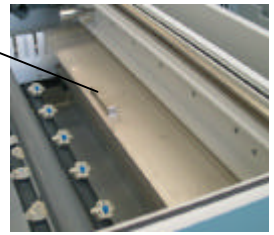
customer

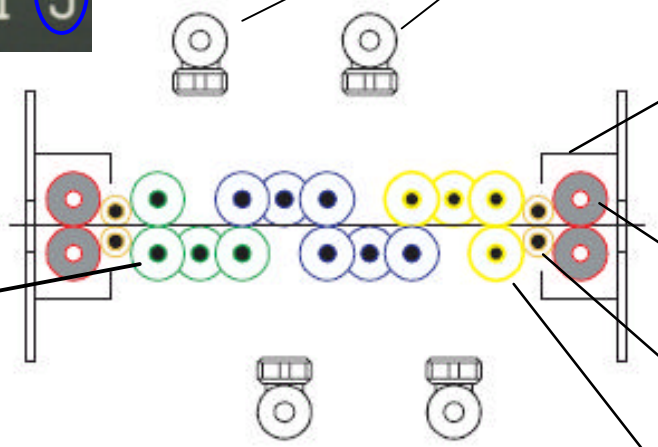
maschine Micro etch

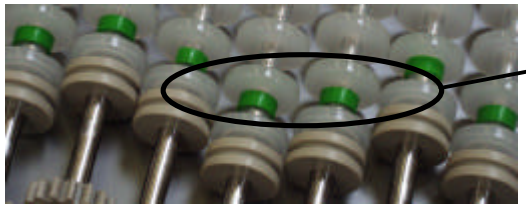
module type TKM3

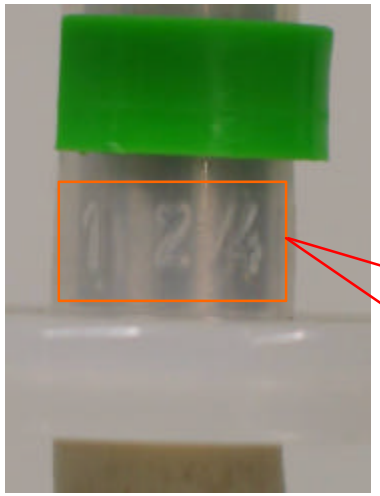


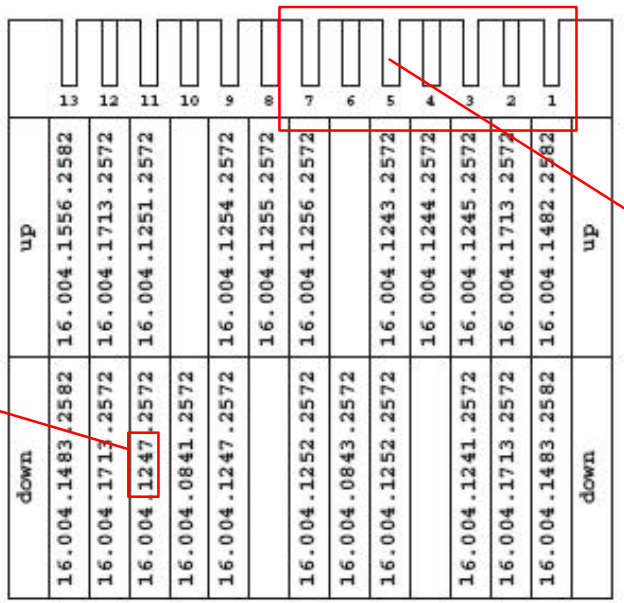


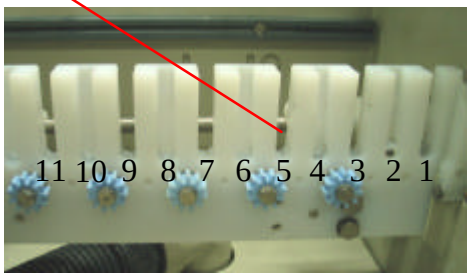








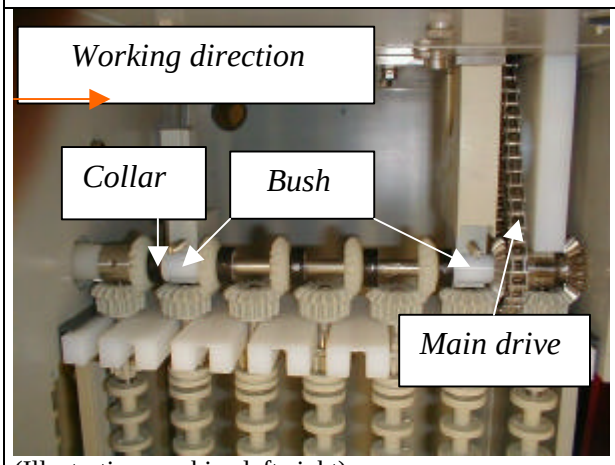




Maintenance Instructions for Feeds with Main Shafts

1) Preventive maintenance at drive shaft

A) Checking the play of bushes and bevel gears on drive shaft



(Illustration machine left-right)

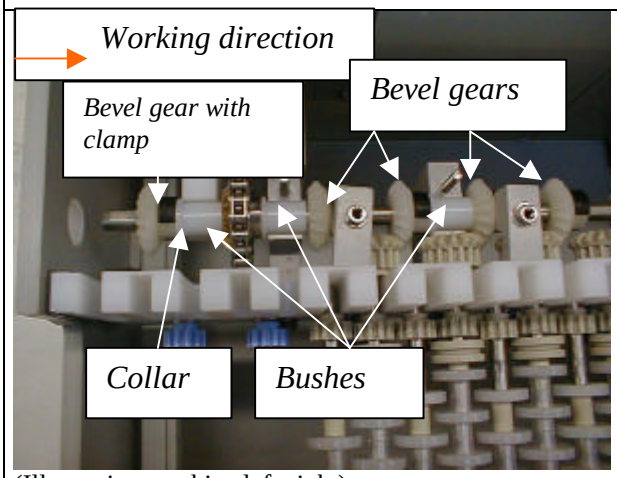
Preventive maintenance:

- Check drive shaft for play
- Check bevel gears for play
- Lubricate chain of *main drive*

Maintenance interval: 1500 hrs.

The main drive shaft is supported in maintenance-free *bearing bushes*, but in various processes these *bearing bushes* may be subject to wear. Such signs of wear are observed particularly in the rinse modules downstream of the pumice spraying, i.e. in the rinse units where sludge forms. Such wear is also encountered, however, in the modules in which the chemicals lead to crystals forming. The decisive question is whether or not the resultant play of the drive shaft still allows the bevel gears to mesh to a sufficient degree. In case of doubt the defective parts should be replaced (see below for assembly tips). The main drive points, i.e. the point at which a feed motor is connected to the drive shaft by a chain, are also exposed to increased stress. The easier the feed turns, the lower the stress is at this point.

B) Assembly tips for replacing bushes and bevel gears on the drive shaft



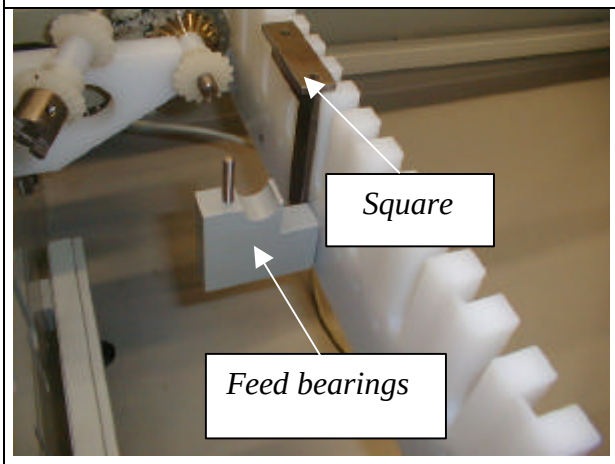
(Illustration machine left-right)

Assembly tips:

- *Collar* of bearing *bush* pointing in the direction of input
- The teeth of the *bevel gears* pointing in the direction of input
- Short squared end of drive shaft pointing in the direction of input

If the drive is placed at the rear, the teeth of the *bevel gears* on the drive shaft have to be mounted facing towards the input (counter to the working direction) in order that the feed retains the correct *working direction.* Should in time the bushes be replaced, pay attention to the fitting position when the *bushes* are mounted. The *collar* of the *bush* must always face the preceding *bevel gear with clamp* in the direction of the input (counter to the working direction). If the complete drive shaft is fitted with new *bevel gears*, pay attention that the short squared end of the shaft is pointing in the direction of the input.

C) Checking the feed bearing is fitted in an angled state and firmly to the feed carrier



Preventive maintanance:

Check angularity of *feed bearings*, then firmly tighten again.

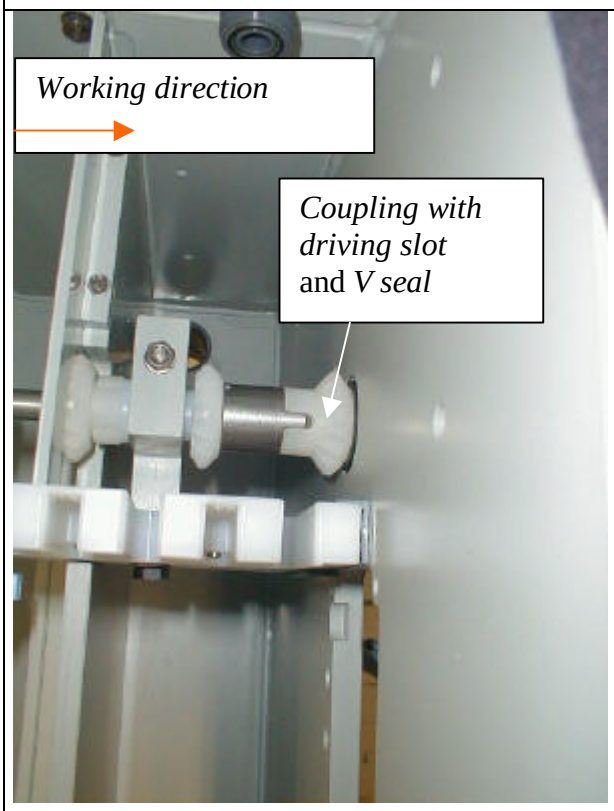
Maintenance interval:

- When mounting the drive shaft
- After 3000 hrs. maximum

Before re-installing the *drive shaft* in the module, also check whether the *feed bearings* are still fitted in a firm and angled state to the feed carrier. A *square* can be used to check the angularity. If the *feed bearings* are not angled, it may be the case that the *shell* is jamming the drive shaft through the *bush*, and this may signify that the feed starts to jolt.

Checking aid: Square

D) Checking the driving slot of the coupling at the drive shaft



Preventive maintenance:

- Check the driving slot of the coupling

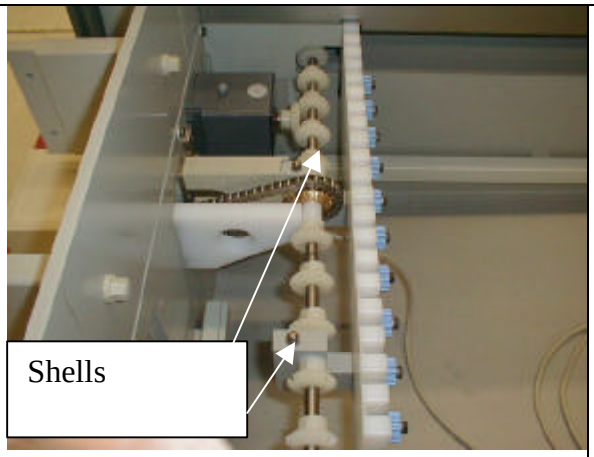
Maintenance interval: 3000 hrs.

Assembly tip:

If the drive shaft is continued at either end, the couplings are positioned in alignment so that the drive shaft can be removed together with the feed carrier.

Before re-installing the complete drive shaft, one should check that the *driving slot* of the *coupling* is intact. If the *driving slot* is excessively abraded, it is replaced.
If a *coupling* is in a wet zone, a *V sealing* ring is fitted on the *coupling* to prevent drag-in of liquid to the next module.

E) Checking the proper fit of the shells on the feed bearings



Once the drive shaft is back in the correct position, the *shells* are placed on the *feed bearings*. In so doing, pay attention that after the *shells* have been tightened, the drive shaft can still be easily turned.

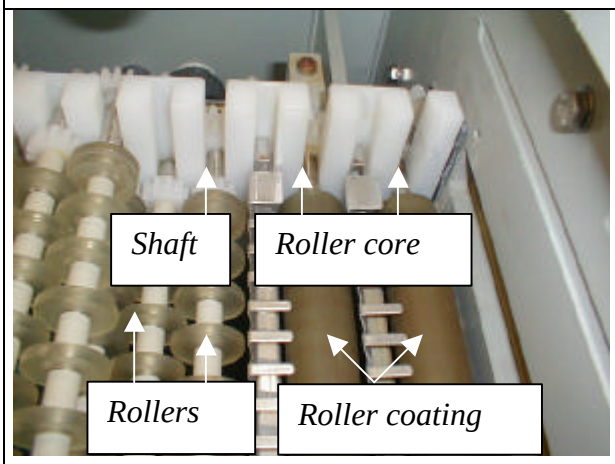
Preventive maintenance:

- Check that shells have a firm fit
- Check the drive shaft for easy movement when the feed bearings have been mounted

Maintenance interval: 3000 hrs.

2) **Maintenance instructions for feed rollers, feed shafts and feed carriers**

A) Checking the diameter of rollers and shafts



Preventive maintenance:

- Check diameters of rollers and shafts for wear

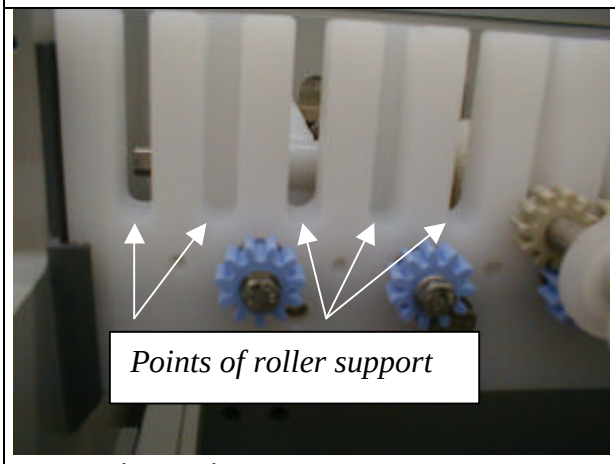
Maintenance interval:

- Visual inspection when the modules are cleaned
- After 500 hrs. maximum
- Measuring check as required

As in the case of the main drive shaft, the conveyor system proper should also be checked for wear at regular intervals. Doing so ensures good panel transpo rt.
For *rollers*, the diameter of the *roller coating* and *roller core* is checked. For *shafts*, the diameter of the *shafts* resting in the feed carriers is checked.
(Visual inspection)

Checking aid: slide gauge

B) Checking the feed carrier



Preventive maintenance:

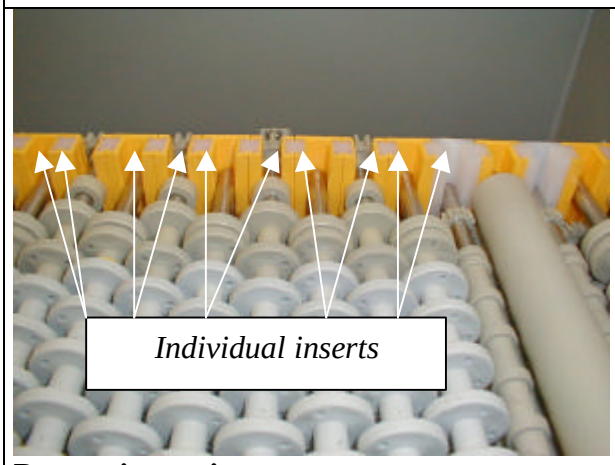
- Check the feed carrier for wear

Maintenance interval: 500 hrs.

For feed carriers without inserts

The feed carriers themselves are subject to greater wear as a result of crystals and sludge forming or by the d rag-in of e.g. pumice. If the *points of roller support* are excessively worn, the entire feed carrier has to be replaced.

C) Checking the inserts



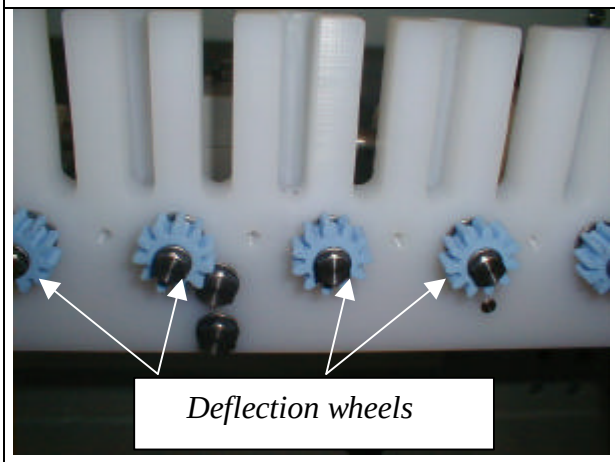
Preventive maintenance:

- Check the inserts for wear

Maintenance interval: 500 hrs.

If the *points of roller support* consist of *individual inserts*, it is sufficient to replace those *inserts* that are worn out.

Checking the deflection wheels



Preventive maintenance:

- Check deflection wheels for wear

Maintenance interval: 3000 hrs.

Depending on conveyor system, *deflection wheels* are also screwed onto the feed carriers. They have to be checked for play and replaced if necessary.

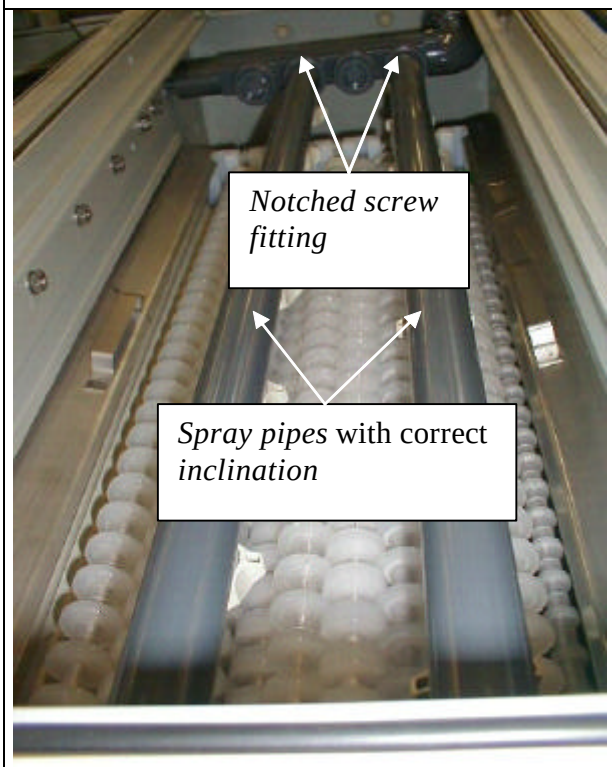
For cleaning the rollers, see Manual Chapter 6.2, Maintenance

Maintenance Instructions for Nozzle Pipes and Flood Bars

1) Basic conditions for a good spraying result

-

A) Setting the inclination of the spray pipes



(Illustration) Correct

Assembly tips:

- Should the setting of the inclination be incorrect, it can be set at the medium-supply side by means of the *notched screw fitting* (7.5 ° increments).
- Before checking the setting of the inclination, make sure that the nozzle pipe is properly locked in the bayonet.

Maintenance interval:

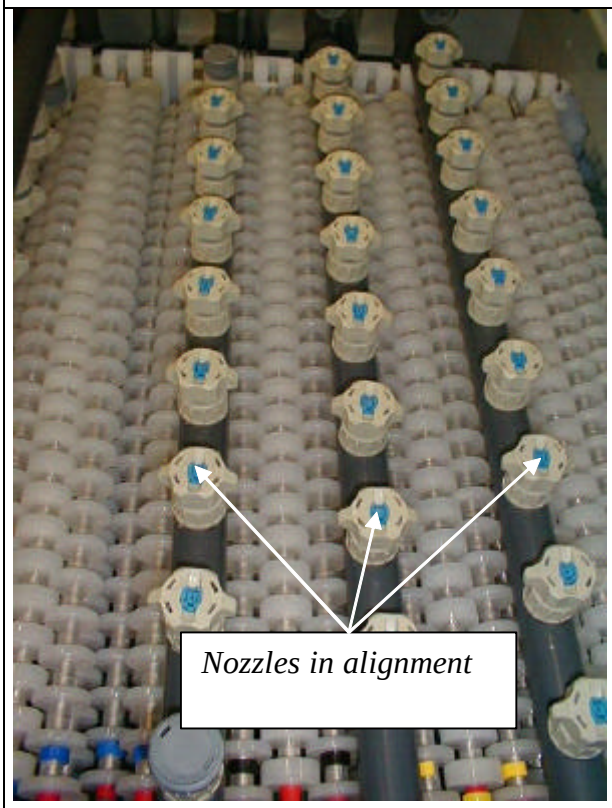
Each time the spray pipe is removed from the module, e.g. for cleaning purposes.

The *spray pipes* have to be at the right *inclination* to the feed so that the spray jet is directed to strike a panel and not a conveyor shaft.

(Illustration) Incorrect

-

B) Checking the angle at which the nozzles are set



(Illustration) Correct

The basic setting (number of degrees through which nozzle is turned) can vary according to module type and application.

Assembly tips:

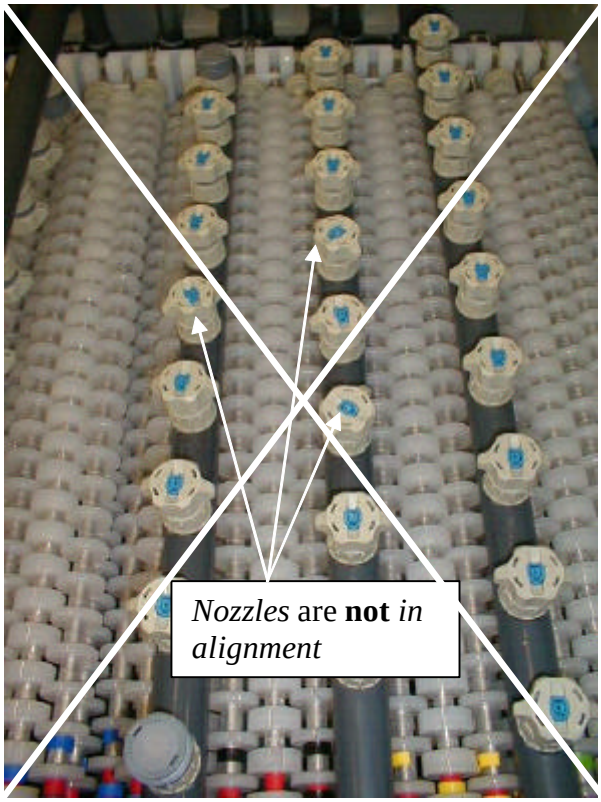
- Should the *nozzles* be misaligned, a nozzle can be adjusted by the notches on the screw fitting
- Before adjusting the *nozzles*, make sure that the bayonet is properly locked.

Maintenance interval:

Each time the nozzles are removed from the nozzle pipe, e.g. for cleaning purposes.

If the *nozzles* were removed together with the *adapters*, pay attention when reassembling that the *nozzles* are *in alignment.*

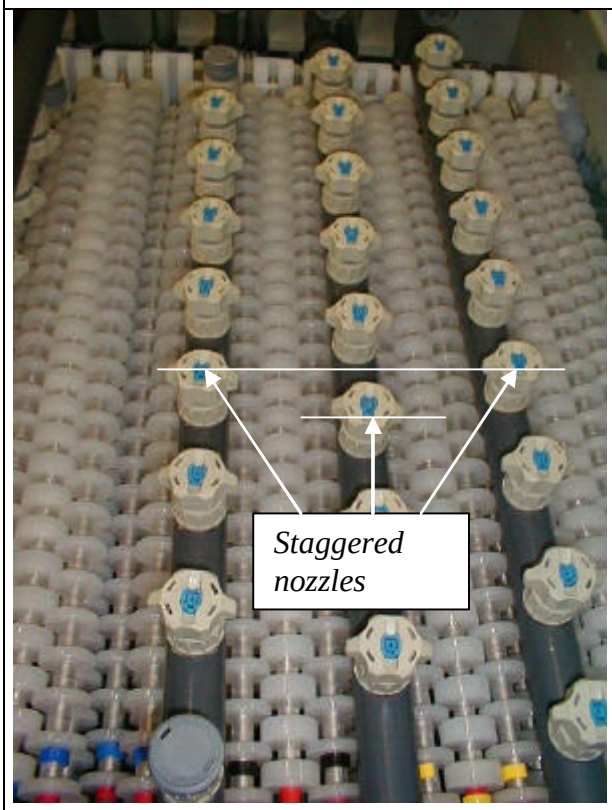
The *nozzles* have to be set *in alignment* to obtain a good overlap of the spray pattern.



(Illustration) Incorrect

-

C) **Checking the *staggering of the nozzles***



(Illustration)

Maintenance interval:
Each time the nozzles and nozzle pipes are removed, e.g. for cleaning purposes.

In case of multiple spray pipes in series in the same module, pay attention that the *nozzles* are always *arranged in staggered relationship* so as to attain uniform spraying of the panel surface.

Assembly tips:

- If, in case of multiple spray pipes in series in a process module, the *nozzles* are not *staggered*: attach the *sealing cap* of the nozzle pipe to the opposite end and mount the pipe the other way round.

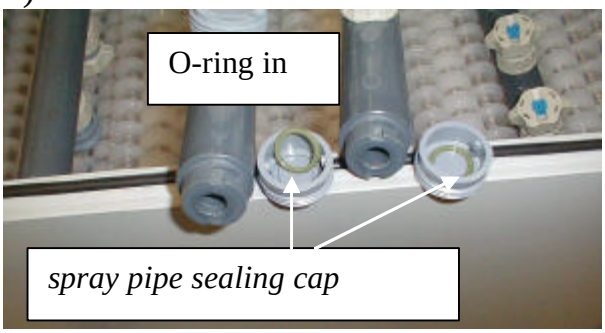
- Ensure that an *O-ring* is inserted in the *sealing cap.*

- When re-mounting the pipes in the module, pay attention that the arrangement is correct and that the inserted seals are intact.

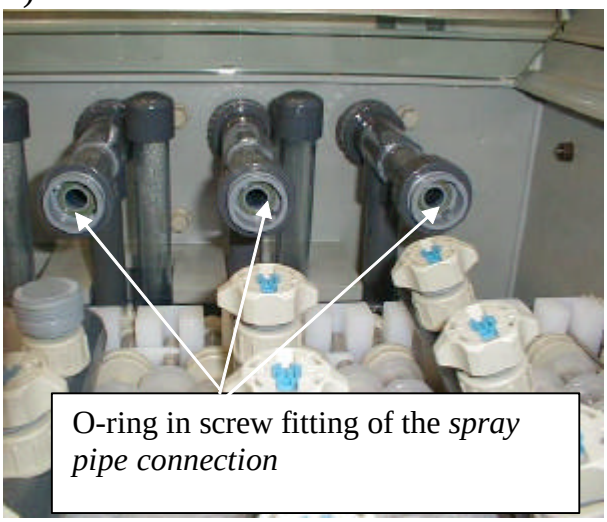
-

D) Checking the seals

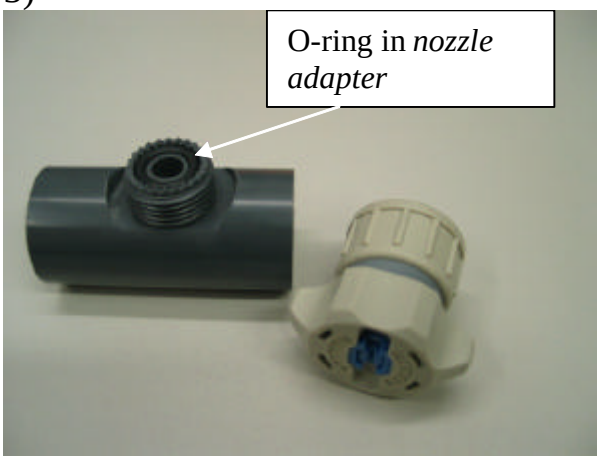
1)



2)



3)

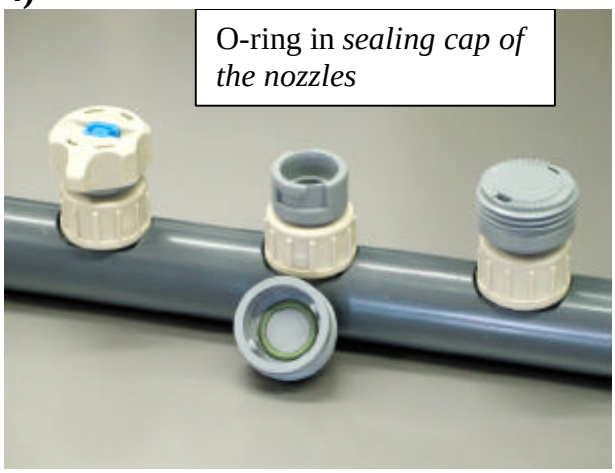


Pay attention that an *O-ring* is situated at each of the following points:

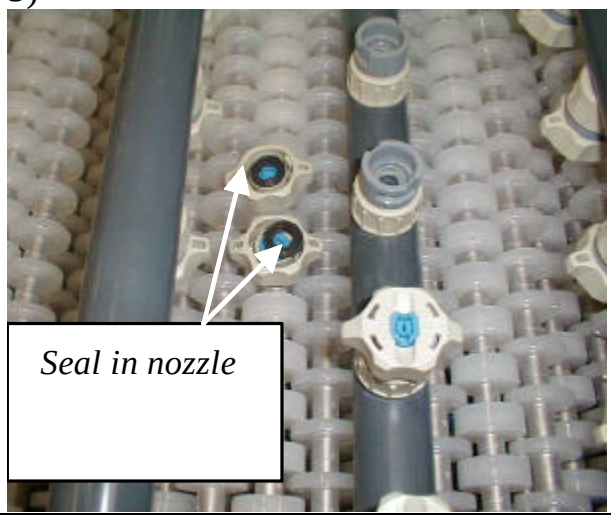
Ill. 1: in the *sealing cap of a spray pipe*
Ill. 2: at the *spray pipe connection*
Ill. 3: in the screw fitting of a *nozzle adapter*
Ill. 4: in the *sealing cap of a nozzle*
Ill. 5: there must also be an intact *seal* on every nozzle with bayonet lock

Maintenance interval: every 3000 hrs.
Check material fatigue of seals and O-rings.

4)

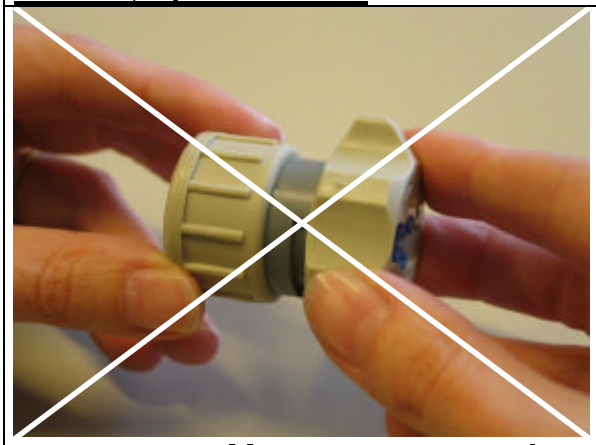


5)



-

Assembly tips for nozzles:



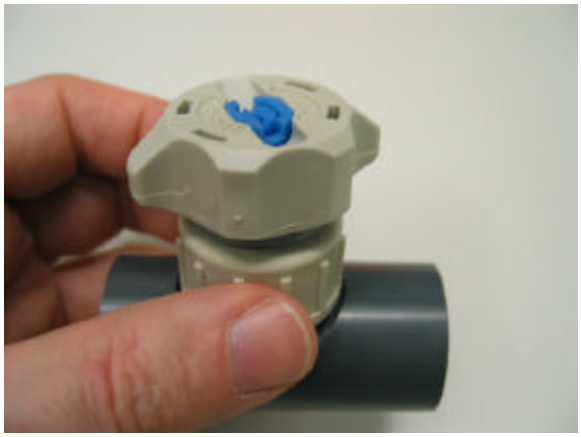
Incorrect assembly: Do not screw nozzle separately onto adapter.

If *adapters*, union nuts and the nozzles are separate, the following assembly sequence is appropriate:

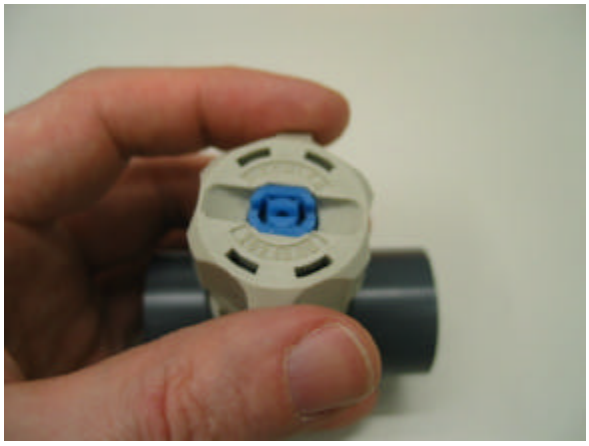
1) First mount *adapter* with *O-ring* on nozzle pipe

2) As the second step, and not before, mount the union nut with nozzle and *seal* in order that the bayonet lock can be closed properly.

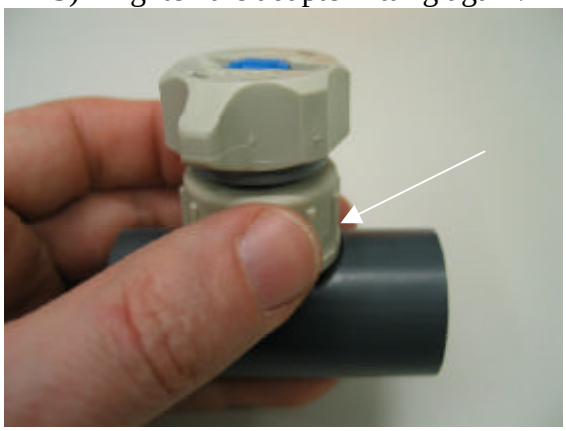
3) Loosen the adapter fitting slightly so that the nozzle direction can be aligned.



4) Align the nozzle.

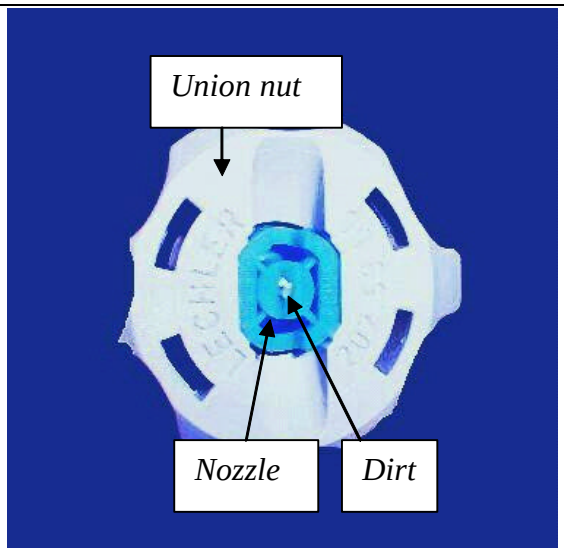


5) Tighten the adapter fitting again.



-

2) Cleaning nozzles



(Illustration)

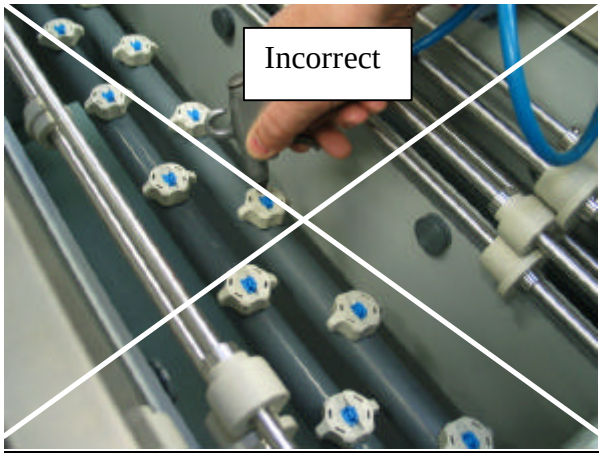
(Illustration)

A dirty nozzle is cleaned best with compressed air from the outside to the inside. Pay attention that the *nozzle with seal* is not lost as a result of the blowing pressure.

Procedure for cleaning the nozzles

For nozzle pipes, the dirty *nozzle* is removed from the spray pipe.

Tip: If *dirt* has lodged firmly, a needle can be used but without damaging the nozzle slot. (needle smaller than hole)



(Illustration)

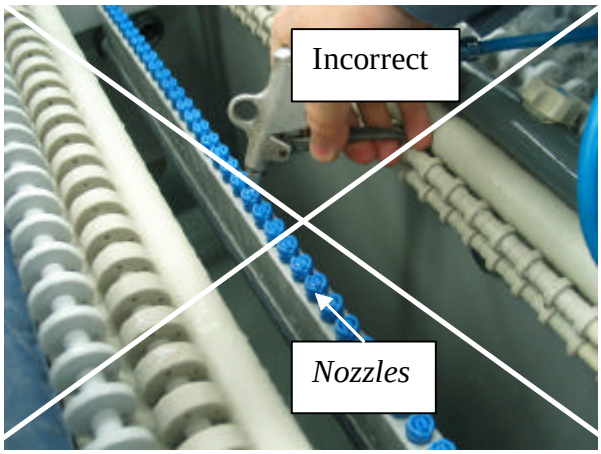
Incorrect: Do not clean the *nozzles* in the assembled condition, because the *dirt* is then pressed back into the *nozzle* afterwards.

Maintenance interval: see below

-

3) Cleaning flood nozzle bars

Procedure for cleaning the nozzles



(Illustration) INCORRECT

Do not clean the flood nozzle bars in the assembled condition!

Since a very large number of *nozzles* are arranged on *flood nozzle bars*, the cleaning operation is different. You remove the *flood bar* from the machine, *mark* the position of the *sealing cap* and remove it.

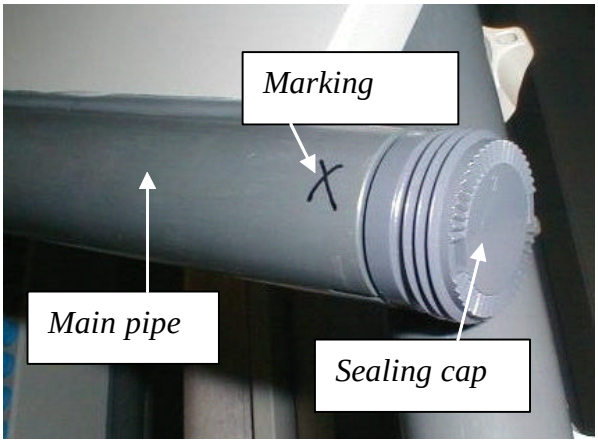


Illustration 1

Then the dirty *nozzles* are blown through with compressed air. This time the *nozzles* are left in the *flood pipe*, but the pipe is in a *dismounted condition*.
If any dirt has lodged firmly, a needle can be used but without damaging the nozzle slot (needle smaller than hole).
If there are only a few clogged nozzles, they can of course be individually unscrewed for cleaning.

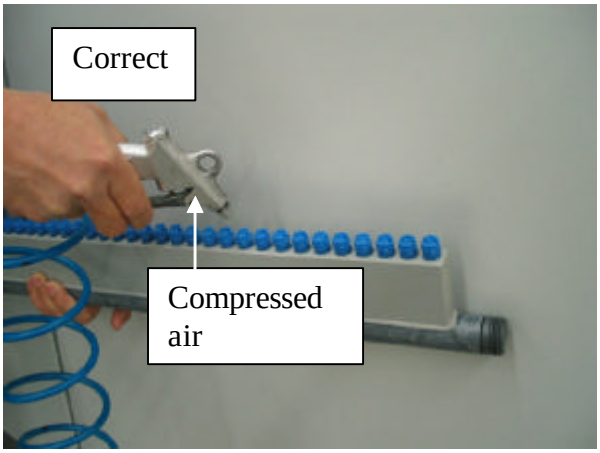


Illustration 2

In the course of blowing the nozzles through, the *nozzles* and the *main pipe* are repeatedly flushed with water to wash out the particles of dirt.

Illustration 3: Rinsing the nozzles

Continued… Flood bar cleaning:

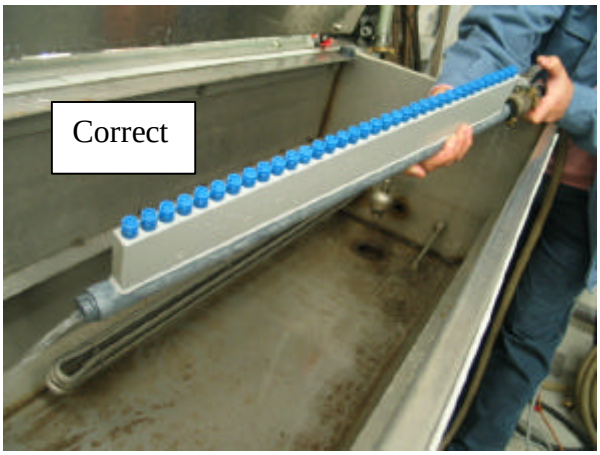


Illustration 4: Rinsing the main pipe

The *nozzles* face upwards during rinsing so that the particles of dirt cannot re-enter the *nozzles*.

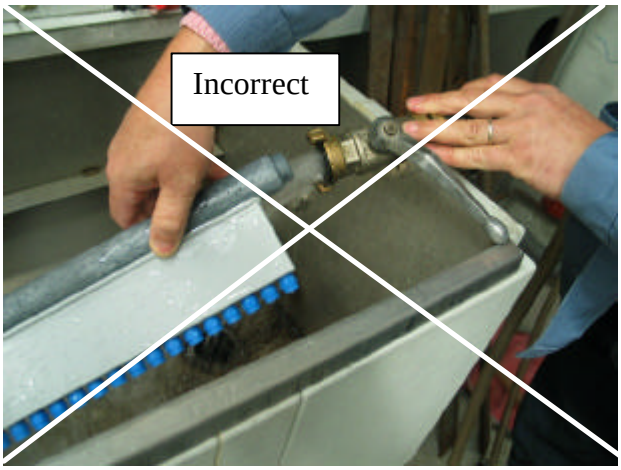


Illustration 5: incorrect

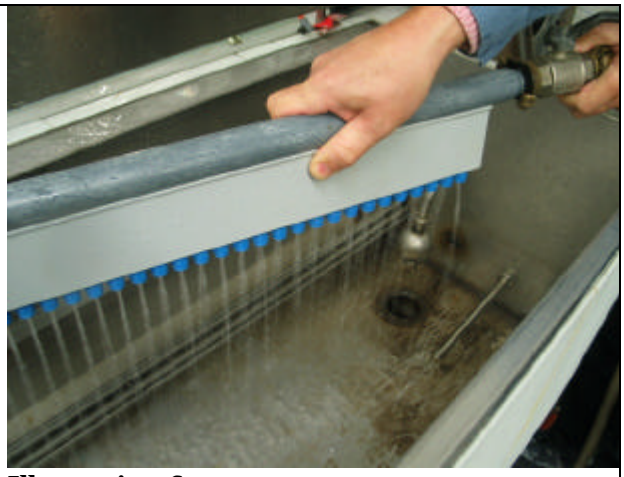


Illustration 6

It can be tested whether the nozzles are unobstructed by using water. Then put the *sealing cap* back on at the *marked* position. Should the same *nozzle* still be clogged, it has to be cleaned in a disassembled condition.

Tips:

- The marking of the *sealing cap* is made in order that the staggered relationship of the nozzles is maintained when there are multiple flood bars in series.
- If any *dirt* has lodged firmly, a needle can be used but without damaging the nozzle slot (needle smaller than hole)

Recommended maintenance interval for nozzles, spray pipes and flood nozzle bars:

The following procedure is recommended **after new installation of a line:**

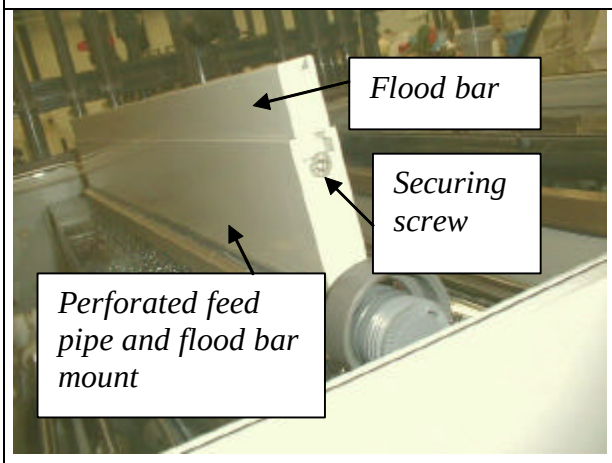
Since all the pumps, spray pipes and all the connecting pipes are new, foreign matter from the production process may clog the nozzles.

Maintenance interval: at least once a shift, for about 1 week, check that all the nozzles deliver a good spray jet.

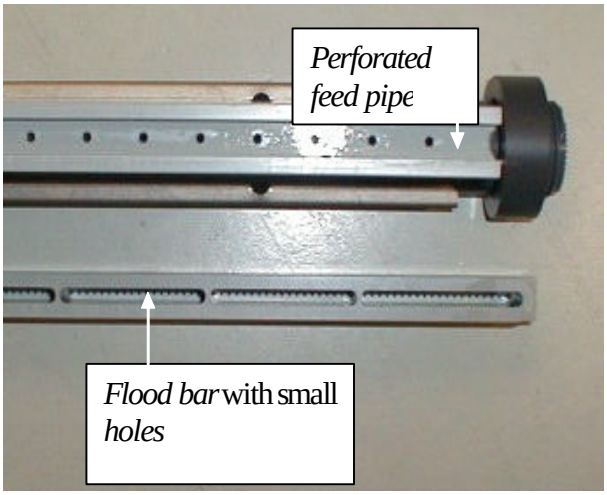
In so doing, you will become more familiar with the operation of the line. As soon as the nozzles are no longer prone to clogging, the interval for checking them can be gradually increased. In this way you will also see how reliably the line runs.

-

4) Flood bar with longitudinal slot



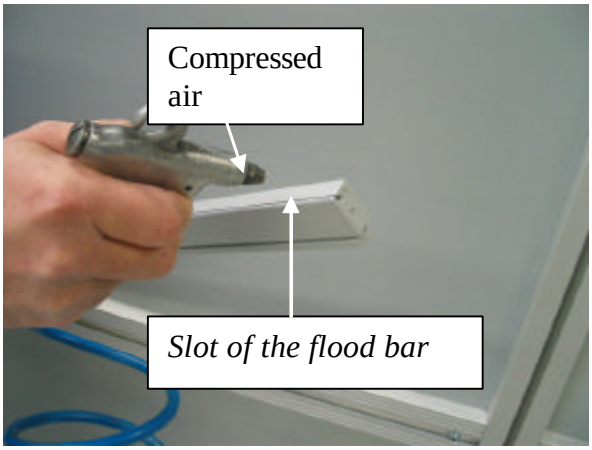
(Illustration)

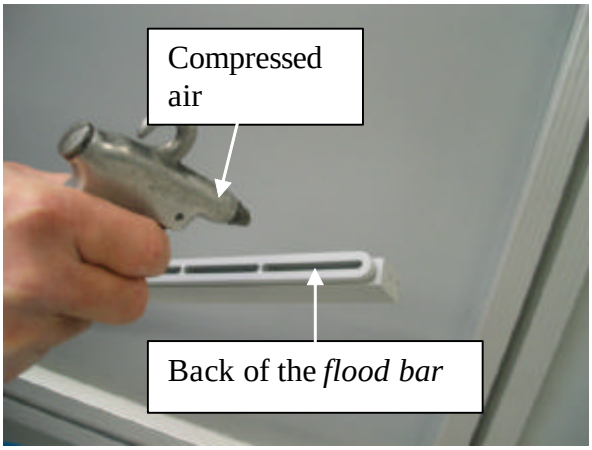


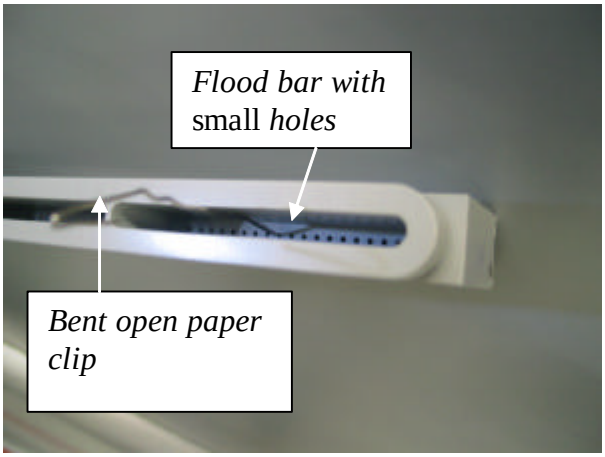
If the *flood bar* with longitudinal slot no longer forms a so-called “sheet”, check whether there is any dirt in

1) the longitudinal slot and
2) the holes distributing the medium.

To clean them, remove the flood bar from the module and detach the *securing screw.* Then slide the *flood bar* to the side, in the direction of the *securing screw.* Before moving the *flood bar*, be sure to make a *marking* so that the *flood slot* is at the right position during reassembly.







Preventive maintenance:

- Avoid dirt
- Keep prefilter in the feeding pipe in working order

Maintenance interval:

After extensive cleaning, or as required.

Now one can see which *holes* are clogged. It is best to try to blow or rinse the *holes* clear in the reverse direction (from the outside of the *slot* inwardly, or vice versa).

If the holes cannot be cleared, you can open them with the aid, for example, of a *bent open paper clip.* Any dirt wedged in the slot can then be carefully dislodged and pushed out at the side using a thickness gauge.

The above-described measures are repeated until the *flood bar* is clean again.
This work is of course carried out in compliance with the general safety guidelines.
The best preventive measure is always to pay attention that the prefilter works properly, because it is very troublesome and time-consuming to clean the small *holes* of the *flood bar.*

-

5) Flood box with diagonal slots	
Photo 1	In the case of flood boxes with diagonal slots, particles of dirt may settle in front of the slots on the intake side. If this is so, they should be cleaned because otherwise the process may become instable. For cleaning purposes, dismount the entire flood box as a unit and then the flood plate – depending on model - can be laterally detached by careful sliding action. **Do not clean flow slots of the flood box in the mounted condition, because particles of dirt are pressed into the slots again by the flow rate of the medium.** Should there still be chemicals on the flood boxes, it is advisable to rinse them well with water. Otherwise take the usual safety precautions.
Photo 2	Now the pre-cleaned flood plates can be blown through with compressed air to clear the slots. If the dirt cannot be dislodged, use e.g. a thickness gauge. If the slots are clogged by deposits of chemicals, it is necessary to investigate how the deposits can be removed without damaging the slots. In the case of flood boxes with permanently installed plate, try to get the particles of dirt out with the aid of a thickness gauge. If this is not possible, press the dirt into the box. Then the flood box has to be thoroughly rinsed through to flush out the dirt. After cleaning, put the flood box back into the module by carrying out the steps in reverse order.

	<u>Preventive maintenance:</u> - Avoid dirt - Keep prefilter in the feeding pipe in working order - Check flood box for dirt

-

Flood box with diagonal slots (cont.)

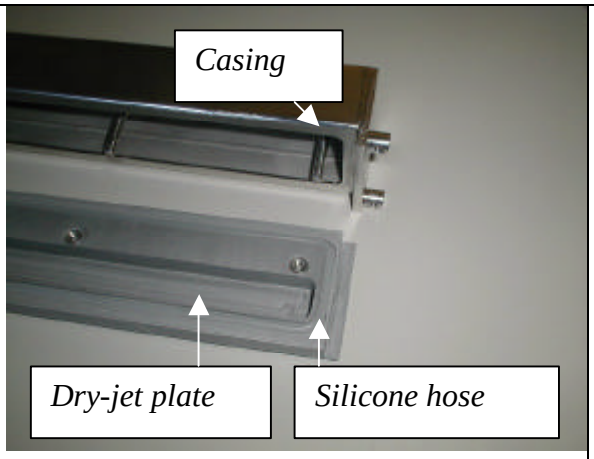
Recommended maintenance interval: The following procedure is recommended following a new installation of a line since the pumps, spray pipes, flood boxes and all the connecting piping are new and foreign matter from the production process may clog the nozzles and slots.

Maintenance interval after installation:

At least once a shift, for about 1 week, check that all the nozzles deliver a good spray jet. In so doing, you will become more familiar with the operation of the line. As soon as the nozzles are no longer prone to clogging, the interval for checking them can be increased. In this way you will also see how reliably the line runs.

-

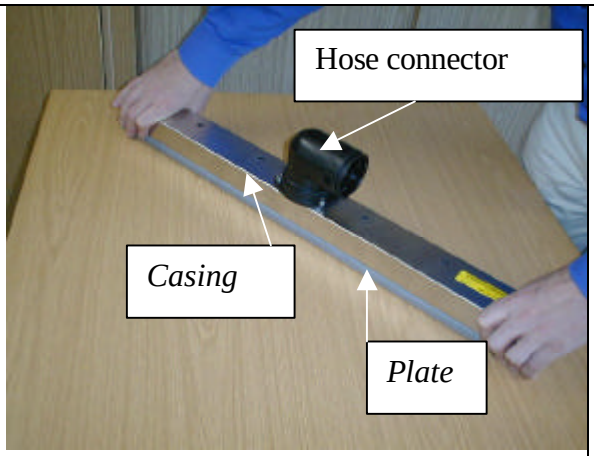
Instructions for Assembly of a Dry-Jet



(Illustration)

Before assembly, carefully clean the *casing* and the *dry-jet plate*. Then cut the *silicone hose* to length and place it in the groove of the *dry-jet plate*. To do so, it is be st to place the *plate* on a flat, clean table.

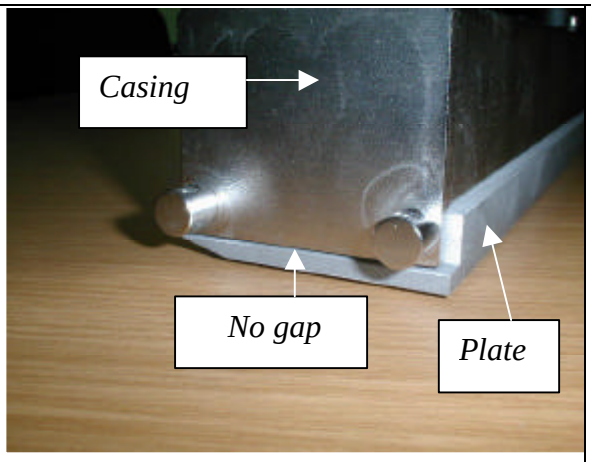
-



(Illustration)

Then the *casing* is lowered into place on the *plate*, moving it to and fro slightly in the process. Pay especial attention that 1) the *silicone hose* stays in the gr oove, and 2) the *plate* and the *casing* join together without leaving a gap.

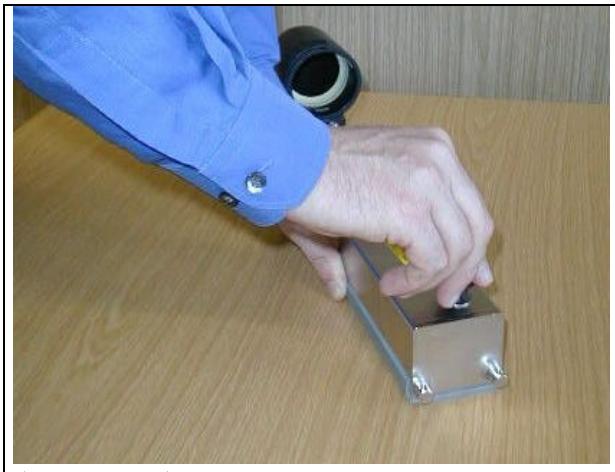
-



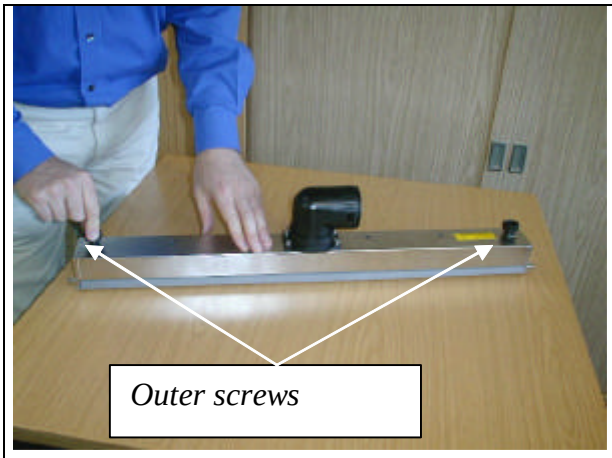
(Illustration)

When the *plate* and the *casing* are pressed together, there must be *no gap* evident.

-

 (Illustration)	When the dry-jet fits properly, the first *screw* is fitted at the outermost location of one of the two ends. Tighten the screw slightly, continuing to apply pressure until the screw fits snugly.

-

 (Illustration)	Then the second outermost *screw* is fitted at the other end and tightened.

-

 (Illustration)	Once the plate is fixed well, the remaining screws are screwed in and tightened. Then the two outer screws are retightened.

Input of Parameters for Siemens Micromaster MM420 F/U Frequency Convertor

Status: 18.12.2003 **Version 1.3**

The parameter level can be changed with the **P**-key. A hook + and 000000 appear in the display..
Selection of the parameter to be changed is performed with **arrow** key Up and DOWN.
By pressing the **P**-key the selected parameter can now be adjusted (value).
When the **P**-key is pressed again the modification of the parameter is taken over.
The last place after the decimal point can be reached with the **FN**-key.

OBSERVE THE RIGHT ORDER !

Before entering into the parameter menu conveyor/pump/fan, etc. have to be ended

Latest changes in grey background

The following parameters are to be entered:			**Conveyor for handling devices Neckar-Motoren (reluctance motors)**	**Conv.of through-feed line with reluctance motors from Getriebebau Nord**	**Belt filters with Dematec motors**	**Pumps and fans**	**Neckar Oscillationmotors**
P10:	**Level for parameter filter: quick commissioning**		1	1	1	1	1
P100:	Identification for European countries		0	0	0	0	0
		Parameters 304, 305, 307, 310 and 311 are indicated on the rating plate of the device. With parameters 305 and 307 the values need to be added, if several devices are addressed at a time. The values at the right show the currently used units !!!!!					
P304:	Rated motor voltage (from rating plate: Volt)		230V	230V	230V	Read values from rating plate. On account of the rated motor speed note of how many Hz the total line diposes.	230V
P305:	Rated motor current (from rating plate: Ampere)		0.4 Ampere	2.3 Ampere	0.4 Ampere		1 Ampere
P307:	Rated motor power (from rating plate: kW)		0.5 kW	0.25 kW	0.5 kW		0,5 kW
P310:	Rated motor frequency (from rating plate: Hz)		50Hz	50Hz	30Hz		50 Hz
P311:	Rated motor speed (from rating plate: rpm)		1500 rpm	1500 rpm	350 rpm		2650 U/min
P700:	Commands for ON/OFF and direction via dig. I/O		2 / with bus 6	2 / with bus 6	2 / with bus 6	2 / with bus 6	2 / with bus 6
P1000:	Set point conveyor speed for 0-10 V at clamp		2 / with bus 6	2 / with bus 6	2 / with bus 6	2 / with bus 6	2 / with bus 6
P1080:	Min. motor frequency		0Hz	0Hz	4Hz	10-50Hz	10 Hz
P1082:	Max. motor frequency		60Hz at approx. 6m/min, approx. 105 Hz at approx. 10 m/min	75Hz at approx. 6 m/min	50Hz at 2m/min	60Hz	60 Hz

The following parameters are to be entered:			**Conveyor for handling devices Neckar-Motoren (reluctance motors)**	**Conv.of through-feed line with reluctance motors from Getriebebau Nord**	**Belt filters with Dematec motors**	**Pumps and fans**	**Neckar Oscillationmotors**
P1120:	Ramp-up time		0.1 sec	0.1 sec	1 sec	3 sec	0,1 sec
P1121:	Ramp-down time		0.1 sec	0.1 sec	1 sec	3 sec./ if blower for dryer: 15 sec.	0,1 sec
P3900	End of quick commissioning		1	1	1	1	1
	Calculations for motor operation are performed /						
	other parameters return to factory reset						
P10:	**Parameter filters reset of quick commissioning: ready**		0	0	0	0	0
For additional parameter inputs the access level is redefined:							
P003:	User access level: 'expert'		3	3	3	3	3
P004:	Parameter filter: 'all parameters are displayed'		0	0	0	0	0
Now perform additional parameter modifications:							
P1300:	V/f characteristic curve via traverse line		3	3	3	2	3
P1320:	Programmable V/f frequency coord. 1		1Hz	1Hz	0Hz		10 Hz
P1321:	programmable V/f voltage coord. 1		30V	26V	0V		30 V
P1322:	Programmable V/f frequency coord. 2		5Hz	5Hz	0Hz		25 Hz
P1323:	Programmable V/f voltage coord. 2		40V	36V	0V		70 V
P1324:	Programmable V/f frequency coord. 3		10Hz	10Hz	0Hz		35 Hz
P1325:	Programmable V/f voltage coord. 3		60V	51V	100V		120 V
P1210:	Restart Options				3		
P1800:	Pulse frequency				2kHz		
P346	Magnetization time		rotating table Vaculine				

Balancing of conveyor speeds:

Nominal Value Default			**Conveyor for handling devices Neckar-Motoren (reluctance motors)**	**Conv.of through-feed line with reluctance motors from Getriebebau Nord**	**Belt filters with Dematec motors**	**Pumps and fans**	**Neckar Oscillationmotors**
Nominal value default:							
P757:	Lower voltage coordinate on characteristic curve for nominal value default for 0.2 m/min.		0.3V	0.33V (via FN-key, 2nd place after the decimal point)	1V	2V (enter without PLC 0V)	
P758:	Output frequency related to nominal frequency for lower voltage coordinate. This value can be compared with the min. pot. of the conveyor card. The value given here is only an example (standard value).		4.5% (standard value)	5.5% (standard value)	17%	20% (standard value)	
P759:	Upper voltage coordinate on the nominal value default for 6 m/min.		10.0V	10.0V	10.0V	10.0V	
P760:	Output frequency related to nominal frequency for upper voltage coordinate. This value can be compared with the max. pot. of the conveyor card. The value given here is only an example (standard value).		108% (standard value) at 6m/min, approx. 160 % at 10/min (standard value)	133%, with bus 100 % (standard value) **Balance at 5m/min**	100%	100%	
P2000		**For conveyor:** **With contactor control: First balance nominal value for upper voltage coordinate. Transfer the determined value to the actual value (see next page, P779).** **With PLC: Nominal and actual value are not identical. Continue balancing until the display in the PC is correct.**					
		With Profibus-DP the set value adjustment has to be done with P2000: 67.3 with Profibus **For pumps only if pressure is too low**					

The following parameters are to be entered:			**Conveyor for handling devices Neckar-Motoren (reluctance motors)**	**Conv.of through-feed line with reluctance motors from Getriebebau Nord**	**Belt filters with Dematec motors**	**Pumps and fans**	**Neckar Oscillationmotors**
Actual Value Response							
P777:	Actual value balance characteristic curve of lower value for conveyor speed (0.2 m/min.)		0.3%	0.1% / with bus 0		0%	
P779:	Actual value balance characteristic curve of upper value for conveyor speed (6 m/min.)		105% at 6m/min, approx.160% at 10 m/min	133% / with bus 100		100%	
				At 5 m/min. calibrate conveyor speed at frequency convertor. When the nominal value is 6 m/min. the actual value is only 5.9 m/min. (for technical reasons)			
			Please note !				
			For reverse run of the conveyor P779 is to be set to approx. -100 % (display of the currently emitted frequency with preceding sign over keys 'Fn' and 'P')				
P0003	**Finally P0003 is to be reset to 0, lock user access**		0	0	0	0	

For display of motor current set P005 to 27
For display of motor frequency set P005 to 21

If for some reason calculation of the entered values is not executed automatically, this can be manually released over P0340.

If the entire process is to be repeated: Set P0010 to 30, then set P0970 to 1: Reset to factory presetting

If only the rating plate data of the motor are to be changed again, quick commissioning with P3900: Close value 3. Other parameters remain unchanged.

Symbole/Symbols

SCHMID
Ihr Partner für perfekte Leiterplattentechnik

Aggregate / Aggregates

Magnetpumpe, Tauchpumpe/
Magnetic pump, Immersion pump

FU Magnetpumpe, Tauchpumpe mit Frequenzumformer
Magnetic pump, Immersion pump with frequency controlled drive

Membran-Dosierpumpe/
Diaphram dosing pump

Hochdruckpumpe/
High pressure pump

M Rührwerk/
Mixer

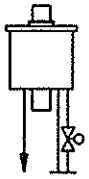
Injektor/
Fluid jet vacuum pump

Windkessel/
Surge absorber unit

Heizung, Kühlung / Heating, Cooling

H M Heizung/
Heating

DH Durchlauferhitzer
Flow heater


Kondensatabscheider/
Condensor

Heizung/
Heating

C M Kühlung/
Cooling

C M M Kühlung verstärkt/
Cooling reinforced

Ventile / Valves

Handventil/
Manual valve

E Handventil mit Endlagenkontrolle/
Manual valve with open-closed position detection

L Handventil abschliessbar/
Manual valve lockable

Magnetventil/
Solenoid valve

E Magnetventil mit Endlagenkontrolle/
Solenoid valve with open-closed position detection

Probeentnahmehahn/
Sampling tap

Überströmventil/
Pressure relief valve

Rückschlagventil/
Non-return valve

M Motorventil/
Motor valve

Z Magnetventil mit Zeitrelais/
Solenoid valve with time relay

Z I S Magnetventil gesteuert über Zeit/Intervall/
Solenoid valve controlled by time/interval

T Antischaumtropfeinrichtung/
Antifoam-dripping unit

Mess- und Überwachungssysteme / Measuring and controlling systems

Sensor /
Sensor

DK/JD Sensor für Durchlaufkontrolle/
Sensor for jam detection

FK/AC Sensor für Flächenkalkulator/
Sensor for area calculator

Sensor kapazitiv/
Capacitive sensor

Plattendickenmessung/
Panel thickness measuring

Impulsgeber/
Pulse generator

Z Zeitrelais/
Time relay

STH Sicherheitsthermostat/
Safety thermostat

TH Thermostat

Symbole/Symbols

Ihr Partner für perfekte Leiterplattentechnik

Mess- und Überwachungssysteme/ Measuring and controlling systems

- Durchflußmesser/ Flow meter
- Durchflußmesser mit min-Kontakt/ Flow meter with min-contact
- Durchflußmesser mit max-Kontakt/ Flow meter with max-contact
- Durchflußmesser mit min/max-Kontakt/ Flow meter with min/max-contact
- Durchflußmesser mit Reedkontaktkette/ Flow meter with Reed-contact chain
- Flügelraddurchflußmesser (digital) Impeller flow meter
- Durchflußmesser induktiv Flow meter inductive
- Niveauschalter/ Level switch
- SH Niveauschalter Sicherheit/ Level switch Safety
- TG Niveauschalter Trockengehschutz/ Level switch Dry-run-protection
- Niveauschalter mit Reedkontaktkette Level switch with Reed-contact chain
- Fotometer/ Photometer
- Dichtesteuerung/ Density control unit
- pH-Meßgerät/ pH-control unit
- Redox-Meßgerät/ Redox-control unit
- Leitwert-Meßgerät/ Conductivity-control unit
- Manometer analog/ Pressure gauge analog
- Manometer digital/ Pressure gauge digital
- Niveauschalter für Dosierbehälter/ Level switch for dosing tanks
- Stabniveauschalter für Liefergebinde/ Level sensor with level switch for supplier tank

Sprühsysteme / Spray systems

- Sprührohr/ Spray bar
- Schwalldüsenrohr/ Flood bar
- Schwallkasten/ Box-type flood unit
- Winkelverteiler/ Angular deviation distributor
- Trockendüsen/ Dry-Jet
- Trockendüsen/ Dry-Jet

Absaugung / Exhaust

- Entlüfter (Tank)/ Venting
- Absaugung/ Exhaust connection
- Absaugung mit Drosselklappe/ Exhaust connection with regulating flap
- Abluftstutzen motorisch/ Air exit motor driven

Filter

- Filter
- Kerzenfilter/ Cartridge filter
- Aktivkohlefilter/ Carbon filter
- Beutelfilter/ Bag filter

Abkürzungen in Schemazeichnung/ Abbreviations in Layout Drawing

	DEUTSCH	ENGLISCH
"A"	Zuleitung kundenseitig	supply pipe (specified by customer)
B	Behälter	tank
"C"	Zuleitung kundenseitig	supply pipe (specified by customer)
C	Kühlung	Cooler
D	Dichtesteuerung	density control
DI	D.I.-Wasser, deionisiertes Wasser	d.i. water (deionized water)
DK	Durchlaufkontrolle	flow control
DN	Durchlaufneutralisation	flow neutralisation
EH	EH- Wasser (teilenthärtet)	partially softened water
EL	Elektrolyse	electrolysis
EPDM	Gummi	rubber
F	Durchfluss	flow
FK	DurchflussFlächenkalkulator	flow area calculator
H	Heizung	Heater
K	Kaskade	cascade
KA	Konzentrate komplexarm	concentrate with little complexing power
KEDTA	Komplex EDTA	complex EDTA
KK	Konzentrat komplexhaltig	concentrate with high complexing power
KK1	Klemmenkasten	switch box
KMnO	Kaliumpermanganat	potassium permanganate
M1	Modul	module
Niv.	Niveau	level
N1/N2	Niveau (im Tank)	level
P1	Pumpe	pump
PE	Kunststoff	plastic
PH	PH Wert	PH value
PP	Polypropylen	polypropylen
PPn	Polypropylen naturfarben	polypropylen, natural
PT 100	Sicherheitsthermostat	safety thermostat
PTFE	Teflon	teflon
PVC	Kunststoff	plastic
"R"	Zuleitung kundenseitig	supply pipe (specified by customer)
R	Reedkontakt (im Tank)	reed contact (im Tank)
RG	Rückgewinnung	recovery
SH	Niveauschalter-Sicherheit	safety level switch
SPS	speicherprogrammierbare Steuerung	SPC stored program control
SS	Edelstahl	stainless steel
STH	Sicherheitsthermostat	safety thermostat

T	Tank	tank
TG	Trockengehschutz	dry-run protection
TH	Thermostat	thermostat
TI	Titan	titanium
VA	VA Stahl	vanadium steel
VE	vollentsalztes Wasser/Deionat	demineralized water
VS	Vorschub	conveyor
Y21	Magnetventile	solenoid valves
"Y"	Tank kundenseitig	tank (specified by customer)
"Z"	Tank kundenseitig	tank (specified by customer)

Modul	Module	PVC/SS	PVC/SS	PVC/TI	PVC/TI	PVC/TI	PVC/SS	PVC/SS	PP/SS	PVC/SS
Pumpe	Pump		1x TP 1.8kW	4x TP 0.37kW	1x TP 1.0kW	3x TP 0.37kW	1x TP 1.8kW	3x TP 0.37kW		
Filter	Filter		1x 1x10"	1x CDPpac (K1)	1x 1x10"		1x 1x10"			
Filterkerze	Cartridge		1x 50µm		1x 50µm		1x 50µm			
Durchflußmesser	Flowmeter									
Badvolumen	Bath volumn		V=185l	V=365l	V=260l	V=285l	V=110l	V=285l		
Temperatur	Temperature		30°C		30°C					
Prozeßzeit	Process time		25sec.		40sec.		11sec.			
Temperaturregler	Temperature control		TH		TH		TH			
Sicherheitsthermostat	Safety thermostat		STH		STH		STH		STH	
Niveaukontrolle "Stehende Welle"	Level control "standing wave"									
Niveaukontrolle	Level control									
			ein							
			TE		TE		TE			

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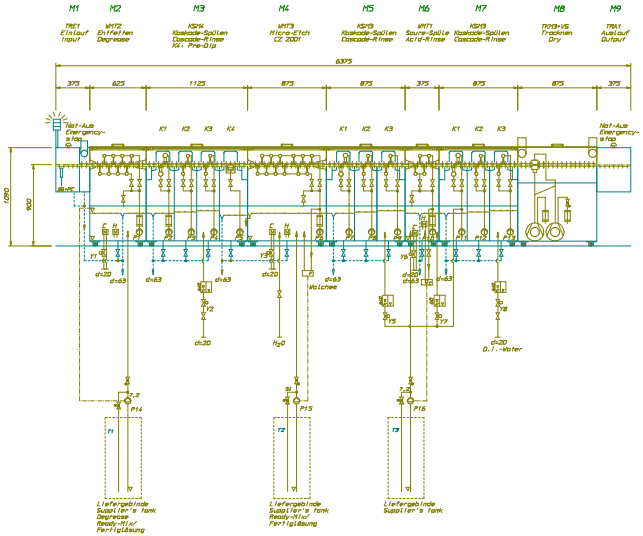
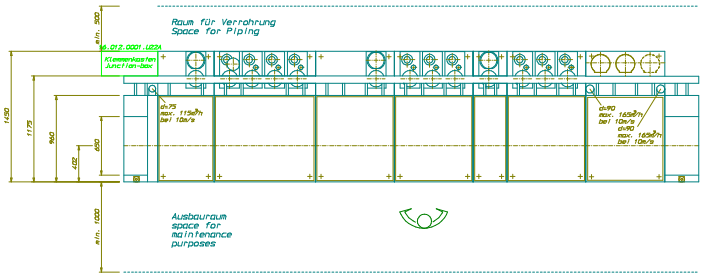
Gebr. Schmid - Maschinenfabrik - Freudenstadt





Schaltschrank
Control Panel
1600x400x2300

Pumpenliste / List of pumps

P1	PUTA030300-03108	1.8kW
P2-P5	PUTA000300-00817	0.37kW
P6	PUTA030300-02525	1.0kW
P7-P9	PUTA000300-00817	0.37kW
P10	PUTA030300-03108	1.8kW
P11-P13	PUTA000300-00817	0.37kW
P14	PUDD225600-03413	0.02kW
P15	PUDD059300-00215	0.09kW
P16	PUDD225600-03413	0.02kW

V_{St} ca. 1.0m/min
Conveyor speed approx. 1.0m/min

IL-Transport

Arbeitsrichtung/Working Direction: L - R
Arbeitsbreite/Working Width 650mm
Plattenformat/Panel Size max.: 635x635mm
min.: 180x180mm
Plattendicke/Panel Thickness max.: 3.2mm
min.: 0.2mm

Com.-No.: 25-05-377

400V/50Hz

Nr.	Datum	Veranlasst	Gepruef	VK	Werk	2005	Date	Name
						Sign.	14.10	Hultz
						Chk.		
						Norm		

1:25

File 187524

GSF Proj.: VCF Lettland

Gebr. Schmid GmbH & Co. Ihr Partner für perfekte Leiterplattentechnik

25-18752-4-A1

Pre-Treatment prior to Soldermask

Elektro-Dokumentation
Electro Documentation

Betriebsspannung Operating voltage	: 400V
Betriebsfrequenz Operating frequenz	: 50Hz
Leistungsaufnahme Power consumption	: 30kW
Stromaufnahme Current consumption	: 71A/Phase
Steuerspannung Control voltage	: DC 24V

Auftraggeber Customer	: VEF Radiotehnika, LV
Anlage Machine	: Pre-Treatment
Kommissions-Nummer Commission number	: 25-05-377
Zeichnungs-Nummer Drawing number	: 25-18752-2-A1
Schaltplan-Nummer Wiring diagram number	: 16.018.1078-E0 - 0
Programm-Nummer Program number	: 25053770.*
Layout-Nummer Layout number	:

Netz Line	: 3/N/PE
Kurzschluss-Strom max. Short circuit max.	: Iq max. 10kA
Vorschriften Regulations	: VDE 0113, EN 60204, IEC 204-1

Zusatz Anlage 1 Acessory Machine	:
Kommissions-Nummer Anlage 1 Commission number Machine	:
Schaltplan-Nummer Anlage 1 Wiring diagram number Machine	:
Zusatz Anlage 2 Acessory Machine	:
Kommissions-Nummer Anlage 2 Commission number Machine	:
Schaltplan-Nummer Anlage 2 Wiring diagram number Machine	:

Aenderung 1 Modification	:
Aenderung 2 Modification	:
Aenderung 3 Modification	:
Aenderung 4 Modification	:
Aenderung 5 Modification	:
Aenderung 6 Modification	:

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

Deckblatt Cover sheet

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer

25050377	25-18752-2-A1	=0 +0
25053770.*	16.018.1078-E0-0	Blatt 1 44 Bl.

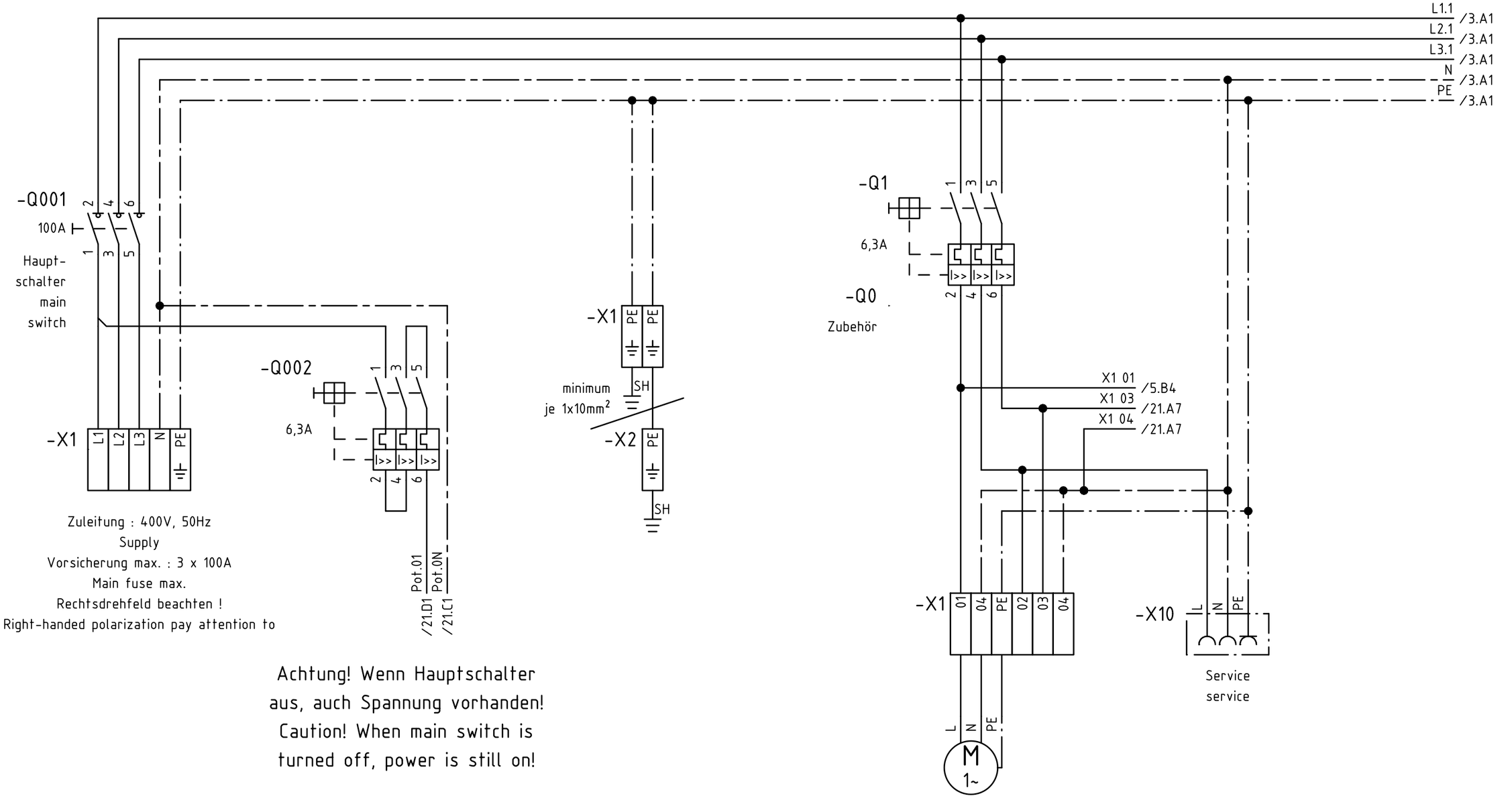
Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta



Achtung! Wenn Hauptschalter
aus, auch Spannung vorhanden!
Caution! When main switch is
turned off, power is still on!

X1 = Klemmleiste Schaltschrank
terminal block control box
X2 = Klemmleiste Maschine
terminal block machine

+0 Schaltschrank
control box
+1 Schaltschrank Tuer
control box door
+2 Maschine
machine

Änderungsnummern								Zeichnungsnummer	
				Datum	28.09.2005	VEF Radiotehnika, LV		Stromlaufplan Circuit diagram	25050377 =0 +0
				Bearbeiter	BZ			25-05-377	
				Geprüft				Pre-Treatment	16.018.1078-E0-0 Blatt 2
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch	44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/2.A8 L1.1 L2.1 L3.1 N PE

L1.1 L2.1 L3.1 N PE /4.A1

-Q2 4,0A (3)

-Q3 2,5A (1,9)

-X1 600 600 GND

-X2 600 GND

-G1 20A 400V 24V DC PE +L -M M

-T1 500VA 400V 115V 115V PE

230V AC

-K001A /13.D2

-X1 253 X1 253 /19.A1

-X1 252 X1 252 /15.A6

-X1 251 X1 251 /15.A6

-X1 PE *

-X1 PE *

-F100 3A

-F101 6A

24V DC

-X1 303 -X1 303 X1 303 /4.D4

-X1 302 -X1 302 X1 302 /12.A1

-X1 301 -X1 301 X1 301 /4.D4

10mm²

-X1 601 -X1 601 -X1 601 -X1 601 -X1 601 -X1 601 -X1 601 X1 601 /23.A1

-X2 601 -X2 601 -X2 601 X2 601 /19.E1

Achtung!
Attention!
Ground analog!
GND

Pot.1 /12.A1

* Wird die Erdung vom Steuerstrom-kreis am Transformator auf-gehoben, muß eine Isolations-ueberwachung eingebaut werden.
If the grounding of the control circuit on transformer is removed, an earth leakage monitor must be installed.

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch
				Datum	28.09.2005			
				Bearbeiter	BZ			
				Geprüft				

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377 =0 +0

16.018.1078-E0-0

Blatt 3
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/3.A8 L1.1 — L1.1 /5.A1
/3.A8 L2.1 — L2.1 /5.A1
/3.A8 L3.1 — L3.1 /5.A1
/3.A8 N — N /5.A1
/3.A8 PE — PE /5.A1

-Q4
10A
1 3 5 13 21
2 4 6 14 22
/16.A2

-K4M
/31.D6
1 2

-X060
9Pins SH A1 B1 (3) (8) off on A2 B2 SH 9Pins
/22.B2 PROFI-BUS1

-K020A
/14.D7
Reset
13 14

-N1
L1 N PE 230V DN3 +24V
Drehzahlregler
speed controller
Micromaster 420; 0,55kW
RL1
ON OFF 60Hz 50Hz 1 2
Achtung! Attention!
Kondensator Entladezeit 5min.
condenser discharge time
GN YE
3x230V
Bus Bus
ON OFF 1 2
W1 W2 W4 W8 W16 W32 W64
ON OFF 1 2 3 4 5 6 7
PROFIBUS-Adresse
Bus: PROFI
Teilnehmer: 10
/41.D2
PEW768 PEW770 PEW772 PEW774 PEW776 PEW778
PAW768 PAW770 PAW772 PAW774 PAW776 PAW778
U V W PE
1 (+24V) 2 (0V)

Istwert (0-20mA)
real value
12 13
-X1 600

-U1
I U
2- 1+ 7+ 8- 6- 5+

-X1 600

-X2 1 2 3 PE 4 SH

-X01 +2 1 2 3 PE 4
U V W PE
M 3~

-M1
+2
2,3A 3x230V
0,25kW
Vorschub Modul 8
conveyor module

/3.D8 X1 303 — X1 303 /12.B2
/3.D8 X1 301 — X1 301 /5.C3

-X1 602 -X1 603
-X2 602 -X2 603
(-)

vorgesehen fuer Sollwert
Geschwindigkeit an extern
reserved for set point
speed to external

				Änderungsnummern		VEF Radiotehnika, LV		Stromlaufplan Circuit diagram	Zeichnungsnummer
				Datum	28.09.2005			25-05-377	25050377 =0 +0
				Bearbeiter	BZ			Pre-Treatment	16.018.1078-E0-0
				Geprüft					Blatt 4 / 44 Bl.
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch	

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/4.A8 L1.1 — L1.1 /6.A1
/4.A8 L2.1 — L2.1 /6.A1
/4.A8 L3.1 — L3.1 /6.A1
/4.A8 N — N /6.A1
/4.A8 PE — PE /6.A1

-Q10 4,0A /16.B2
-Q11 10A /16.B2

/2.C6 X1 01 — X1 01 /9.B4

-K10M /31.D7
-K11M /32.D2
-K113A /32.D3

-V11
Stl.1 -K021A:34 /32.C2

/4.D8 X1 301 — X1 301 /7.C3

-X1 -X2
-X1 -X2
-X1 -X2
-X002 +2

-M10
+2
3,8A
1,8kW
Pumpe 1 Modul 2
pump module

-E11
+2
6A
4kW
Tankheizung Modul 2
tank heating module

-M002
+2
240V
0,01kW
Dosierpumpe 14 Entfetten Modul 2
dosing pump degrease module

Änderungsnummern

R.	Änderung	Datum	Name
		Datum	28.09.2005
		Bearbeiter	BZ
		Geprüft	
		Norm	

VEF Radiotehnika, LV

SCHMID

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer

25050377 =0 +0

16.018.1078-E0-0

Blatt 5
44 Bl.

Ursprung | Ersatz für | Ersatz durch

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

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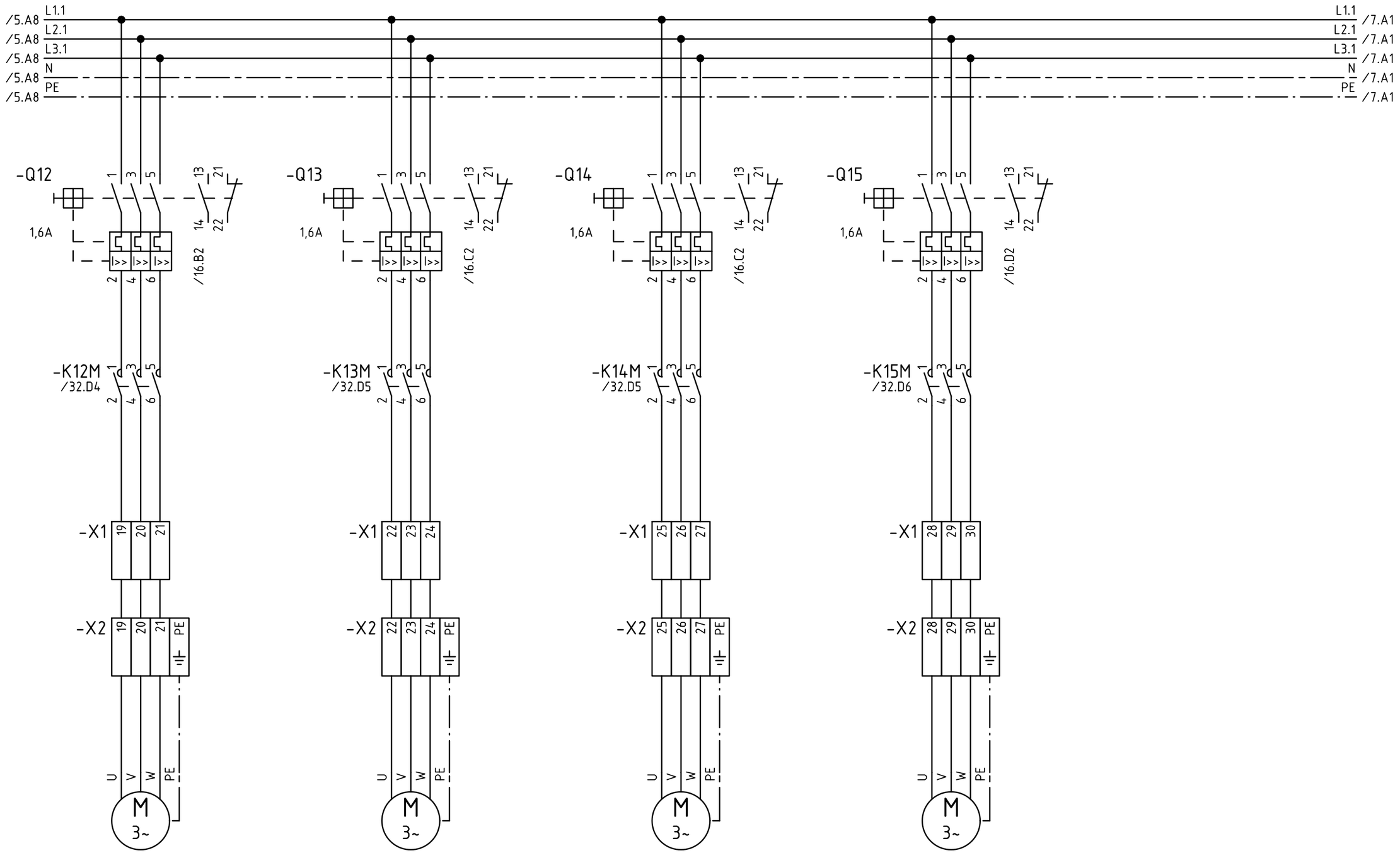


-M12
+2
1,45A
0,37kW
Pumpe 2 Modul 3
pump module

-M13
+2
1,45A
0,37kW
Pumpe 3 Modul 3
pump module

-M14
+2
1,45A
0,37kW
Pumpe 4 Modul 3
pump module

-M15
+2
1,45A
0,37kW
Pumpe 5 Modul 3
pump module

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 6
44 Bl.

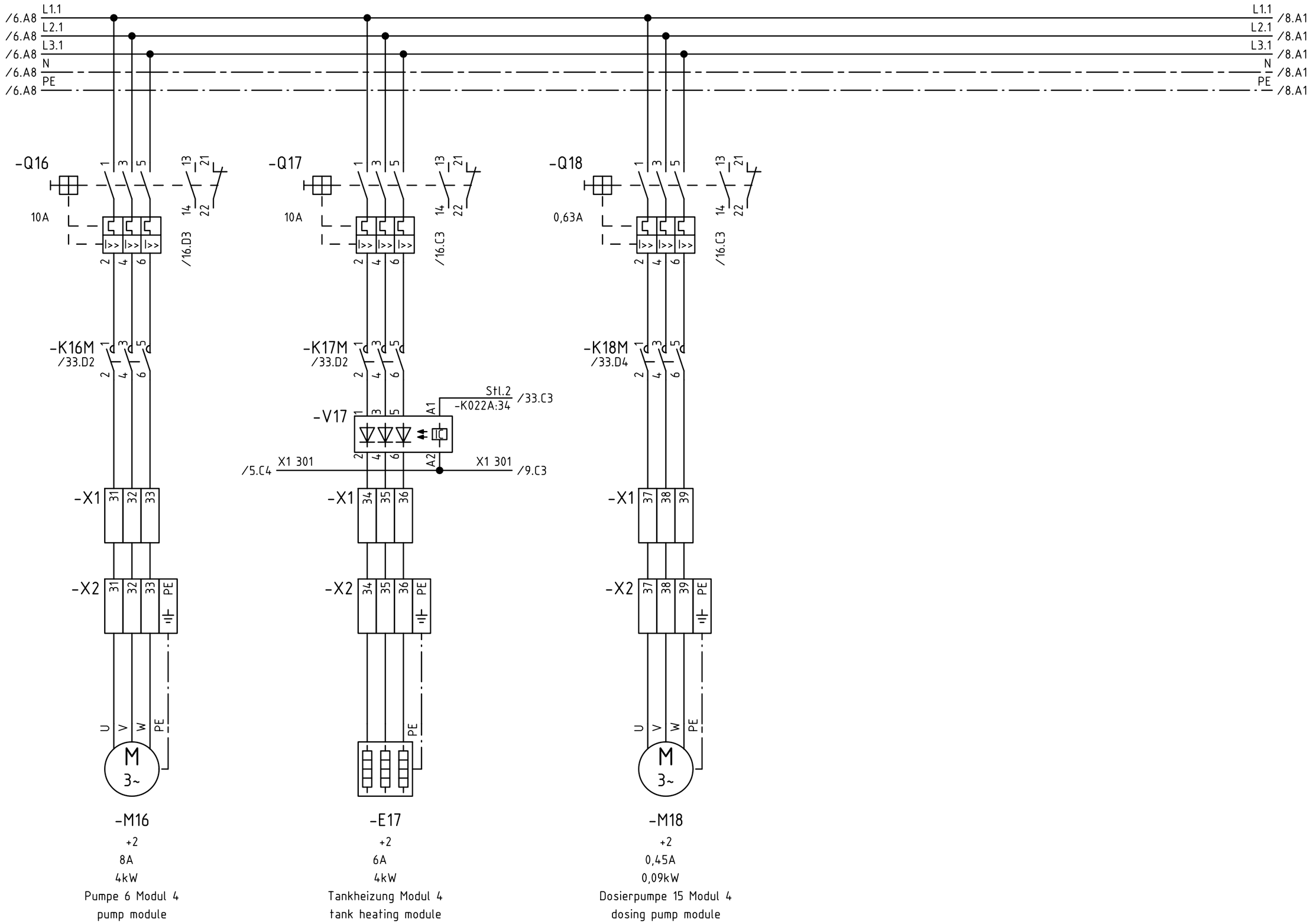
Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta



-M16
+2
8A
4kW
Pumpe 6 Modul 4
pump module

-E17
+2
6A
4kW
Tankheizung Modul 4
tank heating module

-M18
+2
0,45A
0,09kW
Dosierpumpe 15 Modul 4
dosing pump module

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name

Datum	28.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

SCHMID

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

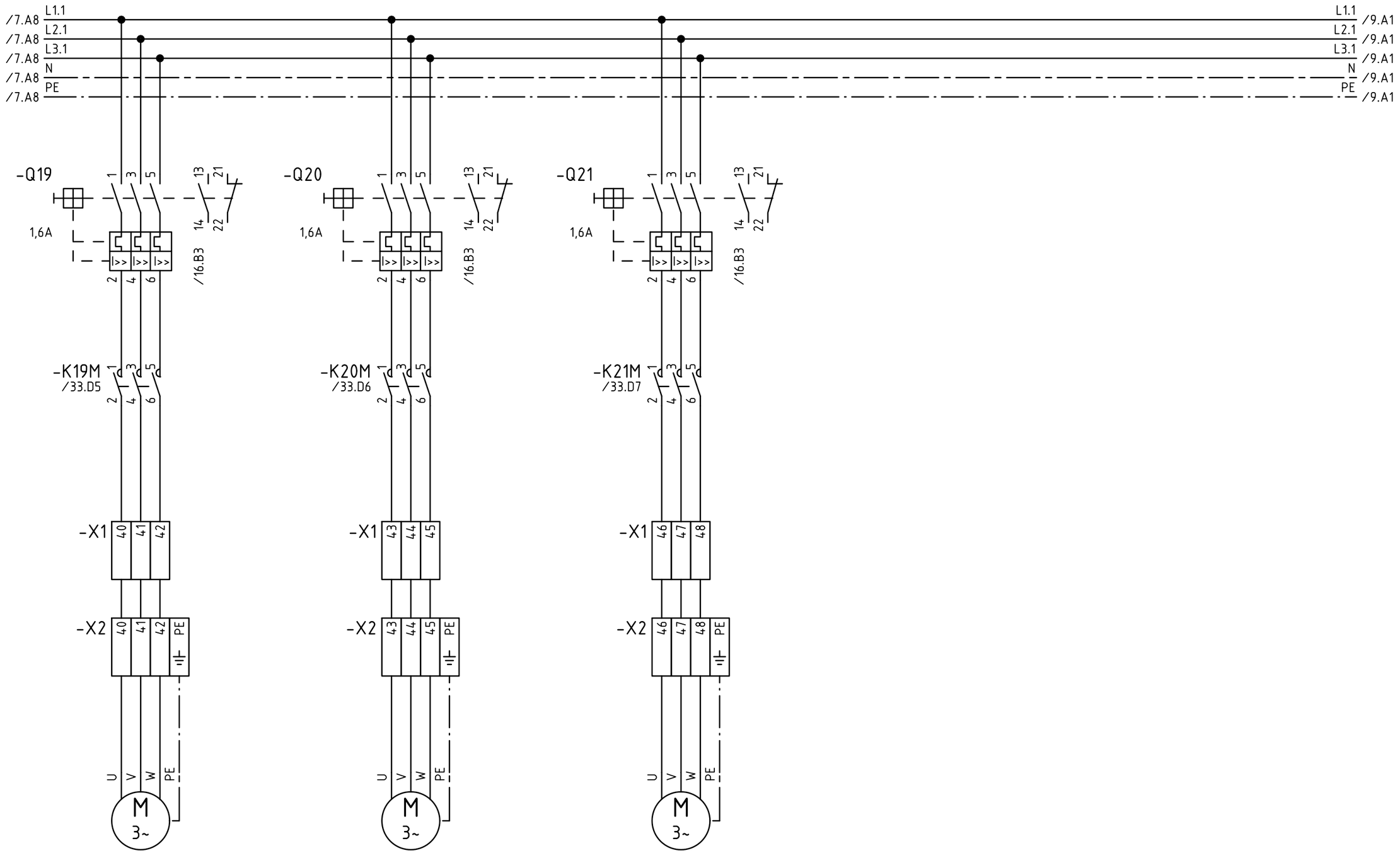
=0
+0

16.018.1078-E0-0

Blatt 7
44 Bl.

Ursprung	Ersatz für	Ersatz durch

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !



-M19
+2
1,45A
0,37kW
Pumpe 7 Modul 5
pump module

-M20
+2
1,45A
0,37kW
Pumpe 8 Modul 5
pump module

-M21
+2
1,45A
0,37kW
Pumpe 9 Modul 5
pump module

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006
Alle Leitungen ohne Querschnittsangabe sind mm²

Änderungsnummern

R.	Änderung	Datum	Name

Datum	28.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer

25050377 =0 +0

16.018.1078-E0-0

Blatt 8
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006
Alle Leitungen ohne Querschnittsangabe sind mm²

/8.A8 L1.1 — L1.1 /10.A1
/8.A8 L2.1 — L2.1 /10.A1
/8.A8 L3.1 — L3.1 /10.A1
/8.A8 N — N /10.A1
/8.A8 PE — PE /10.A1

-Q22 10A /16.B3
-Q23 10A /16.B3

-K22M /34.D2
-K23M /34.D3
-K114A /34.D5

/5.B5 X1 01 — X1 01

-V23
Stl.3 -K023A:34 /34.C4

/7.C4 X1 301 — X1 301 /12.D1

-X1 49 50 51
-X2 49 50 51 PE
U V W PE
M 3~

-M22
+2
8A
4kW
Pumpe 10 Modul 6
pump module

-X1 52 53 54
-X2 52 53 54 PE
PE
-E23
+2
6,8A
4,5kW
Tankheizung Modul 6
tank heating module

-X1 55 56
-X2 55 56 PE
-X003 +2 L N PE
L N PE
M 1~

-M003
+2
240V
0,01kW
Dosierpumpe 16 Modul 6
dosing pump module

Änderungsnummern

R.	Änderung	Datum	Name

Datum	28.09.2005	
Bearbeiter	BZ	
Geprüft		
Norm		

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer
25050377
=0
+0
16.018.1078-E0-0
Blatt 9
44 Bl.

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !
Alle Leitungen ohne Querschnittsangabe sind mm²
07.04.2006
Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/9.A8 L1.1
/9.A8 L2.1
/9.A8 L3.1
/9.A8 N
/9.A8 PE

L1.1 /11.A1
L2.1 /11.A1
L3.1 /11.A1
N /11.A1
PE /11.A1

-Q24 1,6A /16.B3
-Q25 1,6A /16.C3
-Q26 1,6A /16.C3

-K24M /34.D6
-K25M /34.D7
-K26M /35.D2

-X1 57 58 59
-X2 57 58 59 PE

-X1 60 61 62
-X2 60 61 62 PE

-X1 63 64 65
-X2 63 64 65 PE

U V W PE
M 3~

-M24
+2
1,45A
0,37kW
Pumpe 11 Modul 7
pump module

-M25
+2
1,45A
0,37kW
Pumpe 12 Modul 7
pump module

-M26
+2
1,45A
0,37kW
Pumpe 13 Modul 7
pump module

Änderungsnummern

R.	Änderung	Datum	Name

Datum 28.09.2005
Bearbeiter BZ
Geprüft
Norm

Ursprung | Ersatz für | Ersatz durch

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

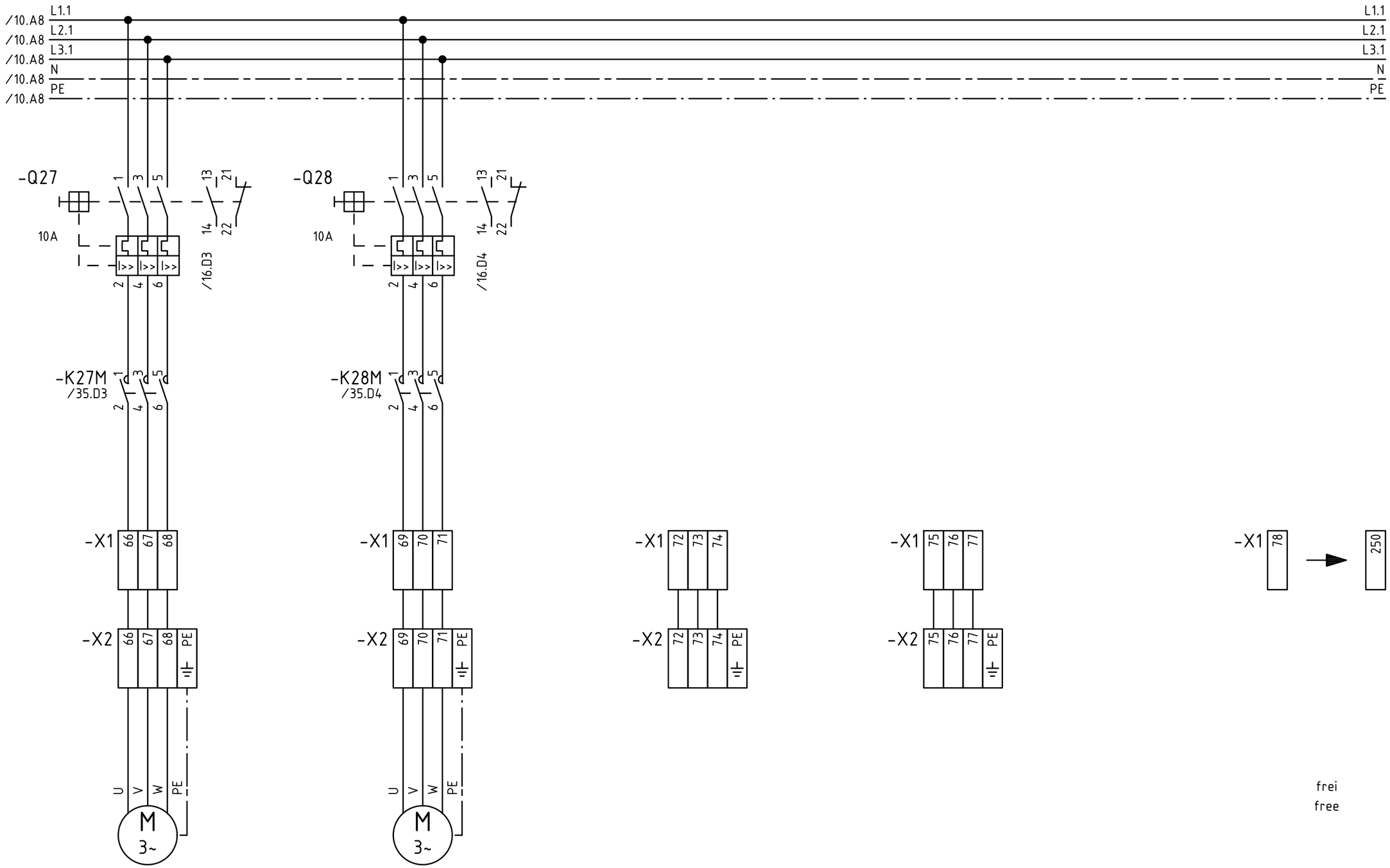
Zeichnungsnummer
25050377
=0
+0
16.018.1078-E0-0
Blatt 10
44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta



Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV	Stromlaufplan Circuit diagram	25050377 =0 +0
				Bearbeiter	BZ		25-05-377	
				Geprüft			Pre-Treatment	16.018.1078-E0-0 Blatt 11
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch		44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/3.D8 X1 302

/3.E3 Pot.1

-X1 302 -X1 302 -X1 302 -X1 302 -X1 302 -X1 302 -X1 302 X1 302 /14.A1

-X2 302 -X2 302 -X2 302 X2 302 /14.A1

-F102 3A

-F103 3A

-F104 3A

-F105 2A

X1 303 /4.D8

-K001A /13.D2 33 34

-K002A /13.D4 13 14

-K002A /13.D4 23 24

-K002A /13.D4 33 34

Pot.5 /23.B3

Pot.4 /23.B3

Pot.3 /23.B2

Pot.2 /23.A1

-X1 303 -X1 303 -X1 303 -X1 303 -X1 303 X1 303 /13.A1

-K101A A1 A2

-K102A A1 A2

-K103A A1 A2

-K104A A1 A2

-K105A A1 A2

/9.C4 X1 301

-X1 301 -X1 301 -X1 301 -X1 301 -X1 301 -X1 301 X1 301 /13.D1

-X2 301 -X2 301 -X2 301 X2 301 /17.E1

/15.B2 14 12 11

/15.B2 14 12 11

/15.B2 14 12 11

/15.C2 14 12 11

/15.C2 14 12 11

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram

25-05-377

Pre-Treatment

25050377

=0

+0

16.018.1078-E0-0

Blatt 12

44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/12.D8 X1 303

X1 303 /17.A1

X1 303

-X2 303

-S1 21 13 +2 22 14 /14.B2

Not-Aus Modul 1 emergency stop module

-S4 21 13 +1 22 14 /14.B4

Not-Aus Schaltschrank emergency stop control box

-X2 304

-X2 304

-X1 306

-X2 306

-K001A 13 D2 14

-S2 21 13 +2 22 14 /14.B3

Not-Aus Modul 9 emergency stop module

-S3 +2

Reserve Not-Aus reserve emergency stop

-S5 21 E +1 22

Steuerung aus control off

-X2 305 -X2 305

-K001A A1 Y1

SICHERHEITS-KOMBINATION 3TK2821

B7 13 14

/3.B7 23 24

/12.B3 33 34

41 42

A2 Y2

Steuerung ein control on

-S6 13 E +1 14

Steuerung ein control on

-K002A 51 A1

SICHERHEITS-KOMBINATION 3TK2830

/12.B4 13 14

/12.B5 23 24

/12.B5 33 34

43 44

52 A2

-P1 2+ h 1

Betr.std.zaehler work. hour meter

-H1 X1 +1 X2 WH

Steuerung ein control on

/12.D8 X1 301

X1 301 /14.D1

Allgemein general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name					
				Datum	28.09.2005	VEF Radiotehnika, LV	SCHMID	Stromlaufplan Circuit diagram 25-05-377 Pre-Treatment
				Bearbeiter	BZ			
				Geprüft				
				Norm		Ursprung	Ersatz für	Ersatz durch

25050377 =0 +0

16.018.1078-E0-0 Blatt 13 44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Schutzvermerk nach DIN 34 ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006
Alle Leitungen ohne Querschnittsangabe sind mm²

/12.A8 X1 302
/12.A8 X2 302

X1 302 /15.A1
X2 302 /16.A1

-X2 302
-X2 302
-X2 302
-X1 302

-S1 +2 13 14
/13.A2
Not-Aus
Modul 1
emergency stop
module

-S2 +2 13 14
/13.B2
Not-Aus
Modul 9
emergency stop
module

-S4 +1 13 14
/13.A4
Not-Aus
Schaltschrank
emergency stop
control box

-S7 13 14
E---
+1
Reset
reset

-X2 307
-X2 307
-X2 307
-X1 307
-X1 307

Stl.4 -X010:12 /25.B2

X1 307 /24.B5

Ueberwachung Not-Aus
observe emergency stop

-K020A A1+ A2-

/13.D8 X1 301
X1 301 /15.D1

Reset
reset

/4.B4 13 14
/17.B3 23 24
/17.B6 33 34
/18.B3 43 44
/18.B6 53 54
63 64
73 74
83 84

Allgemein
general

Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV		Stromlaufplan Circuit diagram	25050377	=0
				Bearbeiter	BZ			25-05-377		+0
				Geprüft				Pre-Treatment	16.018.1078-E0-0	Blatt 14
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch		44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/14.A8 X1 302 ——— X1 302 /16.A1

-K050A D7 (11 / 12 / 14)

-K101A /12.D2 (11 / 12 / 14)

-K102A /12.D3 (11 / 12 / 14)

-K103A /12.D4 (11 / 12 / 14)

-K104A /12.D4 (11 / 12 / 14)

-K105A /12.D5 (11 / 12 / 14)

/24.B6 Stl.5 -X010:8

Ueberwachung Sicherungsautomaten
observe over-current release

230V AC

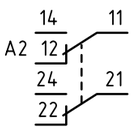
/3.C8 X1 252 ——— X1 252 /17.A2

/3.C8 X1 251 ——— X1 251 /17.A2

-K050A A1 / A2

/14.D8 X1 301 ——— X1 301 /16.D1

Ueberwachung Steuerspannung 230V AC
observe Control voltage



Allgemein
general

Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV		Stromlaufplan Circuit diagram	25050377	=0
				Bearbeiter	BZ			25-05-377		+0
				Geprüft				Pre-Treatment	16.018.1078-E0-0	Blatt 15
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch		44 Bl.

/15.A8 X1 302
/14.A8 X2 302

X1 302 /19.A1
X2 302 /19.A1

-Q4 /4.B2 13 14
-Q10 /5.B2 14 13
-Q11 /5.B3 13 14
-Q12 /6.B2 14 13
-Q13 /6.B3 13 14
-Q14 /6.B4 14 13
-Q15 /6.B6 13 14

-Q21 /8.B4 14 13
-Q20 /8.B3 13 14
-Q19 /8.B2 14 13
-Q18 /7.B4 13 14
-Q17 /7.B3 14 13
-Q16 /7.B2 13 14

-Q22 /9.B2 14 13
-Q23 /9.B3 13 14
-Q24 /10.B2 14 13
-Q25 /10.B3 13 14
-Q26 /10.B4 14 13
-Q27 /11.B2 13 14
-Q28 /11.B3 13 14

Stl.6 /24.B7
-X010:9

Ueberwachung Motorschutz
observe protective motor

-X2 302
-S001 +2 Modul 2 module
-X2 308
-X2 308
-S002 +2 Modul 3 module
-X2 309
-X2 309
-S003 +2 Modul 4 module
-X2 310
-X2 310
-S004 +2 Modul 5 module
-X2 311

X2 314 /25.B5
-X2 314
-S007 +2 Modul 8 module
-X2 313
-X2 313
-S006 +2 Modul 7 module
-X2 312
-X2 312
-S005 +2 Modul 6 module
-X2 311

Ueberwachung Deckelsicherungen
observe lid switches

/15.D8 X1 301

X1 301 /17.D1

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 16
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/13.A8 X1 303

X1 303 /18.A1

230V AC

/15.A7 X1 252

/15.A7 X1 251

X1 252 /18.A2

X1 251 /18.A2

-K106A /30.D2

-K107A /30.D2

-N21

-N22

Sicherung 2A fuse

Sicherheits-thermostat safety thermostat

/26.B5 Stl.7 -X011:6

/27.B2 Stl.8 -X011:13

-K020A /14.D7

-X1 600

-X2 600

-B21 +2

-B22 +2

YE WH GN BN

Temperaturfuehler temperature probe

-Y1 +2

-Y3 +2

-K021A

-K022A

/16.D8 X1 301

/12.E8 X2 301

X1 301 /18.D1

X2 301 /18.E1

Kuehlung cooling

Temperatur in Ordnung temperature is in order

Modul 2 module

/31.C7 13 14

/32.C2 23 24

/32.C2 33 34

43 44

Modul 4 module

/33.C2 13 14

/33.C2 23 24

/33.C3 33 34

43 44

Allgemein general

Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV		Stromlaufplan Circuit diagram	25050377	=0
				Bearbeiter	BZ			25-05-377		+0
				Geprüft				Pre-Treatment	16.018.1078-E0-0	Blatt 17
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch		44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/17.A8 X1 303

230V AC

/17.A7 X1 252

/17.A7 X1 251

-K108A /30.D3 11 12 14

-N23

9 7 8 5 6 1 2

Sicherung 2A fuse

L1 N

Sicherheits- thermostat safety thermostat

/27.B7 Stl.9 -X011:19

-K020A /14.D7 43 44

/38.B5 /38.B5 /38.B5 /38.B5

X2 618 X2 619 X2 620 X2 621

-X1 600

-X1 616 617

-X2 616 617 618 619 620 621

-X2 600

-B23 +2 YE WH GN BN

Temperaturfuehler temperature probe

-X1 317

-X2 317

-Y6 +2 2+ PE 1-

-K023A A1+ A2-

-X2 301

/17.D8 X1 301

/17.E8 X2 301

Kuehlung cooling

Temperatur in Ordnung temperature is in order

Modul 6 module

/34.C2 13 14 23 24

/34.C3 33 34

/34.C4 43 44

X1 303 /22.A1

X1 252

X1 251 /19.A1

-N24

9 7 8 5 6 1 2

Sicherung 2A fuse

L1 N

Sicherheits- thermostat safety thermostat

/28.B4 Stl.10 -X011:25

-K020A /14.D7 53 54

-X1 600

-X1 622 623

-X2 622 623

-X2 600

-B24 +2 YE WH GN BN

Temperaturfuehler temperature probe

-K024A A1+ A2-

X1 301 /19.D1

X2 301 /20.E1

Temperatur in Ordnung temperature is in order

Modul 8 module

/35.C3 13 14 23 24

/35.C4 33 34 43 44

Allgemein general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name

Datum	28.09.2005	
Bearbeiter	BZ	
Geprüft		
Norm		
Ursprung	Ersatz für	Ersatz durch

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram

25-05-377

Pre-Treatment

25050377

=0

+0

16.018.1078-E0-0

Blatt 18

44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/16.A8 X1 302
/16.A8 X2 302

X1 302 /20.A1
X2 302 /20.A1

230V AC

/3.B8 X1 253
/18.A7 X1 251

X1 253
X1 251

-X1 251 253
-X2 251 253

+2
-N51

HOT
NEU
GRD

4-20mA

00000

+ -

-X2 624 X2 624 /39.C2
-X2 625 X2 625 /39.C2

-X2 600
-X1 600

TB3

CONTROLLER
WCU 310

N.O TB2
N.C OUT1
N.O OUT2
N.O OUT3
N.O OUT4
N.O ALRM

F1 F2

FM
FLOW
SWITCH
VM
+5
COM
VR
+2,5

-B51
OG
BU
WH-BU
GN
WH-GN
Sensor
+2

Fotometer
Modul 4
photometer
module

-X2 302

+2
-B52

000

8 Rel.1
7
6
5 Rel.2

Bürkert 8225

2 L+ A B 4
3 L- 4-20mA 1

Leitfaehigkeitsmessung Modul 6
conductimetry module

-X2 600
-X2 626
-X1 600

X2 626 /39.B2

-X2 601

/18.D8 X1 301
/3.E8 X2 601

X1 301 /20.D1
X2 601 /39.E1

Allgemein
general

Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV	Stromlaufplan Circuit diagram	25050377 =0 +0
				Bearbeiter	BZ		25-05-377	
				Geprüft			Pre-Treatment	16.018.1078-E0-0 Blatt 19
R.	Änderung	Datum	Name	Norm		Ursprung / Ersatz für / Ersatz durch		44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/19.A8 X1 302
/19.A8 X2 302

X1 302 /21.A1
X2 302 /24.A1

-K109A /30.D7 — 11 / 12 / 14
-K110A /31.D2 — 11 / 12 / 14
-K111A /31.D2 — 11 / 12 / 14

-X1 318 -X2 318
-X1 319 -X2 319
-X1 320 -X2 320

-H2 +2
-H2; +2 3 RD
-H2: +2 2 YE
-H2. +2 1 GN
0

-X2 301

/19.D8 X1 301
/18.E8 X2 301

X1 301 /21.A1
X2 301 /24.E1

Signallampe fuer Stoerung Warnung Betrieb
signal lamp for disturbance warning operation

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 20
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/20.A8 X1 302
/20.D8 X1 301

X1 302 /22.A1
X1 301 /22.A1

-A0.1
+1

PC
Bus: ETHERNET
Teilnehmer: 1

230V
0
1
/41.A2

Line
USB
Power
ETHERNET

-A0.3

+VS
GND

24V DC 1
ETHERNET 2
SWITCH 3
4
NS-205 5

F.G.

Netz extern
Line external

-A0.2
+1

230V
Monitor
/44.C5

/2.C6 X1 03 X1 03
/2.C6 X1 04 X1 04

ETHERNET
/22.E2

Telephone analog

-X12
1
La
Lb
2
N
TAE
F

Zuleitung
Modem
Supply

/2.D3 Pot.0N
/2.D3 Pot.01

-X11
L
N
PE

Power

-G001
+1

Wall (IN)
Modem (OUT)
Data Port
Power Input 230V AC
Back-UPS CS 650
Reset
On
230V AC Battery BACK UP Output

USV für Computer

Allgemein
general

Änderungsnummern

R.	Änderung	Datum	Name

Datum	28.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer
25050377
=0
+0
16.018.1078-E0-0
Blatt 21
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/21.A8 X1 302 — X1 302 /23.A1

/18.A8 X1 303 — X1 303 /23.A1

/21.A8 X1 301 — X1 301 /23.A1

PROFI-BUS1 /4.B4

-X059 9Pins A1 (8) B1 (3) SH A2 B2 SH 9Pins

PB DP X3

24V DC

PROFI-BUS
Teilnehmer: 2
/41.B2

MPI

/41.B2 MPI X2

VIPA CPU 315SB/DPM

VIPA
S7-300
CPU 315-3DP
Steckplatz 2

ETHERNET /21.D5

Bus ETHERNET
Teilnehmer: 1
/41.B2

-A1.2 X4

Reserve für IM

Steckplatz 3

-X010 1 20 10 11

Drahtbrücken DR1, DR2, DR3 im Frontadapter entfernen

L+ M Vs Vs

SM 321 Alarm

E0.0	/24.D2	2
E0.1	/24.D2	3
E0.2	/24.D3	4
E0.3	/24.D4	5
E0.4	/24.D5	6
E0.5	/24.D5	7
E0.6	/24.D6	8
E0.7	/24.D7	9
E1.0	/25.D2	12
E1.1	/25.D2	13
E1.2	/25.D3	14
E1.3	/25.D4	15
E1.4	/25.D5	16
E1.5	/25.D5	17
E1.6	/25.D6	18
E1.7	/25.D7	19

Steckplatz 4

-A1.4

-X011 1 20 40

Drahtbrücken DR1, DR2, DR3 im Frontadapter entfernen

L+ M M

SM 321

E4.0	/26.D2	2
E4.1	/26.D2	3
E4.2	/26.D3	4
E4.3	/26.D4	5
E4.4	/26.D5	6
E4.5	/26.D5	7
E4.6	/26.D6	8
E4.7	/26.D7	9
E5.0	/27.D2	12
E5.1	/27.D2	13
E5.2	/27.D3	14
E5.3	/27.D4	15
E5.4	/27.D5	16
E5.5	/27.D5	17
E5.6	/27.D6	18
E5.7	/27.D7	19
E6.0	/28.D2	22
E6.1	/28.D2	23
E6.2	/28.D3	24
E6.3	/28.D4	25
E6.4	/28.D5	26
E6.5	/28.D5	27
E6.6	/28.D6	28
E6.7	/28.D7	29
E7.0	/29.D2	32
E7.1	/29.D2	33
E7.2	/29.D3	34
E7.3	/29.D4	35
E7.4	/29.D5	36
E7.5	/29.D5	37
E7.6	/29.D6	38
E7.7	/29.D7	39

Steckplatz 5

-A1.5

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name

Datum	28.09.2005		
Bearbeiter	BZ		
Geprüft			
Norm		Ursprung	Ersatz für / Ersatz durch

VEF Radiotehnika, LV

SCHMID

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 22
44 Bl.

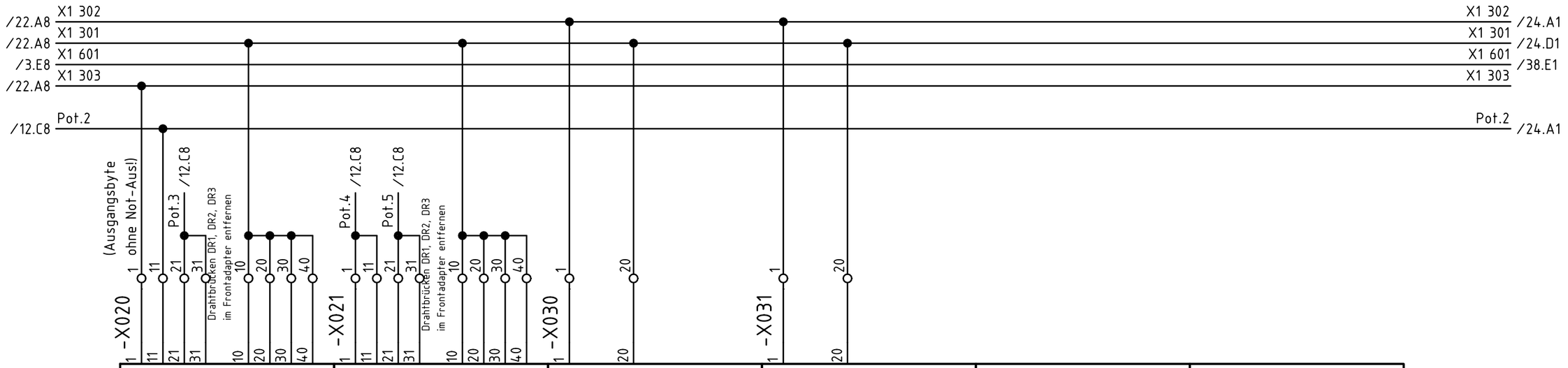
Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta



SM 322			SM 322			SM 331		SM 331		Reserve	Reserve
A8.0	/30.B2	2	A12.0	/34.B2	2	PEW320 /38.D2	2 3	PEW336 /39.D2	2 3		
A8.1	/30.B2	3	A12.1	/34.B2	3						
A8.2	/30.B3	4	A12.2	/34.B3	4	CH0,1 = A		CH0,1 = C			
A8.3	/30.B4	5	A12.3	/34.B4	5						
A8.4	/30.B5	6	A12.4	/34.B5	6	PEW322 /38.D2	4 5	PEW338 /39.D2	4 5		
A8.5	/30.B5	7	A12.5	/34.B5	7						
A8.6	/30.B6	8	A12.6	/34.B6	8						
A8.7	/30.B7	9	A12.7	/34.B7	9						
						PEW324 /38.D3	6 7	PEW340 /39.D3	6 7		
A9.0	/31.B2	12	A13.0	/35.B2	12						
A9.1	/31.B2	13	A13.1	/35.B2	13	CH2,3 = A		CH2,3 = C			
A9.2	/31.B3	14	A13.2	/35.B3	14						
A9.3	/31.B4	15	A13.3	/35.B4	15	PEW326 /38.D4	8 9	PEW342 /39.D4	8 9		
A9.4	/31.B5	16	A13.4	/35.B5	16						
A9.5	/31.B5	17	A13.5	/35.B5	17						
A9.6	/31.B6	18	A13.6	/35.B6	18						
A9.7	/31.B7	19	A13.7	/35.B7	19						
A10.0	/32.B2	22	A14.0	/36.B2	22						
A10.1	/32.B2	23	A14.1	/36.B2	23						
A10.2	/32.B3	24	A14.2	/36.B3	24						
A10.3	/32.B4	25	A14.3	/36.B4	25						
A10.4	/32.B5	26	A14.4	/36.B5	26	PEW328 /38.D5	12 13	PEW344 /39.D5	12 13		
A10.5	/32.B5	27	A14.5	/36.B5	27						
A10.6	/32.B6	28	A14.6	/36.B6	28	CH4,5 = A		CH4,5 = C			
A10.7	/32.B7	29	A14.7	/36.B7	29						
						PEW330 /38.D5	14 15	PEW346 /39.D5	14 15		
A11.0	/33.B2	32	A15.0	/37.B2	32						
A11.1	/33.B2	33	A15.1	/37.B2	33						
A11.2	/33.B3	34	A15.2	/37.B3	34						
A11.3	/33.B4	35	A15.3	/37.B4	35	PEW332 /38.D6	16 17	PEW348 /39.D6	16 17		
A11.4	/33.B5	36	A15.4	/37.B5	36						
A11.5	/33.B5	37	A15.5	/37.B5	37	CH6,7 = A		CH6,7 = C			
A11.6	/33.B6	38	A15.6	/37.B6	38						
A11.7	/33.B7	39	A15.7	/37.B7	39	PEW334 /38.D7	18 19	PEW350 /39.D7	18 19		
Steckplatz 6			Steckplatz 7			Steckplatz 8		Steckplatz 9		Steckplatz 10	Steckplatz 11
-A1.6			-A1.7			-A1.8	10 11	-A1.9	10 11		

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name

Datum	28.09.2005	
Bearbeiter	BZ	
Geprüft		
Norm		
Ursprung	Ersatz für	Ersatz durch

VEF Radiotehnika, LV

SCHMID

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 23
44 Bl.

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !
Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

/23.A8 X1 302 — X1 302 /25.A1
/20.A8 X2 302 — X2 302 /25.A1
/23.A8 Pot.2 — Pot.2 /25.A1

Steuerung ein control on

Ueberwachung Not-Aus observe emergency stop — X1 307 /14.D2

Ueberwachung Sicherungsautomaten observe over-current release — Stl.5 -K105A:14 /15.C4

Ueberwachung Motorschutz observe protective motor — Stl.6 -Q28:13 /16.B4

	-X010 2	-X010 3	-X010 4	-X010 5	-X010 6	-X010 7	-X010 8	-X010 9
-A1.4	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7	DI 8	DI 9
	E0.0 /22.B4	E0.1 /22.B4	E0.2 /22.B4	E0.3 /22.B4	E0.4 /22.B4	E0.5 /22.B4	E0.6 /22.B4	E0.7 /22.B4

/23.A8 X1 301 — X1 301 /25.D1
/20.E8 X2 301 — X2 301 /25.E1

Allgemein
general

Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV	Stromlaufplan Circuit diagram	25050377 =0 +0
				Bearbeiter	BZ		25-05-377	
				Geprüft			Pre-Treatment	16.018.1078-E0-0 Blatt 24
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch		44 Bl.

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !
Alle Leitungen ohne Querschnittsangabe sind mm²

/24.A8 X1 302
/24.A8 X2 302
/24.A8 Pot.2

X1 302 /26.A1
X2 302 /26.A1
Pot.2

Stl.4 /14.B7
-K020A:A1+

Reset
reset

-S8 21 E +1 22
Stopp
stop

-S9 13 E +1 14
Start
start

-S10 13 +1 14
Wartungsschalter
service switch

-S11 13 +1 14
Ueberbrueckung Deckelsicherungen
override lid switches

X2 314 /16.B7
Ueberwachung Deckelsicherungen
observe lid switches

-X2 302
Freigabe von nachfolgender Maschine
release from following machine

-X2 321
-X1 321

-B102 1 P +2 3
Ueberwachung Druckluft Modul 1
observe compressed air module

-X2 302
-X2 322

-X010 12 → 12 -A1.4 DI E1.0 /22.B4
-X010 13 → 13 -A1.4 DI E1.1 /22.B4
-X010 14 → 14 -A1.4 DI E1.2 /22.B4
-X010 15 → 15 -A1.4 DI E1.3 /22.B4
-X010 16 → 16 -A1.4 DI E1.4 /22.B4
-X010 17 → 17 -A1.4 DI E1.5 /22.B4
-X010 18 → 18 -A1.4 DI E1.6 /22.B4
-X010 19 → 19 -A1.4 DI E1.7 /22.B4

/24.D8 X1 301
/24.E8 X2 301

X1 301 /26.D1
X2 301 /26.E1

Allgemein
general

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name				
				Datum	28.09.2005		
				Bearbeiter	BZ		
				Geprüft			
				Norm		Ursprung	Ersatz für / Ersatz durch

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377
=0
+0
16.018.1078-E0-0
Blatt 25
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/25.A8 X1 302 / X2 302 — /27.A1 X1 302 / X2 302

-X2 302

-B103
OGH (PNP) DC 10-36V
1 L+ / 3 L- / 4 Q
+2
Sensor Stand-by sensor stand-by

-S101 Q +2 — Trockengehschutz dry run protection
-S102 Q +2 — Niveau max. level max.
-S103 +2 — Filter Deckelsicherung Pumpe 1 filter lid switch pump
Stl.7 /17.B2 -N21:8 — Temperatur in Ordnung temperature is in order
-S104 Q +2 — Niveau min. Tank T1 level min. tank
-S105 +2 — Durchfluß min. Wasserzulauf flow quantity min. water inlet
-S106 Q +2 — Trockengehschutz dry run protection

-X2 323 / -X2 324 / -X2 325 / -X2 326 / -X2 327 / -X2 328 / -X2 329

-X2 301

-X011 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9

-A1.5 DI
E4.0 /22.B5
E4.1 /22.B5
E4.2 /22.B5
E4.3 /22.B5
E4.4 /22.B5
E4.5 /22.B5
E4.6 /22.B5
E4.7 /22.B5

/25.D8 X1 301 / X2 301 — /27.D1 X1 301 / X2 301 /27.E1

Modul 1 module → Modul 2 module → Modul 3 module → Modul 4 module

Änderungsnummern

R.	Änderung	Datum	Name
			Datum 28.09.2005
			Bearbeiter BZ
			Geprüft
			Norm

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer: 25050377

=0 +0

16.018.1078-E0-0

Blatt 26
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/26.A8 X1 302 — X1 302 /28.A1
/26.A8 X2 302 — X2 302 /28.A1

-X2 302

-S107 1 2 +2
Filter
Deckelsicherung
Pumpe 6
filter
lid switch
pump

Stl.8 /17.B5
-N22:8
Temperatur
in Ordnung
temperature
is in order

-S109 Q +2
Niveau min.
Tank T2
level min.
tank

-S110 1 2 +2
Durchfluß min.
Wasserzulauf
flow quantity min.
water inlet

-S111 3 1 2 Q +2
S2 min S1 max
Trockengehschutz
dry run protection

-S112 1 2 +2
Filter
Deckelsicherung
Pumpe 10
filter
lid switch
pump

Stl.9 /18.B2
-N23:8
Temperatur
in Ordnung
temperature
is in order

-X2 330 | -X2 331 | -X2 332 | -X2 333 | -X2 334 | -X2 335

-X011 12 | -X011 13 | -X011 14 | -X011 15 | -X011 16 | -X011 17 | -X011 18 | -X011 19

-A1.5 DI 12 E5.0 /22.B5
-A1.5 DI 13 E5.1 /22.B5
-A1.5 DI 14 E5.2 /22.B5
-A1.5 DI 15 E5.3 /22.B5
-A1.5 DI 16 E5.4 /22.B5
-A1.5 DI 17 E5.5 /22.B5
-A1.5 DI 18 E5.6 /22.B5
-A1.5 DI 19 E5.7 /22.B5

/26.D8 X1 301 — X1 301 /28.D1
/26.E8 X2 301 — X2 301 /28.E1

Modul 4 module ◄
Modul 5 module ►
Modul 6 module ►

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
			Datum	28.09.2005	
			Bearbeiter	BZ	
			Geprüft		
			Norm		

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377 | =0 | +0

16.018.1078-E0-0

Blatt 27
44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²
07.04.2006
Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/27.A8 X1 302 — X1 302 /29.A1
/27.A8 X2 302 — X2 302 /29.A1

-X2 302 | -X2 302 | -X2 302

-S113 +2 Durchfluß min. Wasserzulauf flow quantity min. water inlet (1, 2)

-S114 Q +2 Niveau min. Tank T3 level min. tank

-S115 +2 Durchfluß min. Wasserzulauf flow quantity min. water inlet (1, 2)

StL.10 /18.B5 -N24:8 Temperatur in Ordnung temperature is in order

-X2 336 | -X2 337 | -X2 338

	-X011 22	-X011 23	-X011 24	-X011 25	-X011 26	-X011 27	-X011 28	-X011 29
	22	23	24	25	26	27	28	29
-A1.5	DI	DI	DI	DI	DI	DI	DI	DI
	E6.0 /22.B5	E6.1 /22.B5	E6.2 /22.B5	E6.3 /22.B5	E6.4 /22.B5	E6.5 /22.B5	E6.6 /22.B5	E6.7 /22.B5

/27.D8 X1 301 — X1 301 /29.D1
/27.E8 X2 301 — X2 301 /29.E1

Modul 6 / module → Modul 7 / module → Modul 8 / module → Reserve / reserve

Änderungsnummern | Zeichnungsnummer

R.	Änderung	Datum	Name			
			Datum	28.09.2005		
			Bearbeiter	BZ		
			Geprüft			
			Norm			

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377 | =0 | +0

16.018.1078-E0-0 | Blatt 28 | 44 Bl.

/28.A8 X1 302 — X1 302 /30.A1
/28.A8 X2 302 — X2 302 /39.A1

-X011 32 — -A1.5 DI E7.0 /22.B5
-X011 33 — -A1.5 DI E7.1 /22.B5
-X011 34 — -A1.5 DI E7.2 /22.B5
-X011 35 — -A1.5 DI E7.3 /22.B5
-X011 36 — -A1.5 DI E7.4 /22.B5
-X011 37 — -A1.5 DI E7.5 /22.B5
-X011 38 — -A1.5 DI E7.6 /22.B5
-X011 39 — -A1.5 DI E7.7 /22.B5

/28.D8 X1 301 — X1 301 /30.D1
/28.E8 X2 301 — X2 301 /30.E1

Reserve
reserve

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !
Alle Leitungen ohne Querschnittsangabe sind mm²
07.04.2006
Erstellt mit ELCAD (R) 7.3.1 SP1 beta

Änderungsnummern

R.	Änderung	Datum	Name

Datum	28.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

Ursprung | Ersatz für | Ersatz durch

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer
25050377
=0
+0
16.018.1078-E0-0
Blatt 29
44 Bl.

/29.A8 X1 302 — X1 302 /31.A1

(Ausgänge nicht über Not-Aus! Outputs without emergency stop!)

-A1.6 /23.B2 A8.0 DO 2 -X020 2
-A1.6 /23.B2 A8.1 DO 3 -X020 3
-A1.6 /23.B2 A8.2 DO 4 -X020 4
-A1.6 /23.B2 A8.3 DO 5 -X020 5
-A1.6 /23.B2 A8.4 DO 6 -X020 6
-A1.6 /23.B2 A8.5 DO 7 -X020 7
-A1.6 /23.B2 A8.6 DO 8 -X020 8
-A1.6 /23.B2 A8.7 DO 9 -X020 9

-K106A A1 A2
-K107A A1 A2
-K108A A1 A2
-H3 +1 X1 X2 RD
-K109A A1 A2

/29.D8 X1 301 — X1 301 /31.D1
/29.E8 X2 301 — X2 301 /31.E1

Kuehlung Modul 2, Y1
cooling module
14 11
/17.B2 12

Kuehlung Modul 4, Y3
cooling module
14 11
/17.B5 12

Kuehlung Modul 6, Y6
cooling module
14 11
/18.B2 12

Stoerung Maschine
disturbance machine

Stoerung
disturbance
14 11
/20.B6 12

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006
Alle Leitungen ohne Querschnittsangabe sind mm²

Allgemein
general

Änderungsnummern

R.	Änderung	Datum	Name

Datum 28.09.2005
Bearbeiter BZ
Geprüft
Norm

Ursprung | Ersatz für | Ersatz durch

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer
25050377
=0
+0
16.018.1078-E0-0
Blatt 30
44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/30.A8 X1 302 — X1 302 /32.A1

-A1.6 /23.B2 A9.0 DO 12 -X020 12
-A1.6 /23.B2 A9.1 DO 13 -X020 13
-A1.6 /23.B2 A9.2 DO 14 -X020 14
-A1.6 /23.B2 A9.3 DO 15 -X020 15
-A1.6 /23.B2 A9.4 DO 16 -X020 16
-A1.6 /23.B2 A9.5 DO 17 -X020 17
-A1.6 /23.B2 A9.6 DO 18 -X020 18
-A1.6 /23.B2 A9.7 DO 19 -X020 19

-X020 19 — -K021A 13 /17.D3 14

-K110A A1 A2
-K111A A1 A2
-H4 +1 X1 X2 WH
-H5 +1 X1 X2 WH
-K112A A1 A2
-P2 2+ h 1
-K4M A1 A2
-K10M A1 A2

/30.D8 X1 301 — X1 301 /32.D1
/30.E8 X2 301 — X2 301 /32.E1

Warnung
warning
14 11 /20.B6 12

Freigabe
release
14 11 /20.B7 12

Start
start

Maschine Freigabe
machine release

Freigabe fuer voraus-
gehende Maschine
release for preceding
machine
14 11 /40.B2 12

Vorschub
Betr.std.zaehler
conveyor
work. hour meter

Vorwahl Vorschub
preselection conveyor
/4.C2 1 2 / 3 4 / 5 6 / 13 14

Pumpe 1
pump
/5.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Allgemein
general

Modul 2
module

Änderungsnummern

Zeichnungsnummer

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				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 31
44 Bl.

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !
Alle Leitungen ohne Querschnittsangabe sind mm²
07.04.2006
Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/31.A8 X1 302 — X1 302 /33.A1

-A1.6 /23.B2 A10.0 DO 22 -X020 22 -K021A 23 /17.D3 24 -K11M A1 A2
-A1.6 /23.B2 A10.1 DO 23 -X020 23 -K021A 33 /17.D3 34 /5.C4 StL.1 -V11:A1 Heizen heat -K113A A1 A2
-A1.6 /23.B2 A10.2 DO 24 -X020 24 -K12M A1 A2
-A1.6 /23.B2 A10.3 DO 25 -X020 25 -K13M A1 A2
-A1.6 /23.B2 A10.4 DO 26 -X020 26 -K14M A1 A2
-A1.6 /23.B2 A10.5 DO 27 -X020 27 -K15M A1 A2
-A1.6 /23.B2 A10.6 DO 28 -X020 28 -X2 339 2+ PE -Y2 +2 1- -X2 301
-A1.6 /23.B2 A10.7 DO 29 -X020 29

/31.D8 X1 301 — X1 301 /33.D1
/31.E8 X2 301 — X2 301 /33.E1

Tankheizung
tank heating

/5.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Dosierpumpe 14 Entfetten
dosing pump degrease

/5.C4 14 11 / 12

Pumpe 2
pump

/6.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 3
pump

/6.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 4
pump

/6.C4 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 5
pump

/6.C6 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Wasserzulauf
water inlet

Modul 2 module

Modul 3 module

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name			
				Datum	28.09.2005	
				Bearbeiter	BZ	
				Geprüft		
				Norm		

Ursprung: VEF Radiotehnika, LV
Ersatz für:
Ersatz durch:

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377
=0
+0
16.018.1078-E0-0
Blatt 32
44 Bl.

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !

/32.A8 X1 302 ——— X1 302 /34.A1

-A1.6 /23.B2 A11.0 DO 32 -X020 32 -K022A 13 /17.D6 14 A1 -K16M A2
-A1.6 /23.B2 A11.1 DO 33 -X020 33 -K022A 23 /17.D6 24 A1 -K17M A2
-A1.6 /23.B2 A11.2 DO 34 -X020 34 -K022A 33 /17.D6 34 Stl.2 -V17:A1 /7.C4 A1 -K18M A2
-A1.6 /23.B2 A11.3 DO 35 -X020 35
-A1.6 /23.B2 A11.4 DO 36 -X020 36 -X2 340
-A1.6 /23.B2 A11.5 DO 37 -X020 37 A1 -K19M A2
-A1.6 /23.B2 A11.6 DO 38 -X020 38 A1 -K20M A2
-A1.6 /23.B2 A11.7 DO 39 -X020 39 A1 -K21M A2

Heizen
heat

-X2 301

/32.D8 X1 301 ——— X1 301 /34.D1
/32.E8 X2 301 ——— X2 301 /34.E1

Pumpe 6
pump

/7.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Tankheizung
tank heating

/7.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Dosierpumpe 15
dosing pump

/7.C4 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 7
pump

/8.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 8
pump

/8.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 9
pump

/8.C4 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Modul 4
module

Modul 5
module

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006
Alle Leitungen ohne Querschnittsangabe sind mm²

Änderungsnummern

Zeichnungsnummer

				Datum	28.09.2005	VEF Radiotehnika, LV	Stromlaufplan Circuit diagram
				Bearbeiter	BZ		25-05-377
				Geprüft			Pre-Treatment
R.	Änderung	Datum	Name	Norm		Ursprung / Ersatz für / Ersatz durch	

25050377 | =0 | +0 | 16.018.1078-E0-0 | Blatt 33 | 44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/33.A8 X1 302 — X1 302 /35.A1

-A1.7 /23.B3 A12.0 DO 2 -X021 2 -X2 341 -Y5 +2 2+ PE 1- -X2 301 — Wasserzulauf water inlet

-A1.7 /23.B3 A12.1 DO 3 -X021 3 -K023A /18.D3 13 14 -K22M A1 A2 — Pumpe 10 pump

-A1.7 /23.B3 A12.2 DO 4 -X021 4 -K023A /18.D3 23 24 -K23M A1 A2 — Tankheizung tank heating

-A1.7 /23.B3 A12.3 DO 5 -X021 5 -K023A /18.D3 33 34 /9.C4 StI.3 -V23:A1 — Heizen heat

-A1.7 /23.B3 A12.4 DO 6 -X021 6 -K114A A1 A2 — Dosierpumpe 16 dosing pump

-A1.7 /23.B3 A12.5 DO 7 -X021 7 -X2 342 -Y7 +2 2+ PE 1- -X2 301 — Wasserzulauf water inlet

-A1.7 /23.B3 A12.6 DO 8 -X021 8 -K24M A1 A2 — Pumpe 11 pump

-A1.7 /23.B3 A12.7 DO 9 -X021 9 -K25M A1 A2 — Pumpe 12 pump

/33.D8 X1 301 — X1 301 /35.D1

/33.E8 X2 301 — X2 301 /35.E1

Pumpe 10 pump: /9.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Tankheizung tank heating: /9.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Dosierpumpe 16 dosing pump: /9.C4 14 11 / 12

Pumpe 11 pump: /10.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Pumpe 12 pump: /10.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Modul 5 module

Modul 6 module

Modul 7 module

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name
		28.09.2005	BZ

Norm

Datum 28.09.2005

Bearbeiter BZ

Geprüft

Ursprung

Ersatz für

Ersatz durch

VEF Radiotehnika, LV

SCHMID

Stromlaufplan Circuit diagram

25-05-377

Pre-Treatment

25050377

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16.018.1078-E0-0

Blatt 34

44 Bl.

/34.A8 X1 302 — X1 302 /36.A1

-A1.7 /23.B3 A13.0 DO 12 -X021 12
-A1.7 /23.B3 A13.1 DO 13 -X021 13
-A1.7 /23.B3 A13.2 DO 14 -X021 14
-A1.7 /23.B3 A13.3 DO 15 -X021 15
-A1.7 /23.B3 A13.4 DO 16 -X021 16
-A1.7 /23.B3 A13.5 DO 17 -X021 17
-A1.7 /23.B3 A13.6 DO 18 -X021 18
-A1.7 /23.B3 A13.7 DO 19 -X021 19

-K024A /18.D6 13 14
-K024A /18.D6 23 24
-K27M D3 14 13

-K26M A1 A2
-X2 343
-Y8 +2 2+ PE 1-
-X2 301
-K27M A1 A2
-K28M A1 A2

/34.D8 X1 301 — X1 301 /36.D1
/34.E8 X2 301 — X2 301 /36.E1

Pumpe 13
pump
/10.C4 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Wasserzulauf
water inlet

Blasen 1 unten
blow bottom
/11.C2 1 2 / 3 4 / 5 6 / 13 14 / 21 22 C4

Blasen 2 oben
blow top
/11.C3 1 2 / 3 4 / 5 6 / 13 14 / 21 22

Modul 7 module
Modul 8 module
Reserve reserve

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !
Alle Leitungen ohne Querschnittsangabe sind mm²
07.04.2006
Erstellt mit ELCAD (R) 7.3.1 SP1 beta

Änderungsnummern

R.	Änderung	Datum	Name

Datum 28.09.2005
Bearbeiter BZ
Geprüft
Norm

Ursprung | Ersatz für | Ersatz durch

VEF Radiotehnika, LV

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

Zeichnungsnummer
25050377
=0
+0
16.018.1078-E0-0
Blatt 35
44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

/35.A8 X1 302 — X1 302 /37.A1

-A1.7 /23.B3 A14.0 DO 22 -X021 22

-A1.7 /23.B3 A14.1 DO 23 -X021 23

-A1.7 /23.B3 A14.2 DO 24 -X021 24

-A1.7 /23.B3 A14.3 DO 25 -X021 25

-A1.7 /23.B3 A14.4 DO 26 -X021 26

-A1.7 /23.B3 A14.5 DO 27 -X021 27

-A1.7 /23.B3 A14.6 DO 28 -X021 28

-A1.7 /23.B3 A14.7 DO 29 -X021 29

/35.D8 X1 301 — X1 301 /37.D1

/35.E8 X2 301 — X2 301 /37.E1

Reserve
reserve

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name			
				Datum	28.09.2005	
				Bearbeiter	BZ	
				Geprüft		
				Norm		

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram

25-05-377

Pre-Treatment

25050377

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16.018.1078-E0-0

Blatt 36

44 Bl.

/36.A8 X1 302 — X1 302 /38.A1

-A1.7 /23.B3 A15.0 DO 32	-A1.7 /23.B3 A15.1 DO 33	-A1.7 /23.B3 A15.2 DO 34	-A1.7 /23.B3 A15.3 DO 35	-A1.7 /23.B3 A15.4 DO 36	-A1.7 /23.B3 A15.5 DO 37	-A1.7 /23.B3 A15.6 DO 38	-A1.7 /23.B3 A15.7 DO 39
-X021 32	-X021 33	-X021 34	-X021 35	-X021 36	-X021 37	-X021 38	-X021 39

/36.D8 X1 301 — X1 301 /38.D1
/36.E8 X2 301 — X2 301

Reserve
reserve

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !
Alle Leitungen ohne Querschnittsangabe sind mm²
07.04.2006
Erstellt mit ELCAD (R) 7.3.1 SP1 beta

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name				
				Datum	28.09.2005		
				Bearbeiter	BZ	VEF Radiotehnika, LV	
				Geprüft			
				Norm		Ursprung	Ersatz für / Ersatz durch

Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377 | =0 | +0

16.018.1078-E0-0

Blatt 37
44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

07.04.2006

/37.A8 X1 302

X1 302 /39.A1

Temperatur Modul 2, B21 temperature module

X2 606 /17.B4
X2 607 /17.B4
X2 608 /17.B4
X2 609 /17.B4

Temperatur Modul 4, B22 temperature module

X2 612 /17.B7
X2 613 /17.B7
X2 614 /17.B7
X2 615 /17.B7

Temperatur Modul 6, B23 temperature module

X2 618 /18.B4
X2 619 /18.B4
X2 620 /18.B4
X2 621 /18.B4

Reserve (PT100) reserve

-X030 2 3 -A1.8 M+ M- Code A PEW320 /23.B4

-X030 4 5 -A1.8 M+ M- Code A PEW322 /23.B4

-X030 6 7 -A1.8 M+ M- Code A PEW324 /23.B4

-X030 8 9 -A1.8 M+ M- Code A PEW326 /23.B4

-X030 12 13 -A1.8 M+ M- Code A PEW328 /23.B4

-X030 14 15 -A1.8 M+ M- Code A PEW330 /23.B4

-X030 16 17 -A1.8 M+ M- Code A PEW332 /23.B4

-X030 18 19 -A1.8 M+ M- Code A PEW334 /23.B4

/37.D8 X1 301

/23.A8 X1 601

X1 301 /39.D1

X1 601 /39.E1

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stromlaufplan Circuit diagram

25-05-377

Pre-Treatment

25050377

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+0

16.018.1078-E0-0

Blatt 38

44 Bl.

Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

/38.A8 X1 302 — X1 302
/29.A8 X2 302 — X2 302

X2 626 /19.D6 — Leitfaehigkeitsmessung Modul 6 (B52) conductimetry module

X2 624 /19.B4 — Fotometer Modul 4 (N51; B51) photometer module

X2 625 /19.B4

-X031 2 3	-X031 4 5	-X031 6 7	-X031 8 9	-X031 12 13	-X031 14 15	-X031 16 17	-X031 18 19
-A1.9 M+ M- Code C PEW336 /23.B5	-A1.9 M+ M- Code C PEW338 /23.B5	-A1.9 M+ M- Code C PEW340 /23.B5	-A1.9 M+ M- Code C PEW342 /23.B5	-A1.9 M+ M- Code C PEW344 /23.B5	-A1.9 M+ M- Code C PEW346 /23.B5	-A1.9 M+ M- Code C PEW348 /23.B5	-A1.9 M+ M- Code C PEW350 /23.B5

/38.D8 X1 301 — X1 301
/38.E8 X1 601 — X1 601
/19.E8 X2 601 — X2 601

Allgemein
general

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name		
				Datum	28.09.2005
				Bearbeiter	BZ
				Geprüft	
				Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

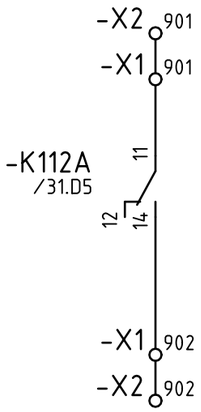
Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377 | =0 | +0

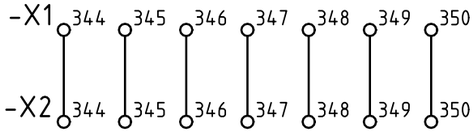
16.018.1078-E0-0

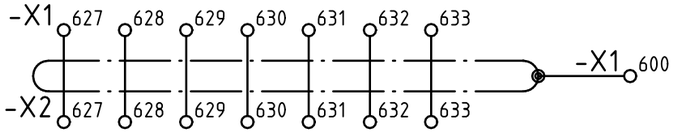
Blatt 39
44 Bl.

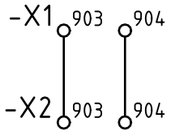
Achtung! Fremdspannung!
Attention! External voltage!



Freigabe fuer voraus-
gehende Maschine
release for preceding
machine







Reserve
reserve

frei
free

Schutzvermerk nach DIN 34 beachten !
Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

Allgemein
general

Änderungsnummern

Zeichnungsnummer

R.	Änderung	Datum	Name				
				Datum	28.09.2005	VEF Radiotehnika, LV	
				Bearbeiter	BZ		
				Geprüft			
				Norm		Ursprung	Ersatz für / Ersatz durch

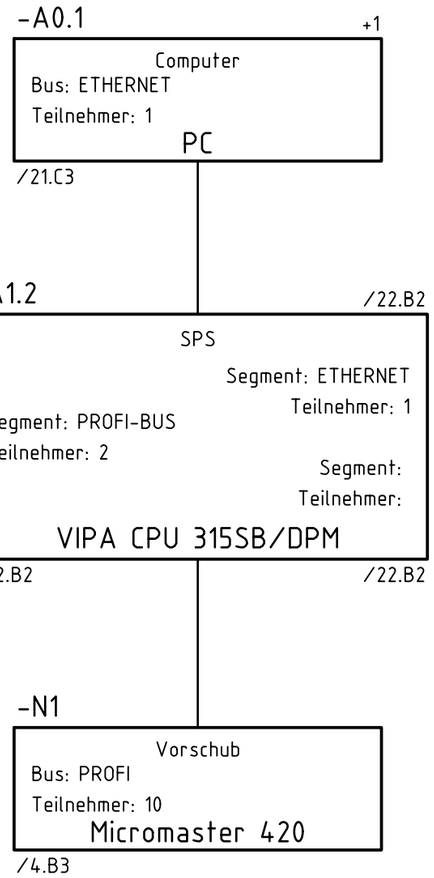
Stromlaufplan Circuit diagram
25-05-377
Pre-Treatment

25050377 | =0 | +0

16.018.1078-E0-0

Blatt 40
44 Bl.

Please observe protection mark according to DIN 34 !
Schutzvermerk nach DIN 34 beachten !



Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006
Alle Leitungen ohne Querschnittsangabe sind mm²

Änderungsnummern

				Datum	29.09.2005	VEF Radiotehnika, LV	
				Bearbeiter	BZ		
				Geprüft			
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für / Ersatz durch

Übersicht General diagram
25-05-377
Pre-Treatment

25050377

=0
+0

16.018.1078-E0-0

Blatt 41
44 Bl.

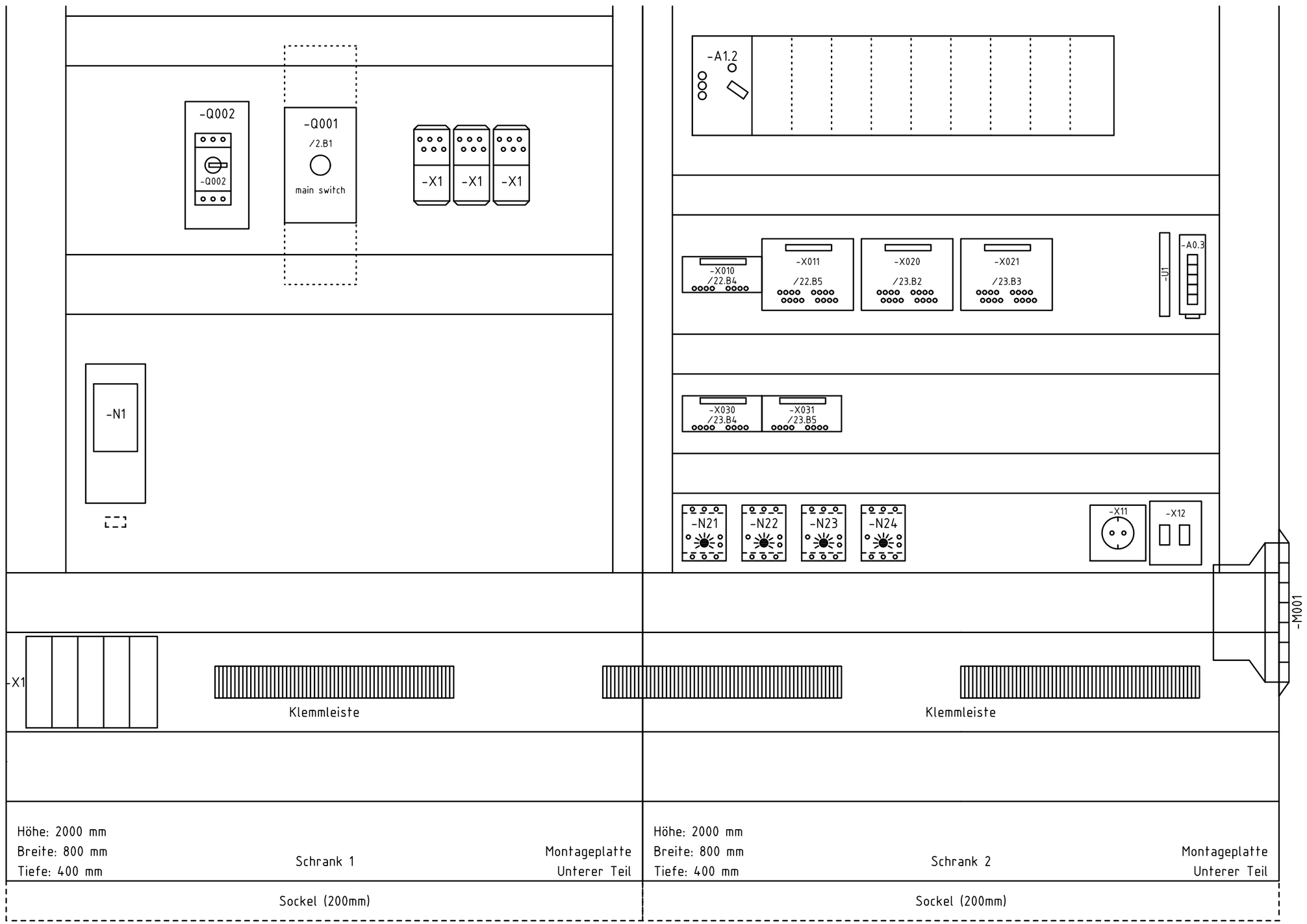
Please observe protection mark according to DIN 34 !

Schutzvermerk nach DIN 34 beachten !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta



Skalierung Maßstab : 1:5

Maßeinheit : mm

Änderungsnummern

R.	Änderung	Datum	Name

Datum	29.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Schaltschranklayout Layout

25-05-377

Pre-Treatment

25050377

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+0

16.018.1078-E0-0

Blatt 42

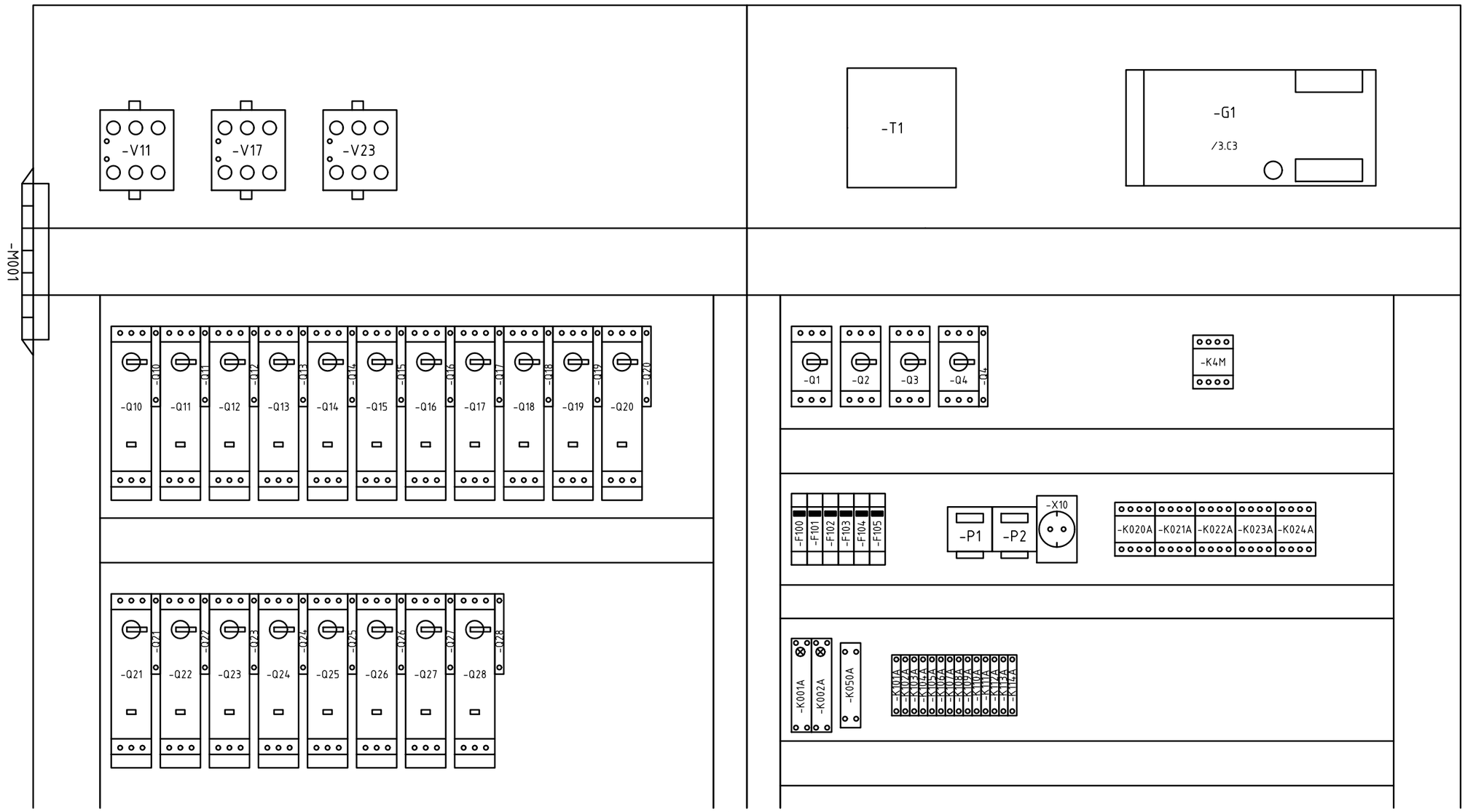
44 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta



Skalierung Maßstab : 1:5

Maßeinheit : mm

Änderungsnummern

R.	Änderung	Datum	Name

Datum	29.09.2005		
Bearbeiter	BZ		
Geprüft			
Norm			

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Schaltschranklayout Layout

25-05-377

Pre-Treatment

25050377

=0

+0

16.018.1078-E0-0

Blatt 43

44 Bl.

-H3 disturbance machine

-H5 machine release

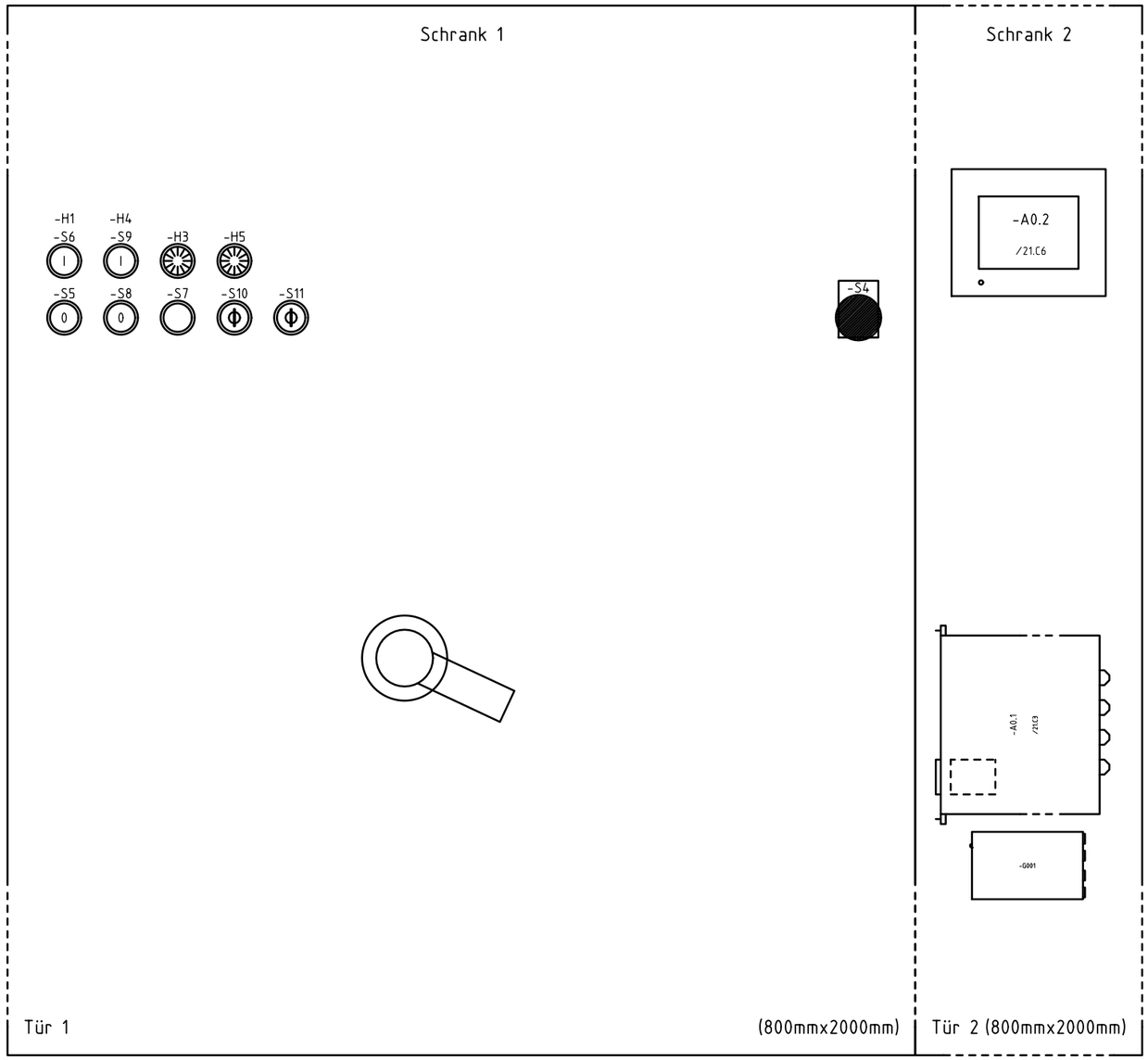
-S6 control on

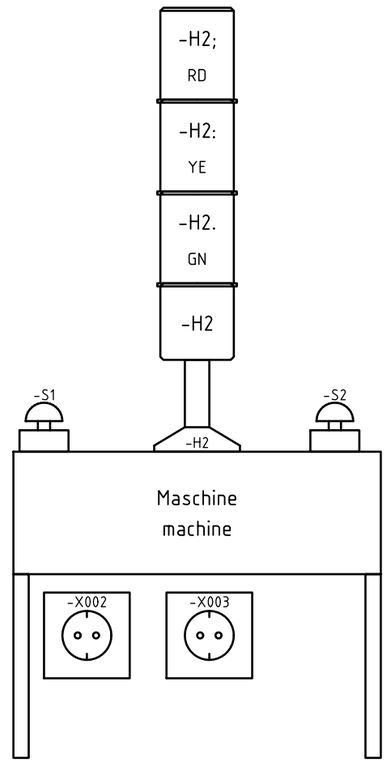
-S7 reset

-S9 start

-S10 service switch

-S11 override lid switches





Skalierung Maßstab : 1:5

Maßeinheit : mm

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Alle Leitungen ohne Querschnittsangabe sind mm²

07.04.2006

Erstellt mit ELCAD (R) 7.3.1 SP1 beta

Änderungsnummern

R.	Änderung	Datum	Name

Datum	29.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Schaltschranklayout Layout

25-05-377

Pre-Treatment

25050377

=0

+0

16.018.1078-E0-0

Blatt 44

44 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
1	-A0.1	EA-000000591-000		MODEM F. PC, INTERN BIS 56kbps	
	=0/21.C3	403360	1	MODEM, INTERN BIS 56kbps	
2	-A0.1	EA-000001010-000		PC 19" INDUSTRIE-PC, NACH SPEC.	
	=0/21.C3	SCHMID	1	PC 19" INDUSTRIAL-PC, TO SPEC.	
3	-A0.1	EA-000001011-000		COMPACT FLASHCARD 2GB	
	=0/21.C3	401430	1	COMPACT FLASHCARD 2GB	
4	-A0.1	16.012.0169.0001		WINKELBLECH RECHNERBEFESTIGUNG	
	=0/21.C3	SCHMID	1	HOLDER FOR COMPUTER	
5	-A0.2	EA-000001014-000		TOUCH-MONITOR 17" SERIELL	
	=0/21.C6	401430	1	TOUCH-MONITOR 17" SERIELL	
6	-A0.2	16.012.0176.000755		MONITORHALTER/VA/BESCHICHTET	
	=0/21.C6	SCHMID	1	MONITOR SUPPORT	
7	-A0.3	EA-000000956-000		ETHERNET 5-PORT SWITCH NS-205	
	=0/21.B4	412070	1	ETHERNET 5-PORT SWITCH NS-205	D-EA-000000956-000.PDF
8	-A0.3	EA-000000957-000		PATCHKABEL RJ45/RJ45 L=3,00	
	=0/21.B4	418260	2	PATCHKABEL RJ45/RJ45 L=3,00	
9	-A1.2	EA-000000587-000		PROFILSCHIENE S7-300, LAENGE 530MM	
	=0/22.B2	419060	1	STRUCTURAL RAIL	
10	-A1.2	EA-000001008-000		VIPA CPU 315SB/DPM SPEED7	
	=0/22.B2	424030	1	VIPA CPU 315SB/DPM SPEED7	E D-EA-000001008-000.PDF
11	-A1.4	EA-000000600-000		DIG.-EING.16E A S7-300 NR.6ES7-321-7BH01	
	=0/22.B4	419060	1	DIG.INP. 16E A S7-300 NR.6ES7 321-7BH01	
12	-A1.4	EA-000000653-000		FRONTSTECKMODUL 2x8, 6ES7 921-3AB00-0AA0	
	=0/22.B4	419060	1	PLUG-IN MODUL 2x8, 6ES7 921-3AB00-0AA0	
13	-A1.5	EA-000000599-000		DIG.-EING.32DE S7-300 NR.6ES7-321-1BL00	
	=0/22.B5	419060	1	DIG.INP. 32DE S7-300 NR.6ES7 321-1BL00	
14	-A1.5	EA-000000637-000		FRONTADAPTER f. 32KANAELE FLKM50-PA-S300	
	=0/22.B5	416040	1	FRONT ADAPTER 32 CHANNELS	
15	-A1.6	EA-000000603-000		DIG.-AUSG.32DA S7-300 NR.6ES7-322-1BL00	
	=0/23.B2	419060	1	DIG.OUTP.32DO S7-300 NR.6ES7 322-1BL00	
16	-A1.6	EA-000000637-000		FRONTADAPTER f. 32KANAELE FLKM50-PA-S300	
	=0/23.B2	416040	1	FRONT ADAPTER 32 CHANNELS	
17	-A1.7	EA-000000603-000		DIG.-AUSG.32DA S7-300 NR.6ES7-322-1BL00	
	=0/23.B3	419060	1	DIG.OUTP.32DO S7-300 NR.6ES7 322-1BL00	
18	-A1.7	EA-000000637-000		FRONTADAPTER f. 32KANAELE FLKM50-PA-S300	
	=0/23.B3	416040	1	FRONT ADAPTER 32 CHANNELS	
19	-A1.8	EA-000000606-000		ANALOG-EING.S7-300 8AE NR.6ES7-331-7KF02	
	=0/23.B4	419060	1	ANALOG INPUT S7-300 8AO 6ES7 331-7KF02	
20	-A1.8	EA-000000653-000		FRONTSTECKMODUL 2x8, 6ES7 921-3AB00-0AA0	
	=0/23.B4	419060	1	PLUG-IN MODUL 2x8, 6ES7 921-3AB00-0AA0	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005	VEF Radiotehnika, LV	Stückliste E0 1
Bearbeiter	BZ		
Geprüft			
Norm		Ursprung / Ersatz für / Ersatz durch	25050377

Pre-Treatment		
16.018.1078-0	25-05-377	Blatt 1 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
21	-A1.9	EA-000000606-000		ANALOG-EING.S7-300 8AE NR.6ES7-331-7KF02	
	=0/23.B5	419060	1	ANALOG INPUT S7-300 8AO 6ES7 331-7KF02	
22	-A1.9	EA-000000653-000		FRONTSTECKMODUL 2x8, 6ES7 921-3AB00-0AA0	
	=0/23.B5	419060	1	PLUG-IN MODUL 2x8, 6ES7 921-3AB00-0AA0	
23	-F100	EF-000000165-000		LEITUNGSSCHUTZSCHALTER FAZ C 3/1	
	=0/3.D4	413330	1	AUTOMATIC FUSE FAZ-C3/1	
24	-F101	EF-000000100-000		LEITUNGSSCHUTZSCHALTER FAZ C 6/1	
	=0/3.D5	413330	1	AUTOMATIC FUSE FAZ-C6/1	
25	-F102	EF-000000165-000		LEITUNGSSCHUTZSCHALTER FAZ C 3/1	
	=0/12.A3	413330	1	AUTOMATIC FUSE FAZ-C3/1	
26	-F103	EF-000000165-000		LEITUNGSSCHUTZSCHALTER FAZ C 3/1	
	=0/12.A4	413330	1	AUTOMATIC FUSE FAZ-C3/1	
27	-F104	EF-000000165-000		LEITUNGSSCHUTZSCHALTER FAZ C 3/1	
	=0/12.A5	413330	1	AUTOMATIC FUSE FAZ-C3/1	
28	-F105	EF-000000164-000		LEITUNGSSCHUTZSCHALTER FAZ C 2/1	
	=0/12.A5	413330	1	AUTOMATIC FUSE FAZ-C2/1	
29	-G1	EG-000000021-000		LASTSTROMVERSORG.20A/MLFB: 6EP1436-2BA00	
	=0/3.C3	419060	1	MAIN CURR.SUPPLY 20A/MLFB: 6EP1436-2BA00	
30	-G001	EG-000000112-000		USV, BACK-UPS CS650 USB; BK650EI	
	=0/21.E2	401430	1	USV, BACK-UPS CS650 USB; BK650EI	D-EG-000000112-000.PDF
31	-H1	EH-000000134-000		LED-ELEMENT, ML22-LED-W	
	=0/13.D7	413330	1	LED ELEMENT	
32	-H2	EH-000000118-000		STANDFUSS MIT ROHR 800MM, TYP:SL-F800	
	=0/20.D5	413330	1	HOLDER 800MM, TYP:SL-F800	
33	-H2	EH-000000120-000		DICHTUNGSSATZ IP65 (VE=4ST.) TYP:SL-IP65	
	=0/20.D5	413330	2	SET OF SEALS	
34	-H2	EH-000000121-000		BASISMODUL, MIT DECKEL, TYP:SL-B	
	=0/20.D5	413330	1	BASIC MODULE, BLACK TYPE:SL-B	
35	-H2.	EH-000000003-000		GLUEHLAMPE 5 W 24V/ART.NR. 4.700.012.0	
	=0/20.D7	420840	1	ELECTRIC BULB	
36	-H2.	EH-000000125-000		DAUERLICHTMODUL, GRUEN, TYP:SL-L-G	
	=0/20.D7	413330	1	LAMP MODULE, GREEN, TYP:SL-L-G	
37	-H2:	EH-000000003-000		GLUEHLAMPE 5 W 24V/ART.NR. 4.700.012.0	
	=0/20.D6	420840	1	ELECTRIC BULB	
38	-H2:	EH-000000126-000		DAUERLICHTMODUL, GELB, TYP:SL-L-Y	
	=0/20.D6	413330	1	LAMP MODULE; YELLOW; TYP:SL-L-Y	
39	-H2;	EH-000000003-000		GLUEHLAMPE 5 W 24V/ART.NR. 4.700.012.0	
	=0/20.D6	420840	1	ELECTRIC BULB	
40	-H2;	EH-000000127-000		DAUERLICHTMODUL, ROT, TYP:SL-L-R	
	=0/20.D6	413330	1	LAMP MODULE, RED, TYP:SL-L-R	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !
Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

				Datum	29.09.2005	VEF Radiotehnika, LV		Stückliste E0 2	Pre-Treatment
				Bearbeiter	BZ				
				Geprüft					16.018.1078-0 / 25-05-377 / Blatt 2 / 11 Bl.
R.	Änderung	Datum	Name	Norm		Ursprung	Ersatz für	Ersatz durch	25050377

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
41	-H3	EH-000000130-000		LEUCHTMELDERVORSATZ, ML22-L-R	
	=0/30.D6	413330	1	INDICATOR LIGHT INSERT	
42	-H3	EH-000000135-000		LED-ELEMENT, ML22-LED-R	
	=0/30.D6	413330	1	LED ELEMENT	
43	-H3	EH-000000138-000		BEFESTIGUNGSADAPTER, M22-A	
	=0/30.D6	413330	1	MOUNTING ADAPTER	
44	-H3	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/30.D6	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	
45	-H4	EH-000000134-000		LED-ELEMENT, ML22-LED-W	
	=0/31.D3	413330	1	LED ELEMENT	
46	-H5	EH-000000129-000		LEUCHTMELDERVORSATZ, ML22-L-W	
	=0/31.D4	413330	1	INDICATOR LIGHT INSERT	
47	-H5	EH-000000134-000		LED-ELEMENT, ML22-LED-W	
	=0/31.D4	413330	1	LED ELEMENT	
48	-H5	EH-000000138-000		BEFESTIGUNGSADAPTER, M22-A	
	=0/31.D4	413330	1	MOUNTING ADAPTER	
49	-H5	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/31.D4	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	
50	-K4M	EK-000000193-000		SYSTEM-LEIST.SCHUETZ/DIL EM-10-G 24V =	
	=0/31.D6	413330	1	SYSTEM PERFORMANCE CONTACTOR	
51	-K001A	EK-000000271-000		SICHERHEITSKOMBIN. GRUNDG. 3TK2821-1CB30	
	=0/13.D2	419060	1	CONTACTOR SAFETY COMB. 3TK2821-1CB30	E D-EK-000000271-000.PDF
52	-K002A	EK-000000272-000		SICHERHEITSKOMBIN. ERWEIT. 3TK2830-1CB30	
	=0/13.D4	419060	1	CONTACTOR SAFETY COMB. 3TK2830-1CB30	E D-EK-000000272-000.PDF
53	-K020A	EK-000000213-000		SYSTEM-HILFSSCHUETZE/TYP:DIL ER40-G 24V=	
	=0/14.D7	413330	1	SYSTEM CONTACTOR RELAY	
54	-K020A	EK-000000217-000		SYSTEM-HSCH-BAUSTEIN/TYP:40 DIL E	
	=0/14.D7	413330	1	SYSTEM CONTACTOR UNIT	
55	-K021A	EK-000000213-000		SYSTEM-HILFSSCHUETZE/TYP:DIL ER40-G 24V=	
	=0/17.D3	413330	1	SYSTEM CONTACTOR RELAY	
56	-K022A	EK-000000213-000		SYSTEM-HILFSSCHUETZE/TYP:DIL ER40-G 24V=	
	=0/17.D6	413330	1	SYSTEM CONTACTOR RELAY	
57	-K023A	EK-000000213-000		SYSTEM-HILFSSCHUETZE/TYP:DIL ER40-G 24V=	
	=0/18.D3	413330	1	SYSTEM CONTACTOR RELAY	
58	-K024A	EK-000000213-000		SYSTEM-HILFSSCHUETZE/TYP:DIL ER40-G 24V=	
	=0/18.D6	413330	1	SYSTEM CONTACTOR RELAY	
59	-K050A	EK-000000116-000		HILFSRELAIS 230/50/TYP:NGS 12	
	=0/15.D7	420580	1	AUXILIARY RELAY 230/50/TYPE:NGS 12	
60	-K101A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC	
	=0/12.D2	416040	1	RELAY-MODULE WITH ONE CONTACTOR	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005	VEF Radiotehnika, LV	Stückliste E0 3
Bearbeiter	BZ		
Geprüft			
Norm		Ursprung / Ersatz für / Ersatz durch	25050377

Pre-Treatment		
16.018.1078-0	25-05-377	Blatt 3 / 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part	Dokumentation Documentation
61	-K102A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/12.D3	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
62	-K103A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/12.D4	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
63	-K104A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/12.D4	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
64	-K105A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/12.D5	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
65	-K106A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/30.D2	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
66	-K107A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/30.D2	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
67	-K108A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/30.D3	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
68	-K109A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/30.D7	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
69	-K110A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/31.D2	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
70	-K111A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/31.D2	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
71	-K112A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/31.D5	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
72	-K113A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/32.D3	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
73	-K114A	EK-000000199-000		RELAIS-MODUL (1WE)/EMG10REL/KSRG24/21LC		
	=0/34.D5	416040	1	RELAY-MODULE WITH ONE CONTACTOR		
74	-M001	EZ-000000265-000		FILTERLUEFTER TYP:SK 3323.107; 230V		
	=0/2.D5	412070	1	FILTER FAN TP:SK 3323.107; 230V		
75	-M001	EZ-000000266-000		AUSTRITTSFILTER TYP:SK 3323.207		
	=0/2.D5	412070	1	EXHAUST FILTER TP:SK 3323.207		
76	-N1	EN-000000261-000		FREQUENZUMRICHTER MM 420; 0,55KW; 1ph		
	=0/4.B3	419060	1	FREQUENCY CONVERTER	E	D-EN-000000261-000.PDF
77	-N1	EN-000000262-000		BASIC OPERATOR PANEL BOP SIEMENS		
	=0/4.B3	419060	1	BASIC OPERATOR PANEL BOP SIEMENS		
78	-N1	EN-000000280-000		PROFIBUS-BAUGRUPPE MICROMASTER4. SIEMENS		
	=0/4.B3	419060	1	PROFIBUS-MODULE MICROMASTER4. SIEMENS		
79	-N21	EN-000000115-000		TEMP.BEGRENZER 230V/970.0098.02 0-120 C		
	=0/17.B3	410150	1	TEMP.LIMITER 230V/970.0098.02 0-120 C	E	D-EN-000000115-000.PDF
80	-N22	EN-000000115-000		TEMP.BEGRENZER 230V/970.0098.02 0-120 C		
	=0/17.B6	410150	1	TEMP.LIMITER 230V/970.0098.02 0-120 C	E	D-EN-000000115-000.PDF

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005	VEF Radiotehnika, LV	Stückliste E0 4
Bearbeiter	BZ		
Geprüft			
Norm		Ursprung / Ersatz für / Ersatz durch	25050377

Pre-Treatment		
16.018.1078-0	25-05-377	Blatt 4 / 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
81	-N23	EN-000000115-000		TEMP.BEGRENZER 230V/970.0098.02 0-120 C	
	=0/18.B3	410150	1	TEMP.LIMITER 230V/970.0098.02 0-120 C	E D-EN-000000115-000.PDF
82	-N24	EN-000000115-000		TEMP.BEGRENZER 230V/970.0098.02 0-120 C	
	=0/18.B6	410150	1	TEMP.LIMITER 230V/970.0098.02 0-120 C	E D-EN-000000115-000.PDF
83	-P1	EP-000000042-000		BETR.-STUNDENZAEHLER TYP:628 A.2/ 24V=	
	=0/13.D6	413780	1	WORK.HOUR METER/TP:628 A.2/ 24V=	
84	-P2	EP-000000042-000		BETR.-STUNDENZAEHLER TYP:628 A.2/ 24V=	
	=0/31.D5	413780	1	WORK.HOUR METER/TP:628 A.2/ 24V=	
85	-Q0	EQ-000000232-000		DREHST.SCHIENENBLOCK/TYP: B3.1/3-PKZ 0	
	=0/2.B5	413330	2	R.C.-BAR BLOCK/TP: B3.1/3-PKZ 0	
86	-Q0	EQ-000000233-000		DREHST.SCHIENENBLOCK/TYP: B3.1/4-PKZ 0	
	=0/2.B5	413330	2	R.C.-BAR BLOCK/TP: B3.1/4-PKZ 0	
87	-Q0	EQ-000000234-000		DREHST.SCHIENENBLOCK/TYP: B3.1/5-PKZ 0	
	=0/2.B5	413330	2	R.C.-BAR BLOCK/TP: B3.1/5-PKZ 0	
88	-Q0	EQ-000000235-000		ANSCHLUSSKLEMME/TYP: BK 25/3-PKZ 0	
	=0/2.B5	413330	3	CONNECT.CLAMP/TP: BK 25/3-PKZ 0	
89	-Q0	EQ-000000236-000		LEERANSCHLUSSABDECK./TYP: H-B3-PKZ 0	
	=0/2.B5	413330	1	EMPTY-CONNECT. COVER/TP: H-B3-PKZ 0	
90	-Q1	EQ-000000287-000		MOTORSCHUTZSCHALTER/PKZM 0- 6.3	
	=0/2.B5	413330	1	PROT.MOTOR SWITCH/PKZM 0- 6.3	
91	-Q2	EQ-000000286-000		MOTORSCHUTZSCHALTER/PKZM 0- 4	
	=0/3.B3	413330	1	PROT.MOTOR SWITCH/PKZM 0- 4	
92	-Q3	EQ-000000285-000		MOTORSCHUTZSCHALTER/PKZM 0- 2.5	
	=0/3.B5	413330	1	PROT.MOTOR SWITCH/PKZM 0- 2.5	
93	-Q4	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/4.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
94	-Q4	EQ-000000288-000		MOTORSCHUTZSCHALTER/PKZM 0-10	
	=0/4.B2	413330	1	PROT.MOTOR SWITCH/PKZM 0-10	
95	-Q10	EQ-000000264-000		KOMPAKTSTARTER 24VDC/PKZM 0- 4.0/SE00-11	
	=0/5.B2	413330	1	COMP.STARTER 24VDC/PKZMO- 4.0 /SE00-11	
96	-Q10	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/5.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
97	-Q11	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/5.B3	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
98	-Q11	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/5.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
99	-Q12	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/6.B2	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
100	-Q12	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/6.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stückliste
E0
5
25050377

Pre-Treatment

16.018.1078-0 | 25-05-377 | Blatt 5 / 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
101	-Q13	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/6.B3	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
102	-Q13	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/6.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
103	-Q14	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/6.B4	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
104	-Q14	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/6.B4	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
105	-Q15	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/6.B6	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
106	-Q15	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/6.B6	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
107	-Q16	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/7.B2	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
108	-Q16	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/7.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
109	-Q17	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/7.B3	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
110	-Q17	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/7.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
111	-Q18	EQ-000000260-000		KOMPAKTSTARTER 24VDC/PKZM 0-0.63/SE00-11	
	=0/7.B4	413330	1	COMP.STARTER 24VDC/PKZMO- 0.63/SE00-11	
112	-Q18	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/7.B4	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
113	-Q19	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/8.B2	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
114	-Q19	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/8.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
115	-Q20	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/8.B3	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
116	-Q20	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/8.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
117	-Q21	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/8.B4	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
118	-Q21	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/8.B4	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
119	-Q22	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/9.B2	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
120	-Q22	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/9.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stückliste
E0
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25050377

Pre-Treatment

16.018.1078-0 | 25-05-377 | Blatt 6 / 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
121	-Q23	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/9.B3	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
122	-Q23	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/9.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
123	-Q24	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/10.B2	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
124	-Q24	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/10.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
125	-Q25	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/10.B3	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
126	-Q25	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/10.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
127	-Q26	EQ-000000262-000		KOMPAKTSTARTER 24VDC/PKZM 0- 1.6/SE00-11	
	=0/10.B4	413330	1	COMP.STARTER 24VDC/PKZMO- 1.6 /SE00-11	
128	-Q26	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/10.B4	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
129	-Q27	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/11.B2	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
130	-Q27	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/11.B2	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
131	-Q28	EQ-000000266-000		KOMPAKTSTARTER 24VDC/PKZM 0-10.0/SE00-11	
	=0/11.B3	413330	1	COMP.STARTER 24VDC/PKZMO-10.0 /SE00-11	
132	-Q28	EQ-000000267-000		NORMALHILFSSCHALTER/NHI 11 PKZ 0	
	=0/11.B3	413330	1	NORMAL SUPPORT SWITCH/NHI 11 PKZ 0	
133	-Q001	EQ-000000474-000		HAUPTSCHALTER PN1- 100	
	=0/2.B1	413330	1	MAIN SWITCH PN1- 100	
134	-Q001	EQ-000000485-000		HAUPTSCHALTERBAUSATZ NZM1-XHBR	
	=0/2.B1	413330	1	MAIN SWITCH KIT NZM1-XHBR	
135	-Q001	EQ-000000501-000		FINGERSCHUTZ NZM1-XIPK	
	=0/2.B1	413330	2	PROTECTION NZM1-XIPK	
136	-Q001	EQ-000000520-000		STEUERLEITUNGSANSCHLUSS NZM-XSTK	
	=0/2.B1	413330	1	CLAMP NZM-XSTK	
137	-Q002	EQ-000000287-000		MOTORSCHUTZSCHALTER/PKZM 0- 6.3	
	=0/2.C3	413330	1	PROT.MOTOR SWITCH/PKZM 0- 6.3	
138	-Q002	EQ-000000398-000		ISOLIERSTOFFGEHÄUSE TYP: CI-PKZ0-M	
	=0/2.C3	413330	1	MOUNTED HOUSING TYPE: CI-PKZ0-M	
139	-S1	ES-000000395-000		NOT-AUS-TASTER KPL., M22-PV/KC11/IY	
	=0/13.A2	413330	1	EMERGENCY STOP BUTTON M22-PV/KC11/IY	
140	-S2	ES-000000395-000		NOT-AUS-TASTER KPL., M22-PV/KC11/IY	
	=0/13.B2	413330	1	EMERGENCY STOP BUTTON M22-PV/KC11/IY	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005	VEF Radiotehnika, LV	Stückliste E0 7
Bearbeiter	BZ		
Geprüft			
Norm		Ursprung / Ersatz für / Ersatz durch	25050377

Pre-Treatment

16.018.1078-0 | 25-05-377 | Blatt 7 / 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
141	-S4	ES-000000396-000		NOT-AUS-TASTE, M22-PV	
	=0/13.A4	413330	1	EMERGENCY STOP BUTTON	
142	-S4	ES-000000397-000		NOT-AUS-SCHILD, M22-XZK	
	=0/13.A4	413330	1	EMERGENCY STOP LABEL	
143	-S4	ES-000000425-000		KONTAKTBLOCK, M22-AK11	
	=0/13.A4	413330	1	CONTACT BLOCK, M22-AK11	
144	-S5	ES-000000398-000		DRUCKTASTE, AUS, M22S-D-R-X0	
	=0/13.B4	413330	1	PRESS BUTTON	
145	-S5	ES-000000423-000		KONTAKTBLOCK, M22-AK01	
	=0/13.B4	413330	1	CONTACT SWITCH / M22-AK01	
146	-S6	ES-000000400-000		LEUCHTDRUCKTASTE, EIN, M22S-DL-W-X1	
	=0/13.D3	413330	1	LUMIN. PUSH BUTTON	
147	-S6	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/13.D3	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	
148	-S6	ES-000000424-000		KONTAKTBLOCK, M22-AK10	
	=0/13.D3	413330	1	CONTACT BLOCK	
149	-S7	ES-000000399-000		DRUCKTASTE, NEUTRAL, M22S-D-X	
	=0/14.A7	413330	1	PRESS BUTTON	
150	-S7	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/14.A7	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	
151	-S7	ES-000000418-000		TASTENPLATTE, RESET, M22-XD-B-X6	
	=0/14.A7	413330	1	PUSH BUTTON INSERT	
152	-S7	ES-000000424-000		KONTAKTBLOCK, M22-AK10	
	=0/14.A7	413330	1	CONTACT BLOCK	
153	-S8	ES-000000398-000		DRUCKTASTE, AUS, M22S-D-R-X0	
	=0/25.B2	413330	1	PRESS BUTTON	
154	-S8	ES-000000423-000		KONTAKTBLOCK, M22-AK01	
	=0/25.B2	413330	1	CONTACT SWITCH / M22-AK01	
155	-S9	ES-000000400-000		LEUCHTDRUCKTASTE, EIN, M22S-DL-W-X1	
	=0/25.B3	413330	1	LUMIN. PUSH BUTTON	
156	-S9	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/25.B3	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	
157	-S9	ES-000000424-000		KONTAKTBLOCK, M22-AK10	
	=0/25.B3	413330	1	CONTACT BLOCK	
158	-S10	ES-000000405-000		SCHLUESSELTASTE, 2STELL., M22S-WRS	
	=0/25.B4	413330	1	KEY OPERATED SWITCH	
159	-S10	ES-000000411-000		KODIERTEIL, M22-XC-R	
	=0/25.B4	413330	1	ENCODING PART	
160	-S10	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/25.B4	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stückliste
E0
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25050377

Pre-Treatment

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Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
161	-S10	ES-000000424-000		KONTAKTBLOCK, M22-AK10	
	=0/25.B4	413330	1	CONTACT BLOCK	
162	-S11	ES-000000405-000		SCHLUESSELTASTE, 2STELL., M22S-WRS	
	=0/25.B5	413330	1	KEY OPERATED SWITCH	
163	-S11	ES-000000411-000		KODIERTEIL, M22-XC-R	
	=0/25.B5	413330	1	ENCODING PART	
164	-S11	ES-000000413-000		TASTENZUSATZSCHILDTRAEGER, M22S-ST-X	
	=0/25.B5	413330	1	PUSH BUTTON ADDITION LABEL CARRIER	
165	-S11	ES-000000424-000		KONTAKTBLOCK, M22-AK10	
	=0/25.B5	413330	1	CONTACT BLOCK	
166	-T1	ET-000000091-000		STEUERTRAFO UNIVERS./4AM4842-8DD40-0FA0	
	=0/3.C5	419060	1	TRANSFORMER	
167	-U1	EU-000000063-000		MCR-C-I-U-0/NR. 28 14 49 8	
	=0/4.C6	416040	1	STANDARD SIG. 3 WAY ISOL. AMPLIFIER	
168	-V11	EV-000000026-000		HALBLEITERRELAIS, 3x22A, SWT 861230	
	=0/5.C3	406120	1	SEMICOND.RELAY, 3x22A, SWT 861230	
169	-V17	EV-000000026-000		HALBLEITERRELAIS, 3x22A, SWT 861230	
	=0/7.C3	406120	1	SEMICOND.RELAY, 3x22A, SWT 861230	
170	-V23	EV-000000026-000		HALBLEITERRELAIS, 3x22A, SWT 861230	
	=0/9.C3	406120	1	SEMICOND.RELAY, 3x22A, SWT 861230	
171	-X1	EX-000000221-000		KLEMMEN-ABDECKUNG/TYP:H-K150/5	
	=0/2.C1	402870	1	COVER F. BINDER/TP:H-K150/5	
172	-X1	EX-000000318-000		KLEMMEN/TYP:K95/5	
	=0/2.C1	411850	1	BINDER/TP: K95/5	
173	-X1	EX-000000366-000		KLEMMENBEZEICHNUNG/ZBM-6 CMS UNBEDRUCKT	
	=0/2.C1	416040	10	ZACK MARKER SHEET UNPRINTED	
174	-X1	EX-000000448-000		POTENTIALVERTEILER/BRU 250A 1POLIG	
	=0/2.C1	420840	1	TERMINALBLOCK BRU 250A 1SINGLE POL	
175	-X1	EX-000000448-000		POTENTIALVERTEILER/BRU 250A 1POLIG	
	=0/2.C1	420840	1	TERMINALBLOCK BRU 250A 1SINGLE POL	
176	-X1	EX-000000448-000		POTENTIALVERTEILER/BRU 250A 1POLIG	
	=0/2.C1	420840	1	TERMINALBLOCK BRU 250A 1SINGLE POL	
177	-X10	EX-000000319-000		SCHUKOEINBAUSTECKDOSE PHOENIX 2963310	
	=0/2.D7	411850	1	BUILT-IN SOCKET/PHOENIX 2963310	
178	-X11	EX-000000013-000		SCHUKO-STECKDOSE/621W ART.NR.154592	
	=0/21.D2	412070	1	SCHUKO-SOCKET/621W ART.NR. 154592	
179	-X12	EX-000000883-000		TAE-DOPPEL-ANSCHLUSSDOSE NF AUFPUTZ	
	=0/21.B2	412070	1	TELECOMMUNICATION BOX	
180	-X002	EX-000000013-000		SCHUKO-STECKDOSE/621W ART.NR.154592	
	=0/5.D4	412070	1	SCHUKO-SOCKET/621W ART.NR. 154592	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005	VEF Radiotehnika, LV	Stückliste E0 9 25050377
Bearbeiter	BZ		
Geprüft			
Norm		Ursprung / Ersatz für / Ersatz durch	

Pre-Treatment

16.018.1078-0 | 25-05-377 | Blatt 9 / 11 Bl.

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
181	-X003	EX-000000013-000		SCHUKO-STECKDOSE/621W ART.NR.154592	
	=0/9.D4	412070	1	SCHUKO-SOCKET/621W ART.NR. 154592	
182	-X010	EA-000000640-000		SYSTEMKABEL 14-pol. 2m f. S7-300	
	=0/22.B4	416040	2	SYSTEM CABLE	
183	-X010	EA-000000650-000		ANSCHALTMODUL f.S7-300 Analogkarten	
	=0/22.B4	416040	1	EXTENSION MODULE	
184	-X011	EA-000000642-000		SYSTEMKABEL 50-pol., 2m f. S7-300/400	
	=0/22.B5	416040	1	SYSTEM CABLE	
185	-X011	EA-000000651-000		ANSCHALTMODUL f.S7-300 32-Kanal, digital	
	=0/22.B5	416040	1	EXTENSION MODULE	
186	-X020	EA-000000642-000		SYSTEMKABEL 50-pol., 2m f. S7-300/400	
	=0/23.B2	416040	1	SYSTEM CABLE	
187	-X020	EA-000000651-000		ANSCHALTMODUL f.S7-300 32-Kanal, digital	
	=0/23.B2	416040	1	EXTENSION MODULE	
188	-X021	EA-000000642-000		SYSTEMKABEL 50-pol., 2m f. S7-300/400	
	=0/23.B3	416040	1	SYSTEM CABLE	
189	-X021	EA-000000651-000		ANSCHALTMODUL f.S7-300 32-Kanal, digital	
	=0/23.B3	416040	1	EXTENSION MODULE	
190	-X030	EA-000000640-000		SYSTEMKABEL 14-pol. 2m f. S7-300	
	=0/23.B4	416040	2	SYSTEM CABLE	
191	-X030	EA-000000650-000		ANSCHALTMODUL f.S7-300 Analogkarten	
	=0/23.B4	416040	1	EXTENSION MODULE	
192	-X031	EA-000000640-000		SYSTEMKABEL 14-pol. 2m f. S7-300	
	=0/23.B5	416040	2	SYSTEM CABLE	
193	-X031	EA-000000650-000		ANSCHALTMODUL f.S7-300 Analogkarten	
	=0/23.B5	416040	1	EXTENSION MODULE	
194	-X059	EA-000000621-000		STECKER PROFIBUS NR.6ES7-972-0BB10-0XA0	
	=0/22.C2	419060	1	PLUG No.6ES7 972-0BB10-0XA0	
195	-X060	EA-000000854-000		STECKER PROFIBUS OHNE PG-ANSCHL.BUCHSE	
	=0/4.B4	407709	1	PLUG FOR PROFIBUS	
196	-Z0	EZ-000000052-000		ANREIHSATZ RITTAL/NR.:PS 4580	
	=0/42.E2	412070	1	ADDING SET FOR SWITCH CABINET	
197	-Z0	EZ-000000067-000		MONTAGEPL.-ZWISCHENSTUECK PS4591 H=2000	
	=0/42.E2	412070	1	MOUNTING PLATE INTERMEDIATE PIECE	
198	-Z0	EZ-000000105-000		SOCKEL H=200/SO2824 0800x0350	
	=0/42.E2	412070	2	PEDESTAL	
199	-Z0	EZ-000000158-000		SCHALTSCHRANK LACK./PS4804 0800x2000x400	
	=0/42.E2	412070	2	CONTROL CABINET	
200	-Z0	EZ-000000159-000		SEITENWAND LACK./PS4104 VE=2Stück	
	=0/42.E2	412070	1	SIDE WALL	

Bemerkungen :

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name

Datum	29.09.2005
Bearbeiter	BZ
Geprüft	
Norm	

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stückliste
E0
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25050377

Pre-Treatment

16.018.1078-0 | 25-05-377 | Blatt 10 / 11 Bl.

Schutzvermerk nach DIN 34 beachten ! Please observe protection mark according to DIN 34 !

Geräte-Stückliste Electrical parts list

Nr.	Betriebsmittel Item Darstellung representation	Artikelnummer Article number Lieferant supplier	Menge quantity	Bezeichnung 1 Designation 1 Bezeichnung 2 Designation 2	Zusatzinfo 1 Additional information 1 Zusatzinfo 2 Additional information 2 Ersatzteil Spare part / Dokumentation Documentation
201	-Z0	EZ-000000166-000		SCHALTPLANTASCHE ST/NR.PS4118 800TUER	
	=0/42.E2	412070	1	WIRING DIAGRAM BAG	
202	-Z0	EZ-000000251-000		ANREIH-SCHNELLVERBINDER TS 8800.500	
	=0/42.E2	412070	1	ADDING RAPID CONNECTOR	
203	-Z0	ZB-000000237-000		BESCHRIFTUNGSBOGEN/BMK11x38mmYE 5031676	
	=0/42.E2	416040	2	LABEL SHEET	
204	-Z0	ZB-000000425-000		SCHRIFTBANDKASSETTE/TX-621 GELB 9mm	
	=0/42.E2	402170	1	TAPE CASSETTE/TX-621 GELB 9mm	

Bemerkungen :

Erstellt mit ELCAD (R) 7.3.1 SP1 beta
07.04.2006

R.	Änderung	Datum	Name			
				Datum	29.09.2005	
				Bearbeiter	BZ	
				Geprüft		
				Norm		

VEF Radiotehnika, LV

Ursprung | Ersatz für | Ersatz durch

Stückliste
E0
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25050377

Pre-Treatment

16.018.1078-0 | 25-05-377 | Blatt 11 / 11 Bl.

Handbücher/Manuals

art of automation

VIPA
Gesellschaft für Visualisierung
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Manual

VIPA System 300S
SPEED7

Order No.: VIPA HB140E
Rev. 05/30

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Suggestions for improvement are always welcome.

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About this manual

This manual describes the System 300S SPEED7 from VIPA. Here you may find -besides of a product overview- a detailed description of the single modules. You'll receive information about the connection and the deployment of the System 300S components.

Outline

Chapter 1: Principles

This chapter introduces the System 300 from VIPA as central res. decentral automation system.

Chapter 2: Hardware description

The SPEED7 CPU is available in different variants. This chapter describes the hardware of the different versions.

Chapter 3: Deployment CPU 31xS

General information about the deployment of the CPU like address assignment, operating modes, deployment of the MCC and communication via PG/OP and MPI is collected in this chapter.

Chapter 4: Deployment I/O periphery CPU 314ST

Here you'll see a description of the I/O periphery of the CPU 314ST. Illustrated are functionality, project engineering and diagnosis of the integrated analog and digital portion.

Chapter 5: Deployment CPU 31xS with Profibus

This chapter contains a description of the deployment and the project engineering of the SPEED7 CPUs from VIPA under Profibus.

Chapter 6: Deployment RS485 for ptp communication

Via the integrated RS485 interface you may establish a ptp communication. This chapter describes the according approach.

Chapter 7: Deployment CPU 31xS with TCP/IP

This chapter shows you the deployment of the CPU 31xSN/NET and the communication with TCP/IP.

Chapter 8: Communication modules - SPEEDbus

Content of this chapter is the structure and the functionality of the fast communication modules for the SPEEDbus from VIPA.

Chapter 9: Fast I/O modules - SPEEDbus

This chapter describes the fast I/O modules for the SPEEDbus.

Chapter 10: Integrated Obs, SFBs and SFCs

Here you'll find the description of the integrated programming blocks of the SPEED7-CPUs from VIPA. Main part of this chapter is the description of the VIPA specific SFCs that are within the consignment of every CPU from VIPA as library.

Chapter 11: Instruction list

This chapter shows the instruction list for the SPEED7-CPUs. The instruction list gives you a fast overview over the commands and their syntax.

Chapter 12: Assembly and installation guidelines

All information required for assembly and cabling of a control consisting of System 300 components are collected in this chapter.

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User considerations

Objective and contents

This manual describes the System 300S SPEED7 from VIPA. It contains a description of the construction, project implementation and usage.

Target audience

The manual is targeted at users who have a background in automation technology.

Structure of the manual

At present the manual consists of 12 chapters. Every chapter provides a self-contained description of a specific topic.

Guide to the document

The following guides are available in the manual:

- an overall table of contents at the beginning of the manual
- an overview of the topics for every chapter
- an index at the end of the manual.

Availability

The manual is available in:

- printed form, on paper
- in electronic form as PDF-file (Adobe Acrobat Reader)

Icons Headings

Important passages in the text are highlighted by following icons and headings:

Danger!
Immediate or likely danger.
Personal injury is possible.

Attention!
Damages to property is likely if these warnings are not heeded.

Note!
Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The System 300S - SPEED7 is constructed and produced for:

- all VIPA System 300 components
- communication and process control
- general control and automation applications
- industrial applications
- operation within the environmental conditions specified in the technical data
- installation into a cubicle

Danger!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

The following conditions must be met before using or commissioning the components described in this manual:

- Modification to the process control system should only be carried out when the system has been disconnected from power!
- Installation and modifications only by properly trained personnel
- The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal

National rules and regulations apply to the disposal of the unit!

Chapter 1 Basics

Outline

This introduction contains hint for the usage and information about the project engineering of the SPEED7 CPUs for the System 300. Main theme of this chapter is the introduction of the CPUs 31xS with SPEED7 technology from VIPA.

You will also find general information about the System 300S like dimensions and environment conditions.

Please also regard the hints for the MPI interface and the Green Cable in this chapter!

The following text describes:

- Safety information for the usage of CPU, MP^{2}I interface and Green Cable
- Components of the System 300S
- General description like dimensions, operating security and environment conditions
- Summary of the project engineering
- Structure, working methods and basics of the programming

Content

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Safety Information for Users

Handling of electrostatically sensitive modules

VIPA modules make use of highly integrated components in MOS-Technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges.

The following symbol is attached to modules that can be destroyed by electrostatic discharges.

The Symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatically sensitive equipment.

It is possible that electrostatically sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatically sensitive modules and they can damage components thereby, causing the module to become inoperable or unusable.

Modules that have been damaged by electrostatic discharges can fail after a temperature change, mechanical shock or changes in the electrical load.

Only the consequent implementation of protection devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatically sensitive modules.

Shipping of electrostatically sensitive modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatically sensitive modules

When you are conducting measurements on electrostatically sensitive modules you should take the following precautions:

- Floating instruments must be discharged before use.
- Instruments must be grounded.

Modifying electrostatically sensitive modules you should only use soldering irons with grounded tips.

Attention!

Personnel and instruments should be grounded when working on electrostatically sensitive modules.

Hints for the deployment of the MPI interface

What is MP²I?

The MP²I jack combines 2 interfaces in 1:

- MPI interface
- RS232 interface

Please regard that the RS232 functionality is only available by using the Green Cable from VIPA.

Deployment as MPI interface

The MPI interface provides the data transfer between CPUs and PCs. In a bus communication you may transfer programs and data between the CPUs interconnected via MPI.

Connecting a common MPI cable, the MPI jack supports the full MPI functionality.

Important notes for the deployment of MPI cables!

Deploying MPI cables at the CPUs from VIPA, you have to make sure that Pin 1 is not connected. This may cause transfer problems and in some cases damage the CPU!

Especially Profibus cables from Siemens, like e.g. the 6XV1 830-1CH30, must not be deployed at MP²I jack.

For damages caused by nonobservance of these notes and at improper deployment, VIPA does not take liability!

Deployment as RS232 interface only via "Green Cable"

For the serial data transfer from your PC, you normally need a MPI transducer. Fortunately you may also use the "Green Cable" from VIPA. You can order this under the order no. VIPA 950-0KB00.

The "Green Cable" supports a serial point-to-point connection for data transfer via the MP²I jack exclusively for VIPA CPU's.

Please regard the hints for the deployment of the "Green Cable" on the following page.

Green Cable from VIPA

What is the Green Cable?

The Green Cable is a green connection cable, manufactured exclusively for the deployment at VIPA System components.

The Green Cable is a programming and download cable for VIPA CPUs with MP^{2}I jack and VIPA fieldbus masters. The Green Cable from VIPA is available under the order no. VIPA 950-0KB00.

The Green Cable allows you to:

- *transfer projects serial*
  Avoiding high hardware needs (MPI transducer, etc.) you may realize a serial point-to-point connection via the Green Cable and the MP^{2}I jack. This allows you to connect components to your VIPA-CPU that are able to communicate serial via an MPI adapter like e.g. a visualization system.
- *execute firmware updates of the CPUs and fieldbus masters*
  Via the Green Cable and an upload application you may update the firmware of all recent VIPA CPU's with MP^{2}I jack and certain fieldbus masters (see Note).

Important notes for the deployment of the Green Cable

Nonobservance of the following notes may cause damages on system components.

For damages caused by nonobservance of the following notes and at improper deployment, VIPA does not take liability!

Note to the application area

The Green Cable may exclusively deployed directly at the concerning jacks of the VIPA components (in between plugs are not permitted).

At this time, the following components support the Green Cable:

VIPA CPU's with MP^{2}I jack and the fieldbus masters from VIPA.

Note to the lengthening

The lengthening of the Green Cable with another Green Cable res. The combination with further MPI cables is not permitted and causes damages of the connected components!

The Green Cable may only be lengthened with a 1:1 cable (all 9 Pins are connected 1:1).

General description of the System 300

The System 300

The System 300 is a modular automation system for middle and high performance needs, that you can use either central or decentral. The single modules are directly clipped to a 530 mm backplane and are connected together with the help of bus clips at the backside.

The CPUs of the System 300 are instruction set compatible to S7-300 from Siemens.

System 300V
System 300S

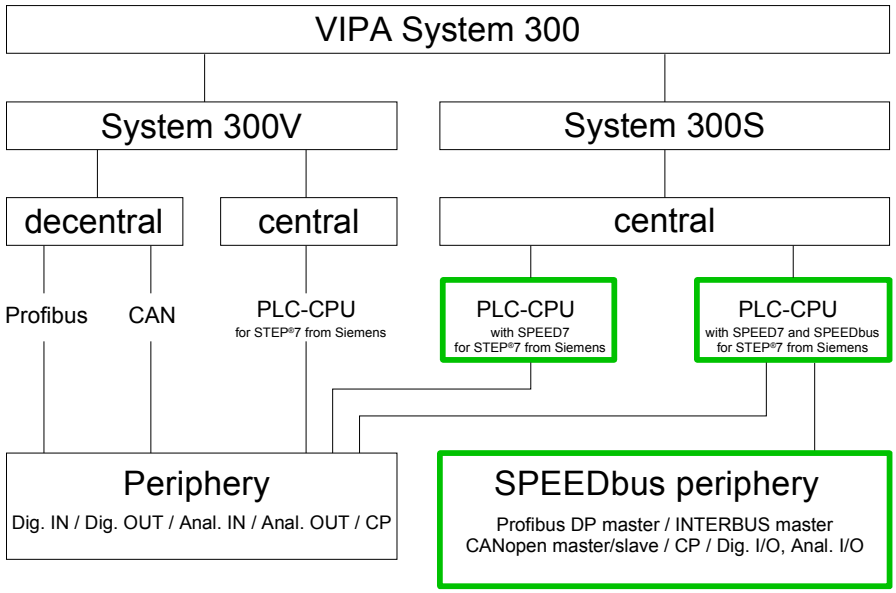
VIPA differentiates between System 300V and System 300S.

- System 300V

  The System 300V allows you to resolve automation tasks central and decentral. The single modules of the System 300V from VIPA are similar in construction to Siemens. Due to the compatible backplane bus, the modules from VIPA and Siemens can be mixed.

- System 300S

  The System 300S extends the central area with high-speed CPUs that have the integrated SPEED7 chip. Additionally some CPU's have got a parallel SPEEDbus that allows the modular connection of fast peripheral modules like IOs or bus master.



Manual overview

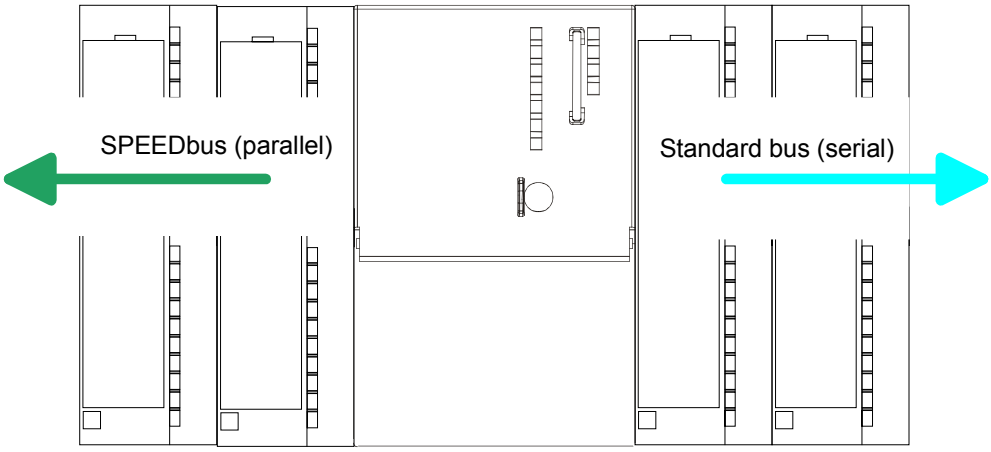
This manual describes the System 300S. This includes the SPEED7-CPUs 31xS and the peripheral modules for SPEEDbus (framed thick green). The description of the System 300V CPU 31x without SPEED7 is to find in the HB 131 and the concerning peripheral modules like digital and analog in-/output modules, power supplies and bus coupler in the HB 130.

System 300S

Outline

The CPUs 31xS are based upon the SPEED7 technology. This supports the CPU at programming and communication by means of co-processors that causes a power improvement for highest needs.

Except of the basic variant, all SPEED7-CPUs are provided with a parallel SPEEDbus that enables the additional connection of up to 16 modules from the SPEEDbus periphery. While the standard peripheral modules are plugged-in at the right side of the CPU, the SPEEDbus peripheral modules are connected via a SPEEDbus bus connector at the left side of the CPU.



CPU 31xS

The System 300S series consists of a number of CPUs. These are programmed in STEP®7 from Siemens. For this you may use WinPLC7 from VIPA or the SIMATIC Manager from Siemens.

CPUs with integrated Ethernet interfaces or additional serial interfaces simplify the integration of the CPU into an existing network or the connection of additional peripheral equipment.

The user application is stored in the battery buffered RAM or on an additionally pluggable MMC storage module.

Due to the automatic address allocation, the deployment of the CPUs 31xS allows to address 32 peripheral modules.

Additionally all CPU 31xS except of the basic version have got a parallel SPEEDbus that allows the modular connection of fast peripheral modules like IOs or bus master.

SPEEDbus

The SPEEDbus is a 32Bit parallel bus developed from VIPA with a maximum data rate of 40MByte/s. Via the SPEEDbus you may connect up to 16 SPEEDbus modules to your CPU 31xS.

In opposite to the "standard" backplane bus where the modules are plugged-in at the right side of the CPU by means of single bus connectors, the modules at the SPEEDbus are plugged-in at the left side of the CPU via a special SPEEDbus rail.

VIPA delivers profile rails with integrated SPEEDbus for 2, 6, 10 or 16 SPEEDbus peripheral modules with different lengths.

SPEEDbus peripheral modules

The SPEEDbus peripheral modules may exclusively plugged at the SPEEDbus slots at the left side of the CPU. The following SPEEDbus modules are in preparation:

- Fast fieldbus modules like Profibus DP, INTERBUS, CANopen master and CANopen slave
- Fast CP 343 (CP 343 Communication processor for Ethernet)
- Fast digital input-/output modules (Fast Digital IN/OUT)

Memory management

At this time, every CPU 31xS is delivered with a 2MB memory. Here are 1MB for data and 1MB for program code. The work memory contains program code and data blocks during runtime.

As external storage medium for programs and firmware you may use a MMC storage module (**Me**m**o**ry **C**ard) from VIPA. The MMC (order no. VIPA 953-0KX00) is preformatted with the FAT16 format and can be accessed via a card reading device.

An access to the MMC always happens after an overall reset.

integrated Profibus DP master

The CPUs of the System 300S series have an integrated Profibus DP master. Via the DP master with a data range of 1kByte for in- and output you may address up to 125 DP slaves. The project engineering takes place in WinPLC7 from VIPA or in the hardware configurator from Siemens.

integrated Ethernet PG/OP channel

Every CPU 31xS has an Ethernet interface for PG/OP communication. Via the "PLC" functions you may directly access the Ethernet PG/OP channel and program res. remote control your CPU. A max. of 2 PG/OP connections is available.

You may also access the CPU with a visualization software via these connections.

Operation Security

- Wiring by means of spring pressure connections (CageClamps) at the front connector
- Core cross-section 0.08...2.5mm^2
- Total isolation of the wiring at module change
- Potential separation of all modules to the backplane bus
- ESD/Burst acc. IEC 61000-4-2/IEC 61000-4-4 (up to level 3)
- Shock resistance acc. IEC 60068-2-6 / IEC 60068-2-27 (1G/12G)

Environmental conditions

- Operating temperature: 0 ... +60°C
- Storage temperature: -25 ... +70°C
- Relative humidity: 5 ... 95% without condensation
- Ventilation by means of a fan is not required

Dimensions/ Weight

- Available lengths of the profile rail in mm: 160, 482, 530, 830 and 2000
- Dimensions of the basic enclosure:
  1tier width: (HxWxD) in mm: 40x125x120
  2tier width: (HxWxD) in mm: 80x125x120

Compatibility

Modules and CPUs of the System 300 from VIPA and Siemens may be used at the "Standard" bus as a mixed configuration.

The project engineering takes place in WinPLC7 from VIPA or in the hardware configurator from Siemens.

The SPEED7 CPUs from VIPA are instruction compatible to the programming language STEP®7 from Siemens and may be programmed via WinPLC7 from VIPA or via the SIMATIC Manager from Siemens.

Here the instruction set of the S7-400 from Siemens is used.

Note!

Please do always use the **CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)** from Siemens of the hardware catalog to project a SPEED7-CPU from VIPA.

For the project engineering, a thorough knowledge of the SIMATIC Manager and the hardware configurator from Siemens is required!

Green Cable

For project engineering of your DP slave you may transfer your projects from your PC to the CPU serial via MPI by using the "Green Cable". Please also regard the hints to the Green Cable in this chapter.

Integrated power supply

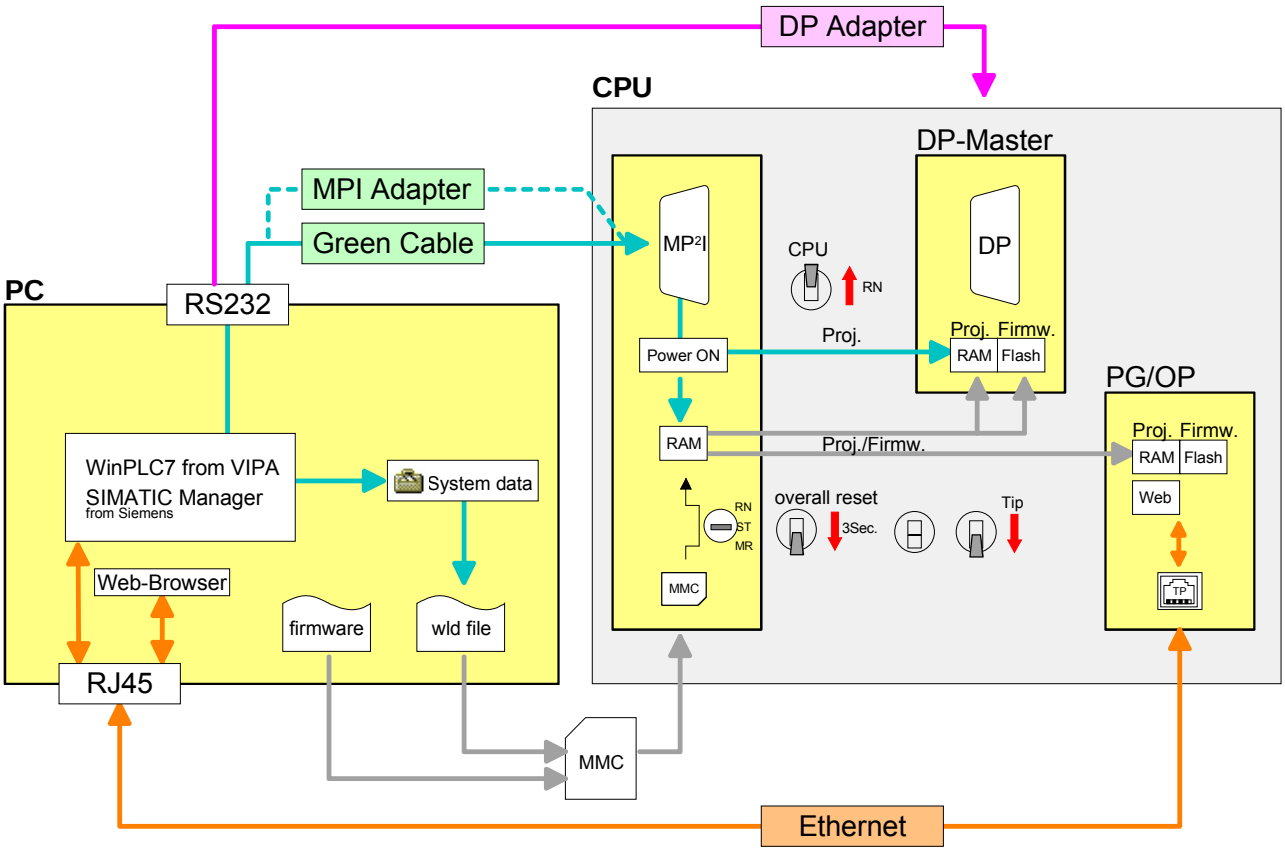
Every CPU res. bus coupler comes with an integrated power supply. The power supply has to be supplied with DC 24V. By means of the supply voltage, the bus coupler electronic is supplied as well as the connected modules via backplane bus. Please regard that the integrated power supply may supply the backplane bus the backplane bus (SPEEDbus and Standard-Bus) depending on the CPU with a sum with max. 5A.

The power supply is protected against inverse polarity and overcurrent.

Every SPEEDbus rail has a plug-in option for an external power supply. This allows you to raise the maximum current at the backplane bus for 6A.

Access options for project engineering and firmware update

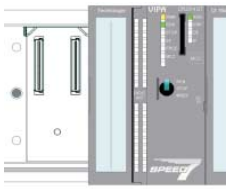
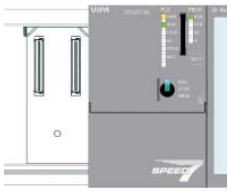
The following overview shows all access options for project engineering and firmware update.



System overview

Performance classes

The SPEED7-CPU family is available in 3 performance classes:

	Basis		Technologie		Extension	
	CPU 315SB DPM	CPU 315SN NET	CPU 314ST DPM	CPU 314ST PtP	CPU 317SE DPM	CPU 317SN NET
						
Order no.	315-2AG10	315-4NE11	314-6CF01	3146BF01	317-2AJ11	317-4NE11
Memory	2MByte (50% Code / 50% Data)					
MP^{2}I	yes					
Real time clock	yes					
Ethernet-PG/OP	yes					
SPEEDbus	-		yes		yes	
16 DIO/AIO: DI 8...16xDC24V DO 8...0 DC24V 0.5A 4 Counter AI 4x12Bit/AO 2x12Bit AI 1xPt100	-		yes		-	
7 Analog I/Os	-		yes		-	
Profibus Master/PtP	yes		yes	-	yes	
RS485 for PtP	-		-	yes	-	
CP343 integrated	-	yes	-		-	yes
Width	1tier	2tier	2tier		2tier	

Basis version

The basic version of the CPU includes the fundamental features. Due to the integrated components like SPEED7 technology, 2MB work memory (50% Data / 50% Code), plug-in slot for MMC storage module, Profibus DP master and Ethernet-PG/OP, this CPU version normally meets the most requirements.

The NET version of the basic module additionally provides a CP343 that enables up to 8 configurable connections. Additionally up to 8 PG/OP channels are at your disposal.

Technology version

The technology version extends the basic version with the integrated SPEEDbus and via the SPEEDbus firmly assigned digital and analog in-/output channels. The CPU is available with Profibus DP master or with RS485 for PtP communication (**p**oint-**t**o-**p**oint).

Extension version

The DPM version is the basic module provided with an integrated SPEEDbus. The NET version is based upon the basic module with integrated SPEEDbus and a CP343 communication processor for communications tasks via up to 16 configurable connections and 8 PG channels.

Hints for the Project Engineering

Outline

For the project engineering of a SPEED7 system please follow this approach:

- Project engineering of the SPEED7-CPU and the internal DP master (if existing) as CPU 318-2DP (318-2AJ00-0AB00)
- Project engineering of the real plugged modules at the standard bus
- Project engineering of the internal Ethernet-PG/OP channel after the real plugged modules as virtual CP 343-1 (Setting of IP address, subnet mask and gateway for online project engineering)
- Project engineering of an internal CP343 (if existing) as 2nd CP 343-1
- Project engineering and connection of the SPEEDbus-CPs res. -DP master as CP 343-1 (343-1EX11) res. CP 342-5 (342-5DA02 V5.0)
- Project engineering of all SPEEDbus modules as single DP slaves in a virtual DP master module (speedbus.gsd required)

Note!

Please do always use the **CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)** from Siemens in the hardware catalog to configure a CPU 31xS from VIPA.

For the project engineering, a thorough knowledge of the SIMATIC Manager and the hardware configurator from Siemens is required!

Requirements

The hardware configurator is part of the SIMATIC Manager from Siemens. it serves the project engineering. Please look at the hardware catalog for the modules that may be configured.

For the deployment of the System 300S modules at the SPEEDbus the inclusion of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is necessary.

Note about the Green Cable

Please regard the hints for the deployment of the Green Cable in this chapter. For damages caused by nonobservance of these hints and/or improper deployment, VIPA does not take liability!

Approach

The project engineering of the SPEED7-CPU has the following components:

To be compatible with the STEP®7 Project engineering tool from Siemens, the following steps are required:

- *Preparation*

  Start the hardware configurator from Siemens and include the speedbus.gsd for the SPEEDbus from VIPA.

- *Project engineering of the CPU*

  Project a CPU 318-2DP (318-2AJ00-0AB00 V3.0). If your SPEED7-CPU contains a DP master, you may now connect it with Profibus and configure your DP slaves.

- *Project engineering of the real plugged modules at the standard bus*

  Set the modules that are at the right side of the CPU at the standard bus starting with slot 4.

- *Project engineering of the integrated CPs*

  For the internal Ethernet-PG/OP channel you have to set a CP 343-1 (343-1EX11) as 1st module at the real plugged modules. If your SPEED7-CPU has additionally an integrated CP 343, this is also configured as CP 343-1 but always below the former placed CP 343-1.

- *Project engineering of the SPEEDbus-CPs and -DP master*

  Plug and connect all CPs as 343-1EX11 and DP master as 342-5DA02 V5.0 at the SPEEDbus below the former configured internal CPU components.

  Please regard that the sequence within a function group (CP res. DP master) corresponds the sequence at the SPEEDbus from right to left.

- *Project engineering of the CPU and all SPEEDbus modules in a virtual master system*

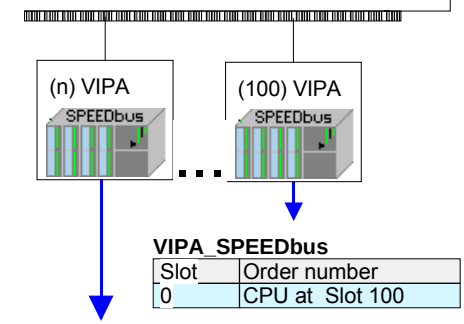
  The slot assignment of the SPEEDbus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place a DP master (342-5DA02 V5.0) with master system as last module. The Profibus address must be <100!

  Now include the slave "vipa_speedbus" for the CPU and every module at the SPEEDbus. After the installation of the speedbus.gsd you may find this under *Profibus-DP / Additional field devices / I/O / VIPA_SPEEDbus*. Set the slot number of the module (100...116) as Profibus address and plug the according module at slot 0 of the slave system.

Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
real Modules at the Standard bus	
343-1EX11 (internal PG/OP)	
343-1EX11 (internal CP343)	
CPs res. DP-Master at the SPEEDbus as 343-1EX11 res. 342-5DA02	
	342-5DA02 V5.0

virtual DP master for CPU and all SPEEDbus modules



VIPA_SPEEDbus

Slot	Order number
0	CPU at Slot 100

VIPA_SPEEDbus

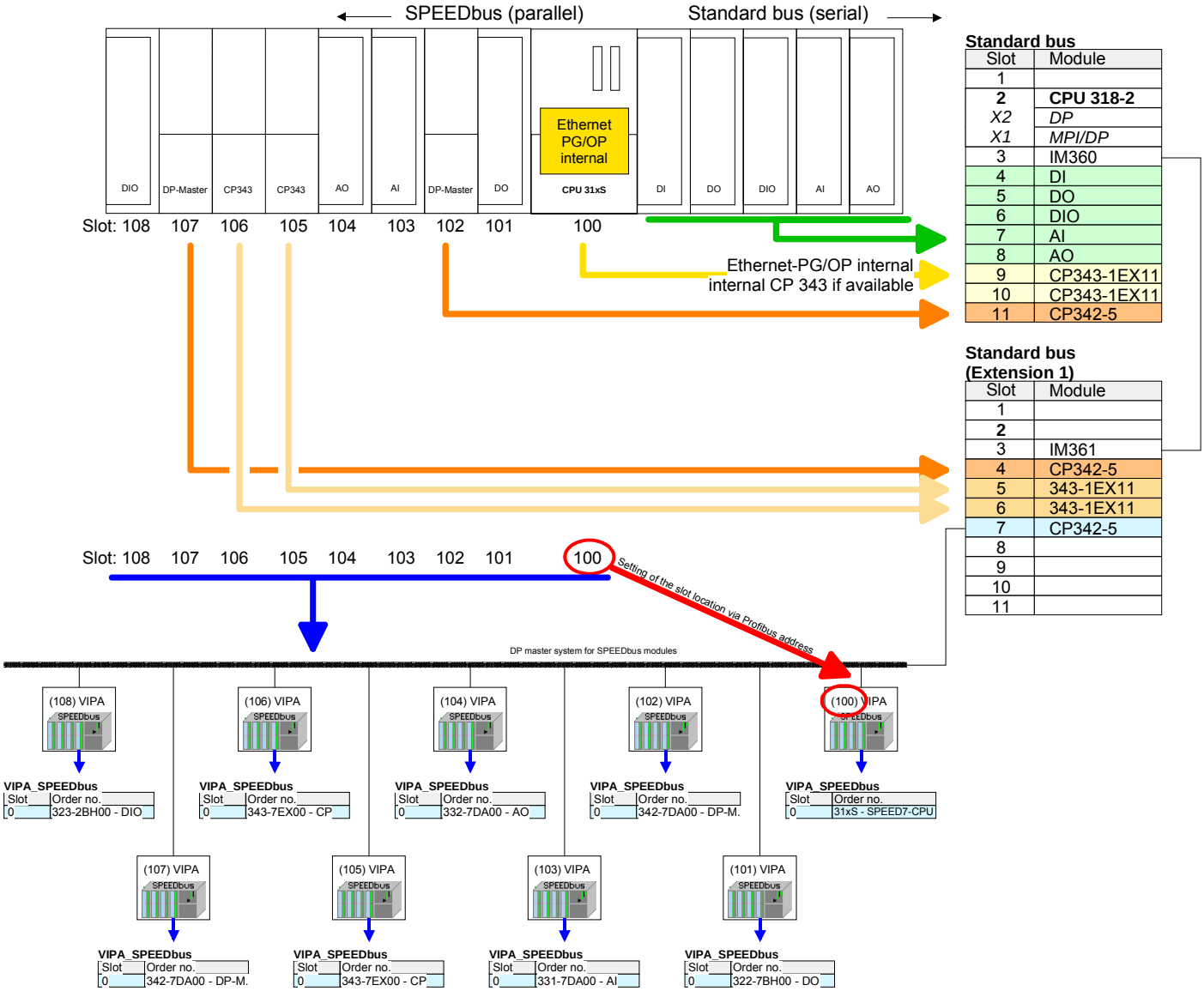
Slot	Order number
0	Module at slot n

Bus extension with IM 360 and IM 361

To extend the bus you may use the IM 360 from Siemens, where 3 further extensions racks can be connected via the IM 361. Bus extensions must be placed at slot 3.

More detailed information is to be found in the chapter "Deployment CPU 31xS" at "Addressing".

Summary The following illustration summarizes all project engineering steps:



The according module is to be taken over from the HW catalog of vipa_speedbus on slot 0.

Note!

The sequence of the DPM- and CP function groups is insignificant. You only have to take care to regard the sequence within a function group (DP1, DP2... res. CP1, CP2 ...).

Hint, valid for all SPEEDbus modules!

The SPEEDbus always requires the Siemens DP master CP 342-5 (342-5DA02 V5.0) as last module to be included, connected and parameterized to the *operation mode* DP master. Every SPEEDbus module has to be connected as VIPA_SPEEDbus slave into this master system.

By setting the SPEEDbus slot number via the Profibus address and by including the according SPEEDbus module at slot 0, the SIMATIC Manager receives information about the modules at the SPEEDbus.

Additionally the following configurations are required depending on the module.

Project engineering of the DP master at the SPEEDbus

The hardware configuration and Profibus project engineering happens in the SIMATIC Manager from Siemens. You have to parameterize a virtual CP 342-5 (342-5DA02 V5.0) for every SPEEDbus-DP master at the standard bus following the real modules and connect it with the depending DP slaves.

Project engineering CP343 at the SPEEDbus

SPEEDbus-CPs have to be configured in the SIMATIC Manager at the standard bus behind the real modules as virtual CP 343 (343-1EX11) and are then connected with the according Ethernet components. For the connection, the Siemens project engineering tool NetPro is required.

Project engineering of the CAN master at the SPEEDbus

The project engineering of the CANopen master at the SPEEDbus happens in WinCoCT (**Win**dows **C**AN**o**pen **C**onfiguration **T**ool) from VIPA.

you export your project from WinCoCT as wld-file. This wld-file can be imported into the hardware configurator from Siemens.

An additional inclusion at the standard bus is not necessary.

Project engineering of the Interbus master at the SPEEDbus

The project engineering of the IBS master system takes place in your CPU user application using the VIPA FCs.

An additional inclusion at the standard bus is not necessary.

Operating structure of a CPU

General

The CPU contains a standard processor with internal program memory. In combination with System 300S peripherals the unit provides a powerful solution for process automation applications within the System 300S family.

A CPU supports the following modes of operation:

- cyclic operation
- timer processing
- alarm controlled operation
- priority based processing

Cyclic processing

Cyclic processing represents the major portion of all the processes that are executed in the CPU. Identical sequences of operations are repeated in a never ending cycle.

Timer processing

Where a process requires control signals at constant intervals you can initiate certain operations based upon a **timer**, e.g. not critical monitoring functions at one-second intervals.

Alarm controlled processing

If a process signal requires a quick response you would allocate this signal to an **alarm controlled** procedure. An alarm can activate a procedure in your program.

Priority based processing

The above processes are handled by the CPU in accordance with their **priority**. Since a timer or an alarm event requires a quick reaction, the CPU will interrupt the cyclic processing when these high-priority events occur to react to the event. Cyclic processing will resume, once the reaction has been processed. This means that cyclic processing has the lowest priority.

CPU 31xS Applications

Overview

The program that is present in every CPU is divided as follows:

- System routine
- User application

System routine

The system routine organizes all those functions and procedures of the CPU that are not related to a specific control application.

User application

This consists of all the functions that are required for the processing of a specific control application. The operating modules provide the interfaces to the system routines.

Operands of the CPU 31xS

Overview

The following series of operands is available for programming the CPU 31xS:

- Process image and periphery
- Bit memory
- Timers and counters
- Data blocks

Process image and periphery

The user application can quickly access the process image of the inputs and outputs PAA/PAE. You may manipulate the following types of data:

- individual Bits
- Bytes
- Words
- Double words

You may also gain direct access to peripheral modules via the bus from user application. The following types of data are available:

- Bytes
- Words
- Blocks

Bit Memory

The bit memory is an area of memory that is accessible by means of certain operations. Bit memory is intended to store frequently used working data.

You may access the following types of data:

- individual Bits
- Bytes
- Words
- Double words

Timers and counters

In your program you may load cells of the timer with a value between 10ms and 9990s. As soon as the user application executes a start-operation, the value of this timer is decremented by the interval that you have specified until it reaches zero.

You may load counter cells with an initial value (max. 999) and increment or decrement these when required.

Data Blocks

A data block contains constants or variables in the form of bytes, words or double words. You may always access the current data block by means of operands.

You may access the following types of data:

- individual Bits
- Bytes
- Words
- Double words

Chapter 2 Hardware description CPU 31xS

Outline

The CPUs 31xS are available in different versions that are described in the following chapter.
The chapter closes with the technical data.

The following text describes:

- operating and display elements of the CPUs
- In-/Output-Range of the CPU 314ST
- Technical data

Content

Topic	Page
Chapter 2 Hardware description	**2-1**
System Overview	2-2
Construction	2-6
Components	2-9
In-/Output range CPU 314ST	2-13
Technical Data	2-16

System Overview

SPEED7-CPUs

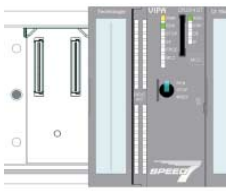
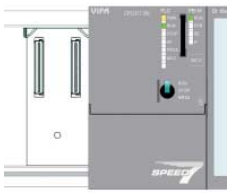
These CPUs are instruction set compatible to STEP®7 from Siemens and are designed for medium and large applications with integrated 24V power supply unit. Every CPU has a plug-in slot for MMC at the front side, an integrated Ethernet interface for PG/OP communication and a MP²I interface and is developed for future memory extensions.

You may poll sensors and control actuators via standardized commands and programs.

Depending on the CPU type you have additionally an integrated CP 343 or a RS485 interface for communication tasks. This CPU series gains you access to the peripheral modules of the System 300V for the standard bus.

Additionally all CPUs 31xS except of the basic version provide a parallel SPEEDbus that allows you to connect fast peripheral modules like IOs or bus master modular.

The following descriptions in this manual refers to the complete SPEED7-CPU family CPU 31xS from VIPA if nothing else is mentioned.

	Basis		Technologie		Extension	
	CPU 315SB DPM	CPU 315SN NET	CPU 314ST DPM	CPU 314ST PtP	CPU 317SE DPM	CPU 317SN NET
						
Order no.	315-2AG10	315-4NE11	314-6CF01	3146BF01	317-2AJ11	317-4NE11
Memory	2MByte (50% Code / 50% Data)					
MP²I	yes					
Real time clock	yes					
Ethernet-PG/OP	yes					
SPEEDbus	-		yes		yes	
16 DIO/AIO: DI 8...16xDC24V DO 8...0 DC24V 0.5A 4 Counter AI 4x12Bit/AO 2x12Bit AI 1xPt100	-		yes		-	
7 Analog I/Os	-		yes		-	
Profibus Master/PtP	yes		yes	-	yes	
RS485 for PtP	-		-	yes	-	
CP 343 integrated	-	yes	-		-	yes
Width	1tier	2tier	2tier		2tier	

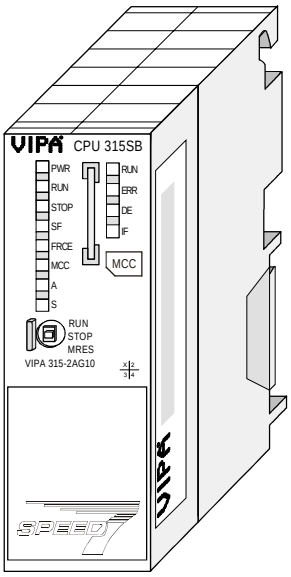
Basis Version

CPU 315SB/DPM
315-2AG10

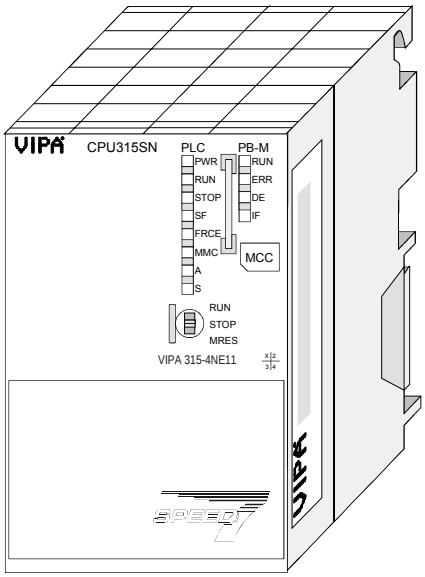
CPU 315SN/NET
315-4NE11

- SPEED7 technology integrated
- 2MByte total memory (1MByte for code, 1MByte for data)
- MP²I-interface
- MMC slot for external memory
- Status-LEDs for operating state and diagnosis
- Real-time clock battery buffered
- Ethernet-PG/OP-interface integrated
- Profibus DP-Master integrated (DP-V0, DP-V1)
- CP 343 integrated for max. 8 configurable connections (only VIPA 315-4NE11)
- I/O address range digital/analog 8191Byte
- 512 timer
- 512 counter
- 8192 Bit memory byte

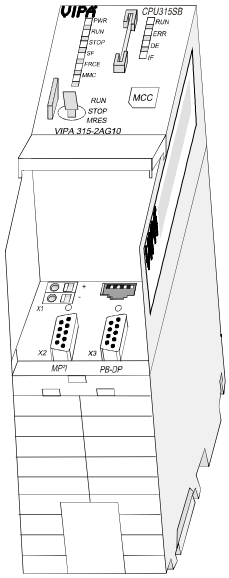
DPM - front



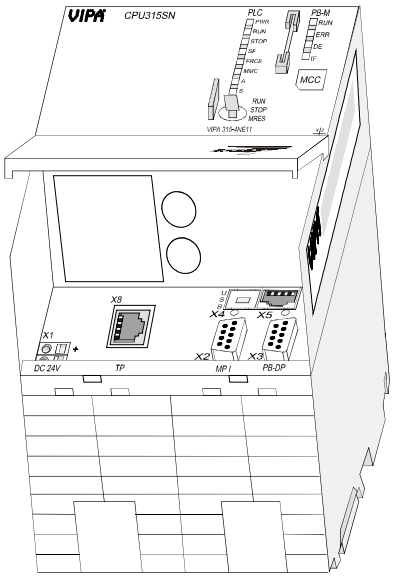
NET - front



DPM - bottom



NET - bottom



Ordering data

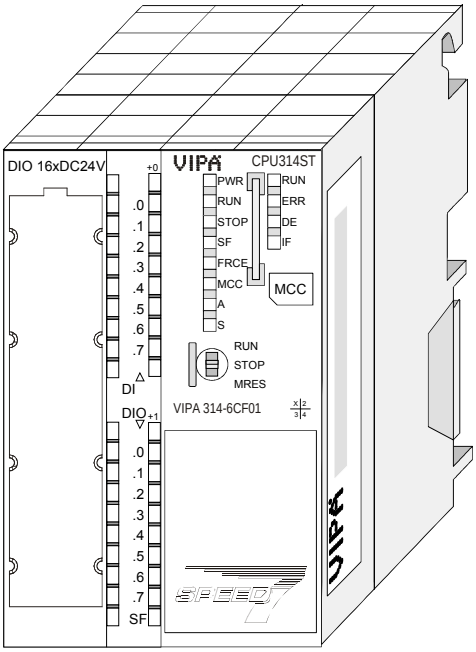
Type	Order number	Description
315SB/DPM	VIPA 315-2AG10	MP²I interface, MMC slot, real time clock, Ethernet interface for PG/OP, Profibus DP master
315SN/NET	VIPA 315-4NE11	MP²I interface, MMC slot, real time clock, Ethernet interface for PG/OP, Profibus DP master, CP 343

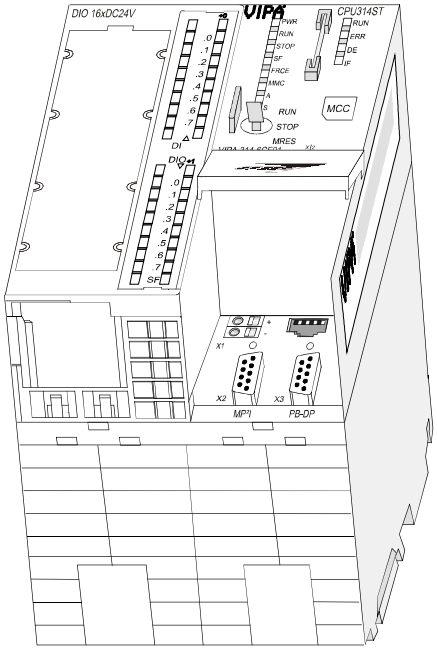
Technology Version

CPU 314ST/DPM
314-6CF01

CPU 314ST/PtP
314-6BF01

- SPEED7 technology and SPEEDbus integrated
- 2MByte total memory (1MByte for code, 1MByte for data)
- MP²I interface
- MMC slot for external memory
- Status-LEDs for operating state and diagnosis
- Real-time clock battery buffered
- Ethernet-PG/OP interface integrated
- Profibus DP master integrated (only VIPA 314-6CF01) supports DP-V0 and DP-V1
- RS485 for PtP communication (only VIPA 314-6BF01)
- Fast digital I/Os: DI 8...16xDC24V / DO 8...0xDC 24V, 0.5A
- Analog I/Os: AI 4x12Bit / AO 2x12Bit / AI 1xPt100
- 4 counter (100kHz)
- I/O address range digital/analog 8191Byte
- 512 timer
- 512 counter
- 8192 Bit memory byte





Ordering data

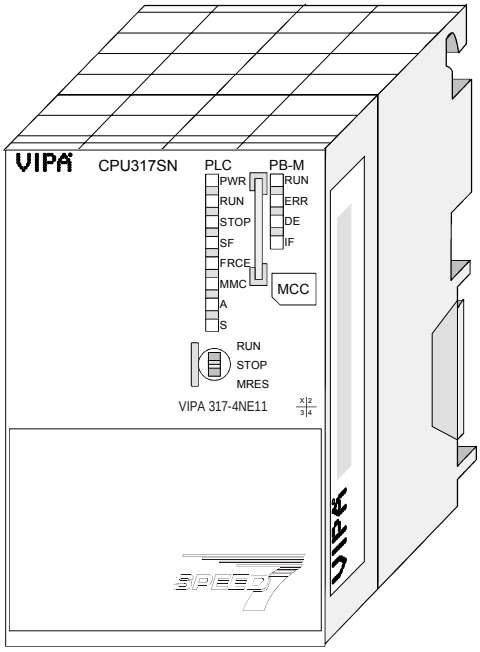
Type	Order number	Decription
314ST/DPM	VIPA 314-6CF01	MP²I interface, MMC slot, real time clock, Ethernet interface for PG/OP, Profibus DP master, SPEEDbus, DI 8...16xDC24V / DO 8...0xDC24V, 0.5A, AI 4x12Bit / AO 2x12Bit / AI 1xPt100, 4 Counter
314ST/PtP	VIPA 314-6BF01	MP²I interface, MMC slot, real time clock, Ethernet interface for PG/OP, RS485 for PtP Communication, SPEEDbus, DI 8...16xDC24V / DO 8...0xDC24V, 0.5A, AI 4x12Bit / AO 2x12Bit / AI 1xPt100, 4 Counter

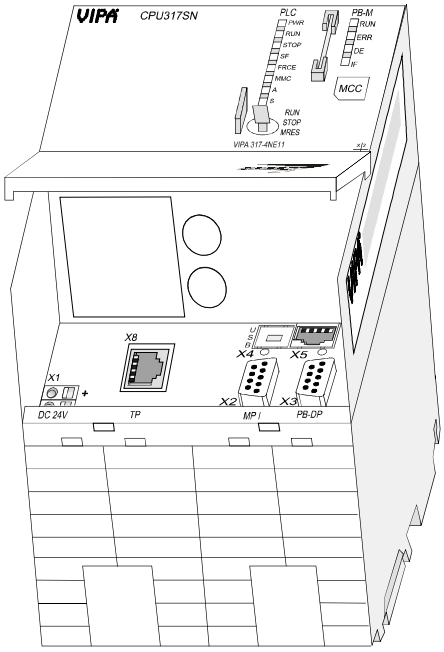
NET Version

CPU 317SE/DPM
317-2AJ11

CPU 317SN/NET
317-4NE11

- SPEED7 technology and SPEEDbus integrated
- 2MByte total memory (1MByte for code, 1MByte for data)
- MP^{2}I interface
- MMC slot for external memory
- Status-LEDs for operating state and diagnosis
- Real-time clock battery buffered
- Ethernet-PG/OP interface integrated
- Profibus DP master integrated (DP-V0, DP-V1)
- CP 343 communication processor integrated (only VIPA 317-4NE11)
- I/O address range digital/analog 8191Byte
- 512 timer
- 512 counter
- 8192 Bit memory byte



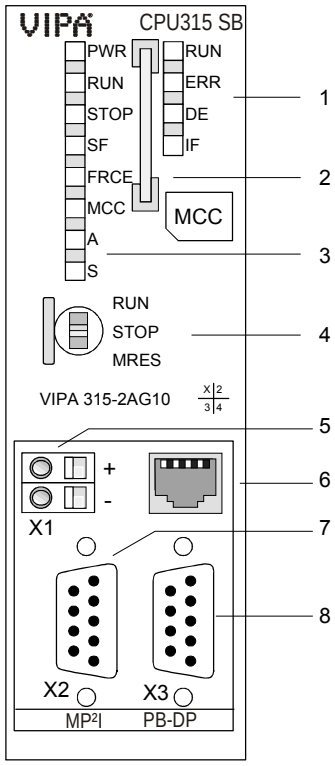


Ordering data

Type	Order number	Description
317SE/DPM	VIPA 317-2AJ11	MP^{2}I interface, MMC slot, real time clock, Ethernet interface for PG/OP, Profibus DP master, SPEEDbus
317SN/NET	VIPA 317-4NE11	MP^{2}I interface, MMC slot, real time clock, Ethernet interface for PG/OP, Profibus DP master, SPEEDbus, CP 343

Construction

CPU 315SB/DPM
315-2AG10

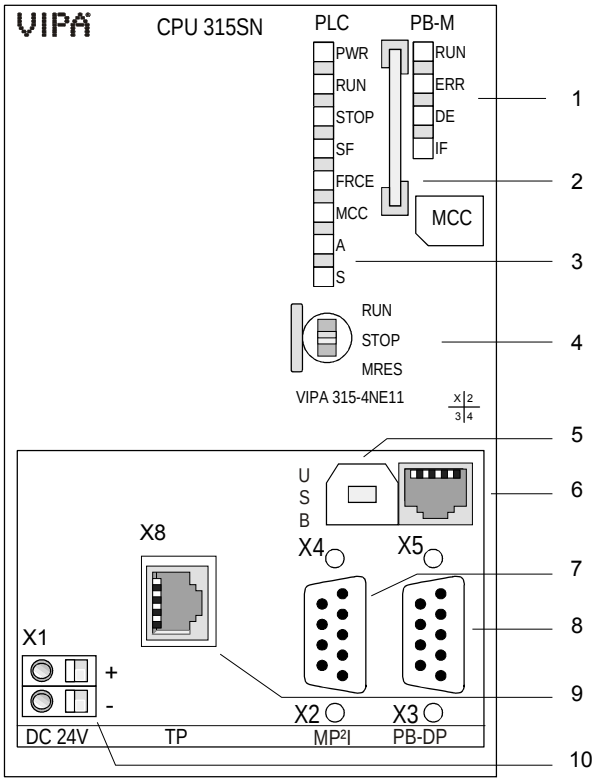


[1] LEDs of the integrated Profibus DP master
[2] MMC slot
[3] LEDs of the CPU part
[4] Operating mode switch CPU

The following components are under the front flap

[5] Slot for DC 24V power supply
[6] Twisted pair interface for PG/OP channel
[7] MP^{2}I interface
[8] Profibus DP interface

CPU 315SN/NET
315-4NE11

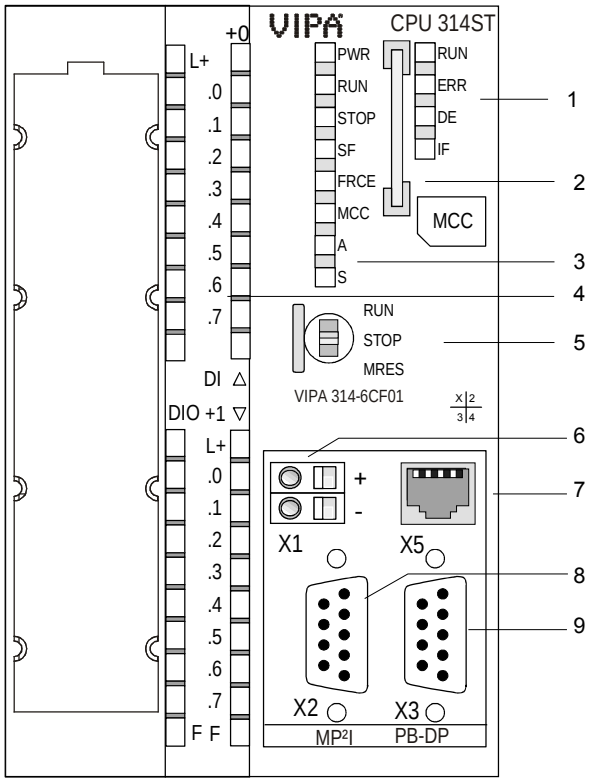


[1] LEDs of the integrated Profibus DP master
[2] MMC slot
[3] LEDs of the CPU part
[4] Operating mode switch CPU

The following components are under the front flap

[5] USB interface
[6] Twisted pair interface for PG/OP channel
[7] MP^{2}I interface
[8] Profibus DP interface
[9] Twisted pair interface for CP 343
[10] Slot for DC 24V power supply

CPU 314ST/DPM
314-6CF01

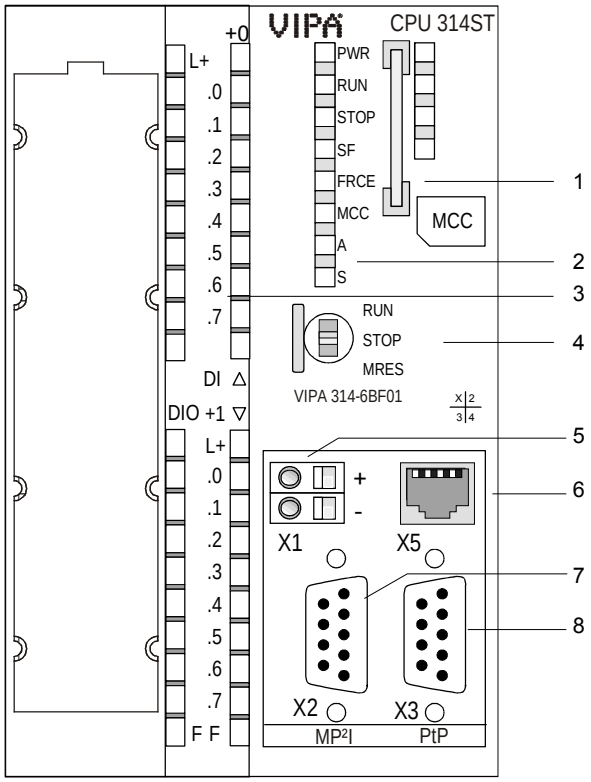


[1] LEDs of the integrated Profibus DP master
[2] MMC slot
[3] LEDs of the CPU part
[4] LEDs of the I/O part
[5] Operating mode switch CPU

The following components are under the front flap

[6] Slot for DC 24V power supply
[7] Twisted pair interface for PG/OP channel
[8] MP^{2}I interface
[9] Profibus DP interface

CPU 314ST/PtP
314-6BF01

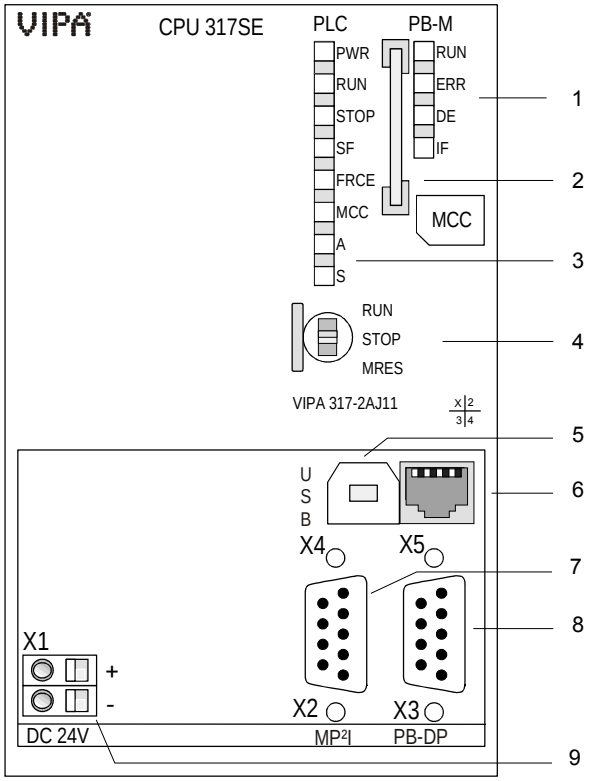


[1] MMC slot
[2] LEDs of the CPU part
[3] LEDs of the I/O part
[4] operating mode Switch CPU

The following components are under the front flap

[5] Slot for DC 24V Power supply
[6] Twisted pair interface for PG/OP channel
[7] MP^{2}I interface
[8] PtP interface

CPU 317SE/DPM
317-2AJ11

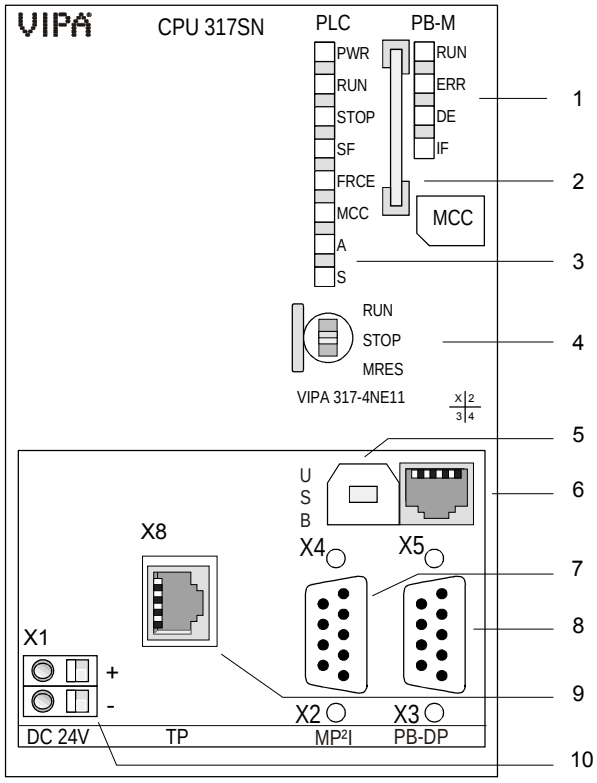


[1] LEDs of the integrated Profibus-DP master
[2] MCC slot
[3] LEDs of the CPU part
[4] Operating mode switch CPU

The following components are under the front flap

[5] USB interface
[6] Twisted pair interface for PG/OP channel
[7] MP^{2}I interface
[8] Profibus DP interface
[9] Slot for DC 24V power supply

CPU 317SN/NET
317-4NE11



[1] LEDs of the integrated Profibus-DP master
[2] MCC slot
[3] LEDs of the CPU part
[4] Operating mode switch CPU

The following components are under the front flap

[5] USB interface
[6] Ethernet PG/OP interface
[7] MP^{2}I interface
[8] Profibus DP interface
[9] Twisted pair interface for CP 343
[10] Slot for DC 24V power supply

Components

CPU 31xS

The here mentioned components are part of every CPU 31xS.

LEDs CPU part

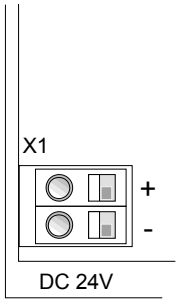
To display the status the CPU has got one row of LEDs on the frontside. The following table shows you the usage of the LEDs and the according colors:

Label	Color	Meaning
PWR	green	CPU part is provided with internal 5V
RUN	green	CPU is in the operating mode RUN
STOP	yellow	CPU is in the operating mode STOP
SF	red	burns at system errors (hardware defect)
FRCE	yellow	burns as soon as variables are forced (fixed)
MCC	yellow	blinks at MMC access
A	green	Activity: on: physically connected off: no physical connection blinks: shows Ethernet activity
S	green	Speed: on: 100MBit off: 10MBit

Note!

All LEDs of the CPU part are blinking three times, when accessing an invalid MMC or when the MMC is pulled out during the reading process.

Power supply



The CPU has an integrated power supply. The power supply has to be provided with DC 24V. For this serves the double DC 24V slot, that is underneath the flap.

Via the power supply not only the internal electronic is provided with voltage, but by means of the backplane bus also the connected modules.

The power supply is protected against polarity inversion and overcurrent.

The internal electronic is galvanically connected with the supply voltage.

Please regard that the integrated power supply may provide the backplane bus (SPEED and standard bus) with a sum of max. 5A depending on the CPU. Every SPEEDbus bar has a plug-in option for an external power supply. This allows you to raise the max. current at the backplane bus for 6A.

Operating mode switch

With the operating mode switch you may switch the CPU between STOP and RUN. The operating mode START-UP is driven automatically from the CPU between STOP and RUN.

Placing the switch to Memory Reset (MRES), you request an overall reset with following load from MMC (project or firmware update).

Memory management

At this time, every CPU 31xS is delivered with a 2MB memory (50% data, 50% code). The work memory stores program code and data blocks during runtime.

As external storage medium for applications and firmware you may use a MMC storage module (**Mem**ory **C**ard) from VIPA. The MMC (order no.: VIPA 953-0KX00) is pre-formatted with the PC format FAT16 and can be accessed via a card reading device.

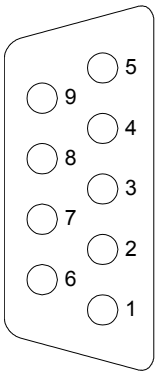
An access to the MMC always happens after an overall reset and PowerON.

MP²I interface

The MP²I interface handles the data exchange between CPU and PC. Via a bus communication you may transfer applications and data between the CPUs that are connected via MPI.

For a serial transfer from your PC you normally need a MPI transducer. Alternatively you may use the "Green Cable" (Order No.: 950-0KB00). from VIPA, that allows a serial connection without transducer. The "Green Cable" may only be used directly and exclusively at CPUs with MP²I interface. Please also regard the hints in the chapter "Basics"!

The MPI-slot has the following pin assignment:



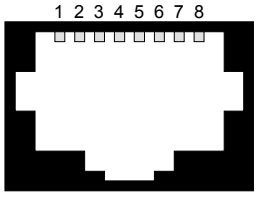
9pin jack

Pin	Assignment
1	reserved (must not be connected) See Hints for the deployment of the MPI interface in chapter 1.
2	M24V
3	RxD/TxD-P (Line B)
4	RTS
5	M5V
6	P5V
7	P24V
8	RxD/TxD-N (Line A)
9	n.c.

Ethernet-PG/OP-channel

The RJ45 jack serves the interface to the Ethernet-PG/OP channel. This interface allows you to program res. remote control your CPU, to access the internal website or to connect a visualization via up to 2 PG/OP connections.

Via a hardware configuration with a CPU 318-2 (318-2AJ00/V3.0) and a CP 343-1 (343-1EX11) you may assign an IP address to the Ethernet-PG/OP channel and by using this access the CPU. Configurable connections are not possible. The jack has the following assignment:



8pin RJ45-slot:

Pin	Signal	Pin	Signal
1	Transmit +	5	-
2	Transmit -	6	Receive -
3	Receive +	7	-
4	-	8	-

Communication components

Additionally to the Ethernet-PG/OP channel the following CPUs provide further communication components:

- CPU 315SB/DPM Profibus DP master
- CPU 315SN/NET Profibus DP master and CP 343
- CPU 314ST/DPM Profibus DP master
- CPU 314ST/PtP PtP via RS485
- CPU 317SE/DPM Profibus DP master
- CPU 317SN/NET Profibus DP master and CP 343

RS485 interface with configurable functionality

Every CPU 31xS has a integrated RS485 interface. The functionality of this interface can be configured by the mean of the parameter "Function RS485" of the SPEEDbus CPUs' hardware configuration.

Here you have the following possibilities:

at CPU 31xS ...	Profibus	PtP	de-activated
... with DP master	yes	yes	yes
... without DP master	no	yes	yes

Profibus functionality

Using the *Profibus* functionality the integrated Profibus DP master is connected to Profibus via RS485 interface. The Profibus DP master gives you access to up to 125 DP slaves. For this the project engineering happens in the hardware configurator from Siemens.

The states of the Profibus DP master are shown at the front side via a row of LEDs. The usage and colors of the LEDs are listed in the following table:

Name	Color	Meaning
RUN	green	Only RUN blinks: the DP master is in RUN. The DP-Slaves are called and the outputs are 0 ("clear"-Status). RUN+DE are blinking: the DP master is in "operate"-Status. It Exchanges data with the DP-Slaves.
ERR	red	blinks at a slave failure
DE	green	DE (Data exchange) shows communication via Profibus DP.
IF	red	Init error at wrong parametrization.

Note!

Please make sure to activate the terminating resistors at the bus ends!

PtP functionality

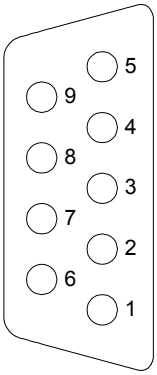
Using the *PtP* functionality the RS485 interface is allowed to connect via serial point-to-point connection to different source res. target systems. Here the following protocols are supported:

ASCII, STX/ETX, 3964R, USS and Modbus-Master (ASCII, RTU)

RS485 interface

RS485 interface of both functionalities have the same pin assignment:

9-pin Profibus SubD jack:



Pin	Belegung
1	shield
2	n.c.
3	RxD/TxD-P (line B)
4	RTS
5	M5V
6	P5V
7	n.c.
8	RxD/TxD-N (line A)
9	n.c.

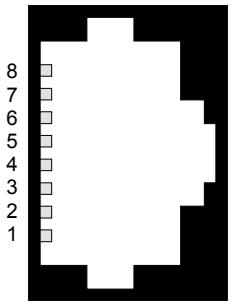
Communication processor CP 343

The CP 343 offers you a communication processor. This serves 8 PG/OP-channels and 16 configurable connections. The project engineering happens using NetPro from Siemens as CP343-1EX11.

Via the RJ45 jack you may connect the CP 343 to Twisted-Pair-Ethernet.

The slot has the following pin assignment:

8pin RJ45 plug:

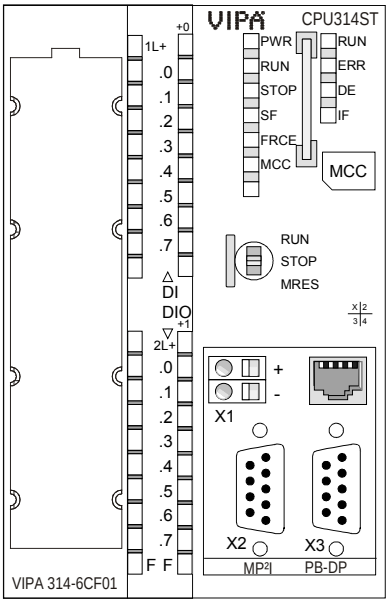


Pin	Signal
1	Transmit +
2	Transmit -
3	Receive +
4	-
5	-
6	Receive -
7	-
8	-

In-/Output range CPU 314ST

Overview

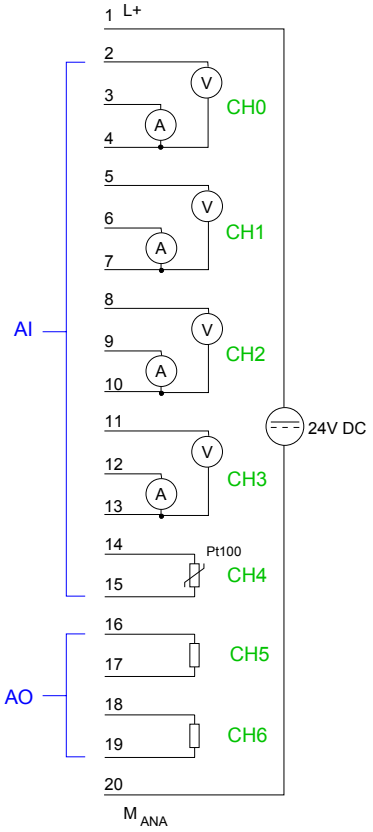
The CPU 314ST has the following integrated analog and digital in- and output ranges:



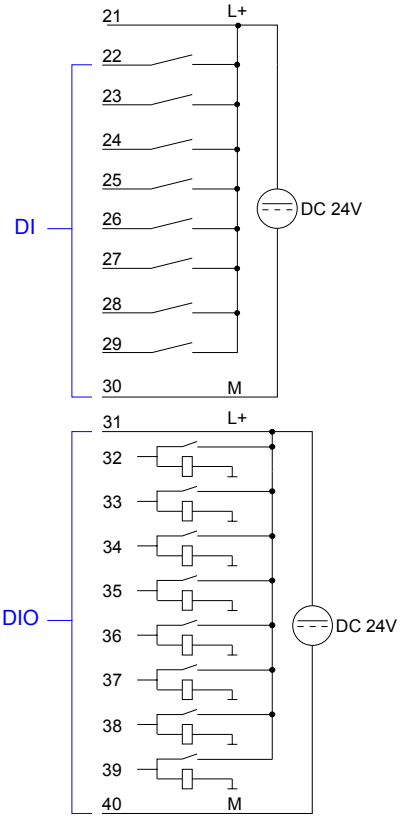
- AI 4x12Bit, 1xPt100
- AO 2x12Bit
- DI 8xDC24V alarm capable, the first 8 inputs parameterizable as 4 counter (100kHz)
- DIO 8xDC24V, 0.5A

Pin assignment:

Analog part



Digital part



Analog part

The analog part consists of 4 input, 1 Pt100 and 2 output channels. 10 byte for input and 4 byte for output are used for the process image.

The channels of the module are galvanically separated from the SPEEDbus via DC/DC transducer and opto couplers.

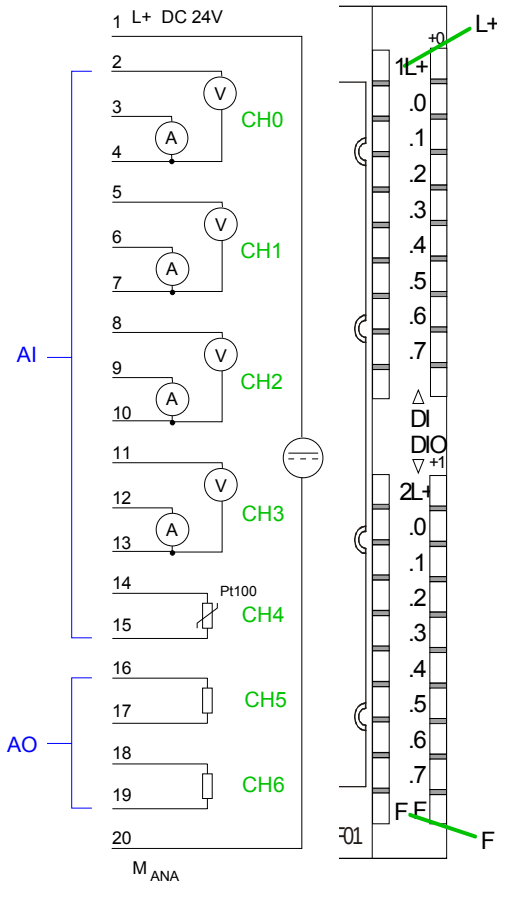
Attention!

Temporarily not used analog inputs with activated channel must be connected to the concerning ground.

Status indicator
Pin assignment

Pin	Assignment
1	Power supply DC 24V for Analog range
2	meas. voltage channel 0
3	meas. current channel 0
4	Ground channel 0
5	meas. voltage channel 1
6	meas. current channel 1
7	Ground channel 1
8	meas. voltage channel 2
9	meas. current channel 2
10	Ground channel 2
11	meas. voltage channel 3
12	meas. current channel 3
13	Ground channel 3
14	Pt 100 channel 4
15	Pt 100 channel 4
16	Output + channel 5
17	Ground output channel 5
18	Output + channel 6
19	Ground output channel 6
20	Ground power supply for analog range

Connection



LEDs

1L+	LED (green) Supply voltage available
F	LED (red) Sum error

Note!

To avoid measuring errors, you should connect only one measuring type per channel.

Digital part

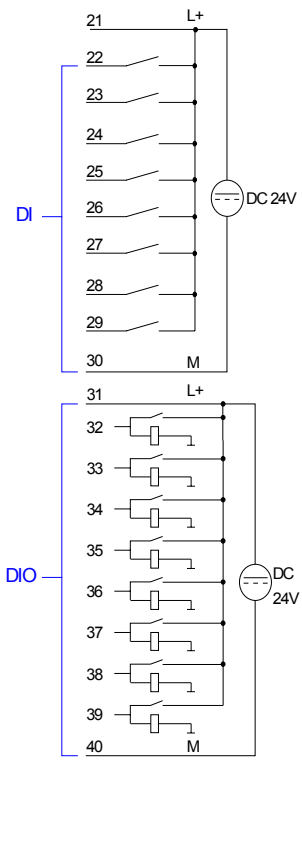
The digital part consists of 8 inputs and 8 in-/outputs. Each of this in-/outputs monitors its state via a LED. Via the parameterization you may assign alarm properties to every digital input. Additionally the digital inputs are parameterizeable as counter (max. 15kHz, with rev. 2 max. 100kHz).

The output channels provide a diagnostic function, i.e. as soon as an output is active, the according input is set to "1". At a short circuit at the load, the input is pulled to "0" and by evaluating the input, the error may be recognized. The DIO part has to be provided with external DC 24V.

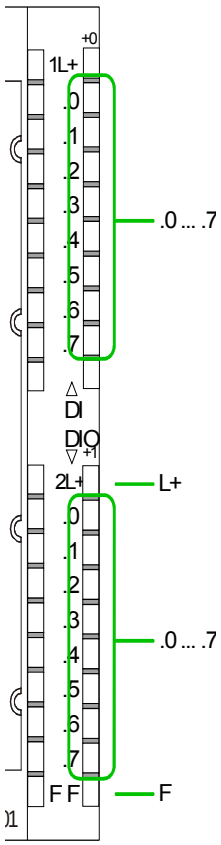
Status indicator
Pin assignment

Pin	Assignment
21	Power supply +DC 24V
22	Input I+0.0 / Counter 0(A)
23	Input I+0.1 / Counter 0(B)
24	Input I+0.2 / Gate0/Latch0/Reset0
25	Input I+0.3 / Counter 1(A)
26	Input I+0.4 / Counter 1(B)
27	Input I+0.5 / Gate1/Latch1/Reset1
28	Input I+0.6 / Counter 2(A)
29	Input I+0.7 / Counter 2(B)
30	Ground DI
31	Power supply +DC 24V
32	I/Q+1.8 / Gate2/Latch2/Reset2
33	I/Q+1.9 / Counter 3(A)
34	I/Q+1.10 / Counter 3(B)
35	I/Q+1.11 / Gate3/Latch3/Reset3
36	I/Q+1.12 / OUT0/Latch0/Reset0
37	I/Q+1.13 / OUT1/Latch1/Reset1
38	I/Q+1.14 / OUT2/Latch2/Reset2
39	I/Q+1.15 / OUT3/Latch3/Reset3
40	Ground DIO

Connection



LEDs



DI:

.0 7	LEDs (green) I+0.0 bis I+0.7 (each Byte) Starting with app. 15V the signal "1" at the input is recognized and the according LED

DIO:

2L+	LED (green) Supply voltage available for DIO
.0 7	LEDs (green) I/Q+1.0 to I/Q+1.7 on at active output/input
F	LED (red) Overload or short circuit error

Attention!

Please take care that the voltage at an output channel always is ≤ the supply voltage via L+.

Further you have to regard that due to the parallel connection of in- and output channel per group a set output can be provided via a connected input signal. A thus set output remains active at connected input signal also the power supply is turned off.

Nonobservance may destroy the module.

Technical Data

CPU 315SB/DPM

Electrical Data	VIPA 315-2AG10
Supply voltage Current consumption Output current to backplane bus	DC 24V max. 1A max. 3A
Status display (LEDs)	via LEDs at the front
Memory External memory	2MB (50% Data / 50% Code) MMC (Memory Card)
Slots / Interfaces: MP^2I RJ45 PG/OP channel RS485	 MPI: 8 static / 8 dynamic connections (max. 1.5MBaud) RS232: 38.4kBaud (only via green cable from VIPA) PG/OP channel via Ethernet with max. 2 connections Configurable functionality via project engineering: *deactivated* *Profibus DP Communication* - Transfer rate: 9.6kBaud to 12MBaud - Max. number of partners: 32 stations in every segment without repeater, with Repeater expandable to 126. - Protocol: DP-V0, DP-V1, PG/OP Communication *PtP Communication* - Transfer rate: 0.15 kBaud to 115.2kBaud - Max. number of partners: ASCII, RTX/ETX, 3964R: 1 Modbus: 256 Stationen, USS: 64 Stationen - Protocol: ASCII, STX/ETX, 3964R, USS_{Master}, Modbus $ASCII_{Master}$/RTU_{Master}
Battery buffer / clock	Lithium battery, 30 days buffer / yes
Bit memory byte / Timer / Counter Number of blocks	8192 / 512 / 512 FBs 1024, FCs 1024, DBs 2047
Measurements and Weight	
Measurements (HxWxL) in mm Weight in g	40x125x120 290

CPU 315SN/NET

Electrical Data	VIPA 315-4NE11
Supply voltage Current consumption Output current to backplane bus	DC 24V max. 1A max. 3A
Status display (LEDs)	via LEDs at the front
Memory External memory	2MB (50% Data / 50% Code) MMC (Memory Card)
Slots / Interfaces: MP^2I	 MPI: 8 static / 8 dynamic connections (max. 1.5MBaud) RS232: 38.4kBaud (only via green cable from VIPA)
RJ45 PG/OP channel	PG/OP channel via Ethernet with max. 2 connections
RS485	Configurable functionality via project engineering: *deactivated* *Profibus DP communication* - Transfer rate: 9.6kBaud to 12MBaud - Max. number of partners: 32 stations in every segment without repeater, with Repeater expandable to 126. - Protocol: DP-V0, DP-V1, PG/OP Communication *PtP Communication* - Transfer rate: 0.15kBaud to 115.2kBaud - Max. number of partners: ASCII, RTX/ETX, 3964R: 1 Modbus: 256 Stationes, USS: 64 Stationes - Protokoll: ASCII, STX/ETX, 3964R, USS_{Master}, Modbus $ASCII_{Master}$/RTU_{Master}
RJ45-Ethernet	Twisted-Pair-Ethernet for CP Communication: - Transfer rate: 10/100MBit - Total length: max. 100m per Segment - PG/OP channel: 8 - Configurable connections: 8
Battery buffer / clock	Lithium battery, 30 days buffer / yes
Bit memory byte / Timer / Counter Number of blocks	8192 / 512 / 512 FBs 1024, FCs 1024, DBs 2047
Measurements and Weight	
Measurements (BxHxT) in mm Weight in g	80x125x120 430

CPU 314ST/DPM
CPU 314ST/PtP

Electrical Data	VIPA 314-6CF01 / VIPA 314-6BF01
Power supply Current consumption Output current to backplane bus	DC 24V max. 1.5A max. 5A (Standard + SPEEDbus)
Status display (LEDs)	via LEDs at the front
Memory External Memory	2MB (50% Data / 50% Code) MMC (Memory Card)
Slots / Interfaces: MP^2I RJ45 PG/OP channel RS485	 MPI: 8 static / 8 dynamic connections (max. 1.5MBaud) RS232: 38.4kBaud (only via Green Cable from VIPA) PG/OP channel via Ethernet with max. 2 connections Configurable functionality via project engineering: *deactivated* *Profibus DP Communication (not VIPA 314-6BF01)* - Transfer rate: 9.6kBaud to 12MBaud - Max. number of partners: 32 stations in every segment without repeater, with Repeater expandable to 126. - Protocol: DP-V0, DP-V1, PG/OP Communication *PtP Communication* - Transfer rate: 0.15kBaud to 115.2kBaud - Max. number of partners: ASCII, RTX/ETX, 3964R: 1 Modbus: 256 Stationes, USS: 64 Stationes - Protokoll: ASCII, STX/ETX, 3964R, USS_{Master}, Modbus $ASCII_{Master}/RTU_{Master}$
SPEEDbus - Data rate - Current consumption	 40MByte/s 400mA
Battery buffer / clock	Lithium battery, 30 days buffer / yes
Bit memory byte / Timer / Counter Number of blocks	8192 / 512 / 512 FBs 1024, FCs 1024, DBs 2047

Digital Input	DI 8 ... 16xDC24V alarm capable
Nominal input voltage Signal voltage "0" / "1" 2wire BERO all. neg. bias: Input current Dissipation power Isolation	DC 24V (18 ... 28.8V) 0 ... 5V / 15 ... 28.8V 1.5mA typ. 7mA 3.5W 500Veff (field voltage - backplane bus)

Continued ...

... Continue Technical Data

Digital Output	DO8...0xDC 24V, 0.5A							
Nominal load voltage No-load current consumption at L+ Output current per channel Isolation	DC 24V (20.4 ... 28.8V) from ext. power supply 30mA (all A.x=off) 0.5A short-circuit proof in groups per 8, 500Veff (field voltage - backplane bus)							
Analoge Ein-/Ausgabe	AI 4x12Bit / AO 2x12Bit / AI 1xPt100							
Number of Current-/Voltage input Number of resistance input Number of outputs Length of cable: shielded	4 1 2 200m							
Voltages, Currents, Potentials								
Supply voltage - reverse polarity protection Constant current for resistance sensor Isolation - channel / backplane (SPEEDbus) - channel / power supply electronic - between the channels Permitted potential difference - between the inputs (U_{CM}) - between the inputs and $M_{INTERNAL}$ (U_{ISO}) Isolation tested with Current consumption - from the backplane bus - from the power supply L+ Power dissipation of the module	DC 24V yes 1.25mA yes yes no DC 4V DC 75V / AC 60V DC 500V 90mA 60mA (without load) 2W							
Analog value calculation input	Conversion time/Resolution (per channel)							
Measuring principle	Sigma-delta							
Parameterizable	yes							
Conversion rate (Hz)	200	170	120	60	30	15	7.5	3.7
Integration time (ms)	5	6	8	17	33	67	133	270
Basic conversion time (ms)	7	8	10	19	35	69	135	272
Resolution (Bit) incl. overrange	10	12	14	15	16	16	16	16
Noise suppression for frequency f1 (Hz)	no				50 and 60Hz			
Basic execution time of the module, in ms (all channels enabled)	28	32	40	76	140	276	540	1088
Smoothing of the measured values	none							
Analog value calculation output channels								
Resolution (incl. overrange) ±10V, ±20mA 4 … 20mA 0 ... 10V, 0 ... 20mA Conversion time (per channel)	 11Bit + sign 10Bit 11Bit 1.5ms							
Settling time - impedance load - capacitive load - inductive load	 0.3ms 1.0ms 0.5ms							

Continued ...

... Continue Technical data

Suppression of interference, limits of error input channels		
Noise suppression for f=n x (f1 ±1%) (f1=interference frequency, n=1,2,...)		
Common-mode interference (U_{CM} < 5V)	> 80dB	
Series-mode noise (peak value of noise < nominal value of input range)	> 80dB	
Crosstalk between the inputs	> 50dB	
Operational limit (only valid to 120W/s) (in the entire temperature range, referring to input range)		
	Measuring range	Tolerance
voltage input	0 ... 10V	±0.4%
current input	±20mA	±0.3%
	0 ... 20mA	±0.6%
	4 ... 20mA	±0.8%
Resistor	0 ... 600Ω, 0 ... 3kΩ	±0.4%
Resistance thermometer	Pt100, Pt1000	±0.4%
	Ni100, Ni1000	±1.0%
Basic error limit (only valid to 120W/s) (during temperature is 25°C, referring to input range)		
Voltage input	1 .. 5V	±0.5%
	0 ... 10V	±0.3%
Current input	±20mA	±0.2%
	0 ... 20mA	±0.4%
	4 ... 20mA	±0.5%
Resistors	0 ... 600Ω	±0.2%
Resistance thermometer	Pt100, Pt1000	±0.5K
	Ni100, Ni1000	±0.5K
Temperature error (with reference to the input range) measuring current		±0.005%/K ±0.015%/K
Linearity error (with reference to the input range)		±0.02%/K
Repeatability (in steady state at 25°C referred to the input range)		±0.05%/K
Suppression of interference, limits of error output channels		
Crosstalk between the outputs	> 40dB	
Operational limit (in the entire temperature range, referring to input range)		
	Measuring range	Tolerance
Voltage output	±10V	±0.4%[1)]
	0 ... 10V	±0.6%[1)]
Current output	±20mA	±0.3%[2)]
	0 ... 20mA	±0.6%[2)]
	4 ... 20mA	±0.8%[2)]

Continued...

... Continue Technical data

Basic error limit (during temperature is 25°C, referring to input range)		
	Measuring range	Tolerance
Voltage output	0 ... 10V	±0.3%[1)]
	±10V	±0.2%[1)]
Current output	±20mA	±0.3%[2)]
	0 ... 20mA	±0.4%[2)]
	4 ... 20mA	±0.5%[2)]
Temperature error (with reference to the output range)	±0.01%/K	
Linearity error (with reference to the output range)	±0.05%	
Repeatability (in steady state at 25°C referred to the output range)	±0.05%	
Output ripple; range 0 to 50kHz (referred to output range)	±0.05%	
States, Alarms, Diagnostic		
Diagnostic alarm	parameterizable	
Diagnostic functions		
- Sum error monitor	red LED (SF)	
- Diagnostic information readable	possible	
Substitute value can be applied	yes	
Data for choosing an encoder		
Voltage input		
±10V, 0 ... 10V	120kΩ	
Current input		
±20mA, 0 ... 20mA, 4 ... 20mA	33Ω	
Resistors		
0...600Ω	10MΩ	
Resistance thermometer		
Pt100, Pt1000, Ni100, Ni1000	10MΩ	
Maximum input voltage for voltage input (destruction limit)	25V	
Maximum input current for current input (destruction limit)	30mA	
Connection of the sensor		
- For measuring voltage	yes	
- For measuring current		
as 2wire transmitter	possible with external power supply	
as 4wire transmitter	yes	
- For measuring resistance		
with 2conductor connection	yes	
Characteristic linearization for Resistance thermometer	Pt100, Pt1000, Ni100, Ni1000	

Continued ...

... Continue Technical data

Data for choosing an actuator	
Output ranges (rated values) - Voltage - Current	 0 ... 10V, ±10V 4 ... 20mA, 0 ... 20mA, ±20mA
Load resistance (in nominal range of the output) - At voltage outputs capacitive load - At current output Inductive load	 min. 1kΩ max. 1µF max. 500 Ω max. 10 mH
Voltage outputs - Short-circuit protection - Short-circuit current	 yes max. 31mA
Current outputs - No-load voltage	 max. 13V
Destruction limit against voltages/currents applied from outside - Voltage at outputs to M_{ANA} - Current	 max. 15V max. 30mA
Connection of actuators - for voltage output - for current output	 2conductor connection 2conductor connection
Dimensions and weight	
Dimensions (WxHxD) in mm Weight	80x125x120 450g

[1] The error limits are measured with a load of R=1GΩ. For voltage output the output impedance is 50Ω.
[2] The error limits are measured with a load of R=10Ω.

CPU 317SE/DPM

Electrical Data	VIPA 317-2AJ11
Power supply Current consumption Output current to backplane bus	DC 24V max. 1.5A max. 5A (Standard + SPEEDbus)
Status display (LEDs)	via LEDs at the front
Memory External Memory	2MB (50% Data / 50% Code) MMC (Memory Card)
Slots / Interfaces: MP^{2}I RJ45 PG/OP channel RS485	 MPI: 8 static / 8 dynamic connections (max. 1.5MBaud) RS232: 38.4kBaud (only via Green Cable from VIPA) PG/OP channel with max. 2 connections Configurable functionality via project engineering: *deactivated* *Profibus DP Communication (not VIPA 314-6BF01)* - Transfer rate: 9.6kBaud to 12MBaud - Max. number of partners: 32 stations in every segment without repeater, with Repeater expandable to 126. - Protocol: DP-V0, DP-V1, PG/OP Communication *PtP Communication* - Transfer rate: 0.15kBaud to 115.2kBaud - Max. number of partners: ASCII, RTX/ETX, 3964R: 1 Modbus: 256 Stationes, USS: 64 Stationes - Protokoll: ASCII, STX/ETX, 3964R, USS_{Master}, Modbus $ASCII_{Master}$/RTU_{Master}
SPEEDbus - Data rate - Current consumption	 40MByte/s 400mA
Batteriepufferung / Uhr	Lithium battery, 30 days buffer / yes
Bit Memory Byte / Timer / Counter Number of blocks	8192 / 512 / 512 FBs 1024, FCs 1024, DBs 2047
Profibus Interface	
Interface Transfer rate Total length Max. number of partners Protocol	RS485 9.6kBaud to 12MBaud without repeater 100m at 12Mbaud with repeater up to 1000m 32 stations in every segment without repeater with Repeater expandable to 126. DPV0, PG/OP communication
Measurements and Weight	
Measurements (BxHxT) in mm Weight in g	80x125x120 420

CPU 317SN/NET

Elektrical Data	VIPA 317-4NE11
Power supply Current consumption Output current to backplane bus Status display (LEDs)	DC 24V max. 1.5A max. 5A (Standard + SPEEDbus) via LEDs at the front
Memory	2MB (50% Data / 50% Code)
External memory	MMC (Memory Card)
Slots / Interfaces: MP²I   RJ45 PG/OP channel RS485

Chapter 3 Deployment of the CPU 31xS

Overview

This chapter describes the employment of a CPU 31xS with SPEED7 technology in the System 300. The description refers directly to the CPU and to the employment in connection with peripheral modules that are mounted on a profile rail together with the CPU and are connected with each other via the backplane bus.

The chapter starts with information about assembly and usage of the CPU like employment of the different interfaces, operating states and the overall reset. Another part is the parameterization and the project engineering in association with peripheral modules.

The chapter closes with tips for the usage of the test functions.

The following text describes

- Basics to assembly and operation of the CPU
- Start-up behavior and addressing
- Access to the website via Ethernet-PG/OP channel
- Project engineering and parameterization
- Operating modes and Overall Reset
- Switch RS485 to PtP communication
- Firmware update and know how protection
- test functions for controlling and monitoring variables

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Note!

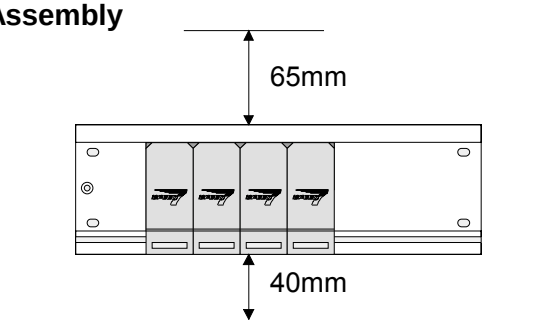
This information is valid for all the CPUs described in this manual, since the back panel communication between the CPU and the peripheral modules is the same for all models of CPU!

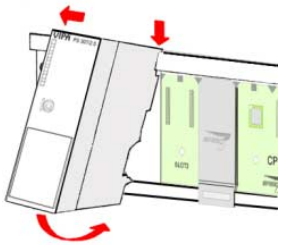
Assembly SPEEDbus

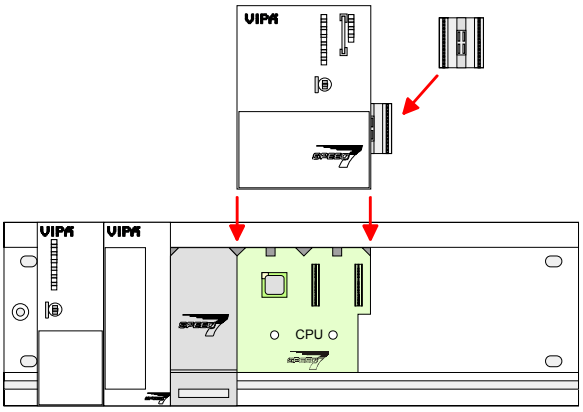
Pre-converted SPEEDbus profile rail

For the employment of SPEEDbus modules a pre-converted SPEEDbus trailing socket required. This is available ready mounted on a profile rail with 2, 6, 10 or 16 extension sockets.

Assembly



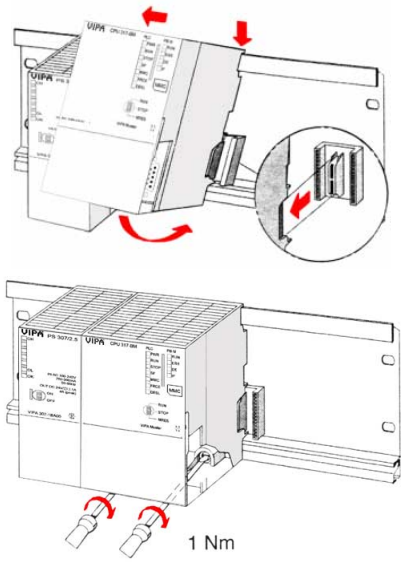




- At the assembly, please regard the permissible environment temperatures:
  - horizontal assembly: 0 to 60°C
  - vertical assembly: 0 to 40°C
- Install the profile rail so that at least 65mm space are left above and 40mm below.
- Take care for a low-impedance connection between profile rail and subsoil and connect the profile rail with the ground wire via the dowel pin (min. 10mm^2) .
- Mount the power supply left of the SPEEDbus.
- To install SPEEDbus modules you put them between the triangular positioning helps of a slot labeled with "SLOT ..." and push them downwards.
- Only "SLOT1 DCDC" allows to mount an additional power supply instead of a SPEEDbus module.
- If also standard modules shall be plugged, take a System 300 bus connector and stick it like shown to the CPU from the backside. When operating the SPEED7-CPU exclusively at the SPEEDbus this is not required.
- Put the CPU like shown between the triangular positioning helps of the slot labeled with "CPU SPEED7" and push it downward.
- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.

Assembly without SPEEDbus profile rail

Approach



- The assembly and grounding of the standard bus rail happens similar to that of the SPEEDbus.
- Hang the power supply into position and push it to the left to app. 5mm before the grounding bolt of the profile rail.
- Take a bus connector and stick it to the CPU from the backside like shown.
- Mount the CPU at the right side of the power supply.
- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.
- Bolt all modules.

More details see chapter "Cabling and installation specifications"

Danger!

- The power supplies must be released before installation and repair tasks, i.e. before handling with the power supply or with the cabling you must disconnect current/voltage (pull plug, at fixed connection switch off the concerning fuse)!
- Installation and modifications only by properly trained personnel!

Start-up behavior

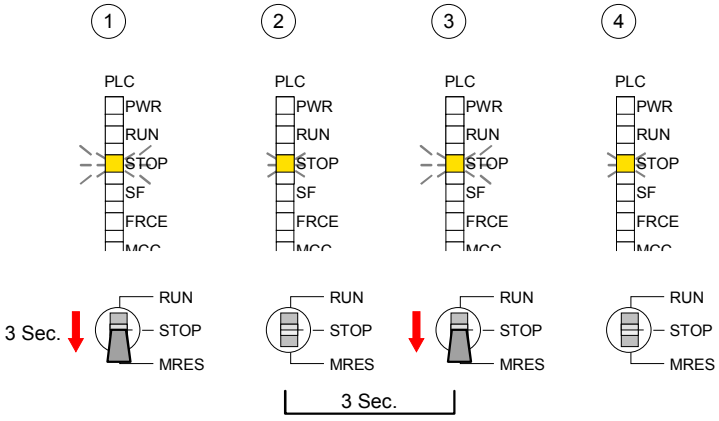
Turn on power supply

After the power supply has been switched on, the CPU changes to the operating mode the operating mode lever shows.

Now you may transfer your project to the CPU via MPI from your configuration tool res. plug in a MMC with your project and run an OVERALL_RESET.

OVERALL_RESET

The following picture shows the approach once more:



Note!

The transfer of the application program from the MMC into the CPU takes always place after an OVERALL_RESET!

Default boot procedure, as delivered

When the CPU is delivered it has been reset.

After a STOP→RUN transition the CPU switches to RUN without program.

Boot procedure with valid data in the CPU

The CPU switches to RUN with the program stored in the battery buffered RAM.

Boot procedure with empty battery

The accumulator/battery is automatically loaded via the integrated power supply and guarantees a buffer for max. 30 days. If this time is exceeded, the battery may be totally discharged. This means that the battery buffered RAM is deleted.

In this state, the CPU executes an OVERALL_RESET. If a MMC is plugged, program code and data blocks are transferred from the MMC into the work memory of the CPU.

If no MMC is plugged, the CPU transfers permanent stored "protected" blocks into the work memory if available.

Information about storing protected blocks in the CPU is to find in this chapter under "Extended Know-how protection".

Depending on the position of the RUN/STOP lever, the CPU switches to RUN res. remains in STOP.

This event is stored in the diagnostic buffer as: "Start OVERALL_RESET automatically (unbuffered POWER_ON)".

Addressing

Overview

To provide specific addressing of the installed peripheral modules, certain addresses must be allocated in the CPU.

At the start-up of the CPU, this assigns automatically peripheral addresses for digital in-/output modules starting with 0 and ascending depending on the slot location.

If no hardware project engineering is available, the CPU stores at the addressing analog modules to even addresses starting with 256.

Modules at the SPEEDbus are also taken into account at the automatic address allocation. Here the digital I/Os are stored beginning with address 128 and analog I/Os, FMs and CPs beginning with address 2048.

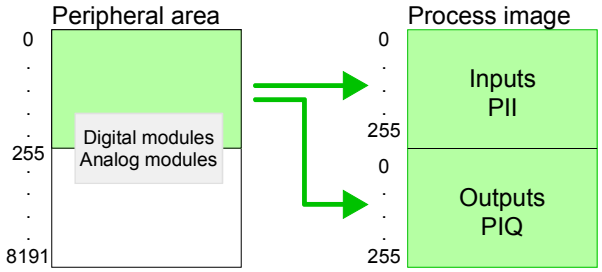
Addressing Backplane bus Periphery

The SPEED7-CPU provides a peripheral area (address 0 ... 8191) and a process image of the in- and outputs (each address 0 ... 255).

The process image stores the signal states of the lower address (0 ... 255) additionally in a separate memory area.

The process image this divided into two parts:

- process image to the inputs (PII)
- process image to the outputs (PIQ)



The process image is updated automatically when a cycle has been completed.

Up to 32 modules in one row

In the hardware configurator from Siemens you may parameterize maximum up to 8 modules per row. At employment of SPEED7-CPUs you may control up to 32 modules at the standard bus and 16 further modules at the SPEEDbus. CPs and DP masters that are additionally virtual configured at the standard bus are taken into the count of 32 modules at the standard bus.

For the project engineering of more than 8 modules you may use virtual line interface connections. For this you set in the hardware configurator the module IM 360 from the hardware catalog to slot 3 of your 1st profile rail. Now you may extend your system with up to 3 profile rails by starting each with a IM 361 from Siemens at slot 3.

Alter address allocation by project engineering

You may change the automatic address allocation at any time by using the hardware configurator from Siemens. For the employment of the System 300S modules from VIPA at the SPEEDbus the integration of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is required. The modules are configured as a virtual Profibus system. For the project engineering the CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) is used. CPs res. DP master at the SPEEDbus are configured and connected as CP 343-1 res. CP342-5 from Siemens after the really plugged modules at the standard bus.

Additionally as last module you have to add a DP master (CP342-5 from Siemens) as last module. Include for every module at the SPEEDbus the SPEEDbus slave system from VIPA.

As Profibus address you set the slot number and place the according SPEEDbus module to the single slot 0.

Attention!

Please take care not to configure a double address assignment at connection via external Profibus-DP masters - required for project engineering of a SPEEDbus system! At external DP master systems, the Siemens hardware configurator does not execute an address check!

Automatic addressing

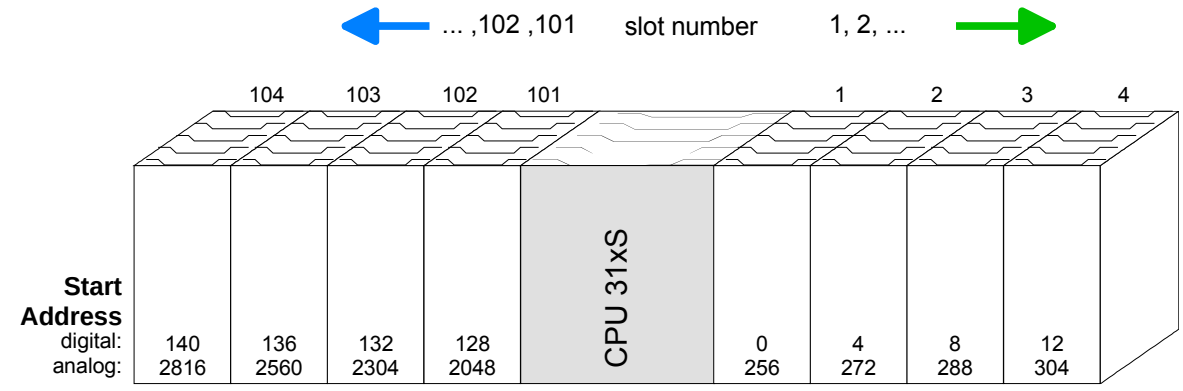
You may access the modules with read res. write accesses to the peripheral bytes or the process image.

At the automatic address allocation DIOs occupy depending on the slot location always 4Byte and AIOs, FMs, CPs always 16Byte at the standard bus and 256Byte at the SPEEDbus.

Depending on the slot location the start address from where on the according module is stored in the address range is calculated with the following formulas:

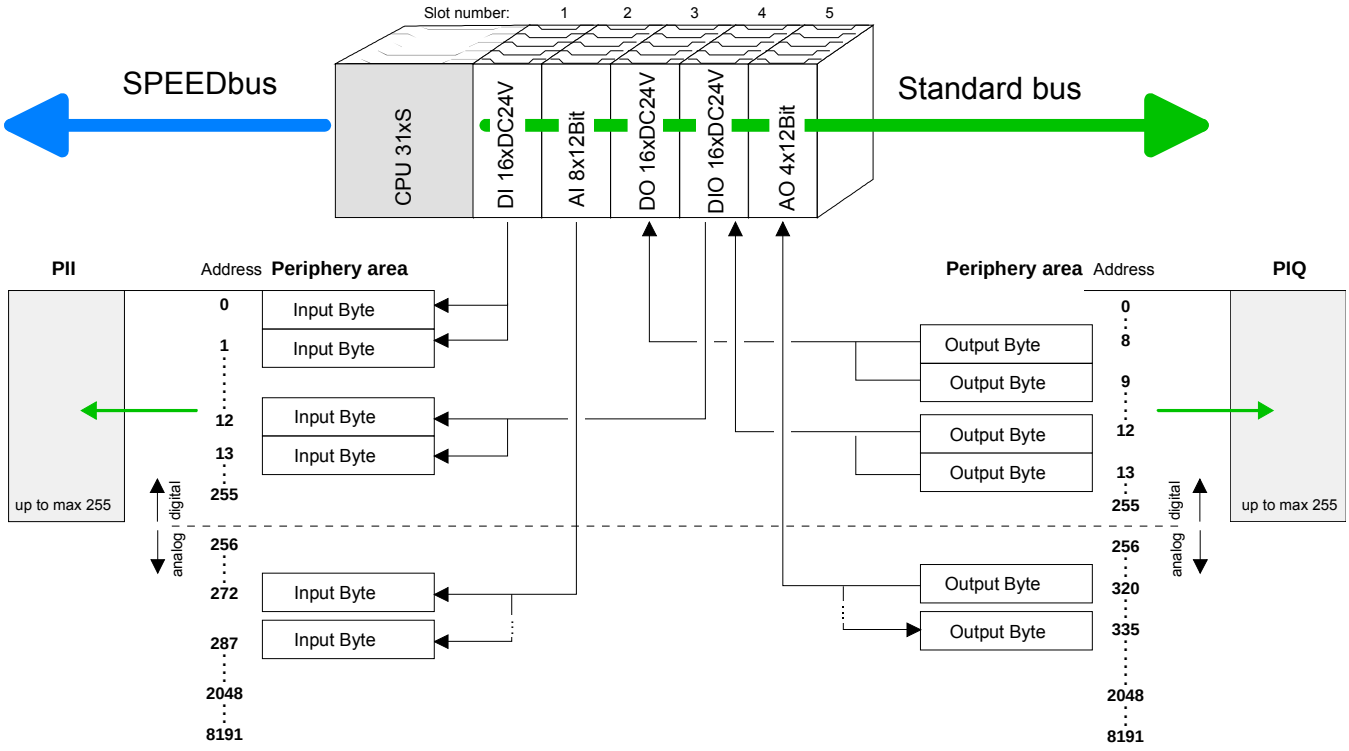
Standard bus	DIOs:	Start address = 4·(slot -1)
	AIOs, FMs, CPs:	Start address = 16·(slot -1)+256
SPEEDbus	DIOs:	Start address = 4·(slot -101)+128
	AIOs, FMs, CPs:	Start address = 256·(slot -101)+2048

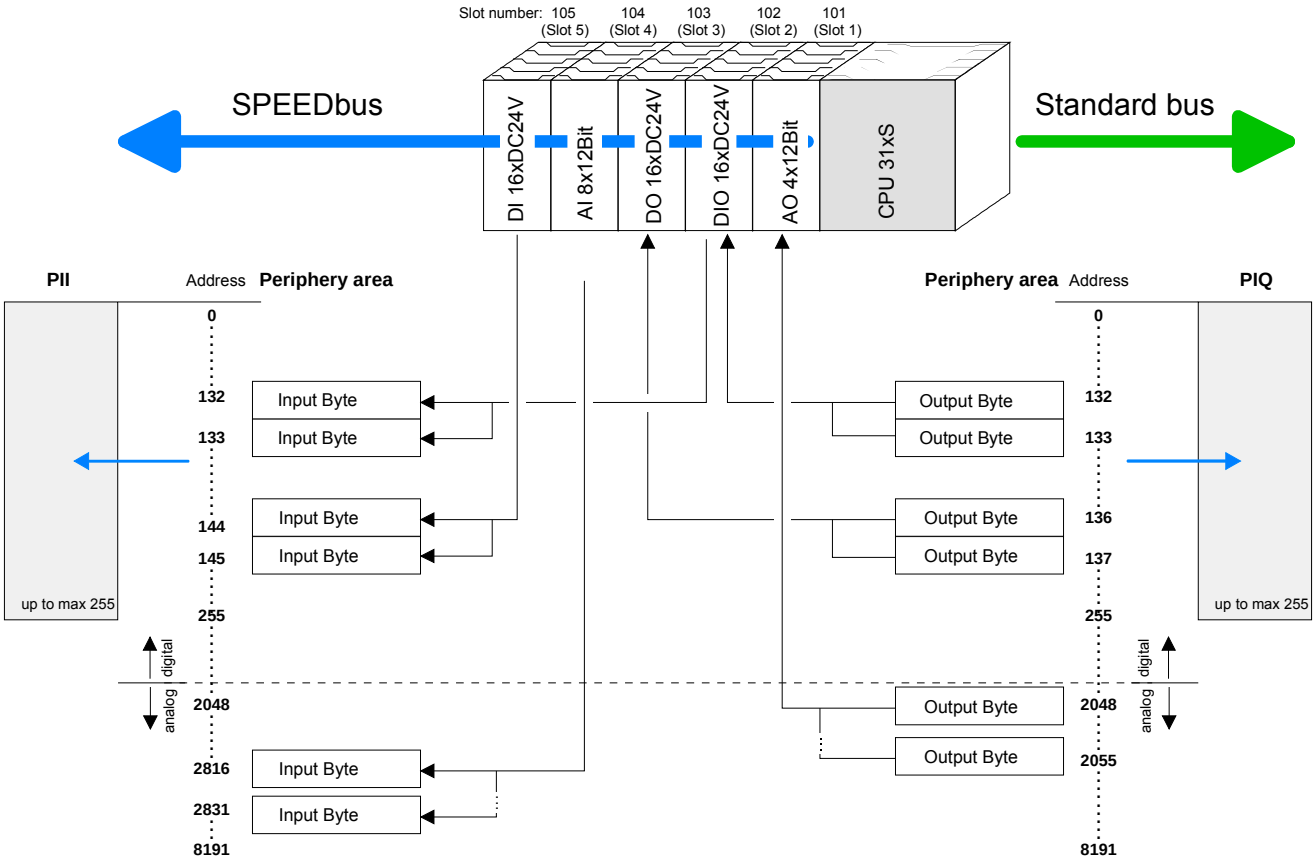
All information to this you may find in the following illustration:



Example for automatic address allocation

The following sample shows the functionality of the automatic address allocation separated for standard bus and SPEEDbus:





Access to Ethernet-PG/OP channel and website

Overview

Every CPU 31xS has an integrated Ethernet-PG/OP channel. This channel allows you to program and remote control your CPU with up to 2 connections.

The PG/OP channel also gives you access to the internal website that contains information about firmware version, connected periphery, current cycle times etc.

The PG/OP access requires that the CPU contains a hardware project engineering (minimal project) where IP address and subnet mask for the CP are defined.

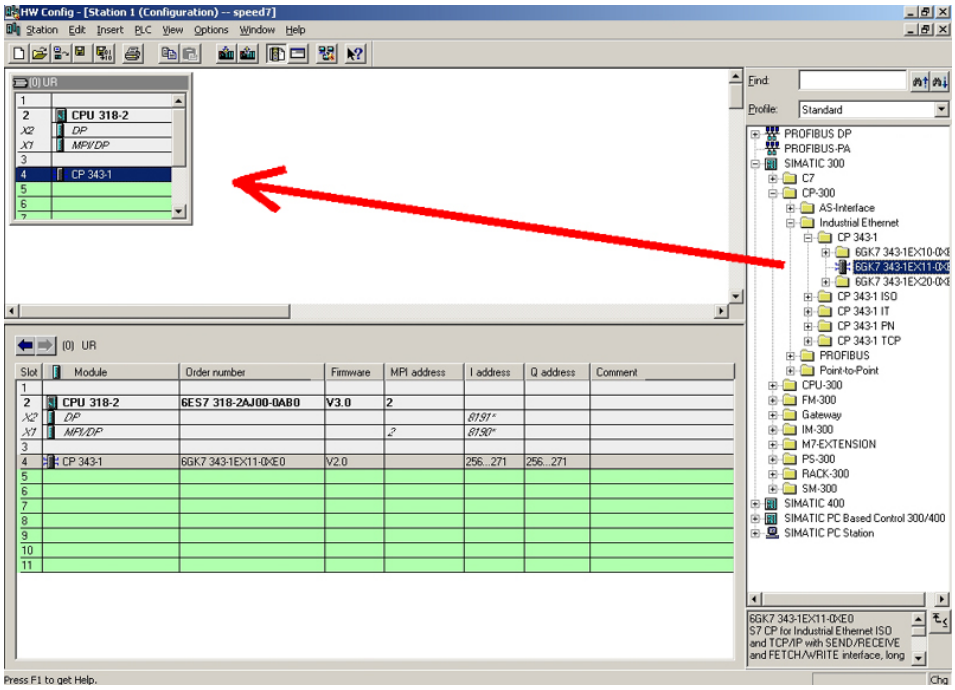
Requirements

For the hardware configuration the following software is necessary:

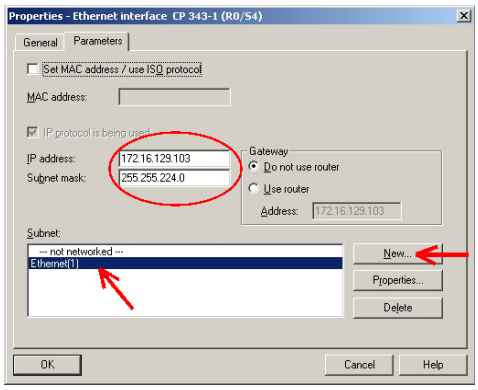
- SIMATIC Manager from Siemens V. 5.1 or higher
- SIMATIC NET

Approach

- Start the SIMATIC Manager from Siemens and create a new project.
- Add a new System 300 station via **Insert** > *Station* > *SIMATIC 300-Station*.
- Activate the station "SIMATIC 300" and open the hardware configurator by clicking on "Hardware".
- Engineer a rack (SIMATIC 300 \ Rack-300 \ Profile rail)
- For the SPEED7-CPUs are configured as CPU 318-2, choose the CPU 318-2 with the order no. 6ES7 318-2AJ00-0AB0 V3.0 from the hardware catalog. You'll find this under SIMATIC 300 \ CPU 300 \ CPU 318-2.
- Include the CP 343-1EX11 at slot 4 (SIMATIC 300 \ CP 300 \ Industrial Ethernet \ CP 343-1).



- Type the wanted IP address and subnet mask into the dialog window and connect the CP with "Ethernet"



- Save and compile your project.
- Transfer your project via MPI or MMC into your CPU.

Project transfer

There are 2 possibilities for the transfer of your project into the CPU:

- Transfer via MP²I
- Transfer via MMC at deployment of a MMC reading device

Transfer via MP²I and Green Cable

- Change to the SIMATIC Manager from Siemens.
- Choose **Options** > *Set PG/PC interface*

  → A dialog window opens where you may configure the MPI interface you want to use.
- Choose the "PC Adapter (MPI)" from the selection list; where appropriate you have to add this first. Click on [Properties].
- Select the wanted COM port in the register "Local Port" and set the transfer rate 38400Baud.
- Connect your PC via MP²I with your CPU and transfer your project.

Transfer via MMC

As external storage medium a MMC (**Mem**ory **C**ard) is employed. The MMC is available at VIPA preformatted with the FAT16 PC file system.

- Create a new wld-file via **File** > *Memory Card file* > *New* and use the mouse to drag the system data case into the window of the wld-file.
- Copy the wld-file with the help of a reading device to the MMC and rename the file to S7PROG.WLD.
- Insert the MMC in your CPU and execute an overall reset. This causes a transfer of the data from the MMC into the battery-buffered RAM of the CPU.

Note!

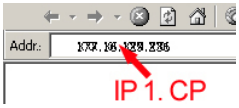
More information about transfer methods is to find in the chapter "Project transfer".

Access to the PG/OP channel

Connect your project engineering-PC and your CPU via the Ethernet-PG/OP socket. Adjust the following settings in the Siemens SIMATIC Manager under **Options** > *PG/PC interface*...: TCP/IP -> network card...Protocol RFC 1006

Now you can access the PG/OP channel via your project.

Website



The PG/OP channel provides a website that you may access via an internet browser. The access takes place via the IP address of the CP 343-1EX11 that has to be present as hardware project engineering in the CPU like mentioned above. The website only serves for information output. The monitored values are not alterable.

Order no. of the CPU

VIPA 317-2AJ10

CPU:
Name, Firmware-Vers, Hardware-Vers., Package information for support purposes
Ethernet-PG/OP: IP-Addr. and subnet mask

CPU with Ethernet-PG/OP V1.0.5 , Px000006.pkg, PRODUCT V1050, HARDWARE V0112, Bx000152 V3620, Ax000055 V1030, Ax000056 V0016
IP-Address : 172.16.129.236, SubnetMask : 255.255.224.0 ,

CPU status info
CPU cycle time:
min= minimum
cur= current
max= maximum

FlashFileSystem : V012
Cpu state : Run
Cycle time [microseconds] : min=546 cur=1880 ave=597 max=5011

Additional CPU components:
Slot201 (DP master)
Name, Firmware-Version, Package and information for support purposes
Slot202 (CP343 or I/O*)
Name, Firmware-Version, Package and information for support purposes

CPU internal
Slot 201
VIPA 742-1DA00 V1.0.3 Px000003.pkg, PRODUCT V1030, BB000154 V4110, AB000051 V3020, AB000049 V30599,
ModuleType CB2C0010
Cycletime [microseconds] : min=65535000 cur=0 ave=0 max=0
Slot 202
VIPA 314-6CF01 PRF V1.0.0 Px000014.pkg, BB000156 V0024, AB000062 V0021, PRODUCT V1000,
ModuleType 8400000

Modules at SPEEDbus:
Slot-No, Name, Firmware-Vers, Package and information for support purposes

SPEEDbus
Slot 101
VIPA 342-7CA00 V1.0.7 Px000015.pkg, PRODUCT V1070, BB000132 V1070, AB000051 V3020, AB000049 V3050,
ModuleType 4CC00020
Cycletime [microseconds] : min=0 cur=0 ave=0 max=0

Modules at Standard bus:
Slot-No, modules type-Code and description

Standard bus
Slot 4 : ModuleType AFD8 : Digital Output 32
Slot 5 : ModuleType 15C5 : Analog Input 8
Slot 6 : ModuleType 9FC3 : Digital Input 32
Slot 7 : ModuleType 9FC3 : Digital Input 32

*) At CPU 31xST with digital and analog I/Os

Project engineering

Overview

For the project engineering of a SPEED7 system please follow this approach:

- Project engineering of the SPEED7-CPU and the internal DP master (if existing) as CPU 318-2DP (318-2AJ00-0AB00)
- Project engineering of the real plugged modules at the standard bus
- Project engineering of the internal Ethernet-PG/OP channel after the real plugged modules as virtual CP 343-1 (Setting of IP address, subnet mask and gateway for online project engineering)
- Project engineering of an internal CP343 (if existing) as 2nd CP 343-1
- Project engineering and connection of the SPEEDbus-CPs res. -DP master as CP 343-1 (343-1EX11) res. CP 342-5 (342-5DA02 V5.0)
- Project engineering of all SPEEDbus modules as single DP slaves in a virtual DP master module (speedbus.gsd required)

Fast introduction

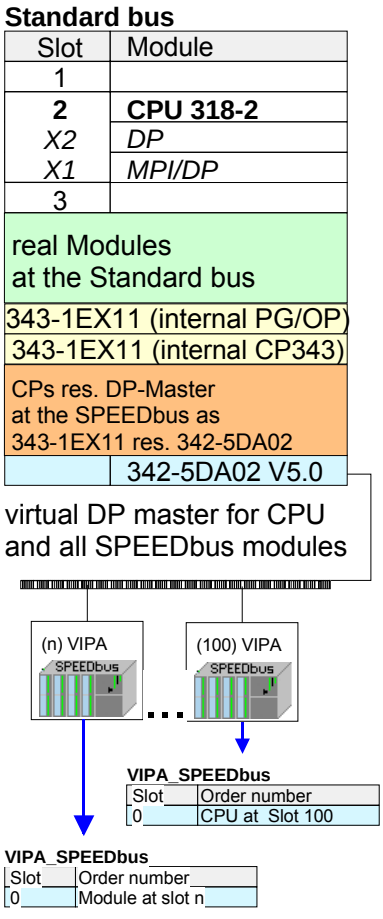
For the employment of the System 300S modules from VIPA at the SPEEDbus the inclusion of the System 300S modules via the GSD-file from VIPA in the hardware catalog is required.

To be compatible with the STEP®7 project engineering tool from Siemens, you have to execute the following steps:

- Start the hardware configurator from Siemens and include the speedbus.gsd for SPEED7 from VIPA.
- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens. Configure a possibly existing internal DP master of your SPEED7-CPU via the internal DP master.
- Starting with slot 4, place the System 300 modules in the plugged sequence.
- Configure the internal PG/OP channel directly below the real plugged modules as virtual CP 343-1 (343-1EX11) with setting of IP address, subnet mask and gateway for access via Ethernet.

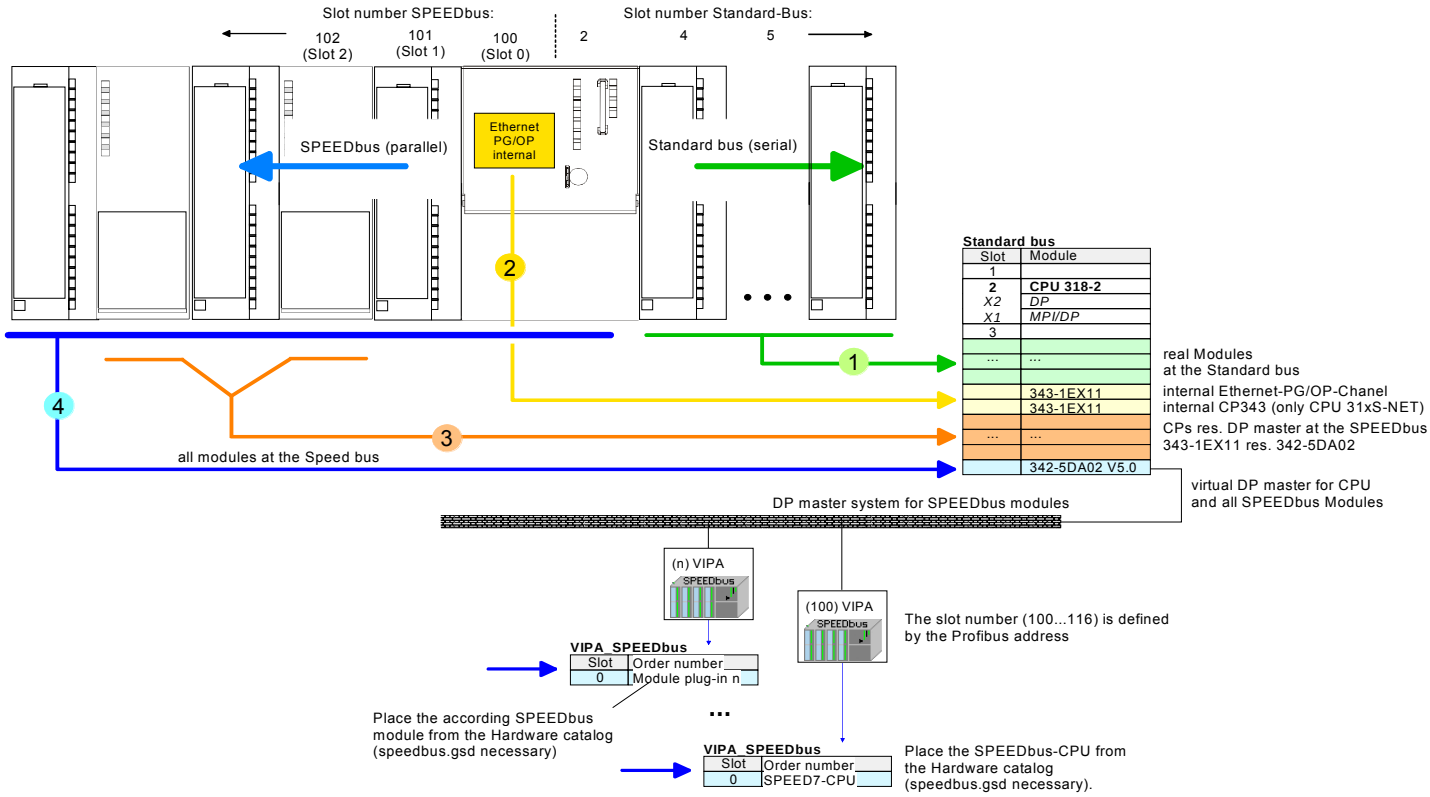
If your SPEED7-CPU has additionally integrated a CP 343, you must always configure and connect it as 2nd CP (343-1EX11).

- Project engineering and connection of the SPEEDbus-CPs res. –DP master at the standard bus as virtual CP 343-1 (343-1EX11) res. CP 342-5 (342-5DA02 V5.0)
- For the SPEEDbus you always include, connect and parameterize to the *operating mode* DP master the DP master CP 342-5 (342-5DA02 V5.0) as last module. To this master system you assign every SPEEDbus module as VIPA_SPEEDbus slave. Here the **Profibus address** corresponds to the **slot no**. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.



Sum overview

In the following the steps are summarized:



Preconditions

The hardware configurator is part of the SIMATIC Manager from Siemens. It serves the project engineering. The modules that may configured here are listed in the hardware catalog.

For the employment of the System 300S modules at the SPEEDbus you have to include the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA.

Note!

For the project engineering a thorough knowledge of the SIMATIC Manager and the hardware configurator from Siemens is required!

Include the SPEED7-GSD-file

- Browse to www.vipa.de > Service > Download > GSD- and EDS-Files > Profibus and select the file *Cx000023_Vxxx*.
- Extract the file to your work directory. The SPEEDbus.gsd is stored in the directory System_300S.
- Start the hardware configurator from Siemens.
- Close all projects.
- Select **Options** > *Install new GSD-file.*
- Navigate to the directory System_300S and select the **SPEEDBUS.GSD**

The modules of the System 300S from VIPA are now included in the hardware catalog at *Profibus-DP \ Additional field devices \ I/O \ VIPA_SPEEDbus*.

Overview

The project engineering of a SPEED7-CPU has the following components:

- *Project engineering of the CPU*

  Configure a CPU 318-2DP (318-2AJ00-0AB00 V3.0). If your SPEED7-CPU provides a DP master you may now connect it to Profibus and include your DP slaves.

- *Project engineering of the real plugged modules at the standard bus*

  Place the modules that are at the right side of the CPU on the standard bus starting with slot 4.

- *Project engineering of the integrated Ethernet-PG/OP channel*

  For the internal Ethernet-PG/OP channel you have to set as 1st module below the real plugged modules a CP 343-1 (343-1EX11).

- *Project engineering of the integrated CP343 (only CPU 31xSN/NET)*

  If your SPEED7-CPU has additionally an integrated CP343 you configure this also as CP 343-1 but always below the first configured CP 343-1.

- *Project engineering of all SPEEDbus-CPs and -DP master*

  Place and configure below the before configured internal components all CPs as 343-1EX11 and DP master as 342-5DA02 V5.0 that are at the SPEEDbus.

  Please regard that the sequence within a function group (CP res. DP master) corresponds to the sequence at the SPEEDbus from the right to the left.

- *Project engineering of the CPU and all SPEEDbus modules in a virtual master system*

  The slot assignment of the SPEEDbus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place as last module a DP master (342-5DA02 V5.0) with master system.

  Now include for the CPU and every module at the SPEEDbus the slave "vipa_speedbus". After the installation of the speedbus.gsd you may locate this under
  Profibus-DP \ *Additional field devices* \ *I/O* \ *VIPA_SPEEDbus*.

  As Profibus address you set the slot no. (100...116) of the module and place the according module to the single slot 0 of the slave system.

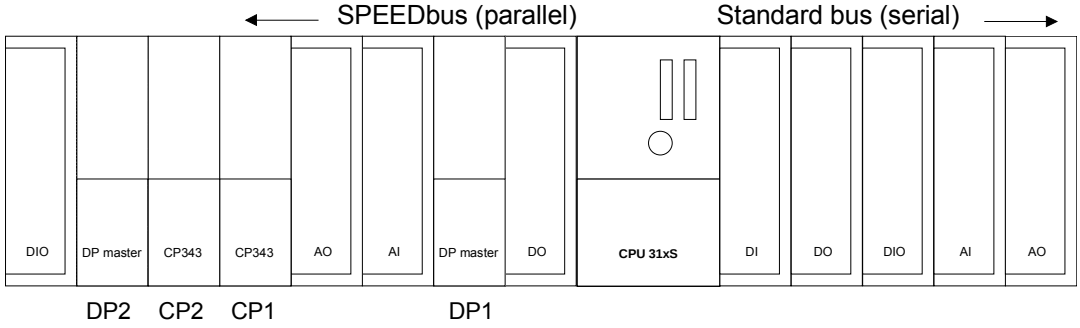
Steps of the project engineering

The following text describes the approach of the project engineering in the hardware configurator from Siemens at an abstract sample.

The project engineering is separated into 5 parts:

- Project engineering of the CPU
- Project engineering of the real plugged modules at the standard bus
- Project engineering of the PG/OP channel and CP343 (only CPU 31xSN/NET)
- Project engineering of all SPEEDbus-CPs and -DP master
- Project engineering of the SPEEDbus modules in a virtual master system

Hardware assembly



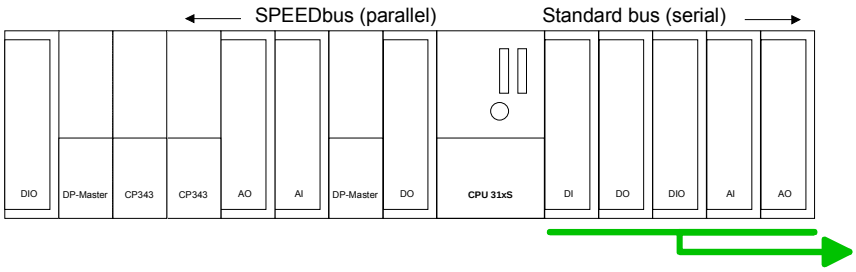
Project engineering of the CPU

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.
- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)
- If your SPEED7-CPU provides a DP master, you may now connect it to Profibus and include your DP slaves.

Project engineering of the modules at the Standard bus

The modules at the right side of the CPU at the Standard bus are configured with the following approach:

- Include your System 300 modules at the standard bus in the plugged sequence starting with slot 4.
- Parameterize the CPU res. the modules where appropriate. The parameter window opens by a double click on the according module.
- To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.



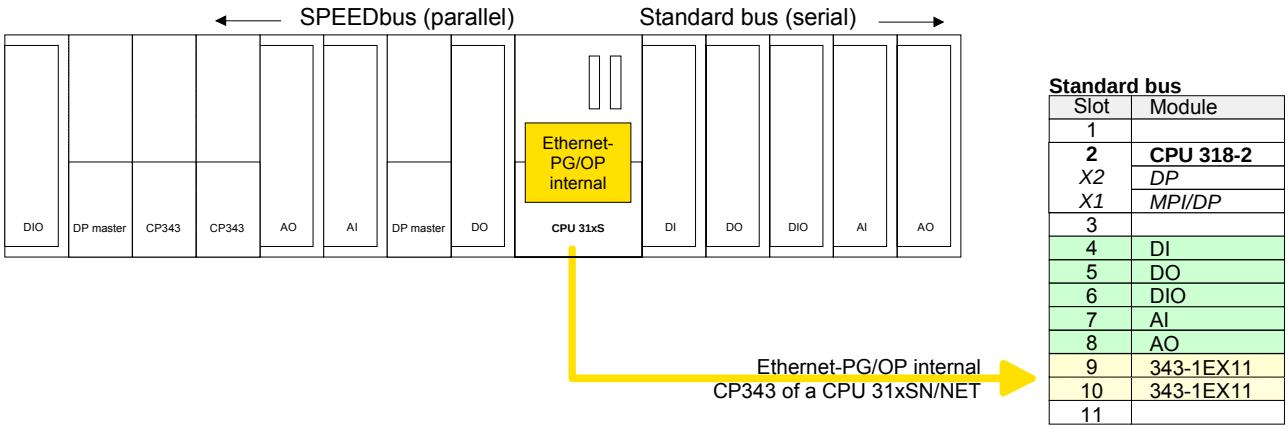
Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	
10	
11	

Project engineering Ethernet-PG/OP channel and CP343 (only CPU 31xSN/NET)

For the internal Ethernet-PG/OP channel that every SPEED7-CPU includes, you have to configure a Siemens CP 343-1 (343-1EX11) as 1st module below the real plugged modules.

If your SPEED7-CPU has additionally an integrated CP343 this is also configured as CP 343-1 but always below the before configured CP 343-1.



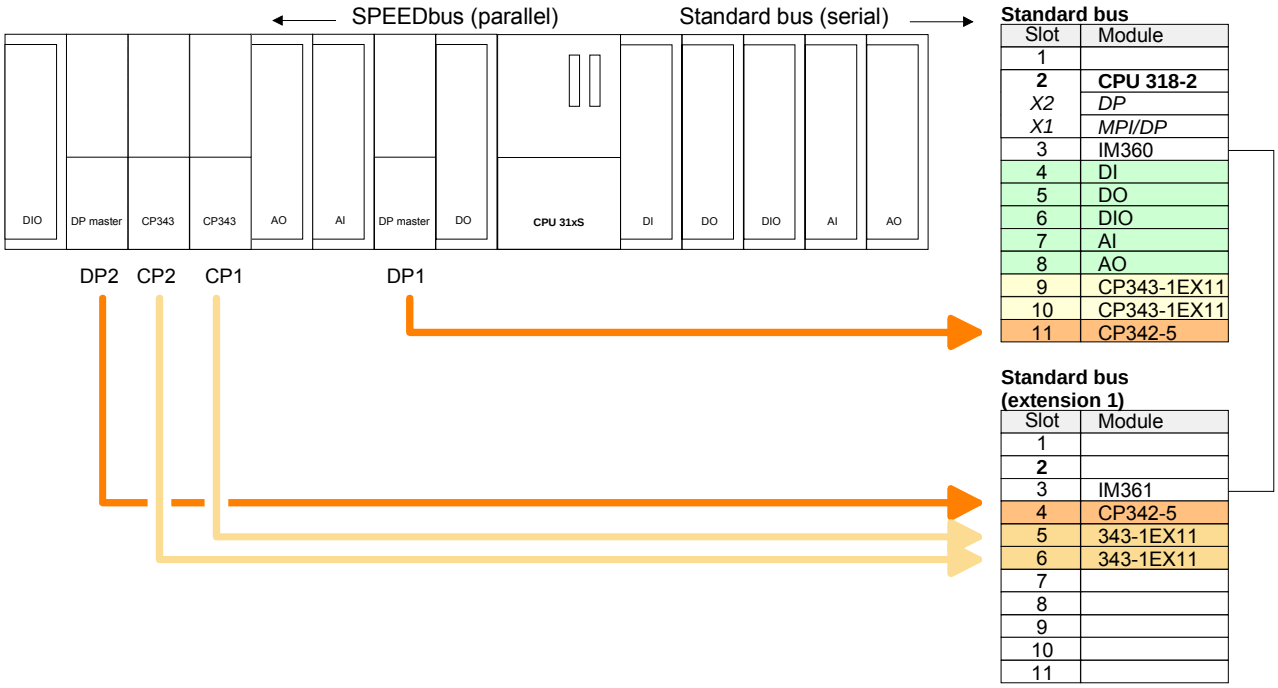
Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	343-1EX11
10	343-1EX11
11	

Project engineering of all SPEEDbus-CPs and -DP master

Place and connect below the before configured internal CPs all CPs as 343-1EX11 and DP master as 342-5DA02 V5.0 that are at the SPEEDbus.

Please regard that the sequence within a function group (CP res. DP master) corresponds to the sequence at the SPEEDbus from the right to the left.



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	IM360
4	DI
5	DO
6	DIO
7	AI
8	AO
9	CP343-1EX11
10	CP343-1EX11
11	CP342-5

Standard bus (extension 1)

Slot	Module
1	
2	
3	IM361
4	CP342-5
5	343-1EX11
6	343-1EX11
7	
8	
9	
10	
11	

Note!

The sequence of the DPM and CP function groups is irrelevant. You only have to take care to regard the sequence within a function group (DP1, DP2... res. CP1, CP2 ...).

Project engineering of all SPEEDbus modules in a virtual master system

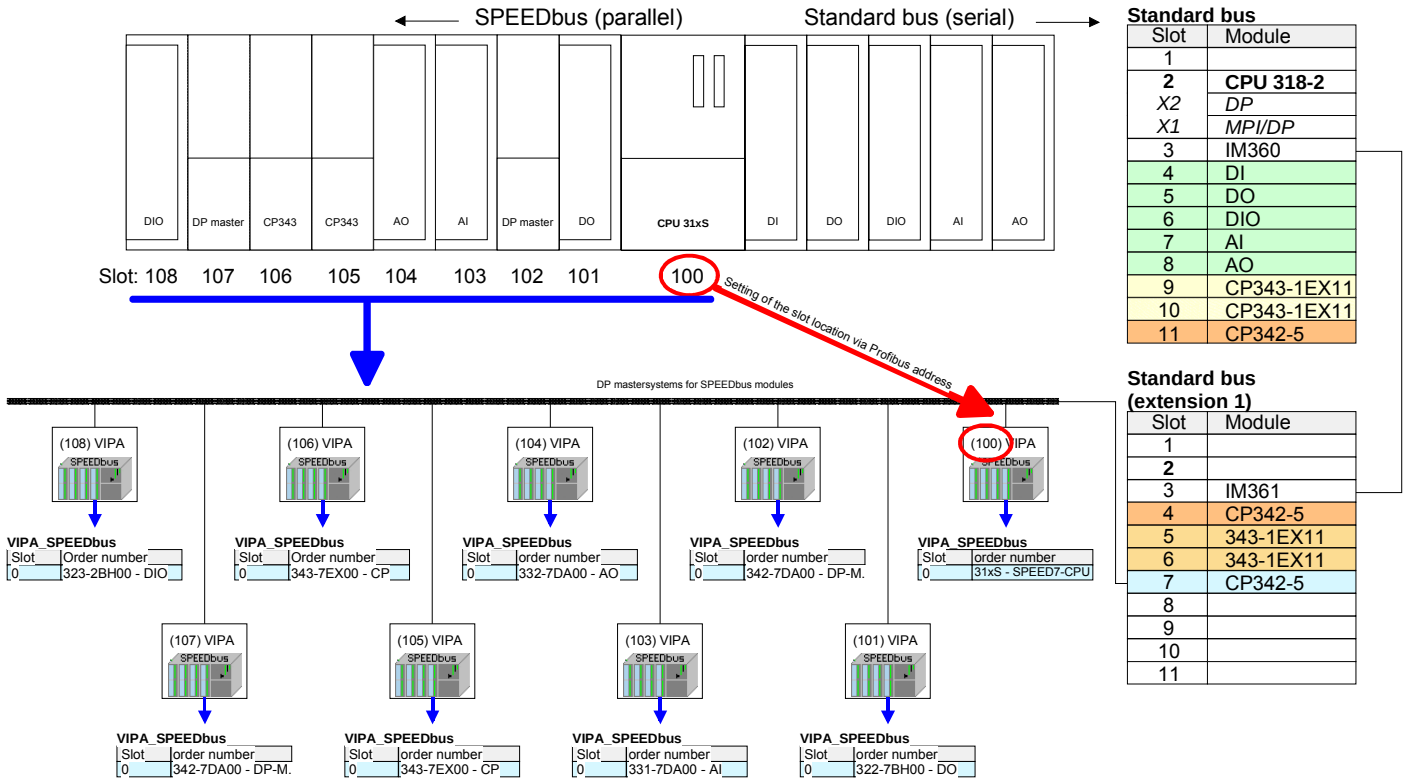
The slot assignment of the SPEEDbus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place as last module a DP master (342-5DA02 V5.0) with master system.

For the employment of the System 300S modules at the SPEEDbus the inclusion of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is required.

After the installation of the speedbus.gsd you may locate under *Profibus DP \ Additional field devices \ I/O \ VIPA_SPEEDbus* the DP slave system vipa_speedbus.

Now include for the CPU and every module at the SPEEDbus a slave system "vipa_speedbus".

Set as Profibus address the slot no. (100...116) of the module and place the according module from the hardware catalog of VIPA_speedbus to slot 0 of the slave system.



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	IM360
4	DI
5	DO
6	DIO
7	AI
8	AO
9	CP343-1EX11
10	CP343-1EX11
11	CP342-5

Standard bus (extension 1)

Slot	Module
1	
2	
3	IM361
4	CP342-5
5	343-1EX11
6	343-1EX11
7	CP342-5
8	
9	
10	
11	

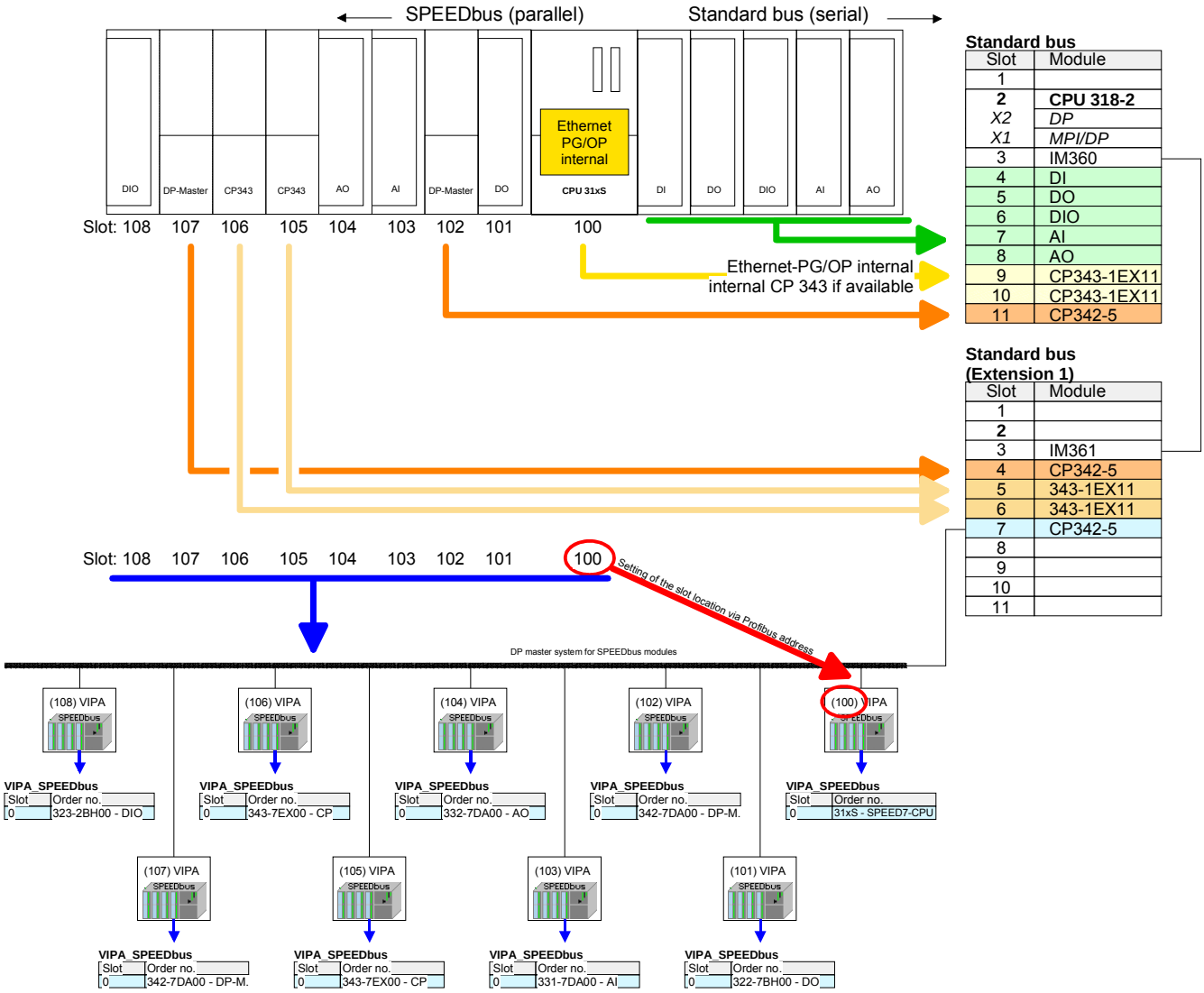
The according module is to be taken over from the HW catalog of vipa_speedbus on slot 0.

Bus extension with IM 360 und IM 361

To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.

More detailed information is above under "Addressing".

Summary The following illustration summarizes the steps of project engineering:



The according module is to be taken over from the HW catalog of vipa_speedbus on slot 0.

Note!

The sequence of the DPM and CP function groups is irrelevant. You only have to take care to regard the sequence within a function group (DP1, DP2 ... res. CP1, CP2 ...).

The following pages show information about parameterizing the CPU and modules and how to transfer the project into the CPU.

Parameterization of CPU and modules

Parameterization via CPU 318-2DP

For the SPEED7-CPUs are configured in the hardware configurator from Siemens as Siemens CPU 318-2DP you may adjust the parameters for the SPEED7-CPUs at the hardware configuration under the "Properties" of the CPU 318-2DP.

Via a double-click on the CPU 318-2 DP you achieve the parameter window of the CPU. The registers give you access to all parameters of the CPU.

Please regard that at this time, not all parameters are supported.

Supported parameters

The CPU does not evaluate all parameters that can be set at the hardware configuration. The following parameters are supported at this time:

General :
- MPI-Address of the CPU
- Baudrate (10.2kB, 187.5kB, 1.5MB)
- maximum MPI address

Start-up:
- Start-up when expected/actual configuration differ
- Finished message by modules
- Transfer of the parameters to modules

Retentive memory:
- No. of memory bytes starting with MB0
- Number of S7 Timers starting withT0
- Number of S7 Counters starting with C0

Protection:
- Level of protection / Password

Memory:
- Local data
- Maximum size local stack

Time of day interrupts:
- OB10 : Execution, Active Start date, Time-of-day
- OB11 : Execution, Active, Start date, Time-of-day

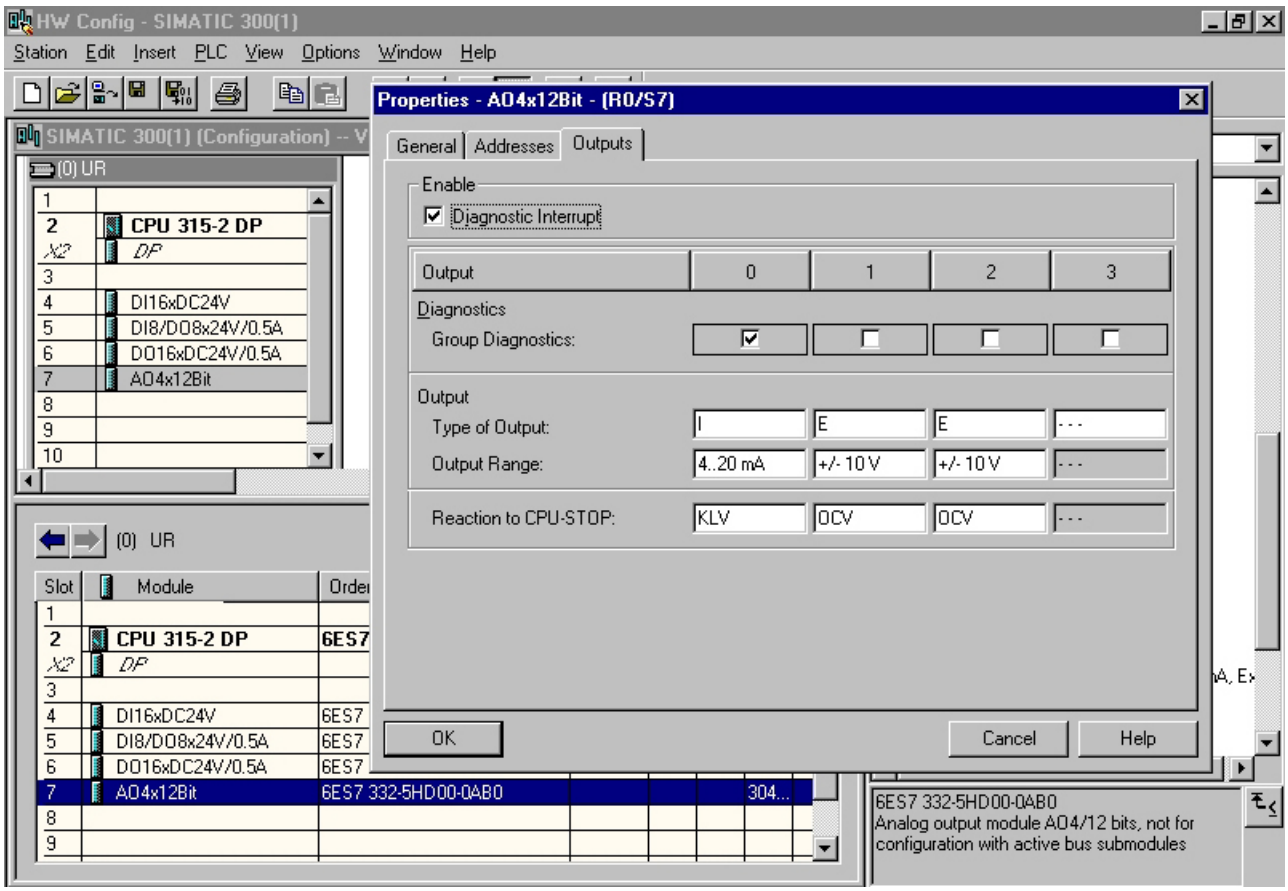
Cyclic interrupt:
- OB32 : Execution, Phase offset
- OB35 : Execution

Cycle / Clock memory:
- Update OB1 process image cyclically
- Scan Cycle monitoring time
- Minimum scan cycle time
- Scan Cycle load from communication (%)
- Size of the process image input area
- Size of the process image output area
- OB85 call up at I/O access error
- Clock memory with clock memory number

Parameterization of modules

System 300 modules may get from the CPU up to 32Byte parameter data at the standard bus and up to 240Byte at the SPEEDbus. By using the SIMATIC Manager from Siemens you may set parameters for parameterizable System 300 modules at any time.

For this, double-click during the project engineering at the slot overview on the module you want to parameterize In the appearing dialog window you may set the wanted parameters.



Parameterization during runtime

By using the SFCs 55, 56 and 57 you may alter and transfer parameters for wanted modules during runtime.

For this you have to store the module specific parameters in so called "record sets".

More detailed information about the structure of the record sets is to find in the according module description.

Project transfer

Overview

There are 3 possibilities for the transfer of your project into the CPU:

- Transfer via MP^{2}I
- Transfer via MMC by using a card reader
- Transfer via integrated Ethernet-PG/OP channel

Transfer via MP^{2}I

For the SPEED7-CPUs provide a MP^{2}I jack you have the following transfer options:

- Transfer via MPI Programming cable (MPI Communication)
- Transfer via Green Cable (Serial Communication)

Transfer via MPI Programming cable

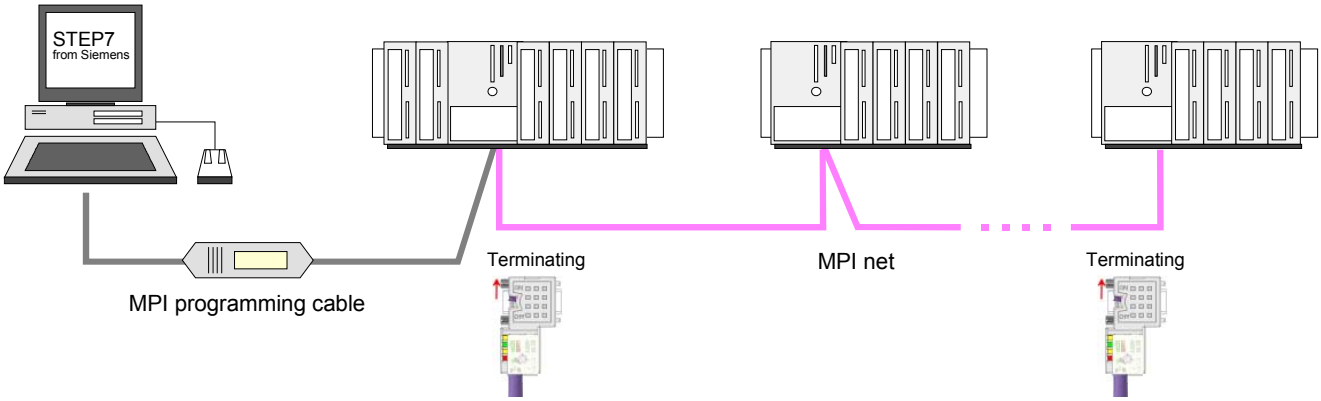
The MPI programming cables are available at VIPA in different variants. The employment of the cables is identical. The cables provide a bus enabled RS485 plug for the MP^{2}I jack of the CPU and a RS232 res. USB plug for the PC.

Due to the RS485 connection you may plug the MPI programming cables directly to a already plugged MPI plug on the MP^{2}I jack. Every bus participant identifies itself at the bus with an unique MPI address, in the course of which the address 0 is reserved for programming devices. The structure of a MPI net is in the principal identical with the structure of a 1.5MBaud Profibus net. I.e. the same rules are valid and you use the same components for the build-up. The single participants are connected with each other via bus interface plugs and Profibus cables. Your CPU 31xS supports transfer rates of up to 1.5MBaud. Per default the MPI net runs with 187.5kBaud. VIPA CPUs are delivered with MPI address 2.

Terminating resistor

A cable has to be terminated with its surge impedance. For this you switch on the terminating resistor at the first and the last participant of a network or a segment.

Please make sure that the participants with the activated terminating resistors are always provided with voltage during start-up and operation.



Approach

- Connect your PC to the MP^{2}I jack of your CPU via a MPI programming cable.
- Load your project in the SIMATIC Manager from Siemens.
- Choose in the menu **Options** > *Set PG/PC interface*
- Select in the according list the "PC Adapter (MPI)"; if appropriate you have to add it first, then click on [Properties].
- Set in the register *MPI* the transfer parameters of your MPI net and type a valid *address*.
- Switch to the register *Local connection*
- Set the COM port of the PCs and the transfer rate 38400Baud for the MPI programming cable from VIPA.
- Via **PLC** > *Load to module* you may transfer your project to the CPU and save it on a MMC via **PLC** > *Copy RAM to ROM* if one is plugged.

Transfer via Green Cable

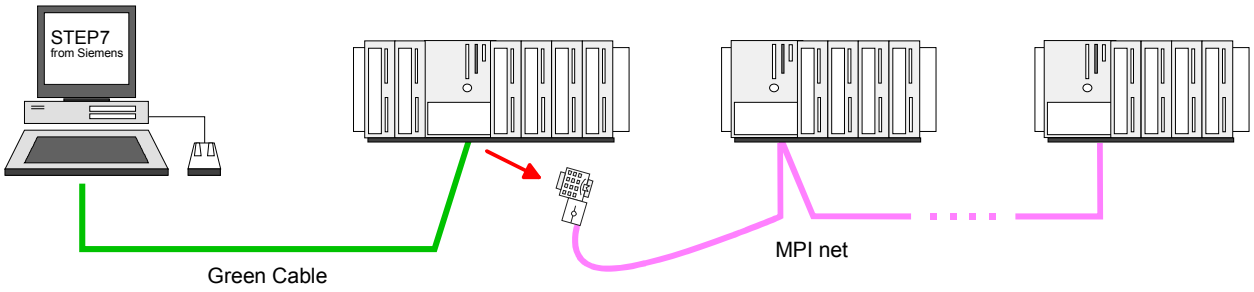
The "Green Cable" is a programming and download cable that may exclusively be plugged directly to VIPA components with MP^{2}I jack. By plugging the Green Cable to a MP^{2}I jack you may establish a serial connection between the COM interface of your PC and the MP^{2}I interface of your CPU.

Attention!

Please regard that you may plug the "Green Cable" exclusively directly to the MP^{2}I interfaces of VIPA-CPUs!

Approach

- Connect the PC and CPU with the Green Cable.
- Load your project in the SIMATIC Manager from Siemens.
- Choose in the menu **Options** > *Set PG/PC interface*
- Select in the according list the "PC Adapter (MPI)"; if appropriate you have to add it first, then click on [Properties].
- Switch to the register *Local connection*
- Set the COM port of the PCs and the transfer rate 38400Baud for the MPI programming cable from VIPA. The settings in the register *MPI* are ignored at the usage of the Green Cable.
- Via **PLC** > *Load to module* you may transfer your project to the CPU and save it on a MMC via **PLC** > *Copy RAM to ROM* if one is plugged.



Transfer via MMC

As external storage medium a MMC is deployed.

The MMC (**Me**m**o**ry **C**ard) serves as external transfer medium for programs and firmware for, among others, it provides the PC compatible FAT16 file system. With an OVERALL_RESET or PowerON the MMC is automatically read. There may be stored several projects and sub-directories on a MMC storage module. Please take care that your current project engineering is stored in the root directory. For reading from the MMC the following file names must be used:

- Read after OVERALL_RESET:
  S7PROG.WLD (S7 project file)
  PROTECT.WLD (Extended Know-how protection)
- Read after PowerON: **AUTOLOAD.WLD** (S7 project file)

Transfer CPU → MMC

When the MMC has been installed, the write command stores the content of the battery buffered RAM as **S7PROG.WLD** at the MMC.

The write command is controlled by means of the Siemens hardware configurator via **PLC** > *Copy RAM to ROM*.

During the write process the yellow "MCC"-LED of the CPU is blinking. When the LED expires the write process is finished.

Process control

After a write process on the MMC, an according ID event is written into the diagnostic buffer of the CPU. To monitor the diagnosis entries, you select **PLC** > *Module Information* in the Siemens SIMATIC Manager. Via the register "Diagnostic Buffer" you reach the diagnosis window. At a successful write process the diagnostic buffer contains 0xE200.

When writing on the MMC, the following events may occur:

Event-ID	Meaning
0xE100	MMC access error
0xE101	MMC error file system
0xE102	MMC error FAT
0xE200	MMC writing finished

More detailed information about this is to find at the end of the chapter "command list".

Transfer MMC → CPU

The transfer of the application program from the MMC into the CPU takes always place after an OVERALL_RESET. The blinking of the yellow LED "MCC" of the CPU marks the active transfer.

An OVERALL RESET of the CPU takes place if the MMC does not contain a valid application program or if the transfer should fail. The red "STOP"-LED blinks three times.

Note!

If the size of the user application exceeds the user memory of the CPU, the content of the MMC is not transferred to the CPU.
Execute a compression before the transfer, for this does not happen automatically.

Transfer via Ethernet-PG/OP channel

Every CPU 31xS contains an integrated Ethernet-PG/OP channel. This allows you to remote control and program your CPU.

This gives you also access to the internal website where you may find information about firmware version, connected periphery, current cycle times etc.

The PG/OP access requires a hardware project engineering (Minimum project) in the CPU where IP address and subnet mask are defined via a virtual CP.

This project is transferred per MMC or MPI into the CPU. After an overall reset you may access the PG/OP channel via the "PLC functions". A maximum of 2 PG/OP connections is supported.

Requirements

For the hardware configuration of the Ethernet-PG/OP channel the following software is required:

- SIMATIC Manager from Siemens V. 5.1 or higher
- SIMATIC NET

Approach

- Start the SIMATIC Manager from Siemens and create a new project.
- Add via **Insert** > *Station* > *SIMATIC 300 station* a new System 300 station.
- Activate the station "SIMATIC 300" and open the hardware configurator by clicking on "Hardware".
- Insert a rack (SIMATIC 300 \ Rack-300 \ profile rail)
- Configure a CPU 318-2 (6ES7 318-2AJ00-0AB0 V3.0). This can be found at SIMATIC 300 \ CPU 300 \ CPU 318-2.
- Include the CP 343-1 (343-1EX11) at slot 4 (SIMATIC 300 \ CP 300 \ Industrial Ethernet \ CP 343-1 \ 343-1EX11).
- Set the wanted IP address and subnet mask in the according dialog window and connect the CP with "Ethernet".
- Save and compile your project.
- Transfer your project to your CPU via MPI or MMC.

Access to the Ethernet-PG/OP channel

Connect your project engineering-PC and your CPU via the Ethernet-PG/OP jack. Adjust the following settings in the Siemens SIMATIC Manager under **Options** > *PG/PC interface*...:

TCP/IP -> Network card...Protocol RFC 1006

Now you gain access to the CP via the destination system functions.

Operating modes

Overview

The CPU can be in one of 4 operating modes:

- Operating mode STOP
- Operating mode START-UP
- Operating mode RUN
- Operating mode HOLD

Certain conditions in the operating modes START-UP and RUN require a specific reaction from the system program. In this case the application interface is often provided by a call to an organization block that was included specifically for this event.

Operating mode STOP

- The application program is not processed.
- If there has been a processing before, the values of counters, timers, flags and the process image are retained during the transition to the STOP mode.
- Outputs are inhibited, i.e. all digital outputs are disabled.
- RUN-LED off
- STOP-LED on

Operating mode START-UP

- During the transition from STOP to RUN a call is issued to the start-up organization block OB 100. The length of this OB is not limited. The processing time for this OB is not monitored. The START-UP OB may issue calls to other blocks.
- All digital outputs are disabled during the START-UP, i.e. outputs are inhibited.
- RUN-LED blinks
- STOP-LED off

When the CPU has completed the START-UP OB, it assumes the operating mode RUN.

Operating mode RUN

- The application program in OB 1 is processed in a cycle. Under the control of alarms other program sections can be included in the cycle.
- All timers and counters being started by the program are active and the process image is updated with every cycle.
- The BASP-signal (outputs inhibited) is deactivated, i.e. all digital outputs are enabled.
- RUN-LED on
- STOP-LED off

Operating mode HOLD

The CPU 31xS gives you the opportunity to define up to 4 breakpoints for program diagnosis. Setting and deletion of breakpoints happens in your programming environment. As soon as a breakpoint is reached, you may process your program step by step and in- and outputs can be activated.

Precondition

For the usage of breakpoints, the following preconditions have to be fulfilled:

- Testing in single step mode is only possible with STL. If necessary switch the view via **View** > *STL* to STL.
- The block must be opened online and must not be protected.
- The open block must not be altered in the editor.

Approach for working with breakpoints

- Activate **View** > *Breakpoint Bar*.
- Set the cursor to the command line where you want to insert a breakpoint.
- Set the breakpoint with **Debug** > *Set Breakpoint*. The according command line is marked with a circle.
- To activate the breakpoint click on **Debug** > *Breakpoints Active*. The circle is changed to a filled circle.
- Bring your CPU into RUN. When the program reaches the breakpoint, your CPU switches to the state HOLD, the breakpoint is marked with an arrow and the register contents are monitored.
- Now you may execute the program code step by step via **Debug** > *Execute Next Statement* or run the program until the next breakpoint via **Debug** > *Resume*.
- Delete (all) breakpoints with the option **Debug** > *Delete All Breakpoints*.

Behavior in operating state HOLD

- The LED RUN blinks and the LED STOP is on.
- The execution of the code is stopped. No level is further executed.
- All times are frozen.
- The real-time clock runs on.
- The outputs are closed, but may be released for test purposes.
- Passive CP communication is possible.

Note!

The usage of breakpoints is always possible. Switching to the operating mode test operation is not necessary.

With more than 3 breakpoints, a single step execution is not possible.

Overall Reset

Overview

During the OVERALL RESET the entire user memory (RAM) is erased. Data located in the memory card is not affected.

You have 2 options to initiate an OVERALL RESET:

- initiate the overall reset by means of the function selector switch
- initiate the overall reset by means of the Siemens SIMATIC Manager

Note!

You should always issue an overall reset to your CPU before loading an application program into your CPU to ensure that all blocks have been cleared from the CPU.

Overall reset by means of the function selector

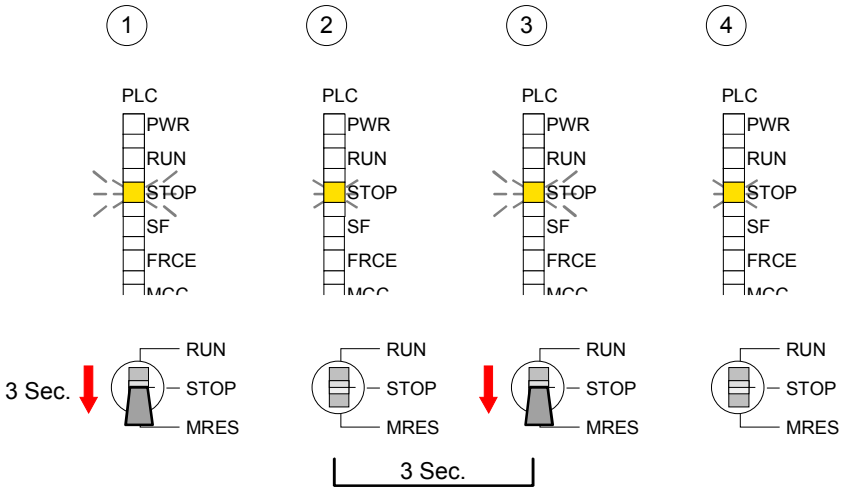
Condition

The operating mode of the CPU is STOP. Place the function selector on the CPU in position "STOP" → the STOP-LED is on.

Overall reset

- Place the function selector in the position MRES and hold it in this position for app. 3 seconds. → The STOP-LED changes from blinking to permanently on.
- Place the function selector in the position STOP and switch it to MRES and quickly back to STOP within a period of less than 3 seconds.
  → The STOP-LED blinks (overall reset procedure).
- The overall reset has been completed when the STOP-LED is on permanently. → The STOP-LED is on.

The following figure illustrates the above procedure:



Automatic reload

At this point the CPU attempts to reload the parameters and the program from the memory card. → The MCC-LED blinks.

When the reload has been completed the LED expires. The operating mode of the CPU will be STOP or RUN, depending on the position of the function selector.

Overall reset by means of the Siemens SIMATIC Manager

Condition

The operating mode of the CPU must be STOP.
You may place the CPU in STOP mode by the menu command **PLC** > *Operating mode*.

Overall reset

You may request the OVERALL RESET by means of the menu command **PLC** > *Clean/Reset*.

In the dialog window you may place your CPU in STOP mode and start the overall reset if this has not been done as yet.

The STOP-LED blinks during the overall reset procedure.

When the STOP-LED is on permanently the overall reset procedure has been completed.

Automatic reload

At this point the CPU attempts to reload the parameters and the program from the memory card. → The MCC-LED blinks.

When the reload has been completed, the LED expires. The operating mode of the CPU will be STOP or RUN, depending on the position of the function selector.

Set back to factory setting

The following approach deletes the internal RAM of the CPU completely and sets it back to the delivery state.

Please regard that the MPI address is also set back to default 2!

- Push down the reset lever for app. 30 seconds. The ST-LED blinks. After a few seconds the LED turns to static light. Count the number of static light phases because now the LED switches between static light and blinking.
- After the 6th static light you release the reset lever and push it down again shortly. Now the green RUN-LED is on once. This means that the RAM is totally deleted.
- Turn the power supply off and on again.

Firmware update

Overview

All CPUs starting with the firmware version 1.0.0 offer you the opportunity to execute a firmware update for CPU, Profibus master and CP via MMC.

The latest 2 firmware versions are to find in the service area at www.vipa.de and at the ftp server under ftp.vipa.de.

The CPU 31xS allows you to transfer firmware updates for several modules via MMC by using reserved file names. Please regard that for every CPU and component in the following table one pkg-file is planned:

Component	Possible with version	File name
CPU 315-2AG10	V. 1.0.0	px000002.pkg
CPU 314-6BF01	V. 1.0.0	px000007.pkg
CPU 314-6CF01	V. 1.0.0	px000008.pkg
CPU 317-2AJ10	V. 1.0.0	px000001.pkg
CPU 317-4NE10	V. 1.0.0	px000006.pkg
DP-Master	V. 1.0.0	px000003.pkg
CP343	V. 1.0.0	px000005.pkg

Attention!

When installing a new firmware you have to be extremely careful. Under certain circumstances you may destroy the CPU, for example if the voltage supply is interrupted during transfer or if the firmware file is defective.

In this case, please call the VIPA-Hotline!

Please regard that the version of the update firmware has to be different from the existing firmware otherwise no update is executed.

Seek firmware version

If you didn't execute a firmware update yet, there are labels beneath the front flap at the right side showing the according firmware versions and px-File names in following sequence:

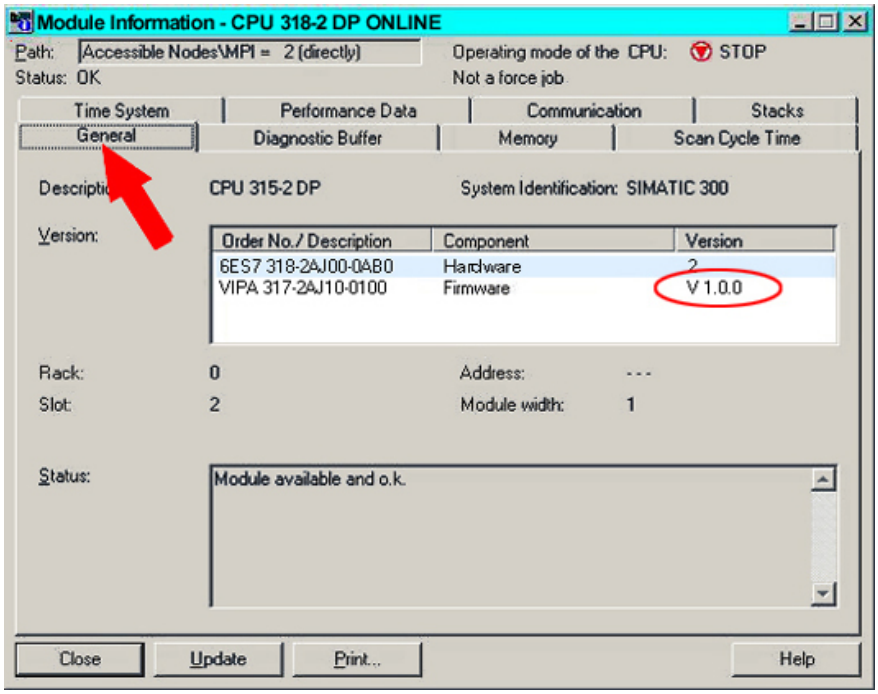
CPU with PG/OP channel
DP master (if appropriate)
Ethernet CP 343 (if appropriate)

Display the Firmware version of the CPU via Siemens SIMATIC Manager

You may display the current firmware version of your CPU via the SIMATIC Manager from Siemens.

To display the firmware version, start the SIMATIC Manager from Siemens and go online with the CPU via your PG res. PC.

Via **PLC** > *Module status,* register "General", the current firmware version is evaluated and displayed.



Display the Firmware version of the SPEED7 system via Web Site

Every SPEED7-CPU has an integrated website that monitors information about firmware version of the SPEED7 components. The Ethernet-PG/OP channel provides the access to this website. To activate the PG/OP channel you have to enter an according hardware project engineering. After that you may access the PG/OP channel with a web browser via the IP address of your project. More detailed information is to be found above at "Ethernet-PG/OP channel and website".

Load firmware and transfer it to MMC

- Go to www.vipa.de.
- Click on Service > Download > Firmware Updates.
- Click on "Firmware for System 300S CPUs"
- Choose the according modules (CPU, DPM, CP...) and download the firmware Px.....zip to your PC.
- Extract the zip-file and copy the extracted file to your MMC.
- Following this approach, transfer all wanted firmware files to your MMC.

Note!

You can find always the two latest firmware versions at the ftp server.

Preconditions for ftp access

For the display of ftp sites in your web browser you may have to execute the following adjustments:

Internet Explorer

ftp access only with version 5.5 or higher

Options > Internet options, Register "Advanced" in the area "Browsing":

- activate: "Enable folder view for ftp sites"
- activate: "Use passive ftp ..."

Netscape

ftp- access only with version 6.0 or higher

No further adjustments are required

If you still have problems with the ftp access, please ask your system operator.

Attention!

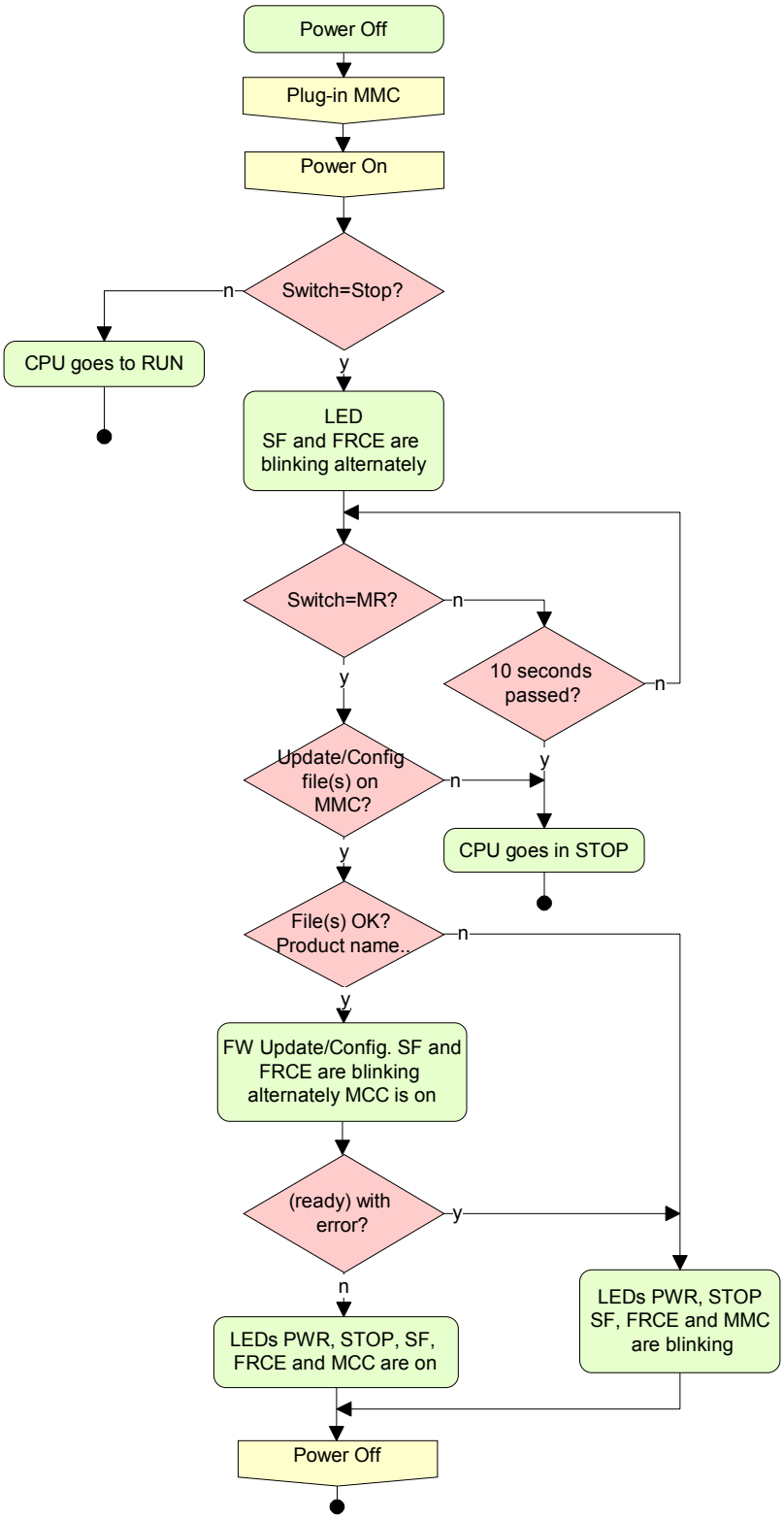
With a firmware update an overall reset is automatically executed. If your program is only available in the load memory of the CPU it is deleted! Save your program before executing a firmware update! After the firmware update you should execute a "Set back to factory settings" (see "OVERALL_RESET" above).

Transfer firmware from MMC into CPU

- Get the RUN-STOP lever of your CPU in position STOP.
- Turn off the voltage supply.
- Plug the MMC with the firmware into the CPU. Please take care of the correct plug-in direction of the MMC.
- Turn on the voltage supply.
- After a short boot-up time, the alternate blinking of the LEDs SF and FRCE shows that the firmware file has been found on the MMC.
- You start the transfer of the firmware as soon as you tip the RUN/STOP lever downwards to MRES within 10s. The CPU shows the transfer via a LED blink line.
- During the update process, the LEDs SF, FRCE and MMC are alternately blinking. This may last several minutes.
- The update is successful finished when all CPU-LEDs PWR, STOP, SF, FRCE and MCC are on. If they are blinking fast, an error occurred.

Flowchart for firmware update

The following flowchart illustrates the CPU behavior at firmware update:



Execute a "Set back to factory settings" afterwards
(see "OVERALL_RESET")

Deployment RS485 interface with PtP communication

Overview

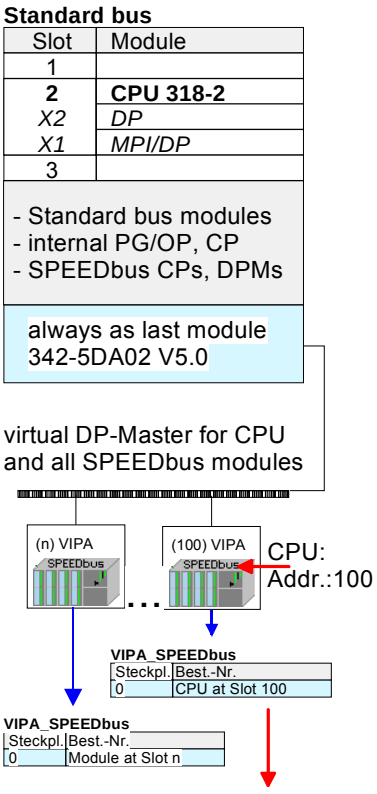
Per default, every CPU 31xS uses the RS485 interface for the Profibus-DP master. Via a hardware configuration you may switch the RS485 interface to point-to-point communication using the parameter "Function RS485" of the object properties.

Switchover to PtP mode

For the employment of the System 300S modules from VIPA at the SPEEDbus the integration of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is required.

The switchover to PtP mode takes place with the following procedure:

- Start the hardware configurator from Siemens and include the speedbus.gsd for SPEED7 from VIPA.
- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens.
- Starting with slot 4, place the System 300 modules in the plugged sequence.
- Below these modules place and connect the CPs (internal) and then SPEEDbus CPs and DP masters.
- For the SPEEDbus do include the Siemens DP master CP 342-5 (342-5DA02 V5.0) always as last module, cable it and parameterize it to the operating mode DP master. The Profibus address must be outside the range of 100...116. To this master system you now link-up the single SPEEDbus modules as VIPA_SPEEDbus slave. For this, the **Profibus address** corresponds the **slot no**. starting with 100 for the CPU. Place the module assigned to the slave at slot no. 0 and change parameters if needed.
- Set the SPEED7 CPU to plug-in location 0 with the Profibus address 100.
- Set "PtP" for the *Function RS485* in the object properties.
- Now place the further SPEEDbus modules as VIPA_SPEEDbus slave



As soon as you transfer your project together with your PLC application into the CPU, the RS485 interface is after the boot sequence available for PtP communication.

Note!

Please regard that the RS485 interface of 31xS CPUs without Profibus-DP master is exclusively running in ptp mode and have no such switch option.

Here the interface can only be deactivated.

Extended know-how protection

Overview

Besides the "standard" Know-how protection the SPEED7-CPUs from VIPA provide an "extended" know-how protection that serves a secure block protection for accesses of 3rd persons.

Standard protection

The standard protection from Siemens transfers also protected blocks to the PG but their content is not displayed. But with according manipulation the Know-how protection is not guaranteed.

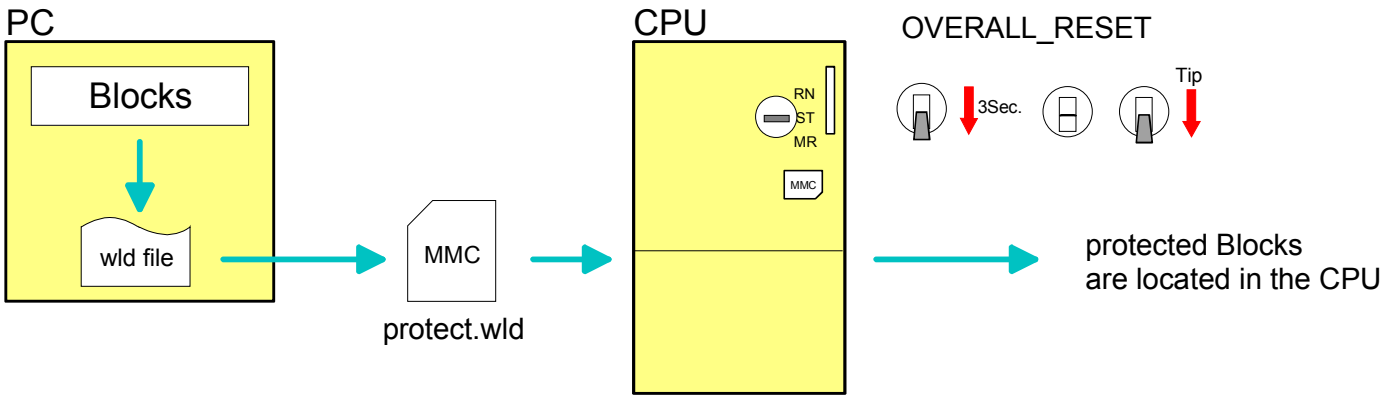
Extended protection

The "extended" know-how protection developed by VIPA offers the opportunity to store blocks permanently in the CPU.

At the "extended" protection you transfer the protected blocks into a WLD-file named protect.wld. By plugging the MMC and following overall reset, the blocks in the protect.wld are permanently stored in the CPU.

You may protect OBs, FBs and FCs.

When back-reading the protected blocks into the PG, exclusively the block header are loaded. The source remains in the CPU and is thus protected for accesses of 3rd persons.



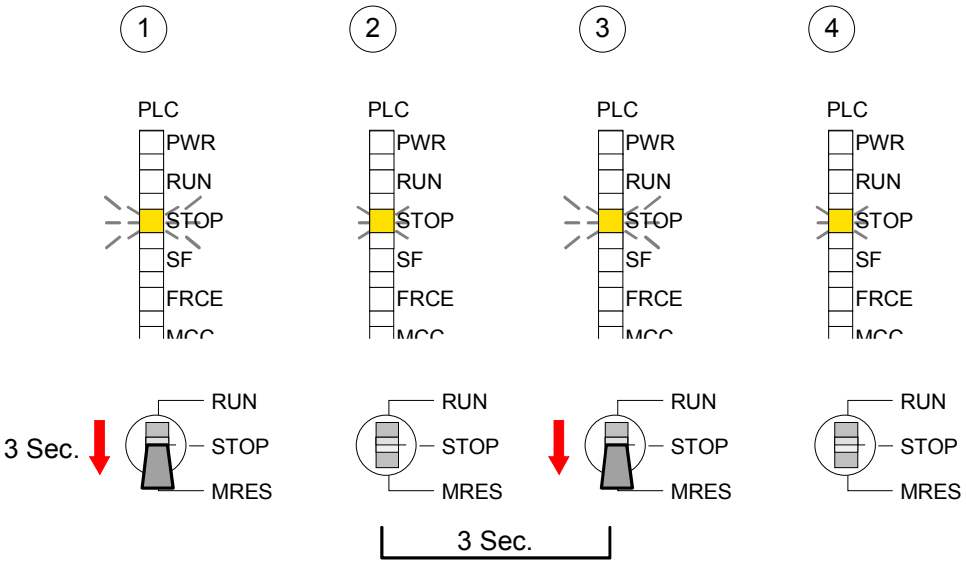
protect blocks with protect.wld

Create a new wld-file in your project engineering tool with **File** > *Memory Card file* > *New* and rename it to "protect.wld".

Transfer the according blocks into the file by dragging them with the mouse from the project to the file window of protect.wld.

Transfer protect.wld to CPU with OVERALL_RESET

Transfer the file protect.wld to a MMC storage module, plug the MMC into the CPU and execute an overall reset with the following approach:



The overall reset stores the blocks in protect.wld permanently in the CPU protected from accesses of 3rd persons.

Protection behavior

Protected blocks are overwritten by a new protect.wld.

Using a PG 3rd persons may access protected blocks but only the block header is transferred to the PG. The block code that is to protect remains in the CPU and can not be read.

Delete protected blocks

The PG can only overwrite protected blocks if these are deleted in the CPU before.

By transferring an empty protect.wld from the MMC you may delete all protected blocks in the CPU.

Usage of protected blocks

Due to the fact that reading of a "protected" block from the CPU monitors no symbol labels it is convenient to provide the "block covers" for the end user.

For this, create a project out of all protected blocks. Delete all networks in the blocks so that these only contain the variable definitions in the according symbolism.

Using test functions for control and monitoring of variables

Overview

For troubleshooting purposes and to display the status of certain variables you can access certain test functions via the menu item **Debug** of the Siemens SIMATIC Manager.

The status of the operands and the VKE can be displayed by means of the test function **Debug** > *Monitor*.

You can modify and/or display the status of variables by means of the test function **PLC** > *Monitor/Modify Variables*.

Debug > *Monitor*

This test function displays the current status and the VKE of the different operands while the program is being executed.

It is also possible to enter corrections to the program.

Note!

When using the test function “Monitor” the PLC must be in RUN mode!

The processing of statuses can be interrupted by means of jump commands or by timer and process-related alarms. At the breakpoint the CPU stops collecting data for the status display and instead of the required data it only provides the PG with data containing the value 0.

For this reason, jumps or time and process alarms can result in the value displayed during program execution remaining at 0 for the items below:

- the result of the logical operation VKE
- Status / AKKU 1
- AKKU 2
- Condition byte
- absolute memory address SAZ. In this case SAZ is followed by a "?".

The interruption of the processing of statuses does not change the execution of the program. It only shows that the data displayed is no longer

PLC >
Monitor/Modify Variables

This test function returns the condition of a selected operand (inputs, outputs, flags, data word, counters or timers) at the end of program-execution.

This information is obtained from the process image of the selected operands. During the "processing check" or in operating mode STOP the periphery is read directly from the inputs. Otherwise only the process image of the selected operands is displayed.

Control of outputs

It is possible to check the wiring and proper operation of output-modules.

You can set outputs to any desired status with or without a control program. The process image is not modified but outputs are no longer inhibited.

Control of variables

The following variables may be modified:

E, A, M, T, Z and D.

The process image of binary and digital operands is modified independently of the operating mode of the CPU 31xS.

When the operating mode is RUN the program is executed with the modified process variable. When the program continues they may, however, be modified again without notification.

Process variables are controlled asynchronously to the execution sequence of the program.

Chapter 4 Deployment I/O periphery CPU 314ST

Outline

This chapter contains all information necessary for the employment of the in-/output periphery of the CPU 314ST. It describes functionality, project engineering and diagnostic of the analog and digital part.

The following text describes:

- Overview over the I/O ranges
- Employment of the analog part
- Employment of the digital part and the counter functions

Content

Topic	Page
Chapter 4 Deployment I/O periphery CPU 314ST	**4-1**
Overview	4-2
In-/Output range	4-3
Analog part	4-5
Analog Part - Parameterization	4-9
Analog part - Diagnostic functions	4-13
Digital part	4-16
Counter - Fast introduction	4-18
Counter - Parameterization	4-21
Counter - Functions	4-26
Counter - Additional functions	4-32
Counter - Diagnostic and alarm	4-39

Overview

General

At the CPU 314ST the analog and digital in-/output channels are together in a 2tier casing.

The following components are integrated:

- Analog input: 4xU/Ix12Bit, 1xPt100
- Analog output: 2xU/Ix12Bit COM
- Digital input: 16(8)xDC24V with parameterizable counter funct.
- Digital output: 0(8)xDC24V 1A
- Counter: max. 4 counter with the operating mode endless, single or periodic count

Project engineering

The project engineering takes place in the SIMATIC manager from Siemens. For this the import of the GSD speedbus.gsd is required. After the installation of the GSD you'll find the CPU in the hardware catalog in the directory VIPA_SPEEDbus with the corresponding order no..

Counter

The here used counters are endless counter where the control happens via the digital input channels. For the counter you may configure alarms that may influence the corresponding digital output channel.

SPEEDbus

The SPEEDbus is a 32Bit parallel bus developed by VIPA with a max. data rate of 40MByte/s. Via the SPEEDbus you have the opportunity to connect up to 16 SPEEDbus modules to your CPU 31xS.

In opposite to the "standard" backplane bus where the modules are plugged at the right side of the CPU via single bus connectors, the SPEEDbus manages the connection via a special SPEEDbus rail at the left side of the CPU.

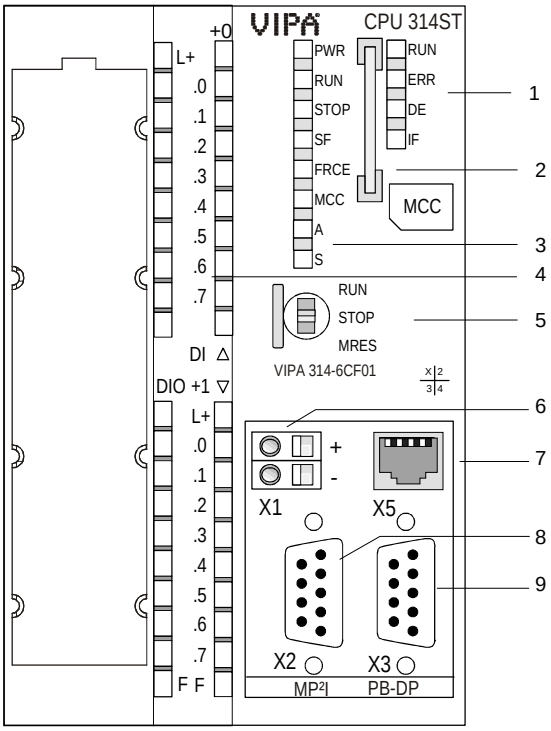
You can order profile rails at VIPA with integrated SPEEDbus for 2, 6, 10 or 16 SPEEDbus periphery modules in different lengths.

Ordering Data

Type	Order number	Description
314ST/DPM	VIPA 314-6CF01	MP^2I interface, MMC slot, real time clock, Ethernet Interface for PG/OP, Profibus DP master, SPEEDbus, DI 8...16xDC24V / DO 8...0xDC24V, 0.5A, AI 4x12Bit / AO 2x12Bit / AI 1xPt100, 4 counter
314ST/PtP	VIPA 314-6BF01	MP^2I interface, MMC slot, real time clock, Ethernet interface for PG/OP, RS485 for PtP communication, SPEEDbus, DI 8...16xDC24V / DO 8...0xDC24V, 0.5A, AI 4x12Bit / AO 2x12Bit / AI 1xPt100, 4 counter

In-/Output range

Construction The picture shows the CPU 314ST with open flap.



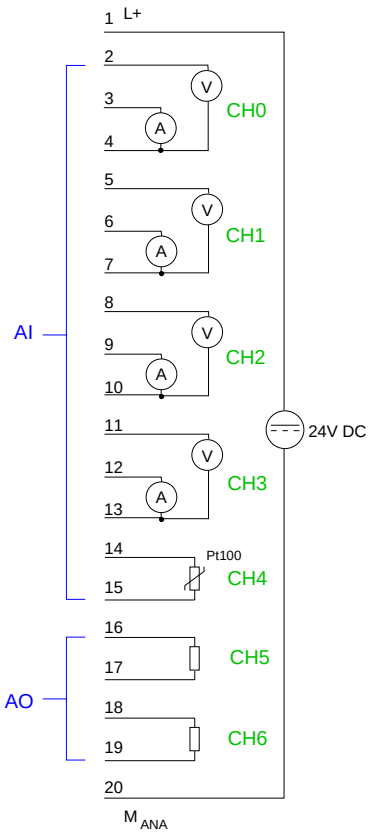
[1] LEDs of the integrated Profibus DP master (only 314-6CF01)
[2] MMC slot
[3] LEDs of the CPU part
[4] LEDs of the I/O part
[5] operating mode Switch CPU

The following components are under the front flap

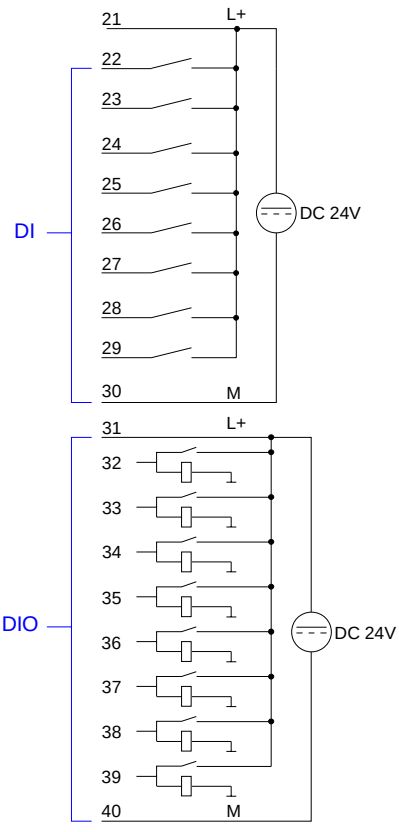
[6] Interface for DC 24V power supply
[7] Ethernet interface (PG/OP)
[8] MP²I interface
[9] Profibus DP interface (314-6CF01)
RS484-PtP interface (314-6BF01)

Pin assignment:

Analog part



Digital part



Address assignment

By including the GSD speedbus.gsd in your hardware configurator the module is at your disposal in the hardware catalog.

After the installation of the GSD you'll find the CPU 314ST under *Additional field devices* \ *I/O* \ *VIPA_SpeedBus*.

For the data input a range of 48Byte and for the data output a range of 24Byte is available:

Input range

Address	Access	Assignment
+0	Byte	Digital Input I+0.0 ... I+0.7
+1	Byte	Digital Input I+1.0 ... I+1.7
+2	Word	reserved
+4	Word	Analog Input CH0
+6	Word	Analog Input CH1
+8	Word	Analog Input CH2
+10	Word	Analog Input CH3
+12	Word	Analog Input CH4
+14	Word	reserved
+16	Double word	Counter 0 / Latch 0
+20	Word	reserved
+22	Word	Status Counter 0
+24	Double word	Counter 1 / Latch 1
+28	Word	reserved
+30	Word	Status Counter 1
+32	Double word	Counter 2 / Latch 2
+36	Word	reserved
+38	Word	Status Counter 2
+40	Double word	Counter 3 / Latch 3
+44	Word	reserved
+46	Word	Status Counter 3

Output range

Address	Access	Assignment
+0	Byte	reserved
+1	Byte	Digital Output Q+1.0 ... Q+1.7
+2	Word	reserved
+4	Word	Analog Output CH0
+6	Word	Analog Output CH1
+8	Word	reserved
+10	Word	Status Counter 0
+12	Word	reserved
+14	Word	Status Counter 1
+16	Word	reserved
+18	Word	Status Counter 2
+20	Word	reserved
+22	Word	Status Counter 3

Analog part

Overview

The analog part consists of 4 input, 1 Pt100 and 2 output channels. The process image uses for the output of the analog part 10 Byte for input and 4 Byte for output.

The channels of the module are galvanically separated from the SPEEDbus via DC/DC transducer and opto couplers.

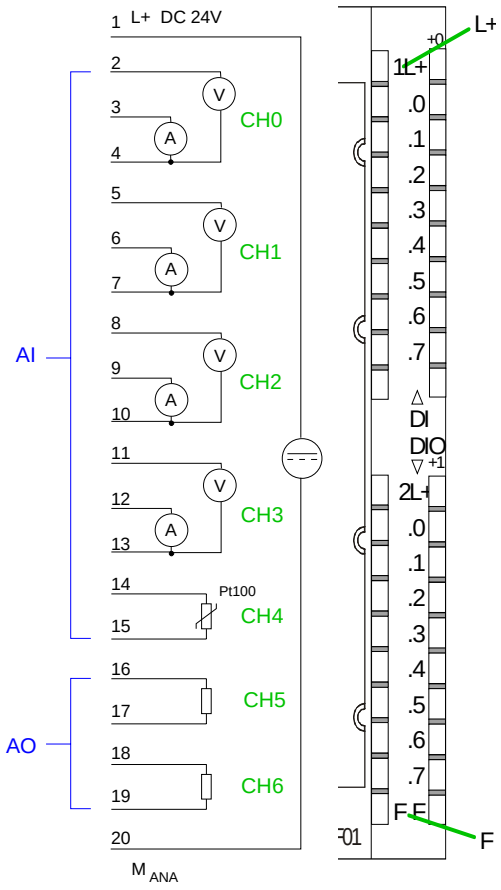
Attention!

Temporarily not used analog inputs with activated channel must be connected to the concerning ground.

Status indicator
Pin assignment

Pin	Assignment
1	Power supply DC 24V for Analog range
2	meas. voltage channel 0
3	meas. current channel 0
4	Ground channel 0
5	meas. voltage channel 1
6	meas. current channel 1
7	Ground channel 1
8	meas. voltage channel 2
9	meas. current channel 2
10	Ground channel 2
11	meas. voltage channel 3
12	meas. current channel 3
13	Ground channel 3
14	Pt 100 channel 4
15	Pt 100 channel 4
16	Output + channel 5
17	Ground output channel 5
18	Output + channel 6
19	Ground output channel 6
20	Ground power supply for analog range

Connection



LEDs

1L+	LED (green) Supply voltage available
F	LED (red) Sum error

Note!

To avoid measuring errors, you should connect only one measuring type per channel.

Access to the Analog part

By including the GSD speedbus.gsd into your hardware configurator the module is available at the hardware catalog.

You can find the CPU 314ST after GSD installation at *Additional filed devices \ I/O \ VIPA_SpeedBus.*

The CPU 314ST creates in the peripheral area 48Byte for data input and 24Byte for data output. Here the analog part occupies 10Byte for analog input and 4Byte for analog output. Without a hardware configuration the ranges start at address 1024. In the following table the according areas are marked ▭ :

Input range

During the measurement, for every channel the measuring data is stored as Word in the data input range.

Address	Access	Assignment
+0	Byte	Digital Input I+0.0 ... I+0.7
+1	Byte	Digital Input I+1.0 ... I+1.7
+2	Word	reserved
+4	Word	Analog Input CH0
+6	Word	Analog Input CH1
+8	Word	Analog Input CH2
+10	Word	Analog Input CH3
+12	Word	Analog Input CH4
+14	Word	reserved
+16	Double word	Counter 0 / Latch 0
+20	Word	reserved
+22	Word	Status Counter 0
+24	Double word	Counter 1 / Latch 1
+28	Word	reserved
+30	Word	Status Counter 1
+32	Double word	Counter 2 / Latch 2
+36	Word	reserved
+38	Word	Status Counter 2
+40	Double word	Counter 3 / Latch 3
+44	Word	reserved
+46	Word	Status Counter 3

Output range

For the output you enter a Word value into the data output range.

Address	Access	Assignment
+0	Byte	reserved
+1	Byte	Digital Output Q+1.0 ... Q+1.7
+2	Word	reserved
+4	Word	Analog Output CH0
+6	Word	Analog Output CH1
+8	Word	reserved
+10	Word	Status Counter 0
+12	Word	reserved
+14	Word	Status Counter 1
+16	Word	reserved
+18	Word	Status Counter 2
+20	Word	reserved
+22	Word	Status Counter 3

Numeric notation in Siemens S7 format

The analog values are represented in two's complement format.

Depending on the parameterized transformation speed the lowest value bits of the measuring value are irrelevant. With increasing sampling rate, the resolution decreases.

The following table lists the resolution in dependence of the sampling rate.

	Analog value															
	High-Byte								Low-Byte							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Resolution	sign	Measuring value														
15 Bit + sign	sign	Relevant output value (at 3.7 ... 30Hz)														
14 Bit + sign	sign	Relevant output value (at 60Hz)														X*
13 Bit + sign	sign	Relevant output value (at 120Hz)													X	X
11 Bit + sign	sign	Relevant output value (at 170Hz)											X	X	X	X
9 Bit + sign	sign	Relevant output value (at 200Hz)									X	X	X	X	X	X

* The lowest value irrelevant bits of the output value are marked with "X".

Algebraic sign bit (sign)

Bit 15 serves as algebraic sign bit. Here is:

Bit 15 = "0" → positive value

Bit 15 = "1" → negative value

Behavior at errors

As soon as a measuring value exceeds the overdrive res. underdrive region, the following value is returned:

Measuring value > Overdrive region: 32767 (7FFFh)

Measuring value < Underdrive region: -32768 (8000h)

At wire break, parameterization error or de-activated analog part the measuring value 32767 (7FFFh) is returned.

Analog part deactivated

With this record set 9Eh you may de-activate the digital res. analog part. Please regard that in spite of the de-activation of the digital res. analog part the process image for both components remains reserved.

The record set has the following structure:

Byte	Bit 15 ... 0
0...1	*Bit 15 ... 0: Module selection* 0000h = Digital- / Analog part activated (default) 0001h = Digital part de-activated 0002h = Analog part de-activated

For detailed information see "Counter parameterization" below.

Digital/Analog conversion

In the following all measuring ranges are listed that are supported by the analog part.

The here listed formulas allow you to transform an evaluated measuring value (digital value) to a value assigned to the measuring range and vice versa.

+/- 10V

Voltage	Decimal	Hex
-10V	-27648	9400
-5V	-13824	CA00
0V	0	0
+5V	13824	3600
+10V	+27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{U}{10}, \quad U = Value \cdot \frac{10}{27648}$$

U: voltage, Value: decimal value

0...10V

Voltage	Decimal	Hex
0V	0	0
5V	13824	3600
10V	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{U}{10}, \quad U = Value \cdot \frac{10}{27648}$$

U: voltage, Value: decimal value

0....20mA

Current	Decimal	Hex
0mA	0	0
+10mA	+13824	3600
+20mA	+27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{I}{20}, \quad I = Value \cdot \frac{20}{27648}$$

I: current, Value: decimal value

4....20mA

Current	Decimal	Hex
+4mA	0	0
+12mA	+13824	3600
+20mA	+27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{I-4}{16}, \quad I = Value \cdot \frac{16}{27648} + 4$$

I: current, Value: decimal value

+/- 20mA

Current	Decimal	Hex
-20mA	-27648	9400
-10mA	-13824	CA00
0mA	0	0
+10mA	+13824	3600
+20mA	+27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{I}{20}, \quad I = Value \cdot \frac{20}{27648}$$

I: current, Value: decimal value

Analog Part - Parameterization

Parameter data

18Byte of parameter data are available for the configuration. By using the record set B4h of the SFC 55 "WR_PARM" you may alter the parameterization in the module during runtime. The time needed until the new parameterization is valid can last up to 50ms. During this time, the measuring value output is 7FFFFh. The following table shows the structure of the parameter data:

Record set B4h

Byte	Bit 7 ... Bit 0	Default
0	Channel 0: Wire break recognition Bit 0: 0 = off (Wire break recognition deactivated) 1 = on (Wire break recognition activated) Channel 1: Wire break recognition Bit 1: 0 = off (Wire break recognition deactivated) 1 = on (Wire break recognition activated) Channel 2: Wire break recognition Bit 2: 0 = off (Wire break recognition deactivated) 1 = on (Wire break recognition activated) Channel 3: Wire break recognition Bit 3: 0 = off (Wire break recognition deactivated) 1 = on (Wire break recognition activated) Channel 4: Wire break recognition Bit 4: 0 = off (Wire break recognition deactivated) 1 = on (Wire break recognition activated) Bit 7 ... 5: reserved	00h
1	Bit 4 ... 0: reserved Channel 5: Reaction at CPU_STOP Bit 5: 0 = Set replacement value *) 1 = Store last value Channel 6: Reaction at CPU_STOP Bit 6: 0 = Set replacement value *) 1 = Store last value Bit 7: reserved	00h
2	Channel 0: Function (see table input ranges)	19h
3	Channel 1: Function (see table input ranges)	19h
4	Channel 2: Function (see table input ranges)	19h
5	Channel 3: Function (see table input ranges)	19h
6	Channel 4: Function (see table input ranges)	00h
7	Channel 0: Measuring cycle (see table next page)	00h
8	Channel 1: Measuring cycle (see table next page)	00h
9	Channel 2: Measuring cycle (see table next page)	00h
10	Channel 3: Measuring cycle (see table next page)	00h
11	Channel 4: Measuring cycle (see table next page)	00h
12	Channel 5: Function (see table output ranges)	19h
13	Channel 6: Function (see table output ranges)	19h
14	Channel 5: High-Byte substitute value	00h
15	Channel 5: Low-Byte substitute value	00h
16	Channel 6: High-Byte substitute value	00h
17	Channel 6: Low-Byte substitute value	00h

*) If you want to get 0A res. 0V as output value at CPU-STOP, you have to set the replacement value E500h.

Parameters

Wire break recognition

The Bits 0 ... 4 of Byte 0 allow you to activate the wire break recognition for the input channels. The wire break recognition is only available for the current measuring range of 4...20mA and thermo resistance measurement. A wire break is recognized, a diagnostic entry is made and displayed by the SF LED when the current during current measuring (4 ... 20mA) sinks under 1.18mA res. at thermo resistance measurement the resistance becomes endless.

If additionally a diagnostic alarm is activated, a diagnostic message is sent to the superordinated system.

Diagnostic alarm

The diagnostic alarm is global released for the digital and analog part. More is to be find at "Counter - Parameterization". In case of an error like e.g. wire break, the superordinated system receives *record set 0*. For a channel specific diagnostic you may then call *record set 1* (see "Diagnostic data").

CPU-Stop reaction and substitute value

With Bit 5 and 6 of Byte 1 and Byte 14 ... 17 you may set the reaction of the module at CPU-Stop for every output channel.

Via Byte 14 ... 17 you predefine a substitute value for the output channel as soon as the CPU switches to Stop.

By setting Bit 5 res. 6, the last output value remains in the output at CPU-Stop. A reset sets the replacement value.

Function No.

Here you set the function no. of your measuring res. output function for every channel. Please see the according table above.

Measuring cycle

Here you may set the transducer velocity for every input channel. Please regard that a higher transducer velocity causes a lower resolution because of the lower integration time.

The data transfer format remains unchanged. Only the lower Bits (LSBs) are not longer relevant for the analog value.

Structure Measuring cycle Byte:

Byte	Bit 7 ... Bit 0	Resolution	Default
7 ... 11	Bit 3 ... 0: Velocity per channel		00h
	0000 15 conversions/s	16	
	0001 30 conversions/s	16	
	0010 60 conversions/s	15	
	0011 120 conversions/s	14	
	0100 170 conversions/s	12	
	0101 200 conversions/s	10	
	0110 3.7 conversions/s	16	
	0111 7.5 conversions/s	16	
	Bit 7 ... 4: reserved		

Function no. assignment

The assignment of a function no. to a certain channel happens during parameterization. By setting 00h you may de-activate the according channel.

Input range
(channel 0 ... 3)

No.	Function	Input range
19h	Voltage ±10V Siemens S7-format	±11.76V 11.76V= End overdrive region (32511) -10V...10V = nominal range (-27648...27648) -11.76 = End underdrive region (-32512) two's complement
18h	Voltage 0...10V Siemens S7-format	0...11.76V 11.76V = End overdrive region (32511) 0...10V = nominal range (0...27648) no underdrive region available
24h	Current ±20mA Siemens S7-format	±23.52mA 23.52mA = End overdrive region (32511) -20...20mA = nominal range (-27648...27648) -23.52mA = End underdrive region (-32512) two's complement
23h	Current 4...20mA Siemens S7-format	1.185...22.81mA 22.81mA = End overdrive region (32511) 4...20mA = nominal range (0...27648) 1.185mA = End underdrive region (-4864) two's complement
22h	Current 0...20mA Siemens S7-format	0...23.52mA 23.52mA = End overdrive region (32511) 0...20mA = nominal range (0...27648) no underdrive region available
00h	Channel not active (turned off)	

Input range
(channel 4)

No.	Function	Measuring range / representation
82h	Pt100 in 2wire mode	-240...1000°C 1000°C = End overdrive region (10000) -200...+850°C **=** nominal range (-2000...8500) -240°C = End underdrive region (-2400) two's complement
85h	Pt1000 in 2wire mode	-240...600°C 600°C = End overdrive region (6000) -200...+500°C **=** nominal range (-2000...5000) -240°C = underdrive region (-2400) two's complement
83h	NI100 in 2wire mode	-105...295°C 295°C = Ende overdrive region (2950) -50...+250°C **=** nominal range (-500...2500) -105°C = Ende underdrive region (-1050) two's complement
86h	NI1000 in 2wire mode	-105...270°C 270°C = Ende overdrive region (2700) -50...+250°C **=** nominal range (-500...2500) -105 = Ende underdrive region (-1050) two's complement
46h	Resistance measurement 600Ohm 2wire	0...705.5Ω 705.5Ω = End overdrive region (32511) 0…600Ω = nominal range (0...27648) no underdrive region available
00h	Channel not active (turned off)	

Output range
(channel 5, channel 6)

No.	Function	Output range
19h	Voltage ±10V Siemens S7-format	±11.76V 11.76V= End overdrive region (32511) -10V...10V = nominal range (-27648...27648) -11.76 = End underdrive region (-32512) two's complement
18h	Voltage 0...10V Siemens S7-format	0...11.76V 11.76V = End overdrive region (32511) 0...10V = nominal range (0...27648) no underdrive region
24h	Current ±20mA Siemens S7-format	±23.52mA 23.52mA = End overdrive region (32511) -20...20mA = nominal range (-27648...27648) -23.52mA = End underdrive region (-32512) two's complement
23h	Current 4...20mA Siemens S7-format	0...22.81mA 22.81mA = End overdrive region (32511) 4...20mA = nominal range (0...27648) 0mA = End underdrive region (-6912) two's complement
22h	Current 0...20mA Siemens S7-format	0...23.52mA 23.52mA = End overdrive region (32511) 0...20mA = nominal range (0...27648) no underdrive region
00h	Channel not active (turned off)	

Note!
Leaving the defined range, the output is 0V res. 0A!

Analog part - Diagnostic functions

Overview

As soon as you've activated the diagnostic alarm release in the parameterization, the following events can release a diagnostic alarm:

- Wire break
- Parameterization error
- Measuring range overflow
- Measuring range underflow

At accumulated diagnostic the CPU interrupts the user application and branches to the OB82 for $diagnostic_{incoming}$. This OB allows you with an according programming to monitor detailed diagnostic information via the SFCs 51 or 59 and to react to it. After the execution of the OB82 the user application processing is continued. The diagnostic data is consistent until leaving the OB82. After error correction automatically a $diagnostic_{going}$ occurs if the diagnostic alarm release is still active. In the following the record sets for $diagnostic_{incoming}$ and $diagnostic_{going}$ are specified:

Record set 0
$Diagnostic_{incoming}$

Byte	Bit 7 ... Bit 0
0	Bit 0: 0 = OK 1 = Module malfunction Bit 1: 0 (fix) Bit 2: External error Bit 3: Channel error present Bit 4: External supply voltage is missing Bit 5 ... 6: 0 (fix) Bit 7: Wrong parameters in the module
1	Bit 3 ... 0: Module class 0101 Analog module Bit 4: Channel information present Bit 7 ... 5: 0 (fix)
2	00h (fix)
3	00h (fix)

Record set 0
$Diagnostic_{going}$

After error correction automatically a $diagnostic_{going}$ occurs if the diagnostic alarm release is still active.

Byte	Bit 7 ... Bit 0
0	00h (fix)
1	Bit 3 ... 0: Module class 0101 Analog module Bit 4: Channel information present Bit 7 ... 5: reserved
2	00h (fix)
3	00h (fix)

Record set 1
channel specific diagnostic$_{incoming}$

The *record set 1* contains the 4Byte of record set 0 and additional 12Byte module specific diagnostic data.

The diagnostic bytes have the following assignment:

Byte	Bit 7 ... Bit 0
0 ... 3	Content record set 0 (see page before)
4	Bit 6 ... 0: Channel type 70h: Digital input 71h: Analog input 72h: Digital output 73h: Analog output 74h: Analog in-/output Bit 7: reserved
5	Number of diagnostic bits per channel (here 08h)
6	Number of channels of a module (here 07h)
7	Bit 0: Channel error Channel 0 Bit 1: Channel error Channel 1 Bit 2: Channel error Channel 2 Bit 3: Channel error Channel 3 Bit 4: Channel error Channel 4 Bit 5: Channel error Channel 5 Bit 6: Channel error Channel 6 Bit 7: 0 (fix)
8	Bit 0: Parameterization error Channel 0 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: 0 (fix) Bit 4: Wire break Channel 0 Bit 5: 0 (fix) Bit 6: Measuring range underflow Channel 0 Bit 7: Measuring range overflow Channel 0
9	Bit 0: Parameterization error Channel 1 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: 0 (fix) Bit 4: Wire break Channel 1 Bit 5: 0 (fix) Bit 6: Measuring range underflow Channel 1 Bit 7: Measuring range overflow Channel 1
10	Bit 0: Parameterization error Channel 2 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: 0 (fix) Bit 4: Wire break Channel 2 Bit 5: 0 (fix) Bit 6: Measuring range underflow Channel 2 Bit 7: Measuring range overflow Channel 2

continued ...

... continue

Byte	Bit 7 ... Bit 0
11	Bit 0: Parameterization error Channel 3 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: 0 (fix) Bit 4: Wire break Channel 3 Bit 5: 0 (fix) Bit 6: Measuring range underflow Channel 3 Bit 7: Measuring range overflow Channel 3
12	Bit 0: Parameterization error Channel 4 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: 0 (fix) Bit 4: Wire break Channel 4 Bit 5: 0 (fix) Bit 6: Measuring range underflow Channel 4 Bit 7: Measuring range overflow Channel 4
13	Bit 0: Parameterization error Channel 5 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: Short circuit Channel 5 Bit 4: Wire break Channel 5 Bit 7 ... 5: 0 (fix)
14	Bit 0: Parameterization error Channel 6 Bit 1: 0 (fix) Bit 2: 0 (fix) Bit 3: Short circuit Channel 6 Bit 4: Wire break Channel 6 Bit 7 ... 5: 0 (fix)

Digital part

Outline

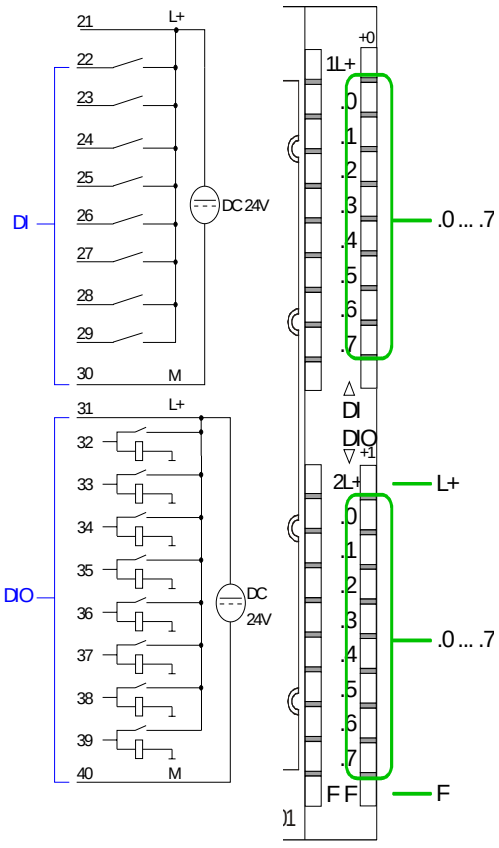
The digital part consists of 8 input and 8 in-/output channels. Each of these channels shows its state via a LED. By means of the parameterization you may assign alarm properties to every digital input. Additionally you may parameterize the digital inputs as counter (max. 15kHz, with release 2 max. 100kHz).

The output channels provide a diagnostic function, i.e. as soon as an output is active, the concerning input is set to "1". At a short circuit at the load, the input is set to "0" and the error may be recognized by evaluating the input. The DIO area has to be provided with external DC 24V.

Pin assignment
Status monitor

Pin	Assignment
21	Supply voltage +DC 24V
22	Input I+0.0 / Counter 0(A)
23	Input I+0.1 / Counter 0(B)
24	Input I+0.2 / Gate0/Latch0/Reset0
25	Input I+0.3 / Counter 1(A)
26	Input I+0.4 / Counter 1(B)
27	Input I+0.5 / Gate1/Latch1/Reset1
28	Input I+0.6 / Counter 2(A)
29	Input I+0.7 / Counter 2(B)
30	Ground DI
31	Supply voltage +DC 24V
32	I/Q+1.0 / Gate2/Latch2/Reset2
33	I/Q +1.1 / Counter 3(A)
34	I/Q +1.2 / Counter 3(B)
35	I/Q +1.3 / Gate3/Latch3/Reset3
36	I/Q +1.4 / OUT0/Latch0/Reset0
37	I/Q +1.5 / OUT1/Latch1/Reset1
38	I/Q +1.6 / OUT2/Latch2/Reset2
39	I/Q +1.7 / OUT3/Latch3/Reset3
40	Ground DIO

Connection



LEDs

DI:

.0 ... .7 LEDs (green) I+0.0 to I+0.7 Starting at app. 15V the signal "1" is recognized at the input and the acc. LED is on

DIO:

2L+ LED (green) Supply voltage for DIO is present

.0 ... .7 LEDs (green) I/Q+1.0 to I/Q+1.7 is on at active output res. input

F LED (red) Error at overload or short circuit

Attention!

Please regard that the voltage at an output channel is always ≤ the supply voltage connected to L+.

Please regard also that due to the parallel connection of in- and output channel for each group one set output can be supplied via a connected input signal.

A thus connected output remains active even with shut down supply voltage.

Non-observance may cause damages of the module.

Access to the digital part

By including the GSD speedbus.gsd into your hardware configurator the module is monitored in the hardware catalog.

After the installation of the GSD you will find the CPU 314ST under *Additional Field devices* \ *I/O* \ *VIPA_SpeedBus*.

The CPU 314ST creates in its peripheral range 48Byte for data input and 24Byte for data output. Out of this, the digital part occupies 34Byte for digital input and 18Byte for digital output. Without a hardware configuration the ranges start at address 1024.

In the following table the according areas are marked ▭ :

Input range

Address	Access	Assignment
+0	Byte	Digital Input I+0.0 ... I+0.7
+1	Byte	Digital Input I+1.0 ... I+1.7
+2	Word	reserved
+4	Word	Analog Input CH0
+6	Word	Analog Input CH1
+8	Word	Analog Input CH2
+10	Word	Analog Input CH3
+12	Word	Analog Input CH4
+14	Word	reserved
+16	Double word	Counter 0 / Latch 0
+20	Word	reserved
+22	Word	Status Counter 0
+24	Double word	Counter 1 / Latch 1
+28	Word	reserved
+30	Word	Status Counter 1
+32	Double word	Counter 2 / Latch 2
+36	Word	reserved
+38	Word	Status Counter 2
+40	Double word	Counter 3 / Latch 3
+44	Word	reserved
+46	Word	Status Counter 3

Output range

For the output you enter a Word value into the data output range.

Address	Access	Assignment
+0	Byte	reserved
+1	Byte	Digital Output Q+1.0 ... Q+1.7
+2	Word	reserved
+4	Word	Analog Output CH0
+6	Word	Analog Output CH1
+8	Word	reserved
+10	Word	Status Counter 0
+12	Word	reserved
+14	Word	Status Counter 1
+16	Word	reserved
+18	Word	Status Counter 2
+20	Word	reserved
+22	Word	Status Counter 3

Counter - Fast introduction

Fast introduction

The CPU 314ST has 4 parameterizable counters integrated that may be controlled separately. During the count process the counter signal is recognized and evaluated. Every counter occupies one double word in the input range for the *counter register* and one word in the in- and output range for the *input* res. *output status*.

Preset res. parameterize counter

By including the speedbus.gsd you may preset all counter parameters via a hardware configuration. Here you may define among other:

- Alarm behavior
- Assignment I/O (Gate, Latch, Reset, OUT)
- Input filter
- Counter operating mode res. behavior
- Start value for load value, end value and comparison value register

You may alter the parameters during runtime by using the SFC 55, 56, 57 and 58, except of the parameters in record set 0. Here you have to send the wanted parameters to the counter by means of the user application using the according SFC and sending the data as record set.

Control counter

The counter is controlled via the internal gate (I-gate). The I-gate is the sum of hardware- (HW) and Software-gate (SW), where the HW-gate evaluation may be deactivated via the parameterization.

HW-gate: Input at $Gate_x$-input at module

SW-gate: Open (activate): Set once output status Bit 2 in the output range

Close (deactivate): Set output status Bit 10 in the output range

The following states influence the gates:

SW- gate	HW- gate	influences I-gate
0	with positive edge	0
1	with positive edge	1
with positive edge	1	1
with positive edge	0	0
with positive edge	de-activated	1

Read counter

Depending on the status setting, the counter register contains the recent counter value (input status Bit 0=0) or the recent Latch value (input status Bit 0=1).

By setting the output status Bit 8 the recent Latch value is transferred to the counter register in the input area.

Transfer the recent counter value by setting the output status Bit 0.

Counter status word

Besides of the counter register in the input area you may find a status word for every counter in the in- res. output range. You may monitor the status or influence the counter by setting according bits like e.g. activate the SW gate.

Input status word

The status word in the input range has the following structure:

Bit	Label	Function
0	COUNT_LTCH	0: Value in input image is counter value 1: Value in input image is latch value
1	CTRL_Count_DO	Is set when the digital output is released
2	STS_SW-GATE	Status software gate (set when SW gate active)
3	reserved	reserved
4	STS_STRT	Status hardware gate (set when HW gate active)
5	STS_GATE	Status internal gate (set when internal gate active)
6	STS_DO	Status of the digital output of a counter (DO)
7	STS_C_DN	Status counter direction backwards
8	STS_C_UP	Status counter direction forward
9	STS_CMP*	Status Comparison (**C**o**mp**are) is set when counter value = comparison value. If comparison is parameterized *never*, the bit is never set
10	STS_END*	Status set when end value is reached
11	STS_OFLW*	Status overflow
12	STS_UFLW*	Status underrun
13	STS_ZP*	Status zero run
14	STS_LTCH	Status of the Latch input of a counter
15	NEW_LTCH	Is set if value in the Latch register has changed

* The bits remains set until reset with RES (Bit 6 status word output image).

Output status word

After setting a bit in the output status word this is immediately set back. Please regard that setting and resetting of a function at the output status word takes place with different bits:

Bit	Label	Function
0	Get _Count_Val	Transfer counter value to process image
1	Set_Count_DO	Release the digital output for counter (output only available via counter)
2	Set_SW-Gate	set software gate
3	reserved	-
4	reserved	-
5	Set_Count_Val	Set counter temporarily to a value (the counter value for Z_x has to be transferred before via record set (9A+x)h
6	Reset_STS	reset Bit STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP
7	reserved	-
8	Get_Latch_Val	Transfer Latch value to process image
9	Reset_Count_DO	Lock digital output for counter (output available only via process image)
10	Reset_SW_Gate	reset software gate
12	reserved	-
...	...	...
15	reserved	-

Counter inputs (Connections)

For not all inputs are available at the same time, you may set the input assignment for every counter via the parameterization. For each counter the following inputs are available:

$Counter_x$ (A)

Pulse input for count signal res. track A of an encoder. Here you may connect encoder with 1-, 2- or 4-tier evaluation.

$Counter_x$ (B)

Direction signal res. track B of the encoder. Via the parameterization you may invert the direction signal.

The following inputs may be assigned to a pin at the module via parameterization:

$Gate_x$

This input allows you to open the HW gate with a high peek and thus start a count process.

$Latch_x$

With a positive edge at $Latch_x$ the recent counter value is stored in a memory that you may read at need.

$Reset_x$

With a positive edge at $Reset_x$ the counter is reset to the load value.

Counter outputs

Every counter has an assigned output channel. The following behavior for the output channel can be set via parameterization:

- No comparison: output is not headed for
- Count value ≥ comparison value: output is set
- Count value ≤ comparison value: output is set
- Count value = comparison value: output is set

Maximum count frequency

At this time the maximum frequency for the release version 1 independent from the number of activated counters is 15kHz. Starting with release version 2 a max. of 100kHz is possible.

Counter - Parameterization

Overview

The parameterization takes place in the hardware configurator. Here, 212Byte parameter data are transferred existing of the following components:

Byte	Record set	Description
16	0h	Counter mode C0 ... C3
2	7Fh	Diagnostic alarm
16	80h	Edge selection for process alarm
32	81h	Filter value I+0.0 ... I+1.7
16	82 ... 86h	C0: Comparison, Set, End value, hysteresis, pulse
16	87h	C0: Sum parameter (Comparison, Set, End value, hysteresis and pulse)
16	88 ... 8Ch	C1: Comparison, Set, End value, hysteresis, pulse
16	8Dh	C1: Sum parameter (Comparison, Set, End value, hysteresis and pulse)
16	8E ... 92h	C2: Comparison, Set, End value, hysteresis, pulse
16	93h	C2: Sum parameter (Comparison, Set, End value, hysteresis and pulse)
16	94 ... 98h	C3: Comparison, Set, End value, hysteresis, pulse
16	99h	C3: Sum parameter (Comparison, Set, End value, hysteresis and pulse)
4	9Ah	C0: Count value that is transferred to counter by setting Bit 5 in the output status word
4	9Bh	C1: Count value that is transferred to counter by setting Bit 5 in the output status word
4	9Ch	C2: Count value that is transferred to counter by setting Bit 5 in the output status word
4	9Dh	C3: Count value that is transferred to counter by setting Bit 5 in the output status word
2	9Eh	Analog-/Digital part activated or de-activated

Except of the parameter in record set 0, you may transfer the other parameters during runtime by using the SFC 55, 56, 57 and 58 to the digital part. For this you have to transfer the wanted parameters to the counter by using the according SFC in the user application.

Record set 0
Counter mode

Via the record set 0 you may preset a counter mode for every counter as double word. Please regard that the record set 0 may not be transferred during runtime. Record set 0 has the following structure:

Byte	Description
0 ... 3	Counter mode C0
4 ... 7	Counter mode C1
8 ... 11	Counter mode C2
12 ... 15	Counter mode C3

Counter mode

The double word for the counter mode has the following structure:

Byte	Bit 7 ... 0
0	*Bit 2 ... 0: Signal evaluation* 000b = Counter de-activated At de-activated counter the further parameter settings for this counter are ignored and the according I/O channel is set as "normal" output if this should be used as output. 001b = Encoder 1-tier (at counter$_x$ (A_x) and counter$_x$ (B_x)) 010b = Encoder 2-tier (at counter$_x$ (A_x) and counter$_x$ (B_x)) 011b = Encoder 4-tier (at counter$_x$ (A_x) and counter$_x$ (B_x)) 100b = Pulse/direction (pulse at counter$_x$ (A_x) and direction at counter$_x$ (B_x)) *Bit 6 ... 3: C_x input* (Function of the counter input as gate, latch or reset) 0000b = de-activated (counter starts at set SW gate) 0001b = Gate$_x$ The input of counter$_x$ serves as gate. High peek at gate activates the HW gate. The counter may only start when HW and SW gate are set. 0010b = Monoflop* 0100b = Latch$_x$ (Positive edge at input saves counter value) 1000b = Reset$_x$ (Positive edge at input sets Counter back) *Bit 7: Gate function (internal gate)* 0 = abort (count process starts again at load value) 1 = interrupt (count process continues with counter value)
1	*Bit 2 ... 0: Output set* (OUT$_x$ of counter$_x$ is set when condition is met) 000b = never 001b = counter value >= comparison value 010b = counter value <= comparison value 100b = counter value = comparison value *Bit 3: Count direction* 0 = count direction inverted: OFF (count direction at B_x not inverted) 1 = count direction inverted: ON (count direction at B_x inverted) *Bit 7 ... 4: reserved*

* not supported at this time

continued ...

... continue

2	*Bit 5 ... 0: Counter function* 000000b = Count endless 000001b = Once: forward 000010b = Once: backwards 000100b = Once: no main direction 001000b = Periodic: forward 010000b = Periodic: backwards 100000b = Periodic: no main direction More details under "Counter - Functions" below. *Bit 7 ... 6: C_x In-/Output* (Function of the counter I/O as OUT, Latch or Reset) 00b = O: OUT_x (at comparison function) 01b = I: $Latch_x$ (rising edge saves counter value) 10b = I: $Reset_x$ (rising edge sets counter back)
3	*Bit 5 ... 0: Alarm behavior* Bit 0: Proc. alarm HW gate open Bit 1: Proc. alarm HW gate closed Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underrun Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm end value By setting the Bits you may activate the wanted process alarms. *Bit 7 ... 5: reserved*

* not supported at this time

Record set 7Fh
Diagnostic alarm

This record set activates res. de-activates the diagnostic function. A diagnostic alarm occurs when during a process alarm execution another process alarm is initialized for the same event.

The record set has the following structure:

Byte	Bit 15 ... 0
0...1	*Bit 15 ... 0: Diagnostic alarm* 0000h = de-activated 0001h = activated
2...3	*Bit 15 ... 0: reserved*

Record set 80h
Edge selection

Via this record set you may activate a process alarm for I+0.0 ... I+1.7 and define for which edge type of the input signal a process alarm is thrown.

The record set has the following structure:

Byte	Bit 7 ... 0
0	*Bit 1 ... 0: Edge selection I+0.0* 00b = de-activated 01b = Process alarm at rising edge 10b = Process alarm at falling edge 11b = Process alarm at rising and falling edge *Bit 7 ... 2: reserved*
...	...
15	*Bit 1 ... 0: Edge selection I+1.7* 00b = de-activated 01b = Process alarm at rising edge 10b = Process alarm at falling edge 11b = Process alarm at rising and falling edge *Bit 7 ... 2: reserved*

Record set 81h
Input filter

This record set allows you to preset an input filter in steps of 2.56µs steps for I+0.0 ... I+1.7. By preceding a filter you define how long an input signal must be present before it is recognized as "1" signal. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

The entry happens as a factor of 2.56µs and is within the range 1 ... 16000 i.e. 2.56µs ... 40.96ms. The record set has the following structure:

Byte	Bit 15 ... 0
0 ... 1	Bit 15 ... 0: Input filter I+0.0 in 2.56µs
2 ... 3	Bit 15 ... 0: Input filter I+0.1 in 2.56µs
4 ... 5	Bit 15 ... 0: Input filter I+0.2 in 2.56µs
...	...
30 ... 31	Bit 15 ... 0: Input filter I+1.7 in 2.56µs

Record set 82 ... 99h
Counter parameter

Each of the following counter parameters has an assigned record set depending on the counter number. Additionally for every counter the parameter are summoned in one record set.

The record sets have the same structure for every counter. Please refer to the following table for the structure and the according record set number assignment. The record set has the following structure:

Count. 0 total: 87h	Count. 1 total: 8Dh	Count. 2 total: 93h	Count. 3 total: 99h	Type	Function
82h	88h	8Eh	94h	Double word	Comparison value
83h	89h	8Fh	95h	Double word	Load value
84h	8Ah	90h	96h	Double word	End value
85h	8Bh	91h	97h	Word	Hysteresis
86h	8Ch	92h	98h	Word	Pulse

… Continue
Record set 82 … 99h

Comparison value

Via the parameterization you may preset a comparison value that may influence the counter output res. throw a process alarm when compared with the recent counter value. The behavior of the output res. the process alarm has to be set via the record set 0.

Load value, end value

You may define a main counting direction for every counter via the parameterization.

If "none" or "endless" is chosen, the complete counting range is available:

Counter limits	Valid value range
Lower count limit	- 2 147 483 648 (-2^{31})
Upper count limit	+ 2 147 483 647 (2^{31}-1)

Otherwise you may set an upper and a lower limit by setting a *load value* as start and an *end value*.

Hysteresis

The hysteresis serves the avoidance of many toggle processes of the output and the alarm, if the counter value is in the range of the comparison value. You may set a range of 0 to 255. The settings 0 and 1 deactivate the hysteresis. The hysteresis influences zero run, comparison, over- and underflow.

Pulse (Pulse duration)

The pulse duration tells for what time the output is set when the parameterized comparison criterion is reached res. overstepped. The pulse duration can be set in steps of 2.048ms between 0 and 522.24ms.

If the pulse duration = 0, the output is set active until the comparison condition is not longer fulfilled.

Note!

More details are under "Counter – Additional functions" below!

Datensatz 9A ... 9Dh
Set counter value temporary

A register can be preset using record set (9A+x)h. The current counter value is replaced by the register value by setting bit 5 of the output status word without any influence to the load value.

Record set 9Eh
Module selection

Using this record set you can de-activate the digital res. analog part. If a part is de-activated the corresponding area of the process image is just reserved.

The record set has the following structure:

Byte	Bit 15 ... 0
0...1	*Bit 15 ... 0: Module selection* 0000h = Digital / analog part activated (default) 0001h = Digital part de-activated 0002h = Analog part de-activated

Counter - Functions

Outline

You may count forward and backwards and choose between the following counter functions:

- Count endless – Distance measuring with incremental encoder
- Count once – Count to a maximum limit
- Count periodic – Count with repeated counter process

In the operating modes "Count once" and "Count periodic" you may define a counter range as start and end value via the parameterization.

For every counter additional parameterizable functions are available like gate function, latch function, comparison, hysteresis and process alarm.

Main counting direction

Via the parameterization you have the opportunity to define a main counting direction for every counter.

If "none" is chosen, the complete counting range is available:

	Valid value range
Lower count limit	- 2 147 483 648 (-2^{31})
Upper count limit	+ 2 147 483 647 (2^{31}-1)

Main counting direction forward

Upper restriction of the count range. The counter counts 0 res. load value in positive direction until the parameterized end value –1 and jumps then back to the load value with the next following encoder pulse.

Main counting direction backwards

Lower restriction of the count range. The counter counts from the parameterized start- res. load value in negative direction to the parameterized end value +1 and jumps then back to the start value with the next following encoder pulse.

Abort - interrupt

Abort count process

The count process starts after closing and restart of the gate beginning with the load value.

Interrupt count process

The count process continuous after closing and restart of the gate beginning with the last recent counter value.

Count Continuously

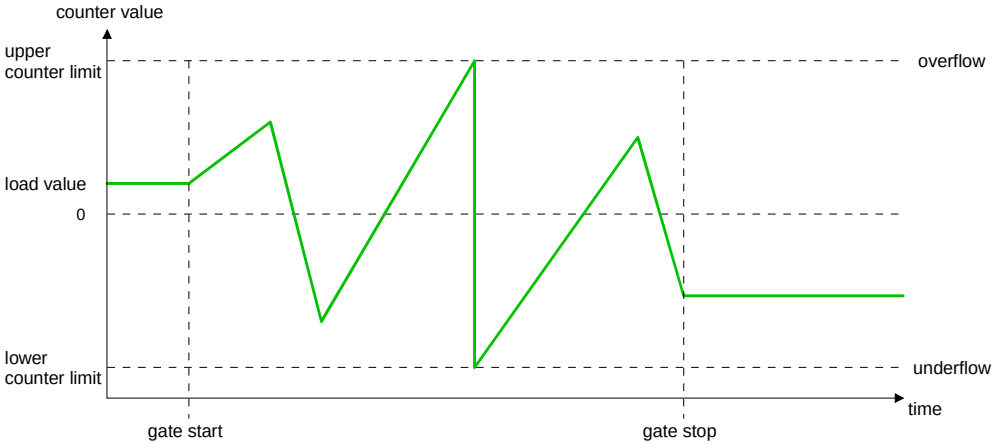
In this operating mode, the counter counts from 0 res. from the load value.

When the counter counts forward and reaches the upper count limit and another counting pulse in positive direction arrives, it jumps to the lower count limit and counts from there on.

When the counter counts backwards and reaches the lower count limit and another counting pulse in negative direction arrives, it jumps to the upper count limit and counts from there on.

The count limits are set to the maximum count range.

	Valid value range
Lower count limit	- 2 147 483 648 (-2^{31})
Upper count limit	+ 2 147 483 647 (2^{31}-1)



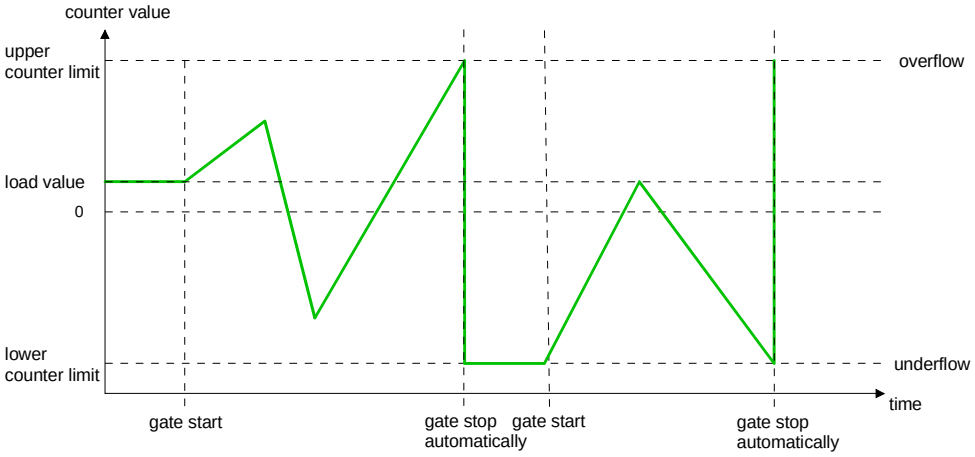
Count Once

No main counting direction

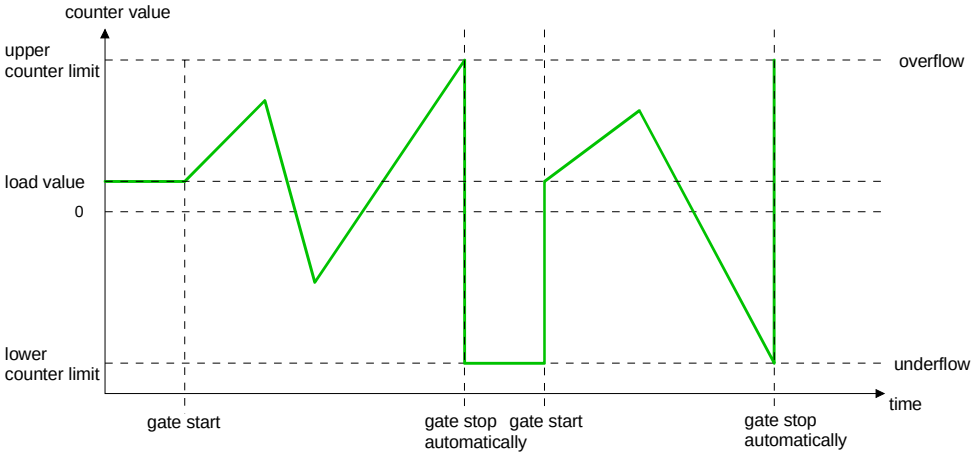
- The counter counts once starting with the load value.
- You may count forward or backwards.
- The count limits are set to the maximum count range.
- At over- or underrun at the count limits, the counter jumps to the according other count limit and the gate is automatically closed.
- To restart the count process, you must create a positive edge of the gate.
- At interrupting gate control, the count process continuous with the last recent counter value.
- At aborting gate control, the counter starts with the load value.

	Valid value range
Lower count limit	- 2 147 483 648 (-2^{31})
Upper count limit	+ 2 147 483 647 (2^{31}-1)

Interrupting gate control:



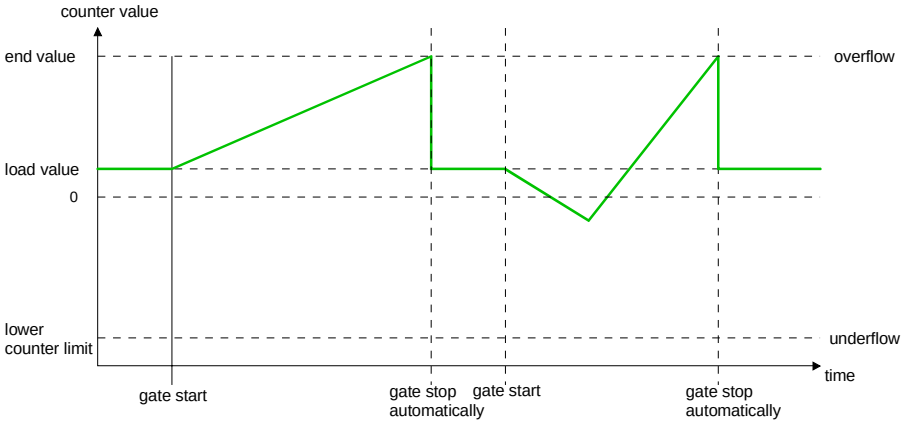
Aborting gate control:



Main counting direction forward

- The counter counts starting with the load value.
- When the counter reaches the end value –1 in positive direction, it jumps to the load value at the next positive count pulse and the gate is automatically closed.
- To restart the count process, you must create a positive edge of the gate. The counter starts with the load value.

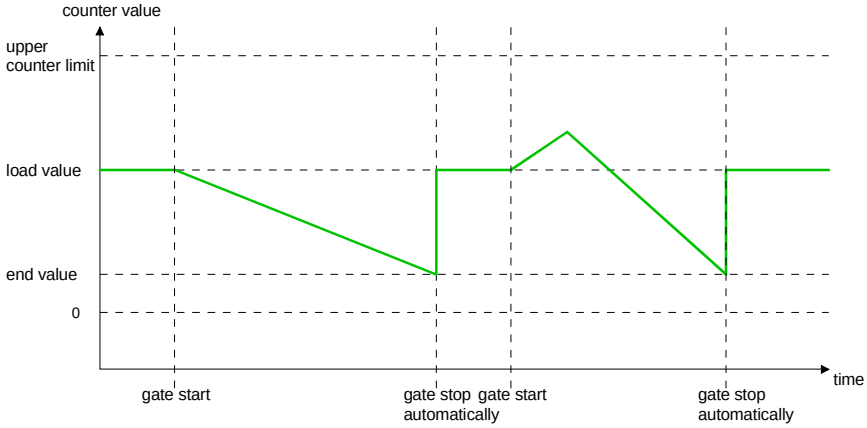
	Valid value range
Limit value	- 2 147 483 646 ($-2^{31}+1$) to + 2 147 483 646 ($2^{31}-1$)
Lower count limit	- 2 147 483 648 (-2^{31})



Main counting direction backwards

- The counter counts backwards starting with the load value.
- When the counter reaches the end value +1 in negative direction, it jumps to the load value at the next negative count pulse and the gate is automatically closed.
- To restart the count process, you must create a positive edge of the gate. The counter starts with the load value.

	Valid value range
Limit value	- 2 147 483 646 ($-2^{31}+1$) to + 2 147 483 646 ($2^{31}-1$)
Upper count limit	+2 147 483 646 ($2^{31}-1$)

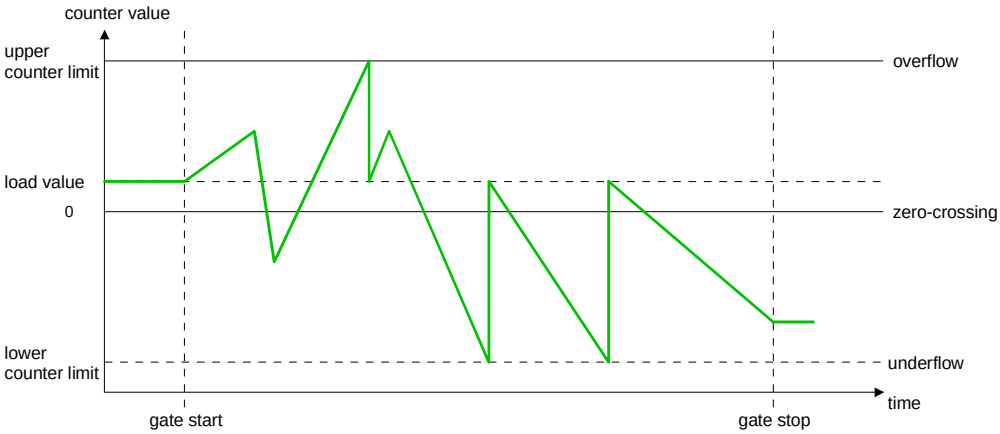


Count Periodically

No main counting direction

- The counter counts forward or backwards starting with the load value.
- At over- or underrun at the count limits, the counter jumps to the according other count limit and counts from there on.
- The count limits are set to the maximum count range.

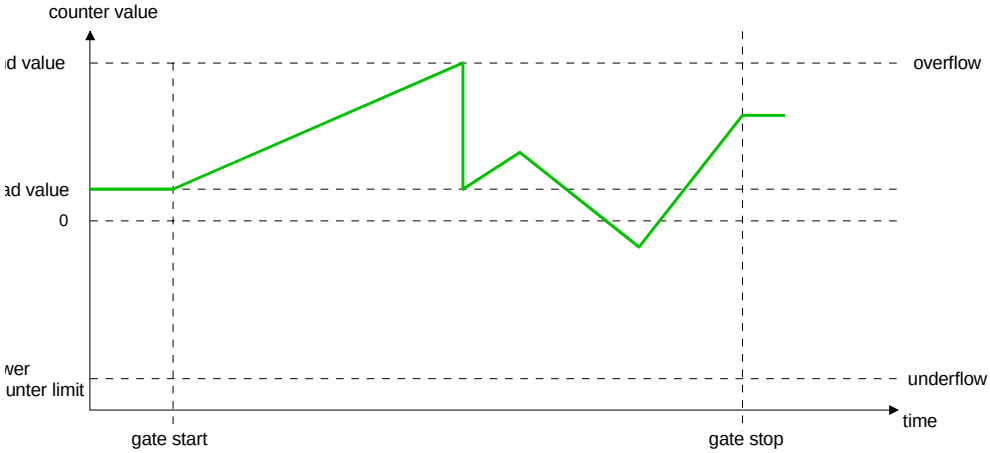
	Valid value range
Lower count limit	- 2 147 483 648 (-2^{31})
Upper count limit	+ 2 147 483 647 (2^{31}-1)



Main counting direction forward

- The counter counts forward starting with the load value
- When the counter reaches the end value –1 in positive direction, it jumps to the load value at the next positive count pulse.

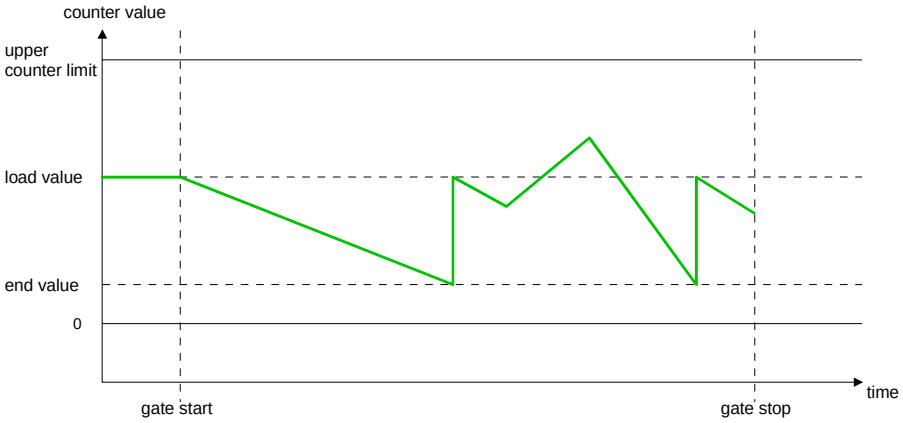
	Valid value range
Limit value	- 2 147 483 647 (-2^{31}+1) to + 2 147 483 647 (2^{31}-1)
Lower count limit	- 2 147 483 648 (-2^{31})



Main counting direction backwards

- The counter counts backwards starting with the load value
- When the counter reaches the end value+1 in negative direction, it jumps to the load value at the next negative count pulse.
- You may exceed the upper count limit.

	Valid value range
Limit value	- 2 147 483 647 ($-2^{31}+1$) to + 2 147 483 647 ($2^{31}-2$)
Upper count limit	+2 147 483 647 ($2^{31}-1$)



Counter - Additional functions

Outline

The following additional functions may be set via the parameterization for every counter:

- Gate function

  The gate function serves the start, stop and interrupt of a count function.
- Latch function

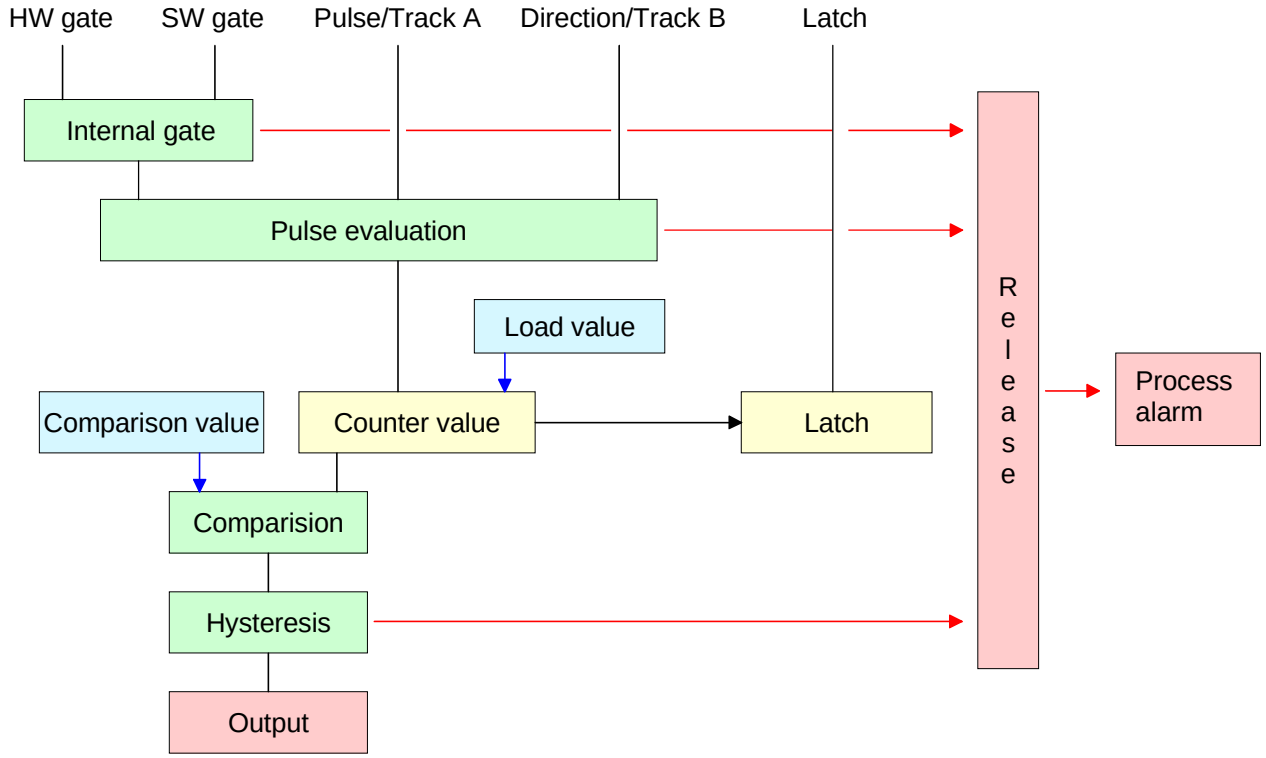
  A positive edge at the digital input "Latch" stores the recent counter value in the latch register.
- Comparison

  You may set a comparison value that activates res. de-activates a digital output res. releases a process alarm depending on the counter value.
- Hysteresis

  The setting of a hysteresis avoids for example a high output toggling when the value of an encoder signal shifts around a comparison value.

Schematic structure

The illustration shows how the additional functions influence the counting behavior. The following pages describe these functions in detail:



Gate function

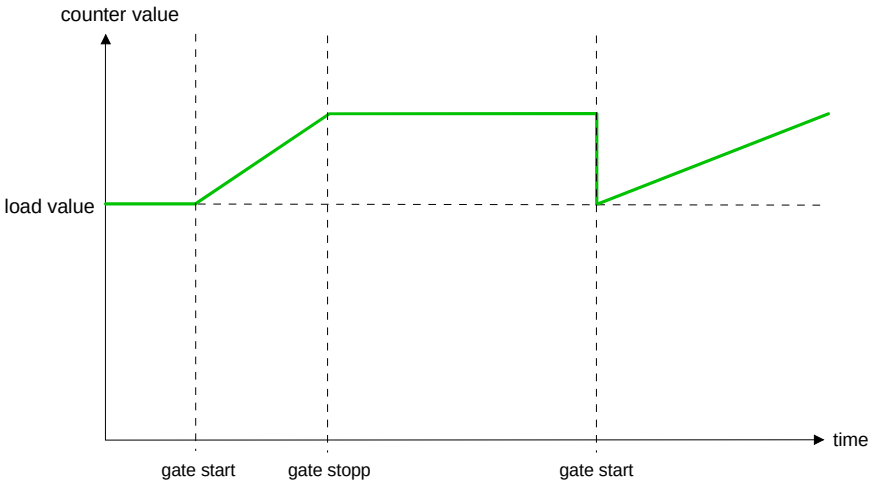
The activation res. de-activation of a counter happens via an internal gate (I-gate). The I-gate consists of a software gate (SW-gate) and a Hardware gate (HW-gate). The SW-gate is opened (activated) via your user application by setting the output status bit 2 for the according counter. The SW-gate is closed (deactivated) by setting the output status bit 10. The HW-gate is controlled via the concerning "Gate" input. The parameterization allows you to de-activate the consideration of the HW-gate so that the counter activation can take place only via the SW-gate. The following states influence the I-gate:

SW- gate	HW- gate	influences I-gate
0	with positive edge	0
1	with positive edge	1
with positive edge	1	0
with positive edge	0	0
with positive edge	de-activated	1

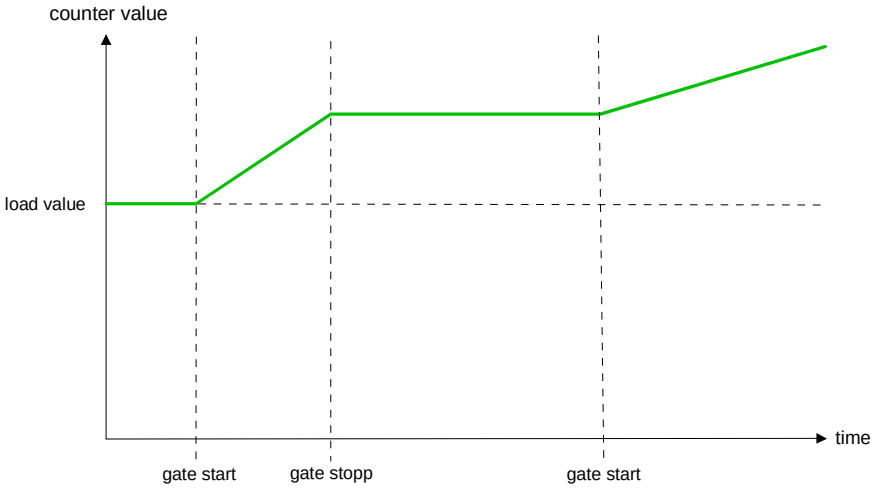
Gate function abort and interrupt

The parameterization defines if the gate interrupts or aborts the counter process.

- At *abort function* the counter starts counting with the load value after gate restart.



- At *interrupt function*, the counter starts counting with the last recent counter value after gate restart.



Gate control abort, interruption

Gate control via SW gate, aborting
(Parameterization: record set 0, Byte 0, Bit 7 ... 3 = 00000b)

SW gate	HW gate	Reaction Counter
positive edge	de-activated	Restart with load value

Gate control via SW gate, interrupting
(Parameterization: record set 0, Byte 0, Bit 7 ... 3 = 10000b)

SW gate	HW gate	Reaction Counter
positive edge	de-activated	Continue

Gate control via SW/HW gate, aborting
(Parameterization: record set 0, Byte 0, Bit 7 ... 3 = 00001b)

SW gate	HW gate	Reaction Counter
positive edge	1	Continue
1	positive edge	Restart with load value

Gate control via SW/HW gate, interrupting
(Parameterization: record set 0, Byte 0, Bit 7 ... 3 = 10001b)

SW gate	HW gate	Reaction Counter
positive edge	1	Continue
1	positive edge	Continue

Gate control "Count once"

Gate control via SW/HW gate, operating mode "Count once"

If the internal gate has been closed automatically it may only be opened again under the following conditions:

SW gate	HW gate	Reaction I gate
1	positive edge	1
positive edge (after positive edge at HW gate)	positive edge	1

Latch function

As soon as during a count process a positive edge is recognized at the "Latch" input of a counter, the recent counter value is stored in the according latch register.

You may access the latch register via the "input image". For this set Bit 15 of the output status word.

At a new latch value additionally Bit 13 is set in the input status word. By setting Bit 15 in the output status word you may read the recent latch value of the according counter and reset the Bit 13 of the input status word.

Comparison

You pre-define the behavior of the counter output via the parameterization:

- output never switches
- output switch when counter value ≥ comparison value
- output switch when counter value ≤ comparison value
- output switch at comparison value

Output never switches

The output is set as normal output.

Output switch when counter value ≥ comparison value

The output remains set as long as the counter value is higher or equal comparison value.

Output switch when counter value ≤ comparison value

The output remains set as long as the counter value is lower or equal comparison value.

Pulse at comparison value

When the counter reaches the comparison value the output is set for the parameterized pulse duration.

If the pulse duration = 0 the output is set until the comparison condition is no longer met.

When you've set a main counting direction the output is only set at reaching the comparison value from the main counting direction.

Pulse duration

The pulse duration defines how long the output is set.
it may be preset in steps of 2.048ms between 0 and 522.24ms.

The pulse duration starts with the setting of the according digital output. The inaccuracy of the pulse duration is less than 2.048ms.

There is no past triggering of the pulse duration when the comparison value has been left and reached again during pulse output.

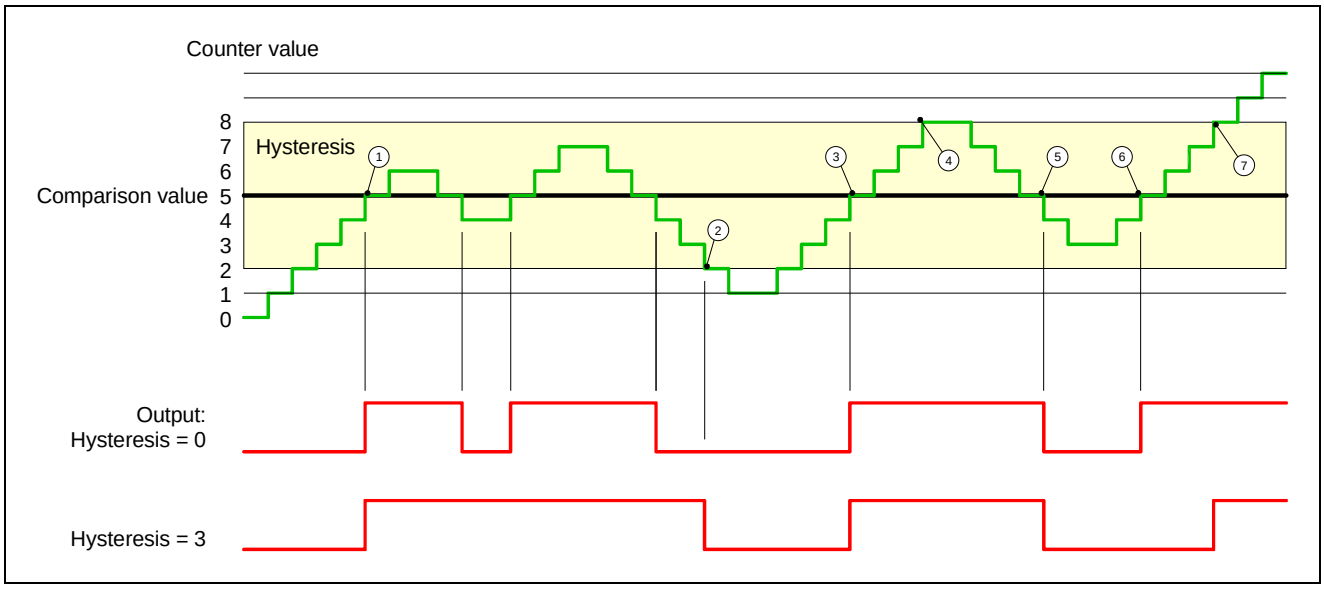
Hysteresis

The hysteresis serves e.g. the avoidance of many toggle processes of the output and the alarm, if the counter value is in the range of the comparison value. You may set a range of 0 to 255. The settings 0 and 1 deactivate the hysteresis. The hysteresis influences the zero run, over- and underflow.

An activated hysteresis remains active after a change. The new hysteresis range is taken over at the next reach of the comparison value.

The following pictures illustrate the output behavior for hysteresis 0 and hysteresis 3 for the according conditions:

Effect at counter value ≥ comparison value



① Counter value ≥ comparison value → output is set and hysteresis activated

② Leave hysteresis range → output is reset

③ Counter value ≥ comparison value → output is set and hysteresis activated

④ Leave hysteresis range, output remains set for counter value ≥ comparison value

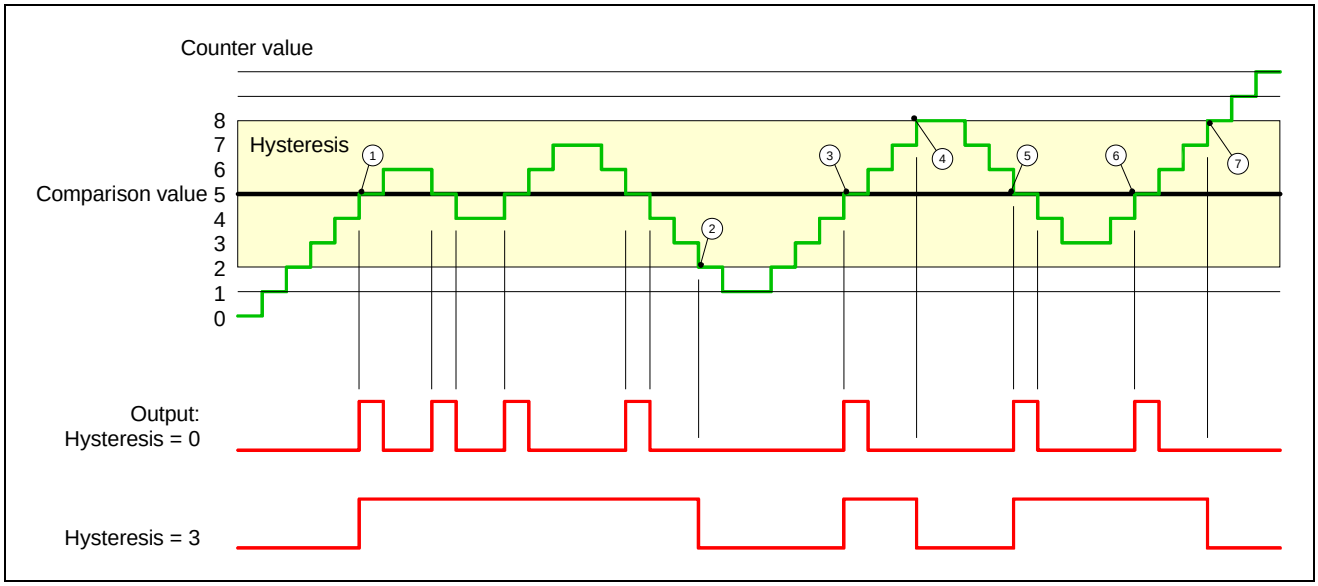
⑤ Counter value < comparison value and hysteresis active → output is reset

⑥ Counter value ≥ comparison value → output is not set for hysteresis active

⑦ Leave hysteresis range, output remains set for counter value ≥ comparison value

With reaching the comparison condition the hysteresis gets active. At active hysteresis the comparison result remains unchanged until the counter value leaves the set hysteresis range. After leaving the hysteresis range a new hysteresis is only activated with again reaching the comparison conditions.

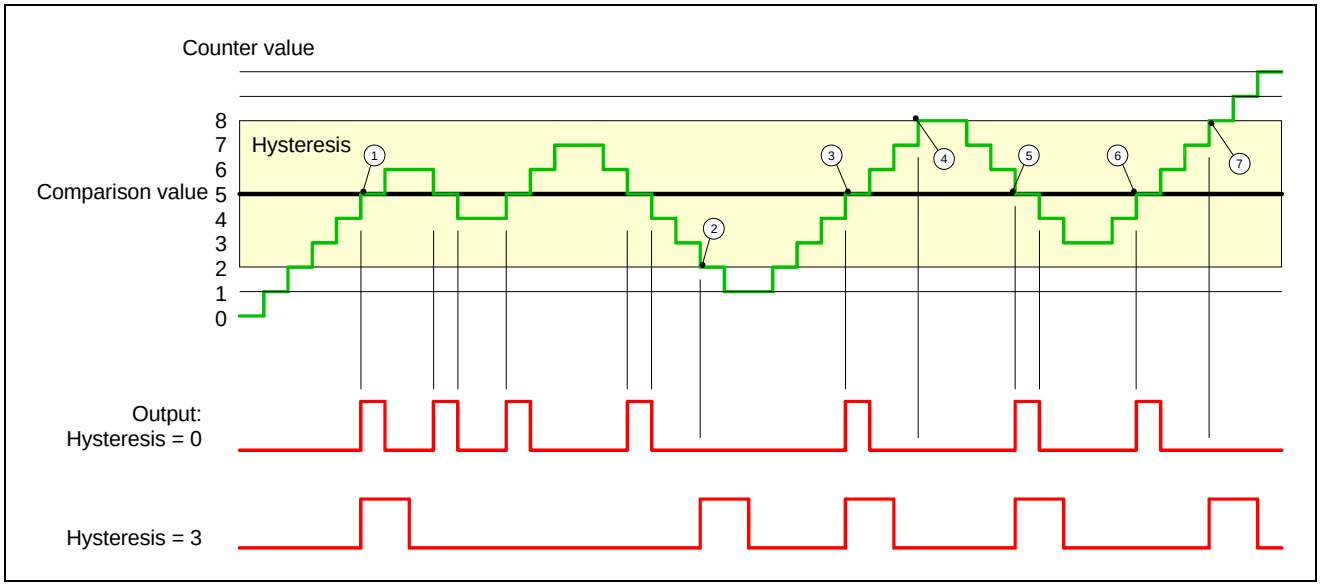
Effect at pulse at comparison value with pulse duration Zero



① Counter value = comparison value → output is set and hysteresis activated
② Leave hysteresis range → output is reset and counter value < comparison value
③ Counter value = comparison value → output is set and hysteresis activated
④ Output is reset for leaving hysteresis range and counter value > comparison value
⑤ Counter value = comparison value → output is set and hysteresis activated
⑥ Counter value = comparison value and hysteresis active → output remains set
⑦ Leave hysteresis range and counter value > comparison value → output is reset

With reaching the comparison condition the hysteresis gets active. At active hysteresis the comparison result remains unchanged until the counter value leaves the set hysteresis range. After leaving the hysteresis range a new hysteresis is only activated with again reaching the comparison conditions.

Effect at pulse at comparison value with pulse duration not zero



① Counter value = comparison value → pulse of the parameterized duration is put out, the hysteresis is activated and the counting direction stored

② Leaving the hysteresis range contrary to the stored counting direction → pulse of the parameterized duration is put out, the hysteresis is de-activated

③ Counter value = comparison value → pulse of the parameterized duration is put out, the hysteresis is activated and the counting direction stored

④ Leaving the hysteresis range without changing counting direction → hysteresis is de-activated

⑤ Counter value = comparison value → pulse of the parameterized duration is put out, the hysteresis is activated and the counting direction stored

⑥ Counter value = comparison value and hysteresis active → no pulse

⑦ Leaving the hysteresis range contrary to the stored counting direction → pulse of the parameterized duration is put out, the hysteresis is de-activated

With reaching the comparison condition the hysteresis gets active and a pulse of the parameterized duration is put out. As long as the counter value is within the hysteresis range, no other pulse is put out. With activating the hysteresis the counting direction is stored in the CPU. If the counter value leaves the hysteresis range contrary to the stored counting direction, a pulse of the parameterized duration is put out. Leaving the hysteresis range without direction change, no pulse is put out.

Counter - Diagnostic and alarm

Outline

The parameterization allows you to define the following trigger for a process alarm that may initialize a diagnostic alarm:

- Status changes at an input
- Status changes at the HW-gate
- Over- res. underflow
- Reaching a comparison value

Process alarm

A process alarm causes a call of the OB40. Within the OB40 you may find the logical basic address of the module that initialized the process alarm by using the *Local word 6*. More detailed information about the initializing event is to find in the *local double word 8*.

Local double word 8 of the OB40

The *local double word 8* of the OB40 has the following structure:

Local byte	Bit 7 ... Bit 0
8	Bit 0: Edge at I+0.0 Bit 1: Edge at I+0.1 Bit 2: Edge at I+0.2 Bit 3: Edge at I+0.3 Bit 4: Edge at I+0.4 Bit 5: Edge at I+0.5 Bit 6: Edge at I+0.6 Bit 7: Edge at I+0.7
9	Bit 0: Edge at I+1.0 Bit 1: Edge at I+1.1 Bit 2: Edge at I+1.2 Bit 3: Edge at I+1.3 Bit 4: Edge at I+1.4 Bit 5: Edge at I+1.5 Bit 6: Edge at I+1.6 Bit 7: Edge at I+1.7
10	Bit 0: Gate counter 0 closed (SW-gate open) Bit 1: Gate counter 0 open (SW-gate open) Bit 2: Over-/underflow/end value counter 0 Bit 3: Counter 0 reached comparison value Bit 4: Gate counter 1 closed (SW-gate open) Bit 5: Gate counter 1 open (SW-gate open) Bit 6: Over-/underflow/ end value counter 1 Bit 7: Counter 1 reached comparison value
11	Bit 0: Gate counter 2 closed (SW-gate open) Bit 1: Gate counter 2 open (SW-gate open) Bit 2: Over-/underflow/end value counter 2 Bit 3: Counter 2 reached comparison value Bit 4: Gate counter 3 closed (SW-gate open) Bit 5: Gate counter 3 open (SW-gate open) Bit 6: Over-/underflow/end value counter 3 Bit 7: Counter 3 reached comparison value

Diagnostic alarm

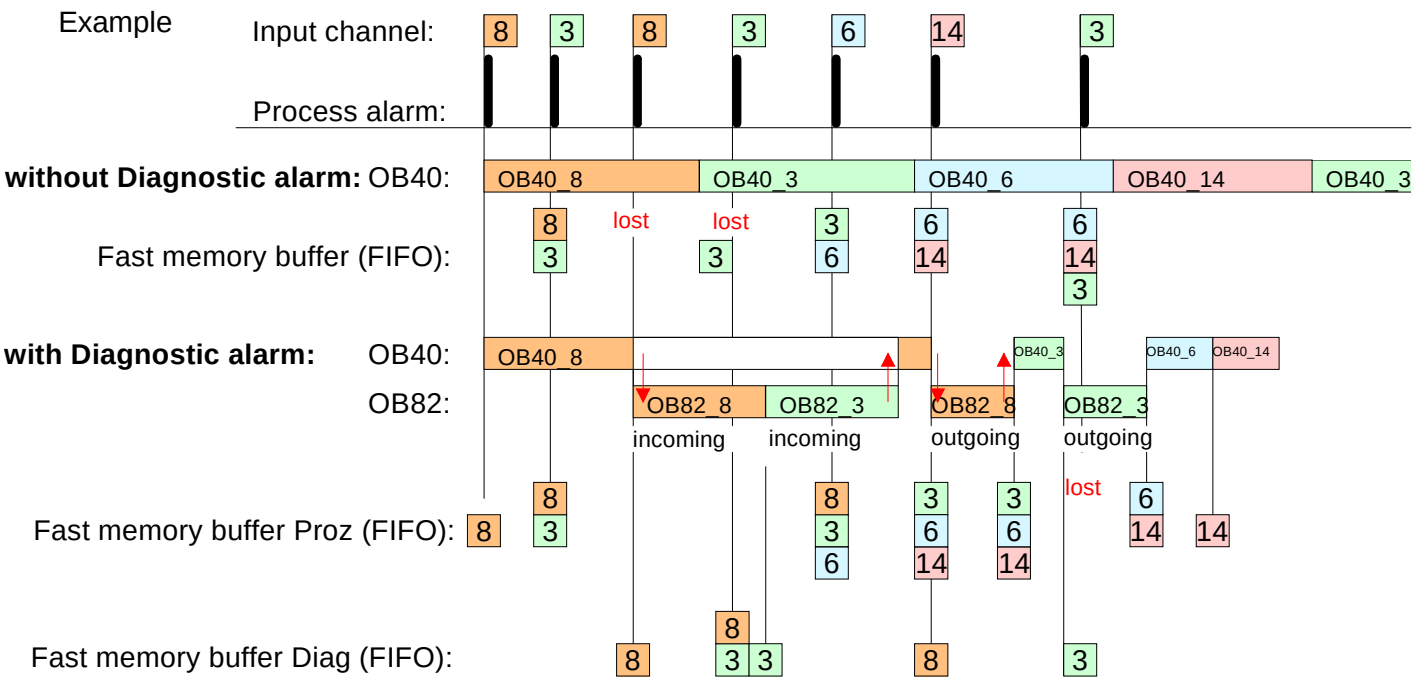
Via the parameterization (record set 7Fh) you may activate a global diagnostic alarm for the analog and digital part.

A diagnostic alarm occurs when during a process alarm execution in OB40 another process alarm is thrown for the same event. The initialization of a diagnostic alarm interrupts the recent process alarm execution in OB40 and branches in OB82 to diagnostic alarm processing$_{incoming}$. If during the diagnostic alarm processing other events are occurring at other channels that may also cause a process res. diagnostic alarm, these are interim stored.

After the end of the diagnostic alarm processing at first all interim stored diagnostic alarms are processed in the sequence of their occurrence and then all process alarms.

If a channel where currently a diagnostic alarm$_{incoming}$ is processed res. interim stored initializes further process alarms, these get lost. When a process alarm for which a diagnostic alarm$_{incoming}$ has been released is ready, the diagnostic alarm processing is called again as diagnostic alarm$_{going}$.

All events of a channel between diagnostic alarm$_{incoming}$ and diagnostic alarm$_{going}$ are not stored and get lost. Within this time window (1st diagnostic alarm$_{incoming}$ until last diagnostic alarm$_{going}$) the SF-LED of the CPU is on. Additionally for every diagnostic alarm$_{incoming/going}$ an entry in the diagnostic buffer of the CPU occurs.



Diagnostic alarm processing

Every OB82 call causes an entry in the diagnostic buffer of the CPU containing error cause and module address.

By using the SFC 59 you may read the diagnostic bytes.

At de-activated diagnostic alarm you have access to the last recent diagnostic event.

If you've activated the diagnostic function in your hardware configuration, the contents of record set 0 are already in the local double word 8 when calling the OB82. The SFC 59 allows you to also read the record set 1 that contains additional information.

After leaving the OB 82 an clear assignment of the data to the last diagnostic alarm is not longer possible.

The record sets of the diagnostic range have the following structure:

Record set 0 Diagnostic$_{incoming}$ (Byte 0 ... 3):

Byte	Bit 7 ... 0
0	Bit 0: set at module failure Bit 1: 0 (fix) Bit 2: set at external error Bit 3: set at channel error Bit 4: set when external auxiliary supply is missing Bit 7 ... 5: 0 (fix)
1	Bit 3 ... 0: Module class 0101b: Analog 1111b: Digital Bit 4: Channel information present Bit 7 ... 5: 0 (fix)
2	Bit 3 ... 0: 0 (fix) Bit 4: Failure module internal supply voltage (output overload) Bit 7 ... 5: 0 (fix)
3	Bit 5 ... 0: 0 (fix) Bit 6: Process alarm lost Bit 7: 0 (fix)

Record set 0 Diagnostic$_{going}$

After the removing error a diagnostic message$_{going}$ takes place if the diagnostic alarm release is still active.

Record set 0 (Byte 0 to 3):

Byte	Bit 7 ... 0
0	Bit 0: set at module failure Bit 1: 0 (fix) Bit 2: set at external error Bit 3: set at channel error Bit 4: set when external auxiliary supply is missing Bit 7 ... 5: 0 (fix)
1	Bit 3 ... 0: Module class 0101b: Analog module 1111b: Digital Bit 4: Channel information present Bit 7 ... 5: 0 (fix)
2	00h (fix)
3	00h (fix)

Diagnostic Record set 1 (Byte 0 ... 15)

The record set 1 contains the 4Byte of the record set 0 and additionally 12Byte module specific diagnostic data.

The diagnostic bytes have the following assignment:

Record set 1 (Byte 0 to 15):

Byte	Bit 7 ... 0
0 ... 3	Contents record set 0 (see page before)
4	Bit 6 ... 0: channel type (here 70h) 70h: Digital input 71h: Analog input 72h: Digital output 73h: Analog output 74h: Analog in-/output Bit 7: More channel types present 0: no 1: yes
5	Number of diagnostic bits per channel (here 08h)
6	Number of channels of a module (here 08h)
7	Bit 0: Error in channel group 0 (I+0.0 ... I+0.3) Bit 1: Error in channel group 1 (I+0.4 ... I+0.7) Bit 2: Error in channel group 2 (I+1.0 ... I+1.3) Bit 3: Error in channel group 3 (I+1.4 ... I+I.7) Bit 4: Error in channel group 4 (Counter 0) Bit 5: Error in channel group 5 (Counter 1) Bit 6: Error in channel group 6 (Counter 2) Bit 7: Error in channel group 7 (Counter 3)
8	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+0.0 Bit 1: 0 (fix) Bit 2: ... input I+0.1 Bit 3: 0 (fix) Bit 4: ... input I+0.2 Bit 5: 0 (fix) Bit 6: ... input I+0.3 Bit 7: 0 (fix)
9	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+0.4 Bit 1: 0 (fix) Bit 2: ... input I+0.5 Bit 3: 0 (fix) Bit 4: ... input I+0.6 Bit 5: 0 (fix) Bit 6: ... input I+0.7 Bit 7: 0 (fix)
10	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+1.0 Bit 1: 0 (fix) Bit 2: ... input I+1.1 Bit 3: 0 (fix) Bit 4: ... input I+1.2 Bit 5: 0 (fix) Bit 6: ... input I+1.3 Bit 7: 0 (fix)

continued ...

... continue Record set 1

11	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+1.4 Bit 1: 0 (fix) Bit 2: ... input I+1.5 Bit 3: 0 (fix) Bit 4: ... input I+1.6 Bit 5: 0 (fix) Bit 6: ... input I+1.7 Bit 7: 0 (fix)
12	Diagnostic alarm due to process alarm lost at... Bit 0: ... Gate Counter 0 closed Bit 1: 0 (fix) Bit 2: ... Gate Counter 0 open Bit 3: 0 (fix) Bit 4: ... Over-/underflow/end value Counter 0 Bit 5: 0 (fix) Bit 6: ... Counter 0 reached comparison value Bit 7: 0 (fix)
13	Diagnostic alarm due to process alarm lost at... Bit 0: ... Gate Counter 1 closed Bit 1: 0 (fix) Bit 2: ... Gate Counter 1 open Bit 3: 0 (fix) Bit 4: ... Over-/underflow/end value Counter 1 Bit 5: 0 (fix) Bit 6: ... Counter 1 reached comparison value Bit 7: 0 (fix)
14	Diagnostic alarm due to process alarm lost at... Bit 0: ... Gate Counter 2 closed Bit 1: 0 (fix) Bit 2: ... Gate Counter 2 open Bit 3: 0 (fix) Bit 4: ... Over-/underflow/end value Counter 2 Bit 5: 0 (fix) Bit 6: ... Counter 2 reached comparison value Bit 7: 0 (fix)
15	Diagnostic alarm due to process alarm lost at... Bit 0: ... Gate Counter 3 closed Bit 1: 0 (fix) Bit 2: ... Gate Counter 3 open Bit 3: 0 (fix) Bit 4: ... Over-/underflow/end value Counter 3 Bit 5: 0 (fix) Bit 6: ... Counter 3 reached comparison value Bit 7: 0 (fix)

Chapter 5 Deployment CPU 31xS with Profibus

Outline

Content of this chapter is the deployment of the CPU 31xS under Profibus. After a short overview the project engineering and parameterization of a CPU 31xS with integrated Profibus-Part from VIPA is shown.

Here you will also get information about using a MMC storing module by deployment of the Profibus-master.

The following chapter describes:

- Overview
- Project engineering of the CPU 31xS with Profibus master res. slave
- Commissioning and Start-up behavior

Content

Topic	Page
Chapter 5 Deployment CPU 31xS with Profibus	**5-1**
Overview	5-2
Project engineering CPU with integrated Profibus master	5-3
Deployment as Profibus DP slave	5-5
Project transfer	5-6
DP master Operating Modes	5-8
Commissioning and Start-up behavior	5-9

Overview

Profibus-DP

Profibus is an international standard applicable to an open and serial fieldbus for building, manufacturing and process automation that can be used to create a low (sensor-/actuator level) or medium (process level) performance network of programmable logic controllers.

Profibus comprises an assortment of compatible versions. The following details refer to Profibus-DP.

Profibus-DP is a special protocol intended mainly for automation tasks in a manufacturing environment. DP is very fast, offers Plug'n'Play facilities and provides a cost-effective alternative to parallel cabling between PLC and remote I/O. Profibus-DP was designed for high-speed data communication on the sensor-actuator level.

The data transfer referred to as "Data Exchange" is cyclical. During one bus cycle, the master reads input values from the slaves and writes output information to the slave.

CPU with DP master

The Profibus DP master is to configure via the hardware configurator from Siemens. Therefore you have to choose the Siemens-CPU 318-2AJ00 in the hardware configurator from Siemens.

The transmission of your project engineering into the CPU takes place by means of MPI. This is internally passing on your project data to the Profibus master part.

During the start-up the DP master automatically includes his data areas into the address range of the CPU. A project engineering in the CPU is not required.

As external storage medium the Profibus DP master uses the MMC (**M**ulti **M**edia **C**ard) together with the CPU.

Deployment of the DP-Master with CPU

Via the Profibus DP master up to 125 Profibus DP slaves may be coupled to the CPU. The DP master communicates with the DP slaves and links up its data areas with the address area of the CPU. There may be created maximal 1024Byte Input and 1024Byte Output data.

At every POWER ON res. OVERALL RESET the CPU fetches the I/O mapping data from the master.

At DP slave failure, the ER-LED is on and the OB 86 is requested. If this is not available, the CPU switches to STOP and BASP is set.

As soon as the BASP signal comes from the CPU, the DP master is setting the outputs of the connected periphery to zero. The DP master remains in the operating mode RUN independent from the CPU.

Profibus address 1 is reserved

Please regard that the Profibus address 1 is reserved for the system. The address 1 should not be used!

CPU with DP slave

For the deployment in a master system of a higher level the delivered GSD file is necessary.

Project engineering CPU with integrated Profibus master

Outline

For the project engineering of the Profibus DP master you have to use the hardware manager from Siemens. Your Profibus projects are transferred via MPI to the CPU 31xDPM by means of the "PLC" functions. The CPU passes the data on to the Profibus DP master.

Preconditions

For the project engineering of the Profibus DP master in the CPU 31xSx/DPM the following preconditions have to be fulfilled:

- SIMATIC Manager from Siemens has to be installed.
- With Profibus DP slaves of the Systems 100V, 200V and 300 from VIPA: GSD Files are included into the hardware configurator.
- There is a transfer possibility between configuration tool and CPU 31xS.

Note!

For the project engineering of the CPU and the Profibus DP master a thorough knowledge of the SIMATIC manager and the hardware configurator from Siemens is required!

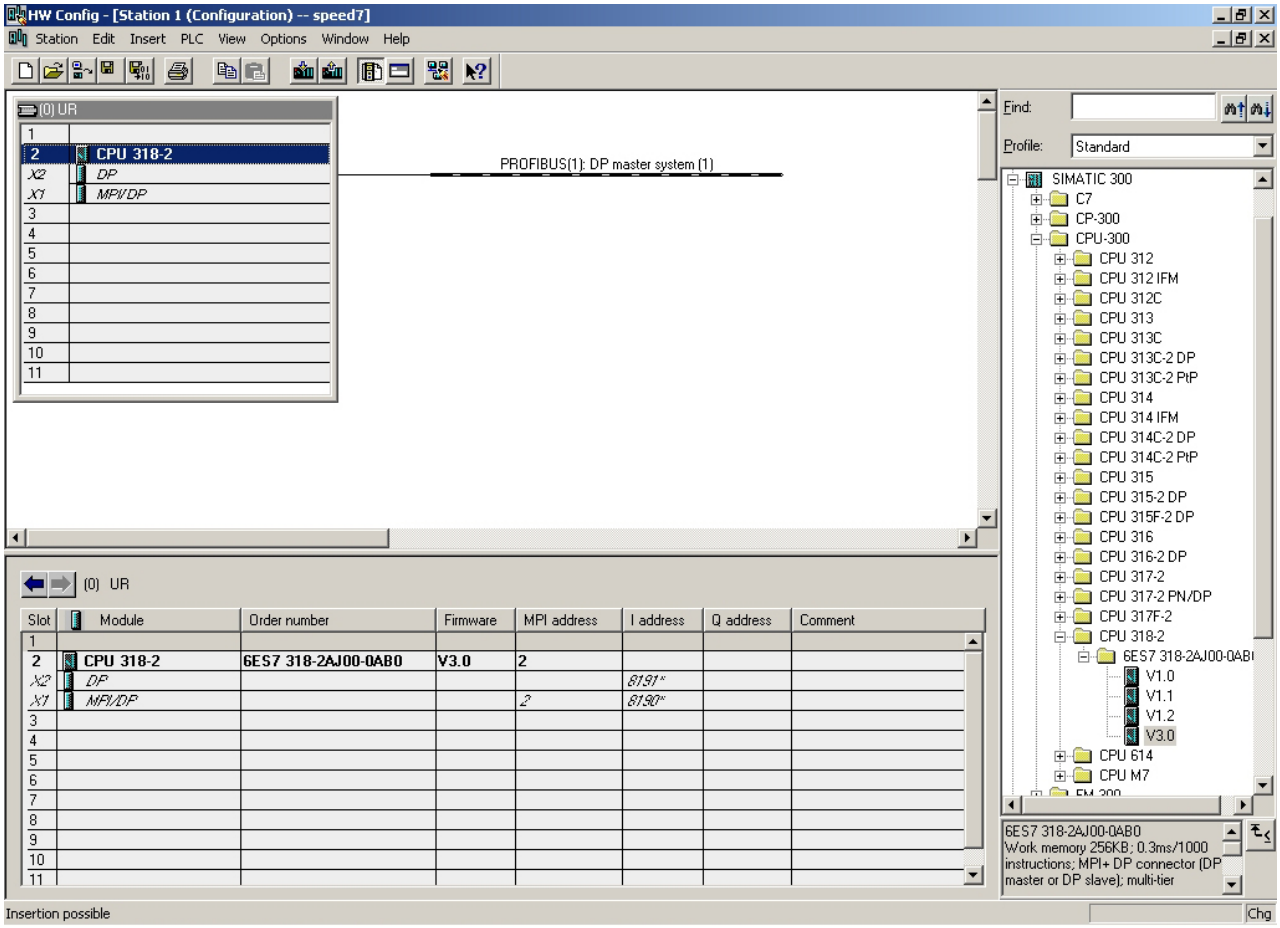
Install Siemens Hardware configurator

The hardware configurator is a part of the STEP®7 projecting tool from Siemens. It serves the project engineering. The modules that may be configured here, are listed in the hardware catalog.

For the deployment of the Profibus DP slaves of the Systems 100V, 200V and 300 from VIPA you have to include the modules into the hardware catalog by means of the GSD file from VIPA.

Configure DP master

- Create a new project System 300.
- Add a profile rail from the hardware catalog.
- In the hardware catalog the CPU with Profibus master is listed as: `Simatic300/CPU-300/CPU318-2DP/`**`6ES7 318-2AJ00-0AB0`**
- Insert the CPU 318-2DP (**6ES7 318-2AJ00-0AB0**).
- Type the Profibus address of your master (e.g. 2).
- Click on DP, choose the operating mode "DP master" under *object properties* and confirm your entry with OK.
- Click on "DP" with the right mouse button and choose "add master system".
- Create a new Profibus subnet via NEW.



Now the project engineering of your Profibus DP master is finished. Please link up now your DP slaves with periphery to your DP master.

- For the project engineering of Profibus DP slaves you search the concerning Profibus-DP slave in the *hardware catalog* and drag&drop it in the subnet of your master.
- Assign a valid Profibus address to the DP slave.
- Link up the modules of your DP slave system in the plugged sequence and add the addresses that should be used by the modules.
- If needed, parameterize the modules.

Note!

If you deploy an IM153 from Siemens under a VIPA CPU 31xDPM, please use the "compatible" DP slave modules.

These are listed in the hardware catalog under
`PROFIBUS-DP/Additional Field Devices/ Compatible Profibus-DP-Slaves.`

Slave operation possible

You may deploy your Profibus part as DP slave. The approach is described on the following page as "Deployment as Profibus DP slave".

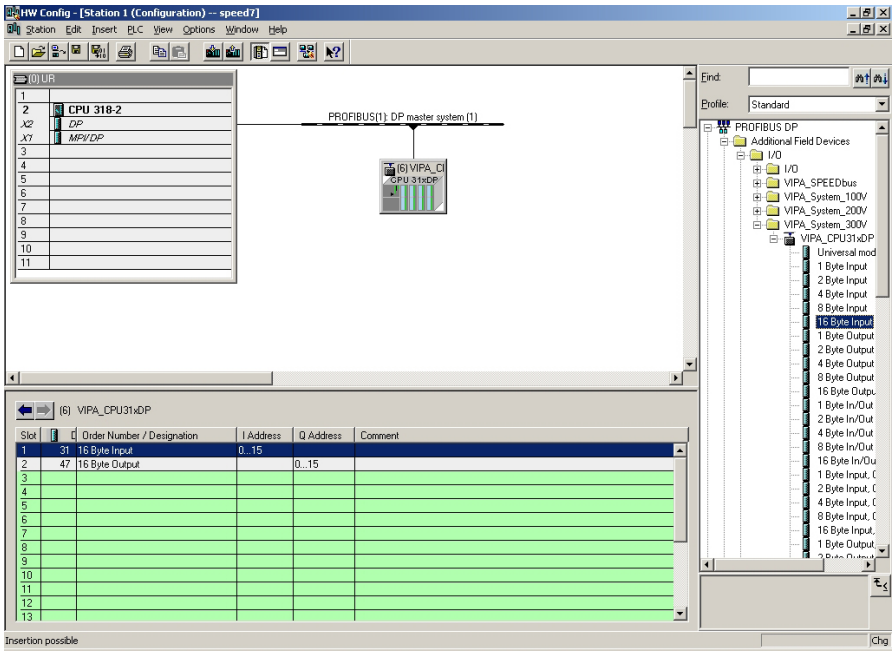
Deployment as Profibus DP slave

Note!

For the deployment of a CPU 31x with Profibus slave from VIPA a GSD-file is required. The GSD-file is stored on the included disk.

A CPU with integrated Profibus slave is projected in a System 300V Profibus DP master as followed:

- Create a new project and project your DP master.
- If you have installed your GSD-file, you will find the CPU with Profibus slave in the hardware catalog under:
  `Profibus-DP/Additional Field Devices/IO/ VIPA_System_300V/`**`VIPA_CPU31xDP`**
- Insert the CPU VIPA_CPU31xDP in your master project engineering by dragging&dropping it into your master system.
- Choose the according Profibus address under *Properties* and click OK.
- Type an address for the diagnostic data and click OK.
- Link up the modules of your DP slave system in the plugged sequence, by dragging&dropping the concerning bytes from the hardware catalog to the according plug.
- If needed, parameterize the modules, assign address areas and save your project.



Note!

Data consistency can only be guaranteed for one unit! The choice "Data consistency by length" is not supported.

Project transfer

Outline

There are 3 possibilities for the transfer of your project into the CPU:

- Transfer via MP²I
- Transfer via MMC by using a write/reading device
- Transfer via integrated Ethernet-PG/OP channel

Note!

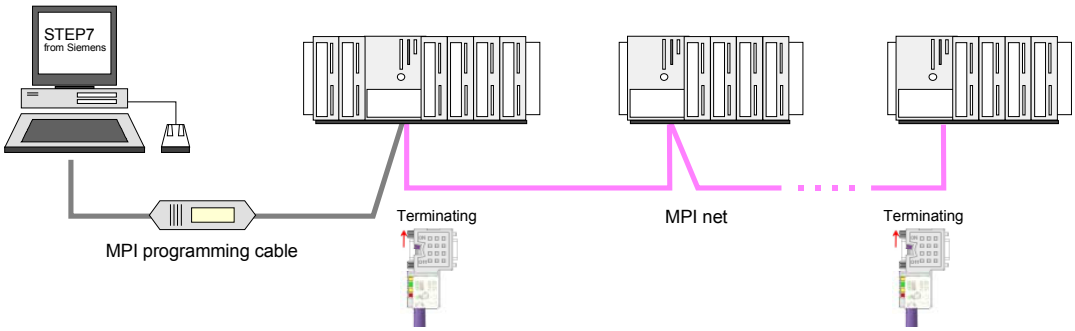
In the following the transfer methods are briefly described. For more information see Chapter "Deployment of the CPU 31xS" at "Project transfer".

Transfer via MP²I

Transfer via MPI Programming cable (MPI Communication)

The MPI programming cables provides a bus enabled RS485 plug for the MP²I jack of the CPU and a RS232 res. USB plug for the PC. The VIPA CPU has 2 as the default MPI address.

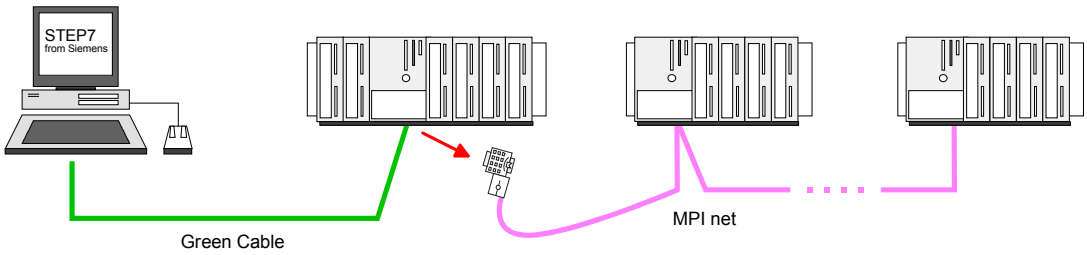
- Choose in the menu **Options** > *Set PG/PC interface*
- Set the *MPI transfer parameters* and a valid *address*.
- Switch to the register *Local connection*
- Set the COM port of the PCs and the transfer rate 38400Baud for the MPI programming cable from VIPA.



Transfer via Green Cable (Serial Communication)

A serial connection between PC and CPU may be established by plugging the Green Cable exclusively directly at the MP²I jack.

- Set at *Local connection* the COM port of the PC and the transfer rate 38400Baud for the MPI programming cable from VIPA. The settings in the register *MPI* are ignored at the usage of the Green Cable.



Transfer via MMC

As external storage medium the MMC is deployed.

The MMC (**M**ulti **M**edia **C**ard) serves as external storage medium for and it provides the FAT16 file system.

Please take care that your current project engineering is stored in the root directory and the following file names could be used:

- Read after OVERALL_RESET:
  S7PROG.WLD (S7 project file)
  PROTECT.WLD (Extended Know-how protection)
- Read after PowerON:
  AUTOLOAD.WLD (S7 project file)

Via **PLC** > *Copy RAM to ROM the* content of the battery buffered RAM is stored as **S7PROG.WLD** at the MMC. At a successful write process the diagnostic buffer contains 0xE200.

The MMC if ülugged is read by PowerON or OVERALL_RESET

Transfer via Ethernet-PG/OP channel

Every CPU 31xS contains a n integrated Ethernet-PG/OP channel.

The PG/OP access requires a hardware project engineering (Minimum project) in the CPU where IP address and subnet mask are defined via a virtual CP.

This project is transferred per MMC or MPI into the CPU. After an overall reset you may access the PG/OP channel via the "PLC functions". A maximum of 2 PG/OP connections is supported.

Approach

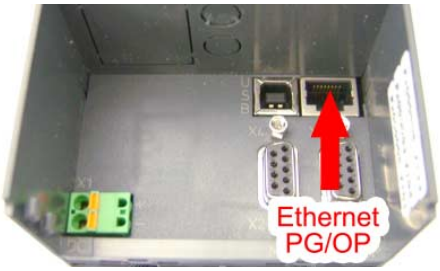
- Configure at the Siemens hardware configurator a CPU 318-2 with the order no. 6ES7 318-2AJ00-0AB0 V3.0.
- Include the CP 343-1 (343-1EX11) at slot 4 res. after the really plugged modules.
- Set the wanted IP address and subnet mask in the according dialog window and connect the CP with "Ethernet".
- Transfer your project to your CPU via MPI or MMC.

Access to the Ethernet-PG/OP channel

Connect your project engineering-PC and your CPU via the Ethernet-PG/OP jack. Adjust the following settings in the SIMATIC manager under **Options** > *PG/PC interface*...:

TCP/IP -> Network card...Protocol RFC 1006

Now you gain access to the CP via the destination system functions.



DP master Operating Modes

STOP → RUN (automatically)

After a PowerON and with valid configuration data in the CPU the project and bus data is automatically transferred to the DP master by the CPU.

Now the communication to the DP slaves is established by the DP master. At successful communication and valid bus parameters, the DP master switches to Data Exchange (DE). The LEDs RUN and DE are switched on.

The DP master is done without an operating mode switch.

At invalid parameters the DP master switches to RUN. Now the DP master is linked up at the bus with the following default bus parameters:

Default-Bus-Parameter: Address:2, Transfer Rate:1.5MBaud.

RUN

In the RUN mode, the RUN- and the DE-LEDs are on. Now data may be exchanged. If an error occurs, like e.g. DP slave failure, this is shown at the DP master via the ERR-LED and an alarm is initialized to the CPU.

Note!

If the CPU goes into STOP during operation, the DP master stays in RUN. By means of the BASP signal all outputs of the peripheral modules, linked up via the DP slaves, are set to zero.

Commissioning and Start-up behavior

Check list for commissioning

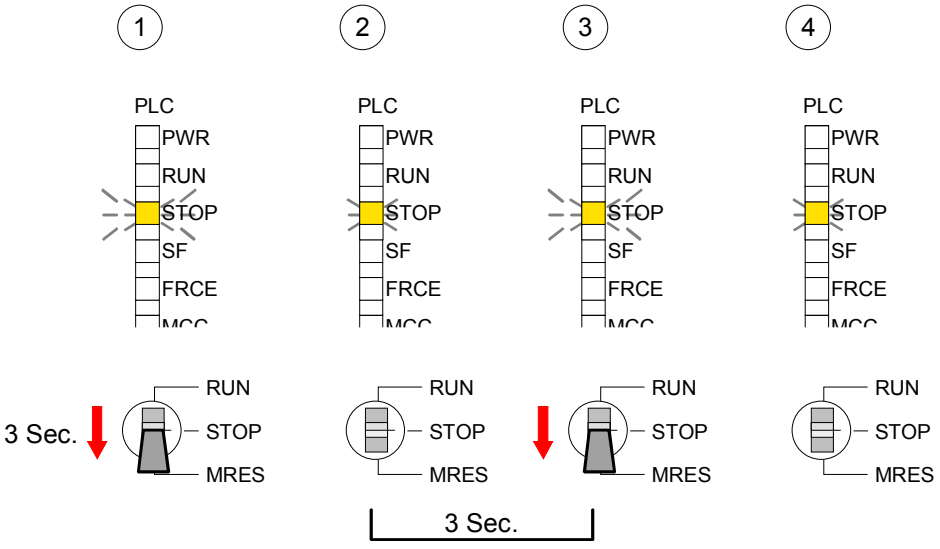
- Turn off your power supply
- Build up your system
- Cable your system
- Plug in your MMC with CPU program and Profibus project
- Turn on your power supply
- For transferring your project from the MMC into the CPU, request an OVERALL_RESET

Turn on power supply

Turn on the power supply. The course of events, described under "start-up behavior", is following.

OVERALL_RESET

The following picture shows the approach once more:



Default boot procedure, as delivered

When the CPU is delivered it has been reseted.

After PowerON the DP master is started by the CPU without any project and with the following default parameters: Profibus address: 2

Transfer rate: 1.5MBaud

Here the Profibus LEDs are switched off.

After a STOP→RUN transition the CPU switches to RUN without program.

Boot procedure with valid data in the CPU

After Power ON the DP master gets his project from the CPU and is started with the project parameters by the CPU.

The *monitoring time* for startup and the CPU behavior on error can be defined by the CPU hardware configuration.

If within this monitoring time the DP master acknowledges with his slaves and the operating mode switch is switched to RUN the CPU starts with the current project.

Start-up with empty battery

The battery is directly loaded via the integrated power supply by means of a special electronic element and it guarantees a buffer of at least 30 days. If this time is exceeded, a complete discharge of the accu may occur. This clears the battery buffered RAM.

In this status after PowerON an OVERALL_RESET is released by the CPU. With plugged-in MMC, the program on the MMC is transferred into CPU memory and the DP master is provided with his project and parameters.

If there is no Profibus project the DP master is started by the CPU with default parameters (Addr.:2, 1.5MBaud). Here the LEDs of the Profibus part are switched off.

Depending on the position of the RUN/STOP lever, the CPU switches to RUN res. remains in STOP.

This procedure is stored in the diagnostic buffer as: "Start automatic OVERALL_RESET (unbuffered POWER-ON)".

Chapter 6 Deployment RS485 for PtP communication

Overview

Content of this chapter is the employment of the RS485 slot for serial PtP communication.

Here you'll find all information about the protocols, the activation and project engineering of the interface which are necessary for the serial communication using the RS485 interface.

The following description includes:

- Principles of the serial communication
- Usage of the protocols ASCII, STX/ETX, 3964R, USS and Modbus
- Switch RS485 interface to PtP usage
- Principals of the data transfer
- Project engineering of connection

Content

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Protocols and procedures	6-3
Deployment of RS485 interface for PtP	6-7
Principals of the data transfer	6-9
Parameterization	6-10
Communication	6-13

Fast introduction

General

You may de-activate the DP master integrated in the SPEED7-CPU via a hardware configuration and thus release the RS485 interface for PtP (**p**oint-**t**o-**p**oint) communication.

The RS485 interface supports in PtP operation the serial process connection to different source res. destination systems.

Protocols

The protocols res. procedures ASCII, STX/ETX, 3964R, USS and Modbus are supported.

Switch of RS485 for point-to-point operation

Per default, every CPU 31xS uses the RS485 interface for the Profibus-DP master. A hardware configuration allows you to switch the RS485 interface to point-to-point operation using *Object properties* and the parameter "Function RS485".

Parameterization

The parameterization happens during runtime using the SFC 216 (SER_CFG). For this you have to store the parameters in a DB for all protocols except ASCII.

Communication

The SFCs are controlling the communication. Send takes place via SFC 217 (SER_SND) and receive via SFC 218 (SER_RCV).

The repeated call of the SFC 217 SER_SND delivers a return value for 3964R, USS and Modbus via RetVal that contains, among other things, recent information about the acknowledgement of the partner station.

The protocols USS and Modbus allow to evaluate the receipt telegram by calling the SFC 218 SER_RCV after SER_SND.

The SFCs are included in the consignment of the CPU 31xS.

Overview SFCs for serial communication

The following SFCs are used for the serial communication:

SFC		Description
SFC 216	SER_CFG	RS485 parameterize
SFC 217	SER_SND	RS485 send
SFC 218	SER_RCV	RS485 receive

Protocols and procedures

Overview

The CPU 31xS supports the following protocols and procedures:

- ASCII communication
- STX/ETX
- 3964R
- USS
- Modbus

ASCII

ASCII data communication is one of the simple forms of data exchange.

Incoming characters are transferred 1 to 1.

At ASCII, with every cycle the read-SFC is used to store the data that is in the buffer at request time in a parameterized receive data block. If a telegram is spread over various cycles, the data is overwritten. There is no reception acknowledgement. The communication procedure has to be controlled by the concerning user application. An according Receive_ASCII-FB is to find at ftp.vipa.de.

STX/ETX

STX/ETX is a simple protocol with start and end ID, where STX stands for **S**tart of **Tex**t and ETX for **E**nd of **Tex**t.

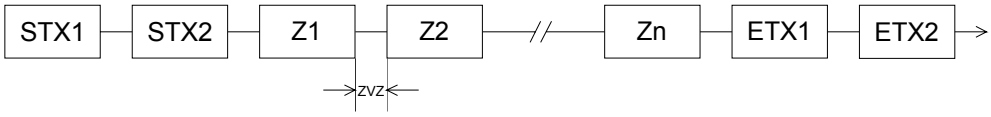
The STX/ETX procedure is suitable for the transfer of ASCII characters. It does not use block checks (BCC). Any data transferred from the periphery must be preceded by an Start followed by the data characters and the end character.

Depending of the byte width the following ASCII characters can be transfered: 5Bit: not allowed: 6Bit: 20...3Fh, 7Bit: 20...7Fh, 8Bit: 20...FFh.

The effective data which includes all the characters between Start and End are transferred to the PLC when the End has been received.

When data is send from the PLC to a peripheral device, any user data is handed to the SFC 217 (SER_SND) and is transferred with added Start- and End-ID to the communication partner.

Message structure:



You may define up to 2 Start- and End-IDs.

You may work with 1, 2 or no Start- and with 1, 2 or no End-ID. As Start- res. End-ID all Hex values from 01h to 1Fh are permissible. Characters above 1Fh are ignored. In the user data, characters below 20h are not allowed and may cause errors. The number of Start- and End-IDs may be different (1 Start, 2 End res. 2 Start, 1 End or other combinations). If no End-ID is defined, all read characters are transferred to the PLC after a parameterizable character delay time (Timeout).

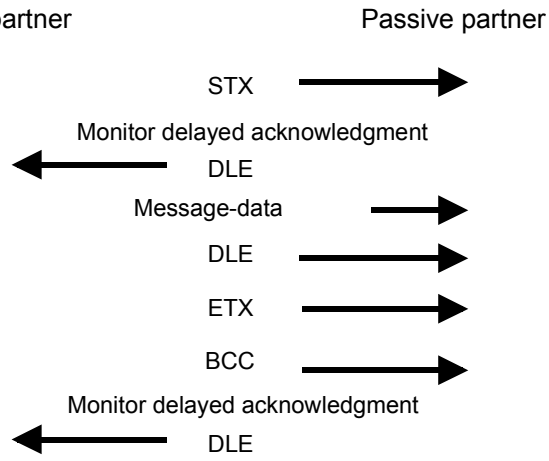
3964R

The 3964R procedure controls the data transfer of a point-to-point link between the CPU 31xS and a communication partner. The procedure adds control characters to the message data during data transfer. These control characters may be used by the communication partner to verify the complete and error free receipt.

The procedure employs the following control characters:

- STX **S**tart of **Te**x**t**
- DLE **D**ata **L**ink **E**scape
- ETX **E**nd of **Te**x**t**
- BCC **B**lock **C**heck **C**haracter
- NAK **N**egative **Ac**k**nowledge**

Procedure



You may transfer a maximum of 255Byte per message.

Note!

When a DLE is transferred as part of the information it is repeated to distinguish between data characters and DLE control characters that are used to establish and to terminate the connection (DLE duplication). The DLE duplication is reversed in the receiving station.

The 3964R procedure requires that a lower priority is assigned to the communication partner. When communication partners issue simultaneous send commands, the station with the lower priority will delay its send command.

USS

The USS protocol (**U**niverselle **s**erielle **S**chnittstelle = universal serial interface) is a serial transfer protocol defined by Siemens for the drive and system components. This allows to build-up a serial bus connection between a superordinated master and several slave systems.

The USS protocol enables a time cyclic telegram traffic by presetting a fix telegram length.

The following features characterize the USS protocol:

- Multi point connection
- Master-Slave access procedure
- Single-Master-System
- Max. 32 participants
- Simple and secure telegram frame

You may connect 1 master and max. 31 slaves at the bus where the single slaves are addressed by the master via an address sign in the telegram. The communication happens exclusively in half-duplex operation.

After a send command, the acknowledgement telegram must be read by a call of the SFC 218 SER_RCV.

The telegrams for send and receive have the following structure:

Master-Slave telegram

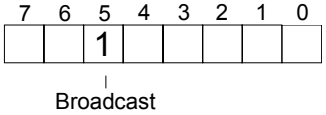
STX	LGE	ADR	PKE		IND		PWE		STW		HSW		BCC
02h			H	L	H	L	H	L	H	L	H	L	

Slave-Master telegram

STX	LGE	ADR	PKE		IND		PWE		ZSW		HIW		BCC
02h			H	L	H	L	H	L	H	L	H	L	

where STX: Start sign
LGE: Telegram length
ADR: Address
PKE: Parameter ID
IND: Index
PWE: Parameter value
STW: Control word
ZSW: State word
HSW: Main set value
HIW: Main effective value
BCC: Block Check Character

Broadcast with set Bit 5 in ADR-Byte



A request can be directed to a certain slave ore be send to all slaves as broadcast message. For the identification of a broadcast message you have to set Bit 5 to 1 in the ADR-Byte. Here the slave addr. (Bit 0 ... 4) is ignored. In opposite to a "normal" send command, the broadcast does not require a telegram evaluation via SFC 218 SER_RCV. Only write commands may be send as broadcast.

Modbus

The Modbus protocol is a communication protocol that fixes a hierarchic structure with one master and several slaves.

Physically, Modbus works with a serial half-duplex connection.

There are no bus conflicts occurring, because the master can only communicate with one slave at a time. After a request from the master, this waits for a preset delay time for an answer of the slave. During the delay time, communication with other slaves is not possible.

After a send command, the acknowledgement telegram must be read by a call of the SFC 218 SER_RCV.

The request telegrams send by the master and the respond telegrams of a slave have the following structure:

Start sign	Slave address	Function Code	Data	Flow control	End sign

Broadcast with slave address = 0

A request can be directed to a special slave or at all slaves as broadcast message. To mark a broadcast message, the slave address 0 is used.

In opposite to a "normal" send command, the broadcast does not require a telegram evaluation via SFC 218 SER_RCV.

Only write commands may be send as broadcast.

ASCII, RTU mode

Modbus offers 2 different transfer modes:

- ASCII mode: Every Byte is transferred in the 2 sign ASCII code. The data are marked with a start and an end sign. This causes a transparent but slow transfer.
- RTU mode: Every Byte is transferred as one character. This enables a higher data pass through as the ASCII mode. Instead of start and end sign, a time control is used.

The mode selection happens during runtime by using the SFC 216 SER_CFG.

Supported Modbus protocols

The following Modbus Protocols are supported by the RS485 interface

- Modbus RTU Master
- Modbus ASCII Master

Deployment of RS485 interface for PtP

Outline

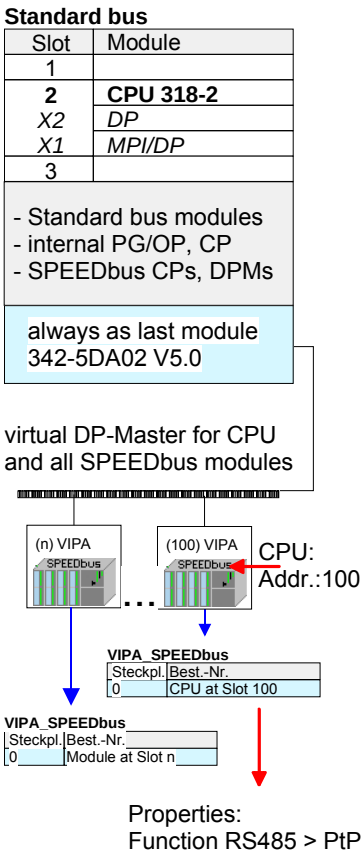
Per default, every CPU 31xS uses the RS485 interface for the Profibus-DP master. A hardware configuration allows you to switch the RS485 interface to point-to-point operation using *Object properties* and the parameter "Function RS485".

Switch to PtP operation

For the usage of the System 300S modules from VIPA at the SPEEDbus, the inclusion of the System 300S modules in the hardware catalog is required using the GSD file from VIPA.

The switch to PtP operation has the following approach:

- Start the hardware configurator from Siemens and include the speedbus.gsd for SPEED7 from VIPA.
- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens.
- Starting with slot 4, place the System 300 modules at the standard bus.
- Place and connect below this modules the CPs (internal) and then SPEEDbus-CPs and DP master.
- For the SPEEDbus, include and connect the Siemens DP master CP 342-5 (342-5DA02 V5.0) always as last module and parameterize it to the *operating mode* DP master. For this, the Profibus address must be different from the range 100...116. This master system is used to connect every SPEEDbus module as VIPA_SPEEDbus slave. Here, the **Profibus address** is equivalent to the **slot no.** starting with 100 for the CPU. Place the concerning module at slot 0 of every slave and alter if needed the parameters.
- Place your SPEED7-CPU with Profibus address 100 at slot 0.
- Set in *Function RS485* "PtP" in the object properties.
- Place now the further SPEEDbus modules as VIPA_SPEEDbus slave.



After transferring your project to the CPU together with your PLC application, the RS485 interface is after the boot sequence available for PtP communication.

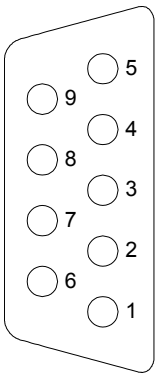
Note!

More detailed information about SPEEDbus project engineering and project transfer is in the chapter “Employment CPU31xS"!

Properties RS485

- Logical states represented by voltage differences between the two cores of a twisted pair cable
- Serial bus connection in two-wire technology using half duplex mode
- Data communications up to a max. distance of 500m
- Data communication rate up to 115.2kBaud

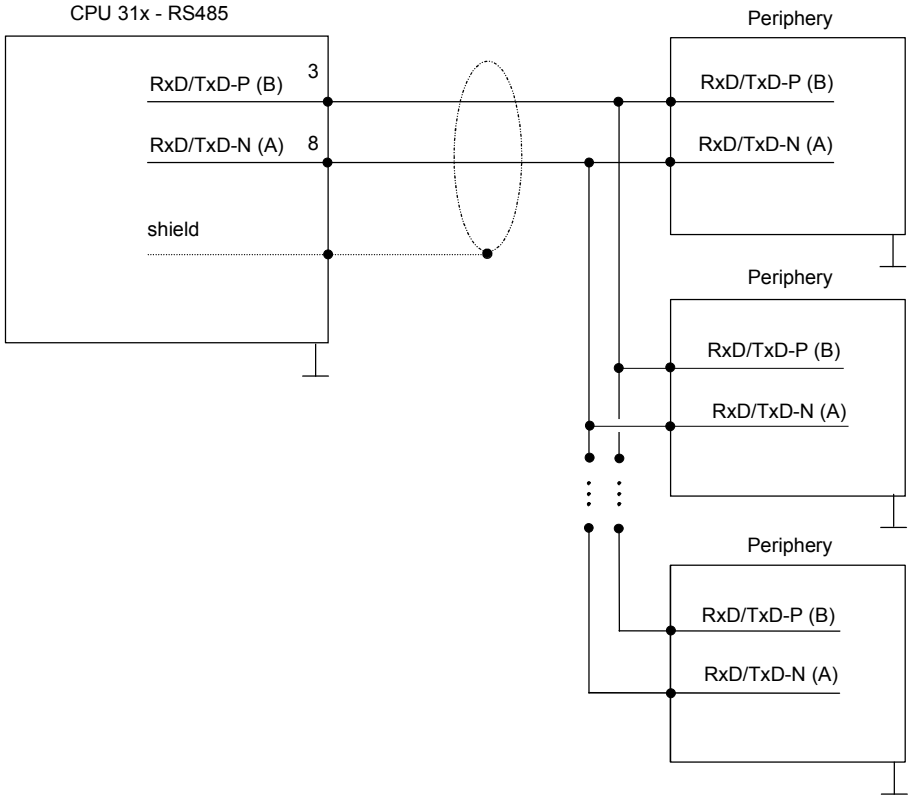
Connection RS485



9pin jack

Pin	RS485
1	n.c.
2	n.c.
3	RxD/TxD-P (Line B)
4	RTS
5	M5V
6	P5V
7	n.c.
8	RxD/TxD-N (Line A)
9	n.c.

Connection



Principals of the data transfer

Overview

The data transfer is handled during runtime by using SFCs. The principles of data transfer are the same for all protocols and is shortly illustrated in the following.

Principle

Data that is into the according data channel by the PLC, is stored in a FIFO send buffer (**f**irst **i**n **f**irst **o**ut) with a size of 2x256Byte and then put out via the interface.

When the interface receives data, this is stored in a FIFO receive buffer with a size of 2x256Byte and can there be read by the PLC.

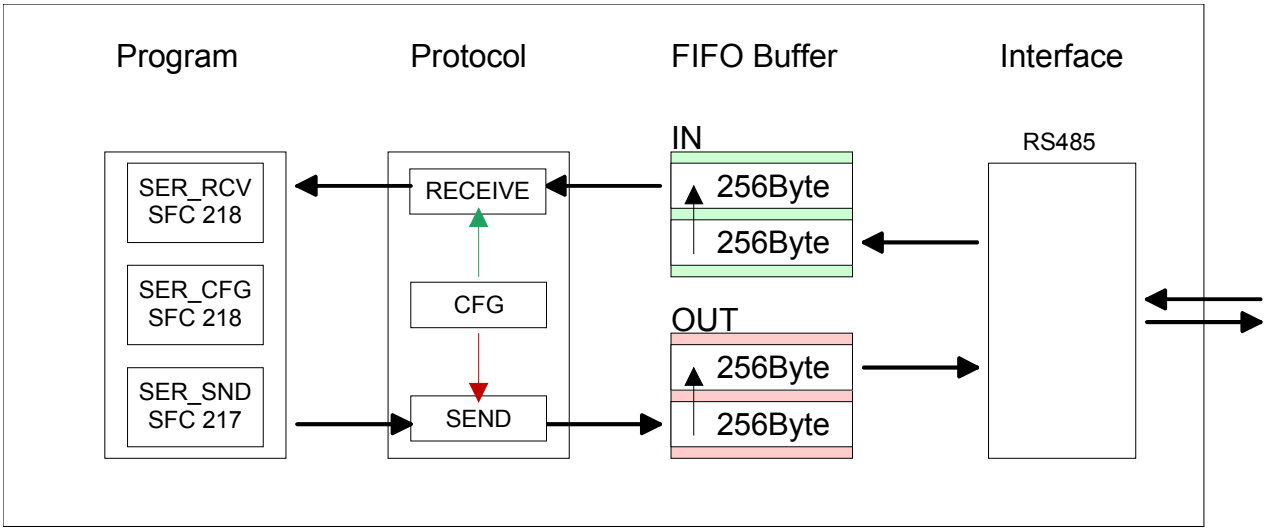
If the data is transferred via a protocol, the adoption of the data to the according protocol happens automatically.

In opposite to ASCII and STX/ETX, the protocols 3964R, USS and Modbus require the acknowledgement of the partner.

An additional call of the SFC 217 SER_SND causes a return value in RetVal that includes among others recent information about the acknowledgement of the partner.

Further on for USS and Modbus after a SER_SND the acknowledgement telegram must be evaluated by call of the SFC 218 SER_RCV.

CPU 31xS - RS485 PtP communication



Parameterization

SFC 216 (SER_CFG)

The parameterization happens during runtime deploying the SFC 216 (SER_CFG). You have to store the parameters for STX/ETX, 3964R, USS and Modbus in a DB.

Name	Declaration	Type	Comment
Protocol	IN	BYTE	1=ASCII, 2=STX/ETX, 3=3964R
Parameter	IN	ANY	Pointer to protocol-parameters
Baudrate	IN	BYTE	Nr for Baudrate
CharLen	IN	BYTE	0=5Bit, 1=6Bit, 2=7Bit, 3=8Bit
Parity	IN	BYTE	0=Non, 1=Odd, 2=Even
StopBits	IN	BYTE	1=1Bit, 2=1.5Bit, 3=2Bit
FlowControl	IN	BYTE	1 (fix)
RetVal	OUT	WORD	Error Code (0 = OK)

Parameter description

All time settings for timeouts must be set as hexadecimal value. Find the Hex value by multiplicating the wanted time in seconds with the baudrate.

Example: Wanted time 8ms at a baudrate of 19200Baud
Calculation: 19200Bit/s x 0,008s ≈ 154Bit → (9Ah)
Hex value is 9Ah.

Protocol

Here you fix the protocol to be used. You may choose between:
1: ASCII
2: STX/ETX
3: 3964R
4: USS Master
5: Modbus RTU Master
6: Modbus ASCII Master

Parameter (as DB)

At ASCII protocol, this parameter is ignored.

At STX/ETX, 3964R, USS and Modbus you fix here a DB that contains the communication parameters and has the following structure for the according protocols:

Data block at STX/ETX

DBB0:	STX1	BYTE	(1. Start-ID in hexadecimal)
DBB1:	STX2	BYTE	(2. Start-ID in hexadecimal)
DBB2:	ETX1	BYTE	(1. End-ID in hexadecimal)
DBB3:	ETX2	BYTE	(2. End-ID in hexadecimal)
DBB4:	TIMEOUT	WORD	(max. delay time between 2 telegrams in a time window of 10ms)

Note!

The start res. end sign should always be a value <20, otherwise the sign is ignored!

Data block at 3964R

DBB0:	Prio	BYTE	(The priority of both partners must be different)
DBB1:	ConnAttmptNr	BYTE	(Number of connection trials)
DBB2:	SendAttmptNr	BYTE	(Number of telegram retries)
DBB4:	CharTimeout	WORD	(Char. delay time in 10ms time window)
DBB6:	ConfTimeout	WORD	(Ackn. delay time in 10ms time window)

Data block at USS

DBB0:	Timeout	WORD	(Delay time in 10ms time grid)

Data block at Modbus-Master

DBB0:	Timeout	WORD	(Respond delay time in 10ms time grid)

Baud rate

Velocity of data transfer in Bit/s (Baud).

04h:	1200Baud	05h:	1800Baud	06h:	2400Baud	07h:	4800Baud
08h:	7200Baud	09h:	9600Baud	0Ah:	14400Baud	0Bh:	19200Baud
0Ch:	38400Baud	0Dh:	57600Baud	0Eh:	115200Baud		

CharLen

Number of data bits where a character is mapped to.

0: 5Bit 1: 6Bit 2: 7Bit 3: 8Bit

Parity

The parity is -depending on the value- even or odd. For parity control, the information bits are extended with the parity bit, that amends via its value ("0" or "1") the value of all bits to a defined status. If no parity is set, the parity bit is set to "1", but not evaluated.

0: NONE 1: ODD 2: EVEN

StopBits

The stop bits are set at the end of each transferred character and mark the end of a character.

1: 1Bit 2: 1.5Bit 3: 2Bit

FlowControl

The parameter FlowControl is ignored. When sending RST=0, when receiving RST=1.

RetVal SFC 216 (Error message SER_CFG)

Return values send by the block:

Error code	Description
0000h	no error
809Ah	interface not found
8x24h	Error at SFC-Parameter x, with x:
	1: Error at "Protocol"
	2: Error at "Parameter"
	3: Error at "Baudrate"
	4: Error at "CharLength"
	5: Error at "Parity"
	6: Error at "StopBits"
	7: Error at "FlowControl"
809xh	Error in SFC parameter value x, where x:
	1: Error at "Protocol"
	3: Error at "Baudrate"
	4: Error at "CharLength"
	5: Error at "Parity"
	6: Error at "StopBits"
	7: Error at "FlowControl"
8092h	Access error in parameter DB (DB too short)
828xh	Error in parameter x of DB parameter, where x:
	1: Error 1st parameter
	2: Error 2nd parameter
	...

Communication

Overview

The communication happens via the send and receive blocks SFC 217 (SER_SND) and SFC 218 (SER_RCV).

The SFCs are included in the consignment of the CPU 31xS.

SFC 217 (SER_SND)

This block sends data via the serial interface.

The repeated call of the SFC 217 SER_SND delivers a return value for 3964R, USS and Modbus via RetVal that contains, among other things, recent information about the acknowledgement of the partner station.

The protocols USS and Modbus require to evaluate the receipt telegram by calling the SFC 218 SER_RCV after SER_SND.

Parameter

Name	Declaration	Type	Comment
DataPtr	IN	ANY	Pointer to Data Buffer for sending data
DataLen	OUT	WORD	Length of data to send
RetVal	OUT	WORD	Error Code (0 = OK)

DataPtr

Here you define a range of the type Pointer for the send buffer where the data that has to be send is stored. You have to set type, start and length.

Example: Data is stored in DB5 starting at 0.0 with a length of 124Byte.

DataPtr:=P#DB5.DBX0.0 BYTE 124

DataLen

Word where the number of the sent Bytes is stored.

If, under **ASCII**, the sending is so fast that not all data can be stored in the send buffer of 256Byte, the value can be different from the length of sent data. This returns the RetVal 9001h.

With **STX/ETX**, **3964R**, **Modbus** and **USS** always the length set in DataPtr is stored or 0.

RetVal SFC 217 (Error message SER_SND)

Return values of the block:

Error code	Description
0000h	Send data - ready
1000h	Nothing sent (data length 0)
20xxh	Protocol executed error free with xx bit pattern for diagnosis
7001h	Data is stored in internal buffer - active (busy)
7002h	Transfer - active
80xxh	Protocol executed with errors with xx bit pattern for diagnosis (no acknowledgement by partner)
90xxh	Protocol not executed with xx bit pattern for diagnosis (no acknowledgement by partner)
8x24h	Error in SFC parameter x, where x: 1: Error in "DataPtr" 2: Error in "DataLen"
8122h	Error in parameter "Data" of SFC 216 (e.g. no DB)
807Fh	Internal error
809Ah	RS232C interface not found
809Bh	RS232C interface not configured

Protocol specific RetVal values

ASCII

Error code	Description
9001h	Buffer overflow (no data send)

STX/ETX

Error code	Description
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)

3964R

Error code	Description
2000h	Send ready without error
8000h	NAK received - error in communication
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)

... Continue RetVal SFC 217 SER_SND

USS

Error code	Description
2000h	Send ready without error
8080h	Receive buffer overflow (no space for receipt)
8090h	Acknowledgement delay time exceeded
80F0h	Wrong checksum in respond
80FEh	Wrong start sign in respond
80FFh	Wrong slave address in respond
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)
9003h	Data too short (<2Byte)

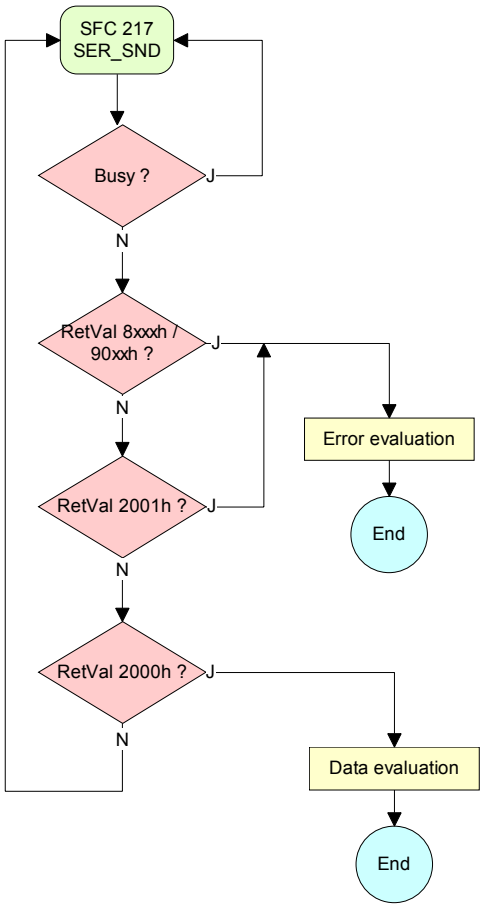
Modbus RTU/ASCII Master

Error code	Description
2000h	Send ready without error
2001h	Send ready with error
8080h	Receive buffer overflow (no space for receipt)
8090h	Acknowledgement delay time exceeded
80F0h	Wrong checksum in respond
80FDh	Length of respond too long
80FEh	Wrong function code in respond
80FFh	Wrong slave address in respond
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)
9003h	Data too short (<2Byte)

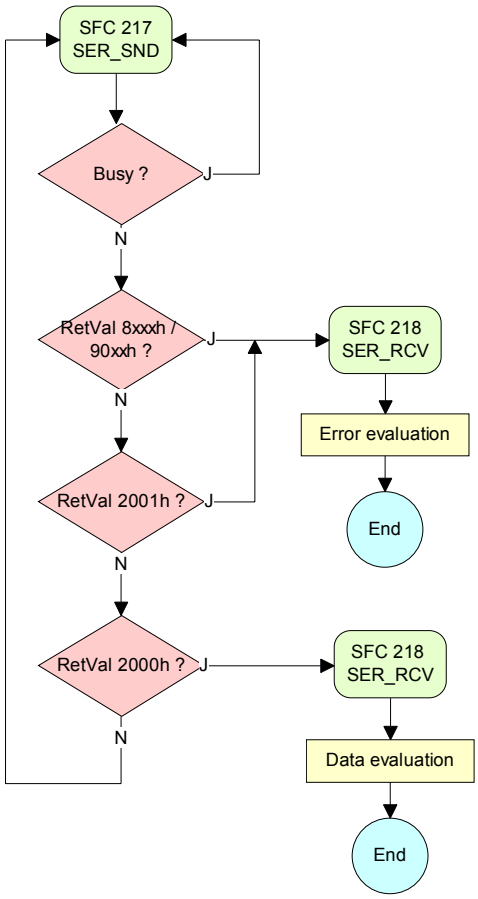
Principles of programming

The following text shortly illustrates the structure of programming a send command for the different protocols.

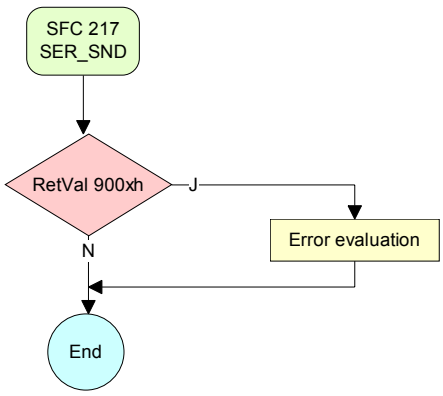
3964R



USS / Modbus



ASCII / STX/ETX



SFC 218 (SER_RCV)

This block receives data via the serial interface.

Using the SFC 218 SER_RCV after SER_SND with the protocols USS and Modbus the acknowledgement telegram can be read.

Parameter

Name	Declaration	Type	Comment
DataPtr	IN	ANY	Pointer to Data Buffer for received data
DataLen	OUT	WORD	Length of received data
Error	OUT	WORD	Error Number
RetVal	OUT	WORD	Error Code (0 = OK)

DataPtr

Here you set a range of the type Pointer for the receive buffer where the reception data is stored. You have to set type, start and length.

Example: Data is stored in DB5 starting at 0.0 with a length of 124Byte.

DataPtr:=P#DB5.DBX0.0 BYTE 124

DataLen

Word where the number of received Bytes is stored.

At **STX/ETX** and **3964R**, the length of the received user data or 0 is entered.

At **ASCII**, the number of read characters is entered. This value may be different from the read telegram length.

Error

This word gets an entry in case of an error. The following error messages may be created depending on the protocol:

ASCII

Bit	Error	Description
0	overrun	Overflow, a sign couldn't be read fast enough from the interface
1	framing error	Error that shows that a defined bit frame is not coincident, exceeds the allowed length or contains an additional Bit sequence (Stopbit error)
2	parity	Parity error
3	overflow	Buffer is full

STX/ETX

Bit	Error	Description
0	overflow	The received telegram exceeds the size of the receive buffer.
1	char	A sign outside the range 20h...7Fh has been received.
3	overflow	Buffer is full

3964R / Modbus RTU/ASCII Master

Bit	Error	Description
0	overflow	The received telegram exceeds the size of the receive buffer.

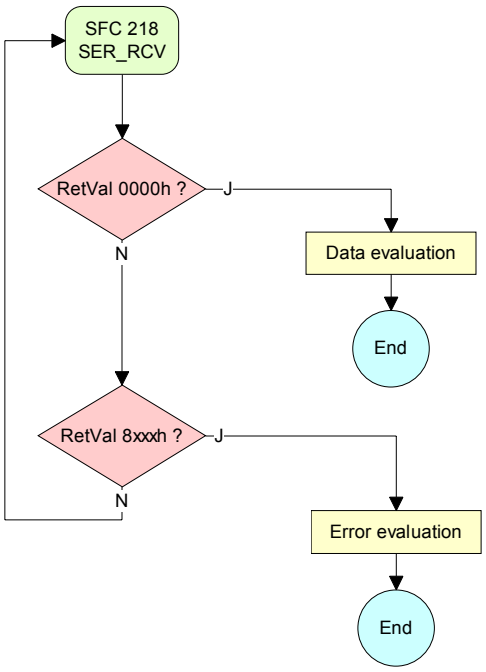
RetVal (Error message)

Return values of the block:

Error code	Description
0000h	no error
1000h	Receive buffer too small (data loss)
8x24h	Error at SFC-Parameter x, with x: 1: Error at "DataPtr" 2: Error at "DataLen" 3: Error at "Error"
8122h	Error in parameter "Data" of SFC 216 (e.g. no DB)
809Ah	serial interface not found res. interface is used by Profibus
809Bh	serial interface not configured

Principles of programming

The following picture shows the basic structure for programming a receive command. This structure can be used for all protocols.



Chapter 7 Deployment CPU 31xS with TCP/IP

Overview

The following chapter describes the deployment of the CPU 31xSN/NET and the communication under TCP/IP. Please regard the chapter "Fast introduction" where you find all information compressed required for the project engineering of the CPU 31xS with CP 343. After the fast introduction, the mentioned steps are described in detail.

The following text describes:

- Basics about a Twisted-Pair network
- Access to the Ethernet-CP website
- Project engineering of a CP communication
- ORG format for the communication with other systems
- Intelligent Process communication
- Sample

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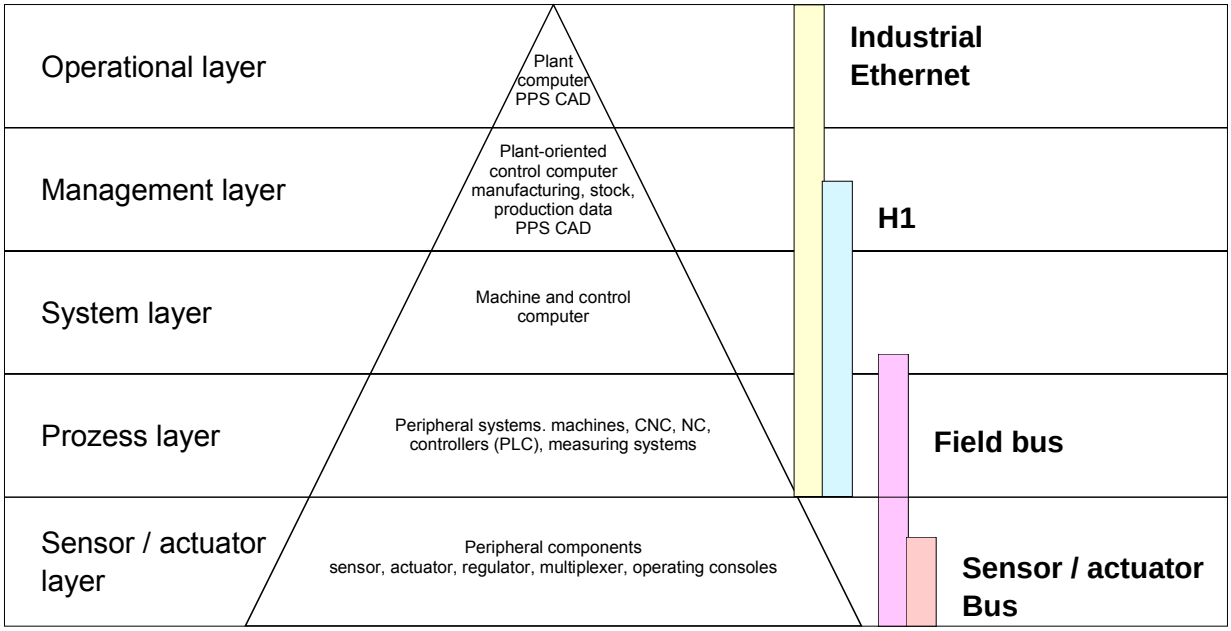
Industrial Ethernet in automation

Overview

The flow of information in a company presents a vast spectrum of requirements that must be met by the communication systems. Depending on the area of business the bus system or LAN must support a different number of users, different volumes of data must be transferred and the intervals between transfers may vary, etc.

It is for this reason that different bus systems are employed depending on the respective task. These may be subdivided into different classes. The following model depicts the relationship between the different bus systems and the hierarchical structures of a company:



Industrial Ethernet

Industrial Ethernet supports operation to sensor layer. It is an electrical net based on shielded twisted pair cabling or optical net based on optical fiber.

Ethernet supports the principle of random bus accesses: every station on the network accesses the bus independently as and when required. These accesses are coordinated by a CSMA/CD (Carrier Sense Multiple Access/Collision Detection) scheme: every station "listens" on the bus cable and receives communication messages that are addressed to it.

Industrial Ethernet is defined by the international standard IEEE 802.3. The net access of Industrial Ethernet corresponds to IEEE 802.3 - CSMA/CD (**C**arrier **S**ense **M**ultiple **A**ccess/**C**ollision **D**etection) scheme: every station "listens" on the bus cable and receives communication messages that are addressed to it.

Stations will only initiate a transmission when the line is unoccupied. In the event that two participants should start transmitting simultaneously, they will detect this and stop transmitting to restart after a random delay time has expired.

Using switches there is the possibility for communication without collisions.

ISO/OSI reference model

Overview

The ISO/OSI reference model is based on a proposal that was developed by the International Standards Organization (ISO). This represents the first step towards an international standard for the different protocols. It is referred to as the ISO-OSI layer model. OSI is the abbreviation for **O**pen **S**ystem **I**nterconnection, the communication between open systems. The ISO/OSI reference model does not represent a network architecture as it does not define the services and protocols used by the different layers. The model simply specifies the tasks that the different layers must perform.
All current communication systems are based on the ISO/OSI reference model which is defined by the ISO 7498 standard. The reference model structures communication systems into 7 layers that cover different communication tasks. In this manner the complexity of the communication between different systems is divided amongst different layers to simplify the task.
The following layers have been defined:

Layer	Function
Layer 7	Application Layer
Layer 6	Presentation Layer
Layer 5	Session Layer
Layer 4	Transport Layer
Layer 3	Network Layer
Layer 2	Data Link Layer
Layer 1	Physical Layer

Depending on the complexity and the requirements of the communication mechanisms a communication system may use a subset of these layers.

Layers

Layer 1 Bit communication layer (physical layer)

The bit communication layer (physical layer) is concerned with the transfer of data bits via the communication channel. This layer is therefore responsible for the mechanical, electrical and the procedural interfaces and the physical communication medium located below the bit communication layer:

- Which voltage represents a logical 0 or a 1?
- The minimum time that the voltage be present to be recognized as a bit.
- The pin assignment of the respective interface.

Layer 2 Security layer (data link layer)

This layer performs error-checking functions for bit strings transferred between two communicating partners. This includes the recognition and correction or flagging of communication errors and flow control functions.

The security layer (data link layer) converts raw communication data into a sequence of frames. This is where frame limits are inserted on the transmitting side and where the receiving side detects them. These limits consist of special bit patterns that are inserted at the beginning and at the end of every frame. The security layer often also incorporates flow control and error detection functions.

The data security layer is divided into two sub-levels, the LLC and the MAC level.

The MAC (**M**edia **A**ccess **C**ontrol) is the lower level and controls how senders are sharing a single transmit channel.

The LLC (**L**ogical **L**ink **C**ontrol) is the upper level that establishes the connection for transferring the data frames from one device into the other.

Layer 3 Network layer

The network layer is an agency layer.

Business of this layer is to control the exchange of binary data between stations that are not directly connected. It is responsible for the logical connections of layer 2 communication. Layer 3 supports the identification of the single network addresses and the establishing and disconnecting of logical communication channels.

Additionally, layer 3 manages the prior transfer of data and the error processing of data packets. IP (Internet Protocol) is based on Layer 3.

Layer 4 Transport layer

Layer 4 connects the network structures with the structures of the higher levels by dividing the messages of higher layers into segments and pass them on to the network layer. Hereby, the transport layer converts the transport addresses into network addresses.

Common transport protocols are: TCP, SPX, NWLink and NetBEUI.

Layers continued...

Layer 5 Session layer

The session layer is also called the communication control layer. It relieves the communication between service deliverer and the requestor by establishing and holding the connection if the transport system has a short time fail out.

At this layer, logical users may communicate via several connections at the same time. If the transport system fails, a new connection is established if needed.

Additionally this layer provides methods for control and synchronization tasks.

Layer 6 Presentation layer

This layer manages the presentation of the messages, when different network systems are using different representations of data.

Layer 6 converts the data into a format that is acceptable for both communication partners.

Here compression/decompression and encrypting/decrypting tasks are processed.

This layer is also called interpreter. A typical use of this layer is the terminal emulation.

Layer 7 Application layer

The application layer is the link between the user application and the network. The tasks of the application layer include the network services like file, print, message, data base and application services as well as the according rules.

This layer is composed from a series of protocols that are permanently expanded following the increasing needs of the user.

Principles

Network (LAN)

A network res. LAN (**l**ocal **a**rea **n**etwork) provides a link between different stations that enables them to communicate with each other.

Network stations consist of PCs, IPCs, TCP/IP adapters, etc.

Network stations are separated by a minimum distance and connected by means of a network cable. The combination of network stations and the network cable represent a complete segment.

All the segments of a network form the Ethernet (physics of a network).

Twisted Pair

In the early days of networking the Triaxial- (yellow cable) or thin Ethernet cable (Cheapernet) was used as communication medium. This has been superseded by the twisted-pair network cable due to its immunity to interference. The CPU 31xSN/NET module has a twisted-pair connector.

The twisted-pair cable consists of 8 cores that are twisted together in pairs. Due to these twists this system is provides an increased level of immunity to electrical interference. For linking please use twisted pair cable which at least corresponds to the category 5.

Where the coaxial Ethernet networks are based on a bus topology the twisted-pair network is based on a point-to-point scheme.

The network that may be established by means of this cable has a star topology. Every station is connected to the star coupler (hub/switch) by means of a separate cable. The hub/switch provides the interface to the Ethernet.

Hub (repeater)

The hub is the central element that is required to implement a twisted-pair Ethernet network.

It is the job of the hub to regenerate and to amplify the signals in both directions. At the same time it must have the facility to detect and process segment wide collisions and to relay this information. The hub is not accessible by means of a separate network address since it is not visible to the stations on the network.

A hub has provisions to interface to Ethernet or to another hub res. switch.

Switch

A switch also is a central element for realizing Ethernet on Twisted Pair. Several stations res. hubs are connected via a switch. Afterwards they are able to communicate with each other via the switch without interfering the network. An intelligent hardware analyzes the incoming telegrams of every port of the switch and passes them collision free on to the destination stations of the switch. A switch optimizes the bandwidth in every connected segment of a network. Switches enable exclusive connections between the segments of a network changing at request.

Protocols

Overview

Protocols define a set of instructions or standards that enable computer to establish communication connections and exchange information as error free as possible.

A commonly established protocol for the standardization of the complete computer communication is the so called ISO/OSI layer model, a model based upon seven layers with rules for the usage of hardware and software (see ISO/OSI reference model above).

The CPU 31xSN/NET from VIPA uses the following protocols

- TCP/IP
- UDP
- RFC1006 (ISO on TCP)

The protocols are described in the following:

TCP/IP

TCP/IP protocols are available on all major systems. At the bottom end this applies to simple PCs, through to the typical mini-computer up to mainframes.

For the wide spread of internet accesses and connections, TCP/IP is often used to assemble heterogeneous system pools.

TCP/IP, standing for **T**ransmission **C**ontrol **P**rotocol and **I**nternet **P**rotocol, collects a various range of protocols and functions.

TCP and IP are only two of the protocols required for the assembly of a complete architecture. The application layer provides programs like "FTP" and "Telnet" for the PC.

The application layer of the Ethernet part of the CPU 31xSN/NET is defined with the user application using the standard handling blocks.

These user applications use the transport layer with the protocols TCP and UDP for the data transfer which themselves communicate via the IP protocol with the internet layer.

IP

The internet protocol covers the network layer (Layer 3) of the ISO/OSI layer model.

The purpose of IP is to send data packages from on PC to another passing several other PCs. These data packages are referred to as datagrams. The IP doesn't guarantee the correct sequence of the datagrams nor the delivery at the receiver.

For the unambiguous identification between sender and receiver 32Bit addresses (IP addresses) are used that are normally written as four octets (exactly 8Bit), e.g. 172.16.192.11.

These internet addresses are defined and assigned worldwide from the DDN network (Defense Department Network), thus every user may communicate with all other TCP/IP users.

One part of the address specifies the network, the rest serves the identification of the participants inside the network. The boarder between the network and the host part is variable and depends on the size of the network.

To save IP addresses, so called *NAT router* are used that have one official IP address and cover the network. Then the network can use any IP address.

TCP

The TCP (**T**ransmission **C**ontrol **P**rotocol) bases directly on the IP and thus covers the transport layer (layer 4) of the OSI layer model. TCP is a connection orientated end-to-end protocol and serves the logic connection between two partners.

TCP guarantees the correct sequence and reliability of the data transfer. Therefore you need a relatively large protocol overhead that slows down the transfer speed.

Every datagram gets a header of at least 20Byte. This header also contains a sequence number identifying the series. This has the consequence that the single datagrams may reach the destination on different ways through the network.

Using TCP connections, the telegram length is not transmitted. This means that the recipient has to know how many bytes belong to a message. To transfer data with variable length you may begin the user data with the length information and evaluate this at the counter station.

Properties

- Besides of the IP address ports are used for the addressing. A port address should be within the range of 2000...65535. Partner and local ports may only be identical at one connection.
- Not depending on the used protocol, the PLC needs the VIPA handling blocks AG_SEND (FC5) and AG_RECV (FC6) for data transfer.

UDP

The UDP (**U**ser **D**atagram **P**rotocol) is a connection free transport protocol. It has been defined in the RFC768 (Request for Comment). Compared to TCP, it has much fewer characteristics.

The addressing happens via port numbers.

UDP is a fast unsafe protocol for it doesn't care about missing data packages nor about their sequence.

ISO-on-TCP RFC1006

The TCP transport service works stream orientated. This means that data packages assembled by the user not necessarily have to receive the partner in the same packaging. Depending on the data amount, packages may though come in in the correct sequence but differently packed. This causes that the recipient may not recognize the package borders anymore. For example you may send 2x 10Byte packages but the counter station receives them as 20Byte package. But for most of the applications the correct packaging is important.

Due to this you need another protocol above TCP. This purpose is defined in the protocol RFC1006. The protocol definition describes the function of an ISO transport interface (ISO 8072) basing upon the transport interface TCP (RFC793).

The basic protocol of RFC1006 is nearly identical to TP0 (Transport Protocol, Class 0) in ISO 8073.

For RFC1006 is run as protocol for TCP, the decoding takes place in the data section of the TCP package.

Properties

- The receipt of data is confirmed by a TCP layer.
- Instead of ports TSAPs are used for the addressing besides of the IP address. The TSAP length may be 1 ... 16Byte. The entry may happen in ASCII or Hex format. Foreign and local TSAPs may only be identical at 1 connection.
- Not depending on the used protocol the VIPA handling blocks AG_SEND (FC5) and AG_RECEIVE (FC6) are necessary for data transfer.
- Contrary to TCP different telegram lengths can be received using RFC1006.

IP address and subnet

IP address structure

The IP address is a 32Bit address that must be unique within the network. The IP address consists of 4 numbers that are separated by a full stop.

Every IP address is a combination of a **Net-ID** and a **Host-ID** and its structure is as follows: **XXX.XXX.XXX.XXX**

Range: 000.000.000.000 to 255.255.255.255

The network administrator also defines IP addresses.

Net-ID
Host-ID

The **Net**work-ID identifies a network res. a network controller that administrates the network.

The Host-ID marks the network connections of a participant (host) to this network.

Subnet mask

The Host-ID can be further divided into a **Subnet-ID** and a *new* **Host-ID** by using an bit for bit AND assignment with the **Subnet mask**.

The area of the original Host-ID that is overwritten by 1 of the Subnet mask becomes the Subnet-ID, the rest is the new Host-ID.

Subnet mask	binary all "1"		binary all "0"
IPv4 address	Net-ID	Host-ID	
Subnet mask and IPv4 address	Net-ID	Subnet-ID	*new* Host-ID

Subnet

A TCP-based communication via point-to-point, hub or switch connection is only possible between stations with identical Network-ID and Subnet-ID! Different area must be connected with a router.

The subnet mask allows you to sort the resources following your needs. This means e.g. that every department gets an own subnet and thus does not interfere another department.

Address at first start-up

At the first start-up of a CPU 31xSN/NET, Ethernet PG/OP and CP 343 of the CPU 31xSN/NET do not have an IP address. The assignment takes place directly via the hardware configuration.

At the first start-up you may assign an IP address and a subnet mask to your CP with the help of a "minimum project" and transfer this via MMC or MPI into the CPU. After a reboot of the CPU and after switching the PG/PC interface to "TCP/IP... RFC1006" you may now configure your CPU online via the CP 343.

Address classes

For IPv4 addresses there are five address formats (class A to class E) that are all of a length of 4byte = 32bit.

Class A	0	Network-ID (1+7bit)	Host-ID (24bit)
Class B	10	Network-ID (2+14bit)	Host-ID (16bit)
Class C	110	Network-ID (3+21bit)	Host-ID (8bit)
Class D	1110	Multicast group	
Class E	11110	Reserved	

The classes A, B and C are used for individual addresses, class D for multicast addresses and class E is reserved for special purposes.

The address formats of the 3 classes A, B, C are only differing in the length of Network-ID and Host-ID.

Private IP networks

To build up private IP-Networks within the internet, RFC1597/1918 reserves the following address areas:

Network class	Start IP	End IP	Standard subnet mask
A	10.0.0.0	10.255.255.255	255.0.0.0
B	172.16.0.0	172.31.255.255	255.255.0.0
C	192.168.0.0	192.168.255.255	255.255.255.0

(The Host-ID is underlined.)

These addresses can be used as net-ID by several organizations without causing conflicts, for these IP addresses are neither assigned in the internet nor are routed in the internet.

Reserved Host-Ids

Some Host-IDs are reserved for special purposes.

Host-ID = 0	Identifier of this network, reserved!
Host-ID = maximum (binary complete 1)	Broadcast address of this network

Note!

Never choose an IP address with Host-ID=0 or Host-ID=maximum!

(e.g. for class B with subnet mask = 255.255.0.0, the "172.16.0.0" is reserved and the "172.16.255.255" is occupied as local broadcast address for this network.)

Network planning

Standards and guidelines

The applicable rules and regulations have to be satisfied in order to establish reliable communications between the different stations.

These agreements define the form of the data protocol, the method of bus access and other principles that are important for reliable communications.

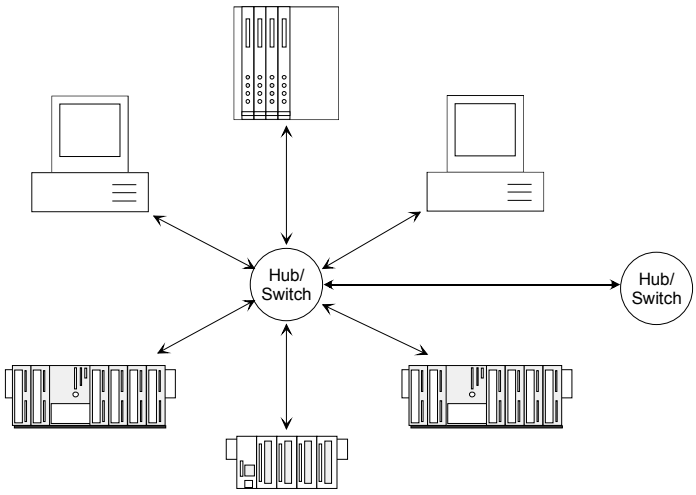
The VIPA CPU 31xSN/NET was developed in accordance with the standards defined by ISO.

International and national committees have defined the following standards and guidelines for networking technologies:

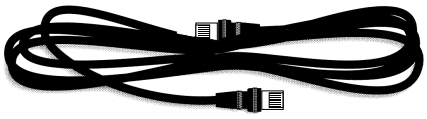
ANSI	American National Standards Institute The ANSI X3T9.5 standard currently defines the provisions for high-speed LANs (100 MB/s) based on fiber optic technology. (FDDI) Fiber Distributed Data Interface.
CCITT	Committee Consultative Internationale de Telephone et Telegraph. Amongst others, this advisory committee has produced the provisions for the connection of industrial networks (MAP) to office networks (TOP) on Wide Area Networks (WAN).
ECMA	European Computer Manufacturers Association. Has produced various MAP and TOP standards.
EIA	Electrical Industries Association (USA) This committee has issued standard definitions like RS-232 (V.24) and RS-511.
IEC	International Electrotechnical Commission. Defines certain special standards, e.g. for the Field Bus.
ISO	International Organization for Standardization. This association of national standards organizations developed the OSI-model (ISO/TC97/SC16). It provides the framework for the standardization of data communications. ISO standards are included in different national standards like for example UL and DIN.
IEEE	Institute of Electrical and Electronic Engineers (USA). The project-group 802 determines LAN-standards for transfer rates of 1 to 1000MB/s. IEEE standards often form the basis for ISO-standards, e.g. IEEE 802.3 = ISO 8802.3.

Overview of components

The CP is exclusively used for deployment in a Twisted-Pair network. Within a Twisted-Pair network all participating stations are connected in star topology via a Twisted-Pair cable to a hub/switch which is also able to communicate with another hub/switch. Two connected stations are building a segment where the length of the Twisted-Pair cable between two stations must be max. 100m.



Twisted Pair Cable



At twisted pair cable has 8 conductors twisted together in pairs. The different conductors have a diameter of 0.4 to 0.6mm.

For linking please use twisted pair cable which at least corresponds to the category 5.

Analyzing the requirements

- What is the size of the area that must be served by the network?
- How many network segments provide the best solution for the physical (space, interference related) conditions encountered on site?
- How many network stations (SPS, IPC, PC, transceiver, bridges if required) must be connected to the cable?
- What is the distance between the different stations on the network?
- What is the expected "growth rate" and the expected number of connections that must be catered for by the system?
- What data amount has to be handled (band width, accesses/sec.)?

Drawing a network diagram

Draw a diagram of the network. Identify every hardware item (i.e. station cable, hub, switch). Observe the applicable rules and restrictions.

Measure the distance between all components to ensure that the maximum length is not exceeded.

Linking with NetPro

Please regard that the following software packages must be installed for the project engineering:

- Siemens SIMATIC Manager V. 5.1
- For the project engineering of SPEED7 modules the vipa_speedbus.gsd is included.
- Siemens SIMATIC NET

To enable the stations to communicate with each other you have to configure the required (sub)nets in the Siemens SIMATIC Manager res. NetPro following this approach:

- Create one or more subnets of the wanted type in your project.
- Adjust the properties of the subnets.
- Connect your participants logically to the subnet.
- Establish communication connections between the single stations.

Net-Project variants

You may administrate several subnets in one project. Every station has to be created once. A station may be assigned to several subnets by assigning the CPs accordingly.

In the following typical project variants for networks are listed:

1 subnet - 1 project

The simplest case is a plant with stations that have to be connected via one subnet of the type Industrial Ethernet.

For this you create an object "Ethernet". Stations that are created in the same project refer to this object when they are configured as net knots. They may then be selected directly. Foreign devices are listed in this subnet as "Other station" during project engineering.

2 or more subnets - 1 project

Due to different tasks of the stations or due to the expansion of your plant it may be necessary to create several nets. Here you may create several subnets in one project and configure the stations easily for communication.

1 or more subnets – several part projects

At complex linked plants it is sensible to administrate plant parts in several part projects. Here it may be necessary to create project exceeding connections. For this the Siemens SIMATIC Manager starting with V5.2 provides the multi project function. This function allows you to split projects and join them again. A more detailed description is to be found in the manual of the Siemens SIMATIC Manager.

Subnet exceeding connections

These are connections that long into another subnet due to the complexity of the plant. The subnets are connected via a router. By setting a router address during the hardware configuration of your CP you may instruct the CP to include the according subnet via this router for communication.

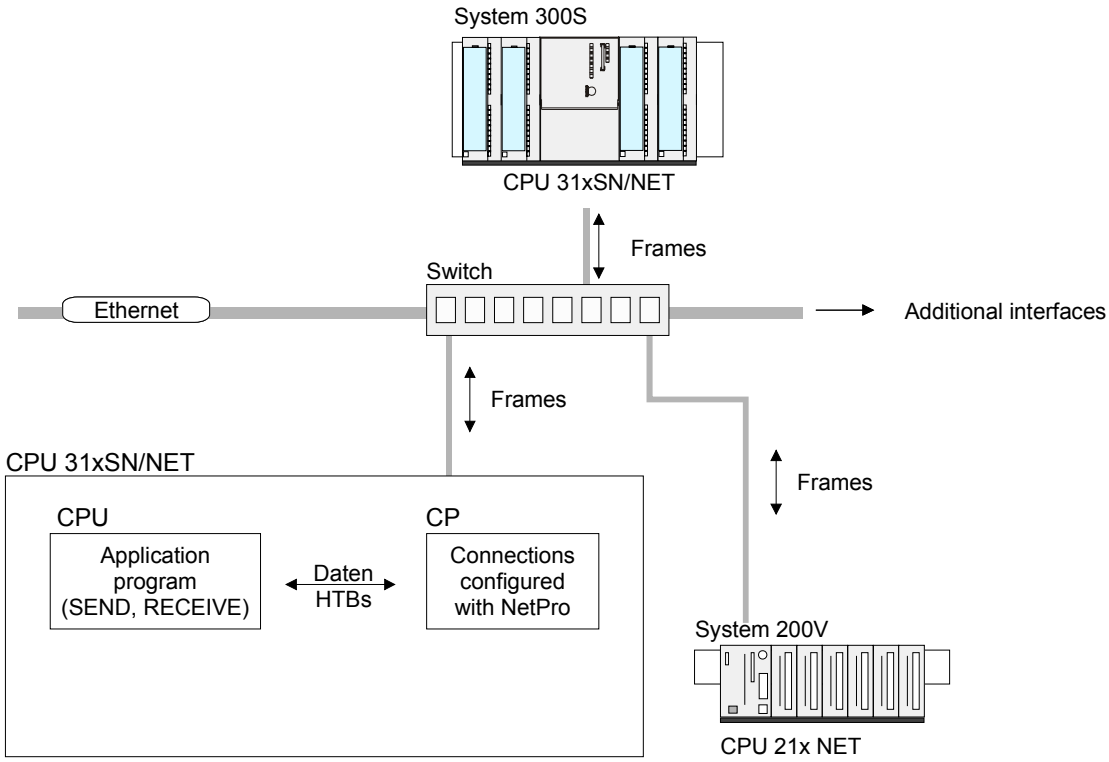
Communication possibilities of the CP

Communication between CP 343 and CPU

The internal CP 343 of the CPU 31xSN/NET is directly connected to the CPU 31xS via a Dual-Port-RAM. The CPU manages the data exchange with the VIPA handling blocks AG_SEND (FC5) and AG_RECV (FC6).

The communication via the according protocols are controlled by connections that are parameterized in the Siemens project engineering tool NetPro and that may be transferred into the CPU via MMC, MPI or directly via Ethernet.

For the transfer via Ethernet, your CPU requires a minimum project where IP address and subnet mask of the CPs are defined. This project can be transferred to the CPU via MMC or MPI.



Communication types

The CP supports the following communication types:

- PG/OP communication
- Configurable connections

PG/OP communication

The PG/OP communication serves the loading of programs and configuration data, for test and diagnostic functions as well as for operating and monitoring a plant. Here you may access the CPU online via the CP (Ethernet).

A simultaneous access of up to 8 participants is possible. Please note for each PG and OP communication 1 connection is reserved.

Configurable connections

Configurable connections are connections for the communication between PLC stations. The connections may be configured with the Siemens project engineering tool NetPro.

The following table shows the combination option with the different operating modes:

Combination options

Connection partner	Connection type	Conn. Establ.	Connection	Operating mode
Specified in NetPro (in recent project)	TCP / ISO-on-TCP	active/passive	specified	SEND/RECEIVE
	UDP	-		
Unspecified in NetPro (in recent project)	TCP / ISO-on-TCP	active	specified	SEND/RECEIVE
		passive	part specified (Port)	SEND/RECEIVE FETCH PASSIV WRITE PASSIV
			unspecified	
	UDP	-	specified	SEND/RECEIVE
Unspecified in NetPro (in "unknown project")	TCP / ISO-on-TCP	active	unspecified (connection name)	SEND/RECEIVE
		Passive	unspecified (connection name)	SEND/RECEIVE FETCH PASSIV WRITE PASSIV
	UDP	-	unspecified (connection name)	SEND/RECEIVE
All Broadcast stations	UDP	-	specified (Port, Broadcast addr)	SEND
All Multicast stations	UDP	-	specified (Port, Multicast group)	SEND/RECEIVE

Connection partner

Connection partner are stations at the counter side.

Specified connection partner

Every station configured in the Siemens SIMATIC Manager is entered in the list of connection partners. By setting an IP address and a subnet mask these stations are uniquely *specified*.

Unspecified connection partner

You may also set an *unspecified* connection partner. Here the connection partner may be within the *recent project* or within an *unknown project*. Connection commands to an *unknown project* must be defined via an unique connection name that has to be used in the projects of both stations. Due to the assignment via a connection name, the connection itself remains *unspecified*.

All broadcast participants

Only with UDP connections you may here send messages to all available broadcast participants. The reception is not possible. The broadcast participants are specified via one port and one broadcast address at sender and receiver.

All multicast participants

This setting allows you to send and receive multicast telegrams between the multicast participants. By setting of one port and one multicast group for sender and receiver the multicast participants are specified.

Connection types

For the communication the following connection types are available:

- **TCP** res**. ISO-on-TCP** for the secured data transfer of related data blocks between two Ethernet participants.
- **UDP** for the unsecured data transfer of related data blocks between two Ethernet.

Connection establishment

Using configurable connections there is always one station that *actively* establishes a connection. The counter station waits *passively* for the active connection. Only then productive data can be transferred.

Connection

By setting IP address and port/TSAP of the counter station, a connection is *specified*. Active connections must always be set specified. An *unspecified* connection which is only possible for passive connection establishment, IP address and port/TSAP of the counter station are not required for telegram evaluation.

There is also an option for *part specified* connections. The part specifications happens via the setting of the port. An IP address is not required.

Operating modes

Depending on the connection, the following operating modes are available:

SEND/RECEIVE

The SEND/RECEIVE interface allows the program controlled communication to any partner station via a configured connection. Here the data transfer happens by call from your user application. The FC5 and FC6 that are part of the VIPA block library are serving as interface.

This enables your control to send messages depending on process events.

FETCH/WRITE PASSIVE

With the help of FETCH/WRITE services partner systems have the direct access to memory areas. This are "passive" communication connections that have to be configured. The connections are "actively" established by the connection partner (e.g. Siemens-S5).

FETCH PASSIVE (request data)

FETCH allows a partner system to request data.

WRITE PASSIVE (write data)

This allows a partner system to write data in the data area of the CPU.

Function overview

Outline

In the following the functions are listed that are supported by the CP part of the CPU 31xSN/Net at this time:

Configurable connections

Function	Property
Maximum number of productive connections	16 (8 at CPU 315-4NE11)
TCP connections	SEND, RECEIVE, FETCH PASSIVE, WRITE PASSIVE Connection establishment active and passive, supports unspecified connection partner
ISO-on-TCP connections (RFC1006)	SEND, RECEIVE, FETCH PASSIVE, WRITE PASSIVE Connection establishment active and passive, supports unspecified connection partner
UDP connections	SEND and RECEIVE The transfer of the telegrams is not acknowledged, i.e. the loss of messages is not recognized by the send block.
UDP Broadcast connection	SEND
UDP Multicast connection	SEND and RECEIVE
Data block length	max. 64kByte (max. 2KByte at UDP)
VIPA handling blocks	For connection commands at the PLC: AG_SEND (FC5) / AG_RECEIVE (FC6) Any call without lock in all OBs

PG connections and diagnostic

Function	Property
Maximum number of PG/OP connections	8 (each 1 connection is reserved for PG and OP)
Diagnostic	Supports NCM diagnostic via Ethernet
Search within network	Supports Siemens SIMATIC Manager search
10/100MBit	Switch happens automatically

Fast introduction

Overview

At the first start-up of a CPU 31xSN/NET, Ethernet PG/OP and CP 343 of the CPU 31xSN/NET do not have any IP address. The assignment takes place directly via the hardware configuration of the Siemens SIMATIC Manager. For the project engineering of a CPU 31xS with CP 343 please follow this approach:

- **Assembly and commissioning**
- **Hardware configuration** (Inclusion of CP in CPU)
- **CP project engineering** via NetPro (connection to Ethernet)
- **PLC programming** via user application (connection to PLC)
- **Transfer of the complete project to CPU**

Note!

To be compatible to the Siemens SIMATIC Manager, the CPU 31xS from VIPA has to be configured as

CPU 318-2DP (6ES7 318-2AJ00-0AB0)!

The Ethernet-PG/OP channel of the CPU 31xSN/NET is always configured virtually as 1st module after the really plugged modules at the standard bus as CP343-1 (343-1EX11) from Siemens. The CP 343 of a CPU 31xSN/NET has always to be configured below the before configured CP also as CP343-1 (343-1EX11).

Assembly and commissioning

- Install your System 300S with the CPU 31xSN/NET.
- Wire the system by connecting cables for voltage supply, signals and Ethernet. A detailed description is to be found in the chapter "Assembly and installation guidelines".
- Switch on the voltage supply. → After a short boot time, the CP is in idle.
  At the first commissioning res. after an overall reset of the CPU, Ethernet-PG/OP channel and CP have no IP address. For control purposes you may now reach the CP via the MAC address. The MAC address is to be found beneath the front flap on the left side of the module at a small label on the module.

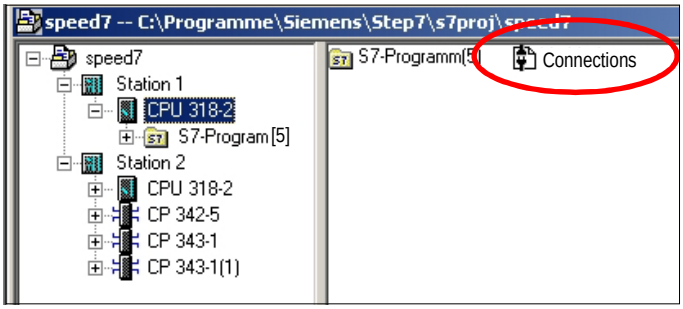
Please regard that a first initialization by means of the MAC address is not supported at this time. The assignment of an IP address happens exclusively via the project engineering. This project may be transferred to the CPU via MPI res. MMC. After every CPU boot res. after every alteration of the configuration data in the CPU, the CP is provided with the recent project data by the CPU. Now you may access the CP via this IP address for project engineering res. diagnostic purposes.

Hardware configuration

- Start Siemens SIMATIC Manager with new project.
- Place a new System 300 station with **Insert** > *Station* > *SIMATIC 300 station*
- Activate the station "SIMATIC 300" and open the hardware configurator by clicking on "Hardware".
- Configure a rack (SIMATIC 300 \ Rack-300 \ Profile rail).
- Engineer in deputy of your CPU 31xSN/NET the Siemens CPU 318-2DP with the order no. 6ES7 318-2AJ00-0AB0 V3.0. which is to be found under SIMATIC 300 \ CPU 300 \ CPU 318-2 \ 318-2AJ00-0AB00. If needed, parameterize the CPU 318-2DP.
- Place the System 300 modules in plugged sequence starting with plug-in location 4.
- Configure the internal PG/OP channel directly under the really plugged modules as virtual **CP 343-1 (343-1EX11)** from Siemens.
- Set IP address, subnet mask and gateway at CP properties.
- Always configure as 2nd CP the internal CP 343 as **CP 343-1 (343-1EX11)** by setting another IP address, subnet mask and gateway.
- Save and compile your project.

Configure connections with NetPro

The link-up between the stations happens with the graphical interface NetPro. Start NetPro by clicking on a network in your project res. on connections in the CPU directory.

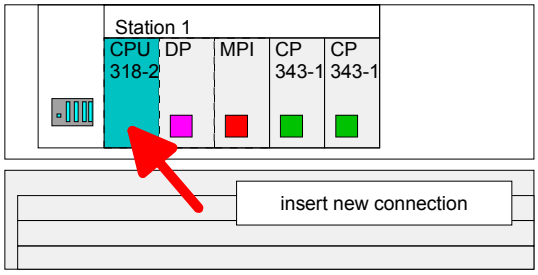


Link-up stations

For the project engineering of connections, connected stations are presumed. To link-up stations, point on the colored net mark of the according CP with the mouse and drag it to the network you want to assign. The connection is displayed graphically by a line.

Configure connections

For the project engineering of new connections click on the according CPU and choose "Insert new connection" from the context menu.



Via the dialog window you may set the parameters for a connection. The parameters ID and LADDR are required for the usage on the blocks AG_SEND res. AG_RECV.

Always use the 2nd CP from the route

Please take care to always choose the 2nd CP from route for communication. As 1st CP you will always see the Ethernet PG/OP channel that does not support configurable connections.

Save and compile connections

Save and compile your project and close NetPro.

To store the CP project engineering data in the system data, you have to activate the option "Save confoguration data on the CPU" (default setting) under *object properties* area *Options* in the hardware configuration of the CP.

PLC user application

For the execution of connection commands at the PLC, your CPU requires an user application. For this, exclusively the VIPA handling blocks AG_SEND (FC5) and AG_RECV (FC6) are used. The blocks are part of the VIPA library that is included in the consignment as CD (SW830).

Specify the according CP via the parameters *ID* and *LADDR* by calling FC5 res. FC6.

Transfer project

There are 3 possibilities to transfer your project into the CPU:

- Transfer via MPI
- Transfer via MMC using a card reader
- Transfer via integrated Ethernet-PG/OP channel

More detailed information about this is to be found below at "Transfer project".

The following pages provide a more detailed description of the steps of the fast introduction.

Hardware configuration

Overview

For the Hardware configuration the hardware configurator from Siemens is used. Here you set amongst others the IP address of the CP and configure the hardware components of your PLC.

Due to the fact that neither the Ethernet-PG/OP channel nor the CP 343 have an IP address in delivery state you may engineer the CPU exclusively via MPI or MMC.

For the access to the CPU via the Ethernet-PG/OP channel res. the CP 343 it is required that the CPU has a hardware project engineering where IP address and subnet mask for Ethernet-PG/OP res. CP 343 are defined.

Requirements

For the hardware configuration the following software is required:

- Siemens SIMATIC Manager V. 5.1 or higher and vipa_speedbus.gsd
- SIMATIC NET

Note!

For the project engineering a thorough knowledge of the SIMATIC Manager and the hardware configurator from Siemens are required and assumed!

Note!

To be compatible to the Siemens SIMATIC Manager, the CPU 31xS from VIPA has to be configured as

CPU 318-2DP (6ES7 318-2AJ00-0AB0)!

The Ethernet-PG/OP channel of the CPU 31xSN/NET is always configured virtually as 1st module after the really plugged modules at the standard bus as CP343-1 (343-1EX11) from Siemens. The CP 343 of a CPU 31xSN/NET has always to be configured below the before configured CP also as CP343-1 (343-1EX11).

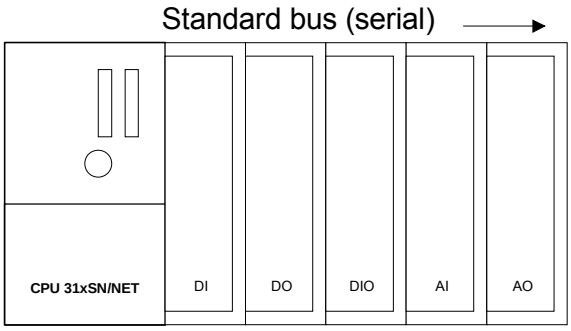
Steps of the project engineering

The following text shows the approach of the project engineering in the hardware configurator from Siemens in an abstract sample.

The project engineering is divided into 3 parts:

- Project engineering of the CPU
- Project engineering of the really plugged modules at the standard bus
- Project engineering Ethernet-PG/OP channel and CP 343

Hardware assembly



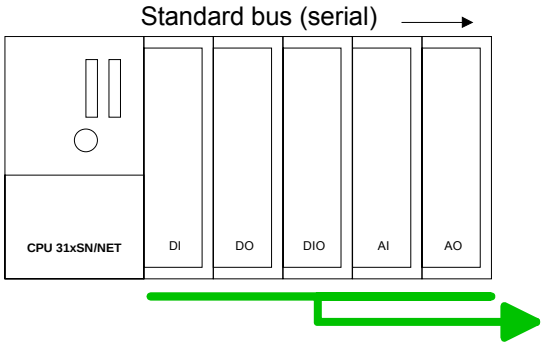
Project engineering of the CPU

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.
- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0 V3.0)

Project engineering of the modules at the standard bus

The modules at the right side of the CPU at the standard bus are configured with the following approach:

- Include your System 300 modules at the standard bus in the plugged sequence starting with slot 4.
- Parameterize the CPU res. the modules where appropriate. The parameter window opens by a double click on the according module.



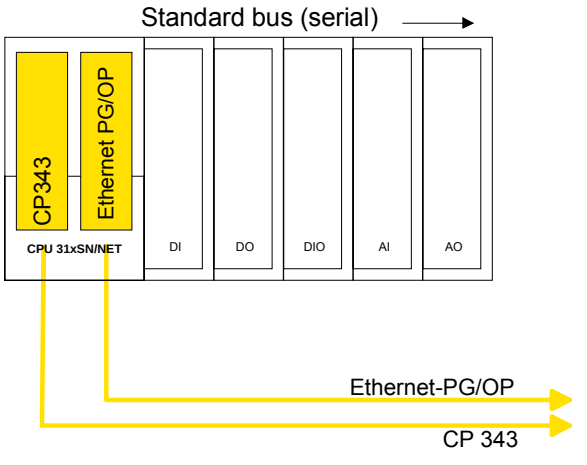
Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	
10	
11	

Project engineering Ethernet-PG/OP channel and CP 343

For the internal Ethernet-PG/OP channel that every SPEED7-CPU includes, you have to configure a Siemens CP 343-1 (SIMATIC 300 \ CP 300 \ Industrial Ethernet \CP 343-1 \ 6GK7 343-1EX11 0XE0) always as 1st module below the really plugged modules.

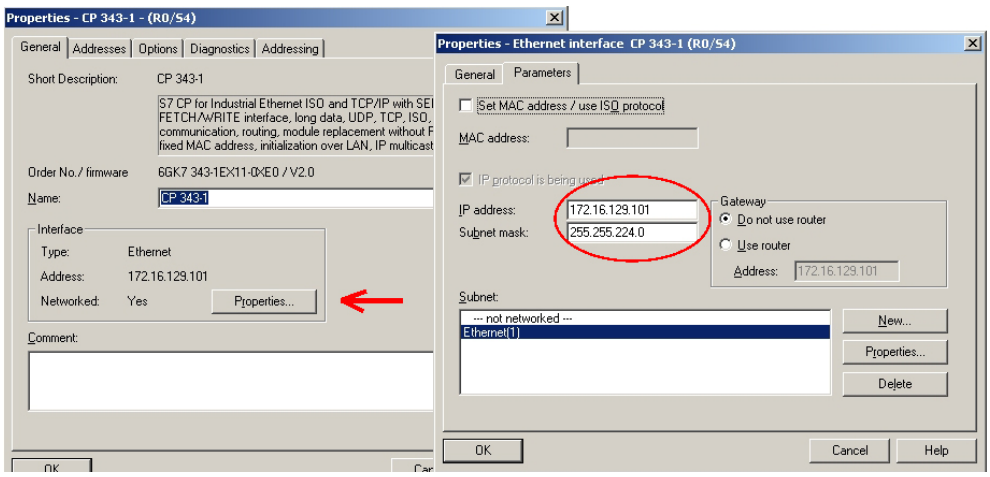
The integrated CP 343 of the CPU 31xSN/NET is also configured as **CP 343-1 (343-1EX11)** but always below the before configured CP 343-1.



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	343-1EX11
10	343-1EX11
11	

Open the property window via double-click on the CP 343-1EX11 and enter under properties the IP address, subnet mask and gateway for the CPs and select the wanted subnet.



Save and compile your project.

Bus extension with IM 360 and IM 361

To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.

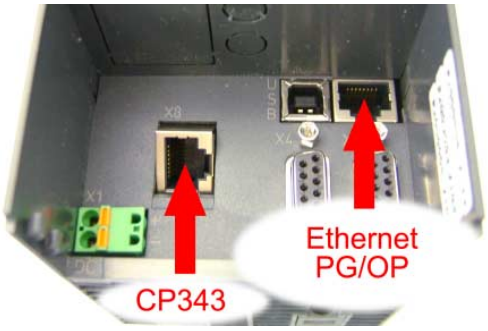
Project engineering SPEEDbus

Detailed information about project engineering of the SPEEDbus modules is to be found under "Deployment CPU 31xS".

Project engineering CPU via Ethernet-PG/OP

The following approach requires that the Ethernet-PG/OP channel is available online, i.e. you assigned an IP address and subnet mask via a hardware configuration and the project engineering PC is in the same IP number circle. For more information see "Access to the Ethernet-PG/OP channel and website..." above.

- For transferring your project to the CPU, you connect the right Ethernet jack (Ethernet-PG/OP) of your CPU 31xSN/NET with your network.



- Adjust the following setting in the SIMATIC Manager under **Options** > *PG/PC interface*...: TCP/IP -> Network card...Protocol RFC 1006
- Change to your project in the hardware configurator and start the transfer with **PLC** > *Download to module*
- Select the wanted module and type as "address" the IP address of the Ethernet-PG/OP channel.
  Before the transfer takes place you receive an error message that the "Online module" is different from the "Offline module". Ignore this message and start the transfer with [OK].

Now you may access the PG/OP channel via your project and configure the wanted connections for the CP 343 with NetPro.

Note!

Provided that no new hardware configuration is transferred to the CPU, the given Ethernet-PG/OP channel is permanently stored in the project as transfer channel.

Configure connections

Outline

The project engineering of connections i.e. the "link-up" between stations happens in NetPro from Siemens. NetPro is a graphical user interface for the link-up of stations.

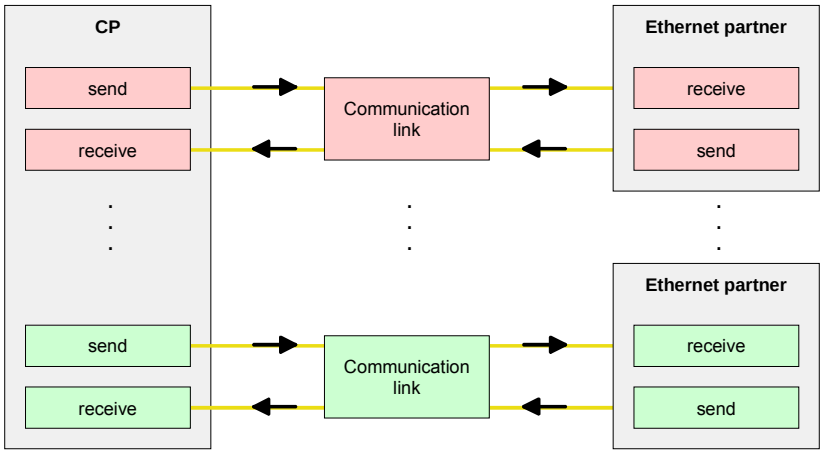
A communication connection enables the program controlled communication between two participants at the Industrial Ethernet. The communication partners may here be part of the same project or - at multi projects - separated within related part projects.

Communication connections to partners outside of a project are configured via the object "In unknown project" or via deputy objects like "Other stations" or Siemens "SIMATIC S5 Station".

Properties

The following properties are characterizing a communication connection:

- One station always executes an active connection establishment.
- Bi-directional data transfer (Send and receive on one connection)
- Both participant have equal rights, i.e. every participant may initialize the send res. receive process event controlled.
- Except of the UDP connection, at a communication connection the address of the communication partner is set via the project engineering.



Requirements

- Siemens SIMATIC Manager V. 5.1 or higher and SIMATIC NET are installed.
- The CP has been engineered at the hardware configuration, entered into the hardware configuration and linked-up to the Ethernet subnet.
- The CP as bus participant has an IP address.

Note!

All stations outside of the recent project must be configured as replacement objects like e.g. Siemens "SIMATIC S5" or "other station" or with the object "In unknown project".

When creating a connection you may also choose the partner type "unspecified" and set the required remote parameter directly in the connection dialog.

Work environment of NetPro

For the project engineering of connections, a thorough knowledge with NetPro from Siemens is required! The following passage only describes the basic usage of NetPro. More detailed information about NetPro is to be found in the according online manual res. documentation.

Start NetPro by clicking on a "net" in the Siemens SIMATIC Manager or on "connections" within the CPU.

The environment of NetPro has the following structure:

1 *Graphic net view*

All stations and networks are displayed in a graphic view. By clicking on the according component you may access and alter the concerning properties.

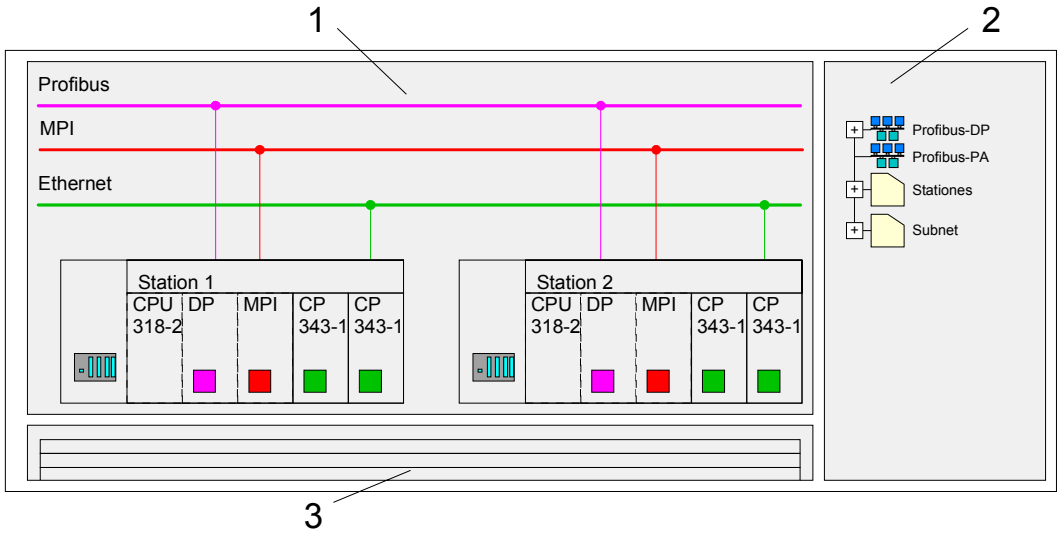
2 *Net objects*

This area displays all available net objects in a directory view. By dragging a wanted object to the net view you may include further net objects and open them in the hardware configurator.

3 *Connection table*

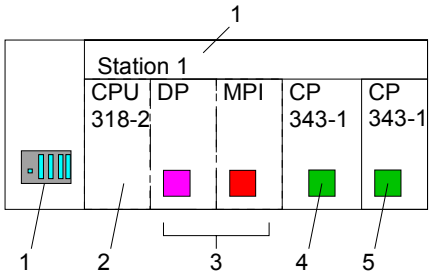
The connection table lists all connections in a table. This list is only shown when you highlighted a connectable module like e.g. a CPU.

You may insert new connections into this table with the according command.



PLC stations

You receive the following graphical display for every PLC station and their component. By selecting the single components, the context menu offers you several functions:



1 *Station*

This includes a PLC station with rack, CPU and communication components. Via the context menu you may configure a station added from the *net objects* and its concerning components in the hardware configurator. After returning to NetPro, the new configured components are shown.

2 *CPU*

A click onto the CPU shows the connection table. The connection table shows all connections that are configured for the CPU.

3 *Internal communication components*

This displays the communication components that are available in your CPU. For the SPEED7-Net-CPUs are configured as CPU 318-2DP the internal components do not show the CP.

Due to this, the CPs that are included in the SPEED7-Net-CPU must be configured as external CPs behind the really plugged modules. The CPs are then also shown in NetPro as external CPs (4, 5) in the station.

4 *Ethernet PG/OP channel*

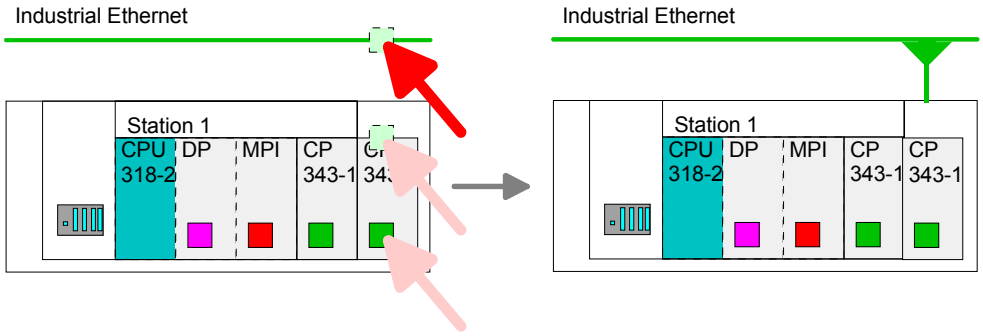
The internal Ethernet-CP must always be configured as 1st CP in the hardware configuration. This CP only serves the PG/OP communication. You may not configure connections.

5 *CP 343*

The internal CP 343 must always be configured as 2nd CP in the hardware configuration after the Ethernet-CP.

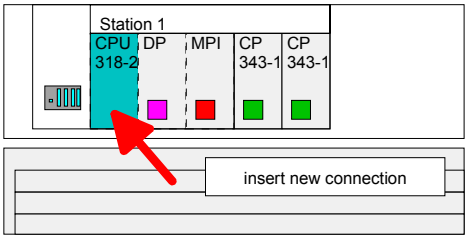
Link up stations

NetPro offers you the option to link-up the communicating stations. You may link-up the stations via the properties in the hardware configuration or graphically via NetPro. For this you point the mouse on the colored net mark of the according CP and drag and drop it to the net you want to link. Now the CP is linked up to the wanted net by means of a line.



Projecting connections

For the project engineering of connections, open the connection list by selecting the according CPU. Choose *Insert new connection* in the context menu:



A dialog window opens where you may choose the connection partner and the type of the connection.

The following connections are supported by the CP 343 of the CPU31xSN/NET at this time:

ISO-ON-TCP (SEND-RECEIVE, FETCH-WRITE PASSIVE)
TCP (SEND-RECEIVE, FETCH-WRITE PASSIVE)
UDP (SEND-RECEIVE)

General information

If activated, a properties dialog for the according connection opens. This dialog window is the link to your PLC program. Here you may adjust the *Local ID* and evaluate the *LADDR*.

ID
LADDR

Both are parameters that must be given to your PLC application when using the FC 5 and 6 (AG_SEND, AG_RECEIVE). Please do always use the VIPA FCs that are delivered with the SW830 as a library.

Note!

Please regard that a CP depending ID is assigned to the connections of the SEND/RECEIVE interface. This may cause alterations of the ID at changes of the project. In this case you also have to adjust the interface supply of AG_SEND res. AG_RECV in the user application.

If a CP is exchanged by another one, this must at least provide the same services and must at least have the same version level. Only this can guarantee the connections configured via the CP to remain consistent and useable.

Route

The *route* allows you to access the concerning CP that should be used for the connection. By using a CPU 31xSN/NET you must use the 2nd CP of the path selection for the communication via the internal CP 343. As 1st CP in the list always the integrated Ethernet-CP is shown though this only supports PG/OP communication.

Addresses

The register addresses shows the relevant local and partner address information as suggestion values. Depending on the communication type you may leave the address information unspecified.

The following table shows the combination options with the different operating modes:

Connection partner	Connection type	Conn. Establ.	Connection	Operating mode
Specified in NetPro (in recent project)	TCP / ISO-on-TCP	active/passive	specified	SEND/RECEIVE
	UDP	-		
Unspecified in NetPro (in recent project)	TCP / ISO-on-TCP	active	specified	SEND/RECEIVE
		passive	part specified (Port)	SEND/RECEIVE FETCH PASSIV WRITE PASSIV
			unspecified	
	UDP	-	specified	SEND/RECEIVE
Unspecified in NetPro (in "unknown project")	TCP / ISO-on-TCP	active	unspecified (connection name)	SEND/RECEIVE
		passive	unspecified (connection name)	SEND/RECEIVE FETCH PASSIV WRITE PASSIV
	UDP	-	unspecified (connection name)	SEND/RECEIVE
All Broadcast stations	UDP	-	specified (Port, Broadcast addr)	SEND
All Multicast stations	UDP	-	specified (Port, Multicast group)	SEND/RECEIVE

Address parameter

A connection is specified by the *local* and *partner* connection end point. At the project engineering of connections ports/TSAPs must be congruent crosswise. Depending on the protocol the following parameters define a connection end point:

IP address Station A			IP address Station B	
partner TSAP	→	*ISO-on-TCP*	→	local TSAP
local TSAP	←	*connection*	←	partner TSAP
IP address Station A			IP address Station B	
partner Port	→	*TCP*	→	local Port
local Port	←	*connection*	←	partner Port
IP address Station A			IP address Station B	
partner Port	→	*UDP*	→	local Port
local Port	←	*connection*	←	partner Port

TSAP

ISO-on-TCP supports TSAP lengths (**T**ransport **S**ervice **A**ccess **P**oint) of 1...16Byte. You may enter the TSAP in ASCII or hexadecimal format. The calculation of the length happens automatically.

Port

Ports res. port addresses are defining the access point to the user application within the station/CPU. These must be unambiguous. A port address should be within the range of 2000...65535. Foreign and local ports may only be identical with one connection.

Save and compile connections

After you configured all connections this way, you may save and compile your project and exit NetPro.

To store the CP project engineering data in the system data, you have to activate the option "Store project data in the CPU" (default setting) under *object properties* area *Options* in the hardware configuration of the CP.

Broadcast-/ Multicast-connections

The expression "connection" is also used at UDP although there is no explicit connection establishment between the communication partners during runtime of the stations.

But during the project engineering like at with e.g. TCP the communication partners are assigned to each other and therefore logical linked-up.

Only at UDP the following options are additionally available at the selection of the connection partner:

- All broadcast stations
- All multicast stations

Broadcast stations

By selecting *All broadcast stations* as connection partner, you define that UDP telegrams are to be send to all available broadcast participants. Please regard that the CP may exclusively receive broadcast telegrams. The reception of user data via broadcast is not possible. Per default, broadcasts that are only serving the Ethernet communication, like e.g. ARP-Requests (Search MAC <> IP address), are received and accordingly processed.

For the identification of the broadcast participants within the net, you have to define a valid broadcast address as partner IP during project engineering of a broadcast connection. Additionally to the broadcast address you have to set a common port for sender and receiver.

Multicast stations

By selecting *All Multicast stations* you define that UDP telegrams have to be send res. received by all participants of a multicast group. In opposite to broadcast here a reception is possible.

For the identification of the multicast participants within the net, you have to define a valid multicast group address as partner IP during project engineering of a multicast connection. Additionally to this address you have to set a common port for sender and receiver.

SEND/RECEIVE with PLC program

Overview

For the execution of connection commands at the PLC, your CPU requires an user application. For this, exclusively the VIPA handling blocks AG_SEND (FC5) and AG_RECV (FC6) are used. By including these blocks into the cycle block OB1 you may send and receive data cyclic.

The two FCs are part of the VIPA library, that is included in the consignment as CD (SW830).

Note!

Please regard that you may only use the SEND/RECV-FCs from VIPA in your user application for the communication with VIPA-CPs. At a change to VIPA-CPs in an already existing project, the present AG_SEND/ AG_LSEND/AG_FSEND res. AG_RECV/AG_LRECV/AG_FRECV may be replaced by AG_SEND res. AG_RECV from VIPA without adjustment. Due to the fact that the CP automatically adjusts itself to the length of the data to transfer, the L and F variants of SEND res. RECV are not required for VIPA CPs.

Communication blocks

For the communication between CPU and CP, the following FCs are available:

AG_SEND (FC5)

This block transfers the user data from the data area given in *SEND* to the CP specified via *ID* and *LADDR*. As data area you may set a PA, bit memory or data block area. When the data area has been transferred without errors, "order ready without error” is returned.

AG_RECV (FC6)

The block transfers the user data from the CP into a data area defined via *RECV*. As data area you may set a PA, bit memory or data block area. When the data area has been transferred without errors, "order ready without error” is returned.

Status displays

The CP processes send and receive commands independently from the CPU cycle and needs for this transfer time. The interface with the FC blocks to the user application is here synchronized by means of acknowledgements/receipts.

For status evaluation the communication blocks return parameters that may be evaluated directly in the user application.

These status displays are updated at every block call.

Deployment at high communication load

Do not use cyclic calls of the communication blocks in OB1. This causes a permanent communication between CPU and CP. Program instead the communication blocks within a time OB where the cycle time is higher res. event controlled.

FC call is faster than CP transfer time

If a block is called a second time in the user application before the data of the last time is already completely send res. received, the FC block interface reacts like this:

AG_SEND

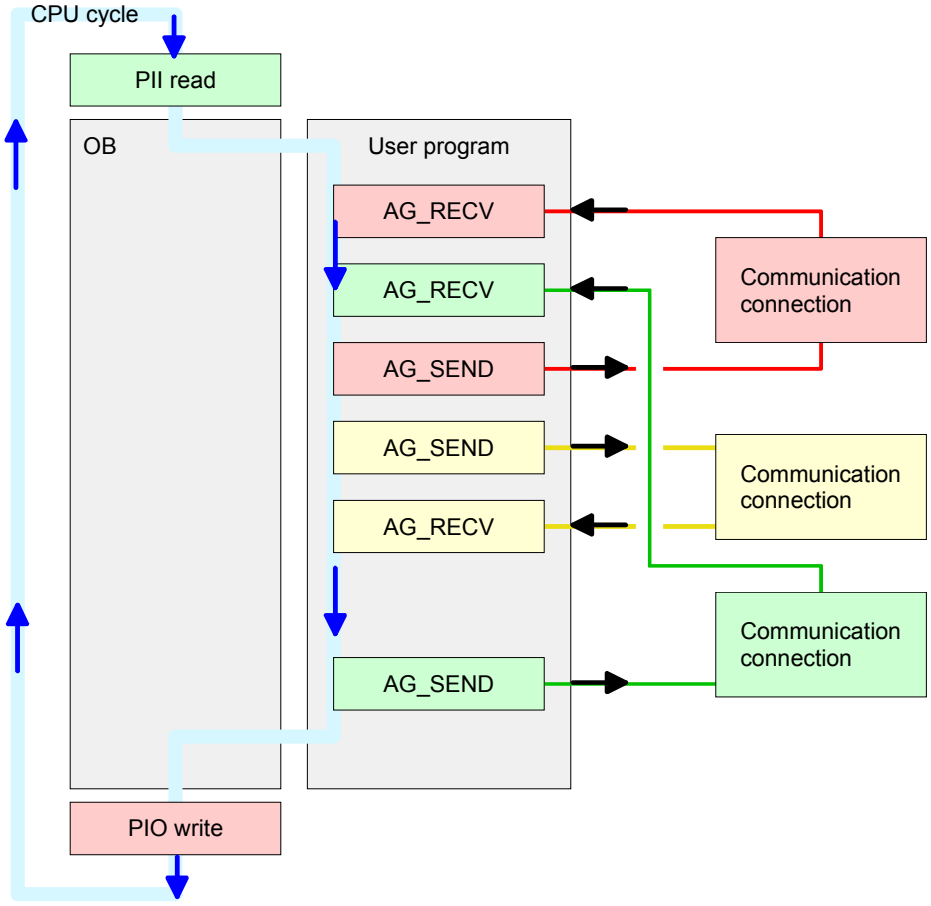
No command is accepted until the data transfer has been acknowledged from the partner via the connection. Until this you receive the message "Order running" before the CP is able to receive a new command for this connection.

AG_RECV

The order is acknowledged with the message "No data available yet" as long as the CP has not received the receive data completely.

AG_SEND, AG_RECV in the user application

The following illustration shows a possible sequence for the FC blocks together with the organizations and program blocks in the CPU cycle:



The FC blocks with concerning communication connection are summed up by color. Here you may also see that your user application may consist of any number of blocks. This allows you to send or receive data (with AG_SEND res. AG_RECV) event or program driven at any wanted point within the CPU cycle.

You may also call the blocks for **one** communication connection several times within one cycle.

AG_SEND (FC5) By means of AG_SEND the data to send are transferred to the CP.

Parameter

Parameter	Declaration	Type	Description
ACT	Input	BOOL	Activation of the sender 0: Updates DONE, ERROR and STATUS 1: The data area defined in SEND with the length LEN is send
ID	Input	INT	Connection number 1 ... 16 (identical with ID of NetPro)
LADDR	Input	WORD	Logical basic address of the CP (identical with LADDR of NetPro)
SEND	Input	ANY	Data area
LEN	Input	INT	Number of bytes from data area to transfer
DONE	Output	BOOL	Status parameter for the order 0: Order running 1: Order ready without error
ERROR	Output	BOOL	Error message 0: Order running (at DONE = 0) 0: Order ready without error (at DONE = 1) 1: Order ready with error
STATUS	Output	WORD	Status message returned with DONE and ERROR. More details are to be found in the following table.

AG_RECV (FC6) By means of AG_RECV the data received from the CP are transferred to the CPU.

Parameter

Parameter	Declaration	Type	Description
ID	Input	INT	Connection number 1 ... 16 (identical with ID of NetPro)
LADDR	Input	WORD	Logical basic address of the CP (identical with LADDR of NetPro)
RECV	Input	ANY	Data area for the received data
NDR	Output	BOOL	Status parameter for the order 0: Order running 1: Order ready data received without error
ERROR	Output	BOOL	Error message 0: Order running (at NDR = 0) 0: Order ready without error (at NDR = 1) 1: Order ready with error
STATUS	Output	WORD	Status message returned with NDR and ERROR. More details are to be found in the following table.
LEN	Output	INT	Number of bytes that have been received

DONE, ERROR, STATUS

The following table shows all messages that can be returned by the CP after a SEND res. RECV command.

A "-" means that this message is not available for the concerning SEND res. RECV command.

DONE (SEND)	NDR (RECV)	ERROR	STATUS	Description
1	-	0	0000h	Order ready without error
-	1	0	0000h	New data received without error
0	-	0	0000h	No order present
-	0	0	8180h	No data available yet
0	0	0	8181h	Order running
0	0	1	8183h	No CP project engineering for this order
0	-	1	8184h	System error
-	0	1	8184h	System error (destination data area failure)
0	-	1	8185h	Parameter LEN exceeds source area SEND
	0	1	8185h	Destination buffer (RECV) too small
0	0	1	8186h	Parameter ID invalid (not within 1 ...16)
0	-	1	8302h	No receive resources at destination station, receive station is not able to process received data fast enough res. has no receive resources reserved.
0	-	1	8304h	The connection is not established. The send command shouldn't be send again before a delay time of >100ms.
-	0	1	8304h	The connection is not established. The receive command shouldn't be send again after a delay time of >100ms.
0	-	1	8311h	Destination station not available under the defined Ethernet address.
0	-	1	8312h	Ethernet error in the CP
0		1	8F22h	Source area invalid, e.g. when area in DB not present Parameter LEN < 0
-	0	1	8F23h	Source area invalid, e.g. when area in DB not present Parameter LEN < 0
0	-	1	8F24h	Range error at reading a parameter.
-	0	1	8F25h	Range error at writing a parameter.
0	-	1	8F28h	Orientation error at reading a parameter.
-	0	1	8F29h	Orientation error at writing a parameter.
-	0	1	8F30h	Parameter is within write protected 1st recent data block
-	0	1	8F31h	Parameter is within write protected 2nd recent data block
0	0	1	8F32h	Parameter contains oversized DB number.
0	0	1	8F33h	DB number error
0	0	1	8F3Ah	Area not loaded (DB)

continued...

... continue DONE, ERROR, STATUS

DONE (SEND)	NDR (RECV)	ERROR	STATUS	Description
0	-	1	8F42h	Acknowledgement delay at reading a parameter from peripheral area.
-	0	1	8F43h	Acknowledgement delay at writing a parameter from peripheral area.
0	-	1	8F44h	Address of the parameter to read locked in access track
-	0	1	8F45h	Address of the parameter to write locked in access track
0	0	1	8F7Fh	Internal error e.g. invalid ANY reference e.g. parameter LEN = 0 .
0	0	1	8090h	Module with this module start address not present or CPU in STOP.
0	0	1	8091h	Module start address not within double word grid.
0	0	1	8092h	ANY reference contains type setting unequal BYTE.
-	0	1	80A0h	Negative acknowledgement at reading the module
0	0	1	80A4h	reserved
0	0	1	80B0h	Module doesn't recognize record set.
0	0	1	80B1h	The length setting (in parameter LEN) is invalid.
0	0	1	80B2h	reserved
0	0	1	80C0h	Record set not readable.
0	0	1	80C1h	The set record set is still in process.
0	0	1	80C2h	Order accumulation.
0	0	1	80C3h	The operating sources (memory) of the CPU are temporarily occupied.
0	0	1	80C4h	Communication error (occurs temporarily; a repetition in the user application is reasonable.)
0	0	1	80D2h	Module start address is wrong.

Status parameter at reboot

At a reboot of the CP, the output parameter are set back as follows:

- DONE = 0
- NDR = 0
- ERROR = 8180h (at AG_RECV)
  ERROR = 8181h (at AG_SEND)

Project transfer

Overview

There are 3 possibilities to transfer your project into the CPU:

- Transfer via MPI
- Transfer via MMC by using a card reader
- Transfer via integrated Ethernet-PG/OP channel

Note!

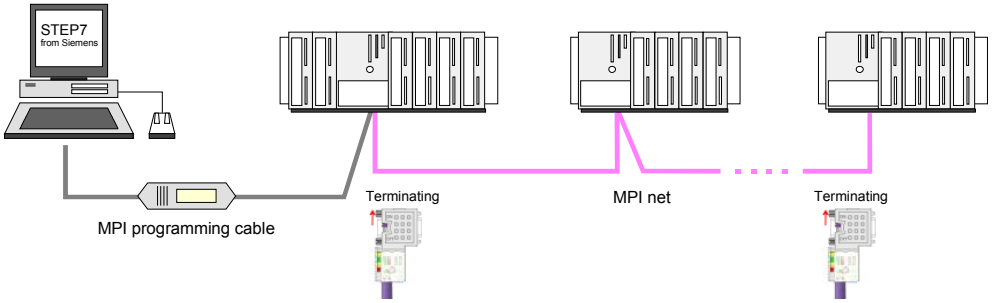
The following text contains a short description of the transfer methods. A more detailed information is to be found under "Employment CPU 31xS" in the chapter "Project transfer".

Transfer via MPI

Transfer with MPI programming cable (MPI communication)

The MPI programming cables from VIPA provide a bus enabled RS485 plug for the MP²I jack of the CPU and a RS232 res. USB plug for the PC. Per default your CPU has the MPI address 2.

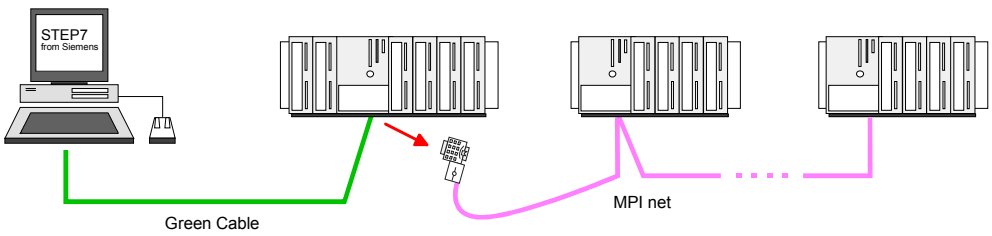
- Choose **Options** > *Set PG/PC interface* in the menu,
- adjust *MPI transfer parameter* and *address*
- Set the PC-COM port and the transfer rate 38400Baud under *Local port*.



Transfer via Green Cable (serial communication)

Via exclusively direct plugging of the Green Cable to a MP²I jack you may establish a serial connection between PC and CPU.

- Set the PC-COM port and the transfer rate 38400Baud under *Local port*. The settings of the register *MPI* are ignored at employment of the Green Cable.



Transfer via MMC

The MMC (**Mem**ory **C**ard) serves as external storage medium and has the FAT16 file system.

Your project engineering must be stored in the root directory and requires the file name: **S7PROG.WLD.**

With an OVERALL_RESET the MMC is automatically read (if plugged).

Transfer via Ethernet-PG/OP channel

Every CPU 31xS contains an integrated Ethernet-PG/OP channel.

The PG/OP access requires a hardware project engineering (Minimum project) in the CPU where IP address and subnet mask are defined via a virtual CP.

This project is transferred per MMC or MPI into the CPU. After an overall reset you may access the PG/OP channel via the destination system functions. A maximum of 2 PG/OP connections is supported.

Approach

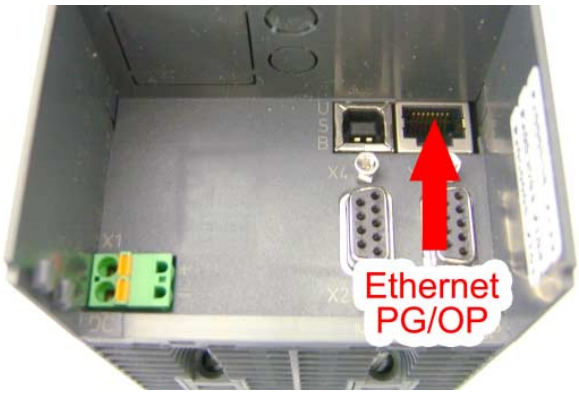
- Configure a CPU 318-2 with the order no. 6ES7 318-2AJ00-0AB0 V3.0 in the hardware configurator.
- Include the CP 343-1 (343-1EX11) at slot 4 res. after the really plugged modules.
- Set the wanted IP address and subnet mask in the according dialog window and connect the CP with "Ethernet".
- Transfer your project to your CPU via MPI or MMC.

Access to the Ethernet-PG/OP channel

Connect your project engineering-PC and your CPU via the Ethernet-PG/OP jack. Adjust the following settings in the SIMATIC Manager under **Options** > *PG/PC interface*...:

TCP/IP -> Network card...Protocol RFC 1006

Now you gain access to the CP via the destination system functions.



Ethernet-PG/OP channel and website

Overview

Every CPU 31xS has an integrated Ethernet-PG/OP channel. This channel allows you to program and remote control your CPU with up to 2 connections.

The PG/OP channel also gives you access to the internal website that contains information about firmware version, connected periphery, current cycle times etc.

The PG/OP access requires that the CPU contains a hardware project engineering (minimal project) where IP address and subnet mask for the CP are defined.

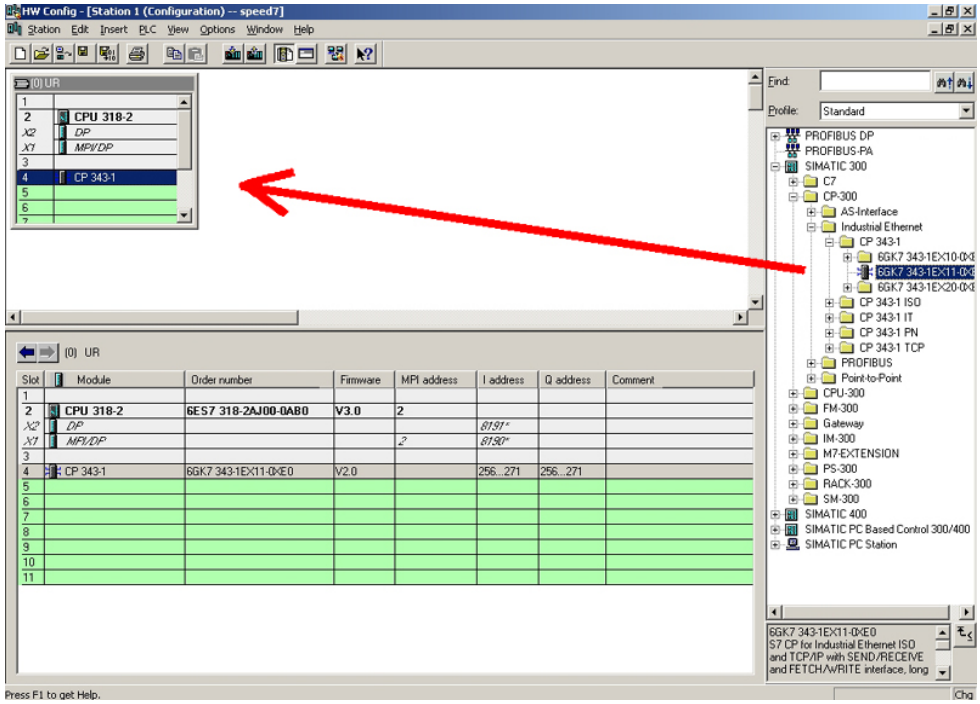
Requirements

For the hardware configuration the following software is necessary:

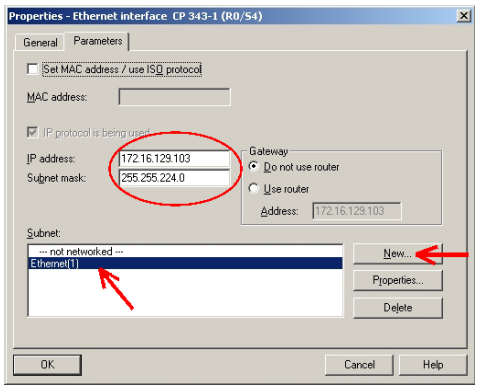
- SIMATIC Manager from Siemens V. 5.1 or higher
- SIMATIC NET

Approach

- Start the SIMATIC Manager from Siemens and create a new project.
- Add a new System 300 station via **Insert** > *Station* > *SIMATIC 300 Station*.
- Activate the station "SIMATIC 300" and open the hardware configurator by clicking on "Hardware".
- Engineer a rack (SIMATIC 300 \ Rack-300 \ Profile rail)
- For the SPEED7-CPUs are configured as CPU 318-2, choose the CPU 318-2 with the order no. 6ES7 318-2AJ00-0AB0 V3.0 from the hardware catalog. You'll find this under SIMATIC 300 \ CPU 300 \ CPU 318-2.
- Include below the really plugged modules otherwise at slot 4 the CP 343-1EX11 (SIMATIC 300 \ CP 300 \ Industrial Ethernet \ CP 343-1).



- Type the wanted IP address and subnet mask into the dialog window and connect the CP with "Ethernet"



- Save and compile your project.
- Transfer your project via MPI or MMC into your CPU.

Transfer project

Now you have 2 possibilities to transfer your project into the CPU:

- Transfer via MPI
- Transfer via MMC by using a card reader

Transfer via MPI and Green Cable

- Change to the SIMATIC Manager from Siemens.
- Choose **Options** > *Set PG/PC interface*

  → A dialog window opens where you may configure the MPI interface you want to use.
- Choose the "PC Adapter (MPI)" from the selection list; where appropriate you have to add this first. Click on [Properties].
- Select the wanted COM port in the register "Local Port" and set the transfer rate 38400Baud.
- Connect your PC via the MP^{2}I jack with your CPU and transfer your project.

Transfer via MMC

As external storage medium a MMC (**Mem**ory **C**ard) is employed. The MMC is available at VIPA preformatted with the FAT16 PC file system.

- Create a new wld-file via **File** > *Memory Card file* > *New* and use the mouse to drag the system data case into the window of the wld-file.
- Copy the wld-file with the help of a card reader to the MMC and rename the file to S7PROG.WLD.
- Insert the MMC in your CPU and execute an overall reset. This causes a transfer of the data from the MMC into the battery-buffered RAM of the CPU.

Note!

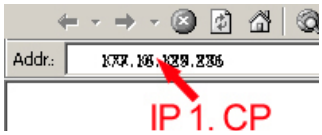
More information about transfer methods is to be found in the chapter "Project transfer".

Access to the PG/OP channel

Connect your project engineering-PC and your CPU via the Ethernet-PG/OP socket. Adjust the following settings in the SIMATIC Manager under **Options** > *PG/PC interface*...: TCP/IP -> network card...Protocol RFC 1006

Now you can access the PG/OP channel via your project.

Website



The PG/OP channel provides a website that you may access via an internet browser. The access takes place via the IP address of the CP 343-1EX11 that has to be present as hardware project engineering in the CPU like mentioned above. The website only serves for information output. The monitored values are not alterable.

Order no. of the CPU

VIPA 317-2AJ10

CPU:
Name, Firmware-Vers, Hardware-Vers., Package and information for support purposes
Ethernet-PG/OP: IP-Addr. and subnet mask

CPU with Ethernet-PG/OP V1.0.5 , Px000006.pkg, PRODUCT V1050, HARDWARE V0112, Bx000152 V3620, Ax000055 V1030, Ax000056 V0016
IP-Address : 172.16.129.236, Subnet mask : 255.255.224.0 ,

CPU state info
CPU cycle time:
min= minimum
cur= current
max= maximum

FlashFileSystem : V012
Cpu state : Run
Cycle time [microseconds] : min=546 cur=1880 ave=597 max=5011

Additional CPU components:
Slot201 (DP master)
Name, Firmware-Version, Package and information for support purposes
Slot202 (CP 343 or I/O*)
Name, Firmware-Version, Package and information for support purposes

CPU internal
Slot 201
VIPA 342-1DA70 V1.0.3 Px000003.pkg, PRODUCT V1030, BB000154 V4110, AB000051 V3020, AB000049 V30599,
ModuleType CB2C0010
Cycletime [microseconds] : min=65535000 cur=0 ave=0 max=0
Slot 202
VIPA 314-6CF01 PRF V1.0.0 Px000014.pkg, BB000156 V0024, AB000062 V0021, PRODUCT V1000,
ModuleType 8400000

Modules at SPEEDbus:
Slot-No, Name, Firmware-Vers, Package and information for support purposes

SPEEDbus
Slot 101
VIPA 342-1CA70 V1.0.7 Px000015.pkg, PRODUCT V1070, BB000132 V1070, AB000051 V3020, AB000049 V3050,
ModuleType 4CC00020
Cycletime [microseconds] : min=0 cur=0 ave=0 max=0

Modules at Standard bus:
Slot-No, Module type-Code and description

Standard-Bus
Slot 4 : ModuleType AFD8 : Digital Output32
Slot 5 : ModuleType 15C5 : Analog Input 8
Slot 6 : ModuleType 9FC3 : Digital Input32
Slot 7 : ModuleType 9FC3 : Digital Input32

*) At CPU 31xST with digital and analog I/Os

NCM diagnostic – Help for error diagnostic

Check list for error search

This page shall help you with the error diagnostic. The following page lists a number of typical problems and their probable causes:

Question	Solution with "no"
CPU in Run?	Control DC 24V voltage supply. Set RUN/STOP lever in position RUN. Check PLC program and transfer it again.
AG_SEND, AG_RECV in user application?	These 2 blocks are required in the user application for the data transfer between CP and CPU. Both blocks must also be called with a passive connection.
Is CP able to connect?	Check Ethernet cable (at a point-to-point connection a crossed Ethernet cable is to be used). Check IP address.
Can data be transferred?	Check Port no. for read and write. Check source and destination areas. Check if the 2nd CP is selected in the route. Enlarge the receive res. send buffer defined via the ANY pointer
Is the complete data block send at ISO-on-TCP?	Check the LEN parameter at AG_SEND. Set the receive res. send buffer defined via the ANY pointer to the required size.

Siemens NCM S7 diagnostic

The CP supports the Siemens NCM diagnostic tool. The NCM diagnostic tool is part of the Siemens SIMATIC Manager. This tool delivers information about the operating state of the communication functions of the online CPs dynamically.

The following diagnostic functions are available:

- Check operating state at Ethernet
- Read the diagnostic buffer of the CP
- Diagnostic of connections

The following pages contain a short description of the NCM diagnostic. More details about the function range and for the deployment of the Siemens NCM diagnostic tool is to be found in the according online help res. the manual from Siemens.

Start NCM diagnostic

There are two options to start the diagnostic tool:

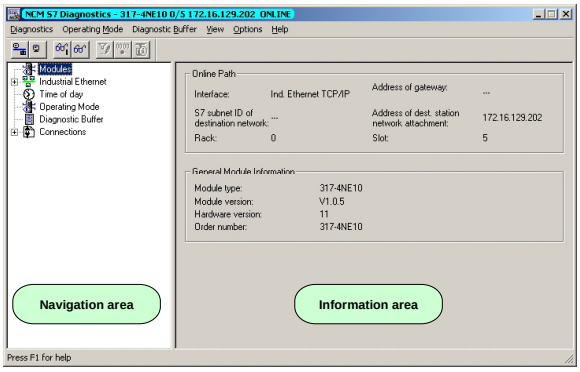
- Via *Windows-START menu > SIMATIC ... NCM S7 > Diagnostic*
- Within the project engineering res. the hardware configuration via the register "Diagnostic" in the "Property" dialog with [Execute].

Structure

The working surface of the diagnostic tool has the following structure:

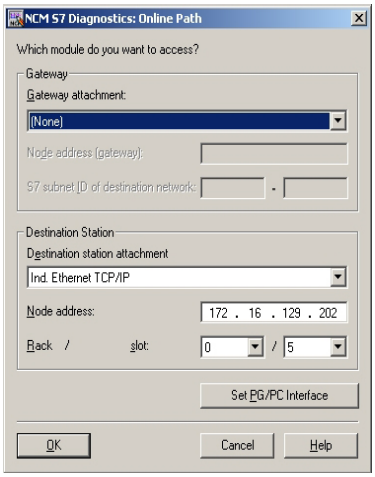
The *navigation area* at the left side contains the hierarchical listed diagnostic objects. Depending on CP type and configured connections there is an adjusted object structure in the navigation area.

The *information area* at the right side always shows the result of the navigation function you chose in the *navigation area*.



No diagnostic without connection

A diagnostic always requires a online connection to the CP you want to control. For this click on at the symbol bar. The following dialog window appears:



Set the following parameters under *destination station*:

Connection...: Ind. Ethernet TCP/IP

Station addr.: Enter the IP address of the CP

Module rack/slot:

Enter the *module rack* and *slot* of the CP 343 that you've placed at the 2nd slot.

Set your PG/PC interface to TCP/IP...RFC1006. Via [OK] you start the online diagnostic.

Read diagnostic buffer

The CP has a diagnostic buffer. This has the architecture of a ring memory and may store up to 100 diagnostic messages. The NCM diagnostic allows you to monitor and evaluate the CP diagnostic messages via the diagnostic object *Diagnostic buffer*.

Via a double click on a diagnostic message the NCM diagnostic shows further information.

Approach for diagnostic

You execute a diagnostic by clicking on a diagnostic object in the navigation area. More functions are available via the menu and the symbol bar.

Note!

Please always control the preconditions for an operative communication using the check at the beginning of this chapter.

For the aimed diagnostic deployment the following approach is convenient:

- Start diagnostic.
- Open the dialog for the online connection with , enter connection parameters and establish the online connection with [OK].
- Identify the CP and check the recent state of the CP via module status.
- Check the connections for particularities like:
  - Connection status
  - Receive status
  - Send status
- Control and evaluate the diagnostic buffer of the CP via *diagnostic buffer*.
- As needed, alter project engineering res. programming and restart diagnostic.

Coupling to other systems

Outline

The operating mode FETCH/WRITE supported at TCP res. ISO-on-TCP can be used for accesses of partner devices to the PLC system memory. To be able to use this access also for example for implementation in PC applications you have to know the telegram structure for orders. The specific headers for request and acknowledgement telegrams have per default a length of 16Byte and are described at the following pages.

ORG format

The organization format is the abbreviated description of a data source or a data destination in a PLC environment. The available ORG formats are listed in the following table.

The ERW-identifier is used for the addressing of data blocks. In this case the data block number is entered into this identifier. The start address and quantity provide the address for the memory area and they are stored in HIGH-/LOW- format (Motorola-formatted addresses)

Description	Type	Range
ORG identifier	BYTE	1..x
ERW identifier	BYTE	1..255
Start address	HILOWORD	0..y
Length	HILOWORD	1..z

The following table contains a list of available ORG-formats. The "length" must not be entered as -1 (FFFFh).

ORG identifier 01h-04h

CPU area	DB	MB	EB	AB
ORG identifier	01h	02h	03h	04h
Description	Source/destination data from/into data Block in main memory.	Source/destination data from/into flag memory area	Source/destination data from/into process image of the inputs (PII).	Source/destination data from/into process image of the outputs (PIO).
ERW identifier (DBNO)	DB, from where the source data is retrieved or to where the destination data is transferred.	irrelevant	irrelevant	irrelevant
Start address significance	DBB-No., from where the data is retrieved or where the data is saved.	MB-No., from where the data is retrieved or where the data is saved.	IB-No., from where the data is retrieved or where the data is saved.	QB-No., from where the data is retrieved or where the data is saved.
Length significance	Length of the source/destination data block in words	Length of the source/destination data block in bytes	Length of the source/destination data block in bytes	Length of the source/destination data block in bytes

Note!

Information about the valid range can be found at Chapter "Hardware description of the CPU".

ORG identifier 05h-0Ah

CPU area	PB	ZB	TB
ORG identifier	05h	06h	07h
Description	source/destination data from/into peripheral modules. Input module for source data, output module for destination data.	source/destination data from/into counter cells.	Source/destination data from/into timer cells.
ERW identifier (DBNO)	irrelevant	irrelevant	irrelevant
Start address Significance	PB-No., from where the data can be retrieved or where it is saved.	ZB-No., from where the data can be retrieved or where it is saved.	TB-No., from where the data can be retrieved or where it is saved.
Length Significance	Length of the source/destination data block in bytes.	Length of the source/destination data block in words (counter cell = 1 word).	Length of the source/destination data block in words (counter cell = 1 word).

Transfer of blocks with numbers >255

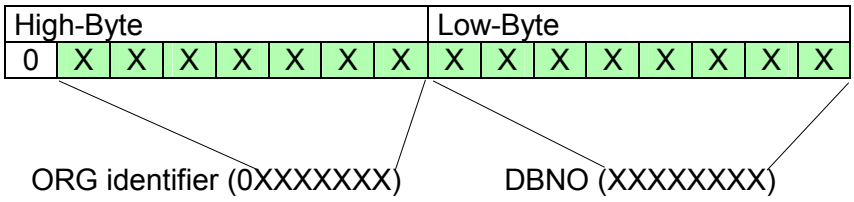
ORG identifier 81h-FFh

To transfer data blocks of the number range 256 ... 32768 you may use the ORG identifier 81h-FFh.

For the setting of a DB No. >255 needs a length of one word, the $DBNO_{new}$ is assembled from the content of the ORG identifier and the DBNO.

$DBNO_{new}$ is created as word as follows:

$DBNO_{new}$



If the highest bit of the ORG identifier is set, the Low-Byte of $DBNO_{new}$ is defined via DBNO and the High-Byte of $DBNO_{new}$ via ORG identifier, where the highest bit of the ORG identifier is eliminated.

The following formula illustrates this:

$DBNO_{new}$ =256 x (ORG-identifier AND 7Fh) + DBNO

Structure of PLC-Header

For every READ and WRITE the CP generates PLC header for request and acknowledgment messages. Normally the length of these headers is 16Bytes and have the following structure:

WRITE

Request telegram Remote Station

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=03h**	(Byte)
ORG block	=03h	(Byte)
Length ORG block	=08h	(Byte)
*ORG identifier**		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Empty block	=FFh	(Byte)
Length empty block	=02h	(Byte)
Data up to 64kByte (only if error no.=0)		

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=04h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ack. block	=03h	(Byte)
Error no.		(Byte)
Empty block	=FFh	(Byte)
Length empty block	=07h	(Byte)
5 empty bytes attached		

FETCH

Request telegram Remote Station

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=05h**	(Byte)
ORG block	=03h	(Byte)
Length ORG block	=08h	(Byte)
*ORG identifier**		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Empty block	=FFh	(Byte)
Length empty block	=02h	(Byte)

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=06h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ackn. block	=03h	(Byte)
Error no.		(Byte)
Empty block	=FFh	(Byte)
Length empty block	=07h	(Byte)
5 empty bytes attached		
Data up to 64kByte (only if error no.=0)		

*) More details to the data area is to be found under "ORG-Format" above.

Note!

Please regard that in opposite to Siemens-S5 systems, the block addressing of these CPUs takes the start address as byte number and the length as number of words.

Messages of error no.

The following messages can be returned via *error no.*:

Error no.	Message
00h	No error occurred
01h	The defined area cannot be read res. written

Intelligent Process Communication (IPK)

Overview

At the IPK (**i**ntelligent **p**rocess **c**ommunication), also called spontaneous operation, data is transferred once on request from the CP to the host. Afterwards only that data is send that has been changed since the last transfer in consideration of a hysteresis. This acyclic transfer method is much faster and causes a lot less net load than the cyclic transfer. This also allows the data survey of several hundreds of PLC systems via TCP/IP. IPK is only available with the order type FETCH-PASSIVE and is supported by other visualization systems.

Project engineering under NetPro

As soon as you configure an **unspecified TCP connection with FETCH-PASSIVE order** in NetPro, this is recognized within the CP as IPK connection and handled accordingly. *Unspecified* means that you do not define a partner IP address and no partner port.

Via this connection up to 8 clients can access one CP with SEND res. RECEIVE.

Unspecified FETCH-PASSIVE order

- Start NetPro from Siemens
- Connect your station with the according network by dragging the CP with the mouse to the network you want to assign.
- Open the connection list by choosing the according CPU and selecting *Insert new connection* in the context menu.
- Enter the following settings in the dialog window "Insert new connection":
  - *Connection partner:* unspecified
  - *Connection type:* TCP connection

  Confirm your entry with [OK]. → The dialog window "Properties TCP connection" appears.
- Please set the following parameters:
  General Information
  Active connection establishment: de-activate
  Route: For the SPEED7-CPUs choose always 2nd CP.
  Addresses
  Partner-IP and *Partner-Port* remain unspecified.
  Options
  O*peration mode:* FETCH PASSIVE
- After you've configured all connections you may "save and compile" your project and close NetPro.
- To store the CP project engineering data in the system data, you have to activate the option "Save configuration data on the CPU" (default setting) at *object properties* area *Options* in the hardware configuration of the CP.
- Transfer the system data into the CPU together with the PLC program.

Telegram course

In the following, all telegrams of an IPK communication are listed.

IPK request to CP

Request: IPK request with OP code 13h and data range definition

Receipt: IPK response with OP code 18h and data range definition, receipt counter (Count) and if error no.=00h data.

Request telegram Remote Station

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=13h**	(Byte)
ORG-Block	=03h	(Byte)
Length ORG-Block	=08h	(Byte)
*ORG identifier **		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Number of data definition blocks (no blocks=FF02h)		(Word)
A data definition block consists of 10Byte, max. 200 data definition blocks may be attached (please adjust number)		

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=18h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ackn. block	=03h	(Byte)
Error no.		(Byte)
*ORG identifier**		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Count	=00h	(Byte)
Data up to 64kByte only if error no.=00h		

Data definition block (10Byte)

Data type	(Word)
Hysteresis value (-)	(Double Word)
Hysteresis value (+)	(Double Word)

Data type (length return value always 4byte)

01h: BYTE	02h: WORD	03h:DWORD
04h: KG	05h: CHAR	06h:SHORT
07h: LONG	08h: FLOAT	

Hysteresis value

By setting of FFFFh you may de-activate the hysteresis, i.e. at every value change a data block is send. At activated hysteresis the CP only sends a data block when the value change exceeds the defined hysteresis value in positive or negative direction.

Altered IPK data from CP

Receipt: IPK response with OP code 18h, data range definition, receipt counter (Count) and if error no.=00h data.

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=18h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ackn. block	=03h	(Byte)
Error no.		(Byte)
*ORG-ID**		*(Byte)*
ERW-ID		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Count		(Byte)
Data up to 64kByte only if error no.=0)		

Data acknowledgement telegram

If you don't define a data definition block, the structure of the data attached to the acknowledgement telegram corresponds the structure of the data block defined in the request telegram.

At attached data definition block, the position within the data definition block and the number of bytes that are occupied due to the data type serve for the localization of the according entries.

*) More details to the data range is to be found under "Communication to other systems ".

Stop a certain IPK order in the CP

Request: Stop order with OP code 14h and data range definition

Receipt: IPK response with OP code 16h, receipt counter (Count) and data range definition

Request telegram Remote Station

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=14h**	(Byte)
ORG-Block	=03h	(Byte)
Length ORG-Block	=08h	(Byte)
*ORG identifier **		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Empty block	=FFh	(Byte)
Length empty block	=02h	(Byte)

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=16h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ackn. block	=03h	(Byte)
Error no.		(Byte)
*ORG identification **		*(Byte)*
ERW identification		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Count		(Byte)

*) More details to the data range is to be found under "Communication to other systems ".

Stop all IPK orders in the CP

Request: Stop all orders with OP code 15h

Receipt: IPK response with OP code 17h

Request telegram Remote Station

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=15h**	(Byte)
ORG-Block	=03h	(Byte)
Length ORG-Block	=08h	(Byte)
ORG identifier	*=00h*	*(Byte)*
ERW identifier	*=00h*	*(Byte)*
Start address	*=0000h*	*(Word)*
Length	*=0000h*	*(Word)*
Empty block	=FFh	(Byte)
Length empty block	=02h	(Byte)

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length.Header	=10h	(Byte)
ID.OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=17h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ackn. block	=03h	(Byte)
Error no.		(Byte)
ORG identification	=00h	(Byte)
ERW identification	=00h	(Byte)
Start address	=0000h	(Word)
Length	=0000h	(Word)
Count		(Byte)

Note!

Please regard that in opposite to Siemens-S5 systems, here the block addressing of the CPUs takes the start address as byte number.

Messages of error no.

The following messages can be returned via *error no.*:

Error no.	Message
00h	No error occurred
01h	The defined area cannot be read res. written
0Fh	The IPK list is full, too many data definition blocks (max. 200)

Example communication CPU 31xSN/NET - CPU 31xSN/NET

Overview

This chapter provides an introduction to use the TCP/IP bus system for the System 300S. The object of this chapter is to create a small communication system between two VIPA CPUs 31xSN/NET that provides a simple approach to the control of the communication processes.

Preconditions

Knowledge of the VIPA CP handling blocks AG_SEND and AG_RECV is required. CP handling blocks provide the options required to utilize the communication functions in the programs of the PLCs.

The minimum technical equipment required for the example is as follows:

Hardware

- 2 CPUs 31xSN/NET from VIPA
- 1 PC or PG with Twisted Pair Ethernet connection

Communication line

- 3 bus cables
- 1 Swich/Hub

Addresses

- 4 IP Addresses and subnet masks for each 2 CPs

Software package

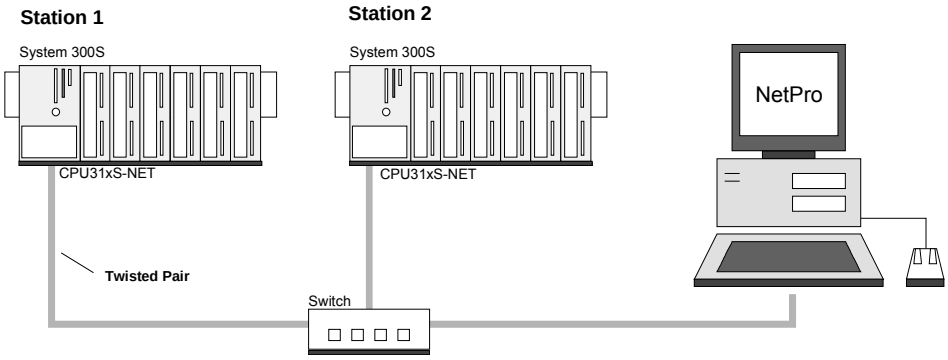
- SIMATIC Manager from Siemens V. 5.1 or higher
- SIMATIC NET

The implementation of the example requires that the two CPUs be programmed as well as the configuration of the CPs by means of NetPro from Siemens.

Note!

The complete example is to e found as zip at ftp.vipa.de/support/demofiles. You may transfer the PLC program directly to both CPUs.

Structure



Station tasks

The example for the application is based upon a communication task that is described in detail in the following passage:

Both of the CPUs contain the same PLC program, only the configuration of the CPs have to be adjusted.

Both stations are sending and receiving 16 data words per second.

- Data block DB11 transfers the data bytes DBB 0 to DBB 32 at an interval of 1s. Data byte DBB 0 in DB 11 is used as message counter. It is only incremented if the preceding transmit command was processed correctly (completed without error). The remaining data words (DBB 2 to DBB 32) can be used for the transfer of user data.
- The receiving station stores the data in DB12 (DBB 0 to DBB 31).
- Using NetPro an active SEND/RECEIVE connection with ID 1 is to be configured for the 2nd CP. This Connection is established at station 2 as a passive SEND/RECEIVE connection.
- The source and destination parameters must be configured directly.

At this point the purpose and the required settings have been outlined. The programs provide additional details of the configuration of the handler blocks. A detailed description follows.

Steps of project engineering

The project engineering is divided into the following steps:

- Project engineering of the CPU
- Project engineering of the really plugged modules at the standard bus
- Project engineering Ethernet-PG/OP channel and CP 343
- Project engineering in NetPro
- PLC user application
- Transfer project

Project engineering of the CPU of Station 1

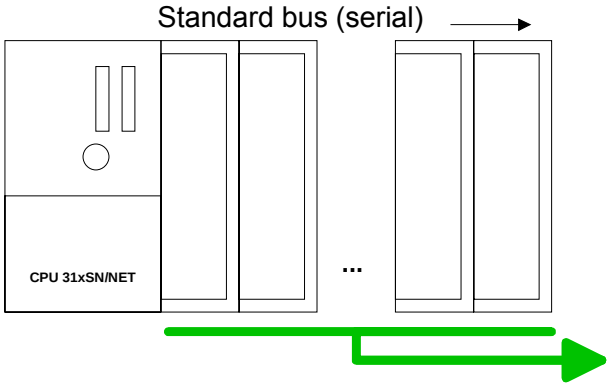
- Start the SIMATIC Manager with a new project
- Insert a "SIMATIC 300 Station" and rename it to "Station 1"
- Start the hardware configurator and add a profile rail from the hardware catalog.
- Place the following Siemens CPU at plug-in location 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0 V3.0)

Project engineering of the modules at the standard bus

The modules at the standard bus at the right side of the CPU are configured like this:

- Include your System 300V modules at the standard bus in the plugged sequence starting with plug-in location 4.
- Parameterize the CPU res. the modules if needed. The parameter window appears as soon as you double click on the according module.
- For bus extension you may use the IM 360 from Siemens where you may link-up up to 3 extension racks via the IM 361. Bus extensions may only be placed at plug-in location 3.

Project engineering of the modules at the standard bus



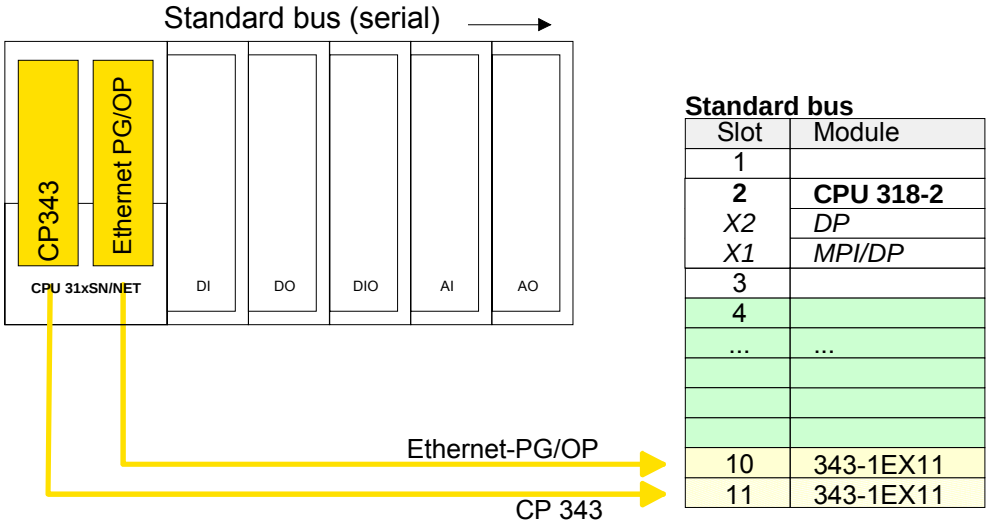
Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	
...	...
11	

Project engineering of the integrated CPs

For the internal Ethernet-PG/OP channel that is included in every SPEED7-CPU, you have to place as 1st module below the really plugged modules a Siemens CP 343-1 (343-1EX11).

The integrated CP 343 of the CPU 31xSN/NET is also configured as CP 343-1 but always below the CP 343-1 placed before. Type a valid IP address, subnet mask and if needed a gateway for the CPs and connect them via "Ethernet". Save and compile your project.



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	
...	...
10	343-1EX11
11	343-1EX11

Project engineering of the CPU of Station 2

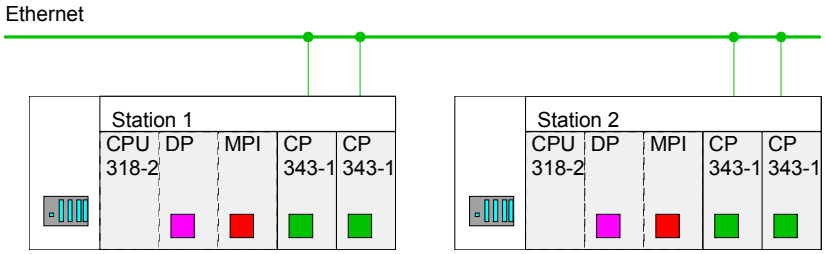
Create, following the approach above, a hardware configuration for the destination CPU and assign the name "Station 2".

For the CPs, use the IP addresses, subnet masks and gateways assigned to Station 2. Save and compile your project.

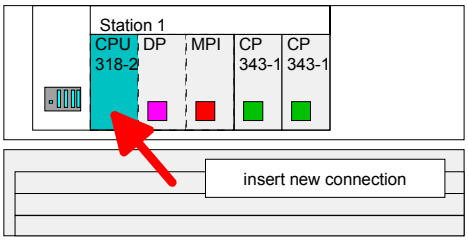
Project engineering with NetPro

Start NetPro by selecting the CPU under *Station 1* and clicking on the object "connections".

In NetPro "Station 1" and "Station 2" are listed together with Ethernet.



To configure the connection open the connection list. For this you choose the CPU of Station 1 and call *Insert new connection* via the context menu:



A dialog window appears where you can select the connection partner and the type of the connection.

Configure the following connection:

New connection

Connection: TCP connection

Connection partner: Station 2 > CPU 318-2

Properties TCP connection

ID: 1

ID and *LADDR* are parameters that you have to define in your PLC program if using FC5 (AG_SEND) and FC6 (AG_RECEIVE).

Route: The *Route* allows you to choose the CP that has to manage the connection.

As 1st CP the list always shows the integrated Ethernet-PG/OP channel which only supports PG/OP communication.

For the communication via the internal CP 343 you always have to use the 2nd CP of the route. E.g. when no local modules are plugged choose "CP 343-1 - (R0/S5)".

Active connection establishment: activated

Save and compile your connection.

PLC user program

For the processing of connection commands at the PLC, a PLC user program is necessary in the concerning CPU. For this only the handling blocks AG_SEND (FC5) and AG_RECV (FC6) are used. By including this blocks into the cycle block OB1 with the parameters *ID* and *LADDR* you may cyclically send and receive data.

The two FCs are part of the VIPA library that is included in the consignment of the CPU as CD.

OB 1 Cycle

Via the cycle OB OB1 the sending and receiving of the data is controlled. The OB1 that you may transfer into both CPUs has the following structure:

```
      UN    T      1              // Timer 1 triggered sending
      L     S5T#1S                // Send initiation every 1 sec
      SV    T      1
      S     M     10.0            // Init bit memory
      CALL  "AG_SEND"
      ACT   :=M10.0               // Init bit memory
      ID    :=1                   // Connection number
      LADDR :=W#16#110            // Module address
      SEND  :=P#DB11.DBX0.0 BYTE 100   // Send buffer area DB11
      LEN   :=32                  // send 32 Byte (16 Words) from DB11
      DONE  :=M10.1
      ERROR :=#Senderror          // Temporary error bit memory
      STATUS:=MW12                // Order res. connection state
      U     M     10.1            // Send ready?
      SPBN  nDon
      U     M     10.1            // Send ready?
      R     M     10.0            // Set back init
      U     #Senderror            // At send error
      SPB   nDon                  // Don't raise send counter
      L     DB11.DBW    0         // Send counter in user data (DBW0)
      L     1                     // increment for 1 and
      +I                          // store again in send buffer
      T     DB11.DBW    0

nDon: NOP   0                     // Send not ready yet

      // Cyclic call of the receive block

      CALL  "AG_RECV"
      ID    :=1                   // Connection number
      LADDR :=W#16#110            // Module address
      RECV  :=P#DB12.DBX100.0 BYTE 32  //Receive buffer
      NDR   :=#Newdata            // NewDataReceived?
      ERROR :=M0.1                // RecError
      STATUS:=MW2                 // Order res. connection state
      LEN   :=#Reclen             // Really received length
      NOP   0                     // Reclen can be at IsoOnTCP < 32
      U     #Newdata              // when new data received
      ZV    Z      1              // Increment Receive counter Counter1
      L     Z      1              // reset counter 1 at overflow
      L     999
      ==I
      R     Z      1
```

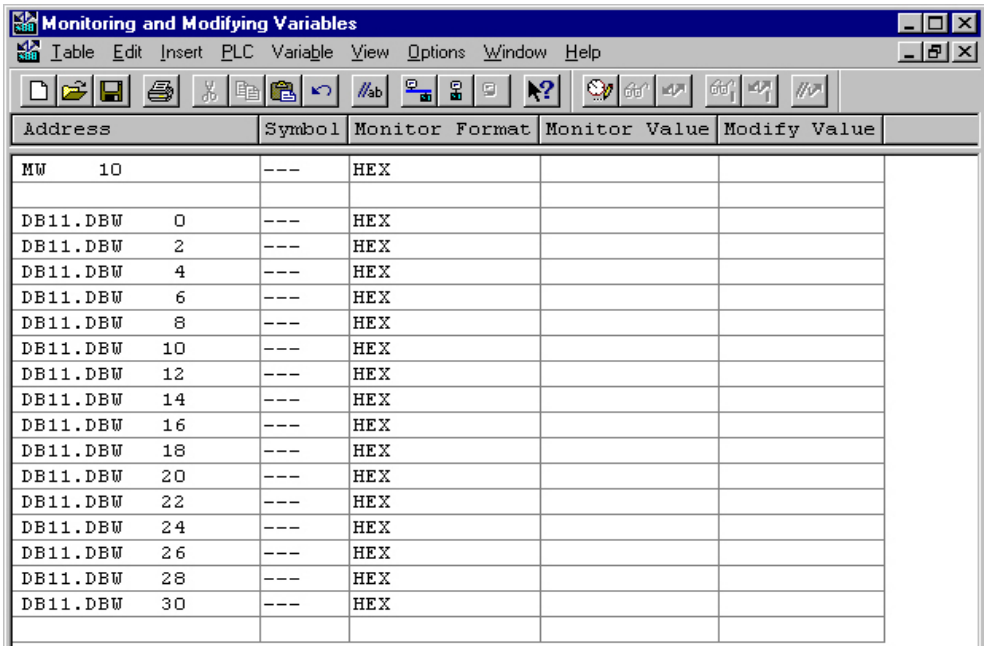
Monitoring the data transfer in the Siemens SIMATIC Manager

It is assumed, that the CPs are programmed and that an overall reset was issued to the CPUs, where the RUN/STOP switch must be located in STOP position.

Now load the above PLC programs into both CPUs and switch them into RUN.

Start the Siemens STEP®7 Manager and execute the following steps to monitor the transmit job:

- **PLC** > *Monitor/Modify Variables*
- In the column "Operand" you have to enter the respective data block number and the data word (DB11.DBB 0-31).
- Establish a connection and click "monitor" .



Entering User data

You may enter user data starting with DW1. Place the cursor on *modify value* and enter the value you wish to transfer, e.g. W#16#1111.

The button transfers the modify value in every cycle and the button initiates a single transfer.

Chapter 8 Communication modules - SPEEDbus

Outline

Content of this chapter is the construction and functionality of the fast communication modules for SPEEDbus from VIPA. The modules can only be used at a SPEEDbus slot at the left side of the CPU

The following description includes:

- System overview of the SPEEDbus Communication modules
- Properties
- Construction
- Circuit and schematic diagram
- Technical data

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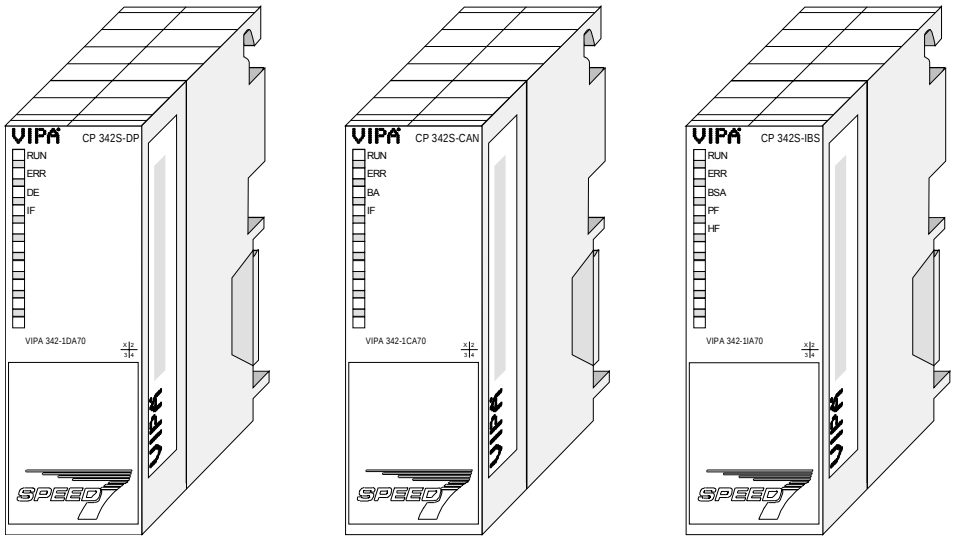
System overview

System 300S SPEEDbus modules

Here follows a summary of the communication modules that are currently available from VIPA, which can only be used at SPEEDbus.

SPEEDbus CPs

- CP 342S DP SPEEDbus Profibus DP master
- CP 342S CAN SPEEDbus CANopen master
- CP 342S IBS SPEEDbus Interbus master



Order data SPEEDbus CPs

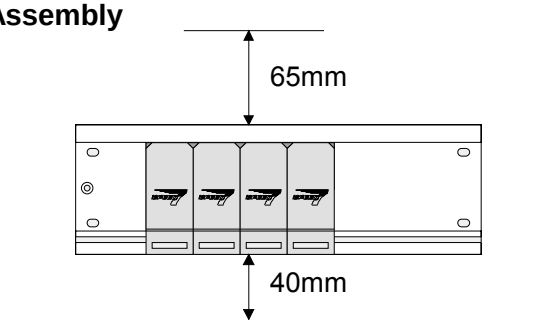
Type	Order No	Page
CP 342S DP - Profibus DP master	VIPA 342-1DA70	8-8
CP 342S CAN - CANopen master	VIPA 342-1CA70	8-19
CP 342S IBS - Interbus master	VIPA 342-1IA70	8-55

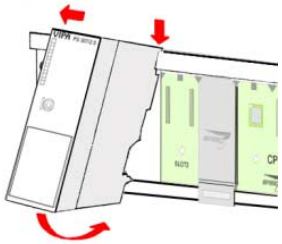
Assembly SPEEDbus

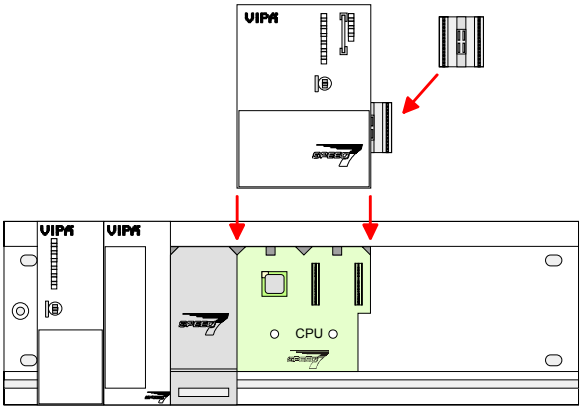
Pre-converted SPEEDbus profile rail

For the deployment of SPEEDbus modules a pre-converted SPEEDbus trailing socket is required. This is available ready mounted on a profile rail with 2, 6, 10 or 16 extension sockets.

Assembly







- At the assembly, please regard the permissible environment temperatures:
  - horizontal assembly: 0 to 60°C
  - vertical assembly: 0 to 40°C
- Install the profile rail so that at least 65mm space are left above and 40mm below.
- Take care for a low-impedance connection between profile rail and subsoil and connect the profile rail with the ground wire via the dowel pin (min. 10mm^2) .
- Mount the power supply left of the SPEEDbus.
- To install SPEEDbus modules you put them between the triangular positioning helps of a slot labeled with "SLOT ..." and push them downwards.
- Only "SLOT1 DCDC" allows to mount either a SPEEDbus module or another additional power supply.
- If also standard modules shall be plugged, take a bus connector and stick it like shown to the CPU from the backside. When operating the SPEED7-CPU exclusively at the SPEEDbus this is not required.
- Put the CPU like shown between the triangular positioning helps of the slot labeled with "CPU SPEED7" and push it downward.

More for installation an cabeling see "Assembly and installation guidelines".

Danger!

The power supplies must be released before installation and repair tasks!

Automatic Addressing at SPEEDbus

Overview

To provide specific addressing of the installed peripheral modules, certain addresses must be allocated in the CPU.

With no hardware configuration present, the CPU assigns automatically peripheral I/O addresses during boot procedure depending on the plug-in location amongst others also for plugged modules at the SPEEDbus.

Up to 32 modules in one row

In the hardware configurator from Siemens you may parameterize maximum up to 8 modules per row. At employment of SPEED7-CPUs you may control up to 32 modules at the standard bus and 16 further modules at the SPEEDbus. CPs and DP masters that are additionally virtual configured at the standard bus are taken into the sum of 32 modules at the standard bus.

For the project engineering of more than 8 modules you may use virtual line interface connections. For this you set in the hardware configurator the module IM 360 from the hardware catalog to slot 3 of your 1st profile rail. Now you may extend your system with up to 3 profile rails by starting each with a IM 361 from Siemens at slot 3.

Automatic addressing

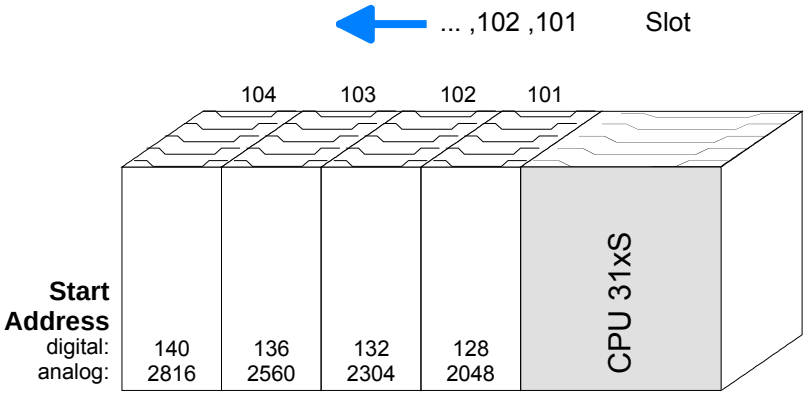
You may access the modules with read res. write accesses to the peripheral bytes or the process image.

At the automatic address allocation DIOs occupy depending on the slot location always 4byte and AIOs, FMs, CPs always 16byte at the standard bus and 256byte at the SPEEDbus.

Depending on the slot location the start address from where on the according module is stored in the address range is calculated with the following formulas:

DIOs: Start address = 4·(slot -101)+128

AIOs, FMs, CPs: Start address = 256·(slot -101)+2048



Alter address allocation by project engineering

To alter automatically assigned addresses you have to create a hardware configuration. Here you may alter addresses at any time via a virtual Profibus system by including the speedbus.gsd. For this, click on the properties of the according module and set the wanted address.

Firmware update

Overview

All CPUs starting with the firmware version 1.0.0 offer you the opportunity to execute a firmware update for SPEEDbus modules and CPU via MMC.

For this an accordingly prepared MMC must be in the CPU during the startup.

So a firmware files can be recognized and assigned with startup, a pkg file name is reserved for each updatable component, which begins with "px" and differs in a number with six digits.

As soon as with startup a pkg file is on the MMC and the firmware is more current than in the components, all the pkg file assigned components get the new firmware.

Latest Firmware at ftp.vipa.de

The latest 2 firmware versions are to find in the service area at www.vipa.de and at the ftp server under ftp.vipa.de.

Assignment component ↔ pkg file

The assignment between pkg file and component can be found in the following table.:

Component	Possible with Version	File name
CPU 315-2AG10	V. 1.0.0	px000002.pkg
CPU 314-6BF01	V. 1.0.0	px000007.pkg
CPU 314-6CF01	V. 1.0.0	px000008.pkg
CPU 317-2AJ10	V. 1.0.0	px000001.pkg
CPU 317-4NE10	V. 1.0.0	px000006.pkg
DP-Master	V. 1.0.0	px000003.pkg
CP 343	V. 1.0.0	px000005.pkg

Attention!

When installing a new firmware you have to be extremely careful. Under certain circumstances you may destroy the CPU, for example if the voltage supply is interrupted during transfer or if the firmware file is defective.

In this case, please call the VIPA-Hotline!

Please regard that the version of the update firmware has to be different from the existing firmware otherwise no update is executed.

Display the Firmware version of the SPEED7 system via Web Site

Every SPEED7-CPU has an integrated website that monitors information about firmware version of the SPEED7 components. The Ethernet-PG/OP channel provides the access to this website. To activate the PG/OP channel you have to enter an according hardware project engineering. After that you may access the PGU/OP channel with a web browser via the IP address of the project engineering. More detailed information is to find in Chapter "Deployment CPU31xS" at " Access to Ethernet-PG/OP channel and website".

Load firmware and transfer it to MMC

- Go to www.vipa.de.
- Click on Service > Download > Firmware Updates.
- Click on "Firmware for System 300S CPUs"
- Choose the according modules (CPU, DPM, CP...) and download the firmware Px.....zip to your PC.
- Extract the zip-file and copy the extracted file to your MMC.
- Following this approach, transfer all wanted firmware files to your MMC.

Note!

The server stores always the latest two firmware versions.

Preconditions for ftp access

For the display of ftp sites in your web browser you may have to execute the following adjustments:

Internet Explorer

ftp access only with version 5.5 or higher

Options > Internet options, Register "Advanced" in the area "Browsing":

- activate: "Enable folder view for ftp sites"
- activate: "Use passive ftp ..."

Netscape

ftp- access only with version 6.0 or higher

No further adjustments are required

If you still have problems with the ftp access, please ask your system operator.

Attention!

With a firmware update an overall reset is automatically executed. If your program is only available in the load memory of the CPU it is deleted! Save your program before executing a firmware update! After the firmware update you should execute a "Set back to factory settings" (see following page).

Transfer firmware from MMC into CPU

- Get the RUN-STOP lever of your CPU in position STOP.
- Turn off the voltage supply.
- Plug the MMC with the firmware into the CPU. Please take care of the correct plug-in direction of the MMC.
- Turn on the voltage supply.
- After a short boot-up time, the alternate blinking of the LEDs SF and FRCE shows that the firmware file has been found on the MMC.
- You start the transfer of the firmware as soon as you tip the RUN/STOP lever downwards to MRES within 10s.
- During the update process, the LEDs SF and FRCE are alternately blinking and MMC LED is on. This may last several minutes.
- The update is successful finished when the LEDs PWR, STOP, SF, FRCE and MCC are on. If they are blinking fast, an error occurred.

Note!

After the firmware update you should execute a "Set back to factory settings".

Set back to factory setting

The following approach deletes the internal RAM of the CPU completely and sets it back to the delivery state.

Please regard that the MPI address is also set back to default 2!

- Push down the reset lever for app. 30 seconds. The ST-LED blinks. After a few seconds the LED turns to static light. Count the number of static light phases because now the LED switches between static light and blinking.
- After the 6th static light you release the reset lever and push it down again shortly. Now the green RUN-LED is on once. This means that the RAM is totally deleted.
- Turn the power supply off and on again.

SPEEDbus Profibus master - Basics

Profibus-DP

Profibus is an international standard applicable to an open fieldbus for building, manufacturing used to create a low (sensor-/actuator level) or medium (process level) performance network of programmable logic controllers.

Profibus comprises an assortment of compatible versions. The following details refer to Profibus-DP.

Profibus-DP is particularly suitable for applications in production automation. DP is very fast, offers Plug'n'Play and is a cost-effective alternative to parallel cabling between PLC and the distributed periphery.

During a single bus cycle the master reads the input values from the various slaves and writes new output information into the slaves.

Data transfer medium

Profibus employs screened twisted pair cable on the basis of the RS485 interfaces or a duplex fiber optic link (FO). The data transfer rate of both systems is limited to a max. of 12MBaud.

Addressing

Every device on the Profibus is identified by an address. This address must be an unique number in the bus system between 1 and 126. At the DP master the address is set during the project engineering.

GSD file

To configure the slave connections in your own configuration tool, you've got all the information about your VIPA-modules in form of an electronic data sheet file.

Structure and content of this file are dictated by the Profibus User Organization (PNO) and can be seen there.

More information can be found at the online help of the according engineering tool.

Deployment of CPU with DP-Master

Via the Profibus-DP master up to 125 Profibus-DP slaves may be coupled to the CPU. The DP master communicates with the DP slaves and links up its data areas with the address area of the CPU. There may be created maximal 1024byte Input and 1024byte Output data.

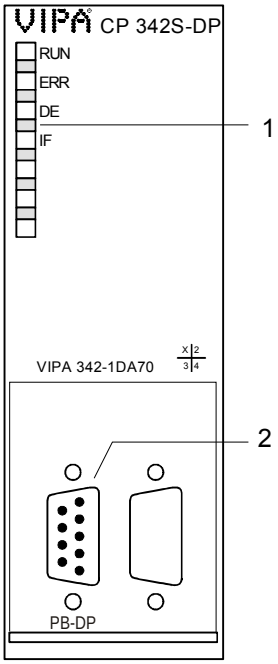
At every POWER ON res. OVERALL RESET the CPU fetches the I/O mapping data from the master.

SPEEDbus Profibus master - Construction

Properties

- Profibus DP master for SPEEDbus
- Class 1 Profibus DP Master
- 125 DP slaves connectable to one DP master
- Project engineering by Siemens SIMATIC Manager
- Diagnostic facilities

Front view



[1] LED status indicators

The following components are under the front flap

[2] RS485 Profibus interface

Components

LEDs

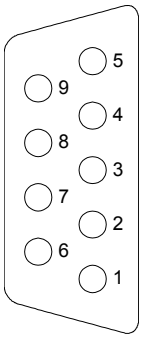
The module carries a number of LEDs that are available for diagnostic purposes on the bus and for displaying the local status. The following table explains the different colors of the diagnostic LEDs.

Label	Color	Description
RUN	green	If RUN is the only LED that is on, then the master status is RUN. The slaves are being accessed and the outputs are 0 ("Clear" state).
		If both RUN+DE are on the status of the Master is "operate". It is communicating with the slaves.
ERR	red	On at slave failure (ERROR)
DE	yellow	DE (Data exchange) indicates Profibus communication activity.
IF	red	Initialization error for bad parameterization

RS485 interface

The VIPA Profibus master is connected to your Profibus network via the 9pin jack.

The following figure shows the assignment of the individual pins:



Pin	Assignment
1	shield
2	n.c.
3	RxD/TxD-P (Line B)
4	RTS
5	M5V
6	P5V
7	n.c.
8	RxD/TxD-N (Line A)
9	n.c.

Note!

Please ensure that the last participant the line is terminated by means of a terminating resistor.

Power supply

The Profibus master receives power via the backplane bus. Here the max. current consumption amounts to 380mA.

Project engineering

The project engineering of the DP master at the SPEEDbus takes place in the hardware configurator from Siemens at the SPEEDbus section as replacement.

The real project engineering is virtual at the standard bus section. For this you virtually configure a CP342-5 DP master from Siemens with according slave periphery.

Set Profibus address via project engineering

The assignment of a Profibus address happens during project engineering. The address may be within the range 2 ... 99 and 117 ... 126, in the course of which every address must be unique within the bus system.

The address 1 is reserved due to the system and the addresses 100 ... 116 are used for the modules at the SPEEDbus for the slot assignment at the SPEEDbus happens via the Profibus address of the SPEEDbus slave.

SPEEDbus Profibus master - Project engineering

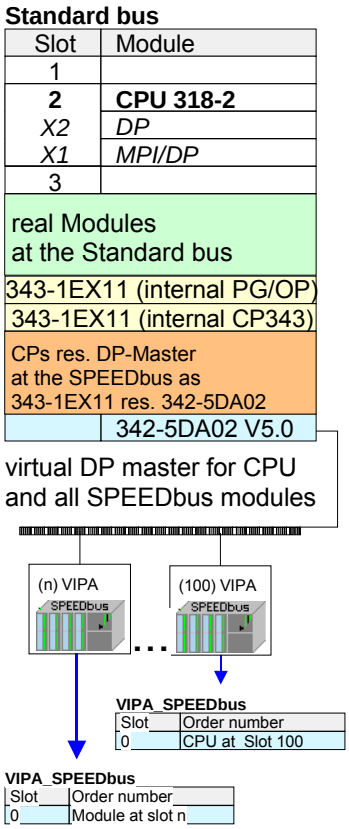
Outline

The project engineering of the SPEEDbus-DP master takes place in the hardware configurator from Siemens and consists of 2 parts:

- Project engineering and link-up at the standard bus as CP 342-5 (342-5DA02 V5.0) from Siemens.
- Project engineering as single VIPA_SPEEDbus DP slave at a virtual DP master (speedbus.gsd required)

Fast introduction

For the deployment of the System 300S modules from VIPA at the SPEEDbus, the inclusion of the System 300S modules via the GSD-file from VIPA in the hardware catalog is required.



To be compatible with the STEP®7 project engineering tool from Siemens, you have to execute the following steps:

- Start the hardware configurator from Siemens and include the speedbus.gsd for SPEED7 from VIPA.
- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens. Configure a possibly existing internal DP master of your SPEED7-CPU via the internal DP master.
- Starting with slot 4, place the System 300 modules in the plugged sequence.
- Project engineering and connection of the SPEEDbus DP master at the standard bus as virtual CP 342-5 (342-5DA02 V5.0)
- For the SPEEDbus you always include, connect and parameterize to the *operating mode* DP master the DP master CP 342-5 (342-5DA02 V5.0) as last module. To this master system you assign every SPEEDbus module as VIPA_SPEEDbus slave. Here the Profibus address corresponds to the slot no. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.

Preconditions

The hardware configurator is part of the SIMATIC manager from Siemens. It serves the project engineering. The modules that may configured here are listed in the hardware catalog.

For the employment of the System 300S modules at the SPEEDbus you have to include the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA.

Note!

For the project engineering a thorough knowledge of the SIMATIC manager and the hardware configurator from Siemens is required!

Include the SPEED7-GSD-file

- Browse to www.vipa.de > Service > Download > GSD- and EDS-Files > Profibus and select the file *Cx000023_Vxxx*.
- Extract the file to your work directory. The SPEEDbus.gsd is stored in the directory System_300S.
- Start the hardware configurator from Siemens.
- Close all projects.
- Select **Options** > *Install new GSD-file.*
- Change to the directory System_300S and select the **SPEEDBUS.GSD**

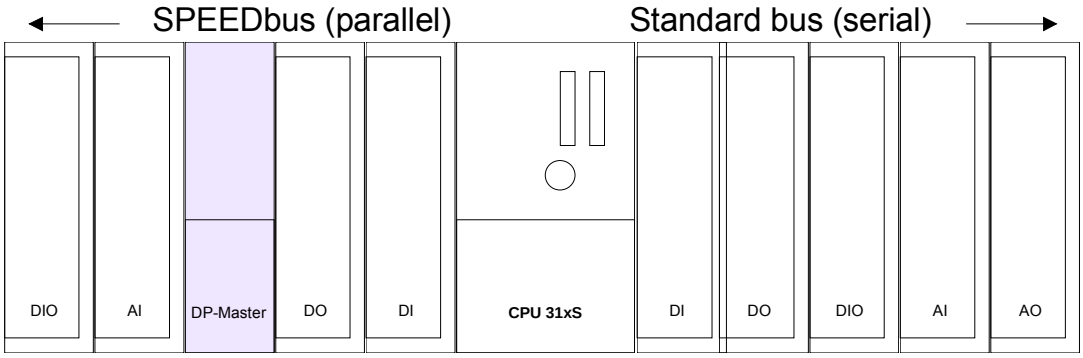
The modules of the System 300S from VIPA are now included in the hardware catalog under *Profibus-DP / Additional field devices / I/O / VIPA_SPEEDbus*.

Steps of the project engineering

The following text describes the approach of the project engineering in the hardware configurator from Siemens at an abstract sample.

The project engineering is separated into 3 parts:

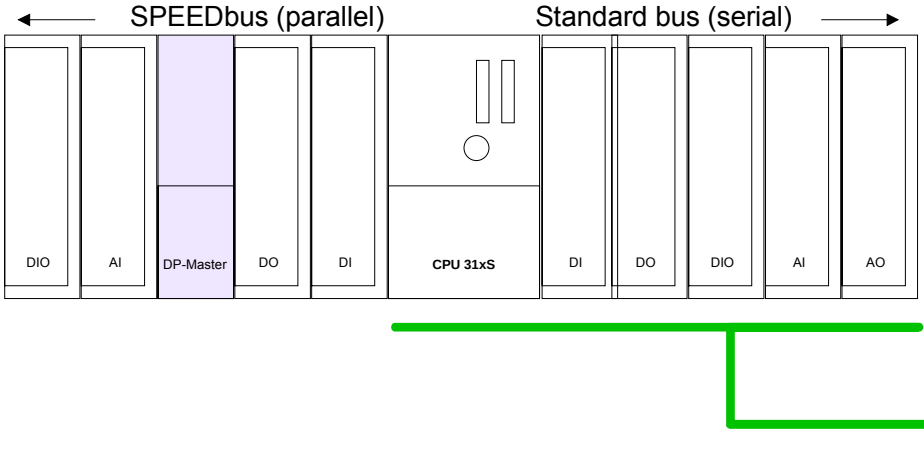
- Project engineering of the real plugged modules at the standard bus
- Project engineering of all SPEEDbus DP master at the standard bus as 342-5DA02 V5.0 from Siemens
- Project engineering of the SPEEDbus modules in a virtual master system. Here the speedbus.gsd is necessary.



Project engineering of the modules at the standard bus

The modules at the right side of the CPU at the standard bus are configured with the following approach:

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.
- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)
- Include your System 300 modules at the standard bus in the plugged sequence starting with slot 4.
- Parameterize the CPU res. the modules where appropriate. The parameter window opens by a double click on the according module.
- To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.
- Save your project.



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO

Note!

To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.

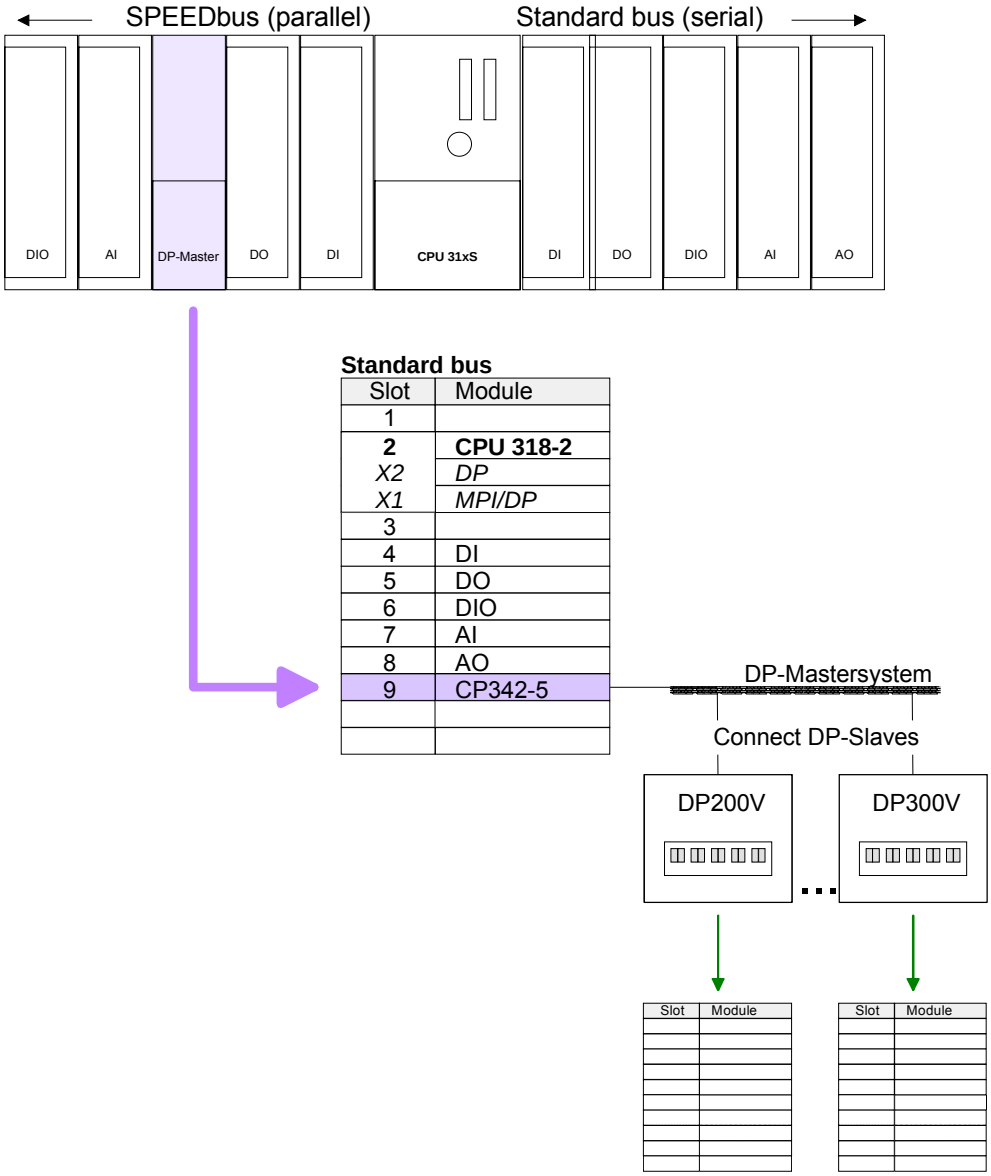
Project engineering of all SPEEDbus-DP master at the standard bus

Due to the fact that a SPEEDbus-DP master is in project engineering and parameterization similar to the DP master CP342-5 from Siemens, every SPEEDbus-DP master is inserted at the standard bus as CP342-5 (342-5DA02 V5.0) after the already configured modules. The sequence follows the one at the SPEEDbus from the right to the left.

Create a master system for the CP342-5 and include here your Profibus slave systems.

Attention!

Please take care to not configure ambiguous address assignments at the connection via external Profibus DP master - for the project engineering of SPEEDbus systems required! The Siemens hardware configurator does not execute an address check for external DP master systems!



Project engineering of all SPEEDbus modules in a virtual master system

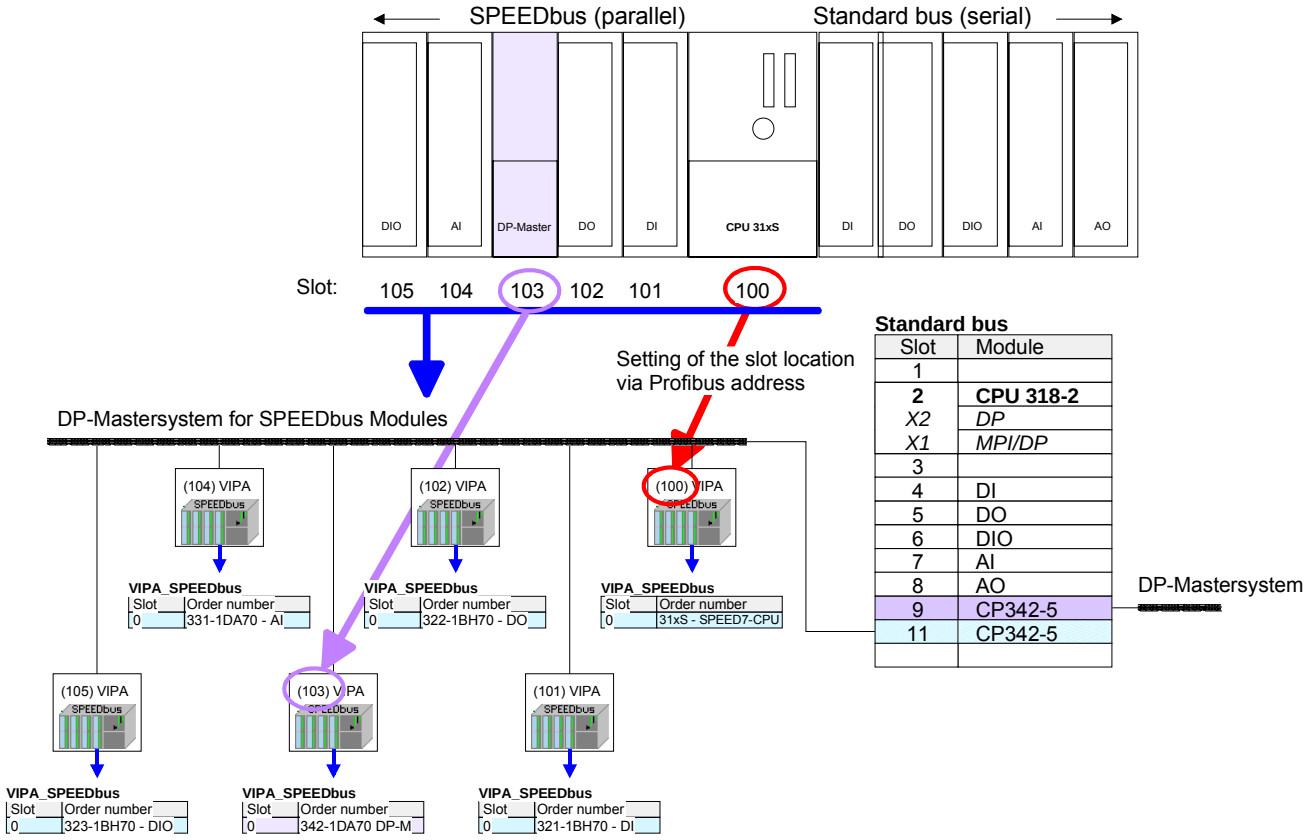
The slot assignment of the SPEEDbus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place as last module a DP master (342-5DA02 V5.0) with master system.

For the employment of the System 300S modules at the SPEEDbus the inclusion of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is required.

After the installation of the speedbus.gsd you may locate under *Profibus DP* / *Additional field devices* / *I/O* / *VIPA_SPEEDbus* the DP slave system vipa_speedbus.

Now include for the CPU and every module at the SPEEDbus a slave system "vipa_speedbus".

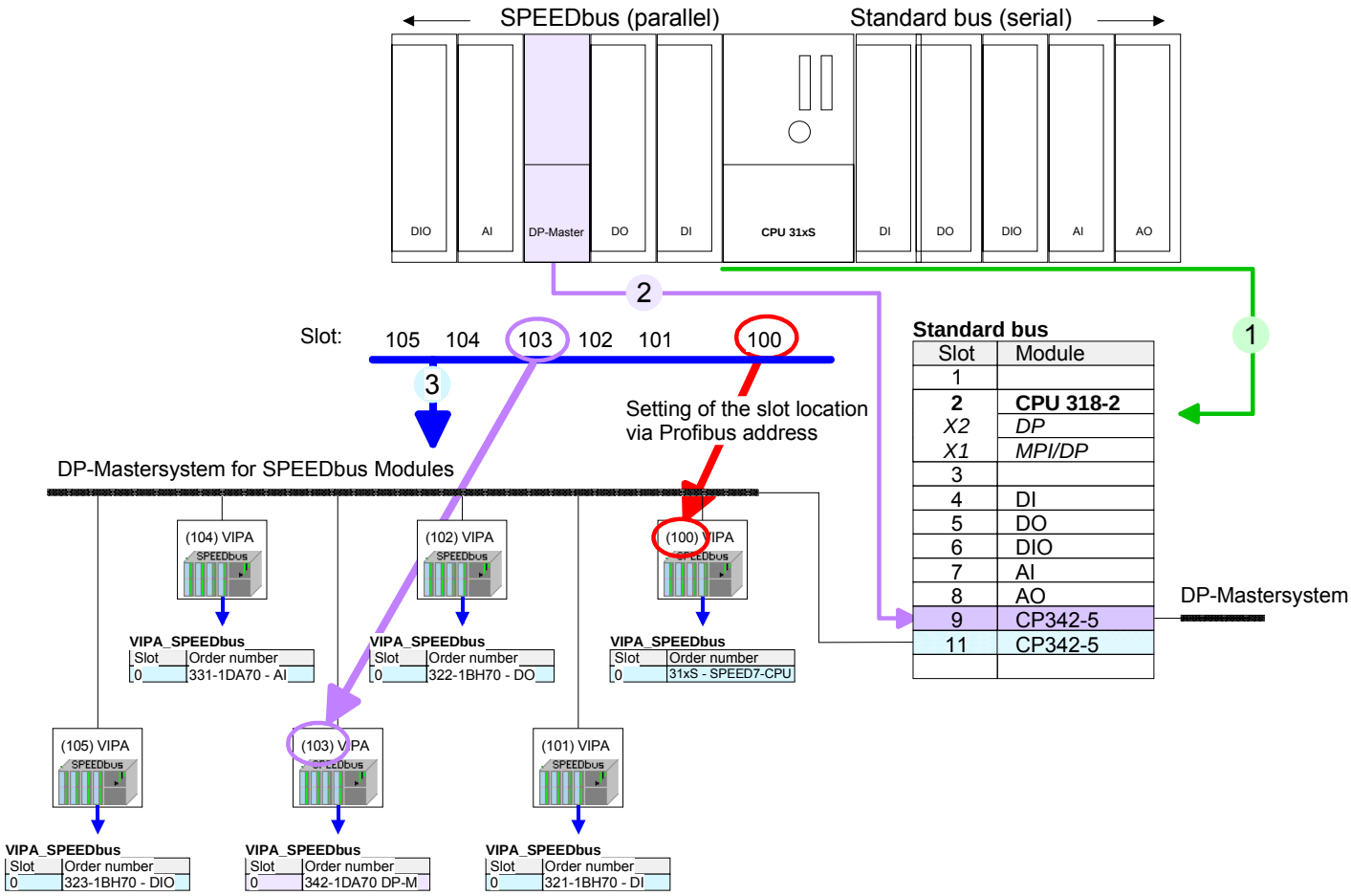
Set as Profibus address the slot no. (100...116) of the module and place the according module from the hardware catalog of VIPA_speedbus to slot 0 of the slave system.



The according module is to be taken over from the HW Catalog of vipa_speedbus to slot 0.

Together with your hardware configuration you may transfer your DP master project engineering into the CPU. This passes the project engineering on to the DP master.

Summary The following illustration summarizes the steps of project engineering:



The according module is to be taken over from the HW Catalog of vipa_speedbus to slot 0.

DP master
Operating modes

STOP → RUN (automatically)

After POWER ON and with valid project data in the CPU, the master switches automatically to RUN. An operating mode switch for the master has been abstained.

After a POWER ON the project data and bus parameters are automatically send from the CPU to the DP master. This establishes a communication to the DP slaves. At successful communication link-up and valid bus parameters, the DP master switches to Data Exchange (DE). The LEDs RUN and DE are on.

With invalid parameters, the DP master switches to RUN and shows a parameterization error via the IF-LED.

Now the DP master is linked at the bus with the following default bus parameters:

Default bus parameter: Address: 2, Transfer rate: 1.5 MBaud.

RUN

In RUN, the RUN and DE-LEDs are on. Now you may exchange data. In case of an error like e.g. DP slave failure, this is shown at the DP master via the ERR-LED and an alarm is send to the CPU.

Note!

If the CPU switches to STOP during operation, the DP master remains in RUN. Due to the BASP signal all outputs of the peripheral modules connected via DP slaves are set to zero.

SPEEDbus Profibus master - Technical Data

Electrical data	VIPA 342-1DA70
Power supply	via backplane bus
Current consumption	max. 380mA
Isolation	≥ AC 500V
Status indicators	via LEDs on the front
Connections/interfaces	9pin D-type jack Profibus connector
Profibus interface	
Connection	9pin D-type jack
Network topology	Linear bus, active bus terminator at both ends
Medium	Screened twisted pair cable, under certain conditions unscreened lines are permitted.
Data transfer rate	9.6kBaud to 12MBaud
Total length	100m without repeaters for 12MBaud, 1000m with repeaters
Max. no. of stations	32 stations in any segment without repeaters. Extendible to 126 stations when using repeaters.
Combination with peripheral modules	
max. no of slaves	125
max. no. of input bytes	1024byte
max. no. of output bytes	1024byte
Dimensions and weight	
Dimensions (WxHxD) in mm	40x125x120
Weight	110g

SPEEDbus CANopen master - Basics

General

CANopen (**C**ontrol **A**rea **N**etwork) is an international standard for open fieldbus systems intended for building, manufacturing and process automation applications that was originally designed for automotive applications.

Due to its extensive error detection facilities, the CAN-Bus system is regarded as the most secure bus system. It has a residual error probability of less than $4.7x10^{-11}$. Bad messages are flagged and retransmitted automatically.

In contrast to Profibus and Interbus, CAN defines under the CAL-level-7-protocol (CAL=**C**AN **a**pplication **l**ayer) defines various level-7 user profiles for the CAN-Bus. One standard user profile defined by the CIA (**C**AN **i**n **A**utomation) e.V. is CANopen.

CANopen

CANopen is a user profile for industrial real-time systems, which is currently supported by a large number of manufacturers. CANopen was published under the heading of DS-301 by the CAN in Automation association (CIA). The communication specifications DS-301 define standards for CAN devices. These specifications mean that the equipment supplied by different manufacturers is interchangeable. The compatibility of the equipment is further enhanced by the equipment specification DS-401 that defines standards for the technical data and process data of the equipment. DS-401 contains the standards for digital and analog input/output modules.

CANopen comprises a communication profile that defines the objects that must be used for the transfer of certain data as well as the device profiles that specify the type of data that must be transferred by means of other objects.

The CANopen communication profile is based upon an object directory that is similar to the profile used by Profibus. The communication profile DS-301 defines two standard objects as well as a number of special objects:

- Process data objects (PDO)
  PDOs are used for real-time data transfers
- Service data objects (SDO)
  SDOs provide access to the object directory for read and write operations

Communication medium

CAN is based on a linear bus topology. You can use router nodes to construct a network. The number of devices per network is only limited by the performance of the bus driver modules.

The maximum distance covered by the network is determined by the runtimes of the signals. This means that a data rate of 1Mbaud limits the network to 40m and 80kBaud limits the network to 1000m.

The CAN-Bus communication medium employs a screened three-core cable (optionally a five-core).

The CAN-Bus operates by means of differential voltages. For this reason it is less sensitive to external interference than a pure voltage or current based interface. The network must be configured as a serial bus, which is terminated by a 120Ω terminating resistor.

Your VIPA CAN-Bus coupler contains a 9pin plug. You must use this plug to connect the CAN-Bus coupler as a slave directly to your CAN-Bus network.

All devices on the network use the same baudrate.

Due to the bus structure of the network it is possible to connect or disconnect any station without interruption to the system. It is therefore also possible to commission a system in various stages. Extensions to the system do not affect the operational stations. Defective stations or new stations are recognized automatically.

Bus access method

Bus access methods are commonly divided into controlled (deterministic) and uncontrolled (random) bus access systems.

CAN employs a Carrier-Sense Multiple Access (CSMA) method, i.e. all stations have the same right to access the bus as long as the bus is not in use (random bus access).

Data communications is message related and not station related. Every message contains a unique identifier, which also defines the priority of the message. At any instance only one station can occupy the bus for a message.

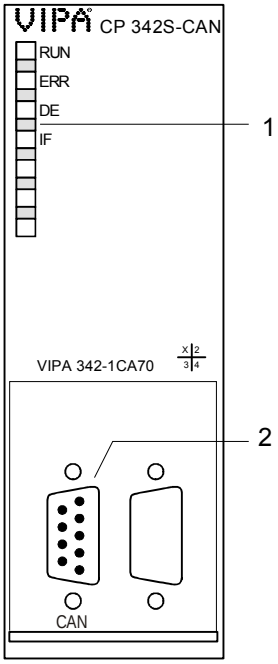
CAN-Bus access control is performed by means of a collision-free, bit-based arbitration algorithm. Collision-free means that the final winner of the arbitration process does not have to repeat his message. The station with the highest priority is selected automatically when more than one station accesses the bus simultaneously. Any station that is has information to send will delay the transmission if it detects that the bus is occupied.

SPEEDbus CANopen master - Construction

Properties

- CANopen master for SPEEDbus
- 125 CAN slaves can be connected to one CANopen master
- Project engineering under WinCoCT from VIPA
- Diagnosis ability
- 40 Transmit PDOs
- 40 Receive PDOs
- PDO-Linking
- PDO-Mapping
- 1 SDO as Server, 127 SDO as Client
- Emergency Object
- NMT Object
- Node Guarding, Heartbeat
- In-/output range 0x6xxx each max. 64bytes
- In-/output range 0xAxxx each max. 320bytes

Front view



[1] LED status indicators

The following components are under the front flap

[2] CAN interface

Components

LEDs

The CANopen master module is equipped with LEDs for diagnostic purposes The following table shows how the diagnostic LEDs are used along with the respective colors.

Name	Color	Description
RN	green	ON: CPU is in RUN
		OFF: CPU is in STOP
ER	red	ON: During initialization and at slave failure
		OFF: All slaves are in the state "operational"
BA	yellow	ON: BA (**B**us **a**ctive) shows communication via CAN bus.
		Blinks with 1Hz: shows state "pre-operational".
IF	red	ON: Initialization error at wrong parameterization.
		OFF: Initialization is OK.

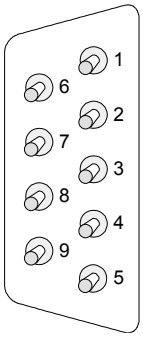
Note!

If all LEDs are blinking with 1Hz, the CAN master awaits valid parameters from the CPU.

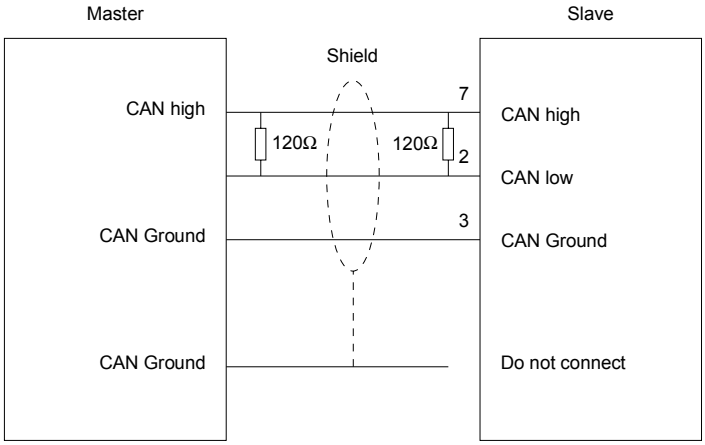
CAN-interface

The VIPA CAN-Bus master is connected to the CAN-Bus system by means of a 9pin plug.

The following diagram shows the pin assignment for the interface.:



Pin	Assignment
1	reserved
2	CAN low
3	CAN Ground
4	reserved
5	reserved
6	optional Ground
7	CAN high
8	reserved
9	optional +24V



Note!

The end of the bus cable must be terminated with a 120Ω terminating resistor to prevent reflections and the associated communication errors!

Power supply

The CANopen master receives the power supply via the backplane bus.

SPEEDbus CANopen master - Project engineering

Overview

The project engineering of the CANopen master happens in WinCoCT (**Win**dows **C**AN**o**pen **C**onfiguration **T**ool) from VIPA. You export your project from WinCoCT as wld-file. This wld-file can then be imported into the hardware configurator from Siemens.

To connect a CAN master module to your SPEED7-CPU, you have to configure the CAN master module as VIPA_SPEEDbus DP slave from the SPEEDbus hardware catalog at a virtual DP master.

Fast introduction

For the deployment of System 300S modules and the CAN master at SPEEDbus, you have to include the System 300S modules into the hardware catalog via the GSD-file from VIPA. For the project engineering in the hardware configurator you have to execute the following steps:

- Start WinCoCT and project the CANopen network.
- Create a master group with and insert a CANopen master via .
- Activate the master function via "Device Access" and "Device is NMT Master".
- Activate in the register "CANopen Manager" Device is NMT Master and confirm your entry.
- Set parameters like diagnosis behavior and CPU address ranges with "Set PLC Parameters".
- Create a slave group with and add your CANopen slaves via .
- Add modules to your slaves via "Modules" and parameterize them if needed.
- Set your process data connections in the matrix via "Connections" and proof your entries if needed in the process image of the master.
- Save the project and export it as wld-file.
- Include speedbus.gsd for SPEED7 from VIPA to Hardware configurator from Siemens.
- Switch to the SIMATIC manager from Siemens and copy the data block from the CAN-wld-file into the block directory.
- Start hardware configurator from Siemens and include speedbus.gsd for SPEED7 from VIPA.
- Project engineering of CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens.
- Starting with slot 4, place the System 300 modules in the plugged sequence.
- For the SPEEDbus you always include, connect and parameterize to the *operating mode* DP master the DP master CP 342-5 (342-5DA02 V5.0) as last module. To this master system you assign every SPEEDbus module as VIPA_SPEEDbus slave. Here the Profibus address corresponds to the slot no. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.

Precondition for the project engineering

The hardware configurator is a part of the SIMATIC manager from Siemens. It serves the project engineering. The modules that can be parameterized with are monitored in the hardware catalog.

For the deployment of the System 300S modules, the inclusion of the System 300S modules into the hardware catalog is necessary. This happens via a GSD-file speedbus.gsd from VIPA.

Note!

For the project engineering a thorough knowledge of the SIMATIC manager and the hardware configurator from Siemens is required!

Include GSD-file

- Copy the delivered VIPA GSD-file speedbus.gsd into your GSD-directory... \siemens\step7\s7data\gsd
- Start the hardware configurator from Siemens
- Close all projects
- Choose **Options** > *Install new GSD-file*
- Select **SPEEDBUS.GSD**

Now the modules of the System 300S from VIPA are integrated in the hardware catalog and can be projected.

WinCoCT

WinCoCT (**Win**dows **C**AN**o**pen **C**onfiguration **T**ool) is a configuration tool developed from VIPA to allow the comfortable project engineering of CANopen networks.

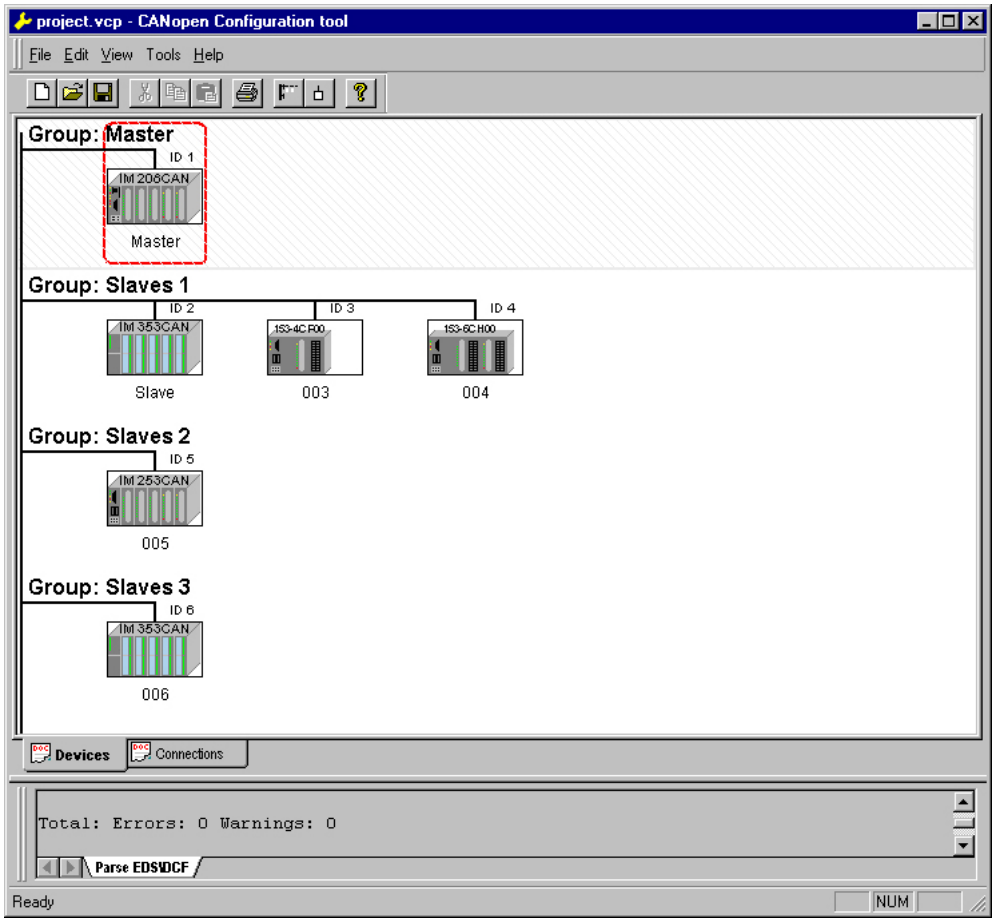
WinCoCT monitors the CANopen network topology in a graphical user interface. Here you may place, parameterize and group field devices and controls and engineer connections.

The selection of the devices happens via a list that can be extended for your needs with an EDS-file (**E**lectronic **D**ata **S**heet) at any time.

A right click onto a device opens a context menu consisting partly of static and partly of dynamic components.

For the configuration of the process data exchange, all process data are monitored in a matrix with the device inputs as rows and the device outputs as columns. Mark a cross point to create the wanted connection.

The telegram collection and optimization is executed by WinCoCT.



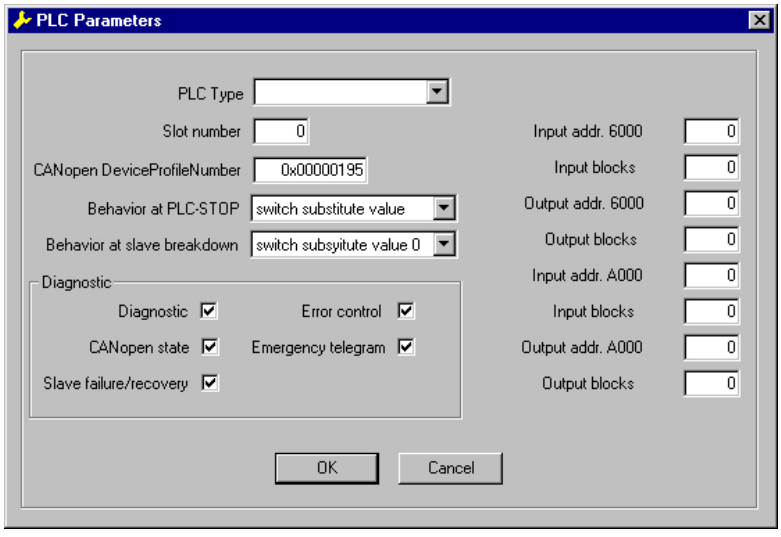
Set project parameters

Via **Tools** > *Project options* you may preset CAN specific parameters like baud rate, selection of the master etc.

More detailed information is to find in the WinCoCT manual.

Parameter CAN master

WinCoCT allows you to preset VIPA specific parameters for the CAN master by doing a right click onto the master and call the following dialog window with Set PLC-Parameters:



PLC Type	Reserved for later extensions
Slot number	Plug-in location no. at the bus 0: For the addressing of the CAN master integrated in the CPU 1 ... 32: For the addressing of CAN master at the standard bus 101 ... 116: Addressing at SPEEDbus, Slot number 101 corresponds SLOT 1 at SPEEDbus
CANopen DeviceProfileNumber	Fix at 0x195
Behavior at PLC-STOP	Here you can define the reaction of the output channels if the CPU switches to STOP. The following values are available: *Switch substitute value 0*: Sets all outputs to 0 *Keep last value*: Keeps the recent state of the outputs.
Behavior at Slave breakdown	Here you set the reaction for the slave input data in case of a slave failure. *Switch substitute value 0*: The data is set to 0. *Keep the last value*: The recent date remain unchanged.
Diagnostic	This area allows you to define the diagnostic reaction of the CAN master. *Diagnostic:* Activates the diagnostic function *CANopen state:* When activated, the CAN master sends its state "preoperational" or "operational" to the CPU. You may request the state via SFC 13. *Slave failure/recovery:* When activated, the OB 86 is called in the CPU in case of slave failure and reboot. *Error control:* If this option is selected, the NMT master sends all Guarding errors as diagnosis to the CPU, that calls the OB 82. *Emergency Telegram:* At activation, the NMT master sends all Emergency telegrams as diagnosis to the CPU, that calls the OB 82.
Address range in the CPU	The following fields allow you to preset the address ranges in the CPU for the CANopen master in- and output ranges. Each block consists of 4byte. *Input addr. 6000, Input blocks* PI basic address in the CPU that are occupied from 0x6000 CAN input data. For input blocks max. 16 (64byte) can be entered.

Output addr. 6000, Output blocks

PO basic address in the CPU that are occupied from 0x6000 CAN output data. For output blocks max. 16 (64byte) can be entered.

Input addr. A000, Input blocks

PI basic address in the CPU that are occupied from 0xA000 CAN input network variables. For input blocks max. 80 (320byte) can be entered.

Output addr. A000, Output blocks

PO basic address in the CPU that are occupied from 0xA000 CAN output network variables. For output blocks max. 80 (320byte) can be entered.

Activate CANopen slave in the CANopen Manager

To enable the master to access a CANopen slave, you have to register it at the according master via WinCoCT. Right click onto your CAN master, choose "Device access" and switch to the register "CANopen Manager".

Via [Change] you can register every single slave res. via [Global] all slaves at your master and preset the error behavior.

Please don't forget to apply the settings into your project engineering by clicking on [Apply to slaves].

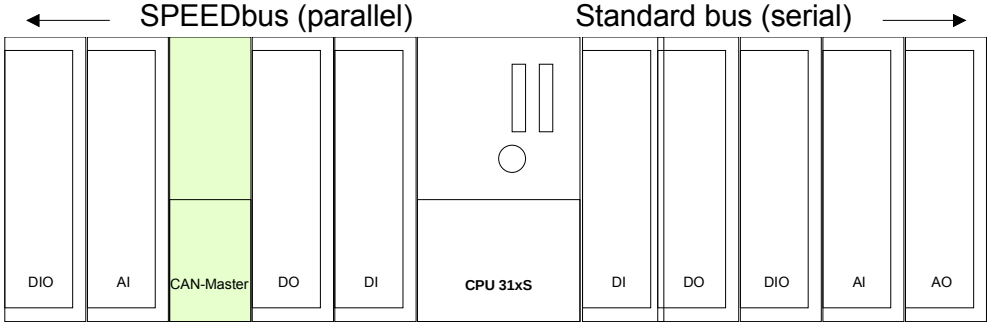
Steps of the project engineering

The following text describes the approach of the project engineering with an abstract sample:

The project engineering is divided into four parts:

- CAN master project engineering in WinCoCT and export as wld-file
- Import CAN master project engineering
- Project engineering of the modules at the standard bus
- Project engineering of all SPEEDbus modules as a virtual Profibus net (you need speedbus.gsd).

Hardware

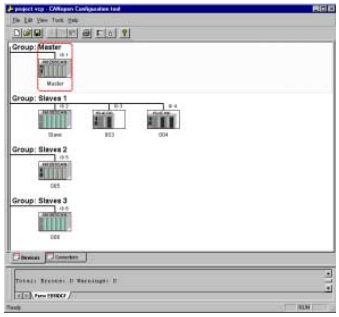


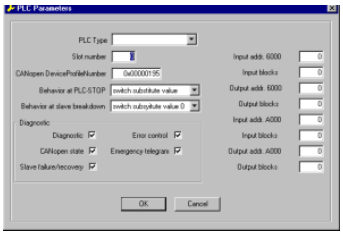
Preconditions

For the project engineering of a CANopen system, the most recent EDS-file has to be transferred into the EDS-directory of WinCoCT.

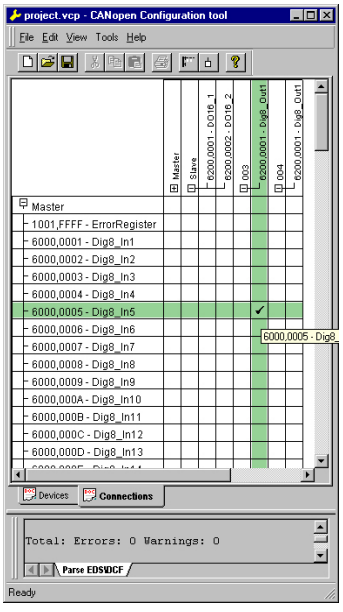
For the deployment of the System 300S modules, you have to include the System 300S modules with the GSD-file speedbus.gsd from VIPA into the hardware catalog.

CAN master project engineering in WinCoCT





- Copy the required EDS-files into the EDS-directory and start WinCoCT.
- Create a master group via and insert a CANopen master via .
- Create a slave group with and add your CANopen slaves via .
- Right click on the according slave and add the needed modules via "Modules".
- Parameterize the modules with [Parameter] res. via the according object directory.
- Right click on the master and open the dialog "Device Access".
- Activate Device is NMT Master in the register "CANopen Manager" and register the according slaves at the master. Don't forget to apply your settings into your project engineering with [Apply to slaves]!
- Right click onto the master and open the VIPA specific dialog "Set PLC Parameters". Here you may adjust the diagnosis behavior and the address ranges that the master occupies in the CPU.
  Under "Slot number" type the SPEEDbus slot no. added with 100 (101...116), where your CAN master is plugged. At export, WinCoCT creates the according DB no. + 2000.



- Change to the register "Connections" in the main window. Here the process data are shown in a matrix as inputs (1st column) and as outputs (1st row).
  To monitor the process data of a device with a "+" click on the according device.
- For helping you, you may only define a connection when the appearing cross has green color. Select the according cell with the mouse pointer in row and column in the matrix and click on it. → The cell is marked with a "✓". You can control the connection by changing into "Devices", click on the master and monitor the process image of the master via "Device Access".
- Save your project.
- Via **File** > *Export* your CANopen project is exported into a wld-file. The name is the combination of project name + node address + ID **Mas**ter/**Slav**e.

Now your CANopen project engineering under WinCoCT is ready.

Import to PLC-Program

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.
- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)
- Open the wld file by using **File** > *Memory Card File > open*
- Copy the DB 2xxx into your DB directory

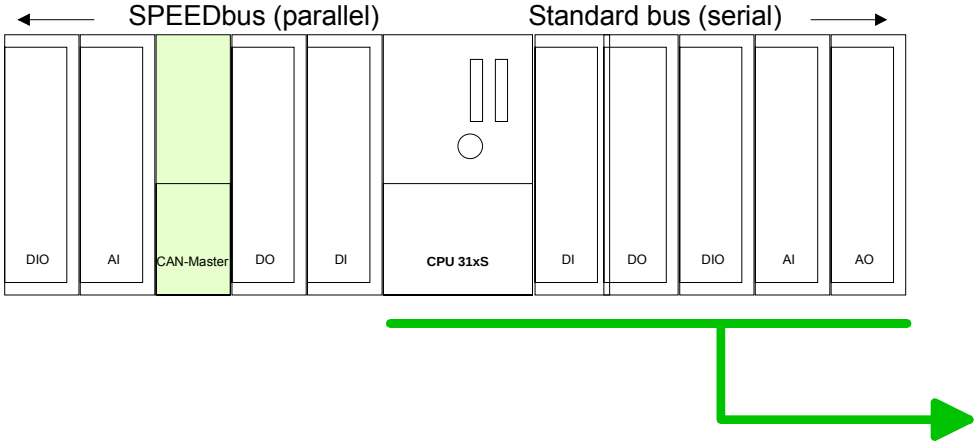
As soon as you transfer this block to your SPEED7-CPU, it is recognized by the CPU and the according parameters are transferred to the wanted CAN master.

This is only possible when the CAN master module is included into the hardware configuration at the SPEEDbus. The following pages show the according approach.

Project engineering of the modules at the standard bus

The modules at the right side of the CPU at the standard bus are configured with the following approach:

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.
- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)
- Include your System 300V modules at the standard bus in the plugged sequence starting with slot 4.
- Parameterize the CPU res. the modules where appropriate. The parameter window opens by a double click on the according module.
- To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.
- Save your project



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO

Project engineering of all SPEEDbus modules in a virtual master system

The slot assignment of the SPEEDbus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place as last module a DP master (342-5DA02 V5.0) with master system.

For the employment of the System 300S modules at the SPEEDbus the inclusion of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is required.

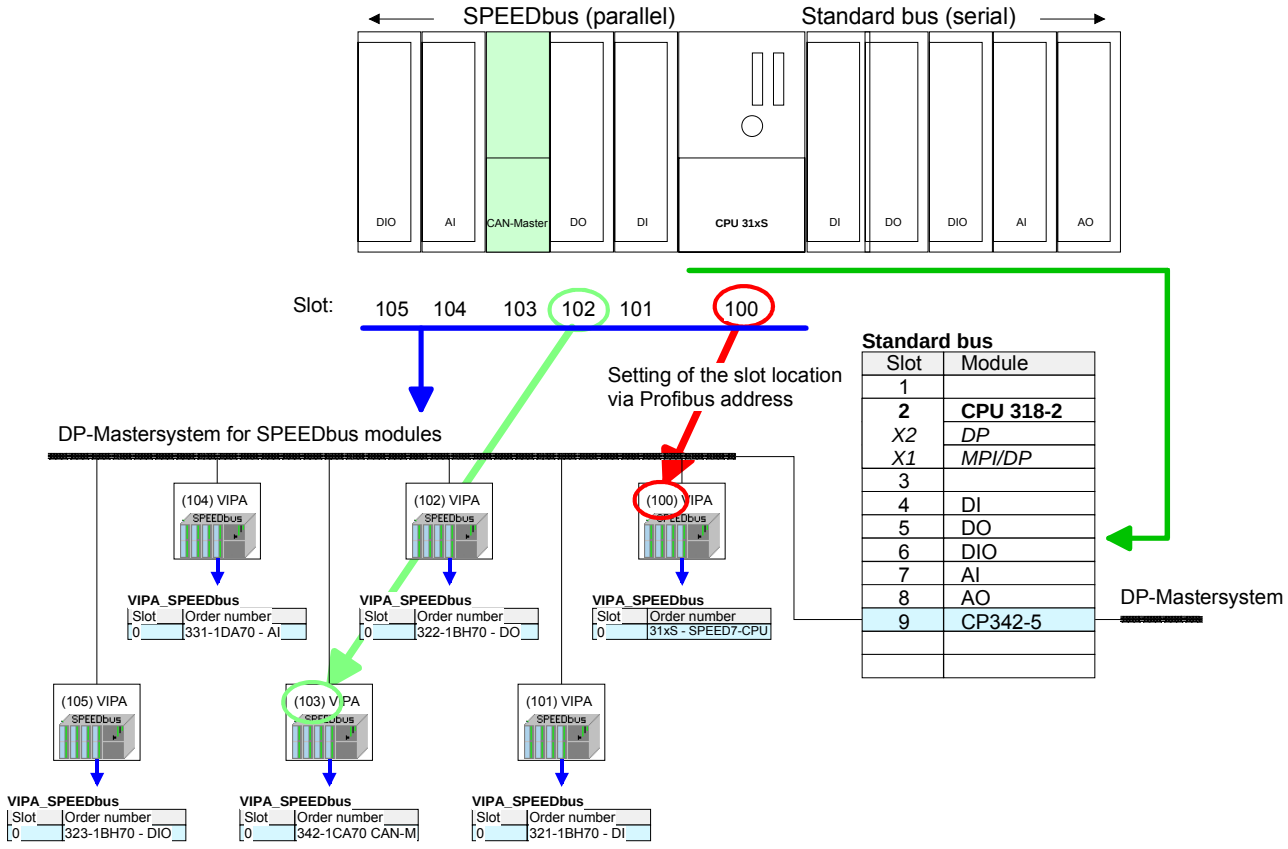
After the installation of the speedbus.gsd you may locate under *Profibus DP* / *Additional field devices* / *I/O* / *VIPA_SPEEDbus* the DP slave system vipa_speedbus.

Now include for the CPU and every module at the SPEEDbus a slave system "vipa_speedbus".

Set as Profibus address the slot no. (100...116) of the module and place the according module from the hardware catalog of VIPA_speedbus to slot 0 of the slave system.

Attention!

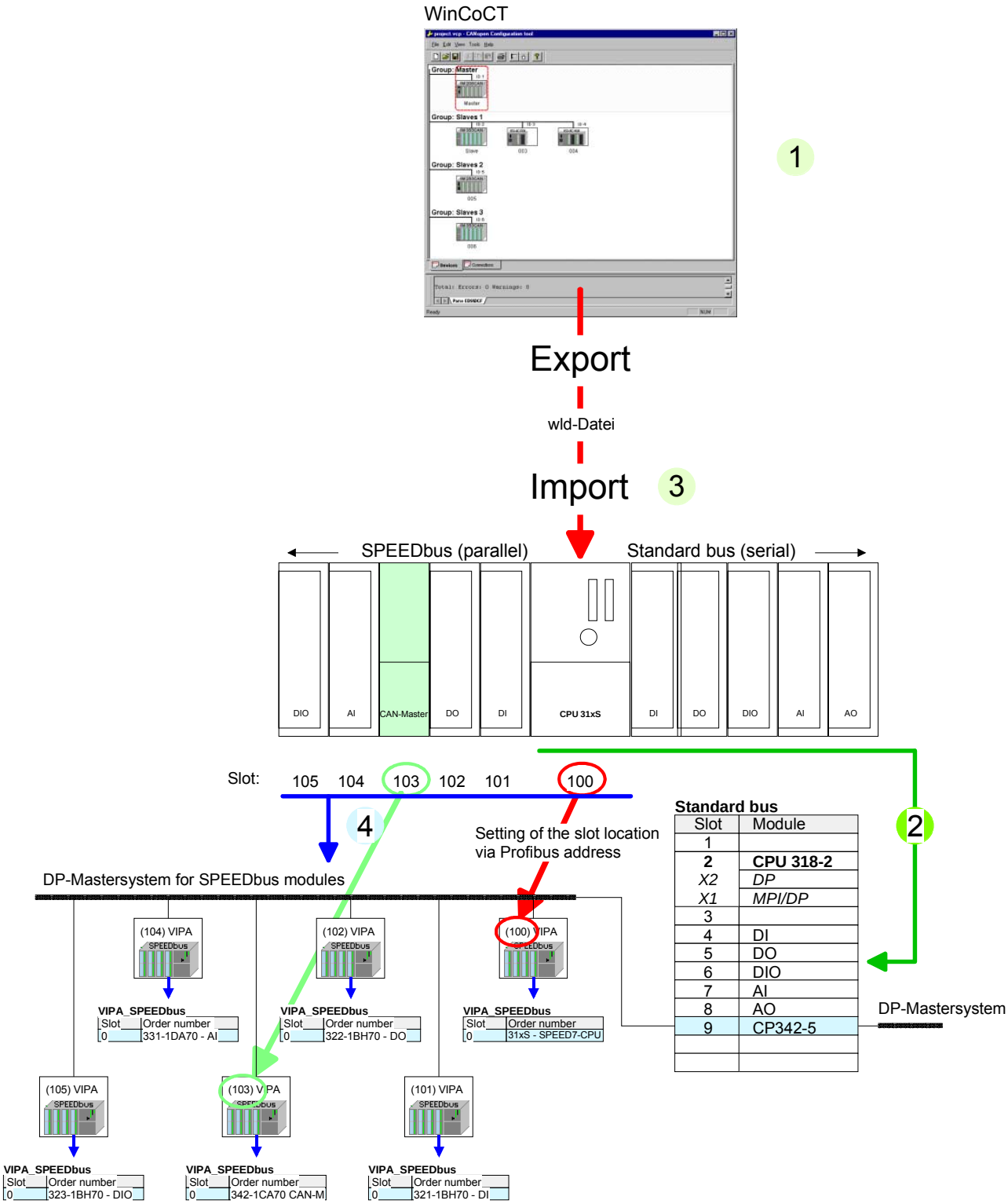
Please take care to not configure ambiguous address assignments at the connection via external Profibus DP master - for the project engineering of SPEEDbus systems required! The Siemens hardware configurator does not execute an address check for external DP master systems!



The according module is to be taken over from the HW Catalog of vipa_speedbus to slot 0.

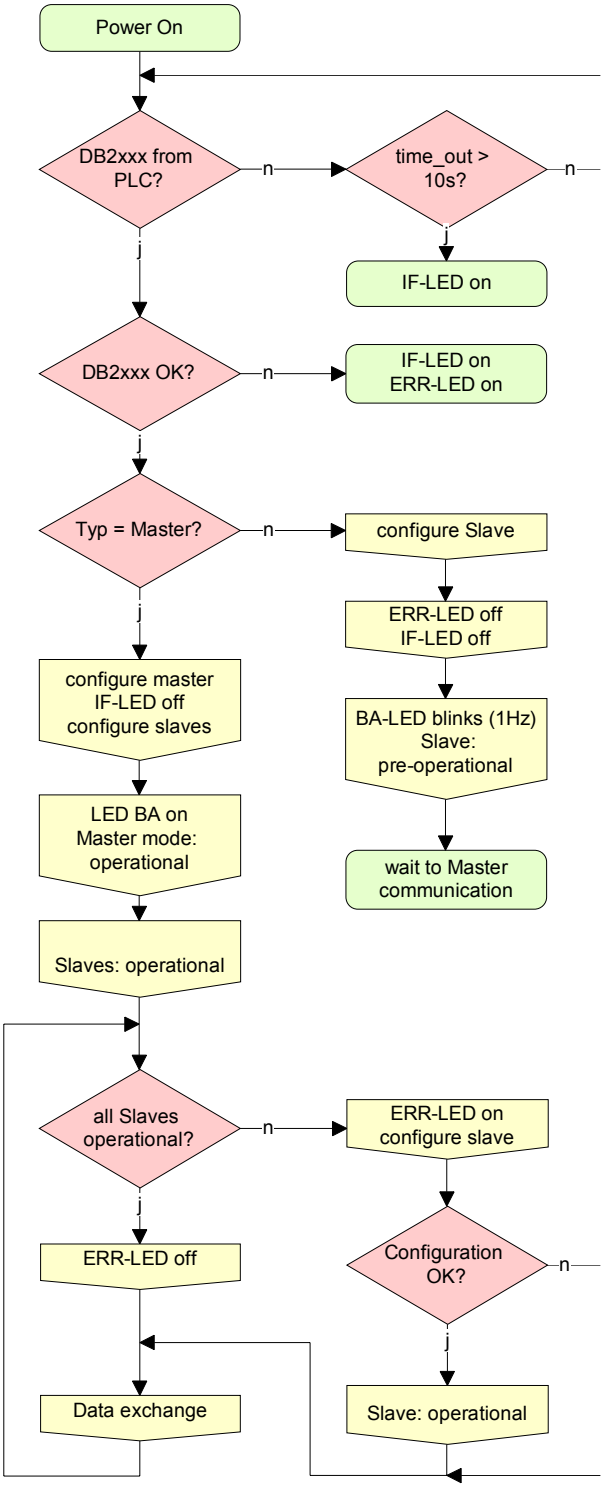
Together with your hardware configuration you may transfer your DP master project engineering into the CPU. This passes the project on to the CAN master.

Summary The following illustration summarizes the steps of project engineering:



The according module is to be taken over from the HW Catalog of vipa_speedbus to slot 0.

SPEEDbus CANopen master - Operation modes



STOP → RUN (automatically)

After POWER ON and at valid project data in the CPU, the master switches automatically into RUN. The master has no operating mode lever.

After POWER ON, the project data is automatically send from the CPU to the CAN master. This establishes a communication to the CAN slaves.

At active communication and valid bus parameters, the CAN master switches into the state "operational". The LEDs RUN and BA are on.

At invalid parameters, the CAN master remains in STOP and shows the parameterization error via the IF-LED.

RUN

In RUN, the RUN- and BA-LEDs are on. Now data can be exchanged.

In case of an error, like e.g. slave failure, the ERR-LED at the CAN master is on and an alarm is send to the CPU.

SPEEDbus CANopen master - Process image

The process image is build of the following parts:

- Process image for input data (PI) for RPDOs
- Process image for output data (PO) for TPDOs

Every part consists of 64byte "Digital-Data"- and 320byte "Network Variables".

Input data

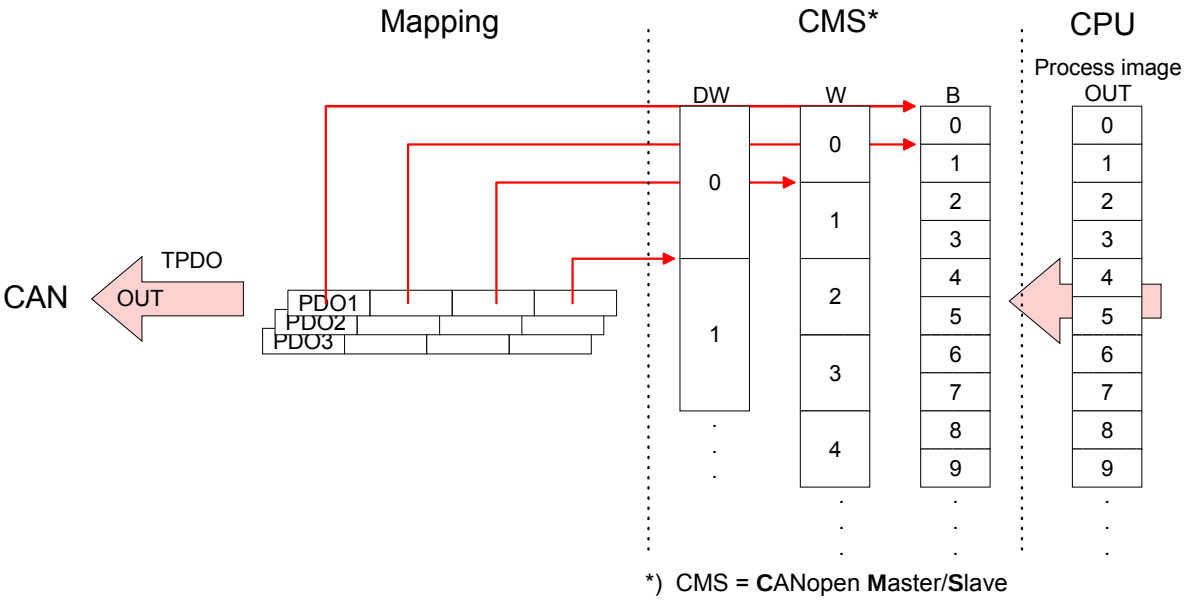
For input data, the following objects are available:

- 8 Bit digital input (Object 0x6000)
- 16 Bit digital input (Object 0x6100)
- 32 Bit digital input (Object 0x6120)
- 8 Bit input network variables (Object 0xA040)
- 16 Bit input network variables (Object 0xA100)
- 32 Bit input network variables (Object 0xA200)
- 64 Bit input network variables (Object 0xA440)

Like to see in the following illustration, the objects of the digital input data use the same memory area of the CPU.

For example, an access to Index 0x6000 with Subindex 2 corresponds an access to Index 0x6100 with Subindex 1. Both objects occupy the same memory cell in the CPU.

Please regard that the input network variables also use the same memory area.



*) CMS = **C**ANopen **M**aster/**S**lave

Output-data

For the digital output data, the assignment is similar.

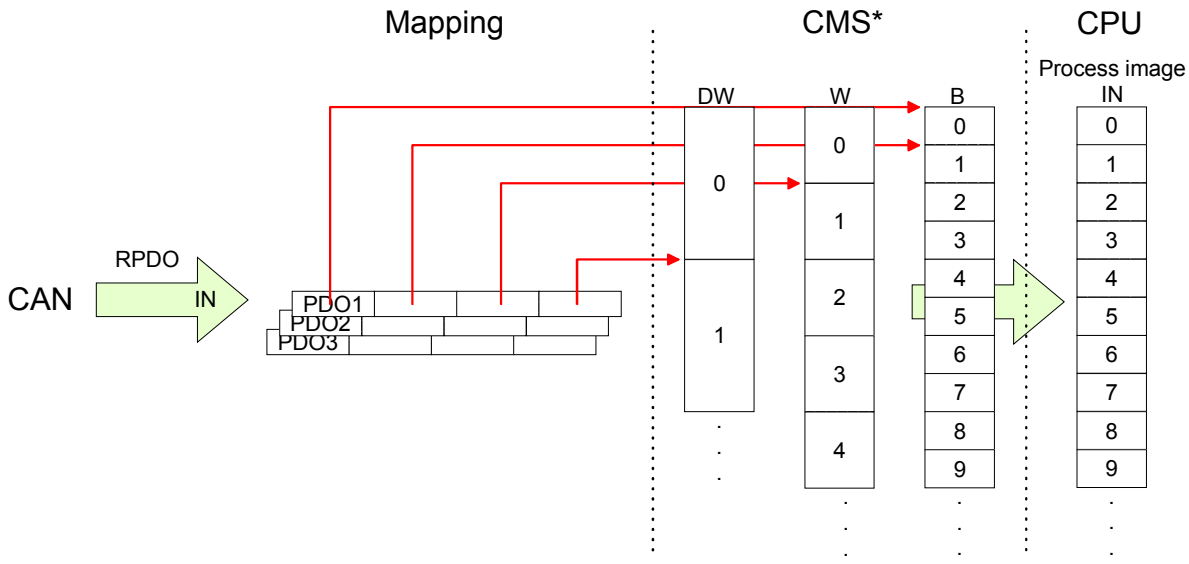
For output data, the following objects are available:

- 8 Bit digital output (Object 0x6200)
- 16 Bit digital output (Object 0x6300)
- 32 Bit digital output (Object 0x6320)
- 8 Bit output network variables (Object 0xA400)
- 16 Bit output network variables (Object 0xA580)
- 32 Bit output network variables (Object 0xA680)
- 64 Bit output network variables (Object 0xA8C0)

Like to see in the following illustration, the objects of the digital output data use the same memory area of the CPU.

For example, an access to Index 0x6200 with Subindex 2 corresponds an access to Index 0x6300 with Subindex 1. Both objects occupy the same memory cell in the CPU.

Please regard that the output network variables also use the same memory area.



*) CMS = **C**ANopen **M**aster/**S**lave

SPEEDbus CANopen master - Message structure

Identifier

All CANopen messages have the following structure according to CIA DS-301

Identifier

Byte	Bit 7 ... Bit 0
1	Bit 3 ... Bit 0: most significant 4 bits of the module-ID Bit 7 ... Bit 4: CANopen function code
2	Bit 3 ... Bit 0: data length code (DLC) Bit 4: RTR-Bit: 0: no data (request code) 1: data available Bit 7 ... Bit 5: Least significant 3 bits of the module-ID

Data

Data

Byte	Bit 7 ... Bit 0
3 ... 10	Data

An additional division of the 2byte identifier into function portion and a module-ID gives the difference between this and a level 2 message. The function determines the type of message (object) and the module-ID addresses the receiver.

CANopen devices exchange data in the form of objects. The CANopen communication profile defines two different object types as well as a number of special objects.

The VIPA CAN master supports the following objects:

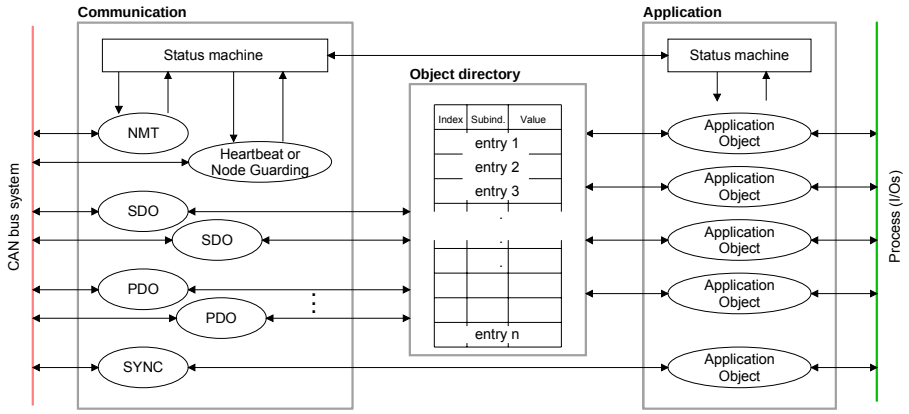
- 40 Transmit PDOs (PDO Linking, PDO Mapping)
- 40 Receive PDOs (PDO Linking, PDO Mapping)
- 2 Standard SDOs (1 Server, 127 Clients)
- 1 Emergency Object
- 1 Network management Object NMT
- Node Guarding
- Heartbeat

Note!

The exact structure and data content of all objects is described in the CIA-Profiles DS-301, DS-302, DS-401 and DS-405.

Structure of the device model

A CANopen device can be structured as follows:



Communication

Serves the communication data objects and the concerning functionality for data transfer via the CANopen network.

Application

The application data objects contain e.g. in- and output data. In case of an error, an application status machine switches the outputs in a secure state.

The object directory is organized as 2 dimension table. The data is addressed via index and sub-index.

Object directory

This object directory contains all data objects (application data + parameters) that are accessible and that influence the behavior of communication, application and status machines.

PDO

In many fieldbus systems the whole process image is transferred - mostly more or less cyclically. CANopen is not limited to this communication principle, for CAN supports more possibilities through multi master bus access coordination.

CANopen divides the process data into segments of max. 8byte. These segments are called **p**rocess **d**ata **o**bjects (PDOs). Every PDO represents one CAN telegram and is identified and prioritized via its specific CAN identifier.

For the exchange of process data, the VIPA CAN-Master supports 80 PDOs. Every PDO consists of a maximum of 8 data bytes. The transfer of PDOs is not verified by means of acknowledgments since the CAN protocol guarantees the transfer.

There are 40 Tx transmit PDOs for input data and 40 Rx receive PDOs for output data. The PDOs are named seen from the CAN-Master:

Receive PDOs (RxPDOs) are received by the CAN-Master and contain input data.

Transmit PDOs (TxPDOs) are send by the CAN-Master and contain output data.

The assignment of the PDOs to input or output data occurs via WinCoCT automatically

SDO

For access to the object directory, the **S**ervice-**D**ata-**O**bject (SDO) is used. The SDO allows you a read or write access to the object directory. In the CAL-Layer-7-Protocol you find the specification of the Multiplexed-Domain-Transfer-Protocol that is used by the SDOs. This protocol allows you to transfer data with any length. At need, the messages are divided into several CAN messages with identical identifier (segmentation). A SDO is transferred acknowledged, i.e. every reception of a message is acknowledged.

Note!

A more detailed description of the SDO telegrams is to find in the CiA norm DS-301.

In the following only the error messages are described that may occur at a wrong parameter communication.

SFC 219 CAN_TLGR SDO request to CAN master

Every CPU has the SFC 219 integrated. This allows you to start a SDO read or write access from your PLC program to the CAN master.

You address your master via the plug-in location and the destination slave via its CAN address. The process data is defined by index and subindex. Via SDO every access transfers max. one data word process data. The SFC 219 contains the following parameters:

Parameter

Name	Declaration	Type	Comment
Request	IN	BOOL	1 = Activation
Slot_Master	IN	BYTE	SPEEDbus slot (101...116)
NodeID	IN	BYTE	CAN address (1...127)
Transfertyp	IN	BYTE	Type of transfer
Index	IN	DWORD	CANopen index
Subindex	IN	DWORD	CANopen subindex
CANopenError	OUT	DWORD	CANopen error
RetVal	OUT	WORD	Error code (0=OK)
Busy	OUT	BOOL	Function is busy
DataBuffer	INOUT	ANY	Data Buffer for SFC communication

Request — Control parameter: 1: Start the order

Slot_Master — 101...115: Slot 1...15 of SPEEDbus master
1...32: VIPA 208-1CA00, depending on plug-in location no.

NodeID — Address of the CANopen node (1...127)

Transfer type — 40h, 60h: Read SDO
61h: Write SDO (undefined length)
23h: Write SDO (1 DWORD)
2Bh: Write SDO (1 WORD)
2Fh: Write SDO (1 BYTE)

Index — CANopen Index

Subindex — CANopen Subindex

CanOpenError

If no error occurs CANopenError returns value 0.

In case of error the CANopenError contains one of the following error messages which are generated in the CAN master:

Code	Description
0x05030000	Toggle bit not alternated
0x05040000	SDO protocol timed out
0x05040001	Client/server command specifier not valid or unknown
0x05040002	Invalid block size (block mode only)
0x05040003	Invalid sequence number (block mode only)
0x05040004	CRC error (block mode only)
0x05040005	Out of memory
0x06010000	Unsupported access to an object
0x06010001	Attempt to read a write only object
0x06010002	Attempt to write a read only object
0x06020000	Object does not exist in the object dictionary
0x06040041	Object cannot be mapped to the PDO
0x06040042	The number and length of the objects to be mapped would exceed PDO length
0x06040043	General parameter incompatibility reason
0x06040047	General internal incompatibility in the device
0x06060000	Access failed due to an hardware error
0x06070010	Data type does not match, length of service parameter does not match
0x06070012	Data type does not match, length of service parameter too high
0x06070013	Data type does not match, length of service parameter too low
0x06090011	Sub-index does not exist
0x06090030	Value range of parameter exceeded (only for write access)
0x06090031	Value of parameter written too high
0x06090032	Value of parameter written too low
0x06090036	Maximum value is less than minimum value
0x08000000	general error
0x08000020	Data cannot be transferred or stored to the application
0x08000021	Data cannot be transferred or stored to the application because of local control
0x08000022	Data cannot be transferred or stored to the application because of the present device state
0x08000023	Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of an file error)

RetVal

When the function has been executed successfully, the return value contains the valid length of the respond data: 1: BYTE, 2: WORD, 4: DWORD.

Unless a SDO demand was processed error free, RetVal contains the length of the valid response data: 1: BYTE, 2: WORD or 4: BYTE.

If an error occurs during function processing, the return value contains an error code.

Value	Description
F021h	Invalid slave address (Call parameter equal 0 or above 127)
F022h	Invalid Transfer type (Value unequal 60h, 61h)
F023h	Invalid data length (data buffer to small, at SDO read access it should be at least 4byte, at SDO write access 1byte, 2byte or 4byte).
F024h	The SFC is not supported
F025h	Write buffer in the CANopen master full, service can not be processed at this time.
F026h	Read buffer in the CANopen master full, service can not be processed at this time.
F027h	The SDO read or write access returned wrong answer, see CANopen Error Codes.
F028h	SDO-Timeout (no CANopen participant with this Node-Id has been found).

Busy

Busy = 1: The read/write job is not yet completed.

DataBuffer

SFC data communication area.

Read SDO: Destination area for the SDO data that were read.

Write SDO: Source area for the SDO data that were write.

Note!

Unless a SDO demand was processed error free, RetVal contains the length of the valid response data in 1, 2 or 4 byte and the CanOpenError the value 0.

SPEEDbus CANopen master - Object directory

Structure

The CANopen object directory contains all relevant CANopen objects for the bus coupler. Every entry in the object directory is marked by a 16Bit index.

If an object exists of several components (e.g. object type Array or Record), the components are marked via an 8Bit sub-index.

The object name describes its function. The data type attribute specifies the data type of the entry.

The access attribute defines, if the entry may only be read, only be written or read and written.

The object directory is divided into the following 3 parts:

Communication specific profile area (0x1000 – 0x1FFF)

This area contains the description of all relevant parameters for the communication.

0x1000 – 0x1018	General communication specific parameters (e.g. device name)
0x1400 – 0x1427	Communication parameters (e.g. identifier) of the receive PDOs
0x1600 – 0x1627	Mapping parameters of the receive PDOs The mapping parameters contain the cross-references to the application objects that are mapped into the PDOs and the data width of the depending object.
0x1800 – 0x1827 0x1A00 – 0x1A27	Communication and mapping parameters of the transmit PDOs

Manufacturer specific profile area (0x2000 – 0x5FFF)

Here you find the manufacturer specific entries. The CAN master from VIPA has no manufacturer specific entries.

Standardized device profile area (0x6000 – 0x9FFF)

This area contains the objects for the device profile acc. DS-401.

Object directory overview

Index	Content of Object
1000h	Device type
1001h	Error register
1005h	COB-ID SYNC
1006h	Communication Cycle Period
1007h	Synchronous Window Length
1008h	Manufacturer Hardware Version
1009h	Hardware Version
100Ah	Software Version
100Ch	Guard Time
100Dh	Life Time Factor
1016h	Consumer Heartbeat Time
1017h	Producer Heartbeat Time
1018h	Identity Object
1400h to 1427h	Receive PDO Communication Parameter
1600h to 1627h	Receive PDO Mapping Parameter
1800h to 1827h	Transmit PDO Communication Parameter
1A00h to 1A27h	Transmit PDO Mapping Parameter
1F22h	Concise DCF
1F25h	Post Configuration
1F80h	NMT StartUp
1F81h	Slave Assignment
1F82h	Request NMT
1F83h	Request Guarding
6000h	Digital-Input-8-Bit Array (see DS 401)
6100h	Digital-Input-16-Bit Array (see DS 401)
6120h	Digital-Input-32Bit Array (see DS 401)
6200h	Digital-Output-8-Bit Array (see DS 401)
6300h	Digital-Output-16-Bit Array (see DS 401)
6320h	Digital-Output-32-Bit Array (see DS 401)
A040h	Dynamic Unsigned8 Input
A100h	Dynamic Unsigned16 Input
A200h	Dynamic Unsigned32 Input
A4400h	Dynamic Unsigned64 Input
A4C0h	Dynamic Unsigned8 Output
A580h	Dynamic Unsigned16 Output
A680h	Dynamic Unsigned32 Output
A8C0h	Dynamic Unsigned64 Output

Device Type

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1000	0	Device Type	Unsigned32	ro	N	0x00050191	Statement of device type

The 32Bit value is divided into two 16Bit fields:

MSB	LSB
Additional information Device	**profile number**
0000 0000 0000 wxyz (bit)	405dec=0x0195

The "additional information" contains data related to the signal types of the I/O device:

z=1 → digital inputs

y=1 → digital outputs

x=1 → analog inputs

w=1 → analog outputs

Error register

Index	Sub-Index	Name	Type	Attr.	Map.	Default value	Meaning
0x1001	0	Error Register	Unsigned8	ro	Y	0x00	Error register

Bit 7							Bit 0
ManSpec	reserved	reserved	Comm.	reserved	reserved	reserved	Generic

ManSpec.: Manufacturer specific error, specified in object 0x1003.

Comm.: Communication error (overrun CAN)

Generic: A not more precisely specified error occurred (flag is set at every error message)

SYNC identifier

Index	Sub-Index	Name	Type	Attr.	Map.	Default value	Meaning
0x1005	0	COB-Id sync message	Unsigned32	ro	N	0x80000080	Identifier of the SYNC message

The lower 11Bit of the 32Bit value contain the identifier (0x80=128dez), while the MSBit indicates whether the device receives the SYNC telegram (1) or not (0).

Attention: In contrast to the PDO identifiers, the MSB being set indicates that this identifier is relevant for the node.

SYNC interval

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1006	0	Communi-cation cycle period	Unsigned32	rw	N	0x00000000	Maximum length of the SYNC interval in µs.

If a value other than zero is entered here, the master goes into error state if no SYNC telegram is received within the set time during synchronous PDO operation.

Synchronous Window Length

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1007	0	Synchronous window length	Unsigned32	rw	N	0x00000000	Contains the length of time window for synchronous PDOs in µs.

Device name

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1008	0	Manufacturer device name	Visible string	ro	N		Device name of the bus coupler

VIPA IM 342-1CA70 = VIPA CANopen Master/Slave 342-1CA70

Since the returned value is longer than 4byte, the segmented SDO protocol is used for transmission.

Hardware version

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1009	0	Manufacturer Hardware version	Visible string	ro	N	1.00	Hardware version number of bus coupler

VIPA 342-1CA70 = 1.00

Since the returned value is longer than 4byte, the segmented SDO protocol is used for transmission.

Software version

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x100A	0	Manufacturer Software version	Visible string	ro	N	1.xx	Software version number CANopen software

VIPA 342-1CA70 = 1.07

Since the returned value is longer than 4byte, the segmented SDO protocol is used for transmission.

Guard time

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x100C	0	Guard time [ms]	Unsigned16	rw	N	0x0000	Interval between two guard telegrams. Is set by the NMT master or configuration tool.

Life time factor

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x100D	0	Life time factor	Unsigned8	rw	N	0x00	Life time factor x guard time = life time (watchdog for life guarding)

If a guarding telegram is not received within the life time, the node enters the error state. If the life time factor and/or guard time =0, the node does not carry out any life guarding, but can itself be monitored by the master (node guarding).

Consumer Heartbeat Time

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1016	0	Consumer heartbeat time	Unsigned8	ro	N	0x05	Number of entries
	1...127		Unsigned32	rw	N	0x00000000	Consumer heartbeat time

Structure of the "Consumer Heartbeat Time" entry::

Bits	31-24	23-16	15-0
Value	Reserved	Node-ID	Heartbeat time
Encoded as	Unsigned8	Unsigned8	Unsigned16

As soon as you try to configure a consumer heartbeat time unequal zero for the same node-ID, the node interrupts the SDO download and throws the error code 0604 0043hex.

Producer Heartbeat Time

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1017	0	Producer heartbeat time	Unsigned16	rw	N	0x0000	Defines the cycle time of heartbeat in ms

Identity Object

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1018	0	Identity Object	Unsigned8	ro	N	0x04	Contains general Information about the device (number of entries)
	1	Vendor ID	Unsigned32	ro	N	0xAFFEAFFE	Vendor ID
	2	Product Code	Unsigned32	ro	N	0x2081CA00	Product Code
	3	Revision Number	Unsigned32	ro	N		Revision Number
	4	Serial Number	Unsigned32	ro	N		Serial Number

Communication parameter RxPDO

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1400 ... 0x1427	0	Number of Elements	Unsigned8	ro	N	0x02	Communication parameter for the first receive PDOs, Subindex 0: number of following parameters
	1	COB-ID	Unsigned32	rw	N	0xC0000200 + NODE_ID	COB-ID RxPDO1
	2	Transmis-sion type	Unsigned8	rw	N	0xFF	Transmission type of the PDO

Sub-index 1 (COB-ID): The lower 11Bit of the 32Bit value (Bits 0-10) contain the CAN identifier, the MSBit (Bit 31) shows if the PDO is active (1) or not(0), Bit 30 shows if a RTR access to this PDO is permitted (0) or not (1).

The sub-index 2 contains the transmission type.

Mapping RxPDO

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1600 ... 0x1627	0	Number of Elements	Unsigned8	rw	N	0x01	Mapping parameter of the first receive PDO; subindex 0: number of mapped objects
	1	1st mapped object	Unsigned32	rw	N	0x62000108	(2 byte index, 1 byte subindex, 1 byte bit-width)
	2	2nd mapped object	Unsigned32	rw	N	0x62000208	(2 byte index, 1 byte subindex, 1 byte bit-width)
	...	...	...	...	...	...	...
	8	8th mapped	Unsigned32	rw	N	0x62000808	(2 byte index, 1 byte subindex, 1 byte bit-width)

The reception PDOs get a default mapping automatically from the master depending on the connected modules.

Communication parameter TxPDO1

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1800 ... 0x1827	0	Number of Elements	Unsigned8	ro	N	0x05	Communication parameter of the first transmit PDO, subindex 0: number of following parameters
	1	COB-ID	Unsigned32	rw	N	0x80000180 + NODE_ID	COB-ID TxPDO1
	2	Transmission type	Unsigned8	rw	N	0xFF	Transmission type of the PDO
	3	Inhibit time	Unsigned16	rw	N	0x0000	Repetition delay [value x 100 µs]
	5	Event time	Unsigned16	rw	N	0x0000	Event timer [value x 1 ms]

Sub-index 1 (COB-ID): The lower 11Bit of the 32Bit value (Bits 0-10) contain the CAN identifier, the MSBit (Bit 31) shows if the PDO is active (1) or not (0), Bit 30 shows if a RTR access to this PDO is permitted (0) or not (1). The sub-index 2 contains the transmission type, sub-index 3 the repetition delay time between two equal PDOs. If an event timer exists with a value unequal 0, the PDO is transmitted when the timer exceeds.

If a inhibit timer exists, the event is delayed for this time.

Mapping TxPDO1

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1A00 ... 0x1A27	0	Number of Elements	Unsigned8	rw	N	depending on the components fitted	Mapping parameter of the first transmit PDO; subindex 0: number of mapped objects
	1	1st mapped object	Unsigned32	rw	N	0x60000108	(2 byte index, 1 byte subindex, 1 byte bit-width)
	2	2nd mapped object	Unsigned32	rw	N	0x60000208	(2 byte index, 1 byte subindex, 1 byte bit-width)
	...	...	...	...	...	...	...
	8	8th mapped object	Unsigned32	rw	N	0x60000808	(2 byte index, 1 byte subindex, 1 byte bit-width)

The send PDOs get a default mapping automatically from the coupler depending on the connected modules.

Concise DCF

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1F22	Array	Concise DCF	Domain	rw	N		

This object is required for the Configuration Manager. The Concise-DCF is the short form of the DCF (**D**evice **C**onfiguration **F**ile).

Post Configuration

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1F25	Array	ConfigureSlave	Unsigned32	rw	N	0x00000000	

Via this entry, the Configuration Manager can be forced to transfer a stored configuration into the net.

The configuration can be initiated for a defined node at any time via the index 0x1F25.

Subindex 0 has the value 128.

Subindex x (with x = 1..127): Starts the reconfiguration for nodes with the node ID x.

Subindex 128: reconfiguration of all nodes.

For example: If you want to initiate the configuration for node 2 and there are configuration data for this node available, you have to write the value 0x666E6F63 (ASCII = "conf") to the object 1F25h Subindex 2.

NMT Start-up

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1F80	0x00	NMTStartup	Unsigned32	rw	N	0x00000000	

Define the device as NMT master.

Bit	Meaning
Bit 0	0 Device is NOT the NMT Master. All other bits have to be ignored. The objects of the Network List have to be ignored. 1 Device is the NMT Master.
Bit 1	0 Start only explicitly assigned slaves. 1 After boot-up perform the service NMT Start Remote Node All Nodes
Bit 2..31	Reserved by CiA, always 0

Slave Assignment

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1F81	0x00	SlaveAssignment	Unsigned32	rw	N	0x00000000	

Enter the nodes that are controlled by the master. For every assigned node you need one entry.

Subindex 0 has the value 127. Every other Subindex corresponds with the Node-ID of the node.

Byte	Bit	Description
Byte 0	Bit 0	0: Node with this ID is not a slave 1: Node with this ID is a slave. After configuration (with Configuration Manager) the Node will be set to state Operational.
	Bit 1	0: On Error Control Event or other detection of a booting slave inform the application. 1: On Error Control Event or other detection of a booting slave inform the application and automatically start Error Control service.
	Bit 2	0: On Error Control Event or other detection of a booting slave do NOT automatically configure and start the slave. 1: On Error Control Event or other detection of a booting slave do start the process Start Boot Slave.
	Bit 3..7	Reserved by CiA, always 0
Byte 1		8 Bit Value for the RetryFactor
Byte 2,3		16 Bit Value for the GuardTime

Request NMT

Index	Sub-Index	Name	Type	Attr.	Map.	Default value	Meaning
0x1F82	0x00	RequestNMT	Unsigned32	rw	N	0x00000000	

If a totally automatic start of the stack is not wanted, the functionalities:

- Status change
- Start of the guarding
- Configuration via CMT

can be also executed at request for every node. The request always happens via objects in the object directory.

The switch of the communication state of all nodes in the network (including the local slaves) happens via the entry 1F82h in the local object directory:

Subindex 0 has the value 128.

Subindex x (with x=1..127): Initiates the NMT service for nodes with Node ID x.

Subindex 128: Initiates NMT service for all nodes.

At write access, the wanted state is given as value.

State	Value
Prepared	4
Operational	5
ResetNode	6
ResetCommunication	7
PreOperational	127

Request Guarding

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x1F83	0x00	RequestGuarding	Unsigned32	rw	N	0x00000000	

Subindex 0 has the value 128.

Subindex x (with x=1..127): Initiates guarding for the slave with Node ID x.

Value	Write Access	Read Access
1	Start Guarding	Slave actually is guarded
0	Stop Guarding	Slave actually is not guarded

Subindex 128: Request Start/Stop Guarding for all nodes.

8bit Digital inputs

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x6000	0x00	8bit digital input block	Unsigned8	ro	N	0x01	Number of available digital 8bit input blocks
	0x01	1st input block	Unsigned8	ro	Y		1st digital input block
	...	...	...	...	...	...	...
	0x40	64th input block	Unsigned8	ro	Y		64th digital input block

16bit Digital inputs

Index	Sub-Index	Name	Type	Attr.	Map.	Default value	Meaning
0x6100	0x00	16bit digital input block	Unsigned8	ro	N	depending on the fitted components	Number of available digital 16bit input blocks
	0x01	1st input block	Unsigned16	ro	N		1st digital input block
	...	...	...	...	...	...	...
	0x20	32nd input block	Unsigned16	ro	N		32nd digital input block

32bit Digital inputs

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x6120	0x00	32bit digital input block	Unsigned8	ro	N	depending on the compo-nents fitted	Number of available digital 32bit input blocks
	0x01	1st input block	Unsigned32	ro	N		1st digital input block
	...	...	...	...	...	...	...
	0x10	16th input block	Unsigned32	ro	N		16th digital input block

8bit Digital outputs

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x6200	0x00	8bit digital output block	Unsigned8	ro	N	0x01	Number of available digital 8bit output blocks
	0x01	1st output block	Unsigned8	rw	Y		1st digital output block
	...	...	...	...	...	...	...
	0x40	64th output block	Unsigned8	rw	Y		64th digital output block

16bit Digital outputs

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x6300	0x00	16bit digital input block	Unsigned8	ro	N	Depending on the compo-nents fitted	Number of available digital 16bit output blocks
	0x01	1st output block	Unsigned16	rw	N		1st digital output block
	...	...	...	...	...	...	...
	0x20	32nd output block	Unsigned16	rw	N		32nd digital output block

32bit Digital outputs

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0x6320	0x00	32bit digital input block	Unsigned8	ro	N	Depending on the compo-nents fitted	Number of available digital 32bit output blocks
	0x01	1st output block	Unsigned32	rw	N		1st digital output block
	...	...	...	...	...	...	...
	0x10	16th output block	Unsigned32	rw	N		16th digital output block

8bit Network input variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA040	0x00	8bit digital input block	Unsigned8	ro	N	0x01	Number of available digital 8bit input blocks
	0x01	1st input block	Unsigned8	ro	Y		1st digital input block
	...	...	...	...	...	...	...
	0x140	320th input block	Unsigned8	ro	Y		320th digital input block

16bit Network input variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA100	0x00	16bit digital input block	Unsigned8	ro	N	depending on the fitted components	Number of available digital 16bit input blocks
	0x01	1st input block	Unsigned16	ro	N		1st digital input block
	...	...	...	...	...	...	...
	0xA0	160th input block	Unsigned16	ro	N		160th digital input block

32bit Network input variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA200	0x00	32bit digital input block	Unsigned8	ro	N	depending on the compo-nents fitted	Number of available digital 32bit input blocks
	0x01	1st input block	Unsigned32	ro	N		1st digital input block
	...	...	...	...	...	...	...
	0x50	80th input block	Unsigned32	ro	N		80th digital input block

64bit Network input variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA440	0x00	64bit digital input block	Unsigned8	ro	N	depending on the compo-nents fitted	Number of available digital 64bit input blocks
	0x01	1st input block	Unsigned32	ro	N		1st digital input block
	...	...	...	...	...	...	...
	0x28	40th input block	Unsigned32	ro	N		40th digital input block

8bit Network output variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA400	0x00	8bit digital output block	Unsigned8	ro	N	0x01	Number of available digital 8bit output blocks
	0x01	1st output block	Unsigned8	rw	Y		1st digital output block
	...	...	...	...	...	...	...
	0x140	320th output block	Unsigned8	rw	Y		320th digital output block

16bit Network output variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA580	0x00	16bit digital input block	Unsigned8	ro	N	Depending on the compo-nents fitted	Number of available digital 16bit output blocks
	0x01	1st output block	Unsigned16	rw	N		1st digital output block
	...	...	...	...	...	...	...
	0xA0	160th output block	Unsigned16	rw	N		160th digital output block

32bit Network output variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA680	0x00	32bit digital input block	Unsigned8	ro	N	Depending on the compo-nents fitted	Number of available digital 32bit output blocks
	0x01	1st output block	Unsigned32	rw	N		1st digital output block
	...	...	...	...	...	...	...
	0x50	80th output block	Unsigned32	rw	N		80th digital output block

64bit Network output variables

Index	Sub-index	Name	Type	Attr.	Map.	Default value	Meaning
0xA8C0	0x00	64bit digital input block	Unsigned8	ro	N	Depending on the compo-nents fitted	Number of available digital 64bit output blocks
	0x01	1st output block	Unsigned32	rw	N		1st digital output block
	...	...	...	...	...	...	...
	0x50	40th output block	Unsigned32	rw	N		40th digital output block

SPEEDbus CANopen master - Technical data

Electrical data	VIPA 342-1CA70
Power supply	via backplane bus
Current consumption	max. 380mA
Isolation	≥ AC 500V
Status indicator	by means of LEDs located on the front
Connectors/interfaces	9pin D-type plug CAN-Bus connection
CAN-Bus interface	
Connection	9pin D-type plug
Network topology	Linear bus, active bus termination at both ends
Medium	Screened three-core cable, unscreened cable permitted - depending on environment.
Data transfer rate	10kBaud to 1MBaud
Max. overall length	1000m at 50kBaud without repeaters
Max. no. of stations	127 stations
Combination with peripheral modules	
Max. number of slaves	125
Max. number of TxPDOs	40
Max. number of RxPDOs	40
Max. number of input bytes	384
Max. number of output bytes	384
Dimensions and weight	
Dimensions (WxHxD) in mm	40x125x120
Weight	110g

SPEEDbus Interbus master - Basics

General

Interbus is a pure master/slave system that has very few protocol overheads. For this reason it is well suited for applications on the sensor/actuator level. Interbus was developed by PHOENIX CONTACT, Digital Equipment and the Technical University of Lemgo during the 80s. The first system components became available in 1988. To this day the communication protocol has remained virtually unchanged. It is therefore means that it is entirely possible to connect devices of the first generation to the most recent master interfaces (generation 4).

Interbus devices are subject to the DIN standard 19258 that defines levels 1 and 2 of the protocol amongst others.

Interbus as shift register

Interbus is based upon a ring structure that operates as a cyclic shift register. Every Interbus module inserts a shift register into the ring. The number of I/O points supported by the module determines the length of this shift register. A ring-based shift register is formed due to the fact that all the devices are connected in series and that the output of the last shift register is returned to the bus master. The length and the structure of this shift register depend on the physical construction of the entire Interbus system.

Interbus operates by means of a master-slave access method where the master also provides the link to any high-level control system. The ring-structure includes all connected devices actively in a closed communication loop.

In comparison to client-server protocols where data is only exchanged when a client receives a properly addressed command, Interbus communications is cyclic in nature and data is exchanged at constant intervals. Every data cycle addresses all devices on the bus.

Restrictions

- Max. 512 participants with 32byte I/O per station
- Up to 400m distance between 2 stations at 500kB
- Total distance up to 13km (Repeater function in every station)
- Removal res. addition of modules during runtime is not permitted
- Data consistency is secure for 1byte. To avoid inconsistencies use the *asynchronous* data exchange with consistency bit or the *interrupt controlled* synchronous pulse.

Note!

Before alterations you must disconnect the according bus coupler from voltage. Please take care to adjust the initialization in the master when changing the periphery!

Modes of operation

Interbus has two modes of operation:

- ID cycle
  An ID cycle is issued when the Interbus system is being initialized and also upon request. During the ID cycle the bus master reads the ID register of every module connected to the bus to generate the process image.
- Data cycle
  The actual transfer of data occurs during the data cycle. During the data cycle the input data from the registers of all devices is transferred to the master and the output data is transferred from the master to the devices. This is a full duplex data transfer.

ID cycle

During the ID cycle that is executed when the Interbus system is being initialized the different modules connected to the bus identify themselves with their individual functionality and the word length. When the Interbus coupler is turned on, it determines its Interbus length during the initialization phase of the bus modules and generates the respective ID code. Depending on the configuration the Interbus coupler replies with a message identifying it as an analog or a digital remote bus device with variable word length.

The Interbus ID code consists of 2byte. The MSB (byte 2) describes the length of the data words that will be transferred. The LSB (byte 1) describes the type of bus module, i.e. the type of signal and other performance criteria

Byte	Bit 7 ... Bit 0
1	Bit 1 ... Bit 0: Direction of data transfer: 00: not used 01: output 10: input 11: input/output Bit 3 ... Bit 2: terminal type Bit 7 ... Bit 4: terminal class The type and class are determined by the Interbus-Club
2	Bit 4 ... Bit 0: Data width 0 to 10 words (binary) Bit 7 ... Bit 5: reserved

Data cycle

Process data words also contain control and inspection information. This information is only transferred once at the beginning or at the end of the peripheral data of any data cycle. This is why this system is also referred to as a cumulative frame procedure.

The communication principle is independent of the type of data being transferred:

Process data that must be transferred to the periphery is stored in the output buffer of the master in the same sequence as the output stations are connected to the bus. The transfer occurs when the master shifts the "loop-back word" through the ring. Following the loop-back word, all the output data is placed on the bus.

... continue data cycle

This means that the data is shifted through the shift register. The information from the process is returned as input data to the input buffer of the master at the same time as the output data is being sent.

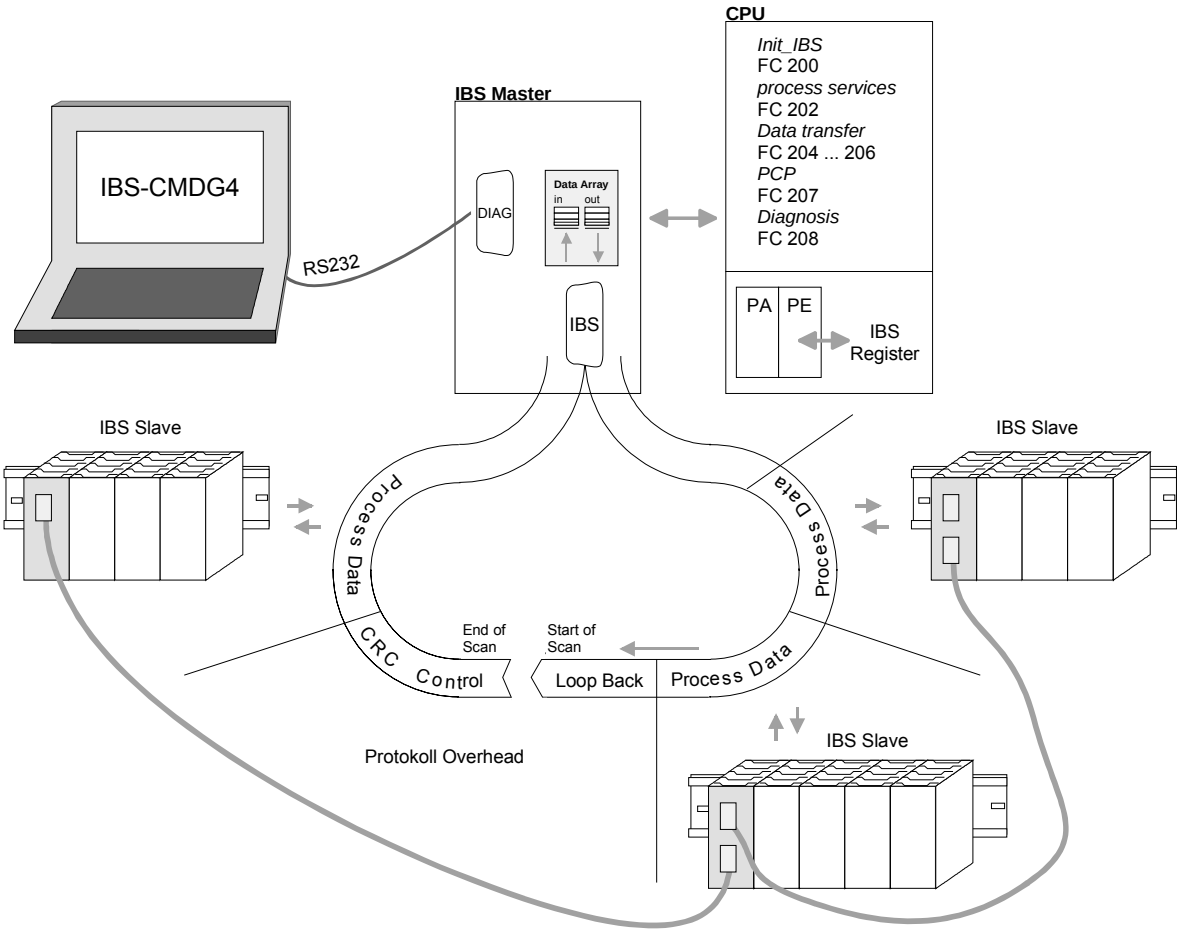
The output data is located at the correct position in the shift registers of the different stations when the entire cumulative frame telegram has been sent and read back again. At this point, the master issues a special control command to the devices on the bus to indicate the end of the data transfer cycle.

When the data check sequence has been processed, output data for the process is transferred from the shift registers. This is stored in the devices connected to the bus and transferred to the respective periphery. At the same time, new information is read from the periphery into the shift registers of the input devices in preparation for the next input cycle.

This procedure is repeated on a cyclic basis. This means that the input and output buffers of the master are also updated cyclically. Interbus data communications is therefore full duplex in nature; i.e. both input data and output data are transferred during a single data cycle.

SPEEDbus IBS master project engineering and Diagnostic

Project engineering and diagnosis at the VIPA SPEEDbus IBS master are taking place by means of FCs that you may receive from VIPA. Additionally you may access the IBS master via the serial diagnosis interface with the help of the project engineering and parameterization tool IBS-CMDG4 from Phönix Contact. After the boot sequence, the IBS master occupies in the CPU depending on the plug-in location each 34byte in the I/O address range.



SPEEDbus Interbus master - Construction

Properties

- **I**nter**b**u**s** master (IBS master) for SPEEDbus
- Up to 512 slaves connectable
- Supports PCP communication 2.0 with band widths of 1, 2 and 4 words at 62 couplers with basic functions and 127 configurable couplers.
- Diagnosis via LEDs, RS232C interface and DPM

Interbus platform

As Interbus hardware platform, the Interbus master card USC4-2 from Phönix Contact is used.

The Interbus section manages all tasks concerning network management and network diagnosis. Here the communication with the CPU happens via a **D**ual **p**ort **m**emory (DPM).

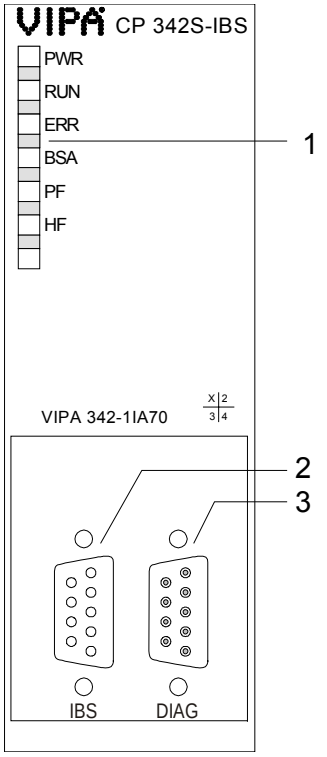
Among others, the DPM has the following interfaces for send and receive:

- SSGI (**S**tandard **Sig**nal **I**nterface) for the exchange of messages like e.g. request of services from the master
- DTA (**Data**) interface for the exchange of process data

Note!

Due to the fact that VIPA provides the same services for master and slave parameterization for this master, we refer at the according places to the extensive documentation of the services from Phönix Contact.

Front view CP 342S



[1] LED status indicators

The following components are under the front flap

[2] RS422 Interbus interface
RS232C interface for project engineering and diagnosis

Components

LEDs

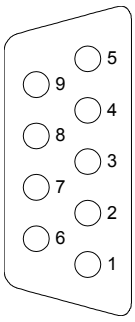
The module has a number of LEDs are available for diagnostic purposes on the bus. The following table explains the purpose and the color of the different LEDs:

Label	Color	Description
PW	green	Indicates that the supply voltage is available.
RUN	green	Shows the operating status.
		On: Interbus is ready for operation and data transfer
		Blinks: Interbus is active, bus parameters has been transferred, bus is checked
ERR	red	On at slave failure res. buss error
BSA	yellow	Signalizes that at least one segment in the subordinated bus is offline.
PF	yellow	Shows a periphery error at a subordinated bus participant.
HF	red	Error at the Interbus master

Jacks and plugs

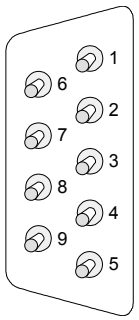
The interfaces for the inbound and the outbound bus lines are located on the front of the module. These consist of 9pin D-type connectors.

9pin D-type plug for Interbus connection



Pin	Assignment
1	DOH
2	DIH
3	GND_{iso}
4	GND
5	$+5V_{iso}$ (90 mA)
6	DOL
7	DIL
8	+5V (90 mA)
9	reserved

9pin D-type plug for diagnosis and project engineering



Pin	Assignment
1	reserved
2	TxD
3	RxD
4	reserved
5	GND
6	reserved
7	RTS
8	CTS
9	reserved

Voltage supply

The Interbus master gets its voltage supply via the SPEEDbus. Here the current consumption is max. 550mA.

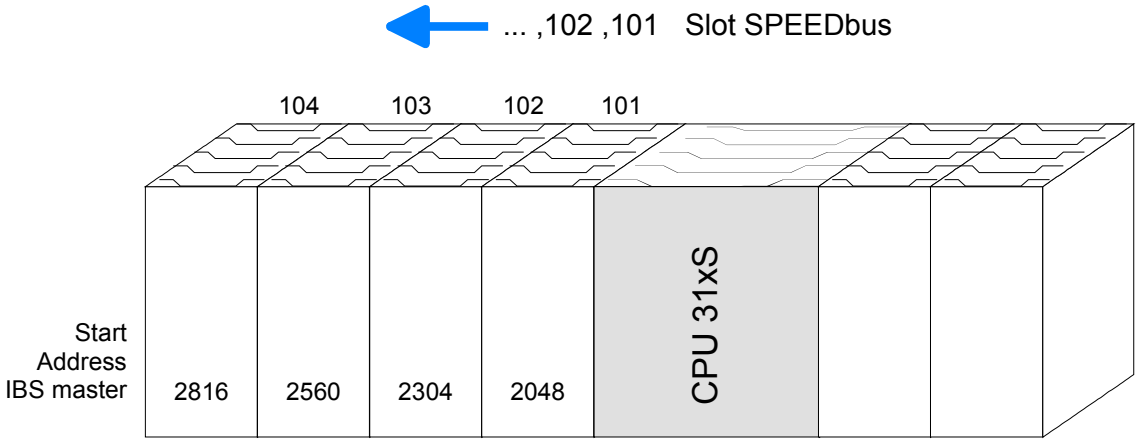
SPEEDbus Interbus master - Addressing

Outline

At the start-up of the CPU, the IBS master are, if no hardware configuration is present, automatically mapped into the address range of the CPU after the following formula:

Start address = 256· (Slot-101)+2048

Information about the plug-in location is to be found in the following table:



Alter address

To alter automatically assigned addresses, you have to execute a hardware configuration. Here you may alter the addresses at any time via a virtual Profibus system by including the speedbus.gsd. For this, click on the properties of the according IBS master module and set the wanted address.

The approach of the hardware configuration is to be found in the according chapter of this manual.

34byte register in the CPU I/O address range

Every IBS master occupies with a register a 34byte wide memory area in the I/O address range of the CPU.

A more detailed description about the register structure is to be found at the following pages.

SPEEDbus Interbus master - Register allocation

Outline

The registers have, starting with the start address LADDR, the following structure and occupy 34byte in the I/O address range of the CPU. In the following you see a description of the register elements:

Address	Assignment	Direction
LADDR	Interrupt register	CPU > Master
LADDR+1	Interrupt register	Master > CPU
LADDR+2	SSGI acknowledge	Master > CPU
LADDR+4	SSGI notification	Master > CPU
LADDR+6	SSGI result	Master > CPU
LADDR+8	SSGI status	Master > CPU
LADDR+10	SSGI start	CPU > Master
LADDR+12	reserved	-
LADDR+14	Standard function parameter register	CPU > Master
LADDR+16	Standard function start register	CPU > Master
LADDR+18	Standard function status register	Master > CPU
LADDR+20	Master diagnosis parameter register	Master > CPU
LADDR+22	Master diagnosis status register	Master > CPU
LADDR+24	reserved	-
LADDR+26	Slave diagnosis status register	Master > CPU
LADDR+28	Configuration register	Master > CPU
LADDR+30	reserved	-
LADDR+32	Status sysfail register	Master > CPU

Interrupt register CPU > Master (LADDR)

Via this register and the register "Interrupt Register Master > CPU" interrupt requests for the synchronous operating mode (FC 206 - IRQ_RW) are created.

7	6	5	4	3	2	1	0
x	x	x	x	X	x	x	x

Possible contents of the register:

APPLICATION_READY_COMMAND 0Eh

Interrupt register Master > CPU (LADDR+1)

This register serves the synchronization between CPU and IBS master during the boot sequence. Additionally it serves together with the register "Interrupt Register CPU > Master" for creation of interrupt requests for the synchronous operating mode. After Power-up-Reset and successfully finished self test, the IBS master writes the value C3h into this register.

7	6	5	4	3	2	1	0
x	x	x	x	x	x	x	x

Possible contents of the register:

MASTER_READY_COMMAND C3h

DATA_CYCLE_READY_COMMAND 10h

SSGI acknowledge Master > CPU (LADDR+2)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	x	res.	res.	res.	res.	res.	res.	res.	res.

Bit 8: Acknowledge-Bit for the message exchange via SSGI (**S**tandard **Sig**nal **I**nterface)

SSGI notification Master > CPU (LADDR+4)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	x	res.	res.	res.	res.	res.	res.	res.	res.

Bit 8: Notification-Bit for the message exchange via SSGI

SSGI result Master > CPU (LADDR+6)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	x	res.	res.	res.	res.	res.	res.	res.	x

Bit 0: Error during automatic configuration

Bit 8: Result-Bit for the message exchange via SSGI

SSGI status Master > CPU (LADDR+8)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	X	res.	res.	res.	res.	res.	res.	res.	x

Bit 0: 0: Automatic start-up is not executed at this time
1: Automatic start-up is executed at this time

Bit 8: Status-Bit for the message exchange via SSGI

SSGI start CPU > Master (LADDR+10)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	x	res.	res.	res.	res.	res.	res.	res.	x

Bit 0: 0: Automatic start-up is not executed at this time
1: Automatic start-up is executed at this time

Bit 8: Status-Bit for the message exchange via SSGI

Standard fct.-param. register CPU > Master (LADDR+14)

The register is used by the CPU for transmission of parameters for the standard functions that are activated with the standard function start register.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Standard fct. start register CPU > Master (LADDR+16)

With the help of this registers and the standard functions parameter register you may control the IBS master without using the SSGI. Several often used commands or command sequences may be executed with the two registers. This minimizes the efforts for service requests.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	x	res.	res.	res.	res.	res.	res.	res.	x	x	x	x	x	x	x

Bit 0 Start bit Start_Data_Transfer_Req
Starts the data transfer.
Precondition: IBS master is in state ACTIVE
Parameter: none

Bit 1 Start bit Alarm_Stop_Req, Activate_Configuration_Req
Interrupts the data transfer, sets the outputs of all IBS stations to "0" and activates a new configuration frame. Afterwards the IBS master is in state ACTIVE.
Parameter: Number of the configuration frame to be loaded (e.g. "1")

Bit 2 Start bit Confirm_Diagnostics_Req
This bit updates the contents of the diagnosis register and the diagnosis monitors.

Bit 3 Start bit Control_Active_Configuration_Req Off
This bit allows you to shut down INTERBUS segments.
Parameter: The segment-no. has to be stored in the higher valued byte and the position in the lower valued byte. At shut-down of a local bus participant, all stations in the according local bus are shut down. When entering a distant bus station or a bus coupler, besides of the concerning device also the continuative IBS interface is shut down and thus all further IBS stations.

Bit 4 Start bit Control_Active_Configuration_Req On
This bit re-activates IBS segments that have been shut down before.
Parameter: See Bit 3

Bit 5 Start bit Control_Active_Configuration_Req Disable
The station set as parameter is toggled in-active within the configuration frame. It may also physically not remain within the data ring and has to be bridged manually.
Parameter: The segment-no. has to be stored in the higher valued byte and the position in the lower valued byte.

Bit 6 Start bit Control_Active_Configuration_Req Enable
The station set as parameter is toggled active again within the configuration frame. It must also physically included back into the data ring.
Parameter: See Bit 5

Bit 14 Application-Busy-Bit (at bus synchronous operating mode) res. Data-Cycle-Activate-Bit (at program synchronous operating mode)

Bit 15 Cons-Activate-Bit for the consistency lock

The bits 14 and 15 serve the processing of protocols for the process data exchange between the IBS master and the CPU.

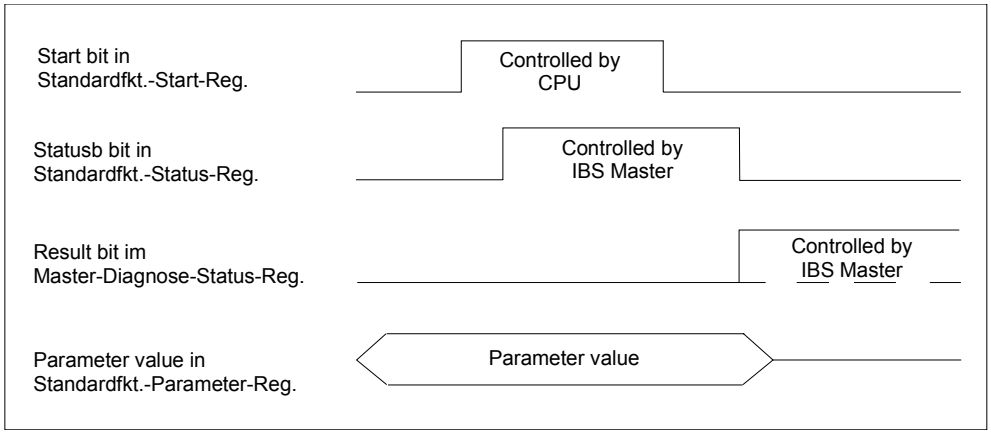
Standard fct.-status register Master > CPU (LADDR+18)

The bits 0...6 of this registers are used by the IBS master to monitor and control the processing of standard functions activated in the standard functions start register. Bit 15 serves the processing of a protocol for the process data exchange between IBS master and the CPU.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	res.	res.	res.	res.	res.	res.	res.	res.	x	x	x	x	x	x	x

Bit 0 : Status bit Start_Data_Transfer_Request
Bit 1 : Status bit Alarm_Stop_Request, Activate_Configuration_Request
Bit 2 : Status bit Confirm_Diagnostics_Request
Bit 3 : Status bit Control_Active_Configuration_Req Off
Bit 4 : Status bit Control_Active_Configuration_Req On
Bit 5 : Status bit Control_Active_Configuration_Req Disable
Bit 6 : Status bit Control_Active_Configuration_Req Enable
Bit 15: Cons-State-Bit for consistency lock

Execution of a standard function with parameter transfer



The diagram in the picture above shows the handshake mechanism at usage of the standard functions. A "0" in Bit 10 (RESULT) of the master diagnosis status register shows that the standard function has been finished successful.

Master diag. param register Master > CPU (LADDR+20)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

This register monitors depending on the type of the error the error code or the error location. The content of the register is managed by the IBS master. Some error types cause additional entries in the *Extended master diagnosis parameter register*. The contents of the extended master diagnosis parameter register is to be found as word under address 168.0 in the work DB.

Master diag status register Master > CPU (LADDR+22)

This register contains information about the state of the IBS master. The table contains the meaning of the bits when set ("1"). The content of the registers is managed by the IBS master. In case of an error additional information is available in the master diagnosis parameter register and in the extended master diagnosis parameter register.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	x	x	res.	res.	x	x	x	x	x	x	x	x	x	x	x

Bit 0 (USER)	User/Parameterization error
Bit 1 (PF)	Periphery failure
Bit 2 (BUS)	Bus failure
Bit 3 (CTRL)	Error at the IBS master
Bit 4 (DETECT)	Diagnosis routine is active
Bit 5 (RUN)	Data transfer is active
Bit 6 (ACTIVE)	Selected Interbus configuration ready for operation
Bit 7 (READY)	IBS master ready for operation
Bit 8 (BSA)	Bus segment(s) shut down
Bit 9 (BASP/SYSFAIL)	Function failure of the CPU detected; outputs at the IBS set back
Bit10 (RESULT)	Negative result of a standard function
Bit13 (WARNING)	Defined bus waiting period exceeded
Bit14 (QUALITY)	Defined error density exceeded (is set at more than 20 failures per 1 million IBS cycles)

Slave diag. status register Master > CPU (LADDR+26)

This register contains information about the state of the optional slave interface to a hierarchical super-ordinated Interbus network. The content of the register is managed by the IBS master.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	x	x	x	x	x

Bit 0 COPY
- 1 Data between IBS master and slave interface are exchanged. The super-ordinated Interbus network is operating.
- 0 No data between IBS master and slave interface are exchanged. The super-ordinated Interbus network is not operating.

Bit 1 FAIL
- 1 The super-ordinated IBS network has been stopped by a bus error or alarm. No data is exchanged with the slave interface anymore. The output data of the slave interface are set to "0".
- 0 No error in the super-ordinated Interbus network.

Bit 2 READY-TO-COPY
- 1 The parameterization of the slave interface has been finished successful.
- 0 The slave interface has not been parameterized yet.

Bit 3 POWER-ON
- 1 The power supply of the slave interface is on.
- 0 The power supply of the slave interface is off.

Bit 4 READY
- 1 The content of the slave diagnosis status register has been initialized.
- 0 The content of the slave diagnosis status register has been not yet initialized,

Configurations register Master > CPU (LADDR+28)

In this register it is monitored if the IBS master has finished a parameterization process storage initialized or from operator panel (IBS SWT CMD G4 from Phönix Contact).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	x	res.

Bit 1 : DPM-Node-Par-Ready 1

1 IBS master is parameterized.

0 IBS master is not parameterized.

If a parameterization has been stored in the parameterization memory of the IBS master, the IBS master starts the execution of the stored instructions as soon as it reaches the state READY. Bit 1 is set by the IBS master after all instructions of the parameterization memory has been processed.

Status sysfail register Master > CPU (LADDR+32)

This register shows a function failure of the CPU that may occur.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
res.	res.	res.	x	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	res.

Bit 12 : 1 function failure of the CPU.

0 no function failure of the CPU.

This bit is set by the IBS master when a function failure of the CPU is announced by the interrupt IRQHOSTL. In this case, all outputs of the Interbus stations are set to "0". Additionally the diagnosis-LED "HF" is on.

SPEEDbus Interbus master - Hardware configuration

Outline

Every module at the SPEEDbus including the CPU has to be configured as single "VIPA_SPEEDbus"-DP slave at a virtual DP master (342-5DA02 V5.0 from Siemens). For this, the inclusion of the GSD speedbus.gsd is required.

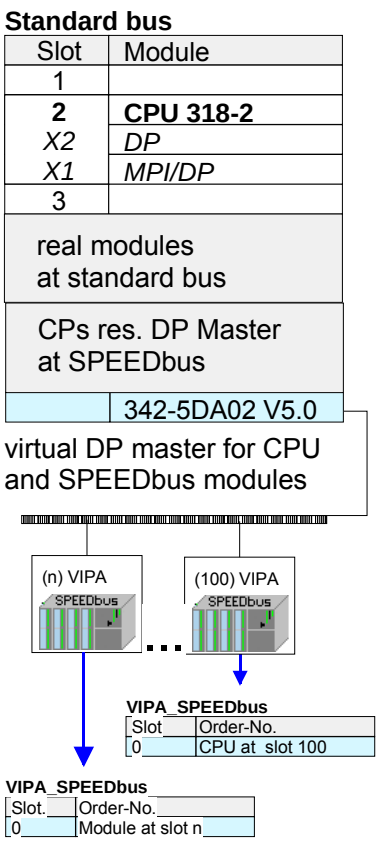
Every "VIPA_SPEEDbus"-DP slave has exactly one slot for the project engineering where the according SPEEDbus module must be placed. The assignment of a SPEEDbus slave to a SPEEDbus slot no. takes place via the Profibus address starting with 100.

Include the SPEED7-GSD-file

- Extract the delivered vipa gsd file speedbus.gsd to your gsd directory... \siemens\step7\s7data\gsd
- Start the hardware configurator from Siemens.
- Close all projects.
- Select **Options** > *Install new GSD-file.*
- Change to the directory System_300S and select the **SPEEDBUS.GSD**

The modules of the System 300S from VIPA are now included in the hardware catalog.

Approach



For the deployment of modules at the SPEEDbus the inclusion of the System 300S modules via the GSD-file from VIPA in the hardware catalog is required.

To be compatible with the SIMATIC Manager from Siemens, you have to execute the following steps:

- Start the hardware configurator from Siemens and include the speedbus.gsd for SPEED7 from VIPA.
- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens.
- Starting with slot 4, place the System 300 modules in the plugged sequence.
- Project engineering and connection of the SPEEDbus DP master at the standard bus as virtual CP 342-5 (342-5DA02 V5.0)
- For the SPEEDbus you always include, connect and parameterize to the *operating mode* DP master the DP master CP 342-5 (342-5DA02 V5.0) as last module. To this master system you assign every SPEEDbus module as IBS master. Here the Profibus address corresponds to the slot no. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.

SPEEDbus Interbus master - Project engineering

Outline

The project engineering and diagnosis happens by means of FCs that are provided under ftp.vipa.de.

At deployment of the FCs you have to create a work DB for every IBS master which the FCs use to communicate.

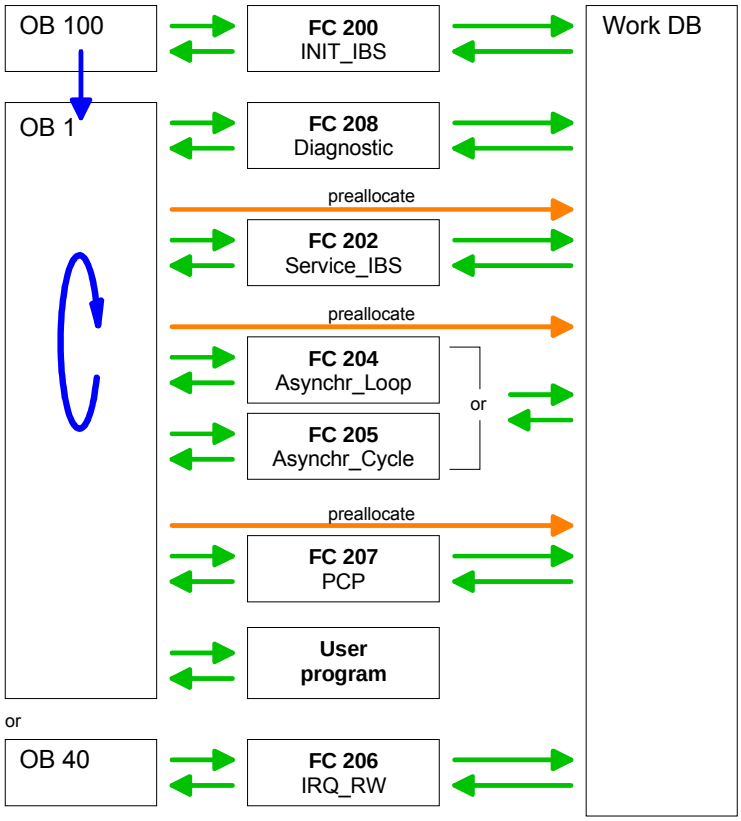
Every IBS master occupies with its register each 34byte in the in-/output address range of the CPU.

Initialization, diagnosis and data exchange between CPU and IBS master happens via "services" that are transferred by means of FCs.

For the transmission of instructions and parameters to an IBS slave, the "**P**eripherals **C**ommunication **P**rotocol" (PCP) is at your disposal where the transfer also happens with a FC.

Fast introduction

- Include IBS-FCs (ftp.vipa.de/support/library/ FX000002_Vxxx.ZIP)
- Create a work DB for every IBS master
- Build-up PLC program following this structure:



Note!

Before calling the according FCs you have to provide the work DB with parameters!

Include FCs

The VIPA specific FCs are available in a library on the ftp server from VIPA.

For the deployment of these FCs you have to import them into your project.

Approach

The following steps are required:

- Browse to ftp.vipa.de
- Load "FX000002_Vxxx.ZIP" from Support/Library
- Extract and *de-archivate* "VIPA.ZIP"
- Open library and transfer the FCs from the IBS directory to the project

De-archivate library

To de-archivate the FC library you start the SIMATIC manager from Siemens. Open a dialog window for archive selection via **File** > *De-archivate*. Choose VIPA.ZIP and click on [Open].

Set a destination directory where the blocks shall be stored. Click [OK] to start the process.

Open library and transfer FCs to project

After the extraction, start the library.

Open your project and copy the needed IBS-FCs from the library to the directory "Blocks" of your project.

Now you have access to the VIPA specific Interbus blocks via the user application.

Function blocks for IBS communication

The deployment of the IBS master at the SPEEDbus happens via the following handling blocks:

Block	Name	Description
FC 200	INIT_IBS	Registration and initialization of an Interbus master at the CPU
FC 202	Service_IBS	Service communication between CPU and IBS master
FC 204	Asynchr_Loop	Slow asynchronous data communication between CPU and IBS master (waits for master release)
FC 205	Asynchr_Cycle	Fast asynchronous data communication between CPU and IBS master (waits not for master release)
FC 206	IRQ_RW	Synchronous data communication between CPU and IBS master with synchronization via interrupt
FC 207	Service_PCP	**P**eripherals **C**ommunication **P**rotocol (PCP) communication for instructions and parameters for IBS slaves
FC 208	Diagnostic	Read diagnostic data from IBS master res. IBS slaves
SFC 254	Internal Functions	Communication block, required for usage of the FCs

Requirements

For the deployment of the handling blocks every IBS master must fulfill the following conditions:

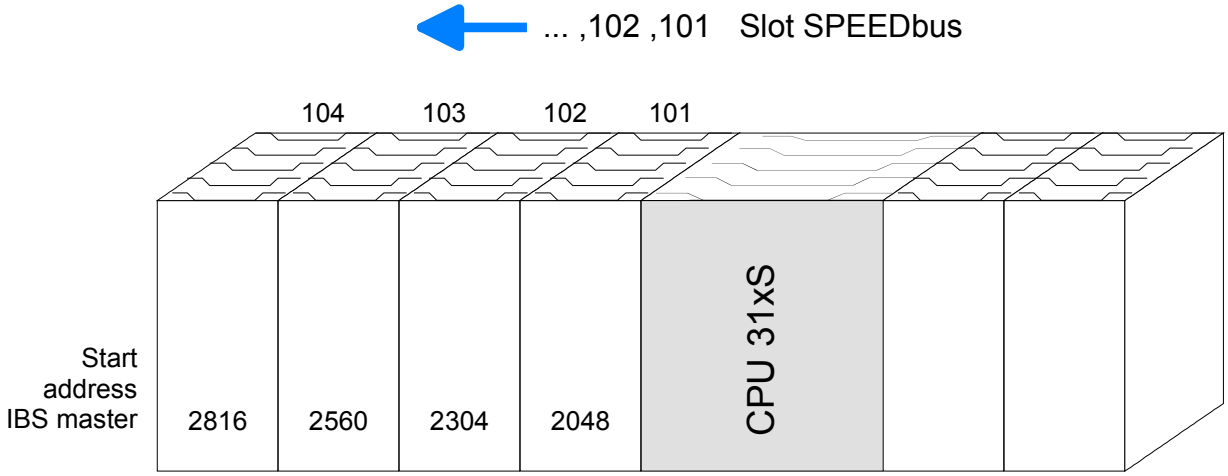
- Set start address from where on the IBS master is mapped into the address range of the CPU.
- Create work DB which the according FCs use to communicate.

Setting of the start address

The IBS masters are mapped automatically into the address range of the CPU at start-up following the formula:

Start address = 256 · (Slot-101)+2048

All information is to be found in the following illustration:



Change address

The automatical addressing is used when no hardware configuration is present.

A hardware configuration allows you to alter the addresses at any time by including the speedbus.gsd. For this click on the properties of the according IBS master module and set the wanted address.

The approach of the hardware configuration of the IBS master is to be found above under "Interbus master for SPEEDbus – Hardware configuration".

Structure of the "Work DB"

You have to create a work DB for every IBS master. You may download this DB together with a sample project in the service area of ftp.vipa.de.

The following table shows the structure of the work DB. Parameters that must be set before calling the according FC are marked gray:

Addr.	Name	Type	Comment
0.0	free	BYTE	
1.0	free_1	BYTE	
2.0	Addr_INT_Host_Mas	DWORD	Address of the interrupt Host-->Master 0xFFF
6.0	Addr_INT_Mas_Host	DWORD	Address of the interrupt Master-->Host 0xFFE
10.0	Addr_SSGI_Ack	DWORD	Address SSGI acknowledge 0xFDE
14.0	Addr_SSGI_Notif	DWORD	Address SSGI notification 0xFE0
18.0	Addr_SSGI_Result	DWORD	Address SSGI result 0xFE2
22.0	Addr_SSGI_Status	DWORD	Address SSGI status 0xFE4
26.0	Addr_SSGI_Start	DWORD	Address SSGI start 0xFE6
30.0	reserved	DWORD	
34.0	Addr_Stand_Fct_Param	DWORD	Address standard function parameter 0xFEA
38.0	Addr_Stand_Fct_Start	DWORD	Address standard function start 0xFEC
42.0	Addr_Stand_Fct_Status	DWORD	Address standard function status 0xFEE
46.0	Addr_Master_Diag_Param	DWORD	Address Master diagnosis parameter 0xFF0
50.0	Addr_Master_Diag_Status	DWORD	Address Master diagnosis status 0xFF2
54.0	reserved_2	DWORD	
58.0	Addr_Slave_Diag_Status	DWORD	Address Slave diagnosis status 0xFF6
62.0	Addr_Configuration	DWORD	Address Configuration 0xFF8
66.0	reserved_3	DWORD	
70.0	Addr_Status_Sysfail	DWORD	Address status system error 0xFFC
74.0	SSGI_Ack	WORD	Register value SSGI Acknowledge
76.0	SSGI_Notif	WORD	Register value SSGI Notification
78.0	SSGI_Result	WORD	Register value SSGI result
80.0	SSGI_Status	WORD	Register value SSGI status
82.0	SSGI_Start	WORD	Register value SSGI start
84.0	reserved_4	WORD	
86.0	Stand_Fct_Param	WORD	Register value standard function parameter
88.0	Stand_Fct_Start	WORD	Register value standard function start
90.0	Stand_Fct_Status	WORD	Register value standard function status
92.0	Master_Diag_Param	WORD	Register value Master diagnosis parameter
94.0	Master_Diag_Status	WORD	Register value Master diagnosis status
96.0	reserved_5	WORD	
98.0	Slave_Diag_Status	WORD	Register value Slave diagnosis status
100.0	Configuration	WORD	Register value Configuration
102.0	reserved_6	WORD	
104.0	Status_Sysfail	WORD	Register value status system error
106.0	Step_Counter_Service	INT	Step counter for FC 202 "process services"
108.0	RET_VALSEND_Service	WORD	Return value of the SFC 254 at send command via FC 202
110.0	RET_VALRECEIVE_Service	WORD	Return value of the SFC 254 at read command via FC202
112.0	Error_Byte_Service	BYTE	Error ID of FC 202
113.0	Number_Service_Error	BYTE	Number of the service where the error has been detected.
114.0	Return1_Function_Service	WORD	Error code 1 return value of the service
116.0	Return2_Function_Service	WORD	Error code 2 return value of the service
118.0	Number_Services	BYTE	Number of services to process for FC 202
119.0	Processed_Services	BYTE	Number of processed services
120.0	Waiting_Receipt	WORD	Interim storage of expected acknowledgement
122.0	Start_Services	BYTE	Number of service that is 1. to process
124.0	Waiting_Time	S5TIME	Waiting period for acknowledgements
126.0	Timer_No	WORD	Timer number for waiting period
128.0	Extended_Diagnosis	BYTE	Bit 0 bit memory bit when extended diagnosis requested
129.0	Additional03	BYTE	
130.0	DB_No_Write	WORD	DB_No. of output data (for FC204/FC205 if data in DB)
132.0	Start_Data_In	WORD	Address of 1st output byte (for FC 204/205)
134.0	Length_Data_In	WORD	Length of output data (for FC 204/205)
136.0	Start_Data_DPM_In	WORD	Start address of output data in DPM (for FC204/205)
138.0	DB_No_Read	WORD	DB-No. of input data (for FC 204/205 if data in DB)
140.0	Start_Data_Out	WORD	Address of 1st input byte (for FC204/205)

142.0	Length_Data_Out	WORD	Length of input data (for FC204/205)
144.0	Start_Data_DPM_Out	WORD	Start address of input data in DPM (for FC 204/205)
146.0	RET_VAL_DATEN_SEND	WORD	Return value of the SFC 254 at writing data via FC 204/205
148.0	RET_VAL_DATEN_REC	WORD	Return value of the SFC 254 at reading data via FC 204/205
150.0	Error_Data_L_S	WORD	Error byte of the FC204/FC205
152.0	Step_FC205	BYTE	Read/Write step counter I/O of FC205
153.0	Additional013	BYTE	
154.0	Step_FC208	WORD	Step counter of FC208
156.0	Order_Diag_316	WORD	Enter command for transmission (316 fix)
158.0	Parameter_Order_316	WORD	Number of parameters for command (316 fix)
160.0	Error_Service_FC208	BYTE	Error byte of the FC208
161.0	Control_bit_FC208	BYTE	Control bits of the FC208
162.0	Waiting_period_Auto	S5TIME	Waiting period at auto start after error
164.0	RET_VAL_SFC_FC208	WORD	Return value of the SFC 254 at read/write data via FC 208
166.0	Timer_FC208	WORD	Number additional timer (Number = Timer_No +1)
168.0	Extension_Diagnosis_Param	WORD	Diagnostic addition to master diagnosis parameter register
170.0	Number_Bus_Errors	INT	Error counter of all bus disruptions
172.0	Number_IBSUSC4_Errors	INT	Error counter of all IBS USC4 errors
174.0	Number_Peripherieerrors	INT	Error counter of all periphery errors
176.0	Number_User_Errors	INT	Error counter of all user errors
178.0	Order_Diag_315	WORD	Enter command for transmission (315 fix)
180.0	Parameter1_Order_315	WORD	Number of parameters for command (315 fix)
182.0	Parameter2_Order_315	WORD	Parameters for command 315
184.0	Waiting_Period_Detection	S5TIME	Waiting period for detection
186.0	Step_Counter_PCP	INT	Step counter of FC 207
188.0	RET_VALSEND_PCP	WORD	Return value of the SFC254 at send command via FC 207
190.0	RET_VALRECEIVE_PCP	WORD	Return value of the SFC254 at read command via FC 207
192.0	Error_Byte_PCP	BYTE	Error byte of the FC 207
193.0	Number_PCP_Errors	BYTE	Number of the PCP where error has been detected
194.0	DW_Counter_PCP	DWORD	Number of error codes returned from the PCP
198.0	Number_PCP	BYTE	Number of PCP to be processed for FC 207
199.0	Processed_PCP	BYTE	Number of already processed PCP
200.0	Waiting_Receipt_PCP	WORD	ID of expected acknowledgement
202.0	Start_PCP	BYTE	Number of 1st PCP to be processed
204.0	Error1_PCP	WORD	Error code 1 Return value of the PCP
. . .	. . .	. . .	. . .
218.0	Error8_PCP	WORD	Error code 8 Return value of the PCP
220.0	Address_SFC254	WORD	Module address for SFC254
222.0	Additional110	BYTE	
. . .	. . .	. . .	. . .
249.0	Additional137	BYTE	
250.0	Diagnosis_Bus_Error[1]	BYTE	Entry of extended diagnosis at bus error
. . .	. . .	. . .	. . .
299.0	Diagnosis_Bus_Error[50]	BYTE	
300.0	Diagnosis_IBSUBC4_Error[1]	BYTE	Entry of extended diagnosis at IBS UBC4 error
. . .	. . .	. . .	. . .
349.0	Diagnosis_IBSUBC4_Error[50]	BYTE	
350.0	Diagnosis_Periph_Error[1]	BYTE	Entry of extended diagnosis at periphery error
. . .	. . .	. . .	. . .
399.0	Diagnosis_Periph_Error[50]	BYTE	
400.0	Diagnosis_USER_Error[1]	BYTE	Entry of extended diagnosis at user error
. . .	. . .	. . .	. . .
449.0	Diagnosis_USER_Error[50]	BYTE	

Program structure

The Interbus functions have to be called at boot of the CPU and in the cyclic program by means of conditional or absolute jumps.

You have to include the FC 200 in the boot sequence. This FC synchronizes the IBS master with the CPU and checks the structure of the connected in- and output bytes as well as the bus structure.

Via the FC 208 you may read diagnostic data of the master res. the slaves in the cyclic program. This block also sets the starting type of the IBS master after an error.

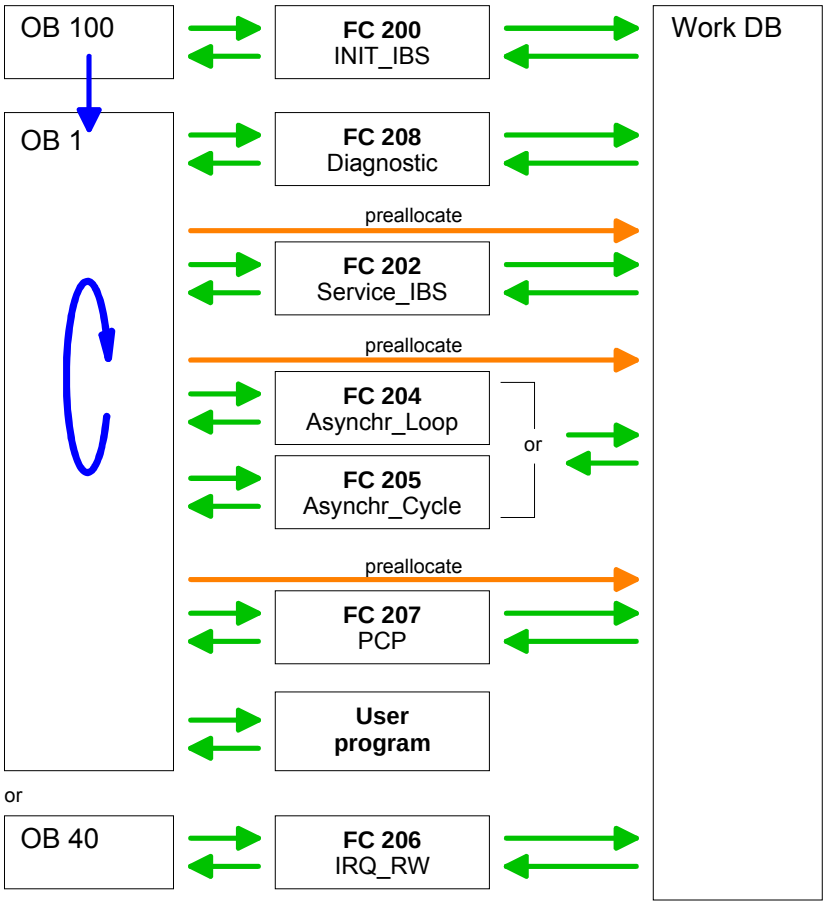
You may parameterize the IBS master via the FC 202. For this you have to transmit a DB that may contain up to 30 service instructions. Before this you must enter the number of services in the work DB under "Number_services".

By calling FC 204 or FC 205 the asynchronous data exchange between IBS master and the CPU starts. Both FCs have the same request parameters. The FC 204 waits after the data request for the data release of the IBS master and then continues the cycle process. In opposite to FC 204, the FC 205 does not wait. As long as no data release is present, it continues the cycle processing. Thus the cycle processing of the CPU is not interrupted.

You may also synchronize the data transfer by using the FC 206 instead and call this within a HW-Interrupt-OB. Here the IBS master announces new data via an interrupt. Reading of data by the CPU is also signalized via an interrupt.

User application

Your user application should have the following structure:



Function blocks

In the following you will find a more detailed description of the function blocks that are required for the Interbus communication.

FC 200
INIT_IBS

This FC synchronizes the IBS master with the CPU and checks the number of connected in- and output bytes as well as the bus structure.

FC 200

Declaration	Name	Type	Comment
in	Work_DB	Block_DB	IBS work DB
in	LADDR	INT	Logical address of IBS master
in	Mode	INT	Mode for operation
in	Wait_Time	S5TIME	Wait time for IBS Master receipt
in	Timer_No	INT	Timer No. for wait time
in	Service_DB_Send	INT	DB No. with services
in	Service_DB_Rec	INT	DB No. with service receipts
in	No_of_Services	Word	No. of services to be processed
in	Read_Diag	BOOL	Read Diagnostic data
out	Ret_Val	WORD	Return value of error number
in_out	First_Service	BYTE	No of 1st service to be processed

Work_DB

Set the work DB for the wanted master.

LADDR

Set the address (**L**ogical **Addr**ess) from where on the register of the masters is to be mapped into the CPU. At start-up of the CPU, the IBS master are mapped into the I/O address range of the CPU with the following formula if no hardware configuration is present:

Start address = 256· (Slot-101)+2048

The slot numbering at the SPEEDbus starts with 101 at the left side of the CPU and ascends from the right to the left. For example, the 1st slot has the address 2048, the 2nd the address 2304 etc.

Mode

This parameter allows you to preset 3 modes for start-up:

0 = Calculate address only

1 = Calculate address and wait for Ready of the IBS master

2 = Calculate address, parameterize and start IBS master

3 = Calculate address and automatical start of Interbus after auto-configuration via switch

Wait_Time
Timer_No

Here you may define a waiting period with the according timer by setting Wait_Time and Timer-No that the CPU has to wait for a master acknowledgement after a service command.

Note!

Please regard at setting a timer-No. That always 2 sequential timers are used:

Timer 1: Timer_No, Timer 2: Timer_No + 1

Service_DB_Send
Service_DB_Rec

Enter the DB that contains the according service instructions via Service_DB_Send. In Service_DB_Rec the IBS master returns the receipt.

More details about the structure of the service DB are to be found on the following page under "FC 202 Process service".

No_of_Services
First_Service

In No_of_Services you enter the number of services that have to be processed in the service DB after the 1st service that you set in First_Service.

Read_Diag

This parameter allows you to influence the structure of a diagnosis:

0 = Normal diagnosis

1 = Extended diagnosis

Ret_Val

In case of an error, Ret_Val may contain the following error messages:

1 = Waiting period for master receipt (READY) exceeded - master not ready

2 = Execution of a service to process has failed

FC 202 Service_IBS

This function block allows you to transfer services to the IBS master and to react to the according acknowledgements.

For the Interbus master card USC4-1 from Phönix Contact is deployed as Interbus hardware platform, please also refer to the extensive documentation (IBS SYS FW G4 UM) from Phönix Contact for the description of the IBS services and IBS error messages.

FC 202

Declaration	Name	Type	Comment
in	Work_DB	Block_DB	IBS work DB
in	Service_DB_Send	INT	DB No. with services
in	Service_DB_Rec	INT	DB No. with service receipts
in	First_Service	Byte	No of 1st service to be processed
in_out	Start	BOOL	Start bit of the function
in_out	Error	BOOL	Error bit of the function

Work_DB

Set the work DB for the wanted master.

Service_DB_Send
Service_DB_Rec

Enter the DB that contains the according service instructions via Service_DB_Send. In Service_DB_Rec the IBS master returns the receipt.

First_Service

Enter the position of the first service within the send DB.

Note!

Please regard that you have to enter the number of services that are to be transferred after First_Service in the work DB before calling the FC 202.

Structure service DB

You may enter a max. of 30 services in one DB. Up to 2 DBs, 60 services in total, may be transferred to the IBS master at every FC call.

DBB	Contents
0 ... 69	Record set 1
70 ... 139	Record set 2
.	.
.	.
.	.
2030 ... 2099	Record set 30
2100	Instruction no. 2nd DB

Structure record set

DBW	Contents
0	Send length (Number of bytes to be send)
1	Code No. of service
2	Parameter count
3 ... 68	Parameter

Start

By setting the start bit, the services are transferred to the IBS master and started.

Error

In case of an error, the start bit is set back and the error bit is set. Additionally, the number of the service that has been processed when the error occurred is entered in the DBB 113 of the work DB. The error code is displayed in DBB 112.

The following error codes may occur:

2 = Error of the master at reading data from SSGI Box

3 = Return code of the acknowledgement not valid

4 = Service could not be processed

5 = No acknowledgement within waiting period

Note!

If DBB 112 contains the error code 4, further error codes are entered into DBW 114 and 116 of the work DB.

Information about these error codes is to be found in the documentation of the services (IBS SYS FW G4 UM) from Phönix Contact.

FC 204 Asynchr_Loop
FC 205 Asynchr_Cycle

The FC 204 serves the exchange of in- and output data between IBS master and CPU. This block always awaits an acknowledgement of the master after a data request and continues the cycle processing only after reception.

If this block influences the cycle processing of the CPU too much, you should use the FC 205 "Asynchr_Cycle" instead. In opposite to the FC 204 this does not wait for an acknowledgement but continues cycle processing after data request.

Occurring error messages are to be found after block processing in the work DB in DBW150.

FC 204/205

Declaration	Name	Type	Comment
in	Work_DB	Block_DB	IBS work DB
in	RW_Mode	INT	Mode of R/W (0=R/W, 1=R, 2=W)
in	Operation_Mode	INT	Operation mode (0=asynchr, 1=asynchr. with consistency)
in	Typ_Out	INT	Data type of IBS slave out data (0=DB, 1=MB, 2=OB)
in	Typ_In	INT	Data type of IBS slave in data (0=DB, 1=MB, 2=IB)
in_out	Start	BOOL	Start bit of the function

Work_DB

Set the work DB for the wanted master.

RW_Mode

The following modes are available:

0 = Read input data and write output data

1 = Read input data only

2 = Write output data only

Operating_Mode

The transfer may happen with the following operating modes:

0 = Asynchronous data exchange without consistency lock

In this operating mode it may happen that read res. written data is not out of the same Interbus cycle and is therefore inconsistent.

1 = Asynchronous data exchange with consistency lock

Here the CPU sets a bit for read/write request. As soon as the next Interbus cycle is finished and data is ready, the IBS master sets a release bit. The CPU transfers its data and signalizes the end of data transfer by setting back the request. Now the IBS master deletes the release and continues the Interbus cycle.

Typ_Out
Typ_In

This parameter defines the type of the data area where the I/O data of connected IBS slaves is stored.

The following types are available:

0 = DB (data block)

1 = MB (bit memory byte)

2 = I/O range of the CPU

Start

By setting the start bit, the FC is executed. The start is set back again in the block.

Error message

During the execution of the block, the following errors that are stored in DBW 150 of the work DB may occur:

1 = Data release of the master missing – read inputs

2 = Data release of the master missing – write outputs

3 = Data release of the masters is not deleted

FC 206
IRQ_RW

At deployment of the FC 206, the data transfer of the in- and output data between CPU and IBS master is controlled via interrupts.

As soon as the IBS master has provided its data, it initializes an interrupt. The CPU transfers its data and also signalizes the end of the data transfer via an interrupt. Now the IBS master continues the Interbus cycle.

FC 206

Declaration	Name	Type	Comment
in	Work_DB	Block_DB	IBS work DB
in	RW_Mode	INT	Mode of R/W (0=R/W, 1=R, 2=W)
in	Typ_Out	INT	Data type of IBS slave out data (0=DB, 1=MB, 2=OB)
in	Typ_In	INT	Data type of IBS slave in data (0=DB, 1=MB, 2=IB)

Work_DB

Set the work DB for the wanted.

RW_Mode

The following modes are available:

0 = Read input data and write output data

1 = Read input data only

2 = Write output data only

Typ_Out
Typ_In

This parameter defines the type of the data area where the I/O data of connected IBS slaves is stored.

The following types are available:

0 = DB (data block)

1 = MB (bit memory byte)

2 = I/O range of the CPU

FC 207
Service_PCP

This function block allows you to transfer PCP services to the IBS master and to react to the according acknowledgements. The **P**eripherals **C**ommunication **P**rotocol (PCP) serves the transmission of instructions and parameters to connected slaves and the reception of acknowledgements and data of the slaves.

Information about the services is to be found in the documentation of the services, available via our application department.

FC 207

Declaration	Name	Type	Comment
in	Work_DB	Block_DB	IBS work DB
in	Service_DB_Send	INT	DB No. with services
in	Service_DB_Rec	INT	DB No. with service receipts
in	First_Service	Byte	No of 1st service to be processed
in_out	Start	BOOL	Start bit of the function
in_out	Error	BOOL	Error bit of the function

Work_DB — Set the work DB for the wanted master.

Service_DB_Send
Service_DB_Rec — Enter the DB that contains the according PCP service instructions via Service_DB_Send. In Service_DB_Rec the slaves return the receipt.

First_Service — Enter the position of the first PCP service within the send.

Note!

Please regard that you have to enter the number of services that are to be transferred after First_Service in the work DB before calling the FC 207.

Structure service DB

You may enter a max. of 30 PCP services in one DB. Up to 2 DBs, 60 PCP services in total, may be transferred to the IBS master at every FC call.

DBB	Content
0 ... 69	Record set 1
70 ... 139	Record set 2
.	.
.	.
.	.
2030 ... 2099	Record set 30
2100	Sequence no. of 2nd DB

Structure record set

DBW	Content
0	Send length (Number of bytes to be send)
1	Code No. of PCP service
2	Parameter count
3 ... 68	Parameter

Start

By setting the start bit, the PCP services are transferred to the IBS master and started.

Error

In case of an error, the start bit is set back and the error bit is set. Additionally, the number of the PCP service that has been processed when the error occurred is entered in the DBB 193. The following error codes may be entered into DBB192:

2 = Error of the master at reading data from SSGI Box

3 = Return code of the acknowledgement not valid

4 = Service could not be processed

5 = No acknowledgement within waiting period

Note!

If Error contains the error code 4, further error codes are entered into DBW 194 and 196 of the work DB.

Information about these error codes is to be found in the documentation of the error codes, available via our application department.

FC 208 Diagnostic

Via this function block you may read diagnostic data from the master res. slave in case of an Interbus break-down. Here you may also define the reboot operating mode of the IBS master after break-down.

FC 208

Declaration	Name	Type	Comment
in	Work_DB	Block_DB	IBS work DB
in	Activate	INT	Manual error receipt
in	Auto_Start	INT	Automatic error receipt
out	Run	Byte	IBS at status RUN
out	Peripheral_Error	BOOL	Error at periphery
out	Bus_Quality	BOOL	Sporadic bus errors occurred
out	Detection	BOOL	Bus error is searched
out	Busy_State	BOOL	Diagnostic function is busy

Work_DB

Set the work DB for the wanted master.

Activate
Auto_Start

The *Activate* transmission parameter of the type Boolean that you may control for example via an external caliper, allows you to reboot the IBS master by setting (push button).

By setting of auto-start, the IBS master reboots automatically after error recovering. *Auto-Start* has always preference before *Activate*.

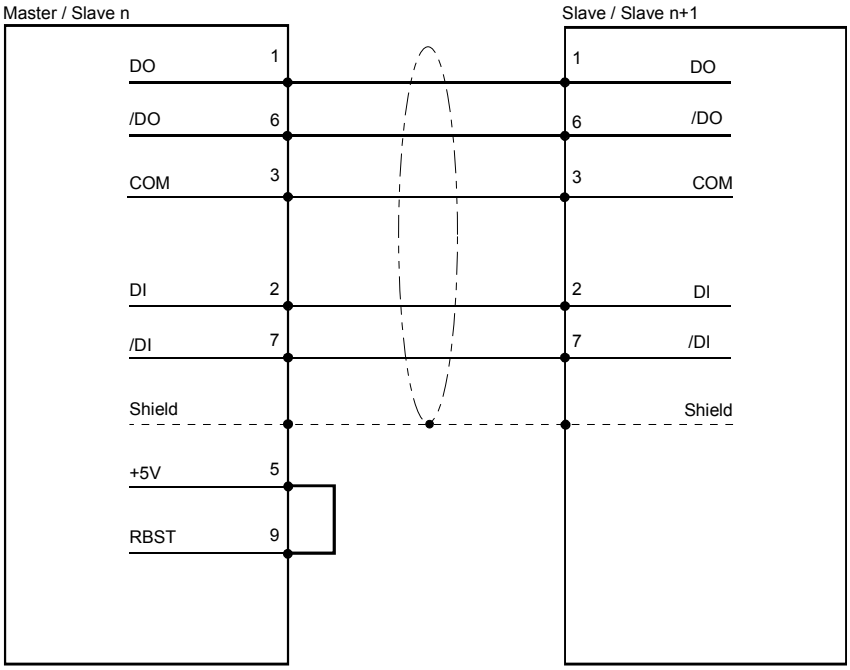
RUN	This parameter shows the status of the IBS master: 0 = IBS master is in STOP 1 = IBS master is in RUN
Peripheral_Error	If an periphery error occurs, the IBS master announces PF = 1. At PF = 0 no periphery error occurred. In case of an error you will see the number of the causing slave in the work DB starting with 1.
Bus_Quality	This parameter displays information about the transfer quality within the Interbus. As soon as the bit is set by the IBS master, some single transmission interferences have occurred. Please check the transfer routes with according diagnosis software.
Detection	The parameter *Detection* is set by the IBS master when the internal error detection is running. When the error detection is finished, *Detection* is set back again.
Busy_State	When a diagnosis is executed within the diagnosis block, *Busy_State* is set. As soon as diagnosis data are available, the block sets *Busy_State* back again.

SPEEDbus Interbus master - Connection

Cabling with Interbus

Although Interbus is substantial build-up in line structure (only one line from the master to the last module) it is in principle a ring structure where the for- and backwards conductor are together in one lead. The ring is closed by the last participant. The most devices are closing the ring automatically when no continuative lead is connected.

For master-slave and slave-slave connection the same connection cable is used. Due to the ring structure and the common logic ground, the cable consists of 5 cores and has the following assignment:



Potential separation

For Interbus distant bus segments cover a wide volume expansion, the single segments must be galvanically separated to avoid potential procrastination. According to the recommendation of the Interbus-Club, a galvanically separation of the incoming distant bus interface from the rest of the control is sufficient. The continuative distant bus interface is thus at the potential of the rest control and the backplane bus.

Please use metal plug casings and put the cable screen on the plug casing.

Note!

Please take care that the plug for the „continuative interface" has a bridge between Pin 5 and 9, otherwise the following slaves are not recognized!

SPEEDbus Interbus master - Example

Outline

The following sample shall illustrate a communication between a SPEEDbus-IBS master and a connected IBS slave.

You may find the example at ftp.vipa.de under *service* as "Ibs_pr_1.zip". After the download you may load the zip file as project into the SIMATIC Manager from Siemens via **File** > *De-archivate*.

Properties

The sample project provides the following features:

- Appropriate for deployment at a VIPA IBS master CP 342S-IBS
- The sample does not include a hardware configuration. The addressing of the IBS master happens automatically. The IBS master must be at the 1st slot at the SPEEDbus for it works with module address 2048. Otherwise you have to adjust the LADDR parameter for the FC 202 accordingly.
- For the IBS configuration is newly detected at reboot, the number of connected IBS slaves is irrelevant.
- During the hardware configuration the CPU receives the IP address 172.16.129.71. With this IP address you may access the CPU online via the internal Ethernet interface. Please regard here that you have to adjust the IP address accordingly if you are working with another number circle.

Program structure

For the program has comment at according lines, here you will only find the basic structure.

OB 100
Boot/Reboot

- Presetting of services for automatic start.
  Service 1303h Stop bus
  Service 0710h Read configuration automatically
  Service 0701h Start bus communication (Master→Slave)
- Call function for initialization of the master
- Set control bit for cyclical reading
- Set control bit for automatical start after error

OB 1

Call FC 1000

OB 40

Call sample at interrupt controlled data transfer

FC 1000 Master processing

- Read diagnosis
- Detect status IBS master (RUN/STOP)
- Call the function for service processing
- Preset data in work DB (DB 120) for read and write accesses of the IBS I/Os
- Read and write IBS I/Os
- Initialize again read and write

DB 10, UDT1, DB 11

For every service, an entry of the type „service“ is to be found in *DB10*. The data type of "service" is defined under *UDT1*.

DB 11

Acknowledgement DB is the DB 11.

DB 110

If you want to transfer more than 30 services, you may set a pointer to another service DB in DB 10 (here DB 110).

This is monitored in OB 100.

SFC 254

The SFC 254 is required for the communication between CPU and IBS master. The call of the SFC 254 happens from IBS-FCs (FC 200 ... FC 208).

SFC 1

The system block SFC 1 is automatically created when you call the FC 208 "Diagnostic".

SPEEDbus Interbus master - Technical data

Electrical data	VIPA 342-1IA70	
Power supply	via backplane bus	
Current consumption	max. 550mA	
Isolation	≥ AC 500V	
Status indicators	via LEDs on the front	
Connections/interfaces	9pin D-type socket	Interbus connector
	9pin D-type plug	Diagnosis interface
Profibus interface		
Connection	9pin D-type socket	
Network topology	Linear with integrated return circuit	
Medium	Screened twisted pair cable	
Data transfer rate	500kBaud	
Total length	12.8km (400m between 2 stations)	
Max. no. of stations	512	
Combination with peripheral modules		
max. no of slaves	512	
max. no. of input bytes	32byte each station	
max. no. of output bytes	32byte each station	
Dimensions and weight		
Dimensions (WxHxD) in mm	40x125x120	
Weight	100g	

Chapter 9 Fast I/O modules - SPEEDbus

Outline

Content of this chapter is the structure and the functionality of the fast digital SPEEDbus modules from VIPA.

The modules can only be used at SPEEDbus slots at the left side of the CPU.

The following text describes:

- System overview of "Fast" I/O modules
- Properties
- Structure
- Circuit and schematic diagram
- Technical data

Content

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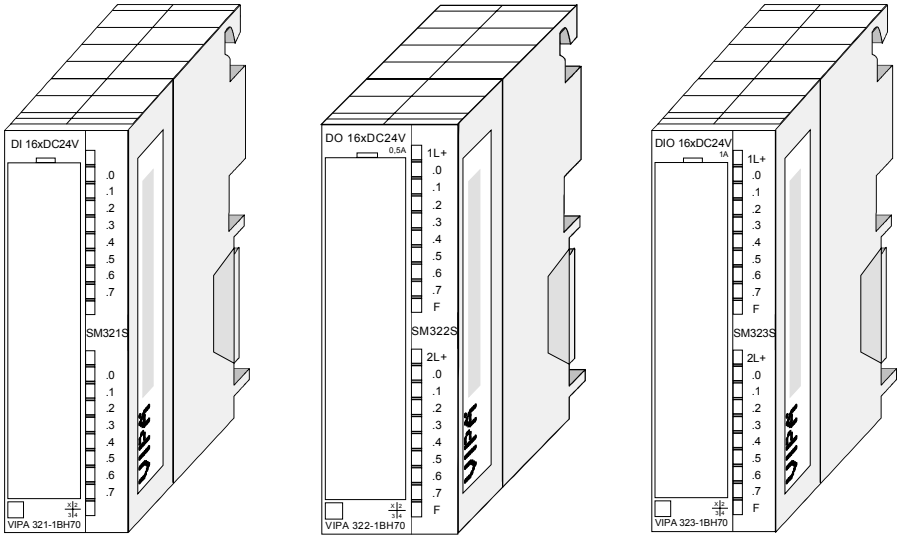
System overview digital Fast I/O modules

I/O modules for SPEEDbus

- SM 321S Fast Digital Input DI 16xDC 24V for SPEEDbus
- SM 322S Fast Digital Output DO 16xDC 24V 0.5A for SPEEDbus
- SM 323S Fast Digital Input/Output DIO 16xDC 24V 0.5A for SPEEDbus



Order data I/O modules

Type	Order No.	Page
DI 16xDC 24V	VIPA 321-1BH70	9-9
DO 16xDC 24V 0.5A	VIPA 322-1BH70	9-19
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Security hint for DIO modules

Attention!

Please regard that the voltage applied to an output channel must be ≤ the voltage supply applied to L+.

Due to the parallel connection of in- and output channel per group, a set output channel may be supplied via an applied input signal.

Thus, a set output remains active even at power-off of the voltage supply with the applied input signal.

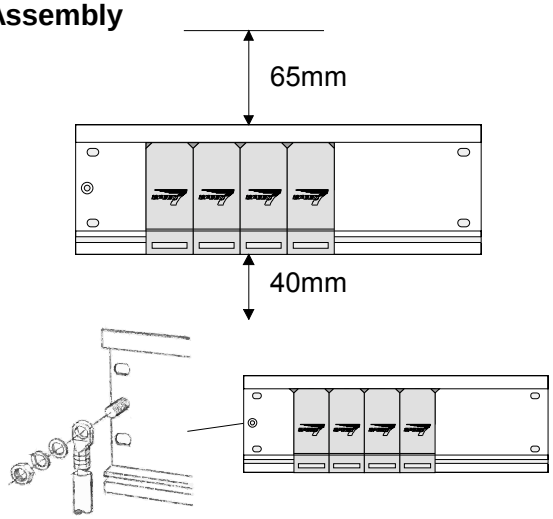
Non-observance may cause module demolition.

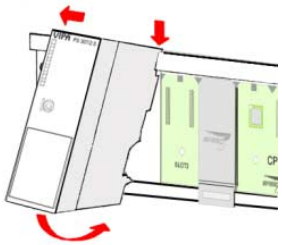
Assembly SPEEDbus

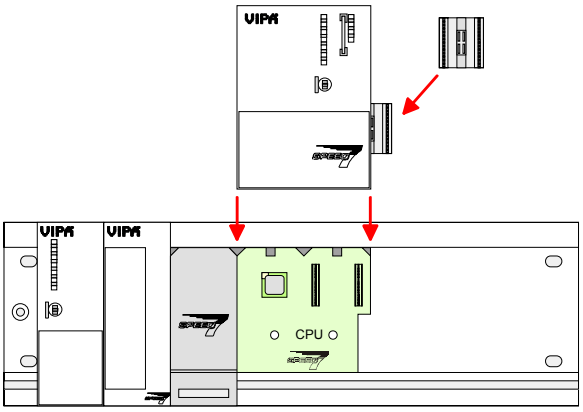
Pre-converted SPEEDbus profile rail

For the employment of SPEEDbus modules a pre-converted SPEEDbus trailing socket required. This is available ready mounted on a profile rail with 2, 6, 10 or 16 extension sockets.

Assembly







- At the assembly, please regard the permissible environment temperatures:
  - horizontal assembly: 0 to 60°C
  - vertical assembly: 0 to 40°C
- Install the profile rail so that at least 65mm space are left above and 40mm below.
- Take care for a low-impedance connection between profile rail and subsoil and connect the profile rail with the ground wire via the dowel pin (min. 10mm^2) .
- Mount the power supply left of the SPEEDbus.
- To install SPEEDbus modules you put them between the triangular positioning helps of a slot labeled with "SLOT ..." and push them downwards.
- Only "SLOT1 DCDC" allows to mount either a SPEEDbus module or another additional power supply.
- If also standard modules shall be plugged, take a bus connector and stick it like shown to the CPU from the backside. When operating the SPEED7-CPU exclusively at the SPEEDbus this is not required.
- Put the CPU like shown between the triangular positioning helps of the slot labeled with "CPU SPEED7" and push it downward.
- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.

Danger!

The power supplies must be released before installation and repair tasks!

Automatic Addressing at SPEEDbus

Overview

To provide specific addressing of the installed peripheral modules, certain addresses must be allocated in the CPU.

With no hardware configuration present, the CPU assigns automatically peripheral I/O addresses during boot procedure depending on the plug-in location amongst others also for plugged modules at the SPEEDbus.

Up to 32 modules in one row

In the hardware configurator from Siemens you may parameterize maximum up to 8 modules per row. At employment of SPEED7-CPUs you may control up to 32 modules at the standard bus and 16 further modules at the SPEEDbus. CPs and DP masters that are additionally virtual configured at the standard bus are taken into the count of 32 modules at the standard bus.

For the project engineering of more than 8 modules you may use virtual line interface connections. For this you set in the hardware configurator the module IM 360 from the hardware catalog to slot 3 of your 1st profile rail. Now you may extend your system with up to 3 profile rails by starting each with a IM 361 from Siemens at slot 3.

Automatic addressing

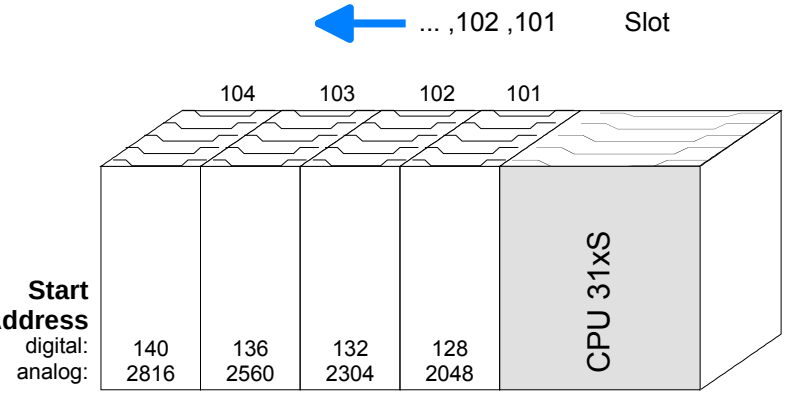
You may access the modules with read res. write accesses to the peripheral bytes or the process image.

At the automatic address allocation DIOs occupy depending on the slot location always 4Byte and AIOs, FMs, CPs always 16Byte at the standard bus and 256Byte at the SPEEDbus.

Depending on the slot location the start address from where on the according module is stored in the address range is calculated with the following formulas:

DIOs: Start address = 4·(slot -101)+128

AIOs, FMs, CPs: Start address = 256·(slot -101)+2048



Alter address allocation by project engineering

To alter automatically assigned addresses you have to create a hardware configuration. Here you may alter addresses at any time via a virtual Profibus system by including the speedbus.gsd. For this, click on the properties of the according module and set the wanted address.

Project engineering

Outline

Every module at the SPEEDbus including the CPU has to be configured as single "VIPA_SPEEDbus"-DP slave at a virtual DP master (342-5DA02 V5.0 from Siemens). For this you have to include the GSD speedbus.gsd.

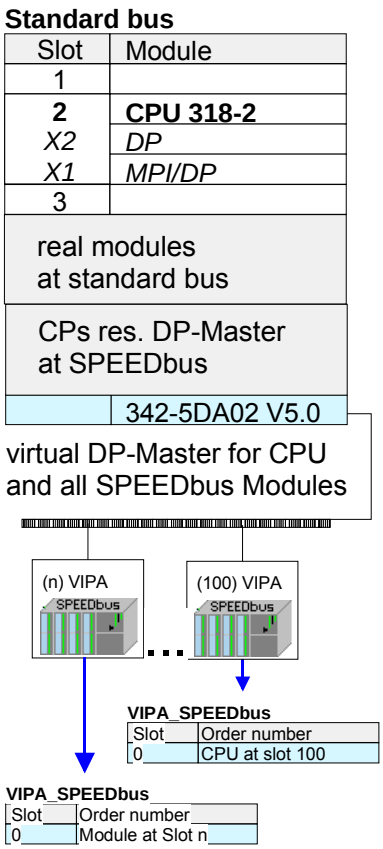
Every "VIPA_SPEEDbus"-DP slave has exactly one plug-in location for the project engineering where you must place the according SPEEDbus module. The assignment of a SPEEDbus slaves to a SPEEDbus slot no. takes place via the Profibus address starting with 100.

Fast introduction

For the employment of the I/O modules at the SPEEDbus the inclusion via the GSD-file from VIPA in the hardware catalog is required.

To be compatible with the STEP®7 project engineering tool from Siemens, you have to execute the following steps:

- Start the hardware configurator from Siemens and include the speedbus.gsd for SPEED7 from VIPA.
- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens.
- Starting with slot 4, place the System 300 modules in the plugged sequence.
- Project engineering and connection of the SPEEDbus-CPs res. –DP master at the standard bus as virtual CP 343-1 (343-1EX11) res. CP 342-5 (342-5DA02 V5.0)
- For the SPEEDbus you always include, connect and parameterize to the *operating mode* DP master the DP master CP 342-5 (342-5DA02 V5.0) as last module. To this master system you assign every SPEEDbus module as VIPA_SPEEDbus slave. Here the Profibus address corresponds to the slot no. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.



Preconditions

The hardware configurator is part of the SIMATIC manager from Siemens. It serves the project engineering. The modules that may configured here are listed in the hardware catalog.

For the employment of the System 300S modules at the SPEEDbus you have to include the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA.

Note!

For the project engineering, a thorough knowledge of the SIMATIC manager and the hardware configurator from Siemens is required!

Include the SPEED7-GSD-file

- Browse to www.vipa.de > Service > Download > GSD- and EDS-Files > Profibus and select the file *Cx000023_Vxxx*.
- Extract the file to your work directory. The SPEEDbus.gsd is stored in the directory System_300S.
- Start the hardware configurator from Siemens.
- Close all projects.
- Select **Options** > *Install new GSD-file.*
- Change to the directory System_300S and select the **SPEEDBUS.GSD**

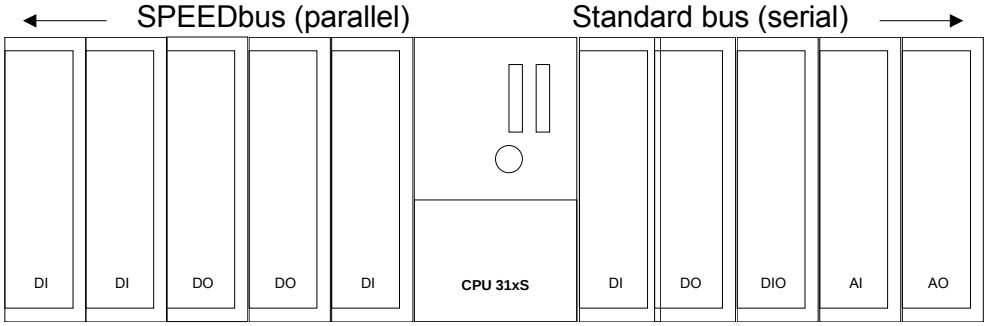
The modules of the System 300S from VIPA are now included in the hardware catalog under
Profibus-DP / Additional field devices / I/O / VIPA_SPEEDbus.

Steps of project engineering

The following text describes the approach of the project engineering in the hardware configurator from Siemens at an abstract sample.

The project engineering is separated into following parts:

- Project engineering of the modules at the standard bus
- Project engineering of the SPEEDbus modules in a virtual master system (speedbus.gsd required)



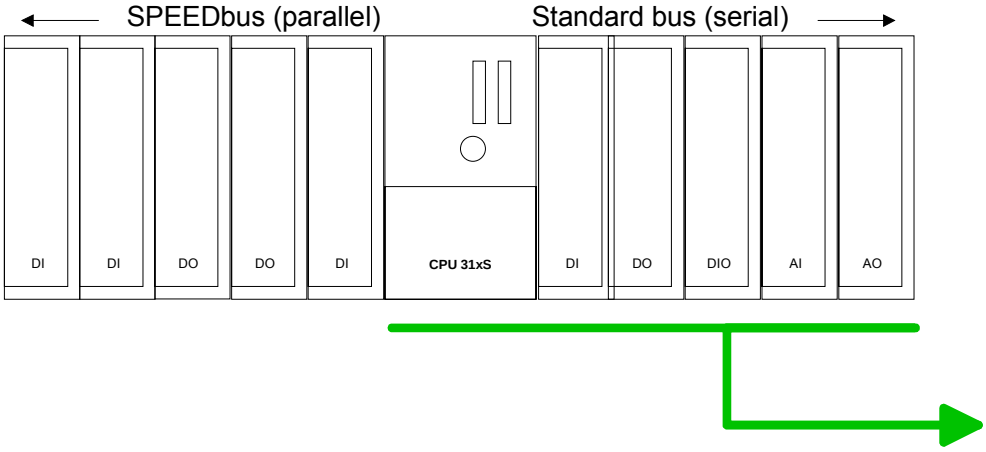
Preconditions

For the employment of the System 300S modules at the SPEEDbus you have to include the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA.

Project engineering of the modules at the standard bus

The modules at the right side of the CPU at the standard bus are configured with the following approach:

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.
- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)
- Include your System 300V modules at the standard bus in the plugged sequence starting with slot 4.
- Parameterize the CPU res. the modules where appropriate. The parameter window opens by a double click on the according module.
- To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.
- Save your project.



Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO

Note!

To extend the bus you may use the IM 360 from Siemens where you can connect up to 3 further extension racks via the IM 361. Bus extensions are always placed at slot 3.

Project engineering of all SPEEDbus modules in a virtual master system

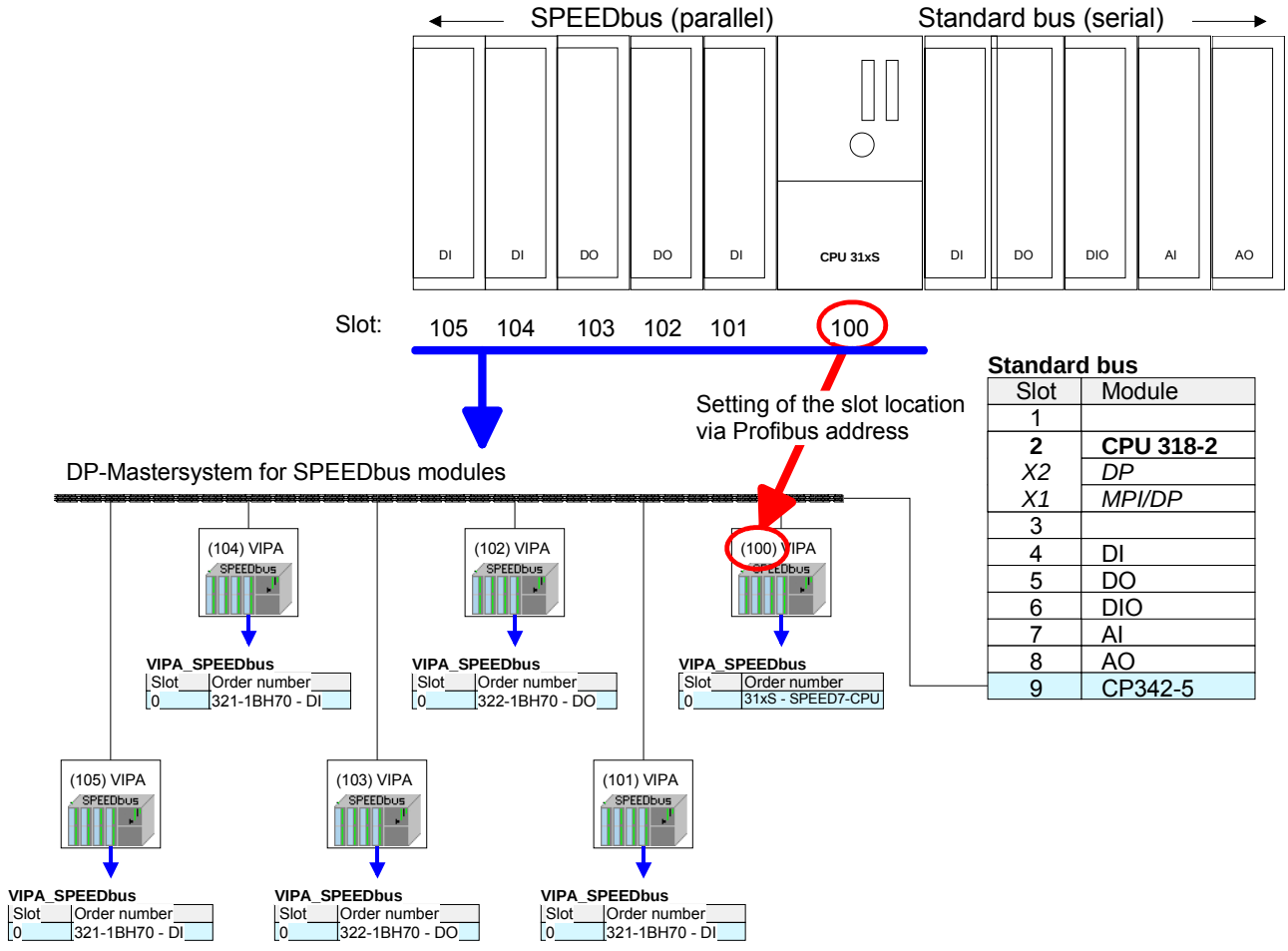
The slot assignment of the SPEEDbus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place as last module a DP master (342-5DA02 V5.0) with master system.

For the employment of the System 300S modules at the SPEEDbus the inclusion of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is required.

After the installation of the speedbus.gsd you may locate under *Profibus DP* / *Additional field devices* / *I/O* / *VIPA_SPEEDbus* the DP slave system vipa_speedbus.

Now include for the CPU and every module at the SPEEDbus a slave system "vipa_speedbus".

Set as Profibus address the slot no. (100...116) of the module and place the according module from the hardware catalog of VIPA_speedbus to slot 0 of the slave system.



The according module is to be taken over from the HW Catalog of vipa_speedbus to slot 0.

DI 16xDC 24V

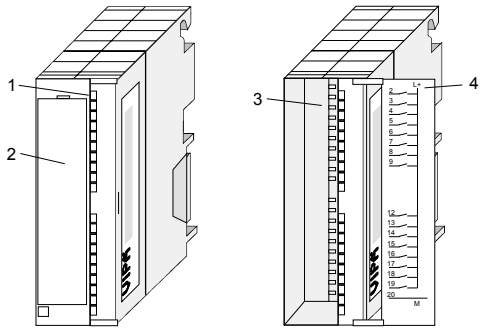
Order data DI 16xDC 24V VIPA 321-1BH70

Description The fast digital input module collects the binary control signals from the process level and transmits them galvanically separated to the superordinated bus system. It has 16 channels and their status is monitored via LEDs.

Properties

- Fast inputs via SPEEDbus
- 16 inputs, potential separated to the backplane bus
- Extended parameterization possibility
- Nominal input voltage DC 24V
- Useable for switches and approximate switches
- Status monitoring of the channels via LED

Construction



[1] LEDs

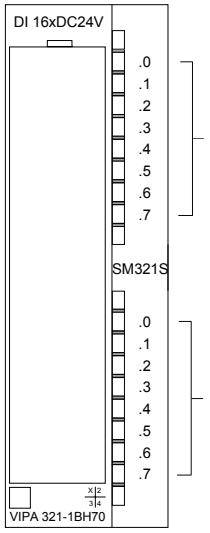
[2] flap with labeling strip

[3] contact bar

[4] flap opened with inner label

Pin assignment
Status monitor

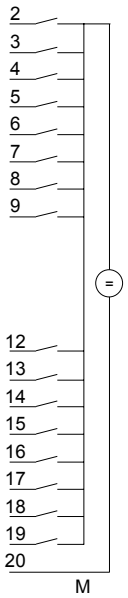
Pin	Assignment
1	not used
2	Input I+0.0
.	.
.	.
.	.
9	Input I+0.7
10	not used
11	not used
12	Input I+1.0
.	.
.	.
.	.
19	Input I+1.7
20	Ground



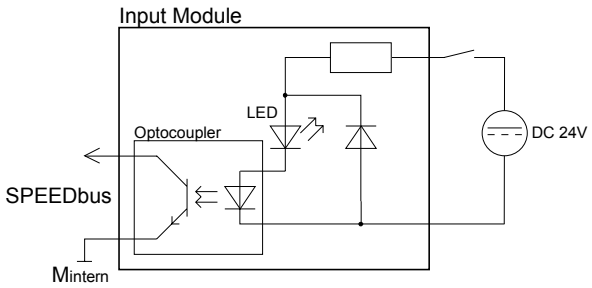
LED	Description
.0 7	LEDs (green) I+0.0 to I+1.7 from ca. 15V on, the signal is recognized as "1" and the according LED is addressed

Circuit and schematic diagram

Circuit diagram



Schematic diagram



Parameterization

Depending on the project engineering, the module occupies 2Byte res. 44Byte in the input range of the CPU. You have the following opportunities for the project engineering:

- Project engineering as 321-1BH70 DI 16xDC24V
  Range in PI: 2Byte
  Parameter: none
- Project engineering as DI 16 Alarm/ETS
  Range in PE: 44Byte
  Parameter: 66Byte (edge selection, time stamp, filter)

Project engineering as 321-1BH70 DI 16xDC24V

At this project engineering you have no parameterization options and your module occupies 2Bytes in the input address range of the CPU.

If no hardware project engineering is present, this operation mode is used as default. Here the module has a delay time of 6.12µs.

Project engineering as DI 16 Alarm/ETS

If the module is defined as "DI 16 Alarm/ETS" in the hardware configuration, it occupies 44Byte of the input range of the CPU and can be parameterized with 66Byte of data.

The following parameters are at your disposal:

- Diagnostic alarm (global for all inputs)
- Edge selection (switchable process alarm per channel)
- Time stamp (activation of a time stamp function per channel)
- Filter value (for grubby input signals per channel)

Structure of the parameter data

During the parameterization, a parameter area of 66 Byte is transferred in the record sets 7Fh, 80h and 81h. Using the SFCs 55, 56 and 57 you may alter parameters and transfer them to the module during runtime.

The record sets have the following structure:

Record set 7Fh
Diagnostic alarm

This record set activates res. de-activates the diagnostic function. A diagnostic alarm occurs when during a process alarm execution another process alarm is initialized for the same event.

The record set has the following structure:

Byte	Bit 15 ... 0
0...1	*Bit 15 ... 0: Diagnostic alarm* 0000h = de-activated 0001h = activated
2...3	*Bit 15 ... 0: reserved*

Record set 80h
Edge selection

Via this record set you may activate a process alarm for I+0.0 ... I+1.7 and define for which edge of the input signal a process alarm is thrown.

The record set has the following structure:

Byte	Bit 7 ... 0
0	*Bit 1 ... 0: Edge selection I+0.0* 00b = de-activated 01b = Process alarm at ascending edge 10b = Process alarm at descending edge 11b = Process alarm at both edges *Bit 7 ... 2: reserved*
...	...
15	*Bit 1 ... 0: Edge selection I+1.7* 00b = de-activated 01b = Process alarm at ascending edge 10b = Process alarm at descending edge 11b = Process alarm both edges *Bit 7 ... 2: reserved*

continued ...

... continue record set 80h

Record set 80h
ETS time stamp
(Byte 16 ... 31)

Every SPEEDbus module carries along a timer with a resolution of 1µs. The timer starts at boot-up of the CPU. Thus gives you a time base with an accuracy of ±1µs at the SPEEDbus. By parameterization of the ETS function (**E**dge **T**ime**s**tamp) for an input, the current time value is entered in the process image of the module at according edge. Thus allows you to compare times of different input channels via your user application.

Via the parameter *Time stamp* you may activate the ETS system and define the edge of the input signal that initiates the process image entry of a time stamp. You have the following options:

- No time stamp
- Time stamp at ascending edge
- Time stamp at descending edge
- Time stamp at both edges

The allocation in the process image is illustrated at the following page.

Note!

The stored times correspond the point in time when the signal has already passed the input filter of the module. To calculate the real time at the clamp, you have to subtract the delay time of 1µs and the parameterized delay time defined under *Filter*.

Byte	Bit 7 ... Bit 0
16	Bit 1,0: Time stamp channel 0 (I+0.0) 00 = no time stamp 01 = Time stamp at ascending edge 10 = Time stamp at descending edge 11 = Time stamp at both edges
...	...
31	Bit 1,0: Time stamp channel 15 (I+1.7) 00 = no time stamp 01 = Time stamp at ascending edge 10 = Time stamp at descending edge 11 = Time stamp at both edges

Record set 81h
Input filter

This record set allows you to preset an input filter in steps of 5.12µs steps for I+0.0 ... I+1.7. By preceding a filter you define how long an input signal must be present before it is recognized as "1" signal. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

The entry happens as a factor of 5.12µs and is within the range 1 ... 31250 i.e. 5.12µs ... 160ms. The record set has the following structure:

Byte	Bit 15 ... 0
0 ... 1	Bit 15 ... 0: Input filter I+0.0 in 5.12µs
...	...
30 ... 31	Bit 15 ... 0: Input filter I+1.7 in 5.12µs

44Bytes in the process image

The module occupies 44Byte in the input address range of the CPU that have the following meaning:

Byte	Bit 7 ... Bit 0
0	State of the channels (1 = set, 0 = not set) Bit 0: Status I+0.0 ... Bit 7: Status I+0.7
1	State of the channels (1 = set, 0 = not set) Bit 8: Status I+1.0 ... Bit 15: Status I+1.7
2 ... 3	reserved
4	Edge evaluation (1=edge detected, 0=no edge detected) Here the last presence of an edge since the last read access to the register is stored. After a read access to this register (in the module) it is set back. Bit 0: Status I+0.0 ... Bit 7: Status I+0.7
5	Edge evaluation Bit 0: Status I+1.0 ... Bit 7: Status I+1.7
6 ... 7	reserved
8	Edge lost (1 = edge lost, 0 = no edge lost) Here is noted if an edge change has been lost, i.e. if there has been more than one edge change since the last read access. Bit 0: Status I+0.0 ... Bit 7: Status I+0.7
9	Edge lost Bit 0: Status I+1.0 ... Bit 7: Status I+1.7
10...11	reserved

continued ...

... continue

Byte	+3	+2	+1	+0
	The following Bytes contain the values of the µs ticker for a channel at the time of an edge change. Only the lower 16Bit are taken over. An overflow after 65ms has to be accordingly processed in the user application.			
12	Time stamp I+0.1		Time stamp I+0.0	
16	Time stamp I+0.3		Time stamp I+0.2	
20	Time stamp I+0.5		Time stamp I+0.4	
24	Time stamp I+0.7		Time stamp I+0.6	
28	Time stamp I+1.1		Time stamp I+1.0	
32	Time stamp I+1.3		Time stamp I+1.2	
36	Time stamp I+1.5		Time stamp I+1.4	
40	Time stamp I+1.7		Time stamp I+1.6	

Process alarm

Via the edge selection you may activate a process alarm in your parameterization and define on which edge of the input signal a process alarm should be initialized.

A process alarm causes a call of the OB40. Within the OB40 you may find the logical basic address of the module that initialized the process alarm by using the *Local word 6*. More detailed information about the initializing event is to find in the *local double word 8*.

Local double word 8 of the OB40

The *local double word 8* of the OB40 has the following structure:

Local byte	Bit 7 ... Bit 0
8	Bit 0: Edge at I+0.0 Bit 1: Edge at I+0.1 Bit 2: Edge at I+0.2 Bit 3: Edge at I+0.3 Bit 4: Edge at I+0.4 Bit 5: Edge at I+0.5 Bit 6: Edge at I+0.6 Bit 7: Edge at I+0.7
9	Bit 0: Edge at I+1.0 Bit 1: Edge at I+1.1 Bit 2: Edge at I+1.2 Bit 3: Edge at I+1.3 Bit 4: Edge at I+1.4 Bit 5: Edge at I+1.5 Bit 6: Edge at I+1.6 Bit 7: Edge at I+1.7
10	00h (fix)
11	00h (fix)

Diagnostic alarm

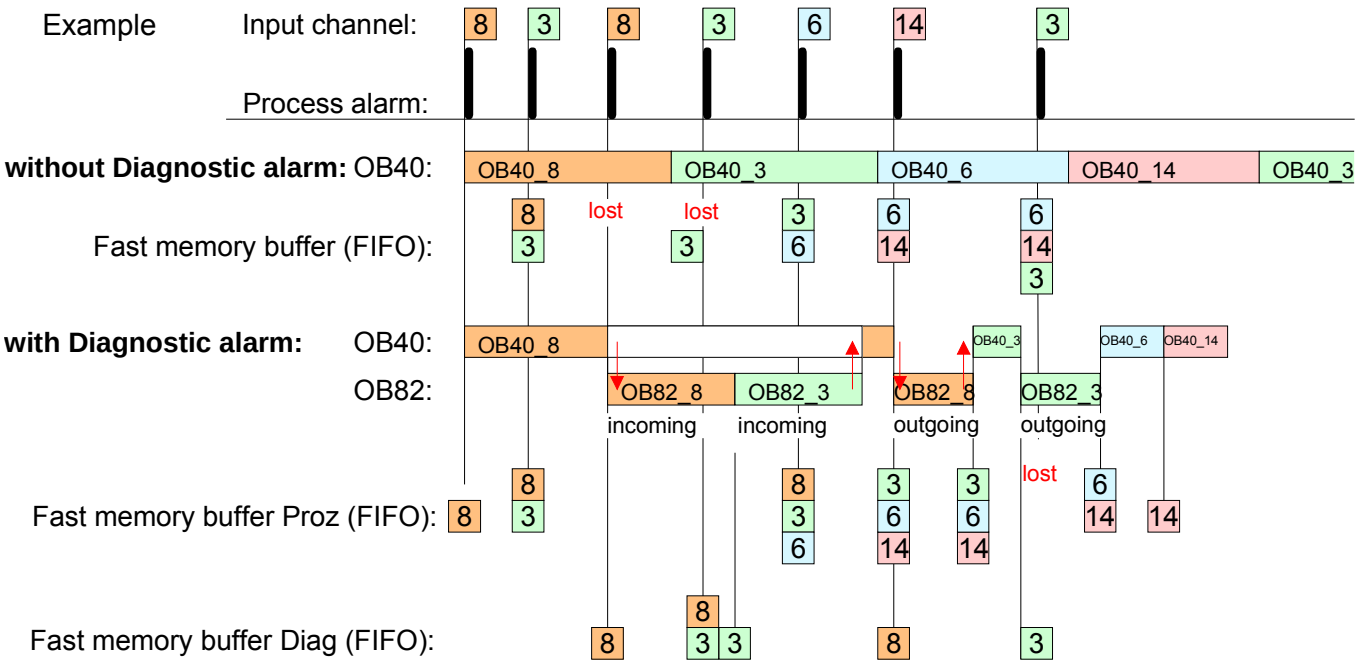
Via the parameterization (record set 7Fh) you may activate a global diagnostic alarm for the module.

A diagnostic alarm occurs when during a process alarm execution in OB40 another process alarm is thrown for the same event. The initialization of a diagnostic alarm interrupts the recent process alarm execution in OB40 and branches in OB82 to diagnostic alarm processing$_{incoming}$. If during the diagnostic alarm processing other events are occurring at other channels that may also cause a process res. diagnostic alarm, these are interim stored.

After the end of the diagnostic alarm processing at first all interim stored diagnostic alarms are processed in the sequence of their occurrence and then all process alarms.

If a channel where currently a diagnostic alarm$_{incoming}$ is processed res. interim stored initializes further process alarms, these get lost. When a process alarm for which a diagnostic alarm$_{incoming}$ has been released is ready, the diagnostic alarm processing is called again as diagnostic alarm$_{outgoing}$.

All events of a channel between diagnostic alarm$_{incoming}$ and diagnostic alarm$_{outgoing}$ are not stored and get lost. Within this time window (1st diagnostic alarm$_{incoming}$ until last diagnostic alarm$_{outgoing}$) the SF-LED of the CPU is on. Additionally for every diagnostic alarm$_{incoming/outgoing}$ an entry in the diagnostic buffer of the CPU occurs.



Diagnostic alarm processing

Every OB82 call causes an entry in the diagnostic buffer of the CPU containing error cause and module address.

By using the SFC 59 you may read the diagnostic bytes.

At de-activated diagnostic alarm you have access to the last recent diagnostic event.

If you've activated the diagnostic function in your hardware configuration, the contents of record set 0 are already in the local double word 8 when calling the OB82. The SFC 59 allows you to also read the record set 1 that contains additional information.

After leaving the OB 82 an clear assignment of the data to the last diagnostic alarm is not longer possible.

The record sets of the diagnostic range have the following structure:

Record set 0 Diagnostic$_{incoming}$

Byte	Bit 7 ... Bit 0
0	Bit 0: set at module failure Bit 1: 0 (fix) Bit 2: set at external error Bit 3: set at channel error Bit 4: set when external auxiliary supply is missing Bit 5 ... 7: 0 (fix)
1	Bit 0 ... 3: Module class 1111b: Digital Bit 4: Channel information present Bit 5 ... 7: 0 (fix)
2	00h (fix)
3	Bit 0 ... 5: 0 (fix) Bit 6: Process alarm lost Bit 7: 0 (fix)

Record set 0 Diagnostic$_{outgoing}$

After the removing error a diagnostic message$_{outgoing}$ takes place if the diagnostic alarm release is still active.

Byte	Bit 7 ... Bit 0
0	Bit 0: set at module failure Bit 1: 0 (fix) Bit 2: set at external error Bit 3: set at channel error Bit 4: set when external auxiliary supply is missing Bit 7 ... 5: 0 (fix)
1	Bit 0 ... 3: Module class 1111b: Digital Bit 4: Channel information present Bit 5 ... 7: 0 (fix)
2	00h (fix)
3	00h (fix)

Diagnostic Record set 1

The record set 1 contains the 4Byte of the record set 0 and additionally 12Byte module specific diagnostic data.

The diagnostic bytes have the following assignment:

Record set 1 (Byte 0 to 15):

Byte	Bit 7 ... Bit 0
0 ... 3	Contents record set 0 (see page before)
4	Bit 0 ... 6: channel type (here 70h) 70h: Digital input Bit 7: More channel types present 0: no 1: yes
5	Number of diagnostic bits the module puts out per channel (here 08h)
6	Number of channels of a module (here 04h)
7	Bit 0: Error in channel group 0 (I+0.0 ... I+0.3) Bit 1: Error in channel group 1 (I+0.4 ... I+0.7) Bit 2: Error in channel group 2 (I+1.0 ... I+1.3) Bit 3: Error in channel group 3 (I+1.4 ... I+I.7) Bit 7 ... 4:0 (fix)
8	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+0.0 Bit 1: 0 (fix) Bit 2: ... input I+0.1 Bit 3: 0 (fix) Bit 4: ... input I+0.2 Bit 5: 0 (fix) Bit 6: ... input I+0.3 Bit 7: 0 (fix)
9	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+0.4 Bit 1: 0 (fix) Bit 2: ... input I+0.5 Bit 3: 0 (fix) Bit 4: ... input I+0.6 Bit 5: 0 (fix) Bit 6: ... input I+0.7 Bit 7: 0 (fix)
10	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+1.0 Bit 1: 0 (fix) Bit 2: ... input I+1.1 Bit 3: 0 (fix) Bit 4: ... input I+1.2 Bit 5: 0 (fix) Bit 6: ... input I+1.3 Bit 7: 0 (fix)
11	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+1.4 Bit 1: 0 (fix) Bit 2: ... input I+1.5 Bit 3: 0 (fix) Bit 4: ... input I+1.6 Bit 5: 0 (fix) Bit 6: ... input I+1.7 Bit 7: 0 (fix)
12 ... 15	00h (fix)

Technical Data

Electrical Data	VIPA 321-1BH70
Number of inputs	16
Nominal input voltage	DC 24V (15 ... 28.8V)
Signal voltage "0" / "1"	0 ... 5V / 15 ... 28.8V
2-wire BERO allowed vacancy	1.5mA
Input current	typ. 7mA
Power supply	5V via backplane bus
Current consumption SPEEDbus	25mA
Dissipation power	3.5W
Potential separation	500Veff (field voltage-bus)
Status monitor	via LEDs on the front side
Project Engineering	321-1BH70 DI 16xDC24V
Type	Inputs
Length	2Byte
Input filter time delay	6.12µs
Parameter data	-
Project Engineering	321-1BH70 DI 16 Alarm/ETS
Type	Inputs
Length	44Byte
Input filter time delay	1µs + parameterized filter
Parameter data	66Byte
Dimensions and weight	
Dimensions (WxHxD) in mm	40x125x120
Weight	200g

DO 16xDC 24V 0.5A

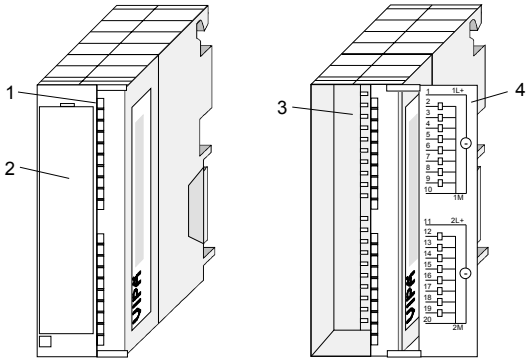
Order data DO 16xDC 24V 0.5A VIPA 322-1BH70

Description The digital fast output module collects the binary control signals from the superordinated bus system and transmits them galvanically separated to the process level. The module has to be provided with 24V via the front slot. It has 16 channels and their status is monitored via LEDs.

Properties

- 16 entries, potential separated to the back panel bus
- supply voltage DC 24V, output voltage 0.5A
- useable for magnetic valve and DC contactor
- LEDs for supply voltage and error messages
- Status monitoring of the channels via LED

Construction



[1] LEDs

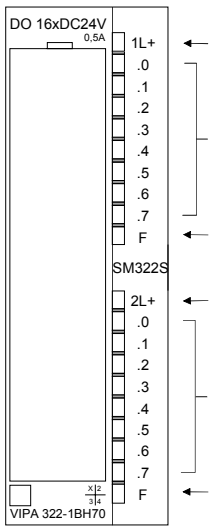
[2] flap with labeling strip

[3] contact bar

[4] flap opened with inner label

Pin assignment
Status monitor

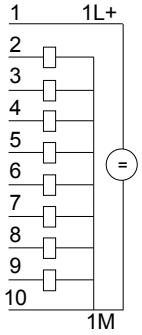
Pin	Assignment
1	Supply voltage DC 24V
2	Output Q+0.0
.	.
.	.
9	Output Q+0.7
10	Ground 1
11	Supply voltage DC 24V
12	Output Q+1.0
.	.
.	.
19	Output Q+1.7
20	Ground 2

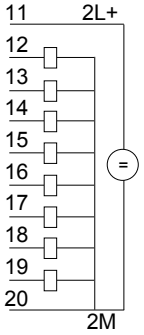


LED	Description
1L+, 2L+	LED (yellow) supply voltage is on
.0 7	LEDs (green) Q+0.0 to Q+1.7 As soon as an output is active, the according LED is addressed
F	LED (red) Error when overload or short circuits

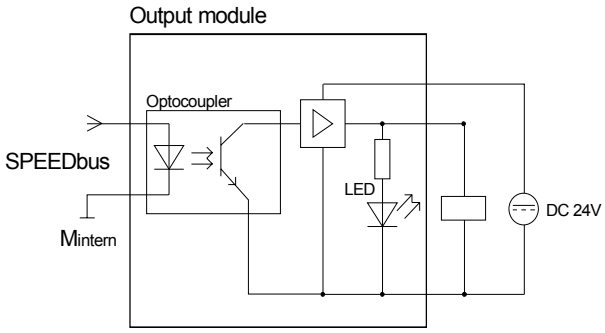
Circuit and schematic diagram

Circuit diagram





Schematic diagram



Technical Data

Electrical Data	VIPA 322-1BH70
Number of outputs	16 in 2 groups per 8 outputs
Nominal load voltage	DC 24V (20.4 ... 28.8V) via external power supply
Current consumption at L+ without load (all A.x=off)	30mA
Output current per channel	0.5A short circuit resistant
Current consumption SPEEDbus	110mA
Dissipation power	4W
Max. lamp load per channel	5W
Power supply	5V via backplane bus
Potential separation	in groups of 8 500Veff (field voltage - bus)
Status monitoring	via LEDs at the front side
Project Engineering	322-1BH70
Type	Outputs
Length	2Byte
Dimensions and weight	
Dimensions (WxHxD) in mm	40x125x120
Weight	200g

DIO 16xDC 24V 0.5A

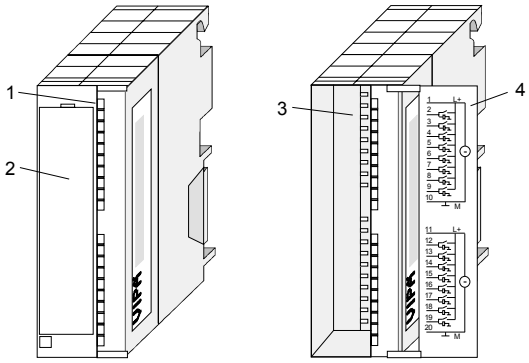
Order Data DIO 16xDC 24V 0.5A VIPA 323-1BH70

Description The module has 16 channels that can be used either as inputs or outputs. Every channel supports a diagnostic function, i.e. as soon as an output is active, the according input is set on "1". If there is a short circuit at the load, the according input is set on "0" and the error can be recognized by analyzing the input.

Properties

- Fast I/O channels via SPEEDbus
- 16 I/O channels, potential separated to the SPEEDbus
- Extended parameterization possibility
- Nominal input voltage DC 24V
- Output current 0.5A
- LED for error message at overload, overheat or short circuit
- Activity monitoring of the channels via LED

Construction



[1] LEDs

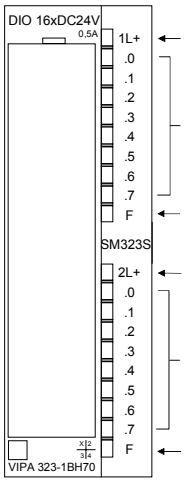
[2] flap with labeling strip

[3] contact bar

[4] flap opened with inner label

Pin assignment
Status monitor

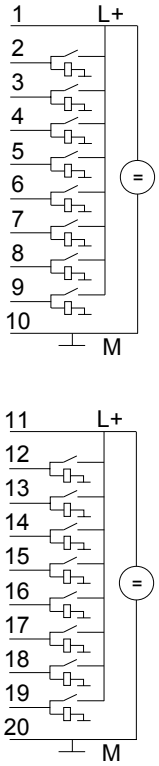
Pin	Assignment
1	Supply voltage +DC 24V
2	I/Q+0.0
...	...
9	I/Q+0.7
10	Ground
11	Supply voltage +DC 24V
12	I/Q+1.0
...	...
19	I/Q+1.7
20	Ground



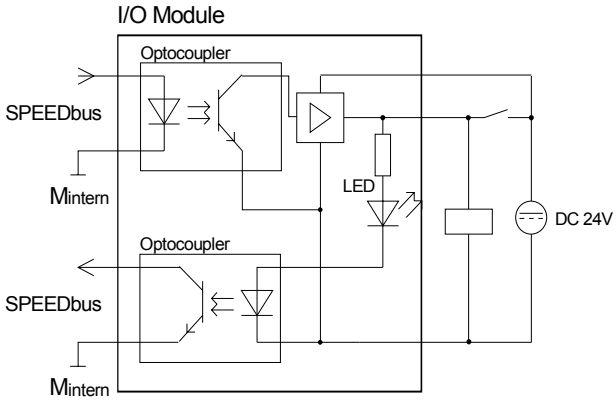
LED	Description
1L+, 2L+	LED (yellow) supply voltage is on
.0 7	LED (green) per Byte As soon as an input signal "1" or an active output is recognized, the according LED is addressed
F	LED (red) error at overload or short circuit

Circuit and schematic diagram

Circuit diagram



Schematic diagram



Due to the parallel connection of in- and output channel per group, a set output can also be provided via a present input signal even if the power supply is shut down and thus it remains active.

Nonobservance may cause destruction of the module!

Project engineering as 323-1BH70 DIO 16xDC24V

At this project engineering you have no parameterization options and your module occupies each 2Byte in the input and output address range of the CPU.

If no hardware project engineering is present, this operation mode is used as default. Here the module has for the inputs a delay time of 6.12µs.

Project engineering as DIO 16 Alarm/ETS

If the module is defined as "DIO 16 Alarm/ETS" in the hardware configuration, it occupies 44Byte of the input range of the CPU and 2Byte in the output range and can be parameterized with 66Byte of data.

The following parameters are at your disposal:

- Diagnostic alarm (global for all inputs)
- Edge selection (switchable process alarm per channel)
- Time stamp (activation of a time stamp function per channel)
- Filter value (for grubby input signals per channel)

Structure of the parameter data

During the parameterization, a parameter area of 66 Byte is transferred in the record sets 7Fh, 80h and 81h. Using the SFCs 55, 56 and 57 you may alter parameters and transfer them to the module during runtime.

The record sets have the following structure:

Record set 7Fh
Diagnostic alarm

This record set activates res. de-activates the diagnostic function. A diagnostic alarm occurs when during a process alarm execution another process alarm is initialized for the same event.

The record set has the following structure:

Byte	Bit 15 ... 0
0...1	*Bit 15 ... 0: Diagnostic alarm* 0000h = de-activated 0001h = activated
2...3	*Bit 15 ... 0: reserved*

Record set 80h
Edge selection
(Byte 0 ... 15)

Via this record set you may activate a process alarm for I+0.0 ... I+1.7 and define for which edge of the input signal a process alarm is thrown.

The record set has the following structure:

Byte	Bit 7 ... 0
0	*Bit 1 ... 0: Edge selection I+0.0* 00b = de-activated 01b = Process alarm at ascending edge 10b = Process alarm at descending edge 11b = Process alarm at both edges *Bit 7 ... 2: reserved*
...	...
15	*Bit 1 ... 0: Edge selection I+1.7* 00b = de-activated 01b = Process alarm at ascending edge 10b = Process alarm at descending edge 11b = Process alarm both edges *Bit 7 ... 2: reserved*

continued ...

... continue record set 80h

Record set 80h
ETS Time stamp
(Byte 16 ... 31)

Every SPEEDbus module carries along a timer with a resolution of 1µs. The timer starts at boot-up of the CPU. Thus gives you a time base with an accuracy of ±1µs at the SPEEDbus. By parameterization of the ETS function (**E**dge **T**ime**s**tamp) for an input, the current time value is entered in the process image of the module at according edge. Thus allows you to compare times of different input channels via your user application.

Via the parameter *Time stamp* you may activate the ETS system and define the edge of the input signal that initiates the process image entry of a time stamp. You have the following options:

- No time stamp
- Time stamp at ascending edge
- Time stamp at descending edge
- Time stamp at both edges

The allocation in the process image is illustrated at the following page.

Note!

The stored times correspond the point in time when the signal has already passed the input filter of the module. To calculate the real time at the clamp, you have to subtract the delay time of 1µs and the parameterized delay time defined under *Filter*.

Byte	Bit 7 ... Bit 0
16	Bit 1,0: Time stamp channel 0 (I+0.0) 00 = no time stamp 01 = Time stamp at ascending edge 10 = Time stamp at descending edge 11 = Time stamp at both edges
...	...
31	Bit 1,0: Time stamp channel 15 (I+1.7) 00 = no time stamp 01 = Time stamp at ascending edge 10 = Time stamp at descending edge 11 = Time stamp at both edges

Record set 81h
Input filter

This record set allows you to preset an input filter in steps of 5.12µs steps for I+0.0 ... I+1.7. By preceding a filter you define how long an input signal must be present before it is recognized as "1" signal. With the help of filters you may e.g. filter signal peaks at a blurred input signal.

The entry happens as a factor of 5.12µs and is within the range 1 ... 31250 i.e. 5.12µs ... 160ms. The record set has the following structure:

Byte	Bit 15 ... 0
0 ... 1	Bit 15 ... 0: Input filter I+0.0 in 5.12µs
...	...
30 ... 31	Bit 15 ... 0: Input filter I+1.7 in 5.12µs

44Bytes in the process image

The module occupies 44Byte in the input address range of the CPU that have the following meaning:

Byte	Bit 7 ... Bit 0
0	State of the channels (1 = set, 0 = not set) Bit 0: Status I+0.0 ... Bit 7: Status I+0.7
1	State of the channels (1 = set, 0 = not set) Bit 8: Status I+1.0 ... Bit 15: Status I+1.7
2 ... 3	reserved
4	Edge evaluation (1=edge detected, 0=no edge detected) Here the last presence of an edge since the last read access to the register is stored. After a read access to this register (in the module) it is set back. Bit 0: Status I+0.0 ... Bit 7: Status I+0.7
5	Edge evaluation Bit 0: Status I+1.0 ... Bit 7: Status I+1.7
6 ... 7	reserved
8	Edge lost (1=edge lost, 0=no edge lost) Here is noted if an edge change has been lost, i.e. if there has been more than one edge change since the last read access. Bit 0: Status I+0.0 ... Bit 7: Status I+0.7
9	Edge lost Bit 0: Status I+1.0 ... Bit 7: Status I+1.7
10...11	reserved

continued ...

... continue

Byte	+3	+2	+1	+0
	The following Bytes contain the values of the µs ticker for a channel at the time of an edge change. Only the lower 16Bit are taken over. An overflow after 65ms has to be accordingly processed in the user application.			
12	Time stamp I+0.1		Time stamp I+0.0	
16	Time stamp I+0.3		Time stamp I+0.2	
20	Time stamp I+0.5		Time stamp I+0.4	
24	Time stamp I+0.7		Time stamp I+0.6	
28	Time stamp I+1.1		Time stamp I+1.0	
32	Time stamp I+1.3		Time stamp I+1.2	
36	Time stamp I+1.5		Time stamp I+1.4	
40	Time stamp I+1.7		Time stamp I+1.6	

Output address range

Byte	Bit 7 ... Bit 0
0	Control output channel (1 = set, 0 = set back) Bit 0: Status Q+0.0 ... Bit 7: Status Q+0.7
1	Control output channel (1 = set, 0 = set back) Bit 0: Status Q+1.0 ... Bit 7: Status Q+1.7

Process alarm

Via the edge selection you may activate a process alarm in your parameterization and define on which edge of the input signal a process alarm should be initialized.

A process alarm causes a call of the OB40. Within the OB40 you may find the logical basic address of the module that initialized the process alarm by using the *Local word 6*. More detailed information about the initializing event is to find in the *local double word 8*.

Local double word 8 of the OB40

The *local double word 8* of the OB40 has the following structure:

Local byte	Bit 7 ... Bit 0
8	Bit 0: Edge at I+0.0 ... Bit 7: Edge at I+0.7
9	Bit 0: Edge at I+1.0 ... Bit 7: Edge at I+1.7
10	00h (fix)
11	00h (fix)

Diagnostic alarm

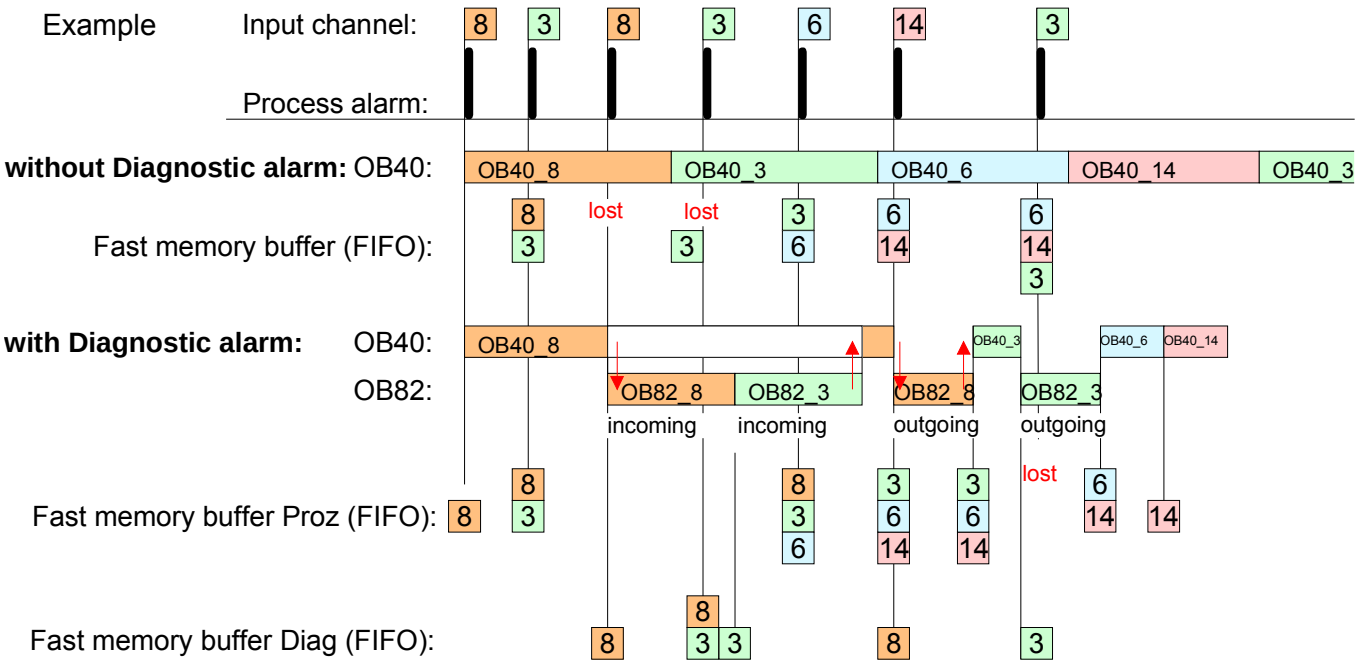
Via the parameterization (record set 7Fh) you may activate a global diagnostic alarm for the module.

A diagnostic alarm occurs when during a process alarm execution in OB40 another process alarm is thrown for the same event. The initialization of a diagnostic alarm interrupts the recent process alarm execution in OB40 and branches in OB82 to diagnostic alarm processing$_{incoming}$. If during the diagnostic alarm processing other events are occurring at other channels that may also cause a process res. diagnostic alarm, these are interim stored.

After the end of the diagnostic alarm processing at first all interim stored diagnostic alarms are processed in the sequence of their occurrence and then all process alarms.

If a channel where currently a diagnostic alarm$_{incoming}$ is processed res. interim stored initializes further process alarms, these get lost. When a process alarm for which a diagnostic alarm$_{incoming}$ has been released is ready, the diagnostic alarm processing is called again as diagnostic alarm$_{outgoing}$.

All events of a channel between diagnostic alarm$_{incoming}$ and diagnostic alarm$_{outgoing}$ are not stored and get lost. Within this time window (1st diagnostic alarm$_{incoming}$ until last diagnostic alarm$_{outgoing}$) the SF-LED of the CPU is on. Additionally for every diagnostic alarm$_{incoming/outgoing}$ an entry in the diagnostic buffer of the CPU occurs.



Diagnostic alarm processing

Every OB82 call causes an entry in the diagnostic buffer of the CPU containing error cause and module address.

By using the SFC 59 you may read the diagnostic bytes.

At de-activated diagnostic alarm you have access to the last recent diagnostic event.

If you've activated the diagnostic function in your hardware configuration, the contents of record set 0 are already in the local double word 8 when calling the OB82. The SFC 59 allows you to also read the record set 1 that contains additional information.

After leaving the OB 82 an clear assignment of the data to the last diagnostic alarm is not longer possible.

The record sets of the diagnostic range have the following structure:

Record set 0 Diagnostic$_{incoming}$ (Byte 0 ... 3):

Byte	Bit 7 ... Bit 0
0	Bit 0: set at module failure Bit 1: 0 (fix) Bit 2: set at external error Bit 3: set at channel error Bit 4: set when external auxiliary supply is missing Bit 5 ... 7: 0 (fix)
1	Bit 0 ... 3: Module class 1111b: Digital Bit 4: Channel information present Bit 5 ... 7: 0 (fix)
2	00h (fix)
3	Bit 0 ... 5: 0 (fix) Bit 6: Process alarm lost Bit 7: 0 (fix)

Record set 0 Diagnostic$_{outgoing}$

After the removing error a diagnostic message$_{outgoing}$ takes place if the diagnostic alarm release is still active.

Record set 0 (Byte 0 to 3):

Byte	Bit 7 ... Bit 0
0	Bit 0: set at module failure Bit 1: 0 (fix) Bit 2: set at external error Bit 3: set at channel error Bit 4: set when external auxiliary supply is missing Bit 7 ... 5: 0 (fix)
1	Bit 0 ... 3: Module class 1111b: Digital Bit 4: Channel information present Bit 5 ... 7: 0 (fix)
2	00h (fix)
3	00h (fix)

Diagnostic Record set 1

The record set 1 contains the 4Byte of the record set 0 and additionally 12Byte module specific diagnostic data.

The diagnostic bytes have the following assignment:

Byte	Bit 7 ... Bit 0
0 ... 3	Contents record set 0 (see page before)
4	Bit 0 ... 6: channel type (here 70h) 70h: Digital input Bit 7: More channel types present 0: no 1: yes
5	Number of diagnostic bits the module puts out per channel (here 08h)
6	Number of channels of a module (here 04h)
7	Bit 0: Error in channel group 0 (I+0.0 ... I+0.3) Bit 1: Error in channel group 1 (I+0.4 ... I+0.7) Bit 2: Error in channel group 2 (I+1.0 ... I+1.3) Bit 3: Error in channel group 3 (I+1.4 ... I+I.7) Bit 7 ... 4:0 (fix)
8	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+0.0 Bit 1: 0 (fix) Bit 2: ... input I+0.1 Bit 3: 0 (fix) Bit 4: ... input I+0.2 Bit 5: 0 (fix) Bit 6: ... input I+0.3 Bit 7: 0 (fix)
9	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+0.4 Bit 1: 0 (fix) Bit 2: ... input I+0.5 Bit 3: 0 (fix) Bit 4: ... input I+0.6 Bit 5: 0 (fix) Bit 6: ... input I+0.7 Bit 7: 0 (fix)
10	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+1.0 Bit 1: 0 (fix) Bit 2: ... input I+1.1 Bit 3: 0 (fix) Bit 4: ... input I+1.2 Bit 5: 0 (fix) Bit 6: ... input I+1.3 Bit 7: 0 (fix)
11	Diagnostic alarm due to process alarm lost at... Bit 0: ... input I+1.4 Bit 1: 0 (fix) Bit 2: ... input I+1.5 Bit 3: 0 (fix) Bit 4: ... input I+1.6 Bit 5: 0 (fix) Bit 6: ... input I+1.7 Bit 7: 0 (fix)
12 ... 15	00h (fix)

Technical Data

Electrical Data	VIPA 323-1BH70
Number of inputs / outputs	max. 16 / max 16
Nominal load voltage	DC 24V (20.4 ... 28.8V) via external power supply
Current consumption SPEEDbus	max. 130mA
Current consumption at L+ without load (all A.x=off)	30mA
Dissipation power	4W
Output current per channel	0.5A, short circuit resistant, max 0.7A
Max. lamp load per group	5W
Nominal input voltage	DC 24V
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 30V
Input filter Time delay	adjustable: 1 ... 31250 x 5.12µs
Input current	typ. 7mA
2-wire BERO allowed vacancy	1.5mA
Power supply	5V via backplane bus
Potential separation	500Veff (field voltage-bus)
Status monitor	via LEDs on the front side
Project Engineering	323-1BH70
Type	Inputs / outputs
Length	2Byte input / 2Byte output
Dimensions and weight	
Dimensions (WxHxD) in mm	40x125x120
Weight	210g

Chapter 10 Integrated OBs SFBs and SFCs

Outline

This chapter contains the description of the integrated OBs, SFBs and SFCs of the SPEED7-CPUs from VIPA for STEP®7 from Siemens.

Besides the instructions for the inclusion of the VIPA specific blocks, this chapter also contains a description of the blocks.

The following text describes:

- Overview over the integrated OBs, SFBs, SFCs
- VIPA specific blocks and their inclusion
- Description of the blocks

Content

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Interbus communication - SFC 254 RW_SBUS	10-36

Integrated OBs and SFBs

General

The system application of the CPU 31xS provides some special functions that you may use by call from FBs, FCs or OBs. These special functions are part of the system application and do not use any space in the user memory. The special functions may be called but neither be read nor altered.

The call of a special function from FB, FC or OB counts as block change and influences the nesting depth for blocks.

Integrated OBs

The following organization blocks (OBs) are available:

OB	Description
OB 1	Free cycle
OB 10	Time alarm
OB 11	Time alarm
OB 20	Delay alarm
OB 21	Delay alarm
OB 32	Clock alarm
OB 35	Clock alarm
OB 40	Process alarm
OB 41	Process alarm
OB 80	Cycle time overstep or time alarm run out
OB 81	Battery error (only after PowerON)
OB 82	Diagnostic alarm
OB 85	OB not found
OB 86	Slave failure res. return
OB 100	Reboot
OB 121	Synchronic errors
OB 122	Periphery error at n^{th} access

Integrated SFBs

The following system function blocks (SFBs) are available:

SFB	Label	Description	L-Stack
SFB 0	CTU	Count forward	18Byte
SFB 1	CTD	Count backwards	18Byte
SFB 2	CTUD	Count forward and backwards	18Byte
SFB 3	TP	Create pulse	22Byte
SFB 4	TON	Create switch-on delay	22Byte
SFB 5	TOF	Create switch-off delay	22Byte
SFB 7	uS_TIME	VIPA micro second timer	-
SFB 32	DRUM	Realization of a step sequential circuit with a max. of 16 steps	-

Note!

Please note that L-Stack memory is occupied by using the above described SFB 0...5. This can be defined by the CPU parameters. The needed Space is to be found in the table above.

Integrated standard SFCs

Standard SFCs The following standard system functions (SFCs) are available:

SFC	Label	Description
SFC 0	SET_CLK	Set time
SFC 1	READ_CLK	Read time
SFC 2	SET_RTM	Set operating hour counter
SFC 3	CTRL_RTM	Start/stop operating hour counter
SFC 4	READ_RTM	Read operating hour counter
SFC 5	GADR_LGC	Search logical address of a channel (only modules in rack 0)
SFC 6	RD_SINFO	Read start information of the current OB
SFC 12	D_ACT_DP	Activate or deactivate DP slaves
SFC 13	DPNRM_DG	Read slave diagnostic data
SFC 14	DPRD_DAT	Read consistent user data (also from DP slaves → DP master FW ≥ V3.00)
SFC 15	DPWR_DAT	Write consistent user data (also to DP slaves → DP master FW ≥ V3.00)
SCF 17	ALARM_SQ	Create acknowledgeable block related messages
SFC 18	ALARM_S	Create not acknowledgeable block related messages
SFC 19	ALARM SC	Acknowledgement state of the last Alarm SQ-arrived-message
SFC 20[1)2)]	BLKMOV	Copy variable within work memory
SFC 21[1)2)]	FILL	Preset field within work memory
SFC 22	CREAT_DB	Create data block
SFC 23	DEL_DB	Delete data block
SFC 24	TEST_DB	Test data block
SFC 28	SET_TINT	Set time alarm
SFC 29	CAN_TINT	Cancel time alarm
SFC 30	ACT_TINT	Activate time alarm
SFC 31	QRY_TINT	Request time alarm
SFC 32	SRT_DINT	Start delay alarm
SFC 33	CAN_DINT	Cancel delay alarm
SFC 34	QRY_DINT	Request delay alarm
SFC 36	MASK_FLT	Mask synchronal error event
SFC 37	DMASK_FLT	De-mask synchronal error event
SFC 38	READ_ERR	Read event status register
SFC 39	DIS_IRT	Discard new events
SFC 40	EN_IRT	Abrogate discard new events
SFC 41	DIS_AIRT	Delay of alarm events
SFC 42	EN_AIRT	Abrogate delay of alarm events
SFC 43	RE_TRIGR	Re-trigger cycle time control
SFC 44	REPL_VAL	Transfer replacement value to AKKU1
SFC 46	STP	Switch CPU in STOP
SFC 47	WAIT	Delay program execution additionally to wait time
SFC 49	LGC_GADR	Search plug-in location of a logical address
SFC 50	RD_LGADR	Search all logical addresses of a module

continued ...

... continue Standard SFCs

SFC 51	RDSYSST	Read information from the system state list
SFC 52	WR_USMSG	Write user entry in diagnostic buffer (send via MPI in preparation)
SFC 54	RD_DPARM	Read predefined parameters
SFC 55	WR_PARM	Write dynamic parameters (only for analog, digital modules, FM350, CP340 / not via Profibus)
SFC 56	WR_DPARM	Write predefined parameters (only for analog, digital modules, FM350, CP340 / not via Profibus)
SFC 57	PARM_MOD	Parameterize module (only for analog, digital modules, FM350, CP340 / not via Profibus)
SFC 58	WR_REC	Write record set (only for analog, digital modules, FM350, CP340 / not via Profibus)
SFC 59	RD_REC	Read record set (only for analog, digital modules, FM350, CP340 / not via Profibus)
SFC 64	TIME_TICK	Read millisecond timer
SFC 65	X_SEND	Send data to external partner
SFC 66	X_RCV	Receive data from external partner
SFC 67	X_GET	Read data from external partner
SFC 68	X_PUT	Write data to external partner
SFC 69	X_ABORT	Interrupt connection to external partner
SFC 81	UBLKMOV	Copy variable non-interruptible

[1] Please note that local stack memory is occupied by using the SFC. This can be defined by the CPU parameters. The needed Space is to be found in the following table above.

[2] Please regarde that the SFC 20 and SFC 21 could return additional error messages (see table below).

Needed local stack

SFC	Label	Local stack
SFC 20	BLKMOV	56Byte
SCF21	FILL	56Byte
SFC47	WAIT	22Byte
SFC64	TIME_TICK	18Byte

Additional error messages of SFC 20, SFC 21

In addition to the standard error messages the SFC 20 and SFC 21 could return the following error messages:

No.	Error message	Remedy
817Dh	Too less local stack	Increase local stack by using CPU parameters
817Eh	Range length error in internal copy loop	Übergabe-Parameter überprüfen

VIPA specific blocks

General

The integrated SFCs are developed in machine-code and are therefore running with high speed. They do not occupy space in the internal application memory.

The integrated blocks are called via the user application.

The following pages list the VIPA specific blocks that may be called in the control application for special functions.

Overview

The following pages describe all VIPA specific blocks:

FC	Label	Description
FC 5	AG_SEND	Transfer data to CP
FC 6	AG_RECV	Receive data from CP

SFB	Label	Description
SFB 7	uS_TIME	VIPA Micro second timer with difference evaluation

SFC	Label	Description
SFC 53	uS_TICK	VIPA Micro second timer
SFC 205	AG_SEND	is used internal for FC 5 AG_SEND
SFC 206	AG_RECV	is used internal for FC 6 AG_RECV
SFC 208	FILE_OPN	Open VIPA File
SFC 209	FILE_CRE	Create VIPA File
SFC 210	FILE_CLO	Close VIPA File
SFC 211	FILE_RD	Read VIPA File
SFC 212	FILE_WR	Write VIPA File
SCF 213	FILE_SEK	Position VIPA File pointer
SFC 214	FILE_REN	Rename VIPA File
SFC 215	FILE_DEL	Delete VIPA File
SFC 216	SER_CFG	VIPA serial interface configure
SFC 217	SER_SND	VIPA serial interface send
SFC 218	SER_RCV	VIPA serial interface receive
SFC 219	CAN_TLGR	VIPA Send CAN telegram
SFC 227	TD_PRM	VIPA parameterization for TD200 communication
SFC 254	RW_SBUS	VIPA accesses to SPEEDbus Interbus master

Include VIPA library

Outline

The VIPA specific SFCs can be downloaded as library from VIPA at ftp.vipa.de under support/library. The libraries are available as packed zip-file.

If you want to use VIPA specific SFCs you have to import these in your project.

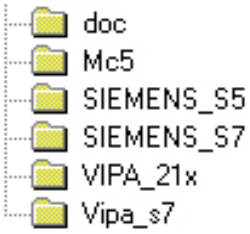
Execute the following steps:

- Extract FX000002_Vxxx.zip
- "De-archivate" the library
- Open library and transfer SFCs into the project

Directory structure of FX000002_Vxxx.zip

Start your un-zip application with a double click on the file FX000002_Vxxx.zip. Extract all files including the directory structure into a destination folder.

The following directory structure is created:



De-archivate library

To de-archivate your SFC library for the SPEED7-CPUs, start the SIMATIC® Manager from Siemens. Open the dialog window for archive selection via **File** > *De-archivate*. You'll find the SFC library in the directory structure shown above under VIPA_S7. The file name is VIPA.ZIP.

Choose VIPA.ZIP and click on [Open].

Select a destination folder where the blocks shall be stored. [OK] starts the extraction.

Open library and transfer SFCs to project

After the extraction open the library.

Open your project and copy the necessary SFCs from the library into the directory "blocks" of your project.

Now you have access to the VIPA specific blocks via your user application.

CP communication - FC 5 AG_SEND / FC 6 AG_RECV

Outline

The two blocks serve the processing of CP connection commands on the side of the PLC. Including these blocks in the cycle block OB1 you may send and receive data cyclically.

Within these blocks, the SFCs 205 and 206 are called that are stored as special function blocks in the CPU.

Note!

Please regard that, for the communication with VIPA CPs, you may only use the SEND/RECV-FCs from VIPA in your user application. At a change to VIPA-CPs in an already existing project you may replace the existing AG_SEND/AG_LSEND/AG_FSEND res AG_RECV/AG_LRECV/AG_FRECV with AG_SEND res. AG_RECV from VIPA without further adjustment. For the CP adjusts itself automatically to the length of the transferred data, the L- and F-versions of SEND res. RECV are not required for VIPA.

AG_SEND (FC 5)

AG_SEND transfers the data that you want to send to the CP.

This block transfers the user data from the data area given in *SEND* to the CP specified via *ID* and *LADDR*. As data area you may set a PA, bit memory or data block area. When the data area has been transferred without errors, "order ready without error" is returned.

Parameter

Parameter	Declaration	Type	Description
ACT	Input	BOOL	Activation of the sender 0: Updates DONE, ERROR and STATUS 1: The data area defined in SEND with the length LEN is send
ID	Input	INT	Connection number 1 ... 16 (identical with ID of NetPro)
LADDR	Input	WORD	Logical basic address of the CP (identical with LADDR of NetPro)
SEND	Input	ANY	Data area
LEN	Input	INT	Number of bytes from data area to transfer
DONE	Output	BOOL	Status parameter for the order 0: Order running 1: Order ready without error
ERROR	Output	BOOL	Error message 0: Order running (at DONE = 0) 0: Order ready without error (at DONE = 1) 1: Order ready with error
STATUS	Output	WORD	Status message returned with DONE and ERROR. More details are to be found in the following table.

AG_RECV (FC 6)

By means of AG_RECV the data received from the CP are transferred to the CPU.

The block transfers the user data from the CP into a data area defined via *RECV*. As data area you may set a PA, bit memory or data block area. When the data area has been transferred without errors, "order ready without error" is returned.

Parameter

Parameter	Declaration	Type	Description
ID	Input	INT	Connection number 1 ... 16 (identical with ID of NetPro)
LADDR	Input	WORD	Logical basic address of the CP (identical with LADDR of NetPro)
RECV	Input	ANY	Data area for the received data
NDR	Output	BOOL	Status parameter for the order 0: Order running 1: Order ready data received without error
ERROR	Output	BOOL	Error message 0: Order running (at NDR = 0) 0: Order ready without error (at NDR = 1) 1: Order ready with error
STATUS	Output	WORD	Status message returned with NDR and ERROR. More details are to be found in the following table.
LEN	Output	INT	Number of bytes that have been received

DONE, ERROR, STATUS

The following table shows all messages that can be returned by the CP after a SEND res. RECV command.

A "-" means that this message is not available for the concerning SEND res. RECV command.

DONE (SEND)	NDR (RECV)	ERROR	STATUS	Description
1	-	0	0000h	Order ready without error
-	1	0	0000h	New data received without error
0	-	0	0000h	No order present
-	0	0	8180h	No data available yet
0	0	0	8181h	Order running
0	0	1	8183h	No CP project engineering for this order
0	-	1	8184h	System error
-	0	1	8184h	System error (destination data area failure)
0	-	1	8185h	Parameter LEN exceeds source area SEND
	0	1	8185h	Destination buffer (RECV) too small
0	0	1	8186h	Parameter ID invalid (not within 1 ...16)
0	-	1	8302h	No receive resources at destination station, receive station is not able to process received data fast enough res. has no receive resources reserved.
0	-	1	8304h	The connection is not established. The send command shouldn't be send again before a delay time of >100 ms.
-	0	1	8304h	The connection is not established. The receive command shouldn't be send again after a delay time of >100 ms.
0	-	1	8311h	Destination station not available under the defined Ethernet address.
0	-	1	8312h	Ethernet error in the CP
0		1	8F22h	Source area invalid, e.g. when area in DB not present Parameter LEN < 0
-	0	1	8F23h	Source area invalid, e.g. when area in DB not present Parameter LEN < 0
0	-	1	8F24h	Range error at reading a parameter.
-	0	1	8F25h	Range error at writing a parameter.
0	-	1	8F28h	Orientation error at reading a parameter.
-	0	1	8F29h	Orientation error at writing a parameter.
-	0	1	8F30h	Parameter is within write protected 1st recent data block
-	0	1	8F31h	Parameter is within write protected 2nd recent data block
0	0	1	8F32h	Parameter contains oversized DB number.
0	0	1	8F33h	DB number error
0	0	1	8F3Ah	Area not loaded (DB)

continued...

... continue DONE, ERROR, STATUS

DONE (SEND)	NDR (RECV)	ERROR	STATUS	Description
0	-	1	8F42h	Acknowledgement delay at reading a parameter from peripheral area.
-	0	1	8F43h	Acknowledgement delay at writing a parameter from peripheral area.
0	-	1	8F44h	Address of the parameter to read locked in access track
-	0	1	8F45h	Address of the parameter to write locked in access track
0	0	1	8F7Fh	Internal error e.g. invalid ANY reference e.g. parameter LEN = 0 .
0	0	1	8090h	Module with this module start address not present or CPU in STOP.
0	0	1	8091h	Module start address not within double word grid.
0	0	1	8092h	ANY reference contains type setting unequal BYTE.
-	0	1	80A0h	Negative acknowledgement at reading the module
0	0	1	80A4h	reserved
0	0	1	80B0h	Module doesn't recognize record set.
0	0	1	80B1h	The length setting (in parameter LEN) is invalid.
0	0	1	80B2h	reserved
0	0	1	80C0h	Record set not readable.
0	0	1	80C1h	The set record set is still in process.
0	0	1	80C2h	Order accumulation.
0	0	1	80C3h	The operating sources (memory) of the CPU are temporarily occupied.
0	0	1	80C4h	Communication error (occurs temporarily; a repetition in the user application is reasonable.)
0	0	1	80D2h	Module start address is wrong.

Status parameter at reboot

At a reboot of the CP, the output parameter are set back as follows:

- DONE = 0
- NDR = 0
- ERROR = 8180h (at AG_RECV)
  ERROR = 8181h (at AG_SEND)

Time measurement - SFB 7 uS_TIME and SFC 53 uS_TICK

SFC 53 uS_TICK

This block allows you to read the µs ticker integrated in the SPEED7-CPU. The µs ticker is a 32Bit µs time counter that starts at every reboot with 0 and counts to 2^{32-1}µs. At an overstep the counter starts again with 0. With the help of the difference creation of the *RetVal* results of 2 SFC 53 calls before and after an application you may thus evaluate the runtime of the application in µs.

Runtime in dependence of the operating mode

Status	µs system time
Start-up	starts with 0 and is permanently updated
RUN	is permanently updated
STOP	is stopped (time can not be read)
Restart (warm restart)	starts again with 0

Parameter

Name	Declaration	Type	Comment
RetVal	OUT	DINT	System time in µs

RetVal

The parameter RetVal contains the read system time in the range of 0 to 2^{32-1}µs

SFB 7 uS_TIME

In opposite to the SFC 53, the SFB 7 returns the difference between two calls in µs.

With *Reset* = 1 the current timer value is transferred to *store*. Another call with *Reset* = 0 displays the difference in µs via *value*.

Parameter

Name	Declaration	Type	Comment
RESET	IN	BOOL	RESET=1 start timer
VALUE	OUT	DWORD	Difference in µs
STORE	STAT	DWORD	DW for 1st time

RESET

RESET=1 transfers the current timer value to STORE.

VALUE

After a call with RESET=0, VALUE returns the time difference between the two SFB 7 calls.

STORE

STORE serves the storage of the 1st time value. STORE is a static variable that is located in the instance block.

MMC access - SFC 208...215

Outline

The SFC 208 ... SCF 215 allow you to include the MMC access into your user application. The following parameters are necessary for the usage of the SFCs:

Handle, Filename

The access takes place via a *Handle* no. That is assigned to a *filename* via a call of the SCF 208 FILE_OPN res. SCF 209 FILE_CRE. At the same time a max. of 4 *Handle* may be opened (0...3). To close an opened file call the SFC 210 FILE_CLO and thus release the *Handle* again.

Media

As media format set 0 for the MMC. Other formats are not supported at this time.

Origin, Offset

Read and write start with the position of a write/read flag. After opening res. creation of a file, the write/read flag is at position 0. With SFC 213 FILE_SEK you may shift the write/read flag from an *Origin* position for an *Offset* (number bytes).

Req, Busy

With *Req* = 1 you activate the according function. *Req* = 0 returns the current state of a function via *RetVal*.

Busy = 1 monitors that the according function is in process.

RetVal

After the execution of a function *RetVal* returns a number code:

RetVal = 0:	Function has been executed without errors
0 < *RetVal* < 7000h:	*RetVal* = Length of the transferred data (only SFC211 and SFC212)
7000h ≤ RetVal < 8000h	Monitors the execution state of the function
RetVal ≥ 8000h:	Indicates an error that is described more detailed in the according SFC.

Attention!

For the access of the MMC you must regard the following hints. Nonobservance may cause data loss at the MMC:

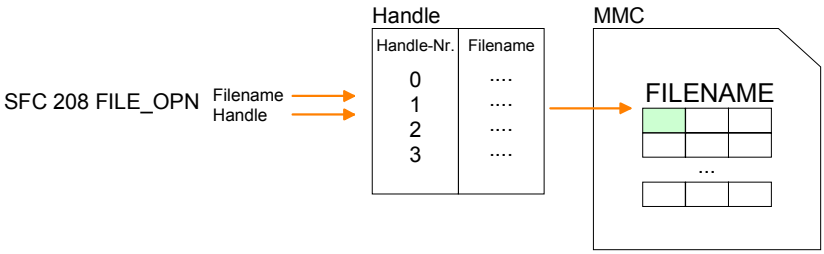
- A max. of 4 Handle (0...3) may be used at the same time!
- File names must follow the 8.3 format!
- These SFCs only gives you access to the top directory level (Root directory) of the MMC!
- You may only rename or delete files that you've closed before with SFCs 210 FILE_CLO!

The following pages describe the according SFCs:

SFC 208 FILE_OPN

You may open a file on the MMC with SFC 208. Here a *Handle* is connected to a *Filename*. By using the *Handle* you now have read and write access to the file until you close the file again with the SFC 210 FILE_CLO. *Req* =1 initializes the function.

After the opening the read/write flag is at 0.



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Media	IN	INT	0 = MMC
Filename	IN	STRING[254]	Name of file to open (must be in 8.3 format)
Handle	IN	INT	Index of file 0...3
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy

RetVal (Error message)

Codes that are returned by *RetVal*:

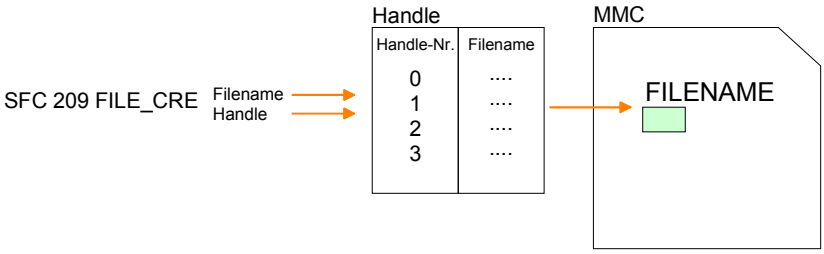
Code	Description
0000h	Ok
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8010h 8011h 8100h	*Filename* is not present (e.g. DB not loaded) *Filename* is not conform with 8.3 The defined *Handle* is not valid
9001h 9002h 9003h	*Handle* is assigned to an already opened file Another function has been called via this *Handle* and is ready. Another function has been called via this *Handle* and is not ready.
A000h A001h A003h A004h A100h	System internal error occurred The defined *Media* type is not valid A general error in the file system occurred The in *Filename* defined file doesn't exist or is a directory General file system error (e.g. no MMC plugged)

SFC 209 FILE_CRE

By using this block you may create a new file with the entered file name on the MMC (if plugged) and open it for read/write access.

Please regard that you may only create files at the top directory level. *Req* =1 initializes the function.

After opening, the write /read flag is at 0.



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Media	IN	INT	0 = MMC
Filename	IN	STRING[254]	Name of file to create (must be in 8.3 format)
Handle	IN	INT	Index of file 0...3
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy

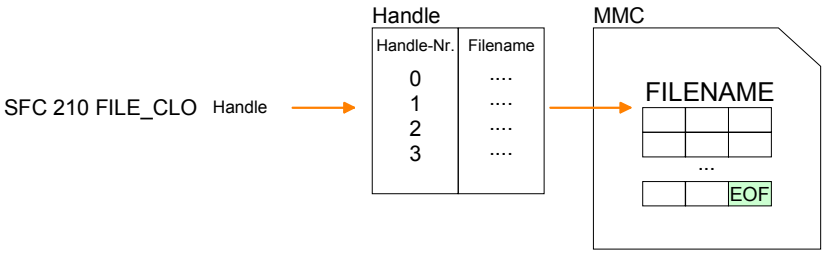
RetVal (Error message)

Codes that are returned by *RetVal*:

Code	Description
0000h	Ok
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8010h 8011h 8100h	*Filename* is not present (e.g. DB not loaded) *Filename* is not conform with 8.3 The defined *Handle* is not valid
9001h 9002h 9003h	*Handle* is assigned to an already opened file Another function has been called via this *Handle* and is ready. Another function has been called via this *Handle* and is not ready.
A000h A001h A003h A004h A100h	System internal error occurred The defined *Media* type is not valid A general error in the file system occurred No root-entry is available in the directory General file system error (e.g. no MMC plugged)

SFC 210 FILE_CLO

This block allows you to close an opened file. Here an EOF (**E**nd **o**f **F**ile) is added, the file is closed and the *Handle* released. *Req* =1 initializes the function.



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Handle	IN	INT	Index of file 0...3
RetVal	OUT	WORD	Error Code (0=OK
Busy	OUT	BOOL	1 = Busy

RetVal (error message)

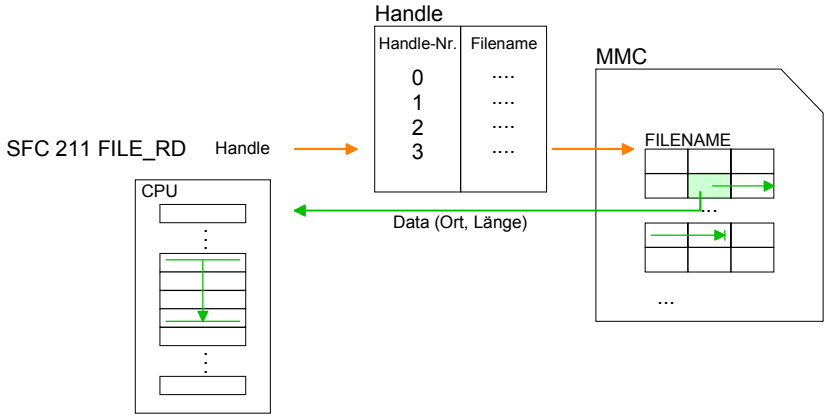
Codes that are returned by *RetVal*:

Code	Description
0000h	Ok
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8100h	The defined *Handle* is invalid
9001h 9002h 9003h	The *Handle* is not assigned to a file name Another function has been called via this *Handle* and is ready. Another function has been called via this *Handle* and is not ready.
A000h A100h	System internal error occurred General file system error (e.g. no MMC plugged)

SFC 211 FILE_RD

This allows you to transfer data from the MMC to the CPU via the opened *Handle* starting from an *Origin* position (position of the read-/write flag). During every call you may transfer a max. of 512byte.

By setting of *Data* you define storage place and length of the write area in the CPU. Req =1 initializes the function.



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Handle	IN	INT	Index of file 0...3
Data	IN	ANY	Pointer to PLC memory and data length
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy

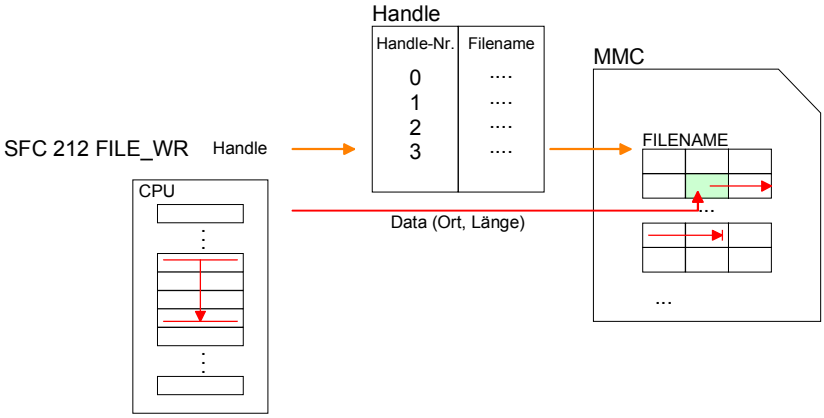
RetVal (Error message)

Codes that are returned by *RetVal*:

Code	Description
0XXXh	0 = Ok, 0XXX = Length of read data
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8010h 8011h 8012h 8013h 8100h	Pointer in *Data* has type BOOL Pointer in *Data* can not be decoded (e.g. DB not loaded) Data length exceeds 512byte Attempted to write protected DB The defined *Handle* is not valid
9001h 9002h 9003h	For this *Handle* no file is opened Another function has been called via this *Handle* and is ready. Another function has been called via this *Handle* and is not ready.
A000h A003h A100h	System internal error occurred Internal error General file system error (e.g. no MMC plugged)

SFC 212 FILE_WR

Use this block for write access to the MMC. This writes data from the position and length of the CPU defined under *Data* to the MMC via the according *Handle* starting at the write/read position. During every call you may transfer a max. of 512byte. *Req* =1 initializes the function.



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Handle	IN	INT	Index of file 0...
Data	IN	ANY	Pointer to PLC memory and data length
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy

RetVal (error message)

Codes that are returned by *RetVal*:

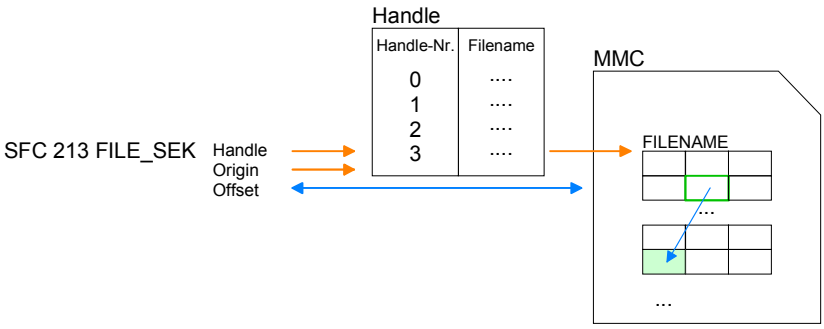
Code	Description
0XXXh	0 = Ok, 0XXX = Length of written data
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8010h 8011h 8012h 8100h	Pointer in *Data* has type BOOL Pointer in *Data* can not be decoded (e.g. DB not loaded) Data length exceeds 512byte The defined *Handle* is not valid
9001h 9002h 9003h	For this *Handle* no file is opened Another function has been called via this *Handle* and is ready. Another function has been called via this *Handle* and is not ready.
A000h A003h A004h A100h	System internal error occurred Internal error File is read-only General file system error (e.g. no MMC plugged)

SFC 213 FILE_SEK

FILE_SEK allows you to detect res. alter the position of the write/read flag of the according *Handle*.

By setting *Origin* as start position and an *Offset* you may define the write/read flag for the according *Handle*.

Req = 1 starts the function.



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Handle	IN	INT	Index of file 0...3
Origin	IN	INT	0=file start, 1=current position, 2=file end
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy
Offset	INOUT	DINT	Offset starts at origin

RetVal (error message)

Codes that are returned by *RetVal*:

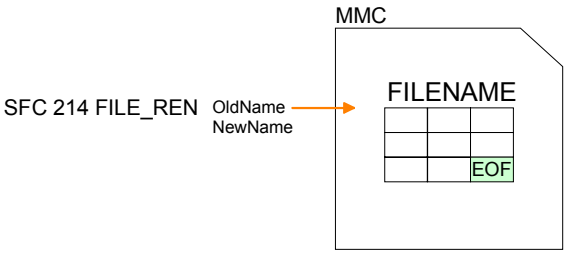
Code	Description
0000h	Ok, Offset contains the current write/read position
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8100h	The defined *Handle* is not valid
9001h 9002h 9003h	For this *Handle* no file is opened Another function has been called via this *Handle* and is ready. Another function has been called via this *Handle* and is not ready.
A000h A004h A100h	System internal error occurred *Origin* parameter is defective General file system error (e.g. no MMC plugged)

SFC 214 FILE_REN

Using FILE_REN you may alter the file name defined in *OldName* to the file name that you type in *NewFilename*.

Attention!

Please regard that you may only rename files that you've closed before with FILE_CLO. Nonobservance may cause data loss at the MMC!



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Media	IN	INT	0 = MMC
OldName	IN	STRING[254]	Old name of file (must be in 8.3 format)
NewName	IN	STRING[254]	New name of file (must be in 8.3 format)
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy

RetVal (error message)

Codes that are returned by *RetVal*:

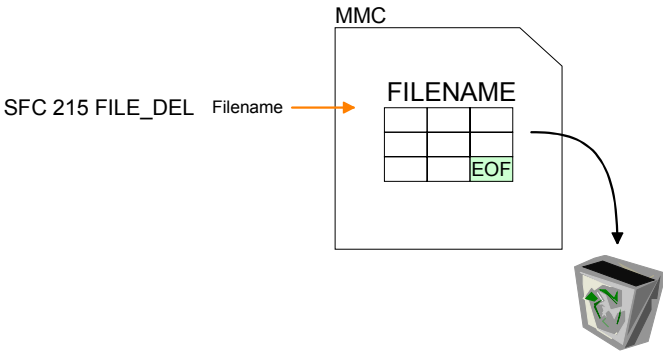
Code	Description
0000h	Ok, file has been renamed
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8010h 8011h	Name in *OldName* is a directory no file *OldName* is not conform with 8.3 format
A000h A001h A003h A004h A100h	System internal error occurred The defined *Media* type is not valid The new filename already exists File not found File system returns error at creation of the file (e.g. no MMC plugged)

SFC 215 FILE_DEL

This block allows you to delete a file at the MMC. For this, type the file name of the file to delete under *Filename*.

Attention!

Please regard that you may only delete files that you've closed before with FILE_CLO. Nonobservance may cause data loss at the MMC!



Parameter

Name	Declaration	Type	Comment
Req	IN	BOOL	1 = Activation
Media	IN	INT	0 = MMC
Filename	IN	STRING[254]	Name of file to delete (must be in 8.3 format)
RetVal	OUT	WORD	Error Code (0=OK)
Busy	OUT	BOOL	1 = Busy

RetVal (Error message)

Codes that are returned by *RetVal*:

Code	Description
0000h	Ok, file has been deleted
7000h 7001h 7002h	*Req* = 0, *Busy* = 0 (nothing present) *Req* = 1, 1st call Block is executed
8010h 8011h	Parameter *Filename* is not available (e.g. DB not loaded) *Filename* is defective (e.g. is not conform with 8.3 format)
A000h A001h A004h A100h	System internal error occurred The defined *Media* type is not valid File is just open General file system error (e.g. no MMC plugged)

PtP communication - SFC 216...218

Overview

You may de-activate the DP master integrated in the SPEED7-CPU via a hardware configuration using *Object properties* and the parameter "Function RS485". and thus release the RS485 interface for PtP (**p**oint-**t**o-**p**oint) communication.

The RS485 interface supports in PtP operation the serial process connection to different source res. destination systems.

Parameterization

The parameterization happens during runtime using the SFC 216 (SER_CFG). For this you have to store the parameters in a DB for all protocols except ASCII.

Communication

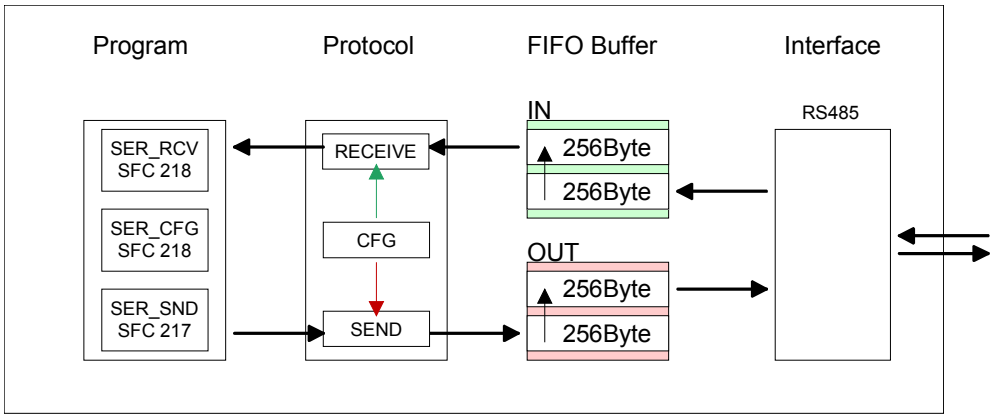
The SFCs are controlling the communication. Send takes place via SFC 217 (SER_SND) and receive via SFC 218 (SER_RCV).

The repeated call of the SFC 217 SER_SND delivers a return value for 3964R, USS and Modbus via RetVal that contains, among other things, recent information about the acknowledgement of the partner station.

The protocols USS and Modbus allow to evaluate the receipt telegram by calling the SFC 218 SER_RCV after SER_SND.

The SFCs are included in the consignment of the CPU 31xS.

CPU 31xS - RS485 PtP communication



Overview SFCs for serial communication

The following SFCs are used for the serial communication:

SFC		Description
SFC 216	SER_CFG	RS485 parameterize
SFC 217	SER_SND	RS485 send
SFC 218	SER_RCV	RS485 receive

SFC 216 (SER_CFG)

The parameterization happens during runtime deploying the SFC 216 (SER_CFG). You have to store the parameters for STX/ETX, 3964R, USS and Modbus in a DB.

Parameter

Name	Declaration	Type	Comment
Protocol	IN	BYTE	1=ASCII, 2=STX/ETX, 3=3964R
Parameter	IN	ANY	Pointer to protocol-parameters
Baudrate	IN	BYTE	Nr for Baudrate
CharLen	IN	BYTE	0=5Bit, 1=6Bit, 2=7Bit, 3=8Bit
Parity	IN	BYTE	0=Non, 1=Odd, 2=Even
StopBits	IN	BYTE	1=1Bit, 2=1.5Bit, 3=2Bit
FlowControl	IN	BYTE	1 (fix)
RetVal	OUT	WORD	Error Code (0 = OK)

All time settings for timeouts must be set as hexadecimal value. Find the Hex value by multiplicating the wanted time in seconds with the baudrate.

Example: Wanted time 8ms at a baudrate of 19200Baud
Calculation: 19200Bit/s x 0,008s ≈ 154Bit → (9Ah)
Hex value is 9Ah.

Protocol

Here you fix the protocol to be used. You may choose between:

1: ASCII
2: STX/ETX
3: 3964R
4: USS Master
5: Modbus RTU Master
6: Modbus ASCII Master

Parameter (as DB)

At ASCII protocol, this parameter is ignored.

At STX/ETX, 3964R, USS and Modbus you fix here a DB that contains the communication parameters and has the following structure for the according protocols:

Data block at STX/ETX

DBB0:	STX1	BYTE	(1. Start-ID in hexadecimal)
DBB1:	STX2	BYTE	(2. Start-ID in hexadecimal)
DBB2:	ETX1	BYTE	(1. End-ID in hexadecimal)
DBB3:	ETX2	BYTE	(2. End-ID in hexadecimal)
DBB4:	TIMEOUT	WORD	(max. delay time between 2 telegrams in a time window of 10ms)

Note!

The start res. end sign should always be a value <20, otherwise the sign is ignored!

Data block at 3964R

DBB0:	Prio	BYTE	(The priority of both partners must be different)
DBB1:	ConnAttmptNr	BYTE	(Number of connection trials)
DBB2:	SendAttmptNr	BYTE	(Number of telegram retries)
DBB4:	CharTimeout	WORD	(Char. delay time in 10ms time window)
DBB6:	ConfTimeout	WORD	(Ackn. delay time in 10ms time window)

Data block at USS

DBB0:	Timeout	WORD	(Delay time in 10ms time grid)

Data block at Modbus-Master

DBB0:	Timeout	WORD	(Respond delay time in 10ms time grid)

Baud rate

Velocity of data transfer in Bit/s (Baud).

04h:	1200Baud	05h:	1800Baud	06h:	2400Baud	07h:	4800Baud
08h:	7200Baud	09h:	9600Baud	0Ah:	14400Baud	0Bh:	19200Baud
0Ch:	38400Baud	0Dh:	57600Baud	0Eh:	115200Baud		

CharLen

Number of data bits where a character is mapped to.

0: 5Bit 1: 6Bit 2: 7Bit 3: 8Bit

Parity

The parity is -depending on the value- even or odd. For parity control, the information bits are extended with the parity bit, that amends via its value ("0" or "1") the value of all bits to a defined status. If no parity is set, the parity bit is set to "1", but not evaluated.

0: NONE 1: ODD 2: EVEN

StopBits

The stop bits are set at the end of each transferred character and mark the end of a character.

1: 1Bit 2: 1.5Bit 3: 2Bit

FlowControl

The parameter FlowControl is ignored. When sending RST=0, when receiving RST=1.

RetVal SFC 216 (Error message SER_CFG)

Return values send by the block:

Error code	Description
0000h	no error
809Ah	interface not found
8x24h	Error at SFC-Parameter x, with x:
	1: Error at "Protocol"
	2: Error at "Parameter"
	3: Error at "Baudrate"
	4: Error at "CharLength"
	5: Error at "Parity"
	6: Error at "StopBits"
	7: Error at "FlowControl"
809xh	Error in SFC parameter value x, where x:
	1: Error at "Protocol"
	3: Error at "Baudrate"
	4: Error at "CharLength"
	5: Error at "Parity"
	6: Error at "StopBits"
	7: Error at "FlowControl"
8092h	Access error in parameter DB (DB too short)
828xh	Error in parameter x of DB parameter, where x:
	1: Error 1st parameter
	2: Error 2nd parameter
	...

SFC 217 (SER_SND)

This block sends data via the serial interface.

The repeated call of the SFC 217 SER_SND delivers a return value for 3964R, USS and Modbus via RetVal that contains, among other things, recent information about the acknowledgement of the partner station.

The protocols USS and Modbus require to evaluate the receipt telegram by calling the SFC 218 SER_RCV after SER_SND.

Parameter

Name	Declaration	Type	Comment
DataPtr	IN	ANY	Pointer to Data Buffer for sending data
DataLen	OUT	WORD	Length of data to send
RetVal	OUT	WORD	Error Code (0 = OK)

DataPtr

Here you define a range of the type Pointer for the send buffer where the data that has to be send is stored. You have to set type, start and length.

Example: Data is stored in DB5 starting at 0.0 with a length of 124Byte.

DataPtr:=P#DB5.DBX0.0 BYTE 124

DataLen

Word where the number of the sent Bytes is stored.

If, under **ASCII**, the sending is so fast that not all data can be stored in the send buffer of 256Byte, the value can be different from the length of sent data. This returns the RetVal 9001h.

With **STX/ETX**, **3964R**, **Modbus** and **USS** always the length set in DataPtr is stored or 0.

RetVal SFC 217 (Error message SER_SND)

Return values of the block:

Error code	Description
0000h	Send data - ready
1000h	Nothing sent (data length 0)
20xxh	Protocol executed error free with xx bit pattern for diagnosis
7001h	Data is stored in internal buffer - active (busy)
7002h	Transfer - active
80xxh	Protocol executed with errors with xx bit pattern for diagnosis (no acknowledgement by partner)
90xxh	Protocol not executed with xx bit pattern for diagnosis (no acknowledgement by partner)
8x24h	Error in SFC parameter x, where x: 1: Error in "DataPtr" 2: Error in "DataLen"
8122h	Error in parameter "Data" of SFC 216 (e.g. no DB)
807Fh	Internal error
809Ah	RS232C interface not found
809Bh	RS232C interface not configured

Protocol specific RetVal values

ASCII

Error code	Description
9001h	Buffer overflow (no data send)

STX/ETX

Error code	Description
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)

3964R

Error code	Description
2000h	Send ready without error
8000h	NAK received - error in communication
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)

... Continue RetVal SFC 217 SER_SND

USS

Error code	Description
2000h	Send ready without error
8080h	Receive buffer overflow (no space for receipt)
8090h	Acknowledgement delay time exceeded
80F0h	Wrong checksum in respond
80FEh	Wrong start sign in respond
80FFh	Wrong slave address in respond
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)
9003h	Data too short (<2Byte)

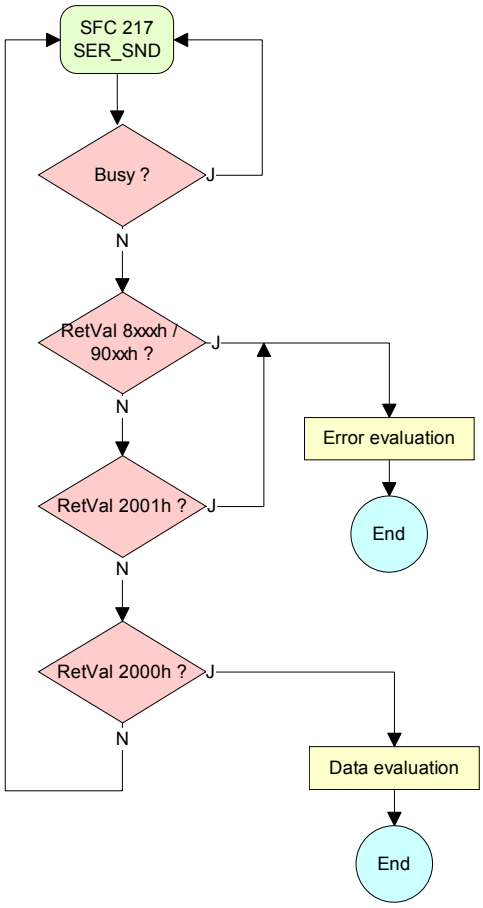
Modbus RTU/ASCII Master

Error code	Description
2000h	Send ready without error
2001h	Send ready with error
8080h	Receive buffer overflow (no space for receipt)
8090h	Acknowledgement delay time exceeded
80F0h	Wrong checksum in respond
80FDh	Length of respond too long
80FEh	Wrong function code in respond
80FFh	Wrong slave address in respond
9001h	Buffer overflow (no data send)
9002h	Data too long (>256Byte)
9003h	Data too short (<2Byte)

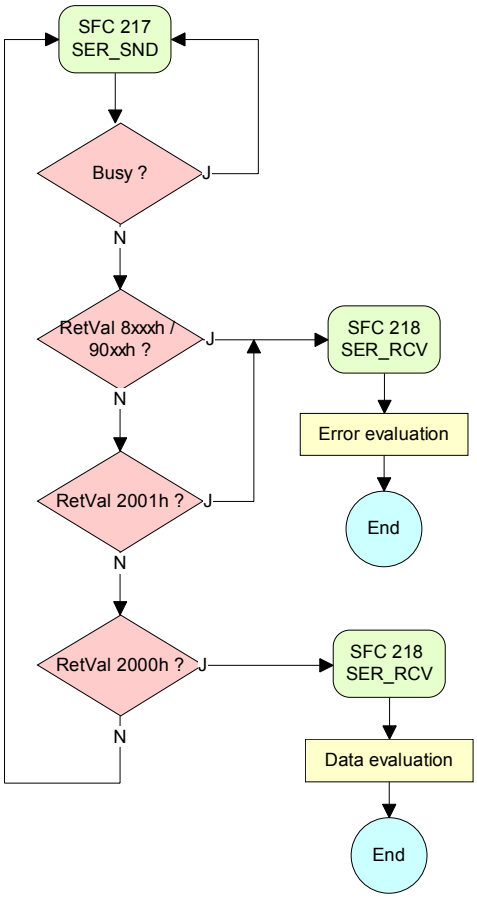
Principles of programming

The following text shortly illustrates the structure of programming a send command for the different protocols.

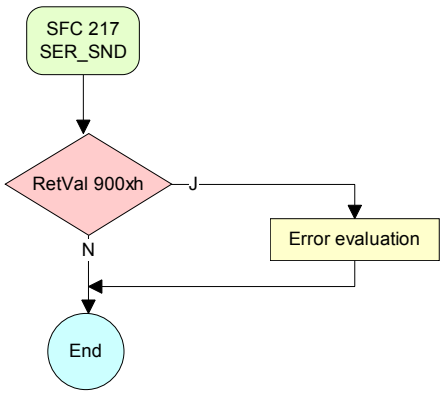
3964R



USS / Modbus



ASCII / STX/ETX



SFC 218 (SER_RCV)

This block receives data via the serial interface.

Using the SFC 218 SER_RCV after SER_SND with the protocols USS and Modbus the acknowledgement telegram can be read.

Parameter

Name	Declaration	Type	Comment
DataPtr	IN	ANY	Pointer to Data Buffer for received data
DataLen	OUT	WORD	Length of received data
Error	OUT	WORD	Error Number
RetVal	OUT	WORD	Error Code (0 = OK)

DataPtr

Here you set a range of the type Pointer for the receive buffer where the reception data is stored. You have to set type, start and length.

Example: Data is stored in DB5 starting at 0.0 with a length of 124Byte.

DataPtr:=P#DB5.DBX0.0 BYTE 124

DataLen

Word where the number of received Bytes is stored.

At **STX/ETX** and **3964R**, the length of the received user data or 0 is entered.

At **ASCII**, the number of read characters is entered. This value may be different from the read telegram length.

Error

This word gets an entry in case of an error. The following error messages may be created depending on the protocol:

ASCII

Bit	Error	Description
0	overrun	Overflow, a sign couldn't be read fast enough from the interface
1	framing error	Error that shows that a defined bit frame is not coincident, exceeds the allowed length or contains an additional Bit sequence (Stopbit error)
2	parity	Parity error
3	overflow	Buffer is full

STX/ETX

Bit	Error	Description
0	overflow	The received telegram exceeds the size of the receive buffer.
1	char	A sign outside the range 20h...7Fh has been received.
3	overflow	Buffer is full

3964R / Modbus RTU/ASCII Master

Bit	Error	Description
0	overflow	The received telegram exceeds the size of the receive buffer.

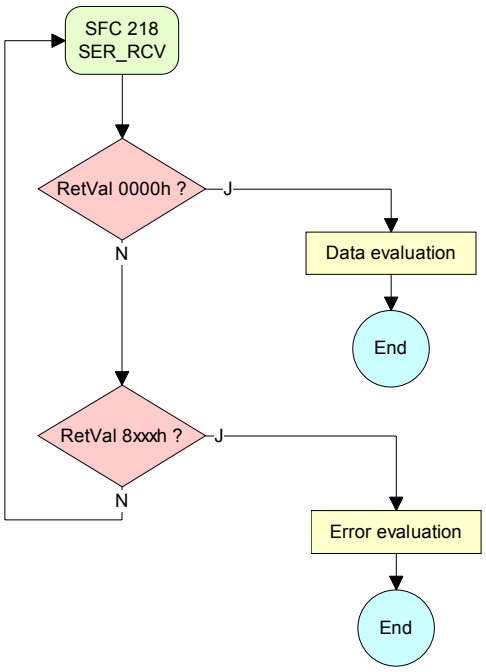
RetVal (Error message)

Return values of the block:

Error code	Description
0000h	no error
1000h	Receive buffer too small (data loss)
8x24h	Error at SFC-Parameter x, with x: 1: Error at "DataPtr" 2: Error at "DataLen" 3: Error at "Error"
8122h	Error in parameter "Data" of SFC 216 (e.g. no DB)
809Ah	serial interface not found res. interface is used by Profibus
809Bh	serial interface not configured

Principles of programming

The following picture shows the basic structure for programming a receive command. This structure can be used for all protocols.



CANopen communication - SFC 219 CAN_TLGR

SFC 219 CAN_TLGR SDO request to CAN master

Every SPEED7-CPU provides the integrated SFC 219. This allows you to initialize a SDO read or write access from the PLC program to the CAN master.

For this you address the master via the plug-in location no. and the destination slave via its CAN address.. The process data is defined by the setting of index and sub index. Via SDO per each access a max. of one data word process data can be transferred.

Parameter

Name	Declaration	Type	Comment
Request	IN	BOOL	1 = Activation
Slot_Master	IN	BYTE	SPEEDbus slot (101...116)
NodeID	IN	BYTE	CAN address (1...127)
Transfertype	IN	BYTE	Type of transfer
Index	IN	DWORD	CANopen index
Subindex	IN	DWORD	CANopen sub index
CANopenError	OUT	DWORD	CANopen error
RetVal	OUT	WORD	Error code (0=OK)
Busy	OUT	BOOL	Function is busy
DataBuffer	INOUT	ANY	Data Buffer for SFC communication

Request — Control parameter: 1: Initialization of the order

Slot_Master — 101...116: Plug-in location 1 ... 16 from master at SPEEDbus

NodeID — Address of the CANopen knot (1...127)

Transfertype — 40h: Read SDO; 23h: Write SDO (1 DWORD); 2Bh: Write SDO (1 WORD); 2Fh: Write SDO (1 BYTE)

Index — CANopen Index

Subindex — CANopen Sub index

Slot_Master

0:	System 200 CPU 21xCAN
1 ... 32:	System 200 IM 208CAN
101 ... 115:	System 300S 342-1CA70

CanOpenError When no error occurs, CanOpenError returns 0.

In case of an error CanOpenError contains one of the following error messages that are created by the CAN master:

Code	Description
05030000h	Toggle Bit not alternated
05040000h	SDO Time out value reached
05040001h	Client/server command specifier not valid, unknown
05040002h	Invalid block size (only block mode)
05040003h	Invalid sequence number (only block mode)
05040004h	CRC error (only block mode)
05040005h	Insufficient memory
06010000h	Attempt to read a write only object
06010001h	Attempt to write a write only object
06020000h	Object does not exist in the object dictionary
06040041h	Object cannot be mapped to the PDO
06040042h	The number and length of the objects to be mapped would exceed PDO length.
06040043h	General parameter incompatibility reason
06040047h	General internal incompatibility reason in the device
06060000h	Access failed because of an hardware error
06070010h	Data type does not match, length of service parameter does not match.
06070012h	Data type does not match, length of service parameter exceeded.
06070013h	Data type does not match, length of service parameter shortfall.
06090011h	Sub index does not exist
06090030h	value range of parameter exceeded (only for write access)
06090031h	Value of parameter written too high
06090032h	Value of parameter written too low
06090036h	Maximum value is less than minimum value
08000000h	General error
08000020h	Data cannot be transferred or stored to the application.
08000021h	Data cannot be transferred or stored to the application because of local control.
08000022h	Data cannot be transferred or stored to the application because of the present device state.
08000023h	Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of an file error.)

RetVal

When the function has been executed without error, the return value contains the valid length of the response data: 1: BYTE, 2: WORD, 4: DWORD

If an error occurs during execution, the return value contains one of the following error codes.

Code	Description
F021h	Invalid slave address (call parameter equal 0 or higher 127)
F022h	Invalid transfer type (value not equal to 40h, 23h, 2Bh, 2Fh)
F023h	Invalid data length (data buffer too small, at SDO read access this should be at least 4byte, at SDO write access at least 1byte, 2byte or 4byte)
F024h	SFC is not supported
F025h	Write buffer in CANopen master overflow, service can not be processed at this time.
F026h	Read buffer in CANopen master overflow, service can not be processed at this time.
F027h	SDO read or write access with defective response, see CANopen Error Codes.
F028h	SDO timeout (no CANopen station with this node-ID found)

Busy

As long as Busy = 1, the current order is not finished.

DataBuffer

Data area via that the SFC communicates. Set here an ANY pointer of the type BYTE.

SDO read access: Destination area for the read user data.

SDO write access: Source area for the user data to write.

Note!

When the SDO request has been executed without errors, RetVal contains the length of the valid response data (1, 2 or 4byte) and CanOpenError the value 0.

TD200 connection - SFC 227 TD_PRM

Description

The SFC 227 serves the connection of the terminal TD200 from Siemens to the VIPA CPUs.

Please regard that the usage of the terminal requires a data block with TD200 configuration data before you may call the SFC 227. This data block can be created with the TDWizard from VIPA. The data block contains besides the general settings like language and display mode also message texts that you may enter comfortably via the TDWizard from VIPA. TDWizard is part of WinPLC7 and available at VIPA.

By calling the SFC 227 you specify the terminal that shall be the communication partner.

Parameter

Name	Declaration	Type	Comment
MPI_ADDR	IN	BYTE	MPI address of TD
TD_STRUCT_PTR	IN	ANY	Pointer to beginning of TD's data (must be in DB)
FUNC_KEY_PTR	IN	ANY	Pointer to area for keys
OFFSET_INPUT	IN	BYTE	Forced values offset in input area
OFFSET_OUTPUT	IN	BYTE	Forced values offset in output area
RET_VAL	OUT	BYTE	Error code (0=OK)

MPI_ADR

MPI address

Type the MPI address of the connected TD200 terminal.

Parameter type: BYTE

TD_STRUCT_PTR

Terminal Structure Pointer

Points to the start of the data block that contains parameterization and text blocks of the terminal.

The data block can be created with TDWizard. This tool is part of the software WinPLC7.

Parameter type: Pointer

Reasonable: DB

FUNC_KEY_PTR

Function Key Pointer

Points to the area where the status byte for pushed keys is stored.

Parameter type: Pointer

Reasonable: I, Q, M

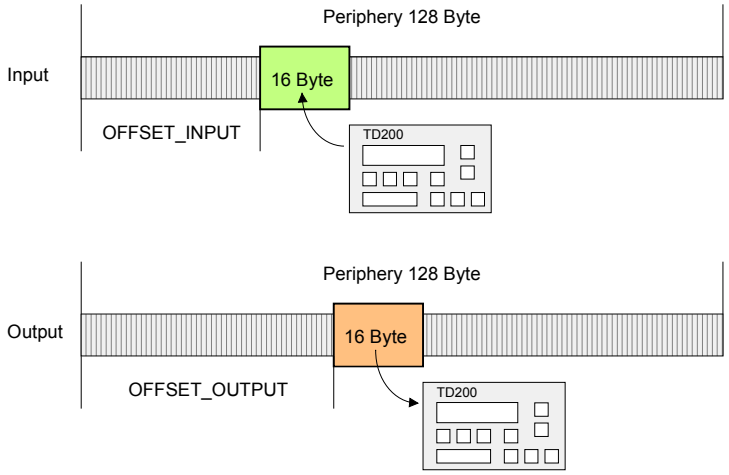
OFFSET_INPUT
OFFSET_OUTPUT

Offset Input, Offset Output

The terminal allows you to set in- and output byte. The TD200 from Siemens supports for in- and output only an area of 16byte.

At employment of the CPUs from VIPA you may access to the complete process image (each 128byte for in- and outputs).

By setting an offset you may map a "frame" with the size of 16byte above the 128byte sized peripheral range for in- and outputs. The following picture illustrates this:



RET_VAL

Return Value

Enter here the bit memory byte where the message returned by the call shall be stored.

The table below shows the (error) messages.

Messages

Value	Description
00h	No error occurred
10h	Error in setting of MPI_ADR
11h	MPI_ADR contains MPI address of CPU
12h	Entry in MPI_ADR exceeds max. MPI address
20h	Error in OFFSET_INPUT
21h	Entry in OFFSET_INPUT too large
30h	Error in OFFSET_OUTPUT
31h	Entry in OFFSET_OUTPUT too large
40h	Error in TD_STRUCT_PTR
41h	TD_STRUCT_PTR points not to a DB
50h	Error in FUNC_KEY_PTR
51h	Error in FUNC_KEY_PTR
52h	FUNC_KEY_PTR points not to an I, Q or M area
60h	An internal error occurred

Interbus communication - SFC 254 RW_SBUS

Description This block serves the Interbus-FCs 20x as communication block between Interbus master and CPU. For the usage of the Interbus-FCs 20x the SFC 254 must be included in your project as block.

Parameter

Name	Declaration	Type	Comment
Read/Write	IN	BYTE	0 = Read, 1 = Write
LADDR	IN	WORD	Logical Address of IBS master
IBS_ADDR	IN	WORD	Address at IBS Master
DataPointer	IN	ANY	Pointer to PLC data
RetVal	OUT	WORD	Error Code (0=OK)

Read/Write This defines the transfer direction seen from the CPU. Read reads the data from the Dual port memory of the IBS master.

LADDR Enter the address (**L**ogical **Addr**ess) from where on the register of the master is mapped in the CPU. At the start-up of the CPU, the IBS master are stored in the I/O address range of the CPU following the shown formula if no hardware configuration is present:

Start address = 256· (plug-in location-101)+2048

The plug-in location numeration at the SPEEDbus starts with 101 at the left side of the CPU and raises from the right to the left. For example the 1st plug-in location has the address 2048, the 2nd the address 2304 etc.

IBS_ADDR Address in the address range of the IBS master.

DataPointer Pointer to the data area of the CPU.

RetVal Value that the function returns. 0 means OK.

Chapter 11 Instruction list

Outline

The following chapter lists the available commands of the SPEED7 CPU 's from VIPA. The instruction list intends to give you an overview over the commands and their syntax. The commands are sorted by topics in alphabetical order.

Via the content the different topics are available.

The alphabetical instruction list gives you direct access to the instructions.

For the parameters are integrated in the instruction list, there is no extra parameter list.

The following chapter describes:

- Instruction and abbreviation list
- Structure of the registers and addressing examples
- Instruction list
- VIPA specific diagnostic entries (Event-IDs)

Content

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Combination instructions (Bit)	11-29
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Alphabetical instruction list

Instruction	Page	Instruction	Page
)	11-31	<>D	11-28
+	11-14	<>I	11-28
+AR1	11-14	<>R	11-28
+AR2	11-14	>=D	11-28
+D	11-13	>=I	11-28
+I	11-13	>=R	11-28
+R	11-13	>I	11-28
-D	11-13	>D	11-28
-I	11-13	>R	11-28
-R	11-13	A	11-29, 11-32, 11-33
*D	11-13	A(	11-31
*I	11-13	ABS	11-13
*R	11-13	ACOS	11-14
/D	11-13	AD	11-35
/I	11-13	AN	11-29, 11-32, 11-33
/R	11-13	AN(	11-31
=	11-21	ASIN	11-14
==D	11-28	ATAN	11-14
==I	11-28	AW	11-35
==R	11-28	BTD	11-27
<=D	11-28	BTI	11-27
<=I	11-28	BE	11-15
<=R	11-28	BEC	11-15
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Abbreviations

Abbreviation	Description
/FC	First check bit
2#	Binary constant
a	Byte address
ACCU	Register for processing bytes, words and double words
AR	Address registers, contain the area-internal or area-crossing addresses for the instructions addressed register-indirect
b	Bit address
B	area-crossing, register-indirect addressed Byte
B (b1,b2)	Constant, 2Byte
B (b1,b2,b3,b4)	Constant, 4Byte
B#16#	Byte hexadecimal
BR	Binary result
c	Operand range
C	Counter
C#	Counter constant (BCD-coded)
CC0	Condition code
CC1	Condition code
D	area-crossing, register-indirect addressed double word
D#	IEC date constant
DB	Data block
DBB	Data byte in the data block
DBD	Data double word in the data block
DBW	Data word in the data block
DBX	Data bit in the data block
DI	Instance data block
DIB	Data byte in the instance DB
DID	Data double word in the instance DB
DIW	Data word in the instance DB
DIX	Data bit in the instance DB
DW#16#	Double word hexadecimal
f	Timer/Counter No.
FB	Function block
FC	Functions
g	Operand range
h	Operand range
I	Input (in the PII)
i	Operand range
i8	Integer (8Bit)
i16	Integer (16Bit)
i32	Integer (32 Bit)
IB	Input byte (in the PII)
ID	Input double word (in the PII)
IW	Input word (in the PII)
k8	Constant (8 Bit)
k16	Constant (16 Bit)
k32	Constant (32 Bit)

Abbreviation	Description
L	Local data
L#	Integer constant (32Bit)
LABEL	Symbolic jump address (max. 4 characters)
LB	Local data byte
LD	Local data double word
LW	Local data word
m	Pointer constant P#x.y (pointer)
M	Bit memory bit
MB	Bit memory byte
MD	Bit memory double word
MW	Bit memory word
n	Binary constant
OB	Organization block
OR	Or
OS	Stored overflow
OV	Overflow
p	Hexadecimal constant
P#	Pointer constant
PIQ	Process image of the outputs
PII	Process image of the inputs
PIB	Periphery input byte (direct periphery access)
PID	Periphery input double word (direct periphery access)
PIW	Periphery input word (direct periphery access)
PQB	Periphery output byte (direct periphery access)
PQD	Periphery output double word (direct periphery access)
PQW	Periphery output word (direct periphery access)
Q	Output (in the PIQ)
q	Real number (32bit floating-point number)
QB	Output byte (in the PIQ)
QD	Output double word (in the PIQ)
QW	Output word (in the PIQ)
r	Block no.
RLO	Result of (previous) logic instruction
S5T#	S5 time constant (16Bit), loads the S5-Timer
SFB	System function block
SFC	System function
STA	Status
T	Timer (times)
T#	Time constant (16/32Bit)
TOD#	IEC time constant
W	area-crossing, register-indirect addressed word
W#16#	Word hexadecimal

Differences between SPEED7 and 300V programming

General

The SPEED7-CPUs lean in the command processing against the S7-400 from Siemens and differs here to the S7-300 from Siemens.

These differences are listed below.

In the following, the S7-318 from Siemens is counted for the S7-400 series from Siemens.

Status register

In opposite to the System 300V, the SPEED7-CPUs use the status register Bits OR, STA, /ER.

If your user application is based upon the circumstance that the mentioned bits in the status register are always zero (like S7-300 from Siemens), the program is not executable at SPEED7-CPUs and S7-400 from Siemens.

ACCU handling at arithmetic operations

The CPUs of the System 300V contain 2 ACCUs. At an arithmetic operation the content of the 2nd ACCU is not altered.

Whereas the SPEED7-CPUs provide 4 ACCUs. At an arithmetic operation the content of ACCU 3 is loaded to ACCU 2.

This may cause conflicts in applications that presume an unmodified ACCU2.

VKE at jumps

The missing of the implementation of the start command bit /ER in the System 300V may cause, under certain circumstances, deviations in the command execution of bit commands between S7-300 and S7-400 res. SPEED7, especially at a jump to a bit conjunction chain.

Example A:

```
A I0.0
A M1.1
= M2.0     // RLO =1  Command end
JU =SP001  // jumps
.....
A M7.6
A M3.0
A M3.1
JO01:      // after the jump...
A Q2.2     // 300V further interlink
           // this command is used by SPEED7 as first request
.....
```

***...continue* VKE at jumps**

Example B:

```
A I0.0
A M1.1
= M2.0       // RLO =1  command end
A Q3.3
JU =SP001    // jumps
.....
A M3.0
A M3.1
JO01:
A M3.2       // link 300V and SPEED7 after jump
             // normal execution
.....
```

BCD consistency

At setting a timer or counter, a valid BCD value must be present in AKKU1. The proof of this BCD value is in the System 300V only executed when timer or counter are taken over (edge change). The SPEED7-CPUs (like the S7-400 from Siemens) always execute the verification.

Example:

```
......
A I5.4
L MW20
S T30        // 300V only proofs if timer is actively
                executed
             // SPEED7 always proofs (also when
                no condition is present)
......
```

Registers

ACCU1 and ACCU4 (32Bit)

The ACCUs are registers for the processing of Byte, words or double words. Therefore the operands are loaded in the ACCUs and combined. The result of the instruction is always in ACCU1.

ACCU	Bit
ACCUx (x=1 to 4)	Bit 0 to Bit 31
ACCUx-L	Bit 0 to Bit 15
ACCUx-H	Bit 16 to Bit 31
ACCUx-LL	Bit 0 to Bit 7
ACCUx-LH	Bit 8 to Bit 15
ACCUx-HL	Bit 16 to Bit 23
ACCUx-HH	Bit 24 to Bit 31

Address register AR1 and AR2 (32Bit)

The address registers contain the area-internal or area-crossing addresses for the register-indirect addressed instructions. The address registers are 32Bit wide.

The area-internal or area-crossing addresses have the following structure:

area-internal address:

00000000 00000bbb bbbbbbbb bbbbbxxx

area-crossing address:

10000yyy 00000bbb bbbbbbbb bbbbbxxx

Legend:

b	Byte address
x	Bit number
Y	Range ID (see chapter "Addressing examples")

Status word (16Bit)

The values are analyzed or set by the instructions.
The status word is 16Bit wide.

Bit	Assignment	Description
0	/FC	First check bit
1	RLO	Result of (previous) logic instruction
2	STA	Status
3	OR	Or
4	OS	Stored overflow
5	OV	Overflow
6	CC0	Condition code
7	CC1	Condition code
8	BR	Binary result
9 to 15	not used	-

Addressing examples

Addressing example	Description
Immediate addressing	
L +27	Load 16Bit integer constant "27" in ACCU1.
L L#-1	Load 32Bit integer constant "-1" in ACCU1.
L 2#1010101010101010	Load binary constant in ACCU1.
L DW#16#A0F0_BCFD	Load hexadecimal constant in ACCU1.
L 'End'	Load ASCII code in ACCU1.
L T#500ms	Load time value in ACCU1.
L C#100	Load counter value in ACCU1.
L B#(100,12)	Load constant as 2Byte.
L B#(100,12,50,8)	Load constant as 4Byte.
L P#10.0	Load area-internal pointer in ACCU1.
L P#E20.6	Load area-crossing pointer in ACCU1.
L -2.5	Load real number in ACCU1.
L D#1995-01-20	Load date.
L TOD#13:20:33.125	Load time-of-day.
Direct addressing	
A I 0.0	AND operation of input bit 0.0
L IB 1	Load input byte 1 in ACCU1.
L IW 0	Load input word 0 in ACCU1.
L ID 0	Load input double word 0 in ACCU1.

continued ...

... continue

Indirect addressing timer/counter	
SP T [LW 8] CU C [LW 10]	Start timer; timer no. is in local data word 8. Start counter; counter no. is in local data word 10.
Memory-indirect, area-internal addressing	
A I [LD 12] e.g.: LP#22.2 T LD 12 A I [LD 12]	AND instruction; input address is in local data double word 12 as pointer.
A I [DBD 1]	AND instruction; input address is in data double word 1 of the DB as pointer.
A Q [DID 12]	AND instruction; output address is in data double word 12 of the instance DB as pointer.
A Q [MD 12]	AND instruction; output address is in bit memory double word 12 as pointer.
Register-indirect, area-internal addressing	
A I [AR1,P#12.2]	AND instruction; input address is calculated "pointer value in address register 1 + pointer P#12.2".
Register-indirect, area-crossing addressing	

For the area-crossing, register indirect addressing the address needs an additional range-ID in the Bits 24-26. The address is in the address register.

Range-ID	**Binary code**	**hex.**	**Area**
P	1000 0**000**	80	Periphery area
I	1000 0**001**	81	Input area
Q	1000 0**010**	82	Output area
M	1000 0**011**	83	Bit memory area
DB	1000 0**100**	84	Data area
DI	1000 0**101**	85	Instance data area
L	1000 0**110**	86	Local data area
VL	1000 0**111**	87	Preceding local data area (access to the local data of the calling block)

L B [AR1,P#8.0]	Load byte in ACCU1; the address is calculated "pointer value in address register 1 + pointer P#8.0".
A [AR1,P#32.3]	AND instruction; operand address is calculated "pointer value in address register 1 + pointer P#32.3".
Addressing via parameters	
A parameter	The operand is addressed via the parameter.

Example for pointer calculation

Example when sum of bit addresses ≤ 7:

```
LAR1 P#8.2
A    I [AR1,P#10.2]
```

Result: The input 18.4 is addressed (by adding the byte and bit addresses)

Example when sum of bit addresses > 7:

```
L MD 0          at will calculated pointer, e.g. P#10.5
LAR1
A    I [AR1,P#10.7]
```

Result: Addressed is input 21.4 (by adding the byte and bit addresses with carry)

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Math instructions

Fixed-point arithmetic (16Bit)			*Status word*									Math instructions of two 16Bit numbers. The result is in ACCU1 res. ACCU1-L.	
+I	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Add up two integers (16Bit).	1
			-	-	-	-	-	-	-	-	-	(ACCU1-L)=(ACCU1-L)+(ACCU2-L)	
-I	-		-	Y	Y	Y	Y	-	-	-	-	Subtract two integers (16Bit).	1
												(ACCU1-L)=(ACCU2-L)-(ACCU1-L)	
*I	-											Multiply two integers (16Bit).	1
												(ACCU1-L)=(ACCU2-L)*(ACCU1-L)	
/I	-											Divide two integers (16Bit).	1
												(ACCU1-L)=(ACCU2-L):(ACCU1-L)	
												The remainder is in ACCU1-H.	
Fixed-point arithmetic (32Bit)			*Status word*									Math instructions of two 32Bit numbers. The result is in ACCU1.	
+D	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Add up two integers (32Bit).	1
			-	-	-	-	-	-	-	-	-	(ACCU1)=(ACCU2)+(ACCU1)	
-D	-		-	Y	Y	Y	Y	-	-	-	-	Subtract two integers (32Bit).	1
												(ACCU1)=(ACCU2)-(ACCU1)	
*D	-											Multiply two integers (32Bit).	1
												(ACCU1)=(ACCU2)*(ACCU1)	
/D	-											Divide two integers (32Bit).	1
												(ACCU1)=(ACCU2):(ACCU1)	
MOD	-											Divide two integers (32Bit) and load the rest of the	1
												division in ACCU1.	
												(ACCU1)=remainder of [(ACCU2):(ACCU1)]	
Floating-point arithmetic (32Bit)			*Status word*									The result of the math instructions is in ACCU1. The execution time of the instruction depends on the value to calculate.	
+R	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Add up two real numbers (32Bit)	1
			-	-	-	-	-	-	-	-	-	(ACCU1)=(ACCU2)+(ACCU1)	
-R	-		-	Y	Y	Y	Y	-	-	-	-	Subtract two real numbers (32Bit).	1
												(ACCU1)=(ACCU2)-(ACCU1)	
*R	-											Multiply two real numbers (32Bit).	1
												(ACCU1)=(ACCU2)*(ACCU1)	
/R	-											Divide two real numbers (32Bit).	1
												(ACCU1)=(ACCU2):(ACCU1)	
NEGR	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Negate the real number in ACCU1.	1
			-	-	-	-	-	-	-	-	-		
ABS	-		-	-	-	-	-	-	-	-	-	Form the absolute value of the real number in ACCU1.	1

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Square root an square instructions (32Bit)			*Status word*									The result of the instructions is in ACCU1. The instructions may be interrupted by alarms.	
SQRT	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Calculate the Square root of a real number in ACCU1.	1
			-	-	-	-	-	-	-	-	-		
SQR	-		-	Y	Y	Y	Y	-	-	-	-	Form the square of a real number in ACCU1.	1
Logarithmic function (32Bit)			*Status word*									The result of the logarithm function is in ACCU1. The instructions may be interrupted by alarms.	
LN	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Calculate the natural logarithm of a real number in	1
			-	-	-	-	-	-	-	-	-	ACCU1.	
EXP	-		-	Y	Y	Y	Y	-	-	-	-	Calculate the exponential value of a real number in ACCU1	1
												on basis e (=2.71828).	
Trigonometrical functions (32Bit)			*Status word*									The result of the trigonometrical function is in ACCU1. The instructions may be interrupted by alarms.	
SIN[1]	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Calculate the sine of the real number.	1
			-	-	-	-	-	-	-	-	-		
ASIN[2]	-		-	Y	Y	Y	Y	-	-	-	-	Calculate the arcsine of the real number.	1
COS[1]	-											Calculate the cosine of the real number.	1
ACOS[2]	-											Calculate the arccosine of the real number.	1
TAN[1]	-											Calculate the tangent of the real number.	1
ATAN[2]	-											Calculate the arctangent of the real number.	1
Addition of constants												Addition of integer constants to ACCU1. The condition code bits are not affected.	
+	i8											Add an 8Bit integer constant.	1
+	i16											Add a 16Bit integer constant.	2
+	i32											Add a 32Bit integer constant.	3
Addition via address register												Adding a 16Bit integer to contents of address register. The value is in the instruction or in ACCU1-L. Condition code bits are not affected	
+AR1	-											Add the contents of ACCU1-L to AR1.	1
+AR1	m											Add a pointer constant to the contents of AR1.	2
+AR2	-											Add the contents of ACCU1-L to those of AR2.	1
+AR2	m											Add pointer constant to the contents of AR2.	2

1 Specify the angle in radians; the angle must be given as a floating point value in ACCU 1.

2 The result is an angle in radians.

Command	Operand	Parameter	Status word BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Function	Length in words
												: Instruction depends on	
												: Instruction influences	

Block instructions

Block call instructions			*Status word* BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
CALL	FB r, DB r	0 bis 8191 0 bis 8191	-	-	-	-	-	-	-	-	-	Unconditional call of a FB, with parameter transfer	
CALL	SFB r, DB r	0 bis 8191 0 bis 8191	-	-	-	-	0	0	1	-	0	Unconditional call of a SFB, with parameter transfer	
CALL	FC r											Unconditional call of a function, with parameter transfer	
CALL	SFC r											Unconditional call of a SFC, with parameter transfer	
UC	FB r FC r Parameter	0 bis 8191										Unconditional call of blocks, without parameter transfer FB/FC call via parameters	1/2
CC	FB r FC r Parameter	0 bis 8191	BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Conditional call of blocks, without parameter transfer	1/2
			-	-	-	-	-	-	-	Y	-		
			-	-	-	-	0	0	1	-	0	FB/FC call via parameters	
OPN	DB r DI r Parameter	0 bis 8191	BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Open a data block	1/2
			-	-	-	-	-	-	-	-	-	Open a instance data block	2
			-	-	-	-	-	-	-	-	-	Open a data block via parameter	2
Block end instructions			*Status word* BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
BE			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	End block.	1
			-	-	-	-	-	-	-	-	-		
BEU			-	-	-	-	0	0	1	-	0	End block unconditionally.	1
BEC			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	End block if RLO="1".	
			-	-	-	-	-	-	-	Y	-		
			-	-	-	-	Y	0	1	1	0		
Exchanging shared data block an instance data block												Exchanging the two current data blocks. The current shared data block becomes the current instance data block and vice versa. The condition code bits are not affected	
CDB												Exchange shared data block and instant data block.	1

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Program display and null instruction instructions

Program display and null operation instructions				The status word is not affected.	
BLD		0 ... 255		Program display instruction: is treated by the CPU like a null operation instruction.	1
NOP		0 1		Null operation instruction	1

Edge-triggered instructions

Edge-triggered instructions			*Status word*									Detection of an edge change. The current signal state of the RLO is compared with the signal state of the instruction or edge bit memory. FP detects a change in the RLO from "0" to "1". FN detects a change in the RLO from "1" to "0".	
FP	I/Q a.b	0.0 to 2047.7	BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Detecting the positive edge in the RLO. The bit addressed	2
	M a.b	0.0 to 8191.7	-	-	-	-	-	-	-	Y	-	in the instruction is the auxiliary edge bit memory.	2
	L a.b	parameterizable	-	-	-	-	-	0	Y	Y	1		2
	DBX a.b	0.0 to 65535.7											2
	DIX a.b	0.0 to 65535.7											2
	c [AR1,m]												2
	c [AR2,m]												2
	[AR1,m]												2
	[AR2,m]												2
	Parameter												2
FN	I/Q a.b	0.0 to 2047.7	BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Detecting the negative edge in the RLO. The bit addressed	2
	M a.b	0.0 to 8191.7	-	-	-	-	-	-	-	Y	-	in the instruction is the auxiliary edge bit memory.	2
	L a.b	parameterizable	-	-	-	-	-	0	Y	Y	1		2
	DBX a.b	0.0 to 65535.7											2
	DIX a.b	0.0 to 65535.7											2
	c [AR1,m]												2
	c [AR2,m]												2
	[AR1,m]												2
	[AR2,m]												2
	Parameter												2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Load instructions

Load instructions				Loading address identifiers into ACCU1. The contents of ACCU1 and ACCU2 are saved first. The status word is not affected.	
L				Load ...	
	IB a	0.0 to 2047		input byte	1/2
	QB a	0.0 to 2047		output byte	1/2
	PIB a	0.0 to 8191		periphery input byte	2
	MB a	0.0 to 8191		bit memory byte	1/2
	LB a	parameterizable		local data byte	2
	DBB a	0.0 to 65535		data byte	2
	DIB a	0.0 to 65535		instance data byte	2
				... in ACCU1	2
	g [AR1,m]			register-indirect, area-internal (AR1)	2
	g [AR2,m]			register-indirect, area-internal (AR2)	2
	B [AR1,m]			area-crossing (AR1)	2
	B [AR2,m]			area-crossing (AR2)	2
	Parameter			via parameters	2
L				Load ...	
	IW a	0.0 to 2046		input word	1/2
	QW a	0.0 to 2046		output word	1/2
	PIW a	0.0 to 8190		periphery input word	
	MW a	0.0 to 8190		bit memory word	1/2
	LW a	parameterizable		local data word	2
	DBW a	0.0 to 65534		data word	1/2
	DIW a	0.0 to 65534		instance data word	1/2
				... in ACCU1-L	
	h [AR1,m]			register-indirect, area-internal (AR1)	2
	h [AR2,m]			register-indirect, area-internal (AR2)	2
	W [AR1,m]			area-crossing (AR1)	2
	W [AR2,m]			area-crossing (AR2)	2
	Parameter			via parameters	2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

L				Load ...	
	ID a	0.0 to 2044		input double word.	1/2
	QD a	0.0 to 2044		output double word.	1/2
	PID a	0.0 to 8188		periphery input double word.	2
	MD a	0.0 to 8188		bit memory double word.	1/2
	LD a	parameterizable		local data double word.	2
	DBD a	0.0 to 65532		data double word.	2
	DID a	0.0 to 65532		instance data double word.	2
				... in ACCU1-L.	
	i [AR1,m]			register-indirect, area-internal (AR1)	2
	i [AR2,m]			register-indirect, area-internal (AR2)	2
	D [AR1,m]			area-crossing (AR1)	2
	D [AR2,m]			area-crossing (AR2)	2
	Parameter			via parameters	2
L				Load ...	
	k8			8Bit constant in ACCU1-LL.	1
	k16			16Bit constant in ACCU1-L.	2
	k32			32Bit constant in ACCU1.	3
	Parameter			Load constant in ACCU1 (addressed via parameters)	2
L	2#n			Load 16Bit binary constant in ACCU1-L.	2
				Load 32Bit binary constant in ACCU1.	3
L	B#8#p			Load 8Bit hexadecimal constant in ACCU1-LL.	1
	W#16#p			Load 16Bit hexadecimal constant in ACCU1-L.	2
	DW#16#p			Load 32Bit hexadecimal constant in ACCU1.	3
L	x			Load one character.	
L	xx			Load two characters.	2
L	xxx			Load three characters.	
L	xxxx			Load four characters.	3
L	D# Date			Load IEC-date (BCD-coded).	3
L	S5T# time value			Load time constant (16Bit).	2
L	TOD# time value			Load 32Bit time constant. (IEC-time-of-day)	3
L	T# time			Load 16Bit time constant.	2
	value			Load 32Bit time constant.	3
L	C# counter value			Load 16Bit counter constant.	2
L	P# bit pointer			Load bit pointer.	3
L	L# Integer			Load 32Bit integer constant.	3
L	Real			Load real number.	3

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Load instructions for timer and counter				Load a time or counter value in ACCU1, before the recent content of ACCU1 is saved in ACCU2. The status word is not affected.	
L	T f	0 to 511		Load time value.	1/2
	Timer parameter			Load time value (addressed via parameters).	2
L	C f	0 to 511		Load counter value.	1/2
	Counter parameter			Load counter value (addressed via parameters).	2
LD	T f	0 to 511		Load time value BCD-coded.	1/2
	Timer parameter			Load time value BCD-coded (addressed via parameters).	2
LD	C f	0 to 511		Load counter value BCD-coded.	1/2
	Counter parameter			Load counter value BCD-coded (addressed via parameters).	2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Shift instructions

Shift instructions			*Status word*									Shifting the contents of ACCU1 and ACCU1-L to the left or right by the specified number of places. If no address identifier is specified, shift the number of places into ACCU2-LL. Any positions that become free are padded with zeros or the sign. The last shifted bit is in condition code bit CC1.	
SLW	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Shift the contents of ACCU1-L to the left.	1
SLW	0 ... 15		-	-	-	-	-	-	-	-	-	Positions that become free are provided with zeros	
SLD	-		-	Y	Y	Y	-	-	-	-	-	Shift the contents of ACCU1 to the left.	1
SLD	0 ... 32											Positions that become free are provided with zeros.	
SRW	-											Shift the contents of ACCU1-L to the right.	1
SRW	0 ... 15											Positions that become free are provided with zeros.	
SRD	-											Shift the contents of ACCU1 to the right.	1
SRD	0 ... 32											Positions that become free are provided with zeros.	
SSI	-											Shift the contents of ACCU1-L to the right with sign.	1
SSI	0 ... 15											Positions that become free are provided with the sign (Bit 15) .	
SSD	-											Shift the contents of ACCU1 to the right with sign	1
SSD	0 ... 32												
Rotation instructions			*Status word*									Rotate the contents of ACCU1 to the left or right by the specified number of places. If no address identifier is specified, rotate the number of places into ACCU2-LL.	
RLD	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Rotate the contents of ACCU1 to the left.	1
RLD	0 ... 32		-	-	-	-	-	-	-	-	-		
RRD	-		-	Y	Y	Y	-	-	-	-	-	Rotate the contents of ACCU1 to the right.	1
RRD	0 ... 32												
RLDA	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Rotate the contents of ACCU1 one bit position to the left,	
			-	-	-	-	-	-	-	-	-	via CC1 bit.	
RRDA	-		-	Y	0	0	-	-	-	-	-	Rotate the contents of ACCU1 one bit position to the right,	
												via CC1 bit.	

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Setting/resetting bit addresses

Set/Reset bit addresses			*Status word*									Assign the value "1" or "0" or the RLO to the addressed instructions.	
S			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Set ...	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	-	input/output to "1".	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	-	0	set bit memory to "1".	1/2
	L a.b	parameterizable										local data bit to "1".	2
	DBX a.b	0.0 to 65535.7										data bit to "1".	2
	DIX a.b	0.0 to 65535.7										instance data bit to "1".	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2
R			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Reset ...	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	-	input/output to "0".	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	-	0	set bit memory to "0".	1/2
	L a.b	parameterizable										local data bit to "0".	2
	DBX a.b	0.0 to 65535.7										data bit to "0".	2
	DIX a.b	0.0 to 65535.7										instance data bit to "0".	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	W [AR1,m]											area-crossing (AR1)	2
	W [AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2
=			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Assign ...	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	-	RLO to input/output	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	-	0	RLO to bit memory	1/2
	L a.b	parameterizable										RLO to local data bit	2
	DBX a.b	0.0 to 65535.7										RLO to data bit	2
	DIX a.b	0.0 to 65535.7										RLO to instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Instructions directly affecting the RLO			*Status word*									The following instructions have a directly effect on the RLO.	
CLR			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Set RLO to "0".	1
			-	-	-	-	-	-	-	-	-		
			-	-	-	-	-	0	0	0	0		
SET			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Set RLO to "1".	1
			-	-	-	-	-	-	-	-	-		
			-	-	-	-	-	0	1	1	0		
NOT			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Negate RLO.	1
			-	-	-	-	-	Y	-	Y	-		
			-	-	-	-	-	-	1	Y	-		
SAVE			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Save RLO into BR-Bit.	1
			-	-	-	-	-	-	-	Y	-		
			Y	-	-	-	-	-	-	-	-		

Jump instructions

Jump instructions			*Status word*									Jump, depending on conditions. 8-Bit operands have a jump width of (-128...+127), 16-Bit operands of (-32768...-129) or (+128...+32767)	
JU	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump unconditionally.	1/2
			-	-	-	-	-	-	-	-	-		
			-	-	-	-	-	-	-	-	-		
JC	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump if RLO="1".	1/2
JCN	LABEL		-	-	-	-	-	-	-	Y	-	Jump if RLO="0".	2
			-	-	-	-	-	0	1	1	0		
JCB	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump if RLO="1".	2
			-	-	-	-	-	-	-	Y	-	Save the RLO in the BR-Bit	
JNB	LABEL		Y	-	-	-	-	0	1	1	0	Jump if RLO="0".	2
												Save the RLO in the BR-Bit	
JBI	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump if BR="1".	2
JNBI	LABEL		Y	-	-	-	-	-	-	-	-	Jump if BR="0".	2
			-	-	-	-	-	0	1	-	0		
JO	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump on stored overflow (OV="1").	1/2
			-	-	-	Y	-	-	-	-	-		
			-	-	-	-	-	-	-	-	-		
JOS	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump on stored overflow (OS="1").	2
			-	-	-	-	Y	-	-	-	-		
			-	-	-	-	0	-	-	-	-		

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

JUO	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump if "unordered instruction" (CC1=1 and CC0=1).	2
JZ	LABEL		-	Y	Y	-	-	-	-	-	-	Jump if result=0 (CC1=0 and CC0=0).	1/2
JP	LABEL		-	-	-	-	-	-	-	-	-	Jump if result>0 (CC1=1 and CC0=0).	1/2
JM	LABEL											Jump if result<0 (CC1=0 and CC0=1).	1/2
JN	LABEL											Jump if result≠0. (CC1=1 and CC0=0) or (CC1=0) and (CC0=1)	1/2
JMZ	LABEL											Jump if result≤0. (CC1=0 and CC0=1) or (CC1=0 and CC0=0)	2
JPZ	LABEL											Jump if result≥0. (CC1=1 and CC0=0) or (CC1=0 and CC0=0)	2
JL	LABEL		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Jump distributor	2
			-	-	-	-	-	-	-	-	-	This instruction is followed by a list of jump instructions.	
			-	-	-	-	-	-	-	-	-	The operand is a jump label to subsequent instructions in	
												this list. ACCU1-L contains the number of the jump instruction to be executed.	
LOOP	LABEL											Decrement ACCU1-L and jump if ACCU1-L _ 0 (loop programming)	2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Transfer instructions

Transfer instructions				Transfer the contents of ACCU1 into the addressed operand. The status word is not affected.	
T				Transfer the contents of ACCU1-LL to...	
	IB a	0.0 to 2047		input byte.	1/2
	QB a	0.0 to 2047		output byte.	1/2
	PQB a	0.0 to 8191		periphery output byte.	1/2
	MB a	0.0 to 8191		bit memory byte.	1/2
	LB a	parameterizable		local data byte.	2
	DBB a	0.0 to 65535		data byte.	2
	DIB a	0.0 to 65535		instance data byte.	2
	g [AR1,m]			register-indirect, area-internal (AR1)	2
	g [AR2,m]			register-indirect, area-internal (AR2)	2
	B [AR1,m]			area-crossing (AR1)	2
	B [AR2,m]			area-crossing (AR2)	2
	Parameter			via parameters	2
T				Transfer the contents of ACCU1-L to ...	
	IW	0.0 to 2046		input word.	1/2
	QW	0.0 to 2046		output word.	1/2
	PQW	0.0 to 8190		periphery output word.	1/2
	MW	0.0 to 8190		bit memory word.	1/2
	LW	parameterizable		local data word.	2
	DBW	0.0 to 65534		data word.	2
	DIW	0.0 to 65534		instance data word.	2
	h [AR1,m]			register-indirect, area-internal (AR1)	2
	h [AR2,m]			register-indirect, area-internal (AR2)	2
	W [AR1,m]			area-crossing (AR1)	2
	W [AR2,m]			area-crossing (AR2)	2
	Parameter			via parameters	2

Command	Operand	Parameter	Status word BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Function	Length in words
												: Instruction depends on : Instruction influences	

T				Transfer the contents of ACCU1 to...	
	ID	0.0 to 2044		input double word.	1/2
	QD	0.0 to 2044		output double word.	1/2
	PQD	0.0 to 8188		periphery output double word.	1/2
	MD	0.0 to 8188		bit memory double word.	1/2
	LD	parameterizable		local data double word.	2
	DBD	0.0 to 65532		data double word.	2
	DID	0.0 to 65532		instance data double word.	2
	i [AR1,m]			register-indirect, area-internal (AR1)	2
	i [AR2,m]			register-indirect, area-internal (AR2)	2
	D [AR1,m]			area-crossing (AR1)	2
	D [AR2,m]			area-crossing (AR2)	2
	Parameter			via parameters	2
Load and transfer instructions for address register				Load a double word from a memory area or a register into AR1 or AR2.	
LAR1				Load the contents from...	
	-			ACCU1.	1
	AR2			address register 2.	1
	DBD a	0 to 65532		data double word.	2
	DID a	0 to 65532		instance data double word.	2
	m			32Bit constant as pointer.	3
	LD a	parameterizable		local data double word.	2
	MD a	0 to 8188		bit memory double word.	2
				... into AR1.	
LAR2				Load the contents from ...	
	-			ACCU1.	1
	DBD a	0 to 65532		data double word.	2
	DID a	0 to 65532		instance data double word.	2
	m			32Bit constant as pointer.	3
	LD a	parameterizable		local data double word.	2
	MD a	0 to 8188		bit memory double word.	2
				... into AR2.	
TAR1				Transfer the contents from AR1 to...	
	-			ACCU1.	1
	AR2			address register 2.	1
	DBD a	0 to 65532		data double word.	2
	DID a	0 to 65532		instance data double word.	2
	LD a	parameterizable		local data double word.	2
	MD a	0 to 8188		bit memory double word.	2

Command	Operand	Parameter	Status word BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Function	Length in words
												: Instruction depends on : Instruction influences	

TAR2												Transfer the contents from AR2 to...	
	-											ACCU1.	1
	DBD a	0 to 65532										data double word.	2
	DID a	0 to 65532										instance data double word.	2
	LD a	parameterizable										local data double word.	2
	MD a	0 to 8188										bit memory double word.	2
TAR												Exchange the contents of AR1 and AR2	1
Load and transfer instructions for the status word			*Status word*										
L	STW		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Load status word in ACCU1.	
	-		Y	Y	Y	Y	Y	0	0	Y	0		
			-	-	-	-	-	-	-	-	-		
T	STW		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Transfer ACCU1 (Bits 0 to 8) into status word.	
	-		-	-	-	-	-	-	-	-	-		
			Y	Y	Y	Y	Y	-	-	Y	-		
Load instructions for DB number and DB length												Load the number/length of a data block to ACCU1. The old contents of ACCU1 are saved into ACCU2. The condition code bits are not affected	
L	DBNO											Load number of data block.	1
L	DINO											Load number of instance data block.	1
L	DBLG											Load length of data block into byte.	1
L	DILG											Load length of instance data block into byte.	1
ACCU transfer instructions, increment, decrement												The status word is not affected.	
CAW	-											Reverse the order of the bytes in ACCU1-L. LL, LH becomes LH, LL.	1
CAD	-											Reverse the order of the bytes in ACCU1. LL, LH, HL, HH becomes HH, HL, LH, LL.	1
TAK	-											Swap the contents of ACCU1 and ACCU2	1
ENT												The contents of ACCU2 and ACCU3 are transferred to ACCU3 and ACCU4.	
LEAVE												The contents of ACCU3 and ACCU4 are transferred to ACCU2 and ACCU3.	
PUSH	-											The contents of ACCU1, ACCU2 and ACCU3 are transferred to ACCU2, ACCU3 and ACCU4.	1
POP	-											The contents of ACCU2, ACCU3 and ACCU4 are transferred to ACCU1, ACCU2 and ACCU3.	1
INC		0 ... 255										Increment ACCU1-LL.	1
DEC		0 ... 255										Decrement ACCU1-LL.	1

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Data type conversion instructions

Data type conversion instructions			*Status word*									The results of the conversion are in ACCU1. When converting real numbers, the execution time depends on the value.	
BTI	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Convert contents of ACCU1 from BCD to integer (16Bit)	1
			-	-	-	-	-	-	-	-	-	(**B**CD **T**o **I**nt.).	
BTD	-		-	-	-	-	-	-	-	-	-	Convert contents of ACCU1 from BCD to integer (32Bit).	1
												(**B**CD **T**o **D**oubleint.).	
DTR	-											Convert cont. of ACCU1 from integer (32Bit) to Real number	1
												(32Bit) (**D**oubleint. **T**o **R**eal).	
ITD	-											Convert contents of ACCU1 from integer (16Bit) to integer	1
												(32Bit) (**I**nt. **T**o **D**oubleint.).	
ITB	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Convert contents of ACCU1 from integer (16Bit) to BCD	1
			-	-	-	-	-	-	-	-	-	0 to +/-999 (**I**nt. **T**o **B**CD).	
DTB	-		-	-	-	Y	Y	-	-	-	-	Convert contents of ACCU1 from integer (32Bit) to BCD	1
												0 to +/-9 999 999 (**D**oubleint. **T**o **B**CD).	
RND	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Convert a real number to 32Bit integer.	1
RND-	-		-	-	-	-	-	-	-	-	-	Convert a real number to 32Bit integer.	1
			-	-	-	Y	Y	-	-	-	-	The number is rounded next hole number..	
RND+	-											Convert real number to 32Bit integer.	1
												It is rounded up to the next integer.	
TRUNC	-											Convert real number to 32Bit integer.	1
												The places after the decimal point are truncated.	
Complement creation			*Status word*										
INVI	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Forms the ones complement of ACCU1-L (integer).	1
INVD	-		-	-	-	-	-	-	-	-	-	Forms the ones complement of ACCU1.	1
			-	-	-	-	-	-	-	-	-		
NEGI	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Forms the twos complement of ACCU1-L.	1
NEGD	-		-	-	-	-	-	-	-	-	-	Forms the twos complement of ACCU1 (double integer).	1
			-	Y	Y	Y	Y	-	-	-	-		

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Comparison instructions

Comparison instructions with integer (16Bit)			*Status word*									Comparing the integer (16Bit) in ACCU1-L and ACCU2-L. RLO=1, if condition is satisfied.	
==I	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	ACCU2-L=ACCU1-L	1
<>I	-		-	-	-	-	-	-	-	-	-	ACCU2-L≠ACCU1-L	1
<I	-		-	Y	Y	0	-	0	Y	Y	1	ACCU2-L<ACCU1-L	1
<=I	-											ACCU2-L<=ACCU1-L	1
>I	-											ACCU2-L>ACCU1-L	1
>=I	-											ACCU2-L>=ACCU1-L	1
Comparison instructions with integer (32Bit)			*Status word*									Comparing the integer (32Bit) in ACCU1 and ACCU2. RLO=1, if condition is satisfied.	
==D	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	ACCU2=ACCU1	1
<>D	-		-	-	-	-	-	-	-	-	-	ACCU2≠ACCU1	1
<D	-		-	Y	Y	0	-	0	Y	Y	1	ACCU2<ACCU1	1
<=D	-											ACCU2<=ACCU1	1
>D	-											ACCU2>ACCU1	1
>=D	-											ACCU2>=ACCU1	1
Comparison instructions with 32Bit real number			*Status word*									Comparing the 32Bit real numbers in ACCU1 and ACCU2. RLO=1, is condition is satisfied. The execution time of the instruction depends on the value to be compared.	
==R	-		BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	ACCU2=ACCU1	1
<>R	-		-	-	-	-	-	-	-	-	-	ACCU2≠ACCU1	1
<R	-		-	Y	Y	Y	Y	0	Y	Y	1	ACCU2<ACCU1	1
<=R	-											ACCU2<=ACCU1	1
>R	-											ACCU2>ACCU1	1
>=R	-											ACCU2>=ACCU1	1

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Combination instructions (Bit)

Combination instructions with bit operands			*Status word*									Examining the signal state of the addressed instruction and gating the result with the RLO according to the appropriate logic function.	
A			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND operation at signal state "1"	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	Y	-	Y	Y	Input/output	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	Y	Y	Y	1	Bit memory	1/2
	L a.b	parameterizable										Local data bit	2
	DBX a.b	0.0 to 65535.7										Data bit	2
	DIX a.b	0.0 to 65535.7										Instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2
AN			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND operation of signal state "0"	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	Y	-	Y	Y	Input/output	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	Y	Y	Y	1	Bit memory	1/2
	L a.b	parameterizable										Local data bit	2
	DBX a.b	0.0 to 65535.7										Data bit	2
	DIX a.b	0.0 to 65535.7										Instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2
O			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	OR operation at signal state "1"	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	Y	Input/output	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	Y	1	Bit memory	1/2
	L a.b	parameterizable										Local data bit	2
	DBX a.b	0.0 to 65535.7										Data bit	2
	DIX a.b	0.0 to 65535.7										Instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2

Command	Operand	Parameter	Status word BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Function	Length in words
												: Instruction depends on	
												: Instruction influences	

			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
ON												OR operation at signal state "0"	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	Y	Input/output	1/2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	Y	1	Bit memory	1/2
	L a.b	parameterizable										Local data bit	2
	DBX a.b	0.0 to 65535.7										Data bit	2
	DIX a.b	0.0 to 65535.7										Instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2
X			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	EXCLUSIVE-OR operation at signal state "1"	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	Y	Input/output	2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	Y	1	Bit memory	2
	L a.b	parametrierbar										Local data bit	2
	DBX a.b	0.0 to 65535.7										data bit	2
	DIX a.b	0.0 to 65535.7										Instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2
XN			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	EXCLUSIVE-OR operation at signal state "0"	
	I/Q a.b	0.0 to 2047.7	-	-	-	-	-	-	-	Y	Y	Input/output	2
	M a.b	0.0 to 8191.7	-	-	-	-	-	0	Y	Y	1	Bit memory	2
	L a.b	parameterizable										Local data bit	2
	DBX a.b	0.0 to 65535.7										Data bit	2
	DIX a.b	0.0 to 65535.7										Instance data bit	2
	c [AR1,m]											register-indirect, area-internal (AR1)	2
	c [AR2,m]											register-indirect, area-internal (AR2)	2
	[AR1,m]											area-crossing (AR1)	2
	[AR2,m]											area-crossing (AR2)	2
	Parameter											via parameters	2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Combination instructions with parenthetical expressions			*Status word*									Saving the bits BR, RLO, OR and a function ID (A, AN, ...) at the nesting stack. For each block 7 nesting levels are possible.	
A(			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND left parenthesis	1
AN(			Y	-	-	-	-	Y	-	Y	Y	AND-NOT left parenthesis	1
O(			-	-	-	-	-	0	1	-	0	OR left parenthesis	1
ON(												OR-NOT left parenthesis	1
X(												EXCLUSIVE-OR left parenthesis	1
XN(												EXCLUSIVE-OR-NOT left parenthesis	1
)			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Right parenthesis, popping an entry off the nesting stack,	1
			-	-	-	-	-	-	-	Y	-	gating RLO with the current RLO in the processor.	
			Y	-	-	-	-	Y	1	Y	1		
ORing of AND operations			*Status word*									The ORing of AND operations is implemented according the rule: AND before OR.	
O			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	OR operations of AND functions according the rule:	1
			-	-	-	-	-	Y	-	Y	Y	AND before OR	
			-	-	-	-	-	Y	1	-	Y		

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Combinations instructions with timer and counters			*Status word*									Examining the signal state of the addressed timer/counter an gating the result with the RLO according to the appropriate logic function.	
A			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND operation at signal state	
	T f	0 to 511	-	-	-	-	-	Y	-	Y	Y	Timer	1/2
	C f	0 to 511	-	-	-	-	-	Y	Y	Y	1	Counter	1/2
	Timer para. Counter p.											Timer addressed via parameters Counter addressed via parameters	2
AN			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND operation at signal state	
	T f	0 to 511	-	-	-	-	-	Y	-	Y	Y	Timer	1/2
	C f	0 to 511	-	-	-	-	-	Y	Y	Y	1	Counter	1/2
	Timer para. Counter p.											Timer addressed via parameters Counter addressed via parameters	2
O			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	OR operation at signal state	
	T f	0 to 511	-	-	-	-	-	-	-	Y	Y	Timer	1/2
	C f	0 to 511	-	-	-	-	-	0	Y	Y	1	Counter	1/2
	Timer para. Counter p.											Timer addressed via parameters Counter addressed via parameters	2
ON			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	OR operation at signal state	
	T f	0 to 511	-	-	-	-	-	-	-	Y	Y	Timer	1/2
	C f	0 to 511	-	-	-	-	-	0	Y	Y	1	Counter	1/2
	Timer para. Counter p.											Timer addressed via parameters Counter addressed via parameters	2
X			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	EXCLUSIVE-OR operation at signal state	
	T f	0 to 511	-	-	-	-	-	-	-	Y	Y	Timer	2
	C f	0 to 511	-	-	-	-	-	0	Y	Y	1	Counter	2
	Timer para. Counter p.											Timer addressed via parameters Counter addressed via parameters	2
XN			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	EXCLUSIVE-OR operation at signal state	
	T f	0 to 511	-	-	-	-	-	-	-	Y	Y	Timer	2
	C f	0 to 511	-	-	-	-	-	0	Y	Y	1	Counter	2
	Timer para. Counter p.											Timer addressed via parameters Counter addressed via parameters	2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Combination instructions using AND, OR and EXCLUSIVE OR			*Status word*									Examining the specified conditions for their signal status, and gating the result with the RLO according to the appropriate function.	
A			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND operation at signal state "1"	
	==0		Y	Y	Y	Y	Y	Y	-	Y	Y	Result=0 (CC1=0) and (CC0=0)	1
	>0		-	-	-	-	-	Y	Y	Y	1	Result>0 (CC1=1) and (CC0=0)	1
	<0											Result<0 (CC1=0) and (CC0=1)	1
	<>0											Result≠0 ((CC1=0) and (CC0=1)) or ((CC1=1) and (CC0=0))	1
	<=0											Result<=0 ((CC1=0) and (CC0=1)) or ((CC1=0) and (CC0=0))	1
	>=0											Result>=0 ((CC1=1) and (CC0=0)) or ((CC1=1) and (CC0=0))	1
	UO											unordered math instruction (CC1=1) and (CC0=1)	1
	OS											OS=1	1
	BR											BR=1	1
	OV											OV=1	1
AN			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND operation at signal state "0"	
	==0		Y	Y	Y	Y	Y	Y	-	Y	Y	Result=0 (CC1=0) and (CC0=0)	1
	>0		-	-	-	-	-	Y	Y	Y	1	Result>0 (CC1=1) and (CC0=0)	1
	<0											Result<0 (CC1=0) and (CC0=1)	1
	<>0											Result≠0 ((CC1=0) and (CC0=1)) or ((CC1=1) and (CC0=0))	1
	<=0											Result<=0 ((CC1=0) and (CC0=1)) or ((CC1=0) and (CC0=0))	1
	>=0											Result>=0 ((CC1=1) and (CC0=0)) or ((CC1=1) and (CC0=0))	1
	UO											unordered math instruction (CC1=1) and (CC0=1)	1
	OS											OS=0	1
	BR											BR=0	1
	OV											OV=0	1
O			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	OR operation at signal state "1"	
	==0		Y	Y	Y	Y	Y	-	-	Y	Y	Result=0 (CC1=0) and (CC0=0)	1
	>0		-	-	-	-	-	0	Y	Y	1	Result>0 (CC1=1) and (CC0=0)	1
	<0											Result<0 (CC1=0) and (CC0=1)	1
	<>0											Result≠0 ((CC1=0) and (CC0=1)) or ((CC1=1) and (CC0=0))	1
	<=0											Result<=0 ((CC1=0) and (CC0=1)) or ((CC1=0) and (CC0=0))	1
	>=0											Result>=0 ((CC1=1) and (CC0=0)) or ((CC1=1) and (CC0=0))	1
	UO											unordered math instruction (CC1=1) and (CC0=1)	1
	OS											OS=1	1
	BR											BR=1	1
	OV											OV=1	1

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

ON			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	OR operation at signal state "0"	
	==0		Y	Y	Y	Y	Y	-	-	Y	Y	Result=0 (CC1=0) and (CC0=0)	1
	>0		-	-	-	-	-	0	Y	Y	1	Result>0 (CC1=1) and (CC0=0)	1
	<0											Result<0 (CC1=0) and (CC0=1)	1
	<>0											Result≠0 ((CC1=0) and (CC0=1)) or ((CC1=1) and (CC0=0))	1
	<=0											Result<=0 ((CC1=0) and (CC0=1)) or ((CC1=0) and (CC0=0))	1
	>=0											Result>=0 ((CC1=1) and (CC0=0)) or ((CC1=1) and (CC0=0))	1
	UO											unordered math instruction (CC1=1) and (CC0=1)	1
	OS											OS=0	1
	BR											BR=0	1
	OV											OV=0	1
X			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	EXCLUSIVE-OR operation at signal state "1"	
	==0		Y	Y	Y	Y	Y	-	-	Y	Y	Result=0 (CC1=0) and (CC0=0)	1
	>0		-	-	-	-	-	0	Y	Y	1	Result>0 (CC1=1) and (CC0=0)	1
	<0											Result<0 (CC1=0) and (CC0=1)	1
	<>0											Result≠0 ((CC1=0) and (CC0=1)) or ((CC1=1) and (CC0=0))	1
	<=0											Result<=0 ((CC1=0) and (CC0=1)) or ((CC1=0) and (CC0=0))	1
	>=0											Result>=0 ((CC1=1) and (CC0=0)) or ((CC1=1) and (CC0=0))	1
	UO											unordered math instruction (CC1=1) and (CC0=1)	1
	OS											OS=1	1
	BR											BR=1	1
	OV											OV=1	1
XN			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	EXCLUSIVE-OR operation at signal state "0"	
	==0		Y	Y	Y	Y	Y	-	-	Y	Y	Result=0 (CC1=0) and (CC0=0)	1
	>0		-	-	-	-	-	0	Y	Y	1	Result>0 (CC1=1) and (CC0=0)	1
	<0											Result<0 (CC1=0) and (CC0=1)	1
	<>0											Result≠0 ((CC1=0) and (CC0=1)) or ((CC1=1) and (CC0=0))	1
	<=0											Result<=0 ((CC1=0) and (CC0=1)) or ((CC1=0) and (CC0=0))	1
	>=0											Result>=0 ((CC1=1) and (CC0=0)) or ((CC1=1) and (CC0=0))	1
	UO											unordered math instruction (CC1=1) and (CC0=1)	1
	OS											OS=0	1
	BR											BR=0	1
	OV											OV=0	1

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Combination instructions (Word)

Combination instructions with the contents of ACCU1			*Status word*									Gating the contents of ACCU1 and/or ACCU1-L with a word or double word according to the appropriate function. The word or double word is either a constant in the instruction or in ACCU2. The result is in ACCU1 and/or ACCU1-L.	
AW			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	AND ACCU2-L	1
AW	k16		-	-	-	-	-	-	-	-	-	AND 16Bit constant	2
OW			-	Y	0	0	-	-	-	-	-	OR ACCU2-L	1
OW	k16											OR 16Bit constant	2
XOW												EXCLUSIVE OR ACCU2-L	1
XOW	k16											EXCLUSIVE OR 16Bit constant	2
AD												AND ACCU2	1
AD	k32											AND 32Bit constant	3
OD												OR ACCU2	1
OD	k32											OR 32Bit constant	3
XOD												EXCLUSIVE OR ACCU2	1
XOD	k32											EXCLUSIVE OR 32Bit constant	3

Timer instructions

Time instructions			*Status word*									Starting or resetting a timer (addressed directly or via parameters). The time value must be in ACCU1-L.	
SP	T f	0 to 511	BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Start time as pulse on edge change from "0" to "1".	1/2
	Timerpara.		-	-	-	-	-	-	-	Y	-		2
SE	T f	0 to 511	-	-	-	-	-	0	-	-	0	Start timer as extended pulse on edge change from	1/2
	Timerpara.											"0" to "1".	2
SD	T f	0 to 511										Start timer as ON delay on edge change	1/2
	Timerpara.											from "0" to "1".	2
SS	T f	0 to 511										Start timer as saving start delay on edge change	1/2
	Timerpara.											from "0" to "1".	2
SA	T f	0 to 511										Start timer as OFF delay on edge change from	1/2
	Timerpara.											"1" to "0".	2
FR	T f	0 to 511										Enable timer for restarting on edge change from "0" to "1"	1/2
	Timerpara.											(reset edge bit memory for starting timer).	2
R	T f	0 to 511										Reset timer.	1/2
	Timerpara.												2

Command	Operand	Parameter	Status word									Function	Length in words
			BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC		
												: Instruction depends on	
												: Instruction influences	

Counter instructions

Counter instructions			*Status word*									The counter value is in ACCU1-L res. in the address transferred as parameter.	
S	C f	0 to 511	BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC	Presetting of counter on edge change from "0" to "1".	1/2
	Counter p.		-	-	-	-	-	-	-	Y	-		2
R	C f	0 to 511	-	-	-	-	-	0	-	-	0	Reset counter to "0".	1/2
	Counter p.												2
CU	C f	0 to 511										Increment counter by 1 on edge change from "0" to "1".	1/2
	Counter p.												2
CD	C f	0 to 511										Decrement counter by 1 on edge change from "0" to "1".	1/2
	Counter p.												2
FR	C f	0 to 511										Enable counter on edge change from "0" to "1".	1/2
	Counter p.											(reset the edge bit memory for up and down counting)	2

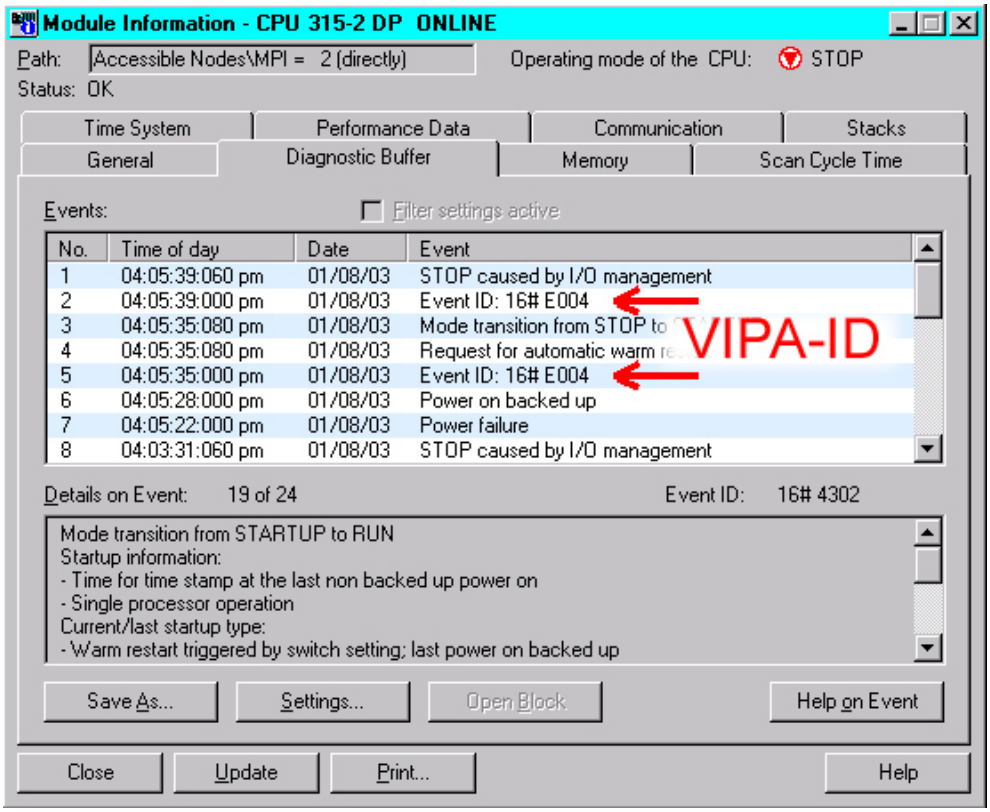
VIPA specific diagnostic entries

Entries in the diagnostic buffer

You may read the diagnostic buffer of the CPU via the SIMATIC Manager from Siemens. Besides of the standard entries in the diagnostic buffer, the VIPA CPUs support some additional specific entries in form of event-IDs.

Monitoring the diagnostic entries

To monitor the diagnostic entries you choose the option **PLC** > *Module Information* in the SIMATIC Manager. Via the register "Diagnostic Buffer" you reach the diagnostic window:



The diagnosis is independent from the operating mode of the CPU. You may store a max. of 100 diagnostic entries in the CPU.

The following page shows an overview of the VIPA specific Event-IDs.

Overview of the Event-IDs

Event-ID	Description
0xE000	reserved
0xE001	reserved
0xE002	reserved
0xE003	Error at parameterization/ configuration VIPA-BUS
0xE004	Multi-parameterization of a peripheral address
0xE005	Error at address information parsing
0xE006	Error at DP slave information parsing
0xE007	Configured in-/output bytes do not fit in the peripheral area (DP-Slave / High-speed counter)
0xE008	Error at High-speed counter information parsing
0xE009	reserved
0xE010	Not defined module detected at backplane bus
0xE0CC	Communication error MPI / Serial
0xE100	MMC access error
0xE101	MMC file system error
0xE102	MMC FAT error
0xE200	MMC writing ready (Copy Ram2Rom)

Chapter 12 Assembly and installation guidelines

Outline

In this chapter you will find all information, required for the installation and the cabling of a process control with the components of the System 300.

The following text describes:

- General overview
- Steps of installation and cabling
- EMC-guidelines for installing a System 300

Content

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Cabling	12-8
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Order data

Type	Order number	Description
SPEED7 alu profile rail	VIPA-391-1AF10	Profile rail 530mm, with integrated Highspeed backplane bus for 2 Expansion slots
SPEED7 alu profile rail	VIPA-391-1AF20	Profile rail 530mm, with integrated. Highspeed backplane bus for 6 Expansion slots
SPEED7 alu profile rail	VIPA-391-1AF30	Profile rail 530mm, with integrated. Highspeed backplane bus for 10 Expansion slots
SPEED7 alu profile rail	VIPA-391-1AF40	Profile rail 830mm, with integrated. Highspeed backplane bus for 16 Expansion slots
Alu profile rail	VIPA 390-1AB60	Profile rail 160mm
Alu profile rail	VIPA 390-9AB60	Profile rail 160mm (100 pc.)
Alu profile rail	VIPA 390-1AE80	Profile rail 482mm
Alu profile rail	VIPA 390-9AE80	Profile rail 482mm (32 pc.)
Alu profile rail	VIPA 390-1AF30	Profile rail 530mm
Alu profile rail	VIPA 390-9AF30	Profile rail 530mm (30 pc.)
Alu profile rail	VIPA 390-1AJ30	Profile rail 830mm
Alu profile rail	VIPA 390-9AJ30	Profile rail 830mm (20 pc.)
Alu profile rail	VIPA 390-9BC00	Profile rail 2000mm (10 pc.)
Front connector	VIPA 392-1AJ00	with screw contacts 20pole
Front connector	VIPA 392-1AM00	with screw contacts 40pole

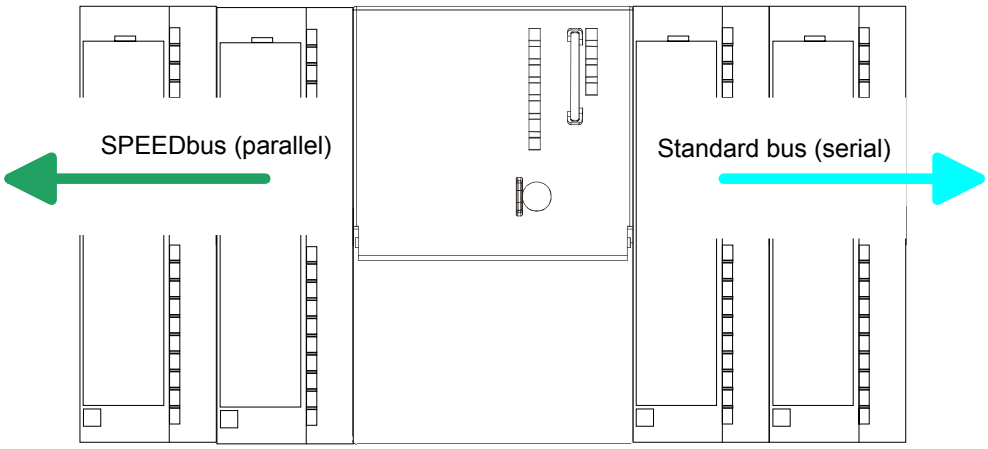
Overview

General

Except of the basic variant, all SPEED7-CPUs are provided with a parallel SPEEDbus that enables the additional connection of up to 16 modules from the SPEEDbus periphery.

While the standard peripheral modules are plugged-in at the right side of the CPU, the SPEEDbus peripheral modules are connected via a SPEEDbus bus connector at the left side of the CPU.

VIPA delivers profile rails with integrated SPEEDbus for 2, 6, 10 or 16 SPEEDbus peripheral modules with different lengths.



Serial Standard bus

The single modules are directly installed on a profile rail and connected via the backplane bus coupler. Before installing the modules you have to clip the backplane bus coupler to the module from the backside.

The backplane bus coupler are included in the delivery of the peripheral modules.

Parallel SPEEDbus

With SPEEDbus the bus connection happens via a SPEEDbus rail integrated in the profile rail at the left side of the CPU. Due to the parallel SPEEDbus not all slots must be occupied in sequence.

SLOT 1 for additional power supply

At SLOT 1 DCDC) you may plug either a SPEEDbus module or an additional power supply.

horizontal and vertical structure

You may install the System 300V as well horizontal as vertical. Please regard the allowed environment temperatures:

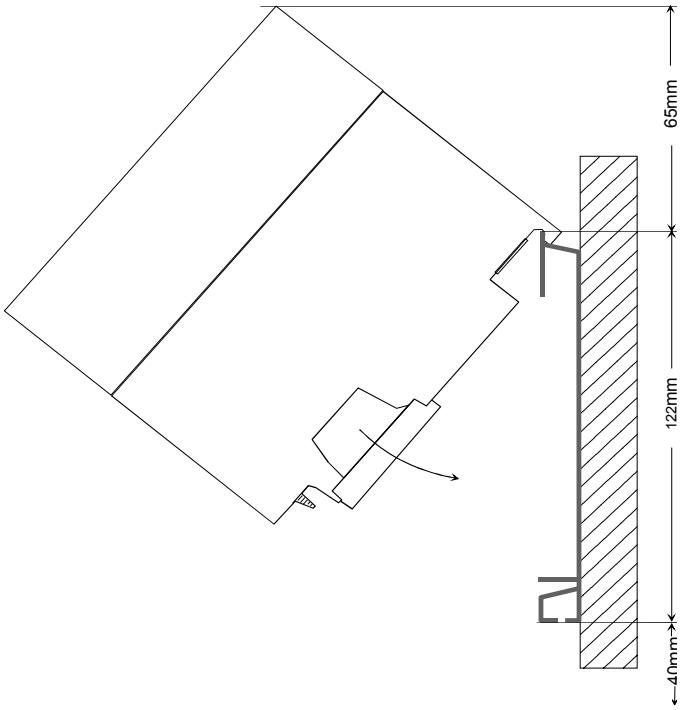
- horizontal structure: from 0 to 60°
- vertical structure: from 0 to 40°

Installation dimensions

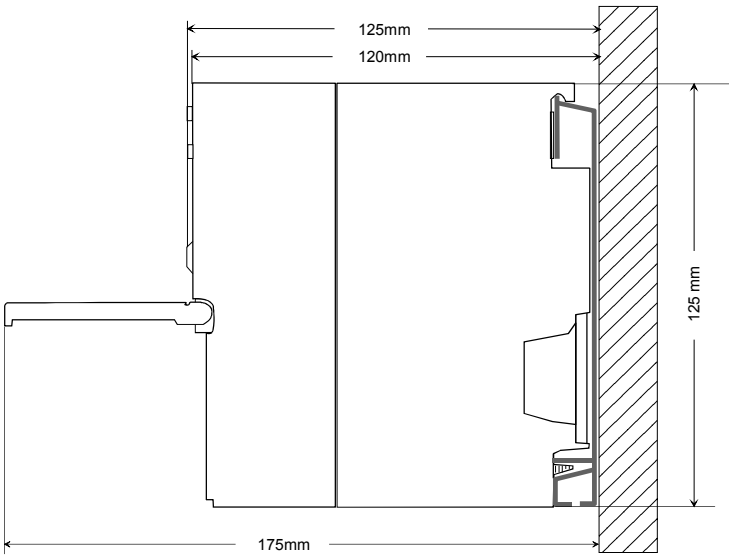
Overview Here follow all the important dimensions of the System 300.

Dimensions Basic enclosure
1tier width (BxHxT) in mm: 40 x 125 x 120
2tier width (BxHxT) in mm: 80 x 125 x 120

Dimensions



Installation dimensions

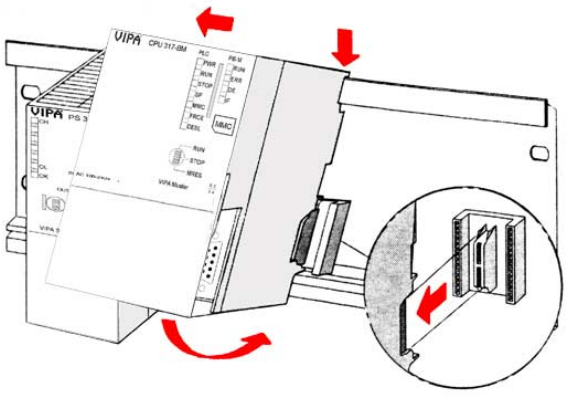


Installation Standard-Bus

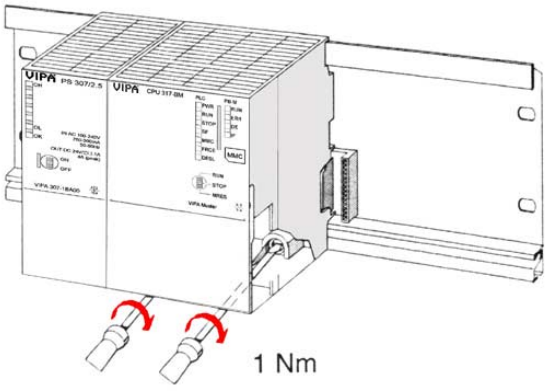
Approach

If you do not deploy SPEEDbus modules, the assembly at the standard bus happens at the right side of the CPU with the following approach:

- Bolt the profile rail with the background (screw size: M6), so that you still have minimum 65mm space above and 40mm below the profile rail.
- If the background is a grounded metal or device plate, please look for a low-impedance connection between profile rail and background.
- Connect the profile rail with the protected earth conductor. For this purpose there is a bolt with M6-thread.
- The minimum cross-section of the cable to the protected earth conductor has to be 10mm^2.



- Stick the power supply to the profile rail and pull it to the left side up to 5mm to the grounding bolt of the profile rail.
- Take a bus coupler and click it at the CPU from behind like shown in the picture.
- Stick the CPU to the profile rail right from the power supply and pull it to the power supply.



- Click the CPU downwards and bolt it like shown.
- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.

Danger!

- Before installing or overhauling the System 300, the power supplies must be disconnected from voltage (pull the plug or remove the fuse)!
- Installation and modifications only by properly trained personnel!

Assembly SPEEDbus

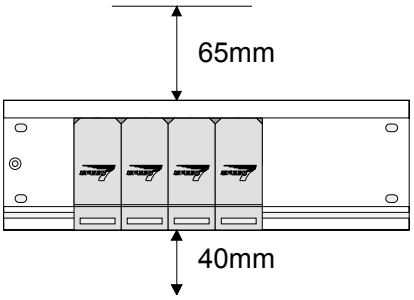
Pre-manufactured SPEEDbus profile rail

For the deployment of SPEEDbus modules, a pre-manufactured SPEEDbus rail is required. This is available mounted on a profile rail with 2, 6, 10 or 16 extension plug-in locations.

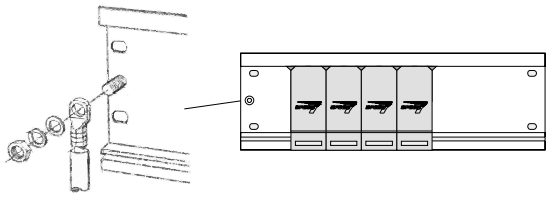
Order number profile rail

Type	Order number	Description
SPEED7 alu profile rail	VIPA-391-1AF10	profile rail 530mm, with integrated Highspeed backplane bus for 2 Expansion slots
SPEED7 alu profile rail	VIPA-391-1AF30	profile rail 530mm, with integrated Highspeed backplane bus for 6 Expansion slots
SPEED7 alu profile rail	VIPA-391-1AF50	profile rail 530mm, with integrated Highspeed backplane bus for 10 Expansion slots
SPEED7 alu profile rail	VIPA-391-1AF80	profile rail 830mm, with integrated Highspeed backplane bus for 16 Expansion slots

Installation of the profile rail



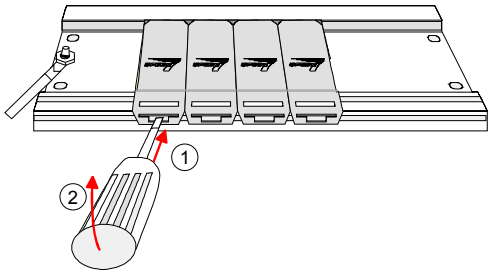
- Bolt the profile rail with the background (screw size: M6), so that you still have minimum 65mm space above and 40mm below the profile rail.
- Please look for a low-impedance connection between profile rail and background



- Connect the profile rail with the protected earth conductor.

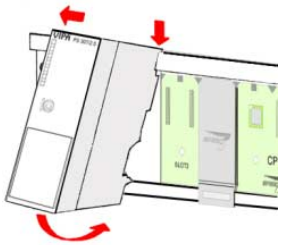
  The minimum cross-section of the cable to the protected earth conductor has to be 10mm^2.

Installation SPEEDbus-Module

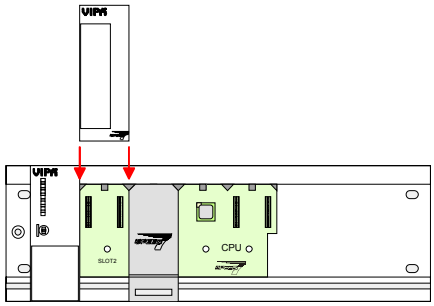


- Dismantle the according protection flaps of the SPEEDbus plug-in locations with a screw driver (open and pull down).

  For the SPEEDbus is a parallel bus, not all SPEEDbus plug-in locations must be used in series. Leave the protection flap installed at an unused SPEEDbus plug-in location.

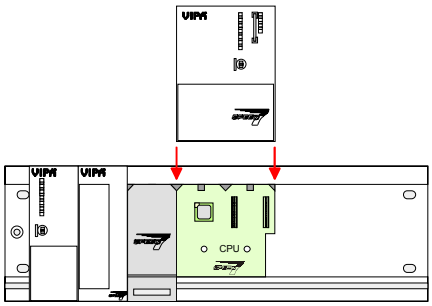


- At deployment of a DC 24V power supply, install it at the shown position at the profile rail at the left side of the SPEEDbus and push it to the left to the isolation bolt of the profile rail.
- Fix the power supply by screwing.



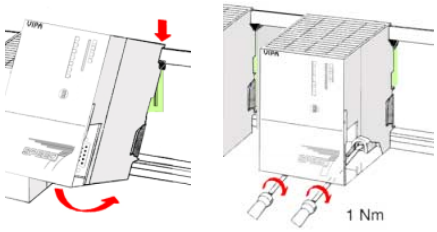
- To connect the SPEEDbus modules, plug it between the triangular positioning helps to a plug-in location marked with "SLOT ..." and pull it down.
- Only the "SLOT1 DCDC" allows you to plug-in either a SPEEDbus module or an additional power supply.
- Fix the modules by screwing.

Installation CPU without Standard-Bus-Modules

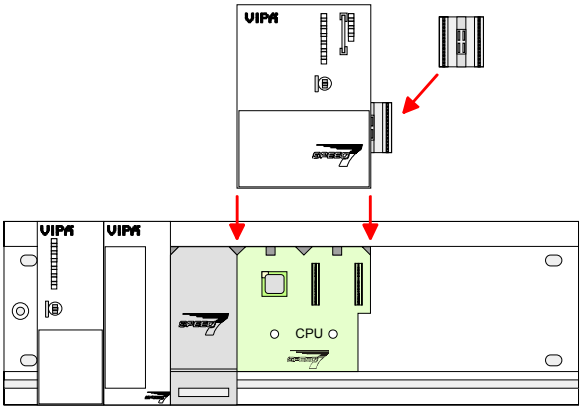


- To deploy the SPEED7-CPU exclusively at the SPEEDbus, plug it between the triangular positioning helps to the plug-in location marked with "CPU SPEED7" and pull it down.
- Fix the CPU by screwing.

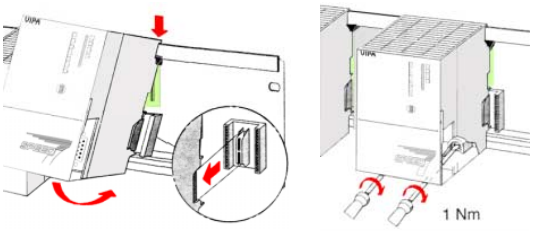
Please regard that only the CPU 317SE may be deployed at the SPEEDbus!



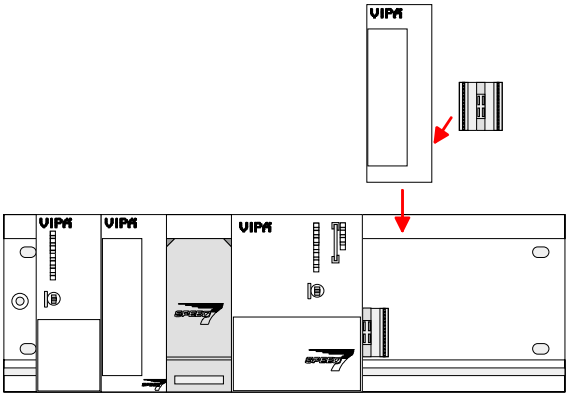
Installation CPU with Standard-Bus-Modules



- Sollen auch Standard-Module gesteckt werden, nehmen Sie einen Busverbinder und stecken Sie ihn wie gezeigt von hinten an die CPU.
- Setzen Sie die CPU zwischen den beiden Positionierhilfen an dem mit "CPU SPEED7" bezeichneten Steckplatz an und klappen sie diese nach unten.
- Schrauben Sie die CPU fest.



Installation Standard-Bus-Modules



- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.

Danger!

- Before installing or overhauling the System 300V, the power supplies must be disconnected from voltage (pull the plug or remove the fuse)!
- Installation and modifications only by properly trained personnel!

Cabling

Outline

The power supplies and CPUs are exclusively delivered with CageClamp contacts. For the signal modules the front connectors are available from VIPA with screw contacts. In the following all connecting types of the power supplies, CPUs and input/output modules are described.

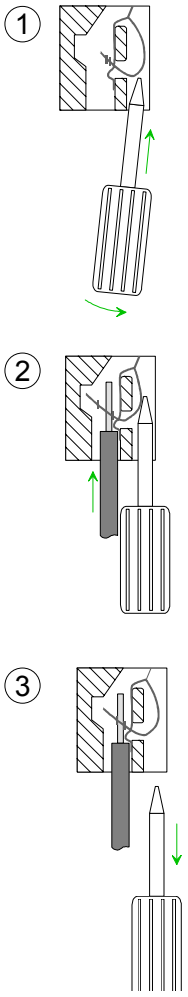
Danger!

- Before installation or overhauling, the power supplies must be disconnected from voltage (pull the plug or remove the fuse)!
- Installation and modifications only by properly trained personnel!

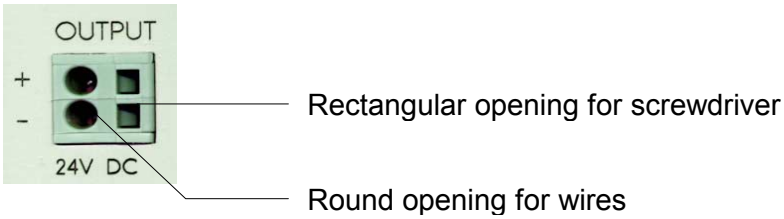
CageClamp technology (gray

For the cabling of power supplies, bus couplers and parts of the CPU, gray connectors with CageClamp technology are used.

You may connect wires with a cross-section of 0.08mm^2 to 2.5mm^2. You can use flexible wires without end case as well as stiff wires.



You fix the conductors to the CageClamps like this:



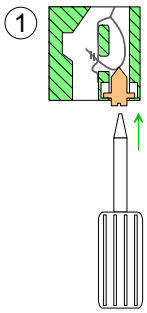
The picture on the left side shows the cabling step by step from top view.

- To conduct a wire you plug a fitting screwdriver obliquely into the rectangular opening like shown in the picture.
- To open the contact spring you have to push the screwdriver in the opposite direction and hold it.
- Insert the insulation striped wire into the round opening. You may use wires with a cross-section from 0.08mm^2 to 2.5mm^2.
- By removing the screwdriver the wire is connected safely with the plug connector via a spring.

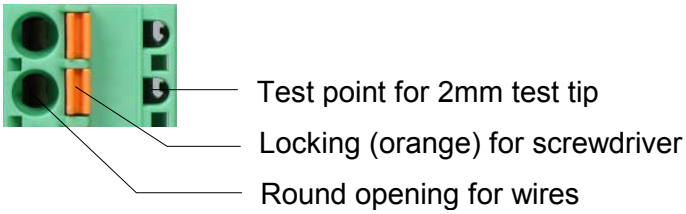
CageClamp technology (green)

For the cabling of e.g. the power supply of a CPU, green plugs with CageClamp technology are deployed.

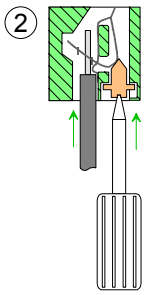
Here also you may connect wires with a cross-section of 0.08mm^2 to 2.5mm^2. You can use flexible wires without end case as well as stiff wires.



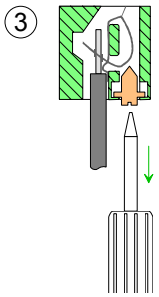
You fix the conductors to the CageClamps like this:



The picture on the left side shows the cabling step by step from top view.



- For cabling you push the locking vertical to the inside with a suiting screwdriver and hold the screwdriver in this position.
- Insert the insulation striped wire into the round opening. You may use wires with a cross-section from 0.08mm^2 to 2.5mm^2.
- By removing the screwdriver the wire is connected safely with the plug connector via a spring.



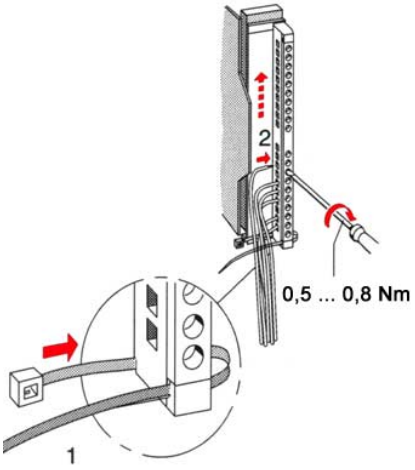
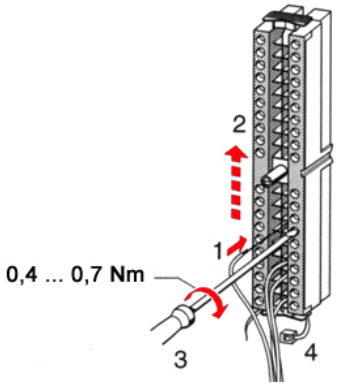
Note!

In opposite to the gray connection clamp from above, the green connection clamp is realized as plug that can be clipped off carefully even if it is still cabled.

Front connectors of the in-/output modules

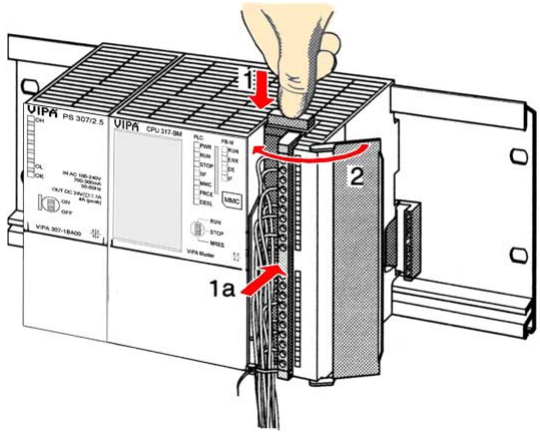
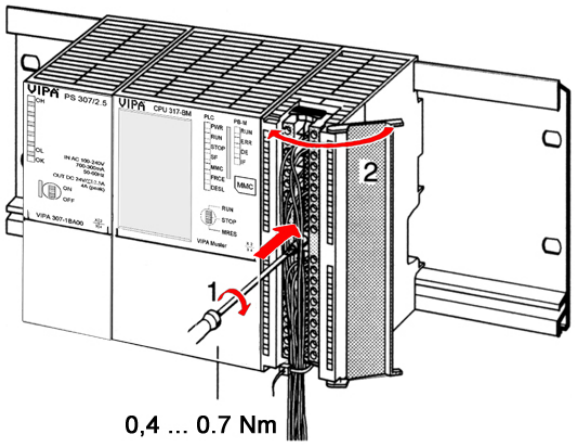
In the following the cabling of the three variants of the front-facing connector is shown:

For the I/O modules the following plugs are available at VIPA:

<table>
<tr><th>20pole screw connection
VIPA 392-1AJ00</th><th>40pole screw connection
VIPA 392-1AM00</th></tr>
<tr><td> </td><td> </td></tr>
<tr><td colspan="2">Open the front flap of your I/O module.</td></tr>
<tr><td colspan="2">Bring the front connector in cabling position.
Herefore you plug the front connector on the module until it locks. In this position the front connector juts out of the module and has no contact yet.</td></tr>
<tr><td colspan="2">Strip the insulation of your wires. If needed, use core end cases.</td></tr>
<tr><td>Thread the included cable binder into the front connector.</td><td></td></tr>
<tr><td colspan="2">If you want to lead out your cables from the bottom of the module, start with the cabling from bottom to top, res. from top to bottom, if the cables should be led out at the top.</td></tr>
<tr><td colspan="2">Bolt also the connection screws of not cabled screw clamps.</td></tr>
<tr><td> 
</td><td>Put the included cable binder around the cable bundle and the front connector.
 
</td></tr>
<tr><td colspan="2">Fix the cable binder for the cable bundle.</td></tr>
</table>

continued ...

... continue

<table>
<tr><th>20pole screw connection
VIPA 392-1AJ00</th><th>40pole screw connection
VIPA 392-1AM00</th></tr>
<tr><td>Push the release key at the front connector on the upper side of the module and at the same time push the front connector into the module until it locks.
  </td><td>Bolt the fixing screw of the front connector.
  </td></tr>
<tr><td colspan="2">Now the front connector is electrically connected with your module.</td></tr>
<tr><td colspan="2">Close the front flap.</td></tr>
<tr><td colspan="2">Fill out the labeling strip to mark the single channels and push the strip into the front flap.</td></tr>
</table>

Installation Guidelines

General

The installation guidelines contain information about the interference free deployment of System 300 systems. There is the description of the ways, interference may occur in your control, how you can make sure the electromagnetic digestibility (EMC), and how you manage the isolation.

What means EMC?

Electromagnetic digestibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interferenced res. without interferencing the environment.

All System 300 components are developed for the deployment in hard industrial environments and fulfill high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

- Fields
- I/O signal conductors
- Bus system
- Current supply
- Protected earth conductor

Depending on the spreading medium (lead bound or lead free) and the distance to the interference cause, interferences to your control occur by means of different coupling mechanisms.

One differs:

- galvanic coupling
- capacitve coupling
- inductive coupling
- radiant coupling

Basic rules for EMC

In the most times it is enough to take care of some elementary rules to guarantee the EMC. Please regard the following basic rules when installing your PLC.

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
  - Install a central connection between the ground and the protected earth conductor system.
  - Connect all inactive metal extensive and impedance-low.
  - Please try not to use aluminum parts. Aluminum is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
  - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
  - Always lay your high voltage lines and signal res. data lines in separate channels or bundles.
  - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- Proof the correct fixing of the lead isolation.
  - Data lines must be laid isolated.
  - Analog lines must be laid isolated. When transmitting signals with small amplitudes the one sided laying of the isolation may be favorable.
  - Lay the line isolation extensively on a isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
  - Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
  - Use metallic or metallized plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
  - Wire all inductivities with erase links, that are not addressed by the System 300V modules.
  - For lightening cabinets you should prefer incandescent lamps and avoid luminescent lamps.
- Create an homogeneous reference potential and ground all electrical operating supplies when possible.
  - Please take care for the targeted employment of the grounding actions. The grounding of the PLC is a protection and functionality activity.
  - Connect installation parts and cabinets with the System 300V in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
  - If potential differences between installation parts and cabinets occur, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

Electrical, magnetical and electromagnetical interference fields are weakened by means of an isolation, one talks of absorption.

Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Hereby you have to make sure, that the connection to the protected earth conductor is impedance-low, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve a high quality interference suppression in the higher frequency area.

  Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
  - the conduction of a potential compensating line is not possible
  - analog signals (some mV res. µA) are transferred
  - foil isolations (static isolations) are used.
- With data lines always use metallic or metallized plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to the System 300V module and **don't** lay it on there again!

Please regard at installation!

At potential differences between the grounding points, there may be a compensation current via the isolation connected at both sides.

Remedy: Potential compensation line

Appendix

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3

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M.Stich

Safety Combination

3TK2821, 3TK2824

DIN EN 60 439 Part 1, VDE 0660 Part 500 (04.94)

Instructions Order No.: 3ZX1012-0TK28-1CA1 **English**

WARNING:

HAZARDOUS VOLTAGE CAN CAUSE ELECTRICAL SHOCK AND BURNS. DISCONNECT POWER BEFORE PROCEEDING WITH ANY WORK ON THIS EQUIPMENT.

Application

You can use the safety combinations 3TK2821/24 in EMERGENCY STOP devices as per EN 418 and in safety circuits as per VDE 0113 Part 1 (11.98) and/or EN 60 204-1 (11.98), e.g. with movable covers and guard doors. Depending on the external connections, categories 3 and 4 (with additional external measures) as per DIN EN 954-1 are achievable.

Functions and connections

Safety combination 3TK2821 has three release circuits (safety circuits) which are configured as NO circuits and a signal circuit configured as an NC circuit.
Safety combination 3TK2824 has two release (safe) circuits which are configured as NO circuits. The number of release circuits can be increased by adding one or more 3TK2830 extension modules. Three LEDs indicate the operating state and function.

When the EMERGENCY STOP button or the limit switch is unlocked and when the ON button is pressed, the internal circuits of the safety combination and the external contactors are checked for proper functioning.

Connect the EMERGENCY STOP pushbutton or the limit switch in the supply cable from A1 to +24 or L24 V. To evaluate over two channels, connect Channel 2 from A2 to 0 V or N. Connect the ON button in series with the NC contacts of the external contactor (feedback circuit) to terminals Y1 and 2 (for circuit examples, see Figs. IV to VII).

Terminal assignments	Operating voltage	A1	L/+
		A2	N/-
	Sensors	Y1, 2	ON button, feedback circuit
	Outputs	13, 14	Release circuit 1 (NO)
		23, 24	Release circuit 2 (NO)
		33, 34	Release circuit 3 (NO)*
		41, 42	Signal circuit (NC)*
			* with 3TK2821 only
Cable lengths	for 2 x 1.5 mm² 150 nF/km		max. 1000 m (total cable length for sensors and power supply lines)

Figures

- Fig. I: Dimension drawings (dimensions in mm)
- Fig. II: Installation / Cage Clamp
- Fig. III: Internal circuit: ① PTC fuse, ② power pack, ③ control logic, ④ Channel 1, ⑤ Channel 2
- Fig. IV: EMERGENCY STOP, category 2 per EN 954-1
- Fig. V: EMERGENCY STOP, category 3 and 4 per EN 954-1
- Fig. VI: Guard door monitoring, category 2 per EN 954-1
- Fig. VII: Guard door monitoring, category 3 and 4 per EN 954-1

Operating states

LEDs			Operation			
POWER	Channel 1	Channel 2	PS	EMERGENCY STOP	ON	Release circuits
☼	☼	☼	ON	not activated	activated	closed
☼	●	●		activated	not activated	open
☼	●	●		not activated	not activated	open
			Faults			
☼	☼	●	• Relay fusion-welded • Motor contactor fusion-welded • Defect in electronics			open
☼	●	☼				
☼	●	●				
●	●	●	Cross or ground faults in EMERGENCY STOP circuit (min. fault current I_{Kmin} = 0.5 A; PTC fuse trips or supply voltage missing)			

Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

Technical data

Permissible ambient temperature T_U	
Operation/storage	-25 to +60°C/-40 to +80°C
Degree of protection to EN 60 529	IP 40, IP 20 at terminals
Rated insulation voltage U_i	300 V
Rated impulse withstand voltage U_{imp}	4 kV
Rated control supply voltage U_S	24 V AC/DC
Rated power	1.5 W
DC operating range	0.85 to 1.2 x U_S
AC operating range	0.85 to 1.1 x U_S
Shock resistance (half-sine) as per IEC 60068	8 *g*/10 ms
Weight	0.240 kg
Recovery time	minimum 200 ms
Release time	max. 150 ms
Response time	max. 200 ms

Utilization category as per DIN VDE 0660 Part 200, IEC 60947-5-1	**Rated operational voltage U_e** (V)	**Rated operational current I_e** with all release circuits loaded (A) 50 °C	60 °C	70 °C
AC-15	230	5	4.5	4
DC-13	24	5	4.5	4
	115	0.2	0.2	0.2
	230	0.1	0.1	0.1
Continuous current I_{th}		5	4.5	4

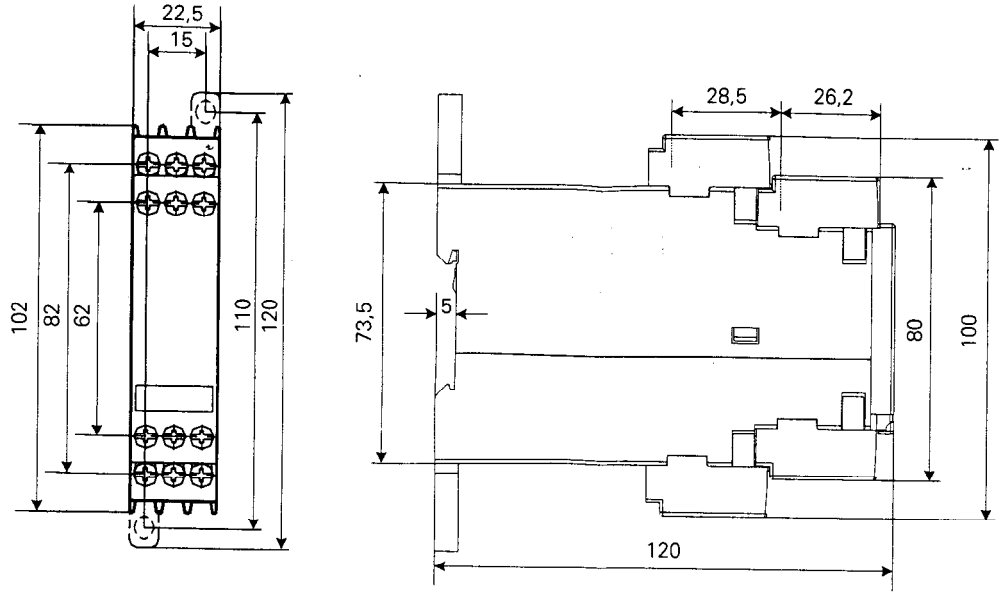
Short-circuit protection	Fuse links	DIAZED
for release circuit	Duty class	gL(gG) 6 A / quick response 10 A
and signal circuit	Duty class	gL(gG) 6 A / quick response 6 A
Control supply voltage		gL(gG) 2 A

The safety combination is protected by an internal self-healing PTC fuse (multifuse).

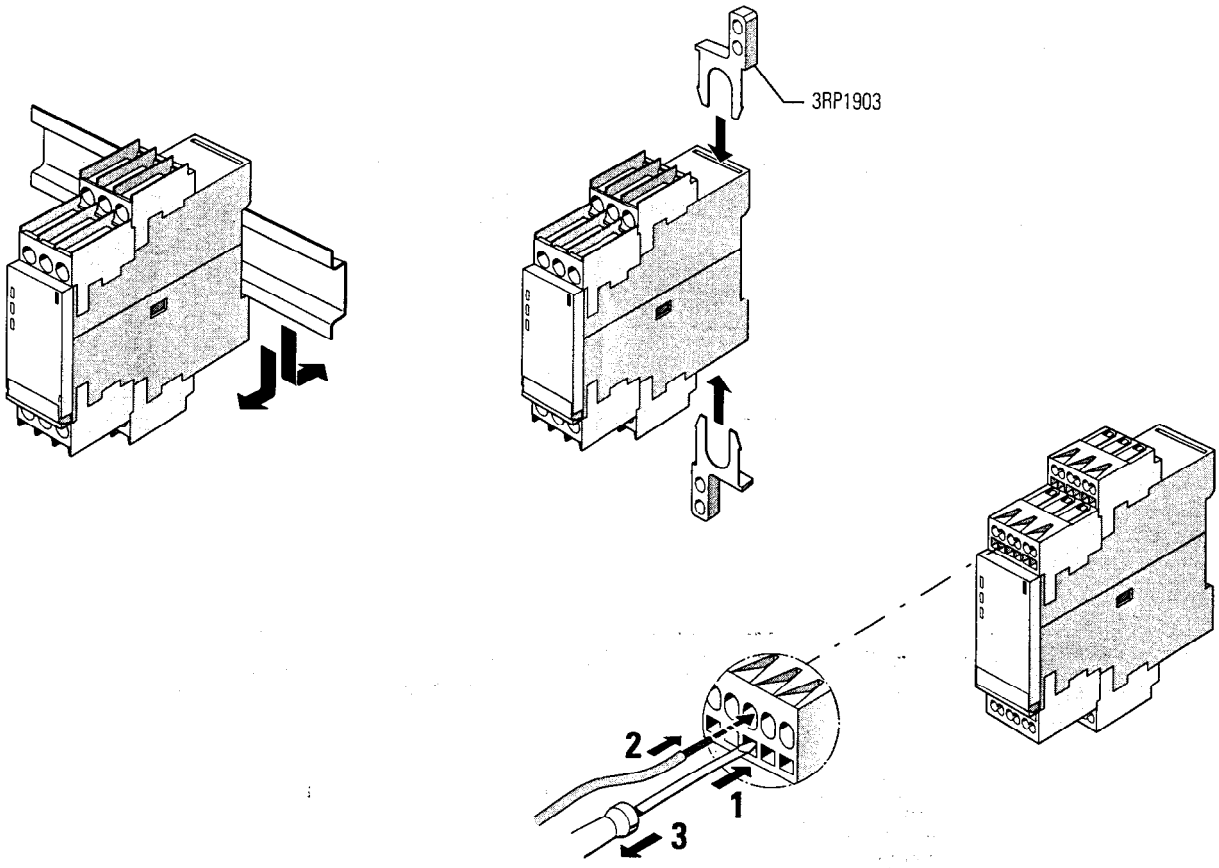
Be sure to fit the specified fuses. Otherwise safe interruption in the event of a fault cannot be guaranteed.

For further data and accessories see Catalog NS K.

I

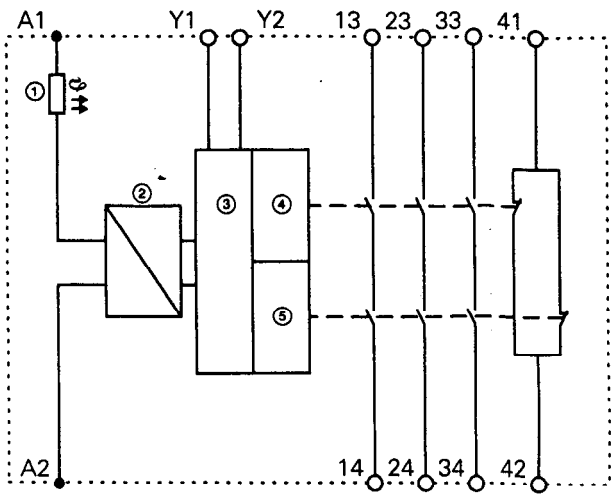


II

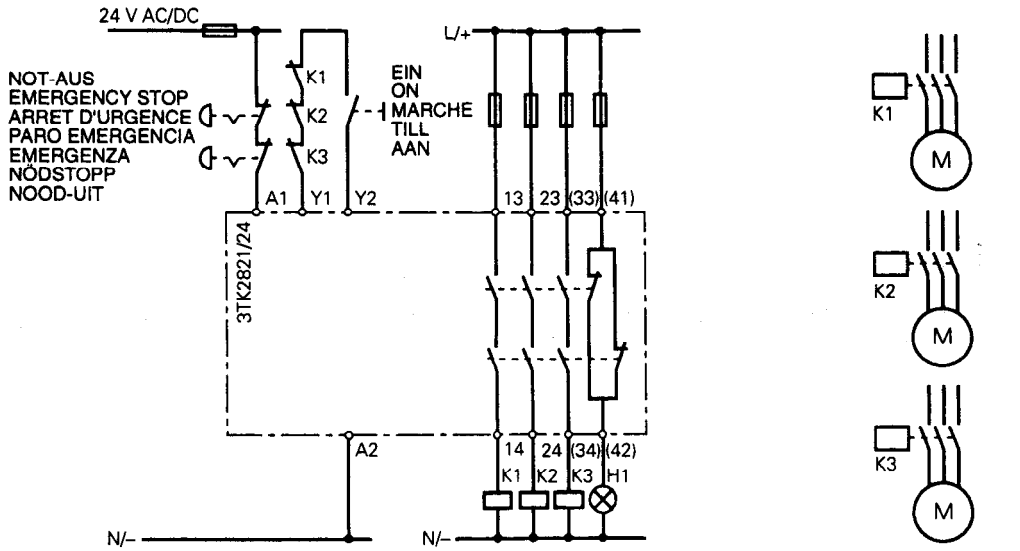


		3TK2821-2... 3TK2824-2...
M3,5	0,8 ... 1,2 Nm 7 to 10.3 LB.IN	----
10	1 x (0,5 ... 4,0) mm² 2 x (0,5 ... 2,5) mm²	2 x 0,25 ... 1,5 mm²
10	1 x (0,5 ... 2,5) mm² 2 x (0,5 ... 1,5) mm²	2 x 0,25 ... 1 mm²
AWG	2 x 20 to 14	2 x 24 to 16

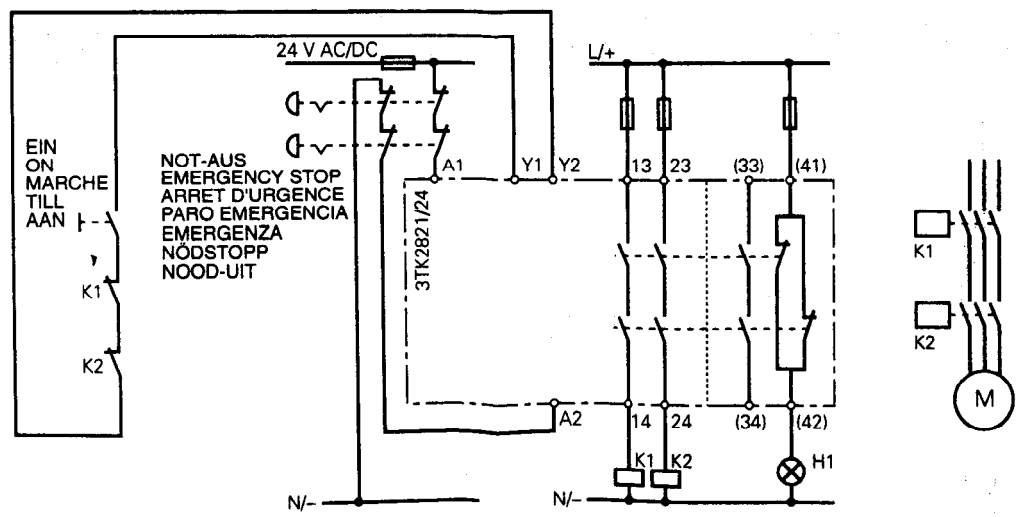
III

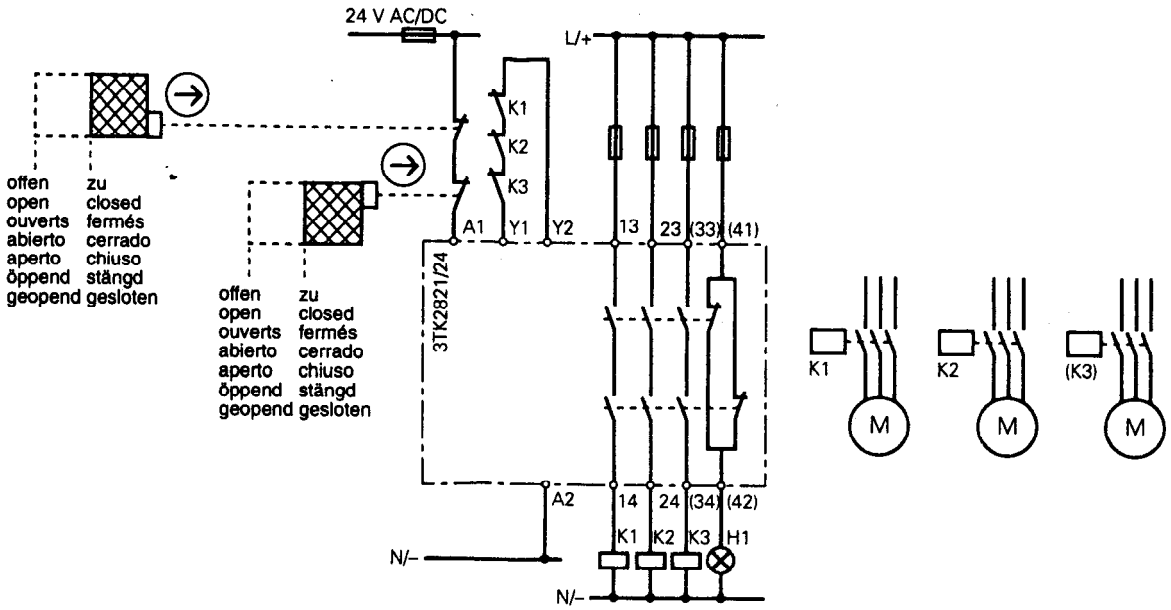

A1
Y1
Y2
13
23
33
41
A2
14
24
34
42

IV

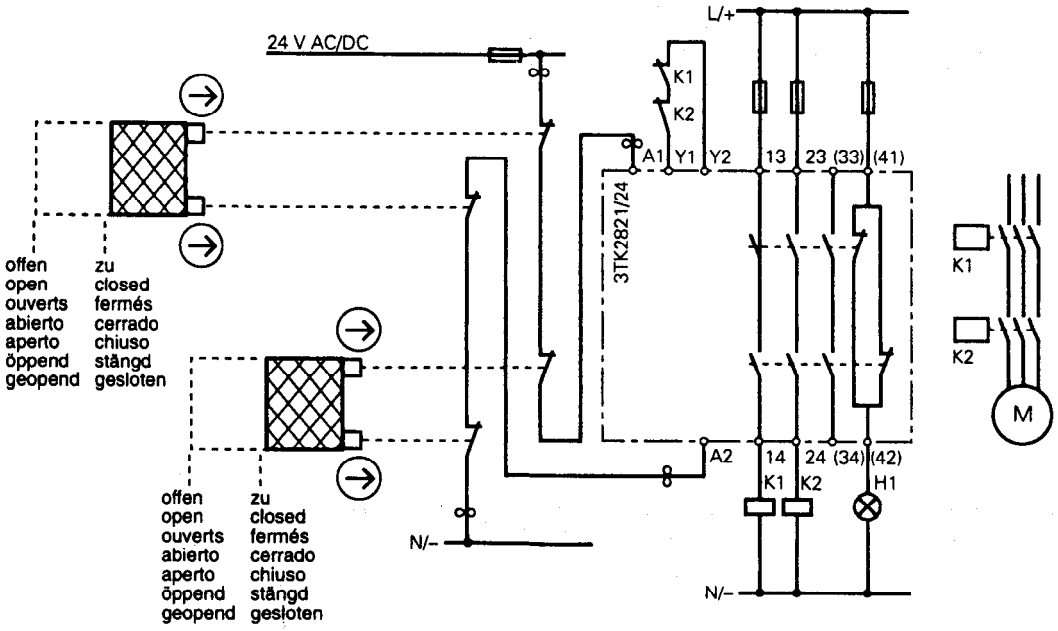

24 V AC/DC
L/+
NOT-AUS
EMERGENCY STOP
ARRET D'URGENCE
PARO EMERGENCIA
EMERGENZA
NÖDSTOPP
NOOD-UIT
K1
K2
K3
EIN
ON
MARCHE
TILL
AAN
A1
Y1
Y2
13
23
(33)
(41)
3TK2821/24
A2
14
24
(34)
(42)
K1
K2
K3
H1
N/-
N/-
K1
K2
K3
M
M
M

V


24 V AC/DC
L/+
EIN
ON
MARCHE
TILL
AAN
K1
K2
NOT-AUS
EMERGENCY STOP
ARRET D'URGENCE
PARO EMERGENCIA
EMERGENZA
NÖDSTOPP
NOOD-UIT
A1
Y1
Y2
13
23
(33)
(41)
3TK2821/24
A2
14
24
(34)
(42)
K1
K2
H1
N/-
N/-
K1
K2
M


24 V AC/DC
L/+
K1
K2
K3
A1
Y1
Y2
13
23
(33)
(41)
3TK2821/24
A2
14
24
(34)
(42)
K1
K2
K3
H1
N/–
N/–
offen
open
ouverts
abierto
aperto
öppend
geopend
zu
closed
fermés
cerrado
chiuso
stängd
gesloten
K1
K2
(K3)
M
M
M

VII


24 V AC/DC
L/+
K1
K2
A1
Y1
Y2
13
23
(33)
(41)
3TK2821/24
A2
14
24
(34)
(42)
K1
K2
H1
N/–
N/–
offen
open
ouverts
abierto
aperto
öppend
geopend
zu
closed
fermés
cerrado
chiuso
stängd
gesloten
K1
K2
M

Extension Module

3TK2830

DIN EN 60 439 Part 1, VDE 0660 Part 500 (04.94)

Instructions Order No.: 3ZX1012-0TK28-3CA1 **English**

WARNING:

HAZARDOUS VOLTAGE CAN CAUSE ELECTRICAL SHOCK AND BURNS. DISCONNECT POWER BEFORE PROCEEDING WITH ANY WORK ON THIS EQUIPMENT.

Application

You can use the extension module 3TK2830 in combination with all the 3TK28 basic units. It extends the number of release circuits. Depending on the external connection, category 4 as per DIN EN 954-1 is achievable with this device.

Functions and connections

The extension module 3TK2830 has four release circuits (safety circuits) configured as NO circuits. Two LEDs indicate operating state and function.

The device is controlled via any release circuit of the safety combinations 3TK28...

When the EMERGENCY STOP pushbutton or the limit switch is unlocked and the ON button is pressed, the internal circuit of the safety combination and the external contactors are checked for correct functioning.

Terminal assignments	Operating voltage	A1	L/+
		A2	N/-
	Outputs	13, 14	Release circuit 1 (NO contact)
		23, 24	Release circuit 2 (NO contact)
		33, 34	Release circuit 3 (NO contact)
		43, 44	Release circuit 4 (NO contact)
	Feedback circuit	51, 52	Extension circuit monitoring

Cable lengths	with 2 x 1.5 mm^2 150 nF/km	max. 1000 m (total cable length for sensors and power supply lines)

Figures

Fig. I: Dimension drawings (dimensions in mm)

Fig. II: Installation / Cage Clamp

Fig. III: Internal circuit

① PTC fuse

② Power pack

③ Control logic

④ Channel 1

⑤ Channel 2

Fig. IV: Guard door monitoring, category 4 per EN 954-1

Fig. V: EMERGENCY STOP, category 4 per EN 954-1

Fig. VI: EMERGENCY STOP with time delay

Operating states

LED		Operation	
Channel 1	Channel 2	PS	Release circuit of 3TK28.. safety combinations
		ON	closed
○	○		open
		Faults	
○	◌	• Relay fusion-welded • Defect in electronics • Motor contactor fusion-welded	
◌	○		
○	○		

Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

Technical data

Permissible ambient temperature T_u	
- Operation	-25 to +60 °C
- Storage	-40 to +80 °C
Degree of protection to EN 60 529	IP 40, IP 20 at terminals
Rated insulation voltage U_i	300 V
Rated impulse withstand voltage U_{imp}	4 kV
Rated control supply voltage U_S	24 V AC/DC
Rated power	1.5 W
DC operating range	0.85 to 1.2 x U_S
AC operating range	0.85 to 1.1 x U_S
Shock resistance (half-sine) as per IEC 60068	8 *g*/10 ms
Weight	0.240 kg
Recovery time	minimum 200 ms
Release time	max. 200 ms
Response time	max. 30 ms

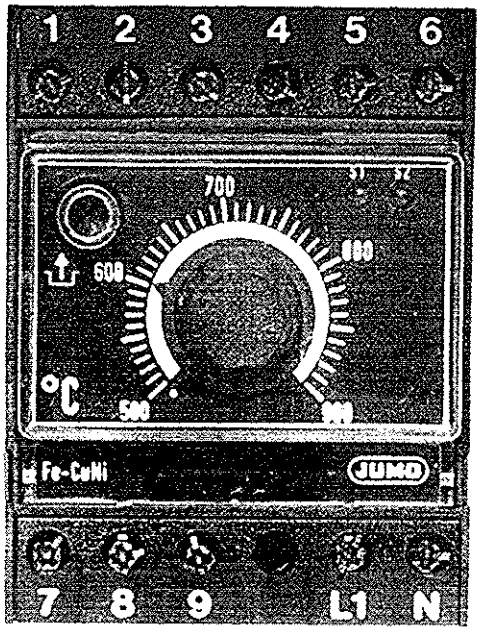
Utilization category as per DIN VDE 0660 Part 200, IEC 60947-5-1	**Rated operational voltage U_e** (V)	**Rated operational current I_e** with all release circuits loaded (A)			
		40 °C	50 °C	60 °C	70 °C
AC-15	230	5	4	3.5	3
DC-13	24	5	4	3.5	3
	115	0.2	0.2	0.2	0.2
	230	0.1	0.1	0.1	0.1
Continuous current I_{th}		5	4	3.5	3

Short-circuit protection for release circuit	Fuse links	DIAZED	
	Duty class	gL(gG)	6 A
		quick response	10 A

The safety combination is protected by an internal self-healing PTC fuse (multifuse).

Be sure to fit the specified fuses. Otherwise safe interruption in the event of a fault cannot be guaranteed.

For further data and accessories see Catalog NS K.



(Safety)
Temperature limiter

(Safety)
Temperature monitor

to DIN 3440

B 70.1130

Operating Instructions

Version 1 / 8.98

Conformance symbol

The instrument conforms with the requirements of DIN 3440.

If any servicing is required, the instrument must be returned to the main factory.
In accordance with the recommendations of Germanische Lloyd, specific applications require the availability of a replacement instrument.

Please read these Operating Instructions before commissioning the instrument. Keep the operating instructions in a place which is accessible to all users at all times.

Please assist us to improve these operating instructions, where necessary.

We are always grateful for your suggestions.

Phone	in Germany	(06 61) 6003-727
	from abroad	(+49)661 6003-0
Fax	in Germany	(06 61) 60 03-5 08
	from abroad	(+49) 661 6003-607

Should any difficulties arise during start-up, you are asked not to carry out any unauthorised manipulations on the instrument. You could endanger your rights under the warranty!

Please contact the nearest JUMO office or the main factory.

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7 Test in the event of a fault

8 Technical data

1 Introduction

1.1 Description

The areas of application for (safety) temperature limiters or monitors ((S)TB or (S)TW) are to be found wherever thermal processes have to be monitored, and where the system must be set to a safe operating condition in the event of a fault. If the permitted temperature limit is reached, or a fault occurs within the permitted temperature range (probe break/short-circuit, component defect, power failure), then the instrument switches off without delay. If the fault is no longer present, then TB and STB must be reset manually. This can be done by means of a reset pushbutton on the instrument, or by an external reset button. The flow of energy is only enabled again when the temperature is lower (O-function) or higher (S-function) than the preset limit temperature by the amount of the switching differential. In the event of a short-term power failure (≤ 1 min) within the satisfactory range of the system, the instrument is enabled automatically after the power has been restored. The amount of the switching differential is 3 °C, 10 °C, 30 °C or 100 °C.

The analogue limit setting knob for the limit temperature is mounted on the front panel. An unintentional or unauthorised adjustment of the limit setting is prevented by a clear cover which can be lead-sealed. The instruments are intended for use as built-in units for fixing onto standard rails to EN 50022-35. The screw terminals for the electrical connection (max. conductor cross-section 2.5mm^2) are on one wiring level.

The instruments function over defined temperature ranges between 0 and 2000 °C.

Temperature monitor TW*

Temperature monitors are devices which, after cutting out, are automatically reset when the probe temperature has fallen below the preset limit value by the amount of the switching differential.

Safety temperature monitor STW*

Safety temperature monitors are temperature monitors which, in addition, meet the requirements for enhanced safety to DIN 3440.

Temperature limiter TB*

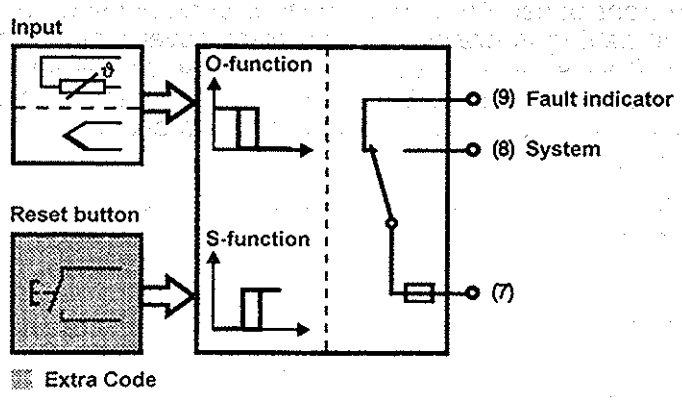
Temperature limiters are devices which are locked out after cutting out. They can be reset, either manually or by means of a tool, when the probe temperature has fallen below the limit value by the amount of the switching differential.

Safety temperature limiter STB*

Safety temperature limiters are temperature limiters which, in addition, comply with the requirements for enhanced safety according to DIN 3440.

* Extract from DIN 3440

1.2 Block structure



1.3 Type designation

	(1)		(2)		(3)		(4)
701130 /	****	–	***	–	**	/	***

(1) Basic type extensions	
0151	Temperature monitor with O-function
0152	Temperature monitor with S-function
0153	Temperature limiter with O-function
0154	Temperature limiter with S-function
0251	Safety temperature monitor with O-function
0252	Safety temperature monitor with S-function
0253	Safety temperature limiter with O-function
0254	Safety temperature limiter with S-function

(2) Measurement inputs	
001	Resistance thermometer Pt100 in 2-wire circuit
037	W3Re-W25Re
042	Fe-Con L
043	NiCr-Ni K
044	Pt10Rh-Pt S
046	Pt30Rh-Pt6Rh B

(3) Supply	
02	230V AC, +10% / -15% 48—63Hz
05	115V AC, +10% / -15% 48—63Hz
08	24V AC, +10% / -15% 48—63Hz

(4) Extra Codes	
202	Switching differential 3°C (only for Pt100)
205	Switching differential 10°C
206	Switching differential 30°C
208	Switching differential 100°C
229	Lead resistance 1Ω internally compensated*
231	Lead resistance 10Ω internally compensated*
233	Lead resistance 30Ω internally compensated*
235	Lead resistance 50Ω internally compensated*
245	Internal reset button (extra Code with TB only)
062	GL

* Lead compensation resistor LAW (10Ω) is included in the delivery

Accessories
External reset button RT Sales No. 70/97097865
Mounting plate BS Sales No. 70/00059172
Lead compensation resistor LAW (10Ω) Sales No. 70/00322800

1.4 Registration number

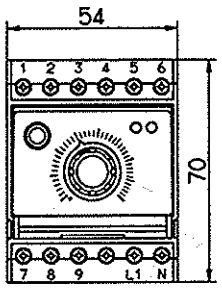
For Type 701130/... : TB/TW/STB/STW 1091 97

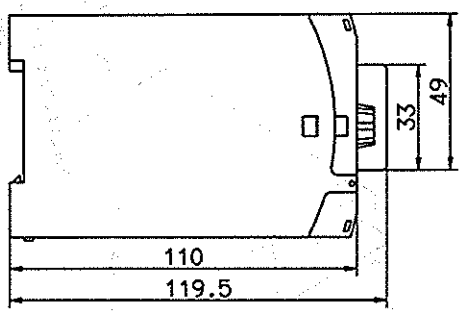
2 Installation

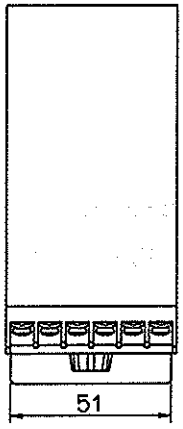
2.1 Location and climatic conditions

The location and the climatic conditions must meet the requirements defined in the specifications under Technical Data. (⇨ Chapter 8).

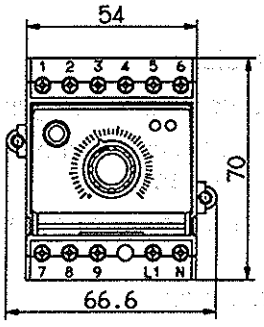
2.2 Dimensions







Dimensions with lateral fixing elements (only for GL-version):

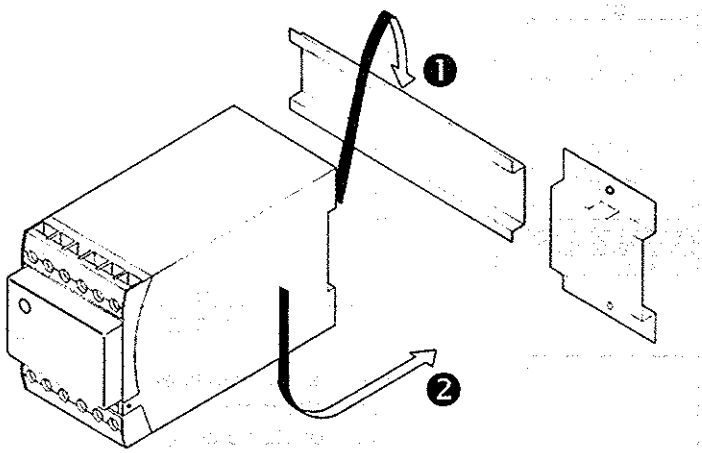


mm	inch
33	1.30
49	1.93
51	2.01
54	2.13
66.6	2.62
70	2.76
110	4.33
119.5	4.70

2.3 Mounting on a standard rail or a mounting plate

The instruments are designed as built-in units and are protected to IP20 as standard.

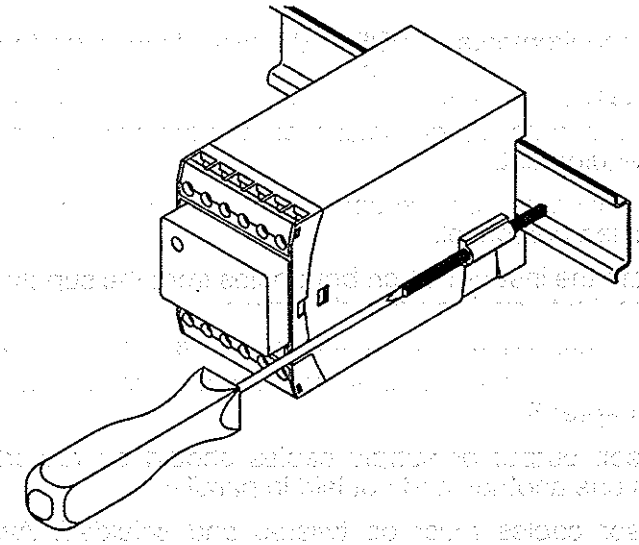
* Insert the instrument from above into the standard rail or into the cut-out of the mounting plate ❶ and swing it down until it snaps into position ❷



Mounting the GL-version:

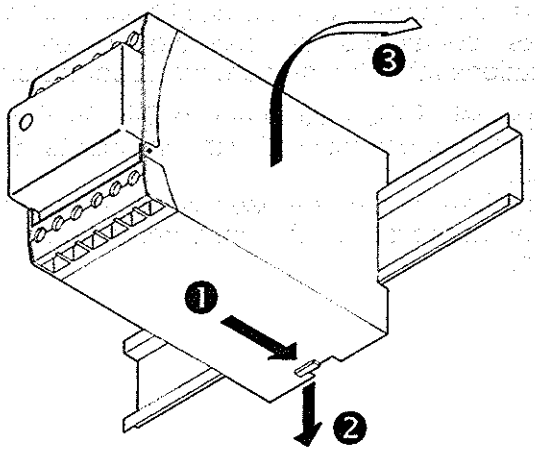
* Push the fixing elements into the guides on the sides
* Insert the unit from above into the rail and swing it down until it snaps into position (as above)
* Push the fixing elements up to the rail and tighten them evenly with a spanner.

(see diagram on next page!)



2.4 Removal

* Insert a screwdriver in the direction of the arrow under the clip ❶
* Press the clip down ❷ and swing the unit up at the same time ❸



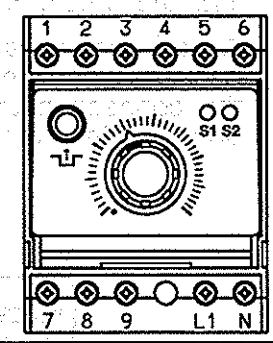
3 Electrical connection

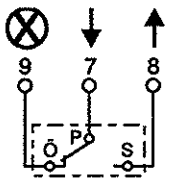
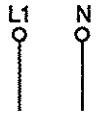
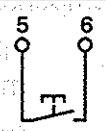
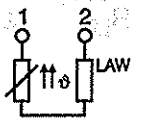
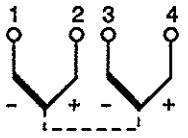
3.1 Installation notes

- The requirements of VDE 0100 "Regulations for the installation of power equipment with rated voltages up to 1000V" or the equivalent national regulations must be observed in the choice of cable material, the installation and the electrical connection of the equipment.
- The electrical connection must only be made by properly qualified personnel.
- Isolate the instrument on both poles from the supply if there may be contact with live parts during work.
- The electromagnetic compatibility (EMC) conforms to the standards and regulations listed under Technical Data.
  ⇨ Chapter 8
- Sensor, output or supply cables should be routed separately from one another, and not laid in parallel.
- Sensor cables must be twisted and shielded. Avoid running them close to current-carrying components or cables.
- Do not connect any additional loads to the supply terminals of the instrument.
- The instrument is not suitable for installation in hazardous areas.
- Inductive components in the neighbourhood of the instrument, such as contactors or solenoid valves, must have RC combinations fitted for interference suppression.
- The approval of the instrument to DIN 3440 is only valid if the temperature probes marked with * in Chapter 8 "Technical Data" are used.
  If temperature probes are used which are not marked or listed, then the approval of the instrument and probes must be checked.

3.2 Connection diagram

The electrical connection must only be carried out by qualified personnel.

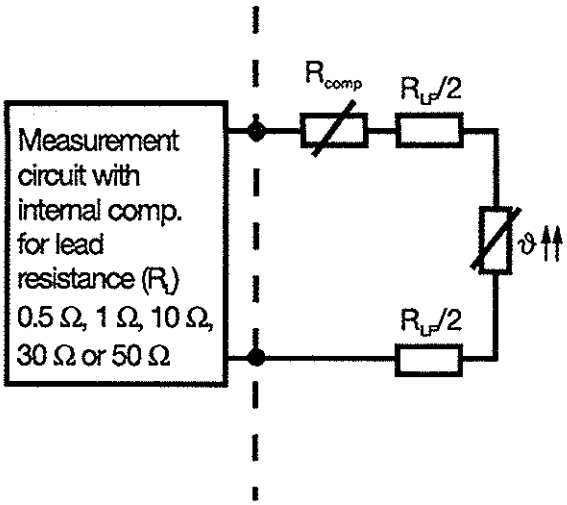


Connection for	Terminals	
Relay output 230V 2A, resistive load	7 common 8 n.o. (make) 9 n.c. (break)	
Supply as on label	L1 line N neutral	
External reset pushbutton	5 6	
Resistance thermometer in 2-wire circuit	1 2 LAW= Lead compensation resistor	
Thermocouple	1 – Thermocouple 1 2 + 3 – Thermocouple 2 4 +	

3.3 Lead compensation

A lead resistance of 0.5Ω is allowed for internally as standard; 1Ω,10Ω, 30Ω or 50Ω (extra Code) to special order.

A lead compensation resistor LAW (10Ω; included in the delivery package when the appropriate extra Code is ordered) is required for the connection to Pt 100 resistance thermometers with a max. operating temperature of 700°C.



Compensation condition: $\mathbf{R_L = R_{comp} + R_{LF}}$

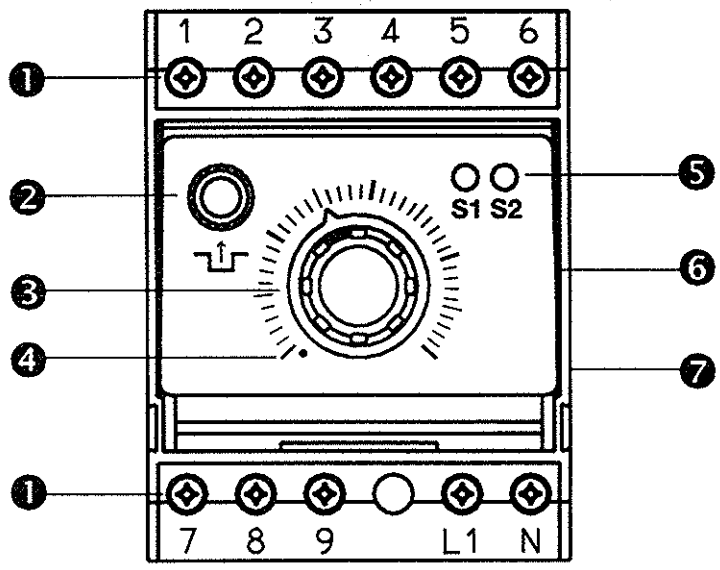
R_L internally compensated lead resistance of the measuring circuit

R_{comp} resistance of the lead compensation resistor LAW

R_{LF} resistance of the probe leads

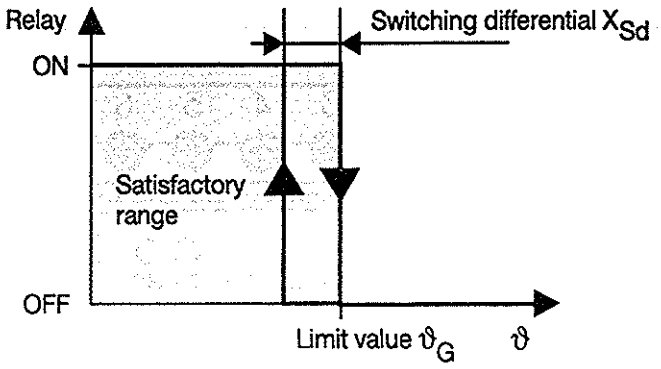
4 Function

4.1 Indication and controls



❶	Screw terminals, max. 2.5mm^2
❷	Reset button (extra Code with TB only)
❸	Limit setting knob
❹	Limit scale
❺	Fault indicator for channel 1 (S1) and channel 2 (S2) S2 only for STB and STW
❻	Lead-sealable clear cover
❼	Plastic casing

4.2 O-function



Response in normal operation
- $\vartheta < \vartheta_G$
- temperature rises

⇒ the relay drops out at $\vartheta = \vartheta_G$.

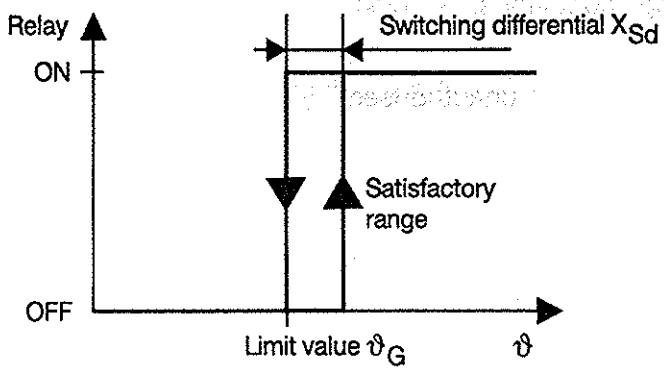
Response after rising above the limit
- $\vartheta > \vartheta_G$
- temperature falls

⇒ the relay pulls in automatically at $\vartheta = \vartheta_G - X_{sd}$ (STW and TW), or has to be reset manually (STB and TB)

Response in fault condition
In the event of a fault (probe break/short-circuit, faulty electronics, supply failure) the relay drops out.
When
- the fault has been cleared
- $\vartheta \leq \vartheta_G - X_{sd}$

⇒ then the relay pulls in automatically (STW and TW). STB and TB must be reset manually. Only in the event of a short-term power failure (≤ 1 min) in the satisfactory range of the system, will the instrument automatically be enabled after the power has been restored.

4.3 S-function



Response in normal operation
- $\vartheta > \vartheta_G$
- temperature falls

⇒ the relay drops out at $\vartheta = \vartheta_G$.

Response after falling below the limit
- $\vartheta < \vartheta_G$
- temperature rises

⇒ the relay pulls in automatically at $\vartheta = \vartheta_G + X_{sd}$ (STW and TW), or has to be reset manually (STB and TB)

Response in fault condition

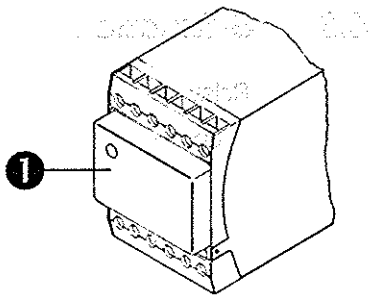
In the event of a fault (probe break/short-circuit, faulty electronics, supply failure) the relay drops out.

When
- the fault has been cleared
- $\vartheta \geq \vartheta_G + X_{sd}$

⇒ then the relay pulls in automatically (STW and TW). STB and TB must be reset manually. Only in the event of a short-term power failure (≤ 1 min) in the satisfactory range of the system, will the instrument automatically be enabled after the power has been restored.

5 Starting up

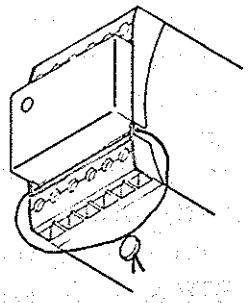
The setting of the limit value must not change by itself under operating conditions. A clear cover ❶ which is lead-sealable is therefore provided to prevent unintentional or unauthorised adjustment.



* Swing the clear cover upwards and remove it.
* Set the required limit on the scale using the limit setting knob. The limit setting can easily be read, even when the clear cover is in position. The start and end of the range are fixed by stops.
* After setting the limit, carry out the function test (⇔ Chapter 6) and lead-seal the clear cover.

☞ The safety circuit must be reset after every switch-on or break in the mains supply, by using the internal or external reset button (only for TB and STB).
Only in the event of a short-term power failure (≤ 1 min) in the satisfactory range of the installation, will the instrument automatically be enabled after the power has been restored.

For lead sealing, a hole is provided on each side of the clear cover. A wire is passed through these holes to connect the cover and the casing. The wire ends are secured by a lead seal.



6 Functional test

6.1 Test frequency

The safety temperature monitors and limiters fulfil the requirements made in Draft DIN 3440 A1 of September 1991.

In addition, the instrument must undergo an annual functional test.

Generally, the functional test always starts from the satisfactory range of the system, i.e. the fault signal diodes must not be lit up and the STBs must be reset.

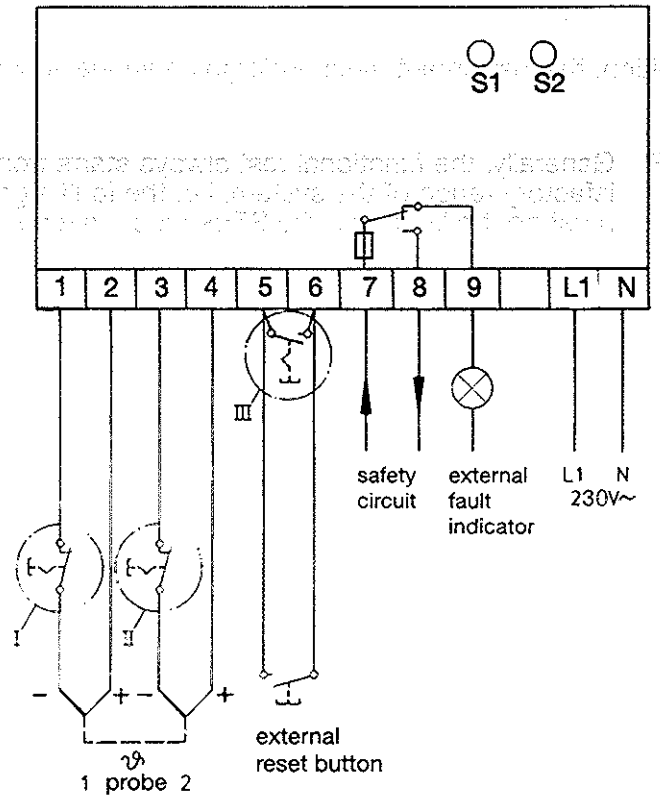
It is necessary to short-circuit or open the measurement input circuit(s) for the functional test. The reset button must also be short-circuited during the test.

For a rapid functional test it is therefore recommended that the buttons I, II, and III are included in the measurement or reset circuits.

When connecting themocouples and buttons it is important to ensure that no additional thermal e.m.f occurs (temperature differences at the terminals).
When resistance thermometers and buttons are connected, it must be ensured that the contact resistance is not too high. (0.4Ω ≈ 1°C error).

Carry out a functional test after every malfunction!

6.2 Testing STBs and STWs with O-function when thermocouples are connected



* Short-circuit the reset button
* Simulate a probe break of thermocouple 1:
  - ☐ The LEDs S1 and S2 must light up.
  - ☐ The external fault indicator must light up. The safety circuit must be opened.
  - ☐ The LEDs S1 and S2 must go out after about 5 sec.
  - ☐ The external fault indicator remains lit up and the safety circuit remains open.

6 Functional test

* Remove the short-circuit across the reset button:
  - ☐ The LEDs S1 and S2 light up again.
  - ☐ The external fault indicator remains on.
* Remove the probe break:
  - ☐ If the probe temperature is within the permitted temperature range i.e. **below** the limit setting by the switching differential, then the two LED S1 and S2 must go out after approx. 5 sec.
  - ☐ For an STW, the external fault indication must also disappear and the safety circuit must close.
  - ☐ For an STB, the external fault indication must continue to be lit up and the safety circuit must remain open. The safety circuit is only closed again when the reset button is pressed.
* Repeat the procedure for thermocouple 2.

Check response on power failure (STB).

In the satisfactory range of the system:

* Switch off mains:
  - ☐ Wait for approx. 1 min
* Switch on mains:
  - ☐ The LEDs S1 and S2 must light up for approx. 5 sec and then go out
  - ☐ The external fault indicator must go out after a further 2 sec approx. and the safety circuit must close automatically.

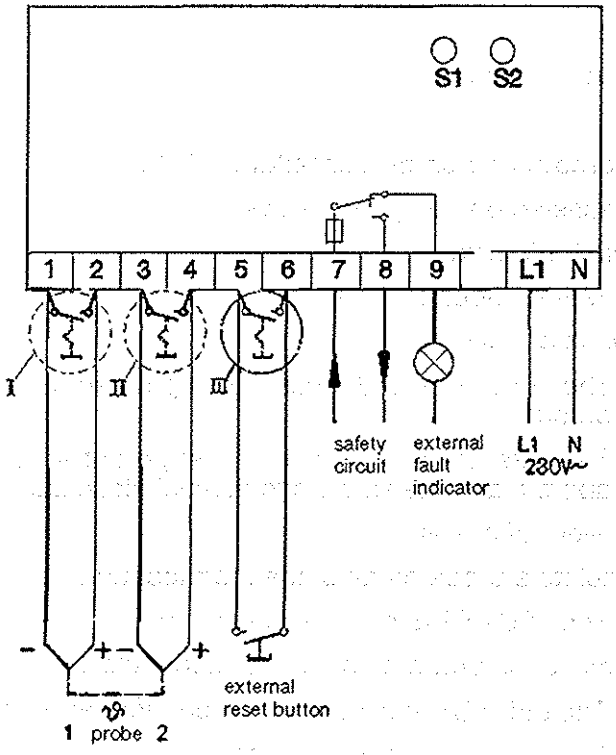
In the event of a fault:

* Simulate a probe break of the thermocouple 1:
  - ☐ The LEDs S1 and S2 must light up.
* Remove the probe break of thermocouple 1:
  - ☐ The LEDs S1 and S2 must go out after about 5 sec.
  - ☐ The safety circuit remains open.

6 Functional test

* Switch off mains for at least 5 sec.
* Switch on mains:
  - ☐ The LEDs S1 and S2 must light up for about 5 sec and then go out.
  - ☐ The external fault indication continues to be lit up and the safety circuit remains open. The safety circuit will only close again, and the external fault indication will go out, when the reset button is pressed.

6.3 Testing STBs and STWs with S-function when thermocouples are connected



6 Functional test

* Short-circuit the reset button
* Simulate a probe short-circuit of thermocouple 1:
  - ☐ The LEDs S1 and S2 must light up.
  - ☐ The external fault indication must light up. The safety circuit must be open.
  - ☐ LEDs S1 and S2 must go out after approx. 5 sec.
  - ☐ The external fault indication remains lit and the safety circuit remains open.
* Remove short-circuit of reset button:
  - ☐ The LEDs S1 and S2 light up again.
  - ☐ The external fault indication remains on.
* Remove probe short-circuit:
  - ☐ If the probe temperature is within the permitted temperature range, i.e. **above** the limit setting by the switching differential, then the two LEDs S1 and S2 must go out after approx. 5 sec.
  - ☐ For an STW, the external fault indication must also disappear and the safety circuit must close.
  - ☐ For an STB, the external fault indication must continue to be lit up and the safety circuit must remain open. It will only close again when then reset button is pressed.
* Repeat the procedure for thermocouple 2.

Check the response after power failure (STB only)

In the satisfactory range of the system:

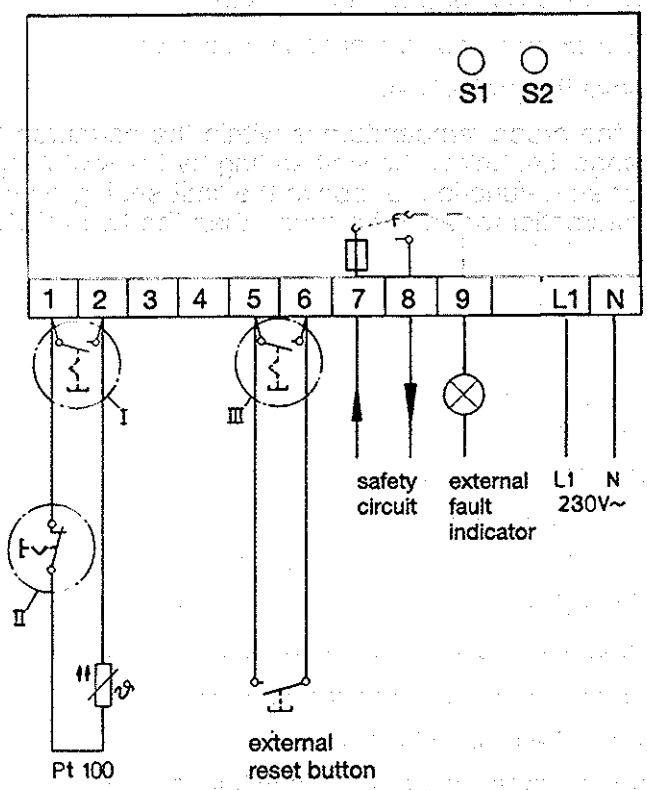
* Switch off mains:
  - ☐ Wait for approx. 1 min
* Switch on mains:
  - ☐ The LEDs S1 and S2 must light up for approx. 5 sec and then go out.

- ☐ The external fault indication must go out after a further 2 sec (approx.) and the safety circuit must close automatically.

In the event of a fault:

* Simulate a probe short-circuit of thermocouple 1:
  - ☐ The LEDs S1 and S2 must light up.
* Remove the probe short-circuit of thermocouple 1
  - ☐ The LEDs S1 and S2 must go out after approx. 5 sec.
  - ☐ The safety circuit remains open.
* Switch off mains for at least 5 sec
* Switch on mains:
  - ☐ The LEDs S1 and S2 must light up for approx. 5 sec and then go out.
  - ☐ The external fault indication continues to be lit up and the safety circuit remains open. Only when the reset button is pressed, will the safety circuit close and the external fault indication go out.

6.4 Testing STBs and STWs with O- or S-function when connecting resistance thermometers



* Short-circuit the reset button
* Simulate a probe break:
  - ☐ The LEDs S1 and S2 must light up.
  - ☐ The external fault indication must light up. The safety circuit must be open.
  - ☐ The LEDs S1 and S2 must go out after approx. 5 sec.

- ☐ The external fault indication continues to be lit up and the safety circuit remains open.

* Remove the short-circuit across the reset button:
  - ☐ The LEDs S1 and S2 light up again.
  - ☐ The external fault indication remains on.
* Remove the probe break:
  - ☐ If the probe temperature is within the permitted temperature range (i.e. below the limit setting by the switching differential for an O-function, or above the limit setting by the switching differential for an S-function), then the two LEDS S1 and S2 go out after approx. 5 sec.
  - ☐ For an STW, the external fault indication must also go out and the safety circuit must close.
* For an STB, the external fault indication must continue to be lit up and the safety circuit must remain open. The safety circuit will only close again when the reset button is pressed.
* Short-circuit the reset button
* Simulate a probe short-circuit:
  - ☐ The LEDs S1 and S2 must light up.
  - ☐ The LEDs S1 and S2 must go out after approx. 5 sec.
* Remove short-circuit across the external reset button:
  - ☐ The LEDs S1 and S2 light up again.
* Remove the probe short-circuit:
  - ☐ If the probe temperature is within the permitted temperature range (i.e. below the limit setting by the switching differential for an O-function, or above the limit setting by the switching differential for an S-function), then the two LEDs S1 and S2 must go out after approx. 5 sec.
  - ☐ For an STW, the external fault indication must go out and the safety circuit must close.

- ☐ For an STB, the external fault indication must continue to be lit up and the safety circuit must remain open. It is only closed again when the reset button is pressed.

Check response after a power failure (STB)

In the satisfactory range of the system:

* Switch off mains:
  - ☐ Wait approx. 1 min
* Switch on mains:
  - ☐ The LEDs S1 and S2 must light up for approx. 5 sec and then go out.
  - ☐ The external fault indication must go out after (approx.) a further 2 sec and the safety circuit must close automatically.

In the event of a fault:

* Simulate a probe break:
  - ☐ The LEDs S1 and S2 must light up.
* Remove the probe break:
  - ☐ The LEDs S1 and S2 must go out after approx. 5 sec
  - ☐ The safety circuit remains open.
* Switch off mains for at least 5 sec
* Switch on mains:
  - ☐ The LEDs S1 and S2 must light up for approx. 5 sec and then go out.
  - ☐ The external fault indication continues to be lit up and the safety circuit remains open. Only when the reset button is pressed, will the safety circuit close and the external fault indication go out.

7 Test in the event of a fault

In the event of a system fault, the instrument switches off the system. This condition is indicated by LED S1 lighting up (S1 and S2 on instruments with enhanced safety). The fault is signalled simultaneously by the external fault indication. In this condition, the relay of the temperature limiting device (STB, TB, STW, TW) is not operated.

Initial condition: STB has switched off the system.

Fault indicators are lit	**Fault indicators are off**
The fault is still present in the system (over/undertemperature, probe break/short-circuit) * Press the reset button (at least 5 sec) until S1 and S2 go out If the safety circuit remains open, the system and the probe circuit have to be checked.	* Press the reset button If the instrument remains inhibited after pressing the reset button, the replacement instrument must be installed and the functional test carried out.

8 Technical data

Inputs

Resistance thermometer

Pt100 in 2-wire circuit:
0—120°C*
0—300°C*
0—400°C*
0—600°C*
200—500°C*

Ambient temperature error: 0.8°C/10°C

Lead compensation:
A lead resistance of 0.5Ω is allowed for internally as standard; 1Ω, 10Ω, 30Ω or 50Ω on request. A lead compensation resistor LAW (10Ω) is required for connection to resistance thermometers with a max. operating temperature of 700°C.

Double thermocouples

NiCr-Ni K:
200— 600°C*
400— 800°C*
600—1000°C*
800—1200°C

Pt10Rh-Pt S:
400— 800°C*
800—1200°C*
1000—1400°C
1200—1600°C

Pt30Rh-Pt6Rh B:
800—1200°C*
1000—1400°C*
1200—1600°C
1400—1800°C

Fe-Con L:
50— 450°C*
200— 600°C*
500— 900°C

W3Re-W25Re:
1600— 2000°C

Ambient temperature error: 2.0°C/10°C

* For temperature probes used in accordance with DIN 3440, the max. limit temperature of the instrument is determined by the upper meas. temperature of the selected temperature probe.

8 Technical data

Outputs

Relay

with floating changeover contact

Switching capacity: 2 A 230 V AC, resistive load
protected by fuse 2A M

Contact life: 100.000 switching operations at rated load

General data

Switching point accuracy ±2% of span

Switching differential 3°C (for Pt100 only),
10°C, 30°C or 100°C

Supply

230V AC,	+10% / -15%	48—63Hz
115V AC,	+10% / -15%	48—63Hz
24V AC,	+10% / -15%	48—63Hz

Power consumption 4 VA approx.

Permissable ambient temperature 0 to +55 °C

Permissable storage temperature −40 to +80 °C

Climatic conditions rel. humidity 75% max., no condensation

Protection IP20 (to EN 60529)

Electrical safety
to EN 60730-1 '96
creepage distances:

mains to electronics and probe	≥ 8mm
mains to relay	≥ 3mm
relay to electronics and probe	≥ 8mm

Instrument can be connected to SELV circuits.

8 Technical data

Test voltages
to EN 60730-1 '96 Tab. 13.2

Electromagnetic compatibility
to EN 50081-1, EN 50082-2

Ambient conditions
to EN 60730-1 '96 Para. 2.12.6
"normal"

Operating conditions
The instrument is designed as a built-in device according to:
- VDE 0160 5.5.1.3 5/88
- VDE 0106 Part 100 3/83

Operating position	unrestricted
Weight	250g approx.
Dimensions (WxHxD)	54mm x 70mm x 110mm

Casing
Plastic
Combustibility class V0

With extra Code "GL"
The instrument meets Application Category C according to the GL-guideline.

Temperature:	0 to 55°C
Rel. humidity:	not exceeding 100% r.H.
Vibration:	not exceeding 0.7g

Standard accessories

- Operating Instructions B 70.1130
- 2 fixing elements (only for GL-version)
- LAW (only with extra Code 229, 231, 233, 235)

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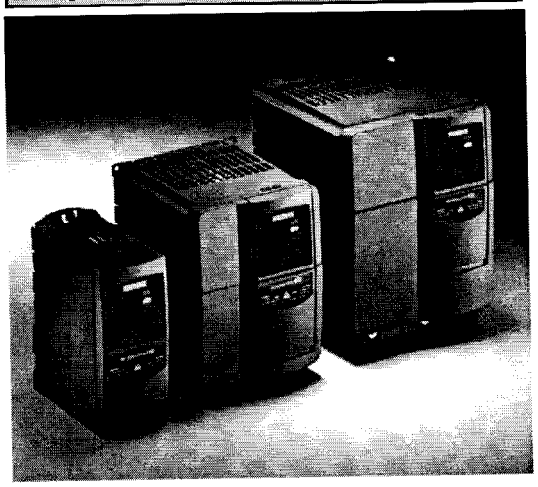
SIEMENS

English

MICROMASTER 420

Getting Started Guide



This Getting Started Guide allows easy and efficient commissioning of the MICROMASTER 420 inverter. For further technical information, please refer to the **Operating Instructions** and the **Reference Manual** on the CD-ROM supplied with the MICROMASTER 420 inverter.

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Warnings, Cautions and Notes

The following Warnings, Cautions and Notes are provided for your safety and as a means of preventing damage to the product or components in the machines connected.

Specific Warnings, Cautions and Notes that apply to particular activities are listed at the beginning of the relevant sections.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your MICROMASTER 420 inverter and the equipment you connect to it.

Warnings

- This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with **Warnings** or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.
- Only suitably qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.
- The DC link of all MICROMASTER modules remains at a hazardous voltage level for 5 minutes after all voltages have been disconnected. Therefore always wait for 5 minutes after disconnecting the inverter from the power supply before carrying out work on any MICROMASTER modules.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 (level 3) and P0335. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230/460V when protected by a time delay fuse (see Table on Page 93 of the Operating Instructions).
- Class 1 60/75° copper wire only.
- Refer to the Operating Instructions for tightening torques.

Caution

- Children and the general public must be prevented from accessing or approaching the equipment!
- This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

Notes

- Keep this Getting Started Guide within easy reach of the equipment and make them available to all users.
- Whenever measuring or testing has to be performed on live equipment, the regulations of Safety Code VBG 4.0 must be observed, in particular § 8 'Permissible Deviations when Working on Live Parts'. Suitable electronic tools should be used.
- Before carrying out any installation and commissioning procedures, you **must** read all safety instructions and warnings, including all warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and ensure missing or damaged labels are replaced.

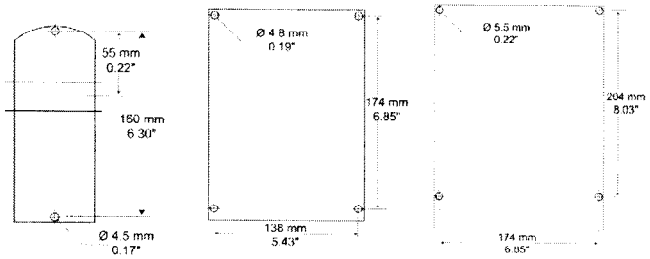
1 Mechanical Installation

Warning

THIS EQUIPMENT MUST BE GROUNDED.

- To ensure the safe operation of the inverter, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in the MICROMASTER 420 operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective gear.
- The mains input, DC and motor terminals carry dangerous voltages even if the inverter is inoperative, wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.

Frame Size A **Frame Size B** **Frame Size C**



Drill pattern for MICROMASTER 420

Frame-Size	Overall Dimensions			Fixing Method	Tightening Torque
	Height	Width	Depth		
A	173mm	73mm	149mm	2 x M4 Bolts 2 x M4 Nuts 2 x M4 Washers Connecting to DIN rail	2.5Nm with washers fitted
B	202mm	149mm	172mm	4 x M4 Bolts 4 x M4 Nuts 4 x M4 Washers	2.5Nm with washers fitted
C	245mm	185mm	195mm	4 x M5 Bolts 4 x M5 Nuts 4 x M5 Washers	3.0Nm with washers fitted

Frame Size measurements and fixing methods

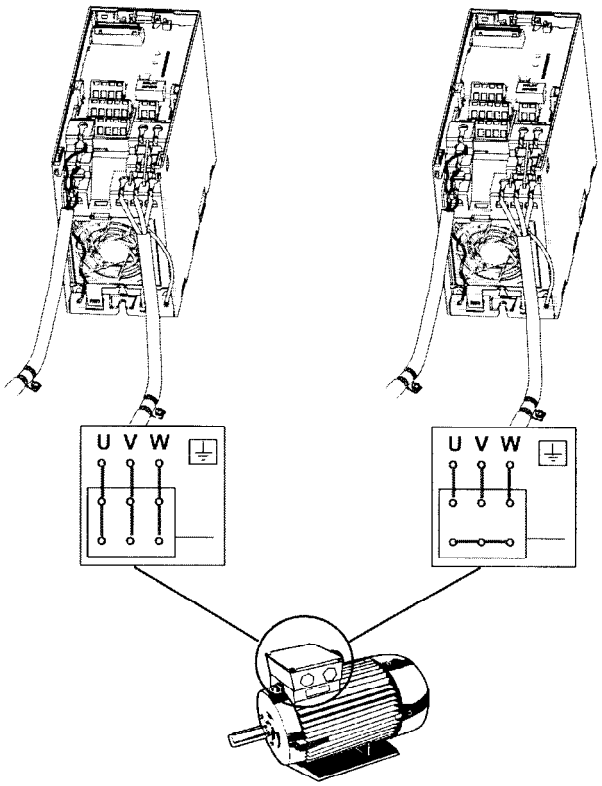
2 Electrical Installation

Warning

- Before electrical installation, set the power supply frequency for Europe or North America. For operation on the North American Power Supply, set the DIP-Switch (2) to 60 Hz (up). For operation on the European Power Supply, leave the DIP-Switch (2) in the default position 50 Hz (down).
- When installing the inverter after a period of storage please refer to Section 2 of the Operating Instructions
- DIP-Switch 1 is not used.

230V
Single Phase

400 V / 230 V (North America)
Three Phase



Delta connection
230 V single phase

Star connection
400 V / 230 V three phase

Note

Motors above 11kW are normally configured 400V Delta or 690 V Star. Motor should be connected appropriately according to the output voltage of the inverter. For further information refer to the Operating Instructions of the motor.

3 Avoiding Electro-Magnetic Interference

The inverters are designed to operate in an industrial environment where a high level of EMI can be expected. Usually, good installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines stated below.

Actions to Take

- Ensure that all equipment in the cubicle is well grounded using short, thick grounding cable connected to a common star point or busbar
- Make sure that any control equipment connected to the inverter (such as a PLC) is connected to the same ground or star point as the inverter via a short, thick link
- Connect the return ground from the motors, directly to the ground connection (PE) on the associated inverter
- Flat conductors are preferred as they have lower impedance at higher frequencies
- Terminate the ends of the cable neatly, ensuring that unscreened wires are as short as possible
- Separate the control cables from the power connections as much as possible, using separate trunking, if necessary at 90^0 right angles.
- Whenever possible, use screened leads for the connections to the control circuitry
- Ensure that contactors inside the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay
- Use screened or armored connections for the motor connections and ground the screen at both ends using cable clamps

Warning

Safety regulations **must not** be compromised when installing inverters!

4 Commissioning the MICROMASTER 420 Inverter

The MM420 is supplied with a Status Display Panel (SDP). Default parameter settings cover the following requirements:

- The motor rating data, Voltage, Current and Frequency are all compatable with the inverter data. (A standard Siemens motor is recommended).
- Linear V/f motor speed, controlled by an analogue potentiometer.
- Maximum speed 3000 min^{-1} with 50 Hz (3600 min^{-1} with 60 Hz), Controllable using a potentiometer via the inverter's analogue inputs
- Ramp-up time / Ramp-down time = 10 s

If more complex application settings are required, please refer to the parameter listing in the Operating Instructions.

For changing parameters you need one of the optional modules "Basic Operator Panel" (BOP), "Advanced Operator Panel" (AOP) or communication options. See Operating Instructions and Reference Manual.

In this Guide, Commissioning with SDP and "Quick Commissioning" with the BOP (including the neccessary parameters) are explained.

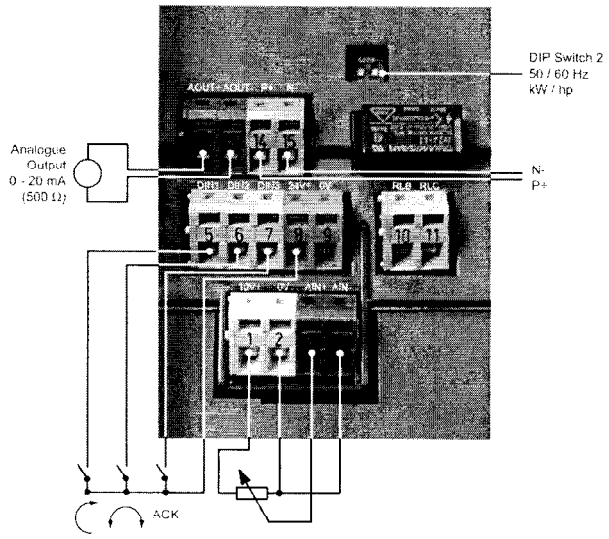
For replacing the SDP by an Operator Panel see Section 6

Note:

Frequency setting: The inverter is delivered as follows:

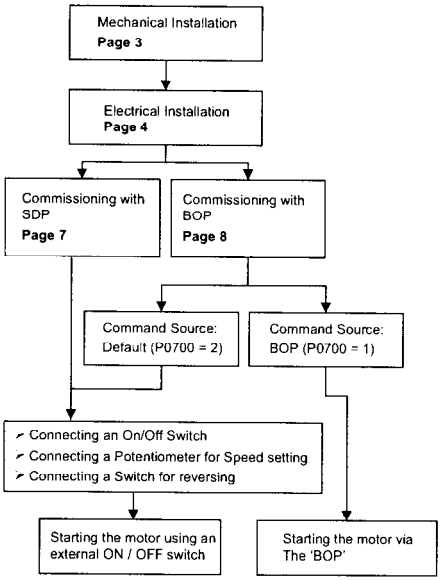
- DIP switch 2:
  - Off position: European defaults (50Hz, kW etc.)
  - On position: North American defaults (60Hz, hp etc.)
- DIP switch 1: Not for customer use.

4.1 Default Settings



Digital inputs	Terminals	Parameter	Default operation
1	5	P0701 = '1'	ON right
2	6	P0702 = '12'	Reverse
3	7	P0703 = '9'	Fault Acknowledge
Output relay	10/11	P0731 = '52.3'	Fault Indication
Analogue Output	12/13	P0771 = '21'	Output Frequency

4.2 Commissioning with Getting Started Guide



4.3 Commissioning with the Status Display Panel

When commissioning the MICROMASTER 420 with the Status Display Panel (SDP), the drive application must be covered by the default settings of your MICROMASTER 420.

- Connect On/Off Switch to the terminals 5 and 8
- Connect Switch for reversing direction to the terminals 6 and 8 (Optional)
- Connect Switch for fault reset to the terminals 7 and 8 (Optional)
- Connect analog frequency display to the terminals 12 and 13 (Optional)
- Connect Output relay to the terminals 10 and 11 (Optional)
- Connect a **5.0 kΩ** Potentiometer for speed control to the terminals 1 to 4

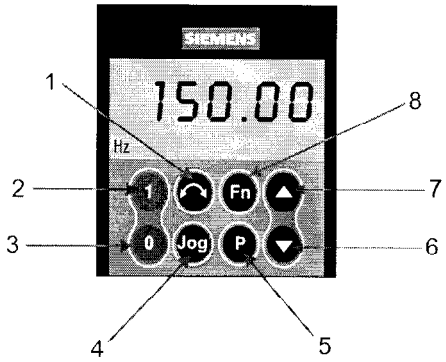
The Inverter is now ready for starting.

4.4 Commissioning with the Basic Operator Panel

With the Basic Operator Panel, which is available as an option, the user can change the default settings of the MM420 to meet particular application requirements. Using the BOP it is possible to access level one, two and three parameter sets. The BOP hosts the following features:

- Speed, frequency, motor direction and current etc displayed as required
- For direct control, the BOP is mounted directly onto the front panel of the inverter

For "Quick Commissioning" of the inverter the Getting Started Guide should be used. For other methods of commissioning, see the Operating Instructions or Reference Manual.



1.	Change Direction	Changes the direction of rotation of the motor. Reverse is indicated by a minus (-) sign.
2.	Start Inverter	This button starts the inverter. This button is disabled by default. To enable this button set P0700 to 1.
3.	Stop Inverter	This button stops the motor in the time set in P1121 (Ramp-down time).
4.	Jog Motor	While the inverter has no output this button causes the motor to start and run at the preset jog frequency. The inverter stops when the button is released.
5.	Access Parameters	Pressing this button allows the user to access the parameters in the selected user access level.
6.	Decrease Value	Pressing this button decreases the displayed value. To change the frequency setpoint via the BOP set P1000 = 1 (when P0700 = 1).
7.	Increase Value	Pressing this button increases the displayed value. To change the frequency setpoint via the BOP set P1000 =1 (when P0700 = 1).
8.	Functions	This button can be used to view additional information. See Section 5.1.2 on page 42 of the MICROMASTER 420 Operating Instructions.

4.5 Changing parameters and settings using a 'BOP' / 'AOP'

The following description shows how to change the parameter P1082. Use this description as a guide for setting any parameters using the 'BOP'.

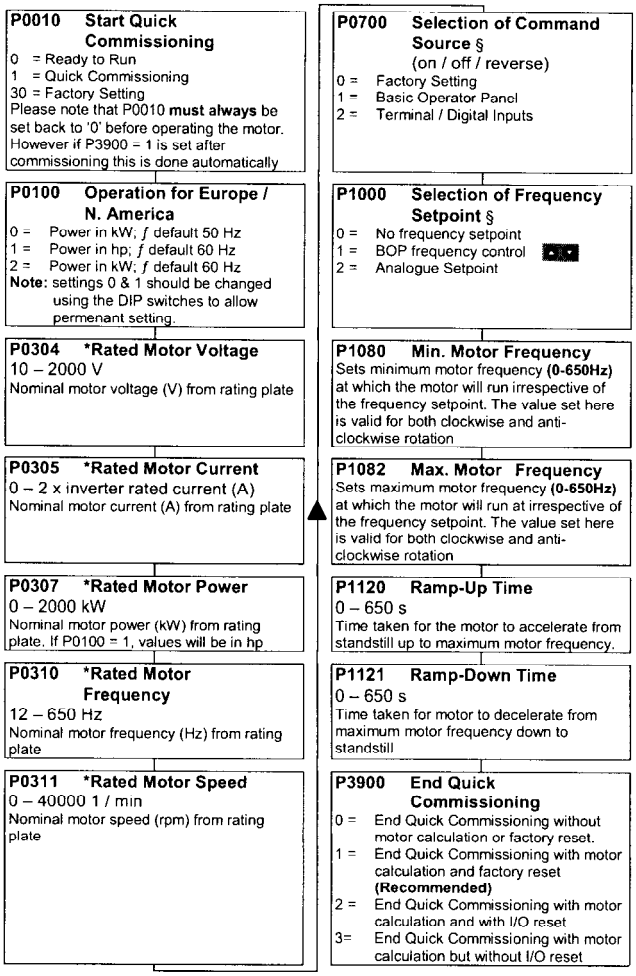
	Step	♦ Result on display
1	Press P to access parameters	P(1) r0000
2	Press ▲ until P0010 is displayed	P(1) P0010
3	Press P to access P0010 Value level	P(1) 0
4	Press ▲ to set P0010 = 1	P(1) 1
5	Press P to save and exit value level	P(1) P0010
6	Press ▲ until P1082 is displayed	P(1) P1082
7	Press P to access P1082 value level	P(1) 50.00
8	Press ▼ to select desired maximum frequency.	P(1) 35.00
9	Press P to save and exit value level	P(1) P1082
10	Press ▼ to return to P0010	P(1) P0010
11	Press P to access P0010 value level	P(1) 1
12	Press ▼ to return value to P0010 = 0	P(1) 0
13	Press P to save and exit value level	P(1) P0010
14	Press ▼ to return to r0000	P(1) r0000
15	Press P to exit Parameterization The LCD will alternate between actual frequency and the requested frequency setpoint	P(1) 35.00 P(1) 00.00

The required maximum frequency has now been stored.

5 Quick Commissioning

The following parameters must be followed through in their entirety to ensure optimised and efficient operation of the inverter. Please note that P0010 must be set to '1 = Quick Commissioning' to allow this procedure to be carried out.

For information on how to change parameter settings, please refer to section 4.5 of this guide.



5.1 RESET Using P0010 & P0970

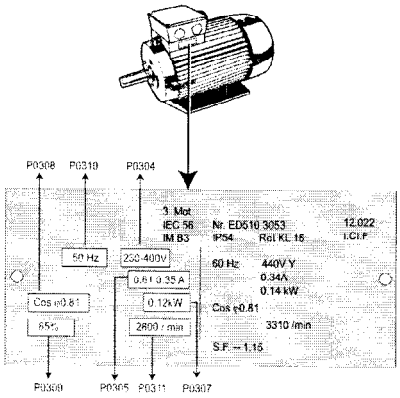
When resetting the inverter P0010 must be set to 30 (Factory Setting), it is then possible to set P0970 to '1'. The inverter will automatically reset all its parameters to their default settings. This can prove beneficial if you experience problems during parameter setup and wish to start again.

§ Denotes parameters that contain more detailed lists of possible settings for use in specific applications. Please refer to the Reference Manual and Operating Instructions on the CD

* Motor related parameters–please refer to motor rating plate drawing.

5.2 Motor Data for "Quick Commissioning"

To achieve optimum performance, the MICROMASTER 420 must have the relevant rated motor data set into the correct parameters. The diagram below indicates the data needed from the motor rating plate and the parameters that need to be set to store the information.



5.3 Starting/Stopping the motor using a 'BOP' (P0700 = 1), (P1000 = 1)

1. Press the green (RUN) button to start the motor.
2. Press the 'UP' button while the motor is turning. Motor speed increases to 50 Hz.
3. When the inverter reaches 50 Hz, press the 'DOWN' button. Motor speed and display are decreased.
4. Change the direction of rotation with the FORWARD / REVERSE button.
5. The red button STOPS the motor.

5.4 Commissioning with the Advanced Operator Panel (AOP)

The **Advanced** Operator Panel **(AOP)**, which is available as an option, has all the functionality of a Basic Operator Panel and at the same time includes the following features:

- Communication via RS232 interface
- Expanded language facility
- Diagnostic menu and fault finding assistance
- Explanation of active parameters, faults etc
- Speed, frequency, motor direction and current values etc displayed
- Capacity to store and download up to 10 parameter sets

5.5 Additional Control Applications

The MICROMASTER 420 can also be controlled by the following means:

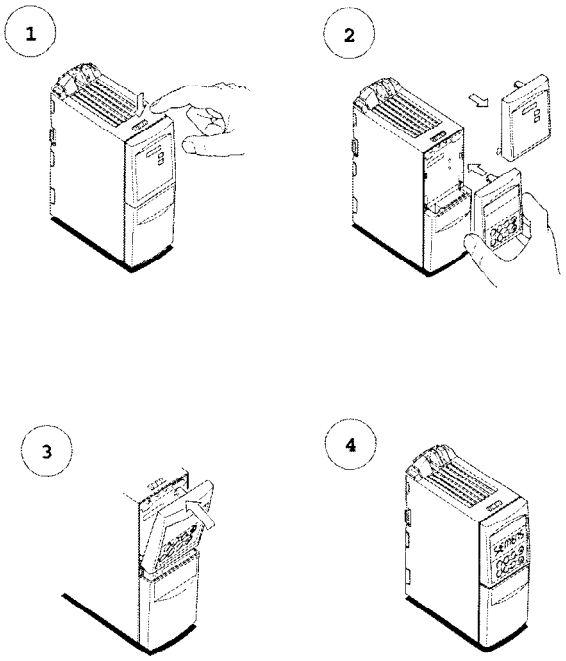
- Digital inputs / Analogue inputs
- Serial Link via USS Protocol
- Automated system via PROFIBUS connection

5.6 Further information ...

For further information about additional control applications, please refer to the Operating Instructions and Reference Manual on the CD delivered with the inverter.

6 Changing the Display / Operator Panel

The procedure for changing the operator panel is illustrated below.



6.1 Changing single digits in Parameter values

For changing the parameter value rapidly, the single digits of the display can be changed by performing the following actions:

1. Ensure you are in the parameter value changing level (see "Changing parameters with BOP").
2. Press Fn (function button), this causes the right hand digit to blink.
3. Change the value of this digit by pressing ▲ / ▼.
4. Press Fn (function button) again causes the next digit to blink.
5. Perform steps 2 to 4 until the required value is displayed.
6. Press the P to leave the parameter value changing level and store the value.

7 Troubleshooting

7.1 With the Status Display Panel

The operating status of the inverter is indicated by the green and red LEDs on the Status Display Panel. These LEDs indicate the following warnings and fault states.

Green	Yellow	Priority Display	Drive Status Definitions
OFF	OFF	1	Mains Not present
OFF	ON	8	Inverter Fault - other than ones listed below
ON	OFF	13	Inverter Running
ON	ON	14	Ready to run - standby
OFF	Flashing -R1	4	Fault Overcurrent
Flashing -R1	OFF	5	Fault Overvoltage
Flashing -R1	ON	7	Fault Motor Overtemperature
ON	Flashing -R1	8	Fault Inverter overtemperature
Flashing –R1	Flashing -R1	9	Warning Current limit-**Both LEDs Flashing same time**
Flashing -R1	Flashing -R1	11	Other Warnings- **Both LEDs Flashing Alternately**
Flashing -R1	Flashing -R2	6/10	Undervoltage Trip/Undervoltage warning
Flashing -R2	Flashing -R1	12	Drive is not in ready state- Display State>0
Flashing –R2	Flashing –R2	2	ROM Failure- **Both LEDs Flashing same time**
Flashing –R2	Flashing –R2	3	RAM Failure- **Both LEDs Flashing Alternately**
R1- On time 900mSec. **R2- On time 300mSec.**			

7.2 With Operator Panels (BOP & AOP)

The following fault codes for the Basic Operator and Advanced Operator Panels indicate the status of the inverter:

BOP/AOP fault code	Status of MICROMASTER 420 Inverter
F0001	Overcurrent
F0002	Overvoltage
F0004	Inverter overtemperature (internal PTC)
F0011	Motor overtemperature by I^2t calculation

Overcurrent (Fault F0001)

- Ramp up time set too short. Increase P1120 accordingly.
- Voltage boost too high. Reduce parameters P1310, P1311 and P1312 to prevent excessive magnetization of the motor.

Overvoltage (Fault F0002)

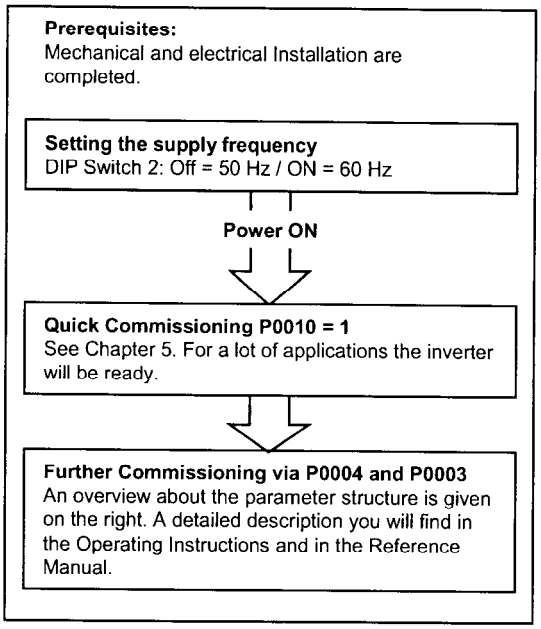
- Ramp down time set too short. Increase P1121 accordingly.

Note

It is possible that the motors' performance may be affected at low frequencies if parameter P1310 falls under 50 (default value).

For further fault code designations, please refer to the MICROMASTER 420 Operating Instructions on the CD included with the inverter.

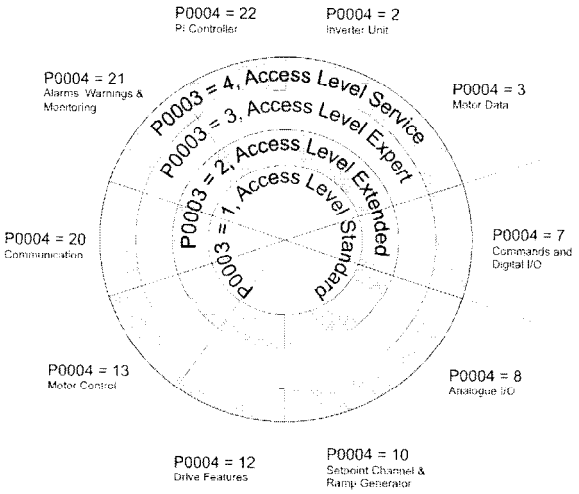
8 Parameterization of the Inverter Overview



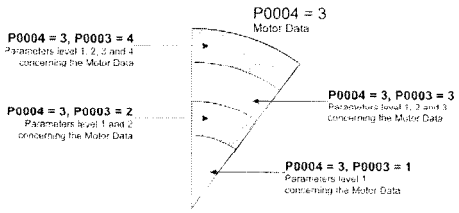
8.1 Parameter Structure

Overall Structure

Example Inverter Unit
(no filter function)
allows direct access to
the parameters depending
on the selected access level



Example Motor Data



European Low Voltage Directive

CE

The MICROMASTER product range complies with the requirements of the Low Voltage Directive 73/23/EEC as amended by Directive 98/68/EEC. The units are certified for compliance with the following standards:

EN 60146-1-1	Semiconductor inverters - General requirements and line commutated inverters
EN 60204-1	Safety of machinery - Electrical equipment of machine

European Machinery Directive

The MICROMASTER inverter series does not fall under the scope of the Machinery Directive. However, the products have been fully evaluated for compliance with the essential Health & Safety Requirements of the directive when used in a typical machine application. A Declaration of incorporation is available on request.

European EMC Directive

When installed according to the recommendations described in this guide, the MICROMASTER fulfils all requirements of the EMC Directive as defined by the EMC Product Standard for Power Drive Systems EN50082-2.

c UL us
LISTED

Underwriters Laboratories

UL and CUL LISTED POWER CONVERSION EQUIPMENT
5B33 for use in a pollution degree 2

ISO 9001

Siemens plc operates a quality management system, which complies with the requirements of ISO 9001

To submit any suggestions for improvements, please visit the Siemens Standard Drives Web Site at http://www.siemens.de/micromaster

Order Number: 6SE6400-5AB00-0BP0
Printed in England
Drawing Nr. G85139-K1790-U225-A1

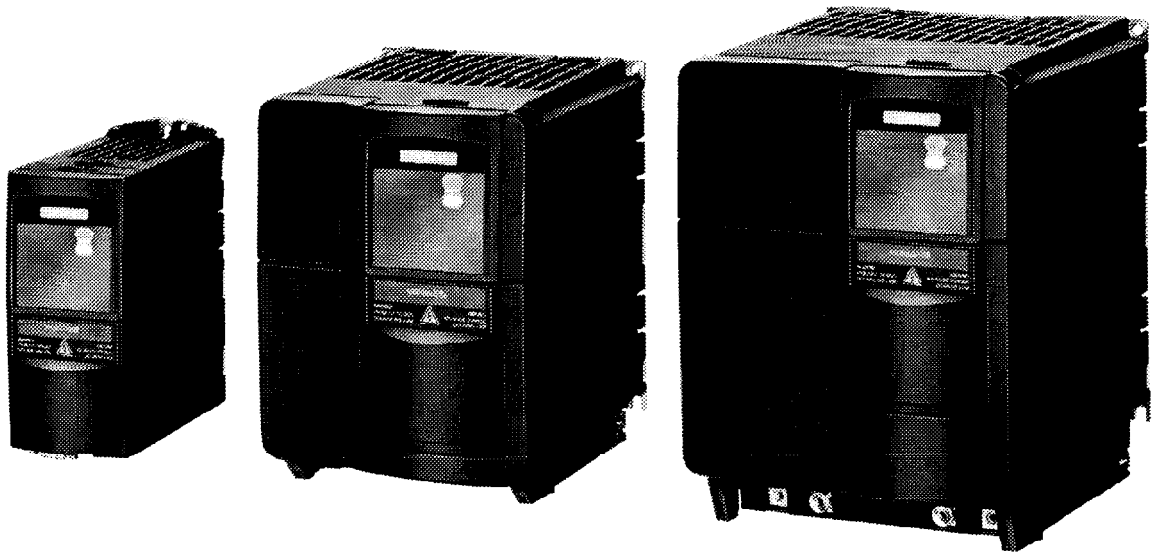
Siemens plc
Automation & Drives
Standard Drives Division
Varey Road,
Congleton, CW12 1PH
United Kingdom

SIEMENS

MICROMASTER 420

0.12 kW - 11 kW

Operating Instructions Issue 12/01

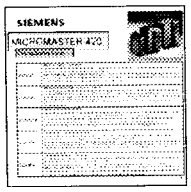


User Documentation
6SE6400-5AA00-0BP0

MICROMASTER 420 Documentation

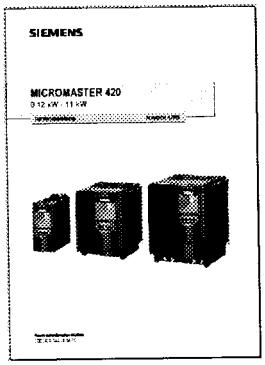
Getting Started Guide

Is for quick commissioning with SDP and BOP.



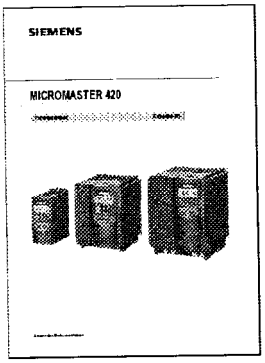
Operating Instructions

Gives information about features of the MICROMASTER 420, Installation, Commissioning, Control modes, System Parameter structure, Troubleshooting, Specifications and available options of the MICROMASTER 420.



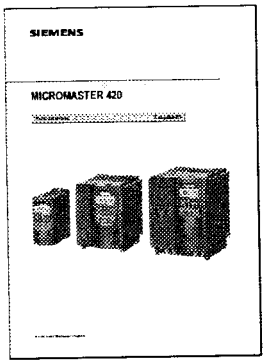
Parameter List

The Parameter List contains the description of all Parameters structured in functional order and a detailed description. The Parameter list also includes a series of function plans.



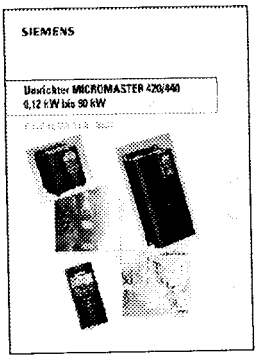
Reference Manual

The Reference Manual gives detailed information about engineering communication troubleshooting and maintenance.



Catalogues

In the catalogue you will find all the necessary information to select an appropriate inverter, as well as filters, chokes, operator panels and communication options.



SIEMENS

MICROMASTER 420

0.12 kW - 11 kW

Operating Instructions
User Documentation

Valid for Release Issue 12/01

Inverter Type
MICROMASTER 420
0.12 kW - 11 kW

Control Version
V1.1

Issue 12/01

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System Parameters 5

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Options 8

Electro-Magnetic Compatibility (EMC) 9

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Further information is available on the Internet under:

http://www.siemens.de/micromaster

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Other functions not described in this document may be available. However, this fact shall not constitute an obligation to supply such functions with a new control, or when servicing.

We have checked that the contents of this document correspond to the hardware and software described. There may be discrepancies nevertheless, and no guarantee can be given that they are completely identical. The information contained in this document is reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

Siemens handbooks are printed on chlorine-free paper that has been produced from managed sustainable forests. No solvents have been used in the printing or binding process.

Document subject to change without prior notice.

Order Number: 6SE6400-5AA00-0BP0

Siemens-Aktiengesellschaft

Foreword

User Documentation

WARNING

Before installing and commissioning, you must read the safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Information is also available from:

Technical Support Nuremberg

Tel: +49 (0) 180 5050 222
Fax: +49 (0) 180 5050 223
Email: techsupport@ad.siemens.de

Monday to Friday: 7:00 am to 5:00 pm (local time)

Internet Home Address

Customers can access technical and general information at:
http://www.siemens.de/micromaster

Contact address

Should any questions or problems arise while reading this manual, please contact the Siemens office concerned using the form provided at the back this manual.

Definitions and Warnings

DANGER

indicates an immiently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

used with the safety alert symbol indicates a potentially hazardous situationwhich, if not avoided, may result in minor or moderate injury.

CAUTION

used without safety alert symbol indicates a potentially hzardous situation which, if not avoided, may result in a property demage.

NOTICE

indicates a potential situation which, if not avoided, may result in an undesireable result or state.

NOTES

For the purpose of this documentation, "Note" indicates important information relating to the product or highlights part of the documentation for special attention.

Qualified personnel

For the purpose of this Instruction Manual and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid.

PE

= Ground

- PE – Protective Earth uses circuit protective conductors sized for short circuits where the voltage will not rise in excess of 50 Volts. This connection is normally used to ground the inverter.
- - Is the ground connection where the reference voltage can be the same as the Earth voltage. This connection is normally used to ground the motor.

Use for intended purpose only

The equipment may be used only for the application stated in the manual and only in conjunction with devices and components recommended and authorized by Siemens.

Safety Instructions

The following Warnings, Cautions and Notes are provided for your safety and as a means of preventing damage to the product or components in the machines connected. This section lists Warnings, Cautions and Notes, which apply generally when handling MICROMASTER 420 Inverters, classified as **General**, **Transport & Storage**, **Commissioning**, **Operation**, **Repair** and **Dismantling & Disposal**.

Specific Warnings, Cautions and Notes that apply to particular activities are listed at the beginning of the relevant chapters and are repeated or supplemented at critical points throughout these chapters.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your MICROMASTER 420 Inverter and the equipment you connect to it.

General

WARNING

- This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with **Warnings** or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.
- Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.
- Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. **It is not permissible to open the equipment until 5 minutes after the power has been removed.**
- **HP ratings are based on the Siemens 1LA motors and are given for guidance only, they do not necessarily comply with UL or NEMA HP ratings.**

CAUTION

- Children and the general public must be prevented from accessing or approaching the equipment!
- This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

NOTICE

- Keep these operating instructions within easy reach of the equipment and make them available to all users
- Whenever measuring or testing has to be performed on live equipment, the regulations of Safety Code VBG 4.0 must be observed, in particular § 8 "Permissible Deviations when Working on Live Parts". Suitable electronic tools should be used.
- Before installing and commissioning, please read these safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Transport & Storage

WARNING

- Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment.

CAUTION

- Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures (*see table on page 76*).

Commissioning

WARNING

- Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
- If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker - *see DIN VDE 0160, section 5.5.2 and EN50178 section 5.2.11.1*).
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L/L1, N/L2, L3.
  - the motor terminals U, V, W, DC+, DC-
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-7 Seite 29, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

Operation

WARNING

- Motor parameters must be accurately configured for the motor overload protection to operate correctly.
- MICROMASTERS operate at high voltages.
- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230 V / 460 V when protected by a time delay fuse (*see Tables see Tables starting on page 77).*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

Repair

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using parts contained in the relevant spare parts list.
- Disconnect the power supply before opening the equipment for access

Dismantling & Disposal

NOTES

- The inverter's packaging is re-usable. Retain the packaging for future use or return it to the manufacturer.
- Easy-to-release screw and snap connectors allow you to break the unit down into its component parts. You can then re-cycle these component parts, dispose of them in **accordance with local requirements or return them to the manufacturer.**

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1 Overview

This Chapter contains:

A summary of the major features of the MICROMASTER 420 range.

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1.1 The MICROMASTER 420

The MICROMASTER 420s are a range of frequency inverters for controlling the speed of three phase AC motors. The various models available range from the 120 W single phase input to the 11 kW three phase input.

The inverters are microprocessor-controlled and use state-of-the-art Insulated Gate Bipolar Transistor (IGBT) technology. This makes them reliable and versatile. A special pulse-width modulation method with selectable Pulse frequency permits quiet motor operation. Comprehensive protective functions provide excellent inverter and motor protection.

The MICROMASTER 420 with its default factory settings, is ideal for a large range of simple motor control applications. The MICROMASTER 420 can also be used for more advanced motor control applications via its comprehensive parameter lists.

The MICROMASTER 420 can be used in both 'stand-alone' applications as well as being integrated into 'Automation Systems'.

1.2 Features

Main characteristics

- Easy installation
- Easy commissioning
- Rugged EMC design
- Can be operated on IT line supplies
- Fast repeatable response time to control signals
- Comprehensive range of parameters enabling configuration for widest range of applications
- Simple cable connection
- Modular design for extremely flexible configuration
- High switching frequencies for low-noise motor operation
- Detailed status information and integrated message functions
- External options for PC communications, Basic Operator Panel (BOP), Advanced Operator Panel (AOP) and Profibus Communications Module

Performance characteristics

- Flux Current Control (FCC) for improved dynamic response and motor control
- Fast Current Limitation (FCL) for operation with trip-free mechanism
- Built-in DC brake
- Compound Braking to improve braking performance
- Acceleration/deceleration times with programmable smoothing
- Closed-loop control using Proportional, Integral (PI) control loop function
- Multi-point V/f characteristic

Protection characteristics

- Overvoltage/undervoltage protection
- Overtemperature protection for the inverter
- Ground fault protection
- Short-circuit protection
- i^2t thermal motor protection
- PTC for motor protection

2 Installation

This Chapter contains:

- General data relating to installation
- Dimensions of Inverter
- Wiring guidelines to minimize the effects of EMI
- Details concerning electrical installation

2.1 General 20
2.2 Ambient operating conditions 21
2.3 Mechanical installation 22
2.4 Electrical installation 25

WARNING

- Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
- If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three-phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker EN50178 Section 5.2.11.1).
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L/L1, N/L2, L3.
  - the motor terminals U, V, W, DC+, DC-
- Always wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*
- The minimum size of the earth bonding conductor must be equal to or greater than the cross-section of the power supply cables.

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-7 on page 29, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

2.1 General

Installation after a Period of Storage

Following a prolonged period of storage, you must reform the capacitors in the inverter. The requirements are listed below.

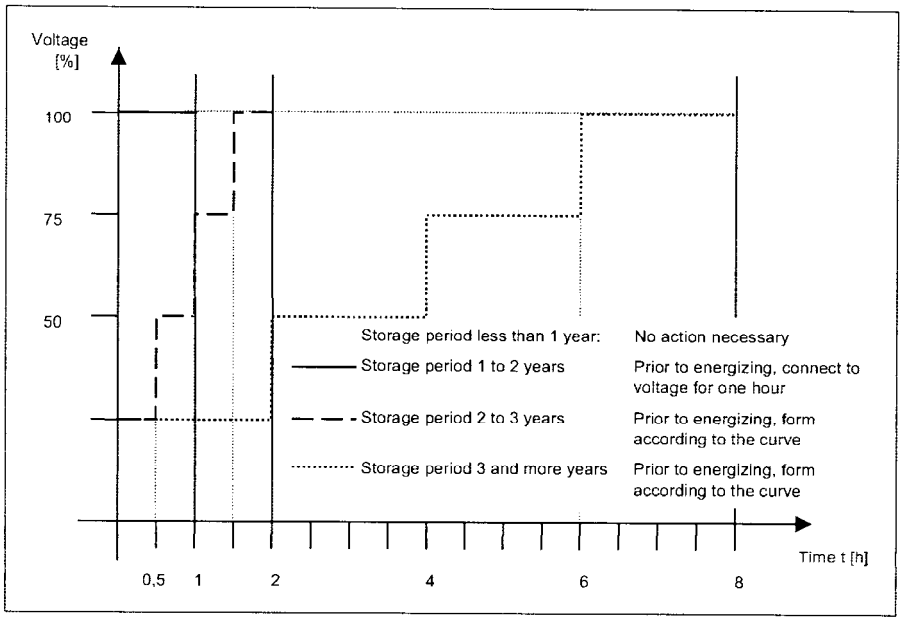


Figure 2-1 Forming

2.2 Ambient operating conditions

Temperature

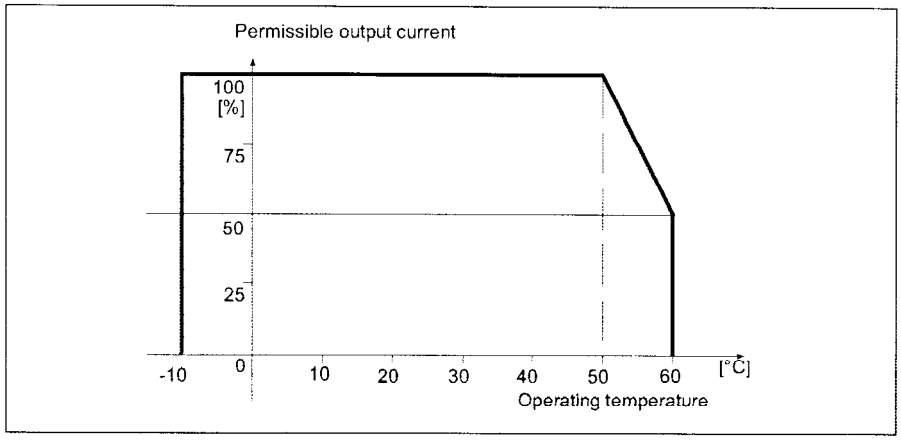


Figure 2-2 Ambient operating temperature

Humidity

Relative air humidity ≤ 95% Non-condensing

Altitude

If the inverter is to be installed at an altitude > 1000 m or > 2000 m above sea level, derating will be required:

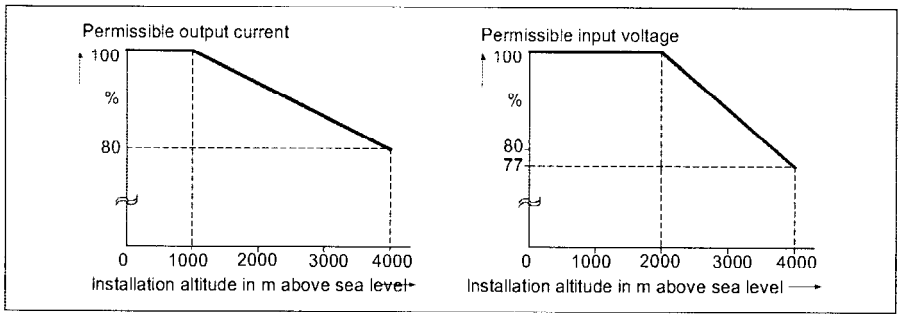


Figure 2-3 Installation altitude

Shock and Vibration

Do not drop the inverter or expose to sudden shock.. Do not install the inverter in an area where it is likely to be exposed to constant vibration.

Mechanical strength to DIN IEC 68-2-6

- Deflection: 0.075 mm (10 ... 58 Hz)
- Acceleration: 9.8 m/s^2 (> 58 ... 500 Hz)

Electromagnetic Radiation

Do not install the inverter near sources of electromagnetic radiation.

Atmospheric Pollution

Do not install the inverter in an environment, which contains atmospheric pollutants such as dust, corrosive gases, etc.

Water

Take care to site the inverter away from potential water hazards, e.g. do not install the inverter beneath pipes that are subject to condensation. Avoid installing the inverter where excessive humidity and condensation may occur.

Installation and cooling

CAUTION

The inverters MUST NOT be mounted horizontally.

The inverters can be mounted without any clearance at either side.

Allow 100 mm clearance above and below the inverter. Make sure that the cooling vents in the inverter are positioned correctly to allow free movement of air.

2.3 Mechanical installation

WARNING

- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective gear.
- The mains input, DC and motor terminals, can carry dangerous voltages even if the inverter is inoperative; wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.
- The inverters can be mounted adjacent to each other. If they are mounted on top of each other, however, a clearance of 100 mm has to be observed.

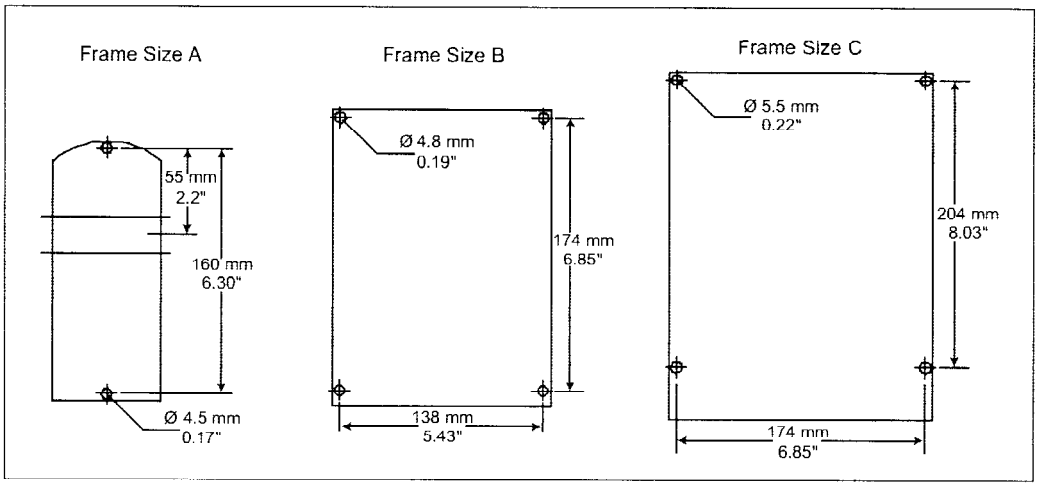


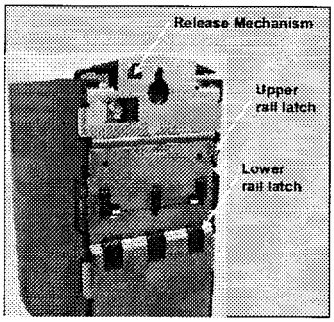
Figure 2-4 Drill pattern for MICROMASTER 420

Table 2-1 Dimensions and Torques of MICROMASTER 420

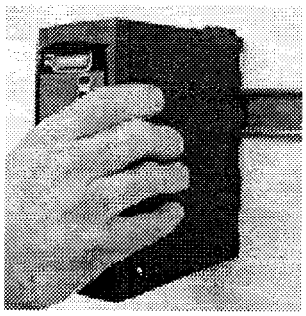
Frame-Size		Overall Dimensions		Fixing Method	Tightening Torque
A	Width x Height x Depth	mm	73 x 173 x 149	2 x M4 Bolts 2 x M4 Nuts 2 x M4 Washers for mounting on standard rail	2.5 Nm with washers fitted
		inch	2.87 x 6.81 x 5.87		
B	Width x Height x Depth	mm	149 x 202 x 172	4 x M4 Bolts 4 x M4 Nuts 4 x M4 Washers	2.5 Nm with washers fitted
		inch	5.87 x 7.95 x 6.77		
C	Width x Height x Depth	mm	185 x 245 x 195	4 x M5 Bolts 4 x M5 Nuts 4 x M5 Washers	2.5 Nm with washers fitted
		inch	7.28 x 9.65 x 7.68		

2.3.1 Mounting on standard rail, Frame Size A

Fitting the Inverter to a 35 mm standard rail (EN 50022)

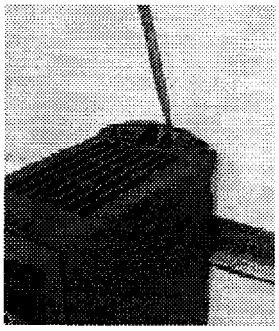


1. Fit the inverter to the rail using the upper rail latch.



2. Push the inverter against the rail and the lower rail latch should click into place.

Removing the Inverter from the rail



1. To disengaged the release mechanism of the inverter, insert a screwdriver into the release mechanism.
2. Apply a downward pressure and the lower rail latch will disengage.
3. Pull the inverter from the rail.

2.4 Electrical installation

WARNING

The inverter must always be grounded.

- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective gear.
- Never use high voltage insulation test equipment on cables connected to the inverter.
- The mains input, DC and motor terminals, can carry dangerous voltages even if the inverter is inoperative; wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.

CAUTION

The control, power supply and motor leads **must** be laid separately. Do not feed them through the same cable conduit/trunking.

2.4.1 General

WARNING

The inverter must always be grounded. If the inverter is not grounded correctly, extremely dangerous conditions may arise within the inverter which could prove potentially fatal.

Operation with ungrounded (IT) supplies

The MICROMASTER will operate from ungrounded supplies and will continue to operate if an input phase is shorted to ground. If an output phase is shorted to ground, the MICROMASTER will trip and indicate F0001.

On ungrounded supplies, it will be necessary to remove the 'Y' capacitor from the inside of the unit and fit an output choke. The procedure for removing this capacitor is described in Appendices 0 and 0.

Operation with Residual Current Device

If an RCD (also referred to as ELCB or RCCB) is fitted, the MICROMASTER inverters will operate without nuisance tripping, provided that:

A type B RCD is used.
The trip limit of the RCD is 300mA.
The neutral of the supply is grounded.
Only one inverter is supplied from each RCD.
The output cables are less than 50m (screened) or 100m (unscreened).

Operation with long cables

All inverters will operate at full specification with cable lengths up to 50 m screened or 100 m unscreened.

2.4.2 Power and motor connections

WARNING

The inverter must always be grounded.

- Isolate the mains electrical supply before making or changing connections to the unit.
- Ensure that the motor is configured for the correct supply voltage: single / three-phase 230 V MICROMASTERS must not be connected to a 400 V three-phase supply.
- When synchronous motors are connected or when coupling several motors in parallel, the inverter must be operated with voltage/frequency control characteristic (P1300 = 0, 2 or 3).

CAUTION

After connecting the power and motor cables to the proper terminals, make sure that the covers have been replaced properly before supplying power to the unit!

NOTICE

- Ensure that the appropriate circuit-breakers/fuses with the specified current rating are connected between the power supply and inverter *(see chapter 7, Tables starting on page 77)*.
- Use Class 1 60/75°C copper wire only (for UL compliance). For tightening torque see Table 7-2, page 76.

Access to the power and motor terminals

You can gain access to the mains and motor terminals by removing the covers (see also Appendices A, B und 0).

The mains and motor connections must be made as shown in Figure 2-6.

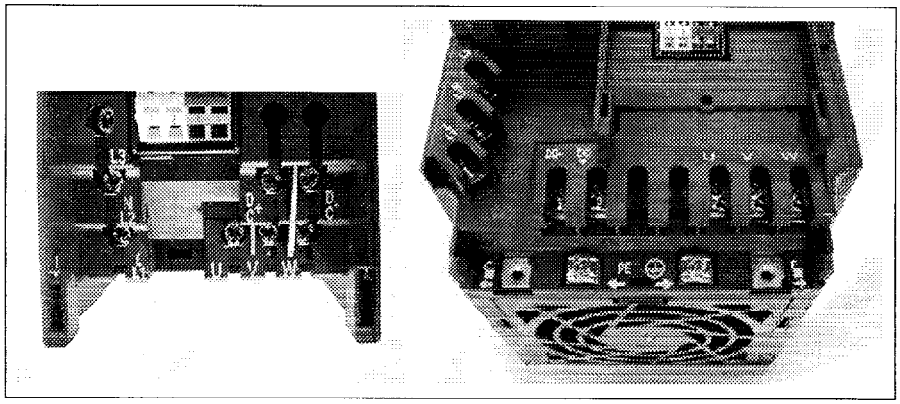


Figure 2-5 MICROMASTER 420 connection terminals

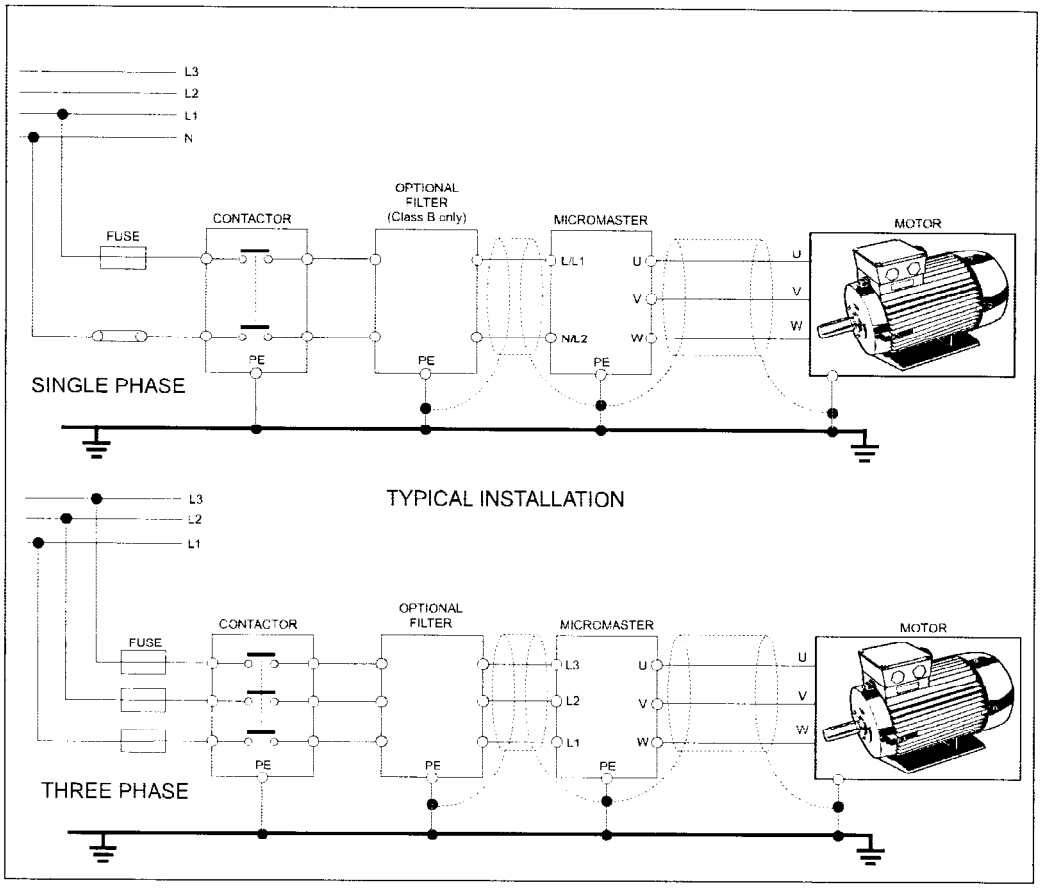


Figure 2-6 Motor and Power Connections

2.4.3 Avoiding Electro-Magnetic Interference (EMI)

The inverters are designed to operate in an industrial environment where a high level of EMI can be expected. Usually, good installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines stated below.

Action to Take

- Ensure that all equipment in the cubicle is well grounded using short, thick grounding cable connected to a common star point or busbar
- Make sure that any control equipment (such as a PLC) connected to the inverter is connected to the same ground or star point as the inverter via a short thick link.
- Connect the return ground from the motors controlled by the inverters directly to the ground connection (PE) on the associated inverter
- Flat conductors are preferred as they have lower impedance at higher frequencies
- Terminate the ends of the cable neatly, ensuring that unscreened wires are as short as possible
- **Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90° to each other.**
- Whenever possible, use screened leads for the connections to the control circuitry
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay
- Use screened or armored cables for the motor connections and ground the screen at both ends using the cable clamps

WARNING

Safety regulations **must not** be compromised when installing inverters!

3 Commissioning

This Chapter contains:

- A schematic diagram of the MICROMASTER 420
- An overview of the commissioning options and the display and operator panels
- An overview of quick commissioing of the MICROMASTER 420

3.1 Block diagram 33
3.2 Commission modes 34
3.3 General operation 44

WARNING

- MICROMASTERS operate at high voltages.
- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230/460V when protected by a time delay fuse *(see Tables starting on page 77).*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

CAUTION

Only qualified personnel may enter settings in the control panels. Particular attention must be paid to safety precautions and warnings at all times.

3.1 Block diagram

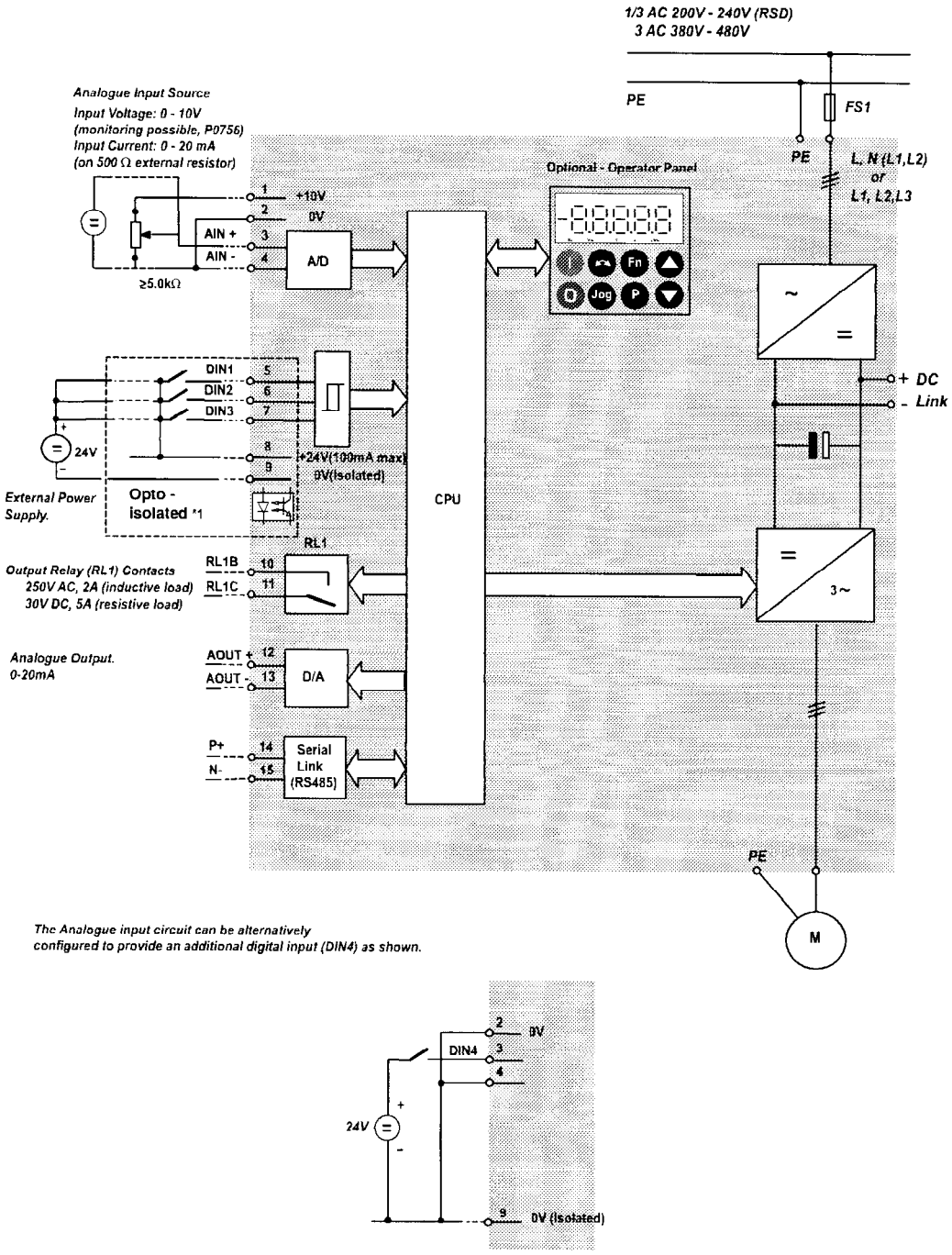
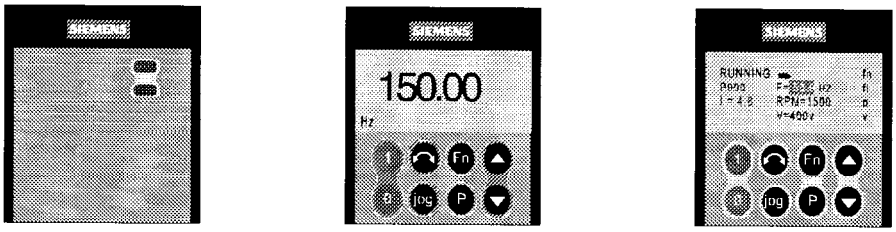


Figure 3-1 Inverter block diagram

3.2 Commission modes

In the standard version, the MICROMASTER 420 is fitted with the Status Display Panel (SDP) (see Figure 3-2) with which it is possible to use the inverter with the pre-assigned factory settings for a large range of applications. If these factory settings are not suitable, you can adapt them to suit your equipment conditions using the Basic Operator Panel (BOP) (see Figure 3-2) or the Advanced Operator Panel (AOP) (see Figure 3-2). The BOP and AOP are available as options. You can also adjust the factory settings using the PC IBN tool "Drive Monitor" or "STARTER". This software is available on the CD ROM which comes with the documentation of the unit.



SDP
Status Display Panel

BOP
Basic Operator Panel

AOP
Advanced Operator Panel

Figure 3-2 Panels available for the MICROMASTER 420 Inverter

For notes on replacing the operator panels please refer to the corresponding annexes A to this manual.

NOTICE

The default (factory value) frequency setting can be altered by means of theDIP switch under the SDP. The inverter is delivered as follows::

- DIP switch 2:
  - Off position:
    European defaults
    (50 Hz, kW usw.)
  - On position:
    North American defaults
    (60 Hz, hp usw.)
- DIP switch 1:
  Not for customer use.

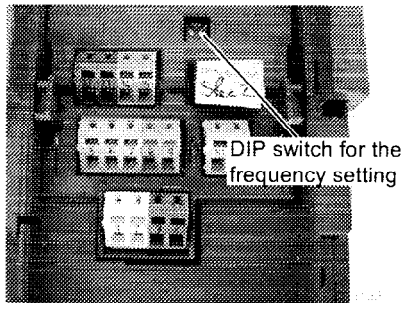
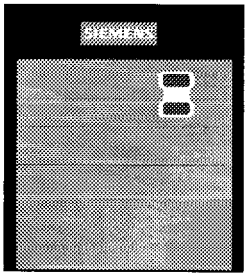


Figure 3-3 DIP switch

3.2.1 Commissioning and Operation with the SDP



The SDP has two LEDs on the front which display the current operating status of the inverter (see Section 6.1).

When the SDP is used, the presettings of the inverter must be compatible with the following motor data:

- Rated motor power
- Motor voltage
- Rated motor current
- Rated motor frequency

(A conventional Siemens motor is recommended)

In addition, the following conditions must be met:

- Linear V/f motor speed controlled by an analog potentiometer.
- Maximum speed 3000 rpm at 50 Hz (3600 rpm at 60 Hz); can be controlled by a potentiometer via the analog inputs of the inverter.
- Ramp acceleration time/ramp deceleration time = 10 s

Settings for more complex applications can be found in the parameter list and in Section 3.2.2 "Commission Overview with BOP or AOP".

Table 3-1 Default settings for operation using the SDP

	Terminals	Parameter	Default Operating
Digital Input 1	5	P0701 = '1'	ON right
Digital Input 2	6	P0702 = '12'	Reverse
Digital Input 3	7	P0703 = '9'	Fault Reset
Output Relay	10/11	P0731 = '52.3'	Fault Identification
Analogue Output	12/13	P0771 = 21	Output Frequency
Analogue input	3/4	P0700 = 0	Frequency Setpoint
	1/2		Analog Input supply

Basic operation with SDP

With the **SDP** fitted, the following is possible:

- Start and stopping the motor
- Reversing the motor
- Fault Reset

Controlling the speed of the motor
Connect the terminals as shown in.Figure 3-4.

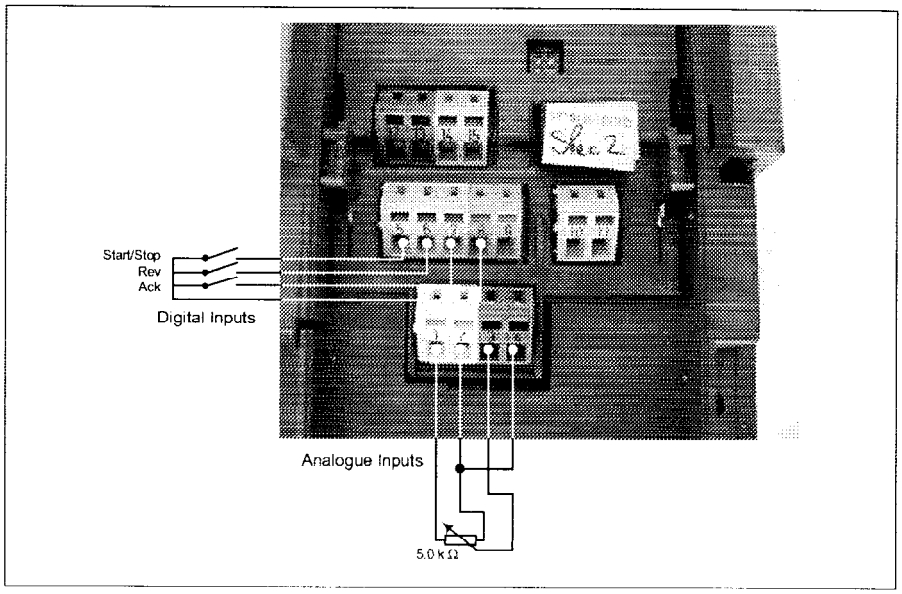
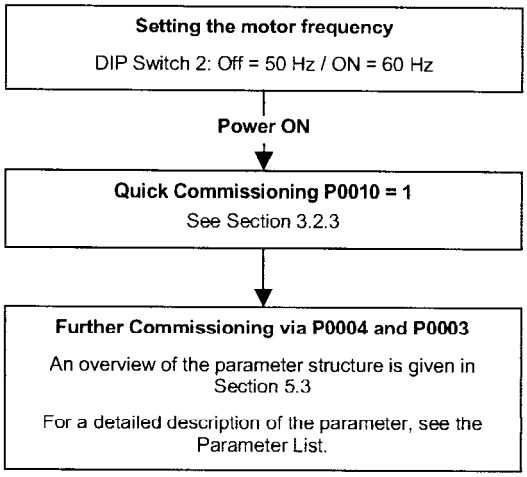


Figure 3-4 Basic operation with SDP

3.2.2 Commission Overview with BOP or AOP

Prerequisites

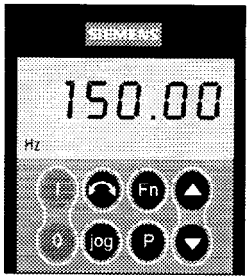
Mechanical and electrical Installation are completed.



NOTES

We recommend the commissioning according this scheme.

3.2.2.1 Commissioning with the BOP



You can alter parameter values via the BOP. To set parameters on this panel, you must remove the SDP and attach the BOP (see Appendix A).

The BOP features a five-digit, seven-segment display for showing parameter numbers and values, alarm and fault messages and setpoints and actual values. Parameter information cannot be saved via the BOP.

Table 3-2 shows the factory default settings for operation via the BOP.

NOTICE

- The BOP motor control functions are disabled by default. To control the motor via the BOP, parameter P0700 should be set to 1 and P1000 set to 1.
- The BOP can be fitted to and removed from the inverter whilst power is applied.
- If the BOP has been set as the I/O control (P0700 = 1), the drive will stop if the BOP is removed.

Table 3-2 Default settings for operation using the BOP

Parameter	Meaning	Default Europe (North America)
P0100	Operating Mode Europe/US	50 Hz, kW (60Hz, hp)
P0307	Power (rated motor)	kW (Hp)
P0310	Motor frequency rating	50 Hz (60 Hz)
P0311	Motor speed rating	1395 (1680) rpm [depending on variant]
P1082	Maximum Motor Frequency	50 Hz (60 Hz)

Buttons on the BOP

Panel/Button	Function	Effects
r0000	Indicates Status	The LCD displays the settings currently used by the converter.
	Start converter	Pressing the button starts the converter. This button is disabled by default. To enable this button set P0700 = 1.
	Stop converter	OFF1 Pressing the button causes the motor to come to a standstill at the selected ramp down rate. Disabled by default, to enable set P0700 = 1. OFF2 Pressing the button twice (or once long) causes the motor to coast to a standstill. This function is always enabled.
	Change direction	Press this button to change the direction of rotation of the motor. Reverse is indicated by a minus (-) sign or a flashing decimal point. Disabled by default, to enable set P0700 = 1.
	Jog motor	Pressing this button while the inverter has no output causes the motor to start and run at the preset jog frequency. The motor stops when the button is released. Pressing this button when the motor is running has no effect.
	Functions	This button can be used to view additional information. It works by pressing and holding the button. It shows the following, starting from any parameter during operation: 1. DC link voltage (indicated by d – units V). 2. output current. (A) 3. output frequency (Hz) 4. output voltage (indicated by o – units V). 5. The value selected in P0005 (If P0005 is set to show any of the above (3, 4, or 5) then this will not be shown again). Additional presses will toggle around the above displays. **Jump Function** From any parameter (rXXXX or PXXXX) a short press of the Fn button will immediately jump to r0000, you can then change another parameter, if required. Upon returning to r0000, pressing the Fn button will return you to your starting point.
	Access parameters	Pressing this button allows access to the parameters.
	Increase value	Pressing this button increases the displayed value. To change the Frequency Setpoint via the BOP set P1000 = 1.
	Decrease value	Pressing this button decreases the displayed value. To change the Frequency Setpoint via the BOP set P1000 = 1.

Figure 3-5 Buttons on the BOP

Changing parameters with the BOP

The procedure for changing the value of parameter P0004 is described below. Modifying the value of an indexed parameter is illustrated using the example of P0719. Follow exactly the same procedure to alter other parameters that you wish to set via the BOP.

Changing P0004 – parameter filter function

	Step	Result on display
1	Press P to access parameters	r0000
2	Press ▲ until P0004 is displayed	P0004
3	Press P to access the parameter value level	0
4	Press ▲ or ▼ to the required value	7
5	Press P to confirm and store the value	P0004
6	Only the command parameters are visible to the user.	

Changing P0719 an indexed parameter Selection of command/setpoint source

	Step	Result on display
1	Press P to access parameters	r0000
2	Press ▲ until P0719 is displayed	P0719
3	Press P to access the parameter value level	in000
4	Press P to display current set value	0
5	Press ▲ or ▼ to the required value	12
6	Press P to confirm and store the value	P0719
7	Press ▼ until r0000 is displayed	r0000
8	Press P to return the display to the standard drive display (as defined by the customer)	

Figure 3-6 Changing parameters via the BOP

NOTES
In some cases - when changing parameter values - the display on the BOP shows P- - - -. This means the inverter is busy with tasks of higher priority.

Changing single digits in Parameter values

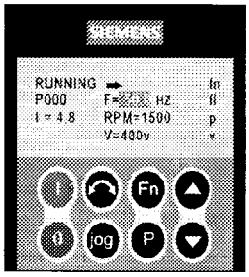
For changing the parameter value rapidly, the single digits of the display can be changed by performing the following actions:

Ensure you are in the parameter value changing level (see "Changing parameters with BOP").

1. Press Fn (function button), which causes the right hand digit to blink.
2. Change the value of this digit by pressing ▲ / ▼.
3. Press Fn (function button) again causes the next digit to blink.
4. Perform steps 2 to 4 until the required value is displayed.
5. Press the P to leave the parameter value changing level.

NOTES
The function button may also be used to acknowledge a fault condition

3.2.2.2 Commissioning with the AOP



The AOP is available as an option. Its advanced features include the following:

- Multilingual clear text display
- Upload/download of multiple parameter sets
- Programmable via PC
- Multidrop capability to drive up to 30 MICROMASTER 4's

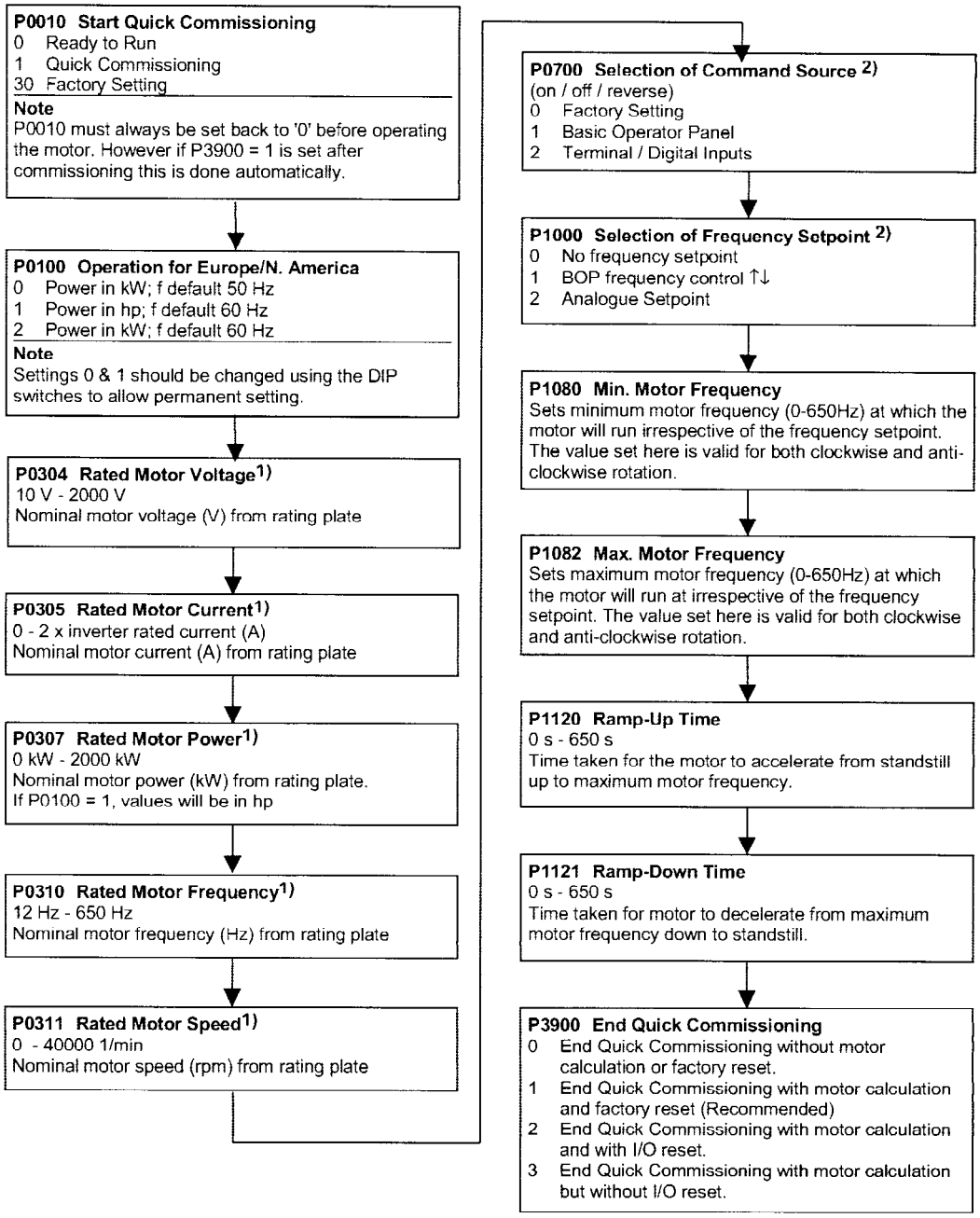
Please refer to the AOP Manual for details or contact your local Siemens sales office for assistance.

3.2.3 Commissioning functions with BOP / AOP

3.2.3.1 Quick commissioning (P0010=1)

It is **important** that parameter P0010 is used for commissioning and P0003 is used to select the number of parameters to be accessed. This parameter allows a group of parameters to be selected that will enable quick commissioning. Parameters such as Motor settings and Ramp settings are included. At the end of the quick commissioning sequence, P3900 should be selected, which, when set to 1, will carry out the necessary motor calculations and clear all other parameters (not included in P0010=1) to the default settings. This will only happen in the Quick Commissioning mode.

Flow chart Quick Commissioning (Level 1 Only)



1) Motor-specific parameters – see motor rating plate.

2) The parameters offer more setting options than listed here. See Parameter List for further setting options.

Motor data for parameterization

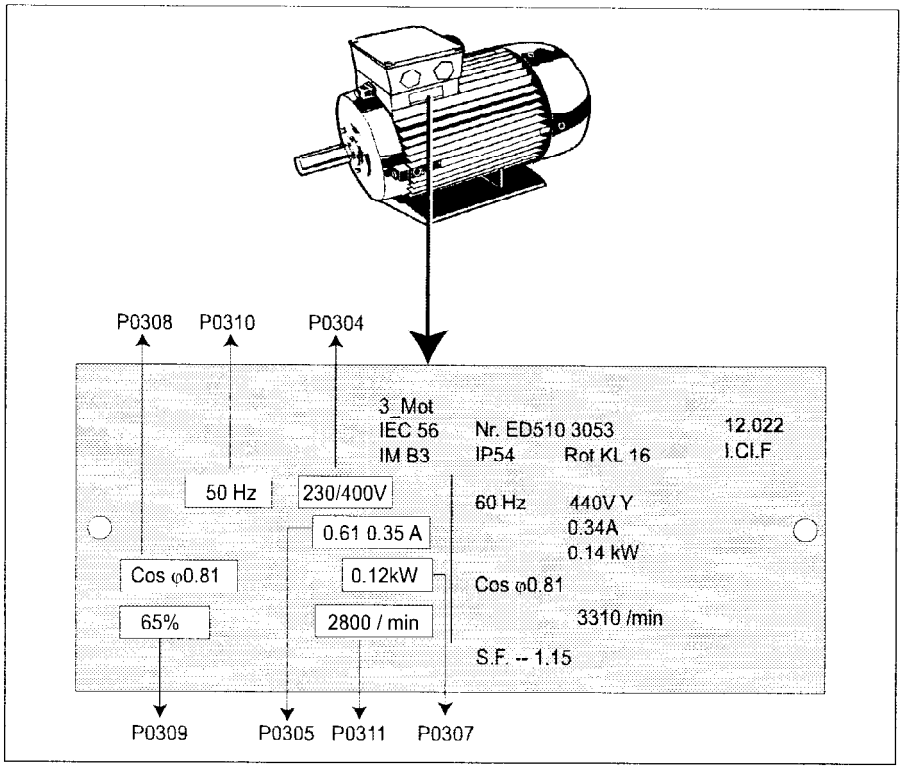


Figure 3-7 Typical Motor Rating Plate Example

NOTICE

- P0308 & P0309 are only visible if P0003 ≥ 2. Only one of the parameters are shown depending on the settings of P0100.
- P0307 indicates kW or HP depending upon the setting of P0100. For detailed information, please see the Parameter List.
- Changing motor parameters is not possible unless P0010=1.
- Ensure that the inverter is configured correctly to the motor, i.e. in the above example delta terminal connection is for 230 V.

3.2.3.2 Reset to Factory default

To reset all parameters to the factory default settings; the following parameters should be set as follows (BOP, AOP or Communication Option needed):

1. Set P0010 = 30
2. Set P0970 = 1

NOTE

The reset process can take up to 3 minutes to complete.

3.3 General operation

For a full description of standard and extended parameters, please refer to the Parameter List.

NOTICE

1. The inverter does not have a main power switch and is live when the mains supply is connected. It waits, with the output disabled, until the RUN button is pressed or for the presence of a digital ON signal at terminal 5 (rotate right).
2. If a BOP or an AOP is fitted and the output frequency is selected to be displayed (P0005 = 21) the corresponding setpoint is displayed approximately every 1.0 seconds while the inverter is stopped.
3. The inverter is programmed at the factory for standard applications on Siemens four-pole standard motors that have the same power rating as the inverters. When using other motors it is necessary to enter the specifications from the motor's rating plate. See Figure 3-7 for details on how to read motor data.
4. Changing motor parameters is not possible unless P0010 = 1.
5. You must set P0010 back to 0 in order to initiate a run.

Basic operation with the BOP/AOP

Prerequisites

P0010 = 0 (in order to initiate the run command correctly).
P0700 = 1 (enables the start/stop button on the BOP).
P1000 = 1 (this enables the motor potentiometer setpoints).

Press the green Button to start the motor.

Press the Button while the motor is turning. Motor speed increases to 50 Hz.

When the inverter reaches 50 Hz, press the Button . Motor speed and display is decreased.

Change the direction of rotation with the Button .

The red button stops the motor .

External motor thermal overload protection

When operated below rated speed, the cooling effect of fans fitted to the motor shaft is reduced. Consequentially, most motors require de-rating for continuous operation at low frequencies. To ensure that the motors are protected against overheating under these conditions, a PTC temperature sensor must be fitted to the motor and connected to the inverter control terminals. P0601 must also be set to 1.

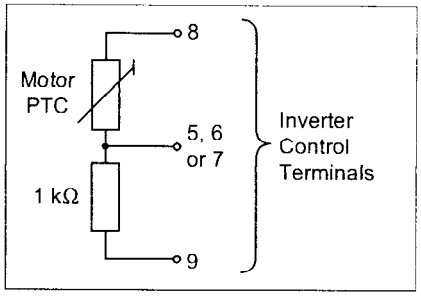


Figure 3-8 Motor Overload PTC Connection

NOTE

To enable the trip function, set parameter P0701, P0702 or P0703 = 29.

4 Using the MICROMASTER 420

This Chapter contains:

- An explanation of the various methods of controlling the inverter
- A summary of the types of control of the inverter

4.1 Frequency setpoint (P1000) 48
4.2 Command sources (P0700) 49
4.3 OFF and braking functions 49
4.4 Control modes (P1300) 50
4.5 Faults and warnings 51

WARNING

- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- MICROMASTERS operate at high voltages.
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC via a digital input.
- This equipment is suitable for use in a circuit capable of delivering not more than 10 000 symmetrical amperes (rms), for a maximum voltage of 230/460V when protected by a time delay fuse (*see Tables starting on page 77).*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4).*

4.1 Frequency setpoint (P1000)

- Standard: Terminal 3/4 (AIN+/ AIN -, 0...10 V corresponds to 0...50/60 Hz)
- Options see P1000

NOTES

For USS see Reference Manual, for PROFIBUS see Reference Manual and Profibus Instructions.

4.2 Command sources (P0700)

NOTICE

The **ramp times** and **ramp-smoothing** functions also affect how the motor starts and stops. For details of these functions, please refer to parameters P1120, P1121, P1130 – P1134 in the Parameter List.

Starting the motor

- Standard — Terminal 5 (DIN1, high)
- Options — see P0700 to P0704

Stopping the motor

There are several ways to stop the motor:

- Standard:
  - OFF1 (4.3.1) — Terminal 5 (DIN1, low)
  - OFF2 (4.3.2) — Off button on BOP/AOP, pressing the Off button once long (two seconds) or twice (with default settings not possible without BOP/AOP)
  - OFF3 (4.3.3) — Not active in the default (factory) setting
- Options — see P0700 to P0704

Reversing the motor

- Standard — Terminal 6 (DIN2, high)
- Options — see P0700 to P0704

4.3 OFF and braking functions

4.3.1 OFF1

This command (produced by canceling the ON command) causes the inverter to come to a standstill at the selected ramp-down rate.

Parameter to change ramp time see P1121

NOTICE

- ON and the following OFF1 command must have the same source.
- If the ON/OFF1 command is set to more than one Digital input, only the last set Digital Input is number e.g. DIN3 is active.
- OFF1 can be combined with DC braking or Compound braking

4.3.2 OFF2

This command causes the motor to coast to a standstill.

NOTICE

The OFF2 command can have one or more sources. By default the OFF2 command is set to BOP/AOP. This source still exists even if other sources are defined by **one** of the following parameters, P0700, P0701, P0702, P0703 and P0704.

4.3.3 OFF3

An OFF3 command causes the motor to decelerate rapidly.

For starting the motor when OFF3 is set, the binary input has to be closed (high). If OFF3 is high, the motor can be started and stopped by OFF1 or OFF2.

If OFF3 is low the motor cannot be started.

- ramp down time: see P1135

NOTICE

OFF3 can be combined with DC braking or compound braking

4.3.4 DC braking

DC braking is possible together with OFF1 and OFF3. A DC current is applied to stop the motor quickly and hold the shaft stationary until the end of the braking period.

- set DC braking: see P0701 to P0704
- set braking period: see P1233
- set braking current: see P1232

NOTICE

If no digital input is set to DC braking and P1233 $\neq$ 0, DC braking will be active after every OFF1 command.

4.3.5 Compound Braking

Compound Braking is possible with both OFF1 and OFF3. For Compound Braking a DC component is added to the AC current.

set the braking current: see P1236

4.4 Control modes (P1300)

All control modes of the MICROMASTER 420 are based on a V/Hz control. The following different control variants are provided to suit different types of application:

- **Linear V/f control, P1300 = 0**
  Can be used for variable and constant torque applications, such as conveyors and positive displacement pumps.
- **Linear V/f control with Flux Current Control (FCC)** **P1300 = 1**
  This control mode can be used to improve the efficiency and dynamic response of the motor.
- **Quadratic V/f control** **P1300 = 2**
  This mode can be used for variable torque loads, such as fans and pumps.
- **Multi-point V/f control P1300 = 3**
  For information regarding this mode of operation, please consult the MM420 Reference Manual.

4.5 Faults and warnings

SDP

If an SDP is fitted, the fault states and warnings are indicated by the two LEDs on the panel, see section 6.1 on page 68 for further information.

Fault-free operation of the inverter is indicated by the following sequence of LED displays:

- Green and yellow = Ready to run
- Green = Run

BOP

If a BOP is installed, the last 8 fault conditions (P0947) and warnings (P2110) are displayed if a fault condition occurs. For further information, please refer to the Parameter List.

AOP

If the AOP is fitted, the fault and warning codes are displayed on the LCD panel.

5 System parameters

This Chapter contains:

- An overview of the parameter structure of the MICROMASTER 420
- A parameter list in short form

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5.2 Parameter overview 55
5.3 Parameter list (short form) 56

5.1 Introduction to MICROMASTER system parameters

The parameters can only be changed by using the BOP, the Advance Operator Panel (AOP) or the Serial Interface.

Parameters can be changed and set using the BOP to adjust the desired properties of the inverter, such as ramp times, minimum and maximum frequencies etc. The parameter numbers selected and the setting of the parameter values are indicated on the optional five-digit LCD display.

- rxxxx indicates a display parameter, **P**xxxx a setting parameter.
- P0010 initiates "quick commissioning".
- The inverter will not run unless P0010 is set to 0 after it has been accessed. This function is automatically perform if P3900 > 0.
- P0004 acts as a filter, allowing access to parameters according to their functionality.
- If an attempt is made to change a parameter that cannot be changed in this status, for example, cannot be changed whilst running or can only be changed in quick commissioning, then - - - - will be displayed.
- **Busy Message**
  In some cases - when changing parameter values - the display on the BOP shows P---- for maximum of five seconds. This means the inverter is busy with tasks of higher priority.

5.1.1 Level

There are four levels of user access, Standard, Extended, Expert and Service selectable by parameter P0003. For most applications, Standard (P0003 = 1) or Extended parameters (P0003 = 2) are sufficient.

The number of parameters that appear within each functional group depends on the access level set in parameter P0003. For further details regarding parameters, see the Parameter List on the Documentation CD-ROM.

5.2 Parameter overview

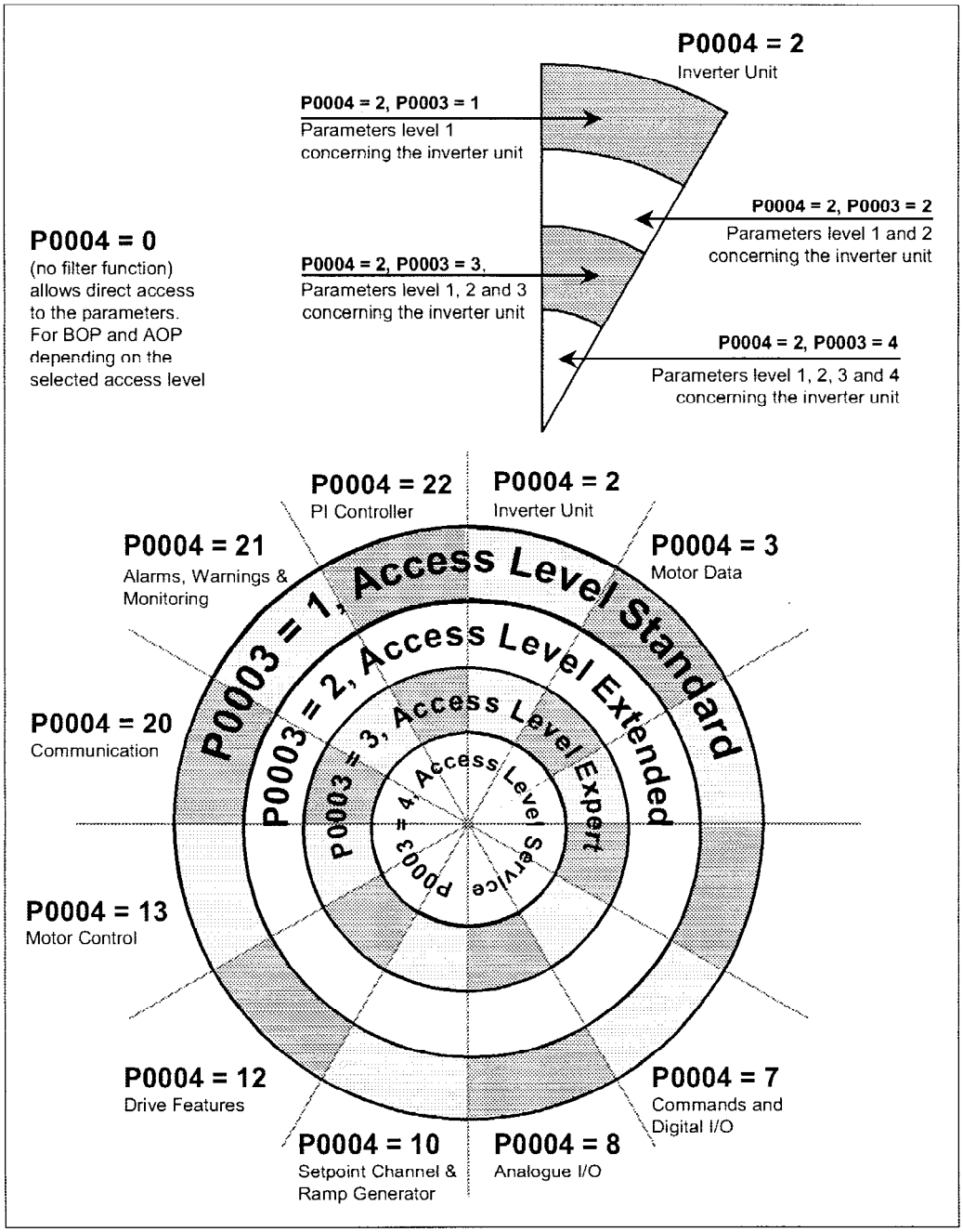


Figure 5-1 Parameter Overview

5.3 Parameter list (short form)

Explanatory information on following table:

- Default: Factory setting
- Level: Access level
- DS Inverter status (Drive State), indicates the inverter state in which a parameter can be modified (see P0010).
  - C Commissioning
  - U Run
  - T Ready to run
- QC Quick Commissioning
  - Q Parameter can be modified in the Quick Commissioning state.
  - N Parameter cannot be modified in the Quick Commissioning state.

Always

Par. No.	Parametername	Default	Acc	WS	QC
r0002	Drive state	-	2	-	-
P0003	User access level	1	1	CUT	-
P0004	Parameter filter	0	1	CUT	-
P0010	Commissioning parameter filter	0	1	CT	N
P3950	Access of hidden parameter	0	4	CUT	-

Quick Commissioning

Par.-No.	Parametername	Default	Level	WS	QC
P0100	Europe / North America	0	1	C	Q
P3900	End of quick commissioning	0	1	C	Q

Parameter Reset

Par.-No.	Parametername	Default	Level	WS	QC
P0970	Factory reset	0	1	C	-

Inverter Unit (P0004 = 2)

Par. No.	Parametername	Default	Acc	WS	QC
r0018	Firmware version	-	1	-	-
r0026	CO: Act. DC-link voltage	-	2	-	-
r0037[1]	CO: Drive temperatures	-	3	-	-
r0039	CO: Energy consumpt. meter [kWh]	-	2	-	-
P0040	Reset energy consumption meter	0	2	CT	-
r0200	Act. power stack code number	-	3	-	-
P0201	Power stack code number	0	3	C	-
r0203	Act. Power stack type	-	3	-	-
r0204	Power stack features	-	3	-	-
r0206	Rated inverter power [kW] or [hp]	-	2	-	-
r0207	Rated drive current	-	2	-	-
r0208	Supply voltage	-	2	-	-
P0210	Supply voltage	230	3	CT	-
r0231[2]	Max. cable length	-	3	-	-
P0290	Drive overload reaction	2	3	CT	-
P0291[1]	Config. Of inverter protection	1	3	CT	-
P0292	Drive overload warning	15	3	CUT	-
P0294	Drive I^2t overload warning	95.0	4	CUT	-
P1800	Switching frequency	4	2	CUT	-
r1801	CO: Act. switching frequency	-	3	-	-
P1802	Modulator mode	0	3	CUT	-
P1803[1]	Max. Modulation	106.0	4	CUT	-
P1820[1]	Reverse output phase sequence	0	2	CT	-
R3954[13]	CM version and GUI ID	-	4	-	-
P3980	Commissioning command Selection	-	4	T	-

Motor Data (P0004 = 3)

Par. No.	Parametername	Default	Acc	WS	QC
r0035[3]	CO: Act. motor temperature	-	2	-	-
P0300[1]	Select motor type	1	2	C	Q
P0304[1]	Rated motor voltage	230	1	C	Q
P0305[1]	Rated motor current	3.25	1	C	Q
P0307[1]	Rated motor power [kW] or [hp]	0.75	1	C	Q
P0308[1]	Rated motor cosPhi	0.000	2	C	Q
P0309[1]	Rated motor efficiency	0.0	2	C	Q
P0310[1]	Rated motor frequency	50.00	1	C	Q
P0311[1]	Rated motor speed	0	1	C	Q
r0313[1]	Motor pole pairs	-	3	-	-
P0320[1]	Motor magnetizing current	0.0	3	CT	Q
r0330[1]	Rated motor slip	-	3	-	-
r0331[1]	Rated magnetization current	-	3	-	-
r0332[1]	Rated power factor	-	3	-	-
P0335[1]	Motor cooling	0	2	CT	Q
P0340[1]	Calc motor model and control	0	2	CT	-
P0344[1]	Motor weight	9.4	3	CUT	-
P0346[1]	Magnetization time	1.000	3	CUT	-
P0347[1]	Demagnetization time	1.000	3	CUT	-
P0350[1]	Stator resistance (line-to-line)	4.0	2	CUT	-
r0370[1]	Stator resistance [%]	-	4	-	-
r0372[1]	Cable resistance [%]	-	4	-	-
r0373[1]	Rated stator resistance [%]	-	4	-	-
r0374[1]	Rotor resistance [%]	-	4	-	-
r0376[1]	Rated rotor resistance [%]	-	4	-	-
r0377[1]	Total leakage reactance [%]	-	4	-	-
r0382[1]	Main reactance	-	4	-	-
r0384[1]	Rotor time constant	-	3	-	-
r0386[1]	Total leakage time constant	-	4	-	-
r0395	Total stator resistance [%]	-	3	-	-
P0610	Motor I^2t temperature reaction	2	3	CT	-
P0611[1]	Motor I^2t time constant	100	2	CT	-
P0614[1]	Motor I^2t overload warning level	100.0	2	CUT	-
P0640[1]	Motor current limit	150.0	2	CUT	Q
P1910	Select motor data identification	0	2	CT	Q
r1912	Identified stator resistance		2	-	-

Commands and Digital I/O (P0004 = 7)

Par. No.	Parametername	Default	Acc	WS	QC
r0002	Drive state	-	2	-	-
r0019	CO/BO: BOP control word	-	3	-	-
r0052	CO/BO: Status word 1	-	2	-	-
r0053	CO/BO: Status word 2	-	2	-	-
r0054	CO/BO: Control word 1	-	3	-	-
r0055	CO/BO: Control word 2	-	3	-	-
P0700[1]	Selection of command source	2	1	CT	Q
P0701[1]	Selection of digital input 1	1	2	CT	-
P0702[1]	Selection of digital input 2	12	2	CT	-
P0703[1]	Selection of digital input 3	9	2	CT	-
P0704[1]	Selection of digital input 4	0	2	CT	-
P0719	Selection of cmd. & freq. setp.	0	3	CT	-
r0720	Number of digital inputs	-	3	-	-
r0722	CO/BO: Binary input values	-	2	-	-
P0724	Debounce time for digital inputs	3	3	CT	-
P0725	PNP / NPN digital inputs	1	3	CT	-
r0730	Number of digital outputs	-	3	-	-
P0731[1]	BI: Digital output	52:3	2	CUT	-
r0747	CO/BO: State of digital outputs	-	3	-	-
P0748	Invert digital outputs	0	3	CUT	-
P0800[1]	BI: Download parameter set 0	0:0	3	CT	-
P0801[1]	BI: Download parameter set 1	0:0	3	CT	-
P0840[1]	BI: ON/OFF1	722:0	3	CT	-
P0842[1]	BI: ON/OFF1 reverse	0:0	3	CT	-
P0844[1]	BI: 1. OFF2	1:0	3	CT	-
P0845[1]	BI: 2. OFF2	19:1	3	CT	-
P0848[1]	BI: 1. OFF3	1:0	3	CT	-
P0849[1]	BI: 2. OFF3	1:0	3	CT	-
P0852[1]	BI: Pulse enable	1:0	3	CT	-
P1020[1]	BI: Fixed freq. selection Bit 0	0:0	3	CT	-
P1021[1]	BI: Fixed freq. selection Bit 1	0:0	3	CT	-
P1022[1]	BI: Fixed freq. selection Bit 2	0:0	3	CT	-
P1035[1]	BI: Enable MOP (UP-command)	19:13	3	CT	-
P1036[1]	BI: Enable MOP (DOWN-command)	19:14	3	CT	-
P1055[1]	BI: Enable JOG right	0:0	3	CT	-
P1056[1]	BI: Enable JOG left	0:0	3	CT	-
P1074[1]	BI: Disable additional setpoint	0:0	3	CUT	-
P1110[1]	BI: Inhibit neg. freq. setpoint	0:0	3	CT	-
P1113[1]	BI: Reverse	722:1	3	CT	-
P1124[1]	BI: Enable JOG ramp times	0:0	3	CT	-
P1230[1]	BI: Enable DC braking	0:0	3	CUT	-
P2103[1]	BI: 1. Faults acknowledgement	722:2	3	CT	-
P2104[1]	BI: 2. Faults acknowledgement	0:0	3	CT	-
P2106[1]	BI: External fault	1:0	3	CT	-

Par. No.	Parametername	Default	Acc	WS	QC
P2220[1]	BI: Fixed PID setp. select Bit 0	0:0	3	CT	-
P2221[1]	BI: Fixed PID setp. select Bit 1	0:0	3	CT	-
P2222[1]	BI: Fixed PID setp. select Bit 2	0:0	3	CT	-
P2235[1]	BI: Enable PID-MOP (UP-cmd)	19:13	3	CT	-
P2236[1]	BI: Enable PID-MOP (DOWN-cmd)	19:14	3	CT	-

Analogue I/O (P0004 = 8)

Par. No.	Parametername	Default	Acc	WS	QC
r0750	Number of ADCs	-	3	-	-
r0751	CO/BO: Status word: ADC-channels	-	4	-	-
r0752[1]	Act. input of ADC [V]	-	2	-	-
P0753[1]	Smooth time ADC	3	3	CUT	-
r0754[1]	Act. ADC value after scaling [%]	-	2	-	-
r0755[1]	CO: Act. ADC after scal. [4000h]	-	2	-	-
P0756[1]	Type of ADC	0	2	CT	-
P0757[1]	Value x1 of ADC scaling	0	2	CUT	-
P0758[1]	Value y1 of ADC scaling	0.0	2	CUT	-
P0759[1]	Value x2 of ADC scaling	10	2	CUT	-
P0760[1]	Value y2 of ADC scaling	100.0	2	CUT	-
P0761[1]	Width of ADC deadband	0	2	CUT	-
P0762[1]	Delay for loss of signal action	10	3	CUT	-
r0770	Number of DACs	-	3	-	-
P0771[1]	CI: DAC	21:0	2	CUT	-
P0773[1]	Smooth time DAC	2	3	CUT	-
r0774[1]	Act. DAC value	-	2	-	-
r0776[1]	Type of DAC	0	3	CT	-
P0777[2]	Value x1 of DAC scaling	0.0	2	CUT	-
P0778[1]	Value y1 of DAC scaling	0	2	CUT	-
P0779[1]	Value x2 of DAC scaling	100.0	2	CUT	-
P0780[1]	Value y2 of DAC scaling	20	2	CUT	-
P0781[1]	Width of DAC deadband	0	2	CUT	-

Setpoint Channel and Ramp Generator (P0004 = 10)

Par. No.	Parametername	Default	Acc	WS	QC
P1000[1]	Selection of frequency setpoint	2	1	CT	Q
P1001	Fixed frequency 1	0.00	2	CUT	-
P1002	Fixed frequency 2	5.00	2	CUT	-
P1003	Fixed frequency 3	10.00	2	CUT	-
P1004	Fixed frequency 4	15.00	2	CUT	-
P1005	Fixed frequency 5	20.00	2	CUT	-
P1006	Fixed frequency 6	25.00	2	CUT	-
P1007	Fixed frequency 7	30.00	2	CUT	-
P1016	Fixed frequency mode - Bit 0	1	3	CT	-
P1017	Fixed frequency mode - Bit 1	1	3	CT	-
P1018	Fixed frequency mode - Bit 2	1	3	CT	-

Par. No.	Parametername	Default	Acc	WS	QC
r1024	CO: Act. fixed frequency	-	3	-	-
P1031[1]	Setpoint memory of the MOP	0	2	CUT	-
P1032	Inhibit reverse direction of MOP	1	2	CT	-
P1040[1]	Setpoint of the MOP	5.00	2	CUT	-
r1050	CO: Act. Output freq. of the MOP	-	3	-	-
P1058	JOG frequency right	5.00	2	CUT	-
P1059	JOG frequency left	5.00	2	CUT	-
P1060[1]	JOG ramp-up time	10.00	2	CUT	-
P1061[1]	JOG ramp-down time	10.00	2	CUT	-
P1070[1]	CI: Main setpoint	755:0	3	CT	-
P1071[1]	CI: Main setpoint scaling	1:0	3	T	-
P1075[1]	CI: Additional setpoint	0:0	3	CT	-
P1076[1]	CI: Additional setpoint scaling	1:0	3	T	-
r1078	CO: Total frequency setpoint	-	3	-	-
r1079	CO: Selected frequency setpoint	-	3	-	-
P1080	Min. frequency	0.00	1	CUT	Q
P1082	Max. frequency	50.00	1	CT	Q
P1091	Skip frequency 1	0.00	3	CUT	-
P1092	Skip frequency 2	0.00	3	CUT	-
P1093	Skip frequency 3	0.00	3	CUT	-
P1094	Skip frequency 4	0.00	3	CUT	-
P1101	Skip frequency bandwidth	2.00	3	CUT	-
r1114	CO: Freq. setp. after dir. ctrl.	-	3	-	-
r1119	CO: Freq. setpoint before RFG input	-	3	-	-
P1120[1]	Ramp-up time	10.00	1	CUT	Q
P1121[1]	Ramp-down time	10.00	1	CUT	Q
P1130[1]	Ramp-up initial rounding time	0.00	2	CUT	-
P1131[1]	Ramp-up final rounding time	0.00	2	CUT	-
P1132[1]	Ramp-down initial rounding time	0.00	2	CUT	-
P1133[1]	Ramp-down final rounding time	0.00	2	CUT	-
P1134[1]	Rounding type	0	2	CUT	-
P1135[1]	OFF3 ramp-down time	5.00	2	CUT	Q
P1140[1]	BI: RFG enable	1:0	4	CT	-
P1141[1]	BI: RFG start	1:0	4	CT	-
P1142[1]	BI: RFG enable setpoint	1:0	4	CT	-
r1170	CO: Frequency setpoint	-	3	-	-

Drive Features (P0004 = 12)

Par. No.	Parametername	Default	Acc	WS	QC
P0005	Display selection	21	2	CUT	-
P0006	Display mode	2	3	CUT	-
P0007	Backlight delay time	0	3	CUT	-
P0011	Lock for user defined parameter	0	3	CUT	-
P0012	Key for user defined parameter	0	3	CUT	-
P0013[20]	User defined parameter	0	3	CUT	-
P1200	Flying start enable	0	2	CUT	-
P1202[1]	Motor-current: Flying start	100	3	CUT	-
P1203[1]	Search rate: Flying start	100	3	CUT	-
P1204	Status word: Flying start	-	4	-	-
P1210	Automatic restart	1	2	CUT	-
P1211	Number of restart attempts	3	3	CUT	-
P1215	MHB function enable	0	2	T	-
P1216	MHB release delay	1.0	2	T	-
P1217	MHB holding time	1.0	2	T	-
P1232	Current of DC braking	100	2	CUT	-
P1233	Duration of DC braking	0	2	CUT	-
P1236	Compound braking current	0	2	CUT	-
P1240[1]	Configuration of Vdc controller	1	3	CT	-
r1242	CO: Switch-on level of Vdc-max	-	3	-	-
P1243[1]	Dynamic factor of Vdc-max	100	3	CUT	-
P1250[1]	Gain Vdc-controller	1.00	4	CUT	-
P1251[1]	Integration time Vdc-controller	40.0	4	CUT	-
P1252[1]	Differential time Vdc-controller	1.0	4	CUT	-
P1253[1]	Vdc-controller output limitation	10	3	CUT	-
P1254	Auto detect Vdc switch-on levels	1	3	CT	-

Motor Control (P0004 = 13)

Par. No.	Parametername	Default	Acc	WS	QC
r0020	CO: Act. frequency setpoint	-	3	-	-
r0021	CO: Act. frequency	-	2	-	-
r0022	Act. rotor speed	3	N	-	-
r0024	CO: Act. output frequency	-	3	-	-
r0025	CO: Act. output voltage	-	2	-	-
r0027	CO: Act. output current	-	2	-	-
r0034[1]	CO: Motor utilization	-	2	-	-
r0036	CO: Drive utilization	-	4	-	-
r0056	CO/BO: Status of motor control	-	2	-	-
r0067	CO: Act. drive current limit	-	3	-	-
r0071	CO: Max. output voltage	-	3	-	-
r0078	CO: Act. current Isq	-	4	-	-
r0084	CO: Act. Air gap flux	-	4	-	-
r0086	CO: Act. active current	-	3	-	-
P1300[1]	Control mode	1	2	CT	Q
P1310[1]	Continuous boost	50.0	2	CUT	-
P1311[1]	Acceleration boost	0.0	2	CUT	-
P1312[1]	Starting boost	0.0	2	CUT	-
r1315	CO: Total boost voltage	-	4	-	-
P1316[1]	Boost end frequency	20.0	3	CUT	-
P1320[1]	Programmable V/f freq. coord. 1	0.00	3	CT	-
P1321[1]	Programmable V/f volt. coord. 1	0.0	3	CUT	-
P1322[1]	Programmable V/f freq. coord. 2	0.00	3	CT	-
P1323[1]	Programmable V/f volt. coord. 2	0.0	3	CUT	-
P1324[1]	Programmable V/f freq. coord. 3	0.00	3	CT	-
P1325[1]	Programmable V/f volt. coord. 3	0.0	3	CUT	-
P1333	Start frequency for FCC	10.0	3	CUT	-
P1335	Slip compensation	0.0	2	CUT	-
P1336	Slip limit	250	2	CUT	-
r1337	CO: Slip frequency	-	3	-	-
P1338	Resonance damping gain V/f	0.00	3	CUT	-
P1340	Imax controller prop. gain	0.000	3	CUT	-
P1341	Imax controller integral time	0.300	3	CUT	-
r1343	CO: Imax controller freq. output	-	3	-	-
r1344	CO: Imax controller volt. output	-	3	-	-
P1350[1]	Voltage soft start	0	3	CUT	-

Communication (P0004 = 20)

Par. No.	Parametername	Default	Acc	WS	QC
P0918	CB bus address	3	2	CT	-
P0927	Parameter changeable via	15	2	CUT	-
r0964[5]	Firmware version data	-	3	-	-
r0967	Control word 1	-	3	-	-
r0968	Status word 1	-	3	-	-
P0971	Transfer data from RAM to EEPROM	0	3	CUT	-
P2000[1]	Reference frequency	50.00	2	CT	-
P2001[1]	Reference voltage	1000	3	CT	-
P2002[1]	Reference current	0.10	3	CT	-
P2009[2]	USS normalization	0	3	CT	-
P2010[2]	USS baudrate	6	2	CUT	-
P2011[2]	USS address	0	2	CUT	-
P2012[2]	USS PZD length	2	3	CUT	-
P2013[2]	USS PKW length	127	3	CUT	-
P2014[2]	USS telegram off time	0	3	CT	-
r2015[4]	CO: PZD from BOP link (USS)	-	3	-	-
P2016[4]	CI: PZD to BOP link (USS)	52:0	3	CT	-
r2018[4]	CO: PZD from COM link (USS)	-	3	-	-
P2019[4]	CI: PZD to COM link (USS)	52:0	3	CT	-
r2024[2]	USS error-free telegrams	-	3	-	-
r2025[2]	USS rejected telegrams	-	3	-	-
r2026[2]	USS character frame error	-	3	-	-
r2027[2]	USS overrun error	-	3	-	-
r2028[2]	USS parity error	-	3	-	-
r2029[2]	USS start not identified	-	3	-	-
r2030[2]	USS BCC error	-	3	-	-
r2031[2]	USS length error	-	3	-	-
r2032	BO: CtrlWrd1 from BOP link (USS)	-	3	-	-
r2033	BO: CtrlWrd2 from BOP link (USS)	-	3	-	-
r2036	BO: CtrlWrd1 from COM link (USS)	-	3	-	-
r2037	BO: CtrlWrd2 from COM link (USS)	-	3	-	-
P2040	CB telegram off time	0	3	CT	-
P2041[5]	CB parameter	0	3	CT	-
r2050[4]	CO: PZD from CB	-	3	-	-
P2051[4]	CI: PZD to CB	52:0	3	CT	-
r2053[5]	CB identification	-	3	-	-
r2054[7]	CB diagnosis	-	3	-	-
r2090	BO: Control word 1 from CB	-	3	-	-
r2091	BO: Control word 2 from CB	-	3	-	-

Alarms, Warnings and Monitoring (P0004 = 21)

Par. No.	Parametername	Default	Acc	WS	QC
r0947[8]	Fault number	-	2	-	-
r0948[12]	Fault time	-	3	-	-
R0949[8]	Fault value	-	4	-	-
P0952	Total number of faults	0	3	CT	-
P2100[3]	Alarm number stop reaction	0	3	CT	-
P2101[3]	Stop reaction value	0	3	CT	-
r2110[4]	Warning number	-	2	-	-
P2111	Total number of warnings	0	3	CT	-
r2114[2]	Run time counter	-	3	-	-
P2115[3]	AOP real time clock	0	3	CT	-
P2120	Indication counter	0	4	CUT	-
P2150[1]	Hysteresis frequency f,hys	3.00	3	CUT	-
P2155[1]	Threshold frequency f1	30.00	3	CUT	-
P2156[1]	Delay time f1	10	3	CUT	-
P2164[1]	Hysteresis frequency f,hysLeave	3.00	3	CUT	-
P2167[1]	Switch-off frequency f_off	1.00	3	CUT	-
P2168[1]	Delay time Toff (inverter switch-off)	10	3	CUT	-
P2170[1]	Threshold current I,thresh	100.0	3	CUT	-
P2171[1]	Delay time current	10	3	CUT	-
P2172[1]	Threshold voltage Vdc, thresh	800	3	CUT	-
P2173[1]	Delay time Vdc	10	3	CUT	-
P2179	Current limit for no load ident.	3.0	3	CUT	-
P2180	Delay time for no load ident.	2000	3	CUT	-
r2197	CO/BO: Status word 1 of monitor	-	2	-	-
P3981	Reset active fault	0	4	CT	-

PI Controller (P0004 = 22)

Par. No.	Parametername	Default	Acc	WS	QC
P2200[1]	BI: Enable PID controller	0:0	2	CT	-
P2201	Fixed PID setpoint 1	0.00	2	CUT	-
P2202	Fixed PID setpoint 2	10.00	2	CUT	-
P2203	Fixed PID setpoint 3	20.00	2	CUT	-
P2204	Fixed PID setpoint 4	30.00	2	CUT	-
P2205	Fixed PID setpoint 5	40.00	2	CUT	-
P2206	Fixed PID setpoint 6	50.00	2	CUT	-
P2207	Fixed PID setpoint 7	60.00	2	CUT	-
P2216	Fixed PID setpoint mode - Bit 0	1	3	CT	-
P2217	Fixed PID setpoint mode - Bit 1	1	3	CT	-
P2218	Fixed PID setpoint mode - Bit 2	1	3	CT	-
r2224	CO: Act. fixed PID setpoint	-	2	-	-
P2231[1]	Setpoint memory of PID-MOP	0	2	CUT	-
P2232	Inhibit rev. direct. of PID-MOP	1	2	CT	-
P2240[1]	Setpoint of PID-MOP	10.00	2	CUT	-
r2250	CO: Output setpoint of PID-MOP	-	2	-	-
P2253[1]	CI: PID setpoint	0:0	2	CUT	-
P2254[1]	CI: PID trim source	0:0	3	CUT	-
P2255	PID setpoint gain factor	100.00	3	CUT	-
P2256	PID trim gain factor	100.00	3	CUT	-
P2257	Ramp-up time for PID setpoint	1.00	2	CUT	-
P2258	Ramp-down time for PID setpoint	1.00	2	CUT	-
r2260	CO: Act. PID setpoint	-	2	-	-
P2261	PID setpoint filter timeconstant	0.00	3	CUT	-
r2262	CO: Act. PID filtered setpoint	-	3	-	-
P2264[1]	CI: PID feedback	755:0	2	CUT	-
P2265	PID feedback filter timeconstant	0.00	2	CUT	-
r2266	CO: PID feedback	-	2	-	-
P2267	Max. value for PID feedback	100.00	3	CUT	-
P2268	Min. value for PID feedback	0.00	3	CUT	-
P2269	Gain applied to PID feedback	100.00	3	CUT	-
P2270[1]	PID feedback function selector	0	3	CUT	-
P2271	PID tranducer type	0	2	CUT	-
r2272	CO: PID scaled feedback	-	2	-	-
r2273	CO: PID error	-	2	-	-
P2280	PID proportional gain	3.000	2	CUT	-
P2285	PID integral time	0.000	2	CUT	-
P2291	PID output upper limit	100.00	2	CUT	-
P2292	PID output lower limit	0.00	2	CUT	-
P2293	Ramp-up /-down time of PID limit	1.00	3	CUT	-
r2294	CO: Act. PID output	-	2	-	-

6 Troubleshooting

This Chapter contains:

- An overview of the operating statuses of the inverter with the SDP
- Notes on troubleshooting with the BOP
- A list of the alarms and fault messages

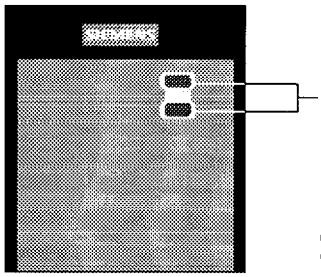
6.1 Troubleshooting with the 68
6.2 Troubleshooting with the BOP 69
6.3 MICROMASTER 420 fault messages 70

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using parts contained in the relevant spare parts list.
- Disconnect the power supply before opening the equipment for access

6.1 Troubleshooting with the SDP

Table 6-1 explains the meaning of the various states of the LEDs on the SDP.



LEDs for indicating the drive state
- Off
- On
- approx. 0,3 s, flashing
- approx. 1 s, twinkling

Table 6-1 Inverter conditions indicated by the LEDs on the SDP

● ●	Mains not present
☼ ☼	Ready to run
● ☼	Inverter fault - other than the ones listed below
☼ ●	Inverter running
● ◎	Fault overcurrent
◎ ●	Fault overvoltage
◎ ☼	Fault motor overtemperature
☼ ◎	Fault inverter temperature
◎ ◎	Warning current limit - both LEDs twinkling **same time**
◎ ◎	Other warnings - both LEDs twinkling **alternatively**
◎ ◉	Undervoltage trip / undervoltage warning
◉ ◎	Drive is not in ready state
◉ ◉	ROM failure - Both LEDs flashing **same time**
◉ ◉	RAM failure - Both LEDs flashing **alternatively**

6.2 Troubleshooting with the BOP

Warnings and faults are displayed on the BOP with Axxx and Fxxx respectively. The individual messages are shown in Section 6.3.

If the motor fails to start when the ON command has been given:

- Check that P0010 = 0.
- Check that a valid ON signal is present.
- Check that P0700 = 2 (for digital input control) or
  P0700 = 1 (for BOP control).
- Check that the setpoint is present (0 to 10V on Terminal 3) or the setpoint has been entered into the correct parameter, depending upon the setpoint source (P1000). See the Parameter List for further details.

If the motor fails to run after changing the parameters, set P0010 = 30 then P0970 = 1 and press **P** to reset the inverter to the factory default parameter values.

Now use a switch between terminals **5** and **8** on the control board. The drive should now run to the defined setpoint by analogue input.

NOTICE

Motor data must relate to the inverter data power range and voltage.

6.3 MICROMASTER 420 fault messages

In the event of a failure, the inverter switches off and a fault code appears on the display.

NOTE

To reset the fault code, one of three methods listed below can be used:

1. Cycle the power to the drive.
2. Press the Fn button on the BOP or AOP.
3. Via Digital Input 3 (default setting)

Fault	Possible Causes	Diagnose & Remedy	Reaction
F0001 Overcurrent	➢ Motor power does not correspond to the inverter power ➢ Motor lead short circuit ➢ Earth fault	Check the following: 1. Motor power (P0307) must correspond to inverter power (P0206) 2. Cable length limits must not be exceeded 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Value of stator resistance (P0350) must be correct 6. Motor must not be obstructed or overloaded ➢ Increase the ramp time ➢ Reduce the boost level	OFF2
F0002 Overvoltage	➢ DC-link voltage (r0026) exceeds trip level (P2172) ➢ Overvoltage can be caused either by too high main supply voltage or if motor is in regenerative mode ➢ Regenerative mode can be cause by fast ramp downs or if the motor is driven from an active load	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate 2. DC-link voltage controller must be enabled (P1240) and parameterized properly 3. Ramp-down time (P1121) must match inertia of load	OFF2
F0003 Undervoltage	➢ Main supply failed ➢ Shock load outside specified limits	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate 2. Supply must not be susceptible to temporary failures or voltage reductions	OFF2
F0004 Inverter Over-temperature	➢ Ambient temperature outside of limits, ➢ Fan failure	Check the following: 1. Fan must turn when inverter is running 2. Pulse frequency must be set to default value 3. Air inlet and outlet points are not obstructed Ambient temperature could be higher than specified for the inverter	OFF2
F0005 Inverter I^2t	➢ Inverter overloaded ➢ Duty cycle too demanding ➢ Motor power (P0307) exceeds inverter power capability (P0206)	Check the following: 1. Load duty cycle must lie within specified limits 2. Motor power (P0307) must match inverter power (P0206)	OFF2
F0011 Motor Over-temperature I^2t	➢ Motor overloaded ➢ Motor data incorrect ➢ Long time period operating at low speeds	1. Check motor data 2. Check loading on motor 3. Boost settings too high (P1310,P1311, P1312) 4. Check parameter for motor thermal time constant 5. Check parameter for motor I^2t warning level	OFF1
F0041 Stator resistance measurement failure	Stator resistance measurement failure	1. Check if the motor is connected to the inverter 2. Check that the motor data has been entered correctly	OFF2

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0051 Parameter EEPROM Fault	Reading or writing of the non-volatile parameter storage has failed	1. Factory reset and new parameterization 2. Change inverter	OFF2
F0052 Powerstack Fault	Reading of the powerstack information has failed or the data is invalid	Change inverter	OFF2
F0060 Asic Timeout	Internal communications failure	1. Acknowledge fault 2. Change inverter if repeated	OFF2
F0070 Communicatio ns board setpoint error	No setpoint received from communications board during telegram off time	1. Check connections to the communications board 2. Check the master	OFF2
F0071 No Data for USS (RS232 link) during Telegramm Off Time	No response during telegram off time via USS (BOP link)	1. Check connections to the communications board 2. Check the master	OFF2
F0072 No Data from USS (RS485 link) during Telegram Off Time	No response during telegram off time via USS (COM link)	1. Check connections to the communications board 2. Check the master	OFF2
F0080 Analogue input - lost input signal	➢ Broken wire ➢ Signal out of limits	Check connection to analogue input	OFF2
F0085 External Fault	External fault is triggered via terminal inputs	Disable terminal input for fault trigger	OFF2
F0101 Stack Overflow	Software error or processor failure	1. Run self test routines 2. Change inverter	OFF2
F0221 PI Feedback below mini-mum value	PID Feedback below minimum value P2268	1. Change value of P2268 2. Adjust feedback gain	OFF2
F0222 PI Feedback above maximum value	PID Feedback above maximum value P2267	1. Change value of P2267 2. Adjust feedback gain	OFF2
F0450 (Service mode only) **BIST Tests Failure**	Fault value 1 Some of the power section tests have failed 2 Some of the control board tests have failed 4 Some of the functional tests have failed 8 Some of the IO module tests have failed 16 The Internal RAM has failed its check on power-up	1. Inverter may run but certain actions will not function correctly 2. Replace inverter	OFF2

6.4 MICROMASTER 420 alarm messages

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0501 Current Limit	➢ Motor power does not correspond to the inverter power ➢ Motor leads are too short ➢ Earth faults	1. Check whether the motor power corresponds to the inverter power 2. Check that the cable length limits have not been exceeded 3. Check motor cable and motor for short-circuits and earth faults 4. Check whether the motor parameters correspond with the motor being used 5. Check the stator resistance 6. Increase the ramp-up-time 7. Reduce the boost 8. Check whether the motor is obstructed or overloaded	--
A0502 Overvoltage limit	➢ Mains supply too high ➢ Load regenerative ➢ Ramp-down time too short	1. Check that mains supply voltage is within allowable range 2. Increase ramp down times **Note:** Vdc-max controller is active, ramp-down times will be automatically increased	--
A0503 Undervoltage Limit	➢ Mains supply too low ➢ Short mains interruption	Check main supply voltage (P0210)	--
A0504 Inverter Over-temperature	Warning level of inverter heat-sink temperature (P0614) is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parametrization in (P0610)	1. Check if ambient temperature is within specified limits 2. Check load conditions and duty cycle 3. Check if fan is turning when drive is running	--
A0505 Inverter I^2t	Warning level is exceeded; current will be reduced if parameterized (P0610 = 1)	Check if duty cycle is within specified limits	--
A0506 Inverter Duty Cycle	Heatsink temperature and thermal junction model are outside of allowable range	Check if duty cycle are within specified limits	--
A0511 Motor Over-temperature I^2t	Motor overloaded	Check the following: 1. P0611 (motor i^2t time constant) should be set to appropriate value 2. P0614 (Motor i^2t overload warning level) should be set to suitable level 3. Are long periods of operation at low speed occuring 4. Check that boost settings are not too high	--
A0541 Motor Data Identification Active	Motor data identification (P1910) selected or running	Wait until motor identification is finished	--
A0600 RTOS Overrun Warning	Software error		
A0700 CB warning 1	CB (communication board) specific	See CB user manual	--
A0701 CB warning 2	CB (communication board) specific	See CB user manual	--
A0702 CB warning 3	CB (communication board) specific	See CB user manual	--
A0703 CB warning 4	CB (communication board) specific	See CB user manual	--
A0704 CB warning 5	CB (communication board) specific	See CB user manual	--
A0705 CB warning 6	CB (communication board) specific	See CB user manual	--

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0706 CB warning 7	CB (communication board) specific	See CB user manual	--
A0707 CB warning 8	CB (communication board) specific	See CB user manual	--
A0708 CB warning 9	CB (communication board) specific	See CB user manual	--
A0709 CB warning 10	CB (communication board) specific	See CB user manual	--
A0710 CB communication error	Communication with CB (communication board) is lost	Check CB hardware	--
A0711 CB configuration error	CB (communication board) reports a configuration error	Check CB parameters	--
A0910 Vdc-max controller deactivated	Vdc max controller has been deactivated, since controller is not capable of keeping DC-link voltage (r0026) within limits (P2172) ➢ Occurs if main supply voltage (P0210) is permanently too high ➢ Occurs if motor is driven by an active load, causing motor to goes into regenerative mode ➢ Occurs at very high load inertias, when ramping down	Check the following: 1. Input voltage (P0756) lies within range? 2. Load must match In certain cases apply braking resistor	--
A0911 Vdc-max controller active	Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits (P2172)	1. Check parameter inverter input voltage 2. Check ramp-down times	--
A0912 Vdc-min controller active	Vdc min controller will be activated if DC-link voltage (r0026) falls below minimum level (P2172) ➢ The kinetic energy of the motor is used to buffer the DC-link voltage, thus causing deceleration of the drive! ➢ So short mains failures do not necessarily lead to an undervoltage trip		--
A0920 ADC parameters not set properly	ADC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for input do not correspond to ADC type	Analogue input parameters should not be set to the same value as each other	--
A0921 DAC parameters not set properly	DAC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for output do not correspond to DAC type	Analogue Output parameters should not be set to the same value as each other	--
A0922 No load applied to inverter	➢ No Load is applied to the inverter ➢ As a result, some functions may not work as under normal load conditions Low output voltage eg when 0 boost applied at 0 Hz	1. Check that load is applied to the inverter 2. Check motor parameters correspond to motor attached 3. As a result, some functions may not work correctly, because there is no normal load condition	--

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
A0923 Both JOG Left and JOG Right are requested	Both JOG right and JOG left (P1055/P1056) have been requested. This freezes the RFG output frequency at its current value. JOG right and JOG left signals active together	Make sure that JOG right and JOG left signals are not applied simultaneously	--

7 MICROMASTER 420 specifications

This Chapter contains:

- Table 7-1 contains the general technical specifications for the MICROMASTER 420 inverter
- Table 7-2 contains terminal tightening torques
- Table 7-3 includes various tables of specific technical data for individual MICROMASTER 420 inverters

Table 7-1 MICROMASTER Performance Ratings

Feature	Specification
Mains operating voltage and Power ranges	1 AC 200 V to 240 V ± 10 % 0,12 kW – 3,0 kW (0,16 hp – 4,0 hp) 3 AC 200 V to 240 V ± 10 % 0,12 kW – 5,5 kW (0,16 hp – 7,5 hp) 3 AC 380 V to 480 V ± 10 % 0,37 kW – 11,0 kW (0,50 hp – 15,0 hp)
Input frequency	47 Hz to 63 Hz
Output frequency	0 Hz to 650 Hz
Power factor	≥ 0,7
Inverter efficiency	96 % to 97 %
Overload capability	50 % overload capability for 60 s within 5 min period referred to the rated output current
Inrush current	Less than nominal input current
Control method	Linear V/f Control; Linear V/f with Flux Current Control (FCC), Quadratic V/f Control; Multi-point V/f control
Pulse frequency	2 kHz to 16 kHz (2 kHz steps)
Fixed frequencies	7, programmable
Skip frequencies	4, programmable
Setpoint resolution	0.01 Hz Digital, 0.01 Hz Serial, 10 bit Analogue (motor potentiometer 0.1 Hz [0.1% (in PID mode)])
Digital inputs	3, programmable (isolated), switchable active high / active low (PNP/NPN)
Analogue input	1, (0 to 10 V) used for frequency setpoint or PI feedback signal, scalable or usable as 4th digital input
Relay outputs	1, programmable 30 V DC / 5 A (resistive), 250 V AC / 2 A (inductive)
Analogue output	1, programmable (0 mA to 20 mA)
Serial interface	RS-485, Option RS-232
Electromagnetic compatibility	Optional EMC filters to EN55011 Class A or B, also Internal Class A filters available
Braking	DC braking, compound braking
Protection level	IP20
Temperature range	-10 °C to +50 °C (14 °F to 122 °F)
Storage temperature	-40 °C to +70 °C (-40 °F to 158 °F)
Humidity	< 95 % RH – non-condensing
Operational altitudes	up to 1000 m above sea level without derating
Protection features	Undervoltage , Overvoltage, Overload, Ground Faults, Short circuit, Stall Prevention, Motor Blocking Protection, Motor Overtemperature, Inverter Overtemperature, Parameter Interlock
Standards	UL, cUL, CE, C-tick
CE Marked	Conformity with EC Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC

Table 7-2 Tightening torques for power terminals

Frame size		A	B	C
Tightening torque	[Nm]	1.1	1.5	2.25
	[lbf.in]	10	13.3	20

Table 7-3 MICROMASTER 420 Specifications

In order to have a UL compliant installation fuses from the SITOR range with the appropriate current rating must be used.

Input voltage range 1 AC 200 V – 240 V, ± 10 %
(with built in Class A Filter)

Order No.	6SE6420-	2AB11-2AA0	2AB12-5AA0	2AB13-7AA0	2AB15-5AA0	2AB17-5AA0	2AB21-1BA0	2AB21-5BA0	2AB22-2BA0	2AB23-0CA0
Motor Output Rating	[kW]	0.12	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
	[hp]	0.16	0.33	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Output Power	[kVA]	0.4	0.7	1.0	1.3	1.7	2.4	3.2	4.6	6.0
Output Current Max.	[A]	0.9	1.7	2.3	3.0	3.9	5.5	7.4	10.4	13.6
Input Current	[A]	2	4	5.5	7.5	9.9	14.4	19.6	26.4	35.5
Recommended Fuse	[A]	10	10	10	10	16	20	20	25	32
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3807	3NA3807	3NA3810	3NA3812
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	2.5	2.5	4.0	6.0
	[awg]	17	17	17	17	17	17	15	11	9
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
	[awg]	17	17	17	17	17	17	17	17	15
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Weight	[kg]	1.2	1.2	1.2	1.3	1.3	3.3	3.6	3.6	5.2
	[lbs]	2.6	2.6	2.6	2.9	2.9	7.3	7.9	7.9	11.4
Dimensions	w [mm]	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68

Input voltage range 3 AC 200 V – 240 V, ± 10 %
(with built in Class A Filter)

Order No.	6SE6420-	2AC23-0CA0	2AC24-0CA0	2AC25-5CA0
Motor Output Rating	[kW]	3.0	4.0	5.5
	[hp]	4.0	5.0	7.5
Output Power	[kVA]	6.0	7.7	9.6
Output Current Max.	[A]	13.6	17.5	22.0
Input Current	[A]	15.6	19.7	26.3
Recommended Fuse	[A]	25	32	35
		3NA3810	3NA3812	3NA3814
Input Cable Min.	[mm^2]	2.5	2.5	4.0
	[awg]	13.0	13.0	11.0
Input Cable Max.	[mm^2]	10.0	10.0	10.0
	[awg]	7.0	7.0	7.0
Output Cable Min.	[mm^2]	1.5	2.5	4.0
	[awg]	15.0	13.0	11.0
Output Cable Max.	[mm^2]	10.0	10.0	10.0
	[awg]	7.0	7.0	7.0
Weight	[kg]	5.2	5.7	5.7
	[lbs]	11.4	12.5	12.5
Dimensions	w [mm]	185.0	185.0	185.0
	h [mm]	245.0	245.0	245.0
	d [mm]	195.0	195.0	195.0
	w [inches]	7.28	7.28	7.28
	h [inches]	9.65	9.65	9.65
	d [inches]	7.68	7.68	7.68

Input voltage range (Unfiltered) **1 AC / 3 AC 200 V – 240 V, ± 10 %**

Order No.	6SE6420-	2UC11 -2AA0	2UC12 -5AA0	2UC13 -7AA0	2UC15 -5AA0	2UC17 -5AA0	2UC21 -1BA0	2UC21 -5BA0	2UC22 -2BA0	2UC23 -0CA0
Motor Output Rating	[kW]	0.12	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
	[hp]	0.16	0.33	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Output Power	[kVA]	0.4	0.7	1.0	1.3	1.7	2.4	3.2	4.6	6.0
Output Current Max.	[A]	0.9	1.7	2.3	3	3.9	5.5	7.4	10.4	13.6
Input Current, 3 AC	[A]	0.7	1.7	2.4	3.1	4.3	6.2	8.3	11.3	15.6
Recommended Fuse	[A]	10	10	10	10	10	16	16	20	25
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3805	3NA3807	3NA3810
Input Current, 1 AC	[A]	2	4	5.5	7.5	9.9	14.4	19.6	26.4	35.5
Recommended Fuse	[A]	10	10	10	10	16	20	20	25	32
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3807	3NA3807	3NA3810	3NA3812
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.5
	[awg]	17	17	17	17	17	17	17	17	13
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
	[awg]	17	17	17	17	17	17	17	17	15
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Weight	[kg]	1.2	1.2	1.2	1.2	1.2	2.9	2.9	3.1	5.2
	[lbs]	2.6	2.6	2.6	2.6	2.6	6.4	6.4	6.8	11.4
Dimensions	w [mm]	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68

Input voltage range (Unfiltered) **3 AC 200 V – 240 V, ± 10 %**

Order No.	6SE6420-	2UC24-0CA0	2UC25-5CA0
Motor Output Rating	[kW]	4.0	5.5
	[hp]	5.0	7.5
Output Power	[kVA]	7.7	9.6
Output Current Max.	[A]	17.5	22
Input Current	[A]	19.7	26.3
Recommended Fuse	[A]	32	35
		3NA3812	3NA3814
Input Cable Min.	[mm²]	2.5	4.0
	[awg]	13.0	11.0
Input Cable Max.	[mm²]	10.0	10.0
	[awg]	7.0	7.0
Output Cable Min.	[mm²]	2.5	4.0
	[awg]	13.0	11.0
Output Cable Max.	[mm²]	10.0	10.0
	[awg]	7.0	7.0
Weight	[kg]	5.5	5.5
	[lbs]	12.1	12.1
Dimensions	w [mm]	185.0	185.0
	h [mm]	245.0	245.0
	d [mm]	195.0	195.0
	w [inches]	7.28	7.28
	h [inches]	9.65	9.65
	d [inches]	7.68	7.68

Input voltage range 3 AC 380 V – 480 V, ± 10 %
(with built in Class A Filter)

Order No.	6SE6420-	2AD22-2BA0	2AD23-0BA0	2AD24-0BA0	2AD25-5CA0	2AD27-5CA0	2AD31-1CA0
Motor Output Rating	[kW]	2.2	3.0	4.0	5.5	7.5	11.0
	[hp]	3.0	4.0	5.0	7.5	10.0	15.0
Output Power	[kVA]	4.5	5.9	7.8	10.1	14.0	19.8
Output Current Max.	[A]	5.9	7.7	10.2	13.2	18.4	26.0
Input Current	[A]	7.5	10	12.8	17.3	23.1	33.8
Recommended Fuse	[A]	16	16	20	20	25	35
		3NA3805	3NA3805	3NA3807	3NA3807	3NA3810	3NA3814
Input Cable Min.	[mm^2]	1.0	1.0	1.5	2.5	4.0	6.0
	[awg]	17	17	15	13	11	9
Input Cable Max.	[mm^2]	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	9	9	9	7	7	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.5	2.5	4.0
	[awg]	17	17	17	15	13	11
Output Cable Max.	[mm^2]	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	9	9	9	7	7	7
Weight	[kg]	3.1	3.3	3.3	5.4	5.7	5.7
	[lbs]	6.8	7.3	7.3	11.9	12.5	12.5
Dimensions	w [mm]	149.0	149.0	149.0	185.0	185.0	185.0
	h [mm]	202.0	202.0	202.0	245.0	245.0	245.0
	d [mm]	172.0	172.0	172.0	195.0	195.0	195.0
	w [inches]	5.87	5.87	5.87	7.28	7.28	7.28
	h [inches]	7.95	7.95	7.95	9.65	9.65	9.65
	d [inches]	6.77	6.77	6.77	7.68	7.68	7.68

Input voltage range (Unfiltered) **3 AC 380 V – 480 V, ± 10 %**

Order No.	6SE6420-	2UD13 -7AA0	2UD15 -5AA0	2UD17 -5AA0	2UD21 -1AA0	2UD21 -5AA0	2UD22 -2BA0	2UD23 -0BA0	2UD24 -0BA0	2UD25 -5CA0	2UD27 -5CA0	2UD31 -1CA0
Motor Output Rating	[kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5	11.0
	[hp]	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	7.5	10.0	15.0
Output Power	[kVA]	0.9	1.2	1.6	2.3	3.0	4.5	5.9	7.8	10.1	14.0	19.8
Output Current Max.	[A]	1.2	1.6	2.1	3.0	4.0	5.9	7.7	10.2	13.2	18.4	26.0
Input Current	[A]	1.6	2.1	2.8	4.2	5.8	7.5	10.0	12.8	17.3	23.1	33.8
Recommended Fuse	[A]	10	10	10	10	10	16	16	20	20	25	32
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3803	3NA3805	3NA3805	3NA3807	3NA3807	3NA3810	3NA3814
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0	6.0
	[awg]	17	17	17	17	17	17	17	15	13	11	9
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7	7	7
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0
	[awg]	17	17	17	17	17	17	17	17	15	13	11
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0	10.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7	7	7
Weight	[kg]	1.3	1.3	1.3	1.3	1.3	3.1	3.3	3.3	5.2	5.5	5.5
	[lbs]	2.9	2.9	2.9	2.9	2.9	6.8	7.3	7.3	11.4	12.1	12.1
Dimensions	w [mm]	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0	185.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0	245.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0	195.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28	7.28	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65	9.65	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68	7.68	7.68

8 Options

An overview of the options available for the MICROMASTER 420 is given in this section. For further information about options, please refer to the catalog or the documentation CD.

8.1 Device-independent options

- Basic Operator Panel (BOP)
- Advanced Operator Panel (AOP)
- PROFIBUS module
- PC to inverter connection kit
- PC to AOP connection kit
- BOP/AOP door mounting kit for single inverter control
- AOP door mounting kit for multiple inverter control
- "DriveMonitor" and "Starter" commissioning tool

8.2 Device-dependent options

- EMC filter, Class A
- EMC filter, Class B
- Additional EMC filter, Class B
- Low leakage Class B filter
- Line commutating choke
- Output choke
- Gland plate

9 Electro-magnetic compatibility (EMC)

This Chapter contains:

EMC information.

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9.1 Electro-magnetic compatibility (EMC)

All manufacturers / assemblers of electrical apparatus which "performs a complete intrinsic function and is placed on the market as a single unit intended for the end user" must comply with the EMC directive 89/336/EEC.

There are three routes for the manufacturer/assembler to demonstrate compliance:

9.1.1 Self-certification

This is a manufacturer's declaration that the European standards applicable to the electrical environment for which the apparatus is intended have been met. Only standards that have been officially published in the Official Journal of the European Community can be cited in the manufacturer's declaration.

9.1.2 Technical construction file

A technical construction file can be prepared for the apparatus describing its EMC characteristics. This file must be approved by a 'Competent Body' appointed by the appropriate European government organization. This approach allows the use of standards that are still in preparation.

9.1.3 EC type examination certificate

This approach is only applicable to radio communication transmitting apparatus. All MICROMASTER units are certified for compliance with the EMC directive, when installed in accordance with the recommendations in Section 2.

9.1.4 EMC Directive Compliance with Imminent Harmonics Regulations

From 1st January 2001 all electrical apparatus covered by the EMC Directive will have to comply with EN 61000-3-2 "Limits for harmonic current emissions (equipment input ≤ 16 A per phase)".

All Siemens variable speed drives of the MICROMASTER, MIDIMASTER, MICROMASTER Eco and COMBIMASTER ranges, which are classified as "Professional Equipment" within the terms of the standard, fulfill the requirements of the standard.

Special considerations for 250 W to 550 W drives with 230 V 1ac mains supplies when used in non-industrial applications

Units in this voltage and power range will be supplied with the following warning:

"This equipment requires supply authority acceptance for connection to the public supply network". Please refer to EN 61000-3-12 sections 5.3 and 6.4 for further information. Units connected to Industrial Networks[1] do not require connection approval (see EN 61800-3, section 6.1.2.2).

The harmonic current emissions from these products are described in the table below:

Table 9-1 Permissible harmonic current emissions

Rating	Typical Harmonic Current (A)					Typical Harmonic Current (%)					Typical Voltage Distortion		
											Distribution Transformer Rating		
											10 kVA	100 kVA	1 MVA
	3rd	5th	7th	9th	11th	3rd	5th	7th	9th	11th	THD (%)	THD (%)	THD (%)
250 W 1AC 230 V	2.15	1.44	0.72	0.26	0.19	83	56	28	10	7	0.77	0.077	0.008
370 W 1AC 230 V	2.96	2.02	1.05	0.38	0.24	83	56	28	10	7	1.1	0.11	0.011
550 W 1AC 230 V	4.04	2.70	1.36	0.48	0.36	83	56	28	10	7	1.5	0.15	0.015

The allowed harmonic currents for "professional equipment" with an input power > 1 kW are not yet defined. Therefore, any electrical apparatus containing the above drives which has an input power > 1 kW will not require connection approval.

Alternatively, the necessity to apply for connection approval can be avoided by fitting the input chokes recommended in the technical catalogues (except 550 W 230 V 1ac units).

1 Industrial Networks are defined as those which do not supply buildings used for domestic purposes.

9.1.5 Classification of EMC performance

Three General classes of EMC performance are available as detailed below:

Class 1: General Industrial

Compliance with the EMC Product Standard for Power Drive Systems EN 68100-3 for use in **Second Environment (Industrial)** and **Restricted Distribution.**

Table 9-2 Class 1 - General Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level A1
Conducted Emissions	EN 68100-3	Limits under consideration
Immunity:		
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 1 kV control
Radio Frequency Electromagnetic Field	IEC 1000-4-3	26-1000 MHz, 10 V/m

Class 2: Filtered Industrial

This level of performance will allow the manufacturer/assembler to self-certify their apparatus for compliance with the EMC directive for the industrial environment as regards the EMC performance characteristics of the power drive system. Performance limits are as specified in the Generic Industrial Emissions and Immunity standards EN 50081-2 and EN 50082-2.

Table 9-3 Class 2 - Filtered Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level A1
Conducted Emissions	EN 55011	Level A1
Immunity:		
Supply Voltage Distortion	IEC 1000-2-4 (1993)	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	IEC 1000-2-1	
Magnetic Fields	EN 61000-4-8	50 Hz, 30 A/m
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 2 kV control
Radio Frequency Electromagnetic Field, amplitude modulated	ENV 50 140	80-1000 MHz, 10 V/m, 80% AM, power and signal lines
Radio-frequency Electromagnetic Field, pulse modulated	ENV 50 204	900 MHz, 10 V/m 50% duty cycle, 200 Hz repetition rate

Class 3: Filtered - for residential, commercial and light industry

This level of performance will allow the manufacturer / assembler to self-certify compliance of their apparatus with the EMC directive for the residential, commercial and light industrial environment as regards the EMC performance characteristics of the power drive system. Performance limits are as specified in the generic emission and immunity standards EN 50081-1 and EN 50082-1.

Table 9-4 Class 3 - Filtered for Residential, Commercial and Light Industry

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions*	EN 55011	Level B
Conducted Emissions	EN 55011	Level B
Immunity:		
Supply Voltage Distortion	IEC 1000-2-4 (1993)	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	IEC 1000-2-1	
Magnetic Fields	EN 61000-4-8	50 Hz, 30 A/m
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 2 kV control
Radio Frequency Electromagnetic Field, amplitude modulated	ENV 50 140	80-1000 MHz, 10 V/m, 80% AM, power and signal lines
Radio-frequency Electromagnetic Field, pulse modulated	ENV 50 204	900 MHz, 10 V/m 50% duty cycle, 200 Hz repetition rate

* These limits are dependent on the inverter being correctly installed inside a metallic switchgear enclosure. The limits will not be met if the inverter is not enclosed.

NOTICE

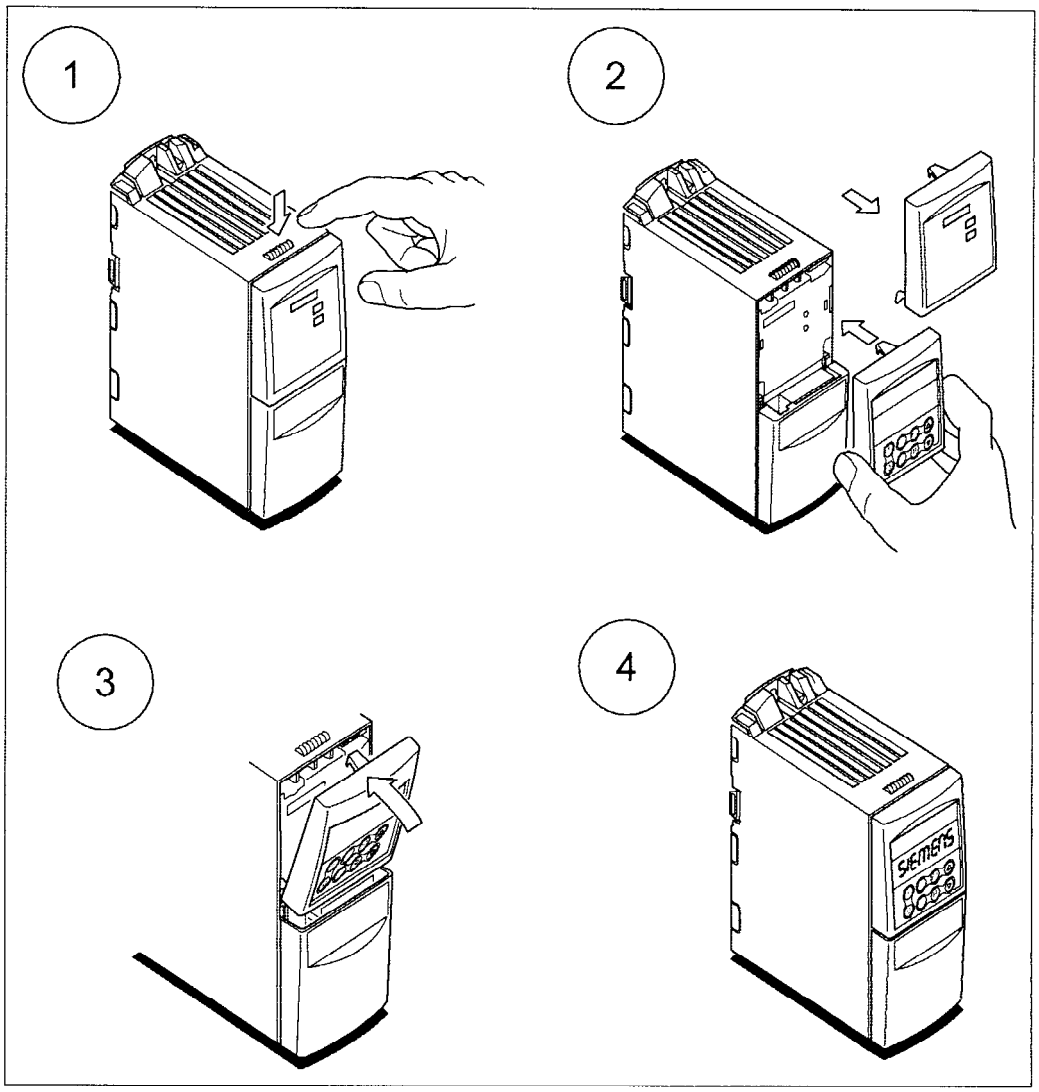
- To achieve these performance levels, you must not exceed the default Pulse frequency nor use cables longer than 25 m.
- The MICROMASTER inverters are intended **exclusively for professional applications**. Therefore, they do not fall within the scope of the harmonics emissions specification EN 61000-3-2.
- Maximum mains supply voltage when filters are fitted is 460 V.

Table 9-5 Compliance Table

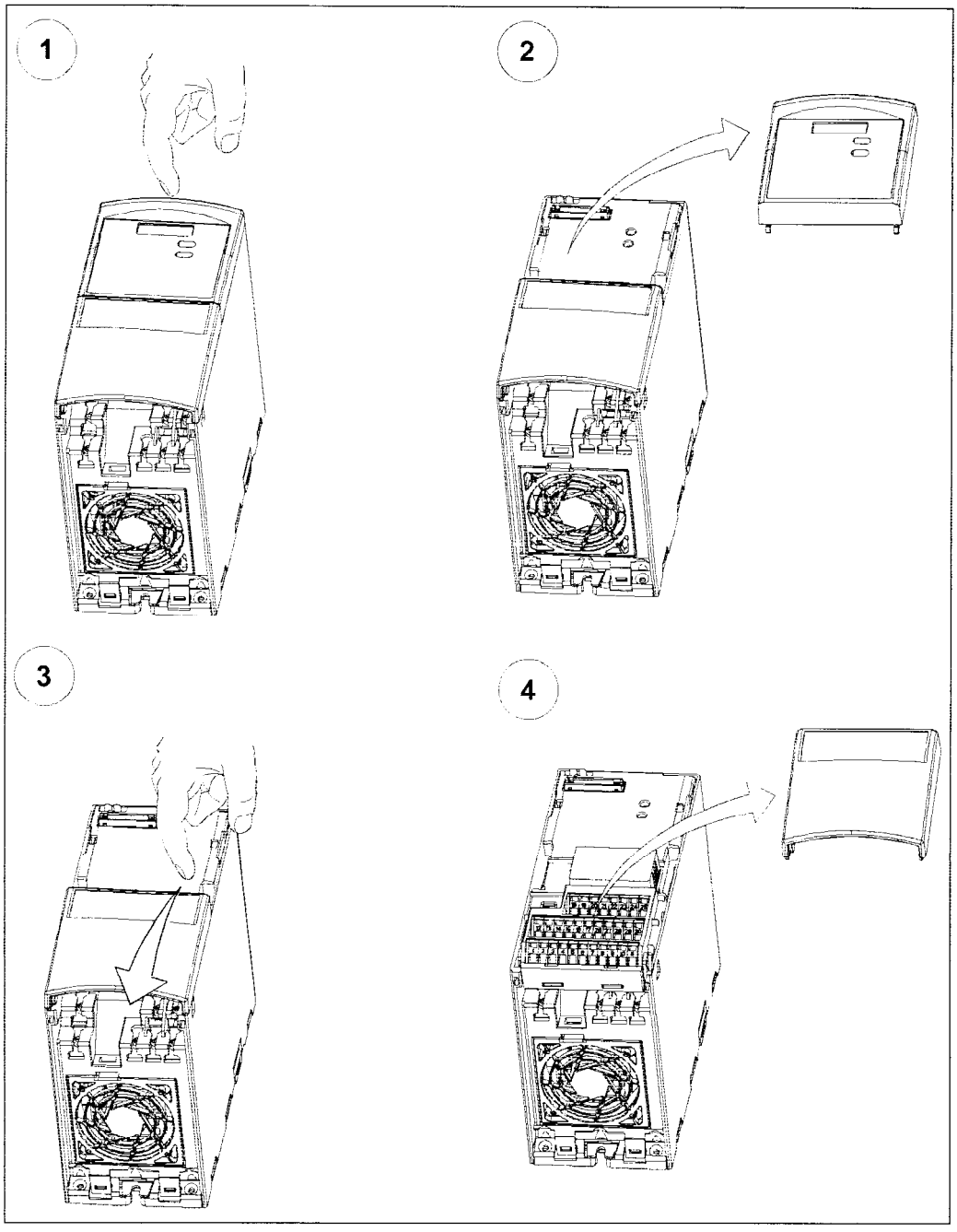
Model	Remarks
Class 1 – General Industrial	
6SE6420-2U***-**A0	Unfiltered units, all voltages and powers.
Class 2 – Filtered Industrial	
6SE6420-2A***-**A0	All units with integral Class A filters
6SE6420-2A***-**A0 with 6SE6400-2FA00-6AD0	Frame size A units 400-480 V with external Class A footprint filters
Class 3 – Filtered for residential, commercial and light industry	
6SE6420-2U***-**A0 with 6SE6400-2FB0*-***0	Unfiltered units fitted with external Class B footprint filters.
* denotes any value is allowed.	

Appendices

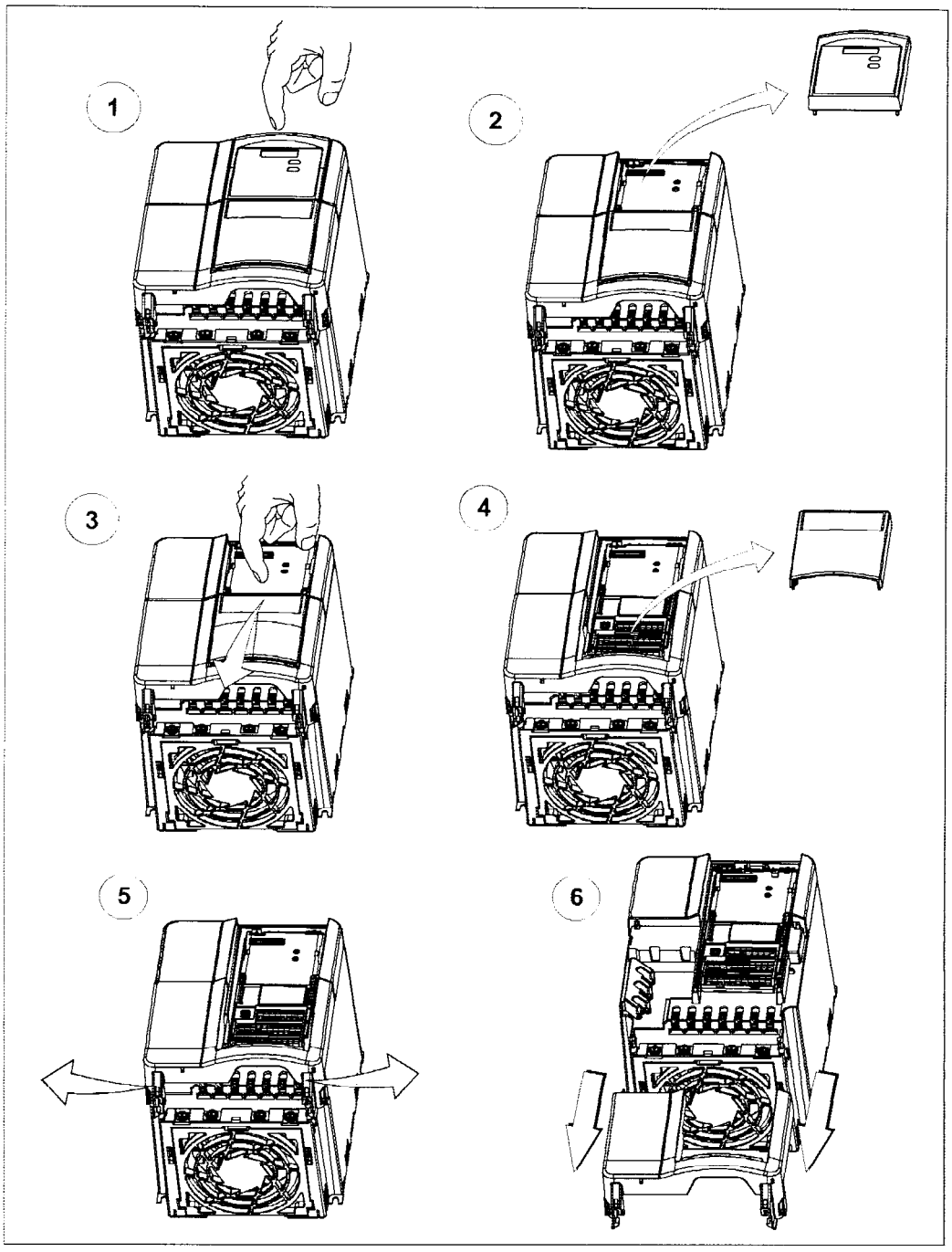
A Changing the Operator Panel



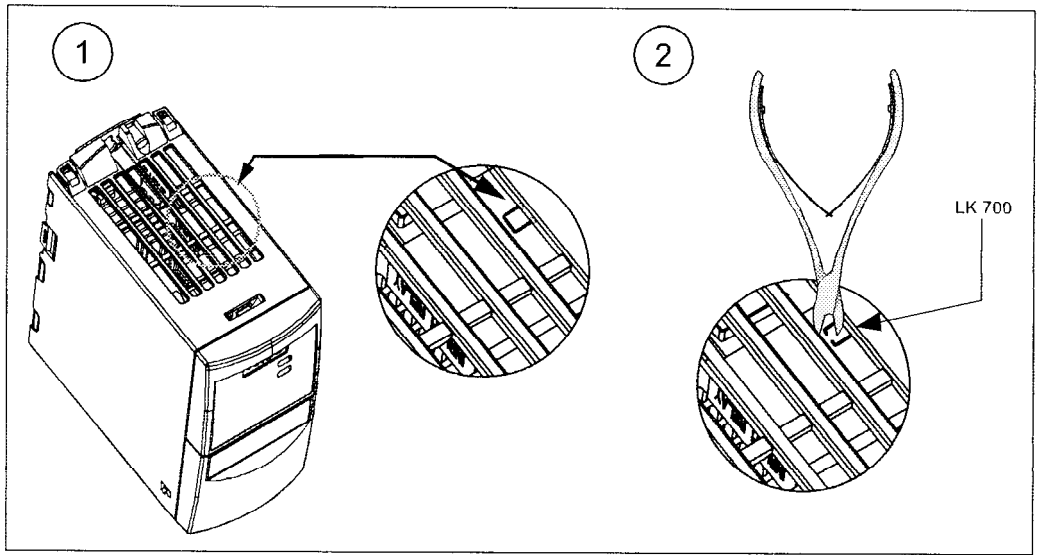
B Removing Covers Frame Size A



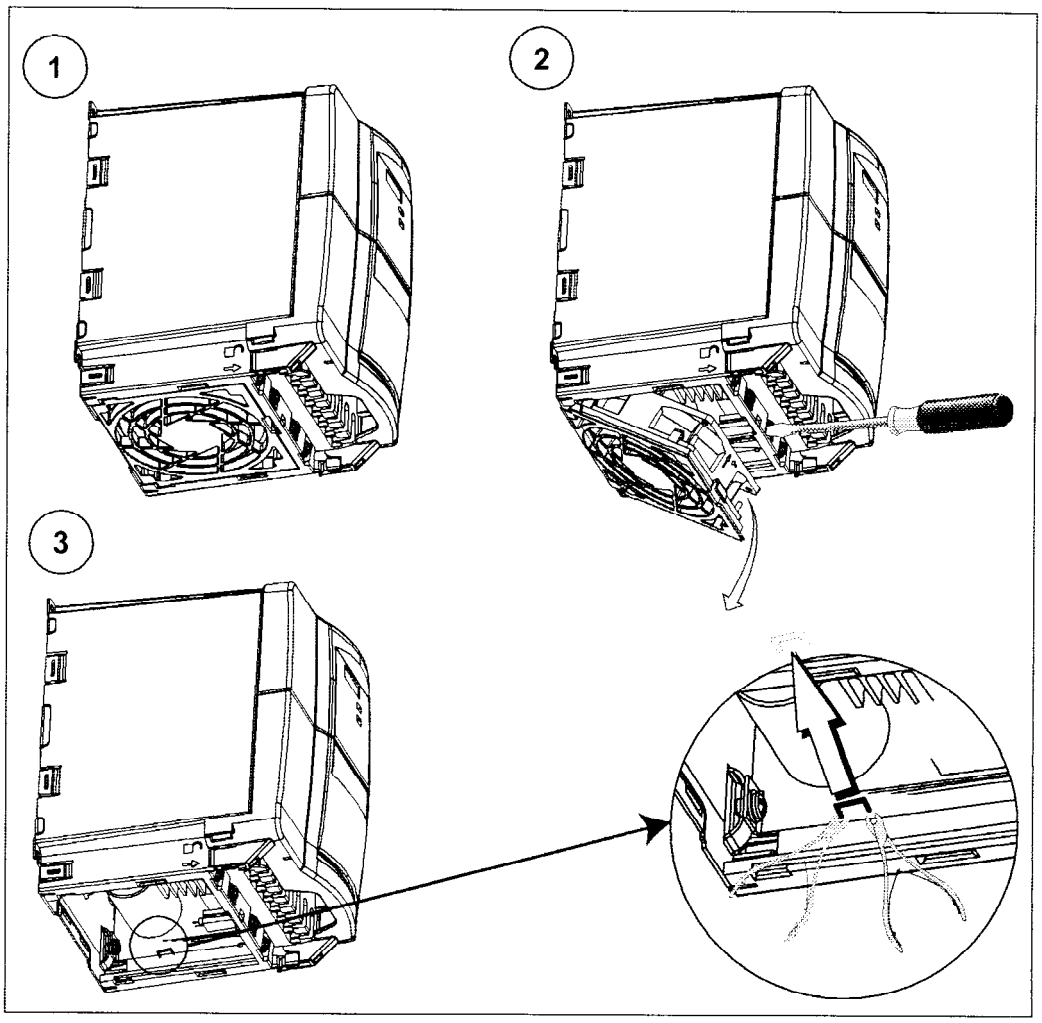
C Removing Covers Frame Size B and C



D Removing 'Y' Cap Frame Size A



E Removing 'Y' Cap Frame Size B and C



F Applicable Standards

CE

European Low Voltage Directive

The MICROMASTER product range complies with the requirements of the Low Voltage Directive 73/23/EEC as amended by Directive 98/68/EEC. The units are certified for compliance with the following standards:

EN 60146-1-1	Semiconductor inverters - General requirements and line commutated inverters
EN 60204-1	Safety of machinery - Electrical equipment of machines

European Machinery Directive

The MICROMASTER inverter series does not fall under the scope of the Machinery Directive. However, the products have been fully evaluated for compliance with the essential Health & Safety requirements of the directive when used in a typical machine application. A Declaration of Incorporation is available on request.

European EMC Directive

When installed according to the recommendations described in this manual, the MICROMASTER fulfils all requirements of the EMC Directive as defined by the EMC Product Standard for Power Drive Systems EN61800-3.

c UL us LISTED

Underwriters Laboratories

UL and CUL LISTED POWER CONVERSION EQUIPMENT 5B33 for use in a pollution degree 2

ISO 9001

Siemens plc operates a quality management system, which complies with the requirements of ISO 9001.

G List of Abbreviations

AC	Alternating Current
AIN	Analog Input
AOP	Advanced Operator Panel
BOP	Basic Operator Panel
CT	Constant Torque
DC	Direct Current
DIN	(Digital Input
DS	Drive State
EEC	European Economic Community
ELCB	Earth Leakage Circuit Breaker
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
FAQ	Frequently Asked Questions
FCC	Flux Current Control
FCL	Fast Current Limitation
I/O	Input and Output
IGBT	Insulated Gate Bipolar Transistor
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PID	Proportional, Integral und Differential
PLC	Programmable Logic Controller
PTC	Positive Temperature Coefficient
QC	Quick Commissioning
RCCB	Residual Current Circuit Breaker
RCD	Residual Current Device
RPM	Revolutions Per Minute
SDP	Status Display Panel
VT	Variable Torque

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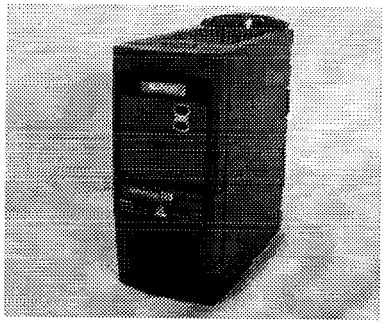
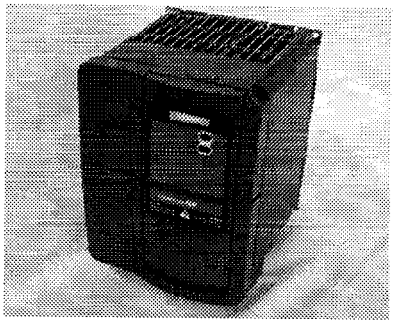
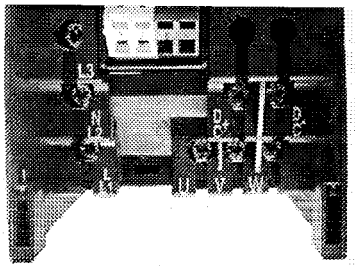
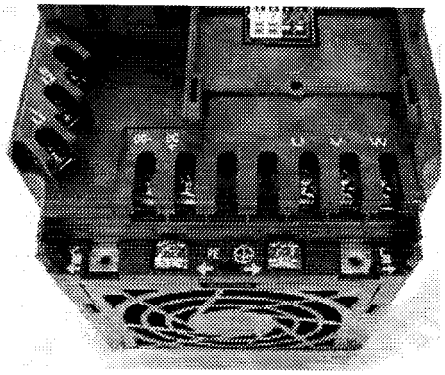
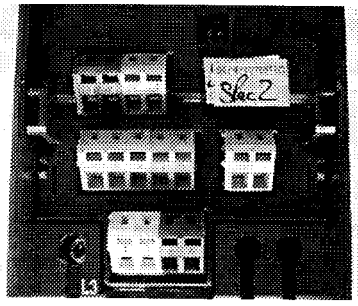
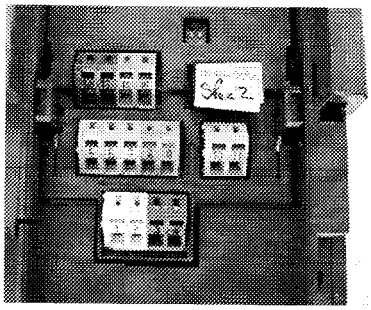
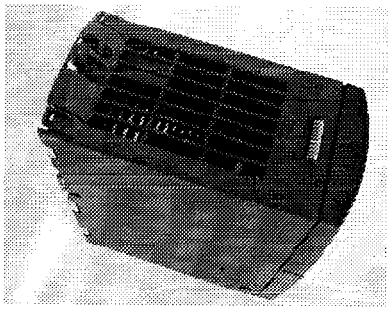
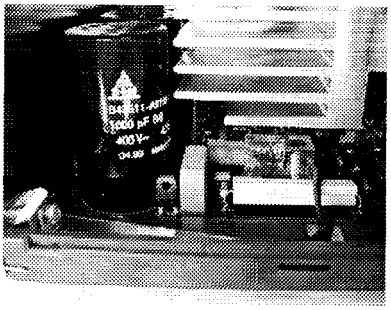
Suggestions and/or Corrections

To: Siemens AG Automation & Drives Group SD VM 4 Postfach 3269 D-91050 Erlangen Bundesrepublik Deutschland Email: Technical.documentation@con.siemens.co.uk	**Suggestions** **Corrections**
	For Publication/Manual: MICROMASTER 420 User Documentation
From Name: Company/Service Department Address: _____ _____ Telephone: _____ / _____ Telefax: _____ / _____	Operating Instructions Order Number: 6SE6400-5AA00-0BP0 Date of Issue: 12/01
	Should you come across any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvement are also welcome.

View of Unit	Frame Size A	Frame Size B & C
SDP fitted		
Power Terminal Connections		
Control Terminal Connections		
Access to "Y Cap "		

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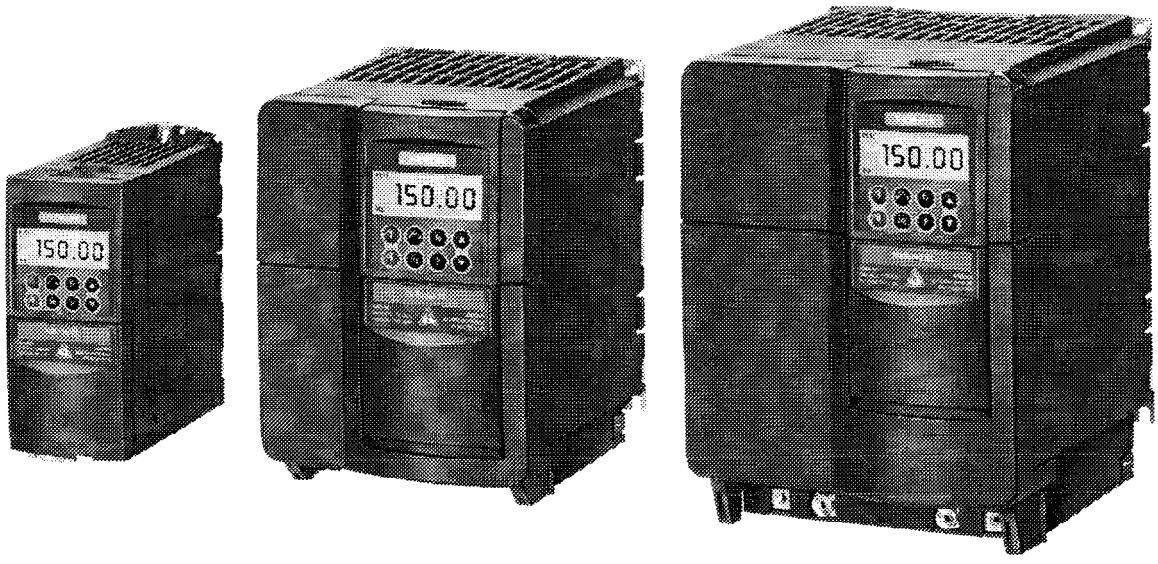
MICROMASTER 420

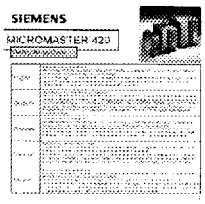
Parameter List **Version 12/01**



User Documentation
6SE6400-5BA00-0BP0

Getting Started Guide

Is for quick commissioning with SDP and BOP.



Operating Instructions

Gives information about features of the MM420, Installation, Commissioning, Control modes, System Parameter structure, Troubleshooting, Specifications and available options of the MM420.

Parameter List

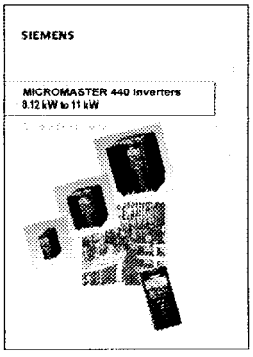
The Parameterlist containes the description of all Parameters structured in functional order and a detailed description. The Parameter list also includes a series of function plans.

Reference Manual

The reference Manual gives elaborate information about engineering communication troubleshooting and maintenance.

Catalogues

In the catalogue you will find all needs to select a certain inverter, as well as filters chokes, operator panels or communications options.



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MICROMASTER 420

Parameter List
User Documentation

Valid for	Version 12/01
Converter Type MICROMASTER 420	*Software Version* V1.1

Version 12/01

Parameter List 1

Alarms and Warnings 2

Warning

Please refer to all Definitiones and Warnings contained in the Operating Instructions. You will find the Operating Instructions on the Docu CD delivered with your inverter. If the CD is lost, it can be ordered via your local Siemens department under the Order No. 6SE6400-5FA00-1AG00.

Further information can be obtained from Internet website:
http://www.siemens.de/micromaster

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Other functions not described in this document may be available. However, this fact shall not constitute an obligation to supply such functions with a new control, or when servicing.

We have checked that the contents of this document correspond to the hardware and software described. There may be discrepancies nevertheless, and no guarantee can be given that they are completely identical. The information contained in this document is reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

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Parameters MICROMASTER 420

This Parameter List must only be used together with the Operating Instructions or the Reference Manual of the MICROMASTER 420. Please pay special attention to the Warnings, Cautions, Notices and Notes contained in these manuals.

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1 Parameters

1.1 Introduction to MICROMASTER 420 System Parameters

The layout of the parameter description is as follows.

1 Par number [index]	2 Parameter name			9 Min:	12 Level:
	3 CStat:	5 Datatype	7 Unit:	10 Def:	2
	4 P-Group:	6 active:	8 Quick Comm:	11 Max:	
	13	Description:			

1. **Parameter number**
   Indicates the relevant parameter number. The numbers used are 4-digit numbers in the range 0000 to 9999. Numbers prefixed with an "r" indicate that the parameter is a "read-only" parameter, which displays a particular value but cannot be changed directly by specifying a different value via this parameter number (in such cases, dashes "-" are entered at the points "Unit", "Min", "Def" and "Max" in the header of the parameter description.
   All other parameters are prefixed with a "P". The values of these parameters can be changed directly in the range indicated by the "Min" and "Max" settings in the header.

   [index] indicates that the parameter is an indexed parameter and specifies the number of indices available.

2. **Parameter name**
   Indicates the name of the relevant parameter. Certain parameter names include the following abbreviated prefixes: BI, BO, CI, and CO followed by a colon.

   These abbreviations have the following meanings:
   BI = Binector input, i.e. parameter selects the source of a binary signal
   BO = Binector output, i.e. parameter connects as a binary signal
   CI = Connector input, i.e. parameter selects the source of an analog signal
   CO = Connector output, i.e. parameter connects as an analog signal
   CO/BO = Connector/Binector output, i.e. parameter connects as an analog signal and/or as a binary signal

   To make use of BiCo you will need access to the full parameter list. At this level many new parameter settings are possible, including BiCo functionality. BiCo functionality is a different, more flexible way of setting and combining input and output functions. It can be used in most cases in conjunction with the simple, level 2 settings.

   The BiCo system allows complex functions to be programmed. Boolean and mathematical relationships can be set up between inputs (digital, analog, serial etc.) and outputs (inverter current, frequency, analog output, relays, etc.).

3. **CStat**
   Commissioning status of the parameter. Three states are possible:
   Commissioning C
   Run U
   Ready to Run T
   This indicates when the parameter can be changed. One, two or all three states may be specified. If all three states are specified, this means that it is possible to change this parameter setting in all three inverter states

4. **P-Group**
   Indicates the functional group of the particular.

   Note
   Parameter P0004 (parameter filter) acts as a filter and focuses access to parameters according to the functional group selected.

5. **Datatype**
   The data types available are shown in the table below.

Notation	Meaning
U16	16-bit unsigned
U32	32-bit unsigned
I16	16-bit integer
I32	32-bit integer
Float	Floating point

6. **Active**
   Indicates whether
   - Immediately changes to the parameter values take effective immediately after they have been entered, or
   - Confirm the "P" button on the operator panel (BOP or AOP) must be pressed before the changes take effect.

7. **Unit**
   Indicates the unit of measure applicable to the parameter values
8. **QuickComm**
   Indicates whether or not (Yes or No) a parameter can only be changed during quick commissioning, i.e. when P0010 (parameter groups for commissioning) is set to 1 (quick commissioning).
9. **Min**
   Indicates the minimum value to which the parameter can be set.
10. **Def**
    Indicates the default value, i.e. the value which applies if the user does not specify a particular value for the parameter.
11. **Max**
    Indicates the maximum value to which the parameter can be set.
12. **Level**
    Indicates the level of user access. There are four access levels: Standard, Extended, Expert and Service. The number of parameters that appear in each functional group depends on the access level set in P0003 (user access level).
13. **Description**
    The parameter description consists of the sections and contents listed below. Some of these sections and contents are optional and will be omitted on a case-to-case basis if not applicable.

Description:	Brief explanation of the parameter function.
Diagram:	Where applicable, diagram to illustrate the effects of parameters on a characteristic curve, for example
Settings:	List of applicable settings. These include Possible settings, Most common settings, Index and Bitfields
Example:	Optional example of the effects of a particular parameter setting.
Dependency:	Any conditions that must be satisfied in connection with this parameter. Also any particular effects, which this parameter has on other parameter(s) or which other parameters have on this one.
Warning / Caution / Notice / Note:	Important information which must be heeded to prevent personal injury or damage to equipment / specific information which should be heeded in order to avoid problems / information which may be helpful to the user
More details:	Any sources of more detailed information concerning the particular parameter.

1.2 Quick commissioning (P0010=1)

The following parameters are necesarry for quick commissioning (P0010=1).

No	Name	Access level	Cstat
P0100	Europe / North America	1	C
P0300	Select motor type	2	C
P0304	Motor voltage rating	1	C
P0305	Motor current rating	1	C
P0307	Motor power rating	1	C
P0308	Motor cosPhi rating	2	C
P0309	Motor efficiency rating	2	C
P0310	Motor frequency rating	1	C
P0311	Motor speed rating	1	C
P0320	Motor magnetizing current	3	CT
P0335	Motor cooling	2	CT
P0640	Motor overload factor [%]	2	CUT
P0700	Selection of command source	1	CT
P1000	Selection of frequency setpoint	1	CT
P1080	Min. speed	1	CUT
P1082	Max. speed	1	CT
P1120	Ramp-up time	1	CUT
P1121	Ramp-down time	1	CUT
P1135	OFF3 ramp-down time	2	CUT
P1300	Control mode	2	CT
P1910	Select motor data identification	2	CT
P3900	End of quick commissioning	1	C

When P0010=1 is chosen, P0003 (user access level) can be used to select the parameters to be accessed. This parameter also allows selection of a user-defined parameter list for quick commissioning.

At the end of the quick commissioning sequence, set P3900 = 1 to carry out the necessary motor calculations and clear all other parameters (not included in P0010=1) to their default settings.

Note
This applies only in Quick Commissioning mode.

Reset to Factory default

To reset all parameters to the factory default settings; the following parameters should be set as follows:

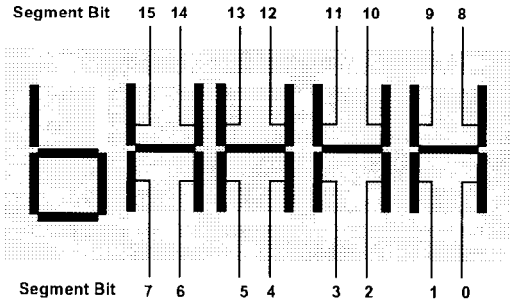
Set P0010=30.

Set P0970=1.

Note
The reset process takes approximately 10 seconds to complete. Reset to Factory default

Seven-segment display

The seven-segment display is structured as follows:



The significance of the relevant bits in the display is described in the status and control word parameters.

1.3 Parameter Description

Note:

Level 4 Parameters are not visible with BOP or AOP.

r0000 **Drive display** Level: 1

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: ALWAYS

Displays the user selected output as defined in P0005.

Note:

Pressing the "Fn" button for 2 seconds allows the user to view the values of DC link voltage, output current, output frequency, and chosen r0000 setting (defined in P0005).

r0002 **Drive state** Level: 2

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMMANDS

Displays actual drive state.

Enum:

0 Commissioning mode (P0010 != 0)
1 Drive ready
2 Drive fault active
3 Drive starting (DC-link precharging)
4 Drive running
5 Stopping (ramping down)

Dependency:

State 3 visible only while precharging DC link, and when externally powered communications board is fitted.

P0003 **User access level** Level: 1

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 1 **Max:** 4

P-Group: ALWAYS **Active:** Immediately **QuickComm.** No

Defines user access level to parameter sets. The default setting (standard) is sufficient for most simple applications.

Enum:

0 User defined parameter list - see P0013 for details on use
1 Standard: Allows access into most frequently used parameters.
2 Extended: Allows extended access e.g. to inverter I/O functions.
3 Expert: For expert use only.
4 Service: Only for use by authorized service personal - password protected.

P0004 **Parameter filter** Level: 1

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 22

P-Group: ALWAYS **Active:** Immediately **QuickComm.** No

Filters available parameters according to functionality to enable a more focussed approach to commissioning.

Example:

P0004 = 22 specifies that only PID parameters will be visible.

Enum:

0 All parameters
2 Inverter
3 Motor
7 Commands, binary I/O
8 ADC and DAC
10 Setpoint channel / RFG
12 Drive features
13 Motor control
20 Communication
21 Alarms / warnings / monitoring
22 Technology controller (e.g. PID)

Dependency:

Parameters marked "Quick Comm: Yes" in the parameter header can only be set when P0010 = 1 (Quick Commissioning).

Note:

The inverter will start with any setting of P0004.

P0005 **Display selection**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	2
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	21
				Max:	2294

Level: **2**

Selects display for parameter r0000 (drive display). Any read-only parameter (rxxxx) can be selected

Common Settings:

21 Actual frequency
25 Output voltage
26 DC link voltage
27 Output current

Notice:

These settings refer to read only parameter numbers ("rxxxx").

Details:

See relevant "rxxxx" parameter descriptions for further functions.

P0006 **Display mode**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	2
				Max:	4

Level: **3**

Defines mode of display for r0000 (drive display).

Enum:

0 In Ready state alternate between setpoint and output freq. In run display output freq.
1 In Ready state display setpoint. In run display output freq.
2 In Ready state alternate between P0005 value and r0020 value. In run display P0005 value
3 In Ready state alternate between r0002 value and r0020 value. In run display r0002 value
4 In all states just display P0005

Note:

When inverter is not running, the display alternates between the values for "Not Running" and "Running".

Per default, the setpoint and actual frequency values are displayed alternately.

P0007 **Backlight delay time**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	2000

Level: **3**

Defines time period after which the backlight display turns off if no operator keys have been pressed.

Value:

P0007 = 0 : Backlight always on (default state)

P0007 = 1-2000 : Number of seconds after which the backlight will turn off

P0010 **Commissioning parameter filter**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	ALWAYS	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	30

Level: **1**

Filters parameters so that only those related to a particular functional group are selected.

Enum:

0 Ready
1 Quick commissioning
2 Inverter
29 Download
30 Factory setting

Dependency:

Reset to 0 for inverter to run.

P0003 (user access level) also determines access to parameters.

Note:

If P3900 is not 0 (0 is the default value), this parameter is automatically reset to 0.
Settings 2 and 29 are only visible in service mode.

P0011 **Lock for user defined parameter**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	65535

Level: **3**

Details:

See parameter P0013 (user defined parameter)

P0012 **Key for user defined parameter**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	65535

Level: **3**

Details:

See parameter P0013 (user defined parameter).

P0013[20] User defined parameter

						Level:
CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0	3
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0	
				Max:	65535	

Defines a limited set of parameters to which the end user will have access.

Instructions for use:
Step 1: Set P0003 = 3 (expert user)
Step 2: Go to P0013 indices 0 to 16 (user list)
Step 3: Enter into P0013 index 0 to 16 the parameters required to be visible in the user-defined list.
The following values are fixed and cannot be changed:
- P0013 index 19 = 12 (key for user defined parameter)
- P0013 index 18 = 10 (commissioning parameter filter)
- P0013 index 17 = 3 (user access level)
Step 4: Set P0003 = 0 to activate the user defined parameter.

Dependency:

First, set P0011 ("lock") to a different value than P0012 ("key") to prevent changes to user-defined parameter. Then, set P0003 to 0 to activate the user-defined list.

When locked and the user-defined parameter is activated, the only way to exit the user-defined parameter (and view other parameters) is to set P0012 ("key") to the value in P0011 ("lock").

Note:

Alternatively, set P0010 = 30 (commissioning parameter filter = factory setting) and P0970 = 1 (factory reset) to perform a complete factory reset.

The default values of P0011 ("lock") and P0012 ("key") are the same.

r0018 Firmware version

						Level:
		Datatype: Float	**Unit:** -	**Min:**	-	1
P-Group:	INVERTER			**Def:**	-	
				Max:	-	

Displays version number of installed firmware.

r0019 CO/BO: BOP control word

						Level:
		Datatype: U16	**Unit:** -	**Min:**	-	3
P-Group:	COMMANDS			**Def:**	-	
				Max:	-	

Displays status of operator panel commands.

The settings below are used as the "source" codes for keypad control when connecting to BICO input parameters.

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES

Note:

When BICO technology is used to allocate functions to panel buttons, this parameter displays the actual status of the relevant command.

The following functions can be "connected" to individual buttons:
- ON/OFF1,
- OFF2,
- JOG,
- REVERSE,
- INCREASE,
- DECREASE

r0020 CO: Act. frequency setpoint

						Level:
		Datatype: Float	**Unit:** Hz	**Min:**	-	3
P-Group:	CONTROL			**Def:**	-	
				Max:	-	

Displays actual frequency setpoint (output from ramp function generator).

r0021 **CO: Act. frequency** Level: 2
Datatype: Float Unit: Hz Min: - Def: - Max: -
P-Group: CONTROL

Displays actual inverter output frequency (r0024) excluding slip compensation, resonance damping and frequency limitation.

r0022 **Act. rotor speed** Level: 3
Datatype: Float Unit: 1/min Min: - Def: - Max: -
P-Group: CONTROL

Displays calculated rotor speed based on inverter output frequency [Hz] x 120 / number of poles.

Note:
This calculation makes no allowance for load-dependent slip.

r0024 **CO: Act. output frequency** Level: 3
Datatype: Float Unit: Hz Min: - Def: - Max: -
P-Group: CONTROL

Displays actual output frequency (slip compensation, resonance damping and frequency limitation are included).

r0025 **CO: Act. output voltage** Level: 2
Datatype: Float Unit: V Min: - Def: - Max: -
P-Group: CONTROL

Displays [rms] voltage applied to motor.

r0026 **CO: Act. DC-link voltage** Level: 2
Datatype: Float Unit: V Min: - Def: - Max: -
P-Group: INVERTER

Displays DC-link voltage.

r0027 **CO: Act. output current** Level: 2
Datatype: Float Unit: A Min: - Def: - Max: -
P-Group: CONTROL

Displays [rms] value of motor current [A].

r0034 **CO: Motor temperature (i2t)** Level: 2
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays calculated motor temperature (I2t model) as [%] of the maximum permissible value.

Note:
A value of 100 % means that the motor has reached its maximum permissible operating temperature. In this case, the motor will attempt to reduce the motor loading as defined in P0610 (motor I2t temperature reaction).

r0036 **CO:Inverter overload utilization** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: INVERTER

Displays inverter overload utilization calculated via I2t model.

The actual I2t value relative to the max. possible I2t value supplies utilization in [%].

If the nominal current of the inverter is not exceed, 0 % utilization will be displayed.

If the current exceeds the threshold for P0294 (inverter I2t overload warning), warning A0504 (inverter overtemperature) is generated and the output current of the inverter reduced via P0290 (inverter overload reaction).

If 100 % utilization is exceeded, alarm F0005 (inverter I2T) is tripped.

r0037 **CO: Inverter temperature [°C]** Level: 3
Datatype: Float Unit: °C Min: - Def: - Max: -
P-Group: INVERTER

Displays internal inverter heatsink temperature.

r0039 **CO: Energy consumpt. meter [kWh]** Level: 2
Datatype: Float Unit: kWh Min: - Def: - Max: -
P-Group: INVERTER

Displays electrical energy used by inverter since display was last reset (see P0040 - reset energy consumption meter).

Dependency:
Value is reset when P3900 = 1 (end quick commissioning), P0970 = 1 (factory reset) or P0040 = 1 (reset energy consumption meter).

P0040 **Reset energy consumption meter** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	INVERTER	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Resets value of parameter r0039 (energy consumption meter) to zero.

Enum:

0	No reset
1	Reset r0039 to 0

Dependency:

No reset until "P" is pressed.

r0052 **CO/BO: Act. status word 1** Level: 2

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMMANDS			**Def:**	-
				Max:	-

Displays first active status word of inverter (bit format) and can be used to diagnose inverter status. The display segments for the status word are shown in the "Introduction to MICROMASTER System Pamarameters".

Bitfields:

Bit00	Drive ready	0	NO
		1	YES
Bit01	Drive ready to run	0	NO
		1	YES
Bit02	Drive running	0	NO
		1	YES
Bit03	Drive fault active	0	NO
		1	YES
Bit04	OFF2 active	0	YES
		1	NO
Bit05	OFF3 active	0	YES
		1	NO
Bit06	ON inhibit active	0	NO
		1	YES
Bit07	Drive warning active	0	NO
		1	YES
Bit08	Deviation setp. / act. value	0	YES
		1	NO
Bit09	PZD control	0	NO
		1	YES
Bit10	Maximum frequency reached	0	NO
		1	YES
Bit11	Warning: Motor current limit	0	YES
		1	NO
Bit12	Motor holding brake active	0	NO
		1	YES
Bit13	Motor overload	0	YES
		1	NO
Bit14	Motor runs direction right	0	NO
		1	YES
Bit15	Inverter overload	0	YES
		1	NO

Note:

Output of Bit3 (Fault) will be inverted on digital output (Low = Fault, High = No Fault).

r0053 **CO/BO: Act. status word 2**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 2

P-Group: COMMANDS

Displays second status word of inverter (in bit format).

Bitfields:

Bit00	DC brake active	0	NO
		1	YES
Bit01	Act. freq. r0024 > P2167	0	NO
		1	YES
Bit02	Act. freq. r0024 > P1080	0	NO
		1	YES
Bit03	Act. current r0027 >= P2170	0	NO
		1	YES
Bit04	Act. freq. r0024 > P2155	0	NO
		1	YES
Bit05	Act. freq. r0024 <= P2155	0	NO
		1	YES
Bit06	Act. freq. r0024 >= setpoint	0	NO
		1	YES
Bit07	Act. Vdc r0026 < P2172	0	NO
		1	YES
Bit08	Act. Vdc r0026 > P2172	0	NO
		1	YES
Bit09	Ramping finished	0	NO
		1	YES
Bit10	PID output r2294 < P2291	0	NO
		1	YES
Bit11	PID output r2294 >= P2291	0	NO
		1	YES
Bit14	Download data set 0 from AOP	0	NO
		1	YES
Bit15	Download data set 1 from AOP	0	NO
		1	YES

Details:

See description of seven-segment display given in the introduction

r0054 **CO/BO: Act. control word 1**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: COMMANDS

Displays first control word of inverter and can be used to diagnose which commands are active.

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

Details:

See description of seven-segment display given in the introduction

r0055 **CO/BO: Add. act. control word** Level: 3

Datatype: U16 Unit: - Min: - Def: - Max: -

P-Group: COMMANDS

Displays additional control word of inverter and can be used to diagnose which commands are active.

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit08	PID enabled	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Details:

See description of seven-segment display given in the introduction

r0056 **CO/BO: Status of motor control** Level: 3

Datatype: U16 Unit: - Min: - Def: - Max: -

P-Group: CONTROL

Displays status of motor control (MM420: V/f status), which can be used to diagnose inverter status.

Bitfields:

Bit00	Init. control finished	0	NO
		1	YES
Bit01	Motor demagnetizing finished	0	NO
		1	YES
Bit02	Pulses enabled	0	NO
		1	YES
Bit03	Voltage soft start select	0	NO
		1	YES
Bit04	Motor excitation finished	0	NO
		1	YES
Bit05	Starting boost active	0	NO
		1	YES
Bit06	Acceleration boost active	0	NO
		1	YES
Bit07	Frequency is negative	0	NO
		1	YES
Bit08	Field weakening active	0	NO
		1	YES
Bit09	Volts setpoint limited	0	NO
		1	YES
Bit10	Slip frequency limited	0	NO
		1	YES
Bit11	F_out > F_max Freq. limited	0	NO
		1	YES
Bit12	Phase reversal selected	0	NO
		1	YES
Bit13	I-max controller active	0	NO
		1	YES
Bit14	Vdc-max controller active	0	NO
		1	YES
Bit15	Vdc-min controller active	0	NO
		1	YES

Details:

See description of seven-segment display given in the introduction

r0067 **CO: Act. output current limit** Level: 3

Datatype: Float Unit: A Min: - Def: - Max: -

P-Group: CONTROL

Displays valid maximum output current of drive.

This value is influenced by P0640 (max. output current), the derating characteristics and the thermal motor and inverter protection.

Dependency:

P0610 (motor I2t temperature reaction) defines reaction when limit is reached.

Note:

Normally, current limit = rated motor current (P0305) x motor current limit (P0640). It is less than or equal to maximum inverter current r0209.

The current limit may be reduced if the motor thermal model calculation indicates that overheating will occur.

r0071 **CO: Max. output voltage**

Datatype: Float **Unit:** V **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: CONTROL

Displays maximum output voltage.

Dependency:

Actual maximum output voltage depends on the actual input supply voltage.

r0078 **CO: Act. current Isq**

Datatype: Float **Unit:** A **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: CONTROL

Displays component of torque generating current.

r0084 **CO: Act. air gap flux**

Datatype: Float **Unit:** % **Min:** - **Def:** - **Max:** - **Level:** 4

P-Group: CONTROL

Displays air gap flux in [%] relative to the rated motor flux.

r0086 **CO: Act. active current**

Datatype: Float **Unit:** A **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: CONTROL

Displays active (real part) of motor current.

Dependency:

Applies when V/f control is selected in P1300 (control mode); otherwise, the display shows the value zero.

P0100 **Europe / North America**

CStat: C **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 2 **Level:** 1

P-Group: QUICK **Active:** Immediately **QuickComm.** Yes

Determines whether power settings (e.g. nominal rating plate power - P0307) are expressed in [kW] or [hp].

The default settings for the nominal rating plate frequency (P0310) and maximum motor frequency (P1082) are also set automatically here, in addition to reference frequency (P2000).

Enum:

0 Europe [kW], frequency default 50 Hz
1 North America [hp], frequency default 60 Hz
2 North America [kW], frequency default 60 Hz

Dependency:

The setting of DIP switch 2 under the I/O board determines the validity of settings 0 and 1 for P0100 according to the table below:

DIP 2 setting	Meaning		P0100 setting	Meaning
OFF	[kW], frequency default 50 [Hz]	**overwrites**	1	[hp], frequency default 60 [Hz]
ON	[hp], frequency default 60 [Hz]	**overwrites**	0	[kW], frequency default 50 [Hz]

Stop drive first (i.e. disable all pulses) before you change this parameter.

P0010 = 1 (commissioning mode) enables changes to be made.

Changing P0100 resets all rated motor parameters as well as other parameters that depend on the rated motor parameters (see P0340 - calculation of motor parameters).

Notice:

P0100 setting 2 (==> [kW], frequency default 60 [Hz]) is not overwritten by the setting of DIP switch 2 (see table above).

r0200 **Act. power stack code number**

Datatype: U32 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: INVERTER

Identifies hardware variant as shown in table below.

Notice:

Parameter r0200 = 0 indicates that no power stack has been identified.

P0201 **Power stack code number**

CStat: C **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 65535 **Level:** 3

P-Group: INVERTER **Active:** Immediately **QuickComm.** No

Confirms actual power stack identified.

r0203 **Act. inverter type** Level: 3
Datatype: U16 Unit: - Min: - Def: - Max: -
P-Group: INVERTER

Type number of actual power stack identified.

Enum:
1 MICROMASTER 420
2 MICROMASTER 440
3 MICRO- / COMBIMASTER 411
4 MICROMASTER 410
5 Reserved

r0204 **Power stack features** Level: 3
Datatype: U32 Unit: - Min: - Def: - Max: -
P-Group: INVERTER

Displays hardware features of power stack.

Bitfields:

Bit00	DC input voltage	0	NO
		1	YES
Bit01	RFI filter	0	NO
		1	YES

Note:
Parameter r0204 = 0 indicates that no power stack has been identified.

r0206 **Rated inverter power [kW] / [hp]** Level: 2
Datatype: Float Unit: - Min: - Def: - Max: -
P-Group: INVERTER

Displays nominal rated motor power from inverter.

Dependency:
Value is displayed in [kW] or [hp] depending on setting for P0100 (operation for Europe / North America).

r0207 **Rated inverter current** Level: 2
Datatype: Float Unit: A Min: - Def: - Max: -
P-Group: INVERTER

Displays maximum continuous output current of inverter.

r0208 **Rated inverter voltage** Level: 2
Datatype: U32 Unit: V Min: - Def: - Max: -
P-Group: INVERTER

Displays nominal AC supply voltage of inverter.

Value:
r0208 = 230 : 200 - 240 V +/- 10 %
r0208 = 400 : 380 - 480 V +/- 10 %
r0208 = 575 : 500 - 600 V +/- 10 %

r0209 **Maximum inverter current** Level: 2
Datatype: Float Unit: A Min: - Def: - Max: -
P-Group: INVERTER

Displays maximum output current of inverter.

P0210 **Supply voltage** Level: 3
CStat: CT Datatype: U16 Unit: V Min: 0 Def: 230 Max: 1000
P-Group: INVERTER Active: first confirm QuickComm. No

Optimizes Vdc controller, which extends the ramp-down time if regenerative energy from motor would otherwise cause DC link overvoltage trips.

Reducing the value enables controller to cut in earlier and reduce the risk of overvoltage.

Dependency:
Set P1254 ("Auto detect Vdc switch-on levels") = 0. Cut-in levels for Vdc controller and compound braking are then derived directly from P0210 (supply voltage).

Note:
If mains voltage is higher than value entered, automatic deactivation of the Vdc controller may occur to avoid acceleration of the motor. An alarm will be issued in this case (A0910).

r0231[2] **Max. cable length** **Min:** - **Level:** 3
Datatype: U16 **Unit:** m **Def:** -
P-Group: INVERTER **Max:** -

Indexed parameter to display maximum allowable cable length between inverter and motor.

Index:
r0231[0] : Max. allowed unscreened cable length
r0231[1] : Max. allowed screened cable length

Notice:
For full EMC compliance, the screened cable must not exceed 25 m in length when an EMC filter is fitted.

P0290 **Inverter overload reaction** **Min:** 0 **Level:** 3
CStat: CT **Datatype:** U16 **Unit:** - **Def:** 2
P-Group: INVERTER **Active:** Immediately **QuickComm.** No **Max:** 3

Selects reaction of inverter to an internal over-temperature.

Enum:
0 Reduce output frequency (usually only effective on variable torque appl.)
1 Trip (F0004)
2 Reduce pulse frequency and output frequency
3 Reduce pulse frequency then trip (F0004)

Notice:
A trip will always result eventually, if the action taken does not sufficiently reduce internal temperature.

The pulse frequency is normally reduced only if higher than 2 kHz (see P0291 - configuration of inverter protection).

P0291 **Config. of inverter protection** **Min:** 0 **Level:** 4
CStat: CT **Datatype:** U16 **Unit:** - **Def:** 1
P-Group: INVERTER **Active:** first confirm **QuickComm.** No **Max:** 1

Control bit for enabling/disabling automatic pulse frequency reduction at output frequencies below 2 Hz.

Bitfields:
Bit00 Pulse freq reduced below 2Hz 0 NO
1 YES

Details:
See P0290 (inverter overload reaction)

P0292 **Inverter overload warning** **Min:** 0 **Level:** 3
CStat: CUT **Datatype:** U16 **Unit:** °C **Def:** 15
P-Group: INVERTER **Active:** Immediately **QuickComm.** No **Max:** 25

Defines temperature difference (in [°C]) between inverter over-temperature trip and warning thresholds.

P0294 **Inverter I2t overload warning** **Min:** 10.0 **Level:** 4
CStat: CUT **Datatype:** Float **Unit:** % **Def:** 95.0
P-Group: INVERTER **Active:** Immediately **QuickComm.** No **Max:** 100.0

Defines the [%] value at which warning A0504 (inverter overtemperature) is generated.

Inverter I2t calculation is used to estimate a maximum tolerable period for inverter overload. The I2t calculation value is deemed = 100 % when this maximum tolerable period is reached.

Dependency:
Motor overload factor (P0640) reduced to 100 % at this point.

Note:
P0294 = 100 % corresponds to stationary nominal load.

P0295 **Inverter fan off delay time** **Min:** 0 **Level:** 3
CStat: CUT **Datatype:** U16 **Unit:** s **Def:** 0
P-Group: TERMINAL **Active:** Immediately **QuickComm.** No **Max:** 3600

Defines inverter fan switch off delay time in seconds after drive has stopped.

Note:
Setting to 0, inverter fan will switch off when the drive stops, that is no delay.

P0300 **Select motor type** Level: **2**

CStat:	C	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** Yes	**Def:**	1
				Max:	2

Selects motor type.

This parameter is required during commissioning to select motor type and optimize inverter performance.
Most motors are asynchronous; if in doubt, use the formula below.
(rated motor frequency (P0310) * 60) / rated motor speed (P0311)

If the result is a whole number, the motor is synchronous.

Enum:

1 Asynchronous motor
2 Synchronous motor

Dependency:

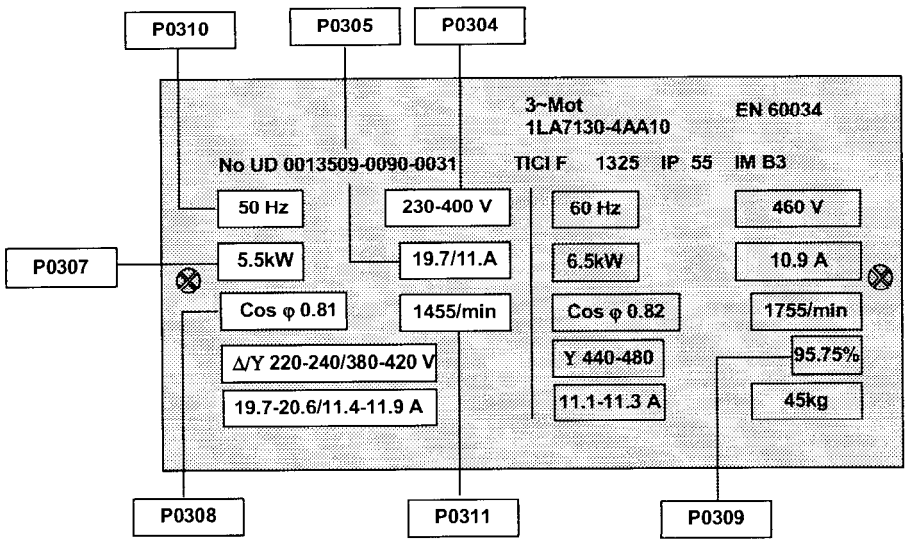
Changeable only when P0010 = 1 (quick commissioning).

If synchronous motor is selected, the following functions are not available:
Power factor (P0308)
Motor efficiency (P0309)
Magnetization time (P0346 (Level 3)
Demagnetization time (P0347 (Level 3)
Flying start (P1200, P1202 (Level 3), P1203 (Level 3))
DC braking (P1230 (Level 3), P1232, P1233)
Slip compensation (P1335)
Slip limit (P1336)
Motor magnetizing current (P0320 (Level 3),
Rated motor slip (P0330),
Rated magnetization current (P0331),
Rated power factor (P0332),
Rotor time constant (P0384)

P0304 **Rated motor voltage** Level: **1**

CStat:	C	**Datatype:** U16	**Unit:** V	**Min:**	10
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** Yes	**Def:**	230
				Max:	2000

Nominal motor voltage [V] from rating plate. Following diagram shows a typical rating plate with the locations of the relevant motor data.



Dependency:

Changeable only when P0010 = 1 (quick commissioning).

P0305 **Rated motor current** Level: 1

CStat: C | Datatype: Float | Unit: A | Min: 0.01 | Def: 3.25 | Max: 10000.00
P-Group: MOTOR | Active: Immediately | QuickComm. Yes

Nominal motor current [A] from rating plate - see diagram in P0304.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Depends also on P0320 (motor magnetization current).

Note:
For asynchronous motors, the maximum value is defined as the maximum inverter current (r0209).

For synchronous motors, the maximum value is defined as twice the maximum inverter current (r0209)

The minimum value is defined as 1/32 times inverter rated current (r0207).

P0307 **Rated motor power** Level: 1

CStat: C | Datatype: Float | Unit: - | Min: 0.01 | Def: 0.75 | Max: 2000.00
P-Group: MOTOR | Active: Immediately | QuickComm. Yes

Nominal motor power [kW/hp] from rating plate.

Dependency:
If P0100 = 1 ([kW],frequency default 50 Hz), values will be in [hp] - see diagram P0304 (rating plate).

Changeable only when P0010 = 1 (quick commissioning).

P0308 **Rated motor cosPhi** Level: 2

CStat: C | Datatype: Float | Unit: - | Min: 0.000 | Def: 0.000 | Max: 1.000
P-Group: MOTOR | Active: Immediately | QuickComm. Yes

Nominal motor power factor (cosPhi) from rating plate - see diagram P0304.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Visible only when P0100 = 0 or 2, (motor power entered in [kW]).

Setting 0 causes internal calculation of value (see r0332).

P0309 **Rated motor efficiency** Level: 2

CStat: C | Datatype: Float | Unit: % | Min: 0.0 | Def: 0.0 | Max: 99.9
P-Group: MOTOR | Active: Immediately | QuickComm. Yes

Nominal motor efficiency in [%] from rating plate.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Visible only when P0100 = 1, (i.e. motor power entered in [hp]).

Setting 0 causes internal calculation of value (see r0332).

Note:
P0309 = 100 % corresponds to superconducting.

Details:
See diagram in P0304 (rating plate)

P0310 **Rated motor frequency** Level: 1

CStat: C | Datatype: Float | Unit: Hz | Min: 12.00 | Def: 50.00 | Max: 650.00
P-Group: MOTOR | Active: Immediately | QuickComm. Yes

Nominal motor frequency [Hz] from rating plate.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Pole pair number recalculated automatically if parameter is changed.

Details:
See diagram in P0304 (rating plate)

P0311 **Rated motor speed** Level: 1

CStat: C | Datatype: U16 | Unit: 1/min | Min: 0
P-Group: MOTOR | Active: Immediately | QuickComm. Yes | Def: 0 | Max: 40000

Nominal motor speed [rpm] from rating plate.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Setting 0 causes internal calculation of value.

Required for vector control and V/f control with speed controller.

Slip compensation in V/f control requires rated motor speed for correct operation.

Pole pair number recalculated automatically if parameter is changed.

Details:
See diagram in P0304 (rating plate)

r0313 **Motor pole pairs** Level: 3

Datatype: U16 | Unit: - | Min: - | Def: - | Max: -
P-Group: MOTOR

Displays number of motor pole pairs that the inverter is currently using for internal calculations.

Value:
r0313 = 1 : 2-pole motor
r0313 = 2 : 4-pole motor
etc.

Dependency:
Recalculated automatically when P0310 (rated motor frequency) or P0311 (rated motor speed) is changed.

P0320 **Motor magnetizing current** Level: 3

CStat: CT | Datatype: Float | Unit: % | Min: 0.0
P-Group: MOTOR | Active: first confirm | QuickComm. Yes | Def: 0.0 | Max: 99.0

Defines motor magnetization current in [%] relative to P0305 (rated motor current).

Dependency:
Affected by P0366 - P0369 (magnetizing curve imag. 1 - 4) Setting 0 causes calculation by P0340 = 1 (data entered from rating plate) or by P3900 = 1 or 2 (end of quick commissioning).

r0330 **Rated motor slip** Level: 3

Datatype: Float | Unit: % | Min: - | Def: - | Max: -
P-Group: MOTOR

Displays nominal motor slip in [%] relative to P0310 (rated motor frequency) and P0311 (rated motor speed).

r0331 **Rated magnetization current** Level: 3

Datatype: Float | Unit: A | Min: - | Def: - | Max: -
P-Group: MOTOR

Displays calculated magnetizing current of motor in [A].

r0332 **Rated power factor** Level: 3

Datatype: Float | Unit: - | Min: - | Def: - | Max: -
P-Group: MOTOR

Displays power factor for motor

Dependency:
Value is calculated internally if P0308 (rated motor cosPhi) set to 0; otherwise, value entered in P0308 is displayed.

P0335 **Motor cooling** Level: 2

CStat: CT | Datatype: U16 | Unit: - | Min: 0
P-Group: MOTOR | Active: Immediately | QuickComm. Yes | Def: 0 | Max: 1

Selects motor cooling system used.

Enum:
0 Self-cooled: Using shaft mounted fan attached to motor
1 Force-cooled: Using separately powered cooling fan

Notice:
Motors of series 1LA1 and 1LA8 have an internal fan. This internal motor fan must not be confused with the fan at the end of the motor shaft.

P0340 **Calculation of motor parameters** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Calculates various motor parameters, including:

Motor weight P0344 (Level 3)
Magnetization time P0346 (Level 3)
Demagnetization time P0347 (Level 3)
Stator resistance P0350 (Level 2)
Reference frequency P2000 (Level 2)
Reference current P2002 (Level 3).

Enum:

0 No calculation
1 Complete parameterization

Note:

This parameter is required during commissioning to optimize inverter performance.

P0344 **Motor weight** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** kg	**Min:**	1.0
P-Group:	MOTOR	**Active:** first confirm	**QuickComm.** No	**Def:**	9.4
				Max:	6500.0

Specifies motor weight [kg].

Note:

This value is used in the motor thermal model.

It is normally calculated automatically from P0340 (motor parameters) but can also be entered manually.

P0346 **Magnetization time** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.000
P-Group:	MOTOR	**Active:** first confirm	**QuickComm.** No	**Def:**	1.000
				Max:	20.000

Sets magnetization time [s], i.e. waiting time between pulse enable and start of ramp-up. Motor magnetization builds up during this time.

Magnetization time is normally calculated automatically from the motor data and corresponds to the rotor time constant (r0384).

Note:

If boost settings are higher than 100 %, magnetization may be reduced.

Notice:

An excessive reduction of this time can result in insufficient motor magnetization.

P0347 **Demagnetization time** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.000
P-Group:	MOTOR	**Active:** first confirm	**QuickComm.** No	**Def:**	1.000
				Max:	20.000

Changes time allowed after OFF2 / fault condition, before pulses can be re-enabled.

Note:

The demagnetization time is approximately 2.5 x rotor time constant (r0384) in seconds.

Notice:

Not active following a normally completed ramp-down, e.g. after OFF1, OFF3 or JOG.

Overcurrent trips will occur if the time is decreased excessively.

P0350 **Stator resistance (line-to-line)** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** Ohm	**Min:**	0.00001
P-Group:	MOTOR	**Active:** first confirm	**QuickComm.** No	**Def:**	4.0
				Max:	2000.0

Stator resistance value in [Ohms] for connected motor (from line-to-line). The parameter value includes the cable resistance.

There are three ways to determine the value for this parameter:
1. Calculate using P0340 = 1 (data entered from rating plate) or P3900 = 1,2 or 3 (end of quick commissioning)
2. Measure using P1910 = 1 (motor data identification - value for stator resistance is overwritten)
3. Measure manually using an Ohmmeter.

Note:

Since measured line-to-line, this value may appear to be higher (up to 2 times higher) than expected.

The value entered in P0350 (stator resistance) is the one obtained by the method last used.

r0370 **Stator resistance [%]** Level: 4

		Datatype: Float	**Unit:** %	**Min:**	-
P-Group:	MOTOR			**Def:**	-
				Max:	-

Displays standardized stator resistance of motor equivalent circuit (phase value) in [%].

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0372 **Cable resistance [%]** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays standardized cable resistance of motor equivalent circuit (phase value)in [%]. It is estimated to be 20 % of the stator resistance.

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0373 **Rated stator resistance [%]** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays rated stator resistance of the motor equivalent circuit (phase value) in [%].

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0374 **Rotor resistance [%]** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays standardized rotor resistance of the motor equivalent circuit (phase value) in [%].

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0376 **Rated rotor resistance [%]** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays rated rotor resistance of the motor equivalent circuit (phase value) in [%].

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0377 **Total leakage reactance [%]** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays standardized total leakage reactance of the motor equivalent circuit (phase value) in [%].

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0382 **Main reactance [%]** Level: 4
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays standardized main reactance of the motor equivalent circuit (phase value) in [%].

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

r0384 **Rotor time constant** Level: 3
Datatype: Float Unit: ms Min: - Def: - Max: -
P-Group: MOTOR

Displays calculated rotor time constant [ms].

r0386 **Total leakage time constant** Level: 4
Datatype: Float Unit: ms Min: - Def: - Max: -
P-Group: MOTOR

Displays total leakage time constant of motor.

r0395 **CO: Total stator resistance [%]** Level: 3
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: MOTOR

Displays stator resistance of motor as [%] of combined stator/cable resistance.

Note:

100 % means : $Z_{ratedmot} * \frac{P0304}{P0305}$

P0610 **Motor I2t temperature reaction** Level: 3

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** No	**Def:**	2
				Max:	2

Defines reaction when motor I2t reaches warning threshold.

Enum:

0 No reaction, warning only
1 Warning and Imax reduction (results in reduced output freq.)
2 Warning and trip (F0011)

Dependency:

Trip level = P0614 (motor I2t overload warning level) * 110 %

P0611 **Motor I2t time constant** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** s	**Min:**	0
P-Group:	MOTOR	**Active:** first confirm	**QuickComm.** No	**Def:**	100
				Max:	16000

Defines motor thermal time constant and is calculated automatically from the motor data (see P0340).

Notice:

A larger number increases the time taken for the calculated motor temperature to change.

P0614 **Motor I2t overload warning level** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** No	**Def:**	100.0
				Max:	400.0

Defines the [%] value at which warning A0511 (inverter overtemperature) is generated.

Inverter I2t calculation is used to estimate a maximum tolerable period (i.e. without overheating) for inverter overload. The I2t calculation value is deemed = 100 % when this maximum tolerable period is reached (see r0034).

Dependency:

A motor over-temperature trip (F0011) is produced at 110 % of this level.

P0640 **Motor overload factor [%]** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	10.0
P-Group:	MOTOR	**Active:** first confirm	**QuickComm.** Yes	**Def:**	150.0
				Max:	400.0

Defines motor overload current limit in [%] relative to P0305 (rated motor current). current.

Dependency:

Limited to maximum inverter current or to 400 % of rated motor current (P0305), whichever is the lower.

Details:

See function diagram for current limitation.

P0700 **Selection of command source** Level: 1

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** Yes	**Def:**	2
				Max:	6

Selects digital command source.

Enum:

0 Factory default setting
1 BOP (keypad)
2 Terminal
4 USS on BOP link
5 USS on COM link
6 CB on COM link

Note:

Changing this parameter resets (to default) all settings on item selected. For example: Changing form 1 to 2 resets all digital inputs to default settings.

P0701 **Function of digital input 1** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	99

Selects function of digital input 1.

Enum:

0	Digital input disabled
1	ON/OFF1
2	ON reverse /OFF1
3	OFF2 - coast to standstill
4	OFF3 - quick ramp-down
9	Fault acknowledge
10	JOG right
11	JOG left
12	Reverse
13	MOP up (increase freq.)
14	MOP down (decrease freq.)
15	Fixed setpoint (Direct selection)
16	Fixed setpoint (Direct selection + ON)
17	Fixed setpoint (Binary coded selection + ON)
25	DC brake enable
29	External trip
33	Disable additional freq setpoint
99	Enable BICO parameterization

Dependency:

Setting 99 (enable BICO parameterization) requires P0700 (command source) or P3900 (end of quick commissioning) = 1, 2 or P0970 (factory reset) = 1 in order to reset.

Notice:

Setting 99 (BICO) for expert use only.

P0702 **Function of digital input 2** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	12
				Max:	99

Selects function of digital input 2.

Enum:

0	Digital input disabled
1	ON/OFF1
2	ON reverse /OFF1
3	OFF2 - coast to standstill
4	OFF3 - quick ramp-down
9	Fault acknowledge
10	JOG right
11	JOG left
12	Reverse
13	MOP up (increase freq.)
14	MOP down (decrease freq.)
15	Fixed setpoint (Direct selection)
16	Fixed setpoint (Direct selection + ON)
17	Fixed setpoint (Binary coded selection + ON)
25	DC brake enable
29	External trip
33	Disable additional freq setpoint
99	Enable BICO parameterization

Details:

See P0701 (function of digital input1).

P0703 **Function of digital input 3** Level: **2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	9
				Max:	99

Selects function of digital input 3.

Enum:

0	Digital input disabled
1	ON/OFF1
2	ON reverse /OFF1
3	OFF2 - coast to standstill
4	OFF3 - quick ramp-down
9	Fault acknowledge
10	JOG right
11	JOG left
12	Reverse
13	MOP up (increase freq.)
14	MOP down (decrease freq.)
15	Fixed setpoint (Direct selection)
16	Fixed setpoint (Direct selection + ON)
17	Fixed setpoint (Binary coded selection + ON)
25	DC brake enable
29	External trip
33	Disable additional freq setpoint
99	Enable BICO parameterization

Details:

See P0701 (function of digital input 1).

P0704 **Function of digital input 4** Level: **2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	99

Selects function of digital input 4 (via analog input).

Enum:

0	Digital input disabled
1	ON/OFF1
2	ON reverse /OFF1
3	OFF2 - coast to standstill
4	OFF3 - quick ramp-down
9	Fault acknowledge
10	JOG right
11	JOG left
12	Reverse
13	MOP up (increase freq.)
14	MOP down (decrease freq.)
21	Local/remote
25	DC brake enable
29	External trip
33	Disable additional freq setpoint
99	Enable BICO parameterization

Details:

See P0701 (function of digital input 1).

P0719 **Selection of cmd. & freq. setp.** Level: 3

CStat: CT Datatype: U8 Unit: - Min: 0
P-Group: COMMANDS Active: * QuickComm. - Def: 0
Max: 66

Central switch to select control command source for inverter.

Switch the command and setpoint source between free programable BICO parameters and fixed command/setpoint profiles. Command and setpoint source can be changed independently.

The tens digit chooses the command source and the once digit choose the setpoint source.

Enum:

0	"Cmd = BICO parameter Setpoint = BICO parameter"
1	"Cmd = BICO parameter Setpoint = MOP setpoint"
2	"Cmd = BICO parameter Setpoint = Analog setpoint"
3	"Cmd = BICO parameter Setpoint = Fixed frequency"
4	"Cmd = BICO parameter Setpoint = USS on BOP-Link"
5	"Cmd = BICO parameter Setpoint = USS on COM-Link"
6	"Cmd = BICO parameter Setpoint = CB on COM-Link"
10	"Cmd = BOP Setpoint = BICO parameter"
11	"Cmd = BOP Setpoint = MOP setpoint"
12	"Cmd = BOP Setpoint = Analog setpoint"
13	"Cmd = BOP Setpoint = Fixed frequency"
14	"Cmd = BOP Setpoint = USS on BOP-Link"
15	"Cmd = BOP Setpoint = USS on COM-Link"
16	"Cmd = BOP Setpoint = CB on COM-Link"
40	"Cmd = USS on BOP-Link Setpoint = BICO parameter"
41	"Cmd = USS on BOP-Link Setpoint = MOP setpoint"
42	"Cmd = USS on BOP-Link Setpoint = Analog setpoint"
43	"Cmd = USS on BOP-Link Setpoint = Fixed frequency"
44	"Cmd = USS on BOP-Link Setpoint = USS on BOP-Link"
45	"Cmd = USS on BOP-Link Setpoint = USS on COM-Link"
46	"Cmd = USS on BOP-Link Setpoint = CB on COM-Link"
50	"Cmd = USS on COM-Link Setpoint = BICO parameter"
51	"Cmd = USS on COM-Link Setpoint = MOP setpoint"
52	"Cmd = USS on COM-Link Setpoint = Analog setpoint"
53	"Cmd = USS on COM-Link Setpoint = Fixed frequency"
54	"Cmd = USS on COM-Link Setpoint = USS on BOP-Link"
55	"Cmd = USS on COM-Link Setpoint = USS on COM-Link"
56	"Cmd = USS on COM-Link Setpoint = CB on COM-Link"
60	"Cmd = CB on COM-Link Setpoint = BICO parameter"
61	"Cmd = CB on COM-Link Setpoint = MOP setpoint"
62	"Cmd = CB on COM-Link Setpoint = Analog setpoint"
63	"Cmd = CB on COM-Link Setpoint = Fixed frequency"
64	"Cmd = CB on COM-Link Setpoint = USS on BOP-Link"
65	"Cmd = CB on COM-Link Setpoint = USS on COM-Link"
66	"Cmd = CB on COM-Link Setpoint = CB on COM-Link"

Note:

Note: - This parameter does not change any previously made BICO connections !

r0720 **Number of digital inputs** Level: 3

Datatype: U16 Unit: - Min: -
P-Group: COMMANDS Def: -
Max: -

Displays number of digital inputs.

r0722 **CO/BO: Binary input values** Level: 2

Datatype: U16 Unit: - Min: -
P-Group: COMMANDS Def: -
Max: -

Displays status of digital inputs.

Bitfields:

Bit00	Digital input 1	0	OFF
		1	ON
Bit01	Digital input 2	0	OFF
		1	ON
Bit02	Digital input 3	0	OFF
		1	ON
Bit03	Digital input 4 (via ADC)	0	OFF
		1	ON

Note:

Segment is lit when signal is active.

P0724 **Debounce time for digital inputs** Level: 3

CStat: CT Datatype: U16 Unit: - Min: 0
P-Group: COMMANDS Active: first confirm QuickComm. No Def: 3
Max: 3

Defines debounce time (filtering time) used for digital inputs.

Enum:

0 No debounce time
1 2.5 ms debounce time
2 8.2 ms debounce time
3 12.3 ms debounce time

P0725 **PNP / NPN digital inputs** Level: 3

CStat: CT Datatype: U16 Unit: - Min: 0
P-Group: COMMANDS Active: first confirm QuickComm. No Def: 1
Max: 1

Switches between active high (PNP) and active low (NPN). This is valid for all digital inputs simultaneously.

The following is valid by using the internal supply:

Value:

NPN: Terminals 5/6/7 must be connected via terminal 9 (0 V).
PNP: Terminals 5/6/7 must be connected via terminal 8 (24 V).

Enum:

0 NPN mode ==> low active
1 PNP mode ==> high active

r0730 **Number of digital outputs** Level: 3

Datatype: U16 Unit: - Min: -
P-Group: COMMANDS Def: -
Max: -

Displays number of digital outputs (relays).

P0731 **BI: Function of digital output 1** Level: 2

CStat: CUT Datatype: U32 Unit: - Min: 0:0
P-Group: COMMANDS Active: Immediately QuickComm. No Def: 52:3
Max: 4000:0

Defines source of digital output 1.

Settings:

52.0	Drive ready	0	Closed
52.1	Drive ready to run	0	Closed
52.2	Drive running	0	Closed
52.3	Drive fault active	0	Closed
52.4	OFF2 active	1	Closed
52.5	OFF3 active	1	Closed
52.6	Switch on inhibit active	0	Closed
52.7	Drive warning active	0	Closed
52.8	Deviation setpoint/actual value	1	Closed
52.9	PZD control (Process Data Control)	0	Closed
52.A	Maximum frequency reached	0	Closed
52.B	Warning: Motor current limit	1	Closed
52.C	Motor holding brake (MHB) active	0	Closed
52.D	Motor overload	1	Closed
52.E	Motor running direction right	0	Closed
52.F	Inverter overload	1	Closed
53.0	DC brake active	0	Closed
53.1	Inverter freq. less switch off limit	0	Closed
53.2	Inverter freq. less minimum freq.	0	Closed
53.3	Current greater or equal than limit	0	Closed
53.4	Act. freq. greater comparison freq.	0	Closed
53.5	Act. freq. less comparison freq.	0	Closed
53.6	Act. freq. greater/equal setpoint	0	Closed
53.7	Voltage less than threshold	0	Closed
53.8	Voltage greater than threshold	0	Closed
53.A	PID output at lower limit (P2292)	0	Closed
53.B	PID output at upper limit (P2291)	0	Closed

r0747 **CO/BO: State of digital outputs** Level: 3

Datatype: U16 Unit: - Min: -
P-Group: COMMANDS Def: -
Max: -

Displays status of digital outputs (also includes inversion of digital outputs via P0748).

Bitfields:

Bit00	Digital output 1 energized	0	NO
		1	YES

Dependency:

Bit 0 0 = relay de-energized / contacts open
1 = relay energized / contacts closed

P0748 **Invert digital outputs** Level: 3
CStat: CUT Datatype: U16 Unit: - Min: 0
P-Group: COMMANDS Active: Immediately QuickComm. No Def: 0
Max: 1

Defines high and low states of relay for a given function.

Bitfields:

Bit00	Invert digital output 1	0	NO
		1	YES

r0750 **Number of ADCs** Level: 3
Datatype: U16 Unit: - Min: -
Def: -
P-Group: TERMINAL Max: -

Displays number of analog inputs available.

r0751 **BO: Status word of ADC** Level: 4
Datatype: U16 Unit: - Min: -
Def: -
P-Group: TERMINAL Max: -

Displays status of analog input.

Bitfields:

Bit00	Signal lost on ADC 1	0	NO
		1	YES

r0752 **Act. input of ADC [V]** Level: 2
Datatype: Float Unit: - Min: -
Def: -
P-Group: TERMINAL Max: -

Displays smoothed analog input value in volts before the characteristic block.

P0753 **Smooth time ADC** Level: 3
CStat: CUT Datatype: U16 Unit: ms Min: 0
P-Group: TERMINAL Active: Immediately QuickComm. No Def: 3
Max: 10000

Defines filter time (PT1 filter) in [ms] for analog input.

Note:

Increasing this time (smooth) reduces jitter but slows down response to the analog input.

P0753 = 0 : No filtering

r0754 **Act. ADC value after scaling [%]** Level: 2
Datatype: Float Unit: % Min: -
Def: -
P-Group: TERMINAL Max: -

Shows smoothed value of analog input in [%] after scaling block.

Dependency:

P0757 to P0760 define range (ADC scaling)

r0755 **CO: Act. ADC after scal. [4000h]** Level: 2
Datatype: I16 Unit: - Min: -
Def: -
P-Group: TERMINAL Max: -

Displays analog input, scaled using ASPmin and ASPmax.

Analog setpoint (ASP) from the analog scaling block can vary from min. analog setpoint (ASPmin) to a max. analog setpoint (ASPmax) as shown in P0757 (ADC scaling).

The largest magnitude (value without sign) of ASPmin and ASPmax defines the scaling of 16384.

Example:

ASPmin = 300 %, ASPmax = 100 % then 16384 represents 300 %.
This parameter will vary from 5461 to 16364

ASPmin = -200 %, ASPmax = 100 % then 16384 represents 200 %.
This parameter will vary from -16384 to +8192

Note:

This value is used as an input to analog BICO connectors.

ASPmax represents the highest analog setpoint (this may be at 10 V)

ASPmin represents the lowest analog setpoint (this may be at 0 V)

Details:

See parameters P0757 to P0760 (ADC scaling)

P0756 **Type of ADC** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Defines type of analog input and also enables analog input monitoring.

Enum:

0 Unipolar voltage input (0 to +10 V)
1 Unipolar voltage input with monitoring (0 to 10 V)

Dependency:

Function disabled if analog scaling block programmed to output negative setpoints (see P0757 to P0760).

Notice:

When monitoring is enabled and a deadband defined (P0761), a fault condition will be generated (F0080) if the analog input voltage falls below 50 % of the deadband voltage.

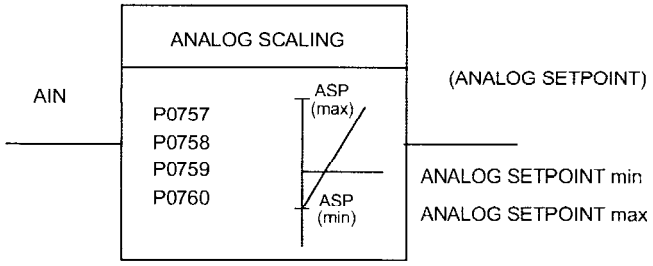
Details:

See P0757 to P0760 (ADC scaling).

P0757 **Value x1 of ADC scaling [V]** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	10

Parameters P0757 - P0760 configure the input scaling as shown in the diagram:



Where:
Analog setpoints represent a [%] of the normalized frequency in P2000.
Analog setpoints may be larger than 100 %
ASPmax represents highest analog setpoint (this may be at 10 V).
ASPmin represents lowest analog setpoint (this may be at 0 V).
Default values provide a scaling of 0 V = 0 %, and 10 V = 100 %.

P0758 **Value y1 of ADC scaling** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-99999.9
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	99999.9

Sets value of Y1 in [%] as described in P0757 (ADC scaling)

Dependency:

Affects P2000 to P2003 (reference frequency, voltage, current or torque) depending on which setpoint is to be generated.

P0759 **Value x2 of ADC scaling [V]** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	10
				Max:	10

Sets value of X2 as described in P0757 (ADC scaling)

P0760 **Value y2 of ADC scaling** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-99999.9
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	100.0
				Max:	99999.9

Sets value of Y2 in [%] as described in P0757 (ADC scaling)

Dependency:

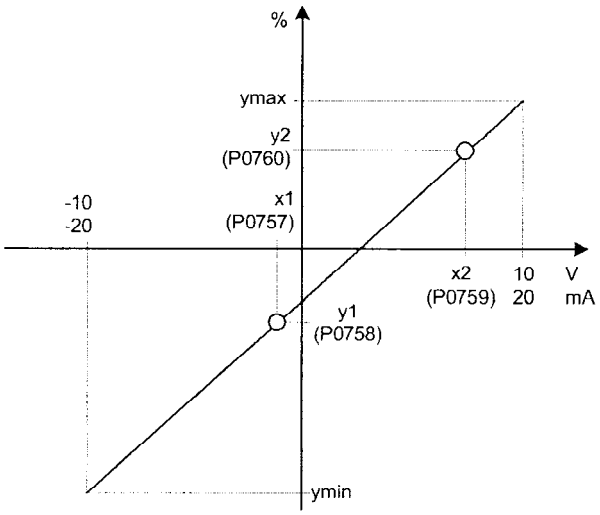
Affects P2000 to P2003 (reference frequency, voltage, current or torque) depending on which setpoint is to be generated.

P0761	**Width of ADC deadband [V]**			**Min:** 0	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** V	**Def:** 0	**2**
	P-Group: TERMINAL	**Active:** Immediately	**QuickComm.** No	**Max:** 10	

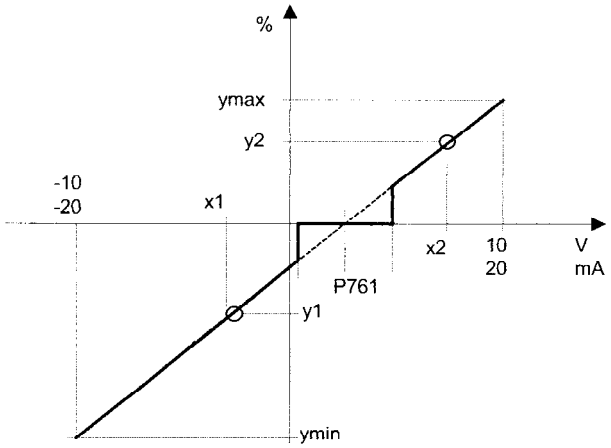
Defines width of deadband on analog input. The diagrams below explain its use

Example:

ADC value 2 to 10 V (0 to 50 Hz)
The above example produces a 2 to 10 V analog input (0 to 50 Hz)
P0757 = 2 V P0761 = 2 V P2000 = 50 Hz



ADC value 2 to 10 V (-50 to +50 Hz)
The above example produces a 2 to 10 V analog input (-50 to +50 Hz) with center zero and a "holding point" 0.2 V wide.
P0758 = -100 % P0761 = 0.1 (0.1 V to each side of center)



Note:

P0761[x] = 0 : No deadband active.

Notice:

Deadband starts from 0 V to value of P0761, if both values of P0758 and P0760 (y coordinates of ADC scaling) are positive or negative respectively. However, deadband is active in both directions from point of intersection (x axis with ADC scaling curve), if sign of P0758 and P0760 are opposite.

Fmin (P1080) should be zero when using center zero setup. There is no hysteresis at the end of the deadband.

P0762	**Delay for loss of signal action**			**Min:** 0	Level:
	CStat: CUT	**Datatype:** U16	**Unit:** ms	**Def:** 10	**3**
	P-Group: TERMINAL	**Active:** first confirm	**QuickComm.** No	**Max:** 10000	

Defines time delay between loss of analog setpoint and appearance of fault code F0080.

Note:

Expert users can choose the desired reaction to F0080 (default is OFF2).

r0770 **Number of DACs**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** - Level: 3

P-Group: TERMINAL

Displays number of analog outputs available.

P0771 **CI: DAC**

CStat: CUT **Datatype:** U32 **Unit:** - **Min:** 0:0 **Def:** 21:0 **Max:** 4000:0 Level: 2

P-Group: TERMINAL **Active:** Immediately **QuickComm.** No

Defines function of the 0 - 20 mA analog output.

Settings:

21 CO: Act. frequency (scaled to P2000)
24 CO: Act. output frequency (scaled to P2000)
25 CO: Act. output voltage (scaled to P2001)
26 CO: Act. DC-link voltage (scaled to P2001)
27 CO: Act. output current (scaled to P2002)

P0773 **Smooth time DAC**

CStat: CUT **Datatype:** U16 **Unit:** ms **Min:** 0 **Def:** 2 **Max:** 1000 Level: 3

P-Group: TERMINAL **Active:** Immediately **QuickComm.** No

Defines smoothing time [ms] for analog output signal. This parameter enables smoothing for DAC input using a PT1 filter.

Dependency:

P0773 = 0: Deactivates filter.

r0774 **Act. DAC value [mA]**

Datatype: Float **Unit:** - **Min:** - **Def:** - **Max:** - Level: 2

P-Group: TERMINAL

Shows value of analog output in [V] or [mA] after filtering and scaling.

P0776 **Type of DAC**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 0 Level: 4

P-Group: TERMINAL **Active:** Immediately **QuickComm.** No

Defines type of analog output.

Enum:

0 Current output

Note:

The analog output is designed as a current output with a range of 0...20 mA.

For a voltage output with a range of 0...10 V an external resistor of 500 Ohms has to be connected at the terminals

(12/13).

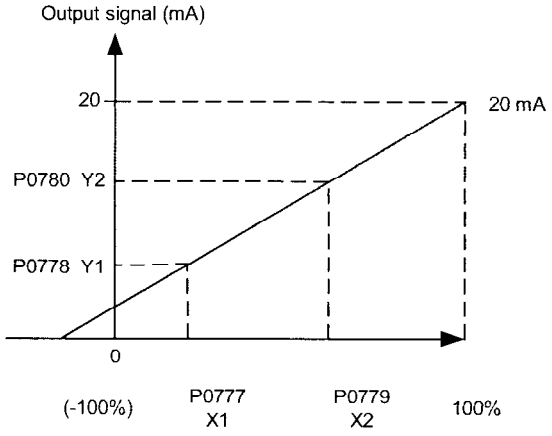
P0777 **Value x1 of DAC scaling**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-99999.0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	99999.0

Level: **2**

Defines x1 output characteristic in [%]. Scaling block is responsible for adjustment of output value defined in P0771 (DAC connector input).

Parameters of DAC scaling block (P0777 ... P0781) work as follows:



Where:
Points P1 (x1, y1) and P2 (x2, y2) can be chosen freely.

Example:
The default values of the scaling block provides a scaling of
P1: 0.0 % = 0 mA or 0 V and P2: 100.0 % = 20 mA or 20 V.

Dependency:
Affects P2000 to P2003 (referency frequency, voltage, current or torque) depending on which setpoint is to be generated.

P0778 **Value y1 of DAC scaling**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	20

Level: **2**

Defines y1 of output characteristic.

P0779 **Value x2 of DAC scaling**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-99999.0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	100.0
				Max:	99999.0

Level: **2**

Defines x2 of output characteristic in [%].

Dependency:
Affects P2000 to P2003 (referency frequency, voltage, current or torque) depending on which setpoint is to be generated.

P0780 **Value y2 of DAC scaling**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	20
				Max:	20

Level: **2**

Defines y2 of output characteristic.

P0781 **Width of DAC deadband**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0
P-Group:	TERMINAL	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	20

Level: **2**

Sets width of dead-band in [mA] for analog output.

P0800 **BI: Download parameter set 0**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: 3

Defines source of command to start download of parameter set 0 from attached AOP. The first three digits describe the parameter number of the command source, the last digit refers to the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

Note:

Signal of digital input:
0 = No download
1 = Start download parameter set 0 from AOP.

P0801 **BI: Download parameter set 1**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: 3

Defines sources of command to start download of parameter set 1 from attached AOP. The first three digits describe the parameter number of the command source, the last digit refers to the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

Note:

Signal of digital input:
0 = No download
1 = Start download parameter set 1 from AOP.

P0840 **BI: ON/OFF1**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	722:0
				Max:	4000:0

Level: 3

Allows ON/OFF1 command source to be selected using BICO. The first three digits describe the parameter number of the command source; the last digit denotes the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.0 = ON/OFF1 via BOP/AOP

Dependency:

Active only when P0719 = 0 (remote selection of command/setpoint source).

BICO requires P0700 set to 2 (enable BICO).

The default setting (ON right) is digital input 1 (722.0). Alternative source possible only when function of digital input 1 is changed (via P0701) before changing value of P0840.

P0842 **BI: ON/OFF1 reverse**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: 3

Allows ON/OFF1 reverse command source to be selected using BICO. The first three digits describe the parameter number of the command source and the last digit denotes the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.0 = ON/OFF1 via BOP/AOP

Dependency:

Active only when P0719 = 0 (remote selection of command/setpoint source).

P0844 **BI: 1. OFF2**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Level: **3**

Defines first source of OFF2 when P0719 = 0 (BICO). The first three digits describe the parameter number of the command source and the last digit denotes the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.0 = ON/OFF1 via BOP/AOP
19.1 = OFF2: Electrical stop via BOP/AOP

Dependency:

Active only when P0719 = 0 (remote selection of command/setpoint source).

If one of the digital inputs is selected for OFF2, the inverter will not run unless the digital input is active.

Note:

OFF2 means immediate pulse-disabling; the motor is coasting.

OFF2 is low-active, i.e. :
0 = Pulse disabling.
1 = Operating condition.

P0845 **BI: 2. OFF2**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	19:1
				Max:	4000:0

Level: **3**

Defines second source of OFF2. The first three digits describe the parameter number of the command source and the last digit denotes the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.0 = ON/OFF1 via BOP/AOP

Dependency:

In contrast to P0844 (first source of OFF2), this parameter is always active, independent of P0719 (selection of command and frequency setpoint).

If one of the digital inputs is selected for OFF2, the inverter will not run unless the digital input is active.

Note:

OFF2 means immediate pulse-disabling; the motor is coasting.

OFF2 is low-active, i.e. :
0 = Pulse disabling.
1 = Operating condition.

P0848 **BI: 1. OFF3**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Level: **3**

Defines first source of OFF3 when P0719 = 0 (BICO). The first three digits describe the parameter number of the command source and the last digit denotes the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.0 = ON/OFF1 via BOP/AOP

Dependency:

Active only when P0719 = 0 (remote selection of command/setpoint source).

If one of the digital inputs is selected for OFF3, the inverter will not run unless the digital input is active.

Note:

OFF3 means fast ramp-down to 0.

OFF3 is low-active, i.e.
0 = Ramp-down.
1 = Operating condition.

P0849 **BI: 2. OFF3**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Level: 3

Defines second source of OFF3. The first three digits describe the parameter number of the command source and the last digit denotes the bit setting for that parameter.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.0 = ON/OFF1 via BOP/AOP

Dependency:

In contrast to P0848 (first source of OFF3), this parameter is always active, independent of P0719 (selection of command and frequency setpoint).

If one of the digital inputs is selected for OFF3, the inverter will not run unless the digital input is active.

Note:

OFF3 means fast ramp-down to 0.

OFF3 is low-active, i.e.
0 = Ramp-down.
1 = Operating condition.

P0852 **BI: Pulse enable**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Level: 3

Defines source of pulse enable/disable signal.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

Dependency:

Active only when P0719 = 0 (remote selection of command/setpoint source).

P0918 **CB address**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	3
				Max:	65535

Level: 2

Defines address of CB (communication board) or address of the other option modules.

There are two ways to set the bus address:
1 via DIP switches on the PROFIBUS module
2 via a user-entered value

Note:

Possible PROFIBUS settings:
1 ... 125
0, 126, 127 are not allowed

The following applies when a PROFIBUS module is used:
DIP switch = 0 Address defined in P0918 (CB address) is valid
DIP switch not = 0 DIP switch setting has priority and P0918 indicates DIP switch setting.

P0927 **Parameter changeable via**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	15
				Max:	15

Level: 2

Specifies the interfaces which can be used to change parameters.

Example:

"b - - n n" (bits 0, 1, 2 and 3 set) in the default setting means that parameters can be changed via any interface.
"b - - r n" (bits 0, 1 and 3 set) would specify that parameters can be changed via PROFIBUS/CB, BOP and USS on COM link (RS485 USS) but not via USS on BOP link (RS232)

Bitfields:

Bit00	PROFIBUS / CB	0	NO
		1	YES
Bit01	BOP	0	NO
		1	YES
Bit02	USS on BOP link	0	NO
		1	YES
Bit03	USS on COM link	0	NO
		1	YES

Details:

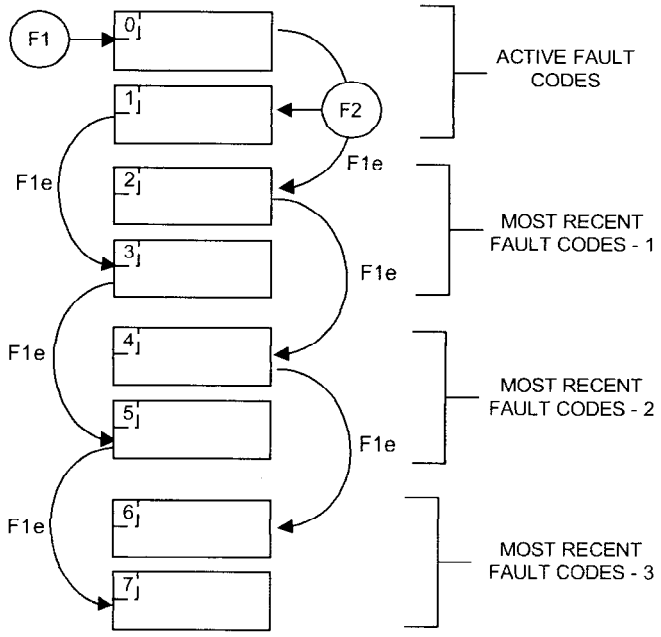
The seven-segment display is explained in the "Introduction to MICROMASTER System Parameters".

r0947[8]	Last fault code	Datatype: U16	Unit: -	Min: -	Level:
	P-Group: ALARMS			Def: -	2
				Max: -	

Displays fault history according to the diagram below

where:
"F1" is the first active fault (not yet acknowledged).
"F2" is the second active fault (not yet acknowledged).
"F1e" is the occurrence of the fault acknowledgement for F1 & F2.

This moves the value in the 2 indices down to the next pair of indices, where they are stored. Indices 0 & 1 contain the active faults. When faults are acknowledged, indices 0 & 1 are reset to 0.



Example:

If the inverter trips on undervoltage and then receives an external trip before the undervoltage is acknowledged, you will obtain:
Index 0 = 3 Undervoltage
Index 1 = 85 External trip

Whenever a fault in index 0 is acknowledged (F1e), the fault history shifts as indicated in the diagram above.

Index:

r0947[0] : Recent fault trip --, fault 1
r0947[1] : Recent fault trip --, fault 2
r0947[2] : Recent fault trip -1, fault 3
r0947[3] : Recent fault trip -1, fault 4
r0947[4] : Recent fault trip -2, fault 5
r0947[5] : Recent fault trip -2, fault 6
r0947[6] : Recent fault trip -3, fault 7
r0947[7] : Recent fault trip -3, fault 8

Dependency:

Index 2 used only if second fault occurs before first fault is acknowledged.

Details:

See fault codes in Operating Instructions Manual.

r0948[12] **Fault time** Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3
P-Group: ALARMS

Time stamp to indicate when the fault has occurred. P2114 (run-time counter) or P2115 (real time clock) are the possible sources of the time stamp.

Example:

The time is taken from P2115 if this parameter has been updated with the real time. If not, P2114 is used.

Index:

r0948[0] : Recent fault trip --, fault time seconds+minutes
r0948[1] : Recent fault trip --, fault time hours+days
r0948[2] : Recent fault trip --, fault time month+year
r0948[3] : Recent fault trip -1, fault time seconds+minutes
r0948[4] : Recent fault trip -1, fault time hours+days
r0948[5] : Recent fault trip -1, fault time month+year
r0948[6] : Recent fault trip -2, fault time seconds+minutes
r0948[7] : Recent fault trip -2, fault time hours+days
r0948[8] : Recent fault trip -2, fault time month+year
r0948[9] : Recent fault trip -3, fault time seconds+minutes
r0948[10] : Recent fault trip -3, fault time hours+days
r0948[11] : Recent fault trip -3, fault time month+year

Note:

P2115 can be updated via AOP, Starter, DriveMonitor, etc.

r0949[8] **Fault value** Datatype: U16 Unit: - Min: - Def: - Max: - Level: 4
P-Group: ALARMS

Displays drive fault values.

Index:

r0949[0] : Recent fault trip --, fault value 1
r0949[1] : Recent fault trip --, fault value 2
r0949[2] : Recent fault trip -1, fault value 3
r0949[3] : Recent fault trip -1, fault value 4
r0949[4] : Recent fault trip -2, fault value 5
r0949[5] : Recent fault trip -2, fault value 6
r0949[6] : Recent fault trip -3, fault value 7
r0949[7] : Recent fault trip -3, fault value 8

P0952 **Total number of faults** Min: 0 Def: 0 Max: 8 Level: 3
CStat: CT Datatype: U16 Unit: - QuickComm. No
P-Group: ALARMS Active: Immediately

Displays number of faults stored in P0947 (last fault code)

Dependency:

Setting 0 resets fault history (changing to 0 also resets parameter P0948 - fault time).

r0964[5] **Firmware version data** Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3
P-Group: COMM

Firmware version data.

Example:

r0964[0] = 42 "SIEMENS"
r0964[1] = 1001 "MICROMASTER 420"
1002 "MICROMASTER 440"
1003 "MICRO- / COMBIMASTER 411"
1004 "MICROMASTER 410"
1005 "Reserved"
r0964[4] = 507 means 5th July.

Index:

r0964[0] : Company (Siemens = 42)
r0964[1] : Product type
r0964[2] : Firmware version
r0964[3] : Firmware date (year)
r0964[4] : Firmware date (day/month)

r0965 **Profibus profile** Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3
P-Group: COMM

Identification for PROFIDrive. Profile number and version.

r0967	Control word 1			Min: -	Level:
		Datatype: U16	Unit: -	Def: -	3
	P-Group: COMM			Max: -	

Displays control word 1.

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

r0968	Status word 1			Min: -	Level:
		Datatype: U16	Unit: -	Def: -	3
	P-Group: COMM			Max: -	

Displays active status word of inverter (in binary) and can be used to diagnose which commands are active.

Bitfields:

Bit00	Drive ready	0	NO
		1	YES
Bit01	Drive ready to run	0	NO
		1	YES
Bit02	Drive running	0	NO
		1	YES
Bit03	Drive fault active	0	NO
		1	YES
Bit04	OFF2 active	0	YES
		1	NO
Bit05	OFF3 active	0	YES
		1	NO
Bit06	ON inhibit active	0	NO
		1	YES
Bit07	Drive warning active	0	NO
		1	YES
Bit08	Deviation setp. / act. value	0	YES
		1	NO
Bit09	PZD control	0	NO
		1	YES
Bit10	Maximum frequency reached	0	NO
		1	YES
Bit11	Warning: Motor current limit	0	YES
		1	NO
Bit12	Motor holding brake active	0	NO
		1	YES
Bit13	Motor overload	0	YES
		1	NO
Bit14	Motor runs direction right	0	NO
		1	YES
Bit15	Inverter overload	0	YES
		1	NO

P0970 **Factory reset** Level: **1**

CStat:	C	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	PAR_RESET	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

P0970 = 1 resets all parameters to their default values.

Enum:

0 Disabled
1 Parameter reset

Dependency:

First set P0010 = 30 (factory settings)

Stop drive (i.e. disable all pulses) before you can reset parameters to default values.

Note:

The following parameters retain their values after a factory reset:
P0918 (CB address),
P2010 (USS baud rate) and
P2011 (USS address)

P0971 **Transfer data from RAM to EEPROM** Level: **3**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Transfers values from RAM to EEPROM when set to 1.

Enum:

0 Disabled
1 Start transfer

Note:

All values in RAM are transferred to EEPROM.

Parameter is automatically reset to 0 (default) after successful transfer.

P1000 **Selection of frequency setpoint** Level: 1

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** Yes	**Def:**	2
				Max:	66

Selects frequency setpoint source. In the table of possible settings below, the main setpoint is selected from the least significant digit (i.e., 0 to 6) and any additional setpoint from the most significant digit (i.e., x0 through to x6).

Example:

Setting 12 selects main setpoint (2) derived from analog input with additional setpoint (1) taken from the motor potentiometer.

Settings:

1 Motor potentiometer setpoint
2 Analog input
3 Fixed frequency setpoint
4 USS on BOP link
5 USS on COM link
6 Communication board (CB) on COM link

Other settings including an additional setpoint can be selected using the table above.

Enum:

0	No main setpoint
1	MOP setpoint
2	Analog setpoint
3	Fixed frequency
4	USS on BOP link
5	USS on COM link
6	CB on COM link
10	No main setpoint + MOP setpoint
11	MOP setpoint + MOP setpoint
12	Analog setpoint + MOP setpoint
13	Fixed frequency + MOP setpoint
14	USS on BOP link + MOP setpoint
15	USS on COM link + MOP setpoint
16	CB on COM link + MOP setpoint
20	No main setpoint + Analog setpoint
21	MOP setpoint + Analog setpoint
22	Analog setpoint + Analog setpoint
23	Fixed frequency + Analog setpoint
24	USS on BOP link + Analog setpoint
25	USS on COM link + Analog setpoint
26	CB on COM link + Analog setpoint
30	No main setpoint + Fixed frequency
31	MOP setpoint + Fixed frequency
32	Analog setpoint + Fixed frequency
33	Fixed frequency + Fixed frequency
34	USS on BOP link + Fixed frequency
35	USS on COM link + Fixed frequency
36	CB on COM link + Fixed frequency
40	No main setpoint + USS on BOP link
41	MOP setpoint + USS on BOP link
42	Analog setpoint + USS on BOP link
43	Fixed frequency + USS on BOP link
44	USS on BOP link + USS on BOP link
45	USS on COM link + USS on BOP link
46	CB on COM link + USS on BOP link
50	No main setpoint + USS on COM link
51	MOP setpoint + USS on COM link
52	Analog setpoint + USS on COM link
53	Fixed frequency + USS on COM link
54	USS on BOP link + USS on COM link
55	USS on COM link + USS on COM link
56	CB on COM link + USS on COM link
60	No main setpoint + CB on COM link
61	MOP setpoint + CB on COM link
62	Analog setpoint + CB on COM link
63	Fixed frequency + CB on COM link
64	USS on BOP link + CB on COM link
65	USS on COM link + CB on COM link
66	CB on COM link + CB on COM link

Note:

Single digits denote main setpoints that have no additional setpoint.

P1001 **Fixed frequency 1**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 1.

There are 3 types of fixed frequencies:
1. Direct selection
2. Direct selection + ON command
3. Binary coded selection + ON command

1. Direct selection (P0701 - P0703 = 15)
In this mode of operation 1 digital input selects 1 fixed frequency.
If several inputs are active together, the selected frequencies are summed.
E.g.: FF1 + FF2 + FF3.
2. Direct selection + ON command (P0701 - P0703 = 16)
The fixed frequency selection combines the fixed frequencies with an ON command.
In this mode of operation 1 digital input selects 1 fixed frequency.
If several inputs are active together, the selected frequencies are summed.
E.g.: FF1 + FF2 + FF3.
3. Binary coded selection + ON command (P0701 - P0703 = 17)
Up to 7 fixed frequencies can be selected using this method. The fixed frequencies are selected according to the following table:

		DIN3	DIN2	DIN1
	OFF	Inactive	Inactive	Inactive
P1001	FF1	Inactive	Inactive	Active
P1002	FF2	Inactive	**Active**	Inactive
P1003	FF3	Inactive	**Active**	**Active**
P1004	FF4	**Active**	Inactive	Inactive
P1005	FF5	**Active**	Inactive	**Active**
P1006	FF6	**Active**	**Active**	Inactive
P1007	FF7	**Active**	**Active**	**Active**

Dependency:
Select fixed frequency operation (using P1000).

Inverter requires ON command to start in the case of direct selection (P0701 - P0706 = 15)

Note:
Fixed frequencies can be selected using the digital inputs, and can also be combined with an ON command.

P1002 **Fixed frequency 2**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	5.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 2.

Details:
See parameter P1001 (fixed frequency 1).

P1003 **Fixed frequency 3**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	10.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 3.

Details:
See parameter P1001 (fixed frequency 1).

P1004 **Fixed frequency 4**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	15.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 4.

Details:
See parameter P1001 (fixed frequency 1).

P1005 **Fixed frequency 5**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	20.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 5.

Details:
See parameter P1001 (fixed frequency 1).

P1006 **Fixed frequency 6**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	25.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 6.

Details:
See parameter P1001 (fixed frequency 1).

P1007 **Fixed frequency 7**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	30.00
				Max:	650.00

Level: **2**

Defines fixed frequency setpoint 7.

Details:
See parameter P1001 (fixed frequency 1).

P1016 **Fixed frequency mode - Bit 0**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	3

Level: **3**

Fixed frequencies can be selected in three different modes. Parameter P1016 defines the mode of selection Bit 0.

Enum:
1 Direct selection
2 Direct selection + ON command
3 Binary coded selection + ON command

Details:
See table in P1001 (fixed frequency 1) for description of how to use fixed frequencies.

P1017 **Fixed frequency mode - Bit 1**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	3

Level: **3**

Fixed frequencies can be selected in three different modes. Parameter P1017 defines the mode of selection Bit 1.

Enum:
1 Direct selection
2 Direct selection + ON command
3 Binary coded selection + ON command

Details:
See table in P1001 (fixed frequency 1) for description of how to use fixed frequencies.

P1018 **Fixed frequency mode - Bit 2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	3

Level: **3**

Fixed frequencies can be selected in three different modes. Parameter P1018 defines the mode of selection Bit 2.

Enum:
1 Direct selection
2 Direct selection + ON command
3 Binary coded selection + ON command

Details:
See table in P1001 (fixed frequency 1) for description of how to use fixed frequencies.

P1020 **BI: Fixed freq. selection Bit 0**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: **3**

Defines origin of fixed frequency selection.

Settings:
P1020 = 722.0 ==> Digital input 1
P1021 = 722.1 ==> Digital input 2
P1022 = 722.2 ==> Digital input 3

Dependency:
Accessible only if P0701 - P0703 = 99 (function of digital inputs = BICO)

P1021 **BI: Fixed freq. selection Bit 1**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: **3**

Defines origin of fixed frequency selection.

Dependency:
Accessible only if P0701 - P0703 = 99 (function of digital inputs = BICO)

Details:
See P1020 (fixed frequency selection Bit 0) for most common settings

P1022 **BI: Fixed freq. selection Bit 2** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Defines origin of fixed frequency selection.

Dependency:

Accessible only if P0701 - P0703 = 99 (function of digital inputs = BICO)

Details:

See P1020 (fixed frequency selection Bit 0) for most common settings

r1024 **CO: Act. fixed frequency** Level: 3

		Datatype: Float	**Unit:** Hz	**Min:**	-
P-Group:	SETPOINT			**Def:**	-
				Max:	-

Displays sum total of selected fixed frequencies.

P1031 **Setpoint memory of the MOP** Level: 2

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	0
				Max:	1

Saves last motor potentiometer setpoint (MOP) that was active before OFF command or power down.

Enum:

0 PID-MOP setpoint will not be stored
1 PID-MOP setpoint will be stored (P2240 is updated)

Note:

On next ON command, motor potentiometer setpoint will be the saved value in parameter P1040 (setpoint of the MOP).

P1032 **Inhibit reverse direction of MOP** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	1

Inhibits reverse setpoint selection

Enum:

0 Reserve direction is allowed
1 Reserve direction inhibited

Dependency:

Motor potentiometer (P1040) must be chosen as main setpoint or additional setpoint (using P1000).

Note:

It is possible to change motor direction using the motor potentiometer setpoint (increase / decrease frequency either by using digital inputs or BOP/AOP keypad up / down).

P1035 **BI: Enable MOP (UP-command)** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	19:13
				Max:	4000:0

Defines source for motor potentiometer setpoint increase frequency.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.D = MOP up via BOP/AOP

P1036 **BI: Enable MOP (DOWN-command)** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	19:14
				Max:	4000:0

Defines source for motor potentiometer setpoint decrease frequency.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.E = MOP down via BOP/AOP

P1040 **Setpoint of the MOP** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	5.00
				Max:	650.00

Determines setpoint for motor potentiometer control (P1000 = 1).

Note:

If motor potentiometer setpoint is selected either as main setpoint or additional setpoint, the reverse direction will be inhibited by default of P1032 (inhibit reverse direction of MOP).

To re-enable reverse direction, set P1032 = 0.

r1050 **CO: Act. Output freq. of the MOP** Level: 3

Datatype: Float Unit: Hz Min: - Def: - Max: -

P-Group: SETPOINT

Displays output frequency of motor potentiometer setpoint ([Hz]).

P1055 **BI: Enable JOG right** Level: 3

CStat: CT Datatype: U32 Unit: - Min: 0:0 Def: 0:0 Max: 4000:0

P-Group: COMMANDS Active: Immediately QuickComm. No

Defines source of JOG right when P0719 = 0 (remote selection of command/setpoint source).

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.8 = JOG right via BOP/AOP

P1056 **BI: Enable JOG left** Level: 3

CStat: CT Datatype: U32 Unit: - Min: 0:0 Def: 0:0 Max: 4000:0

P-Group: COMMANDS Active: Immediately QuickComm. No

Defines source of JOG left when P0719 = 0 (remote selection of command/setpoint source).

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.9 = JOG left via BOP/AOP

P1058 **JOG frequency right** Level: 2

CStat: CUT Datatype: Float Unit: Hz Min: 0.00 Def: 5.00 Max: 650.00

P-Group: SETPOINT Active: first confirm QuickComm. No

Jogging advances the motor speed by small amounts. The JOG buttons uses a non-latching switch on one of the digital inputs to control the motor speed.

While JOG right is selected, this parameter determines the frequency at which the inverter will run.

Dependency:

P1060 and P1061 set up and down ramp times respectively for jogging.

P1059 **JOG frequency left** Level: 2

CStat: CUT Datatype: Float Unit: Hz Min: 0.00 Def: 5.00 Max: 650.00

P-Group: SETPOINT Active: first confirm QuickComm. No

While JOG left is selected, this parameter determines the frequency at which the inverter will run.

Dependency:

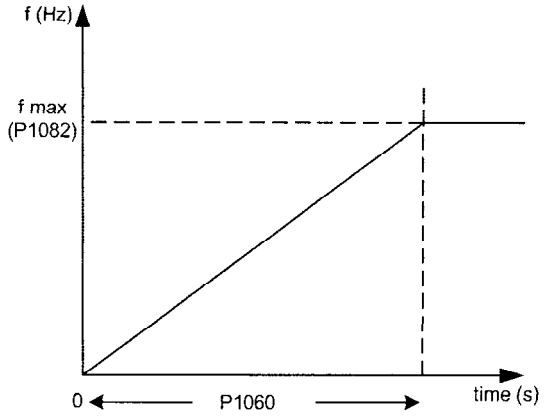
P1060 and P1061 set up and down ramp times respectively for jogging.

P1060 **JOG ramp-up time** Level: 2

CStat: CUT Datatype: Float Unit: s Min: 0.00 Def: 10.00 Max: 650.00

P-Group: SETPOINT Active: Immediately QuickComm. No

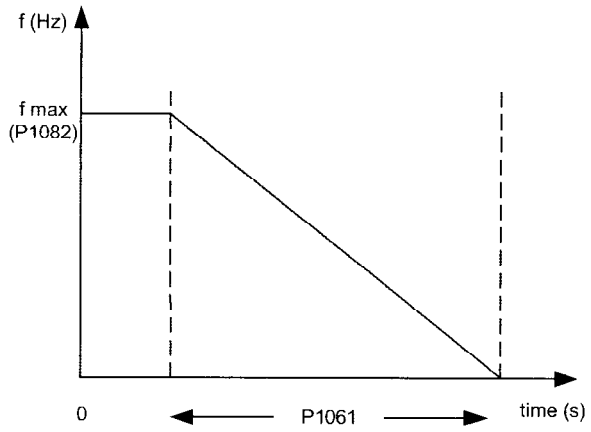
Sets ramp-up time. This is the time used while jogging or when P1124 (enable JOG ramp times) is active.



P1061 **JOG ramp-down time** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	10.00
				Max:	650.00

Sets ramp-down time. This is the time used while jogging or when P1124 (enable JOG ramp times) is active.



P1070 **CI: Main setpoint** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	755:0
				Max:	4000:0

Defines source of main setpoint.

Settings:

755 = Analog input 1 setpoint
1024 = Fixed frequency setpoint
1050 = Motor potentiometer (MOP) setpoint

P1071 **CI: Main setpoint scaling** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Defines source of the main setpoint scaling.

Settings:

755 = Analog input 1 setpoint
1024 = Fixed frequency setpoint
1050 = Motor potentiometer (MOP) setpoint

P1074 **BI: Disable additional setpoint** Level: 3

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Disables additional setpoint

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

P1075 **CI: Additional setpoint** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Defines source of the additional setpoint (to be added to main setpoint).

Settings:

755 = Analog input 1 setpoint
1024 = Fixed frequency setpoint
1050 = Motor potentiometer (MOP) setpoint

P1076 **CI: Additional setpoint scaling** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Defines source of scaling for additional setpoint (to be added to main setpoint).

Settings:

1 = Scaling of 1.0 (100%)
755 = Analog input 1 Setpoint
1024 = Fixed Frequency Setpoint
1050 = MOP Setpoint

r1078 **CO: Total frequency setpoint** Level: 3

Datatype: Float **Unit:** Hz **Min:** - **Def:** - **Max:** -

P-Group: SETPOINT

Displays sum of main and additional setpoints in [Hz].

r1079 **CO: Selected frequency setpoint** Level: 3

Datatype: Float **Unit:** Hz **Min:** - **Def:** - **Max:** -

P-Group: SETPOINT

Displays selected frequency setpoint.

Following frequency setpoints are displayed:
Total frequency setpoint r1078
JOG frequency right P1058
JOG frequency left P1059

Dependency:

P1055 (BI: Enable JOG right) or P1056 (BI: Enable JOG left) define command source of JOG right or JOG left respectively.

Note:

P1055 = 0 and P1056 = 0 ==> Total frequency setpoint is selected.

P1080 **Min. frequency** Level: 1

CStat: CUT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Def:** 0.00

P-Group: SETPOINT **Active:** first confirm **QuickComm.** Yes **Max:** 650.00

Sets minimum motor frequency [Hz] at which motor will run irrespective of frequency setpoint.

Note:

Value set here is valid both for clockwise and for anticlockwise rotation.

Under certain conditions (e.g. ramping, current limiting), motor can run below minimum frequency.

P1082 **Max. frequency** Level: 1

CStat: CT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Def:** 50.00

P-Group: SETPOINT **Active:** Immediately **QuickComm.** Yes **Max:** 650.00

Sets maximum motor frequency [Hz] at which motor will run irrespective of the frequency setpoint.

Note:

The value set here is valid for both clockwise and anticlockwise rotation.

The maximum output frequency of inverter can be exceeded if one of the following is active:

Slip compensation = $f_{max} + f_{slipcomp\,max}$

or

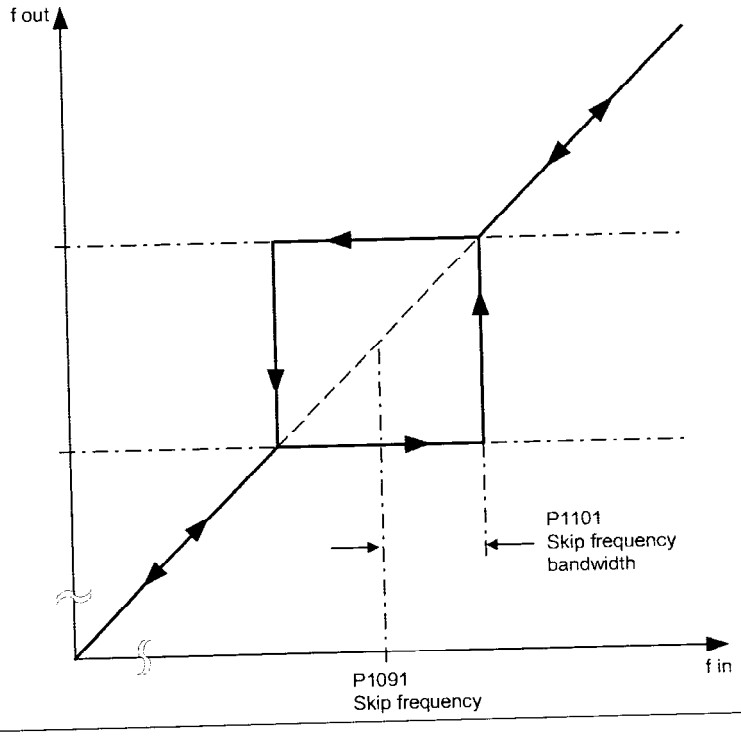
Flying restart = $f_{max} + f_{slipnom}$

Notice:

Maximum motor speed is subject to mechanical limitations.

P1091 **Skip frequency 1**
CStat: CUT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Level:** 3
P-Group: SETPOINT **Active:** first confirm **QuickComm.** No **Def:** 0.00 **Max:** 650.00

Defines skip frequency 1 which avoids effects of mechanical resonance and suppresses frequencies within +/- P1101 (skip frequency bandwidth).



Notice:
Stationary operation is not possible within the suppressed frequency range; the range is merely passed through (on the ramp).

For example, if P1091 = 10 Hz and P1101 = 2 Hz, it is not possible to operate continuously between 10 Hz +/- 2 Hz (i.e. between 8 and 12 Hz).

P1092 **Skip frequency 2**
CStat: CUT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Level:** 3
P-Group: SETPOINT **Active:** first confirm **QuickComm.** No **Def:** 0.00 **Max:** 650.00

Defines skip frequency 2 which avoids effects of mechanical resonance and suppresses frequencies within +/- P1101 (skip frequency bandwidth).

Details:
See P1091 (skip frequency 1).

P1093 **Skip frequency 3**
CStat: CUT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Level:** 3
P-Group: SETPOINT **Active:** first confirm **QuickComm.** No **Def:** 0.00 **Max:** 650.00

Defines skip frequency 3 which avoids effects of mechanical resonance and suppresses frequencies within +/- P1101 (skip frequency bandwidth).

Details:
See P1091 (skip frequency 1).

P1094 **Skip frequency 4**
CStat: CUT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Level:** 3
P-Group: SETPOINT **Active:** first confirm **QuickComm.** No **Def:** 0.00 **Max:** 650.00

Defines skip frequency 4 which avoids effects of mechanical resonance and suppresses frequencies within +/- P1101 (skip frequency bandwidth).

Details:
See P1091 (skip frequency 1).

P1101 **Skip frequency bandwidth** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	2.00
				Max:	10.00

Delivers frequency bandwidth to be applied to skip frequencies (in [Hz]).

Details:

See P1091 (skip frequency 1).

P1110 **BI: Inhibit neg. freq. setpoint** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Inhibits direction reversal, thus preventing a negative setpoint from causing motor from running in reverse. Instead, it will run at minimum frequency (P1080) in the normal direction.

Settings:

0 = Disabled
1 = Enabled

Note:

It is possible to disable all reverse commands (i.e. the command is ignored). To do this, set P0719 = 0 (remote selection of command/setpoint source) and define the command sources (P1113) individually.

Notice:

This function does not disable the "reverse" command function; rather, a reverse command causes motor to run in the normal direction as described above.

P1113 **BI: Reverse** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	722:1
				Max:	4000:0

Defines source of reverse command used when P0719 = 0 (remote selection of command/setpoint source).

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

19.B = Reverse via BOP/AOP

r1114 **CO: Freq. setp. after dir. ctrl.** Level: 3

		Datatype: Float	**Unit:** Hz	**Min:**	-
P-Group:	SETPOINT			**Def:**	-
				Max:	-

Displays setpoint frequency after change of direction

r1119 **CO: Freq. setpoint before RFG** Level: 3

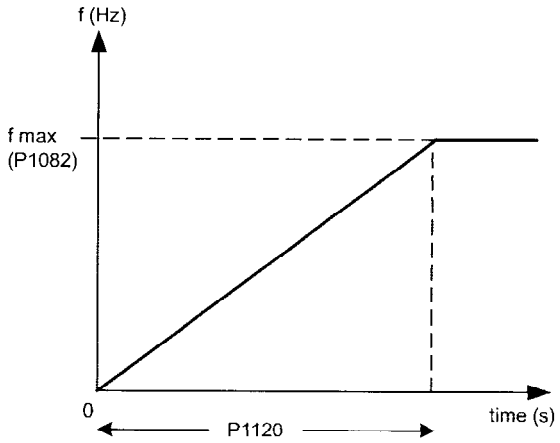
		Datatype: Float	**Unit:** Hz	**Min:**	-
P-Group:	SETPOINT			**Def:**	-
				Max:	-

Displays output frequency after modification by other functions, e.g. BI: Inhibit neg. freq. setpoint (P1110) or skip frequencies, f_min, f_max, limitations, etc.

P1120 **Ramp-up time** Level: 1

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** Yes	**Def:**	10.00
				Max:	650.00

Time taken for motor to accelerate from standstill up to maximum motor frequency (P1082) when no rounding is used.



Setting the ramp-up time too short can cause the inverter to trip (overcurrent).

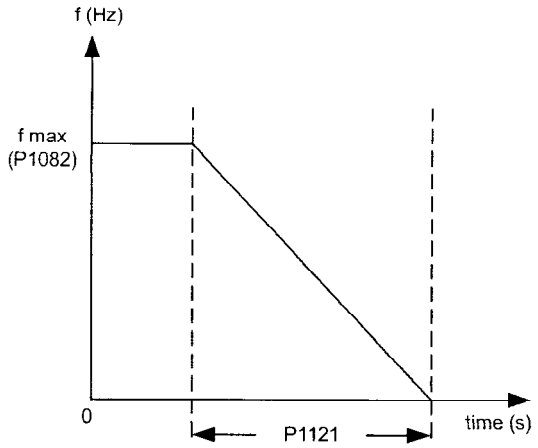
Note:

If an external frequency setpoint with set ramp rates is used (e.g. from a PLC), the best way to achieve optimum drive performance is to set ramp times in P1120 and P1121 slightly shorter than those of the PLC.

P1121 **Ramp-down time** Level: 1

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** Yes	**Def:**	10.00
				Max:	650.00

Time taken for motor to decelerate from maximum motor frequency (P1082) down to standstill when no rounding is used.



Notice:

Setting the ramp-down time too short can cause the inverter to trip (overcurrent (F0001) / overvoltage (F0002)).

P1124 **BI: Enable JOG ramp times** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Defines source for switching between jog ramp times and normal ramp times as applied to the RFG.

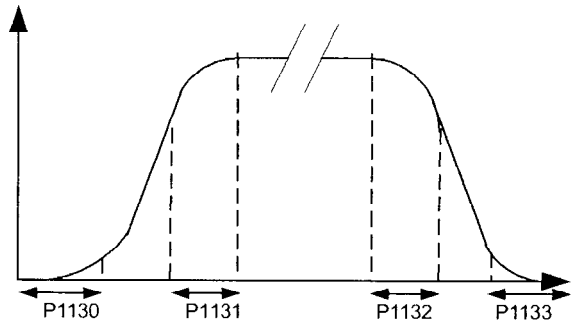
Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

P1130 **Ramp-up initial rounding time** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines initial rounding time in seconds as shown on the diagram below.



where:

$$T_{up\ total} = \frac{1}{2}P1130 + X * P1120 + \frac{1}{2}P1131$$

$$T_{down\ total} = \frac{1}{2}P1130 + X * P1121 + \frac{1}{2}P1133$$

X is defined as $\Delta f = X * fmax$

i.e. X is the ratio between the frequency step and fmax

Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1131 **Ramp-up final rounding time** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines rounding time at end of ramp-up as shown in P1130 (ramp-up initial rounding time).

Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1132 **Ramp-down initial rounding time** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines rounding time at start of ramp-down as shown in P1130 (ramp-up initial rounding time).

Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1133 **Ramp-down final rounding time** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines rounding time at end of ramp-down as shown in P1130 (ramp-up initial rounding time).

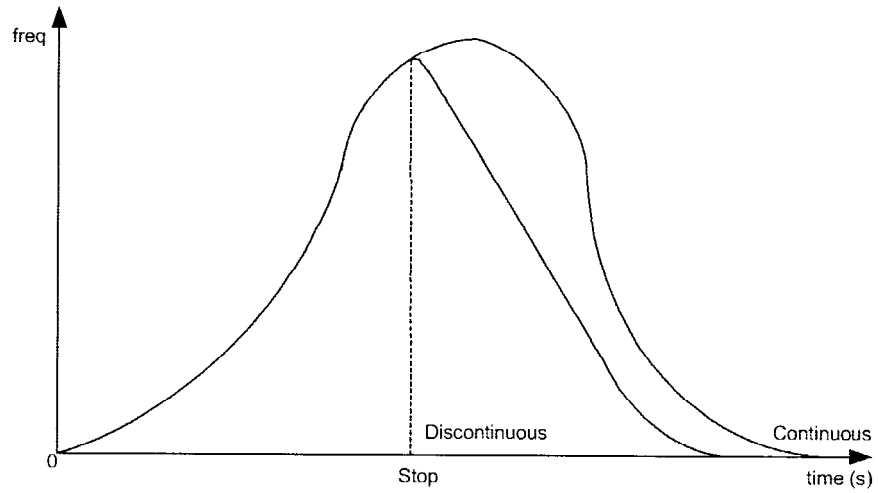
Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1134 **Rounding type** Level: 2

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** first confirm	**QuickComm.** No	**Def:**	0
				Max:	1

Defines smoothing response to OFF commands or setpoint reduction.



Enum:

0 Continuous smoothing
1 Discontinuous smoothing

Dependency:

No effect until total rounding time (P1130) > 0 s.

Notice:

Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1135 **OFF3 ramp-down time** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** Yes	**Def:**	5.00
				Max:	650.00

Defines ramp-down time from maximum frequency to standstill for OFF3 command.

Note:

This time may be exceeded if the VDC_max. level is reached.

P1140 **BI: RFG enable** Level: 4

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Defines command source of RFG enable command (RFG: ramp function generator).

P1141 **BI: RFG start** Level: 4

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Defines command source of RFG start command (RFG: ramp function generator).

P1142 **BI: RFG enable setpoint** Level: 4

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Defines command source of RFG enable setpoint command (RFG: ramp function generator).

r1170 **CO: Frequency setpoint after RFG** Level: 3

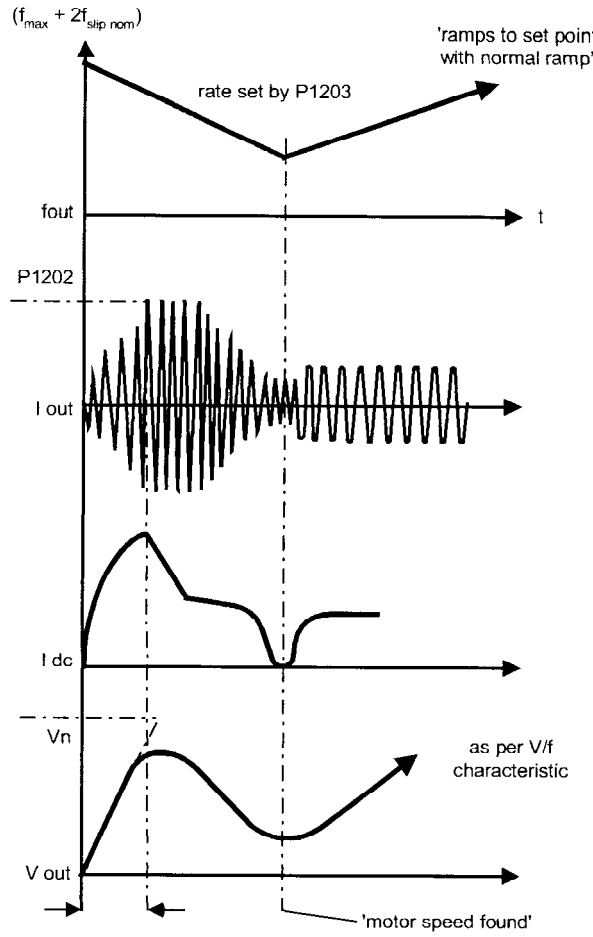
		Datatype: Float	**Unit:** Hz	**Min:**	-
P-Group:	SETPOINT			**Def:**	-
				Max:	-

Displays overall frequency setpoint after ramp generator.

P1200 **Flying start**

						Level:
CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0	2
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0	
				Max:	6	

Starts inverter onto a spinning motor by rapidly changing the output frequency of the inverter until the actual motor speed has been found. Then, the motor runs up to setpoint using the normal ramp time.



Enum:

0	Flying start disabled
1	Flying start is always active, start in direction of setpoint
2	Flying start is active if power on, fault, OFF2, start in direction of setpoint
3	Flying start is active if fault, OFF2, start in direction of setpoint
4	Flying start is always active, only in direction of setpoint
5	Flying start is active if power on, fault, OFF2, only in direction of setpoint
6	Flying start is active if fault, OFF2, only in direction of setpoint

Note:

Useful for motors with high inertia loads.

Settings 1 to 3 search in both directions.
Settings 4 to 6 search only in direction of setpoint.

Notice:

Flying start must be used in cases where the motor may still be turning (e.g. after a short mains break) or can be driven by the load. Otherwise, overcurrent trips will occur.

P1202 **Motor-current: Flying start**

						Level:
CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	10	3
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	100	
				Max:	200	

Defines search current used for flying start.

Value is in [%] based on rated motor current (P0305).

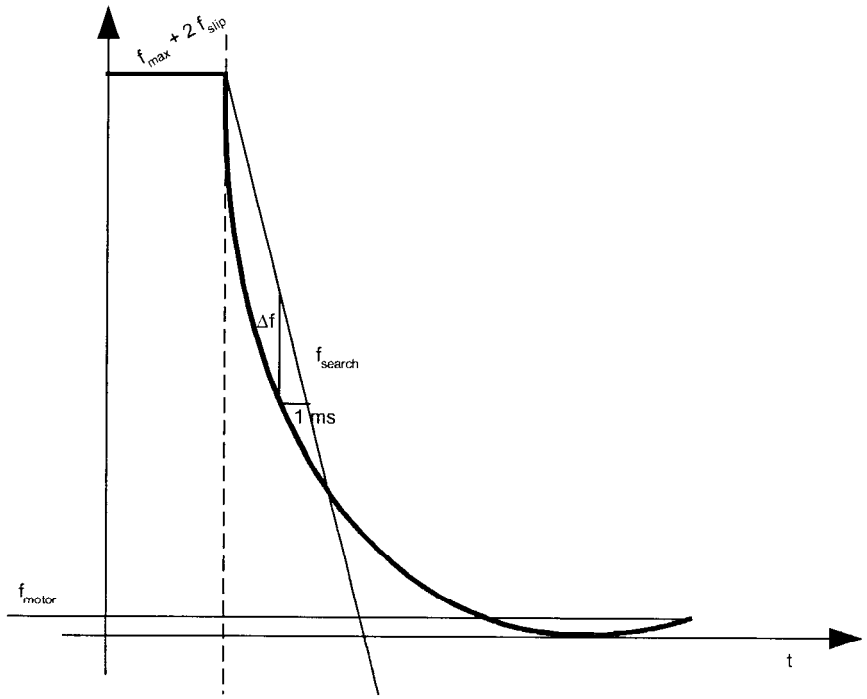
Note:

Reducing the search current may improve performance for flying start if the inertia of the system is not very high.

P1203 **Search rate: Flying start**

						Level:
CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	10	3
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	100	
				Max:	200	

Sets factor by which the output frequency changes during flying start to synchronize with turning motor. This value is entered in [%] relative to the default time factor defines the initial gradient in the curve below (and thus influences the time taken to search for the motor frequency):



$$\Delta f = \frac{100\%}{P1203} * 2\% f_{slip}$$

The search time is the time taken to search through all frequencies between f_max + 2 x f_slip to 0 Hz.

P1203 = 100 % is defined as giving a rate of 2 % of f_slip,nom / [ms]
P1203 = 200 % would result in a rate of frequency change of 1 % of f_slip,nom / [ms]

Example:

For a motor with 50 Hz, 1350 rpm, 100 % would produce a maximum search time of 600 ms. If the motor is turning, the motor frequency is found in a shorter time.

Note:

A higher value produces a flatter gradient and thus a longer search time.
A lower value has the opposite effect.

r1204 **Status word: Flying start**

						Level:
		Datatype: U16	**Unit:** -	**Min:**	-	4
P-Group:	FUNC			**Def:**	-	
				Max:	-	

Bit parameter for checking and monitoring states during search.

Bitfields:

Bit00	Current applied	0	NO
		1	YES
Bit01	Current could not be applied	0	NO
		1	YES
Bit02	Voltage reduced	0	NO
		1	YES
Bit03	Slope-filter started	0	NO
		1	YES
Bit04	Current less threshold	0	NO
		1	YES
Bit05	Current-minimum	0	NO
		1	YES
Bit07	Speed could not be found	0	NO
		1	YES

P1210 **Automatic restart**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	5

Level: **2**

Enables restart after a mains break or after a fault.

Enum:

0 Disabled
1 Trip reset after power on: P1211 disabled
2 Restart mains break; power on: P1211 disabled
3 Restart after fault/mains break: P1211 enabled
4 Restart after mains break: P1211 enabled
5 Restart mains break/fault/power on: P1211 disabled

Dependency:

Auto restart requires constant ON command (e.g. via a digital input wire link).

Caution1:

Settings 2 to 5 can cause the motor to restart unexpectedly !

Notice:

Flying start must be used in cases where the motor may still be turning (e.g. after a short mains break) or can be driven by the load (P1200).

P1211 **Number of restart attempts**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	3
				Max:	10

Level: **3**

Specifies number of times inverter will attempt to restart if P1210 (flying start) is activated.

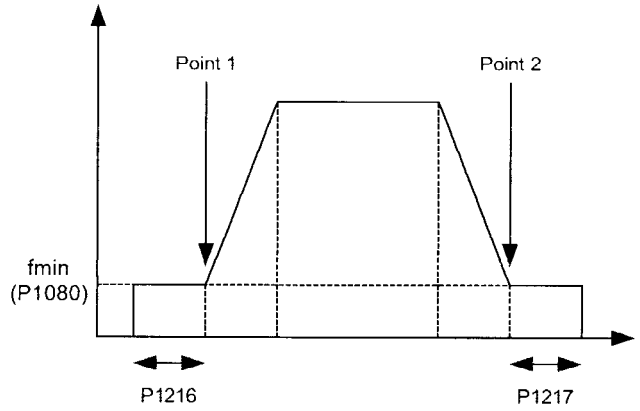
P1215 **Holding brake enable**

CStat:	T	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Level: **2**

Enables/disables holding brake function. This function applies the following profile to the inverter:

Relay switching is also possible at point 1 and point 2 (if programmed in P0731 = 52.C) to control a brake.



Enum:

0 Motor holding brake disabled
1 Motor holding brake enabled

Note:

The brake relay opens at point 1, if enabled using P0731 (function of digital output), and closes at point 2.

P1216 **Holding brake release delay**

CStat:	T	**Datatype:** Float	**Unit:** s	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	1.0
				Max:	20.0

Level: **2**

Defines period during which inverter runs at f_min before ramping up at point 1 (as shown in P1215 - holding brake enable). Inverter starts at f_min on this profile, i.e. it does not use a ramp.

Note:

A typical value of f_min for this type of application is the slip frequency of the motor.

You can calculate the rated slip frequency by using the following formula:

$$\frac{n_{syn} - n_n}{n_{syn}} * f_n$$

Notice:

If used to hold the motor at a certain frequency against a mechanical brake (i.e. you are using a relay to control mechanical brake), it is important that f_min < 5 Hz; otherwise, the current drawn may be too high and the relay may not open.

P1217 **Holding time after ramp down**

CStat:	T	**Datatype:** Float	**Unit:** s	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	1.0
				Max:	20.0

Level: **2**

Defines time for which inverter runs at minimum frequency (P1080) after ramping down at point 2.

Details:
See diagram P1215 (holding brake enable)

P1230 **BI: Enable DC braking**

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: **3**

Enables DC braking via a signal applied from an external source. Function remains active while external input signal is active.

DC braking causes the motor to stop rapidly by applying a DC braking current (current applied also holds shaft stationary).

When the DC braking signal is applied, the inverter output pulses are blocked and the DC current is not applied until the motor has been sufficiently demagnetized.

Settings:
722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

Caution2:
Frequent use of long periods of DC braking can cause the motor to overheat.

Notice:
This delay time is set in P0347 (demagnetization time). If this delay is too short, overcurrent trips can occur.

P1232 **DC braking current**

CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	100
				Max:	250

Level: **2**

Defines level of DC current in [%] relative to rated motor current (P0305).

P1233 **Duration of DC braking**

CStat:	CUT	**Datatype:** U16	**Unit:** s	**Min:**	0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	0
				Max:	250

Level: **2**

Defines duration for which DC injection braking is to be active following an OFF1 command.

Value:
P1233 = 0 : Not active following OFF1.
P1233 = 1 - 250 : Active for the specified duration.

Caution2:
Frequent use of long periods of DC braking can cause the motor to overheat.

Notice:
The DC braking function causes the motor to stop rapidly by applying a DC braking current (the current applied also holds the shaft stationary). When the DC braking signal is applied, the inverter output pulses are blocked and the DC current not applied until the motor has been sufficiently demagnetized (demagnetization time is calculated automatically from motor data).

P1236 **Compound braking current**

CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	0
				Max:	250

Level: **2**

Defines DC level superimposed on AC waveform. The value is entered in [%] relative to rated motor current (P0305)..

Value:
P1236 = 0 : Compound braking disabled.
P1236 = 1 - 250 : Level of DC braking current defined as a [%] of rated motor current (P0305).

Dependency:
Active after OFF1 / OFF3 command.

Notice:
Increasing the value will generally improve braking performance; however, if you set the value too high, an overcurrent trip may result.

P1240 **Configuration of Vdc controller**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	1
				Max:	1

Level: **3**

Enables / disables Vdc controller.

The Vdc controller dynamically controls the DC link voltage to prevent overvoltage trips on high inertia systems.

Enum:

0 Vdc controller disabled
1 Vdc-max controller enabled

Note:

Vdc max automatically increases ramp-down times to keep the DC-link voltage (r0026) within limits (P2172)

Vdc min is activated if DC-link voltage falls below minimum level. The kinetic energy of the motor is then used to buffer the DC-link voltage, thus causing deceleration of the drive.

r1242 **CO: Switch-on level of Vdc-max**

		Datatype: Float	**Unit:** V	**Min:**	-
P-Group:	FUNC			**Def:**	-
				Max:	-

Level: **3**

Displays switch-on level of Vdc max controller.

P1243 **Dynamic factor of Vdc-max**

CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	10
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	100
				Max:	200

Level: **3**

Defines dynamic factor for DC link controller in [%].

Dependency:

P1243 = 100 % means parameters P1250, P1251 and P1252 (integration time, differential time and output limitation) are used as set. Otherwise, these are multiplied by P1243 (dynamic factor of Vdc-max).

Note:

Vdc controller adjustment is calculated automatically from motor and inverter data.

P1250 **Gain of Vdc-controller**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0.00
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	1.00
				Max:	10.00

Level: **4**

Enters gain for Vdc controller.

P1251 **Integration time Vdc-controller**

CStat:	CUT	**Datatype:** Float	**Unit:** ms	**Min:**	0.1
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	40.0
				Max:	1000.0

Level: **4**

Enters integral time constant for Vdc controller.

P1252 **Differential time Vdc-controller**

CStat:	CUT	**Datatype:** Float	**Unit:** ms	**Min:**	0.0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	1.0
				Max:	1000.0

Level: **4**

Enters differential time constant for Vdc controller.

P1253 **Vdc-controller output limitation**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	10
				Max:	600

Level: **3**

Limits maximum effect of Vdc max controller.

P1254 **Auto detect Vdc switch-on levels**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** first confirm	**QuickComm.** No	**Def:**	1
				Max:	1

Level: **3**

Enables/disables auto-detection of switch-on levels for Vdc max controller.

Enum:

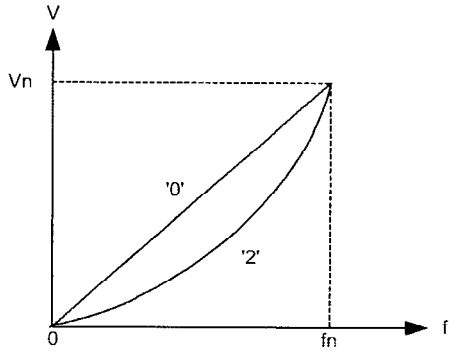
0 Disabled
1 Enabled

P1300 **Control mode**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** Yes	**Def:**	0
				Max:	3

Level: **2**

Controls relationship between speed of motor and voltage supplied by inverter as illustrated in the diagram below



Enum:

0	V/f with linear charac.
1	V/f with FCC
2	V/f with parabolic charac.
3	V/f with programmable charac.

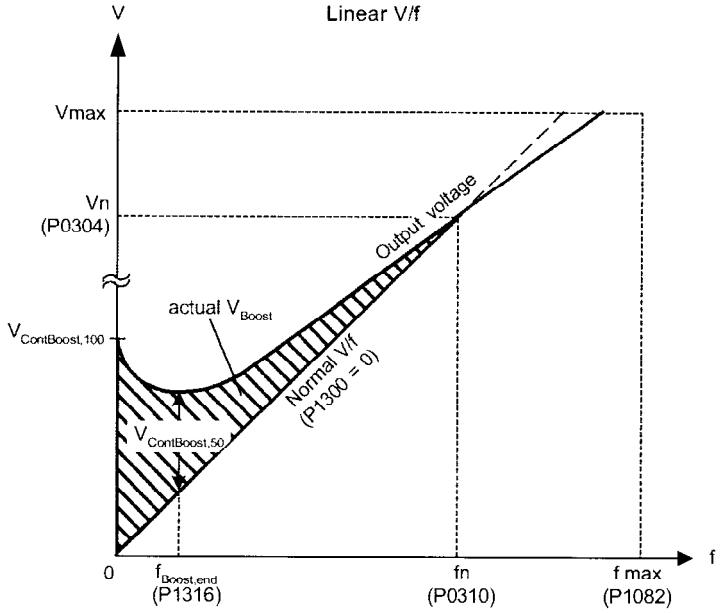
Note:

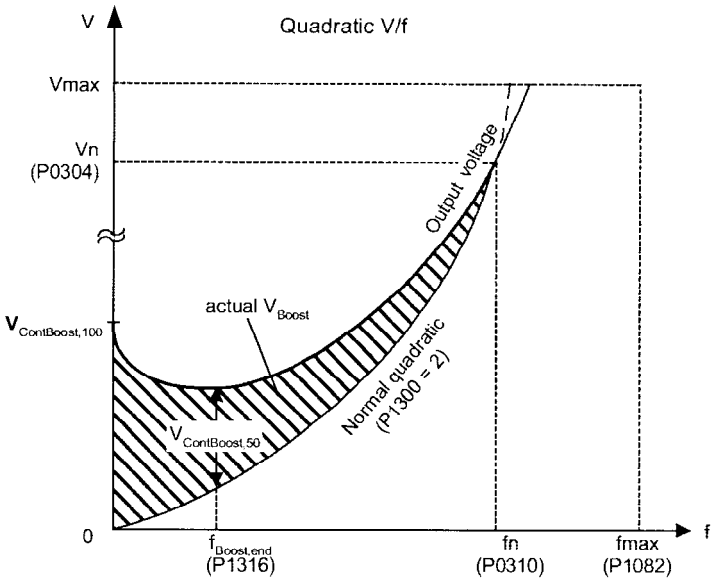
P1300 = 1 : V/f with FCC
* Maintains motor flux current for improved efficiency
* If FCC is chosen, linear V/f is active at low frequencies.

P1300 = 2 : V/f with a quadratic curve
* Suitable for centrifugal fans / pumps

P1310	Continuous boost				Min: 0.0	Level:
	CStat: CUT	Datatype: Float	Unit: %		Def: 50.0	2
	P-Group: CONTROL	Active: first confirm	QuickComm. No		Max: 250.0	

Defines boost level in [%] relative to P0305 (rated motor current) applicable to both linear and quadratic V/f curves according to the diagram below:





where
V_Boost,100 = voltage given by rated motor current (P0305) * Stator resistance (P0350)

Dependency:
Setting in P0640 (motor overload factor [%]) limits the boost.

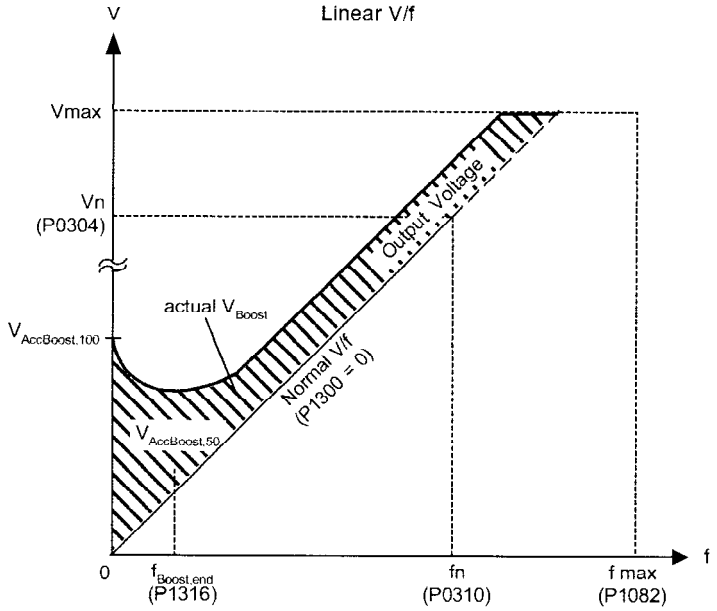
Note:
The boost values are combined when continuous boost (P1310) used in conjunction with other boost parameters (acceleration boost P1311 and starting boost P1312). However priorities are allocated to these parameters as follows:
P1310 > P1311 > P1312

Notice:
Increasing the boost levels increases motor heating (especially at standstill).

$$\text{Boosts} \leq \frac{300}{I_{mot}} * Rs$$

P1311	Acceleration boost					Level:
	CStat: CUT	**Datatype:** Float	**Unit:** %	**Min:** 0.0		
	P-Group: CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:** 0.0		2
				Max: 250.0		

Applies boost in [%] relative to P0305 (rated motor current) following a positive setpoint change and drops back out once the setpoint is reached.



Dependency:
Setting in P0640 (motor overload factor [%]) limits boost.

Note:
Acceleration boost can help to improve response to small positive setpoint changes.

$$\text{Boosts} \leq \frac{300}{I_{mot}} * Rs$$

Notice:
Increasing the boost level increases motor heating.

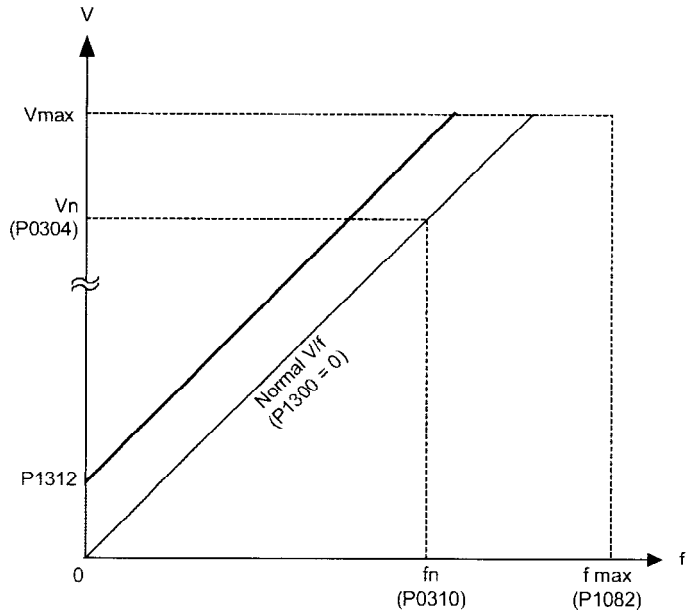
Details:
See note in P1310 for boost priorities.

P1312 **Starting boost** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.0
				Max:	250.0

Applies a constant linear offset (in [%] relative to P0305 (rated motor current)) to active V/f curve (either linear or quadratic) after an ON command and is active until setpoint is reached for the first time. This is useful for starting loads with high inertia.

Setting the starting boost (P1312) too high will cause the inverter to limit the current, which will in turn restrict the output frequency to below the setpoint frequency.



Dependency:
Setting in P0640 (motor overload factor [%]) limits boost.

Notice:
Increasing the boost levels increases motor heating.

$$\text{Boosts} \leq \frac{300}{I_{mot}} * Rs$$

Details:
See note in P1310 for boost priorities.

r1315 **CO: Total boost voltage** Level: 4

		Datatype: Float	**Unit:** V	**Min:**	-
P-Group:	CONTROL			**Def:**	-
				Max:	-

Displays total value of voltage boost (in volts).

P1316 **Boost end frequency** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	20.0
				Max:	100.0

Defines point at which programmed boost reaches 50 % of its value.

This value is expressed in [%] relative to P0310 (rated motor frequency).

This frequency is defined as follows:

$$f_{Boost\,min} = 2 * \left(\frac{153}{\sqrt{P_{motor}}} + 3 \right)$$

It is displayed as [%] value of the f_nominal.

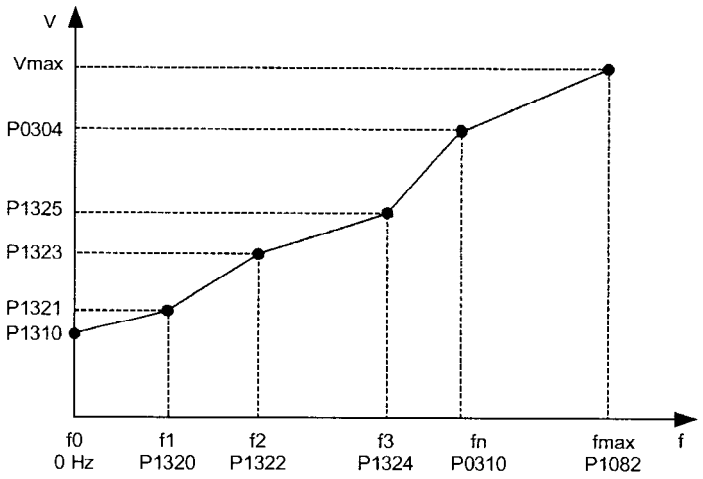
Note:
The expert user may change this value to alter the shape of the curve, e.g. to increase torque at a particular frequency.

Details:
See diagram in P1310 (continuous boost)

P1320 **Programmable V/f freq. coord. 1** Level: 3

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

Sets V/f coordinates (P1320/1321 to P1324/1325) to define V/f characteristic.



$$P1310[V] = \frac{P1310[\%]}{100[\%]} \cdot \frac{r0395[\%]}{100[\%]} \cdot P0304[V]$$

Example:
This parameter can be used to provide correct torque at correct frequency and is useful when used with synchronous motors.

Dependency:
To set parameter, select P1300 = 3 (V/f with programmable characteristic)

Note:
Linear interpolation will be applied between points set from P1320/1321 to P1324/1325.

V/f with programmable characteristic (P1300 = 3) has 3 programmable points. The two non-programmable points are:
Boost voltage P1310 at zero 0 Hz
Nominal voltage at nominal frequency

The acceleration boost and starting boost defined in P1311 and P1312 are applied to V/f with programmable characteristic.

P1321 **Programmable V/f volt. coord. 1** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0.0
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.0
				Max:	3000.0

See P1320 (programmable V/f freq. coord. 1).

P1322 **Programmable V/f freq. coord. 2** Level: 3

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

See P1320 (programmable V/f freq. coord. 1).

P1323 **Programmable V/f volt. coord. 2** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0.0
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.0
				Max:	3000.0

See P1320 (programmable V/f freq. coord. 1).

P1324 **Programmable V/f freq. coord. 3** Level: 3

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

See P1320 (programmable V/f freq. coord. 1).

P1325 **Programmable V/f volt. coord. 3** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0.0
P-Group:	CONTROL	**Active:** first confirm	**QuickComm.** No	**Def:**	0.0
				Max:	3000.0

See P1320 (programmable V/f freq. coord. 1).

P1333 **Start frequency for FCC**
CStat: CUT **Datatype:** Float **Unit:** % **Min:** 0.0 **Def:** 10.0 **Max:** 100.0 **Level:** 3
P-Group: CONTROL **Active:** first confirm **QuickComm.** No

Defines start frequency at which FCC (flux current control) is enabled as [%] of rated motor frequency (P0310).

Notice:
If this value is too low, the system may become unstable.

P1335 **Slip compensation**
CStat: CUT **Datatype:** Float **Unit:** % **Min:** 0.0 **Def:** 0.0 **Max:** 600.0 **Level:** 2
P-Group: CONTROL **Active:** first confirm **QuickComm.** No

Dynamically adjusts output frequency of inverter so that motor speed is kept constant independent of motor load.

Value:
P1335 = 0 % : Slip compensation disabled.
P1335 = 100 % : This uses the motor data and motor model to add the rated slip frequency rated motor speed and rated motor current.

Note:
Gain adjustment enables fine-tuning of the actual motor speed (see P1460 - gain speed control).

100% = standard setting for warm stator

P1336 **Slip limit**
CStat: CUT **Datatype:** U16 **Unit:** % **Min:** 0 **Def:** 250 **Max:** 600 **Level:** 2
P-Group: CONTROL **Active:** first confirm **QuickComm.** No

Compensation slip limit in [%] relative to r0330 (rated motor slip), which is added to frequency setpoint.

Dependency:
Slip compensation (P1335) active.

r1337 **CO: V/f slip frequency**
Datatype: Float **Unit:** % **Min:** - **Def:** - **Max:** - **Level:** 3
P-Group: CONTROL

Displays actual compensated motor slip as [%]

Dependency:
Slip compensation (P1335) active.

P1338 **Resonance damping gain V/f**
CStat: CUT **Datatype:** Float **Unit:** - **Min:** 0.00 **Def:** 0.00 **Max:** 10.00 **Level:** 3
P-Group: CONTROL **Active:** first confirm **QuickComm.** No

Defines resonance damping gain for V/f.

Note:
The resonance circuit damps oscillations of the active current which frequently occur during no-load operation.

In V/f modes (see P1300), the resonant damping circuit is active in a range from approx. 5 % to 70 % of rated motor frequency (P0310).

P1340 **Imax controller prop. gain**
CStat: CUT **Datatype:** Float **Unit:** - **Min:** 0.000 **Def:** 0.000 **Max:** 0.499 **Level:** 3
P-Group: CONTROL **Active:** first confirm **QuickComm.** No

Proportional gain of the I_max controller.

Dynamically controls the inverter if the output current exceeds the maximum motor current (P0067). It does this by first limiting the inverter output frequency (to a possible minimum of the nominal slip frequency). If this action does not successfully remove the overcurrent condition, the inverter output voltage is reduced. When the overcurrent condition has been removed successfully, frequency limiting is removed using the ramp-up time set in P1120.

P1341 **Imax controller integral time**
CStat: CUT **Datatype:** Float **Unit:** s **Min:** 0.000 **Def:** 0.300 **Max:** 50.000 **Level:** 3
P-Group: CONTROL **Active:** first confirm **QuickComm.** No

Integral time constant of the I_max controller.
P1341 = 0 : I_max controller disabled
P1340 = 0 and P1341 > 0 : enhanced integral
P1340 > 0 and P1341 > 0 : normal PI control

See description in parameter P1340 for further information.

r1343 **CO: Imax controller freq. output** Datatype: Float Unit: Hz Min: - Def: - Max: - Level: 3

P-Group: CONTROL

Displays effective frequency limitation.

Dependency:
If I_max controller not in operation, parameter normally shows f_max (P1082).

r1344 **CO: Imax controller volt. output** Datatype: Float Unit: V Min: - Def: - Max: - Level: 3

P-Group: CONTROL

Displays amount by which the I_max controller is reducing the inverter output voltage.

P1350 **Voltage soft start** CStat: CUT Datatype: U16 Unit: - Min: 0 Def: 0 Max: 1 Level: 3

P-Group: CONTROL Active: Immediately QuickComm. No

Sets whether voltage is built up smoothly during magnetization time (ON) or whether it simply jumps to boost voltage (OFF)

Enum:
0 OFF
1 ON

Note:
The settings for this parameter bring benefits and drawbacks:
0 = OFF (jump to boost voltage)
Benefit: flux is built up quickly
Drawback: motor may move
1 = ON (smooth voltage build-up)
Benefit: motor less likely to move
Drawback: flux build-up takes longer

P1800 **Pulse frequency** CStat: CUT Datatype: U16 Unit: kHz Min: 2 Def: 4 Max: 16 Level: 2

P-Group: INVERTER Active: first confirm QuickComm. No

Sets pulse frequency of power switches in inverter. The frequency can be changed in steps of 2 kHz.

Pulse frequencies > 4 kHz selected on 380-480 V units reduce the maximum continuous motor current.

Dependency:
Minimum pulse frequency depends on P1082 (maximum frequency) and P0310 (rated motor frequency).

Note:
At 4 kHz, full output current is obtained up to 50 degrees C (CT mode);
over 50 degrees C, full output may be obtained at 8 kHz

If silent operation is not absolutely necessary, lower pulse frequencies may be selected to reduce inverter losses and radio-frequency emissions.

Under certain circumstances, the inverter may reduce the switching frequency to provide protection against over-temperature (see P0290, Level 3).

r1801 **CO: Act. switching frequency** Datatype: U16 Unit: kHz Min: - Def: - Max: - Level: 3

P-Group: INVERTER

Actual pulse frequency of power switches in inverter.

Notice:
Under certain conditions (inverter overtemperature, see P0290), this can differ from the values selected in P1800 (pulse frequency).

P1802 **Modulator mode** CStat: CUT Datatype: U16 Unit: - Min: 0 Def: 0 Max: 2 Level: 3

P-Group: INVERTER Active: Immediately QuickComm. No

Selects inverter modulator mode.

Enum:
0 SVM/ASVM automatic mode
1 Asymmetric SVM
2 Space vector modulation

Notice:
Asymmetric space vector modulation (ASVM) produces lower switching losses than space vector modulation (SVM), but may cause irregular rotation at very low speeds.

Space vector modulation (SVM) with over-modulation may produce current waveform distortion at high output voltages.

Space vector modulation (SVM) without over-modulation will reduce maximum output voltage available to motor.

P1803 **Max. modulation** Level: 4

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	20.0
P-Group:	INVERTER	**Active:** first confirm	**QuickComm.** No	**Def:**	106.0
				Max:	150.0

Sets maximum modulation index.

Note:
P1803 = 100 % = limit for over-control (for ideal inverter without switching delay). For vector control the modulation limit will be reduced automatically with 4 %.

P1820 **Reverse output phase sequence** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	INVERTER	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Changes direction of motor rotation without changing setpoint polarity.

Enum:
0 OFF
1 ON

Dependency:
If positive and negative revolution is enabled, frequency setpoint is directly used.
If both positive and negative revolution are disabled, reference value is set to zero.

Details:
See P1000 (select frequency setpoint)

P1910 **Select motor data identification** Level: 2

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** Yes	**Def:**	0
				Max:	2

Performs stator resistance measuring.

Enum:
0 Disabled
1 Identification of Rs with parameter change
2 Identification of Rs without parameter change

Dependency:
No measurement if motor data incorrect.

P1910 = 1 : Calculated value for stator resistance (see P0350) is overwritten.

P1910 = 2 : Values already calculated are not overwritten.

Note:
Before selecting motor data identification, "Quick commissioning" has to be performed in advance.

Once enabled (P1910 = 1), A0541 generates a warning that the next ON command will initiate measurement of motor parameters.

Notice:
When choosing the setting for measurement, observe the following:
1. "with parameter change" means that the value is actually adopted as P0350 parameter setting and applied to the control as well as being shown in the read-only parameters below.
2. "without parameter change" means that the value is only displayed, i.e. shown for checking purposes in the read-only parameter r1912 (identified stator resistance). The value is not applied to the control.

r1912 **Identified stator resistance** Level: 2

		Datatype: Float	**Unit:** Ohm	**Min:**	-
P-Group:	MOTOR			**Def:**	-
				Max:	-

Displays measured stator resistance value (line-to-line) in [Ohms]

Note:
This value is measured using P1910 = 1 or 2 , i.e., identification of all parameters with/without change.

P2000 **Reference frequency** Level: 2

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	1.00
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	50.00
				Max:	650.00

Full-scale frequency setting used by serial link (corresponds to 4000H), analog I/O and P/D controller.

P2001 **Reference voltage** Level: 3

CStat:	CT	**Datatype:** U16	**Unit:** V	**Min:**	10
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	1000
				Max:	2000

Full-scale output voltage (i.e. 100 %) used over serial link (corresponds to 4000H).

Example:
P0201 = 230 specifies that 4000H received via USS denotes 230 V.

P2002 **Reference current** Level: 3

CStat:	CT	**Datatype:** Float	**Unit:** A	**Min:**	0.10
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	0.10
				Max:	10000.00

Full-scale output current used over serial link (corresponds to 4000H).

P2009[2] USS normalization

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Level: 3

Enables special normalization for USS.

Enum:

0 Disabled
1 Enabled

Index:

P2009[0] : Serial interface COM link
P2009[1] : Serial interface BOP link

Note:

If enabled, the main setpoint (word 2 in PZD) is not interpreted as 100 % = 4000H, but as "absolute" instead (e.g. 4000H = 16384 means 163.84 Hz).

P2010[2] USS baudrate

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	3
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	6
				Max:	9

Level: 2

Sets baud rate for USS communication.

Enum:

3 1200 baud
4 2400 baud
5 4800 baud
6 9600 baud
7 19200 baud
8 38400 baud
9 57600 baud

Index:

P2010[0] : Serial interface COM link
P2010[1] : Serial interface BOP link

P2011[2] USS address

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	31

Level: 2

Sets unique address for inverter.

Index:

P2011[0] : Serial interface COM link
P2011[1] : Serial interface BOP link

Note:

You can connect up to a further 30 inverters via the serial link (i.e. 31 inverters in total) and control them with the USS serial bus protocol.

P2012[2] USS PZD length

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	2
				Max:	4

Level: 3

Defines the number of 16-bit words in PZD part of USS telegram. The PZD part of the USS telegram is used for the main setpoint, and to control the inverter.

Index:

P2012[0] : Serial interface COM link
P2012[1] : Serial interface BOP link

P2013[2] USS PKW length

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	127
				Max:	127

Level: 3

Defines the number of 16-bit words in PKW part of USS telegram. The PKW part of the USS telegram is used to read and write individual parameter values

Enum:

0 No words
3 3 words
4 4 words
27 Variable

Index:

P2013[0] : Serial interface COM link
P2013[1] : Serial interface BOP link

Notice:

Setting P2013 has implications for the PKW word order, please refer to the Reference Manual for details

P2014[2] **USS telegram off time**

CStat:	CT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	COMM	**Active:** first confirm	**QuickComm.** No	**Def:**	0
				Max:	65535

Level: **3**

Defines a time T_off after which a fault will be generated (F0070) if no telegram is received via the USS channels.

Index:

P2014[0] : Serial interface COM link
P2014[1] : Serial interface BOP link

Notice:

By default (time set to 0), no fault is generated (i.e. watchdog disabled).

r2015[4] **CO: PZD from BOP link (USS)**

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Level: **3**

Displays process data received via USS on BOP link (RS232 USS).

Index:

r2015[0] : Received word 0
r2015[1] : Received word 1
r2015[2] : Received word 2
r2015[3] : Received word 3

Note:

The control words can be viewed as bit parameters r2032 and r2033.

P2016[4] **CI: PZD to BOP link (USS)**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMM	**Active:** first confirm	**QuickComm.** No	**Def:**	52:0
				Max:	4000:0

Level: **3**

Selects signals to be transmitted to serial interface via BOP link

Example:

P2016[0] = 52.0 (default). In this case, the value of r0052[0] (CO/BO: Status word) is transmitted as 1st PZD to the BOP link.

Index:

P2016[0] : Transmitted word 0
P2016[1] : Transmitted word 1
P2016[2] : Transmitted word 2
P2016[3] : Transmitted word 3

Note:

If r0052 not indexed, display does not show an index (".0").

r2018[4] **CO: PZD from COM link (USS)**

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Level: **3**

Displays process data received via USS on COM link

Index:

r2018[0] : Received word 0
r2018[1] : Received word 1
r2018[2] : Received word 2
r2018[3] : Received word 3

Note:

The control words can be viewed as bit parameters r2032 and r2033.

P2019[4] **CI: PZD to COM link (USS)**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMM	**Active:** first confirm	**QuickComm.** No	**Def:**	52:0
				Max:	4000:0

Level: **3**

Index:

P2019[0] : Transmitted word 0
P2019[1] : Transmitted word 1
P2019[2] : Transmitted word 2
P2019[3] : Transmitted word 3

Details:

See r2016 (PZD to BOP link)

r2024[2] **USS error-free telegrams**

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Level: **3**

Displays number of error-free USS telegrams received.

Index:

r2024[0] : Serial interface COM link
r2024[1] : Serial interface BOP link

r2025[2] **USS rejected telegrams**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS telegrams rejected.

Index:
r2025[0] : Serial interface COM link
r2025[1] : Serial interface BOP link

r2026[2] **USS character frame error**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS character frame errors.

Index:
r2026[0] : Serial interface COM link
r2026[1] : Serial interface BOP link

r2027[2] **USS overrun error**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS telegrams with overrun error.

Index:
r2027[0] : Serial interface COM link
r2027[1] : Serial interface BOP link

r2028[2] **USS parity error**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS telegrams with parity error.

Index:
r2028[0] : Serial interface COM link
r2028[1] : Serial interface BOP link

r2029[2] **USS start not identified**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS telegrams with unidentified start.

Index:
r2029[0] : Serial interface COM link
r2029[1] : Serial interface BOP link

r2030[2] **USS BCC error**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS telegrams with BCC error.

Index:
r2030[0] : Serial interface COM link
r2030[1] : Serial interface BOP link

r2031[2] **USS length error**

Datatype: U16 Unit: - Min: - Def: - Max: - Level: 3

P-Group: COMM

Displays number of USS telegrams with incorrect length.

Index:
r2031[0] : Serial interface COM link
r2031[1] : Serial interface BOP link

r2032 **BO: CtrlWrd1 from BOP link (USS)** Level: 3

Datatype: U16 Unit: - Min: - Def: - Max: -

P-Group: COMM

Displays control word 1 from BOP link (word 1 within USS).

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

r2033 **BO: CtrlWrd2 from BOP link (USS)** Level: 3

Datatype: U16 Unit: - Min: - Def: - Max: -

P-Group: COMM

Displays control word 2 from BOP link (i.e. word 4 within USS)

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit08	PID enabled	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Dependency:

P0700 = 5 (USS on COM link) and P0719 = 0 (Cmd / Setpoint = BICO parameter).

r2036 **BO: CtrlWrd1 from COM link (USS)** Level: 3

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMM

Displays control word 1 from COM link (i.e. word 1 within USS)

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

Details:

See r2033 (control word 2 from BOP link)

r2037 **BO: CtrlWrd2 from COM link (USS)** Level: 3

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMM

Displays control word 2 from COM link (i.e. word 4 within USS)

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit08	PID enabled	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Details:

See r2033 (control word 2 from BOP link)

P2040 **CB telegram off time** Level: 3

CStat: CT **Datatype:** U16 **Unit:** ms **Min:** 0 **Def:** 20 **Max:** 65535

P-Group: COMM **Active:** first confirm **QuickComm.** No

Defines time after which a fault will be generated (F0070) if no telegram is received via the link (SOL).

Dependency:

Setting 0 = watchdog disabled

P2041[5] **CB parameter** Level: 3

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	65535

Configures a communication board (CB).

Index:

P2041[0] : CB parameter 0
P2041[1] : CB parameter 1
P2041[2] : CB parameter 2
P2041[3] : CB parameter 3
P2041[4] : CB parameter 4

Details:

See relevant communication board manual for protocol definition and appropriate settings

r2050[4] **CO: PZD from CB** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays PZD received from communication board (CB).

Index:

r2050[0] : Received word 0
r2050[1] : Received word 1
r2050[2] : Received word 2
r2050[3] : Received word 3

Note:

The control words can be viewed as bit parameters r2032 and r2033.

P2051[4] **CI: PZD to CB** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMM	**Active:** first confirm	**QuickComm.** No	**Def:**	52:0
				Max:	4000:0

Connects PZD to CB.

This parameter allows the user to define the source of status words and actual values for the reply PZD.

Settings:

Status word 1 = 52
CO/BO: Act. status word 1 (see r0052)
Actual value 1 = 21 inverter output frequency (see r0021)

Other BICO settings are possible

Index:

P2051[0] : Transmitted word 0
P2051[1] : Transmitted word 1
P2051[2] : Transmitted word 2
P2051[3] : Transmitted word 3

r2053[5] **CB identification** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays identification data of the communication board (CB). The different CB types (r2035[0]) are given in the Enum declaration.

Enum:

0 No CB option board
1 PROFIBUS DP
2 DeviceNet
56 not defined

Index:

r2053[0] : CB type (PROFIBUS = 1)
r2053[1] : Firmware version
r2053[2] : Firmware version detail
r2053[3] : Firmware date (year)
r2053[4] : Firmware date (day/month)

r2054[7] **CB diagnosis** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays diagnostic information of communication board (CB).

Index:

r2054[0] : CB diagnosis 0
r2054[1] : CB diagnosis 1
r2054[2] : CB diagnosis 2
r2054[3] : CB diagnosis 3
r2054[4] : CB diagnosis 4
r2054[5] : CB diagnosis 5
r2054[6] : CB diagnosis 6

Details:

See relevant communications board manual.

r2090 **BO: Control word 1 from CB**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: COMM

Displays control word 1 received from communication board (CB).

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

Details:

See relevant communication board manual for protocol definition and appropriate settings

r2091 **BO: Control word 2 from CB**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 3

P-Group: COMM

Displays control word 2 received from communication board (CB).

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit08	PID enabled	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Details:

See relevant communication board manual for protocol definition and appropriate settings

P2100[3] **Alarm number selection**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 65535 **Level:** 3

P-Group: ALARMS **Active:** Immediately **QuickComm.** No

Selects up to 3 faults or warnings for non-default reactions.

Example:

If you want F0005 to perform an OFF3 instead of an OFF2, set P2100[0] = 5, then select the desired reaction in P2101[0] (in this case, set P2101[0] = 3).

Note:

All fault codes have a default reaction to OFF2. Some fault codes caused by hardware trips (e.g. overcurrent) cannot be changed from the default reactions.

P2101[3] Stop reaction value Level: 3

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	ALARMS	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	4

Sets drive stop reaction values for fault selected by P2100 (alarm number stop reaction).

This indexed parameter specifies the special reaction to the faults/warnings defined in P2100 indices 0 to 2.

Enum:

0 No reaction, no display
1 OFF1 stop reaction
2 OFF2 stop reaction
3 OFF3 stop reaction
4 No reaction warning only

Note:

Settings 0 - 3 only are available for fault codes

Settings 0 and 4 only are available for warnings

Index 0 (P2101) refers to fault/warning in index 0 (P2100)

P2103 BI: 1. Faults acknowledgement Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	722:2
				Max:	4000:0

Defines source of fault acknowledgement, e.g. keypad/DIN, etc. (depending on setting).

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

P2104 BI: 2. Faults acknowledgement Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Selects second source of fault acknowledgement.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

P2106 BI: External fault Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	1:0
				Max:	4000:0

Selects source of external faults.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

r2110[4] Warning number Level: 2

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	ALARMS			**Def:**	-
				Max:	-

Displays warning information.

A maximum of 2 active warnings (indices 0 and 1) and 2 historical warnings (indices 2 and 3) may be viewed.

Index:

r2110[0] : Recent Warnings --, warning 1
r2110[1] : Recent Warnings --, warning 2
r2110[2] : Recent Warnings -1, warning 3
r2110[3] : Recent Warnings -1, warning 4

Note:

The keypad will flash while a warning is active. The LEDs indicate the warning status in this case.

If an AOP is in use, the display will show number and text of the active warning.

Notice:

Indices 0 and 1 are not stored.

P2111 Total number of warnings Level: 3

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	ALARMS	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	4

Displays number of warning (up to 4) since last reset. Set to 0 to reset the warning history.

r2114[2] **Run time counter**

P-Group: ALARMS **Datatype:** U16 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 3

Displays run time counter

Details:

See P0948 (fault time)

P2115[3] **AOP real time clock**

CStat: CT **P-Group:** ALARMS **Datatype:** U16 **Active:** first confirm **Unit:** - **QuickComm.** No **Min:** 0 **Def:** 0 **Max:** 65535 **Level:** 3

Displays AOP real time.

Details:

See P0948 (fault time)

P2120 **Indication counter**

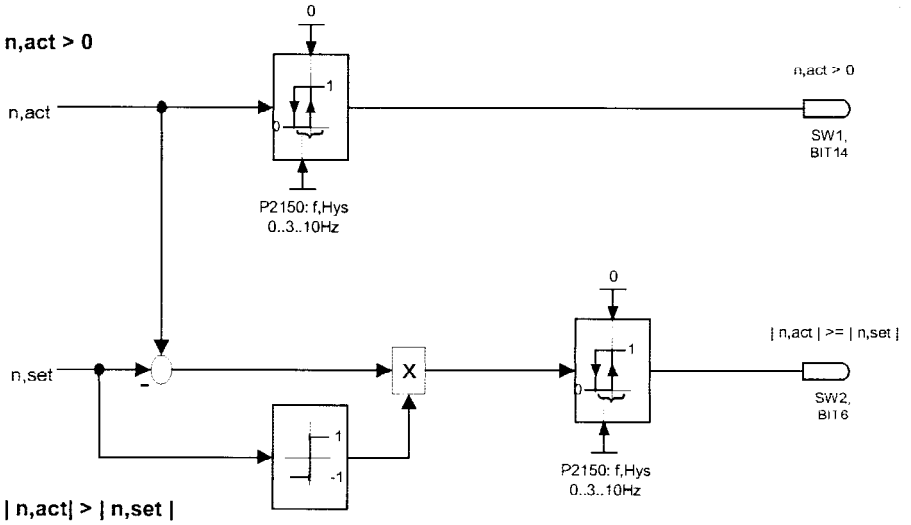
CStat: CUT **P-Group:** ALARMS **Datatype:** U16 **Active:** first confirm **Unit:** - **QuickComm.** No **Min:** 0 **Def:** 0 **Max:** 65535 **Level:** 4

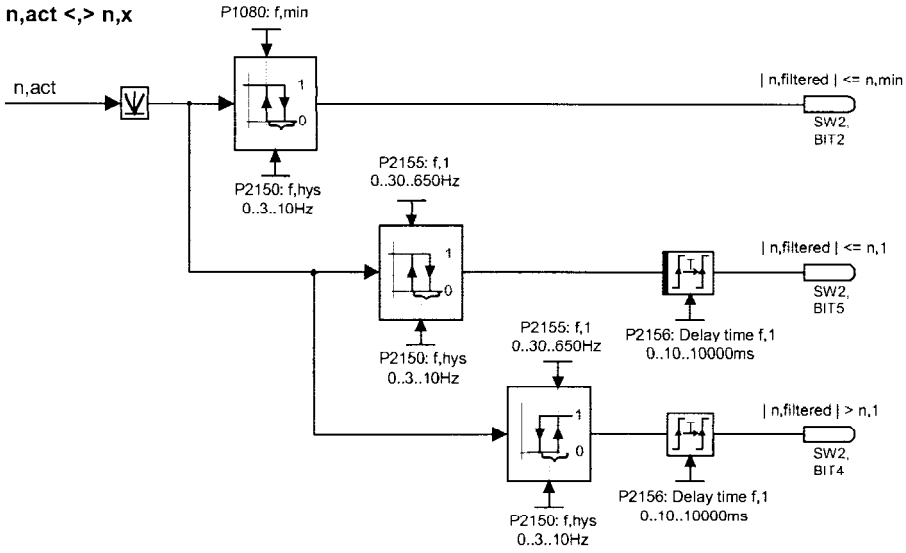
Indicates total number of alarm events. This parameter is incremented whenever an alarm event occurs.

P2150 **Hysteresis frequency f_hys**

CStat: CUT **P-Group:** ALARMS **Datatype:** Float **Active:** first confirm **Unit:** Hz **QuickComm.** No **Min:** 0.00 **Def:** 3.00 **Max:** 10.00 **Level:** 3

Defines hysteresis level applied for comparing frequency and speed to threshold as illustrated in the diagrams below





P2155 **Threshold frequency f_1**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	30.00
				Max:	650.00

Level: 3

Sets a threshold for comparing actual speed or frequency to threshold values f_1.
This threshold controls status bits 4 and 5 in status word 2 (r0053).

Details:
See diagram in P2150 (hysteresis frequency f_hys)

P2156 **Delay time of threshold freq f_1**

CStat:	CUT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	10
				Max:	10000

Level: 3

Sets delay time prior to threshold frequency f_1 comparison (P2155).

Details:
See diagram in P2150 (hysteresis frequency f_hys)

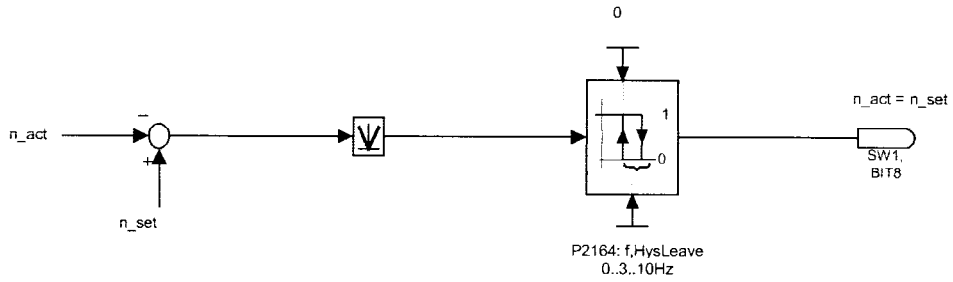
P2164 **Hysteresis frequency deviation**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	3.00
				Max:	10.00

Level: 3

Hysteresis frequency for detecting permitted deviation (from setpoint) or frequency or speed. This frequency controls bit 8 in status word 1 (P0052) and bit 6 in status word 2 (P0053)

n_act = n_set



P2167 **Switch-off frequency f_off**

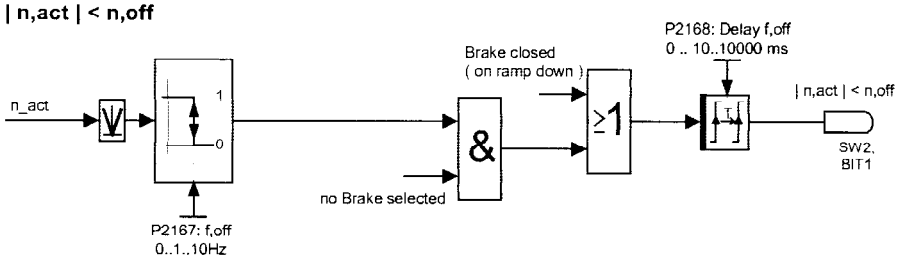
CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	1.00
				Max:	10.00

Level: 3

Sets frequency threshold below which inverter switches off.

If the frequency falls below this threshold, bit 1 in status word 2 (r0053)is set.

| n,act | < n,off



Dependency:
Switched off only if OFF1 or OFF3 active.

P2168 **Delay time T_off**

CStat:	CUT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	10
				Max:	10000

Level: 3

Defines time for which the inverter may operate below switch-off frequency (P2167) before switch off occurs.

Dependency:
Active if holding brake (P1215) not parameterized.

Details:
See diagram in P2167 (switch-off frequency)

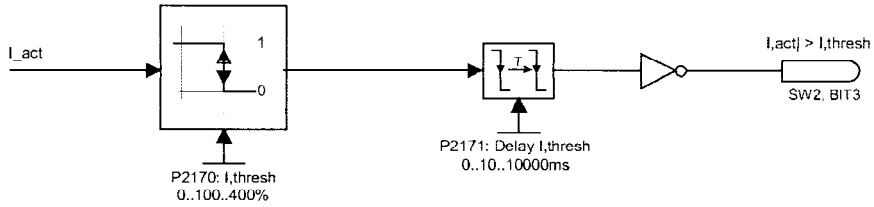
P2170 **Threshold current I_thresh**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	100.0
				Max:	400.0

Level: **3**

Defines threshold current in [%] relative to P0305 (rated motor current) to be used in comparisons of I_act and I_Thresh as illustrated in the diagram below.

|I,act| > I,thresh



Note:

This threshold controls bit 3 in status word 3 (P0053).

P2171 **Delay time current**

CStat:	CUT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	10
				Max:	10000

Level: **3**

Defines delay time prior to activation of current comparison.

Details:

See diagram in P2170 (threshold current I_thresh)

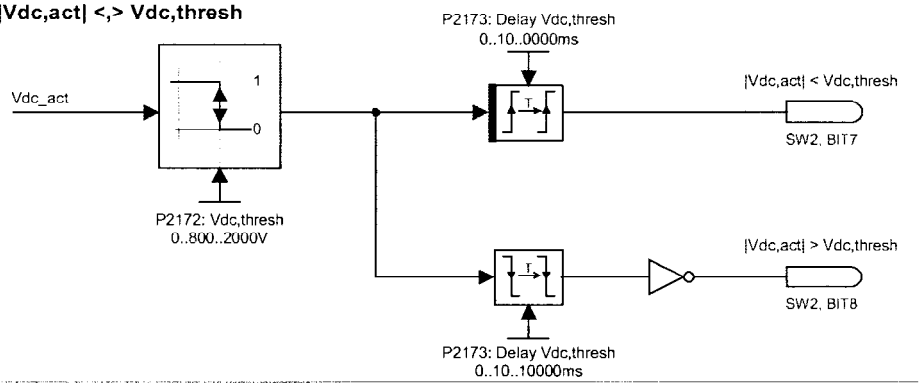
P2172 **Threshold DC-link voltage**

CStat:	CUT	**Datatype:** U16	**Unit:** V	**Min:**	0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	800
				Max:	2000

Level: **3**

Defines DC link voltage to be compared to actual voltage as illustrated in the diagram below.

|Vdc,act| <,> Vdc,thresh



Note:

This voltage controls bits 7 and 8 in status word 3 (P0053).

P2173 **Delay time DC-link voltage**

CStat:	CUT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	10
				Max:	10000

Level: **3**

Defines delay time prior to activation of threshold comparison.

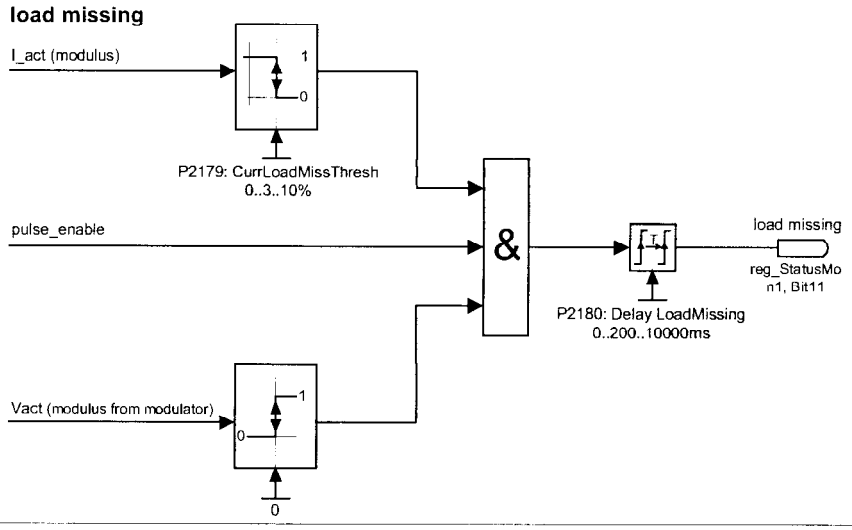
Details:

See diagram in P2172 (threshold DC-link voltage)

P2179 **Current limit for no load ident.** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	3.0
				Max:	10.0

Threshold current for A0922 (load missing) in [%] relative to P0305 (rated motor current) as illustrated in the diagram below.



Note:
It may be that the motor is not connected (load missing) or a phase could be missing.

Notice:
If a motor setpoint cannot be entered and the current limit (P2179) is not exceeded, Alarm A0922 (no load applied) is issued when delay time (P2180) expires.

P2180 **Delay time for no load ident.** Level: 3

CStat:	CUT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	ALARMS	**Active:** first confirm	**QuickComm.** No	**Def:**	2000
				Max:	10000

Delay time load missing

Note:
It may be that the motor is not connected (load missing) or a phase could be missing.

Notice:
If a motor setpoint cannot be entered and the current limit (P2179) is not exceeded, Alarm A0922 (no load applied) is issued when delay time (P2180) expires.

Details:
See diagram in P2179 (current limit for no load identification)

r2197 **CO/BO: Monitoring word 1**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** - **Level:** 2

P-Group: ALARMS

Monitoring word 1 which indicates the state of monitor functions. Each bit represents one monitor function.

Bitfields:

Bit00	Act. freq. r0024 <= P1080	0	NO
		1	YES
Bit01	Act. freq. r0024 <= P2155	0	NO
		1	YES
Bit02	Act. freq. r0024 > P2155	0	NO
		1	YES
Bit03	Act. freq. r0024 > zero	0	NO
		1	YES
Bit04	Act. freq. r0024 >= setp.	0	NO
		1	YES
Bit05	Act. freq. r0024 <= P2167	0	NO
		1	YES
Bit06	Act. freq. r0024 >= P1082	0	NO
		1	YES
Bit07	Act. freq. r0024 == setp.	0	NO
		1	YES
Bit08	Act. current r0027 >= P2170	0	NO
		1	YES
Bit09	Act. unfilt. Vdc < P2172	0	NO
		1	YES
Bit10	Act. unfilt. Vdc > P2172	0	NO
		1	YES
Bit11	No load condition	0	NO
		1	YES

P2200 **BI: Enable PID controller**

CStat: CT **Datatype:** U32 **Unit:** - **Min:** 0:0 **Def:** 0:0 **Max:** 4000:0 **Level:** 2

P-Group: TECH **Active:** Immediately **QuickComm.** No

PID mode Allows user to enable/disable the PID controller. Setting to 1 enables the PID closed-loop controller.

Dependency:

Setting 1 automatically disables normal ramp times set in P1120 and P1121 and the normal frequency setpoints.

Following an OFF1 or OFF3 command, however, the inverter frequency will ramp down to zero using the ramp time set in P1121 (P1135 for OFF3).

Note:

The PID setpoint source is selected using P2253. The PID setpoint and the PID feedback signal are interpreted as [%] values (not [Hz]). The output of the PID controller is displayed as [%] and then normalized into [Hz] through P2000 (reference frequency) when PID is enabled.

In level 3, the PID controller source enable can also come from the digital inputs in settings 722.0 to 722.2 for DIN1 to DIN3 or from any other BiCo source

Notice:

The minimum and maximum motor frequencies (P1080 and P1082) as well as the skip frequencies (P1091 to P1094) remain active on the inverter output. However, enabling skip frequencies with PID control can produce instabilities.

P2201 **Fixed PID setpoint 1**

						Level:
CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00	2
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00	
				Max:	200.00	

Defines Fixed PID Setpoint 1

In addition, you can set any of the digital input parameters to Fixed PID Setpoint via the digital inputs (P0701 - P0703).

There are three selection modes for the PID fixed setpoint:
1 Direct selection (P0701 = 15 or P0702 = 15, etc)
In this mode of operation, 1 digital input selects one PID fixed setpoint.

2 Direct selection with ON command (P0701 = 16 or P0702 = 16, etc.)
Description as for 1), except that this type of selection issues an ON command concurrent with any setpoint selection.

3 Binary Coded Decimal selection (P0701 - P0703 = 17)
Using this method to select the PID Fixed Setpoint allows you to choose up to 7 different PID setpoints. The setpoints are selected according to the following table:

		DIN3	DIN2	DIN1
	OFF	Inactive	Inactive	Inactive
P2201	FF1	Inactive	Inactive	Active
P2202	FF2	Inactive	**Active**	Inactive
P2203	FF3	Inactive	**Active**	**Active**
P2204	FF4	**Active**	Inactive	Inactive
P2205	FF5	**Active**	Inactive	**Active**
P2206	FF6	**Active**	**Active**	Inactive
P2207	FF7	**Active**	**Active**	**Active**

Dependency:
P2000 = 1 required in user access level 2 to enable setpoint source.

In mode 1 (above):
ON command required to start motor (enable pulses).

In mode 2 (above):
If inputs programmed to PID fixed setpoint and selected together, the selected setpoints are summed.

Note:
You may mix different types of frequencies; however, remember that they will be summed if selected together.

P2201 = 100 % corresponds to 4000 hex

P2202 **Fixed PID setpoint 2**

						Level:
CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00	2
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	10.00	
				Max:	200.00	

Defines Fixed PID Setpoint 2

Details:
See P2201 (Fixed PID Setpoint 1).

P2203 **Fixed PID setpoint 3**

						Level:
CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00	2
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	20.00	
				Max:	200.00	

Defines Fixed PID Setpoint 3

Details:
See P2201 (Fixed PID Setpoint 1).

P2204 **Fixed PID setpoint 4**

						Level:
CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00	2
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	30.00	
				Max:	200.00	

Defines Fixed PID Setpoint 4

Details:
See P2201 (Fixed PID Setpoint 1).

P2205 **Fixed PID setpoint 5**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	40.00
				Max:	200.00

Level: 2

Defines Fixed PID Setpoint 5

Details:
See P2201 (Fixed PID Setpoint 1).

P2206 **Fixed PID setpoint 6**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	50.00
				Max:	200.00

Level: 2

Defines Fixed PID Setpoint 6

Details:
See P2201 (Fixed PID Setpoint 1).

P2207 **Fixed PID setpoint 7**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	60.00
				Max:	200.00

Level: 2

Defines Fixed PID Setpoint 7

Details:
See P2201 (Fixed PID Setpoint 1).

P2216 **Fixed PID setpoint mode - Bit 0**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	3

Level: 3

Fixed frequencies for PID setpoint can be selected in three different modes. Parameter P1016 defines the mode of selection Bit 0.

Enum:
1 Direct selection
2 Direct selection + ON command
3 Binary coded selection + ON command

P2217 **Fixed PID setpoint mode - Bit 1**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	3

Level: 3

BCD or direct selection Bit 1 for PID setpoint.

Enum:
1 Direct selection
2 Direct selection + ON command
3 Binary coded selection + ON command

P2218 **Fixed PID setpoint mode - Bit 2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	3

Level: 3

BCD or direct selection Bit 2 for PID setpoint.

Enum:
1 Direct selection
2 Direct selection + ON command
3 Binary coded selection + ON command

P2220 **BI: Fixed PID setp. select Bit 0**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: 3

Defines command source of fixed PID setpoint selection Bit 0

Settings:
722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

P2221 **BI: Fixed PID setp. select Bit 1**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: 3

Defines command source of fixed PID setpoint selection Bit 1.

Settings:
722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

P2222 **BI: Fixed PID setp. select Bit 2**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: 3

Defines command source of fixed PID setpoint selection Bit 2

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

r2224 **CO: Act. fixed PID setpoint**

		Datatype: Float	**Unit:** %	**Min:**	-
P-Group:	TECH			**Def:**	-
				Max:	-

Level: 2

Displays total output of PID fixed setpoint selection.

Note:

r2224 = 100 % corresponds to 4000 hex

P2231 **Setpoint memory of PID-MOP**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	0
				Max:	1

Level: 2

Setpoint memory

Enum:

0 PID-MOP setpoint will not be stored
1 PID-MOP setpoint will be stored (P2240 is updated)

Dependency:

If 0 selected, setpoint returns to value set in P2240 (setpoint of PID-MOP) after an OFF command

If 1 is selected, active setpoint is 'remembered' and P2240 updated with current value.

Details:

See P2240 (setpoint of PID-MOP)

P2232 **Inhibit rev. direct. of PID-MOP**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	1

Level: 2

Inhibits reverse setpoint selection when PID motor potentiometer is chosen either as a main setpoint of additional setpoint (using P1000)

Enum:

0 Reserve direction is allowed
1 Reserve direction inhibited

Note:

Setting 0 enables a change of motor direction using the motor potentiometer setpoint (increase/decrease frequency either by using digital inputs or motor potentiometer up/down buttons.

P2235 **BI: Enable PID-MOP (UP-cmd)**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	19:13
				Max:	4000:0

Level: 3

Defines source of UP command.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)

19.D = Keypad UP cursor

P2236 **BI: Enable PID-MOP (DOWN-cmd)**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** Immediately	**QuickComm.** No	**Def:**	19:14
				Max:	4000:0

Level: 3

Defines source of DOWN command.

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.E = Keypad DOWN cursor

P2240 **Setpoint of PID-MOP**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	-200.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	10.00
				Max:	200.00

Level: **2**

Setpoint of the motor potentiometer.

Allows user to set a digital PID setpoint in [%].

Settings:

722.0 = Digital input 1 (requires P0701 to be set to 99, BICO)
722.1 = Digital input 2 (requires P0702 to be set to 99, BICO)
722.2 = Digital input 3 (requires P0703 to be set to 99, BICO)
722.3 = Digital input 4 (via analog input, requires P0704 to be set to 99)

19.D = Keypad UP cursor

Dependency:

To change setpoint:
1. Use UP / DOWN key on BOP or
2. Set P0702/P0703 = 13/14 (function of digital inputs 2 and 3)

Note:

P2240 = 100 % corresponds to 4000 hex

r2250 **CO: Output setpoint of PID-MOP**

		Datatype: Float	**Unit:** %	**Min:**	-
P-Group:	TECH			**Def:**	-
				Max:	-

Level: **2**

Displays output setpoint of motor potentiometer in [%].

Note:

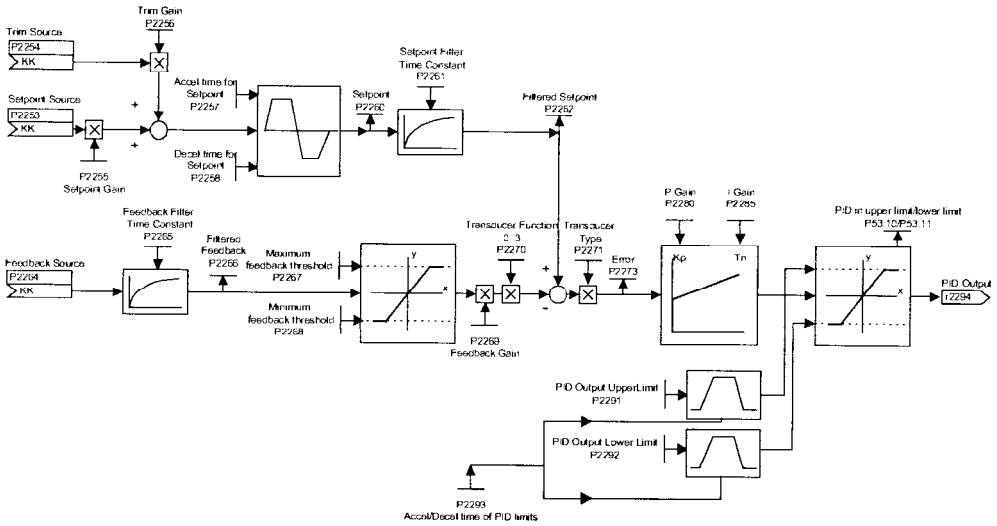
r2250 = 100 % corresponds to 4000 hex

P2253 **CI: PID setpoint**

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: **2**

Defines setpoint source for PID setpoint input.



This parameter allows the user to select the source of the PID setpoint. Normally, a digital setpoint is selected either using a fixed PID setpoint or an active setpoint.

Settings:

755 = Analog input 1
2224 = Fixed PI setpoint (see P2201 to P2207)
2250 = Active PI setpoint (see P2240)

P2254 **CI: PID trim source**

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Level: **3**

Selects trim source for PID setpoint. This signal is multiplied by the trim gain and added to the PID setpoint.

Settings:

755 = Analog input 1
2224 = Fixed PI setpoint (see P2201 to P2207)
2250 = Active PI setpoint (see P2240)

P2255 **PID setpoint gain factor**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	100.00
				Max:	100.00

Level: **3**

Gain factor for PID setpoint. The trim input is multiplied by this gain factor to produce a suitable ratio between setpoint and trim.

P2256 **PID trim gain factor**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	100.00
				Max:	100.00

Level: **3**

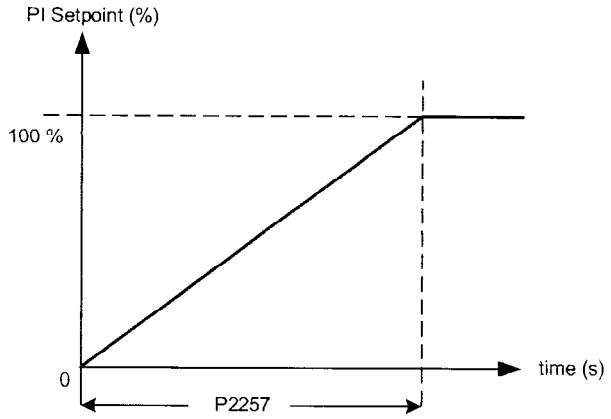
Gain factor for PID trim. This gain factor scales the trim signal, which is added to the main PID setpoint.

P2257 **Ramp-up time for PID setpoint**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	1.00
				Max:	650.00

Level: **2**

Sets the ramp-up time for the PID setpoint.



Dependency:

P2200 = 1 (PID control is enabled) disable normal ramp-up time (P1120).

PID ramp time effective only on PID setpoint and only active when PID setpoint is changed or when RUN command is given (when PID uses this ramp to reach its value from 0 %).

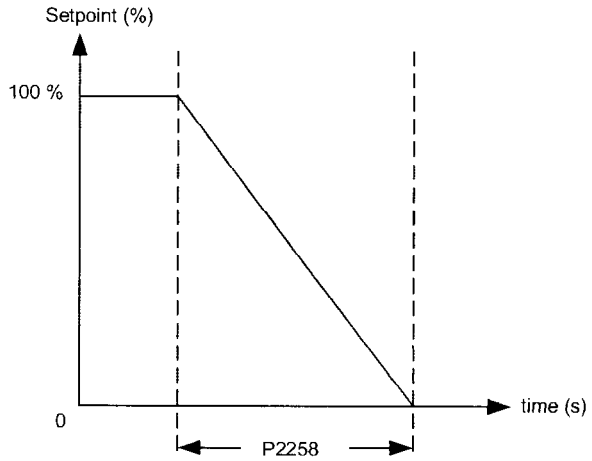
Notice:

Setting the ramp-up time too short may cause the inverter to trip, on overcurrent for example.

P2258 **Ramp-down time for PID setpoint** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	1.00
				Max:	650.00

Sets ramp-down time for PID setpoint.



Dependency:

P2200 = 1 (PID control is enabled) disables normal ramp-up time (P1120).

PID setpoint ramp effective only on PID setpoint changes.

P1121 (ramp-down time) and P1135 (OFF3 ramp-down time) define the ramp times used after OFF1 and OFF2 respectively.

Notice:

Setting the ramp-down time too short can cause the inverter to trip on overvoltage (F0002) / overcurrent (F0001).

r2260 **CO: Act. PID setpoint** Level: 2

		Datatype: Float	**Unit:** %	**Min:**	-
				Def:	-
P-Group:	TECH			**Max:**	-

Displays total active PID setpoint in [%].

Note:

r2260 = 100 % corresponds to 4000 hex

P2261 **PID setpoint filter timeconstant** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00
				Max:	60.00

Sets a time constant for smoothing the PID setpoint.

Note:

0 = no smoothing

r2262 **CO: Act. PID filtered setpoint** Level: 3

		Datatype: Float	**Unit:** %	**Min:**	-
				Def:	-
P-Group:	TECH			**Max:**	-

Displays PID setpoint in [%] after smoothing.

Note:

r2262 = 100 % corresponds to 4000 hex

P2264 **CI: PID feedback** Level: 2

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	TECH	**Active:** Immediately	**QuickComm.** No	**Def:**	755:0
				Max:	4000:0

Selects the source of the PID feedback signal.

Settings:

755 = Analog input 1 setpoint
2224 = Fixed PID setpoint
2250 = Output setpoint of PID-MOP

Note:

When analog input is selected, offset and gain can be implemented using parameters P0756 to P0760.

P2265 **PID feedback filter timeconstant** Level: 2

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	0.00
				Max:	60.00

Defines time constant for PID feedback filter.

r2266 **CO: PID filtered feedback** Level: 2
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: TECH

Displays PID feedback signal in [%].

Note:
r2266 = 100 % corresponds to 4000 hex

P2267 **Max. value for PID feedback** Level: 3
CStat: CUT Datatype: Float Unit: % Min: -200.00 Def: 100.00 Max: 200.00
P-Group: TECH Active: first confirm QuickComm. No

Sets the upper limit for the value of the feedback signal in [%].

Note:
P2267 = 100 % corresponds to 4000 hex

Notice:
When PID is enabled (P2200 = 1) and the signal rises above this value, the inverter will trip with F0222 .

P2268 **Min. value for PID feedback** Level: 3
CStat: CUT Datatype: Float Unit: % Min: -200.00 Def: 0.00 Max: 200.00
P-Group: TECH Active: first confirm QuickComm. No

Sets lower limit for value of feedback signal in [%].

Note:
P2268 = 100 % corresponds to 4000 hex

Notice:
When PID is enabled (P2200 = 1) and the signal rises above this value, the inverter will trip with F0221.

P2269 **Gain applied to PID feedback** Level: 3
CStat: CUT Datatype: Float Unit: - Min: 0.00 Def: 100.00 Max: 500.00
P-Group: TECH Active: first confirm QuickComm. No

Allows the user to scale the PID feedback as a percentage value [%].

A gain of 100.0 % means that feedback signal has not changed from its default value.

P2270 **PID feedback function selector** Level: 3
CStat: CUT Datatype: U16 Unit: - Min: 0 Def: 0 Max: 3
P-Group: TECH Active: first confirm QuickComm. No

Applies mathematical functions to the PID feedback signal, allowing multiplication of the result by P2269 (gain applied to PID feedback).

Enum:
0 Disabled
1 Square root (root(x))
2 Square (x*x)
3 Cube (x*x*x)

P2271 **PID tranducer type** Level: 2
CStat: CUT Datatype: U16 Unit: - Min: 0 Def: 0 Max: 1
P-Group: TECH Active: first confirm QuickComm. No

Allows the user to select the transducer type for the PID feedback signal.

Value:
0 : [default] If the feedback signal is less than the PID setpoint, the PID controller will increase motor speed to correct this.

1 : If the feedback signal is greater than the PID setpoint, the PID controller will reduce motor speed to correct this.

Enum:
0 Disabled
1 Inversion of PID feedback signal

Notice:
It is essential that you select the correct tranducer type.

If you are unsure whether 0 or 1 is applicable, you can determine the correct type as follows:
1 Disable the PID function (P2200 = 0).
2 Increase the motor frequency while measuring the feedback signal.
3 If the feedback signal increases with an increase in motor frequency, the PID transducer type should be 0.
4 If the feedback signal decreases with an increase in motor frequency the PID transducer type should be set to 1.

r2272 **CO: PID scaled feedback** Level: 2
Datatype: Float Unit: % Min: - Def: - Max: -
P-Group: TECH

Displays PID scaled feedback signal in [%].

Note:
r2272 = 100 % corresponds to 4000 hex

r2273 **CO: PID error**

Datatype: Float Unit: % Min: - Def: - Max: - Level: 2

P-Group: TECH

Displays PID error (difference) signal between setpoint and feedback signals in [%].

Note:

r2273 = 100 % corresponds to 4000 hex

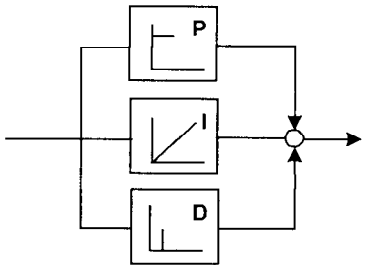
P2280 **PID proportional gain**

CStat: CUT Datatype: Float Unit: - Min: 0.000 Def: 3.000 Max: 65.000 Level: 2

P-Group: TECH Active: first confirm QuickComm. No

Allows user to set proportional gain for PID controller.

The PID controller is implemented using the standard model.



For best results, enable both P and I terms.

Dependency:

If P term = 0, I term acts on the square of the error signal.

Note:

If the system is prone to sudden step changes in the feedback signal, P term should normally be set to a small value (0.5) with a faster I term for optimum performance.

The D term (P2274) multiplies the difference between the present and previous feedback signal thus accelerating the controller reaction to an error that appears suddenly.

Notice:

The D term should be used carefully, since it can cause the controller output to fluctuate as every change in the feedback signal is amplified by the controller derivative action.

P2285 **PID integral time**

CStat: CUT Datatype: Float Unit: s Min: 0.000 Def: 0.000 Max: 60.000 Level: 2

P-Group: TECH Active: first confirm QuickComm. No

Sets integral time constant for PID controller.

Details:

See P2280 (PID proportional gain).

P2291 **PID output upper limit**

CStat: CUT Datatype: Float Unit: % Min: -200.00 Def: 100.00 Max: 200.00 Level: 2

P-Group: TECH Active: first confirm QuickComm. No

Sets upper limit for PID controller output in [%].

Dependency:

If F max (P1082) is greater than P2000 (reference frequency), either P2000 or P2291 (PID output upper limit) must be changed to achieve F max.

Note:

P2291 = 100 % corresponds to 4000 hex (as defined by P2000 (reference frequency)).

P2292 **PID output lower limit**

CStat: CUT Datatype: Float Unit: % Min: -200.00 Def: 0.00 Max: 200.00 Level: 2

P-Group: TECH Active: first confirm QuickComm. No

Sets lower limit for the PID controller output in [%].

Dependency:

A negative value allows bipolar operation of PID controller.

Note:

P2292 = 100 % corresponds to 4000 hex

P2293 **Ramp-up /-down time of PID limit** Level: 3

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	TECH	**Active:** first confirm	**QuickComm.** No	**Def:**	1.00
				Max:	100.00

Sets maximum ramp rate on output of PID.

When PI is enabled, the output limits are ramped up from 0 to the limits set in P2291 (PID output upper limit) and P2292 (PID output lower limit). Limits prevent large step changes appearing on the output of the PID when the inverter is started. Once the limits have been reached, the PID controller output is instantaneous.

These ramp times are used whenever a RUN command is issued.

Note:

If an OFF1 or OFF 3 are issued, the inverter output frequency ramps down as set in P1121 (ramp-down time) or P1135 (OFF3 ramp-down time).

r2294 **CO: Act. PID output** Level: 2

		Datatype: Float	**Unit:** %	**Min:**	-
P-Group:	TECH			**Def:**	-
				Max:	-

Displays PID output in [%]

Note:

r2294 = 100 % corresponds to 4000 hex

P3900 **End of quick commissioning** Level: 1

CStat:	C	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	QUICK	**Active:** Immediately	**QuickComm.** Yes	**Def:**	0
				Max:	3

Performs calculations necessary for optimized motor operation.

After completion of calculation, P3900 and P0010 (parameter groups for commissioning) are automatically reset to their original value 0.

Enum:

0 No quick commissioning
1 Start quick commissioning with factory reset
2 Start quick commissioning
3 Start quick commissioning only for motor data

Dependency:

Changeable only when P0010 = 1 (quick commissioning)

Note:

When setting 1 is selected, only the parameter settings carried out via the commissioning menu "Quick commissioning", are retained; all other parameter changes, including the I/O settings, are lost. Motor calculations are also performed.

When setting 2 is selected, only those parameters, which depend on the parameters in the commissioning menu "Quick commissioning" (P0010 = 1) are calculated. The I/O settings are also reset to default and the motor calculations performed.

When setting 3 is selected, only the motor and controller calculations are performed. Exiting quick commissioning with this setting saves time (for example, if only motor rating plate data have been changed).

Calculates a variety of motor parameters, overwriting previous values. These include P0344 (Level 3, motor weight), P0350 (Level 3, demagnetization time), P2000 (reference frequency), P2002 (Level 3, reference current).

P3950 **Access of hidden parameter** Level: 4

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	ALWAYS	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	255

Accesses special parameters for development (expert only) and factory functionality (calibration parameter).

r3954[13] **CM version and GUI ID**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: - **Level:** **4**

Used to classify firmware (only for SIEMENS internal purposes).

Index:

r3954[0] : CM version (major release)
r3954[1] : CM version (minor release)
r3954[2] : CM version (baselevel or patch)
r3954[3] : GUI ID
r3954[4] : GUI ID
r3954[5] : GUI ID
r3954[6] : GUI ID
r3954[7] : GUI ID
r3954[8] : GUI ID
r3954[9] : GUI ID
r3954[10] : GUI ID
r3954[11] : GUI ID major release
r3954[12] : GUI ID minor release

r3955 **Version for DriveMonitor**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: - **Level:** **H**

Displays the version for DriveMonitor.

P3980 **Commissioning command selection**

CStat: T **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 66

P-Group: - **Active:** Immediately **QuickComm.** No **Level:** **4**

Toggles command and setpoint sources between freely programmable BICO parameters and fixed command/setpoint profiles for commissioning.

The command and setpoint sources can be changed independently. The tens digit selects the command source, the ones digit the setpoint source.

Enum:

0	Cmd = BICO parameter	Setpoint = BICO parameter
1	Cmd = BICO parameter	Setpoint = MOP setpoint
2	Cmd = BICO parameter	Setpoint = Analog setpoint
3	Cmd = BICO parameter	Setpoint = Fixed frequency
4	Cmd = BICO parameter	Setpoint = USS on BOP link
5	Cmd = BICO parameter	Setpoint = USS on COM link
6	Cmd = BICO parameter	Setpoint = CB on COM link
10	Cmd = BOP	Setpoint = BICO parameter
11	Cmd = BOP	Setpoint = MOP setpoint
12	Cmd = BOP	Setpoint = Analog setpoint
13	Cmd = BOP	Setpoint = Fixed frequency
14	Cmd = BOP	Setpoint = USS on BOP link
15	Cmd = BOP	Setpoint = USS on COM link
16	Cmd = BOP	Setpoint = CB on COM link
40	Cmd = USS on BOP link	Setpoint = BICO parameter
41	Cmd = USS on BOP link	Setpoint = MOP setpoint
42	Cmd = USS on BOP link	Setpoint = Analog setpoint
43	Cmd = USS on BOP link	Setpoint = Fixed frequency
44	Cmd = USS on BOP link	Setpoint = USS on BOP link
45	Cmd = USS on BOP link	Setpoint = USS on COM link
46	Cmd = USS on BOP link	Setpoint = CB on COM link
50	Cmd = USS on COM link	Setpoint = BICO parameter
51	Cmd = USS on COM link	Setpoint = MOP setpoint
52	Cmd = USS on COM link	Setpoint = Analog setpoint
53	Cmd = USS on COM link	Setpoint = Fixed frequency
54	Cmd = USS on COM link	Setpoint = USS on BOP link
55	Cmd = USS on COM link	Setpoint = USS on COM link
56	Cmd = USS on COM link	Setpoint = CB on COM link
60	Cmd = CB on COM link	Setpoint = BICO parameter
61	Cmd = CB on COM link	Setpoint = MOP setpoint
62	Cmd = CB on COM link	Setpoint = Analog setpoint
63	Cmd = CB on COM link	Setpoint = Fixed frequency
64	Cmd = CB on COM link	Setpoint = USS on BOP link
65	Cmd = CB on COM link	Setpoint = USS on COM link
66	Cmd = CB on COM link	Setpoint = CB on COM link

P3981 **Reset active fault**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0 **Level:** 4
P-Group: ALARMS **Active:** Immediately **QuickComm.** No **Def:** 0 **Max:** 1

Resets active faults when changed from 0 to 1.

Enum:

0 No fault reset
1 Reset fault

Note:

Automatically reset to 0.

Details:

See P0947 (last fault code)

r3986[2] **Number of parameters**

Datatype: U16 **Unit:** - **Min:** - **Level:** 4
P-Group: - **Def:** - **Max:** -

Number of parameters on the drive

Index:

r3986[0] : Read only
r3986[1] : Read & write

2 Alarms and Warnings

2.1 MICROMASTER 420 fault messages

In the event of a failure, the inverter switches off and a fault code appears on the display.

NOTE
To reset the fault code, one of three methods listed below can be used:

1. Cycle the power to the drive.
2. Press the button on the BOP or AOP.
3. Via Digital Input 3 (default setting)

Fault	Possible Causes	Diagnose & Remedy	Reaction
F0001 Overcurrent	➢ Motor power does not correspond to the inverter power ➢ Motor lead short circuit ➢ Earth fault	Check the following: 1. Motor power (P0307) must correspond to inverter power (P0206) 2. Cable length limits must not be exceeded 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Value of stator resistance (P0350) must be correct 6. Motor must not be obstructed or overloaded ➢ Increase the ramp time ➢ Reduce the boost level	OFF2
F0002 Overvoltage	➢ DC-link voltage (r0026) exceeds trip level (P2172) ➢ Overvoltage can be caused either by too high main supply voltage or if motor is in regenerative mode ➢ Regenerative mode can be cause by fast ramp downs or if the motor is driven from an active load	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate 2. DC-link voltage controller must be enabled (P1240) and parameterized properly 3. Ramp-down time (P1121) must match inertia of load	OFF2
F0003 Undervoltage	➢ Main supply failed ➢ Shock load outside specified limits	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate 2. Supply must not be susceptible to temporary failures or voltage reductions	OFF2
F0004 Inverter Over-temperature	➢ Ambient temperature outside of limits, ➢ Fan failure	Check the following: 1. Fan must turn when inverter is running 2. Pulse frequency must be set to default value 3. Air inlet and outlet points are not obstructed Ambient temperature could be higher than specified for the inverter	OFF2
F0005 Inverter I^2t	➢ Inverter overloaded ➢ Duty cycle too demanding ➢ Motor power (P0307) exceeds inverter power capability (P0206)	Check the following: 1. Load duty cycle must lie within specified limits 2. Motor power (P0307) must match inverter power (P0206)	OFF2
F0011 Motor Over-temperature I^2t	➢ Motor overloaded ➢ Motor data incorrect ➢ Long time period operating at low speeds	1. Check motor data 2. Check loading on motor 3. Boost settings too high (P1310,P1311, P1312) 4. Check parameter for motor thermal time constant 5. Check parameter for motor I^2t warning level	OFF1
F0041 Stator resistance measurement failure	Stator resistance measurement failure	1. Check if the motor is connected to the inverter 2. Check that the motor data has been entered correctly	OFF2

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0051 Parameter EEPROM Fault	Reading or writing of the non-volatile parameter storage has failed	1. Factory reset and new parameterization 2. Change inverter	OFF2
F0052 Powerstack Fault	Reading of the powerstack information has failed or the data is invalid	Change inverter	OFF2
F0060 Asic Timeout	Internal communications failure	1. Acknowledge fault 2. Change inverter if repeated	OFF2
F0070 Communicatio ns board setpoint error	No setpoint received from communications board during telegram off time	1. Check connections to the communications board 2. Check the master	OFF2
F0071 No Data for USS (RS232 link) during Telegramm Off Time	No response during telegram off time via USS (BOP link)	1. Check connections to the communications board 2. Check the master	OFF2
F0072 No Data from USS (RS485 link) during Telegram Off Time	No response during telegram off time via USS (COM link)	1. Check connections to the communications board 2. Check the master	OFF2
F0080 Analogue input - lost input signal	➢ Broken wire ➢ Signal out of limits	Check connection to analogue input	OFF2
F0085 External Fault	External fault is triggered via terminal inputs	Disable terminal input for fault trigger	OFF2
F0101 Stack Overflow	Software error or processor failure	1. Run self test routines 2. Change inverter	OFF2
F0221 PI Feedback below mini-mum value	PID Feedback below minimum value P2268	1. Change value of P2268 2. Adjust feedback gain	OFF2
F0222 PI Feedback above maximum value	PID Feedback above maximum value P2267	1. Change value of P2267 2. Adjust feedback gain	OFF2
F0450 (Service mode only) **BIST Tests Failure**	Fault value 1 Some of the power section tests have failed 2 Some of the control board tests have failed 4 Some of the functional tests have failed 8 Some of the IO module tests have failed 16 The Internal RAM has failed its check on power-up	1. Inverter may run but certain actions will not function correctly 2. Replace inverter	OFF2

2.2 MICROMASTER 420 alarm messages

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0501 Current Limit	➢ Motor power does not correspond to the inverter power ➢ Motor leads are too short ➢ Earth faults	1. Check whether the motor power corresponds to the inverter power 2. Check that the cable length limits have not been exceeded 3. Check motor cable and motor for short-circuits and earth faults 4. Check whether the motor parameters correspond with the motor being used 5. Check the stator resistance 6. Increase the ramp-up-time 7. Reduce the boost 8. Check whether the motor is obstructed or overloaded	--
A0502 Overvoltage limit	➢ Mains supply too high ➢ Load regenerative ➢ Ramp-down time too short	1. Check that mains supply voltage is within allowable range 2. Increase ramp down times **Note**: Vdc-max controller is active, ramp-down times will be automatically increased	--
A0503 Undervoltage Limit	➢ Mains supply too low ➢ Short mains interruption	Check main supply voltage (P0210)	--
A0504 Inverter Over-temperature	Warning level of inverter heat-sink temperature (P0614) is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parametrization in (P0610)	1. Check if ambient temperature is within specified limits 2. Check load conditions and duty cycle 3. Check if fan is turning when drive is running	--
A0505 Inverter I^2t	Warning level is exceeded; current will be reduced if parameterized (P0610 = 1)	Check if duty cycle is within specified limits	--
A0506 Inverter Duty Cycle	Heatsink temperature and thermal junction model are outside of allowable range	Check if duty cycle are within specified limits	--
A0511 Motor Over-temperature I^2t	Motor overloaded	Check the following: 1. P0611 (motor I^2t time constant) should be set to appropriate value 2. P0614 (Motor I^2t overload warning level) should be set to suitable level 3. Are long periods of operation at low speed occuring 4. Check that boost settings are not too high	--
A0541 Motor Data Identification Active	Motor data identification (P1910) selected or running	Wait until motor identification is finished	--
A0600 RTOS Overrun Warning	Software error		
A0700 CB warning 1	CB (communication board) specific	See CB user manual	--
A0701 CB warning 2	CB (communication board) specific	See CB user manual	--
A0702 CB warning 3	CB (communication board) specific	See CB user manual	--
A0703 CB warning 4	CB (communication board) specific	See CB user manual	--
A0704 CB warning 5	CB (communication board) specific	See CB user manual	--
A0705 CB warning 6	CB (communication board) specific	See CB user manual	--
A0706 CB warning 7	CB (communication board) specific	See CB user manual	--
A0707 CB warning 8	CB (communication board) specific	See CB user manual	--
A0708 CB warning 9	CB (communication board) specific	See CB user manual	--
A0709 CB warning 10	CB (communication board) specific	See CB user manual	--

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
A0710 CB communi-cation error	Communication with CB (communication board) is lost	Check CB hardware	--
A0711 CB configu-ration error	CB (communication board) reports a configuration error	Check CB parameters	--
A0910 Vdc-max controller de-activated	Vdc max controller has been de-activated, since controller is not capable of keeping DC-link voltage (r0026) within limits (P2172) ➢ Occurs if main supply voltage (P0210) is permanently too high ➢ Occurs if motor is driven by an active load, causing motor to goes into regenerative mode ➢ Occurs at very high load inertias, when ramping down	Check the following: 1. Input voltage (P0756) lies within range? 2. Load must match In certain cases apply braking resistor	--
A0911 Vdc-max controller active	Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits (P2172)	1. Check parameter inverter input voltage 2. Check ramp-down times	--
A0912 Vdc-min controller active	Vdc min controller will be activated if DC-link voltage (r0026) falls below minimum level (P2172) ➢ The kinetic energy of the motor is used to buffer the DC-link voltage, thus causing deceleration of the drive! ➢ So short mains failures do not necessarily lead to an undervoltage trip		--
A0920 ADC parameters not set properly	ADC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for input do not correspond to ADC type	Analogue input parameters should not be set to the same value as each other	--
A0921 DAC parameters not set properly	DAC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for output do not correspond to DAC type	Analogue Output parameters should not be set to the same value as each other	--
A0922 No load applied to inverter	➢ No Load is applied to the inverter ➢ As a result, some functions may not work as under normal load conditions Low output voltage eg when 0 boost applied at 0 Hz	1. Check that load is applied to the inverter 2. Check motor parameters correspond to motor attached 3. As a result, some functions may not work correctly, because there is no normal load condition	--
A0923 Both JOG Left and JOG Right are requested	Both JOG right and JOG left (P1055/P1056) have been requested. This freezes the RFG output frequency at its current value. JOG right and JOG left signals active together	Make sure that JOG right and JOG left signals are not applied simultaneously	--

Suggestions and/or Corrections

To
Siemens AG
Automation & Drives
Group
SD VM 4
P.O. Box 3269

D-91050 Erlangen
Federal Republic of Germany

Suggestions for technical documentation☐

Suggestions
Corrections

For Publication/Manual:

MICROMASTER 420

Parameter List

User Documentation

From
Name:

Company/Service Department
Address: _____
_____
Phone: _____ / _____
Fax: _____ / _____

Order No.: 6SE6400-5BA00-0BP0
Version 12/01

Should you come across any printing errors when reading this publication, please notify us on this sheet.

Suggestions for improvement are also welcome.

7. Machine Parts

7.1 Replacement Parts Orders

ATTENTION!

Spare parts must meet the technical standards of the machine manufacturers. Use only original replacement parts.

Please direct all inquiries and orders for spare parts directly to the manufacturer. All required data with regard to the machine and its manufacturer is listed in **Chapter 1.2** (techn. data) of this manual.
By means of the following parts lists you can locate - with the aid of the item no. on the drawing resp. diagramme shown in the 1. column - the respective parts. The following columns give you information about the designation and the part no. of the respective part.
The numerous diagrammes enable you to locate exactly specific machine parts and machine assemblies. If position numbers of a diagramme are mentioned in the text, they are placed in parentheses (pos. X). Descriptions referring to locations, such as "front", "above", "below", "left", "right", etc., assume you are facing the front (operator) side of the machine.
Please address your spare parts orders with the required data and the enclosed order sheet completely filled in to:

Gebr. Schmid
Maschinenfabrik
Spare Parts
Mr. Bauer
Robert-Bosch-Str. 32-34
D-72250 Freudenstadt

Telephone: 07441/538-0
Telefax: 07441/538-175
e-mail: ABauer@Schmid-Online.de

7. Machine Parts

7.2 Use of Spare Parts Lists

Mechanical Spare Part

For each module there are separate spare parts lists. The modules consist of several assemblies, individual parts and parts from sub-suppliers.

Each module starts with a module survey spare parts list (fig. 1).

Head line

Inter line

Spare Parts Area

Com.no.:	12-98-202-03	Order:	300000434		
Description:	KSM 3 PVC/VA	Item:	000050		
Quantity:	1 ST	Page:	000001/01		
Drawing:	Ohne/Without	Date:	19.10.98		

Item no	Part-No. / Description	Quantity	Unit	SP
	16.02.FA03.02.0N Behälter+V/FA03/PVC/TI/3SZ/H500	1	PC	
	16.5.FA00.06.0A Zulauf/FAM/2AS/+SF/0.25 KW/Ö25	3	PC	
	16.010.0024.U00A Schwimmerschalter/PVC/EPDM/ES-335	3	PC	
1	16.005.0008.2H1B Sprührohr/D32/PVC/0650/06DÜ/BJ/BJ/G71	6	PC	E
	16.004.0126.U23L Vorschub/ST/PVC/VA/KL-KU/d=27	1	PC	
	16.004.0039.U801 Vorschub/4WA/VA/80/10/32/T50	4	PC	
	16.04.KS00.01.0L Vorschub/1K+SR/VA/54/54/T50	3	PC	
2	MG-000000092-000 DF-Messer/Polysulfon/PVC/0060-00640 1/h	1	PC	E
3	ES-000000200-000 Magnetschalter/Typ:1257 Min. D10/15	1	PC	E

Figure 1: Module Survey Spare Parts Lists

Parts without item nos. see corresponding assembly parts list

7. Machine Parts

Head line

Assembly:	12-98-202-03	*Commission-No. And Module-No.*
Designation:	KSM3PVC/VA	*Module Description*
Quantity:	1ST	*No.of pieces*
Drawing:	OHNE/WITHOUT	i.e. for this module survey there is no separate square part drawing
Order:	300000434	*Internal SAP-Order-No.*
Item:	50	*consecutive item no.*
Page:	000001/01	*consecutive page no.*
Date:	29.10.1998	*date of issue*

Inter line

see separate assembly square parts list (fig.3)

Spare Parts Area

Item no.	Part-No. Designation	Quantity	Unit	SP
	: 16.02FA03.02.0N Behälter+V/FA03/PVC/Ti/357/H500 : :		1 PC	
1	16.005.0008.2H1B Sprührohr/D32/PVC/0650/06DÜ/Bj/Bj/G71 : :		6 PC	E

Figure 2:
Legend
Spare Parts List

When there is no number in the column "item" and no E in the column "SP", this assembly does contain spare parts, however the complete assembly cannot be ordered as spare part. This means automatically the reference to one of the assembly spare parts lists following this list.
(See fig. 3)

7. Machine Parts

When there is a number in the column "item" and an E in the column "SP", this assembly does contain spare parts, however the complete asssembly can be ordered as spare part, too. If not the complete assembly, but spare parts out of this assembly are required, see one of the assembly spare parts lists following this list. (See fig. 3)

When there is a drawing no. under the head line position "Drawing: .....", and a number is shown in the column "item", this consecutive item no. is corresponding to the reference number on the respective spare part drawing.

Assembly:	16.02.FA03.02.0N	*corresponding assembly no.*
Designation:	Behälter+V/FA03/PVC/Ti/3SZ/H500	
Quantity:	1 ST	
Drawing:	16.02.FA01E02.00	*respective spare part drawing for above-mentioned assembly spare parts list (see fig.4)*
	see separate assembly spare parts list (see fig.5)	

Item no.	Part no. Designation	Quantity	Unit	SP
	16.002.0030.U23N Glasdeckel/Kpl./23/Ti	1	ST	
1	16.002.0508.0760 Profil/"Viton B"	0,820	M	E
	order as complete set or see separate assembly spare parts list for individual spare parts			

Figure 3: Assembly Spare Parts List

7. Machine Parts

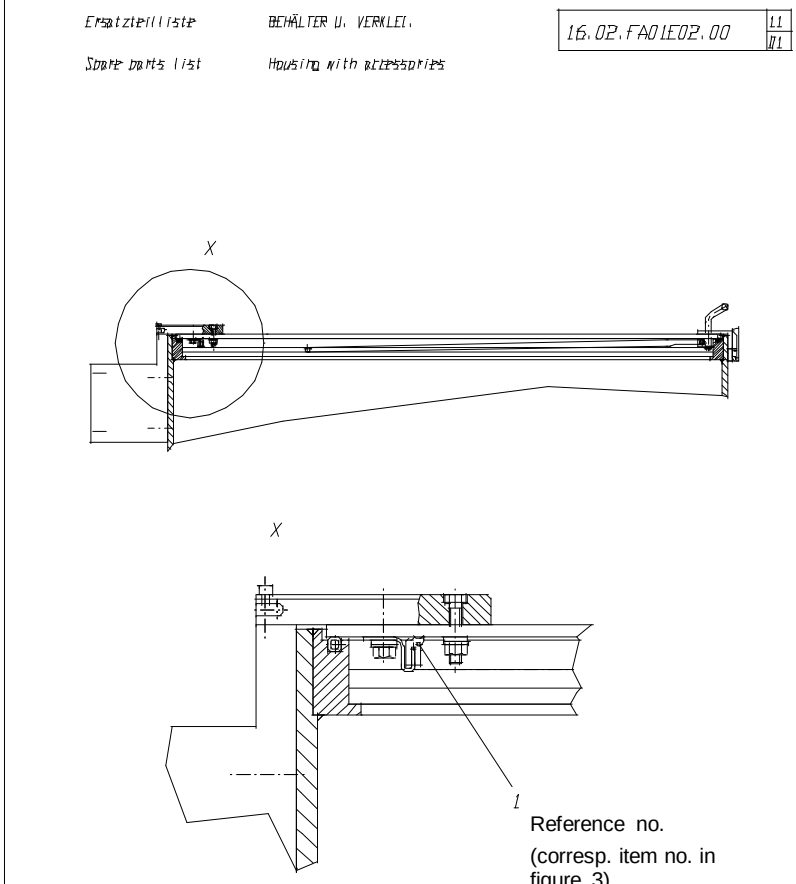


Figure 4:
Assembly
Spare Parts
Drawing
16.02.FA01E02.00

7. Machine Parts

Head line

Assembly:	16.022.0030.U23N	Order:	300000434
Designation:	Glasdeckel/Kpl./23/Ti	Item:	000051
Quantity:	1 ST	Page:	000003/02
Drawing:	16.002.0030EU000 (see figure 6)	Date:	20.10.98

Iinter line

Item no.	Part no. Designation:	Qty	Unit	SP
1	16.002.0022.2230 Glasdeckel/23/0650/0843x0932x06	1	ST	E
	16.002.0029.U00N Deckelteile/PVC/Ti	1	ST	
2	SCHL8009-04x1.5 EPDM-Schlauch/ID=4x1.5	3,610	M	E

Spare Parts Area

Figure 5: Next in the hierarchy following assembly spare parts list

Parts without item no. see respective assembly parts list

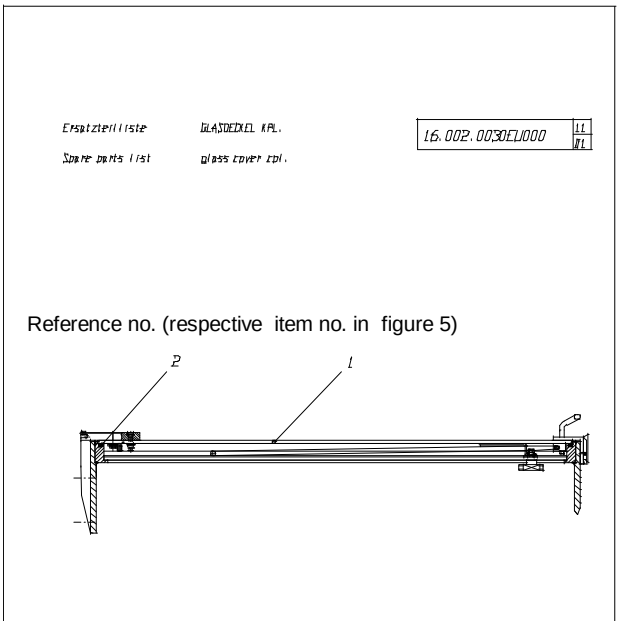


Figure 6: Assembly Spare Parts Drawing

The complete parts lists are organized hierarchically. This principle runs through the entire machine.

7. Machine Parts

7.3 Technical Customer Service

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7.4 Technical Procedure Questions

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HKappler@Schmid-Online.de
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Module Abbreviations (alphabetical order)

ADM	transport input module Segmenta
AZM	etching module
BONBUN	brush module
CuTM	electroless copper tank module (without pump)
CuTMP	electroless copper tank module (with pump)
EDM	transport exit module Segmenta
ETM	developer
FAM	replenisher module
KSM	cascade-rinse module
KSM (EDELSTAHL)	cascade-rinse module (stainless steel)
OS	oscillation
SON/SUN	wet grinding top/bottom
SRM	spray rotation module
STM	stripping module
STM+ZBF	stripping module with cyclone belt filter
TKM	dry module
TKM + VS	dry module with conveyor
TQM	drying-squeezing module
TRA	transport exit
TRA1+VS	transport exit with conveyor
TRE	transport input
TRE + VS	transport input with conveyor
TRK	transport with monitoring
TRK + VS	transport with monitoring, with conveyor
TRK + VS + VS	transport with monitoring, with conveyor
VS	conveyor
WMT	rinse/process module with big tank
WMT + OS	rinse/process module with big tank/ with oscillation
WMTW	rinse/process module with big tank/ with flood tray
WSI	rinse/process module, intermittent spraying
WSM	rinse/process module
WTM	rinse/process module with small tank
WTM-W	rinse/process module with small tank, with flood tray

Module number is hidden in the parts list number at the end,
e.g. parts list 45-01-063-03 is module 3 of machine 45-01-063.

Assembly	: Micro-Etching machine	Commiss.	: 25-05-377
Label	: Spare parts (module overview)	Position	:
Quant.	: 0,000	Page	: 000001/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	25-05-377-00 add Parts	1,000	ST	
	25-05-377-01 M01, Input - TRE 1 PVC/SS	1,000	ST	
	25-05-377-02 M02, Degrease - WMT 2 PVC/SS	1,000	ST	
	25-05-377-03 M03, Cascade-Rinse - KSM 4 PVC/TI	1,000	ST	
	25-05-377-04 M04, Micro-Etch - WMT 3 PVC/TI	1,000	ST	
	25-05-377-05 M05, Cascade-Rinse - KSM 3 PVC/TI	1,000	ST	
	25-05-377-06 M06, Rinse - WMT 1 PVC/SS	1,000	ST	
	25-05-377-07 M07, Cascade-Rinse - KSM 3 PVC/SS	1,000	ST	
	25-05-377-08 M08, Dry - TKM 3 PP/SS	1,000	ST	
	25-05-377-09 M09, Output - TRA 1 PVC/SS	1,000	ST	

Assembly	: 25-05-377-00	Commiss.	: 25-05-377
Label	: add Parts	Position	: 000020
Quant.	: 1,000 ST	Page	: 000002/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0054.U003 CONNECTION/KPL./TIT/+VST/KL-KU	4,000	ST	
	16.002.0054.U002 CONNECTION,KPL./V2A/+VST/KL-KU	2,000	ST	
	16.002.0057.U002 CONNECTION,KPL./VA/+VST/ANGLE/KL-KU	2,000	ST	
	16.004.0123.U000 CLUTCH PARTS/ADD. FINAL MODULES	1,000	ST	
	16.004.0430.U003 MODULE-TO-MODULE TRANSITION	4,000	ST	
	16.004.0430.U002 MODULE-TO-MODULE TRANSITION	4,000	ST	
1	16.004.1712.2573 SHAFT/CPL/32/O+U/ / /Fj	4,000	ST	X
2	16.004.1712.2572 SHAFT/CPL/32/O+U/ / /Fj	4,000	ST	X

Assembly	: 16.002.0054.U003	Commiss.	: 25-05-377
Label	: CONNECTION/KPL./TIT/+VST/KL-KU	Position	: 000020
Quant.	: 4,000 ST	Page	: 000003/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0001.U003 CONNCETION PARTS/TIT	1,000	ST	
	16.004.0122.U803 CLUTCH/CPL./TI/EP/CLAW-CLUTCH	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.002.0001.U003	Commiss.	: 25-05-377
Label	: CONNCETION PARTS/TIT	Position	: 000020
Quant.	: 1,000 ST	Page	: 000004/01
Drawing	: 16.002.0001EU000	Date	: 10.04.2006

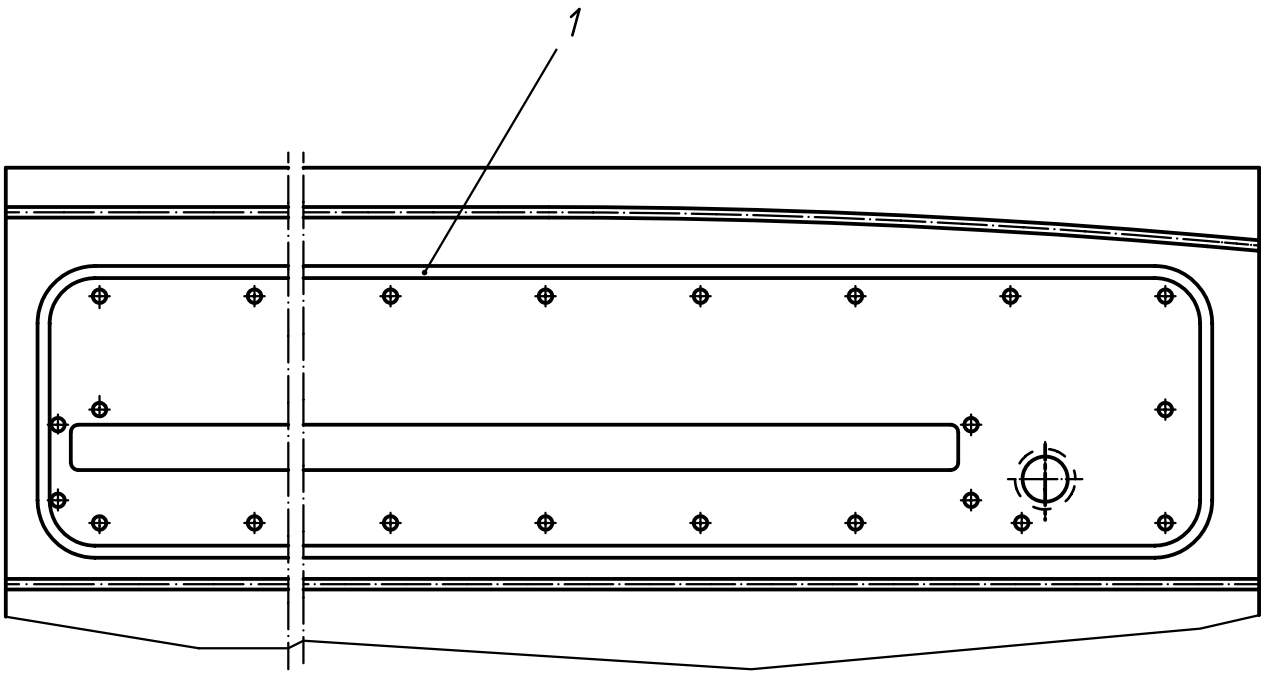
Pos.	Part N° Label	Quant.	Unit	SP
1	SCHL8009-04X1.5 EPDM-HOSE/ID=4x1.5	2,100	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VERBINDUNGSTEILE

Spare parts list Connection parts

16.002.0001EU000	11
	00



Assembly	: 16.004.0122.U803	Commiss.	: 25-05-377
Label	: CLUTCH/CPL./TI/EP/CLAW-CLUTCH	Position	: 000020
Quant.	: 1,000 ST	Page	: 000005/01
Drawing	: 16.004.0122EU000	Date	: 10.04.2006

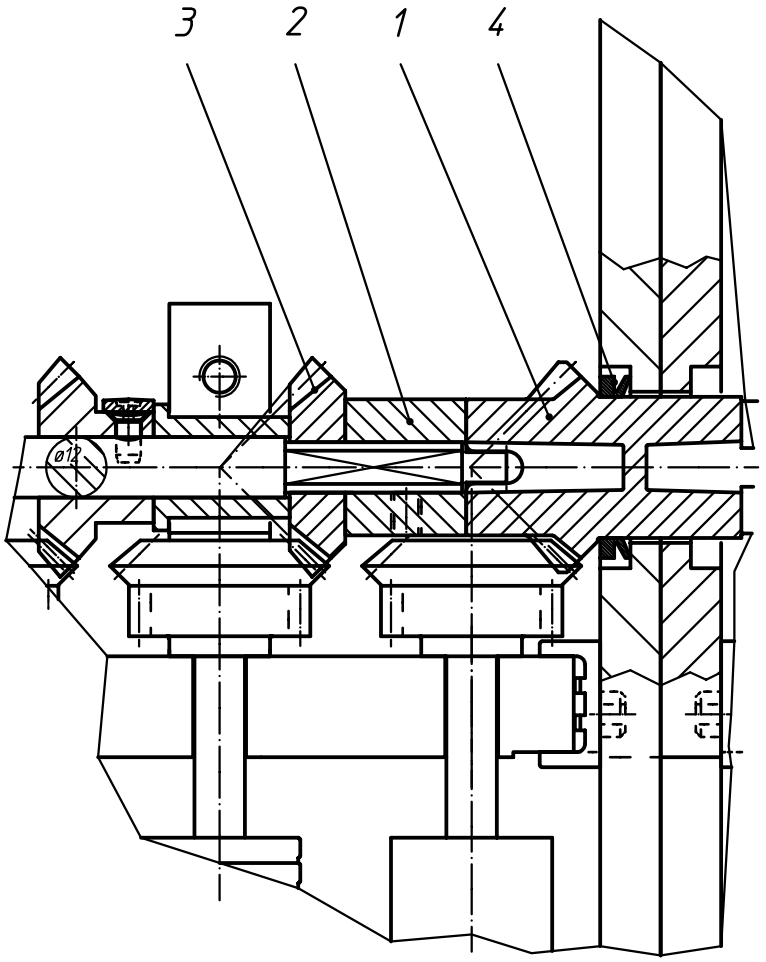
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0352.0001 CLUTCH/PVDF/Z=016/M=2.5	1,000	ST	X
2	16.004.0330.0003 COUPLING/PART2/TI	1,000	ST	X
3	00.001.0011.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/v=10.0	1,000	ST	X
4	DICH1080-V28A V-RING V28A/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KUPPLUNG KPL.

Spare parts list Coupling cpl.

16.004.0122EU000	11
	00



Assembly	: 16.002.0054.U002	Commiss.	: 25-05-377
Label	: CONNECTION,KPL./V2A/+VST/KL-KU	Position	: 000020
Quant.	: 2,000 ST	Page	: 000006/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0001.U001 CONNECTION PARTS/V2A	1,000	ST	
	16.004.0122.U802 CLUTCH/CPL./VA/EP/CLAW-CLUTCH	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.002.0001.U001	Commiss.	: 25-05-377
Label	: CONNECTION PARTS/V2A	Position	: 000020
Quant.	: 1,000 ST	Page	: 000007/01
Drawing	: 16.002.0001EU000	Date	: 10.04.2006

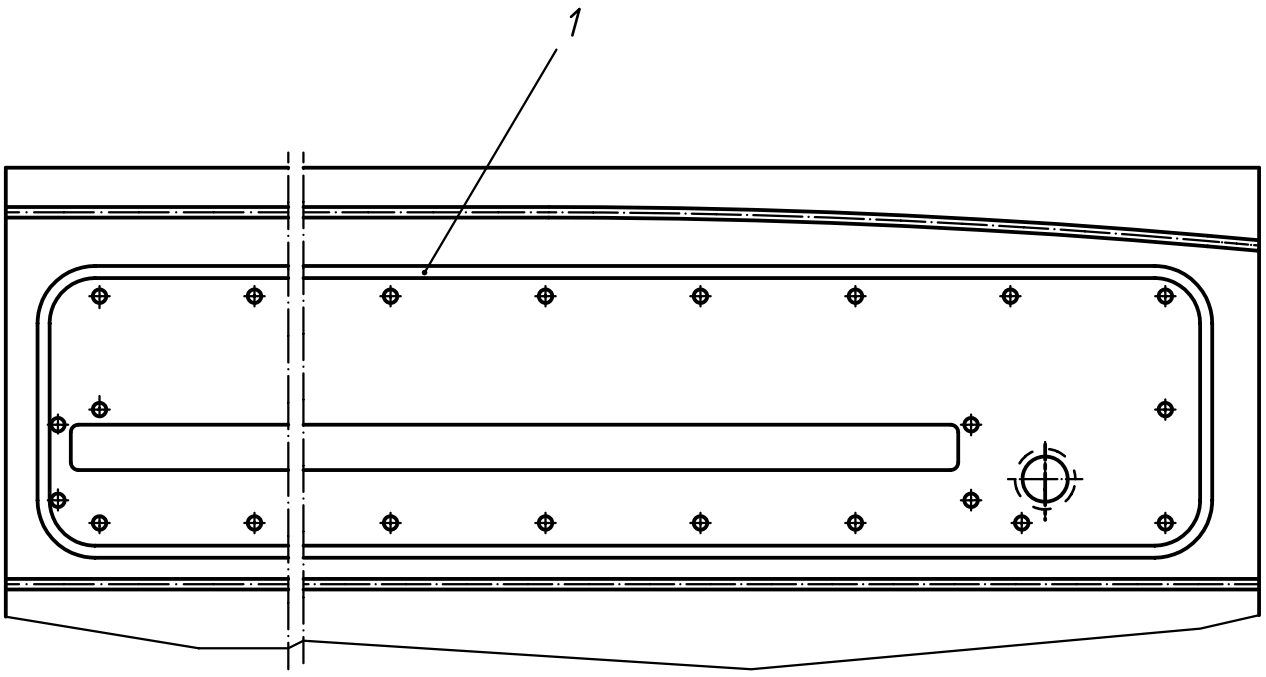
Pos.	Part N° Label	Quant.	Unit	SP
1	SCHL8009-04X1.5 EPDM-HOSE/ID=4x1.5	2,100	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VERBINDUNGSTEILE

Spare parts list Connection parts

16.002.0001EU000	11
	00



Assembly	: 16.004.0122.U802	Commiss.	: 25-05-377
Label	: CLUTCH/CPL./VA/EP/CLAW-CLUTCH	Position	: 000020
Quant.	: 1,000 ST	Page	: 000008/01
Drawing	: 16.004.0122EU000	Date	: 10.04.2006

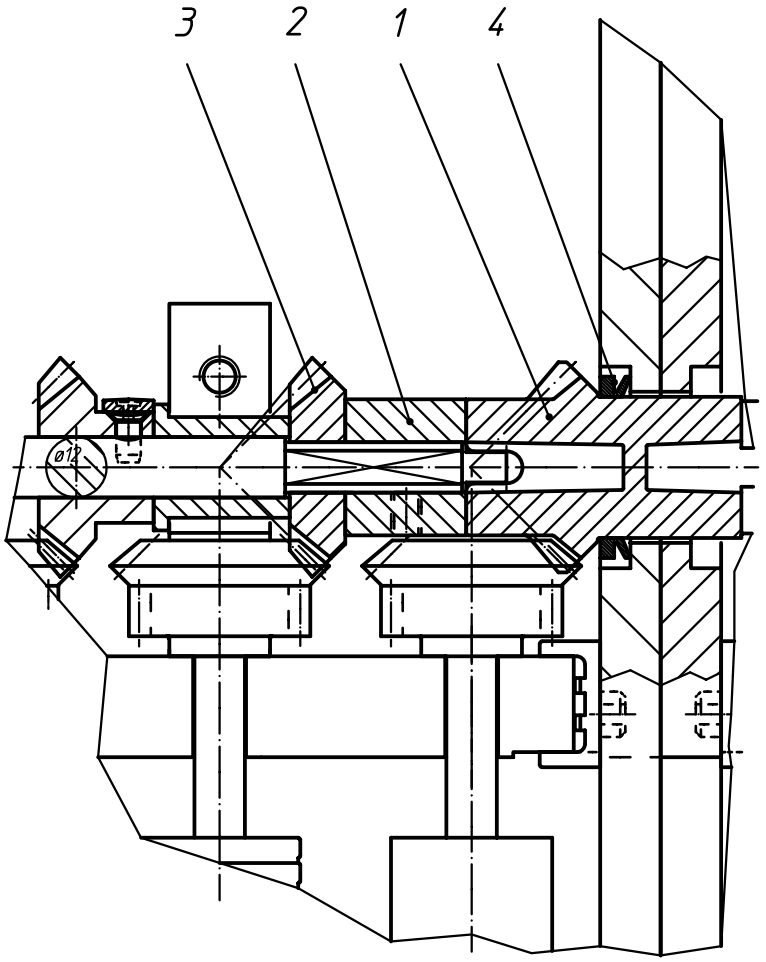
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0352.0001 CLUTCH/PVDF/Z=016/M=2.5	1,000	ST	X
2	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X
3	00.001.0011.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/v=10.0	1,000	ST	X
4	DICH1080-V28A V-RING V28A/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KUPPLUNG KPL.

Spare parts list Coupling cpl.

16.004.0122EU000	11
	00



Assembly	: 16.002.0057.U002	Commiss.	: 25-05-377
Label	: CONNECTION,KPL./VA/+VST/ANGLE/KL-KU	Position	: 000020
Quant.	: 2,000 ST	Page	: 000009/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0044.U002 CONNECTION PARTS/V2A/+ANGLE	1,000	ST	
	16.004.0122.U802 CLUTCH/CPL./VA/EP/CLAW-CLUTCH	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.002.0044.U002	Commiss.	: 25-05-377
Label	: CONNECTION PARTS/V2A/+ANGLE	Position	: 000020
Quant.	: 1,000 ST	Page	: 000010/01
Drawing	: 16.002.0044EU000	Date	: 10.04.2006

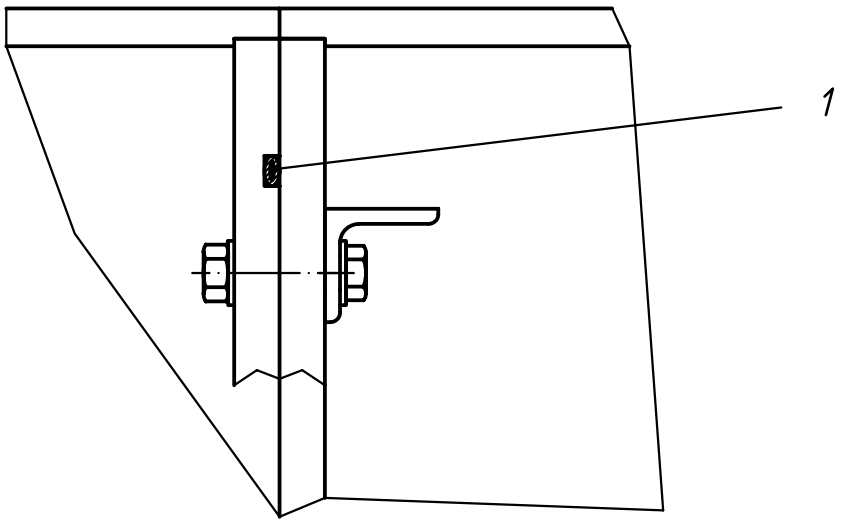
Pos.	Part N° Label	Quant.	Unit	SP
1	SCHL8009-04X1.5 EPDM-HOSE/ID=4x1.5	2,100	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VERBINDUNGSTEILE

Spare parts list Connection parts

16.002.0044EU000	11
	00



Assembly	: 16.004.0122.U802	Commiss.	: 25-05-377
Label	: CLUTCH/CPL./VA/EP/CLAW-CLUTCH	Position	: 000020
Quant.	: 1,000 ST	Page	: 000011/01
Drawing	: 16.004.0122EU000	Date	: 10.04.2006

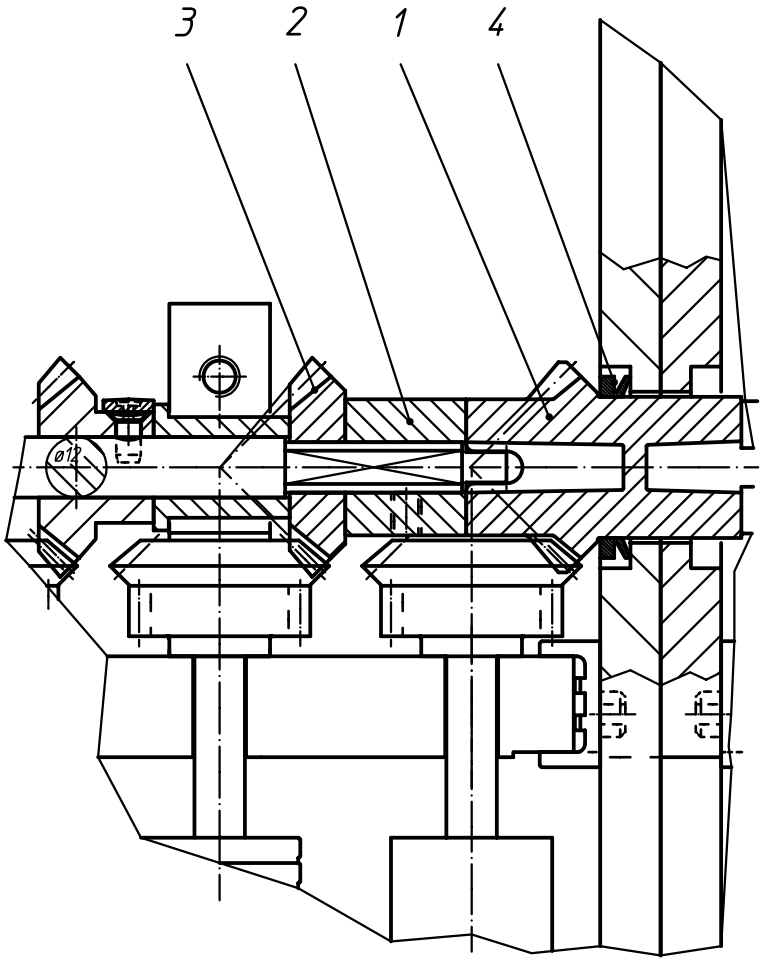
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0352.0001 CLUTCH/PVDF/Z=016/M=2.5	1,000	ST	X
2	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X
3	00.001.0011.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/v=10.0	1,000	ST	X
4	DICH1080-V28A V-RING V28A/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KUPPLUNG KPL.

Spare parts list Coupling cpl.

16.004.0122EU000	11
	00



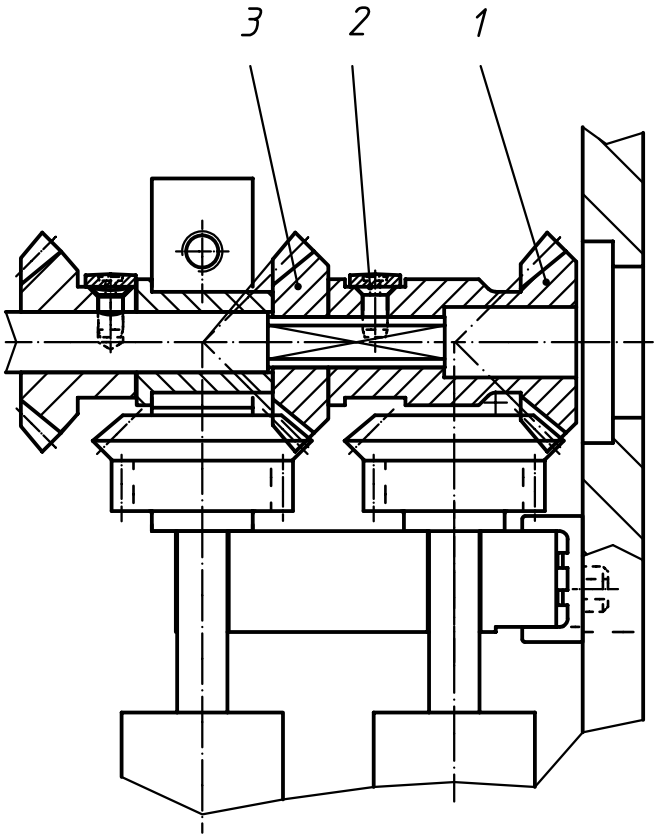
Assembly	: 16.004.0123.U000	Commiss.	: 25-05-377
Label	: CLUTCH PARTS/ADD. FINAL MODULES	Position	: 000020
Quant.	: 1,000 ST	Page	: 000012/01
Drawing	: 16.004.0123EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	00.001.0100.0001 bevel wheel/PVDF/Z=16/M=2.5/v=10.0	1,000	ST	X
2	03.004.0278.0003 CLAMP/WHITE/PVDF-TI	1,000	ST	X
3	00.001.0011.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/v=10.0	1,000	ST	X

Ersatzteilliste KUPPLUNGSTEILE .

Spare parts list Coupling parts

16.004.0123EU000	11
	00



Assembly	: 16.004.0430.U003	Commiss.	: 25-05-377
Label	: MODULE-TO-MODULE TRANSITION	Position	: 000020
Quant.	: 4,000 ST	Page	: 000013/01
Drawing	: 16.004.0430EU000	Date	: 10.04.2006

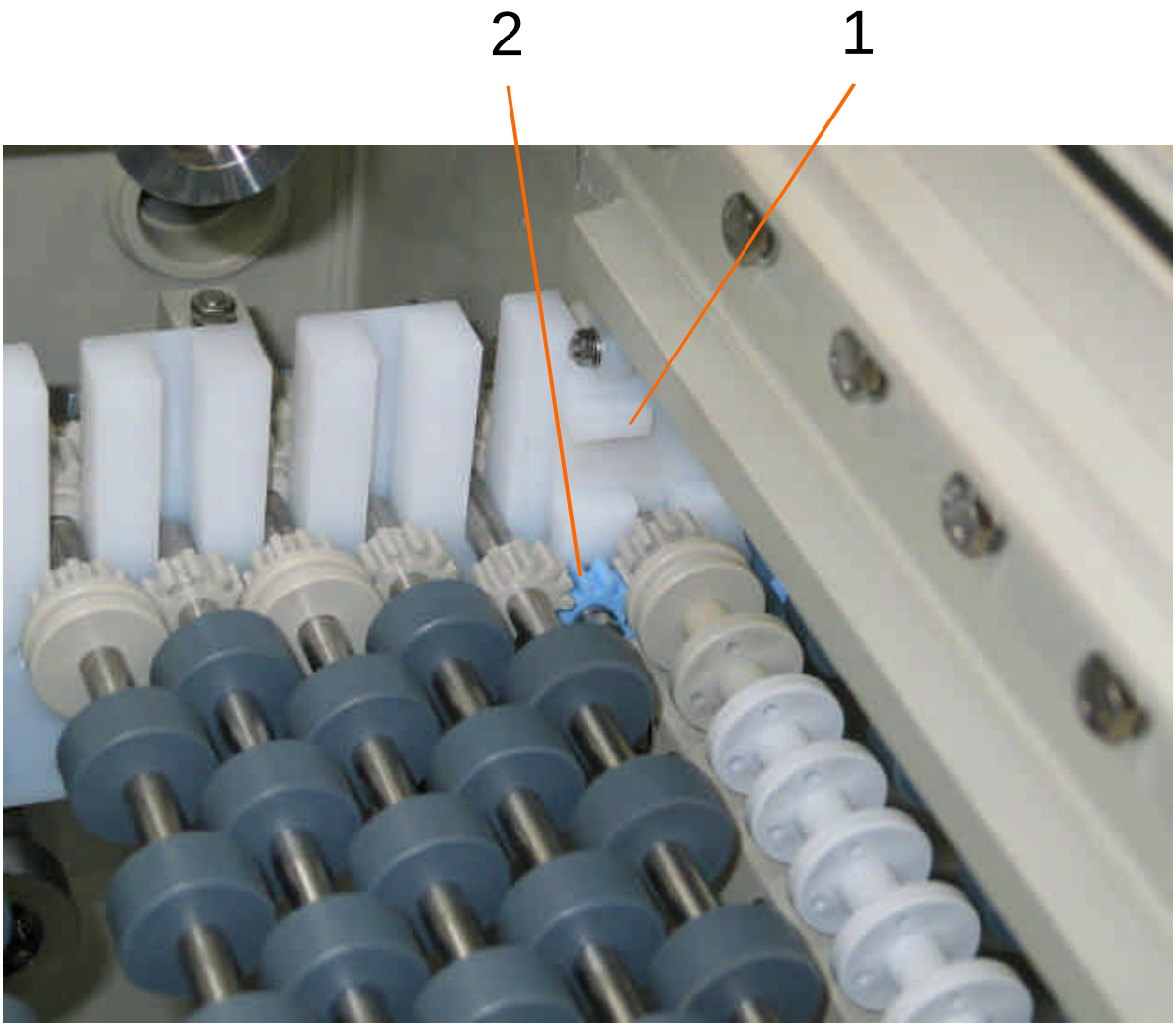
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1265.000H SUPPORT/GUR-N/d10/D32/T25/F	2,000	ST	X
	16.004.0395.U003 deflection wheel/Z=11/M2/TI/PP-N/F	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Modulübergang

Spare parts list Module Transition

16.004.0430EU000	11
	00



Assembly	: 16.004.0395.U003	Commiss.	: 25-05-377
Label	: deflection wheel/Z=11/M2/TI/PP-N/F	Position	: 000020
Quant.	: 1,000 ST	Page	: 000014/01
Drawing	: 16.004.0395EU001	Date	: 10.04.2006

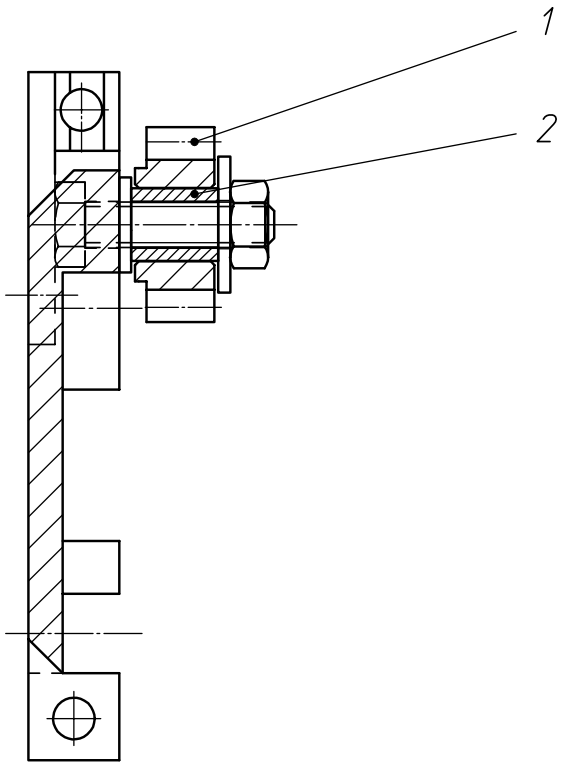
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0204.0000 SPUR WHEEL/PP/Z=11/M=2.0/d=09.7	1,000	ST	X
2	00.019.0274.0003 BUSHING/TI/d=06.1/D=09.6/L=11.5	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0395EU001	11
	00



Assembly	: 16.004.0430.U002	Commiss.	: 25-05-377
Label	: MODULE-TO-MODULE TRANSITION	Position	: 000020
Quant.	: 4,000 ST	Page	: 000015/01
Drawing	: 16.004.0430EU000	Date	: 10.04.2006

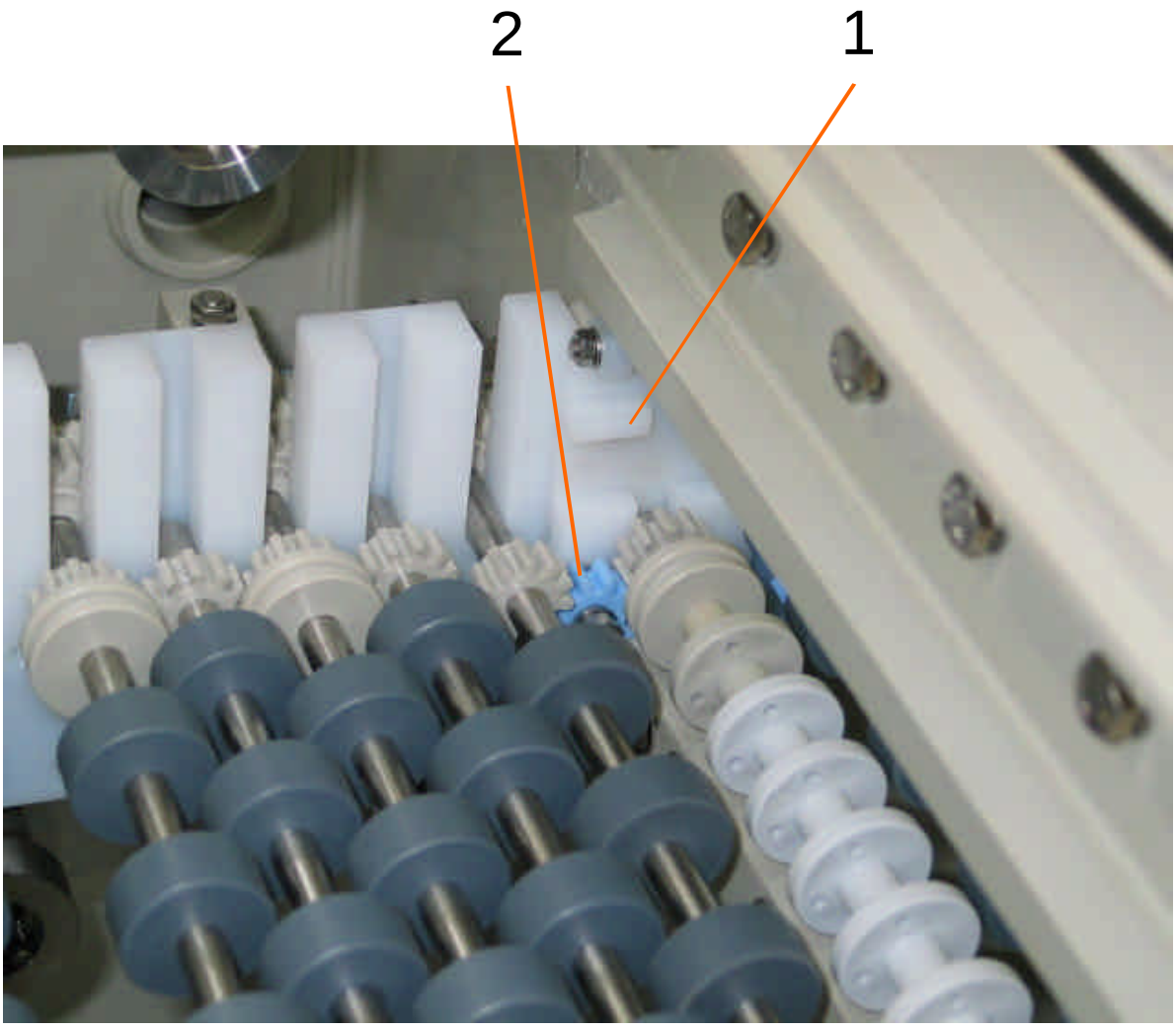
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1265.000H SUPPORT/GUR-N/d10/D32/T25/F	2,000	ST	X
	16.004.0395.U002 GEAR WHEEL CONPL:/Z=11/M2/V4A/PP-N	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Modulübergang

Spare parts list Module Transition

16.004.0430EU000	11
	00



Assembly	: 16.004.0395.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL CONPL:/Z=11/M2/V4A/PP-N	Position	: 000020
Quant.	: 1,000 ST	Page	: 000016/01
Drawing	: 16.004.0395EU001	Date	: 10.04.2006

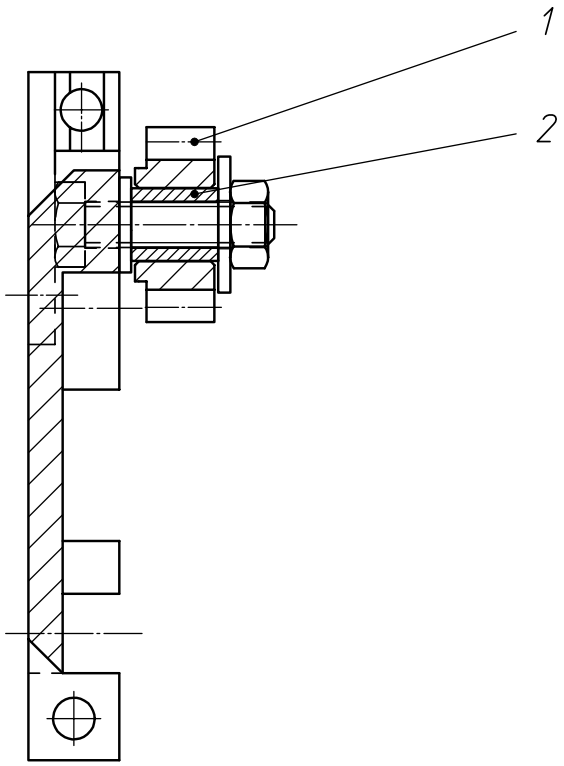
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0204.0000 SPUR WHEEL/PP/Z=11/M=2.0/d=09.7	1,000	ST	X
2	00.019.0274.0002 BUSHING/V4A/d=06.1/D=09.6/L=11.5	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0395EU001	11
	00



Assembly	: 16.004.1712.2573	Commiss.	: 25-05-377
Label	: SHAFT/CPL/32/O+U/ / /Fj	Position	: 000020
Quant.	: 4,000 ST	Page	: 000017/01
Drawing	: 16.004.1712E0570	Date	: 10.04.2006

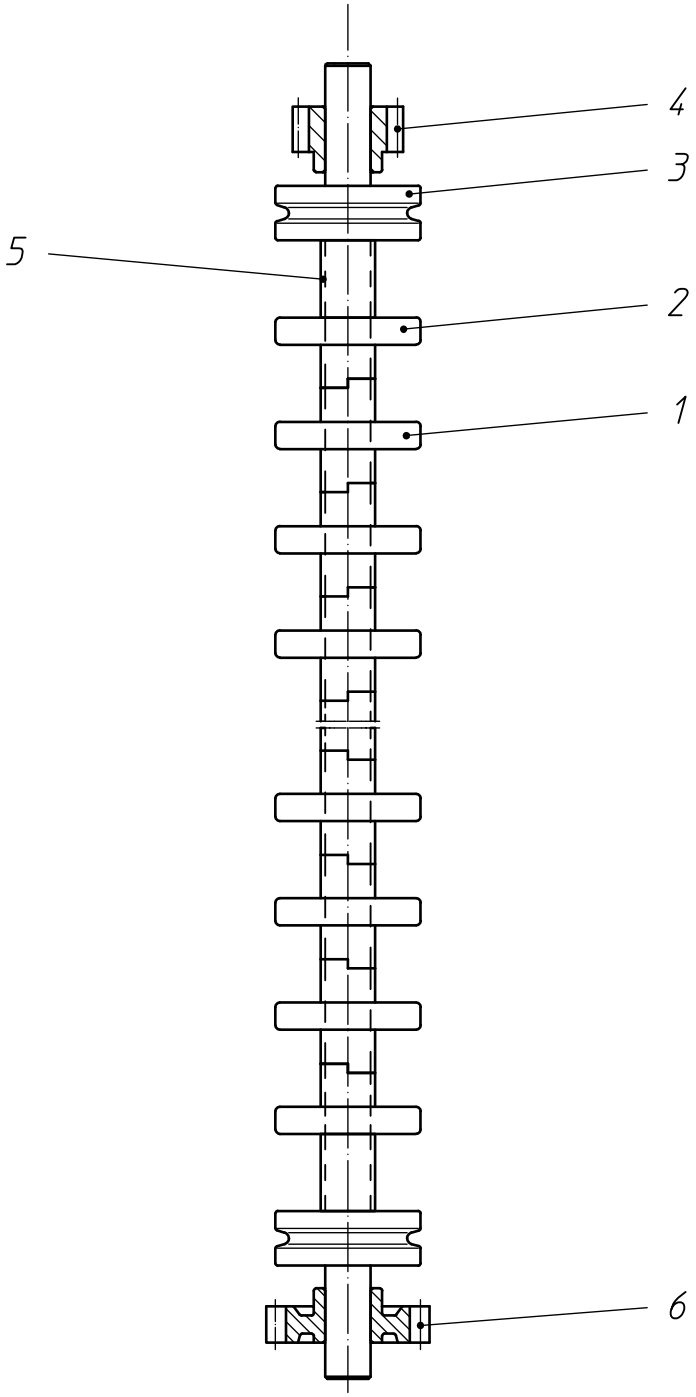
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0230.00RE BUSHING/PP-R/d=12.0/D=10.2/L=17.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1712E0570 1/1 00



Assembly	: 16.004.1712.2572	Commiss.	: 25-05-377
Label	: SHAFT/CPL/32/O+U/ / /Fj	Position	: 000020
Quant.	: 4,000 ST	Page	: 000018/01
Drawing	: 16.004.1712E0570	Date	: 10.04.2006

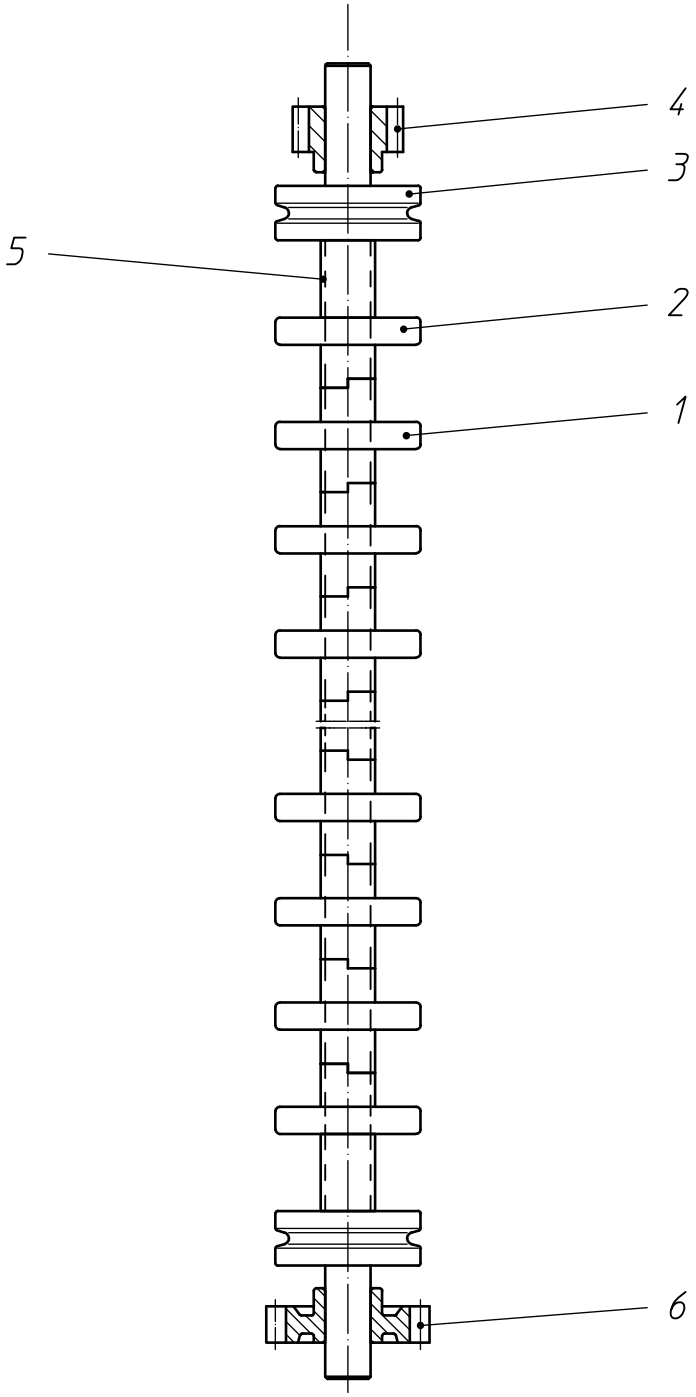
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1712E0570 1/1 00



Assembly	: 25-05-377-01	Commiss.	: 25-05-377
Label	: M01, Input - TRE 1 PVC/SS	Position	: 000030
Quant.	: 1,000 ST	Page	: 000019/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.012.0005.U00H SENSOR+FIXING	1,000	ST	
	16.004.0127.U21L CONVEYOR/ST/021/VA/CLAW-CLUTCH/d=27	1,000	ST	
	VS-25-05-377-01 CONVEYOR/TRE-AS 1/650/PVC/VA	1,000	ST	
	16.012.0003.U21A CABLE CHANNEL/CPL./21/PVC/BS	1,000	ST	
1	03.002.2283.000A SUPPORT/PVC-HG/NOT-STOP	1,000	ST	X
2	PG-000000012-000 MAINTENANCE UNIT CPL./SK-1/4-SO	1,000	ST	X
3	PD-000000001-000 PRESS. SWITCH/PEV-1/4-B/10773	1,000	ST	X
4	PF-000000169-000 PLASTIC HOSE/PE BEIGE ID=4 AD=6	50,000	M	X

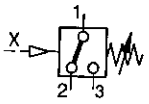
Parts without Pos.-N° see assembly parts list

PD-000000001-000

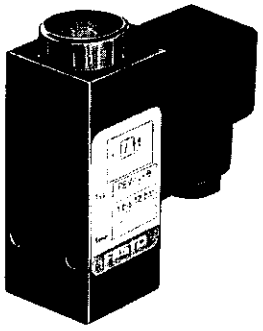
FESTO PNEUMATIC

Pressure switch (adjustable)
Type PEV-1/4-B

with plug connector to DIN 43 650



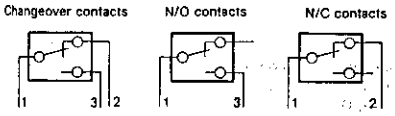
Accessory:
Mounting plate Type APL-2N-PEV
to mount the pressure switch on a 2n mounting frame

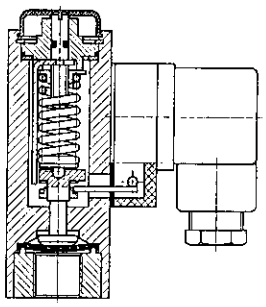


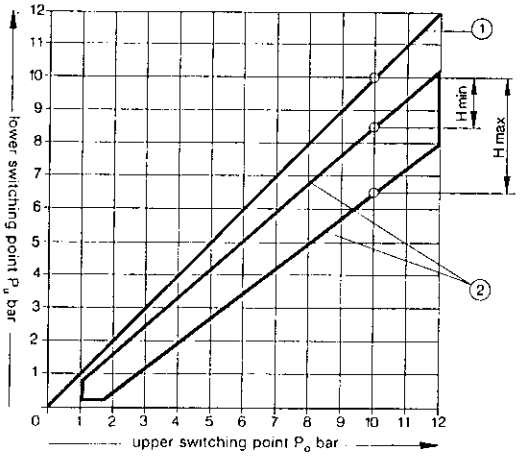
The pressure switch is used to convert adjustable pressure signals into electrical signals.
When the medium pressure at port X reaches the preset switching point, a diaphragm actuates a microswitch. The switching point can be infinitely adjusted between 1 and 12 bar.

Depending on the way it is connected up, the microswitch can be used as a normally-closed contact, normally-open contact or changeover contact.
In the factory, the pressure switch is set to an upper switching point of 6 bar ± 3% and a lower switching point of 4.8 bar ± 3%.
The upper and lower switching points can be increased by turning the adjusting screw clockwise (1 turn corresponds to approx. 1.3 bar).
The hysteresis can be adjusted by turning the hexagonal nut under the cover cap. This varies the hysteresis, while retaining the setting for the lower switching point (see graph).
Clockwise rotation increases the hysteresis.
Anticlockwise rotation decreases the hysteresis.
Adjustable hysteresis

Contact configurations:







Order code Part No./Type	10773 PEV-1/4-B	9349 APL-2N-PEV
Medium	Compressed air, filtered (lubricated or unlubricated) and non-corrosive media	
Design	Pressure-electrical signal converter	
Mounting	2 through-holes in housing, or on mounting plate	On mounting frame
Connection	G 1/4	
Pressure adjustment range	1 to 12 bar	
Accuracy of repetition	±3%	
Return switching difference	Pressure-dependent (see graph)	
Max. switching frequency	3.3 Hz	
Max. voltage	250 V~	
Max. electrical load	5 A	
Degree of protection to DIN 40050	IP 65	
Temperature range	−20 to +80 °C	
Materials	Housing: aluminium	Polyamide
Weight	0.240 kg	0.030 kg

PG-000000012-000 WARTUNGSEINHEIT KPL.
MK-06 ID-PB20649-000
** Service unit **

airfit

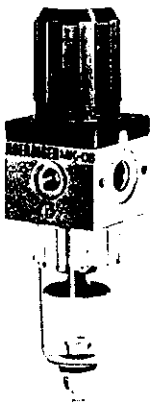
Combination Unit G1/8, G1/4, G3/8

Pressure regulator with Filter-water-separator

Degree of moisture separation 95 (93) %

MK

Combination unit (spring loaded) with secondary pressure relief handwheel lockable

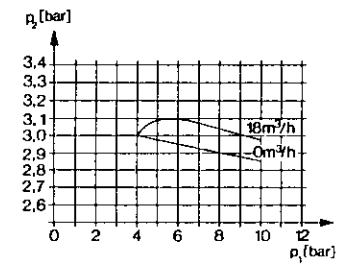


Characteristics — Pressures quoted as gauge pressure

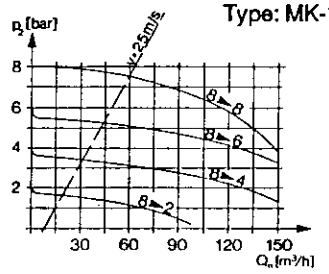
System			Cyclon system with filter element, combined with a diaphragm-type pressure regulating valve (spring loaded) secondary pressure relief		
Type			**MK-06**	**MK-08**	**MK-10**
Port size			G 1/8	G 1/4	G 3/8
Pore size of filter element		µm	standard 30 on request 5		
Max. condensate capacity		cm^3	18		38
Condensate drainage			standard: manually on request: semiautomatic with pressure relief		
Installation			vertical		
Medium and ambient temperatures	ϑ_{min} ϑ_{max}	°C °C	0 +50 at 10 bar	(further temperatures on request)	
Weight (mass)		kg	0.60		0.65
Pneumatic characteristics					
Operating pressure range - inlet pressure	$p_{1\,min}$ $p_{1\,max}$	bar bar	0 16		
Operating pressure range - outlet pressure	$p_{2\,min}$ $p_{2\,max}$	bar bar	0.5 8		
Min. pressure difference	p_1-p_2	bar	0.2		
Hysteresis p_1=10/p_2=0 Hysteresis p_1=10/p_2=8		bar bar	0.6 0.3		
Recommended flow 1)	Q_n	m^3/h	18	33	51
Degree of moisture separation at recommended flow	η	%	95	95	93

1) at p_2 = 6 bar and 25 m/s

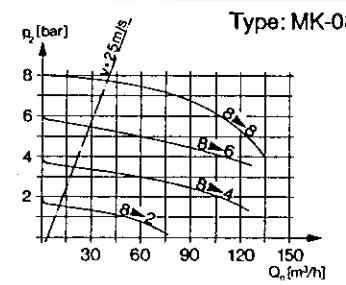
Fluctuation of outlet pressure according to fluctuating inlet pressure



Flow characteristic



Flow characteristic



Accessories

Gauge: Ø 40 mm, 0-10 bar, G1/8

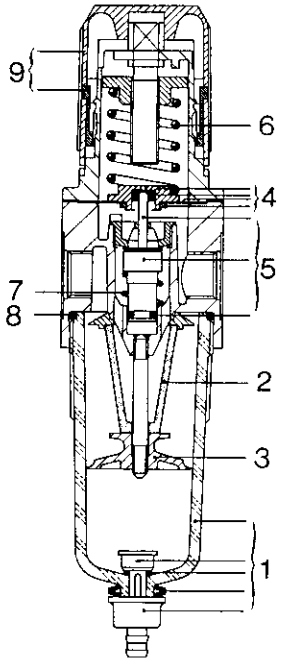
Order No. KZ 8454

For single units see 5.10.004-5.10.007
For air preparation units see 5.10.002 - 5.10.003
For product group list see 5.10.001

HOERBIGER PNEUMATIC

January 1988 | Cat.- No. 5.10.004E

Ersatzteilliste – Kombinationsgeräte
List of spare parts – Combined units
Type: airfit m



MK-06/08/10

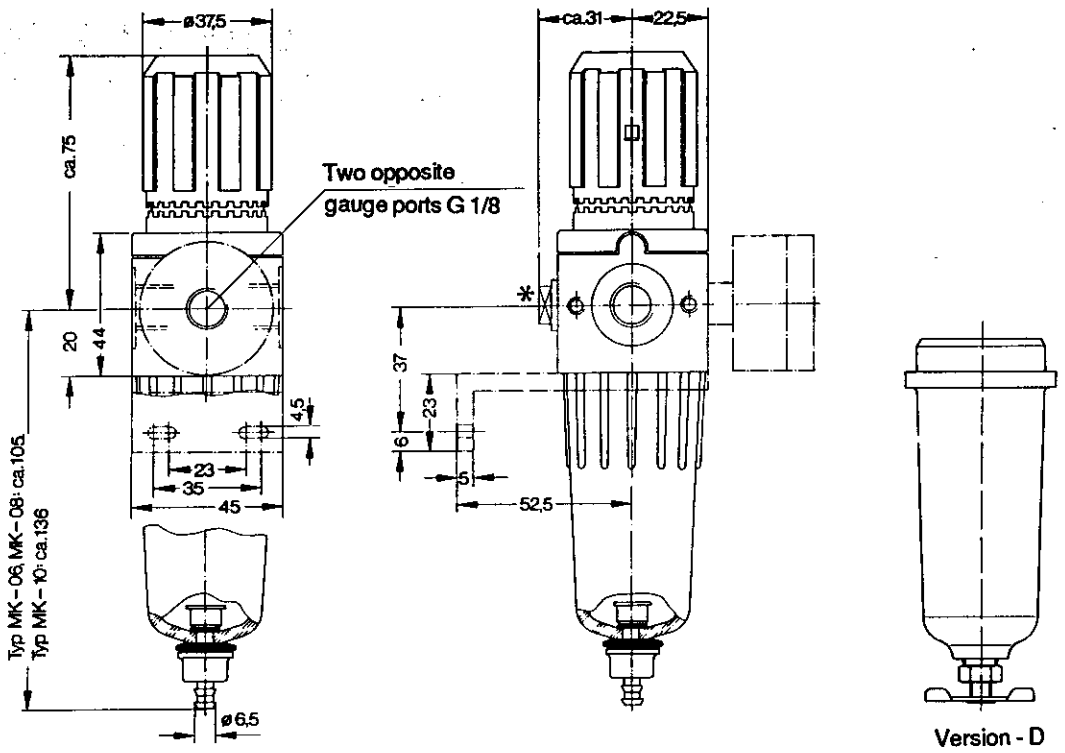
Teil Part	Benennung Description	Variante Variant	Bestell-Nr. Code	
			MK-06/08	MK-10
1	Behälter komplett Bowl complete	–	PL 08930	PL 15100
	halbautomat. Kondensatentl. semiautomatic drainage	H	PL 15204	PL 15205
	Lösungsmittelbeständig solvent resistant	D	PL 15481-11	PL 15481-11
2	Filtereinsatz 30 µm Filter element	–	PL 08919	PL 08919
	Filtereinsatz 5 µm Filter element	5	PL 08919-5	PL 08919-5
3	Prallscheibe komplett Baffle plate complete	–	PL 08917	PL 08917
4	Membraneinheit Diaphragm unit	–	PL 15763	PL 15763
5	Ventilkolbeneinheit Valve piston unit	–	PL 15406	PL 15406
6	Regelfeder Regulator spring	–	PL 08904	PL 08904
7	Feder Spring	–	PL 08905	PL 08905
8	Dichtring 36 x 2,5 Seal	–	KY 7223	KY 7223
9	Handrad komplett Handwheel complete	–	PL 08992	PL 08992

HOERBIGER PNEUMATIC GMBH., D-8920 Schongau, Postf. 20, Tel. 0 88 61/210-1, FS 59 736
Telefax 0 88 61/210-305
HOERBIGER FLUIDTECHNIK KG., A-1103 Wien, Postfach 76, Tel. 65 67 01-0, FS 133687
Telefax (0 22 2) 65 67 01-329

HOERBIGER PNEUMATIC
Juli 1987
K.-Nr. 8.40.152

Dimensions (mm)

Type: MK-06/08/10



*) On delivery the plug screw is not assembled

Order Instructions

Description	Type	Port size	Order No.
Basic model	MK-06	G 1/8	PB 20649-000
Basic model	MK-08	G 1/4	PB 20749-000
Basic model	MK-10	G 3/8	PB 20849-000
with semiautomatic drainage	MK-06-H	G 1/8	PB 20649-001
with semiautomatic drainage	MK-08-H	G 1/4	PB 20749-001
with semiautomatic drainage	MK-10-H	G 3/8	PB 20849-001
with metal bowl	MK-06-D	G 1/8	PB 20649-003
with metal bowl	MK-08-D	G 1/4	PB 20749-003
with metal bowl	MK-10-D	G 3/8	PB 20849-003

Accessories

Description	Order No.
Gauge Ø40, 0-10 bar, G 1/8	KZ 8454
Mounting kit	PL 15024
Coupling kit	PL 15146
Porting block kit	PL 15282
Metal bowl kit	PL 15481

Assembly	: 16.012.0005.U00H	Commiss.	: 25-05-377
Label	: SENSOR+FIXING	Position	: 000030
Quant.	: 1,000 ST	Page	: 000020/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.012.0006.U000 REFLEX KEY/AC/DC	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.012.0006.U000	Commiss.	: 25-05-377
Label	: REFLEX KEY/AC/DC	Position	: 000030
Quant.	: 1,000 ST	Page	: 000021/01
Drawing	: 16.012.0006EU000	Date	: 10.04.2006

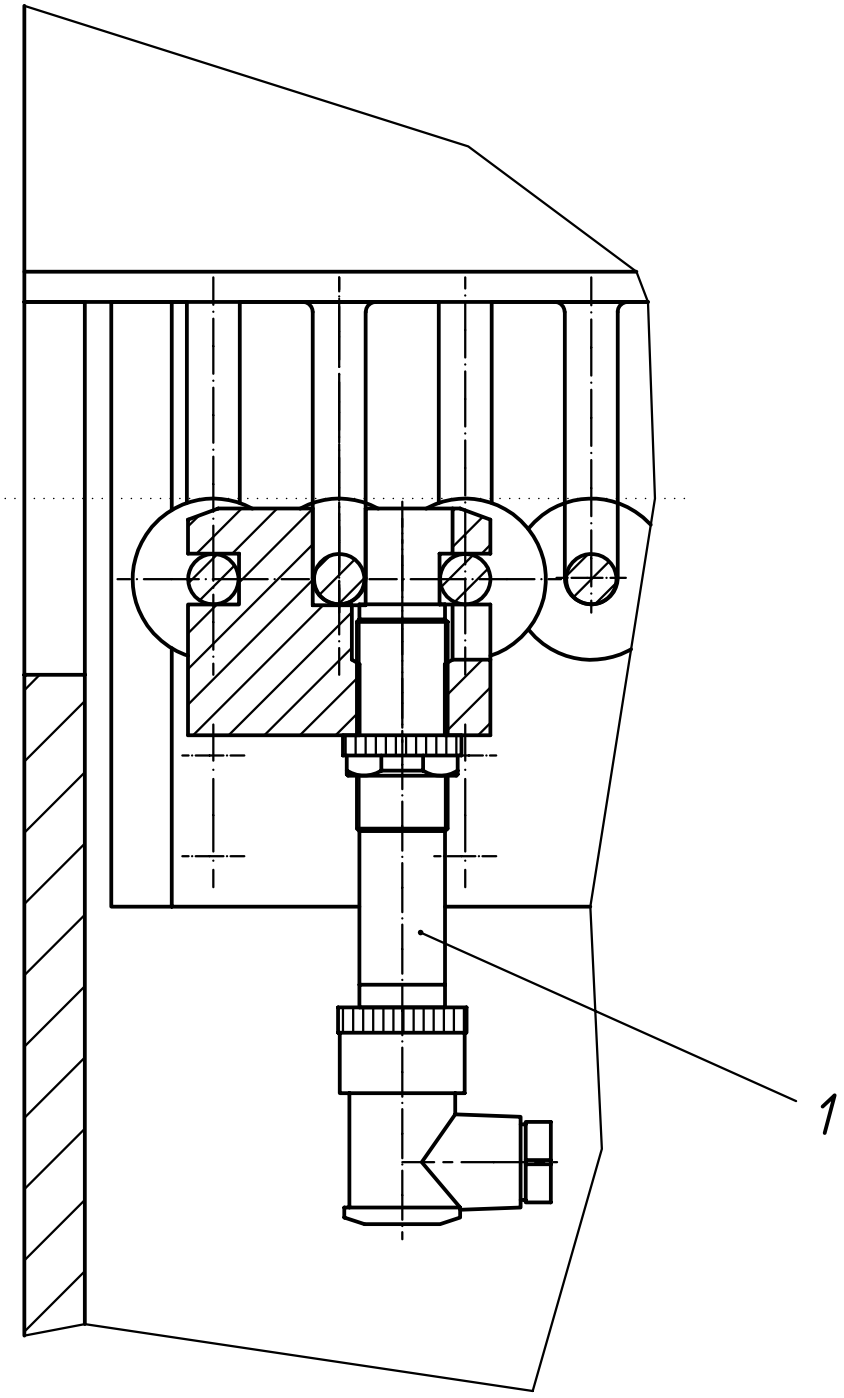
Pos.	Part N° Label	Quant.	Unit	SP
1	EB-000000171-000 REFLEX KEY, OG5121	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste REFLEXTASTER

Spare parts list REFLEX SCANNER

16.012.0006EU000	11
	00



CE

ifm electronic

EB-000000171-000

Bedienungsanleitung
Operating instructions
Notice pour utilisateurs

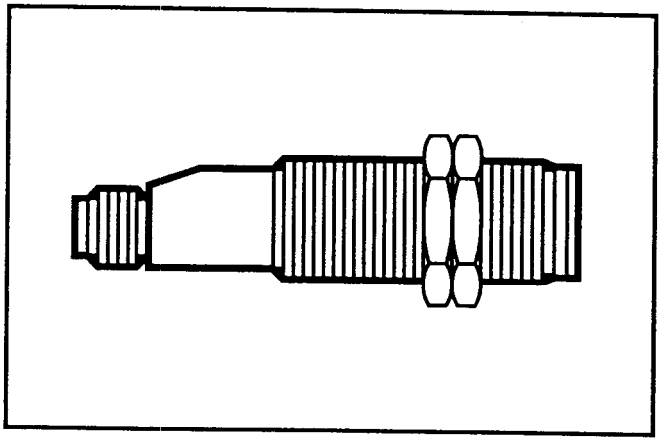
efector200

Reflexlichttaster mit Hintergrundausblendung OGH
Diffuse reflection sensor with background suppression OGH
Système réflexion directe avec suppression de l'arrière-plan OGH

DEUTSCH

ENGLISH

FRANÇAIS



Sachnr. /01166/02 03/01

Function and features

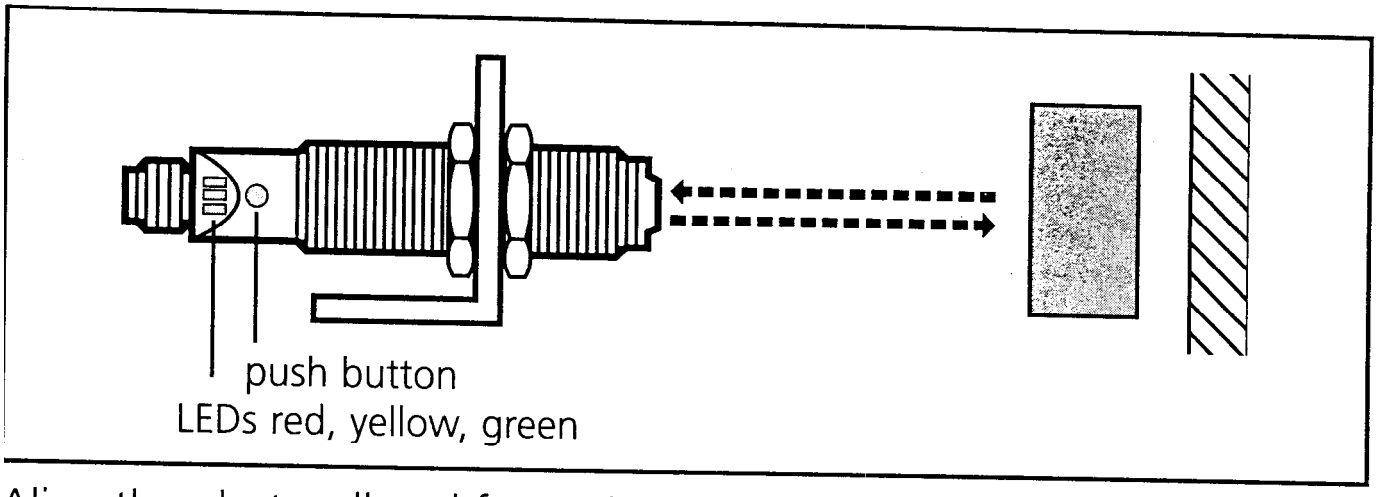
The diffuse reflection sensor detects objects and materials without contact and indicates their presence by a switched signal. Range (r): see type label (value referred to white paper 200mm x 200mm).

Electrical connection

⚠ Isolate power, then connect the unit (see page 10 or type label).

Core colours (for sensors with cable connection): BN = brown, BU = blue, BK = black.
Programming of the output function (light-on or dark-on) by wiring (see page 10 or type label).

Installation

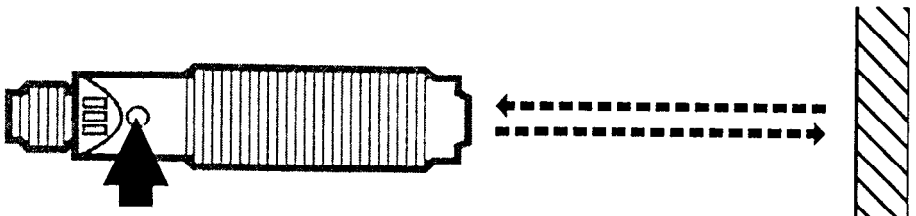


Align the photocell and fasten it to a mounting bracket.
Maximum range is only possible with precise alignment.

Setting of the sensitivity with stationary objects

1

Activate the programming mode of the unit **without** object.

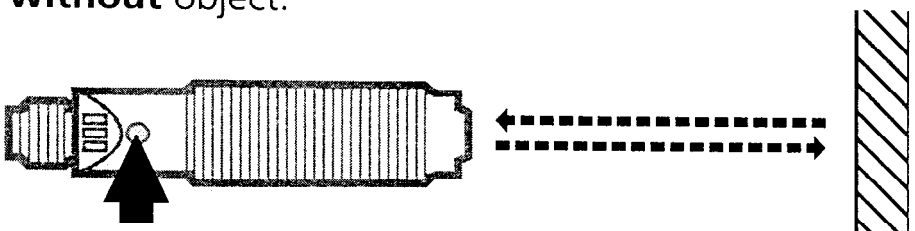


Press for about 2s until the red LED flashes.

The red LED goes out; the yellow and green LEDs flash alternately.
The unit is in the programming mode.
If in addition the red LED is lit, the reflection of the background is too intensive (e.g. reflecting surface). Angle the unit in the horizontal plane until the red LED goes out.
If you continue with step 3 although the red LED is lit, programming is interrupted. The unit then passes into the operating mode with the setting being unchanged.

2

Setting **without** object.

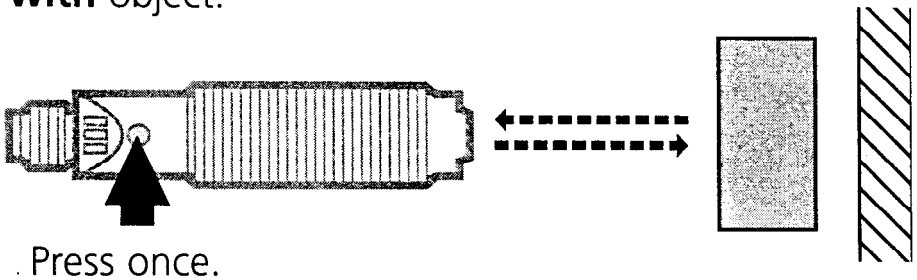


Press once.

The yellow and green LEDs go out for approx. 1s,
then flash again alternately.

3

Setting **with** object.



Press once.

The yellow and green LEDs go out for approx. 1s,
then the green LED is on.
The unit is in the operating mode.

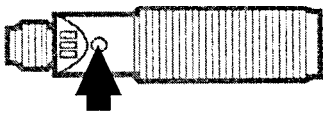
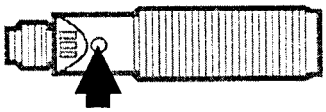
Programming is only possible if you keep to this order (first background, then object).

⚠ If the setting of the sensitivity is not possible (e.g. object signal and background signal are about the same), the red LED flashes after step 3 for approx. 2s. The unit then passes into the operating mode with the sensitivity being unchanged.

Setting of the maximum sensitivity

- Go into the programming mode (step 1).
- Align the unit so that no light is reflected.
- Press the setting button twice (see steps 2 and 3).

Locking / Unlocking:

 Press for 10s.	➡	The red LED lights for a short time, then the yellow and green LEDs flash alternately; after 10s the LEDs go out, the unit is locked.
 Press for 10s.	➡	After 10s the LEDs go out, locking is cancelled.

Operation

Check the safe functioning of the diffuse reflection sensor. Display by LEDs.

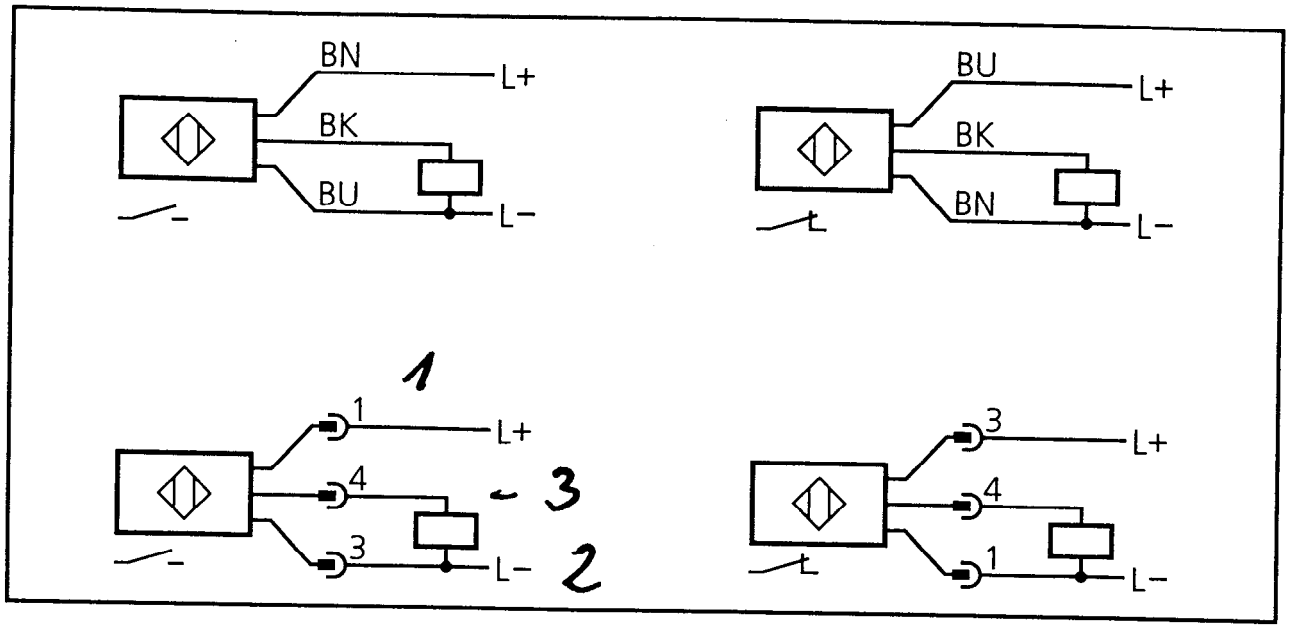
LED green lights	Unit is ready for operation.
LED yellow lights	Output is switched.
LEDs red + yellow	Flash alternately, 2 Hz: output short-circuited. Flash alternately, 1 Hz: internal malfunction, (output is not switched).

Maintenance

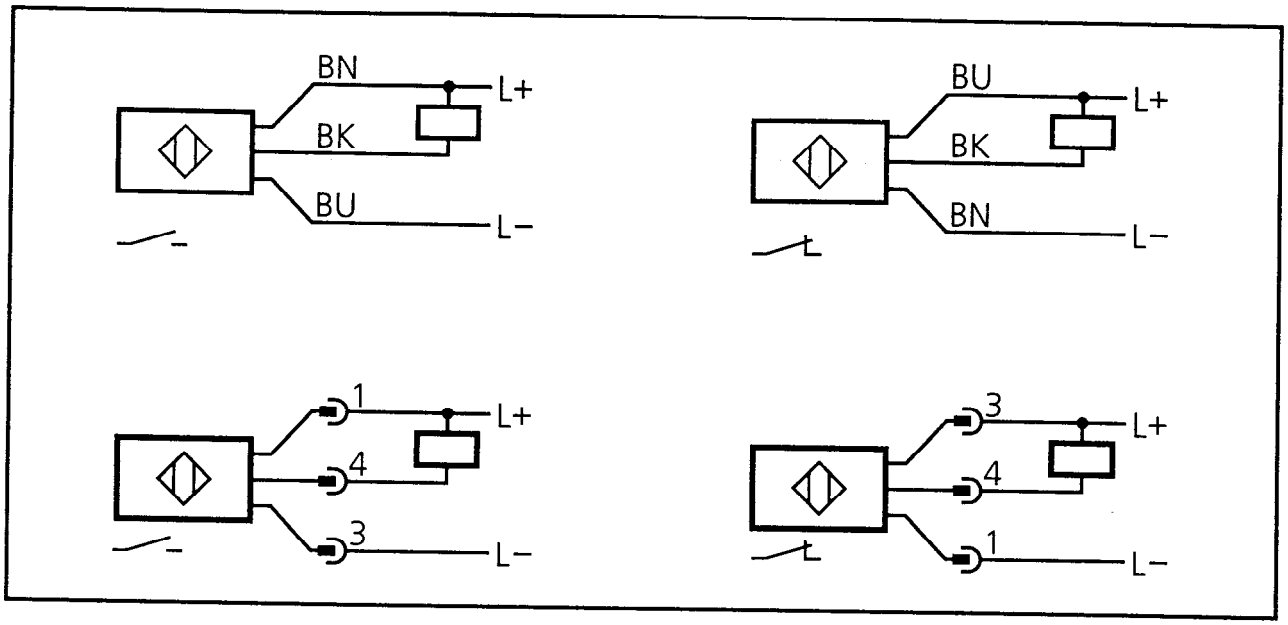
Keep the lens of the sensor free from soiling.
For cleaning do not use any solvents or cleaning agents which could damage the plastic lenses.

Anschlußschema / Wiring / Schéma de branchement

DC PNP



DC NPN



DEUTSCH
ENGLISH
FRANCAIS

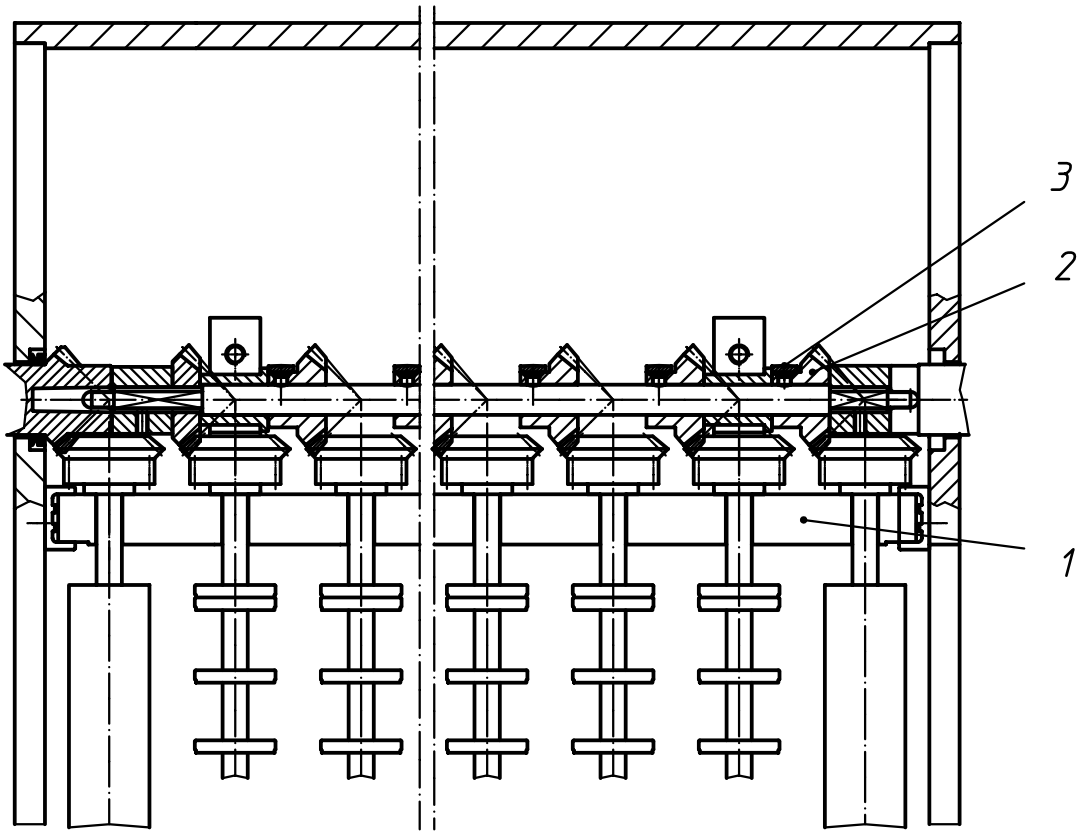
Assembly	: 16.004.0127.U21L	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/021/VA/CLAW-CLUTCH/d=27	Position	: 000030
Quant.	: 1,000 ST	Page	: 000022/01
Drawing	: 16.004.0127EU000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0125.U21L DRIVE SHAFT/CPL./021/VA/CONV./KL-KU/d=27	1,000	ST	
1	16.004.0002.021H SUPPORT/GUR-N/21/d=10/T=50	2,000	ST	X
2	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	1,000	ST	X
3	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	1,000	ST	X

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0127EU000	11
	00



Assembly	: 16.004.0125.U21L	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./021/VA/CONV./KL-KU/d=2	Position	: 000030
Quant.	: 1,000 ST	Page	: 000023/01
Drawing	: 16.004.0125EU000	Date	: 10.04.2006

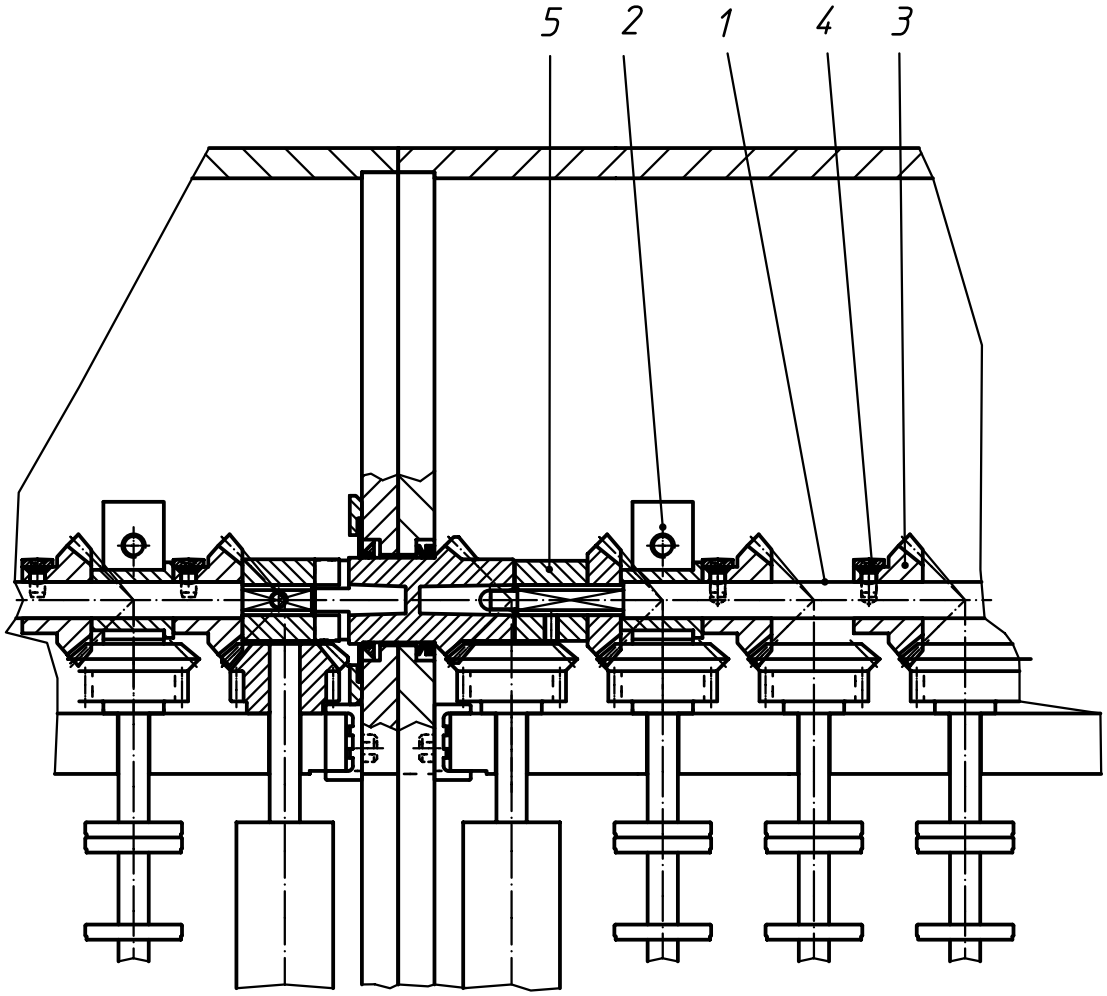
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0353.0212 DRIVE SHAFT/V4A/021/KL-KU/CONV.	1,000	ST	X
2	16.004.0007.U00L SEATING/CPL./PVC /VA	2,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	4,000	ST	X
4	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	4,000	ST	X
5	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ANTRIEBSWELLE KPL. VS

Spare parts list Drive shaft cpl. + conv.

16.004.0125EU000	11
	00



Assembly	: 16.004.0007.U00L	Commiss.	: 25-05-377
Label	: SEATING/CPL./PVC /VA	Position	: 000030
Quant.	: 2,000 ST	Page	: 000024/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

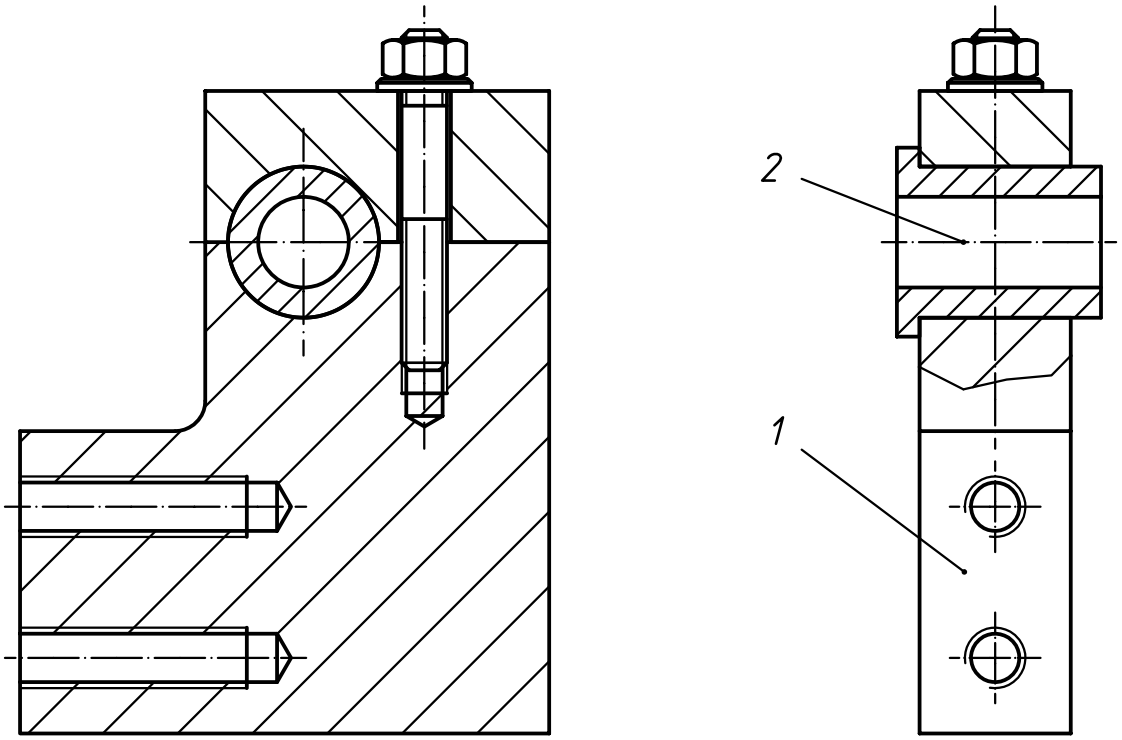
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0005.0002 SEATING/PVC-HG/V4A	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



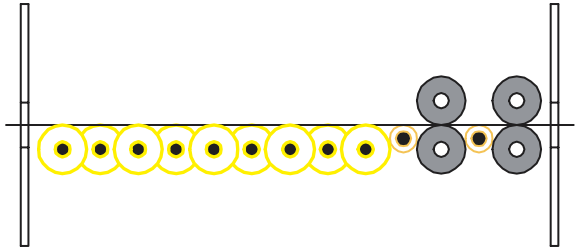
Assembly	: VS-25-05-377-01	Commiss.	: 25-05-377
Label	: CONVEYOR/TRE-AS 1/650/PVC/VA	Position	: 000030
Quant.	: 1,000 ST	Page	: 000025/01
Drawing	: VS-25-05-377-01	Date	: 10.04.2006

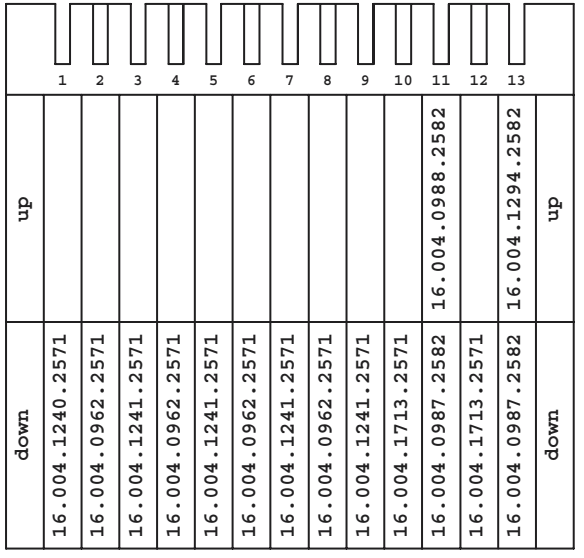
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0987.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	2,000	ST	X
2	16.004.0988.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	1,000	ST	X
3	16.004.1294.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	1,000	ST	X
4	16.004.1713.2571 SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	2,000	ST	X
5	16.004.1241.2571 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	4,000	ST	X
6	16.004.0962.2571 Shaft/10/12/32/T25/650/1.4301/PP/U/K/FE	4,000	ST	X
7	16.004.1240.2571 Shaft/CPL/32/U /L/ /FJ/MODU L/A+E/V2A	1,000	ST	X
	16.004.0559.U002 GEAR WHEEL/Z=11/M2/VA/PP /=0162	4,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	2,000	ST	

Parts without Pos.-N° see assembly parts list

positioning plan of conveyor

conveyor no.	VS-25-05-377-01	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/VA
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	TRE-AS1	**working direction**	L-R
remark			





Assembly	: 16.004.0987.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	Position	: 000030
Quant.	: 2,000 ST	Page	: 000026/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

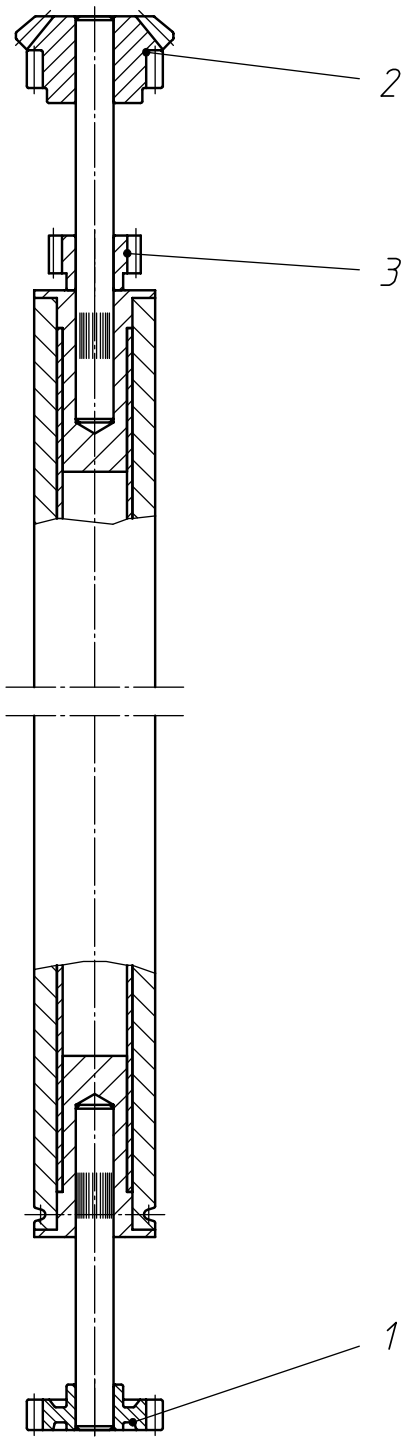
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	Position	: 000030
Quant.	: 1,000 ST	Page	: 000027/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

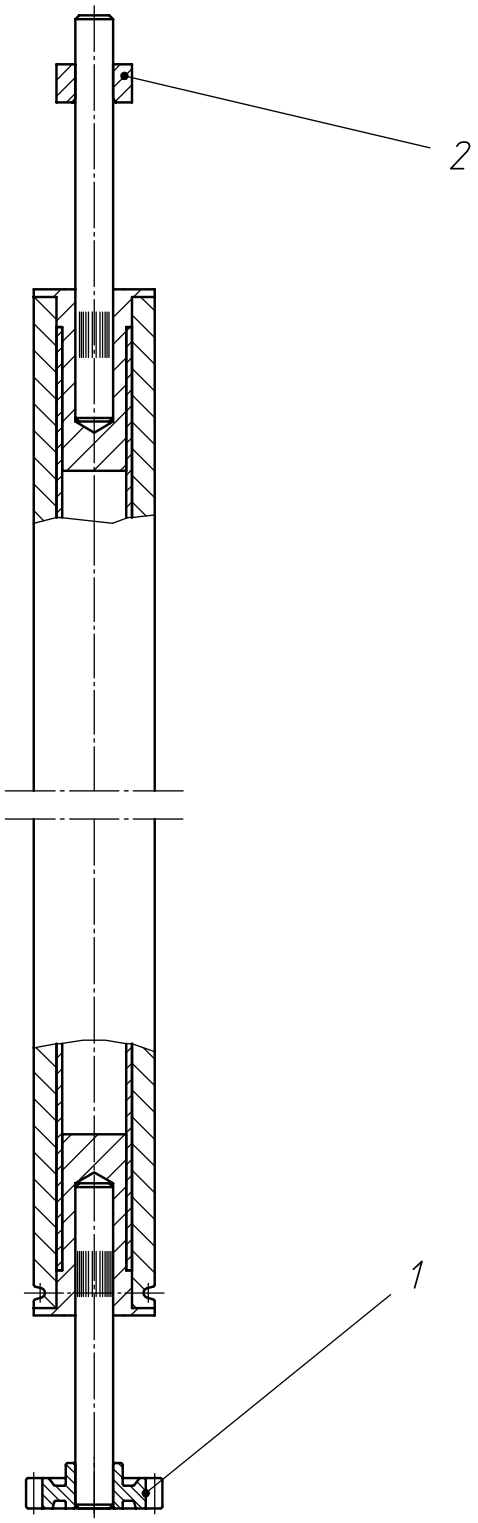
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	Position	: 000030
Quant.	: 1,000 ST	Page	: 000028/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

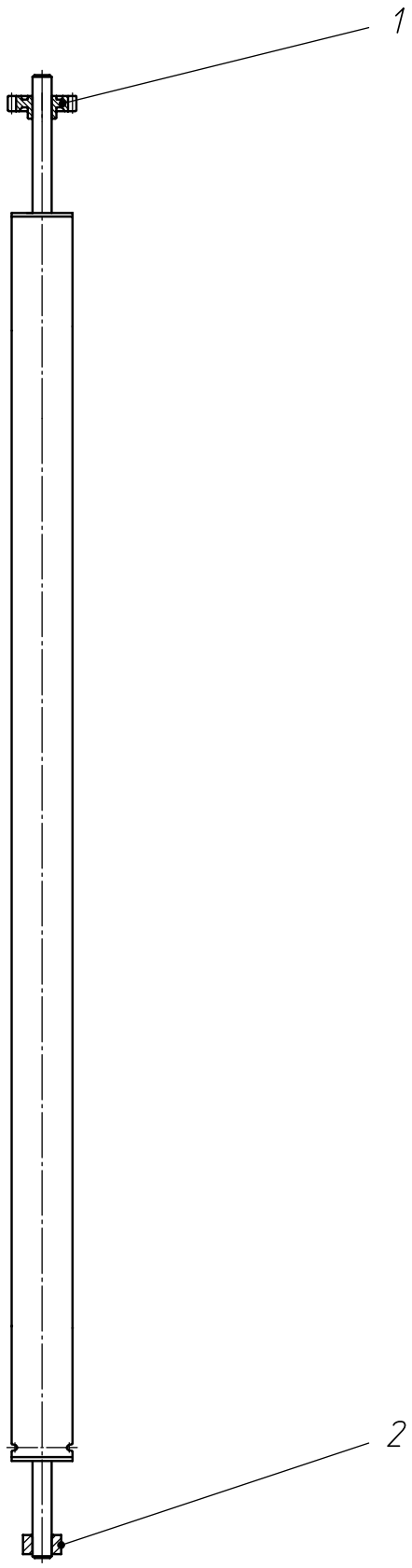
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



Assembly	: 16.004.1713.2571	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	Position	: 000030
Quant.	: 2,000 ST	Page	: 000029/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

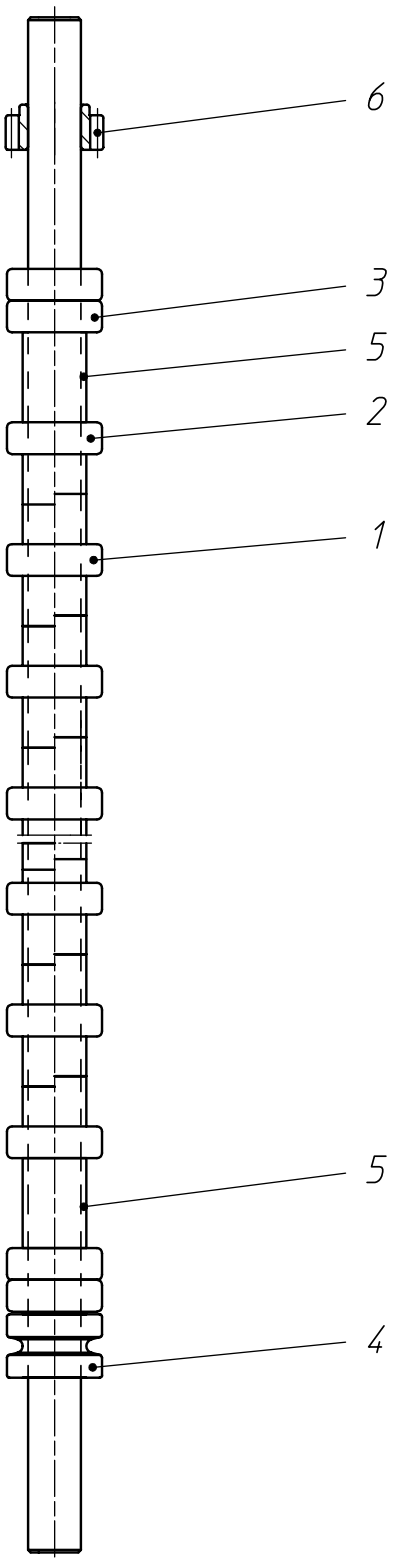
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000030
Quant.	: 4,000 ST	Page	: 000030/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

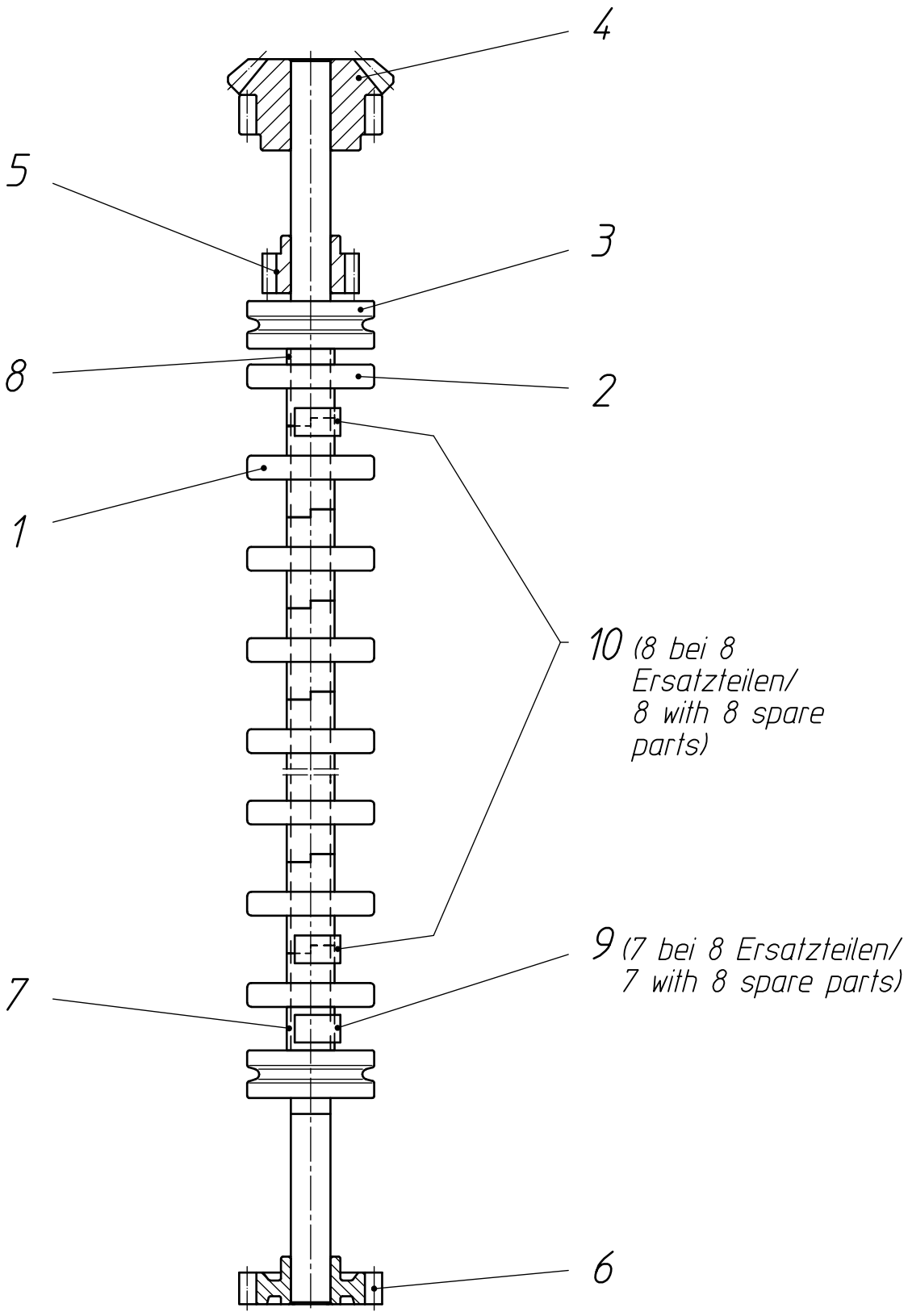
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0962.2571	Commiss.	: 25-05-377
Label	: Shaft/10/12/32/T25/650/1.4301/PP/U/K/FE	Position	: 000030
Quant.	: 4,000 ST	Page	: 000031/01
Drawing	: 16.004.0962E0570	Date	: 10.04.2006

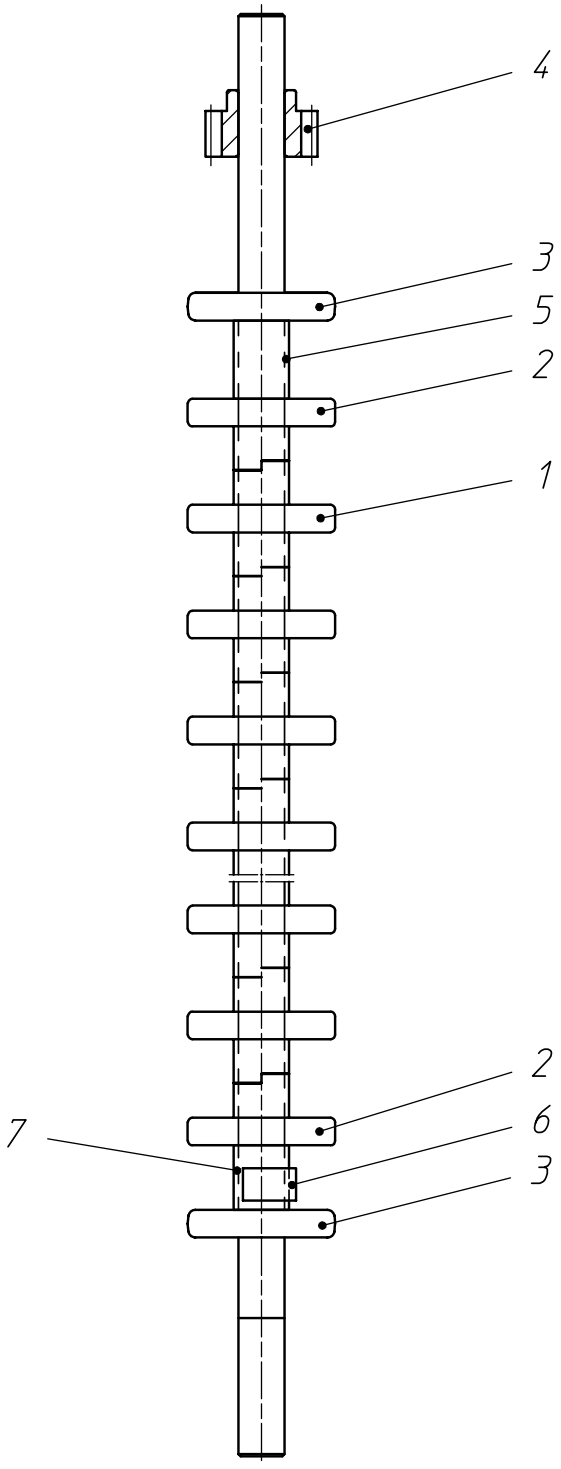
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
7	00.019.0266.000E BUSHING /PP-G/d=10.2/D=12.0/L=14.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0962E0570	11
	00



Assembly	: 16.004.1240.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/MODU L/A+E/V2A	Position	: 000030
Quant.	: 1,000 ST	Page	: 000032/01
Drawing	: 16.004.1240E0570	Date	: 10.04.2006

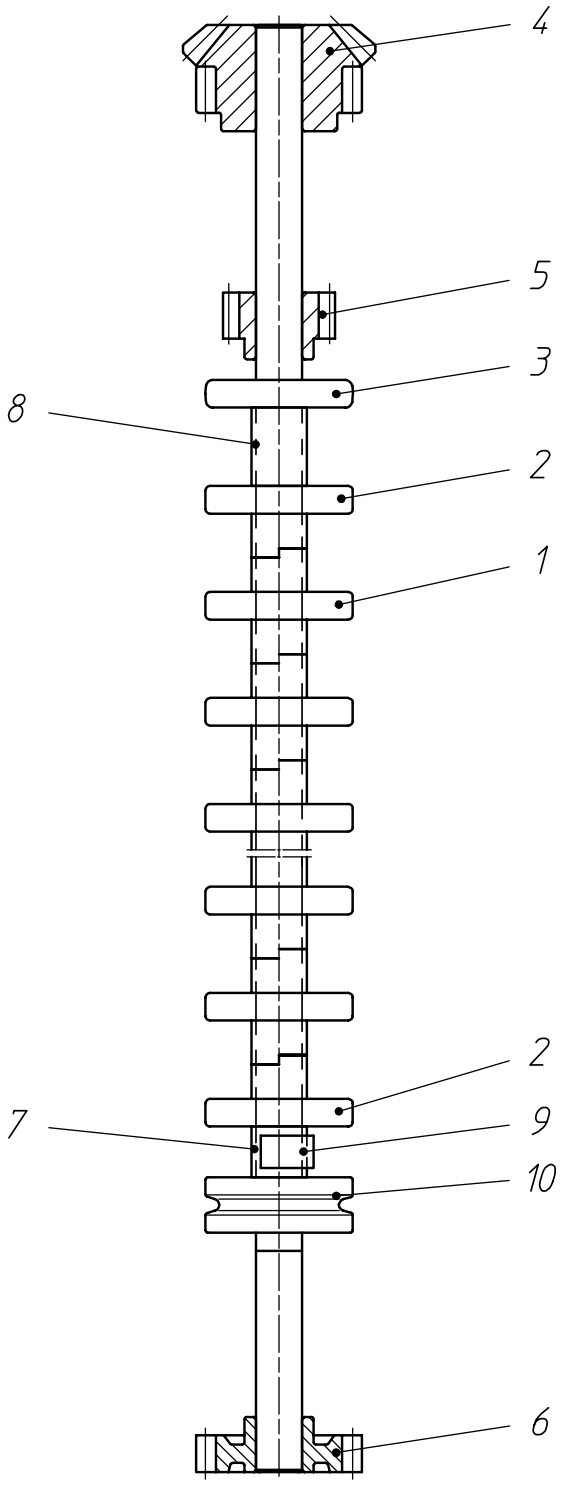
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
9	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
10	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1240E0570	11
	00



Assembly	: 16.004.0559.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL/Z=11/M2/VA/PP /=0162	Position	: 000030
Quant.	: 4,000 ST	Page	: 000033/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

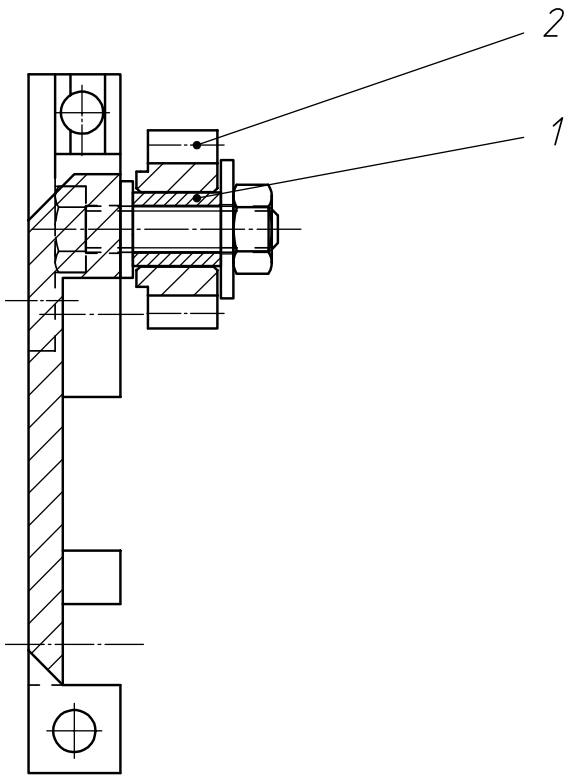
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0002 00SHING/SS/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



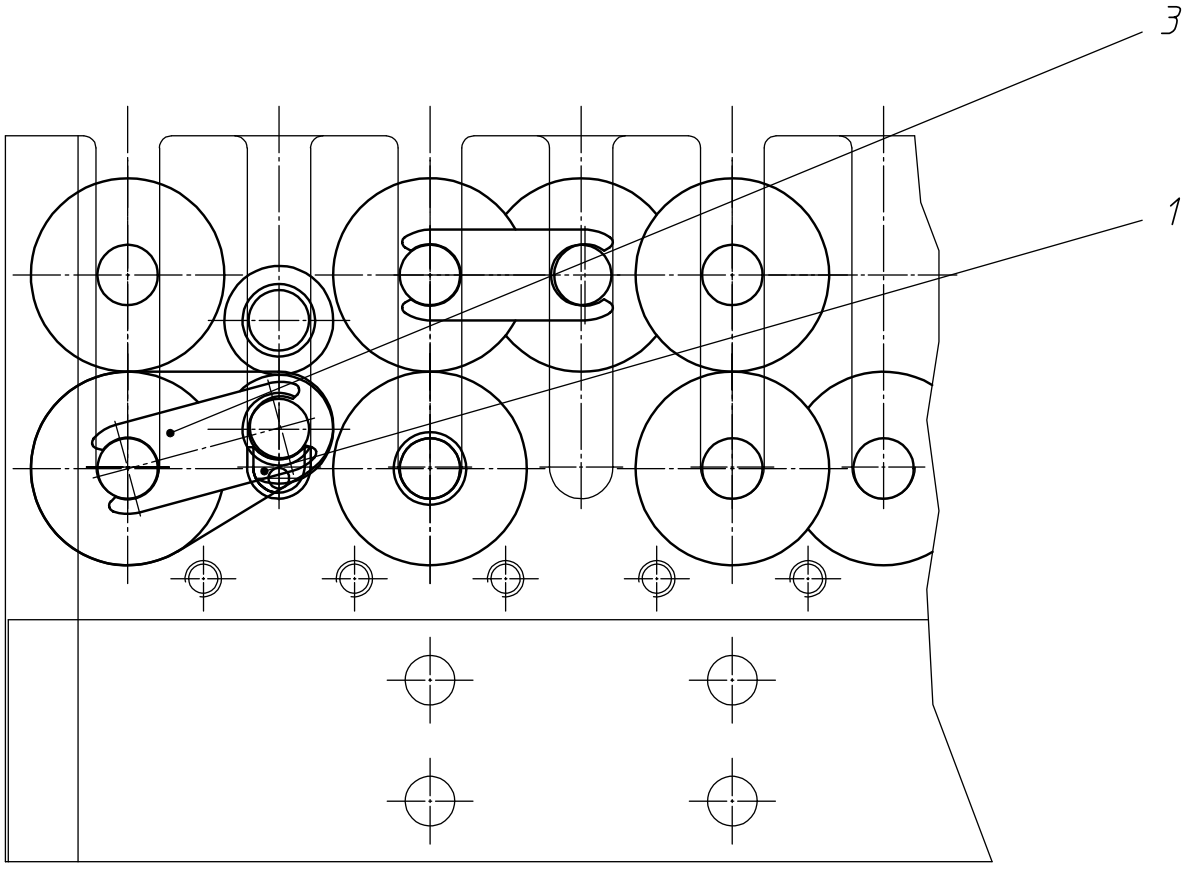
Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000030
Quant.	: 2,000 ST	Page	: 000034/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

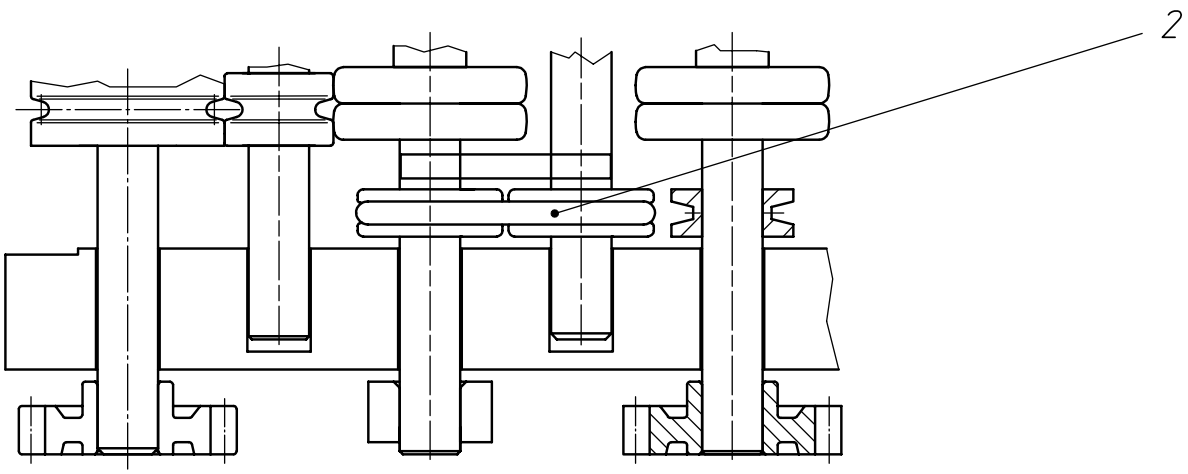
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 16.012.0003.U21A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./21/PVC/BS	Position	: 000030
Quant.	: 1,000 ST	Page	: 000035/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

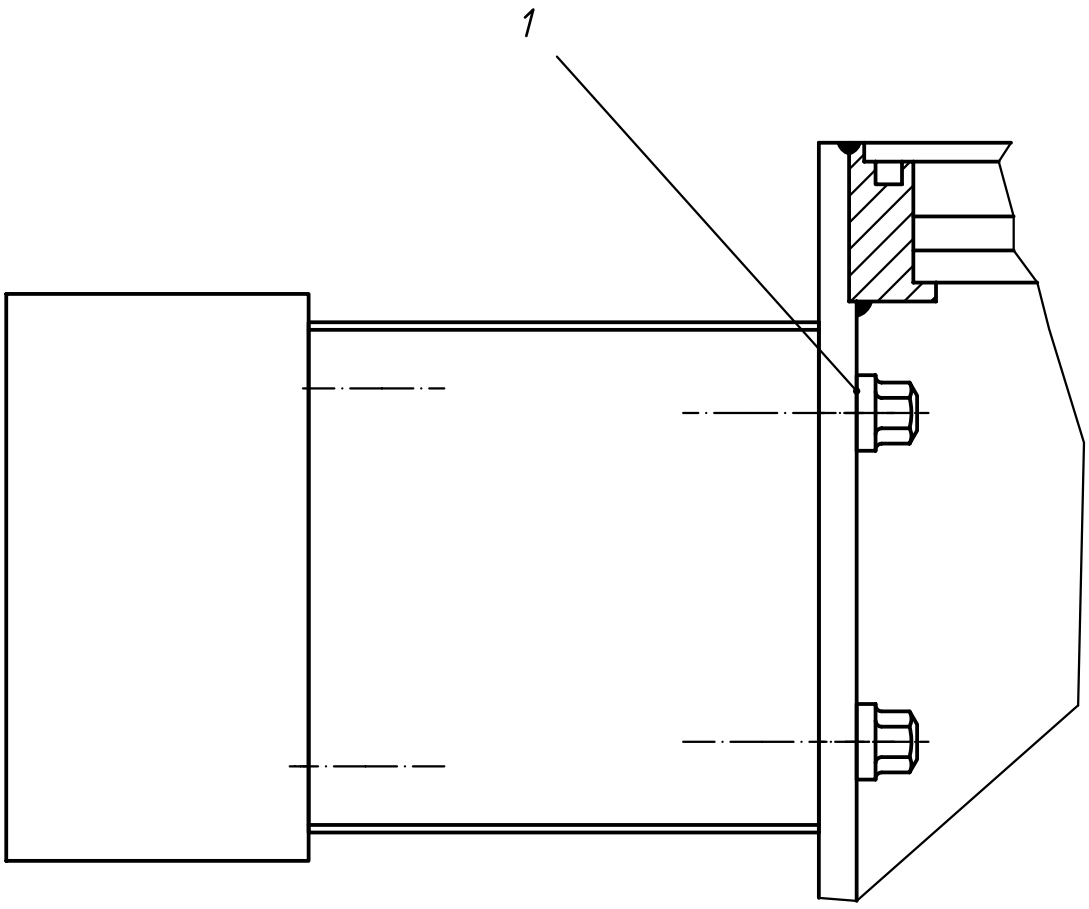
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 25-05-377-02	Commiss.	: 25-05-377
Label	: M02, Degrease - WMT 2 PVC/SS	Position	: 000040
Quant.	: 1,000 ST	Page	: 000036/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.WMT2.20.0L CONTAINER[520]/WMT2/PVC/VA	1,000	ST	
	16.002.0040.U221 INTERMEDIATE GLASS COVER/KPL./22/PP/V2A	1,000	ST	
	16.05.W002.01.0A FEED/WMT2/PVC /PVC /EP/AS08	1,000	ST	
1	16.005.0010.2O2B SPRAYPIPE/PVC-D/ 650/ 9D/F/G/12,06L/MIN	8,000	ST	X
	16.009.0005.U00A COOLING/ACCESSORIES/PVC/1KS	1,000	ST	
2	03.009.0052.0002 COOLING COIL/V4A/L=700	1,000	ST	X
	16.010.0018.U00L BATH HEATER+RECEIVER/ 4.00kW/VA/PVC	1,000	ST	
	16.010.0005.U001 TEMPERATURE PROBE/VA/EP/2xPt100/MAZ/L200	1,000	ST	
	16.010.0006.U00A LEVEL SWITCH/PVC/EPDM /ES-297	2,000	ST	
3	21.322.000-12 BALL VALVE-PVC/EPDM/NR.161.322.200 D=12	1,000	ST	X
	16.008.0004.U001 PUMP FIXING/VA/PP-G/EPDM	1,000	ST	
	50.003.0006.U000 TA/RE/1.80kW/MF/ET=270/PUTA.04.K.000175	1,000	ST	
	16.004.0126.U22L CONVEYOR/ST/22/PVC/VA/KL-KU/d=27	1,000	ST	
	VS-25-05-377-02 CONVEYOR/ WMT 2/650/PVC/VA	1,000	ST	
4	PUDO225600-03413 DOSING PUMP/E10.072/PV10EPP/LA/5/0.019kW	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 25-05-377-02	Commiss.	: 25-05-377
Label	: M02, Degrease - WMT 2 PVC/SS	Position	: 000040
Quant.	: 1,000 ST	Page	: 000036/02
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
5	XE-000009416-000 LA-SUCTION PIPE PP/NR.KA90188 PP/L=1000	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Land-Dosierpumpe

Spare parts list Dosing pump

PUD0225600-03413 11/00

Bitte bei Bestellung angeben:
To be indicated on order:

Typ: Elados EMP II / E10.025 PV 10 EPP
230V 50Hz/60Hz
0.019kW

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1 General

This technical manual contains all the necessary instructions for the installation, start-up, maintenance and repair of ELADOS® EMP electrical motor-driven metering pumps.

The safety instructions and pointers must always be observed!

Scope of guarantee:

The manufacturer only accepts the guarantee with regard to the operating safety, reliability and capacity of the metering pump under the following conditions:

- Assembly, connection, adjustment, maintenance and repairs are carried out by authorised, qualified personnel.

- The metering device is used in accordance with the instructions in the technical manual.

- Only **original spare parts** are used for repairs.

- If the pump casing is opened, then the guarantee will become void.

1.1 Safety instructions

Repairs may **only** be carried out with plug disconnected from the mains, or when the appliance is dead.

During maintenance and repair work on parts which come into contact with dangerous chemicals, and when changing the container, the prescribed **protective clothing** (protective glasses, protective gloves, apron) must be worn because of the danger of irritation.

Only **original spare parts** must be used for repairs.

1.2 Pointers

In this manual, the **CAUTION, ATTENTION** and **NOTE** pointers have the following meanings:

CAUTION: This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to injury or accident.

ATTENTION: This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to the device being damaged.

NOTE: This heading is used if a special feature is being pointed out.

2. Function and Structure

The metering pumps in the ELADOS® EMP II range are electromotive-driven diaphragm positive-displacement pumps.

2.1 Functional description

The metering pump is driven by a non-blocking synchronous motor (pos. 1) running at a constant rotational speed.

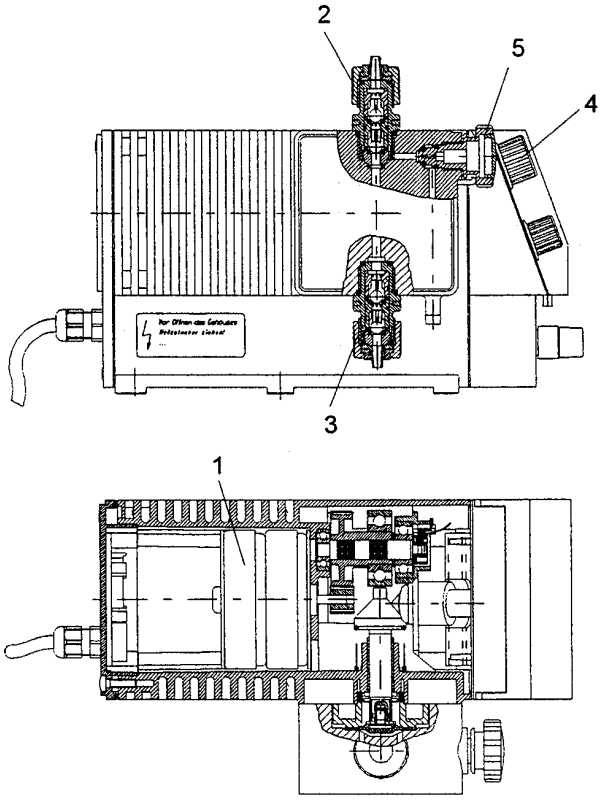
An eccentric gear moves the diaphragm and thus displaces the metering medium via the pressure valve (pos. 2) with double ball seal. The suction valve is closed.

The diaphragm is restored by a return spring and this causes the metering medium to be sucked into the pump head via the suction valve (pos. 3). The pressure valve is closed.

The volume delivered can be infinitely variable adjusted during operation via the stroke adjustment (pos 4). This limits the restoring movement of the diaphragm.

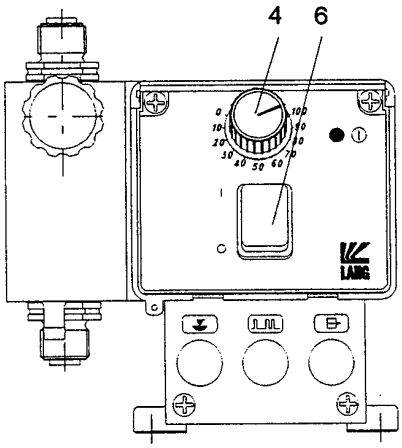
The pump heads are fitted with a rapid vent valve (pos. 5).

2.2 Structure

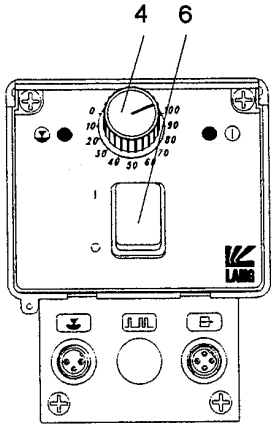


3. Control Variants

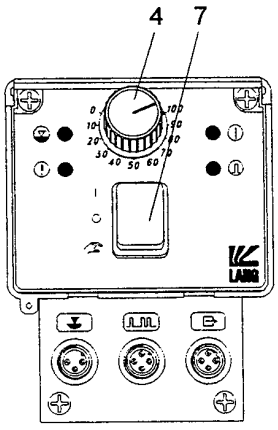
3.1 Diagramm



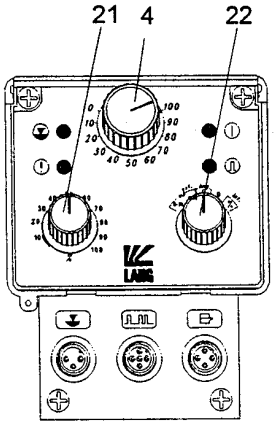
Version E 10



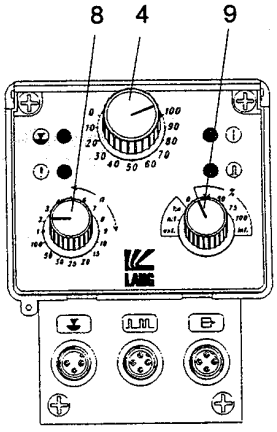
Version E 11



Version E 20 / E 22



Version E 30 / E 32



Version E 40 / E 42

3.2 Description

E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment	Function
x	x	x	x	x	x	x	x	Mechanical stroke adjustment (pos. 4)	Metering amount adjustment
x	x	x	x	x	x	x	x	Green LED	Pump ready for operation
	x	x	x	x	x	x	x	Red LED (level) blinking	Reserve signal, pump running
	x	x	x	x	x	x	x	Red LED (level) steady	Empty signal, pump switches off
		x	x	x	x	x	x	Yellow LED	Stroke indication
		x	x	x	x	x	x	Red LED (error signal) steady	Empty signal with defective electronics, blocking (pump switches off)
x	x							On/off switch (pos. 6)	Continuous operation (max. stroke frequency)
		x	x					On/off/test switch On (pos. 7) TEST self-resetting to "off"	Pulse operation Continual operation (max. stroke frequency)
						x	x	Selector switch for factor "n" (pos. 8)	1 - 100 for pulse multiplication and division with external control (factor 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 15, 20, 25, 30, 50, 100)
						x	x	Mode switch (pos. 9): - Position 100 - Position 75 - Position 50 - Position 25 - Position 0 - Position 1 : n - Position n : 1	- External, 0, internal change-over - Internal frequency 100 %= 122 1/min - Internal frequency 75 % - Internal frequency 50 % - Internal frequency 25 % - Pump off, no green LED - External multiplication e. g. selector switch setting n = 2: 1 external pulse = 2 strokes of metering pump - External division e. g. selector switch setting n = 3: 3 external pulses = 1 stroke of metering pump
				x	x			Stroke frequency rotary switch % (pos. 21)	100% = continual operation 122 1/min reproducible setting range 10 - 100 %

E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment	Function
				x	x			Mode switch (pos. 22) - Position 0 - Position % (int.) - Position pulse input - Position 4 - 20 mA - Position 0 - 20 mA	Pump off, no green LED Pump is running, adjusted frequency see stroke frequency rotary switch (pos. 21) 1 pulse = 1 stroke 20 mA = continuous operation 122 1/min 4 mA = pump switches off <4 mA = error red LED 20 mA = continuous operation 122 1/min 0 mA = pump switches off
	x	x	x	x	x	x	x	Empty signal input- 3pole (I) with level pre-warning	(See plug allocation, section 10.2)
		x	x			x	x	Pulse input- 4pole (II)	(See plug allocation section 10.2) 1 pulse = 1 stroke
				x	x			Pulse- / current input- 5pole (II)	(See plug allocation section 10.2) 1 pulse = 1 stroke
			x		x		x	Pulse memory*	From pulse frequency 122 1/min the pulses are stored and added up to a max. of 50,000 pulses, executed during continuous running
		x	x	x	x	x	x	Metering stop	(See plug allocation section 10.2) Contact open = pump closed
		x	x	x	x	x	x	Pulse output- 4pole (III)	(See plug allocation section 10.2)
		x	x	x	x	x	x	Empty signal output	Floating
		x	x	x	x	x	x	Stroke signal	Floating

NOTE: In version E 11 the connection socket I and in version E 20 to E 42 connection socket I and II must always be occupied, either by the mounted bridge connectors (protective cap with corresponding symbol) or by connecting the empty signal device or pulse control lead (see plug allocation, section 10.2)

NOTE: In versions E11 to E42 the bridge connectors (protective cap with corresponding symbol) should be retained after removal for re-use.

***Attention:** Pulse memory is not cancelled for a reserve and empty signal report. The memory is cancelled for a metering stop (contact open), switch position "0", change of operation mode or mains failure.

3.3 Description of symbols

Level pre-warning and empty signal indication (red)

Error signal indication (red)

Operating indication (green)

Metering indication (yellow)

Empty signal input

Pulse input, current input
and metering stop

Empty signal output and
stroke signal output

4. Installation and start-up

4.1 Installation instructions:

NOTE: Long suction lines should be avoided (max. 3 m).

CAUTION: If the metering line can be blocked off, an overflow valve which opens at the maximum allowed pressure should be installed on the pressure side for safeguarding the metering line. This can prevent the metering line from bursting if wrongly operated.

If the circumstances are unfavourable, the pressure can rise to 3 times the nominal pressure.

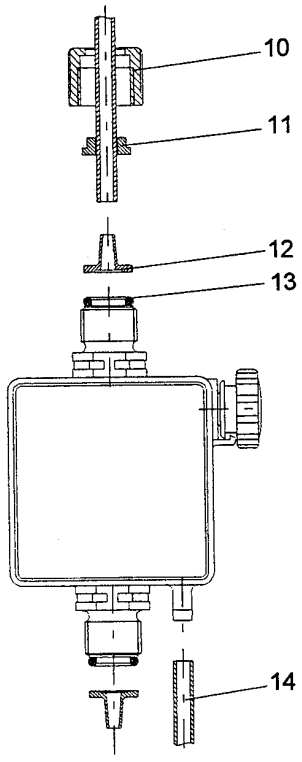
4.2 Electrical connection

Produce VDE power connection.

4.3 Start up

- Mount pump on container or on horizontal console. Observe suction height of max. 2 mWs.
- Connect suction and metering line
  - Cut off tube straight
  - Push union nut (pos. 10) and pressure piece (pos. 11) over hose and push onto connection nipple (pos. 12) as far as stop collar
  - Place O-ring (pos. 13) into valve groove and tighten union nut
  - Put the vent line (pos. 14) on
- Set metering setting and, if necessary, metering frequency setting to 100%
- Open vent screw approx. 1 turn and leave open until the metering medium enters the vent line without bubbles. Close vent screw and ensure that the metering line is not shut-off in any place.

  If the pump has drawn in air, it must be revented.



Improved suction can be achieved if the pressure valve is unscrewed and the pump head filled with a suitable liquid.

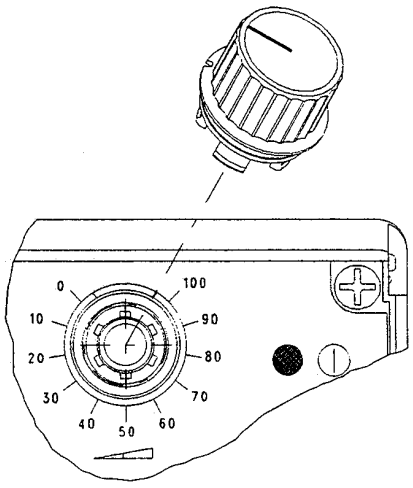
NOTE: After an operation of 24 hours, the metering head screws must be tightened up diagonally with 3 - 4 Nm.

NOTE: In versions E40 / E 42, the metering pump can only be put into operation with the setting "intern 100 %", when there is no external metering stop (contact locked). If necessary, disconnect the corresponding plug (II) and attach the bridge connector.

CAUTION: The metering pump may contain residual water from works testing.

4.4 Setting the mechanical stroke adjustment

The metering pump is set to nominal pressure at the factory in accordance with the metering curves. Should the stroke setting be set the wrong way through pulling off the adjustment knob (pos. 9), the basic setting can be found out as follows:



1. Switch metering pump on.
2. Place button on 100 % and turn clockwise until adjusting screw is noticeably tensioned. Because of the eccentric gear, it is possible to turn the button step by step only with the pump running.

   If no resistance is reached, remove button at setting "0" and repeat stage 2.
3. Then pull button off and put adjusting notch and marking back on scale setting "0" and set desired metering capacity.

   To determine the exact metering capacity, the pump should be gauged by liters.

5. Metering capacity

General:

The reproducible metering precision is about +/- 3% at a minimum of 30% stroke length and under constant conditions.

The characteristics of the pump are such that higher outputs may occur until the operating temperature is reached (continuous operation at least 2 hours).

Precise metering can be achieved by taking the following points into consideration:

a) All metering capacity information relates to measurements using water at 20°C, with a constant power supply and warmed-up pump.

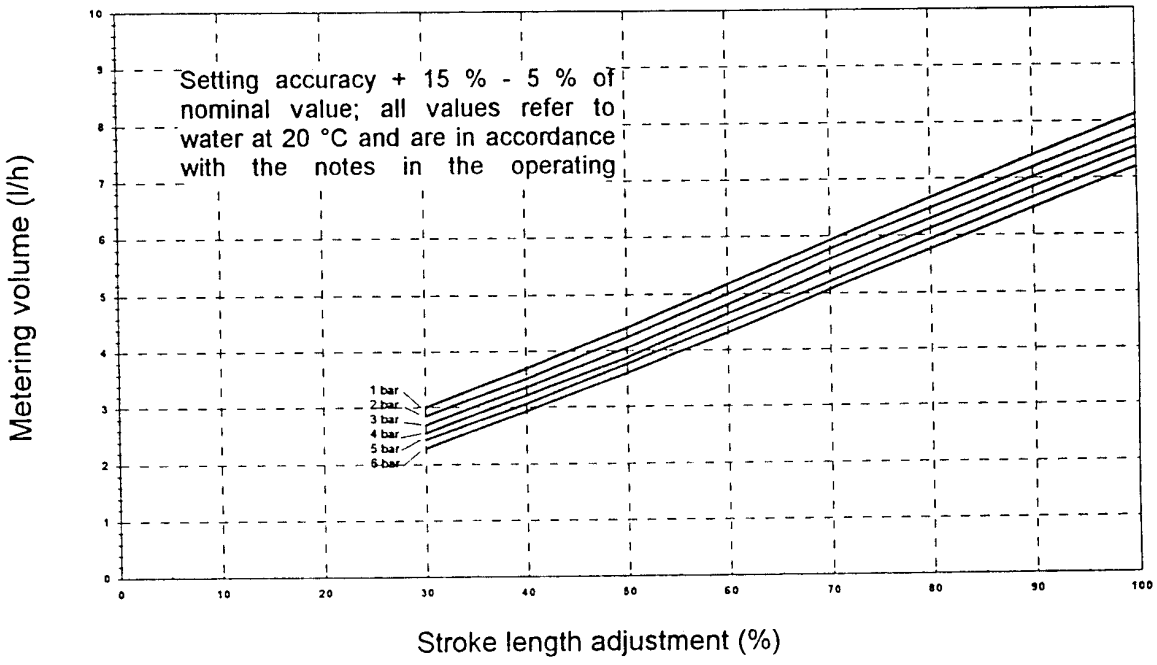
b) In order to obtain a high degree of metering precision with free flow, a pressure maintenance valve (or metering valve) should be used, in order to produce a constant back pressure of at least 0.5 bar.

c) If there is pre-pressure on the suction side, the pressure difference between the suction and the pressure side should be at least 1 bar. The water column on the metering pump must be protected by an appropriate valve arrangement.

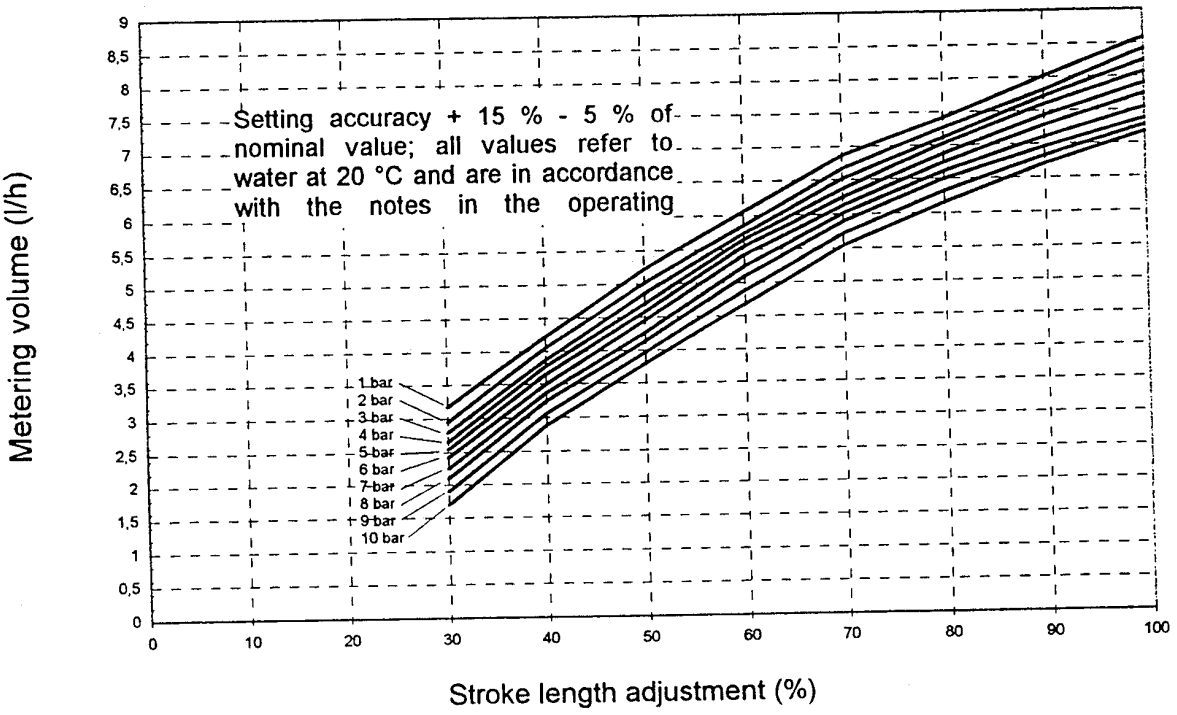
NOTE: A pressure maintenance valve or metering valve is not a completely reliable blocking element.

ATTENTION: Only carry out metering stroke adjustment when the pump is running and the stroke adjustment screw is not under pressure.

Delivery capacity, 7.2 l/h / 6 bar



Delivery capacity 7.2 l/h / 10 bar



7. Maintenance

CAUTION: Metering pumps must be maintained by expert, authorised personnel only.

NOTE: Quarterly maintenance interval, shorter intervals if load is greater (e.g. constant running).

It is recommended that the following be checked:

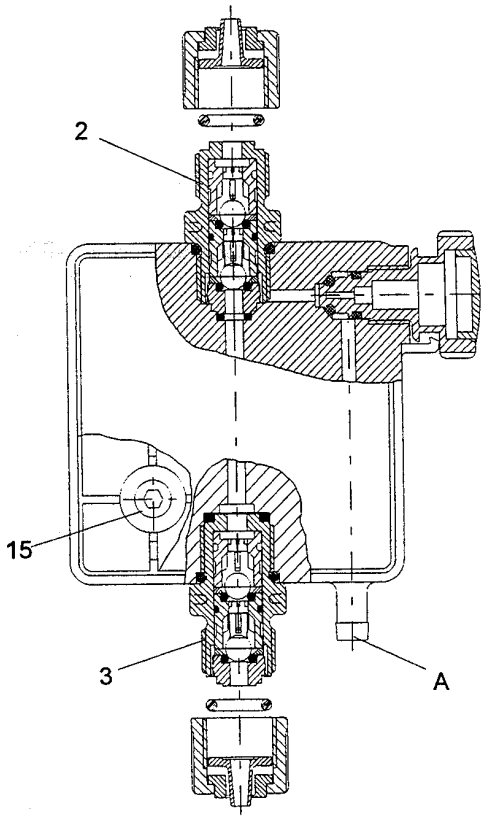
- Suction and pressure line for leak-free connection
- Suction (pos. 3) and pressure valve (pos. 2) for soiling and sealing function
- Exit hole (A) on pump head (fracture in diaphragm)
- Correct delivery by suction operation
- Metering head screws (pos. 15) (firm seating, 3-4 Nm)

NOTE:

The lifetime of the diaphragm depends on:

Back pressure, operating temperature and metering medium.

Frequent checking of the diaphragm is recommended at extreme operation conditions and when metering abrasive materials.



8. Tips for dealing with faults which may occur

8.1 Faults which you can rectify yourself

CAUTION: Before carrying out repair and maintenance work or when metering dangerous substances, always rinse the metering head, relieve the pressure line and wear **protective clothing** (protective glasses, protective gloves and apron).

Electrical repairs must only be carried out by electrical experts (Liability Insurance Association safety regulations VB G 4 and ZH 1/11) !

CAUTION: When opening covers or removing parts, unless possible without using tools, live parts may be exposed. Connection points may also be live.

Before carrying out a calibration, service, overhaul or when replacing parts, the device must be disconnected from all power sources if it needs to be opened.

Fault	Possible cause	Rectification
Metering pump does not work, green LED not showing	- Incorrect voltage	- Check mains voltage
Pump does not suck up despite venting and max. stroke	- Deposits, jamming, valves dried out	- Rinse the metering head through suction line, if necessary dismantle valves and clean or replace
Metering head is leaking, medium is escaping from leaking connections	- Metering head is loose - Diaphragm ruptured	- Tighten metering head screw diagonally - Replace diaphragm
Level LED flashes	- Reserve signal	- Stock up product
Level LED permanently on	- Lack of chemicals - Loose bridge connector	- Top up storage tank - Check if bridge connection is properly plugged in
Pump not working (red LED not indicating fault)	- Metering stop in operation - Connector not making contact at terminal II	- Attach bridge connector to terminal II - Cancel metering stop in accordance with wiring diagram - Check connector contact at terminal II

Fault	Possible cause	Rectification
Level LED lights up despite full tank	- Float jammed - Suction lance plug or bridge connector is loose or not plugged in - Suction lance cable faulty	- Release float, tighten plug, clean contacts - Check that bridge connector is properly plugged in - Replace empty signal device
Metering pump not running although switch is ON or, in versions E20/E22/ E30/ E32/E40/E42 yellow metering indicator is flashing	- Air in pump head - Metering volume setting too low	- Vent metering head through vent screw - Increase stroke volume adjustment
Error signal LED lights up	- Metering valve clogged - Metering back pressure too high	- Clean and rinse valve - Check metering line Once the cause of the fault has been removed, the mains must be switched off or the switch must be turned to "0" in order to acknowledge the error signal*
Error signal LED lights up when E30 / E32 operating at 4 - 20 mA	- Input current interrupted or current < 4 mA	- Establish electric circuit, choose input range 0 - 20 mA, if necessary
Metering pump not working, no green LED display (version E 11 - E 42)	- 5 V output at cable socket II overloaded	- Limit max. load to 80 mA

ATTENTION: *Pulse memory is cancelled (E22 / E32 / E42)

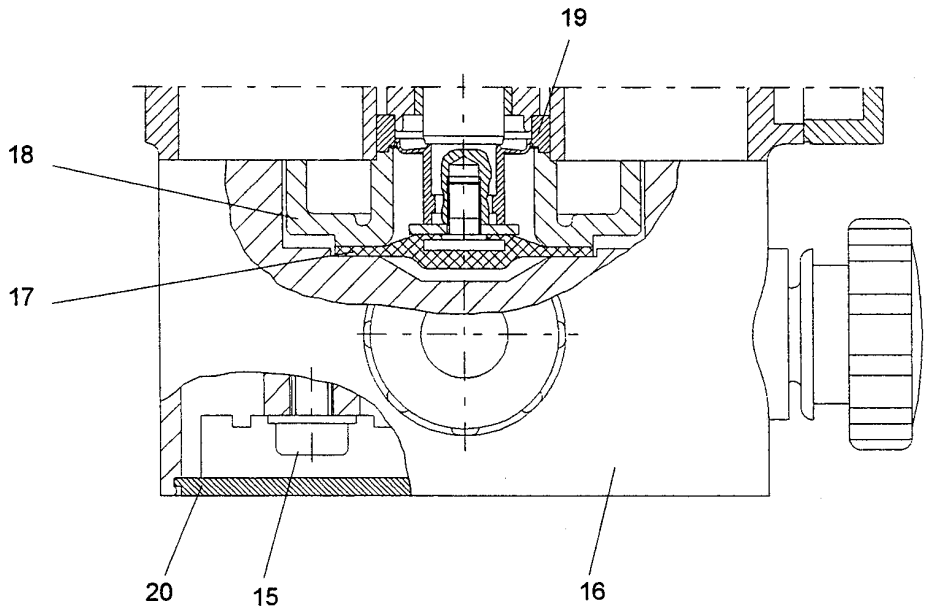
8.2 Faults which must be fixed by customer service

Fault	Possible cause	Rectification
Error signal LED lights up	- Metering system blocked - Metering without request being made	- Internal fault - Internal fault
Metering pump not working, no green LED display	- Mains cable damaged	- Replace mains cable

9. Replacement of diaphragm and pump head

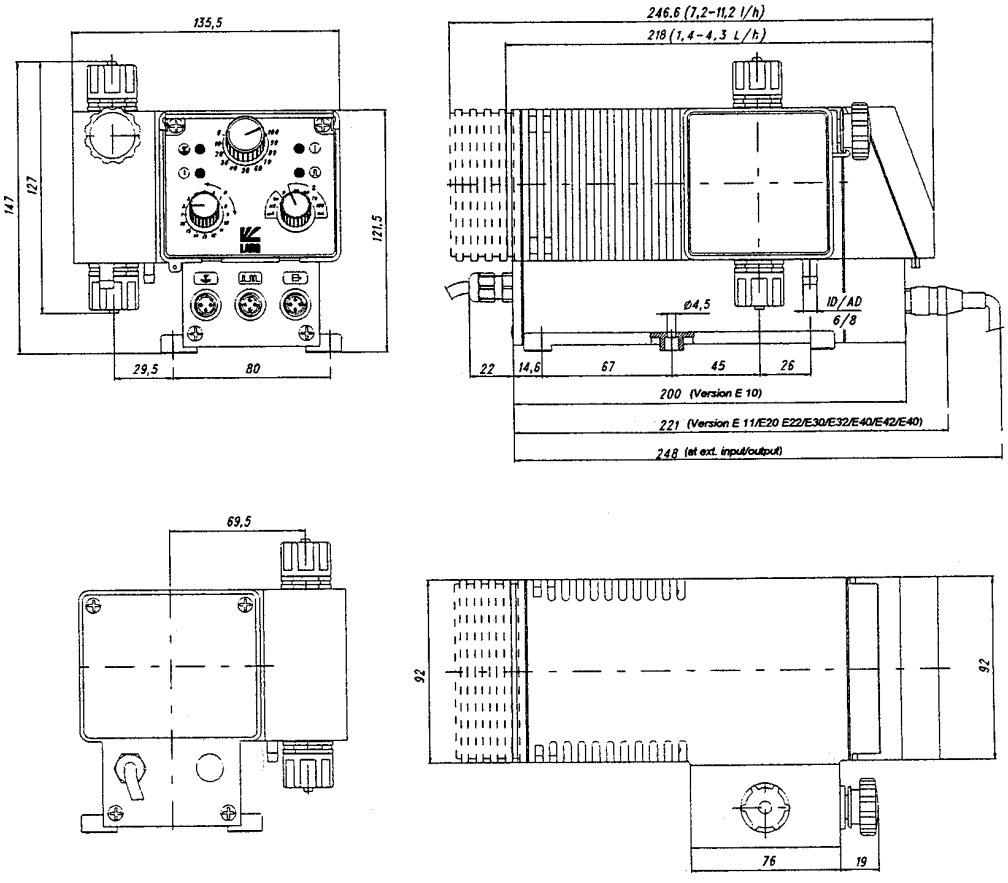
Remove cover plate (pos. 20) from metering head, loosen attachment screws (pos. 15) and remove pump head (pos. 16), unscrew diaphragm (pos. 17), including intermediate piece (pos. 18) and supporting disk. Replace intermediate diaphragm (pos. 19) from tappet. When fitting the diaphragm, do not overtighten (lightly tighten by hand, without tools). The leak connection of the intermediate piece must point downwards. Tighten metering head evenly diagonally.

NOTE: Check metering head screw tightening torque after 24 hours. Tightening torque 3 - 4 Nm.



10. Dimensions, connections

10.1 Dimensions



11. Ordering code

E 10 014 PV 10 FP G

Ball material
G = Glass — standard
E = Stainless steel 1.4401 — option
P = PTFE — option

Seal material
FP = FPM (Viton B) — standard
EP = EPDM — option
KL = Kalrez — option

Metering back pressure
04 = 4 bar
05 = 5 bar
06 = 6 bar
10 = 10 bar

Pump head material
PV = PVDF — standard
PP = Polypropylene — option
E = Stainless steel 1.4571 — option

Pump capacity
014 = 1.4 l/h
025 = 2.5 l/h
043 = 4.3 l/h
048 = 4.8 l/h
072 = 7.2 l/h
112 = 11.2 l/h

Electrical version
E10 = On/off switch, mechanical stroke adjustment
E11 = On/off switch, mechanical stroke adjustment, empty signal report with level pre-warning
E20 = On/off switch, mechanical stroke adjustment, pulse input, empty signal report with level pre-warning empty signal output, stroke signal output
E22 = E20 with pulse memory
E30 = External-0-internal mode switch for infinitely variable frequency control or current signal input 0/4 ...20 mA or external pulse input, mechanical stroke adjustment, empty signal report with level pre-warning, empty signal output, stroke signal output
E32 = E30 with pulse memory
E40 = External-0-internal mode switch for frequency control (100/75/50/25%) or external pulse input for pulse multiplication/division, mechanical stroke adjustment, empty signal report with level pre-warning, empty signal output, stroke signal output
E42 = E40 with pulse memory

12. Technical data

Pump capacity l/h	**1.4**	**2.5**	**4.8**	**4.3**	**7.2**	**7.2**	**11.2**
Max. metering back pressure (bar)	10	10	4	10	6	10	5
Number of strokes (1/min)	122	122	122	122	122	122	122
Metering volume/stroke (cm³)	0,19	0,34	0,65	0,57	0,98	0,98	1,5
Metering accuracy (see section 6)	< ± 3%						
Suction height (mWS) at 100 % stroke setting *	2	2	2	2	2	2	2
Suction/pressure connection *** int. dia/ ext. dia (mm)	4/6	4/6	4/6	4/6	4/6	4/6	6/8
Power supply Special power supplies on request	230 V / 50/60 Hz ** + 6 % - 10 %						
Current consumption (mA) 50 Hz/60 Hz	45/ 50	45/ 50	45/ 50	81/ 86	81/ 86	130/ 150	130/ 150
Power consumption (W) 50 Hz/60Hz	10,4/ 11,5	10,4/ 11,5	10,4/ 11,5	18,7/ 19,8	18,7/ 19,8	30/ 34,5	30/ 34,5
Protection class	I						
Protection category	IP 65						
Max. ambient temperature	40 °C						
Insulation category	B						
Output circuit up to 24 V / 240 V Empty signal output Stroke signal output	24 V 3 A AC/DC / 240 V 3 A 24 V 0,3 A DC / not permissible						
Weight (kg)	2	2	2	2,4	2,4	3,1	3.1

* Suction heights with clean, moist valves

** at a mains frequency of 60 Hz, the delivery capacity increases by 20% and the metering back pressure decreases by 15%

All data refer to water at 20°C, when operated in accordance with the instructions on page 11.

Attention: *** The max. permissible pressure ranges for pressure lines or metering lines must be observed!

Materials:

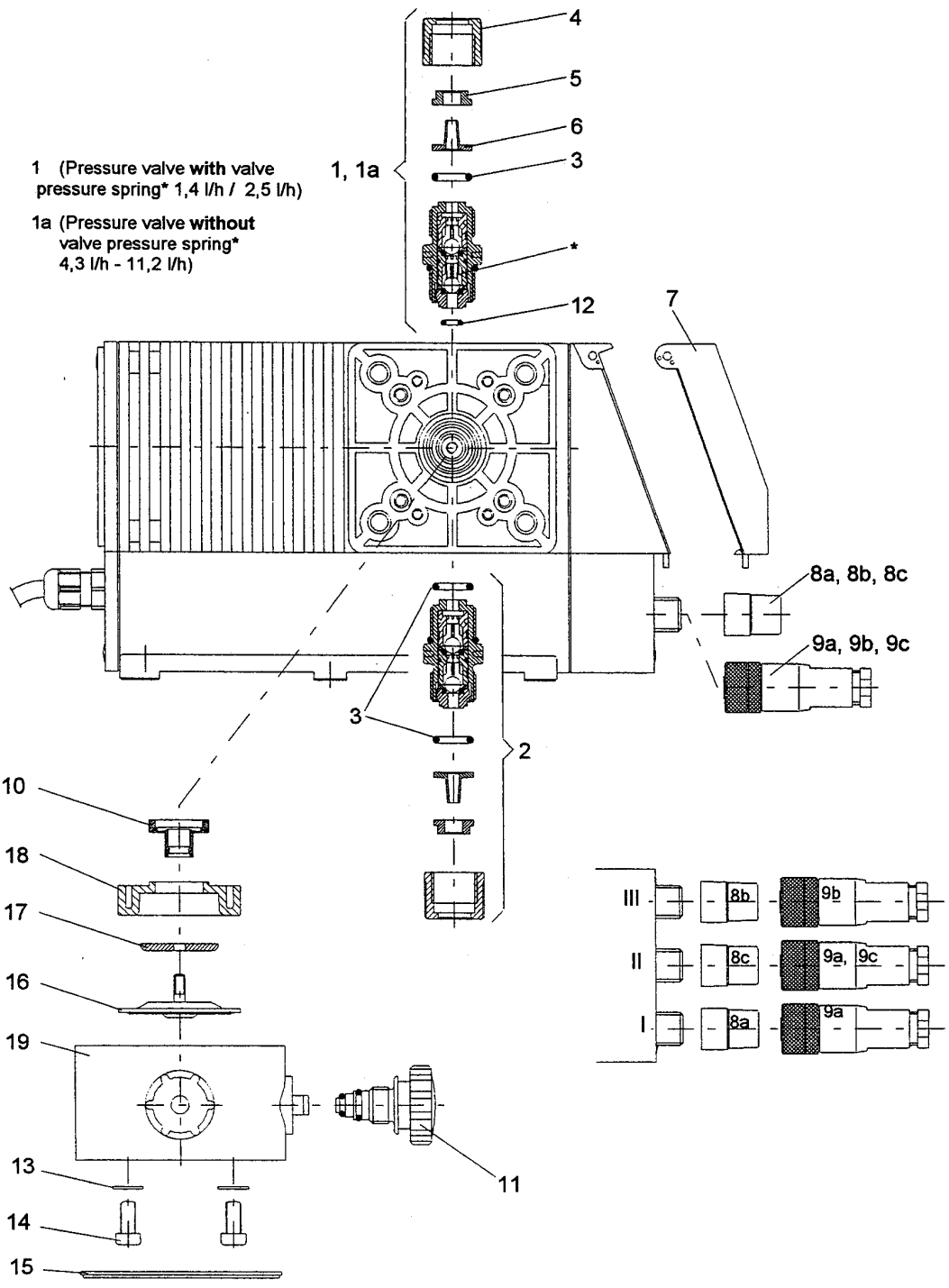
Pump head:	PVDF, optionally PP, stainless steel 1.4571
Diaphragm:	PTFE-EPDM compound diaphragm
Seals:	FPM/Viton B, optionally EPDM, Kalrez
Valves:	PVDF, optionally PP, stainless steel 1.4571
Valve balls:	Glass, optionally stainless steel 1.4401, PTFE
Valve springs:	Elgiloy/Hastelloy C4
Housing:	Thermoplastic polyester
Colour:	Blue, RAL 5007

Special versions on request.

13. Wearing and replacement parts

Item No.	Description	Article No.
1	Pressure valve with valve spring (1.4 l/h - 2.5 l/h)	2.480.03
1a	Pressure valve without valve spring (4.3 l/h - 11.2 l/h)	2.480.04
2	Suction valve (1.4 l/h - 11.2 l/h)	2.480.04
3	O-ring for suction and pressure valve (FPM)	4.1.7003.327
4	3/8" union nut	3.480.01-42
5	4/6, PE/PTFE thrust piece 6/8, PE/PTFE thrust piece 6/12 PVC fabric, thrust piece	3.450.01-89 3.450.01-90 3.404.01-07
6	4/6 connection nipple 6/8 connection nipple	3.400.02-30 3.400.02-76
7	Transparent cover	3.480.01-20
8a	Bridge connector, empty signal input	2.481.86
8b	Cover cap	3.480.01-17
8c	Bridge connector, pulse / current signal input	2.481.87
9a	Plug 4 pole (3 pole) empty signal / pulse signal input	4.1.8463.115
9b	Plug, 4 pole, special version empty signal / pulse signal output	4.1.8463.117
9c	Plug 5 pole E30/E32 current signal / pulse signal input	4.1.8463.118
10	Bellows	3.480.01-32
11	Vent screw	2.430.77
12	O-ring (FPM)	4.1.7003.316
13	Washer	4.1.3501.720
14	Screw	4.1.3031.026
15	Cover plate	5.400.01-88

		1.4 l/h	2.5 l/h	4.3/4.8 l/h	7.2 l/h	11.2 l/h
16	Diaphragm	3.480.01-34	3.480.01-55	3.480.01-56	3.480.01-57	3.480.01-57
17	Support disk	3.400.01-58	--	3.402.43-02	3.404.01-10	3.400.01-45
18	Intermed. plate	3.480.01-33	3.480.01-50	3.480.01-51	3.480.01-52	3.480.01-52
19	PVDF pump head	3.402.01-04	3.402.01-05	3.402.01-06	3.402.01-07	3.402.01-07
19	PP pump head	3.400.01-84	3.400.01-85	3.400.01-86	3.400.01-87	3.400.01-87

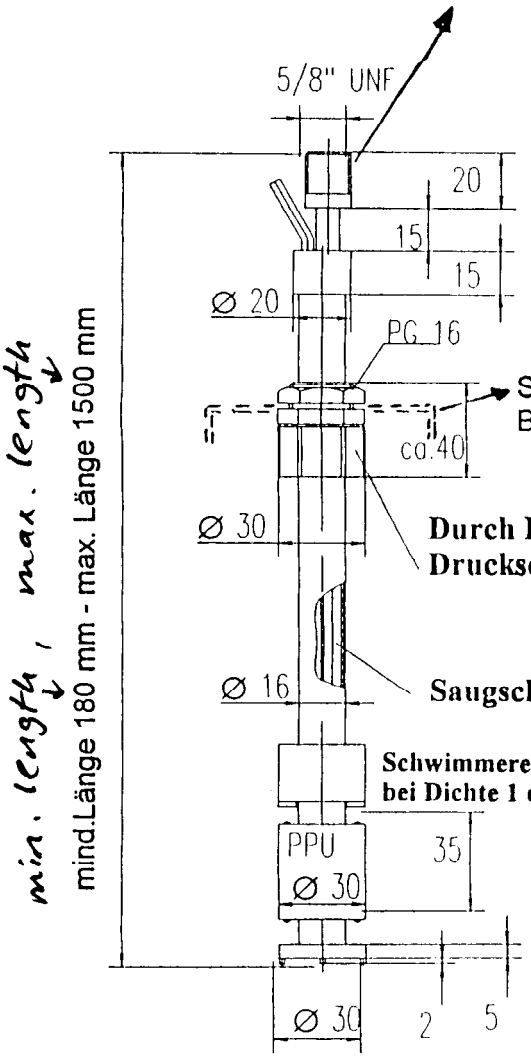

1 (Pressure valve with valve pressure spring* 1,4 l/h / 2,5 l/h)
1a (Pressure valve without valve pressure spring* 4,3 l/h - 11,2 l/h)
1, 1a
4
5
6
3
*
12
7
8a, 8b, 8c
9a, 9b, 9c
3
2
10
18
17
16
19
13
14
15
11
III
II
I
8b
9b
8c
9a, 9c
8a
9a

Variable Suction Rod

MEDOTEC MEß- UND DOSIERTECHNIK GMBH	VARIABLE SAUGLANZE FÜR LIEFERGEBINDE	AUSGABE AB 1/1997

Standard-Schlauchanschluß 4x6, 6x8, 6x12 mm
Option 5x8, 8,12, 9x12 mm

Standard hose Connection



Kontaktart:
Öffner oder Schließer durch Drehen des Schwimmers

Contact type: opener or closer by turning the floating element

Screwing lid, opening 22,5 supplied

see overleaf

Technische Daten:

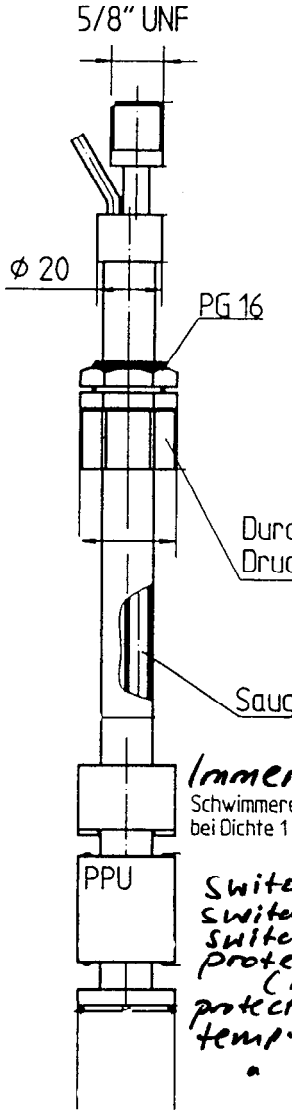
Schaltspannung	max. 250 V
Schaltstrom	max. 1 A
Schaltleistung	max. 50 W / 50 VA
Schutzart Kopfstück	IP 65 (IEC 529)
Schutzart ab Unterk.Schraubdeckel	IP 65 (IEC 529)
Temperaturbereich PVC	- 10°C - + 65°C

see overleaf

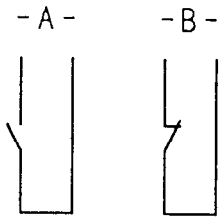
XE-000009416-000

Sauglanze S 1 . . . 0 . .

variable suction rod



types of contact
Kontaktarten



can be changed by loosening of pressure screw

suction pipe PE, inside Ø 6

Immersion depth/density 1, approx. 21 mm

switch. voltage
switch. current
switch. power
protection type (head)
protection, lower part
temp. range PVC
" PP

TECHNISCHE DATEN: techn. data

Schaltspannung:	max. 50 V	max. 250 V
Schaltstrom:	max. 0,5 A	max. 1 A
Schaltleistung:	max. 10 W / 10 VA	max. 50 W / 50 VA
Schutzart Kopfstück:	IP 65 (IEC 529)	
Schutzart ab Unterkante Schraubdeckel:	IP 67 (IEC 529)	
Temperaturbereich PVC:	-10°C ... +65°C	
Temperaturbereich PP:	-25°C ... +100°C	

Typenschlüssel für Sauglanze S 1 . . . 0 . .

material code ← of supplier

* Nennlänge 0 - 5 in 200 mm Schritten abgestuft
0 = ≤ 200 mm 1 = ≤ 400 mm 2 = ≤ 600 mm
3 = ≤ 800 mm 4 = ≤ 1000 mm 5 = ≤ 1200 mm

Kontaktarten
A = - A - B = - B - C = - C -

Schaltspannung
0 = < 50 V 1 = < 250 V (nur A oder B Kontakt)

Material Sauglanze / Flußventil
B = PVC / PVC C = PP / PP

Schaltpunkt 0 = fallendes Niveau
1 = steigendes Niveau

Assembly	: 16.02.WMT2.20.0L	Commiss.	: 25-05-377
Label	: CONTAINER[520]/WMT2/PVC/VA	Position	: 000040
Quant.	: 1,000 ST	Page	: 000037/01
Drawing	: 16.02.WT01E01.00	Date	: 10.04.2006

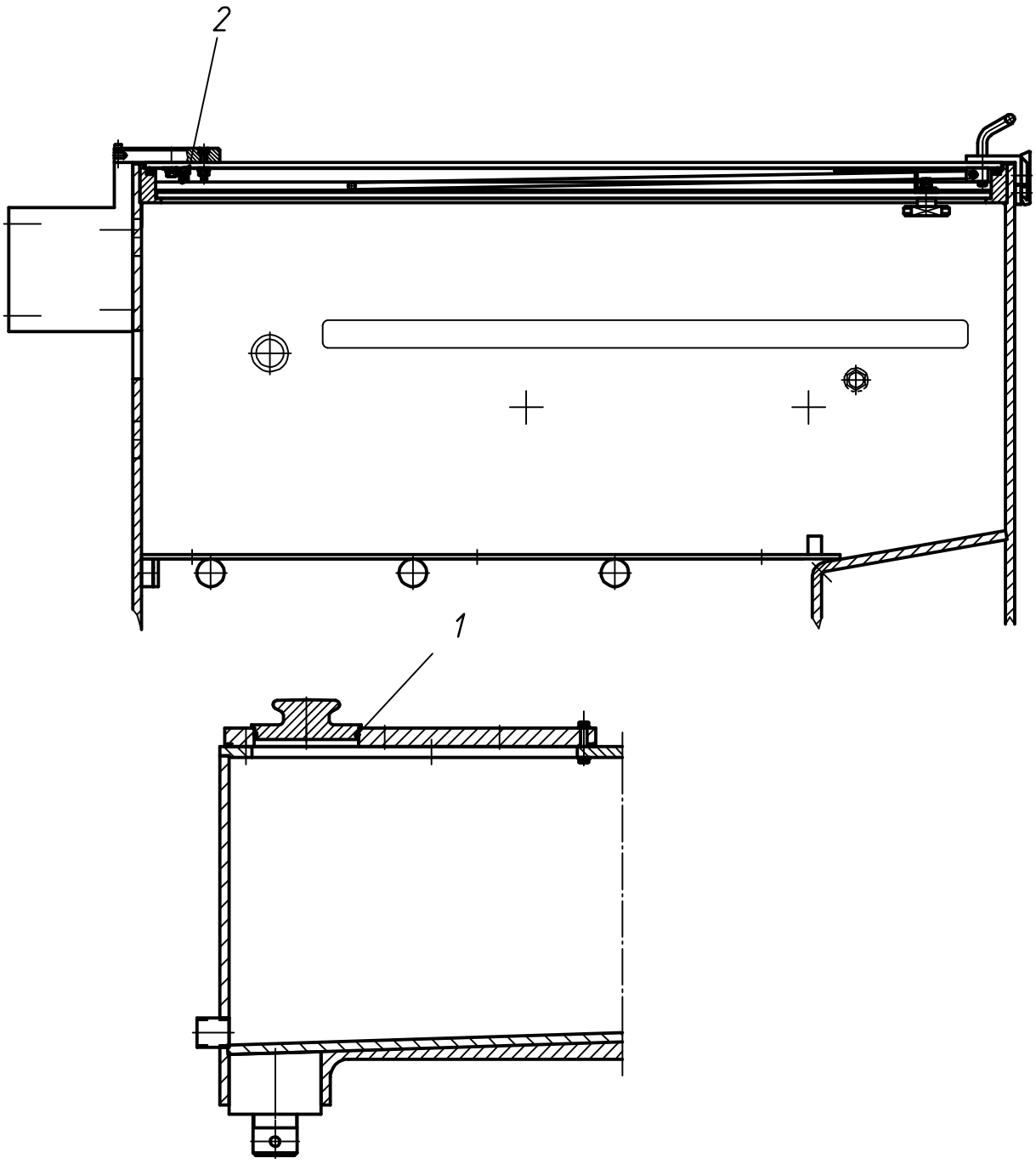
Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.1474.222A CONTAINER/PVC/WMT/22/0650/FA	1,000	ST	
	16.002.0141.U222 GLASS COVER[020]/22/V4A/PVC	1,000	ST	
1	DICH0580-239 O-RING/EPDM/BLACK/091.76x3.53	1,000	ST	X
2	16.002.0508.0760 PROFILE/"VITON B"	,565	M	X
	16.012.0003.U22A CABLE CHANNEL/CPL./022/PVC/V2A/BS	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste BEHÄLTER U. VERKLEI.

Spare parts list housing with accessories

16.02.WT01E01.00 | 11/03



Assembly	: 16.002.1474.222A	Commiss.	: 25-05-377
Label	: CONTAINER/PVC/WMT/22/0650/FA	Position	: 000040
Quant.	: 1,000 ST	Page	: 000038/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	03.010.0059.000B SCREWING-IN PART/PVC-DG/d=46.5/R 2 3/4"	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.002.0141.U222	Commiss.	: 25-05-377
Label	: GLASS COVER[020]/22/V4A/PVC	Position	: 000040
Quant.	: 1,000 ST	Page	: 000039/01
Drawing	: 16.002.0141EU000	Date	: 10.04.2006

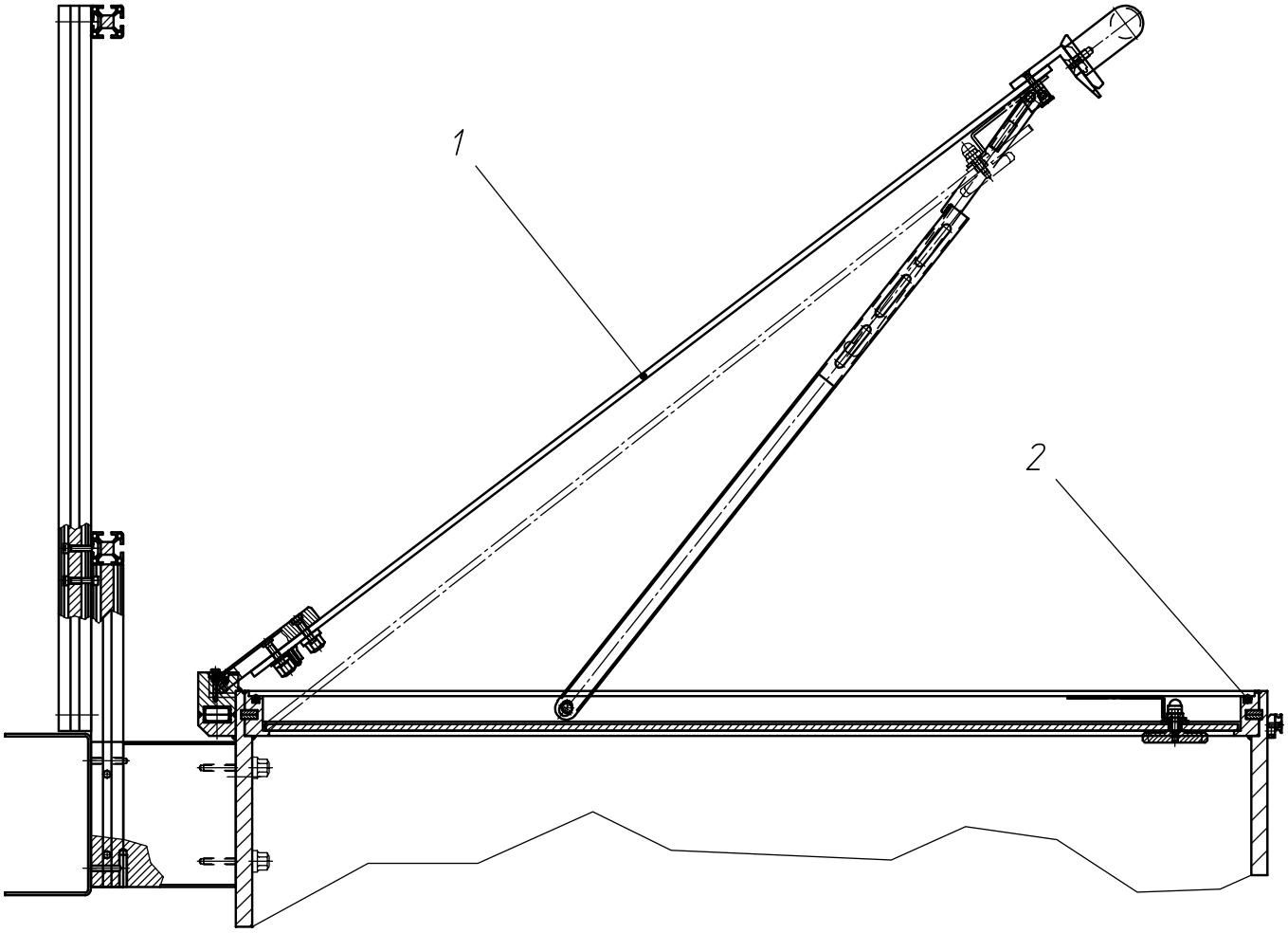
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0022.2220 GLASS COVER/22/0650/0593x0932x06	1,000	ST	X
	16.002.0142.U002 COVER PARTS/PVC/V4A	1,000	ST	
2	16.002.1178.2220 GLASS COVER SEALING/A/22/0650/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list GLASS COVER

16.002.0141EU000	11
	00



Assembly	: 16.002.0142.U002	Commiss.	: 25-05-377
Label	: COVER PARTS/PVC/V4A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000040/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

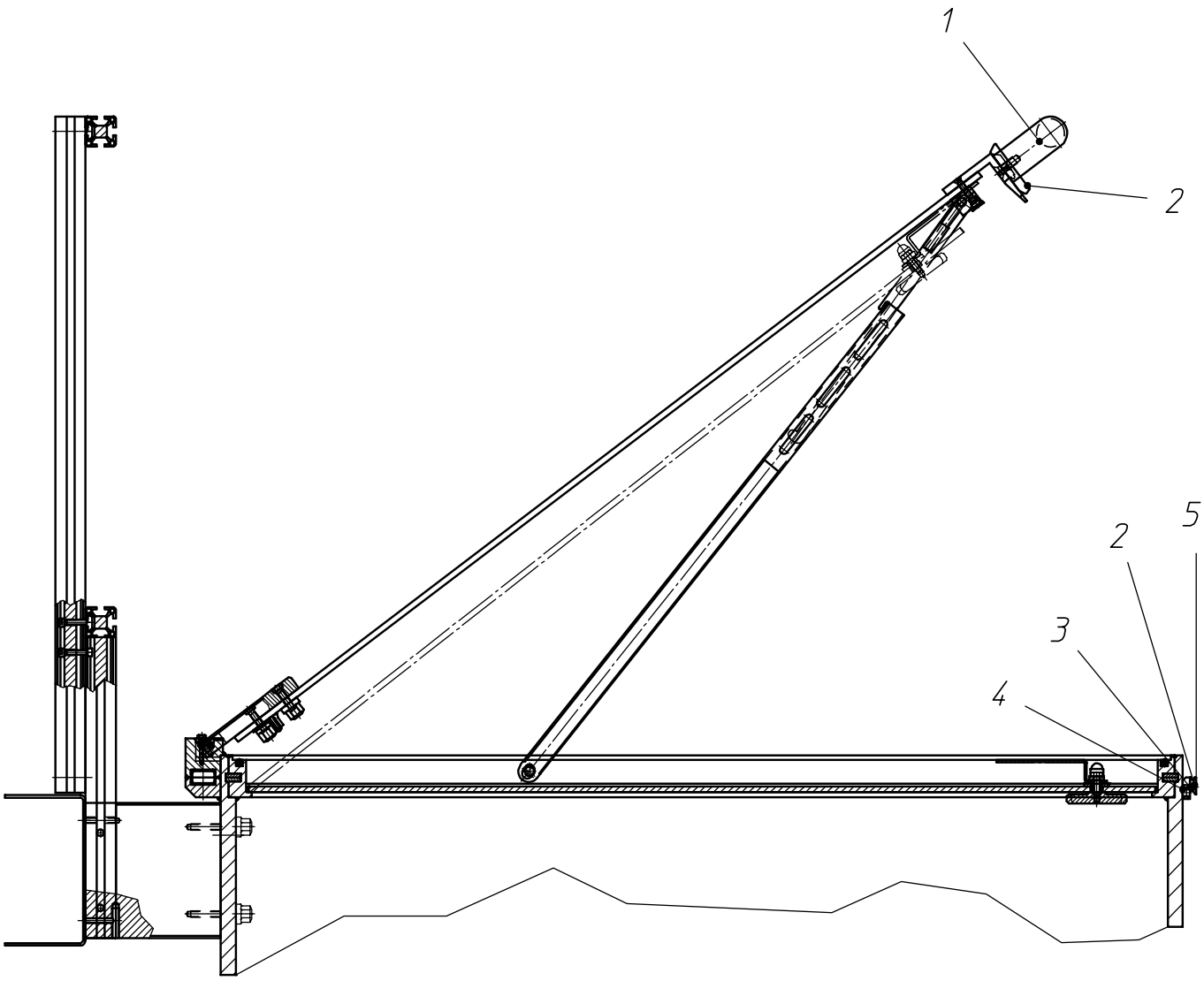
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	DICH0700-6 SEALING RING M6/POLYPROPYLEN GREY	4,000	ST	X
3	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
4	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
5	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
HAMLIN

www.breedelectronics.com

59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

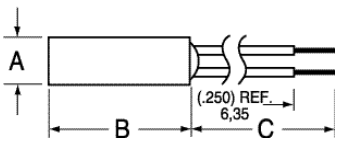
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

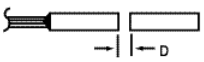
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

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Breed Electronics France Tel: +33 1 46 87 02 02 • Fax:+33 1 46 86 67 86 • Email: hamectrol@hamectrol.fr

Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000040
Quant.	: 1,000 ST	Page	: 000041/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

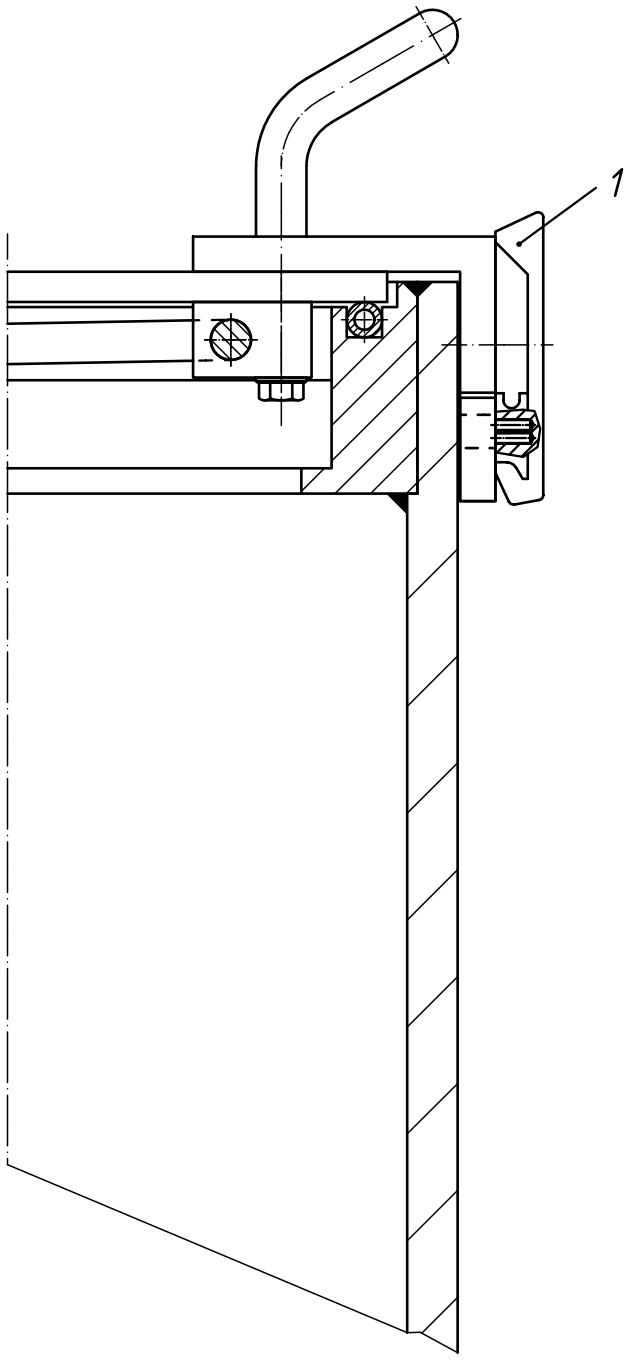
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.012.0003.U22A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./022/PVC/V2A/BS	Position	: 000040
Quant.	: 1,000 ST	Page	: 000042/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

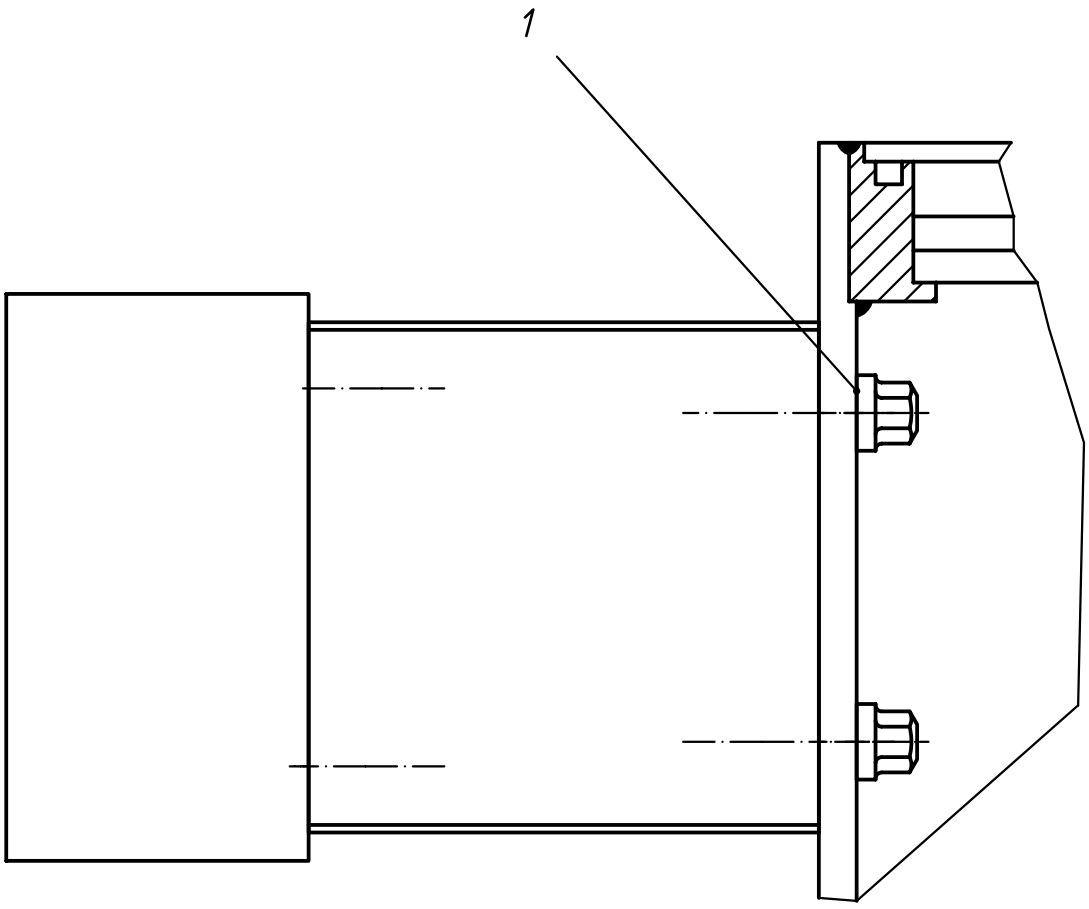
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 16.002.0040.U221	Commiss.	: 25-05-377
Label	: INTERMEDIATE GLASS COVER/KPL./22/PP/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000043/01
Drawing	: 16.002.0040EU000	Date	: 10.04.2006

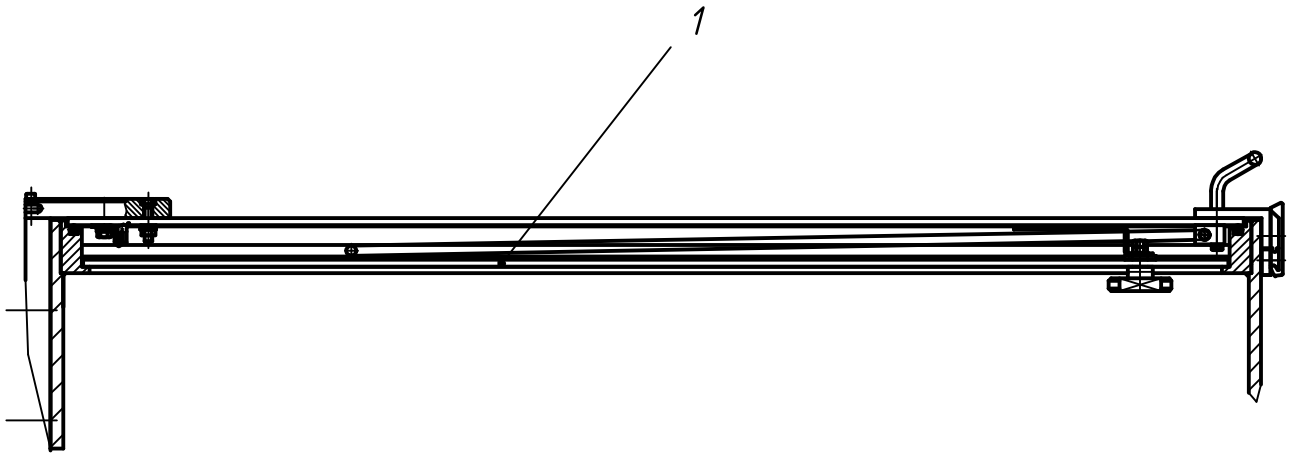
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0100.2220 GLASS COVER/22/0650/0541x0906x06.0	1,000	ST	X
	16.002.0004.U001 COVER PARTS/V2A/INTERMEDIATE COVER	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZWI.-GLASDECKEL KPL.

Spare parts list Intermediate glass cover cpl.

16.002.0040EU000	11
	00



Assembly	: 16.002.0004.U001	Commiss.	: 25-05-377
Label	: COVER PARTS/V2A/INTERMEDIATE COVER	Position	: 000040
Quant.	: 1,000 ST	Page	: 000044/01
Drawing	: 16.002.0004EU000	Date	: 10.04.2006

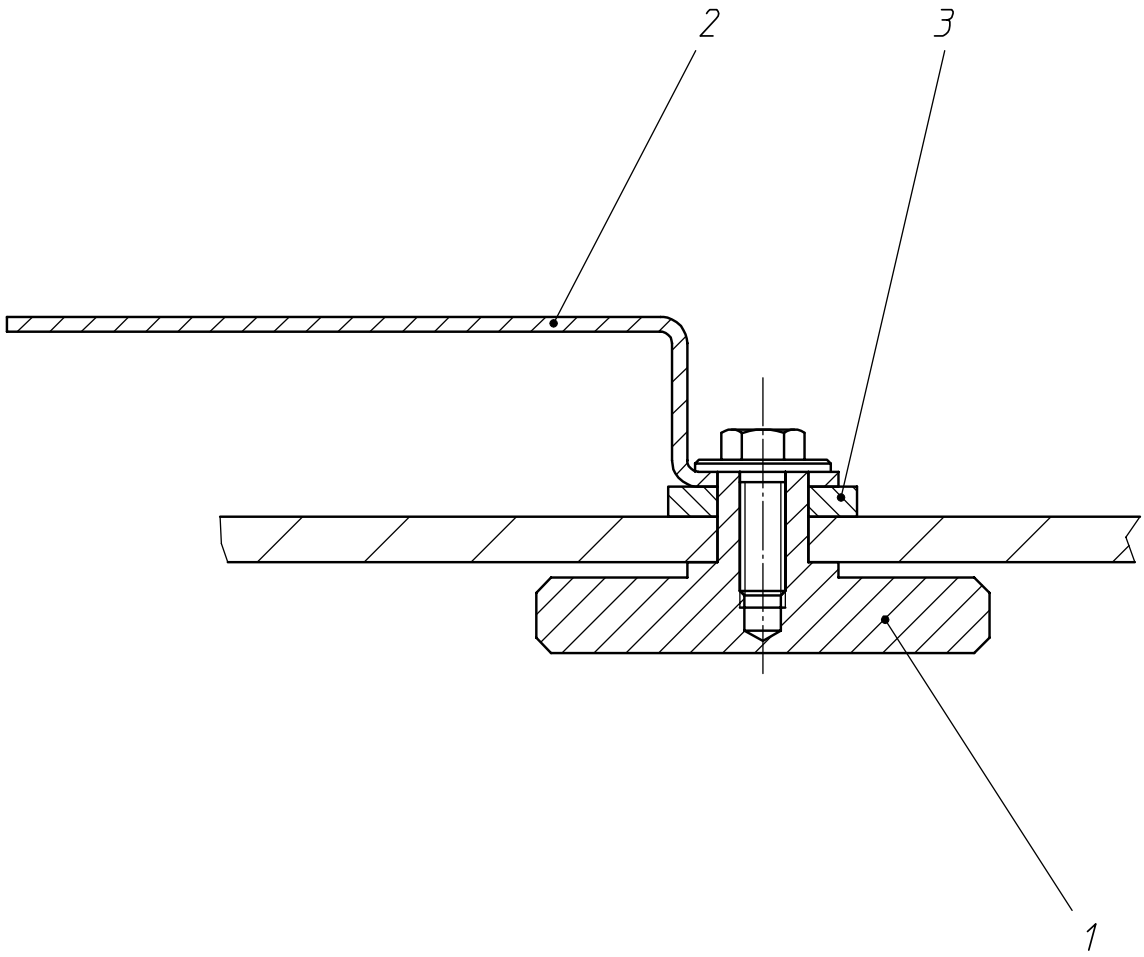
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0209.000E HANDLE/PP-G	1,000	ST	X
2	16.002.2506.0002 LOCKING BOLT	1,000	ST	X
3	00.005.0207.000E DISC/PP-G/d=12.0/D=025.0/L=2.0	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list cover parts

16.002.0004EU000	11
	01



Assembly	: 16.05.W002.01.0A	Commiss.	: 25-05-377
Label	: FEED/WMT2/PVC /PVC /EP/AS08	Position	: 000040
Quant.	: 1,000 ST	Page	: 000045/01
Drawing	: 16.05.W001E01.00	Date	: 10.04.2006

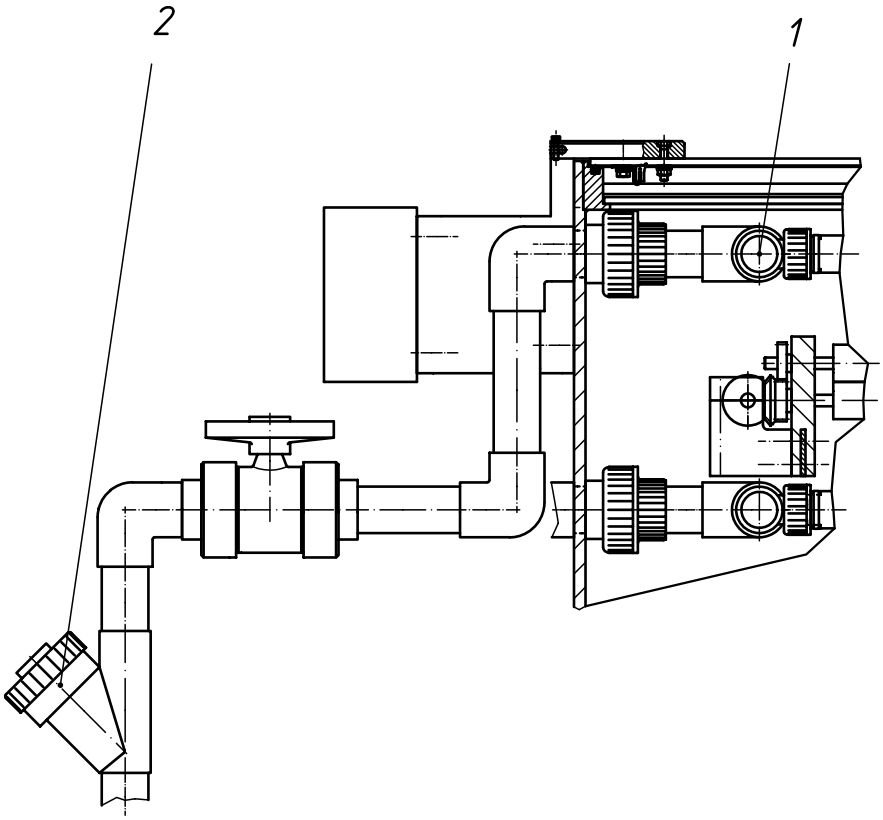
Pos.	Part N° Label	Quant.	Unit	SP
1	16.005.0397.022B DISTRIBUTOR PIPE/PVC/EP/022/KPL./5A/1B	2,000	ST	X
2	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF

Spare parts list INFLOW

16.05.W001E01.00	11
	00



Assembly	: 16.005.0397.022B	Commiss.	: 25-05-377
Label	: DISTRIBUTOR PIPE/PVC/EP/022/KPL./5A/1B	Position	: 000040
Quant.	: 2,000 ST	Page	: 000046/01
Drawing	: 16.005.0024E0000	Date	: 10.04.2006

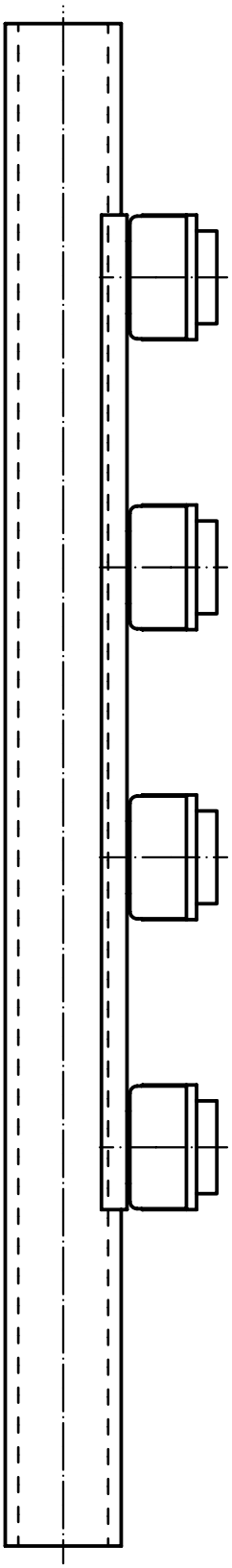
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	5,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	10,000	ST	X
3	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	5,000	ST	X

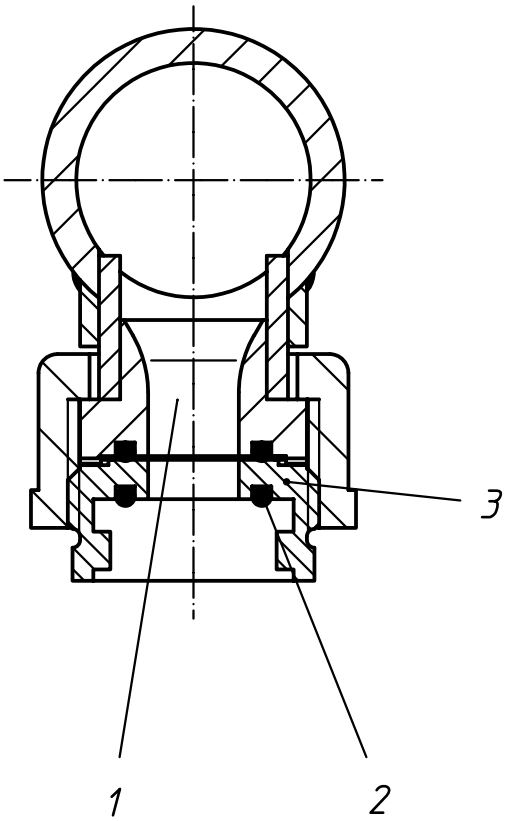
Parts without Pos.-N° see assembly parts list

Ersatzteilliste VERTEILERROHR KPL.

Spare parts list DISTRIBUTOR PIPE CPL.

16.005.0024E0000	11 / 01





Assembly	: 16.005.0010.2O2B	Commiss.	: 25-05-377
Label	: SPRAYPIPE/PVC-D/ 650/ 9D/F/G/12,06L/MIN	Position	: 000040
Quant.	: 8,000 ST	Page	: 000047/01
Drawing	: 16.005.0010E0000	Date	: 10.04.2006

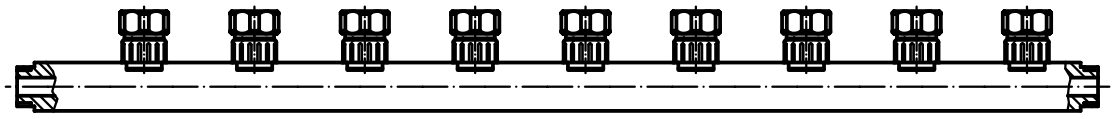
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000166-000 SEAL-NUT/PPNR.065.202.53.00.001	9,000	ST	X
2	DÜ-000000142-000 NOZZLE/652.514.5E/BJ/PVDF/60°	9,000	ST	X
3	DI-000000133-000 SEALING RING EPDM/18,4x10x3 MM	9,000	ST	X
4	03.005.0401.000C ADAPTER/CPL./PVC-C/RA=15°	9,000	ST	X
5	DICH0580-112 O-RING/EPDM/BLACK/012.37x2.62	9,000	ST	X

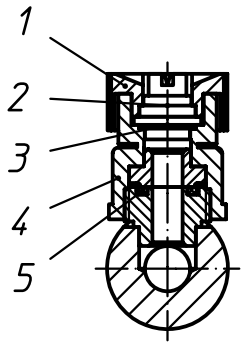
Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPRÜHROHR KPL.

Spare parts list SPRAY PIPE CPL.

16.005.0010E0000	11 / 01





Assembly	: 16.009.0005.U00A	Commiss.	: 25-05-377
Label	: COOLING/ACCESSORIES/PVC/1KS	Position	: 000040
Quant.	: 1,000 ST	Page	: 000048/01
Drawing	: 16.009.0005EU000	Date	: 10.04.2006

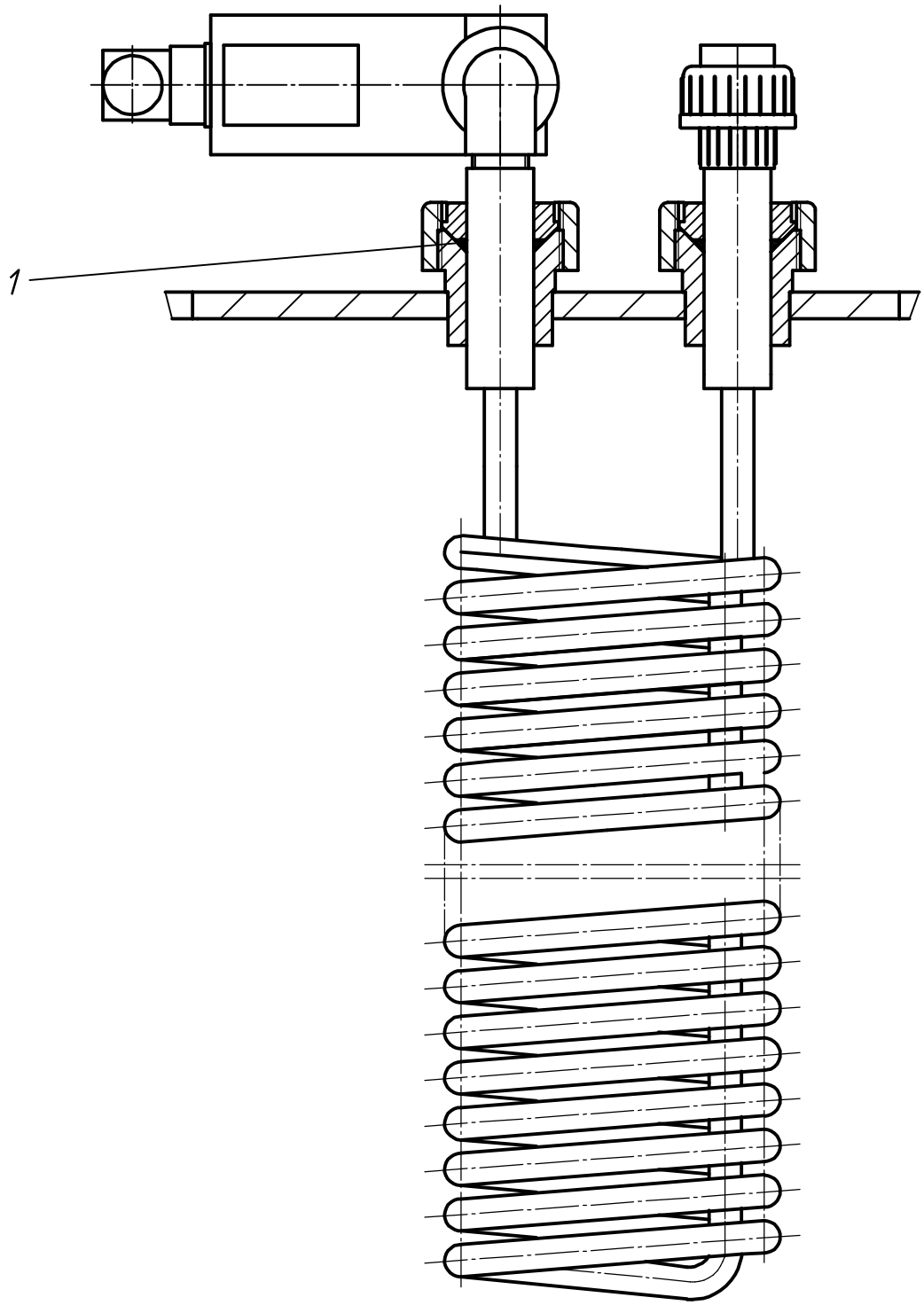
Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
1	DICH0576-318 O-RING/VITON/GREEN/024.77x5.33	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KÜHLUNG

Spare parts list Cooling

16.009.0005EU000	11
	01



Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000040
Quant.	: 1,000 ST	Page	: 000049/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

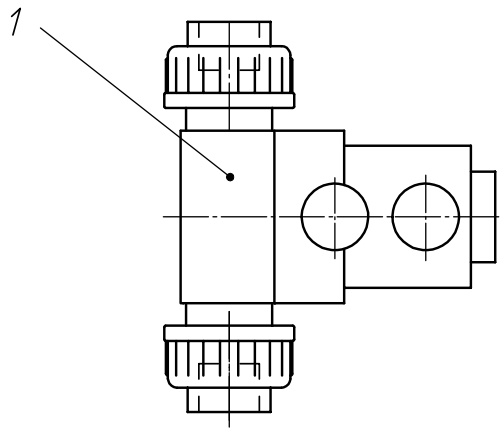
Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

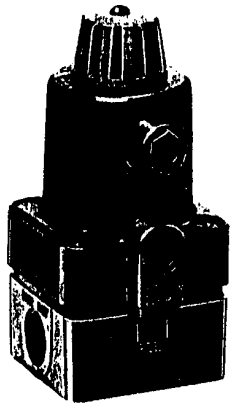
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

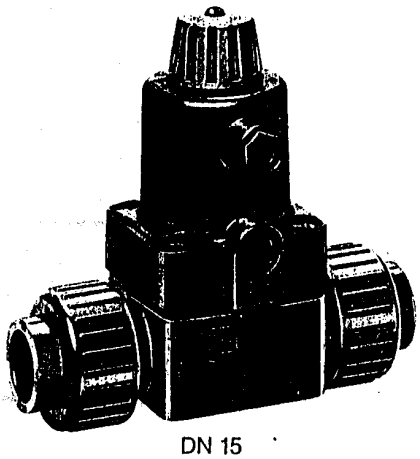
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

GEMÜ®

Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

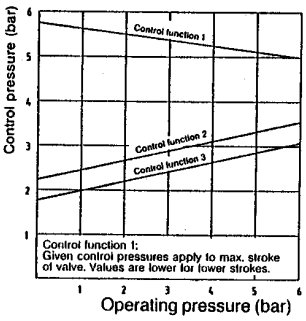
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

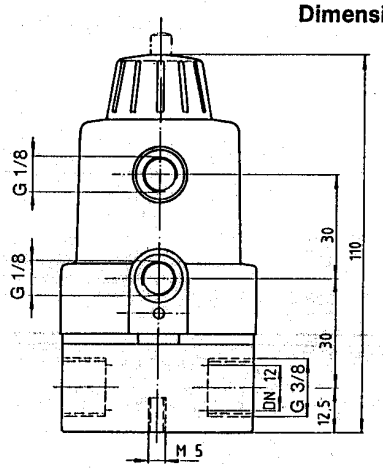
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

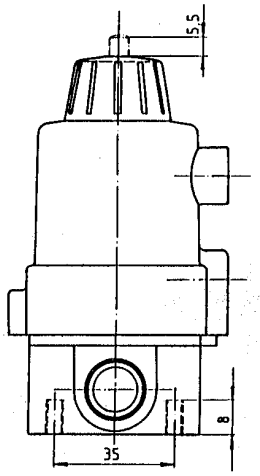
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

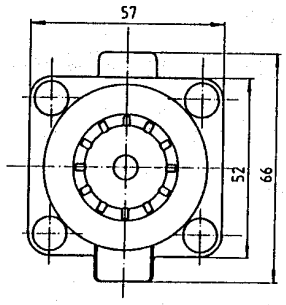
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



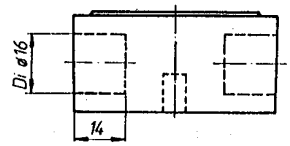
Dimensions



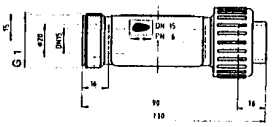




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

GEMÜ GEBR. MÜLLER
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Tel. 07940/123-0 · Telex 74126 · FAX 07940/123-106

Presented by:

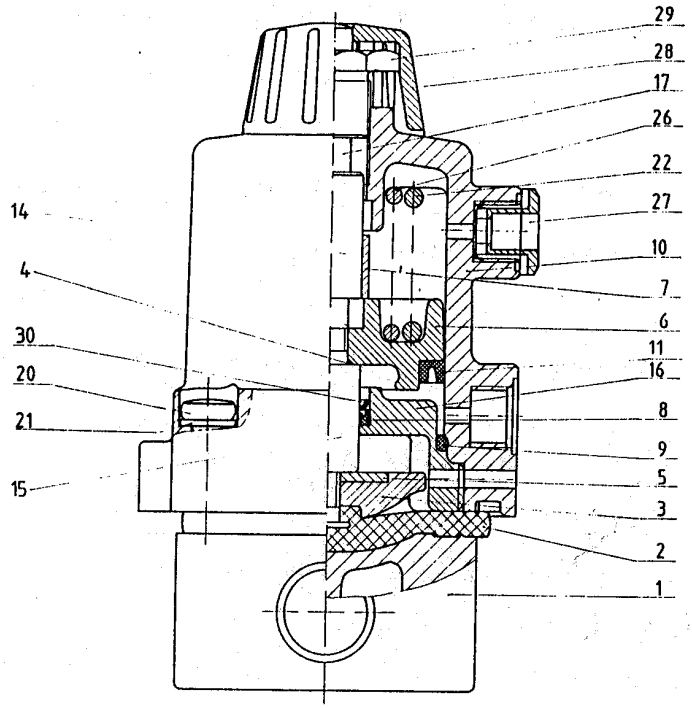
Printed in West Germany – Oha-Druck GmbH, Ingelfingen

GEMÜ®

Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000040
Quant.	: 1,000 ST	Page	: 000050/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

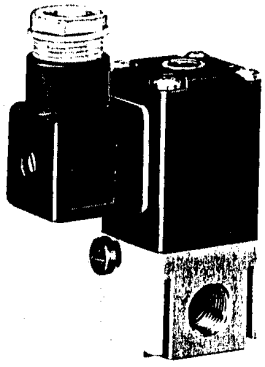
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

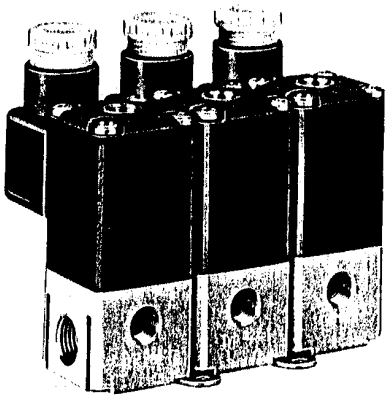
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

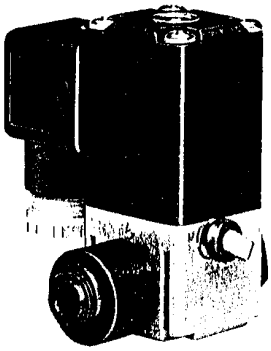
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

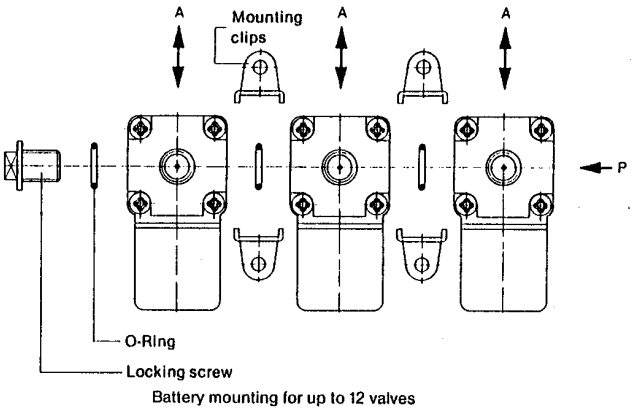


Type 322



Type 324

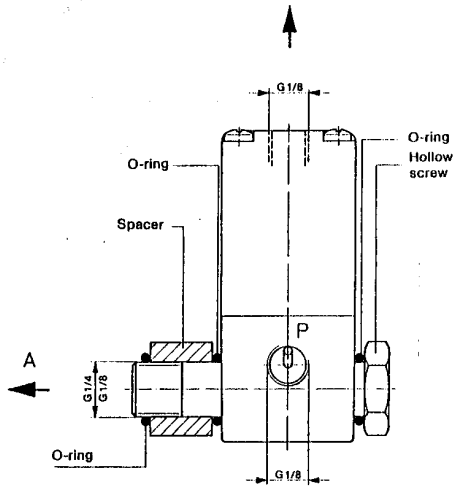
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

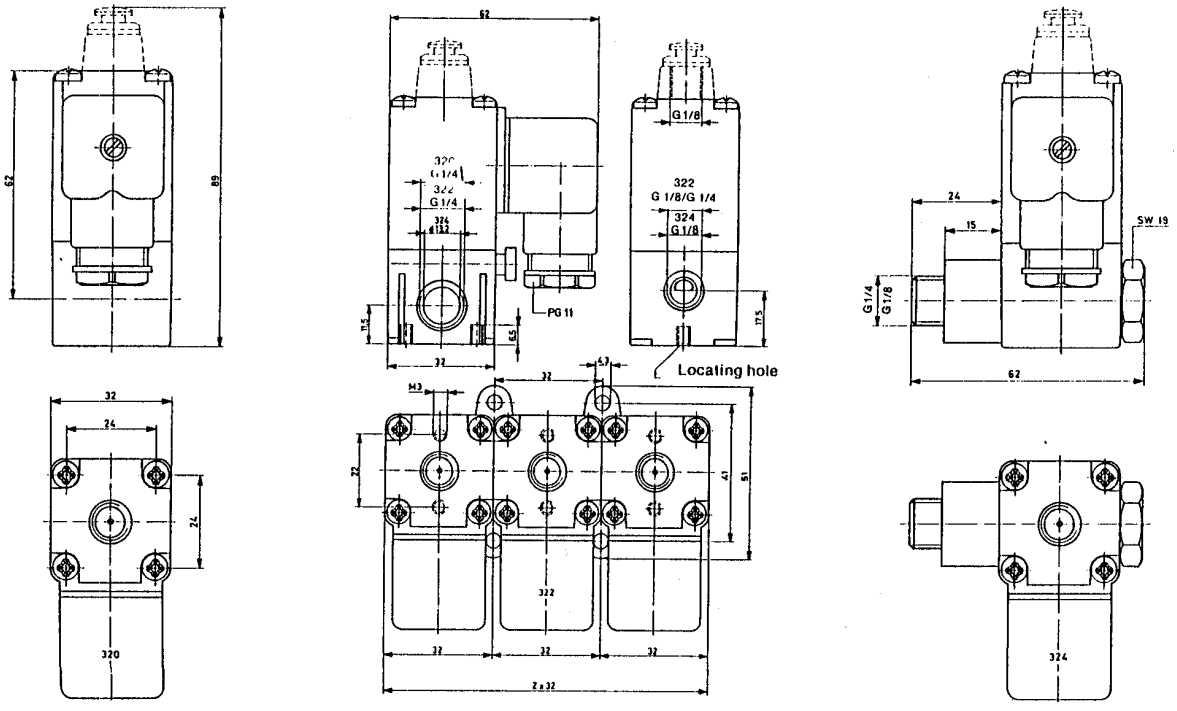
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

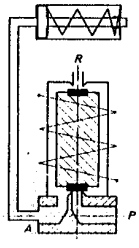
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

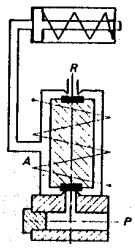
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

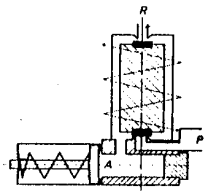
Control function normally closed



Type 320

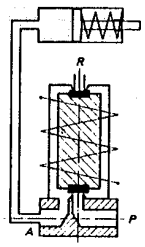


Type 322

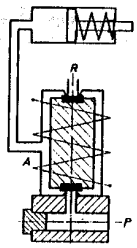


Type 324

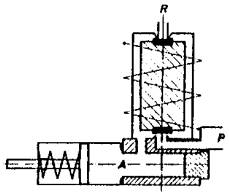
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

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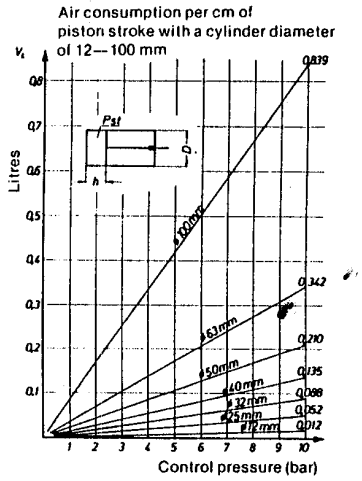
Tel. 079 40/123-0 · Telex 74126 · FAX 079 40/123-106

Presented by:

Printed in West Germany – Ohg-Druck GmbH, Ingelfingen

Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

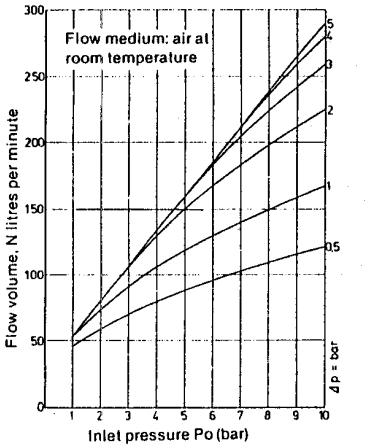
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

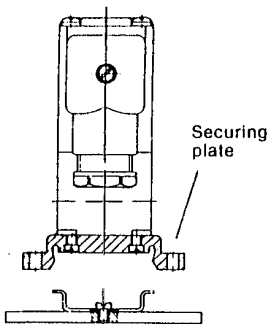
The flow quantity for other gases and temperatures can be calculated according to the following formula:

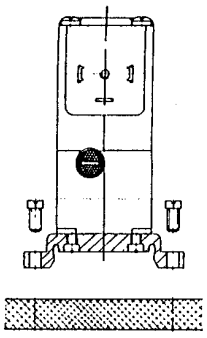
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 16.010.0018.U00L	Commiss.	: 25-05-377
Label	: BATH HEATER+RECEIVER/ 4.00kW/VA/PVC	Position	: 000040
Quant.	: 1,000 ST	Page	: 000051/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.010.0017.U00L BATH HEATER/ACCESSORIES/PVC/VA	1,000	ST	
	CE-10-00-10-01 HEATING 4KW/VA/L=1000	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.010.0017.U00L	Commiss.	: 25-05-377
Label	: BATH HEATER/ACCESSORIES/PVC/VA	Position	: 000040
Quant.	: 1,000 ST	Page	: 000052/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	CE-10-00-11-00 RECEPTACLE HEATING/PVC-DG	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: CE-10-00-11-00	Commiss.	: 25-05-377
Label	: RECEPTACLE HEATING/PVC-DG	Position	: 000040
Quant.	: 1,000 ST	Page	: 000053/01
Drawing	: CE-10-00E11-00	Date	: 10.04.2006

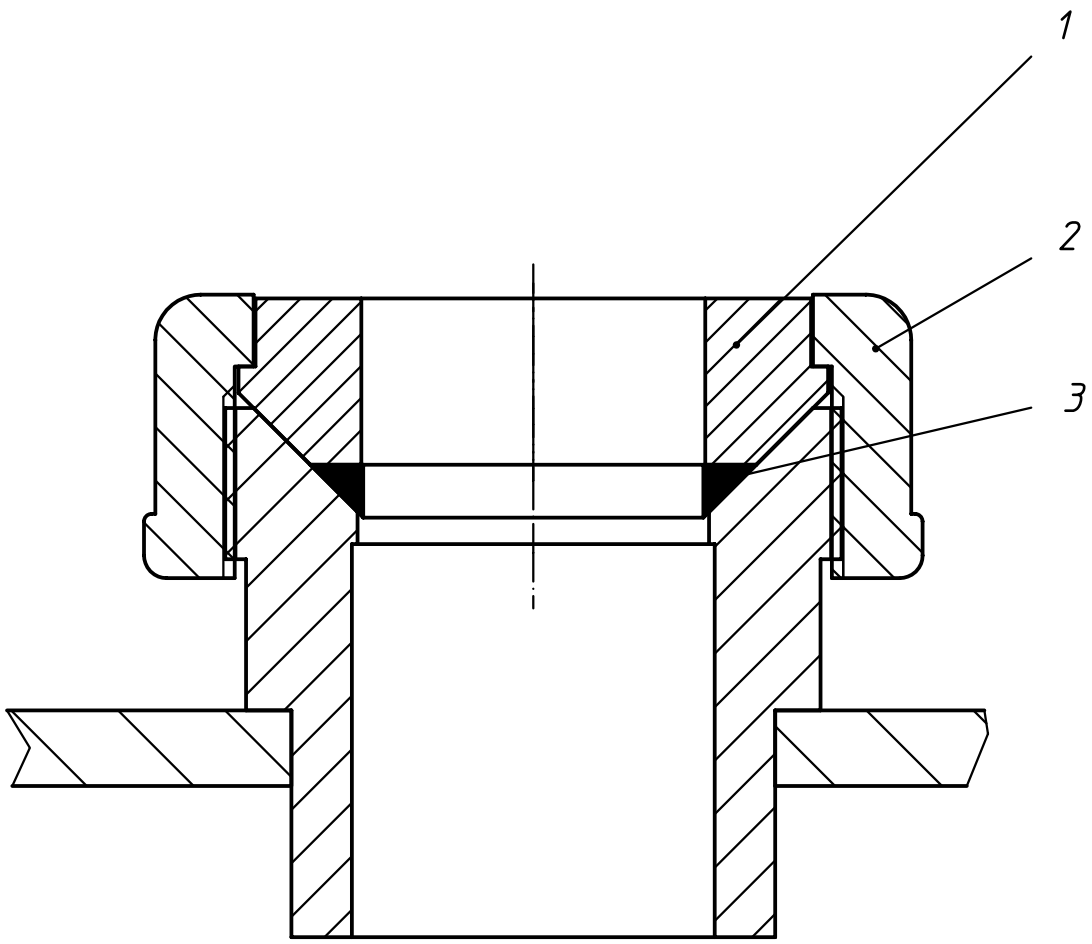
Pos.	Part N° Label	Quant.	Unit	SP
1	03.010.0002.000B INSERT/PART/PVC-DG/D=78.0/d=45.5	1,000	ST	X
2	21.69.00-63 MB-NUT/PVC-DG/NR.21.69.00 D=63	1,000	ST	X
3	DICH0576-327 O-RING/VITON/GREEN/043.82x5.33	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste AUFNAHME BADWÄRMER

Spare parts list RECEPTACLE HEATING

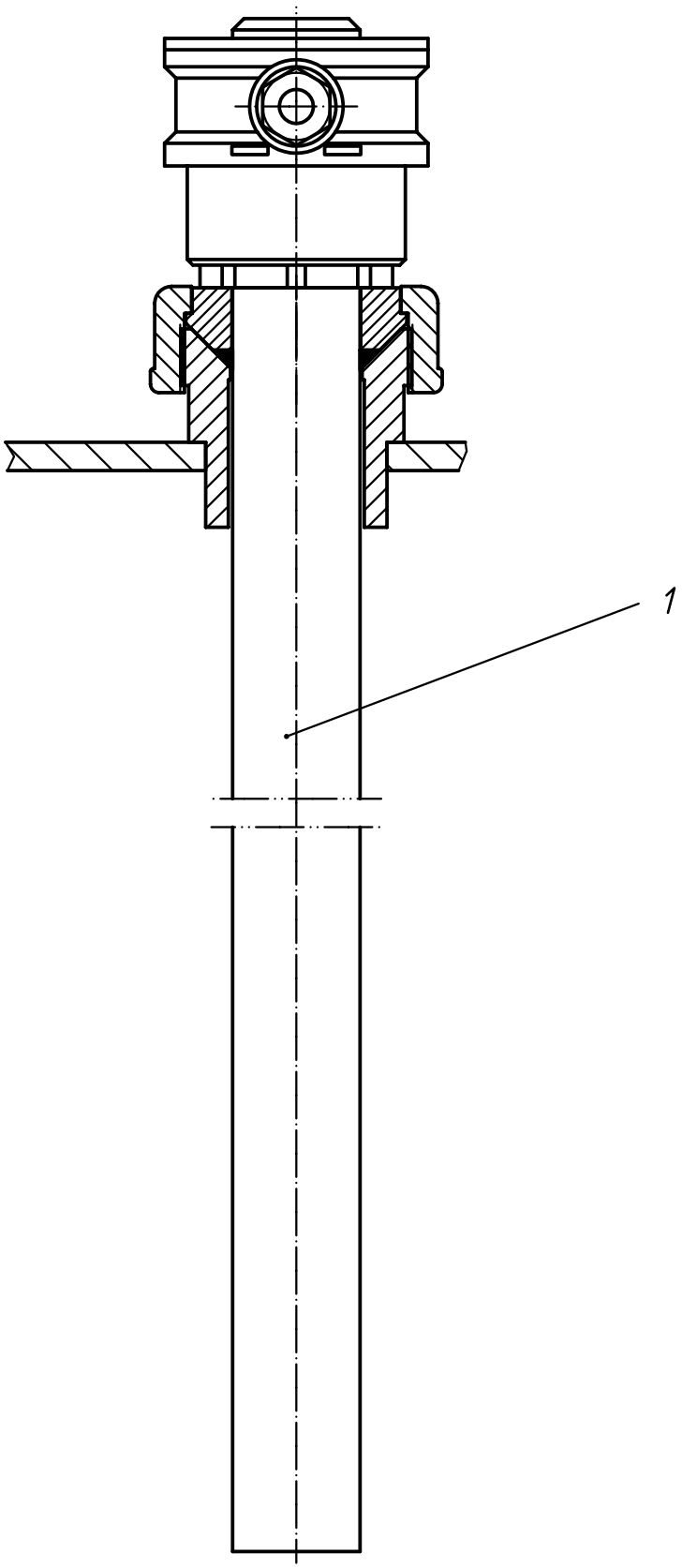
CE-10-00E11-00	11 / 01



Assembly	: CE-10-00-10-01	Commiss.	: 25-05-377
Label	: HEATING 4KW/VA/L=1000	Position	: 000040
Quant.	: 1,000 ST	Page	: 000054/01
Drawing	: CE-10-00E10-00	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	EHEI00423-004000 Heating KB1000/4.0DS400V /S-MET=875	1,000	ST	X

Parts without Pos.-N° see assembly parts list


1

Installation and operating instructions for safety immersion heaters ROTKAPPE®, and safety immersion heaters ROTKAPPE® angular design

WG 10,18,19/04.03/1

E-MBA 95

Our immersion heaters are intended exclusively for heating process liquids and exclusively for trade and industrial use.
Heaters with the type designation B-... carry the VDE inspection symbol and the VDE electromagnetic compatibility (EMC) symbol, certifying that they comply with the low-voltage regulation 73/23/EEC and the EMC regulation 89/336/EEC. The compliance with these regulations is indicated by the CE symbol on the rating plate.
In order to ensure correct operation, reliability and a long lifetime, the following must be observed:

1. Electrical Safety
The heaters may be connected only by a qualified electrician, technician or engineer!

Always check that the rated voltage of the units agrees with your supply voltage.
If the immersion heaters are connected directly to an electrical installation, contactors which disconnect all poles of the supply must be provided (phasebreak 3 mm). The units must not be connected to the power supply when persons are in contact with the liquid to be heated.
In order to ensure maximum electrical safety, a fault current (FI) circuit breaker should be provided for immersion heaters. The recommended tripping value for this circuit breaker is 30 mA, in accordance with EN 61008-1/2-1. To avoid malfunction one circuit breaker should protect a maximum of 12 heaters or a maximum of 40 kW.

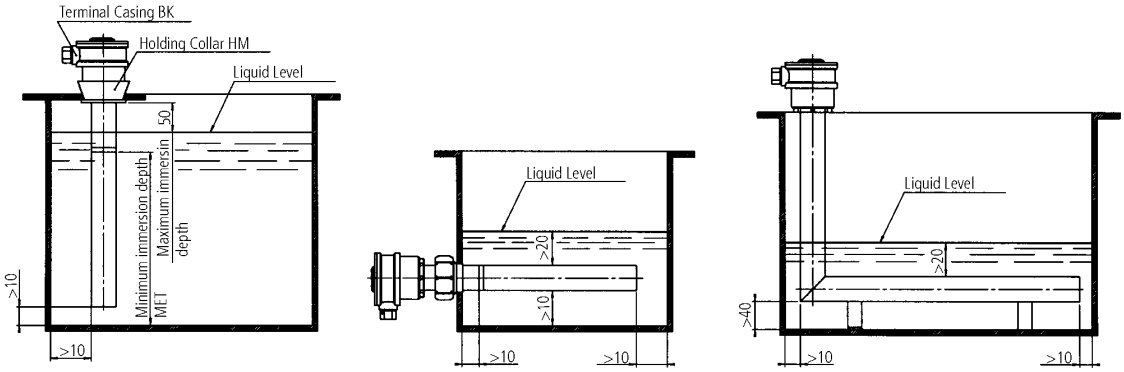
Radio interference suppression / electromagnetic compatibility
The approval in accordance with EMC Guideline 89/336/EEC covers the interference capability of the Safety Immersion Heater ROTKAPPE® Type B-... as a non-independent component. Radio interference which may result from laying the cables in a different manner during installation of the units is not covered by the test of the interference capability.
During operation under conditions other than those used for the test, interference may be increased by the different coupling conditions between the mains and load lines. The user must therefore ensure that the complete installation complies with the appropriate interference suppression guidelines. The „distributor" is responsible for any additional interference which results after installation.

2. Operating Conditions
Before installation, check that the material of the immersion tube is chemically resistant to the liquid to be heated. Avoid electrolytic effects which could damage the metallic immersion tubes, such as polarisation by an electrolytic current (see your chemical resistance list).
The terminal casing and the lead should not come into direct contact with the liquid or hot steam. Polypropylene terminal casings must be protected by the customer against attack by highly oxidising liquids (such as chromic acid).
Immersion tubes made of porcelain or glass must not be subjected to mechanical stress or shocks. The user must provide the necessary protection. In case of possible damage (e.g. fissures) the units must be removed from operation immediately.

3. Installation
The minimum immersion depth (MET) of the heater is shown by a permanent ring-shaped mark on the immersion tube. The liquid level must never drop below this mark.
The maximum immersion depth is in all cases 50 mm below the lower edge of the terminal casing.
The heated immersion tube surface must not get into contact with heat-sensitive mounting parts or the container wall (minimum distance > 10 mm).
The immersion heaters can be attached to the edge of the tank with a special support HB (accessories) or a mounting beam. A security device to prevent inadvertent removal of the heater from the bath is provided on the terminal casing and on the mounting bracket. The terminal casing of the immersion heater and the support device can be connected by the aid of a plastic insulated cord. Furthermore, mounting collar EM or holding collar HM (accessories) are available for installation of the immersion heater.

MAZURCZAK
ELEKTROWÄRME

Schlachthofstraße 3, D-91126 Schwabach, Tel: 09122/9855-0, Fax: 09122/9855-99, Internet: www.mazurczak.de, eMail: kontakt@mazurczak.de



4. Overheating Protection

The user must provide safety precautions such, as a level regulation system, to prevent dry operation of the heater (see also our range of accessories).

The regulation EN 60519/1-2 specifies that electrical heating equipment must be arranged such that there is no possibility of danger to the operator, the surroundings and the materials being heated from the temperature of the electrical heating equipment, even if the equipment is not monitored and/or is switched on inadvertently.

If dangers may result in the case of a fault, such as failure of the temperature controller, a safety device must be provided in order to limit the temperature of the equipment. This safety device must be functionally and electrically separate from the temperature controller.

The units conform to thermal safety specifications class 1 provided that safety devices such as a temperature limiter and a thermal cut-out are installed into the container.

After power has been switched off, the immersion heaters must not be removed form the liquid until their latent heat has been dissipated (which takes about 30 minutes).

Note

At a maximum permissible tube surface load of 4,5 W/cm², a sudden loss of the liquid and simultaneous disconnection of power will result in a maximum ambient temperature at a distance of 10 mm from the immersion tube of 50 °C.

5. Maintenance and Repair

Any deposits on the immersion tube should be removed at regular intervals. In no case must the deposits be allowed to block the dissipation of heat from the tube, as this will reduce the lifetime of the heater (e.g. incrustation or operation in sludge).

In case of repairs, always fit new gaskets on the terminal casing in order to maintain a good seal. In the case of exposure to extremely aggressive chemicals, we recommend that the gaskets be replaced at regular intervals.

After any repairwork, the immersion heater should be inspected by a specialist to ensure that it complies with the VDE standards.

6. Opening and Closing the Terminal Casing

The universal wrench (US) (accessory) is used to open and close the terminal casing BK and for fitting and removing heater inserts, immersion tubes and cables.

Enclosure type of the terminal casing BK: IP 65 (water-jet proof, EN 60528).

The terminal casing is not proof against immersion in liquids.

If you connect the cable yourself, ensure that the pullrelief and/or the pressure screw for the cable gland and the cover is securely tightened. (The triangular marks on the cover must coincide with those on the cable connections.)

Non-compliance with these instructions invalidates the warranty.

In case of a claim under guarantee or if any repairs are to be made, please **clean** and **neutralize** the device concerned and return it to our factory freight prepaid.

These Installation and Operating Instructions are also available in German and French.

MAZURCZAK
ELEKTROWÄRME

Schlachthofstraße 3, D-91126 Schwabach, Tel: 09122/9855-0, Fax: 09122/9855-99, Internet: www.mazurczak.de, eMail: kontakt@mazurczak.de

Assembly	: 16.010.0005.U001	Commiss.	: 25-05-377
Label	: TEMPERATURE PROBE/VA/EP/2xPt100/MAZ/L20	Position	: 000040
Quant.	: 1,000 ST	Page	: 000055/01
Drawing	: 16.010.0005EU000	Date	: 10.04.2006

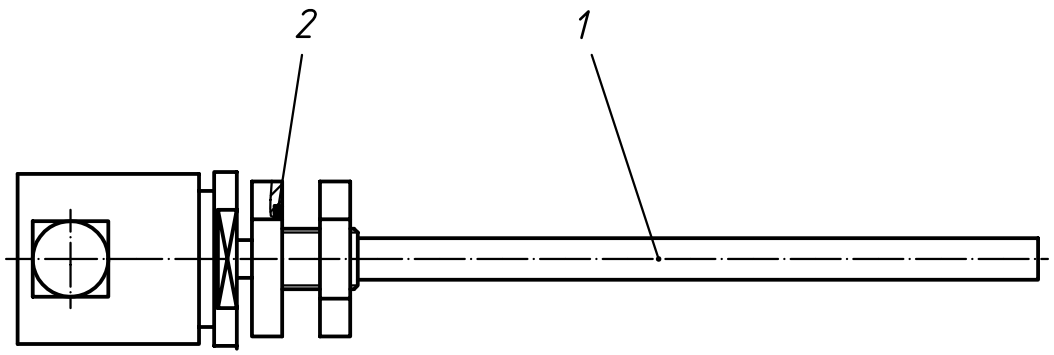
Pos.	Part N° Label	Quant.	Unit	SP
1	EB-000000224-000 TEMPERATURE PROBE/MAZ/V4A/2xPt100/L=200	1,000	ST	X
2	DICH0580-212 O-RING/EPDM/BLACK/021.82x3.53	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste TEMPERATURFÜHLER

Spare parts list TEMPERATURE PROBE

16.010.0005EU000	11
	00



Assembly	: 16.010.0006.U00A	Commiss.	: 25-05-377
Label	: LEVEL SWITCH/PVC/EPDM /ES-297	Position	: 000040
Quant.	: 2,000 ST	Page	: 000056/01
Drawing	: 16.010.0006EU000	Date	: 10.04.2006

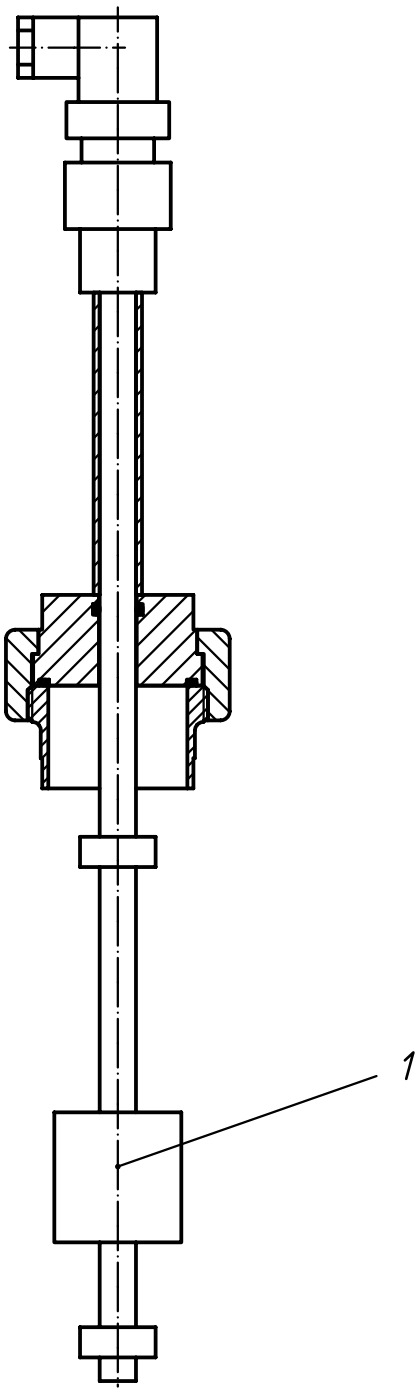
Pos.	Part N° / Label	Quant.	Unit	SP
	16.010.0002.U00A RECEIVER/S-SWITCH/PVC/EPDM	1,000	ST	
1	ES-000000297-000 FLOAT SWITCH/PP/L1=205, L2=305	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SCHWIMMERSCHALTER

Spare parts list FLOAT SWITCH

16.010.0006EU000 | 11/01



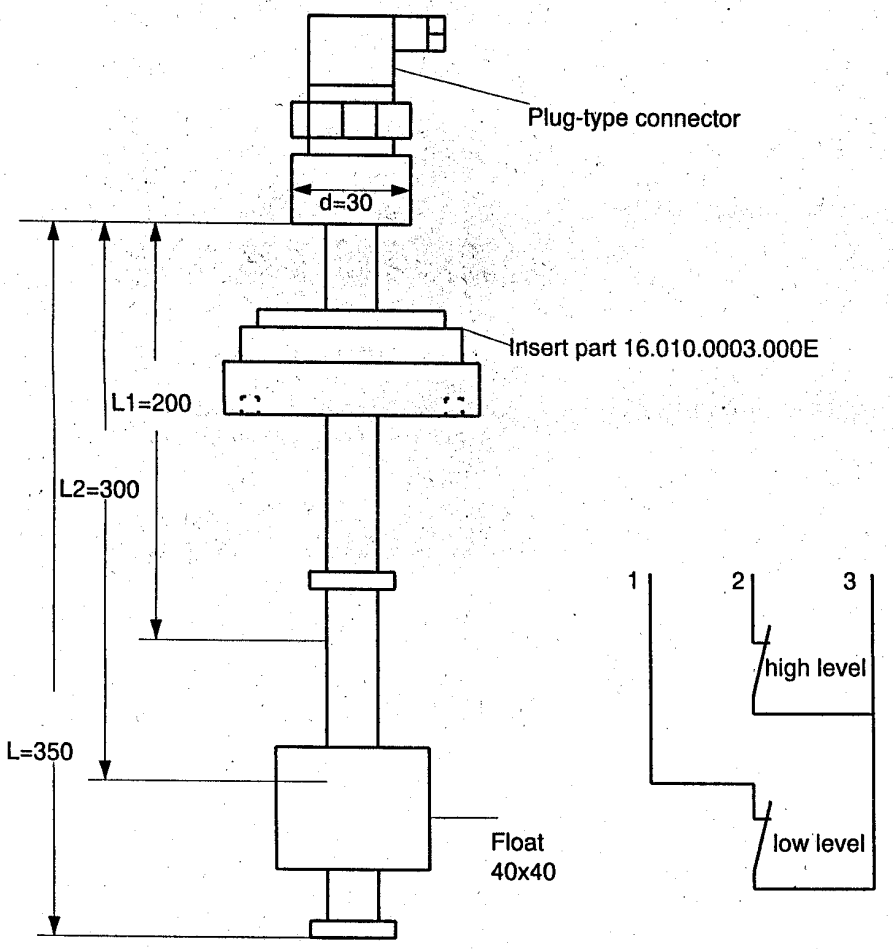
ENGLER

Steuer,Mess,-und Regeltechnik

Technical Data

Float switch Type: SSPP.2.A2.B4.205.305.RST

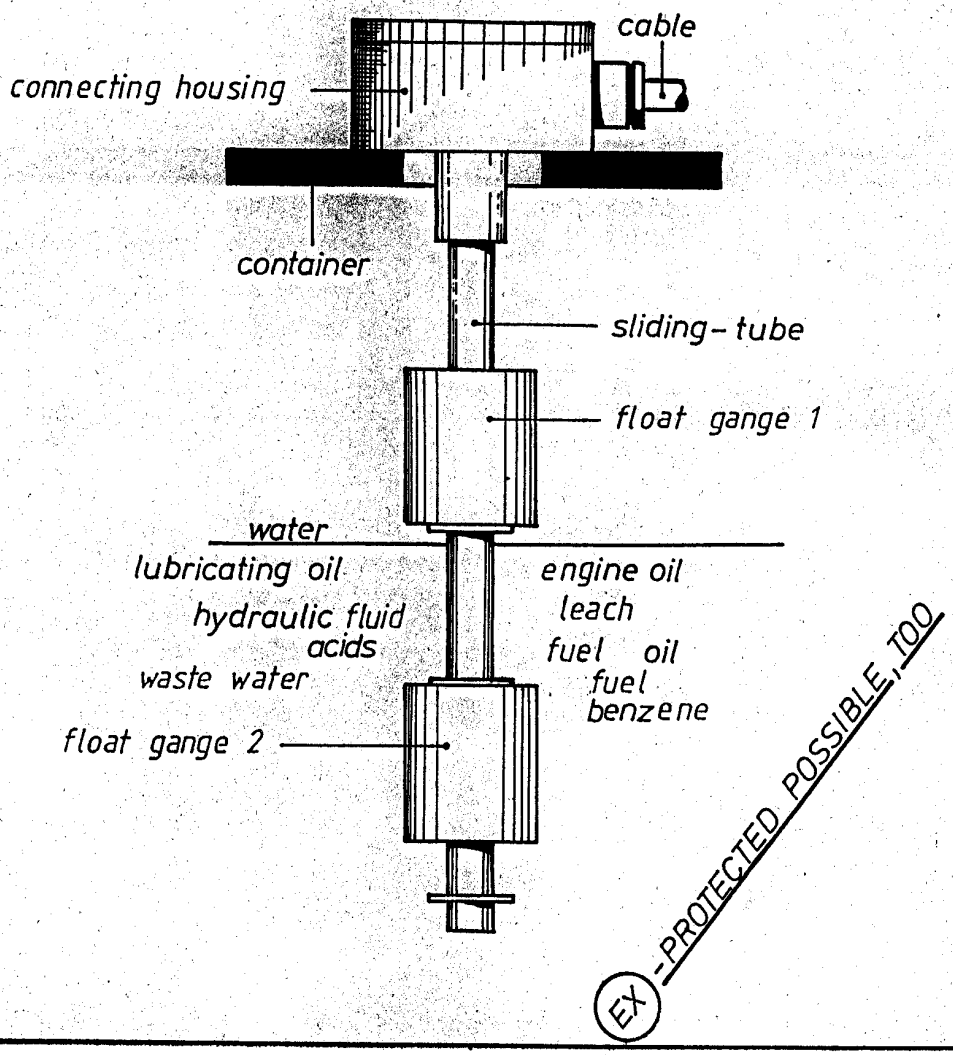
Part Nr. 1162800305 ES-000 000 297-000



Material :	PP(Polypropylen)	**Switch current:**	max. 1A
	Plug-type connector=Durethan	**Switch capacity:**	max. 60VA
Operating temperature:	max. 80°C	**Attention!**	
Allowed pressure:	athmospheric	Concerning inductive load resistence please assign protective switching!	
Protetive system:	IP 65		
Type of contact:	high level= opener going up low level = opener going down		
Switch voltage:	max. 230VAC		

ENGLER

FLOAT SWITCHES FOR FLUID MEDIUMS



7424 Heroldstatt/Sontheim
Lange Straße 151
Tel.(07389)1203

ENGLER

Specification:

Switching power max.:

normally open contact:	250 VA
normally closed contact:	250 VA
change over contact:	60 VA

Switching voltage max.:

normally open contact:	250 V
normally closed contact:	250 V
change over contact:	220 V

Switching current max.:

normally open contact:	3 A
normally closed contact:	3 A
change over contact:	1 A

Repeatable accuracy:

level-difference	5 mm

Max. contacts / switch:

4 normally open contacts
4 normally closed contacts or
3 change over contacts

Connecting housing made of:

Al-die casting (colour grey) or
Polyamid

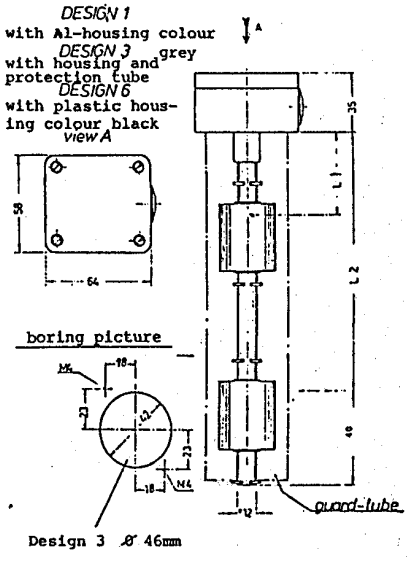
Protection:	IP 65
Cable-entry:	PG 11
cable-connection:	1,5 mm^2
operating pressure:	
operating temperature:	on request

Temperature switch:

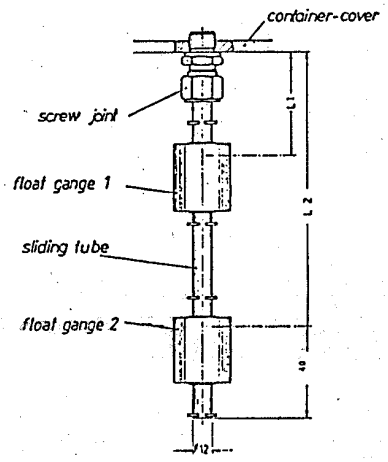
Switching voltage max: 220V
Switching current max: 2A

ENGLER

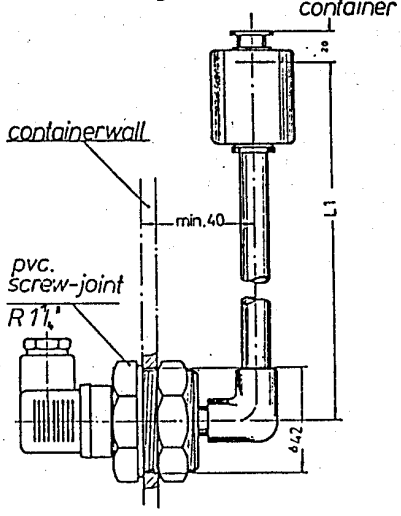
DESIGN 1
with Al-housing colour grey
DESIGN 3
with housing and protection tube
DESIGN 6
with plastic housing colour black



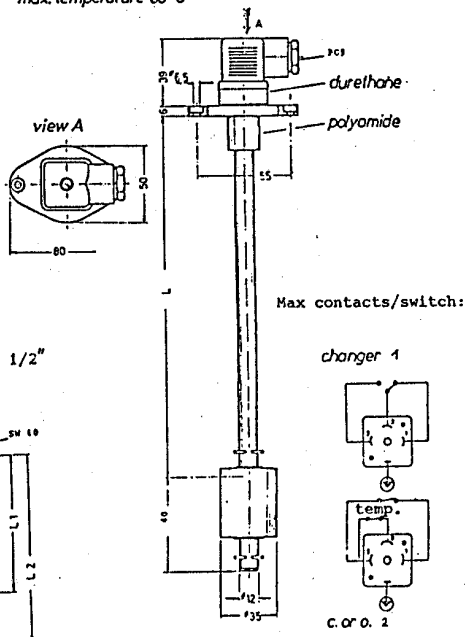
DESIGN 2
with straight pipe union standart
model:
screw coupling R3/8"
brass with 1m flex. oil filled cable



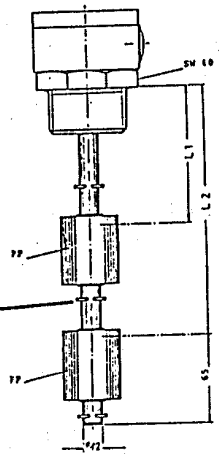
DESIGN 4
for mounting into the wall of the container



DESIGN 5
with mounting flange and coupler plug
max. temperature 80°C



DESIGN 7
with plastic-housing and
PVC-Inclosing capsule R1 1/2"



It is possible to change the forward break over point by a threated joint in the conduit box.

AENGLER

In case of emergency:
signal by float-switches.
AE-float-switches are controlling instruments, which supervise level positions and signalize breakdowns.

This is the construction and the function of the AE-float-switch:
The construction of the AE-float-switch is concepted like this, that the use is possible in a lot of industrial areas - in the chemical industry as well. The elements of the switches are reed contacts. They are felled with protective gas.
The actuating of those reed contacts effects without any touch by a magnet, which is poured in the float.
To be able to make electrical locking gear changing, every reed contact is influenced by a float gange.
By the breaking elements, which lie one upon the other it is possible to supervise different level positions with only one instrument.
The waterprooved and dust-protected connecting housing contents a connection-plan.

Assembly	: 16.010.0002.U00A	Commiss.	: 25-05-377
Label	: RECEIVER/S-SWITCH/PVC/EPDM	Position	: 000040
Quant.	: 1,000 ST	Page	: 000057/01
Drawing	: 16.010.0002EU000	Date	: 10.04.2006

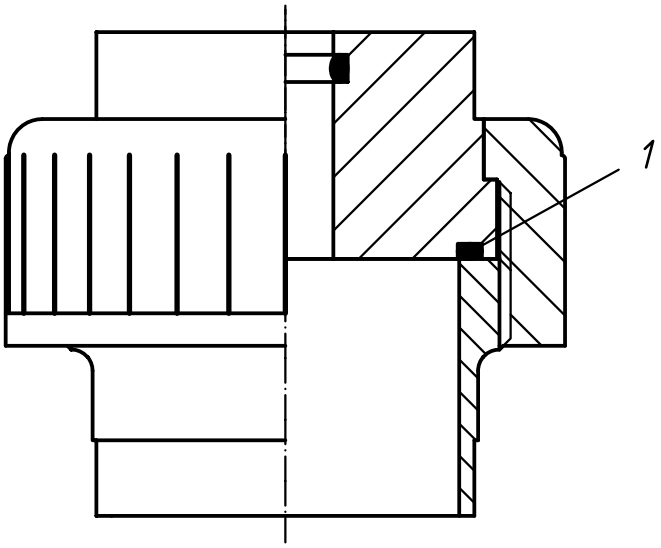
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-134 O-RING/EPDM/BLACK/047.29x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste AUFNAHME S-SCHALTER

Spare parts list RECEPTACLE FLOAD SWITCH

16.010.0002EU000	11
	00



Assembly	: 16.008.0004.U001	Commiss.	: 25-05-377
Label	: PUMP FIXING/VA/PP-G/EPDM	Position	: 000040
Quant.	: 1,000 ST	Page	: 000058/01
Drawing	: 16.008.0004EU000	Date	: 10.04.2006

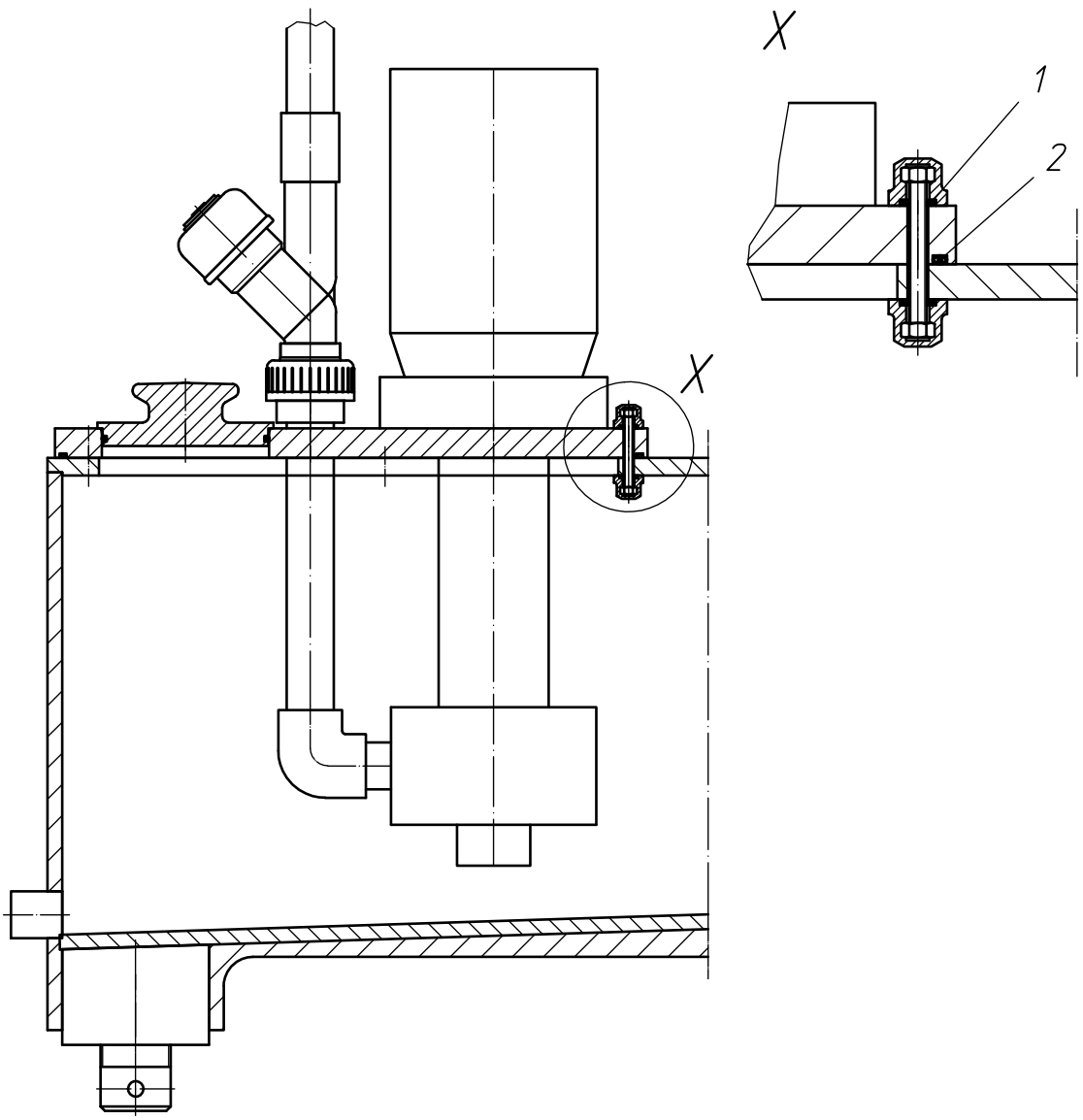
Pos.	Part N° Label	Quant.	Unit	SP
1	DI-000000076-000 O-RING/EPDM/BLACK/8.00x2.40 MM	8,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,250	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste PUMPENBEFESTIGUNG

Spare parts list PUMP FIXTURE

16.008.0004EU000	1/1
	02



Assembly	: 50.003.0006.U000	Commiss.	: 25-05-377
Label	: TA/RE/1.80kW/MF/ET=270/PUTA.04.K.000175	Position	: 000040
Quant.	: 1,000 ST	Page	: 000059/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	PUTA030300-03108 TA/PUTA.04.K.000175/RE/30/1.800kW/ET=270	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste *Tauchpumpe* *PUTA030300-03108*

Spare parts list *Immersion pump*

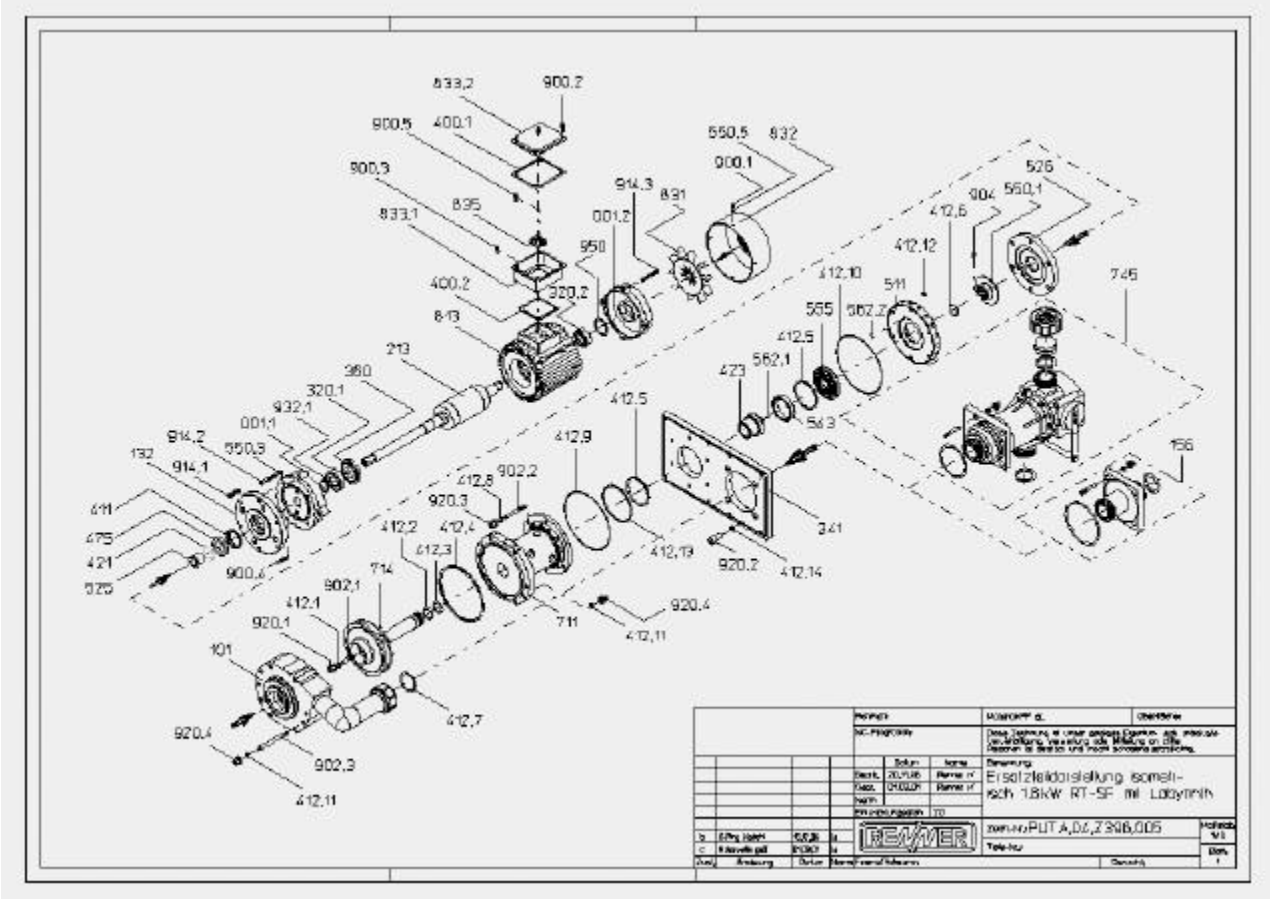
Bitte bei Bestellung angeben:
To be indicated on order:

PUTA030300-03108 *PUTA.04.K.000175*

SPARE PARTS LIST FOR VERTICAL SUBMERSIBLE CENTRIFUGAL PUMPS WITH LABYRINTH-SEAL

Combination possibilities with pressure pipe or quick change filter SF1/EU

Type: **RT-PP-24/340-1,8D/3-270 EPDM - 230/400V - 50Hz**
Built-in assembly flange: **404x220x20mm**
Art.-No.: **PUTA.04.K.000175**
Drawing-No.: **PUTA.04.Z396.005**



Attention: If the vertical submersible centrifugal pump will be combined with a filter SF1/EU one exit must be closed, otherwise the motor will be overstrained!

Pos.	Piece	Article-No.	Designation	Material
001.1	1	PUTA.00.1500.015	end plate A-side	
001.2	1	PUTA.00.1500.012	end plate B-side	
101	1	PUTA.34.0350.003	pump housing (50Hz)	PP grey
132	1	PUTA.00.1500.063	intermediate flange 1,8-4,0kW (Dietz)	Al
213	1	PUTA.00.1800.021	rotor with shaft length: 270mm (Dietz) [left-hand thread] [hexagon shaft]	titanium
320.1	1	PUTA.00.3000.020	ball bearing 6206 ZZ	
320.2	1	PUTA.00.1500.029	ball bearing 6205 ZZ	
341	1	PUTA.34.0350.001	built-in assembly flange 404x220x20	PP grey
360	1	PUTA.00.1500.026	ball bearing cover	

Pos.	Piece	Article-No.	Designation	Material
400.1	1	PUTA.00.1500.061	flat packing	
400.2	1	PUTA.00.1500.066	flat packing	
411	1	PUTA.24.0340.081	cup leather	EPDM
412.1	1	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.2	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.3	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.4	1	PUTA.30.0340.019	o-ring 165x4	EPDM
412.5	2	PUMA.24.0340.072	o-ring 80x5	EPDM
412.6	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.7	1	FISF.00.0000.150	o-ring 47x5,3	EPDM
412.8	6	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.9	1	PUTA.34.0350.010	o-ring 172x2	EPDM
412.10	1	PUTA.34.0350.010	o-ring 172x2	EPDM
412.11	18	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.12	6	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.13	1	FISF.00.0000.260	o-ring 104,37x3,53	EPDM
412.14	4	PUMA.09.0125.004	o-ring 11x2,5	EPDM
421	1	PUTA.24.0340.060	v-ring	FPM
423	1	PUTA.34.0350.040	shaft-protecting sleeve with labyrinth	oxide ceramic
475	1	PUTA.24.0340.070	ceramic ring	oxide ceramic
511	1	PUTA.24.0340.015	aeration flange	PP grey
525	1	PUTA.34.0350.014	separator special steel	1.4305
526	1	PUTA.34.0350.017	intermediate flange	PP grey
543	1	PUTA.34.0350.048	separator	PP grey
550.1	1	PUTA.34.0350.034	fan	PP black
550.3	8	PUTA.00.4000.012	spring washer A6 DIN127	galvanized
550.5	4	PUTA.00.1800.012	plastic ring (Nylite-Siegel)	
555	1	PUTA.34.0350.042	flange with labyrinth	oxide ceramic
562.1	1	PUTA.34.0350.067	parallel pin 3m6x10 DIN7	titanium
562.2	1	PUTA.24.0340.027	parallel pin 6m6x24 DIN7	titanium
711	1	PUTA.34.0350.004	stand pipe length: 270mm	PP grey
714	1	PUTA.05.B.000020	shaft sleeve with impeller 1,8kW 50Hz length: 270mm	PP grey
813	1	PUTA.00.1800.003	winding with housing 1,8kW Dietz 220-240/380-415 // 240-277/415-480V 50/60Hz	
831	1	PUTA.00.1500.011	paddle	
832	1	PUTA.00.3000.022	ventilator cowl	
833.1	1	PUTA.00.1500.016	terminal box for „Dietz“-motor	
833.2	1	PUTA.00.1500.065	terminal box cover plate	
835	1	PUTA.00.1800.004	terminal board	
900.1	4	SO00.00.0000.763	hexagon head cap screw M4x6 DIN933	titanium
900.2	4	PUTA.00.1800.007	pan head screw M4x20	
900.3	4	PUTA.00.4000.016	pan head screw M5x16 DIN84	galvanized
900.4	2	PUTA.00.1800.010	pan head screw M5x30 DIN84	galvanized
900.5	1	PUTA.00.4000.017	pan head screw M4x16 DIN84	galvanized
902.1	1	PUTA.24.0340.298	stud bolt length=39mm M8Lx14/M6Lx6,5 [left-hand thread]	titanium
902.2	6	PUTA.34.0350.022	stud bolt length=91mm M8x14/M6x8	titanium

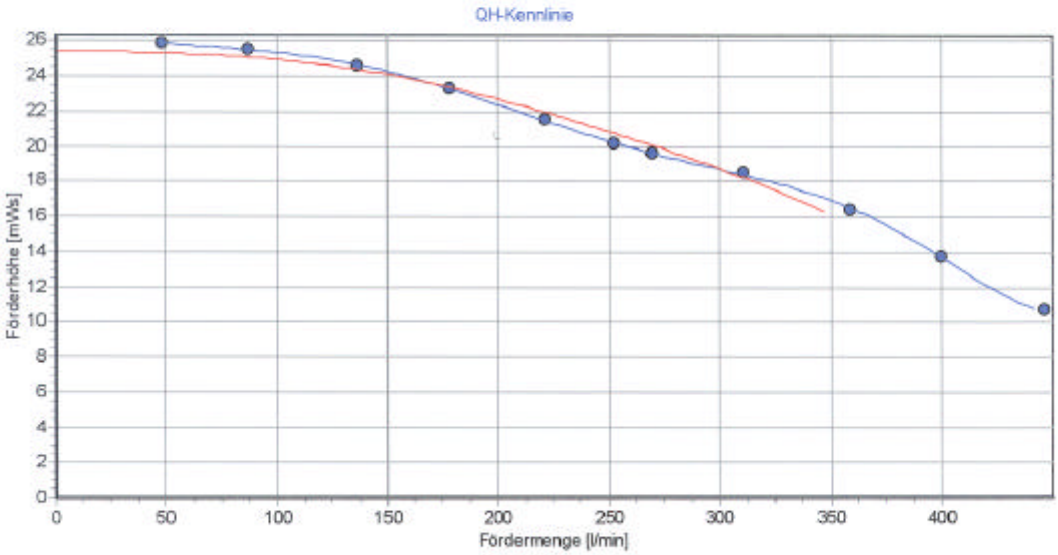
Pos.	Piece	Article-No.	Designation	Material
902.3	9	PUTA.34.0350.018	stud bolt covered with polypropylene	titanium/PP
904	1	PUMA.18.0240.002	threaded pin M6x10 DIN914	inox
914.1	4	PUMA.24.0340.061	hexagon socket screw M8x25 DIN912	inox
914.2	4	PUTA.00.1800.002	hexagon socket screw M6x45 DIN912	galvanized
914.3	4	PUTA.00.1800.005	hexagon socket screw M6x30 DIN912 (for end plate B-side)	galvanized
920.1	1	PUTA.34.0350.074	cap nut M6 [left-hand thread]	PP / titanium
920.2	4	SO00.00.0000.017	injection moulded hexagon union nut M8	PP black
920.3	6	PUTA.34.0350.027	cap nut M6	PP / titanium
920.4	18	PUTA.34.0350.028	cap nut M6	PP / titanium
932.1	1	PUTA.00.4000.011	circlip A30 x 1,5 DIN471	
950	1	PUTA.00.1800.006	compensation disk 51x42x0,5	

Supplies:

156	1	PUTA.30.0340.017	pressure pipe complete according to a separate spare parts list
745	1		filter SF1/EU according to a separate spare parts list

Einzelprotokoll

Auftrags-Nr. : 030467/005 Artikel-Nr.: PUTA.04.K.000175 Datum: 19.03.03 14:22:12



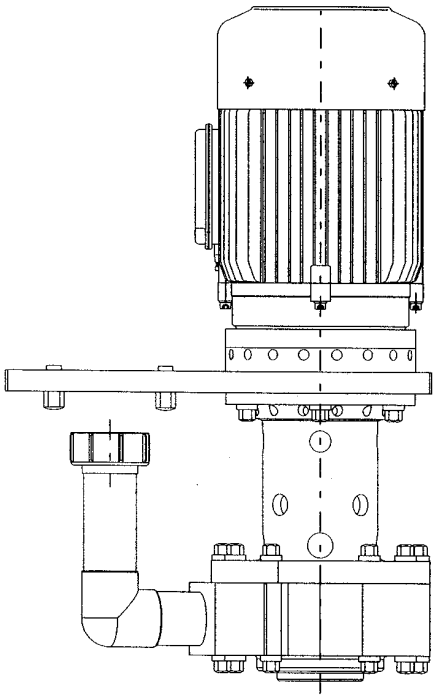
QH-Kennliniendaten Frequenz : 50 [Hz] Polzahl : 2 Nennleistung : 1800 [W]

OPERATING INSTRUCTIONS

Vertical submersible centrifugal pump group 4 (ventilated) with labyrinth-seal

Article-No.:	
Serial-No.:	
Mounting-flange:	
Type:	

The pump can be combined with a quick change filter „SF1-EU“



21-July-99
Edition 04

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75433 Maulbronn / Germany

Telephone: +49-7043-2103 or
+49-7043-8031
Fax: +49-7043-5503

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CE

EC - DECLARATION OF CONFORMITY

in mind of the EC Machinery Directive 89/392/EEC, appendix II A

We herewith confirm that the pump aggregate

Product: **Vertical centrifugal immersion pump**
Type: 0,045kW - 6,0kW

corresponds to the following EC-rules:

EC Machinery Directive	**91/368/EEC, appendix I No.1**
EC Low Voltage Directive	**73/23/EWG, 93/68/EEC (1.Amendment)**

Wolfgang Renner
Geschäftsführer

Maulbronn, den 30.12.1994 RENNER GMBH

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1 General information

The pump may only be used in the range of applications authorised by the manufacturer. In case of modified operating conditions, please consult your supplier and/or the manufacturer.

NOTE

Disassembly of the pump will cancel the right to all warranty claims provided this disassembly has been effected by an unauthorized person as specified in items 2.2 to 2.8.!

1.1 Range of applications

- electroplating baths
- etchant fluids
- alkaline fluids

WARNING

Make sure that the materials used for the pump are resistant to the fluids being delivered!

NOTE

Please ask the manufacturer for information on the chemical resistance of the materials used!

1.2 Capacity ratings

Besides the operational data of the pump, the name plate also gives its type and serial number. Please cite these data when asking for additional information, placing reorders and, in particular, ordering spare parts. For additional information, please consult your supplier or the manufacturer.

2 Safety

This operating manual gives basic instructions which are to be observed during installation, operation and maintenance of the pump. It is therefore imperative that this manual be read by the responsible personnel / operator prior to assembly and comissioning. It is always to be kept available at the installation site.

It is not only the general safety instructions contained under this main heading safety that are to be observed but also the specific information provided under the other main headings.

2.1 Identification of safety instructions in the operating manual

Safety instructions given in this manual non-compliance with which would affect safety are identified by the following symbol:

(see DIN 4844-W9)

or where electrical safety is involved with

(see DIN 4844-W8)

Instructions non-compliance with which would give rise to malfunctioning of the machinery are identified by the word

WARNING

It is imperative that signs affixed to the machine, e.g.

- arrow indicating the direction of rotation
- symbols indicating fluid connection

be observed and kept legible.

2.2 Qualification and training of operating personnel

The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified. Scope of responsibility and supervision of the personnel must be exactly defined by the plant operator. If the staff does not have the necessary knowledge, they must be trained and instructed, which may be performed by the machine manufacturer or supplier on behalf of the plant operator. Moreover, the plant operator of the operating manual are fully understood by the personnel.

2.3 Hazards in the event of non-compliance with the safety instructions

Non-compliance with the safety instructions may produce a risk to the personnel as well as to the environment and the machine and results in a loss of any right to claim damages.
For example, non-compliance may involve the following hazards:

- Failure of important functions of the machine / plant.
- Failure of specified procedures of maintenance and repair.
- Exposure of people to electrical, mechanical an chemical hazards.
- Endangering the environment owing to hazardous substances being released.

2.4 Compliance with regulations pertaining of safety at work

When operating the pump, the safety instructions contained in this manual, the relevant national accident prevention regulations and any other service and safety instructions issued by the plant operator are to be observed.

2.5 Safety instructions relevant for operation

- If hot or cold machine components involve hazards, they must be guarded against accidental contact.
- Guards for moving parts (e.g. coupling) must not be removed from the machine while in operation.
- Any leakage of hazardous (e.g. explosive, toxic, hot) fluids (e.g. from the shaft seal) must be drained away so as to prevent any risk occurring to persons or the environment. Statutory regulations are to be complied with.
- Hazards resulting from electricity are to be precluded (see, for examgple, the VDE Specifications and the bye-laws of the local power supply utilities).

2.6 Safety instructions relevant for maintenance, inspection and assembly work

It shall be the plant operator´s responsibility to ensure that all maintenance, inspection and assembly work is performed by authorized and qualified personnel who have adequately familiarized themvelves with the subject matter by studying this manual in detail.

Any work on the machine shall only be performed when it is at a standstill, it being imperative that the procedure for shutting down the machine described in this manual be followed.

Pumps and pump units which convey hazardous media must be decontaminated.

On completion of work all safety and protective facilities must be re-installed and made operative again.

Prior to restarting the machine, the instructions listed under ´Initial commissioning´ are to be observed.

2.7 Unauthorized alterations and production of spare parts

Any modifications may be made to the machine only after concultation with the manufacturer. Using spare parts and accessories authorised by the manufacturer is in the interest of safety. Use of other parts may exempt the manufacturer from any liability.

2.8 Unauthorized modes of operation

The reliability of the machine delivered will be only guaranteed if it is used in the manner intended, in accordance with clause 1 of this manual. The limit values specified in the data sheet mut under no circumstances be exceeded.

3 Transportation and storage

3.1 Transportation

The pump is delivered by the manufacturer in a ready-to-work state. In the event of damages occurring during and due to transportation, the forwarding agent must make a factual statement. The pump should always be transported appropriately and according to the state of the art.

3.2 Storage

An eventual storage place must be absolutely dry. Make sure that the interior of the pump is protected from pollutants.

4 Product features and accessories

4.1 General description

This submersible pump type RT-BG4 with labyrinth seal is a vertical centrifugal pump made of plastics and safe to run dry.

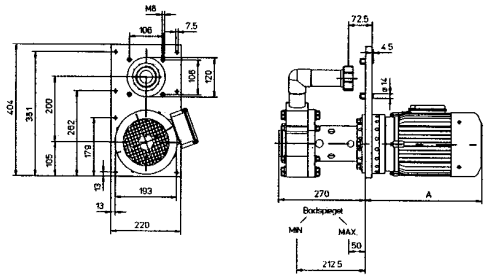
The labyrinth seal may optionally be replaced by a V-ring seal. Labyrinth seals being more resistant to wear are mainly used for pumps delivering crystallizing fluids. Make sure that the labyrinth seal is periodically cleaned. Proceed as described in chapter 7 „Maintenance".

WARNING

If the labyrinth seal is not checked and cleaned periodically, the pump may be destroyed!

4.2 Design

Since this submersible centrifugal pump is installed vertically, it is provided with an built-in assembly flange that serves to screw the pump to the container.

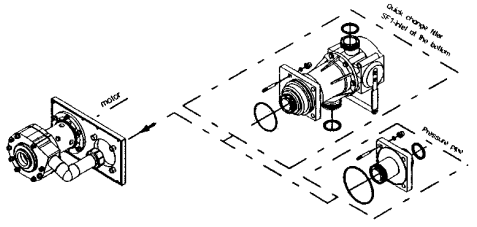


[fig. 4-1]

The suction side of the pump is provided without a male thread and the delivery side with a male thread R2 1/4".

Motor output [kW]	Dimension „A" [mm]
1,8 kW	330
3,7 kW	354,6
4,0 kW	363

This submersible pump can be combined with a quick change filter type „SF1-with the inlet at the bottom".



[fig. 4-2]

Provided that a filter is not necessary, the pressure pipe (have a look at fig. 4-2) has to be fixed at the built-in assembly flange.

Depending on the fluid to be delivered, each component of the pump is available in various materials.

NOTE

The materials used are listed on the name plate or the delivery note!

A choice of materials:

All parts which are in contact with the fluid	PP, PVDF, oxide ceramic, titanium
Packings	FPM, EPDM

4.3 Accessories

Screwed connections, extension tubes, pressure pipes and other components are available on request.

5 Mounting and installation

The pump should be installed at a place allowing easy access at all times. Normally, the ambient temperature should not exceed the following limits:

max. 40°C

NOTE

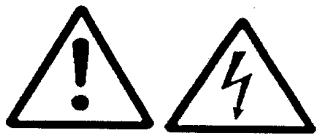
In case of higher ambient temperatures, please consult your supplier!

- Vertically install the pump in a container or a pit and screw it with the flange. Make sure that no tension, if any, is transmitted to the pump.
- Make sure that the suction side of the pump is always free. It must not touch the ground of the container.

WARNING

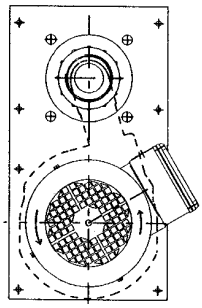
Do not pass neither the maximum nor the minimum level of the bath!

5.1 Electrical connection



All electrical connections to the pump may only be performed by experts!

- The direction of rotation indicated by an arrow on the pump must be respected and controlled after installation.
  (fig. 5-1: looking on the motor)



[fig. 5-1]

- The motor must be equipped with a motor protection switch and a temperature sensor.

NOTE

Motor protection devices can be delivered by the manufacturer!

- The power supply must have been cut for at least 5 minutes before you may start any work at the terminal box of the pump.
- Make sure that the data given on the name plate correspond to the existing power supply.

- All electrical connections and installations of additional protection devices should be performed by an expert in accordance with the instructions of the local power suppliers and/or the Association of German Electrotechnical Engineers VDE.

6 Starting and shutdown procedures

6.1 Preparations for starting

- Fix the pressure pipe R2 1/4" respectively the quick change filter at the built-in assembly flange.
- Install the pump into the container provided for it.
- Connect the pressure line.
- Do the electrical connection.
- Tighten all connecting screws.

WARNING

Observe the minimum level but do not exceed the permitted maximum level!

6.2 Starting procedure

- Switch on the motor
- Adjust the operating point by slowly closing the shut-off device of the delivery line. If there is no shut-off device installed, the operating point will be adjusted automatically in accordance with the pump curve.

6.3 Shutdown procedure

- Switch off the motor.
- Close all shut-off devices.
- In case some fluid remains within the pump, secure the shut-off devices to prevent an accidental opening.

7 Maintenance

7.1 General information

The pump is designed for continuous operation and is therefore maintenance-free.

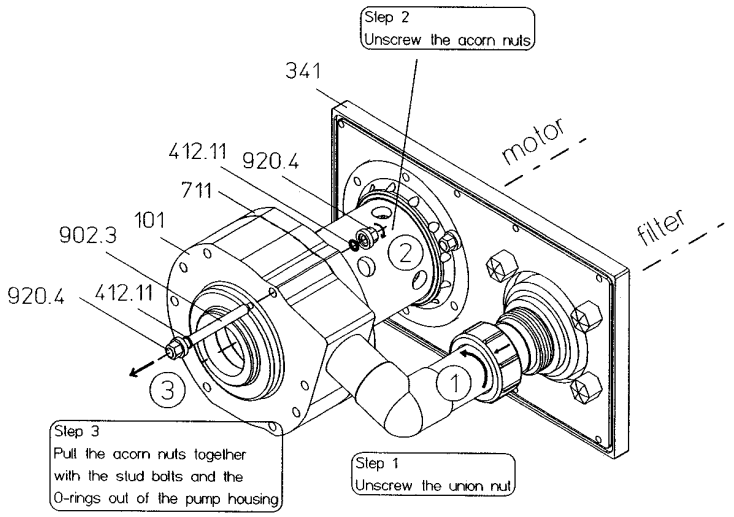
7.2 Preventive maintenance

- Clean the ventilator cowl at least once per month in order to prevent the motor from overheating.
- Periodically clean the labyrinth seal (i.e. after about 2.500 operating hours). When operated with crystallizing fluids, it should be cleaned more often.
- When servicing the pump, also check the (V-ring and O-ring) seals and replace them, if necessary.

WARNING

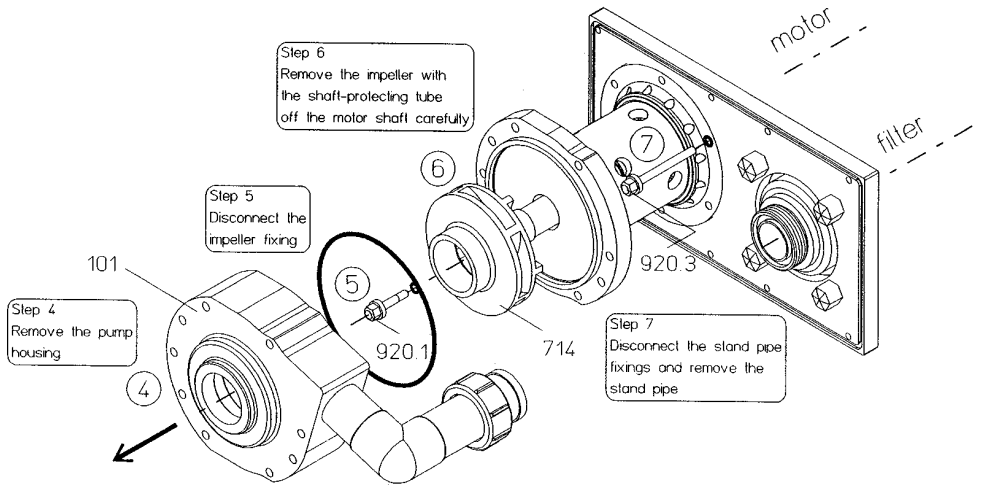
If the labyrinth seal is not checked and cleaned periodically, the pump may be destroyed!

Disassembly of the submersible centrifugal pump:



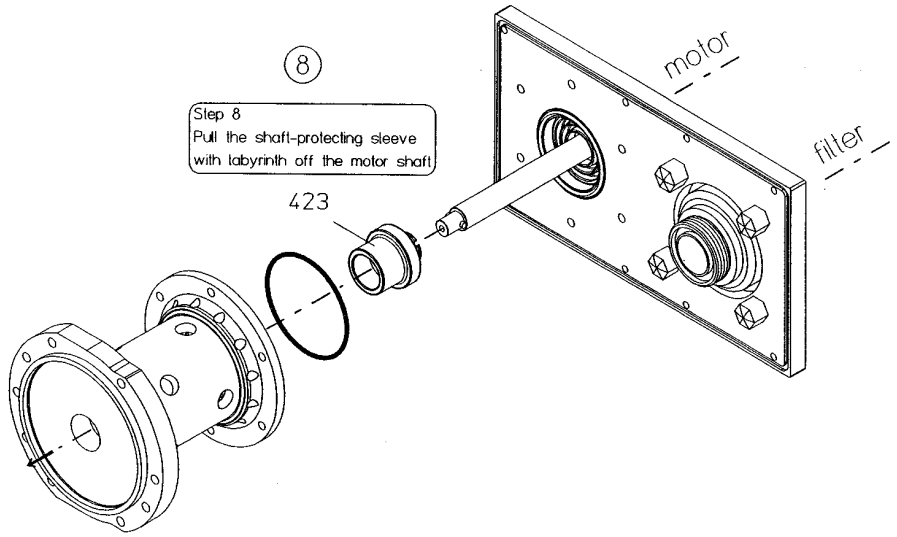
[fig. 7-1]

1. Remove the union nut on the suction tube (step 1)
2. Unscrew the 9 acorn nuts (pos 920.4) on the pump housing
3. Pull the 9 acorn nuts (pos 920.4) together with the stud bolts and the O-rings out of the pump housing (pos 101).



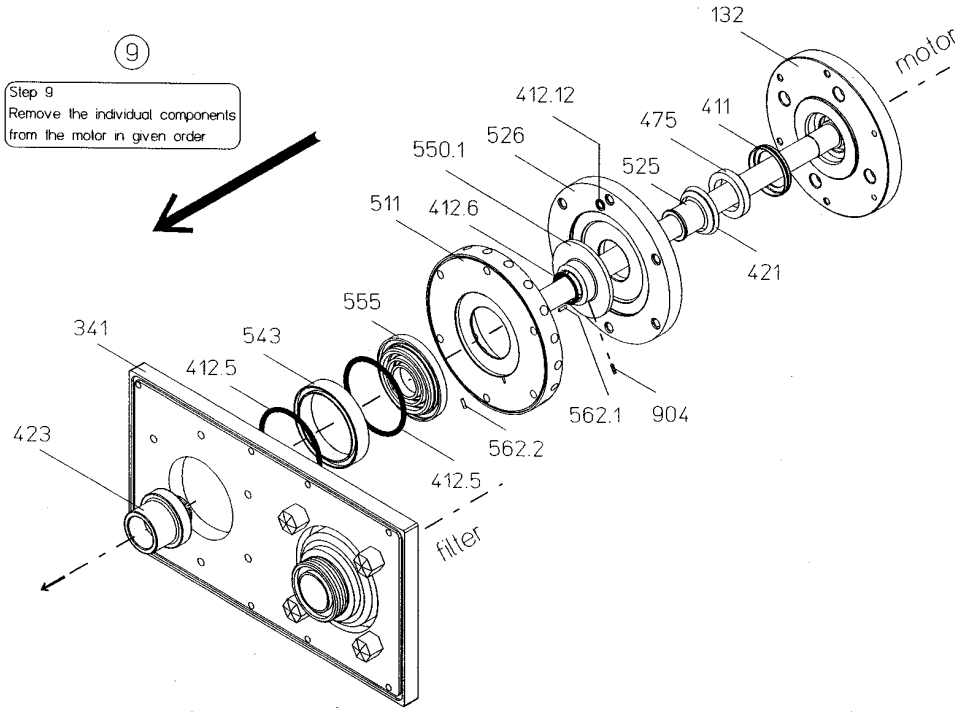
[fig. 7-2]

4. Remove the pump housing (pos 101).
5. Disconnect the impeller fixings (pos 920.1 acorn nut with stud bolt)
6. Use two tire levers to carefully remove the impeller and the shaft-protecting tube (pos 714).
7. Disconnect the stand pipe fixings (pos 920.3 acorn nut with stud bolt) and remove the stand pipe (pos 714).



[fig. 7-3]

8. Pull the shaft-protecting sleeve with the labyrinth seal (pos 525.2) off the motor shaft.



[fig. 7-4]

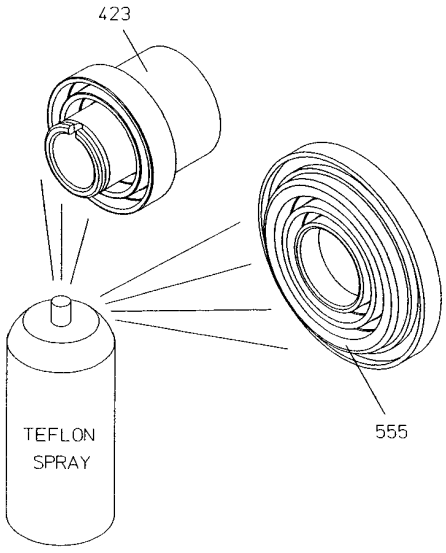
9. Remove the individual components from the motor in given order (fig. 7-4).

Cleaning the pump components:

1. Manually clean all pump elements (especially stand pipe [pos 711], pump housing [pos 101], flange with labyrinth [pos 555] and shaft-protecting sleeve with labyrinth [pos 423]) with appropriate mechanical means (i.e. brush, screwdriver, water etc.) and remove all crystal deposits.
2. Check all (O-ring and V-ring) seals and replace the entire sealing set, if necessary.

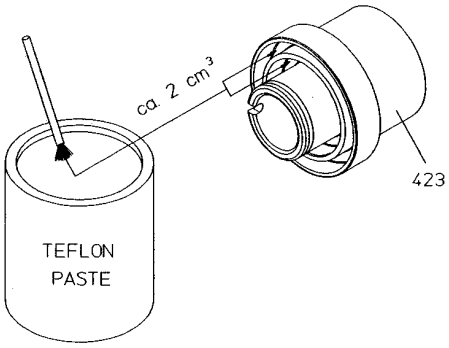
Assembly of the submersible centrifugal pump:

1. Spray the labyrinth seal (pos. 423 **and** 555) with Teflon spray [fig. 7-5].



[fig. 7-5]

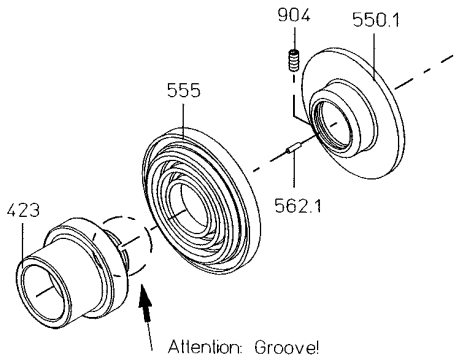
2. Fill the shaft-protecting sleeve (pos. 423) with about 2 cm³ of Teflon paste [fig. 7-6].



[fig. 7-6]

WARNING

Do not use in any case grease and/or greasy Teflon paste!



[fig. 7-7]

3. Rotate the shaft-protecting sleeve with labyrinth (pos. 423) on the shaft as far as its groove snap into the parallel pin (pos. 562.1) of the fan (pos. 550.1). Only then it´s allowed to press the shaft-protecting sleeve (pos. 423) into the fan (pos. 550.1).

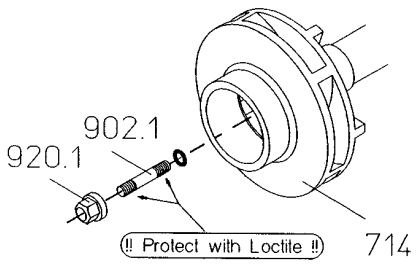
WARNING

Non-observance of this assembly-instruction can cause a break of the shaft-protecting sleeve (pos. 423)!

4. To assemble the pump, proceed in reverse order (fig. 7-1 to 7-4).

WARNING

Protect the thread of the stud bolt (pos. 902.1) and the acorn nut (pos. 920.1) - for fixing the impeller (pos. 714) - with „Loctite" or similar adhesives.



[fig. 7-8]

Cleaning the pump before a longer period of rest:

- If the pump will not be in operation for a longer period of time (especially without fluid), it should be cleaned carefully. Otherwise you risk that residues remaining in the pump may harden and damage the pump, once it is started again.

Doing repair work:

- Any other repair than the replacement of worn parts should be done by an expert, since inappropriate maintenance work usually results in unnecessary costs.

8 Troubleshooting

Malfunction	Causes	Corrective action
Pump does not work when switched on	No voltage	Test the voltage
	Impurities in the pump housing	Remove the impurities
Motor is overheating	Clogged ventilator cowl	Clean the ventilator and the cowl
Pump is working, but not delivering	Gas accumulation in the lines	Evacuate the system
Delivery rate too low	Air in the system	Evacuate the system
	Delivery line cross-section is too small (significant losses)	Increase the delivery line cross-section
	Valve is not entirely open	Entirely open the valve
Delivery rate too high	Pump losses are less significant than presumed	Install a flow control valve in the delivery line

9 Parts illustration; spare parts list

Drawing-No.: _____

Art.-No.: _____

Assembly	: 16.004.0126.U22L	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/22/PVC/VA/KL-KU/d=27	Position	: 000040
Quant.	: 1,000 ST	Page	: 000060/01
Drawing	: 16.004.0126EU000	Date	: 10.04.2006

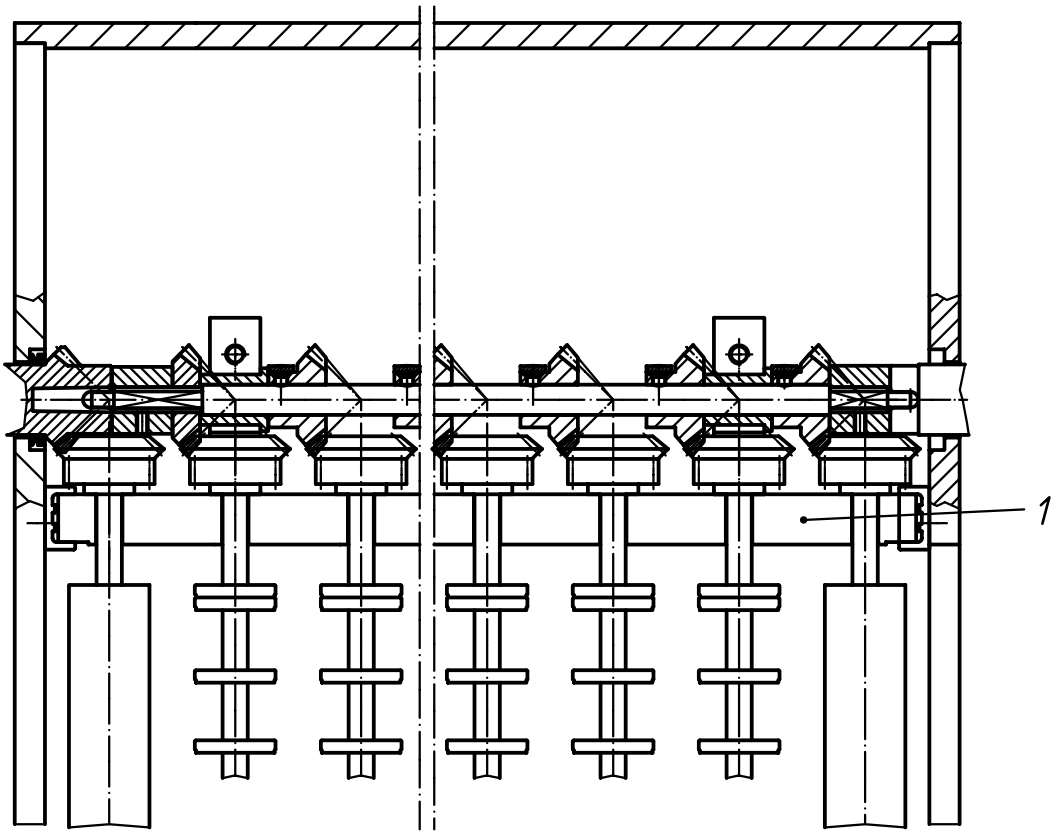
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0124.U22L DRIVE SHAFT/CPL./022/VA	1,000	ST	
1	16.004.0002.022V SUPPORT/GUR-N/SS/22/d=10/T=50	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0126EU000	11
	00



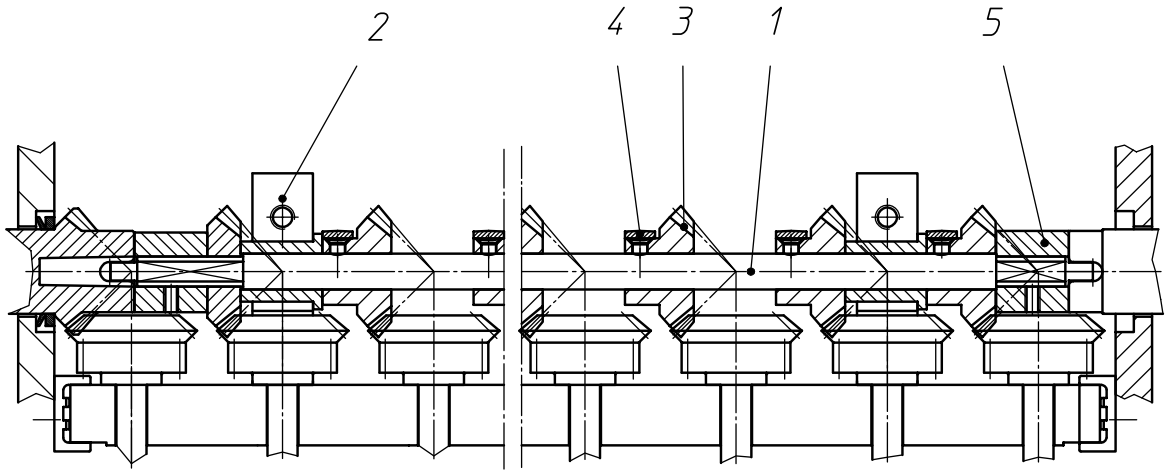
Assembly	: 16.004.0124.U22L	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./022/VA	Position	: 000040
Quant.	: 1,000 ST	Page	: 000061/01
Drawing	: 16.004.0124EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0331.0222 DRIVE SHAFT/V4A/022/KL-KU/D=27	1,000	ST	X
2	16.004.0007.U00L SEATING/CPL./PVC /VA	3,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	10,000	ST	X
4	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	10,000	ST	X
5	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X

Ersatzteilliste ANTRIEBSWELLE

Spare parts list Drive shaft

16.004.0124EU000	11
	00



Assembly	: 16.004.0007.U00L	Commiss.	: 25-05-377
Label	: SEATING/CPL./PVC /VA	Position	: 000040
Quant.	: 3,000 ST	Page	: 000062/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

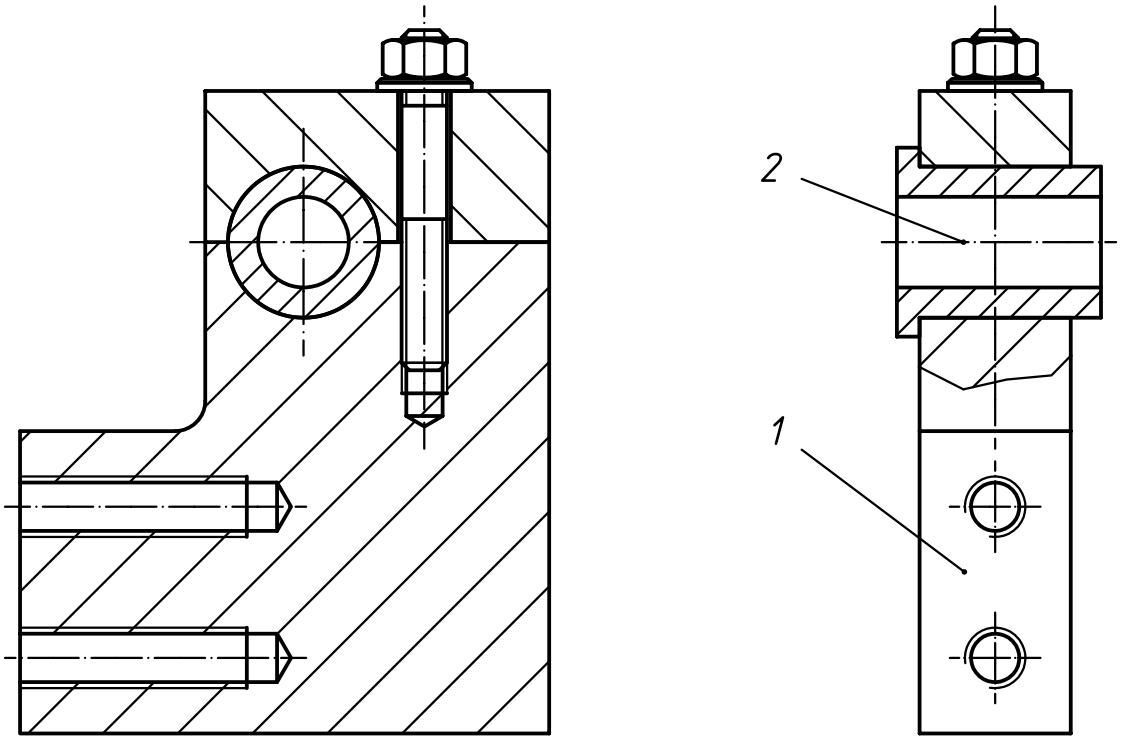
Pos.	Part N° Label	Quant.	Unit	SP
1	03.004.0005.0002 SEATING/PVC-HG/V4A	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: VS-25-05-377-02	Commiss.	: 25-05-377
Label	: CONVEYOR/ WMT 2/650/PVC/VA	Position	: 000040
Quant.	: 1,000 ST	Page	: 000063/01
Drawing	: VS-25-05-377-02	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0987.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	3,000	ST	X
2	16.004.0988.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	2,000	ST	X
3	16.004.1294.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	1,000	ST	X
4	16.004.1713.2571 SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	3,000	ST	X
5	16.004.1241.2571 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	3,000	ST	X
6	16.004.0838.2571 Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/FE	1,000	ST	X
7	16.004.1244.2571 Shaft/KPL/32/O /K/ /FJ/V2A	1,000	ST	X
8	16.004.1243.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
9	16.004.1245.2571 Shaft/KPL/O /L/AH/FJ/V2A	1,000	ST	X
10	16.004.1247.2571 Shaft/CPL/32/U /L/ /FJ/V2A	2,000	ST	X
11	16.004.0841.2571 Shaft/KPL/32/O+U/K/B/FK/GREEN/V2A	1,000	ST	X
12	16.004.1250.2571 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
13	16.004.1249.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
14	16.004.1251.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	2,000	ST	X
15	16.004.1252.2571 Shaft/CPL/32/U /L/ /FJ/V2A	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: VS-25-05-377-02	Commiss.	: 25-05-377
Label	: CONVEYOR/ WMT 2/650/PVC/VA	Position	: 000040
Quant.	: 1,000 ST	Page	: 000063/02
Drawing	: VS-25-05-377-02	Date	: 10.04.2006

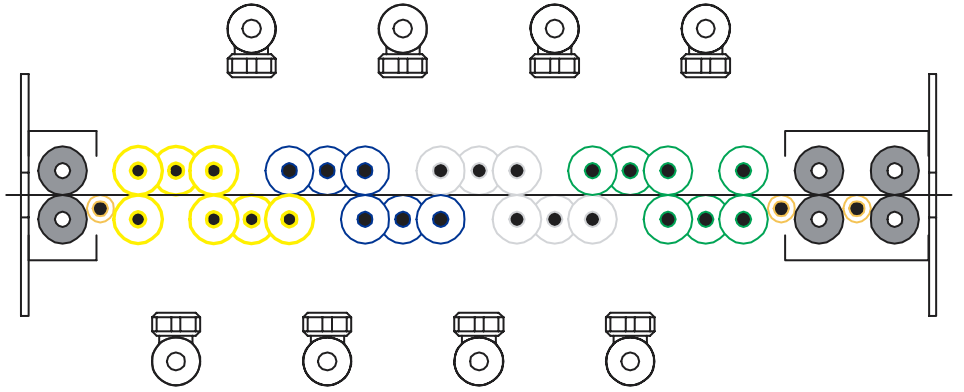
Pos.	Part N° / Label	Quant.	Unit	SP
16	16.004.0843.2571 Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/FE	1,000	ST	X
17	16.004.1255.2571 Shaft/KPL/32/O/L/AV/FJ/V2A	1,000	ST	X
18	16.004.1254.2571 Shaft/KPL/32/O/ /L/AV/FJ/V2A	1,000	ST	X
19	16.004.1256.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	1,000	ST	X
20	16.004.1257.2571 Shaft/CPL/32/U /L/ /FJ/V2A	2,000	ST	X
21	16.004.0846.2571 Shaft/10/12/32/T25/650/V2A /PP/U/K/B/FE	1,000	ST	X
22	16.004.1260.2571 Shaft/KPL/32/O /K/ /FJ/V2A	1,000	ST	X
23	16.004.1259.2571 Shaft/1KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
24	16.004.1261.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	1,000	ST	X
	16.004.0559.U002 GEAR WHEEL/Z=11/M2/VA/PP /=0162	4,000	ST	
	16.004.0393.U800 BELT DRIVE/SHAFT/O/SPRAY/FJ	4,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	3,000	ST	

Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-02	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/VA
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	WMT2	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
up	16.004.0988.2582		16.004.1245.2571	16.004.1244.2571	16.004.1243.2571		16.004.1256.2571	16.004.1255.2571	16.004.1254.2571		16.004.1261.2571	16.004.1260.2571	16.004.1259.2571		16.004.1251.2571	16.004.1250.2571	16.004.1249.2571		16.004.1251.2571		16.004.0988.2582		16.004.1294.2582	up
down	16.004.0987.2582	16.004.1713.2571	16.004.1241.2571		16.004.1241.2571	16.004.0838.2571	16.004.1241.2571		16.004.1252.2571	16.004.0843.2571	16.004.1252.2571		16.004.1257.2571	16.004.0846.2571	16.004.1257.2571		16.004.1247.2571	16.004.0841.2571	16.004.1247.2571	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.0987.2582	down

Assembly	: 16.004.0987.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	Position	: 000040
Quant.	: 3,000 ST	Page	: 000064/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

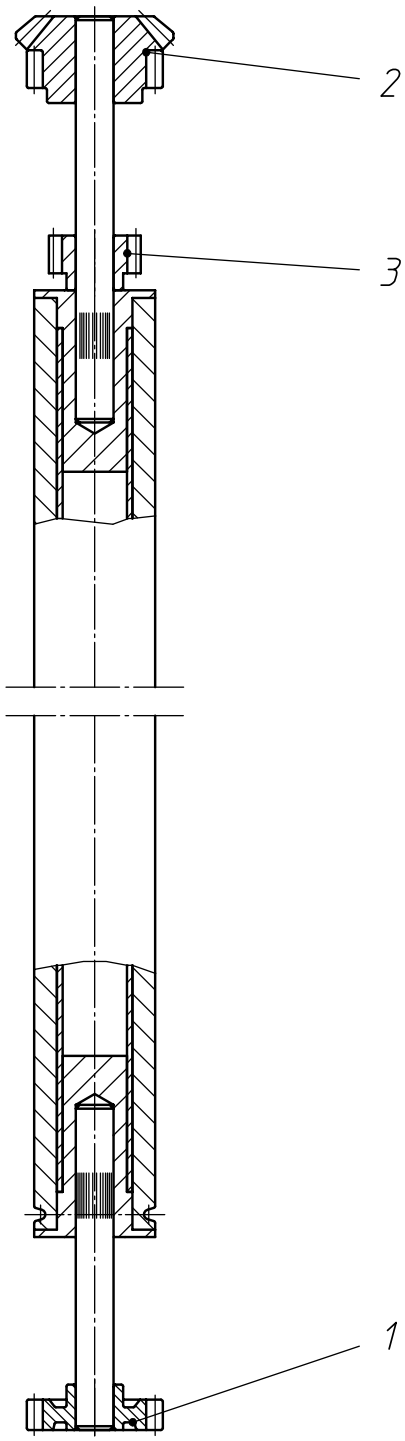
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	Position	: 000040
Quant.	: 2,000 ST	Page	: 000065/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

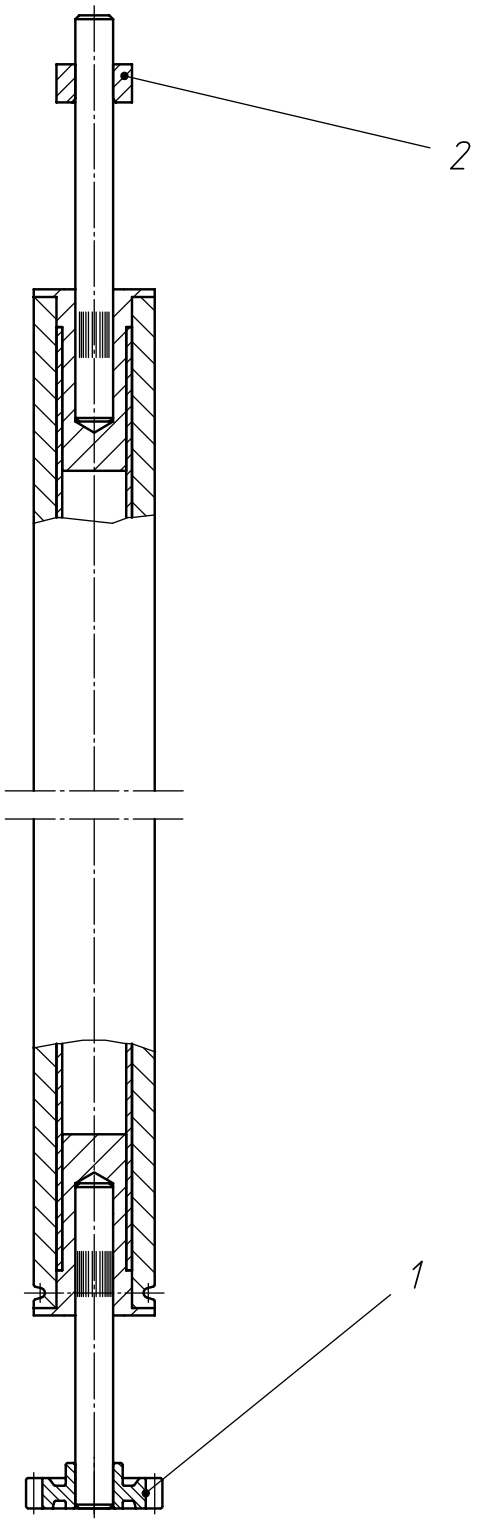
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	Position	: 000040
Quant.	: 1,000 ST	Page	: 000066/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

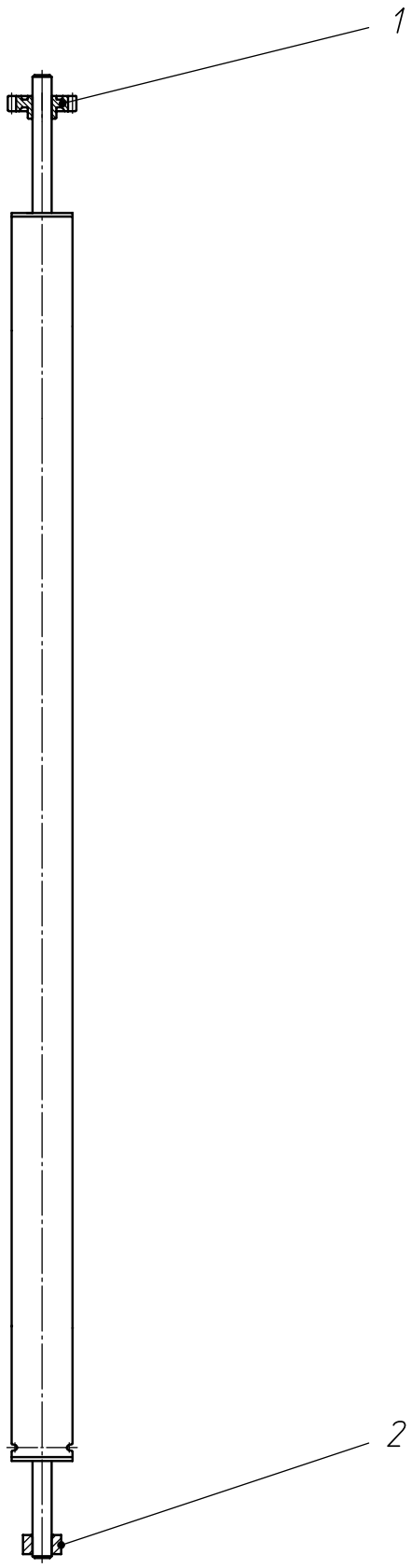
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



Assembly	: 16.004.1713.2571	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	Position	: 000040
Quant.	: 3,000 ST	Page	: 000067/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

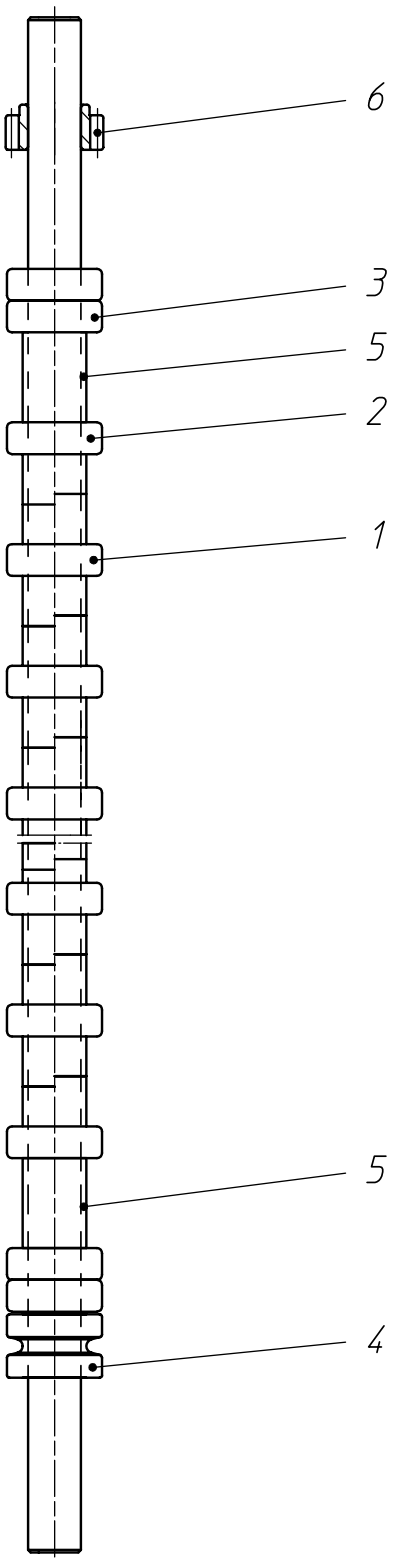
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000040
Quant.	: 3,000 ST	Page	: 000068/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

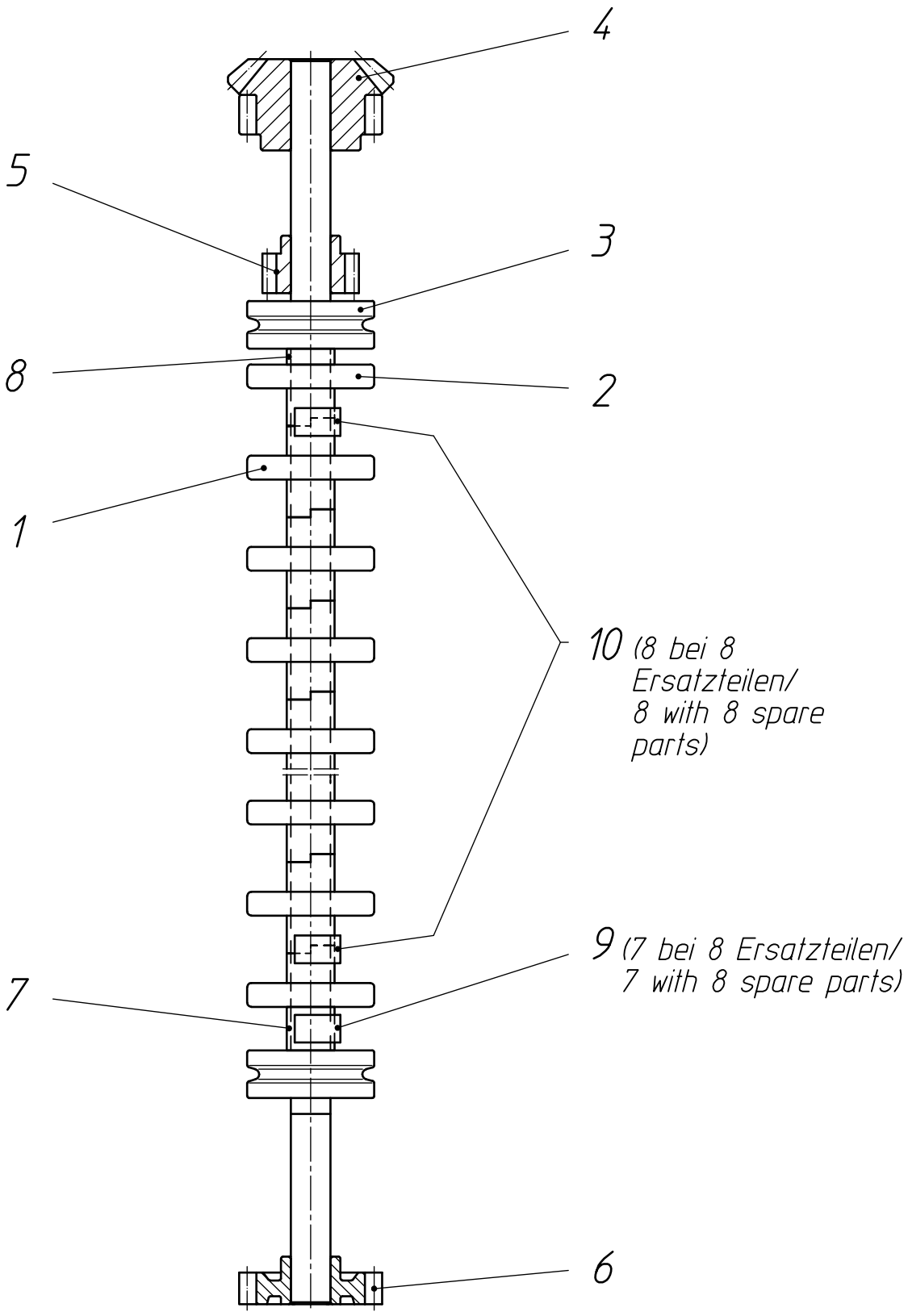
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0838.2571	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/F	Position	: 000040
Quant.	: 1,000 ST	Page	: 000069/01
Drawing	: 16.004.0838E0580	Date	: 10.04.2006

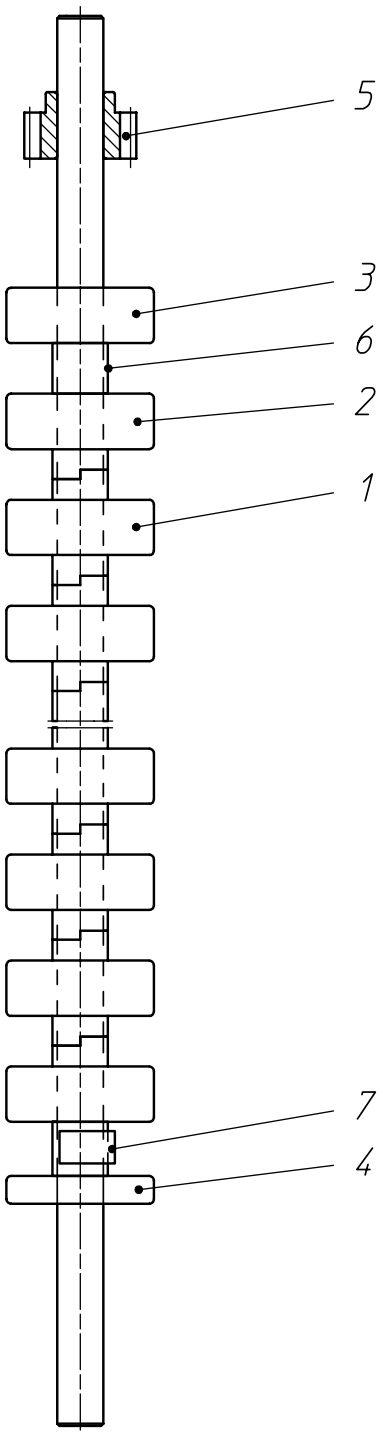
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0838E0580	11
	00



Assembly	: 16.004.1244.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000070/01
Drawing	: 16.004.1244E0570	Date	: 10.04.2006

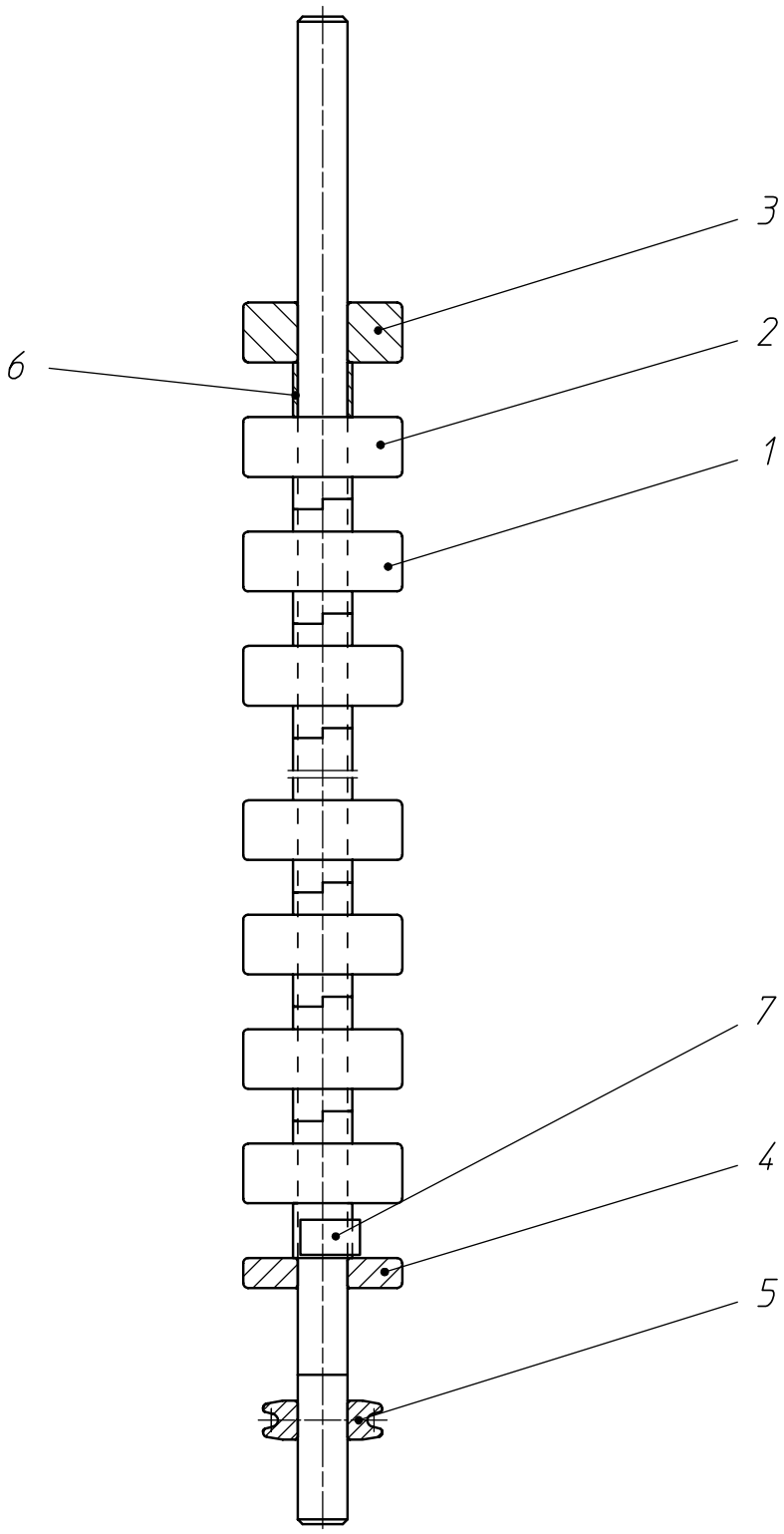
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1244E0570	11
	00



Assembly	: 16.004.1243.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000071/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

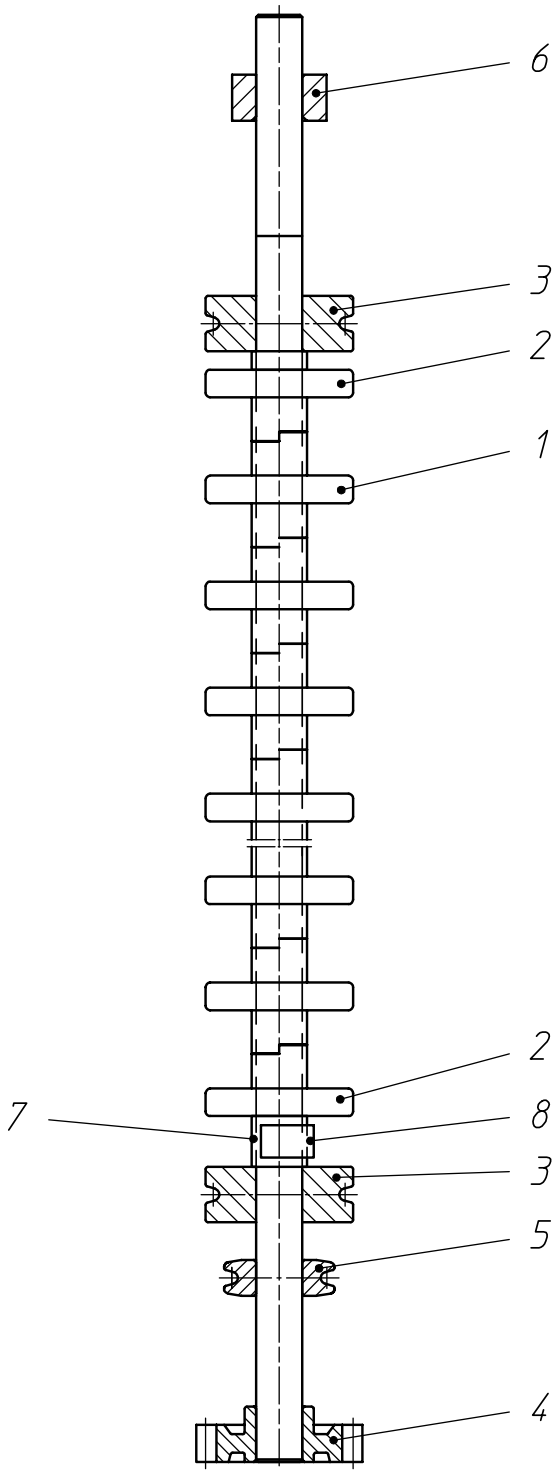
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000072/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

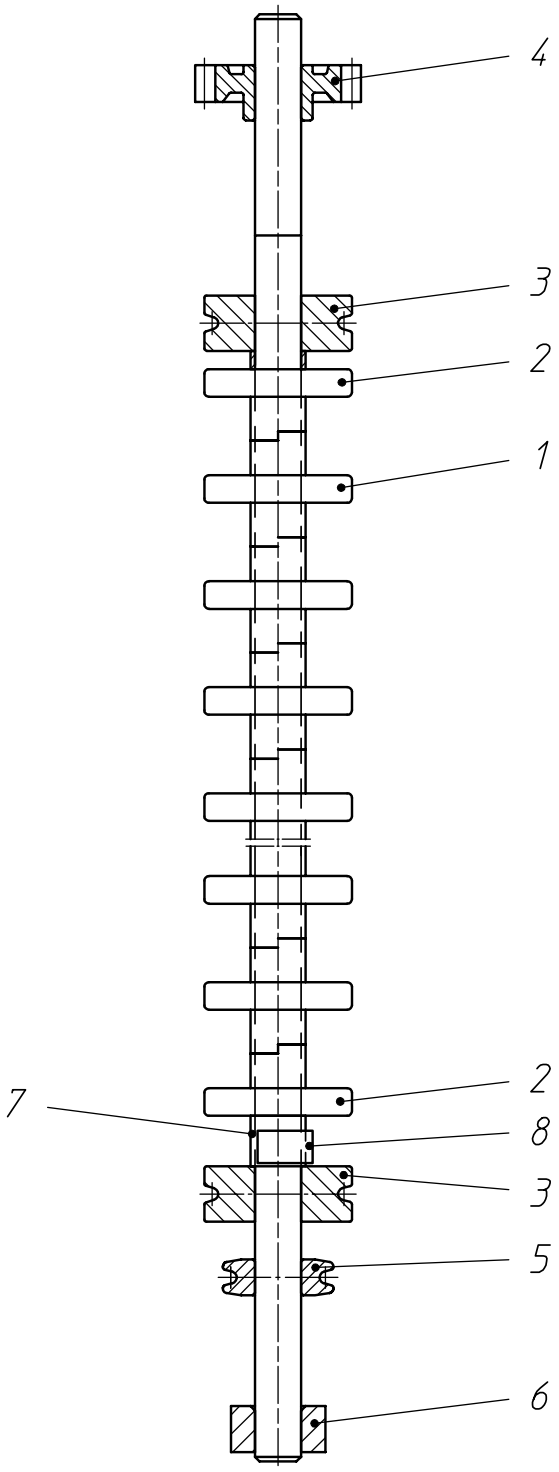
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000040
Quant.	: 2,000 ST	Page	: 000073/01
Drawing	: 16.004.1247E0570	Date	: 10.04.2006

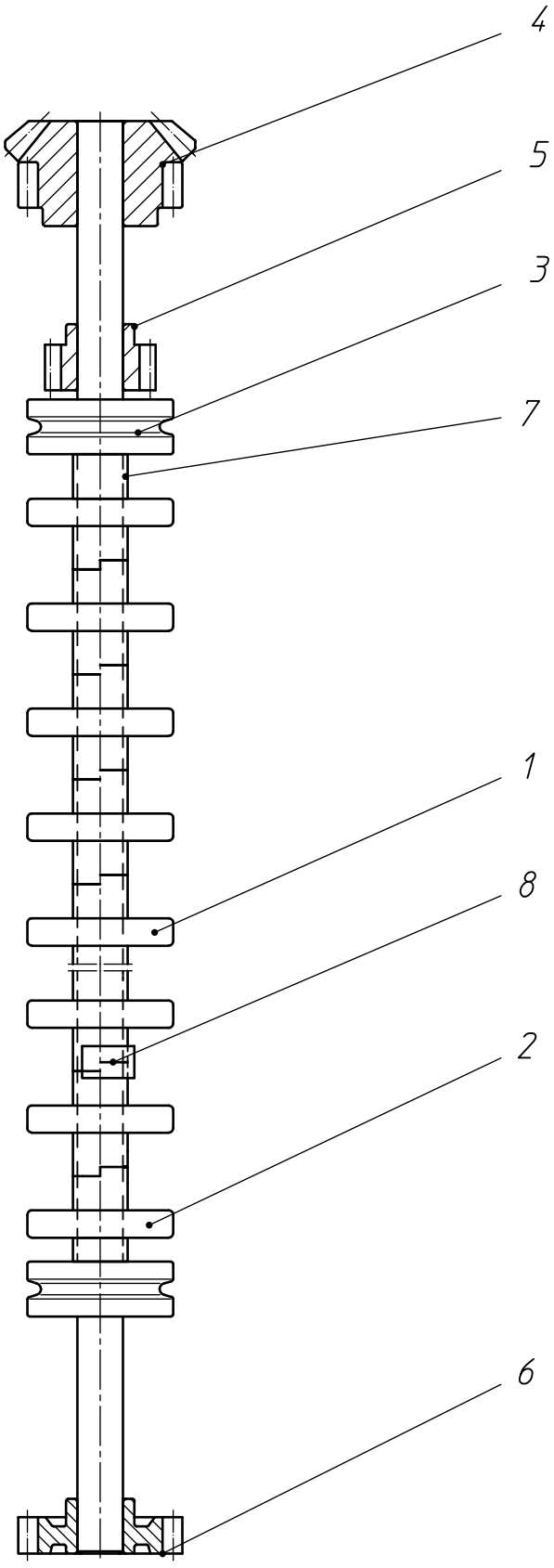
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1247E0570	1/1
	00



Assembly	: 16.004.0841.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O+U/K/B/FK/GREEN/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000074/01
Drawing	: 16.004.0841E0570	Date	: 10.04.2006

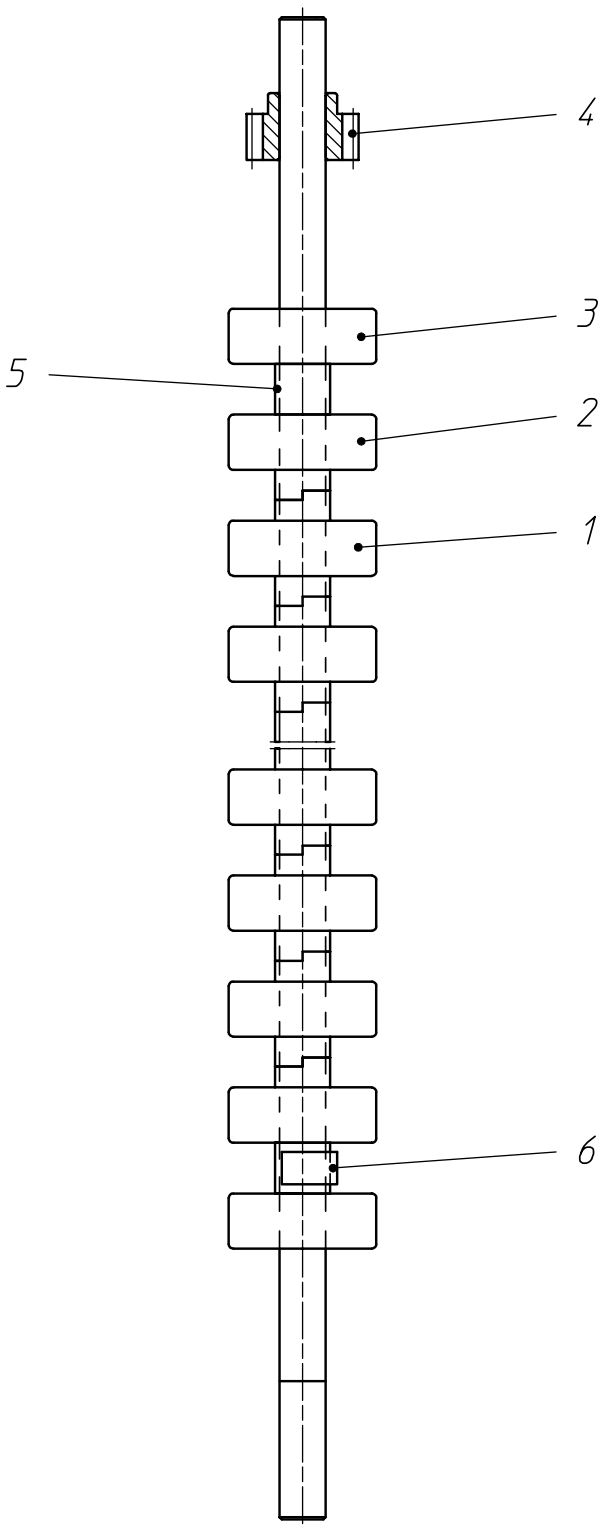
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0841E0570	11
	00



Assembly	: 16.004.1250.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000040
Quant.	: 1,000 ST	Page	: 000075/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

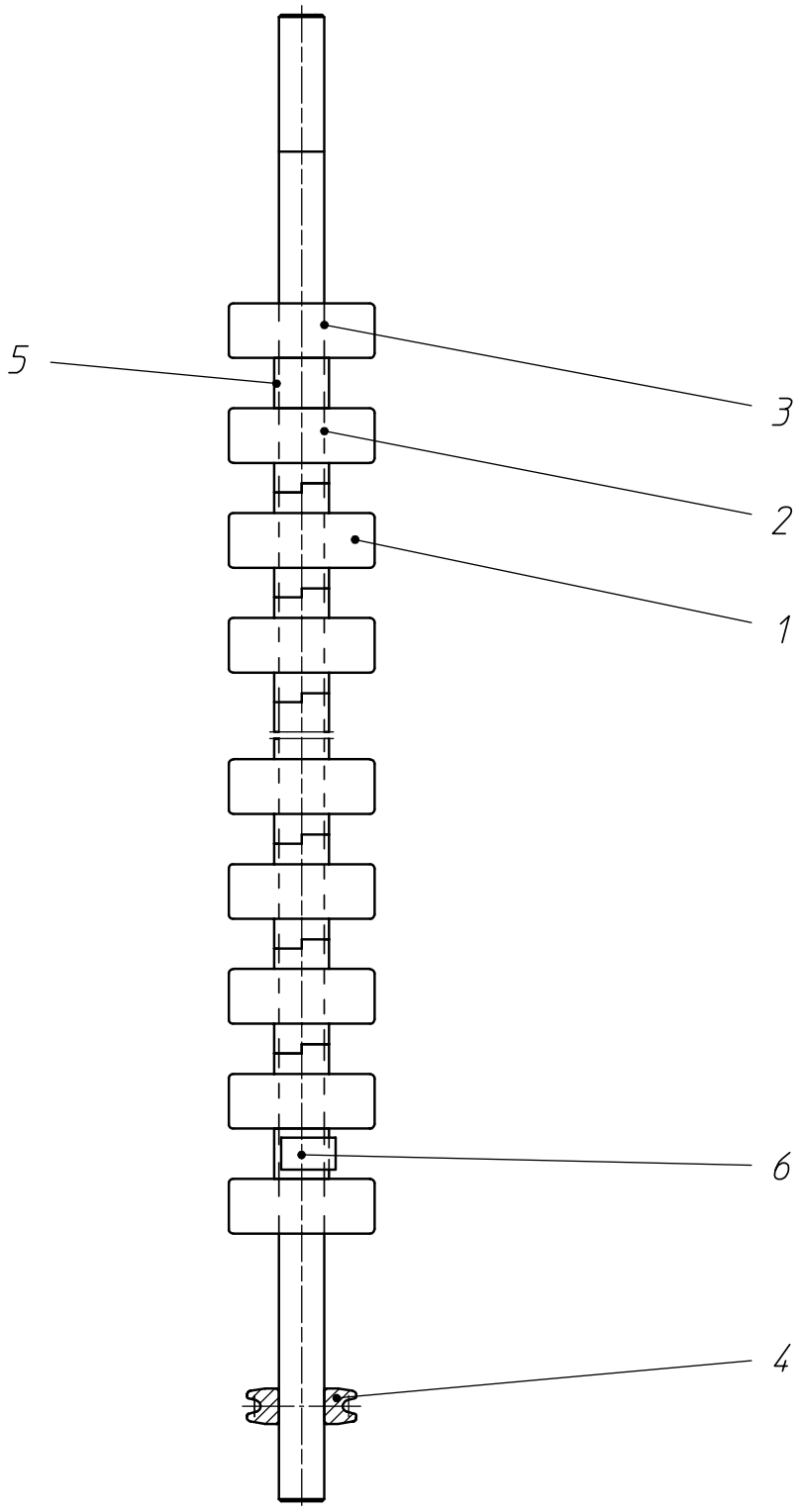
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1249.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000076/01
Drawing	: 16.004.1249E0570	Date	: 10.04.2006

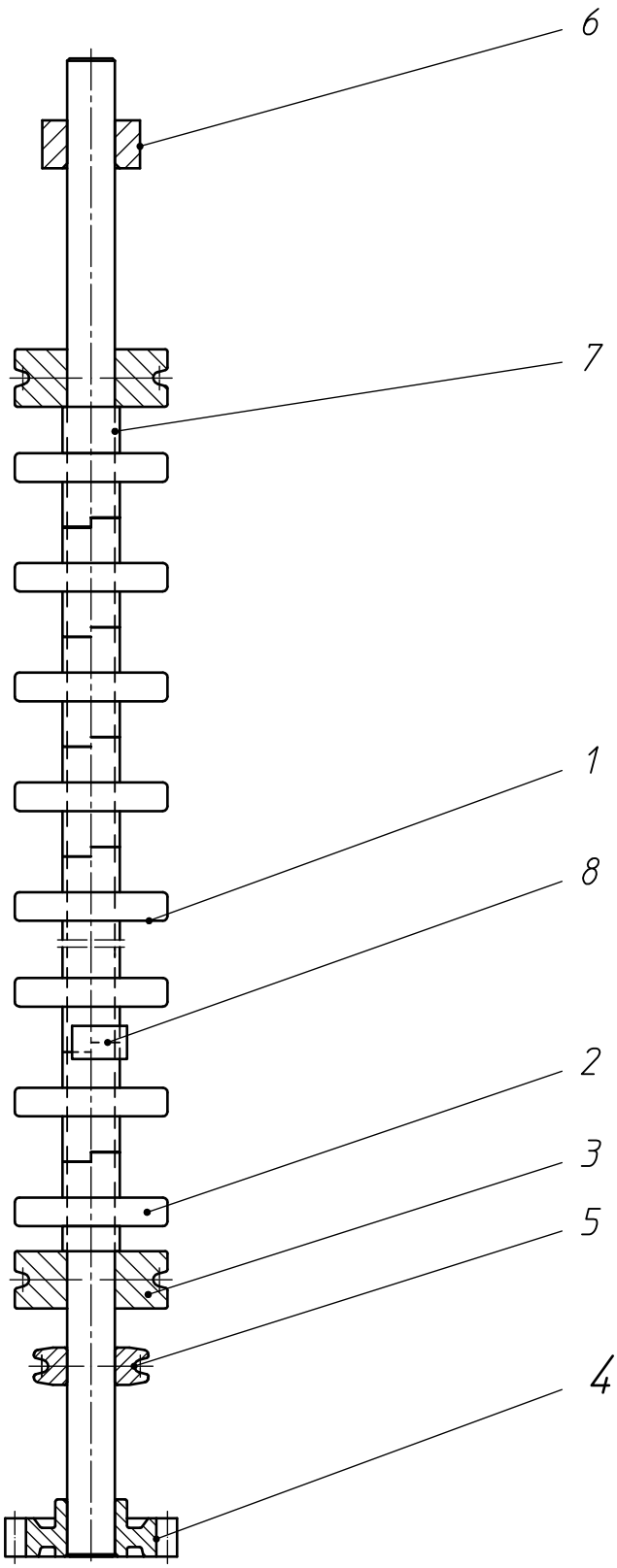
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1249E0570	1/1
	00



Assembly	: 16.004.1251.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000040
Quant.	: 2,000 ST	Page	: 000077/01
Drawing	: 16.004.1251E0570	Date	: 10.04.2006

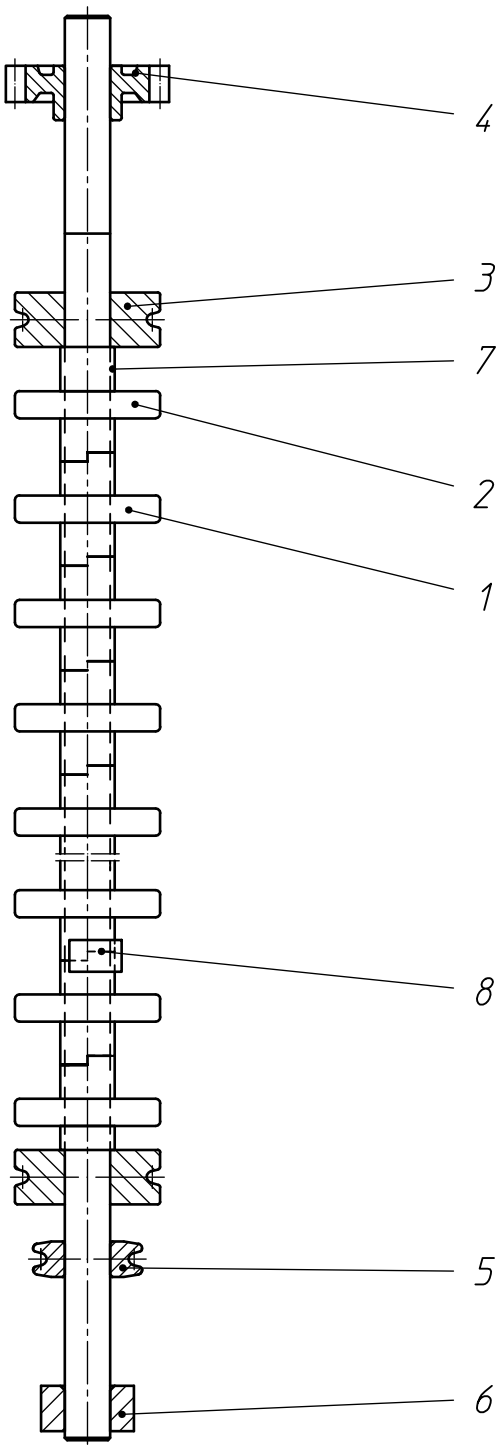
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1251E0570	1/1
	00



Assembly	: 16.004.1252.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000040
Quant.	: 2,000 ST	Page	: 000078/01
Drawing	: 16.004.1252E0570	Date	: 10.04.2006

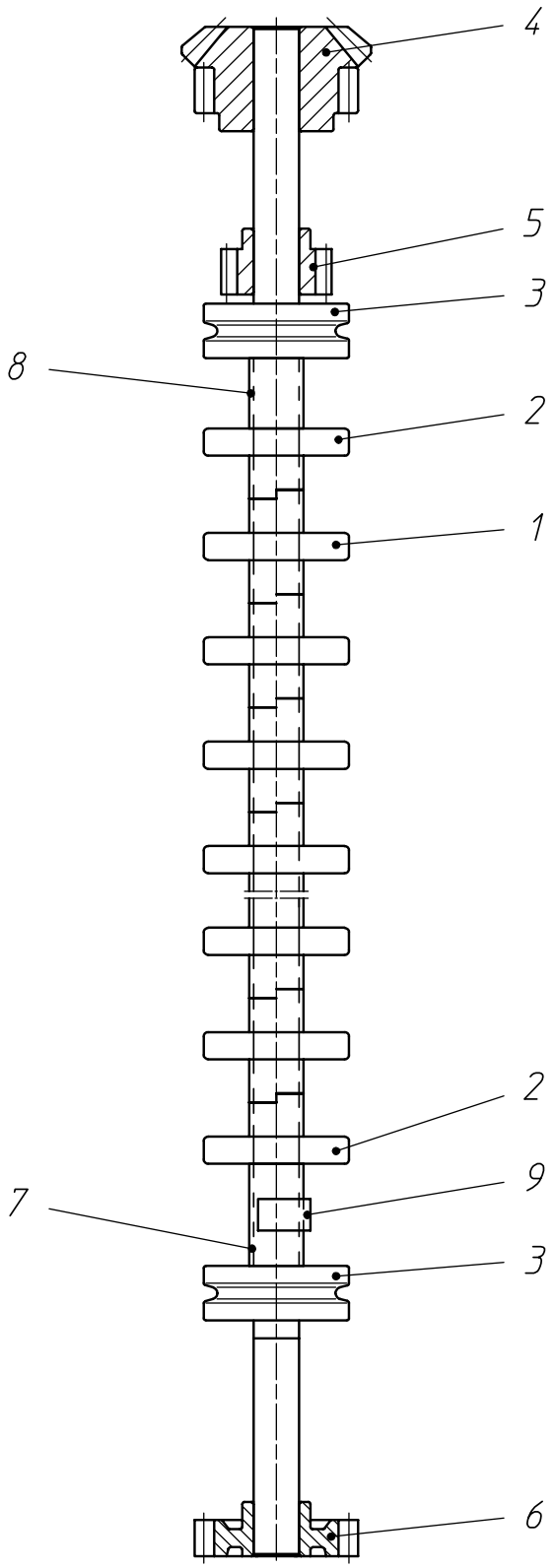
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1252E0570	11
	00



Assembly	: 16.004.0843.2571	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/F	Position	: 000040
Quant.	: 1,000 ST	Page	: 000079/01
Drawing	: 16.004.0843E0570	Date	: 10.04.2006

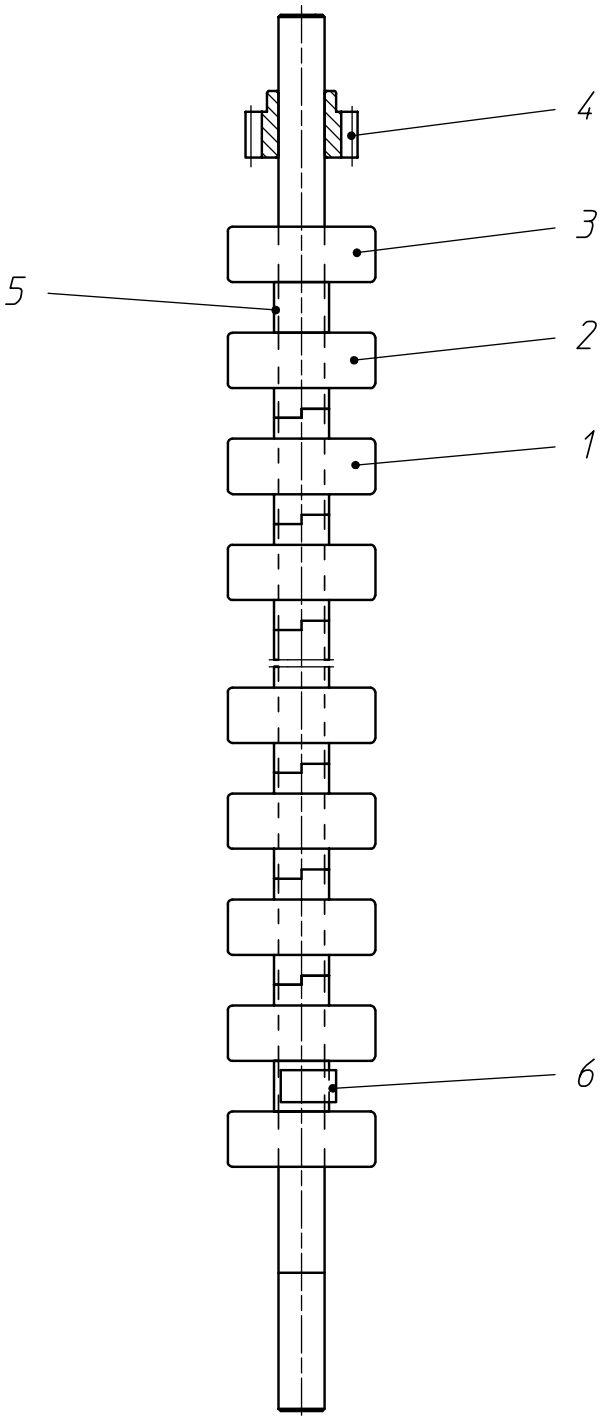
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0843E0570	11
	00



Assembly	: 16.004.1255.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/L/AV/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000080/01
Drawing	: 16.004.1255E0570	Date	: 10.04.2006

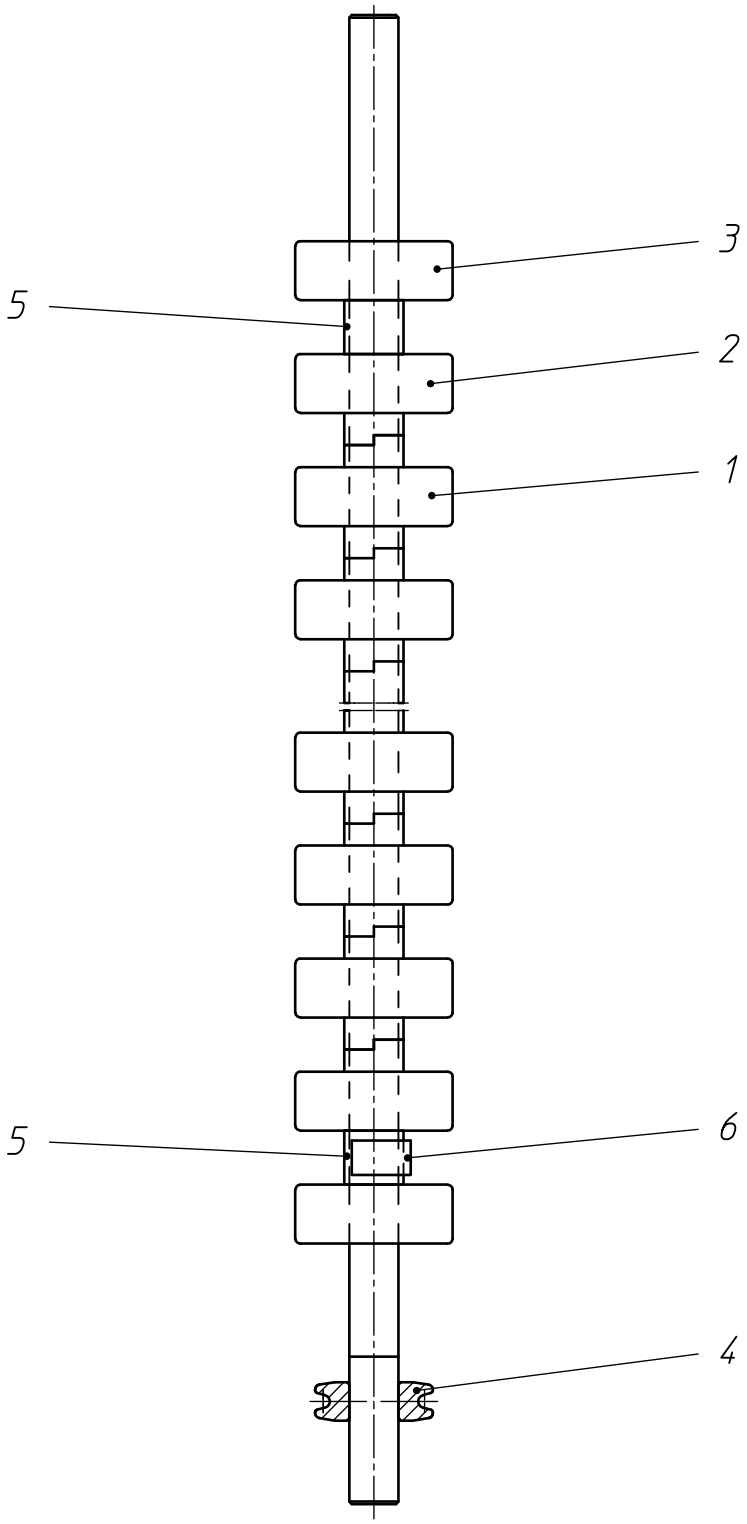
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1255E0570	1/1
	00



Assembly	: 16.004.1254.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/ /L/AV/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000081/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

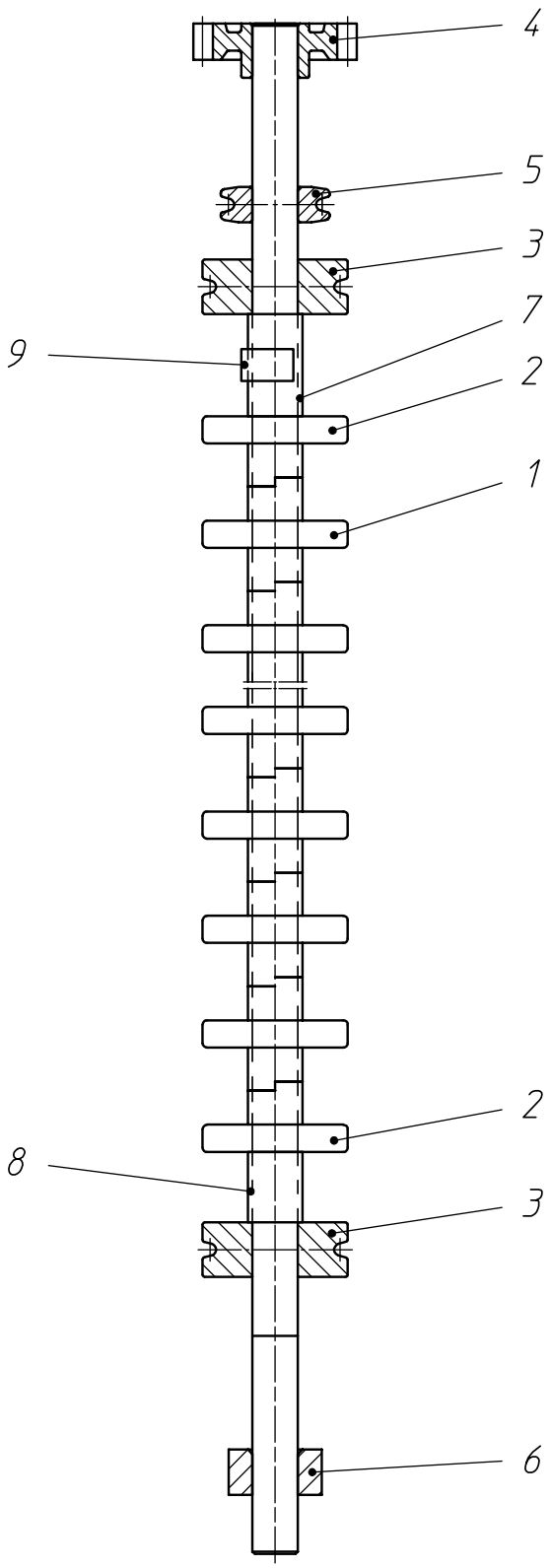
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1256.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000082/01
Drawing	: 16.004.1256E0570	Date	: 10.04.2006

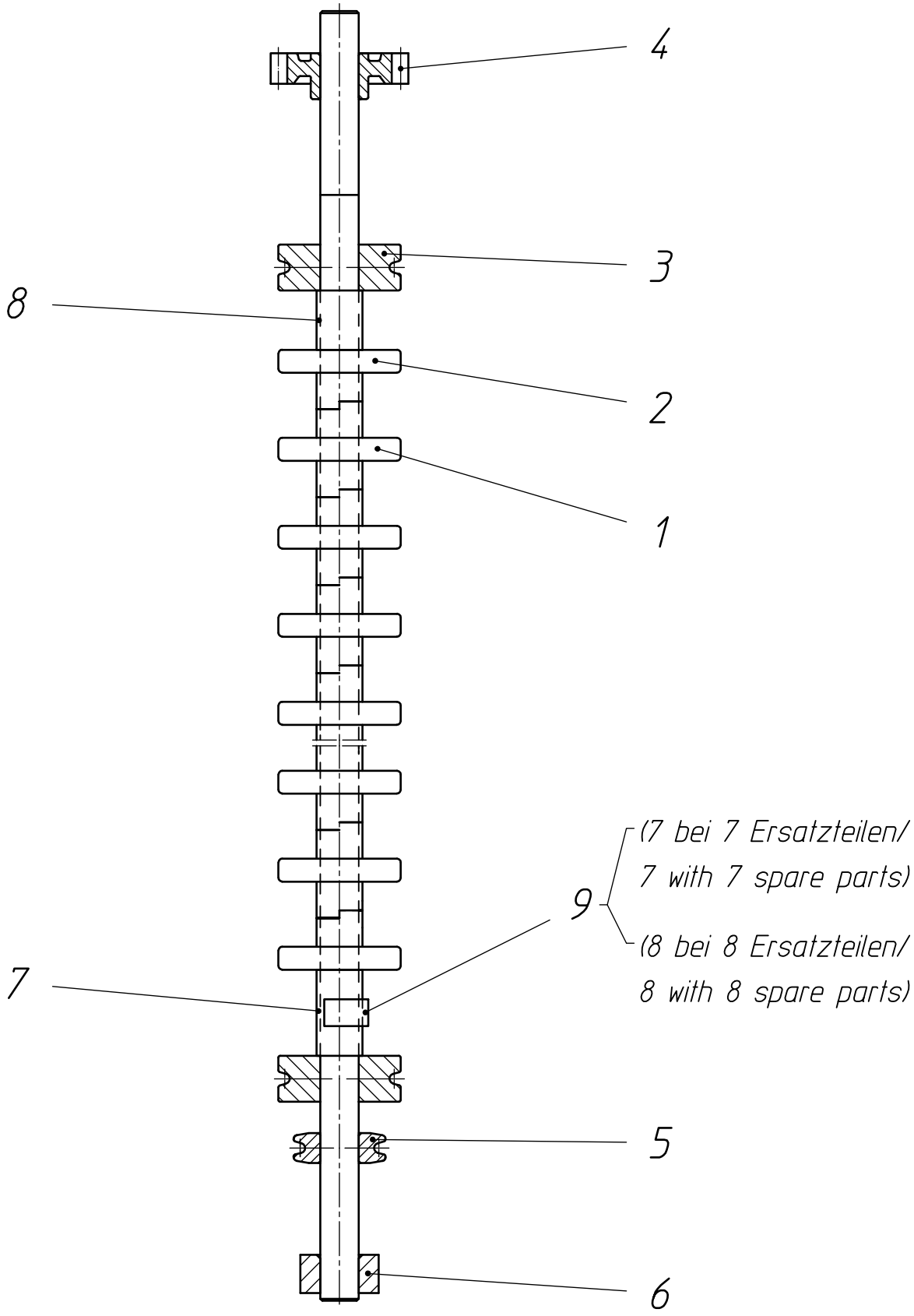
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1256E0570	1/1
	01



Assembly	: 16.004.1257.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000040
Quant.	: 2,000 ST	Page	: 000083/01
Drawing	: 16.004.1257E0572	Date	: 10.04.2006

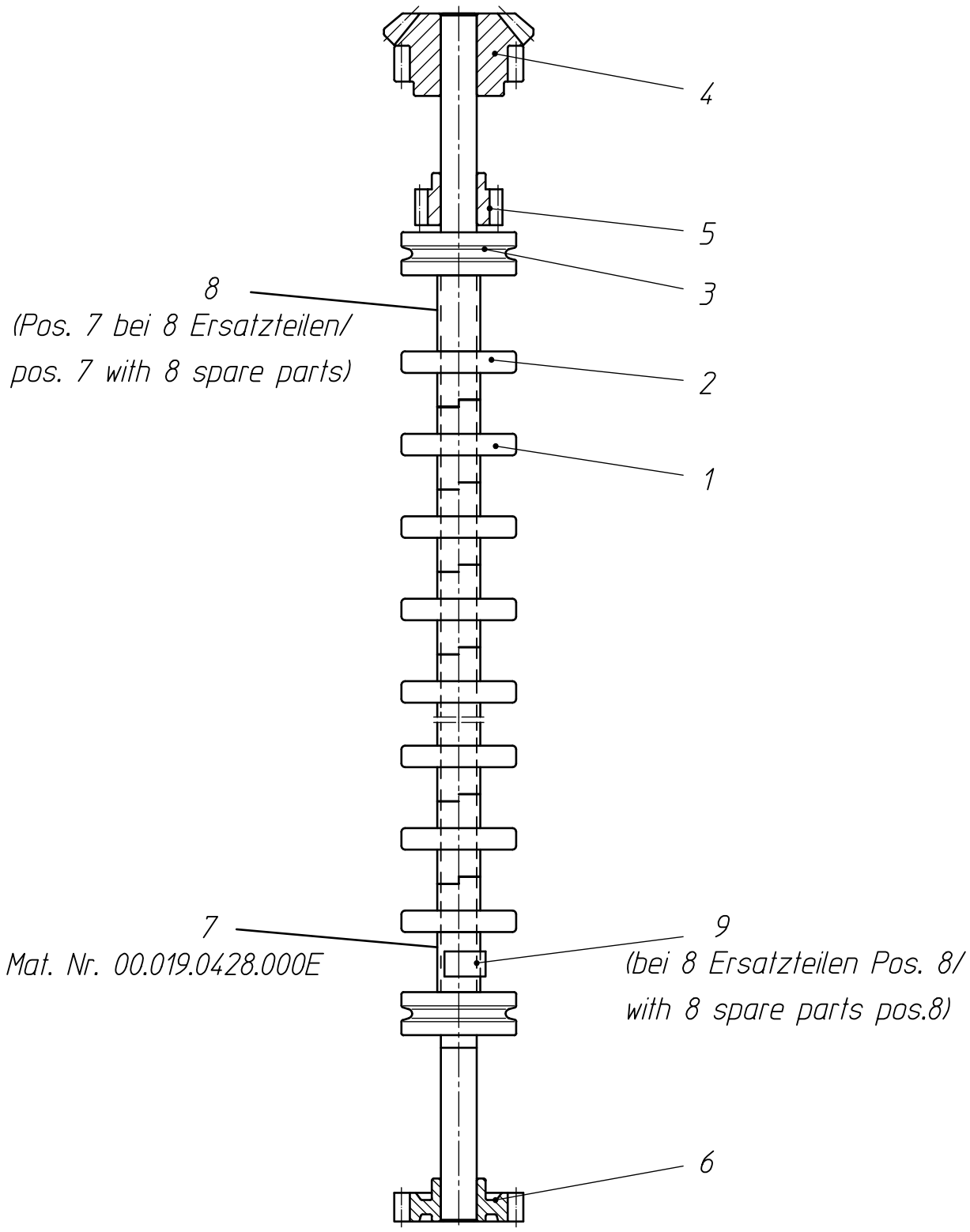
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0428.000E BUSHING/PP-G/D=12.0/d=10.2/L=16.25	1,000	ST	X
8	00.019.0420.000E BUSHING/PP-G/d=12.0/D=10.2/L=21.25	1,000	ST	X
9	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1257E0572 | 1/1 | 01



Assembly	: 16.004.0846.2571	Commiss.	: 25-05-377
Label	: Shaft/10/12/32/T25/650/V2A /PP/U/K/B/FE	Position	: 000040
Quant.	: 1,000 ST	Page	: 000084/01
Drawing	: 16.004.0846E0570	Date	: 10.04.2006

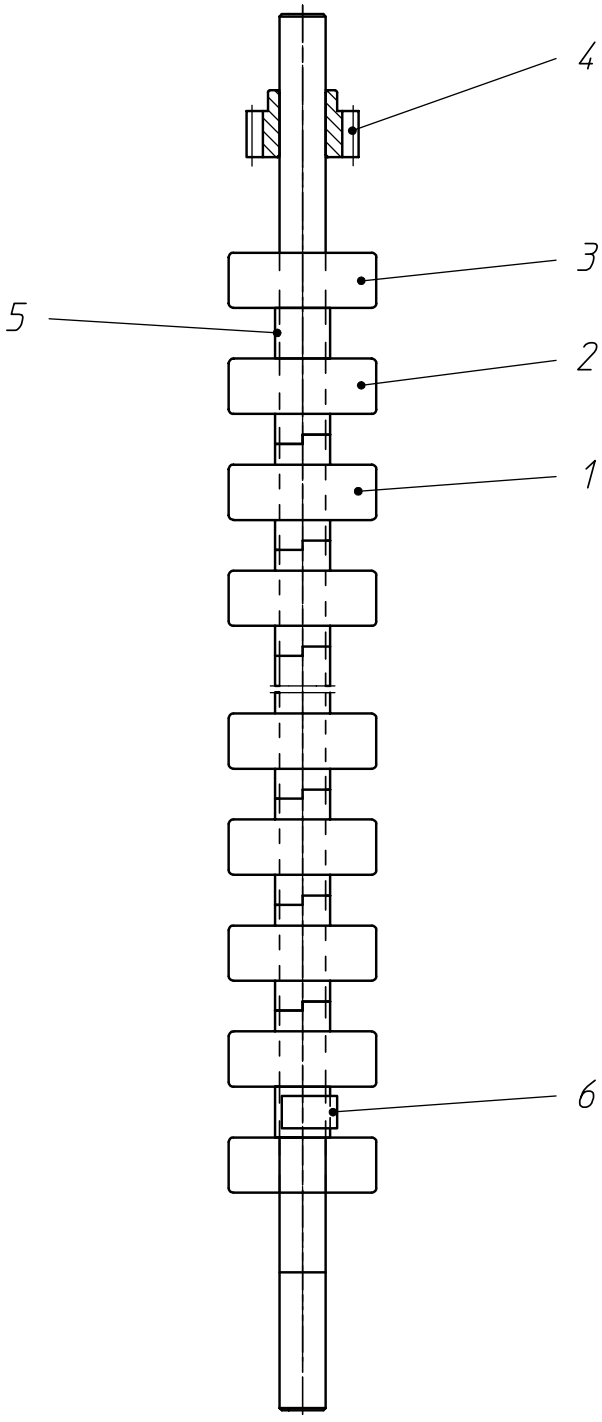
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0846E0570	11
	00



Assembly	: 16.004.1260.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000085/01
Drawing	: 16.004.1260E0570	Date	: 10.04.2006

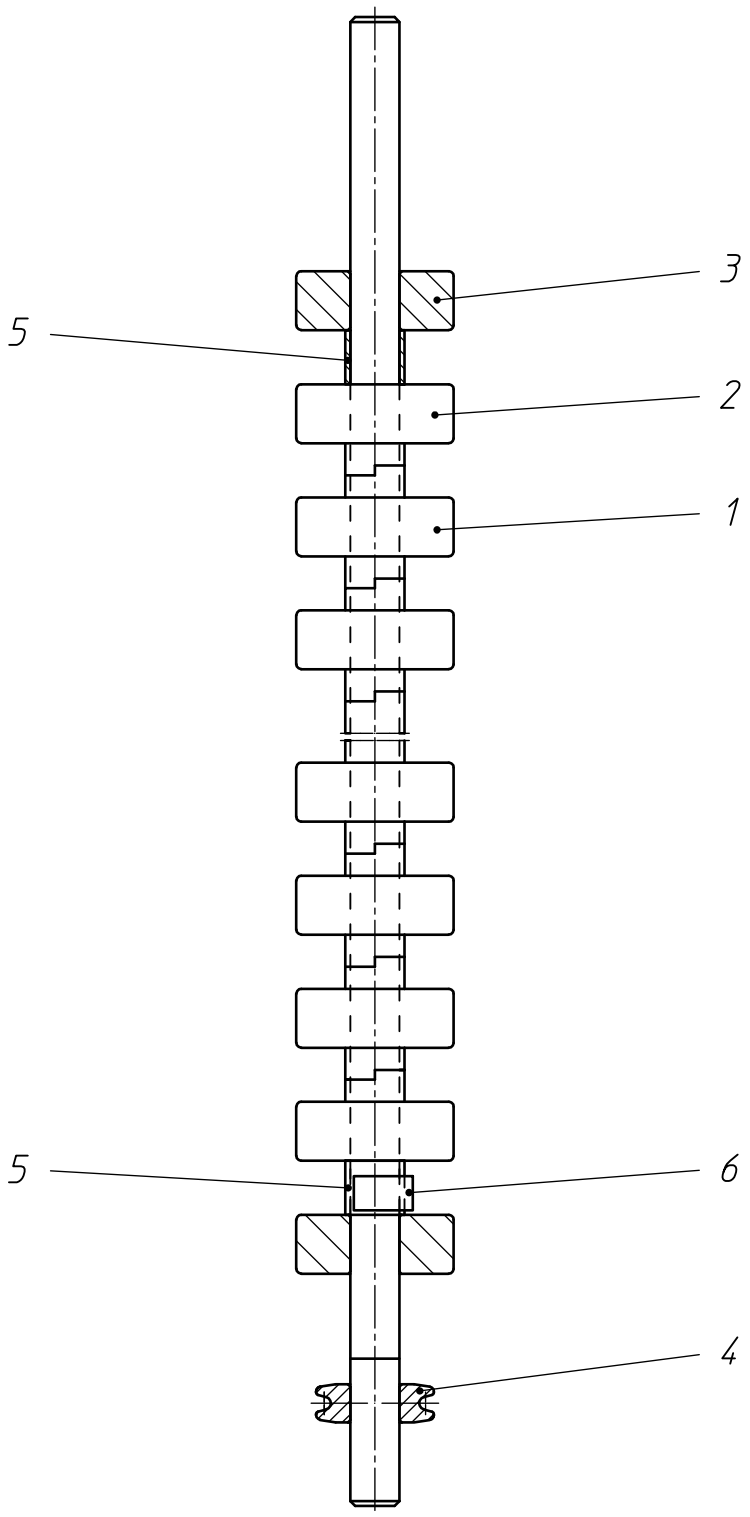
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1260E0570	1/1
	00



Assembly	: 16.004.1259.2571	Commiss.	: 25-05-377
Label	: Shaft/1KPL/32/O /L/AV/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000086/01
Drawing	: 16.004.1259E0570	Date	: 10.04.2006

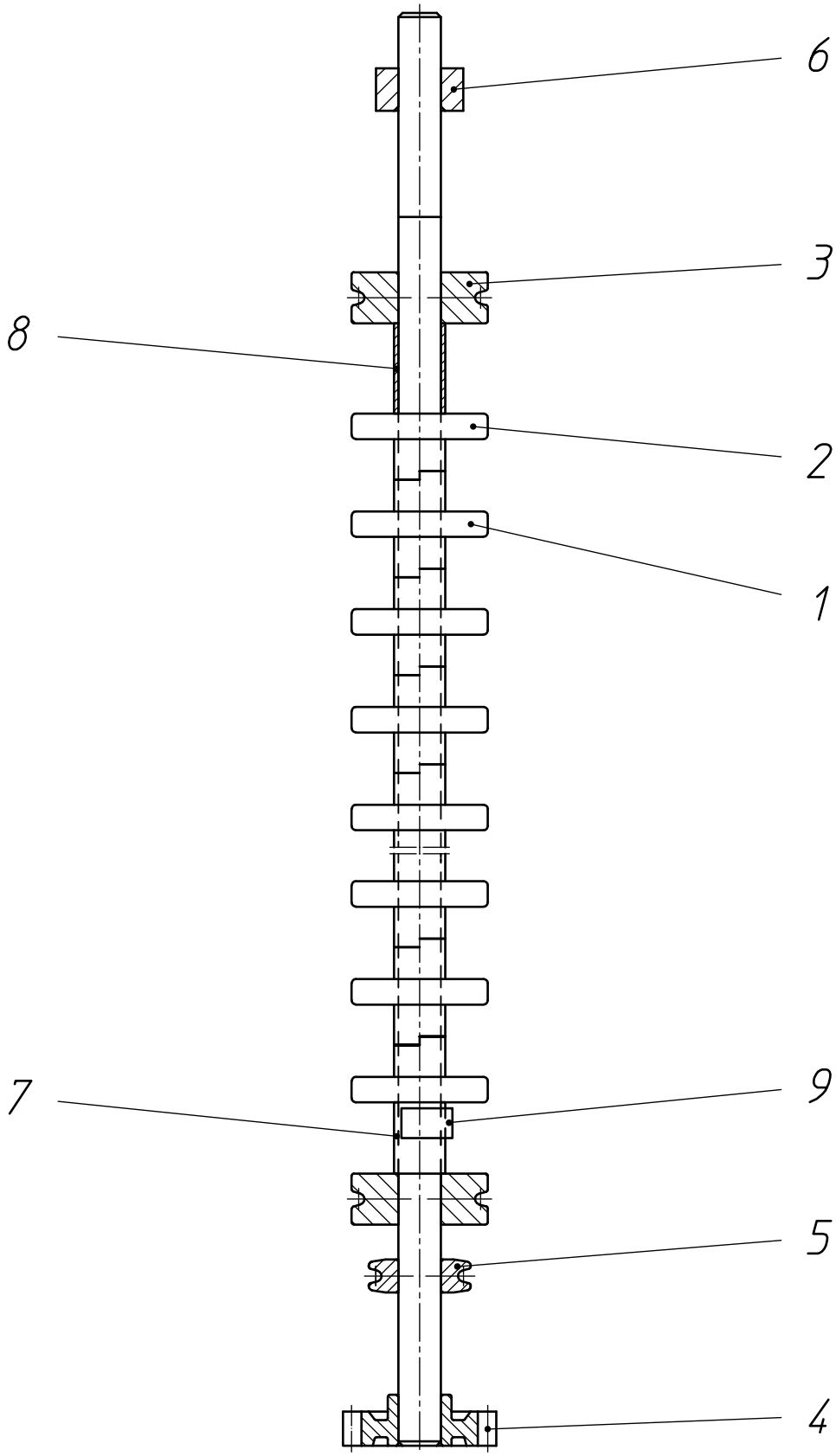
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0429.000E BUSHING/PP-G/D=12.0/d=10.2/L=16.75	1,000	ST	X
8	00.019.0420.000E BUSHING/PP-G/d=12.0/D=10.2/L=21.25	1,000	ST	X
9	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1259E0570	1/1
	00



Assembly	: 16.004.1261.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000040
Quant.	: 1,000 ST	Page	: 000087/01
Drawing	: 16.004.1261E0570	Date	: 10.04.2006

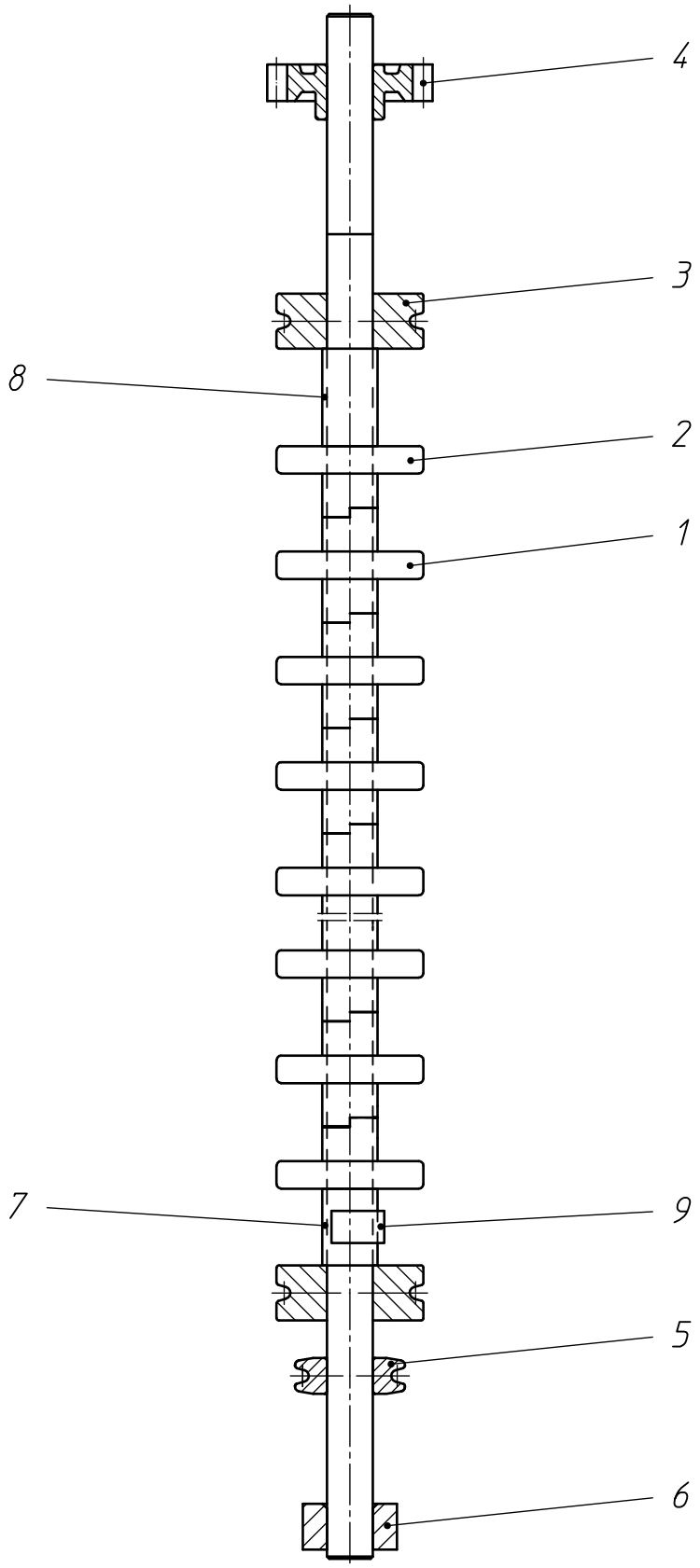
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0429.000E BUSHING/PP-G/D=12.0/d=10.2/L=16.75	1,000	ST	X
8	00.019.0420.000E BUSHING/PP-G/d=12.0/D=10.2/L=21.25	1,000	ST	X
9	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1261E0570	1/1
	00



Assembly	: 16.004.0559.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL/Z=11/M2/VA/PP /=0162	Position	: 000040
Quant.	: 4,000 ST	Page	: 000088/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

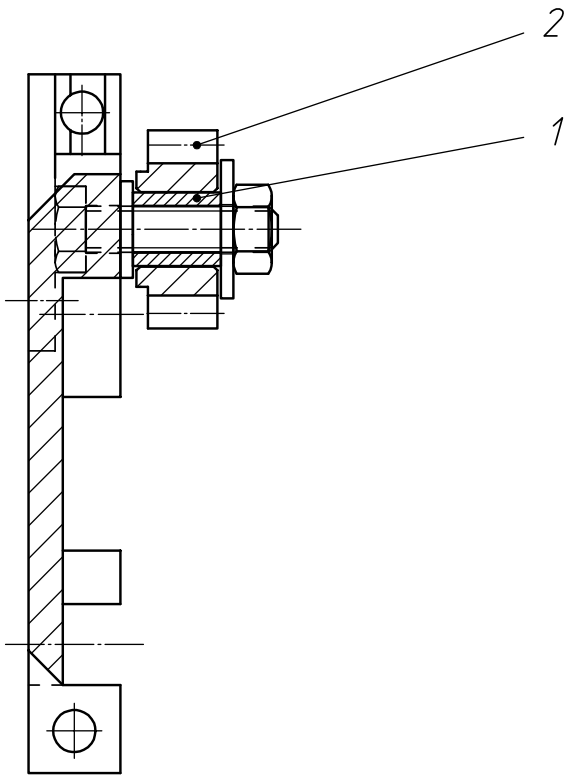
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0002 00SHING/SS/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0393.U800	Commiss.	: 25-05-377
Label	: BELT DRIVE/SHAFT/O/SPRAY/FJ	Position	: 000040
Quant.	: 4,000 ST	Page	: 000089/01
Drawing	: 16.004.0393EU000	Date	: 10.04.2006

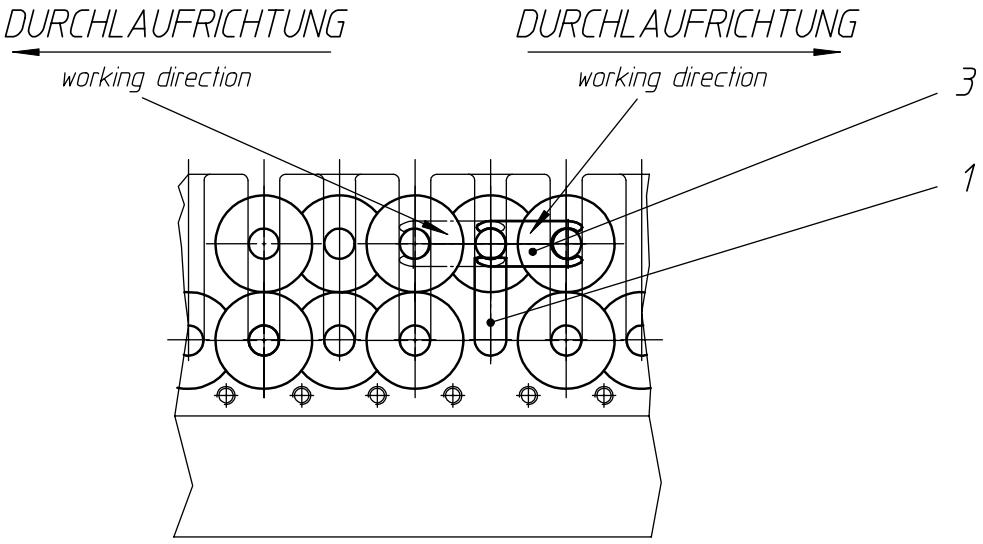
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0084.000H DISTANCE/GUR-N	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1178.000H CLIP/GUR-N/T25/TOP	2,000	ST	X

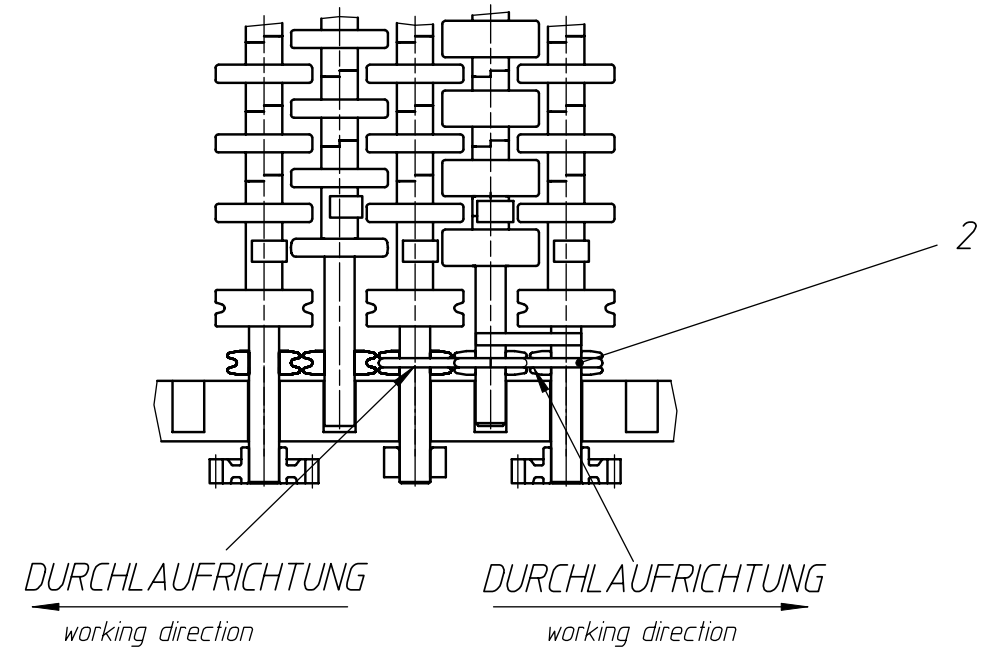
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMENANTRIEB

Spare parts list BELT DRIVE

16.004.0393EU000	11
	00





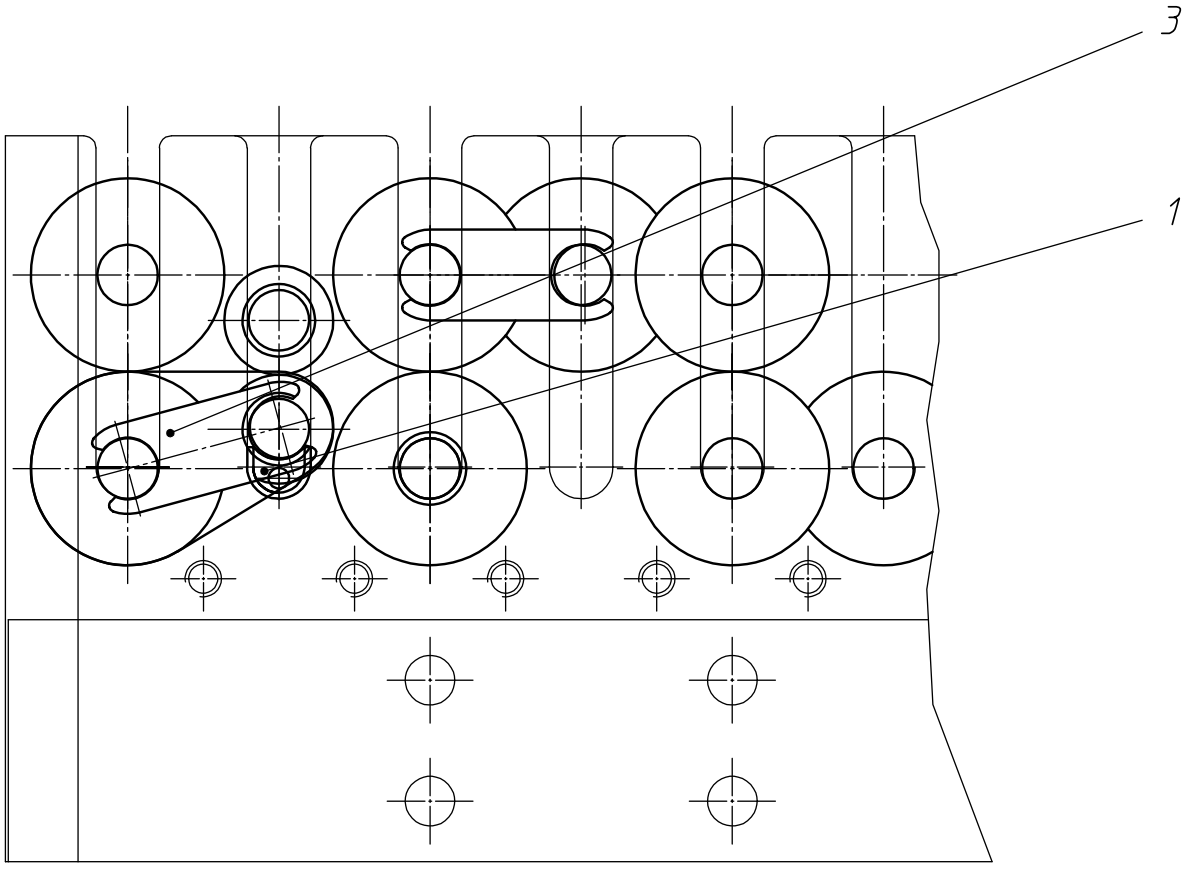
Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000040
Quant.	: 3,000 ST	Page	: 000090/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

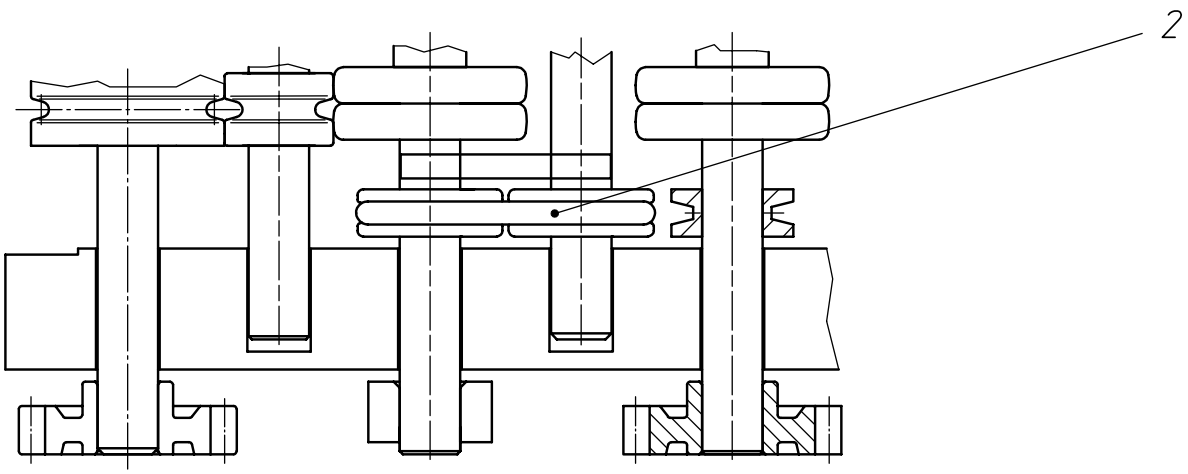
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 25-05-377-03	Commiss.	: 25-05-377
Label	: M03, Cascade-Rinse - KSM 4 PVC/TI	Position	: 000050
Quant.	: 1,000 ST	Page	: 000091/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.KSM4.20.0N CONTAINER[520]KSM4/PVC/TI	1,000	ST	
	16.05.KS00.41.0A INLET/1AS/PVC/DIRT CATCHER D=40	1,000	ST	
	16.05.KS00.42.0A INLET/2AS/PVC/DIRT CATCHER D=40	2,000	ST	
	16.05.KS00.32.0A INLET /2AS/-SF/PVC	1,000	ST	
1	16.005.0008.2H1B SPRAYPIPE/PVC-D/ 650/ 6D/F/G/ 8,04L/MIN	4,000	ST	X
2	16.005.0206.2A4A BLAST PIPE CPL./0650/H80/BJ	2,000	ST	X
	16.061.0024.U00N STANDING WAVE/PVC/TIT/KSM/+SW	1,000	ST	
	16.008.0004.U003 PUMP FIXING/TI/PP-G/EPDM	4,000	ST	
	50.003.0008.U000 TA/AS/0.37kW/OF/ET=270/ETLB-25-125	4,000	ST	
3	16.013.0066.000B FILTER HOUSING/PVC-DG/FILTER 1X10"	1,000	ST	X
4	FL-000000127-000 GX-DEEP FILTER ELEM./PP/ L=9 3/4"/75µ	1,000	ST	X
	16.004.0126.U24N CONVEYOR/ST/24/PVC/TI/KL-KU/d=27	1,000	ST	
	VS-25-05-377-03 CONVEYOR/KSM [K] 4/650/PVC/TI	1,000	ST	
	16.005.0086.U00A INLET/PVC/DFM640/GK-MIN/MV/D=20	1,000	ST	

Parts without Pos.-N° see assembly parts list

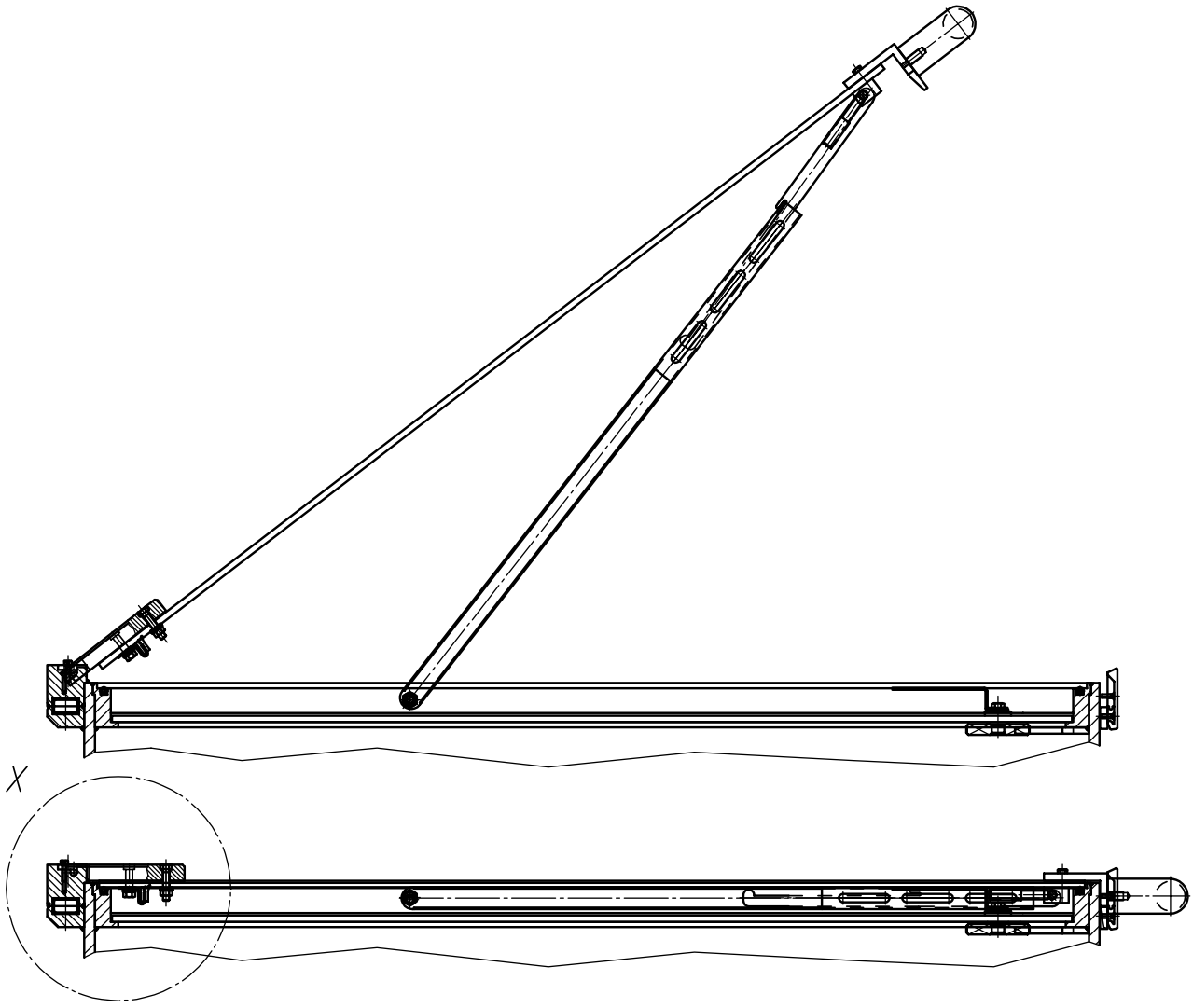
Assembly	: 16.02.KSM4.20.0N	Commiss.	: 25-05-377
Label	: CONTAINER[520]KSM4/PVC/TI	Position	: 000050
Quant.	: 1,000 ST	Page	: 000092/01
Drawing	: 16.02.FA01E02.00	Date	: 10.04.2006

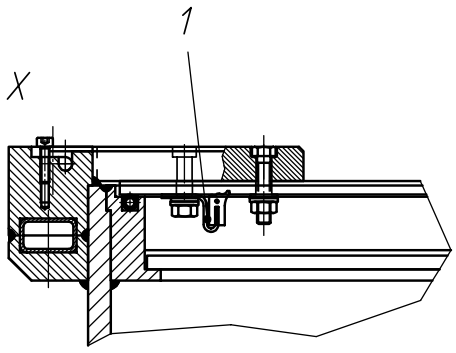
Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0141.U24N GLASS COVER[520]/24/PVC/TI	1,000	ST	
1	16.002.0508.0760 PROFILE/"VITON B"	1,065	M	X
	16.07.KSM4.02.0A DRAIN/PVC/KSM5/D=50	1,000	ST	
	16.012.0003.U24A CABLE CHANNEL/CPL./024/PVC/BS	1,000	ST	

Ersatzteilliste BEHÄLTER U. VERKLEI.

Spare parts list Housing with accessories

16.02.FA01E02.00 | 11/02





Assembly	: 16.002.0141.U24N	Commiss.	: 25-05-377
Label	: GLASS COVER[520]/24/PVC/TI	Position	: 000050
Quant.	: 1,000 ST	Page	: 000093/01
Drawing	: 16.002.0141EU000	Date	: 10.04.2006

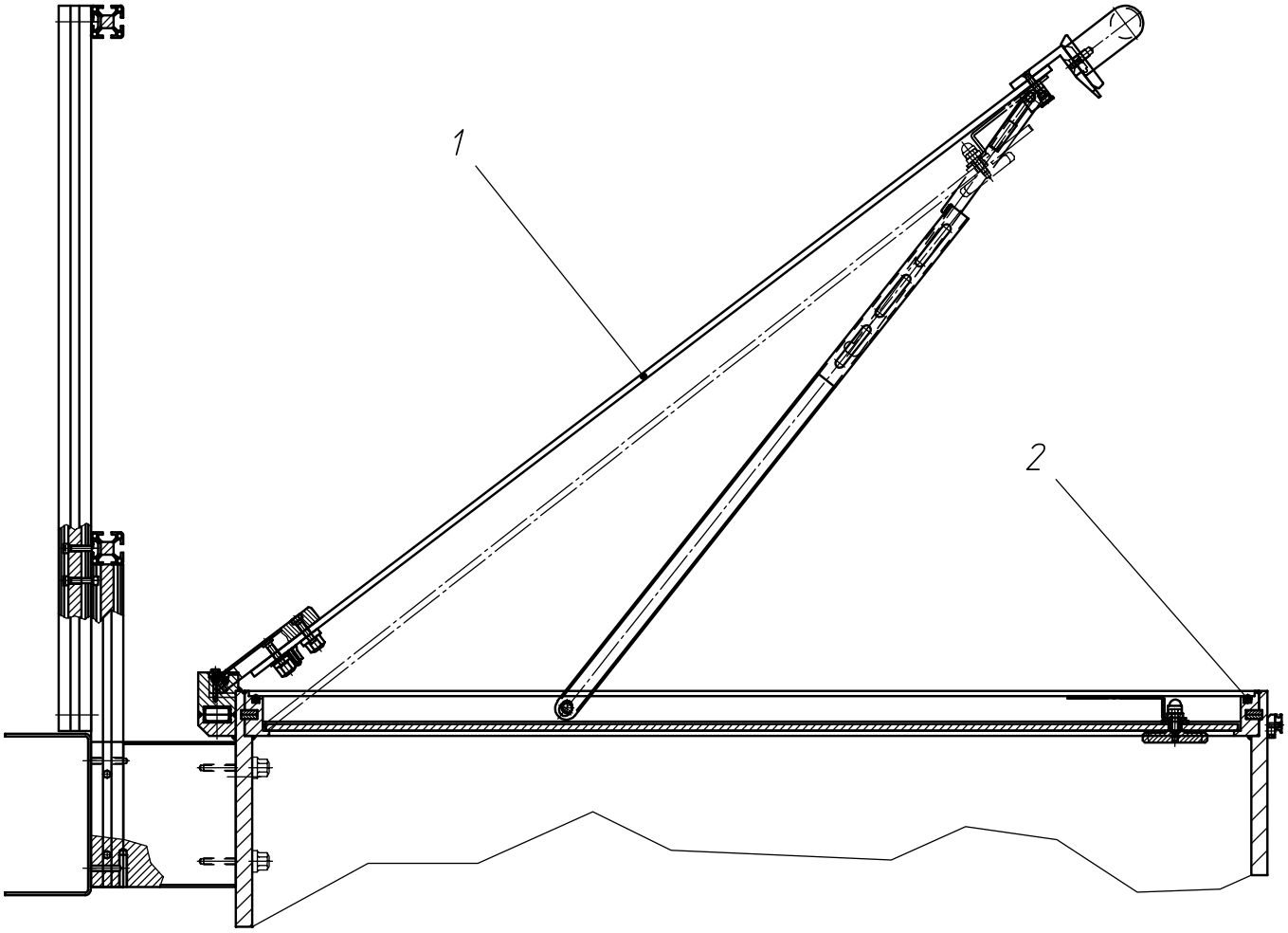
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0022.2240 GLASS COVER/24/0650/0932x1093x06	1,000	ST	X
	16.002.0142.U00N COVER PARTS/PVC/TIT	1,000	ST	
2	16.002.1178.2240 GLASS COVER SEALING/A/24/0650/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list GLASS COVER

16.002.0141EU000	11
	00



Assembly	: 16.002.0142.U00N	Commiss.	: 25-05-377
Label	: COVER PARTS/PVC/TIT	Position	: 000050
Quant.	: 1,000 ST	Page	: 000094/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

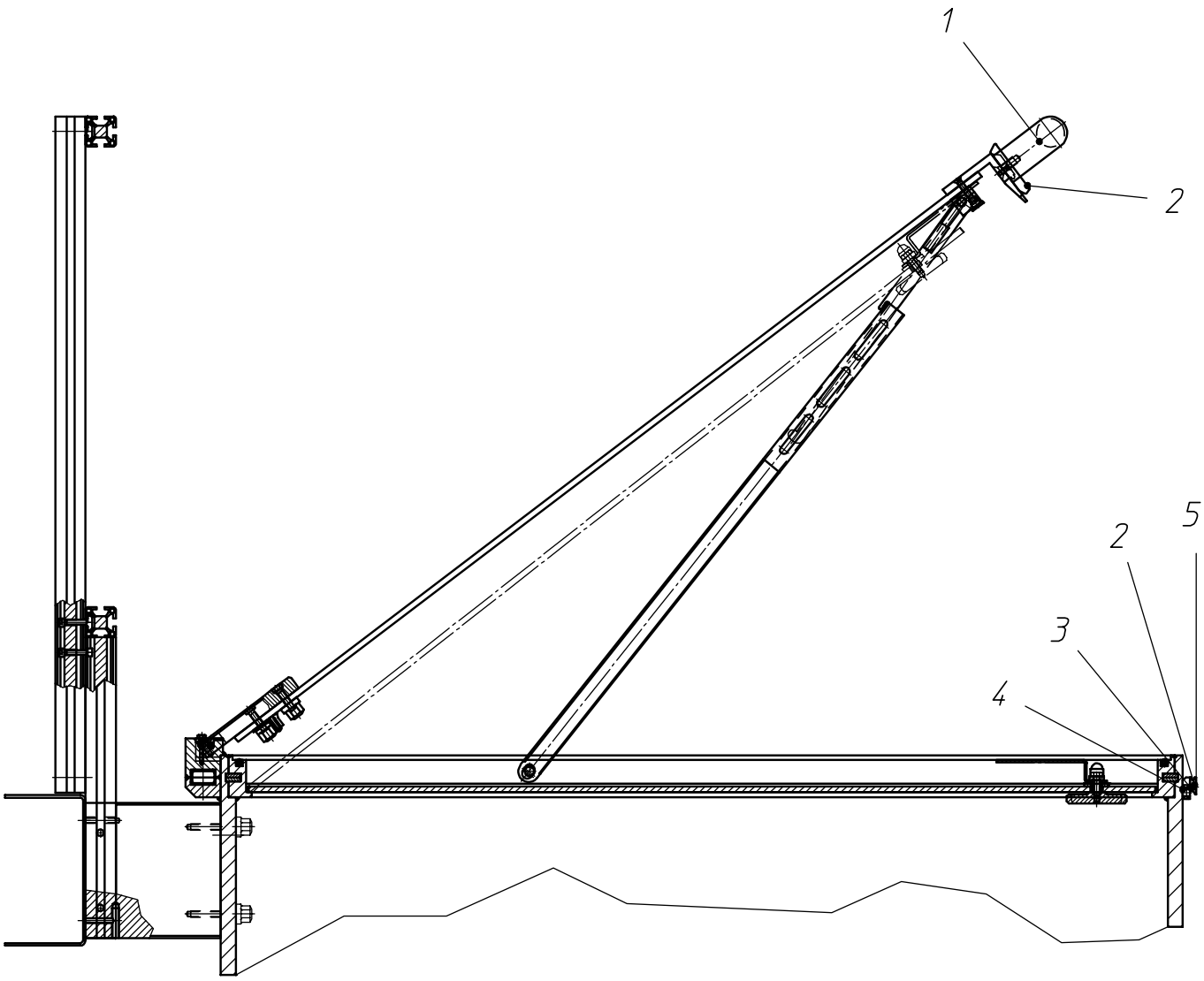
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
3	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
4	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
HAMLIN

www.breedelectronics.com

59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

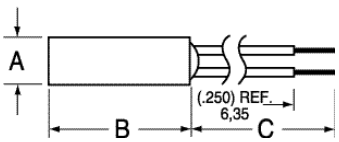
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

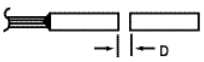
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

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Breed Electronics France Tel: +33 1 46 87 02 02 • Fax:+33 1 46 86 67 86 • Email: hamectrol@hamectrol.fr

Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000050
Quant.	: 1,000 ST	Page	: 000095/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

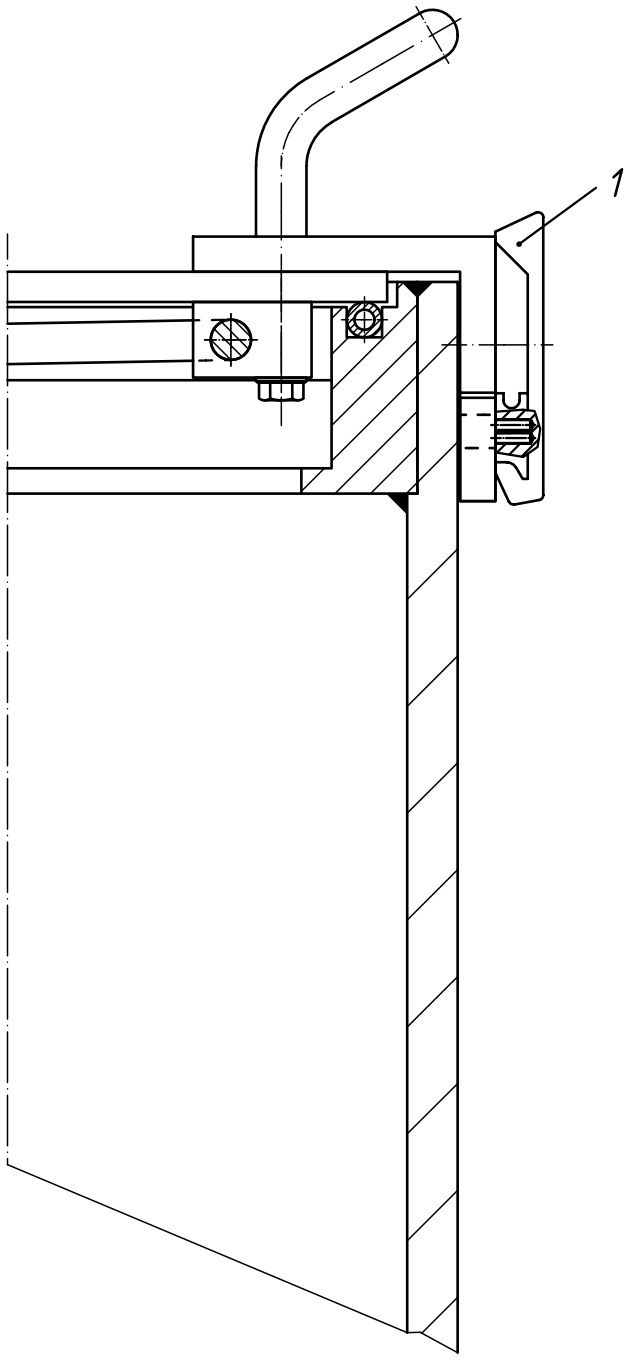
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.07.KSM4.02.0A	Commiss.	: 25-05-377
Label	: DRAIN/PVC/KSM5/D=50	Position	: 000050
Quant.	: 1,000 ST	Page	: 000096/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	FK-101508001-050 BALL VALVE-PVC/EPDM/101/PVC/EPDM /D=50	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.012.0003.U24A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./024/PVC/BS	Position	: 000050
Quant.	: 1,000 ST	Page	: 000097/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

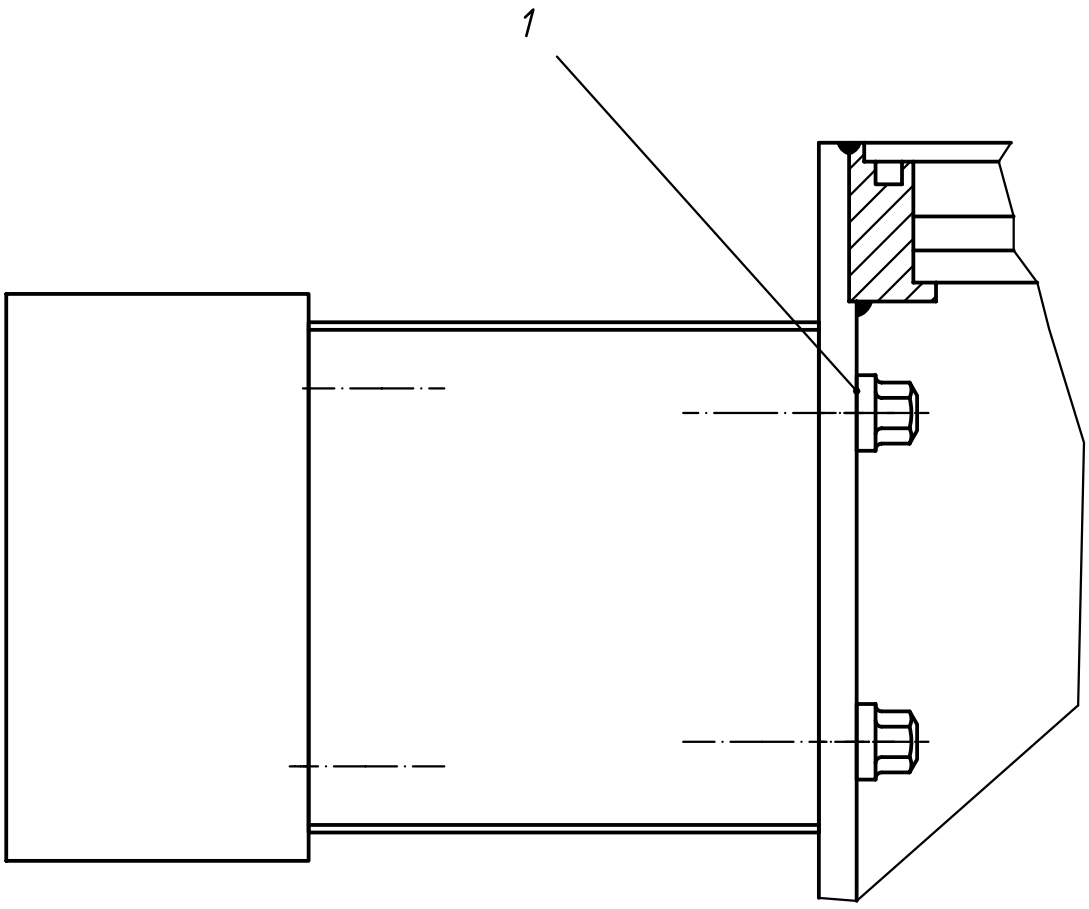
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	8,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 16.05.KS00.41.0A	Commiss.	: 25-05-377
Label	: INLET/1AS/PVC/DIRT CATCHER D=40	Position	: 000050
Quant.	: 1,000 ST	Page	: 000098/01
Drawing	: 16.05.KS00E31.00	Date	: 10.04.2006

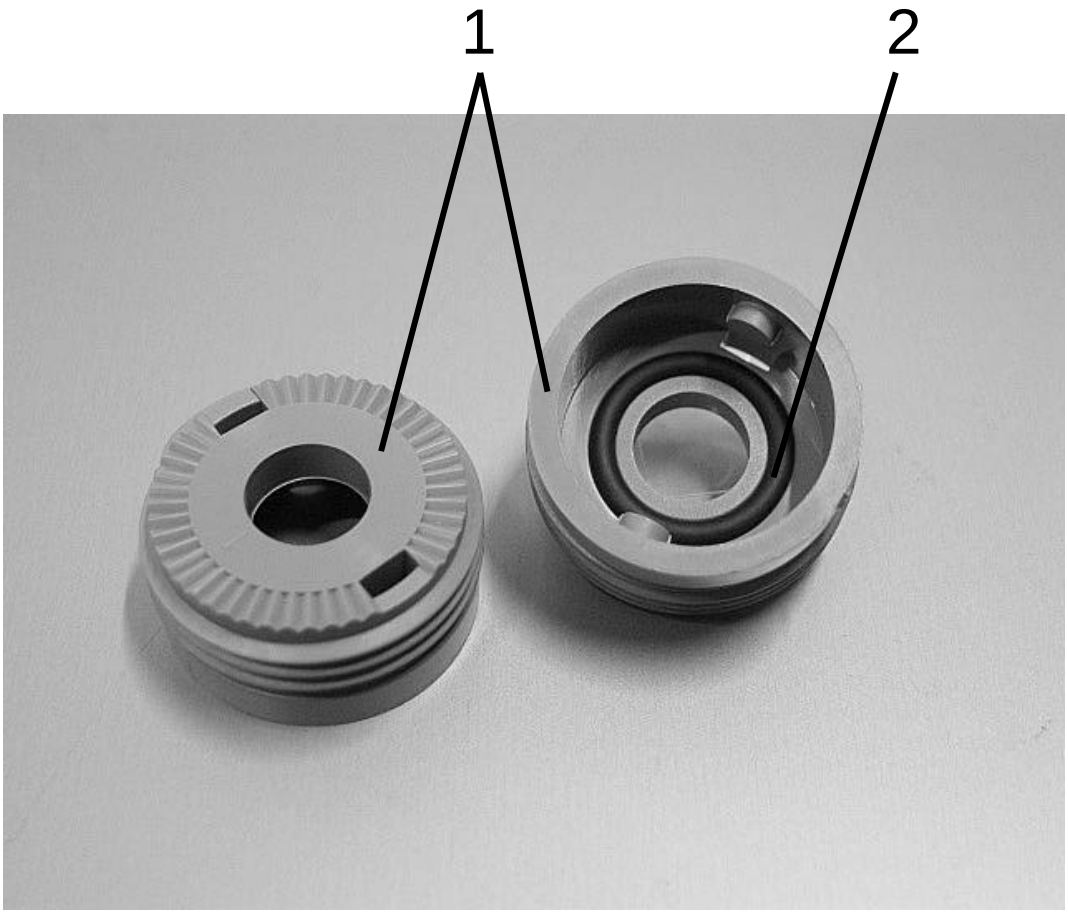
Pos.	Part N° / Label	Quant.	Unit	SP
	16.005.0091.U80A INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	1,000	ST	
1	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	1,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Zulauf

Spare parts list inlet

16.05.KS00E31.00	1/1
	00



Assembly	: 16.005.0091.U80A	Commiss.	: 25-05-377
Label	: INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	Position	: 000050
Quant.	: 1,000 ST	Page	: 000099/01
Drawing	: 16.005.0091EU000	Date	: 10.04.2006

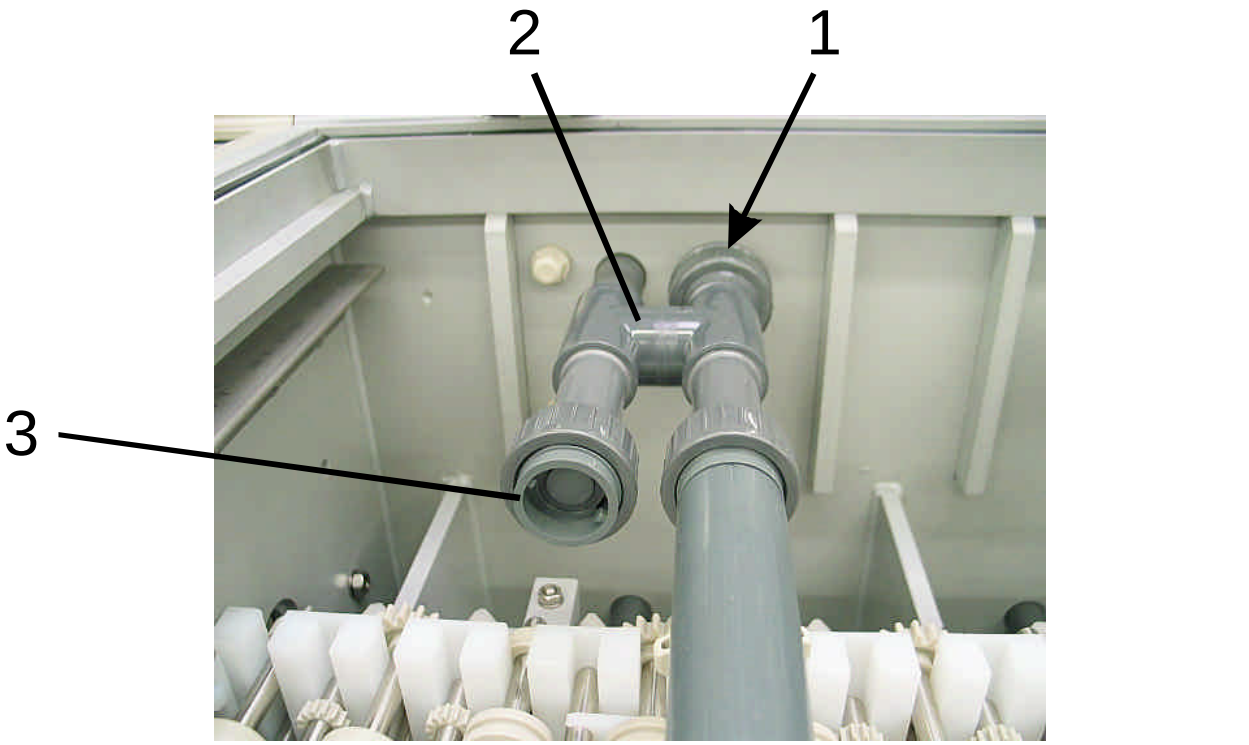
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-216 O-RING/EPDM/BLACK/028.17x3.53	2,000	ST	X
2	16.005.0017.000B SPRAY FRAME/A=50/KSM/BJ	2,000	ST	X
3	03.005.0675.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=00	4,000	ST	X
4	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
5	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
6	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

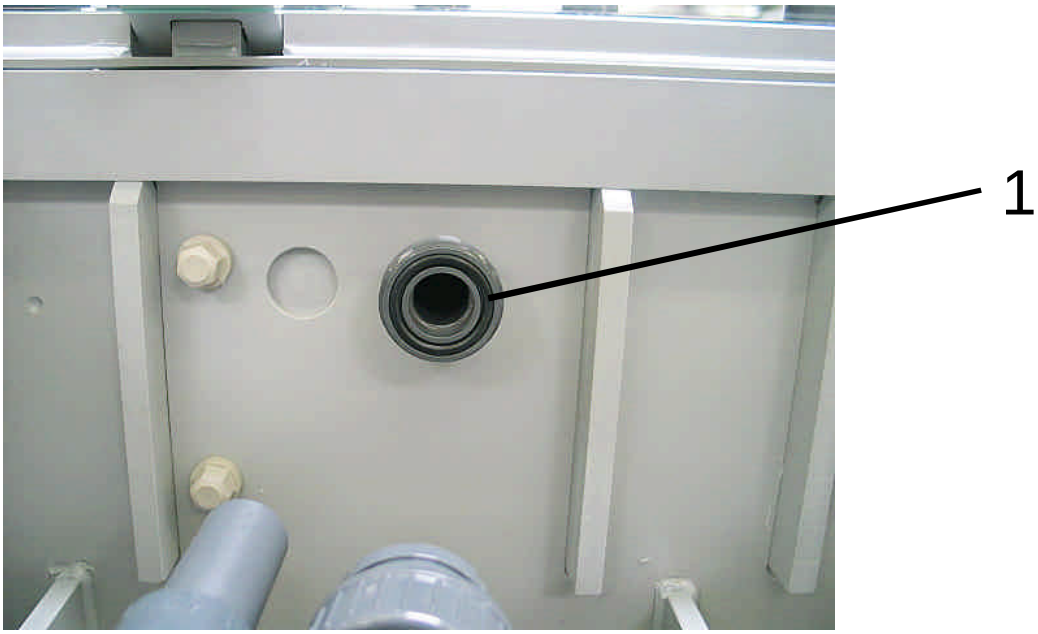
Parts without Pos.-N° see assembly parts list

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000	1/2
	00

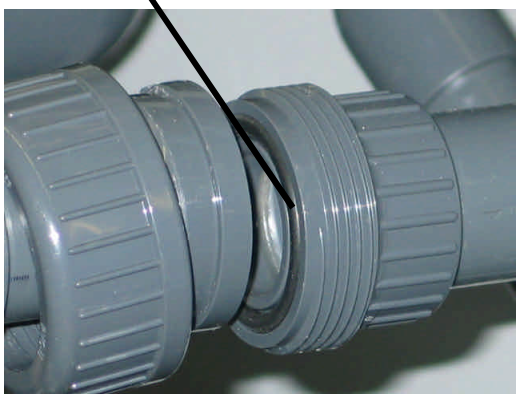


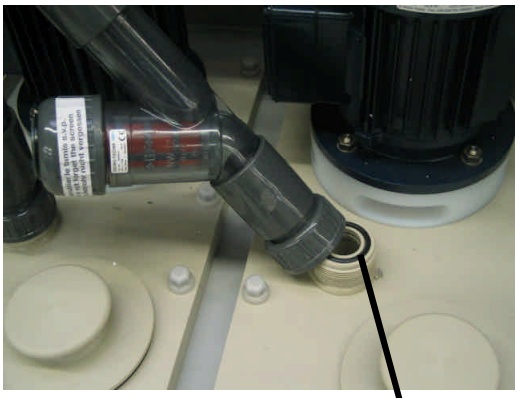


Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000 2/2 00





Assembly	: 16.005.0017.000B	Commiss.	: 25-05-377
Label	: SPRAY FRAME/A=50/KSM/BJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000100/01
Drawing	: 16.005.0017E0000	Date	: 10.04.2006

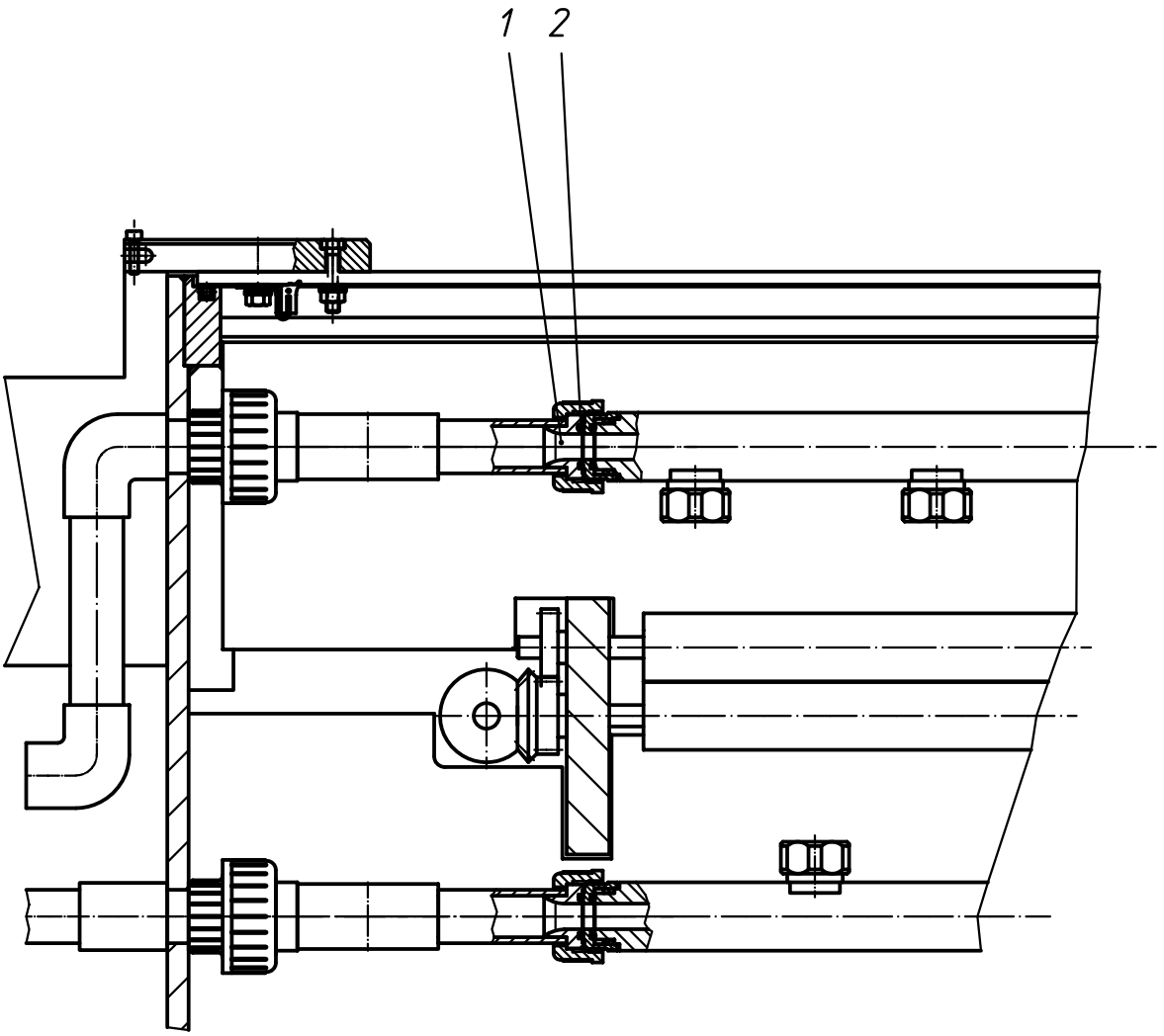
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENSTOCK

Spare parts list SPRAY FRAME

16.005.0017E0000	11
	00



Assembly	: 16.05.KS00.42.0A	Commiss.	: 25-05-377
Label	: INLET/2AS/PVC/DIRT CATCHER D=40	Position	: 000050
Quant.	: 2,000 ST	Page	: 000101/01
Drawing	: 16.05.KS00E00.00	Date	: 10.04.2006

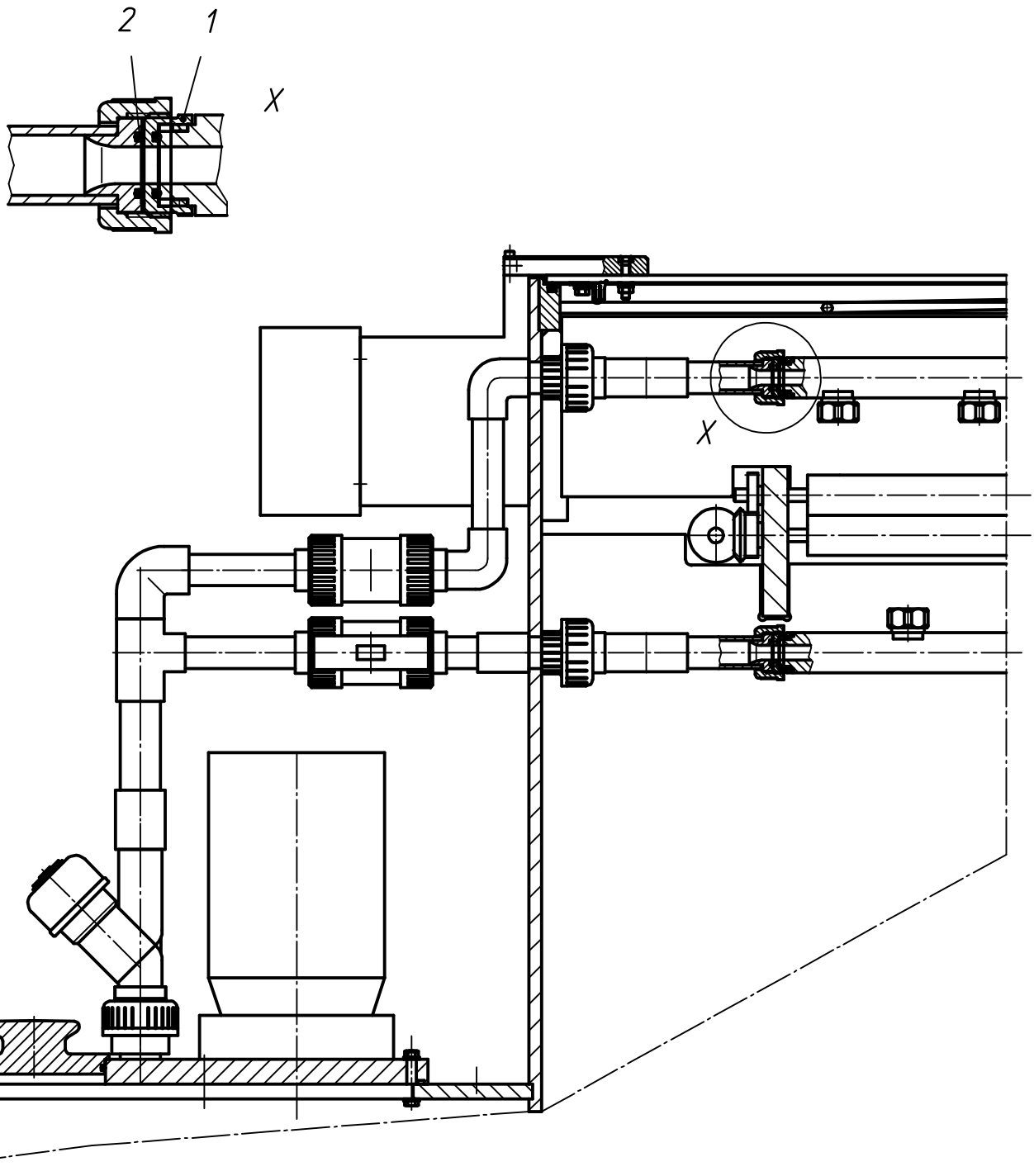
Pos.	Part N° / Label	Quant.	Unit	SP
	16.005.0091.U80A INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	1,000	ST	
1	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF KSM-KAMMER

Spare parts list INFLOW

16.05.KS00E00.00 | 11/01



Assembly	: 16.005.0091.U80A	Commiss.	: 25-05-377
Label	: INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	Position	: 000050
Quant.	: 1,000 ST	Page	: 000102/01
Drawing	: 16.005.0091EU000	Date	: 10.04.2006

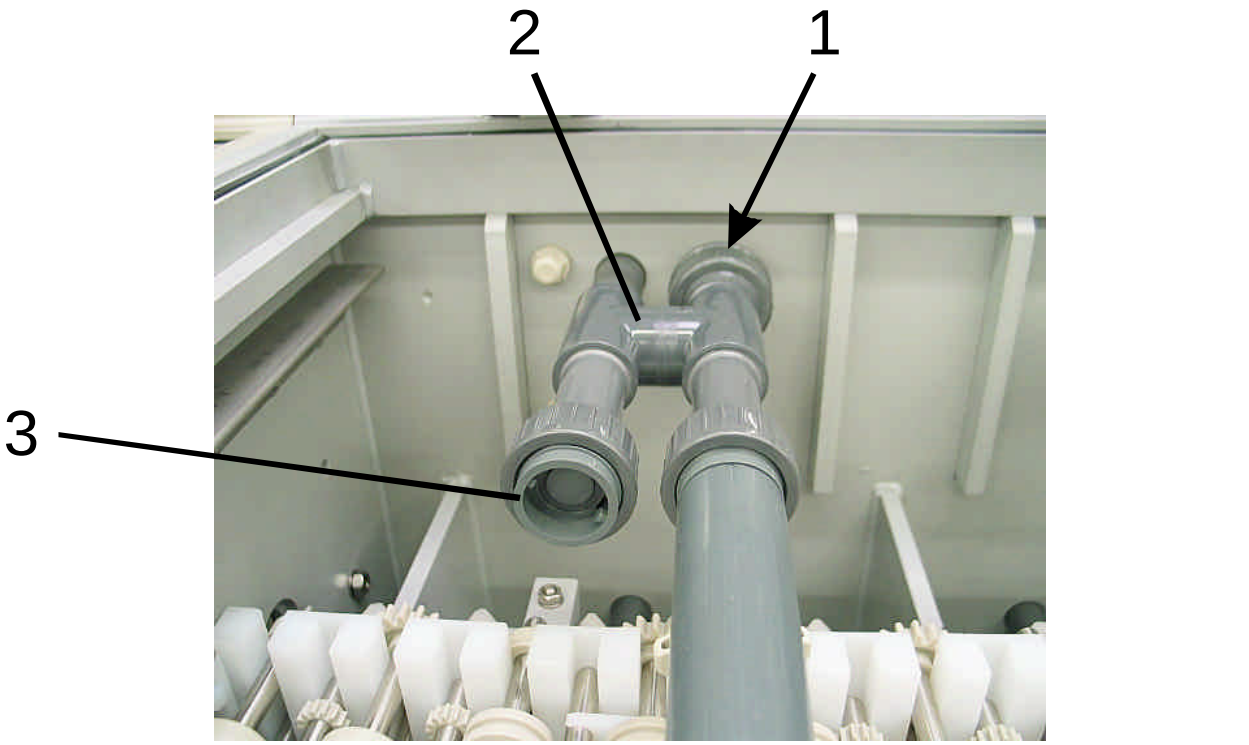
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-216 O-RING/EPDM/BLACK/028.17x3.53	2,000	ST	X
2	16.005.0017.000B SPRAY FRAME/A=50/KSM/BJ	2,000	ST	X
3	03.005.0675.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=00	4,000	ST	X
4	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
5	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
6	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

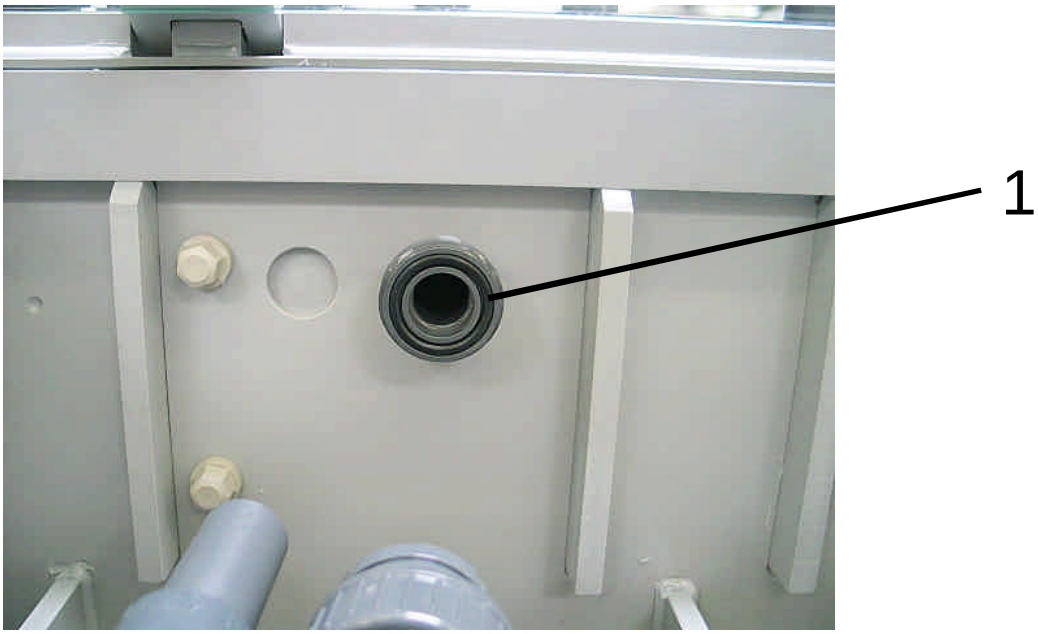
Parts without Pos.-N° see assembly parts list

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000	1/2
	00

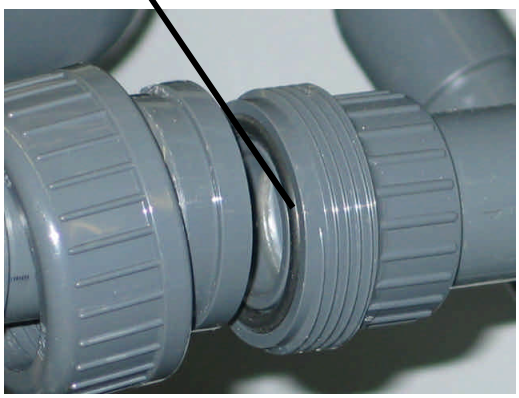


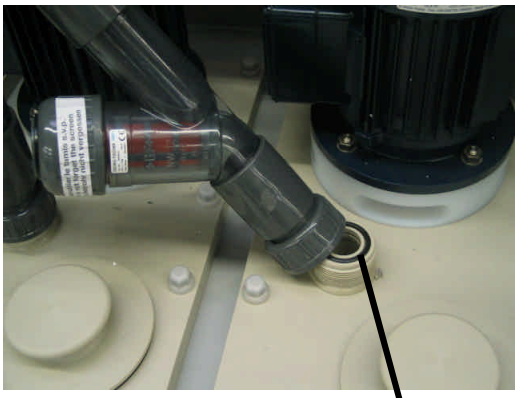


Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000 2/2 00





Assembly	: 16.005.0017.000B	Commiss.	: 25-05-377
Label	: SPRAY FRAME/A=50/KSM/BJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000103/01
Drawing	: 16.005.0017E0000	Date	: 10.04.2006

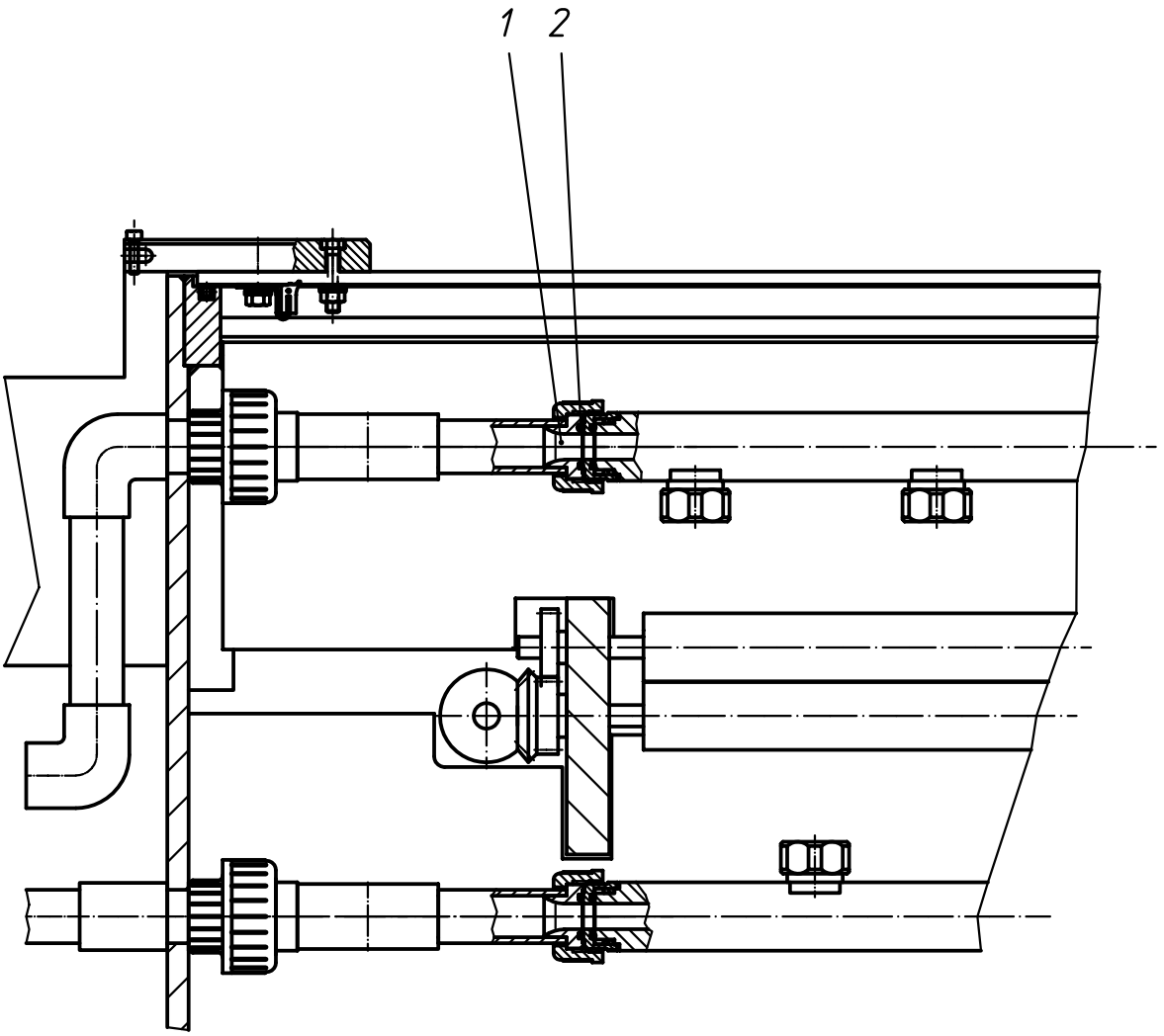
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENSTOCK

Spare parts list SPRAY FRAME

16.005.0017E0000	11
	00



Assembly	: 16.05.KS00.32.0A	Commiss.	: 25-05-377
Label	: INLET /2AS/-SF/PVC	Position	: 000050
Quant.	: 1,000 ST	Page	: 000104/01
Drawing	: 16.05.KS00E00.00	Date	: 10.04.2006

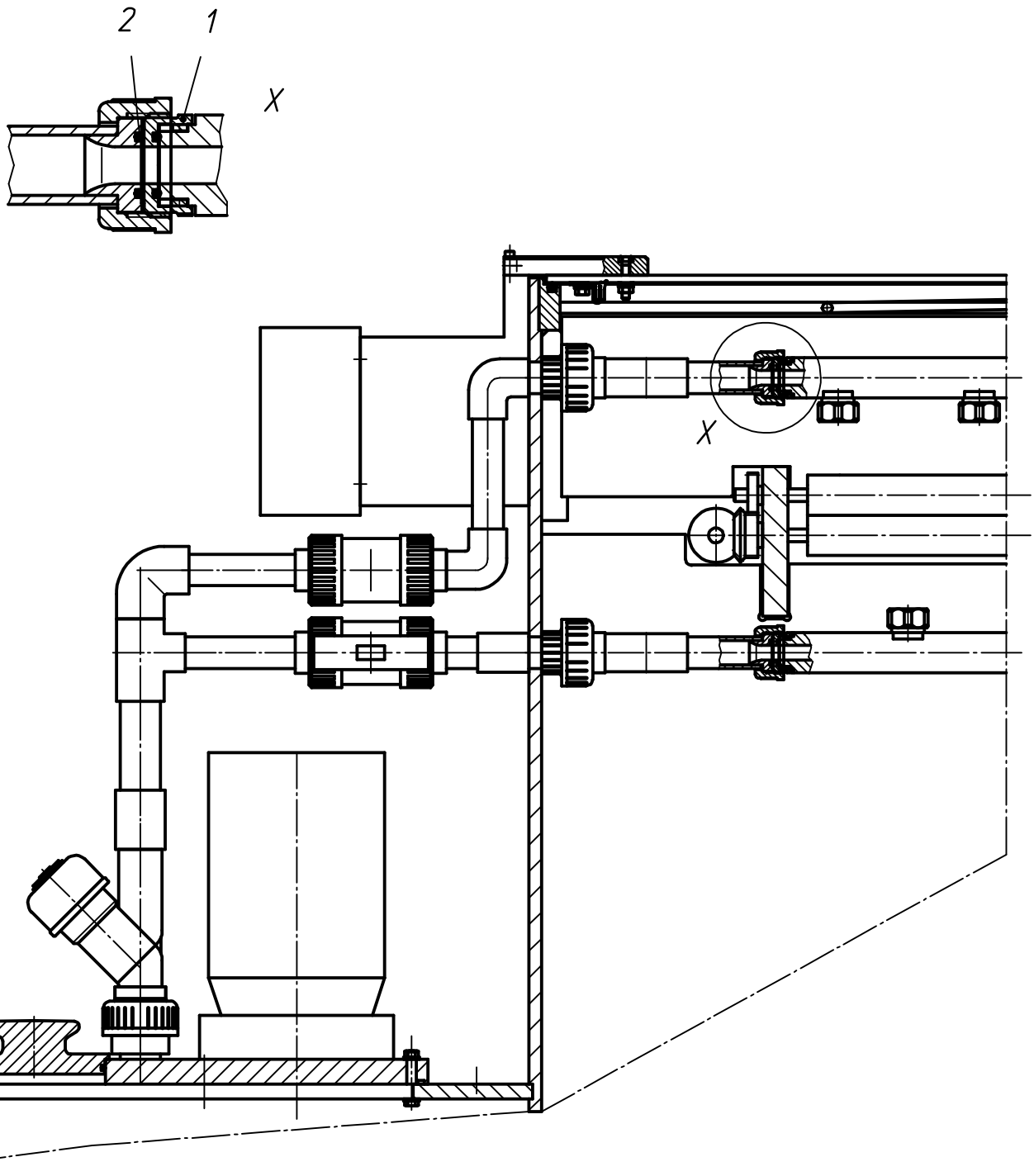
Pos.	Part N° Label	Quant.	Unit	SP
	16.005.0084.U000 INLET/KSM-CHAMBER/PVC/EP/CF	1,000	ST	
1	03.005.0460.000C PIPE COVER END CAP/PVC-C/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF KSM-KAMMER

Spare parts list INFLOW

16.05.KS00E00.00 | 11/01



Assembly	: 16.005.0084.U000	Commiss.	: 25-05-377
Label	: INLET/KSM-CHAMBER/PVC/EP/CF	Position	: 000050
Quant.	: 1,000 ST	Page	: 000105/01
Drawing	: 16.005.0084EU000	Date	: 10.04.2006

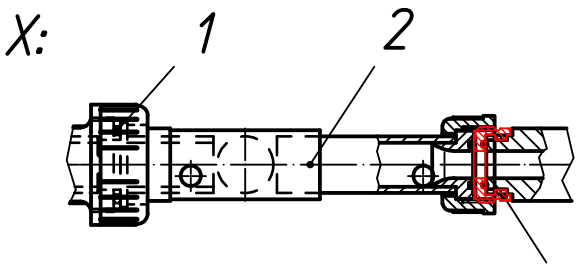
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-216 O-RING/EPDM/BLACK/028.17x3.53	2,000	ST	X
2	16.005.0017.000B SPRAY FRAME/A=50/KSM/BJ	2,000	ST	X
3	03.005.0675.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=00	4,000	ST	X
4	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF

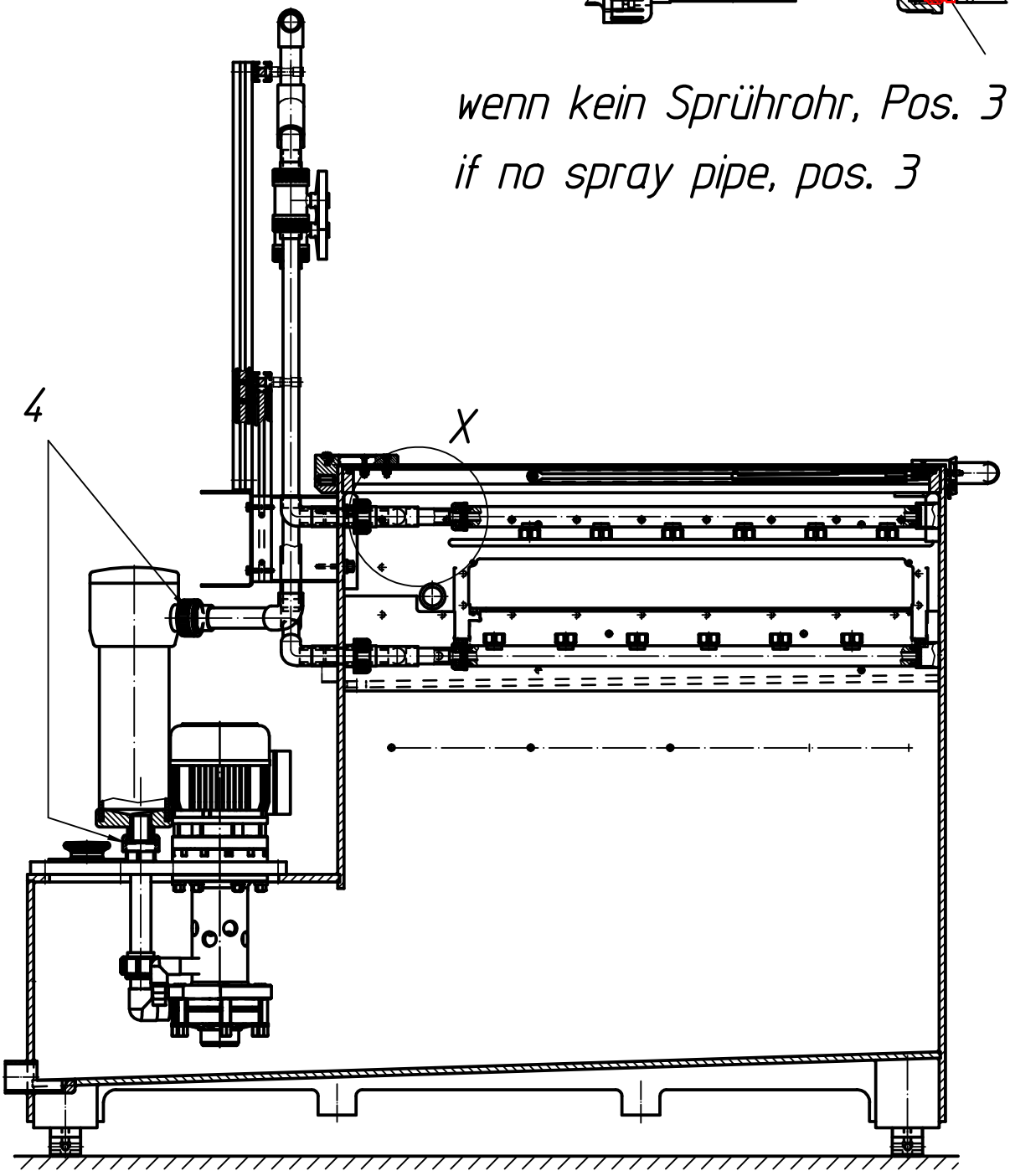
Spare parts list INLET

16.005.0084EU000	1/1
	01



wenn kein Sprührohr, Pos. 3

if no spray pipe, pos. 3



Assembly	: 16.005.0017.000B	Commiss.	: 25-05-377
Label	: SPRAY FRAME/A=50/KSM/BJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000106/01
Drawing	: 16.005.0017E0000	Date	: 10.04.2006

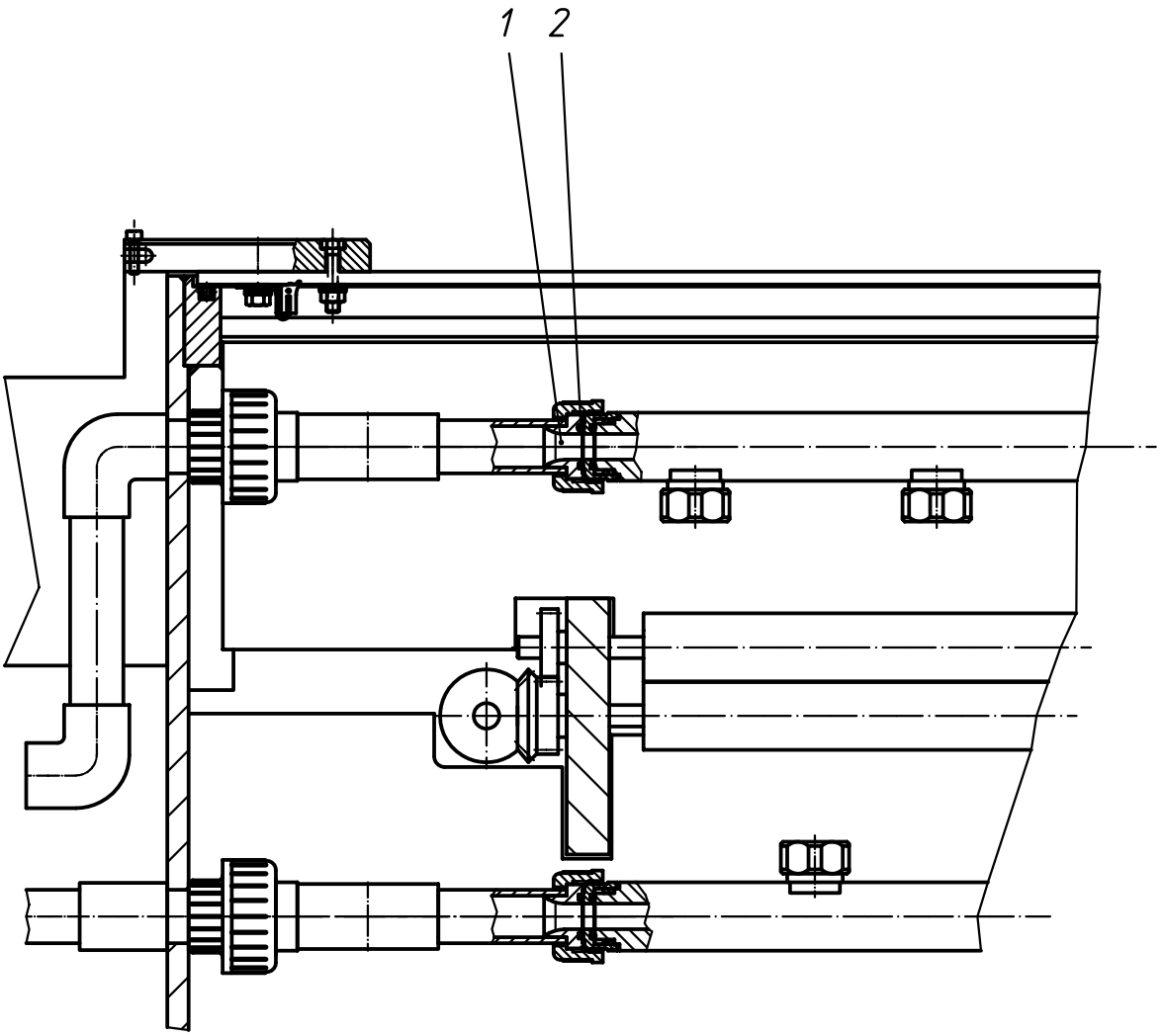
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENSTOCK

Spare parts list SPRAY FRAME

16.005.0017E0000	11
	00



Assembly	: 16.005.0008.2H1B	Commiss.	: 25-05-377
Label	: SPRAYPIPE/PVC-D/ 650/ 6D/F/G/ 8,04L/MIN	Position	: 000050
Quant.	: 4,000 ST	Page	: 000107/01
Drawing	: 16.005.0008E0000	Date	: 10.04.2006

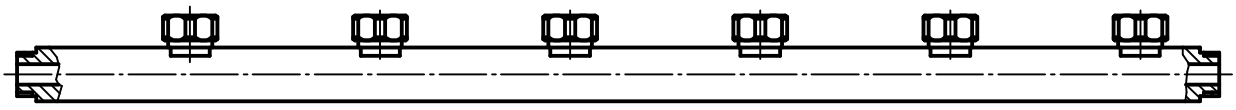
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000166-000 SEAL-NUT/PPNR.065.202.53.00.001	6,000	ST	X
2	DÜ-000000071-000 NOZZLE/652.516.5EFU1/BJ/PVDF/90°	6,000	ST	X
3	DI-000000133-000 SEALING RING EPDM/18,4x10x3 MM	6,000	ST	X

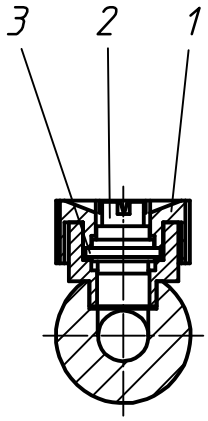
Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPRÜHROHR KPL.

Spare parts list SPRAY PIPE CPL.

16.005.0008E0000	11
	01





Assembly	: 16.005.0206.2A4A	Commiss.	: 25-05-377
Label	: BLAST PIPE CPL./0650/H80/BJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000108/01
Drawing	: 16.005.0030E0000	Date	: 10.04.2006

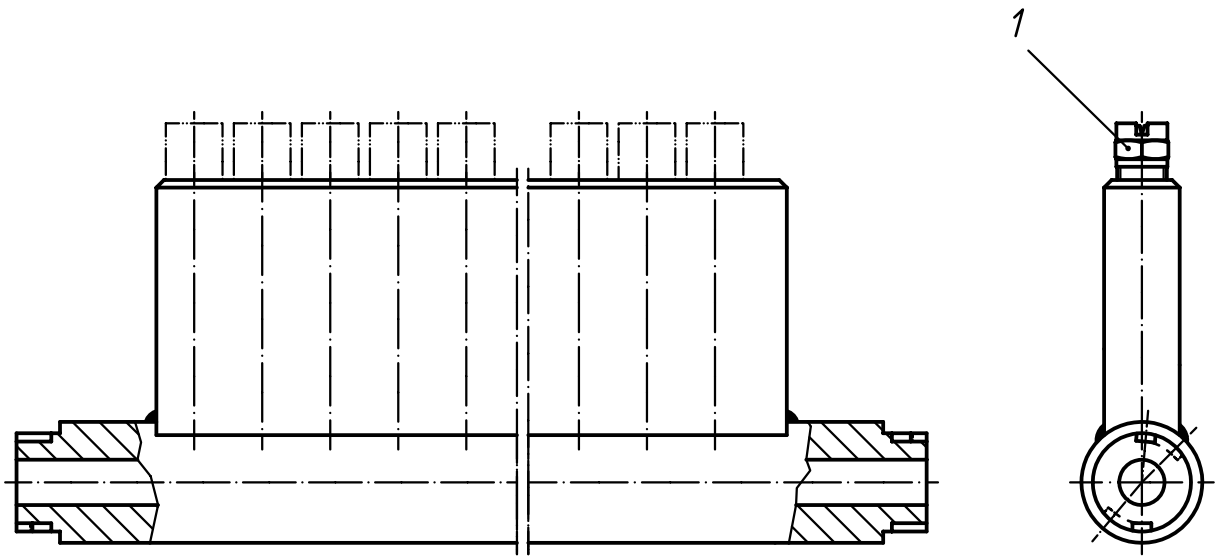
Pos.	Part N° / Label	Quant.	Unit	SP
1	DÜ-000000004-000 NOZZLE/632.516.5E.BC/1/4"/NPT/PVDF/90°	17,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENROHR KPL.

Spare parts list Blast pipe cpl.

16.005.0030E0000	11
	02



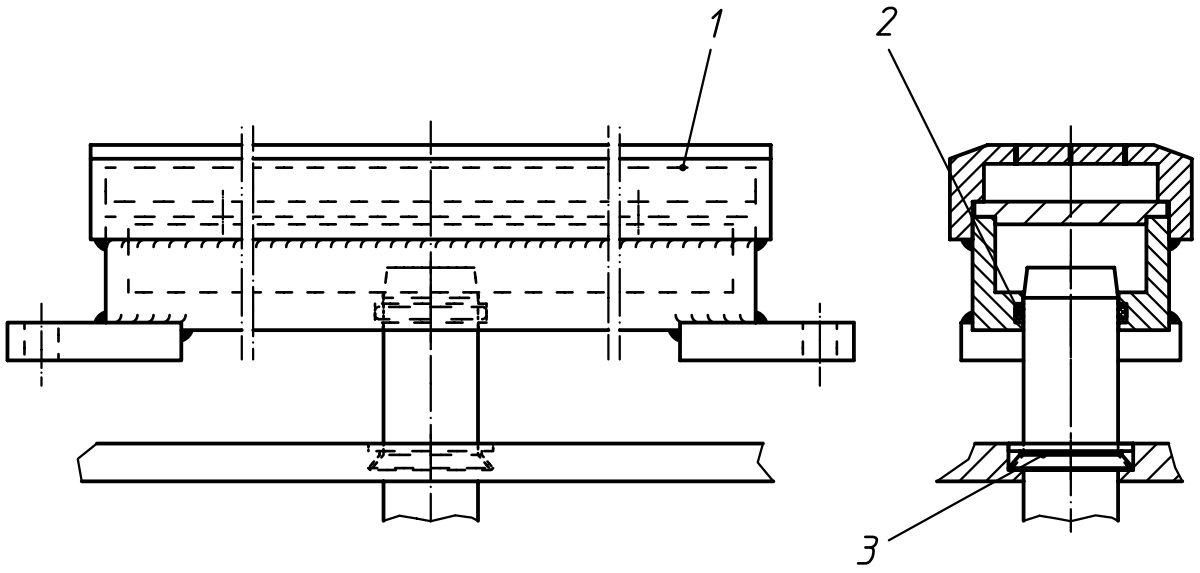
Assembly	: 16.061.0024.U00N	Commiss.	: 25-05-377
Label	: STANDING WAVE/PVC/TIT/KSM/+SW	Position	: 000050
Quant.	: 1,000 ST	Page	: 000109/01
Drawing	: 16.061.0024EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	16.061.0028.200E FLOOD BOX/PP-G/0650	1,000	ST	X
2	DICH0580-120 O-RING/EPDM/BLACK/025.07x2.62	1,000	ST	X
3	DICH1080-V25A V-RING V25A/EPDM	1,000	ST	X

Ersatzteilliste STEHENDE WELLE KSM

Spare parts list STANDING WAVE KSM

16.061.0024EU000	11
	00



Assembly	: 16.008.0004.U003	Commiss.	: 25-05-377
Label	: PUMP FIXING/TI/PP-G/EPDM	Position	: 000050
Quant.	: 4,000 ST	Page	: 000110/01
Drawing	: 16.008.0004EU000	Date	: 10.04.2006

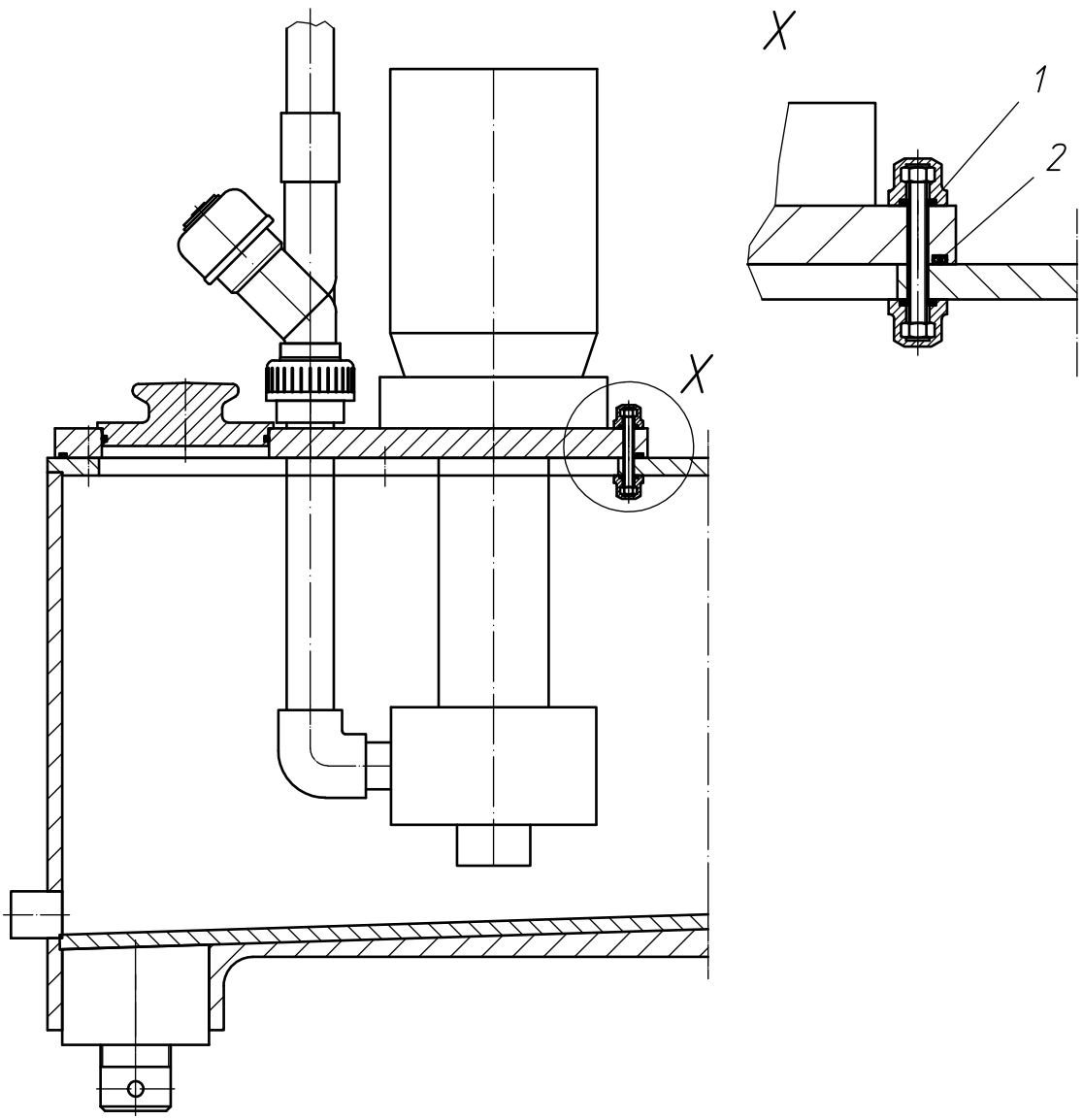
Pos.	Part N° / Label	Quant.	Unit	SP
1	DI-000000076-000 O-RING/EPDM/BLACK/8.00x2.40 MM	8,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,250	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste PUMPENBEFESTIGUNG

Spare parts list PUMP FIXTURE

16.008.0004EU000	1/1
	02



Assembly	: 50.003.0008.U000	Commiss.	: 25-05-377
Label	: TA/AS/0.37kW/OF/ET=270/ETLB-25-125	Position	: 000050
Quant.	: 4,000 ST	Page	: 000111/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	PUTA000300-00817 TA/ETLB-25-125/AS/00/0.370kW/50 Hz	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Tauchpumpe

Spare parts list Immersion pump

PUTA_____-00817 | 11 / 00

Bitte bei Bestellung angeben:
To be indicated on order:

PUTA000300-00817 / PUTA 063300-00817
ETLB 25-125 230/400V/50Hz 0.37kW
/ 60 Hz

Stübbe®

1. General

This pump/unit may not be operate beyond the limit values specified in the technical documentation for the medium handled, capacity, speed, density, pressure, temperature and motor rating. Make sure that operation is in accordance with the instructions laid down in this manual or in the contract documentation. (Contact the manufacturer, if required). The indification plate indicates the type series/size, main operating data and production number; please quote this information in all queries, repeated orders and particularly when ordering spare parts.

2. Safety

These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel/ operators prior to installation and commissioning, and it must always be kept close to the location of operation of the pump/unit for easy access.

2.1 Marking of Instructions in the Manual

The safety instructions in this manual whose non-observance might cause hazards to persons are specially marked with the general hazard sign, namely

safety sign in accordance with DIN 4844 - W9.

The electrical danger warning sign is safety sign in accordance with DIN 4844 - W8.

The word Attention is used to introduce safety instructions whose non-observance may lead to damage to the pump and its functions.

Attention

Instructions attached directly to the pump, e.g.

- arrow indicating the direction of rotation
- markings for fluid connections

must always be complied with and be kept in perfect legible condition at times.

2.2 Personnel Qualification and Training

All personnel involved in the operation, maintenance, inspection and installation of the pump must be fully qualified to carry out the work involved. Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the requisit know-how, appropriate training and instruction must be provided. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

2.3 Non-compliance with Safety Instructions

Non-compliance with instructions can jeopardise the safety of personnel, the environment and the pump itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.
In particular, non compliance can, for example, result in:

- failure of important pump/unit functions
- failure of prescribed maintenance and servicing practices
- hazard to persons by electical, mechanical and chemical effects
- hazard to the environment due to leakage of hazardous substances.

2.4 Safety Awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.

2.5 Safety Instructions for the Operator/User

- Any hot or cold components that could pose a hazard must be equipped with a guard by the operator.
- Guards which are fitted to prevent accidental contact with moving parts (e.g. coupling) may not be removed whilst the pump is operating.
- Leakages (e.g. explosive, toxic, hot) must be contained so as to avoid any danger to persons and the environment. Pertinent legal provisions must be adhered to.
- Elecrical hazards must be eliminated. (In this respect refer to the relevant safety regulations applicable to different countries and/or the local energy supply companies.)

2.6 Safety Instructions for Maintenance, Inspection and Installation Work

The operator is responsible for ensuring that all maintenance, inspection and installation work to be performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
The pump must have cooled down to ambient temperature. It must be drained and its pressure must be released. Work on the pump must be carried out only during standstill. The shutdown procedure described in the manual for taking the pump out of service must be adhered to without fail. Pumps or pump units handling media injurious to health must be decontaminated. Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and/or reactivated. Please observe all instructions set out in the chapter on Commissioning before returning the pump to service.

2.7 Unauthorised Modification and Manufacture of Spare Parts

Modifications or alterations of the pump are only permitted after consultation with the manufacturer. Original spare

parts and accessories authorised by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.

2.8 Unauthorised Modes of Operation
The warranty relating to the operating reliability and safety of the pump/unit supplied is only valid if the pump is used in accordance with its designated use as described in the following sections. The limits stated in the data sheet may not be exceeded under any circum-stances.

3. Transport and Interim Storage

3.1 Transport
Transport of the pump requires proper preparation and handling. Always make sure that the pump or the unit remains in horizontal position during transport and cannot slip out of the transport suspension arrangement. Do not use lifting sling on the free shaft end of the pump or on the motor eyebolt.

If the pump/unit slips out of the suspension arrangement, it may cause personal injury and damage to property!

3.2 Interim Storage
Each ASV pump leaves the factory carefully assembled. If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump storage:
Store the pump in a dry location! Rotate the rotor by hand once a month. Protect all stored goods against humidity, dirt, vermin and unauthorised access! All openings of the assembled unit components are closed and must only be opened when required during installation.

4.1 Environment influences
All parts in contact with the fluid are made of thermo-plastic material. Other external metal parts, e. g. housing, motor as well as motor bracket, are protected against corrosion by paint.

- It is understood according to the constuction principle and the regulations all external metal parts must not necessarily be resistant.
  Any wetting of external metal parts with aggressive fluids from leakages of the plant has to be avoided. At any leakage of the sealing system the ASV-service should be called.

4.2 Wetness, plant leakages

- On extreme wetness at the installation locations - rain, condense water especially on plant leakages - protections against corrosive influences have to be arranged.
  This is especially due for electrical drivers, switches, measuring instruments and so on.
- Components made of thermoplastic material or elastomers should not be wetted by other fluids than those mentioned in the original order.
  It is recommended not to get them in contact with
- synthetic and mineral oils and grease
- solvents and cleaning agent and/or other chemical material especially such of which the components are not known

4.3 Operating and ambient temperature

- For maximal allowed operating temperature of the pump the recommended values in our pump leaflet are to be taken care of.
- Ambient temperature above +40 °C are to be forwarded to ASV for proper checking.
  Eventually the motor shows a reduced efficiency. At the location of installation a very good circulation and ventilation is to be taken care of.

4.4 Vibrations, shocks

- Vibrations and shock having external influences to pump and drive must follow the limit values of the VDI recommendation.

4.5 Mechanical load

- External mechanical load on pump or drive because of weight of the plant equipment are unacceptable.
- Pipeline and valves have to be supported in order not to load their weight on the pump.
- Any longitudinal extension of the pipeline because of operating temperature should also not cause any load on the pump. Eventually a compensator must be installed.

4.6 Electricity

Connection to the power supply must be effected by a trained electrician only.

- The drive of the pump has to be grounded according to DIN VDE 0113. At dangerous fluids (ChemG) internal or other instruction have to be observed.
- At pumping electrolyte - conductive fluids - with potential differences to the parts of the pump the pump must be grounded.

It exists the possible danger of electrochemical corrosion at metal parts in contact with the fluid especially it concerns the mechanical seal.

4.7 The protection of health and UVV
as well as the regulations and warnings for „Security and environment protections" as well as the local and/or internal regulations have to be attended at any installation by the operator on his own responsibility.

Attention! Non-observance of this operating and maintenance instruction manual or the use of the pumps for other operating conditions than actually

agreed upon is not in accordance with the regulation for this application.

4.8 For any consequences the operator is responsible.

- The operator of the pump has to inform all personal entrusted with works at the pump about the potential danger at this place and/or the complete plant and has to make sure that all precaution for proper working condition and regulation of the protection of health have been taken care of.
- Subject of a safe installation with proper function of the pump later is the qualification of the personel respectively. All persons in charge have to be acquainted with the operating manual and the usual technical regulations and have to follow them.

Please pay maximum attention to this installation and starting instruction of the pumps as we do not accept any claim of damages in case of not following the instructions.

4.9 Application

ASV-Thermoplastic vertical sump pumps are used for transportation of acids, caustic solutions as well as abrasive, aggressive and neutral fluids.

4.10 Examination/Test

Before each pump is leaving our factory a functional test is executed by controlling the capacity, head and current consumption acc. to DIN 1944. Test certificates for guaranty purpose acc. to DIN 19944-II are available against extra charge.

4.11 Guaranty

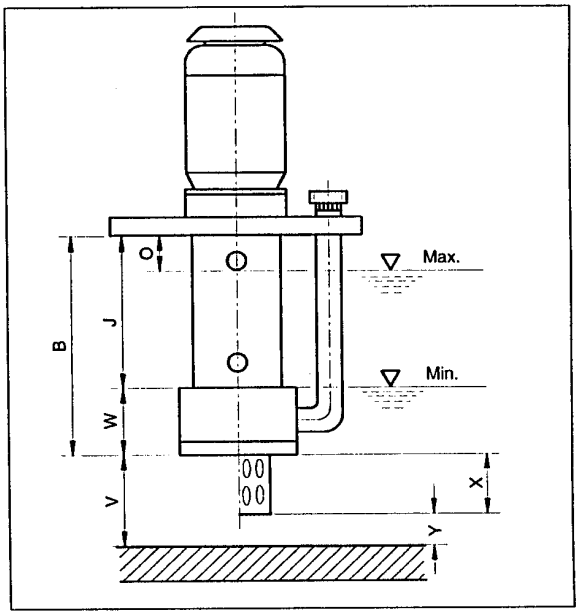
The time of guaranty is stipulated in our General Delivery- and Payment Conditions. For the resistance of the material we guarantee only if the operation conditions are known to us at the time of offering the pump.
Within the time of guaranty repair work or any alteration should only be arranged by our engineers or with a written confirmation by us. In case of any necessary repair we recommend to call one of our technician or to return the pump to our factory if trained personal is not available at your factory. Please send your requirements for spare parts to our sales department for pumps.

5. Mounting and installation

5.1 Mounting

The ASV-Thermoplastic-Vertical Pumps ETLB has to be mounted with holding down bolts or fastening elements on a plane, stable base.
The connections of the pipework are carried out in accordance with DIN 24256.

Attention! Pump unit to be kept free of tension and stress when fastening the fixing screws. Eventually the installation area has to be levelled.



Size ETLB	O min. mm	V min. mm	J[1] mm	J[2] mm	x min. mm	Y mm
15-60	30	60	206	406	80	10
20-100	30	60	192	392	100	10
25-125	30	60	192	392	100	10
32-125	30	60	185	385	125	10
32-160	30	60	155	355	125	10
40-125	30	60	155	355	150	10
40-160	30	60	155	355	150	10
50-125	30	60	155	355	125	10

1) Standard depth B = 275 mm 2) Standard depth B = 475 mm

The distance between the end of the suction pipe and the bottom of the sump may not be less than 60 mm.

Liquid level »Max.«

- Highest permissible liquid level
- At level control: Upper shift-point.

Liquid level »Min.«

- During every starting of the pump:
  Lowest permissible liquid level at standard suction connection and/or foot valve!
- At level control: Lower shift-point at starting.
- The size »W«, the liquid cover of the pump housing must be increased by rising working temperature.

5.2 Installation of pipeline

The pump should not be loaded by the force of the connected pipeline. The nominal width of the connected pipeline has correspond with the pressure connections of the pump. Pipe connections with the pump should be made without stress and vibration. In case of flange connections the tightening of the screws may not cause twist or tension.
A gasket should not reach into the open area of the pipe. Only suitable elastomer gaskets and seals have to be used. Do not use hard and unelastic seals. Line offsets must be avoided in case of flange connections.

5.3 Pressure Line

The velocity of flow in the pressure line should not be more than 3 m per second, the sizes of the pipework are determined by economy aspects. Install a shut-off or diaphragm valve near to the pump in the pressure line. In case of shut-off of the pump a non-return valve should be mounted in the pressure line, if the reverse flow is large or a higher pressure is available.

5.4 Water hammer

At long pressure pipe lines as well as at the use of automatic valves with short closing and opening time a slow down (switch off/closing) or an acceleration (start/opening) of the flowing fluid head might occur with a considerable pressure fluctuation and a so called water hammer in the pipe line. Water hammer may cause considerable damages or even destroy the pump or other plant equipment.
To reduce the danger of water hammer the following should be done or installed:

- Automatic valves with slowed down closing and opening time.
- The velocity of the flow in the pipeline is to be reduced which means to choose a larger diameter (DN) of the pipeline and/or to use pressure regulating valves to avoid water hammer, for example ASV-pressure relief valves, type 715/716/725.

6. Operation of pump

6.1 Before starting the pump

1. Before the pipelines will be connected with the pump the complete pressure-pipework especially the connected containers on suction side the pump sumps and other installations have to be cleaned carefully (solidfree) and to be flushed sufficiently from time to time with neutral fluid (water).
   Dirt and solids - residue from welding, waste from mounting and packagings etc. - will cause damages on the pump on the start-up afterwards.

2. Before the pump is connected with the installed pipelines/pipework the delivery line have to be tested separately for tightness and to be examined acc. to the respective regulations of compression trials.
   - The compression trial has to be carried out with a neutral fluid (water).
   - Testpressure:
   - 1,5 x operating pressure, - 1,5 x PN = max 15.0 bar or
   - acc. to the respective regulations but not higher than 15,0 bar !

   Attention! The pump may never be involved in a compression trial. Damages on the pump will be the effect and leakages can occur.

3. Check the Max.- and Min. liquid level (see page 5). Due to the construction of the ETLB pump the distance between the mounting plate and the max. liquid level may not be less than 30 mm.

Attention! At every tank evacuation it is neccessary to check the minimum liquid level before starting the pump.

Check motor-voltage and protective switch.
Do not run the pump dry.
Pay attention to the direction of rotation of the pump (arrow on the pump). Check by shortly switching on and then off again.

6.2 Start up

Please open the valve a little bit on the pressure side in order to remove the air better by starting the pump. Start the motor, open the valve on the pressure side until the operating point is reached.

6.3 Operation

Do not run pump for longer time against closed valve. This would lead to thermal damages in the pipeline and pump. For longer closing time of the valve a bypass has to be installed to return the fluid to the pump sump or tank.

In order to secure trouble free function of the ASV-Vertical Sump Pump ETLB, please pay attention to the following points:

1. The pump should run noiseless and free of vibrations.

2. E-Motors should be loaded only with the respective rated capacity.

3. E-Motors with more than 7,5 KW should be started in Y-delta connection to avoid currents at make.

4. For the pump material the fixed max. operating temperature has to be observed (for PP max. +70 °C and for PVDF max. +90 °C, depending on the chemical, thermal and mechanical stress - see ASV-Resistance-table).

5. Please also observe that at start-up of the pump the fluid level reaches at least the upper edge of the spiral casing in order to guarantee proper function. This is also important in cases where the pump operates with an extended suction pipe.

6.3 Switch-Off

1. The shut-off valve in the pressure line has to be adjusted to the minimal rate or to be closed.
2. Switch off the E-motor.
3. Close the shut-off valve in the suction line.
4. If the fluid crystallizes out, the pump should be cleaned with suitable resolvents, the evacuation can be arranged with the drain-valve of the suction line or the pump.

7. Maintenance

The Vertical Sump Pumps ETLB are maintenance-free.

8. Dismantling and Reassembly General Instructions

Before dismantling, secure the pump so as to make sure it cannot be switched on accidentally.
The shut-off valves in the pressure line must be closed.
The pump must have cooled down to ambient temperature, it must be drained and it must be decontaminated, if necessary.
Repair and maintenance work to the pump must only be carried out by specially trained personnel, using original spare parts.
Observe the safety regulations laid down in sections 2.
Any work on the motor shall be governed by the specifications and regulations of the respective motor supplier.
Diamantling and reassembly must always be carried out in accordance with the relevant general drawing.
Make sure the pump unit and the individual components cannot tip over during dismantling.

8.1 Dismantling ETLB 25 - 125 and 32 - 125

1. Remove the spiral cassing cover (Pos. 103).

Attention! Left-handed thread!

2. Loosen the impeller cap (260) with O-ring (412.4).
3. Remove the hexagonal nut (920.1) with spring-washer (934), plate (550) and key (940.2).
4. Pull off the impeller (230) with the shaft protection sleev from the motor shaft.

The bearingless ASV-Vertical-Pumps ETLB are equipped with high-quality V-rings to protect the bearings in the dry area.

For their change:

1. Unscrew the hexagonal nuts (920.4).
2. Pull off the base plate with support tube (713).
3. Remove the diffuser disc (558).
3. Dismount the V-rings (507) with seal cover (444) and change the V-rings.

8.2 Reassembly

Attention! Clean all dismantled components and check them for signs of wear.
Damaged or worn components are to be replaced by original spare parts.
Make sure that the seal faces are clean and that V-rings and O-rings are properly fitted.

Reassembly is effected in reverse order to dismantling.
Use the general drawing and the list of components for orientation. All screws and bolts must be properly tightened during assembly.

8.3 Tightening Torques Nm

	Tightening torques Nm		
Thread	1)	2)	3)
M 6	9	6	5
M 8	21	7	6
M 10	42	14	10
M 12	73	24	25
M 16	170	63	30
M 20	340	113	32
M 24	580	193	34

1) Screw connection between metal-to-metal
2) Screw connection between plastic-to-plastic
3) Screw connection with self-tapping insert

11. Failure, Possible reason and Repair

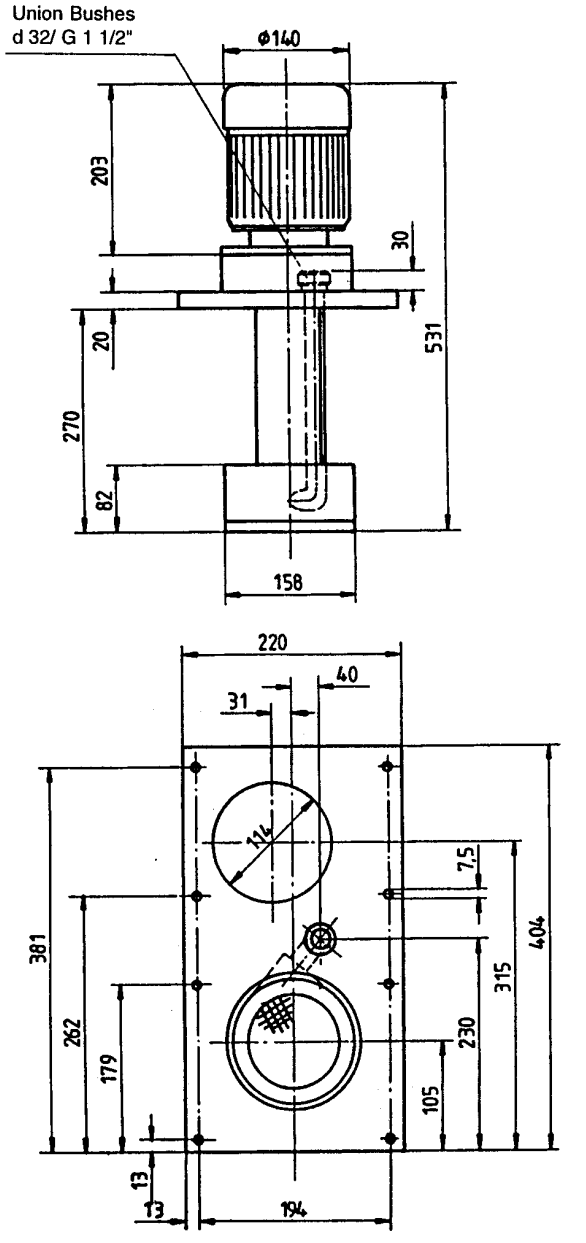
Failure	Possible reason	Repair
11. 1 Pump does not deliver.	11. 1. 1 Direction of motor is wrong.	Two supply cable are mixed.
	11. 1. 2 Level of fluid to be pumped is too low. Pump not sufficiently filled.	Check level and fill pump, remove air.
	11. 1. 3 Pump sucks air.	Suction line, footvalve and mechanical seal to be checked on air tightness.
	11. 1. 4 In suction line an air bag is included.	Install pipe line properly so that air can evacuate. Install gate valve with handle at side.
	11. 1. 5 Available back pressure is bigger than max. pressure of pump.	Size of pump not correctly selected. Advise exact delivery conditions.
11. 2 Delivery of pump is too low.	11. 2. 1 Suction or supply line of pump or impeller is clogged.	Clean pipe line and eventually dismount and clean impeller.
	11. 2. 2 Air bag in pipe line.	Arrange pipe line newly and eventually install vent valve.
	11. 2. 3 Geodetic head is too high.	Increase diameter of pipe line, impeller or choose eventually a bigger pump. Please contact us!
	11. 2. 4 Resistance of pipe line is bigger than assumed.	Increase diameter of pipe line, of impeller or choose a bigger pump. Please contact us!
	11. 2. 5 Suction head too high (in case of suction operation vaporization the pump, cavitation).	Clean footvalve and suction line eventually increase diameter of suction line. Check footvalve, wether it is fully opened, eventually lower level of pump. If a pre-receiving tank is used mount a larger size
	11. 2. 6 Temperature of fluid is too high.	Reduce temperature, lower level pump.
	11. 2. 7 Viscosity of fluid is higher than originally assumed.	Dilute or pre-heat fluid

Failure	Possible reason	Repair
11.3 Pump delivers too much.	11. 3. 1 Actual head of process plant is lower as delivery head of pump.	Close valve on pressure line accordingly. Mount smaller impeller. If possible reduce RPM. Use smaller pump.
11. 4 Overload of motor.	11. 4. 1 Pump delivers too much.	Look at 11. 3. 1.
	11. 4. 2 Specific gravity or viscosity of fluid is too high.	Check delivery data, mount motor with bigger capacity.
	11. 4. 3 Impeller touches wall of pump.	Check mounting of impeller, fasten impeller cap again. Impeller deformed by too high temperature. Exchange impeller and eliminate reason for too high temperature.
	11. 4. 4 Pump deformed improper mounting.	Align pump and motor carefully on base plate and mount pipe line without any tension.
11. 5 Unquiet or unbalanced rotation.	11. 5. 1 Pump not properly aligned.	Arrange alignment of pump and motor.
	11. 5. 2 Suction head too high.	Look at 11. 2. 4.
	11. 5. 3 Diameter of suction line too small.	Increase diameter of pipe line.
	11. 5. 4 Valve at suction line too much closed.	Open it more.
	11. 5. 6 Fixing on foundation not sufficient.	Tighten foundation anchor again.
	11. 5. 7 Cavitation.	Look at 11. 2. 1, 11. 2. 5, 11. 2. 6.
	11. 5. 8 Bearing damage.	Check bearing, exchange bearing.

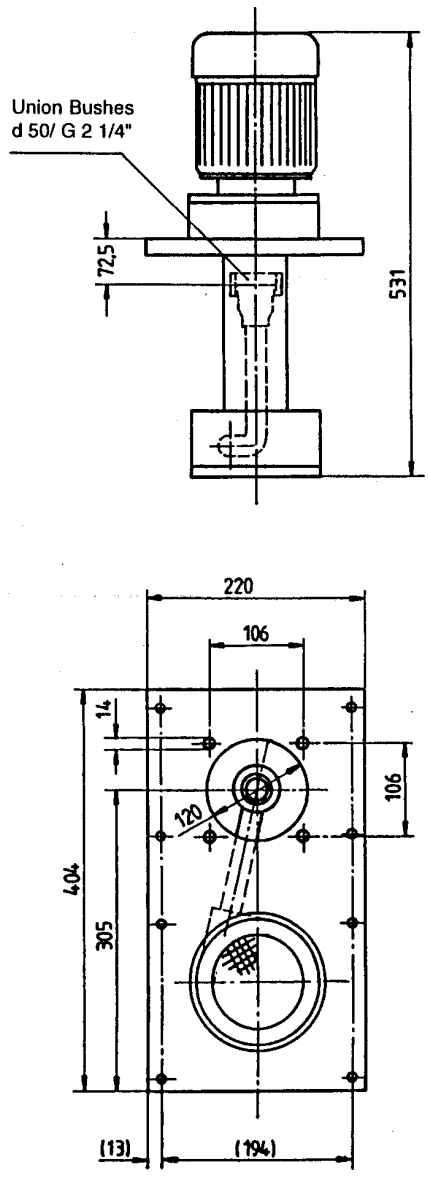
Stübbe

12. Dimensions ETLB (Schmid)

Ident-No. 86517
Ident-No. 86544



Ident.No. 86516
Ident-No. 86547



Technical details might be subjects to change

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Stübbe®

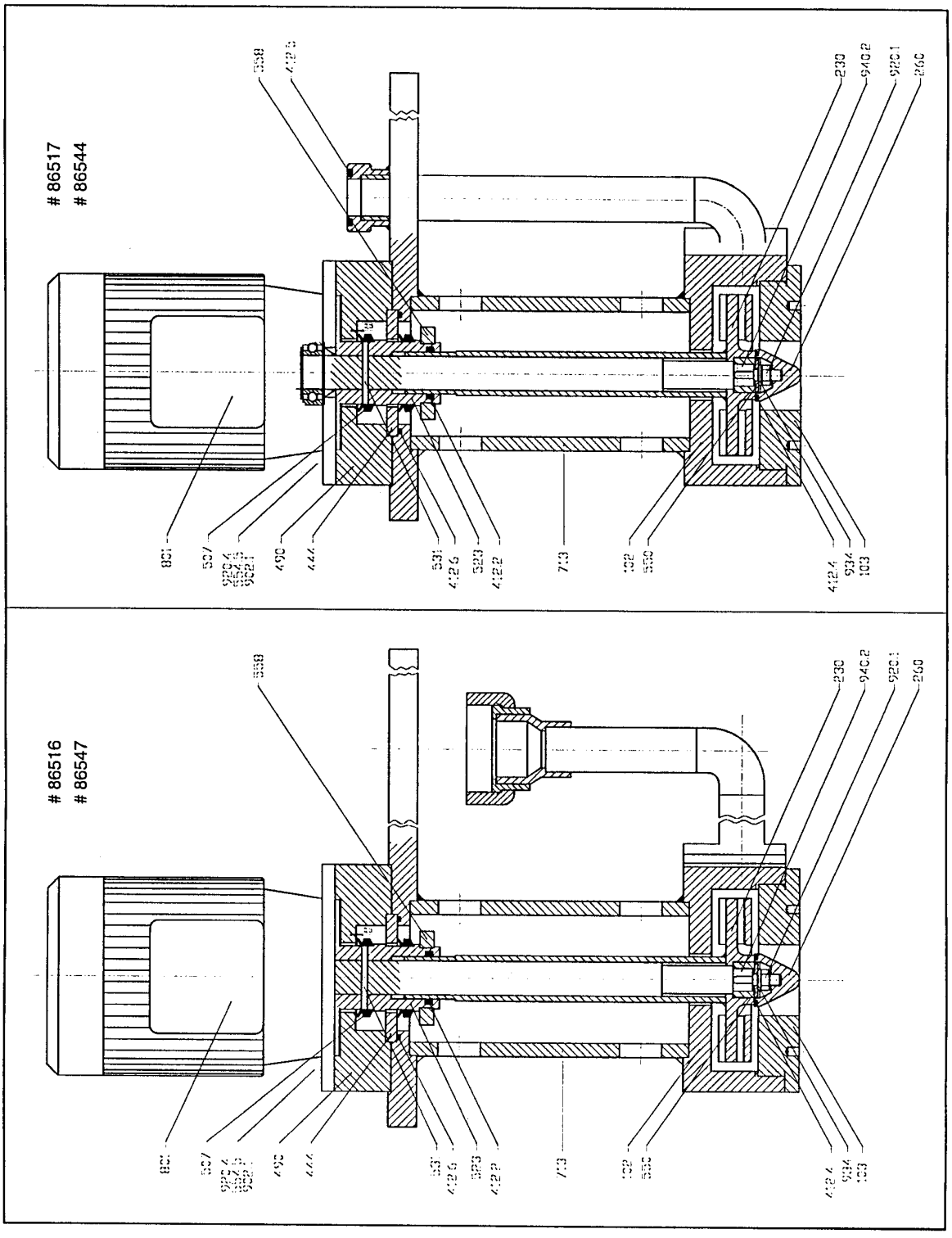
Betriebsanleitung, Schmid
Ersatzteillisten
Tauchpumpe ETLB,
Baugröße 25-125/270 mm

Operating manual, Schmid
Part Lists
Vertical sump pump ETLB,
Size 25-125/270 mm

Schmid 05/98

Art.-Nr.:	50 Hz	Art.-Nr.:	60 Hz
Ident.-No.:		Ident.-No.:	60 Hz
86516	0,37 kW	86544	0,45 kW
86517	0,37 kW	86547	0,45 kW

Stübbe

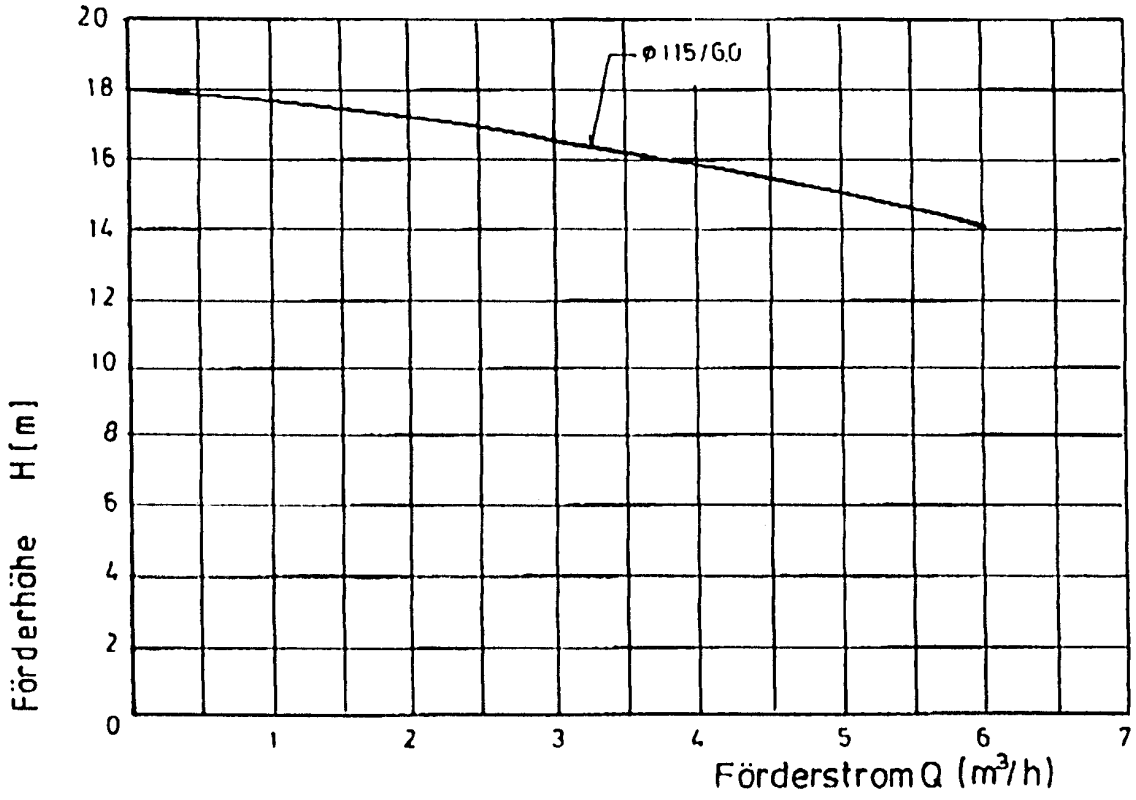


Stübbe®

Teil *Item*	Stück *Pieces*	Bennenung *Denomination*	Werkst. *Material*	Ident.-Nr.(Bestell-Nr.) / *Order no.*							
				50 Hz				60 Hz			
				86516	86517			86544	86547		
103	1	Gehäusedeckel *Casing cover*	PP	83926	83926			83926	83926		
230.1	1	Laufrad mit Wellenschutzrohr *Impeller with shaft protection*	PP	86522	86522			86546	86546		
260	1	Laufradkappe *Impeller hub cap*	PP	56308	56308			56308	56308		
412.2	1	Runddichtring *O-Ring*	EPDM	97123	97123			97123	97123		
412.4	1	Runddichtring *O-Ring*	EPDM	97230	97230			97230	97230		
412.5	1	Runddichtring *O-Ring*	EPDM	53930	53930			53930	53930		
412.6	1	Runddichtring *O-Ring*	EPDM	97126	97126			97126	97126		
412.8	1	*Runddichtring* *O-Ring*	EPDM	-	-			-	-		
444.0	1	Dichtscheibe *Seal cover*	SiC inf.	95374	95374			95374	95374		
490	1	Dichtflansch *Seal flange*	PE-RCH 1000	97121	97121			97121	97121		
507.0	2	V-Ring *V-seal ring*	FPM	95212	95212			95212	95212		
523	1	Wellenhülse *Shaft protection pipe*	PP	80137	80137			80137	80137		
531	1	Spannstift *Dowel pin*	1.4305	97130	97130			97130	97130		
550	1	U-Scheibe *Washer*	1.4104	51222	51222			51222	51222		
555	4	U-Scheibe *Washer*	TITAN	82487	82487			82487	82487		
558	1	Schleuderscheibe Diffuser disc	PP	80150	80150			80150	80150		
566.0	2	Halbrundkerbnagel *Round headed notched nail*	1.4305	90514	90514			90514	90514		
713.0	1	Aufhängerohr *Base plate and support tube*	PP	84045	84042			84042	84045		
801	1	Drehstrom-Motor *Three phase electric motor*	0,37 kW 0,45kW - -	86527 - - -	86527 - - -			- 86527 - -	- 86527 - -		

ASV Stübbe Type: ETLB 25-125 Drehzahl : 2900 min

(Fa. Schmid)



Stübbe

Teil *Item*	Stück *Pieces*	Bennenung *Denomination*	Werkst. *Material*	Ident.-Nr.(Bestell-Nr.) / *Order no.*							
				50 Hz				60 Hz			
				86516	86517			86544	86547		
902.1	4	*Stiftschraube* *Stud bolt*	TITAN	98616	98616			98616	98616		
920.1	1	Sechskantmutter *Hexagon nut*	1.4571	93959	93959			93959	93959		
920.4	4	*Sechskantmutter* *Hexagon nut*	TITAN	82486	82486			82486	82486		
934.0	1	Federring *Spring ring*	1.4571	91288	91288			91288	91288		
940.2	1	Passfeder *Key*	1.4301	90534	90534			90534	90534		
970	1	Leistungsschild *Identification plate*	1.4301	86590	86590			86590	86590		
980	1	Deckel (Kontrollöffnung) *Inspection- or check cover*	PP	-	84055			84055	-		
999	1	Runddichtring zu Teil 980 *O-Ring for item 980*	CSM	-	97426			97426	-		

Technische Änderungen vorbehalten
Errors and omissions excepted

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Assembly	: 16.013.0066.000B	Commiss.	: 25-05-377
Label	: FILTER HOUSING/PVC-DG/FILTER 1X10"	Position	: 000050
Quant.	: 1,000 ST	Page	: 000112/01
Drawing	: 16.013.0066E0000	Date	: 10.04.2006

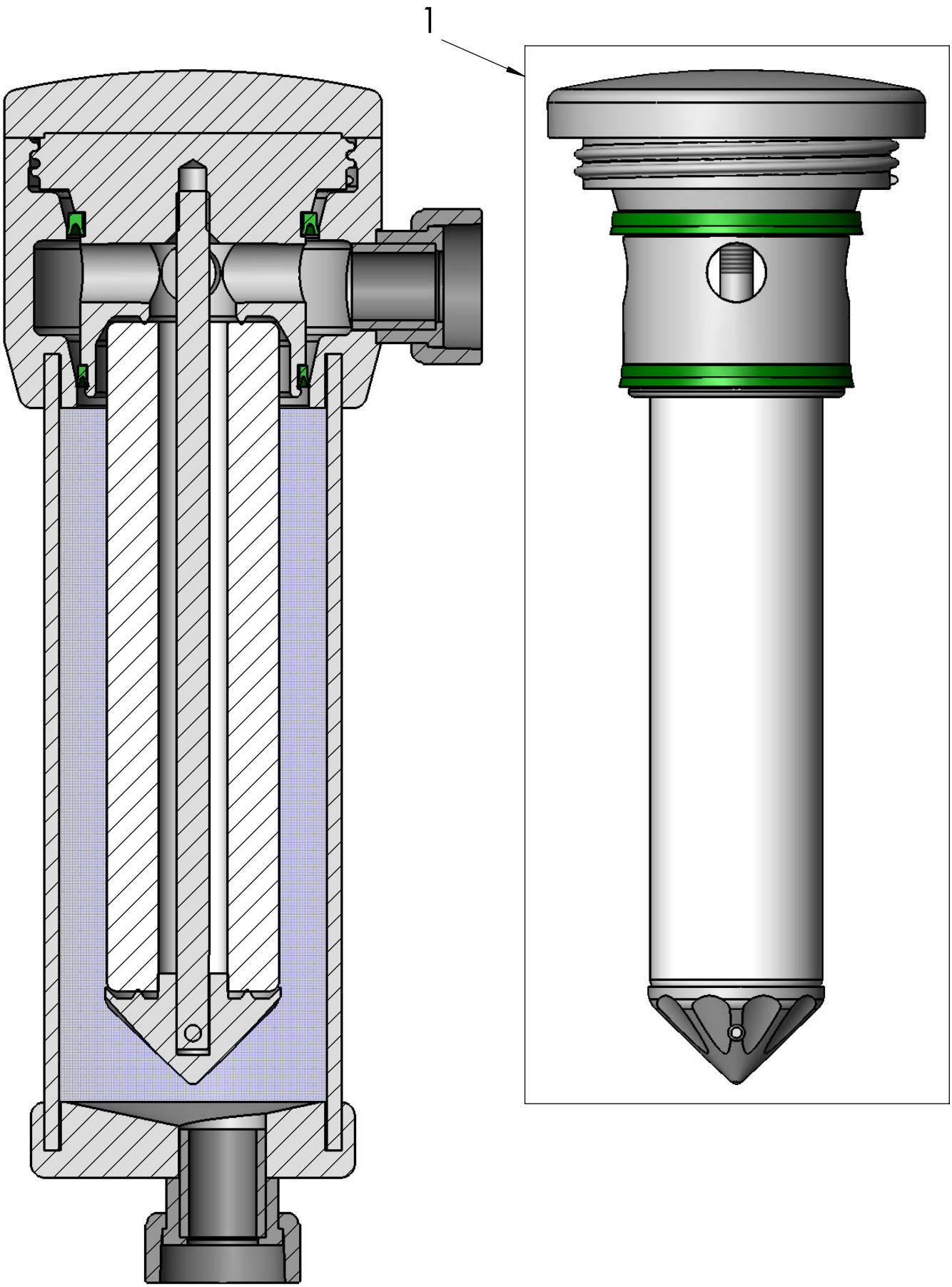
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.013.0079.000B FILTER LID/PVC-DG/FILTER 1X10"	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KOMPAKTFILTER

Spare parts list COMPACT FILTER

16.013.0066E0000	1/1
	00



Assembly	: 16.013.0079.000B	Commiss.	: 25-05-377
Label	: FILTER LID/PVC-DG/FILTER 1X10"	Position	: 000050
Quant.	: 1,000 ST	Page	: 000113/01
Drawing	: 16.013.0079E0000	Date	: 10.04.2006

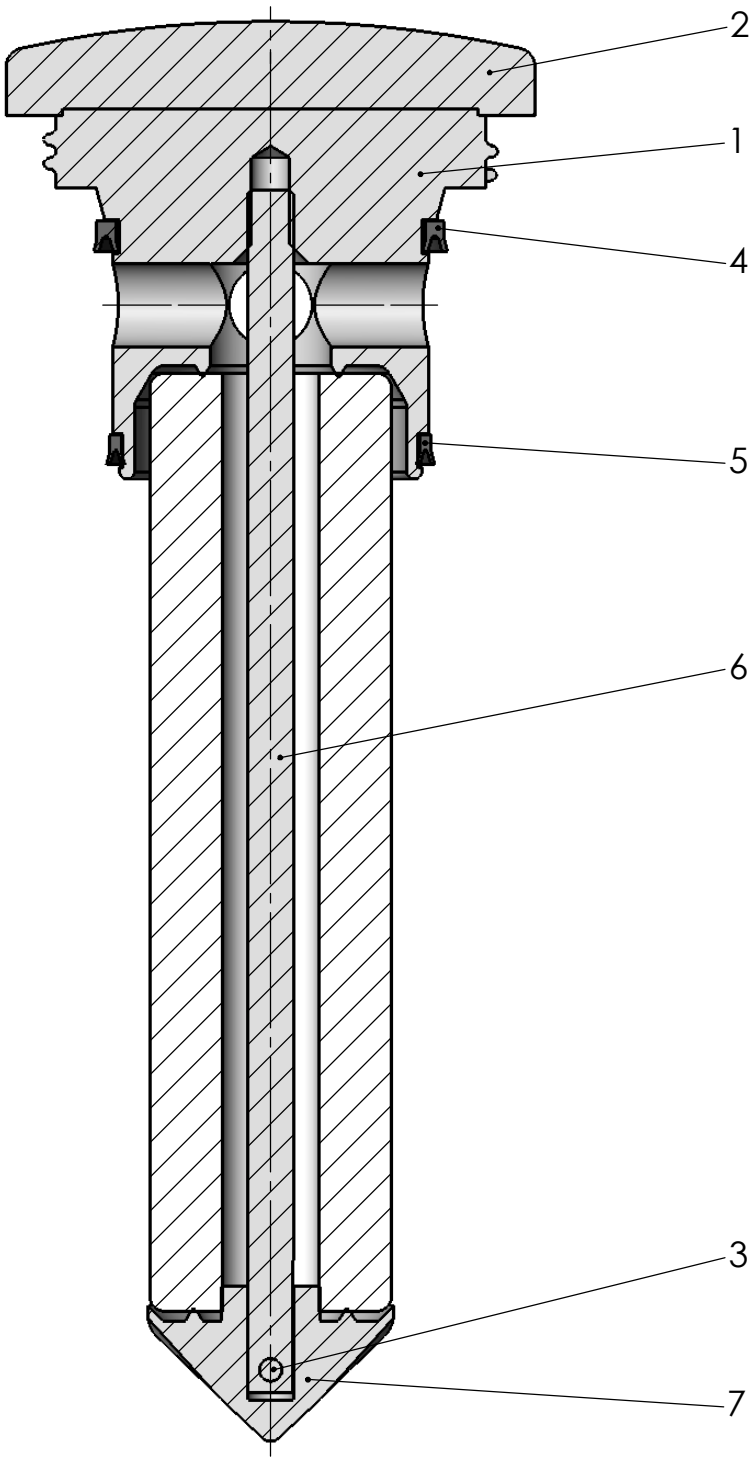
Pos.	Part N° Label	Quant.	Unit	SP
1	16.013.0058.000B FILTER LID/PVC-DG/FILTER1X10"	1,000	ST	X
2	16.013.0065.000B FILTER LID HEAD/PVC-DG/FILTER1X10"	1,000	ST	X
3	00.004.0096.000B ** pin **	1,000	ST	X
4	DI-000000070-000 GROOVED RINGS EPDM 282/NR.:N 80-13	1,000	ST	X
5	DI-000000265-000 GROOVED RINGS EPDM 282/NR.:N 78-1	1,000	ST	X
6	16.013.0060.000M TENSIONING ROD	1,000	ST	X
7	16.013.0059.000B TIGHTENING ELEMENT/PVC-DG/FILTER 1X10"	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KOMPAKTFILTERDECKEL

Spare parts list COMPACT FILTER LID

16.013.0079E0000	1/1
	00



Assembly	: 16.004.0126.U24N	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/24/PVC/TI/KL-KU/d=27	Position	: 000050
Quant.	: 1,000 ST	Page	: 000114/01
Drawing	: 16.004.0126EU000	Date	: 10.04.2006

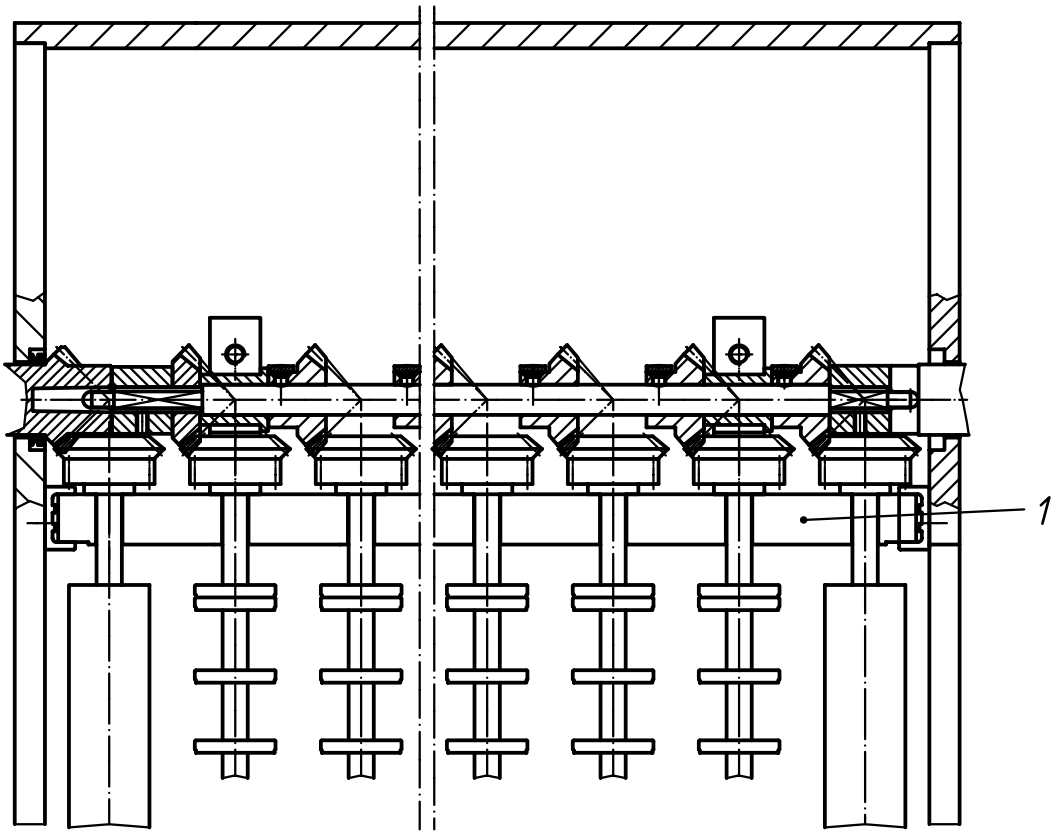
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0124.U24N DRIVE SHAFT/CPL./024/TI	1,000	ST	
1	16.004.0002.024X SUPPORT/GUR-N/TIT/24/d=10/T=50	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0126EU000	11
	00



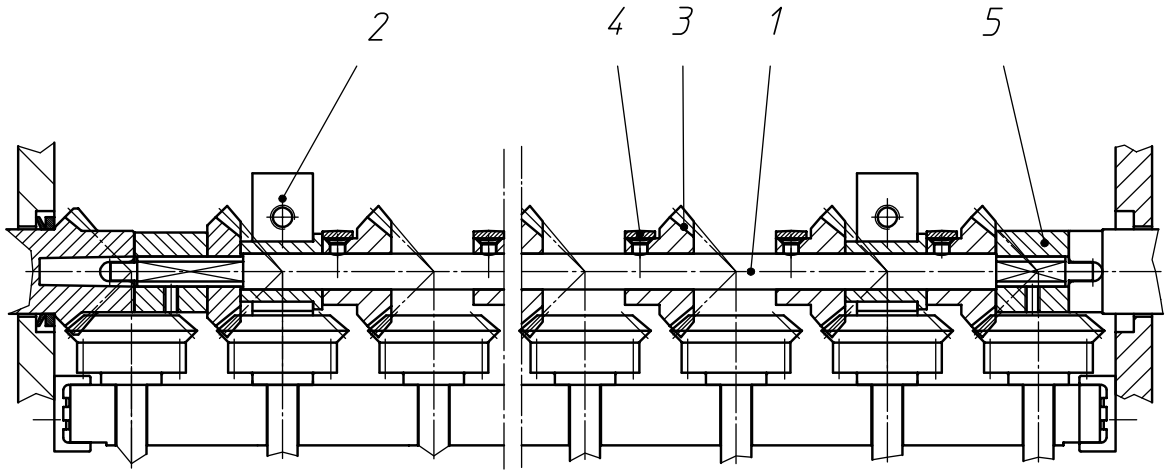
Assembly	: 16.004.0124.U24N	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./024/TI	Position	: 000050
Quant.	: 1,000 ST	Page	: 000115/01
Drawing	: 16.004.0124EU000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0331.0243 DRIVE SHAFT/TI/024/KL-KU/D=27	1,000	ST	X
2	16.004.0007.U00N SEATING/KPL./PVC /TI	4,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	20,000	ST	X
4	03.004.0278.0003 CLAMP/WHITE/PVDF-TI	20,000	ST	X
5	16.004.0330.0003 COUPLING/PART2/TI	1,000	ST	X

Ersatzteilliste ANTRIEBSWELLE

Spare parts list Drive shaft

16.004.0124EU000	11
	00



Assembly	: 16.004.0007.U00N	Commiss.	: 25-05-377
Label	: SEATING/KPL./PVC /TI	Position	: 000050
Quant.	: 4,000 ST	Page	: 000116/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

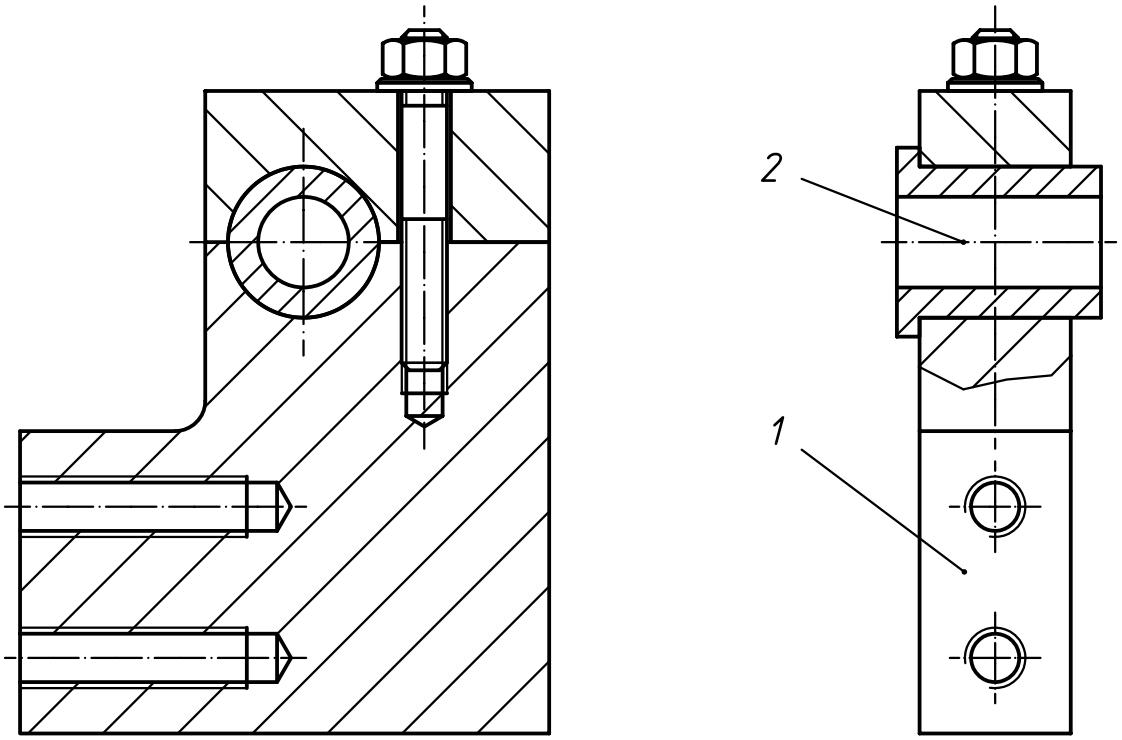
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0005.0003 SEATING/PVC-HG/TI PVC	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: 03.004.0005.0003	Commiss.	: 25-05-377
Label	: SEATING/PVC-HG/TI PVC	Position	: 000050
Quant.	: 1,000 ST	Page	: 000117/01
Drawing	: 03.004.0005E0000	Date	: 10.04.2006

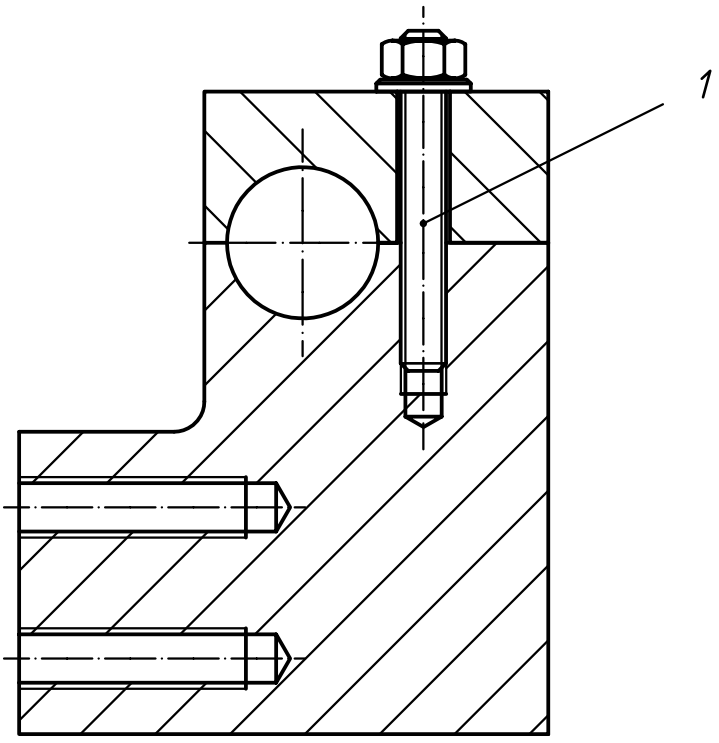
Pos.	Part N° Label	Quant.	Unit	SP
1	00.013.0008.0003 THREADED BOLT/TIT/M06x045	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER

Spare parts list Seating

03.004.0005E0000	11
	00



Assembly	: VS-25-05-377-03	Commiss.	: 25-05-377
Label	: CONVEYOR/KSM [K] 4/650/PVC/TI	Position	: 000050
Quant.	: 1,000 ST	Page	: 000118/01
Drawing	: VS-25-05-377-03	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0987.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/U/FJ	11,000	ST	X
2	16.004.0988.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/O/AV/FJ	6,000	ST	X
3	16.004.1294.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/O/AH/FJ	7,000	ST	X
4	16.004.1713.2573 SHAFT/10/18/CPL/T25/0650/3.7035/PP/FE	13,000	ST	X
5	16.004.1241.2573 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	2,000	ST	X
6	16.004.0838.2573 Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/FE	1,000	ST	X
7	16.004.1244.2573 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
8	16.004.1243.2573 Shaft/KPL/32/O /L/AV/FJ	1,000	ST	X
9	16.004.1245.2573 Shaft/KPL/O /L/AH/FJ	1,000	ST	X
10	16.004.1247.2573 Shaft/CPL/32/U /L/ /FJ/	3,000	ST	X
11	16.004.0841.2573 SHAFT/CPL/32/O+U/K/B/FK/GREEN	1,000	ST	X
12	16.004.1250.2573 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
13	16.004.1249.2573 SHAFT/KPL/32/O /L/AV/FJ	1,000	ST	X
14	16.004.1251.2573 Shaft/KPL/32/O /L/AH/FJ	2,000	ST	X
15	16.004.1252.2573 Shaft/CPL/32/U /L/ /FJ/	3,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: VS-25-05-377-03	Commiss.	: 25-05-377
Label	: CONVEYOR/KSM [K] 4/650/PVC/TI	Position	: 000050
Quant.	: 1,000 ST	Page	: 000118/02
Drawing	: VS-25-05-377-03	Date	: 10.04.2006

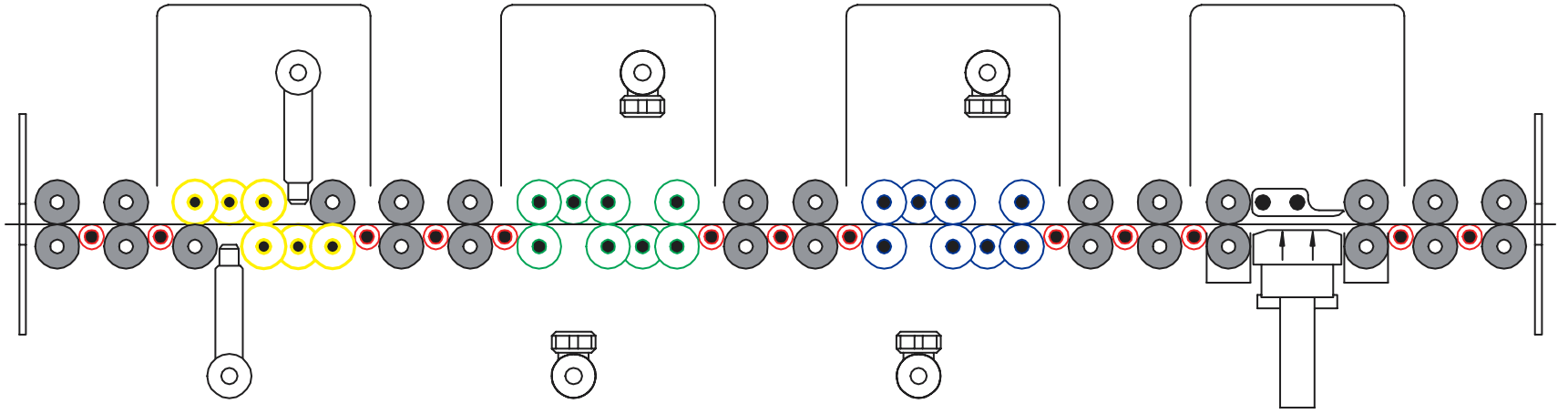
Pos.	Part N° / Label	Quant.	Unit	SP
16	16.004.0843.2573 Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/FE	1,000	ST	X
17	16.004.1255.2573 Shaft/KPL/32/O/L/AV/FJ	1,000	ST	X
18	16.004.1254.2573 Shaft/KPL/32/O/ /L/AV/FJ	2,000	ST	X
19	16.004.1256.2573 Shaft/KPL/32/O /L/AH/FJ	1,000	ST	X
	16.004.0559.U003 GEAR WHEEL COMPL /Z=11/M2/TI/PP /=0162	3,000	ST	
	16.004.0393.U800 BELT DRIVE/SHAFT/O/SPRAY/FJ	4,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	13,000	ST	
20	16.004.1298.2583 ROLLER/d10/D32/CPL/U/0650/TIT/PP-G/FJ	2,000	ST	X

Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-03	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/TI
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	KSM (K)4	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
up	16.004.0988.2583		16.004.1294.2583		16.004.1243.2573	16.004.1244.2573	16.004.1245.2573		16.004.0988.2583		16.004.1294.2583		16.004.0988.2583		16.004.1251.2573	16.004.1250.2573	16.004.1249.2573		16.004.1251.2573		16.004.0988.2583		16.004.1294.2583		16.004.1254.2573	16.004.1255.2573	16.004.1256.2573		16.004.1254.2573		16.004.1294.2583		16.004.0988.2583		16.004.1294.2583				16.004.1294.2583		16.004.0988.2583		16.004.1294.2583	up
down	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583		16.004.1241.2573	16.004.0838.2573	16.004.1241.2573	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.1247.2573		16.004.1247.2573	16.004.0841.2573	16.004.1247.2573	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.1252.2573		16.004.1252.2573	16.004.0843.2573	16.004.1252.2573	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.1298.2583				16.004.1298.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	down

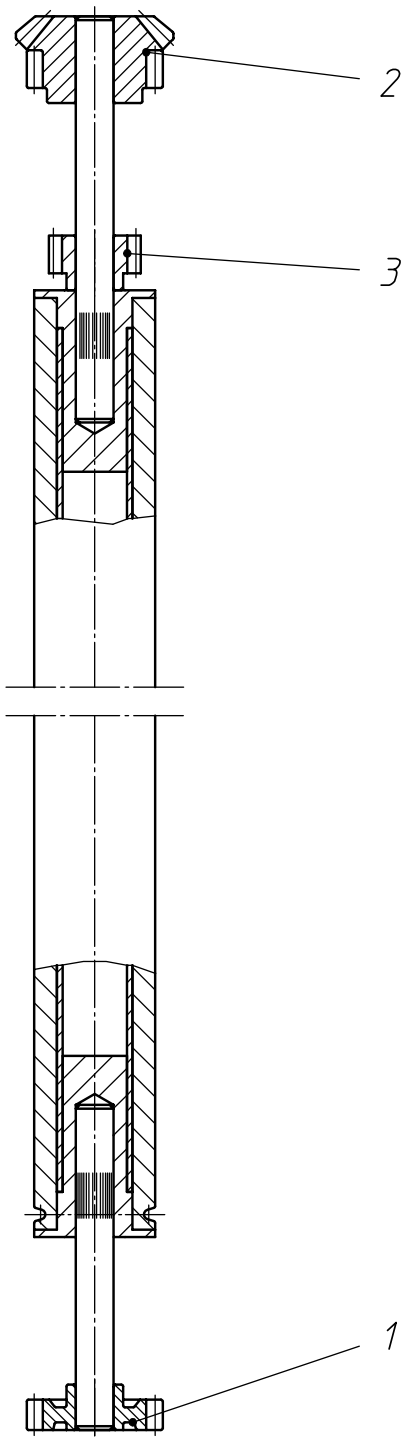
Assembly	: 16.004.0987.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/U/FJ	Position	: 000050
Quant.	: 11,000 ST	Page	: 000119/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/O/AV/FJ	Position	: 000050
Quant.	: 6,000 ST	Page	: 000120/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

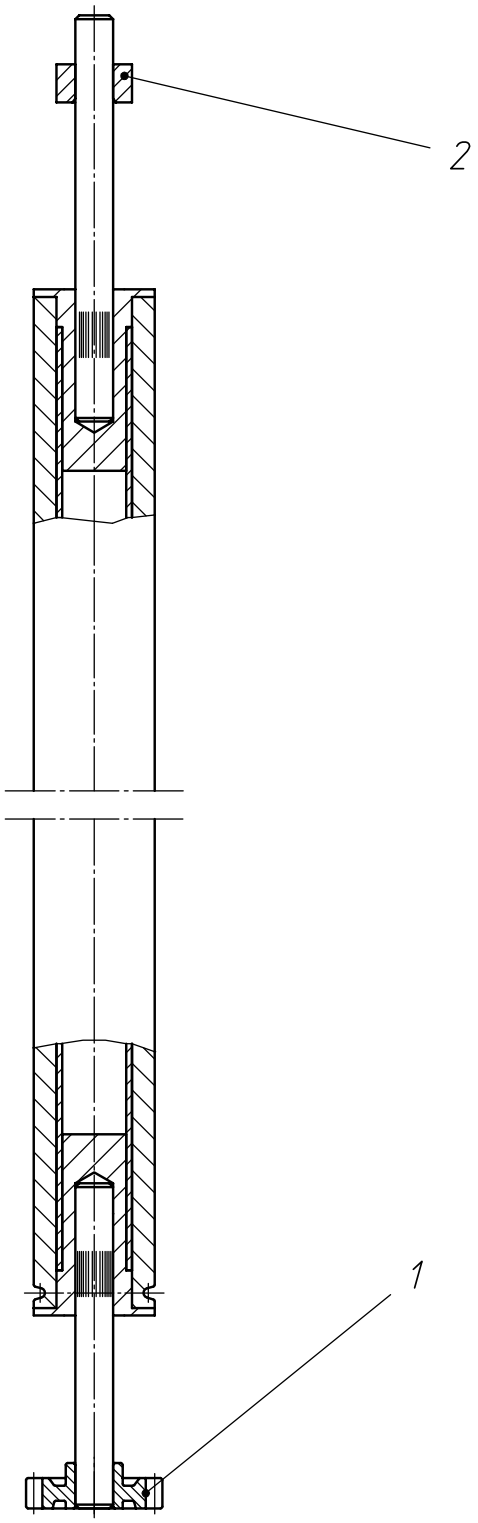
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/O/AH/FJ	Position	: 000050
Quant.	: 7,000 ST	Page	: 000121/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

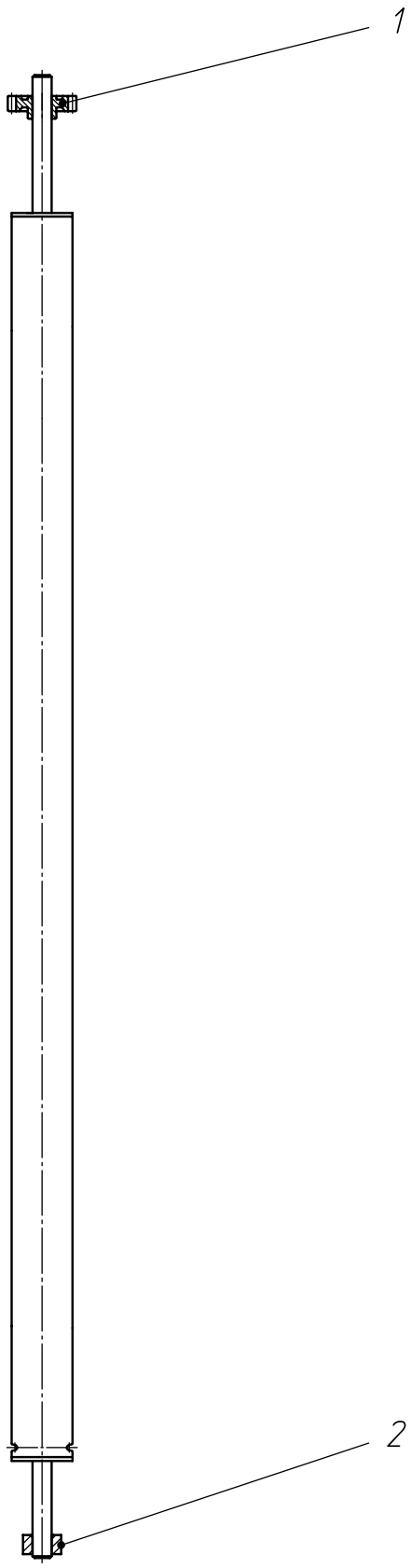
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



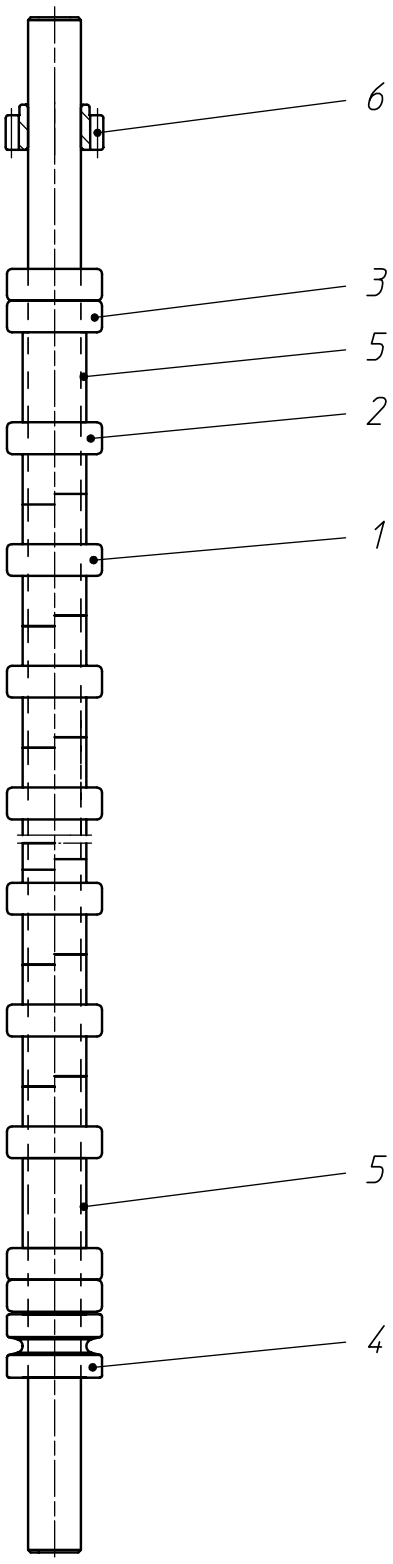
Assembly	: 16.004.1713.2573	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/3.7035/PP/FE	Position	: 000050
Quant.	: 13,000 ST	Page	: 000122/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X
7	00.019.0230.00RE BUSHING/PP-R/d=12.0/D=10.2/L=17.0	1,000	ST	X

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



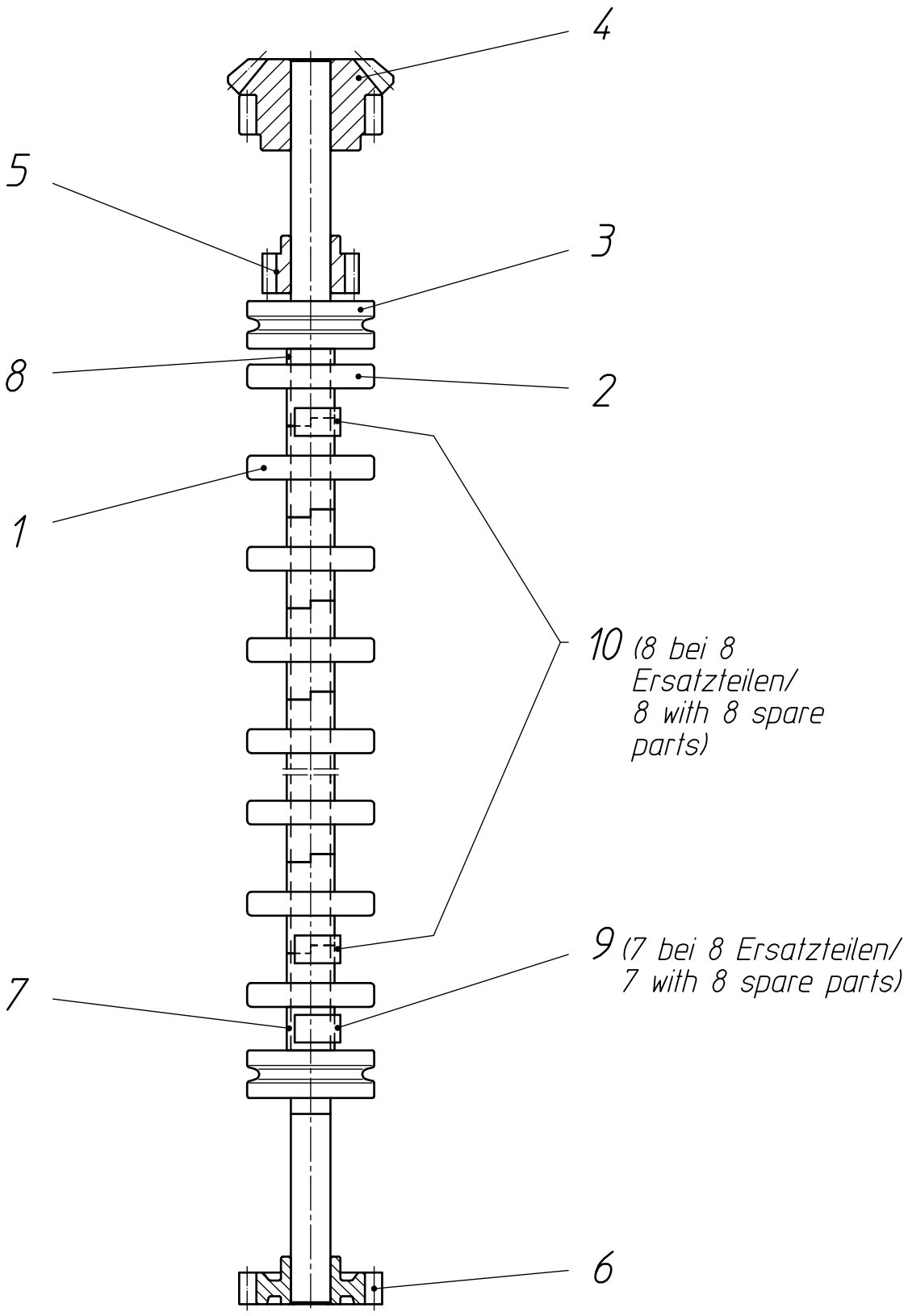
Assembly	: 16.004.1241.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000050
Quant.	: 2,000 ST	Page	: 000123/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0838.2573	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/F	Position	: 000050
Quant.	: 1,000 ST	Page	: 000124/01
Drawing	: 16.004.0838E0580	Date	: 10.04.2006

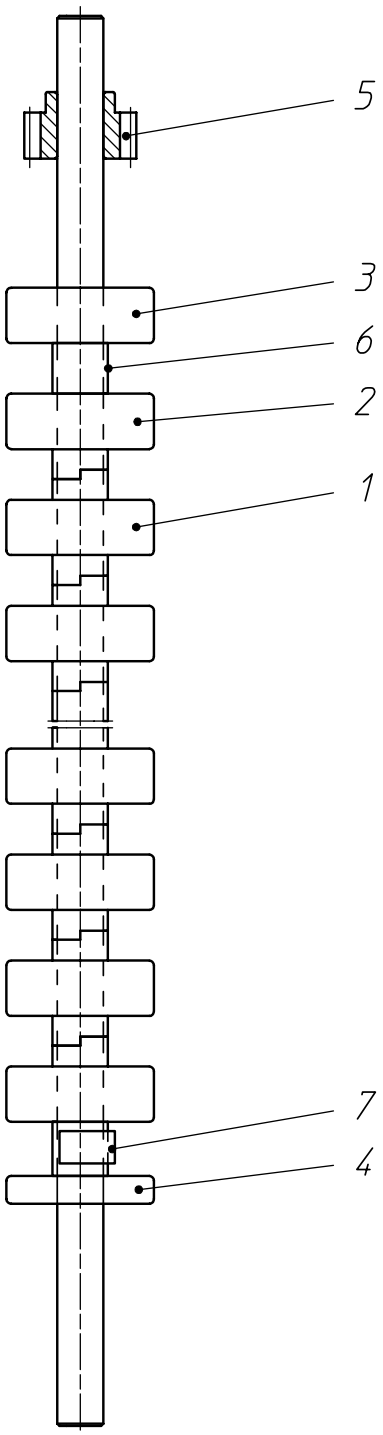
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
8	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0838E0580	11
	00



Assembly	: 16.004.1244.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000125/01
Drawing	: 16.004.1244E0570	Date	: 10.04.2006

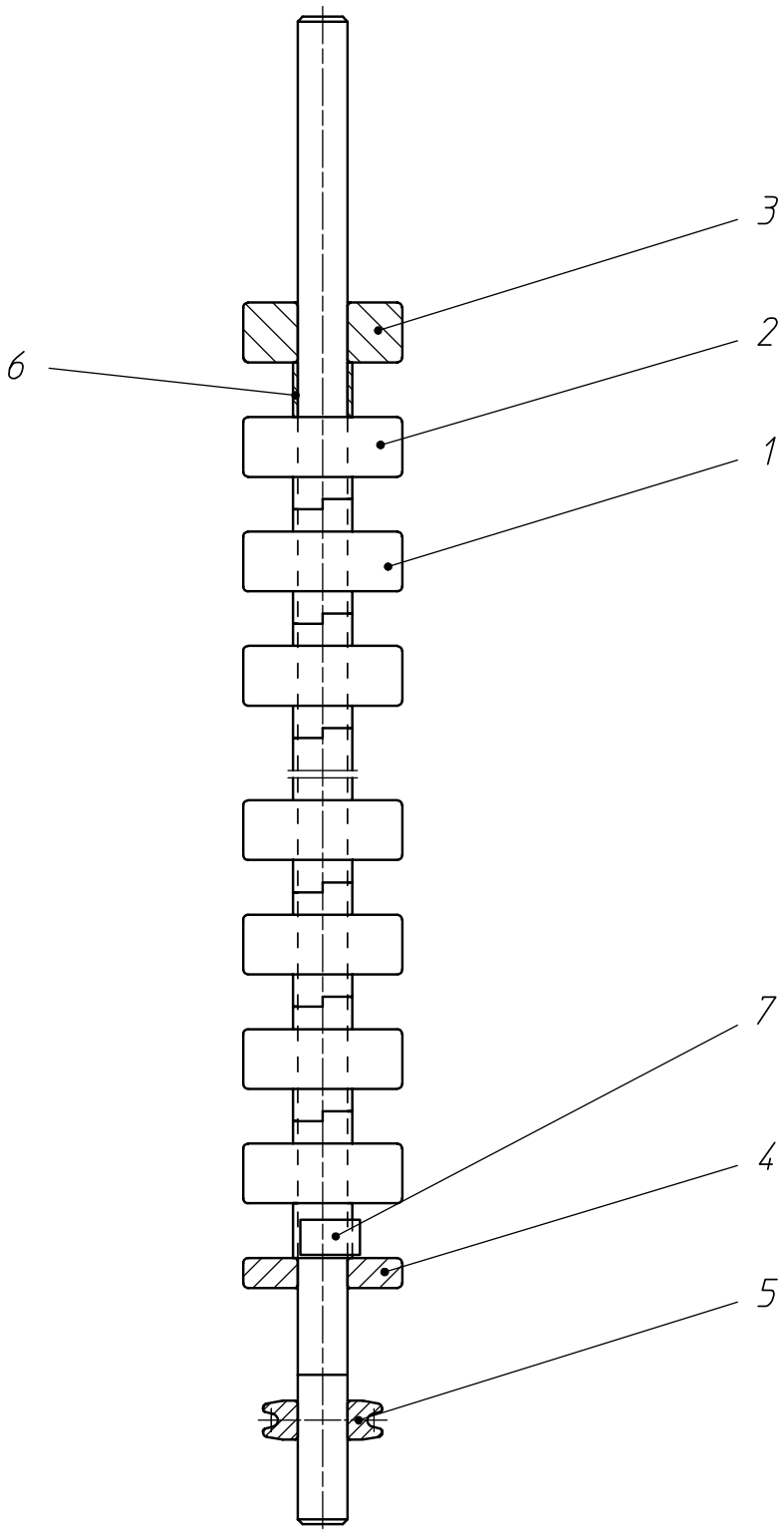
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1244E0570	11
	00



Assembly	: 16.004.1243.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000126/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

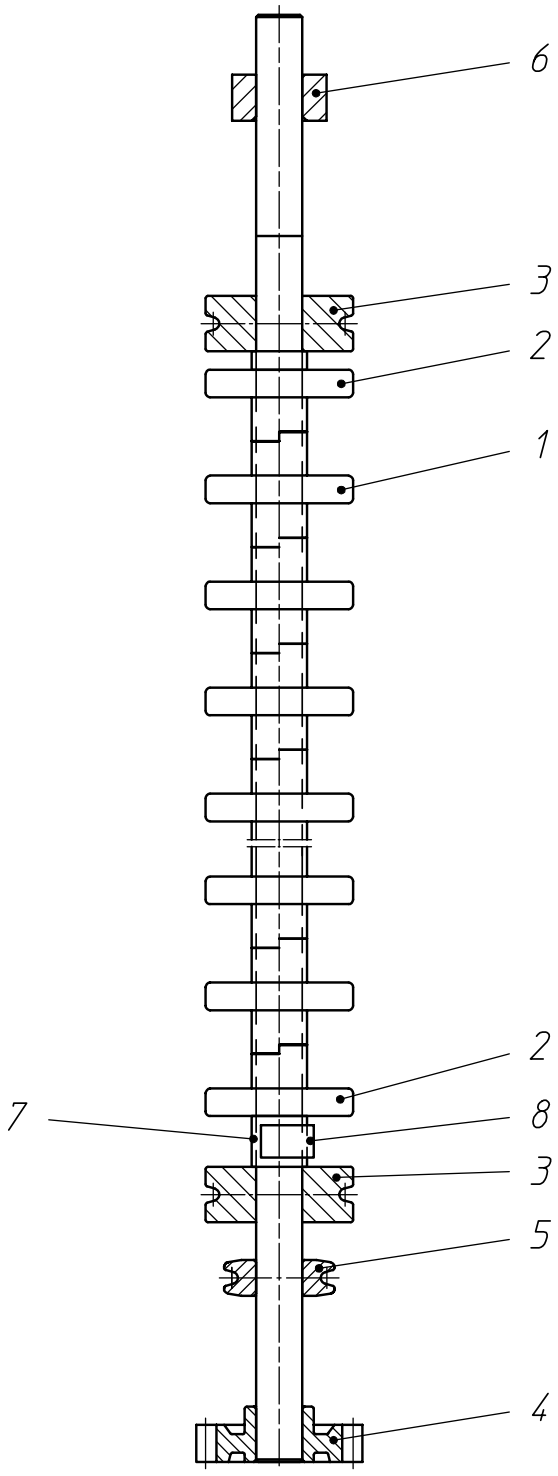
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000127/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

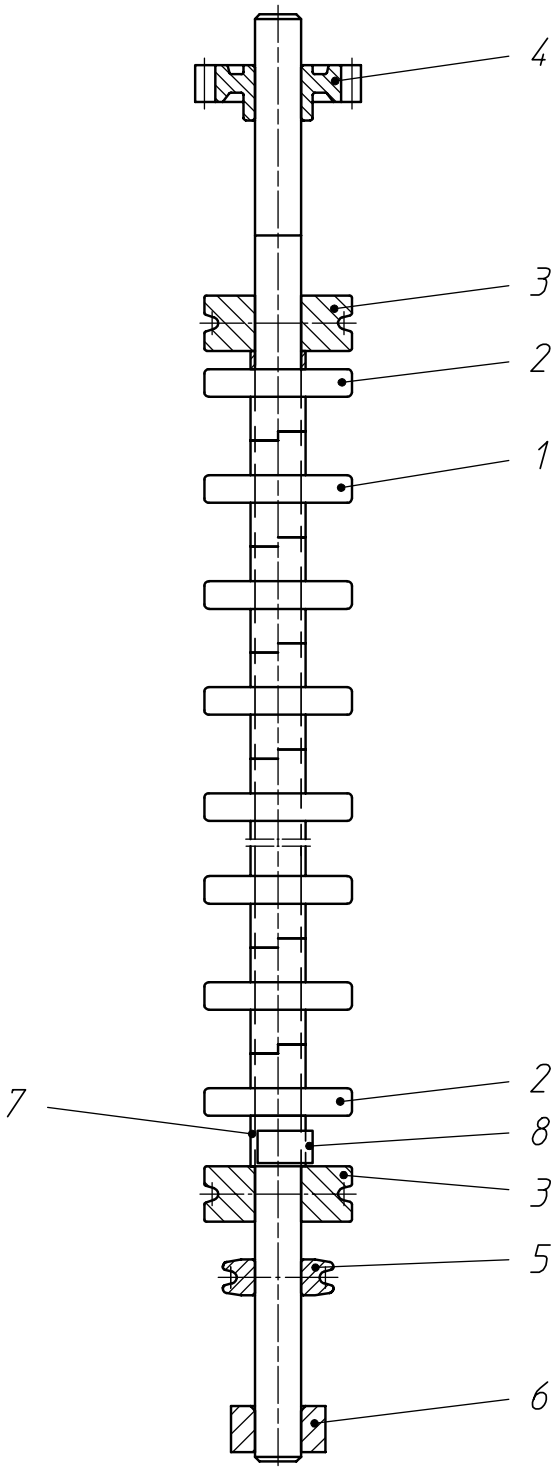
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000050
Quant.	: 3,000 ST	Page	: 000128/01
Drawing	: 16.004.1247E0000	Date	: 10.04.2006

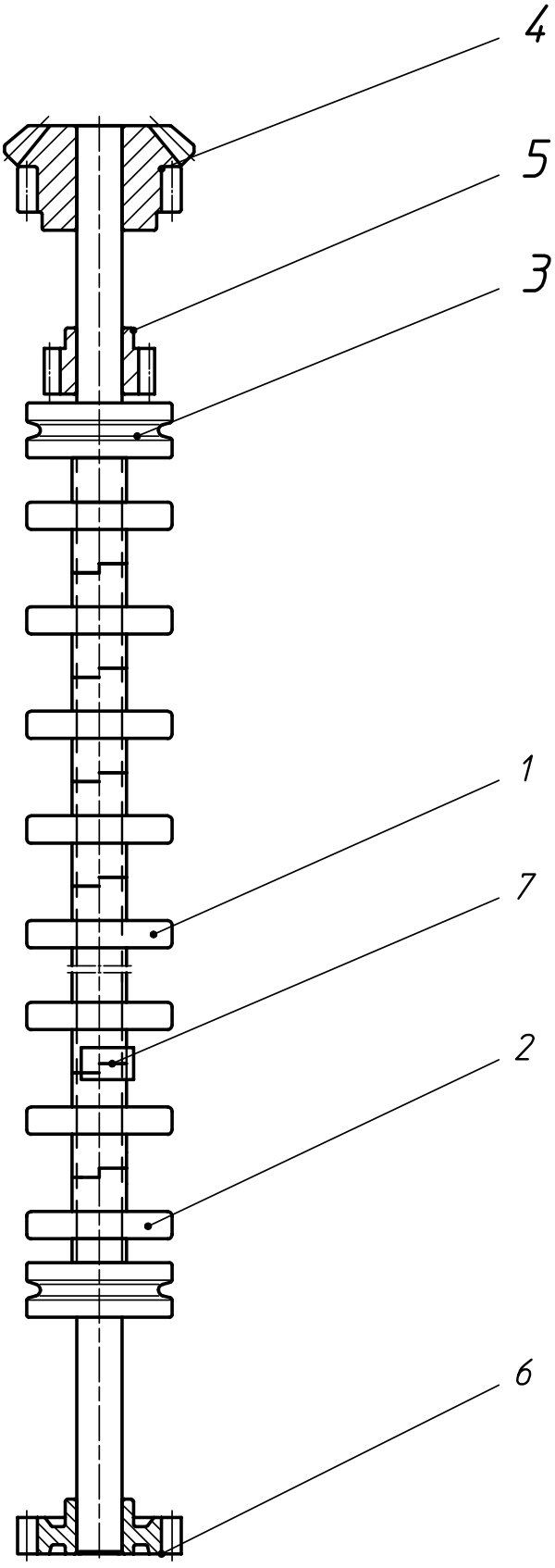
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT

16.004.1247E0000	11
	00



Assembly	: 16.004.0841.2573	Commiss.	: 25-05-377
Label	: SHAFT/CPL/32/O+U/K/B/FK/GREEN	Position	: 000050
Quant.	: 1,000 ST	Page	: 000129/01
Drawing	: 16.004.0841E0570	Date	: 10.04.2006

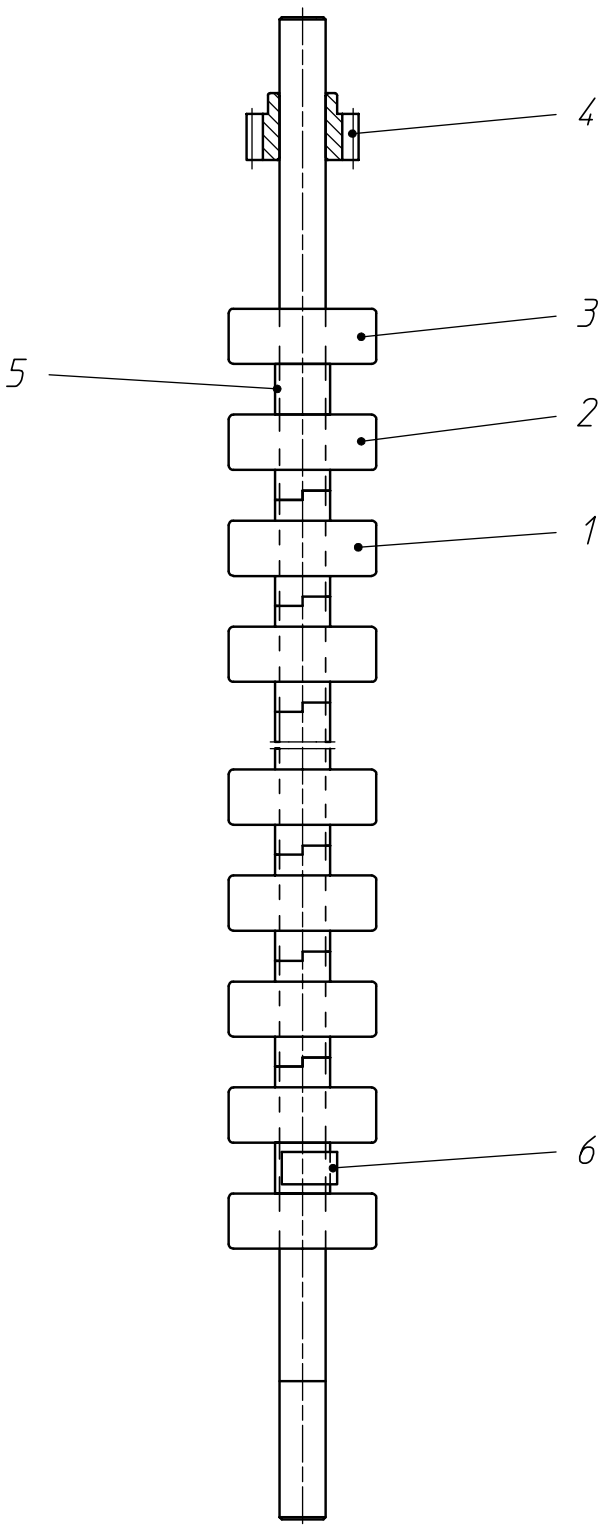
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0841E0570	11
	00



Assembly	: 16.004.1250.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000130/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

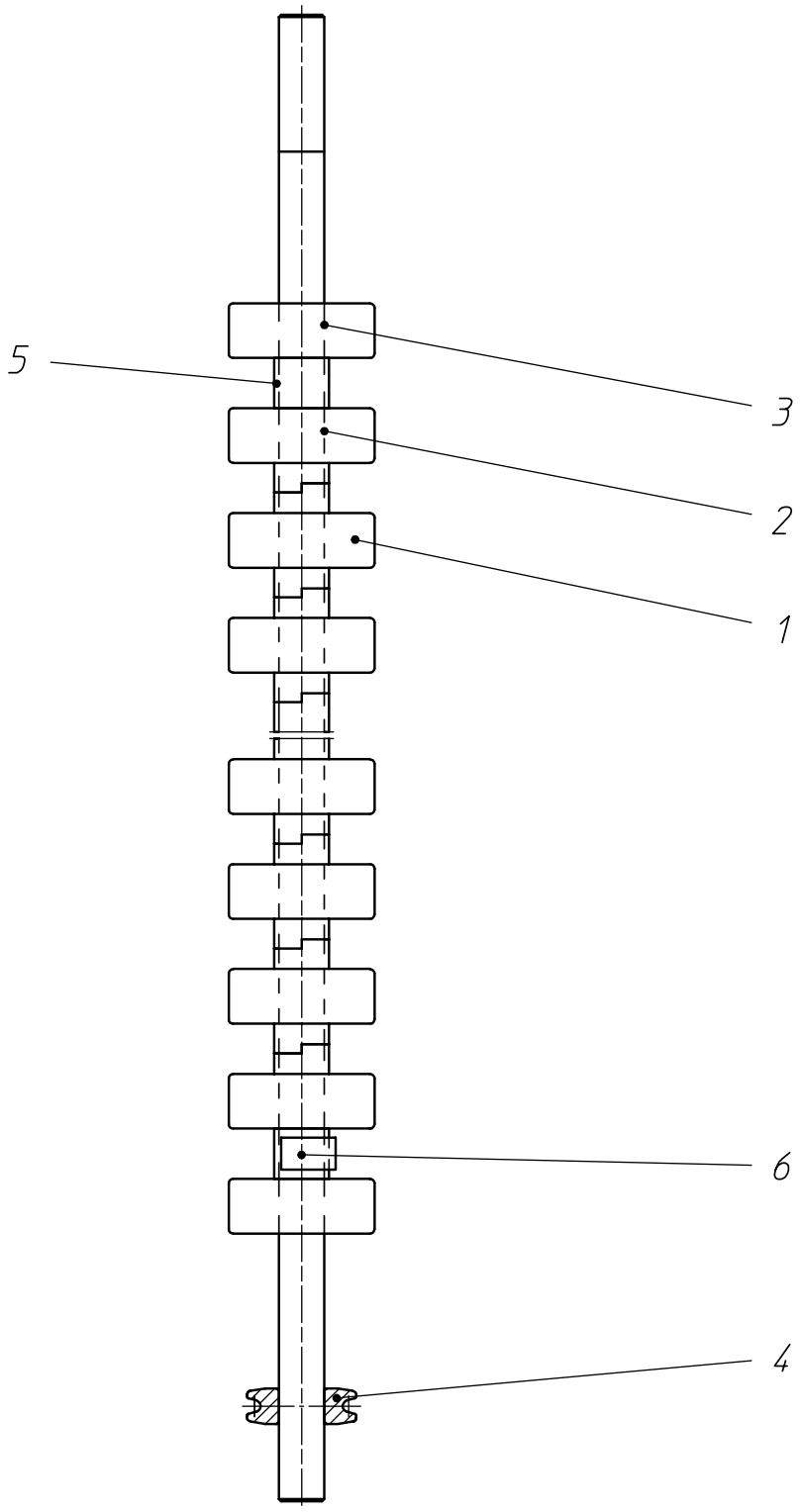
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1249.2573	Commiss.	: 25-05-377
Label	: SHAFT/KPL/32/O /L/AV/FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000131/01
Drawing	: 16.004.1249E0000	Date	: 10.04.2006

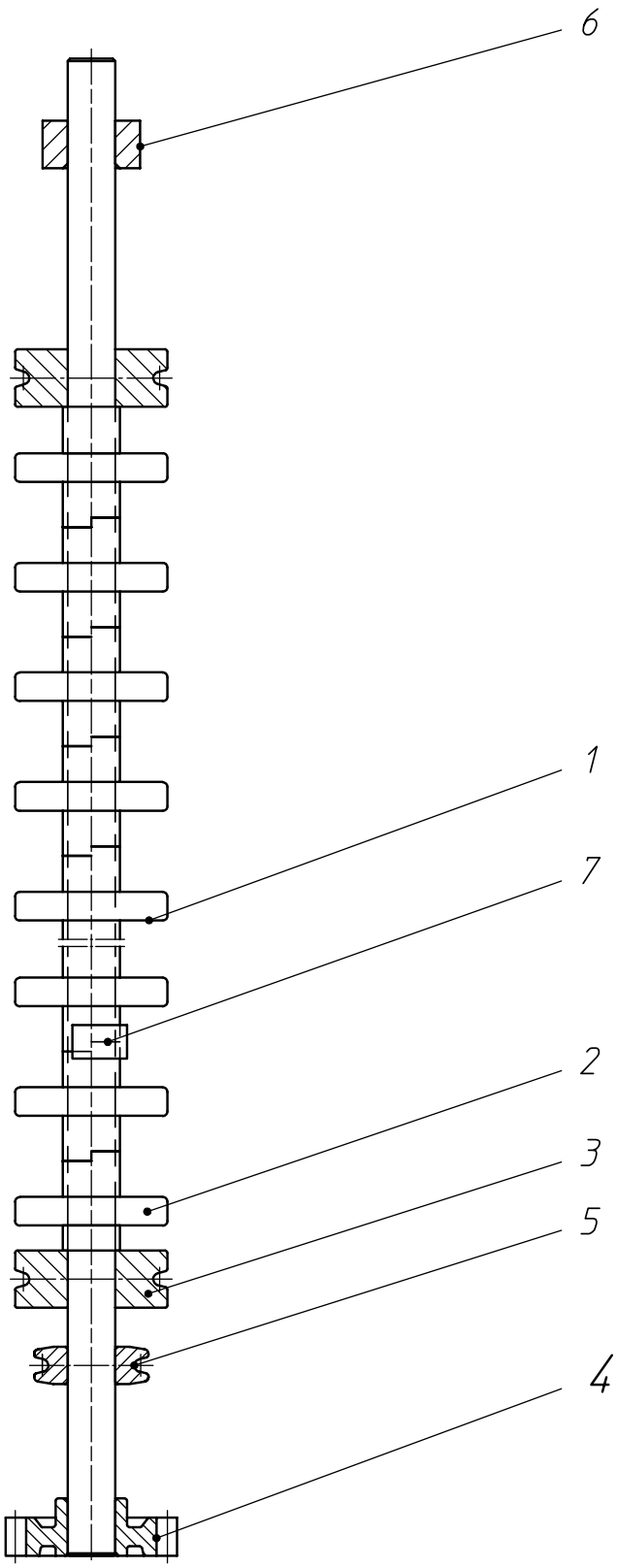
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1249E0000	11
	00



Assembly	: 16.004.1251.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000132/01
Drawing	: 16.004.1251E0000	Date	: 10.04.2006

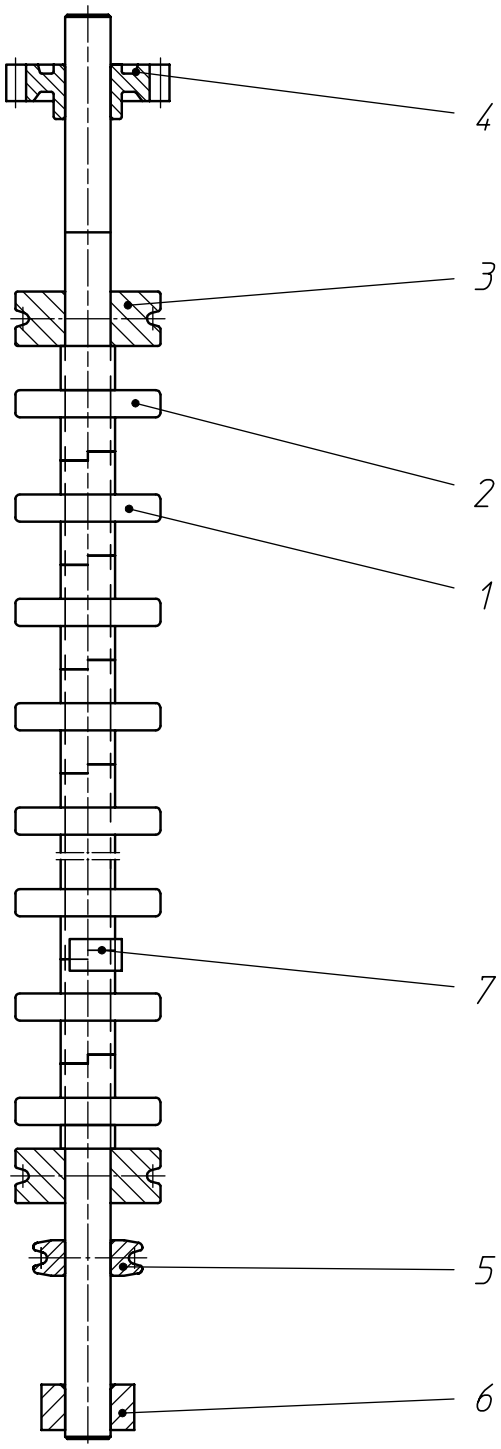
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1251E0000	11
	00



Assembly	: 16.004.1252.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000050
Quant.	: 3,000 ST	Page	: 000133/01
Drawing	: 16.004.1252E0570	Date	: 10.04.2006

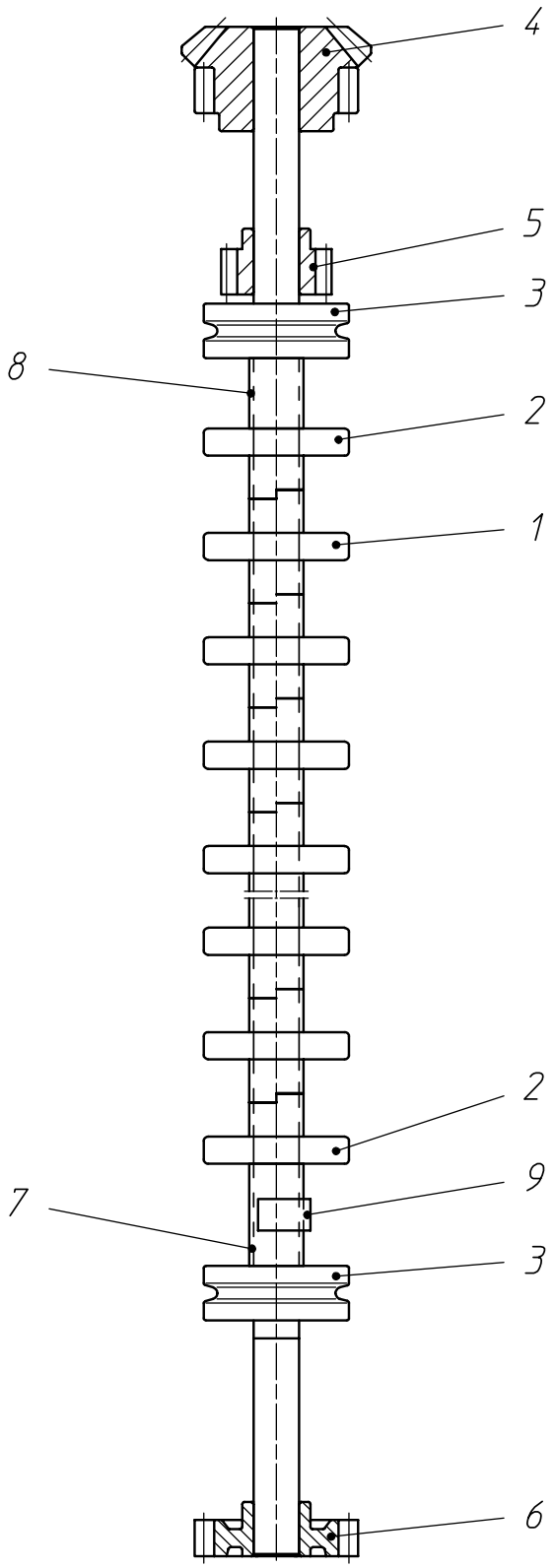
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1252E0570	11
	00



Assembly	: 16.004.0843.2573	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/F	Position	: 000050
Quant.	: 1,000 ST	Page	: 000134/01
Drawing	: 16.004.0843E0570	Date	: 10.04.2006

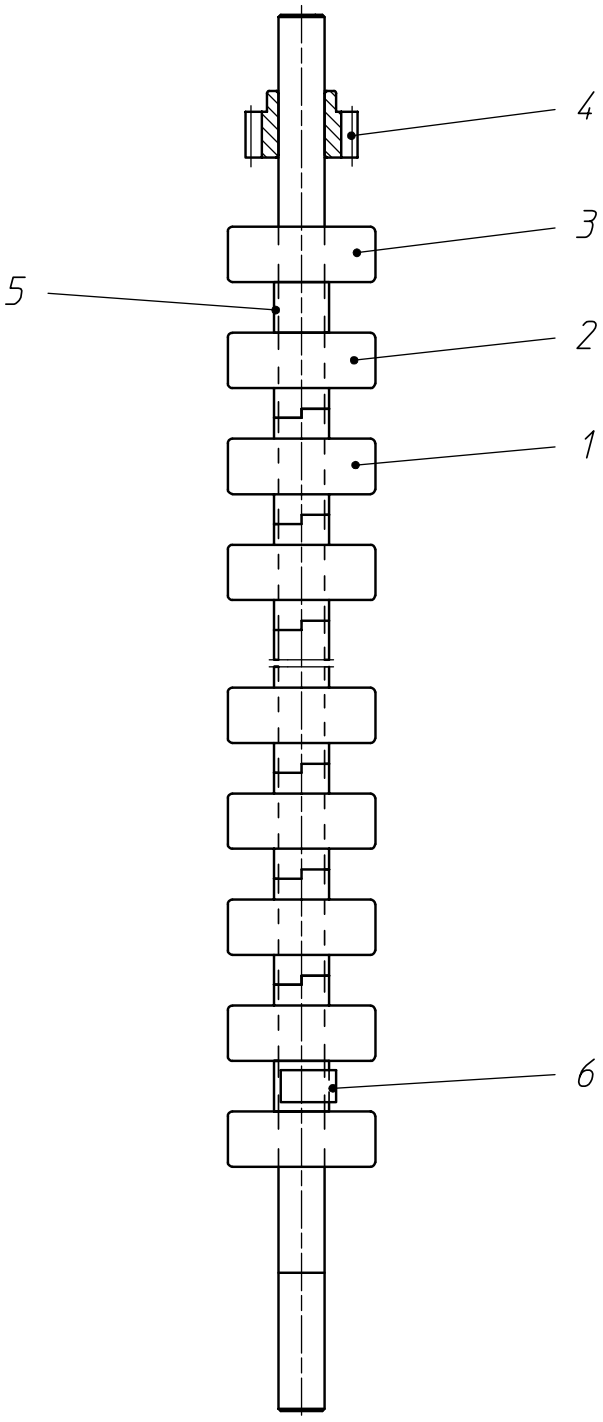
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0843E0570	11
	00



Assembly	: 16.004.1255.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/L/AV/FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000135/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

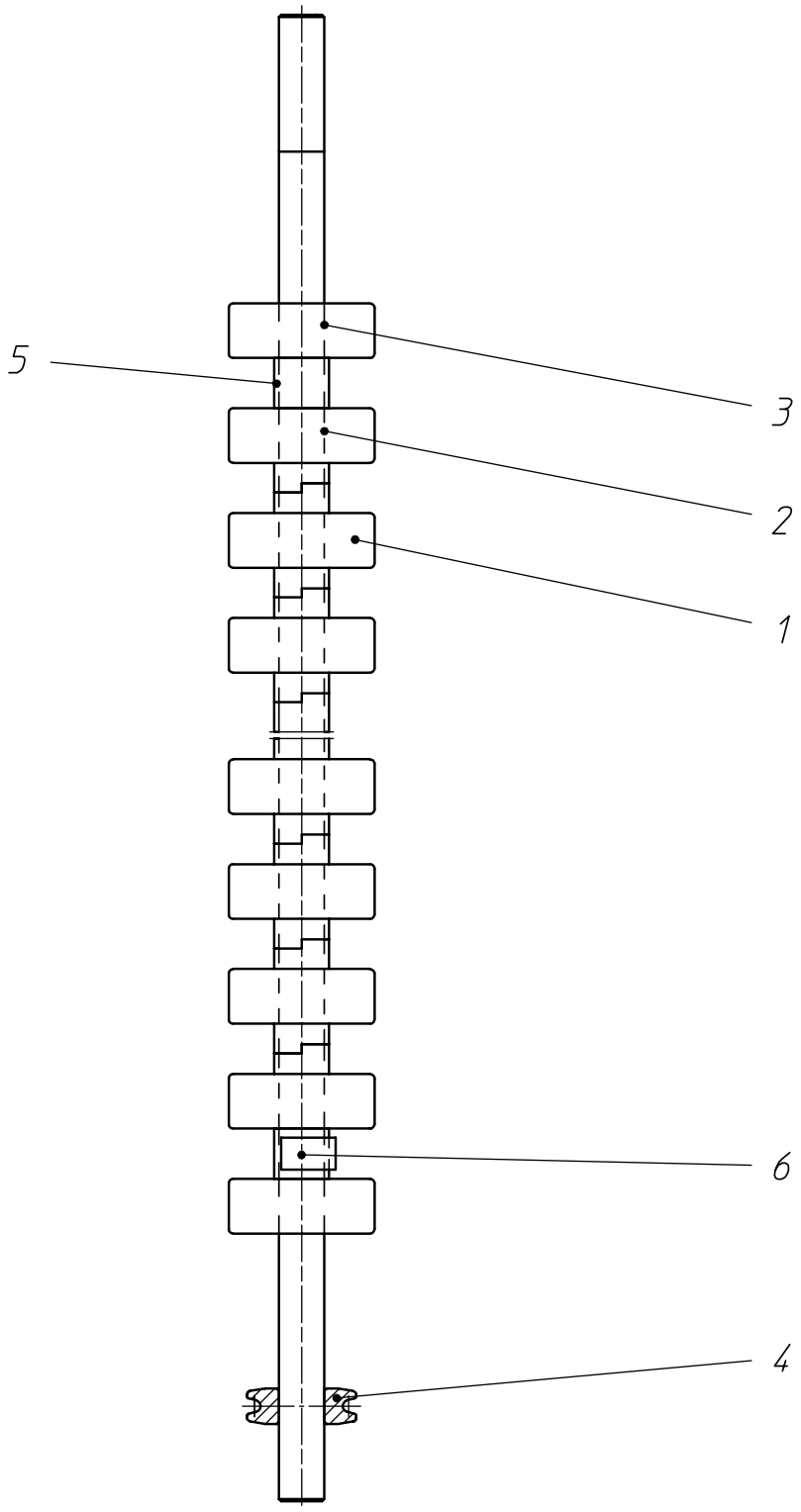
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1254.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/ /L/AV/FJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000136/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

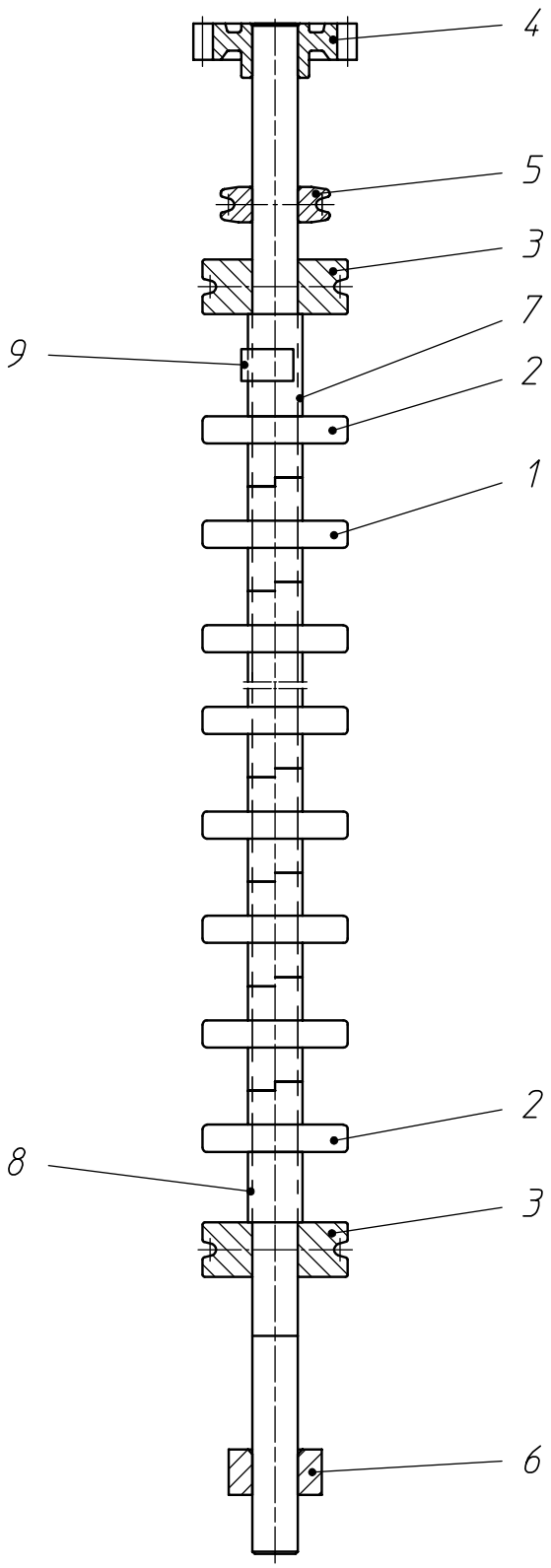
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1256.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000050
Quant.	: 1,000 ST	Page	: 000137/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

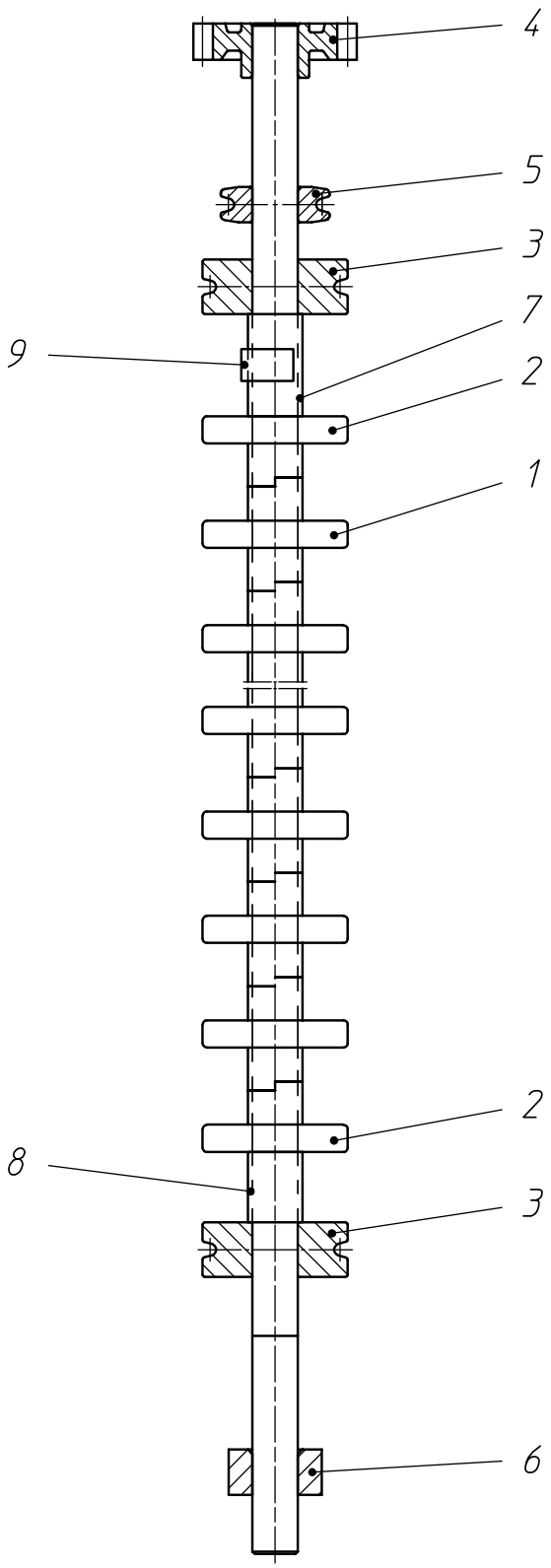
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.0559.U003	Commiss.	: 25-05-377
Label	: GEAR WHEEL COMPL /Z=11/M2/TI/PP /=0162	Position	: 000050
Quant.	: 3,000 ST	Page	: 000138/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

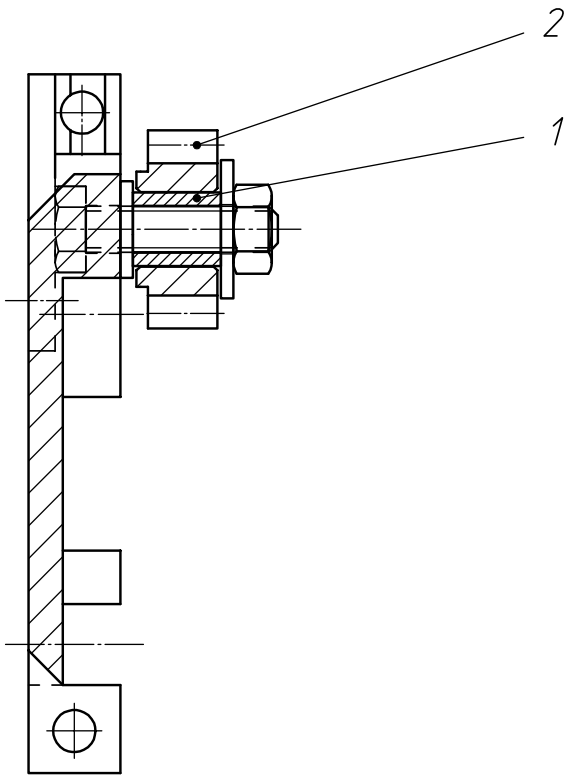
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0003 BUSHING/TIT/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0393.U800	Commiss.	: 25-05-377
Label	: BELT DRIVE/SHAFT/O/SPRAY/FJ	Position	: 000050
Quant.	: 4,000 ST	Page	: 000139/01
Drawing	: 16.004.0393EU000	Date	: 10.04.2006

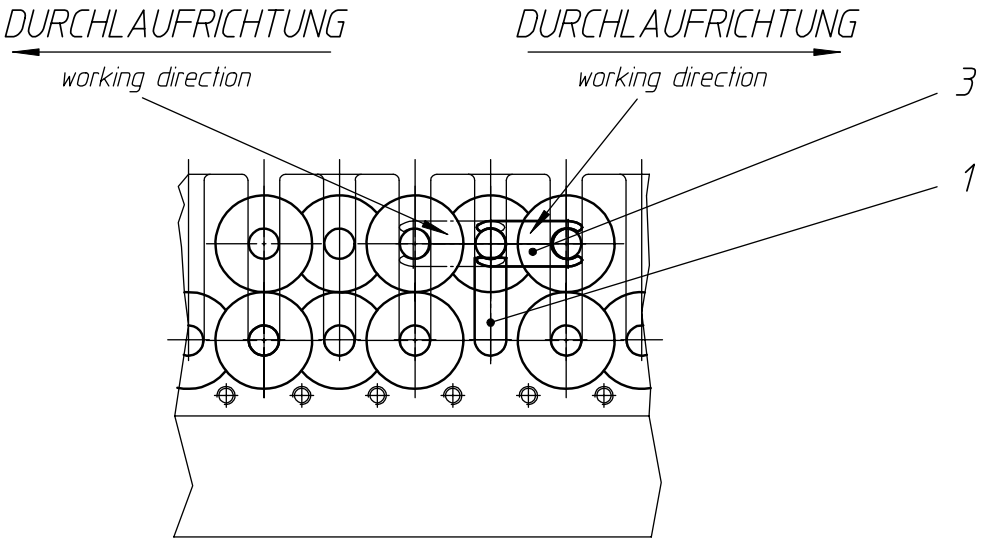
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0084.000H DISTANCE/GUR-N	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1178.000H CLIP/GUR-N/T25/TOP	2,000	ST	X

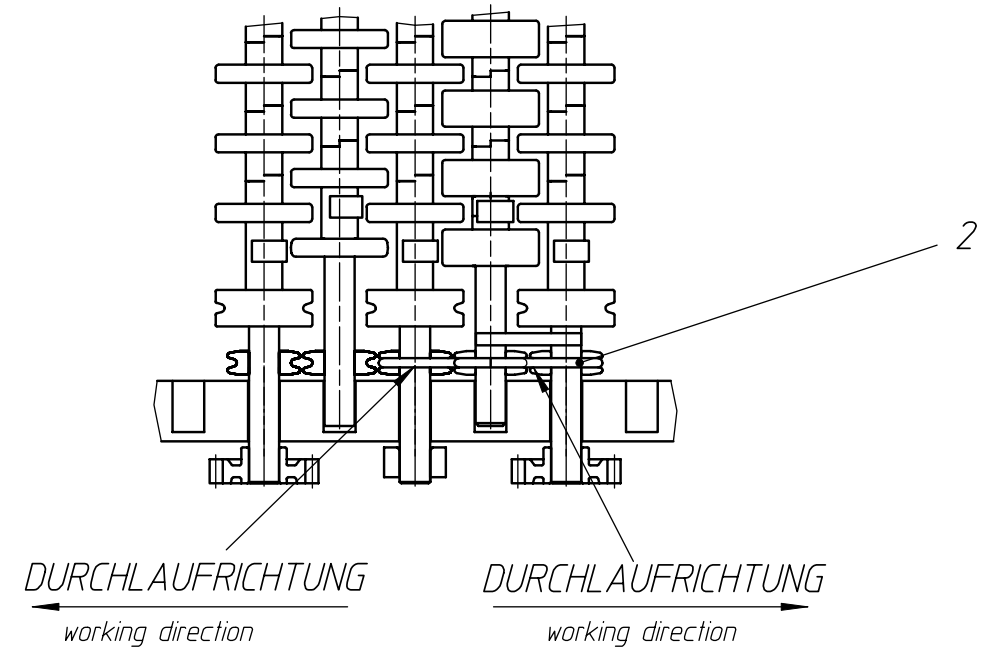
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMENANTRIEB

Spare parts list BELT DRIVE

16.004.0393EU000	11
	00





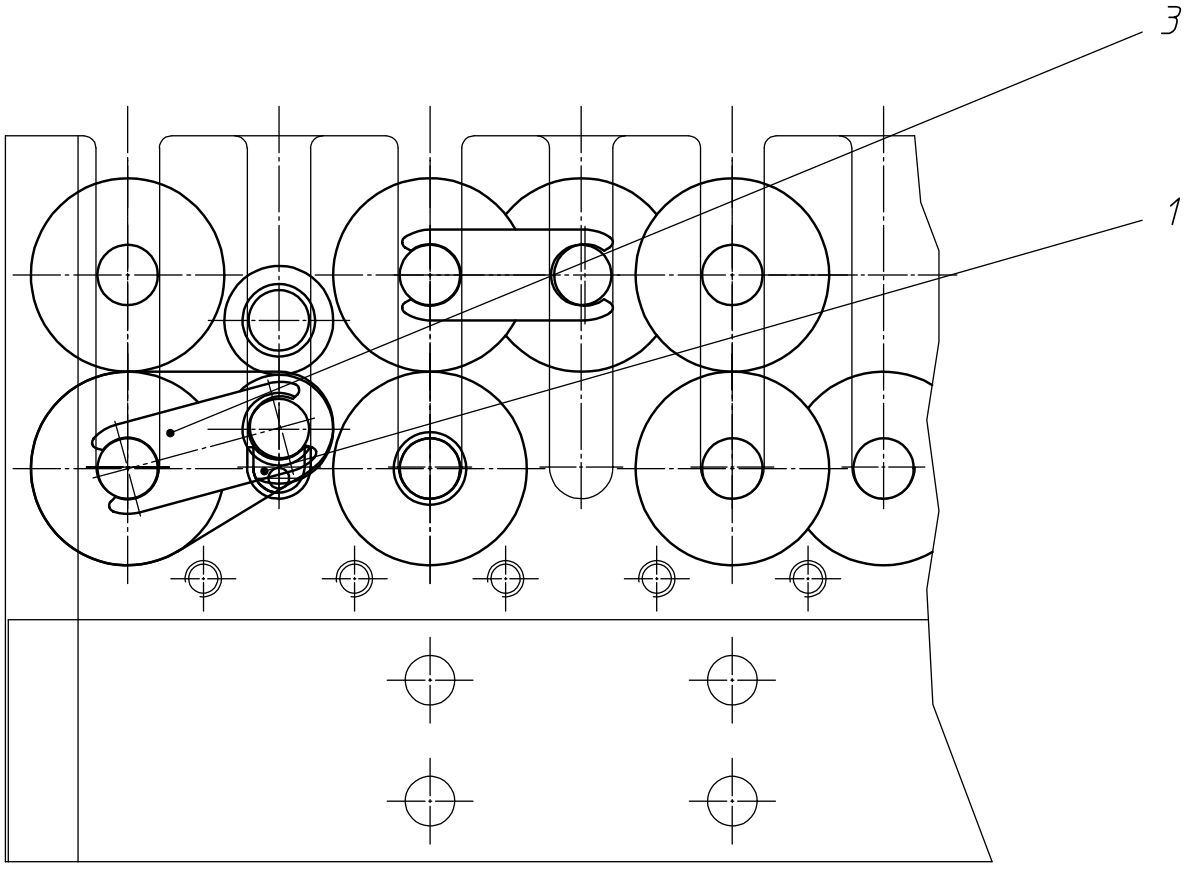
Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000050
Quant.	: 13,000 ST	Page	: 000140/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

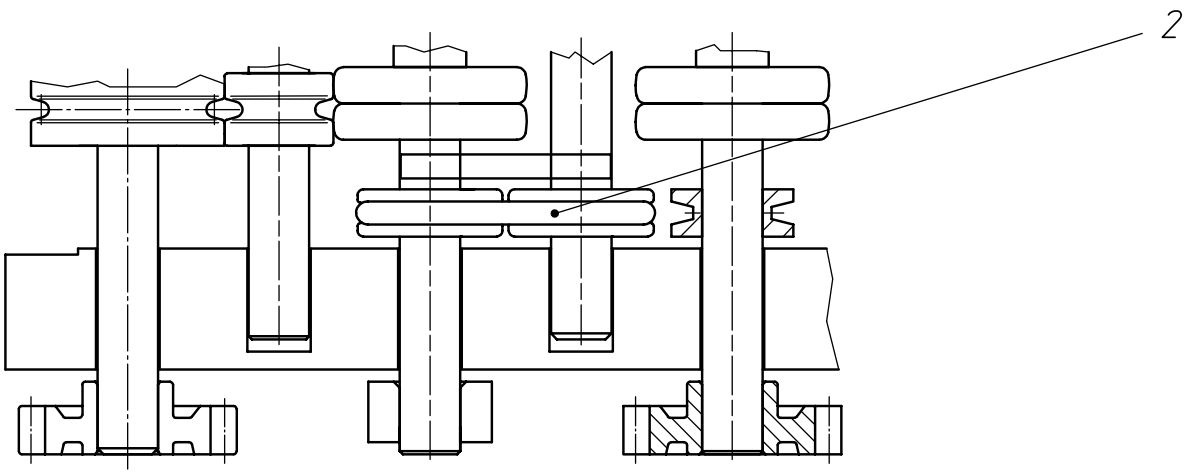
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 16.004.1298.2583	Commiss.	: 25-05-377
Label	: ROLLER/d10/D32/CPL/U/0650/TIT/PP-G/FJ	Position	: 000050
Quant.	: 2,000 ST	Page	: 000141/01
Drawing	: 16.004.1298E0000	Date	: 10.04.2006

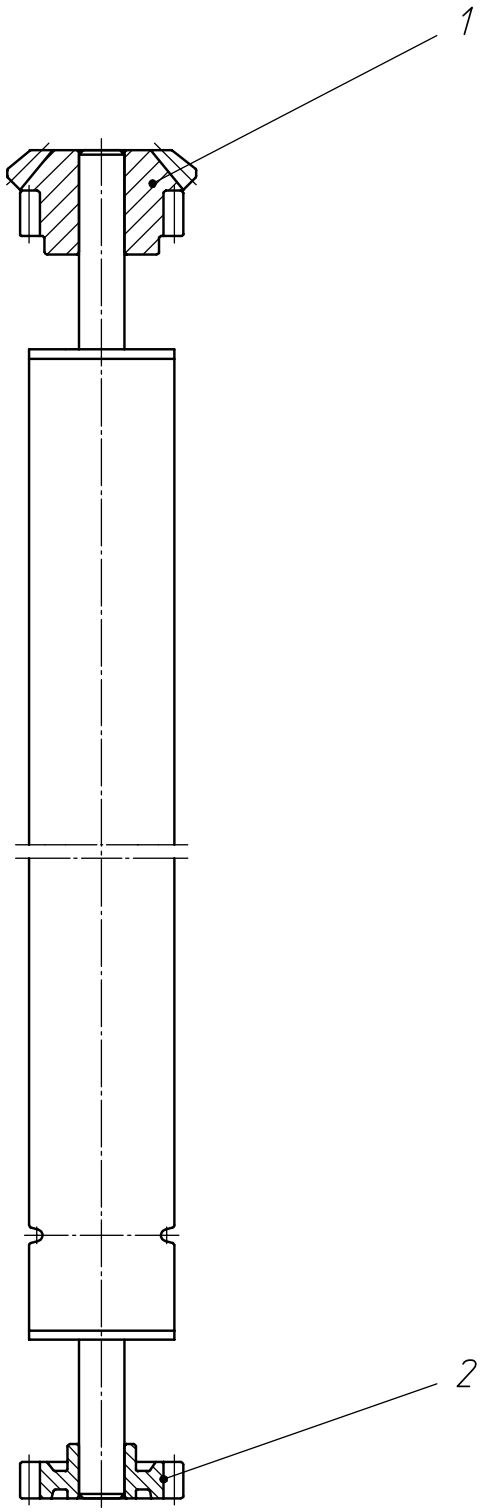
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
2	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.1298E0000	11
	01



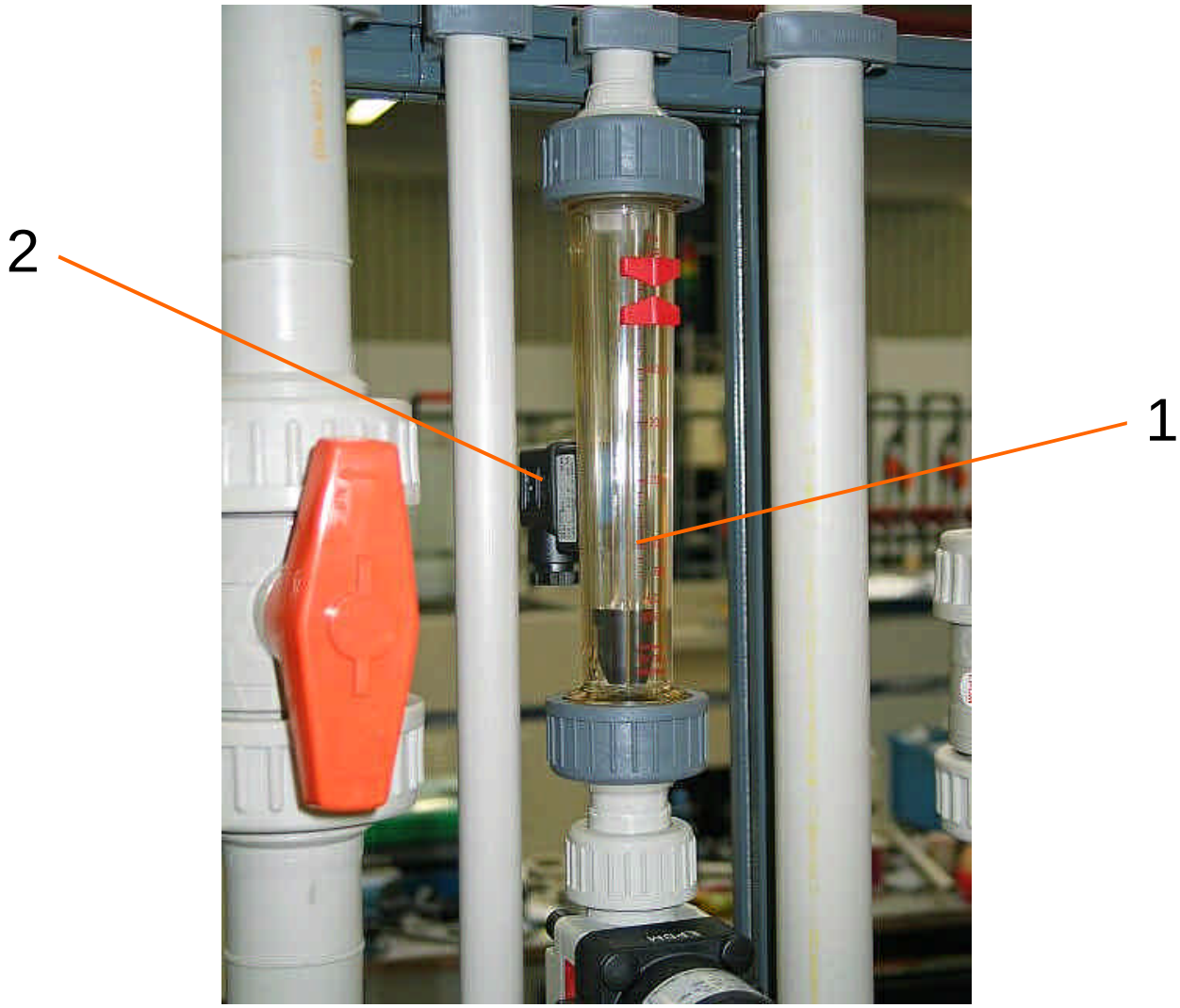
Assembly	: 16.005.0086.U00A	Commiss.	: 25-05-377
Label	: INLET/PVC/DFM640/GK-MIN/MV/D=20	Position	: 000050
Quant.	: 1,000 ST	Page	: 000142/01
Drawing	: 16.005.0086EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
1	MG-000000092-000 FLOW METER/POLYSULFON86/PVC/0060-00640 I	1,000	ST	X
2	ES-000000200-000 MAGNETIC SWITCH/TP:1257 MIN.DN10/15	1,000	ST	X

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0086EU000	11
	00



GEMÜ®

Limit Switches Instrument Sensors

Description

Limit switches, types 1251–1257, for flowmeters operating on the variable area principle. Reading of the level of the float at the switching points.
Instrument sensors, types 1270–1273 for flowmeters operating on the variable area principle. Continuous reading of the level of the float.

Construction

Types 1251–1257
In the switches there are bistable reed contacts actuated by the magnet incorporated in the float.

Types 1270–1273
The instrument sensor contains reed contacts which are triggered by the magnetic flowmeter float.

Types 1272/1273 are equipped with an integrated 2-wire signal converter which realizes a current output signal.

Function

The limit switches and instrument sensors are fixed to the dovetail-sections moulded onto the flowmeter type series 800 and 850 (see datasheets 800 and 850). The float in the flowmeter is equipped with a permanent magnet.

Types 1251–1257
When the magnetic float has passed the limit switches fixed to the tube at least once, it will produce the following circuit condition:

Position of the float in relation to the limit switch:

	above the switch	**below the switch**
Max. limit switch (types 1251/1256):	closed	open
Min. limit switch (types 1252/1257):	open	closed

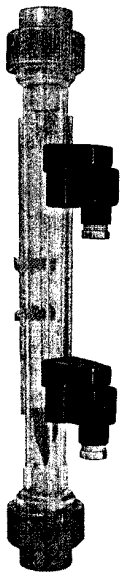
The switches then **remain** in this position, even if the float moves a long way from the min. or max. switch and will only change when the float passes the respective switch again.

Types 1270–1273
After passing through the type 1274 or 1279 signal transmitters, the reading from the type 1270/1271 instrument sensor is available as a digital indicating signal and as an analogue output signal which can then be used for further processing.

Types 1272/1273 produce a current output signal which can be directly processed without any further conversion.

The function of the limit switches or instrument sensors is neither affected by the working pressure, nor by the conductivity, concentration or density of the medium.

The application of the flowmeters with continuous reading or limit switches together with a signal converter is suitable for use with conducting, non-conducting and also with turbid media.



Types 1251–1257

Types 1270–1273

Types 1251/1256 Max. Limit Switches – Types 1252/1257 Min. Limit Switches

Housing material: Plastic
Electrical connection: Standard connector, supplied with switch
Contacts: Bistable reed switches
Switching function: Min. or max. switch as described
Degree of protection: IP 65
Max. voltage: 250 V
Max. peak value of marking current: 0.5 A
Max. steady current: 0.2 A
Max. switching duty: 10 VA
Specification: 1251/1252 for types 800 and 850 DN 25; cable gland PG 9
1256/1257 for type 850 DN 10, 15, 20; cable gland PG 9

Ordering Information:

Types 1251/1256 max. limit switches
Types 1252/1257 min. limit switches

Types 1270–1273 Instrument Sensors

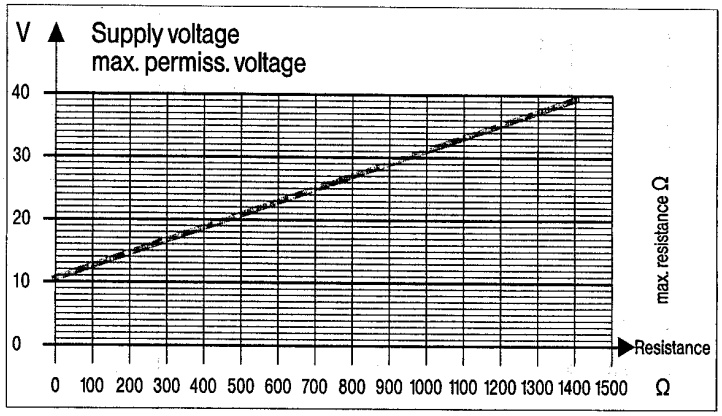
Housing material: Impact resistant plastic
Electrical connection: Standard connector with PG 9 cable gland, supplied with instrument sensor
Sensing system: Series of reed switches connected to a chain of resistors (0–10 kΩ)
Degree of protection: IP 65

Types 1272 and 1273 Instrument Sensors

Voltages: Operating voltage must be either abs. direct current or regulated direct current
$U_{min.} = 11\,V + 0.02 \times$ burden (Ohm)
$U_{max.} = 40\,V + 0.004 \times$ burden (Ohm)
Value acc. to diagram
Power consumption: V × 20 mA
Current output: 4–20 mA

Supply voltage dependent upon the resistance (in types 1272/73)

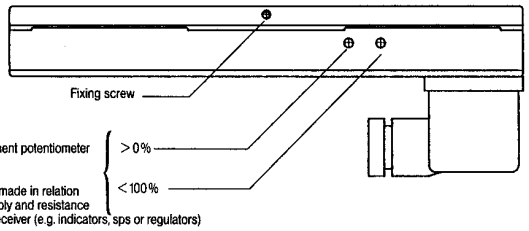
Supply voltage in V	Resistance in Ω	Current in mA
11.0	0.55	20
12.45	47	20
13.5	100	20
14.6	150	20
15.7	200	20
17.6	300	20
19.7	400	20
21.7	500	20
23.8	600	20
25.6	700	20
27.7	800	20
29.8	900	20
31.7	1000	20
33.7	1100	20
35.8	1200	20
37.7	1300	20
39.9	1400	20
41.8	1500	20



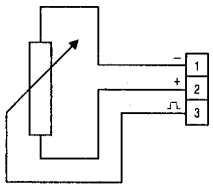
Ordering Information

Type	For flow-meter type	Signal transmitter	Metering length	Number of switch points	Distance of reed contacts	Combination within the GEMÜ modular system
Type 1270/000/Z 25	800	without	230 mm	55	4.25 mm	Types 1281–1284
Type 1271/000/Z 10	850/DN 10–20	without	122 mm	43	3.00 mm	Types 1286–1289
Type 1271/000/Z 25	850/DN 25	without	147 mm	43	3.50 mm	Types 1274–1279, Type 1510
Type 1272/000/Z 25	800	with integrated two wire signal converter	230 mm	55	4.25 mm	Type 3000, remote indication with input 4-20 mA, e.g. SPS
Type 1273/000/Z 10	850/DN 10–20		122 mm	43	3.00 mm	
Type 1273/000/Z 25	850/DN 25		230 mm	55	4.25 mm	

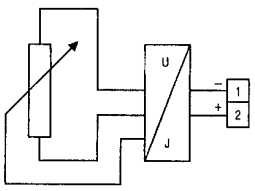
Types 1272/1273



Types 1270/1271



Types 1272/1273



Ordering Information: Types 1274/1279 signal transmitter, Types 1281-1289 3-point controllers, Type 1510 signal converter, Type 3000 accumulated flow counter
Please order separate datasheets.

Subject to alteration · 1/94 · 88048793

GEMÜ Gebr. Müller · Apparatebau GmbH & Co. KG · Criesbach · Neuer Wasen 6 · D-74653 Ingelfingen · Telefon 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Plastic Flowmeter

– Variable Area Principle –

Description

A range of plastic flowmeters, based on the variable area principle, which are corrosion resistant, extremely accurate, simple to use and maintain, and which possess considerable impact resistance.

Construction

The type 800 series of flowmeters operates according to the variable area principle, whereby the float can move freely within the metering tube.

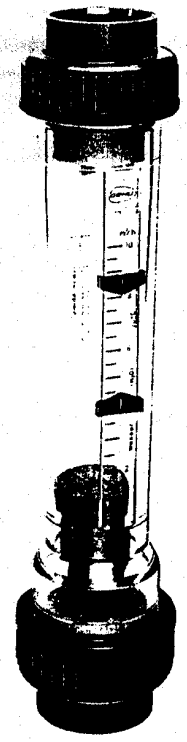
Metering tubes are available in Trogamid T, suitable for neutral media, and Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in Polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals of EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded onto the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), minimum and/or maximum limit switches, and a continous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 800

Accuracy class:
4; according to VDE/VDI 3513 sheet 2, i.e. 1% of end value + 3% of indicated flow inaccuracy

Flow ranges:

Standard Range*/** (Liquids)	Malleable Iron Unions Weight (kg)	PVC Unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	Hydrochloric acid HCl 30-33% Tube: Polysulfon	Sodium hydroxide NaOH 30% Tube: Trogamid-T	Sodium hydroxide NaOH 50% Tube: Trogamid-T	%-Scala Tube Trogamid-T Polysulfon	Tube Size Ref. no.
Type 805/815	0.70	0.40	DN 25	15– 160 l/h	10–130 l/h	–	–	10–100%	51
	0.70	0.40	DN 25	20– 250 l/h	10–200 l/h	2–110 l/h	–	10–100%	52
Material of float:	0.70	0.40	DN 25	40– 400 l/h	20–350 l/h	–	–	10–100%	53
	0.70	0.40	DN 25	60– 640 l/h	40–540 l/h	–	1–130 l/h	10–100%	54
PP (Polypropylene)	1.20	0.70	DN 32	100–1000 l/h	–	–	–	10–100%	61
	1.20	0.70	DN 32	150–1600 l/h	–	–	–	10–100%	62
(Type 815 with magnet)	2.50	1.60	DN 50	0.2– 2.5 m^3/h	–	–	–	10–100%	71
	2.50	1.60	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	72
	2.50	1.60	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	73
	3.80	2.50	DN 65	1–11 m^3/h	–	–	–	10–100%	76
Type 807/817	0.75	0.45	DN 25	25– 250 l/h	–	–	–	10–100%	51
	0.75	0.45	DN 25	40– 400 l/h	–	–	–	10–100%	52
Material of float:	0.75	0.45	DN 25	60– 640 l/h	–	–	–	10–100%	53
	0.75	0.45	DN 25	100–1000 l/h	–	–	–	10–100%	54
1.4571	1.30	0.80	DN 32	150–1600 l/h	–	–	10–540 l/h	10–100%	61
Stainless steel	1.30	0.80	DN 32	200–2500 l/h	–	–	–	10–100%	62
	3.00	2.10	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	71
(Type 817 with magnet)	3.00	2.10	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	72
	3.00	2.10	DN 50	1–10 m^3/h	–	–	–	10–100%	73
	4.70	3.40	DN 65	1.5–18 m^3/h	–	–	–	10–100%	76

*All scales of the standard range are based on a medium temperature of 20° C.

Standard Range (Gaseous media)	Malleable Iron Unions Weight	PVC Unions Weight	Size (mm)	Medium Air 1 bar abs. and 20°C	Tube Size Ref. no.
Type 825	0.70	0.40	DN 25	0.25 – 2.5 Nm^3/h	51
	0.70	0.40	DN 25	0.4 – 4.0 Nm^3/h	52
Material of float:	0.70	0.40	DN 25	0.63 – 6.3 Nm^3/h	53
	0.70	0.40	DN 25	1.0 – 10 Nm^3/h	54
PP (Polypropylene)	1.20	0.70	DN 32	1.6 – 16 Nm^3/h	61
	1.20	0.70	DN 32	2.5 – 25 Nm^3/h	62
	2.50	1.60	DN 50	4.0 – 40.0 Nm^3/h	71
	2.50	1.60	DN 50	6.3 – 63.0 Nm^3/h	72
	2.50	1.60	DN 50	10.0 –100.0 Nm^3/h	73
	3.80	2.50	DN 65	16.0 –180.0 Nm^3/h	76
Type 835	0.75	0.45	DN 25	0.63– 6.3 Nm^3/h	51
	0.75	0.45	DN 25	1.0 – 10.0 Nm^3/h	52
Material of float:	0.75	0.45	DN 25	1.6 – 16.0 Nm^3/h	53
	0.75	0.45	DN 25	2.5 – 25.0 Nm^3/h	54
PP (Polypropylene)	1.30	0.80	DN 32	4.0 – 40.0 Nm^3/h	61
	1.30	0.80	DN 32	6.3 – 63.0 Nm^3/h	62
with magnet	3.00	2.10	DN 50	10.0 –100.0 Nm^3/h	71
	3.00	2.10	DN 50	16.0 –160.0 Nm^3/h	72
	3.00	2.10	DN 50	25.0 –250.0 Nm^3/h	73
	4.70	3.40	DN 65	40.0 –400.0 Nm^3/h	76

**** For smaller or larger flow ranges, see types 850, 840 and back page of datasheet type 800. Further ranges available on enquiry.**

To types 825/835.
Note: with gaseous media the scaling alters according to operating pressure.
Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note ordering instructions.

Ordering information

Material of float	Working medium	Type Ref. no.
PP	Liquids	805
PP (with magnet)	Liquids	815
Stainless steel 1.4571	Liquids	807
Stainless steel 1.4571 (with magnet)	Liquids	817
PP	Gas	825
PP (with magnet)	Gas	835

Size	Ref. no.
DN 25	25
DN 32	32
DN 50	50
DN 65	65

Body configuration: D = straight through

Tube end connections	Ref. no.
Threaded spigots	7

Material of tube	Ref. no.
Trogamid-T Temp. range: 0– 60°C	21
Polysulfon Temp. range: 0–100°C	22
(Stated temperatures are valid for water).	

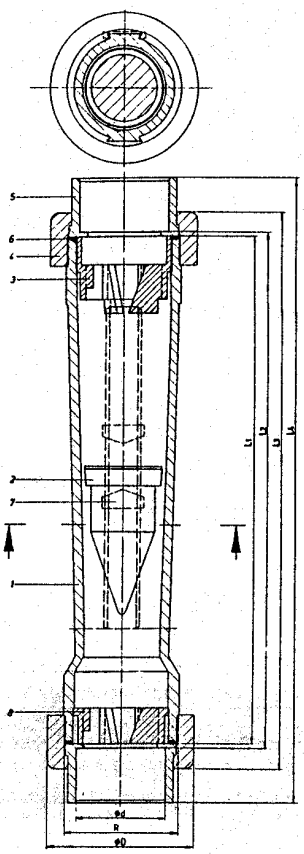
Material of O-Rings	Ref. no.
FPM (Viton)	4
EPDM (Ethylene-propylene)	14

End connection material	Ref. no.
PVC unions with adhesive sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16	6

Size of tube
(see table on left)

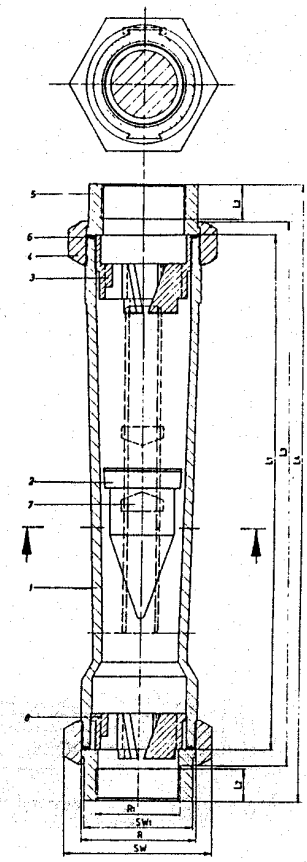
Flow range:
(see table on left)

Note:
When ordering, the flow ranges should be stated as follows:
Liquids: l/h
Gaseous media: Nm^3/h



DN	R	R_1	SW	SW_1	L_1	L_2	L_3	L_4
25	G 1½	G 1	54	38	350	17	370	402
32	G 2	G 1¼	66	47	350	19	370	410
50	G 2¾	G 2	90	66	350	24	374	420
65	G 3½	G 2½	110	83	350	30	374	430

PVC-Unions



DN	ø d	R	ø D	L_1	L_2	L_3	L_4
25	32	G 1½	60	350	356	376	400
32	40	G 2	74	350	356	380	408
50	63	G 2¾	103	350	356	386	433
65	75	G 3½	122	350	356	388	445

Malleable iron unions

Spare parts list

Pos.	Description	Pieces
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1

Ordering Example	805	25	D	7	21	14	1	51	160
Type (float PP)	805								
Size (mm)		25							
Body configuration			D						
End connection of tube				7					
Material of metering tube					21				
Material of O-ring						14			
End connection material							1		
Tube cone								51	
Flow range max. (e.g. 160 l/h, H_2O)									160

Required information

In order to size a flowmeter the following data are necessary:
1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h or kg/h)
4. Operating pressure (bar abs or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)
8. Float with or without magnet

Plastic Flowmeter for Larger Flow Ranges

Standard scale: Range 12 – 26 m^3/h., medium: water at 20°C

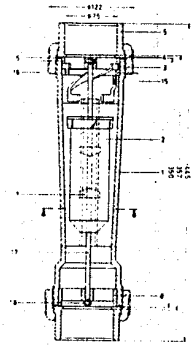
Version:

Construction and materials as for types 807/817, nominal bore size: 65 mm.
The float is guided by means of a rod.

Ordering Information:

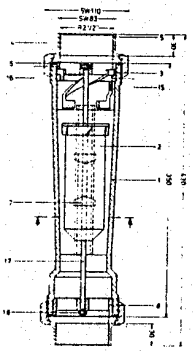
Analogue: As for types 807 / 817. In addition, following the range (26.000 l/h.), please give the version of the float according to the following ref. nos.:

Material of float	Type ref. no.	Additional ref. no.
Stainless steel no. 1.4571	807	1105
Stainless steel no. 1.4571 (with magnet)	817	1106



DN	Od	OD	I	L
65	75	122	357	445

Version
PVC unions
weight 4.6 kg.



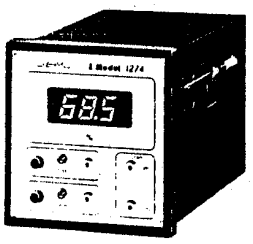
DN	SW	SW1	D	I	L
65	110	83	G 2½	30	430

Version
Malleable iron unions
weight 6.0 kg.

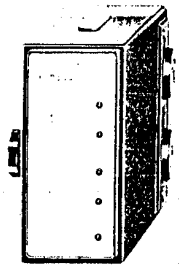
Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3, 15, 16	Compl. float stop	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1
17	Guiding rod	1
18	Nut for guiding rod (17)	2

Accessories for Flowmeter Series 800



Type 1274/1279



Type 1520/1521

Type 1270

Type 1251

Type 1252

To increase the versatility of the flowmeter series 800, numerous accessories have been developed which can be retrofitted onto the tube. The float however, must be one containing a magnet, in order for these accessories to function.

- Type 1251 Limit switch (max.) 10 VA
- Type 1252 Limit switch (min.) 10 VA
- Type 1270/ Instrument sensor for continual float level readings.
- Type 1274/ **E-module**, signal transmitter.
  1279 Designs: panel mounting or eurocard (19"/24")
- Type 1520/ **E-module**, isolating switch amplifier.
  1521 Designs: panel mounting or eurocard (19"/24")

For the above accessories there are separate datasheets. For further enquiries, please apply for the respective sheets.

Further product range

- Plastic valves, pneumatically, electrically and manually operated
- Metal valves, pneumatically, electrically and manually operated

Manufacturer

GEMÜ GEBR. MÜLLER
Apparatebau GmbH & Co. KG
Postfach 30 · D-7118 Ingelfingen 2 · West Germany
Tel. 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Presented by:

GEMÜ®

Plastic Flowmeter

DN 10–25

Description

A plastic flowmeter, operating on the variable area principle, which is extremely accurate, resistant to corrosion, resistant to impact, and is simple to use.

Construction

This GEMÜ plastic flowmeter operates according to the variable area principle, whereby the float can move freely within the metering tube.

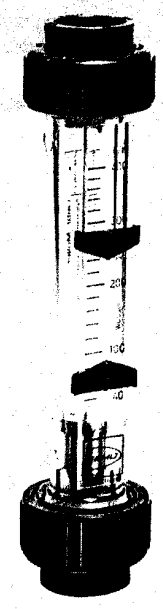
Metering tubes are available in Trogamid, suitable for neutral media, and in Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals in EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded on to the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), min. and/or. max. limit switches, or a continuous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 850

Flow Ranges

Standard Ranges*/** (liquids)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	% scale Tube: Trogamid-T Polysulfon	Tube size ref. no.
Type 855/865	0.18	0.07	DN 10	2– 25 l/h	10–100 %	11
	0.18	0.07	DN 10	4– 40 l/h	10–100 %	12
	0.18	0.07	DN 10	5– 60 l/h	10–100 %	13
	0.18	0.07	DN 10	10– 100 l/h	10–100 %	14
Float material	0.18	0.07	DN 10	15– 160 l/h	10–100 %	15
	0.30	0.12	DN 15	5– 60 l/h	10–100 %	21
	0.30	0.12	DN 15	10– 100 l/h	10–100 %	22
	0.30	0.12	DN 15	15– 160 l/h	10–100 %	23
PP (Polypropylene)	0.30	0.12	DN 15	20– 250 l/h	10–100 %	24
	0.30	0.12	DN 15	30– 320 l/h	10–100 %	25
(Type 865 with magnet)	0.48	0.21	DN 20	15– 160 l/h	10–100 %	31
	0.48	0.21	DN 20	20– 250 l/h	10–100 %	32
	0.48	0.21	DN 20	40– 400 l/h	10–100 %	33
	0.48	0.21	DN 20	60– 640 l/h	10–100 %	34
	0.61	0.29	DN 25	20– 250 l/h	10–100 %	41
	0.61	0.29	DN 25	40– 400 l/h	10–100 %	42
	0.61	0.29	DN 25	60– 640 l/h	10–100 %	43
	0.61	0.29	DN 25	100–1000 l/h	10–100 %	44
Type 857/867	0.19	0.08	DN 10	4– 40 l/h	10–100 %	11
	0.19	0.08	DN 10	5– 60 l/h	10–100 %	12
	0.19	0.08	DN 10	10– 100 l/h	10–100 %	13
	0.19	0.08	DN 10	15– 160 l/h	10–100 %	14
Float material	0.19	0.08	DN 10	20– 250 l/h	10–100 %	15
	0.31	0.13	DN 15	10– 100 l/h	10–100 %	21
	0.31	0.13	DN 15	15– 160 l/h	10–100 %	22
1.4571	0.31	0.13	DN 15	20– 250 l/h	10–100 %	23
Stainless steel	0.31	0.13	DN 15	40– 400 l/h	10–100 %	24
(Type 867 with magnet)	0.31	0.13	DN 15	50– 500 l/h	10–100 %	25
	0.51	0.24	DN 20	20– 250 l/h	10–100 %	31
	0.51	0.24	DN 20	40– 400 l/h	10–100 %	32
	0.51	0.24	DN 20	60– 600 l/h	10–100 %	33
	0.51	0.24	DN 20	100–1000 l/h	10–100 %	34
	0.66	0.34	DN 25	40– 400 l/h	10–100 %	41
	0.66	0.34	DN 25	60– 640 l/h	10–100 %	42
	0.66	0.34	DN 25	100–1000 l/h	10–100 %	43
	0.66	0.34	DN 25	150–1600 l/h	10–100 %	44

* All scales of the standard range are based on a medium temperature of 20°C.

****For larger flow ranges see type series 800.**

Standard Ranges (gaseous media)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Medium air at 1 bar abs. and 20°C	Tube size ref. no.
Type 875	0.18	0.07	DN 10	30– 360 N l/h	11
	0.18	0.07	DN 10	50– 550 N l/h	12
	0.18	0.07	DN 10	100– 900 N l/h	13
	0.18	0.07	DN 10	150–1500 N l/h	14
Float material	0.18	0.07	DN 10	200–2400 N l/h	15
	0.29	0.11	DN 15	100– 900 N l/h	21
	0.29	0.11	DN 15	150–1500 N l/h	22
	0.29	0.11	DN 15	200–2400 N l/h	23
	0.29	0.11	DN 15	400–3800 N l/h	24
PP (Polypropylene)	0.29	0.11	DN 15	500–4800 N l/h	25
	0.46	0.19	DN 20	0.2– 2.5 Nm^3/h	31
	0.46	0.19	DN 20	0.4– 4.0 Nm^3/h	32
	0.46	0.19	DN 20	0.5– 5.5 Nm^3/h	33
	0.46	0.19	DN 20	1.0–10.0 Nm^3/h	34
	0.57	0.25	DN 25	0.4– 4 Nm^3/h	41
	0.57	0.25	DN 25	0.6– 6 Nm^3/h	42
	0.57	0.25	DN 25	1.0–10 Nm^3/h	43
	0.57	0.25	DN 25	1.5–16 Nm^3/h	44

To type 875
Note: With gaseous media the scaling alters according to operating pressure. Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note the ordering instructions.

Ordering Information

Version:

Flowmeter with float material	Operating medium	Type ref. no.
PP	Liquids	855
PP (with magnet)	Liquids	865
Stainless steel (1.4571)	Liquids	857
Stainless steel (1.4571) (with magnet)	Liquids	867
PP	Gas	875

Size (mm)	Ref. no.
DN 10	10
DN 15	15
DN 20	20
DN 25	25

Body configuration: D = straight through

Tube end connections	Ref. no.
Male threads	7

Material of tube	Ref. no.
Trogamid-T temperature range: 0 – 60°C	21
Polysulfon temperature range: 0 – 100°C	22
(Given temperatures are valid for water)	

Material of O-rings		Ref. no.
O-ring Viton	FPM	4
Ethylene Propylene	EPDM	14

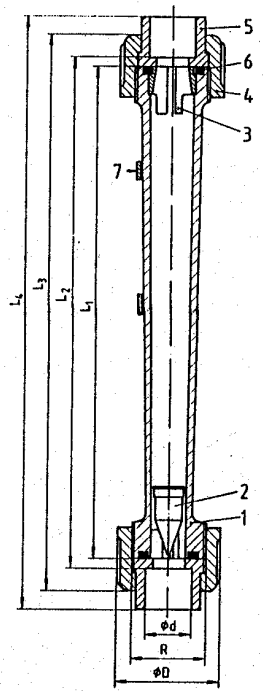
End connection material	Ref. no.
PVC unions with solvent welded sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16.	6

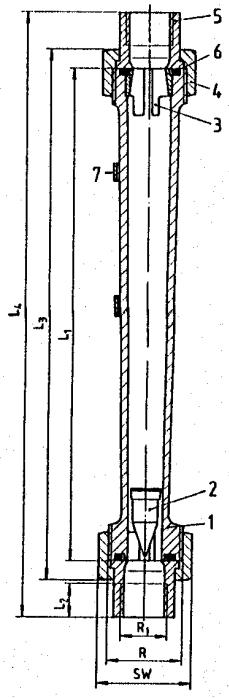
Size of tube
(see table on left)

Measuring range
(see table on left)

Note:
The scale divisions correspond to the actual flows. For liquid media the flow values are in l/h and for gaseous media in Nm^3/h or N l/h

Accuracy class:
4; according to VDE/VDI 3513, sheet 2, i.e. 1% of end value + 3 % of measured value.





DN	Ød	G	ØD	L1	L2	L3	L4
10	16	G¾	35	165	171	186	199
15	20	G 1	43	170	176	192	208
20	25	G1¼	53	185	191	210	229
25	32	G1½	59	200	206	226	250

Version: PVC unions

DN	G 1	G	SW	L1	L2	L3	L4
10	G⅜	G¾	32	165	12	180	207
15	G½	G 1	41	170	13	185	215
20	G¾	G1¼	50	185	16	201	230
25	G 1	G1½	55	200	19	219	250

Version: Malleable iron unions

Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2

Ordering Example	855	10	D	7	21	14	1	13	60
Type (float PP)	855								
Size (mm)		10							
Body configuration			D						
Connection (ref. no.)				7					
Tube material (ref. no.)					21				
Material of O-rings						14			
End connection material							1		
Tube cone								13	
Flow range max. (e.g. l/h H_2O)									60

Required information:
In order to size a flowmeter, the following data are necessary:

1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h, kg./h)
4. Operating pressure (bar abs. or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)

Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000050
Quant.	: 1,000 ST	Page	: 000143/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

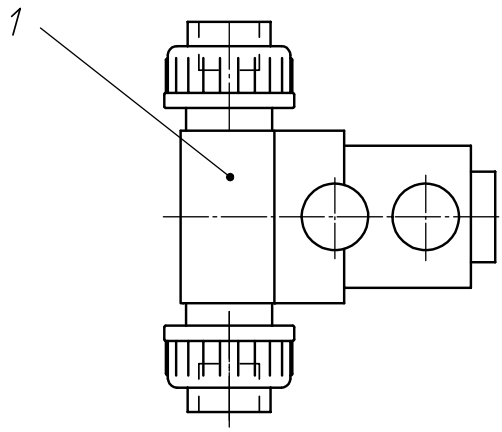
Pos.	Part N° / Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

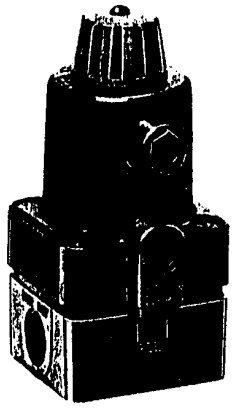
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

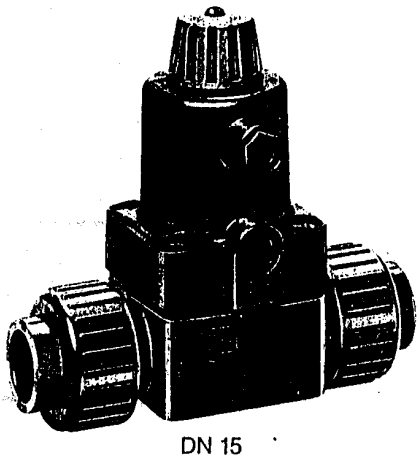
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

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Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

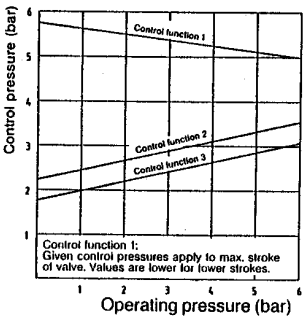
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

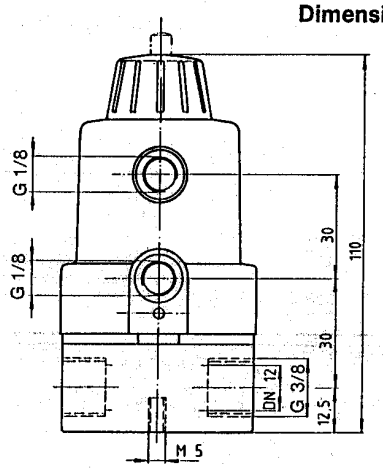
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

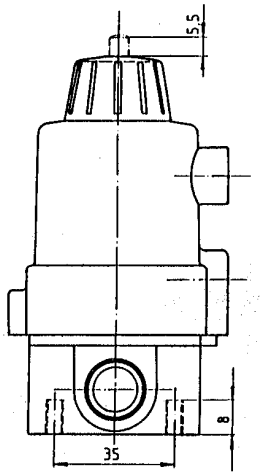
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

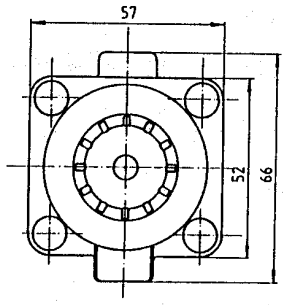
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



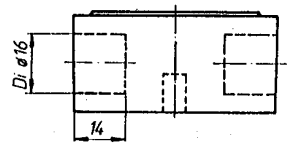
Dimensions



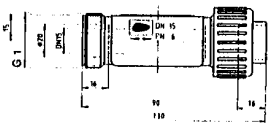




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

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Presented by:

Printed in West Germany – Oha-Druck GmbH, Ingelfingen

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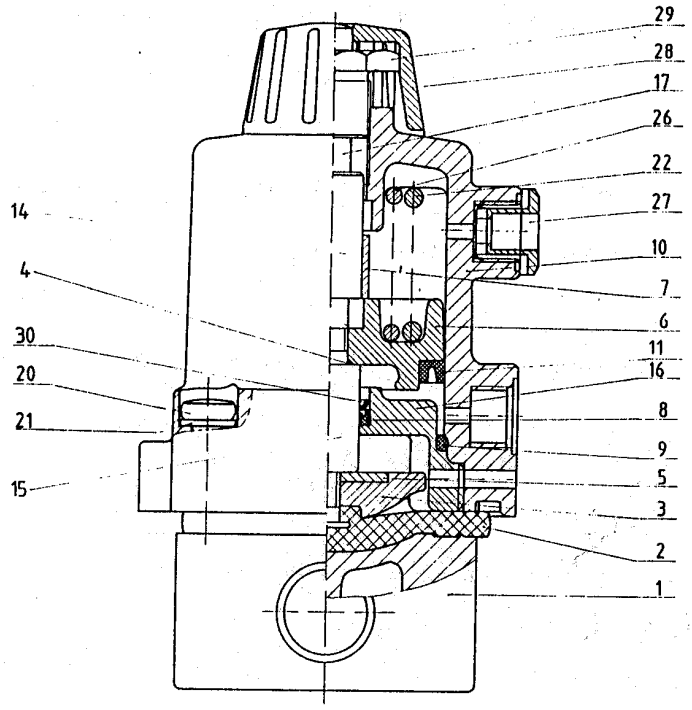
Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000050
Quant.	: 1,000 ST	Page	: 000144/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

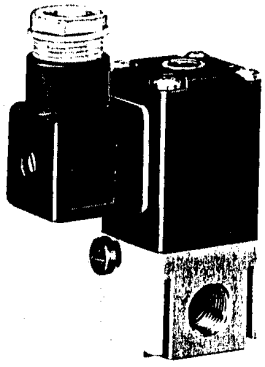
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

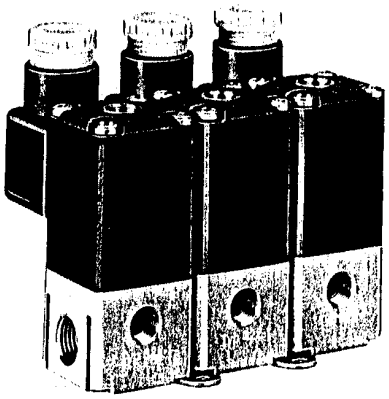
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

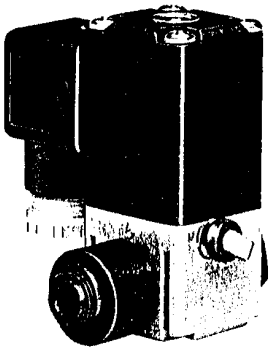
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

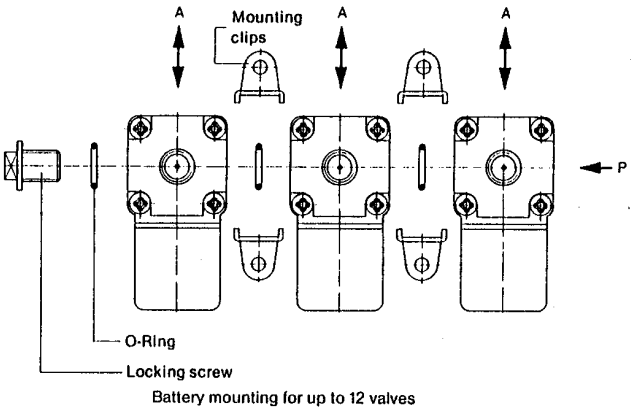


Type 322



Type 324

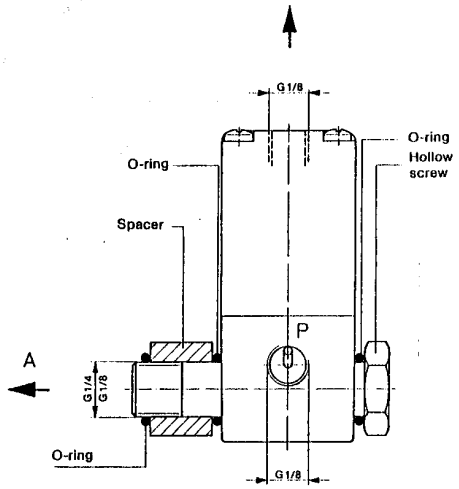
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

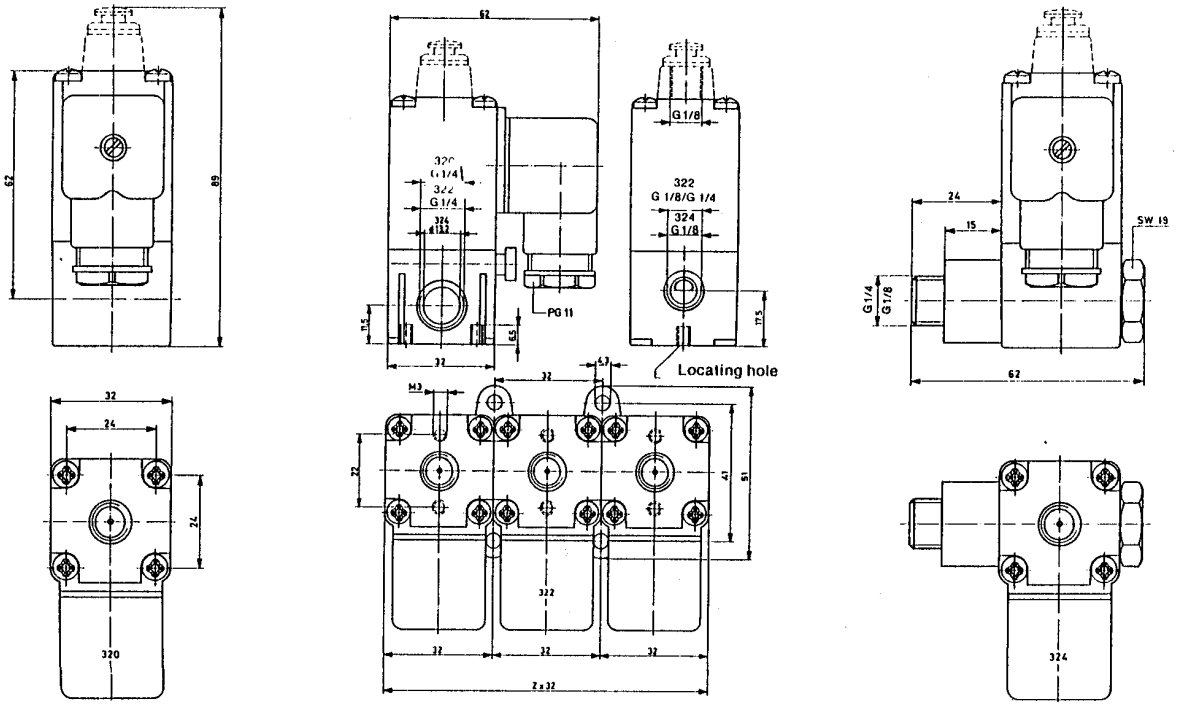
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

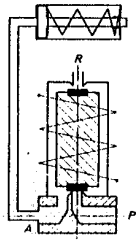
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

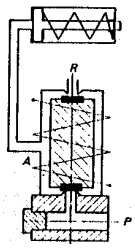
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

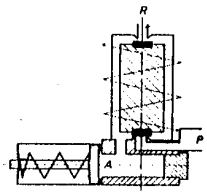
Control function normally closed



Type 320

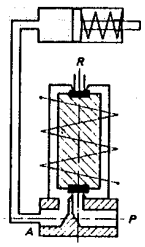


Type 322

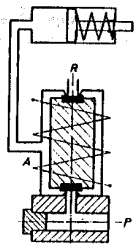


Type 324

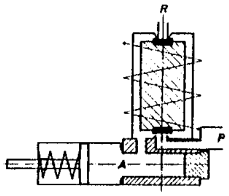
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

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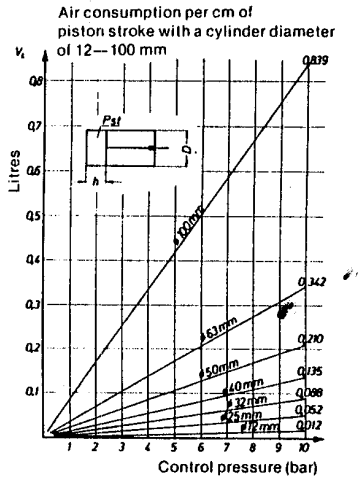
Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

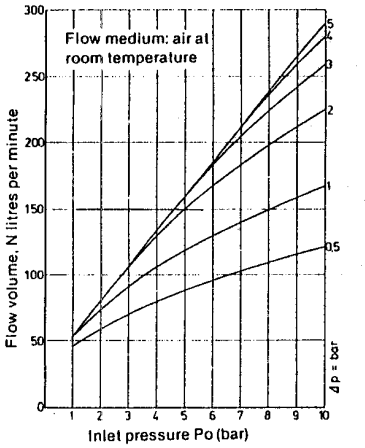
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

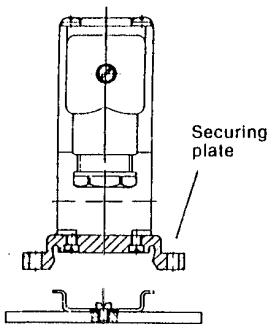
The flow quantity for other gases and temperatures can be calculated according to the following formula:

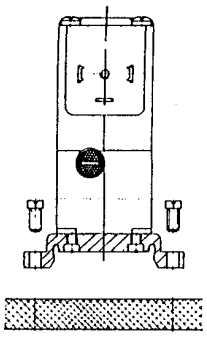
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 25-05-377-04	Commiss.	: 25-05-377
Label	: M04, Micro-Etch - WMT 3 PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000145/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.WMT3.20.0N CONTAINER[520]/WMT3/PVC/TI	1,000	ST	
	16.002.0040.U233 INTERMEDIATE GLASS COVER/KPL./23/PP/TI	1,000	ST	
	16.05.W003.01.0A FEED/WMT3/PVC /PVC /EP/AS12	1,000	ST	
1	16.005.0010.2O2B SPRAYPIPE/PVC-D/ 650/ 9D/F/G/12,06L/MIN	12,000	ST	X
	16.009.0005.U00A COOLING/ACCESSORIES/PVC/1KS	1,000	ST	
2	03.009.0052.0003 COOLING COIL/TIT/L=700	1,000	ST	X
	16.010.0018.U00N BATH HEATER+RECEIVER/ 4.00kW/TI/PVC	1,000	ST	
	16.010.0015.U000 BLIND CAP/HEATING ROD/PVC/EPDM	1,000	ST	
	16.010.0005.U003 TEMPERATURE PROBE/TI/EP/2xPt100/MAZ/L200	1,000	ST	
	16.010.0006.U00A LEVEL SWITCH/PVC/EPDM /ES-297	1,000	ST	
	16.008.0004.U003 PUMP FIXING/TI/PP-G/EPDM	1,000	ST	
	50.003.0009.U000 TA/RE/4.00kW/MF/ET=270/PUTA.04.K.000211	1,000	ST	
3	FL-000000282-000 GX-DEEP FILTER ELEM./PP/ L=9 3/4"/50µ	1,000	ST	X
	16.004.0126.U23N CONVEYOR/ST/23/PVC/TI/KL-KU/d=27	1,000	ST	
	VS-25-05-377-04 CONVEYOR/WMT 3/650/PVC/TI	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 25-05-377-04	Commiss.	: 25-05-377
Label	: M04, Micro-Etch - WMT 3 PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000145/02
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
4	PUDO059300-00215 DOSING PUMP/E00.0540PP10EPP/LA/59/0.09kW	1,000	ST	X
	16.023.0026.U00E **PUMP-ANCILLARIES**	1,000	ST	
5	XE-000009416-000 LA-SUCTION PIPE PP/NR.KA90188 PP/L=1000	1,000	ST	X
6	MG-000000409-000 COPPER CONTROLLER/WCU 310-5N1	1,000	ST	X

Parts without Pos.-N° see assembly parts list

MG-000000369 -000

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Statement of Limited Warranty

WALCHEM Corporation warrants equipment of its manufacture, and bearing its identification to be free from defects in workmanship and material for a period of 24 months for electronics and 12 months for mechanical parts from date of delivery from the factory or authorized distributor under normal use and service and otherwise when such equipment is used in accordance with instructions furnished by WALCHEM Corporation and for the purposes disclosed in writing at the time of purchase, if any. WALCHEM Corporation's liability under this warranty shall be limited to replacement or repair, F.O.B. Holliston, MA U.S.A. of any defective equipment or part which, having been returned to WALCHEM Corporation, transportation charges prepaid, has been inspected and determined by WALCHEM Corporation to be defective. Replaceable elastomeric parts and glass components are expendable and are not covered by any warranty.

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P/N 180099.C
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1.0 Introduction

The WCU310 series copper controllers are optoelectronic on-line analyzers that may be used in variety of applications including electroless copper baths, microetch baths and a number of other chemistries that contain more than 0.01 grams/liter (g/L) of copper ions.

There are four relays that may be used as control outputs that are activated simultaneously. The direction of control is selected via software. The outputs each have timers associated with them, that may be used to track the volume of chemistry added, or the time that the output has been on.

An optional 4-20 mA output that is proportional to the copper concentration is available.

Either an immersible in-tank sensor or flow-through out-of-tank sensor may be specified.

2.0 Specifications

2.1 Measurement Performance

Electroless Copper Concentration Range:	.01 - 5.5 g/L	(.001 - 0.73 oz/gal)
Microetch Copper Concentration Range:	.01 - 20 g/L	(.001 - 2.66 oz/gal)
Concentration Resolution:	.001 g/L	(.0001 oz/gal)
Concentration Accuracy:	.01 g/L	(.001 oz/gal)

2.2 Electrical: Input/Output

Input Power

115 VAC ± 15% 50/60 Hz, 60 mA	or	230 VAC ± 15% 50/60 Hz, 30 mA

Input Signals

Sensor	Power: + 5VDC, 150 mA Signals: 0 to 2VDC
Interlock (optional)	Isolated dry contact closure required (i.e., flow, level, etc.)

Output

Mechanical Relays (5)	@ 115 VAC, 10A resistive, 1/8 HP @ 230 VAC, 6A resistive, 1/8 HP
4 - 20 mA (optional)	Fully isolated, internally powered 600 Ω max. resistive load. Resolution .001% of span, accuracy ± 1% of reading.

2.3 Mechanical

Controller

Enclosure:	Fiberglass
NEMA Rating:	NEMA 4X
Dimensions:	6.75" x 7.5" x 5.0"
Display:	2 x 16 character backlit liquid crystal
Operating Ambient Temp:	32 - 158°F (0 - 70°C)
Storage Temperature:	-20 to 180°F (-29 to 80°C)
Shipping Weight:	10 lbs (approximately)

Sensor

	Immersible	Flow Through
Enclosure:	Polycarbonate/Polypro	ABS
NEMA Rating:	NEMA 4X	NEMA 4X
Dimensions:	5.25" x 4.0" x 20.25"	6.75" x 4.75" x 2.25"
Operating Ambient Temp:	32 - 158°F (0 - 70°C)	32 - 158°F (0 - 70°C)
Storage Temperature:	-40 to 185°F (-40 to 85°C)	-40 to 185°F (-40 to 85°C)
Solution Temperature:	200°F (93°C) max.	200°F (93°C) max.
Maximum cable length:	80 ft .	80 ft.

3.0 Unpacking and Installation

3.1 Unpacking the unit

Inspect the contents of the carton. Please notify the carrier immediately if there are any signs of damage to the controller or its parts. Contact your distributor if any of the parts are missing. The carton should contain a WCU310 controller and instruction manual. Any options or accessories will be incorporated as ordered.

3.2 Mounting the electronic enclosure

The WCU series controller is supplied with mounting holes on the enclosure. It should be wall mounted with the display at eye level, on a vibration-free surface, utilizing all 4 mounting holes for maximum stability. The enclosure is NEMA 4X rated. The maximum operating ambient temperature is 158° F (70° C). The enclosure requires the following clearances:

Top:	2"
Left:	8"
Right:	4"
Bottom:	7"

3.3 Immersible Copper Sensor Installation

The immersible copper sensor is designed for direct in-tank monitoring of electroless copper and microetch solutions. By monitoring the copper content directly in the solution, control lag and hydraulic problems are eliminated.

The sensor is constructed such that a constant path length exists between the fiber optic light guides. The solution between the light guides absorbs light at specific wavelengths in proportion to the copper concentration. The lamp and electronics are located under the cover of the sensor. In order to avoid a shift in calibration due to condensation, the sensor's cover should NEVER be opened.

The immersible sensor is provided with a mounting plate and 20 feet of cable. Extension cable is available if the sensor can not be mounted within 20 feet of the controller. The maximum cable length is 80 feet.

While the positioning of the sensor is not particularly sensitive to the tank layout, the following suggestions are given to aid installation:

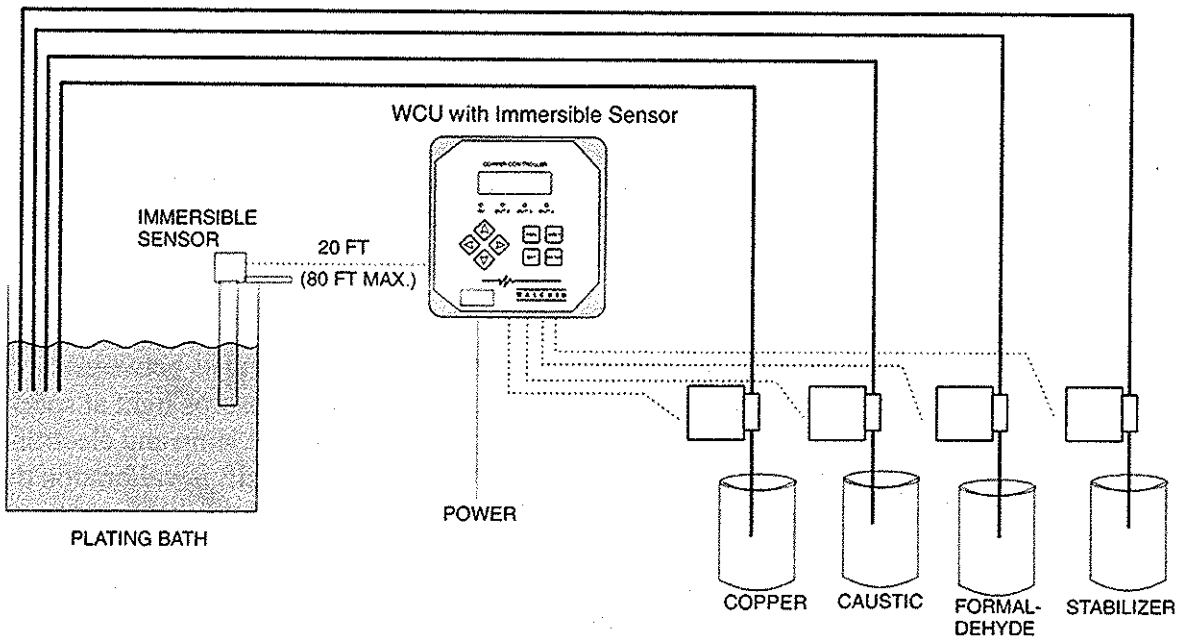
- Do not place the sensor beside heaters; if solution flow stops, the polypropylene guard may melt.
- Do not immerse the entire sensor, or the cable.
- Place the sensor where the loads of parts will not strike it.
- Place the sensor in an area of good solution movement, but not directly in the path of any air agitation.
- Mount the sensor securely to the rim of the tank using the holes provided. If the tank is rimless, use a block to provide the support for the mounting plate.

Attach the cable's connector to the WCU controller. The connector is keyed, do not force! The sensor you receive with the controller has already been calibrated.

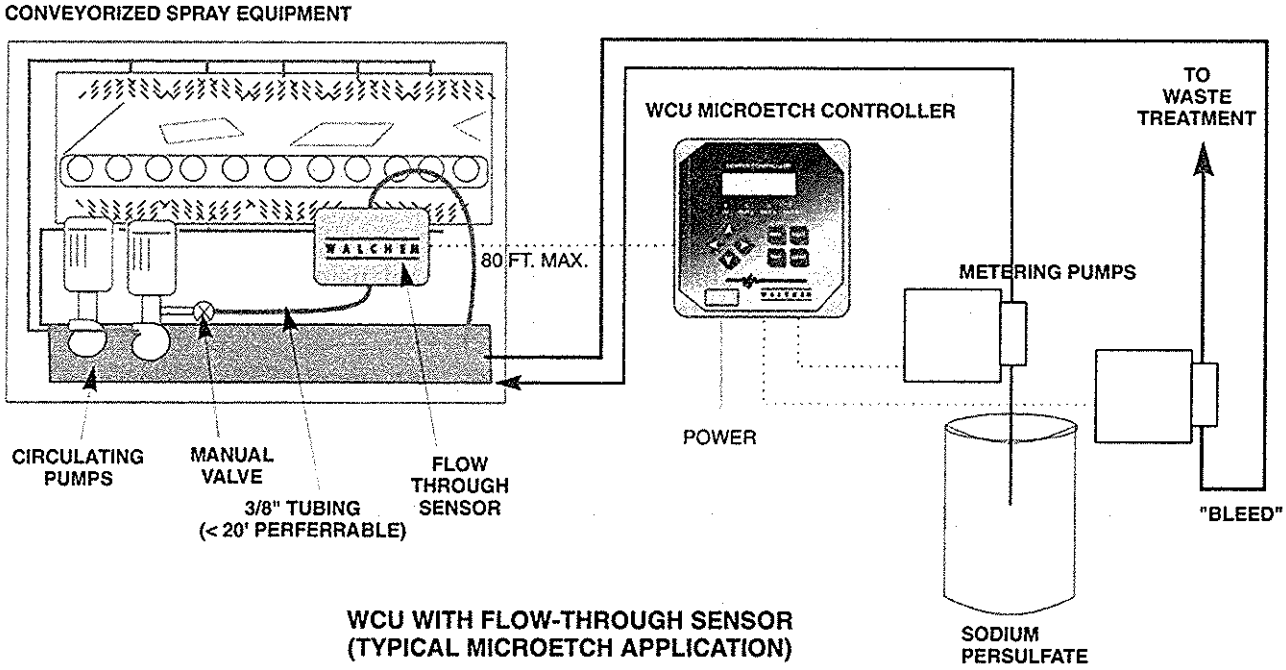
3.4 Flow Through Copper Sensor/Sample Loop Installation

The copper flow through sensor is designed for out-of-tank monitoring of electroless copper and microetch solutions.

The sensor is designed with a glass tube that contains the copper solution that forms a fixed path length between the lamp and receptor module. The solution absorbs light at specific wavelengths in proportion to the copper concentration. In order to avoid a shift in calibration caused by condensation, the sensor cover should NEVER be removed!



WCU WITH IMMERSIBLE SENSOR
(TYPICAL ELECTROLESS COPPER APPLICATION)



WCU WITH FLOW-THROUGH SENSOR
(TYPICAL MICROETCH APPLICATION)

Figure 1 Typical Installation

The flow through sensor is provided with a mounting plate and 20 feet of cable. Extension cable is available if the sensor can not be placed within 20 feet of the controller. The maximum cable length is 80 feet.

The sample loop consists of a shut off valve, a cooling coil or plate, a sensor and a pump or any combination thereof. The shut off valve is to quickly isolate the system if necessary. A cooling coil or plate is necessary to cool the copper solution down to a temperature acceptable to a sample pump. Cooling the solution is also recommended to help reduce the amount of plate out which may form in the sample loop. The pump may be either a stand alone sample pump (which typically have temperature restriction) or a high temperature pump (which is usually just a branch off the recirculation pump).

The flow through sensor/sample loop must be installed according to the following guidelines:

- Mount the sensor on a vibration-free, vertical surface so that the sensor tubing inlet connection is at the bottom and the outlet is at the top. The vertical orientation will prevent air bubbles from being trapped in the sensor.

- Install a shut-off valve at the beginning of the sample loop so that the system may be shut off quickly if necessary.

- If a sample pump is to be used, it must be installed last, after the flow through sensor and the cooling coil or plate, if applicable.

Other installation guidelines which may be helpful in the overall system:

- Mount the sensor as close to solution as possible. Keep tubing distances to the sensor inlet as short as possible to avoid hydraulic lag time. Maximum recommended length of tubing from solution to sensor is 25 feet. If this is not possible, see Application Notes below.

- The solution inlet should draw sample from an area of good solution movement in order to respond quickly to chemical additions. However, the solution inlet should not draw too near to where the chemistry is added to avoid artificial 'spikes' in concentration.

- The solution discharge should be open to atmospheric pressure in order to ensure proper flow.

- The cable connector to the controller is keyed, do not force!

Application Notes

If the distance from the solution to the sensor is further than the recommended length of 25 feet, the maximum lagtime must be calculated from the desired control band to determine a pump flow rate based on a given distance of standard, uniform tubing. The maximum lagtime is the maximum allowable time for the solution to continuously get to the sensor in order to achieve the desired control band.

To calculate maximum lagtime:

$$\text{Max. Lagtime} = \frac{\text{Desired Control Band*}}{4 \times \text{Depletion Rate}}$$

where Control band = Maximum deviation of concentration
Depletion rate = Rate at which the bath will deplete per unit of time

* The deadband should be adjusted so that it is 1/4 the desired control band.

For Example: The set point is 4.00 g/L.

If the desired control band is 0.20 g/L (± 0.10 g/L or 2.5%) and the bath is depleting at a rate of 1.25 g/L every 15 minutes (0.08333 g/L every minute),

$$\text{then Max. Lagtime} = \frac{0.20 \text{ g/L}}{4 \times (0.08333 \text{ g/L /min})}$$

$$= 0.60 \text{ minutes}$$

So, 0.60 minutes is the maximum time it should take for the solution to reach the sensor.

To calculate pump flow rate:

$$\text{Minimum Pump Flow Rate} = \frac{\text{Volume of System*}}{\text{Maximum Lagtime}}$$

where Volume of system = $B \left(\frac{\text{Tubing I.D.}}{2}\right)2 \times$ Length of tubing
Maximum lagtime = Previously calculated time to get solution to sensor.

* Volume is based on length from solution to sensor, not the return.

For Example: If the system parameters are: Tubing is 3/8" O.D. x 1/4" I.D.
Length is 30 feet (360 inches)

$$\text{then the volume of the system} = B \left(\frac{0.25 \text{ in}}{2}\right)2 \times (360 \text{ in}) = 17.7 \text{ in}3$$

Note: 1 U.S. Gallon = 231 U.S cubic inches	1 Liter = 61.03 U.S. cubic inches
Volume of Cooling Coil: 0.018 Gallons 0.068 Liters	Volume of Cooling Plate: 0.023 Gallons 0.088 Liters
Volume of 3/8" O.D. x 1/4" I.D. (0.59 in3/ft):	0.00255 Gallons/linear ft 0.00965 Liters/linear ft

$$\text{Volume of the system} = \frac{17.7 \text{ in3}}{231 \text{ in3 / gallon}} = 0.0765 \text{ gallons}$$

Maximum lagtime = 0.60 minutes (previously calculated)

So, the minimum pump flow rate

$$= \frac{0.0765 \text{ gallons}}{0.60 \text{ minutes}}$$

$$= 0.127 \text{ gal/min (483 mL/min)}$$

Caution: The calculated pump flow rate is the minimum required to obtain the desired control band, however, if the flow rate increases over the recommended rate of 500 mL/min (approx. 0.13 gal/min) the rate of cooling will decrease. This may be compensated for by re-evaluating the system criteria: length / desired control band or to double up on the cooling plate/coil.

Consult factory with any further installation questions.

3.5 Control Module Installation

Once the enclosure is mounted, the output pumps may be located at any distance from the controller. The sensor may be placed up to 80 feet from the controller. Shielded cable is preferable. Always route AC voltage wiring in conduit that is separated a minimum of 6 inches away from low voltage DC signal lines (such as the sensor signal).

3.6 Electrical Installation

Based on the model number, the following voltages are required:

WCU310-1xx	115 VAC, 50/60 Hz
WCU310-4xx	115 VAC, 50/60 Hz
WCU310-5xx	230 VAC, 50/60 Hz

The various standard wiring options are shown below. Your WCU series controller will arrive from the factory prewired or ready for hardwiring. Depending on your configuration of controller options, you may be required to hardwire some or all of the input/output devices. Refer to figures 3 and 4 for circuit board layout and wiring.

Note: When wiring the optional 4-20 mA output or a remote flow switch, it is advisable to use stranded, shielded, twisted pair wire between 22-26 AWG. Shield should be terminated at the controller ground stud (see figure 4).

CAUTION: There are live circuits inside the controller even when the power switch on the front panel is turned "off". The front panel should never be opened before power to the controller is removed.

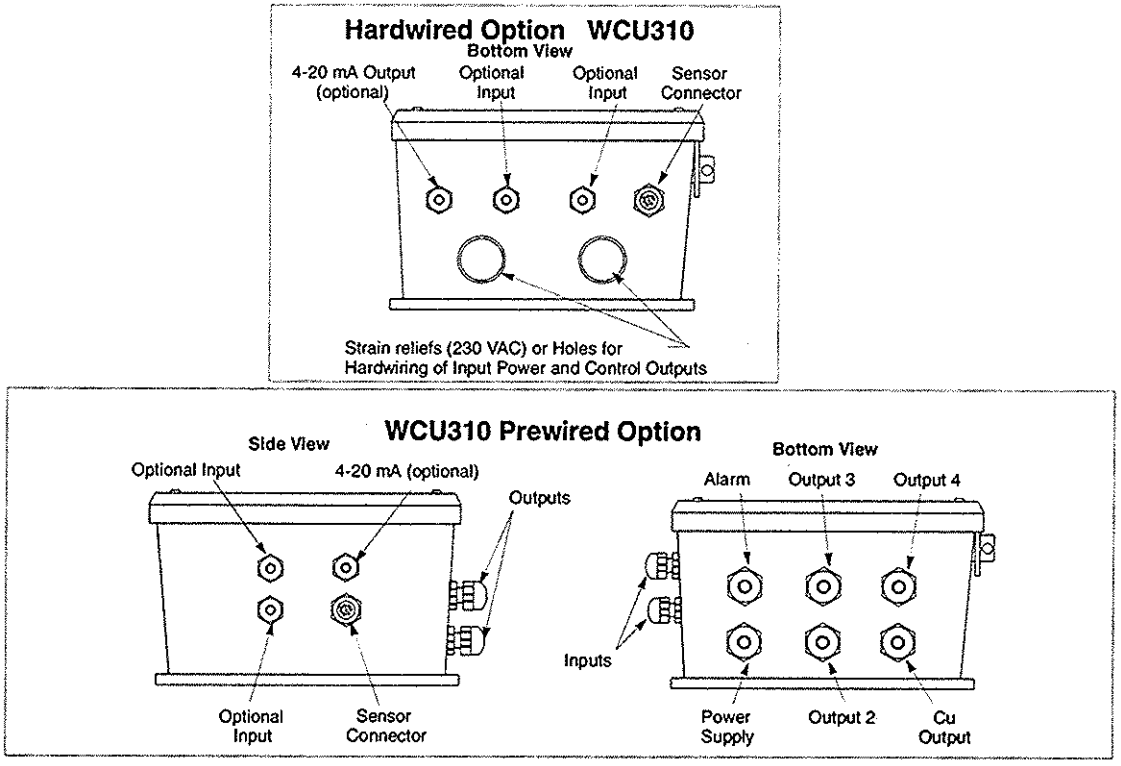


Figure 2 Conduit/Wiring Configuration

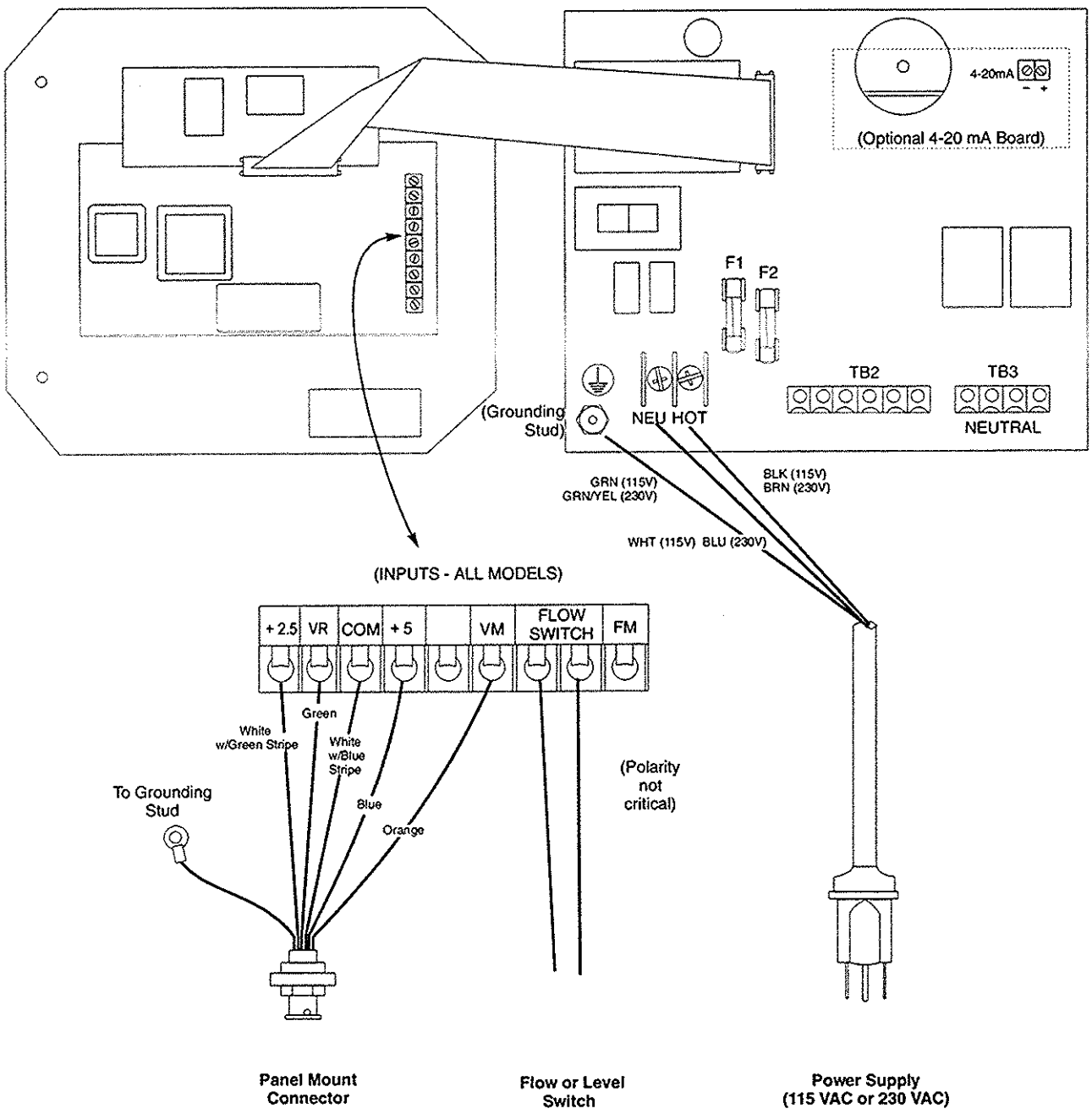


Figure 3 Inputs

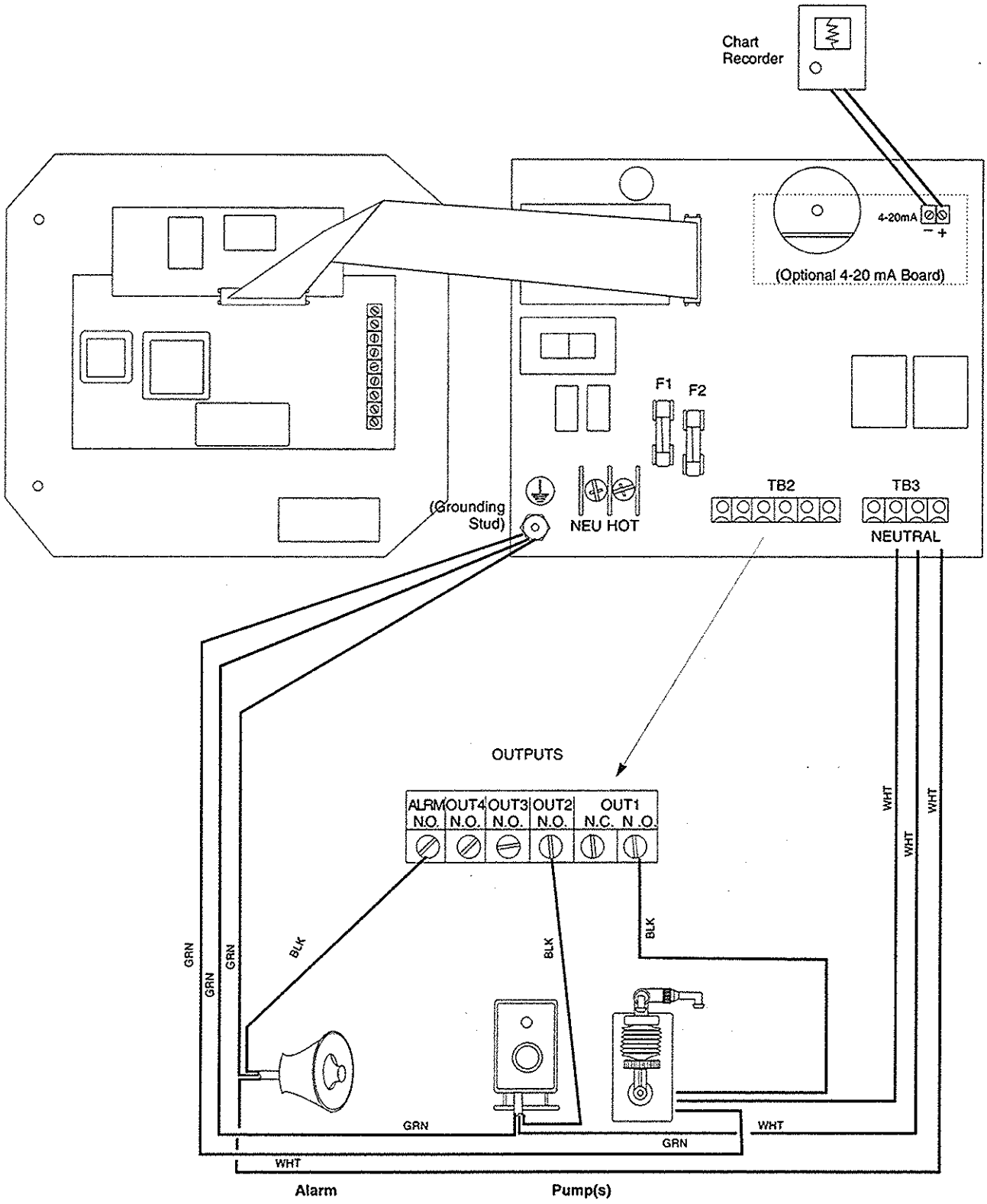
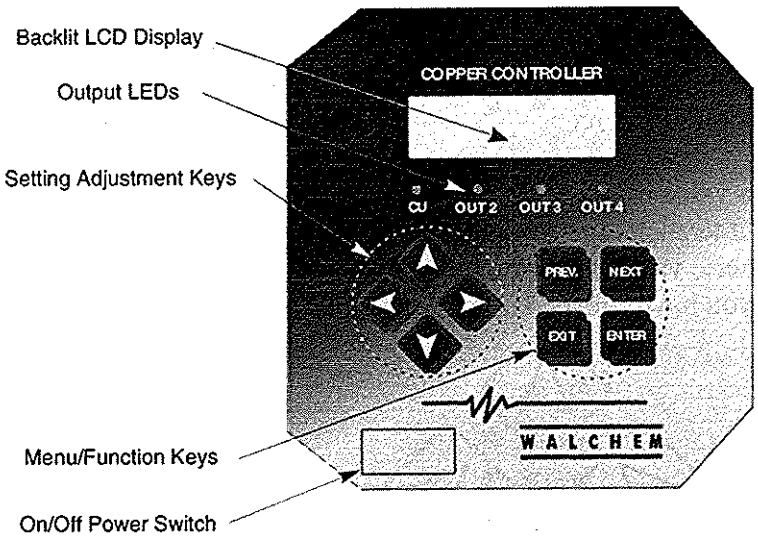


Figure 4 Outputs

4.0 Function Overview

4.1 Front Panel



Front Panel

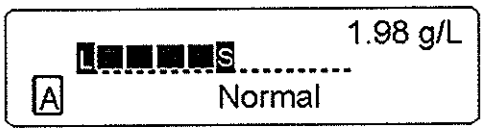
4.2 Display

A summary screen is displayed while the WCU controller is on. This display shows a bar graph of the copper concentration relative to the set point, a digital display of the copper concentration, and the current operating conditions.

Towards the center of the bar graph is an (S), which represents the set point. For each 1% rise above the set point a vertical line appears to the right of the (S). For each 1% drop below the set point a vertical bar appears to the left of the (S). There are small breaks in the bars at each 5%. If high or low alarm limits are reached, then either an (H) or (L) will appear.

The operating conditions which may be displayed on the bottom line of the display are: Control Delay 30* (number counts down), Sensor Error, Light Bulb Out, No Sample, Plate Out, Manual Output* Interlock, Output Disabled*, Pump Overrun, High/Low Alarm, Turnover Limit, Calibration Time, Outputs On* and Normal*

*These messages do not activate the diagnostic alarm relay.

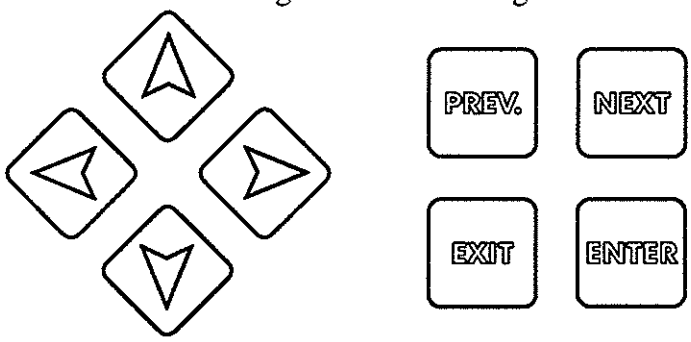


Summary Display

4.3 Keypad

The keypad consists of 4 directional arrows and 4 function keys. The arrow keys are used to move the adjustment cursor and change settings, while the function keys are used to enter values, and navigate the various menu screens. The function keys are **ENTER, EXIT, NEXT** and **PREV** (previous). **NEXT** and **PREV** scroll through the various menu choices. **ENTER** is used to enter a menu and to enter a value. **EXIT** is used to back up one menu level. If you are at the main menu level, **EXIT** will return you to the summary screen.

To change a value or option in a submenu, the left/right arrow keys move the cursor left and right to each digit or option that can be changed. The up/down arrows will change numeric values up or down, or scroll through option choices. Press **ENTER** only when you have finished making ALL of the changes for that menu screen.



4.4 Access Code

The WCU series controller is shipped with the access code disabled. If you wish to enable it, see Section 5.8 for operation. With the access code enabled, any user can view parameter settings, but not change them. Note that this provides protection only against casual tampering. Use a lock on the cover latch if you need more protection.

4.5 Startup

Initial Startup

After having mounted the enclosure and wired the unit, the controller is ready to use.

CONTROL DELAY: The display will show the WCU series model number then revert to the top level summary screen with "Control Delay" for a status message. This message will be displayed for approximately 30 seconds. In some situations, the user may not want the unit to be controlling and possibly turning on pumps when it is first powered on. This allows you enough time to enter the Output menus and disable the outputs. The only difference in the controller operation during these 30 seconds is that it will not activate any outputs. All measurements are live and all menus are accessible. Scroll through the menus, calibrate the sensor, and set the control parameters as detailed in Section 5, Operation.

To return to the summary screen, press the **EXIT** key until you return to this screen. The controller will automatically return to this screen after 10 minutes.

Normal Startup

Startup is a simple process once your set points are in memory. Simply check your supply of chemicals, turn on the controller, calibrate the sensor if necessary and it will start controlling.

4.6 Shutdown

To shut the WCU controller down, simply turn off the power switch. Programming remains in memory.

5.0 Operation

These units control continuously while power is applied. Programming is accomplished via the local keypad and display.

To view the top level menu, press any key. The menu structure is grouped by inputs and outputs. Each input has its own setup menu for calibration and unit of measure selection as needed. Each output has its own setup menu including set points, timer values, direction of control, etc as needed. After 10 minutes of inactivity in the menu, the display will return to the summary screen. Keep in mind that even while browsing through the menus, the unit is still controlling.

5.1 Main Menu

The exact configuration of your WCU controller determines which menus are available as you scroll through the settings. Certain menus are only available if you select certain options. All settings are grouped under the following main menu items:

Sensor
Out 1
Out 2
Out 3
Out 4
Alarm
Time
4-20 mA (Only if 4-20 mA option circuit board is installed)
Access Code

The **NEXT** key travels forward through this list while the **PREV** key travels backwards through the list. Pressing **ENTER** will enter the lower level menu that is currently displayed.

5.2 Sensor Menu

The sensor menu provides the following settings: Calibration history (informational only), 1 point calibration, Days between Calibration, Units of measure, Control mode, and New sensor set-up. Each is discussed in detail below. Refer to the Sensor Menu Chart.

Note: If you are programming the unit for the first time, scroll to the Cu Mode menu and set the "Cu Mode" option first, choosing either Electroless Copper or Microetch mode. Then press ***PREV*** *to choose units of measure. Then press* ***NEXT*** *to set the rest of the menus.*

Cal'd

Displays the date of the last sensor calibration.

1 Pt Calibration

Press **ENTER** to perform a 1 point calibration of the copper sensor. This calibration is best performed at normal operating temperature.

Keep the immersible sensor in place or have solution flowing through the flow-through sensor. Take a sample of the solution and note the concentration displayed by the WCU controller. Carefully perform the normal laboratory analysis of the copper concentration. Calculate the offset by subtracting the displayed value from the lab results. If the lab analysis is significantly different, adjust the offset in the 1 point calibration menu, using the arrow keys to change the value and the +/- sign. If the controller's display is higher than the lab analysis, the offset should be negative.

Days Btwn Cal

Use the arrow keys to set the number of days that you would like to go by before recalibrating the sensor. The controller will prompt you to recalibrate when that time has expired. Setting this to zero days will disable the calibration reminder.

Conc. Units

Press **ENTER** to change the units of measure. Use the Up and Down arrows to toggle between grams per liter and ounces per gallon, then press **ENTER** to make your selection. The controller will warn you to check your set points, since all set point values will stay the same even though the units of measure may have changed.

Cu Mode

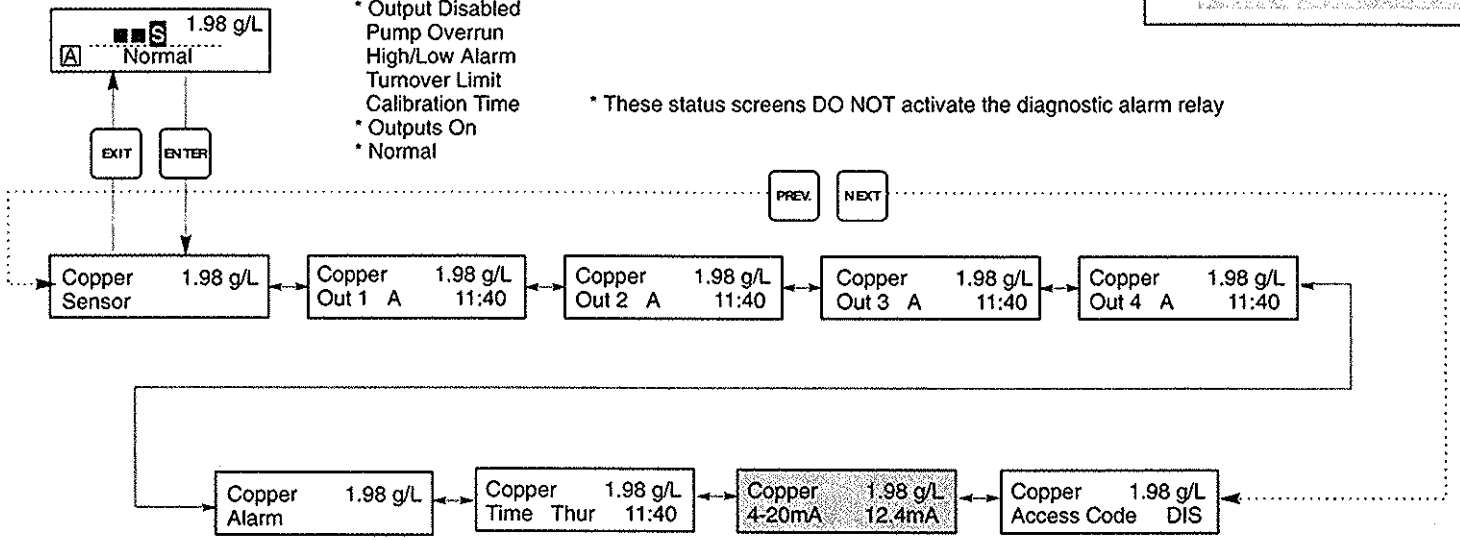
Press **ENTER** to change the controller from Electroless copper mode to Microetch mode by toggling between the two choices using the Up and Down arrow keys. The controller will warn you to check your set points, since these do not change when the Cu Mode is changed.

Main Menu

Possible Status Screens

* Control Delay 30
  Sensor Error
  Light Bulb Out
  No Sample
  Plate Out
* Manual Input
  Interlock
* Output Disabled
  Pump Overrun
  High/Low Alarm
  Turnover Limit
  Calibration Time
* Outputs On
* Normal

* These status screens DO NOT activate the diagnostic alarm relay



Legend

4-20mA menu is only present if 4-20mA option is installed.

Operation

Press Enter key to enter menu or submenu.
Press Exit key to exit menu.
After 10 minutes of inactivity the controller will automatically return to the summary screen.

Self Test

This feature is a diagnostic tool which can help isolate a problem between the sensor and controller. Before initiating the self test, the sensor **MUST** be disconnected from the controller in order to function properly. When **ENTER** is pressed the controller disables the sensor inputs and injects 2 test signals, simulating a properly functioning sensor. The controller will display "PASS" or "FAIL" along with a live mV reading. If "PASS" is displayed then it indicates the controller is functioning properly and the problem is likely to be with the sensor. See the troubleshooting section for further details. If "FAIL" is indicated, the controller is defective. Consult your factory representative for service options.

New Sensor Setup

THIS MENU IS ONLY USED WHEN REPLACING THE SENSOR. THE SENSOR THAT YOU RECEIVE WITH THE CONTROLLER HAS ALREADY BEEN CALIBRATED.

Press **ENTER** to set up a new sensor. First you see a warning message: "WARNING Chg sensor cal? N" This acts as a safety precaution for those who may only be "browsing" through the menus. If you enter the New Sensor Setup menu, you may easily, inadvertently, change the calibration of the sensor. If you continue with the following procedures, you must recalibrate the new sensor.

Water....xxxx.x
Place the immersible sensor in clean tap or DI water, or circulate through the flow through sensor. When the number on the display is constant, press **ENTER.**

Sample....xxxx.x
Place the sensor in the bath at a known concentration or restart pumping the bath sample through the flow through sensor. No work should be going through the bath so that the concentration remains constant. Ideally the bath should be at the typical operating copper concentration. When the number on the display is constant, press **ENTER.**

Smpl Conc
Use the arrow keys to change the displayed number to the actual concentration of the bath in grams/liter or ounces/gallon, depending on the unit of measure you have selected, then press **ENTER.**

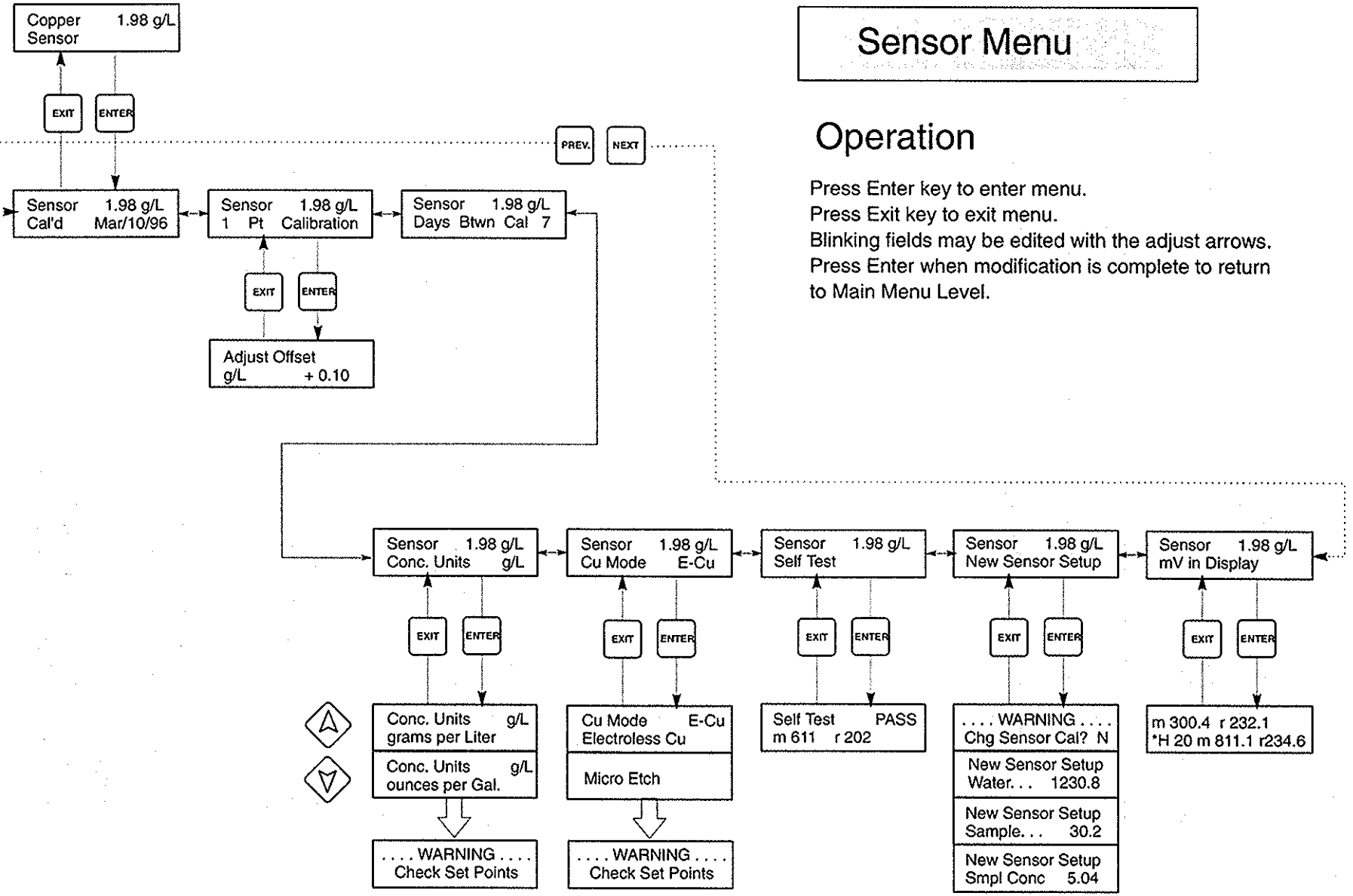
mV in Display

This display is only for diagnostic purposes. The top line shows 2 live voltage readings from the sensor in millivolts. The bottom line shows the stored values for each sensor signal from the most recent new sensor set up calibration - specifically the signal values measured with water.

Sensor Menu

Operation

Press Enter key to enter menu.
Press Exit key to exit menu.
Blinking fields may be edited with the adjust arrows.
Press Enter when modification is complete to return to Main Menu Level.



5.3 Output 1 Menu

The Out 1 menu is used to set the control set point, and to configure the timer/totalizer to keep track of replenishment in the desired way. This menu provides the following settings: Total 1, Set Point, Dead Band, Time Limit, Interlock, and H O A.

The top level menu status line may display the following messages: Off, Intrlck, Timeout, or a time. "Off" indicates that the output is off. "Intrlck" indicates that the output would be on but is not because of a signal from a flow switch or level switch is stopping control. "Overrun" indicates that the output has been on for longer than the maximum time programmed by the user. The time shows how long the output has been on.

Total 1

Press **ENTER** to program the timer/totalizer functions.

Reset Total Y/N
Use the arrow keys to toggle between Y(Yes) and N(No) to reset the totalizer.

Total As
Press **ENTER**, then use the Up and Down arrows to choose whether to totalize in units of time, volume or copper metal turnovers.

Turnover Lim.
Only appears if you choose to totalize by metal turnovers. Use the arrow keys to enter the maximum number of turnovers. The controller will prompt you when this number has been exceeded.

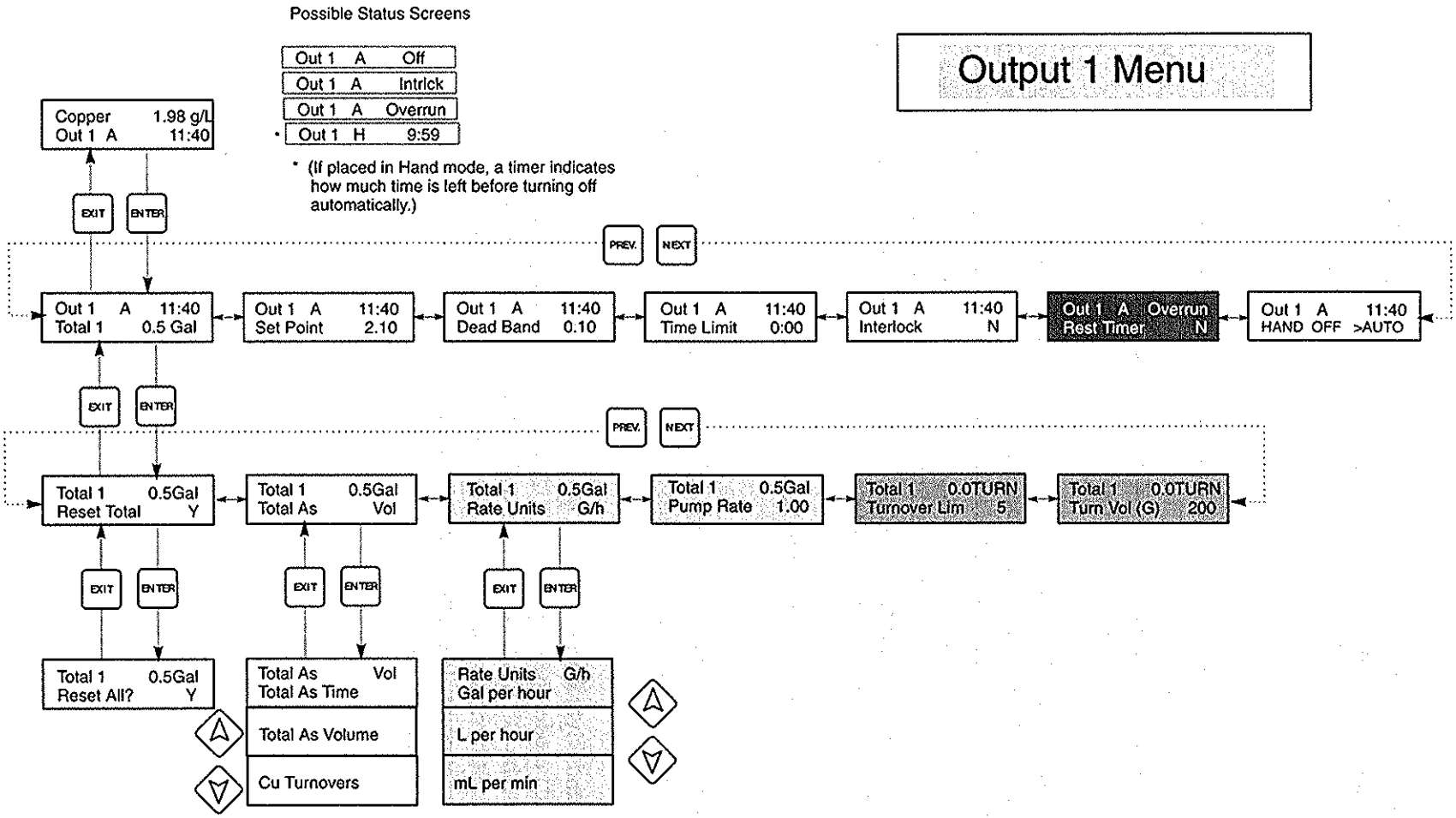
Turn Vol(G or L)
Only appears if you choose to totalize by metal turnovers. Enter the number of gallons (G) or liters (L) that equals one metal turnover. The unit of measure displayed correlates with that of the rate units selected in the next menu.

Rate Units
Only appears if you choose to totalize by volume or metal turnovers. Press **ENTER,** then use the arrow keys to toggle between Gallons per Hour, mL per minute or Liters per hour. These units of measure will be used to enter the rate at which the replenishment pump adds chemicals.

Pump Rate
Only appears if you choose to totalize by volume or metal turnovers. Use the arrow keys to set the flow rate of the replenishment pump.

Set Point
Use the arrow keys to adjust the display to read the desired set point value of the bath. Press **ENTER** to accept the change.

Output 1 Menu



Legend

Menu appears when a pump overrun condition occurs

Menu appears when Total As Volume or As Cu Turnovers is selected

Menu appears when Total As Copper Turnovers is selected

Operation

Press Enter key to enter menu.
Press Exit key to exit menu.
Blinking fields may be edited with the adjust arrows.
Press Enter when modification is complete to return to Main Menu Level.

Dead Band

Use the arrow keys to set the desired dead band, then press **ENTER.** If the set point is 2.50 g/L, and the dead band is 0.05 g/L, then the relay will close at 2.50 g/L and open 0.05 g/L away from 2.50 g/L (2.55 g/L if set for EC, 2.45 g/L if set for microetch).

Time Limit

Use the arrow keys to set the time limit for the output to be active, then press **ENTER.** Since all outputs are turned on at the same time for control purposes, the time limit set applies to outputs 2, 3 and 4 also. If it is set for "0:00", no limit will be imposed and the output could stay on forever.

Interlock

Use the Up and Down arrows to toggle between Y(Yes) and N(No). Choosing Y means that the output will deactivate depending on the state of the device attached to the controller. If the device is open, the interlock condition exists and control is stopped. For example, if the sensor is installed in a recirculating pipe line, a flow switch that is closed if flow is sufficient and open if flow is insufficient may be installed in the line, so that if flow past the sensor stops, the controller will not pump in chemicals based on a stagnant sample.

An interlock condition disables all outputs.

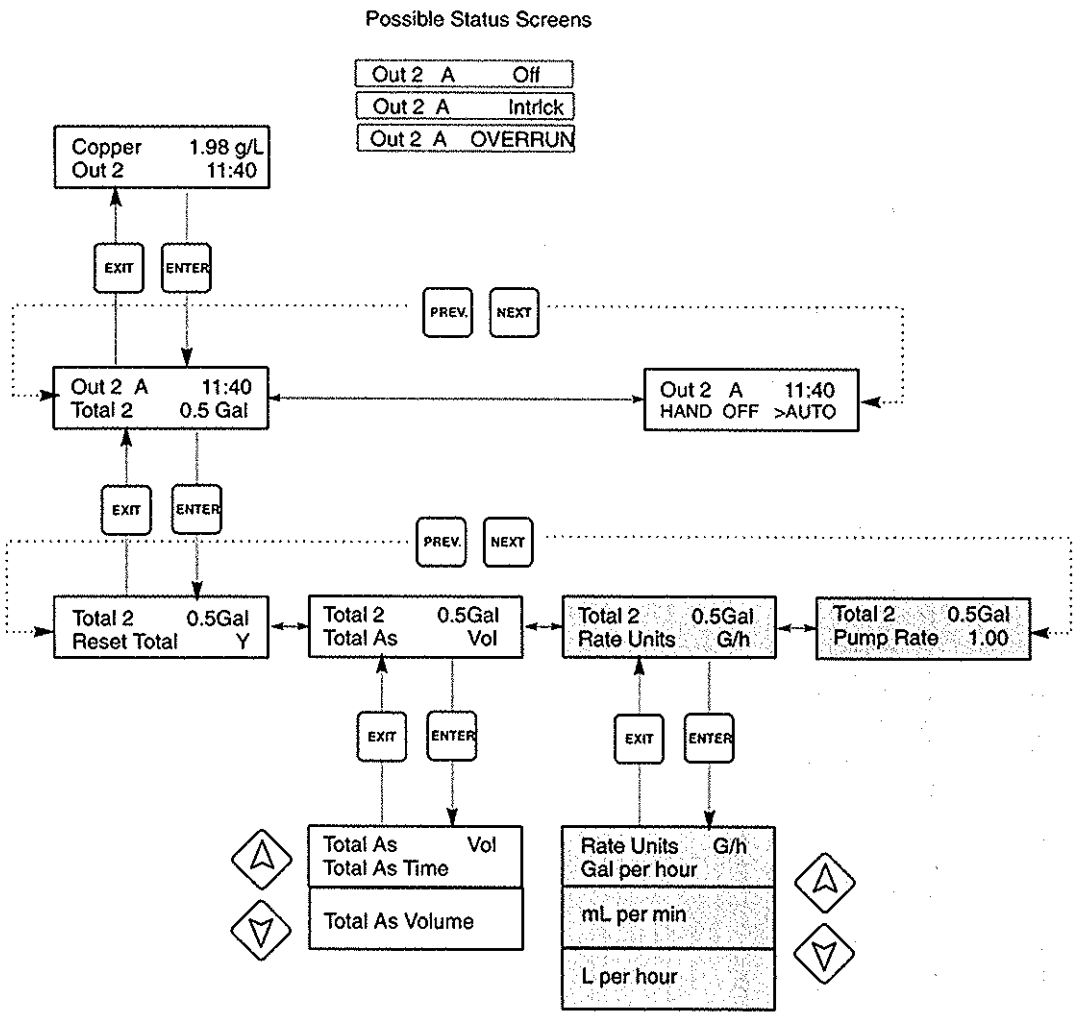
Reset Timer

This menu appears when the programmed time limit has elapsed, creating a pump overrun condition. Use this menu to reset the timer. This applies to all outputs.

H O A

Use the Left and Right arrows to move between Hand, Off and Auto (H O A). In Hand (Manual) mode, the output will be turned on immediately for a maximum of 10 minutes. In the Off mode, the output will be turned off indefinitely. In the Auto mode, the output turns on and off in response to changes in the process value relative to the set point. The letter inside the block on the status screen indicates which mode the output is in.

Output 2, 3 & 4 Menus



Legend

Menu appears when Total As Volume is selected

Operation

Press Enter key to enter menu.
Press Exit key to exit menu.
Blinking fields may be edited with the adjust arrows.
Press Enter when modification is complete to return to Main Menu Level.

5.4 Output 2, 3, and 4 Menus

The Out 2, 3 and 4 menus are separate from each other but operate in exactly the same way. Each menu provides the Total and H O A settings. These additional outputs are activated simultaneously with output 1 and are provided to be able to add other bath components in proportion to the copper, and display independent replenishment totals.

The top level menu status line may display the following messages: Off, Intrlck, Timeout, or a time. "Off" indicates that the output is off. "Intrlck" indicates that the output would be on but is not because of a signal from a flow switch or level switch is stopping control. "Overrun" indicates that the output has been on for longer than the maximum time programmed by the user. The time shows that the output is on, and has been for that amount of time.

Total 2,3 or 4

This menu works the same as Total 1 described for Out 1 in Section 5.3.

H O A

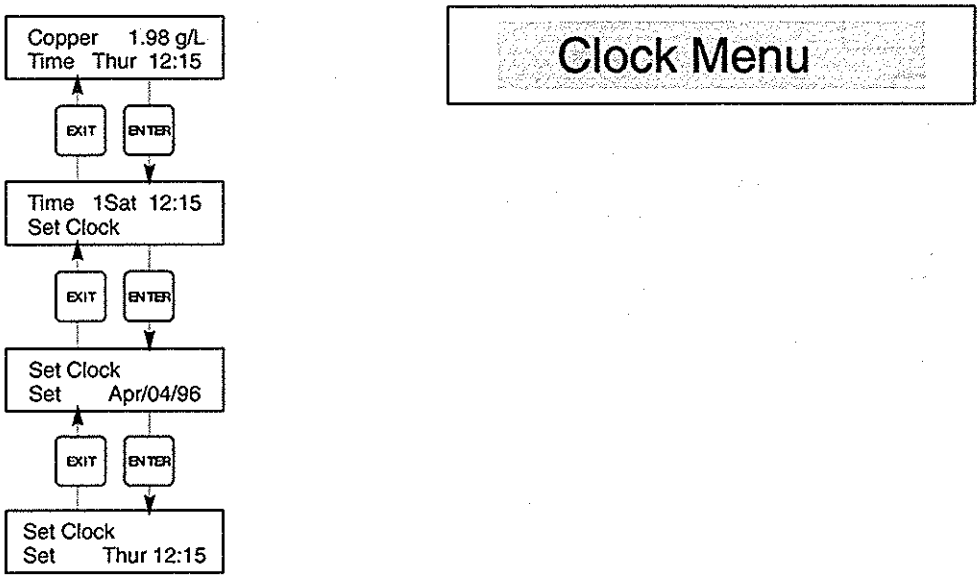
Use the Left and Right arrows to move between Hand, Off and Auto (H O A). In Hand (Manual) mode, the output will be turned on immediately for a maximum of 10 minutes. In the Off mode, the output will be turned off indefinitely. In the Auto mode, the output turns on and off in response to changes in the process value relative to the set point. The letter inside the block on the status screen indicates which mode the output is in.

5.5 Clock Menu

The clock menu is used to set the date and time that the controller uses to schedule calibration prompts. There is only one menu selection: Set Clock.

Set Clock

Press **ENTER** to set the clock. Use the arrow keys to change the year, date, and month, then press **ENTER**. Use the arrow keys again to set the day of the week and the time. Use military time (for example, 1:00 PM is 13:00). Press **ENTER** to return to the top level clock menu.



Clock Menu

5.6 Alarm Menu

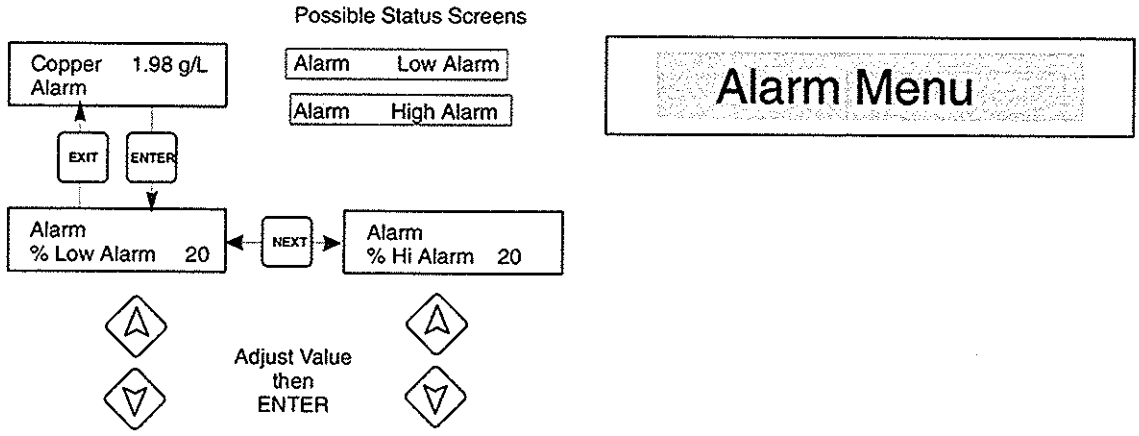
This menu is used to set the high and low copper concentration alarm points. Press ENTER to adjust the alarm set points.

% Low Alarm

Use the arrow keys to change the % below the set point copper concentration that will trigger a low alarm. Percentage range is 0-50%. Alarm can be disabled if zero is entered.

% High Alarm

As above for the high alarm set point.



Alarm Menu

5.7 4-20 mA Menu (Optional)

This menu will only appear if the optional 4-20 mA output board is installed. It is used to scale the 4-20 mA output to a corresponding copper range. It contains the following menu selections: 4 mA Point, 20 mA Point, and Calibrate.

4 mA Pt

Use the arrow keys to enter the copper concentration that you want to correspond to a 4 mA output from the controller.

20 mA Pt

Use the arrow keys to enter the copper concentration that you want to correspond to a 20 mA output from the controller.

Calibrate

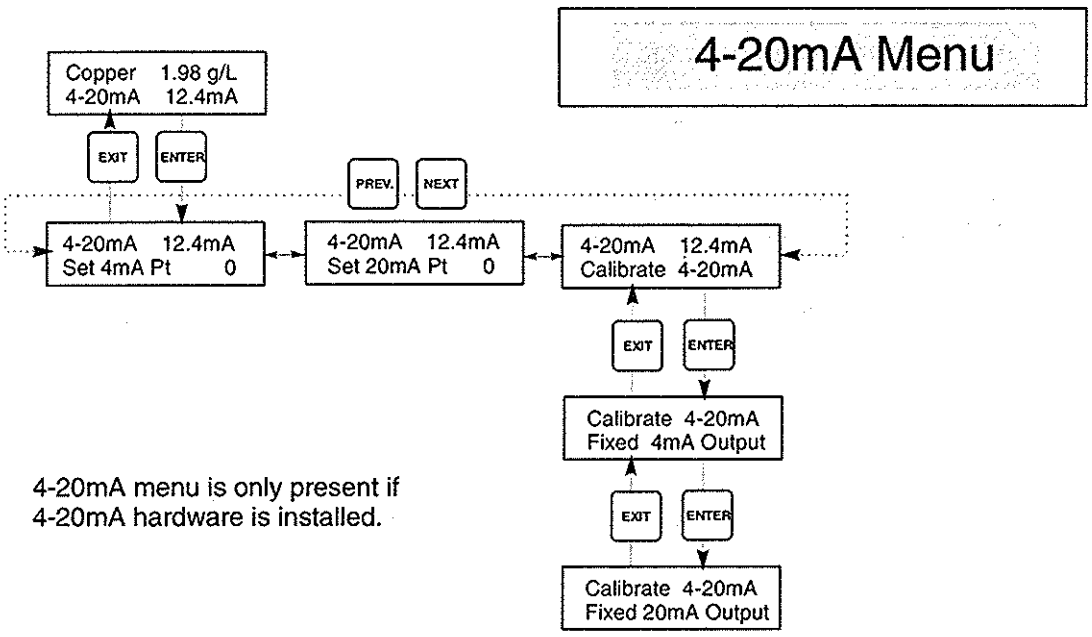
This menu, in conjunction with an ammeter, is used to calibrate the mA output. Press **ENTER** to start the calibration.

Fixed 4 mA Out

The controller will output 4.00 mA. Adjust the chart recorder or data logger per its instruction so that the process value displayed is what is expected for a 4.00 mA input.

Fixed 20 mA Out

As above, except that the controller will output 20.00 mA.
The design of the 4-20 mA output is such that it should never need calibration. If the mA signal is not what it should be, call the factory for service.



4-20 mA Menu

5.8 Access Code Menu

This menu determines whether the access code feature of the controller is enabled or disabled and allows you to customize the access code. The access code controls whether or not you are allowed to change the parameters in the controller. With the access code disabled, any user may change any parameter. With the access code enabled, any user can view any parameter, but cannot change them.

Once an attempt is made to change a parameter, the display will prompt the user to enter the access code. If the correct code is entered, the parameter can be changed. (If the cursor is blinking, a change will be allowed; if the number or words are not blinking, they can't be changed). Once the correct access code has been entered, it will remain valid until there is a period of 5 minutes without a key being pressed.

Possible status screens are: Access Code REQ, Access Code OK, and Access Code DIS.

The first indicates that the access code is required to alter settings. The second indicates that the access code is required and has been entered correctly, and the last indicates that the access code has been disabled.

Enable Y/N

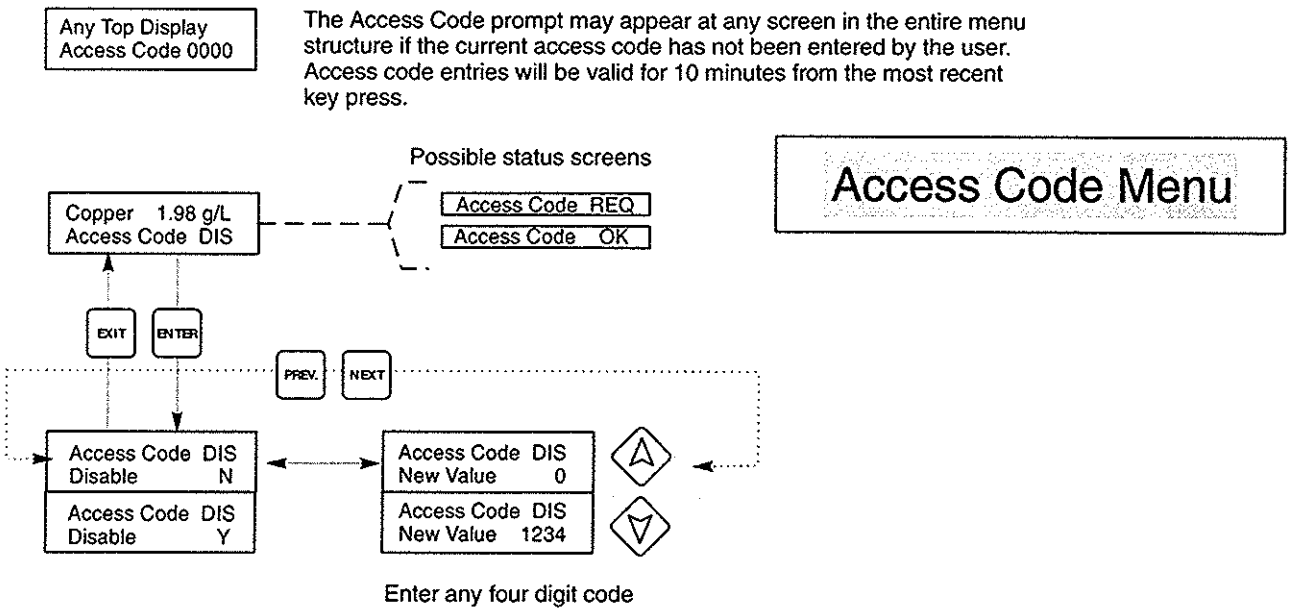
Use the arrow keys to select Y(Yes) or N(No) and press ENTER to enable or disable the access code. If the code was enabled, you must enter the access code in order to disable it.

New Value

Press **ENTER** to display the current access code value and use the arrow keys to change it to any value between 0 and 9999. If the access code has been enabled, you will be prompted to enter the current access code before being allowed to change it.

The factory default access code is 1995.

If you change the access code and can't remember it, follow this procedure:
1. Turn off the power to the controller.
2. Wait 10 seconds.
3. Press and hold the Up and Down arrow keys while turning on the power.
4. Read the access code on the display.
5. Release the arrow keys and the code will disappear.



Access Code Menu

6.0 Maintenance

The WCU control module itself needs very little maintenance. Clean the outside of the controller enclosure with a damp cloth. Do not spray down the controller unless the enclosure door is closed and latched. "Pigtails" should be protected from spray or washdown. Check the cords and cables for damage.

6.1 Sensor Maintenance

The most important maintenance item for the sensor is to keep the optical paths clean of plate-out or other coatings. In electroless copper applications, the sensor should be etched when the tank is etched, or whenever plate-out is evident. If plate-out does occur in the sample line or sensor, etch the system as you would the tank.

Avoid any mechanical cleaning of the optical surfaces to avoid scratching them. Chemical cleaning is preferred over mechanical cleaning methods. Plate-out should be removed using nitric acid or a persulfate or peroxide/sulfuric etch.

Field repairs should not be attempted. Call your factory representative in order to arrange for factory service.

NOTE: TO PREVENT CALIBRATION SHIFTS DUE TO CONDENSATION FORMING ON THE FIBER OPTIC LIGHT GUIDES INSIDE THE CAP OF THE SENSOR, DO NOT REMOVE THE SENSOR CAP FOR ANY REASON!

6.2 Replacing the Fuses

CAUTION: Disconnect power to the controller before opening front panel!

Locate the fuses on the circuit board at the back of the controller enclosure. Gently remove the old fuse from its retaining clip and discard. Press the new fuse into the clip, secure the front panel of the controller and return power to the unit.

Warning: Use of non-approved fuses can affect product safety approvals. Fuse ratings depend on controller power rating. Specifications are shown below. To insure product safety certifications are maintained, it is recommended that a Walchem fuse is used.

Controller Rating	F1	Walchem PN	F2	Walchem PN
115 Vac	5X20mm,1/8A,250V	102369	5X20mm,10A,125V	102432
230 Vac	5X20mm,1/8A,250V	102369	5X20mm, 5A, 250V	102370

7.0 Troubleshooting

CAUTION: Disconnect power to the controller before opening front panel!

Troubleshooting and repair of a malfunctioning controller should only be attempted by qualified personnel using caution to ensure safety and limit unnecessary further damage. Contact the factory.

7.1 Error Messages

HIGH ALARM

The summary screen will display an H at the right side of the bar graph if the copper concentration rises above the high alarm set point.

Possible Cause	Corrective Action
1. Overshooting set point	Reduce replenishment pump rate. Increase solution flow through sensor. Immerse sensor in area of better solution movement. Place replenishment line closer to sensor.
2. Pump siphoning	Check all valves. Re-route tubing.
3. Output 1 in HAND mode	Go to H O A menu and put in AUTO mode.

LOW ALARM

The summary screen will display an L at the left side of the bar graph if the copper concentration drops below the low alarm set point.

Possible Cause	Corrective Action
1. Pump not working	Inspect and repair pump if necessary.
2. No replenishment	Refill chemical supply. Check pump valves.
3. Output 1 in OFF mode	Go to H O A menu and put in AUTO mode.

NO SAMPLE

No sample will be displayed if the measurement signals indicate excess air in the sample. Perform a self test to verify that the control module passes, which indicates that the problem is with the sensor (see section 5.2). If the control module fails the self test, return it for repair.

Possible Cause	Corrective Action
1. Liquid level too low for immersible sensor.	Increase liquid level
2. Sample pump failure.	Repair sample pump
3. Leak in or blockage of sample line.	Repair sample line
4. Partial plate out of sensor.	Etch sensor.
5. Excess air in line.	Check vertical mounting of sensor

LIGHT BULB OUT

This message indicates that the measurement signals have disappeared. Perform a self test to verify that the control module passes, which indicates that the problem is with the sensor (see section 5.2). If the control module fails the self test, return it for repair.

Possible Cause	Corrective Action
1. Light bulb failure	Return sensor for repair
2. Severe plate out	Etch sensor
3. Sensor disconnected	Reconnect sensor

PLATE OUT

This message is displayed when signals levels have been reduced considerably due to plate out. Perform a self test to verify that the control module passes, which indicates that the problem is with the sensor (see section 5.2). If the control module fails the self test, return it for repair.

Possible Cause	Corrective Action
1. Plate-out of sensor	Etch sensor

SENSOR ERROR

Caused by the measurement signals being outside the normal range, such as a negative concentration reading. perform a self test to verify that the control module passes, which indicates that the problem is with the sensor (see section 5.2). If the control module fails the self test, return it for repair.

Possible Cause	Corrective Action
1. Condensation inside sensor	Allow to dry out thoroughly
2. Faulty new sensor set-up	Repeat new sensor set-up with clean water
3. Sensor disconnected	Reconnect sensor

CALIBRATION TIME

The controller will display this prompt based upon the setting of the "Days between cal" menu in the Sensor menu group and the time of the last calibration. It may be cleared by performing a 1 point calibration of the sensor. If this feature is not desired, setting "Days between cal" to 0 will disable it.

TURNOVER LIMIT

This prompt is displayed if the output 1 totalizer has calculated a replenishment volume that exceeds the number of turnovers set in the "turnover limit" menu.

PUMP OVERRUN

This display appears if the pump output has been on longer than the time limit set in the "Maximum pump time" menu. It could be caused by a pump failure, lack of replenishment chemical, the time limit being set too low, or a failure of the pump to respond.

INTERLOCK

This error message is displayed if the signal from a flow or level switch is open, and the "Interlock Y/N" menu is set for "Y". Restore flow or level. The switch may be tested by measuring ohms when the switch should be closed (it should be very low, not infinite). The input may be tested by shorting the two terminals (interlock message should disappear).

CHECK SET POINTS

This is a normal display if you have changed the units of measure of the copper concentration. This serves as a reminder that the controller does not convert the numerical value of the set points; for example, if the set point was 7.5 g/L, it will become 7.5 oz/gal, not 1 oz/gal.

PASS

This message is displayed after initiating the SELF TEST feature. This indicates the controller is functioning properly and the problem is likely to be with the sensor. However, the wiring between the controller front panel circuit board and the external sensor connector should be checked for breakage or wear. See diagram in figure 3.

FAIL

This message is displayed after initiating the SELF TEST feature. The controller is probably defective. Make sure to disconnect the sensor prior to attempting the self test. Consult your factory representative for service options.

8.0 Service Policy

The WCU Series Copper Controller has a 2-year warranty on electronic components and a 1-year warranty on mechanical parts (keypad, terminal strip and relays).

We stock circuit boards for immediate exchange after we have isolated the cause of the problem.

Factory authorized repairs that are received by next-day-air will be returned within 24 hours. Normal priority for returns is two weeks.

Out of warranty repairs or circuit board exchanges are done on a flat fee basis after the warranty is expired.

ECOLAB

Membrandosierpumpe
Diaphragm Metering Pump
Pompe doseuse à membrane

Elados® EMP III
16 – 120 l/h

Bedienungsanleitung
User's Manual
Notice Technique

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1 General

This technical manual contains all the necessary instructions for the installation, start-up, maintenance and repair of ELADOS® EMP electrical motor-driven metering pumps.

The safety instructions and pointers must always be observed!

Scope of guarantee:

The manufacturer only accepts the guarantee with regard to the operating safety, reliability and capacity of the metering pump under the following conditions:

- Assembly, connection, adjustment, maintenance and repairs are carried out by authorized, qualified personnel.

- The metering device is used in accordance with the instructions in the technical manual.

- Only **orginal spare parts** are used for repairs.

- If the pump casing is opened, then the guarantee will become void.

1.1 Safety instructions

Repairs may **only** be carried out with plug disconnected from the mains, or when the appliance is off load.

During maintenance and repair work on parts which come into contact with cleaning products, and when replacing the bindings, the prescribed **protective clothing** (protective glasses, protective gloves, apron) must be worn because of the danger of irritation.

Only **original spare parts** must be used for repairs.

1.2 Pointers

In this manual, the **CAUTION, ATTENTION** and **NOTE** pointers have the following meanings:

CAUTION: This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to injury or accident.

ATTENTION: This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to the device being damaged.

NOTE: This heading is used if a special feature is being pointed out.

2 Function and Structure

The metering pump in the ELADOS® EMP III range are electronic motor-driven membrane positive-displacement pumps.

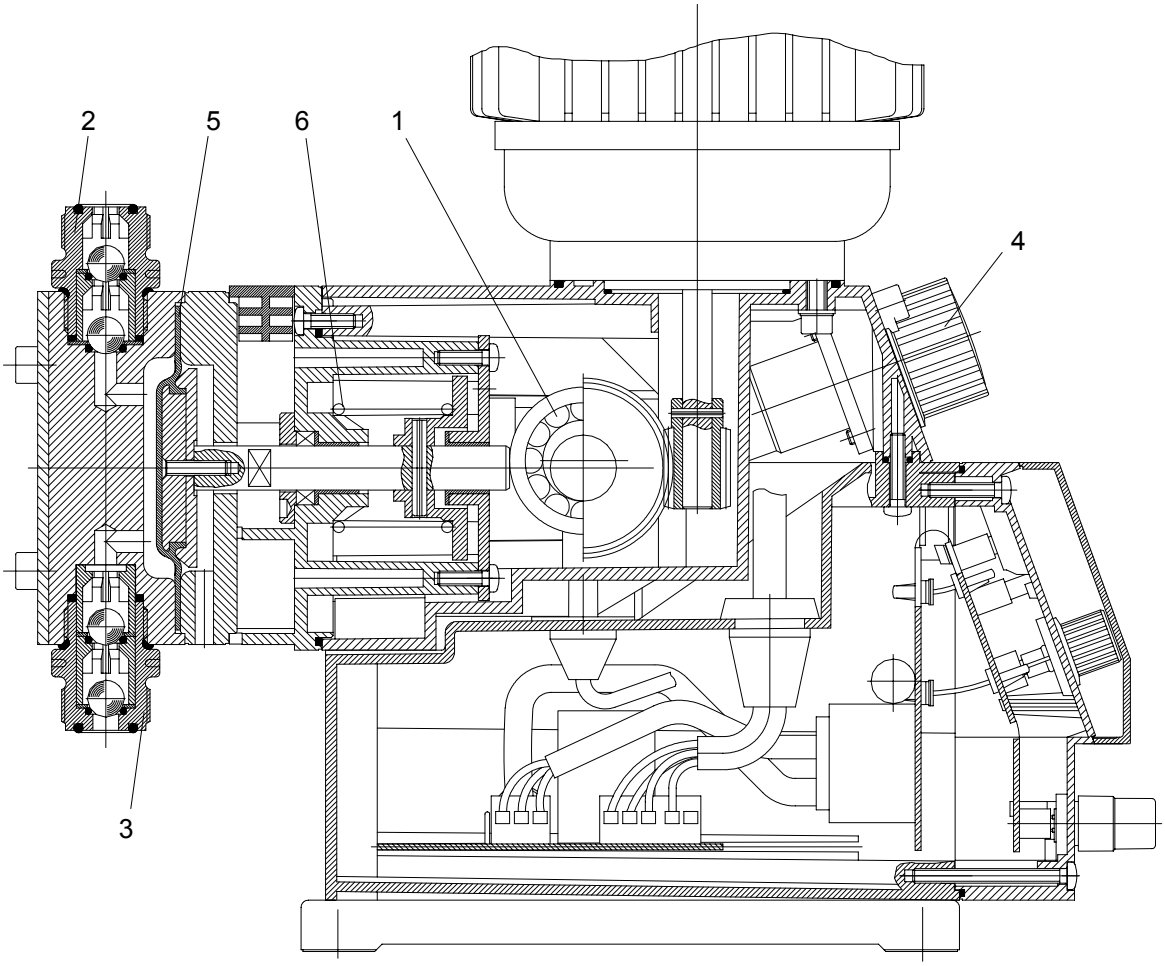
2.1 Functional description (ill. 2/2)

The eccentric screw drive (pos. 1) moves the membranes (pos. 5) and thus transports the metering material via the pressure valve (pos. 2). The suction valve is closed.

The membrane is moved back using a return spring (pos. 6), by means of which the metering material is sucked into the pump head via the suction valve (pos. 3). The pressure valve is closed.

The transported material can only be regulated via the stroke regulator (pos. 4) in 2% steps **during operation**. Here the return movement of the membranes is restricted.

2.2 Structure

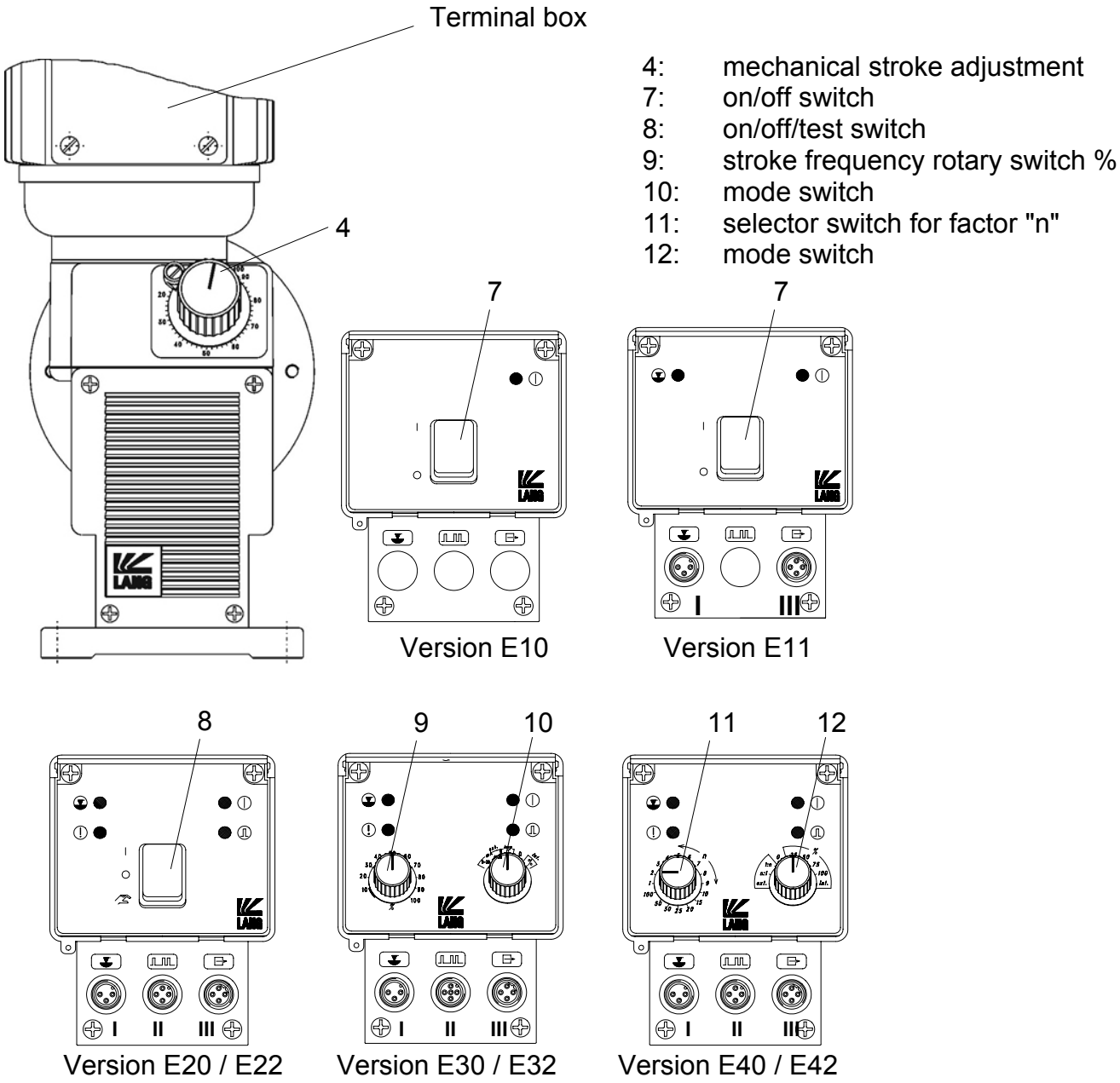


ill. 2/2

1 eccentric screw drive
2 pressure valve
3 suction valve
4 stroke regulator
5 membranes
6 return spring

3 Control Variants

3.1 Diagramm



4: mechanical stroke adjustment
7: on/off switch
8: on/off/test switch
9: stroke frequency rotary switch %
10: mode switch
11: selector switch for factor "n"
12: mode switch

ill. 3/1

Note: Version E10 - E42: The mechanical stroke adjustment (pos. 4) is not shown.

3.2 Description (ill. 3/1)

E 00	E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment ➔ Function
x	x	x	x	x	x	x	x	x	Mechanical stroke adjustment (pos.4) ➔ Metering capacity setting
x									Terminal box on motor ➔ Continual operation without ON/OFF switch, without operation lamp
	x	x	x	x	x	x	x	x	Green LED ⓘ ➔ Pump ready for operation
		x	x	x	x	x	x	x	Red LED (level) blinking ⓫ ➔ Reserve signal, pump running
		x	x	x	x	x	x	x	Red LED (level) steady ⓫ ➔ Empty signal, pump switches off
			x	x	x	x	x	x	Yellow LED ⎍ ➔ Stroke indicator
			x	x	x	x	x	x	Red LED (fault indicator) steady ⓘ ➔ Fault indicator with defective electronics, blocking (pump switches off)
	x	x							On/off switch (pos. 7) ➔ Continual operation (max. stroke frequency)
			x	x					On/off/test switch (pos. 8) ➔ Pulse operation Continual operation (max. stroke frequency)
					x	x			Stroke frequency rotary switch % (pos. 9) ➔ 100% = continual operation 124 1/min, reproducible setting range 10 - 100 %
					x	x			Mode switch (pos. 10) - Setting 0 ➔ Pump off, no green LED - Setting % (int.) ➔ Pump is running, adjusted frequenzy see stroke frequenzy rotary switch (pos.9) - Setting pulse input ⎍ ➔ 1 pulse = 1 stroke - Setting 4 - 20 mA ➔ 20 mA =continual operation 124 1/min 4 mA = pump switches off <4 mA = error red LED

E 00	E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment ➔ Function
									- Setting 0 - 20 mA ➔ 20 mA =continual operation 124 1/min 0 mA = pump switches off
							x	x	Selector switch for factor "n" (pos. 11) ➔ 1 - 100 for pulse multiplication and division with external control (factor 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 50, 100)
							x	x	Mode switch (pos. 12): ➔ External, 0, internal switching - Setting 100 ➔ Internal frequency 100 % = 124 1/min - Setting 75 ➔ Internal frequency 75 % - Setting 50 ➔ Internal frequency 50 % - Setting 25 ➔ Internal frequency 25 % - Setting 0 ➔ Pump off, no green LED - Setting 1 : n ➔ External multiplication e. g. selector switch setting n = 2: 1 external pulse =2 strokes of metering pump - Setting n : 1 ➔ External division e. g. selector switch setting n = 3: 3 external pulses =1 stroke of metering pump
		x	x	x	x	x	x	x	Empty signal input – 3 pin (I) with level pre-warning ➔ (See pin assignment, section 10.2)
			x	x			x	x	Pulse input – 4 pin (II) ➔ (See pin assignment, section 10.2), 1 pulse = 1 stroke
					x	x			Pulse-/current signal input - 5pin (II) ➔ (See pin assignment, section 10.2), 1 pulse = 1 stroke
				x		x		x	Memory pulse* ➔ from pulse frequency 124 1/min the pulses are stored and added up to a max. of 50,000 pulses, executed during continuous running
			x	x	x	x	x	x	Remote on-/off control (II) ➔ (See pin assignment, section 10.2) Contact open = pump locked

E 00	E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment ➔ Function
		x	x	x	x	x	x	x	Pulse output (III) ➔ (See pin assignment, section 10.2), potential-free
			x	x	x	x	x	x	Stroke signal 4 pin (III) ➔ (See pin assignment, section 10.2), potential-free

NOTE: In version E 11 connection socket I and in versions E20 to E42 connection sockets I and II must always be occupied, either by the mounted bridge connectors (protective cap with corresponding symbol) or by connecting the empty indicator equipment or pulse control lead (see pin assignment, section 10.2).

NOTE: With external cycles of the metering pumps E20 – E40, use the function "METERING LOCK".

An external cycle of the types E20 – E40 must **not** occur over the supply voltage.

NOTE: In versions E11 to /E42, the bridge connectors (protective cap with corresponding symbol) should be retained after removal for re-use.

***ATTENTION:** Pulse Memory is not cleared for a reserve or empty signal. The memory is cleared for a metering block (contact open), switch position "0", change of operating mode and mains failure.

3.3 Description of symbols

Level pre-warning and empty indicator (red)

Fault indicator (red)

Operating indicator (green)

Metering indicator (yellow)

Empty signal input

Pulse input, current signal input
and metering block

Empty signal output and
stroke signal output

4 Installation and start-up

4.1 Installation instructions

NOTE: Long suction lines should be avoided (max. 3 m).

The pressure difference between the metering point and the suction end should not be less than +1 bar.

In order to allow ventilation when transporting dangerous materials, it is recommended that a 3-way valve be installed directly after the pressure valve. The bypass line to the metering container should be installed.

CAUTION: If the metering line can be blocked off, an overflow valve (safety valve) which opens at the maximum allowed pressure should be installed on the pressure side for safeguarding the metering line and pump. This can stop the metering line bursting if wrongly operated.

The pressure can rise to 3 times the nominal pressure.

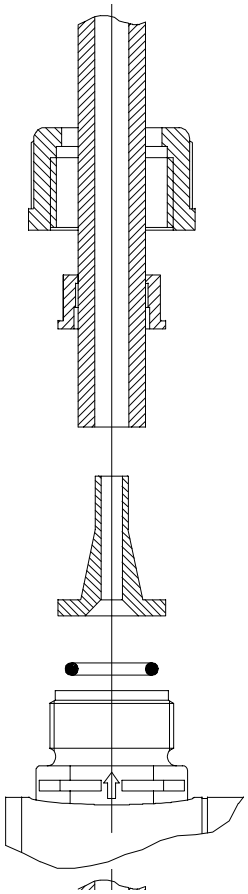
4.2 Electrical connection

Produce VDE power connection.

Motor stops by an installed thermic winding protector when overloaded.

4.3 Start up (ill. 4/3)

- Mount pump on console in horizontal position. Observe suction capacity of max. 2 mWs.
- Connect suction and metering line
  - Cut off tube cleanly
  - Push swivel nut (pos. 13) and pressure piece (pos. 14) over tube and push onto connecting nipple (pos. 15) as far as stop collar.
  - Place O-ring (pos. 16) into valve groove and tighten swivel nut.
- When installing a 3-way valve, connect bypass line.
- Set metering setting and metering frequency setting (if required) to 100% (see also section 4.4).
- Ventilate pump:
- Ventilation can only take place if a **non-pressurised** metering line is used. In order to do this, set 3-way valve to bypass and relieve pump on pressure side. Switch device on until material exits metering line free of bubbles. Move 3-way valve to metering position.



ill. 4/3

Improved suction can be achieved if the pressure valve is subsequently unscrewed and the pump head filled with a suitable liquid.

NOTE: After 24 hours of operation, the metering head screws should be diagonally tightened to 3 - 4 Nm.

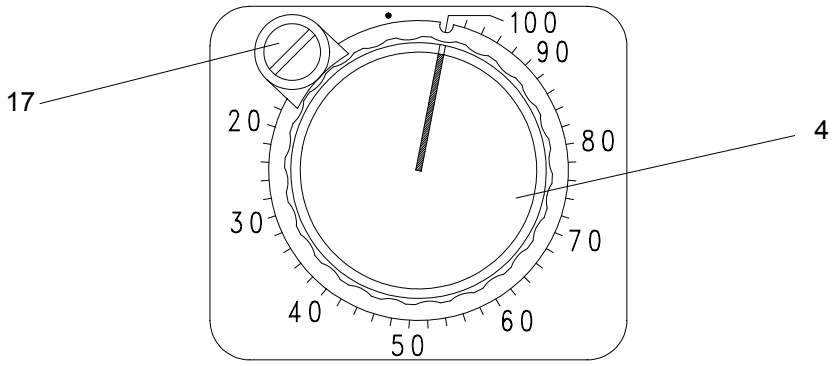
NOTE: In the E40/E42 version, the metering pump can only be 100% commissioned in internal setting, if there is no external metering blocking (contact closed). If necessary, the appropriate plug (II) can be disconnected and the bridging connector put on.

CAUTION: The metering pump head may contain residual water from works testing.

4.4 Setting metering capacity (mechanical) (ill. 4/4)

The metering capacity can only be set **during operation** using the stroke adjustment knob (pos. 4). The fixing screw (pos. 17) should be loosened beforehand by about 1 turn.

WARNING: Re-tighten fixing screw after adjusting metering volume.



ill. 4/4

5 Metering capacity

Allgemeines:

General:

The reproducible metering precision is about +/- 3% at a minimum 30% stroke distance and under constant conditions.

Precise metering can be achieved by taking the following points into consideration:

a) All metering capacity informations relates to measurements using water at 20°C, with a constant power supply and warmed-up pump.

b) In order to obtain a high degree of metering precision with free flow, a pressure maintenance valve (or metering valve) should be used, in order to produce a constant counterpressure of at least 0.5 bar.

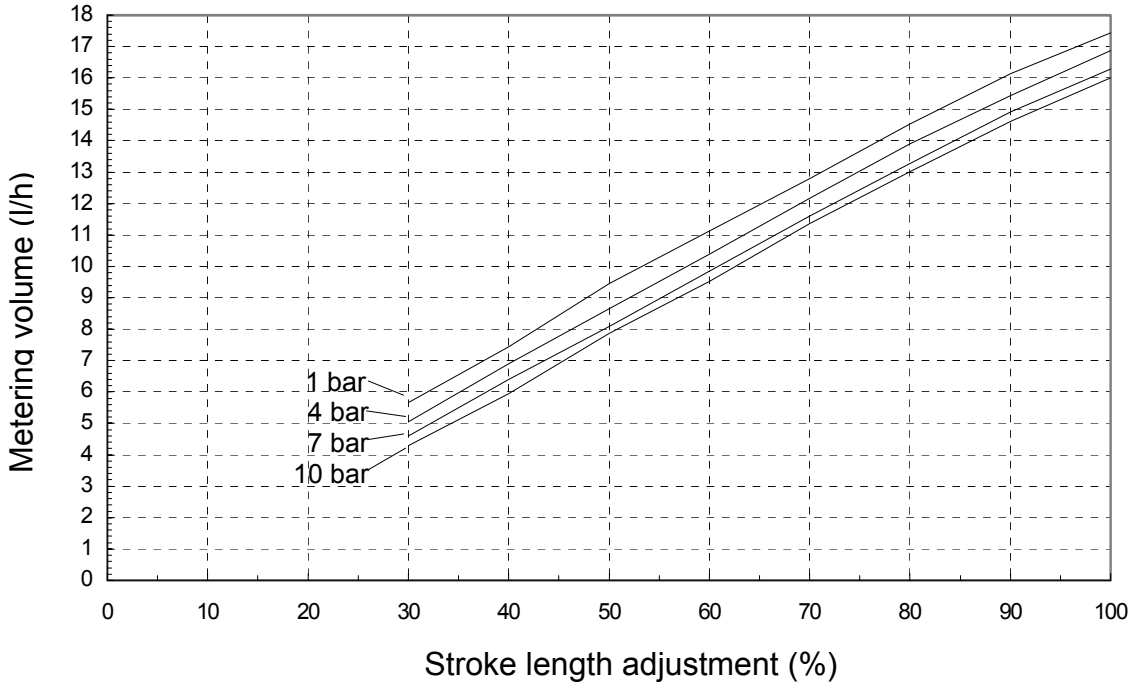
c) If there is pre-pressure on the suction side, the pressure difference between the suction and the pressure sides should be at least 1 bar. The water column on the metering pump must be protected by an appropriate valve arrangement.

NOTE: A pressure maintenance valve or metering valve is not a completely reliable blocking element.

WARNING: Only carry out metering stroke adjustments when the pump is running if the stroke adjustment pump is not under pressure.

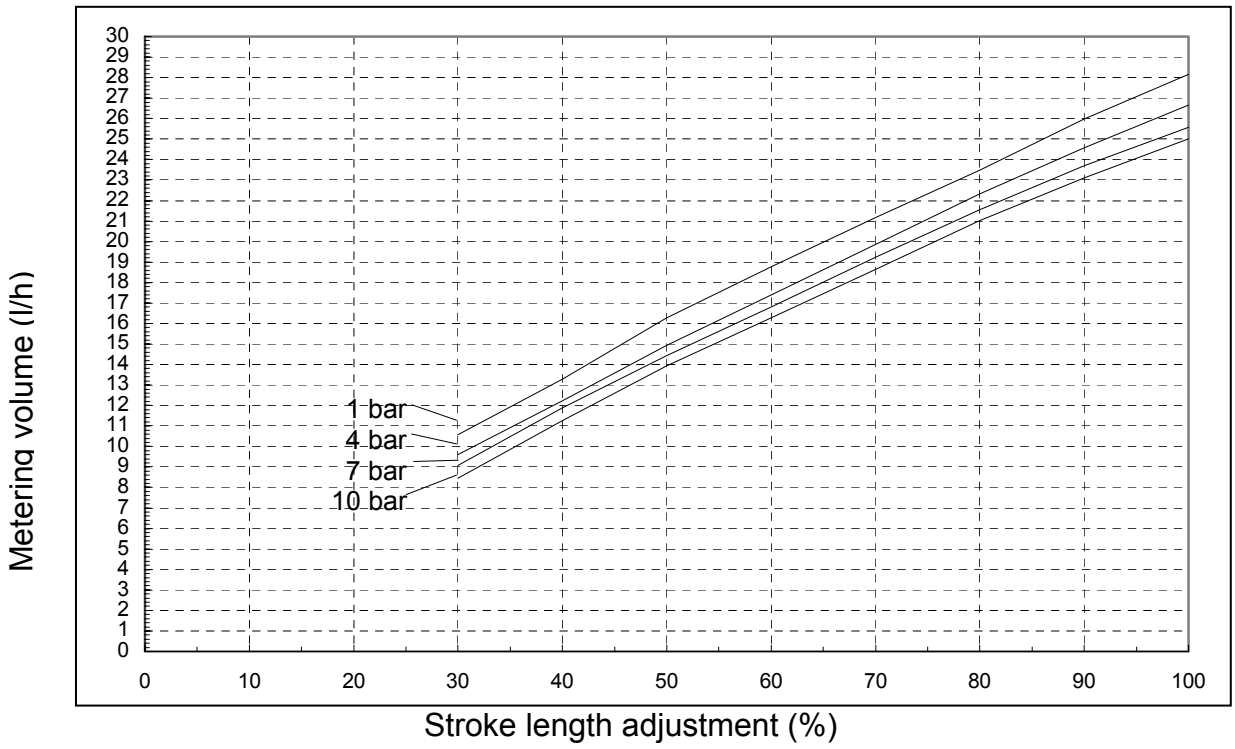
6 Pump capacity in relation to counter-pressure and metering stroke setting

Delivery rate 16 l/h:

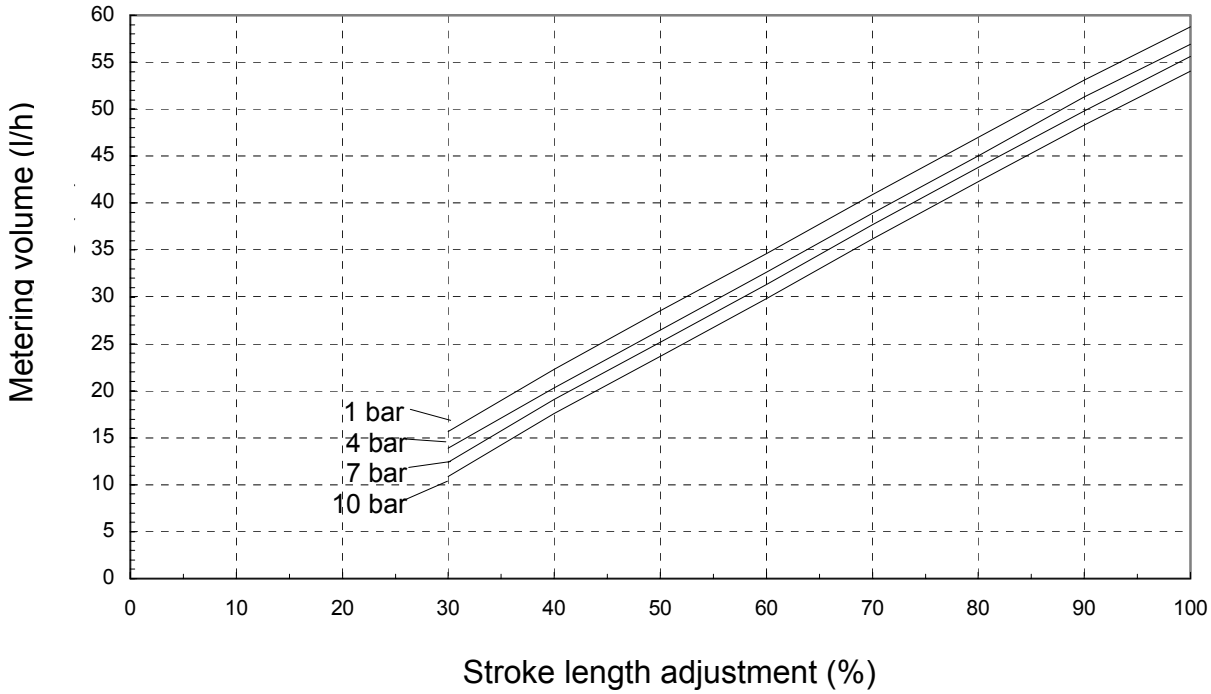


Setting accuracy + 15 % - 5 % of rated value; all values refer to water at 20 °C and are in accordance with the notes in the operating instructions.

Delivery rate 25 l/h:

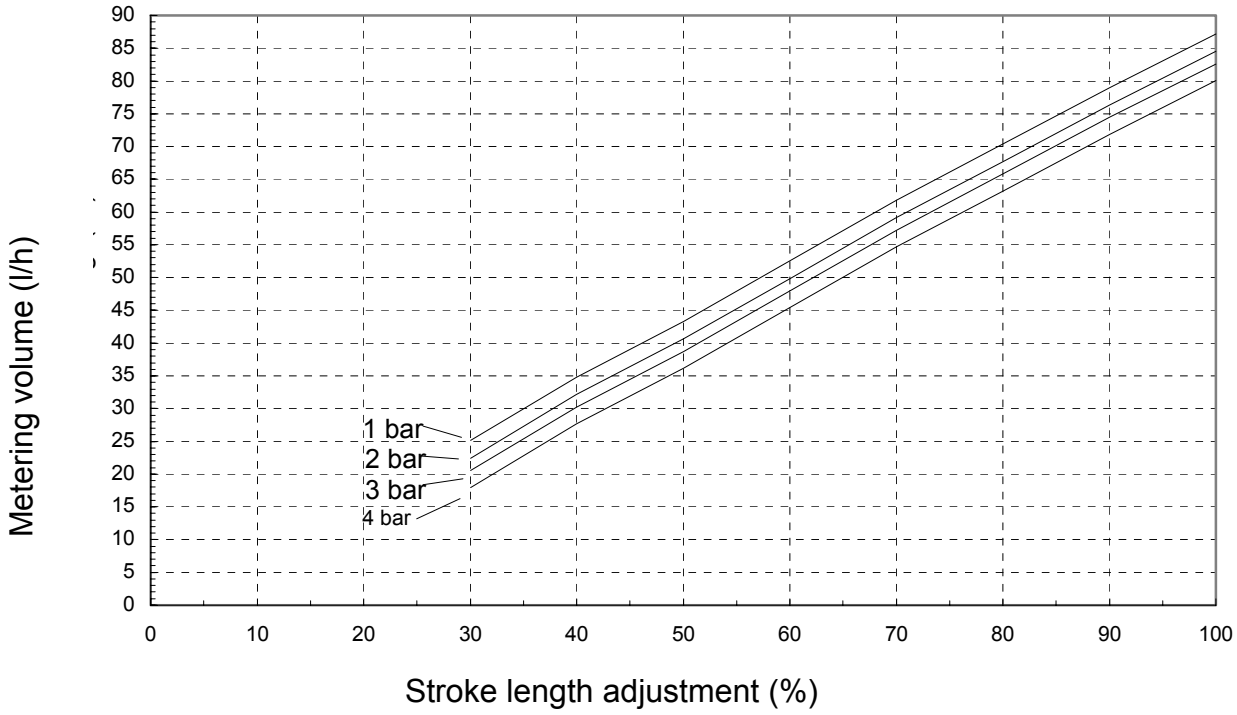


Delivery rate 54 l/h:

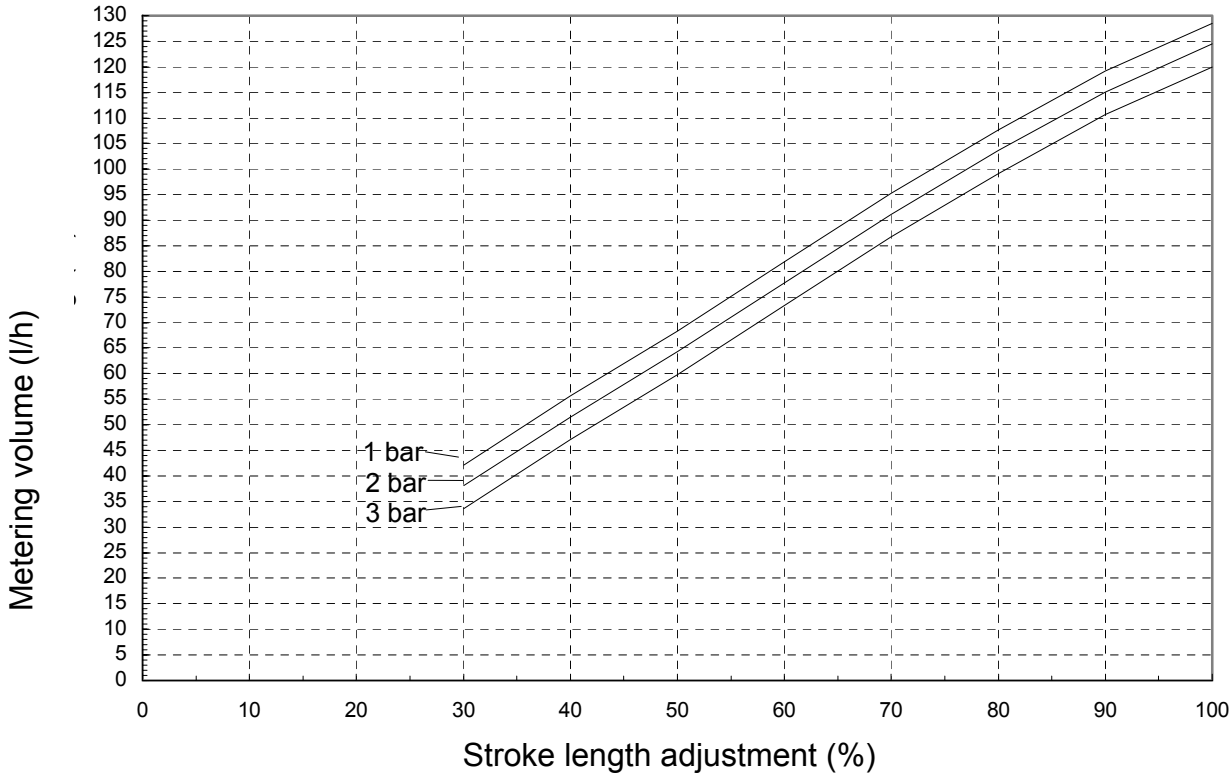


Setting accuracy + 15 % - 5 % of rated value; all values refer to water at 20 °C and are in accordance with the notes in the operating instructions.

Delivery rate 80 l/h:



Delivery rate 120 l/h:



Setting accuracy + 15 % - 5 % of rated value; all values refer to water at 20 °C and are in accordance with the notes in the operating instructions.

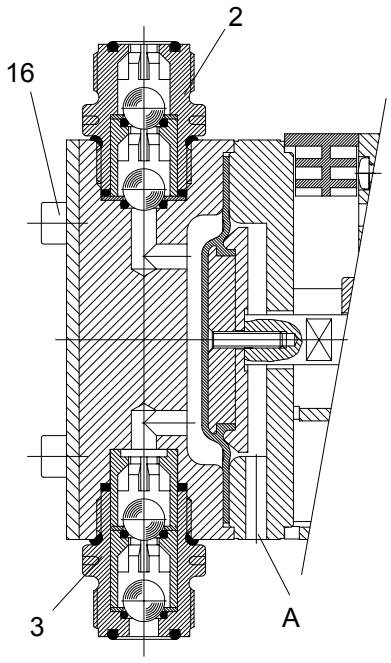
7 Maintenance (ill. 7/1)

CAUTION: Metering pumps may only be maintained by expert, authorised personnel.

NOTE: Quarterly maintenance interval, shorter intervals if load is greater (e.g. constant running).

It is recommended that the following be checked:

- Suction and pressure line for leak-free connection
- Suction (pos. 3) and pressure valve (pos. 2) for soiling and sealing function
- Check exit hole (A) on intermediate pump section (membrane break)
- Check correct pumping by suction drive
- Metering head screws (pos. 18) (firm seating, 3-4 Nm)



ill. 7/1

NOTE: The lifetime of the membrane depends on:

Counterpressure, operating tem-perature and metering material.

Frequent checking of the membrane is recommended at extreme temperatures and when metering abrasive materials.

For safety reasons, the membrane should be replaced after max. 2000 hours of operation (see chapter 9 “replacing membrane and pump head”, page 58).

8 Tips for dealing with faults which may occur

8.1 Faults which you can rectify yourself

CAUTION: Before carrying out repair and maintenance work or when metering dangerous substances, always rinse the metering head, relieve the pressure line and wear **protective clothing** (protective glasses, protective gloves and apron).

Electrical repairs may only be carried out by electrical experts (Liability Insurance Association safety regulations VB G 4 and ZH 1/11) !

CAUTION: Opening covers or removing parts, unless possible without using tools, may expose live parts. Connection points may also be live.

Before carrying out a calibration, service, or overhaul and when replacing parts, the device must be disconnected from all power sources if it needs to be opened.

Fault	Possible cause	Rectification
Metering pump does not work, green LED not showing	- Incorrect voltage	- Check power supply
Pump does not suck up despite bleeding and max. stroke setting	- Precipitations, sticking together, drying out of valves	- Rinse pump head through suction line, eventually dismantle and clean or exchange valves
Metering head is leaking, medium is escaping from leaking connection	- Metering head is loose - Diaphragm ruptured	- Tighten metering head screw diagonally - Replace diaphragm
Level LED flashes	- Low level warning	- Stock up product
Level LED permanently on	- Lack of chemicals - Loose jumper plugs	- Top up storage tank - Check that jumper plug is properly plugged in
Pump not working (red LED not indicating fault)	- Metering lock in operation - Connector not making contact at terminal II	- Attach jumper plug to terminal II - Cancel metering lock in accordance with wiring diagram - Check connector contact at terminal II

Fault	Possible cause	Rectification
Level LED flashes despite full container	- Float is blocked - Suction lance plug or bridge connector is loose or disconnected - Suction lance cable defective	- Release float - Tighten up plug, clean contacts - Check if bridge connector is plugged in properly - Exchange empty signal device
Metering pump does not work, even though ON-switch or yellow metering display (with E20/E30/ E40) flashes	- Air in pump head - Metering volume setting too low	- Vent metering head - Increase stroke volume setting
Error signal LED lights up	- Metering valve clogged - Metering back-pressure too high	- Clean and rinse valve - Check metering lines Once the cause of the fault has been removed, mains must be switched off or must be turned to "0" in order to acknowledge the error signal*
Error signal LED lights up when E30/E32 operating at 4-20 mA	- Input current interrup-ted or current < 4 mA	- Establish circuit, perhaps choose input range 0 - 20 mA
Metering pump not wor-king, no green LED display (version E 11 - E 42)	- 5 V output at cable bushing II overloaded	- Limit load to 80 mA
Metering pump doesn't operate, despite of reset of fault message and again switched-on pump E20/E22/ E30/E32/E40/E42	- Motor protection turned off by winding protector - Motor overload caused by too high back-pressure	- Motor turns on auto-matically after cooling - Check metering pipe
Metering pump doesn't operate, despite of mains connection E00/E10/E11	- Motor protection turned off by winding protector - Motor overload caused by too high back-pressure	- Motor turns on auto-matically after cooling - Check metering pipe

ATTENTION: *Pulse memory is cleared (E22/E32/E42).

8.2 Faults which must be fixed by customer service

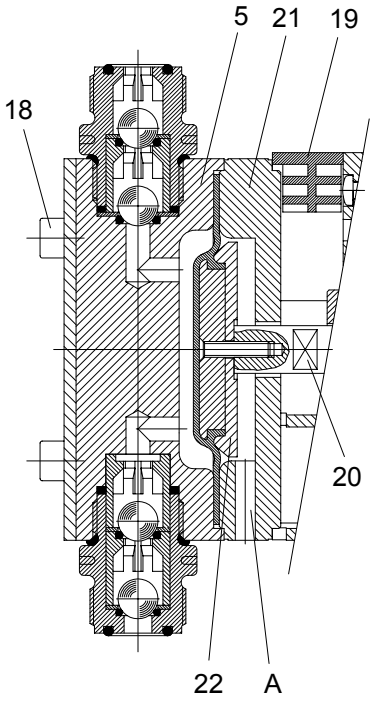
Fault	Possible cause	Rectification
Error signal LED lights up	- Metering system blocked - Metering without request being made	- Internal fault - Internal fault
Metering pump not working, no green LED display	- Mains cable damaged	- Replace mains cable

9 Replacing the diaphragm and pump head (ill. 9/1)

Loosen attachment screws (pos. 18), prise out stopper (pos. 19) with screwdriver, safeguard piston rod (pos. 20) from twisting with fork wrench SW 8 (membrane and transition piece may need to be twisted in order to get the piston rod wrench surface into the right position), twist out membrane (pos. 5), intermediate piece (pos. 21) and support disk (pos. 22).

Ensure that the attachment holes are aligned when tightening the membrane and the intermediate piece, (lightly tighten manually without tools). Remove the fork wrench and turn the membrane and inter-mediate piece as one unit until the housing holes are aligned, and the leakage hole (A) points down-wards. The metering head should be evenly diagonally tightened to about 4 Nm.

NOTE: Check metering head screw tightening torque after 24 hours. Tightening torque 3 - 4 Nm.

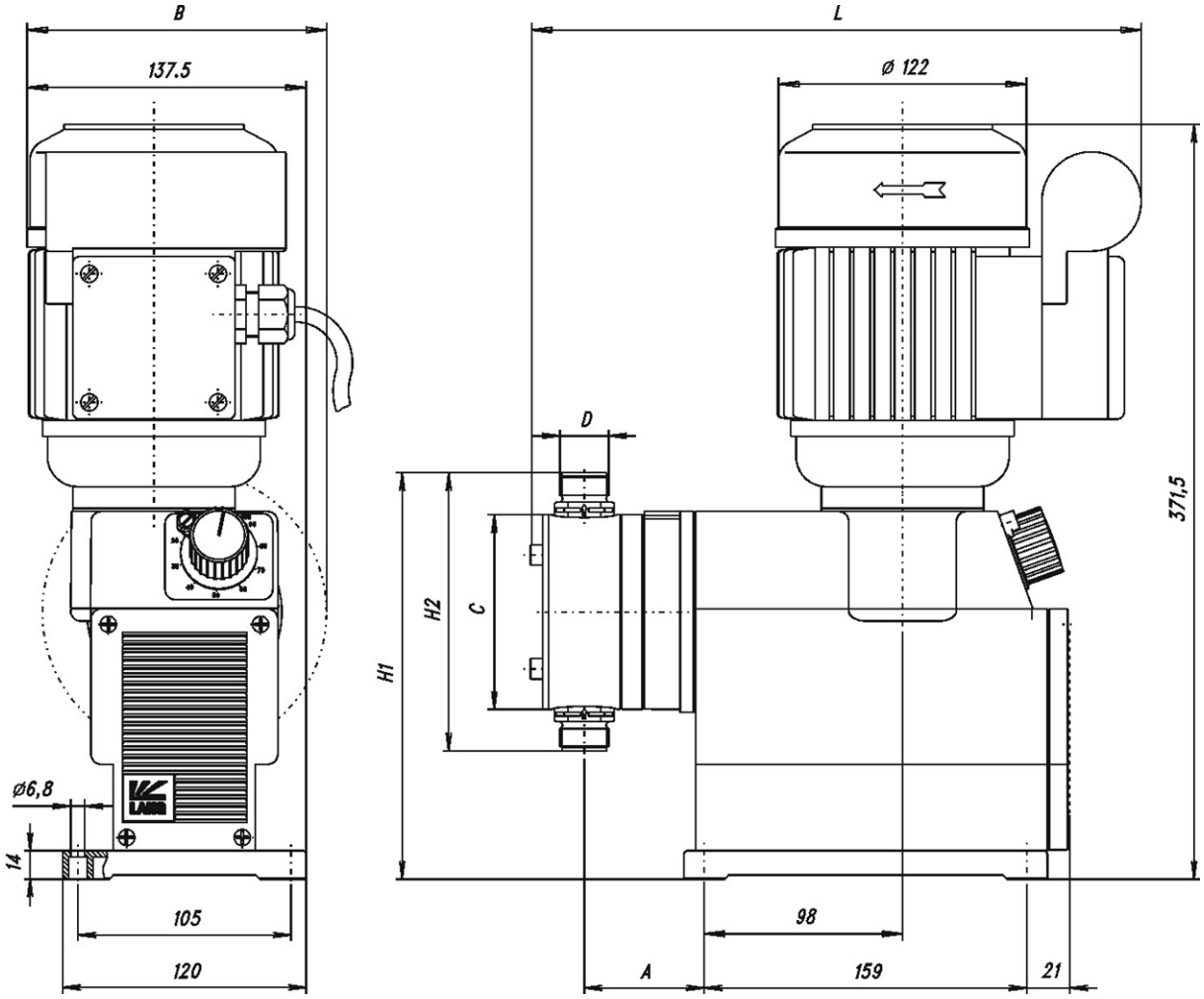


ill. 9/1

10 Dimensions, connections

10.1 Dimensions

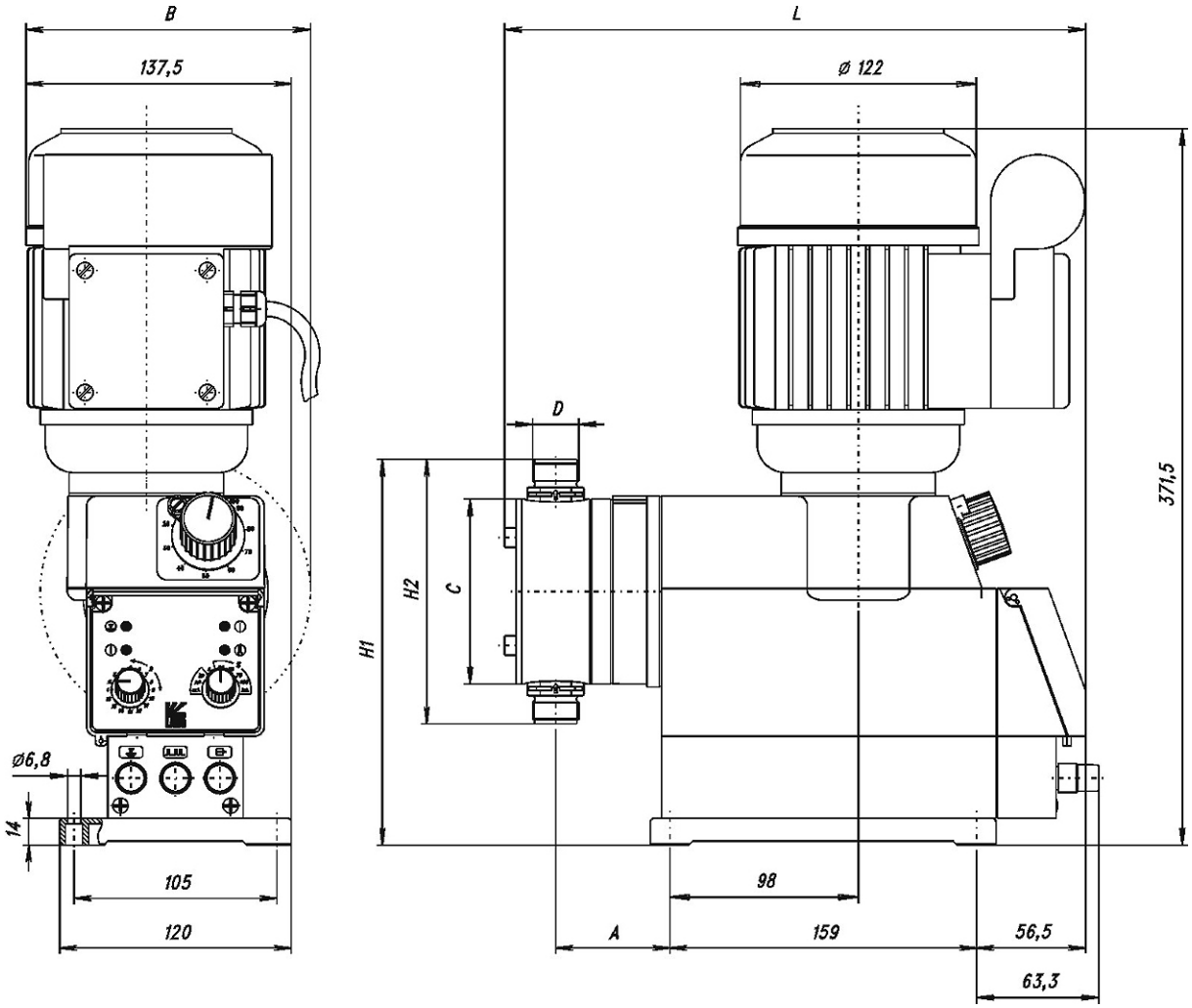
Dimension sheet version E 00



ill. 10/1

Capacity	Dimensions in mm						
l / h	A	B	C	L	H1	H2	D
16	59	-	∅ 96	301	200	137	5/8"
25	59	-	∅ 96	301	200	137	5/8"
54	63	-	∅ 96	303	200	137	5/8"
80	74,5	140	∅ 130	328	219,3	175,5	1 1/4"
120	74,5	145	∅ 140	330	224,3	185,5	1 1/4"

Dimension sheet version E10 to E42

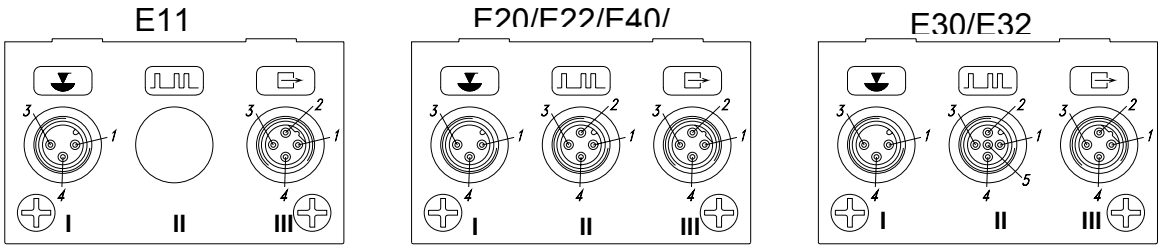


ill. 10/2

Capacity	Dimensions in mm						
l / h	A	B	C	L	H1	H2	D
16	59	-	∅ 96	301	200	137	5/8"
25	59	-	∅ 96	301	200	137	5/8"
54	63	-	∅ 96	303	200	137	5/8"
80	74,5	140	∅ 130	328	219,3	175,5	1 1/4"
120	74,5	145	∅ 140	330	224,3	185,5	1 1/4"

10.2 Pin assignment

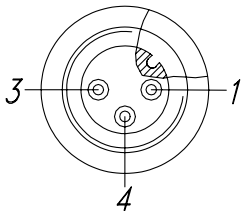
View of the switch boxes on the pump



Connector I

Empty signal input
contact 3 / 4
open = pump stopped

Reserve signal input
contact 1 / 4
open = reserve signal, pump running



1 Reserve signal input, brown
3 Empty signal input, blue
4 GND, black

Connector II
4-pole for E20/E22/E40/E42
5-pole for E30/E 32

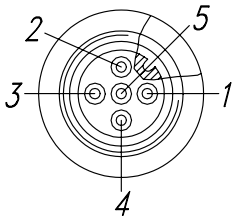
Metering lock, contact 3 / 4
closed = pump operational

CAUTION: If the metering lock is not used when the 4-pole connector is connected, contact 3 / 4 must always be bridged!

Pulse input, contact 2 / 4
(e.g. water meter with reed contact)
closed = a pulse is processed
- min. pulse length: 15 msec = 1 stroke
- max. pulse train: 124 pulses/min = continuous running

5 V output, contact 1
e.g. water meter connection with hall effect element
1 = 5 V / 2 = pulse / 4 = GND
max. load 80 mA

extra for E30/E32 (5-pole):
Input 0/4 .. 20 mA, contact 5 / 4



1 Output 5 V, brown
2 Pulse input, white
3 Metering lock, blue
4 GND, black
5 Input 0/4...20 mA (only E30/E32), grey

Connector III

Output protective circuit up to 240V:

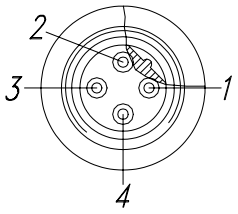
Empty signal output, contact 1 / 2
(floating relay contact) closed = empty signal display (pump stopped, tank empty or reserve signal) or fault message
Load: 240V AC/DC / 3A

CAUTION: Connection of stroke signal output 3/4 not allowed acc. to VDE. Use only 2-pole cable.

Output protective circuit up to 24V:

Empty signal output, contact 1 / 2
(floating relay contact) closed = empty signal display (pump stopped, tank empty or reserve signal) or fault message
Load: 24 V AC/DC / 3 A

Stroke signal output, contact 3 / 4
(floating transistor output)
1 pulse = 1 stroke
Load: 24V DC / 300 mA



1 Empty signal output, brown
2 Empty signal output, white
3 Stroke signal output, blue (+)
4 Stroke signal output, black (-)

NOTE: The cable core colour allocations indicated only apply to the standard cables that are available as accessories.

11 Ordering code

Pump code 1

1. Electrical version

E00 Terminal box on motor, mechanical stroke adjustment

E10 on/off switch, mechanical stroke adjustment

E11 E 10 with empty signal with low level pre-warning

E20 on/off/test switch, mechanical stroke adjustment, pulse input, empty signal with low level prewarning, empty signal output, stroke signal output

E22 E 20 with pulse memory

E30 External-0-internal mode switch for frequency control or current signal input 0/4...20 mA or external pulse input, mechani-cal stroke adjustment, empty signal with low level pre-warning, empty signal output, stroke signal output

E32 E 30 with pulse memory

E40 External-0-internal mode switch for frequency control (100/75/ 50/25%) or external pulse input for pulse multiplication/division, mechanical stroke adjustment, empty signal with low level pre-warning, empty signal output, stroke signal output

E42 E 40 with pulse memory

Pump code 1

1. Electrical version (description see page before)

E00 Terminal box on motor, mechanical stroke adjustment

E10 ...

...

2. Pump capacity 50 Hz [60 Hz]

00160	=	16 l/h	[19 l/h]
00250	=	25 l/h	[30 l/h]
00540	=	54 l/h	[64 l/h]
00800	=	80 l/h	[96 l/h]
01200	=	120 l/h	[144 l/h]

3. Pump head material

PP	=	PP	(standard)
PV	=	PVDF	
VA	=	V4A	

4. Metering back pressure

03	=	3 bar (for 120 l/h)	[2,5 bar]
04	=	4 bar (for 80 l/h)	[3,3 bar]
10	=	10 bar	[8 bar]

5. Sealing material

EP	=	EPDM	
FP	=	Viton B	(standard)
KA	=	Kalrez	

6. Ball material

GL	=	glass	(standard)
VA	=	stainless steel	
KE	=	ceramic	
PT	=	Teflon	

7. valve material

PP	=	PP	(standard)
PV	=	PVDF	
VA	=	stainless steel	

8. valve spring

08	=	suction valve without spring; pressure valve double spring loaded (each 0,2 bar)
10	=	suction valve without spring; pressure valve spring loaded (0,1 bar)
99	=	without spring

9. Cable version

01	=	mains cable 2m shock-proof plug
02	=	mains cable 3-wired 2,4m end splices
03	=	mains cable 3-wired 3m end splices
09	=	mains cable USA version
13	=	mains cable Italy version
99	=	without mains cable

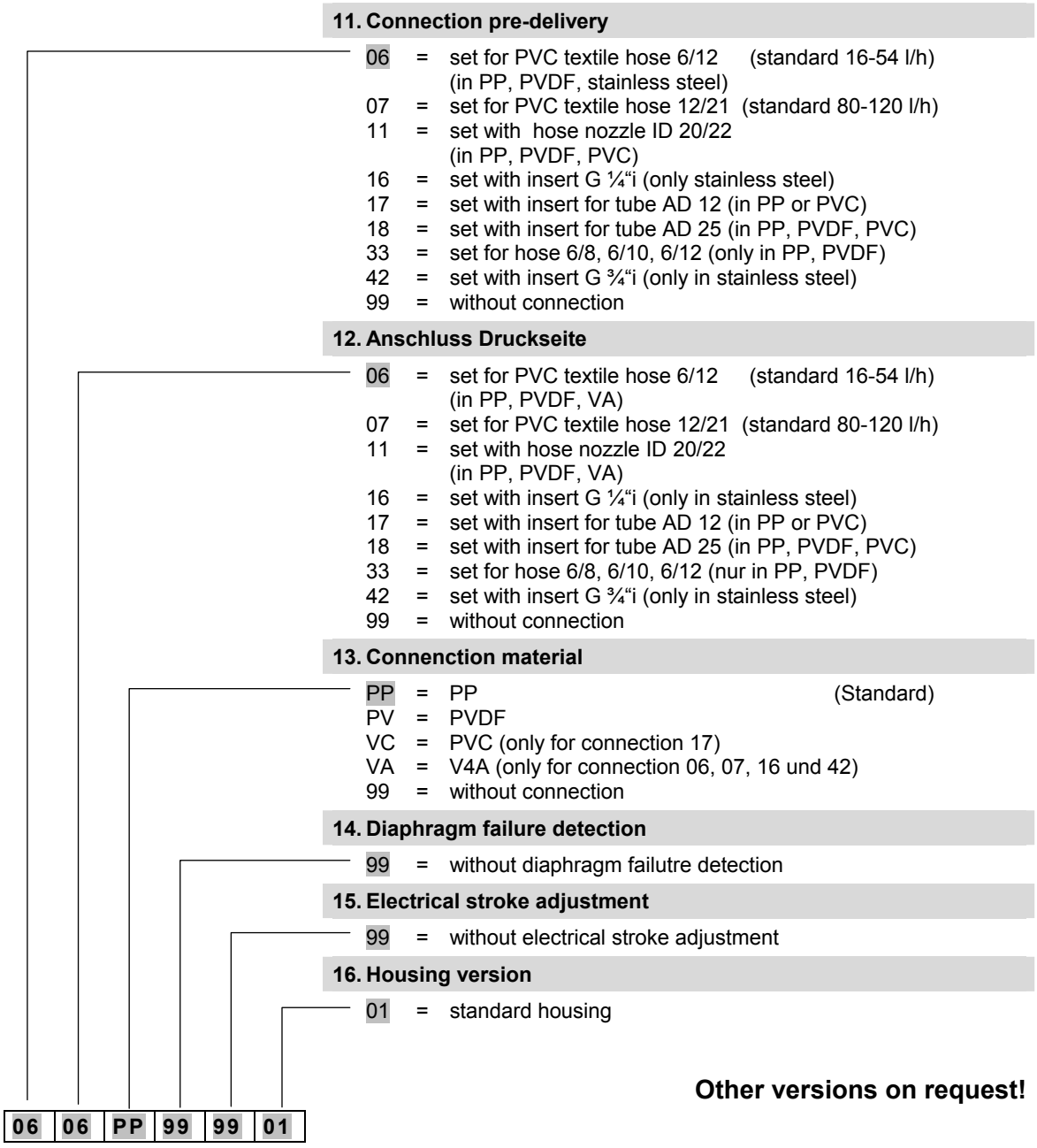
10. Power supply

01	=	115V / 50 Hz	
02	=	115V / 60 Hz	
03	=	230V / 50 Hz	(standard)
04	=	230V / 60 Hz	
10	=	3PE 400/230 V 50/60 Hz (only version E00)	

E00	00250	PP	10	FP	GL	PP	99	99	03

Other versions on request!

Pump code 2



Example of a complete pump code of a standard pump:

E00	00250	PP	10	FP	GL	PP	99	99	03	-	06	06	PP	99	99	01

(Pump codel 1) (Pump code 2)

12 Technical data

Pump capacity l/h	16	25	54	80	120
max. metering back pressure (bar)	10	10	10	4	3
number of strokes (1/min)	124	124	124	124	124
metering volume/stroke (cm³)	2,1	3,4	7,3	10,8	16,1
metering accuracy (see section 5)	< ± 3%				
suction head (mWS) at 100 % stroke setting *	2	2	2	2	2
suction/pressure connection ** int. dia/ext. dia (mm)	PVC tube 6/12 Stainless steel tube G¼“			PVC tube 12/21 Stainless steel tube G¾“	
power supply special power supplies on request	230 V / 50 Hz + 6 % - 10 %				
current consumption (A) 50 Hz	0,95	0,95	0,95	0,95	0,95
power output (W) 50 Hz	90	90	90	90	90
type of protection	IP 55				
max. ambient temperature (°C)	40				
output circuit to 24 V / 240 V empty signal output stroke signal output	24 V 3 A AC/DC / 240 V 3 A 24 V 0,3 A DC / not permitted				
weight (kg)	7,4	7,4	7,4	8,6	8,6

* Suction heights with clean, moist valves

All data refer to water at 20°C, when operated in accordance with the instructions on page 50.

CAUTION: ** For the pressure lines and metering lines, the maximum permissible pressure ranges must be observed!

Materials:

- Pump head: PP, optionally PVDF, stainless steel 1.4571
- Diaphragm: PTFE-EPDM composite
- Seals: FPM/Viton B, optionally EPDM, Kalrez
- Valve balls: Glass, optionally stainless steel 1.4401, PTFE
- Valve springs: Elgiloy/Hastelloy C4
- Housing: thermoplastic polyester
- Colour: blue, RAL 5007

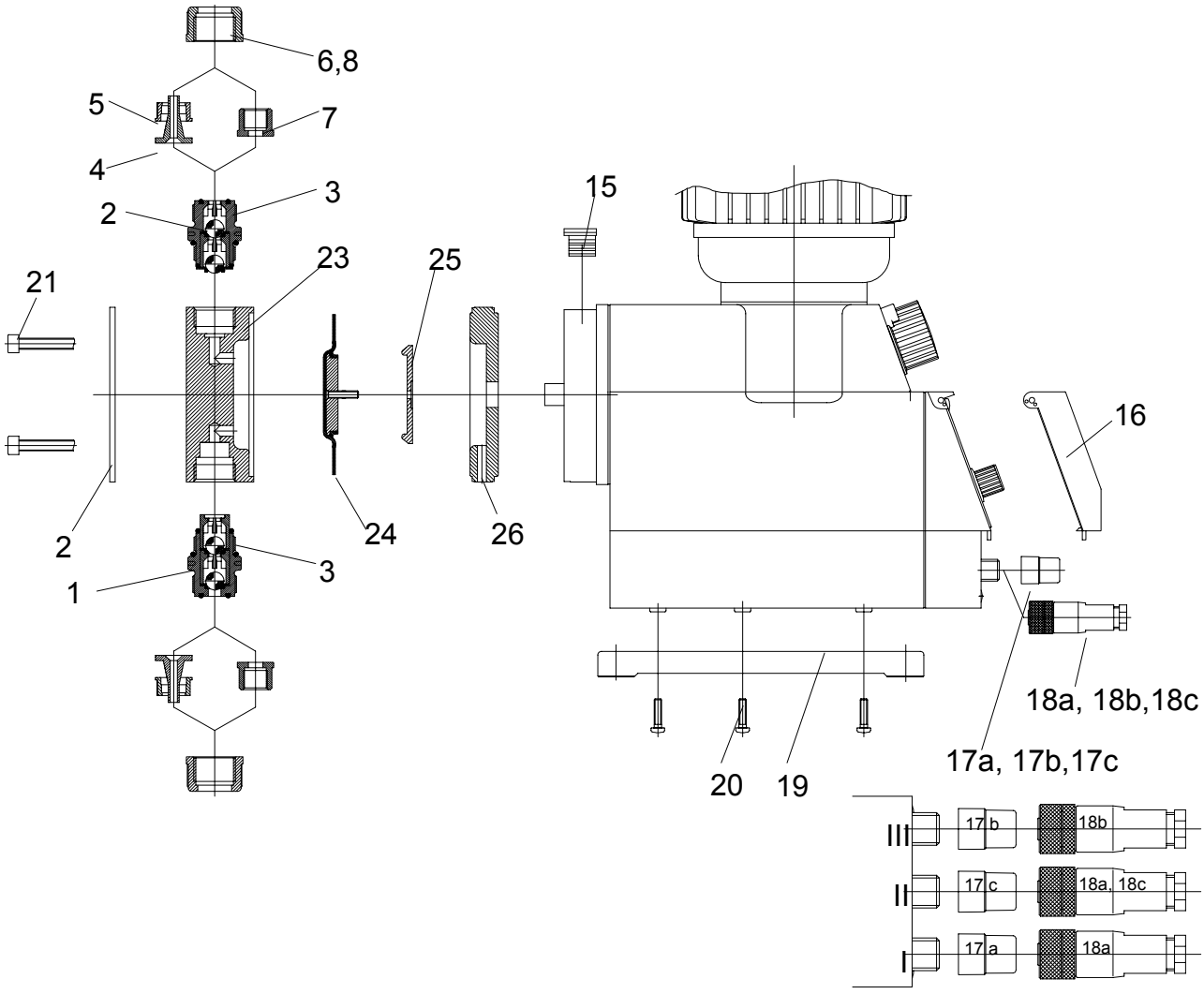
Special versions on request.

13 Wearing and replacement parts (standard version) (ill. 13/1 and ill. 13/2)

Item	Description	Material-No.
1	Complete G 5/8” suction valve, 16 - 54 l/h, PVDF, Glass balls, VITON B seal	245019
2	Complete G 5/8” pressure valve, 16 - 54 l/h, PVDF, glass balls, VITON B seal	245020
3	O-ring (VITON B) for suction and pressure connection, G 5/8”	417003334
4	PVC bearing part for PVC fabric ID/AD 6/12 1.4571 bearing part for PVC fabric ID/AD 6/12	38610403 38610301
5	PVC tensioning part for PVC fabric ID/AD 6/12 1.4305 tensioning part for PVC fabric ID/AD 6/12	38612103 38610302
6	PVDF swivel nut	34500133
7	**For connecting G ¼" stainless steel tube** 1.4571 inlay part, G 1/4” connecting thread	34900185
8	G 5/8" swivel nut, 1.4571	38610406
9	Complete G1 ¼” suction pressure valve, 80 - 120 l/h, PVDF, glass bearing, VITON B seal	249002
10	VITON O-ring for suction/ pressure connection, G 1 ¼”	417003593
11	PVC bearing part for PVC fabric ID/AD 12/21 1.4571 bearing part for PVC fabric ID/AD 12/21	38610404 38610201
12	PVC tensioning part for PVC fabric ID/AD 12/21 1.4305 tensioning part for PVC fabric ID/AD 12/21	38610203 38610202
13	G 1 ¼” swivel nut, PVC	415100287
14	**For connecting G ¾" stainless steel tube** 1.4571 inlay part, G ¾” connecting thread	38610407
13	G 1 ¼“ swivel nut, 1.4305	38610405
15	Covering stopper	34900168
16	Transparent cover	34800120
17a	Dummy plug empty signal input	248186
17b	Cover	34800117
17c	Jumper plug pulse- / current signal input	248187
18a	Plug 4 pin (3 pin) empty signal- / pulse signal input	418463115
18b	Plug 4 pin, special version, empty signal-/pulse signal output	418463117
18c	Plug 5 pin E30/E32, current signal-/pulse signal input	418463118
19	Mounting plate	34900120
20	Screw B40 x 16	413071167

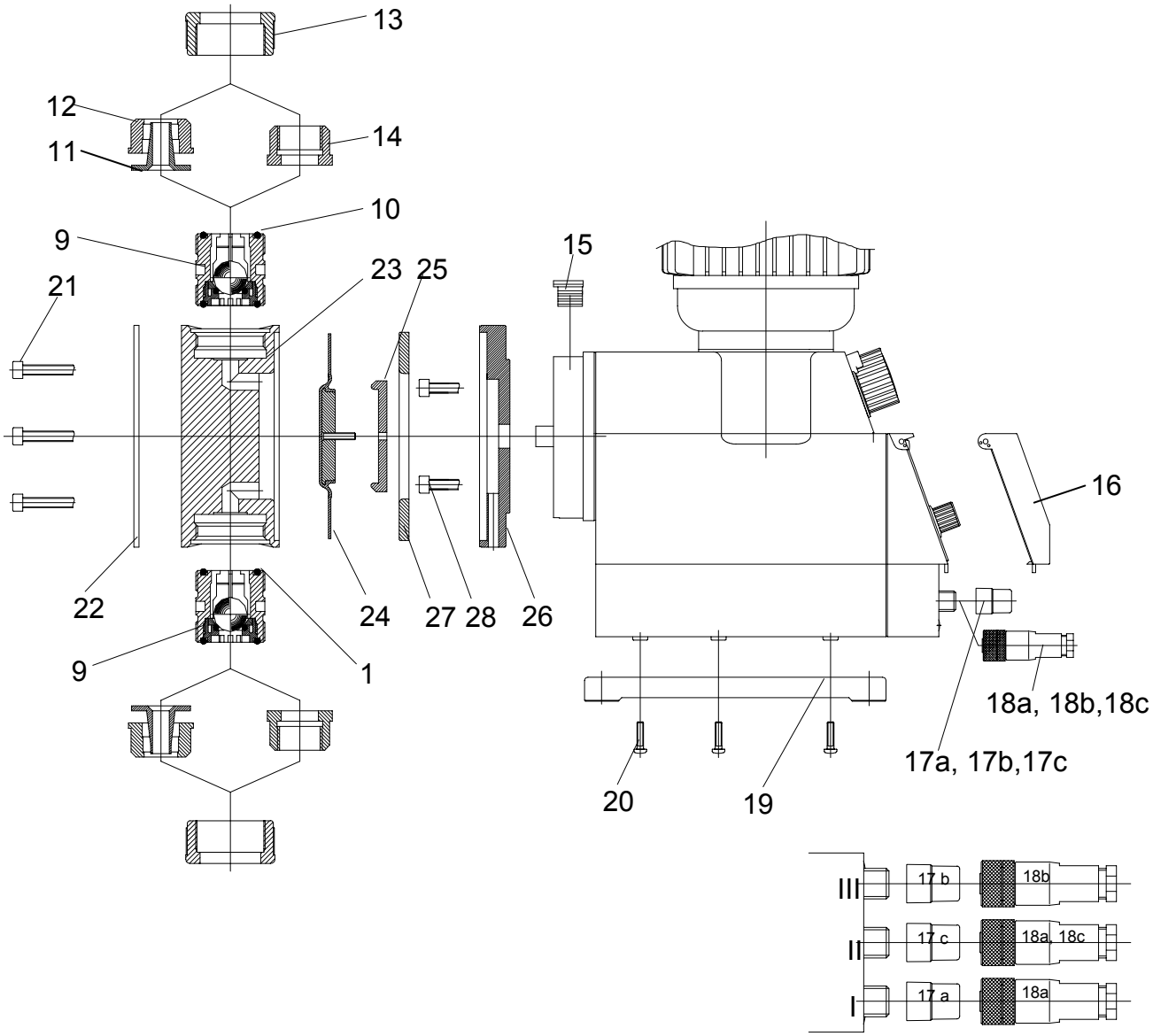
Item	Description	16 l/h	25 l/h	54 l/h	80 l/h	120 l/h
21	Pump head screw	413031048	413031048	413031048	413031047	413031064
22	Pressure plate	34900138	34900138	34900138	34900139	34900140
23	PP Pump head PVDF Pump head	34900102 34900175	34900103 34900176	34900104 34900177	34900105 34900178	34900106 34900179
24	Membrane	34900108	34900109	34900110	34900111	34900112
25	Support Disk	34900131	34900113	34900145	34900149	34900151
26	Intermediate plate	34900132	34900115	34900133	34900134	34900135
27	Indermediate disk	--	--	--	34900136	34900137
28	Screw	--	--	--	413031042	413031042

Delivery rate 16 – 54 l/h



ill. 13/1

Delivery rate 80 - 120 l/h



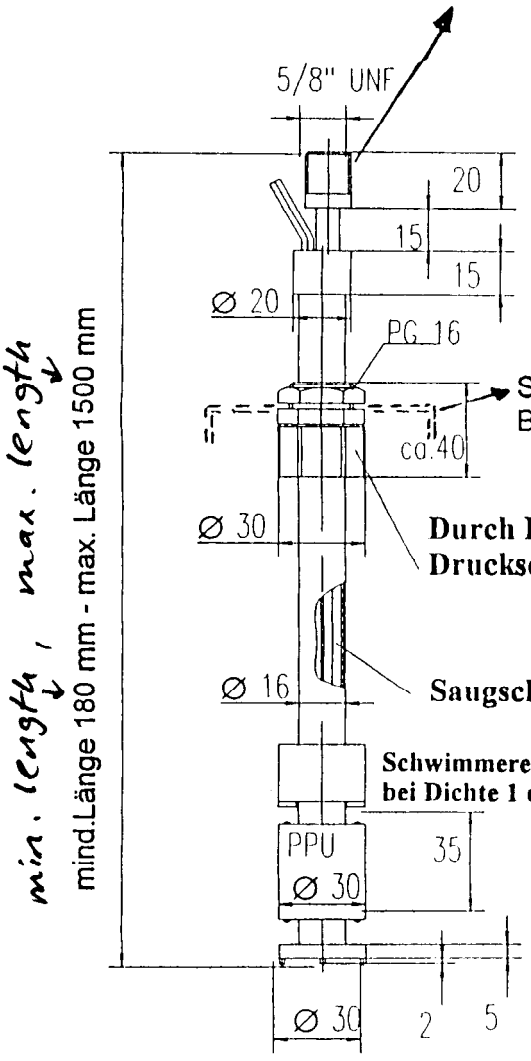
ill. 13/2

Variable Suction Rod

MEDOTEC MEß- UND DOSIERTECHNIK GMBH	VARIABLE SAUGLANZE FÜR LIEFERGEBINDE	AUSGABE AB 1/1997

Standard-Schlauchanschluß 4x6, 6x8, 6x12 mm
Option 5x8, 8,12, 9x12 mm

Standard hose Connection



Kontaktart:
Öffner oder Schließer durch Drehen des Schwimmers

Contact type: opener or closer by turning the floating element

Screwing lid, opening 22,5 supplied

see overleaf

Technische Daten:

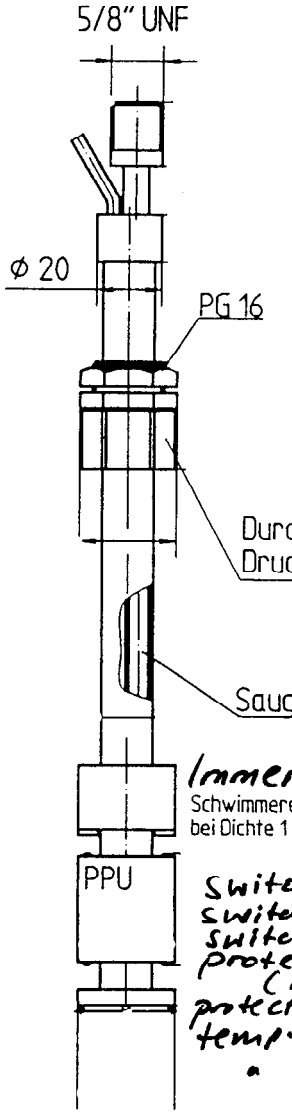
Schaltspannung	max. 250 V
Schaltstrom	max. 1 A
Schaltleistung	max. 50 W / 50 VA
Schutzart Kopfstück	IP 65 (IEC 529)
Schutzart ab Unterk.Schraubdeckel	IP 65 (IEC 529)
Temperaturbereich PVC	- 10°C - + 65°C

see overleaf

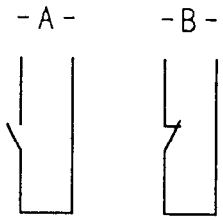
XE-000009416-000

Sauglanze S 1 . . . 0 . .

variable suction rod



types of contact
Kontaktarten



can be changed by loosening of pressure screw

suction pipe PE, inside Ø 6

Immersion depth/density 1, approx. 21 mm

switch. voltage
switch. current
switch. power
protection type (head)
protection, lower part
temp. range PVC
" PP

TECHNISCHE DATEN: techn. data

Schaltspannung:	max. 50 V	max. 250 V
Schaltstrom:	max. 0,5 A	max. 1 A
Schaltleistung:	max. 10 W / 10 VA	max. 50 W / 50 VA
Schutzart Kopfstück:	IP 65 (IEC 529)	
Schutzart ab Unterkante Schraubdeckel:	IP 67 (IEC 529)	
Temperaturbereich PVC:	-10°C ... +65°C	
Temperaturbereich PP:	-25°C ... +100°C	

Typenschlüssel für Sauglanze S 1 . . . 0 . .

material code ← of supplier

* Nennlänge 0 - 5 in 200 mm Schritten abgestuft
0 = ≤ 200 mm 1 = ≤ 400 mm 2 = ≤ 600 mm
3 = ≤ 800 mm 4 = ≤ 1000 mm 5 = ≤ 1200 mm

Kontaktarten
A = - A - B = - B - C = - C -

Schaltspannung
0 = < 50 V 1 = < 250 V (nur A oder B Kontakt)

Material Sauglanze / Flußventil
B = PVC / PVC C = PP / PP

Schaltpunkt 0 = fallendes Niveau
1 = steigendes Niveau

Assembly	: 16.02.WMT3.20.0N	Commiss.	: 25-05-377
Label	: CONTAINER[520]/WMT3/PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000146/01
Drawing	: 16.02.WT01E01.00	Date	: 10.04.2006

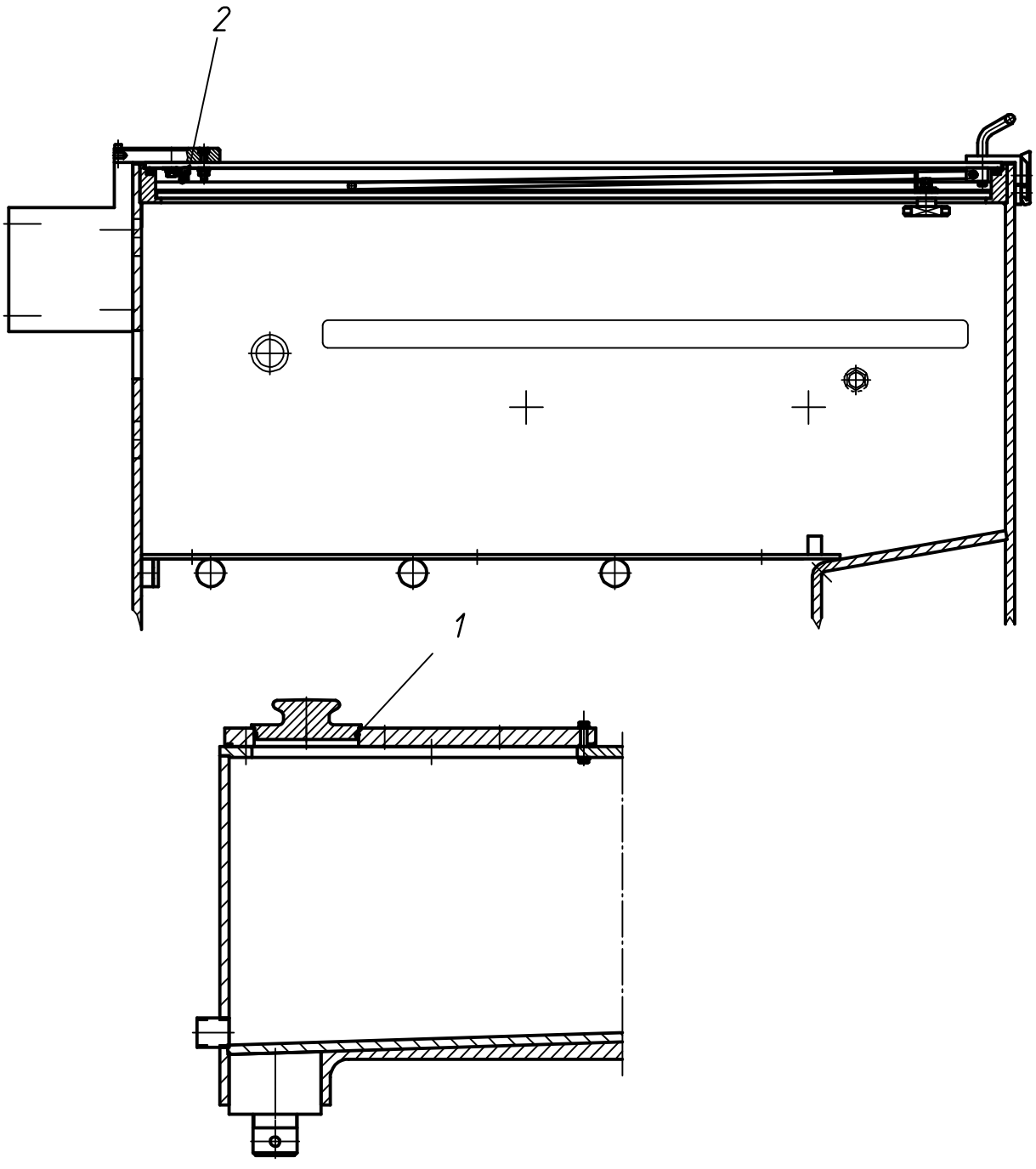
Pos.	Part N° Label	Quant.	Unit	SP
	16.002.0141.U23N GLASS COVER[520]/23/PVC/TI	1,000	ST	
1	DICH0580-239 O-RING/EPDM/BLACK/091.76x3.53	1,000	ST	X
2	16.002.0508.0760 PROFILE/"VITON B"	,815	M	X
	16.012.0003.U23A CABLE CHANNEL/CPL./023/PVC/BS	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste BEHÄLTER U. VERKLEI.

Spare parts list housing with accessories

16.02.WT01E01.00 | 11/03



Assembly	: 16.002.0141.U23N	Commiss.	: 25-05-377
Label	: GLASS COVER[520]/23/PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000147/01
Drawing	: 16.002.0141EU000	Date	: 10.04.2006

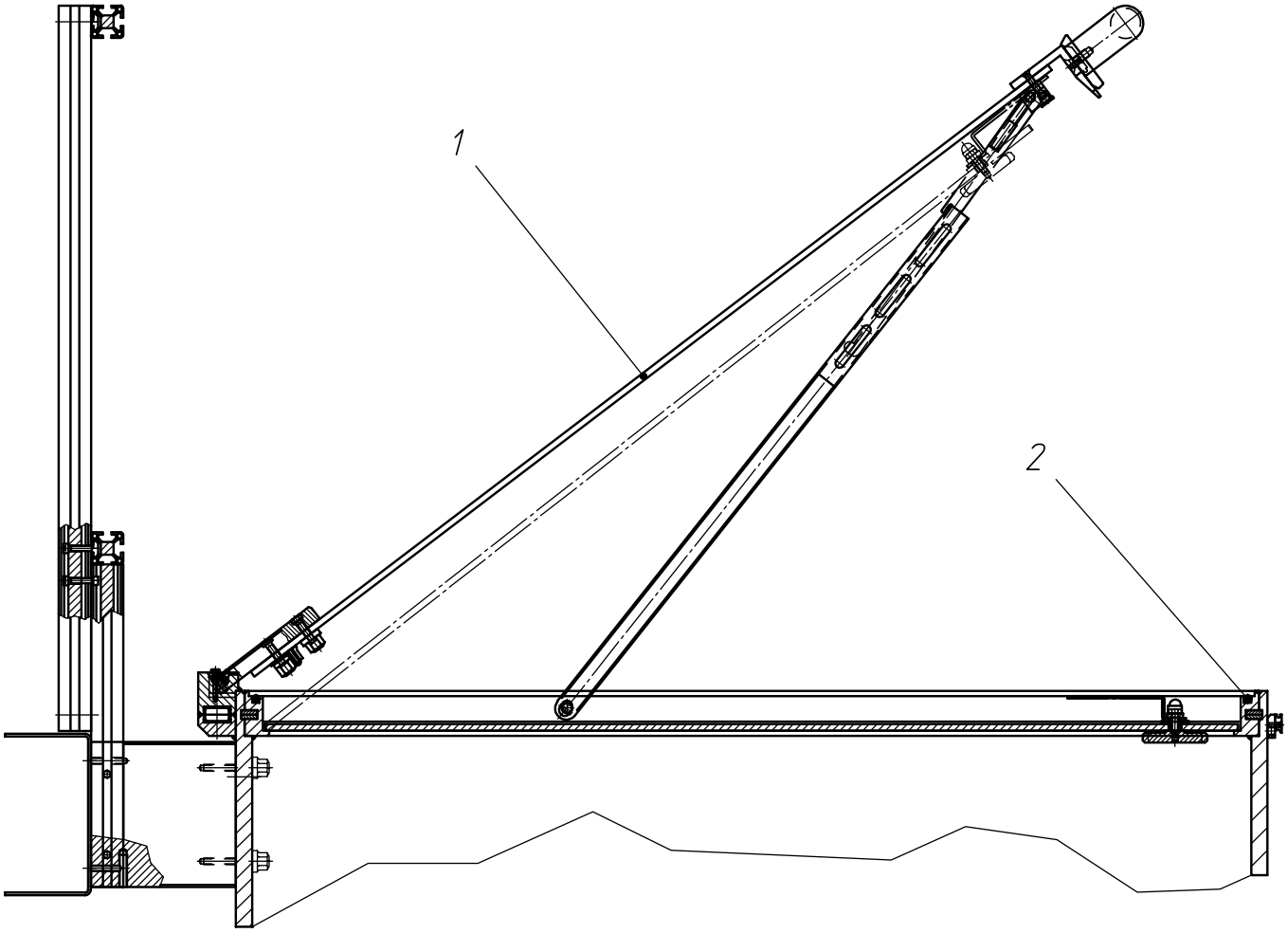
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0022.2230 GLASS COVER/23/0650/0843x0932x06	1,000	ST	X
	16.002.0142.U00N COVER PARTS/PVC/TIT	1,000	ST	
2	16.002.1178.2230 GLASS COVER SEALING/A/23/0650/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list GLASS COVER

16.002.0141EU000	11
	00



Assembly	: 16.002.0142.U00N	Commiss.	: 25-05-377
Label	: COVER PARTS/PVC/TIT	Position	: 000060
Quant.	: 1,000 ST	Page	: 000148/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

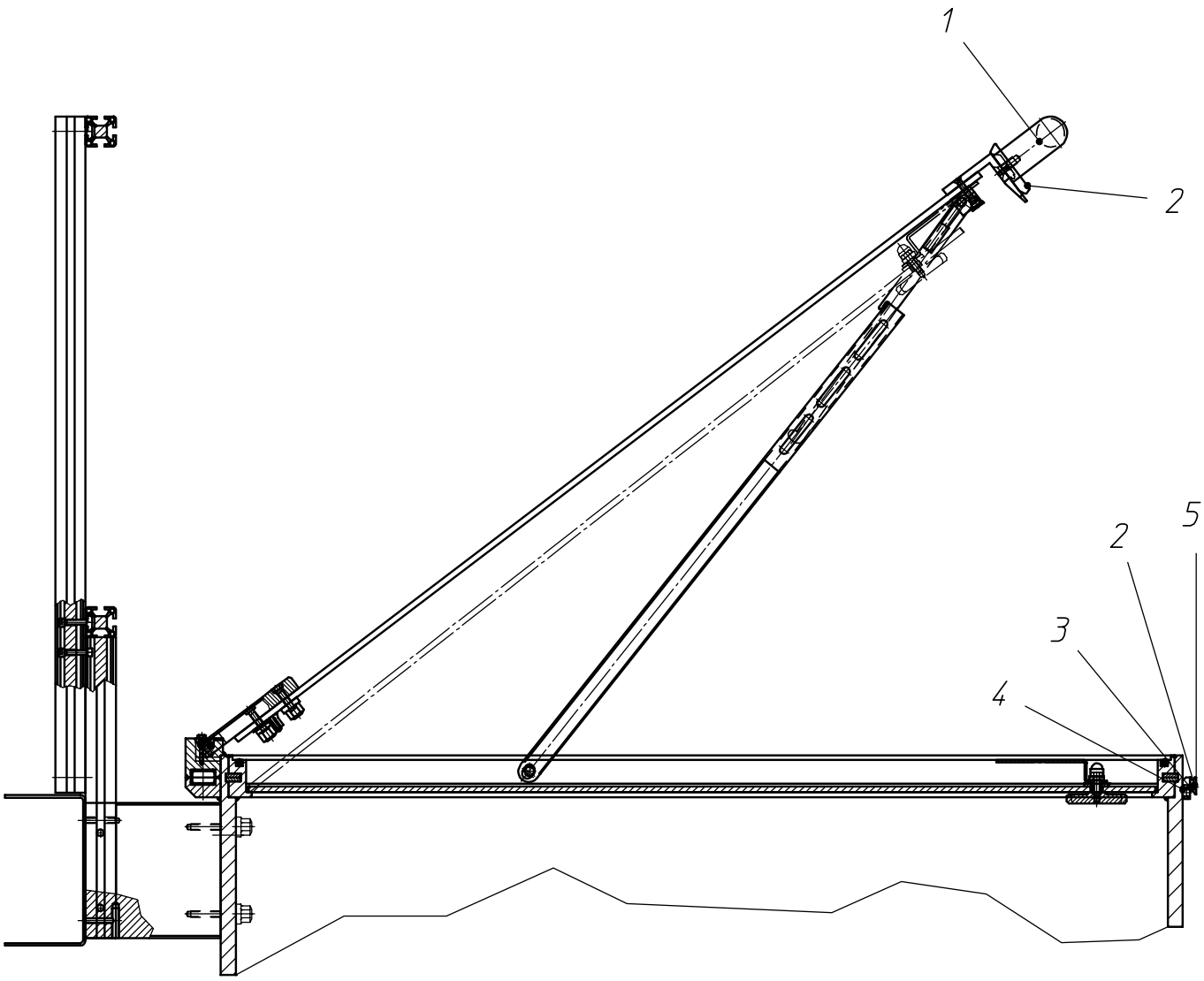
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
3	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
4	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
HAMLIN

www.breedelectronics.com

59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

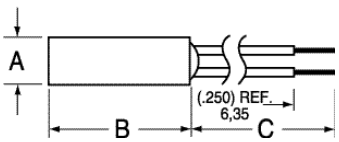
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

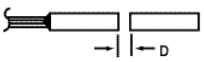
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

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Breed Electronics France Tel: +33 1 46 87 02 02 • Fax:+33 1 46 86 67 86 • Email: hamectrol@hamectrol.fr

Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000060
Quant.	: 1,000 ST	Page	: 000149/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

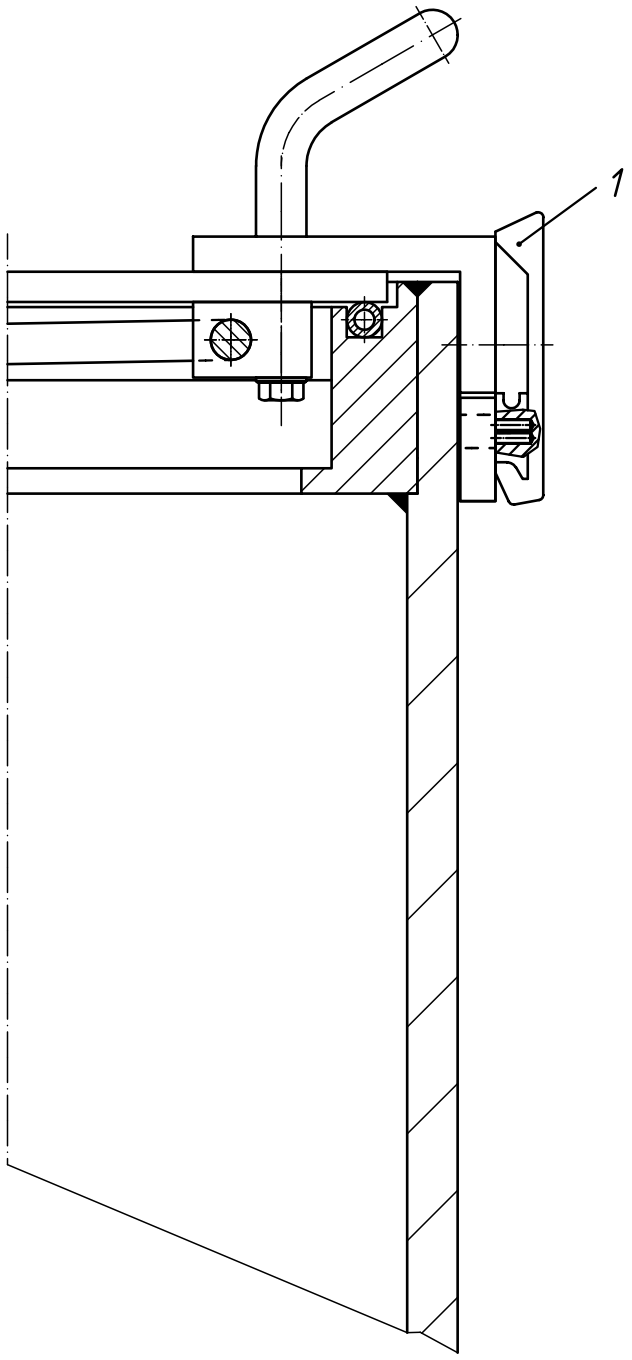
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.012.0003.U23A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./023/PVC/BS	Position	: 000060
Quant.	: 1,000 ST	Page	: 000150/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

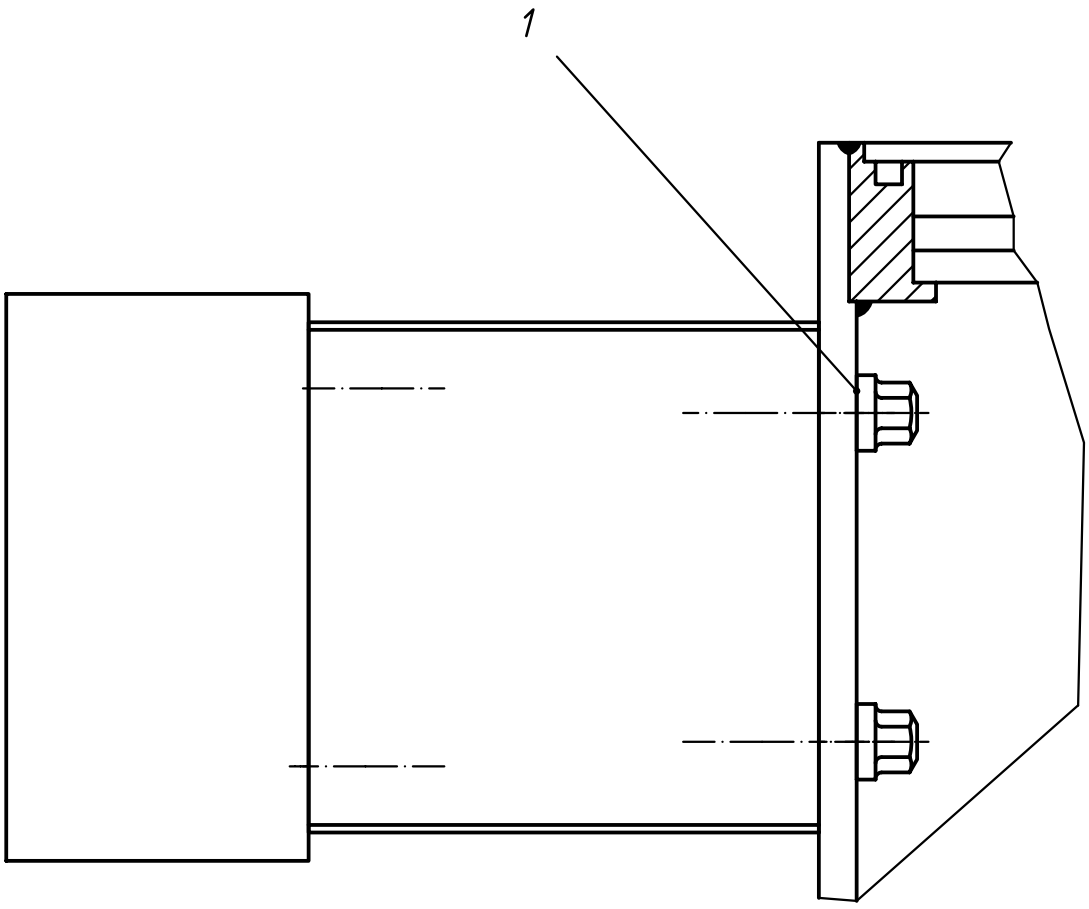
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	8,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 16.002.0040.U233	Commiss.	: 25-05-377
Label	: INTERMEDIATE GLASS COVER/KPL./23/PP/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000151/01
Drawing	: 16.002.0040EU000	Date	: 10.04.2006

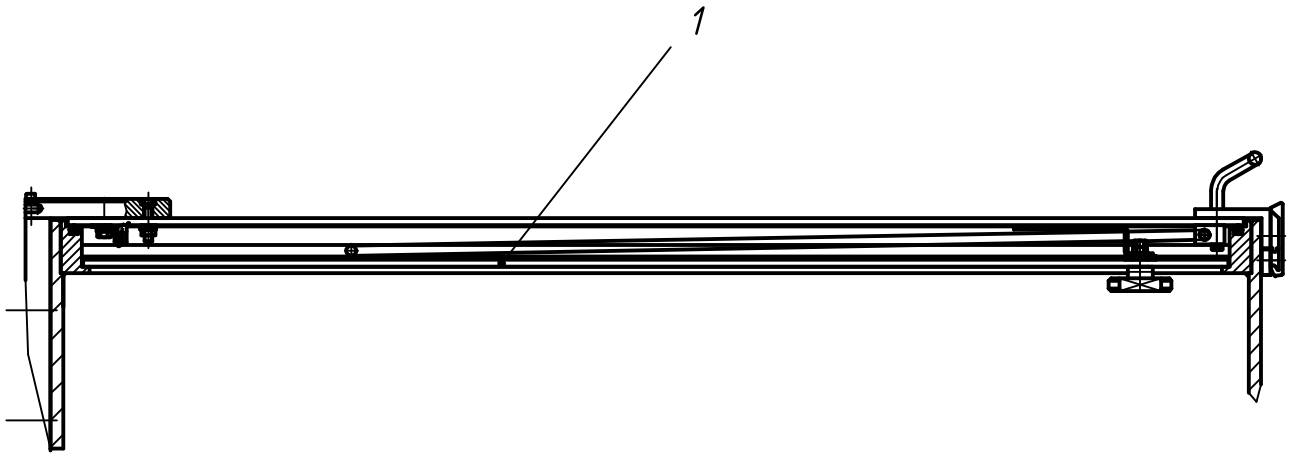
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0100.2230 GLASS COVER/23/0650/0791x0906x06.0	1,000	ST	X
	16.002.0004.U003 COVER PARTS/TIT	2,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZWI.-GLASDECKEL KPL.

Spare parts list Intermediate glass cover cpl.

16.002.0040EU000	11
	00



Assembly	: 16.002.0004.U003	Commiss.	: 25-05-377
Label	: COVER PARTS/TIT	Position	: 000060
Quant.	: 2,000 ST	Page	: 000152/01
Drawing	: 16.002.0004EU000	Date	: 10.04.2006

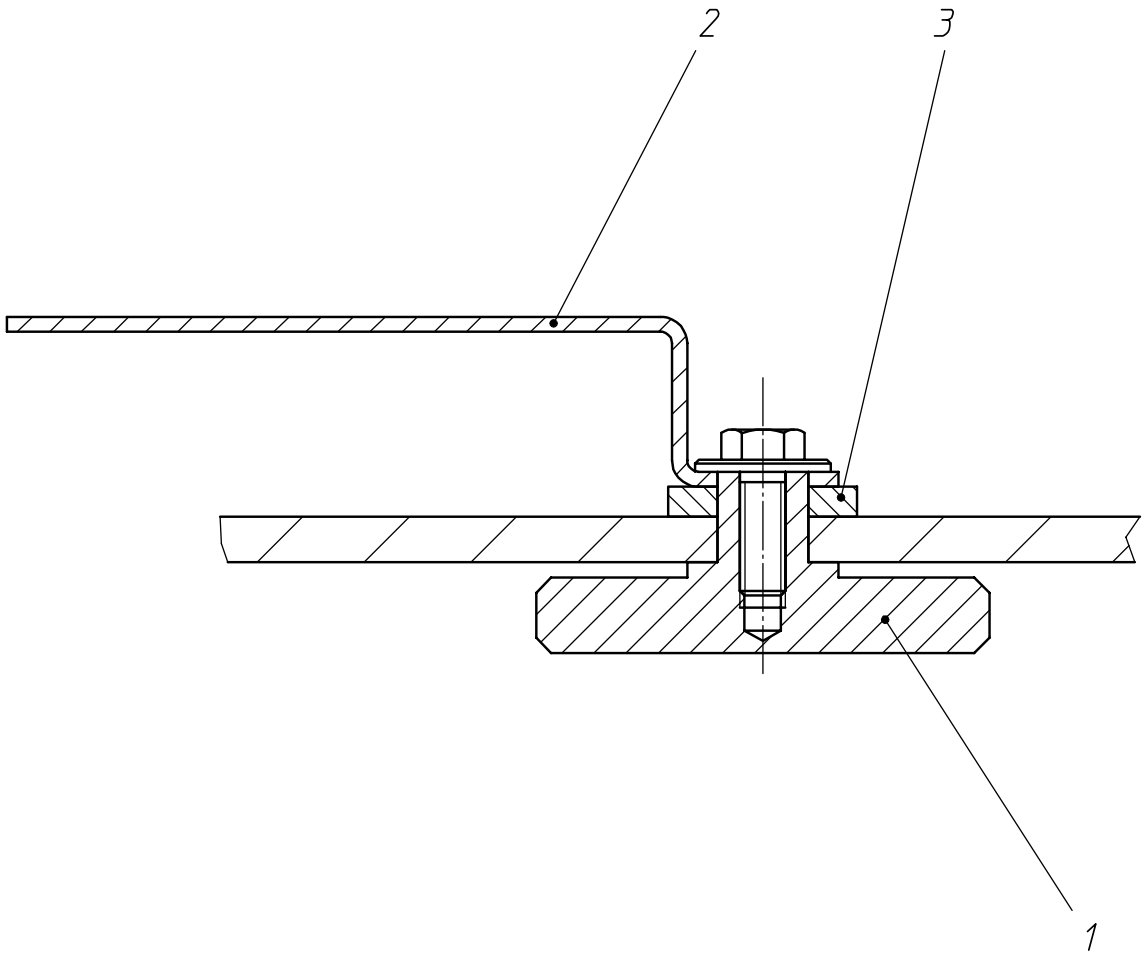
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0209.000E HANDLE/PP-G	1,000	ST	X
2	16.002.2506.0003 Glass handle [Bar Tit]	1,000	ST	X
3	00.005.0207.000E DISC/PP-G/d=12.0/D=025.0/L=2.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list cover parts

16.002.0004EU000	11
	01



Assembly	: 16.05.W003.01.0A	Commiss.	: 25-05-377
Label	: FEED/WMT3/PVC /PVC /EP/AS12	Position	: 000060
Quant.	: 1,000 ST	Page	: 000153/01
Drawing	: 16.05.W001E01.00	Date	: 10.04.2006

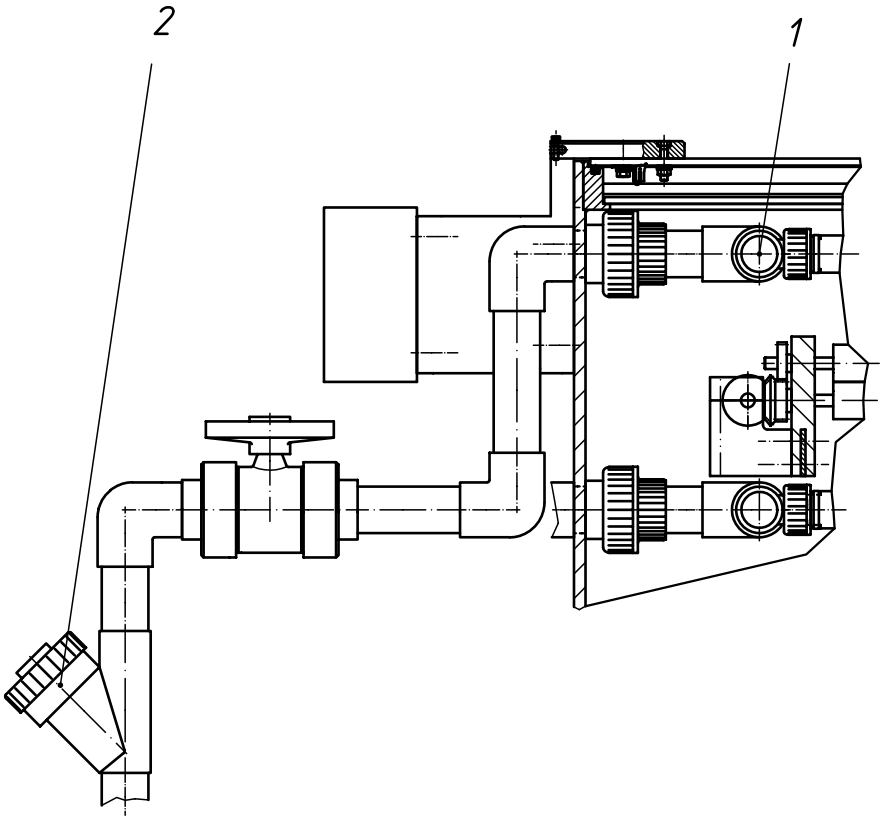
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.005.0397.023B DISTRIBUTOR PIPE/PVC/EP/023/KPL./7A/1B	2,000	ST	X
2	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF

Spare parts list INFLOW

16.05.W001E01.00	11
	00



Assembly	: 16.005.0397.023B	Commiss.	: 25-05-377
Label	: DISTRIBUTOR PIPE/PVC/EP/023/KPL./7A/1B	Position	: 000060
Quant.	: 2,000 ST	Page	: 000154/01
Drawing	: 16.005.0024E0000	Date	: 10.04.2006

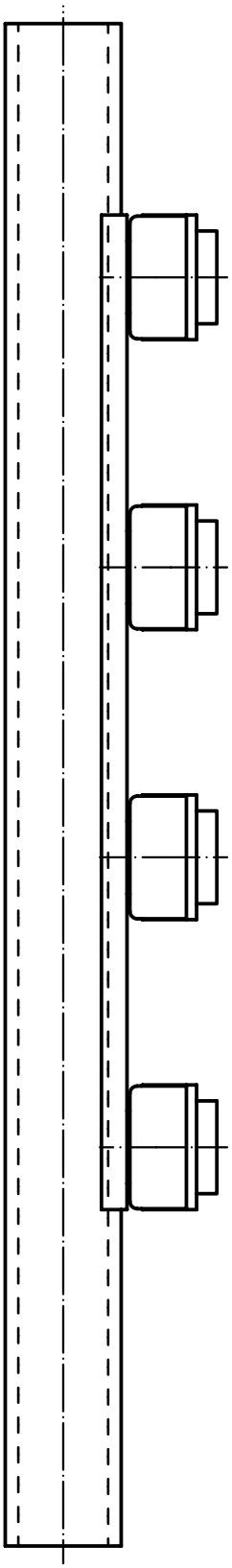
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	7,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	14,000	ST	X
3	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	7,000	ST	X

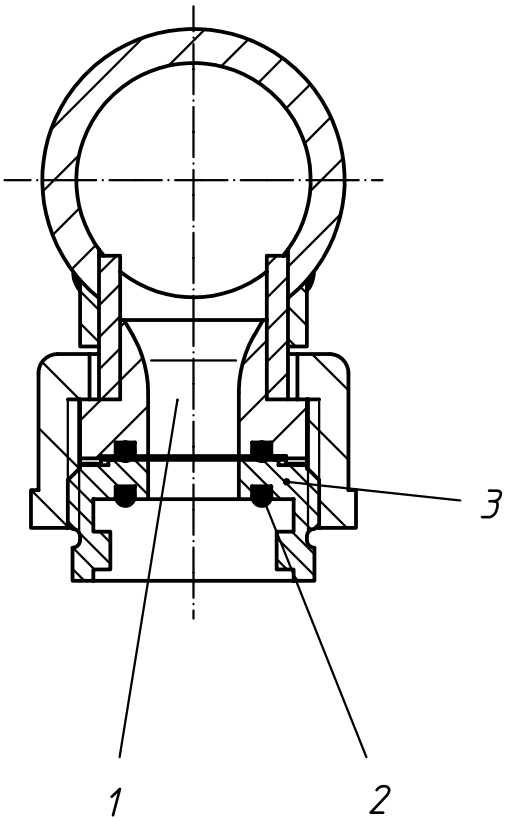
Parts without Pos.-N° see assembly parts list

Ersatzteilliste VERTEILERROHR KPL.

Spare parts list DISTRIBUTOR PIPE CPL.

16.005.0024E0000	11 / 01





Assembly	: 16.005.0010.2O2B	Commiss.	: 25-05-377
Label	: SPRAYPIPE/PVC-D/ 650/ 9D/F/G/12,06L/MIN	Position	: 000060
Quant.	: 12,000 ST	Page	: 000155/01
Drawing	: 16.005.0010E0000	Date	: 10.04.2006

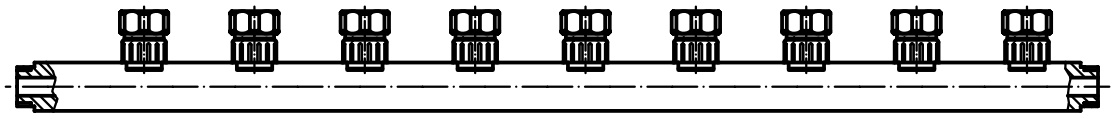
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000166-000 SEAL-NUT/PPNR.065.202.53.00.001	9,000	ST	X
2	DÜ-000000142-000 NOZZLE/652.514.5E/BJ/PVDF/60°	9,000	ST	X
3	DI-000000133-000 SEALING RING EPDM/18,4x10x3 MM	9,000	ST	X
4	03.005.0401.000C ADAPTER/CPL./PVC-C/RA=15°	9,000	ST	X
5	DICH0580-112 O-RING/EPDM/BLACK/012.37x2.62	9,000	ST	X

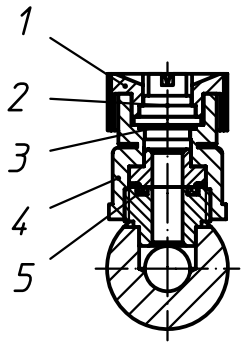
Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPRÜHROHR KPL.

Spare parts list SPRAY PIPE CPL.

16.005.0010E0000	11 / 01





Assembly	: 16.009.0005.U00A	Commiss.	: 25-05-377
Label	: COOLING/ACCESSORIES/PVC/1KS	Position	: 000060
Quant.	: 1,000 ST	Page	: 000156/01
Drawing	: 16.009.0005EU000	Date	: 10.04.2006

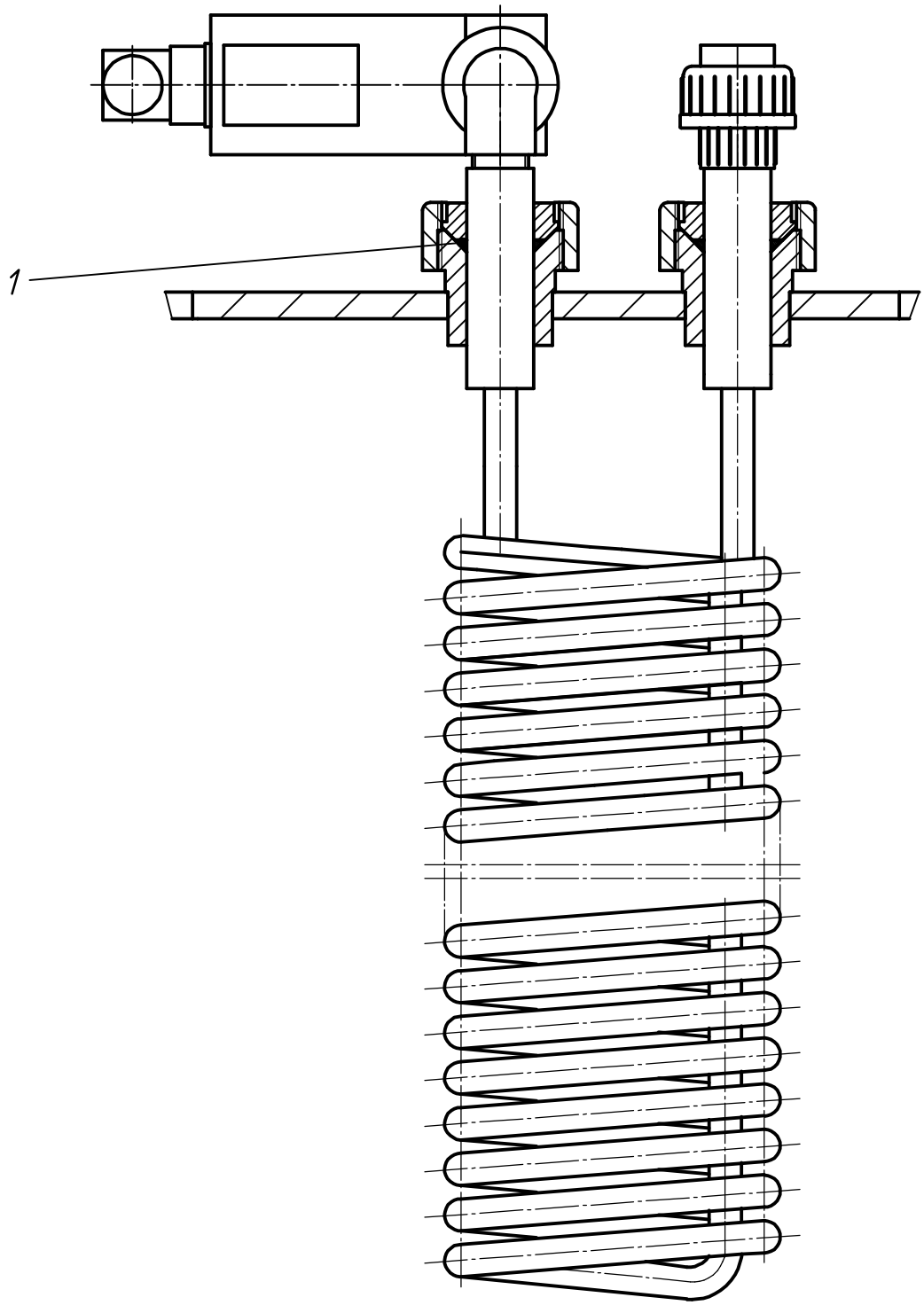
Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
1	DICH0576-318 O-RING/VITON/GREEN/024.77x5.33	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KÜHLUNG

Spare parts list Cooling

16.009.0005EU000	11
	01



Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000060
Quant.	: 1,000 ST	Page	: 000157/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

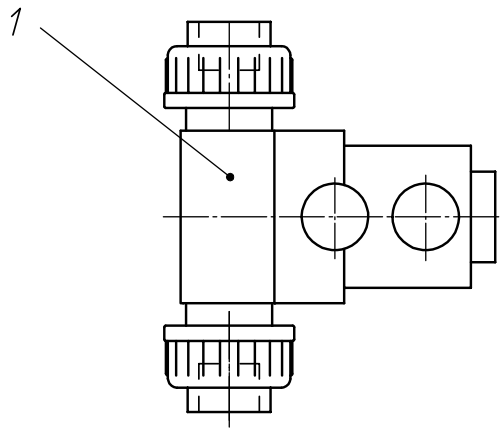
Pos.	Part N° / Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

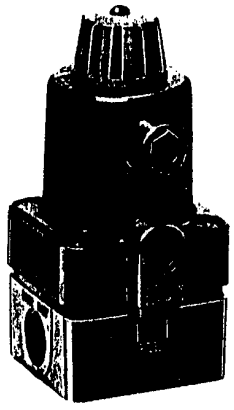
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

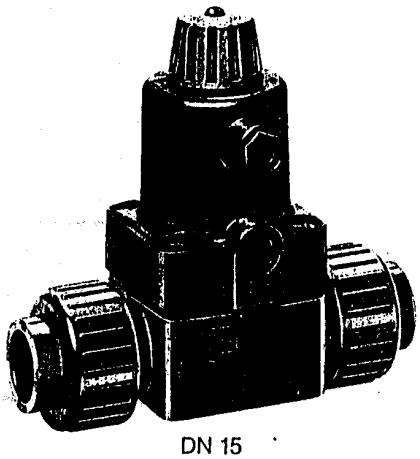
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

GEMÜ®

Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

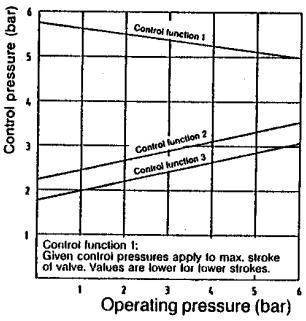
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

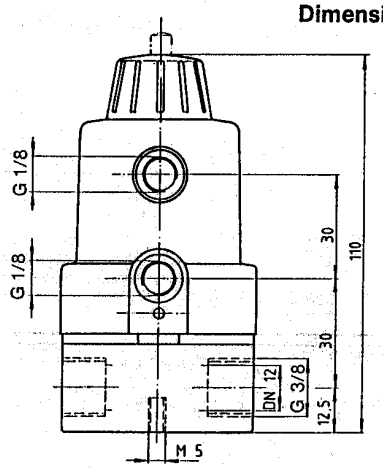
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

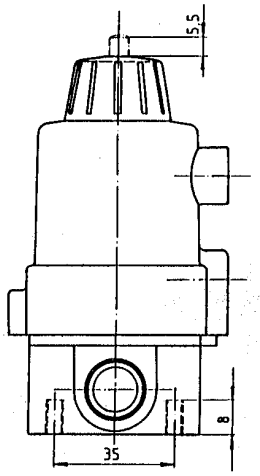
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

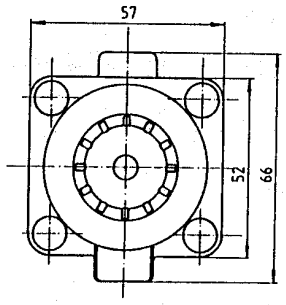
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



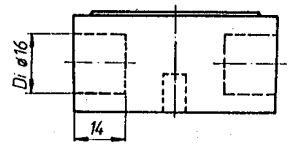
Dimensions



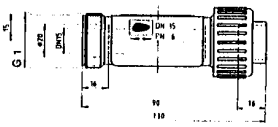




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

GEMÜ GEBR. MÜLLER
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Tel. 07940/123-0 · Telex 74126 · FAX 07940/123-106

Presented by:

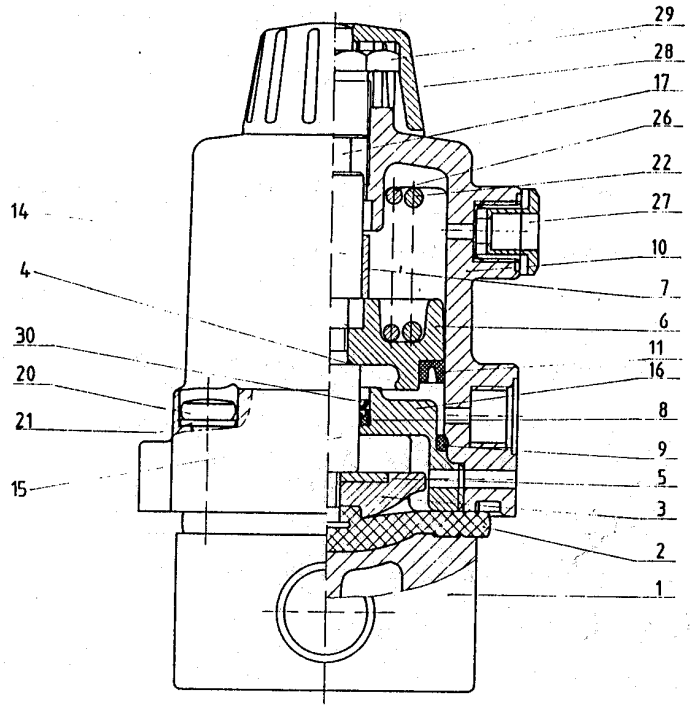
Printed in West Germany – Oha-Druck GmbH, Ingelfingen

GEMÜ®

Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000060
Quant.	: 1,000 ST	Page	: 000158/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

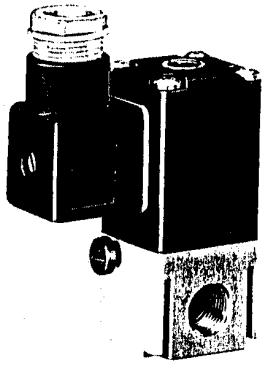
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

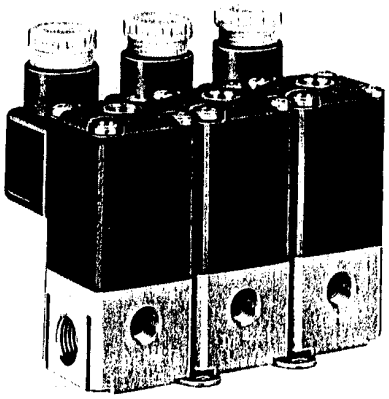
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

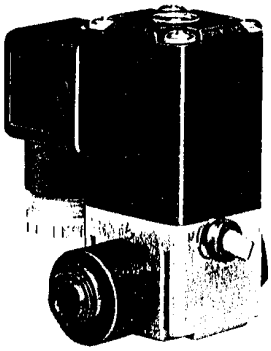
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

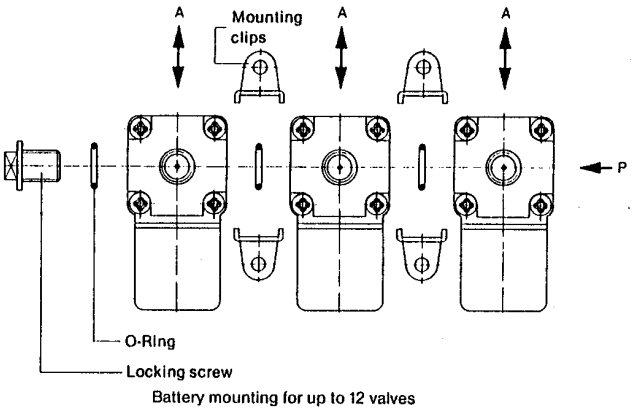


Type 322



Type 324

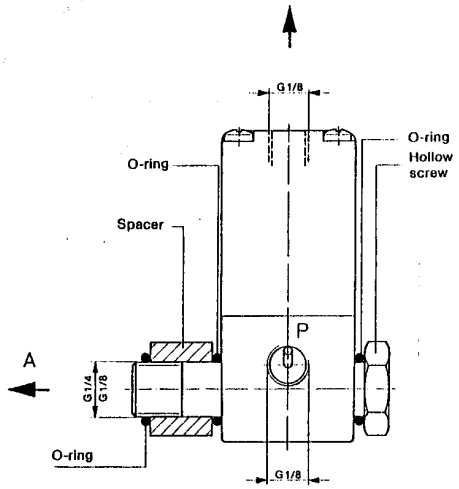
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

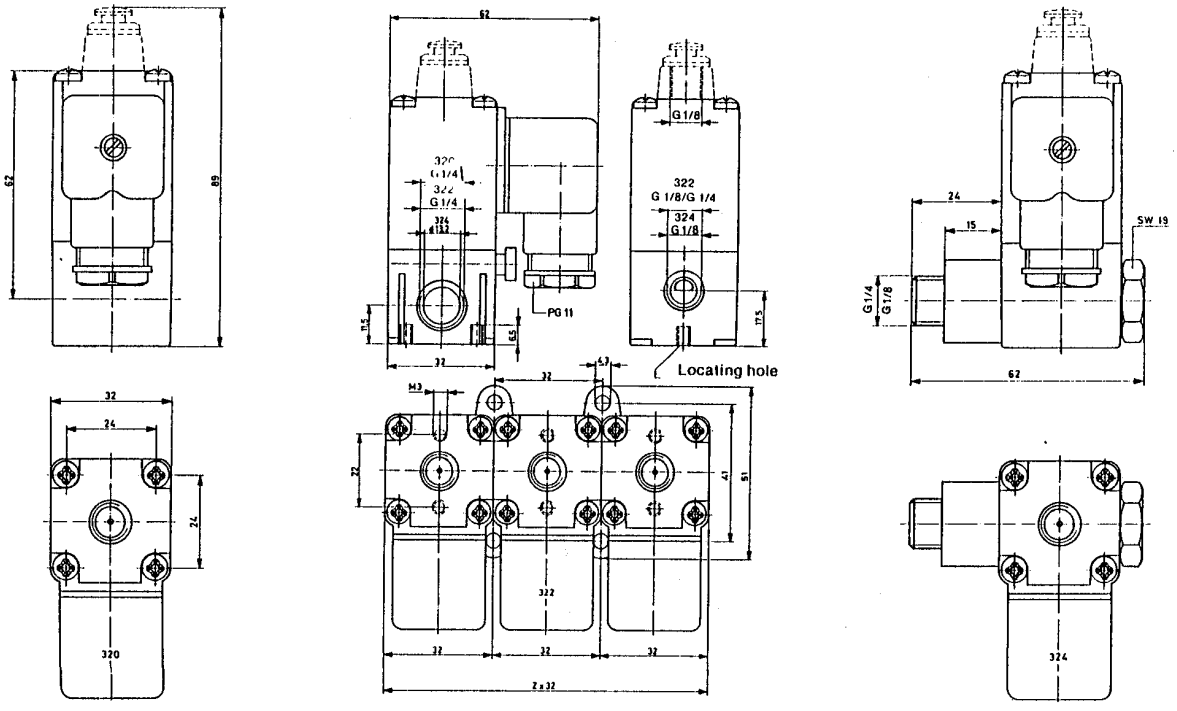
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

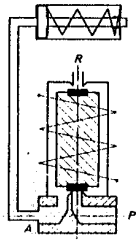
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

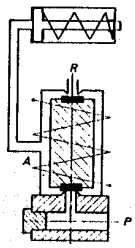
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

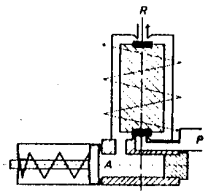
Control function normally closed



Type 320

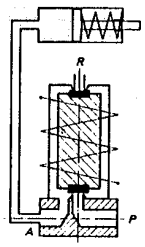


Type 322

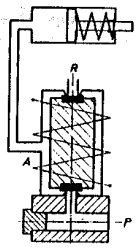


Type 324

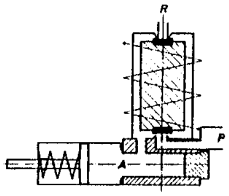
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

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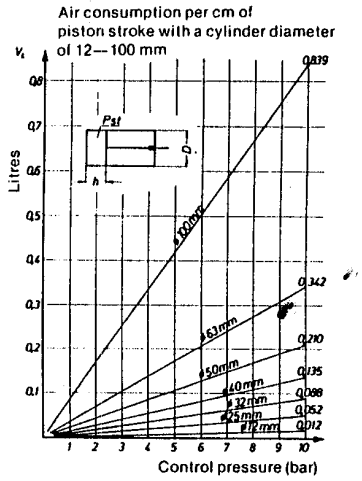
Tel. 079 40/123-0 · Telex 74126 · FAX 079 40/123-106

Presented by:

Printed in West Germany – Ohg-Druck GmbH, Ingelfingen

Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

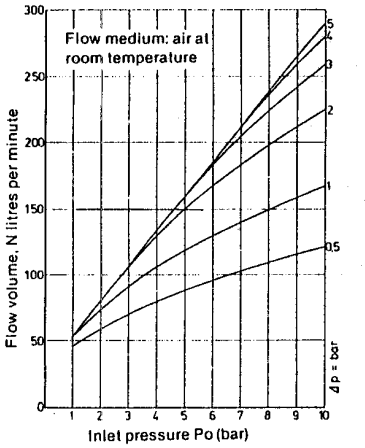
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

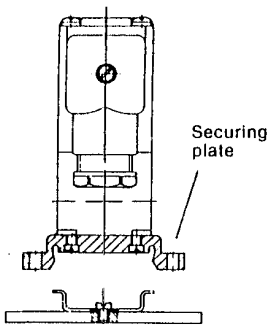
The flow quantity for other gases and temperatures can be calculated according to the following formula:

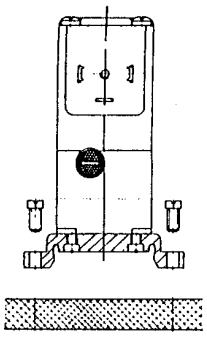
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 16.010.0018.U00N	Commiss.	: 25-05-377
Label	: BATH HEATER+RECEIVER/ 4.00kW/TI/PVC	Position	: 000060
Quant.	: 1,000 ST	Page	: 000159/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.010.0017.U00N BATH HEATER/ACCESSORIES/PVC/TI	1,000	ST	
	CE-10-00-10-00 BATHHEATER 4KW/TI/L=1000	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.010.0017.U00N	Commiss.	: 25-05-377
Label	: BATH HEATER/ACCESSORIES/PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000160/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	CE-10-00-11-00 RECEPTACLE HEATING/PVC-DG	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: CE-10-00-11-00	Commiss.	: 25-05-377
Label	: RECEPTACLE HEATING/PVC-DG	Position	: 000060
Quant.	: 1,000 ST	Page	: 000161/01
Drawing	: CE-10-00E11-00	Date	: 10.04.2006

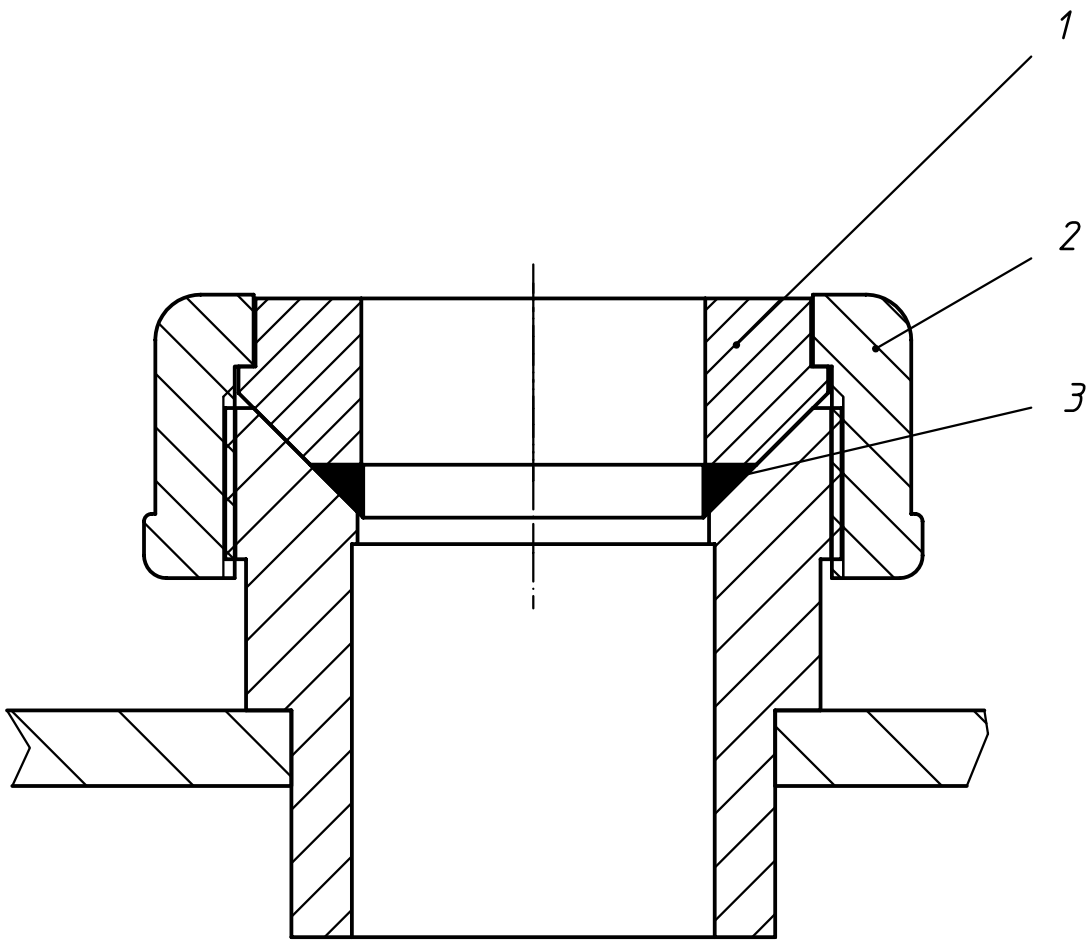
Pos.	Part N° Label	Quant.	Unit	SP
1	03.010.0002.000B INSERT/PART/PVC-DG/D=78.0/d=45.5	1,000	ST	X
2	21.69.00-63 MB-NUT/PVC-DG/NR.21.69.00 D=63	1,000	ST	X
3	DICH0576-327 O-RING/VITON/GREEN/043.82x5.33	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste AUFNAHME BADWÄRMER

Spare parts list RECEPTACLE HEATING

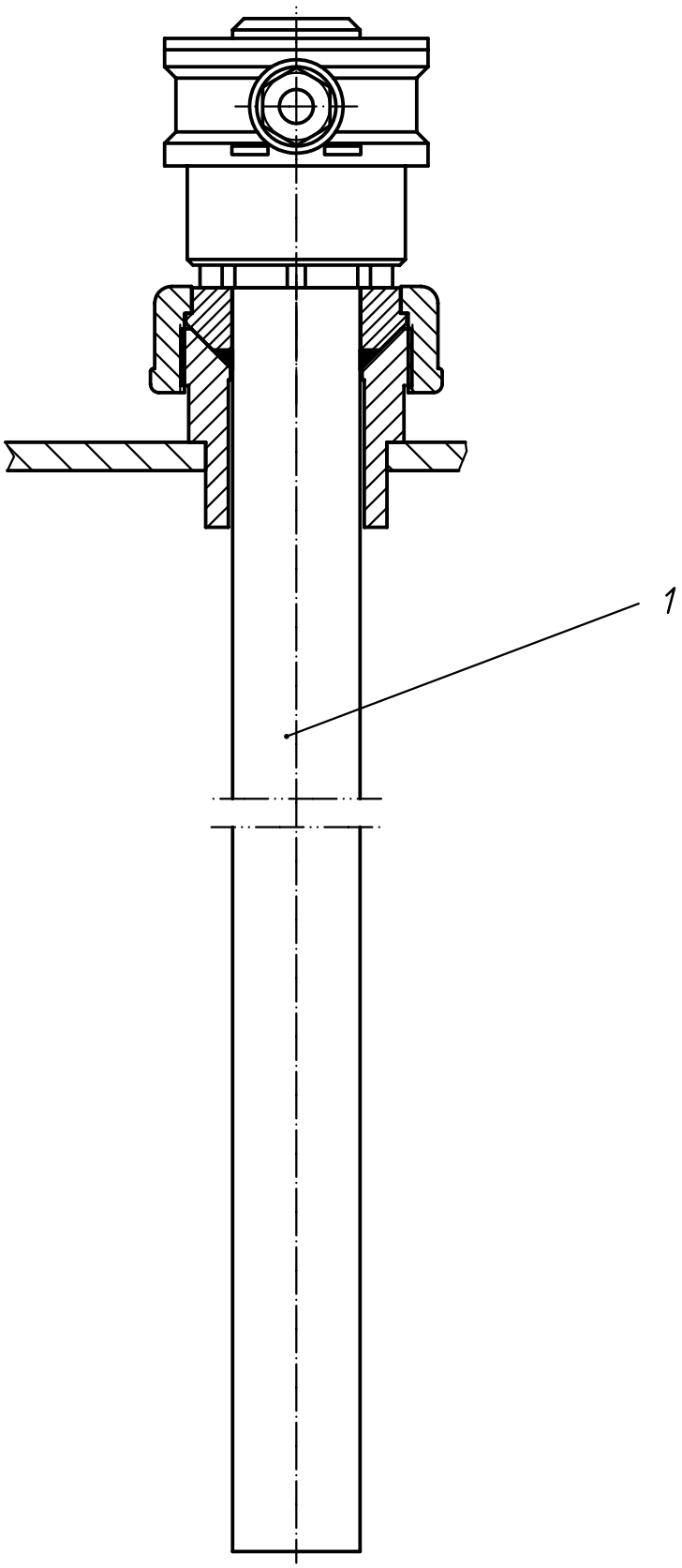
CE-10-00E11-00	11 / 01



Assembly	: CE-10-00-10-00	Commiss.	: 25-05-377
Label	: BATHHEATER 4KW/TI/L=1000	Position	: 000060
Quant.	: 1,000 ST	Page	: 000162/01
Drawing	: CE-10-00E10-00	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	EHEI00421-004000 Heater/TI1000/4.0DS400V S-MET=875	1,000	ST	X

Parts without Pos.-N° see assembly parts list


1

Installation and operating instructions for safety immersion heaters ROTKAPPE®, and safety immersion heaters ROTKAPPE® angular design

WG 10,18,19/04.03/1

E-MBA 95

Our immersion heaters are intended exclusively for heating process liquids and exclusively for trade and industrial use.
Heaters with the type designation B-... carry the VDE inspection symbol and the VDE electromagnetic compatibility (EMC) symbol, certifying that they comply with the low-voltage regulation 73/23/EEC and the EMC regulation 89/336/EEC. The compliance with these regulations is indicated by the CE symbol on the rating plate.
In order to ensure correct operation, reliability and a long lifetime, the following must be observed:

1. Electrical Safety
The heaters may be connected only by a qualified electrician, technician or engineer!

Always check that the rated voltage of the units agrees with your supply voltage.
If the immersion heaters are connected directly to an electrical installation, contactors which disconnect all poles of the supply must be provided (phasebreak 3 mm). The units must not be connected to the power supply when persons are in contact with the liquid to be heated.
In order to ensure maximum electrical safety, a fault current (FI) circuit breaker should be provided for immersion heaters. The recommended tripping value for this circuit breaker is 30 mA, in accordance with EN 61008-1/2-1. To avoid malfunction one circuit breaker should protect a maximum of 12 heaters or a maximum of 40 kW.

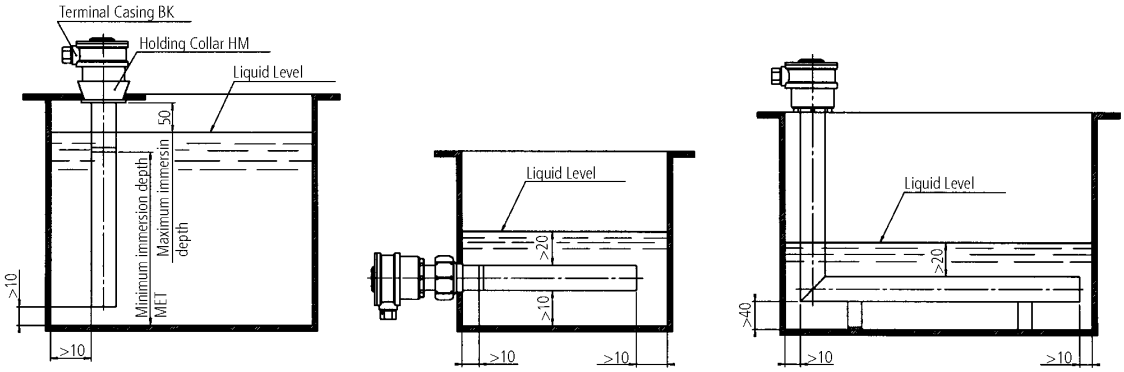
Radio interference suppression / electromagnetic compatibility
The approval in accordance with EMC Guideline 89/336/EEC covers the interference capability of the Safety Immersion Heater ROTKAPPE® Type B-... as a non-independent component. Radio interference which may result from laying the cables in a different manner during installation of the units is not covered by the test of the interference capability.
During operation under conditions other than those used for the test, interference may be increased by the different coupling conditions between the mains and load lines. The user must therefore ensure that the complete installation complies with the appropriate interference suppression guidelines. The „distributor" is responsible for any additional interference which results after installation.

2. Operating Conditions
Before installation, check that the material of the immersion tube is chemically resistant to the liquid to be heated. Avoid electrolytic effects which could damage the metallic immersion tubes, such as polarisation by an electrolytic current (see your chemical resistance list).
The terminal casing and the lead should not come into direct contact with the liquid or hot steam. Polypropylene terminal casings must be protected by the customer against attack by highly oxidising liquids (such as chromic acid).
Immersion tubes made of porcelain or glass must not be subjected to mechanical stress or shocks. The user must provide the necessary protection. In case of possible damage (e.g. fissures) the units must be removed from operation immediately.

3. Installation
The minimum immersion depth (MET) of the heater is shown by a permanent ring-shaped mark on the immersion tube. The liquid level must never drop below this mark.
The maximum immersion depth is in all cases 50 mm below the lower edge of the terminal casing.
The heated immersion tube surface must not get into contact with heat-sensitive mounting parts or the container wall (minimum distance > 10 mm).
The immersion heaters can be attached to the edge of the tank with a special support HB (accessories) or a mounting beam. A security device to prevent inadvertent removal of the heater from the bath is provided on the terminal casing and on the mounting bracket. The terminal casing of the immersion heater and the support device can be connected by the aid of a plastic insulated cord. Furthermore, mounting collar EM or holding collar HM (accessories) are available for installation of the immersion heater.

MAZURCZAK
ELEKTROWÄRME

Schlachthofstraße 3, D-91126 Schwabach, Tel: 09122/9855-0, Fax: 09122/9855-99, Internet: www.mazurczak.de, eMail: kontakt@mazurczak.de



4. Overheating Protection

The user must provide safety precautions such, as a level regulation system, to prevent dry operation of the heater (see also our range of accessories).

The regulation EN 60519/1-2 specifies that electrical heating equipment must be arranged such that there is no possibility of danger to the operator, the surroundings and the materials being heated from the temperature of the electrical heating equipment, even if the equipment is not monitored and/or is switched on inadvertently.

If dangers may result in the case of a fault, such as failure of the temperature controller, a safety device must be provided in order to limit the temperature of the equipment. This safety device must be functionally and electrically separate from the temperature controller.

The units conform to thermal safety specifications class 1 provided that safety devices such as a temperature limiter and a thermal cut-out are installed into the container.

After power has been switched off, the immersion heaters must not be removed form the liquid until their latent heat has been dissipated (which takes about 30 minutes).

Note

At a maximum permissible tube surface load of 4,5 W/cm², a sudden loss of the liquid and simultaneous disconnection of power will result in a maximum ambient temperature at a distance of 10 mm from the immersion tube of 50 °C.

5. Maintenance and Repair

Any deposits on the immersion tube should be removed at regular intervals. In no case must the deposits be allowed to block the dissipation of heat from the tube, as this will reduce the lifetime of the heater (e.g. incrustation or operation in sludge).

In case of repairs, always fit new gaskets on the terminal casing in order to maintain a good seal. In the case of exposure to extremely aggressive chemicals, we recommend that the gaskets be replaced at regular intervals.

After any repairwork, the immersion heater should be inspected by a specialist to ensure that it complies with the VDE standards.

6. Opening and Closing the Terminal Casing

The universal wrench (US) (accessory) is used to open and close the terminal casing BK and for fitting and removing heater inserts, immersion tubes and cables.

Enclosure type of the terminal casing BK: IP 65 (water-jet proof, EN 60528).

The terminal casing is not proof against immersion in liquids.

If you connect the cable yourself, ensure that the pullrelief and/or the pressure screw for the cable gland and the cover is securely tightened. (The triangular marks on the cover must coincide with those on the cable connections.)

Non-compliance with these instructions invalidates the warranty.

In case of a claim under guarantee or if any repairs are to be made, please **clean** and **neutralize** the device concerned and return it to our factory freight prepaid.

These Installation and Operating Instructions are also available in German and French.

MAZURCZAK
ELEKTROWÄRME

Schlachthofstraße 3, D-91126 Schwabach, Tel: 09122/9855-0, Fax: 09122/9855-99, Internet: www.mazurczak.de, eMail: kontakt@mazurczak.de

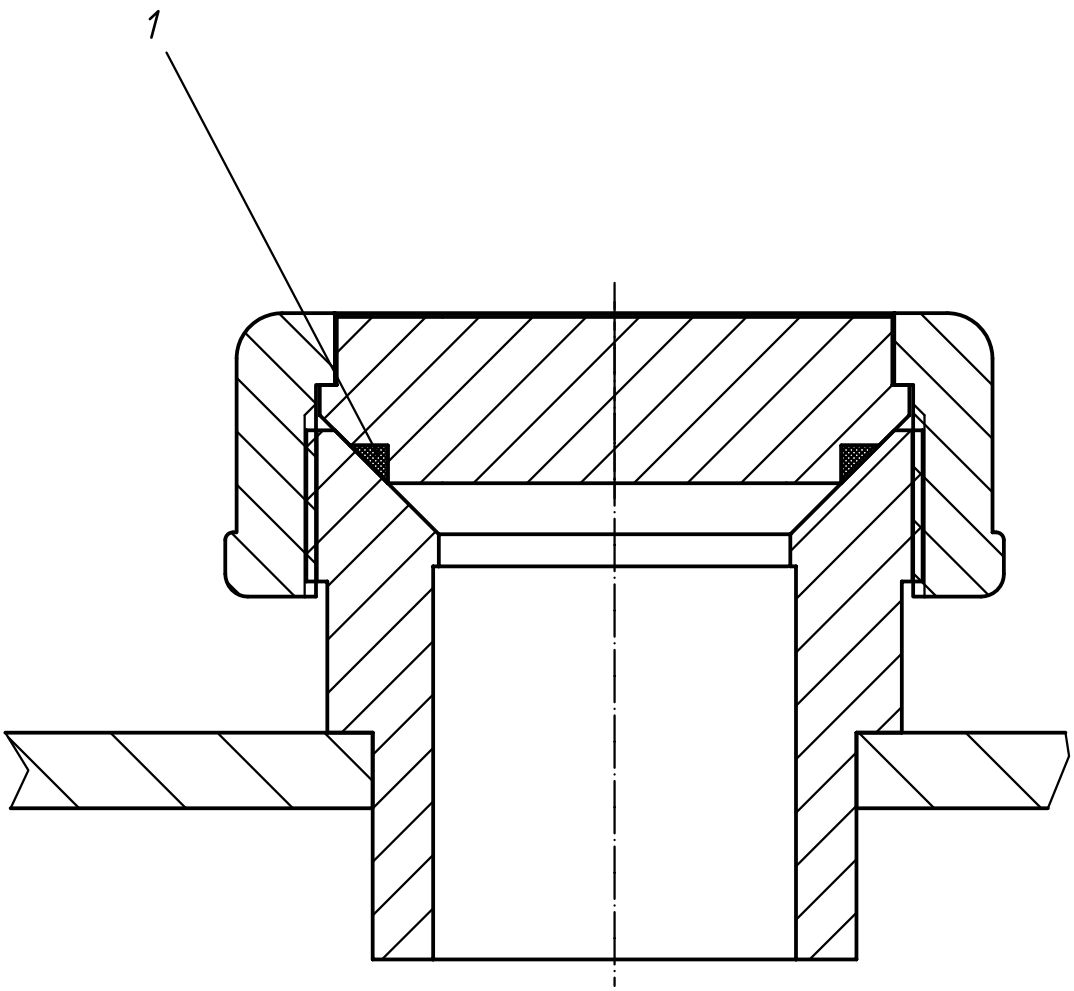
Assembly	: 16.010.0015.U000	Commiss.	: 25-05-377
Label	: BLIND CAP/HEATING ROD/PVC/EPDM	Position	: 000060
Quant.	: 1,000 ST	Page	: 000163/01
Drawing	: 16.010.0015EU000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	DICH0580-229 O-RING/EPDM/BLACK/059.92x3.53	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste — BLINDKAPPE
HEIZUNG
Spare parts list — WELSH SEAL HEATING

16.010.0015EU000 | 11 | 00



Assembly	: 16.010.0005.U003	Commiss.	: 25-05-377
Label	: TEMPERATURE PROBE/TI/EP/2xPt100/MAZ/L20	Position	: 000060
Quant.	: 1,000 ST	Page	: 000164/01
Drawing	: 16.010.0005EU000	Date	: 10.04.2006

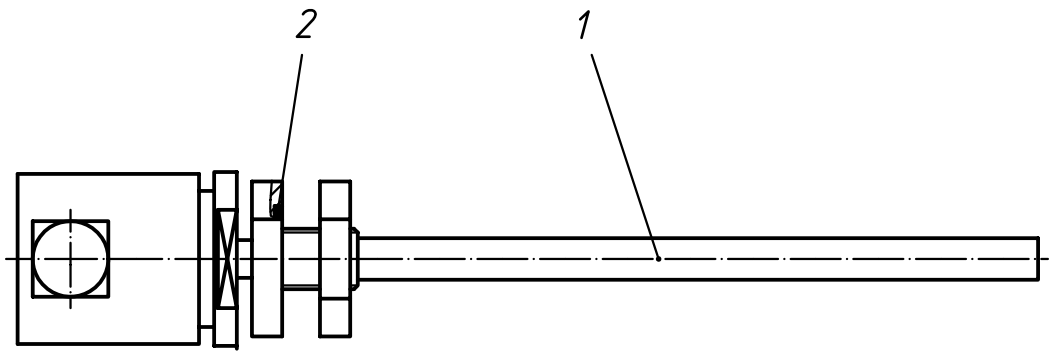
Pos.	Part N° Label	Quant.	Unit	SP
1	EB-000000223-000 TEMPERATURE PROBE/MAZ/TIT/2xPt100/L=200	1,000	ST	X
2	DICH0580-212 O-RING/EPDM/BLACK/021.82x3.53	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste TEMPERATURFÜHLER

Spare parts list TEMPERATURE PROBE

16.010.0005EU000	11
	00



Assembly	: 16.010.0006.U00A	Commiss.	: 25-05-377
Label	: LEVEL SWITCH/PVC/EPDM /ES-297	Position	: 000060
Quant.	: 1,000 ST	Page	: 000165/01
Drawing	: 16.010.0006EU000	Date	: 10.04.2006

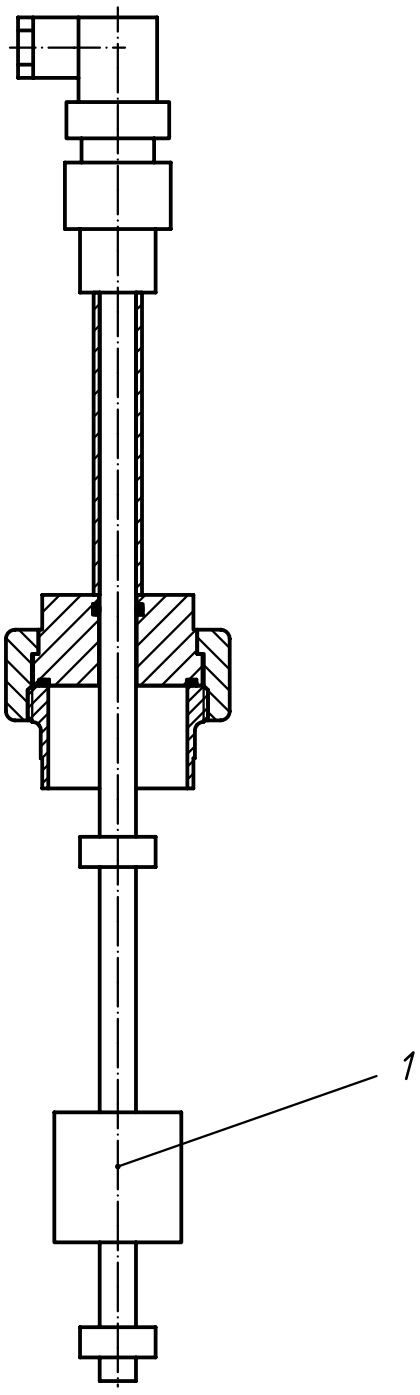
Pos.	Part N° Label	Quant.	Unit	SP
	16.010.0002.U00A RECEIVER/S-SWITCH/PVC/EPDM	1,000	ST	
1	ES-000000297-000 FLOAT SWITCH/PP/L1=205, L2=305	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SCHWIMMERSCHALTER

Spare parts list FLOAT SWITCH

16.010.0006EU000 | 11/01



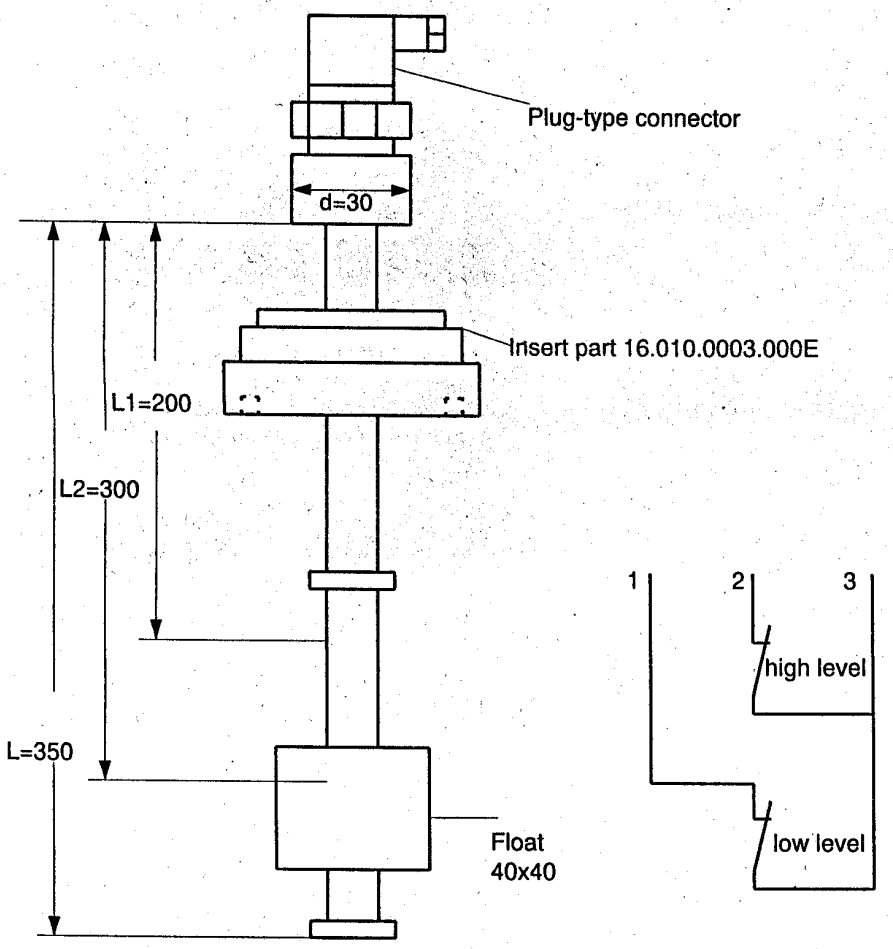
ENGLER

Steuer,Mess,-und Regeltechnik

Technical Data

Float switch Type: SSPP.2.A2.B4.205.305.RST

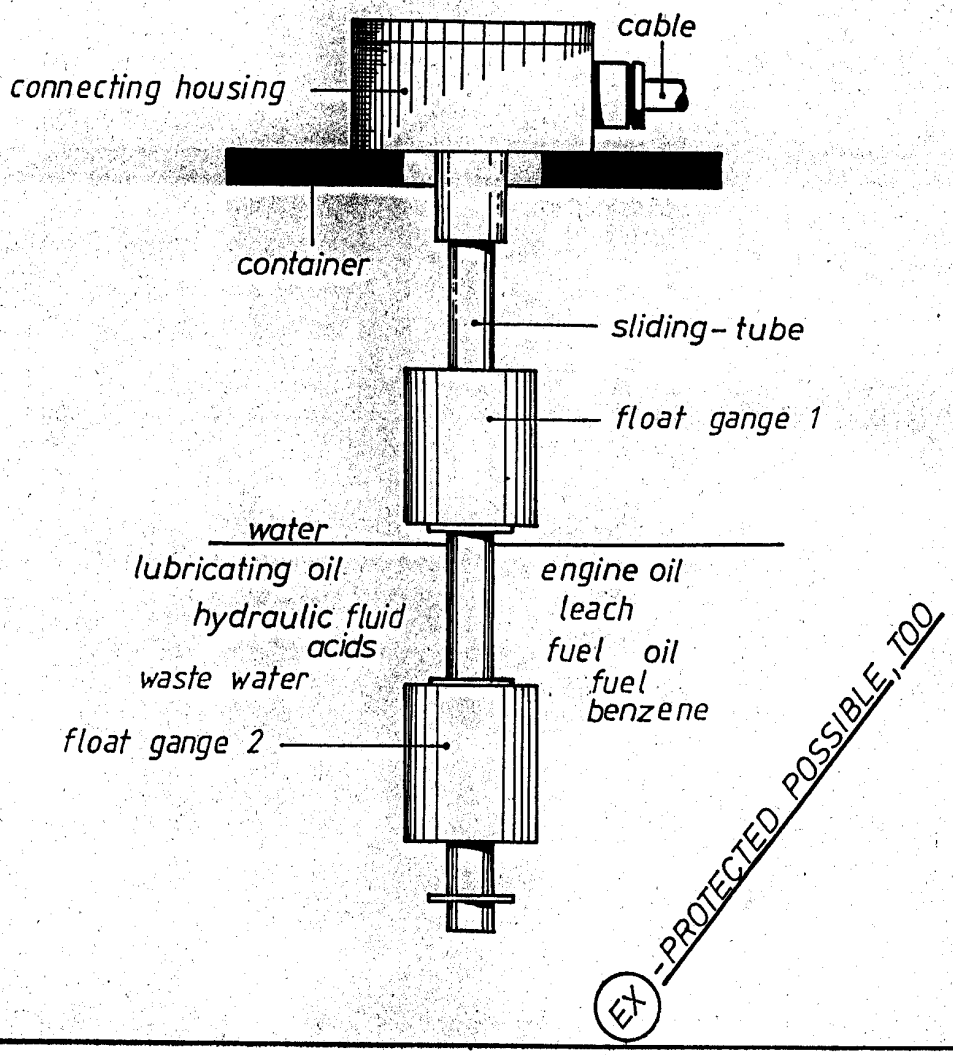
Part Nr. 1162800305 ES-000 000 297-000



Material :	PP(Polypropylen)	**Switch current:**	max. 1A
	Plug-type connector=Durethan	**Switch capacity:**	max. 60VA
Operating temperature:	max. 80°C	**Attention!**	
Allowed pressure:	athmospheric	Concerning inductive load resistence please assign protective switching!	
Protetive system:	IP 65		
Type of contact:	high level= opener going up low level = opener going down		
Switch voltage:	max. 230VAC		

ENGLER

FLOAT SWITCHES FOR FLUID MEDIUMS



7424 Heroldstatt/Sontheim
Lange Straße 151
Tel.(07389)1203

ENGLER

Specification:

Switching power max.:

normally open contact:	250 VA
normally closed contact:	250 VA
change over contact:	60 VA

Switching voltage max.:

normally open contact:	250 V
normally closed contact:	250 V
change over contact:	220 V

Switching current max.:

normally open contact:	3 A
normally closed contact:	3 A
change over contact:	1 A

Repeatable accuracy:

level-difference	5 mm

Max. contacts / switch:

4 normally open contacts
4 normally closed contacts or
3 change over contacts

Connecting housing made of:

Al-die casting (colour grey) or
Polyamid

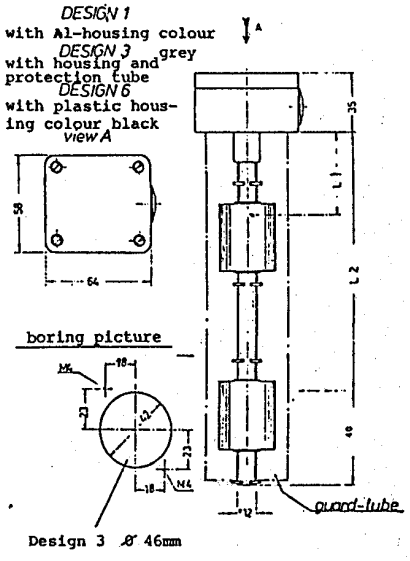
Protection:	IP 65
Cable-entry:	PG 11
cable-connection:	1,5 mm^2
operating pressure:	
operating temperature:	on request

Temperature switch:

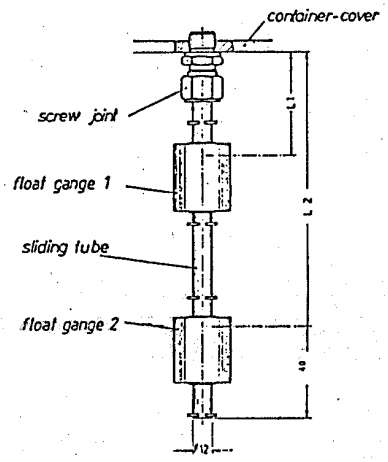
Switching voltage max: 220V
Switching current max: 2A

ENGLER

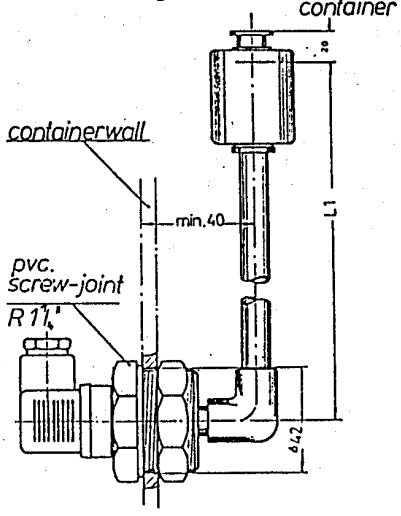
DESIGN 1
with Al-housing colour grey
DESIGN 3
with housing and protection tube
DESIGN 6
with plastic housing colour black



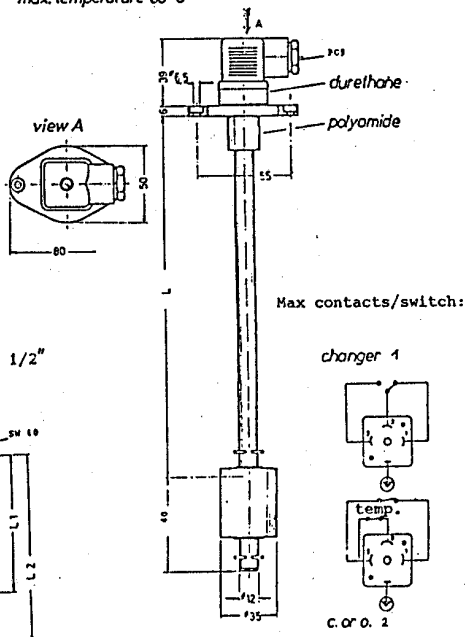
DESIGN 2
with straight pipe union standart
model:
screw coupling R3/8"
brass with 1m flex. oil filled cable



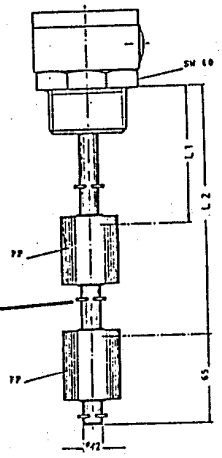
DESIGN 4
for mounting into the wall of the container



DESIGN 5
with mounting flange and coupler plug
max. temperature 80°C



DESIGN 7
with plastic-housing and
PVC-Inclosing capsule R1 1/2"



It is possible to change the forward break over point by a threated joint in the conduit box.

AENGLER

In case of emergency:
signal by float-switches.
AE-float-switches are controlling instruments, which supervise level positions and signalize breakdowns.

This is the construction and the function of the AE-float-switch:
The construction of the AE-float-switch is concepted like this, that the use is possible in a lot of industrial areas - in the chemical industry as well. The elements of the switches are reed contacts. They are felled with protective gas.
The actuating of those reed contacts effects without any touch by a magnet, which is poured in the float.
To be able to make electrical locking gear changing, every reed contact is influenced by a float gange.
By the breaking elements, which lie one upon the other it is possible to supervise different level positions with only one instrument.
The waterprooved and dust-protected connecting housing contents a connection-plan.

Assembly	: 16.010.0002.U00A	Commiss.	: 25-05-377
Label	: RECEIVER/S-SWITCH/PVC/EPDM	Position	: 000060
Quant.	: 1,000 ST	Page	: 000166/01
Drawing	: 16.010.0002EU000	Date	: 10.04.2006

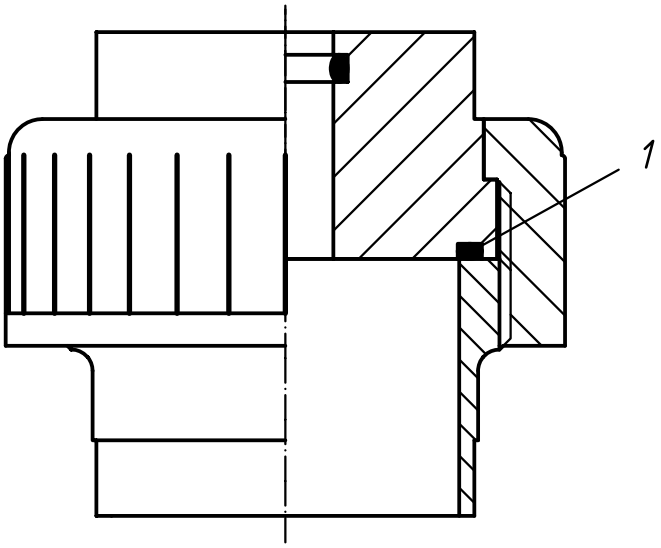
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-134 O-RING/EPDM/BLACK/047.29x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste AUFNAHME S-SCHALTER

Spare parts list RECEPTACLE FLOAD SWITCH

16.010.0002EU000	11
	00



Assembly	: 16.008.0004.U003	Commiss.	: 25-05-377
Label	: PUMP FIXING/TI/PP-G/EPDM	Position	: 000060
Quant.	: 1,000 ST	Page	: 000167/01
Drawing	: 16.008.0004EU000	Date	: 10.04.2006

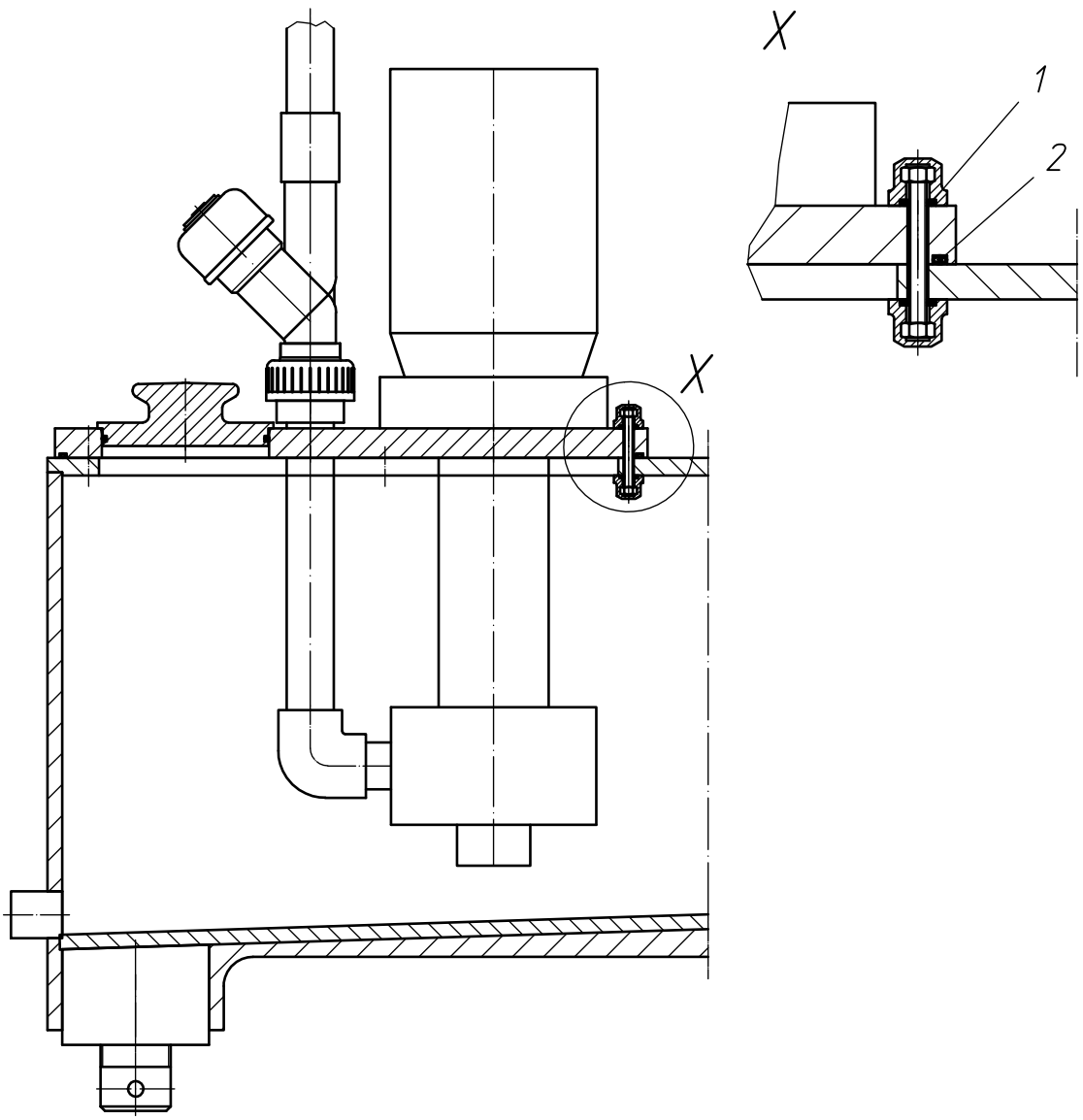
Pos.	Part N° Label	Quant.	Unit	SP
1	DI-000000076-000 O-RING/EPDM/BLACK/8.00x2.40 MM	8,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,250	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste PUMPENBEFESTIGUNG

Spare parts list PUMP FIXTURE

16.008.0004EU000	1/1
	02



Assembly	: 50.003.0009.U000	Commiss.	: 25-05-377
Label	: TA/RE/4.00kW/MF/ET=270/PUTA.04.K.000211	Position	: 000060
Quant.	: 1,000 ST	Page	: 000168/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	PUTA030300-02522 TA/PUTA.04.K.000211/RE/30/4.000kW/ET=270	1,000	ST	X

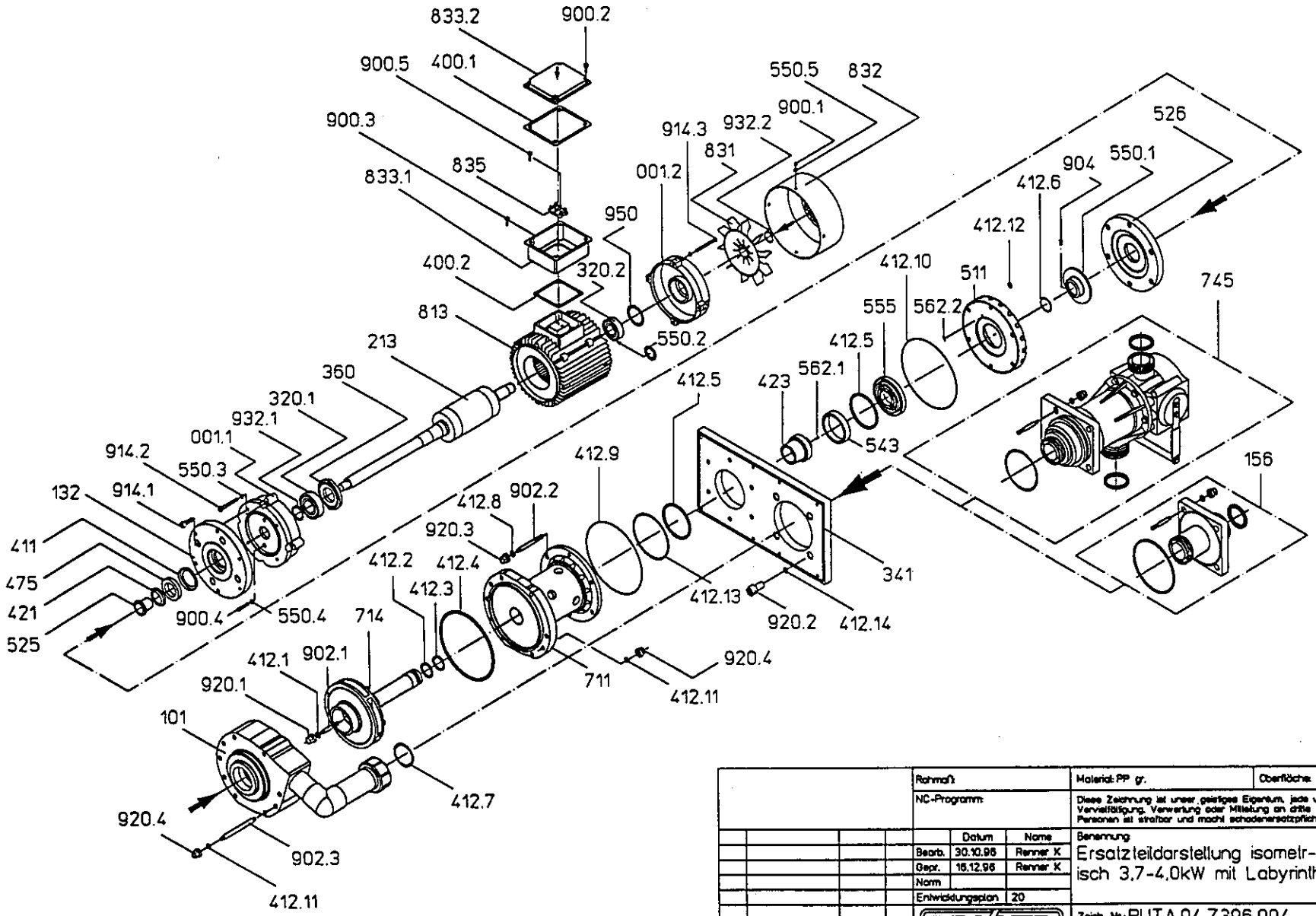
Parts without Pos.-N° see assembly parts list

Ersatzteilliste *Tauchkreiselpumpe* *PUTA030300-02522*

Spare parts list *vertical submersible centrifugal pump*

Bitte bei Bestellung angeben:
To be indicated on order:

PUTA030300-2522 *TA/PUTA.04.K.00021 I/RE/30/4.000kW/ET=270*

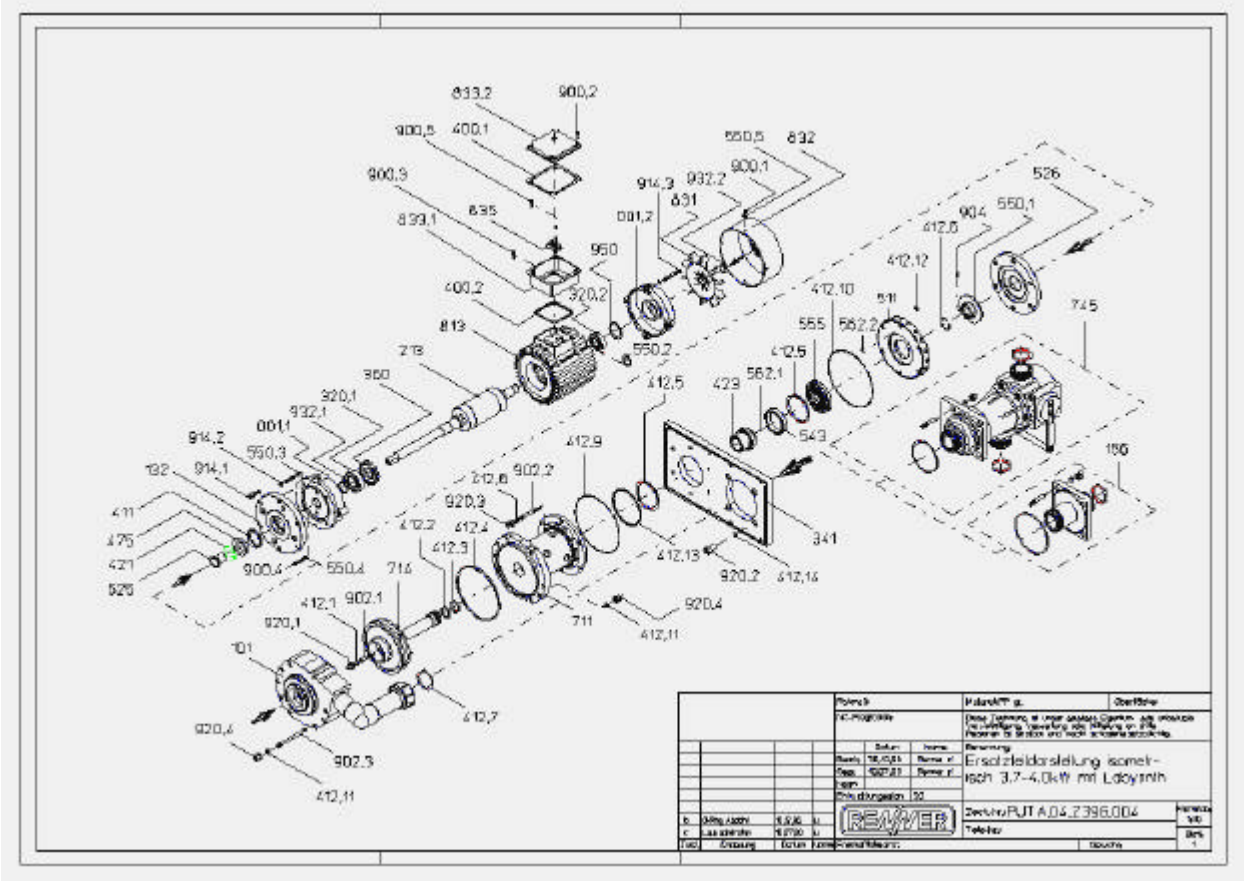


				Rohmaß:			Material: PP gr.		Oberfläche:
				NC-Programm:			Diese Zeichnung ist unser geistiges Eigentum, jede unbefugte Vervielfältigung, Verwertung oder Mitteilung an dritte Personen ist strafbar und macht schadenersatzpflichtig.		
					Datum	Name	Benennung:		
				Bearb.	30.10.96	Renner K	Ersatzteildarstellung isometrisch 3,7-4,0kW mit Labyrinth		
				Gepr.	16.12.96	Renner K			
				Norm					
				Entwicklungsplan	20				
				RENNER			Zeich.-Nr.: PUTA.04.Z396.004		Maßstab: 1:10
b	O-Ring Abdicht.	16.12.96	ke				Teile-Nr.:		Blatt: 1
Zust.	Änderung	Datum	Name	Freimaßtoleranz:				Gewicht:	

SPARE PARTS LIST FOR VERTICAL SUBMERSIBLE CENTRIFUGAL PUMPS WITH LABYRINTH-SEAL

Combination possibilities with pressure pipe or quick change filter SF1 / EU

Type: RT-PP-30/340-4,0D/3-270 EPDM
220-240/380-415V-50Hz
Built-in assembly flange: 404x220x20mm
Art.-No.: PUTA.04.K.000211
Drawing-No.: PUTA.04.Z396.004



Pos.	Piece	Article-No.	Designation	Material
001.1	1	PUTA.00.4000.008	end plate A-side B14-160 (Dietz-motor)	
001.2	1	PUTA.00.4000.002	end plate B-side (4,0kW Dietz-motor)	
101	1	PUTA.34.0350.003	pump housing (50Hz)	PP grey
132	1	PUTA.00.1500.063	intermediate flange 1,8-4,0KW (Dietz)	Al
213	1	PUTA.00.4000.044	rotor with shaft length: 270mm 4,0kW [left-hand thread] [hexagon shaft]	titanium
320.1	1	PUTA.00.3000.020	ball bearing 6206ZZ	
320.2	1	PUTA.00.3000.020	ball bearing 6206ZZ	
341	1	PUTA.34.0350.001	built-in assembly flange 404x220x20mm	PP grey
360	1	PUTA.00.1500.026	ball bearing cover	
400.1	1	PUTA.00.1500.061	flat packing	
400.2	1	PUTA.00.1500.066	flat packing	
411	1	PUTA.24.0340.081	cup leather	EPDM

Pos.	Piece	Article-No.	Designation	Material
412.1	1	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.2	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.3	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.4	1	PUTA.30.0340.019	o-ring 165x4	EPDM
412.5	2	PUMA.24.0340.072	o-ring 80x5	EPDM
412.6	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.7	1	FISF.00.0000.150	o-ring 47x5,3	EPDM
412.8	6	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.9	1	PUTA.34.0350.010	o-ring 172x2	EPDM
412.10	1	PUTA.34.0350.010	o-ring 172x2	EPDM
412.11	18	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.12	6	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.13	1	FISF.00.0000.260	o-ring 104,37x3,53	EPDM
412.14	4	PUMA.09.0125.004	o-ring 11x2,5	EPDM
421	1	PUTA.24.0340.060	v-ring	FPM
423	1	PUTA.34.0350.040	shaft-protecting sleeve with labyrinth	oxide ceramic
475	1	PUTA.24.0340.070	ceramic ring	oxide ceramic
511	1	PUTA.24.0340.015	aeration flange	PP grey
525	1	PUTA.34.0350.014	separator special steel	1.4305
526	1	PUTA.34.0350.017	intermediate flange	PP grey
543	1	PUTA.34.0350.048	separator	PP grey
550.1	1	PUTA.34.0350.034	fan Ø85mm	PP black
550.2	1	PUTA.00.4000.006	supporting ring 30x42x2,5 DIN988	
550.3	8	PUTA.00.4000.012	spring washer A6 DIN127	galvanized
550.4	2	PUTA.00.4000.028	plastic ring (Nylite-Siegel)	Nylite
550.5	4	PUTA.00.1800.012	plastic ring (Nylite-Siegel)	Nylite
555	1	PUTA.34.0350.042	flange with labyrinth	oxide ceramic
562.1	1	PUTA.34.0350.067	parallel pin 3m6x10 DIN7	titanium
562.2	1	PUTA.24.0340.027	parallel pin 6m6x24 DIN7	titanium
711	1	PUTA.34.0350.004	stand pipe length: 270mm	PP grey
714	1	PUTA.05.B.00 0018	shaft sleeve with impeller 4,0kW 50HZ Ø152mm / 14,5mm	PP grey
813	1	PUTA.00.4000.003	winding with housing 4,0kW Dietz 220-240/380-415 // 220-277/380-480V 50//60Hz	
831	1	PUTA.00.4000.001	paddle	
832	1	PUTA.00.4000.034	ventilator cowl	
833.1	1	PUTA.00.1500.016	terminal box	
833.2	1	PUTA.00.1500.065	terminal box cover plate	
835	1	PUTA.00.1800.004	terminal board	
900.1	4	SO00.00.0000.763	hexagon head cap screw M4x6 DIN933	titanium
900.2	4	PUTA.00.1800.007	pan head screw M4x20	
900.3	4	PUTA.00.4000.016	pan head screw M5x16 DIN84	galvanized
900.4	2	PUTA.00.1800.010	pan head screw M5x30 DIN84	galvanized
900.5	1	PUTA.00.4000.017	pan head screw M4x16 DIN84	galvanized
902.1	1	PUTA.24.0340.298	stud bolt length=46mm M8Lx14/M6Lx6,5 [left-hand thread]	titanium
902.2	6	PUTA.34.0350.022	stud bolt length=91mm M8x14/M6x8	titanium
902.3	9	PUTA.34.0350.018	stud bolt covered with polypropylene	titanium/PP
904	1	PUMA.18.0240.002	threaded pin M6x10 DIN914	inox

Pos.	Piece	Article-No.	Designation	Material
914.1	4	PUMA.24.0340.061	hexagon socket screw M8x25 DIN912	inox
914.2	4	PUTA.00.1800.005	hexagon socket screw M6x30 DIN912	galvanized
914.3	4	PUTA.00.1800.005	hexagon socket screw M6x30 DIN912	galvanized
920.1	1	PUTA.34.0350.074	cap nut M6L [left-hand thread]	PP / titanium
920.2	4	SO00.00.0000.017	injection moulded hexagon union nut M8	PP black
920.3	6	PUTA.34.0350.027	cap nut M6	PP / titanium
920.4	18	PUTA.34.0350.028	cap nut M6	PP / titanium
932.1	1	PUTA.00.4000.011	circlip A30 x 1,5 DIN471	
932.2	1	PUTA.00.1500.024	circlip A28 x 1,5 DIN471	
950	1	PUTA.00.4000.015	compensation disk 61x51x0,5 K2 L+M-Norm 1103	

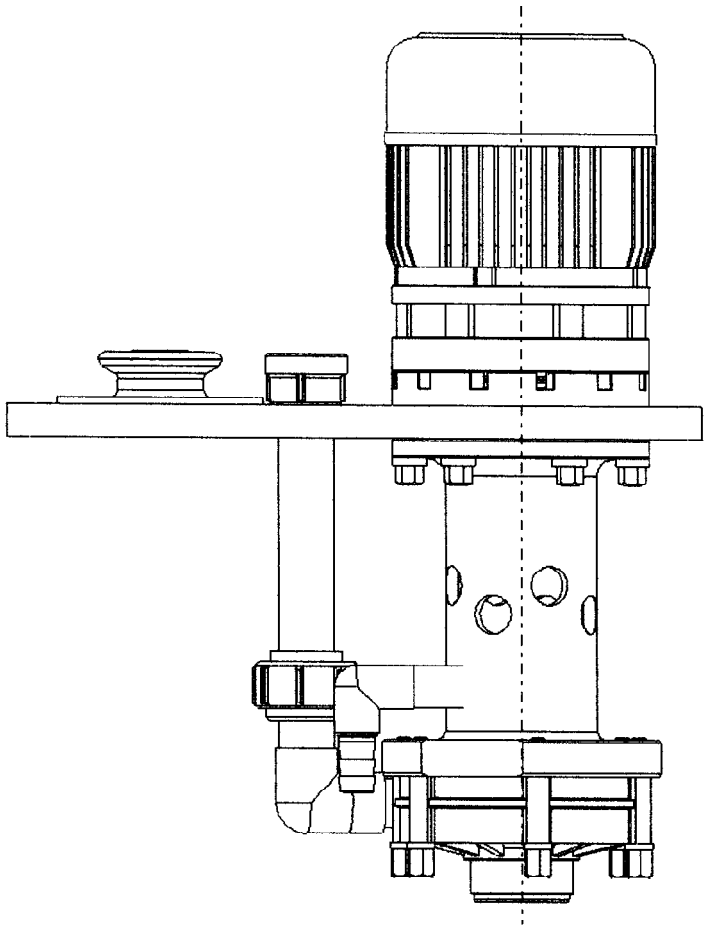
Supplies:

156	1	PUTA.30.0340.017	pressure pipe complete according to a separate spare parts list
745	1		filter SF1/EU according to a separate spare parts list

OPERATING INSTRUCTIONS

Vertical submersible centrifugal pump
Group 3 (ventilated)

Article-No.:	
Serial-No:	
Built-in assembly flange:	404x220x20mm
Type:	RTL-PP-20/300-0,75/3-270



09-May-97
Edition 01

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Glaitstraße 43
75433 Maulbronn / Germany

Telephone: +49-7043-2103 or
+49-7043-8031
Fax: +49-7043-5503

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CE

EC - DECLARATION OF CONFORMITY

in mind of the EC Machinery Directive 89/392/EEC, appendix II A

We herewith confirm that the pump aggregate

Product: **Vertical centrifugal immersion pump**
Type: 0,045kW - 6,0kW

corresponds to the following EC-rules:

EC Machinery Directive **91/368/EEC, appendix I No.1**
EC Low Voltage Directive **73/23/EWG, 93/68/EEC (1.Amendment)**

Wolfgang Renner
Geschäftsführer

Maulbronn, den 30.12.1994 RENNER GMBH

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1 General information
1.1 Range of application
1.2 Capacity ratings

2 Safety
2.1 Identification of safety instructions in the operating manual
2.2 Qualification and training of operating personnel
2.3 Hazards in the eventt of non-compliance with the safety instructions
2.4 Compliance with regulations pertaining of safety at work
2.5 Safety instructions relevant for operation
2.6 Safety instructions relevant for maintenance, inspection and assembly work
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2.8 Unauthorized modes of operation

3 Transportation and storage
3.1 Transportation
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4 Product features and accessories
4.1 General description
4.2 Design
4.3 Accessories

5 Mounting and installation
5.1 Examples of mounting
5.2 Electrical connection

6 Starting and shutdown procedures
6.1 Preparations for starting
6.2 Starting procedure
6.3 Shutdown procedure

7 Maintenance
7.1 General information
7.2 Preventive maintenance

8 Troubleshooting

9 Parts illustration; spare parts list

1 General information

The pump may only be used in the range of applications authorised by the manufacturer. In case of modified operating conditions, please consult your supplier and / or the manufacturer.

NOTE

Disassembly of the pump will cancel the right to all warranty claims!

1.1 Range of applications

- Delivery of low-viscosity liquids resembling water.
- Delivery of acids, alcaline solutions etc.
- Delivery of gaseous fluids.

WARNING

Make sure that the materials used for the pump are resistant to the fluids being delivered!

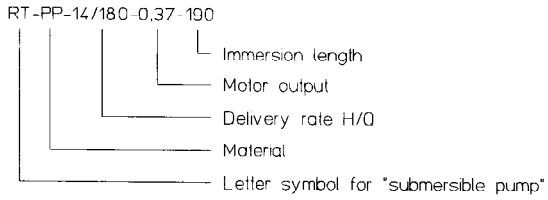
NOTE

Please ask the manufacturer for information on the chemical resistance of the materials used!

1.2 Capacity ratings

Besides the operational data of the pump, the name plate also gives its type and serial number. Please cite these data when asking for additional information, placing reorders and, in particular, ordering spare parts. For additional information, please consult your supplier or the manufacturer.

The letters and numbers indicated on the name plate and/or the delivery note are to be read as follows:



2 Safety

This operating manual gives basic instructions which are to be observed during installation, operation and maintenance of the pump. It is therefore imperative that this manual be read by the responsible personnel / operator prior to assembly and comissioning. It is always to be kept available at the installation site.

It is not only the general safety instructions contained under this main heading safety that are to be observed but also the specific information provided under the other main headings.

2.1 Identification of safety instructions in the operating manual

Safety instructions given in this manual non-compliance with which would affect safety are identified by the following symbol:

(see DIN 4844-W9)

or where electrical safety is involved with

(see DIN 4844-W8)

Instructions non-compliance with which would give rise to malfunctioning of the machinery are identified by the word

WARNING

It is imperative that signs affixed to the machine, e.g.

- arrow indicating the direction of rotation
- symbols indicating fluid connection

be observed and kept legible.

2.2 Qualification and training of operating personnel

The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified. Scope of responsibility and supervision of the personnel must be exactly defined by the plant operator. If the staff does not have the necessary knowledge, they must be trained and instructed, which may be performed by the machine manufacturer or supplier on behalf of the plant operator. Moreover, the plant operator of the operating manual are fully understood by the personnel.

2.3 Hazards in the event of non-compliance with the safety instructions

Non-compliance with the safety instructions may produce a risk to the personnel as well as to the environment and the machine and results in a loss of any right to claim damages.
For example, non-compliance may involve the following hazards:

- Failure of important functions of the machine / plant.
- Failure of specified procedures of maintenance and repair.
- Exposure of people to electrical, mechanical an chemical hazards.
- Endangering the environment owing to hazardous substances being released.

2.4 Compliance with regulations pertaining of safety at work

When operating the pump, the safety instructions contained in this manual, the relevant national accident prevention regulations and any other service and safety instructions issued by the plant operator are to be observed.

2.5 Safety instructions relevant for operation

- If hot or cold machine components involve hazards, they must be guarded against accidental contact.
- Guards for moving parts (e.g. coupling) must not be removed from the machine while in operation.
- Any leakage of hazardous (e.g. explosive, toxic, hot) fluids (e.g. from the shaft seal) must be drained away so as to prevent any risk occurring to persons or the environment. Statutory regulations are to be complied with.
- Hazards resulting from electricity are to be precluded (see, for examgple, the VDE Specifications and the bye-laws of the local power supply utilities).

2.6 Safety instructions relevant for maintenance, inspection and assembly work

It shall be the plant operator's responsibility to ensure that all maintenance, inspection and assembly work is performed by authorized and qualified personnel who have adequately familiarized themvelves with the subject matter by studying this manual in detail.

Any work on the machine shall only be performed when it is at a standstill, it being imperative that the procedure for shutting down the machine described in this manual be followed.

Pumps and pump units which convey hazardous media must be decontaminated.

On completion of work all safety and protective facilities must be re-installed and made operative again.

Prior to restarting the machine, the instructions listed under 'Initial commissioning' are to be observed.

2.7 Unauthorized alterations and production of spare parts

Any modifications may be made to the machine only after concultation with the manufacturer. Using spare parts and accessories authorised by the manufacturer is in the interest of safety. Use of other parts may exempt the manufacturer from any liability.

2.8 Unauthorized modes of operation

The reliability of the machine delivered will be only guaranteed if it is used in the manner intended, in accordance with clause 1 of this manual. The limit values specified in the data sheet mut under no circumstances be exceeded.

3 Transportation and storage

3.1 Transportation

The pump is delivered by the manufacturer in a ready-to-work state. In the event of damages occurring during and due to transportation, the forwarding agent must make a factual statement. The pump should always be transported appropriately and according to the state of the art.

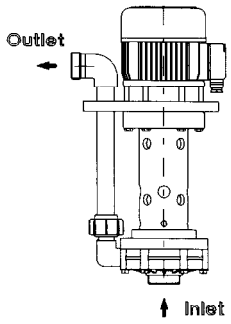
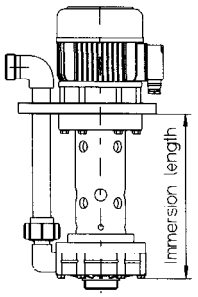
3.2 Storage

An eventual storage place must be absolutely dry. Make sure that the interior of the pump is protected from pollutants.

4 Product features and accessories

4.1 General description

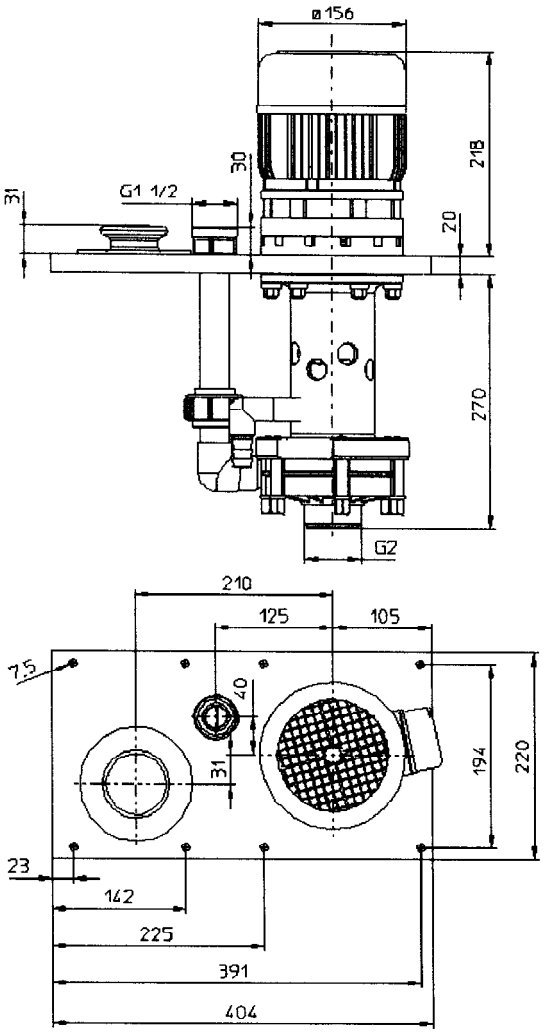
Type: RT-BG 3

• **Type**	Vertical submersible centrifugal pump
• **Bearing**	Since the pump does not contain any fluid-lubricated sleeve bearing, it is absolutely safe from dry-running
• **Pump shaft**	Overrunning
• **Inlet** at the bottom side of the housing • **Outlet** vertically past the mounting flange, either a perpendicular or an angular outgoing tube is available.	
• **Immersion length** 190 - 500mm	
• **Drive**	Electric motor

To achieve a long service life, the pump should be cleaned at regular intervals. For further details, see chapter 7 on "Service and maintenance".

4.2 Design

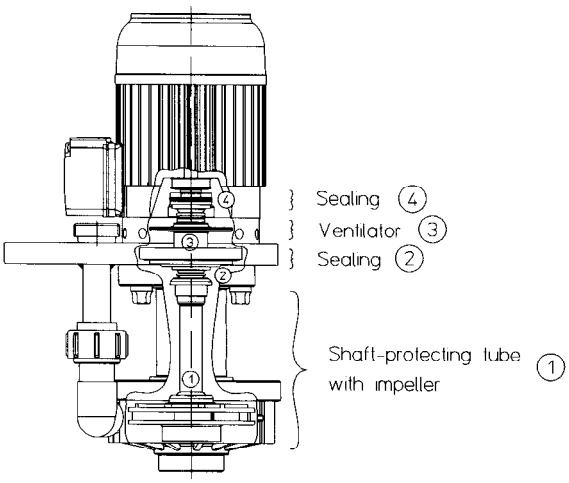
Since this submersible centrifugal pump is installed vertically, it is provided with an built-in assembly flange that serves to screw the pump to the container. (see chapter 5.1 on „Examples of mounting").



[fig. 4-1]

The suction side of the pump is provided with a male G2" thread and the delivery side with a male G1 1/2" thread.

Two ball bearings support the pump shaft in the motor. Within the pump, the shaft is overrunning. Since fluid-lubricated sleeve bearings are not necessary, submersible centrifugal pumps of the RT type are absolutely safe from dry-running.



[fig. 4-2]

A special sealing system (sealing 1 and sealing 2) at the driving end of the pump - outside the area in contact with the fluid - prohibits vapours from penetrating into the motor. In addition to this sealing system, a ventilator (3) is integrated to the pumping end, which evacuates emerging vapours from the immersion tube.

Depending on the fluid to be delivered, each component of the pump is available in various materials.

NOTE

The materials used are listed on the name plate or the delivery note!

A choice of materials:

All pieces in contact with the fluid	PP, PVDF, PPS
Sealings	FPM (Viton), EPDM, NBR

4.3 Accessories

Individual accessories such as screw fittings, extension pipes, delivery tubes or pickup screens may be enclosed to the pump. So please carefully check all packagings.

NOTE

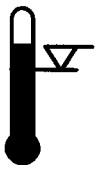
If there is a risk of particles being in the fluid, always use a pickup screen!

WARNING

Do not pass neither the maximum nor the minimum level of the bath!

5 Mounting and installation

The pump should be installed at a place allowing easy access at all time. Normally the ambient temperature should not exceed the following limits:

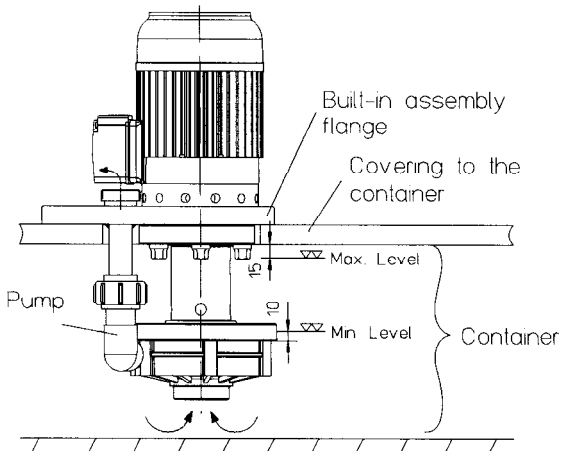


max. 40°C

NOTE

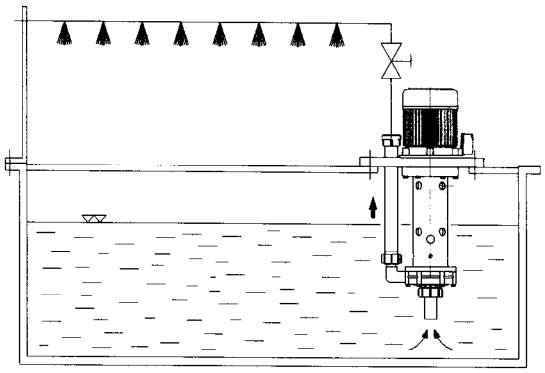
In case of higher ambient temperatures, please consult your supplier!

- Vertically install the pump in a container or a pit and screw it with the flange. Make sure that no tension, if any, is transmitted to the pump
- Make sure that the suction side of the pump is always free. It must not touch the ground of the container.



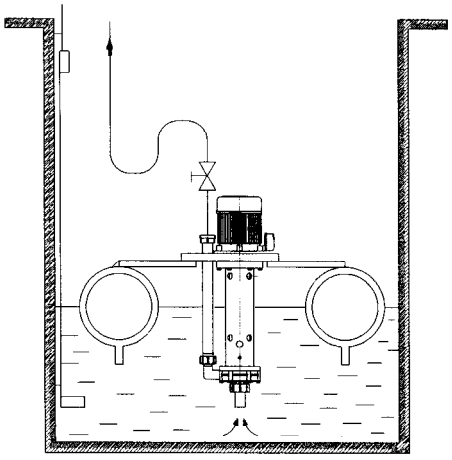
5.1 Examples of mounting

1. The submersible pump is firmly attached to the container by means of the mounting flange. The delivery pipe is provided with spraying nozzles.



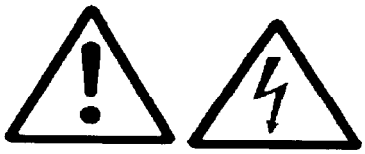
[fig. 5-2]

2. The submersible pump is flexibly mounted onto the float.



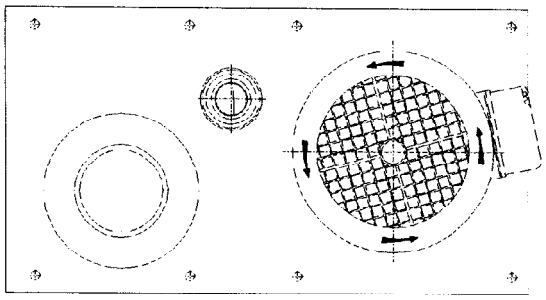
[fig. 5-3]

5.2 Electrical connection



All electrical connections to the pump may only be performed by experts!

- Before connecting the pump to the electrical mains, compare the voltage indicated on the name plate to the existing operating voltage.
- The direction of rotation indicated by an arrow on the pump must be respected and controlled after installation. (fig.5-3: looking on the motor)



[fig. 5-4]

- The motor must be equipped with a motor protection switch and a temperature sensor.

NOTE

Motor protection devices can be delivered by the manufacturer!

- The power supply must have been cut for at least 5 minutes before you may start any work at the terminal box of the pump.
- Make sure that the data given on the name plate correspond to the existing power supply.
- All electrical connections and installations of additional protection devices should be performed by an expert in accordancce with the instructions of the local power suppliers and / or the Association of German Electrotechnical Engineers VDE.

6 Starting and shutdown procedures

6.1 Preparations for starting

- Install the pump in the container intended for use.
- Install the delivery pipe.
- Connect the pump to the electrical mains.
- Tighten all screwed connections and fittings.

WARNING

Make sure that the minimum fluid level is kept!

6.2 Starting procedure

- Switch on the motor
- Adjust the operating point by slowly closing the shut-off device of the delivery line. If there is no shut-off device installed, the operating point will be adjusted automatically in accordance with the pump curve.
- If the container is to be emptied via an extension tube, do not switch off the pump when the level of the fluid is below the pump housing. In this case, the pump cannot suck in the fluid. This should also be taken into account when installing level adjustment controls. Set the switching points (ON/OFF) correspondingly.

6.3 Shutdown procedure

- Switch off the motor.
- Close all shut-off devices.
- In case some fluid remains within the pump, secure the shut-off devices to prevent an accidental opening.

7 Maintenance

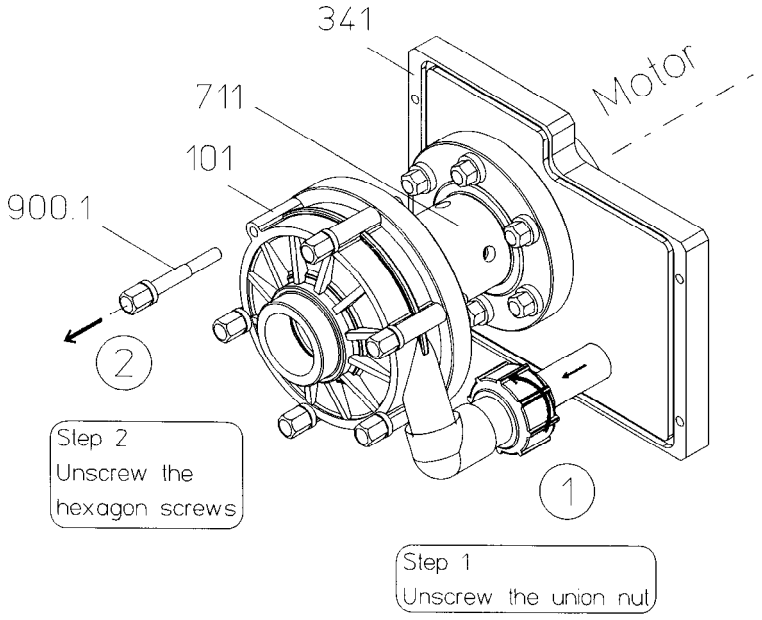
7.1 General information

The pump is designed for continuous operation and is therefore maintenance-free.

7.2 Preventive maintenance

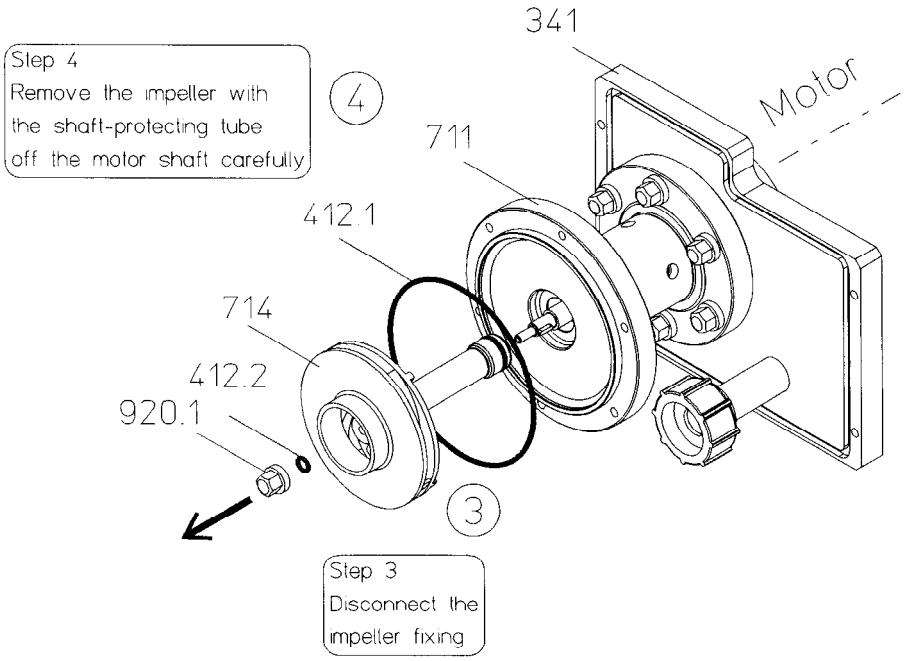
- Clean the ventilator cowl at least **once per month** in order to prevent the motor from overheating.
- When servicing the pump, also check the sealings (V-ring and O-rings) and replace them, if necessary.

Disassembly of this submersible centrifugal pump:



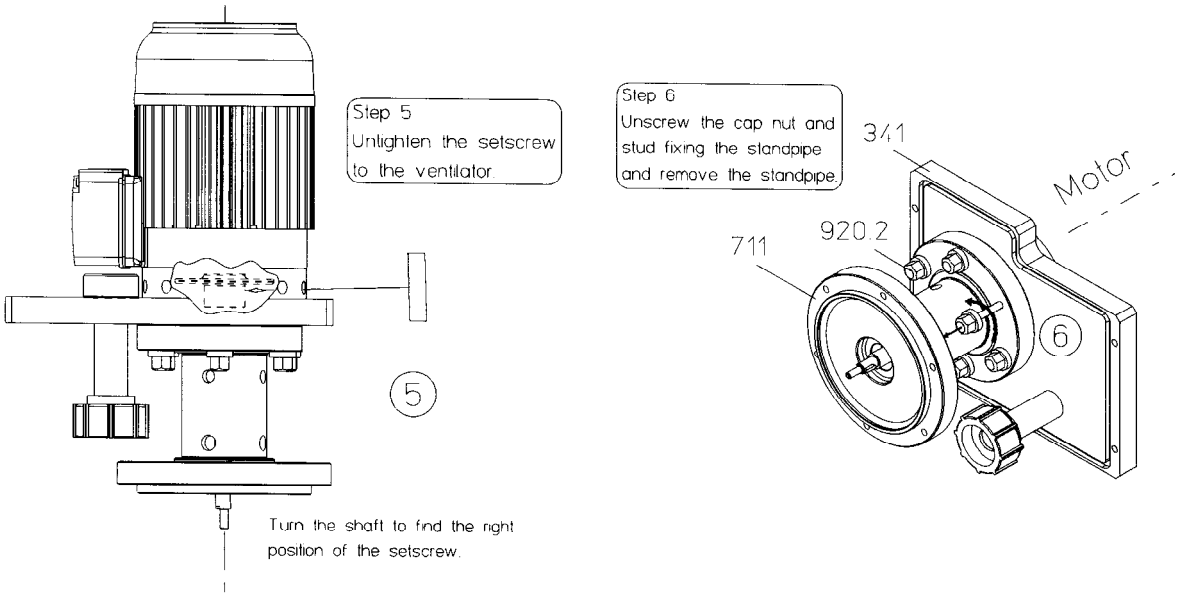
[fig. 7-1]

1. Remove the union nut on the pressure pipe (step 1)
2. Unscrew the 6 hexagon head screws (Pos. 900.1) at the pump housing and remove the housing (Pos. 101) from the standpipe.



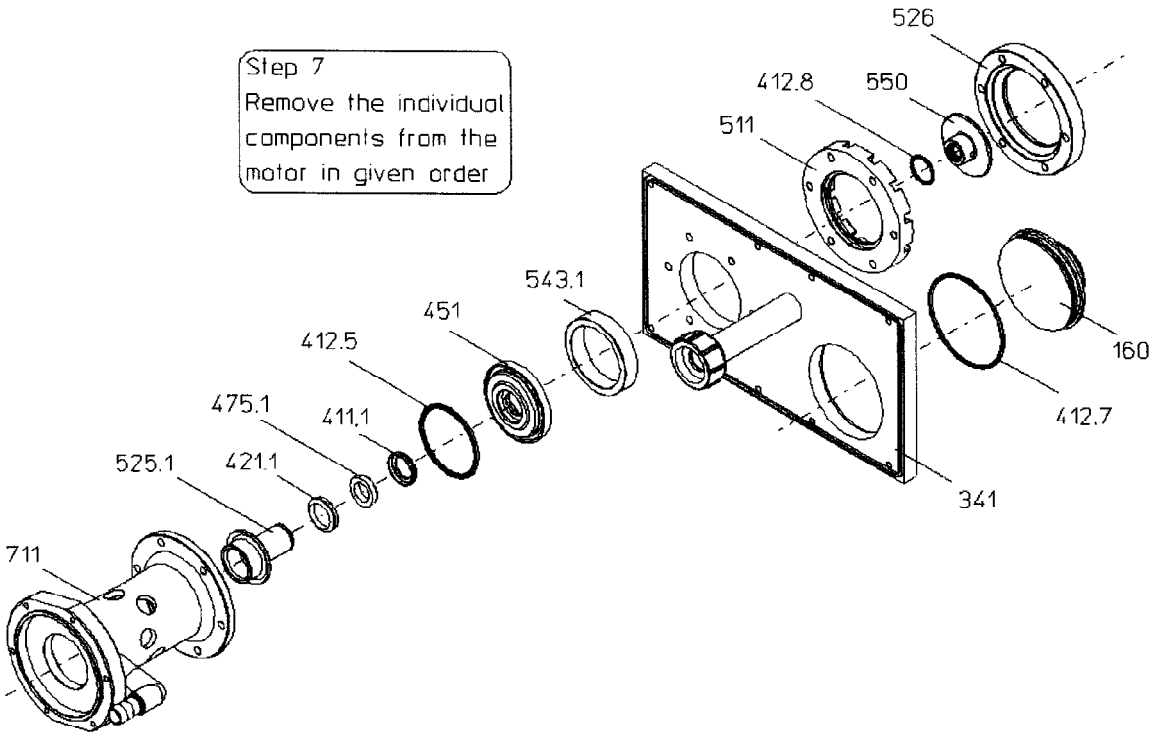
[fig. 7-2]

3. Disconnect the impeller fixings (pos. 920.1 acorn nut).
4. Use two tire levers to carefully remove the impeller and shaft-protecting tube (pos 714).



[fig. 7-3]

5. **Untighten the setscrew to the ventilator.**
6. **Unscrew the cap nut and stud (Pos 920.2) fixing the standpipe and remove the standpipe (Pos 711)**

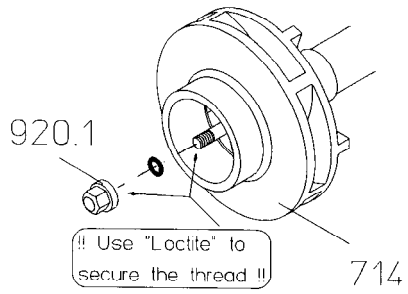


[fig. 7-4]

7. **Remove the individual components from the motor in given order (fig. 7-4).**

Cleaning the pump components:

1. Manually clean all pump elements (especially stand pipe [Pos 711], pump housing [Pos 101] with appropriate mechanical means (i.e. brush, screwdriver, water etc.) and remove all crystal deposits.
2. Check all (O-ring and V-ring) seals and replace the entire sealing set, if necessary.



[fig. 7-8]

Assembly of this submersible centrifugal pump:

- To assemble the pump, proceed in reverse order (fig. 7-1 to 7-4).

WARNING

Protect the thread of the acorn nut (pos. 920.1) - for fixing the impeller (pos. 714) - with „Loctite" or similar adhesives!

Cleaning the pump before a longer period of rest:

- If the pump will not be in operation for a longer period of time (especially without fluid), it should be cleaned carefully. Otherwise you risk that residues remaining in the pump may harden and damage the pump, once it is started again.

Doing repair work:

- Any other repair than the replacement of worn parts should be done by an expert, since inappropriate maintenance work usually results in unnecessary costs.

8 Troubleshooting

Malfunction	Causes	Corrective action
Pump does not work when switched on	No voltage	Test the voltage
	Impurities in the pump housing	Remove the impurities
Motor is overheating	Clogged ventilator cowl	Clean the ventilator and the cowl
Pump is working, but not delivering	Gas accumulation in the lines	Evacuate the lines
Delivery rate too low	Air in the system	Evacuate the system
	Delivery line cross-section is too small (significant losses)	Increase the delivery line cross-section
	Valve is not entirely open	Entirely open the valve
Delivery rate too high	Pump losses are less significant than presumed	Install a flow control valve in the delivery line

9 Parts illustration; spare parts list

Drawing-No.: PUTA.03.Z399.000

Article-No.:

NOTE

Please indicate the reference number, the type of the pump, the serial number, the motor output and the drawing number in case of ordering spare parts!

Vertikale Tauchkreiselpumpe

RT 5 PP/PVDF

RTL-30/340-4,0D/3-____ RT-SF

Laufrad: Ø152/14,5mm

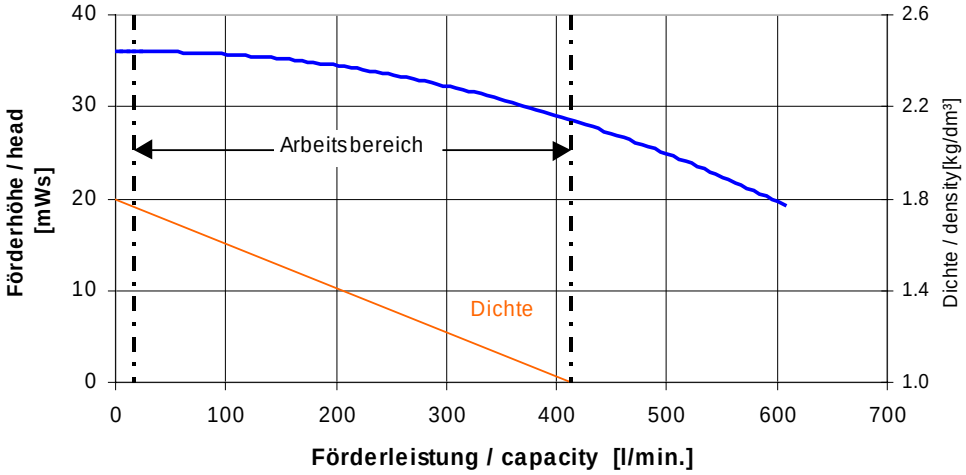
Motor 4,0kW
230/400V 50Hz

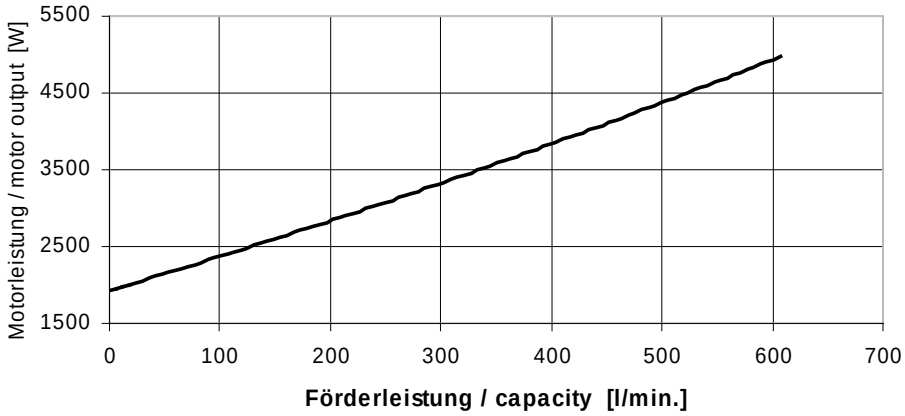
H_{max} = 36 mWS
Q_{max} = 410 l/min.

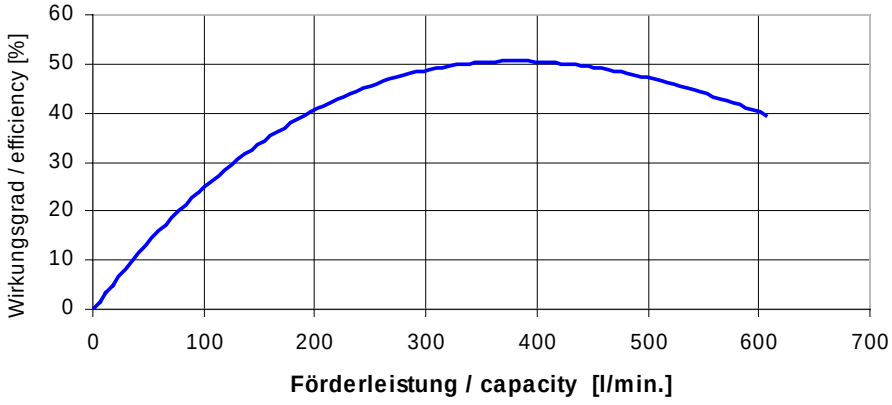
PUTA.04.K.000211

RTL-PP-30/340-4,0D/3-270 RT-SF

MOTOR: 4,0kW 230/400V 50Hz 2-pol.







Leistungskurve basierend auf Wasser bei 21°C (70°F)

RENNER GmbH
Glaitstrasse 43
75433 Maulbronn-Schmie

Phone: +49 (7043) 951-0
Fax.: +49 (7043) 951-199

Visit our website
www.renner-pumpen.de
info@renner-pumpen.de

Datum: 16.11.04

Assembly	: 16.004.0126.U23N	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/23/PVC/TI/KL-KU/d=27	Position	: 000060
Quant.	: 1,000 ST	Page	: 000169/01
Drawing	: 16.004.0126EU000	Date	: 10.04.2006

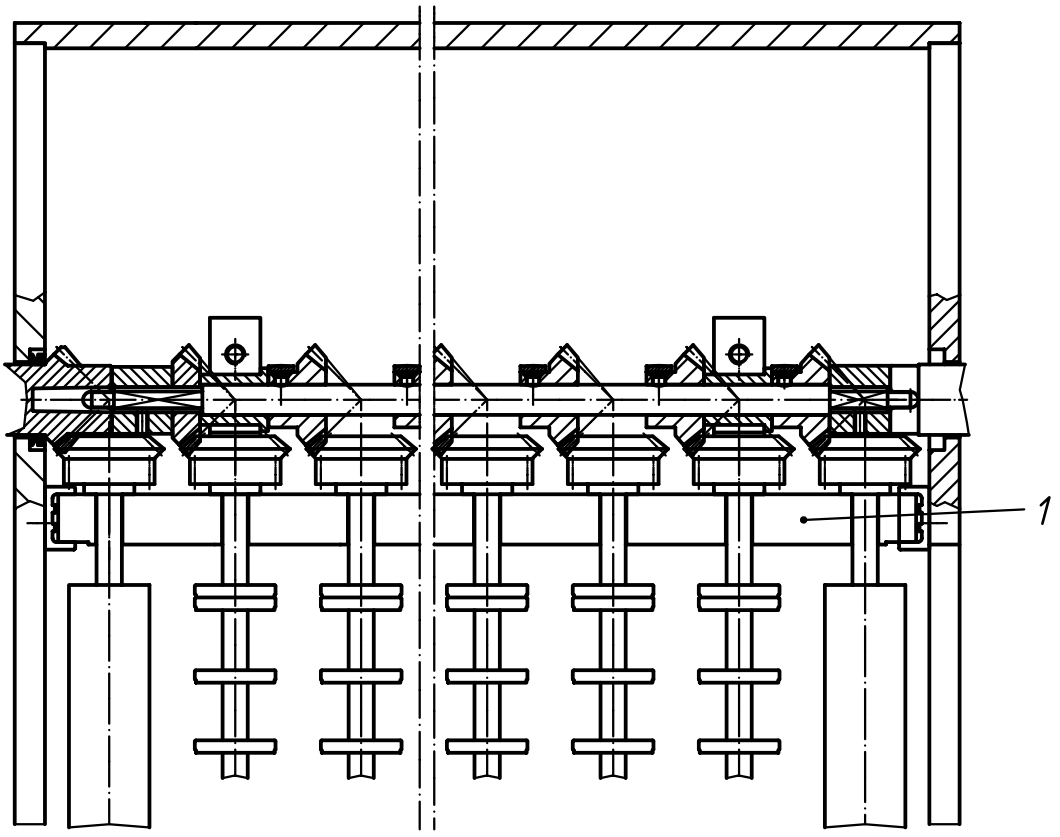
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0124.U23N DRIVE SHAFT/CPL./023/TI	1,000	ST	
1	16.004.0002.023X SUPPORT/GUR-N/TIT/23/d=10/T=50	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0126EU000	11
	00



Assembly	: 16.004.0124.U23N	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./023/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000170/01
Drawing	: 16.004.0124EU000	Date	: 10.04.2006

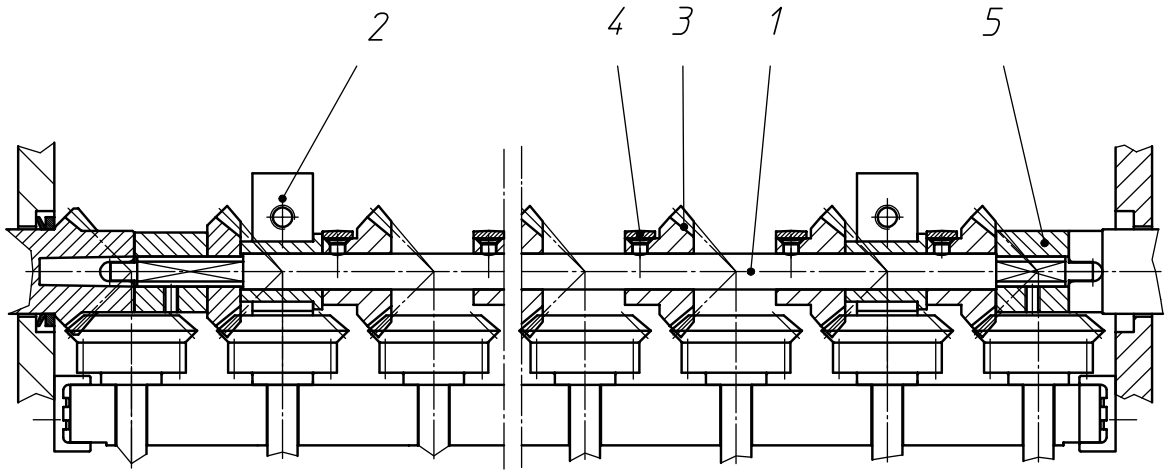
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0331.0233 DRIVE SHAFT/TI/23/CLAW COUPLINGL.-d=27	1,000	ST	X
2	16.004.0007.U00N SEATING/KPL./PVC /TI	4,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	15,000	ST	X
4	03.004.0278.0003 CLAMP/WHITE/PVDF-TI	15,000	ST	X
5	16.004.0330.0003 COUPLING/PART2/TI	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ANTRIEBSWELLE

Spare parts list Drive shaft

16.004.0124EU000	11
	00



Assembly	: 16.004.0007.U00N	Commiss.	: 25-05-377
Label	: SEATING/KPL./PVC /TI	Position	: 000060
Quant.	: 4,000 ST	Page	: 000171/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

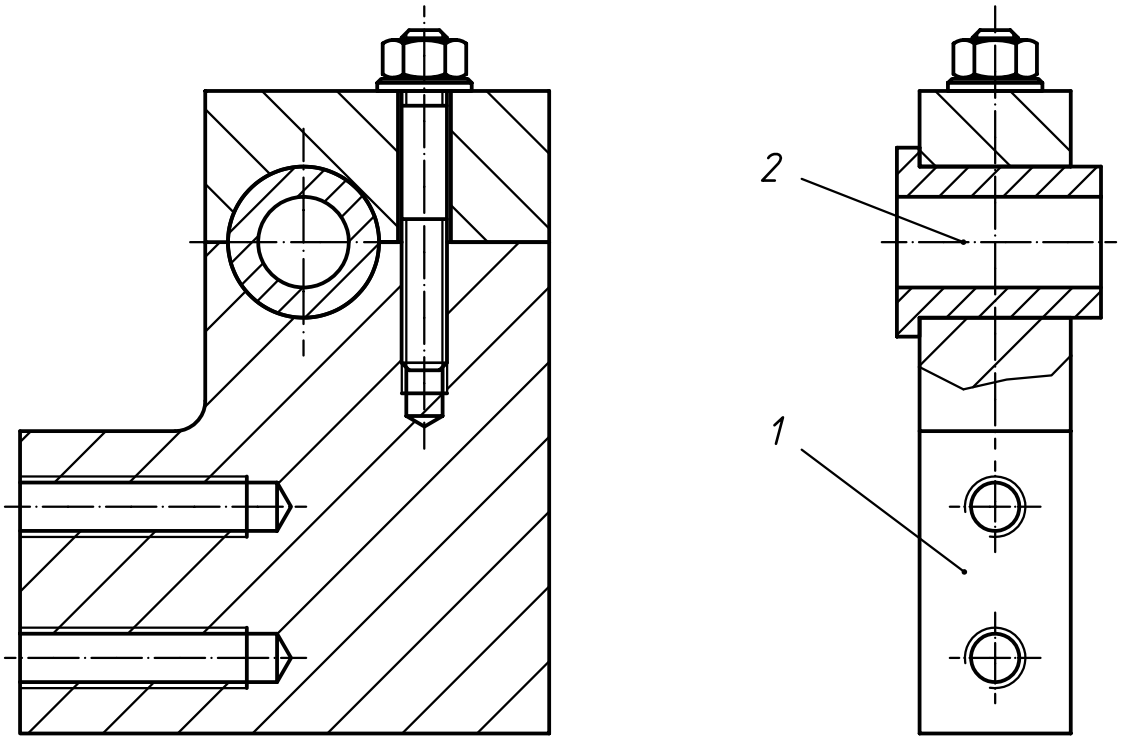
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0005.0003 SEATING/PVC-HG/TI PVC	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: 03.004.0005.0003	Commiss.	: 25-05-377
Label	: SEATING/PVC-HG/TI PVC	Position	: 000060
Quant.	: 1,000 ST	Page	: 000172/01
Drawing	: 03.004.0005E0000	Date	: 10.04.2006

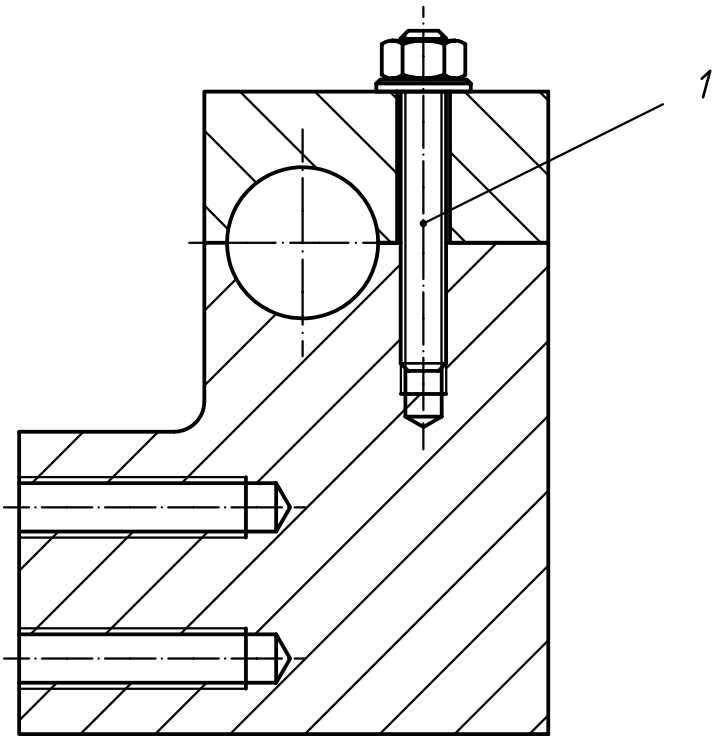
Pos.	Part N° Label	Quant.	Unit	SP
1	00.013.0008.0003 THREADED BOLT/TIT/M06x045	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER

Spare parts list Seating

03.004.0005E0000	11
	00



Assembly	: VS-25-05-377-04	Commiss.	: 25-05-377
Label	: CONVEYOR/WMT 3/650/PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000173/01
Drawing	: VS-25-05-377-04	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0987.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/U/FJ	2,000	ST	X
2	16.004.0988.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/O/AV/FJ	1,000	ST	X
3	16.004.1294.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/O/AH/FJ	1,000	ST	X
4	16.004.1713.2573 SHAFT/10/18/CPL/T25/0650/3.7035/PP/FE	2,000	ST	X
5	16.004.1241.2573 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	3,000	ST	X
6	16.004.0838.2573 Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/FE	1,000	ST	X
7	16.004.1244.2573 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
8	16.004.1243.2573 Shaft/KPL/32/O /L/AV/FJ	1,000	ST	X
9	16.004.1245.2573 Shaft/KPL/O /L/AH/FJ	1,000	ST	X
10	16.004.1247.2573 Shaft/CPL/32/U /L/ /FJ/	3,000	ST	X
11	16.004.0841.2573 SHAFT/CPL/32/O+U/K/B/FK/GREEN	1,000	ST	X
12	16.004.0847.2573 Shaf/CPL//32/U /K/ /FJ/	1,000	ST	X
13	16.004.1250.2573 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
14	16.004.1249.2573 SHAFT/KPL/32/O /L/AV/FJ	2,000	ST	X
15	16.004.1251.2573 Shaft/KPL/32/O /L/AH/FJ	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: VS-25-05-377-04	Commiss.	: 25-05-377
Label	: CONVEYOR/WMT 3/650/PVC/TI	Position	: 000060
Quant.	: 1,000 ST	Page	: 000173/02
Drawing	: VS-25-05-377-04	Date	: 10.04.2006

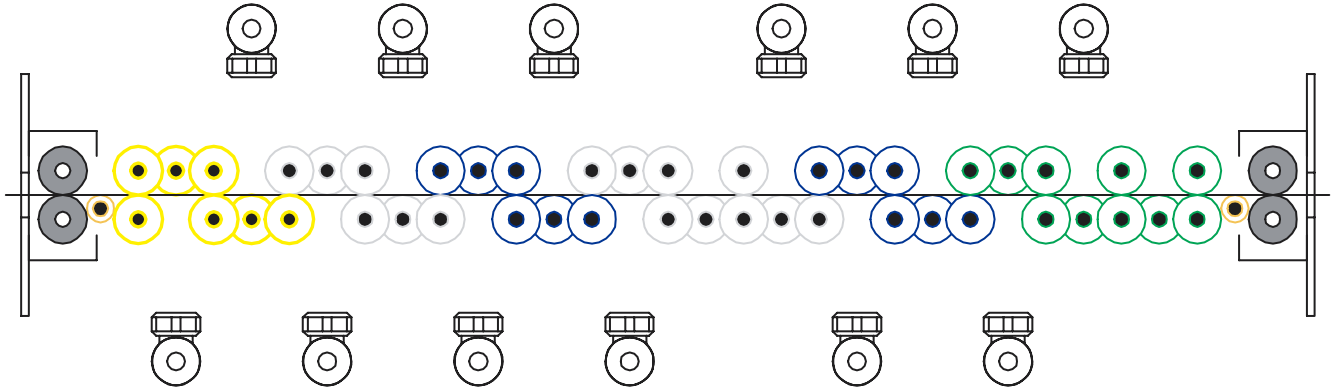
Pos.	Part N° / Label	Quant.	Unit	SP
16	16.004.1252.2573 Shaft/CPL/32/U /L/ /FJ/	4,000	ST	X
17	16.004.0843.2573 Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/FE	2,000	ST	X
18	16.004.1255.2573 Shaft/KPL/32/O/L/AV/FJ	2,000	ST	X
19	16.004.1254.2573 Shaft/KPL/32/O/ /L/AV/FJ	2,000	ST	X
20	16.004.1256.2573 Shaft/KPL/32/O /L/AH/FJ	2,000	ST	X
21	16.004.1257.2573 Shaft/CPL/32/U /L/ /FJ/	5,000	ST	X
22	16.004.0846.2573 Shaft/10/12/32/T25/650/TIT /PP/U/K/B/FE	2,000	ST	X
23	16.004.0961.2573 Shaf/CPL//32/U /K/ /FJ/	1,000	ST	X
24	16.004.1260.2573 Shaft/KPL/32/O /K/ /FJ	2,000	ST	X
25	16.004.1259.2573 Shaft/1KPL/32/O /L/AV/FJ	2,000	ST	X
26	16.004.1261.2573 Shaft/KPL/32/O /L/AH/FJ	3,000	ST	X
	16.004.0559.U003 GEAR WHEEL COMPL /Z=11/M2/TI/PP /=0162	8,000	ST	
	16.004.0393.U800 BELT DRIVE/SHAFT/O/SPRAY/FJ	6,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	2,000	ST	

Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-04	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/TI
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	WMT3	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
up	16.004.0988.2583		16.004.1245.2573	16.004.1244.2573	16.004.1243.2573		16.004.1261.2573	16.004.1260.2573	16.004.1259.2573		16.004.1256.2573	16.004.1255.2573	16.004.1254.2573		16.004.1261.2573	16.004.1260.2573	16.004.1259.2573		16.004.1261.2573		16.004.1254.2573	16.004.1255.2573	16.004.1256.2573		16.004.1249.2573	16.004.1250.2573	16.004.1251.2573		16.004.1249.2573		16.004.1251.2573		16.004.1294.2583	up
down	16.004.0987.2583	16.004.1713.2573	16.004.1241.2573		16.004.1241.2573	16.004.0838.2573	16.004.1241.2573		16.004.1257.2573	16.004.0846.2573	16.004.1257.2573		16.004.1252.2573	16.004.0843.2573	16.004.1252.2573		16.004.1257.2573	16.004.0961.2573	16.004.1257.2573	16.004.0846.2573	16.004.1257.2573		16.004.1252.2573	16.004.0843.2573	16.004.1252.2573		16.004.1247.2573	16.004.0841.2573	16.004.1247.2573	16.004.0847.2573	16.004.1247.2573	16.004.1713.2573	16.004.0987.2583	down

Assembly	: 16.004.0987.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/U/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000174/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

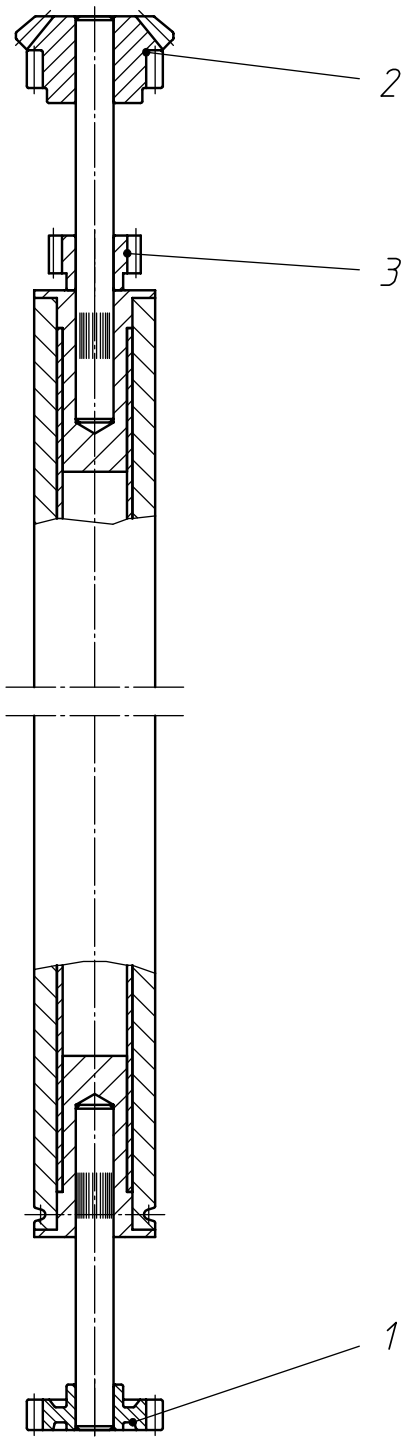
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/O/AV/FJ	Position	: 000060
Quant.	: 1,000 ST	Page	: 000175/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

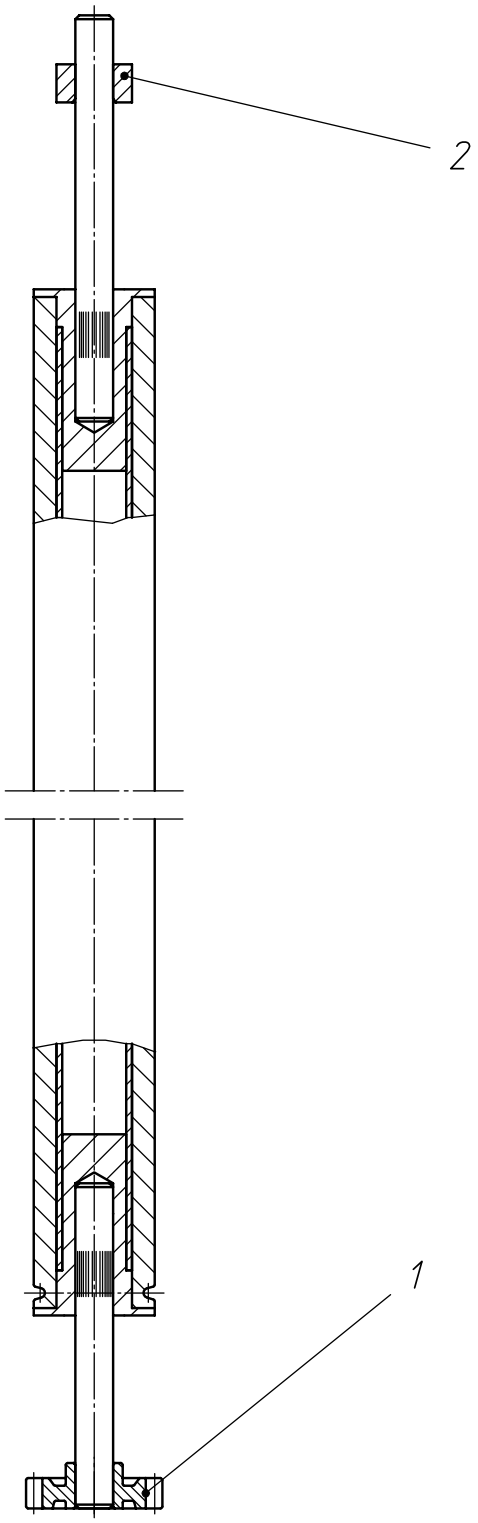
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/O/AH/FJ	Position	: 000060
Quant.	: 1,000 ST	Page	: 000176/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

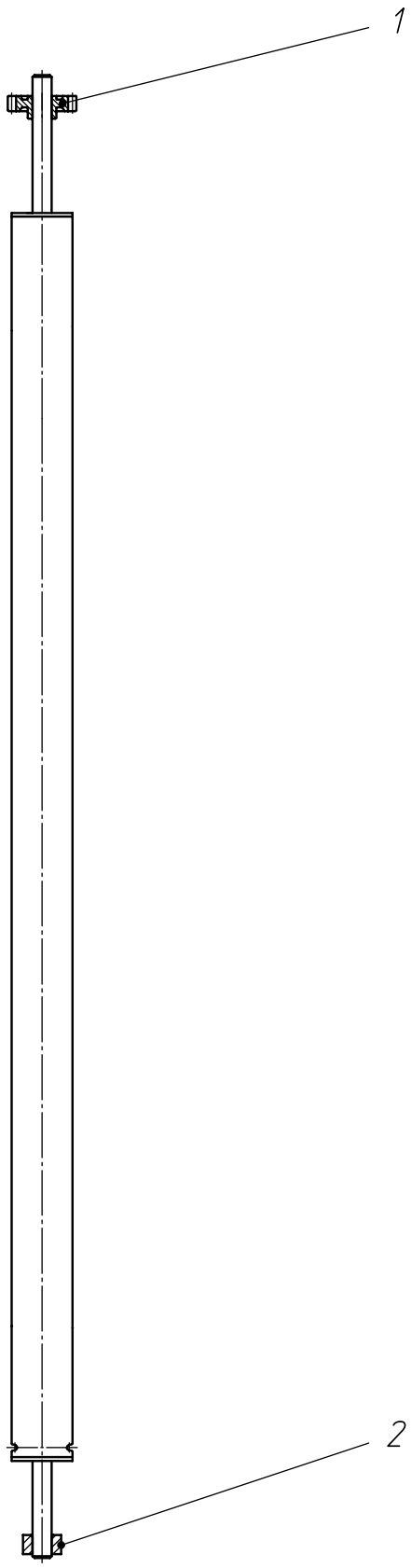
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



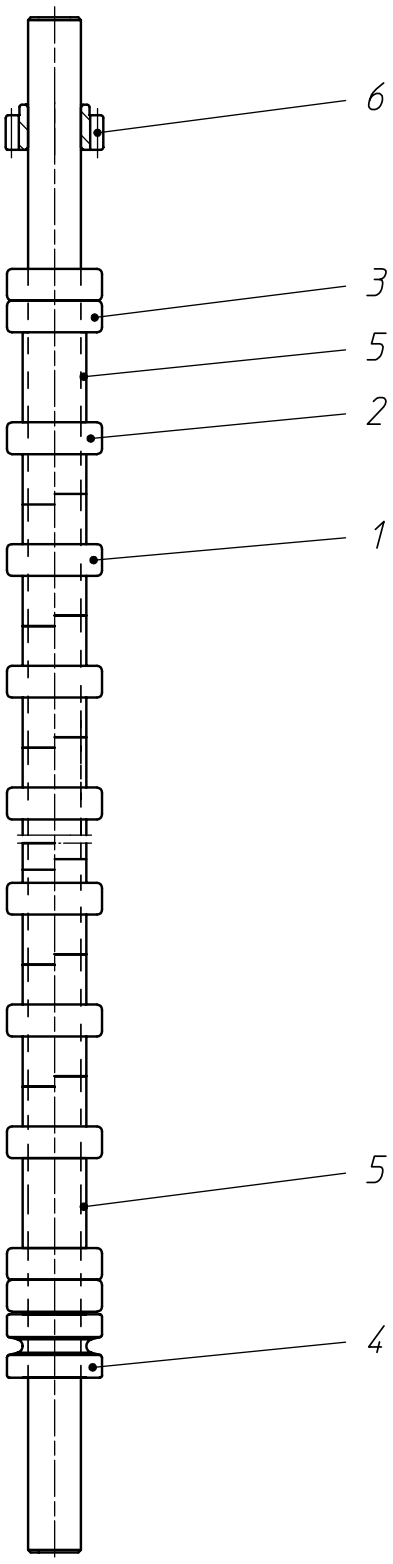
Assembly	: 16.004.1713.2573	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/3.7035/PP/FE	Position	: 000060
Quant.	: 2,000 ST	Page	: 000177/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X
7	00.019.0230.00RE BUSHING/PP-R/d=12.0/D=10.2/L=17.0	1,000	ST	X

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000060
Quant.	: 3,000 ST	Page	: 000178/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

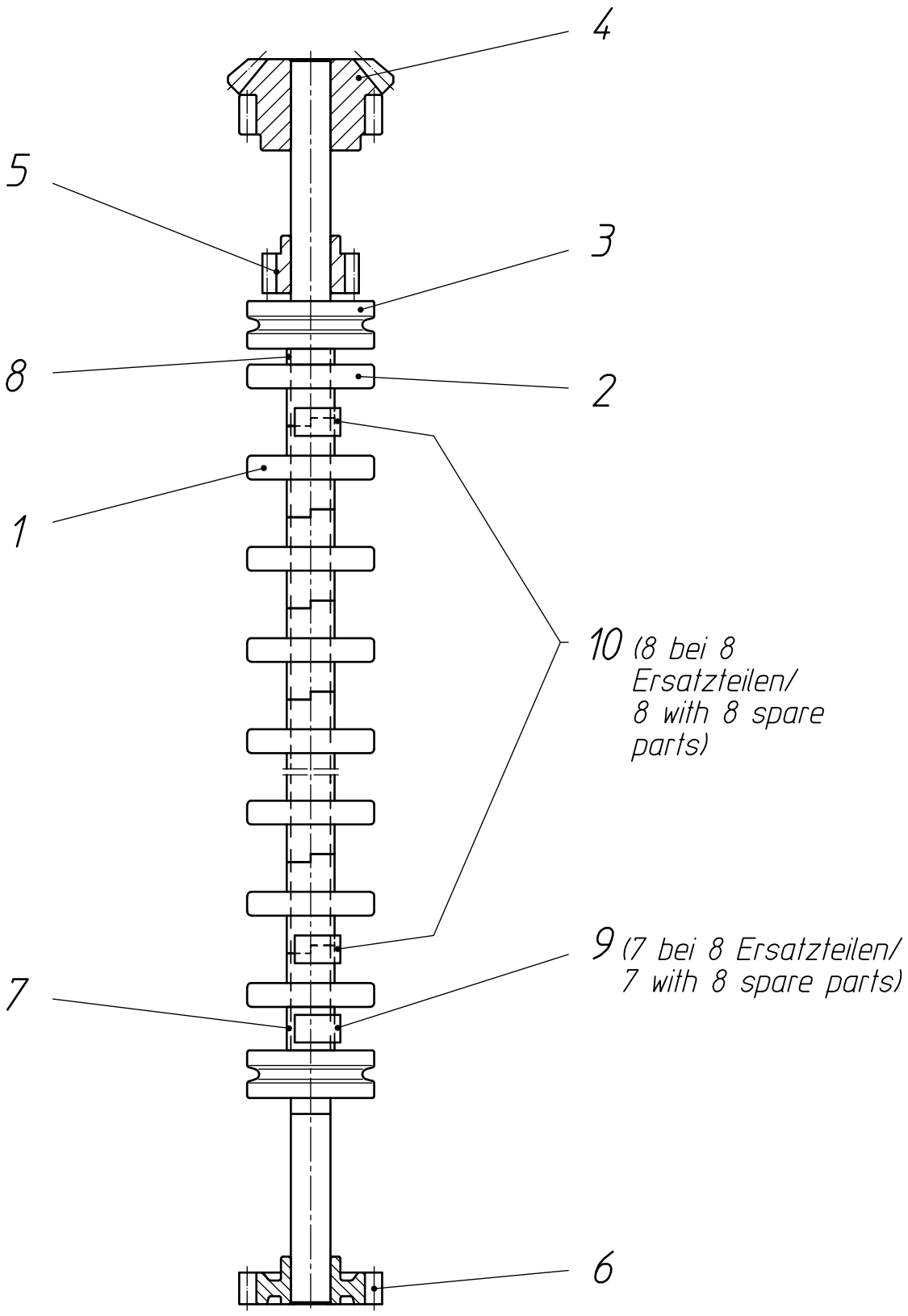
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0838.2573	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/F	Position	: 000060
Quant.	: 1,000 ST	Page	: 000179/01
Drawing	: 16.004.0838E0580	Date	: 10.04.2006

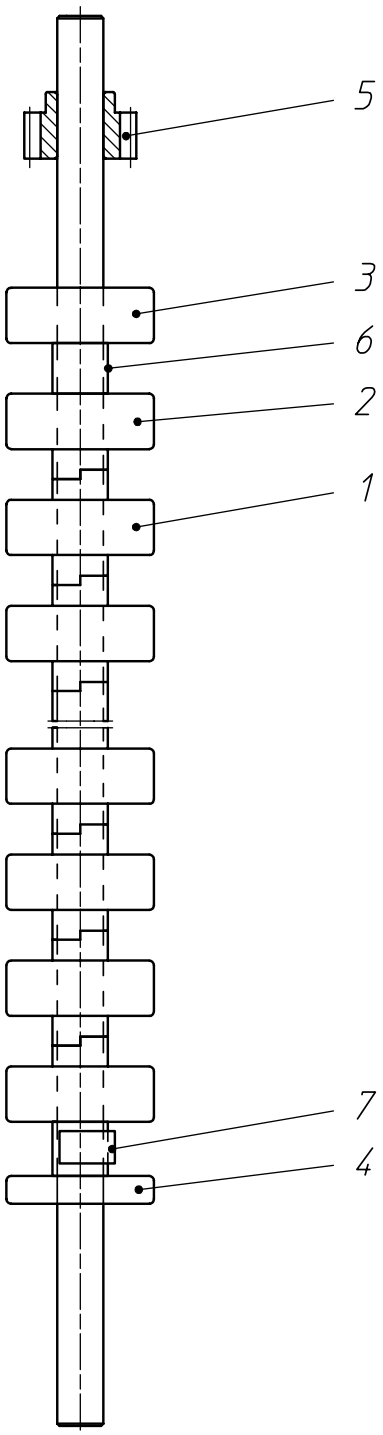
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
8	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0838E0580	11
	00



Assembly	: 16.004.1244.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000060
Quant.	: 1,000 ST	Page	: 000180/01
Drawing	: 16.004.1244E0570	Date	: 10.04.2006

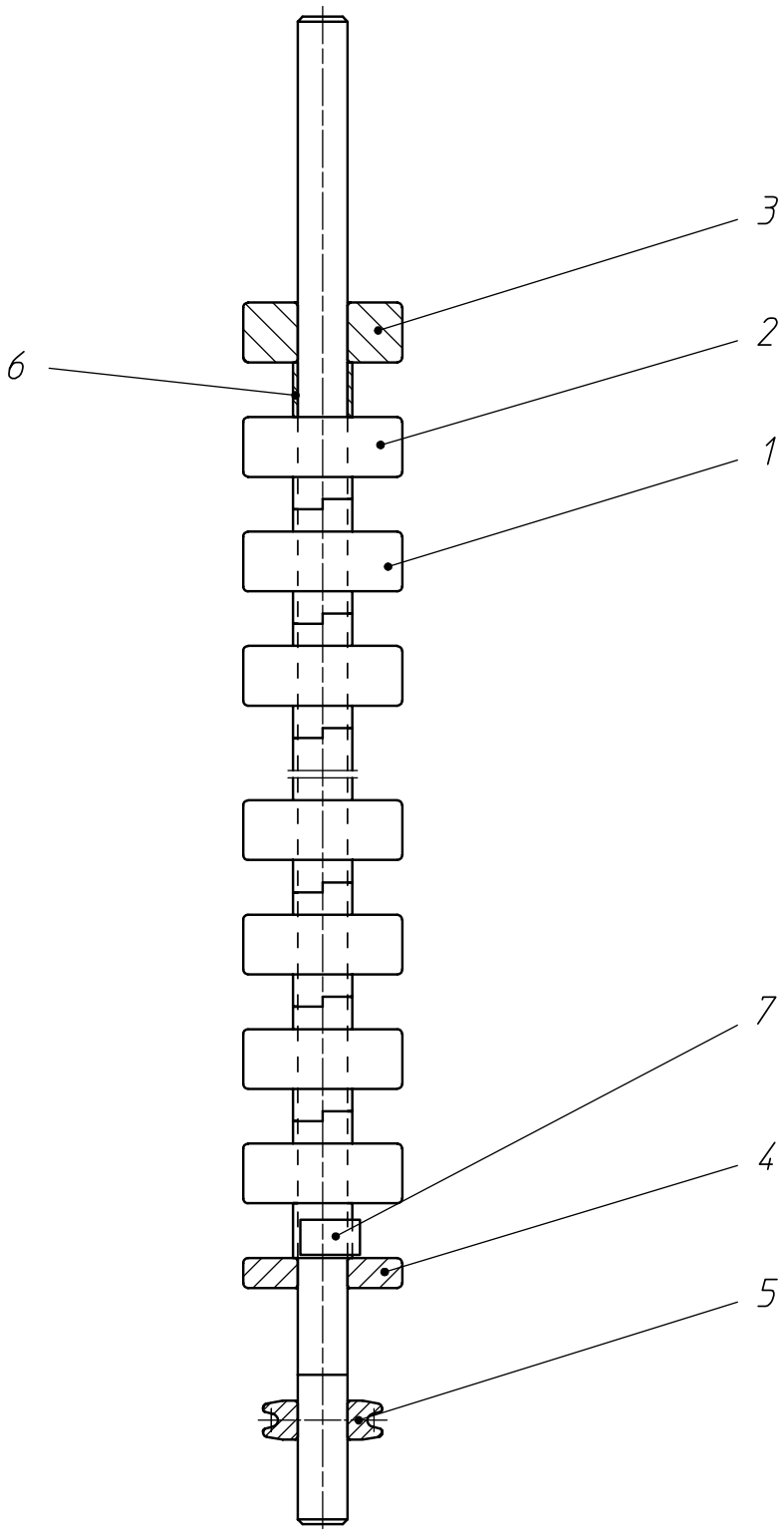
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1244E0570	11
	00



Assembly	: 16.004.1243.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ	Position	: 000060
Quant.	: 1,000 ST	Page	: 000181/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

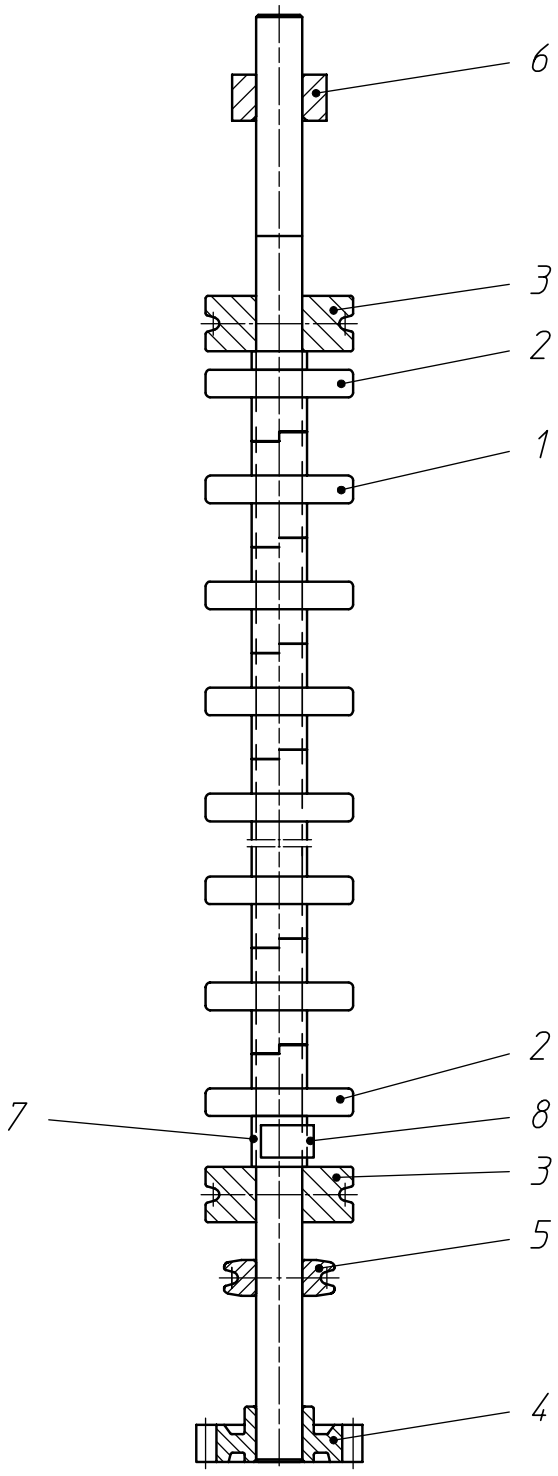
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ	Position	: 000060
Quant.	: 1,000 ST	Page	: 000182/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

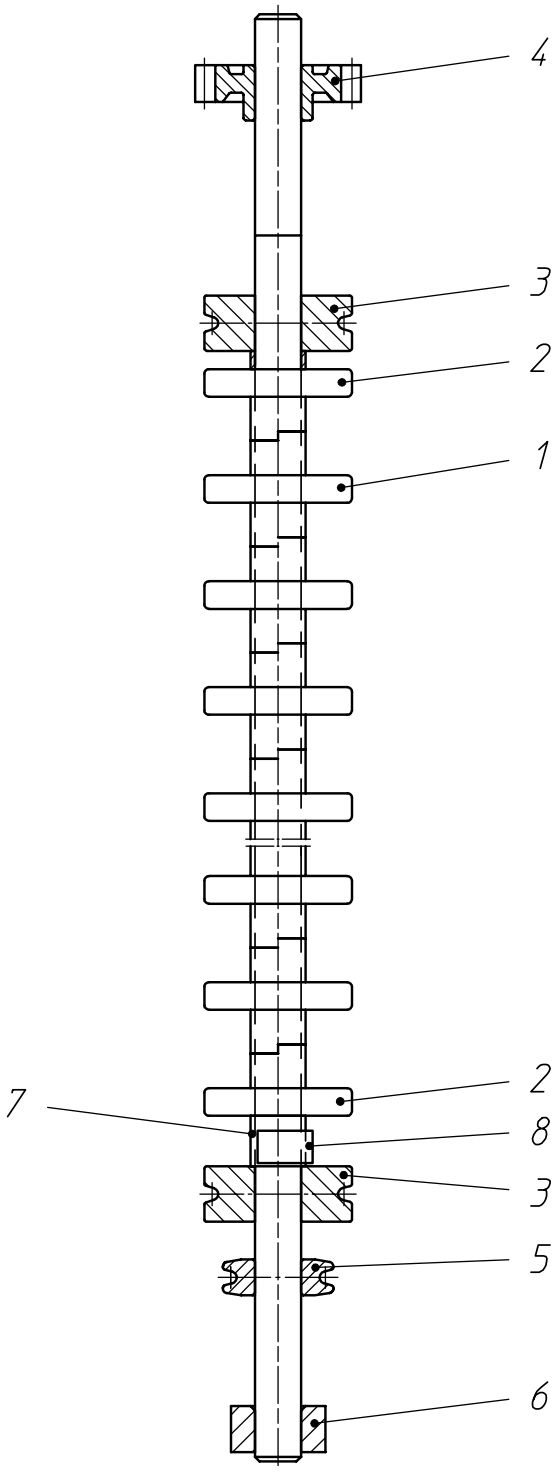
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000060
Quant.	: 3,000 ST	Page	: 000183/01
Drawing	: 16.004.1247E0000	Date	: 10.04.2006

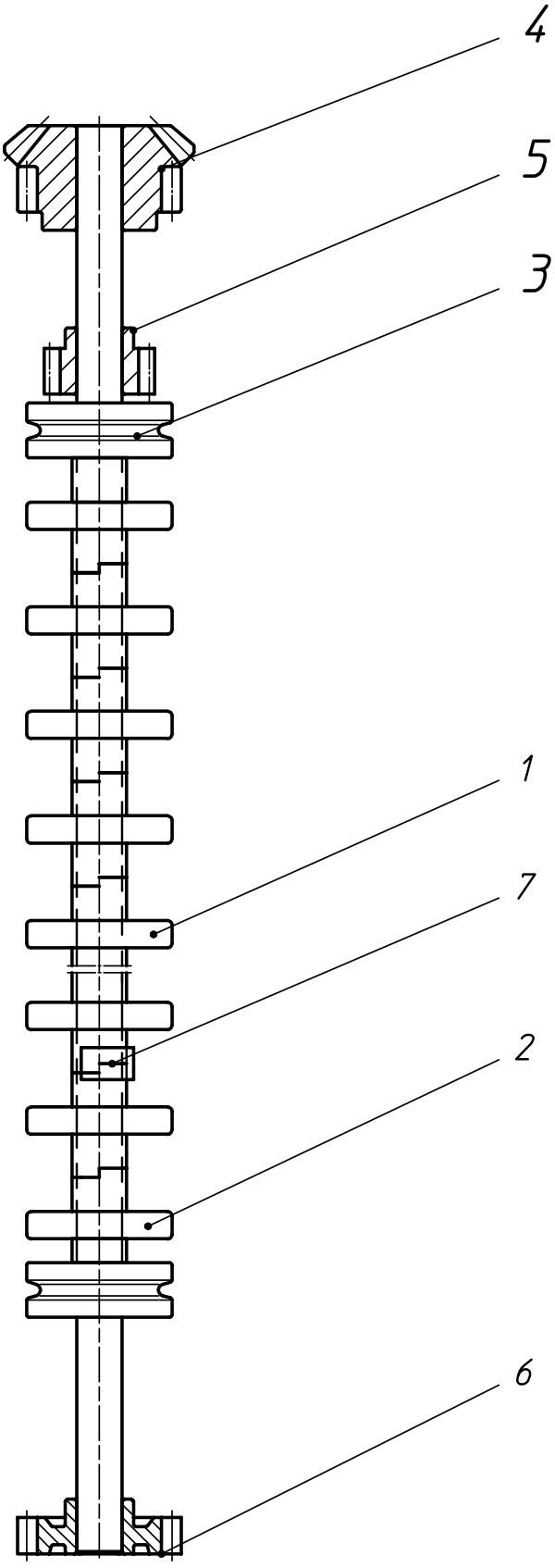
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT

16.004.1247E0000	11
	00



Assembly	: 16.004.0841.2573	Commiss.	: 25-05-377
Label	: SHAFT/CPL/32/O+U/K/B/FK/GREEN	Position	: 000060
Quant.	: 1,000 ST	Page	: 000184/01
Drawing	: 16.004.0841E0570	Date	: 10.04.2006

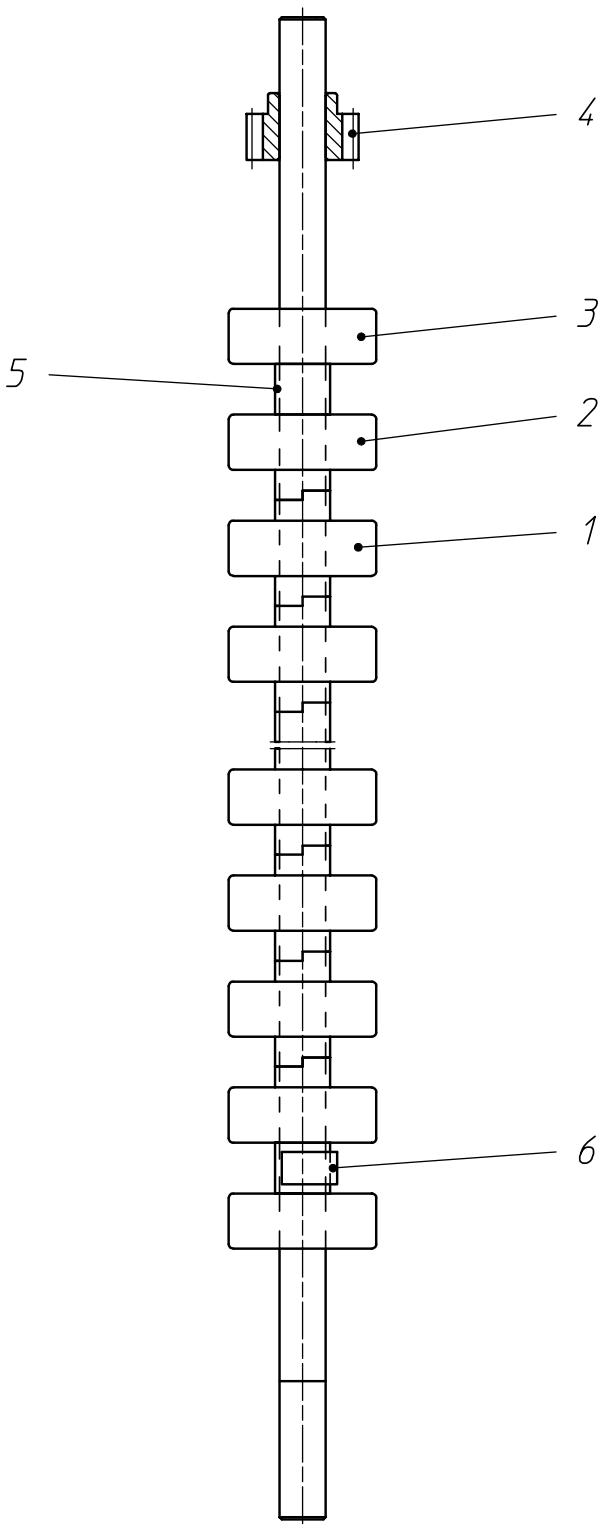
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0841E0570	11
	00



Assembly	: 16.004.0847.2573	Commiss.	: 25-05-377
Label	: Shaf/CPL//32/U /K/ /FJ/	Position	: 000060
Quant.	: 1,000 ST	Page	: 000185/01
Drawing	: 16.004.0844E0570	Date	: 10.04.2006

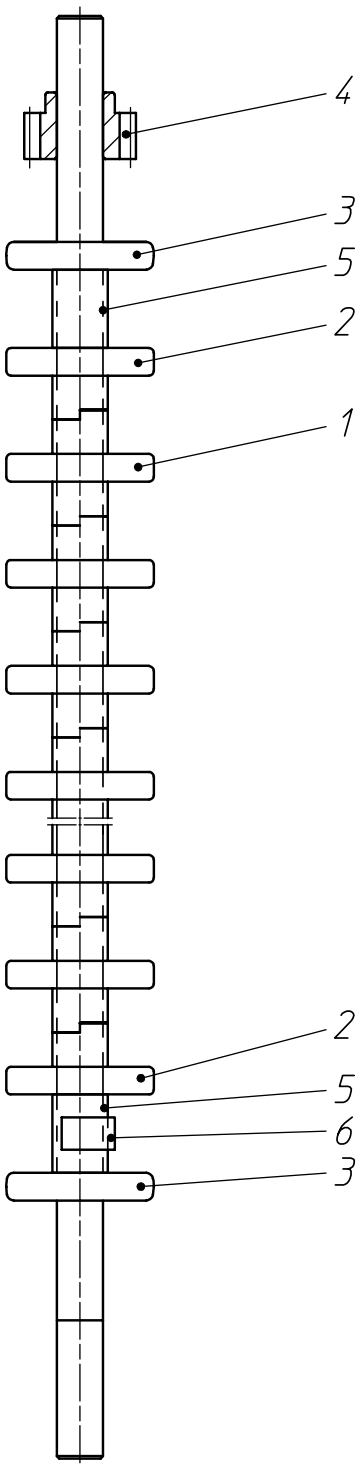
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	23,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0230.00RE BUSHING/PP-R/d=12.0/D=10.2/L=17.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0844E0570	11
	00



Assembly	: 16.004.1250.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000060
Quant.	: 1,000 ST	Page	: 000186/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

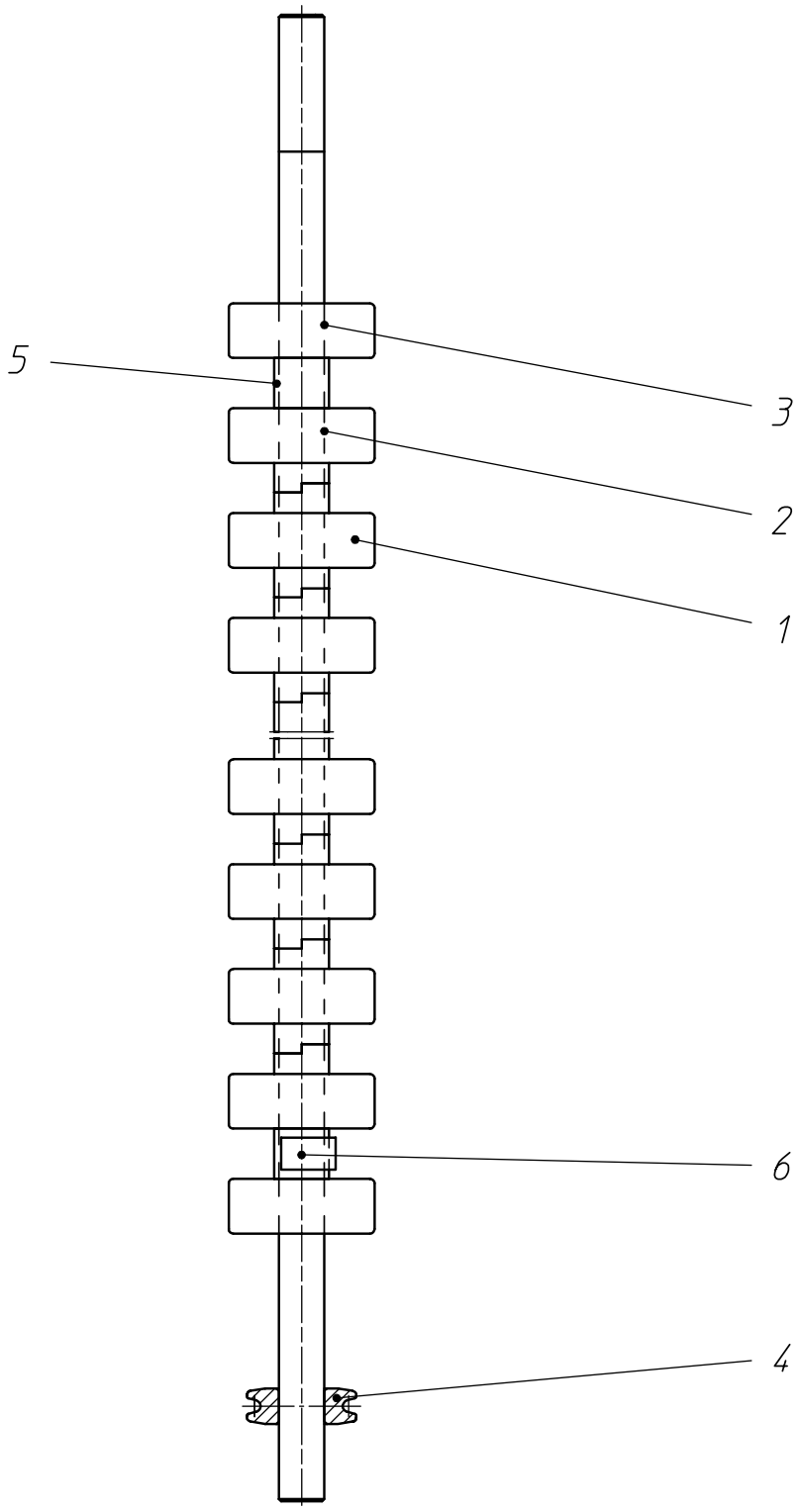
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1249.2573	Commiss.	: 25-05-377
Label	: SHAFT/KPL/32/O /L/AV/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000187/01
Drawing	: 16.004.1249E0000	Date	: 10.04.2006

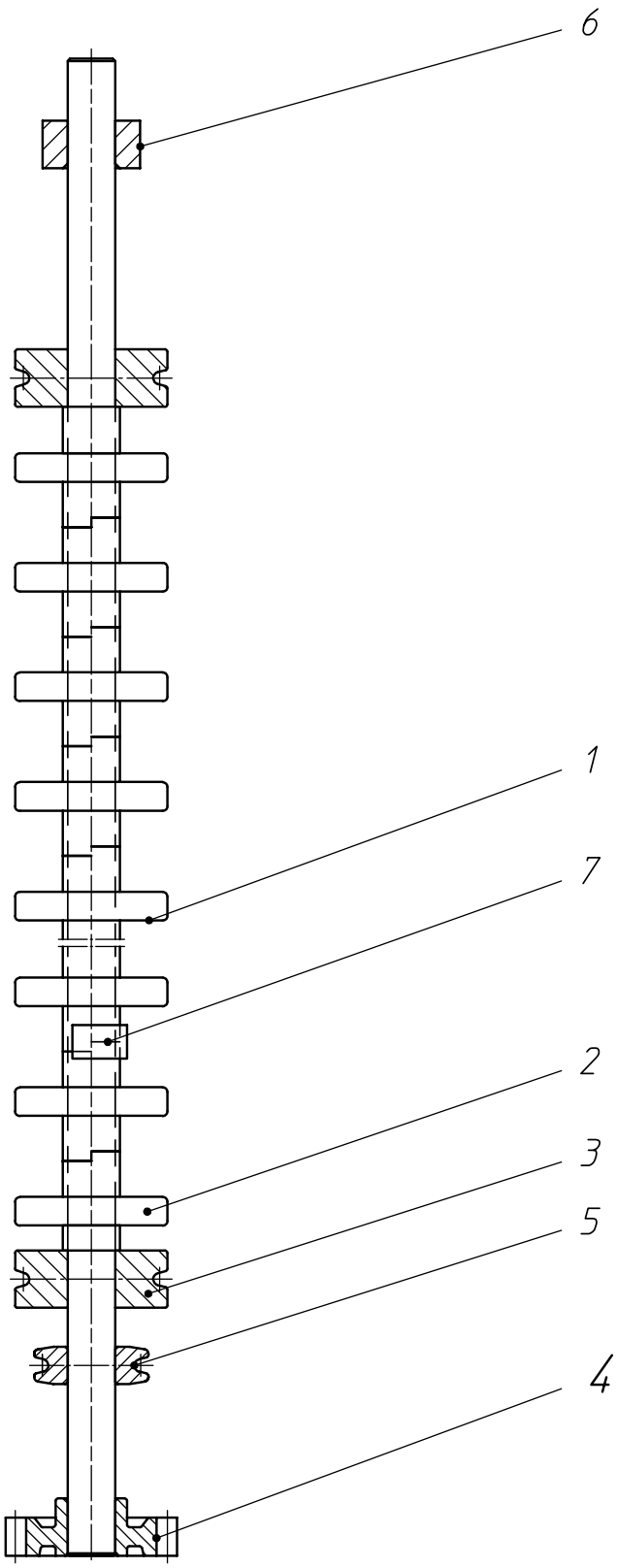
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1249E0000	11
	00



Assembly	: 16.004.1251.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000188/01
Drawing	: 16.004.1251E0000	Date	: 10.04.2006

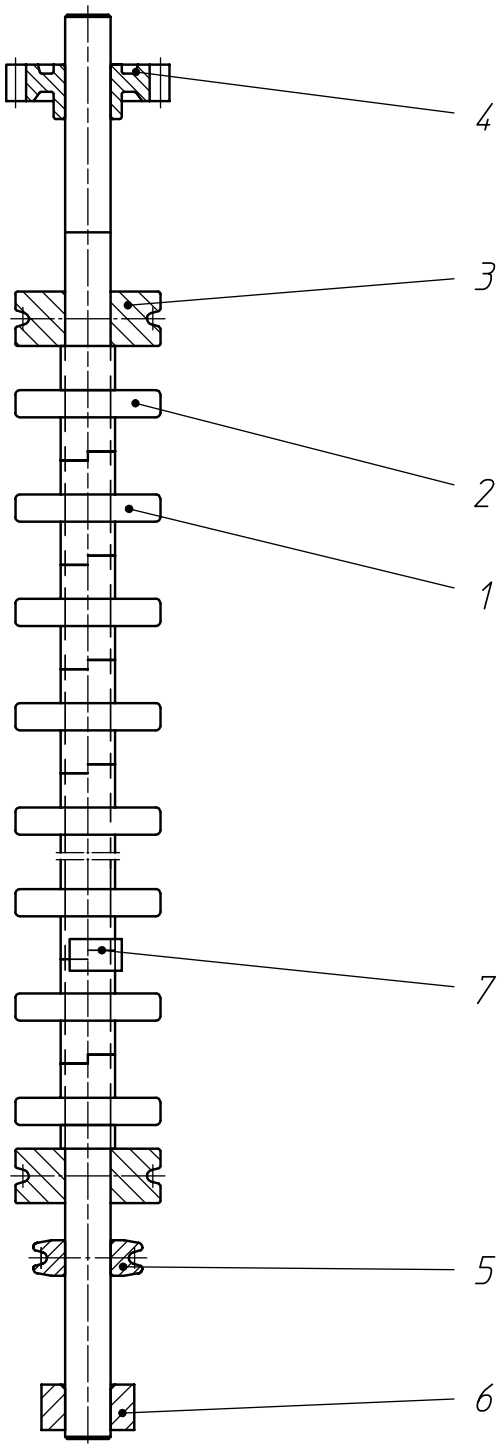
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1251E0000	11
	00



Assembly	: 16.004.1252.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000060
Quant.	: 4,000 ST	Page	: 000189/01
Drawing	: 16.004.1252E0570	Date	: 10.04.2006

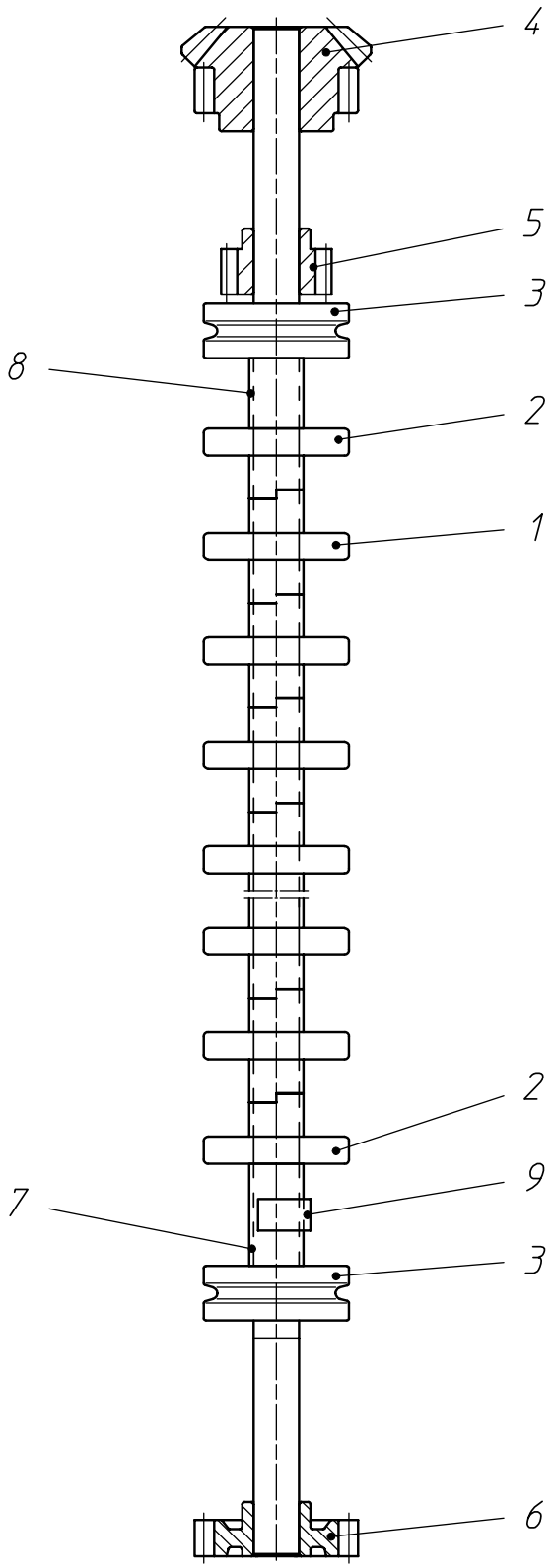
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1252E0570	11
	00



Assembly	: 16.004.0843.2573	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/F	Position	: 000060
Quant.	: 2,000 ST	Page	: 000190/01
Drawing	: 16.004.0843E0570	Date	: 10.04.2006

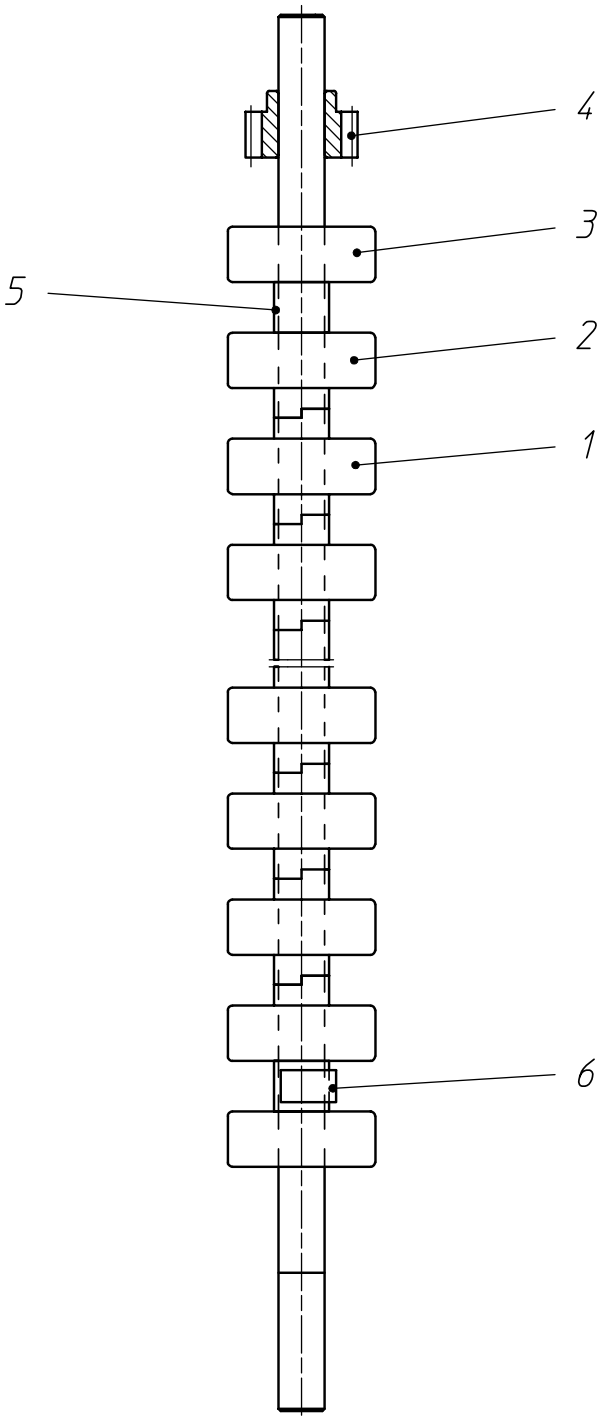
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0843E0570	11
	00



Assembly	: 16.004.1255.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/L/AV/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000191/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

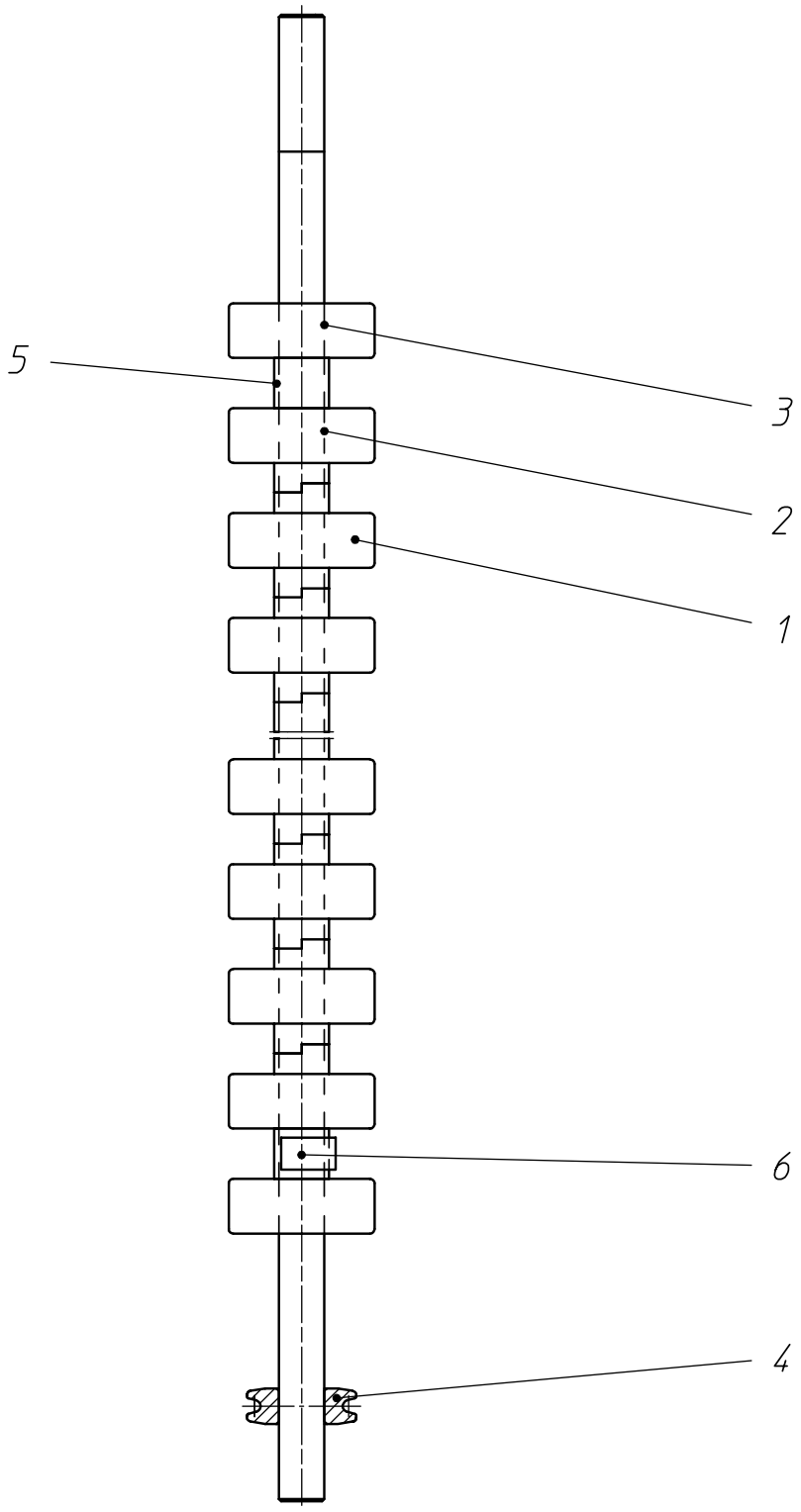
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1254.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/ /L/AV/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000192/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

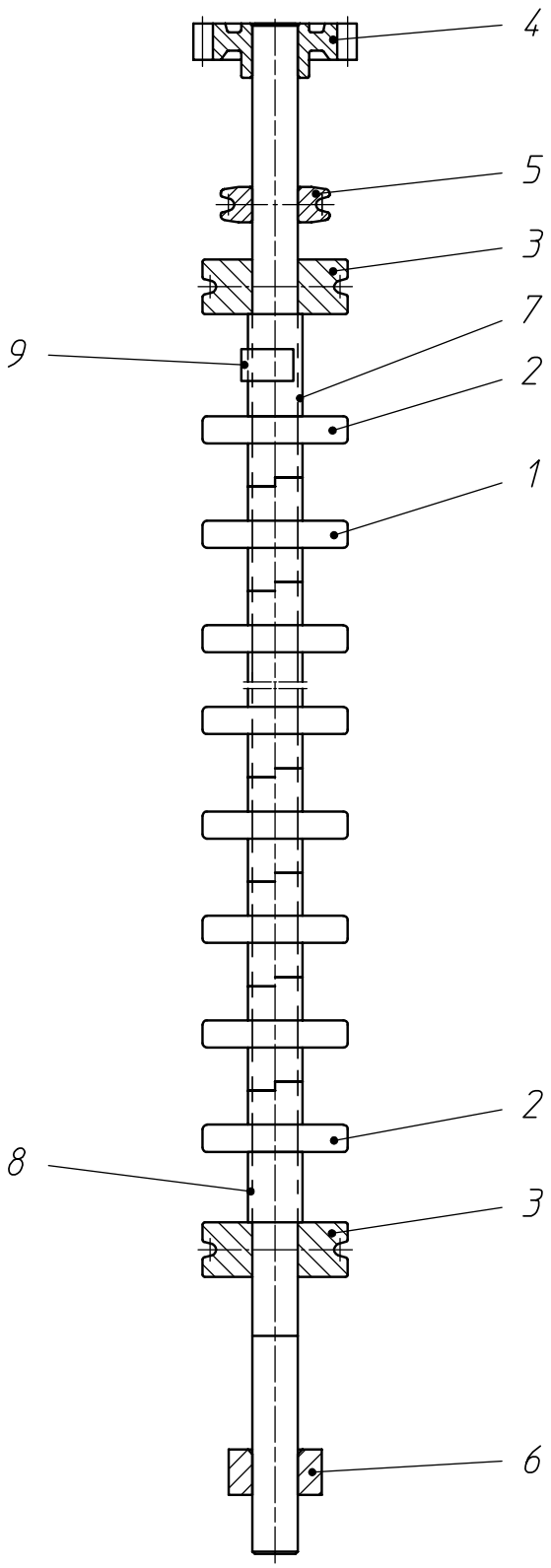
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1256.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000193/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

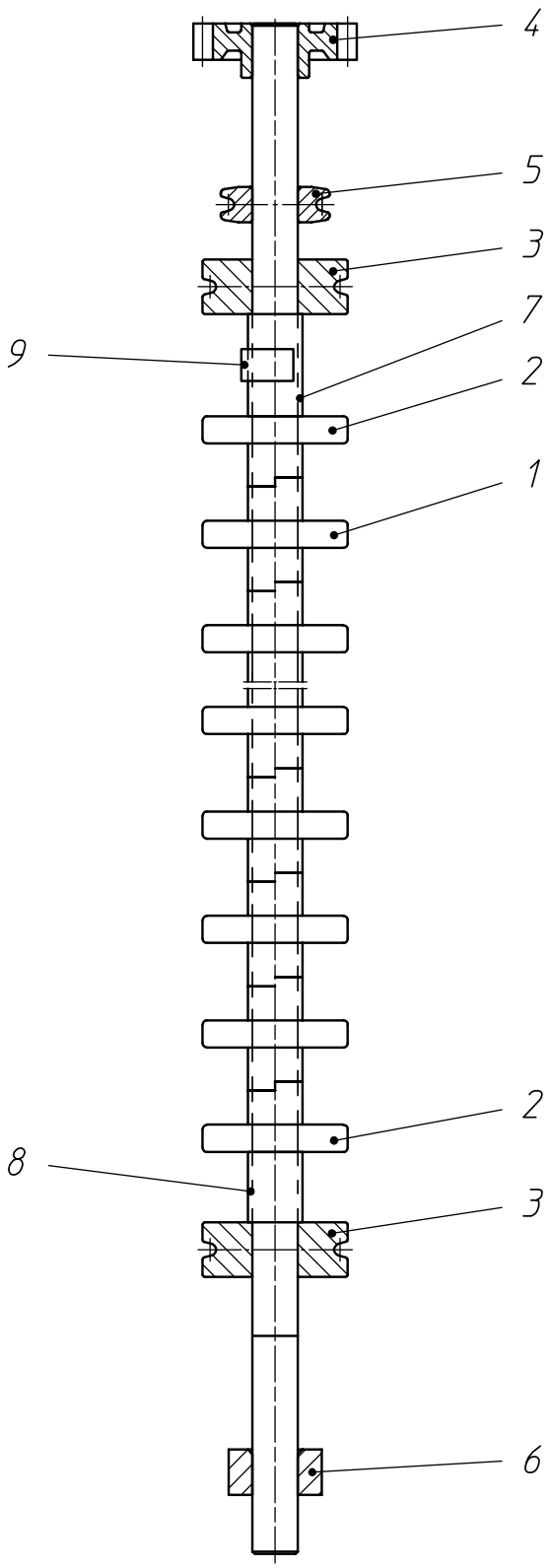
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1257.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000060
Quant.	: 5,000 ST	Page	: 000194/01
Drawing	: 16.004.1257E0572	Date	: 10.04.2006

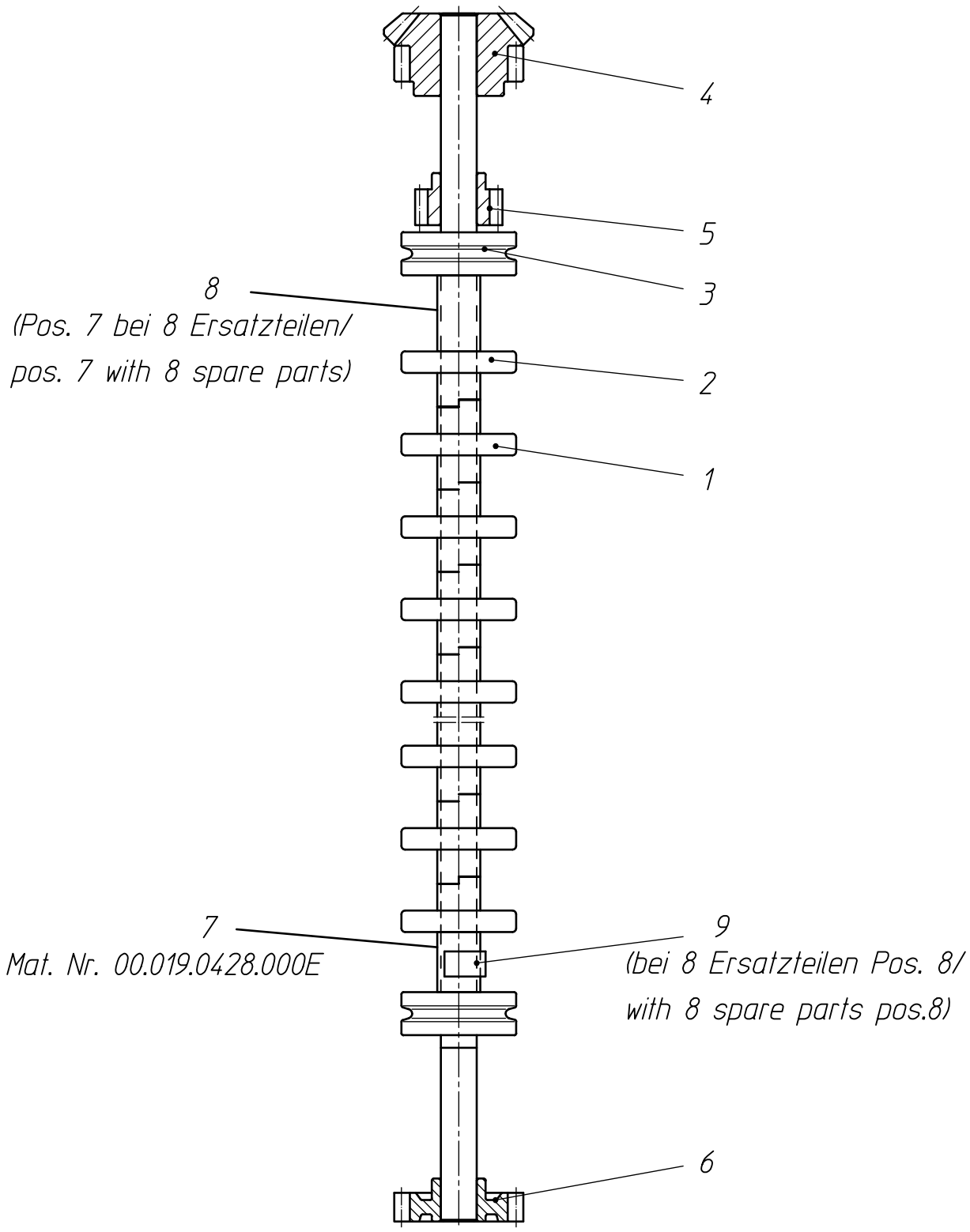
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0428.00RE BUSHING/PP-R/D=12.0/d=10.2/L=16.25	1,000	ST	X
8	00.019.0420.000E BUSHING/PP-G/d=12.0/D=10.2/L=21.25	1,000	ST	X
9	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1257E0572 | 1/1 | 01



Assembly	: 16.004.0846.2573	Commiss.	: 25-05-377
Label	: Shaft/10/12/32/T25/650/TIT /PP/U/K/B/FE	Position	: 000060
Quant.	: 2,000 ST	Page	: 000195/01
Drawing	: 16.004.0846E0570	Date	: 10.04.2006

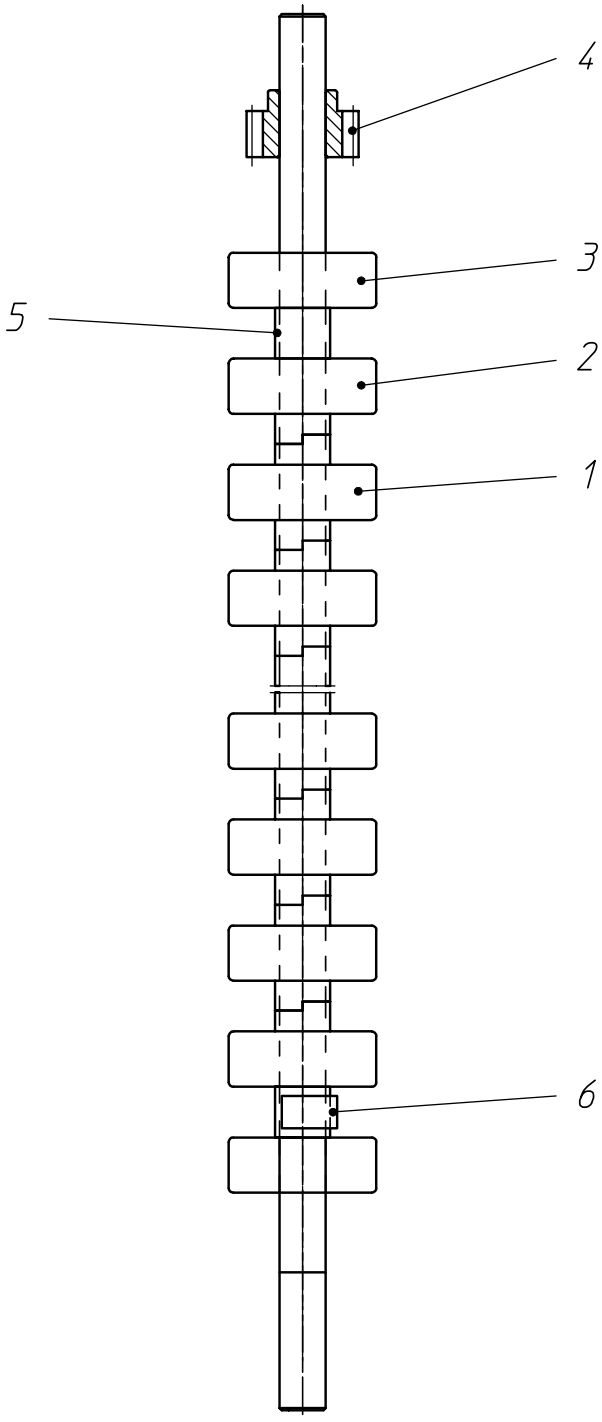
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0846E0570	11
	00



Assembly	: 16.004.0961.2573	Commiss.	: 25-05-377
Label	: Shaf/CPL//32/U /K/ /FJ/	Position	: 000060
Quant.	: 1,000 ST	Page	: 000196/01
Drawing	: 16.004.0844E0570	Date	: 10.04.2006

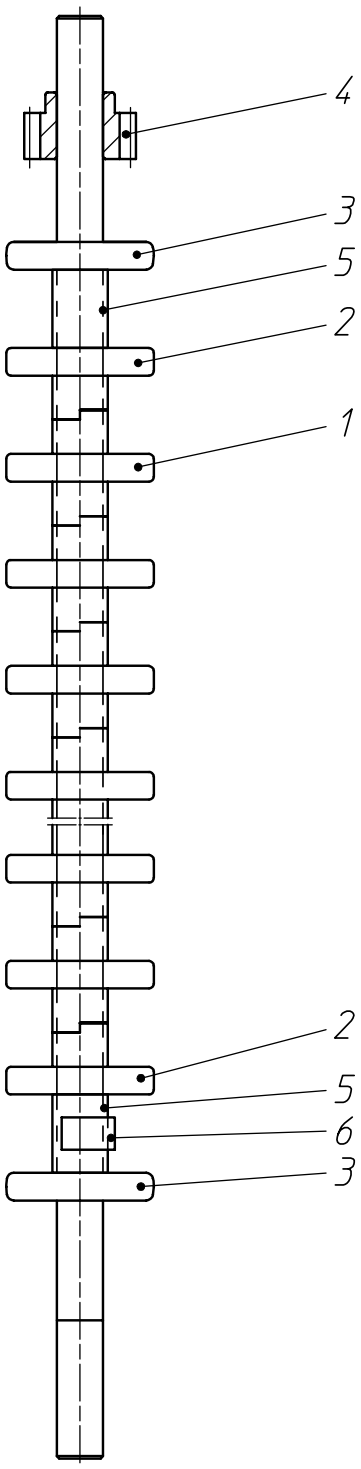
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X
7	00.019.0230.00RE BUSHING/PP-R/d=12.0/D=10.2/L=17.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0844E0570	11
	00



Assembly	: 16.004.1260.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000197/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

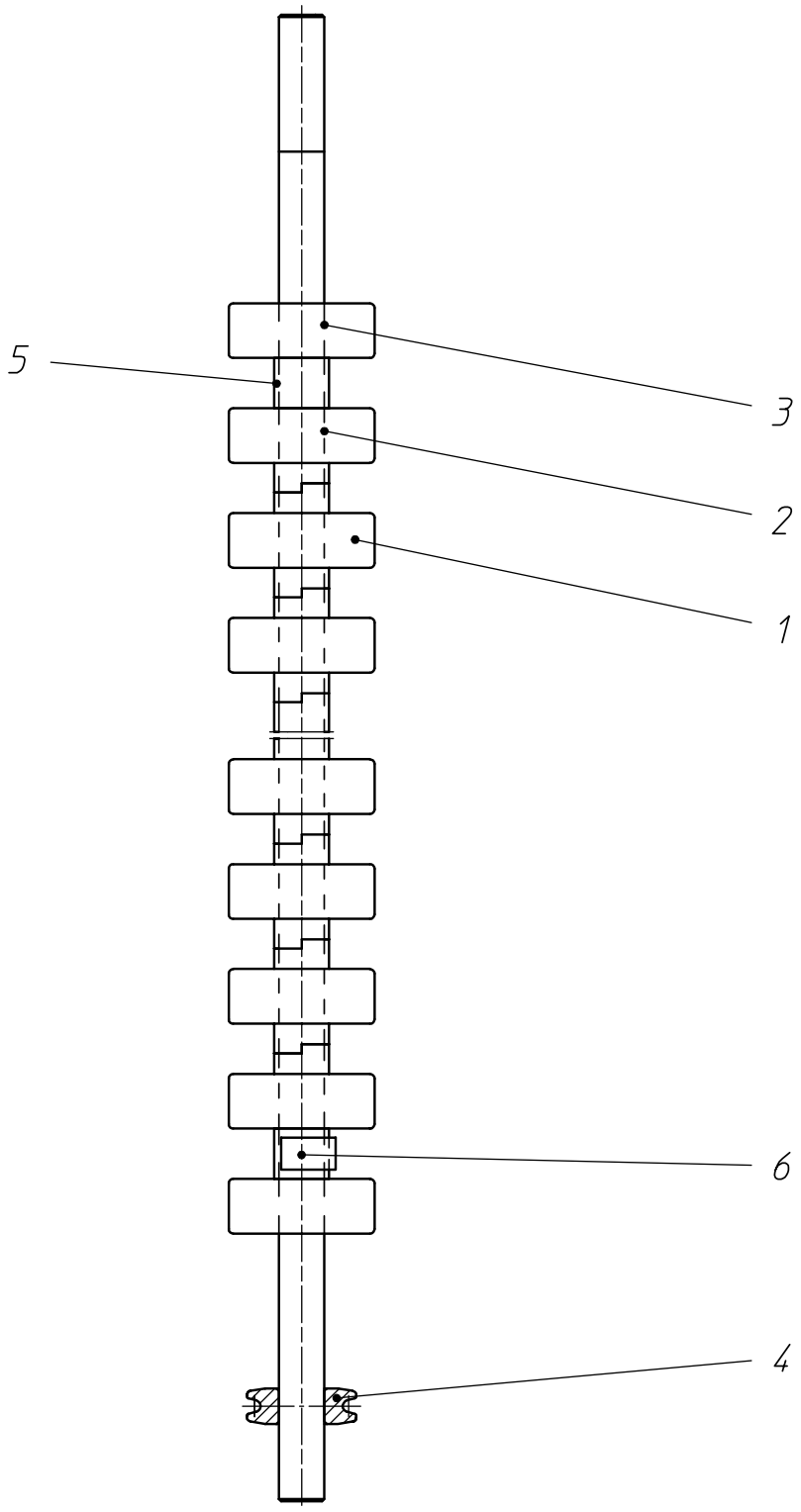
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



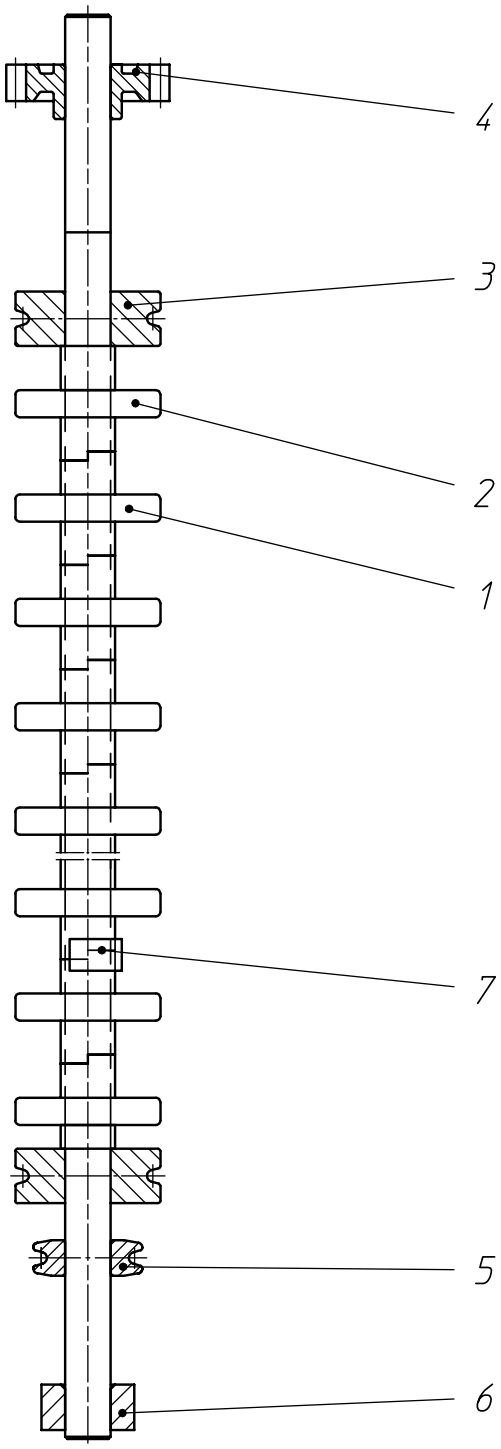
Assembly	: 16.004.1259.2573	Commiss.	: 25-05-377
Label	: Shaft/1KPL/32/O /L/AV/FJ	Position	: 000060
Quant.	: 2,000 ST	Page	: 000198/01
Drawing	: 16.004.1251E0000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0429.00RE BUSHING/PP-R/D=12.0/d=10.2/L=16.75	1,000	ST	X
8	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1251E0000	11
	00



Assembly	: 16.004.1261.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000060
Quant.	: 3,000 ST	Page	: 000199/01
Drawing	: 16.004.1261E0570	Date	: 10.04.2006

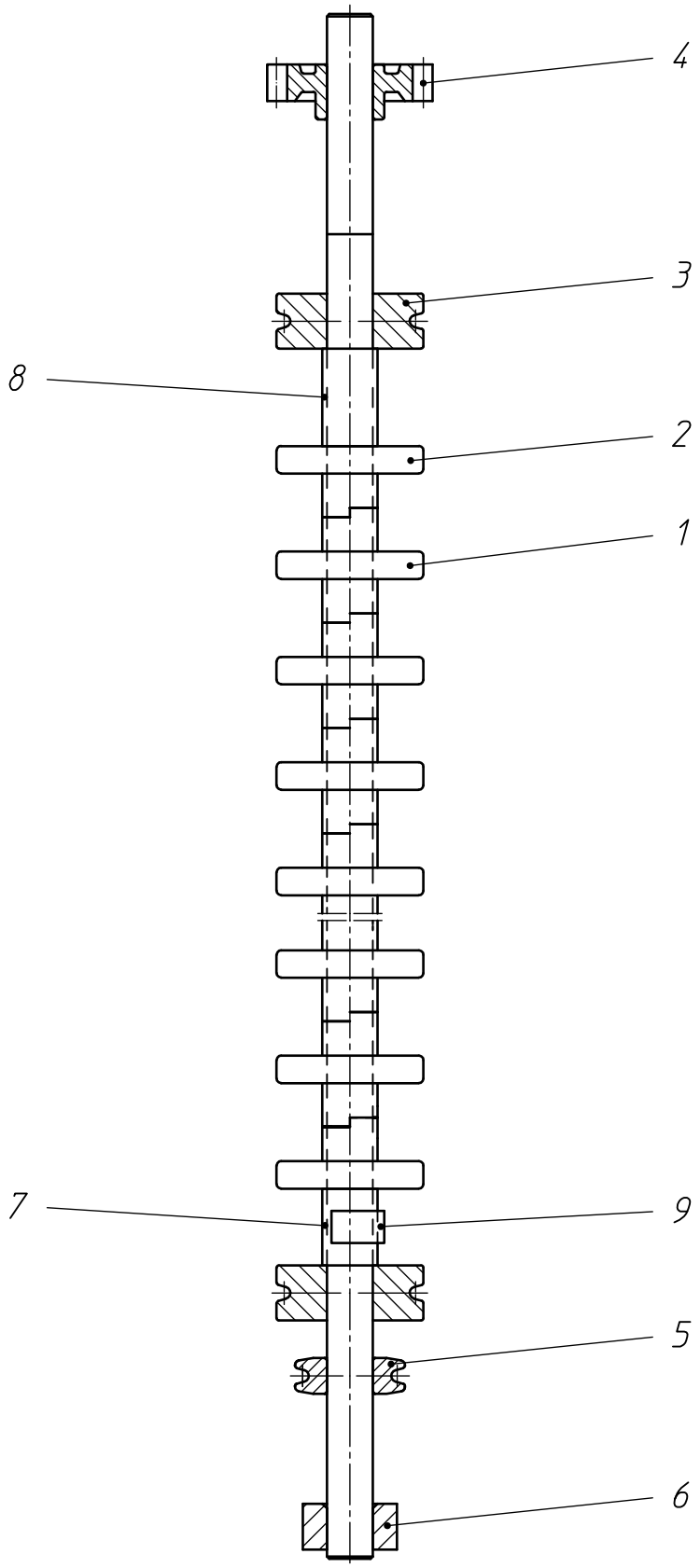
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0429.00RE BUSHING/PP-R/D=12.0/d=10.2/L=16.75	1,000	ST	X
8	00.019.0420.000E BUSHING/PP-G/d=12.0/D=10.2/L=21.25	1,000	ST	X
9	16.004.0870.0040 CLIP/COLOUR MARKING/PP/BLACK/RAL9005	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1261E0570	1/1
	00



Assembly	: 16.004.0559.U003	Commiss.	: 25-05-377
Label	: GEAR WHEEL COMPL /Z=11/M2/TI/PP /=0162	Position	: 000060
Quant.	: 8,000 ST	Page	: 000200/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

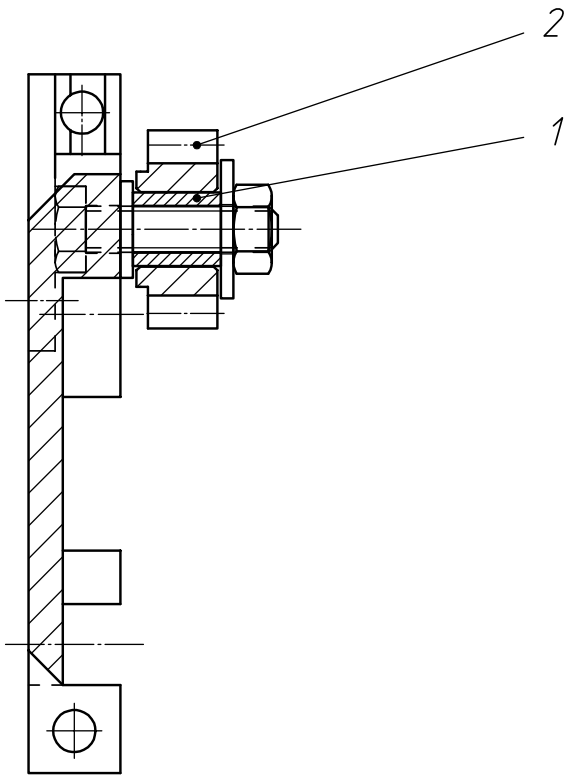
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0003 BUSHING/TIT/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0393.U800	Commiss.	: 25-05-377
Label	: BELT DRIVE/SHAFT/O/SPRAY/FJ	Position	: 000060
Quant.	: 6,000 ST	Page	: 000201/01
Drawing	: 16.004.0393EU000	Date	: 10.04.2006

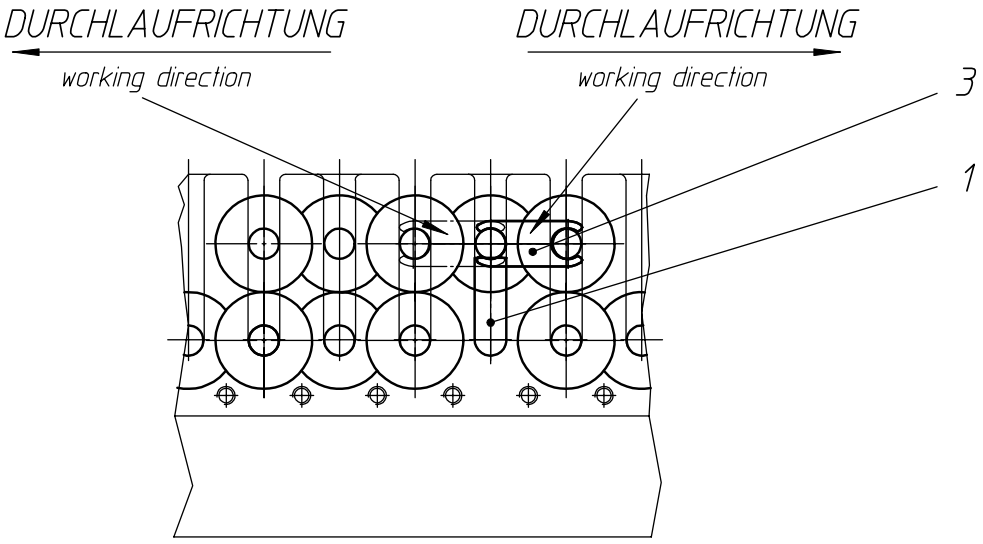
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0084.000H DISTANCE/GUR-N	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1178.000H CLIP/GUR-N/T25/TOP	2,000	ST	X

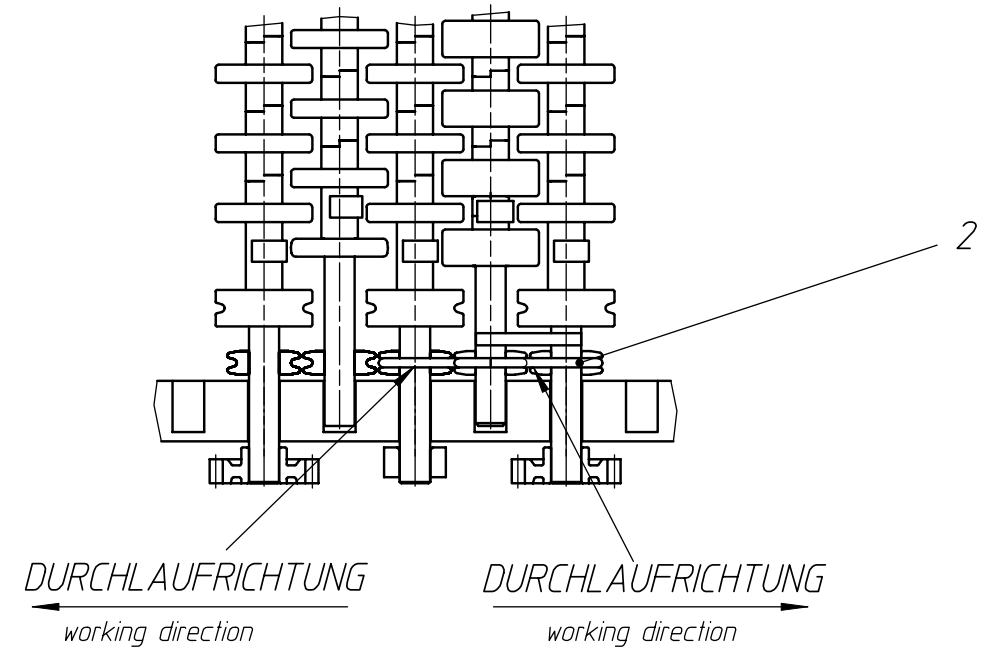
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMENANTRIEB

Spare parts list BELT DRIVE

16.004.0393EU000	11
	00





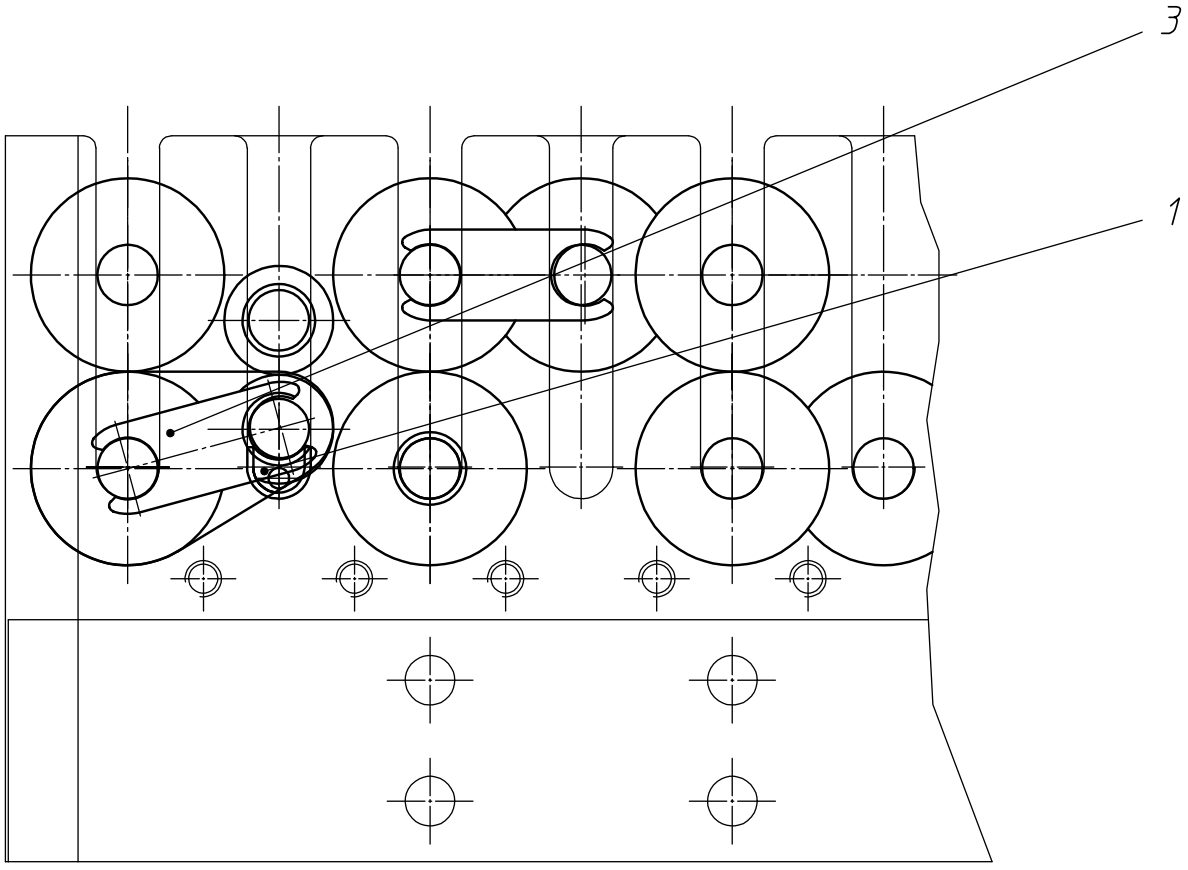
Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000060
Quant.	: 2,000 ST	Page	: 000202/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

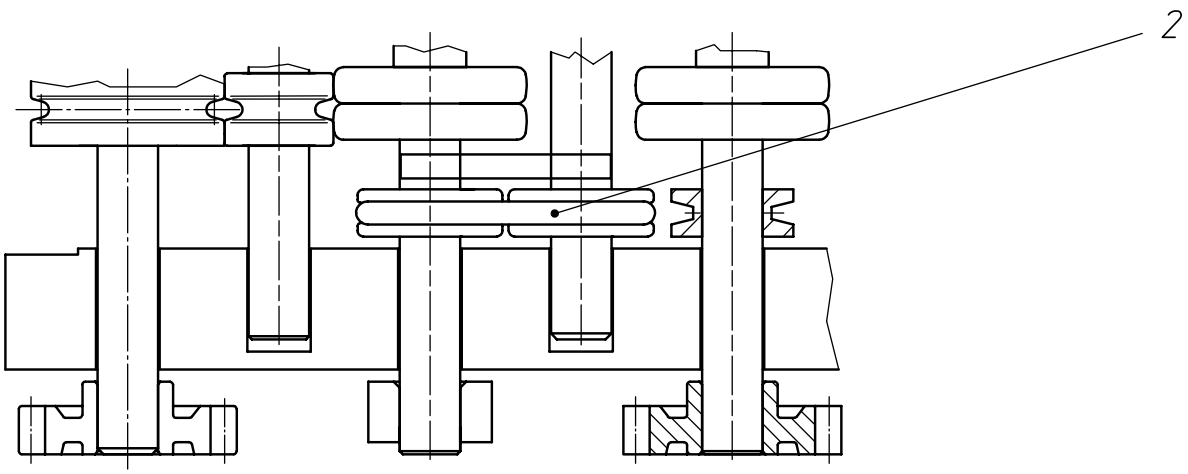
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 16.023.0026.U00E	Commiss.	: 25-05-377
Label	: **PUMP-ANCILLARIES**	Position	: 000060
Quant.	: 1,000 ST	Page	: 000203/01
Drawing	: 16.023.0026EU000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	VE-000000276-000 MULTI VALVE PP/EPDM/16-54 ltr.	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Dosierpumpenzübehör

Spare parts list dosing pump access.

16.023.0026EU000	1/1
	00

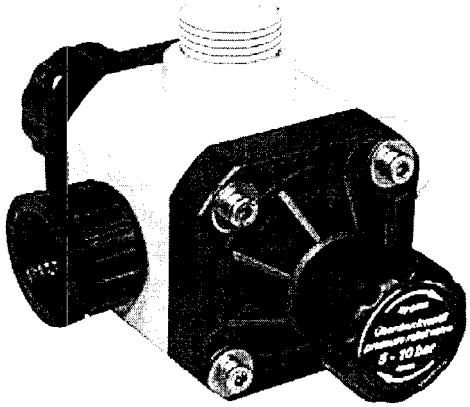
ECOLAB

VE - 000000 276 - 000

Mehrfunktionsventil
Multiple Function Valve
Soupape multifonction

für / for / pour
Elados² EMP II / III (1,4 - 120 l/h)

Bedienungsanleitung | User´s Manual | Notice Technique



417101389 Gebrüder Schmidt 12/2001

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1 Allgemeines

Dieses Technische Handbuch enthält alle Anweisungen zur Installation, Inbetriebnahme, Wartung und Reparatur des Mehrfunktionsventils.

Die Sicherheitshinweise und Hervorhebungen sind in jedem Fall zu beachten!

Gewährleistungsumfang:

Gewährleistung in Bezug auf Betriebssicherheit, Zuverlässigkeit und Leistung des Ventils wird vom Hersteller nur unter folgenden Bedingungen übernommen:

- Montage, Anschluß, Einstellung, Wartung und Reparaturen werden von autorisiertem Fachpersonal durchgeführt.
- Das Ventil wird entsprechend den Ausführungen des Technischen Handbuches verwendet.
- Bei Reparaturen werden nur Original-Ersatzteile verwendet.

1.1 Sicherheits-hinweise

Reparaturarbeiten dürfen **nur** bei ausgeschalteter Dosierpumpe vorgenommen werden.

Bei Wartungs- und Reparaturarbeiten an Teilen, die mit gefährlichen Produkten in Berührung kommen ist wegen der Verletzungsgefahr die vorgeschriebene **Schutzkleidung** (Schutzbrille, Schutzhandschuhe, Schürze) zu tragen.

Bei Reparaturen dürfen nur **Original-Ersatzteile** verwendet werden.

1 General

This technical manual contains all the necessary instructions for the installation, start-up, maintenance and repair of the multiple function valve.

The safety instructions and pointers must always be observed!

Scope of guarantee:

The manufacturer only accepts the guarantee with regard to the operating safety, reliability and capacity of the valve under the following conditions:

- Assembly, connection, adjustment, maintenance and repairs are carried out by authorised, qualified personnel.
- The valve is used in accordance with the instructions in the technical manual.
- Only original spare parts are used for repairs.

1.1 Safety instructions

Repairs may **only** be carried out with plug disconnected from the mains, or when the appliance is off load.

During maintenance and repair work on parts which come into contact with cleaning products, and when replacing the bindings, the pre-scribed **protective clothing** (pro-tective glasses, protective gloves, apron) must be worn because of the danger of irritation.

Only **original spare parts** must be used for repairs.

1 Informations générales

Ce Manuel Technique contient toutes les instructions concernant l'installation, la mise en marche, l'entretien et la réparation de la soupape multifonction.

Les instructions de sécurité et les avertissements doivent toujours être observés !

L'étendue de notre garantie:

Le fabricant garantit la sécurité de fonctionnement, la fiabilité et la performance opérationnelle de la soupape que sous les conditions suivantes :

- Montage, raccordement, réglage, entretien et réparations sont effectués par un personnel autorisé et qualifié.
- La soupape est utilisée conformément aux instructions du présent Manuel Technique.
- En cas de réparations, seules les pièces de rechange d'origine sont utilisées.

1.1 Instructions de sécurité

Toute réparation peut **uniquement** être effectuée si la fiche secteur de la pompe de dosage est débranchée.

À cause des risques de lésion il est absolument nécessaire de porter le **vêtement protecteur** prescrit (lunettes de protection, gants de protection et tablier) chaque fois qu'il faut effectuer travaux d'entretien ou de réparation sur des pièces qui entrent en contact avec des substances dangereuses.

Pour les réparations, seules les **pièces de rechange d'origine** doivent être employées.

1.2 Hervorhebungen

In diesem Handbuch haben die Hervorhebungen **VORSICHT**, **ACHTUNG** und **HINWEIS** folgende Bedeutung:

VORSICHT:

Diese Überschrift wird benutzt, wenn ungenaues Befolgen oder Nichtbefolgen von Bedienungsanweisungen, Arbeitsanweisungen, vorgeschriebenen Arbeitsabläufen und dergleichen zu Verletzungen oder Unfällen führen kann.

ACHTUNG:

Diese Überschrift wird benutzt, wenn ungenaues Befolgen oder Nichtbefolgen von Bedienungsanweisungen, Arbeitsanweisungen, vorgeschriebenen Arbeitsabläufen und dergleichen zur Beschädigung des Gerätes führen kann.

HINWEIS:

Diese Überschrift wird benutzt, wenn auf eine Besonderheit aufmerksam gemacht werden soll.

1.2 Pointers

In this manual, the **CAUTION, ATTENTION** and **NOTE** pointers have the following meanings:

CAUTION:

This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to injury or accident.

ATTENTION:

This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to the device being damaged.

NOTE:

This heading is used if a special feature is being pointed out.

1.2 Avertissements

Dans le présent manuel les avertissements **PRECAUTION, ATTENTION** et **INDICATION** ont la signification suivante :

PRECAUTION:

Cet avertissement est donné si la non-observation partielle ou totale des instructions peut avoir pour conséquence blessure ou accident.

ATTENTION:

Cet avertissement est donné si la non-observation partielle ou totale des instructions peut avoir pour conséquence l'endommagement de l'appareil.

INDICATION:

Cet avertissement est employé pour attirer l'attention sur une caractéristique spéciale ou un point précis.

2 Funktion und Bedienung

2.1 Funktionsbeschreibung

Durch zwei federbelastete Membranen werden folgende Funktionen realisiert:

2 Function and Use

2.1 Functional Description

The following functions are done by two spring loaded diaphragms:

2 Fonctionnement et utilisation

2.1 Description fonctionnelle

Deux membranes équilibrées par ressort réalisent les fonctions suivantes :

a) Ansaughilfe bei Inbetriebnahme der Pumpe gegen Druck.

b) Entleerung und somit Entlastung der Druckleitung bei Stillstand der Anlage.

c) Schutz gegen unzulässigen Überdruck in der Druckleitung (Öffnungsdruck einstellbar).

d) Erzeugung eines Gegendrucks von 1 bar bei Dosierung gegen freien Auslauf.

e) Anti-Siphon-Funktion bei Unterdruck an der Dosierstelle.

a) Suction help for taking into operation of the pump back-pressure.

b) Emptying as well as relief of the pressure line during a standstill of the unit.

c) Protection against unallowed over pressure in the pressure line (opening pressure is adjustable).

d) Generation of a back-pressure of 1 bar while metering free flow.

e) Anti-Siphon function at underpressure at the metering point.

a) Moyen technique d'aspiration à la mise en marche de la pompe contre pression.

b) Vidange et donc décharge de la conduite à pression en cas de l'arrêt du système.

c) Protection contre une surpression inadmissible dans la conduite à pression (pression d'ouverture ajustable).

d) Production d'une contre-pression de 1 bar en cas de dosage contre écoulement libre.

e) Fonction antisiphon en cas d'une dépression à l'emplacement du doseur.

a) Entlüftung (Abb. 2/1)

a) Venting (Fig. 2/1)

a) Purge de l'air (Fig. 2/1)

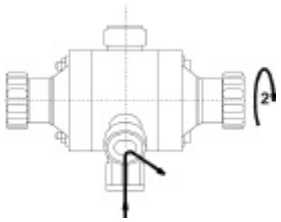


Abb. 2/1 Fig. 2/1 Fig. 2/1

Durch Drehen des Betätigungsknopfes 2 nach rechts (Überdruckventil) wird der Dosiergegendruck entlastet

Wird der Knopf um mehr als ca. 20° gedreht, rastet der Betätigungsknopf in die Ausgangsstellung zurück.

By turning the operation button 2 to the right (pressure relief valve), the metering back pressure is relieved.

If the button is turned more than 20°, it returns to the original position.

En tournant le bouton de commande 2 vers la droite (soupape de surpression) la contre-pression de dosage est réduite.

Se le bouton de commande est tourné de plus de 20°, celui-ci s'encliquete à nouveau dans sa position initiale.

b) Entleerung (Abb. 2/2)

b) Emptying (Fig. 2/2)

b) Vidange (Fig. 2/2)

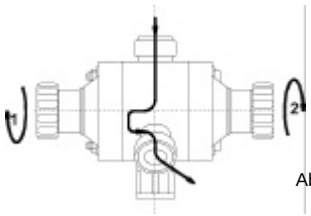


Abb. 2/2 Fig. 2/2 Fig. 2/2

Durch Drehen der beiden Knöpfe 1 und 2 wird die Dosierleitung entleert.

The metering pipe is emptied by turning both buttons 1 and 2.

En tournant les deux boutons 1 et 2 la conduite de dosage est vidée.

c) d) e) (Abb. 2/3)

c) d) e) (Fig. 2/3)

c) d) e) (Fig. 2/3)

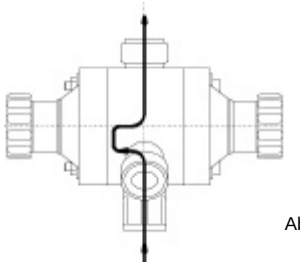


Abb. 2/3 Fig. 2/3 Fig. 2/3

Normalbetrieb mit Druckhaltefunktion und eingestellter Überdruckfunktion.

Regular operation with pressure maintenance function and adjusted overpressure function.

Marche normale avec fonction de maintien de la pression et fonction de surpression ajustée.

3 Installation und Inbetriebnahme

3.1 Hinweise zur Installation (Abb. 3/1)

- Mehrfunktionsventil auf den Druckanschluß der Dosierpumpe aufschrauben.
  - ? O-Ring (Pos. 3) in die O-Ring-Nut legen und Überwurfmutter (Pos. 4) festziehen.
- Dosierleitung anschließen bei Ventilgröße 3/8" und 5/8"
  - ? Schlauch (Pos. 5) gerade abschneiden.
  - ? Überwurfmutter (Pos. 6) und Druckstück (Pos. 7) über Schlauch schieben und zum Anschlagbund auf Anschlußnippel (Pos. 8) stecken.
  - ? O-Ring (Pos. 9) in die O-Ring-Nut legen und Überwurfmutter (Pos. 6) festziehen.
  - ? Rücklaufleitung ebenso anschließen.
- Dosierleitung anschließen bei Ventilgröße 1 ¼"
  - ? O-Ring (Pos. 9) in die O-Ring-Nut legen.
  - ? Kegelteil 12/21 (Pos.8) aufschrauben.
  - ? Schlauch (Pos. 5) gerade abschneiden.
  - ? Überwurfmutter (Pos. 6) und Druckstück (Pos. 7) über Schlauch schieben und zum Anschlagbund auf Anschlußnippel (Pos. 8) stecken.
  - ? Überwurfmutter (Pos. 6) festziehen, eventuell Kegelteil mit Schlüssel gegenhalten.

VORSICHT:

Die Rücklaufleitung (Entlüftungsleitung) muß immer angeschlossen werden. Das Mehrfunktionsventil ist kein absolut abdichtendes Absperrorgan. Der Mindestquerschnitt muß entsprechend der Ventilgröße eingehalten werden (siehe Punkt 8).

3 Installation and Start-up

3.1 Installation Instructions (Fig. 3/1)

- Screw the multiple function valve on the pressure connection of the metering pump.
  - ? Put the O-ring (Pos. 3) in the O-ring-nut and tighten the union nut (Pos. 4).
- Connecting the metering hose with valve size 3/8" and 5/8"
  - ? Cut the hose (Pos. 5) evenly.
  - ? Place the union nut (Pos. 6) and the thrust piece (Pos. 7) over the hose up to the stop collar on the connection nipple (Pos. 8).
  - ? Place the o-ring (Pos. 9) in the o-ring-nut and tighten the union nut (Pos. 6).
  - ? Also connect the return line.
- Connecting the metering hose with valve size 1 ¼"
  - ? Place the o-ring (Pos. 9) in the o-ring-nut.
  - ? Screw on tapered part 12/21 (Pos.8).
  - ? Cut the hose (Pos. 5) evenly.
  - ? Place the union nut (Pos. 6) and the thrust piece (Pos. 7) over the hose up to the stop collar on the connection nipple (Pos. 8).
  - ? Tighten up union nut (Pos. 6) and perhaps keep the tapered part by using a key.

WARNING:

The return line (venting line) must always be connected. The multiple function valve is not an absolute sealing shut-off device. The minimal cross section must correspond to the valve size (see Point 8).

3 Installation et mise en marche

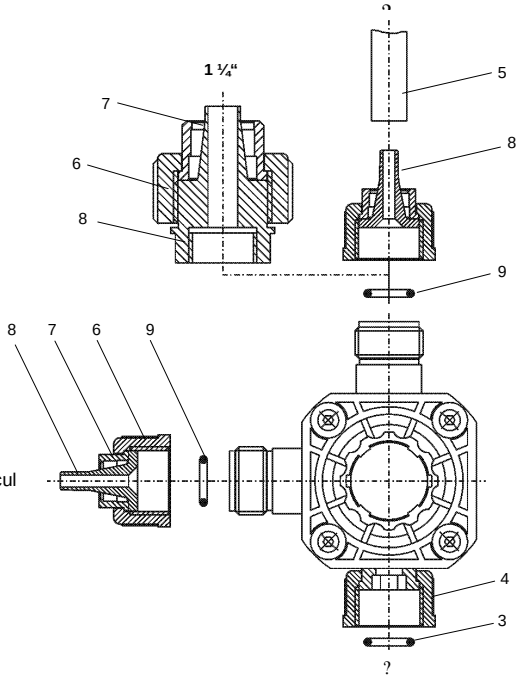
3.1 Indications concernant l'installation (Fig. 3/1)

- Visser la soupape multifonction sur le raccord de refoulement de la pompe de dosage.
  - ? Placer le joint torique (Rep. 3) dans la rainure prévue et serrer l'écrou-raccord (Rep. 4).
- Raccorder la conduite de dosage avec soupape de dimension 3/8" et 5/8"
  - ? Couper le tuyau (Rep. 5) proprement.
  - ? Pousser écrou-raccord (Rep. 6) et bague de serrage (Rep. 7) sur le tuyau et enficher le tuyau dans le raccord (Rep. 8) jusqu'au collet de butée.
  - ? Placer le joint torique (Rep. 9) dans la rainure prévue et serrer l'écrou-raccord (Rep. 6).
  - ? Raccorder la conduite de retour de la même façon.
- Raccorder la conduite de dosage avec soupape de dimension 1 ¼"
  - ? Poser le joint torique (Rep. 9) dans la rainure du joint torique.
  - ? Visser la pièce conique 12/21 (Rep.8).
  - ? Couper le tuyau (Rep. 5) proprement.
  - ? Pousser écrou-raccord (Rep. 6) et bague de serrage (Rep. 7) sur le tuyau et enficher le tuyau dans le raccord (Rep. 8) jusqu'au collet de butée.
  - ? Serrer l'écrou-raccord (Rep. 6), à fond, et éventuellement retenir la pièce conique à l'aide d'une clé.

PRECAUTION :

La conduite de retour (conduite de purge) doit toujours être branchée. La sou-pape multifonction ne représente pas un organe d'arrêt qui rende absolu-ment étanche. La coupe transversale minimum doit être conforme à la dimen-sion de la soupape (voir point 8).

Dosierleitung / metering line / Conduite de dosage



3 O-Ring
4 Überwurfmutter
5 Schlauch
6 Überwurfmutter
7 Druckstück
8 Anschlußnippel
9 O-Ring

3 O-ring
4 union nut
5 hose
6 union nut
7 thrust piece
8 connection nipple
9 o-ring

3 joint torique
4 écrou-raccord
5 tuyau
6 écrou-raccord
7 bague de serrage
8 le ajutage
9 joint torique

Rücklauf / return / recul

Dosierpumpe / metering pump / pompe de dosage

Abb. 3/1 Fig. 3/1 Fig. 3/1

3.2 Inbetriebnahme (Abb. 3/2)

- Sicherstellen, daß die Dosierleitung an keiner Stelle abgesperrt ist.
- Entlüftung: Betätigungsknopf (Pos.2) (Überdruckventil) nach rechts drehen und so lange halten, bis das Dosiermedium blasenfrei in die Rücklaufleitung eintritt, dann Betätigungsknopf auslassen.

3.2 Start up (Fig. 3/2)

- Ensure that the metering line is not shut off at any place.
- Ventilation: turn the operation button (Pos.2) (overpressure valve) to the right and hold until the metering product is gas-free in the return line, than release the operation button.

3.2 Mise en marche (Fig. 3/2)

- Vérifier que la conduite de dosage n'est bloquée nulle part.
- Purge de l'air : tourner le bouton de commande (Rep. 2) (soupape de surpression) à droite. Retenir le bouton jusqu'à ce que l'agent de dosage coule dans la conduite de retour sans former de bulles. Ensuite, relâcher le bouton de commande.

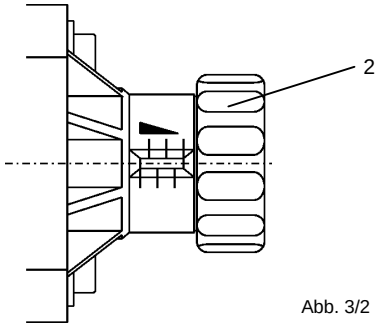


Abb. 3/2 Fig. 3/2 Fig. 3/2

4 Wartung (Abb. 4/1)

VORSICHT:

Die Wartung darf nur von sachkundigen und autorisierten Personen durchgeführt werden.

4 Maintenance (Fig. 4/1)

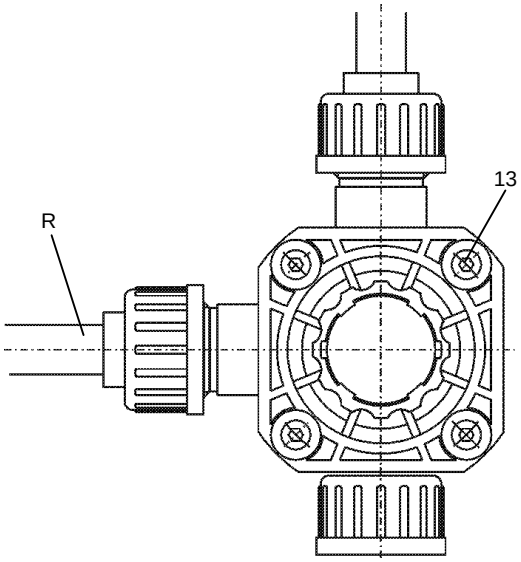
WARNING:

The maintenance may only be carried out by professional and authorised persons.

4 Entretien (Fig. 4/1)

PRECAUTION :

L'entretien doit toujours être effectué par des personnes autorisées et qualifiées.



13 Gehäuseschrauben
R Rücklaufleitung

13 casing screws
R return line

13 vis du boîtier
R Conduite de retour

Abb. 4/1 Fig. 4/1 Fig. 4/1

Empfohlen wird die Kontrolle von:

- Saug- und Druckleitung auf leck-freien Anschluß
- Rücklaufleitung (R) am Ventil (Membranbruch)
- festen Sitz der Gehäuseschrauben (Pos. 13 (3 - 4 Nm))

Recommended is to control the following:

- Suction and pressure lines for leak-free connections
- Return line (R) at the valve (breakage of the diaphragm)
- proper fitting of the casing screws (Position 13 (3 - 4 Nm))

Les vérifications suivantes sont recommandées :

- Vérifier que les raccords des conduites d'aspiration et de dosage n'aient pas de fuites
- Conduite de retour (R) sur la soupape (déchirure de la membrane)
- Contrôler si les vis du boîtier (Rep. 13 (3 - 4 Nm)) ont été bien serrées

5 Austausch der Membrane (Abb. 5/1)

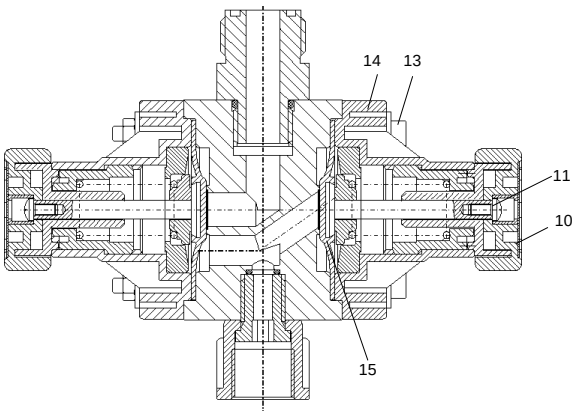
Dosierpumpe abschalten und Druckleitung entleeren (Funktion b unter Pkt. 2.1) Gehäuseschrauben (Pos. 13) lösen und Ventildeckel (Pos. 14) abnehmen. Abdeckscheibe (Pos. 10) am Betätigungsknopf per Hand oder mit einem kleinen Schraubenzieher entfernen. Schraube (Pos. 11) lösen und Membrane (Pos. 15) austauschen. Die Gehäuseschrauben gleichmäßig diagonal anziehen (3-4 Nm).

5 Replacement of the Diaphragm (Fig. 5/1)

Switch the metering pump off and empty the pressure line (function B under point 2.1). Loosen the casing screws (Pos. 13) and remove the valve lid (Pos. 14). Remove the sealing plug (Pos. 10) on the opera-ion button either manually or with a small screwdriver. Loosen the screw (Pos. 11) and replace the diaphragm (Pos. 15). Tighten the casing screws diagonally equally (3-4 Nm).

5 Remplacement de la membrane (Fig. 5/1)

Débrancher la pompe de dosage et vider la conduite à pression (fonction b au point 2.1), détacher les vis du boîtier (Rep. 13) et ôter le couvercle de la soupape (Rep. 14). Enlever le disque de recouvrement (Rep. 10) sur le bouton de commande à main ou bien avec un petit tournevis. Puis, desserrer la vis (Rep. 11) et échanger la membrane (Rep. 15). Serrer les vis du boîtier uniformément et de façon cruciforme (3-4 Nm).



10	Abdeckscheibe	
11	Schraube	
13	Gehäuseschrauben	
14	Ventildeckel	
15	Membrane	
10	sealing plug	
11	scres	
13	casing screws	
14	valve lid	
15	diaphragm	
10	disque de recouvrement	
11	vis	
13	vis du boîtier	
14	couvercle de la soupape	
15	membrane	

Abb. 5/1 Fig. 5/1 Fig. 5/1

VORSICHT:

Beim Lösen der Schraube (Pos. 11) muß aufgrund der Federvorspannung unbedingt die Membrane gehalten werden.

WARNUNG:

The diaphragm must be held when the screw (Pos. 11) is being loosened due to the spring tension.

PRECAUTION :

Au dévissage de la vis (Rep. 11) il faut absolument tenir la membrane à cause de la prétension du ressort.

HINWEIS:

Ventilschrauben-Anzugsmoment nach 24 Stunden nachziehen. Anzugsmoment 3 - 4 Nm.

NOTE:

The tightening torque of the valve screws must be re-tightened after 24 hours. The tightening torque is 3-4 Nm.

INDICATION :

Resserrer le couple initial de démarrage des vis de soupape après 24 heures. Le couple de démarrage est de 3 - 4 Nm.

6 Abmessungen, Anschlüsse (Abb. 6/1)

6 Measurements, Connections (Fig. 6/1)

6 Dimensions, connecteurs (Fig. 6/1)

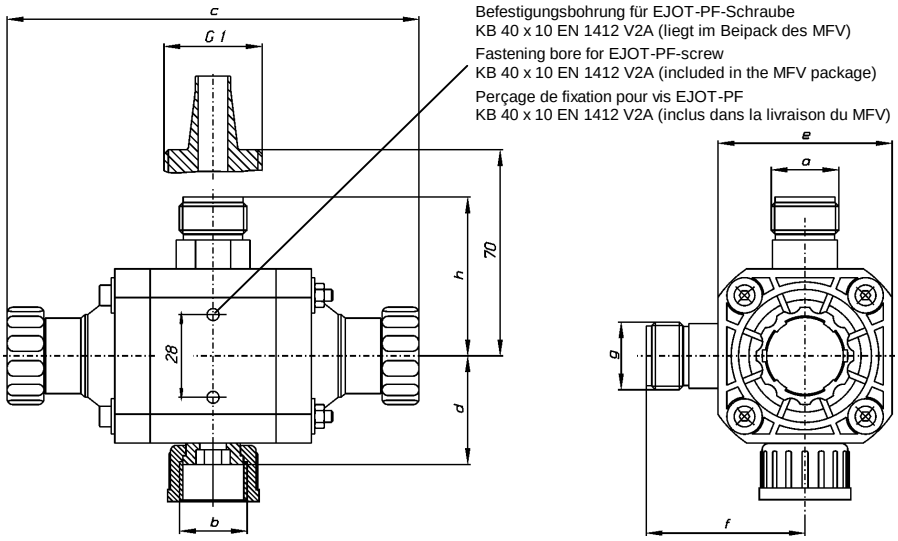


Abb. 6/1 Fig. 6/1 Fig. 6/1

Ventilgröße Valve size Dimension de la soupape	a	b	c	d	e	f	g	h
I	G 5/8	G 3/8	140	36	59	54	5/8“	54
II	G 5/8	G 5/8	140	37	59	54	5/8“	54
III	G 1*	G 1 ¼	140	53,5	59	54	5/8“	70* (54)

* mit Anschlußteil für PVC-Gewebeschlauch ID/AD 12/21

* with connection part for PVC hose ID/OD 12/21

* avec pièce de raccordement pour tuyau souple en C.V.P. à tissu DI/DE 12/21

7 Technische Daten 7 Technical Data 7 Spécifications techniques

Ventilgröße Valve size Dimension de la soupape	**I** G 3/8“	**II** G 5/8“	**III** G 1¼“
Überdruckfunktion Overpressure function Fonction de surpression	Werkseinstellung Manufacturing adjustment Réglage à l'usine	**3 bar + 20 %**	
Druckhaltefunktion Pressure maintenance function Fonction de maintien de la pression	0,5 – 1 bar		
Durchfluß max l/h Flow max l/h Débit max l/h	12 l/h	54 l/h	120 l/h
Anschluß Eingangsseite Input side connection Raccordement sur le côté d'entrée	G 3/8“	G 5/8“	G 1 ¼“
Anschluß Ausgangsseite Output side connection Raccordement sur le côté de sortie */**	ID/AD 4/6, 6/8 für Rohr PE ID/OD 4/6, 6/8 for Pipe PE DI/DE 4/6, 6/8 pour tube PE ID/AD 6/12 für PVC Gewebeschlauch ID/OD 6/12 for PVC textile-reinforced hose DI/DE 6/12 pour tuyau souple en C.V.P. à tissu	ID/AD 6/12 für PVC-Gewebeschlauch ID/OD 6/12 for PVC-textile-reinforced hose DI/DE 6/12 pour tuyau souple en C.V.P. à tissu	ID/AD 12/21für PVC Gewebeschlauch ID/OD 12/21for PVC textile-reinforced hose DI/DE 12/21 pour tuyau souple en C.V.P. à tissu
Anschluß Rücklauf Return connection Raccordement recul	ID/AD 4/6; 6/8 für Rohr PE ID/OD 4/6; 6/8 for Pipe PE DI/DE 4/6, 6/8 pour tube PE ID/AD 6/12 für PVC-Gewebeschlauch ID/OD 6/12 for PVC- textile-reinforced hose DI/DE 6/12 pour tuyau souple en C.V.P. à tissu	ID/AD 6/12 für PVC-Gewebeschlauch ID/OD 6/12 for PVC-textile-reinforced hose DI/DE 6/12 pour tuyau souple en C.V.P. à tissu	ID/AD 12/21 für PVC-Gewebeschlauch ID/OD 12/21 for PVC-textile-reinforced hose DI/DE 12/21 pour tuyau souple en C.V.P. à tissu
Mindestquerschnitt der Rücklaufleitung Minimal cross section of the return line Coupe transversale minimum de la conduite de retour	NW 4	NW 6	NW 9

ACHTUNG:

* Bei den Dosierleitungen sind die max. zulässigen Druck bereiche zu beachten!

** andere Anschlußgrößen auf Anfrage

CAUTION:

* The maximum permitted pressure range must be respected in the metering lines!

** connection sizes on request

ATTENTION :

* Il faut observer le maximum admissible des plages de pression dans les conduites de dosage !

** autres dimensions de raccorde ment sur demande

Medienberührte Werkstoffe:		Parts which come in contact with the metering product:		Matériaux en contact avec le milieu :	
Ventilkörper:	PP ohne Glasfaser-verstärkung	Valve unit:	PP without glass	Corps de soupape :	PP sans renforce-ment à fibre de verre
Membrane:	PTFE-EPDM-Verbundmembrane	Diaphragm:	PTFE-EPDM compound diaphragm	Membrane :	PTFE-EPDM-membrane composite
O-Ringe:	Viton B und wahlweise EPDM	O-rings:	Viton B and alternatively EPDM	Joints toriques :	Viton B et EPDM optionnellement

8 Verschleiß- und Ersatzteile

8 Wearing and replacementparts

8 Pièces d'usure et de rechange

Pos. Item Rep.n°	Beschreibung	Description	Description	Artikel-Nr. Article-No. Référence
1	Grundkörper für 3/8" Grundkörper für 5/8" und 1 ¼"	Basic body for 3/8" Basic body for 5/8" and 1 ¼"	Corps de base pour 3/8" Corps de base pour 5/8" et 1 ¼"	34904041 34904042
2	Betätigungsknopf	Control button	Bouton d' opération	34904005
3	O-Ring EPDM 281 - für 3/8" (10x2,5) - für 5/8" (12x2,5) - für 1 ¼" (28,17x3,53) O-Ring FPM 602 - für 3/8" (10x2,5) - für 5/8" (12x2,5) - für 1 ¼" (28x3,5)	O-Ring EPDM 281 - for 3/8" (10x2,5) - for 5/8" (12x2,5) - for 1 ¼" (28,17x3,53) O-Ring FPM 602 - for 3/8" (10x2,5) - for 5/8" (12x2,5) - for 1 ¼" (28x3,5)	Joint torique EPDM 281 - pour 3/8" (10x2,5) - pour 5/8" (12x2,5) - pour 1 ¼" (28,17x3,53) Joint torique FPM 602 - pour 3/8" (10x2,5) - pour 5/8" (12x2,5) - pour 1 ¼" (28x3,5)	 417001080 417001102 417001277 417003327 417003334 417003593
4	Überwurfmutter 3/8" Überwurfmutter 5/8" Überwurfmutter 1 ¼"	Union nut 3/8" Union nut 5/8" Union nut 1 ¼"	Écrou-raccord 3/8" Écrou-raccord 5/8" Écrou-raccord 1 ¼"	34720160 34500133 415099835
6	Überwurfmutter 5/8" (3/8" und 5/8"-Ventil) Überwurfmutter 1" (1 ¼"-Ventil)	Union nut 5/8" (3/8" and 5/8" valves) Union nut 1" (1 ¼" valve)	Écrou-raccord 5/8" (vannes 3/8" et 5/8") Écrou-raccord 1" (1 ¼"-Ventil)	34500133 415099835
7	Druckstück 4/6 Druckstück 6/8 Druckstück 6/12 Druckstück 12/21	4/6 thrust piece 6/8 thrust piece 6/12 thrust piece 12/21 thrust piece	Bague de serrage 4/6 Bague de serrage 6/8 Bague de serrage 6/12 Bague de serrage 12/21	34500187 34500186 38610302 34904032
8	Anschlußnippel 4/6 Anschlußnippel 6/8 Anschlußnippel 6/12 Anschlußteil 12/21	4/6 connection nipple 6/8 connection nipple 6/12 connection nipple 12/21 connecting piece	Raccord fileté 4/6 Raccord fileté 6/8 Raccord fileté 6/12 Pièce de raccordement 12/21	34900232 34900230 34900231 34904031

Pos. Item Rep.n°	Beschreibung	Description	Description	Artikel-Nr. Article-No. Référence
9	O-Ring 12 x 2,5 - EPDM 281 - FPM 602	O-Ring 12 x 2,5 - EPDM 281 - FPM 602	Joint torique 12 x 2,5 - EPDM 281 - FPM 602	 417001102 417003334
10	Abdeckscheibe - Druckseite - Überströmseite '1-5 bar'	Covering disk - delivery side - overflow side '1-5 bar'	Disque de recouvrement - côté pression - côté trop-plein '1-5 bar'	 34904020 34904021
11	Schraube	Srew	Vis	34904033
13	Gehäuseschrauben	Casing screws	Vis du boîtier	413031015
14	Ventildeckel - mit Sichtfenster - ohne Sichtfenster	Valve lid - with control window - without control window	Couvercle de la soupage - avec voyant - sans voyant	 34904002 34904003
15	Membrane	Diaphragm	Membrane	34904023
16	Adapter M16-G5/8"	Fitting piece M16-G5/8"	Adaptateur M16-G5/8"	34904038
17	O-Ring 12 x 2,5 - EPDM 281 - FPM 602	O-Ring 12 x 2,5 - EPDM 281 - FPM 602	Joint torique 12 x 2,5 - EPDM 281 - FPM 602	 417001102 417003334
18	Adapter MFV - M12-3/8" - M16-5/8" - M16-1 ¼"	Fitting piece MFV - M12-3/8" - M16-5/8" - M16-1 ¼"	Adaptateur MFV - M12-3/8" - M16-5/8" - M16-1 ¼"	 34904043 34904044 34904029
19	O-Ring für 3/8"-Ventil - 6 x 1,5 EPDM 281 - 6 x 1,5 FPM 602 O-Ring für 5/8 und 1 ¼"-Ventil - 13 x 2 EPDM 281 - 13 x 2 FPM 602	O-Ring for 3/8" valve - 6 x 1,5 EPDM 281 - 6 x 1,5 FPM 602 O-Ring for 5/8 and 1 ¼" valve - 13 x 2 EPDM 281 - 13 x 2 FPM 602	Joint torique pour vanne 3/8" - 6 x 1,5 EPDM 281 - 6 x 1,5 FPM 602 Joint torique pour vannes 5/8 et 1 ¼" - 13 x 2 EPDM 281 - 13 x 2 FPM 602	 417001033 417003304 417001942 417003595

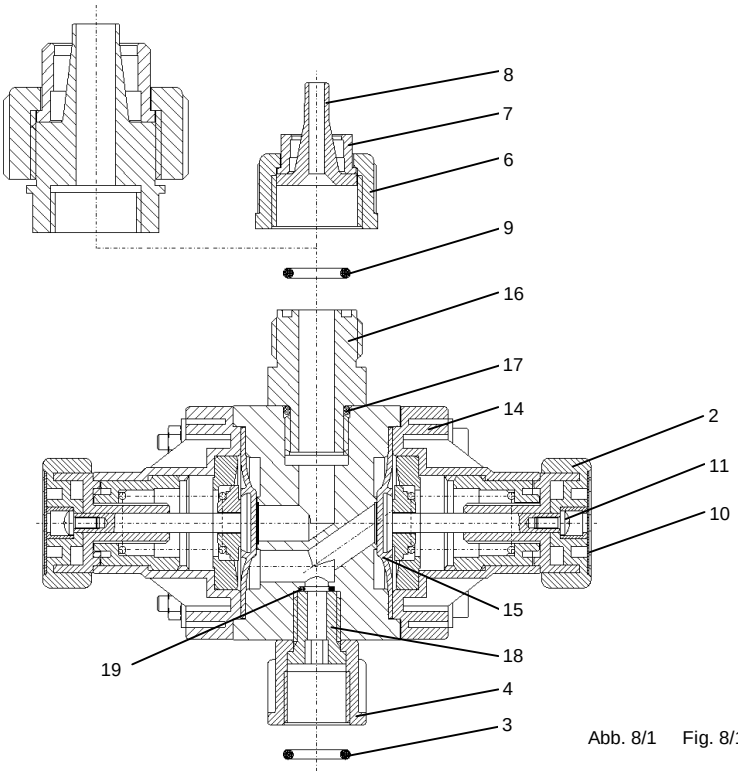


Abb. 8/1 Fig. 8/1 Fig. 8/1

Assembly	: 25-05-377-05	Commiss.	: 25-05-377
Label	: M05, Cascade-Rinse - KSM 3 PVC/TI	Position	: 000070
Quant.	: 1,000 ST	Page	: 000204/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.KSM3.20.0N CONTAINER[520]KSM3/PVC/TI	1,000	ST	
	16.05.KS00.42.0A INLET/2AS/PVC/DIRT CATCHER D=40	3,000	ST	
1	16.005.0008.2H1B SPRAYPIPE/PVC-D/ 650/ 6D/F/G/ 8,04L/MIN	4,000	ST	X
2	16.005.0206.2A4A BLAST PIPE CPL./0650/H80/BJ	2,000	ST	X
	16.008.0004.U003 PUMP FIXING/TI/PP-G/EPDM	3,000	ST	
	50.003.0008.U000 TA/AS/0.37kW/OF/ET=270/ETLB-25-125	3,000	ST	
	16.004.0126.U23N CONVEYOR/ST/23/PVC/TI/KL-KU/d=27	1,000	ST	
	VS-25-05-377-05 CONVEYOR/KSM [K] 3/650/PVC/TI	1,000	ST	
	16.005.0086.U00A INLET/PVC/DFM640/GK-MIN/MV/D=20	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.02.KSM3.20.0N	Commiss.	: 25-05-377
Label	: CONTAINER[520]KSM3/PVC/TI	Position	: 000070
Quant.	: 1,000 ST	Page	: 000205/01
Drawing	: 16.02.FA01E02.00	Date	: 10.04.2006

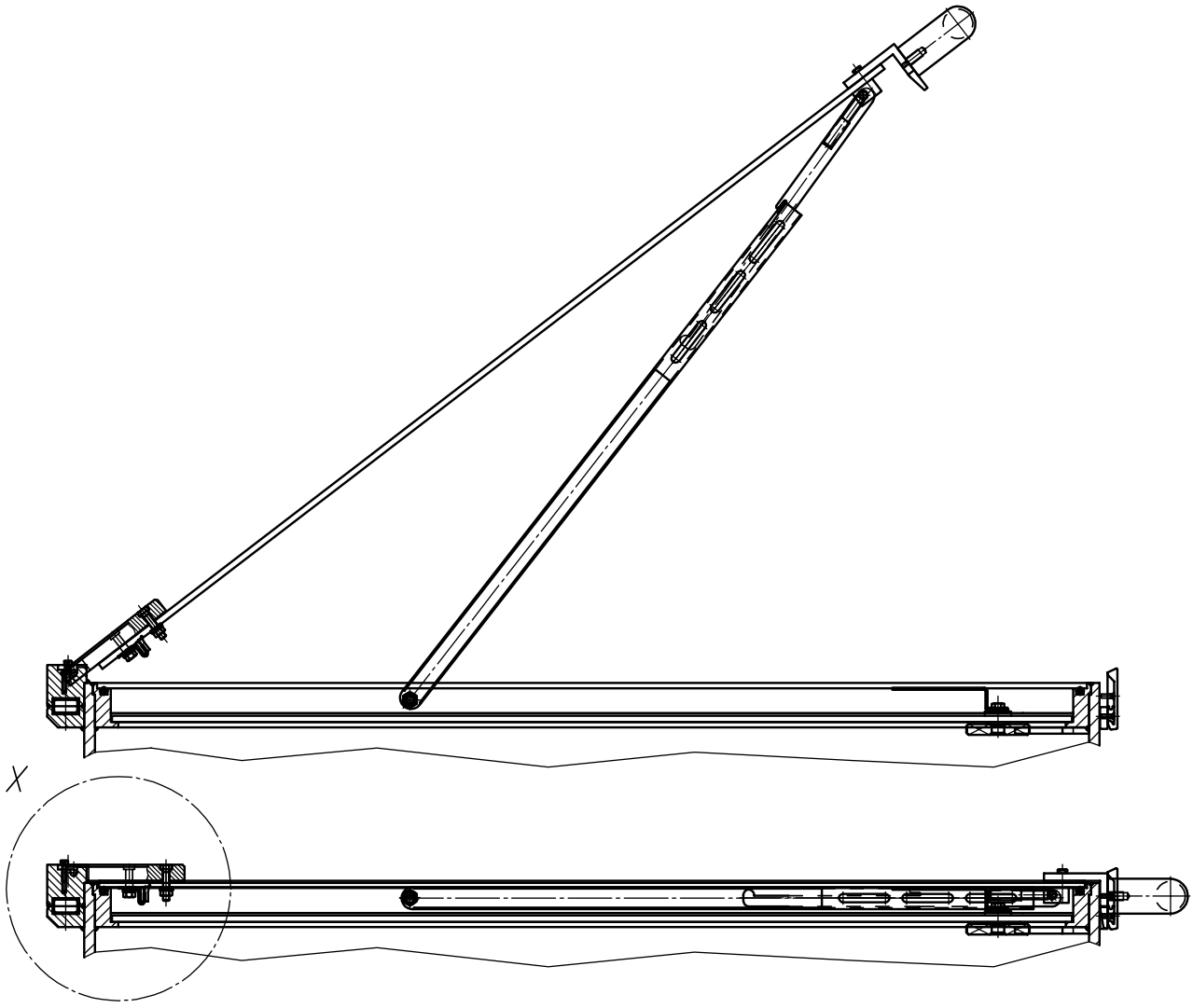
Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0141.U23N GLASS COVER[520]/23/PVC/TI	1,000	ST	
1	16.002.0508.0760 PROFILE/"VITON B"	,815	M	X
	16.07.KSM3.02.0A DRAIN/PVC/KSM5/D=50	1,000	ST	
	16.012.0003.U23A CABLE CHANNEL/CPL./023/PVC/BS	1,000	ST	

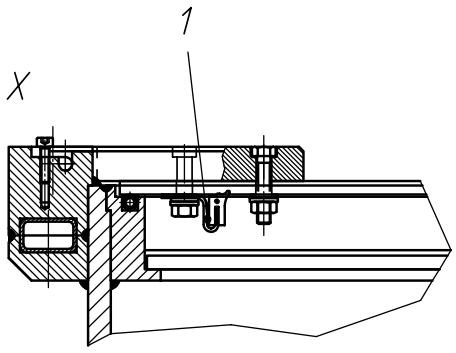
Parts without Pos.-N° see assembly parts list

Ersatzteilliste BEHÄLTER U. VERKLEI.

Spare parts list Housing with accessories

16.02.FA01E02.00 | 11/02





Assembly	: 16.002.0141.U23N	Commiss.	: 25-05-377
Label	: GLASS COVER[520]/23/PVC/TI	Position	: 000070
Quant.	: 1,000 ST	Page	: 000206/01
Drawing	: 16.002.0141EU000	Date	: 10.04.2006

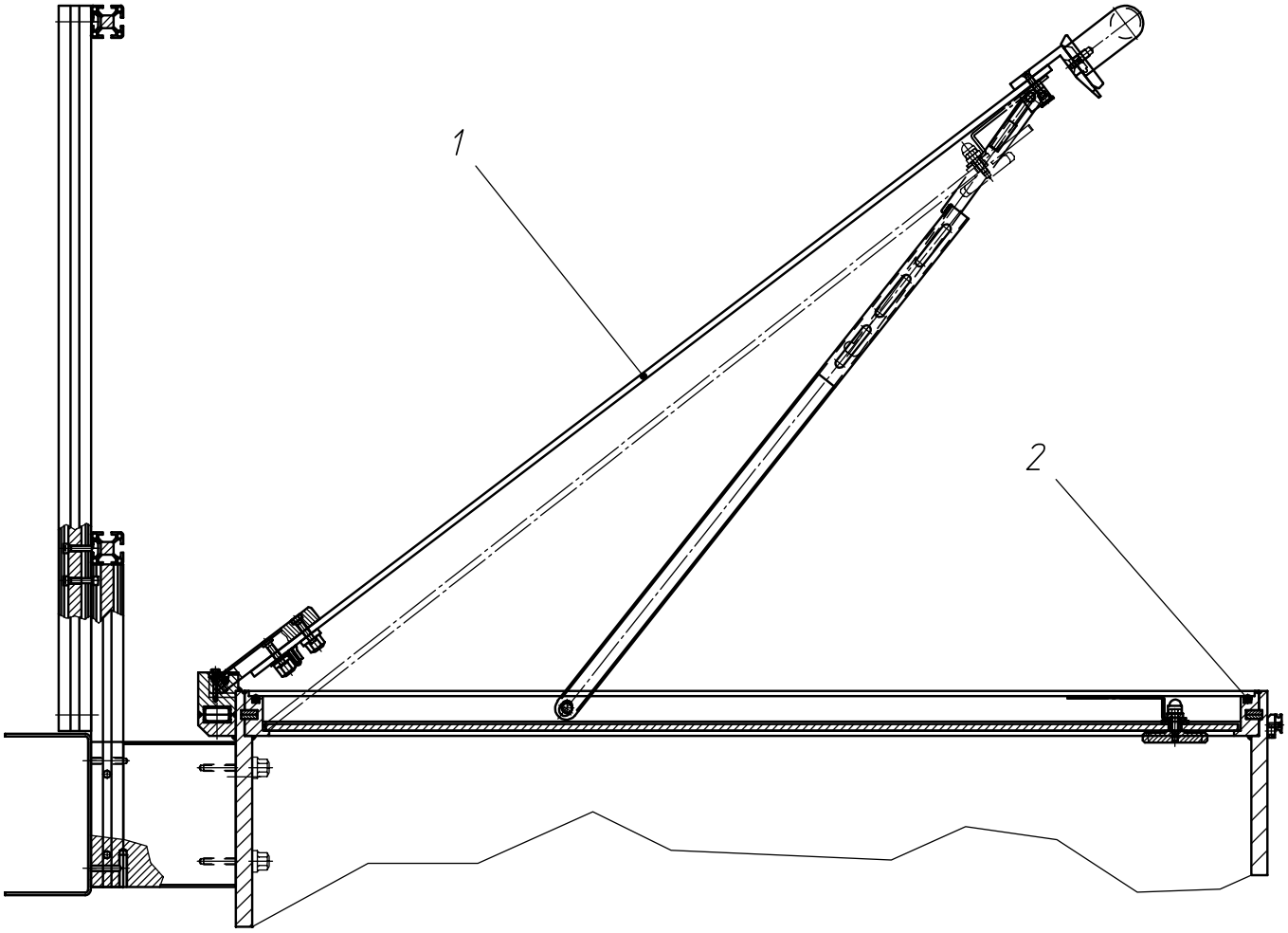
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0022.2230 GLASS COVER/23/0650/0843x0932x06	1,000	ST	X
	16.002.0142.U00N COVER PARTS/PVC/TIT	1,000	ST	
2	16.002.1178.2230 GLASS COVER SEALING/A/23/0650/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list GLASS COVER

16.002.0141EU000	11
	00



Assembly	: 16.002.0142.U00N	Commiss.	: 25-05-377
Label	: COVER PARTS/PVC/TIT	Position	: 000070
Quant.	: 1,000 ST	Page	: 000207/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

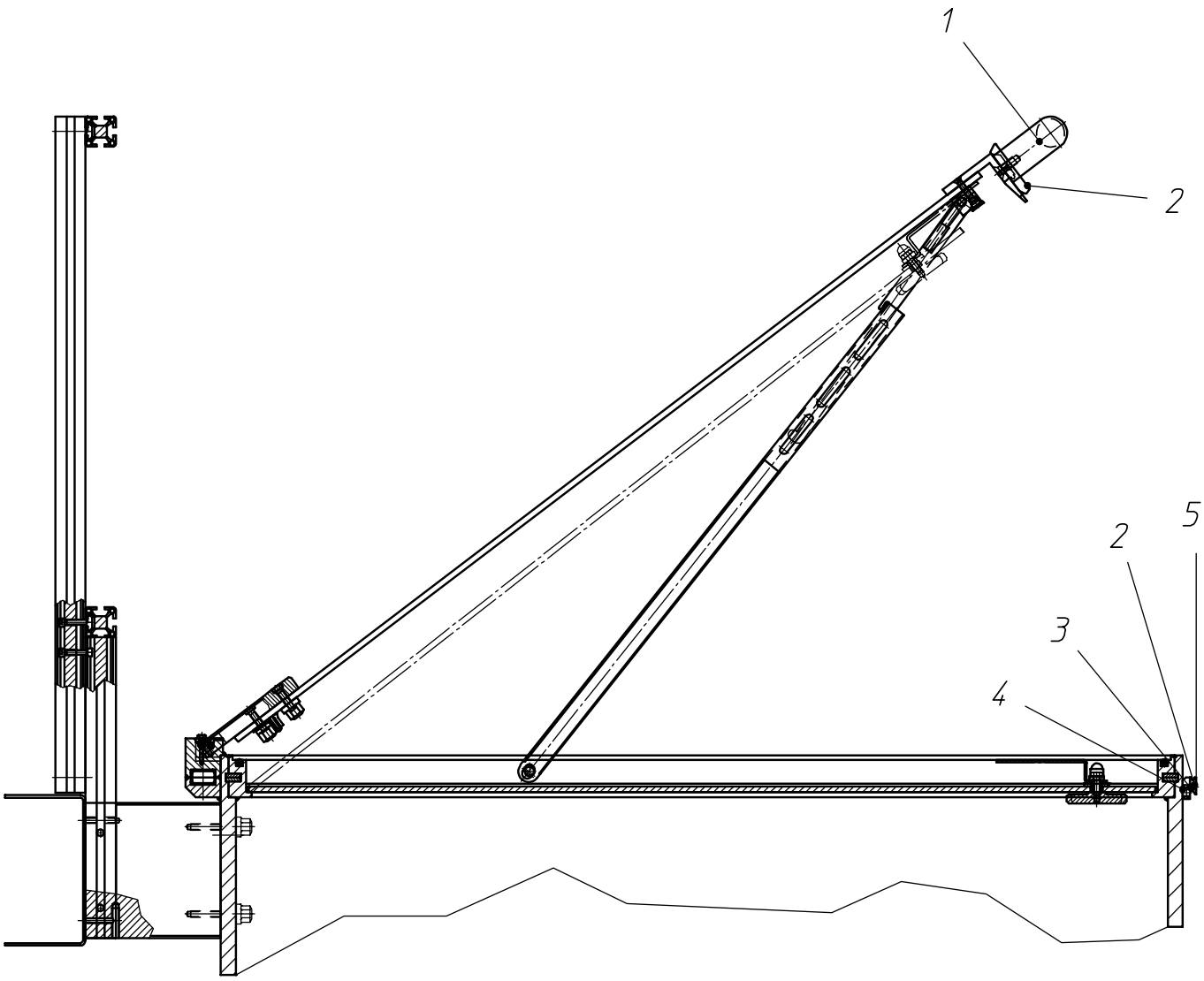
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
3	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
4	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
HAMLIN

www.breedelectronics.com

59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

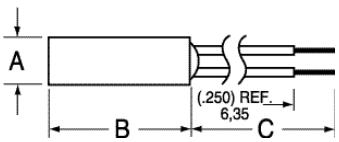
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

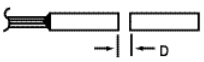
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

INFORMATION PROVIDED ON THIS DATA SHEET IS PROVIDED FOR INFORMATION PURPOSES ONLY AND SHOULD NOT BE RELIED UPON AS BEING ACCURATE FOR ANY PARTICULAR PURPOSE. Product performance may be affected by the application to which the product is put. Upon request,HAMLIN will assist purchasers by providing information specific to any particular application.HAMLIN disclaims any and all liability whatsoever for any purchaser's reliance upon the information contained on this data sheet without further consultation with authorised representatives of HAMLIN.

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Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000070
Quant.	: 1,000 ST	Page	: 000208/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

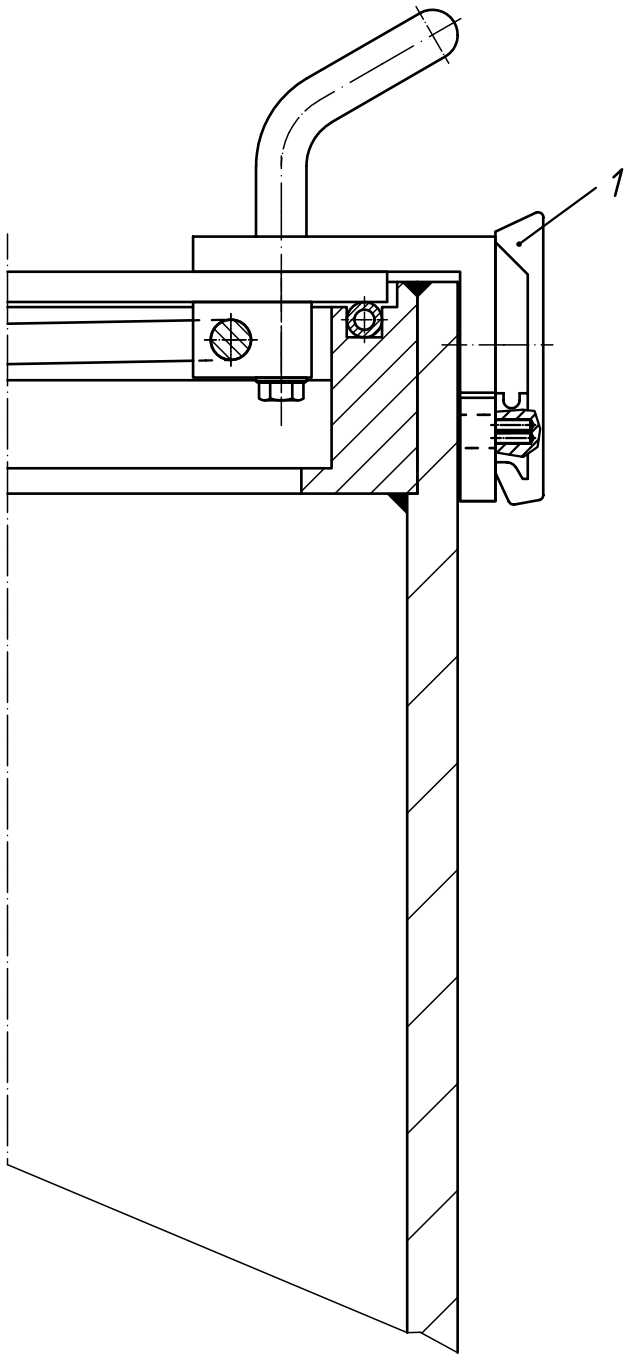
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.07.KSM3.02.0A	Commiss.	: 25-05-377
Label	: DRAIN/PVC/KSM5/D=50	Position	: 000070
Quant.	: 1,000 ST	Page	: 000209/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	FK-101508001-050 BALL VALVE-PVC/EPDM/101/PVC/EPDM /D=50	3,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.012.0003.U23A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./023/PVC/BS	Position	: 000070
Quant.	: 1,000 ST	Page	: 000210/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

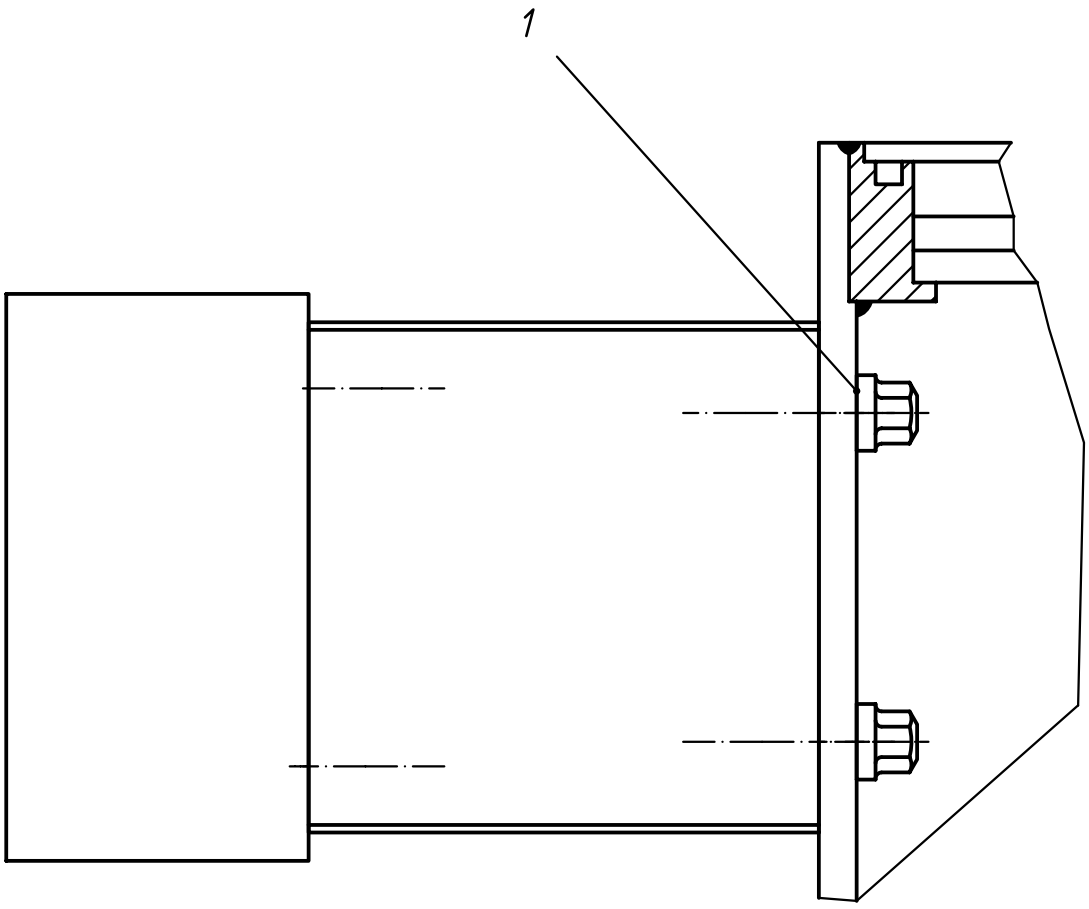
Pos.	Part N° / Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	8,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 16.05.KS00.42.0A	Commiss.	: 25-05-377
Label	: INLET/2AS/PVC/DIRT CATCHER D=40	Position	: 000070
Quant.	: 3,000 ST	Page	: 000211/01
Drawing	: 16.05.KS00E00.00	Date	: 10.04.2006

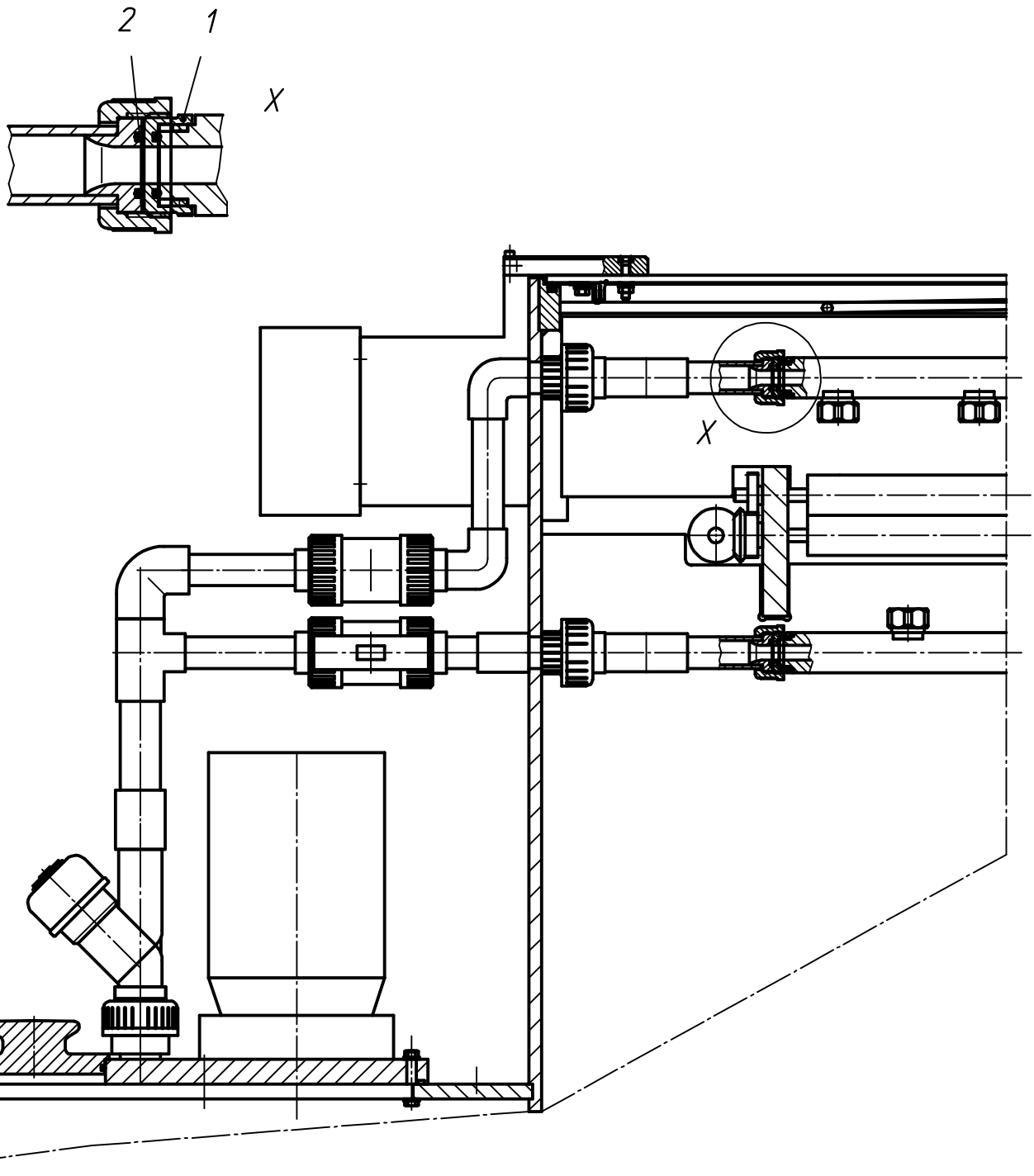
Pos.	Part N° / Label	Quant.	Unit	SP
	16.005.0091.U80A INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	1,000	ST	
1	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF KSM-KAMMER

Spare parts list INFLOW

16.05.KS00E00.00 | 11/01



Assembly	: 16.005.0091.U80A	Commiss.	: 25-05-377
Label	: INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	Position	: 000070
Quant.	: 1,000 ST	Page	: 000212/01
Drawing	: 16.005.0091EU000	Date	: 10.04.2006

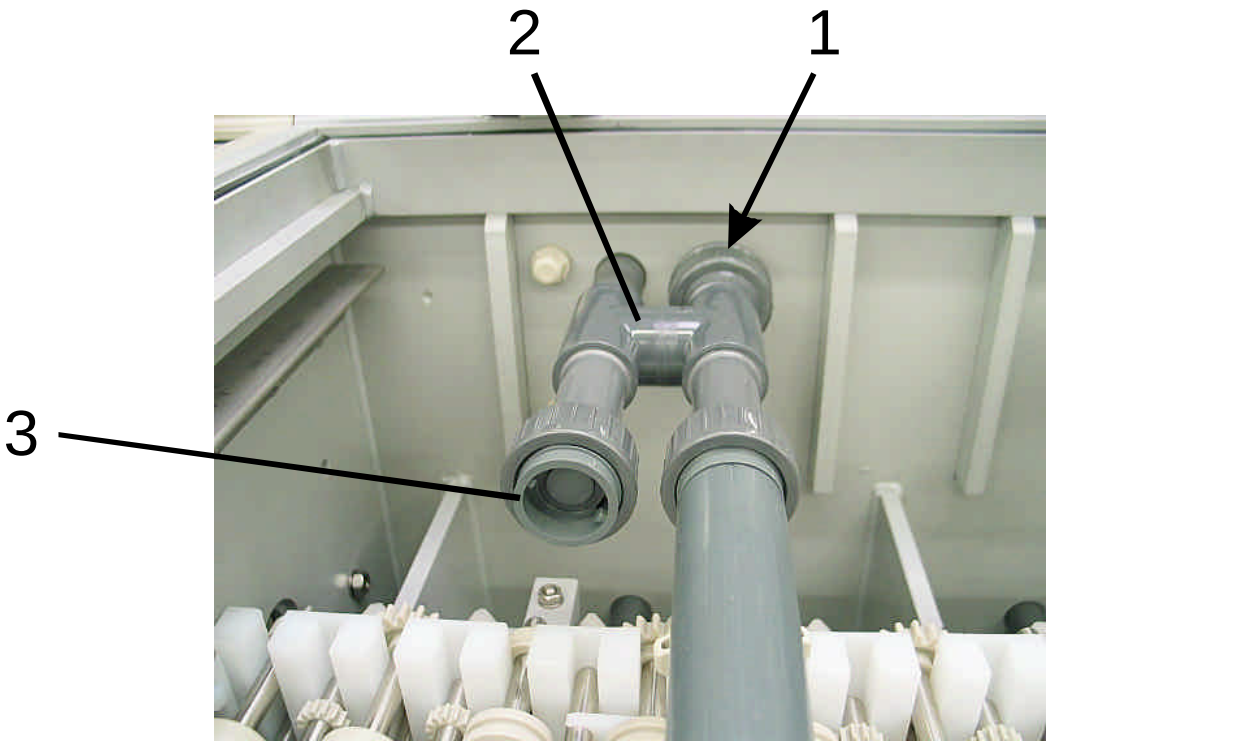
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-216 O-RING/EPDM/BLACK/028.17x3.53	2,000	ST	X
2	16.005.0017.000B SPRAY FRAME/A=50/KSM/BJ	2,000	ST	X
3	03.005.0675.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=00	4,000	ST	X
4	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
5	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
6	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

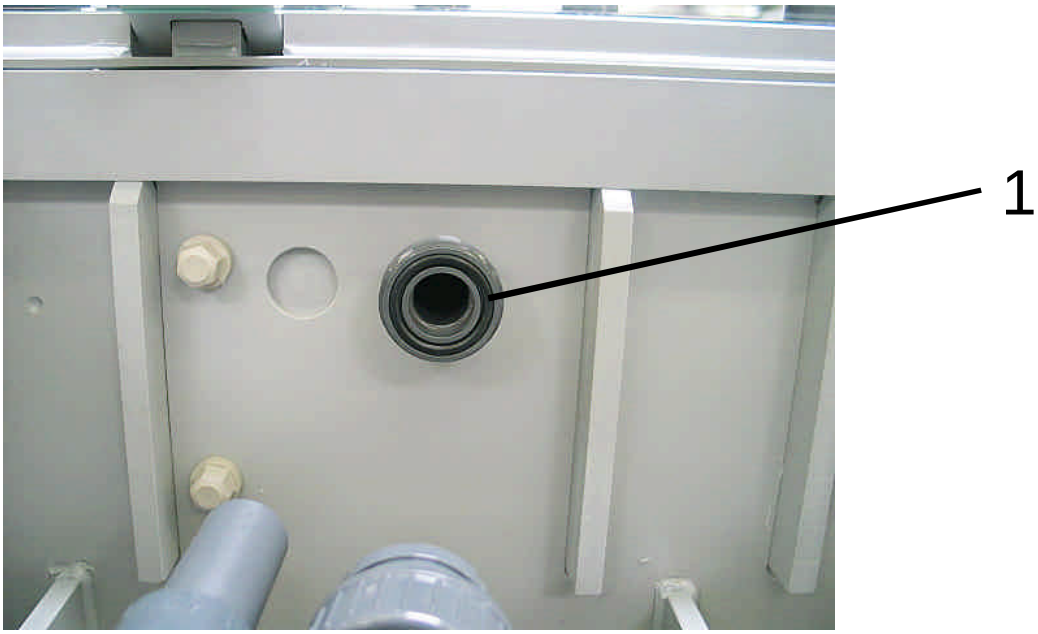
Parts without Pos.-N° see assembly parts list

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000	1/2
	00

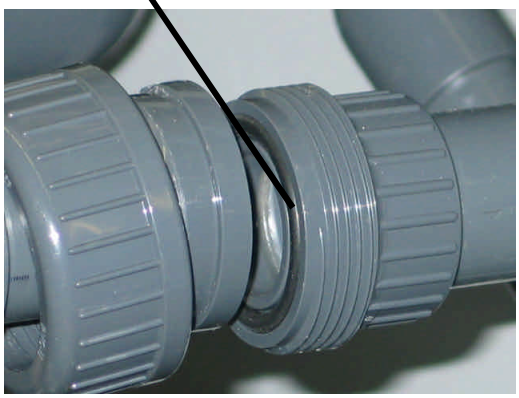


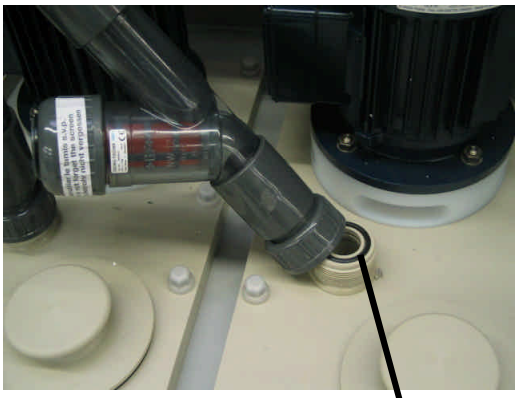


Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000 2/2 00





Assembly	: 16.005.0017.000B	Commiss.	: 25-05-377
Label	: SPRAY FRAME/A=50/KSM/BJ	Position	: 000070
Quant.	: 2,000 ST	Page	: 000213/01
Drawing	: 16.005.0017E0000	Date	: 10.04.2006

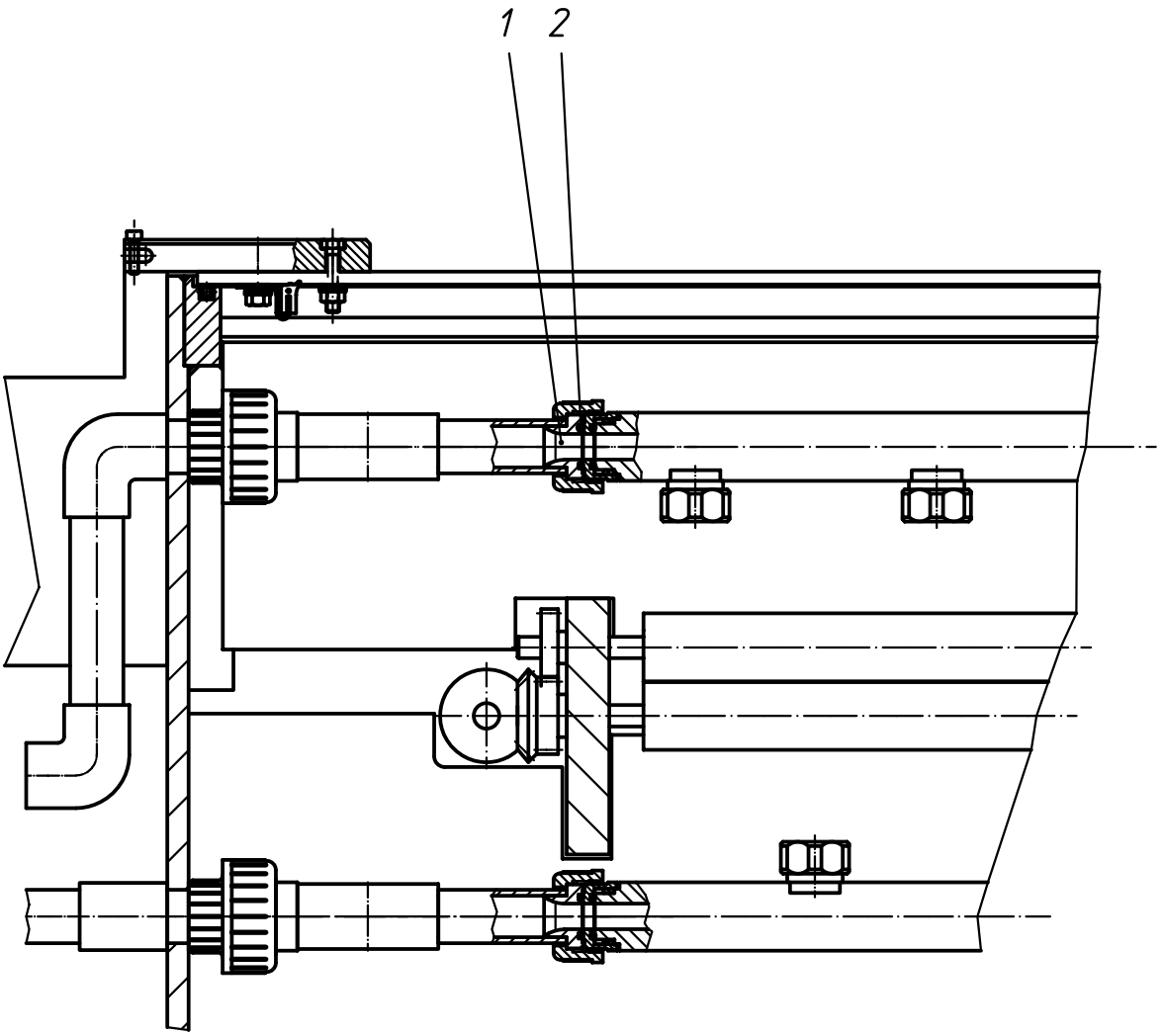
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENSTOCK

Spare parts list SPRAY FRAME

16.005.0017E0000	11
	00



Assembly	: 16.005.0008.2H1B	Commiss.	: 25-05-377
Label	: SPRAYPIPE/PVC-D/ 650/ 6D/F/G/ 8,04L/MIN	Position	: 000070
Quant.	: 4,000 ST	Page	: 000214/01
Drawing	: 16.005.0008E0000	Date	: 10.04.2006

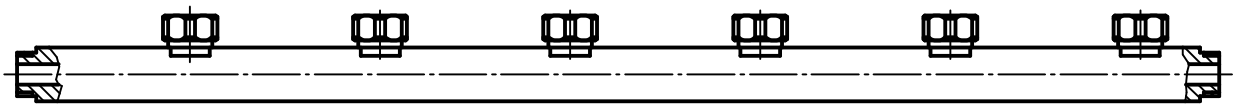
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000166-000 SEAL-NUT/PPNR.065.202.53.00.001	6,000	ST	X
2	DÜ-000000071-000 NOZZLE/652.516.5EFU1/BJ/PVDF/90°	6,000	ST	X
3	DI-000000133-000 SEALING RING EPDM/18,4x10x3 MM	6,000	ST	X

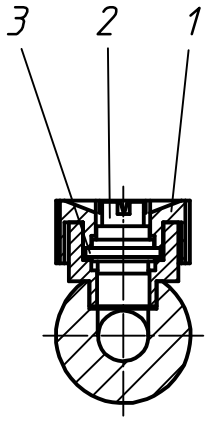
Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPRÜHROHR KPL.

Spare parts list SPRAY PIPE CPL.

16.005.0008E0000	11
	01





Assembly	: 16.005.0206.2A4A	Commiss.	: 25-05-377
Label	: BLAST PIPE CPL./0650/H80/BJ	Position	: 000070
Quant.	: 2,000 ST	Page	: 000215/01
Drawing	: 16.005.0030E0000	Date	: 10.04.2006

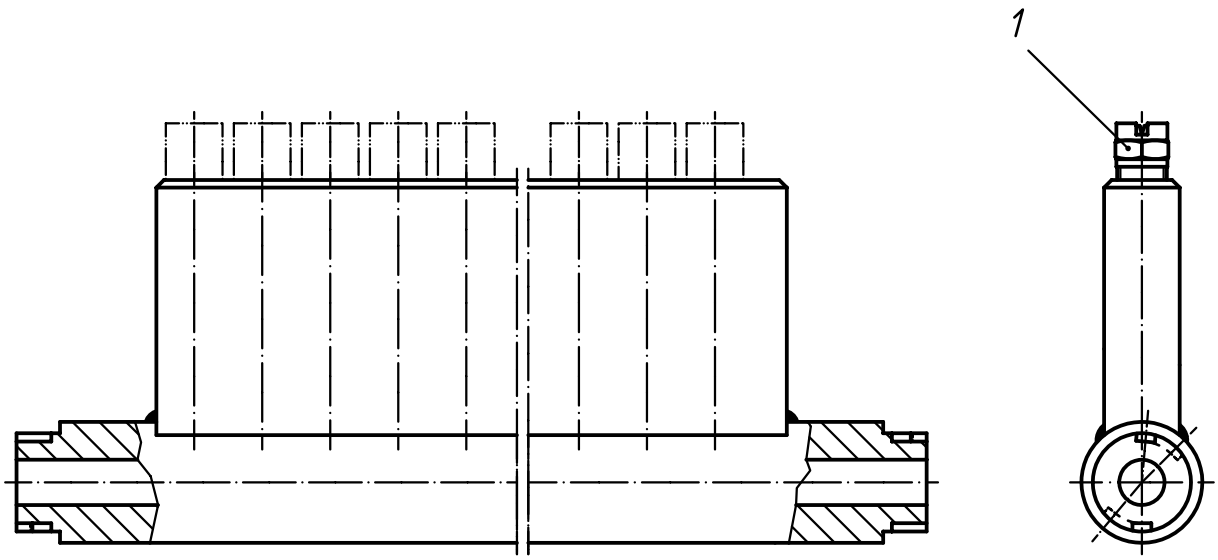
Pos.	Part N° / Label	Quant.	Unit	SP
1	DÜ-000000004-000 NOZZLE/632.516.5E.BC/1/4"/NPT/PVDF/90°	17,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENROHR KPL.

Spare parts list Blast pipe cpl.

16.005.0030E0000	11
	02



Assembly	: 16.008.0004.U003	Commiss.	: 25-05-377
Label	: PUMP FIXING/TI/PP-G/EPDM	Position	: 000070
Quant.	: 3,000 ST	Page	: 000216/01
Drawing	: 16.008.0004EU000	Date	: 10.04.2006

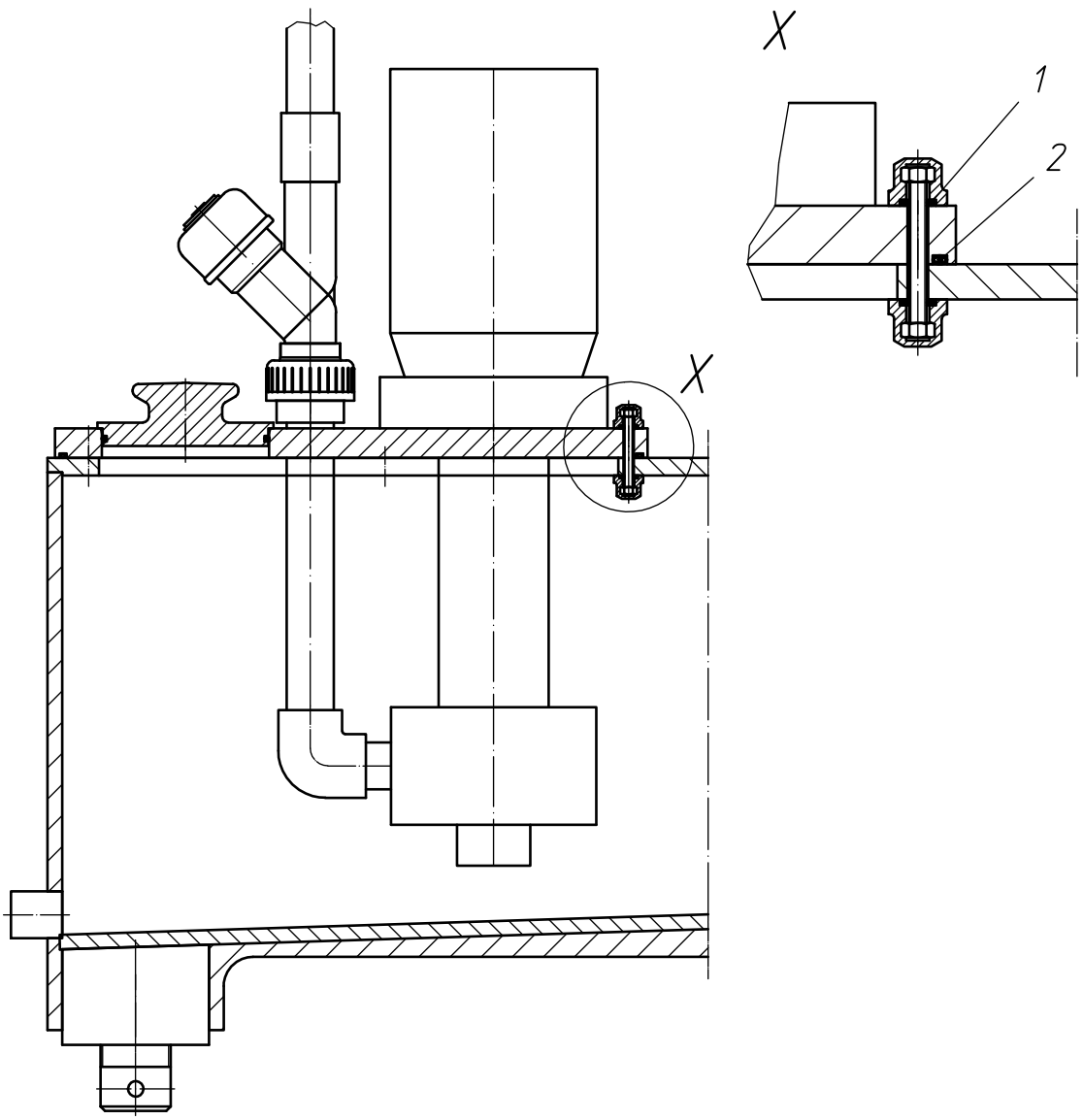
Pos.	Part N° Label	Quant.	Unit	SP
1	DI-000000076-000 O-RING/EPDM/BLACK/8.00x2.40 MM	8,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,250	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste PUMPENBEFESTIGUNG

Spare parts list PUMP FIXTURE

16.008.0004EU000	1/1
	02



Assembly	: 50.003.0008.U000	Commiss.	: 25-05-377
Label	: TA/AS/0.37kW/OF/ET=270/ETLB-25-125	Position	: 000070
Quant.	: 3,000 ST	Page	: 000217/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	PUTA000300-00817 TA/ETLB-25-125/AS/00/0.370kW/50 Hz	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Tauchpumpe

Spare parts list Immersion pump

PUTA_____-00817 | 11 / 00

Bitte bei Bestellung angeben:
To be indicated on order:

PUTA000300-00817 / PUTA 063300-00817
ETLB 25-125 230/400V/50Hz 0.37kW
/ 60 Hz

Stübbe®

1. General

This pump/unit may not be operate beyond the limit values specified in the technical documentation for the medium handled, capacity, speed, density, pressure, temperature and motor rating. Make sure that operation is in accordance with the instructions laid down in this manual or in the contract documentation. (Contact the manufacturer, if required). The indification plate indicates the type series/size, main operating data and production number; please quote this information in all queries, repeated orders and particularly when ordering spare parts.

2. Safety

These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel/ operators prior to installation and commissioning, and it must always be kept close to the location of operation of the pump/unit for easy access.

2.1 Marking of Instructions in the Manual

The safety instructions in this manual whose non-observance might cause hazards to persons are specially marked with the general hazard sign, namely

safety sign in accordance with DIN 4844 - W9.

The electrical danger warning sign is safety sign in accordance with DIN 4844 - W8.

The word Attention is used to introduce safety instructions whose non-observance may lead to damage to the pump and its functions.

Attention

Instructions attached directly to the pump, e.g.

- arrow indicating the direction of rotation
- markings for fluid connections

must always be complied with and be kept in perfect legible condition at times.

2.2 Personnel Qualification and Training

All personnel involved in the operation, maintenance, inspection and installation of the pump must be fully qualified to carry out the work involved. Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the requisit know-how, appropriate training and instruction must be provided. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

2.3 Non-compliance with Safety Instructions

Non-compliance with instructions can jeopardise the safety of personnel, the environment and the pump itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.
In particular, non compliance can, for example, result in:

- failure of important pump/unit functions
- failure of prescribed maintenance and servicing practices
- hazard to persons by electical, mechanical and chemical effects
- hazard to the environment due to leakage of hazardous substances.

2.4 Safety Awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.

2.5 Safety Instructions for the Operator/User

- Any hot or cold components that could pose a hazard must be equipped with a guard by the operator.
- Guards which are fitted to prevent accidental contact with moving parts (e.g. coupling) may not be removed whilst the pump is operating.
- Leakages (e.g. explosive, toxic, hot) must be contained so as to avoid any danger to persons and the environment. Pertinent legal provisions must be adhered to.
- Elecrical hazards must be eliminated. (In this respect refer to the relevant safety regulations applicable to different countries and/or the local energy supply companies.)

2.6 Safety Instructions for Maintenance, Inspection and Installation Work

The operator is responsible for ensuring that all maintenance, inspection and installation work to be performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
The pump must have cooled down to ambient temperature. It must be drained and its pressure must be released. Work on the pump must be carried out only during standstill. The shutdown procedure described in the manual for taking the pump out of service must be adhered to without fail. Pumps or pump units handling media injurious to health must be decontaminated. Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and/or reactivated. Please observe all instructions set out in the chapter on Commissioning before returning the pump to service.

2.7 Unauthorised Modification and Manufacture of Spare Parts

Modifications or alterations of the pump are only permitted after consultation with the manufacturer. Original spare

parts and accessories authorised by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.

2.8 Unauthorised Modes of Operation
The warranty relating to the operating reliability and safety of the pump/unit supplied is only valid if the pump is used in accordance with its designated use as described in the following sections. The limits stated in the data sheet may not be exceeded under any circum-stances.

3. Transport and Interim Storage

3.1 Transport
Transport of the pump requires proper preparation and handling. Always make sure that the pump or the unit remains in horizontal position during transport and cannot slip out of the transport suspension arrangement. Do not use lifting sling on the free shaft end of the pump or on the motor eyebolt.

If the pump/unit slips out of the suspension arrangement, it may cause personal injury and damage to property!

3.2 Interim Storage
Each ASV pump leaves the factory carefully assembled. If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump storage:
Store the pump in a dry location! Rotate the rotor by hand once a month. Protect all stored goods against humidity, dirt, vermin and unauthorised access! All openings of the assembled unit components are closed and must only be opened when required during installation.

4.1 Environment influences
All parts in contact with the fluid are made of thermo-plastic material. Other external metal parts, e. g. housing, motor as well as motor bracket, are protected against corrosion by paint.

- It is understood according to the constuction principle and the regulations all external metal parts must not necessarily be resistant.
  Any wetting of external metal parts with aggressive fluids from leakages of the plant has to be avoided. At any leakage of the sealing system the ASV-service should be called.

4.2 Wetness, plant leakages

- On extreme wetness at the installation locations - rain, condense water especially on plant leakages - protections against corrosive influences have to be arranged.
  This is especially due for electrical drivers, switches, measuring instruments and so on.
- Components made of thermoplastic material or elastomers should not be wetted by other fluids than those mentioned in the original order.
  It is recommended not to get them in contact with
- synthetic and mineral oils and grease
- solvents and cleaning agent and/or other chemical material especially such of which the components are not known

4.3 Operating and ambient temperature

- For maximal allowed operating temperature of the pump the recommended values in our pump leaflet are to be taken care of.
- Ambient temperature above +40 °C are to be forwarded to ASV for proper checking.
  Eventually the motor shows a reduced efficiency. At the location of installation a very good circulation and ventilation is to be taken care of.

4.4 Vibrations, shocks

- Vibrations and shock having external influences to pump and drive must follow the limit values of the VDI recommendation.

4.5 Mechanical load

- External mechanical load on pump or drive because of weight of the plant equipment are unacceptable.
- Pipeline and valves have to be supported in order not to load their weight on the pump.
- Any longitudinal extension of the pipeline because of operating temperature should also not cause any load on the pump. Eventually a compensator must be installed.

4.6 Electricity

Connection to the power supply must be effected by a trained electrician only.

- The drive of the pump has to be grounded according to DIN VDE 0113. At dangerous fluids (ChemG) internal or other instruction have to be observed.
- At pumping electrolyte - conductive fluids - with potential differences to the parts of the pump the pump must be grounded.

It exists the possible danger of electrochemical corrosion at metal parts in contact with the fluid especially it concerns the mechanical seal.

4.7 The protection of health and UVV
as well as the regulations and warnings for „Security and environment protections" as well as the local and/or internal regulations have to be attended at any installation by the operator on his own responsibility.

Attention! Non-observance of this operating and maintenance instruction manual or the use of the pumps for other operating conditions than actually

agreed upon is not in accordance with the regulation for this application.

4.8 For any consequences the operator is responsible.

- The operator of the pump has to inform all personal entrusted with works at the pump about the potential danger at this place and/or the complete plant and has to make sure that all precaution for proper working condition and regulation of the protection of health have been taken care of.
- Subject of a safe installation with proper function of the pump later is the qualification of the personel respectively. All persons in charge have to be acquainted with the operating manual and the usual technical regulations and have to follow them.

Please pay maximum attention to this installation and starting instruction of the pumps as we do not accept any claim of damages in case of not following the instructions.

4.9 Application

ASV-Thermoplastic vertical sump pumps are used for transportation of acids, caustic solutions as well as abrasive, aggressive and neutral fluids.

4.10 Examination/Test

Before each pump is leaving our factory a functional test is executed by controlling the capacity, head and current consumption acc. to DIN 1944. Test certificates for guaranty purpose acc. to DIN 19944-II are available against extra charge.

4.11 Guaranty

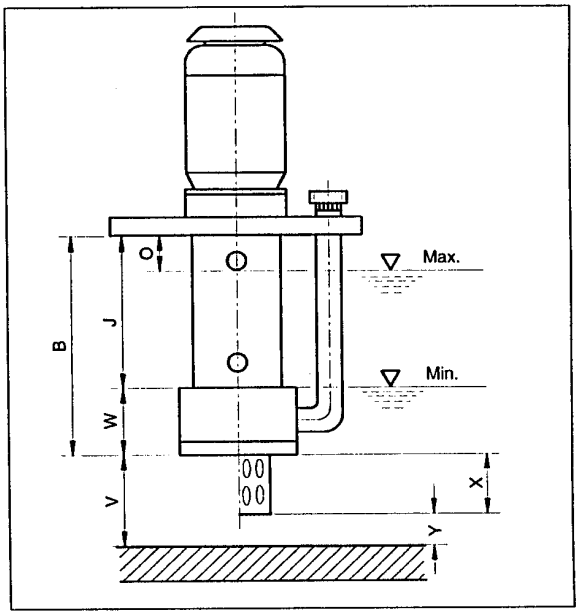
The time of guaranty is stipulated in our General Delivery- and Payment Conditions. For the resistance of the material we guarantee only if the operation conditions are known to us at the time of offering the pump.
Within the time of guaranty repair work or any alteration should only be arranged by our engineers or with a written confirmation by us. In case of any necessary repair we recommend to call one of our technician or to return the pump to our factory if trained personal is not available at your factory. Please send your requirements for spare parts to our sales department for pumps.

5. Mounting and installation

5.1 Mounting

The ASV-Thermoplastic-Vertical Pumps ETLB has to be mounted with holding down bolts or fastening elements on a plane, stable base.
The connections of the pipework are carried out in accordance with DIN 24256.

Attention! Pump unit to be kept free of tension and stress when fastening the fixing screws. Eventually the installation area has to be levelled.



Size ETLB	O min. mm	V min. mm	J[1] mm	J[2] mm	x min. mm	Y mm
15-60	30	60	206	406	80	10
20-100	30	60	192	392	100	10
25-125	30	60	192	392	100	10
32-125	30	60	185	385	125	10
32-160	30	60	155	355	125	10
40-125	30	60	155	355	150	10
40-160	30	60	155	355	150	10
50-125	30	60	155	355	125	10

1) Standard depth B = 275 mm 2) Standard depth B = 475 mm

The distance between the end of the suction pipe and the bottom of the sump may not be less than 60 mm.

Liquid level »Max.«

- Highest permissible liquid level
- At level control: Upper shift-point.

Liquid level »Min.«

- During every starting of the pump:
  Lowest permissible liquid level at standard suction connection and/or foot valve!
- At level control: Lower shift-point at starting.
- The size »W«, the liquid cover of the pump housing must be increased by rising working temperature.

5.2 Installation of pipeline

The pump should not be loaded by the force of the connected pipeline. The nominal width of the connected pipeline has correspond with the pressure connections of the pump. Pipe connections with the pump should be made without stress and vibration. In case of flange connections the tightening of the screws may not cause twist or tension.
A gasket should not reach into the open area of the pipe. Only suitable elastomer gaskets and seals have to be used. Do not use hard and unelastic seals. Line offsets must be avoided in case of flange connections.

5.3 Pressure Line

The velocity of flow in the pressure line should not be more than 3 m per second, the sizes of the pipework are determined by economy aspects. Install a shut-off or diaphragm valve near to the pump in the pressure line. In case of shut-off of the pump a non-return valve should be mounted in the pressure line, if the reverse flow is large or a higher pressure is available.

5.4 Water hammer

At long pressure pipe lines as well as at the use of automatic valves with short closing and opening time a slow down (switch off/closing) or an acceleration (start/opening) of the flowing fluid head might occur with a considerable pressure fluctuation and a so called water hammer in the pipe line. Water hammer may cause considerable damages or even destroy the pump or other plant equipment.
To reduce the danger of water hammer the following should be done or installed:

- Automatic valves with slowed down closing and opening time.
- The velocity of the flow in the pipeline is to be reduced which means to choose a larger diameter (DN) of the pipeline and/or to use pressure regulating valves to avoid water hammer, for example ASV-pressure relief valves, type 715/716/725.

6. Operation of pump

6.1 Before starting the pump

1. Before the pipelines will be connected with the pump the complete pressure-pipework especially the connected containers on suction side the pump sumps and other installations have to be cleaned carefully (solidfree) and to be flushed sufficiently from time to time with neutral fluid (water).
   Dirt and solids - residue from welding, waste from mounting and packagings etc. - will cause damages on the pump on the start-up afterwards.

2. Before the pump is connected with the installed pipelines/pipework the delivery line have to be tested separately for tightness and to be examined acc. to the respective regulations of compression trials.
   - The compression trial has to be carried out with a neutral fluid (water).
   - Testpressure:
   - 1,5 x operating pressure, - 1,5 x PN = max 15.0 bar or
   - acc. to the respective regulations but not higher than 15,0 bar !

   Attention! The pump may never be involved in a compression trial. Damages on the pump will be the effect and leakages can occur.

3. Check the Max.- and Min. liquid level (see page 5). Due to the construction of the ETLB pump the distance between the mounting plate and the max. liquid level may not be less than 30 mm.

Attention! At every tank evacuation it is neccessary to check the minimum liquid level before starting the pump.

Check motor-voltage and protective switch.
Do not run the pump dry.
Pay attention to the direction of rotation of the pump (arrow on the pump). Check by shortly switching on and then off again.

6.2 Start up

Please open the valve a little bit on the pressure side in order to remove the air better by starting the pump. Start the motor, open the valve on the pressure side until the operating point is reached.

6.3 Operation

Do not run pump for longer time against closed valve. This would lead to thermal damages in the pipeline and pump. For longer closing time of the valve a bypass has to be installed to return the fluid to the pump sump or tank.

In order to secure trouble free function of the ASV-Vertical Sump Pump ETLB, please pay attention to the following points:

1. The pump should run noiseless and free of vibrations.

2. E-Motors should be loaded only with the respective rated capacity.

3. E-Motors with more than 7,5 KW should be started in Y-delta connection to avoid currents at make.

4. For the pump material the fixed max. operating temperature has to be observed (for PP max. +70 °C and for PVDF max. +90 °C, depending on the chemical, thermal and mechanical stress - see ASV-Resistance-table).

5. Please also observe that at start-up of the pump the fluid level reaches at least the upper edge of the spiral casing in order to guarantee proper function. This is also important in cases where the pump operates with an extended suction pipe.

6.3 Switch-Off

1. The shut-off valve in the pressure line has to be adjusted to the minimal rate or to be closed.
2. Switch off the E-motor.
3. Close the shut-off valve in the suction line.
4. If the fluid crystallizes out, the pump should be cleaned with suitable resolvents, the evacuation can be arranged with the drain-valve of the suction line or the pump.

7. Maintenance

The Vertical Sump Pumps ETLB are maintenance-free.

8. Dismantling and Reassembly General Instructions

Before dismantling, secure the pump so as to make sure it cannot be switched on accidentally.
The shut-off valves in the pressure line must be closed.
The pump must have cooled down to ambient temperature, it must be drained and it must be decontaminated, if necessary.
Repair and maintenance work to the pump must only be carried out by specially trained personnel, using original spare parts.
Observe the safety regulations laid down in sections 2.
Any work on the motor shall be governed by the specifications and regulations of the respective motor supplier.
Diamantling and reassembly must always be carried out in accordance with the relevant general drawing.
Make sure the pump unit and the individual components cannot tip over during dismantling.

8.1 Dismantling ETLB 25 - 125 and 32 - 125

1. Remove the spiral cassing cover (Pos. 103).

Attention! Left-handed thread!

2. Loosen the impeller cap (260) with O-ring (412.4).
3. Remove the hexagonal nut (920.1) with spring-washer (934), plate (550) and key (940.2).
4. Pull off the impeller (230) with the shaft protection sleev from the motor shaft.

The bearingless ASV-Vertical-Pumps ETLB are equipped with high-quality V-rings to protect the bearings in the dry area.

For their change:

1. Unscrew the hexagonal nuts (920.4).
2. Pull off the base plate with support tube (713).
3. Remove the diffuser disc (558).
3. Dismount the V-rings (507) with seal cover (444) and change the V-rings.

8.2 Reassembly

Attention! Clean all dismantled components and check them for signs of wear.
Damaged or worn components are to be replaced by original spare parts.
Make sure that the seal faces are clean and that V-rings and O-rings are properly fitted.

Reassembly is effected in reverse order to dismantling.
Use the general drawing and the list of components for orientation. All screws and bolts must be properly tightened during assembly.

8.3 Tightening Torques Nm

	Tightening torques Nm		
Thread	1)	2)	3)
M 6	9	6	5
M 8	21	7	6
M 10	42	14	10
M 12	73	24	25
M 16	170	63	30
M 20	340	113	32
M 24	580	193	34

1) Screw connection between metal-to-metal
2) Screw connection between plastic-to-plastic
3) Screw connection with self-tapping insert

11. Failure, Possible reason and Repair

Failure	Possible reason	Repair
11. 1 Pump does not deliver.	11. 1. 1 Direction of motor is wrong.	Two supply cable are mixed.
	11. 1. 2 Level of fluid to be pumped is too low. Pump not sufficiently filled.	Check level and fill pump, remove air.
	11. 1. 3 Pump sucks air.	Suction line, footvalve and mechanical seal to be checked on air tightness.
	11. 1. 4 In suction line an air bag is included.	Install pipe line properly so that air can evacuate. Install gate valve with handle at side.
	11. 1. 5 Available back pressure is bigger than max. pressure of pump.	Size of pump not correctly selected. Advise exact delivery conditions.
11. 2 Delivery of pump is too low.	11. 2. 1 Suction or supply line of pump or impeller is clogged.	Clean pipe line and eventually dismount and clean impeller.
	11. 2. 2 Air bag in pipe line.	Arrange pipe line newly and eventually install vent valve.
	11. 2. 3 Geodetic head is too high.	Increase diameter of pipe line, impeller or choose eventually a bigger pump. Please contact us!
	11. 2. 4 Resistance of pipe line is bigger than assumed.	Increase diameter of pipe line, of impeller or choose a bigger pump. Please contact us!
	11. 2. 5 Suction head too high (in case of suction operation vaporization the pump, cavitation).	Clean footvalve and suction line eventually increase diameter of suction line. Check footvalve, wether it is fully opened, eventually lower level of pump. If a pre-receiving tank is used mount a larger size
	11. 2. 6 Temperature of fluid is too high.	Reduce temperature, lower level pump.
	11. 2. 7 Viscosity of fluid is higher than originally assumed.	Dilute or pre-heat fluid

Failure	Possible reason	Repair
11.3 Pump delivers too much.	11. 3. 1 Actual head of process plant is lower as delivery head of pump.	Close valve on pressure line accordingly. Mount smaller impeller. If possible reduce RPM. Use smaller pump.
11. 4 Overload of motor.	11. 4. 1 Pump delivers too much.	Look at 11. 3. 1.
	11. 4. 2 Specific gravity or viscosity of fluid is too high.	Check delivery data, mount motor with bigger capacity.
	11. 4. 3 Impeller touches wall of pump.	Check mounting of impeller, fasten impeller cap again. Impeller deformed by too high temperature. Exchange impeller and eliminate reason for too high temperature.
	11. 4. 4 Pump deformed improper mounting.	Align pump and motor carefully on base plate and mount pipe line without any tension.
11. 5 Unquiet or unbalanced rotation.	11. 5. 1 Pump not properly aligned.	Arrange alignment of pump and motor.
	11. 5. 2 Suction head too high.	Look at 11. 2. 4.
	11. 5. 3 Diameter of suction line too small.	Increase diameter of pipe line.
	11. 5. 4 Valve at suction line too much closed.	Open it more.
	11. 5. 6 Fixing on foundation not sufficient.	Tighten foundation anchor again.
	11. 5. 7 Cavitation.	Look at 11. 2. 1, 11. 2. 5, 11. 2. 6.
	11. 5. 8 Bearing damage.	Check bearing, exchange bearing.

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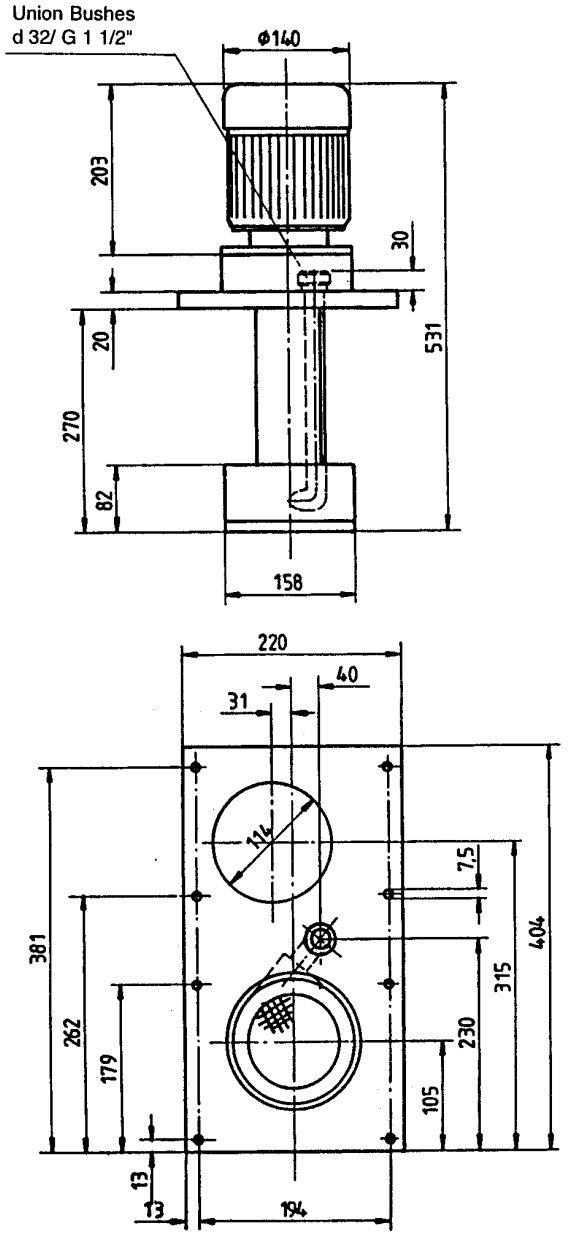
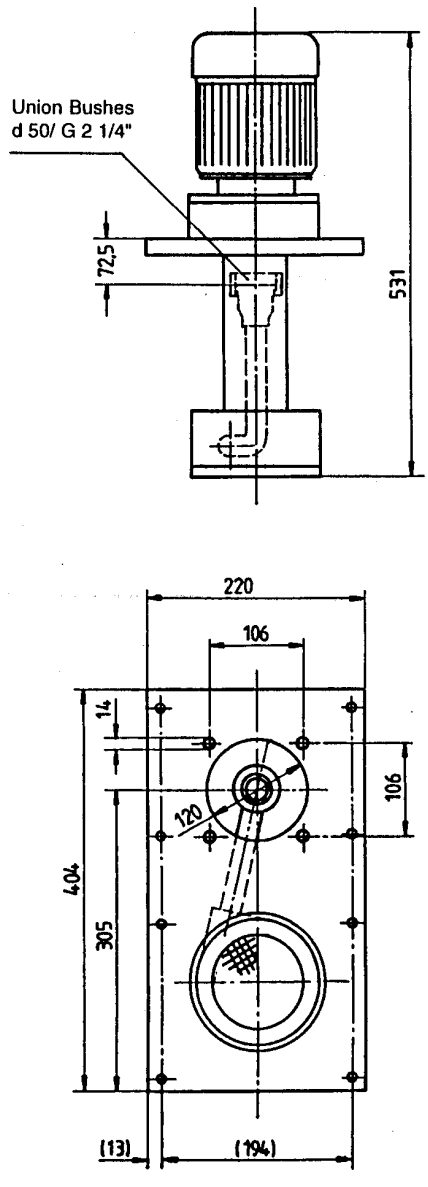
12. Dimensions ETLB (Schmid)

Ident-No. 86517
Ident-No. 86544



Ident.No. 86516
Ident-No. 86547



Technical details might be subjects to change

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http://www.asv-stuebbe.de e-mail: info@asv-stuebbe.de

Stübbe®

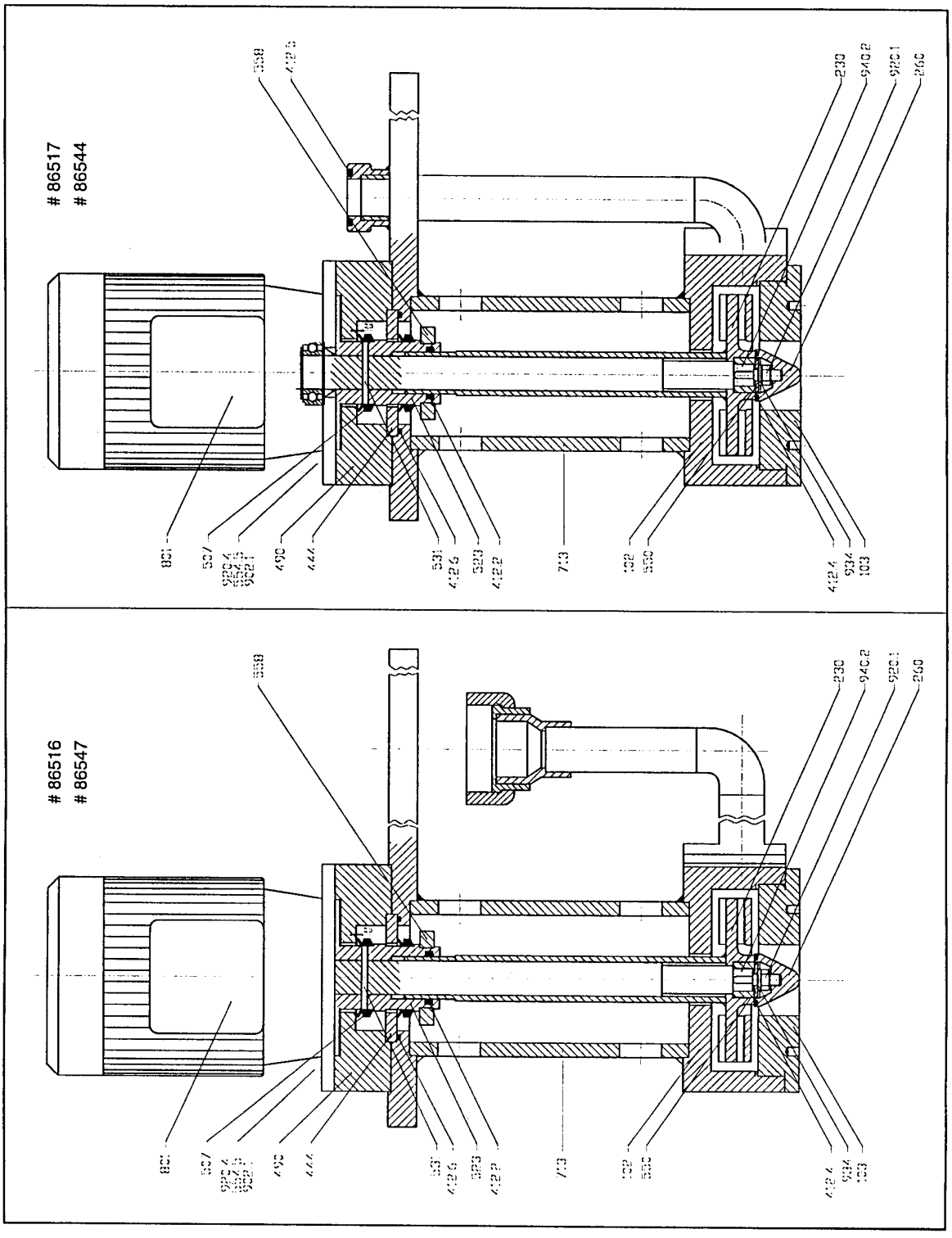
Betriebsanleitung, Schmid
Ersatzteillisten
Tauchpumpe ETLB,
Baugröße 25-125/270 mm

Operating manual, Schmid
Part Lists
Vertical sump pump ETLB,
Size 25-125/270 mm

Schmid 05/98

Art.-Nr.:	50 Hz	Art.-Nr.:	60 Hz
Ident.-No.:		Ident.-No.:	60 Hz
86516	0,37 kW	86544	0,45 kW
86517	0,37 kW	86547	0,45 kW

Stübbe

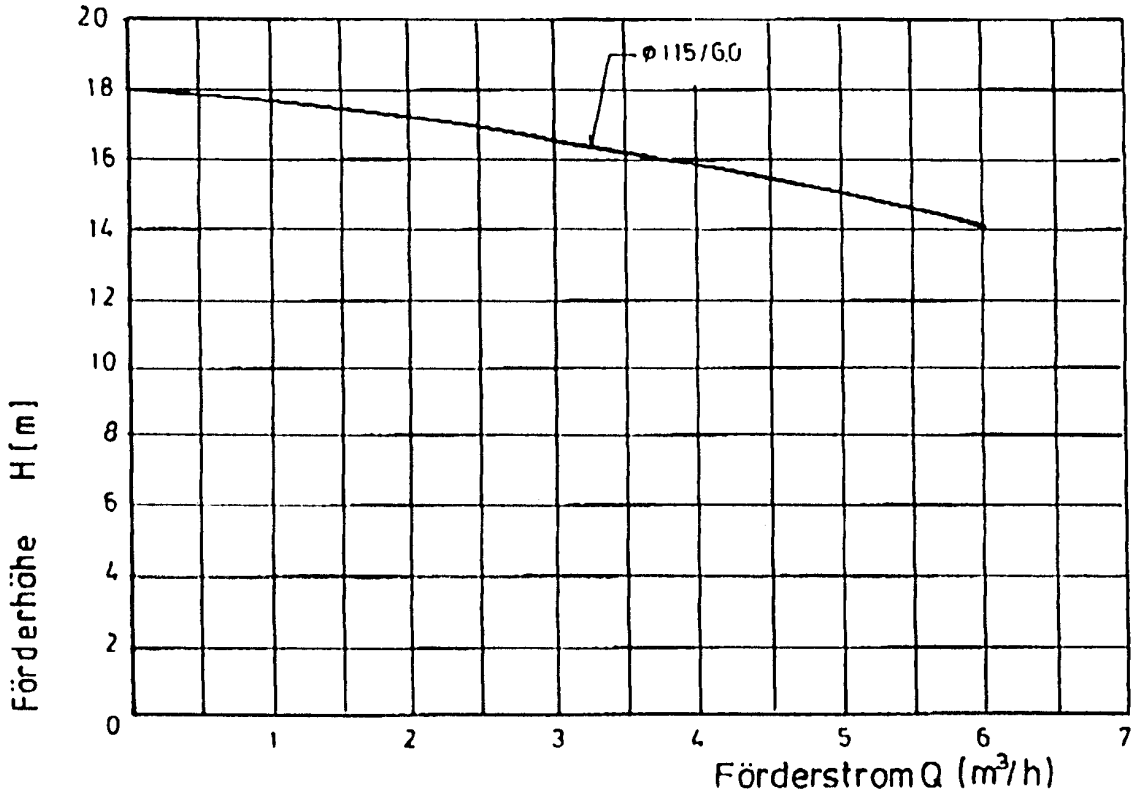


Stübbe®

Teil *Item*	Stück *Pieces*	Bennenung *Denomination*	Werkst. *Material*	Ident.-Nr.(Bestell-Nr.) / *Order no.*							
				50 Hz				60 Hz			
				86516	86517			86544	86547		
103	1	Gehäusedeckel *Casing cover*	PP	83926	83926			83926	83926		
230.1	1	Laufrad mit Wellenschutzrohr *Impeller with shaft protection*	PP	86522	86522			86546	86546		
260	1	Laufradkappe *Impeller hub cap*	PP	56308	56308			56308	56308		
412.2	1	Runddichtring *O-Ring*	EPDM	97123	97123			97123	97123		
412.4	1	Runddichtring *O-Ring*	EPDM	97230	97230			97230	97230		
412.5	1	Runddichtring *O-Ring*	EPDM	53930	53930			53930	53930		
412.6	1	Runddichtring *O-Ring*	EPDM	97126	97126			97126	97126		
412.8	1	*Runddichtring* *O-Ring*	EPDM	-	-			-	-		
444.0	1	Dichtscheibe *Seal cover*	SiC inf.	95374	95374			95374	95374		
490	1	Dichtflansch *Seal flange*	PE-RCH 1000	97121	97121			97121	97121		
507.0	2	V-Ring *V-seal ring*	FPM	95212	95212			95212	95212		
523	1	Wellenhülse *Shaft protection pipe*	PP	80137	80137			80137	80137		
531	1	Spannstift *Dowel pin*	1.4305	97130	97130			97130	97130		
550	1	U-Scheibe *Washer*	1.4104	51222	51222			51222	51222		
555	4	U-Scheibe *Washer*	TITAN	82487	82487			82487	82487		
558	1	Schleuderscheibe Diffuser disc	PP	80150	80150			80150	80150		
566.0	2	Halbrundkerbnagel *Round headed notched nail*	1.4305	90514	90514			90514	90514		
713.0	1	Aufhängerohr *Base plate and support tube*	PP	84045	84042			84042	84045		
801	1	Drehstrom-Motor *Three phase electric motor*	0,37 kW 0,45kW - -	86527 - - -	86527 - - -			- 86527 - -	- 86527 - -		

ASV Stübbe Type: ETLB 25-125 Drehzahl : 2900 min

(Fa. Schmid)



Stübbe

Teil *Item*	Stück *Pieces*	Bennenung *Denomination*	Werkst. *Material*	Ident.-Nr.(Bestell-Nr.) / *Order no.*							
				50 Hz				60 Hz			
				86516	86517			86544	86547		
902.1	4	*Stiftschraube* *Stud bolt*	TITAN	98616	98616			98616	98616		
920.1	1	Sechskantmutter *Hexagon nut*	1.4571	93959	93959			93959	93959		
920.4	4	*Sechskantmutter* *Hexagon nut*	TITAN	82486	82486			82486	82486		
934.0	1	Federring *Spring ring*	1.4571	91288	91288			91288	91288		
940.2	1	Passfeder *Key*	1.4301	90534	90534			90534	90534		
970	1	Leistungsschild *Identification plate*	1.4301	86590	86590			86590	86590		
980	1	Deckel (Kontrollöffnung) *Inspection- or check cover*	PP	-	84055			84055	-		
999	1	Runddichtring zu Teil 980 *O-Ring for item 980*	CSM	-	97426			97426	-		

Technische Änderungen vorbehalten
Errors and omissions excepted

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http://www.asv-stuebbe.de • e-mail: info@asv-stuebbe.de

Assembly	: 16.004.0126.U23N	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/23/PVC/TI/KL-KU/d=27	Position	: 000070
Quant.	: 1,000 ST	Page	: 000218/01
Drawing	: 16.004.0126EU000	Date	: 10.04.2006

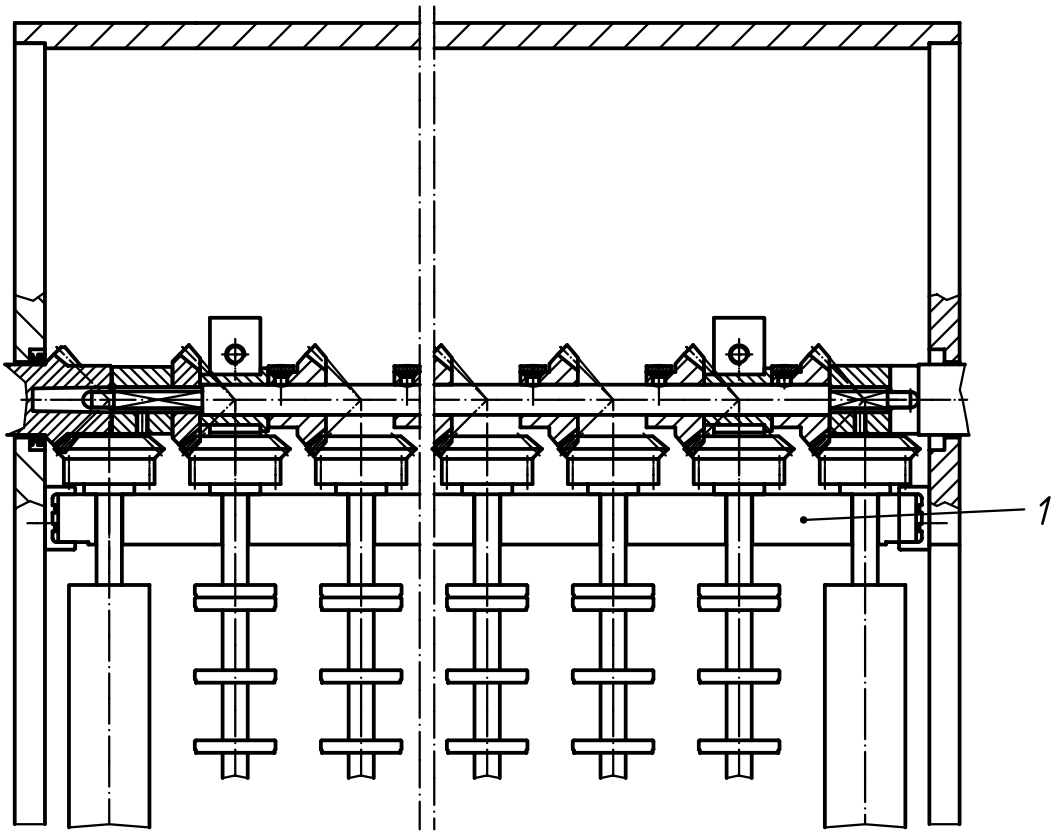
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0124.U23N DRIVE SHAFT/CPL./023/TI	1,000	ST	
1	16.004.0002.023X SUPPORT/GUR-N/TIT/23/d=10/T=50	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0126EU000	11
	00



Assembly	: 16.004.0124.U23N	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./023/TI	Position	: 000070
Quant.	: 1,000 ST	Page	: 000219/01
Drawing	: 16.004.0124EU000	Date	: 10.04.2006

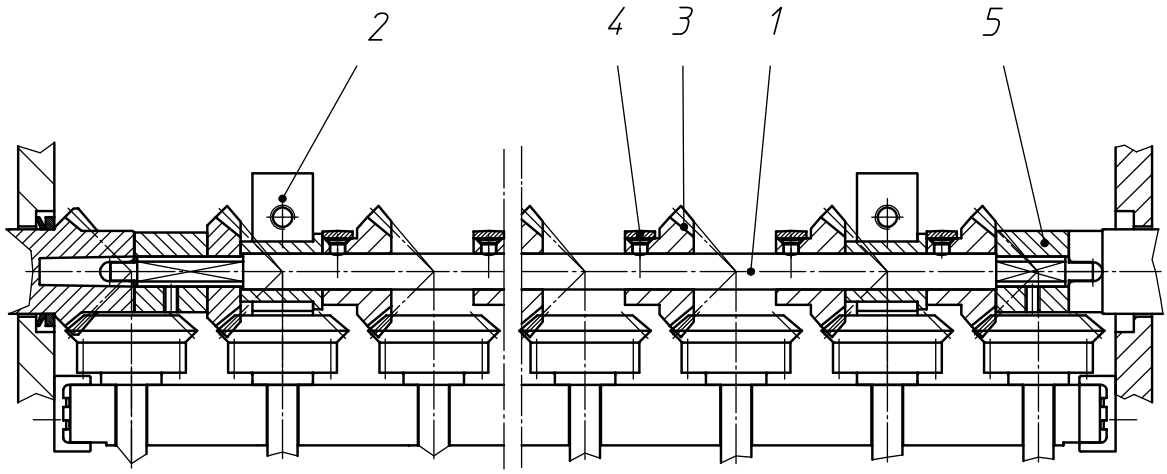
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0331.0233 DRIVE SHAFT/TI/23/CLAW COUPLINGL.-d=27	1,000	ST	X
2	16.004.0007.U00N SEATING/KPL./PVC /TI	4,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	15,000	ST	X
4	03.004.0278.0003 CLAMP/WHITE/PVDF-TI	15,000	ST	X
5	16.004.0330.0003 COUPLING/PART2/TI	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ANTRIEBSWELLE

Spare parts list Drive shaft

16.004.0124EU000	11
	00



Assembly	: 16.004.0007.U00N	Commiss.	: 25-05-377
Label	: SEATING/KPL./PVC /TI	Position	: 000070
Quant.	: 4,000 ST	Page	: 000220/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

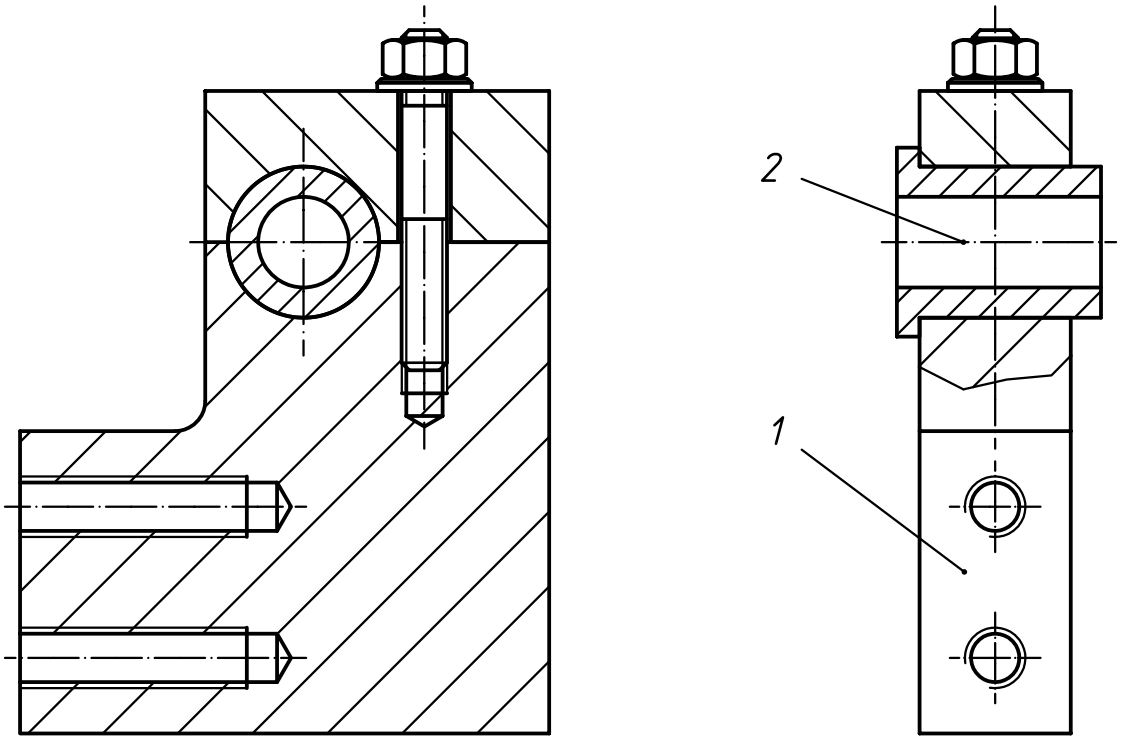
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0005.0003 SEATING/PVC-HG/TI PVC	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: 03.004.0005.0003	Commiss.	: 25-05-377
Label	: SEATING/PVC-HG/TI PVC	Position	: 000070
Quant.	: 1,000 ST	Page	: 000221/01
Drawing	: 03.004.0005E0000	Date	: 10.04.2006

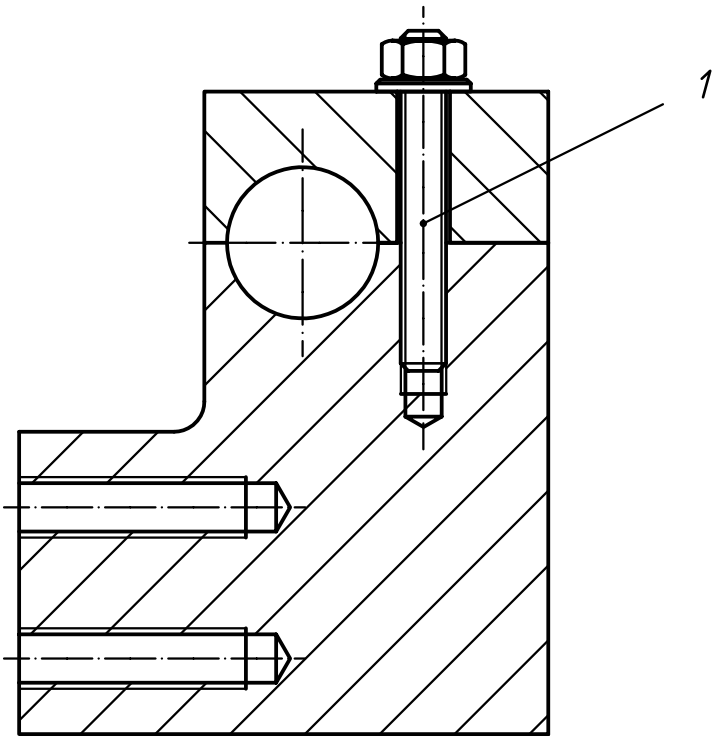
Pos.	Part N° Label	Quant.	Unit	SP
1	00.013.0008.0003 THREADED BOLT/TIT/M06x045	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER

Spare parts list Seating

03.004.0005E0000	11
	00



Assembly	: VS-25-05-377-05	Commiss.	: 25-05-377
Label	: CONVEYOR/KSM [K] 3/650/PVC/TI	Position	: 000070
Quant.	: 1,000 ST	Page	: 000222/01
Drawing	: VS-25-05-377-05	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0987.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/U/FJ	9,000	ST	X
2	16.004.0988.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/O/AV/FJ	5,000	ST	X
3	16.004.1294.2583 ROLLER/10/32/CPL/T25/0650/TI/PP/O/AH/FJ	4,000	ST	X
4	16.004.1713.2573 SHAFT/10/18/CPL/T25/0650/3.7035/PP/FE	10,000	ST	X
5	16.004.1241.2573 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	2,000	ST	X
6	16.004.0838.2573 Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/FE	1,000	ST	X
7	16.004.1244.2573 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
8	16.004.1243.2573 Shaft/KPL/32/O /L/AV/FJ	1,000	ST	X
9	16.004.1245.2573 Shaft/KPL/O /L/AH/FJ	1,000	ST	X
10	16.004.1247.2573 Shaft/CPL/32/U /L/ /FJ/	3,000	ST	X
11	16.004.0841.2573 SHAFT/CPL/32/O+U/K/B/FK/GREEN	1,000	ST	X
12	16.004.1250.2573 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
13	16.004.1249.2573 SHAFT/KPL/32/O /L/AV/FJ	1,000	ST	X
14	16.004.1251.2573 Shaft/KPL/32/O /L/AH/FJ	2,000	ST	X
15	16.004.1252.2573 Shaft/CPL/32/U /L/ /FJ/	3,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: VS-25-05-377-05	Commiss.	: 25-05-377
Label	: CONVEYOR/KSM [K] 3/650/PVC/TI	Position	: 000070
Quant.	: 1,000 ST	Page	: 000222/02
Drawing	: VS-25-05-377-05	Date	: 10.04.2006

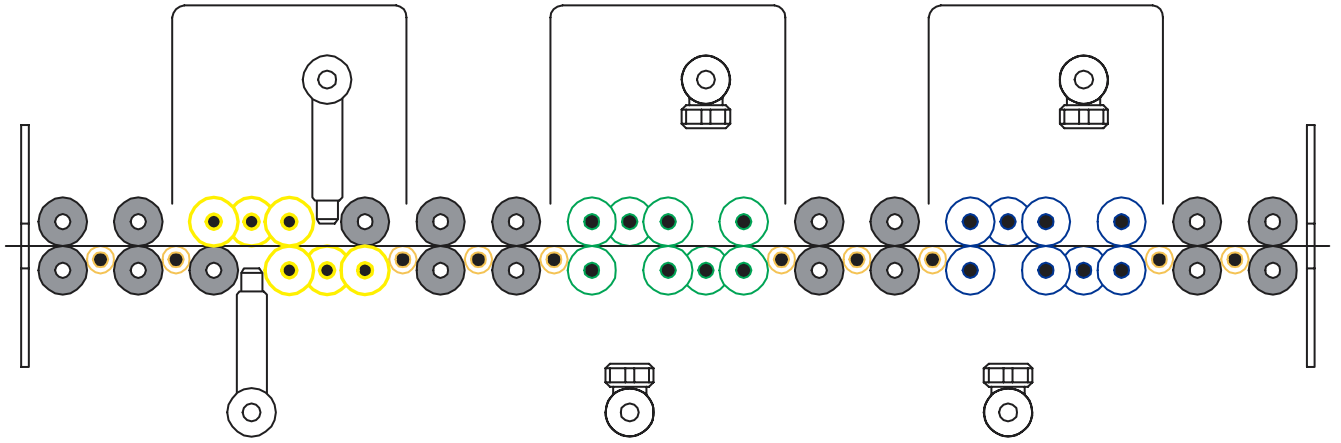
Pos.	Part N° / Label	Quant.	Unit	SP
16	16.004.0843.2573 Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/FE	1,000	ST	X
17	16.004.1255.2573 Shaft/KPL/32/O/L/AV/FJ	1,000	ST	X
18	16.004.1254.2573 Shaft/KPL/32/O/ /L/AV/FJ	2,000	ST	X
19	16.004.1256.2573 Shaft/KPL/32/O /L/AH/FJ	1,000	ST	X
	16.004.0559.U003 GEAR WHEEL COMPL /Z=11/M2/TI/PP /=0162	3,000	ST	
	16.004.0393.U800 BELT DRIVE/SHAFT/O/SPRAY/FJ	3,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	10,000	ST	
20	16.029.0134.0001 GUIDING/O/PVDF/d=12/D=32/T=050	6,000	ST	X

Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-05	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/TI
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	KSM (K)3	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
up	16.004.0988.2583		16.004.1294.2583		16.004.1243.2573	16.004.1244.2573	16.004.1245.2573		16.004.0988.2583		16.004.1294.2583		16.004.0988.2583		16.004.1251.2573	16.004.1250.2573	16.004.1249.2573		16.004.1251.2573		16.004.0988.2583		16.004.1294.2583		16.004.1254.2573	16.004.1255.2573	16.004.1256.2573		16.004.1254.2573		16.004.1294.2583		16.004.0988.2583	up
down	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583		16.004.1241.2573	16.004.0838.2573	16.004.1241.2573	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.1247.2573		16.004.1247.2573	16.004.0841.2573	16.004.1247.2573	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.1252.2573		16.004.1252.2573	16.004.0843.2573	16.004.1252.2573	16.004.1713.2573	16.004.0987.2583	16.004.1713.2573	16.004.0987.2583	down

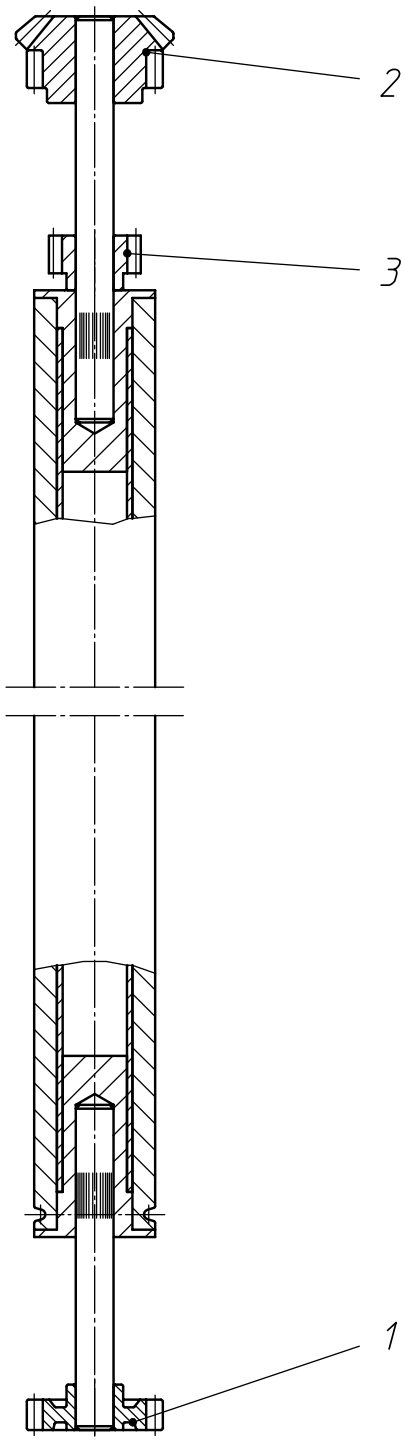
Assembly	: 16.004.0987.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/U/FJ	Position	: 000070
Quant.	: 9,000 ST	Page	: 000223/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/O/AV/FJ	Position	: 000070
Quant.	: 5,000 ST	Page	: 000224/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

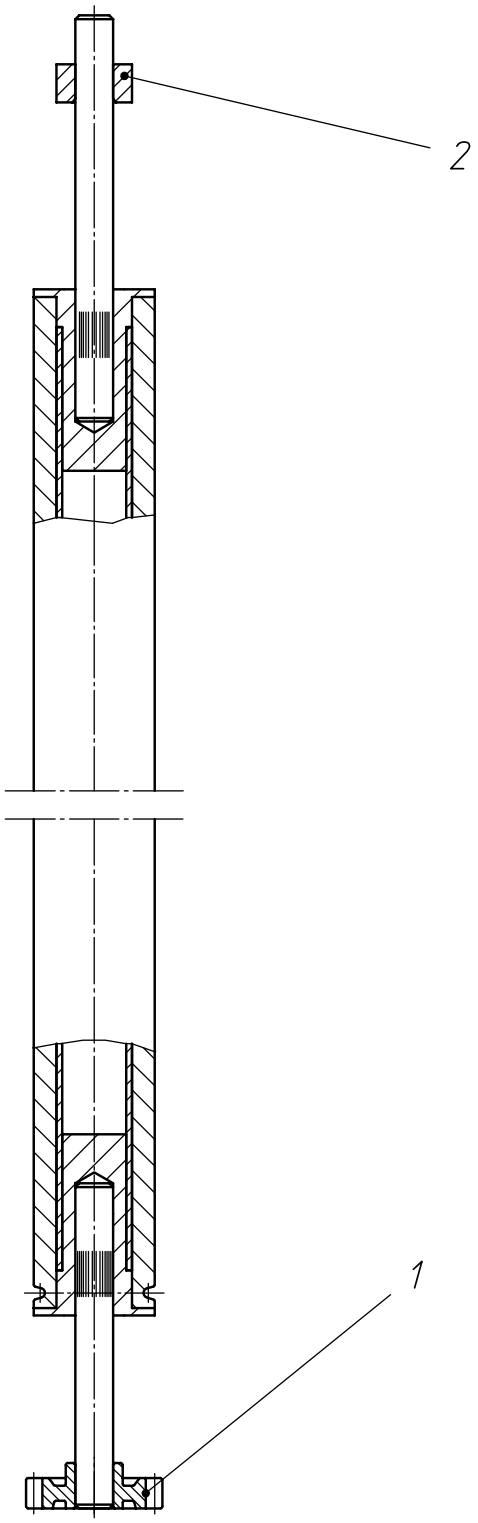
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2583	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/TI/PP/O/AH/FJ	Position	: 000070
Quant.	: 4,000 ST	Page	: 000225/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

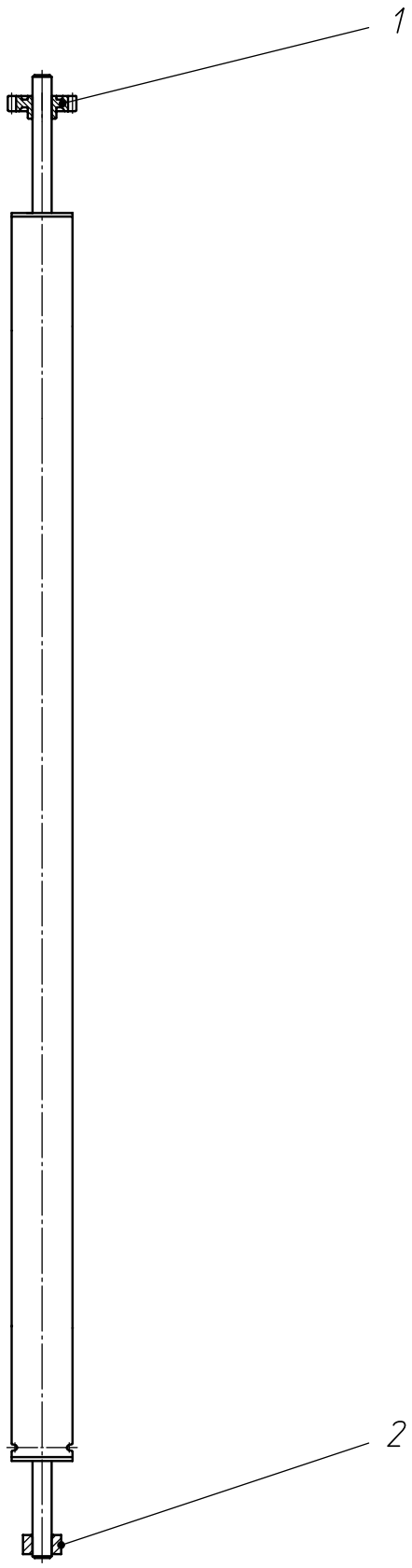
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



Assembly	: 16.004.1713.2573	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/3.7035/PP/FE	Position	: 000070
Quant.	: 10,000 ST	Page	: 000226/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

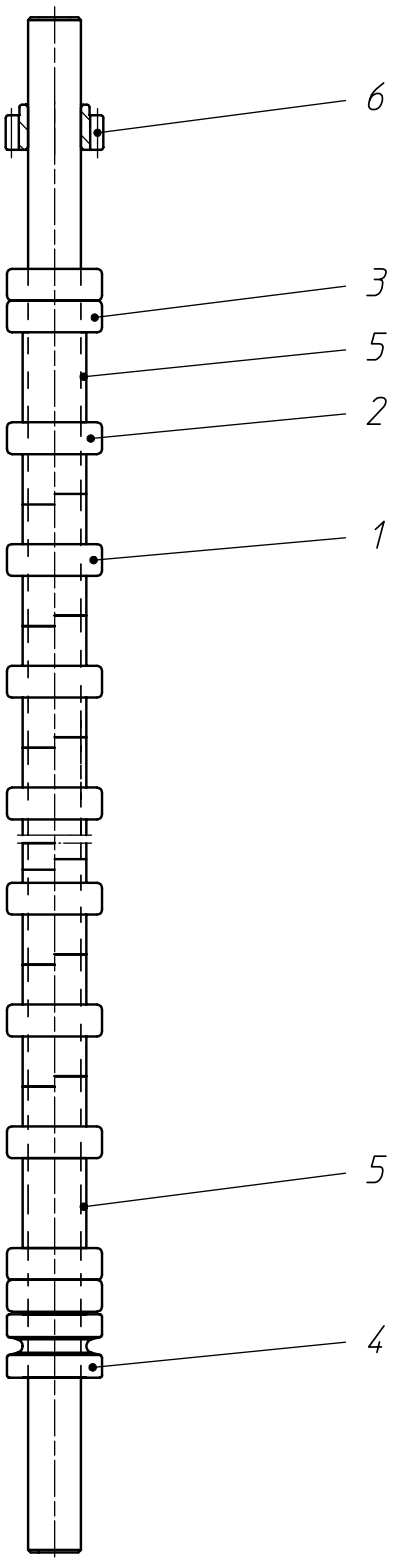
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X
7	00.019.0230.00RE BUSHING/PP-R/d=12.0/D=10.2/L=17.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000070
Quant.	: 2,000 ST	Page	: 000227/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

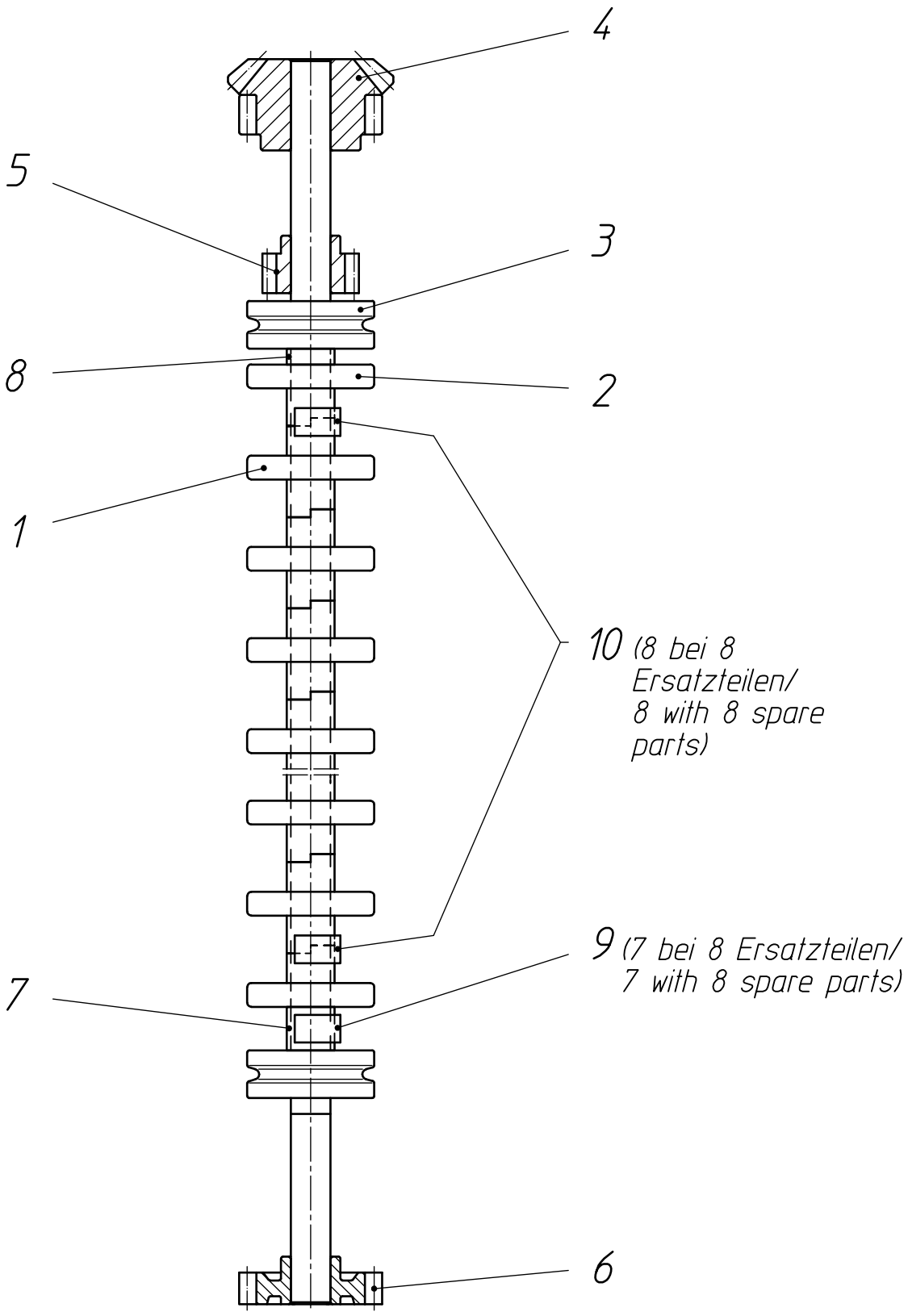
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0838.2573	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/F	Position	: 000070
Quant.	: 1,000 ST	Page	: 000228/01
Drawing	: 16.004.0838E0580	Date	: 10.04.2006

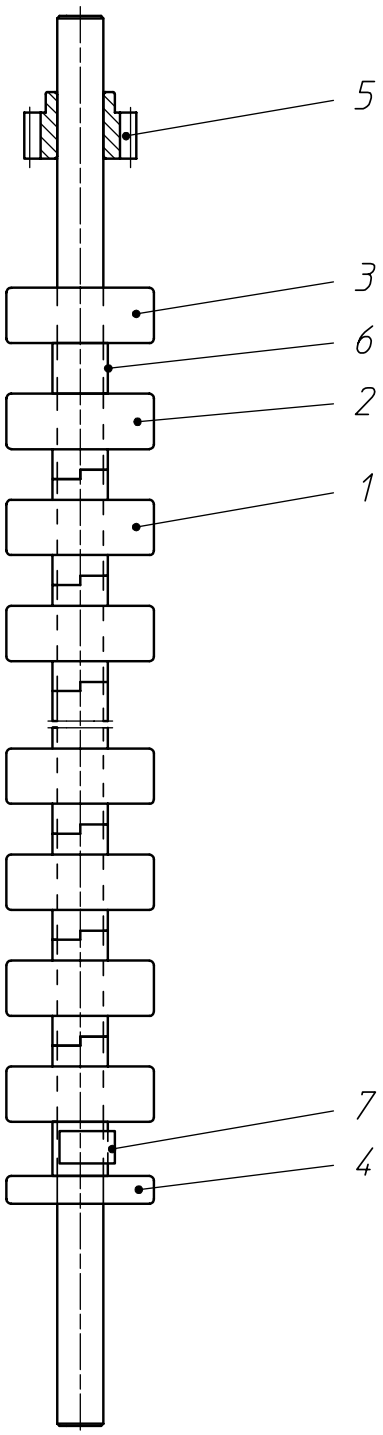
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
8	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0838E0580	11
	00



Assembly	: 16.004.1244.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000229/01
Drawing	: 16.004.1244E0570	Date	: 10.04.2006

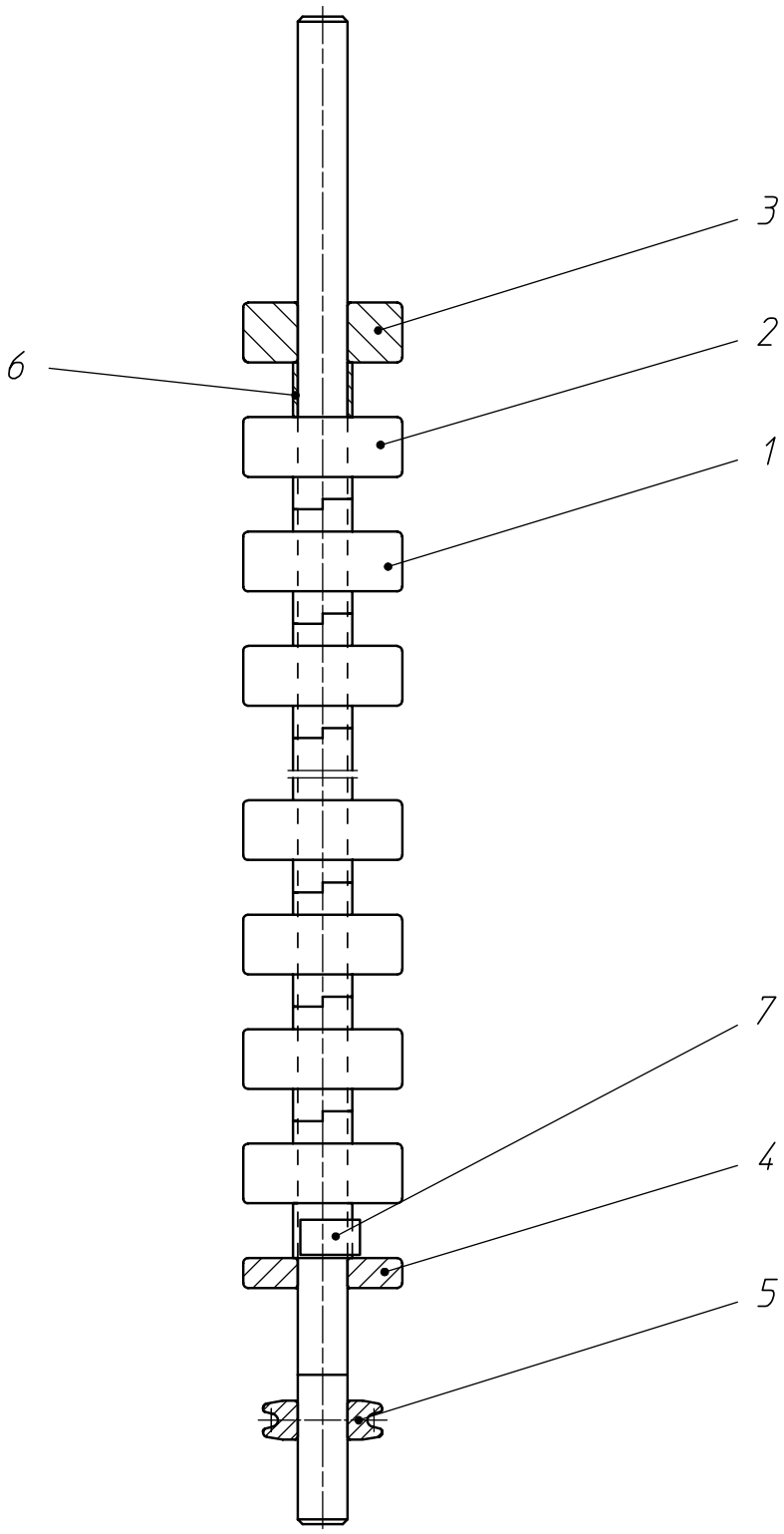
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1244E0570	11
	00



Assembly	: 16.004.1243.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000230/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

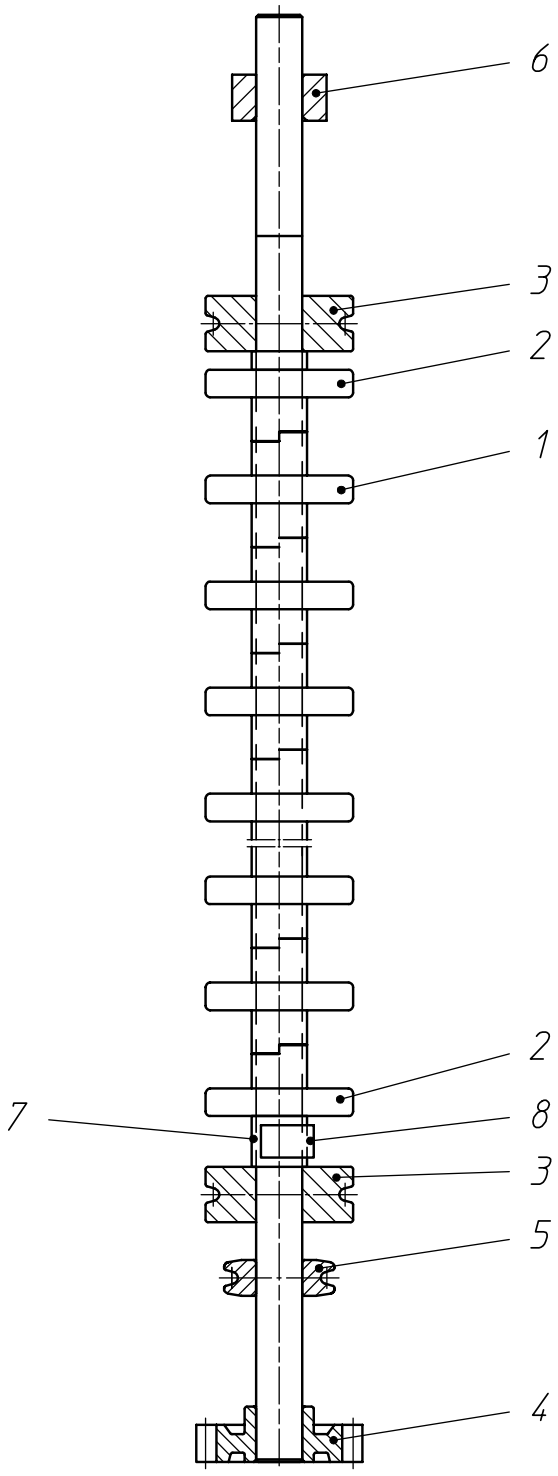
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000231/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

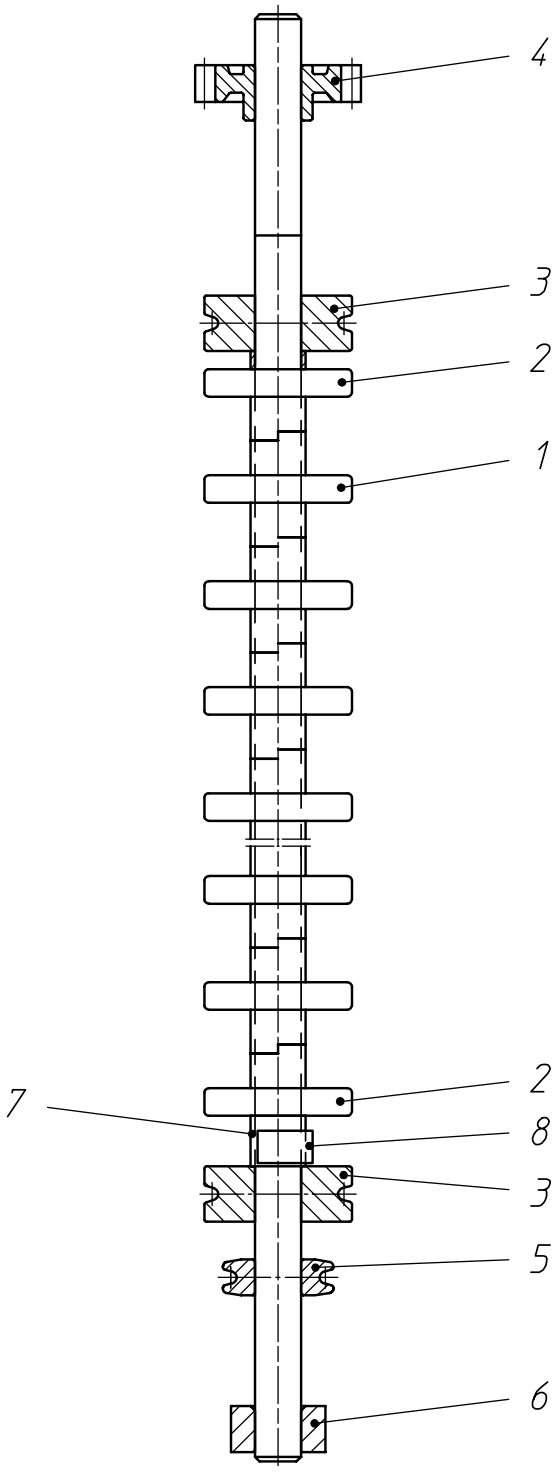
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000070
Quant.	: 3,000 ST	Page	: 000232/01
Drawing	: 16.004.1247E0000	Date	: 10.04.2006

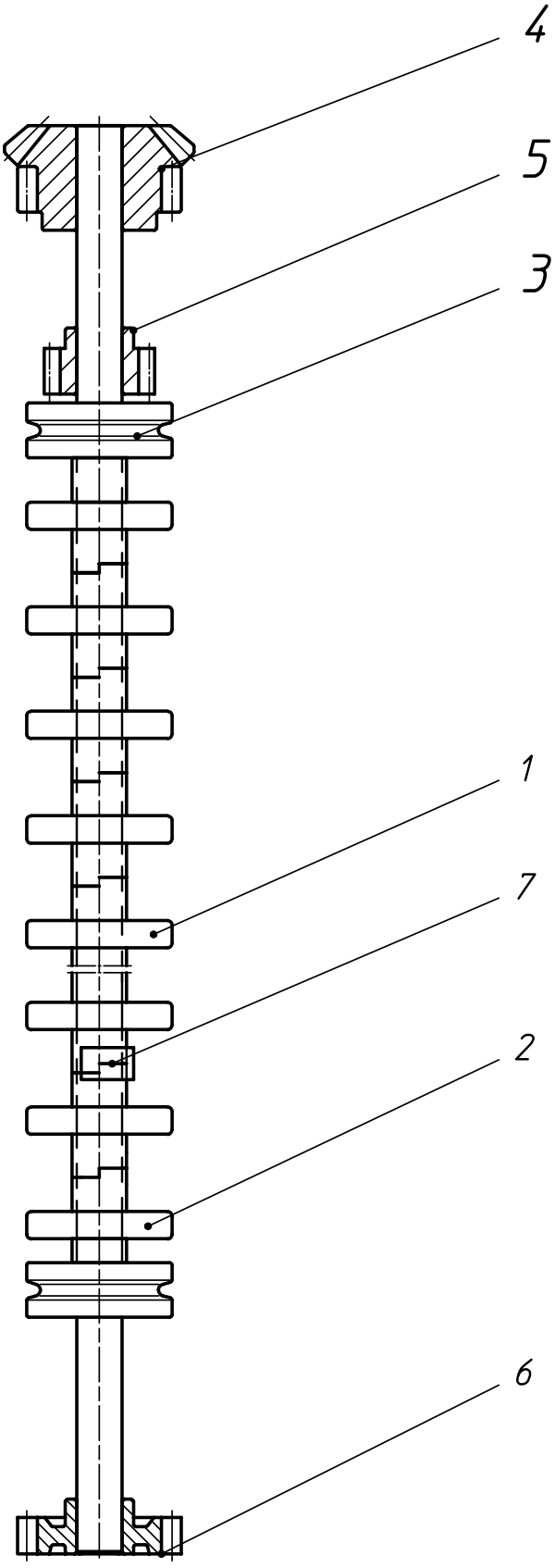
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT

16.004.1247E0000	11
	00



Assembly	: 16.004.0841.2573	Commiss.	: 25-05-377
Label	: SHAFT/CPL/32/O+U/K/B/FK/GREEN	Position	: 000070
Quant.	: 1,000 ST	Page	: 000233/01
Drawing	: 16.004.0841E0570	Date	: 10.04.2006

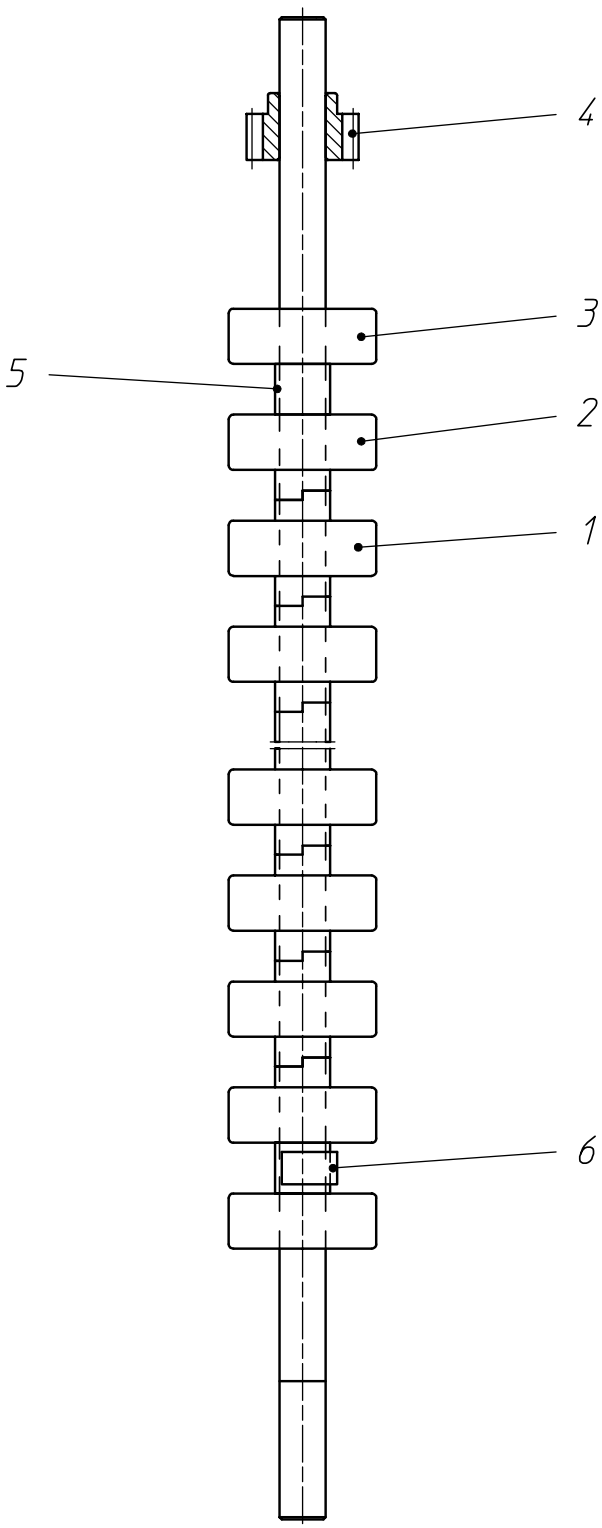
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0841E0570	11
	00



Assembly	: 16.004.1250.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000234/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

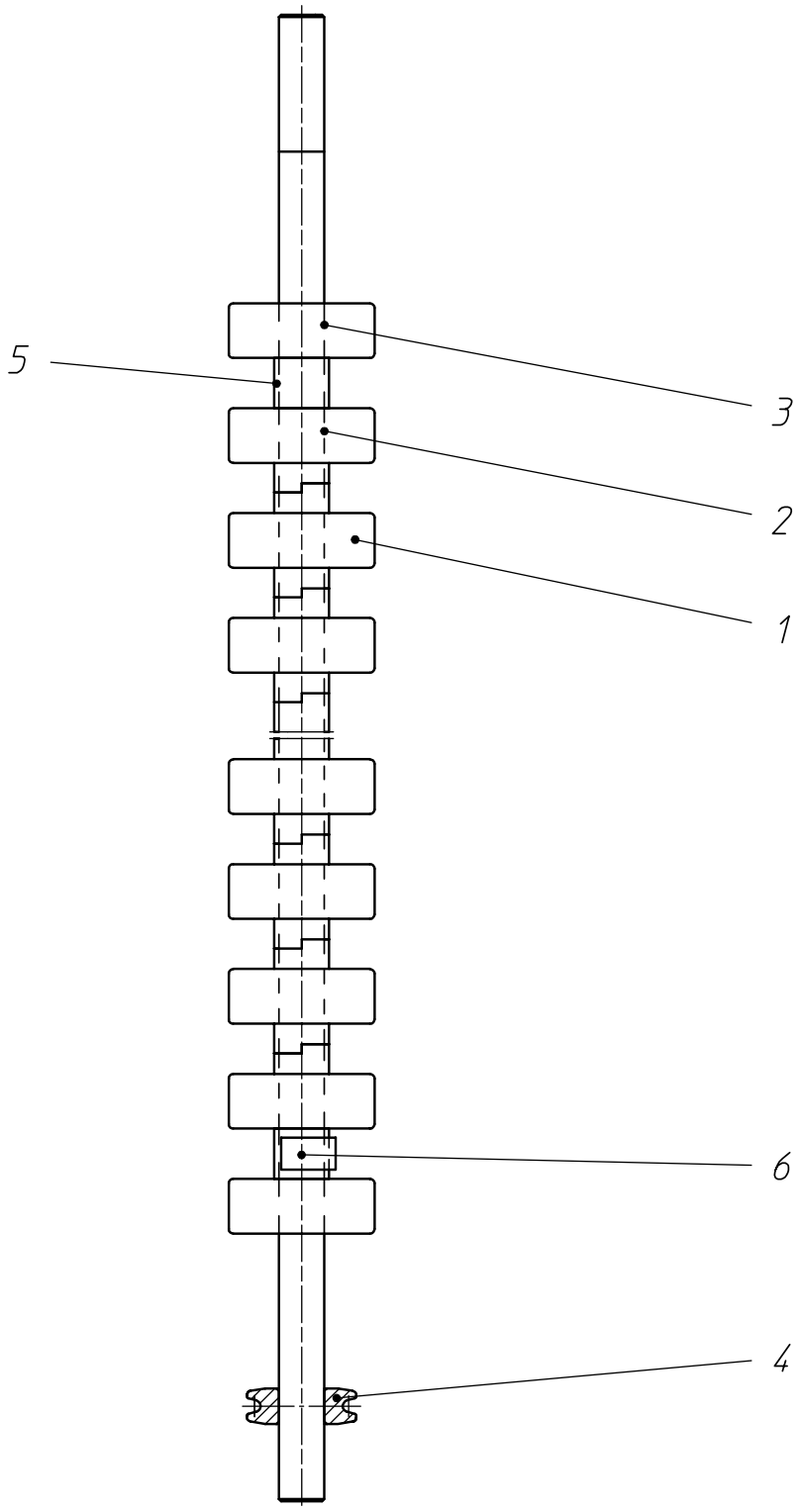
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1249.2573	Commiss.	: 25-05-377
Label	: SHAFT/KPL/32/O /L/AV/FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000235/01
Drawing	: 16.004.1249E0000	Date	: 10.04.2006

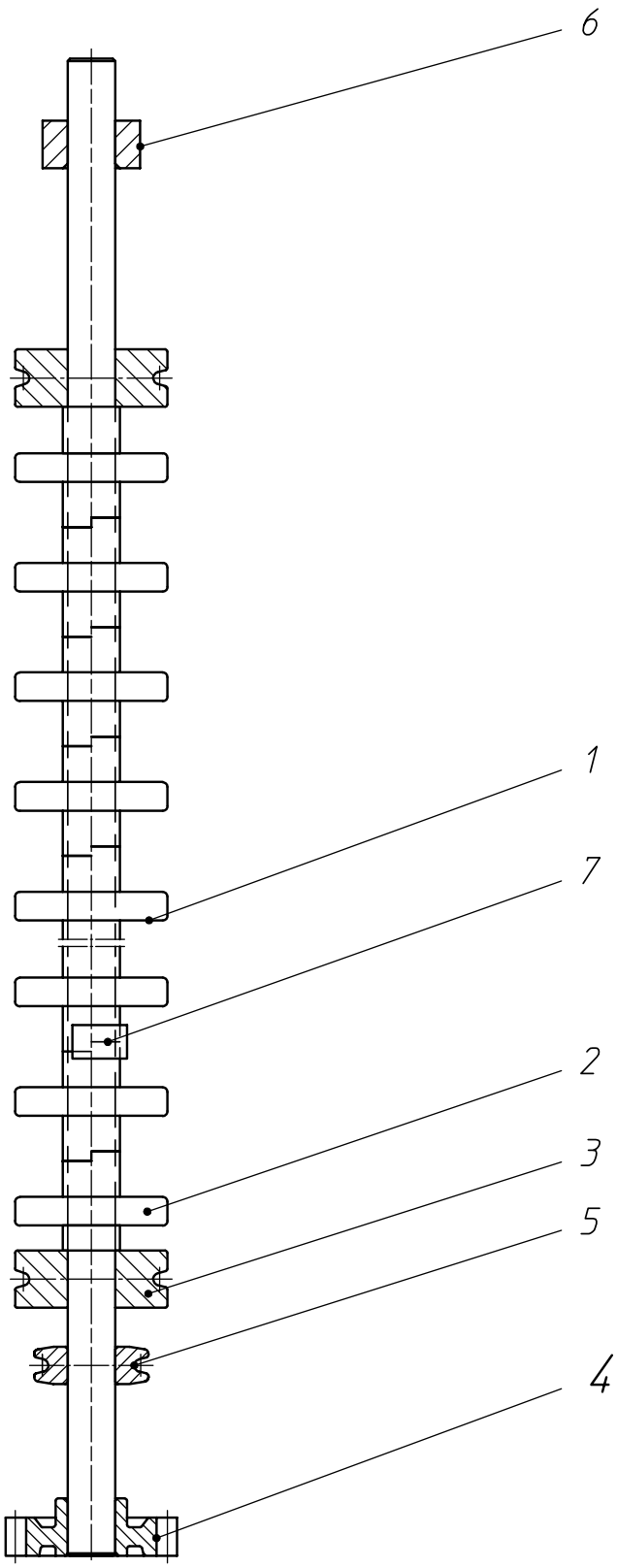
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1249E0000	11
	00



Assembly	: 16.004.1251.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000070
Quant.	: 2,000 ST	Page	: 000236/01
Drawing	: 16.004.1251E0000	Date	: 10.04.2006

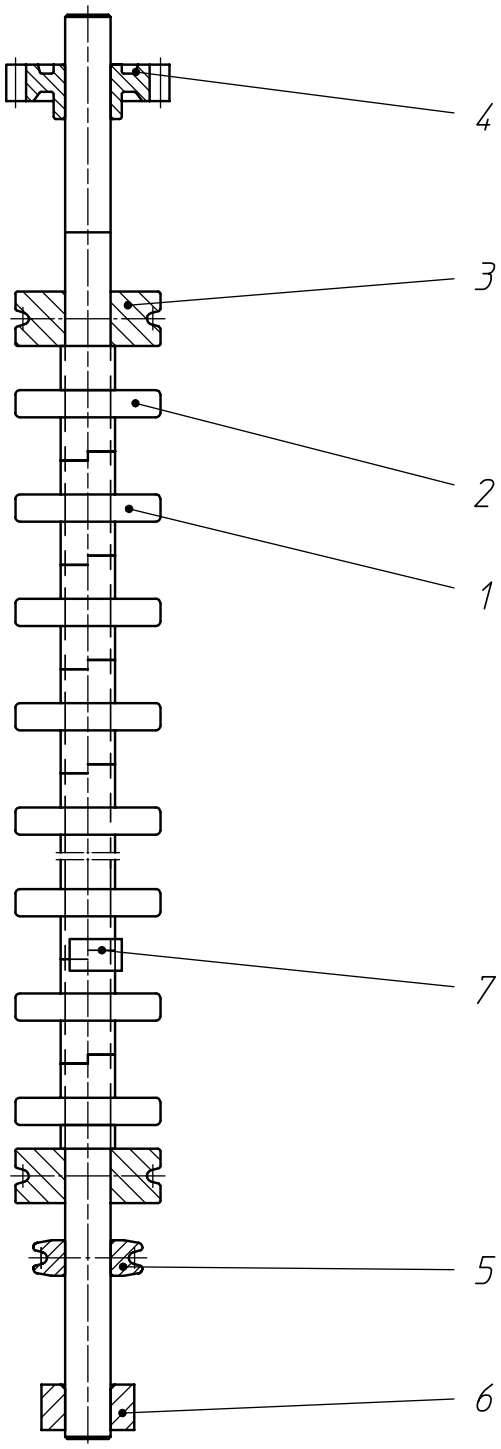
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list SHAFT

16.004.1251E0000	11
	00



Assembly	: 16.004.1252.2573	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/	Position	: 000070
Quant.	: 3,000 ST	Page	: 000237/01
Drawing	: 16.004.1252E0570	Date	: 10.04.2006

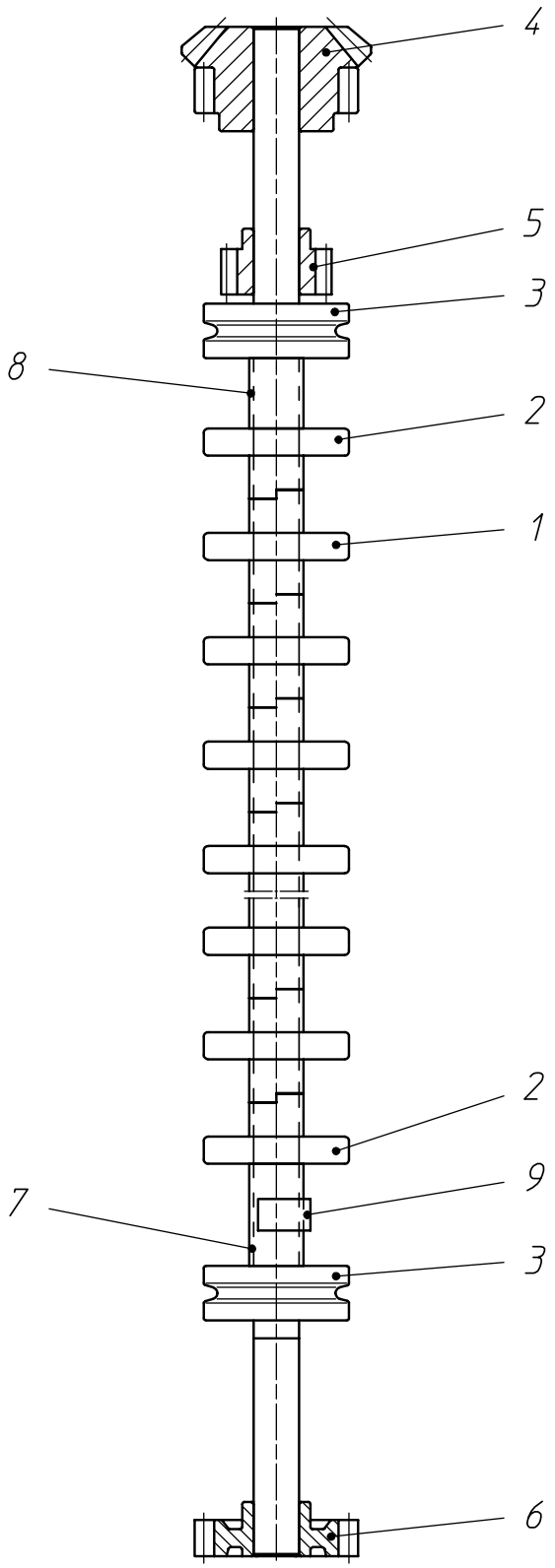
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1252E0570	11
	00



Assembly	: 16.004.0843.2573	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/TIT /PP/U/K/B/F	Position	: 000070
Quant.	: 1,000 ST	Page	: 000238/01
Drawing	: 16.004.0843E0570	Date	: 10.04.2006

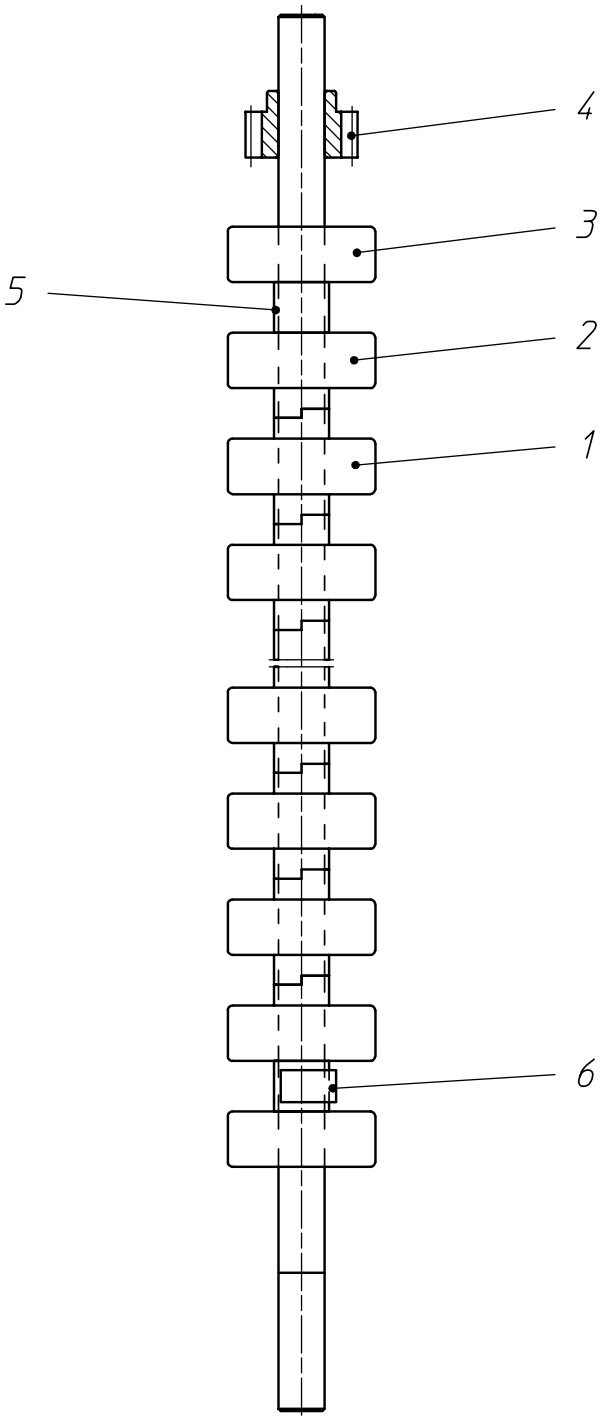
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0843E0570	11
	00



Assembly	: 16.004.1255.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/L/AV/FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000239/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

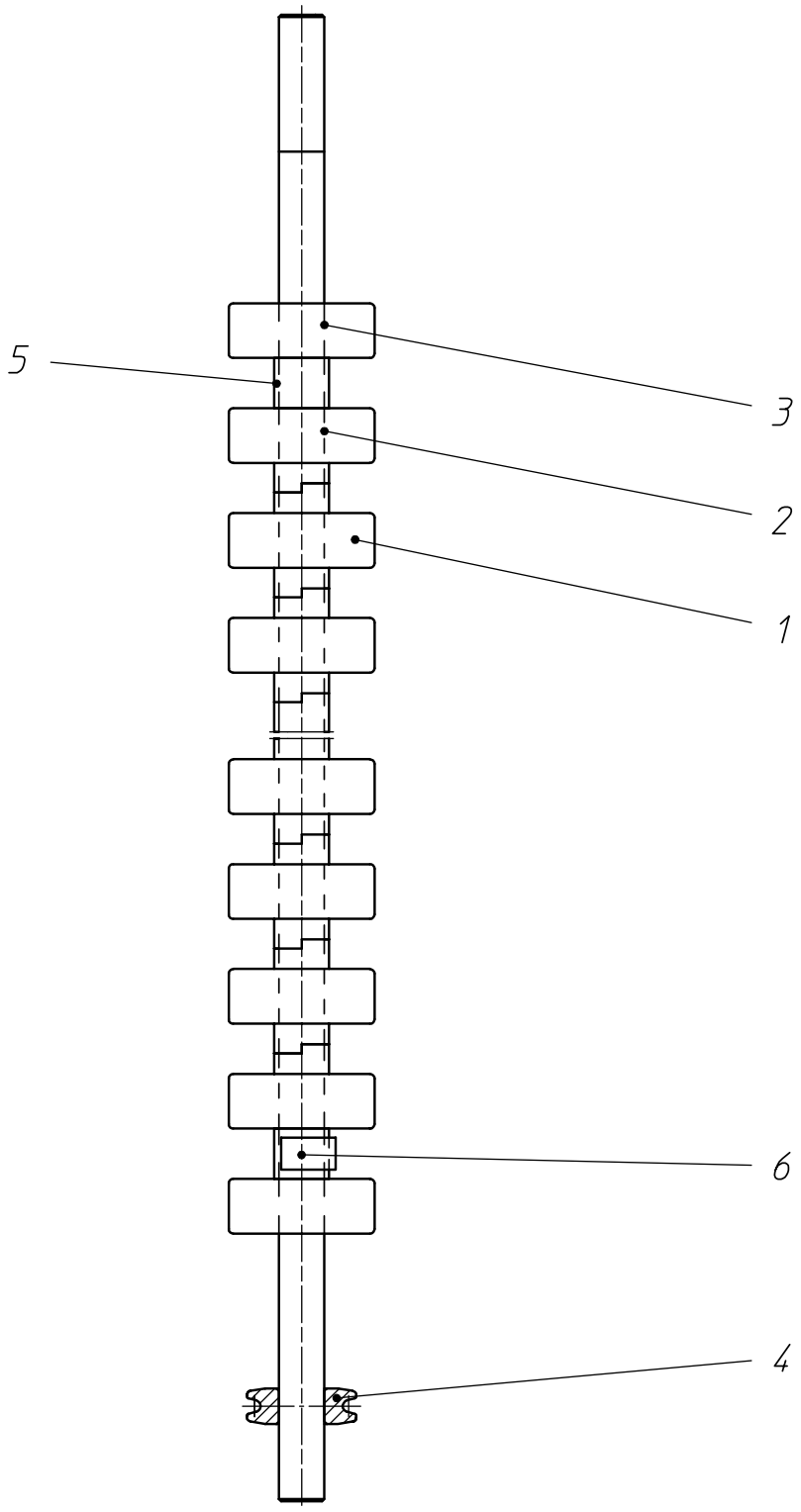
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X
7	00.019.0419.00RE BUSHING/PP-R/D=12.0/d=10.2/L=11	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1254.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/ /L/AV/FJ	Position	: 000070
Quant.	: 2,000 ST	Page	: 000240/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

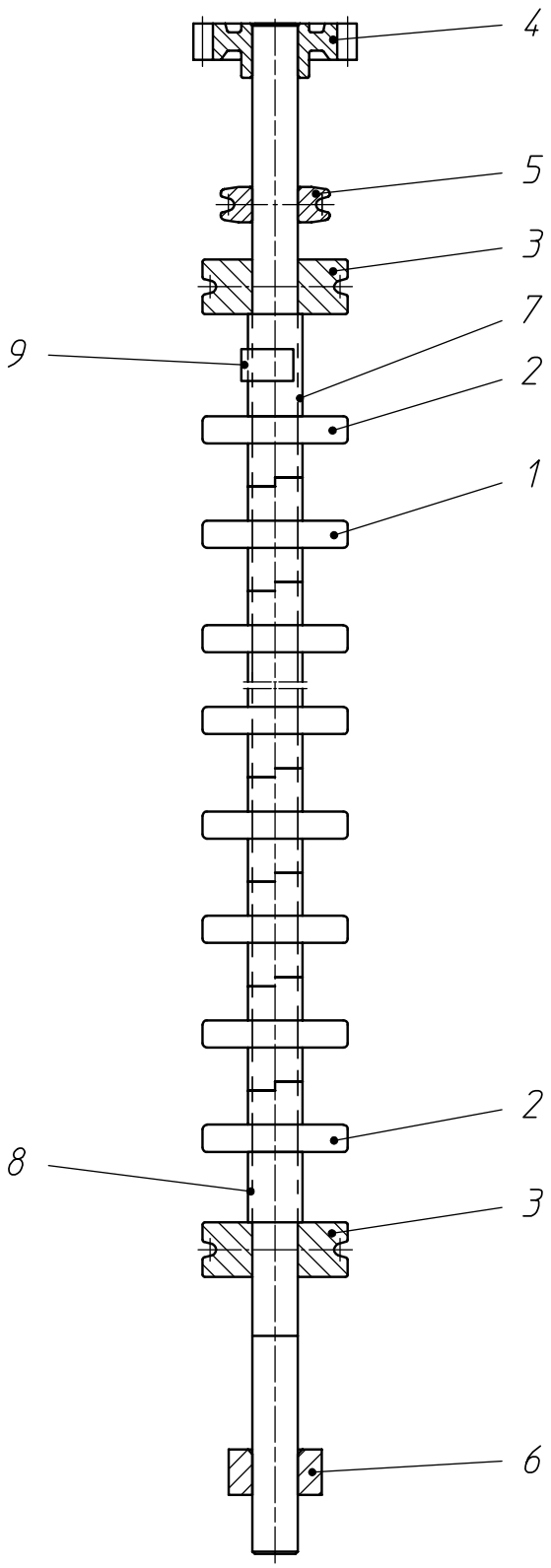
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1256.2573	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ	Position	: 000070
Quant.	: 1,000 ST	Page	: 000241/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

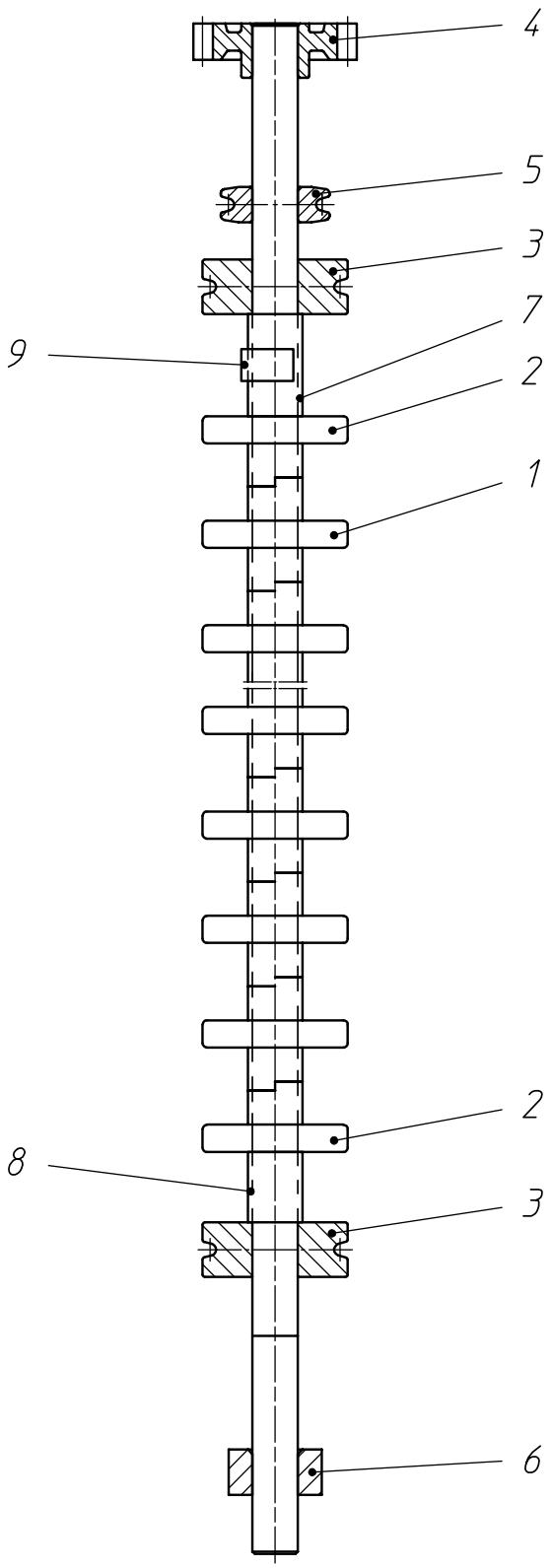
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.00RE BUSHING /PP-R/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



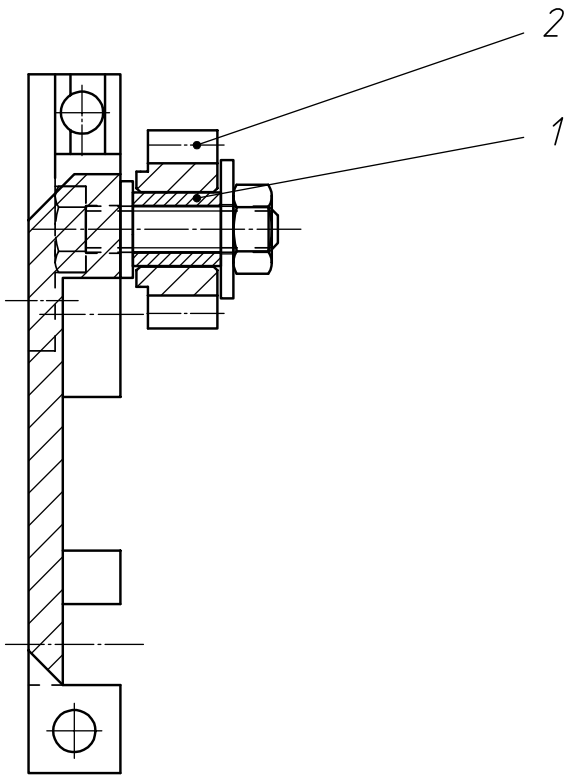
Assembly	: 16.004.0559.U003	Commiss.	: 25-05-377
Label	: GEAR WHEEL COMPL /Z=11/M2/TI/PP /=0162	Position	: 000070
Quant.	: 3,000 ST	Page	: 000242/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	00.019.0224.0003 BUSHING/TIT/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0393.U800	Commiss.	: 25-05-377
Label	: BELT DRIVE/SHAFT/O/SPRAY/FJ	Position	: 000070
Quant.	: 3,000 ST	Page	: 000243/01
Drawing	: 16.004.0393EU000	Date	: 10.04.2006

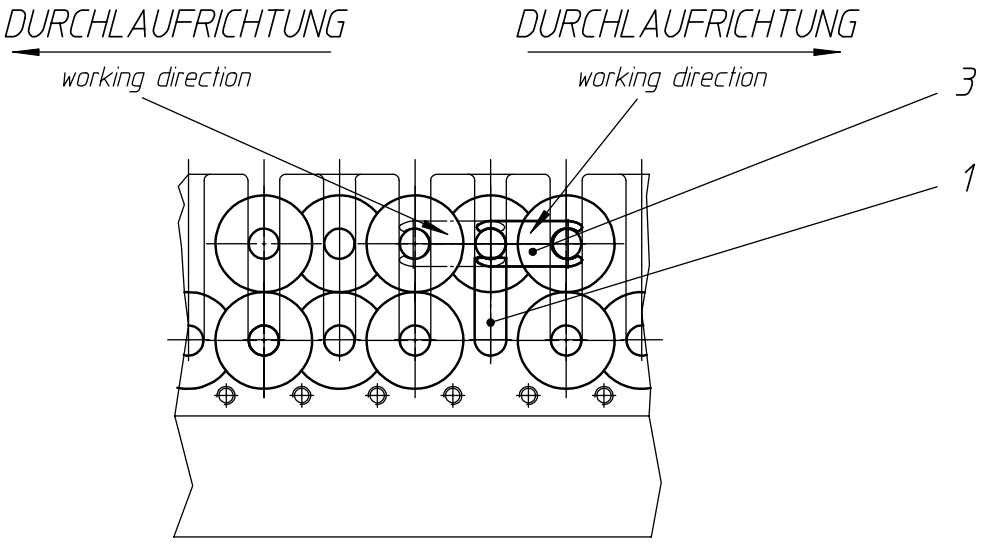
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0084.000H DISTANCE/GUR-N	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1178.000H CLIP/GUR-N/T25/TOP	2,000	ST	X

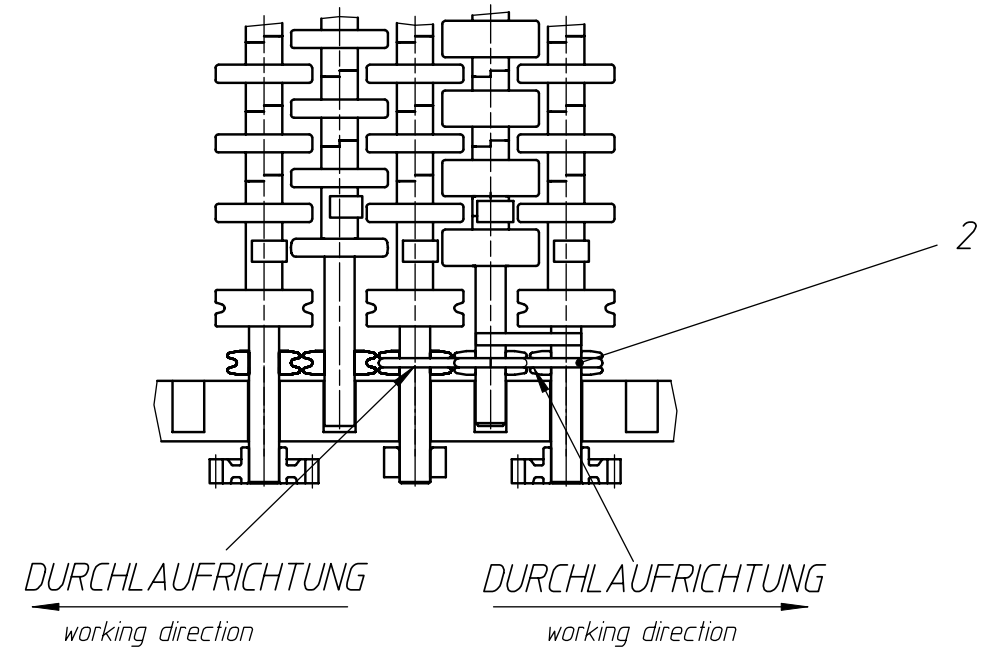
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMENANTRIEB

Spare parts list BELT DRIVE

16.004.0393EU000	11
	00





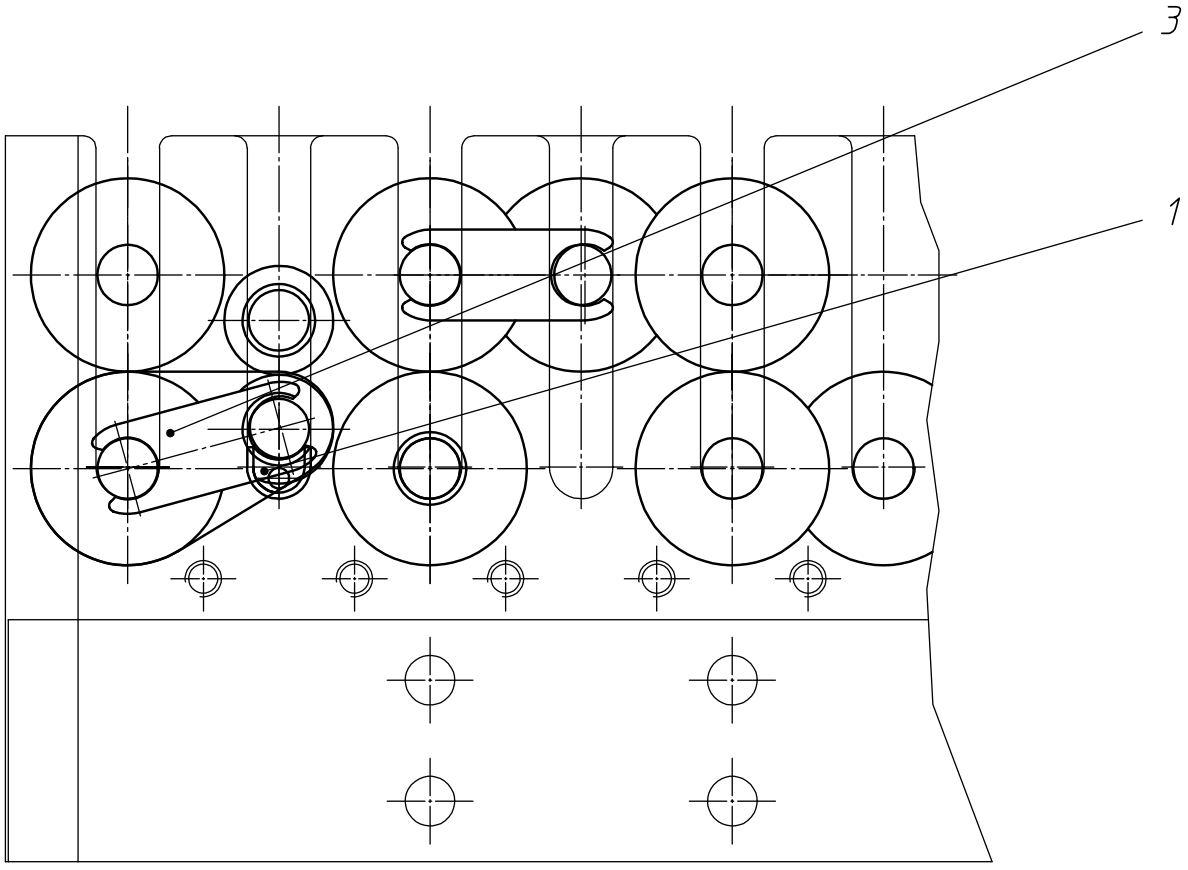
Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000070
Quant.	: 10,000 ST	Page	: 000244/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

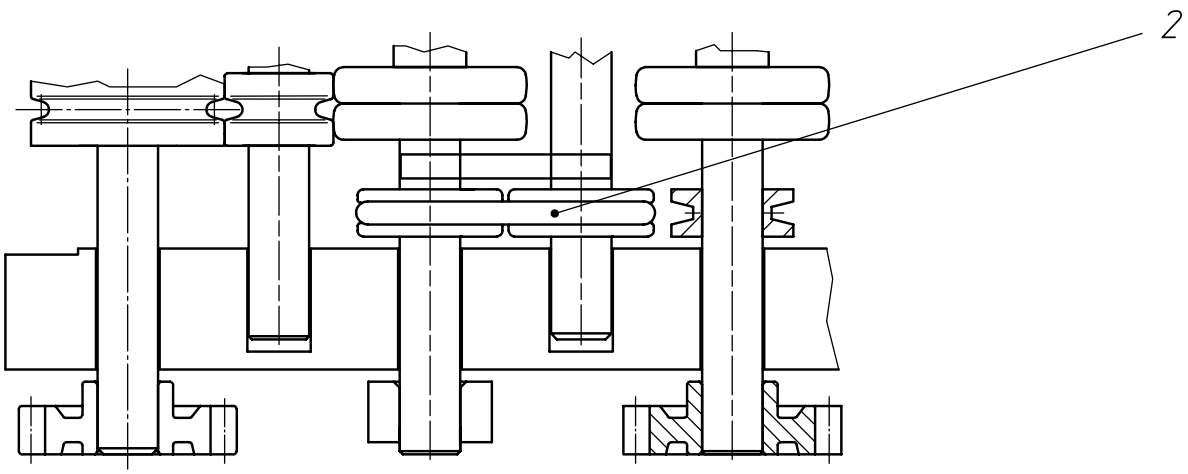
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 16.005.0086.U00A	Commiss.	: 25-05-377
Label	: INLET/PVC/DFM640/GK-MIN/MV/D=20	Position	: 000070
Quant.	: 1,000 ST	Page	: 000245/01
Drawing	: 16.005.0086EU000	Date	: 10.04.2006

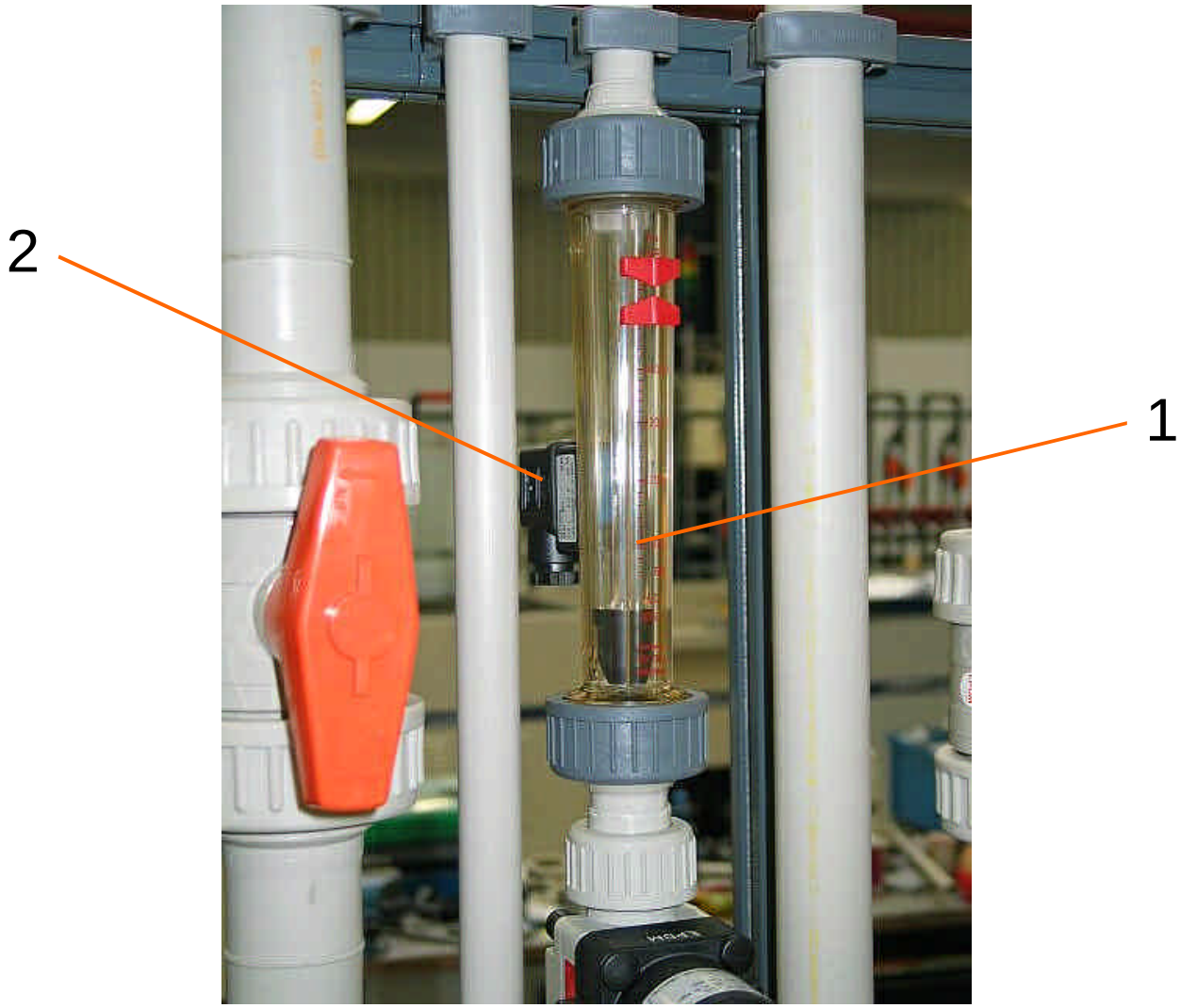
Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
1	MG-000000092-000 FLOW METER/POLYSULFON86/PVC/0060-00640 I	1,000	ST	X
2	ES-000000200-000 MAGNETIC SWITCH/TP:1257 MIN.DN10/15	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0086EU000	11
	00



GEMÜ®

Limit Switches Instrument Sensors

Description

Limit switches, types 1251–1257, for flowmeters operating on the variable area principle. Reading of the level of the float at the switching points.
Instrument sensors, types 1270–1273 for flowmeters operating on the variable area principle. Continuous reading of the level of the float.

Construction

Types 1251–1257
In the switches there are bistable reed contacts actuated by the magnet incorporated in the float.

Types 1270–1273
The instrument sensor contains reed contacts which are triggered by the magnetic flowmeter float.

Types 1272/1273 are equipped with an integrated 2-wire signal converter which realizes a current output signal.

Function

The limit switches and instrument sensors are fixed to the dovetail-sections moulded onto the flowmeter type series 800 and 850 (see datasheets 800 and 850). The float in the flowmeter is equipped with a permanent magnet.

Types 1251–1257
When the magnetic float has passed the limit switches fixed to the tube at least once, it will produce the following circuit condition:

Position of the float in relation to the limit switch:

	above the switch	**below the switch**
Max. limit switch (types 1251/1256):	closed	open
Min. limit switch (types 1252/1257):	open	closed

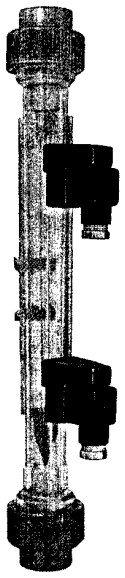
The switches then **remain** in this position, even if the float moves a long way from the min. or max. switch and will only change when the float passes the respective switch again.

Types 1270–1273
After passing through the type 1274 or 1279 signal transmitters, the reading from the type 1270/1271 instrument sensor is available as a digital indicating signal and as an analogue output signal which can then be used for further processing.

Types 1272/1273 produce a current output signal which can be directly processed without any further conversion.

The function of the limit switches or instrument sensors is neither affected by the working pressure, nor by the conductivity, concentration or density of the medium.

The application of the flowmeters with continuous reading or limit switches together with a signal converter is suitable for use with conducting, non-conducting and also with turbid media.



Types 1251–1257

Types 1270–1273

Types 1251/1256 Max. Limit Switches – Types 1252/1257 Min. Limit Switches

Housing material: Plastic
Electrical connection: Standard connector, supplied with switch
Contacts: Bistable reed switches
Switching function: Min. or max. switch as described
Degree of protection: IP 65
Max. voltage: 250 V
Max. peak value of marking current: 0.5 A
Max. steady current: 0.2 A
Max. switching duty: 10 VA
Specification: 1251/1252 for types 800 and 850 DN 25; cable gland PG 9
1256/1257 for type 850 DN 10, 15, 20; cable gland PG 9

Ordering Information:

Types 1251/1256 max. limit switches
Types 1252/1257 min. limit switches

Types 1270–1273 Instrument Sensors

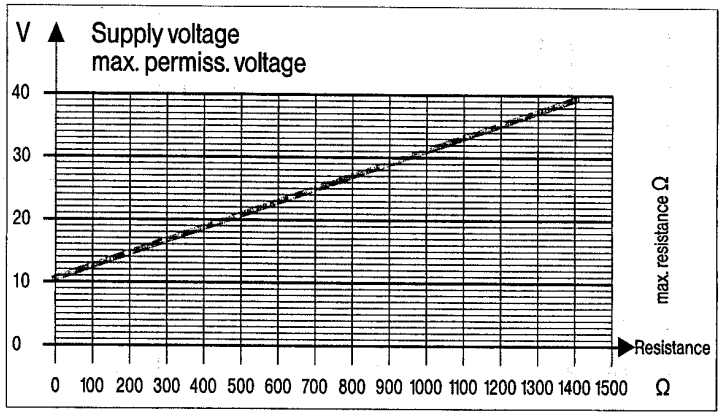
Housing material: Impact resistant plastic
Electrical connection: Standard connector with PG 9 cable gland, supplied with instrument sensor
Sensing system: Series of reed switches connected to a chain of resistors (0–10 kΩ)
Degree of protection: IP 65

Types 1272 and 1273 Instrument Sensors

Voltages: Operating voltage must be either abs. direct current or regulated direct current
$U_{min.} = 11\,V + 0.02 \times$ burden (Ohm)
$U_{max.} = 40\,V + 0.004 \times$ burden (Ohm)
Value acc. to diagram
Power consumption: V × 20 mA
Current output: 4–20 mA

Supply voltage dependent upon the resistance (in types 1272/73)

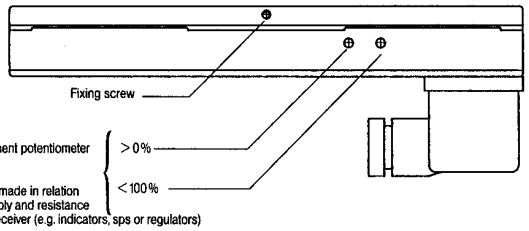
Supply voltage in V	Resistance in Ω	Current in mA
11.0	0.55	20
12.45	47	20
13.5	100	20
14.6	150	20
15.7	200	20
17.6	300	20
19.7	400	20
21.7	500	20
23.8	600	20
25.6	700	20
27.7	800	20
29.8	900	20
31.7	1000	20
33.7	1100	20
35.8	1200	20
37.7	1300	20
39.9	1400	20
41.8	1500	20



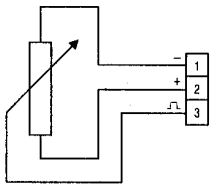
Ordering Information

Type	For flow-meter type	Signal transmitter	Metering length	Number of switch points	Distance of reed contacts	Combination within the GEMÜ modular system
Type 1270/000/Z 25	800	without	230 mm	55	4.25 mm	Types 1281–1284
Type 1271/000/Z 10	850/DN 10–20	without	122 mm	43	3.00 mm	Types 1286–1289
Type 1271/000/Z 25	850/DN 25	without	147 mm	43	3.50 mm	Types 1274–1279, Type 1510
Type 1272/000/Z 25	800	with integrated two wire signal converter	230 mm	55	4.25 mm	Type 3000, remote indication with input 4-20 mA, e.g. SPS
Type 1273/000/Z 10	850/DN 10–20		122 mm	43	3.00 mm	
Type 1273/000/Z 25	850/DN 25		230 mm	55	4.25 mm	

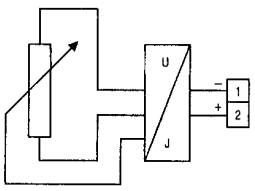
Types 1272/1273



Types 1270/1271



Types 1272/1273



Ordering Information: Types 1274/1279 signal transmitter, Types 1281-1289 3-point controllers, Type 1510 signal converter, Type 3000 accumulated flow counter
Please order separate datasheets.

Subject to alteration · 1/94 · 88048793

GEMÜ Gebr. Müller · Apparatebau GmbH & Co. KG · Criesbach · Neuer Wasen 6 · D-74653 Ingelfingen · Telefon 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Plastic Flowmeter

– Variable Area Principle –

Description

A range of plastic flowmeters, based on the variable area principle, which are corrosion resistant, extremely accurate, simple to use and maintain, and which possess considerable impact resistance.

Construction

The type 800 series of flowmeters operates according to the variable area principle, whereby the float can move freely within the metering tube.

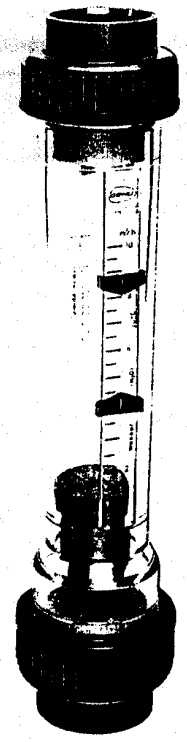
Metering tubes are available in Trogamid T, suitable for neutral media, and Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in Polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals of EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded onto the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), minimum and/or maximum limit switches, and a continous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 800

Accuracy class:
4; according to VDE/VDI 3513 sheet 2, i.e. 1% of end value + 3% of indicated flow inaccuracy

Flow ranges:

Standard Range*/** (Liquids)	Malleable Iron Unions Weight (kg)	PVC Unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	Hydrochloric acid HCl 30-33% Tube: Polysulfon	Sodium hydroxide NaOH 30% Tube: Trogamid-T	Sodium hydroxide NaOH 50% Tube: Trogamid-T	%-Scala Tube Trogamid-T Polysulfon	Tube Size Ref. no.
Type 805/815	0.70	0.40	DN 25	15– 160 l/h	10–130 l/h	–	–	10–100%	51
	0.70	0.40	DN 25	20– 250 l/h	10–200 l/h	2–110 l/h	–	10–100%	52
Material of float:	0.70	0.40	DN 25	40– 400 l/h	20–350 l/h	–	–	10–100%	53
	0.70	0.40	DN 25	60– 640 l/h	40–540 l/h	–	1–130 l/h	10–100%	54
PP (Polypropylene)	1.20	0.70	DN 32	100–1000 l/h	–	–	–	10–100%	61
	1.20	0.70	DN 32	150–1600 l/h	–	–	–	10–100%	62
(Type 815 with magnet)	2.50	1.60	DN 50	0.2– 2.5 m^3/h	–	–	–	10–100%	71
	2.50	1.60	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	72
	2.50	1.60	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	73
	3.80	2.50	DN 65	1–11 m^3/h	–	–	–	10–100%	76
Type 807/817	0.75	0.45	DN 25	25– 250 l/h	–	–	–	10–100%	51
	0.75	0.45	DN 25	40– 400 l/h	–	–	–	10–100%	52
Material of float:	0.75	0.45	DN 25	60– 640 l/h	–	–	–	10–100%	53
	0.75	0.45	DN 25	100–1000 l/h	–	–	–	10–100%	54
1.4571	1.30	0.80	DN 32	150–1600 l/h	–	–	10–540 l/h	10–100%	61
Stainless steel	1.30	0.80	DN 32	200–2500 l/h	–	–	–	10–100%	62
	3.00	2.10	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	71
(Type 817 with magnet)	3.00	2.10	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	72
	3.00	2.10	DN 50	1–10 m^3/h	–	–	–	10–100%	73
	4.70	3.40	DN 65	1.5–18 m^3/h	–	–	–	10–100%	76

*All scales of the standard range are based on a medium temperature of 20° C.

Standard Range (Gaseous media)	Malleable Iron Unions Weight	PVC Unions Weight	Size (mm)	Medium Air 1 bar abs. and 20°C	Tube Size Ref. no.
Type 825	0.70	0.40	DN 25	0.25 – 2.5 Nm^3/h	51
	0.70	0.40	DN 25	0.4 – 4.0 Nm^3/h	52
Material of float:	0.70	0.40	DN 25	0.63 – 6.3 Nm^3/h	53
	0.70	0.40	DN 25	1.0 – 10 Nm^3/h	54
PP (Polypropylene)	1.20	0.70	DN 32	1.6 – 16 Nm^3/h	61
	1.20	0.70	DN 32	2.5 – 25 Nm^3/h	62
	2.50	1.60	DN 50	4.0 – 40.0 Nm^3/h	71
	2.50	1.60	DN 50	6.3 – 63.0 Nm^3/h	72
	2.50	1.60	DN 50	10.0 –100.0 Nm^3/h	73
	3.80	2.50	DN 65	16.0 –180.0 Nm^3/h	76
Type 835	0.75	0.45	DN 25	0.63– 6.3 Nm^3/h	51
	0.75	0.45	DN 25	1.0 – 10.0 Nm^3/h	52
Material of float:	0.75	0.45	DN 25	1.6 – 16.0 Nm^3/h	53
	0.75	0.45	DN 25	2.5 – 25.0 Nm^3/h	54
PP (Polypropylene)	1.30	0.80	DN 32	4.0 – 40.0 Nm^3/h	61
	1.30	0.80	DN 32	6.3 – 63.0 Nm^3/h	62
with magnet	3.00	2.10	DN 50	10.0 –100.0 Nm^3/h	71
	3.00	2.10	DN 50	16.0 –160.0 Nm^3/h	72
	3.00	2.10	DN 50	25.0 –250.0 Nm^3/h	73
	4.70	3.40	DN 65	40.0 –400.0 Nm^3/h	76

**** For smaller or larger flow ranges, see types 850, 840 and back page of datasheet type 800. Further ranges available on enquiry.**

To types 825/835.
Note: with gaseous media the scaling alters according to operating pressure.
Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note ordering instructions.

Ordering information

Material of float	Working medium	Type Ref. no.
PP	Liquids	805
PP (with magnet)	Liquids	815
Stainless steel 1.4571	Liquids	807
Stainless steel 1.4571 (with magnet)	Liquids	817
PP	Gas	825
PP (with magnet)	Gas	835

Size	Ref. no.
DN 25	25
DN 32	32
DN 50	50
DN 65	65

Body configuration: D = straight through

Tube end connections	Ref. no.
Threaded spigots	7

Material of tube	Ref. no.
Trogamid-T Temp. range: 0– 60°C	21
Polysulfon Temp. range: 0–100°C	22
(Stated temperatures are valid for water).	

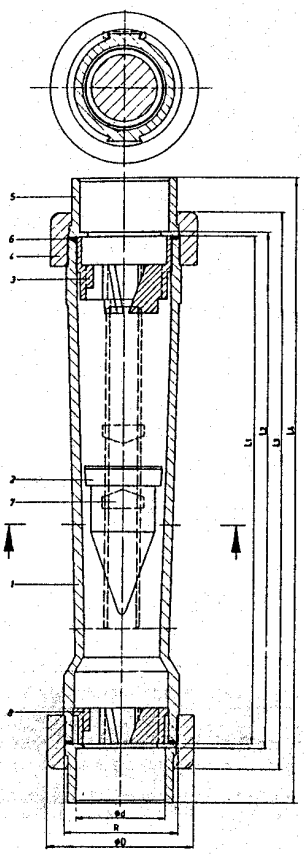
Material of O-Rings	Ref. no.
FPM (Viton)	4
EPDM (Ethylene-propylene)	14

End connection material	Ref. no.
PVC unions with adhesive sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16	6

Size of tube
(see table on left)

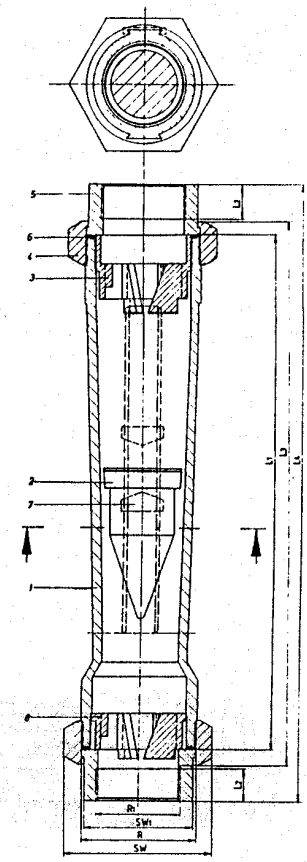
Flow range:
(see table on left)

Note:
When ordering, the flow ranges should be stated as follows:
Liquids: l/h
Gaseous media: Nm^3/h



DN	R	R_1	SW	SW_1	L_1	L_2	L_3	L_4
25	G 1½	G 1	54	38	350	17	370	402
32	G 2	G 1¼	66	47	350	19	370	410
50	G 2¾	G 2	90	66	350	24	374	420
65	G 3½	G 2½	110	83	350	30	374	430

PVC-Unions



DN	ø d	R	ø D	L_1	L_2	L_3	L_4
25	32	G 1½	60	350	356	376	400
32	40	G 2	74	350	356	380	408
50	63	G 2¾	103	350	356	386	433
65	75	G 3½	122	350	356	388	445

Malleable iron unions

Spare parts list

Pos.	Description	Pieces
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1

Ordering Example	805	25	D	7	21	14	1	51	160
Type (float PP)	805								
Size (mm)		25							
Body configuration			D						
End connection of tube				7					
Material of metering tube					21				
Material of O-ring						14			
End connection material							1		
Tube cone								51	
Flow range max. (e.g. 160 l/h, H_2O)									160

Required information

In order to size a flowmeter the following data are necessary:
1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h or kg/h)
4. Operating pressure (bar abs or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)
8. Float with or without magnet

Plastic Flowmeter for Larger Flow Ranges

Standard scale: Range 12 – 26 m^3/h., medium: water at 20°C

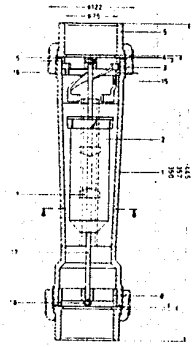
Version:

Construction and materials as for types 807/817, nominal bore size: 65 mm.
The float is guided by means of a rod.

Ordering Information:

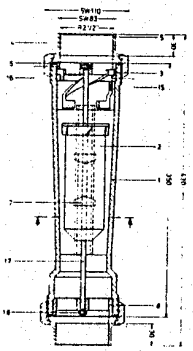
Analogue: As for types 807 / 817. In addition, following the range (26.000 l/h.), please give the version of the float according to the following ref. nos.:

Material of float	Type ref. no.	Additional ref. no.
Stainless steel no. 1.4571	807	1105
Stainless steel no. 1.4571 (with magnet)	817	1106



DN	Od	OD	I	L
65	75	122	357	445

Version
PVC unions
weight 4.6 kg.



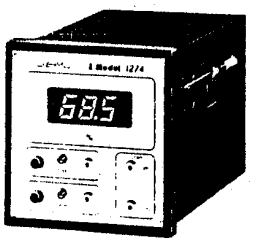
DN	SW	SW1	D	I	L
65	110	83	G 2½	30	430

Version
Malleable iron unions
weight 6.0 kg.

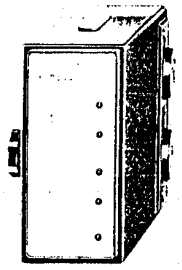
Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3, 15, 16	Compl. float stop	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1
17	Guiding rod	1
18	Nut for guiding rod (17)	2

Accessories for Flowmeter Series 800



Type 1274/1279



Type 1520/1521

Type 1270

Type 1251

Type 1252

To increase the versatility of the flowmeter series 800, numerous accessories have been developed which can be retrofitted onto the tube. The float however, must be one containing a magnet, in order for these accessories to function.

- Type 1251 Limit switch (max.) 10 VA
- Type 1252 Limit switch (min.) 10 VA
- Type 1270/ Instrument sensor for continual float level readings.
- Type 1274/ **E-module**, signal transmitter.
  1279 Designs: panel mounting or eurocard (19"/24")
- Type 1520/ **E-module**, isolating switch amplifier.
  1521 Designs: panel mounting or eurocard (19"/24")

For the above accessories there are separate datasheets. For further enquiries, please apply for the respective sheets.

Further product range

- Plastic valves, pneumatically, electrically and manually operated
- Metal valves, pneumatically, electrically and manually operated

Manufacturer

GEMÜ GEBR. MÜLLER
Apparatebau GmbH & Co. KG
Postfach 30 · D-7118 Ingelfingen 2 · West Germany
Tel. 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Presented by:

GEMÜ®

Plastic Flowmeter

DN 10–25

Description

A plastic flowmeter, operating on the variable area principle, which is extremely accurate, resistant to corrosion, resistant to impact, and is simple to use.

Construction

This GEMÜ plastic flowmeter operates according to the variable area principle, whereby the float can move freely within the metering tube.

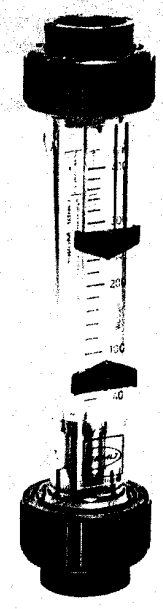
Metering tubes are available in Trogamid, suitable for neutral media, and in Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals in EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded on to the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), min. and/or. max. limit switches, or a continuous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 850

Flow Ranges

Standard Ranges*/** (liquids)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	% scale Tube: Trogamid-T Polysulfon	Tube size ref. no.
Type 855/865	0.18	0.07	DN 10	2– 25 l/h	10–100 %	11
	0.18	0.07	DN 10	4– 40 l/h	10–100 %	12
	0.18	0.07	DN 10	5– 60 l/h	10–100 %	13
	0.18	0.07	DN 10	10– 100 l/h	10–100 %	14
Float material	0.18	0.07	DN 10	15– 160 l/h	10–100 %	15
	0.30	0.12	DN 15	5– 60 l/h	10–100 %	21
	0.30	0.12	DN 15	10– 100 l/h	10–100 %	22
	0.30	0.12	DN 15	15– 160 l/h	10–100 %	23
PP (Polypropylene)	0.30	0.12	DN 15	20– 250 l/h	10–100 %	24
	0.30	0.12	DN 15	30– 320 l/h	10–100 %	25
(Type 865 with magnet)	0.48	0.21	DN 20	15– 160 l/h	10–100 %	31
	0.48	0.21	DN 20	20– 250 l/h	10–100 %	32
	0.48	0.21	DN 20	40– 400 l/h	10–100 %	33
	0.48	0.21	DN 20	60– 640 l/h	10–100 %	34
	0.61	0.29	DN 25	20– 250 l/h	10–100 %	41
	0.61	0.29	DN 25	40– 400 l/h	10–100 %	42
	0.61	0.29	DN 25	60– 640 l/h	10–100 %	43
	0.61	0.29	DN 25	100–1000 l/h	10–100 %	44
Type 857/867	0.19	0.08	DN 10	4– 40 l/h	10–100 %	11
	0.19	0.08	DN 10	5– 60 l/h	10–100 %	12
	0.19	0.08	DN 10	10– 100 l/h	10–100 %	13
	0.19	0.08	DN 10	15– 160 l/h	10–100 %	14
Float material	0.19	0.08	DN 10	20– 250 l/h	10–100 %	15
	0.31	0.13	DN 15	10– 100 l/h	10–100 %	21
	0.31	0.13	DN 15	15– 160 l/h	10–100 %	22
1.4571	0.31	0.13	DN 15	20– 250 l/h	10–100 %	23
Stainless steel	0.31	0.13	DN 15	40– 400 l/h	10–100 %	24
(Type 867 with magnet)	0.31	0.13	DN 15	50– 500 l/h	10–100 %	25
	0.51	0.24	DN 20	20– 250 l/h	10–100 %	31
	0.51	0.24	DN 20	40– 400 l/h	10–100 %	32
	0.51	0.24	DN 20	60– 600 l/h	10–100 %	33
	0.51	0.24	DN 20	100–1000 l/h	10–100 %	34
	0.66	0.34	DN 25	40– 400 l/h	10–100 %	41
	0.66	0.34	DN 25	60– 640 l/h	10–100 %	42
	0.66	0.34	DN 25	100–1000 l/h	10–100 %	43
	0.66	0.34	DN 25	150–1600 l/h	10–100 %	44

* All scales of the standard range are based on a medium temperature of 20°C.

****For larger flow ranges see type series 800.**

Standard Ranges (gaseous media)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Medium air at 1 bar abs. and 20°C	Tube size ref. no.
Type 875	0.18	0.07	DN 10	30– 360 N l/h	11
	0.18	0.07	DN 10	50– 550 N l/h	12
	0.18	0.07	DN 10	100– 900 N l/h	13
	0.18	0.07	DN 10	150–1500 N l/h	14
Float material	0.18	0.07	DN 10	200–2400 N l/h	15
	0.29	0.11	DN 15	100– 900 N l/h	21
	0.29	0.11	DN 15	150–1500 N l/h	22
	0.29	0.11	DN 15	200–2400 N l/h	23
	0.29	0.11	DN 15	400–3800 N l/h	24
PP (Polypropylene)	0.29	0.11	DN 15	500–4800 N l/h	25
	0.46	0.19	DN 20	0.2– 2.5 Nm^3/h	31
	0.46	0.19	DN 20	0.4– 4.0 Nm^3/h	32
	0.46	0.19	DN 20	0.5– 5.5 Nm^3/h	33
	0.46	0.19	DN 20	1.0–10.0 Nm^3/h	34
	0.57	0.25	DN 25	0.4– 4 Nm^3/h	41
	0.57	0.25	DN 25	0.6– 6 Nm^3/h	42
	0.57	0.25	DN 25	1.0–10 Nm^3/h	43
	0.57	0.25	DN 25	1.5–16 Nm^3/h	44

To type 875
Note: With gaseous media the scaling alters according to operating pressure. Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note the ordering instructions.

Ordering Information

Version:

Flowmeter with float material	Operating medium	Type ref. no.
PP	Liquids	855
PP (with magnet)	Liquids	865
Stainless steel (1.4571)	Liquids	857
Stainless steel (1.4571) (with magnet)	Liquids	867
PP	Gas	875

Size (mm)	Ref. no.
DN 10	10
DN 15	15
DN 20	20
DN 25	25

Body configuration: D = straight through

Tube end connections	Ref. no.
Male threads	7

Material of tube	Ref. no.
Trogamid-T temperature range: 0 – 60°C	21
Polysulfon temperature range: 0 – 100°C	22
(Given temperatures are valid for water)	

Material of O-rings		Ref. no.
O-ring Viton	FPM	4
Ethylene Propylene	EPDM	14

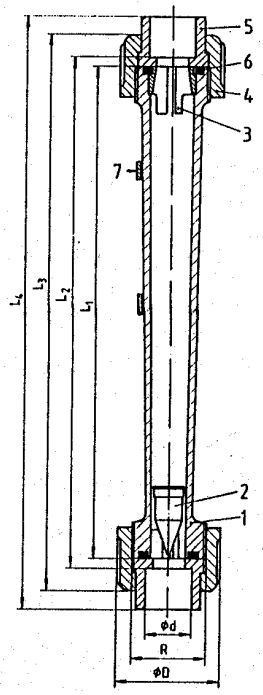
End connection material	Ref. no.
PVC unions with solvent welded sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16.	6

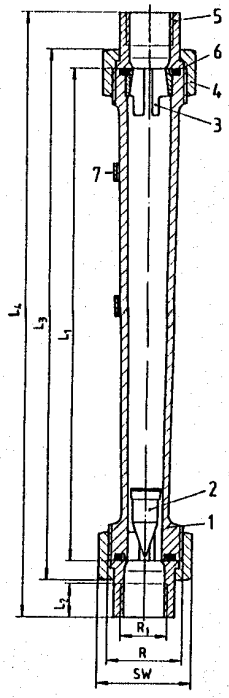
Size of tube
(see table on left)

Measuring range
(see table on left)

Note:
The scale divisions correspond to the actual flows. For liquid media the flow values are in l/h and for gaseous media in Nm^3/h or N l/h

Accuracy class:
4; according to VDE/VDI 3513, sheet 2, i.e. 1% of end value + 3 % of measured value.





DN	Ød	G	ØD	L1	L2	L3	L4
10	16	G¾	35	165	171	186	199
15	20	G 1	43	170	176	192	208
20	25	G1¼	53	185	191	210	229
25	32	G1½	59	200	206	226	250

Version: PVC unions

DN	G 1	G	SW	L1	L2	L3	L4
10	G⅜	G¾	32	165	12	180	207
15	G½	G 1	41	170	13	185	215
20	G¾	G1¼	50	185	16	201	230
25	G 1	G1½	55	200	19	219	250

Version: Malleable iron unions

Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2

Ordering Example	855	10	D	7	21	14	1	13	60
Type (float PP)	855								
Size (mm)		10							
Body configuration			D						
Connection (ref. no.)				7					
Tube material (ref. no.)					21				
Material of O-rings						14			
End connection material							1		
Tube cone								13	
Flow range max. (e.g. l/h H_2O)									60

Required information:
In order to size a flowmeter, the following data are necessary:

1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h, kg./h)
4. Operating pressure (bar abs. or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)

Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000070
Quant.	: 1,000 ST	Page	: 000246/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

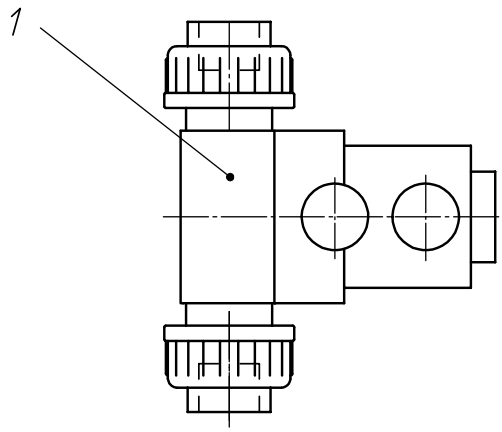
Pos.	Part N° / Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

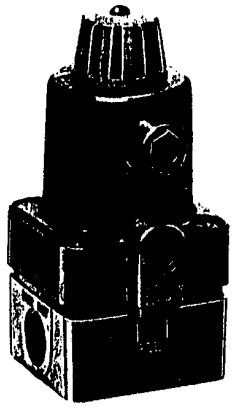
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

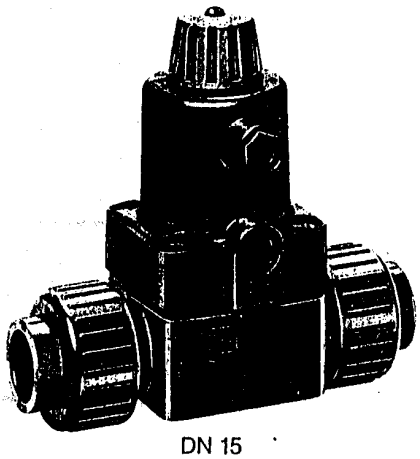
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

GEMÜ®

Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

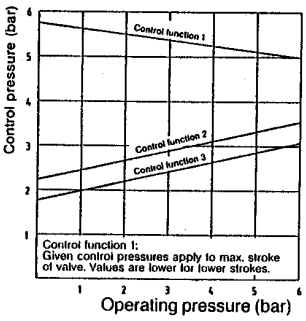
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

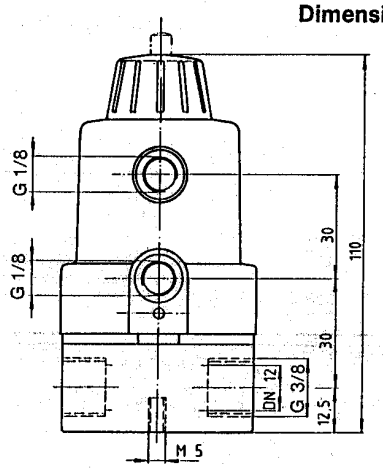
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

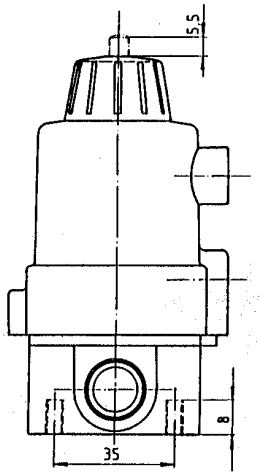
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

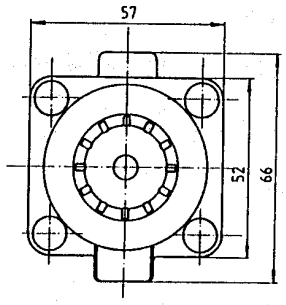
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



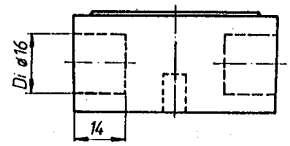
Dimensions



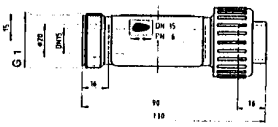




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

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Tel. 07940/123-0 · Telex 74126 · FAX 07940/123-106

Presented by:

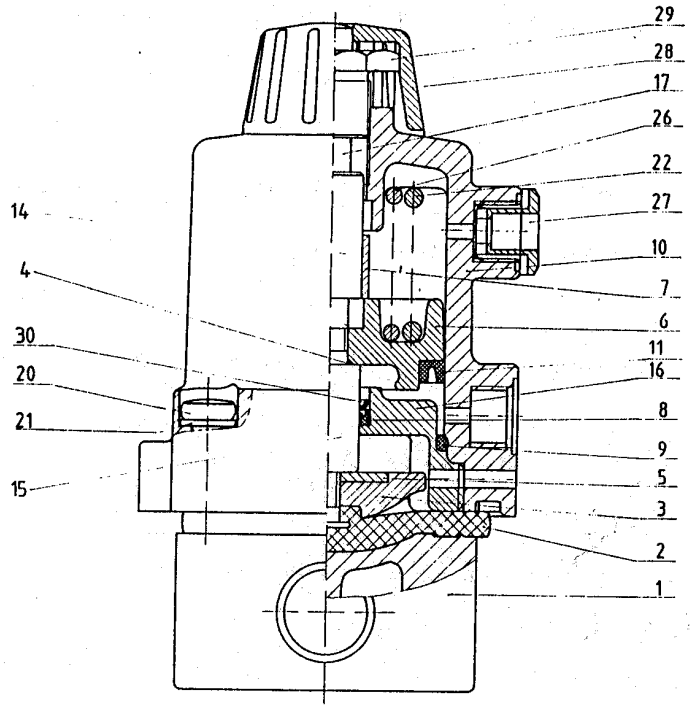
Printed in West Germany – Oha-Druck GmbH, Ingelfingen

GEMÜ®

Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000070
Quant.	: 1,000 ST	Page	: 000247/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

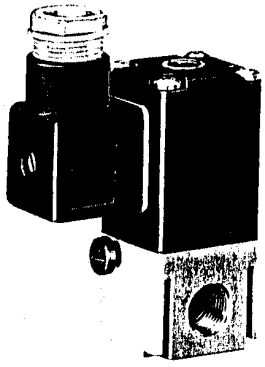
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

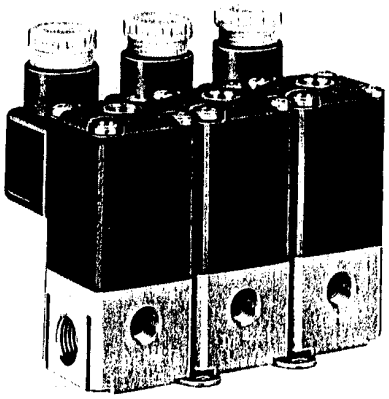
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

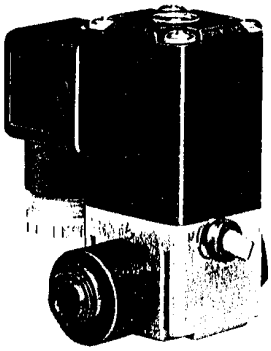
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

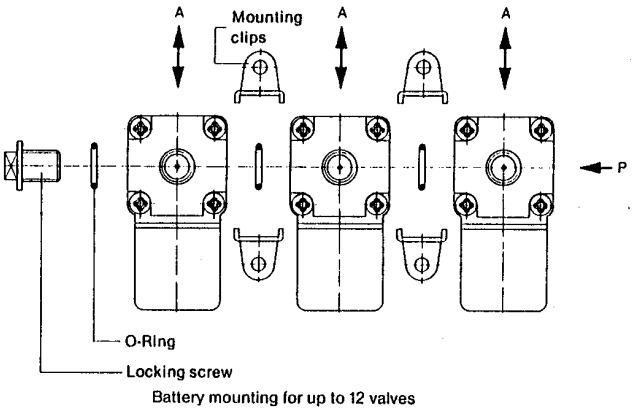


Type 322



Type 324

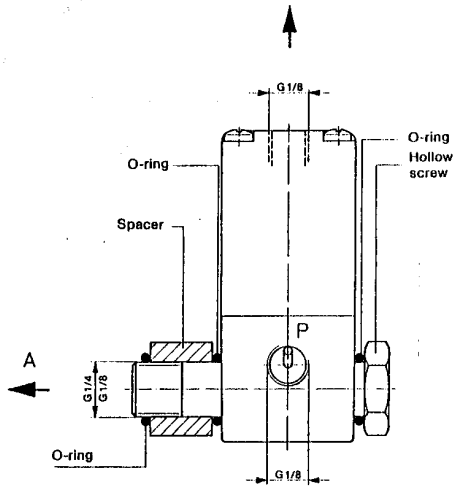
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

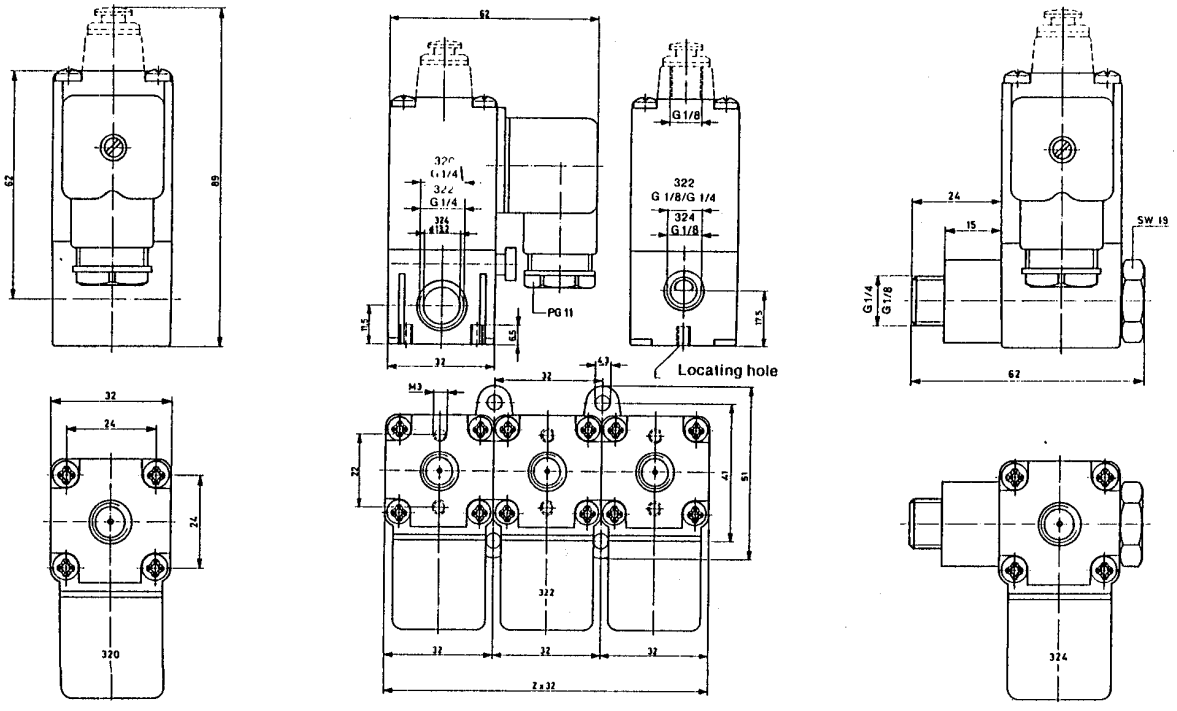
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

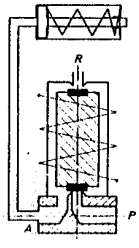
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

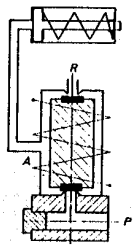
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

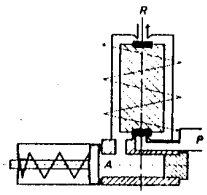
Control function normally closed



Type 320

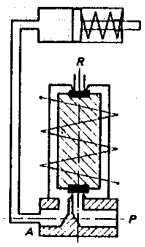


Type 322

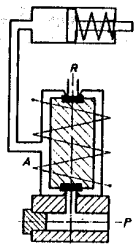


Type 324

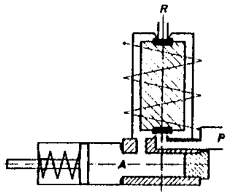
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

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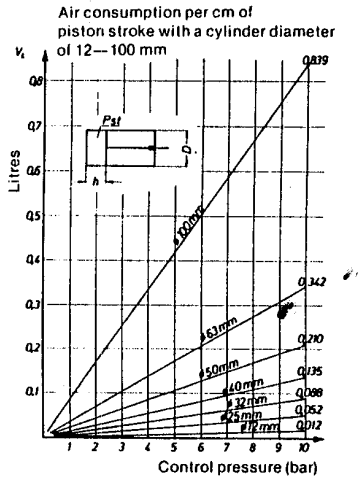
Printed in West Germany – Ohg-Druck GmbH, Ingelfingen

Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

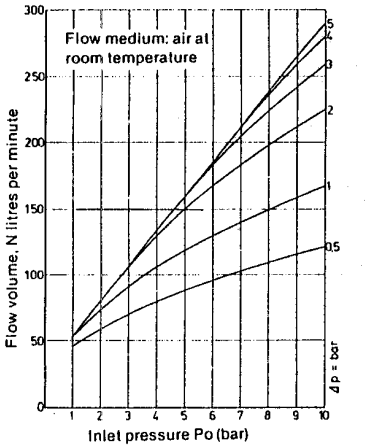
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

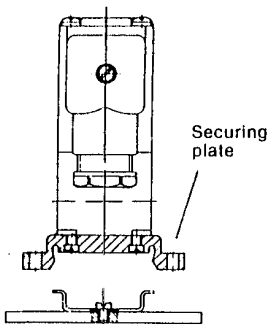
The flow quantity for other gases and temperatures can be calculated according to the following formula:

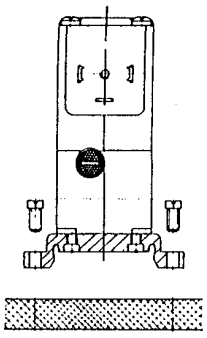
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 25-05-377-06	Commiss.	: 25-05-377
Label	: M06, Rinse - WMT 1 PVC/SS	Position	: 000080
Quant.	: 1,000 ST	Page	: 000248/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.WMT1.20.0L CONTAINER[520]/WMT1/PVC/VA	1,000	ST	
	16.002.0040.U211 INTERMEDIATE GLASS COVER/KPL./21/PP/V2A	1,000	ST	
	16.05.W001.01.0A FEED/WMT1/PVC /PVC /EP/AS08	1,000	ST	
1	16.005.0010.2O2B SPRAYPIPE/PVC-D/ 650/ 9D/F/G/12,06L/MIN	4,000	ST	X
	16.009.0005.U00A COOLING/ACCESSORIES/PVC/1KS	1,000	ST	
2	03.009.0052.0002 COOLING COIL/V4A/L=700	1,000	ST	X
	16.010.0040.U00L HEATING/4,50KW/VA/PVC/CS	1,000	ST	
	16.010.0005.U001 TEMPERATURE PROBE/VA/EP/2xPt100/MAZ/L200	1,000	ST	
	16.010.0006.U00A LEVEL SWITCH/PVC/EPDM /ES-297	1,000	ST	
	16.008.0004.U001 PUMP FIXING/VA/PP-G/EPDM	1,000	ST	
	50.003.0006.U000 TA/RE/1.80kW/MF/ET=270/PUTA.04.K.000175	1,000	ST	
3	FL-000000282-000 GX-DEEP FILTER ELEM./PP/ L=9 3/4"/50µ	1,000	ST	X
	16.004.0126.U21L CONVEYOR/ST/21/PVC/VA/KL-KU/d=27	1,000	ST	
	VS-25-05-377-06 CONVEYOR/WMT 1/650/PVC/VA	1,000	ST	
4	21.322.000-12 BALL VALVE-PVC/EPDM/NR.161.322.200 D=12	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 25-05-377-06	Commiss.	: 25-05-377
Label	: M06, Rinse - WMT 1 PVC/SS	Position	: 000080
Quant.	: 1,000 ST	Page	: 000248/02
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.027.0002.U00A CONDUCTANCE MEASURING DEVICE/IND.	1,000	ST	
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
5	MG-000000229-000 FLOW METER	1,000	ST	X
6	ES-000000200-000 MAGNETIC SWITCH/TP:1257 MIN.DN10/15	1,000	ST	X
7	PUDO225600-03413 DOSING PUMP/E10.072/PV10EPP/LA/5/0.019kW	1,000	ST	X
8	XE-000009416-000 LA-SUCTION PIPE PP/NR.KA90188 PP/L=1000	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Limit Switches Instrument Sensors

Description

Limit switches, types 1251–1257, for flowmeters operating on the variable area principle. Reading of the level of the float at the switching points.
Instrument sensors, types 1270–1273 for flowmeters operating on the variable area principle. Continuous reading of the level of the float.

Construction

Types 1251–1257
In the switches there are bistable reed contacts actuated by the magnet incorporated in the float.

Types 1270–1273
The instrument sensor contains reed contacts which are triggered by the magnetic flowmeter float.

Types 1272/1273 are equipped with an integrated 2-wire signal converter which realizes a current output signal.

Function

The limit switches and instrument sensors are fixed to the dovetail-sections moulded onto the flowmeter type series 800 and 850 (see datasheets 800 and 850). The float in the flowmeter is equipped with a permanent magnet.

Types 1251–1257
When the magnetic float has passed the limit switches fixed to the tube at least once, it will produce the following circuit condition:

Position of the float in relation to the limit switch:

	above the switch	**below the switch**
Max. limit switch (types 1251/1256):	closed	open
Min. limit switch (types 1252/1257):	open	closed

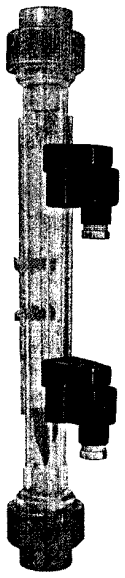
The switches then **remain** in this position, even if the float moves a long way from the min. or max. switch and will only change when the float passes the respective switch again.

Types 1270–1273
After passing through the type 1274 or 1279 signal transmitters, the reading from the type 1270/1271 instrument sensor is available as a digital indicating signal and as an analogue output signal which can then be used for further processing.

Types 1272/1273 produce a current output signal which can be directly processed without any further conversion.

The function of the limit switches or instrument sensors is neither affected by the working pressure, nor by the conductivity, concentration or density of the medium.

The application of the flowmeters with continuous reading or limit switches together with a signal converter is suitable for use with conducting, non-conducting and also with turbid media.



Types 1251–1257

Types 1270–1273

Types 1251/1256 Max. Limit Switches – Types 1252/1257 Min. Limit Switches

Housing material: Plastic
Electrical connection: Standard connector, supplied with switch
Contacts: Bistable reed switches
Switching function: Min. or max. switch as described
Degree of protection: IP 65
Max. voltage: 250 V
Max. peak value of marking current: 0.5 A
Max. steady current: 0.2 A
Max. switching duty: 10 VA
Specification: 1251/1252 for types 800 and 850 DN 25; cable gland PG 9
1256/1257 for type 850 DN 10, 15, 20; cable gland PG 9

Ordering Information:

Types 1251/1256 max. limit switches
Types 1252/1257 min. limit switches

Types 1270–1273 Instrument Sensors

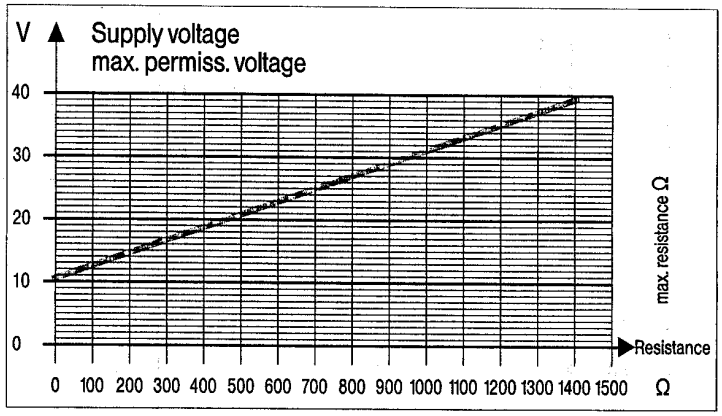
Housing material: Impact resistant plastic
Electrical connection: Standard connector with PG 9 cable gland, supplied with instrument sensor
Sensing system: Series of reed switches connected to a chain of resistors (0–10 kΩ)
Degree of protection: IP 65

Types 1272 and 1273 Instrument Sensors

Voltages: Operating voltage must be either abs. direct current or regulated direct current
$U_{min.} = 11\,V + 0.02 \times$ burden (Ohm)
$U_{max.} = 40\,V + 0.004 \times$ burden (Ohm)
Value acc. to diagram
Power consumption: V × 20 mA
Current output: 4–20 mA

Supply voltage dependent upon the resistance (in types 1272/73)

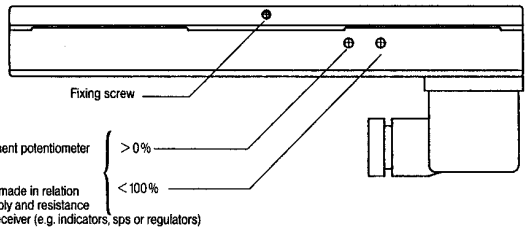
Supply voltage in V	Resistance in Ω	Current in mA
11.0	0.55	20
12.45	47	20
13.5	100	20
14.6	150	20
15.7	200	20
17.6	300	20
19.7	400	20
21.7	500	20
23.8	600	20
25.6	700	20
27.7	800	20
29.8	900	20
31.7	1000	20
33.7	1100	20
35.8	1200	20
37.7	1300	20
39.9	1400	20
41.8	1500	20



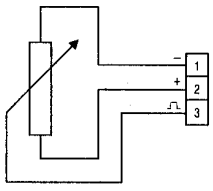
Ordering Information

Type	For flow-meter type	Signal transmitter	Metering length	Number of switch points	Distance of reed contacts	Combination within the GEMÜ modular system
Type 1270/000/Z 25	800	without	230 mm	55	4.25 mm	Types 1281–1284
Type 1271/000/Z 10	850/DN 10–20	without	122 mm	43	3.00 mm	Types 1286–1289
Type 1271/000/Z 25	850/DN 25	without	147 mm	43	3.50 mm	Types 1274–1279, Type 1510
Type 1272/000/Z 25	800	with integrated two wire signal converter	230 mm	55	4.25 mm	Type 3000, remote indication with input 4-20 mA, e.g. SPS
Type 1273/000/Z 10	850/DN 10–20		122 mm	43	3.00 mm	
Type 1273/000/Z 25	850/DN 25		230 mm	55	4.25 mm	

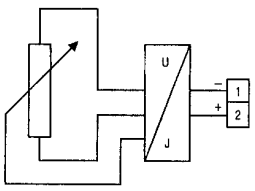
Types 1272/1273



Types 1270/1271



Types 1272/1273



Ordering Information: Types 1274/1279 signal transmitter, Types 1281-1289 3-point controllers, Type 1510 signal converter, Type 3000 accumulated flow counter
Please order separate datasheets.

Subject to alteration · 1/94 · 88048793

GEMÜ Gebr. Müller · Apparatebau GmbH & Co. KG · Criesbach · Neuer Wasen 6 · D-74653 Ingelfingen · Telefon 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Plastic Flowmeter

– Variable Area Principle –

Description

A range of plastic flowmeters, based on the variable area principle, which are corrosion resistant, extremely accurate, simple to use and maintain, and which possess considerable impact resistance.

Construction

The type 800 series of flowmeters operates according to the variable area principle, whereby the float can move freely within the metering tube.

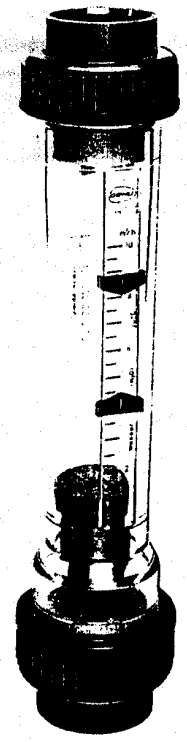
Metering tubes are available in Trogamid T, suitable for neutral media, and Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in Polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals of EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded onto the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), minimum and/or maximum limit switches, and a continous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 800

Accuracy class:
4; according to VDE/VDI 3513 sheet 2, i.e. 1% of end value + 3% of indicated flow inaccuracy

Flow ranges:

Standard Range*/** (Liquids)	Malleable Iron Unions Weight (kg)	PVC Unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	Hydrochloric acid HCl 30-33% Tube: Polysulfon	Sodium hydroxide NaOH 30% Tube: Trogamid-T	Sodium hydroxide NaOH 50% Tube: Trogamid-T	%-Scala Tube Trogamid-T Polysulfon	Tube Size Ref. no.
Type 805/815	0.70	0.40	DN 25	15– 160 l/h	10–130 l/h	–	–	10–100%	51
	0.70	0.40	DN 25	20– 250 l/h	10–200 l/h	2–110 l/h	–	10–100%	52
Material of float:	0.70	0.40	DN 25	40– 400 l/h	20–350 l/h	–	–	10–100%	53
	0.70	0.40	DN 25	60– 640 l/h	40–540 l/h	–	1–130 l/h	10–100%	54
PP (Polypropylene)	1.20	0.70	DN 32	100–1000 l/h	–	–	–	10–100%	61
	1.20	0.70	DN 32	150–1600 l/h	–	–	–	10–100%	62
(Type 815 with magnet)	2.50	1.60	DN 50	0.2– 2.5 m^3/h	–	–	–	10–100%	71
	2.50	1.60	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	72
	2.50	1.60	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	73
	3.80	2.50	DN 65	1–11 m^3/h	–	–	–	10–100%	76
Type 807/817	0.75	0.45	DN 25	25– 250 l/h	–	–	–	10–100%	51
	0.75	0.45	DN 25	40– 400 l/h	–	–	–	10–100%	52
Material of float:	0.75	0.45	DN 25	60– 640 l/h	–	–	–	10–100%	53
	0.75	0.45	DN 25	100–1000 l/h	–	–	–	10–100%	54
1.4571	1.30	0.80	DN 32	150–1600 l/h	–	–	10–540 l/h	10–100%	61
Stainless steel	1.30	0.80	DN 32	200–2500 l/h	–	–	–	10–100%	62
	3.00	2.10	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	71
(Type 817 with magnet)	3.00	2.10	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	72
	3.00	2.10	DN 50	1–10 m^3/h	–	–	–	10–100%	73
	4.70	3.40	DN 65	1.5–18 m^3/h	–	–	–	10–100%	76

*All scales of the standard range are based on a medium temperature of 20° C.

Standard Range (Gaseous media)	Malleable Iron Unions Weight	PVC Unions Weight	Size (mm)	Medium Air 1 bar abs. and 20°C	Tube Size Ref. no.
Type 825	0.70	0.40	DN 25	0.25 – 2.5 Nm^3/h	51
	0.70	0.40	DN 25	0.4 – 4.0 Nm^3/h	52
Material of float:	0.70	0.40	DN 25	0.63 – 6.3 Nm^3/h	53
	0.70	0.40	DN 25	1.0 – 10 Nm^3/h	54
PP (Polypropylene)	1.20	0.70	DN 32	1.6 – 16 Nm^3/h	61
	1.20	0.70	DN 32	2.5 – 25 Nm^3/h	62
	2.50	1.60	DN 50	4.0 – 40.0 Nm^3/h	71
	2.50	1.60	DN 50	6.3 – 63.0 Nm^3/h	72
	2.50	1.60	DN 50	10.0 –100.0 Nm^3/h	73
	3.80	2.50	DN 65	16.0 –180.0 Nm^3/h	76
Type 835	0.75	0.45	DN 25	0.63– 6.3 Nm^3/h	51
	0.75	0.45	DN 25	1.0 – 10.0 Nm^3/h	52
Material of float:	0.75	0.45	DN 25	1.6 – 16.0 Nm^3/h	53
	0.75	0.45	DN 25	2.5 – 25.0 Nm^3/h	54
PP (Polypropylene)	1.30	0.80	DN 32	4.0 – 40.0 Nm^3/h	61
	1.30	0.80	DN 32	6.3 – 63.0 Nm^3/h	62
with magnet	3.00	2.10	DN 50	10.0 –100.0 Nm^3/h	71
	3.00	2.10	DN 50	16.0 –160.0 Nm^3/h	72
	3.00	2.10	DN 50	25.0 –250.0 Nm^3/h	73
	4.70	3.40	DN 65	40.0 –400.0 Nm^3/h	76

**** For smaller or larger flow ranges, see types 850, 840 and back page of datasheet type 800. Further ranges available on enquiry.**

To types 825/835.
Note: with gaseous media the scaling alters according to operating pressure.
Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note ordering instructions.

Ordering information

Material of float	Working medium	Type Ref. no.
PP	Liquids	805
PP (with magnet)	Liquids	815
Stainless steel 1.4571	Liquids	807
Stainless steel 1.4571 (with magnet)	Liquids	817
PP	Gas	825
PP (with magnet)	Gas	835

Size	Ref. no.
DN 25	25
DN 32	32
DN 50	50
DN 65	65

Body configuration: D = straight through

Tube end connections	Ref. no.
Threaded spigots	7

Material of tube	Ref. no.
Trogamid-T Temp. range: 0– 60°C	21
Polysulfon Temp. range: 0–100°C	22
(Stated temperatures are valid for water).	

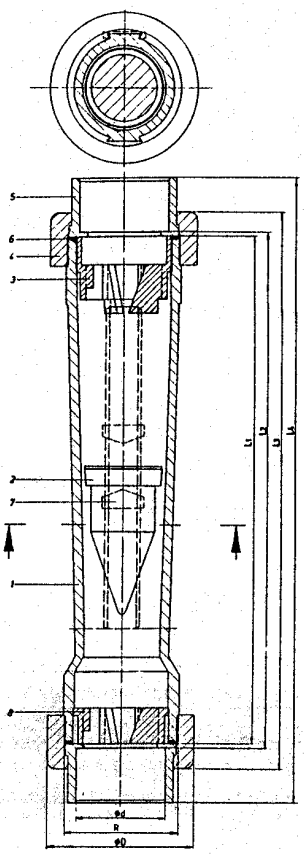
Material of O-Rings	Ref. no.
FPM (Viton)	4
EPDM (Ethylene-propylene)	14

End connection material	Ref. no.
PVC unions with adhesive sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16	6

Size of tube
(see table on left)

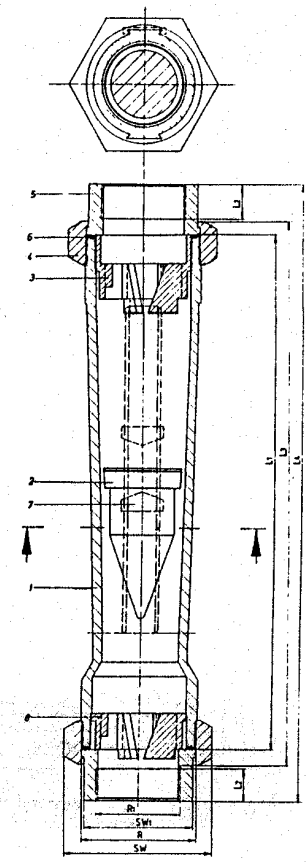
Flow range:
(see table on left)

Note:
When ordering, the flow ranges should be stated as follows:
Liquids: l/h
Gaseous media: Nm^3/h



DN	R	R_1	SW	SW_1	L_1	L_2	L_3	L_4
25	G 1½	G 1	54	38	350	17	370	402
32	G 2	G 1¼	66	47	350	19	370	410
50	G 2¾	G 2	90	66	350	24	374	420
65	G 3½	G 2½	110	83	350	30	374	430

PVC-Unions



DN	ø d	R	ø D	L_1	L_2	L_3	L_4
25	32	G 1½	60	350	356	376	400
32	40	G 2	74	350	356	380	408
50	63	G 2¾	103	350	356	386	433
65	75	G 3½	122	350	356	388	445

Malleable iron unions

Spare parts list

Pos.	Description	Pieces
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1

Ordering Example	805	25	D	7	21	14	1	51	160
Type (float PP)	805								
Size (mm)		25							
Body configuration			D						
End connection of tube				7					
Material of metering tube					21				
Material of O-ring						14			
End connection material							1		
Tube cone								51	
Flow range max. (e.g. 160 l/h, H_2O)									160

Required information

In order to size a flowmeter the following data are necessary:
1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h or kg/h)
4. Operating pressure (bar abs or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)
8. Float with or without magnet

Plastic Flowmeter for Larger Flow Ranges

Standard scale: Range 12 – 26 m^3/h., medium: water at 20°C

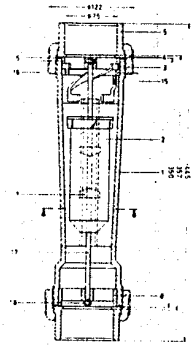
Version:

Construction and materials as for types 807/817, nominal bore size: 65 mm.
The float is guided by means of a rod.

Ordering Information:

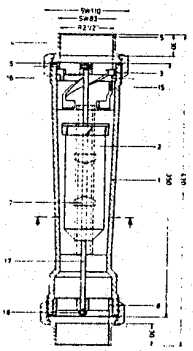
Analogue: As for types 807 / 817. In addition, following the range (26.000 l/h.), please give the version of the float according to the following ref. nos.:

Material of float	Type ref. no.	Additional ref. no.
Stainless steel no. 1.4571	807	1105
Stainless steel no. 1.4571 (with magnet)	817	1106



DN	Od	OD	I	L
65	75	122	357	445

Version
PVC unions
weight 4.6 kg.



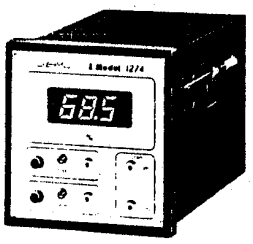
DN	SW	SW1	D	I	L
65	110	83	G 2½	30	430

Version
Malleable iron unions
weight 6.0 kg.

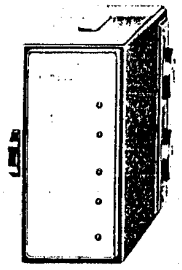
Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3, 15, 16	Compl. float stop	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1
17	Guiding rod	1
18	Nut for guiding rod (17)	2

Accessories for Flowmeter Series 800



Type 1274/1279



Type 1520/1521

Type 1270

Type 1251

Type 1252

To increase the versatility of the flowmeter series 800, numerous accessories have been developed which can be retrofitted onto the tube. The float however, must be one containing a magnet, in order for these accessories to function.

- Type 1251 Limit switch (max.) 10 VA
- Type 1252 Limit switch (min.) 10 VA
- Type 1270/ Instrument sensor for continual float level readings.
- Type 1274/ **E-module**, signal transmitter.
  1279 Designs: panel mounting or eurocard (19"/24")
- Type 1520/ **E-module**, isolating switch amplifier.
  1521 Designs: panel mounting or eurocard (19"/24")

For the above accessories there are separate datasheets. For further enquiries, please apply for the respective sheets.

Further product range

- Plastic valves, pneumatically, electrically and manually operated
- Metal valves, pneumatically, electrically and manually operated

Manufacturer

GEMÜ GEBR. MÜLLER
Apparatebau GmbH & Co. KG
Postfach 30 · D-7118 Ingelfingen 2 · West Germany
Tel. 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Presented by:

GEMÜ®

Plastic Flowmeter

DN 10–25

Description

A plastic flowmeter, operating on the variable area principle, which is extremely accurate, resistant to corrosion, resistant to impact, and is simple to use.

Construction

This GEMÜ plastic flowmeter operates according to the variable area principle, whereby the float can move freely within the metering tube.

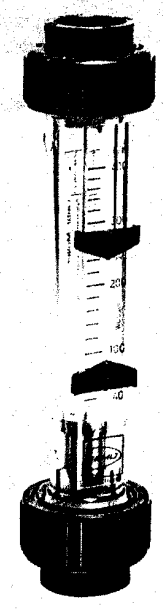
Metering tubes are available in Trogamid, suitable for neutral media, and in Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals in EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded on to the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), min. and/or. max. limit switches, or a continuous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 850

Flow Ranges

Standard Ranges*/** (liquids)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	% scale Tube: Trogamid-T Polysulfon	Tube size ref. no.
Type 855/865	0.18	0.07	DN 10	2– 25 l/h	10–100 %	11
	0.18	0.07	DN 10	4– 40 l/h	10–100 %	12
	0.18	0.07	DN 10	5– 60 l/h	10–100 %	13
	0.18	0.07	DN 10	10– 100 l/h	10–100 %	14
Float material	0.18	0.07	DN 10	15– 160 l/h	10–100 %	15
	0.30	0.12	DN 15	5– 60 l/h	10–100 %	21
	0.30	0.12	DN 15	10– 100 l/h	10–100 %	22
	0.30	0.12	DN 15	15– 160 l/h	10–100 %	23
PP (Polypropylene)	0.30	0.12	DN 15	20– 250 l/h	10–100 %	24
	0.30	0.12	DN 15	30– 320 l/h	10–100 %	25
(Type 865 with magnet)	0.48	0.21	DN 20	15– 160 l/h	10–100 %	31
	0.48	0.21	DN 20	20– 250 l/h	10–100 %	32
	0.48	0.21	DN 20	40– 400 l/h	10–100 %	33
	0.48	0.21	DN 20	60– 640 l/h	10–100 %	34
	0.61	0.29	DN 25	20– 250 l/h	10–100 %	41
	0.61	0.29	DN 25	40– 400 l/h	10–100 %	42
	0.61	0.29	DN 25	60– 640 l/h	10–100 %	43
	0.61	0.29	DN 25	100–1000 l/h	10–100 %	44
Type 857/867	0.19	0.08	DN 10	4– 40 l/h	10–100 %	11
	0.19	0.08	DN 10	5– 60 l/h	10–100 %	12
	0.19	0.08	DN 10	10– 100 l/h	10–100 %	13
	0.19	0.08	DN 10	15– 160 l/h	10–100 %	14
Float material	0.19	0.08	DN 10	20– 250 l/h	10–100 %	15
	0.31	0.13	DN 15	10– 100 l/h	10–100 %	21
	0.31	0.13	DN 15	15– 160 l/h	10–100 %	22
1.4571	0.31	0.13	DN 15	20– 250 l/h	10–100 %	23
Stainless steel	0.31	0.13	DN 15	40– 400 l/h	10–100 %	24
(Type 867 with magnet)	0.31	0.13	DN 15	50– 500 l/h	10–100 %	25
	0.51	0.24	DN 20	20– 250 l/h	10–100 %	31
	0.51	0.24	DN 20	40– 400 l/h	10–100 %	32
	0.51	0.24	DN 20	60– 600 l/h	10–100 %	33
	0.51	0.24	DN 20	100–1000 l/h	10–100 %	34
	0.66	0.34	DN 25	40– 400 l/h	10–100 %	41
	0.66	0.34	DN 25	60– 640 l/h	10–100 %	42
	0.66	0.34	DN 25	100–1000 l/h	10–100 %	43
	0.66	0.34	DN 25	150–1600 l/h	10–100 %	44

* All scales of the standard range are based on a medium temperature of 20°C.

****For larger flow ranges see type series 800.**

Standard Ranges (gaseous media)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Medium air at 1 bar abs. and 20°C	Tube size ref. no.
Type 875	0.18	0.07	DN 10	30– 360 N l/h	11
	0.18	0.07	DN 10	50– 550 N l/h	12
	0.18	0.07	DN 10	100– 900 N l/h	13
	0.18	0.07	DN 10	150–1500 N l/h	14
Float material	0.18	0.07	DN 10	200–2400 N l/h	15
	0.29	0.11	DN 15	100– 900 N l/h	21
	0.29	0.11	DN 15	150–1500 N l/h	22
	0.29	0.11	DN 15	200–2400 N l/h	23
	0.29	0.11	DN 15	400–3800 N l/h	24
PP (Polypropylene)	0.29	0.11	DN 15	500–4800 N l/h	25
	0.46	0.19	DN 20	0.2– 2.5 Nm^3/h	31
	0.46	0.19	DN 20	0.4– 4.0 Nm^3/h	32
	0.46	0.19	DN 20	0.5– 5.5 Nm^3/h	33
	0.46	0.19	DN 20	1.0–10.0 Nm^3/h	34
	0.57	0.25	DN 25	0.4– 4 Nm^3/h	41
	0.57	0.25	DN 25	0.6– 6 Nm^3/h	42
	0.57	0.25	DN 25	1.0–10 Nm^3/h	43
	0.57	0.25	DN 25	1.5–16 Nm^3/h	44

To type 875
Note: With gaseous media the scaling alters according to operating pressure. Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note the ordering instructions.

Ordering Information

Version:

Flowmeter with float material	Operating medium	Type ref. no.
PP	Liquids	855
PP (with magnet)	Liquids	865
Stainless steel (1.4571)	Liquids	857
Stainless steel (1.4571) (with magnet)	Liquids	867
PP	Gas	875

Size (mm)	Ref. no.
DN 10	10
DN 15	15
DN 20	20
DN 25	25

Body configuration: D = straight through

Tube end connections	Ref. no.
Male threads	7

Material of tube	Ref. no.
Trogamid-T temperature range: 0 – 60°C	21
Polysulfon temperature range: 0 – 100°C	22
(Given temperatures are valid for water)	

Material of O-rings		Ref. no.
O-ring Viton	FPM	4
Ethylene Propylene	EPDM	14

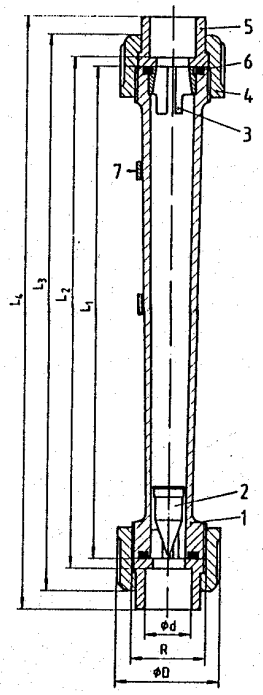
End connection material	Ref. no.
PVC unions with solvent welded sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16.	6

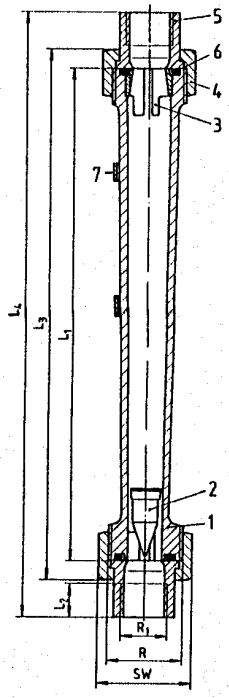
Size of tube
(see table on left)

Measuring range
(see table on left)

Note:
The scale divisions correspond to the actual flows. For liquid media the flow values are in l/h and for gaseous media in Nm^3/h or N l/h

Accuracy class:
4; according to VDE/VDI 3513, sheet 2, i.e. 1% of end value + 3 % of measured value.





DN	Ød	G	ØD	L1	L2	L3	L4
10	16	G¾	35	165	171	186	199
15	20	G 1	43	170	176	192	208
20	25	G1¼	53	185	191	210	229
25	32	G1½	59	200	206	226	250

Version: PVC unions

DN	G 1	G	SW	L1	L2	L3	L4
10	G⅜	G¾	32	165	12	180	207
15	G½	G 1	41	170	13	185	215
20	G¾	G1¼	50	185	16	201	230
25	G 1	G1½	55	200	19	219	250

Version: Malleable iron unions

Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2

Ordering Example	855	10	D	7	21	14	1	13	60
Type (float PP)	855								
Size (mm)		10							
Body configuration			D						
Connection (ref. no.)				7					
Tube material (ref. no.)					21				
Material of O-rings						14			
End connection material							1		
Tube cone								13	
Flow range max. (e.g. l/h H_2O)									60

Required information:
In order to size a flowmeter, the following data are necessary:

1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h, kg./h)
4. Operating pressure (bar abs. or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)

Ersatzteilliste Land-Dosierpumpe

Spare parts list Dosing pump

PUD0225600-03413 11/00

Bitte bei Bestellung angeben:
To be indicated on order:

Typ: Elados EMP II / E10.025 PV 10 EPP
230V 50Hz/60Hz
0.019kW

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1 General

This technical manual contains all the necessary instructions for the installation, start-up, maintenance and repair of ELADOS® EMP electrical motor-driven metering pumps.

The safety instructions and pointers must always be observed!

Scope of guarantee:

The manufacturer only accepts the guarantee with regard to the operating safety, reliability and capacity of the metering pump under the following conditions:

- Assembly, connection, adjustment, maintenance and repairs are carried out by authorised, qualified personnel.

- The metering device is used in accordance with the instructions in the technical manual.

- Only **original spare parts** are used for repairs.

- If the pump casing is opened, then the guarantee will become void.

1.1 Safety instructions

Repairs may **only** be carried out with plug disconnected from the mains, or when the appliance is dead.

During maintenance and repair work on parts which come into contact with dangerous chemicals, and when changing the container, the prescribed **protective clothing** (protective glasses, protective gloves, apron) must be worn because of the danger of irritation.

Only **original spare parts** must be used for repairs.

1.2 Pointers

In this manual, the **CAUTION, ATTENTION** and **NOTE** pointers have the following meanings:

CAUTION: This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to injury or accident.

ATTENTION: This heading is used if imprecise or non-adherence to operating instructions, work instructions, prescribed work procedures and the like can lead to the device being damaged.

NOTE: This heading is used if a special feature is being pointed out.

2. Function and Structure

The metering pumps in the ELADOS® EMP II range are electromotive-driven diaphragm positive-displacement pumps.

2.1 Functional description

The metering pump is driven by a non-blocking synchronous motor (pos. 1) running at a constant rotational speed.

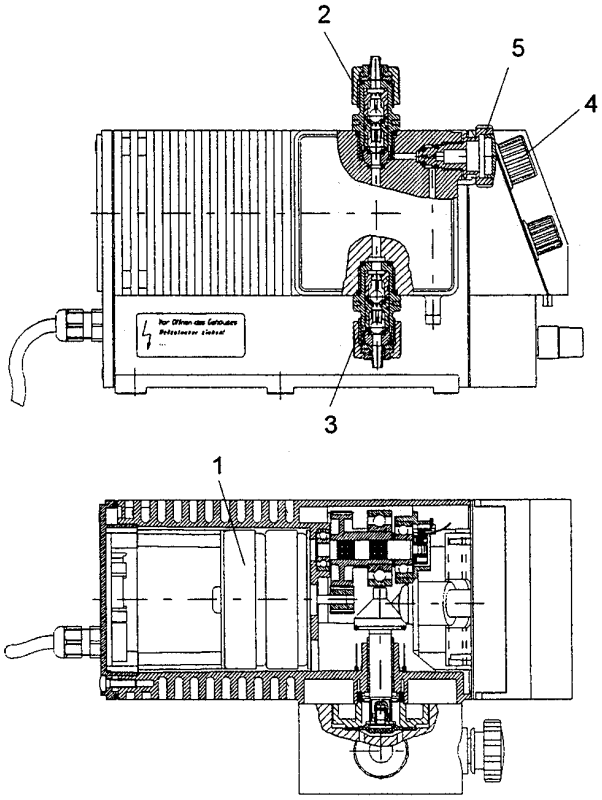
An eccentric gear moves the diaphragm and thus displaces the metering medium via the pressure valve (pos. 2) with double ball seal. The suction valve is closed.

The diaphragm is restored by a return spring and this causes the metering medium to be sucked into the pump head via the suction valve (pos. 3). The pressure valve is closed.

The volume delivered can be infinitely variable adjusted during operation via the stroke adjustment (pos 4). This limits the restoring movement of the diaphragm.

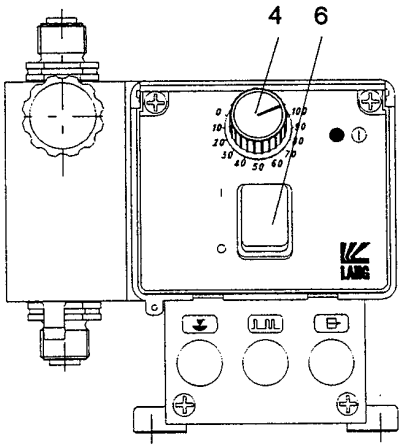
The pump heads are fitted with a rapid vent valve (pos. 5).

2.2 Structure

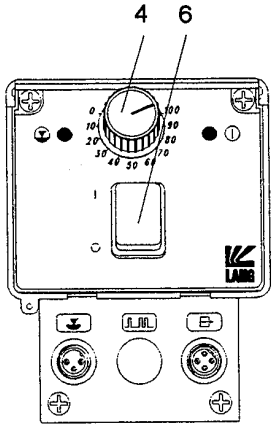


3. Control Variants

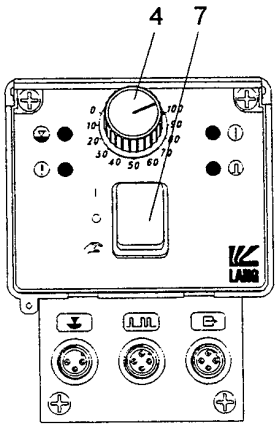
3.1 Diagramm



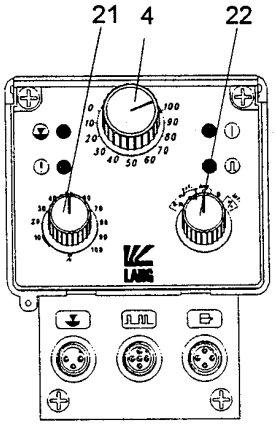
Version E 10



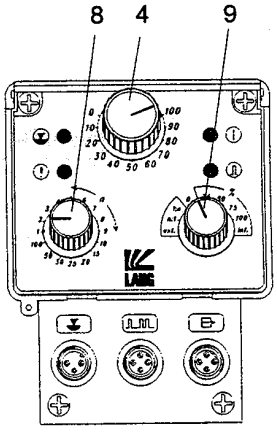
Version E 11



Version E 20 / E 22



Version E 30 / E 32



Version E 40 / E 42

3.2 Description

E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment	Function
x	x	x	x	x	x	x	x	Mechanical stroke adjustment (pos. 4)	Metering amount adjustment
x	x	x	x	x	x	x	x	Green LED	Pump ready for operation
	x	x	x	x	x	x	x	Red LED (level) blinking	Reserve signal, pump running
	x	x	x	x	x	x	x	Red LED (level) steady	Empty signal, pump switches off
		x	x	x	x	x	x	Yellow LED	Stroke indication
		x	x	x	x	x	x	Red LED (error signal) steady	Empty signal with defective electronics, blocking (pump switches off)
x	x							On/off switch (pos. 6)	Continuous operation (max. stroke frequency)
		x	x					On/off/test switch On (pos. 7) TEST self-resetting to "off"	Pulse operation Continual operation (max. stroke frequency)
						x	x	Selector switch for factor "n" (pos. 8)	1 - 100 for pulse multiplication and division with external control (factor 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 15, 20, 25, 30, 50, 100)
						x	x	Mode switch (pos. 9): - Position 100 - Position 75 - Position 50 - Position 25 - Position 0 - Position 1 : n - Position n : 1	- External, 0, internal change-over - Internal frequency 100 %= 122 1/min - Internal frequency 75 % - Internal frequency 50 % - Internal frequency 25 % - Pump off, no green LED - External multiplication e. g. selector switch setting n = 2: 1 external pulse = 2 strokes of metering pump - External division e. g. selector switch setting n = 3: 3 external pulses = 1 stroke of metering pump
				x	x			Stroke frequency rotary switch % (pos. 21)	100% = continual operation 122 1/min reproducible setting range 10 - 100 %

E 10	E 11	E 20	E 22	E 30	E 32	E 40	E 42	Equipment	Function
				x	x			Mode switch (pos. 22) - Position 0 - Position % (int.) - Position pulse input - Position 4 - 20 mA - Position 0 - 20 mA	Pump off, no green LED Pump is running, adjusted frequency see stroke frequency rotary switch (pos. 21) 1 pulse = 1 stroke 20 mA = continuous operation 122 1/min 4 mA = pump switches off <4 mA = error red LED 20 mA = continuous operation 122 1/min 0 mA = pump switches off
	x	x	x	x	x	x	x	Empty signal input- 3pole (I) with level pre-warning	(See plug allocation, section 10.2)
		x	x			x	x	Pulse input- 4pole (II)	(See plug allocation section 10.2) 1 pulse = 1 stroke
				x	x			Pulse- / current input- 5pole (II)	(See plug allocation section 10.2) 1 pulse = 1 stroke
			x		x		x	Pulse memory*	From pulse frequency 122 1/min the pulses are stored and added up to a max. of 50,000 pulses, executed during continuous running
		x	x	x	x	x	x	Metering stop	(See plug allocation section 10.2) Contact open = pump closed
		x	x	x	x	x	x	Pulse output- 4pole (III)	(See plug allocation section 10.2)
		x	x	x	x	x	x	Empty signal output	Floating
		x	x	x	x	x	x	Stroke signal	Floating

NOTE: In version E 11 the connection socket I and in version E 20 to E 42 connection socket I and II must always be occupied, either by the mounted bridge connectors (protective cap with corresponding symbol) or by connecting the empty signal device or pulse control lead (see plug allocation, section 10.2)

NOTE: In versions E11 to E42 the bridge connectors (protective cap with corresponding symbol) should be retained after removal for re-use.

***Attention:** Pulse memory is not cancelled for a reserve and empty signal report. The memory is cancelled for a metering stop (contact open), switch position "0", change of operation mode or mains failure.

3.3 Description of symbols

Level pre-warning and empty signal indication (red)

Error signal indication (red)

Operating indication (green)

Metering indication (yellow)

Empty signal input

Pulse input, current input
and metering stop

Empty signal output and
stroke signal output

4. Installation and start-up

4.1 Installation instructions:

NOTE: Long suction lines should be avoided (max. 3 m).

CAUTION: If the metering line can be blocked off, an overflow valve which opens at the maximum allowed pressure should be installed on the pressure side for safeguarding the metering line. This can prevent the metering line from bursting if wrongly operated.

If the circumstances are unfavourable, the pressure can rise to 3 times the nominal pressure.

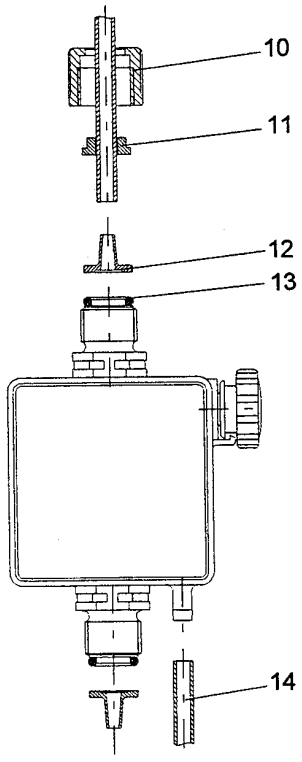
4.2 Electrical connection

Produce VDE power connection.

4.3 Start up

- Mount pump on container or on horizontal console. Observe suction height of max. 2 mWs.
- Connect suction and metering line
  - Cut off tube straight
  - Push union nut (pos. 10) and pressure piece (pos. 11) over hose and push onto connection nipple (pos. 12) as far as stop collar
  - Place O-ring (pos. 13) into valve groove and tighten union nut
  - Put the vent line (pos. 14) on
- Set metering setting and, if necessary, metering frequency setting to 100%
- Open vent screw approx. 1 turn and leave open until the metering medium enters the vent line without bubbles. Close vent screw and ensure that the metering line is not shut-off in any place.

  If the pump has drawn in air, it must be revented.



Improved suction can be achieved if the pressure valve is unscrewed and the pump head filled with a suitable liquid.

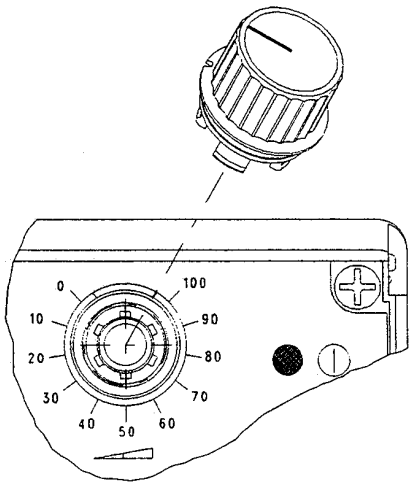
NOTE: After an operation of 24 hours, the metering head screws must be tightened up diagonally with 3 - 4 Nm.

NOTE: In versions E40 / E 42, the metering pump can only be put into operation with the setting "intern 100 %", when there is no external metering stop (contact locked). If necessary, disconnect the corresponding plug (II) and attach the bridge connector.

CAUTION: The metering pump may contain residual water from works testing.

4.4 Setting the mechanical stroke adjustment

The metering pump is set to nominal pressure at the factory in accordance with the metering curves. Should the stroke setting be set the wrong way through pulling off the adjustment knob (pos. 9), the basic setting can be found out as follows:



1. Switch metering pump on.
2. Place button on 100 % and turn clockwise until adjusting screw is noticeably tensioned. Because of the eccentric gear, it is possible to turn the button step by step only with the pump running.

   If no resistance is reached, remove button at setting "0" and repeat stage 2.
3. Then pull button off and put adjusting notch and marking back on scale setting "0" and set desired metering capacity.

   To determine the exact metering capacity, the pump should be gauged by liters.

5. Metering capacity

General:

The reproducible metering precision is about +/- 3% at a minimum of 30% stroke length and under constant conditions.

The characteristics of the pump are such that higher outputs may occur until the operating temperature is reached (continuous operation at least 2 hours).

Precise metering can be achieved by taking the following points into consideration:

a) All metering capacity information relates to measurements using water at 20°C, with a constant power supply and warmed-up pump.

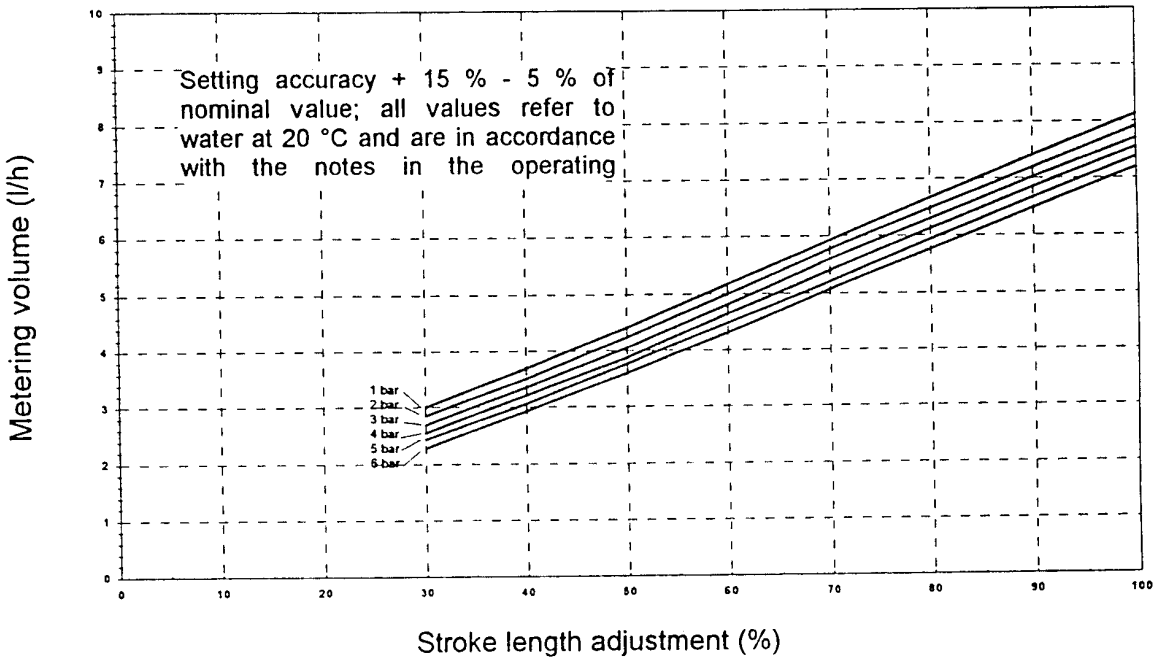
b) In order to obtain a high degree of metering precision with free flow, a pressure maintenance valve (or metering valve) should be used, in order to produce a constant back pressure of at least 0.5 bar.

c) If there is pre-pressure on the suction side, the pressure difference between the suction and the pressure side should be at least 1 bar. The water column on the metering pump must be protected by an appropriate valve arrangement.

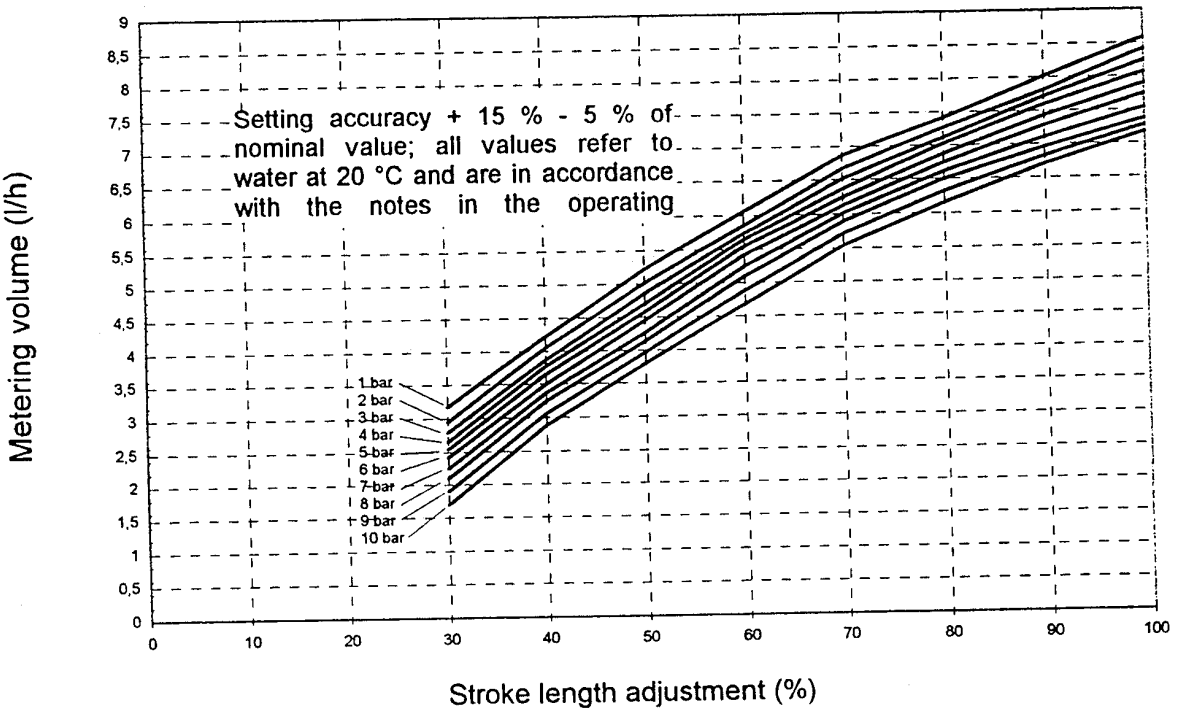
NOTE: A pressure maintenance valve or metering valve is not a completely reliable blocking element.

ATTENTION: Only carry out metering stroke adjustment when the pump is running and the stroke adjustment screw is not under pressure.

Delivery capacity, 7.2 l/h / 6 bar



Delivery capacity 7.2 l/h / 10 bar



7. Maintenance

CAUTION: Metering pumps must be maintained by expert, authorised personnel only.

NOTE: Quarterly maintenance interval, shorter intervals if load is greater (e.g. constant running).

It is recommended that the following be checked:

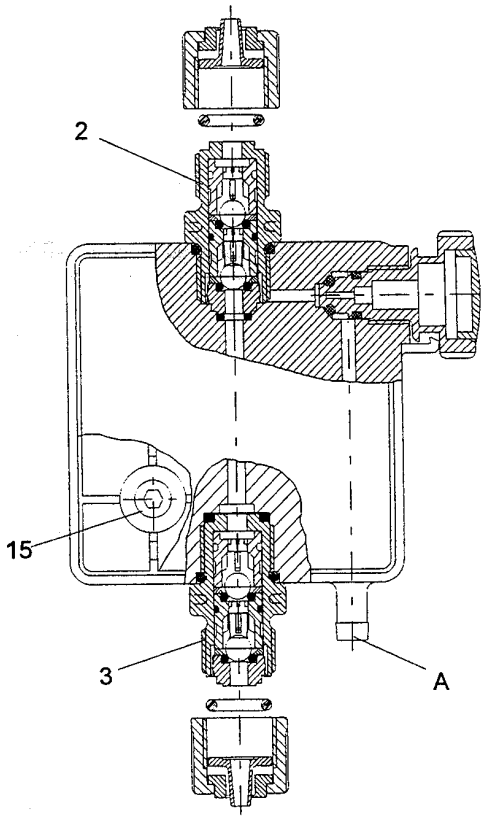
- Suction and pressure line for leak-free connection
- Suction (pos. 3) and pressure valve (pos. 2) for soiling and sealing function
- Exit hole (A) on pump head (fracture in diaphragm)
- Correct delivery by suction operation
- Metering head screws (pos. 15) (firm seating, 3-4 Nm)

NOTE:

The lifetime of the diaphragm depends on:

Back pressure, operating temperature and metering medium.

Frequent checking of the diaphragm is recommended at extreme operation conditions and when metering abrasive materials.



8. Tips for dealing with faults which may occur

8.1 Faults which you can rectify yourself

CAUTION: Before carrying out repair and maintenance work or when metering dangerous substances, always rinse the metering head, relieve the pressure line and wear **protective clothing** (protective glasses, protective gloves and apron).

Electrical repairs must only be carried out by electrical experts (Liability Insurance Association safety regulations VB G 4 and ZH 1/11) !

CAUTION: When opening covers or removing parts, unless possible without using tools, live parts may be exposed. Connection points may also be live.

Before carrying out a calibration, service, overhaul or when replacing parts, the device must be disconnected from all power sources if it needs to be opened.

Fault	Possible cause	Rectification
Metering pump does not work, green LED not showing	- Incorrect voltage	- Check mains voltage
Pump does not suck up despite venting and max. stroke	- Deposits, jamming, valves dried out	- Rinse the metering head through suction line, if necessary dismantle valves and clean or replace
Metering head is leaking, medium is escaping from leaking connections	- Metering head is loose - Diaphragm ruptured	- Tighten metering head screw diagonally - Replace diaphragm
Level LED flashes	- Reserve signal	- Stock up product
Level LED permanently on	- Lack of chemicals - Loose bridge connector	- Top up storage tank - Check if bridge connection is properly plugged in
Pump not working (red LED not indicating fault)	- Metering stop in operation - Connector not making contact at terminal II	- Attach bridge connector to terminal II - Cancel metering stop in accordance with wiring diagram - Check connector contact at terminal II

Fault	Possible cause	Rectification
Level LED lights up despite full tank	- Float jammed - Suction lance plug or bridge connector is loose or not plugged in - Suction lance cable faulty	- Release float, tighten plug, clean contacts - Check that bridge connector is properly plugged in - Replace empty signal device
Metering pump not running although switch is ON or, in versions E20/E22/ E30/ E32/E40/E42 yellow metering indicator is flashing	- Air in pump head - Metering volume setting too low	- Vent metering head through vent screw - Increase stroke volume adjustment
Error signal LED lights up	- Metering valve clogged - Metering back pressure too high	- Clean and rinse valve - Check metering line Once the cause of the fault has been removed, the mains must be switched off or the switch must be turned to "0" in order to acknowledge the error signal*
Error signal LED lights up when E30 / E32 operating at 4 - 20 mA	- Input current interrupted or current < 4 mA	- Establish electric circuit, choose input range 0 - 20 mA, if necessary
Metering pump not working, no green LED display (version E 11 - E 42)	- 5 V output at cable socket II overloaded	- Limit max. load to 80 mA

ATTENTION: *Pulse memory is cancelled (E22 / E32 / E42)

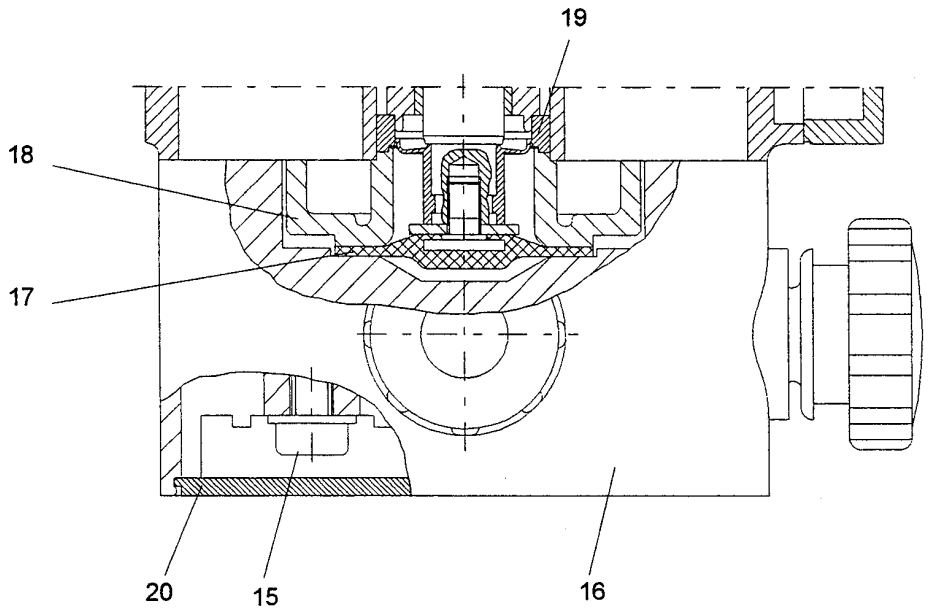
8.2 Faults which must be fixed by customer service

Fault	Possible cause	Rectification
Error signal LED lights up	- Metering system blocked - Metering without request being made	- Internal fault - Internal fault
Metering pump not working, no green LED display	- Mains cable damaged	- Replace mains cable

9. Replacement of diaphragm and pump head

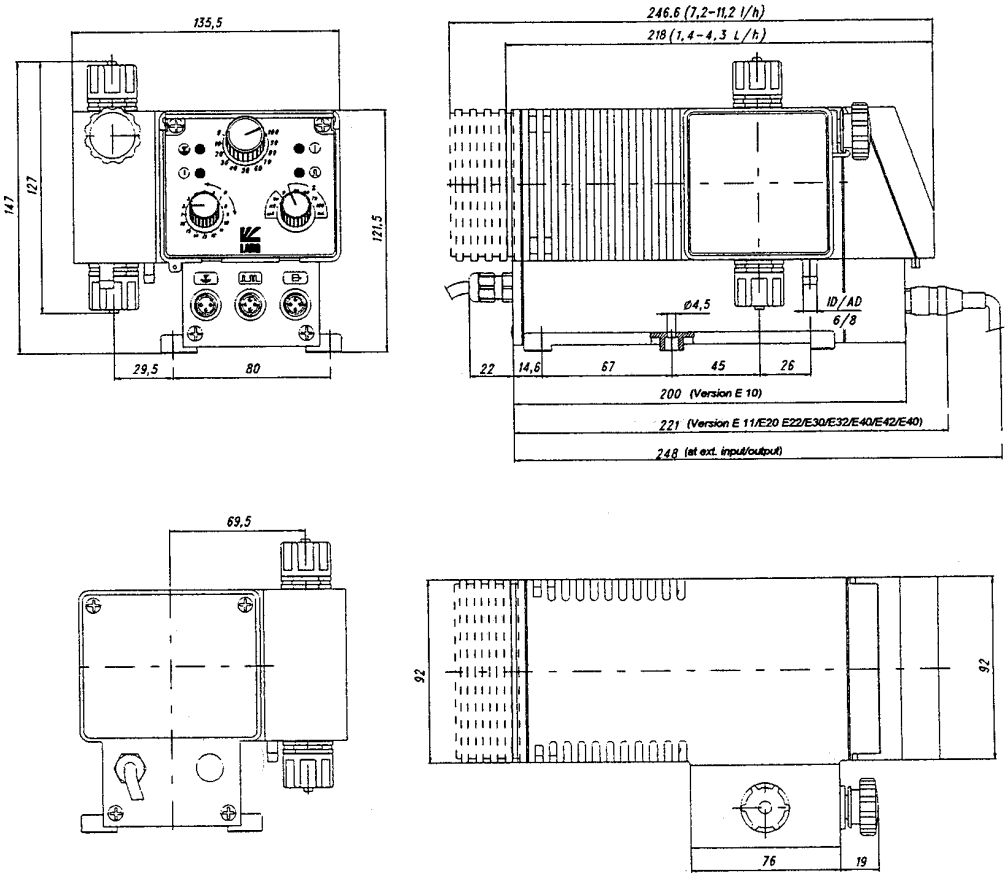
Remove cover plate (pos. 20) from metering head, loosen attachment screws (pos. 15) and remove pump head (pos. 16), unscrew diaphragm (pos. 17), including intermediate piece (pos. 18) and supporting disk. Replace intermediate diaphragm (pos. 19) from tappet. When fitting the diaphragm, do not overtighten (lightly tighten by hand, without tools). The leak connection of the intermediate piece must point downwards. Tighten metering head evenly diagonally.

NOTE: Check metering head screw tightening torque after 24 hours. Tightening torque 3 - 4 Nm.



10. Dimensions, connections

10.1 Dimensions



11. Ordering code

E 10 014 PV 10 FP G

Ball material
G = Glass — standard
E = Stainless steel 1.4401 — option
P = PTFE — option

Seal material
FP = FPM (Viton B) — standard
EP = EPDM — option
KL = Kalrez — option

Metering back pressure
04 = 4 bar
05 = 5 bar
06 = 6 bar
10 = 10 bar

Pump head material
PV = PVDF — standard
PP = Polypropylene — option
E = Stainless steel 1.4571 — option

Pump capacity
014 = 1.4 l/h
025 = 2.5 l/h
043 = 4.3 l/h
048 = 4.8 l/h
072 = 7.2 l/h
112 = 11.2 l/h

Electrical version
E10 = On/off switch, mechanical stroke adjustment
E11 = On/off switch, mechanical stroke adjustment, empty signal report with level pre-warning
E20 = On/off switch, mechanical stroke adjustment, pulse input, empty signal report with level pre-warning empty signal output, stroke signal output
E22 = E20 with pulse memory
E30 = External-0-internal mode switch for infinitely variable frequency control or current signal input 0/4 ...20 mA or external pulse input, mechanical stroke adjustment, empty signal report with level pre-warning, empty signal output, stroke signal output
E32 = E30 with pulse memory
E40 = External-0-internal mode switch for frequency control (100/75/50/25%) or external pulse input for pulse multiplication/division, mechanical stroke adjustment, empty signal report with level pre-warning, empty signal output, stroke signal output
E42 = E40 with pulse memory

12. Technical data

Pump capacity l/h	**1.4**	**2.5**	**4.8**	**4.3**	**7.2**	**7.2**	**11.2**
Max. metering back pressure (bar)	10	10	4	10	6	10	5
Number of strokes (1/min)	122	122	122	122	122	122	122
Metering volume/stroke (cm³)	0,19	0,34	0,65	0,57	0,98	0,98	1,5
Metering accuracy (see section 6)	< ± 3%						
Suction height (mWS) at 100 % stroke setting *	2	2	2	2	2	2	2
Suction/pressure connection *** int. dia/ ext. dia (mm)	4/6	4/6	4/6	4/6	4/6	4/6	6/8
Power supply Special power supplies on request	230 V / 50/60 Hz ** + 6 % - 10 %						
Current consumption (mA) 50 Hz/60 Hz	45/ 50	45/ 50	45/ 50	81/ 86	81/ 86	130/ 150	130/ 150
Power consumption (W) 50 Hz/60Hz	10,4/ 11,5	10,4/ 11,5	10,4/ 11,5	18,7/ 19,8	18,7/ 19,8	30/ 34,5	30/ 34,5
Protection class	I						
Protection category	IP 65						
Max. ambient temperature	40 °C						
Insulation category	B						
Output circuit up to 24 V / 240 V Empty signal output Stroke signal output	24 V 3 A AC/DC / 240 V 3 A 24 V 0,3 A DC / not permissible						
Weight (kg)	2	2	2	2,4	2,4	3,1	3.1

* Suction heights with clean, moist valves

** at a mains frequency of 60 Hz, the delivery capacity increases by 20% and the metering back pressure decreases by 15%

All data refer to water at 20°C, when operated in accordance with the instructions on page 11.

Attention: *** The max. permissible pressure ranges for pressure lines or metering lines must be observed!

Materials:

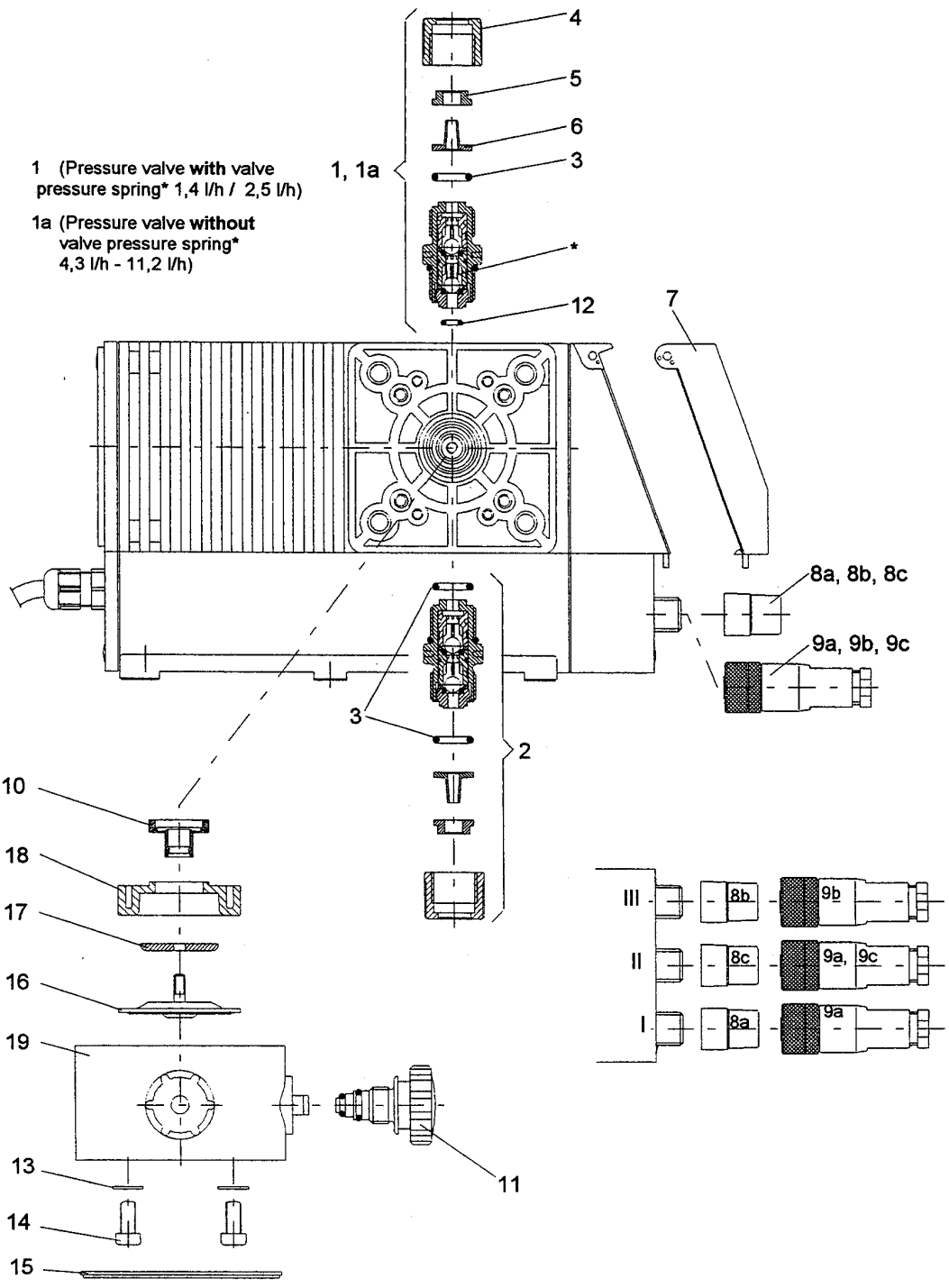
Pump head:	PVDF, optionally PP, stainless steel 1.4571
Diaphragm:	PTFE-EPDM compound diaphragm
Seals:	FPM/Viton B, optionally EPDM, Kalrez
Valves:	PVDF, optionally PP, stainless steel 1.4571
Valve balls:	Glass, optionally stainless steel 1.4401, PTFE
Valve springs:	Elgiloy/Hastelloy C4
Housing:	Thermoplastic polyester
Colour:	Blue, RAL 5007

Special versions on request.

13. Wearing and replacement parts

Item No.	Description	Article No.
1	Pressure valve with valve spring (1.4 l/h - 2.5 l/h)	2.480.03
1a	Pressure valve without valve spring (4.3 l/h - 11.2 l/h)	2.480.04
2	Suction valve (1.4 l/h - 11.2 l/h)	2.480.04
3	O-ring for suction and pressure valve (FPM)	4.1.7003.327
4	3/8" union nut	3.480.01-42
5	4/6, PE/PTFE thrust piece 6/8, PE/PTFE thrust piece 6/12 PVC fabric, thrust piece	3.450.01-89 3.450.01-90 3.404.01-07
6	4/6 connection nipple 6/8 connection nipple	3.400.02-30 3.400.02-76
7	Transparent cover	3.480.01-20
8a	Bridge connector, empty signal input	2.481.86
8b	Cover cap	3.480.01-17
8c	Bridge connector, pulse / current signal input	2.481.87
9a	Plug 4 pole (3 pole) empty signal / pulse signal input	4.1.8463.115
9b	Plug, 4 pole, special version empty signal / pulse signal output	4.1.8463.117
9c	Plug 5 pole E30/E32 current signal / pulse signal input	4.1.8463.118
10	Bellows	3.480.01-32
11	Vent screw	2.430.77
12	O-ring (FPM)	4.1.7003.316
13	Washer	4.1.3501.720
14	Screw	4.1.3031.026
15	Cover plate	5.400.01-88

		1.4 l/h	2.5 l/h	4.3/4.8 l/h	7.2 l/h	11.2 l/h
16	Diaphragm	3.480.01-34	3.480.01-55	3.480.01-56	3.480.01-57	3.480.01-57
17	Support disk	3.400.01-58	--	3.402.43-02	3.404.01-10	3.400.01-45
18	Intermed. plate	3.480.01-33	3.480.01-50	3.480.01-51	3.480.01-52	3.480.01-52
19	PVDF pump head	3.402.01-04	3.402.01-05	3.402.01-06	3.402.01-07	3.402.01-07
19	PP pump head	3.400.01-84	3.400.01-85	3.400.01-86	3.400.01-87	3.400.01-87

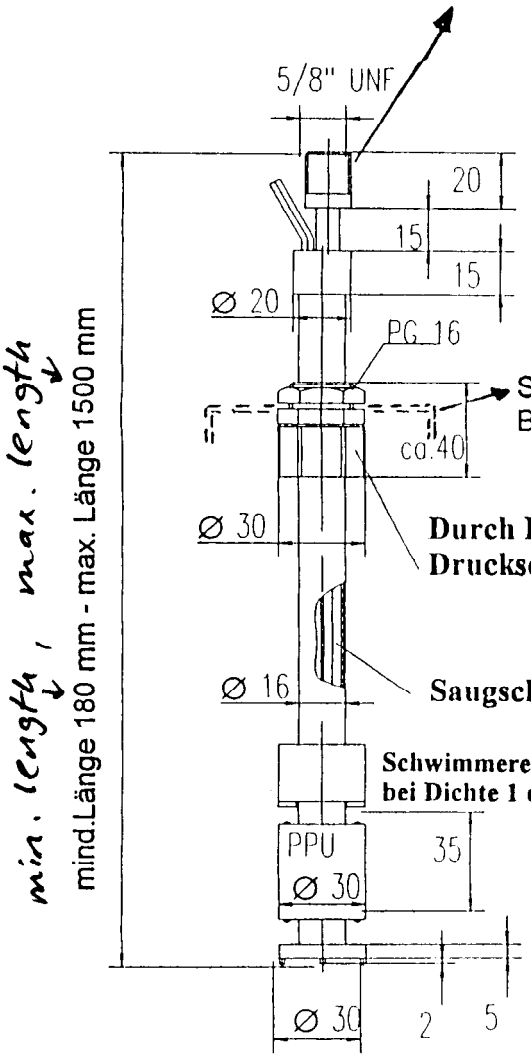

1 (Pressure valve with valve pressure spring* 1,4 l/h / 2,5 l/h)
1a (Pressure valve without valve pressure spring* 4,3 l/h - 11,2 l/h)
1, 1a
4
5
6
3
*
12
7
8a, 8b, 8c
9a, 9b, 9c
3
2
10
18
17
16
19
13
14
15
11
III
II
I
8b
9b
8c
9a, 9c
8a
9a

Variable Suction Rod

MEDOTEC MEß- UND DOSIERTECHNIK GMBH	VARIABLE SAUGLANZE FÜR LIEFERGEBINDE	AUSGABE AB 1/1997

Standard-Schlauchanschluß 4x6, 6x8, 6x12 mm
Option 5x8, 8,12, 9x12 mm

Standard hose Connection



Kontaktart:
Öffner oder Schließer durch Drehen des Schwimmers

Contact type: opener or closer by turning the floating element

Screwing lid, opening 22,5 supplied

see overleaf

Technische Daten:

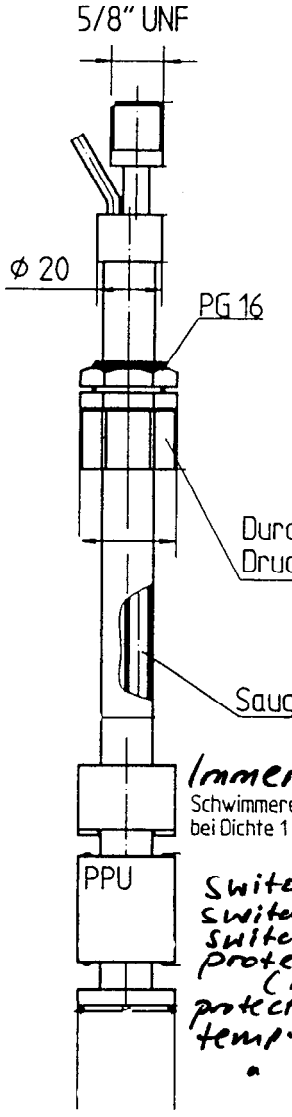
Schaltspannung	max. 250 V
Schaltstrom	max. 1 A
Schaltleistung	max. 50 W / 50 VA
Schutzart Kopfstück	IP 65 (IEC 529)
Schutzart ab Unterk.Schraubdeckel	IP 65 (IEC 529)
Temperaturbereich PVC	- 10°C - + 65°C

see overleaf

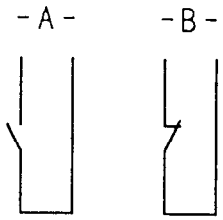
XE-000009416-000

Sauglanze S 1 . . . 0 . .

variable suction rod



types of contact
Kontaktarten



can be changed by loosening of pressure screw

suction pipe PE, inside Ø 6

Immersion depth/density 1, approx. 21 mm

switch. voltage
switch. current
switch. power
protection type (head)
protection, lower part
temp. range PVC
" PP

TECHNISCHE DATEN: techn. data

Schaltspannung:	max. 50 V	max. 250 V
Schaltstrom:	max. 0,5 A	max. 1 A
Schaltleistung:	max. 10 W / 10 VA	max. 50 W / 50 VA
Schutzart Kopfstück:	IP 65 (IEC 529)	
Schutzart ab Unterkante Schraubdeckel:	IP 67 (IEC 529)	
Temperaturbereich PVC:	-10°C ... +65°C	
Temperaturbereich PP:	-25°C ... +100°C	

Typenschlüssel für Sauglanze S 1 . . . 0 . .

material code ← of supplier

* Nennlänge 0 - 5 in 200 mm Schritten abgestuft
0 = ≤ 200 mm 1 = ≤ 400 mm 2 = ≤ 600 mm
3 = ≤ 800 mm 4 = ≤ 1000 mm 5 = ≤ 1200 mm

Kontaktarten
A = - A - B = - B - C = - C -

Schaltspannung
0 = < 50 V 1 = < 250 V (nur A oder B Kontakt)

Material Sauglanze / Flußventil
B = PVC / PVC C = PP / PP

Schaltpunkt 0 = fallendes Niveau
1 = steigendes Niveau

Assembly	: 16.02.WMT1.20.0L	Commiss.	: 25-05-377
Label	: CONTAINER[520]/WMT1/PVC/VA	Position	: 000080
Quant.	: 1,000 ST	Page	: 000249/01
Drawing	: 16.02.WT01E01.00	Date	: 10.04.2006

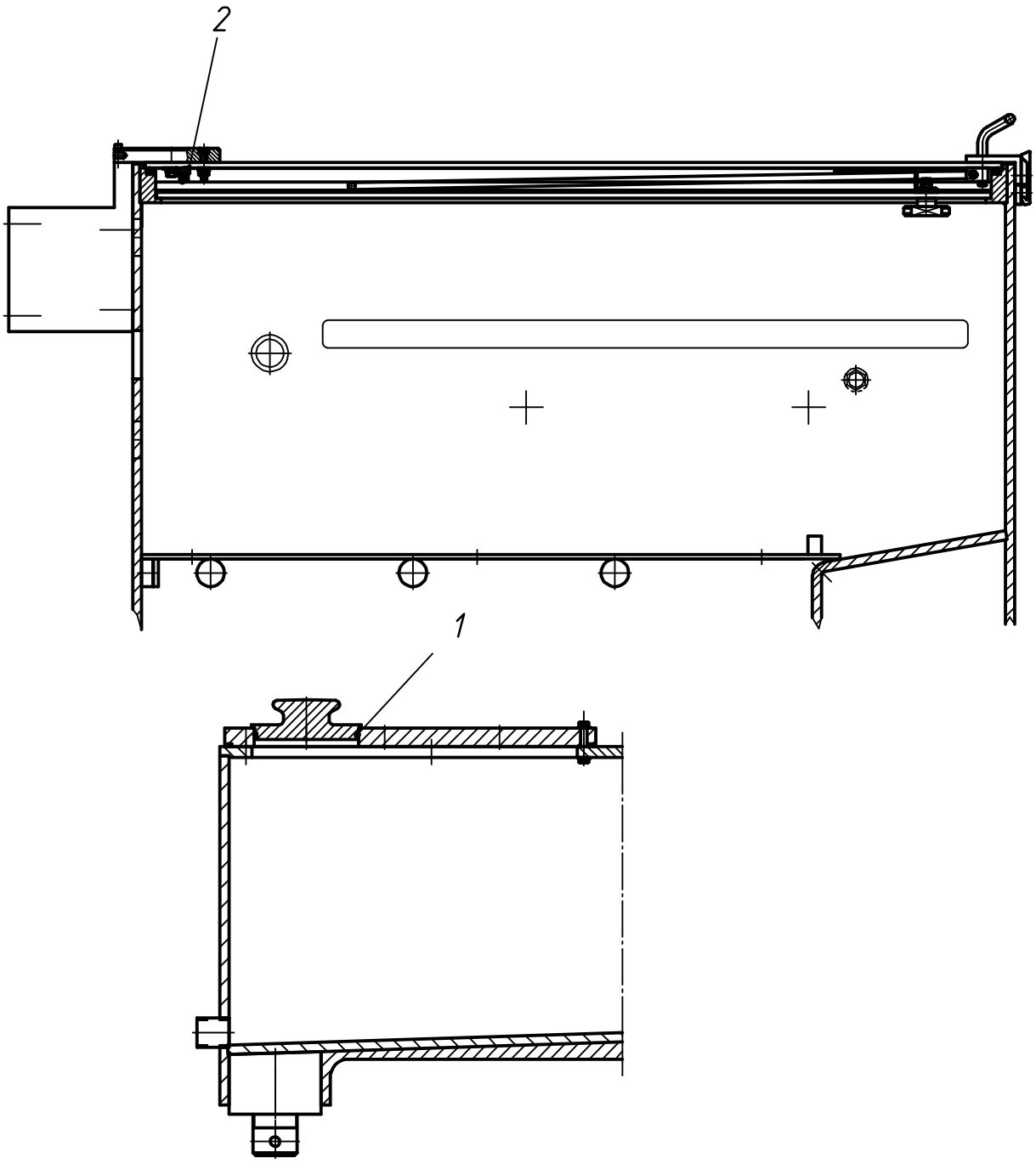
Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.1474.221A CONTAINER/PVC/WMT/21/0650/FA	1,000	ST	
	16.002.0141.U212 GLASS COVER[020]/21/V4A/PVC	1,000	ST	
1	DICH0580-239 O-RING/EPDM/BLACK/091.76x3.53	1,000	ST	X
2	16.002.0508.0760 PROFILE/"VITON B"	,315	M	X
	16.012.0003.U21A CABLE CHANNEL/CPL./21/PVC/BS	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste BEHÄLTER U. VERKLEI.

Spare parts list housing with accessories

16.02.WT01E01.00 | 11/03



Assembly	: 16.002.1474.221A	Commiss.	: 25-05-377
Label	: CONTAINER/PVC/WMT/21/0650/FA	Position	: 000080
Quant.	: 1,000 ST	Page	: 000250/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	03.010.0059.000B SCREWING-IN PART/PVC-DG/d=46.5/R 2 3/4"	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.002.0141.U212	Commiss.	: 25-05-377
Label	: GLASS COVER[020]/21/V4A/PVC	Position	: 000080
Quant.	: 1,000 ST	Page	: 000251/01
Drawing	: 16.002.0141EU000	Date	: 10.04.2006

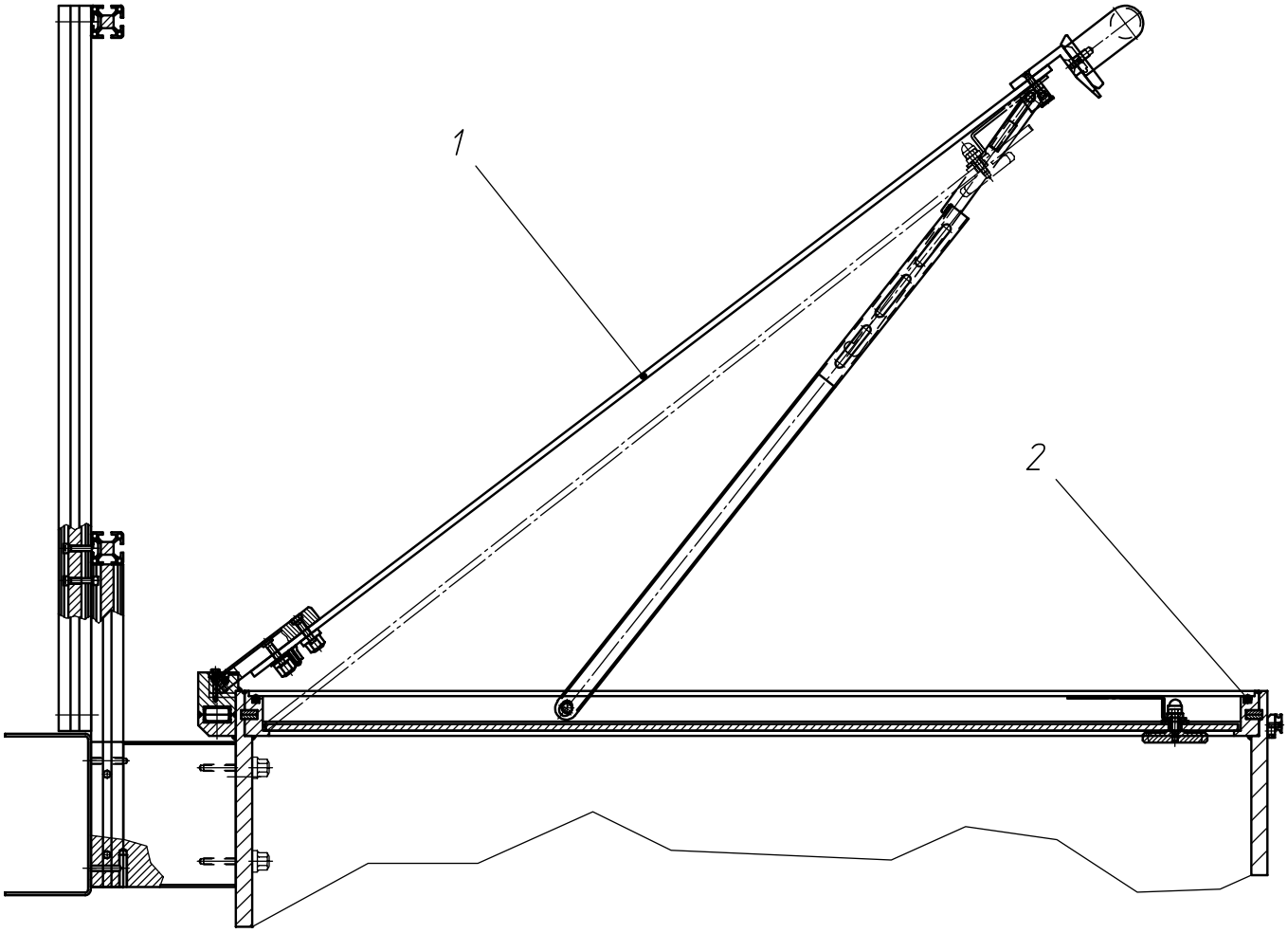
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0022.2210 GLASS COVER/21/0650/0343x0932x06	1,000	ST	X
	16.002.0142.U002 COVER PARTS/PVC/V4A	1,000	ST	
2	16.002.1178.2210 GLASS COVER SEALING/A/21/0650/EPDM	1,000	ST	X
3	DICH0700-5 SEALING RING M5	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list GLASS COVER

16.002.0141EU000	11
	00



Assembly	: 16.002.0142.U002	Commiss.	: 25-05-377
Label	: COVER PARTS/PVC/V4A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000252/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

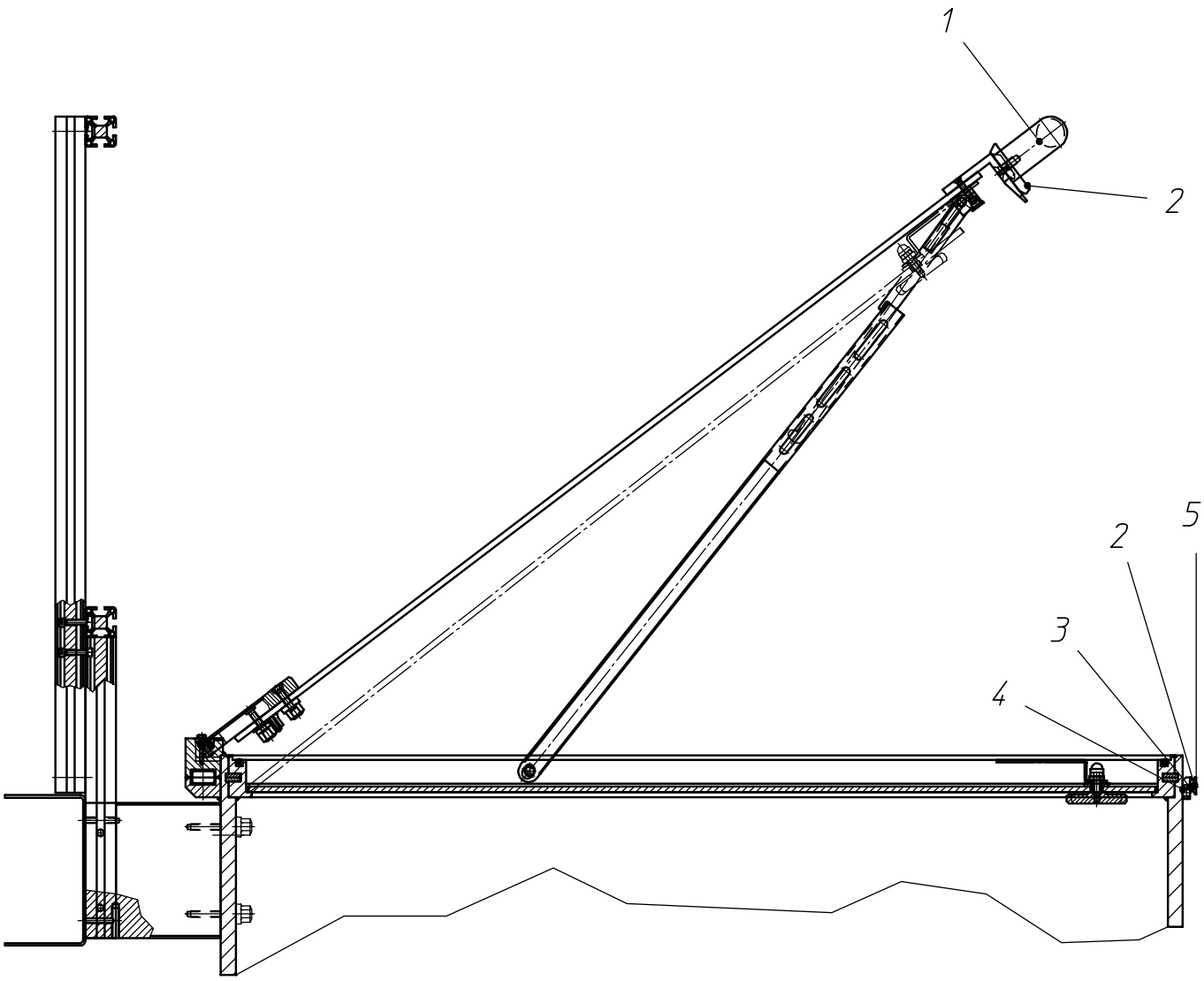
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	DICH0700-6 SEALING RING M6/POLYPROPYLEN GREY	4,000	ST	X
3	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
4	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
5	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
HAMLIN

www.breedelectronics.com

59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

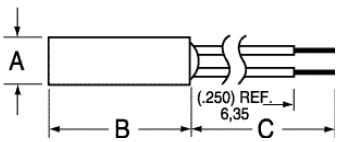
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

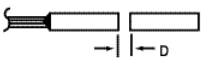
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

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Breed Electronics France Tel: +33 1 46 87 02 02 • Fax:+33 1 46 86 67 86 • Email: hamectrol@hamectrol.fr

Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000080
Quant.	: 1,000 ST	Page	: 000253/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

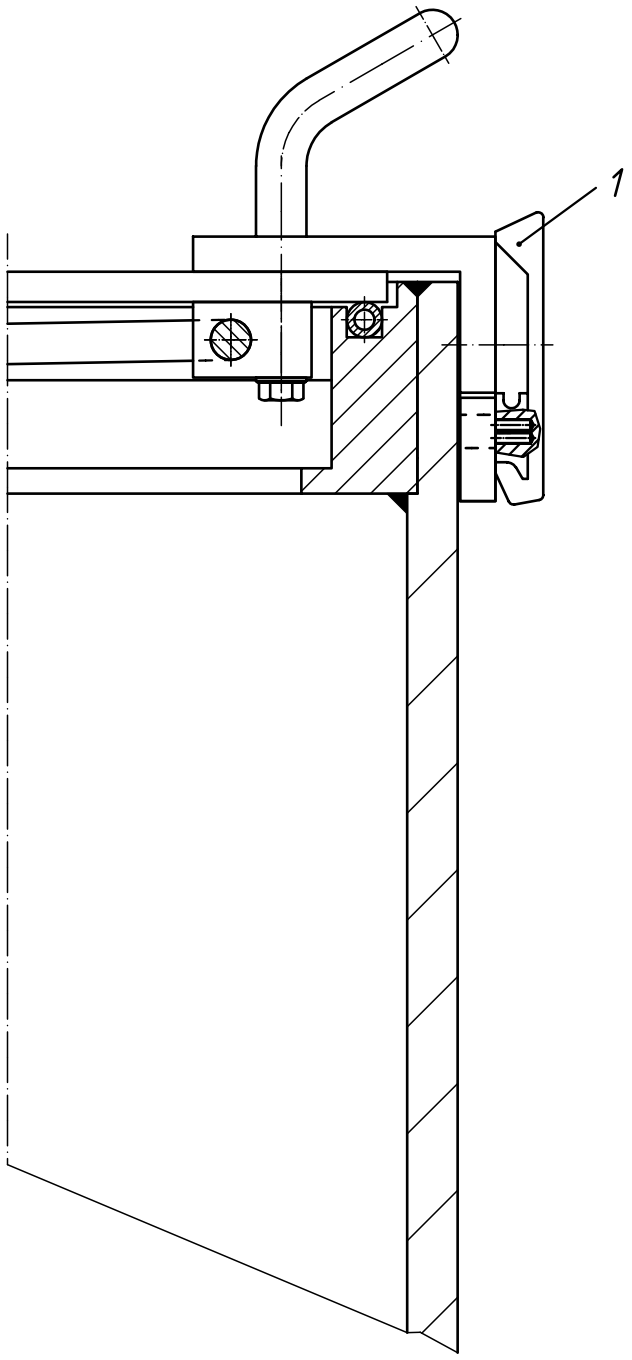
Pos.	Part N° / Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.012.0003.U21A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./21/PVC/BS	Position	: 000080
Quant.	: 1,000 ST	Page	: 000254/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

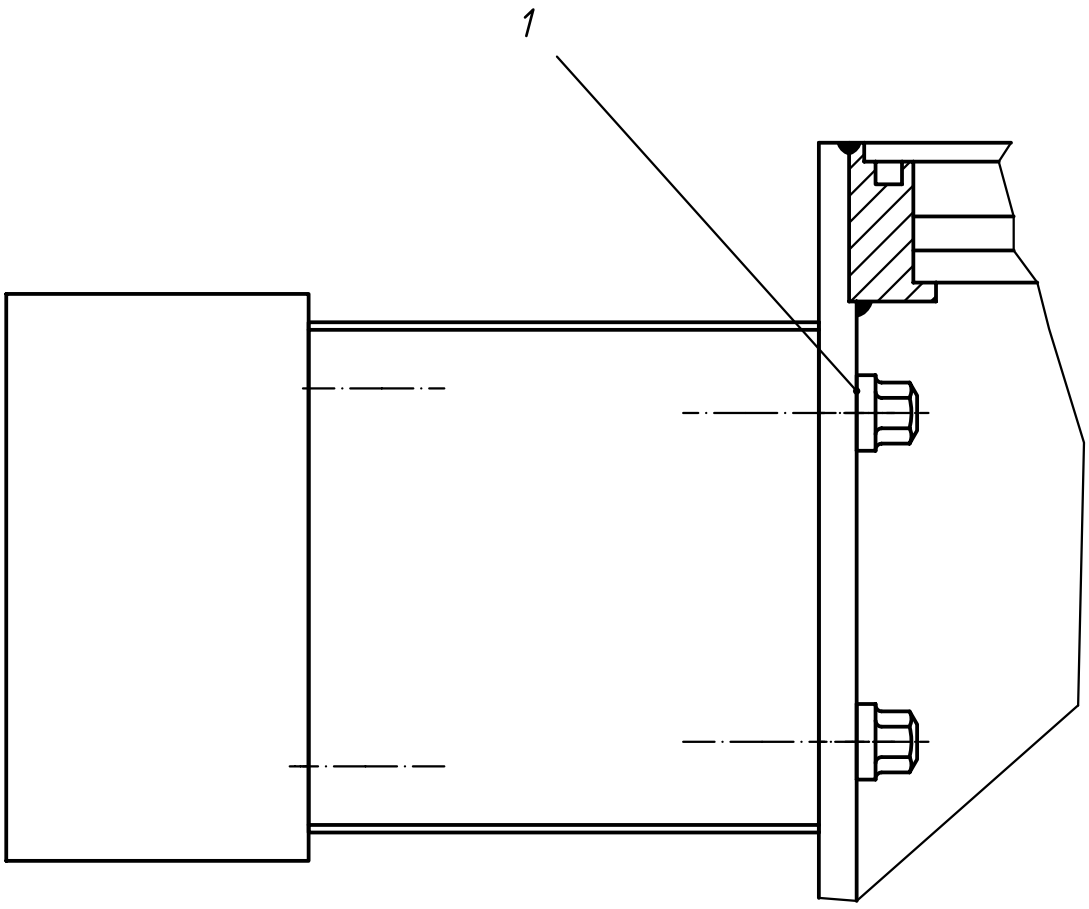
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 16.002.0040.U211	Commiss.	: 25-05-377
Label	: INTERMEDIATE GLASS COVER/KPL./21/PP/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000255/01
Drawing	: 16.002.0040EU000	Date	: 10.04.2006

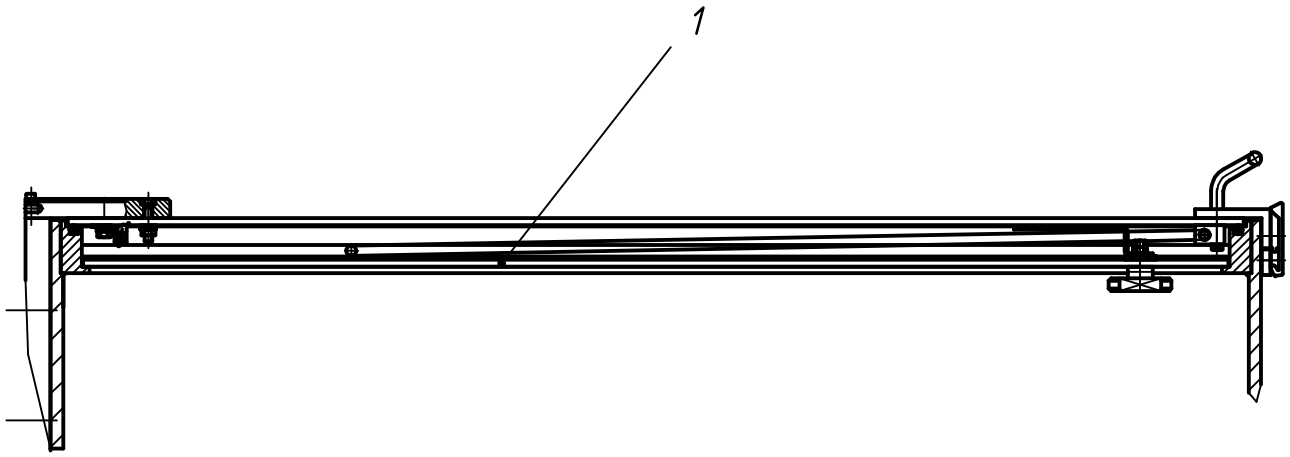
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0100.2210 GLASS COVER/21/0650/0291x0906x06.0	1,000	ST	X
	16.002.0004.U001 COVER PARTS/V2A/INTERMEDIATE COVER	1,000	ST	

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZWI.-GLASDECKEL KPL.

Spare parts list Intermediate glass cover cpl.

16.002.0040EU000	11
	00



Assembly	: 16.002.0004.U001	Commiss.	: 25-05-377
Label	: COVER PARTS/V2A/INTERMEDIATE COVER	Position	: 000080
Quant.	: 1,000 ST	Page	: 000256/01
Drawing	: 16.002.0004EU000	Date	: 10.04.2006

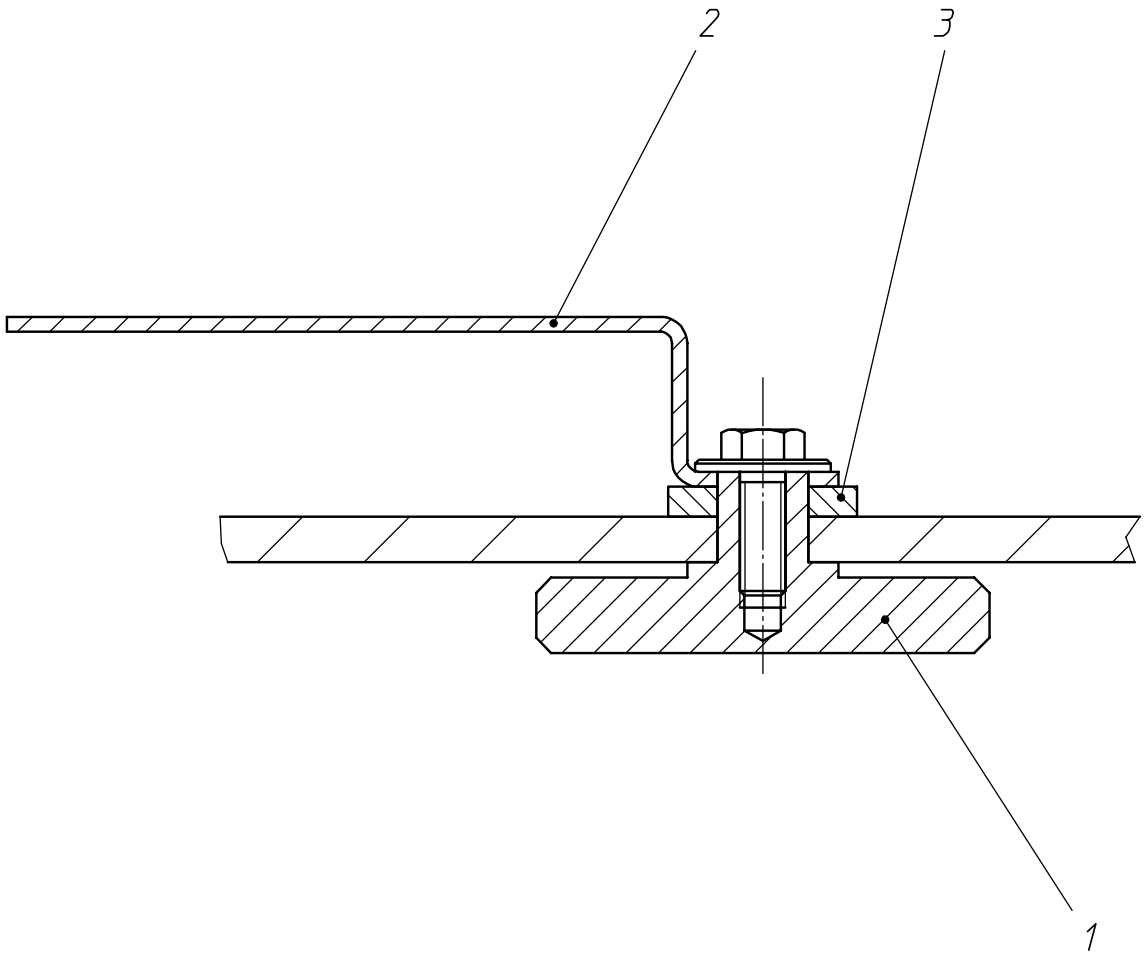
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0209.000E HANDLE/PP-G	1,000	ST	X
2	16.002.2506.0002 LOCKING BOLT	1,000	ST	X
3	00.005.0207.000E DISC/PP-G/d=12.0/D=025.0/L=2.0	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list cover parts

16.002.0004EU000	11
	01



Assembly	: 16.05.W001.01.0A	Commiss.	: 25-05-377
Label	: FEED/WMT1/PVC /PVC /EP/AS08	Position	: 000080
Quant.	: 1,000 ST	Page	: 000257/01
Drawing	: 16.05.W001E01.00	Date	: 10.04.2006

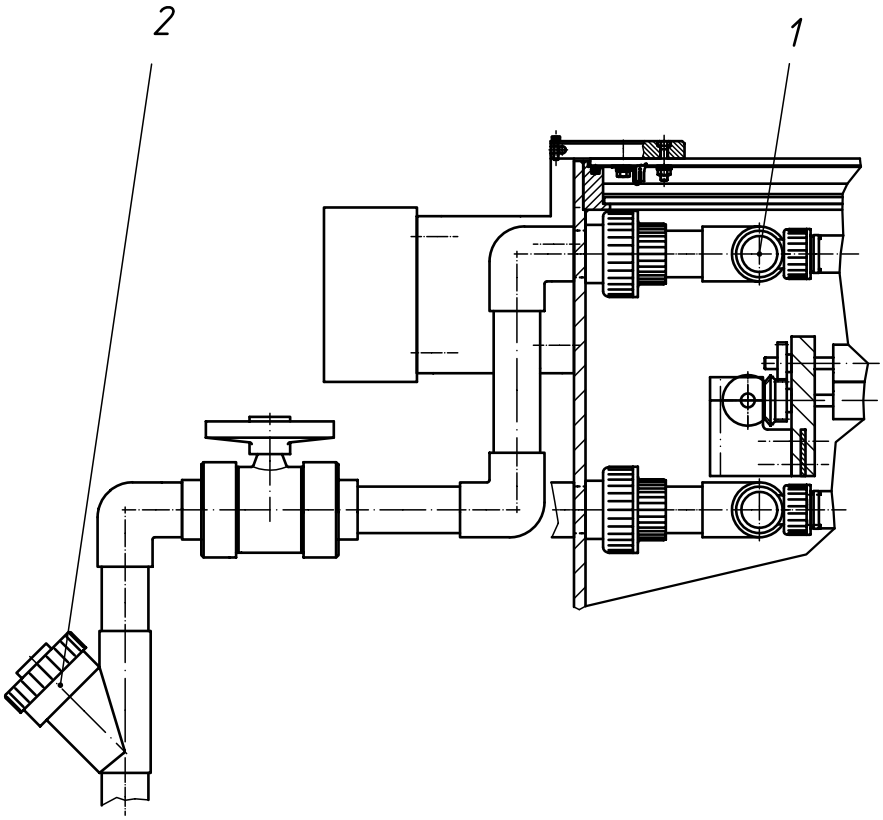
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.005.0397.021B DISTRIBUTOR PIPE/PVC/EP/021/KPL./4A/0B	2,000	ST	X
2	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF

Spare parts list INFLOW

16.05.W001E01.00	11
	00



Assembly	: 16.005.0397.021B	Commiss.	: 25-05-377
Label	: DISTRIBUTOR PIPE/PVC/EP/021/KPL./4A/0B	Position	: 000080
Quant.	: 2,000 ST	Page	: 000258/01
Drawing	: 16.005.0024E0000	Date	: 10.04.2006

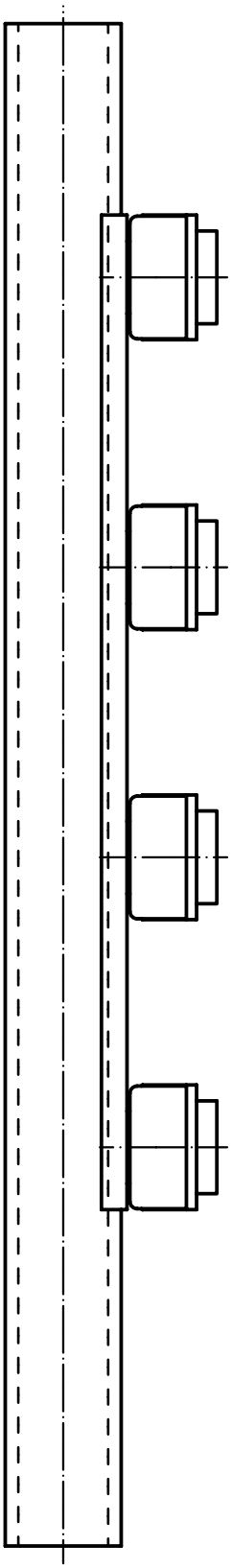
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	4,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	8,000	ST	X
3	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	4,000	ST	X

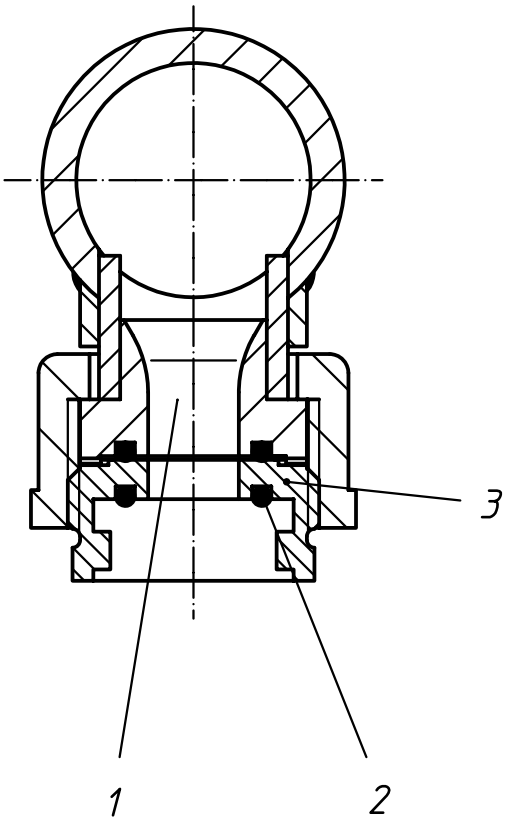
Parts without Pos.-N° see assembly parts list

Ersatzteilliste VERTEILERROHR KPL.

Spare parts list DISTRIBUTOR PIPE CPL.

16.005.0024E0000	11 / 01





Assembly	: 16.005.0010.2O2B	Commiss.	: 25-05-377
Label	: SPRAYPIPE/PVC-D/ 650/ 9D/F/G/12,06L/MIN	Position	: 000080
Quant.	: 4,000 ST	Page	: 000259/01
Drawing	: 16.005.0010E0000	Date	: 10.04.2006

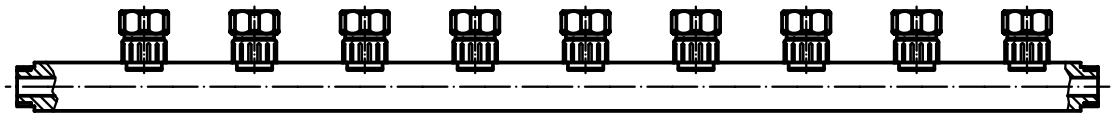
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000166-000 SEAL-NUT/PPNR.065.202.53.00.001	9,000	ST	X
2	DÜ-000000142-000 NOZZLE/652.514.5E/BJ/PVDF/60°	9,000	ST	X
3	DI-000000133-000 SEALING RING EPDM/18,4x10x3 MM	9,000	ST	X
4	03.005.0401.000C ADAPTER/CPL./PVC-C/RA=15°	9,000	ST	X
5	DICH0580-112 O-RING/EPDM/BLACK/012.37x2.62	9,000	ST	X

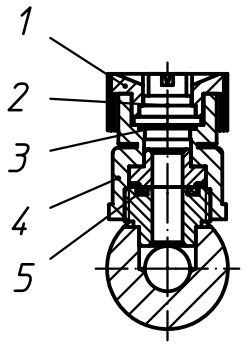
Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPRÜHROHR KPL.

Spare parts list SPRAY PIPE CPL.

16.005.0010E0000	11 / 01





Assembly	: 16.009.0005.U00A	Commiss.	: 25-05-377
Label	: COOLING/ACCESSORIES/PVC/1KS	Position	: 000080
Quant.	: 1,000 ST	Page	: 000260/01
Drawing	: 16.009.0005EU000	Date	: 10.04.2006

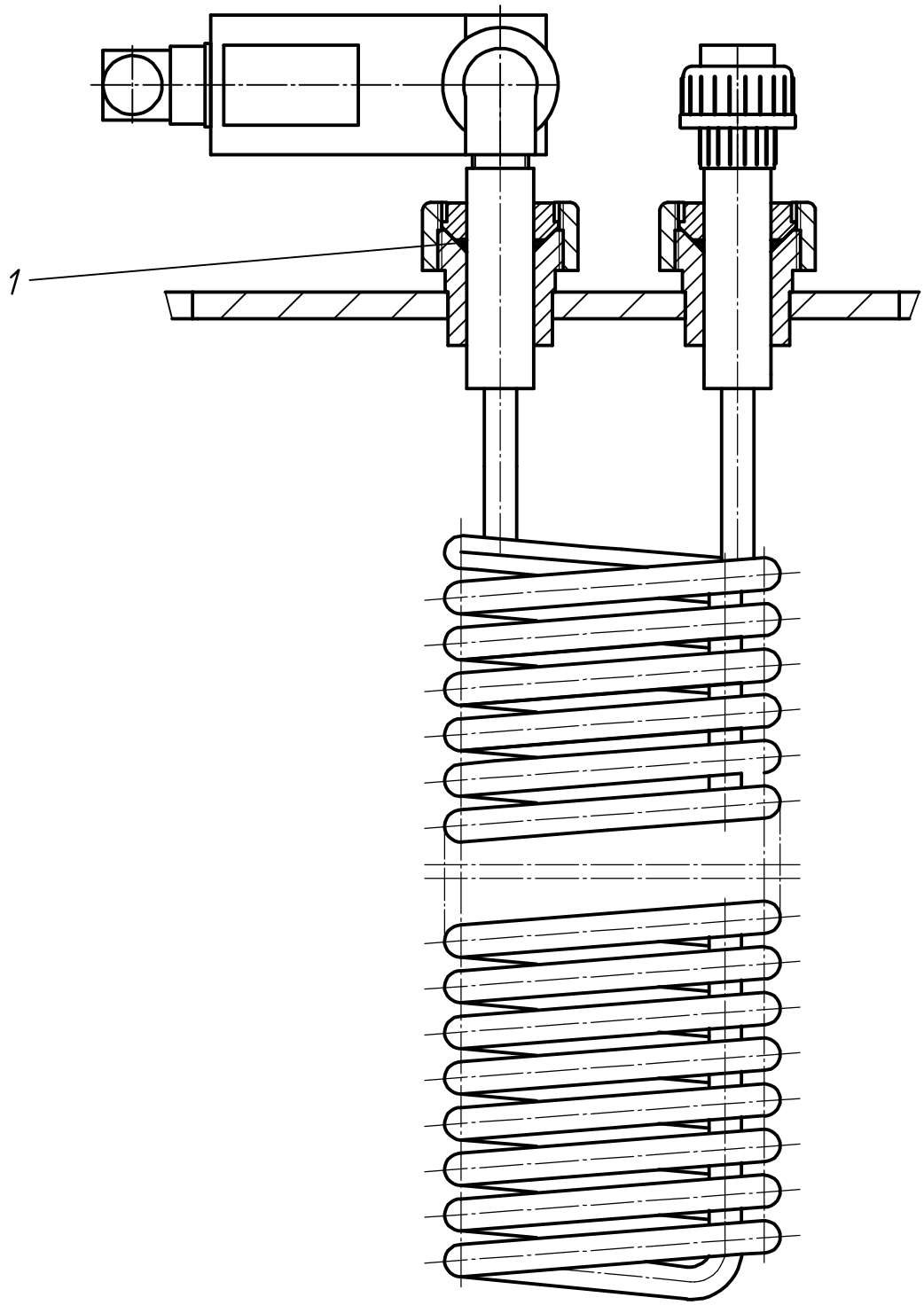
Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
1	DICH0576-318 O-RING/VITON/GREEN/024.77x5.33	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KÜHLUNG

Spare parts list Cooling

16.009.0005EU000	11
	01



Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000080
Quant.	: 1,000 ST	Page	: 000261/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

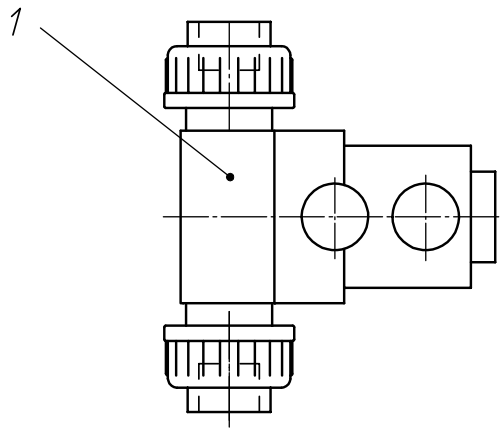
Pos.	Part N° / Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

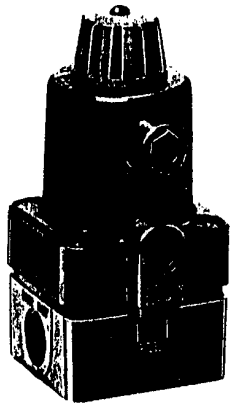
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

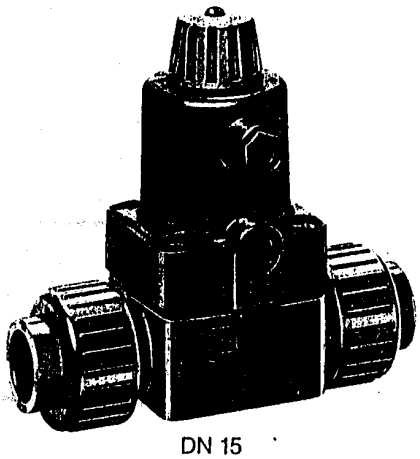
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

GEMÜ®

Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

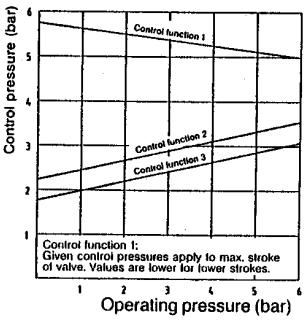
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

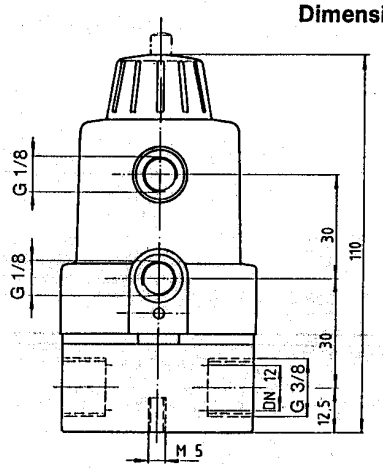
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

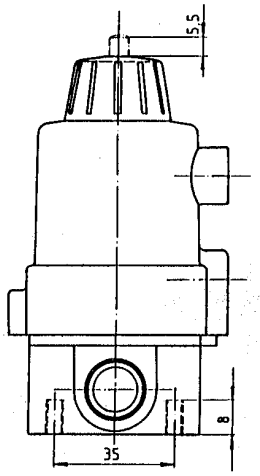
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

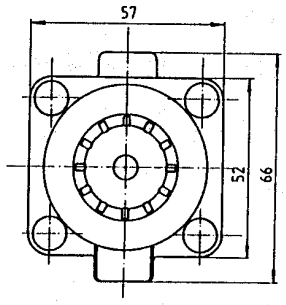
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



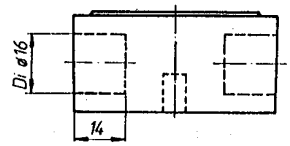
Dimensions



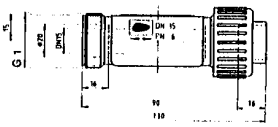




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

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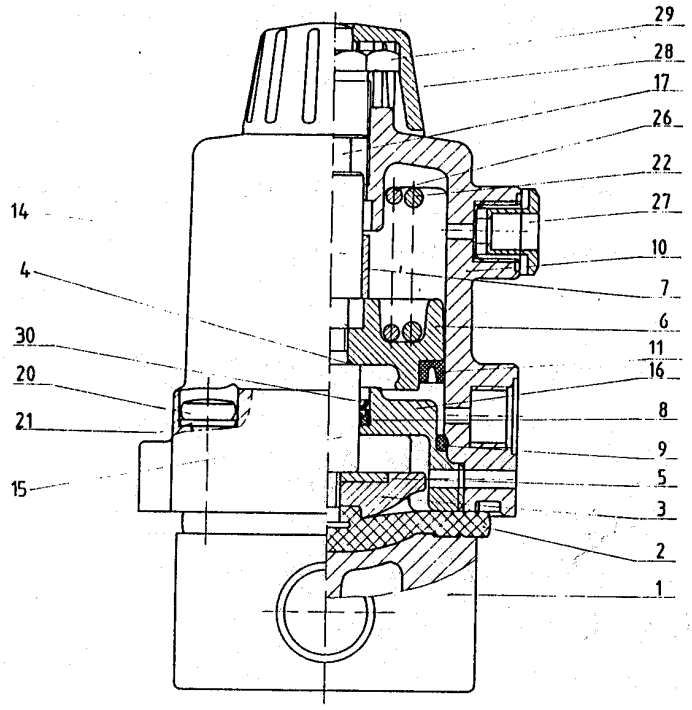
Printed in West Germany – Oha-Druck GmbH, Ingelfingen

GEMÜ®

Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000080
Quant.	: 1,000 ST	Page	: 000262/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

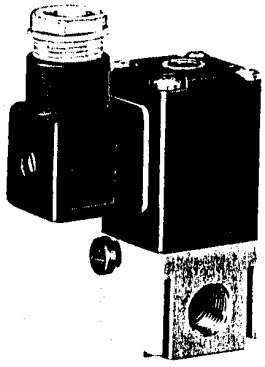
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

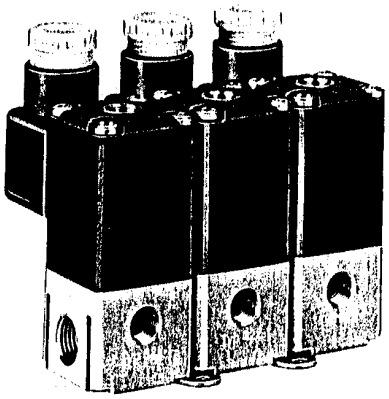
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

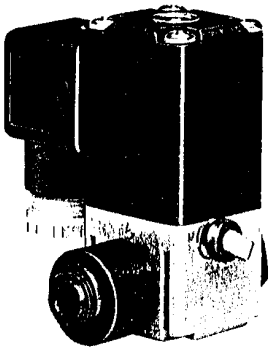
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

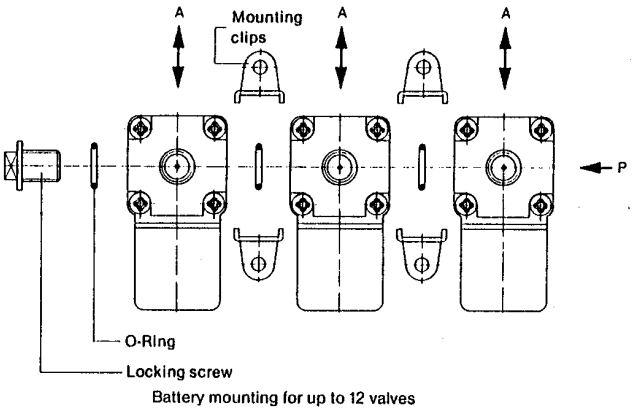


Type 322



Type 324

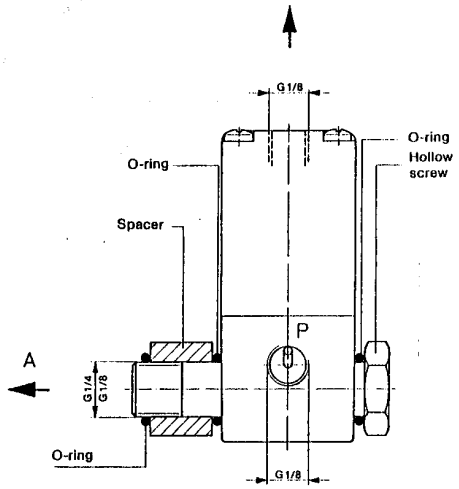
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

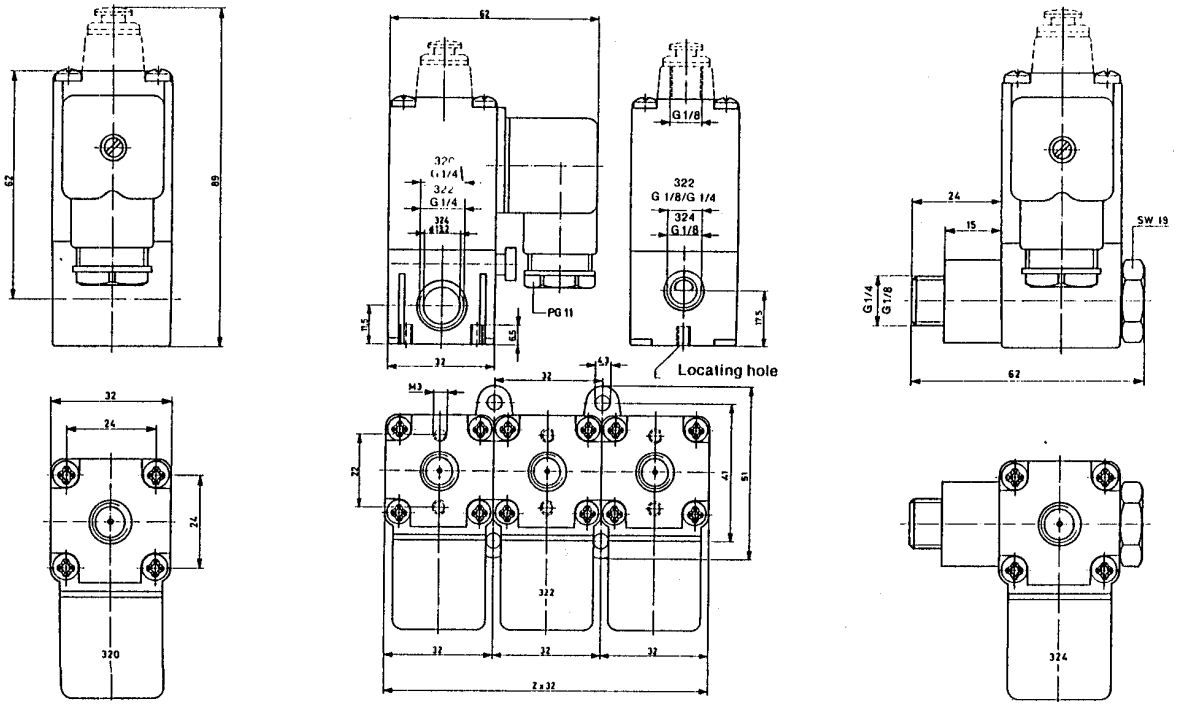
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

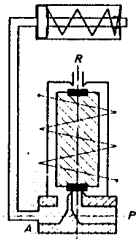
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

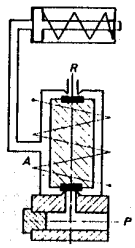
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

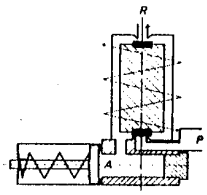
Control function normally closed



Type 320

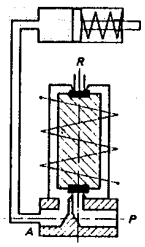


Type 322

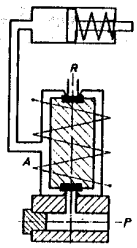


Type 324

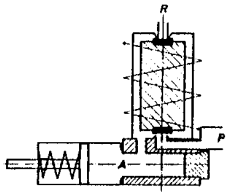
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

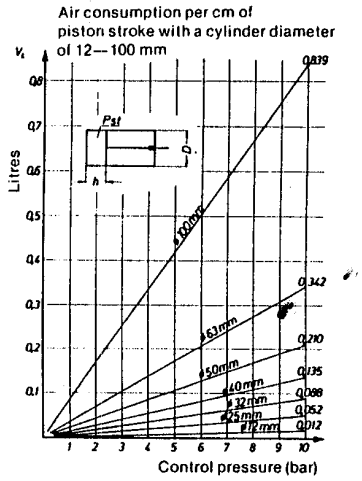
GEMÜ®

GEMÜ GEBR. MÜLLER
Apparatebau GmbH & Co. KG
Postfach 30 · D-7118 Ingelfingen 2
Tel. 079 40/123-0 · Telex 74126 · FAX 079 40/123-106

Presented by:

Printed in West Germany – Ohg-Druck GmbH, Ingelfingen

Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

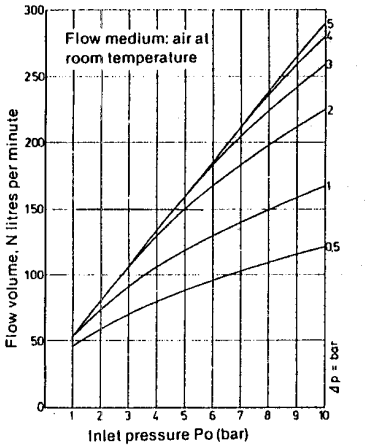
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

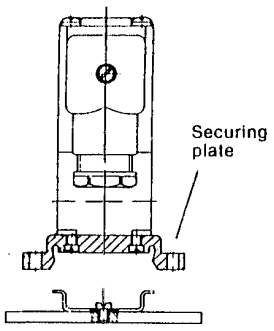
The flow quantity for other gases and temperatures can be calculated according to the following formula:

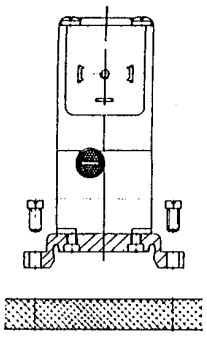
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 16.010.0040.U00L	Commiss.	: 25-05-377
Label	: HEATING/4,50KW/VA/PVC/CS	Position	: 000080
Quant.	: 1,000 ST	Page	: 000263/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	CS-10-00-10-00 SCREWED HEATER/4.5kW/V2A/ET600	1,000	ST	
1	DICH0580-326 O-RING/EPDM/BLACK/040.64x5.33	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: CS-10-00-10-00	Commiss.	: 25-05-377
Label	: SCREWED HEATER/4.5kW/V2A/ET600	Position	: 000080
Quant.	: 1,000 ST	Page	: 000264/01
Drawing	: CS-10-00E10-01	Date	: 10.04.2006

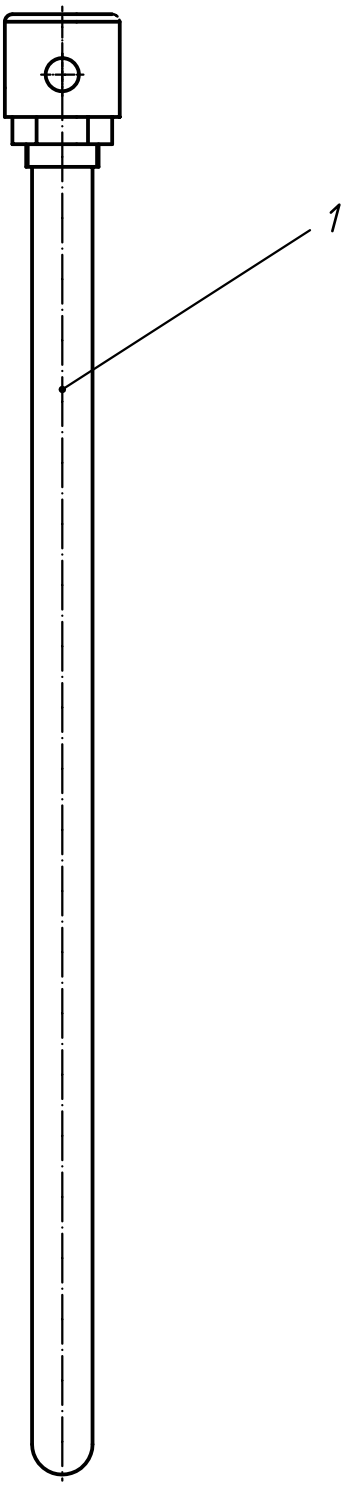
Pos.	Part N° / Label	Quant.	Unit	SP
1	EHEI30407-004500 Heating rod/ET600/R1 1/2"4.5KW 380 V	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste EINSCHRAUBHEIZKÖRPER

Spare parts list HEATING

CS-10-00E10-01	11
	00



Assembly	: 16.010.0005.U001	Commiss.	: 25-05-377
Label	: TEMPERATURE PROBE/VA/EP/2xPt100/MAZ/L20	Position	: 000080
Quant.	: 1,000 ST	Page	: 000265/01
Drawing	: 16.010.0005EU000	Date	: 10.04.2006

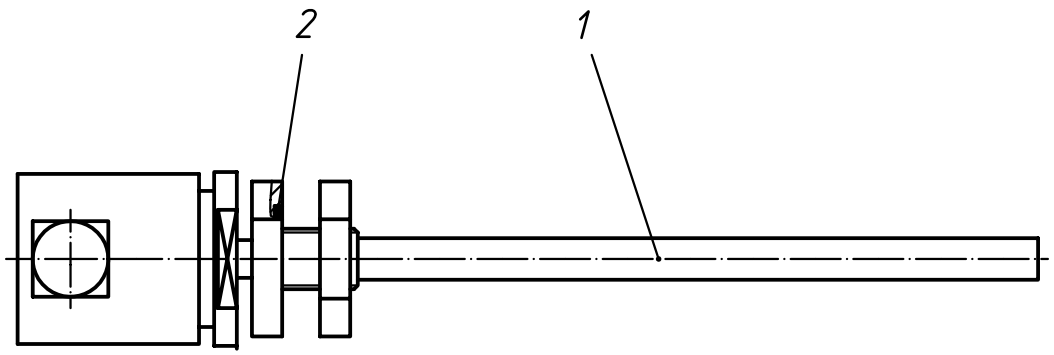
Pos.	Part N° Label	Quant.	Unit	SP
1	EB-000000224-000 TEMPERATURE PROBE/MAZ/V4A/2xPt100/L=200	1,000	ST	X
2	DICH0580-212 O-RING/EPDM/BLACK/021.82x3.53	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste TEMPERATURFÜHLER

Spare parts list TEMPERATURE PROBE

16.010.0005EU000	11
	00



Assembly	: 16.010.0006.U00A	Commiss.	: 25-05-377
Label	: LEVEL SWITCH/PVC/EPDM /ES-297	Position	: 000080
Quant.	: 1,000 ST	Page	: 000266/01
Drawing	: 16.010.0006EU000	Date	: 10.04.2006

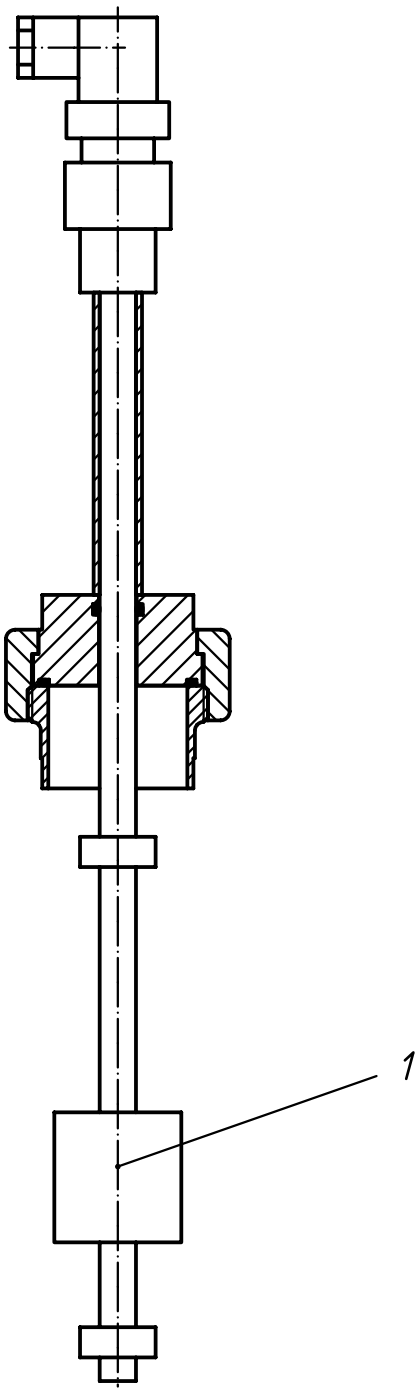
Pos.	Part N° Label	Quant.	Unit	SP
	16.010.0002.U00A RECEIVER/S-SWITCH/PVC/EPDM	1,000	ST	
1	ES-000000297-000 FLOAT SWITCH/PP/L1=205, L2=305	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SCHWIMMERSCHALTER

Spare parts list FLOAT SWITCH

16.010.0006EU000 | 11/01



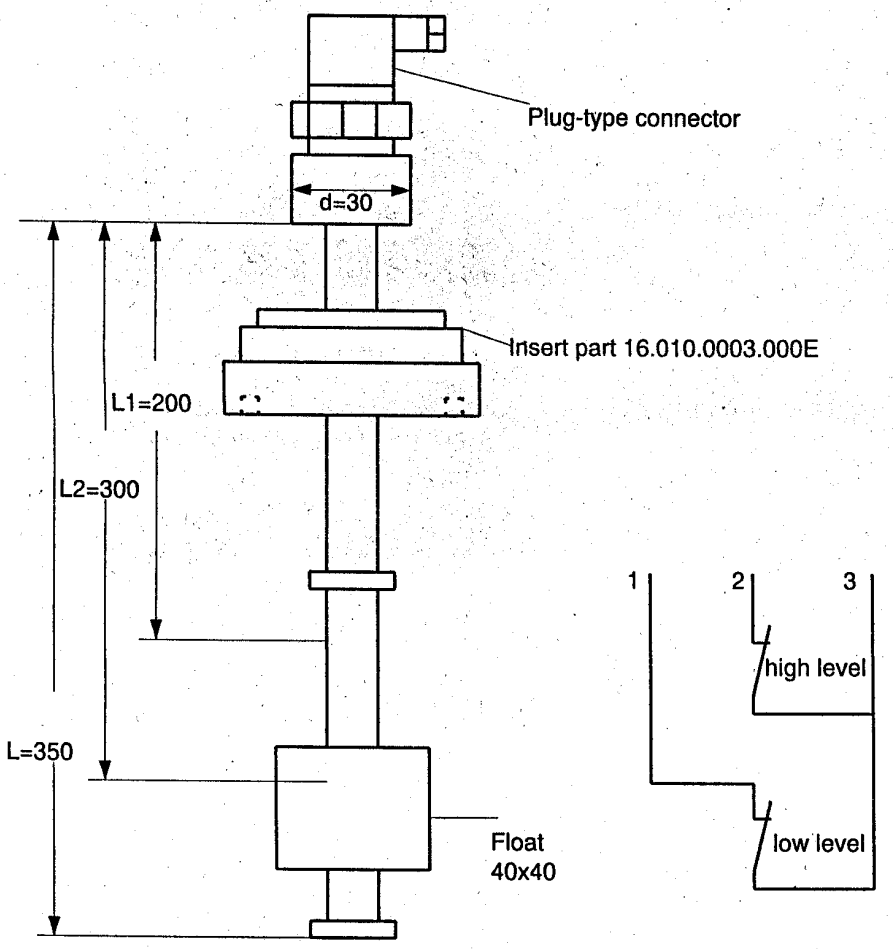
ENGLER

Steuer,Mess,-und Regeltechnik

Technical Data

Float switch Type: SSPP.2.A2.B4.205.305.RST

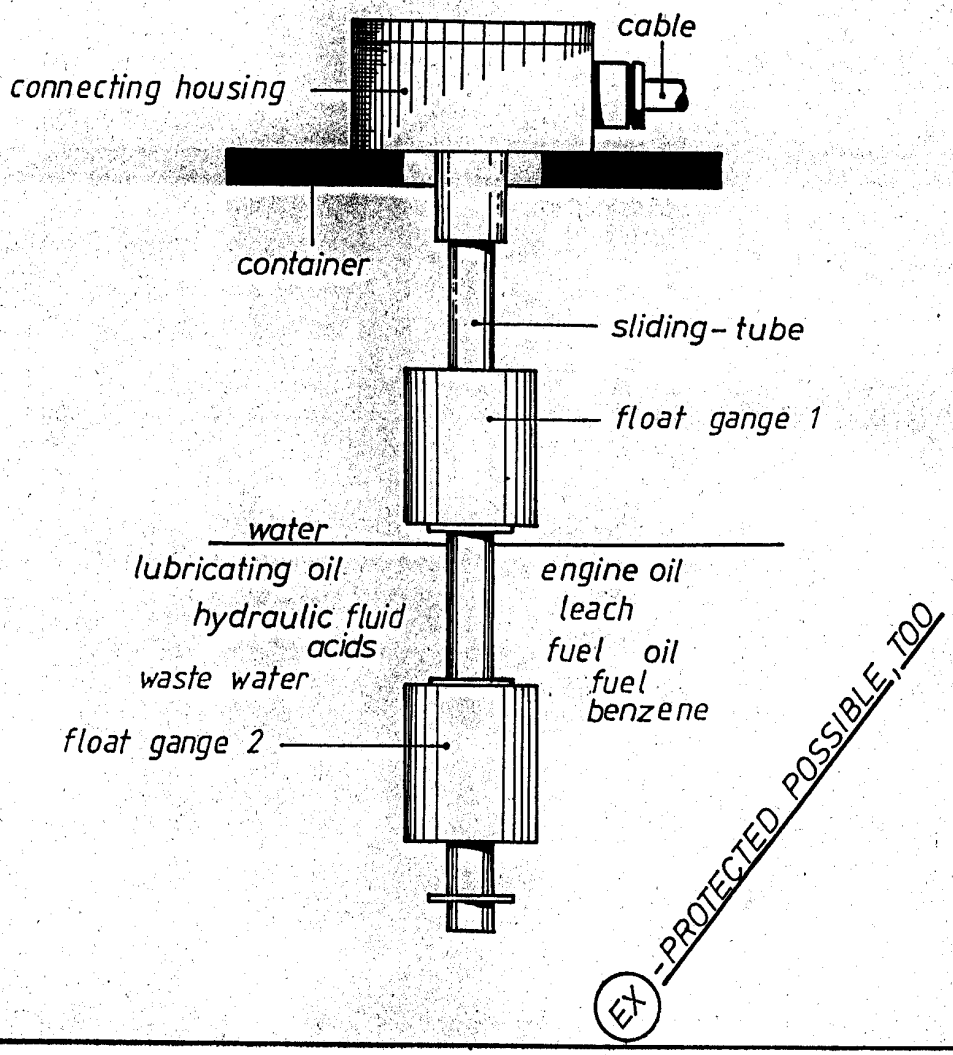
Part Nr. 1162800305 ES-000 000 297-000



Material :	PP(Polypropylen)	**Switch current:**	max. 1A
	Plug-type connector=Durethan	**Switch capacity:**	max. 60VA
Operating temperature:	max. 80°C	**Attention!**	
Allowed pressure:	athmospheric	Concerning inductive load resistence please assign protective switching!	
Protetive system:	IP 65		
Type of contact:	high level= opener going up low level = opener going down		
Switch voltage:	max. 230VAC		

ENGLER

FLOAT SWITCHES FOR FLUID MEDIUMS



7424 Heroldstatt/Sontheim
Lange Straße 151
Tel.(07389)1203

ENGLER

Specification:

Switching power max.:

normally open contact:	250 VA
normally closed contact:	250 VA
change over contact:	60 VA

Switching voltage max.:

normally open contact:	250 V
normally closed contact:	250 V
change over contact:	220 V

Switching current max.:

normally open contact:	3 A
normally closed contact:	3 A
change over contact:	1 A

Repeatable accuracy:

level-difference	5 mm

Max. contacts / switch:

4 normally open contacts
4 normally closed contacts or
3 change over contacts

Connecting housing made of:

Al-die casting (colour grey) or
Polyamid

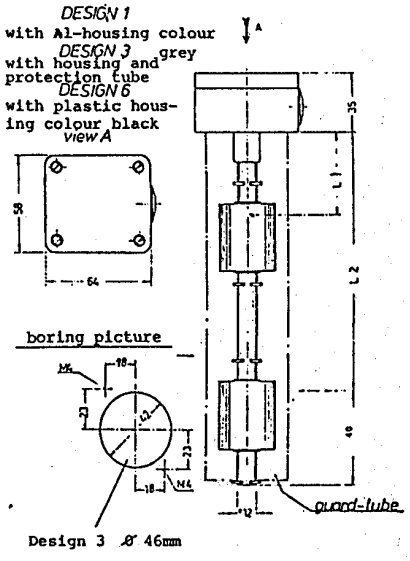
Protection:	IP 65
Cable-entry:	PG 11
cable-connection:	1,5 mm^2
operating pressure:	
operating temperature:	on request

Temperature switch:

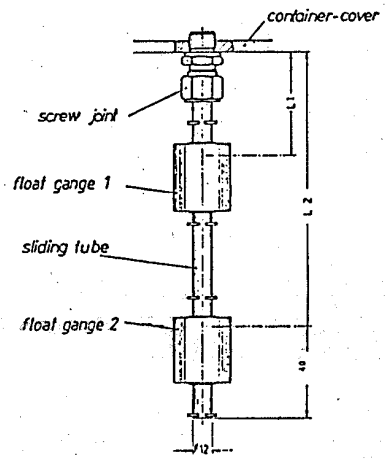
Switching voltage max: 220V
Switching current max: 2A

ENGLER

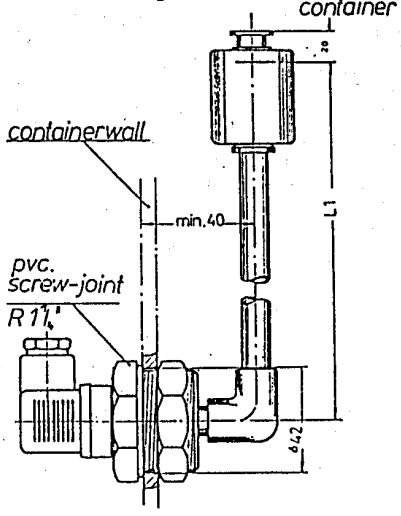
DESIGN 1
with Al-housing colour grey
DESIGN 3
with housing and protection tube
DESIGN 6
with plastic housing colour black



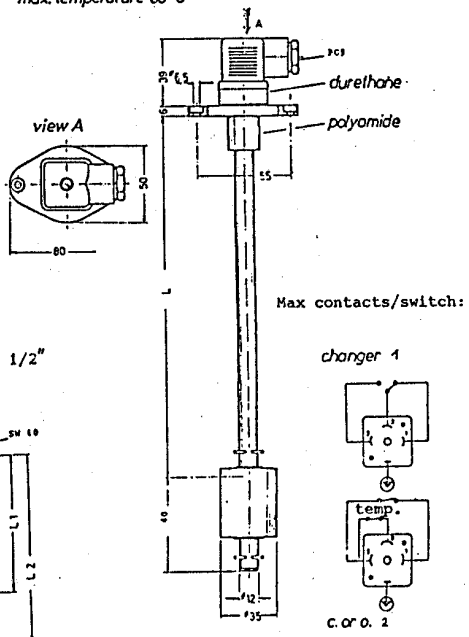
DESIGN 2
with straight pipe union standart
model:
screw coupling R3/8"
brass with 1m flex. oil filled cable



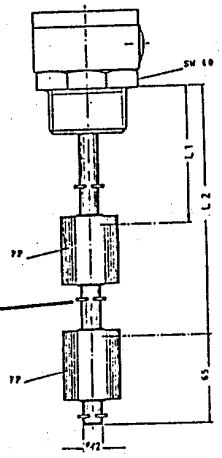
DESIGN 4
for mounting into the wall of the container



DESIGN 5
with mounting flange and coupler plug
max. temperature 80°C



DESIGN 7
with plastic-housing and
PVC-Inclosing capsule R1 1/2"



It is possible to change the forward break over point by a threated joint in the conduit box.

AENGLER

In case of emergency:
signal by float-switches.
AE-float-switches are controlling instruments, which supervise level positions and signalize breakdowns.

This is the construction and the function of the AE-float-switch:
The construction of the AE-float-switch is concepted like this, that the use is possible in a lot of industrial areas - in the chemical industry as well. The elements of the switches are reed contacts. They are felled with protective gas.
The actuating of those reed contacts effects without any touch by a magnet, which is poured in the float.
To be able to make electrical locking gear changing, every reed contact is influenced by a float gange.
By the breaking elements, which lie one upon the other it is possible to supervise different level positions with only one instrument.
The waterprooved and dust-protected connecting housing contents a connection-plan.

Assembly	: 16.010.0002.U00A	Commiss.	: 25-05-377
Label	: RECEIVER/S-SWITCH/PVC/EPDM	Position	: 000080
Quant.	: 1,000 ST	Page	: 000267/01
Drawing	: 16.010.0002EU000	Date	: 10.04.2006

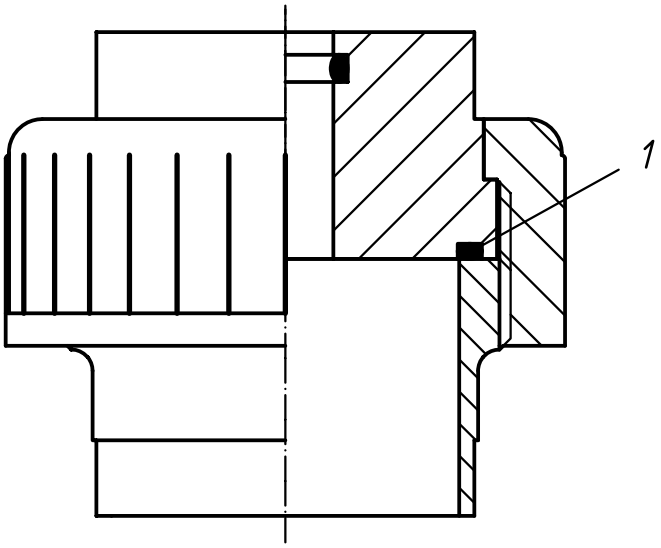
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-134 O-RING/EPDM/BLACK/047.29x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste AUFNAHME S-SCHALTER

Spare parts list RECEPTACLE FLOAD SWITCH

16.010.0002EU000	11
	00



Assembly	: 16.008.0004.U001	Commiss.	: 25-05-377
Label	: PUMP FIXING/VA/PP-G/EPDM	Position	: 000080
Quant.	: 1,000 ST	Page	: 000268/01
Drawing	: 16.008.0004EU000	Date	: 10.04.2006

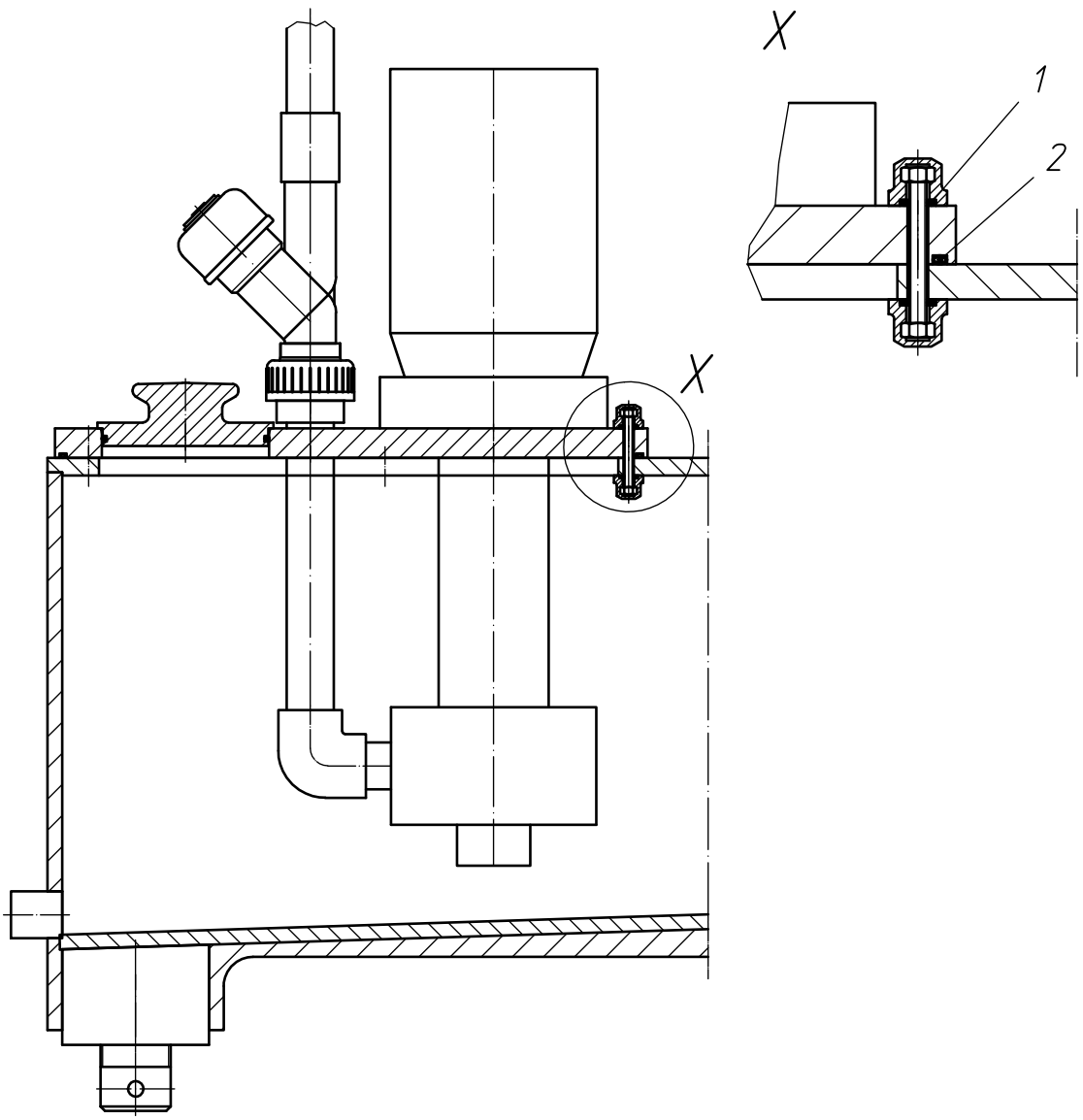
Pos.	Part N° Label	Quant.	Unit	SP
1	DI-000000076-000 O-RING/EPDM/BLACK/8.00x2.40 MM	8,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,250	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste PUMPENBEFESTIGUNG

Spare parts list PUMP FIXTURE

16.008.0004EU000	1/1
	02



Assembly	: 50.003.0006.U000	Commiss.	: 25-05-377
Label	: TA/RE/1.80kW/MF/ET=270/PUTA.04.K.000175	Position	: 000080
Quant.	: 1,000 ST	Page	: 000269/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	PUTA030300-03108 TA/PUTA.04.K.000175/RE/30/1.800kW/ET=270	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste *Tauchpumpe* *PUTA030300-03108*

Spare parts list *Immersion pump*

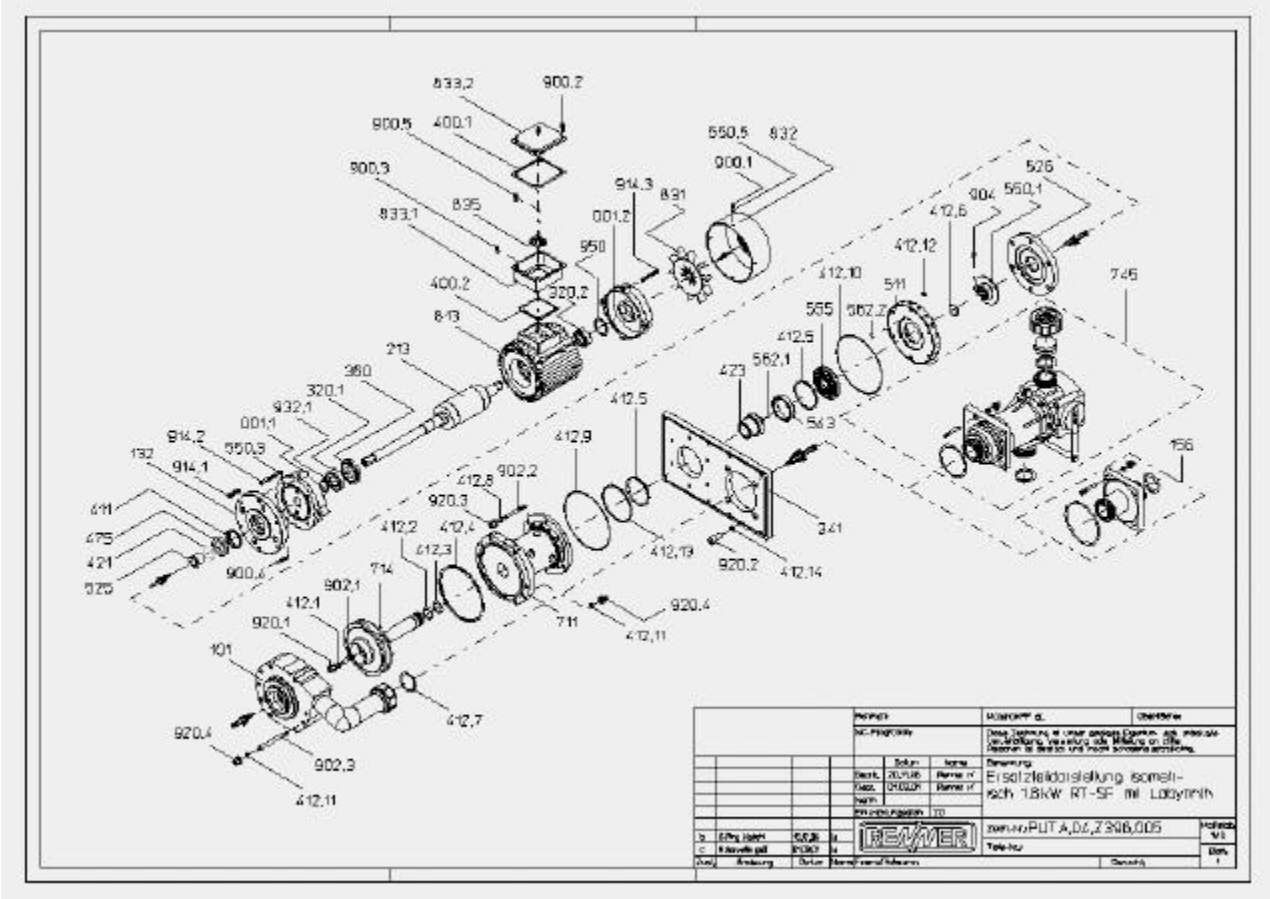
Bitte bei Bestellung angeben:
To be indicated on order:

PUTA030300-03108 *PUTA.04.K.000175*

SPARE PARTS LIST FOR VERTICAL SUBMERSIBLE CENTRIFUGAL PUMPS WITH LABYRINTH-SEAL

Combination possibilities with pressure pipe or quick change filter SF1/EU

Type: **RT-PP-24/340-1,8D/3-270 EPDM - 230/400V - 50Hz**
Built-in assembly flange: **404x220x20mm**
Art.-No.: **PUTA.04.K.000175**
Drawing-No.: **PUTA.04.Z396.005**



Attention: If the vertical submersible centrifugal pump will be combined with a filter SF1/EU one exit must be closed, otherwise the motor will be overstrained!

Pos.	Piece	Article-No.	Designation	Material
001.1	1	PUTA.00.1500.015	end plate A-side	
001.2	1	PUTA.00.1500.012	end plate B-side	
101	1	PUTA.34.0350.003	pump housing (50Hz)	PP grey
132	1	PUTA.00.1500.063	intermediate flange 1,8-4,0kW (Dietz)	Al
213	1	PUTA.00.1800.021	rotor with shaft length: 270mm (Dietz) [left-hand thread] [hexagon shaft]	titanium
320.1	1	PUTA.00.3000.020	ball bearing 6206 ZZ	
320.2	1	PUTA.00.1500.029	ball bearing 6205 ZZ	
341	1	PUTA.34.0350.001	built-in assembly flange 404x220x20	PP grey
360	1	PUTA.00.1500.026	ball bearing cover	

Pos.	Piece	Article-No.	Designation	Material
400.1	1	PUTA.00.1500.061	flat packing	
400.2	1	PUTA.00.1500.066	flat packing	
411	1	PUTA.24.0340.081	cup leather	EPDM
412.1	1	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.2	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.3	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.4	1	PUTA.30.0340.019	o-ring 165x4	EPDM
412.5	2	PUMA.24.0340.072	o-ring 80x5	EPDM
412.6	1	PUMA.05.0050.121	o-ring 30x3	EPDM
412.7	1	FISF.00.0000.150	o-ring 47x5,3	EPDM
412.8	6	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.9	1	PUTA.34.0350.010	o-ring 172x2	EPDM
412.10	1	PUTA.34.0350.010	o-ring 172x2	EPDM
412.11	18	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.12	6	SO00.00.0000.281	o-ring 8x2,4	EPDM
412.13	1	FISF.00.0000.260	o-ring 104,37x3,53	EPDM
412.14	4	PUMA.09.0125.004	o-ring 11x2,5	EPDM
421	1	PUTA.24.0340.060	v-ring	FPM
423	1	PUTA.34.0350.040	shaft-protecting sleeve with labyrinth	oxide ceramic
475	1	PUTA.24.0340.070	ceramic ring	oxide ceramic
511	1	PUTA.24.0340.015	aeration flange	PP grey
525	1	PUTA.34.0350.014	separator special steel	1.4305
526	1	PUTA.34.0350.017	intermediate flange	PP grey
543	1	PUTA.34.0350.048	separator	PP grey
550.1	1	PUTA.34.0350.034	fan	PP black
550.3	8	PUTA.00.4000.012	spring washer A6 DIN127	galvanized
550.5	4	PUTA.00.1800.012	plastic ring (Nylite-Siegel)	
555	1	PUTA.34.0350.042	flange with labyrinth	oxide ceramic
562.1	1	PUTA.34.0350.067	parallel pin 3m6x10 DIN7	titanium
562.2	1	PUTA.24.0340.027	parallel pin 6m6x24 DIN7	titanium
711	1	PUTA.34.0350.004	stand pipe length: 270mm	PP grey
714	1	PUTA.05.B.000020	shaft sleeve with impeller 1,8kW 50Hz length: 270mm	PP grey
813	1	PUTA.00.1800.003	winding with housing 1,8kW Dietz 220-240/380-415 // 240-277/415-480V 50/60Hz	
831	1	PUTA.00.1500.011	paddle	
832	1	PUTA.00.3000.022	ventilator cowl	
833.1	1	PUTA.00.1500.016	terminal box for „Dietz“-motor	
833.2	1	PUTA.00.1500.065	terminal box cover plate	
835	1	PUTA.00.1800.004	terminal board	
900.1	4	SO00.00.0000.763	hexagon head cap screw M4x6 DIN933	titanium
900.2	4	PUTA.00.1800.007	pan head screw M4x20	
900.3	4	PUTA.00.4000.016	pan head screw M5x16 DIN84	galvanized
900.4	2	PUTA.00.1800.010	pan head screw M5x30 DIN84	galvanized
900.5	1	PUTA.00.4000.017	pan head screw M4x16 DIN84	galvanized
902.1	1	PUTA.24.0340.298	stud bolt length=39mm M8Lx14/M6Lx6,5 [left-hand thread]	titanium
902.2	6	PUTA.34.0350.022	stud bolt length=91mm M8x14/M6x8	titanium

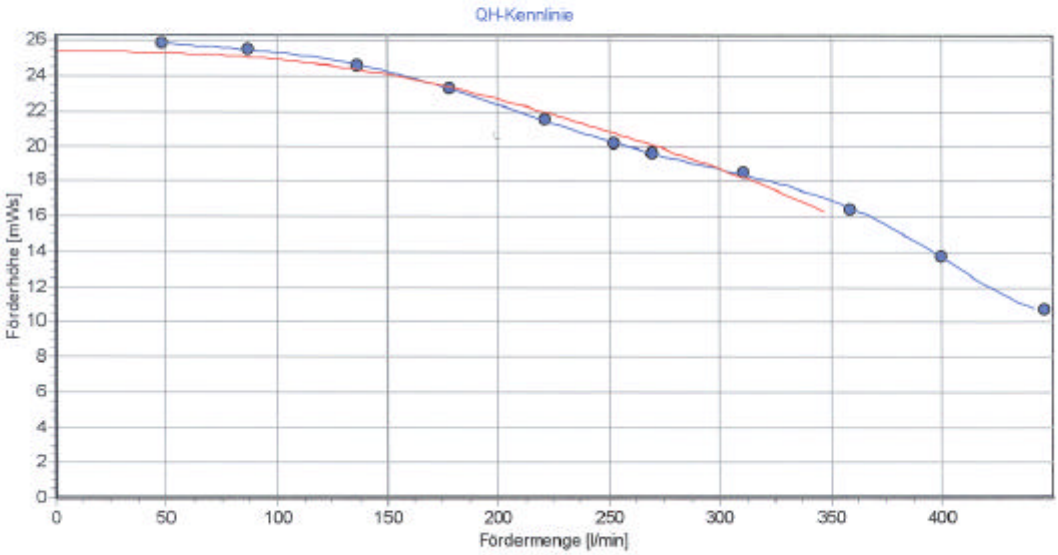
Pos.	Piece	Article-No.	Designation	Material
902.3	9	PUTA.34.0350.018	stud bolt covered with polypropylene	titanium/PP
904	1	PUMA.18.0240.002	threaded pin M6x10 DIN914	inox
914.1	4	PUMA.24.0340.061	hexagon socket screw M8x25 DIN912	inox
914.2	4	PUTA.00.1800.002	hexagon socket screw M6x45 DIN912	galvanized
914.3	4	PUTA.00.1800.005	hexagon socket screw M6x30 DIN912 (for end plate B-side)	galvanized
920.1	1	PUTA.34.0350.074	cap nut M6 [left-hand thread]	PP / titanium
920.2	4	SO00.00.0000.017	injection moulded hexagon union nut M8	PP black
920.3	6	PUTA.34.0350.027	cap nut M6	PP / titanium
920.4	18	PUTA.34.0350.028	cap nut M6	PP / titanium
932.1	1	PUTA.00.4000.011	circlip A30 x 1,5 DIN471	
950	1	PUTA.00.1800.006	compensation disk 51x42x0,5	

Supplies:

156	1	PUTA.30.0340.017	pressure pipe complete according to a separate spare parts list
745	1		filter SF1/EU according to a separate spare parts list

Einzelprotokoll

Auftrags-Nr. : 030467/005 Artikel-Nr.: PUTA.04.K.000175 Datum: 19.03.03 14:22:12



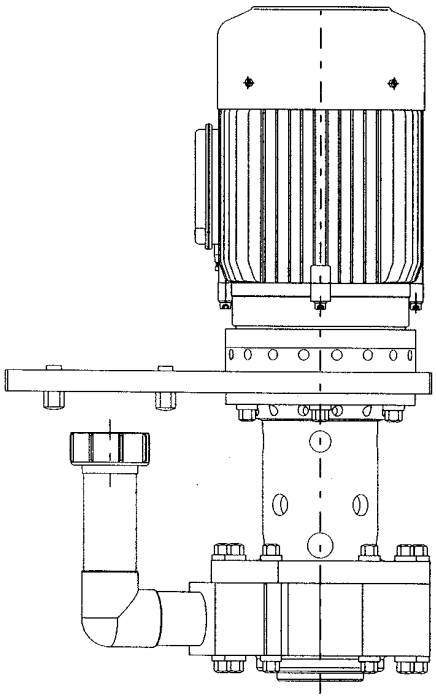
QH-Kennliniendaten Frequenz : 50 [Hz] Polzahl : 2 Nennleistung : 1800 [W]

OPERATING INSTRUCTIONS

Vertical submersible centrifugal pump group 4 (ventilated) with labyrinth-seal

Article-No.:	
Serial-No.:	
Mounting-flange:	
Type:	

The pump can be combined with a quick change filter „SF1-EU“



21-July-99
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CE

EC - DECLARATION OF CONFORMITY

in mind of the EC Machinery Directive 89/392/EEC, appendix II A

We herewith confirm that the pump aggregate

Product: **Vertical centrifugal immersion pump**
Type: 0,045kW - 6,0kW

corresponds to the following EC-rules:

EC Machinery Directive	**91/368/EEC, appendix I No.1**
EC Low Voltage Directive	**73/23/EWG, 93/68/EEC (1.Amendment)**

Wolfgang Renner
Geschäftsführer

Maulbronn, den 30.12.1994 RENNER GMBH

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1 General information

The pump may only be used in the range of applications authorised by the manufacturer. In case of modified operating conditions, please consult your supplier and/or the manufacturer.

NOTE

Disassembly of the pump will cancel the right to all warranty claims provided this disassembly has been effected by an unauthorized person as specified in items 2.2 to 2.8.!

1.1 Range of applications

- electroplating baths
- etchant fluids
- alkaline fluids

WARNING

Make sure that the materials used for the pump are resistant to the fluids being delivered!

NOTE

Please ask the manufacturer for information on the chemical resistance of the materials used!

1.2 Capacity ratings

Besides the operational data of the pump, the name plate also gives its type and serial number. Please cite these data when asking for additional information, placing reorders and, in particular, ordering spare parts. For additional information, please consult your supplier or the manufacturer.

2 Safety

This operating manual gives basic instructions which are to be observed during installation, operation and maintenance of the pump. It is therefore imperative that this manual be read by the responsible personnel / operator prior to assembly and comissioning. It is always to be kept available at the installation site.

It is not only the general safety instructions contained under this main heading safety that are to be observed but also the specific information provided under the other main headings.

2.1 Identification of safety instructions in the operating manual

Safety instructions given in this manual non-compliance with which would affect safety are identified by the following symbol:

(see DIN 4844-W9)

or where electrical safety is involved with

(see DIN 4844-W8)

Instructions non-compliance with which would give rise to malfunctioning of the machinery are identified by the word

WARNING

It is imperative that signs affixed to the machine, e.g.

- arrow indicating the direction of rotation
- symbols indicating fluid connection

be observed and kept legible.

2.2 Qualification and training of operating personnel

The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified. Scope of responsibility and supervision of the personnel must be exactly defined by the plant operator. If the staff does not have the necessary knowledge, they must be trained and instructed, which may be performed by the machine manufacturer or supplier on behalf of the plant operator. Moreover, the plant operator of the operating manual are fully understood by the personnel.

2.3 Hazards in the event of non-compliance with the safety instructions

Non-compliance with the safety instructions may produce a risk to the personnel as well as to the environment and the machine and results in a loss of any right to claim damages.
For example, non-compliance may involve the following hazards:

- Failure of important functions of the machine / plant.
- Failure of specified procedures of maintenance and repair.
- Exposure of people to electrical, mechanical an chemical hazards.
- Endangering the environment owing to hazardous substances being released.

2.4 Compliance with regulations pertaining of safety at work

When operating the pump, the safety instructions contained in this manual, the relevant national accident prevention regulations and any other service and safety instructions issued by the plant operator are to be observed.

2.5 Safety instructions relevant for operation

- If hot or cold machine components involve hazards, they must be guarded against accidental contact.
- Guards for moving parts (e.g. coupling) must not be removed from the machine while in operation.
- Any leakage of hazardous (e.g. explosive, toxic, hot) fluids (e.g. from the shaft seal) must be drained away so as to prevent any risk occurring to persons or the environment. Statutory regulations are to be complied with.
- Hazards resulting from electricity are to be precluded (see, for examgple, the VDE Specifications and the bye-laws of the local power supply utilities).

2.6 Safety instructions relevant for maintenance, inspection and assembly work

It shall be the plant operator´s responsibility to ensure that all maintenance, inspection and assembly work is performed by authorized and qualified personnel who have adequately familiarized themvelves with the subject matter by studying this manual in detail.

Any work on the machine shall only be performed when it is at a standstill, it being imperative that the procedure for shutting down the machine described in this manual be followed.

Pumps and pump units which convey hazardous media must be decontaminated.

On completion of work all safety and protective facilities must be re-installed and made operative again.

Prior to restarting the machine, the instructions listed under ´Initial commissioning´ are to be observed.

2.7 Unauthorized alterations and production of spare parts

Any modifications may be made to the machine only after concultation with the manufacturer. Using spare parts and accessories authorised by the manufacturer is in the interest of safety. Use of other parts may exempt the manufacturer from any liability.

2.8 Unauthorized modes of operation

The reliability of the machine delivered will be only guaranteed if it is used in the manner intended, in accordance with clause 1 of this manual. The limit values specified in the data sheet mut under no circumstances be exceeded.

3 Transportation and storage

3.1 Transportation

The pump is delivered by the manufacturer in a ready-to-work state. In the event of damages occurring during and due to transportation, the forwarding agent must make a factual statement. The pump should always be transported appropriately and according to the state of the art.

3.2 Storage

An eventual storage place must be absolutely dry. Make sure that the interior of the pump is protected from pollutants.

4 Product features and accessories

4.1 General description

This submersible pump type RT-BG4 with labyrinth seal is a vertical centrifugal pump made of plastics and safe to run dry.

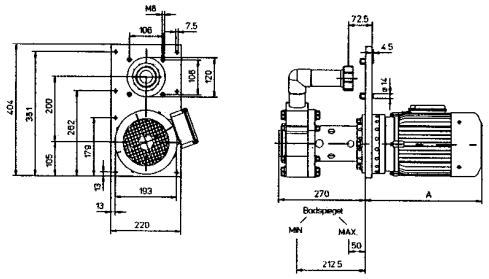
The labyrinth seal may optionally be replaced by a V-ring seal. Labyrinth seals being more resistant to wear are mainly used for pumps delivering crystallizing fluids. Make sure that the labyrinth seal is periodically cleaned. Proceed as described in chapter 7 „Maintenance".

WARNING

If the labyrinth seal is not checked and cleaned periodically, the pump may be destroyed!

4.2 Design

Since this submersible centrifugal pump is installed vertically, it is provided with an built-in assembly flange that serves to screw the pump to the container.

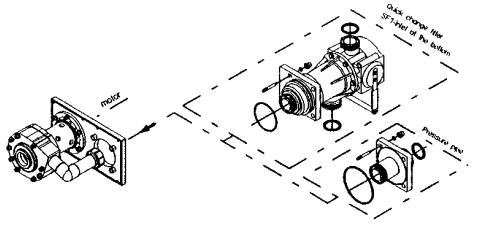


[fig. 4-1]

The suction side of the pump is provided without a male thread and the delivery side with a male thread R2 1/4".

Motor output [kW]	Dimension „A" [mm]
1,8 kW	330
3,7 kW	354,6
4,0 kW	363

This submersible pump can be combined with a quick change filter type „SF1-with the inlet at the bottom".



[fig. 4-2]

Provided that a filter is not necessary, the pressure pipe (have a look at fig. 4-2) has to be fixed at the built-in assembly flange.

Depending on the fluid to be delivered, each component of the pump is available in various materials.

NOTE

The materials used are listed on the name plate or the delivery note!

A choice of materials:

All parts which are in contact with the fluid	PP, PVDF, oxide ceramic, titanium
Packings	FPM, EPDM

4.3 Accessories

Screwed connections, extension tubes, pressure pipes and other components are available on request.

5 Mounting and installation

The pump should be installed at a place allowing easy access at all times. Normally, the ambient temperature should not exceed the following limits:

max. 40°C

NOTE

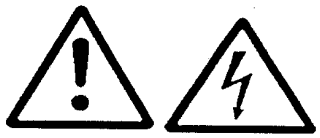
In case of higher ambient temperatures, please consult your supplier!

- Vertically install the pump in a container or a pit and screw it with the flange. Make sure that no tension, if any, is transmitted to the pump.
- Make sure that the suction side of the pump is always free. It must not touch the ground of the container.

WARNING

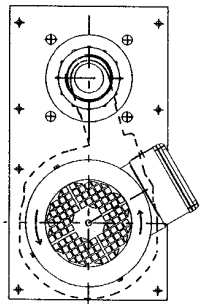
Do not pass neither the maximum nor the minimum level of the bath!

5.1 Electrical connection



All electrical connections to the pump may only be performed by experts!

- The direction of rotation indicated by an arrow on the pump must be respected and controlled after installation.
  (fig. 5-1: looking on the motor)



[fig. 5-1]

- The motor must be equipped with a motor protection switch and a temperature sensor.

NOTE

Motor protection devices can be delivered by the manufacturer!

- The power supply must have been cut for at least 5 minutes before you may start any work at the terminal box of the pump.
- Make sure that the data given on the name plate correspond to the existing power supply.

- All electrical connections and installations of additional protection devices should be performed by an expert in accordance with the instructions of the local power suppliers and/or the Association of German Electrotechnical Engineers VDE.

6 Starting and shutdown procedures

6.1 Preparations for starting

- Fix the pressure pipe R2 1/4" respectively the quick change filter at the built-in assembly flange.
- Install the pump into the container provided for it.
- Connect the pressure line.
- Do the electrical connection.
- Tighten all connecting screws.

WARNING

Observe the minimum level but do not exceed the permitted maximum level!

6.2 Starting procedure

- Switch on the motor
- Adjust the operating point by slowly closing the shut-off device of the delivery line. If there is no shut-off device installed, the operating point will be adjusted automatically in accordance with the pump curve.

6.3 Shutdown procedure

- Switch off the motor.
- Close all shut-off devices.
- In case some fluid remains within the pump, secure the shut-off devices to prevent an accidental opening.

7 Maintenance

7.1 General information

The pump is designed for continuous operation and is therefore maintenance-free.

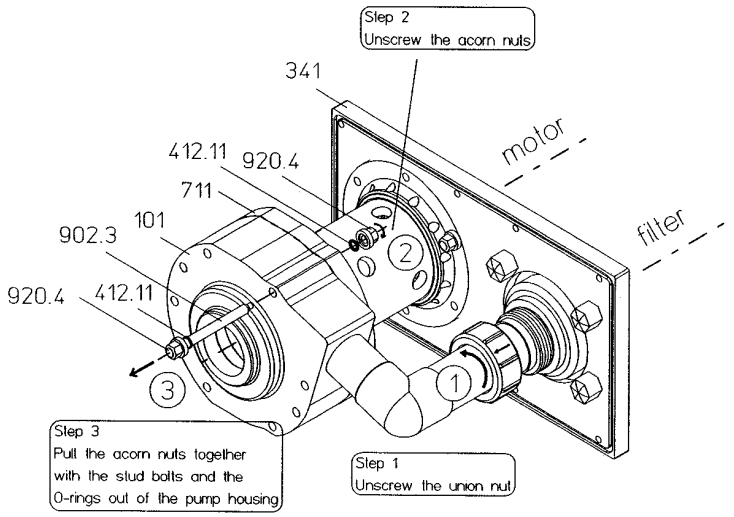
7.2 Preventive maintenance

- Clean the ventilator cowl at least once per month in order to prevent the motor from overheating.
- Periodically clean the labyrinth seal (i.e. after about 2.500 operating hours). When operated with crystallizing fluids, it should be cleaned more often.
- When servicing the pump, also check the (V-ring and O-ring) seals and replace them, if necessary.

WARNING

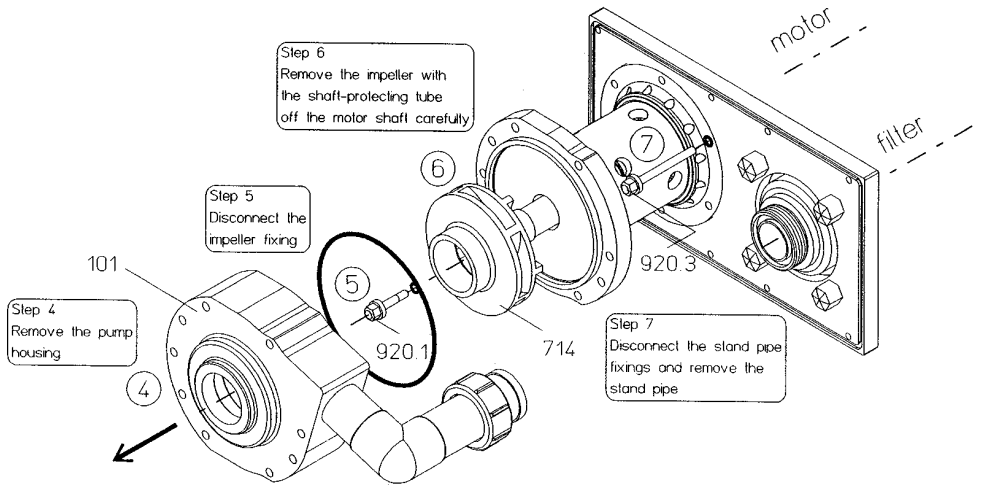
If the labyrinth seal is not checked and cleaned periodically, the pump may be destroyed!

Disassembly of the submersible centrifugal pump:



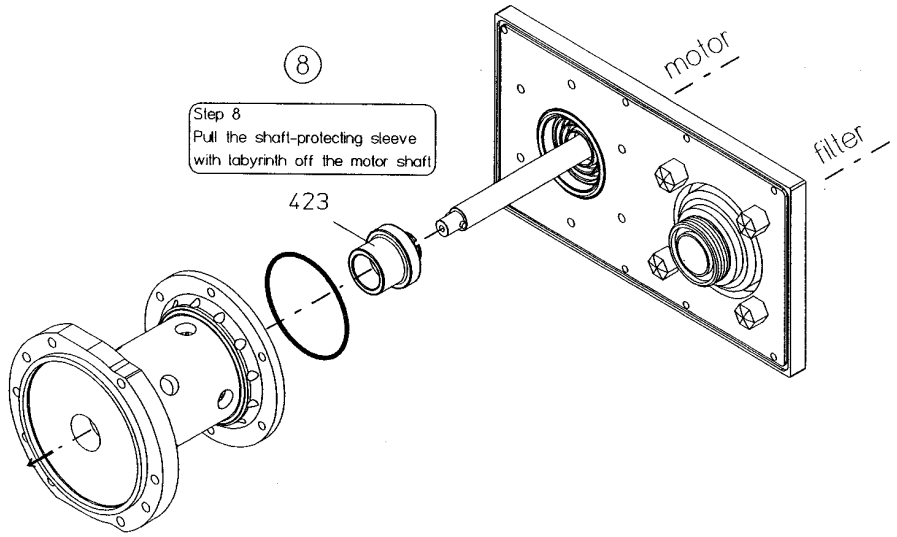
[fig. 7-1]

1. Remove the union nut on the suction tube (step 1)
2. Unscrew the 9 acorn nuts (pos 920.4) on the pump housing
3. Pull the 9 acorn nuts (pos 920.4) together with the stud bolts and the O-rings out of the pump housing (pos 101).



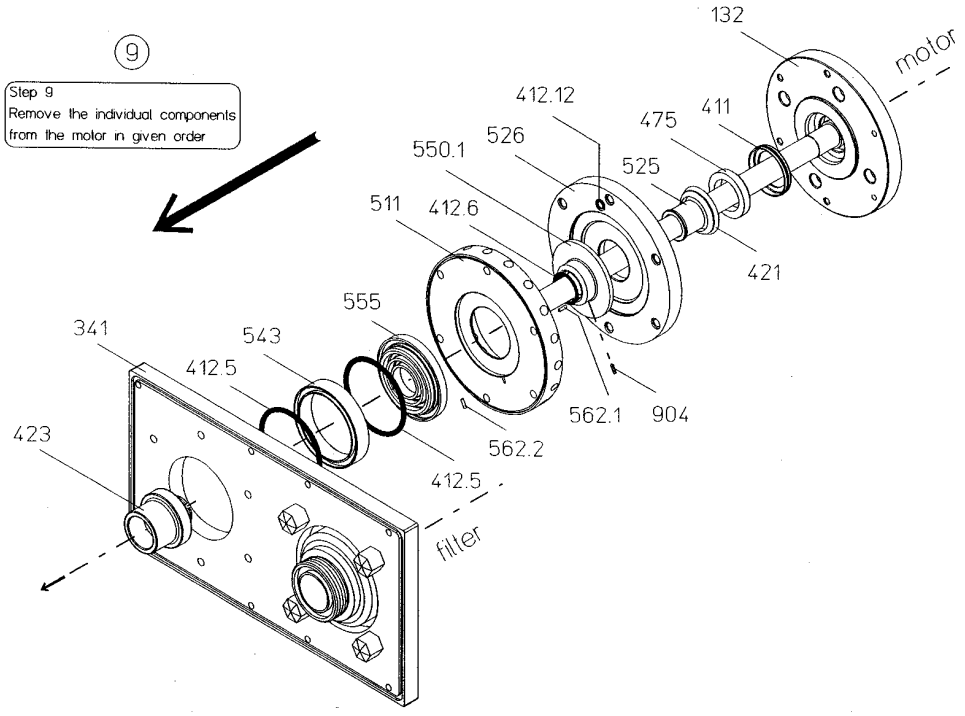
[fig. 7-2]

4. Remove the pump housing (pos 101).
5. Disconnect the impeller fixings (pos 920.1 acorn nut with stud bolt)
6. Use two tire levers to carefully remove the impeller and the shaft-protecting tube (pos 714).
7. Disconnect the stand pipe fixings (pos 920.3 acorn nut with stud bolt) and remove the stand pipe (pos 714).



[fig. 7-3]

8. Pull the shaft-protecting sleeve with the labyrinth seal (pos 525.2) off the motor shaft.



[fig. 7-4]

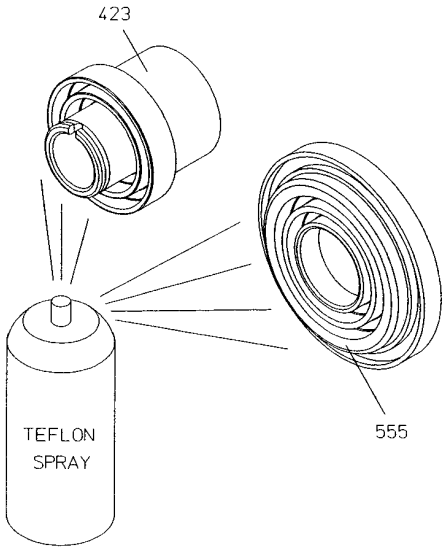
9. Remove the individual components from the motor in given order (fig. 7-4).

Cleaning the pump components:

1. Manually clean all pump elements (especially stand pipe [pos 711], pump housing [pos 101], flange with labyrinth [pos 555] and shaft-protecting sleeve with labyrinth [pos 423]) with appropriate mechanical means (i.e. brush, screwdriver, water etc.) and remove all crystal deposits.
2. Check all (O-ring and V-ring) seals and replace the entire sealing set, if necessary.

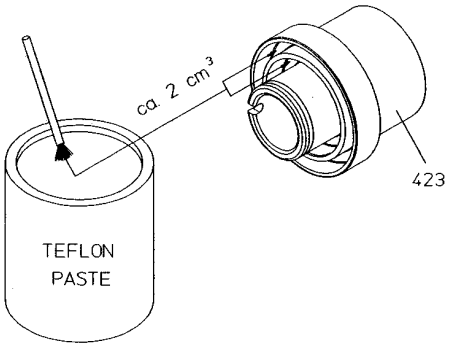
Assembly of the submersible centrifugal pump:

1. Spray the labyrinth seal (pos. 423 **and** 555) with Teflon spray [fig. 7-5].



[fig. 7-5]

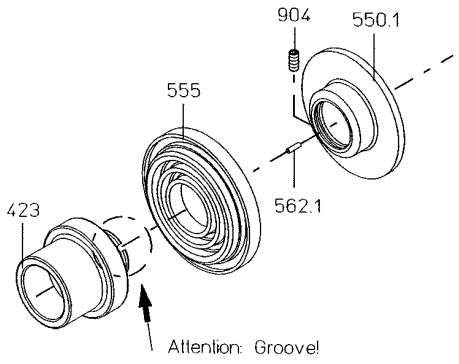
2. Fill the shaft-protecting sleeve (pos. 423) with about 2 cm³ of Teflon paste [fig. 7-6].



[fig. 7-6]

WARNING

Do not use in any case grease and/or greasy Teflon paste!



[fig. 7-7]

3. Rotate the shaft-protecting sleeve with labyrinth (pos. 423) on the shaft as far as its groove snap into the parallel pin (pos. 562.1) of the fan (pos. 550.1). Only then it´s allowed to press the shaft-protecting sleeve (pos. 423) into the fan (pos. 550.1).

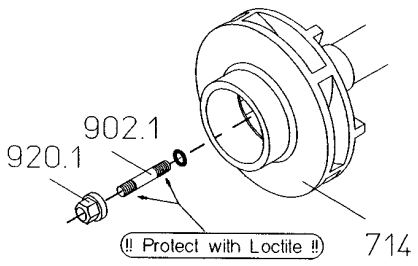
WARNING

Non-observance of this assembly-instruction can cause a break of the shaft-protecting sleeve (pos. 423)!

4. To assemble the pump, proceed in reverse order (fig. 7-1 to 7-4).

WARNING

Protect the thread of the stud bolt (pos. 902.1) and the acorn nut (pos. 920.1) - for fixing the impeller (pos. 714) - with „Loctite" or similar adhesives.



[fig. 7-8]

Cleaning the pump before a longer period of rest:

- If the pump will not be in operation for a longer period of time (especially without fluid), it should be cleaned carefully. Otherwise you risk that residues remaining in the pump may harden and damage the pump, once it is started again.

Doing repair work:

- Any other repair than the replacement of worn parts should be done by an expert, since inappropriate maintenance work usually results in unnecessary costs.

8 Troubleshooting

Malfunction	Causes	Corrective action
Pump does not work when switched on	No voltage	Test the voltage
	Impurities in the pump housing	Remove the impurities
Motor is overheating	Clogged ventilator cowl	Clean the ventilator and the cowl
Pump is working, but not delivering	Gas accumulation in the lines	Evacuate the system
Delivery rate too low	Air in the system	Evacuate the system
	Delivery line cross-section is too small (significant losses)	Increase the delivery line cross-section
	Valve is not entirely open	Entirely open the valve
Delivery rate too high	Pump losses are less significant than presumed	Install a flow control valve in the delivery line

9 Parts illustration; spare parts list

Drawing-No.: _____

Art.-No.: _____

Assembly	: 16.004.0126.U21L	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/21/PVC/VA/KL-KU/d=27	Position	: 000080
Quant.	: 1,000 ST	Page	: 000270/01
Drawing	: 16.004.0126EU000	Date	: 10.04.2006

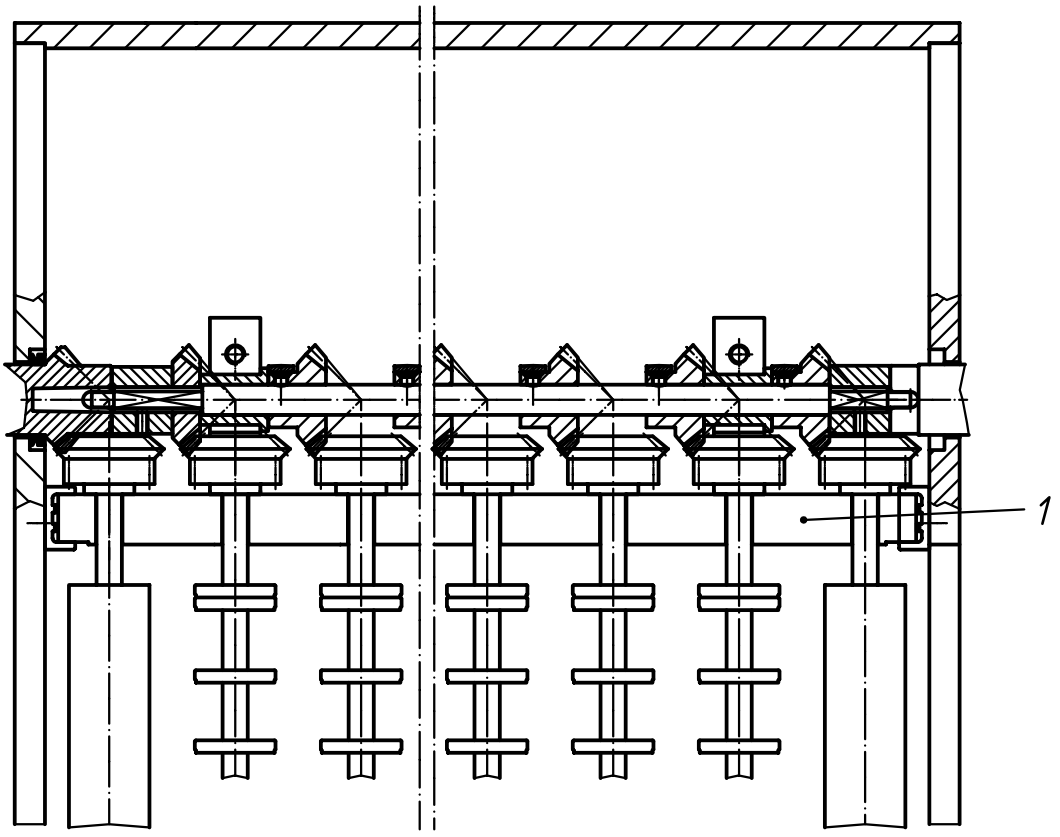
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0124.U21L DRIVE SHAFT/CPL./021/VA	1,000	ST	
1	16.004.0002.021H SUPPORT/GUR-N/21/d=10/T=50	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0126EU000	11
	00



Assembly	: 16.004.0124.U21L	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./021/VA	Position	: 000080
Quant.	: 1,000 ST	Page	: 000271/01
Drawing	: 16.004.0124EU000	Date	: 10.04.2006

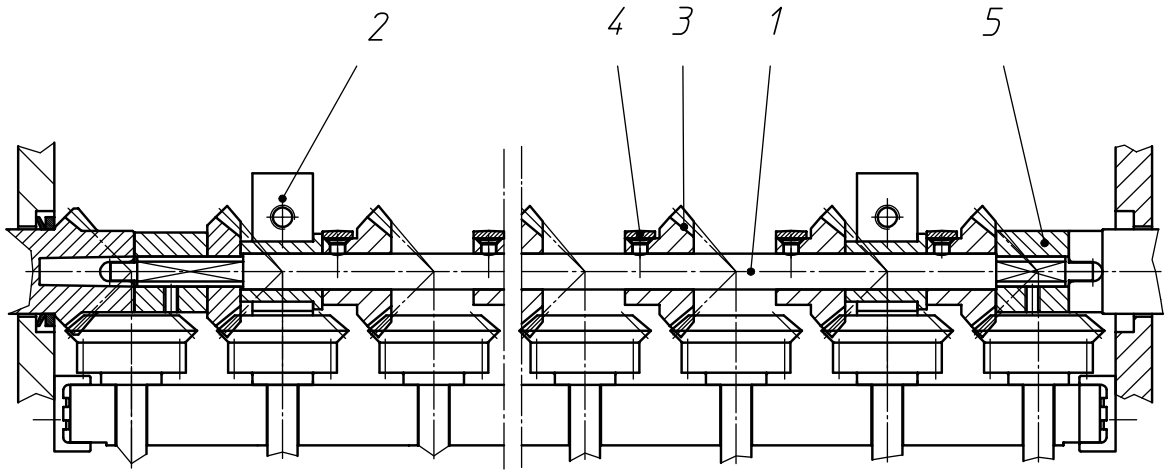
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0331.0212 DRIVE SHAFT/V4A/021/KL-KU/D=27	1,000	ST	X
2	16.004.0007.U00L SEATING/CPL./PVC /VA	2,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	5,000	ST	X
4	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	5,000	ST	X
5	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ANTRIEBSWELLE

Spare parts list Drive shaft

16.004.0124EU000	11
	00



Assembly	: 16.004.0007.U00L	Commiss.	: 25-05-377
Label	: SEATING/CPL./PVC /VA	Position	: 000080
Quant.	: 2,000 ST	Page	: 000272/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

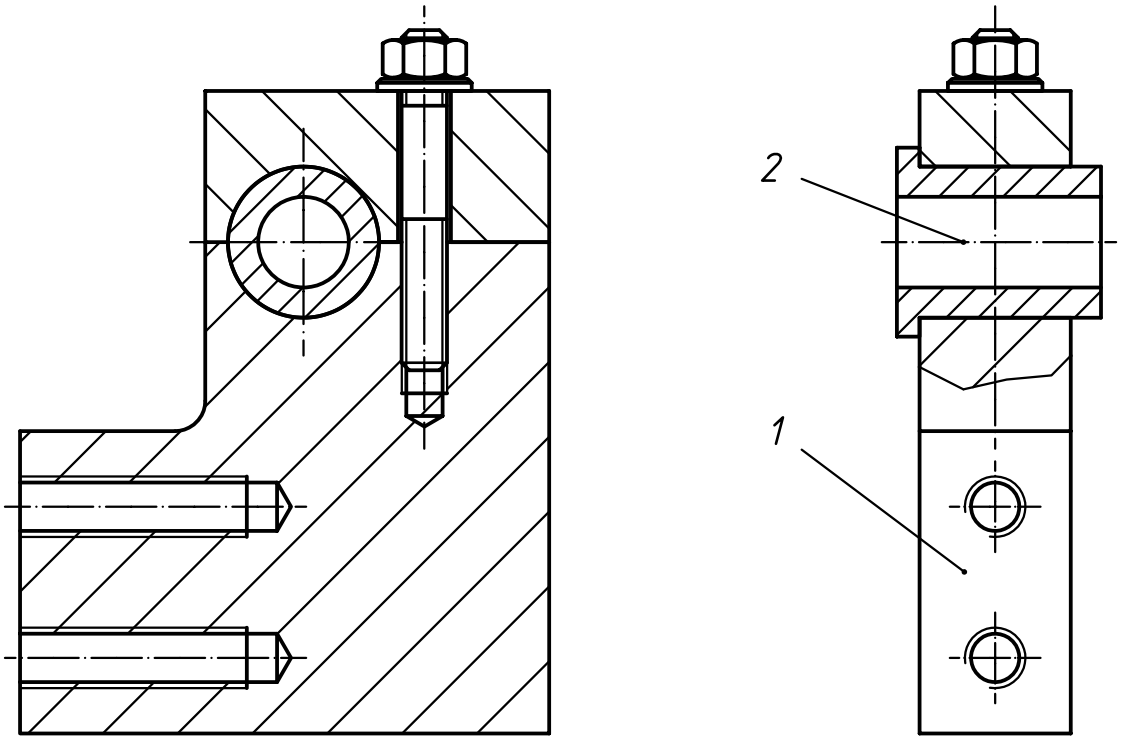
Pos.	Part N° Label	Quant.	Unit	SP
1	03.004.0005.0002 SEATING/PVC-HG/V4A	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: VS-25-05-377-06	Commiss.	: 25-05-377
Label	: CONVEYOR/WMT 1/650/PVC/VA	Position	: 000080
Quant.	: 1,000 ST	Page	: 000273/01
Drawing	: VS-25-05-377-06	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0987.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	2,000	ST	X
2	16.004.0988.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	2,000	ST	X
3	16.004.1294.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	1,000	ST	X
4	16.004.1713.2571 SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	2,000	ST	X
5	16.004.1241.2571 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	1,000	ST	X
6	16.004.1244.2571 Shaft/KPL/32/O /K/ /FJ/V2A	1,000	ST	X
7	16.004.1243.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
8	16.004.1245.2571 Shaft/KPL/O /L/AH/FJ/V2A	1,000	ST	X
9	16.004.1247.2571 Shaft/CPL/32/U /L/ /FJ/V2A	2,000	ST	X
10	16.004.0841.2571 Shaft/KPL/32/O+U/K/B/FK/GREEN/V2A	1,000	ST	X
11	16.004.1252.2571 Shaft/CPL/32/U /L/ /FJ/V2A	2,000	ST	X
12	16.004.0843.2571 Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/FE	1,000	ST	X
13	16.004.1255.2571 Shaft/KPL/32/O/L/AV/FJ/V2A	1,000	ST	X
14	16.004.1254.2571 Shaft/KPL/32/O/ /L/AV/FJ/V2A	1,000	ST	X
15	16.004.1256.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: VS-25-05-377-06	Commiss.	: 25-05-377
Label	: CONVEYOR/WMT 1/650/PVC/VA	Position	: 000080
Quant.	: 1,000 ST	Page	: 000273/02
Drawing	: VS-25-05-377-06	Date	: 10.04.2006

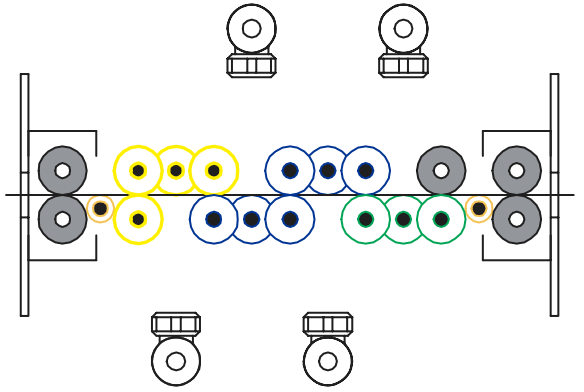
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0559.U002 GEAR WHEEL/Z=11/M2/VA/PP /=0162	2,000	ST	
	16.004.0393.U800 BELT DRIVE/SHAFT/O/SPRAY/FJ	2,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	2,000	ST	

Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-06	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/VA
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	WMT1	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	
up	16.004.0988.2582		16.004.1245.2571	16.004.1244.2571	16.004.1243.2571		16.004.1256.2571	16.004.1255.2571	16.004.1254.2571		16.004.0988.2582		16.004.1294.2582	up
down	16.004.0987.2582	16.004.1713.2571	16.004.1241.2571		16.004.1252.2571	16.004.0843.2571	16.004.1252.2571		16.004.1247.2571	16.004.0841.2571	16.004.1247.2571	16.004.1713.2571	16.004.0987.2582	down

Assembly	: 16.004.0987.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	Position	: 000080
Quant.	: 2,000 ST	Page	: 000274/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

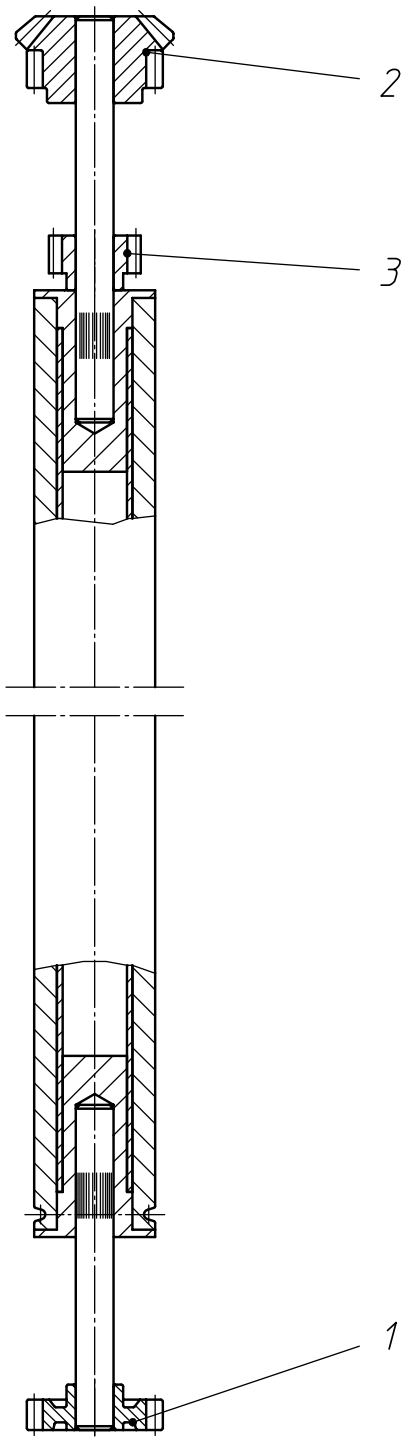
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	Position	: 000080
Quant.	: 2,000 ST	Page	: 000275/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

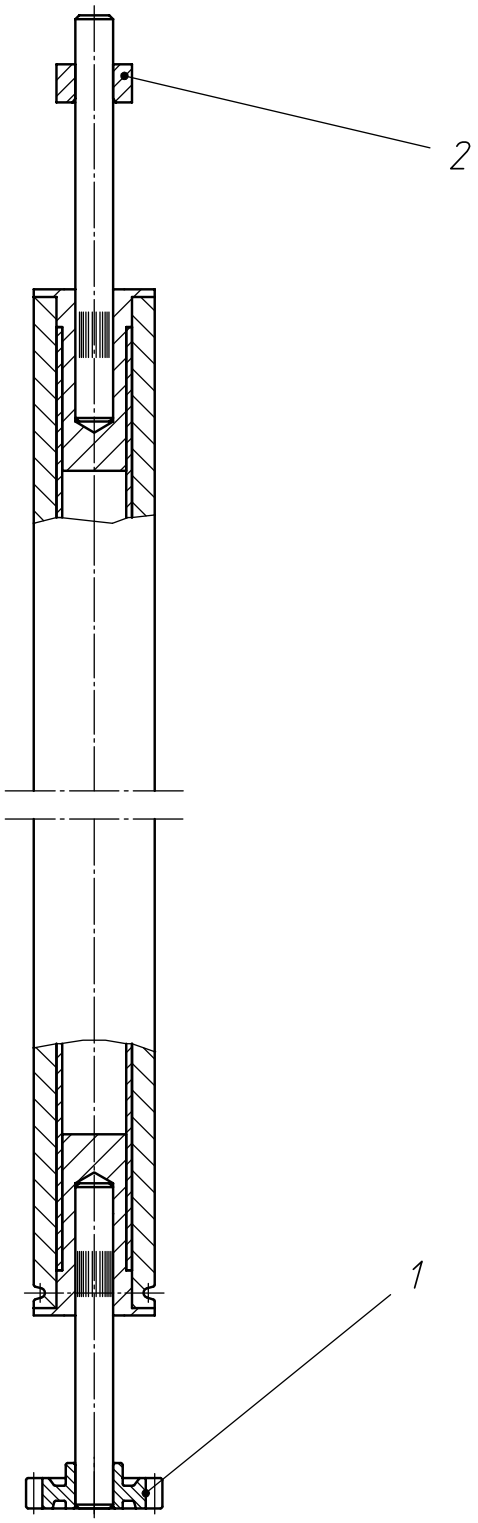
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	Position	: 000080
Quant.	: 1,000 ST	Page	: 000276/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

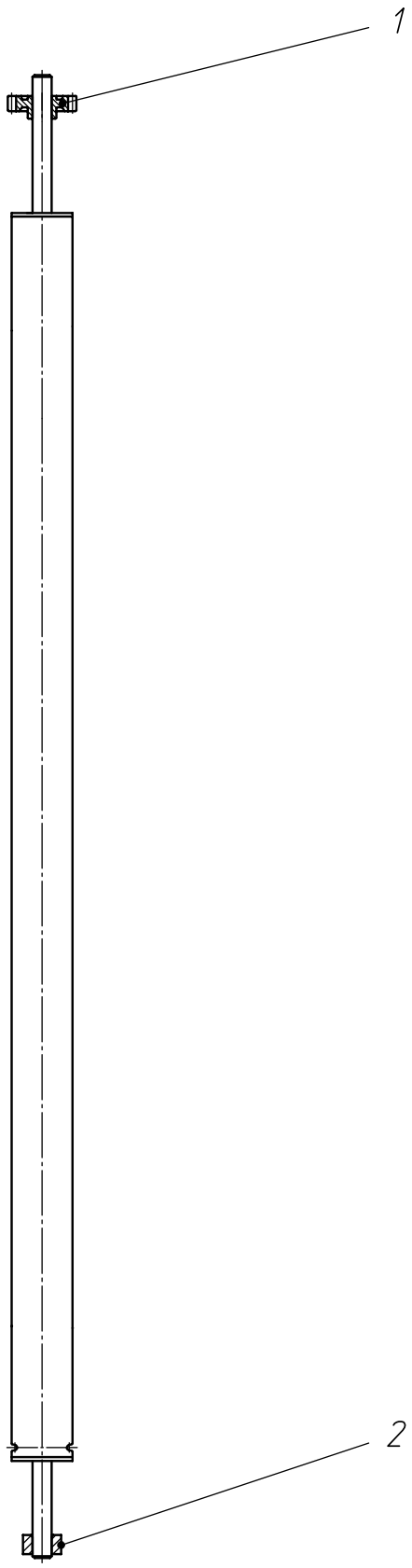
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



Assembly	: 16.004.1713.2571	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	Position	: 000080
Quant.	: 2,000 ST	Page	: 000277/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

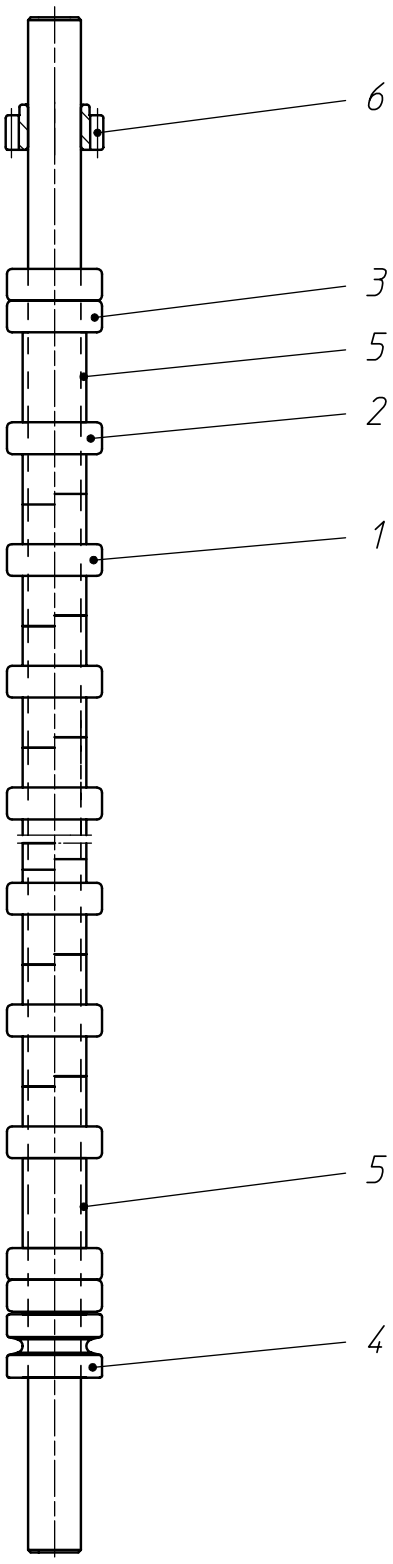
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000080
Quant.	: 1,000 ST	Page	: 000278/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

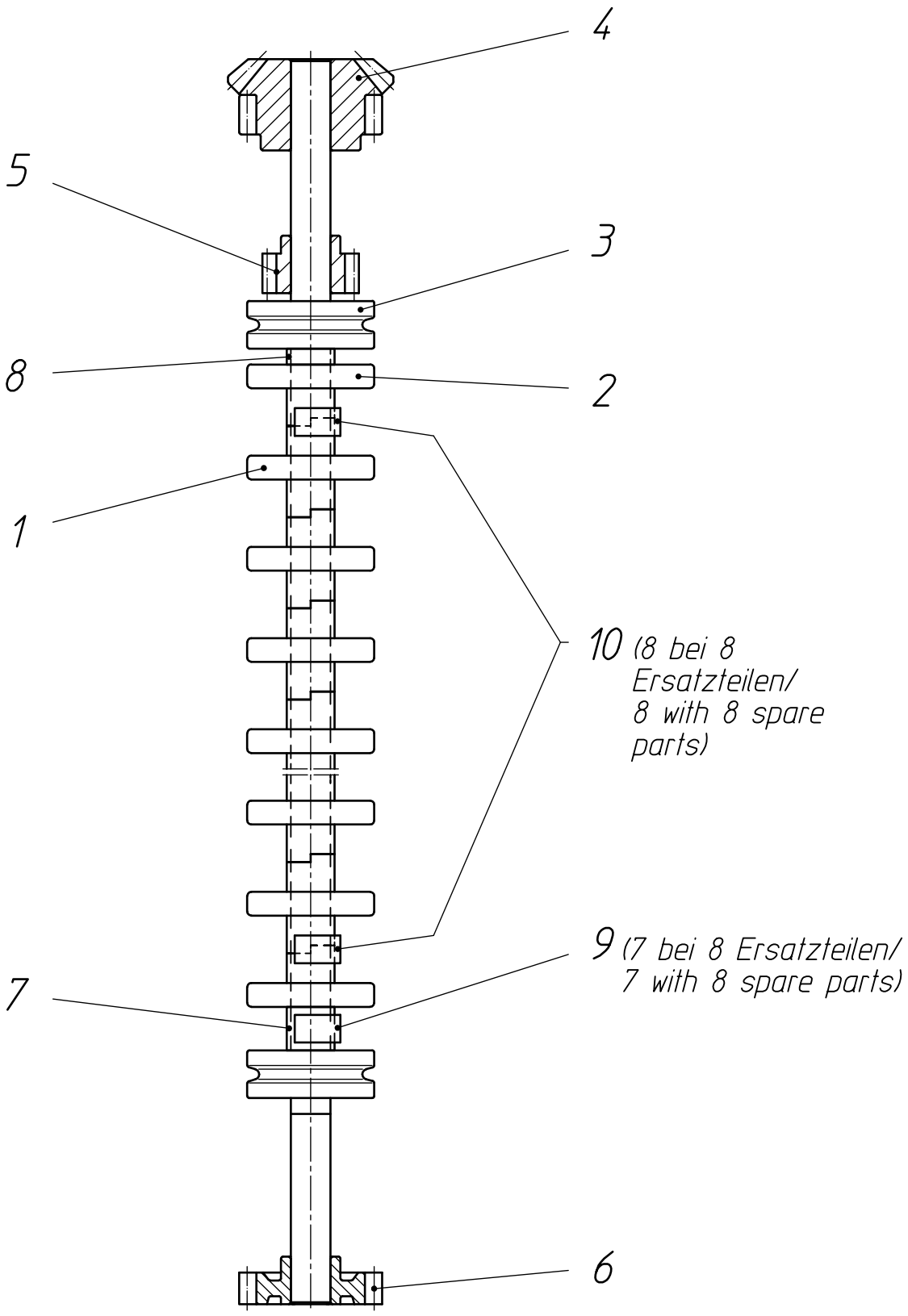
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.1244.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000279/01
Drawing	: 16.004.1244E0570	Date	: 10.04.2006

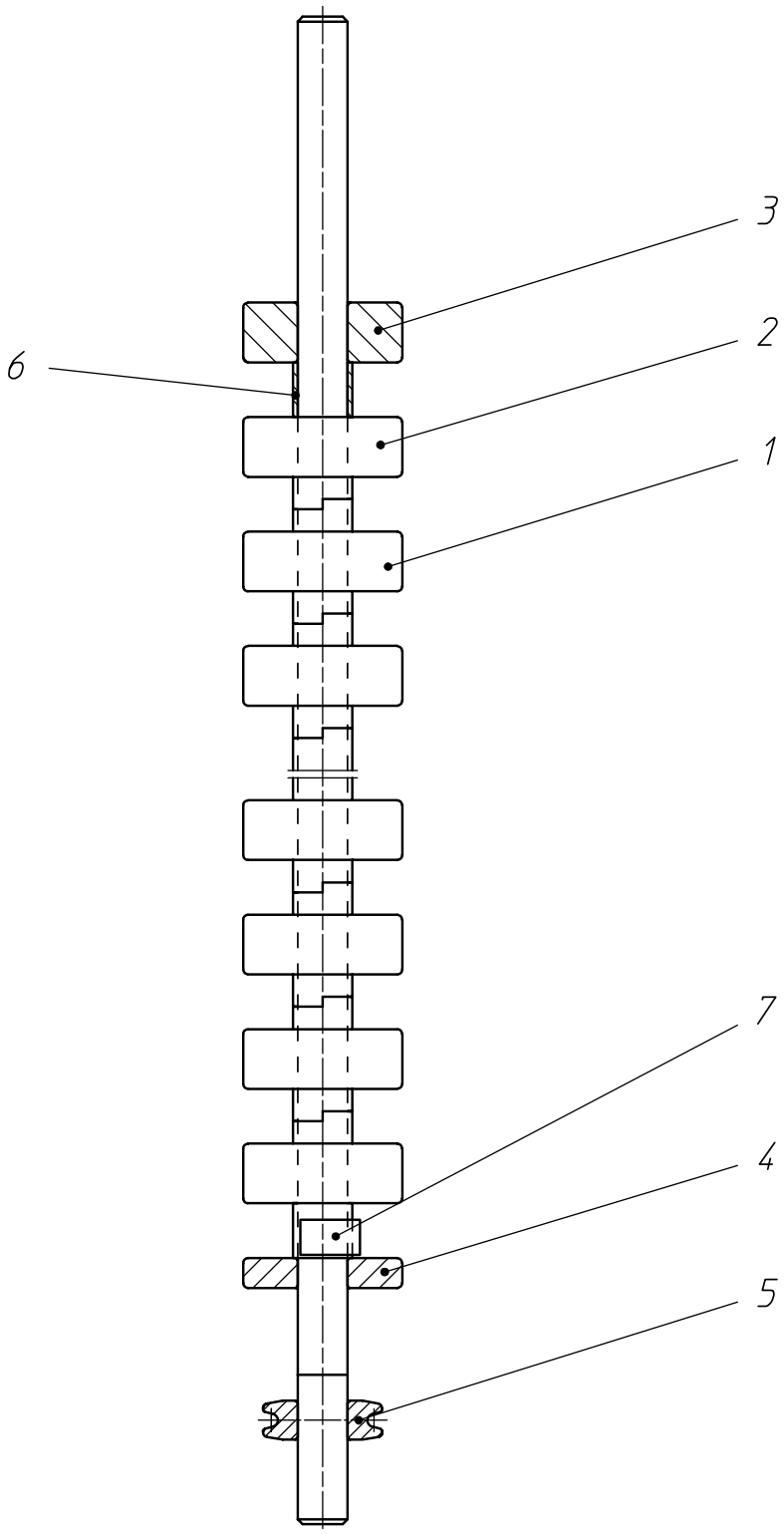
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1244E0570	11
	00



Assembly	: 16.004.1243.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000280/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

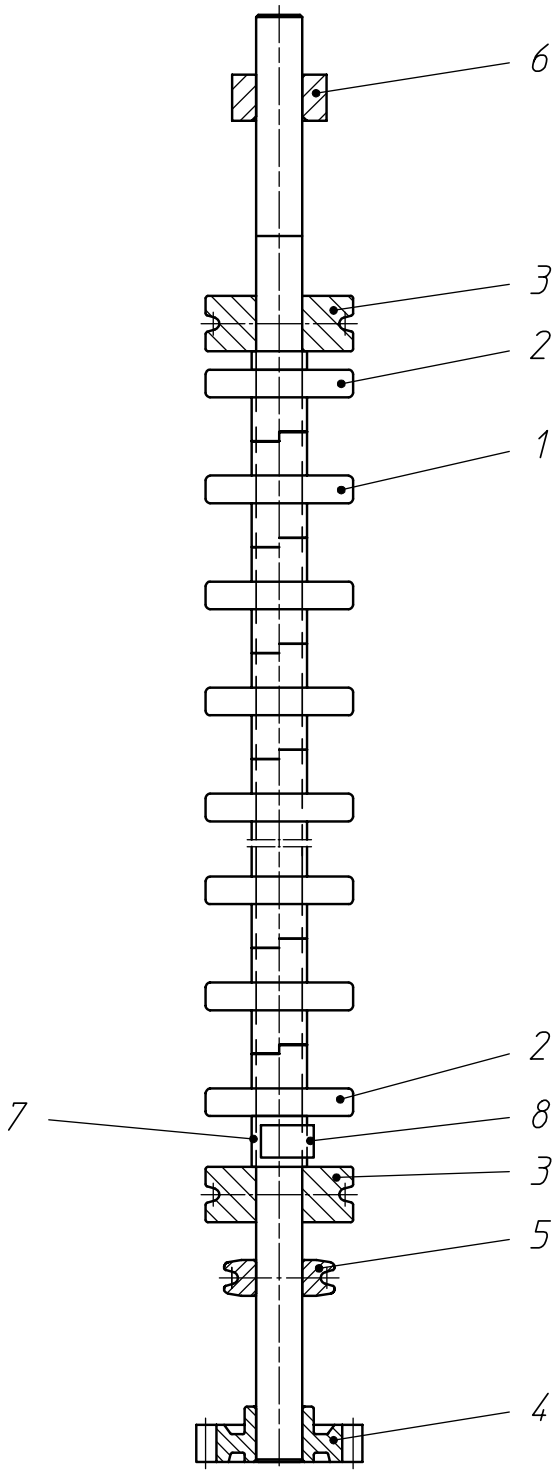
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000281/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

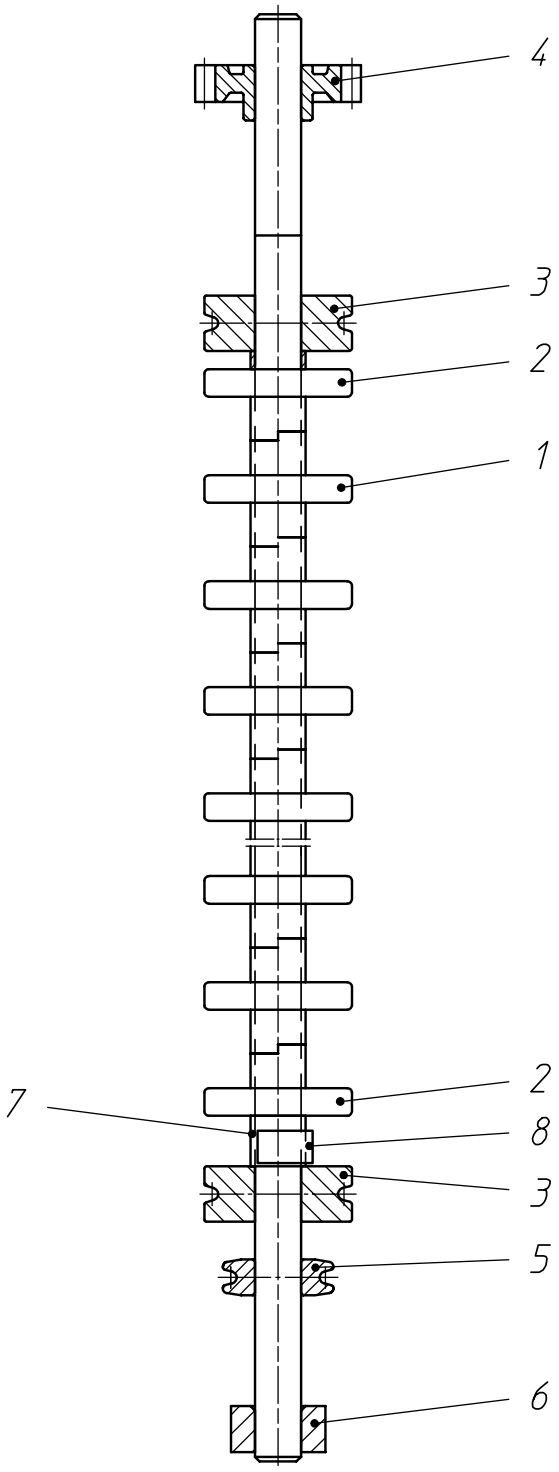
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000080
Quant.	: 2,000 ST	Page	: 000282/01
Drawing	: 16.004.1247E0570	Date	: 10.04.2006

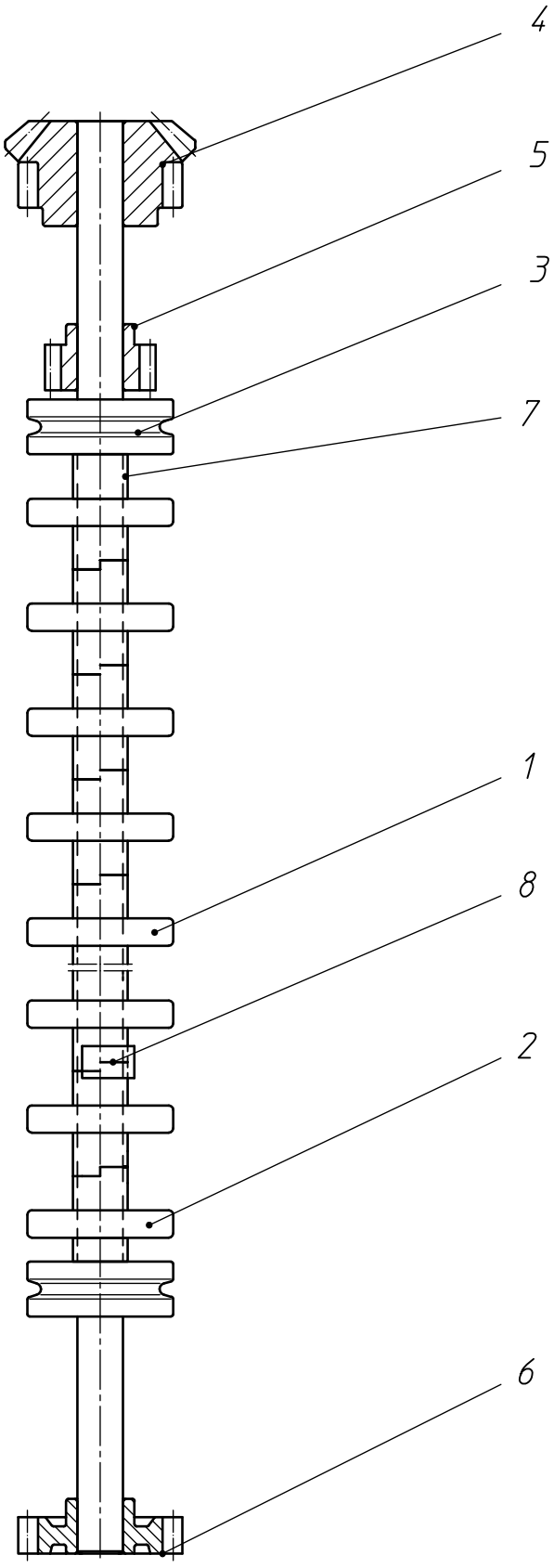
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1247E0570	1/1
	00



Assembly	: 16.004.0841.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O+U/K/B/FK/GREEN/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000283/01
Drawing	: 16.004.0841E0570	Date	: 10.04.2006

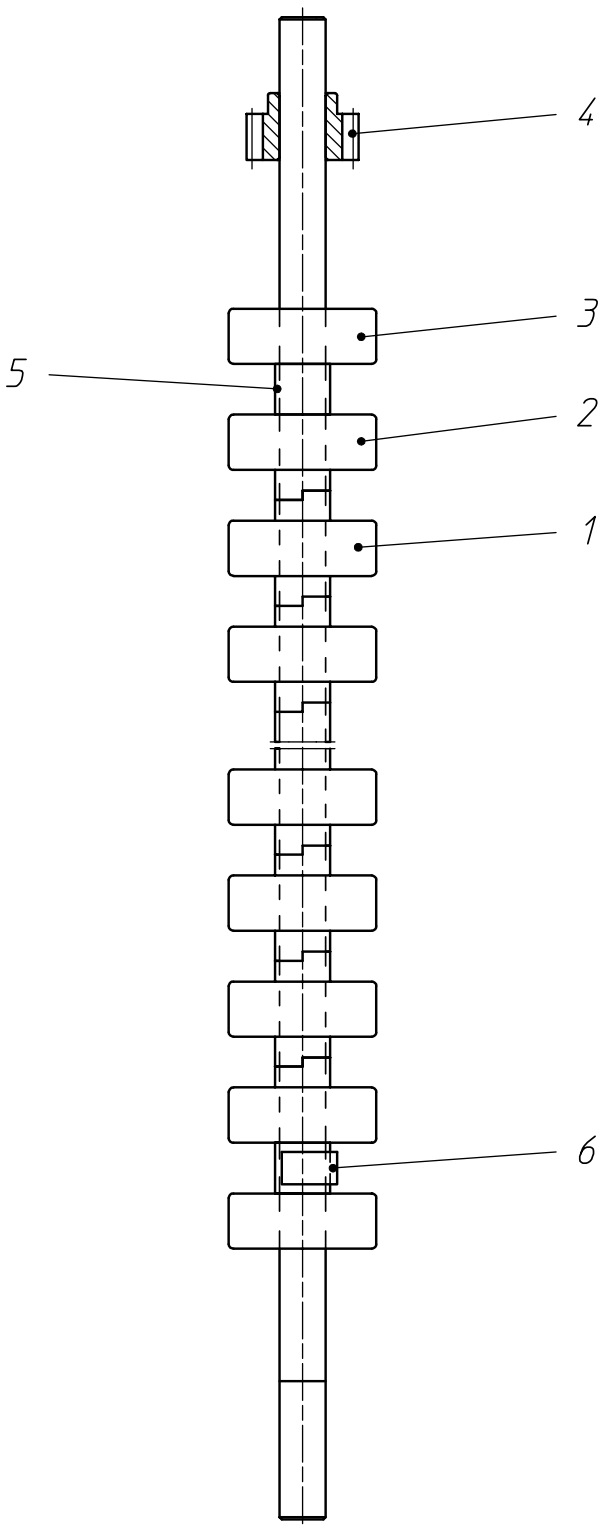
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0841E0570	11
	00



Assembly	: 16.004.1252.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000080
Quant.	: 2,000 ST	Page	: 000284/01
Drawing	: 16.004.1252E0570	Date	: 10.04.2006

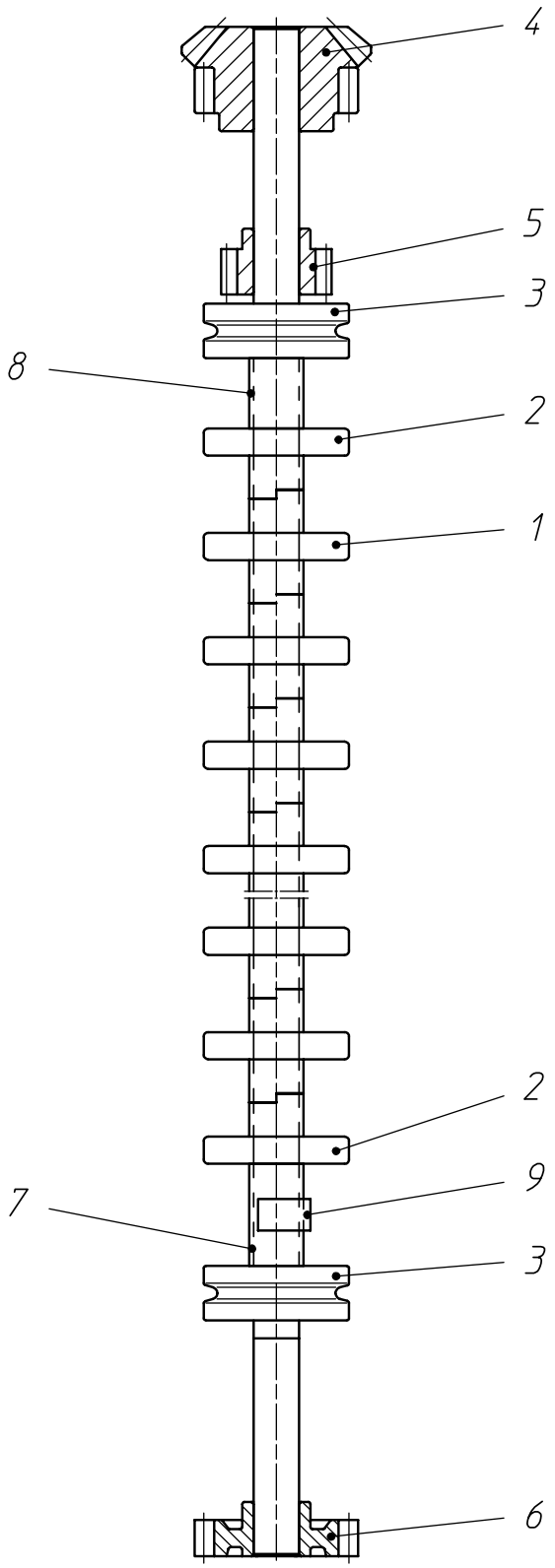
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1252E0570	11
	00



Assembly	: 16.004.0843.2571	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/F	Position	: 000080
Quant.	: 1,000 ST	Page	: 000285/01
Drawing	: 16.004.0843E0570	Date	: 10.04.2006

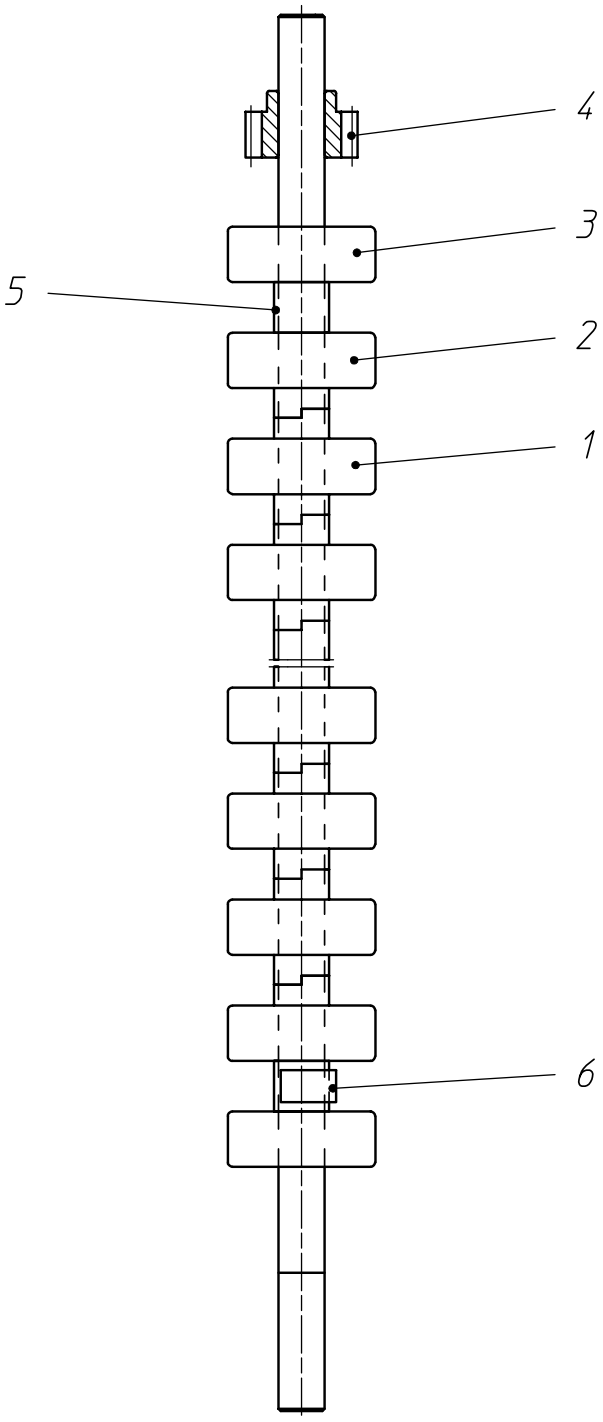
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0843E0570	11
	00



Assembly	: 16.004.1255.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/L/AV/FJ/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000286/01
Drawing	: 16.004.1255E0570	Date	: 10.04.2006

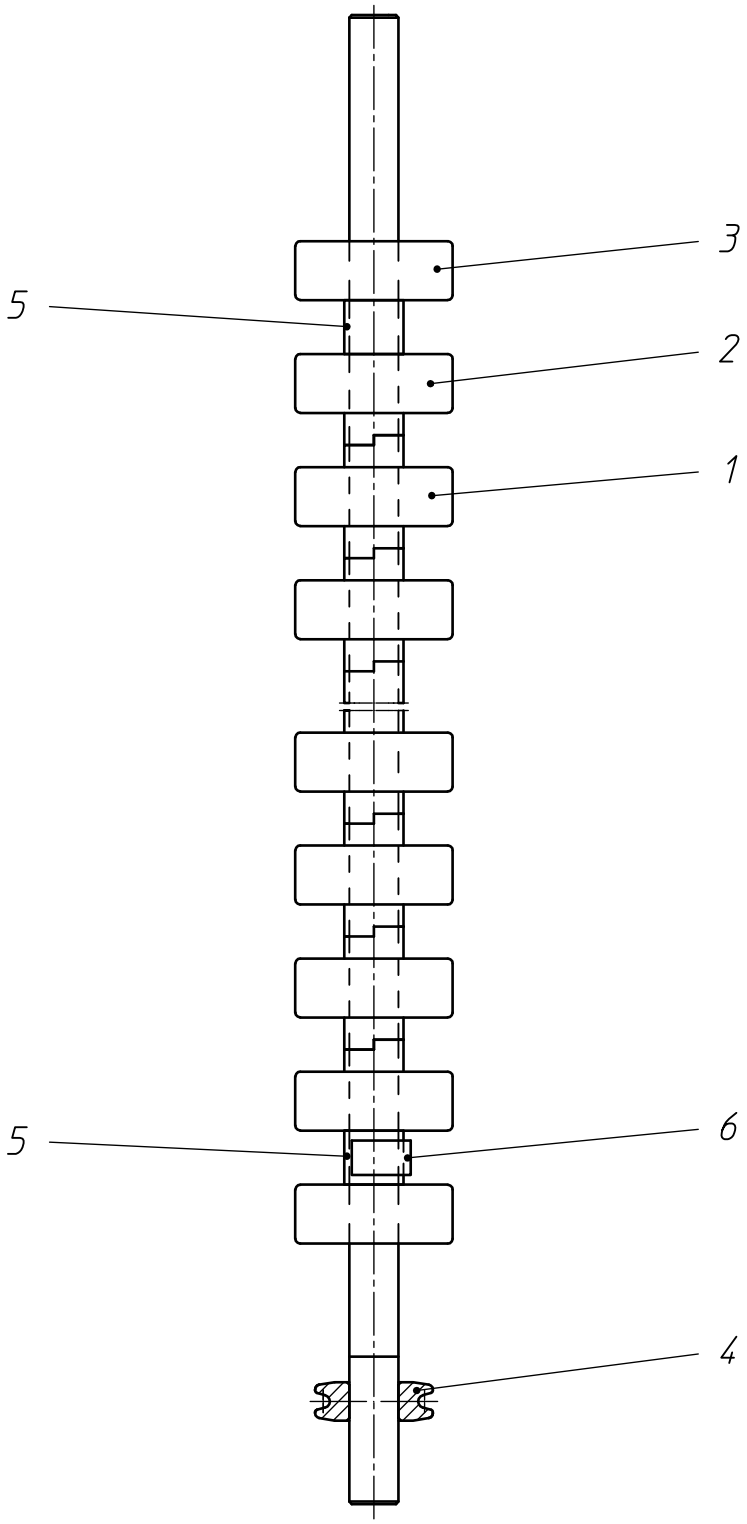
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1255E0570	1/1
	00



Assembly	: 16.004.1254.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/ /L/AV/FJ/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000287/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

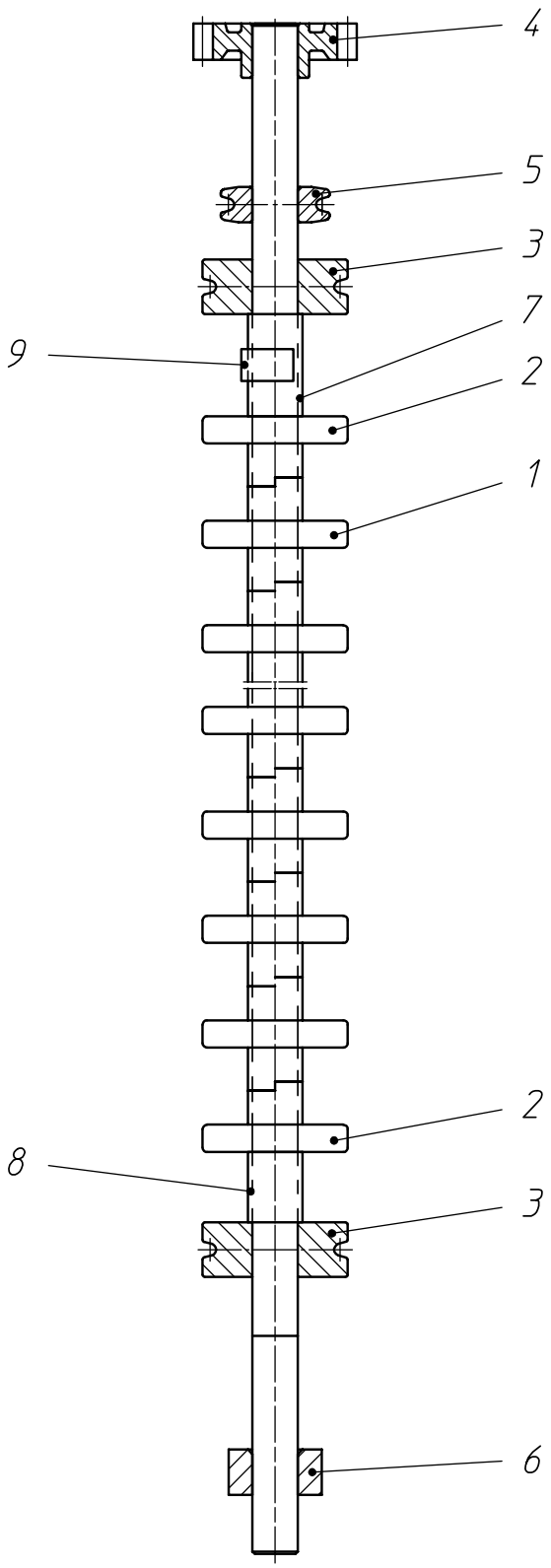
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1256.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000080
Quant.	: 1,000 ST	Page	: 000288/01
Drawing	: 16.004.1256E0570	Date	: 10.04.2006

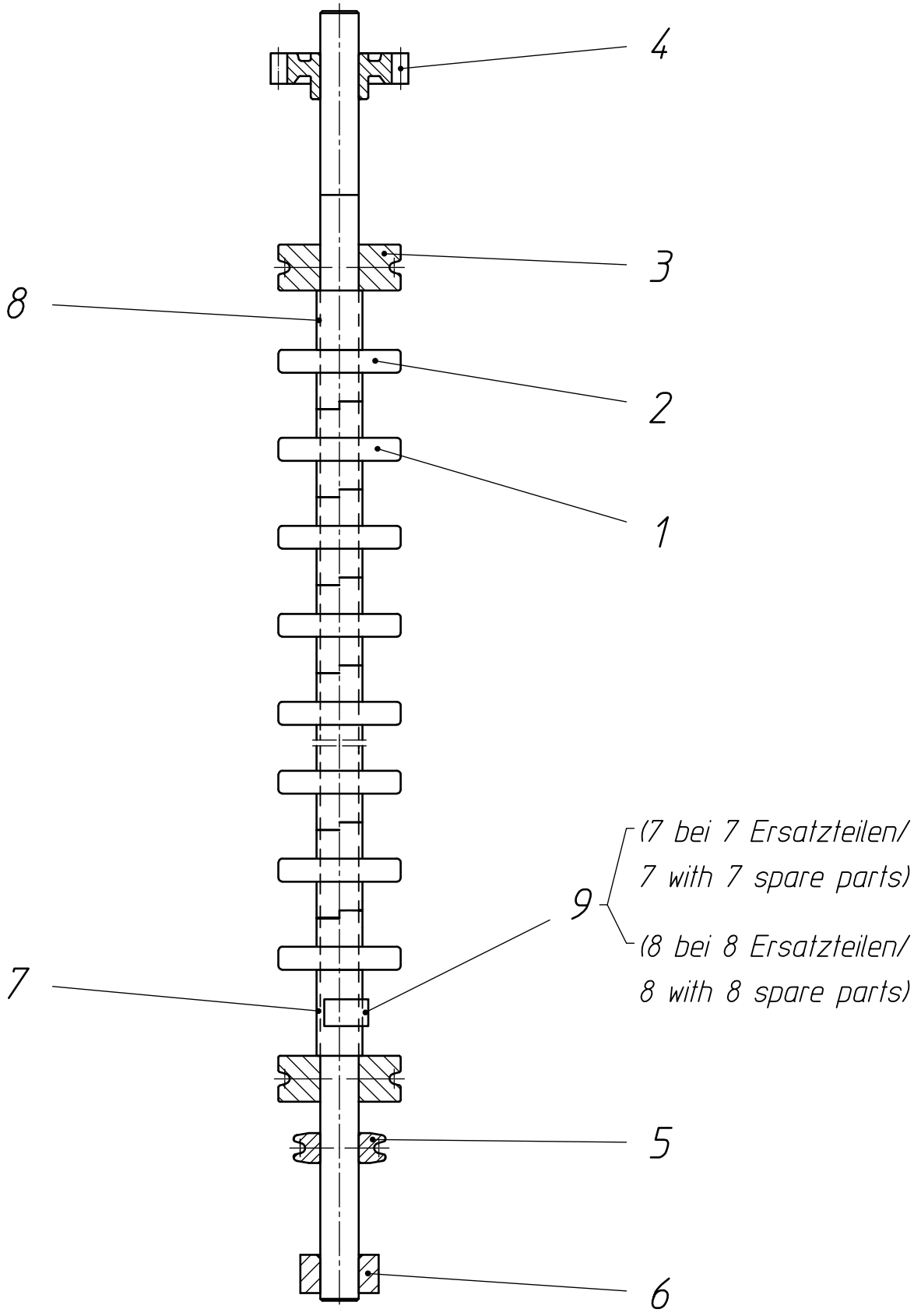
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1256E0570	1/1
	01



Assembly	: 16.004.0559.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL/Z=11/M2/VA/PP /=0162	Position	: 000080
Quant.	: 2,000 ST	Page	: 000289/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

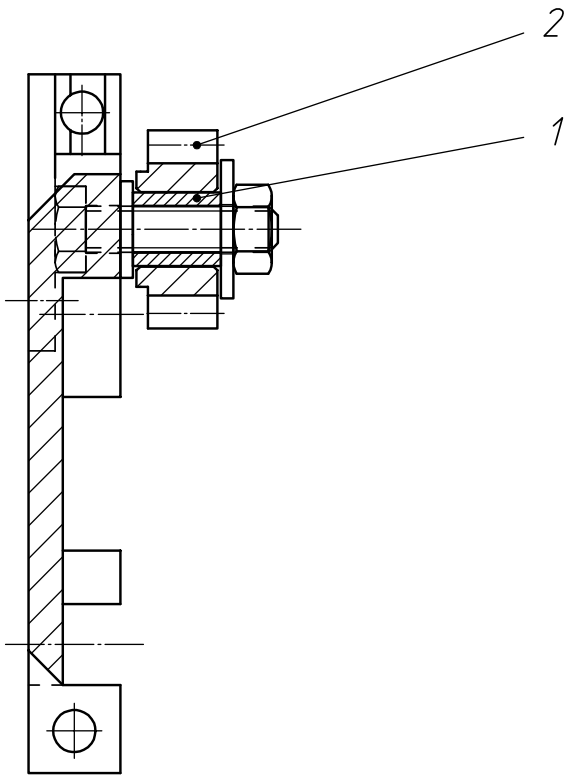
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.019.0224.0002 00SHING/SS/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0393.U800	Commiss.	: 25-05-377
Label	: BELT DRIVE/SHAFT/O/SPRAY/FJ	Position	: 000080
Quant.	: 2,000 ST	Page	: 000290/01
Drawing	: 16.004.0393EU000	Date	: 10.04.2006

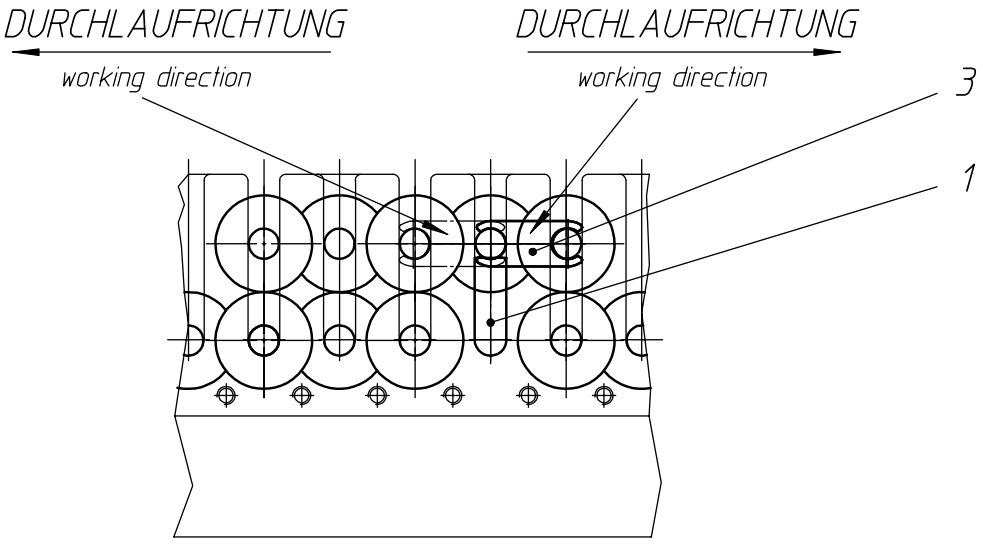
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0084.000H DISTANCE/GUR-N	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1178.000H CLIP/GUR-N/T25/TOP	2,000	ST	X

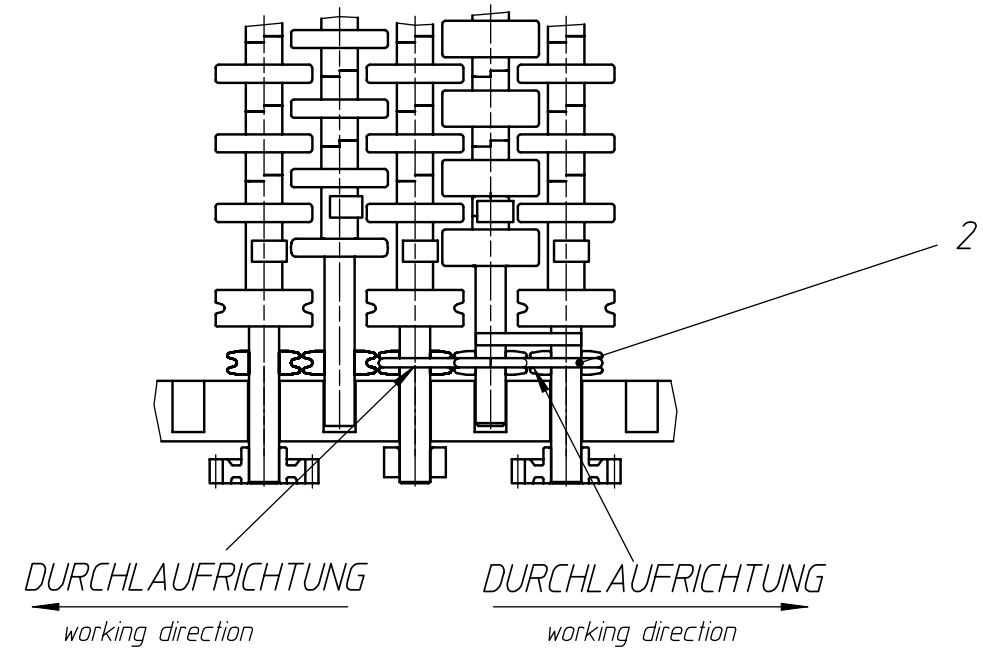
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMENANTRIEB

Spare parts list BELT DRIVE

16.004.0393EU000	11
	00





Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000080
Quant.	: 2,000 ST	Page	: 000291/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

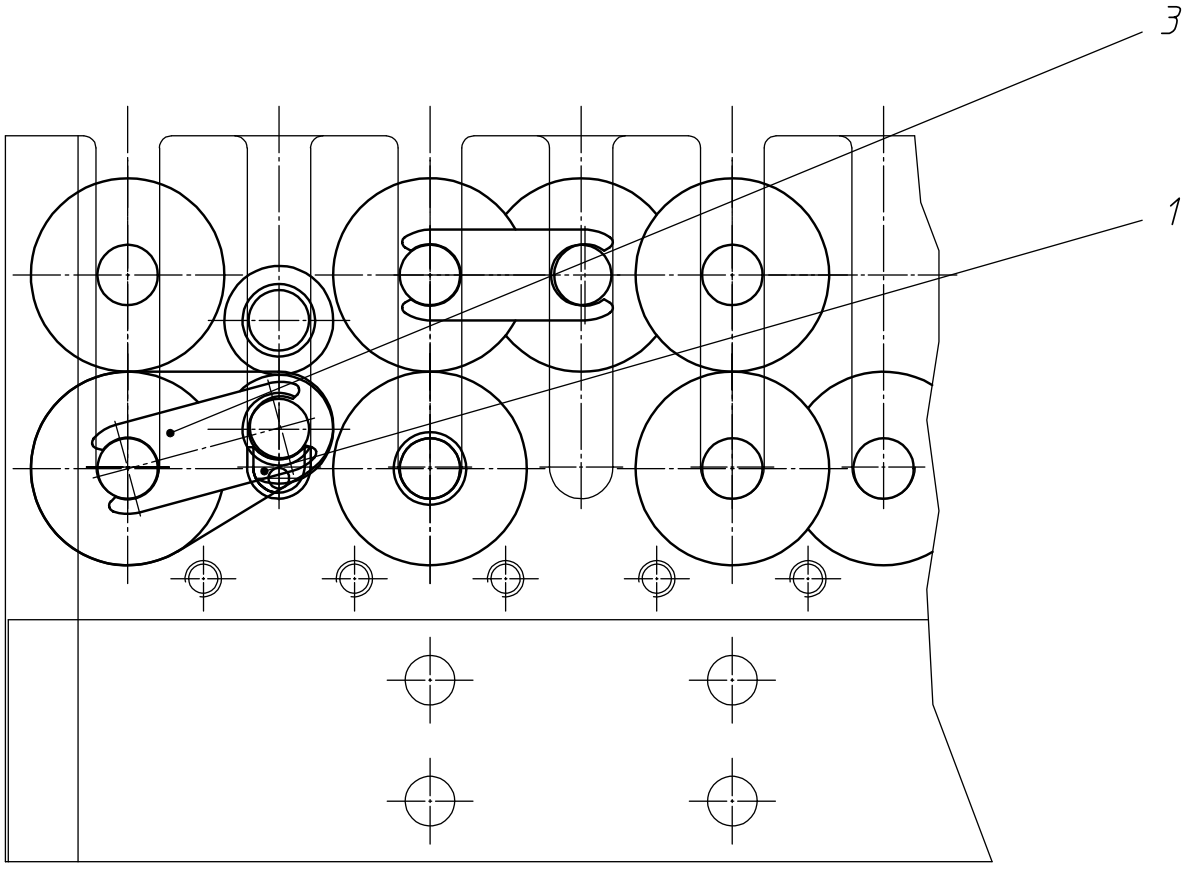
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

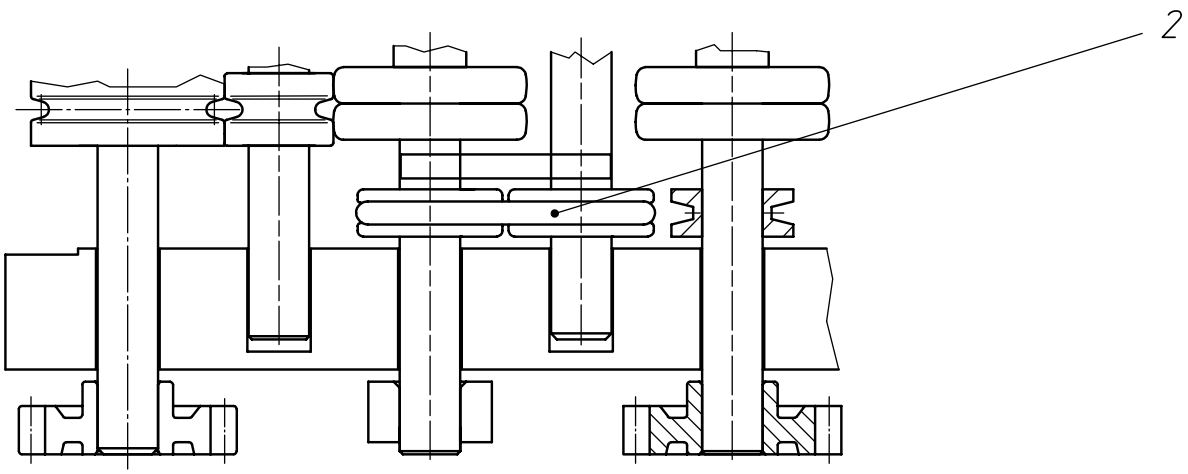
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 16.027.0002.U00A	Commiss.	: 25-05-377
Label	: CONDUCTANCE MEASURING DEVICE/IND.	Position	: 000080
Quant.	: 1,000 ST	Page	: 000292/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	MG-000000351-000 CONDUCT.MEASUR.DEV./INDUKTIV/PEEK/2xRel.	1,000	ST	X

Parts without Pos.-N° see assembly parts list

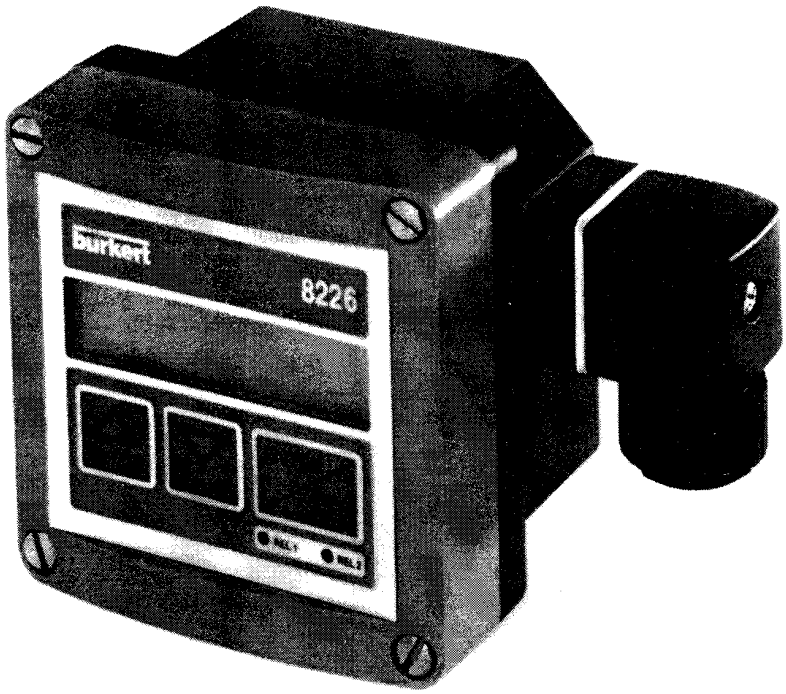
Bedienungsanleitung
Instruction manual / Manuel utilisateur

Induktiver Leitfähigkeits-Transmitter Typ 8226
Inductive Conductivity Transmitter Type 8226
Transmetteur de conductivité inductif type 8226

bürkert
Easy Fluid Control Systems

TYPE 8226

Inductive Conductivity Transmitter



Instruction Manual

bürkert
Easy Fluid Control Systems

INTRODUCTION

ENGLISH

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INTRODUCTION

1.1 SYMBOLS USED

Indicates information which must be followed. Failure to follow the information could endanger the user and effect the function of the device.

Indicates that the page contains general information.

Indicates a quickstart guide for quickly commissioning the transmitter.

Indicates that the page contains information about installation.

Indicates that the page contains information about configuration, programming and operation.

Indicates important information, tips and recommendations.

Indicates a worked example.

Indicates an action which has to be continued or reference to a relevant section.

Indicates information about repairs, service, maintenance and spare parts.

1.2 GENERAL SAFETY INSTRUCTIONS

Congratulations on purchasing our 8226 Digital Conductivity Transmitter.

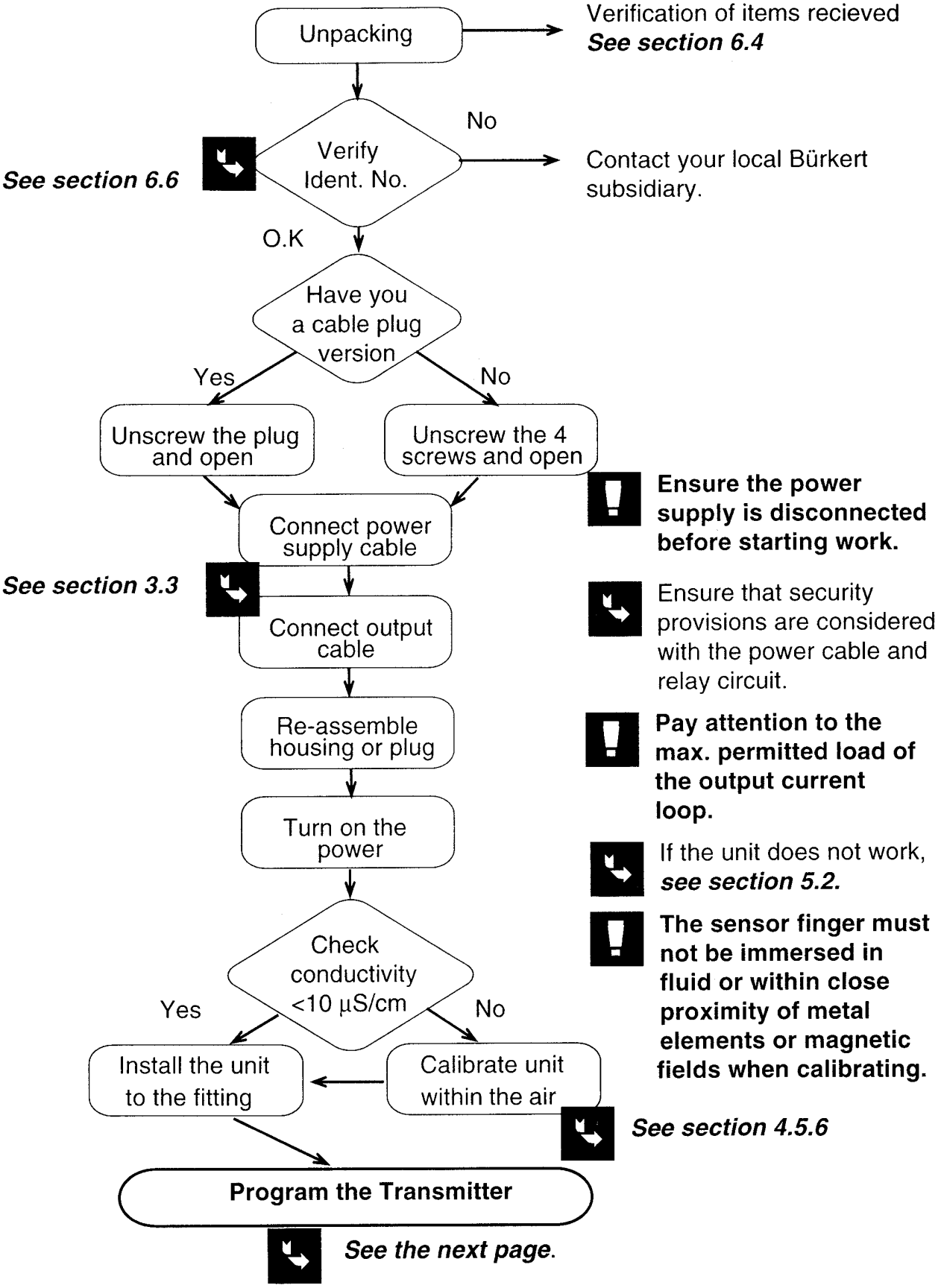
Before installing or using this product, please read this manual and any other relevant documentation to ensure you fully benefit from all the advantages the product can offer.

- Please verify that the product is complete and free from any damage. (see reference table section 6.6).
- It is the customer's responsibility to select an appropriate transmitter for the application, ensure the unit is installed correctly and maintain all components.
- It is the customer's responsibility to ensure the materials the transmitter is made of are chemically compatible with his application.
- This product should only be installed or repaired by specialist staff using the correct tools.
- Please observe the relevant safety regulations throughout the operation, maintenance and repair of the product.
- Always ensure that the power supply is switched off before working on the device / system.
- If these instructions are ignored, no liability will be accepted and the guarantee on the device and accessories will become invalid.

QUICK START

This section provides a comprehensive installation and operation guide which will assist with the commissioning of the 8226 Conductivity Transmitter.

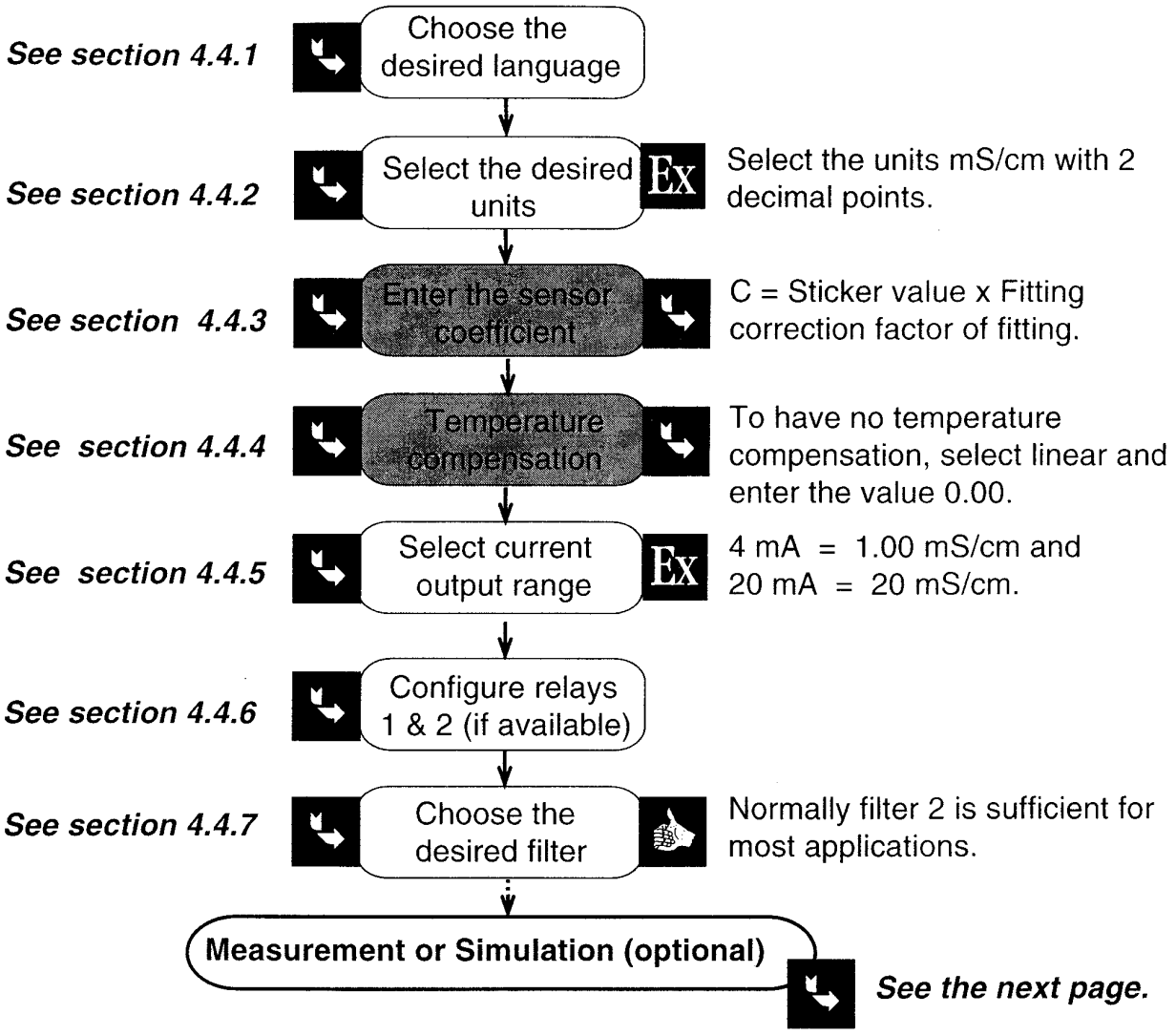
2.1 INSTALLATION



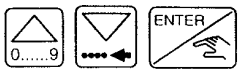
To access the **CALIBRATION MENU** simutaneously press ▽ ENTER for 5 seconds.

- Ensure that the enter key is unlocked - section 4.1.
- Reference can additionally be made to the menu guide - section 4.2.

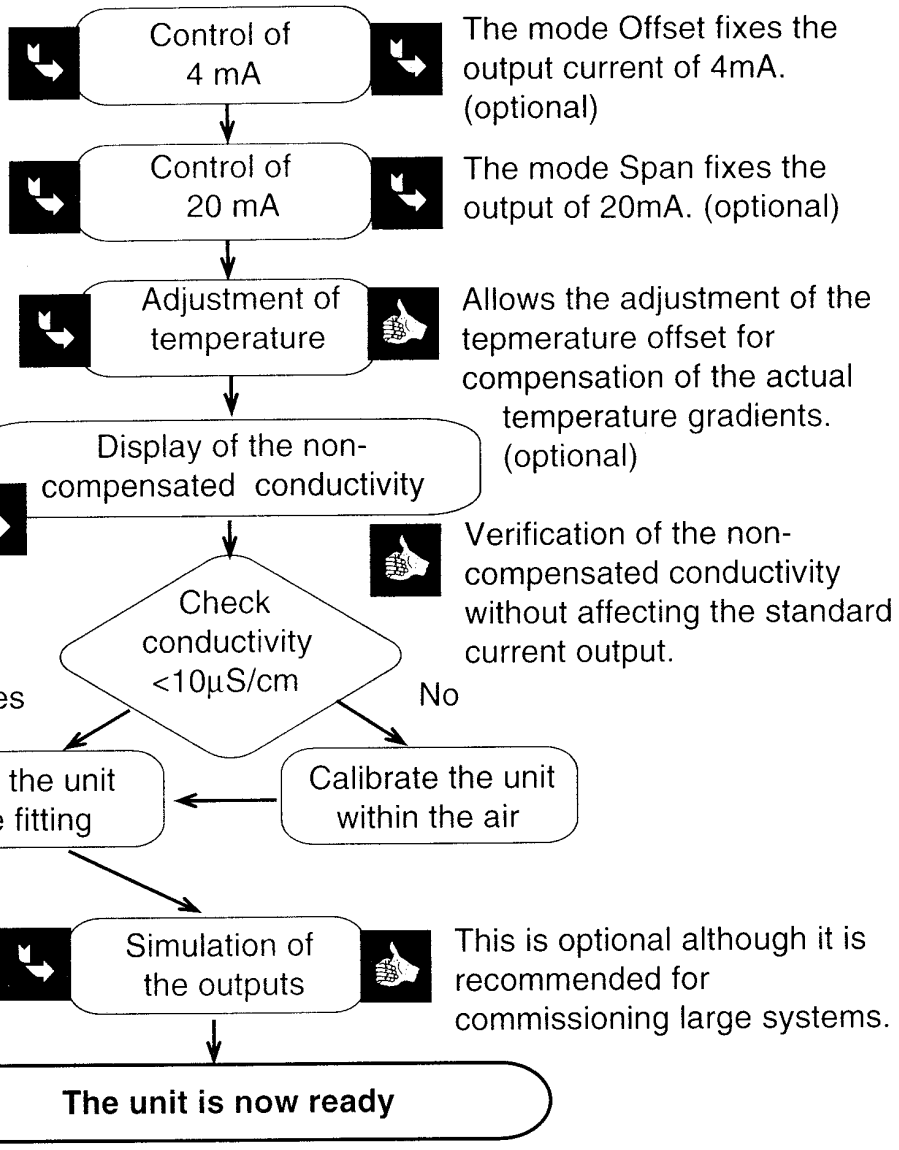
2.2 PROGRAMMING



The actions which are highlighted in grey must be fully completed for accurate measurement.

To access the **TEST MENU** simutaneously press  for 5 seconds.

2.3 TESTING



See Section 4.5.1

See Section 4.5.2

See Section 4.5.3

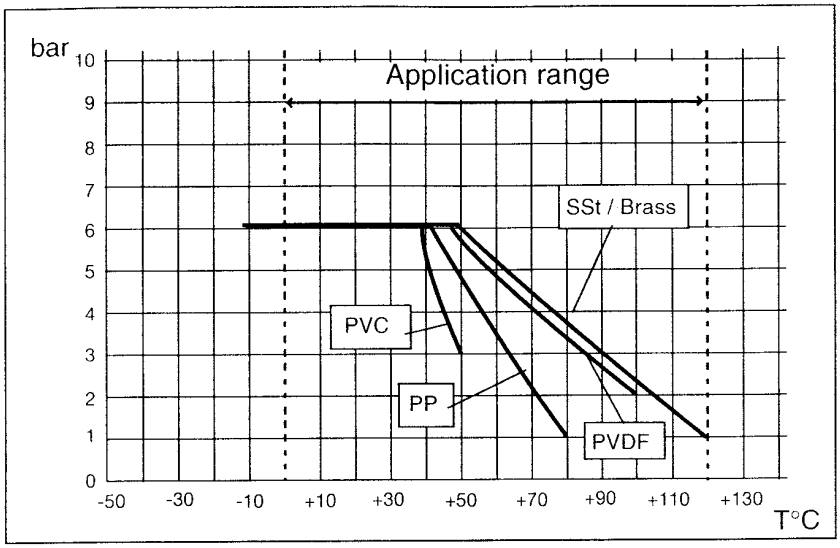
See Section 4.5.4

See section 4.5.5

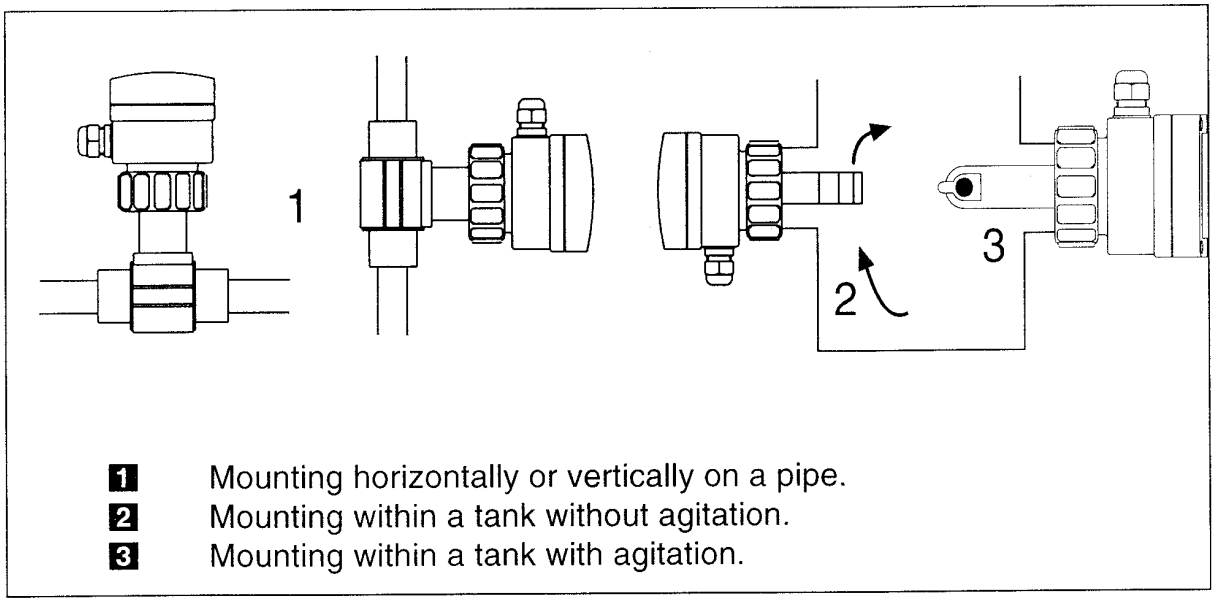
3.1 INSTALLATION GUIDELINES

- **Pressure - Temperature Diagram**

  Please be aware of the pressure-temperature dependence according to the respective fitting and sensor material as shown in the diagram below.



-



1 Mounting horizontally or vertically on a pipe.
2 Mounting within a tank without agitation.
3 Mounting within a tank with agitation.

Fig. 3.1 8226 Transmitter positioning

- Select the appropriate installation position to avoid air bubbles or cavities.
- The device must be protected against constant heat radiation and other environmental influences such as magnetic fields or direct exposure to sunlight.
- **Dismounting precautions:**

All precautions must be taken before removing the transmitter depending on the process used as the pipe may contain dangerous / agressive fluids which maybe hot.

3.2 INSTALLATION

The 8226 conductivity transmitter can be easily installed into pipes using our specially designed fitting system.

- Place the plastic nut **3** onto the fitting **4** and snap the plastic ring **2** into the guide -bush **5**.
- Ensure that the sensor is fully inserted and sitting correctly, making sure that the lug **6** is aligned correctly onto the fitting and that the sensor housing **1** cannot be rotated.

The plastic nut must only be tightened by hand!

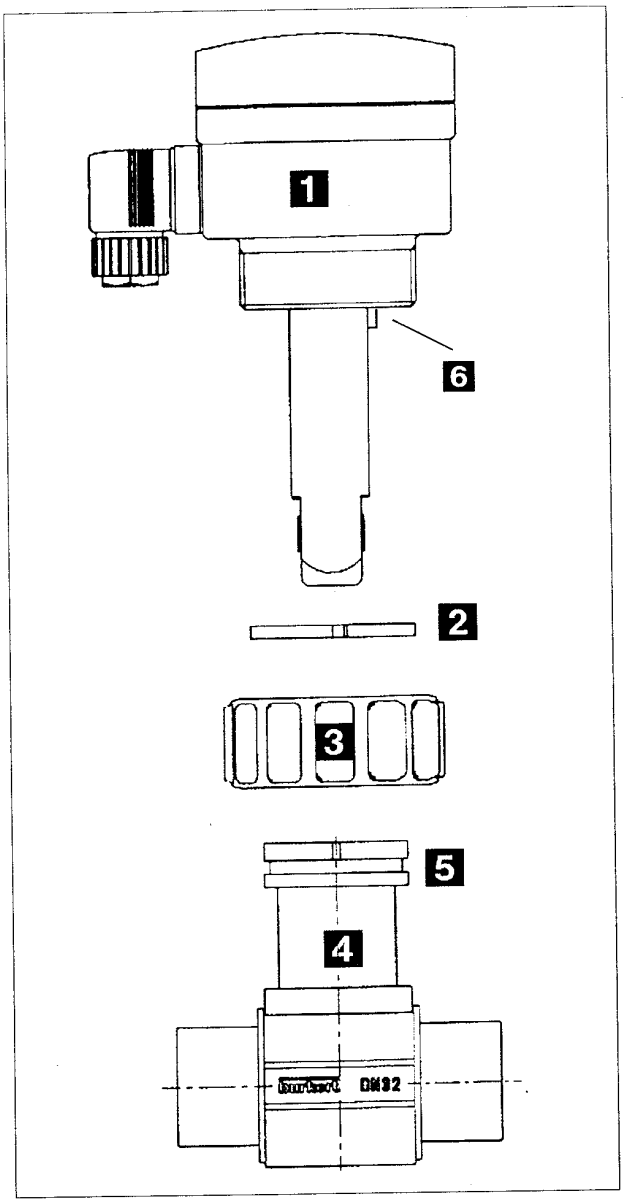


Fig. 3.2 8226 Transmitter installation

3.3 GENERAL ELECTRICAL CONNECTION

- Use cables with a temperature limit of 80°C minimum.
- For normal operating conditions the measuring signal can be transmitted by a simple cable of 0.75 mm² cross section.
- The line must not be installed in combination with carrying lines with a higher voltage or frequency.
- If a combined installation cannot be avoided, a minimum space of 30 cm (1 ft) or shielded cables should be adopted.
- When using shielded cables observe faultless grounding of the shield.

- In case of doubt, always use shielded cables.
- The power supply must be regulated - section 6.1.

- **Do not open and wire the transmitter with the power supply connected.**
- **It is advisable to put security devices on :**
  Power supply : Fuse (eg/ 250mA) and an interrupter
  Relay : 3A fuse max. and circuit breaker (depending on application).

ELECTRICAL WIRING 12-30 VDC

3.3.1 Wiring via a cable plug without relay.

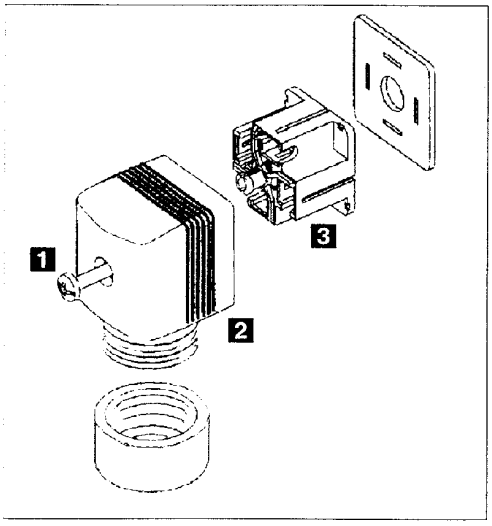


Fig. 3.3 Plug assembly type 2508

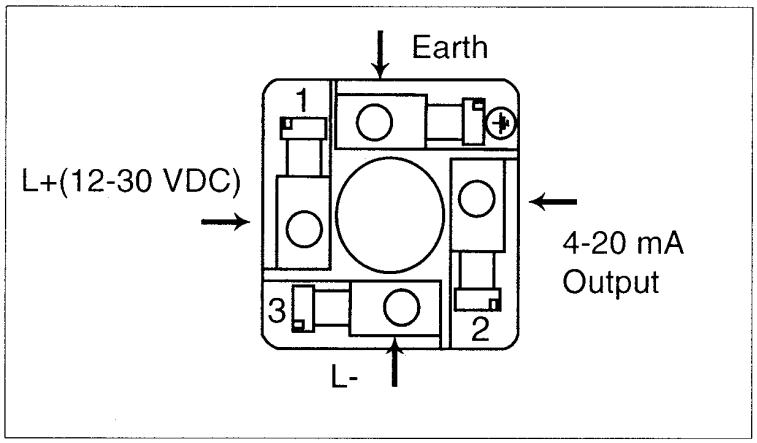


Fig. 3.4 Pin assignment

1: L+ (12-30 VDC)
2: 4-20 mA Output
3: L-
⏚: Earth

1. To open the connector remove screw **1** and the plastic ring (Fig. 3.3).
2. Remove the internal part **3** from the external casing **2** with a screwdriver blade.
3. Connect the transmitter according to the pin assignment in Fig. 3.4
4. When re-assembling, the internal part can be rotated in 90°steps to a desired position before inserting back into the casing **2**.

3.3.2 12-30 VDC version without relay, with PG 13.5

Remove the cover via the screws on the front display and pull the cable through the Pg 13.5 and wire according to one of the pin assignment diagrams below.
The electronics within the 8226 allows a sourcing or sinking PLC to be connected. Position A (Fig 3.5) provides a sourcing configuration and Position B (Fig 3.6) a sinking configuration.

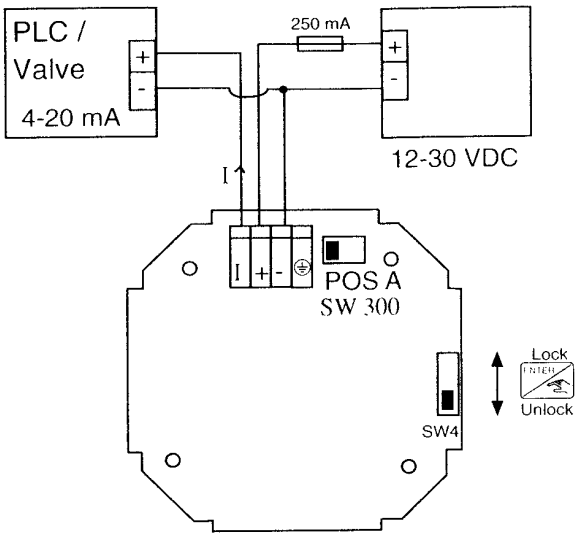


Fig. 3.5 Pin assignment, Position A

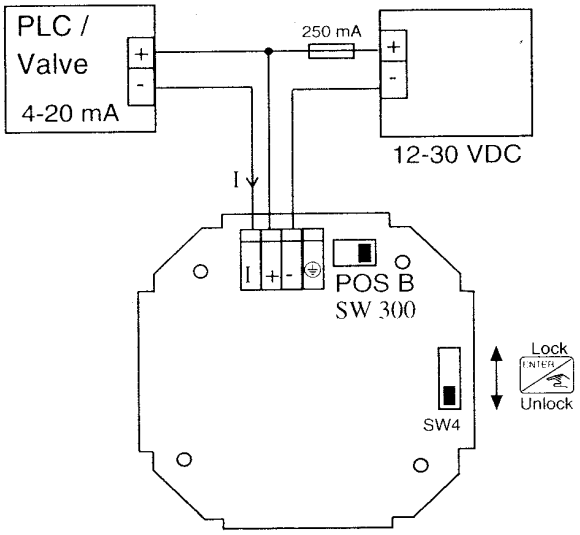


Fig. 3.6 Pin assignment, Position B

3.3.3 12-30 VDC version with relays and PG 13.5

The electrical wiring of this model is possible via the use of 2 cable glands. Remove the cover via the screws on the front display and pull the cables through the Pg 13.5's and wire according to pin assignment diagram below (Fig. 3.7).

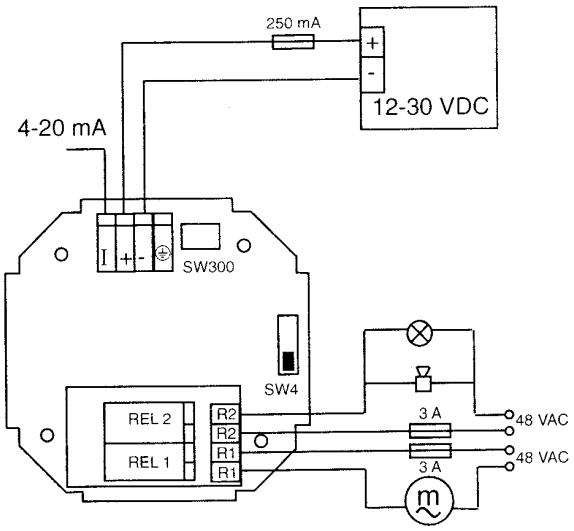


Fig. 3.7 Pin assignment for relays

- The ENTER Key can be locked to avoid accidental or unauthorised access.
- The device can be easily connected to a PLC independently of the respective version.

3.3.4 115/230 VAC version without relay, with PG 13.5

Remove the cover via the screws on the front display and pull the cable through the Pg 13.5 and wire according to one of the pin assignment diagrams below.
The electronics within the 8226 allows a sourcing or sinking PLC to be connected. Position A (Fig 3.5) provides a sourcing configuration and Position B (Fig 3.6) a sinking configuration.

- **Do not open and wire the transmitter with the power supply connected.**
- **Ensure that the power supply switch is selected for the appropriate voltage 115VAC or 230 VAC.**

The connection for relays 1 and 2 are identical to that of the 12...30VDC on the previous page - section 3.3.3.

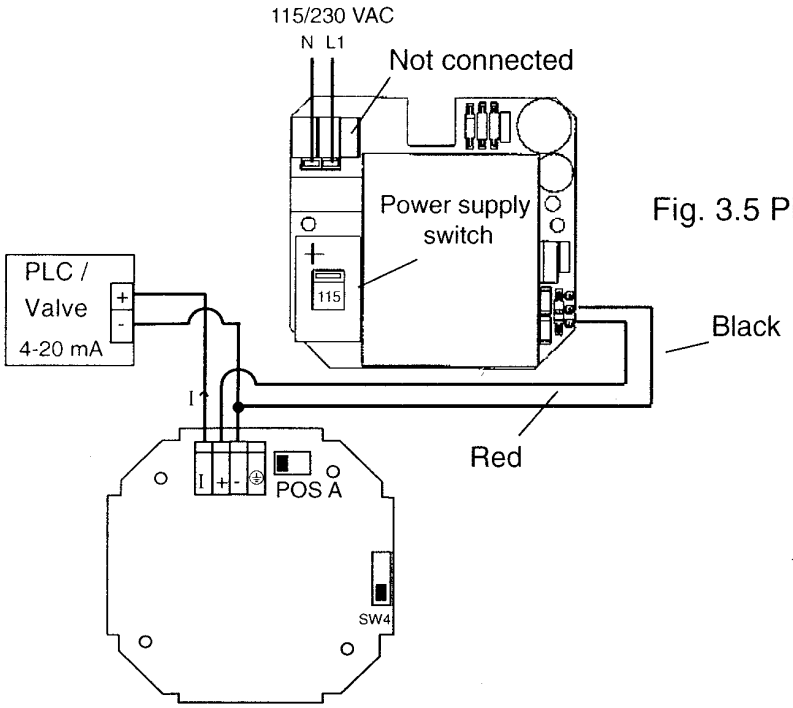


Fig. 3.5 Pin assignment, Position A

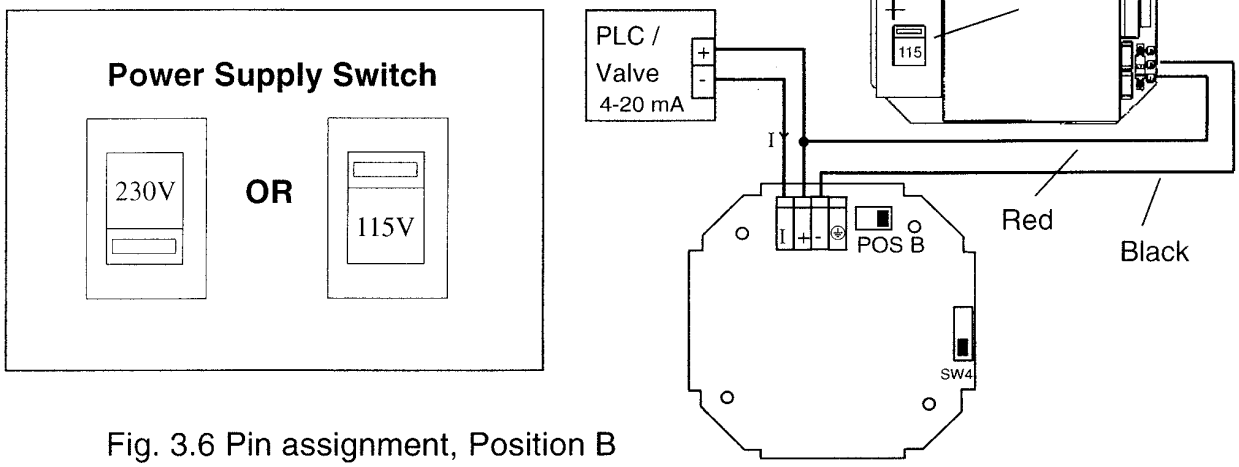
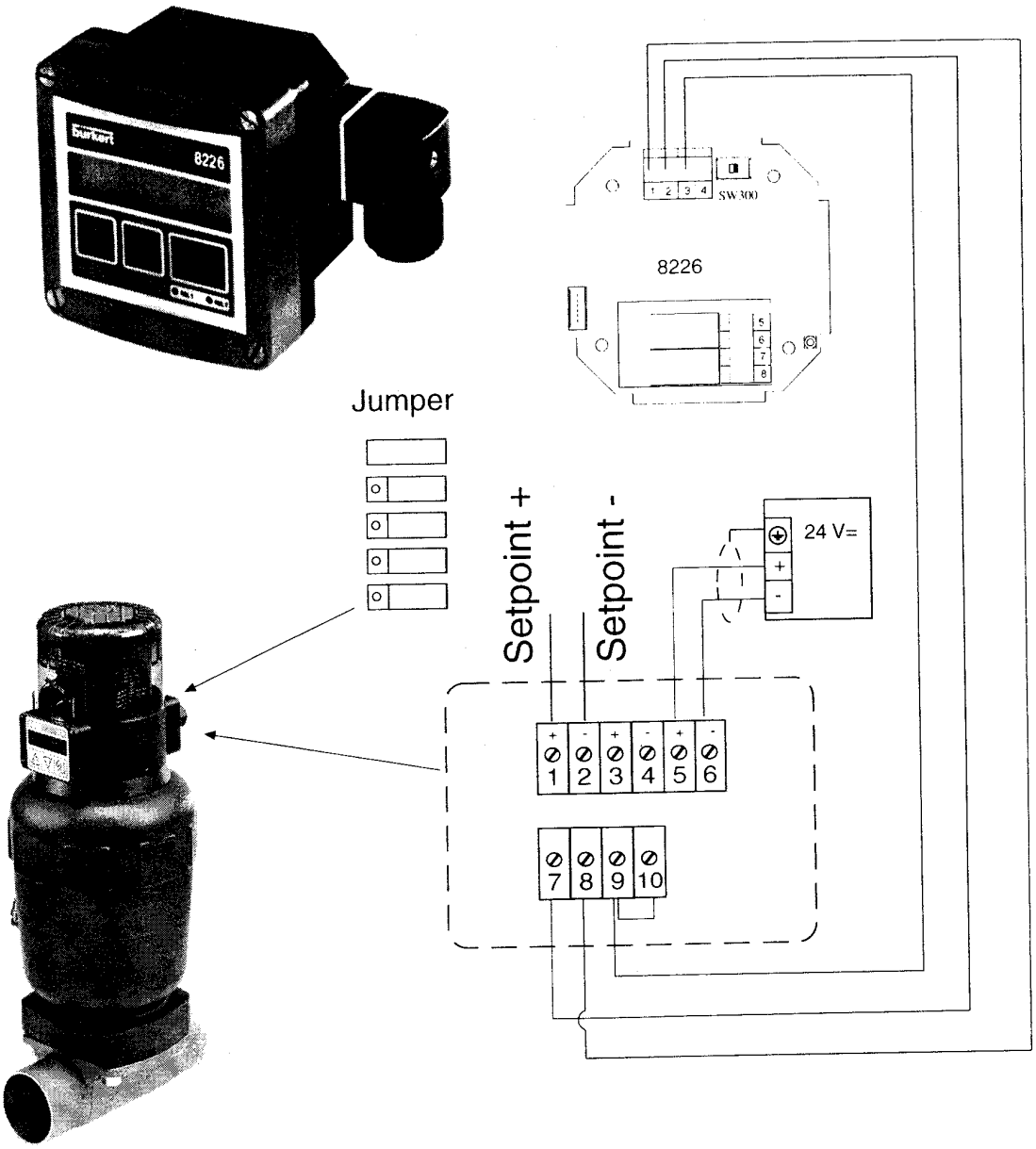


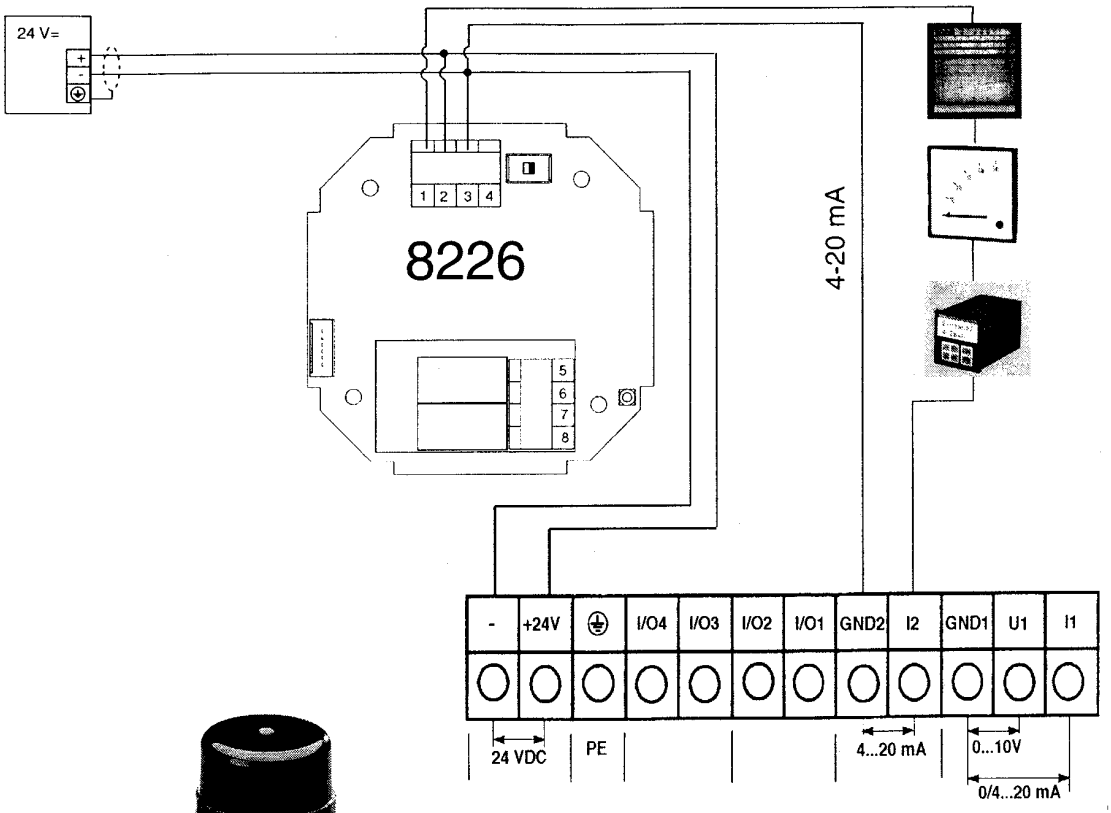
Fig. 3.6 Pin assignment, Position B

3.4 EASY LINK CONNECTIONS

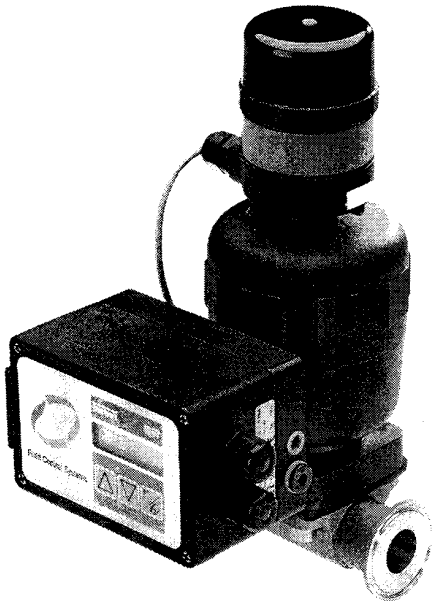


TopControl and diaphragm valve

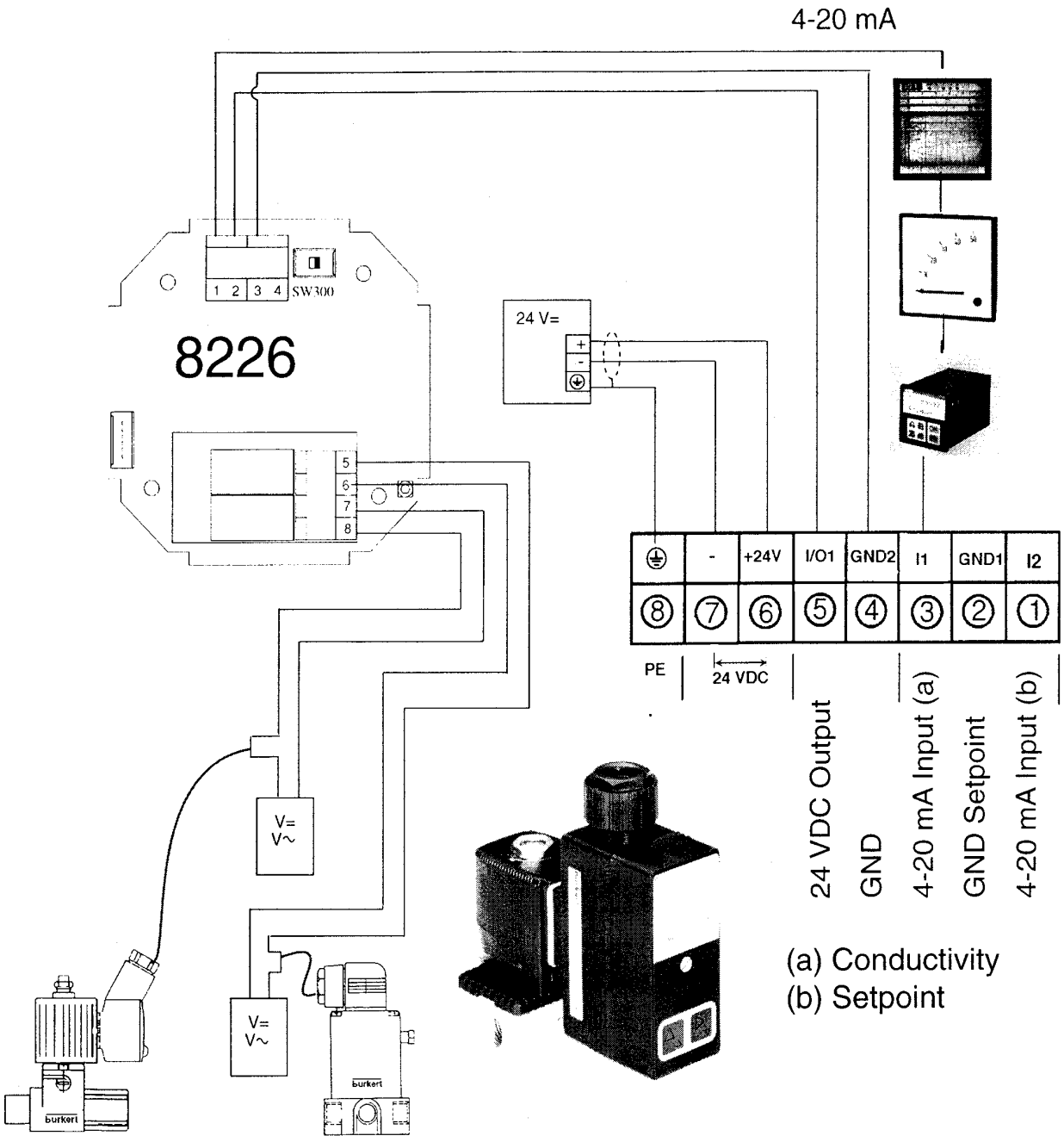
Example of an *Easy* LINK between the Conductivity Transmitter 8226 12-30 VDC with relays and the Top Control 8630 mounted on a diaphragm valve 2031.



Positioner Type 1067



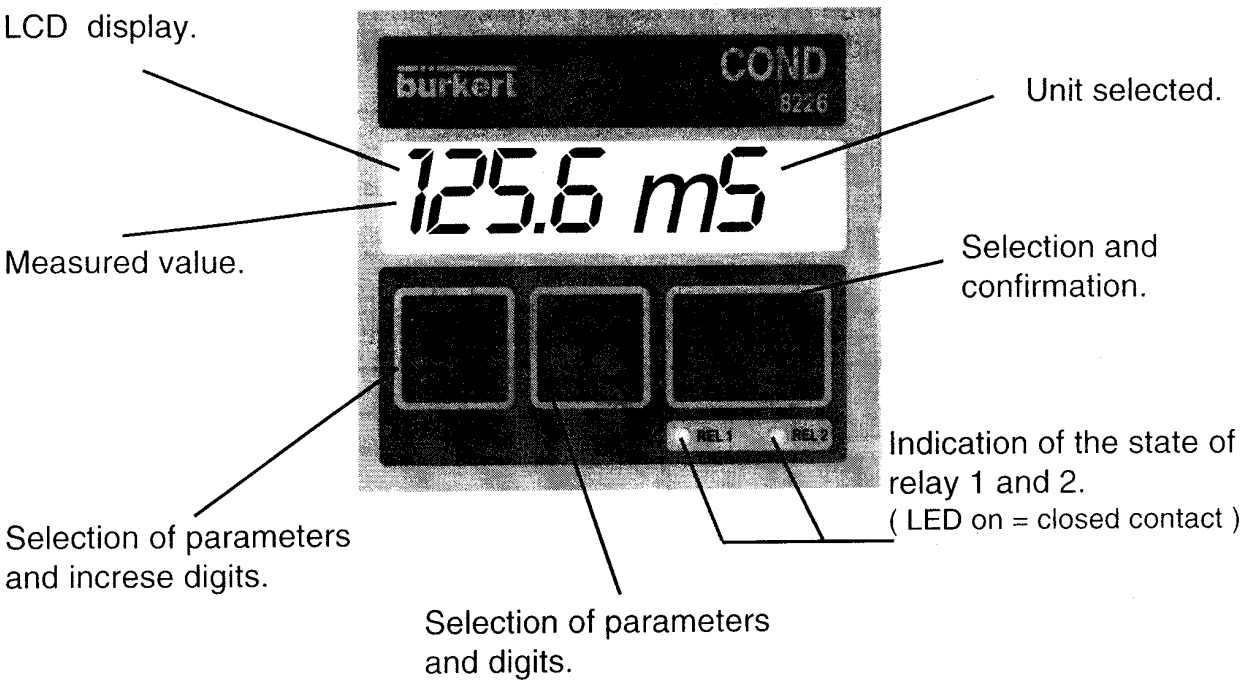
Example of an *Easy* LINK between the Conductivity Transmitter 8226 12-30 VDC with relays and the 1067 positioner mounted on a diaphragm valve 2031.



Solenoid control valve with PI-controller Type 8624

Example of an *Easy* LINK between the Conductivity Transmitter 8226 12-30 VDC with relays and a solenoid valve with a 8624 PI controller.

4.1 OPERATING AND CONTROL GUIDE



Keys	Menu Mode	Finding a value
0.....9	Previous Menu	Increase from the blinking digit
▽	Next Menu	Advance to the next digit
ENTER	Activate the menu display (If "END" is displayed, save the modified parameters and return to the main menu	Validate the displayed value
ENTER 5 Seconds	Activating or deactivating the HOLD MENU*	
0.....9 + ▽	Stop the Teach-In option	
▽ + ENTER 5 Seconds	Access to the CALIBRATION MENU*	
0.....9 + ▽ + ENTER 5 Seconds	Access to the TEST MENU*	

* Only available within the main menu.

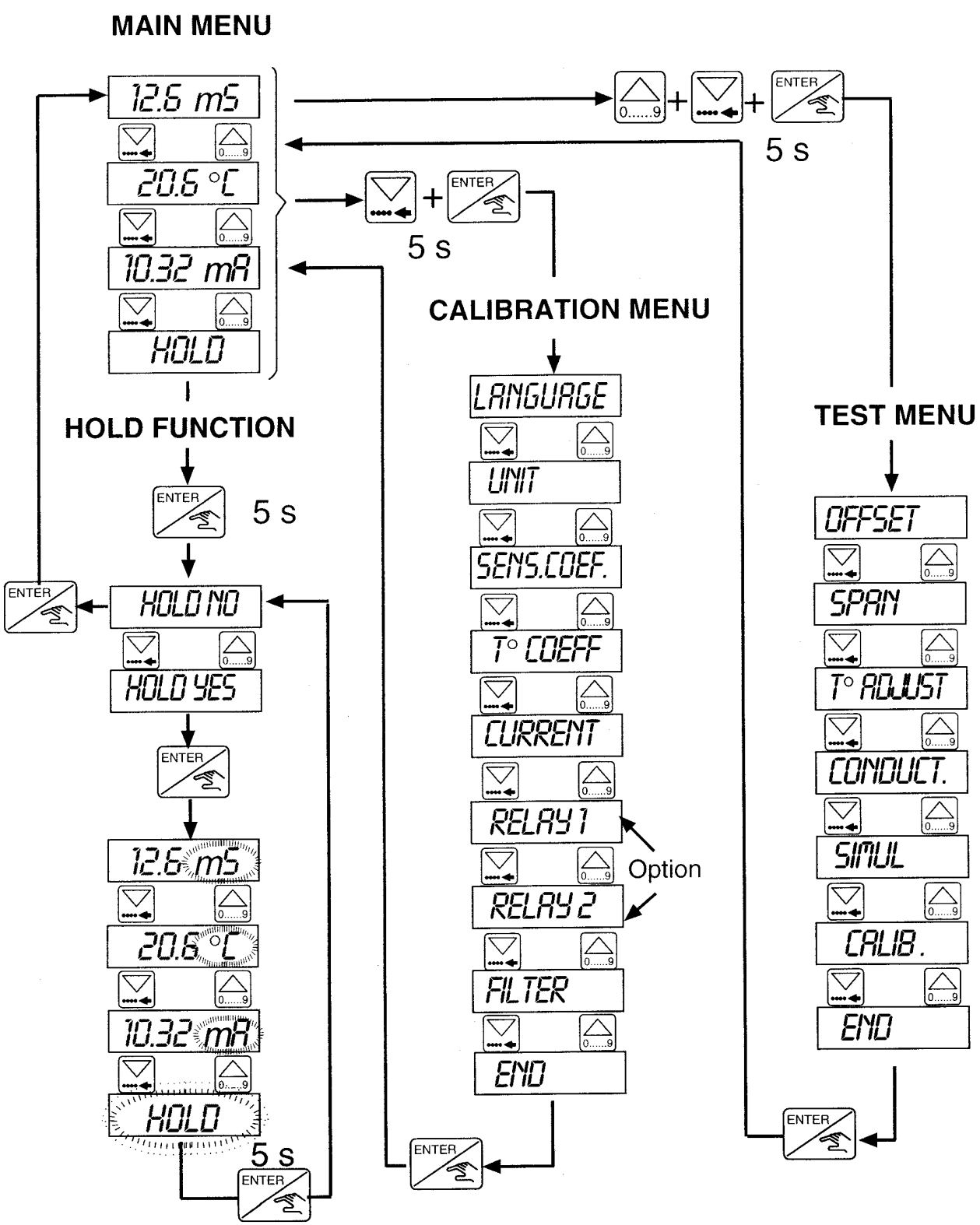
The ENTER Key can be locked to avoid accidental or unauthorised access.

For further information see section 3.3.2.

OPERATION

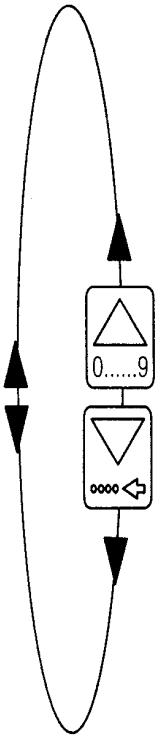
4.2 MENU GUIDE

- The menu guide below will assist in quickly and easily finding a desired parameter and programming the 8226 conductivity transmitter.
- Indicates blinking digits.



4.3 MAIN MENU

The following information is displayed within the Main Menu:



12.6 mS

Conductivity : If "0000" or "9999" is displayed, the input value is out of range and the unit or decimal point must be changed. If the sensor unit is disconnected the following message will be displayed "----".

20.6 °C

Temperature : If the temperature is out of range or the connection to the temperature sensor is interrupted, the following message will be displayed "----" in the respective unit selected *°C or °F.*
(Range - 40.0 to 120.0°C)

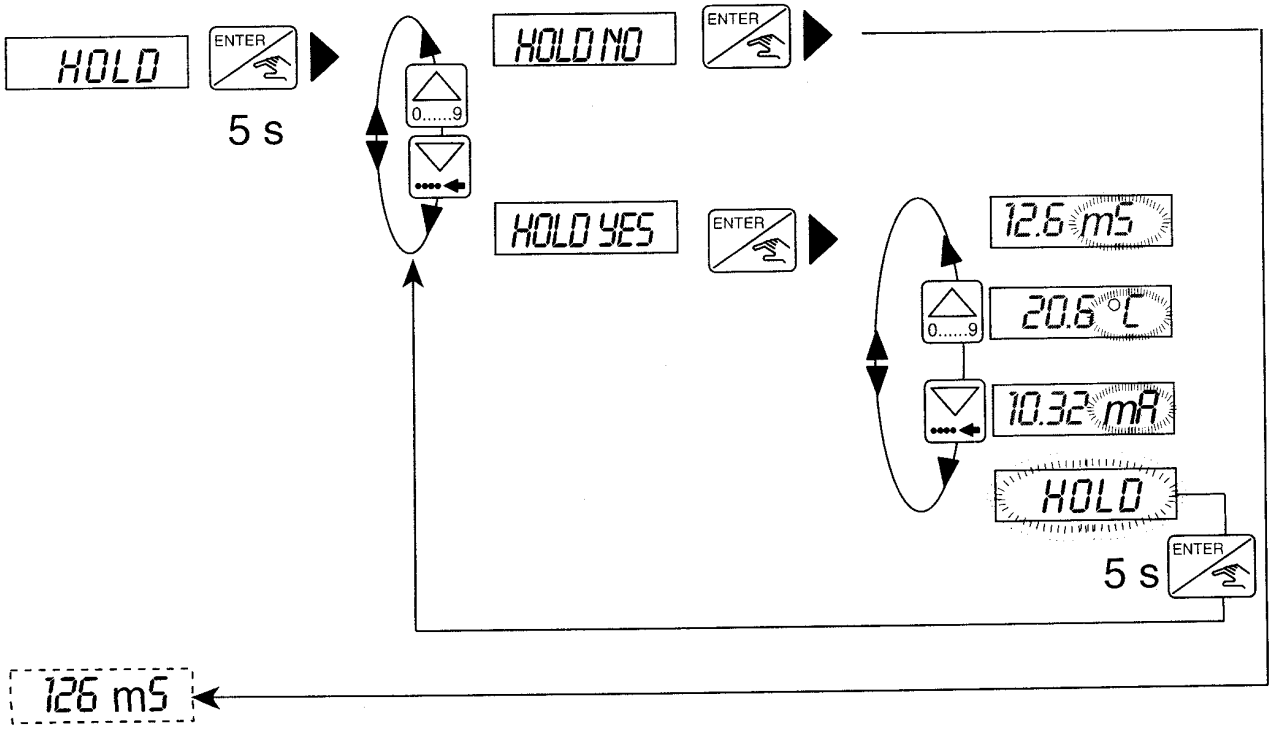
10.32 mA

Output signal : The standard output signal range is proportional to the conductivity or temperature.
(Range 4.00mA to 20.00mA and 22mA error signal).

HOLD

HOLD-function : If this is activated the transmitter:

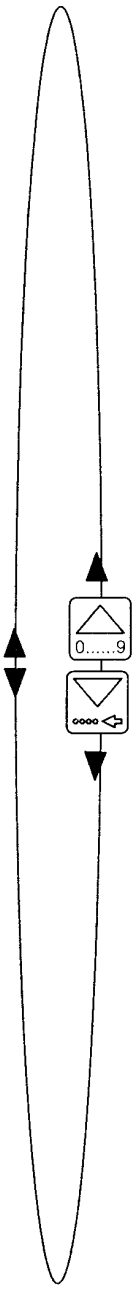
- Generates an output current corresponding to the last measured value.
- The relays are held in their previous states.
- Access to the alternative menus will be denied.
- The parameters within the main menu will flash.



4.4 CALIBRATION MENU

PRESS ▽ ENTER SIMULTANEOUSLY FOR 5 SECONDS

The following parameters can be set within this menu:

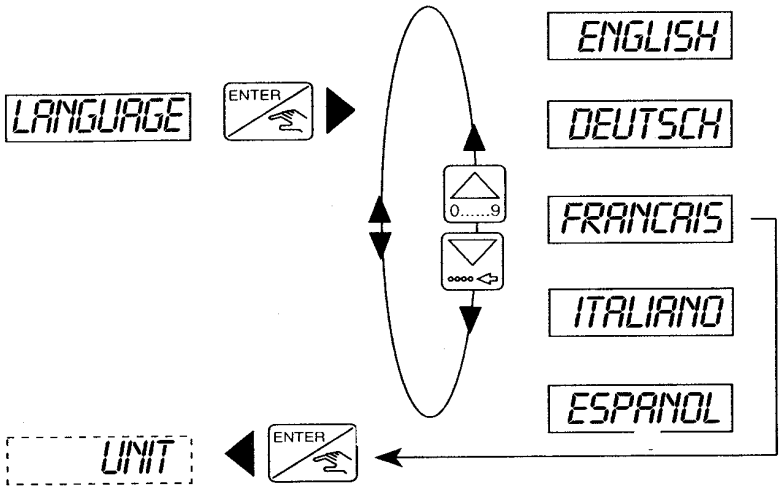


		SECTIONS
LANGUAGE	Selection between English, German, French, Italian or Spanish.	4.4.1
UNIT	Selection of engineering units for conductivity and temperature.	4.4.2
SENS.COEF.	Enter the coefficient of the sensor. *(Range 0 to 50.000)*	4.4.3
T°COEFF	Selection of the temperature compensation mode (linear, automatic or Teach-in function). *(Linear range 0.00 to 9.99% / °C)*	4.4.4
CURRENT	Determination of the 4...20 mA measuring range. (Selection between conductivity and temperature)	4.4.5
RELAY 1	Parameter definition of relay 1. This message only appears if this relay option is available.	4.4.6
RELAY 2	Parameter definition of relay 2. This message only appears if this relay option is available.	4.4.6
FILTER	Damping selection. There are ten different steps available. *(Range 0 to 9)*	4.4.7
END	Back to the operation mode; store the new parameters set.	

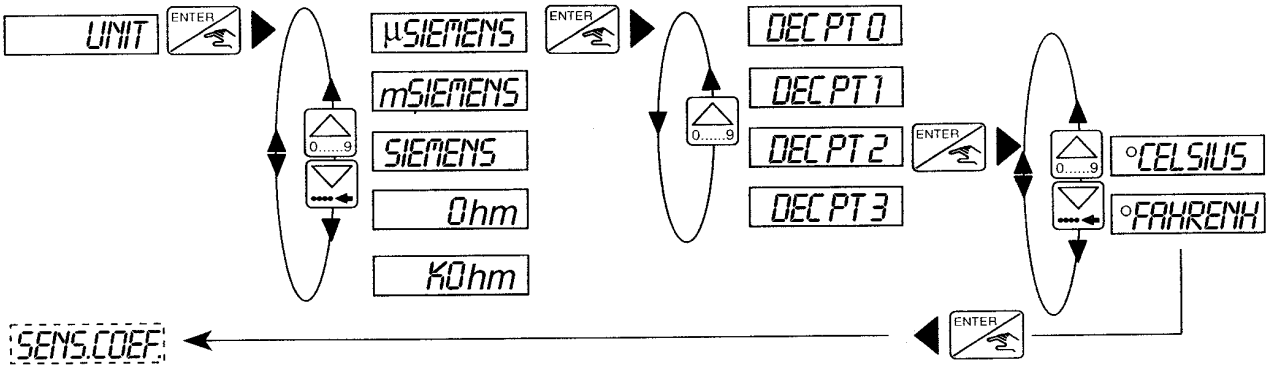
The following sections explain how to change the parameter values within the calibration menu above.

4.4.1 LANGUAGE

The selection of an alternative language is confirmed by the Enter-key and becomes immediately active.



4.4.2 ENGINEERING UNITS



- The selection of units is confirmed by the Enter-key and becomes immediately active.
- The conductivity can be displayed with 0, 1, 2 or 3 decimal places but 4 digits will always be displayed. (µSiemens/cm are always expressed in integer values; Siemens/cm always with 3 decimal points).

4.4.3 SENSOR COEFFICIENT

4.4.3.1 Initial calculation of the cell constant

The cell constant is a specific value for each sensor depending on the material and diameter of the fitting used. It is calculated by using the following equation:

$$C = C_S \times C_f$$

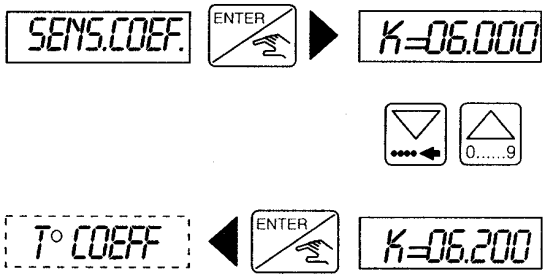
Where :
- C = Sensor coefficient to be calculated and programmed
- C_S = Basic cell constant of the sensor. This value is written on a sticker on the side of the sensor housing or on the cell cable.
- C_f = Correction factor of the fitting used (see table).

Ex

C_S = 6.295

C_f = 0.985 (DN 50 in Brass)

C = 6.295 x 0.985 = **6.200**



Correction Factor Tables for the 8226 Transmitter

Weld Ends Male / Female threaded ports			True union and Solvent spigots		
DN	**Brass**	**Stainless Steel**	**PVDF**	**PP**	**PVC**
32	0.991	0.989	1.113	1.098	1.093
40	0.989	0.989	1.049	1.045	1.045
50	0.985	0.983	1.022	1.021	1.022

Solvent or Fusion spigots					Saddles
DN	**Brass**	**Stainless Steel**	**PVDF**	**PP**	**PVC**
65	--	0.993	1.020	1.019	1.025
80	--	0.995	1.020	1.019	1.022
100	--	0.998	1.019	1.017	1.010

- If a DN fitting > 100 is used which is not listed or a reservoir, a correction factor of 1.000 should be applied.
- For high precison it is recommended that the coefficient of the sensor is recalculated. (See following section).
- For DN 32 with a reduction to DN 15,20 or 25 take the correction factor for DN32.

4.4.3.2 Modification of the cell constant.

The cell constant may drift with time due to deposits on the sensor or the fitting. It is advisable to periodically check this value by measuement with a buffer solution or reference device and ensure that the sensor finger is clean.

A new cell constant can be calculated as follows:

$$C_{new} = C_{old} \times \frac{\text{Cond } ref}{\text{Cond } 8226}$$

Where :

- C_{new} - New value for the known sensor coefficient.
- C_{old} - Old value for the programmed sensor coefficient.
- Cond $_{ref}$ - Value for the measured conductivity.
- Cond $_{8226}$ - Value for the conductivity indicated by the 8226 transmitter.

Ex

Calibration with a solution of 10.00 mS

Electric cell constant programmed = 6.295

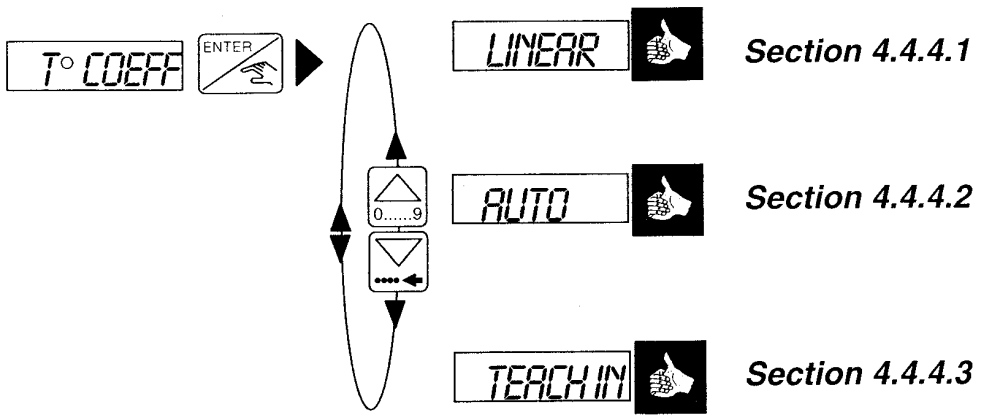
Conductivity measured by the 8226 = 10.50

Elec cst $_{new}$ = 6.295 x 10.00 / 10.50 = **5.995**

- In cases of the sensor finger replacement, please take into account the new cell constant value.

4.4.4 TEMPERATURE COMPENSATION COEFFICIENT

The Conductivity Transmitter offers 3 different types of temperature compensation; Linear, Automatic and Teach-In.



1) Linear Compensation (*LINEAR*)

Enter a single value for compensation over the entire conductivity and temperature ranges (e.g. 2.1 % / °C).

For no compensation enter 0.0% / °C within this option.

2) Compensation with memorized curves (*AUTO*)

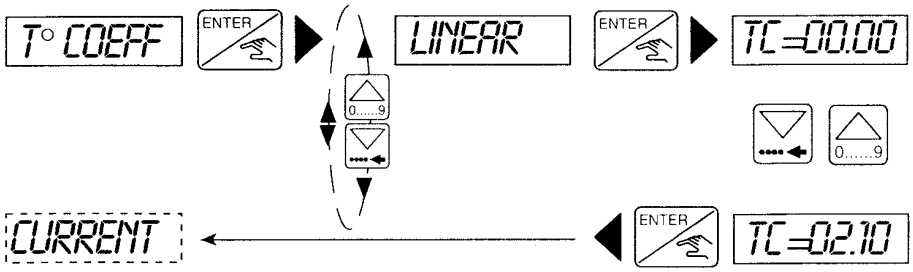
Select one of the 4 pre-programmed compensation curves for commonly used products. The available compensation curves include; NaOH, HNO_3, H_2SO_4, NaCl or special (determined by Teach-In).

3) Teach-In function (*TEACH-IN*)

This function allows the user to practically determine with the transmitter a compensation curve within the desired temperature range. From entering the temperature limits and starting measurement the conductivity transmitter automatically computes the compensation curve.

4.4.4.1 LINEAR TEMPERATURE COMPENSATION (*LINEAR*)

In some cases linear compensation provides enough precision for process monitoring or control. Linear temperature compensation requires just one input value which is the average compensation for both the temperature and conductivity ranges.



- The units for this option are %/°C
- The linear limit range is 0.00...9.99%/°C
- For calculating the average compensation value α, the following equation can be used:

$$\alpha = \frac{\Delta\chi}{\Delta T} \times \frac{1}{\chi_{25}}$$

The figure below explains the significance of the linear temperature compensation coefficient.

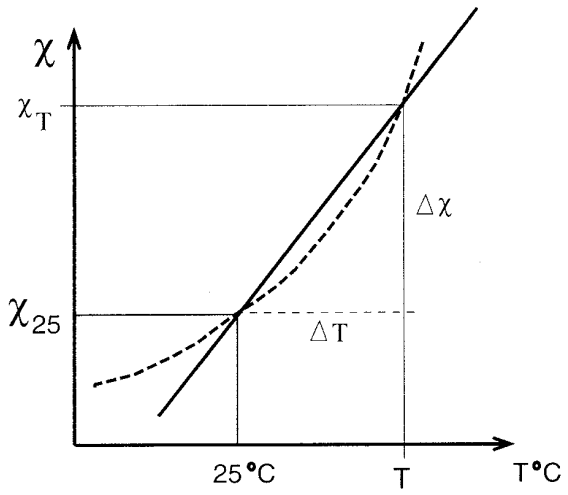


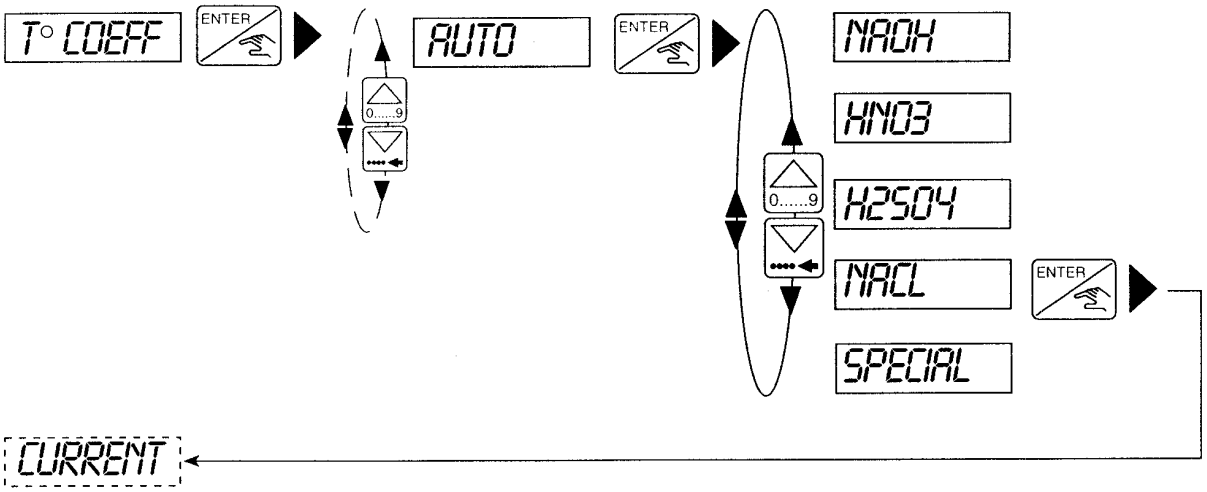
Figure 4.1 - Linear Compensation

4.4.4.2 AUTOMATIC TEMPERATURE COMPENSATION (*AUTO*)

The compensation curves for NaOH, HNO_3, H_2SO_4 and NaCl have been determined over the temperature range of 10...80°C for the following concentrations:

NaCl :	0,2%
NaOH :	1,0%
HNO_3 :	1,0%
H_2SO_4 :	20.0% from 5 to 55°C

The option "special" stores the compensation curve achieved by the customer through the Teach-In function (see next section).



- The "*SPECIAL*" option is not available until a Teach-In function has been completed, i.e. there is no temperature compensation of the conductivity.

- The memorized compensation curve for NaCl applies for concentrations between 60mg/l (≅ 100µS) to 270 g/l (≅ 220mS). In most cases the compensation within this option will be sufficient for water and diluted solutions.

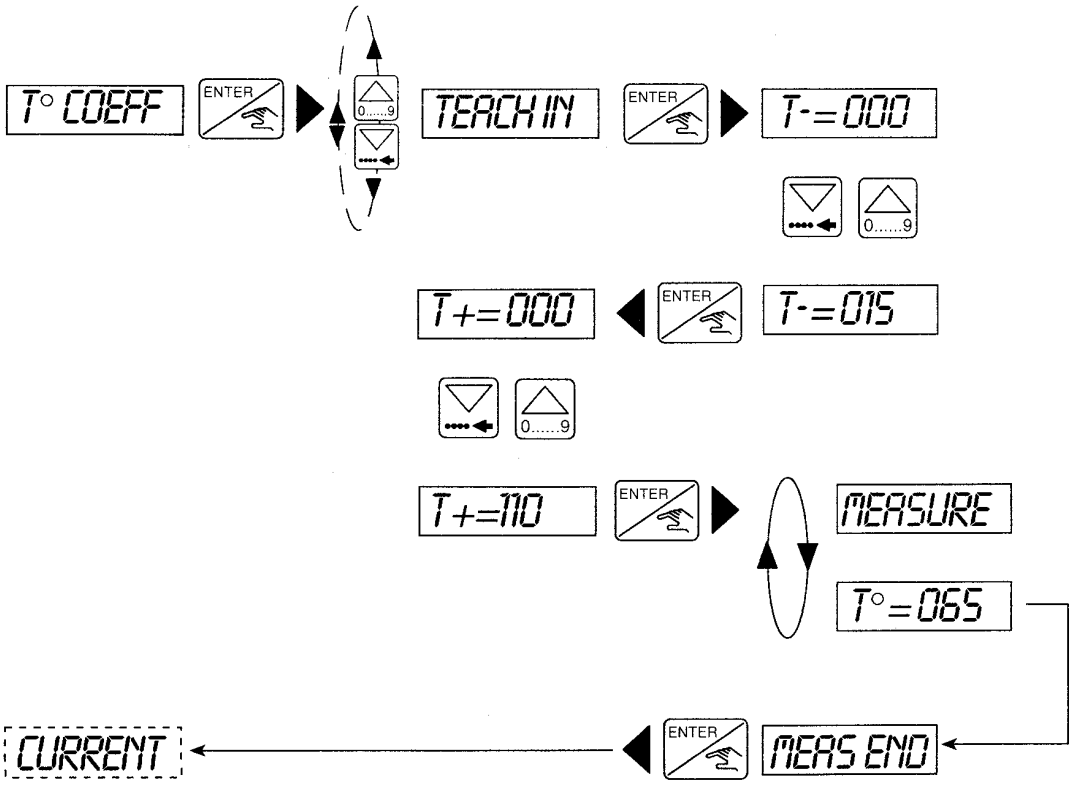
4.4.4.3 TEACH-IN TEMPERATURE COMPENSATION (*TEACH-IN*)

This option enables the practical definition of the compensation curve over a specified temperature range.

Steps for sucessful measurement.

- Enter the temperature range (T - and T +) of the fluid making sure the difference between T - and T + exceeds 5°C.
- During the measurement the temperature of the solution must reach 25°C.
- Immerse the device into the solution and heat slowly from T- until T+ has been reached (if T- < 25 °C < T+) or from 25°C until T+ has been reached (if 25 °C < T- < T+) or from T- unitl 25°C has been reached (if T- < T+ < 25 °C).
- The compensation coefficients are automatically calculated and stored for further reference within the "*SPECIAL*" option within the automatic compensation option.
- If the message "*ERROR*" appears on display, it means that a problem has occured (for example the liquid has been heated too quickly). In this case the operation must be repeated.

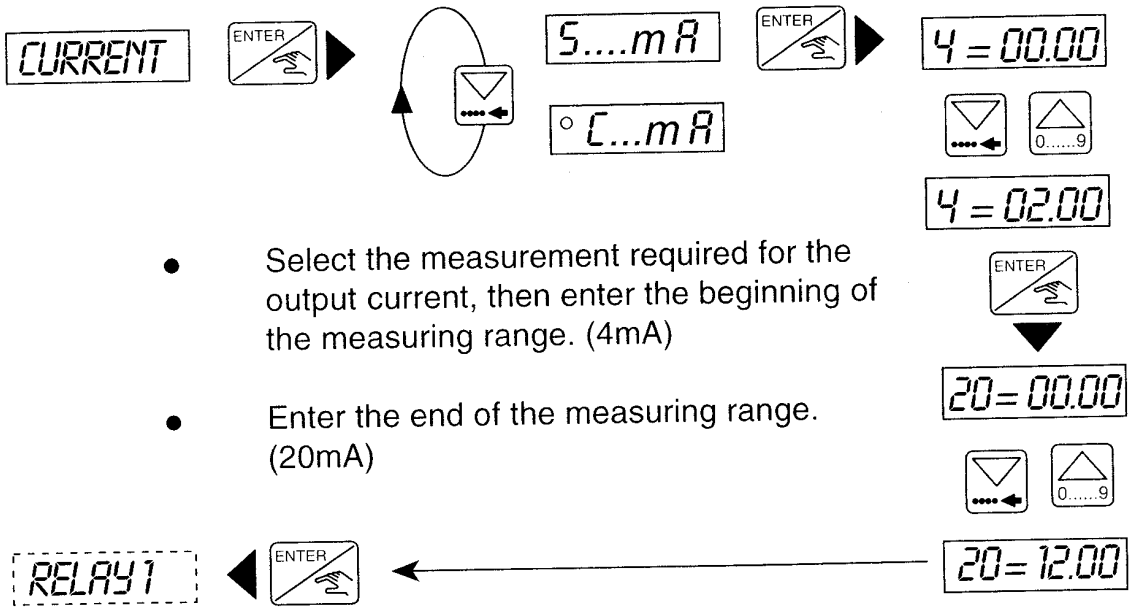
The increase in temperature must be slow in order to compensate the thermal resistance of the temperature sensor. Please avoid bubbles appearing on the surface of the sensor. The user can quit the Teach-In option at any time by pressing [0.....9] [▽] for a duration of 5 sec.



4.4.5 CURRENT OUTPUT

Within this option the measuring range for the conductivity or temperature can be defined corresponding to the output current of 4...20 mA.

- The beginning of the measuring range might be larger than the end creating an inverted signal, eg/ 0....10 mS/cm corresponds to 20...4 mA.
- The adjustments (engineering unit and decimal point) selected for the conductivity or temperature display will be valid within this option.



- Select the measurement required for the output current, then enter the beginning of the measuring range. (4mA)
- Enter the end of the measuring range. (20mA)

Ex:

- 2....12 mS/cm corresponds to 4...20 mA.
- The figure below shows the type of relationship between the 4.....20mA output and the associated measuring range.

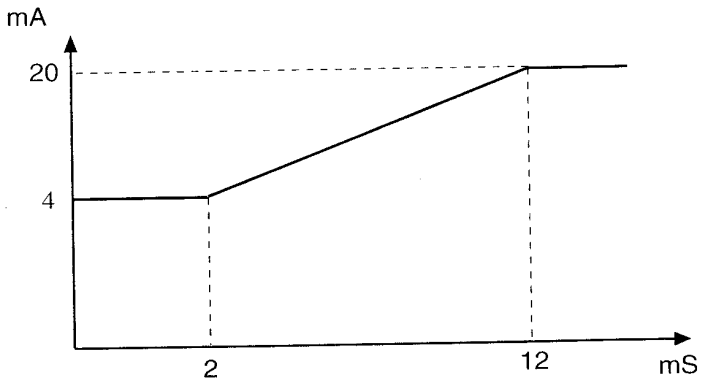


Figure 4.3 - Output Signal

4.4.6 RELAY *(OPTION)*

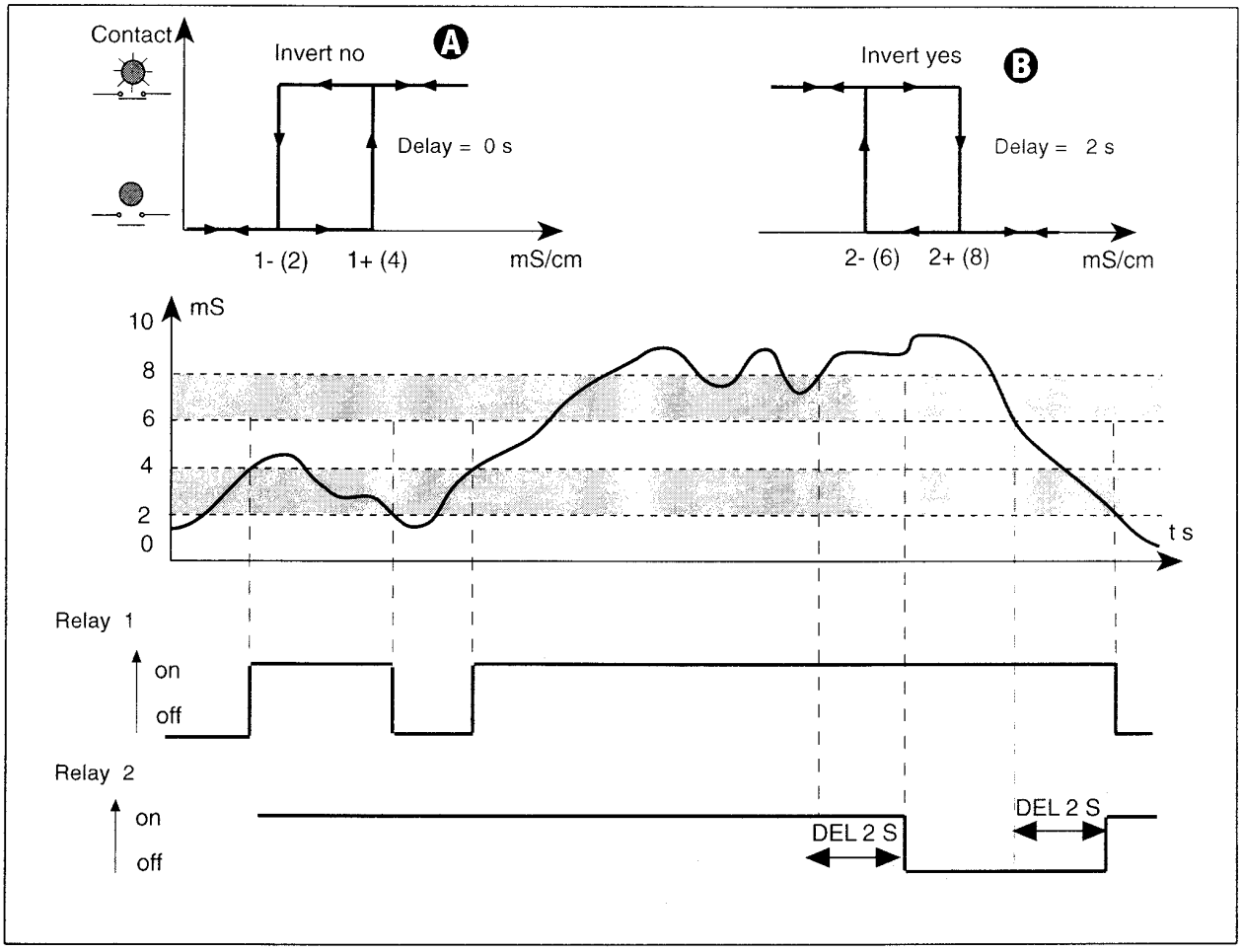
The parameter definition of the limit contacts is completed within this mode. Two limit values are entered for each relay : - 1, + 1 and - 2, + 2. The user also has the option to invert the relays and to set a delay time between 0 and 180 seconds. This delay shall prevent the relays from being activated too quickly, eg/ when time for homogenization is required (eg/ measurements within tanks with agitator). If the conductivity exceeds a limit value, the transmitter will wait for the designated delay time before activating the relay. If the conductivity does not exceed the limit value or drops under the limit value before the delay is completed the relay will not be activated.

The unit and decimal point for conductivity or temperature are activated within this option as selected within the "*UNIT*" menu (see section 4.4.2).

The following conditions must be observed: 1- ≤ 1+, 2- ≤ 2+.

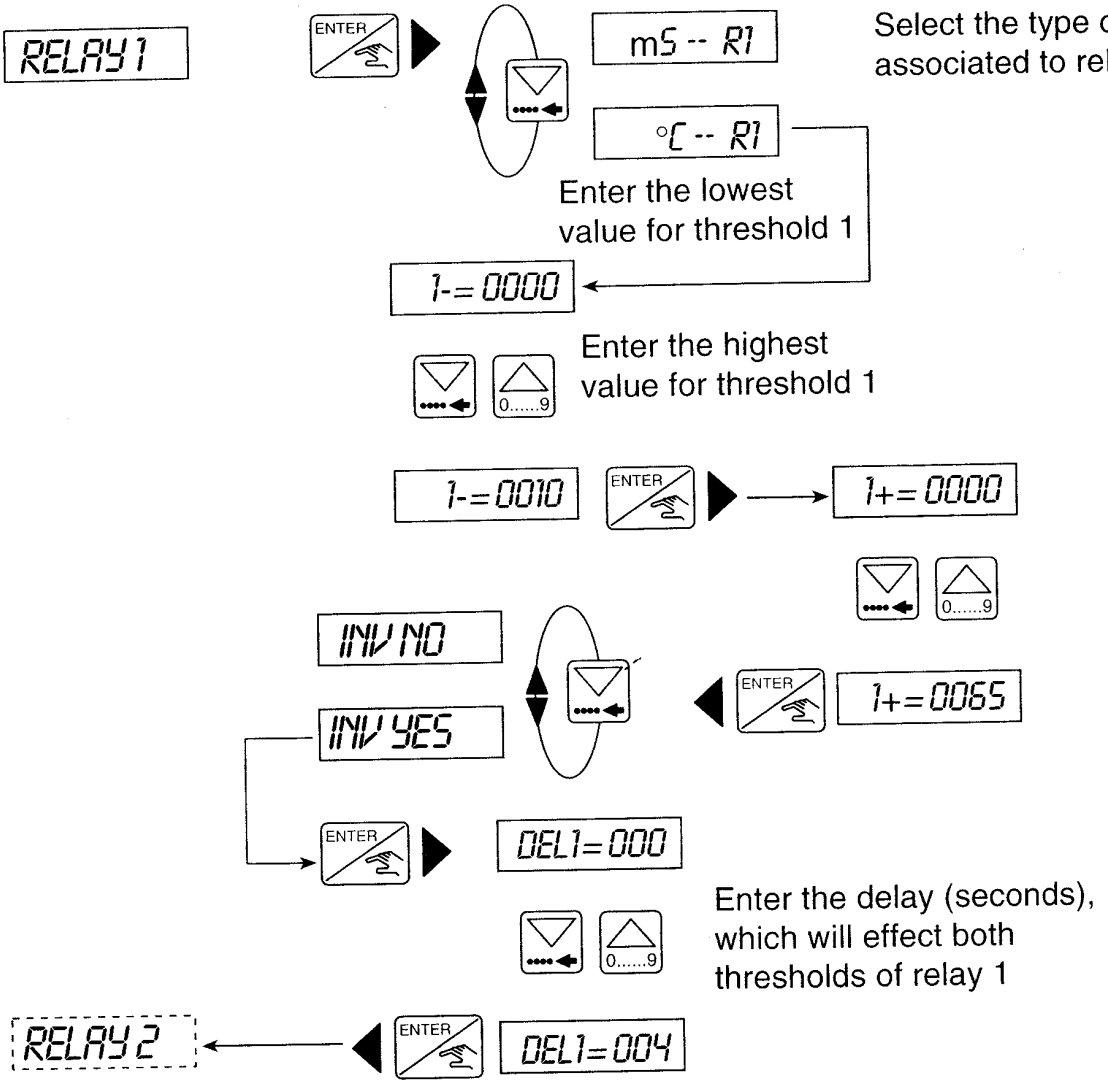
Ⓐ Relay 1 : Non inverted with thresholds of 2 and 4 mS/cm and no delay.
Ⓑ Relay 2 : Inverted with thresholds of 6 and 8mS/cm and delay of 2 Sec.

1- and 2- = the low settings for both relays
1+ and 2+ = the high settings for both relays



4.4.6.1 RELAY 1

Relay 1 maybe configured as a conductivity or temperature alarm as shown in the diagram below.



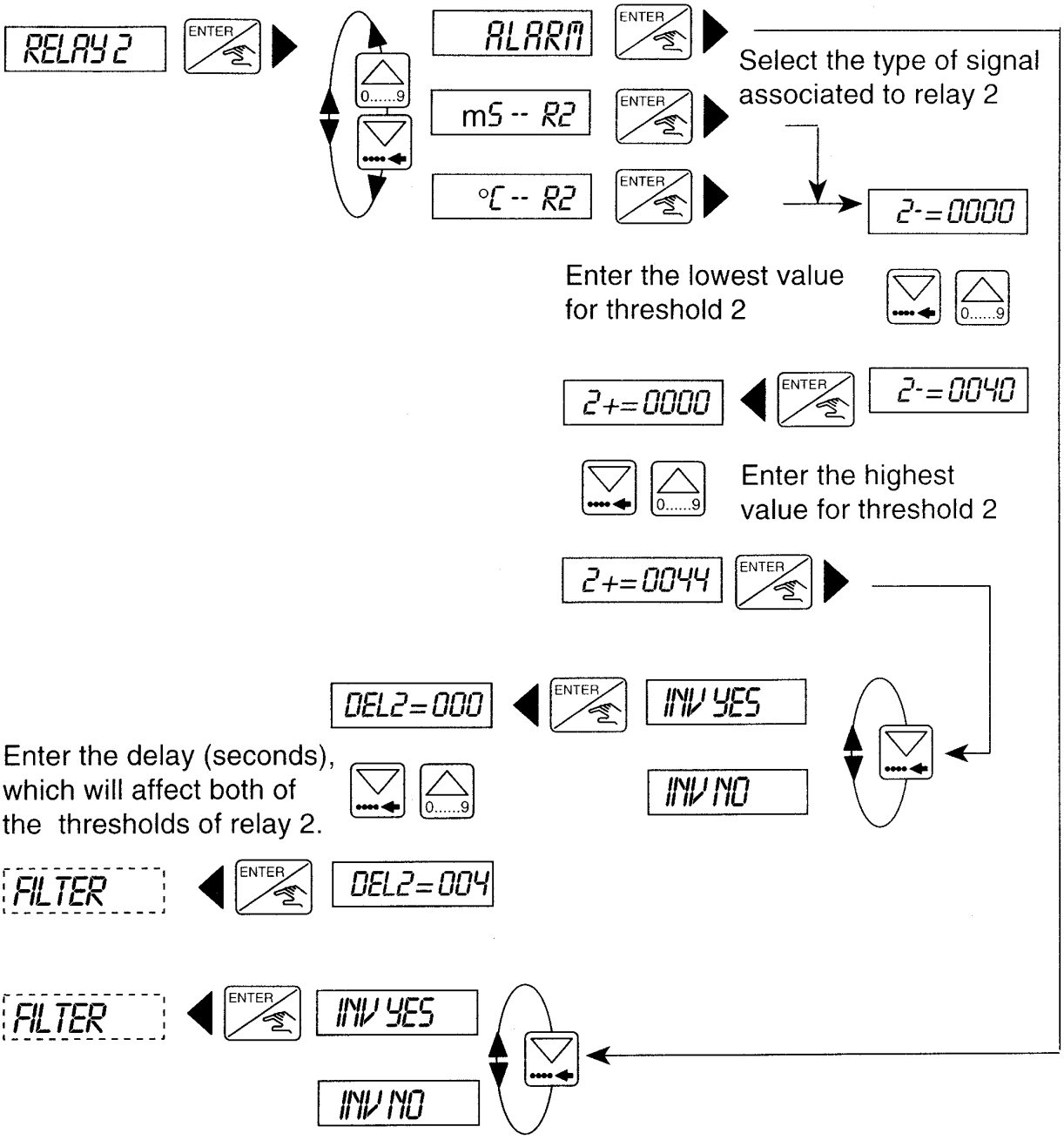
To deactivate a relay configuration the conductivity of the threshold 1+ and 1- must equal 0.00.

4.4.6.2 RELAY 2

Relay 2 maybe configured as conductivity, temperature or a general alarm for a connection failure.

The alarm is activated in the following situations:

- Problem with the power supply (display "PWR FAIL")
  - Supply < 12V or it is not regulated
- Measurement problem
  - Sensor finger is disconnected
- Measurement is out of range
  - χ > 2S/cm or - 40°C < T < 120°C

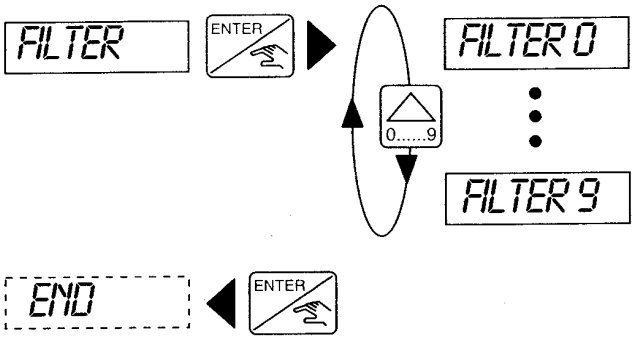


If the relay 2 is used as an alarm, ensure that the normally open state of the relay corresponds to a safe position of the process.

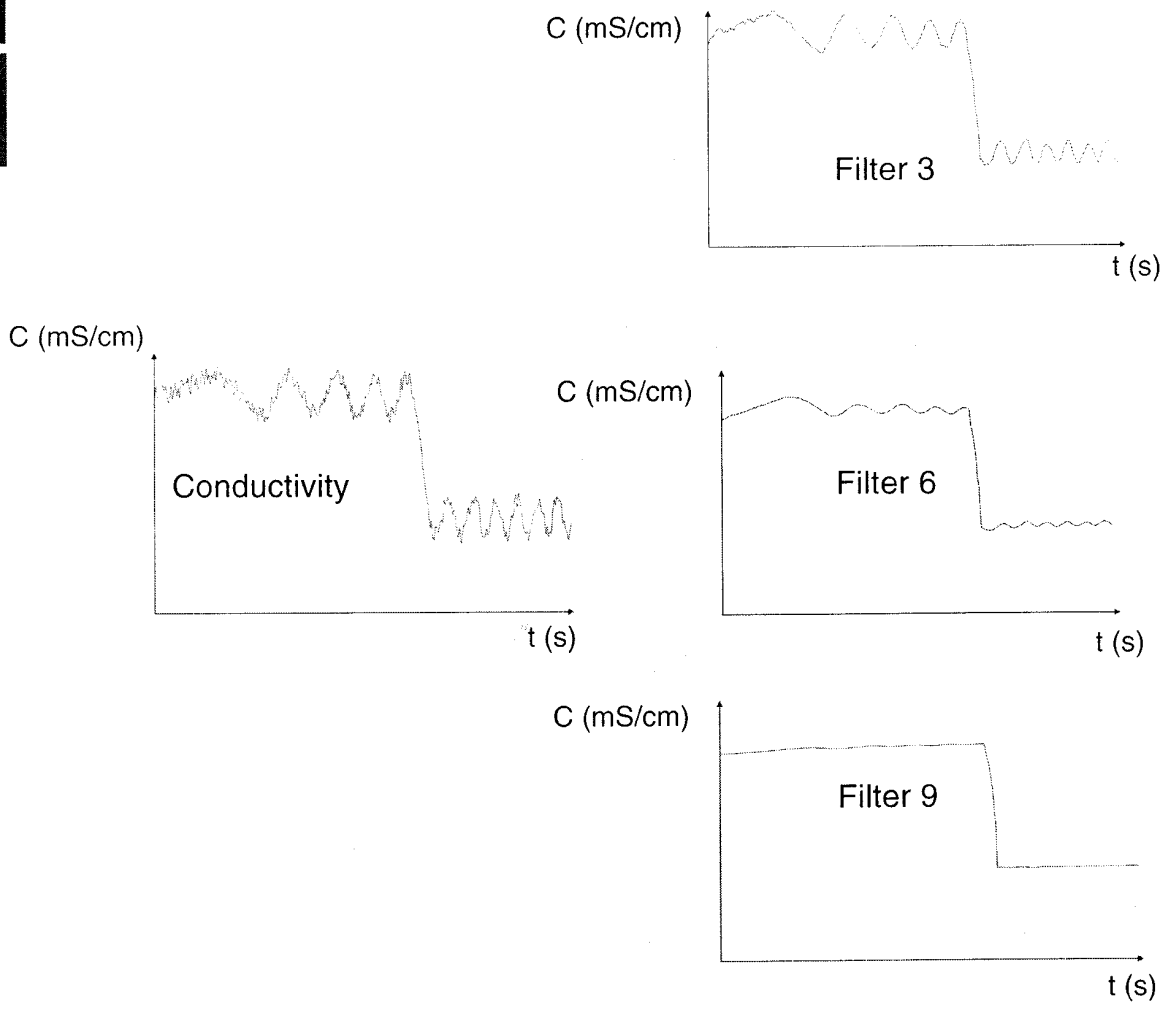
4.4.7 FILTER FUNCTION

The filter function provides a damping effect to prevent fluctuation within the output current and display. There are 10 levels available from 0 to 9 with 0 having no damping effect.

The filter which will be appropriate for most applications is filter 2.



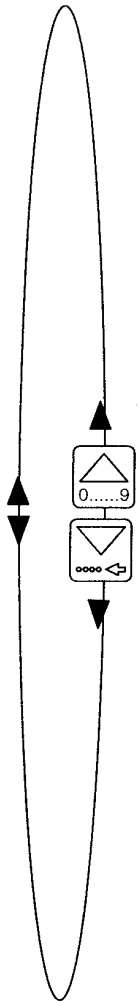
From the diagram below it is possible to see how the different filters influence the conductivity output and display over time.



4.5 TEST MENU

PRESS **SIMULTANEOUSLY FOR 5 SECONDS**

The following parameters are selected and set within this menu;



		SECTIONS
OFFSET	Zero point compensation (4 mA).	4.5.1
SPAN	Span compensation (20 mA).	4.5.2
T° ADJUST	Temperature correction + / - 5°C or 9°F.	4.5.3
CONDUCT.	Display of non-compensated conductivity.	4.5.4
SIMUL	Input of the conductivity to be simulated. The current and relay outputs will react according to this value.	4.5.5
CALIB	Calibration of the zero point. This must be completed if the conductivity is > 10 µS/cm before mounting the device.	4.5.6
END	Return to the main menu and store the new parameters set for OFFSET and SPAN. If one of the two values is inappropriate, the device will automatically return to the *"OFFSET"* parameter and new values must be entered.	

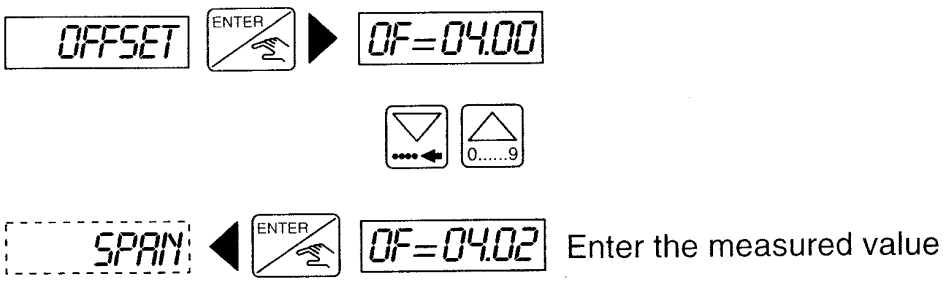
The following sections explain how to change and investigate the parameter values within the test menu above.

4.5.1 OFFSET COMPENSATION

Within this option the user has the possibility of correcting the basic setting of 4 mA generated by the transmitter. The transmitter generates a value of 4mA by pressing ENTER when"*OFFSET*" is displayed within the main test menu.

Measure the generated current with an ammeter. If the displayed value is incorrect it can be corrected by entering the measured value on the ammeter.

Adjustment range : + / - 0.5mA

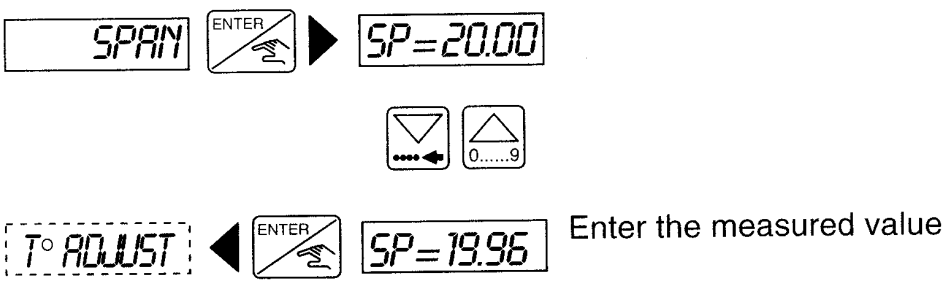


4.5.2 SPAN COMPENSATION

Span compensation provides the option of changing the basic setting of 20 mA. The procedure is identical to that of the offset compensation above. The transmitter generates 20mA if the ENTER key is pressed when "*SPAN* " is displayed within the main test menu.

Measure the generated current with an ammeter. If the displayed value is incorrect it can be corrected by entering the measured value on the ammeter.

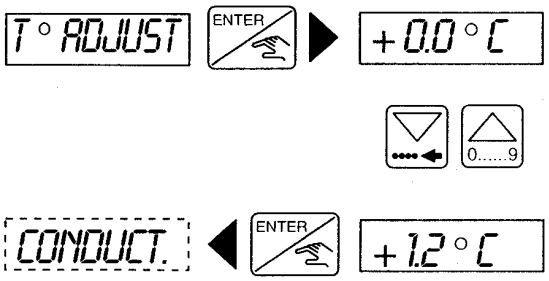
Adjustment range : + / - 0.5mA



4.5.3 TEMPERATURE ADJUSTMENT

The 8226 conductivity transmitter posseses a temperature probe within the sensor. The value from the temperature sensor can be adjusted by an offset for compensation of the actual temperature gradients. To enter a desired offset press ENTER when "T °ADJUST" is displayed within the test menu and enter the value.

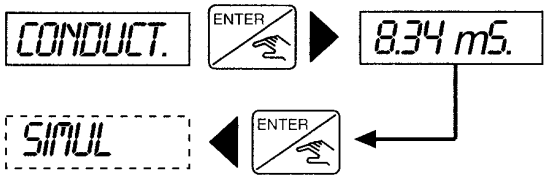
- The offset range is + or - 5°C.
- The selected temperature value will influence the compensated conductivity value.
- The temperature adjustment remains active until another value is entered.



Enter the temperature offset in (°C or °F)

4.5.4 DISPLAY OF NON-COMPENSATED CONDUCTIVITY

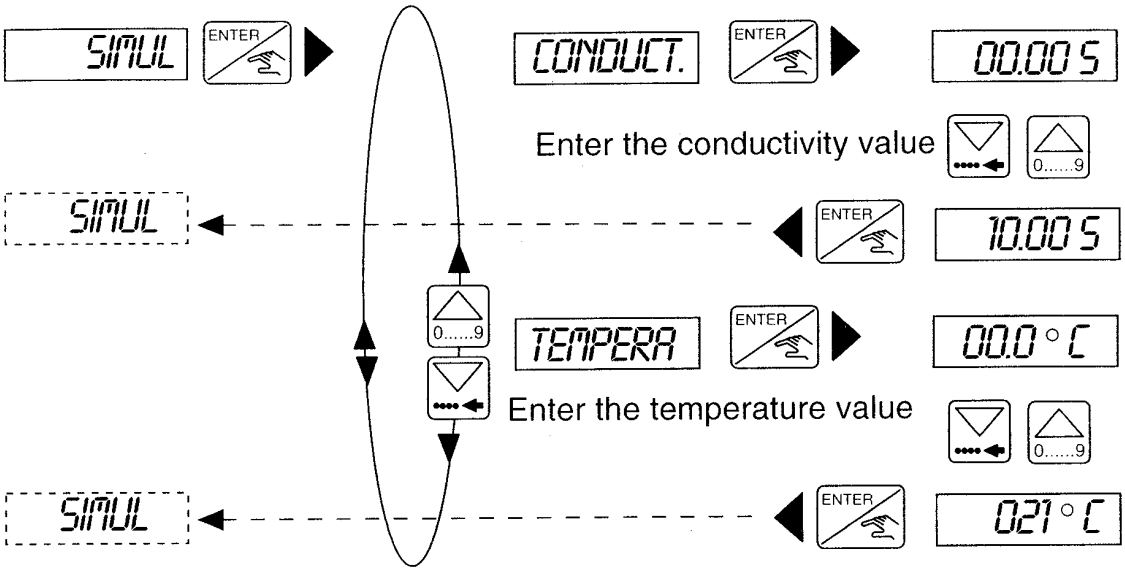
This option provides a conductivity value without any compensation for verifying the actual conductivity. To view this value press ENTER as shown in the diagram below.



The decimal point behind the unit indicates the difference between the display within this option and the compensated value within the normal function mode in the main menu.

4.5.5 CONDUCTIVITY SIMULATION

A conductivity or temperature value can be simulated within this menu, allowing the user to test the system without any liquid being present. The simulated value influences all the outputs including the relays.

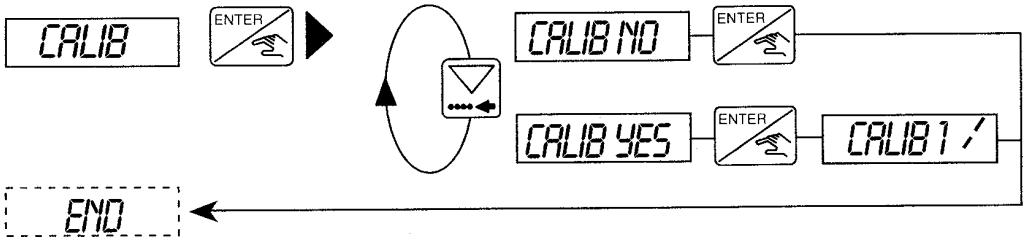


Quit the sub-menu SIMUL by pressing 0.....9 or .

The simulation will remain active until the user enters another parameter or menu.

4.5.6 CALIBRATION OF THE ZERO POINT

If the conductivity display within the main menu is greater than 10 µS/cm in the air, perform a new calibration of the transmitter with the sensor in the air.
To calibrate the unit, hold the sensor in the air and select "CALIB YES" and the unit will automatically perform a calibration test.



The measure for calibration continues for a duration of about 1 min.

4.6 8226 SETTINGS

The 8226 Conductivity Transmitter is calibrated within the factory before delivery to the settings shown in the table below.

4.6.1 FACTORY SETTING OF CONDUCTIVITY TRANSMITTER TYPE 8226

Language:		English	Relay:	1-:	00.00
Unit of conductivity:		mS/cm		1+:	00.00
Unit of temperature:		°C		2-:	00.00
Decimal points:		2		2+:	00.00
Cell constant:		≅ 6.30 (PVDF)		DEL1:	000
		≅ 7,50 (PEEK)		DEL2:	000
Temperature compensation coefficient:		00.00%/°C	Filter:		Filter 2
Current:	4 mA:	00.00			
	20 mA:	00.00			

The table below allows the configuration settings for the 8226 conductivity transmitter to be written for future reference and quick referral.

4.6.2 USER SETTING OF CONDUCTIVITY TRANSMITTER TYPE 8226

IDENT N°: **SERIAL N°:**

Language:		.....	Relay:	1-:	.....
Unit of conductivity:		.....		1+:	.....
Unit of temperature:		.....		2-:	.....
Decimal points:		.....		2+:	.....
Cell constant:		.....		DEL1:	.....
Temperature compensation coefficient:		.....		DEL2:	.....
			Filter:		.....
Current:	4 mA:	.....			
	20 mA:	.....			

MAINTENANCE

5.1 STORING AND CLEANING OF THE SENSOR

Inductive conductivity sensors do not require any special maintenance, however the hole / duct of the sensor must never become blocked especially by conductive deposits. If necessary, the sensor can be easily cleaned with slightly acidic-containing solutions or any solvent compatible with PVDF or PEEK, depending on the version.

While checking the sensor, the HOLD function can be activated.

Ensure that the pipe does not contain any fluid before dismounting.

5.2 TROUBLE SHOOTING GUIDE

If any problems persist, please contact your local Bürkert subsidiary or return the product with a full explaination of the problem.

This section is designed to assit with problems which may occur during installation or operation. If in doubt please do not hesitate to contact your local Bürkert subsidiary.

Faults	Status	Actions	
The transmitter does not work			
Transmitter connected ?	No	Connect the device	3.3
Fuses OK (if any) ?	No	Change the fuses	3.3
Switch ON (if any) ?	No	Set the switch ON	----
Power supply on terminal + and - OK ?	No	Check the connection	3.3
Transmitter programming / testing unavailable			
Switch SW4 up (ENTER key locked) ?	Yes	Set SW4 switch down	3.3
The unit is blinking	Yes	Deactivate the hold option	4.3
Display 'PWR FAIL'			
Power supply not stabilised or inferior to 12 VDC ?	Yes	Change the power supply	----
Display 'ERROR'			
Display at the start-up (EEPROM failure) ?	Yes	Restart the device	----
Error at each start-up?	Yes	Return the device	6.8
Display after validation of the menu (EEPROM failure)	Yes	Configure the device again	4.4
Failure at each validation of the menu?	Yes	Return the device	6.8
Display within the Teach-In mode ?	Yes	Perform the Teach-In again	4.4.4.3
Display ' ---- °C'			
Temperature of the fluid between -40 and 120 °C?	No	Device out of range	----
Black connector connected (Open the transmitter)	No	Connect the black connector again	3.3
Display '---- mS'			
Black connector connected (Open the transmitter)	No	Connect the black connector again	3.3
Display always '00.00 mS'			
Sensor coefficient = 0?	Yes	Configure sensor coefficient	4.4.3
Coaxial cable connected (brown)	No	Reconnect the cable	----

MAINTENANCE

Faults	Status	Actions	
Blinking display of the conductivity : '2,000 S'			
Conductivity > 2 S/cm?	Yes	Device out of range	---
Blinking unit	Yes	Turn off the hold option	4.3
Conductivity measurement incorrect			
Ensure the sensor finger is clean	No	Clean the sensor finger	5.1
Air conductivity < 10µS/cm (zero drift) ?	No	Perform a calibration within the air	4.5.4
Temperature compensation value OK ?	No	Select a correct temperature compensation value	4.4.4
Sensor coefficient OK ?	No	Enter the coefficient	4.4.4
Current output of 22 mA			
Fluid temperature between -40 and 120 °C ?	No	Device out of range	---
Conductivity > 2 S/cm ?	Yes	Device out of range	---
Display message ' ERROR' ?	Yes	Indicates loss of data - reprogramme the unit.	4.4
Current output value zero or different from the display			
SW300 correctly set (sinking or sourcing) ?	No	Modify SW300	3.3.2
Connection of the current output OK ?	No	Connect current output	3.3
Failure < 1 mA ?	Yes	Set the offset and span	4.5
Fixed current output value (4 or 20 mA)			
Parameters for current output OK ?	No	Program the current output	4.4.5
Conductivity or temperature value out of range	Yes	Program the current output	4.4.5
The devices connected to the relays do not work			
Parameter relays OK (threshold, inversion and delays) ?	No	Program the relay output again	4.4.6
Conductivity or temperature out of the threshold range?	Yes	Program the relay output again	4.4.6
Relays correctly connected ?	No	Connect relays	3.3.3
Connection of relays 1 and 2 inverted ?	Yes	Connect relays accordingly	3.3.3
Protection fuses for the relays OK (if any) ?	No	Change the fuses	3.3
Relay switches ON (if any) ?	No	Relay switches 'ON'	---

SPECIFICATIONS

6.1 SPECIFICATIONS

Specifications in relation to the process

Conductivity measurement

Measurement type	Inductive conductivity measurement
Measuring range	0...2 S/cm (minimum)
Accuracy	+ / - 2% of the measured value from 100µS...2S/cm
Temperature drift	0.1 % / °C (maximum)
Response time	< 1 s

Temperature measurement

Measurement type	Numeric measurement
Measuring range	- 40...120 °C
Accuracy	+ / - 0.5°C from 0...110°C and + / - 1°C from - 40°C...0°C and 110°C...120°C

Piping installation

Pipes	Stainless steel, brass or plastic (PVDF, PP and PVC)
Connection	Solvent/fusion spigots, threaded ports (G, NPT,Rc), buttwelding ends, flange, Tri-clamp - See instruction manual S020 - Ident. No. 429633
Pressure rating	PN 6
Fluid temperature	0...120°C
Material contacting the fluid:	Sensor body : PVDF or PEEK Seals : EPDM or FPM

Specification in relation to the control outputs

Electrical connection

Power supply	12...30 VDC regulated +/- 5% 115/230 VAC
Consumption	250mA (maximum)

Proportional output

Output type	Current output from 4...20 mA (error signal 22 mA)
Accuracy	+ / - 1%
Wiring	Sinking or sourcing mode
Maximum load	1000 Ω at 30VDC 800 Ω at 24VDC 450 Ω at 15VDC 330 Ω at 12VDC
Adjustment	Selectable software measuring range (4... 20mA) for conductivity or temperature measuremnet 22mA if the signal is out of the measuring range (Conductivity > 2S or T < - 40, T > 120°C)
Output calibration	Software: offset (4mA) and span (20mA) adjustable

Relay output

Output type	Normally open relays
Load	DC: 75V = ; 3A AC: 48V ≅ ; 3A -
Life expectancy	100 000 cycles (minimum)
Thresholds	Hysteresis programmable according to the temperature or conductivity.
Switching delay	Programmable from 0...180 s

SPECIFICATIONS

Specifications in relation to the user

User's interface

Display	8 digits alphanumeric LCD 9mm high
Conductivity units	µS/cm without decimal point mS/cm with 4 positions for the decimal point S/cm with 3 positions for the decimal point
Resistance units	Ω and kΩ with 4 positions for the decimal point
Temperature units	Temperature °C of °F with 1 decimal point
Display :	
Current output	Generated current indication : 'xx.xx mA'
Relay state	Red LED's on when the contact is closed
Programming	Menus with 3 programming keys
Protection	Lockable switch for the 'Enter' key

Processing

Assistance for commissioning		Simulation of the conductivity or temperature to check the correct running of the installation
Filtering of the conductivity		10 levels of filtering (Filter 0...9)
Temperature adjustment		+ / - 5°C maximum, programmable
Temperature conpensation		Reference of 25°C
Type of compensation :	Linear:	(from 0.00...9.99% / °C)
	Automatic:	Sodium chloride (NaCl) from 0.05...270g/ l from 0...80°C Nitric acid (HNO3) dosing 1% from 10...80°C Sodium hydroxyde (NaOH) dosing 1% form 10...80°C Sulfuric acid (H2SO3) dosing 20% from 5...55°C
	Teach-In:	Teach-In of the variations from the conductivity according to T°C splitting the variations curve into 5 linear segments
Maintenance		HOLD function to maintain the output signals

Specifications in relation to the environment

Ambient conditions

Storing temperature	0...60°C (32...140°F)
Storing humidity	Maximum of 80%
Operating temperature	0...60°C (32...140°F)
Operating humidity	Maximum of 80%
Enclosure rating	IP65

Construction

Dimensions maximum	188 x 88 x 126mm (PVDF sensor) 190 x 88 x 126mm (PEEK sensor)
Weight	550 g (maximum)

Materials in contact with the environment

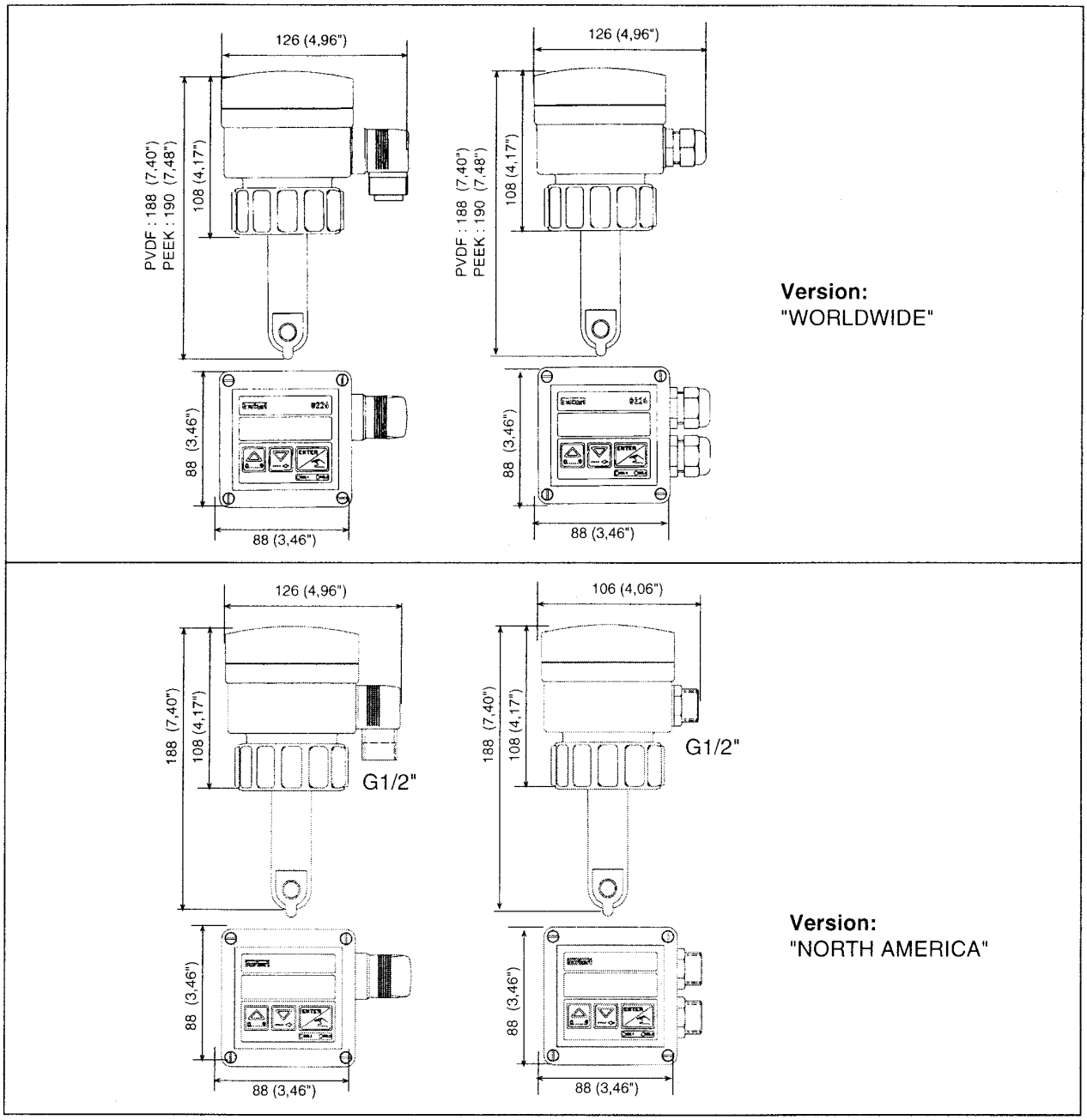
Electronic housing	PC 20% glass reinforced fibre (if PVDF sensor) PPA 33% glass reinforced fibre (if PEEK sensor)
Front plate	Polyester

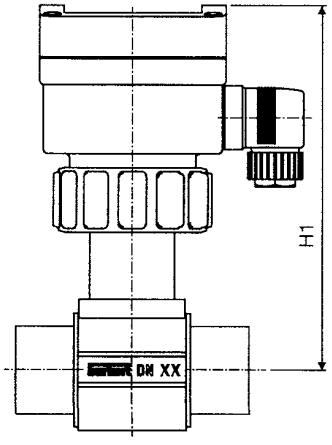
Conformity to standards

Emission	According to generic norm EN 50081.1
Immunity	According to generic norm EN 50082.2 Output current accuracy +/- 2% according to Test ENV 50145 (only valid for 115/230 VAC with relay)
Safety	According to safety regulations for measuring instruments for regulation and laboratory NF EN 61010-1

INFORMATION

6.2 DIMENSIONS - (IN MM)





Variable dimensions (in mm)

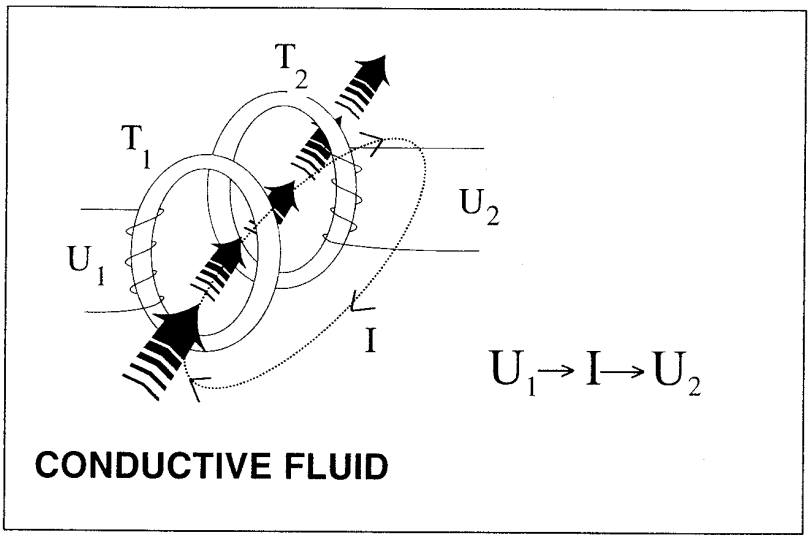
DN	H1
15	177
20	177
25	177
32	177
40	178
50	184

INFORMATION

6.3 MEASURING PRINCIPLE

Conductivity is the ability of a liquid / solution to conduct an electrical current. To measure the conductivity of a solution the 8226 conductivity transmitter uses the following principle:

- A voltage is connected to the primary magnetic coil.
- The magnetic field induced generates a current in the secondary magnetic coil.
- The intensity of the current is a direct function of the conductivity of the solution between the 2 magnetic coils.



6.4 STANDARD DELIVERY

From a standard delivery you should of recieved the following:

- 1 8226 Inductive Conductivity Transmitter
- 1 Instruction Manual (3 languages)

(If the transmitter has 1 or 2 Pg13.5 connections you should additionally recieve 1 or 2 multiway seals depending on the version).

ANNEX

6.5 TYPE SPECIFICATION

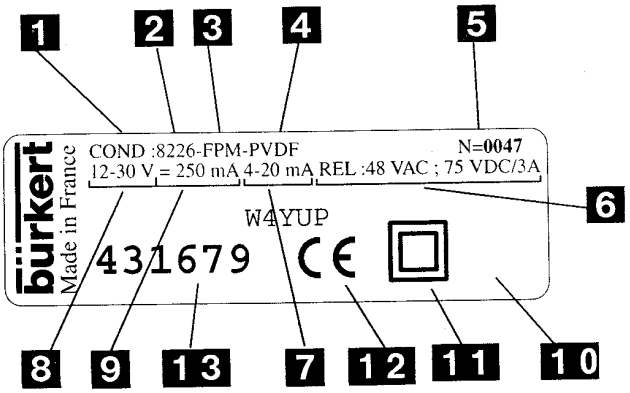
Inductive Type 8226 Conductivity Transmitter
Worldwide types
4-20 mA output

Power supply	Relays	Gasket	Connection	Ident N°
12...30 VDC	No	FPM	DIN 43650	**431673**
12...30 VDC	No	EPDM	DIN 43650	**431675**
12...30 VDC	No	FPM	1x PG 13,5	**431674**
12...30 VDC	No	EPDM	1x PG 13,5	**431676**
12...30 VDC	2	FPM	2 x PG 13,5	**431679**
12...30 VDC	2	EPDM	2 x PG 13,5	**431680**
115/230 VAC	No	FPM	2x PG 13,5	**431677**
115/230 VAC	No	EPDM	2x PG 13,5	**431678**
115/230 VAC	2	FPM	2x PG 13,5	**431681**
115/230 VAC	2	EPDM	2x PG 13,5	**431682**

Inductive Conductivity Transmitter Type 8226
North America types; G 1/2" connection
4-20 mA output

Power supply	Relays	Gasket	Connection	Ident N°
12...30 VDC	No	FPM	1 x G1/2"	**431683**
12...30 VDC	No	EPDM	1 x G1/2"	**431684**
12...30 VDC	2	FPM	2 x G1/2"	**431687**
12...30 VDC	2	EPDM	2 x G1/2"	**431688**
115/230 VAC	No	FPM	2 x G1/2"	**431685**
115/230 VAC	No	EPDM	2 x G1/2"	**431686**
115/230 VAC	2	FPM	2 x G1/2"	**431689**
115/230 VAC	2	EPDM	2 x G1/2"	**431690**

6.6 LABEL TYPE 8226



1	Conductivity
2	Type
3	Seal material
4	Sensor material
5	Serial number
6	Relay caracteristics
7	Output current
8	Power supply
9	Power/current consumption
10	(Factory internal N°)
11	Protection rating
12	CE mark
13	Ident. No.

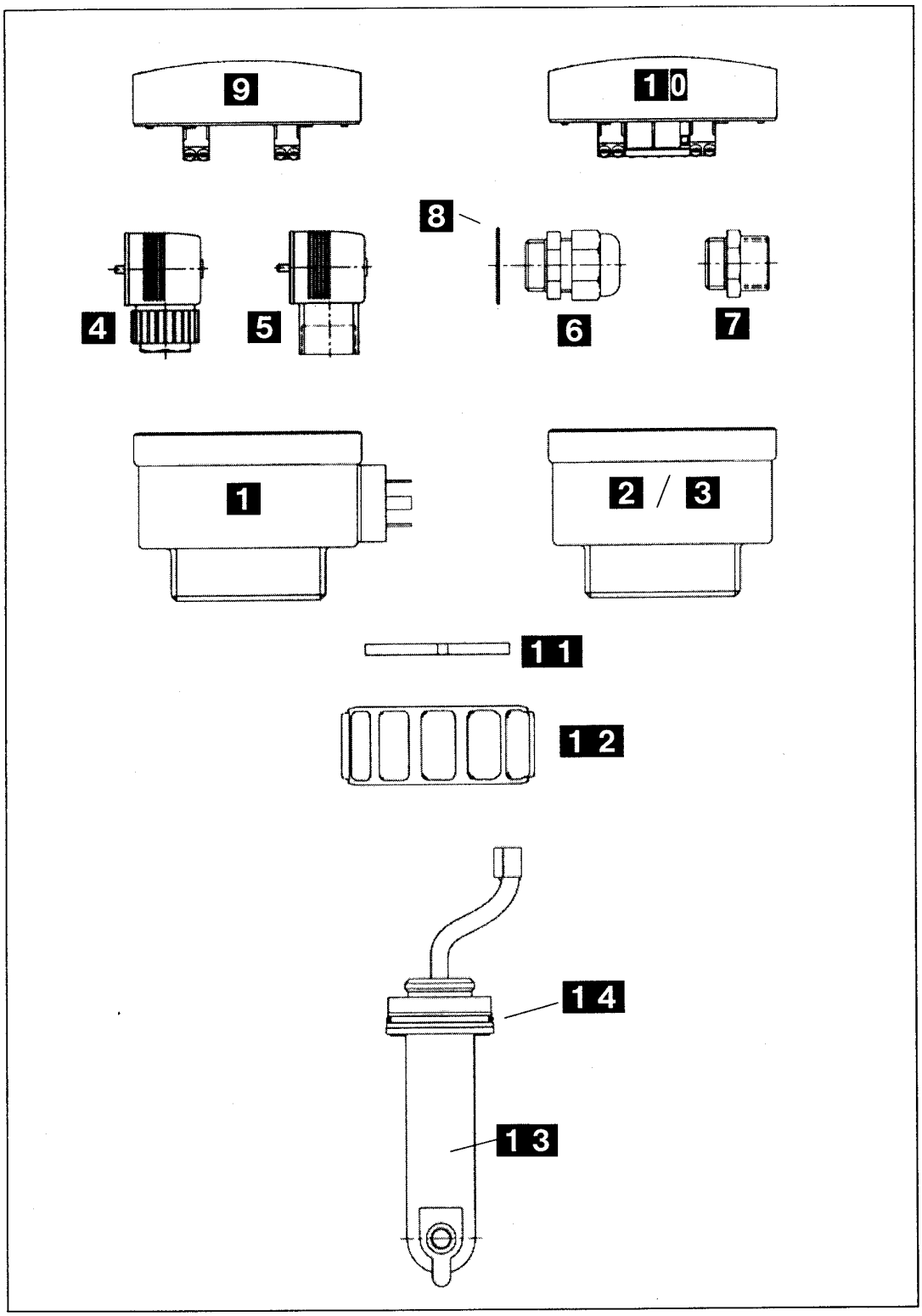
ANNEX

6.7 SPARE PARTS LIST

Position	Specifications	Ident. No.
1	PC sensor housing with cable plug DIN43650 PPA sensor housing with cable plug DIN43650	432753 440386
2	PC sensor housing with ring, and 1 PG13.5 PPA sensor housing with ring, and 1 PG13.5	427252 440387
3	PC sensor housing with ring, and 2 PG13.5 PPA sensor housing with ring, and 2 PG13.5	433446 440388
4 5 6 7	Cable plug (standard) Cable plug USA-version PG 13,5 standard version PG 13,5 USA-version (G 1/2 ")	424205 424206 418339 418340
8	NBR Gasket PG13.5	415719
9 10	PC cover with screws, sheeting and printed circuit board Transmitter without relays PPA cover with screws, sheeting and printed circuit board Transmitter without relays PC cover with screws, sheeting and printed circuit board Transmitter with relays PPA cover with screws, sheeting and printed circuit board Transmitter with relays	431691 440452 431692 440453
11	Ring	619205
12	PC Union nut PPA Union nut	619204 440229
13	Inductive conductivity sensor with a PVDF sensor Inductive conductivity sensor with a PEEK sensor	427139 440230
14	FPM seal kit EPDM seal kit	425554 425555
15	Instruction manual in 3 languages (D, GB, F)	428979

For easy identification of the spare parts an exploded diagram is provided on the next page.

ANNEX



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Fax +1 320 584 58 71

bürkert

Easy Fluid Control Systems

CE

428979-Ind*1/Jun00

IDS IMPRESSION - SÉLESTAT

Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000080
Quant.	: 1,000 ST	Page	: 000293/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

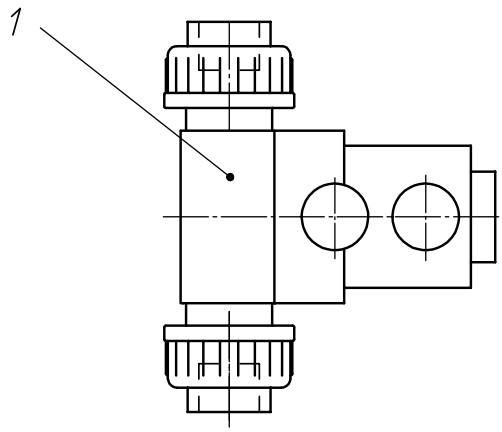
Pos.	Part N° / Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

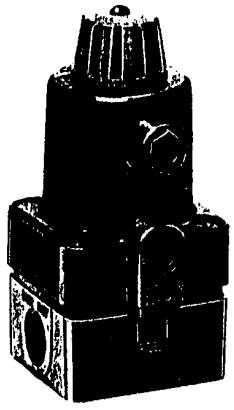
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

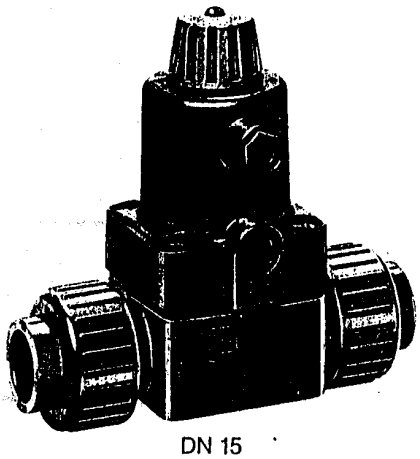
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

GEMÜ®

Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

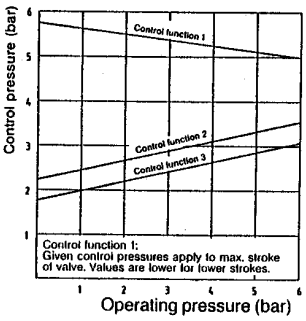
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

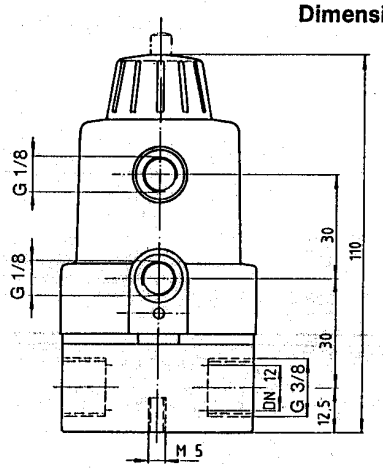
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

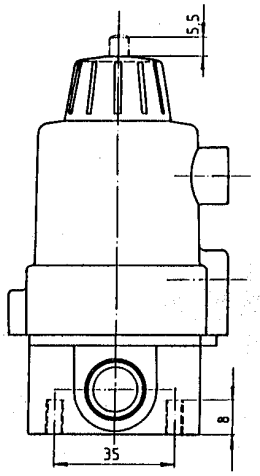
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

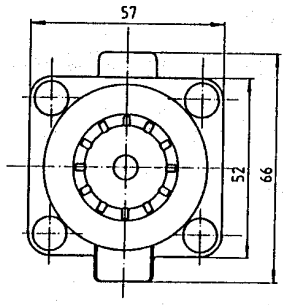
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



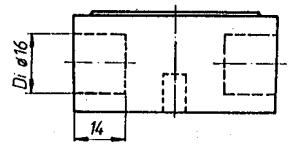
Dimensions



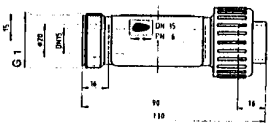




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

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Presented by:

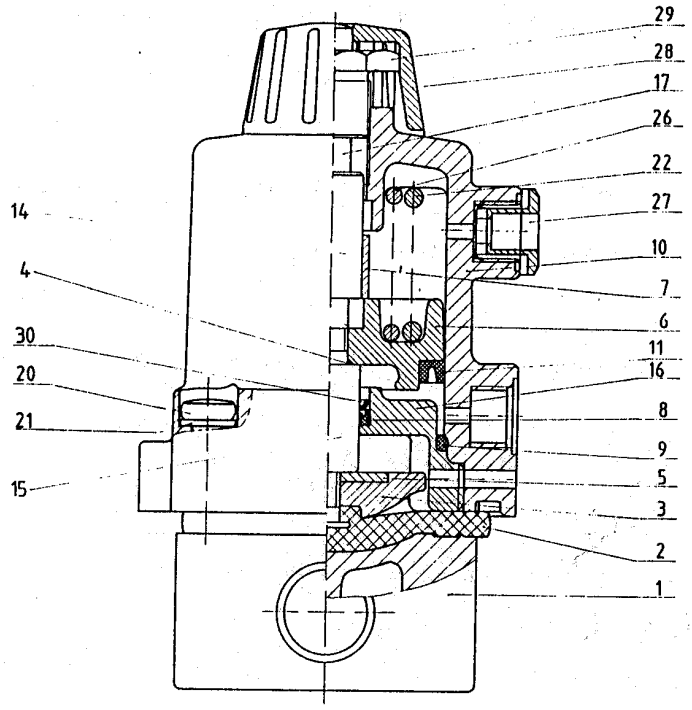
Printed in West Germany – Oha-Druck GmbH, Ingelfingen

GEMÜ®

Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000080
Quant.	: 1,000 ST	Page	: 000294/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

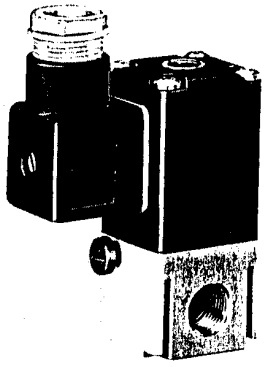
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

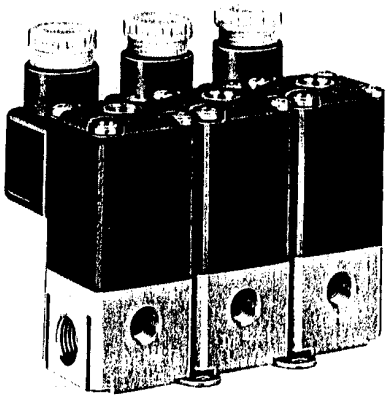
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

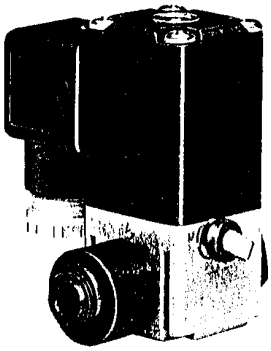
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

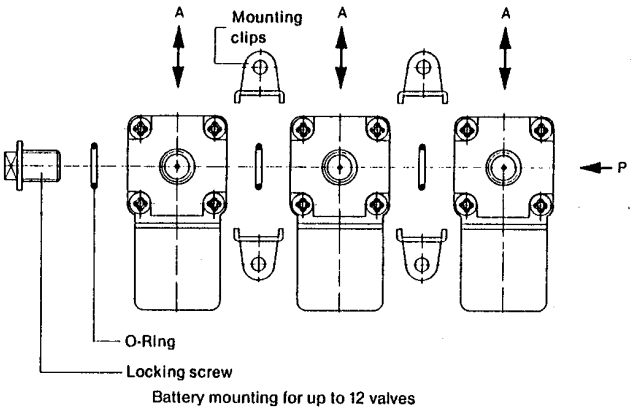


Type 322



Type 324

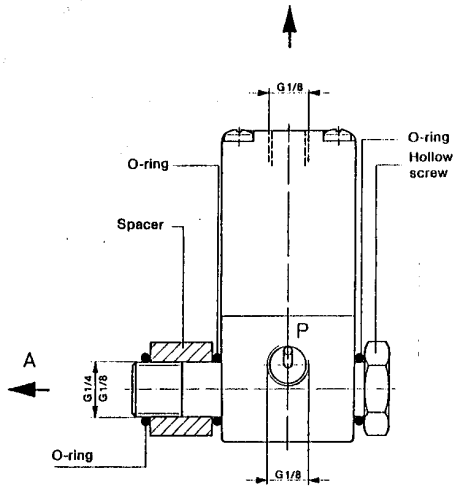
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

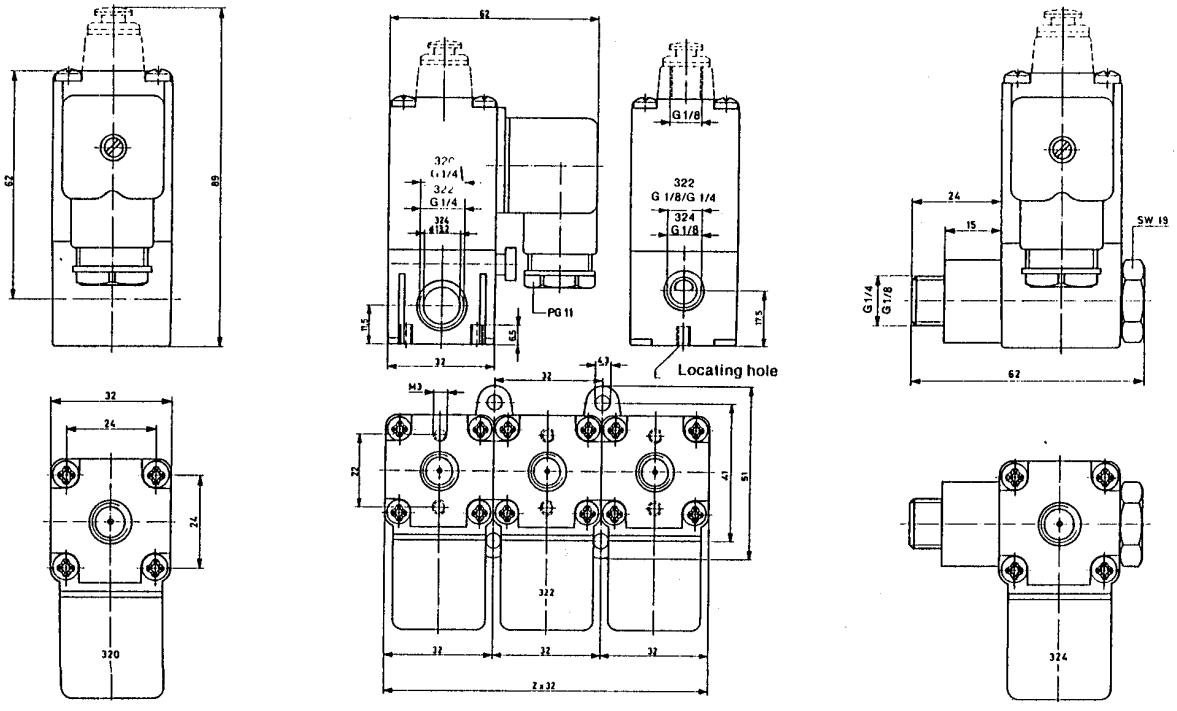
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

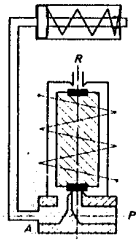
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

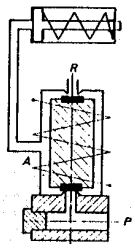
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

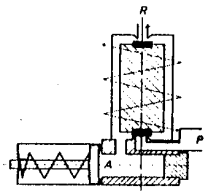
Control function normally closed



Type 320

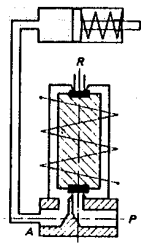


Type 322

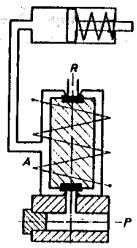


Type 324

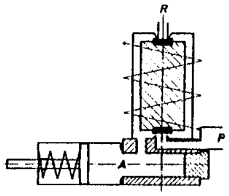
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

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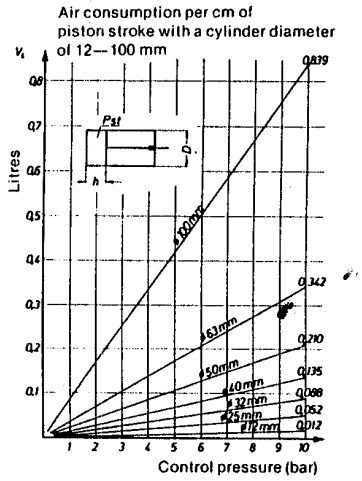
Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

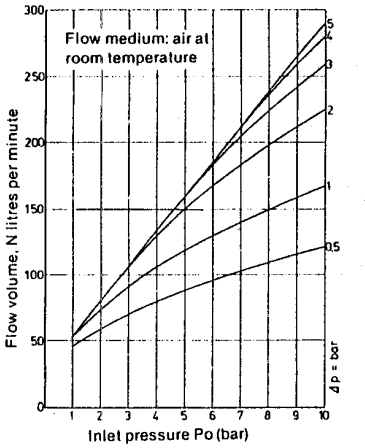
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

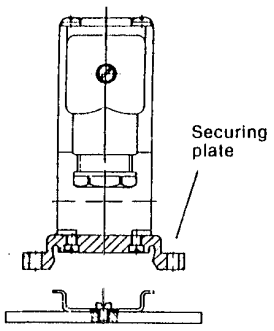
The flow quantity for other gases and temperatures can be calculated according to the following formula:

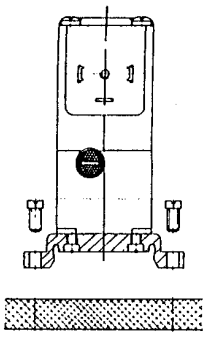
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 25-05-377-07	Commiss.	: 25-05-377
Label	: M07, Cascade-Rinse - KSM 3 PVC/SS	Position	: 000090
Quant.	: 1,000 ST	Page	: 000295/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.KSM3.21.0L CONTAINER[520]KSM3/PVC/VA/GD+B	1,000	ST	
	16.05.KS00.42.0A INLET/2AS/PVC/DIRT CATCHER D=40	3,000	ST	
1	16.005.0008.2H1B SPRAYPIPE/PVC-D/ 650/ 6D/F/G/ 8,04L/MIN	4,000	ST	X
2	16.005.0206.2A4A BLAST PIPE CPL./0650/H80/BJ	2,000	ST	X
	16.008.0004.U001 PUMP FIXING/VA/PP-G/EPDM	3,000	ST	
	50.003.0008.U000 TA/AS/0.37kW/OF/ET=270/ETLB-25-125	3,000	ST	
	16.004.0126.U23L CONVEYOR/ST/23/PVC/VA/KL-KU/d=27	1,000	ST	
	VS-25-05-377-07 CONVEYOR/KSM [K] 3/650/PVC/VA	1,000	ST	
	16.005.0086.U00A INLET/PVC/DFM640/GK-MIN/MV/D=20	1,000	ST	

Assembly	: 16.02.KSM3.21.0L	Commiss.	: 25-05-377
Label	: CONTAINER[520]KSM3/PVC/VA/GD+B	Position	: 000090
Quant.	: 1,000 ST	Page	: 000296/01
Drawing	: 16.02.FA01E02.00	Date	: 10.04.2006

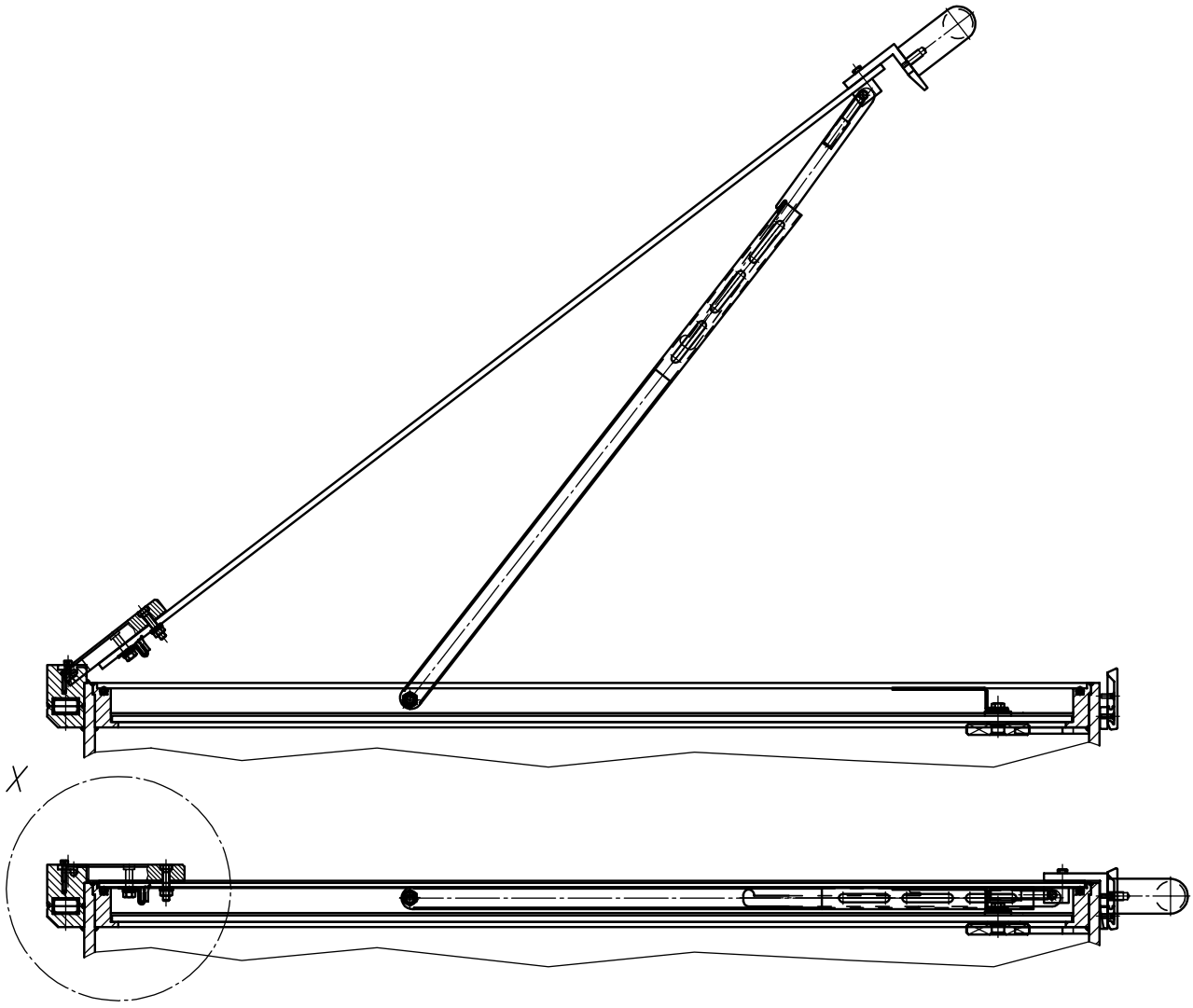
Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0143.U232 GLASS COVER[520]/23/PVC/V4/BOHR	1,000	ST	
1	16.002.0508.0760 PROFILE/"VITON B"	,815	M	X
	16.07.KSM3.02.0A DRAIN/PVC/KSM5/D=50	1,000	ST	
	16.012.0003.U23A CABLE CHANNEL/CPL./023/PVC/BS	1,000	ST	

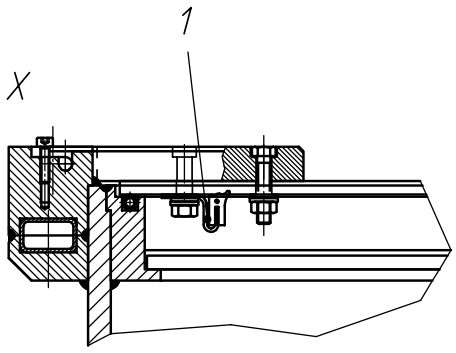
Parts without Pos.-N° see assembly parts list

Ersatzteilliste BEHÄLTER U. VERKLEI.

Spare parts list Housing with accessories

16.02.FA01E02.00 | 11/02





Assembly	: 16.002.0143.U232	Commiss.	: 25-05-377
Label	: GLASS COVER[520]/23/PVC/V4/BOHR	Position	: 000090
Quant.	: 1,000 ST	Page	: 000297/01
Drawing	: 16.002.0141EU000	Date	: 10.04.2006

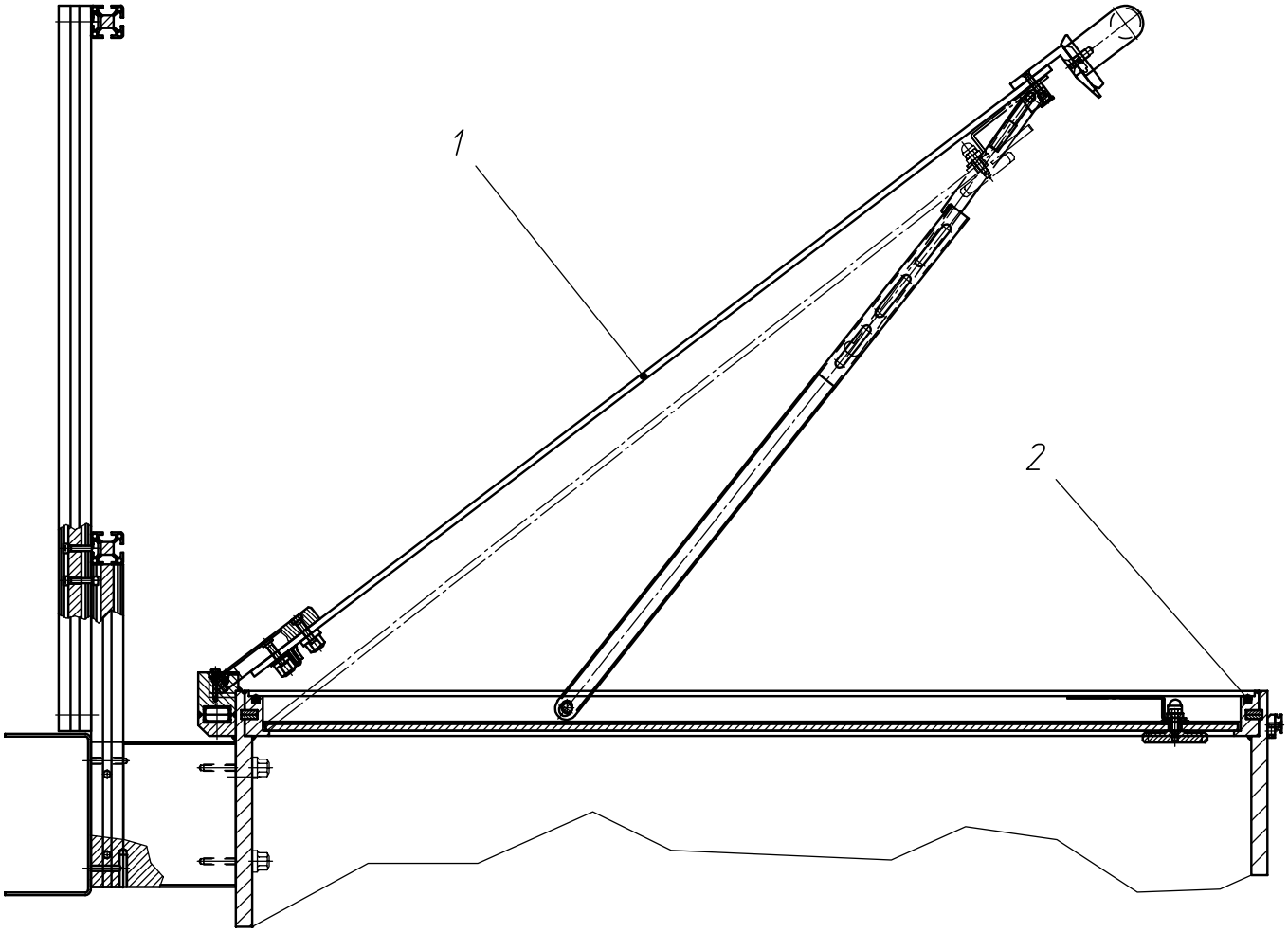
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0666.2230 GLASS COVER/23/0650/0843x0932x06	1,000	ST	X
	16.002.0142.U002 COVER PARTS/PVC/V4A	1,000	ST	
2	16.002.1178.2230 GLASS COVER SEALING/A/23/0650/EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list GLASS COVER

16.002.0141EU000	11
	00



Assembly	: 16.002.0142.U002	Commiss.	: 25-05-377
Label	: COVER PARTS/PVC/V4A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000298/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

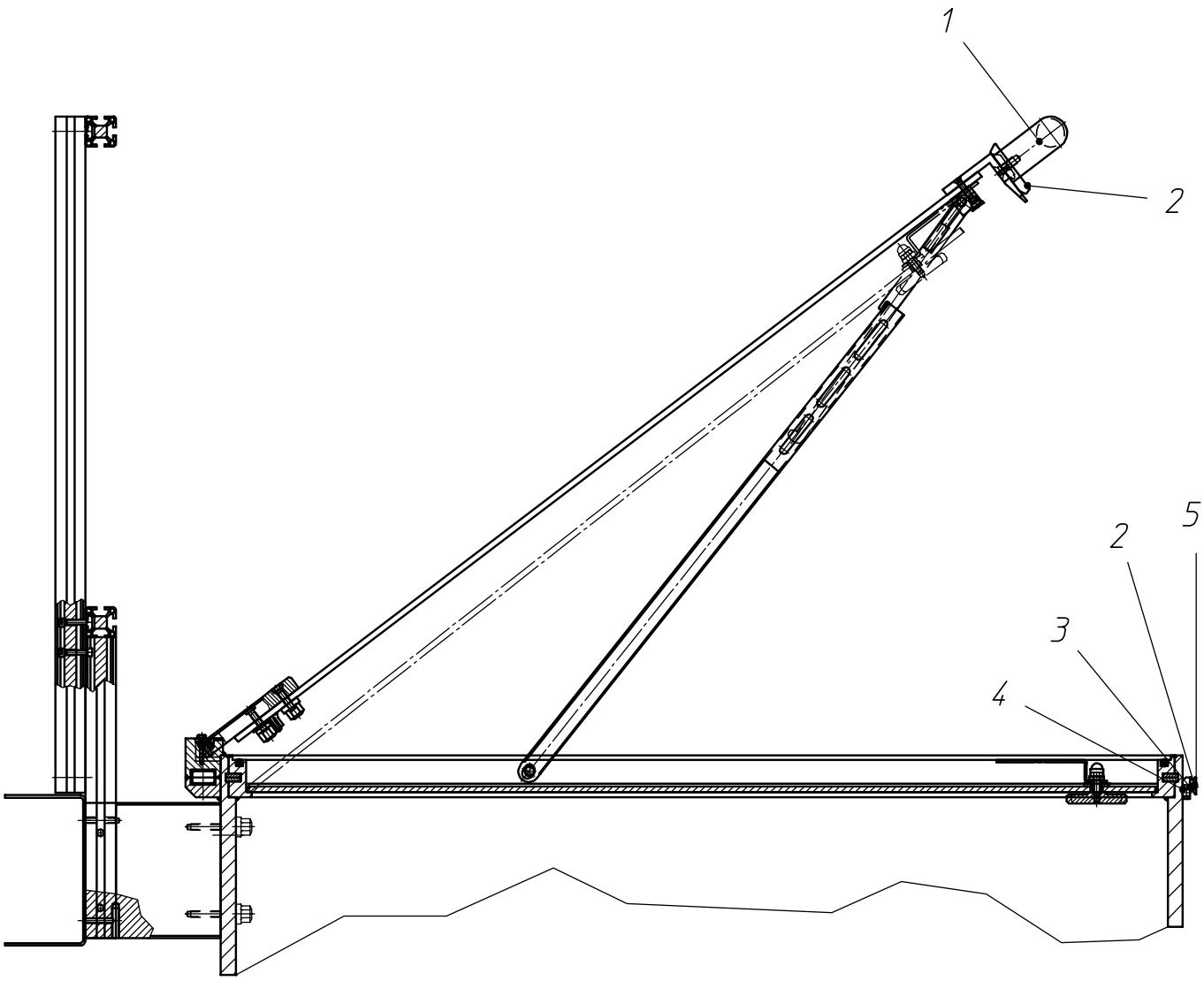
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	DICH0700-6 SEALING RING M6/POLYPROPYLEN GREY	4,000	ST	X
3	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
4	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
5	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
HAMLIN

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59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

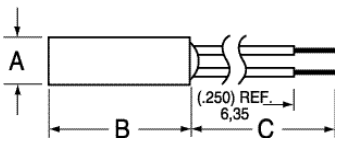
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

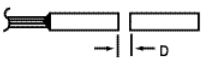
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

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Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000090
Quant.	: 1,000 ST	Page	: 000299/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

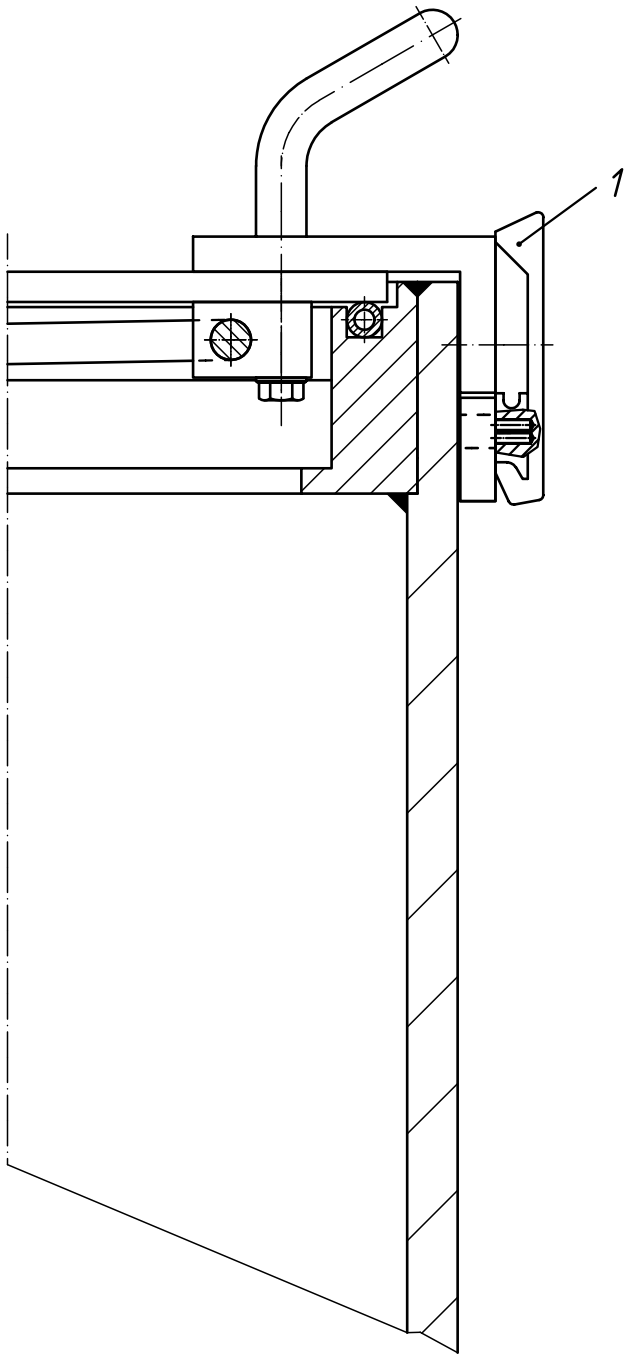
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.07.KSM3.02.0A	Commiss.	: 25-05-377
Label	: DRAIN/PVC/KSM5/D=50	Position	: 000090
Quant.	: 1,000 ST	Page	: 000300/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	FK-101508001-050 BALL VALVE-PVC/EPDM/101/PVC/EPDM /D=50	3,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.012.0003.U23A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./023/PVC/BS	Position	: 000090
Quant.	: 1,000 ST	Page	: 000301/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

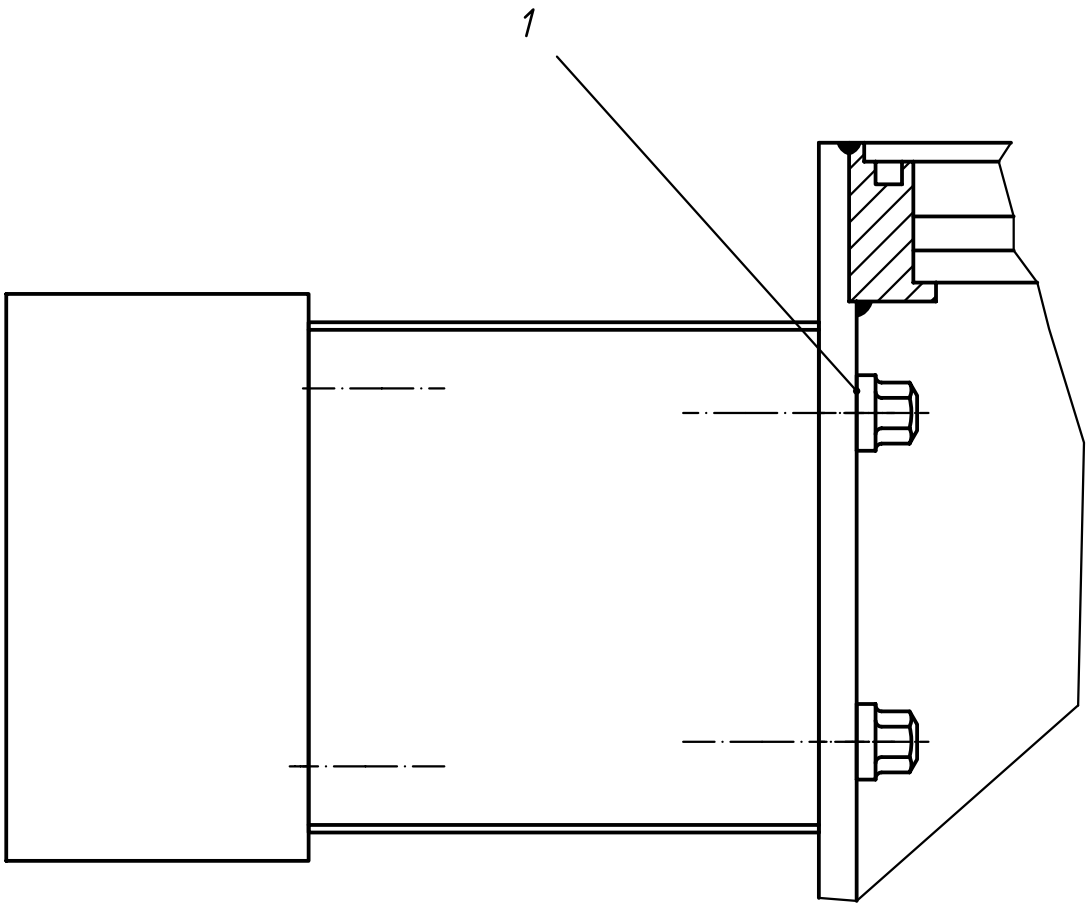
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	8,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00



Assembly	: 16.05.KS00.42.0A	Commiss.	: 25-05-377
Label	: INLET/2AS/PVC/DIRT CATCHER D=40	Position	: 000090
Quant.	: 3,000 ST	Page	: 000302/01
Drawing	: 16.05.KS00E00.00	Date	: 10.04.2006

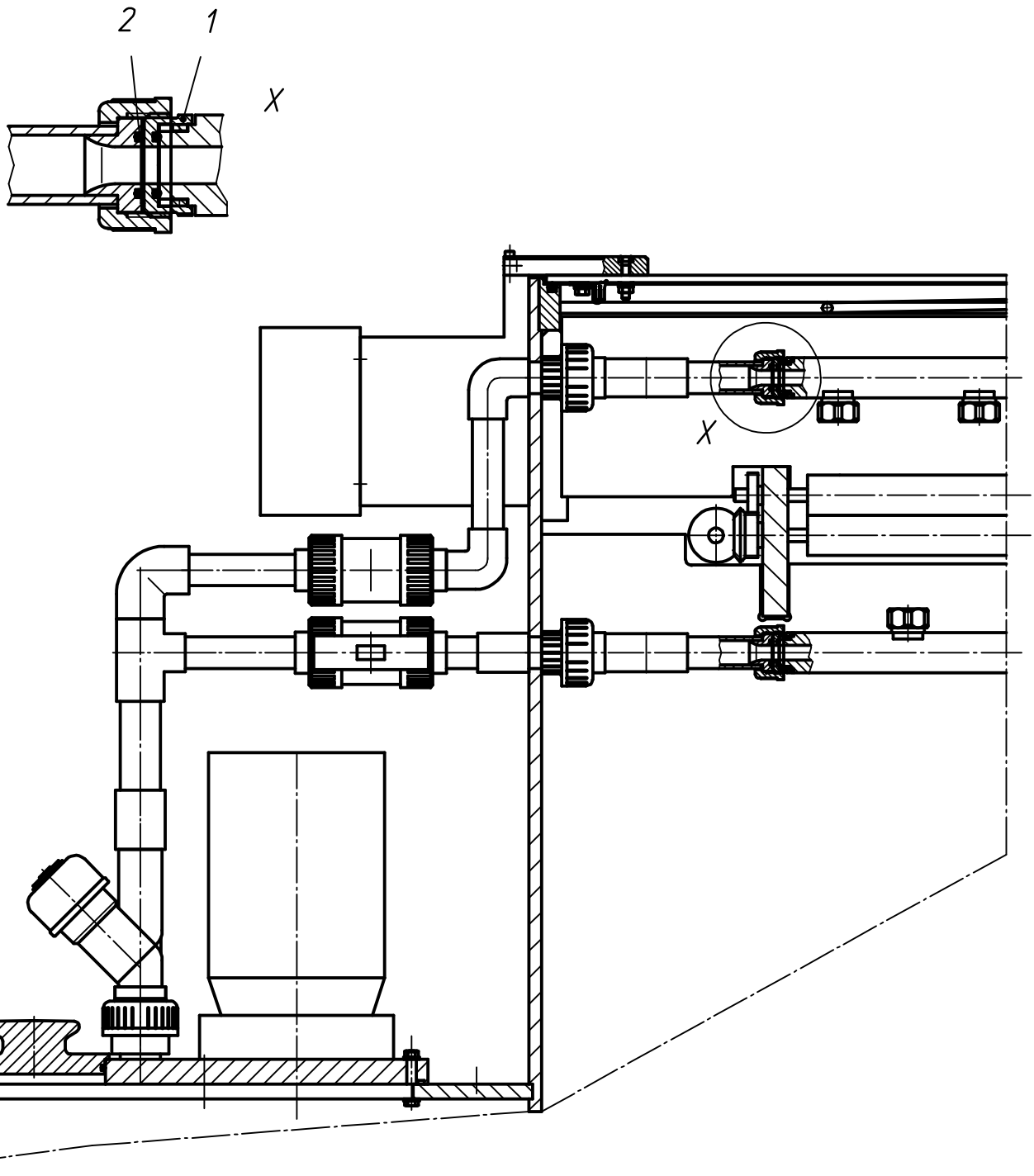
Pos.	Part N° / Label	Quant.	Unit	SP
	16.005.0091.U80A INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	1,000	ST	
1	03.005.0460.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ZULAUF KSM-KAMMER

Spare parts list INFLOW

16.05.KS00E00.00 | 11/01



Assembly	: 16.005.0091.U80A	Commiss.	: 25-05-377
Label	: INLET/KSM CHAMBER/PVC/EP/DIRT CAT. D=40	Position	: 000090
Quant.	: 1,000 ST	Page	: 000303/01
Drawing	: 16.005.0091EU000	Date	: 10.04.2006

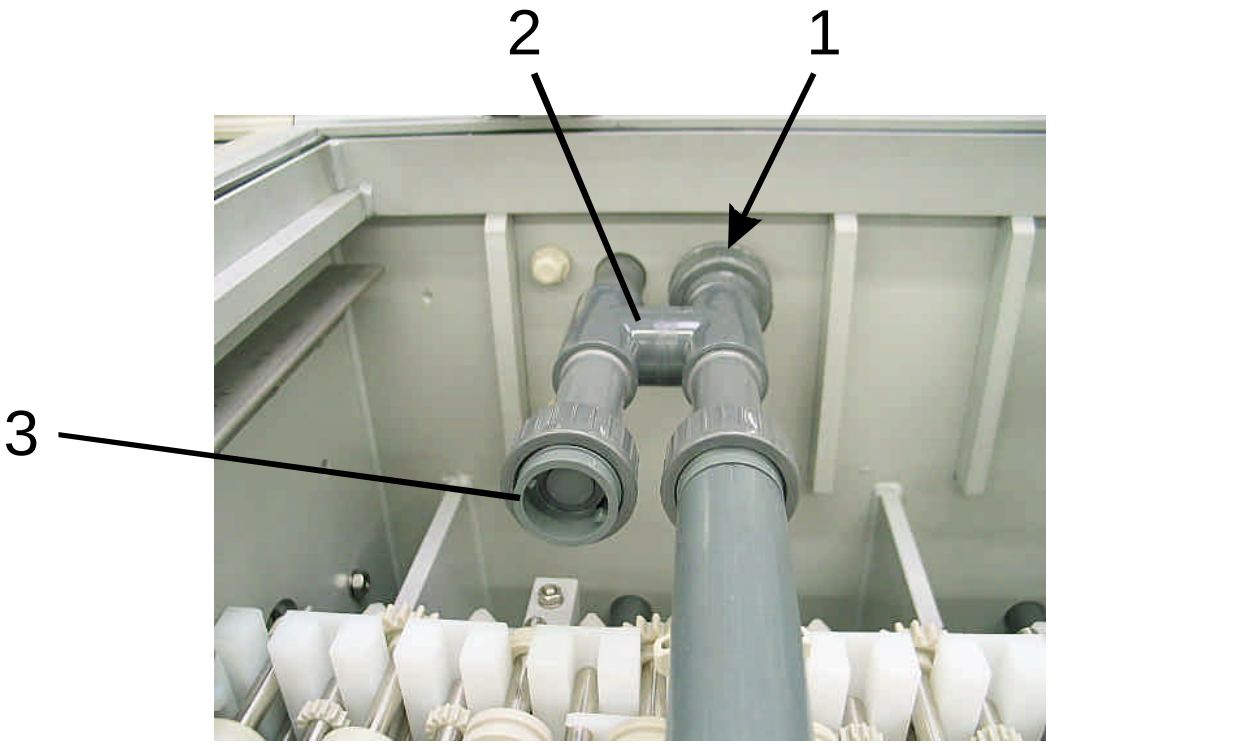
Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-216 O-RING/EPDM/BLACK/028.17x3.53	2,000	ST	X
2	16.005.0017.000B SPRAY FRAME/A=50/KSM/BJ	2,000	ST	X
3	03.005.0675.000B SCREWING-IN PART/PVC-DG/RA=7.5°/d=00	4,000	ST	X
4	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
5	DICH0580-219 O-RING/EPDM/BLACK/032.92x3.53	1,000	ST	X
6	161.305.488-40 STRAINER PIPE D=40 L=0.8/NR.161.305.488	1,000	ST	X

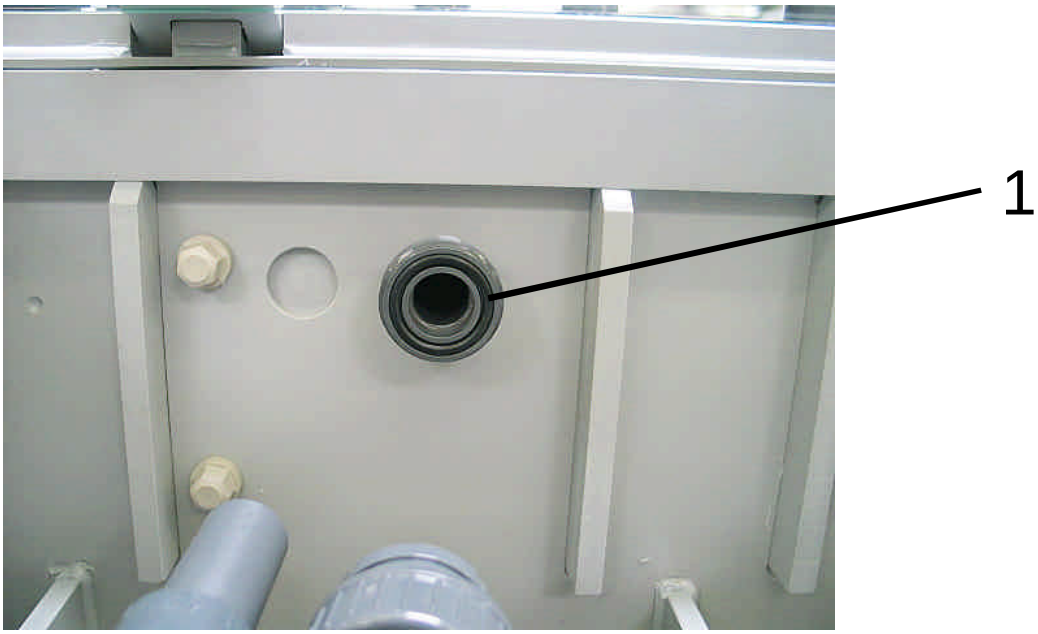
Parts without Pos.-N° see assembly parts list

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000	1/2
	00

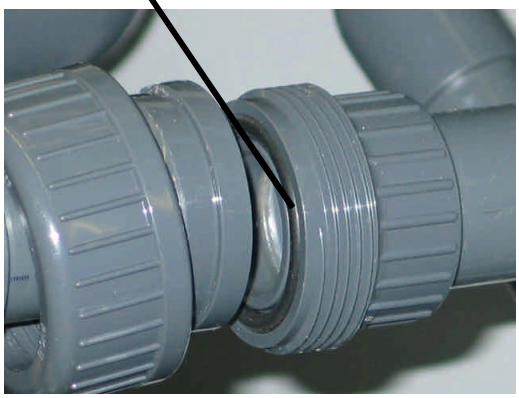


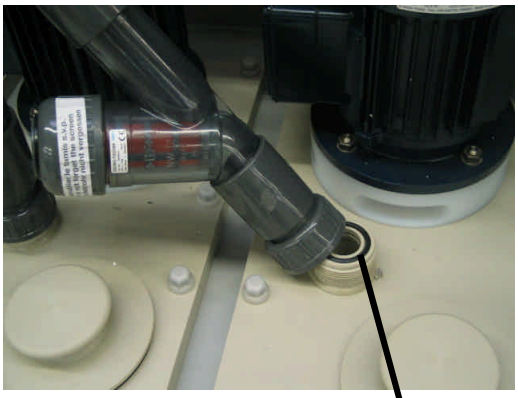


Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0091EU000 2/2 00





Assembly	: 16.005.0017.000B	Commiss.	: 25-05-377
Label	: SPRAY FRAME/A=50/KSM/BJ	Position	: 000090
Quant.	: 2,000 ST	Page	: 000304/01
Drawing	: 16.005.0017E0000	Date	: 10.04.2006

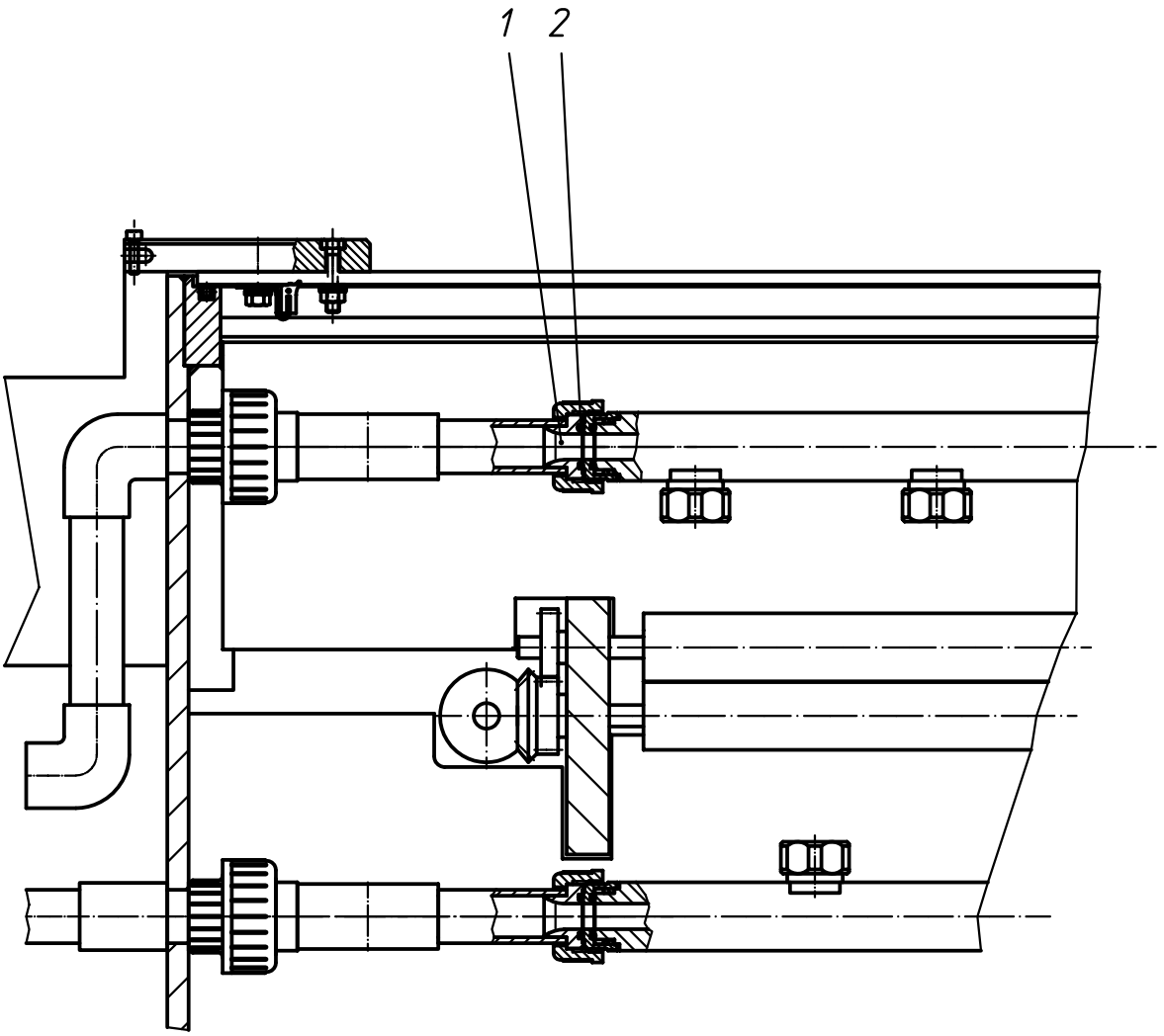
Pos.	Part N° Label	Quant.	Unit	SP
1	03.005.0459.000B INSERT PART/PVC-DG/RA=7.5°/d=12	2,000	ST	X
2	DICH0580-114 O-RING/EPDM/BLACK/015.54x2.62	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENSTOCK

Spare parts list SPRAY FRAME

16.005.0017E0000	11
	00



Assembly	: 16.005.0008.2H1B	Commiss.	: 25-05-377
Label	: SPRAYPIPE/PVC-D/ 650/ 6D/F/G/ 8,04L/MIN	Position	: 000090
Quant.	: 4,000 ST	Page	: 000305/01
Drawing	: 16.005.0008E0000	Date	: 10.04.2006

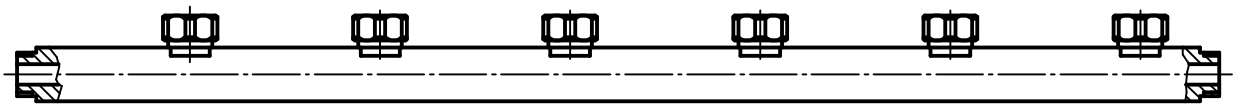
Pos.	Part N° Label	Quant.	Unit	SP
1	ZB-000000166-000 SEAL-NUT/PPNR.065.202.53.00.001	6,000	ST	X
2	DÜ-000000071-000 NOZZLE/652.516.5EFU1/BJ/PVDF/90°	6,000	ST	X
3	DI-000000133-000 SEALING RING EPDM/18,4x10x3 MM	6,000	ST	X

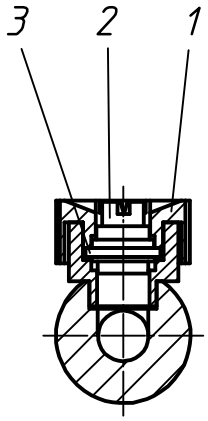
Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPRÜHROHR KPL.

Spare parts list SPRAY PIPE CPL.

16.005.0008E0000	11
	01





Assembly	: 16.005.0206.2A4A	Commiss.	: 25-05-377
Label	: BLAST PIPE CPL./0650/H80/BJ	Position	: 000090
Quant.	: 2,000 ST	Page	: 000306/01
Drawing	: 16.005.0030E0000	Date	: 10.04.2006

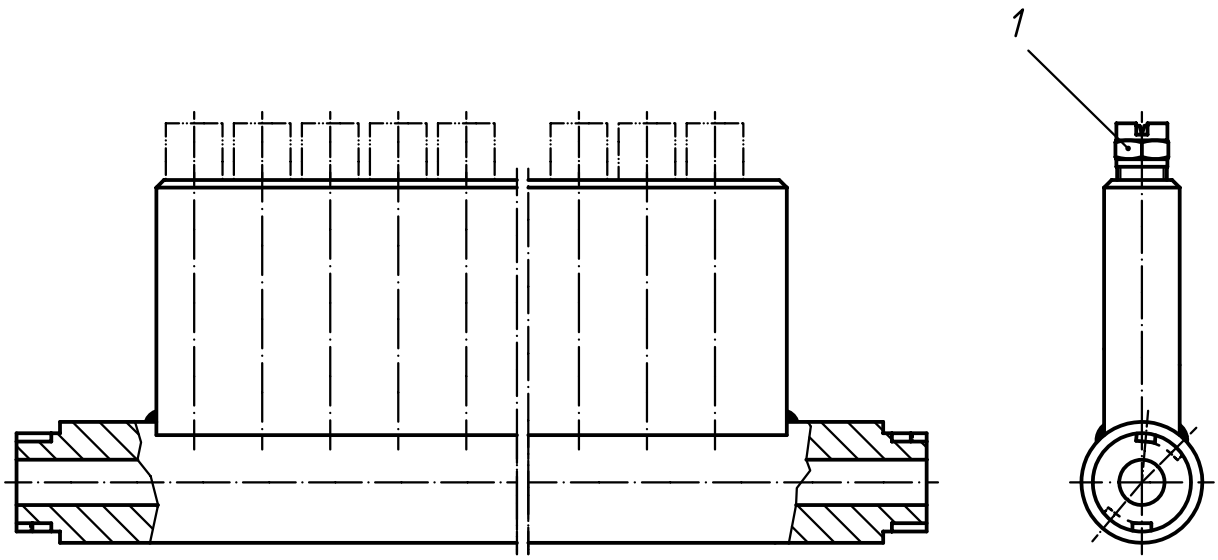
Pos.	Part N° / Label	Quant.	Unit	SP
1	DÜ-000000004-000 NOZZLE/632.516.5E.BC/1/4"/NPT/PVDF/90°	17,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DÜSENROHR KPL.

Spare parts list Blast pipe cpl.

16.005.0030E0000	11
	02



Assembly	: 16.008.0004.U001	Commiss.	: 25-05-377
Label	: PUMP FIXING/VA/PP-G/EPDM	Position	: 000090
Quant.	: 3,000 ST	Page	: 000307/01
Drawing	: 16.008.0004EU000	Date	: 10.04.2006

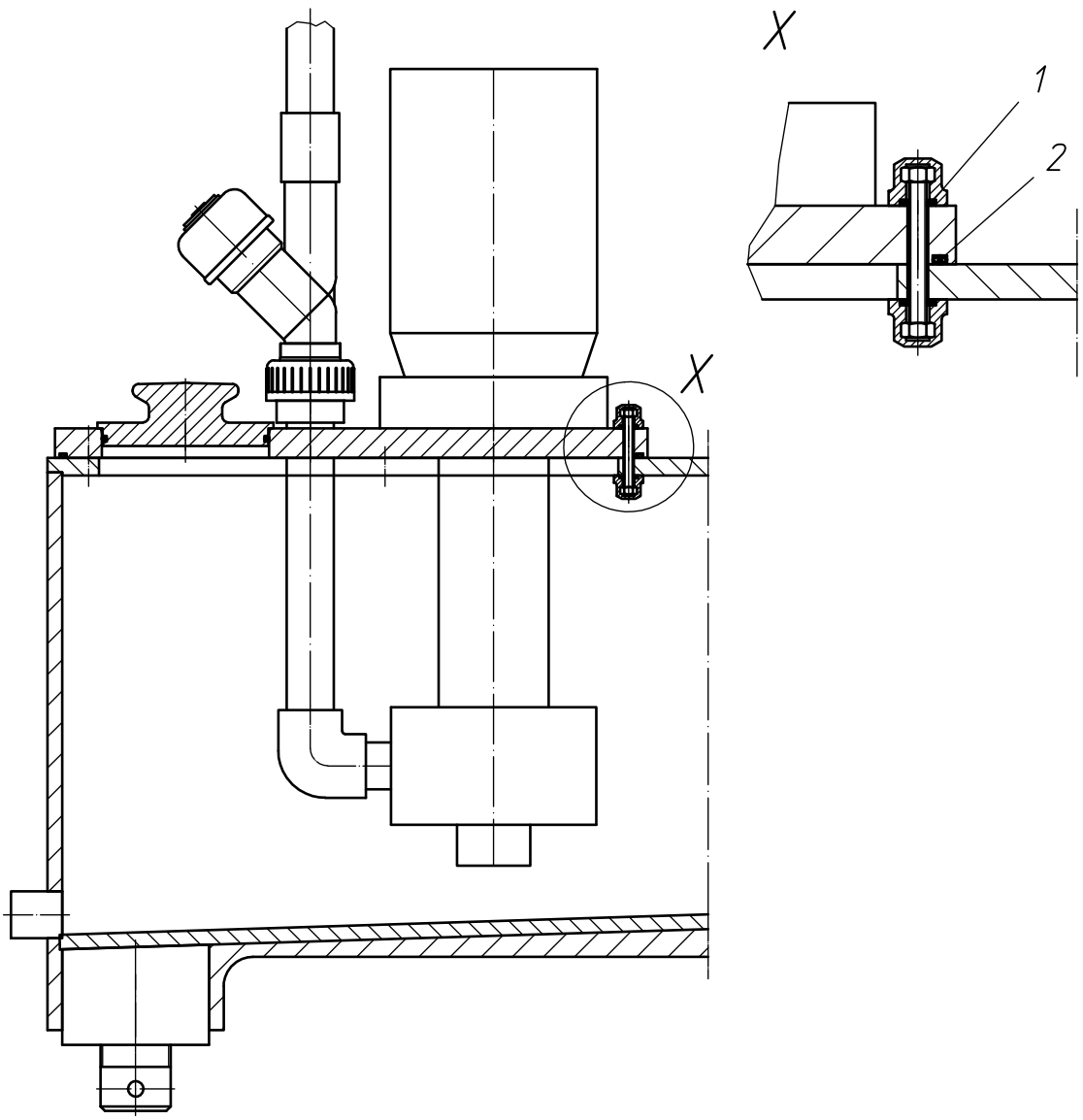
Pos.	Part N° Label	Quant.	Unit	SP
1	DI-000000076-000 O-RING/EPDM/BLACK/8.00x2.40 MM	8,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,250	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste PUMPENBEFESTIGUNG

Spare parts list PUMP FIXTURE

16.008.0004EU000	1/1
	02



Assembly	: 50.003.0008.U000	Commiss.	: 25-05-377
Label	: TA/AS/0.37kW/OF/ET=270/ETLB-25-125	Position	: 000090
Quant.	: 3,000 ST	Page	: 000308/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	PUTA000300-00817 TA/ETLB-25-125/AS/00/0.370kW/50 Hz	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste Tauchpumpe

Spare parts list Immersion pump

PUTA_____-00817 | 11 / 00

Bitte bei Bestellung angeben:
To be indicated on order:

PUTA000300-00817 / PUTA 063300-00817
ETLB 25-125 230/400V/50Hz 0.37kW
/ 60 Hz

Stübbe®

1. General

This pump/unit may not be operate beyond the limit values specified in the technical documentation for the medium handled, capacity, speed, density, pressure, temperature and motor rating. Make sure that operation is in accordance with the instructions laid down in this manual or in the contract documentation. (Contact the manufacturer, if required). The indification plate indicates the type series/size, main operating data and production number; please quote this information in all queries, repeated orders and particularly when ordering spare parts.

2. Safety

These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel/ operators prior to installation and commissioning, and it must always be kept close to the location of operation of the pump/unit for easy access.

2.1 Marking of Instructions in the Manual

The safety instructions in this manual whose non-observance might cause hazards to persons are specially marked with the general hazard sign, namely

safety sign in accordance with DIN 4844 - W9.

The electrical danger warning sign is safety sign in accordance with DIN 4844 - W8.

The word Attention is used to introduce safety instructions whose non-observance may lead to damage to the pump and its functions.

Attention

Instructions attached directly to the pump, e.g.

- arrow indicating the direction of rotation
- markings for fluid connections

must always be complied with and be kept in perfect legible condition at times.

2.2 Personnel Qualification and Training

All personnel involved in the operation, maintenance, inspection and installation of the pump must be fully qualified to carry out the work involved. Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the requisit know-how, appropriate training and instruction must be provided. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

2.3 Non-compliance with Safety Instructions

Non-compliance with instructions can jeopardise the safety of personnel, the environment and the pump itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.
In particular, non compliance can, for example, result in:

- failure of important pump/unit functions
- failure of prescribed maintenance and servicing practices
- hazard to persons by electical, mechanical and chemical effects
- hazard to the environment due to leakage of hazardous substances.

2.4 Safety Awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.

2.5 Safety Instructions for the Operator/User

- Any hot or cold components that could pose a hazard must be equipped with a guard by the operator.
- Guards which are fitted to prevent accidental contact with moving parts (e.g. coupling) may not be removed whilst the pump is operating.
- Leakages (e.g. explosive, toxic, hot) must be contained so as to avoid any danger to persons and the environment. Pertinent legal provisions must be adhered to.
- Elecrical hazards must be eliminated. (In this respect refer to the relevant safety regulations applicable to different countries and/or the local energy supply companies.)

2.6 Safety Instructions for Maintenance, Inspection and Installation Work

The operator is responsible for ensuring that all maintenance, inspection and installation work to be performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
The pump must have cooled down to ambient temperature. It must be drained and its pressure must be released. Work on the pump must be carried out only during standstill. The shutdown procedure described in the manual for taking the pump out of service must be adhered to without fail. Pumps or pump units handling media injurious to health must be decontaminated. Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and/or reactivated. Please observe all instructions set out in the chapter on Commissioning before returning the pump to service.

2.7 Unauthorised Modification and Manufacture of Spare Parts

Modifications or alterations of the pump are only permitted after consultation with the manufacturer. Original spare

parts and accessories authorised by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.

2.8 Unauthorised Modes of Operation
The warranty relating to the operating reliability and safety of the pump/unit supplied is only valid if the pump is used in accordance with its designated use as described in the following sections. The limits stated in the data sheet may not be exceeded under any circum-stances.

3. Transport and Interim Storage

3.1 Transport
Transport of the pump requires proper preparation and handling. Always make sure that the pump or the unit remains in horizontal position during transport and cannot slip out of the transport suspension arrangement. Do not use lifting sling on the free shaft end of the pump or on the motor eyebolt.

If the pump/unit slips out of the suspension arrangement, it may cause personal injury and damage to property!

3.2 Interim Storage
Each ASV pump leaves the factory carefully assembled. If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump storage:
Store the pump in a dry location! Rotate the rotor by hand once a month. Protect all stored goods against humidity, dirt, vermin and unauthorised access! All openings of the assembled unit components are closed and must only be opened when required during installation.

4.1 Environment influences
All parts in contact with the fluid are made of thermo-plastic material. Other external metal parts, e. g. housing, motor as well as motor bracket, are protected against corrosion by paint.

- It is understood according to the constuction principle and the regulations all external metal parts must not necessarily be resistant.
  Any wetting of external metal parts with aggressive fluids from leakages of the plant has to be avoided. At any leakage of the sealing system the ASV-service should be called.

4.2 Wetness, plant leakages

- On extreme wetness at the installation locations - rain, condense water especially on plant leakages - protections against corrosive influences have to be arranged.
  This is especially due for electrical drivers, switches, measuring instruments and so on.
- Components made of thermoplastic material or elastomers should not be wetted by other fluids than those mentioned in the original order.
  It is recommended not to get them in contact with
- synthetic and mineral oils and grease
- solvents and cleaning agent and/or other chemical material especially such of which the components are not known

4.3 Operating and ambient temperature

- For maximal allowed operating temperature of the pump the recommended values in our pump leaflet are to be taken care of.
- Ambient temperature above +40 °C are to be forwarded to ASV for proper checking.
  Eventually the motor shows a reduced efficiency. At the location of installation a very good circulation and ventilation is to be taken care of.

4.4 Vibrations, shocks

- Vibrations and shock having external influences to pump and drive must follow the limit values of the VDI recommendation.

4.5 Mechanical load

- External mechanical load on pump or drive because of weight of the plant equipment are unacceptable.
- Pipeline and valves have to be supported in order not to load their weight on the pump.
- Any longitudinal extension of the pipeline because of operating temperature should also not cause any load on the pump. Eventually a compensator must be installed.

4.6 Electricity

Connection to the power supply must be effected by a trained electrician only.

- The drive of the pump has to be grounded according to DIN VDE 0113. At dangerous fluids (ChemG) internal or other instruction have to be observed.
- At pumping electrolyte - conductive fluids - with potential differences to the parts of the pump the pump must be grounded.

It exists the possible danger of electrochemical corrosion at metal parts in contact with the fluid especially it concerns the mechanical seal.

4.7 The protection of health and UVV
as well as the regulations and warnings for „Security and environment protections" as well as the local and/or internal regulations have to be attended at any installation by the operator on his own responsibility.

Attention! Non-observance of this operating and maintenance instruction manual or the use of the pumps for other operating conditions than actually

agreed upon is not in accordance with the regulation for this application.

4.8 For any consequences the operator is responsible.

- The operator of the pump has to inform all personal entrusted with works at the pump about the potential danger at this place and/or the complete plant and has to make sure that all precaution for proper working condition and regulation of the protection of health have been taken care of.
- Subject of a safe installation with proper function of the pump later is the qualification of the personel respectively. All persons in charge have to be acquainted with the operating manual and the usual technical regulations and have to follow them.

Please pay maximum attention to this installation and starting instruction of the pumps as we do not accept any claim of damages in case of not following the instructions.

4.9 Application

ASV-Thermoplastic vertical sump pumps are used for transportation of acids, caustic solutions as well as abrasive, aggressive and neutral fluids.

4.10 Examination/Test

Before each pump is leaving our factory a functional test is executed by controlling the capacity, head and current consumption acc. to DIN 1944. Test certificates for guaranty purpose acc. to DIN 19944-II are available against extra charge.

4.11 Guaranty

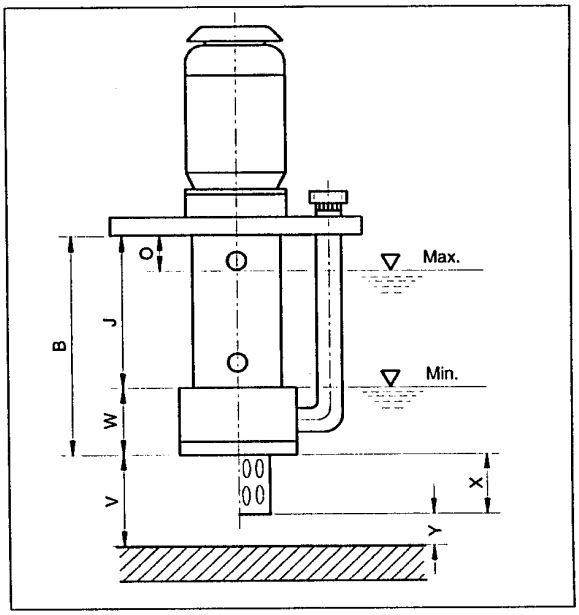
The time of guaranty is stipulated in our General Delivery- and Payment Conditions. For the resistance of the material we guarantee only if the operation conditions are known to us at the time of offering the pump.
Within the time of guaranty repair work or any alteration should only be arranged by our engineers or with a written confirmation by us. In case of any necessary repair we recommend to call one of our technician or to return the pump to our factory if trained personal is not available at your factory. Please send your requirements for spare parts to our sales department for pumps.

5. Mounting and installation

5.1 Mounting

The ASV-Thermoplastic-Vertical Pumps ETLB has to be mounted with holding down bolts or fastening elements on a plane, stable base.
The connections of the pipework are carried out in accordance with DIN 24256.

Attention! Pump unit to be kept free of tension and stress when fastening the fixing screws. Eventually the installation area has to be levelled.



Size ETLB	O min. mm	V min. mm	J[1] mm	J[2] mm	x min. mm	Y mm
15-60	30	60	206	406	80	10
20-100	30	60	192	392	100	10
25-125	30	60	192	392	100	10
32-125	30	60	185	385	125	10
32-160	30	60	155	355	125	10
40-125	30	60	155	355	150	10
40-160	30	60	155	355	150	10
50-125	30	60	155	355	125	10

1) Standard depth B = 275 mm 2) Standard depth B = 475 mm

The distance between the end of the suction pipe and the bottom of the sump may not be less than 60 mm.

Liquid level »Max.«

- Highest permissible liquid level
- At level control: Upper shift-point.

Liquid level »Min.«

- During every starting of the pump:
  Lowest permissible liquid level at standard suction connection and/or foot valve!
- At level control: Lower shift-point at starting.
- The size »W«, the liquid cover of the pump housing must be increased by rising working temperature.

5.2 Installation of pipeline

The pump should not be loaded by the force of the connected pipeline. The nominal width of the connected pipeline has correspond with the pressure connections of the pump. Pipe connections with the pump should be made without stress and vibration. In case of flange connections the tightening of the screws may not cause twist or tension.
A gasket should not reach into the open area of the pipe. Only suitable elastomer gaskets and seals have to be used. Do not use hard and unelastic seals. Line offsets must be avoided in case of flange connections.

5.3 Pressure Line

The velocity of flow in the pressure line should not be more than 3 m per second, the sizes of the pipework are determined by economy aspects. Install a shut-off or diaphragm valve near to the pump in the pressure line. In case of shut-off of the pump a non-return valve should be mounted in the pressure line, if the reverse flow is large or a higher pressure is available.

5.4 Water hammer

At long pressure pipe lines as well as at the use of automatic valves with short closing and opening time a slow down (switch off/closing) or an acceleration (start/opening) of the flowing fluid head might occur with a considerable pressure fluctuation and a so called water hammer in the pipe line. Water hammer may cause considerable damages or even destroy the pump or other plant equipment.
To reduce the danger of water hammer the following should be done or installed:

- Automatic valves with slowed down closing and opening time.
- The velocity of the flow in the pipeline is to be reduced which means to choose a larger diameter (DN) of the pipeline and/or to use pressure regulating valves to avoid water hammer, for example ASV-pressure relief valves, type 715/716/725.

6. Operation of pump

6.1 Before starting the pump

1. Before the pipelines will be connected with the pump the complete pressure-pipework especially the connected containers on suction side the pump sumps and other installations have to be cleaned carefully (solidfree) and to be flushed sufficiently from time to time with neutral fluid (water).
   Dirt and solids - residue from welding, waste from mounting and packagings etc. - will cause damages on the pump on the start-up afterwards.

2. Before the pump is connected with the installed pipelines/pipework the delivery line have to be tested separately for tightness and to be examined acc. to the respective regulations of compression trials.
   - The compression trial has to be carried out with a neutral fluid (water).
   - Testpressure:
   - 1,5 x operating pressure, - 1,5 x PN = max 15.0 bar or
   - acc. to the respective regulations but not higher than 15,0 bar !

   Attention! The pump may never be involved in a compression trial. Damages on the pump will be the effect and leakages can occur.

3. Check the Max.- and Min. liquid level (see page 5). Due to the construction of the ETLB pump the distance between the mounting plate and the max. liquid level may not be less than 30 mm.

Attention! At every tank evacuation it is neccessary to check the minimum liquid level before starting the pump.

Check motor-voltage and protective switch.
Do not run the pump dry.
Pay attention to the direction of rotation of the pump (arrow on the pump). Check by shortly switching on and then off again.

6.2 Start up

Please open the valve a little bit on the pressure side in order to remove the air better by starting the pump. Start the motor, open the valve on the pressure side until the operating point is reached.

6.3 Operation

Do not run pump for longer time against closed valve. This would lead to thermal damages in the pipeline and pump. For longer closing time of the valve a bypass has to be installed to return the fluid to the pump sump or tank.

In order to secure trouble free function of the ASV-Vertical Sump Pump ETLB, please pay attention to the following points:

1. The pump should run noiseless and free of vibrations.

2. E-Motors should be loaded only with the respective rated capacity.

3. E-Motors with more than 7,5 KW should be started in Y-delta connection to avoid currents at make.

4. For the pump material the fixed max. operating temperature has to be observed (for PP max. +70 °C and for PVDF max. +90 °C, depending on the chemical, thermal and mechanical stress - see ASV-Resistance-table).

5. Please also observe that at start-up of the pump the fluid level reaches at least the upper edge of the spiral casing in order to guarantee proper function. This is also important in cases where the pump operates with an extended suction pipe.

6.3 Switch-Off

1. The shut-off valve in the pressure line has to be adjusted to the minimal rate or to be closed.
2. Switch off the E-motor.
3. Close the shut-off valve in the suction line.
4. If the fluid crystallizes out, the pump should be cleaned with suitable resolvents, the evacuation can be arranged with the drain-valve of the suction line or the pump.

7. Maintenance

The Vertical Sump Pumps ETLB are maintenance-free.

8. Dismantling and Reassembly General Instructions

Before dismantling, secure the pump so as to make sure it cannot be switched on accidentally.
The shut-off valves in the pressure line must be closed.
The pump must have cooled down to ambient temperature, it must be drained and it must be decontaminated, if necessary.
Repair and maintenance work to the pump must only be carried out by specially trained personnel, using original spare parts.
Observe the safety regulations laid down in sections 2.
Any work on the motor shall be governed by the specifications and regulations of the respective motor supplier.
Diamantling and reassembly must always be carried out in accordance with the relevant general drawing.
Make sure the pump unit and the individual components cannot tip over during dismantling.

8.1 Dismantling ETLB 25 - 125 and 32 - 125

1. Remove the spiral cassing cover (Pos. 103).

Attention! Left-handed thread!

2. Loosen the impeller cap (260) with O-ring (412.4).
3. Remove the hexagonal nut (920.1) with spring-washer (934), plate (550) and key (940.2).
4. Pull off the impeller (230) with the shaft protection sleev from the motor shaft.

The bearingless ASV-Vertical-Pumps ETLB are equipped with high-quality V-rings to protect the bearings in the dry area.

For their change:

1. Unscrew the hexagonal nuts (920.4).
2. Pull off the base plate with support tube (713).
3. Remove the diffuser disc (558).
3. Dismount the V-rings (507) with seal cover (444) and change the V-rings.

8.2 Reassembly

Attention! Clean all dismantled components and check them for signs of wear.
Damaged or worn components are to be replaced by original spare parts.
Make sure that the seal faces are clean and that V-rings and O-rings are properly fitted.

Reassembly is effected in reverse order to dismantling.
Use the general drawing and the list of components for orientation. All screws and bolts must be properly tightened during assembly.

8.3 Tightening Torques Nm

	Tightening torques Nm		
Thread	1)	2)	3)
M 6	9	6	5
M 8	21	7	6
M 10	42	14	10
M 12	73	24	25
M 16	170	63	30
M 20	340	113	32
M 24	580	193	34

1) Screw connection between metal-to-metal
2) Screw connection between plastic-to-plastic
3) Screw connection with self-tapping insert

11. Failure, Possible reason and Repair

Failure	Possible reason	Repair
11. 1 Pump does not deliver.	11. 1. 1 Direction of motor is wrong.	Two supply cable are mixed.
	11. 1. 2 Level of fluid to be pumped is too low. Pump not sufficiently filled.	Check level and fill pump, remove air.
	11. 1. 3 Pump sucks air.	Suction line, footvalve and mechanical seal to be checked on air tightness.
	11. 1. 4 In suction line an air bag is included.	Install pipe line properly so that air can evacuate. Install gate valve with handle at side.
	11. 1. 5 Available back pressure is bigger than max. pressure of pump.	Size of pump not correctly selected. Advise exact delivery conditions.
11. 2 Delivery of pump is too low.	11. 2. 1 Suction or supply line of pump or impeller is clogged.	Clean pipe line and eventually dismount and clean impeller.
	11. 2. 2 Air bag in pipe line.	Arrange pipe line newly and eventually install vent valve.
	11. 2. 3 Geodetic head is too high.	Increase diameter of pipe line, impeller or choose eventually a bigger pump. Please contact us!
	11. 2. 4 Resistance of pipe line is bigger than assumed.	Increase diameter of pipe line, of impeller or choose a bigger pump. Please contact us!
	11. 2. 5 Suction head too high (in case of suction operation vaporization the pump, cavitation).	Clean footvalve and suction line eventually increase diameter of suction line. Check footvalve, wether it is fully opened, eventually lower level of pump. If a pre-receiving tank is used mount a larger size
	11. 2. 6 Temperature of fluid is too high.	Reduce temperature, lower level pump.
	11. 2. 7 Viscosity of fluid is higher than originally assumed.	Dilute or pre-heat fluid

Failure	Possible reason	Repair
11.3 Pump delivers too much.	11. 3. 1 Actual head of process plant is lower as delivery head of pump.	Close valve on pressure line accordingly. Mount smaller impeller. If possible reduce RPM. Use smaller pump.
11. 4 Overload of motor.	11. 4. 1 Pump delivers too much.	Look at 11. 3. 1.
	11. 4. 2 Specific gravity or viscosity of fluid is too high.	Check delivery data, mount motor with bigger capacity.
	11. 4. 3 Impeller touches wall of pump.	Check mounting of impeller, fasten impeller cap again. Impeller deformed by too high temperature. Exchange impeller and eliminate reason for too high temperature.
	11. 4. 4 Pump deformed improper mounting.	Align pump and motor carefully on base plate and mount pipe line without any tension.
11. 5 Unquiet or unbalanced rotation.	11. 5. 1 Pump not properly aligned.	Arrange alignment of pump and motor.
	11. 5. 2 Suction head too high.	Look at 11. 2. 4.
	11. 5. 3 Diameter of suction line too small.	Increase diameter of pipe line.
	11. 5. 4 Valve at suction line too much closed.	Open it more.
	11. 5. 6 Fixing on foundation not sufficient.	Tighten foundation anchor again.
	11. 5. 7 Cavitation.	Look at 11. 2. 1, 11. 2. 5, 11. 2. 6.
	11. 5. 8 Bearing damage.	Check bearing, exchange bearing.

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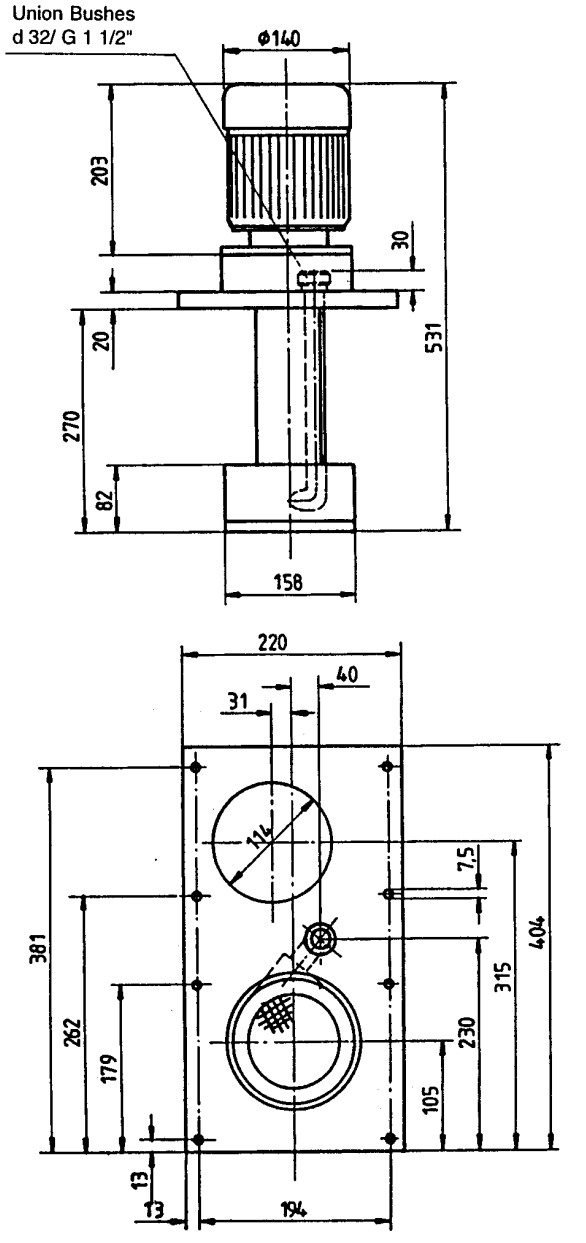
12. Dimensions ETLB (Schmid)

Ident-No. 86517
Ident-No. 86544



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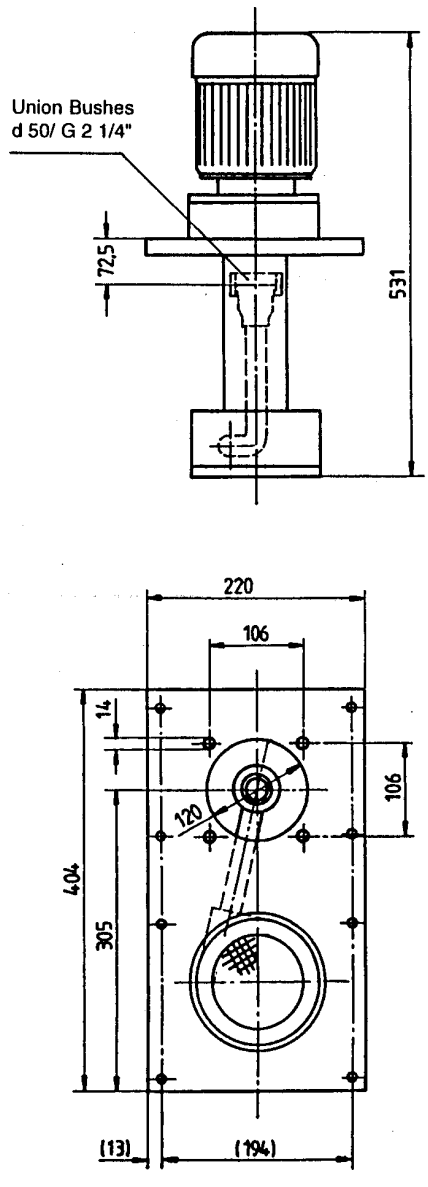

Technical details might be subjects to change

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Stübbe®

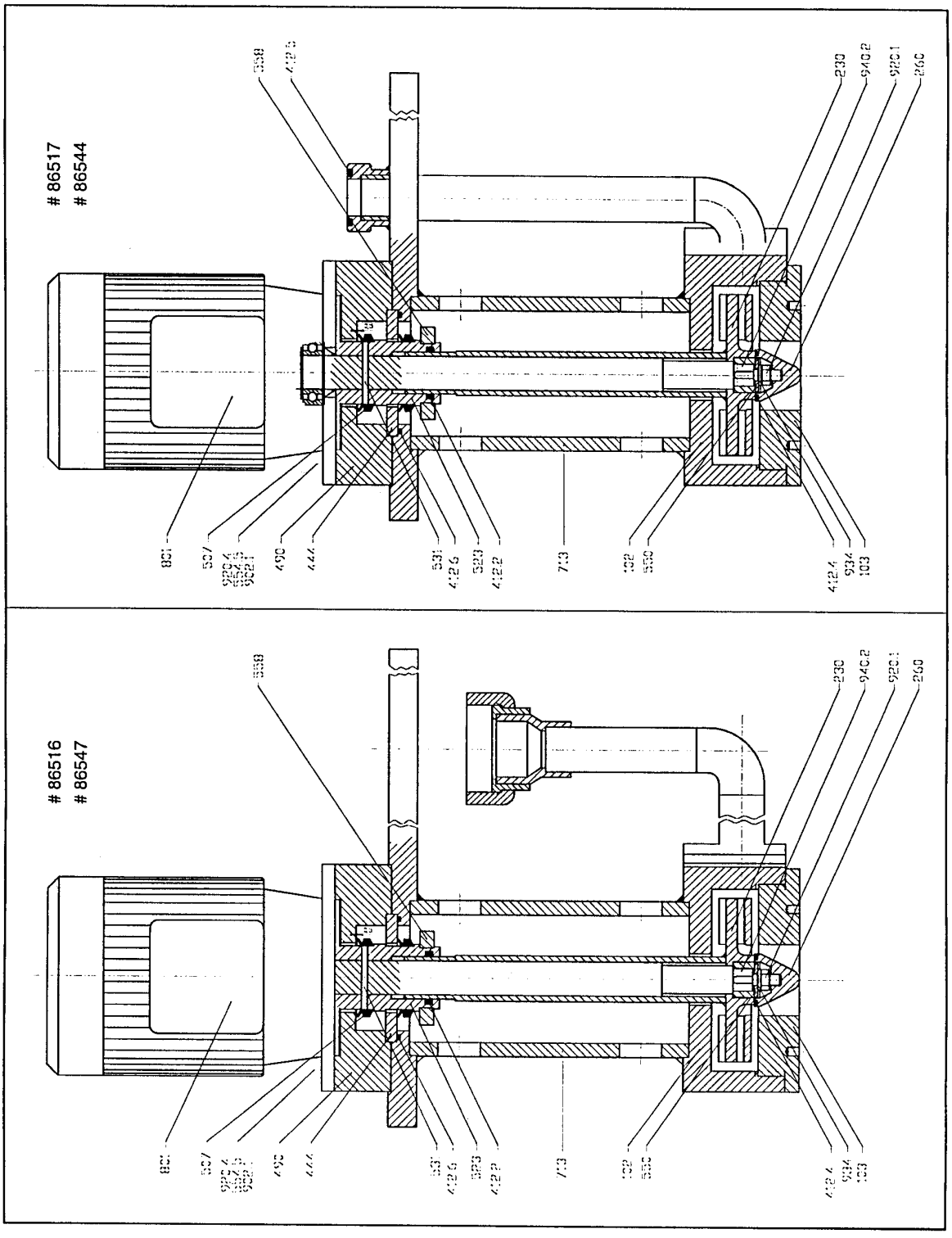
Betriebsanleitung, Schmid
Ersatzteillisten
Tauchpumpe ETLB,
Baugröße 25-125/270 mm

Operating manual, Schmid
Part Lists
Vertical sump pump ETLB,
Size 25-125/270 mm

Schmid 05/98

Art.-Nr.:	50 Hz	Art.-Nr.:	60 Hz
Ident.-No.:		Ident.-No.:	60 Hz
86516	0,37 kW	86544	0,45 kW
86517	0,37 kW	86547	0,45 kW

Stübbe



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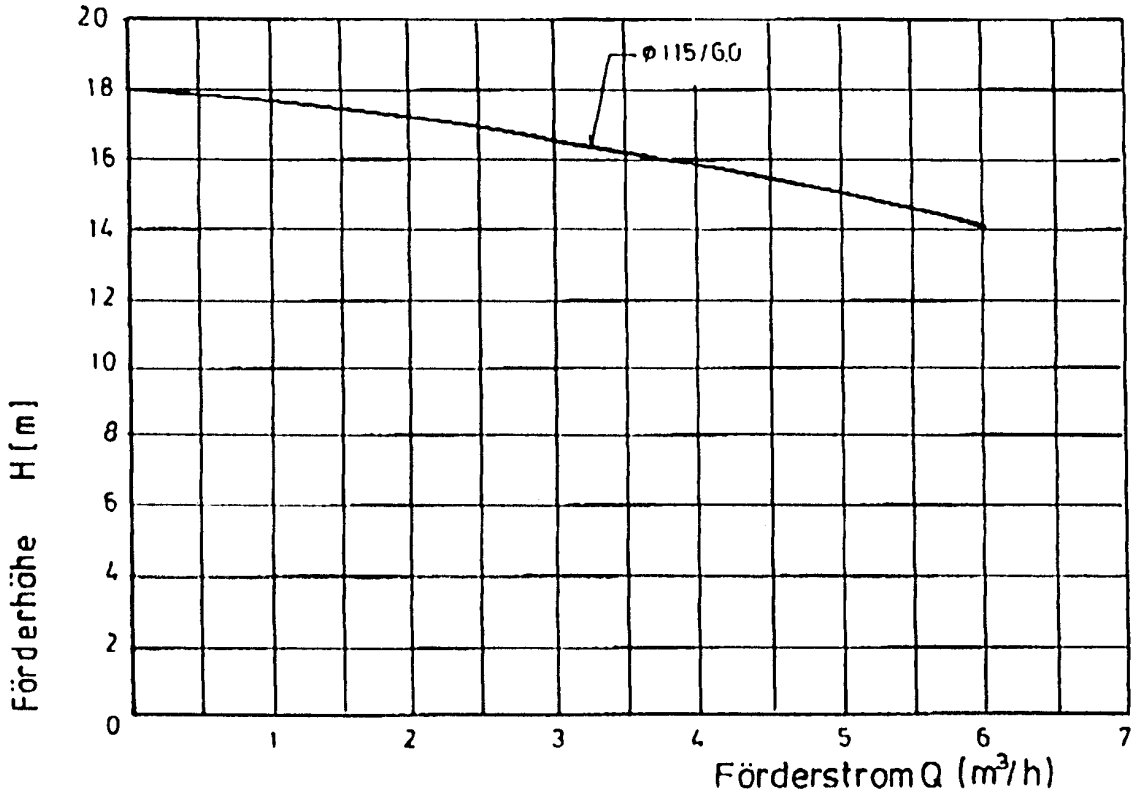
Teil *Item*	Stück *Pieces*	Bennenung *Denomination*	Werkst. *Material*	Ident.-Nr.(Bestell-Nr.) / *Order no.*							
				50 Hz				60 Hz			
				86516	86517			86544	86547		
103	1	Gehäusedeckel *Casing cover*	PP	83926	83926			83926	83926		
230.1	1	Laufrad mit Wellenschutzrohr *Impeller with shaft protection*	PP	86522	86522			86546	86546		
260	1	Laufradkappe *Impeller hub cap*	PP	56308	56308			56308	56308		
412.2	1	Runddichtring *O-Ring*	EPDM	97123	97123			97123	97123		
412.4	1	Runddichtring *O-Ring*	EPDM	97230	97230			97230	97230		
412.5	1	Runddichtring *O-Ring*	EPDM	53930	53930			53930	53930		
412.6	1	Runddichtring *O-Ring*	EPDM	97126	97126			97126	97126		
412.8	1	*Runddichtring* *O-Ring*	EPDM	-	-			-	-		
444.0	1	Dichtscheibe *Seal cover*	SiC inf.	95374	95374			95374	95374		
490	1	Dichtflansch *Seal flange*	PE-RCH 1000	97121	97121			97121	97121		
507.0	2	V-Ring *V-seal ring*	FPM	95212	95212			95212	95212		
523	1	Wellenhülse *Shaft protection pipe*	PP	80137	80137			80137	80137		
531	1	Spannstift *Dowel pin*	1.4305	97130	97130			97130	97130		
550	1	U-Scheibe *Washer*	1.4104	51222	51222			51222	51222		
555	4	U-Scheibe *Washer*	TITAN	82487	82487			82487	82487		
558	1	Schleuderscheibe Diffuser disc	PP	80150	80150			80150	80150		
566.0	2	Halbrundkerbnagel *Round headed notched nail*	1.4305	90514	90514			90514	90514		
713.0	1	Aufhängerohr *Base plate and support tube*	PP	84045	84042			84042	84045		
801	1	Drehstrom-Motor *Three phase electric motor*	0,37 kW 0,45kW - -	86527 - - -	86527 - - -			- 86527 - -	- 86527 - -		

ASV Stübbe Type: ETLB 25-125 Drehzahl : 2900 min

(Fa. Schmid)



Stübbe

Teil *Item*	Stück *Pieces*	Bennenung *Denomination*	Werkst. *Material*	Ident.-Nr.(Bestell-Nr.) / *Order no.*							
				50 Hz				60 Hz			
				86516	86517			86544	86547		
902.1	4	*Stiftschraube* *Stud bolt*	TITAN	98616	98616			98616	98616		
920.1	1	Sechskantmutter *Hexagon nut*	1.4571	93959	93959			93959	93959		
920.4	4	*Sechskantmutter* *Hexagon nut*	TITAN	82486	82486			82486	82486		
934.0	1	Federring *Spring ring*	1.4571	91288	91288			91288	91288		
940.2	1	Passfeder *Key*	1.4301	90534	90534			90534	90534		
970	1	Leistungsschild *Identification plate*	1.4301	86590	86590			86590	86590		
980	1	Deckel (Kontrollöffnung) *Inspection- or check cover*	PP	-	84055			84055	-		
999	1	Runddichtring zu Teil 980 *O-Ring for item 980*	CSM	-	97426			97426	-		

Technische Änderungen vorbehalten
Errors and omissions excepted

ASV Stübbe GmbH & Co. KG • Hollwieser Straße 5 • D-32602 Vlotho • Telefon (05733) 799-0 • Fax (05733) 799-200
http://www.asv-stuebbe.de • e-mail: info@asv-stuebbe.de

Assembly	: 16.004.0126.U23L	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/23/PVC/VA/KL-KU/d=27	Position	: 000090
Quant.	: 1,000 ST	Page	: 000309/01
Drawing	: 16.004.0126EU000	Date	: 10.04.2006

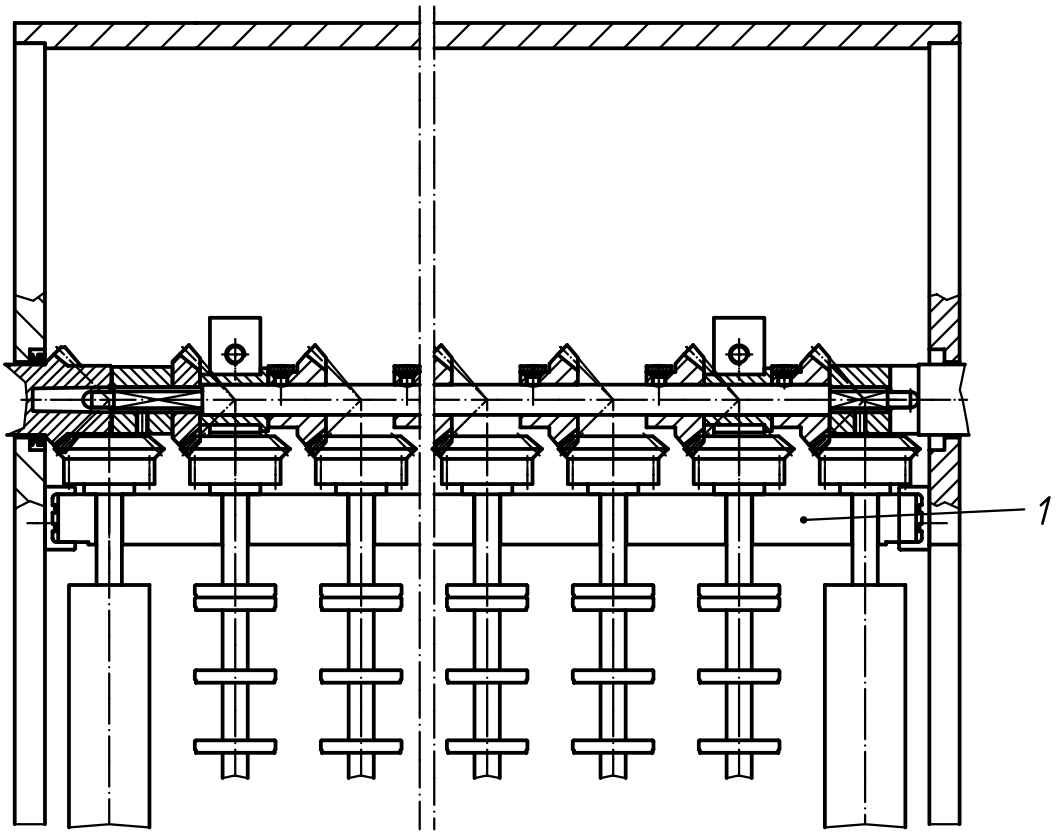
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0124.U23L DRIVE SHAFT/CPL./023/VA	1,000	ST	
1	16.004.0002.023V SUPPORT/GUR-N/SS/23/d=10/T=50	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0126EU000	11
	00



Assembly	: 16.004.0124.U23L	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./023/VA	Position	: 000090
Quant.	: 1,000 ST	Page	: 000310/01
Drawing	: 16.004.0124EU000	Date	: 10.04.2006

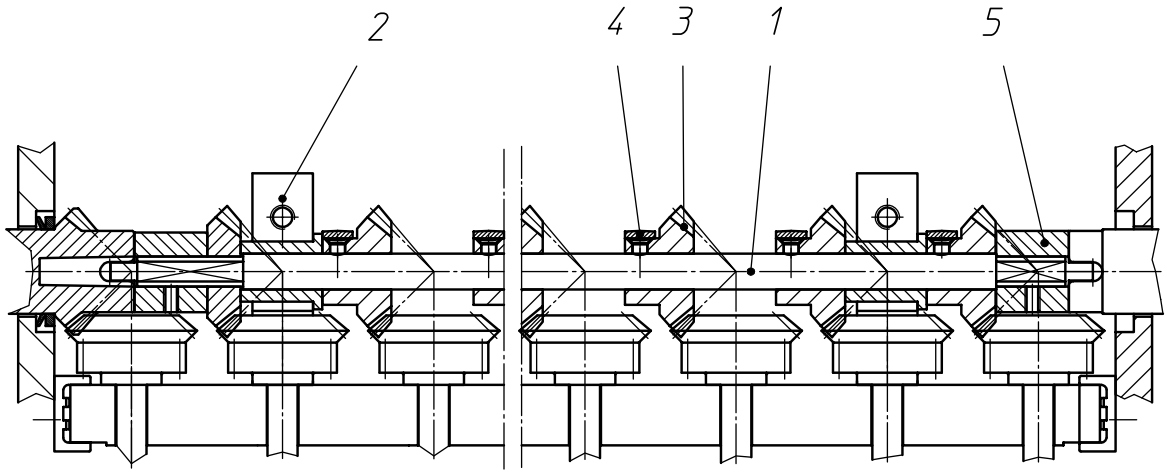
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0331.0232 DRIVE SHAFT/SS/023/KL-KU/D=27	1,000	ST	X
2	16.004.0007.U00L SEATING/CPL./PVC /VA	4,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	15,000	ST	X
4	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	15,000	ST	X
5	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ANTRIEBSWELLE

Spare parts list Drive shaft

16.004.0124EU000	11
	00



Assembly	: 16.004.0007.U00L	Commiss.	: 25-05-377
Label	: SEATING/CPL./PVC /VA	Position	: 000090
Quant.	: 4,000 ST	Page	: 000311/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

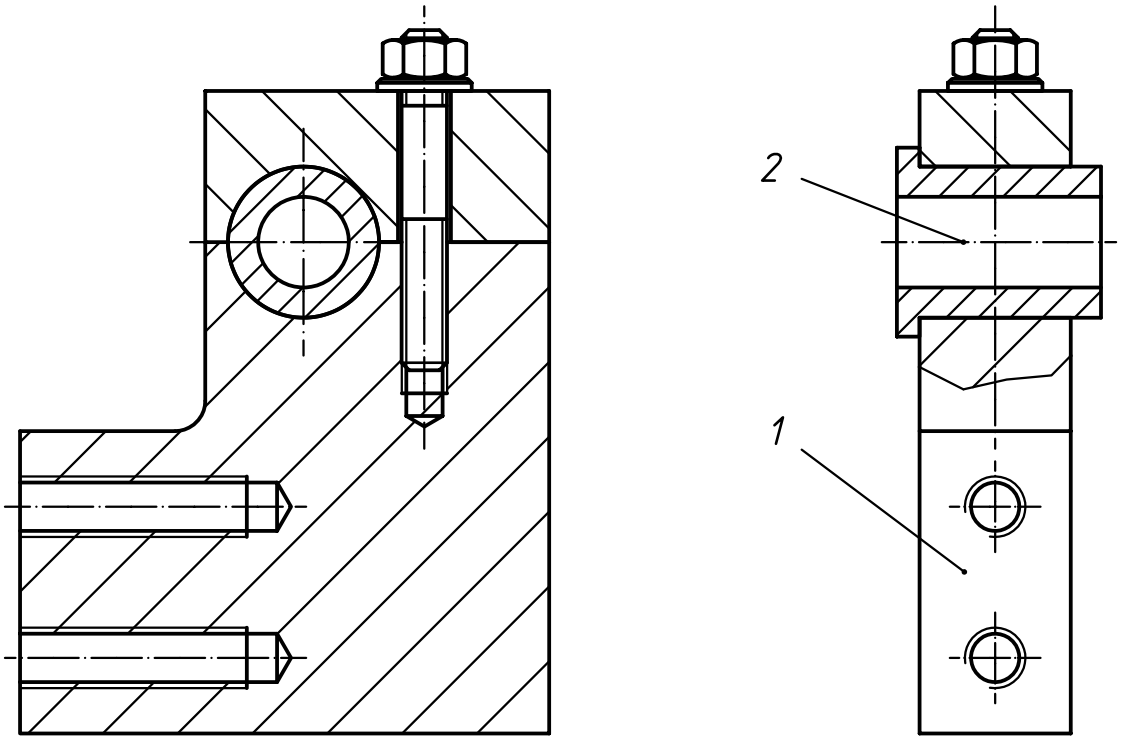
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0005.0002 SEATING/PVC-HG/V4A	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: VS-25-05-377-07	Commiss.	: 25-05-377
Label	: CONVEYOR/KSM [K] 3/650/PVC/VA	Position	: 000090
Quant.	: 1,000 ST	Page	: 000312/01
Drawing	: VS-25-05-377-07	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0987.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	9,000	ST	X
2	16.004.0988.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	5,000	ST	X
3	16.004.1294.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	4,000	ST	X
4	16.004.1713.2571 SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	10,000	ST	X
5	16.004.1241.2571 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	2,000	ST	X
6	16.004.0838.2571 Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/FE	1,000	ST	X
7	16.004.1244.2571 Shaft/KPL/32/O /K/ /FJ/V2A	1,000	ST	X
8	16.004.1243.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
9	16.004.1245.2571 Shaft/KPL/O /L/AH/FJ/V2A	1,000	ST	X
10	16.004.1247.2571 Shaft/CPL/32/U /L/ /FJ/V2A	3,000	ST	X
11	16.004.0841.2571 Shaft/KPL/32/O+U/K/B/FK/GREEN/V2A	1,000	ST	X
12	16.004.1250.2571 Shaft/KPL/32/O /K/ /FJ	1,000	ST	X
13	16.004.1249.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
14	16.004.1251.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	2,000	ST	X
15	16.004.1252.2571 Shaft/CPL/32/U /L/ /FJ/V2A	3,000	ST	X

Parts without Pos.-N° see assembly parts list

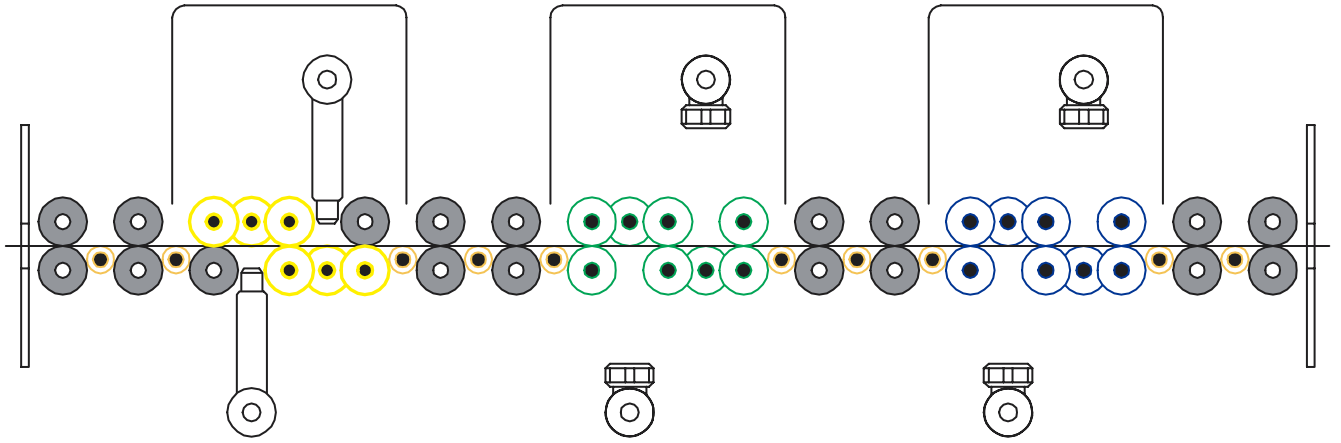
Assembly	: VS-25-05-377-07	Commiss.	: 25-05-377
Label	: CONVEYOR/KSM [K] 3/650/PVC/VA	Position	: 000090
Quant.	: 1,000 ST	Page	: 000312/02
Drawing	: VS-25-05-377-07	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
16	16.004.0843.2571 Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/FE	1,000	ST	X
17	16.004.1255.2571 Shaft/KPL/32/O/L/AV/FJ/V2A	1,000	ST	X
18	16.004.1254.2571 Shaft/KPL/32/O/ /L/AV/FJ/V2A	2,000	ST	X
19	16.004.1256.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	1,000	ST	X
	16.004.0559.U002 GEAR WHEEL/Z=11/M2/VA/PP /=0162	3,000	ST	
	16.004.0393.U800 BELT DRIVE/SHAFT/O/SPRAY/FJ	3,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	10,000	ST	
20	16.029.0134.0001 GUIDING/O/PVDF/d=12/D=32/T=050	6,000	ST	X

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-07	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/VA
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	KSM (K)3	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
up	16.004.0988.2582		16.004.1294.2582		16.004.1243.2571	16.004.1244.2571	16.004.1245.2571		16.004.0988.2582		16.004.1294.2582		16.004.0988.2582		16.004.1251.2571	16.004.1250.2571	16.004.1249.2571		16.004.1251.2571		16.004.0988.2582		16.004.1294.2582		16.004.1254.2571	16.004.1255.2571	16.004.1256.2571		16.004.1254.2571		16.004.1294.2582		16.004.0988.2582	up
down	16.004.0987.2582	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.0987.2582		16.004.1241.2571	16.004.0838.2571	16.004.1241.2571	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.1247.2571		16.004.1247.2571	16.004.0841.2571	16.004.1247.2571	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.1252.2571		16.004.1252.2571	16.004.0843.2571	16.004.1252.2571	16.004.1713.2571	16.004.0987.2582	16.004.1713.2571	16.004.0987.2582	down

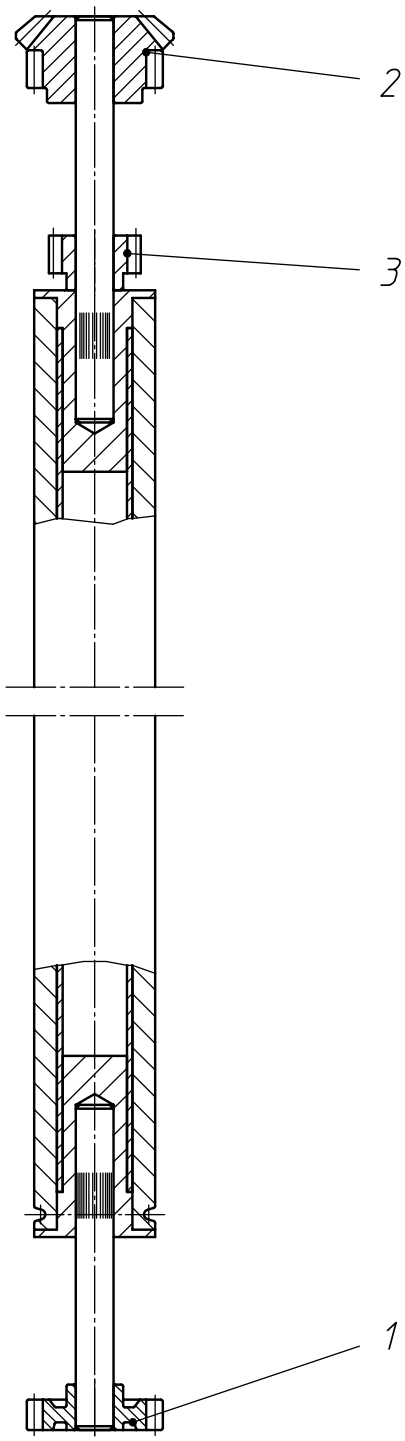
Assembly	: 16.004.0987.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	Position	: 000090
Quant.	: 9,000 ST	Page	: 000313/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	Position	: 000090
Quant.	: 5,000 ST	Page	: 000314/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

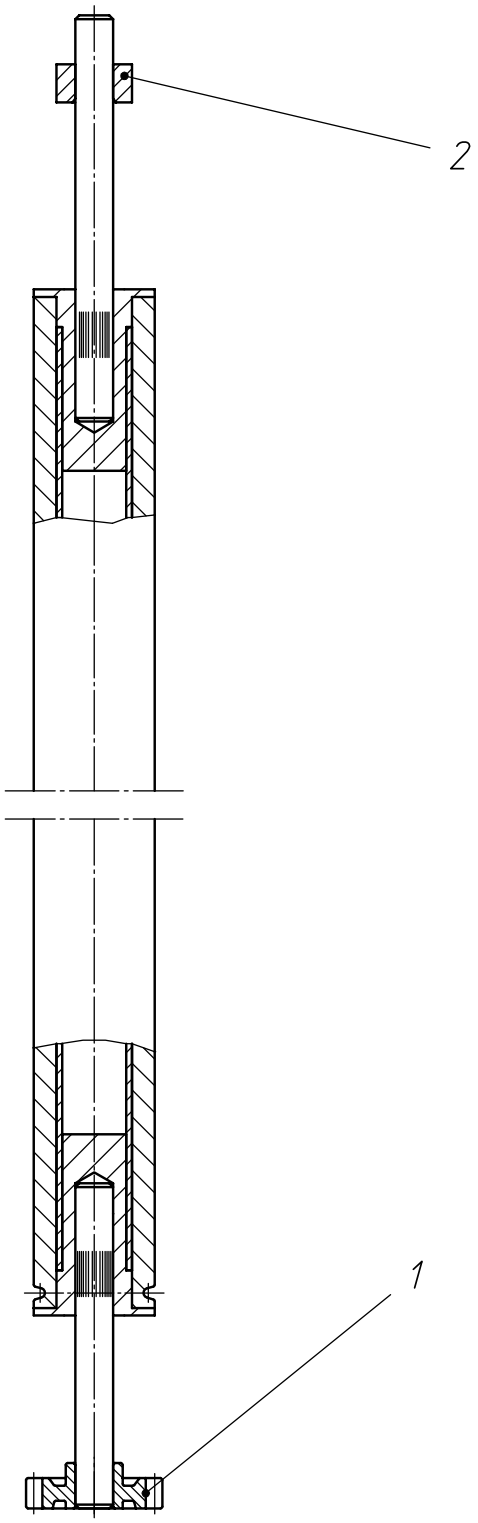
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1294.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AH/FJ	Position	: 000090
Quant.	: 4,000 ST	Page	: 000315/01
Drawing	: 16.004.1294E0000	Date	: 10.04.2006

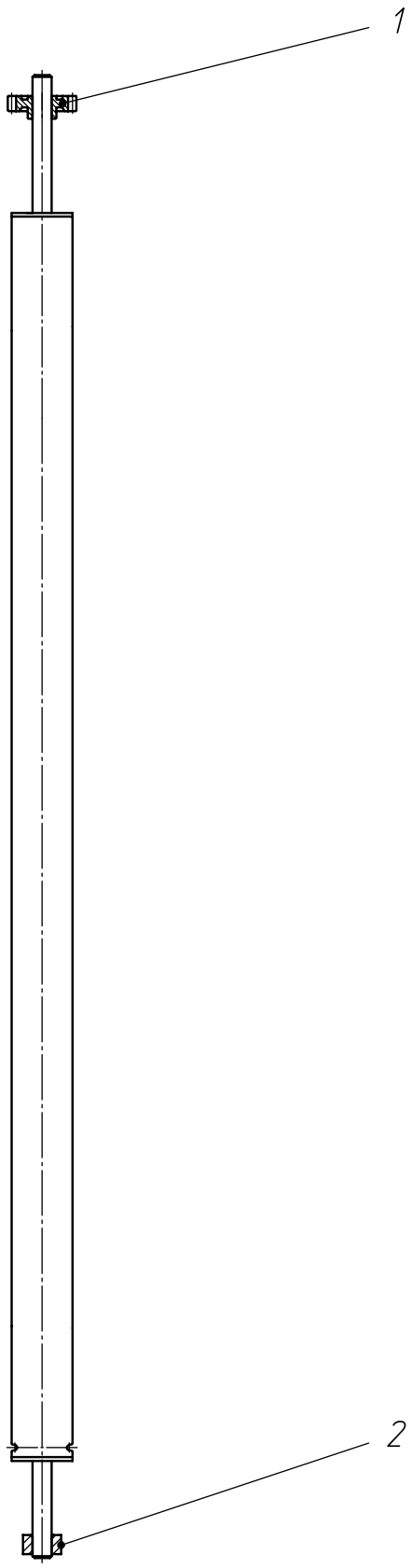
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.1294E0000	11
	00



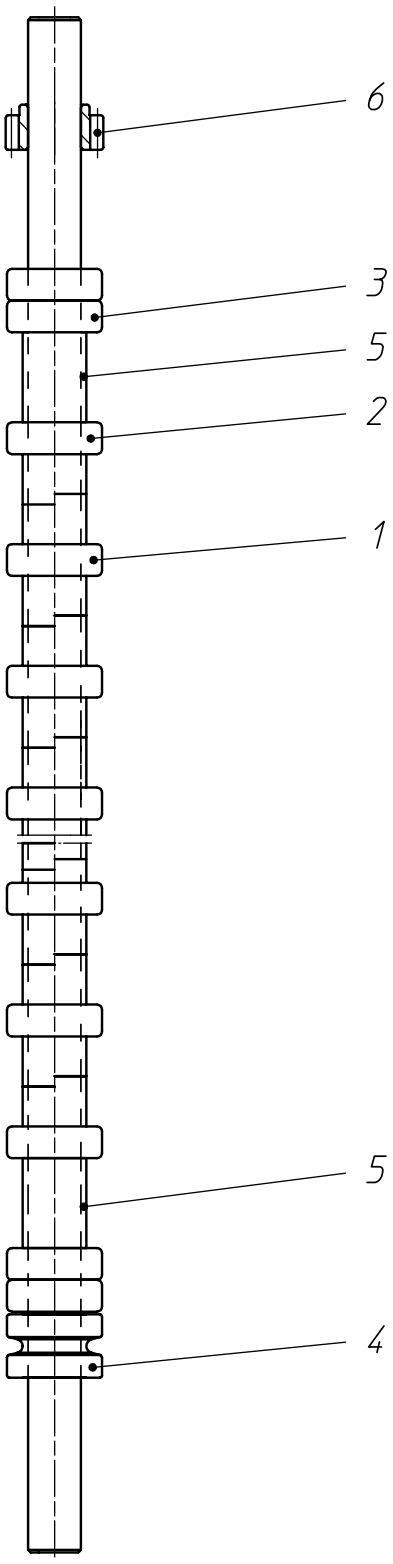
Assembly	: 16.004.1713.2571	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	Position	: 000090
Quant.	: 10,000 ST	Page	: 000316/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000090
Quant.	: 2,000 ST	Page	: 000317/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

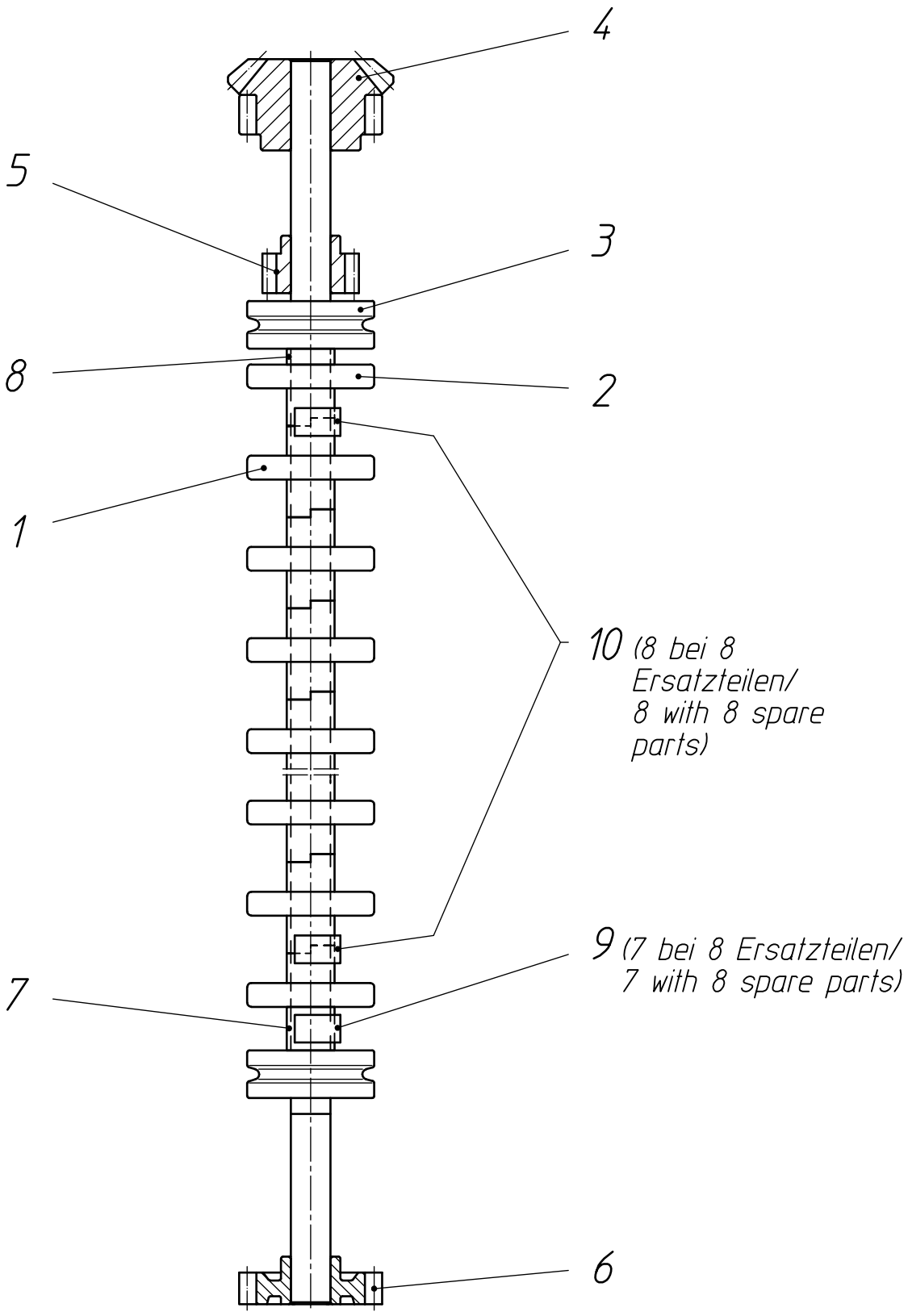
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0838.2571	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/F	Position	: 000090
Quant.	: 1,000 ST	Page	: 000318/01
Drawing	: 16.004.0838E0580	Date	: 10.04.2006

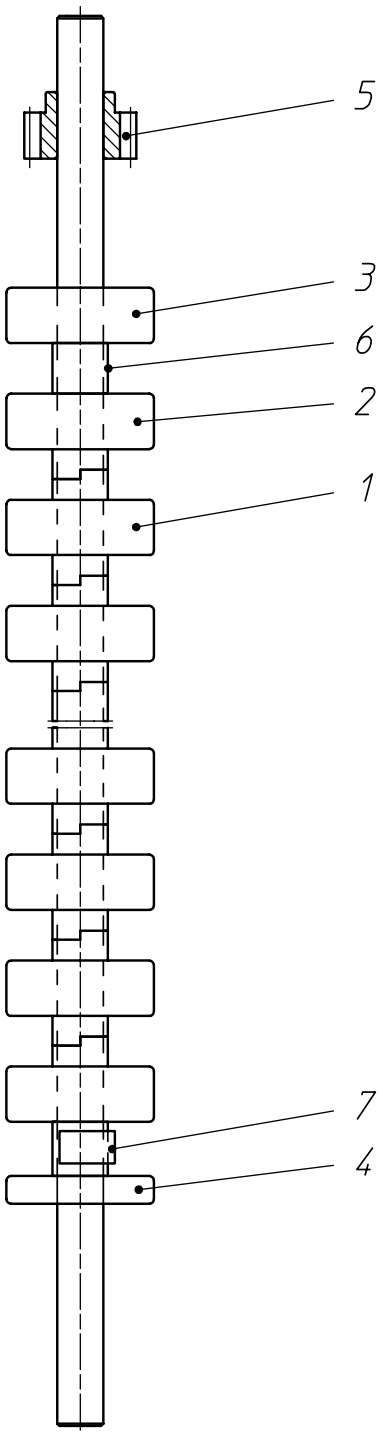
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0838E0580	11
	00



Assembly	: 16.004.1244.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000319/01
Drawing	: 16.004.1244E0570	Date	: 10.04.2006

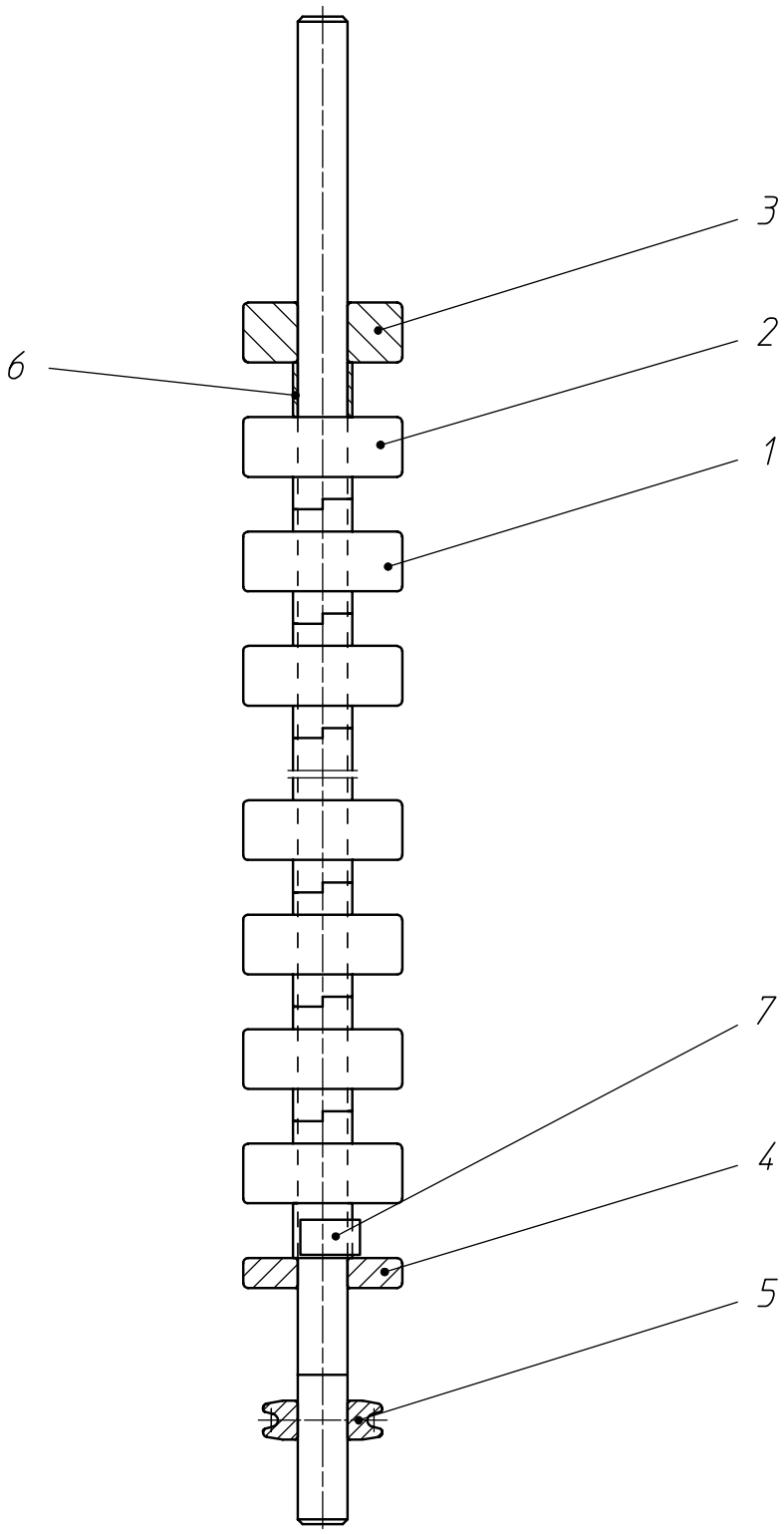
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	1,000	ST	X
4	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1244E0570	11
	00



Assembly	: 16.004.1243.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000320/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

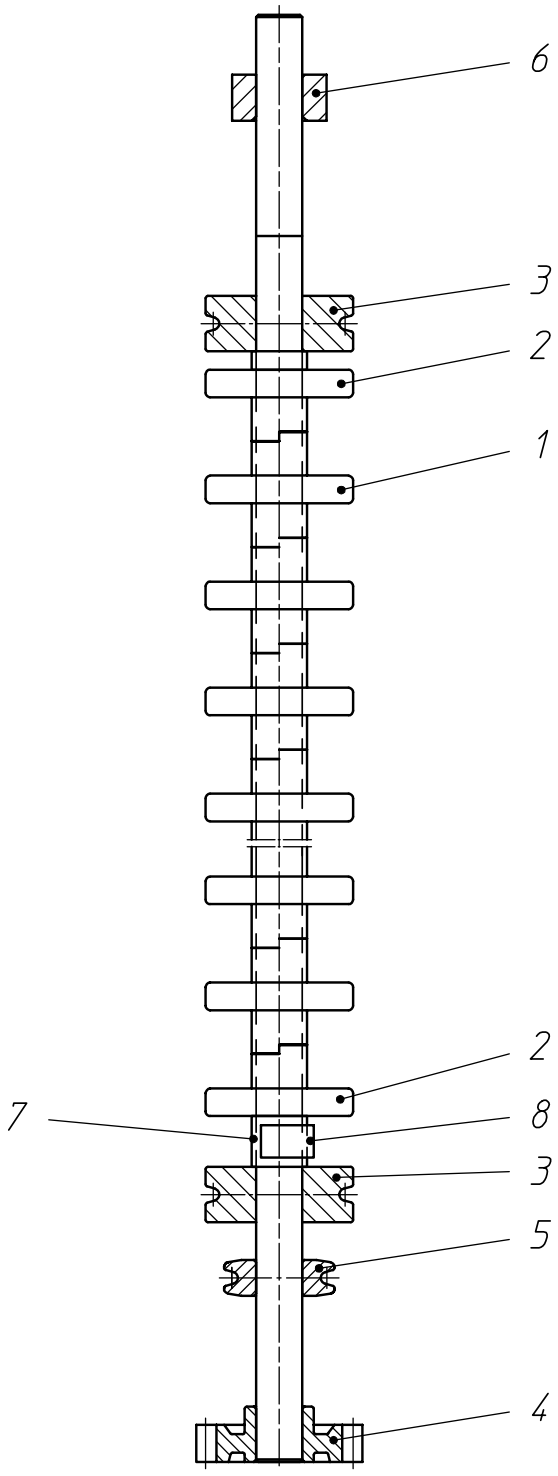
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000321/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

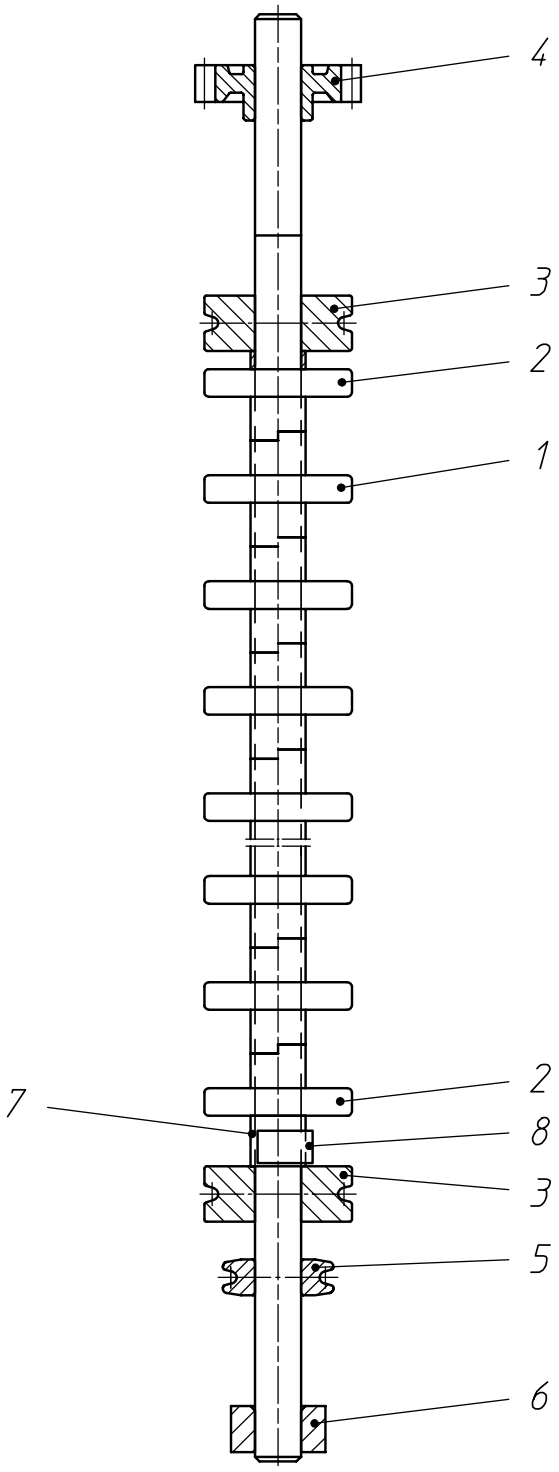
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000090
Quant.	: 3,000 ST	Page	: 000322/01
Drawing	: 16.004.1247E0570	Date	: 10.04.2006

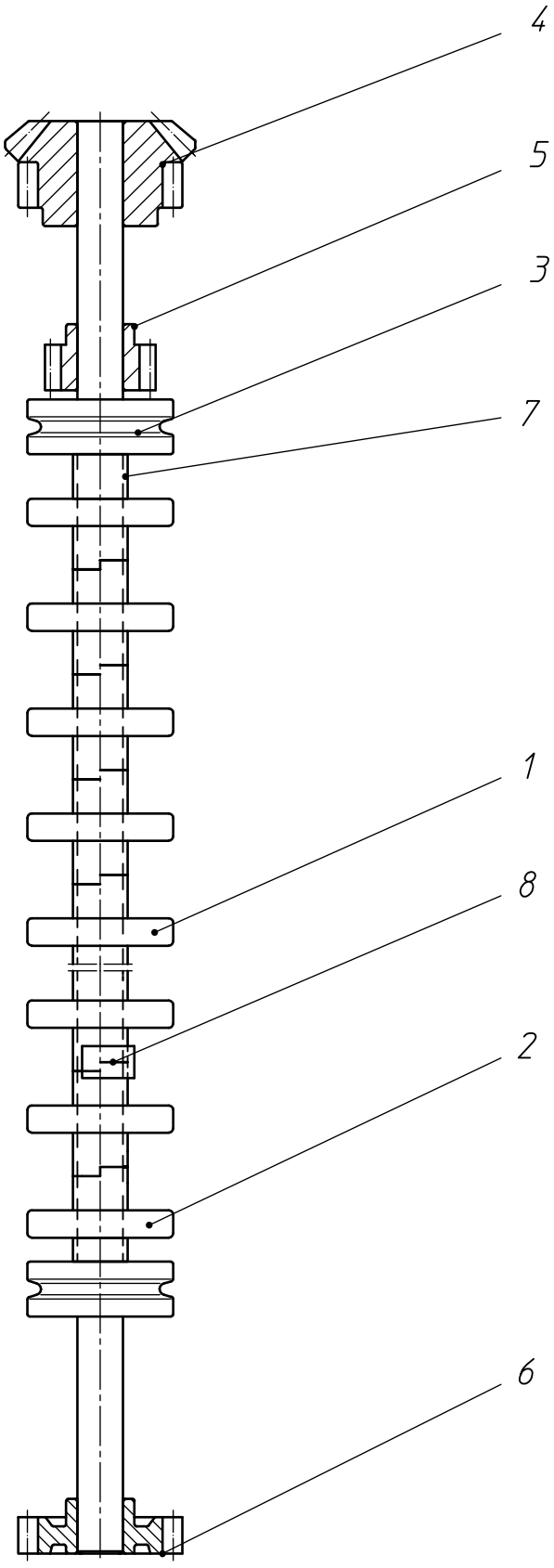
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1247E0570	1/1
	00



Assembly	: 16.004.0841.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O+U/K/B/FK/GREEN/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000323/01
Drawing	: 16.004.0841E0570	Date	: 10.04.2006

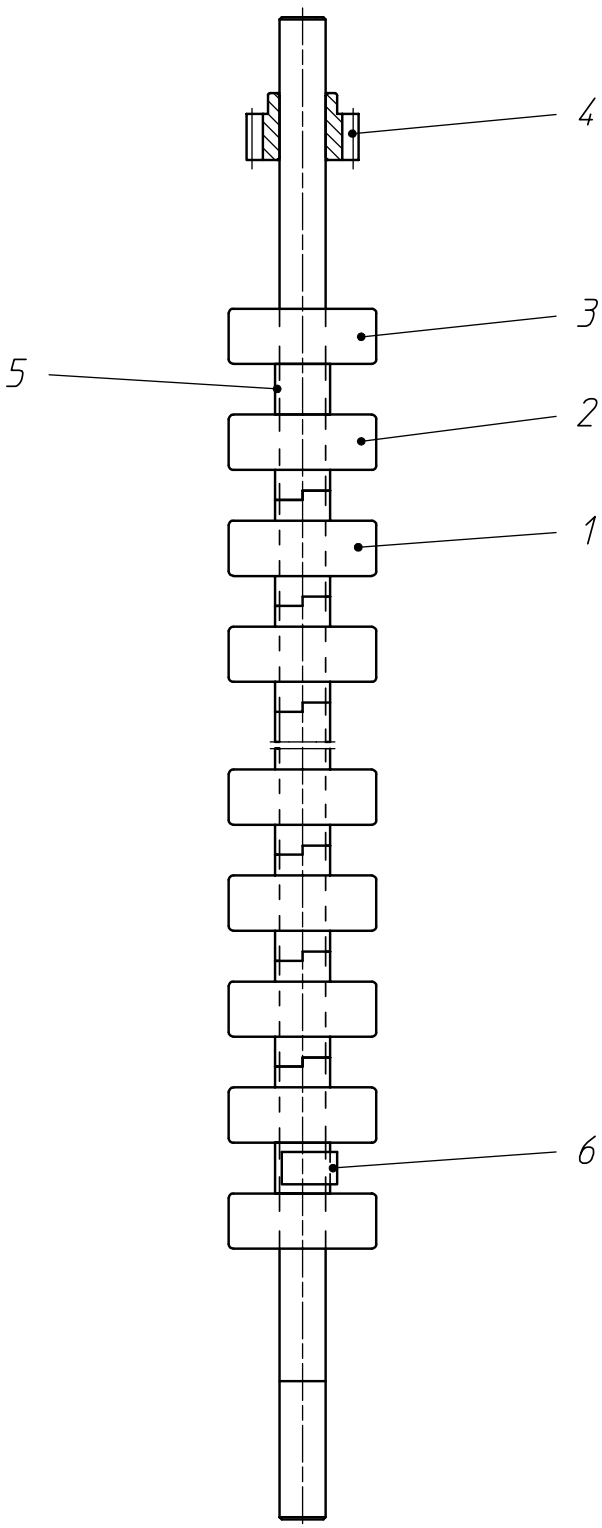
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0841E0570	11
	00



Assembly	: 16.004.1250.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ	Position	: 000090
Quant.	: 1,000 ST	Page	: 000324/01
Drawing	: 16.004.1250E0570	Date	: 10.04.2006

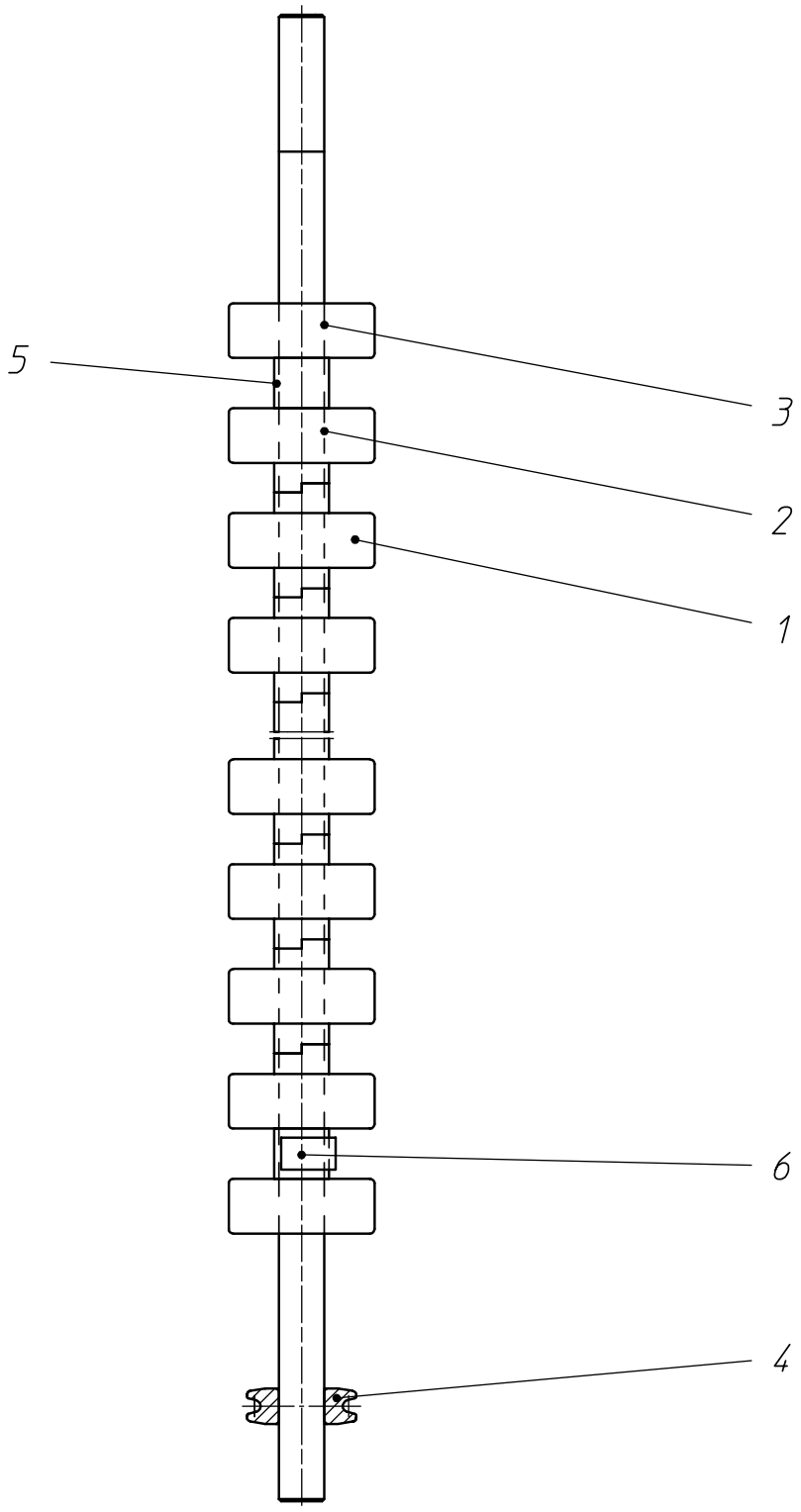
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	23,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1250E0570	11
	00



Assembly	: 16.004.1249.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000325/01
Drawing	: 16.004.1249E0570	Date	: 10.04.2006

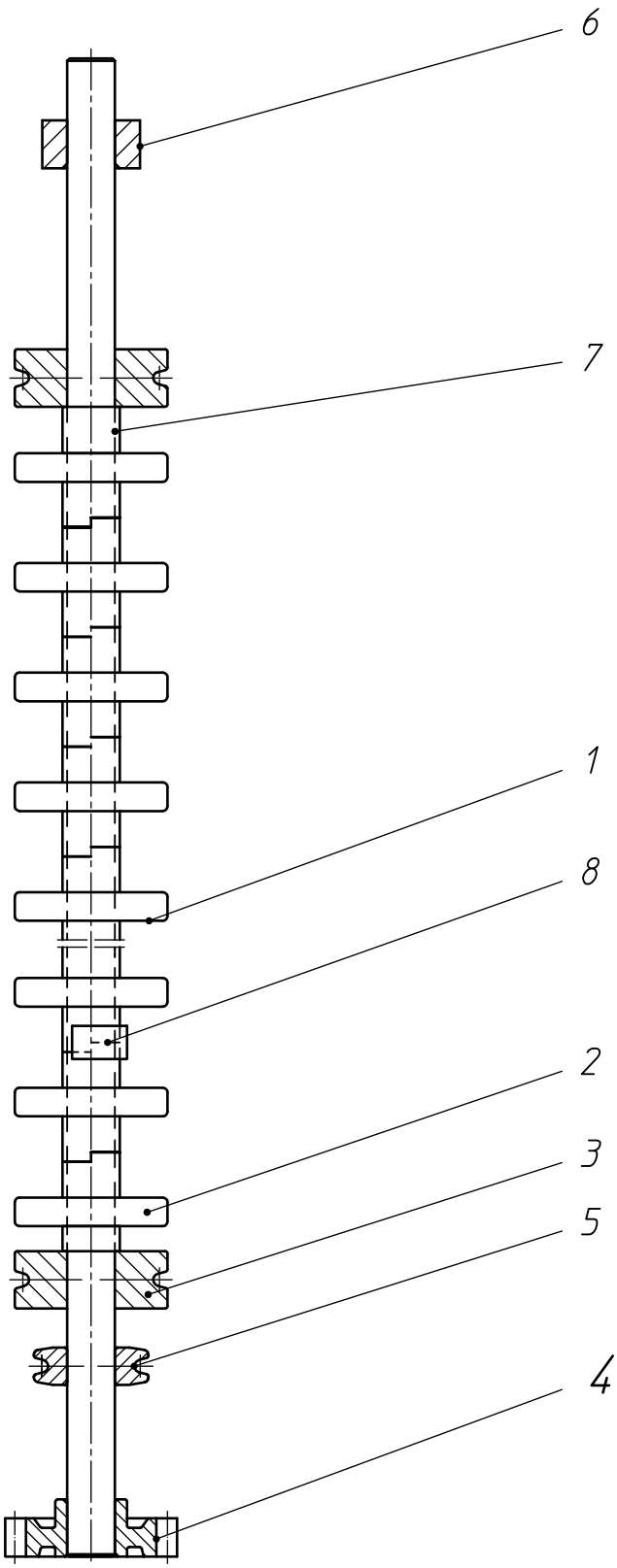
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1249E0570	1/1
	00



Assembly	: 16.004.1251.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000090
Quant.	: 2,000 ST	Page	: 000326/01
Drawing	: 16.004.1251E0570	Date	: 10.04.2006

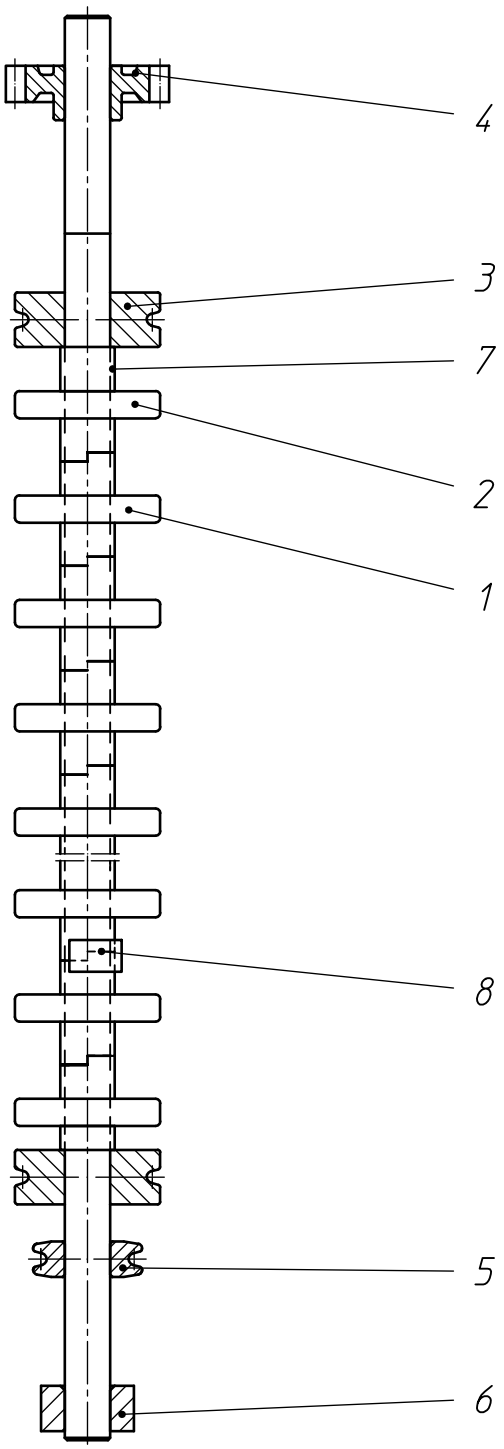
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1251E0570	1/1
	00



Assembly	: 16.004.1252.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000090
Quant.	: 3,000 ST	Page	: 000327/01
Drawing	: 16.004.1252E0570	Date	: 10.04.2006

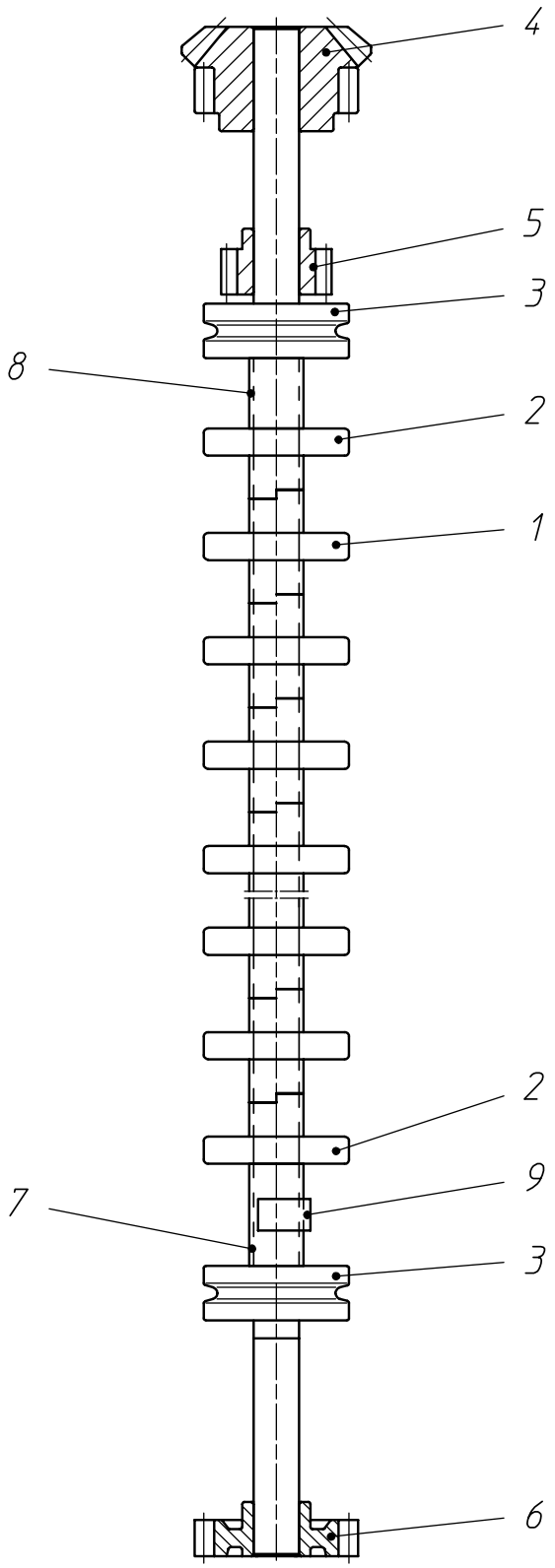
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1252E0570	11
	00



Assembly	: 16.004.0843.2571	Commiss.	: 25-05-377
Label	: Shaft/10/32/CPL/T25/650/V2A /PP/U/K/B/F	Position	: 000090
Quant.	: 1,000 ST	Page	: 000328/01
Drawing	: 16.004.0843E0570	Date	: 10.04.2006

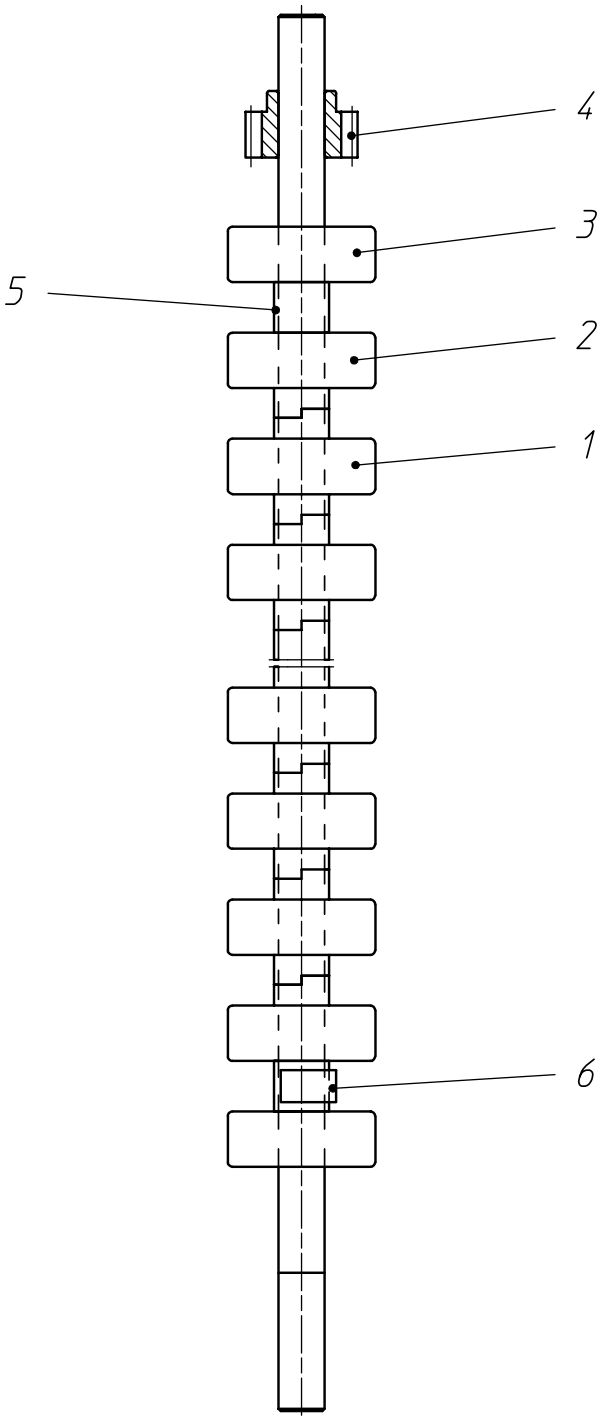
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0843E0570	11
	00



Assembly	: 16.004.1255.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/L/AV/FJ/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000329/01
Drawing	: 16.004.1255E0570	Date	: 10.04.2006

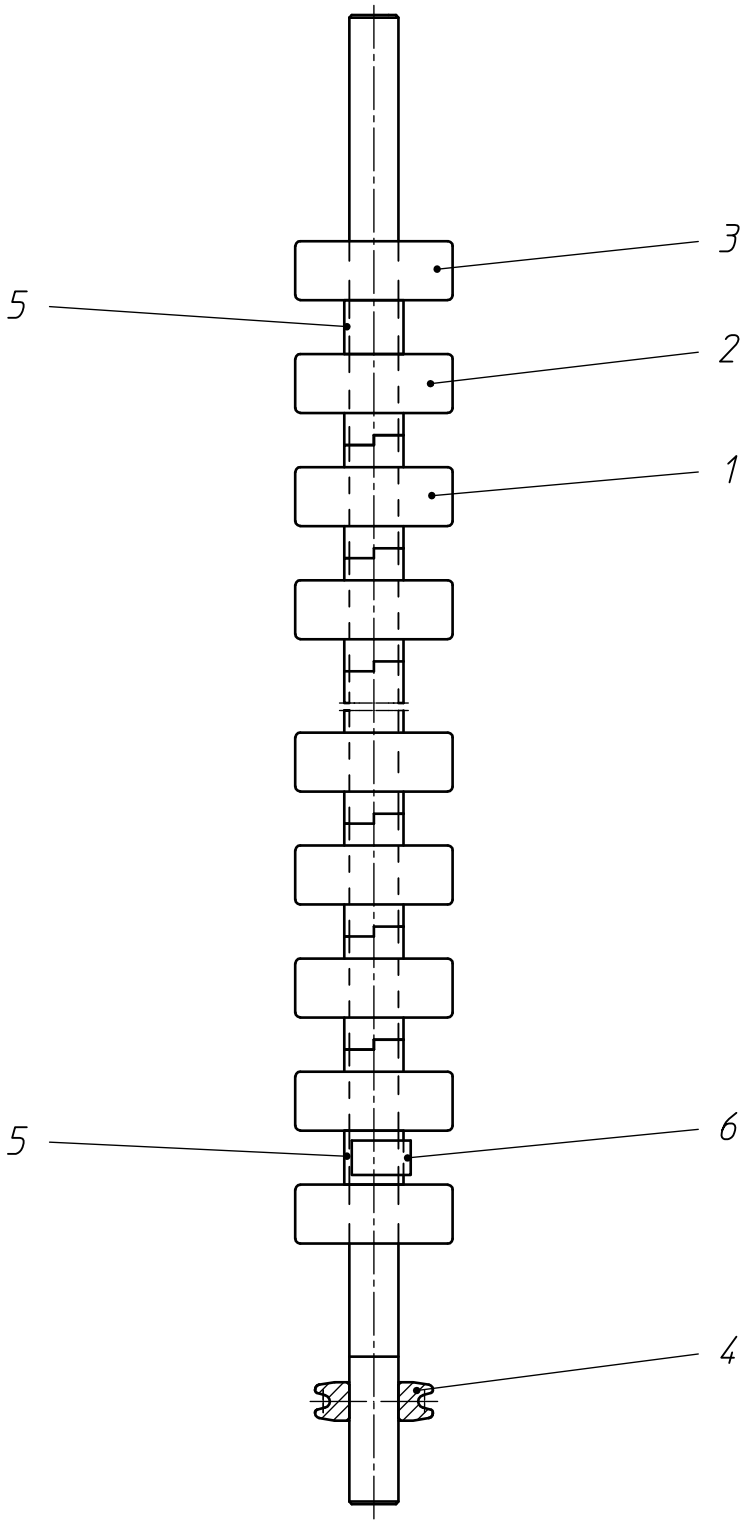
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1678.0570 WHEEL/57/d10/D32/D12/L25/WIDE	24,000	ST	X
2	16.004.0807.0570 WHEEL/57/d10/D32/D12/L25/WIDE	2,000	ST	X
3	00.018.0057.0570 DISTANCE DISC/57/d=09.6/D=32/L=12	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	2,000	ST	X
6	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1255E0570	1/1
	00



Assembly	: 16.004.1254.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O/ /L/AV/FJ/V2A	Position	: 000090
Quant.	: 2,000 ST	Page	: 000330/01
Drawing	: 16.004.1254E0570	Date	: 10.04.2006

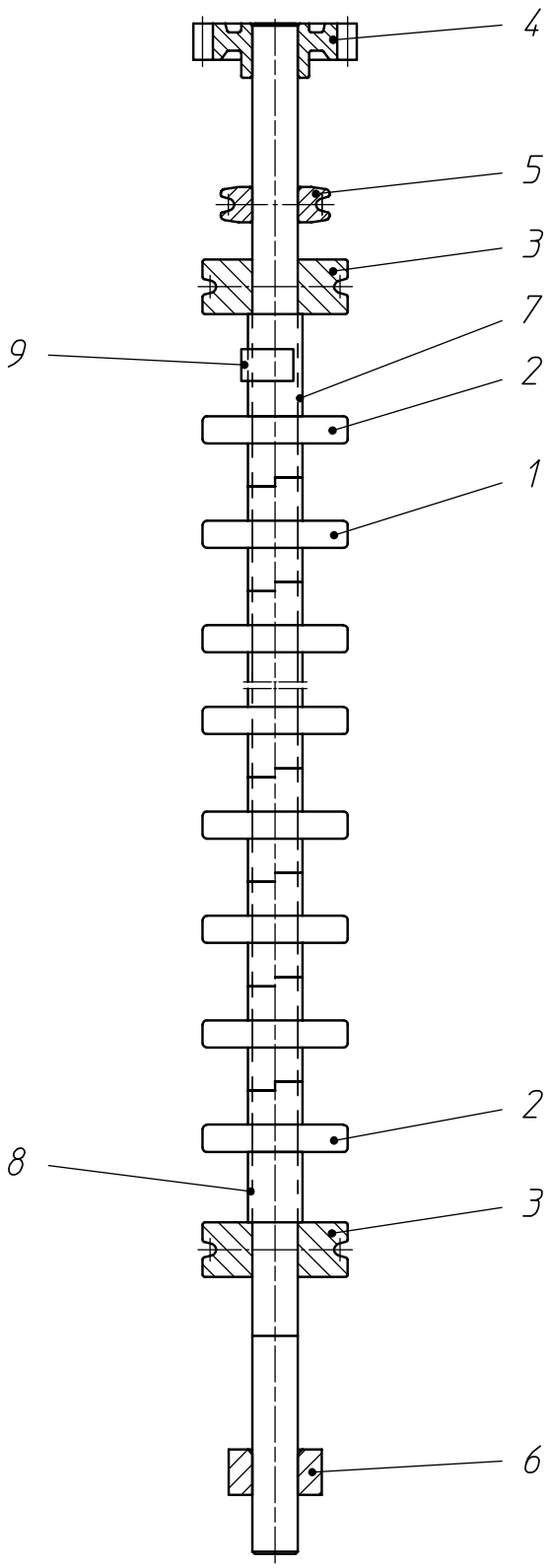
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1254E0570	11
	00



Assembly	: 16.004.1256.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000090
Quant.	: 1,000 ST	Page	: 000331/01
Drawing	: 16.004.1256E0570	Date	: 10.04.2006

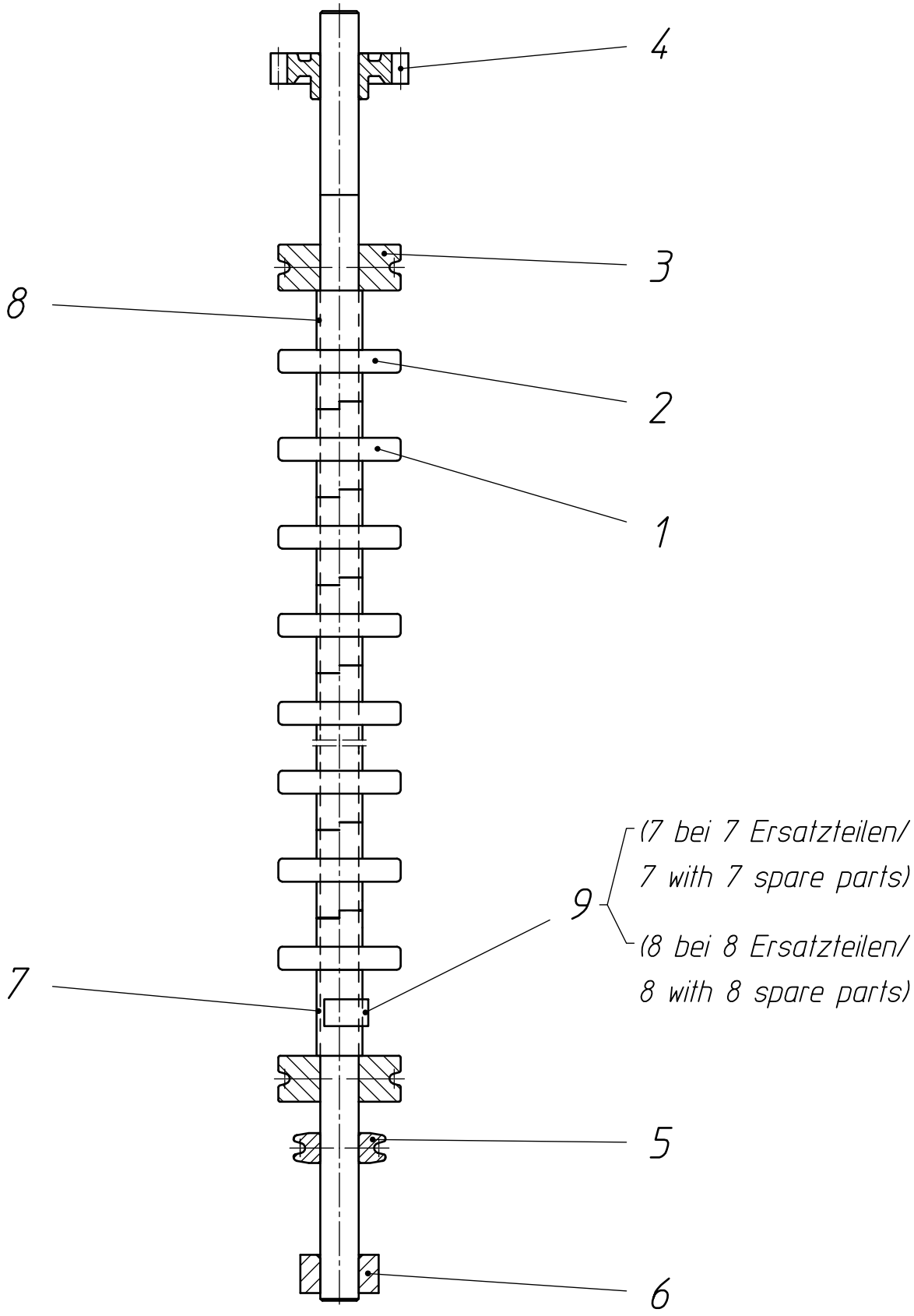
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0269.000E BUSHING /PP-G/d=10.2/D=12.0/L=22.5	1,000	ST	X
8	00.019.0416.000E BUSHING/PP-G/d=12.0/D=10.2/L=15.5	1,000	ST	X
9	16.004.0870.0030 CLIP/COLOUR MARKING/PP/BLUE/RAL5015	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1256E0570	1/1
	01



Assembly	: 16.004.0559.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL/Z=11/M2/VA/PP /=0162	Position	: 000090
Quant.	: 3,000 ST	Page	: 000332/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

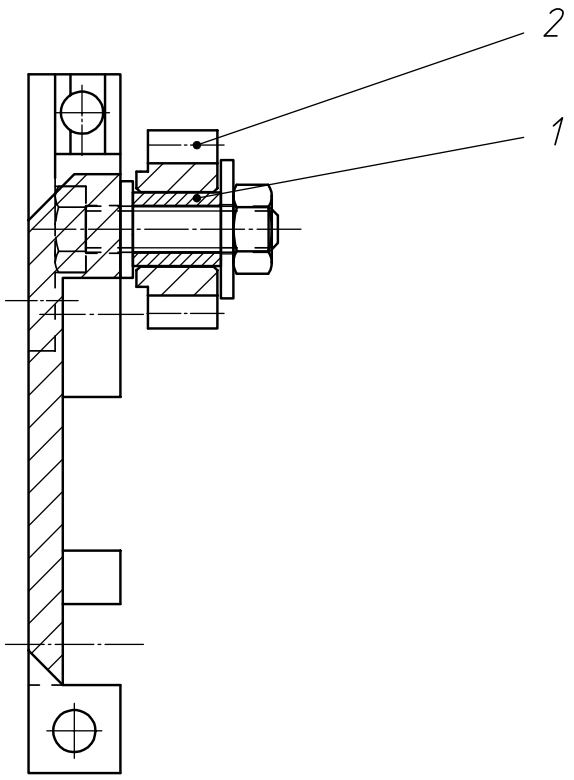
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0002 00SHING/SS/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0393.U800	Commiss.	: 25-05-377
Label	: BELT DRIVE/SHAFT/O/SPRAY/FJ	Position	: 000090
Quant.	: 3,000 ST	Page	: 000333/01
Drawing	: 16.004.0393EU000	Date	: 10.04.2006

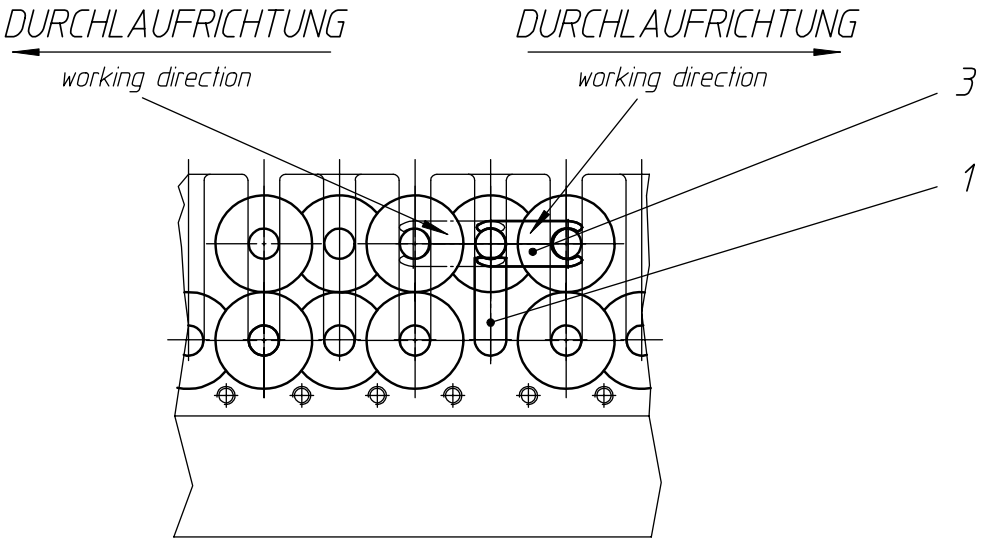
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0084.000H DISTANCE/GUR-N	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1178.000H CLIP/GUR-N/T25/TOP	2,000	ST	X

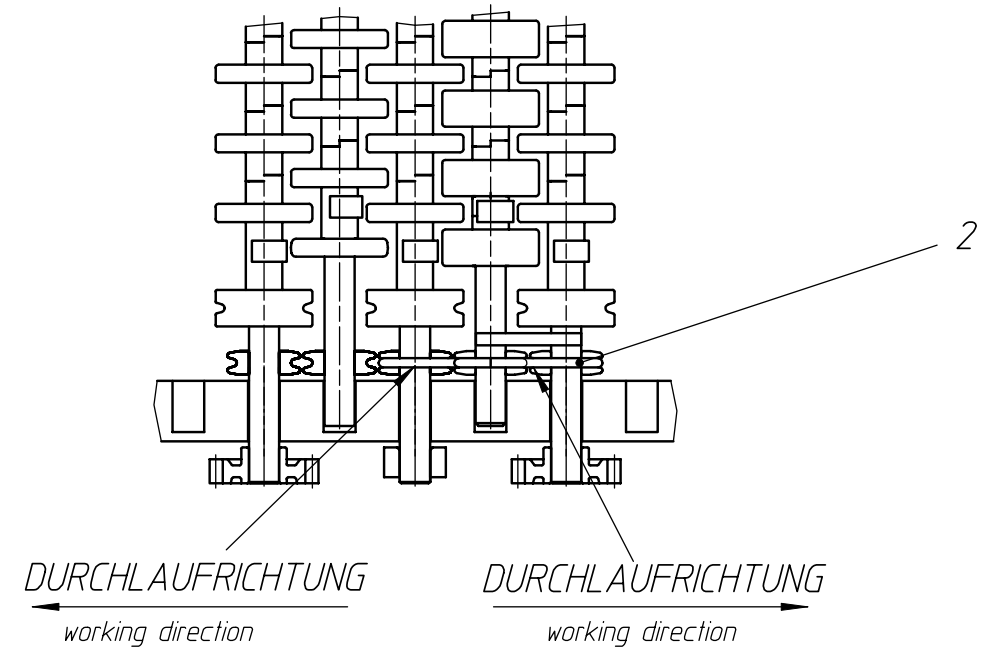
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMENANTRIEB

Spare parts list BELT DRIVE

16.004.0393EU000	11
	00





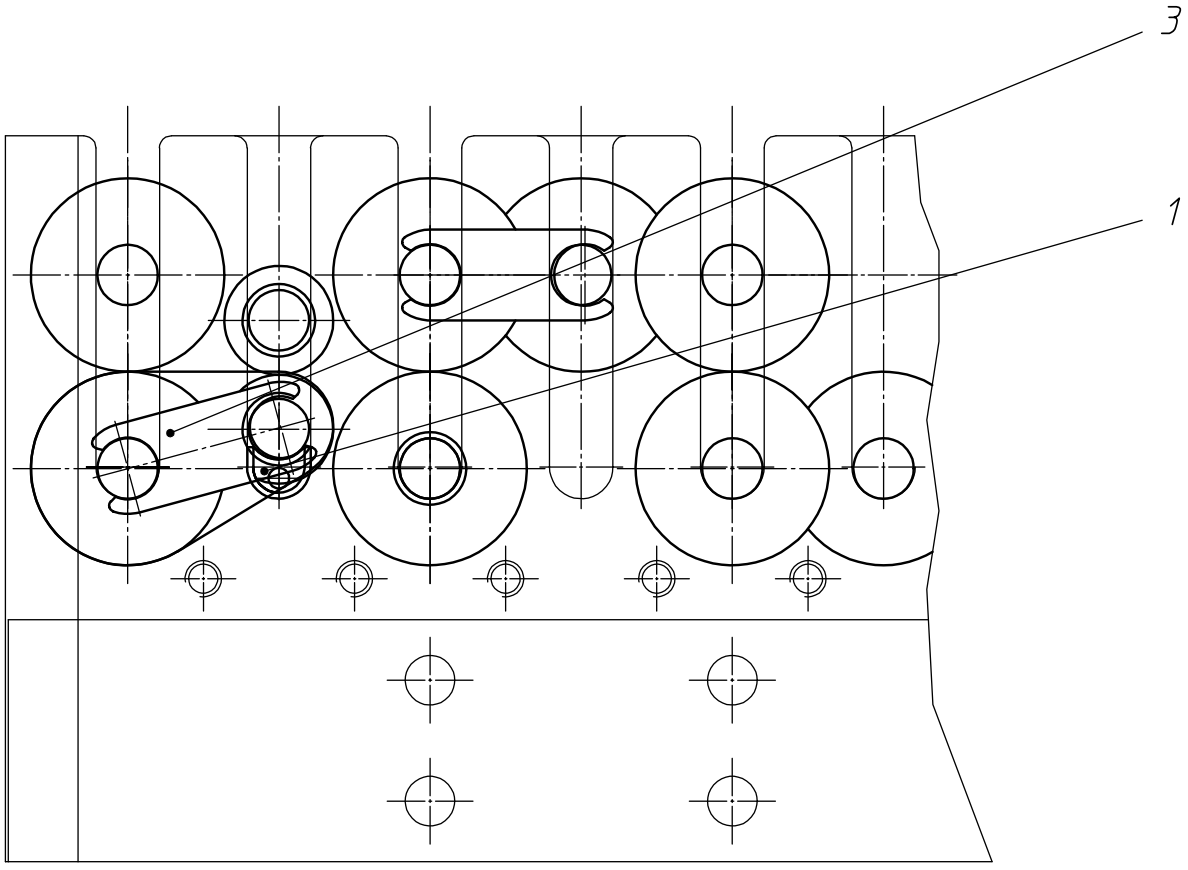
Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000090
Quant.	: 10,000 ST	Page	: 000334/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

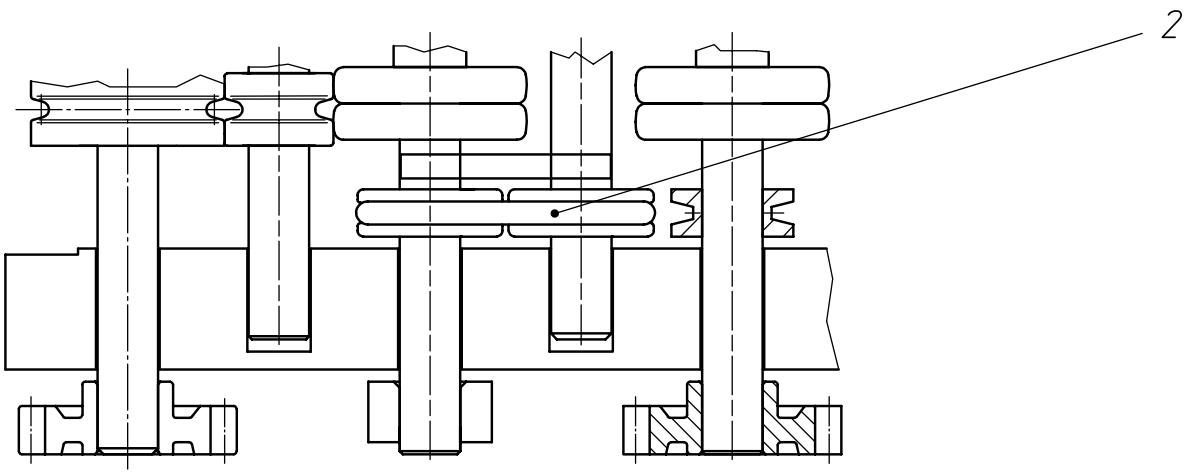
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





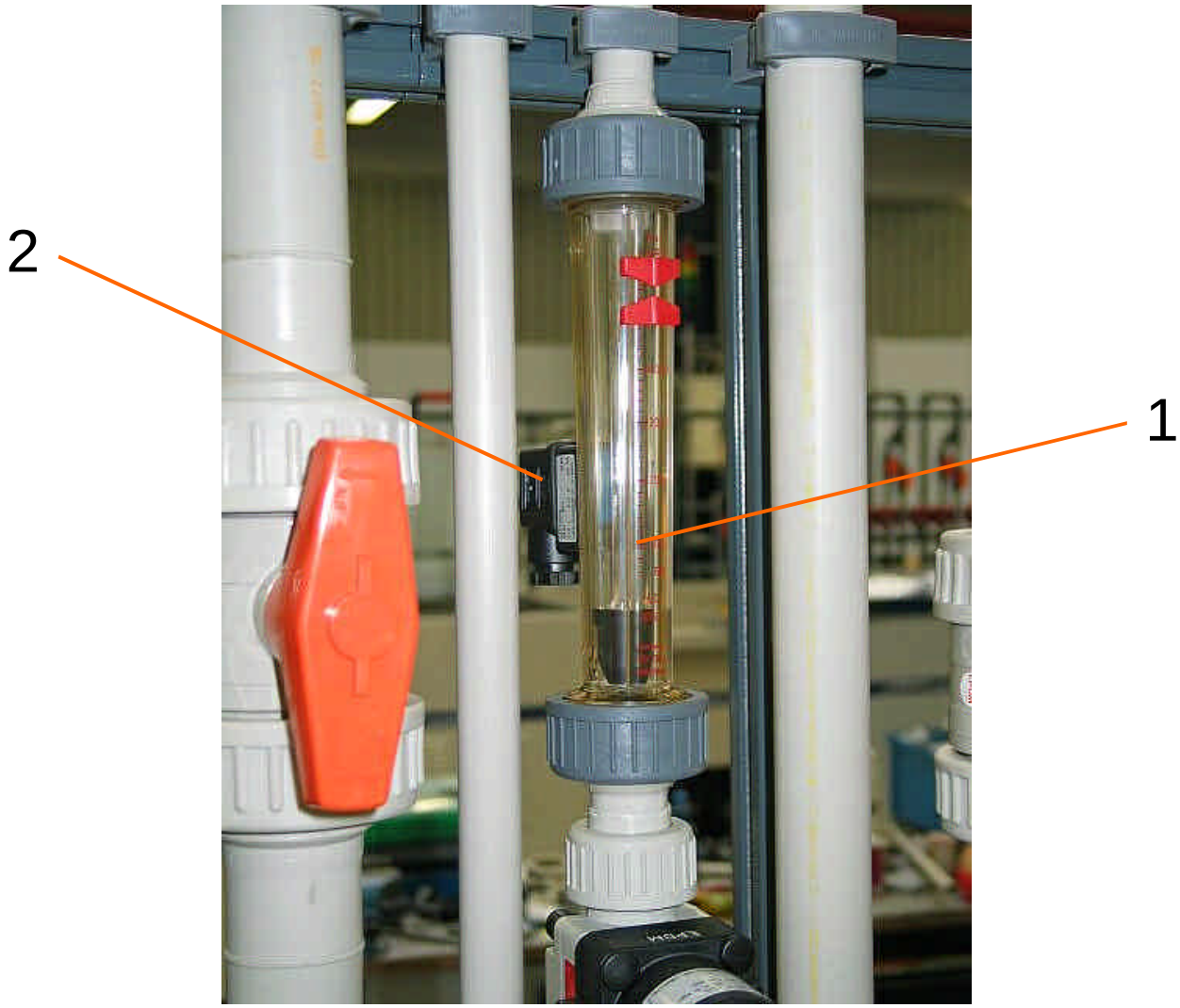
Assembly	: 16.005.0086.U00A	Commiss.	: 25-05-377
Label	: INLET/PVC/DFM640/GK-MIN/MV/D=20	Position	: 000090
Quant.	: 1,000 ST	Page	: 000335/01
Drawing	: 16.005.0086EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
	50.001.0004.U000 MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	1,000	ST	
1	MG-000000092-000 FLOW METER/POLYSULFON86/PVC/0060-00640 I	1,000	ST	X
2	ES-000000200-000 MAGNETIC SWITCH/TP:1257 MIN.DN10/15	1,000	ST	X

Ersatzteilliste Zulauf

Spare parts list inlet

16.005.0086EU000	11
	00



GEMÜ®

Limit Switches Instrument Sensors

Description

Limit switches, types 1251–1257, for flowmeters operating on the variable area principle. Reading of the level of the float at the switching points.
Instrument sensors, types 1270–1273 for flowmeters operating on the variable area principle. Continuous reading of the level of the float.

Construction

Types 1251–1257
In the switches there are bistable reed contacts actuated by the magnet incorporated in the float.

Types 1270–1273
The instrument sensor contains reed contacts which are triggered by the magnetic flowmeter float.

Types 1272/1273 are equipped with an integrated 2-wire signal converter which realizes a current output signal.

Function

The limit switches and instrument sensors are fixed to the dovetail-sections moulded onto the flowmeter type series 800 and 850 (see datasheets 800 and 850). The float in the flowmeter is equipped with a permanent magnet.

Types 1251–1257
When the magnetic float has passed the limit switches fixed to the tube at least once, it will produce the following circuit condition:

Position of the float in relation to the limit switch:

	above the switch	**below the switch**
Max. limit switch (types 1251/1256):	closed	open
Min. limit switch (types 1252/1257):	open	closed

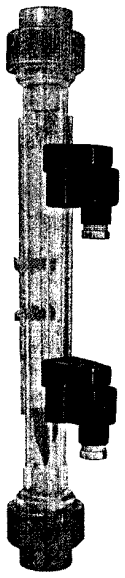
The switches then **remain** in this position, even if the float moves a long way from the min. or max. switch and will only change when the float passes the respective switch again.

Types 1270–1273
After passing through the type 1274 or 1279 signal transmitters, the reading from the type 1270/1271 instrument sensor is available as a digital indicating signal and as an analogue output signal which can then be used for further processing.

Types 1272/1273 produce a current output signal which can be directly processed without any further conversion.

The function of the limit switches or instrument sensors is neither affected by the working pressure, nor by the conductivity, concentration or density of the medium.

The application of the flowmeters with continuous reading or limit switches together with a signal converter is suitable for use with conducting, non-conducting and also with turbid media.



Types 1251–1257

Types 1270–1273

Types 1251/1256 Max. Limit Switches – Types 1252/1257 Min. Limit Switches

Housing material: Plastic
Electrical connection: Standard connector, supplied with switch
Contacts: Bistable reed switches
Switching function: Min. or max. switch as described
Degree of protection: IP 65
Max. voltage: 250 V
Max. peak value of marking current: 0.5 A
Max. steady current: 0.2 A
Max. switching duty: 10 VA
Specification: 1251/1252 for types 800 and 850 DN 25; cable gland PG 9
1256/1257 for type 850 DN 10, 15, 20; cable gland PG 9

Ordering Information:

Types 1251/1256 max. limit switches
Types 1252/1257 min. limit switches

Types 1270–1273 Instrument Sensors

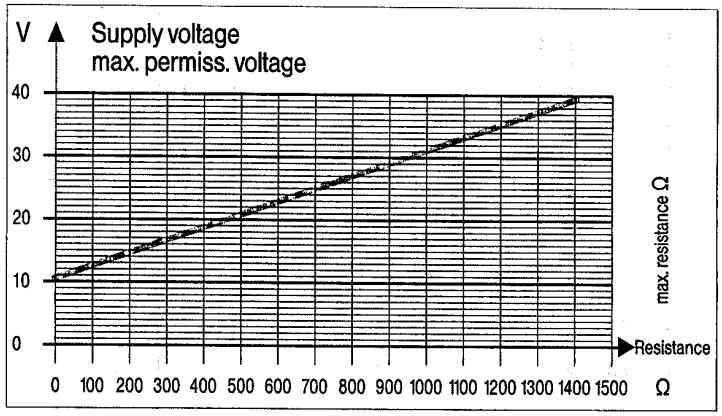
Housing material: Impact resistant plastic
Electrical connection: Standard connector with PG 9 cable gland, supplied with instrument sensor
Sensing system: Series of reed switches connected to a chain of resistors (0–10 kΩ)
Degree of protection: IP 65

Types 1272 and 1273 Instrument Sensors

Voltages: Operating voltage must be either abs. direct current or regulated direct current
$U_{min.} = 11\,V + 0.02 \times$ burden (Ohm)
$U_{max.} = 40\,V + 0.004 \times$ burden (Ohm)
Value acc. to diagram
Power consumption: V × 20 mA
Current output: 4–20 mA

Supply voltage dependent upon the resistance (in types 1272/73)

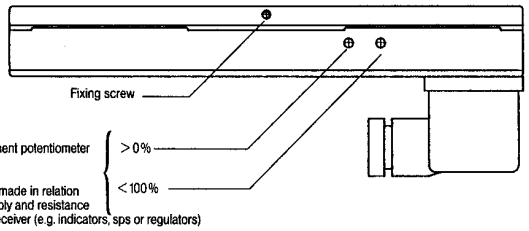
Supply voltage in V	Resistance in Ω	Current in mA
11.0	0.55	20
12.45	47	20
13.5	100	20
14.6	150	20
15.7	200	20
17.6	300	20
19.7	400	20
21.7	500	20
23.8	600	20
25.6	700	20
27.7	800	20
29.8	900	20
31.7	1000	20
33.7	1100	20
35.8	1200	20
37.7	1300	20
39.9	1400	20
41.8	1500	20



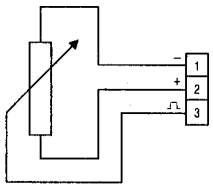
Ordering Information

Type	For flow-meter type	Signal transmitter	Metering length	Number of switch points	Distance of reed contacts	Combination within the GEMÜ modular system
Type 1270/000/Z 25	800	without	230 mm	55	4.25 mm	Types 1281–1284
Type 1271/000/Z 10	850/DN 10–20	without	122 mm	43	3.00 mm	Types 1286–1289
Type 1271/000/Z 25	850/DN 25	without	147 mm	43	3.50 mm	Types 1274–1279, Type 1510
Type 1272/000/Z 25	800	with integrated two wire signal converter	230 mm	55	4.25 mm	Type 3000, remote indication with input 4-20 mA, e.g. SPS
Type 1273/000/Z 10	850/DN 10–20		122 mm	43	3.00 mm	
Type 1273/000/Z 25	850/DN 25		230 mm	55	4.25 mm	

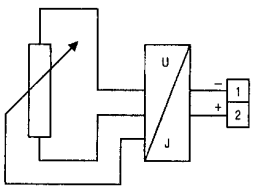
Types 1272/1273



Types 1270/1271



Types 1272/1273



Ordering Information: Types 1274/1279 signal transmitter, Types 1281-1289 3-point controllers, Type 1510 signal converter, Type 3000 accumulated flow counter
Please order separate datasheets.

Subject to alteration · 1/94 · 88048793

GEMÜ Gebr. Müller · Apparatebau GmbH & Co. KG · Criesbach · Neuer Wasen 6 · D-74653 Ingelfingen · Telefon 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Plastic Flowmeter

– Variable Area Principle –

Description

A range of plastic flowmeters, based on the variable area principle, which are corrosion resistant, extremely accurate, simple to use and maintain, and which possess considerable impact resistance.

Construction

The type 800 series of flowmeters operates according to the variable area principle, whereby the float can move freely within the metering tube.

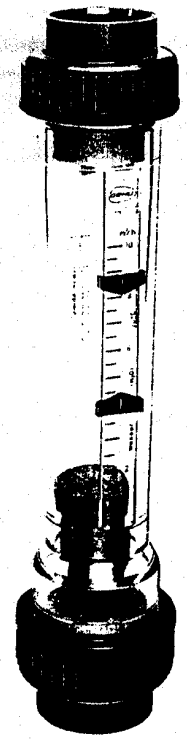
Metering tubes are available in Trogamid T, suitable for neutral media, and Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in Polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals of EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded onto the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), minimum and/or maximum limit switches, and a continous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 800

Accuracy class:
4; according to VDE/VDI 3513 sheet 2, i.e. 1% of end value + 3% of indicated flow inaccuracy

Flow ranges:

Standard Range*/** (Liquids)	Malleable Iron Unions Weight (kg)	PVC Unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	Hydrochloric acid HCl 30-33% Tube: Polysulfon	Sodium hydroxide NaOH 30% Tube: Trogamid-T	Sodium hydroxide NaOH 50% Tube: Trogamid-T	%-Scala Tube Trogamid-T Polysulfon	Tube Size Ref. no.
Type 805/815	0.70	0.40	DN 25	15– 160 l/h	10–130 l/h	–	–	10–100%	51
	0.70	0.40	DN 25	20– 250 l/h	10–200 l/h	2–110 l/h	–	10–100%	52
Material of float:	0.70	0.40	DN 25	40– 400 l/h	20–350 l/h	–	–	10–100%	53
	0.70	0.40	DN 25	60– 640 l/h	40–540 l/h	–	1–130 l/h	10–100%	54
PP (Polypropylene)	1.20	0.70	DN 32	100–1000 l/h	–	–	–	10–100%	61
	1.20	0.70	DN 32	150–1600 l/h	–	–	–	10–100%	62
(Type 815 with magnet)	2.50	1.60	DN 50	0.2– 2.5 m^3/h	–	–	–	10–100%	71
	2.50	1.60	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	72
	2.50	1.60	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	73
	3.80	2.50	DN 65	1–11 m^3/h	–	–	–	10–100%	76
Type 807/817	0.75	0.45	DN 25	25– 250 l/h	–	–	–	10–100%	51
	0.75	0.45	DN 25	40– 400 l/h	–	–	–	10–100%	52
Material of float:	0.75	0.45	DN 25	60– 640 l/h	–	–	–	10–100%	53
	0.75	0.45	DN 25	100–1000 l/h	–	–	–	10–100%	54
1.4571	1.30	0.80	DN 32	150–1600 l/h	–	–	10–540 l/h	10–100%	61
Stainless steel	1.30	0.80	DN 32	200–2500 l/h	–	–	–	10–100%	62
	3.00	2.10	DN 50	0.4– 4 m^3/h	–	–	–	10–100%	71
(Type 817 with magnet)	3.00	2.10	DN 50	0.6– 6.3 m^3/h	–	–	–	10–100%	72
	3.00	2.10	DN 50	1–10 m^3/h	–	–	–	10–100%	73
	4.70	3.40	DN 65	1.5–18 m^3/h	–	–	–	10–100%	76

*All scales of the standard range are based on a medium temperature of 20° C.

Standard Range (Gaseous media)	Malleable Iron Unions Weight	PVC Unions Weight	Size (mm)	Medium Air 1 bar abs. and 20°C	Tube Size Ref. no.
Type 825	0.70	0.40	DN 25	0.25 – 2.5 Nm^3/h	51
	0.70	0.40	DN 25	0.4 – 4.0 Nm^3/h	52
Material of float:	0.70	0.40	DN 25	0.63 – 6.3 Nm^3/h	53
	0.70	0.40	DN 25	1.0 – 10 Nm^3/h	54
PP (Polypropylene)	1.20	0.70	DN 32	1.6 – 16 Nm^3/h	61
	1.20	0.70	DN 32	2.5 – 25 Nm^3/h	62
	2.50	1.60	DN 50	4.0 – 40.0 Nm^3/h	71
	2.50	1.60	DN 50	6.3 – 63.0 Nm^3/h	72
	2.50	1.60	DN 50	10.0 –100.0 Nm^3/h	73
	3.80	2.50	DN 65	16.0 –180.0 Nm^3/h	76
Type 835	0.75	0.45	DN 25	0.63– 6.3 Nm^3/h	51
	0.75	0.45	DN 25	1.0 – 10.0 Nm^3/h	52
Material of float:	0.75	0.45	DN 25	1.6 – 16.0 Nm^3/h	53
	0.75	0.45	DN 25	2.5 – 25.0 Nm^3/h	54
PP (Polypropylene)	1.30	0.80	DN 32	4.0 – 40.0 Nm^3/h	61
	1.30	0.80	DN 32	6.3 – 63.0 Nm^3/h	62
with magnet	3.00	2.10	DN 50	10.0 –100.0 Nm^3/h	71
	3.00	2.10	DN 50	16.0 –160.0 Nm^3/h	72
	3.00	2.10	DN 50	25.0 –250.0 Nm^3/h	73
	4.70	3.40	DN 65	40.0 –400.0 Nm^3/h	76

**** For smaller or larger flow ranges, see types 850, 840 and back page of datasheet type 800. Further ranges available on enquiry.**

To types 825/835.
Note: with gaseous media the scaling alters according to operating pressure.
Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note ordering instructions.

Ordering information

Material of float	Working medium	Type Ref. no.
PP	Liquids	805
PP (with magnet)	Liquids	815
Stainless steel 1.4571	Liquids	807
Stainless steel 1.4571 (with magnet)	Liquids	817
PP	Gas	825
PP (with magnet)	Gas	835

Size	Ref. no.
DN 25	25
DN 32	32
DN 50	50
DN 65	65

Body configuration: D = straight through

Tube end connections	Ref. no.
Threaded spigots	7

Material of tube	Ref. no.
Trogamid-T Temp. range: 0– 60°C	21
Polysulfon Temp. range: 0–100°C	22
(Stated temperatures are valid for water).	

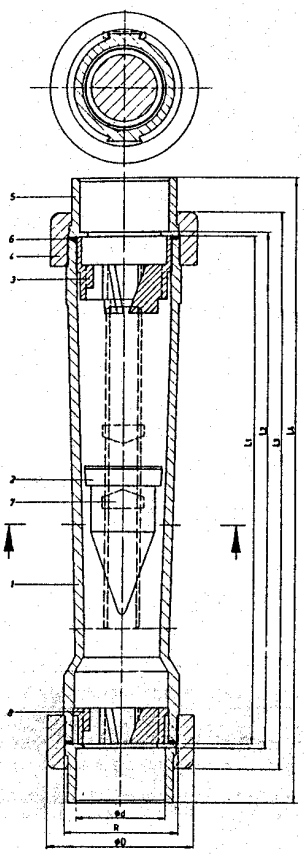
Material of O-Rings	Ref. no.
FPM (Viton)	4
EPDM (Ethylene-propylene)	14

End connection material	Ref. no.
PVC unions with adhesive sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16	6

Size of tube
(see table on left)

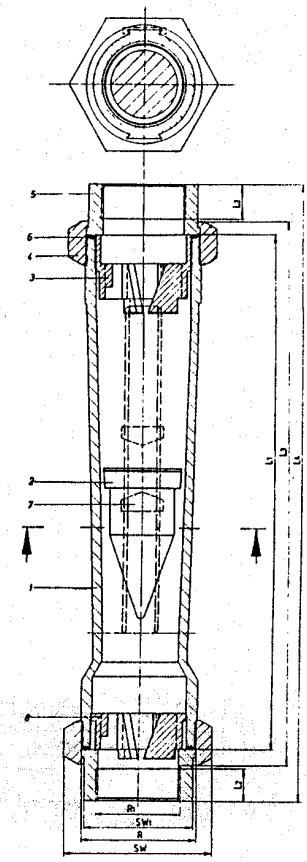
Flow range:
(see table on left)

Note:
When ordering, the flow ranges should be stated as follows:
Liquids: l/h
Gaseous media: Nm^3/h



DN	R	R_1	SW	SW_1	L_1	L_2	L_3	L_4
25	G 1½	G 1	54	38	350	17	370	402
32	G 2	G 1¼	66	47	350	19	370	410
50	G 2¾	G 2	90	66	350	24	374	420
65	G 3½	G 2½	110	83	350	30	374	430

PVC-Unions



DN	ø d	R	ø D	L_1	L_2	L_3	L_4
25	32	G 1½	60	350	356	376	400
32	40	G 2	74	350	356	380	408
50	63	G 2¾	103	350	356	386	433
65	75	G 3½	122	350	356	388	445

Malleable iron unions

Spare parts list

Pos.	Description	Pieces
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1

Ordering Example	805	25	D	7	21	14	1	51	160
Type (float PP)	805								
Size (mm)		25							
Body configuration			D						
End connection of tube				7					
Material of metering tube					21				
Material of O-ring						14			
End connection material							1		
Tube cone								51	
Flow range max. (e.g. 160 l/h, H_2O)									160

Required information

In order to size a flowmeter the following data are necessary:
1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h or kg/h)
4. Operating pressure (bar abs or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)
8. Float with or without magnet

Plastic Flowmeter for Larger Flow Ranges

Standard scale: Range 12 – 26 m^3/h., medium: water at 20°C

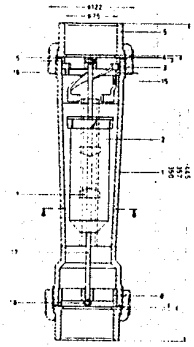
Version:

Construction and materials as for types 807/817, nominal bore size: 65 mm.
The float is guided by means of a rod.

Ordering Information:

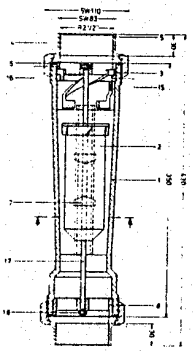
Analogue: As for types 807 / 817. In addition, following the range (26.000 l/h.), please give the version of the float according to the following ref. nos.:

Material of float	Type ref. no.	Additional ref. no.
Stainless steel no. 1.4571	807	1105
Stainless steel no. 1.4571 (with magnet)	817	1106



DN	Od	OD	I	L
65	75	122	357	445

Version
PVC unions
weight 4.6 kg.



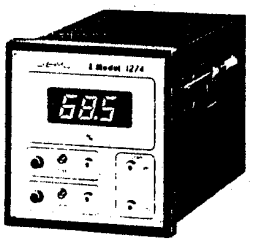
DN	SW	SW1	D	I	L
65	110	83	G 2½	30	430

Version
Malleable iron unions
weight 6.0 kg.

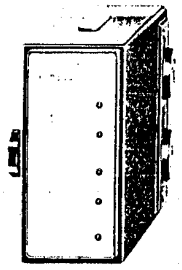
Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3, 15, 16	Compl. float stop	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2
8	Float stop (lower)	1
17	Guiding rod	1
18	Nut for guiding rod (17)	2

Accessories for Flowmeter Series 800



Type 1274/1279



Type 1520/1521

Type 1270

Type 1251

Type 1252

To increase the versatility of the flowmeter series 800, numerous accessories have been developed which can be retrofitted onto the tube. The float however, must be one containing a magnet, in order for these accessories to function.

- Type 1251 Limit switch (max.) 10 VA
- Type 1252 Limit switch (min.) 10 VA
- Type 1270/ Instrument sensor for continual float level readings.
- Type 1274/ **E-module**, signal transmitter.
  1279 Designs: panel mounting or eurocard (19"/24")
- Type 1520/ **E-module**, isolating switch amplifier.
  1521 Designs: panel mounting or eurocard (19"/24")

For the above accessories there are separate datasheets. For further enquiries, please apply for the respective sheets.

Further product range

- Plastic valves, pneumatically, electrically and manually operated
- Metal valves, pneumatically, electrically and manually operated

Manufacturer

GEMÜ GEBR. MÜLLER
Apparatebau GmbH & Co. KG
Postfach 30 · D-7118 Ingelfingen 2 · West Germany
Tel. 07940/123-0 · Telex 74126 · Telefax 07940/123-106

Presented by:

GEMÜ®

Plastic Flowmeter

DN 10–25

Description

A plastic flowmeter, operating on the variable area principle, which is extremely accurate, resistant to corrosion, resistant to impact, and is simple to use.

Construction

This GEMÜ plastic flowmeter operates according to the variable area principle, whereby the float can move freely within the metering tube.

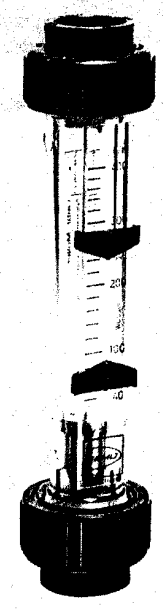
Metering tubes are available in Trogamid, suitable for neutral media, and in Polysulfon, for corrosive media. Both materials are highly resistant to impact and pressure and possess high flectional strength.

Floats are available in polypropylene (PP) or stainless steel (1.4571), depending on flow medium and range requirements.

Male threads on the ends of the metering tube allow for easy mounting of unions, which are available in PVC or malleable iron. The O-ring seals in EPDM or Viton ensure reliable sealing between metering tube and union **without radial forces, which could lead to bursting of the tube.**

Dovetail sections moulded on to the metering tube allow for easy mounting of adjustable flow indicators (supplied with the flowmeter), min. and/or. max. limit switches, or a continuous readout transmitter.

The scale on the metering tube can be suited to the medium and is available in l/h, m^3/h or %.



Type 850

Flow Ranges

Standard Ranges*/** (liquids)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Water H_2O Tube: Trogamid-T	% scale Tube: Trogamid-T Polysulfon	Tube size ref. no.
Type 855/865	0.18	0.07	DN 10	2– 25 l/h	10–100 %	11
	0.18	0.07	DN 10	4– 40 l/h	10–100 %	12
	0.18	0.07	DN 10	5– 60 l/h	10–100 %	13
	0.18	0.07	DN 10	10– 100 l/h	10–100 %	14
Float material	0.18	0.07	DN 10	15– 160 l/h	10–100 %	15
	0.30	0.12	DN 15	5– 60 l/h	10–100 %	21
	0.30	0.12	DN 15	10– 100 l/h	10–100 %	22
	0.30	0.12	DN 15	15– 160 l/h	10–100 %	23
PP (Polypropylene)	0.30	0.12	DN 15	20– 250 l/h	10–100 %	24
	0.30	0.12	DN 15	30– 320 l/h	10–100 %	25
(Type 865 with magnet)	0.48	0.21	DN 20	15– 160 l/h	10–100 %	31
	0.48	0.21	DN 20	20– 250 l/h	10–100 %	32
	0.48	0.21	DN 20	40– 400 l/h	10–100 %	33
	0.48	0.21	DN 20	60– 640 l/h	10–100 %	34
	0.61	0.29	DN 25	20– 250 l/h	10–100 %	41
	0.61	0.29	DN 25	40– 400 l/h	10–100 %	42
	0.61	0.29	DN 25	60– 640 l/h	10–100 %	43
	0.61	0.29	DN 25	100–1000 l/h	10–100 %	44
Type 857/867	0.19	0.08	DN 10	4– 40 l/h	10–100 %	11
	0.19	0.08	DN 10	5– 60 l/h	10–100 %	12
	0.19	0.08	DN 10	10– 100 l/h	10–100 %	13
	0.19	0.08	DN 10	15– 160 l/h	10–100 %	14
Float material	0.19	0.08	DN 10	20– 250 l/h	10–100 %	15
	0.31	0.13	DN 15	10– 100 l/h	10–100 %	21
	0.31	0.13	DN 15	15– 160 l/h	10–100 %	22
1.4571	0.31	0.13	DN 15	20– 250 l/h	10–100 %	23
Stainless steel	0.31	0.13	DN 15	40– 400 l/h	10–100 %	24
(Type 867 with magnet)	0.31	0.13	DN 15	50– 500 l/h	10–100 %	25
	0.51	0.24	DN 20	20– 250 l/h	10–100 %	31
	0.51	0.24	DN 20	40– 400 l/h	10–100 %	32
	0.51	0.24	DN 20	60– 600 l/h	10–100 %	33
	0.51	0.24	DN 20	100–1000 l/h	10–100 %	34
	0.66	0.34	DN 25	40– 400 l/h	10–100 %	41
	0.66	0.34	DN 25	60– 640 l/h	10–100 %	42
	0.66	0.34	DN 25	100–1000 l/h	10–100 %	43
	0.66	0.34	DN 25	150–1600 l/h	10–100 %	44

* All scales of the standard range are based on a medium temperature of 20°C.

****For larger flow ranges see type series 800.**

Standard Ranges (gaseous media)	Malleable iron unions Weight (kg)	PVC unions Weight (kg)	Size (mm)	Medium air at 1 bar abs. and 20°C	Tube size ref. no.
Type 875	0.18	0.07	DN 10	30– 360 N l/h	11
	0.18	0.07	DN 10	50– 550 N l/h	12
	0.18	0.07	DN 10	100– 900 N l/h	13
	0.18	0.07	DN 10	150–1500 N l/h	14
Float material	0.18	0.07	DN 10	200–2400 N l/h	15
	0.29	0.11	DN 15	100– 900 N l/h	21
	0.29	0.11	DN 15	150–1500 N l/h	22
	0.29	0.11	DN 15	200–2400 N l/h	23
	0.29	0.11	DN 15	400–3800 N l/h	24
PP (Polypropylene)	0.29	0.11	DN 15	500–4800 N l/h	25
	0.46	0.19	DN 20	0.2– 2.5 Nm^3/h	31
	0.46	0.19	DN 20	0.4– 4.0 Nm^3/h	32
	0.46	0.19	DN 20	0.5– 5.5 Nm^3/h	33
	0.46	0.19	DN 20	1.0–10.0 Nm^3/h	34
	0.57	0.25	DN 25	0.4– 4 Nm^3/h	41
	0.57	0.25	DN 25	0.6– 6 Nm^3/h	42
	0.57	0.25	DN 25	1.0–10 Nm^3/h	43
	0.57	0.25	DN 25	1.5–16 Nm^3/h	44

To type 875
Note: With gaseous media the scaling alters according to operating pressure. Please state when ordering.

Special scales:
For other media and operating requirements which differ from those given for standard versions, special scales are available.
Please note the ordering instructions.

Ordering Information

Version:

Flowmeter with float material	Operating medium	Type ref. no.
PP	Liquids	855
PP (with magnet)	Liquids	865
Stainless steel (1.4571)	Liquids	857
Stainless steel (1.4571) (with magnet)	Liquids	867
PP	Gas	875

Size (mm)	Ref. no.
DN 10	10
DN 15	15
DN 20	20
DN 25	25

Body configuration: D = straight through

Tube end connections	Ref. no.
Male threads	7

Material of tube	Ref. no.
Trogamid-T temperature range: 0 – 60°C	21
Polysulfon temperature range: 0 – 100°C	22
(Given temperatures are valid for water)	

Material of O-rings		Ref. no.
O-ring Viton	FPM	4
Ethylene Propylene	EPDM	14

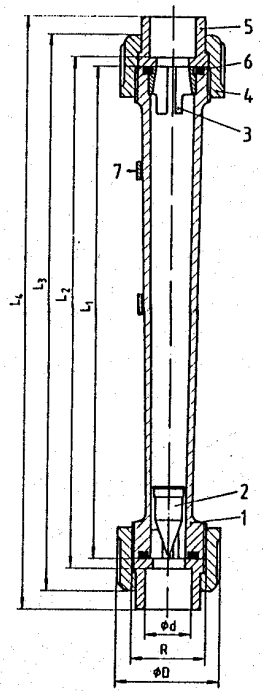
End connection material	Ref. no.
PVC unions with solvent welded sockets acc. to DIN 8063; max. working pressure PN 10.	1
Malleable iron unions with female threads acc. to DIN 2950; max. working pressure PN 16.	6

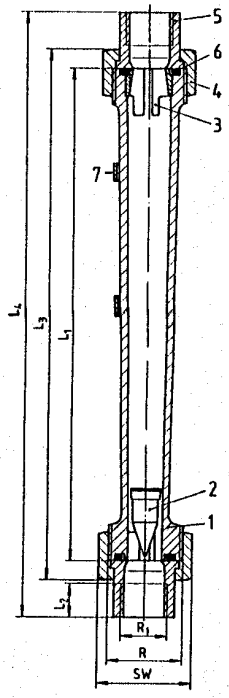
Size of tube
(see table on left)

Measuring range
(see table on left)

Note:
The scale divisions correspond to the actual flows. For liquid media the flow values are in l/h and for gaseous media in Nm^3/h or N l/h

Accuracy class:
4; according to VDE/VDI 3513, sheet 2, i.e. 1% of end value + 3 % of measured value.





DN	Ød	G	ØD	L1	L2	L3	L4
10	16	G¾	35	165	171	186	199
15	20	G 1	43	170	176	192	208
20	25	G1¼	53	185	191	210	229
25	32	G1½	59	200	206	226	250

Version: PVC unions

DN	G 1	G	SW	L1	L2	L3	L4
10	G⅜	G¾	32	165	12	180	207
15	G½	G 1	41	170	13	185	215
20	G¾	G1¼	50	185	16	201	230
25	G 1	G1½	55	200	19	219	250

Version: Malleable iron unions

Spare Parts List

Item:	Description:	Qty.:
1	Tube	1
2	Float	1
3	Float stop (upper)	1
4	Union nut	2
5	Union hub	2
6	O-ring	2
7	Sliding indicator	2

Ordering Example	855	10	D	7	21	14	1	13	60
Type (float PP)	855								
Size (mm)		10							
Body configuration			D						
Connection (ref. no.)				7					
Tube material (ref. no.)					21				
Material of O-rings						14			
End connection material							1		
Tube cone								13	
Flow range max. (e.g. l/h H_2O)									60

Required information:
In order to size a flowmeter, the following data are necessary:

1. Type of medium
2. Concentration of medium (%)
3. Required flow range (l/h, m^3/h, kg./h)
4. Operating pressure (bar abs. or rel.)
5. Temperature of medium (°C)
6. Viscosity (if available)
7. Specific gravity (if available)

Assembly	: 50.001.0004.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE/EL-PN/D20*EL-MA/D16*PVC/EP	Position	: 000090
Quant.	: 1,000 ST	Page	: 000336/01
Drawing	: 50.001.0004EU000	Date	: 10.04.2006

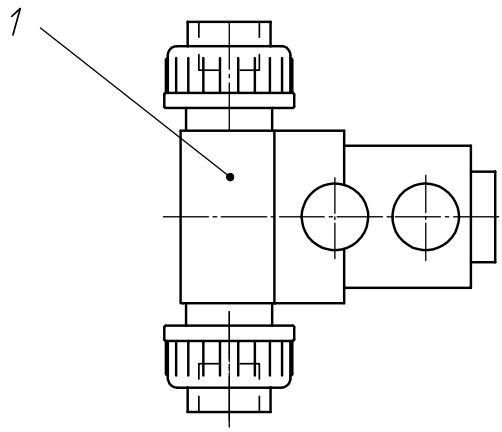
Pos.	Part N° / Label	Quant.	Unit	SP
	50.001.0003.U000 MAGNET VALVE /PNEWW./322	1,000	ST	
1	VE-000000040-000 MEMBRANVALVE PVC/610/15/D 7 114-1 EPDM	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste MEMBRANVENTIL

Spare parts list Diaphragm valve

50.001.0004EU000	11
	01



GEMU®

Plastic Diaphragm Valve

2/2 way, pneumatically operated

Description

Compact, pneumatically operated, plastic bodied diaphragm valve, with good flow characteristics.
Suitable for inert and corrosive liquids and gases.

Construction

The type 610 valve is actuated by a maintenance free piston actuator, which can be controlled by any inert liquid or gas.

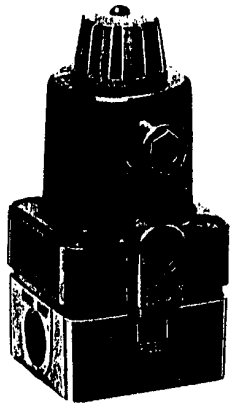
The actuator is of the normally closed (fail safe) type, with a spring holding the valve in the closed position, until pressure is applied to the actuator.

Both valve body and the diaphragm are available in various materials depending on the chemical and thermic conditions.

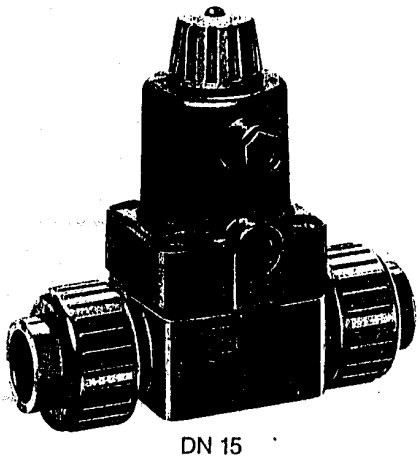
The compact construction of this valve makes it an ideal choice where space is at a premium.

A visible indicator the position of the valve stroke.

The areas of application of this valve are increased by the use of such accessories as an electrical position indicator or a stroke limiter.



DN 12



DN 15

Advantages

- The type 610 valve will close against in either direction
- High corrosion resistance
- Good flow characteristic
- Hermetic seal
- Can be installed in any position
- Eliminates water hammer
- Optical position indicator is standard
- Compact design
- Maintenance free plastic actuator
- Valve size 15 mm, equipped with outside threads and adhesive sockets can be fitted to the pipeline without additional connection elements.

Type 610

4

GEMÜ®

Assembly Instructions Type 610

12 + 15 mm through flow diaphragm valve

610.01.012

I. Assembly

Push the indicator spindle (17) into the operating spindle (14). Screw the valve spindle (15), O-ring (4) and piston (6) into the operating spindle. Mount the lip ring (11) onto the piston (6). Place the compression spring (22) and (26) together with the thoroughly greased piston into the hood (10). Screw the guide piece (16) together with the lip ring (8), washer (30) and O-ring (9) into the hood. Screw the diaphragm (2) together with the pressure disc (5) and pressure piece (3) into the valve spindle. Place the actuator onto valve body (1), position the diaphragm and screw into place with the screws (20) and washers (21).

II. Maintenance

The valve requires no maintenance.

III. Operating instructions

Mounting position: The valve can be mounted in any position.
Direction of flow: The valve can be used for flow in either direction.
Working pressure: The maximum permissible pressure must not be exceeded. This is marked on the type label.

2

Type 610 — Technical Data and Ordering Information

Working Medium

Most neutral and aggressive liquids and gases subject to correct choice of body and seal materials.

Max. temperature of process media:
PVC 60 °C, PP 80 °C, PVDF 90 °C.
Valve will close against flow in either direction, up to full working pressure.

Control Medium

Any inert liquid or gas.

Min. control pressure: see table
Max. control pressured: 7 bar (control function 1)
Max. temperature: 40 °C
Actuator volume: 0.021 Nl

Ordering Specifications

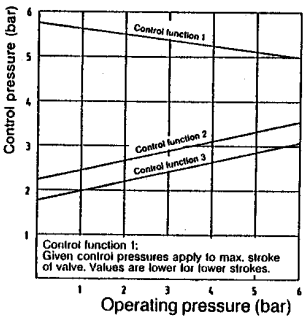
Nominal dia. (mm)	Working pressure (bar)	Control pressure (bar) control function 1	Control pressure (bar) control function 2+3	Body configuration (straight through)	Connection Code no. 1 Threaded sockets	Connection Code no. 2 Adhesive/ Welded sockets	Connection Code no. 7 Threaded spigots w. unions	Kv-value (m^3/h)	Weight (grams)
12	0–6	max. 7	max. 5	D	3/8" (PVC, PP, PVDF)	16 ø (PVC, PVDF)	–	2.8	240
15	0–6	max. 7	max. 5	D	–	–	G1	3.5	290

All pressure are given as gauge pressures.

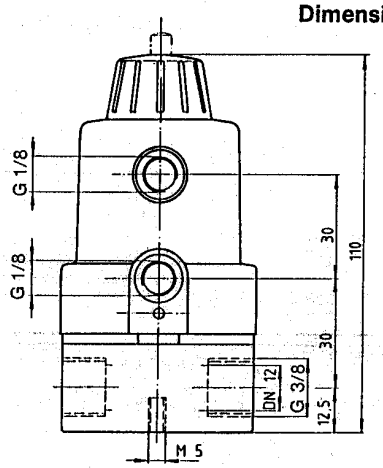
Valve Body Material	Ref. no.
Hard-PVC	1
Polypropylene	5
PVDF	20

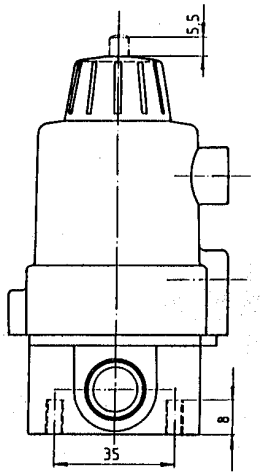
Diaphragm Material		Ref. no.
Perbunan	NBR	2
Viton	FPM	4
Teflon	PTFE	5
Ethylene Propylene	EPDM	14

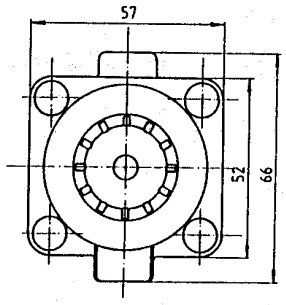
Control Function	Ref. no.
Normally closed	1
Normally open	2
Double acting	3



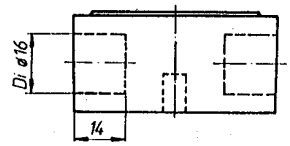
Dimensions



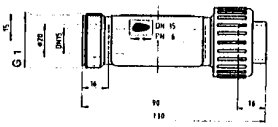




DN 12 Code no. 2 Adhesive or welded sockets



DN 15 Code no. 7 or 2 Threaded spigots/adhesive/ welded/sockets



Ordering Example	610	12	D	2	1	14	1
Type	610						
Size (mm)		12					
Body configuration			D				
Connection				2			
Valve body material					1		
Diaphragm material						14	
Control function							1

Ordering Information:

(Pilot valves see types 320–324)

Accitional information for size 15 mm:
Connection code no. 2:
Adhesive sockets without unions.
Connection code no. 7:
With additional unions.

Accessory: Stroke limiter type 1100/000 Z01

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Presented by:

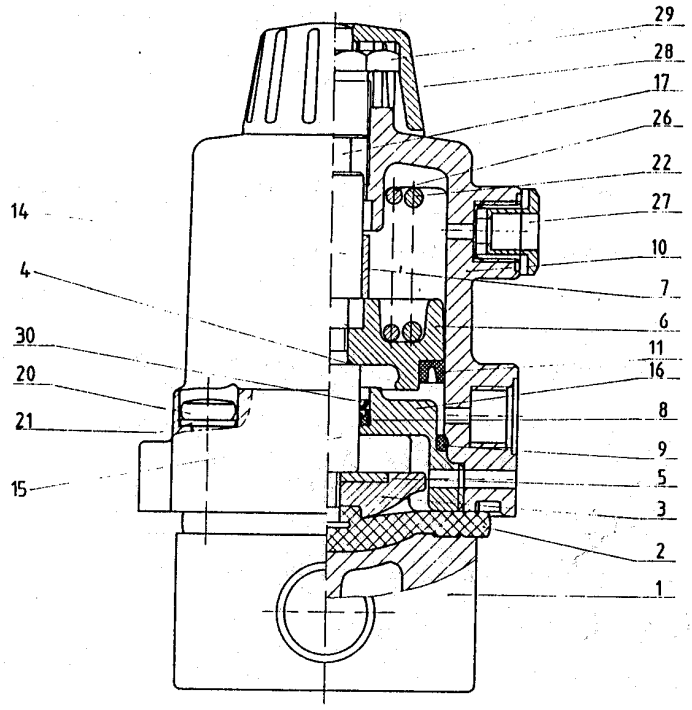
Printed in West Germany – Oha-Druck GmbH, Ingelfingen

GEMÜ®

Spare Parts List Type 610

12 + 15 mm through flow diaphragm valve

610.01.012



Item	Part	Number off
1	Valve body	1
2	Valve-closing diaphragm	1
3	Pressure piece	1
4	O-ring	1
5	Pressure disc	1
6	Piston assembly	1
7	Distance sleeve	1
8	Lip ring	1
9	O-ring	1
10	Hood	1
11	Lip ring	1
14	Operating spindle	1
15	Valve spindle	1
16	Guide piece	1
17	Indicator spindle	1
20	Philips-head fasteners	4
21	Washers	4
22	Compression spring	4
26	Compression spring	1
27	Plug	1
28	Cap	1
29	Stroke limiter (accessory)	1
30	Washer	1

Edition 9/87 – subject to alteration

Assembly	: 50.001.0003.U000	Commiss.	: 25-05-377
Label	: MAGNET VALVE /PNEWW./322	Position	: 000090
Quant.	: 1,000 ST	Page	: 000337/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	EV26NW02-322 SOLEN.VALVE/024/DC/TYP:322/2/M0125 4-1	1,000	ST	X
2	DICH0580-108 O-RING/EPDM/BLACK/006.02x2.62	1,000	ST	X

Parts without Pos.-N° see assembly parts list

GEMÜ®

Plastic Solenoid Valve

3/2-way, directly controlled

Description

Directly controlled 3/2-way plastic solenoid valve for inert gases, with emergency manual operator.
Due to the low power consumption it can be controlled by computers. Control functions: normally open and normally closed.

Construction

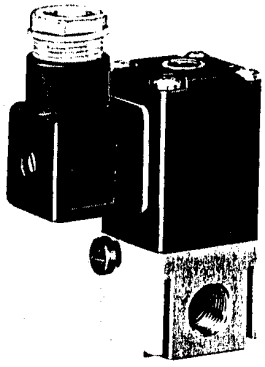
The uniform basic construction of all three types in the series 320/322/324 makes many applications possible without special additional components.

The valve consisting of the solenoid system with a plastic cover and the valve body is very easy to dismantle so that the parts can be replaced separately. In addition to automatic operation the valve can be opened or closed manually. Threaded inserts in the valve body provide an additional mounting facility for panels and standard tracks. The various possibilities for connection provide optimal installation conditions.

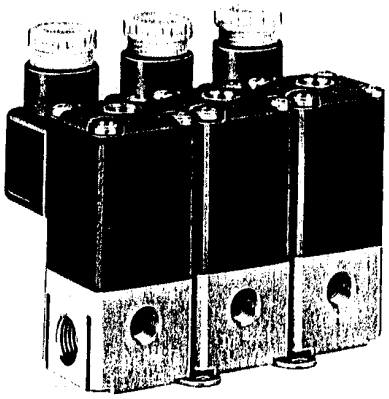
Type 320: Connections: threaded sockets ¼" BSP
Straight through configuration
Suitable for single valve applications

Type 322: Connections: threaded sockets ⅛" & ¼" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for battery mounting
May also be used as a single valve

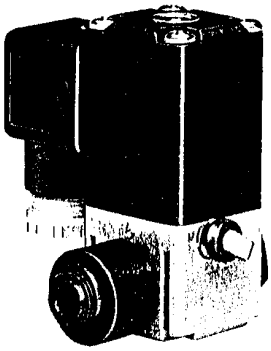
Type 324: Connections: threaded sockets ⅛" BSP
Inlet and outlet arranged at an angle of 90°
Suitable for direct mounting on process valve by hollow screw with ¼" or ⅛" BSP thread



Type 320

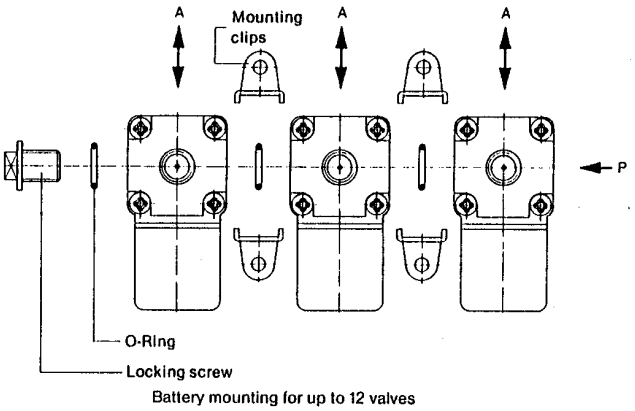


Type 322



Type 324

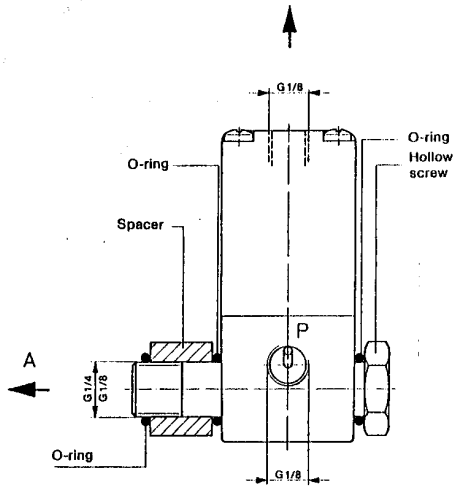
Mounting Instructions, Type 322, Battery Mounting



The items required for battery mounting (2 mounting clips, 1 O-ring and 1 locking screw per valve) are supplied with type 322 when specified.

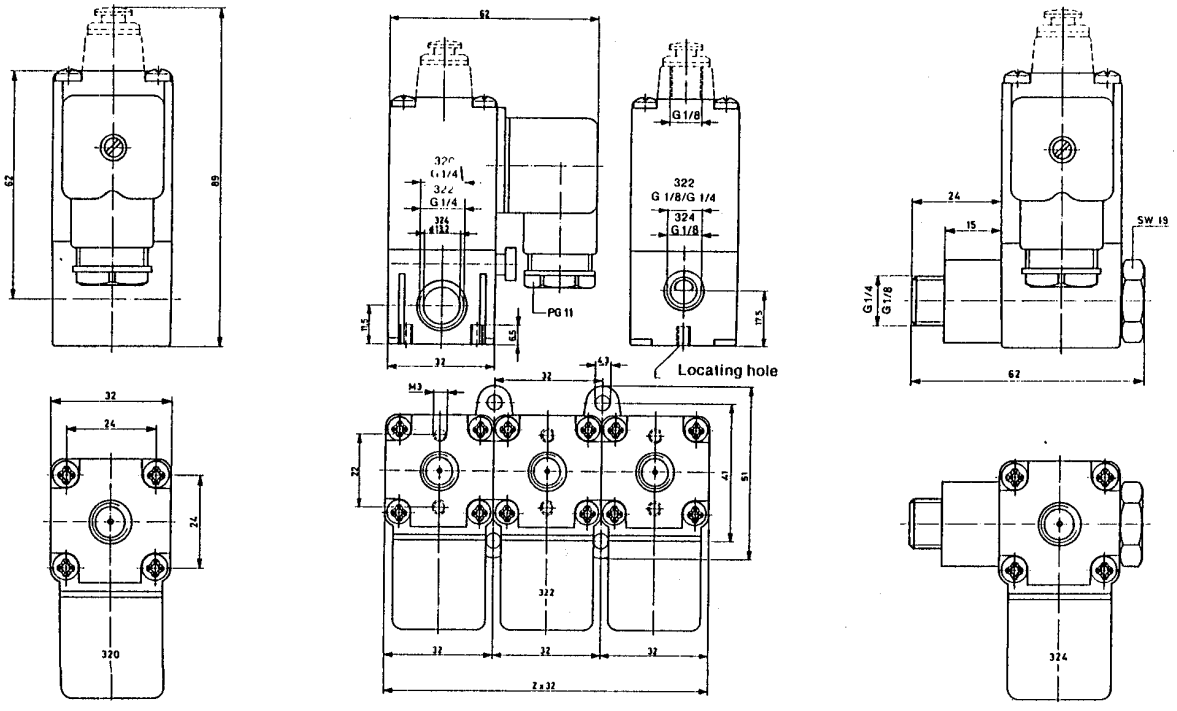
Construction of a battery: Stand the valves upside down, insert the O-ring in the groove on the connection side. Press the adjacent valve with the connection side without groove against the fist valve with the O-ring inserted and fix the clips in the cutouts on the body. After positioning the two clips, push them fully home.

Mounting Instructions, Type 324



Type 324 is supplied with the items required for mounting: (1 hollow screw, 3 O-rings, 1 spacer).
Mounting of the valve is carried out as follows: Slide the O-ring onto the hollow screw and push the hollow screw through the valve body. Place the second O-ring on the hollow screw and apply the spacer. Position the seal and screw on the valve by means of the hollow screw.

Dimension Sheet, types 320, 322, 324



Types 320/322/324 Technical Data and Ordering Information

The data apply to types 320, 322 and 324

Technical Data

Duty cycle:	100%
Cycles per minute:	600
Switching time:	20 ms
Voltages:	
A.C. voltage:	24, 42, 48, 110, 220, 240 V/50 Hz, 24, 110, 220 V/60 Hz.
D.C. voltage:	12, 24, 48, 110 V. Other voltages and frequencies are available on request.
Permissible voltage tolerances:	–10 +5% according to VDE 0580
Weight:	220 g

Operating media: neutral gases

Power consumption:	
Pull in current:	18 VA
Hold in current:	8 VA or 6.5 W
Protection class:	IP 65
Electrical connection:	Standard plug with PG 11 gland plug can be rotated through 90°
Temperature range:	–15 to +50 °C
Ambient temperature:	–20 to +50 °C
Operating pressure:	0–10 bar
Kv-value:	Normally closed 2.0 l/min Normally open 1.67 l/min (See diagram on page 2)
Installation note:	**If installed in switch gear cubicles adequate ventilation must be provided.**

Ordering Specifications:

Type:	320; 322; 324
Size:	2 mm
Body Configuration:	M (3 way)

Connection	Ref. no.
Threaded sockets	1

Body Material	Ref. no.
PBTP	25

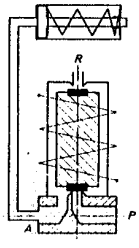
Seal Material	Ref. no.
Viton FPM	4

Control Function	Ref. no.
Normally closed	1

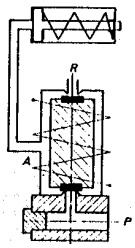
Control Function	Ref. no.
Normally open	2

Type of Design (Type 324)	K-ref. no. of additional information
Hollow screw Male thread G ¼	–
Hollow screw Male thread G ⅛	5200

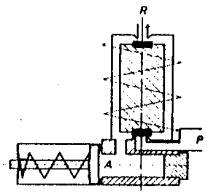
Control function normally closed



Type 320

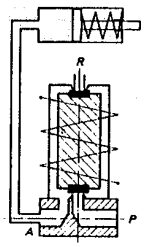


Type 322

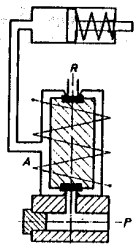


Type 324

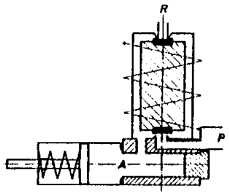
Control function normally open



Type 320



Type 322



Type 324

Type 320-324: Silencer type 1750
Type 320 and 322: Mounting plate type 1050

Ordering Example	324	2	M	1	25	4	1	220	50	–
Type	324									
Nominal bore (mm)		2								
Body configuration (M)			M							
Connection (ref. no.)				1						
Body material (ref. no.)					25					
Seal material (ref. no.)						4				
Control function (ref. no.)							1			
Supply voltage (volts)								220		
Supply frequency (Hz)									50	
Type of design (K-ref. no.)										–

Ordering Information:

When ordering please give the following information:

1. Type of design
2. Supply voltage

If the process medium is contaminated, a strainer should be fitted in front of the valve.

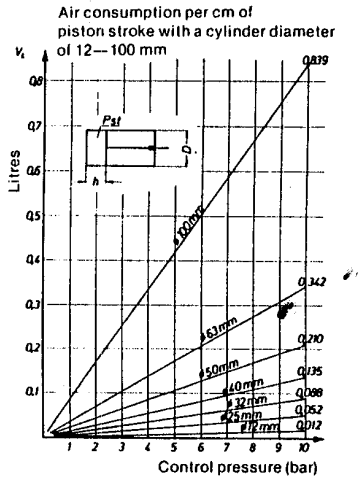
GEMÜ®

GEMÜ GEBR. MÜLLER
Apparatebau GmbH & Co. KG
Postfach 30 · D-7118 Ingelfingen 2
Tel. 079 40/123-0 · Telex 74126 · FAX 079 40/123-106

Presented by:

Printed in West Germany – Ohg-Druck GmbH, Ingelfingen

Edition 7/89 – Subject to alteration



For sizing control systems it is sometimes important to know the air consumption of the components being controlled. For piston actuators the air consumption can be determined with the aid ot the diagram and the given formula. The diagram shows cylinder diamters of 12 to 100 mm. The vertical axis provides the air consumption in N litres per cm of piston stroke at the relevant control pressure, which is shown on the horizontal axis. In order to calculate the total consumption per stroke, the value VL is multiplied by the piston stroke h.

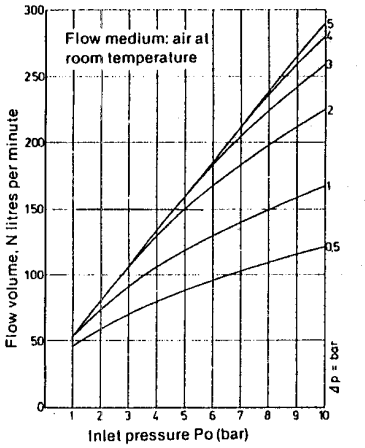
$V_{ges} = VL \cdot h$ (N)

V_{ges} = Air consumption in N litres

VL = Air consumption per cm of stroke

h = Stroke in cm

An allowance should be added to the air consumption if extended control lines ared used.



The flow quantity given in N litres per minute for gas can be read off the second figure. The Kv-value on which the graph calculation is based is Kv = 2.0 l/min.

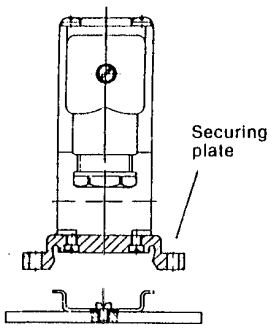
The flow quantity for other gases and temperatures can be calculated according to the following formula:

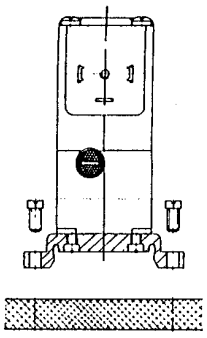
Formula $Q_N = 514 \cdot Kv \sqrt{\frac{\Delta p \cdot p_2}{\rho \cdot (273 + t)}}$

The values in this formula are as follows:

QN = Flow quantity in Nm^3/h
Kv = Kv-value in m^3/h
p2 = Pressure down stream of the valve in kp/cm^2 (absolute pressure)
Δp = Pressure loss in kp/cm^2
ρ_N = Density in kg/Nm^3
t = Temperature in °C

The formula applies to $\Delta p < \frac{p_1}{2}$ whereby p_1 is the upstream pressure (connection P)





Fitting Arrangements

According to requirements, it is possible to secure the units either to panels or standard track (track type 35, DIN 46247) by means of a plastic securing plate (accessory part number 1050).

Metal
Track (DIN 46247)

Assembly	: 25-05-377-08	Commiss.	: 25-05-377
Label	: M08, Dry - TKM 3 PP/SS	Position	: 000100
Quant.	: 1,000 ST	Page	: 000338/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.02.TKM3.20.0Q CONTAINER[520]TKM3/PP /VA	1,000	ST	
	16.004.0127.U23Q CONVEYOR/ST./023/VA/CLAW-CLUTCH/d=27	1,000	ST	
	16.004.0422.U000 CONVEYORMOTOR/D32/TKM/0,20- 6,0 /REL	1,000	ST	
	VS-25-05-377-08 CONVEYOR/TKM 3/650/PP/VA	1,000	ST	
	16.017.0049.U000 COMPRESSOR /SAP300/FILTER	2,000	ST	
	16.17.TQ00.00.74 AIR DISTRIBUTION/TQB/1DRY-JET-PAIR	1,000	ST	
	16.17.TQ00.00.71 DRY-JET-PAIR-TI/[4]/STANDARD/R	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.02.TKM3.20.0Q	Commiss.	: 25-05-377
Label	: CONTAINER[520]TKM3/PP /VA	Position	: 000100
Quant.	: 1,000 ST	Page	: 000339/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.002.0141.U230 GLASS COVER[020]/23/V4A/PP	1,000	ST	
	16.012.0012.U23E CABLE CHANNEL/CPL./23/PP /BS/TKM	1,000	ST	
	16.010.0016.U001 TEMPERATURE PROBE/VA/EP/2xPt100/MAZ/L080	1,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: 16.002.0141.U230	Commiss.	: 25-05-377
Label	: GLASS COVER[020]/23/V4A/PP	Position	: 000100
Quant.	: 1,000 ST	Page	: 000340/01
Drawing	: 16.002.0182EU000	Date	: 10.04.2006

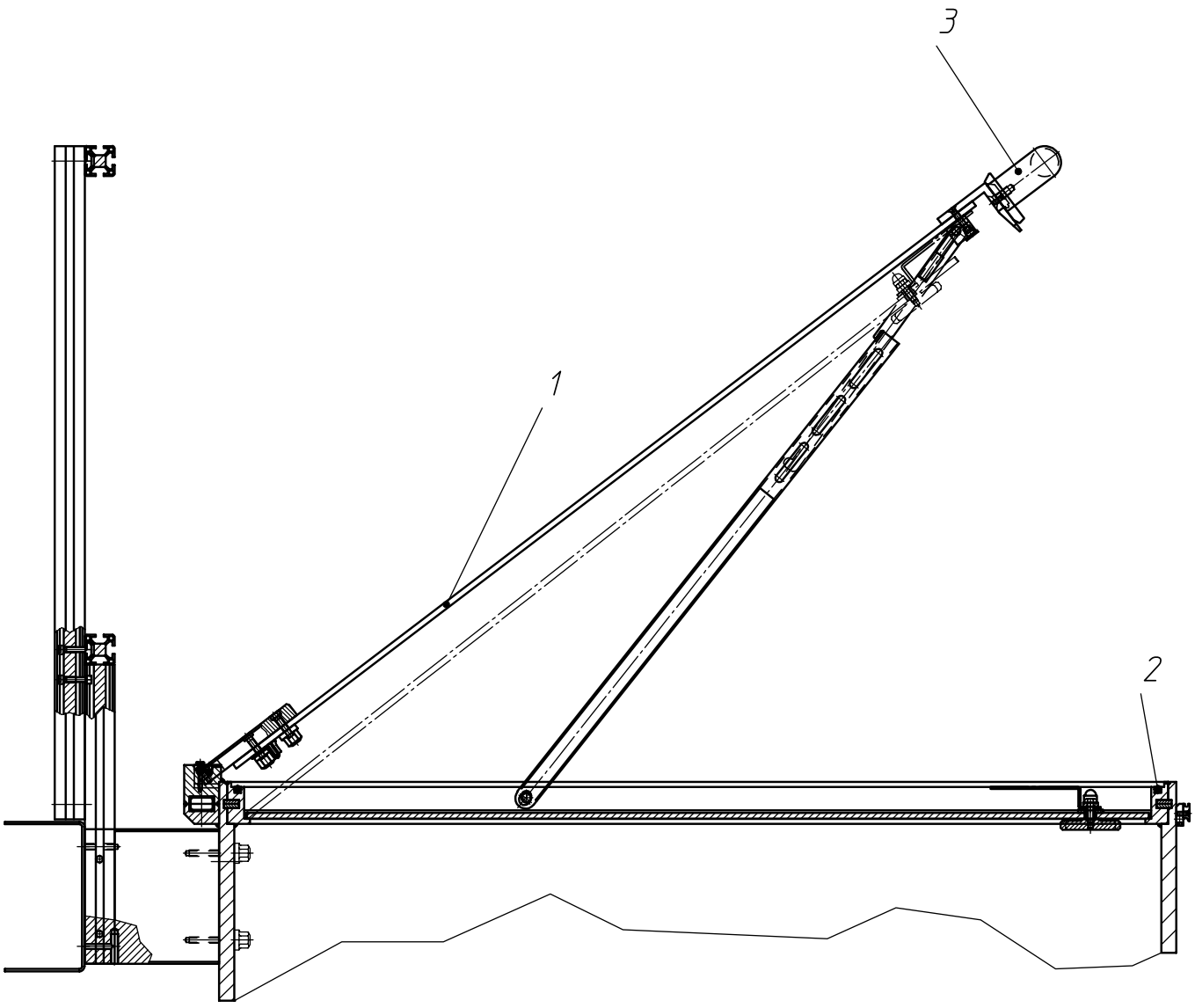
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.002.0022.2230 GLASS COVER/23/0650/0843x0932x06	1,000	ST	X
	16.002.0142.U000 COVER PARTS/PP/V4A	1,000	ST	
2	16.002.1178.2230 GLASS COVER SEALING/A/23/0650/EPDM	1,000	ST	X
3	DICH0700-5 SEALING RING M5	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste GLASDECKEL RASTBAR

Spare parts list glass cover w. lock-in mech.

16.002.0182EU000	11
	00



Assembly	: 16.002.0142.U000	Commiss.	: 25-05-377
Label	: COVER PARTS/PP/V4A	Position	: 000100
Quant.	: 1,000 ST	Page	: 000341/01
Drawing	: 16.002.0142EU000	Date	: 10.04.2006

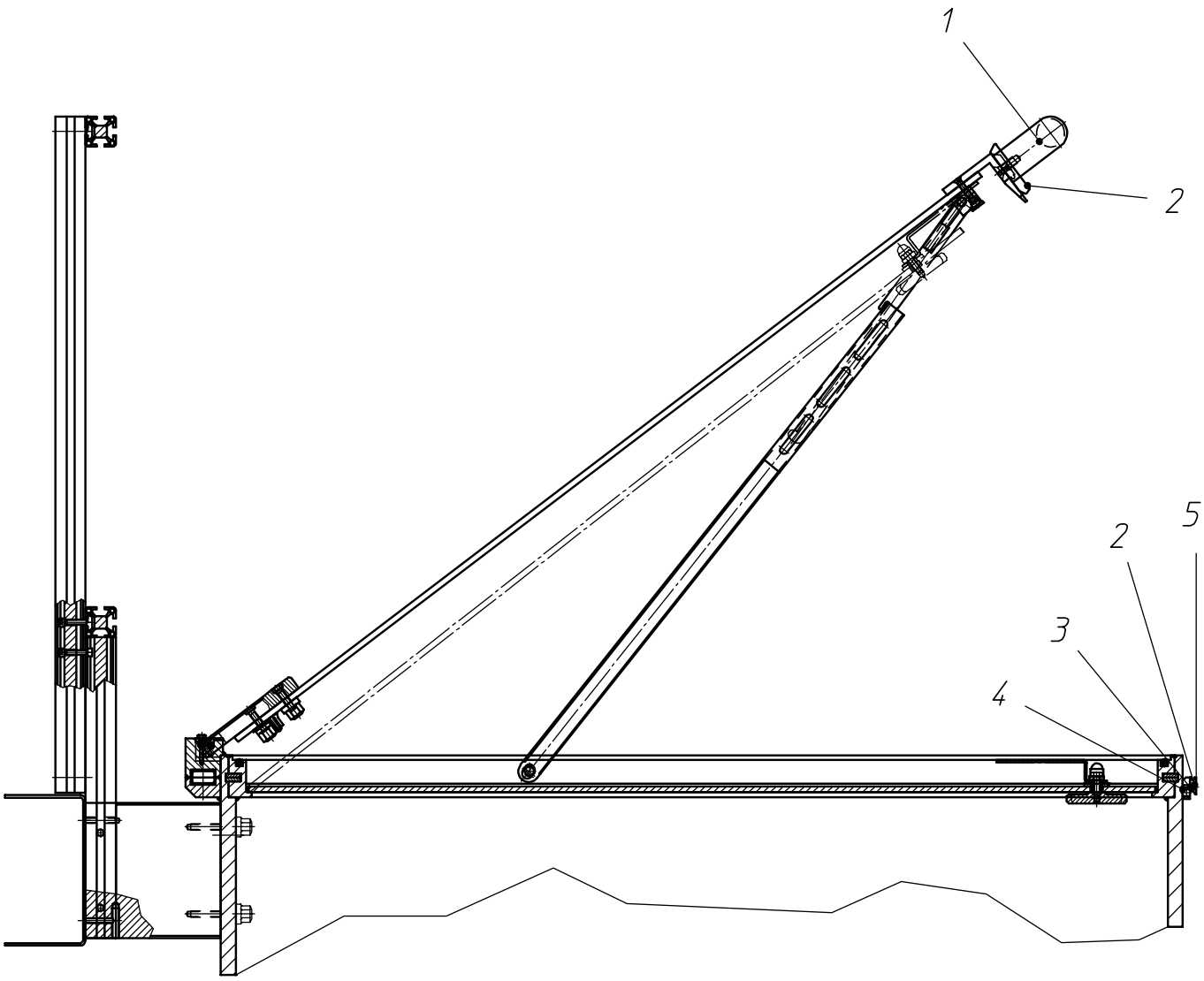
Pos.	Part N° Label	Quant.	Unit	SP
1	GR-000000039-000 GRIP/GN 669-28-200-A-RT	1,000	ST	X
2	DICH0700-6 SEALING RING M6/POLYPROPYLEN GREY	4,000	ST	X
3	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X
4	16.002.0155.0000 FASTENER WITH MAGNET	1,000	ST	X
5	EB-000000212-000 REED-SENSOR/NR.:59025-010	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste DECKELTEILE

Spare parts list GLASS COVER PARTS

16.002.0142EU000	11
	01



BREED ELECTRONICS
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59020 and 59025 Firecracker Features and Benefits

Features

- 2 Part Magnetically Operated Proximity Sensor
- 304mm (12") lead outs
- UL Recognised
- Choice of normally open, normally closed or change over switching
- Subminiature version also available

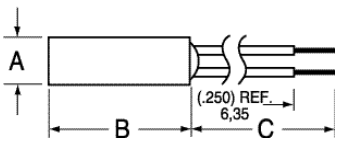
Benefits

- Quick and easy to install
- No standby power requirement
- Operates through non-ferrous materials such as wood,plastic or aluminium
- Hermetically sealed,magnetically operated contacts continue to operate long after optical and other technologies fail due to contamination

Applications

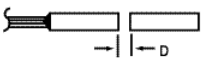
- Position and limit sensing
- Security
- Level sensing
- Linear actuators

DIMENSIONS



	A Max	B Max	C ± .250 (15,24)	
57020	(.201) 5,10	(.600) 15,24	-	
57025	(.245) 6,22	(1.00) 25,4	-	
59020	(.201) 5,10	(.650) 16,4	(12.00) 304,8	
59025	(.201) 6,22	(1.00) 25,4	(12.00) 304,8	File E61760(N)

Recommended Activating Positions:



Sensors and Matching Actuators (Note 2)		Actuator	Sensor				
Must Actuate	Must Release						
.100 (2,54)	.300 (7,62)	57020-000	59020-010	—	—	—	—
.150 (3,81)	.800 (20,32)	57025-000	—	59025-010	59025-020	59025-030	59025-040

Electrical Specifications and Operating Characteristics			Form A SPST-NO	Form A SPST-NO	Form A SPST-NO	Form C SPDT-CO	Form B SPST-NC
Contact Type			Signal Level	Standard	High Voltage	Standard	Standard
Contact Rating		Watt - max.	3	10	10	5	5
Voltage	Switching	Vdc - max.	100	200	300	175	175
	Breakdown	Vdc - min.	170	250	450	200	200
Current	Switching	A - max.	0.25	0.5	0.5	0.25	0.25
	Carry	A - max.	0.5	1.2	1.5	1.5	1.5
Resistance	Contact,Initial	Ω - max.	0.2	0.2	0.2	0.2	0.2
	Insulation	Ω - min.	10^{10}	10^{10}	10^{10}	10^{9}	10^{9}
Capacitance	Contact	p F - typ.	0.2	0.3	0.2	0.3	0.3
Temperature	Operating	°C	-40 to + 105	-40 to + 105	-20 to + 105	-40 to + 105	-40 to + 105
	Storage	°C	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105	-65 to + 105
Time	Operate	ms - typ.	1.0	1.0	1.0	1.0	1.0
	Release	ms - typ.	1.0	1.0	1.0	1.0	1.0
Shock	11ms 1/2 sine	G - max.	100	100	100	50	50
Vibration	50-2000 Hz	G - max.	30	30	30	30	30

Notes: 1.Flying Leads 59025 are 24 AWG 7/32 PVC, 105 deg. C.,UL 1569.Leads are stripped .250 (6,35),untinned. **59020** 26 AWG,UL 1569

2.Order Actuators as a separate item.

3. Underwriters Laboratories recognition. For details on electrical specifications,contact Hamlin,Inc.

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Assembly	: 16.002.0155.0000	Commiss.	: 25-05-377
Label	: FASTENER WITH MAGNET	Position	: 000100
Quant.	: 1,000 ST	Page	: 000342/01
Drawing	: 16.002.0155E0000	Date	: 10.04.2006

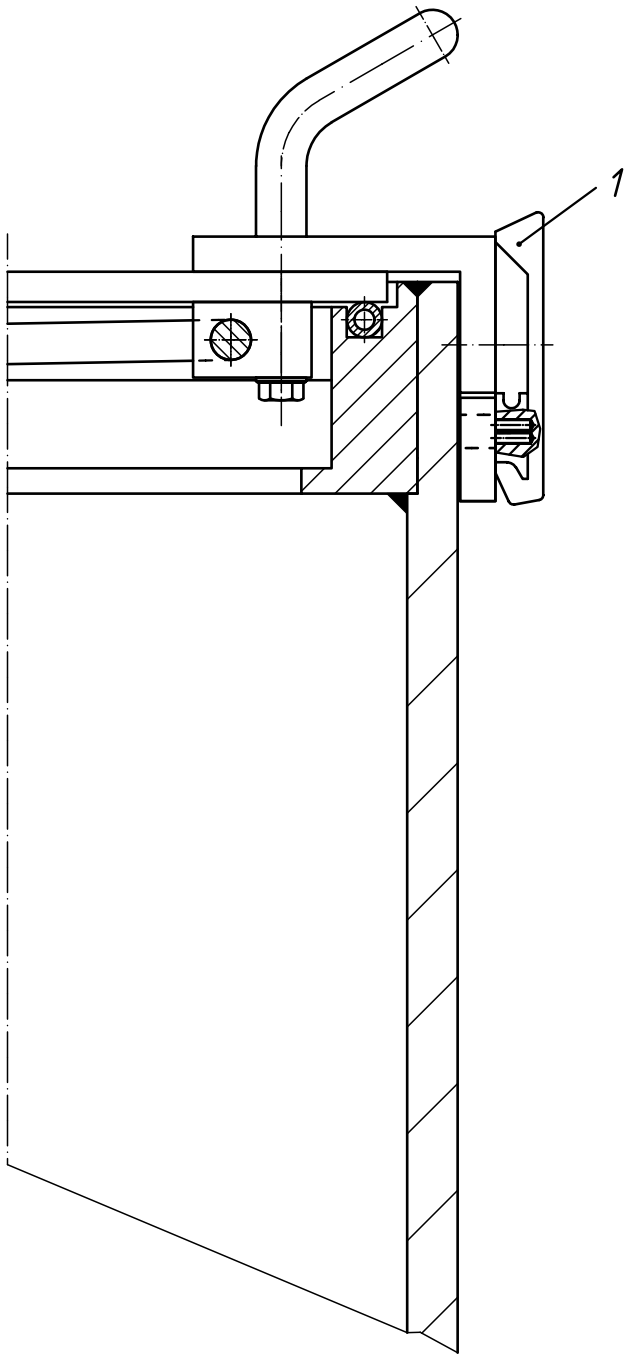
Pos.	Part N° / Label	Quant.	Unit	SP
1	ZB-000000311-000 TENS.LOCK/07-10-301-12 BLACK	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste SPANNVERSCHLUSS

Spare parts list FASTENER

16.002.0155E0000	11 / 00



Assembly	: 16.012.0012.U23E	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./23/PP /BS/TKM	Position	: 000100
Quant.	: 1,000 ST	Page	: 000343/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	8,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.010.0016.U001	Commiss.	: 25-05-377
Label	: TEMPERATURE PROBE/VA/EP/2xPt100/MAZ/L08	Position	: 000100
Quant.	: 1,000 ST	Page	: 000344/01
Drawing	: 16.010.0005EU000	Date	: 10.04.2006

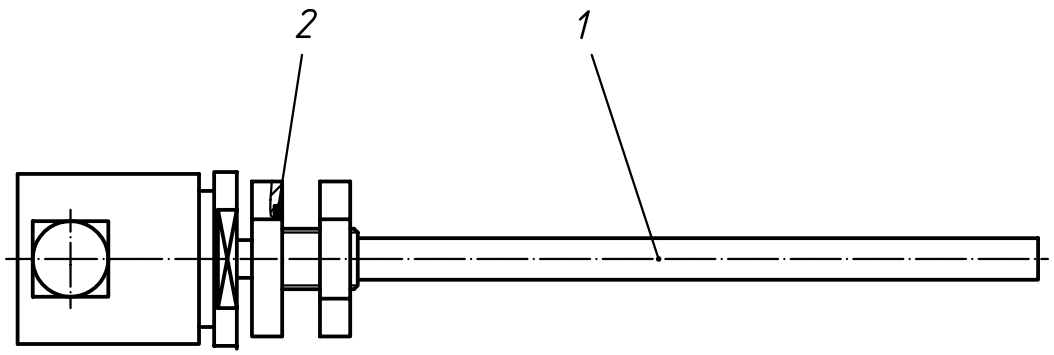
Pos.	Part N° Label	Quant.	Unit	SP
1	EB-000000225-000 TEMPERATURE PROBE/MAZ/SS/2xPt100/L=080	1,000	ST	X
2	DICH0580-212 O-RING/EPDM/BLACK/021.82x3.53	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste TEMPERATURFÜHLER

Spare parts list TEMPERATURE PROBE

16.010.0005EU000	11
	00



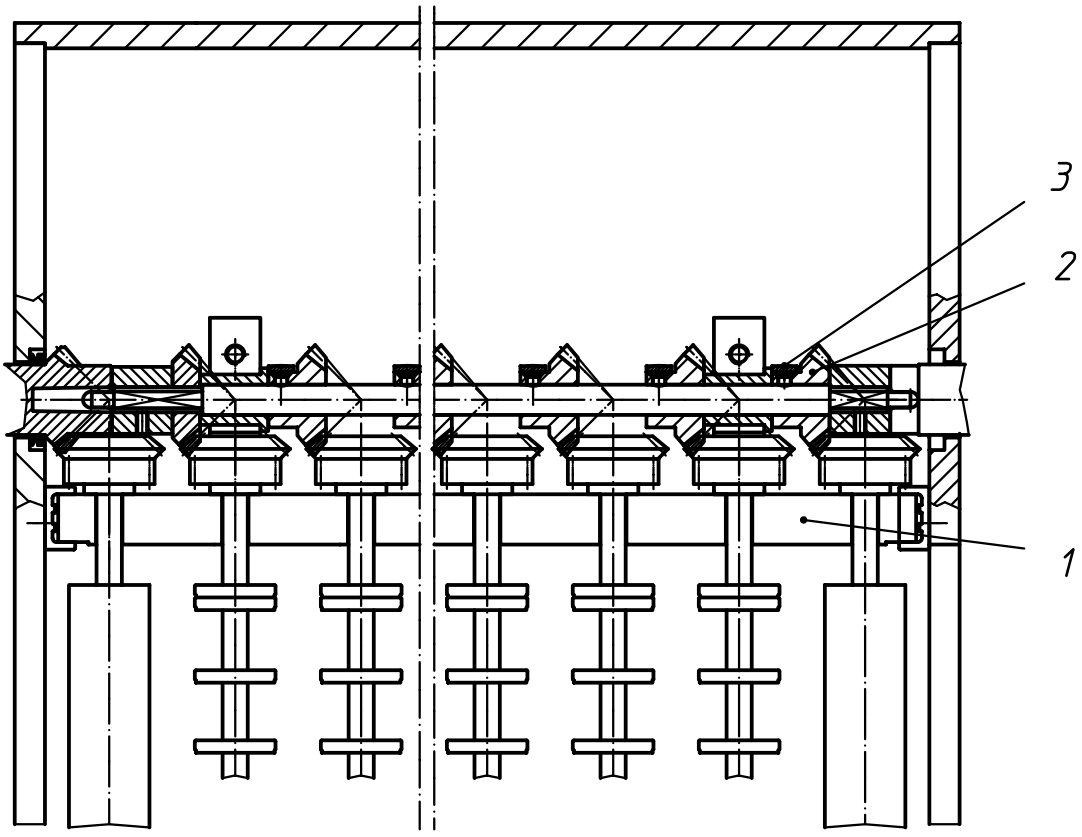
Assembly	: 16.004.0127.U23Q	Commiss.	: 25-05-377
Label	: CONVEYOR/ST./023/VA/CLAW-CLUTCH/d=27	Position	: 000100
Quant.	: 1,000 ST	Page	: 000345/01
Drawing	: 16.004.0127EU000	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0125.U23Q DRIVE SHAFT/CPL./023/VA/CONV./KL-KU/d=27	1,000	ST	
1	16.004.0002.023V SUPPORT/GUR-N/SS/23/d=10/T=50	2,000	ST	X
2	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	1,000	ST	X
3	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	1,000	ST	X

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0127EU000	11
	00



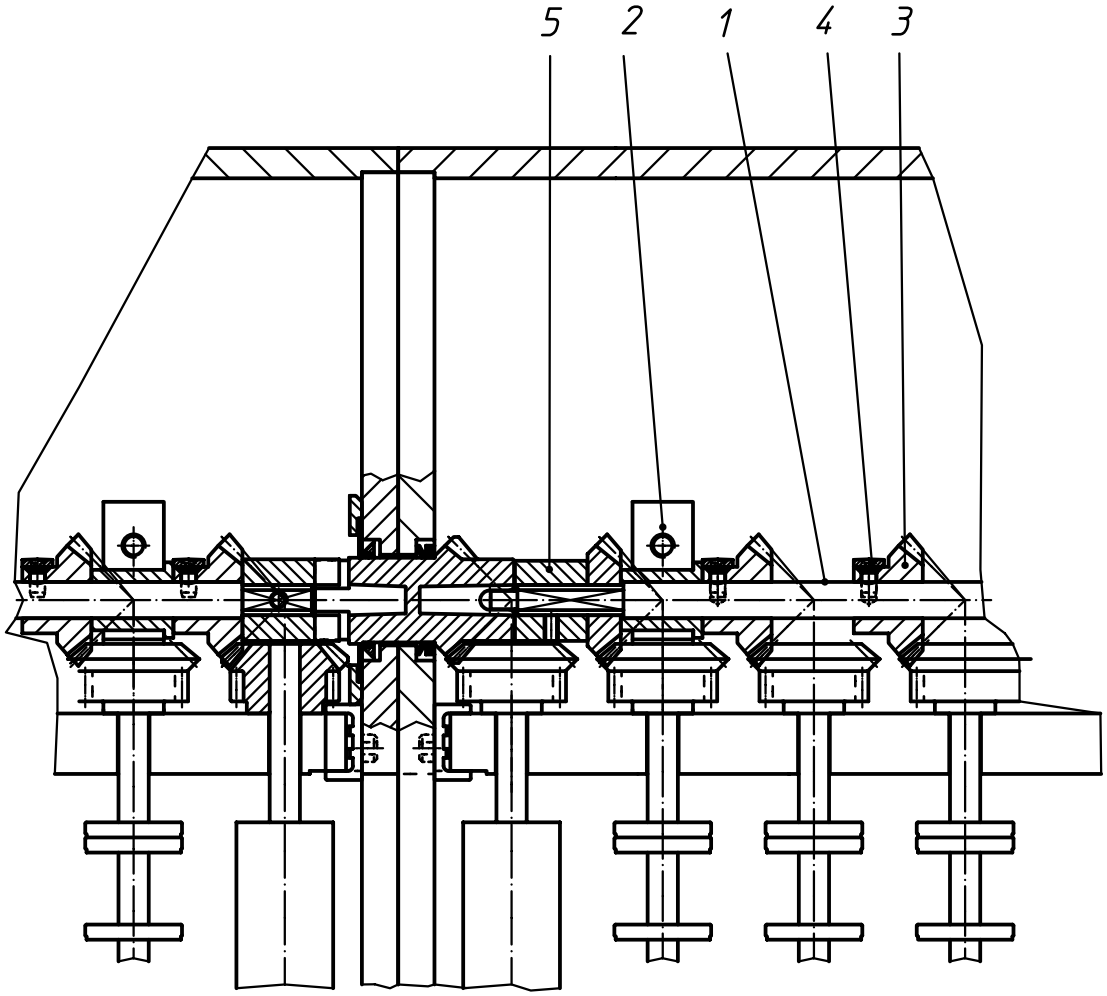
Assembly	: 16.004.0125.U23Q	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./023/VA/CONV./KL-KU/d=2	Position	: 000100
Quant.	: 1,000 ST	Page	: 000346/01
Drawing	: 16.004.0125EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0353.0232 DRIVE SHAFT/V4A/023/CLAW-CLUTCH/CONV.	1,000	ST	X
2	16.004.0007.U00Q SEATING/KPL./PP /VA	4,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	14,000	ST	X
4	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	14,000	ST	X
5	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X

Ersatzteilliste ANTRIEBSWELLE KPL. VS

Spare parts list Drive shaft cpl. + conv.

16.004.0125EU000	11
	00



Assembly	: 16.004.0007.U00Q	Commiss.	: 25-05-377
Label	: SEATING/KPL./PP /VA	Position	: 000100
Quant.	: 4,000 ST	Page	: 000347/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

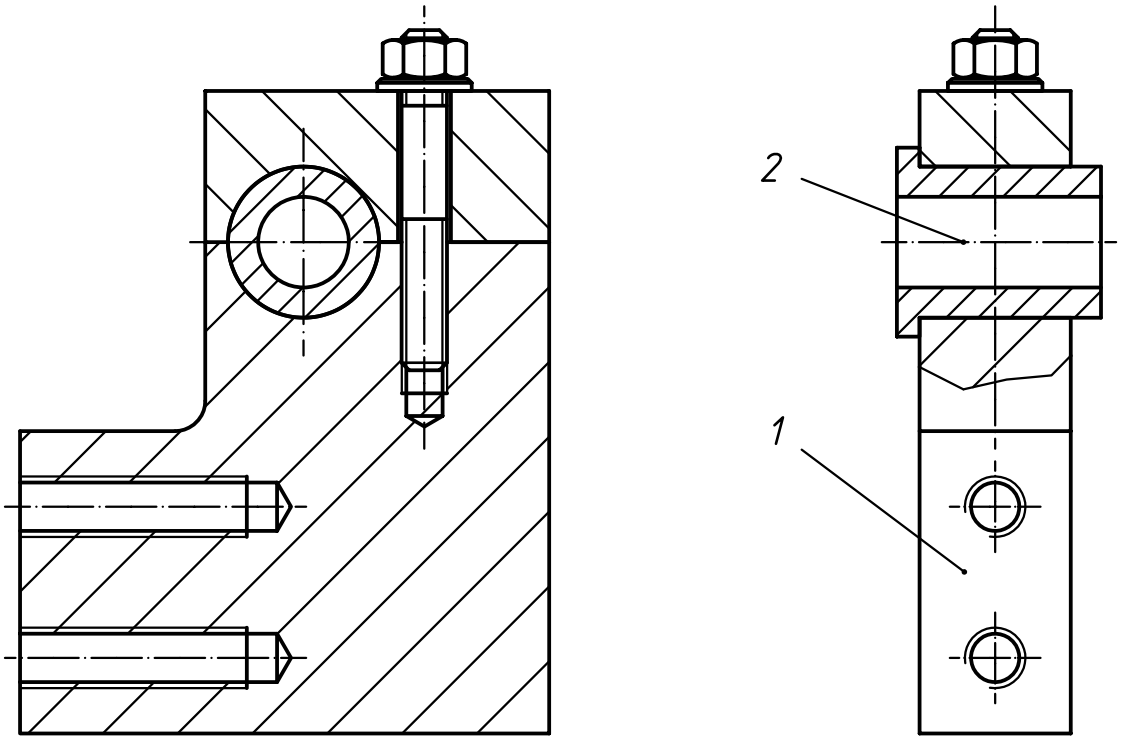
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0014.0002 SEATING/PP-G/1.4571	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: 16.004.0422.U000	Commiss.	: 25-05-377
Label	: CONVEYORMOTOR/D32/TKM/0,20- 6,0 /REL	Position	: 000100
Quant.	: 1,000 ST	Page	: 000348/01
Drawing	: 16.004.0010EU000	Date	: 10.04.2006

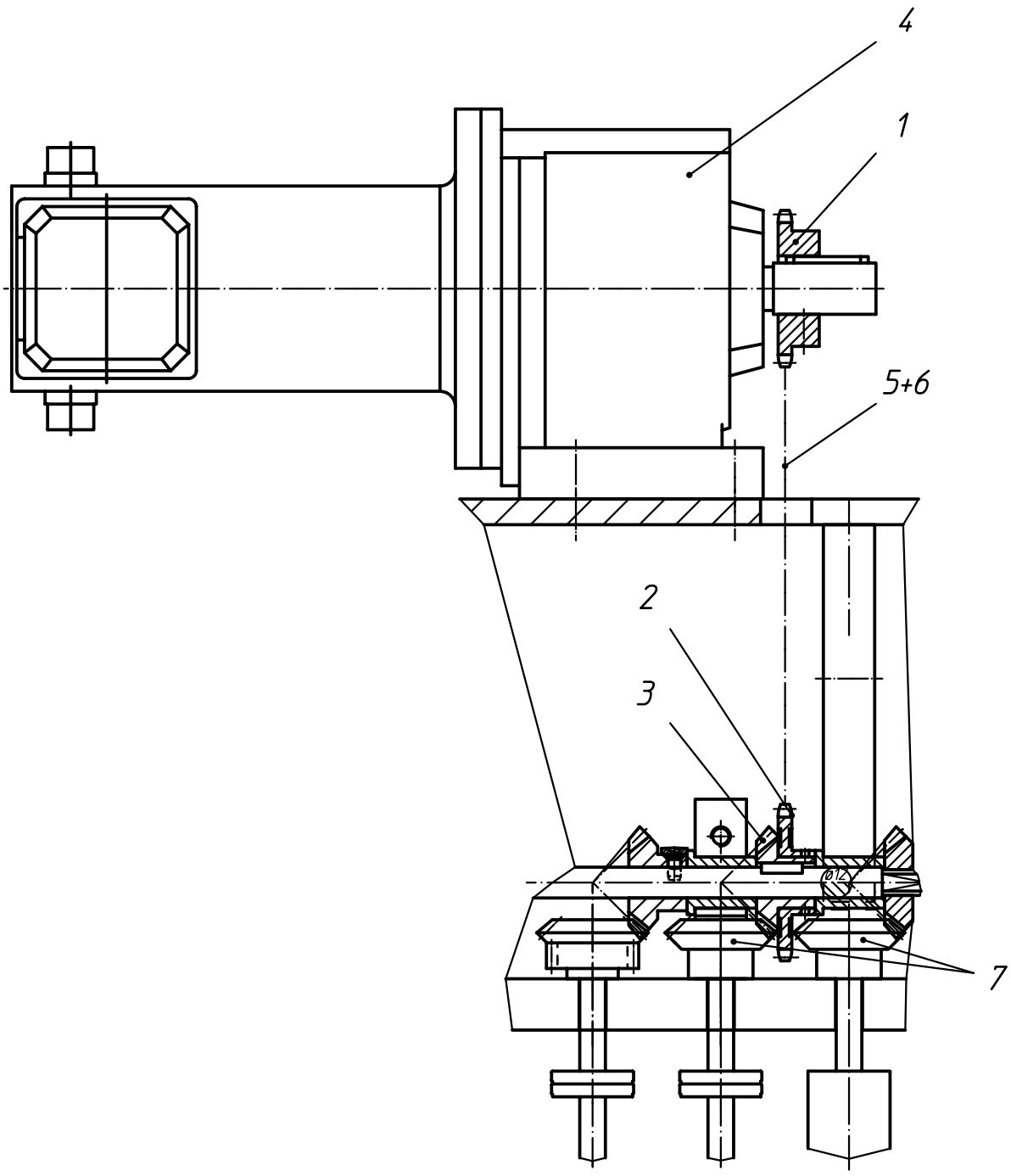
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0079.U001 SUPPORT BEARING/KPL./VA/GUR-N	1,000	ST	
1	00.003.0020.0000 CHAIN WHEEL/Z019/3/8x7/32/d=20.0	1,000	ST	X
2	00.003.0009.0001 CHAIN WHEEL/1N/V2A/Z019/3/8x7/32/d=20.0	1,000	ST	X
3	00.001.0019.0000 BEVEL WHEEL/CuAlNi-Bz/Z=16/M=2.5/d=12.0	1,000	ST	X
4	EMGE00055.002100 ST/SK05 SO-71L-4REL/IP55/0.25kW/I=33,69	1,000	ST	X
5	KE-300-101-600 SINGLE ROLLER CHAIN/3/8x7/32 STAINLESS	,750	M	X
6	KE-300-101-601 CLOSING LINK STRAIGHT/3/8x7/32 1.4301	1,000	ST	X
7	00.001.0002.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=09.8	2,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0010EU000	11
	01



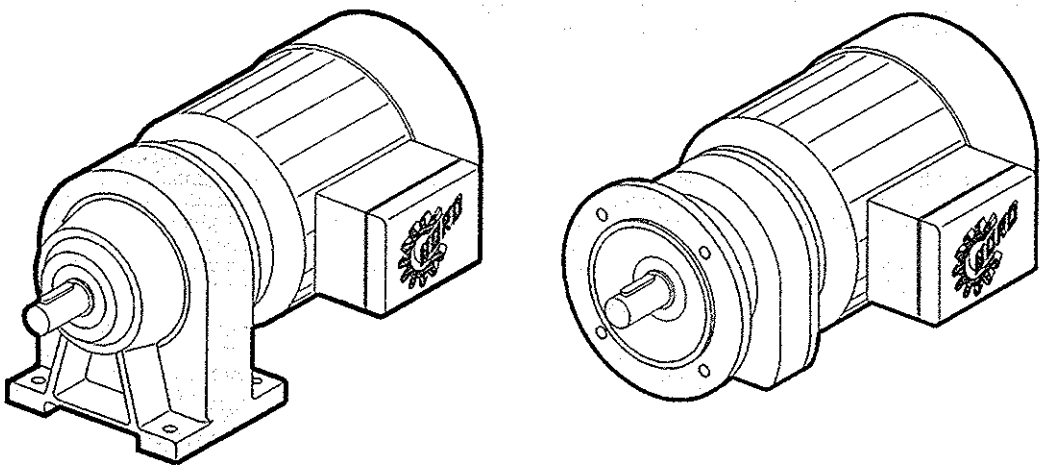
Betriebs- und Wartungsanleitung
Operating and Maintenance Instruction
Instructions de conduite et d'entretien

B 1012

02/99

Diese Sicherheitshinweise sind aufzubewahren.
These safety instructions must be kept available.
nstructions de sécurité doivent être observées.

D GB F



Standard - Stirnradgetriebe
Standard Helical Gearboxes
Réducteurs standard à engrenages cylindriques

Δ Warnung
Es wird vorausgesetzt, daß die grundsätzlichen Planungsarbeiten der Anlage sowie Transport, Montage, Installation, Inbetriebnahme, Wartung und Reparaturen von qualifiziertem Personal ausgeführt bzw. durch verantwortliche Fachkräfte kontrolliert werden. Bei Arbeiten am Getriebemotor muß garantiert sein, daß keinerlei Spannung anliegt, und dieser gegen Wiedereinschaltung gesichert ist.

Δ Caution
It is presumed that fundamental project work as well as all work with regard to transport, assembly, installation, starting-up, maintenance and repair is performed by qualified personnel or supervised by skilled labour taking overall responsibility. Make absolutely sure that no voltage is applied at all while work is being done on the geared motor. Drive must also be secured against switching on.

Δ Avertissement
Il est impératif que les travaux fondamentaux de l'installation, ainsi que tous les travaux de transport, montage, installation, mise en exploitation, entretien et réparation soient accomplis par du personnel qualifié et contrôlés par des techniciens spécialisés dans ce domaine. Avant toute intervention sur le motoréducteur, il faut s'assurer que celui-ci n'est plus sous tension et que la remise sous tension soit interdite.

Δ Warnung
Veränderungen gegenüber dem Normalbetrieb (höhere Leistungsaufnahme, Temperaturen, Schwingungen, Geräusche usw. oder Ansprechen der Überwachungseinrichtungen) lassen vermuten, daß die Funktion beeinträchtigt ist. Zur Vermeidung von Störungen, die ihrerseits mittelbar oder unmittelbar schwere Personen- oder Sachschäden bewirken könnten, muß das zuständige Wartungspersonal dann umgehend verständigt werden.

Δ Caution
Any deviation from normal operating conditions (increased power consumption, temperature, vibrations, noise etc.) or warning signals by monitoring equipment suggest malfunction. Inform the responsible maintenance personnel at once to prevent the trouble from getting worse and causing, directly or indirectly, serious physical injury or material damage.

Δ Avertissement
Si en utilisation normale, des modifications de fonctionnement apparaissent telles que puissance absorbée trop élevée, température élevée, vibrations fortes, bruit intense etc. ou en rapport avec les contrôles techniques, cela laisse supposer que différentes fonctions de l'appareil peuvent être détériorées. Pour éviter ensuite des problèmes, qui pourraient entraîner de graves accidents corporels ou de graves dégats matériels, le personnel d'entretien compétent doit immédiatement être informé.

Δ Im Zweifelsfall die entspechenden Betriebsmittel sofort abschalten!

Δ In case of doubt disconnect the machine immediately!

Δ Si vous êtes dans le doute, coupez immédiatement l'alimentation!

Getriebebau NORD GmbH & Co. KG

D-22934 Bargteheide · P.O. Box 1262 · D-22941 Bargteheide · Rudolf-Diesel-Straße 1
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Aufstellung, Vorbereitung
- Transportösen am Getriebe sind für das Gewicht des Antriebs ausgelegt
- Fundamente ausreichend bemessen und schwingungsfrei ausführen
- Getriebe oder -motor fest und ohne Verspannung montieren
- ausreichende Belüftung vorsehen
- serienmäßiges Innengewinde nach DIN 332 zum Aufziehen von Verbindungselementen auf die Wellen benutzen
- Schläge auf die Wellen vermeiden (Lagerbeschädigung!)
- Maschine und Getriebe möglichst mit elastischen Kupplungen verbinden
- vor dem Einschalten Abtriebselemente aufziehen bzw. Paßfeder sichern
- bei Aufsteckgetrieben mit Drehmomentstütze Gummipuffer verwenden

Preparing and performing installation
- Lifting devices on the drive are designed to carry the drive weight
- the foundation (base) should be of adequate size and vibration-proof
- install gear unit or geared motor rigid and braceless
- ensure sufficient ventilation
- make use of tapped hole (DIN 332) to suit fastening to the shaft end
- avoid shocks on shafts (bearing damage!)
- preferably use flexible coupling between output shaft and driven machine
- fit output elements to shaft end or secure feather key before starting the motor
- use torque arm with rubber buffer on shaft mounting gearboxes

Mise en place, préparation
- Le matériel utilisé pour la manutention doit tenir compte du poids de l'équipement
- prendre largement les dimensions des embases et les réaliser exemptes de vibrations
- monter les réducteurs et motoréducteurs solidement et sans haubanage
- prévoir une aération suffisante
- prévoir le taraudage conforme à la norme DIN 332 pour monter des accouplements sur les arbres d'entrée et de sortie
- éviter de donner des coups sur les arbres (cela pourrait détériorer le roulement!)
- lier autant que possible la machine et le réducteur avec des accouplements élastiques
- avant la mise en service, enlever l'élément d'accouplement ou/et fixer la clavette
- utiliser pour l'exécution arbre creux avec bras de réaction une butée en caoutchouc

Elektrischer Anschluß
- Motoranschluß nach Schaltbild vornehmen
- Übereinstimmung von Netzspannung und Frequenz mit den Typenschild-Daten sicherstellen
- Sichere Schutzleiterverbindung herstellen
- evtl. falsche Drehrichtung korrigieren durch Vertauschen von 2 Phasen
- Nicht benötigte Kabeleinführungsöffnungen und den Kasten selbst staub- und wasserdicht verschließen
- Überbelastung und Phasenausfall durch Schutzschalter vorbeugen
- Einstellen des Motorschutzschalters auf Nennstrom
- Schaltbilder auf der letzten Seite

Connection of motor
- Connect motor according to diagram
- make sure that mains voltage/frequency are in accordance with nameplate information
- make secure protective conductor conection
- if motor is running in reverse direction, interchange two phases
- Close unused cable entrances holes and the box itself in a dust- and watertight manner.
- install protective switches to prevent overload and phase failure
- set motor protection switch to nominal current
- wiring diagrams on the last page

Branchements électriques
- brancher le moteur selon le schéma
- s'assurer que la tension du réseau et la fréquence correspondent aux données inscrites sur la plaque signalétique
- Le cable de raccordement doit être protégé
- corriger un éventuel mauvais sens de rotation par une inversion de deux phases
- Les entrées de câbles non utilisées doivent être obturées, la boîte elle-même devant être fermée de façon à être étanche à l'eau et à la poussiére
- prévoir une protection électrique contre les surcharges, court-circuit et défaut de phases
- régler la protection électrique suivant l'intensité nominale du moteur
- schéma de branchement à la demiére page

Inbetriebnahme
- bei längeren Lagerzeiten besondere Vorkehrungen treffen (siehe Werknormblatt "Langzeitlagerung")
- Lage der Ölstandschraube nach Bauformtabellen des entsprechenden Kataloges feststellen
- Prüfen des Ölstandes
- Entfernen des Verschlußstopfens vor Inbetriebnahme (Überdruck!), ggf. Druckentlüftungsschraube montieren
- Normale Erstbefüllung: siehe Schmierstofftabelle
- Luftgekühlte Motoren sind für Umgebungstemperaturen von - 20°C bis +40°C sowie Aufstellungshöhen â 1.000 m über NN ausgelegt
- Der Einsatz im Ex-Bereich ist nicht zulässig, sofern nicht ausdrücklich hierfür vorgesehen

Starting up
- in case of long-time storage take special precautions (as provided in works standard sheet "Extended Storage")
- check position of oil-level plug with help of mounting position tables in applicable catalogue
- check oil-level
- prior to starting-up, remove vent plug from vent screw if necessary
- if not specified otherwise, first oil filling as is shown in list of lubricants
- air-cooled motors are designed for ambient temperautres between -20°C and +40°C and for installation at altitudes â 1.000 m above M.S.L.
- Their use in hazardous areas is prohibited unless they are expressly intended for such use (follow additional instructions)

Mise en fonctionnement
- si un stockage longue durée du réducteur est prévu, il faut prendre les dispositions nécessaires (voir spécification "Stockage longue durée")
- vérifier que la vis de niveau d'huile corresponde à la position de montage du réducteur (voir catalogue)
- contrôler le niveau d'huile
- enlever la mèche de la vis d'évent avant la mise en route (pour éviter une surpression) ou fixer le clapet d'évent sur le réducteur
- pour le premier remplissage voir le tableau des lubrifiants
- les moteurs autoventilés sont dimensionnés pour des températures ambiantes comprises entre -20°C et +40°C, ainsi que pour une altitude â 1000 mètres au-dessus du niveau de la mer
- Leur utilisation dans des atmosphères explosives est interdite, à moins qu'elles ne soient expressément prévues à cet effet (respecter les indications supplémentaires)

Wartung
MOTOR
- Staubablagerungen entfernen (Überhitzung!)
- Wälzlager ausbauen, reinigen und einfetten
- Es ist zu beachten, daß der gesamte Freiraum um das Lager ca. 1/3 mit Fett gefüllt ist
- Schmierstoffsorten siehe unten

Maintenance
MOTOR
- remove dust deposit (overheating)
- dismount anti-friction bearings for cleaning and refill with grease
- ensure that the bearing cage is packed to about 1/3 with grease, distribute evenly
- select proper type of lubricating grease from following table

Entretien
DU MOTEUR
- enlever la poussière du moteur (échauffement)
- démonter les roulements, les nettoyer et les regraisser
- la cage des roulements doit être remplie au 1/3 environ
- lubrifiant voir tableau ci-après

GETRIEBE
- regelmäßige Ölstandskontrolle
- Wechseln des Schmierstoffes alle 10.000 Betriebsstunden oder spätestens nach 2 Jahren.
- Doppelte Fristen bei synthetischen Produkten
- Verkürzung der Schmierstoffwechselintervalle bei extremen Betriebsbedingungen (hohe Luftfeuchtigkeit, aggressive Umgebung und hohe Temperaturschwankungen)
- Verbinden des Schmierstoffwechsels mit gründlicher Reinigung des Getriebes

GEARBOX
- regular oil level check
- change lubricant every 10.000 working hours or after two years at the latest.
- combine the lubricant change with thorough cleaning of gear unit
- lubricant changing intervals will be twice as long if synthetic products are used
- extreme working conditions (high air humidity, aggressive media and large temperature variations) call for reduced lubricant changing intervals

DU REDUCTEUR
- vérifier régulièrement le niveau d'huile
- vidanger le lubrifiant après 10.000 heures de fonctionnement ou au plus tard après 2 ans d'utilisation.
- profiter de la vidange pour effectuer un nettoyage approfondi du réducteur
- pour des lubrifiants synthétiques, ce délai peut être doublé
- réduire les intervalles entre les vidanges dans des conditions d'utilisation extrêmes (hygrométrie élevée, ambiance agressive ou variations importantes des températures)

Δ Synthetische und mineralische Schmierstoffe nicht miteinander mischen! Das gilt auch für die Entsorgung der Schmierstoffe!

Δ Synthetic and mineral lubricants must not be mixed either for filling or for disposal!

Δ Des lubrifiants synthétiques et minéraux ne doivent pas être mélangés! Ceci s'applique également pour le retraitement des lubrifiants!

Schmierstoffarten / Type of lubricant / Type de lubrifiant

Schmierstoffart Type of lubricant Type de lubrifiant	Umgebungstemp. Ambient temp. Temp. ambiante	Viskosität Viscosity Viscosité	ARAL	BP	Castrol	DEA	Esso	KLÜBER LUBRICATION	Mobil	Shell	TRIBOL
Mineralöl Mineral oil Huile minérale	- 5... 40 (normal) - 15... 25 * - 50...-15	ISO VG 220 ISO VG 100 ISO VG 15	Degol BG 220 Degol BG 100 Vitamol 1010	Energol GR-XP220 Energol GR-XP100 Bartran HV15	Alpha SP 220 Alpha MW 220 Alpha MAX 220 Alpha SP 100 Alpha MW 100 Alpha MAX 220 Hyspin AWS 15 Hyspin SP 15 Hyspin ZZ 15	Deagear DX SAE 85W-90 Falcon CLP 220 Deagear DX SAE 80W Falcon CLP 150 Airkraft Hydraulic Oil 15	Spartan EP 220 Spartan EP 100 Univis J13	Klüberoil GEM 1-220 Klüberoil GEM 1-100 Isoflex MT 30 rot	Mobil-gear 630 Mobil-gear 627 Mobil DTE 11 M	Shell Omala Oel 220 Shell Omala Oel 100 Shell Tellus Oel T 15	Tribol 1100 / 220 Tribol 1100 / 100 Tribol 770
Synthetisches Öl Synthetic oil Huile synthétique	- 25... 80	ISO VG220	Degol GS 220	Enersyn SG-XP 220	Alphasyn PG 220	Polydea PGLP 220	ESSO Glycolube 220	Klübersynth GH 6-220	Glygoyle 30	Shell Tivela Oel WB	Tribol 800 / 220
Biologisch abbaubare Öle Biodegradable oil Huiles biodégradables	- 25... 80	ISO VG 220	Bio-Degol S 220	Biogear SE 220	Carelube GES 220	Plantogear 220 S		Klüber-Bio GM2 - 220	Mobil DTE FM 220		Tribol 800 / 220
Lebensmittelverträgliche Öle Food-grade oil Huiles pour environnement alimentaire	- 25... 80	ISO VG 220	Degol FG 220		OPTIMOL Optileb GE 220	Renolin 220	GEAR OIL FM 220	Klüberoil 4UH1-220		Cassida 220	Tribol Food Proof 1810 / 220
Synthetisches Fließfett Synthetic fluid grease Graisse fluide synthétique	- 35... 60		Aralub SKA 00	Enersyn GSF	Alpha Gel 00	Glissando 6833 EP 00	Fließfett S 420	Klübersynth GE 46-1200	Glygoyle Grease 00	Shell Tivela compound A	Tribol 800 / 1000
Wälzlager / Anti friction bearings / Roulements à rouleaux											
Fett (Mineralölbasis) Grease (mineral oil basis) Graisse (base huile minérale)	- 30... 60 (normal) * -50... 110		Aralub HL 3 Aralub HL 2 Aralub BAB EP2	Energrease LS3 Energrease LS2	Spheerol AP 3 Spheerol AP 2 LZV - EP Spheerol EPL2	Glissando 30 Glissando 20 Glissando FT 3	Mehrzweckfett Beacon 3 Mehrzweckfett Beacon 2	Centoplex 3 Centoplex 2	Mobilux 3 Mobilux 2	Alvania Fett R3 oder Alvania Fett RL2	Tribol 3030/100-2 Tribol 4020/220-2 Tribol 3785
Synthetisches Fett Synthetic grease Graisse synthétique	* -50... 110		Aralub SKL 2		Product 783/46	Discor 8 - EP 2	Beacon 325	Isoflex Topas NB 52	Mobiltem p SHC 32	Aero Shell Grease 16 oder 7	Tribol 3499

* Bei Umgebungstemperaturen unterhalb -30°C und oberhalb 60°C sind Wellendichtringein besonderer Werkstoffqualität einzusetzen
* With ambient temperatures below -30°C and above approx. 60°C shaft sealing rings of a special material quality must be used
* Lors d'une température ambiante inférieure à -30°C ou supérieure à environ 60°C, il y lieu d'utiliser des joints d'étanchéité spéciaux

ÖLFÜLLMENGE [cm³] CAPACITY [cm³] QUANTITE DE LUBRIFIANT [cm³]

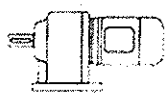
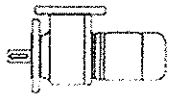
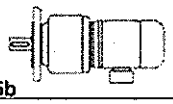
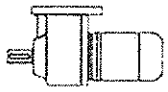
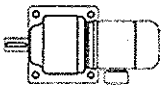
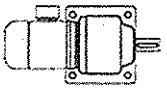
	Waagerechte Anordnung Horizontal position Position horizontale										Senkrechte Anordnung Vertical position Position verticale					
	Stirnradgetriebe zwei- und dreistufig				**Helical Gearboxesé double and triple reduction**						**Réducteurs à engrenages cylindriques à deux et trois train d'engrenages**					
	B 3	**B 5**	**B 3/5**	**B 8/5**	**B 5a**	**B 5b**	**B 5c**	**B 8**	**B 6**	**B 7**	**V 1**	**V 3**	**V1/5**	**V 5**	**V 6**	**V3/6**
SK 0	100	100	100	100	100	100	100	100	100	100	150	150	150	150	150	150
SK 000	200	200	200	200	200	200	200	200	200	200	240	240	240	240	240	240
SK 01	250	250	250	250	250	250	250	250	250	250	400	400	400	400	400	400
SK 010	600	600	600	600	600	600	600	600	600	600	650	650	650	650	650	650
SK 20	510	510	510	510	510	510	510	510	510	510	700	700	700	700	700	700
SK 200	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1400	1400	1400	1400	1400	1400
SK 25	700	700	700	700	700	700	700	700	700	700	1000	1000	1000	1000	1000	1000
SK 250	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1500	1500	1500	1500	1500	1500
SK 30	800	800	800	800	800	800	800	800	800	800	1400	1400	1400	1400	1400	1400
SK 300	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1500	1500	1500	1500	1500	1500
SK 33	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1600	1600	1600	1600	1600	1600
SK 330	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1580	1580	1580	1580	1580	1580

Die Normalbefüllung der Getriebe ist Mineralöl. Synthetisches Öl ist gegen Mehrpreis lieferbar.
Standard lubricant for the gearboxes is mineral-oil. Synthetic oil is available at a surcharge.
Les réducteurs sont remplis d'huile minérale. Ils peuvent être remplis d'huile synthétique contre supplément de prix.

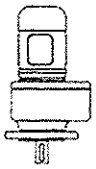
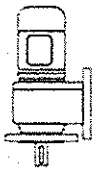
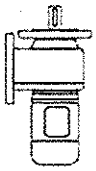
HINWEIS / REMARK / REMARQUE:
Ölfüllmengen sind ca.Angaben. Ölniveau anhand der Ölkontrollschraube prüfen.
Filling quantities are approx. figures. Oil level must be checked according to oil-level plugs.
Les quantités d'huile sont données à titre indicatif. Vérifier la quantité d'huile grâce à la vis de niveau d'huile.

BAUFORMEN
MOUNTING POSITIONS
POSITIONS DE MONTAGE

Waagerechte Anordnung Horizontal position Position horizontale

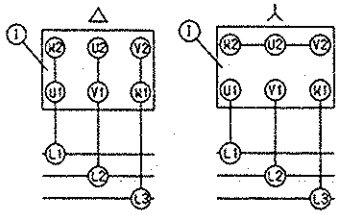
		
B3	**B5**	**B3 / B5**
		 **B5b**
B8 / B5	**B5a**	**B5c**
		
B8	**B6**	**B7**

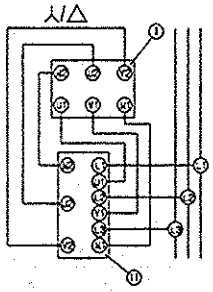
Senkrechte Anordnung Vertical position Position verticale

		
V1	**V3**	**V1 / V5**
		
V5	**V6**	**V3 / V6**

Schaltbilder / Wiring diagrams / Schémas de branchement

Drehstrom-Motor mit Kurzschlußanker
Three phase squirrel-cage motor
Moteur triphasé à cage d'écureuil

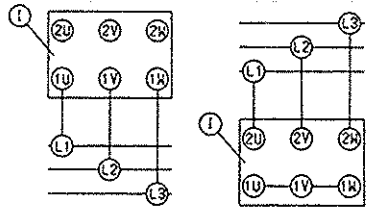




I) Klemmbrett
Terminal board
Plaque à bornes

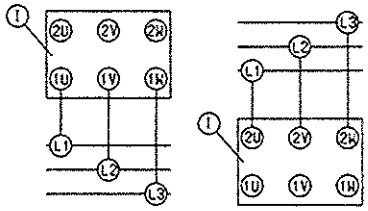
II) Schalter
Switch
Démarreur

Drehstrom-Motor mit Kurzschlußanker, in Dahlander-Schaltung
Three phase squirrel-cage motor, Dahlander connection
Moteur triphasé à cage d'écrureuil, couplage Dahlander



niedrige - Drehzahl - hohe
low - speed - high
inférieure - vitesse - supérieure

Drehstrom-Motor, polumschaltbar, zwei getrennte Wicklungen
Three phase motor, polechanging, two separate windings, two speeds
Moteur triphasé à commutation de pôles, deux bobinages séparés, deux vitesses



niedrige - Drehzahl - hohe
low - speed - high
inférieure - vitesse - supérieure

Art.-Nr. 06061208 09.01

GETRIEBEBAU NORD

GmbH & Co. KG 22941 BARGTEHEIDE RUDOLF-DIESEL-STR. 1 TELEFON : 04532/401-0

-ERSATZTEILLISTE-

27.03.2002 AUFTRAGSNR.: 1002304403/00

GEBR. SCHMID 72238 FREUDENSTADT

GETRIEBETYP SK 05-71 L/4 REL

BAUFORM	FLANSCH	AB-WE	AN-WE	Z-UNTER	DREHZAHL
B3		20 X 40		33,69	45

KW	DREHZ
0,25	1500

SPAN.	HZ	ISO	IPM	IPK	BETR.ART
230	50	F	55	55	S1

POS	TEILENR	STK	BEZEICHNUNG	PREIS
			GETR. VOLLKOMMEN GESCHLOSSEN	
			LACKIERUNG: FARBE 3	
			ANSTRICH RAL 5011	
			RELUKTANZMOTOR	
			MOTORAUSF. OHNE KALTLEITER,	
			OHNE KLEMMENKASTEN,	
			HARTING ANBAUGEHAEUSE	
			092000 30820 U. 4-POLIGEM	
			STIFTEINSATZ 09 20 004 2611	
			STECKERBELEGUNG:	
			PE : ERDE	
			PIN 1 : PHASE 1	
			PIN 2 : PHASE 2	
			PIN 3 : PHASE 3	
			PIN 4 : FREI	
			MOTOR IN 230V/DREIECK	
			GESCHALTET.	
			STECKERLAGE 1/I	
12	5007104 0	1	ANTRIEBSRAD Z=70 M=1,00	
			DRIVING GEAR	
13	5007213 0	1	ABTR-RITZEL Z=12 M=1,25	
			PINION SHAFT	
14	5007313 0	1	ABTRIEBSRAD Z=52 M=1,25	
			DRIVEN GEAR	
20	5001055 0	1	FUSSGEHAEUSE 3OEL SK 05N	
			GEAR CASE,FOOT MOUNT	
27	5001351 0	1	GETRIEBEDECKEL 105 SK 0N	
			COVER	
40	5003030 0	1	ABTR-W 05 20X40 SERIE	
			OUTPUT SHAFT	
50	2462042 0	1	KUGELLAGER 6204 2Z EMF	I
			BEARING	
51	2460040 0	1	KUGELLAGER 6004	II
			BEARING	
52	2463000 0	1	KUGELLAGER 6300	II
			BEARING	

-ERSATZTEILLISTE-

27.03.2002 AUFTRAGSNR.: 1002304403/00

GEBR. SCHMID 72238 FREUDENSTADT

SK 05-71 L/4 REL

POS	TEILENR	STK	BEZEICHNUNG	PREIS
53	2463002 0	1	KUGELLAGER 6300 2Z II BEARING	
70	2502507 0	1	WDR 25X 47X 7 AS WST.:NBR SHAFT SEAL	
90	5009703 0	1	GETR-DICHT FA SK 0/000N S=0,5 SEAL	
92	5019751 0	1	MOTORDICHT FA SK01 105X 70 LK 85 S=0,5 GASKET	

GETRIEBEBAU NORD

GmbH & Co. KG 22941 BARGTEHEIDE RUDOLF-DIESEL-STR. 1 TELEFON : 04532/401-0

-SPARE PARTS LIST-

27.03.2002 ORDER NUMBER: 1002304403/00

GEBR. SCHMID 72238 FREUDENSTADT

GEAR-TYPE SK 05-71 L/4 REL

MOUNTING POS.	FLANGE	O-SHAFT	I-SHAFT	I-TOTAL	SPEED
B3		20 X 40		33,69	45

KW	SPEED
0,25	1500

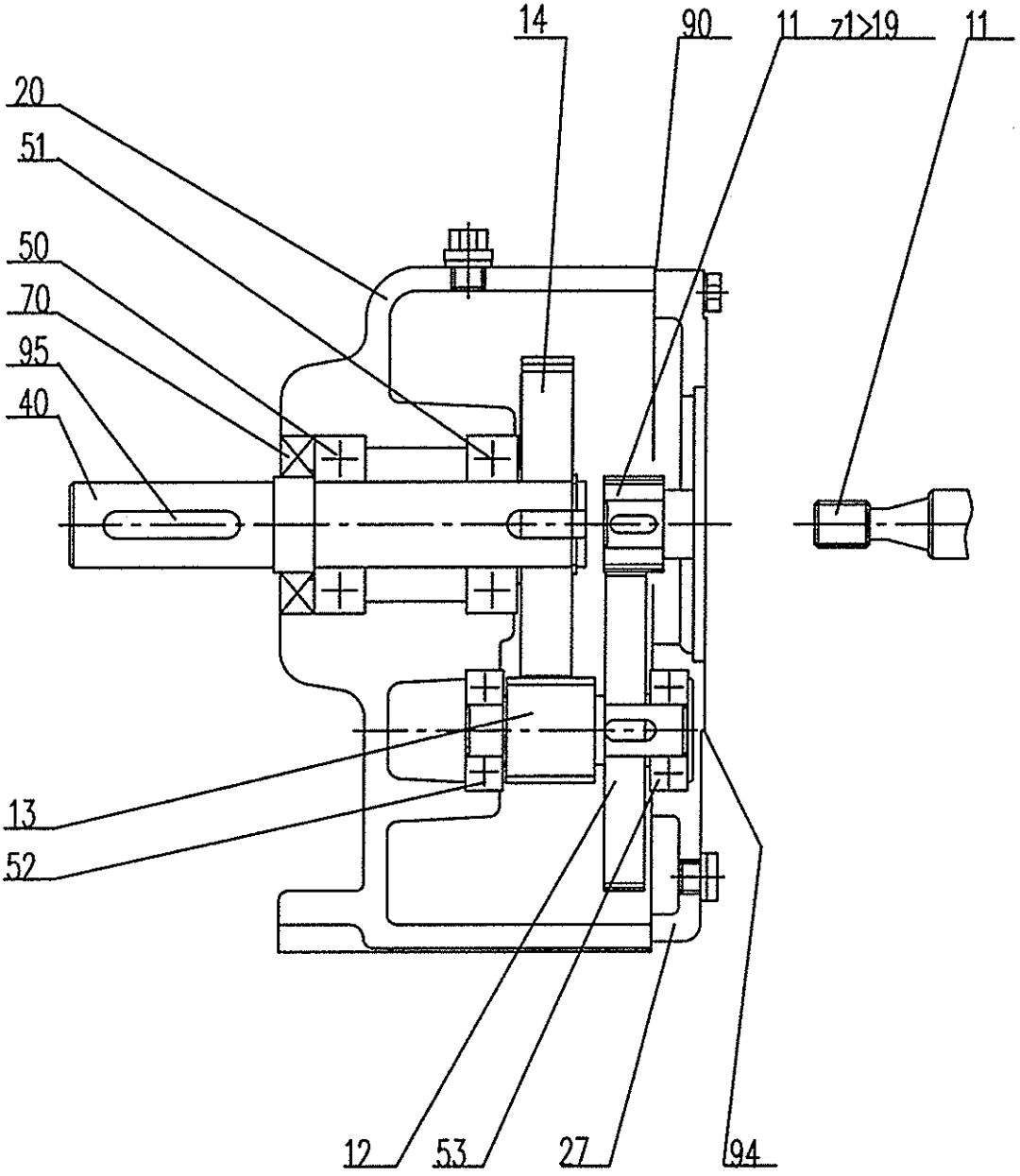
VOLTAGE	HZ	ISO-CL	ENCL	TB	DUTY
230	50	F	55	55	S1

POS	PARTNUMBER	QTY	TYPE	PRICE
12	5007104 0	1	DRIVING GEAR	
13	5007213 0	1	PINION SHAFT	
14	5007313 0	1	DRIVEN GEAR	
20	5001055 0	1	GEAR CASE,FOOT MOUNT	
27	5001351 0	1	COVER	
40	5003030 0	1	OUTPUT SHAFT	
50	2462042 0	1	BEARING	
51	2460040 0	1	BEARING	
52	2463000 0	1	BEARING	
53	2463002 0	1	BEARING	
70	2502507 0	1	SHAFT SEAL	
90	5009703 0	1	SEAL	
92	5019751 0	1	GASKET	

ERSATZTEILLISTE

SPARE PARTS LIST / VUE ECLATEE ET NOMENCLATURE

SK 0N – SK 50 , SK 05N – SK 505



1997	DAT. DATE	NAME NAME					052 9600 – 0	CAD
GEZEICHNET DRAWN	07.11.	Lender						
GEPRÜFT CHECKED			IND.–NR IND.–NO	ÄNDERUNG NR MODIFIC. NO	DAT. DATE	NAME NAME		

Assembly	: 16.004.0079.U001	Commiss.	: 25-05-377
Label	: SUPPORT BEARING/KPL./VA/GUR-N	Position	: 000100
Quant.	: 1,000 ST	Page	: 000349/01
Drawing	: 16.004.0079EU000	Date	: 10.04.2006

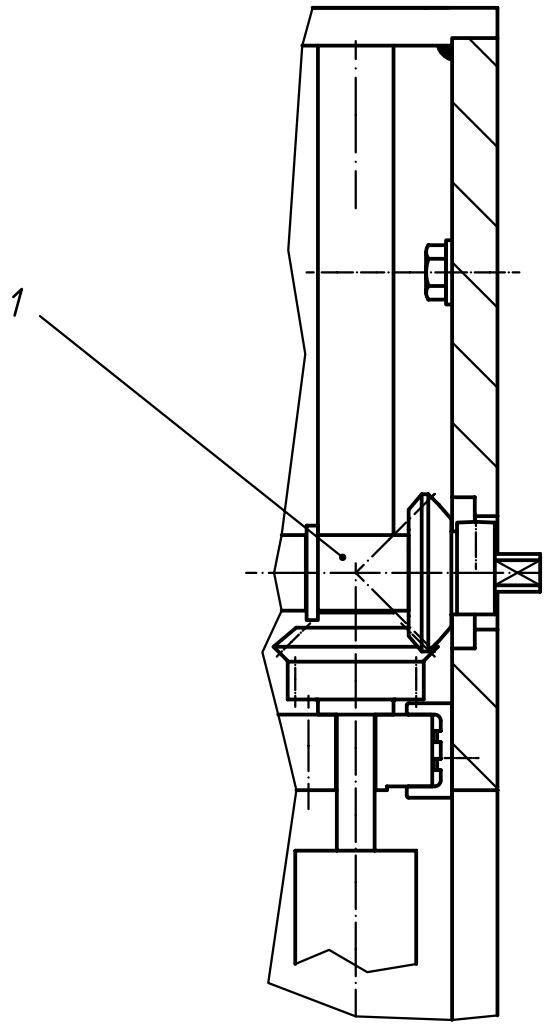
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste STÜTZLAGER KPL.

Spare parts list Support seating cpl.

16.004.0079EU000	11
	00



Assembly	: VS-25-05-377-08	Commiss.	: 25-05-377
Label	: CONVEYOR/TKM 3/650/PP/VA	Position	: 000100
Quant.	: 1,000 ST	Page	: 000350/01
Drawing	: VS-25-05-377-08	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.0987.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	1,000	ST	X
2	16.004.0988.2582 ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	1,000	ST	X
3	16.004.1713.2571 SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	1,000	ST	X
4	16.004.1241.2571 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	12,000	ST	X
5	16.004.0962.2571 Shaft/10/12/32/T25/650/1.4301/PP/U/K/FE	12,000	ST	X
6	16.004.1240.2571 Shaft/CPL/32/U /L/ /FJ/MODU L/A+E/V2A	1,000	ST	X
7	16.004.1242.2571 Shaft/KPL/32/O /K/ /FJ/V2A	2,000	ST	X
8	16.004.1243.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	7,000	ST	X
9	16.004.1245.2571 Shaft/KPL/O /L/AH/FJ/V2A	6,000	ST	X
10	16.004.1247.2571 Shaft/CPL/32/U /L/ /FJ/V2A	2,000	ST	X
11	16.004.0847.2571 Shaf/CPL//32/U /K/ /FJ/V2A	1,000	ST	X
12	16.004.1248.2571 Shaft/KPL/32/O /K/ /FJ/V2A	1,000	ST	X
13	16.004.1249.2571 Shaft/KPL/32/O /L/AV/FJ/V2A	1,000	ST	X
14	16.004.1251.2571 Shaft/KPL/32/O /L/AH/FJ/V2A	1,000	ST	X
	16.004.0559.U002 GEAR WHEEL/Z=11/M2/VA/PP /=0162	13,000	ST	

Parts without Pos.-N° see assembly parts list

Assembly	: VS-25-05-377-08	Commiss.	: 25-05-377
Label	: CONVEYOR/TKM 3/650/PP/VA	Position	: 000100
Quant.	: 1,000 ST	Page	: 000350/02
Drawing	: VS-25-05-377-08	Date	: 10.04.2006

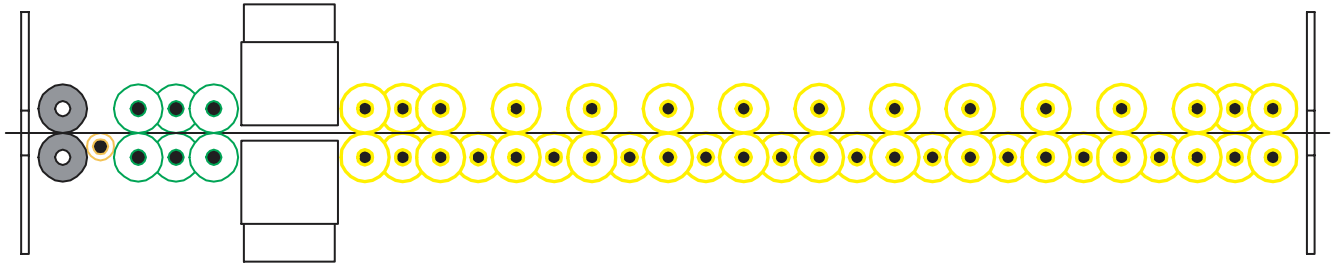
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0306.U000 GUIDE/WE-WE/TKM DRYJET/D32-D12-d12/FE	1,000	ST	
	16.004.0411.U803 BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	1,000	ST	

Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-08	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PP/VA
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	TKM3	**working direction**	L-R
remark			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
up	16.004.0988.2582		16.004.1249.2571	16.004.1248.2571	16.004.1251.2571				16.004.1243.2571	16.004.1242.2571	16.004.1245.2571		16.004.1243.2571		16.004.1245.2571		16.004.1243.2571		16.004.1245.2571		16.004.1243.2571		16.004.1245.2571		16.004.1243.2571		16.004.1245.2571		16.004.1243.2571		16.004.1245.2571	16.004.1242.2571	16.004.1243.2571	up
down	16.004.0987.2582	16.004.1713.2571	16.004.1247.2571	16.004.0847.2571	16.004.1247.2571				16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1241.2571	16.004.0962.2571	16.004.1240.2571	down

Assembly	: 16.004.0987.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/U/FJ	Position	: 000100
Quant.	: 1,000 ST	Page	: 000351/01
Drawing	: 16.004.0987E0000	Date	: 10.04.2006

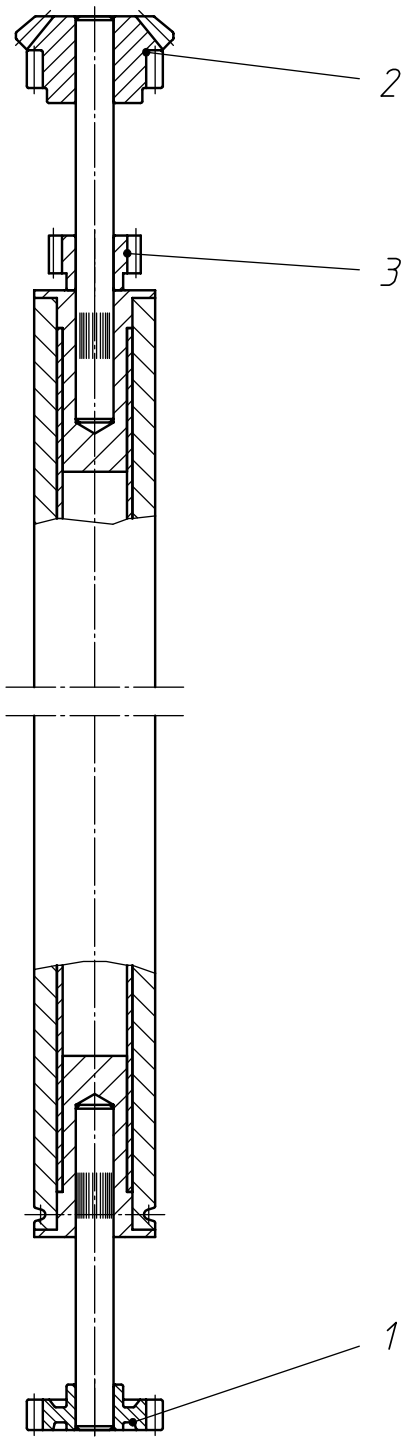
Pos.	Part N° Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
3	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE UNTEN

Spare parts list ROLLER

16.004.0987E0000	11
	00



Assembly	: 16.004.0988.2582	Commiss.	: 25-05-377
Label	: ROLLER/10/32/CPL/T25/0650/SS/PP/O/AV/FJ	Position	: 000100
Quant.	: 1,000 ST	Page	: 000352/01
Drawing	: 16.004.0988E0000	Date	: 10.04.2006

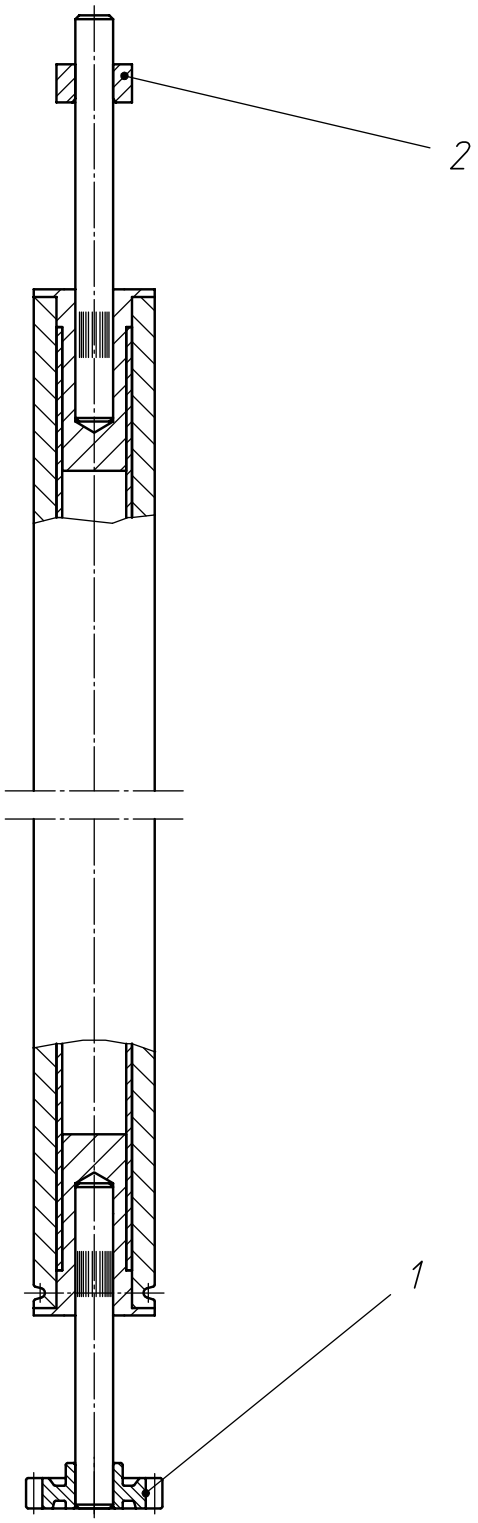
Pos.	Part N° / Label	Quant.	Unit	SP
1	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
2	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WALZE OBEN

Spare parts list ROLLER

16.004.0988E0000	11
	00



Assembly	: 16.004.1713.2571	Commiss.	: 25-05-377
Label	: SHAFT/10/18/CPL/T25/0650/1.4301/PP/FE	Position	: 000100
Quant.	: 1,000 ST	Page	: 000353/01
Drawing	: 16.004.1713E0570	Date	: 10.04.2006

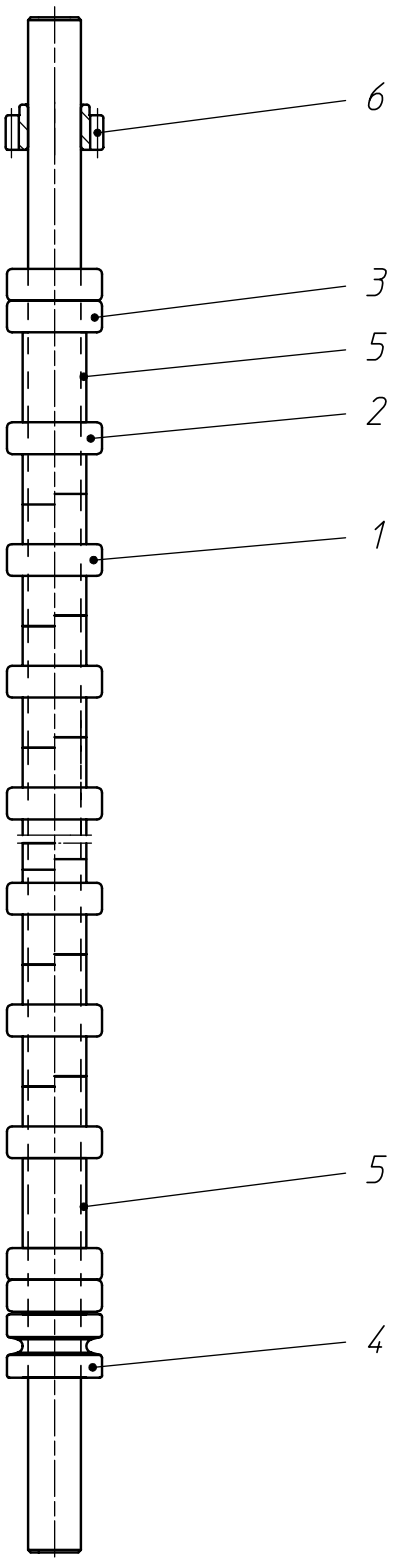
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0794.0570 WHEEL/57/d10/D18/D12/L25	24,000	ST	X
2	16.004.0795.0570 WHEEL/57/d10/D18/D12/L15,5	2,000	ST	X
3	00.011.0035.0570 wheel/57/d=09.6D=18.0/L=06.0	4,000	ST	X
4	00.008.0073.000E BELT DISC/PP-G/d=09.8/D=018.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	00.002.0220.000E SPUR WHEEL/PP-G/Z=13/M=1.25/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KPL.

Spare parts list shaft

16.004.1713E0570	11
	00



Assembly	: 16.004.1241.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000100
Quant.	: 12,000 ST	Page	: 000354/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

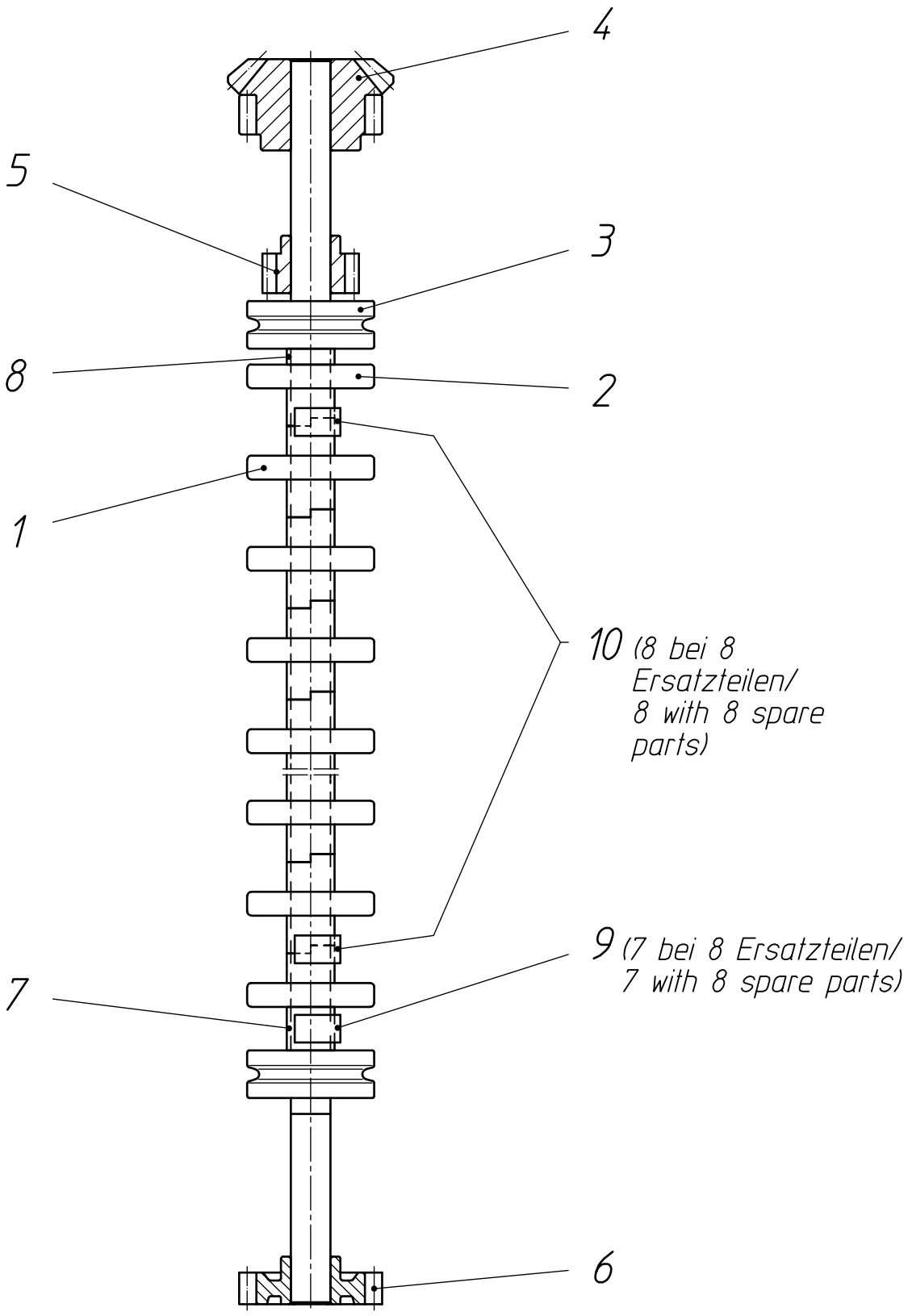
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0962.2571	Commiss.	: 25-05-377
Label	: Shaft/10/12/32/T25/650/1.4301/PP/U/K/FE	Position	: 000100
Quant.	: 12,000 ST	Page	: 000355/01
Drawing	: 16.004.0962E0570	Date	: 10.04.2006

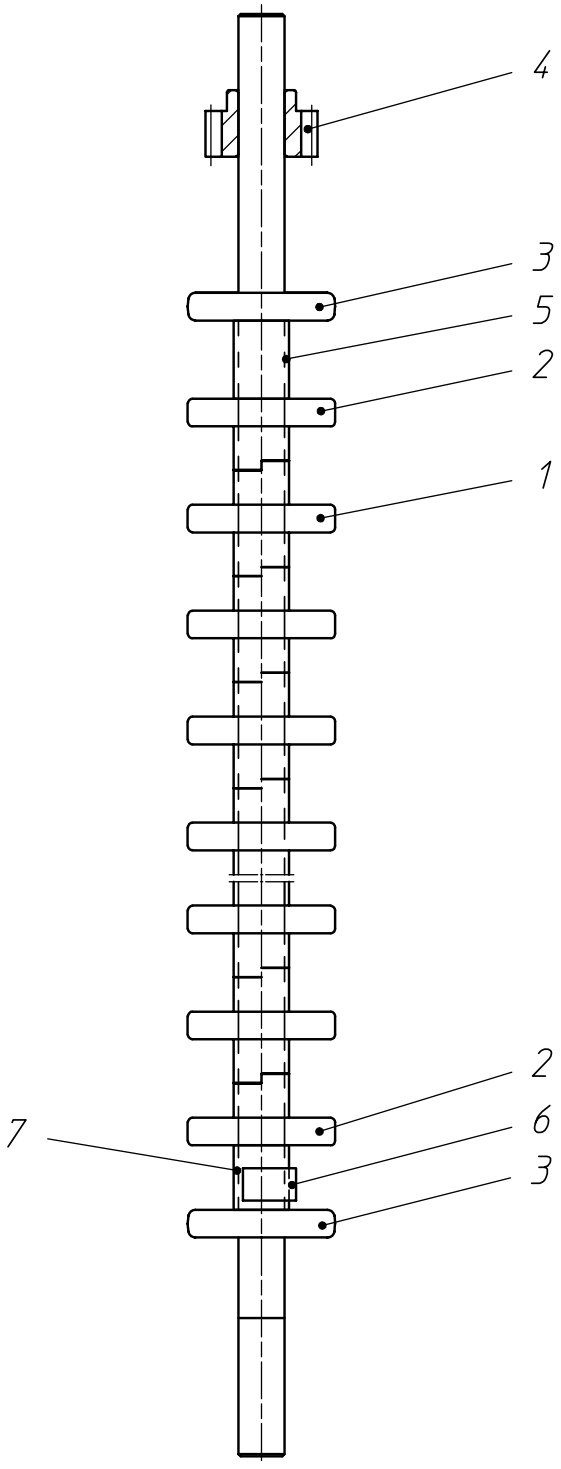
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
7	00.019.0266.000E BUSHING /PP-G/d=10.2/D=12.0/L=14.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0962E0570	11
	00



Assembly	: 16.004.1240.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/MODU L/A+E/V2A	Position	: 000100
Quant.	: 1,000 ST	Page	: 000356/01
Drawing	: 16.004.1240E0570	Date	: 10.04.2006

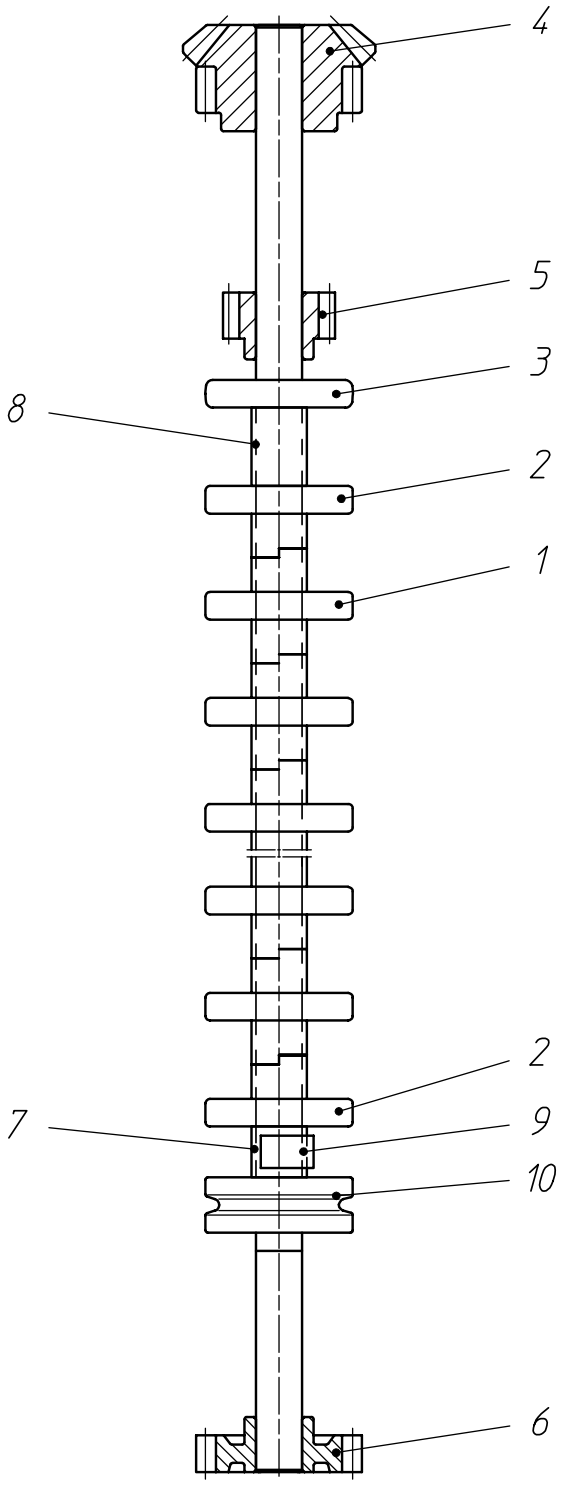
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
9	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
10	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1240E0570	11
	00



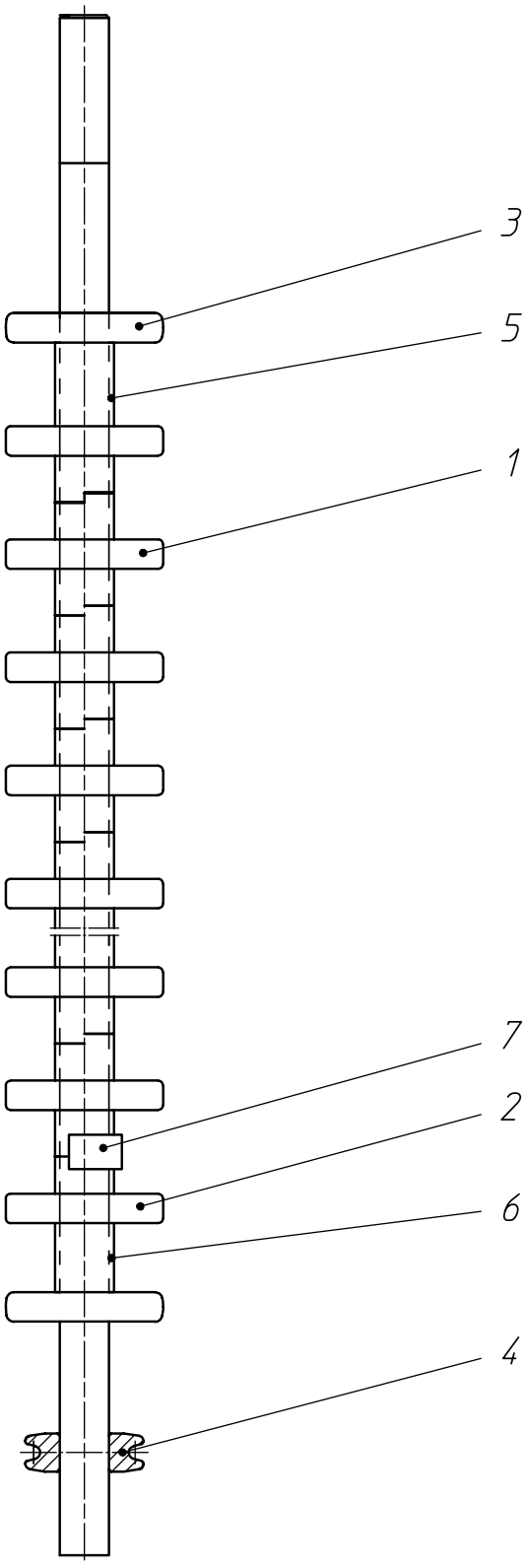
Assembly	: 16.004.1242.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ/V2A	Position	: 000100
Quant.	: 2,000 ST	Page	: 000357/01
Drawing	: 16.004.1242E0570	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	00.019.0266.000E BUSHING /PP-G/d=10.2/D=12.0/L=14.0	1,000	ST	X
7	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Ersatzteilliste WELLE KURZ OBEN

Spare parts list SHAFT

16.004.1242E0570	11
	00



Assembly	: 16.004.1243.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000100
Quant.	: 7,000 ST	Page	: 000358/01
Drawing	: 16.004.1243E0570	Date	: 10.04.2006

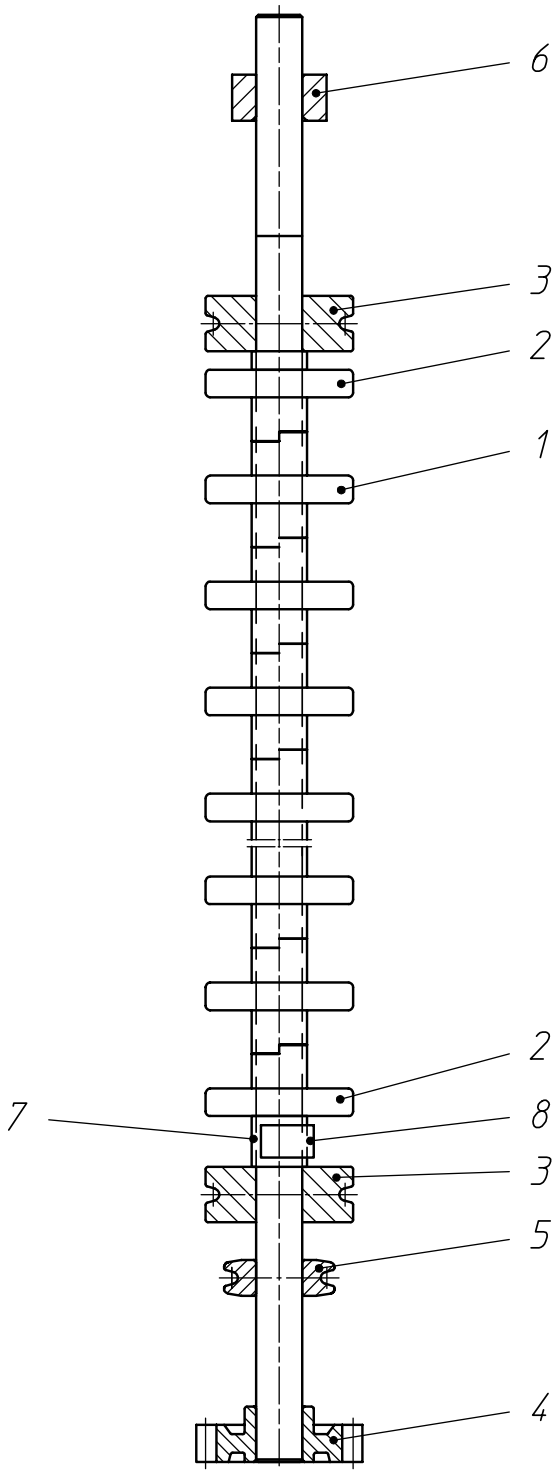
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1243E0570	11
	00



Assembly	: 16.004.1245.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/O /L/AH/FJ/V2A	Position	: 000100
Quant.	: 6,000 ST	Page	: 000359/01
Drawing	: 16.004.1245E0570	Date	: 10.04.2006

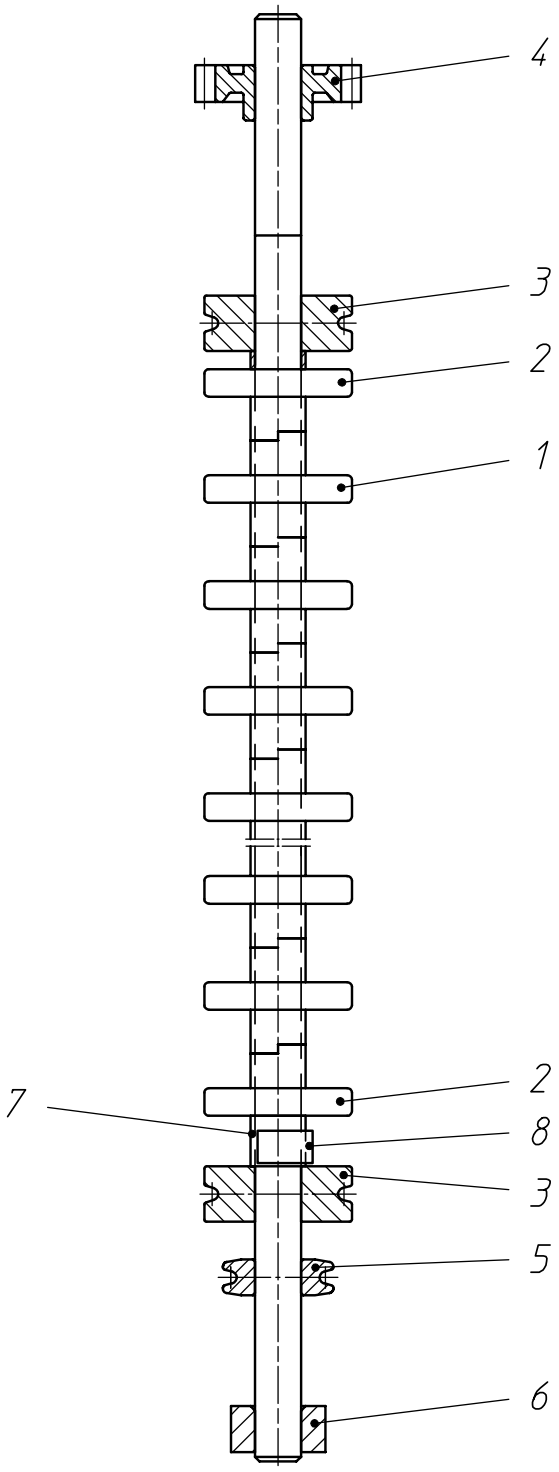
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE OBEN

Spare parts list shaft

16.004.1245E0570	11
	00



Assembly	: 16.004.1247.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/V2A	Position	: 000100
Quant.	: 2,000 ST	Page	: 000360/01
Drawing	: 16.004.1247E0570	Date	: 10.04.2006

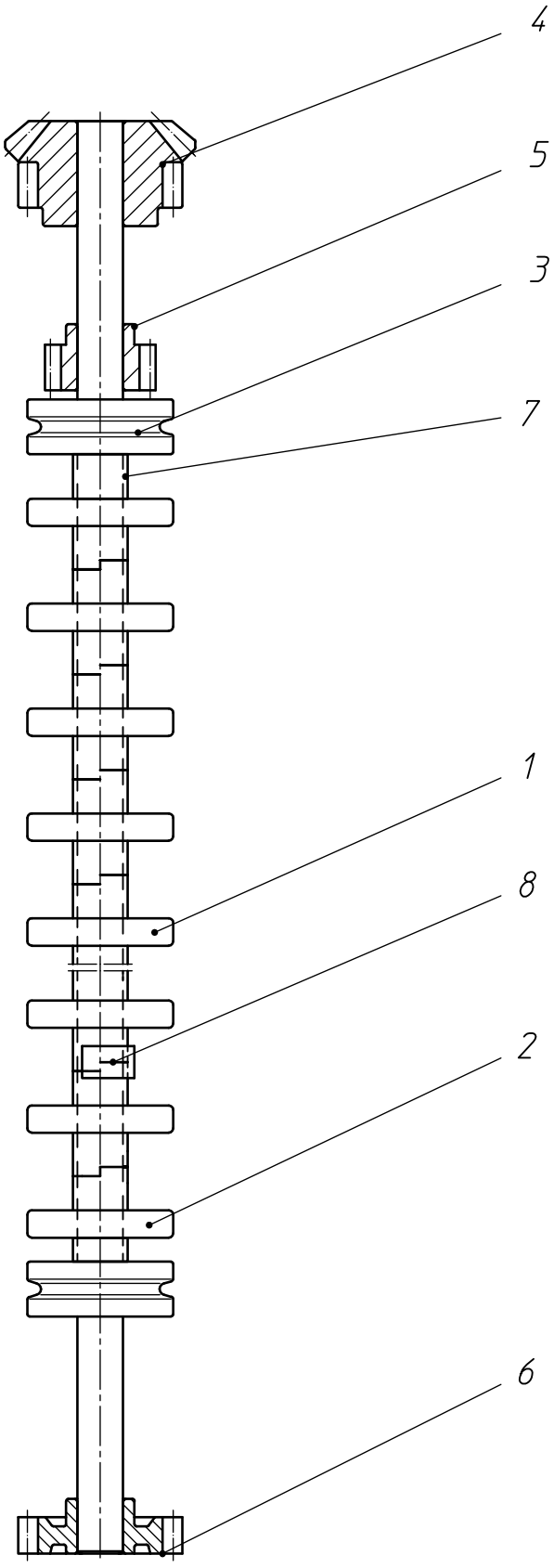
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1247E0570	1/1
	00



Assembly	: 16.004.0847.2571	Commiss.	: 25-05-377
Label	: Shaf/CPL//32/U /K/ /FJ/V2A	Position	: 000100
Quant.	: 1,000 ST	Page	: 000361/01
Drawing	: 16.004.0847E0580	Date	: 10.04.2006

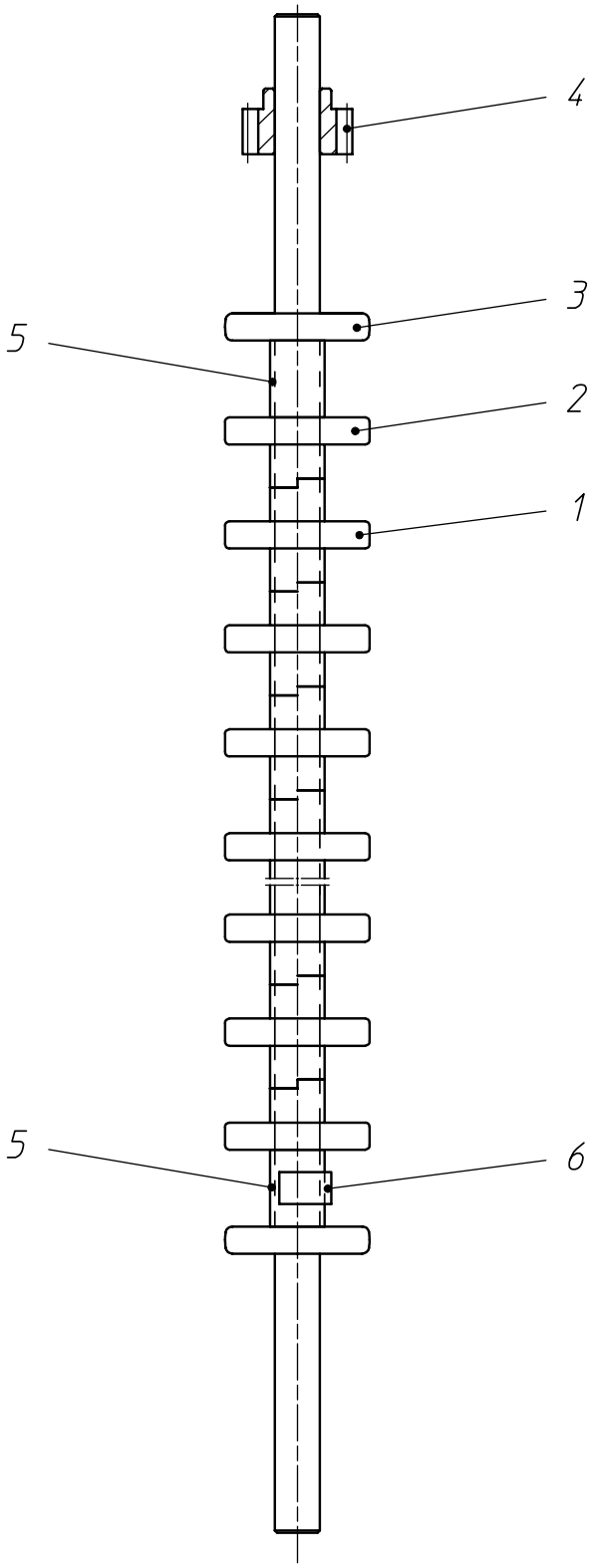
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	23,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0847E0580	11
	00



Assembly	: 16.004.1248.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /K/ /FJ/V2A	Position	: 000100
Quant.	: 1,000 ST	Page	: 000362/01
Drawing	: 16.004.1248E0570	Date	: 10.04.2006

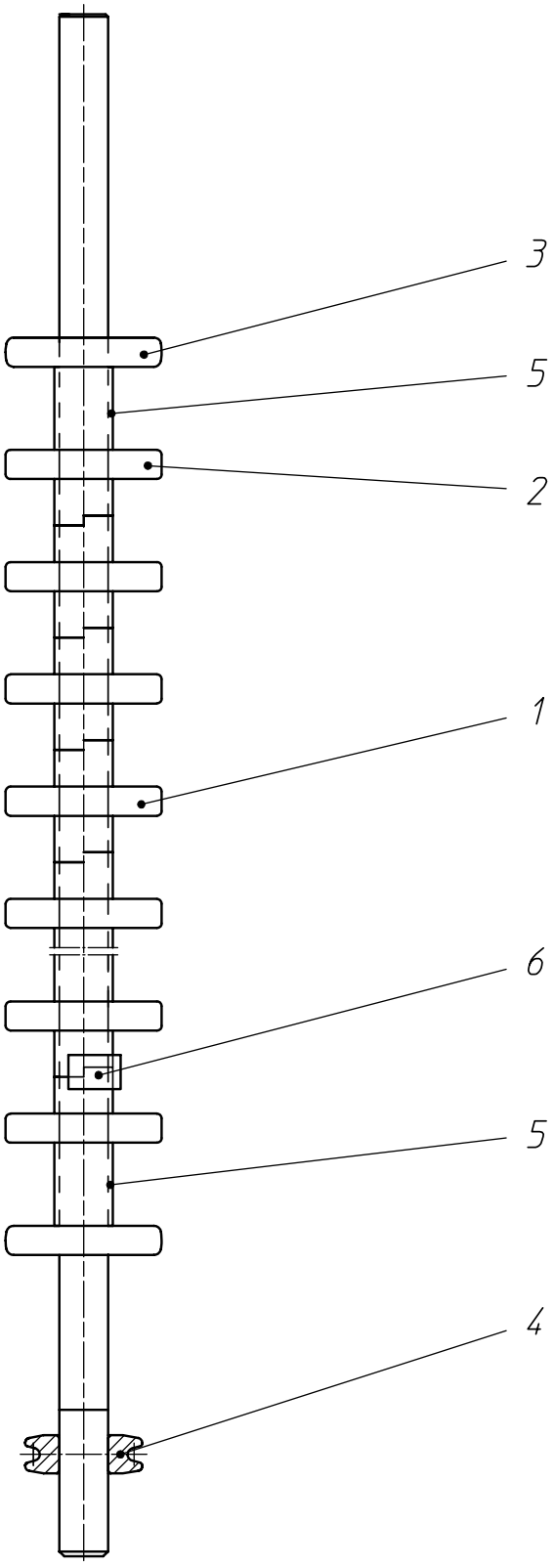
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	23,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	2,000	ST	X
6	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ OBEN

Spare parts list

16.004.1248E0570	11
	00



Assembly	: 16.004.1249.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AV/FJ/V2A	Position	: 000100
Quant.	: 1,000 ST	Page	: 000363/01
Drawing	: 16.004.1249E0570	Date	: 10.04.2006

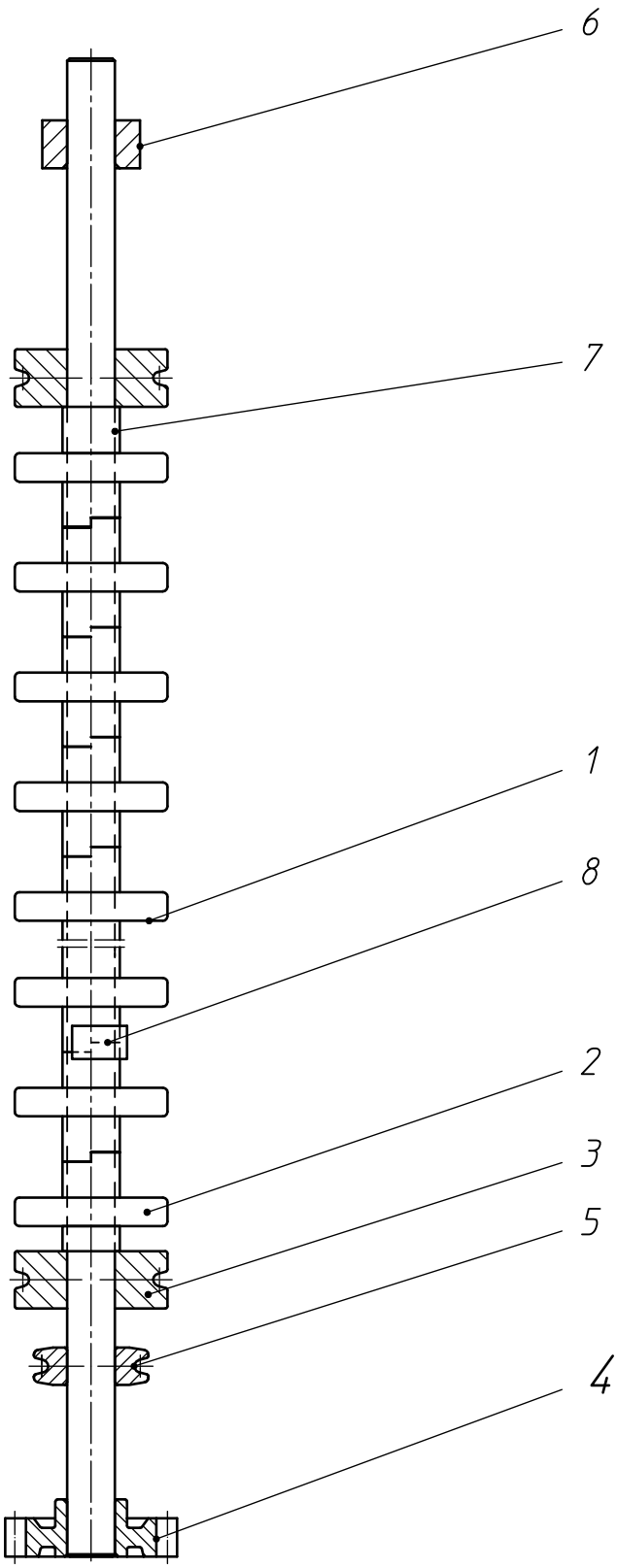
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1249E0570	1/1
	00



Assembly	: 16.004.1251.2571	Commiss.	: 25-05-377
Label	: Shaft/KPL/32/O /L/AH/FJ/V2A	Position	: 000100
Quant.	: 1,000 ST	Page	: 000364/01
Drawing	: 16.004.1251E0570	Date	: 10.04.2006

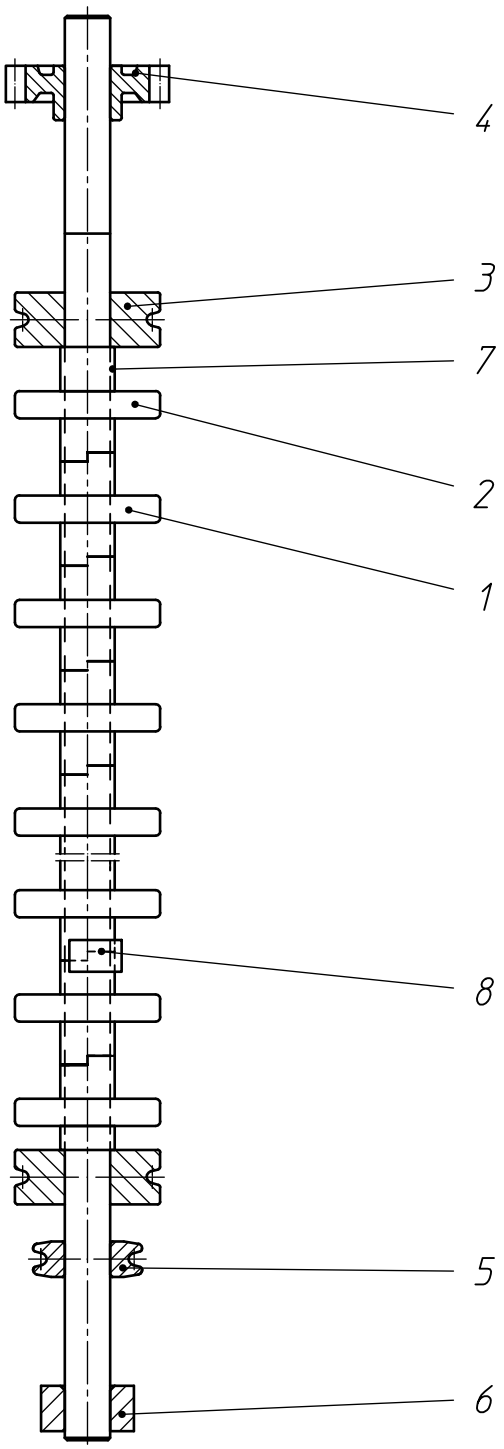
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
5	00.008.0082.000E BELT DISC/PP-G/d=09.6D=024.0/1R	1,000	ST	X
6	00.019.0228.000E BUSHING/PP-G/d=09.5/D=20.0/L=10.0	1,000	ST	X
7	00.019.0426.000E BUSHING/PP-G/D=12.0/d=10.2/L=9.75	1,000	ST	X
8	16.004.0870.0020 CLIP/COLOUR MARKING/PP/GREEN/RAL6018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE

Spare parts list SHAFT

16.004.1251E0570	1/1
	00



Assembly	: 16.004.0559.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL/Z=11/M2/VA/PP /=0162	Position	: 000100
Quant.	: 13,000 ST	Page	: 000365/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

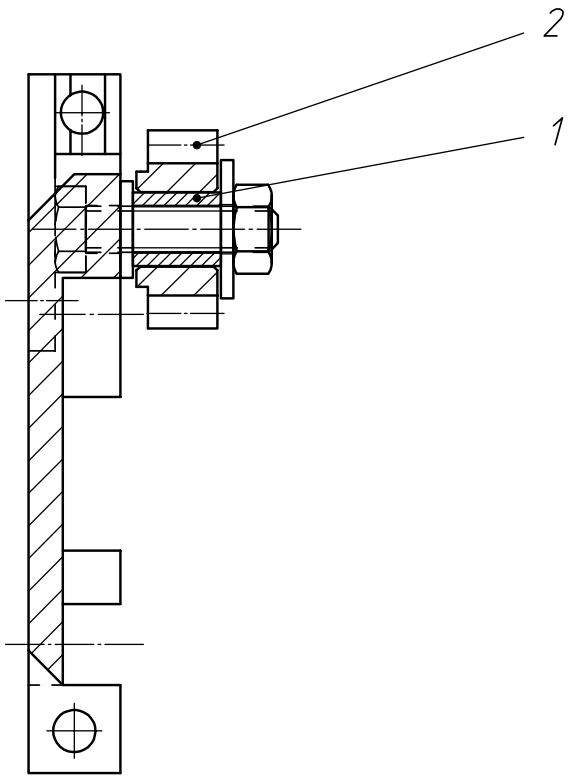
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0002 00SHING/SS/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00



Assembly	: 16.004.0306.U000	Commiss.	: 25-05-377
Label	: GUIDE/WE-WE/TKM DRYJET/D32-D12-d12/FE	Position	: 000100
Quant.	: 1,000 ST	Page	: 000366/01
Drawing	: 16.004.0306EU000	Date	: 10.04.2006

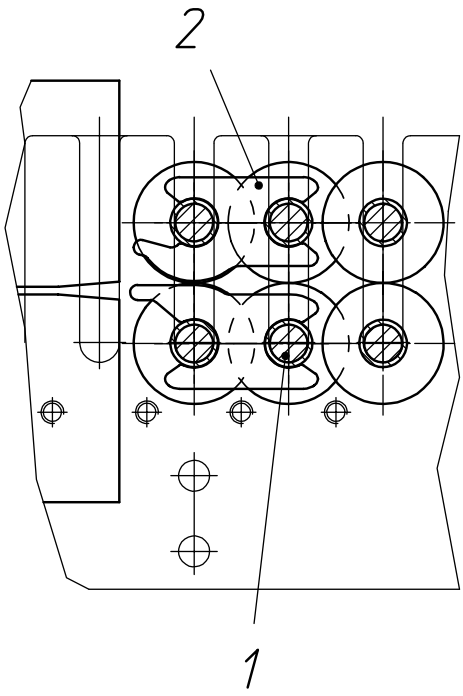
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.029.0094.0001 GUIDING DEVICE/PVDF/d=12/d=12/D=32/T=25	14,000	ST	X
2	16.029.0103.0001 GUIDING DEVICE/PVDF/d12/d12/D32/T25/O	14,000	ST	X

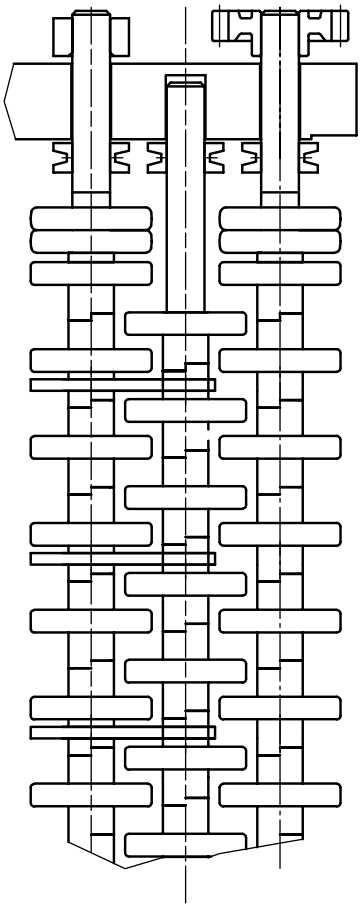
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMEN+FÜHRUNG TKM

Spare parts list Belt+Guide

16.004.0306EU000	11
	00





Assembly	: 16.004.0411.U803	Commiss.	: 25-05-377
Label	: BELT DRIVE+GUIDE/WA-WA/D32-D23/FE	Position	: 000100
Quant.	: 1,000 ST	Page	: 000367/01
Drawing	: 16.004.0411EU000	Date	: 10.04.2006

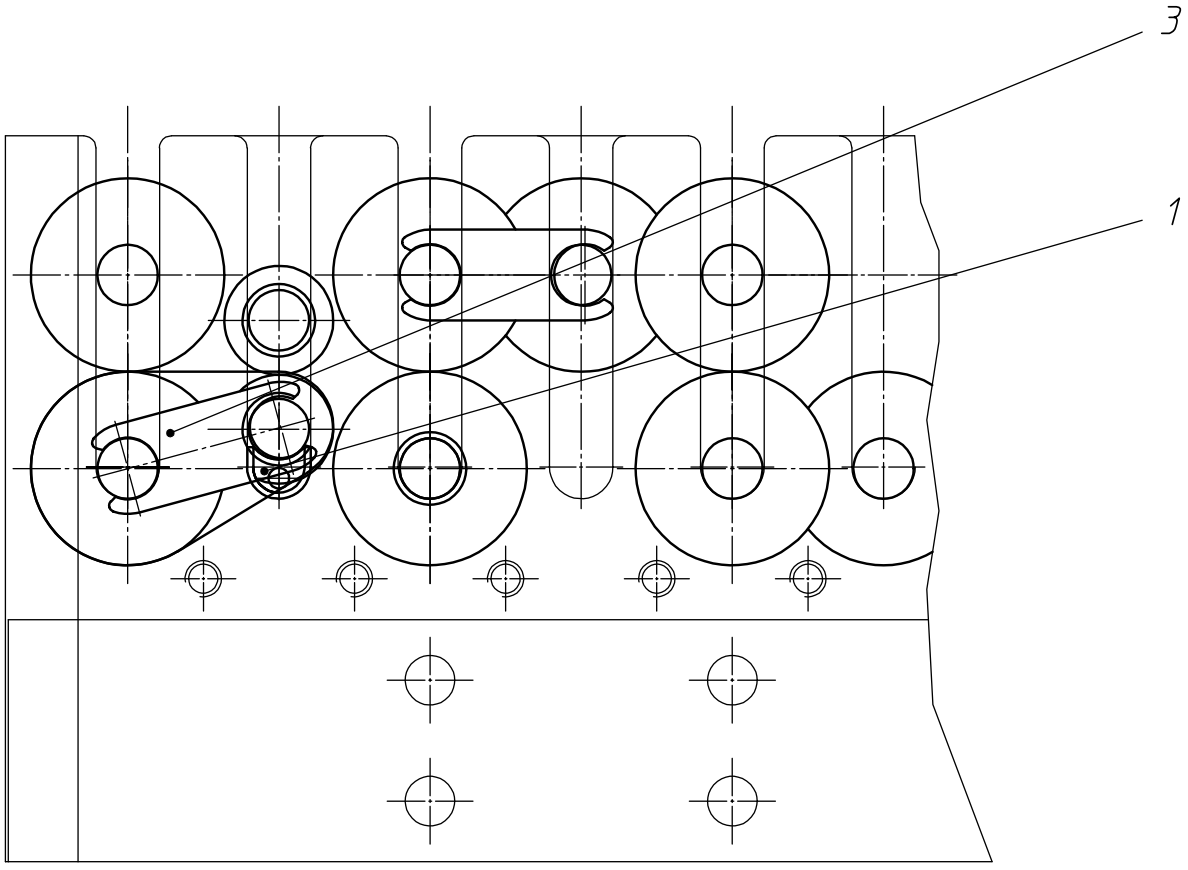
Pos.	Part N° Label	Quant.	Unit	SP
1	00.017.0080.000H insert/GUR-N/d=10/D=18/L=6,8	2,000	ST	X
2	DICH0580-124 O-RING/EPDM/BLACK/031.42x2.62	1,000	ST	X
3	16.004.1177.000H CLIP/GUR-N/T25/BOTTOM	1,000	ST	X

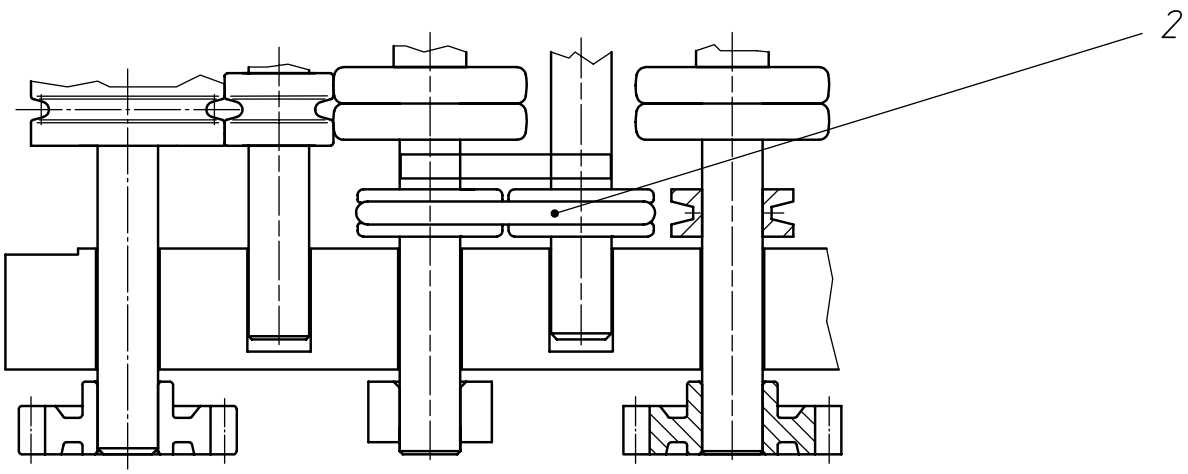
Parts without Pos.-N° see assembly parts list

Ersatzteilliste RIEMEN+FÜHRUNG

Spare parts list BELT DRIVE+GUIDE

16.004.0411EU000	11
	00





Assembly	: 16.017.0049.U000	Commiss.	: 25-05-377
Label	: COMPRESSOR /SAP300/FILTER	Position	: 000100
Quant.	: 2,000 ST	Page	: 000368/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	FILT06-300 FILTER/F. SAP-300	1,000	ST	X
2	FILT06-301 HOLDER FOR FILTER	1,000	ST	X
3	FILT06-303 CONNECTION FOR FILTER	1,000	ST	X
4	SCHL0018-060 HOT AIR HOSE/P2 SP ID=60 mm	3,000	M	X
5	FILT06-307 COVER/NR.3902867910/MANN+HUMMEL	1,000	ST	X
6	FILT06-308 INTERMEDIATE PIPE/NR.EIT-028-3718MANN+HU	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.17.TQ00.00.74	Commiss.	: 25-05-377
Label	: AIR DISTRIBUTION/TQB/1DRY-JET-PAIR	Position	: 000100
Quant.	: 1,000 ST	Page	: 000369/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	SCHL1920-46-70 HOSE CLAMP/BR.14TRIDON 46-70 1.4301	3,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.17.TQ00.00.71	Commiss.	: 25-05-377
Label	: DRY-JET-PAIR-TI/[4]/STANDARD/R	Position	: 000100
Quant.	: 1,000 ST	Page	: 000370/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
1	16.017.0248.2001 BLOW. NOZZLE/PVC-C/V2A/0650/BO=1,0/60Hz	2,000	ST	X
2	SCHL0018-060 HOT AIR HOSE/P2 SP ID=60 mm	1,000	M	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.017.0248.2001	Commiss.	: 25-05-377
Label	: BLOW. NOZZLE/PVC-C/V2A/0650/BO=1,0/60Hz	Position	: 000100
Quant.	: 2,000 ST	Page	: 000371/01
Drawing	: 16.017.0248E0001	Date	: 10.04.2006

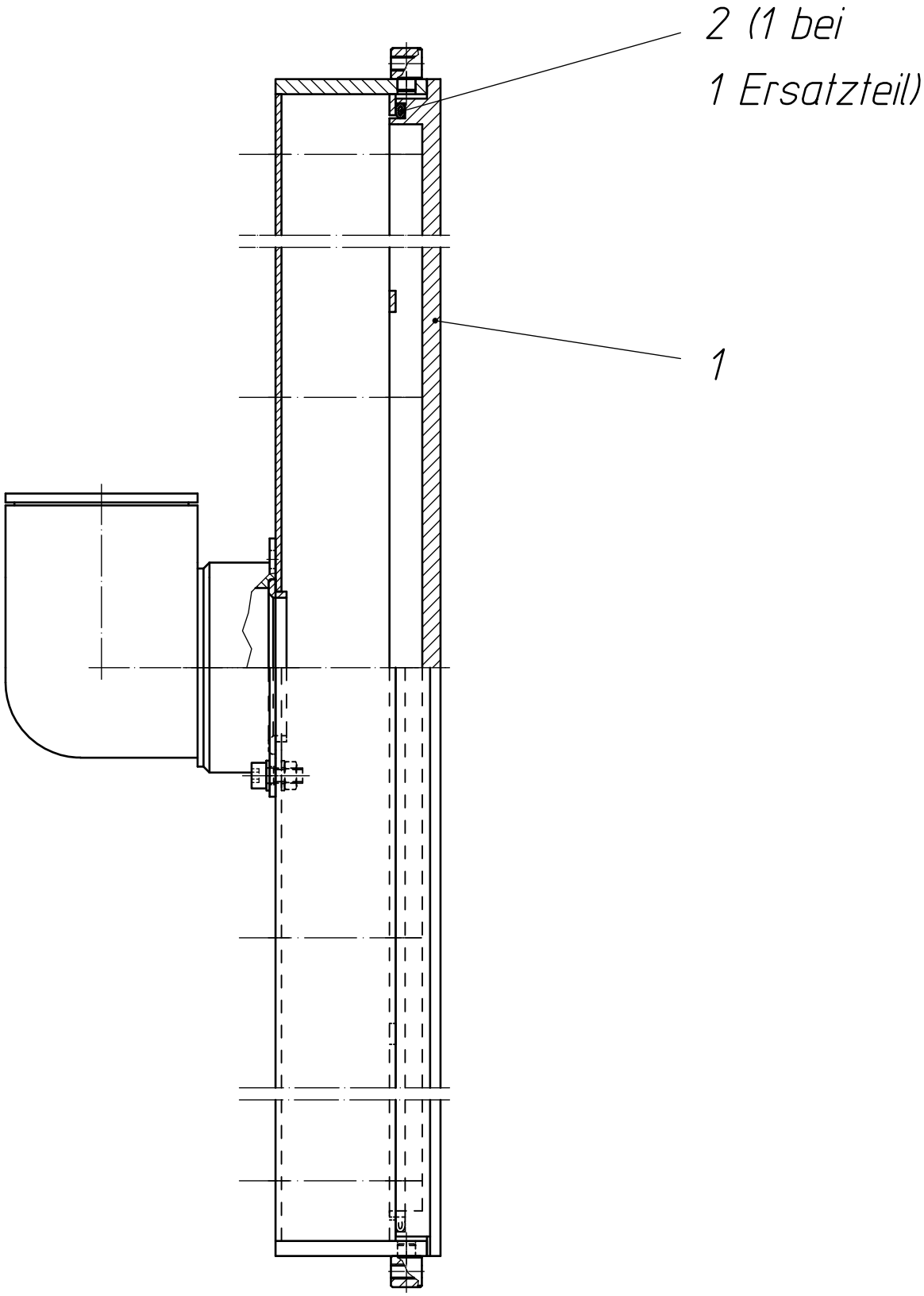
Pos.	Part N° Label	Quant.	Unit	SP
1	16.017.0244.2000 DISTRIBUTOR PLATE/0650/EPOXY-ALU/SS	1,000	ST	X
2	SC-000000074-000 SILICON HOSE/ID=03x1 NATUR	1,500	M	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste BLASDÜSE

Spare parts list BLOWING NOZZLE

16.017.0248E0001	1/1
	01



Assembly	: 25-05-377-09	Commiss.	: 25-05-377
Label	: M09, Output - TRA 1 PVC/SS	Position	: 000110
Quant.	: 1,000 ST	Page	: 000372/01
Drawing	: without	Date	: 10.04.2006

Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0127.U21L CONVEYOR/ST/021/VA/CLAW-CLUTCH/d=27	1,000	ST	
	VS-25-05-377-09 CONVEYOR/TRA 1/650/PVC/VA	1,000	ST	
	16.012.0003.U21A CABLE CHANNEL/CPL./21/PVC/BS	1,000	ST	
1	03.002.2283.000A SUPPORT/PVC-HG/NOT-STOP	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Assembly	: 16.004.0127.U21L	Commiss.	: 25-05-377
Label	: CONVEYOR/ST/021/VA/CLAW-CLUTCH/d=27	Position	: 000110
Quant.	: 1,000 ST	Page	: 000373/01
Drawing	: 16.004.0127EU000	Date	: 10.04.2006

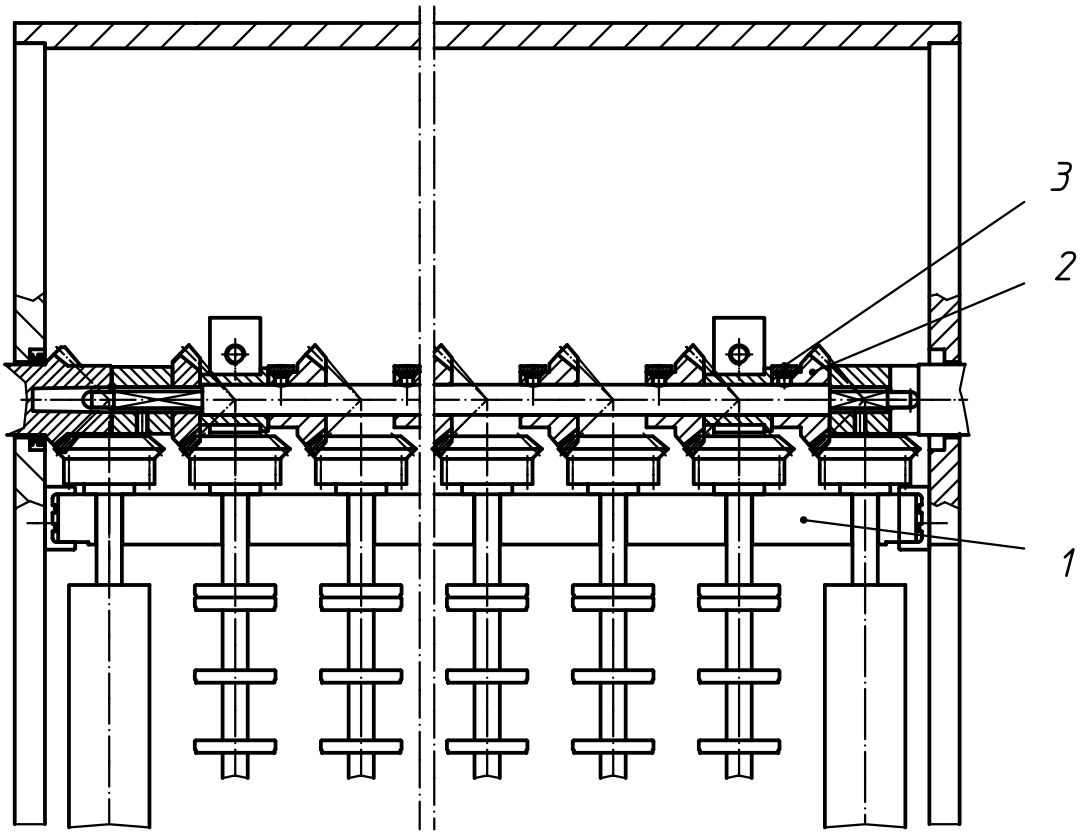
Pos.	Part N° / Label	Quant.	Unit	SP
	16.004.0125.U21L DRIVE SHAFT/CPL./021/VA/CONV./KL-KU/d=27	1,000	ST	
1	16.004.0002.021H SUPPORT/GUR-N/21/d=10/T=50	2,000	ST	X
2	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	1,000	ST	X
3	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste VORSCHUB

Spare parts list Conveyor

16.004.0127EU000	11
	00



Assembly	: 16.004.0125.U21L	Commiss.	: 25-05-377
Label	: DRIVE SHAFT/CPL./021/VA/CONV./KL-KU/d=2	Position	: 000110
Quant.	: 1,000 ST	Page	: 000374/01
Drawing	: 16.004.0125EU000	Date	: 10.04.2006

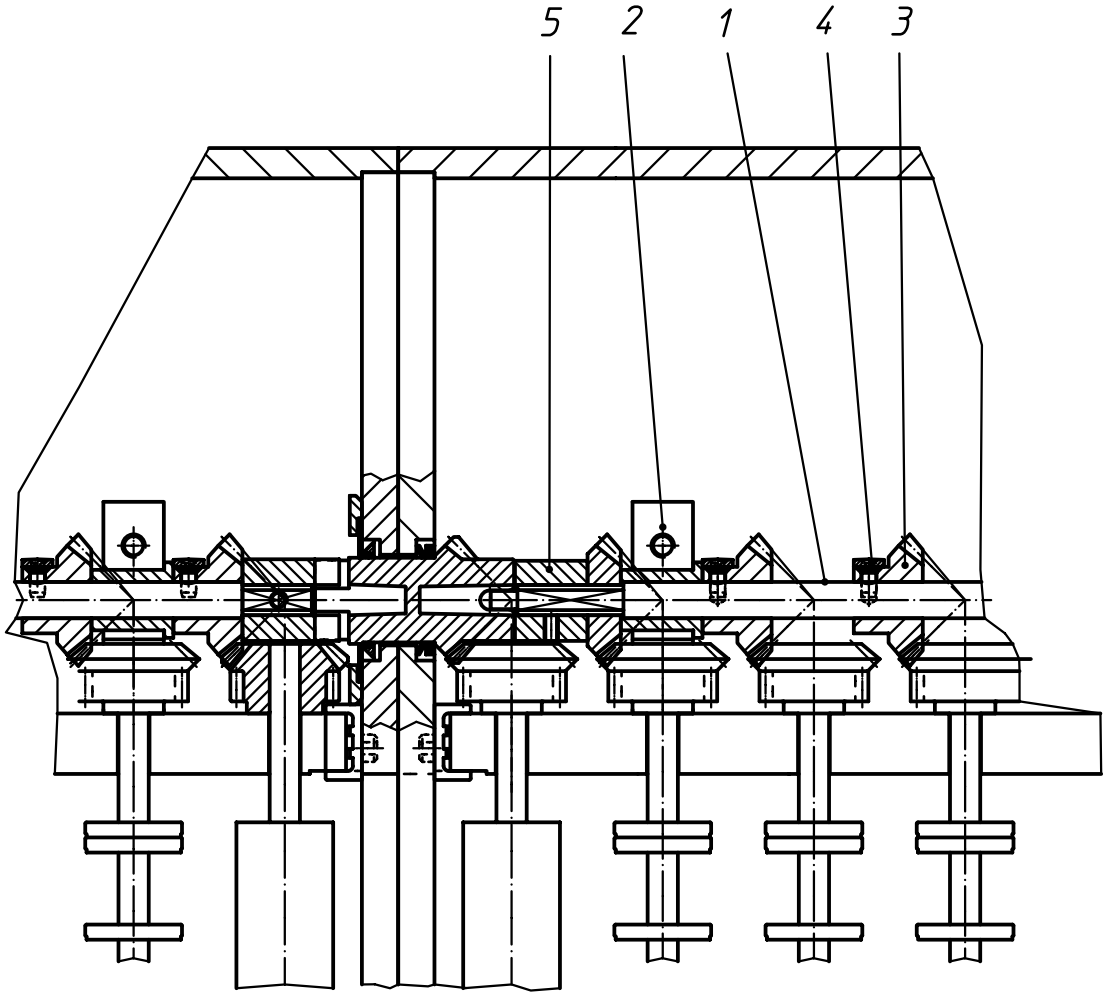
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.0353.0212 DRIVE SHAFT/V4A/021/KL-KU/CONV.	1,000	ST	X
2	16.004.0007.U00L SEATING/CPL./PVC /VA	2,000	ST	X
3	00.001.0010.0001 ANGULAR WHEEL/PVDF/Z=16/M=2.5/d=12.0	4,000	ST	X
4	03.004.0278.0002 CLAMP/BLACK/PVDF/1.4571	4,000	ST	X
5	16.004.0330.0002 COUPLING/SS/PART 2	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste ANTRIEBSWELLE KPL. VS

Spare parts list Drive shaft cpl. + conv.

16.004.0125EU000	11
	00



Assembly	: 16.004.0007.U00L	Commiss.	: 25-05-377
Label	: SEATING/CPL./PVC /VA	Position	: 000110
Quant.	: 2,000 ST	Page	: 000375/01
Drawing	: 16.004.0007EU000	Date	: 10.04.2006

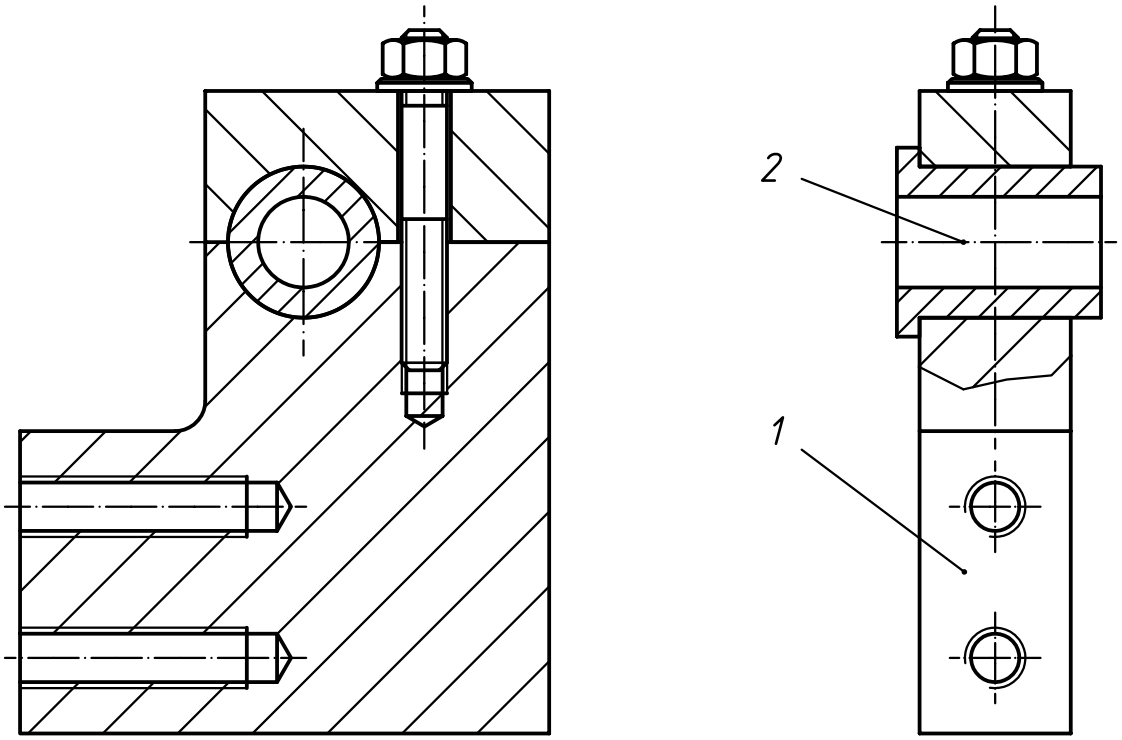
Pos.	Part N° / Label	Quant.	Unit	SP
1	03.004.0005.0002 SEATING/PVC-HG/V4A	1,000	ST	X
2	00.020.0006.000H BUSHING/GUR-N/d=12.0/D=20.0/L=27.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste LAGER KPL.

Spare parts list SEATING CPL.

16.004.0007EU000	11
	00



Assembly	: VS-25-05-377-09	Commiss.	: 25-05-377
Label	: CONVEYOR/TRA 1/650/PVC/VA	Position	: 000110
Quant.	: 1,000 ST	Page	: 000376/01
Drawing	: VS-25-05-377-09	Date	: 10.04.2006

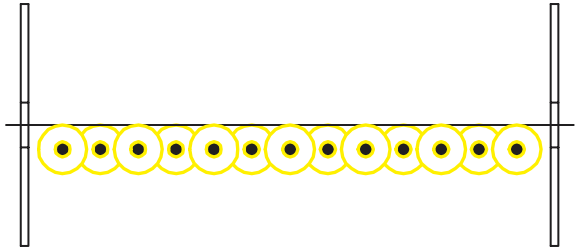
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1241.2571 Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	5,000	ST	X
2	16.004.0962.2571 Shaft/10/12/32/T25/650/1.4301/PP/U/K/FE	6,000	ST	X
3	16.004.1240.2571 Shaft/CPL/32/U /L/ /FJ/MODU L/A+E/V2A	2,000	ST	X
	16.004.0559.U002 GEAR WHEEL/Z=11/M2/VA/PP /=0162	6,000	ST	

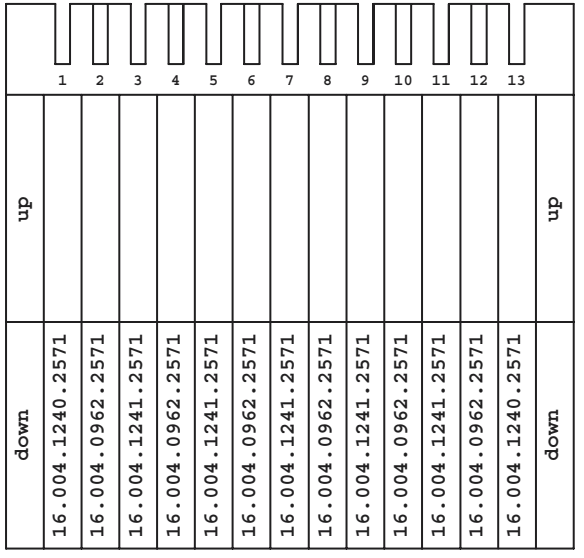
Parts without Pos.-N° see assembly parts list

date 10.04.2006

positioning plan of conveyor

conveyor no.	VS-25-05-377-09	**conveyor system**	IJ
customer	VEF Radiotehnika RRR	**material**	PVC/VA
maschine	Micro etch - chemical pre-treatment	**working width**	650
module type	TRA1	**working direction**	L-R
remark			





Assembly	: 16.004.1241.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/d10/d12/D32/T25	Position	: 000110
Quant.	: 5,000 ST	Page	: 000377/01
Drawing	: 16.004.1241E0570	Date	: 10.04.2006

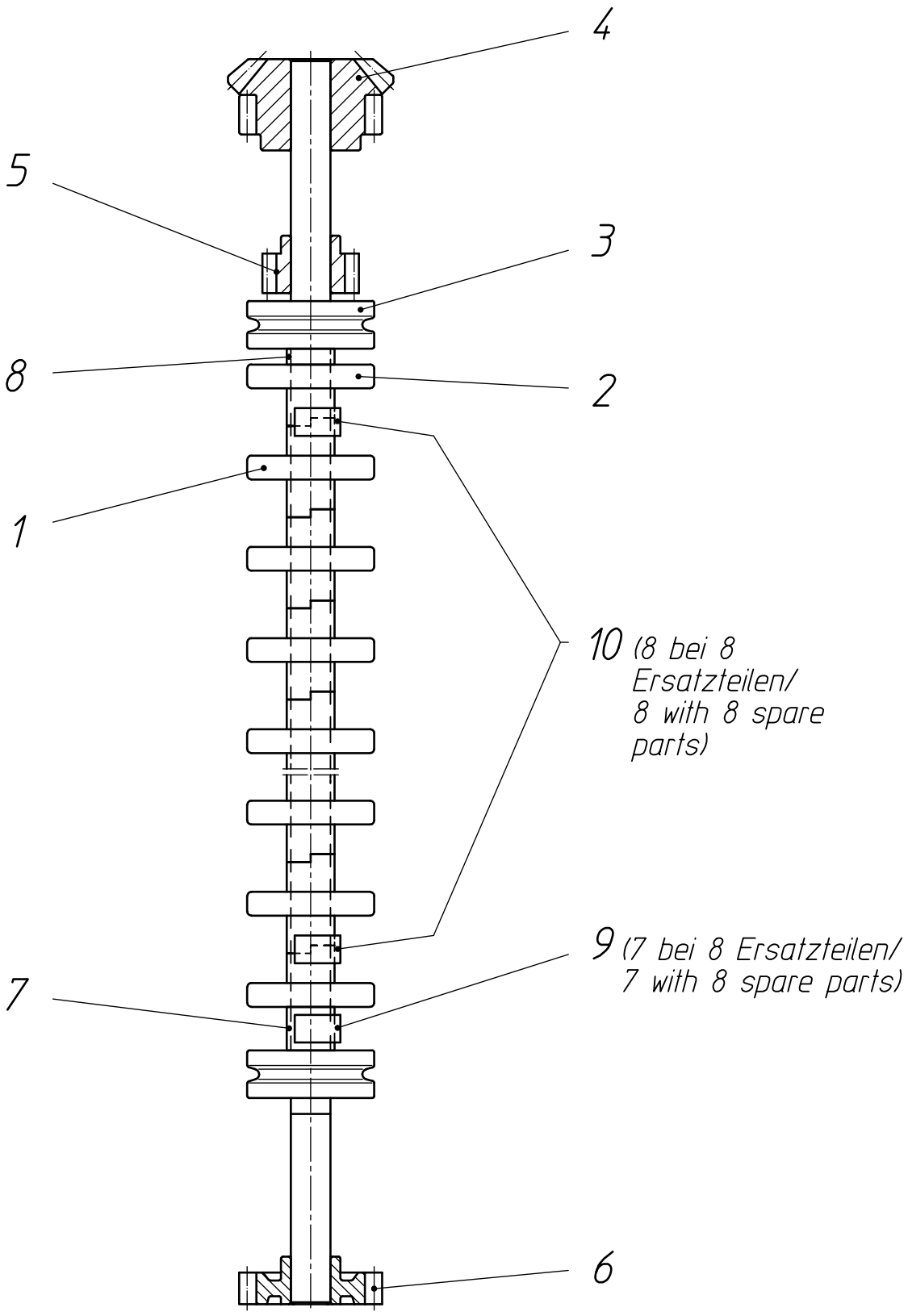
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	26,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	2,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list SHAFT, BOTTOM

16.004.1241E0570	1/1
	01



Assembly	: 16.004.0962.2571	Commiss.	: 25-05-377
Label	: Shaft/10/12/32/T25/650/1.4301/PP/U/K/FE	Position	: 000110
Quant.	: 6,000 ST	Page	: 000378/01
Drawing	: 16.004.0962E0570	Date	: 10.04.2006

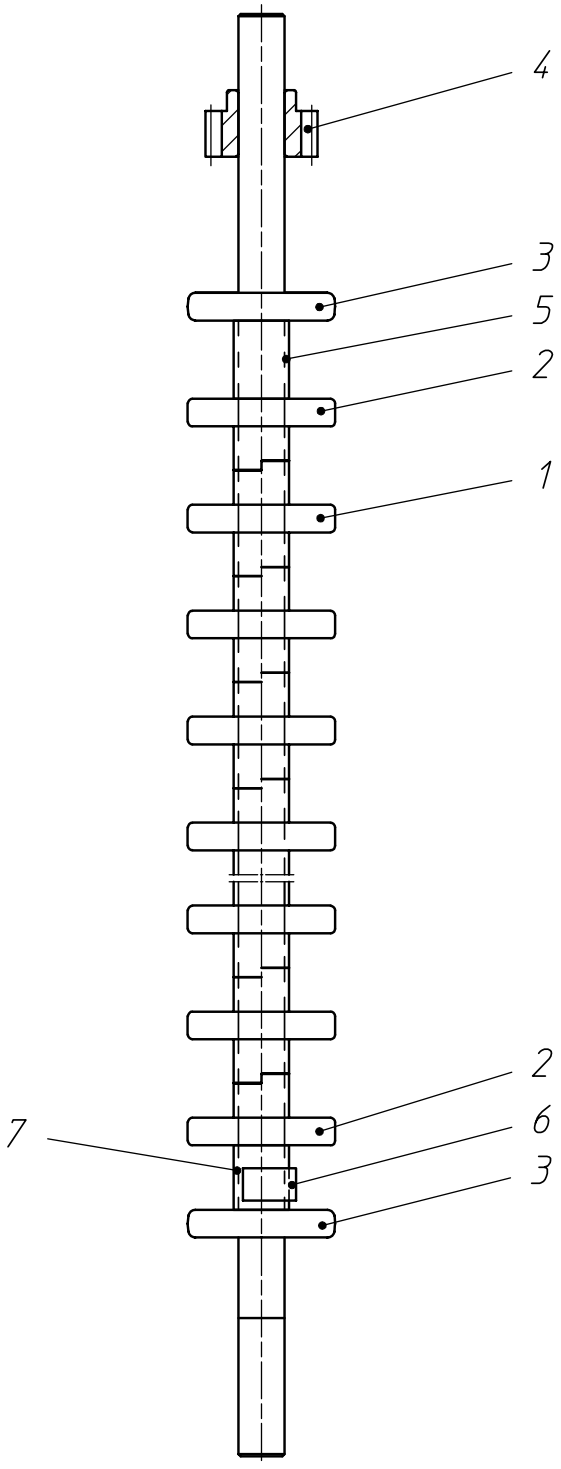
Pos.	Part N° Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	24,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	2,000	ST	X
4	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
5	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
6	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
7	00.019.0266.000E BUSHING /PP-G/d=10.2/D=12.0/L=14.0	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE KURZ UNTEN

Spare parts list shaft

16.004.0962E0570	11
	00



Assembly	: 16.004.1240.2571	Commiss.	: 25-05-377
Label	: Shaft/CPL/32/U /L/ /FJ/MODU L/A+E/V2A	Position	: 000110
Quant.	: 2,000 ST	Page	: 000379/01
Drawing	: 16.004.1240E0570	Date	: 10.04.2006

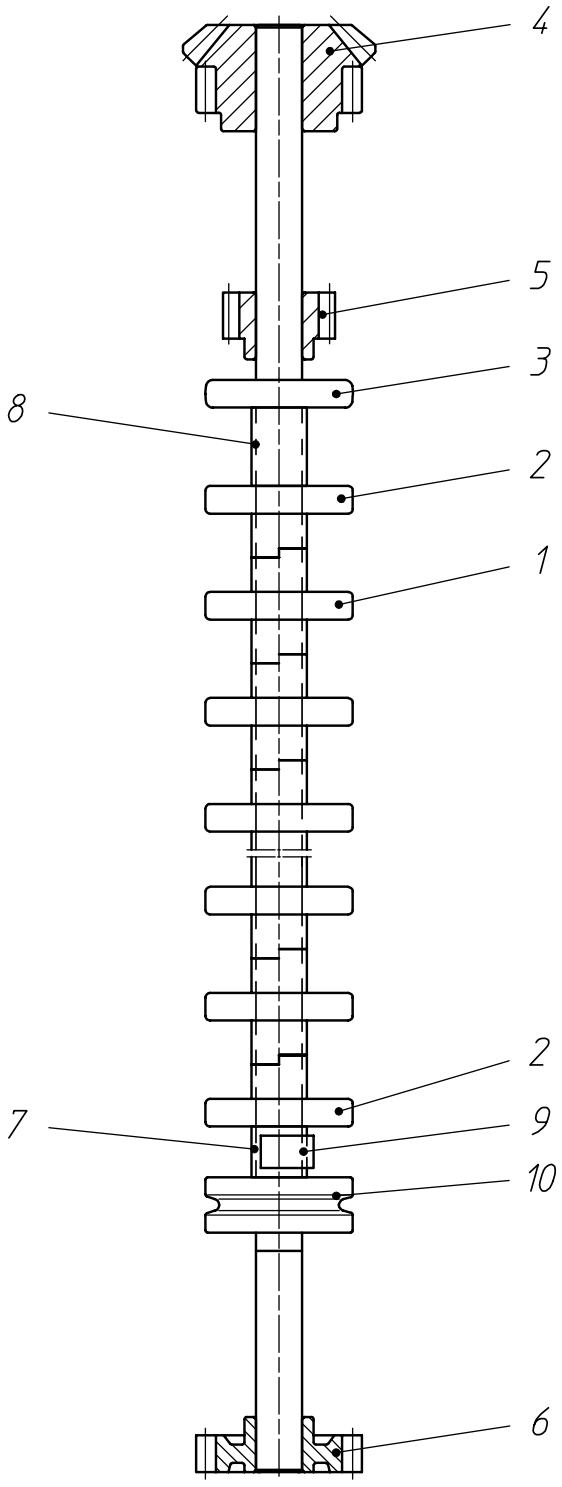
Pos.	Part N° / Label	Quant.	Unit	SP
1	16.004.1691.0570 WHEEL/57/d10/D32/d12/L25	25,000	ST	X
2	16.004.0798.0570 WHEEL/57/d10/D32/D12/L15,5	2,000	ST	X
3	00.011.0033.0570 WHEEL/d=9.6/D=32.0/L=6.0	1,000	ST	X
4	00.025.0001.000E BEVEL WHEEL/PPG/CPL/Z16/16/M2.0/2.5/d9.8	1,000	ST	X
5	00.002.0140.000E SPUR WHEEL/PP-G/Z=11/M=2.0/d=09.7	1,000	ST	X
6	00.002.0122.000E SPUR WHEEL/PP-GREY/Z=16/M=2.0/d=09.8	1,000	ST	X
7	00.019.0419.000E BUSHING/PP-G/D=12.0/d=10.2/L=11	1,000	ST	X
8	00.019.0230.000E BUSHING/PP-G/d=12.0/D=10.2/L=17.0	1,000	ST	X
9	16.004.0870.0010 CLIP/COLOUR MARKING/PP/YELLOW/RAL1018	1,000	ST	X
10	00.008.0074.000E BELT DISC/PP-G/d=09.8/D=032.0/1R	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste WELLE UNTEN

Spare parts list shaft

16.004.1240E0570	11
	00



Assembly	: 16.004.0559.U002	Commiss.	: 25-05-377
Label	: GEAR WHEEL/Z=11/M2/VA/PP /=0162	Position	: 000110
Quant.	: 6,000 ST	Page	: 000380/01
Drawing	: 16.004.0482EU000	Date	: 10.04.2006

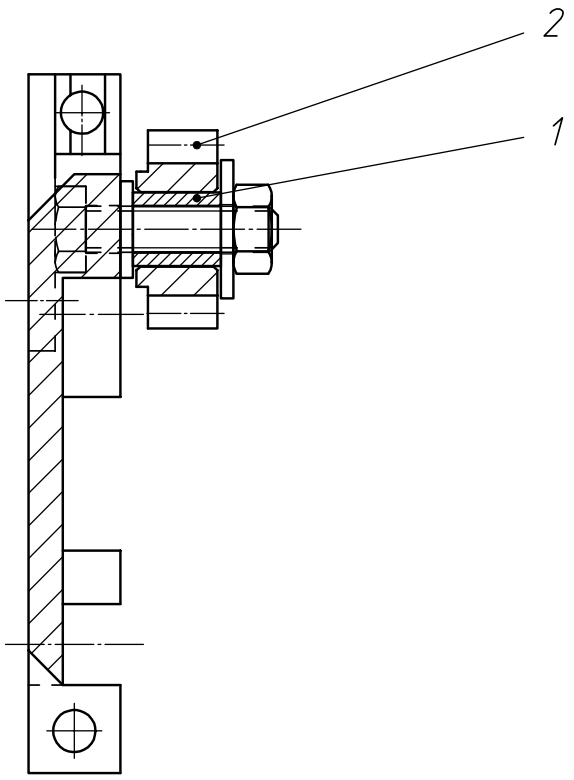
Pos.	Part N° Label	Quant.	Unit	SP
1	00.019.0224.0002 00SHING/SS/d=06.1/D=09.6/L=16.0	1,000	ST	X
2	00.002.0203.0001 SPUR WHEEL/PVDFf/Z=11/M=2.0/d=09.7	1,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste UMLENKZAHNRAD

Spare parts list GEAR WHEEL

16.004.0482EU000	11
	00

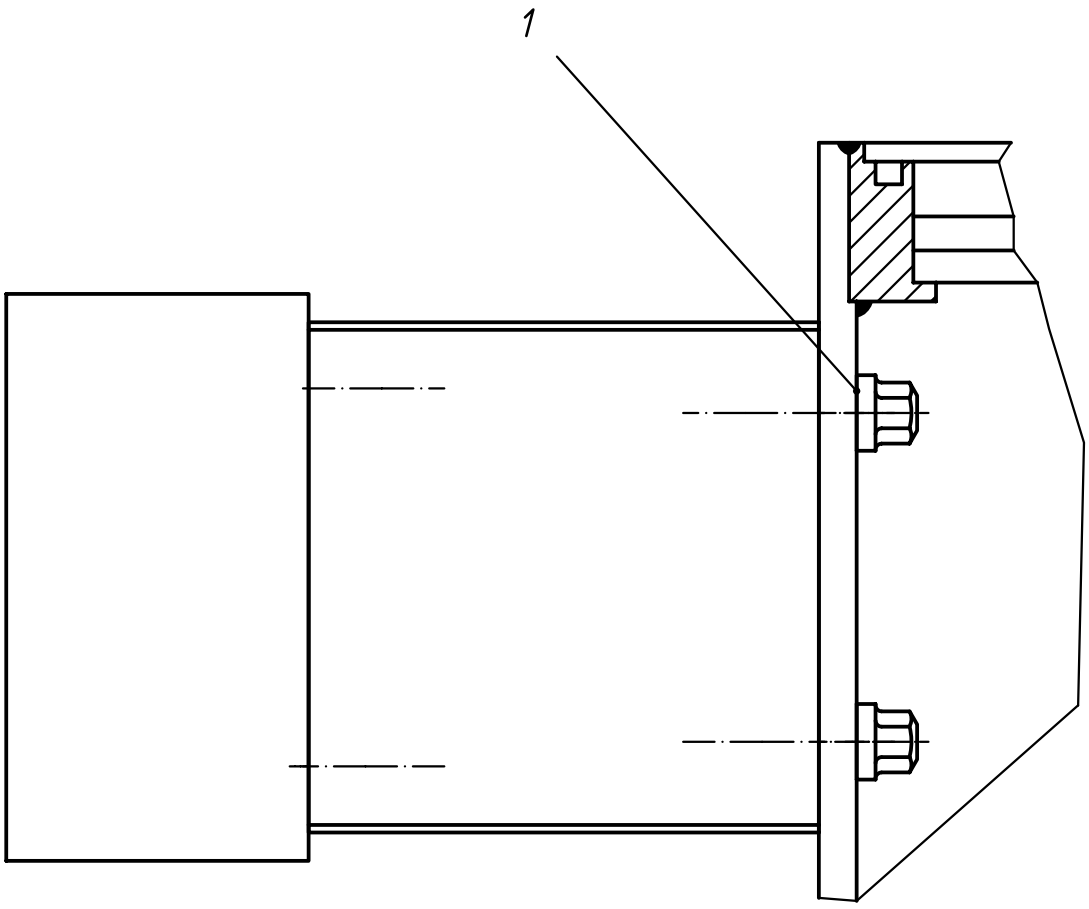


Assembly	: 16.012.0003.U21A	Commiss.	: 25-05-377
Label	: CABLE CHANNEL/CPL./21/PVC/BS	Position	: 000110
Quant.	: 1,000 ST	Page	: 000381/01
Drawing	: 16.012.0003EU000	Date	: 10.04.2006

Pos.	Part N° Label	Quant.	Unit	SP
1	DICH0580-110 O-RING/EPDM/BLACK/009.19x2.62	4,000	ST	X

Parts without Pos.-N° see assembly parts list

Ersatzteilliste KABELKANAL

Spare parts list Cable conduit

16.012.0003EU000	11
	00