MASS

Operating Manual

[Translation of the original instructions]

Vacuum Plugging Machine

VCP 5000-1

Serial No. #1894

Version: 07.07.2016

Read operating manual prior to commissioning

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Contents

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MASS GmbH
Wilhelm-Lorenz-Str. 13
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EC-declaration of conformity

corresponding to EG-directives for machinery 2006/42/EG Appendix II A

We herewith declare, that construction and design of this machine as well as this special type is corresponding to the basical requirements of security and health of EG-directives. If this machine has been modified without our agreement, this declaration will not be valid anymore.

Designation of the machine	Vacuum Plugging Machine
Typ:	VCP 5000-1
Serial-No.:	**#1894**
Application:	Fill holes in printed circuit boards with conductive or non conductive paste

EC-directives:	EC-machine directive 2006/42/EC EMV-directive 2014/30/EU EC-low voltage directive 2014/35/EU

European directives:

• DIN EN 60204-1	Safety of machinery, Electrical equipment of machines
• DIN EN ISO 13850	Safety of machinery; emergency stop equipment, functional aspects; principles for design
• DIN EN ISO 13849-1	Safety-related parts of control systems
• DIN EN ISO 12100	Safety of machinery; Part 1, basic concepts
• DIN EN ISO 13857	Safety of machinery; Safety distances to prevent hazard zones being reached by upper and lower limbs
• DIN EN 349	Safety of machinery; minimum gaps to avoid crushing of parts of the human body
• DIN EN 614-1	Safety of machinery; Terminology and general principles
• DIN EN 614-2	Safety of machinery; Interactions between the design of machinery and work tasks
• DIN EN ISO 4414	Pneumatic fluid power; General rules and safety requirements for systems and their components

National directives :
DGUV V3, BGV A1

Date, Manufacturer- signature	Geseke, 07.07.2016
	Dipl.-Ing. Dietmar Hellmold
Function of signatory:	CE-Documentation Plenipotentiary, Technical manager

Manufacturer contact details

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Safety information

The equipment described is intended for use in industrial electrical drive systems.

This equipment can endanger life through rotating machinery and high voltages, therefore it is essential that guards for both electrical and mechanical parts are not removed.

The following points should be observed for the safety of the personnel:

- Only qualified personnel familiar with the equipment are permitted to install, operate and maintain the devices.
- System documentation must be available and observed at all times.
- All non-qualified personnel are to be kept at a safe distance from the equipment.
- The system must be installed in accordance with local regulations.

A qualified person is a person who is familiar with all safety notes and established safety practices, with the installation, operation and maintenance of this equipment and the hazards involved. For more detailed definitions see IEC 364.

It is recommended that anyone who operates or maintains electrical or mechanical equipment see IEC 364.
It is recommended that anyone who operates or maintains electrical or mechanical equipment should have a basic knowledge of First Aid. As a minimum, they should know where the First Aid equipment is kept and the identity of the official First Aiders.

These safety notes do not represent a complete list of the steps necessary to ensure safe operation of the equipment. If you wish further information, please contact MASS GmbH.

The specifications in this manual describe the features of the products, without guarantee.

MASS GmbH personnel has carefully checked this manual and the equipment, but cannot be held responsible for its accuracy.

Technical alternatives reserved

Warning!!
When operative, the paste container is under pressure.
Do not open when under pressure. Be careful when opening or dismounting.
Vacuum chamber is under vacuum during operation.
Prior to starting maintenance works, machine first to be made unpressurized.

Warning!!
When handling the paste, the safety instructions of the manufacturer are to be followed.
When closing the door, keep the hands off the working area. Failure to so may result in contusions.

General

- The low-voltage recommendation applies to all electrical equipment used with a nominal voltage between 50V and 1000V of alternating current, a direct current between 75 and 1500V and usual ambient conditions, save the use of electrical equipment in explosive atmospheres and electrical parts of passenger and freight elevators.

- The low-voltage recommendation is directed at using only such electrical equipment neither exposing to danger the safety of human beings and domestic animals nor threatening the conservation of tangible property.

Safety and operation instructions

- During the operation, according to their system of protection, drive power converters can have live, bare or mobile or rotating parts and elements as well as hot surfaces.

- Inadmissible removing of the required cover, improper use, wrong installation or operation could result in serious personal injury or material damages. Further information to be learned from the documentation.

- All transport, installation, start-up and repairing works are to be performed by qualified staff only (IEC 364 and/or CENELEC HD 384 or DIN VDE 0100 and IEC-report 664 or DIN VDE 0110 and national safety regulations to be observed).

- Prior to working on the machine, the supply power must be switched off!

- The operating instructions must be available and on hand.

- MASS GmbH refuses any liability for improper and inappropriate use.

WARNING!
There is the risk of squashing hands and arms. Take a great deal of care when opening/closing the door and the squeegees.

Danger!
Subject to the load, the servomotor for traverse is getting hot. There is the risk of burns. Prior to starting the maintenance works, check the temperature of the motor.

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All product names and brand names depicted herein are registered trademarks of their respective manufacturers or owners.

Safety instructions

The safety-consciousness of staff working procedures based on the operating manual should be checked at least occasionally.

Personnel must not be allowed to wear long hair, loose clothing or ornaments including rings, as these may get caught or entangled and lead to injuries.

Personal protective equipment must be worn where necessary or required by the regulations.

All safety notices and warnings on the plant must be observed.

All labels on the machine which display safety and operating instructions must always be kept legible. Worn or damaged labels must be replaced immediately.

No modifications, additions or conversions of the machine which might impair safety may be undertaken without the permission of the supplier. This also applies to the installation of safety devices and valves, as well as to welding work on supporting components.

Such interventions or modifications by the user will also lead to the loss of guarantee claims.

Before starting

Familiarise yourself sufficiently with:

- the machine's operating and control elements
- the machine's fittings
- how the machine works
- the immediate environment of the machine
- the machine's safety installations
- measurements in case of an emergency

The following activities must be performed prior to starting the machine each time:

- Check to make sure that all safety devices are fitted and functioning.
- Check the machine for visible damage; any defects found must be corrected immediately or reported to the supervisor — the machine may only be operated if it is free of faults.
- Make sure that only authorised persons remain within the operating area of the machine and that no other persons are endangered when the machine is started up.
- All objects and other materials which are not required for operation of the machine must be removed from the machine's operating area.

Field of application and correct utilization

The VCP machine is designed to fill holes in printed circuit boards with conductive or non-conductive paste under vacuum, max. panel format 610x760 mm.

Any other operation is considered as not being in line with the rules. The manufacturer cannot be held responsible for neither physical injuries nor plant or other asset damages resulting from inexpert operation.

The plant must be operated and fitted by **skilled** and **authorized** staff only.
The staff must be **trained** and **versed** with the operation instructions.
Any modifications or amendments to this plant are to be made in consultation with the manufacturer only.

Unauthorized actions will exclude any guarantee and affect the manufacturer to be immediately released from the guarantee contract

Service, conversion works and manipulations on the plant construction must be made by skilled, trained and qualified staff only with observing the relevant public rules and provisions.

Irrespective of the following instructions, the local safety rules
for the operation of the plant to apply in any case.
Please observe the local rules and laws (e.g. workplace regulations,
VDE, safety regulations etc.) as well as the principles and guideline for the safety of machines of the EN 50009 part 1.

Danger!

Operational safety of the machine is only guaranteed if it is used as intended!

The machine is only to be used for its intended purpose and when in perfect condition from a safety engineering point of view.

Requirements of personnel

Warning
Danger of injury caused by inadequate skills of the operating personnel
Improper handling of the machine can lead to significant personal injury and damage to property. Therefore: Only have any work carried out by qualified personnel.

The instruction manual is aimed at trained operating personnel and at specially trained maintenance and service personnel.
Prior to start-up and before maintenance and service work, it is extremely important to read the instruction manual!

Operating personnel are considered to be any persons instructed to operate the machine by the operator of the product. Regarding operating personnel, a difference needs to be made between the following qualifications.

Trained person

has been trained in training sessions provided by the operator about the tasks assigned to him and possible dangers in the event of improper behaviour.

Expert personnel

because of their professional training, know-how and experience as well as knowledge of the relevant regulations, are in a position to carry out the work entrusted to him and to independently recognise and avoid potential dangers.

This in particular includes maintenance and service personnel.

Qualified electrician

because of his professional training, know-how and experience as well as knowledge of the relevant rules and regulations, is in a position
to carry out the work on electrical systems and to independently recognise and avoid potential dangers.

The qualified electrician is trained for the specific site of operation he is working in and is familiar with the relevant standards and regulations.

Electrotechnically trained person

An electrotechnically trained person is considered to be a person trained by a qualified electrician to carry out certain work who has been instructed on the assigned work and the dangers and has been informed about the necessary safety devices and protective measures.

Training

The personnel must receive regular training from the operator. This should be recorded as evidence of the training.

Training records				
Date	**Name Trainee**	**Type of Training**	**Trained by**	**Signature Trainee**

Figure: Example of a training record

Unauthorised person

Warning

Danger for unauthorised persons!

Unauthorised persons who do not meet the above described criteria, are not aware of the dangers of the machine and of the work area.

Therefore:

- Keep unauthorised persons away from the machine
- Speak to unauthorised persons and instruct them to move away from the work area
- In an emergency, discontinue work, if necessary switch off machine until unauthorised persons have been removed from the work area.

Operator responsibility

The machine is used in the commercial sector. Therefore the operator of the machine is subject to the legal obligations pertaining to safety at work.
The operator (contractor / company) is considered to be who operates the product and applies it as intended or has it operated by suitable and trained persons.

Apart from the occupational health and safety information in this manual, the safety, accident prevention and environmental protection regulations valid for the scope of application of the machine must be adhered to. The following apply in particular:

- The operator must inform himself about the applicable occupational health and safety regulations and must carry out a risk assessment including risks resulting from the special working conditions at the place the machine is being used. This then has to be converted into an instruction manual for operating the machine.
- During the entire operating time of the machine, the operator must check whether the instruction manual prepared by him still meets current rules and regulations and must adapt it where necessary.
- The operator must clearly regulate and define the responsibilities for installation, operation, maintenance and cleaning.
- The operator must ensure that all employees who work with the machine have read the instruction manual and have understood it.
  Apart from that, he must provide personnel with regular training and inform them about the dangers.

Furthermore, the operator is responsible for always keeping the machine in perfect condition. Therefore, the following applies:

- The operator must ensure that the service intervals described in this instruction manual are kept to.
- The operator must have all safety devices regularly checked to make sure that they work and that they are complete.
- The operator must provide the personnel with the necessary protective equipment.
- The operator must nominate a machine supervisor who is responsible for safe operation and the coordination of all work.

Instructions, particularly safety instructions provided in the instruction manual, provide the user with information which ensures that the product works safely and functionally.

	**Warning**
	Risk of injury by not paying attention to the safety information
	If such information is disregarded, this can lead to malfunctions or disruptions! In the worst case, this can have a detrimental effect on the health of the user

1. Personal protective equipment

While working, it is necessary to wear personal protective equipment to minimise any health risks.

- Always wear the protective equipment necessary for the respective work.
- Comply with any notices on personal protective equipment displayed in the work area.

	**Protective clothing** is close-fitting work clothing with low tear resistance, close-fitting sleeves and no protruding parts. It serves mainly to protect against getting caught on moving parts. Do not wear any rings, chains or other jewellery.

	**Protective gloves** to protect hands from friction, abrasion, pricking or deep wounds or from touching hot or cold surfaces.

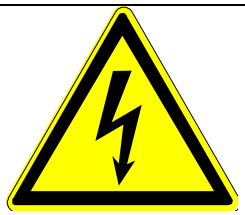
	**Safety shoes** to protect from heavy, falling parts and against slipping on slippery ground.

Particular dangers

In the following section, residual risks are listed which have been ascertained on the basis of a risk assessment.

Attention must be paid to the safety information given here and the warning signs in the following chapters of this manual to reduce health risks and to avoid dangerous situations.

Electric current



Danger

Acute danger from electrical voltage

There is acute danger caused by touching live parts.

Damage to the insulation or to individual components can be life-threatening.

Therefore:

- If the insulation is damaged, immediately switch off the power supply and effect a repair.
- Work on the electrical systems may only be carried out by qualified electricians.
- For all work on the electrical system, switch off the current and check that it is off.
- Before carrying out any maintenance, cleaning and repair work, switch off the power supply and secure it against being switched on again.
- Do not bridge any fuses or disable them. When replacing fuses, keep to the correct ampere number.
- Keep moisture away from parts carrying a current. This could lead to a short-circuit.

Danger!

Danger of being crushed / pinched / dragged in by moving parts

Therefore:

- If the drive power is being applied, never reach into the feed inlet or discharge outlet or into an unlocked maintenance opening.

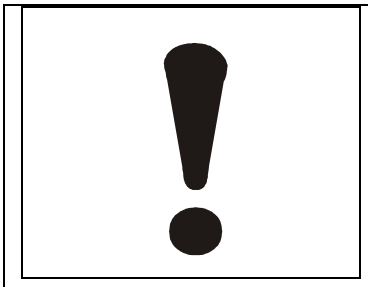
Secure against being switched on again:

1. Switch off power supply.
2. If possible, secure the switch with a lock and attach a sign like the one shown in the following picture to be clearly visible on the switch.
3. The key should be stored by the employee named on the sign.
4. If it is not possible to secure the switch with a lock, set up a sign like the one in the second picture.
5. Once all the work has been carried out, **make sure that no people are in the danger zone any more.**
6. Make sure that all safety devices have been installed and are fully functional.
7. Now you can remove the sign.

	**Danger!** **Do not switch on!** Switch secured with lock on the: ..... at ..... o'clock. The lock may only be removed by: . once measures have been taken to ensure nobody is in the danger zone any more.

	**Danger!** **Do not switch on!** Switched off on the: ..... at ..... o'clock. May only be switched on by by: ..... once measures have been taken to ensure nobody is in the danger zone any more.

Environmental protection

	**Caution!**
	Environmental hazard!
	If environmentally hazardous materials are handled incorrectly, in particular if disposed of incorrectly, significant damage to the environment can be the result. Therefore: • If material that is hazardous to the environment accidentally gets into the environment, then take suitable measures immediately. If in doubt, inform the responsible local authority about the damage.

The following materials that are hazardous to the environment are used:

- Lubricant
- Grease
- Paste
- Oil (vacuum pump and air service unit)

EMERGENCY-STOP

In the event of danger press the EMERGENCY-STOP-Button immediately.

Do not dismount or manipulate the safety equipment.
In case the safety equipment requires to be dismounted for set-up, repair or maintenance works, it must be remounted prior to production start.

EMERGENCY-STOP
The plant is fitted with EMERGENCY-STOP buttons to be activated in the event of emergencies only.

Warning!


There is the risk of physical injury caused by electrical shock. The machine is not idle once the EMERGENCY-STOP button has been released.
Prior to control box works, make the complete plant idle by turning the main switch off. Even if the main disconnector is switched off, the main terminals are under voltage.

Transport and assembly

Transport

The Vacuum Plugging Machine only to be transported by fork lift truck or elevating truck.

The machine is only to be lifted on the bottom and transported to the desired installation place. The weight data are indicated in the shipment papers.

The machine is to be unloaded by experienced and skilled staff only being familiar with the handling of hoists and auxiliary tools.

After the transport the machine is to be checked for damages and proper condition.

In the event of damages, both the responsible forwarder and the machine manufacturer, MASS GmbH are to be advised immediately.

The four feet of the machine are to be set such as to make the machine level.
Connect the compressed air and electrical connections.

Assembly / alignment

The adjustable feet of the machine are to be aligned such that the machine is level.
Then, the counternuts are to be tightened.

Installation instructions
Check oil level of vacuum pump.
Check rotating direction of Pump and Motors

Attention!
The machine must be installed and put in operation by qualified and skilled staff only!
Connect the compressed air and electrical connection
The electric connection is made via a 3x480V socket.

Check the operating voltage for being identical to the mains voltage.
Prior to starting up, all the supply terminals in the control box are to be checked and tightened, if required.

Note!
The machine must be installed and put into operation by qualified staff only.

Technical Data

Machine designation	:	Vacuum Plugging Machine
Machine type	:	VCP 5000-1
Serial No.	:	**#1894**
Panel size (wxh)	:	max. 610 x 760 mm (24x30”)
Dimension (wxdxh)	:	250 0mm x 630 mm x 2100 mm
free space around the machine	:	800 mm (1000 mm back side)
Panel thickness	:	0,25 – 7,5 mm
Compressed air pressure	:	about 90 psi (6 bar)
Operating voltage	:	3x480V / /PE
Frequency	:	60 Hz
Total load	:	5 kW
Max. speed traverse VCP	:	170 mm/sec.
Max. speed traverse ES	:	100 mm/sec.
Room temp	:	22 +- 2°C / 72 F +- 3,6 F /
Room humidity	:	50 +- 10 %
Weight	:	950 kg
Exhaust air	:	600 m^3/h

More details see technical drawings.

Version of manual

Version : 1.0
Date : 07.07.2016

Application
This machine is designed to fill holes in printed circuit boards with conductive or non-conductive paste. The hole filling can be applied in via and in blind holes. The filling from blind holes is possible in a double side mode in one step. The machine is equipped with doors for visual quality control on both panel sides.
The front door is automatically opened/closed. The rear door allows to be slewed open for inspection purposes.

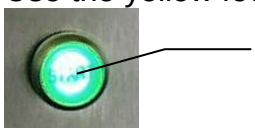
INFO!
We recommend the installation of an exhaust-system for the VCP machine.
See drawing no.: 047025,0

3.0 General functional description

Contents

Function:

PCB to be hanged up by hand in the notches and the automatic mode started by pressing the green button on the machine (with *Automatic Mode* started on PC).
Use the yellow foot switch to lock pcb.



Press START in automatic mode

The door is closed and locked.
The vacuum chamber is evacuated (if vacuum is active in recipe).
Both the squeegees are opened and the traverse moves quickly upwards to the upper set position (adjustable by software "*Plugging start 1*").
Now wait until vacuum set point is reached.
Paste pressure is cut in with set values for paste pressure.
The *delay time squeegee open* runs off, with opened squeegees.
Both the squeegees are pneumatically moved to the pcb ►|◄ with fixed pressure 0,8 bar. The *delay time for fill* runs off to fill the squeegee completely with paste and press out potential air bubbles.
Once expired the time *delay time for fill* it is switched over to the squeegee pressure as set in the recipe.

Then the traverse moves down at the speed set and the pcb is plugged with the set recipe values.

Function: Second speed (option)

From position *Plugging Start 2* it is changed over to the recipe values for the central second section.
This second section is left with *Plugging Stop 2* and the recipe values of the first upper section apply again.
The paste pressure is switched off at the bottom position *Plugging end 1*
The *delay time opening* runs off and the squeegees are opened.

The traverse moves to position "Length of pcb" + minimal offset.

Should multiple plugging (plugging quantity) be stored, the pcb is once more run off with the same recipe values at continuous vacuum.

The vacuum chamber is aired. The door opens.

Use the yellow foot switch to unlock pcb.
If there are still some hole voids, the operator can replug the same printed circuit board. That's the great advantage when "*plugging under vacuum*".

The paste is kept in refillable cartridges.
Subject to the printed circuit format, different squeegee sizes are available.

Now bring the pcb to the External Scavenger ES, lock the pcb with the yellow foot switch and press start button on External Scavenger ES.
See also chapter 9 External Scavenger ES

3.1 Equipment start up

1. Main switch to be switched on
2. Press white „ON“ button, control voltage switches on
3. Start PC, log in
4. Load a stored recipe
5. Go to *Automatic mode*
6. PCB to be hanged up and clamped via foot switch
7. Start process by pressing the green START-Button
8. Once finished plugging pcb to hold on and foot switch to actuate again (to release clamping).

Start the process
Press again to pause (the traverse stops)

3.2 Preparations:

Change cartridge

quick changing adapter

block with sealing face

The VCP is equipped with a quick changing adapter.

TS adapter

Loose knurled screw and push the TS adapter to the left side.
Now the TS adapter is free and you can easily change the cartridge inside.
Pull TS adapter out of the holder.

To fasten the knurled screw after changing only use 2 fingers.
Do not give too much power.

Paste filling

Paste to be filled into the cartridges and cartridge placed into the holder.

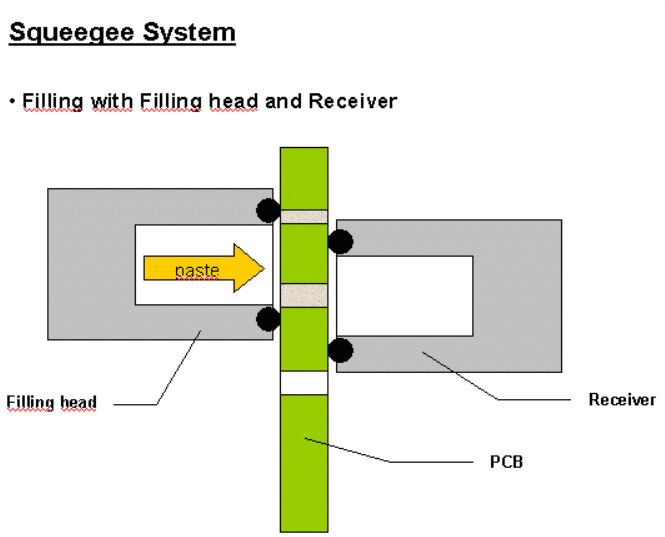
Provided air hoses to be connected.
The compressed air acts on a piston, which presses the paste into the hose of the filling squeegee.

This makes the paste not to have a direct contact with the compressed air.
Select „Paste Pressure ON„ in Maintenance mode and press the paste into the squeegee.

Wait until the squeegee* is completely filled.

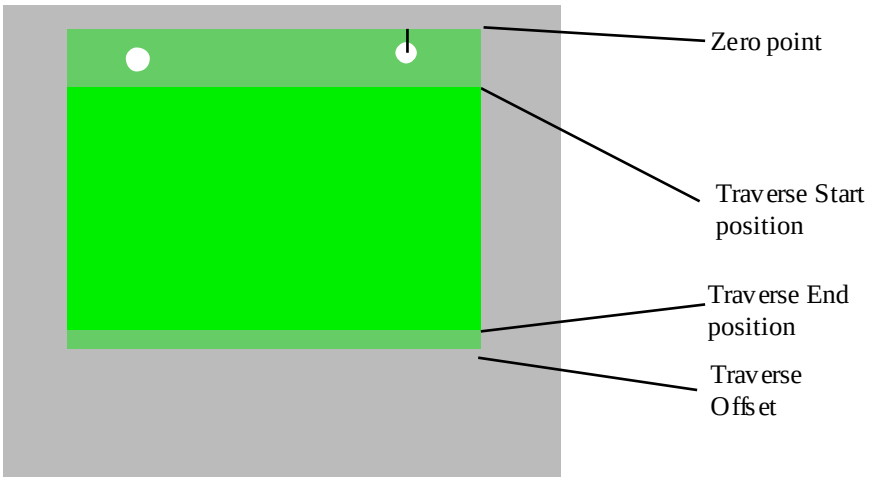
* Different sizes of squeegees are available depending on your panel size.

3.2.1 Squeegee system

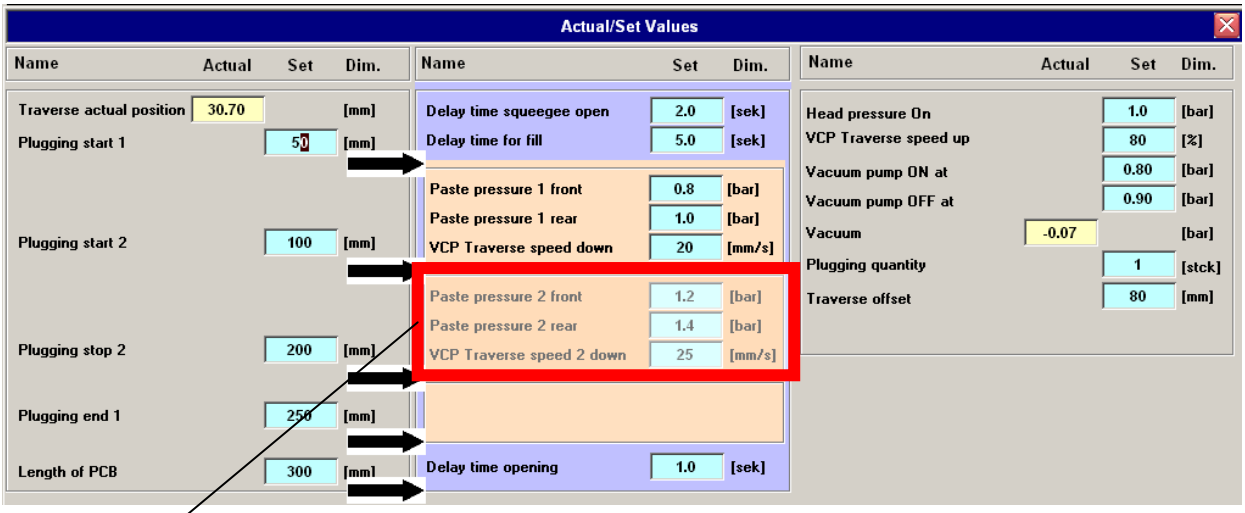


3.3 Setting of the start and stop point of the plugging

Drawing: Plugging area values



Key in the desired values (confirm with return-key)

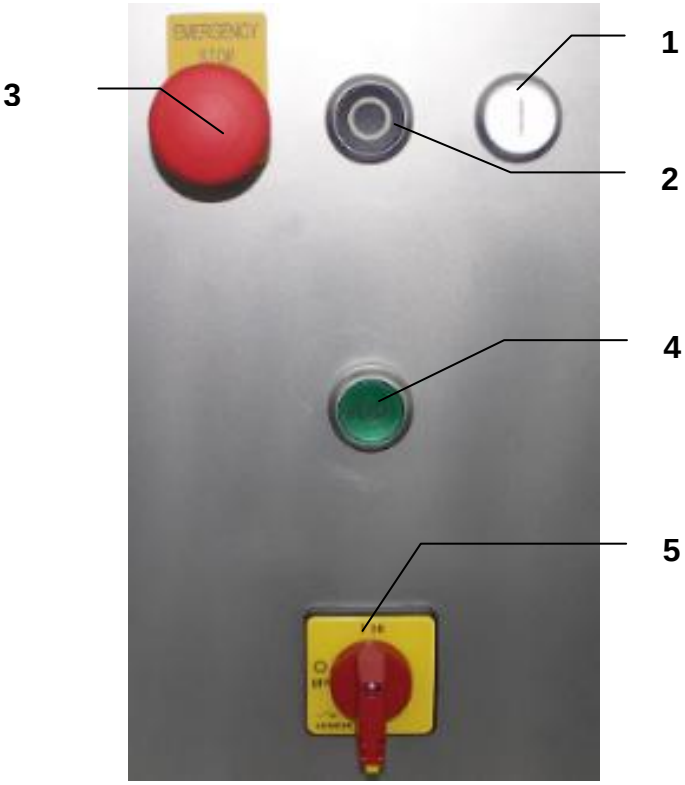


In the middle plugging area you can use different values for pressure and speed.

Start and stop point of the plugging area can be set by software *Plugging start/end Position*.

More details see description of PC-Software Visiwin

3.4 Operating panel

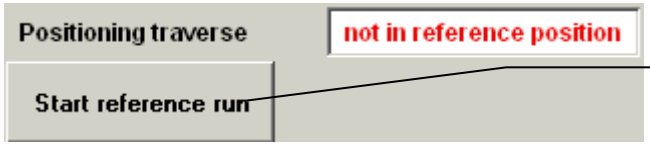


1. **Button : Control voltage ON**
2. **Button : Control voltage OFF**
3. **Button : EMERGENCY-STOP**
4. **Button : Start automatic process**
5. **Main switch ON/OFF**

3.5 START automatic mode

Automatic mode:

The plugging machine passes a fully automatic coating process.
Press Green Start Button in Automatic Mode.
Automatic status must be "Automatic enabled"



Drive to home position (works only in Automatic mode)

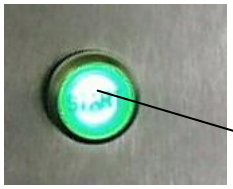
Manual mode: (for qualified service personnel only with level 3).
Drives and movements allow to be selected manually.

Warning:
The Manual mode allows to move all drives and motors without a specific monitoring. For that reason, the most extreme caution is to be paid to the drives and motors when being switched on in <F2 Manual mode>.

Maintenance mode:
Drives and movements allow to be selected manually
The traverse allows to be moved **only within preset limits**

Example:

- The traverse must be in home position (reference position).
- Door is open.
- Automatic mode is now enabled.



Start with plugging process

3.6 Safety Light Curtain on door

Safety light curtain consists of an emitter and a receiver. More details see Operating manual from Keyence on MASS CD-Rom folder Accessories/Keyence.

If somebody puts his hands into the light curtain, the traverse stops. Press the green START-key again and the traverse moves further to the final position.

Error. „Limit switch actuated“

If a faulty function causes the traverse to move on and to actuate the limit switch, the drive is immediately switched off

Drive the Traverse up in manual mode.

Info!
Do not change Position of limit switch and U-shaped light barrier.

3.7 Tower light (Option)

Green light : Everything is OK
Green light blinking : Container filling is active (only with large container)
Yellow light : Plugging is active
Red light : There is an error

Tower light is only for Errors on VCP module.
Errors of ES are not displayed. (only on PC-Monitor)

Pneumatics

There is both an oil-free and oiled pressure circuit.
Oil-free compressed air is only used for the cylinders within the vacuum chamber while the compressed air outside the vacuum chamber is oiled.
The compressed air supply is initiated in the control cabinet via an air-servicing unit. The air-servicing unit consists of pressure regulator, oiler and water separator.

Air servicing unit
The air-servicing unit is located easily accessible next to the operating field behind the cladding of the centering unit. A pressure of appr. 6 bar has been set on the pressure regulator.

The compliance with the individually indicated limit values for pressures and temperatures, and the observation of instructions is a prerequisite for the proper function and must be guaranteed by the user.

Ensure that operation takes place with properly prepared compressed air without aggressive media. Furthermore, the individual environmental conditions at the installation site must be taken into consideration.

When used in a safety area, the respective regulations of the Employers Liability Insurance and the Technical Control Association or the appropriate national ordinances must be observed.

Water separator

The following points must be observed for the perfect function of the unit!

- *Drain condensate on time*
  The condensate is drained under pressure by opening the drain plug on the filter shell.

- The filter cartridge must be cleaned or changed when it is heavily clogged (to avoid drop in power)

Cleaning the filter cartridge:
After removing the filter shell, turn the support spring to the left and remove the sintered filter. The filter cartridge may be washed using Tri, Petroleum or Gasoline (must not come in contact with the filter shell). Subsequently, blow dry from inside to outside.

Cleaning the filter shell:
Switch off air pressure, turn shell 45° (bayonet catch) and remove by pulling down. Only use water for cleaning.

Pressure control valve

Set the operating pressure from the top on the pressure setting knob.
In arrow direction + pressure increase
In arrow direction - pressure reduction
The pressure setting knob is locked by tightening the locking screw.

Pneumatics

Oiler
When the oil is at the minimum level, it must be topped up with oil. This is possible during operation!
Actuate the vent valve to vent the oil shell.
During the venting process, turn the shell 45° (bayonet catch) and remove by pulling down. Clean oil shell and refill with oil. Only use water for cleaning.
Press the vent valve when reassembling the shell.
Setting the number of drips:
Control the number of drips on the setscrew above the oiler.
In praxis, 1 to 12 drips to 1000 l air, is sufficient.

Suitable oil types	**Viscosity**
Festo Spezialöl Avia Avilub RSL 10 BP Energol HLP 10 Esso Spinesso 10 Shell Telus oil C10 Mobil DTE 21 Blaser Blasol 154	9 to 11 mm>>/s at 40°C

Trouble shooting

- *No pressure display*

Main valve closed	Open main valve
Pressure not set	Set pressure by means of pressure setscrew
Defective pressure gauge	Replace pressure gauge

- *Low flow-through (the operating pressure breaks down with air* consumption)

Filter cartridge is clogged,	Clean filter cartridge
Narrowing between main valve and air servicing unit	Check line

- *Pressure exceeds the preset operating pressure*

Valve cone defective at seal seating	Replace valve cone

- *Audible blow off at the setting knob*

O-ring defective in hole at the top section of the valve cone	Remove valve cone and replace O-ring
Defective piston seal	Replace seal

- *Audible blow off on the drain plug*

Leaking drain plug	Tighten or replace

- *No oil flow*

Oil set screw closed	Open oil set screw
Oil level too low	Top up with oil

Pneumatics

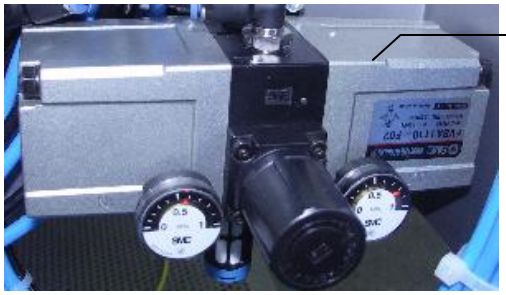
Air service unit

Pressure switch, air pressure OK

Adjust system pressure

Manometer system pressure

Air supply connector (6 bar)



Booster to increase air pressure to 10 bar (optional)

General maintenance instructions
Mechanics, Electrics

Mechanics

Mechanical work must be made by skilled and qualified staff only.
The instructions given in these guidelines and in the annex are to be observed.
To avoid troubles and machine breakdowns, regular checks and preventative maintenance must to be carried out.
When working on or in the area of movable parts (cylinder, belt drive) the machine is to be cut off.
Turn the main switch on the control box to „0“ and lock it by padlock against unauthorized reswitching on.

To be checked in particular:

- Fastening screws, drive motors
- Belt tensions
- Function of the sensors
- Filter compressed air supply to be checked for condensate, replace filter if required

Defective components must be immediately replaced. Only original parts are to be used !

Protective equipment removed for repair purposes must be remounted prior to turning machine back on.

Electrics

Electrical work must be made by skilled and qualified staff only.
Since special electric elements require the manufacturer to prepare special instructions, they cannot be listed here in detail.

The instructions of the foreign manufacturers form part of this technical documentation.

In the event of trouble or maintenance work, please use these instructions for fault correction.

Do not dismount or manipulate the safety equipment.
In the event the safety equipment requires to be dismounted for set-up, repair or maintenance work, it must be remounted prior to production start.

Cleaning of the machine

Once finished the work, paste and dirt should be removed for preventing from baking.

Spare part orders

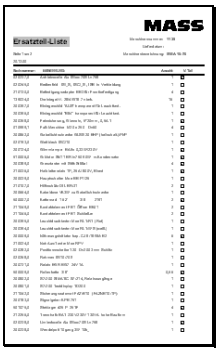
The following data must be included on spare part orders:

1. Machine type and Serial-Number (see typeplate)
2. Required spare part with **name, item number and quantity**

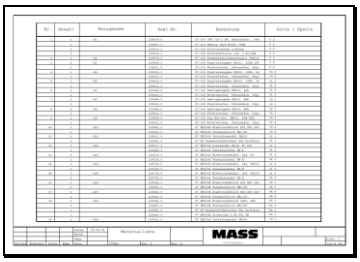
The relevant data to be learnt from the technical documentation

Spare part identification

Spare part list



Material list



Example of illustration

1. Spare part identification

   Digital photos: Important parts to be seen here with order number

2. Spare part list (all parts)

   All parts with order number to be seen here.

   Wearing parts which we cannot guarantee for are accordingly marked in the list.

piece:	Wear-part
1	☑
2	☑

Wearing parts

3. Material list (only electric components)

   The material list to be found in the chapter: “wiring diagram“

   All electric components can be seen there.

   The wiring diagram is divided in:

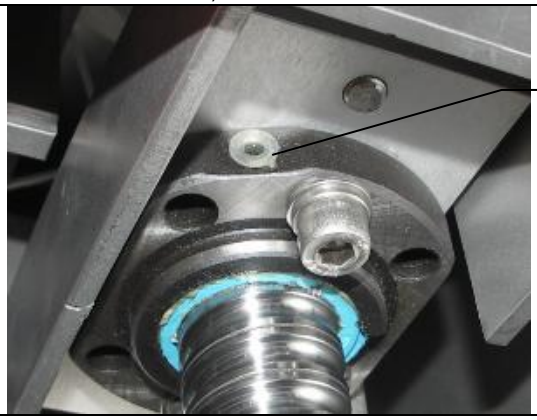
   1. Wiring diagram
   2. Terminal diagram
   3. Material list*

*The identification listed under reference (e.g. -S47) corresponds to the resource identification (sticker beside the component).

MASS

Preventative Maintenance List

Maintenance Issues	Frequency			
	Daily	Weekly	Monthly	6 Month
Electric				
Check all lamps		X		
Check emergency stop	X			
Check safety switches for function			X	
Check grounding				X
Tighten screws - terminal strip (The first time after 20 service hours)				X
Check tower light for function (if build in)		X		
Check safety equipment (light curtains) for function	X			
Check all sensors for function		X		
Visual inspection	X			
Motors/Drive unit				
Grease thread spindle´s on ES Use vacuum-suitable special grease Part- No. 490024,0		X(1)		
Check Timing belts tension and gear wheels		X		
Check motors and gears (visual inspection)			X	
Vacuum pump www.becker-international.com				
Check Vacuum pump (visual inspection)	X			
Check oil level daily (inspection glass) while the pump is switched off	X			
Change oil and oil filter (The first time after 500 service hours) next time 2000 then 4000 hours At least twice a year More details see manual from "*Becker*" on MASS CD-Rom				**500h, 2000h 4000h**
Vacuum pump; change oil separating element and filter cartridge once a year				**1x/year**
Pneumatics				
Check air cylinders, valves and tubes for function	X			
Check oil level (service unit)	X			
Drain condensate		X		
Change the filter cartridge in service unit				X(1)
Replace tubes for paste (tubes are affected by the paste)				X
Check air pressure 88 psi (6 bar)	X			
Generally				
Visual inspection	X			
Tighten all screws (The first time after 20 service hours)				X
Machine and guides to be cleaned from excess and paste.		X		
Clean acrylic panes (front and rear door) only with a mixture of soap and water			X	
Check brake of G-Motor ES Check adjustable braking torque, ventilation gap see manual of Ruhrgetriebe RGM				X
The acrylic panes (door) should daily be checked for crackings.	X			
Defective parts immediately to be replaced!!				

Maintenance Issues	Frequency			
	Daily	Weekly	Monthly	6 Month
General visual inspection	X			
Check function of ES light curtain	X			
Oil change interval on bevel helical gearbox from Vogel, www.vogel-online.de First time after approx 200 operating hours Further oil changes are necessary after every 3000 operating hours. See manual on MASS CD-Rom folder Accessories				
Check oil level		X		
Spindle in vacuum chamber				
Use an injection with 3-5 ccm vacuum-suitable special grease and grease the mother inside Part- No. 490024,0		X(1)		
				
Re-insert plug				
Clean VIP valve from Omal (if present) every month eg in the MASS cleaning unit RE 1000			X	
Large ContainerSystem LCS (optional)				
Gearbox on LCS from Alltec/ Columbus Mckinnon Grease the spindle in regular intervals! **see manual from Alltec/Columbus Mckinnon gear** every 5 years or after 1000 operating hours / disassemble the gear, clean from old grease and re-fill with new grease.		X(1) **5 years**		
LCS: Sensor: Clean sensor and all parts on LCS **completely** from paste every 1-2 weeks. The paste will be hardening and the parts can damage.		X		
Touch panel from Janz Clean touch panel surface in regular intervals Do not use aggressive solvents or scouring powder. The touch panel is equipped with a protective foil. The self-adhesive protective foil prevents the screen from being scratched and soiled. Replace protective foil if damaged. More details of touch panel see Janz on MASS CD-Rom.		X		

CAUTION !
Make sure that no water gets into the operating-area while cleaning. Risk of destroying electronics !
- Check the mechanical parts for wear and replace, if required.

(1)
Subject to operating conditions and degree of dirt, replacement possibly to be done more often than indicated in the maintenance intervals.

Maintenance work

Clean fill heads		
	The supplied protective cap must be mounted before cleaning the fill head with BDG 	

Topic: order and cleanliness

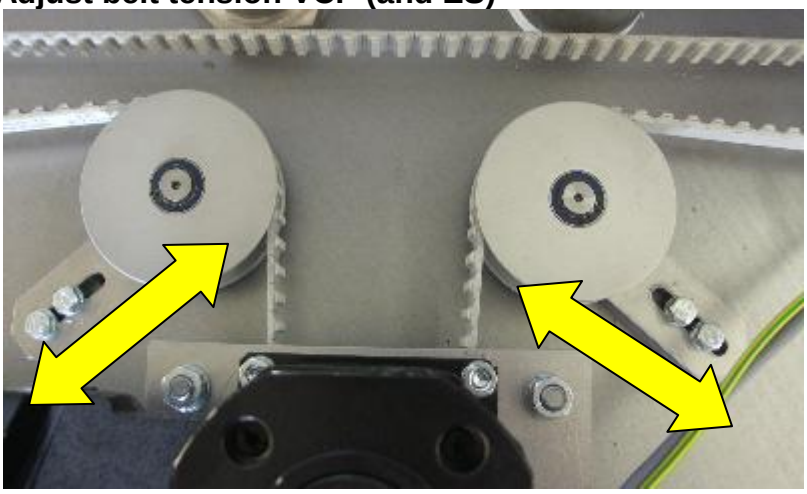
In general, it is important to keep the machine and parts thoroughly clean.
Contaminants such as paste residues lead to increased wear and even possibly also to machine standstill.

MASS but cannot make any general guidelines and established cleaning intervals.
The properties of the various pastes and the different processing by the customer require flexible cleaning intervals.

Damaged parts should be replaced immediately with original parts.
MASS therefore offers maintenance contracts (preventive maintenance).
Damage can be detected early and replaced.

Maintenance work

Adjust belt tension VCP (and ES)



Loosen the screw.
Set tension of the toothed belt and retighten screw.

Warning !
There is the risk of squashing hands and arms. Take a great deal of care when working in the machine.

O-ring / Faceplate´s

Mount a new o-ring with the adhesive joint point downwards.
Push the o-ring carefully in the groove. Check o-ring for damage.

LCS: pressure sensor (option)

Clean sensor every
1-2 weeks

Very important information for VCP Equipment

Due to the high vacuum in the vacuum chamber, the pane of the VCP is exposed to high loads. For this reason, it is made of high-quality synthetic material. The bores are drilled in a special procedure. However, in progress of time a material fatigue and embrittlement may occur. For this reason, the pane is to be checked for damages in regular intervals.

Bore with environmental stress crackings

The panes should daily be checked for crackings .
If the crackings are bigger than 2 mm, the affected point must exactly be observed. If the crack is getting bigger, the pane must **immediately** be replaced

Warning, danger to life!!
In the event of an implosion, splinters flying around might cause serious injuries.

Such materials only to be used, which are approved by the manufacturer. Do not use other than original MASS spare parts. Defective components and parts are immediately to be replaced.
Please never change the MASS transparent plates on the MASS Vacuum equipment (VCP and VHF) to on other material (like “Plexiglas”) then the MASS original material, spare part.
Instructions for pane cleaning
If the pane gets dirty, only ethyl alcohol is to be used for cleaning.
Dilution or cleaning petrol may not be used for preventing the synthetic material from embrittling. When using a wrong cleaning agent, the pane will be damaged and requires to be replaced.

In the event of the pane having been damaged by an impact, it must be replaced, too.

MASS recommends to change the pane after about 2-3 years.

Instructions for pane replacement
Prior to installing the new pane, the seal is to be checked. A damaged seal must be replaced. The pane is to be mounted by using the original fastening material. For order of the assembly, see drawing 047037,1. The screws to be tightened according to the torque as given.

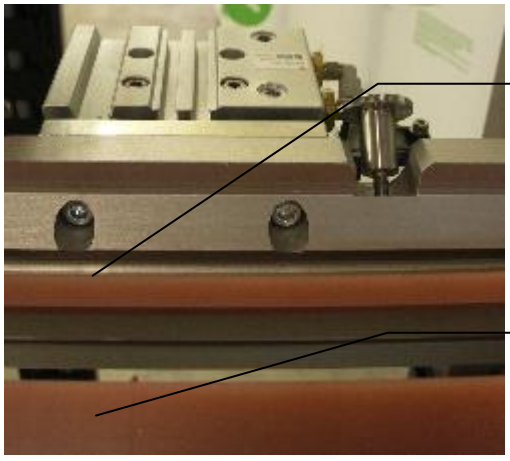
ES External Squeegee

Function:

The external squeegee ES External Squeegee is designed for cleaning the printed circuit boards from excess paste after finishing the plugging process.
The external squeegee is made up of a rack and a squeegee pair fitted with linear guides and designed for cleaning the suspended printed circuit boards. The squeegee rubbers have a hardness of 90 Shore and are contact-pressed by pneumatic cylinders. The contact pressure of the front squeegee rubber is adjusted by a pressure regulator (adjust in Software). The angle of the squeegee rubbers is adjustable by threaded rods on the pneumatic cylinders.

Operation sequence:

- PCB to be hanged up and clamped via foot switch
- Press the green start button.
- The squeegee pair is lift up with max speed
- Before end position is reached, speed switches to slow speed
- The squeegee pair is contact-pressed with the adjusted pressure.
- 2 sec. delay time runs off.
- Then, the traverse drives down.
- Remove the printed circuit board after releasing the clamping system via foot switch.



INFO
The rear wiper is energized first with system pressure

INFO
Front rear wiper is energized with adjustable pressure

Info!
Both wiper must be reground in regular intervals, for instance on a MASS Plane Raze Device SV 100/200.

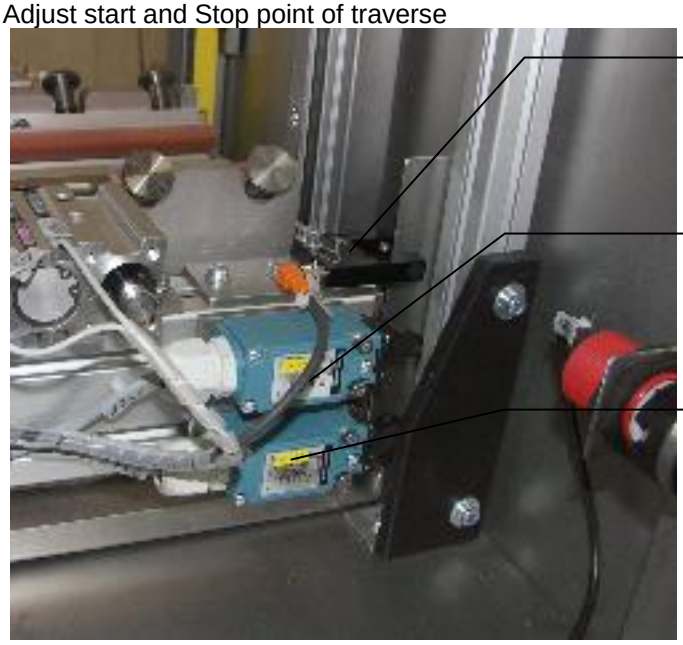
ES External Squeegee

Safety Light Curtain on ES module

Safety light curtain consists of an emitter and a receiver. More details see Operating manual from Keyence on MASS CD-Rom folder Accessories/Keyence.

If somebody puts his hands into the light curtain, the traverse stops. Press the green START-key again and the traverse moves further to the final position.

Adjust start and Stop point of traverse



Light fork sensor:
Drive with slow speed at top position

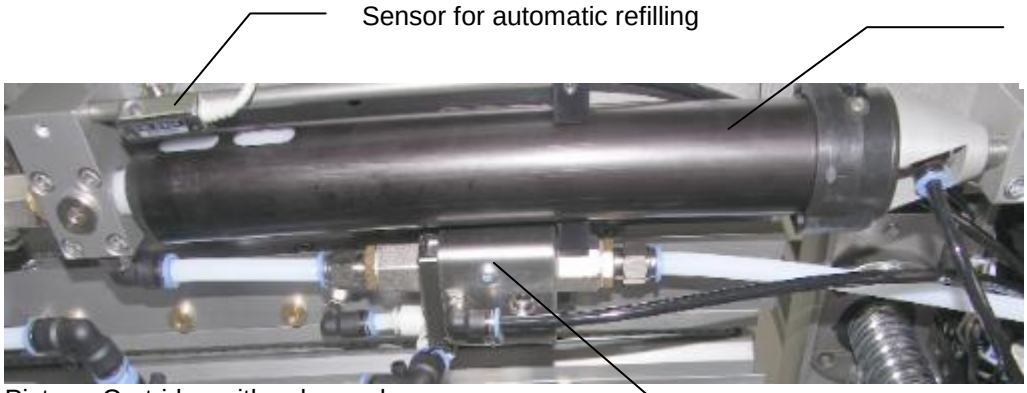
Limit switch Stop point at Top position

Limit switch: Stop point at Bottom position

Adjust Position of Stop point at top position

Large container System LCS (*optional*)

The large container system LCS is an option for the VCP Plugging Equipment.
Advantage of this system is that cartridges are refilled automatically.
The container of the LCS System is containing 8 times more than the cartridge, approx. 2.5 kg.
The LCS System with the paste is set-up outside of the VCP.
A VIP valve for dispending the paste is located under the traverse within the vacuum chamber of plugging machine VCP.



Picture: Cartridge with valve and sensor

Process description of the large container:

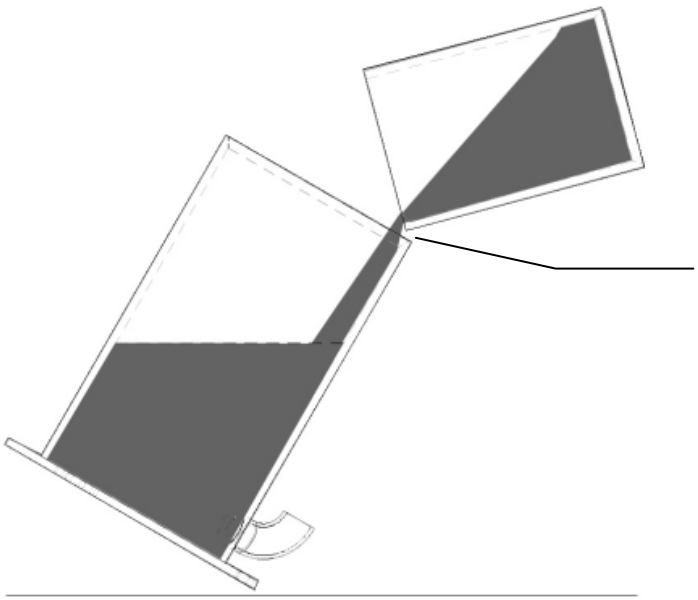
The piston is pressed into the paste container with a frequency controlled gear motor. At the bottom of the container, the paste is pressed through a tube into the cartridge. The 12 oz (330 ml) cartridge is filled continually by the signal of the sensor, when the actual filling process is completed.


Picture: large container system LCS
With Large Container System the cartridges are **refilled automatically.**
The filling time depends on the paste viscosity, typ. 15 to 45 seconds.
When cartridge is filled, the paste is pressed into the fill heads of the Plugging machine VCP.
Process description for filling the cartridges

Large container System LCS (*optional*)

The cartridges in the machine are automatically filled using the large container system LCS. The paste is pressed from the cartridge into the fill heads of the machine.
When the cartridge is almost empty (Refilling-sensor) a signal is sent to the PC, to start the refilling process when the active pluggingprocess has finished.

Picture: paste container



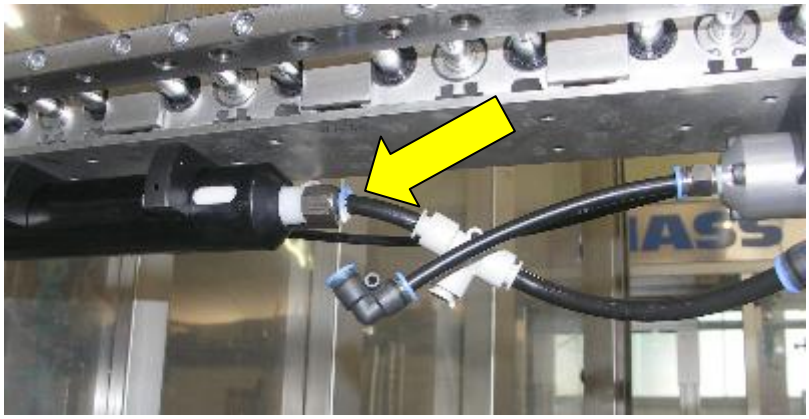
Picture: Fill large container

Start up LCS system

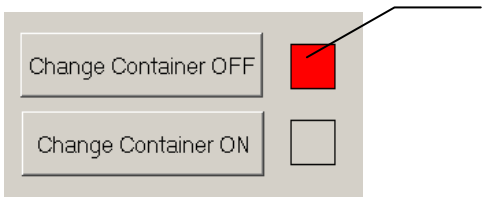
- Fill container with paste. (fill the paste slowly over the edge of the container to avoid air inclusions).
- Close door of LCS.
- Start Visiwin Software and go to <F3 maintenance> mode.
- Press the button *change container ON* **to work with buttons up/down** on LCS.
- Move down piston with valve on LCS opened.
- STOP as soon as paste comes out from the valve and close the valve.
- Now go on moving down; the paste is pressed through the hose towards the high-pressure valve.

First filling with paste

Hose on the marked point (see arrow) to loosen.
To fill until paste escapes out of the hose.
Hose to remount.
Now to continue filling until cartridge is full.
The remaining air to get escaped by removing the vent plug in piston (via tool supplied) and screw to retighten.



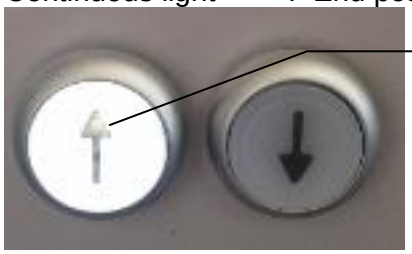
Software settings



Change large container system is **OFF** now
ON: work with buttons on large container system

Buttons on LCS system

Blinking : During movement of piston
Continuous light : End position of piston is reached



Button UP
Press 1x to drive up
Press again to release button

More details see operating manual PC-Software [Visiwin]

Valve to vent
Paste container

Info!
If paste container is empty, open the valve first to move up.

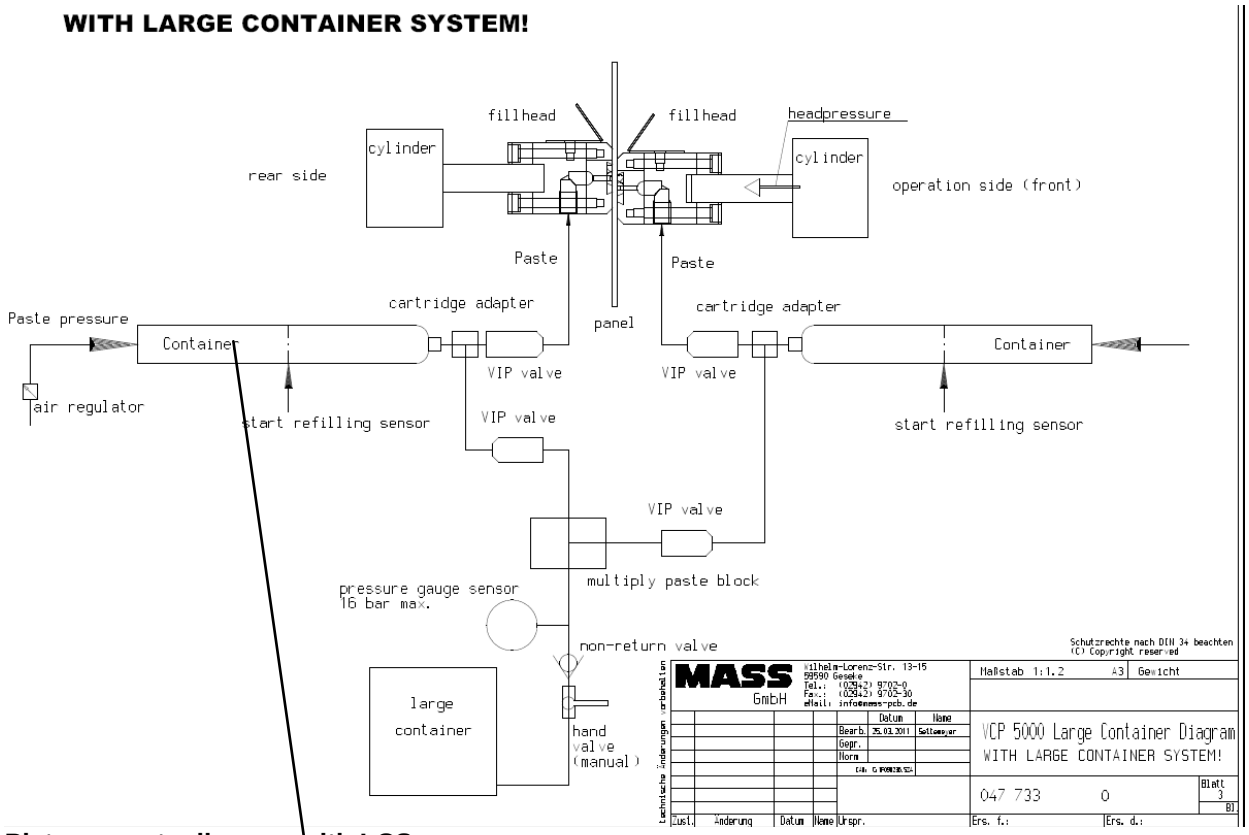
Switch for LCS system

in control cabinet

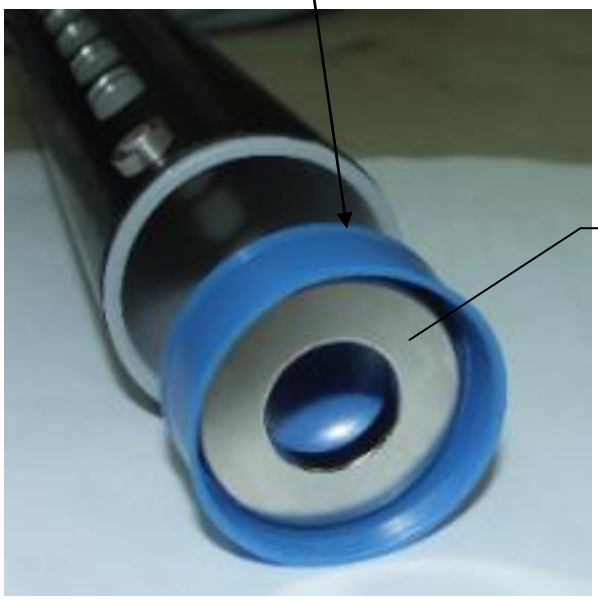
Switch:
1 – The detection of LCS is activ
0 – The detection of LCS is not activ

If no LCS system is connected, the switch is not relevant.

Container / cartridge for LCS



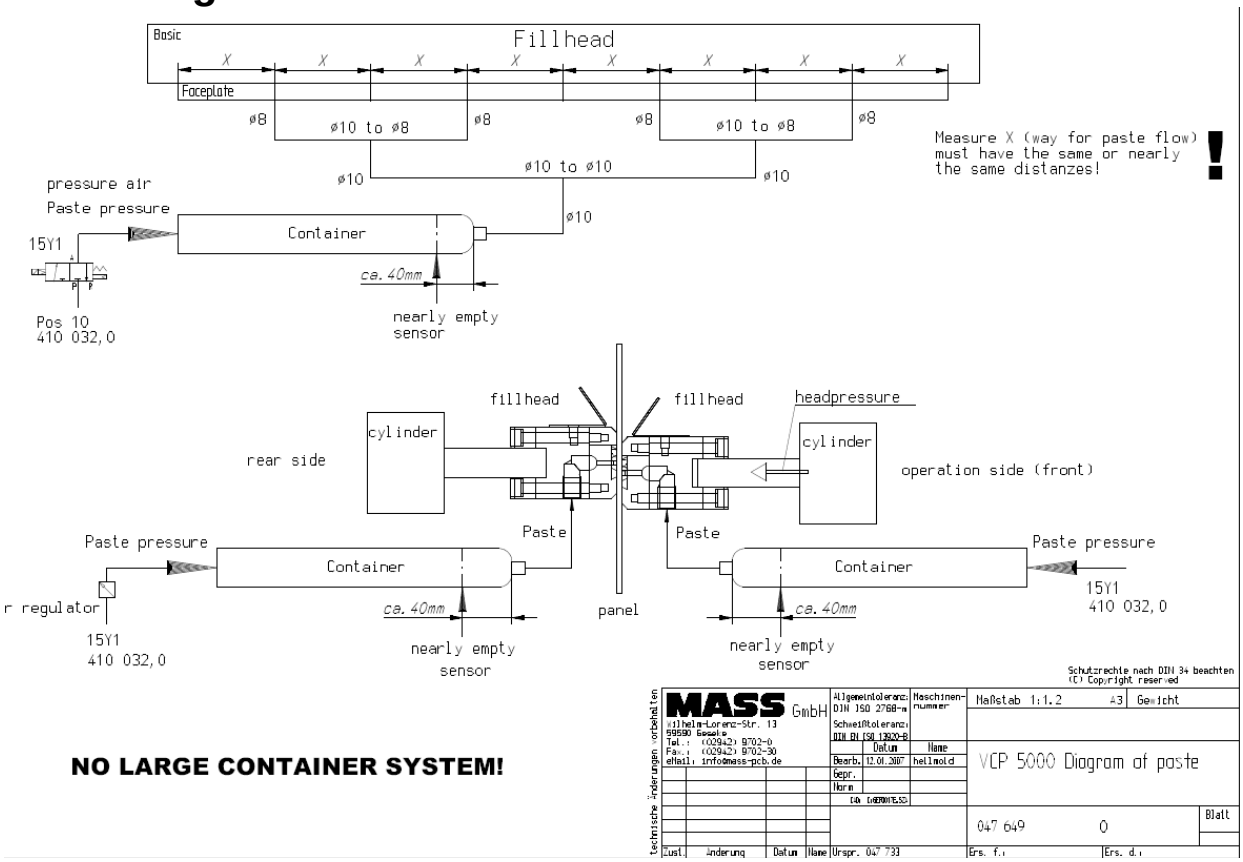
Picture: paste diagram with LCS



Magnetic ring for detection of piston position.
Put the magnet ring in every new cartridge

Picture cartridge with magnet ring in piston

Paste diagram

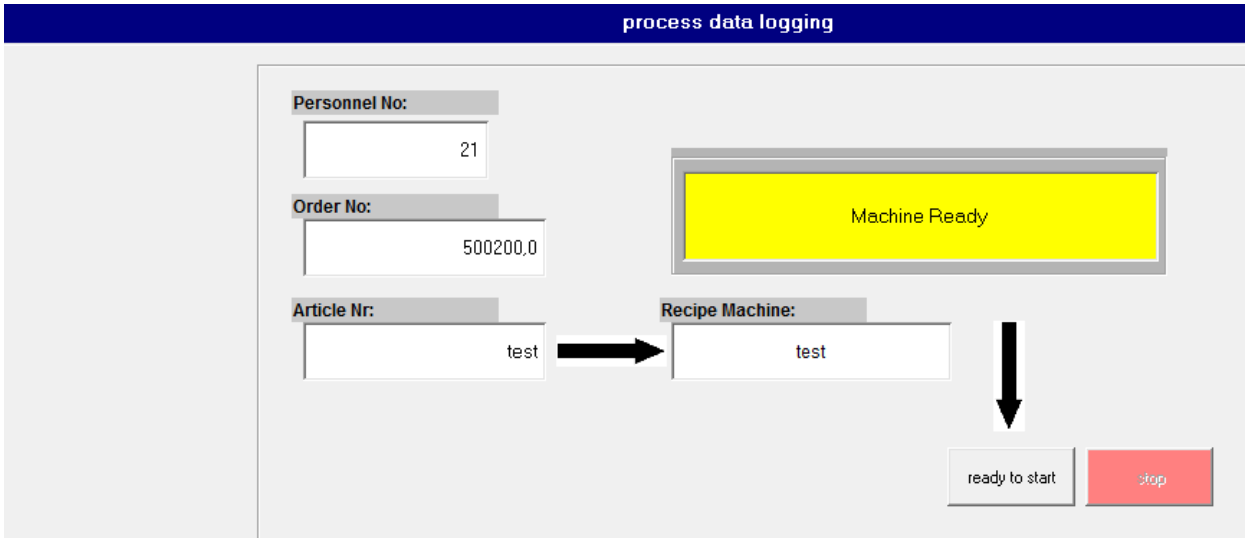


NO LARGE CONTAINER SYSTEM!

Drawing: paste diagram without LCS-system

Data recording system / Barcode/ Scanner function

The machine is equipped with a data recording system, to log process data for each job.



Preparation:
Login to the visualization.
For each job create a recipe with the job name and store the recipe.

Process data acquisition start:
Press <F1 Proc. data> button (In the ES module and VCP separately).
Enter, or scan personnel number manually and confirm with return key.
Scan (barcode scanner) or manually enter the order number.

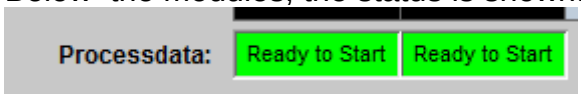
This recipe name appears in Recipe machine:
Enter,or scan article no. for the job manually. The article numbers must match the recipe box machine.

Data recording system / Barcode/ Scanner

If all of the inputs are done, the ready to start button is active.

Stop: stops the data collection process.

Below the modules, the status is shown: Ready to Start



Only when the state is "Ready to Start", so the field is green, the boards are gepluggt (the green Start button on the machine is active).

Process Data:
The process data are located in C: \ PC_Visu \ MASS \ VCP \charge\ for VCP and ES separately.
The file name is the recipe name.

```
VCP
Order No.: 2
Operator: 1
Start date: 25.04.2013
Start time: 16:35:13

Lot no./Process:test-microvia

TS        ;CY   ;PPF    ;        ;        ;PPR    ;        ;        ;HP     ;        ;S 1     ;S 2
          ;     ;Set 1  ;Set 2  ;act     ;Set 1  ;Set 2  ;act     ;Set    ;act     ;        ;
16:42:53  ; 1   ;0.2    ;0.2    ;0.2     ;0.8    ;0.8    ;0.9     ;0.7    ;0.8     ;5.3     ;7
16:46:49  ; 1   ;0.2    ;0.2    ;0.2     ;0.8    ;0.8    ;0.9     ;0.7    ;0.8     ;5.3     ;7
16:56:35  ; 1   ;0.2    ;0.2    ;0.2     ;0.8    ;0.8    ;0.8     ;0.7    ;0.8     ;5.3     ;8
17:00:33  ; 2   ;0.2    ;0.2    ;0.2     ;0.8    ;0.8    ;0.9     ;0.7    ;0.8     ;5.3     ;8
17:15:20  ; 1   ;1.7    ;1.7    ;1.8     ;1.1    ;1.1    ;1.1     ;0.7    ;0.8     ;4       ;7
17:18:51  ; 2   ;1.7    ;1.7    ;1.8     ;1.1    ;1.1    ;1.2     ;0.7    ;0.8     ;4       ;7
17:25:40  ; 3   ;1.7    ;1.7    ;1.8     ;1.1    ;1.1    ;1.2     ;0.7    ;0.8     ;4       ;7
17:32:33  ; 1   ;1.7    ;1.7    ;1.8     ;1.7    ;1.7    ;1.8     ;0.7    ;0.8     ;4       ;7
17:36:56  ; 2   ;1.7    ;1.7    ;1.8     ;1.7    ;1.7    ;1.8     ;0.7    ;0.8     ;4       ;7
17:53:25  ; 1   ;0.2    ;0.2    ;0.2     ;0.8    ;0.8    ;0.9     ;0.7    ;0.8     ;5.3     ;8
17:56:49  ; 1   ;0.2    ;0.2    ;0.2     ;0.8    ;0.8    ;0.9     ;0.7    ;0.8     ;5.3     ;8
18:01:16  ; 1   ;1.7    ;1.7    ;1.8     ;1.1    ;1.1    ;1.2     ;0.7    ;0.8     ;4       ;7
18:06:42  ; 2   ;1.7    ;1.7    ;1.8     ;1.1    ;1.1    ;1.2     ;0.7    ;0.8     ;4       ;7
18:10:16  ; 3   ;1.7    ;1.7    ;1.8     ;1.1    ;1.1    ;1.2     ;0.7    ;0.8     ;4       ;7
End dat: 25.04.2013
End time: 18:13:10
```

Example of a log, part 1

Data recording system / Barcode/ Scanner

;TmpF	;	;TmpR	;	;V	;		
;Set	;act	;Set	;act	;Set On	;Set Off	;act	;
;26	;25.5	;26	;25.6	;0.75	;0.8	;0.8	;
;26	;25.8	;26	;25.6	;0.75	;0.8	;0.8	;
;26	;25.6	;26	;25.6	;0.75	;0.8	;0.8	;
;26	;25.5	;26	;25.6	;0.75	;0.8	;0.8	;
;26	;25.4	;26	;25.6	;0.85	;0.9	;0.9	;
;26	;25.8	;26	;25.6	;0.85	;0.9	;0.89	;
;26	;25.7	;26	;25.6	;0.85	;0.9	;0.89	;
;26	;25.6	;26	;25.6	;0.85	;0.9	;0.9	;
;26	;25.6	;26	;25.7	;0.85	;0.9	;0.9	;
;26	;25.6	;26	;25.8	;0.75	;0.8	;0.8	;
;26	;25.7	;26	;25.9	;0.75	;0.8	;0.8	;
;26	;25.6	;26	;25.7	;0.85	;0.9	;0.9	;
;26	;25.6	;26	;25.8	;0.85	;0.9	;0.9	;
;26	;25.6	;26	;25.7	;0.85	;0.9	;0.9	;

Example of a log, part 2

Legend:
TS= Time stamp
CY= Multiplugging, how much cycles
PPF= Paste pressure front
PPR= Paste pressure rear
HP= Head pressure
S1= Speed traverse down 1
S2= Speed traverse down 2
TmpF=Temperature fill head front
TmpR=Temperature fill head rear
V= Vacuum actual vacuum and set value