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IPC MEMBER

DEVMASTER MK I 24"

INSTRUCTION AND MAINTENANCE MANUAL

Serial N. 0757465

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1 GENERAL

1.1. **Parts identification;** there are two different methods for identifying the same part:

1.2. Each part appearing in a drawing may be identified, by the drawing number (five digits) followed by the number as shown in the same drawing.
Example: 03941/7
This means: part shown as 7 on drawing 03941, i.e. transport wheel.
This is the method used in the instructions of this manual.

1.3. Each drawing is followed by a "legend" where each part is described and identified with a pos. number (7 in the above example) as well as a ref. number (46026 in the example).

1.4. This is the real number which identifies the part in question. The same part may appear in a different drawing or in a different manual (= machine) where it may be identified with a different pos. number (example drawing 04072 pos. 6) but the same ref. number (46026) will be given.

1.2. Specifications

- Maximum panel width: 660 mm
- Maximum panel thickness: 5mm
- Minimum panel thickness: 0.1 mm (innerlayers of multilayers)
- Conveyor speed: 0-3 m/min
- First development: length of chamber:1800 mm
  capacity of tank: 350 litres
- Second development: length of chamber 370 mm
  capacity of tank: 110 litres
- Workspace: see drawing 03929
- Overall dimensions: width: 1500 mm
  length: 4340 mm (5000 with drier)
  height: 1300 mm
- Approximate net weight: 1600 kg (1900 with drier)
- Approximate gross weight: 2000 kg (2300 with drier)

Electric power supply	380 Volts, threephase,50 Hz (others upon request)
Water consumption:	standard: 2730-3300 litres/hour (2 to 3 /cm^2) ecological: 500 l/h

2 DESCRIPTION

The machine has been specifically designed for processing aqueous dry-films by means of alkaline solutions and ensures perfect development of the dry-films of this type, used in the manufacture of printed circuit boards.

2.1. General information

The DEVMASTER is the result of close collaboration with the leading manufacturers of p.c. boards and includes our long experience in this field.
This unit features the well-known advantages of our machines such as: highest efficiency, ease of maintenance, quick replacement of all parts.
Main material used in construction is stainless steel. The basic frame is of a self-supporting design and consists of 3 mm thick stainless steel, bent and welded to final shape to give the highest chemical and mechanical resistance.
The developing and washing sections are sealed by means of a large tempered glass cover. This cover with spring loaded supports can be easily opened for check-ups and maintenance. The machine is delivered ready to operate and needs only very simple connections to power, water supply and drain.
A stainless steel bottom tray is provided as a built-in item and allows easy and fast installation without any particular preparation of the floor.
The adjustable feet on the machine compensate for any unevenness of the floor.

The materials to be processed are transported through the following stations:

2.2. Description of stations (Standard see DWG 03932 Ecological see DWG 03933)

2.2.1. Free input conveyor "A": length 670 mm

This consists of six driven stainless steel shafts with rubber wheels.

2.2.2. Separating chamber "B": length 130 mm

2.2.3. First developing chamber"C": length 1800 mm

Most of the coating to be removed from the boards will come off at this stage.

Characteristics:

Two heaters 4000 W each
Three centrifugal pumps 4 HP each
Spray pressure roughly 2.5 to 2.7 bar
Pump capacity roughly 300 l/min.
Two cooling coils controlled by solenoid valve
Level control with two points of intervention: drain of waste solution at maximum level and alarm with protection of heaters at minimum level.

2.2.4. Second developing chamber "D": length 370 mm

The boards must be completely cleaned before leaving this station. Fresh solution is fed into this chamber and cascades into the first developing chamber.

Characteristics:

One heater: 4000 W
One centrifugal pump 2 HP
Spray pressure 2.5 to 2.7 bar
Pump capacity roughly 100 l/min.
Low level alarm for heater protection
one cooling coil controlled by solenoid valve

2.2.5. First "standard" rinse chamber E_1-E_2: length 740 mm

Rinse water is recirculated by means of a centrifugal pump and water is renewed in cascade from rinse chamber "E_3".

2.2.6. Final "standard" rinse chamber "E_3"

The final rinse is supplied with water coming from the mains through which is controlled by the board sensor on the input conveyor. This water cascades into rinse section "E_2" - "E_1". Water consumption is roughly 2700 l/h during effective production.

2.2.7. First "ecological" rinse chamber "E_1": length 370 mm
Rinse water is recirculated by means of a centrifugal pump and water is renewed in cascade from rinse chamber "E_2".

2.2.8. Second "ecological" rinse chamber "E_2": length 370 mm.
Rinse water is recirculated by means of a centrifugal pump and water is renewed in cascade from rinse chamber "E_3".

2.2.9. Third "ecological" rinse chamber "E_3": length 370 mm
Rinse water is recirculated by means of a centrifugal pump and is renewed with water coming from the mains through. Water comes in thorugh solenoid valve and flow meter. The solenoid valve is controlled by the board sensor on input conveyor for effective usage.

2.2.10. Squeegee section "G": length 150 mm

The boards are squeezed in this section and leave the machine partially dry.

OPTIONAL EXTRAS:

2.2.11. Ecological system for make up of fresh developing solution by rinse water recovery (see drawing 03979 and 03980).

This system offers partial recovery of the rinsing water, efficiency of water usage and a great reduction of the rinse water going to the sewer.
Moreover it allows for feeding of concentrated developing solution directly into the machine thus eliminating the need for a STORAGE/TRANSFER SYSTEM for feed and bleed of fresh solution.
Fresh water is fed in through flow meter B into the rinsing tank and it cascades back into the previous tanks while the exceeding water overflows to the sewer.
This water is necessary to compensate all losses for evaporation and drag-out and to keep the water in the above mentioned tanks to an acceptable degree of cleanliness.
According to our experience and depending on the working conditions this flow-rate may vary from 300 to 500 l/hour. We recommend periodical control and to of the degree of contamination of water in rinsing sections and increase the water flow rate through flow meter if necessary.
Water is taken from the tank of the first rinse chamber through metering pump 03980/2 controlled by the sensor on the input conveyor.
This water is sent into the final developing chamber.
Simultaneously metering pump 03979/3 feeds a suitable quantity of concentrated solution also into the last developing chamber.
The ratio of concentrated solution and water can be regulated through the metering pumps according to requirements.
The mixing of concentrated solution and water in a given ratio inside the sump is equivalent to the feeding of ready made solution and allows for keeping its efficiency (developing speed) at a constant value.
In general, the strength of the diluted solution is established by the suppliers of the dry-film.
The flow rate of diluted solution must be established by practical tests and experience, while the recommendations of the suppliers of the dry-film are also of great help.
Depending on working conditions (type and thickness of dry-film, chemistry, percentage of developed area, throughput, etc.), this flow rate may vary from 20 to 200 litres/hour.

Once this has been decided, the flow rate of concentrated solution from pump 03979/3 and of water 03980/2 can be calculated according to the following formulas:

P = desired flow rate (= feed and bleed) of diluted solution
P7 = (03979/3) flow rate of concentrated solution
P8 = (03980/2) flow rate of water from tank (E_1) into tank (D)
C = desired strength of the developing solution (= diluted solution)
Cl = strength of the concentrated solution

$P8 = P - P7$

$P7 = P \cdot C \div Cl + C$

Under normal conditions P7 is negligible compared to P and C is negligible compared to Cl.
Therefore the same formulas can be simplified as follows:

$P8 \cong P.C \div Cl$

EXAMPLE:

P = 80 l/h
C = 0.75%
Cl = 20%
P8 = 80 l/h
P7 = 0.75 ÷ 20 = 3 l/h

IMPORTANT NOTE:

Two pumps (03980/2) P8 working in parallel, each one with a full rate flow of 100 litres/hour are provided.
The dial on these pumps indicates litres/hour, therefore the water flow rate from tank to tank is the sum of the two flow rates as set on the knob of each of the two pumps. Calibration of the pumps is necessary from time to time.
Metering pump (03979/3) P7 for concentrated solution has a full rate flow of 20 litres/hour while its dial rates from 0 to 100 (= 20 litres/hour).

Therefore each mark on this dial shows 0.2 litres/hour. The desired flow rate of pump P may be established by setting the relative knob on the scale as follows:

knob setting = P7 ÷ 0.2

Example: P7 = 3 litres/hour

- Knob setting = 3 ÷ 0.2 = 15.

3 INSTALLATION

3.1. Uncrating

Be sure to uncrate the DEVMASTER and to inspect it immediately for shipping damage.
Report any damage to the local I.S. Representative and notify the responsible carrier by writing as soon as possible.
The machine is fixed to the pallet by means of threaded bars which replace supporting feet.
These pass through the pallet itself and are fixed by nuts from underneath.
Lift the pallet while the machine is fixed on it, unscrew the nuts from underneath and then lift the machine off the pallet.
Replace the threaded bars with the regular feet provided.

3.2. Positioning

The DEVMASTER is delivered complete and only a few connections are necessary (see drawings 03931 and 03929).
The machine should be installed on a floor of sufficient strength for supporting the total weight of the machine full with solution.
Level the machine by means of the adjustable feet provided.

3.3. Plumbing connections (see drawings 03931)

Do not fill the machine but check first that the cooling coils and the relative fittings have not suffered from transportation and that they are leak proof.
To do this, connect water inlet and cooling water outlet.
Let the water run under pressure for a few minutes, then look for leaks inside tank.
The machine tank has already been filled with water at our premises, but it could be worthwhile to test again before starting with the developing solution (transport damages).

3.4. Electrical connections

Connect electrical power supply to mains inlet, inside electrical control box.
Before starting the conveyor we recommend to check that all movable parts inside the machine, such as rollers, grids, guides, separators, covers, etc. did not move and/or lift out of their correct position.
Check correct rotation of waste solution pump and exchange two Phases at mains input if necessary.

3.5. Exhaust

3.6. Connections must be made to 03931/D.
Exhaust required is roughly 50 m3/h.

3.7. Optional connections (only upon request)

A pump for clean solvent supply through inlet 03931/C can be electrically connected to the electrical control panel.
See electrical schematics for further details.
A sensor on the input conveyor will control the above mentioned pump.

4 OPERATION

4.1. Start up

If the machine is connected to a solution storage system start clean solvent pump selector switch to manual until level control starts waste solvent pump.
Turn clean solvent pump back to automatic at this point and the machine is ready for operation.

4.2. Filling with developing solution

We recommend to start with the tanks of the machine empty and to prepare a 1.0 to 1.2 % solution (in weight) of Sodium Carbonate in a separate tank (clean solvent tank).
If so desired, first tests can also be made by preparing the solution directly inside the machine.
Start heaters and set temperature of thermostats on control panel to the desired value: see instructions of dry-film employed.

4.2.1. Temperature control

Two thermostats with two points of intervention control the temperature in each of the developing tanks.
When the temperature is lower than the first set point the electrical heaters start to quickly heat the solvent.
Once the set temperature has been reached the electrical heaters will switch off and the energy given by the pumps will heat the solution.
The temperature will increase with the action of the pumps and when the value goes above the second set point, then the solenoid valves for the cooling coils will open to allow cooling to take place.
Normal developing temperatures for most commonly used dry-films vary between 30 and 35 °C.

4.2.2. Start developing solution pumps.

Check for leakages at solvent pump outlets and tighten if necessary (transport damage).
Pressure of upper and lower spray manifolds can be regulated by means of valves on upper and lower spray manifolds.

4.2.3. Antifoam pump (see drawing 03968)

Connect antifoam pump inlet to a suitable antifoam container and check that when starting the conveyor, a small amount of antifoam is pumped up.
This will avoid foam build up in the spray chambers.
Antifoam may be also added by hand from time to time or added in concentrated solution tank during preparation of the fresh solution, if the machine is supplied with the ecological system.

4.3. Conveyor speed regulation

The conveyor speed has to be adjusted by means of central controller and digital speed display on control panel, according to the thickness of coating to be removed.
Normally the speed should be such as to have boards visually developed within first developing chamber.

5 MAINTENANCE

The DEVMASTER is of very simple and solid construction so that normal maintenance and care will ensure best performances. However, perfect cleaning of the boards will be obtained only by keeping all stations as clean as possible.

5.1. Section 03932 chamber C and D.

Periodically check correct spraying of nozzles: remove and clean if necessary.
Normal spraying pressure in developing sections is as follows:

Section (C) pressure 1.8 to 2.0 bar
Section (D) pressure 2.0 to 2.3 bar

5.2. Filters (see drawing 03399)

Clean or replace filters at pump outlets when necessary.
A drop of pressure is normally caused by dirt in these filters.

5.3. Section 03932 chamber C-D-E_1-E_2-E_3

Check jets of water spraying nozzles and clean if necessary.

5.4. Replacement of rubber sheathings (03939/14)

Replace rubber sheathings of transport rollers when damaged or dirty.
To do this slice (cut) the sheathing and replace.
The rubber sheathings are supplied by the meter and are fitted with the aid of compressed air.

5.5. Periodical emptying of the DEVMASTER

In order to avoid a build-up of sludge at the bottom of the developing tanks which could lead to problems in developing, the machine must be periodically emptied and washed.

ROUTINE CLEANING

Routing cleaning of the DEVMASTER operated in a batch or a continuous mode is required to eliminate accumulations of developer residues which are potentially problematic and may be cause for poor developing quality and reject able parts.
The operation of a developer in a continuous mode does not eliminate the need for periodical developer cleaning.

CLEANOUT PROCEDURE

1. Drain and flush the developer with a high pressure garden hose.
   If recirculating rinse modules are part of the developer system, these should be drained and flushed as well.

2. Refill the sumps and add 2% sulphuric acid.
   Allow the solution to circulate for 20 to 30 minutes at 30°C maximum.
   The acid step aids in the breakdown of water scale accumulations, decomposition of residues, precipitation of alkaline solubles, and removal of acid solubles.

3. Drain and flush

4. Refill the sumps with a 1% solution of caustic soda and allow the solution to circulate for 15 to 20 minutes at about 30°C.

5. Drain and flush.
   Filter cartridges should be cleaned at this time.

6. Refill the sump and make up to operating concentration and temperature.

SPARE PARTS

For spare parts ordering please always state SERIAL NUMBER of machine and refer to attached drawings.

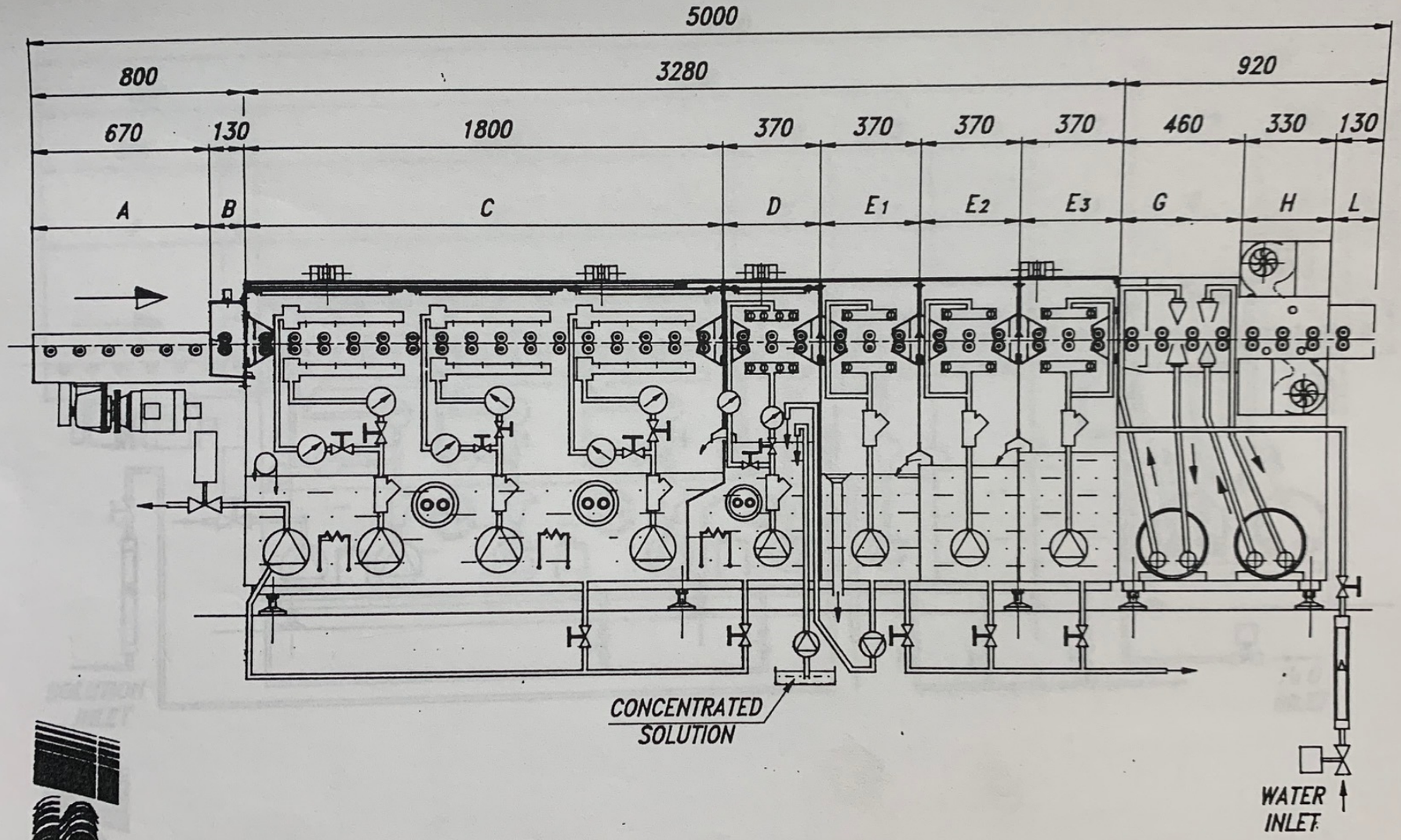
6 WARRANTY

The DEVMASTER is guaranteed by I.S. against defects in materials or workmanship for a period of six months from the date of shipment, provided the DEVMASTER has not been abused or operated contrary to instructions, and further provided no alterations or repairs have been made, other than by a properly authorised I.S. Representative.
The DEVMASTER is not to be returned to I.S. without first obtaining the written consent or authorisation of a properly authorised I.S. Representative.
The liability of I.S. for breach of any warranty or guarantee shall be limited to replacement or repair of the defective parts during the first six months after shipment, and in no case shall I.S.'s liability exceed a refund of a purchase price.
Except as provided herein, I.S. makes no other warranties or guarantees expressed or implied.

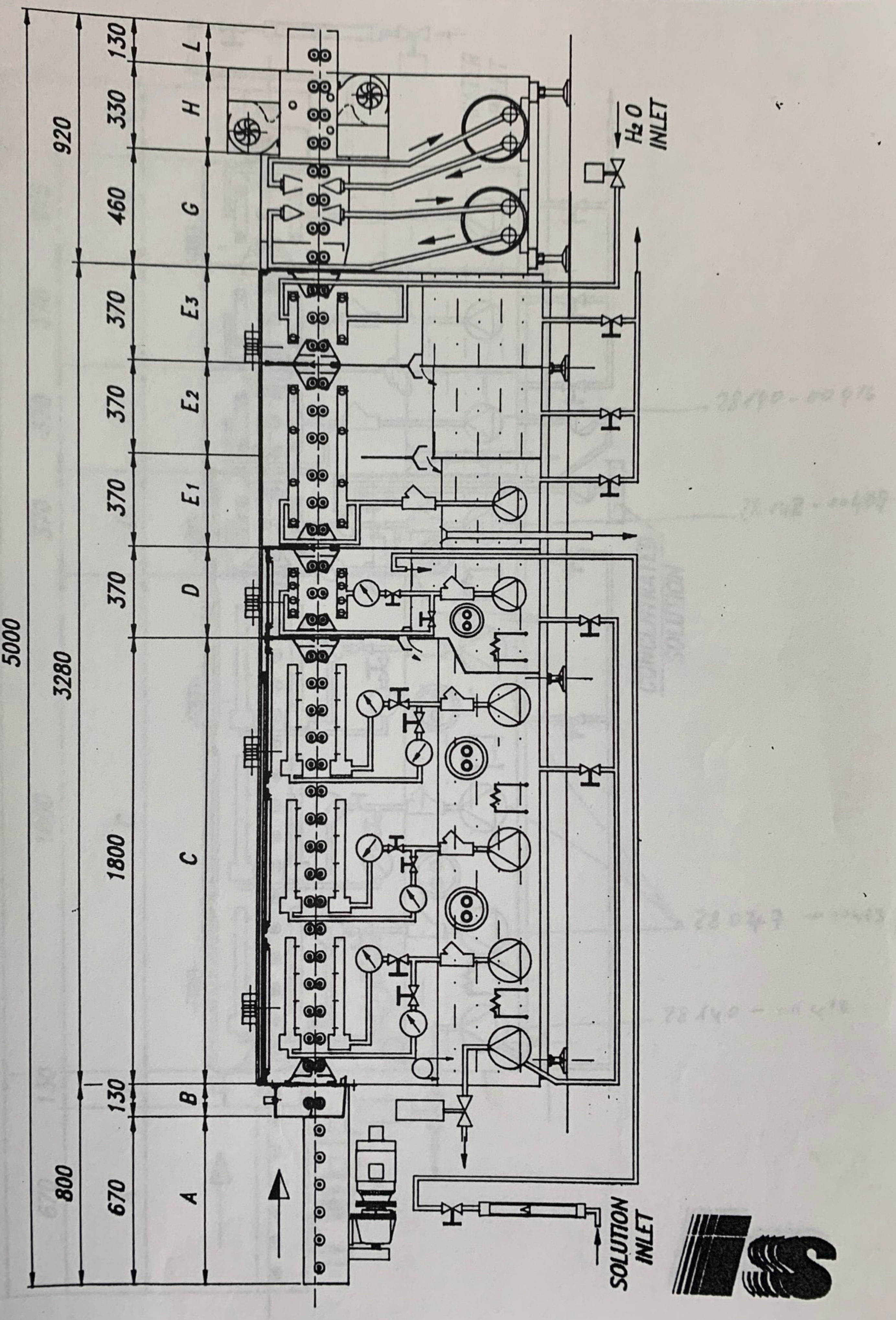
DWG. 04078

SCHEMATIC CROSS SECTION

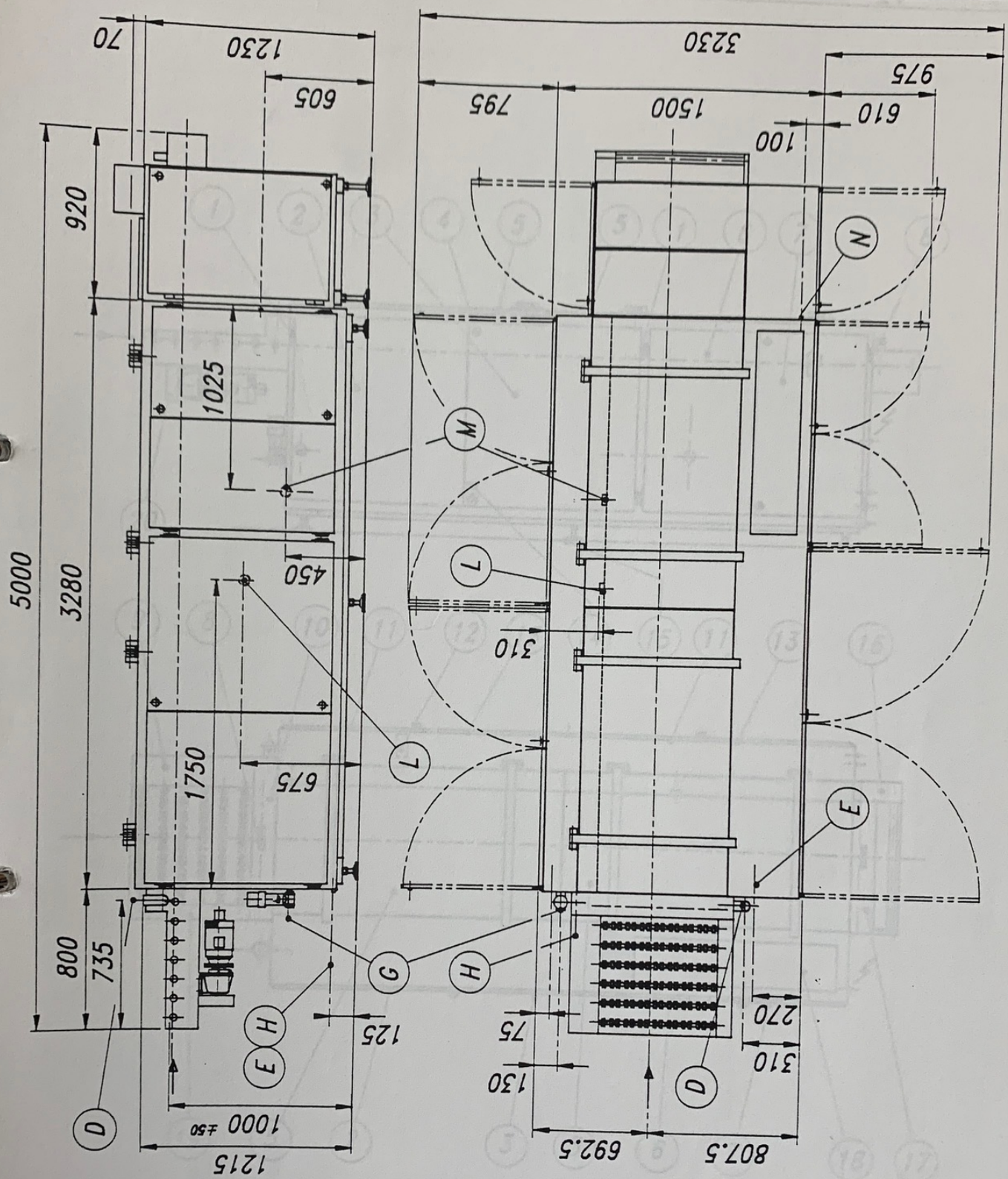
DEVMASTER MK II WITH ECOL
RINSE AND SHD II



DWG. 04077	SCHEMATIC CROSS SECTION	DEVMASTER MK II STANDARD WITH SHD II



DWG. 04070	WORK SPACE AND CONNECTIONS	DEVMASTER MK II 24" WITH SHD II	



D= Exhaust for input conveyor ø60 mm.
E= Right hand drain valve for tray ø1" G
G= Waste solution outlet ø1" G
H= Left hand drain valve for tray ø1" G
L= Safety overflow for solution ø60 mm.
M= Rinsing water overflow ø60 mm.
N= Power supply 40 KW 3Phase