Operating Manual
Injection Moulding Machine type PLUS

Read before using the injection moulding machine and keep nearby for reference

Machine Type: PLUS 350 / 75
Control Type: UNILOG B2
Machine No.: 25336
Year of manufacture: 2003
Operating Manual
Injection Moulding Machine type PLUSV

Read before using the control unit and keep nearby for reference

Machine Type: PLUS 350V / 75
Control Type: UNILOG B2
Machine No.: 25556
Year of manufacture: 2003
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9.1 General information
1.0 General information

1.1 Introduction

This machine documentation is written with the intention that it should be read, understood and followed by all those who will be responsible for this Battenfeld injection moulding machine (referred to as IMM hereafter).

The complete documentation should be held close to the IMM and be available to operating and maintenance staff at all times.

Only after reading through thoroughly, especially Section "Safety", can problems with the IMM be avoided and trouble free operation ensured. It is therefore essential that this operating manual be made available to the personnel concerned. This should take place before commissioning, because we can take no responsibility for damage and operating faults arising from ignorance of this operating manual!

There are facilities for the training of your operating staff in your works or at our factory. For further information, contact the "Training Department".

Should you still encounter difficulties, please contact our Customer Service Department or our Local Technician or Agent (addresses are given in Section "Customer Service") who will be pleased to help.

This Operating Manual is valid only for the IMM specified on the front cover.

The presentation and content of this manual are subject to technical alteration, as required by continuous improvements of the IMM and / or its plant components.

1.2 Scope

IMM of the present series of this range have been designed as standard for the processing of thermoplastics and optionally for processing elastomers and LIM (Liquid Injection Moulding - process for the injection moulding of liquid two part silicone rubbers).

Any other use is regarded as improper. The manufacturer accepts no responsibility for any resulting damage; the risk is borne entirely by the operator.

1.3 Explanation of symbols

The Warning symbol is to be found with all work safety instructions in this operating manual where there is a hazard to the health and safety of persons. Follow these instructions and act in these cases with extreme care. Pass on all work safety instructions to other users. In addition to the instructions given in this operating manual, the general health and safety regulations for the prevention of accidents must be observed.
These warning and prohibition symbols may be present on the IMM. They warn of particular dangers of death or injury to operating and maintenance personnel.

The "Hot surface" sign indicates areas where there is a burning hazard. The user must be protected by appropriate personnel protective equipment (PPE) (see DIN EN 407).

Areas indicated by the "Pinch hazard" sign warn of possible pinching or crushing hazards.

Surfaces with the "No step" sign must not be stepped on.

Caution
Caution marks those sections in this operating manual where there are instructions or regulations which must be observed and/or that the correct sequence of work should be followed, and/or that care must be taken to avoid damage to the IMM and associated equipment.

The high voltage symbol in the manual indicates those places where personnel can come into contact with electrical equipment and materials. Care must be taken to ensure that the applicable local electrical safety regulations are followed.

The symbol for environmental hazard draws attention to environmental hazards, for instance, concerning the disposal of all sorts of materials. When carrying out repair and maintenance work the corresponding rules and regulations must be adhered to.

1.4 Copyright
The copyright of this operating manual remains with Battenfeld GmbH. This operating manual is intended for assembly, operating and supervisory staff. It contains instructions and diagrams of a technical nature which may not be reproduced entirely or in part, distributed or used without authorisation for the purposes of competition or conveyed to third parties.

1.5 Transfer Certificate
The transfer certificate enclosed with this operating manual is to confirm the transfer of the IMM and the completeness of the operating manual. After checking, the transfer certificate should be completed, signed, and returned to the "Documentation" department.

1.6 Declaration of conformity
The Declaration of conformity is included at the end of this chapter.
Telefax message

To: Documentation Dept. BKU ++43/2252 404 - 3002
    Documentation Dept. BMF ++49/2354 72 - 551

Transfer Certificate

for confirmation of acceptance of technical documentation by the customer

1) Machine type: __________________________ Com. no.: ________________
2) Customer’s address ________________________________________________
   __________________________________________________________________
   __________________________________________________________________

3) We have acquired the machine detailed in para. 1. On handover of the
   were provided with ___________________________________ (number)
   Operating manual(s) in the __________________________ language.
   ________________________________ ________________________________
   Date Customer’s signature

4) Date of transfer: ___________________________________________

5) Address of authorised agent or importer:

   Company stamp / signature

6) The injection moulding machine has
   been handed over to the customer in
   accordance with the manufacturer’s
   instructions.

   ________________________________
   Date Service technician's signature

   Signature if different from Para. 5

Battenfeld
2.0 Safety

2.1 Safety regulations

General information

Numerous safety devices contribute to safety and accident prevention on the machine (hereinafter IMM) or robot. The proprietor of the machine is responsible for the proper function of the safety devices.

The IMM is designed and built to the currently applicable safety requirements of European Standard EN 201 and is safe in operation. Hazards can arise from this IMM if it is improperly used by untrained personnel or is used for purposes for which it is not designed.

For reasons of safety the control software must not be changed. Any modification of the software without our consent will invalidate clauses of the warranty!

The environment, safety and accident prevention regulations, as well as operating procedures, are always applicable to the running of the IMM.

Unauthorised modifications or alterations which affect the safety of the IMM are not permitted.

Proper use of the IMM includes observation of the instructions laid down by the manufacturer for assembly, dismantling, commissioning, operation and maintenance.

Responsibilities and procedures for all work involving installation, dismantling, modification and maintenance of the IMM are to be recorded in a procedure.

Modifications and alterations which affect the safety of the IMM, as well as all work relating to maintenance, are to be documented in an inspection record which is to be stored for at least ten years.

The IMM is designed and built to the currently applicable Standard DIN EN 292-2 so that noise emission hazards when used properly with optimised settings are reduced to the lowest attainable level.

Before operating the IMM with a robot, the safety regulations in the Robot Operating Manual must be followed without fail.

Before operating the IMM with integrated peripheral equipment (e.g. material feeder) the safety regulations in the appropriate Peripheral Equipment Operating Manual(s) must be followed without fail.

Connection and installation of peripheral equipment may only be carried out by authorised personnel.

The top guard over the clamping unit (PLUS horizontal) must remain permanently closed, unless robots have been fitted which conform to the local safety regulations.
The proprietor of the IMM has to make sure and verify that the operator is aware of the safety instructions and potential hazards and follows the operating manual at regular intervals.

Even if the IMM is only subject to slight modifications in terms of position it should be disconnected from any power supply. Reconnect all power supplies according to the operating manual before restarting the machine.

When disposing of the IMM to a third party (or company), the Operating Manual must also be handed over. It is recommended to have a written confirmation of this.

Installation

For installation, dismantling, modification, adaptation, and maintenance work parts, components or the entire IMM has to be secured and carefully attached to the lifting gear so as to prevent any dangers from arising. Only use appropriate lifting gear in proper working order with sufficient carrying force. Personnel or other persons must by no means stand or work under suspended loads.

Loads may only be fastened, secured and transported by experienced, authorised and trained personnel.

The IMM may only be lifted using the lifting points described in Chapter "Transport - Installation".

Before installation of the IMM the safety measures detailed in DIN EN 292-2, Para. 6.1.2 are to be observed.

After electrical work or repair, the safety devices must be tested (e.g. earthing resistance).

Operation and maintenance

All work is principally to be carried out when the IMM is shutdown. The appropriate shut down procedures are to be followed.

Before starting work on the IMM its drive and periphery equipment must be secured against accidental reconnection, e.g. using a padlock on the main switch.

Before reconnecting the IMM the safety devices must always be checked for their proper function.

Before putting into operation after repair it must be verified that all the safety devices are in place according to regulations.

Safety devices may only be removed with the IMM switched off and secured against accidental reconnection.

If the ejector or core pullers are operated with the safety gate open, it must be ensured that there are no pinching or crushing points on the mould.
Spare parts must meet or exceed the technical specification laid down by the manufacturer.

The operator has a duty to ensure that electrical motors and components do not come in contact with any liquids.

Carefully clean the environment, especially connections and fittings before servicing the plant.

Cleaning materials are hazardous to health and flammable. The manufacturer’s instructions are to be followed without fail. Do not use aggressive cleaning agents. Use non-fibrous cleaning cloths.

When using oils, greases or other chemical substances, follow the safety regulations applicable to this product.

The proprietor is responsible for secure and proper waste disposal of process material.

Always tighten screw connections which have become loose during operating and maintenance work. Check pipework for leaks, loosened screw connections, chafe marks, and damage. Remedy detected defects immediately.

Safety instructions with respect to personnel

All persons involved with the IMM on the operator’s premises, whether for installation, dismantling, commissioning, operation, maintenance (inspection, service and repair) must first read and understand the appropriate Operating Manual, especially Chapter “Safety”. The proprietor of the machine is advised to have this confirmed in writing.

The IMM may only be operated, maintained and repaired by authorised, trained personnel. Personnel must have undergone special instruction about possible hazards.

Personnel to be trained, instructed or who have not yet finished the professional training may only work at the IMM if supervised by authorised, trained and instructed staff.

The operators must wear their hair tied back, close-fitting clothes and must not wear any jewellery including rings. There is a danger of injury, e.g. becoming trapped or caught.

Responsibilities for installation, dismantling, commissioning, operation, and maintenance must be clearly defined and adhered to so that no "grey areas" arise on the subject of responsibilities for safety.
Safety

For all work involving installation, dismantling, modification and maintenance, the IMM is to be switched off at the main switch and secured against accidental reconnection (e.g. by using a padlock on the main switch).

When undertaking work involving installation, dismantling, modification, operation and maintenance, no flammable liquids may be allowed to come into contact with components whose high temperatures could cause a fire or explosion risk.

Before any work involving installation, dismantling, modification and maintenance, the heating elements and their guards, mould temperature control units and their flow and return lines and their fittings must have cooled to a safe temperature.

The operator must protect him / herself from burning hazards from the heating elements, heating-cooling devices and their covers, flow and return lines and their fittings and the housings of electrical motors by wearing appropriate PPE (see DIN EN 407).

The operator has a duty always to use the IMM with closed safety gates and guards.

No working method which compromises the safety of the IMM should be employed.

The operator has a duty to ensure that no unauthorised person works on the IMM.

The operating and other staff must always stand at the front of the IMM on the operator’s side while it is in operation.

It is forbidden to stand on the IMM or to reach into the injection unit during operation.

The shut down procedures given in the operating manual are always to be followed for all work on the IMM.

The operator is obliged to report at once any alteration in the IMM which affects safety. If necessary the IMM should be switched off at once by operating the emergency stop button and the main switch.

The operator has a duty always to operate the IMM in a fault free condition.

Cleanliness and tidiness of the IMM are to be ensured by appropriate instruction and monitoring on the part of the proprietors of the machine.

The operator is obliged to observe all safety regulations and danger signs at the IMM. These signs must be complete and fully legible.

If the material hopper, the material feeder or the stuffing device are located higher than the average body height, climbing aids and working platforms which meet the legal safety requirements must be used for installation, dismantling, modification, maintenance and filling. Do not use the IMM components as climbing aid. When working at greater heights proper equipment for protection against falling down must be worn.

The operator has a duty to ensure that no foreign bodies enter the material hopper or barrel throat.
It is essential that the operator ensures proper fitting of the nozzle or there may be a risk of its shooting out.

When using Mouldmaster nozzles (nozzles in the mould) the operator must ensure that there are no pinching or crushing points.

In any work involving installation, dismantling, modification and maintenance, the following potential pinching and crushing hazards may arise:

- Between the safety gate and machine frame on closing the clamping unit’s safety gate(s)
- Between the purge guard and the nozzle platen on closing the purge guard
- With hydraulic shut-off nozzles from the movement of their closing mechanism
- Between the nozzle and the fixed platen when moving the injection unit forward with the purge guard open
- In the area of the screw shaft and thrust bearing (axial bearing) when coupling the screw
- Around the material outlet when swinging the hopper in and out or sliding it backward and forwards

There is a crushing and/or shearing and/or impact hazard in the machine well (below the mould space) from:

- Moving parts of the mould which can be reached through the machine well
- Falling injection moulded parts

Safety regulations Hydraulics / pneumatics

The IMM is designed and built to the currently applicable safety requirements of European Standard EN 982:1996 and is safe in operation. Hazards can, however, arise from the hydraulic system of this IMM if it is improperly used by untrained personnel or if it is used for purposes for which it is not designed. Thus all work involving installation, dismantling, modification and maintenance may only be carried out by a qualified hydraulic or pneumatic technician.

Hydraulic technicians are persons who due to specialised training and experience have sufficient knowledge in the field of oil hydraulics and who are familiar with the relevant safety regulations, regulations for the prevention of accidents, directives and generally approved rules in technology, e.g. DIN standards.

Before opening hydraulic or pneumatic components and hoses, the hydraulic unit has to be relieved from pressure as described in this operating manual.
Compressed air pipework for the pneumatic system and water pipework for the cooling of the hydraulic system have to be expertly installed and laid. Fittings, length and cross section have to meet the requirements.

Hydraulic fluids (oils) escaping at high pressure can penetrate the skin and cause severe injury. A physician must be consulted at once as there is also a risk of infection.

All pipework, hoses and screw connections should be checked for leaks and damage visible from outside at regular intervals. Remedy damage immediately. Hydraulic oil escaping at high pressure can cause severe injuries and fires.

Hydraulic hoses and hose assemblies have to be replaced at the intervals given in the "Maintenance" chapter, even if there are no defects to be detected which affect safety.

Hydraulic hoses and hose assemblies must be protected from damaging external influences.

The safety regulations for hydraulic hoses and hose assemblies according to DIN 20066 Part 4 and 5, ZH 1/74 and EN 201 are to be particularly carefully observed.

For this reason, all work involving installation, dismantling, modifications and maintenance may only be carried out by personnel trained in this field.

Work (repair, connection of a pressure gauge) on an IMM with pressure vessels (accumulators) must not be carried out until the hydraulic pressure has been released; i.e. the pressure in the accumulator(s) must have completely decreased. Neither welding nor mechanical processing may be undertaken.

The pressure vessels must be subject to acceptance tests at their place of use by the technical standards organisation responsible in the proprietor’s region before being put into operation.

Pressure vessels may only be filled with nitrogen "N2". The use of other gases causes explosion hazards.

Keep the test certificates for the pressure vessels and the safety valves in a safe place.

The proprietor is responsible for the proper condition, operation and monitoring of the pressure vessel (e.g. regular testing). The relevant pressure vessel regulations can be found from Carl Heymans Verlag KG, Gereonsstr. 18-32, 50670 Cologne, under order No.: ZH 1/400.

The operator must keep appropriate absorbent materials for use in the event of hydraulic oil spillages.

When disposing of used oil and lubricants the legal requirements and regulations must be adhered to. The proprietor is responsible for proper waste disposal.
Safety instructions for materials

The IMM is intended exclusively for the processing of polymeric materials as stated in the "General information" chapter. Any other use is considered improper and any loss damage or injury arising is the responsibility of the company. The manufacturer can accept no liability.

The operator is responsible for ensuring that no easily drawn in material or explosive air mixtures may be near the inlet area of the screw barrel heating or barrel temperature control (radial ventilators).

The operator has a duty to ensure that the cooling fans are in good technical condition with undamaged electrics.

When processing plastics which give rise to harmful gases, dusts or vapours, the proprietor of the machine has a duty to provide suitable extraction for the protection of operating personnel.

Some plastics, if they are not properly dried, may spit material from the nozzle. Follow the plastic manufacturers’ instructions.

There is a burning hazard at operating temperature from:

- The nozzle
- Plasticised melt emerging from the nozzle

Provide appropriate protective clothing (DIN EN 407).

Safety instructions for electrics

The electrical equipment on the IMM is designed and built to the currently valid standards EN 60204-1 and IEC 801-2 and is safe to operate. Hazards can, however, arise from the electrical system of this IMM if it is improperly used by untrained personnel or is used for purposes for which it is not designed. Thus all work involving installation, dismantling, modification and maintenance may only be carried out by a qualified electrician (as defined in DIN VDE 0105 or DIN EN 60204-1).

The electrical equipment may only be connected to a mains supply which corresponds in terms of current type, voltage and frequency to the specifications on the IMM specification plate. The electrical supply lines must meet the requirements.

The IMM must be switched off at the main switch before all work involving installation, dismantling, modification and maintenance. Check the electrical equipment for lack of voltage, then earth it and short it out.

The mains supply and power heating terminals remain live even when the machine is switched off.

The electrical equipment is to be checked at regular intervals. Defects such as loose connections or scorched cables must be immediately remedied.
For reasons of safety, the operator must log off from the control unit after finishing the setting mode in order to prevent unauthorised persons from data entry.

For all work involving installation, dismantling, modifications and maintenance, the legal requirements and regulations must be observed.

**Safety instructions for changing nozzle, screw and barrel**

When installing a complete injection unit, only parts supplied or specified by Battenfeld may be used.

When fitting or removing the nozzle, screw or barrel it is essential to activate and use the IMM without the guarding on the injection unit.

The proprietor therefore has a duty to ensure that the danger zone is adequately protected and that no unauthorised persons enter this zone.

Before moving the injection or nozzle contact cylinders with their guarding removed it must be ensured that no tools or other materials are left on the IMM.

Whilst moving the injection piston or nozzle contact cylinder with the injection unit guarding removed, the operator must maintain a safe distance.

Immediately after moving the injection or nozzle contact cylinders with their guarding removed, the IMM must be switched off again and secured against accidental reconnection.

If proper procedures are not followed in the fitting or removal or in handling the nozzle, screw, barrel or the respective heating elements there is a risk of injury or burning. Wear appropriate protective clothing (see DIN EN 407).

When fitting or removing the nozzle, screw and barrel, no tools may be used which could cause damage to these components.
2.2 Safety grid monitoring

This monitoring controls the appropriate task according to the following components:

- The alternating position of the position switch (230S3, 230S4)
- The limit switch of the hydraulic interlock (position monitoring valves 240Y1, S240 which are operated directly by the position switch 240S1)
- The restricted guidance contactor relay (230K1, 230K2) in the valve circuit of the clamping unit

If a defect is detected in the above components it will be displayed on the error message "Safety grid".

2.3 Pneumatic Safety Hood and Safety Bar (PLUS-V)

The clamping unit is completely covered to prevent accidents.

The working area between nozzles and mould-mounting-plates is secured by a plexiglass safety hood with a safety bar, which ensures a good view of the working area.

To avoid risk of injury when the safety hood is closed, an electric monitored safety bar can be found on its underside. In the event of an obstruction a counter movement will automatically be triggered and the safety hood opened.

To prevent accidents, the opening and closing movements of the opened safety hood are both electronically and hydraulically disabled. In addition the closing movements are prevented by a mechanical closing interlock.

Monitoring unit safety bar

1. Function

The electronics of the switching equipment monitor the electrical resistance of a connected contact element with a defined static current. If the required static current flows, both output relays are triggered (ON) and the yellow light diodes "Relays ON" are illuminated. If the contact element is activated, the output relays are no longer triggered (OUT) and the yellow light diodes go out.
2. Characteristics

Contact element - input
\[ R = 1200 \, \text{W} \]
Static current contact element
\[ I < 5\, \text{mA} \]

Shift point when pressed
\[ 500 \, \text{W} < R < 700 \, \text{W} \]
Shift point on disconnection
\[ 1,9 \, \text{kJ} < R < 2,5 \, \text{kJ} \]

3. Test:

- Both output relays must be activated when contact elements are ready for operation and illuminate the yellow LEDs "Relays ON"
- Touch contact element. Both output relays must be released, both yellow LEDs "relays ON" must go out

4. Trouble shooting and Measures

- Relay does not switch on
- LED does not light up

Check whether the supply voltage to terminals 11, 12 is connected correctly and that it corresponds to the device voltage of the side-name-plate.

Check whether the contact element is connected correctly to terminals 8, 9 and that the terminal voltage amounts to approximately 4 V DC. If a higher voltage is supplied, the terminating resistor of the contact element must be checked. The device only operates with a terminating resistor of 1,2 kW.

Nevertheless if the device does not switch on, the switching equipment is faulty and must be replaced.

- If the LED remains constantly illuminated, it indicates an error

The switching equipment is faulty and must be replaced.

2.4 Safety hood and guard

The clamping unit is completely covered to prevent accidents. The frontside part of the cover is formed as a single-piece covering hood. By loosening 4 screws this can be removed to be adjusted.

The working area between nozzles and mould-mounting-plates is secured by two sliding safety hoods which allow a good view of the working area.

The front side of the safety hood is kept closed by a magnet. The locking force is reduced after approximately 0,5 sec to allow a slight opening in the safetyhood.

In automatic mode (exception: in the machines starting position) or during a machine movement, the safety gate cannot be opened.

To prevent accidents, all movements, electric as well as hydraulic, are disabled when the safety hood is open (closing, opening, ejecting, nozzle, metering, decompression and injection movements).
2.5 Robot protective equipment
(option)

According to safety regulations, for the protection of the operator, the robot must be fused with appropriate safety devices to prevent contact with the system.

**Caution**

"We refuse to assume any responsibility in case of a failure to observe this safety device!"

Appropriate protective equipment has therefore been designed, in case required, which is installed in your Robot. If the customer wishes the robot to be delivered **without** the safety device, the customer, as well as the user, **must** always take the necessary safety measures himself.

2.6 Checking safety devices

The safety devices of the machine can only fulfill their purpose if their faultless operation can be guaranteed. It is therefore necessary to check their effective function at all times.

1. Checking electrical closing interlock
   - Limit switches securely fixed

2. Checking hydraulic interlock
   - Directional valve securely fixed
   - Electrical limit switches securely fixed (only with PLUS-V)

3. Checking mechanical scotch
   - Smooth operation of the stop on the nozzle platen
   - Switching distance of the activated initiator 2 mm (only with PLUS-V)

**Caution**

*If a fault appears on the machine which causes the mechanical scotch to come into operation, Battenfeld Customer Service or the responsible agent must be contacted!*

4. Checking safety hood
   - Limit switches securely fixed
   - Smooth operation of the closing movement (only with PLUS-V)

5. Checking safety hood and guard
   - Security of all fixing bolts and undamaged condition

6. Checking robot protective equipment
   (option)
   - Security of all fixing bolts and undamaged condition

   *Reasonably foreseeable unfavourable installation / use*
### 2.7 Table for risk assessment

**Reasonably foreseeable unfavourable inst**

<table>
<thead>
<tr>
<th>Case</th>
<th>Hazard</th>
<th>Consequence / other hazards</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of unsuitable materials</td>
<td>IMM overload; possible fire or explosion, emission of health hazardous products</td>
<td>Warnings and allowed material range in the Operating Manual</td>
</tr>
<tr>
<td>2</td>
<td>Use of unsuitable moulds; Mould not installed</td>
<td>IMM overload, uncertain operating conditions, escape of hot material</td>
<td>Instructions in the Operating Manual</td>
</tr>
<tr>
<td>3</td>
<td>Missing covers and limit switches not working</td>
<td>High surface temperatures, moving parts during closing movement</td>
<td>Warnings, labels, instructions in the Operating Manual</td>
</tr>
<tr>
<td>4</td>
<td>Operating error</td>
<td>Loss of machine function</td>
<td>Instructions in the Operating Manual</td>
</tr>
</tbody>
</table>

**Reasonably foreseeable faults in installation and electrical connection**

<table>
<thead>
<tr>
<th>Case</th>
<th>Hazard</th>
<th>Consequence / other hazards</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrical supply (voltage, frequency, cable size)</td>
<td>no proper functioning</td>
<td>Instructions in the Operating Manual</td>
</tr>
<tr>
<td>2</td>
<td>Unsuitable coolant (Water flow rate, pressure)</td>
<td>Blockage, overheating</td>
<td>Instructions in the Operating Manual</td>
</tr>
</tbody>
</table>

*) The given measures should only be carried out by trained operators / setters.
3.0 Technical Data

The chapter "Technical data" contains all the technical data required for normal installation, commissioning and operation of the injection moulding machine.

3.1 General information

- Machine type / control: see cover sheet
- Machine No. / year of construction: see cover sheet
- Machine weight gross/nett: see foundation and installation plan
- Main dimensions of the IMM: see foundation and installation plan
- Noise level (DIN EN ISO 3744 46): 72 dB(A)

3.2 Hydraulic equipment

- Hydraulic oil, tank volume: HPL 46, 125 l (33 gal)
- Oil temperature min / max: min 35 °C (95 °C); max. 65 °C (149 °C)
- Oil cooling trigger temperature: 45 °C (104 °F)

3.3 Electrical equipment

- Power, hydraulic pump: 7,5 kW, 40 l/min (10,6 gal/min)
- Motor voltage: see electrical spec. plate
- Frequency: see electrical spec. plate
- Screw barrel temperature: max. 350 °C (662 °F) (option 450 °C, 842 °F)

3.4 Water system

- Oil cooler: Cooling water consumption: max. 80 l/h (21 gal/h)
- Water supply: max. 30 °C (86 °F)
- Cooling water distrib.: Cooling water supply: Ø 1/2", Ø 13 mm, max.10 bar (145 psi)
- Water return: Ø 1/2", Ø 13 mm
3.5 UNIFEED material feeder (option)

**Throughput**

<table>
<thead>
<tr>
<th>Throughput PA</th>
<th>lb / h</th>
<th>kg / h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>112</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>225</td>
<td>100</td>
</tr>
<tr>
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<tr>
<td>5</td>
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</table>

**Noise level**

- 1 - V at 100 % demand
- 2 - V at 50 kg (52.16 kg) material / h
- 3 - V at 35 kg (80 lb) material / h

At 6 bar (87 psi) pneumatic pressure, 100 % demand and a nominal 19.05 mm (0.75 inch) hose of which 4 m (13 ft) are vertical.

**Air consumption**

1 - V at 100 % demand
2 - V at 50 kg (52.16 kg) material / h
3 - V at 35 kg (80 lb) material / h

**Air consumed Q**

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<tr>
<th>Pneumatic pressure (abs.) bar (psi)</th>
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Figure: PL-0033.WMF

Figure: PL-0034.WMF
### Injection unit 50

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<th>Property</th>
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<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
<th>Unit 6</th>
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<tbody>
<tr>
<td><strong>Screw diameter</strong></td>
<td>mm</td>
<td>inch</td>
<td>18</td>
<td>22</td>
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<td><strong>Specific injection pressure</strong></td>
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<td>psi</td>
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<td>cu in</td>
<td>25.4</td>
<td>38</td>
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<td>oz</td>
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<td>122</td>
<td>44,6</td>
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<td>lb/h</td>
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<td>lb/h</td>
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<td>cu in/s</td>
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### Injection unit 75

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<td>cu in</td>
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<td>122</td>
<td>44,6</td>
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<td>lb/h</td>
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<td>cu in/s</td>
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### 3.7 Clamping unit

**Clamping unit PLUS 250 - PLUS 350**

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<td></td>
<td></td>
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<td>3.25</td>
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<tr>
<td><strong>Mounting platen size</strong></td>
<td>mm</td>
<td>inch</td>
<td>470 x 280</td>
<td>18.50 x 11.02</td>
<td>470 x 280</td>
<td>18.50 x 11.02</td>
</tr>
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<td>60</td>
<td>2.36</td>
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<td>inch</td>
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<td>270</td>
<td>10.63</td>
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<tr>
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<td>mm</td>
<td>inch</td>
<td>150 - 250</td>
<td>5.9 - 9.8</td>
<td>150 - 250</td>
<td>5.9 - 9.8</td>
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<tr>
<td><strong>Opening stroke at max. mould height</strong></td>
<td>mm</td>
<td>inch</td>
<td>200</td>
<td>7.87</td>
<td>200</td>
<td>7.87</td>
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<tr>
<td><strong>Max daylight</strong></td>
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<td>inch</td>
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<td>450</td>
<td>17.72</td>
</tr>
<tr>
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<td>sh tn</td>
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<td>26</td>
<td>2.87</td>
</tr>
<tr>
<td><strong>Ejector stroke</strong></td>
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<td>inch</td>
<td>100</td>
<td>3.94</td>
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**Clamping unit PLUS 250 V - PLUS 350 V**

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<td>sh tn</td>
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<td></td>
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<tr>
<td><strong>Opening force</strong></td>
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<td>3.25</td>
<td></td>
<td></td>
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<td>3.25</td>
</tr>
<tr>
<td><strong>Mounting platen size</strong></td>
<td>mm</td>
<td>inch</td>
<td>470 x 280</td>
<td>18.50 x 11.02</td>
<td>470 x 280</td>
<td>18.50 x 11.02</td>
</tr>
<tr>
<td><strong>Tiebar diameter</strong></td>
<td>mm</td>
<td>inch</td>
<td>60</td>
<td>2.36</td>
<td>60</td>
<td>2.36</td>
</tr>
<tr>
<td><strong>Distance between tiebars</strong></td>
<td>mm</td>
<td>inch</td>
<td>270</td>
<td>10.63</td>
<td>270</td>
<td>10.63</td>
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<tr>
<td><strong>Mould height adjustable from ... to</strong></td>
<td>mm</td>
<td>inch</td>
<td>200 - 250</td>
<td>7.9 - 9.8</td>
<td>200 - 250</td>
<td>7.9 - 9.8</td>
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<td><strong>Opening stroke at max. mould height</strong></td>
<td>mm</td>
<td>inch</td>
<td>200</td>
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<td>200</td>
<td>7.87</td>
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<tr>
<td><strong>Max daylight</strong></td>
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<td>17.72</td>
<td>450</td>
<td>17.72</td>
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<tr>
<td><strong>Max. ejector force</strong></td>
<td>kN</td>
<td>sh tn</td>
<td>26</td>
<td>2.87</td>
<td>26</td>
<td>2.87</td>
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<tr>
<td><strong>Ejector stroke</strong></td>
<td>mm</td>
<td>inch</td>
<td>100</td>
<td>3.94</td>
<td>100</td>
<td>3.94</td>
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</table>
3.8 Injection pressure charts

Injection assembly 50

1. Screw D = 18 mm (0.709 inch)  
   2431 bar (35250 psi)

2. Screw D = 22 mm (0.866 inch)  
   1627 bar (23590 psi)

3. Screw D = 25 mm (0.984 inch)  
   1260 bar (18270 psi)

Figure: PL-0015.WMF
Injection assembly 75

1. Screw D = 18 mm  
   3038 bar  (44050 psi)

2. Screw D = 22 mm  
   2034 bar  (29500 psi)

3. Screw D = 25 mm  
   1575 bar  (22840 psi)

4. Screw D = 30 mm  
   1094 bar  (15860 psi)
3.9 Injection speed chart

These technical data refer to the injection flow in the open.

For Screw D = 30:
- cm³/sec (inch³/sec)
- 100 (4.27, 70)
- 90 (3.84, 63)
- 80 (3.42, 56)
- 70 (2.99, 49)
- 60 (2.56, 42)
- 50 (2.14, 35)
- 40 (1.71, 28)
- 30 (1.28, 21)
- 20 (0.85, 14)
- 10 (0.43, 7)

For Screw D = 25:
- cm³/sec (inch³/sec)
- 100 (4.27, 70)
- 90 (3.84, 63)
- 80 (3.42, 56)
- 70 (2.99, 49)
- 60 (2.56, 42)
- 50 (2.14, 35)
- 40 (1.71, 28)
- 30 (1.28, 21)
- 20 (0.85, 14)
- 10 (0.43, 7)

For Screw D = 22:
- cm³/sec (inch³/sec)
- 55 (3.36, 55)
- 49.5 (3.02, 49.5)
- 44 (2.68, 44)
- 38.5 (2.35, 38.5)
- 33 (2.01, 33)
- 27.5 (1.68, 27.5)
- 22 (1.34, 22)
- 16.5 (1.01, 16.5)
- 11 (0.67, 11)
- 5.5 (0.34, 5.5)

For Screw D = 18:
- cm³/sec (inch³/sec)
- 35 (2.14, 35)
- 31.5 (1.92, 31.5)
- 28 (1.71, 28)
- 24.5 (1.49, 24.5)
- 21 (1.28, 21)
- 17.5 (1.07, 17.5)
- 14 (0.85, 14)
- 10.5 (0.64, 10.5)
- 7 (0.43, 7)
- 3.5 (0.21, 3.5)
3.10 Injection volume chart

**Screw D = 30**

<table>
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<tr>
<td>63</td>
<td>90</td>
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<tr>
<td>70</td>
<td>100</td>
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**Screw D = 25**

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<tr>
<td>45</td>
<td>90</td>
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<tr>
<td>50</td>
<td>100</td>
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**Screw D = 22**

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<tr>
<td>8</td>
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<td>12</td>
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<tr>
<td>36</td>
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<td>40</td>
<td>100</td>
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</table>

**Screw D = 18**

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<td>22.5</td>
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<tr>
<td>25</td>
<td>100</td>
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</table>

Figure: PL-0017.WMF
3.11 Screw speed chart

![Screw speed chart](Figure: PL-0018.WMF)

1. Screw speed 420 min⁻¹ (standard torque)
2. Screw speed 336 min⁻¹ (stronger torque)

3.12 Clamping force charts PLUS 250 / PLUS 250 V

![Clamping force chart](Figure: PL-0018.WMF)

<table>
<thead>
<tr>
<th>shtn</th>
<th>kN</th>
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<tr>
<td>19.3</td>
<td>175</td>
</tr>
<tr>
<td>16.5</td>
<td>150</td>
</tr>
<tr>
<td>13.8</td>
<td>125</td>
</tr>
<tr>
<td>11.0</td>
<td>100</td>
</tr>
<tr>
<td>8.2</td>
<td>75</td>
</tr>
<tr>
<td>5.5</td>
<td>50</td>
</tr>
<tr>
<td>2.8</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>21</th>
<th>42</th>
<th>63</th>
<th>84</th>
<th>105</th>
<th>126</th>
<th>147</th>
<th>168</th>
<th>189</th>
<th>210</th>
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<tbody>
<tr>
<td>305</td>
<td>609</td>
<td>914</td>
<td>1218</td>
<td>1523</td>
<td>1827</td>
<td>2132</td>
<td>2426</td>
<td>2741</td>
<td>3045</td>
</tr>
</tbody>
</table>
3.13 Clamping force charts Plus 350 / Plus 350 V

<table>
<thead>
<tr>
<th>shtn</th>
<th>kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>38,5</td>
<td>350</td>
</tr>
<tr>
<td>34,7</td>
<td>315</td>
</tr>
<tr>
<td>30,9</td>
<td>280</td>
</tr>
<tr>
<td>27,0</td>
<td>245</td>
</tr>
<tr>
<td>23,2</td>
<td>210</td>
</tr>
<tr>
<td>19,3</td>
<td>175</td>
</tr>
<tr>
<td>15,4</td>
<td>140</td>
</tr>
<tr>
<td>11,6</td>
<td>105</td>
</tr>
<tr>
<td>7,7</td>
<td>730</td>
</tr>
<tr>
<td>3,9</td>
<td>35</td>
</tr>
</tbody>
</table>

Figure: PL-0018.WMF

3.14 Clamping speed charts
3.15 Mould dimensions

Minimum effective mould diameter

With the 2 clamping cylinders the clamping system ensures a gentle application and even distribution of the clamping force.

These functions can only be fulfilled if the effective diameter of the mould does not fall below a certain minimum, so that "wrap-round" of the mould mounting platens is kept within acceptable limits.

Since the dimensional accuracy of the injection moulded parts, the loading on the mould and the mould's function especially with complex tooling (multi-plate tools, side actions) are affected by the wrap-round of the mould mounting platens, keeping to these guidelines will ensure that unacceptable overloading of the clamping unit and the mould are avoided.

Thus the following minimum mould dimensions should be observed, bearing in mind the required clamping force in respect of mould loading and energy consumption.

PLUS 250 - PLUS 250 V
min. mould diameter 160 mm (6.3 inch)

PLUS 350 - PLUS 350 V
min. mould diameter 160 mm (6.3 inch)

Special attention must be paid to off-centre moulds and to parallelism of the mould and mould parting surfaces. Any deficiency here can cause deformation of both the mould and the clamping unit, with a very detrimental effect on the service life of sealing and guiding components.

Maximum mould weights

The required dimensional accuracy of the injection moulded part, the loading and the mould's function especially with complex tooling (multi-plate tools, side actions) are heavily dependent upon the parallelism of the mould mounting platens.

The degree of parallelism required by EUROMAP 9 will be achieved if the following mould weights are not exceeded:

PLUS 250 - PLUS 250 V
min. mould weight 140 kg (315 lb)

PLUS 350 - PLUS 350 V
min. mould weight 140 kg (315 lb)

The total weight of the mould half on the moving platen must not be more than 2/3 of the total mould weight given in the table.
3.16 Conversion table for shot weights

The maximum shot weights (g/oz) are calculated by multiplying the theoretical shot volume (cm³/cu inch) by the factors given above. The grey fields contain the factors for thermoset plastics.

<table>
<thead>
<tr>
<th>Material</th>
<th>Factor</th>
<th>Material</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>0.88</td>
<td>PP + 40% Talcum</td>
<td>0.98</td>
</tr>
<tr>
<td>CA</td>
<td>1.02</td>
<td>PP + 20% GF</td>
<td>0.85</td>
</tr>
<tr>
<td>CAB</td>
<td>0.97</td>
<td>PS</td>
<td>0.91</td>
</tr>
<tr>
<td>PA</td>
<td>0.91</td>
<td>PVC-rigid</td>
<td>1.12</td>
</tr>
<tr>
<td>PC</td>
<td>0.97</td>
<td>PVC-plasticised</td>
<td>1.02</td>
</tr>
<tr>
<td>PE</td>
<td>0.71</td>
<td>SAN</td>
<td>0.88</td>
</tr>
<tr>
<td>PMMA</td>
<td>0.94</td>
<td>SB</td>
<td>0.88</td>
</tr>
<tr>
<td>POM</td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>0.73</td>
<td>PF</td>
<td>1.3</td>
</tr>
<tr>
<td>PP + 20% Talcum</td>
<td>0.85</td>
<td>UP</td>
<td>1.6</td>
</tr>
</tbody>
</table>

3.17 Weights of screws and barrels

Load requirements for lifting gear for barrels including screws when changing screws and barrels.

<table>
<thead>
<tr>
<th>Screw diameter [mm]</th>
<th>Weight [kg]</th>
<th>Weight [lb]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>22</td>
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<td>45</td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
<td>45</td>
</tr>
</tbody>
</table>

3.18 Torque settings for bolts

<table>
<thead>
<tr>
<th>Nominal thread size</th>
<th>Torque setting for fitting tensile strength class 8.8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Nm]</td>
</tr>
<tr>
<td>M 10</td>
<td>42</td>
</tr>
<tr>
<td>M 12</td>
<td>72</td>
</tr>
<tr>
<td>M 14</td>
<td>114</td>
</tr>
<tr>
<td>M 16</td>
<td>174</td>
</tr>
<tr>
<td>M 20</td>
<td>340</td>
</tr>
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<td>M 24</td>
<td>580</td>
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<tr>
<td>M 27</td>
<td>855</td>
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<td>M 27 x 2</td>
<td>900</td>
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<tr>
<td>M 30</td>
<td>180</td>
</tr>
<tr>
<td>M 33 x 2</td>
<td>180</td>
</tr>
<tr>
<td>M 36</td>
<td>2030</td>
</tr>
<tr>
<td>M 36 x 2</td>
<td>2200</td>
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<tr>
<td>M 39</td>
<td>2620</td>
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<tr>
<td>M 42</td>
<td>3240</td>
</tr>
<tr>
<td>M 48</td>
<td>4890</td>
</tr>
</tbody>
</table>

3.19 Mould mounting dimensions

Please refer to the appendix of chapter.

3.20 Foundation and installation plan

Please refer to the appendix of this chapter.
4.0 Transport - Installation

4.1 General information

After delivery of the injection moulding machine (hereinafter called IMM) it should be checked immediately for any damage and for completeness.

The IMM delivery kit includes:

- Operating manual
- Levelling mounts (option)

All keys etc. for the switch cabinet, guarding etc. are to be found attached to the main switch.

We would recommend to have the installation of the IMM carried out by Battenfeld personnel. We can accept no responsibility for loss, damage or injury resulting from improper installation.

The foundation plan and installation plan can be found in the chapter "Technical Data". This chapter includes, amongst other information, the weights and dimensions which should be taken into account when installing the IMM. The installation drawings have been simplified.

4.2 Storage

The IMM is packed as standard to withstand transportation without damage. However it should be commissioned immediately after handover from the transport company.

If it is to be stored for a longer period, our customer service department has to be contacted.

4.3 Unloading

Trouble free operation and some clauses of the guarantee are conditional upon proper unloading of the IMM!

The IMM may only be lifted and moved horizontally and using the provided lifting and transport elements. It is essential that the slings are prevented from slipping!

The safe working load of the crane and the slings must equal or exceed the weight of the IMM. See "Technical Data" chapter, Foundation and installation plan for details!

Follow without fail the transport plan fixed to the IMM!

No persons may stand or linger under the suspended load!

The complete IMM may only be placed on a level surface capable of supporting the appropriate load!
4.4 Space requirement plan

The exact space requirement can be taken from the "Foundation and Installation Plan" in the "Technical Data" chapter.

For maintenance work 0,6 m (25 inch), 1,3 m (56 2inch), must be allowed.

4.5 Transporting the IMM

If the transport plans do not agree with the following descriptions and diagrams, the transport plans in the "Technical Data" chapter are to be taken as definitive!

Forklifts / Crane transport

When using forklifts, the prescribed lifting points given in the "Foundation and Installation Plan" in Section "Technical Data" must be used.

PLUS H

[Diagram of IMM with forklift]

PLUS V

[Diagram of IMM with crane]
4.6 Installing the IMM

The IMM may only be installed in a dry, dust-free environment above freezing point.

A special foundation is not required. However, it must have a level surface and support shocks, as well as the weight of the machine.

Levelling mounts

The levelling mounts (option) allow installation of the IMM without fixing it to the floor. They enable the IMM to be levelled, act as shock absorbers and protect the environment by reducing the noise level. The mounts facilitate installation and removal of the IMM since they are not fixed to the floor and are adjustable for height.

4.7 Removing preservative agents

General information

All unplated moving parts and guides (tie-bars, piston rods, etc.), must have the rust protection removed, using cloths soaked in white spirit, paraffin (kerosene) or similar solvents.

Small components delivered with the IMM such as screw tips and check rings are protected by wax dipping. The wax coating should be removed before use.

Caution
Even a single stroke without removing the corrosion protection can drive it into the guides and lead to wear!

If not expertly preserved warranty is invalidated.

These cleaning fluids are considered hazardous to health and are flammable. Follow the manufacturers’ instructions!

The local regulations must be observed when disposing of these liquids and cloths soaked in them!
**Clamping unit**

1. Mould mounting surfaces  
2. Ejector coupling and guides  
3. Tiebars  
4. Clamping platen slideways  
5. Stroke transducer rod  
6. Rack of the mechanical scotch bar (option)

**Injection side**

1. Nozzle movement cylinder piston rods  
2. Carriage slideways injection unit  
3. Barrel, screw shaft and coupling  
4. Piston rods Injection cylinder  
5. Material hopper (inside)

---

**4.8 Levelling the IMM**

**General information**

A machine spirit level with an accuracy of 0.1 mm/m (0.004 in/3.281 ft) and a true straight-edge are essential for levelling the IMM. In addition the machine must be equipped with levelling mounts (option).

**Injection unit**

The centricity of the nozzle has been set in the factory, but must still be checked after moving the IMM, and readjusted if necessary (see structure and function chapter).

- Fill with hydraulic oil; see "Hydraulic unit"
- Connect power; see "Electrical equipment" paragraph
- Select "Setting" mode
- Move the injection unit back until the nozzle is flush with the nozzle side mould mounting surface
- Switch off at the main switch and secure against accidental reconnection
4.9 Hydraulic unit

**Caution**

The IMM’s hydraulic unit requires oil of the cleanliness class 15/12 to ISO 4406. Contamination above this cleanliness class by improper filling or use of unsuitable hydraulic oil will invalidate the guarantee!

If hydraulic oil becomes contaminated with water it will be of inferior quality and must not be used any further!

If the hydraulic system is not relieved of pressure before work is started it may empty explosively with the risk of damage and injury!

If the clamping platen, nozzle and screw are not in one of their limit positions then the hydraulic system is relieved from pressure. Any residual pressure can be released by carefully loosening (but not completely undoing) a hydraulic fitting.

Secure the main switch in the OFF position so that it cannot be accidentally reconnected by pressing the red locking bar.

**Oil filling**

Unscrewing the coverplate on the underside of the machine allows access to the filling-venting filter. 125 l (33 gal) of hydraulic oil is used for the first filling of the integrated oil-tank.

**Caution**

Test the hydraulic oil for the possible ingress of water!

Never switch the IMM on without hydraulic oil. Even the shortest period of running will damage hydraulic equipment!

Before switching on for the first time the hydraulic pump housing(s) must be primed with hydraulic oil via the leakage line!
Caution
Before switching on the hydraulic pump the hydraulic motor's direction of rotation should be checked!

Caution
Before switching on the IMM the hydraulic oil should be allowed to "stand" for approx. 1 hour to let the air trapped during filling escape!

Air bleeding

After filling the oil tank air must be bled from the hydraulic system.

• Connect power; see "Electrical equipment" paragraph
• Connect cooling water; see "Water system" paragraph
• Press the "Hydraulic start" key to switch on the hydraulics
• Press the "Setting" key
• Open and close all safety gates
• Drive the clamping platen, nozzle and injection piston to and fro over their whole stroke several times

The IMM is effectively bled when no oil foam appears in the hydraulic tank, movements are smooth and there are no strange noises.

The oil level should be checked after bleeding and topped up if necessary. Care must be taken to use the same oil type.

Any oil leaks arising after a few hours' running are usually cured simply by tightening the fittings.

Core-puller (option) - see chapters "Structure and function" / "Hydraulic unit"

Hydraulic core pullers may only be fitted and put into operation by a hydraulics expert. The safety regulations in the "Safety" chapter are to be followed without fail!
4.10 Water system

Caution
When installing water pipework note the corrosion stability of metallic materials against water in accordance with DIN 50930!

Water quality

If there are deviations from the following guidelines please contact our technical customer service or one of our subsidiaries. The addresses can be found in the “Customer service” chapter.

pH value: 6,5 - 9
Water hardness: < 1,8 mmol / l (681 ppm / gal)
Solids: < 0,03 % (30 ppm)
Filter mesh: < 100 µm (0.004 inch)

In the relation of solids content to water hardness it should be noted that the harder the cooling water is, the lower the solids content has to be. If the solids content is above 0.003 % (30 ppm), a water filter with a mesh size of < 100 µm (0.004 inch) must be installed in the supply line.

It is also recommended to add a corrosion inhibitor to the cooling water (e.g. Ferrophos 8579 from Henkel).

We recommend ethylene glycol type 420 as an antifreeze (60 % water and 40 % ethylene glycol). This is suitable for a temperature range down to -30 °C (-22 °F) and is also a corrosion inhibitor.

Cooling water connection

If the pressure in the cooling water system is not released before starting work, this may cause an explosive pressurisation with the risk of damage and injury!

The cooling system for the IMM can also be run as a closed cooling system. The purest, most chalk-free water should be used. The required nominal diameters of the hoses are quoted in the "Technical Data" chapter. The bore of the flow and return lines must not be smaller than those of the connections on the IMM.

Cooling water flow controls

The cooling water flow controls provide cooling water for various users, such as mould, screw barrel, etc., from a common water supply. The cooling water flow rate and thus the different temperatures of the various consumers are controlled by the appropriate hand-wheels.

Burning hazard if touched! Wear suitable protective clothing with water temperatures above 50 °C (122 °F)!
Injury hazard to operating and other personnel and possible damage to cooling water flow control if used at improper temperatures and pressures!

The cooling water pressure must be set for different temperatures according to the following table:

| Temperature max. pressure | Temperature max. pressure
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>40 °C (104 °F) 10 bar 145 psi</td>
<td>60 °C (140 °F) 8 bar 116 psi</td>
</tr>
<tr>
<td>80 °C (176 °F) 6 bar 87 psi</td>
<td>100 °C (212 °F) 4 bar 58 psi</td>
</tr>
</tbody>
</table>

• The cooling water hoses must be routed so that unhindered water supply and return are ensured. Kinks and squeezing will prevent the optimised flow of the cooling water.

Water assemblies have to be expertly installed and laid. Fittings, length and cross chapter have to meet the requirements!

• The hoses must be suitable for the system pressure (max. 10 bar - 145 psi) and the temperatures used (max. 100 °C - 212 °F)

Before the cooling water flow control is connected it must be ensured that the hand-wheels are closed clockwise.

Next, the various users are connected to the cooling water flow controls.

Now the cooling water flow control is connected to the cooling water system. By turning the two hand-wheels counterclockwise, the cooling water flow is opened and the required flow rate can be set.

Using a marker ring, the required flow rate can be marked so that the desired flow rate can be set again easily after a user has been turned off.

• Make sure the hoses are long enough to allow for movement of the various units.
The flow rate set can be calculated from the bobbin’s position in the water stream and the scale using the following chart.

Flow range of each circuit (default setting 4 l/min, 0.88 imp.gal/min):
- Brass bobbin: 0.5 - 8 l/min (0.11 - 1.76 imp.gal/min)
- Temperature: max. 80 °C (176 °F)
- Pressure: max. 10 bar (145 psi)

Oil cooling

The hydraulic oil is cooled in a heat exchanger. In the oil cooler cooling water is passed through cooling coils immersed in the hydraulic oil.

A pilot solenoid valve regulates the water flow. It starts and stops the cooling water flow as necessary to ensure constant oil temperature.

A temperature sensor in the hydraulic tank measures and monitors the oil temperature and sends the actual value to the IMM's control unit. This in turn orders the solenoid valve to be opened or closed.

Water assemblies for cooling the hydraulic system have to be expertly laid and installed. Fittings, length and cross chapter have to meet the requirements!

- The cooling water hoses must be routed so that unhindered water supply and return are ensured. Kinks and squeezing will prevent the optimised flow of the cooling water.
The hoses must be suitable for the system pressure and the temperatures reached in use.

The IMM is most efficient at an oil temperature between 45 °C and 50 °C (113 °F and 112 °F). The maximum water supply temperature must not exceed 30 °C (86 °F).

Cooling water consumption conditions:
- Oil side max. 16 bar 232 psi
- Water side max. 16 bar 232 psi
- Water: 2 m/s 1,8 yd/s
- Oil-water: 25 °C 77 °F

**Temperature control unit**

Temperature control units (option) are used for liquid temperature conditioning of moulds, barrels and screws.

⚠️ **Before operating the IMM its Safety regulations and those of the temperature control unit must be observed without fail!**

⚠️ **A temperature control unit may only be installed by a qualified electrician (according to DIN VDE 0105, or IEC 364)!**

The installation, connection and commissioning of the temperature control unit are detailed in the separate Operating Manual and in the corresponding wiring diagram in the "Spares / Plans" chapter.

The standard location for the connection(s) is on the side of the switch cabinet.
4.11 Pneumatic system

Air supply unit

*Compressed air piping for the pneumatic system must be expertly laid and installed. Fittings, length and cross chapter have to meet the requirements!*

*Work at the pneumatic system may only be carried out by a skilled pneumatic technician!*

*If the pneumatic system is not relieved from all pressure before work starts, there is a risk of explosive emptying with possible damage or injury!*

---

**UNIFEED material feeder**

The UNIFEED material feeder (option) replaces the hopper so that production is not interrupted by filling the hopper.

It is especially suitable for feeding the following polymer granulates: PE-HD, PE-LD, PS, PA, PA + GF, PP, ABS, POM, PPO.

The UNIFEED material feeder is well suited to conveying regrind and virgin materials together. The granule size, however, must no be larger than 3 - 4 mm (0.12 - 0.16 inch).

---

**Setting**

- Turn pressure valve control knob (1) clockwise until the desired pressure (min. 6 bar - max. 10 bar / min. 87 psi - max. 145 psi) is shown on the pressure gauge (3)

---

*If the material feeder is located higher than the average body height, climbing aids and working platforms which meet the legal safety requirements must be used for filling!*
• Move the climbing aid in front of the IMM
• Place the material feeder base plate on the hopper support and fix with 5 bolts (in delivery kit)
• Mount the material feeder on the base plate and attach it with knurled screws
• Line up the suction tube with the mounting holes on the day bin (material reservoir)
• Fit the air valve and proximity switch and connect according to wiring diagram
• Position the proximity switch directly on the perspex and adjust it with the adjusting screw so that the LED lights up when the tube is full and goes out when the tube is empty
• Attach the compressed air hose (ND 19 mm / 0.75 inch) to the connecting branch and fasten with a hose clip
• The air hose must be laid so that an unrestricted air supply is guaranteed. Care must be taken not to kink or crush hoses
• The hose must be long enough to allow for the movement of the injection unit
• The hose must be suitable for the system pressure (max. 7 bar - 101 psi) and the temperatures reached in use

4.12 Electrical equipment

The IMM may only be connected to a power supply which corresponds in terms of current type, voltage and frequency to the data given on the electrical specification plate.

The machine can be connected to a power supply with a frequency of 50 Hz or 60 Hz.

The PLUS-series is supplied in three different voltage variants.

a) **Voltage 3~230/400 Volt**
The mains voltage is determined according to the norm IEC at 3~230/400 Volt (+6 %, -10 %).
In addition the machines can be operated with a power supply of 3~220/380 Volts or 3~240/415 Volts within the above voltage variations. A neutral conductor connector is essential here.

b) **Voltage 3~230 Volts**
A neutral conductor connector is not essential here.

c) **Voltage 3~200 Volts - 220 Volts**
The machine can be operated within the above voltage limits. A neutral conductor connector is not essential here.
Electrical installation may only be carried out by a qualified electrician (qualified to DIN VDE 0105 or IEC 364 or equivalent)!

The electrical supply lines must be designed according to the specifications on the nameplate!

The currently valid local regulations on earthing and overload protection (overload, wrong polarity protection) in TN-, IT- or TT supplies must be observed without fail by the proprietor of the machine!

The protection for the phase conductors and the neutral conductor (IT-supply) must be arranged to comply with the data on the electrical specification plate!

Connection as "Classical zero rising" (EN-conductor) must not be used. E-conductor and N-conductor (if used) must always be connected separately!

Main connector
The connection directly to the main switch
The correct phase sequence (righthand field) is to be noted here.

The main switch is further equipped with an N-switch contact leading to all-pole separation.

The cable feed is alternatively possible on two PG 29 inlets on the side of the electric cabinet

Checking the direction of rotation of the hydraulic pump's drive

Before switching on the IMM it must be ensured that:

- The hydraulic system is sealed, the electrical cabinet is closed, the hydraulic tank is filled and the hydraulic pump(s) has/have been primed
- The guarding and safety gates have been properly fitted and are closed

Caution
The pump will not work correctly if the direction of rotation is wrong and the drive and the hydraulic pump will fail!

- Connect the supplies, as described under "Electrical equipment" paragraph
The hydraulic motor's direction of rotation may only be tested by a qualified electrician (qualified to DIN VDE 0105 or IEC 364 or equivalent)!

- Open the electrical cabinet
- Connect a phase sensor to lines 1L1, 1L2 and 1L3 on the main switch
- Switch on the power supply (low voltage distribution)
- The phase sensor must now indicate a right-hand (clockwise) field

![Diagram showing direction of rotation](image)

- Switch off the power supply (low voltage distribution) if the direction of rotation is not correct and exchange two phase of the power connections 1L1, 1L2, and 1L3 of the mains cable in the electrical cabinet
- Close the electrical cabinet

Finally start the hydraulic pump(s) in "Setting mode" and allow to run for a few seconds without load in order to lubricate the pump(s).
4.13 Mould mounting

Preparation

If the IMM has a robot interface (according to Euromap 12; VDMA) and the IMM is to be run without the robot, then the latter should be switched off and the supplied dummy plug (430X1) must be inserted. Operation of the IMM without this linking out is not possible. The installation of the links is detailed under "Interfaces". The interface is located on the side of the electrical cabinet or in the rear middle panel.

It is a good idea to check the following before mounting a mould, to avoid unnecessary work:

- Mould height and dimensions must suit the IMM
- The sprue bush or hot runner radius must correspond to the IMM nozzle radius
- The centring mechanism must be the correct size for the boring in the nozzle (or moving) platen
- The length of the ejector bar and the ejector stroke must be compared with the IMM specification (see "Technical Data" chapter)
- Check that the water fittings are the right size
- The mould should have been checked for binding, seizing, missing or loose parts and badly adjusted side actions
- Water and air connections should be made to check for leakage

Danger! It must be ensured that no persons stand or linger under the suspended load!

The lifting gear should not be removed until the mould is bolted securely to both platens and this has been verified by authorised personnel!
When the above points have been checked the mould can be mounted. The following points should now be observed and followed without fail:

- The mould must hang vertically from the lifting gear
- The mould halves must be prevented from sliding apart
- The mould clamps (mounting elements for the mould; not supplied as standard with the IMM) must be the same height as the thickness of the mould bolsters, as otherwise there is a risk of the mould slipping

**Caution**

*The number of mould clamps must be adequate for the opening force!*

- Make sure the bolts are of the right length; at least 1.5 D. (D = diameters of thread)

- Use proper washers
- The above points apply equally to the mounting of a mould to platens with T-slots

**Mould mounting**

1. Switch on main switch
2. Press and release the emergency stop buttons on the IMM and robot, if present; the "Test EMERGENCY STOP" error message will disappear
3. Turn on water supply from cooling water system to oil cooler
4. Open and close all safety gates (to test the safety gate monitoring)
5. The hydraulic drive and at the same time the oil pre-heating are switched on with the "Hydraulic Start" key
6. After the control boots up the "Pass word - System" page will appear
7 Press the “Error messages” key; the “Error messages” page appears

The “Oil heating” fault symbol lights up
This error message disappears automatically as soon as the hydraulic oil comes up to operating temperature
See also the “Error messages” Section in the “UNILOG B2 Users’ Manual”

8 Return to the “Password - System” page with the “Machine general” key

9 Log on to the control

10 Enter the password “1998”

11 Press the “ENTER” key

12 If further error messages are displayed, see the "UNILOG B2 Operators’ Manual", "Alarm list" section to find out how to clear them

Once all the errors are cleared and the hydraulic pump is started, mould mounting can be continued

13 Mount mould on nozzle platen

13.1 Press the "Mould open" key and open the mould

13.2 Bring the mould into the open clamping unit

13.3 Locate the mould in the nozzle platen’s centring mechanism

13.4 Position the mould square to the IMM’s lateral axes

13.5 Attach the mould to the nozzle platen with mould clamps; it is essential to use bolts of the correct length; at least 1.5 D (D = diameters of thread) must screw into the IMM platen

The mould clamps (mounting elements for the mould; not supplied as standard with the IMM) must be the same height as the thickness of the mould bolsters, as otherwise there is a risk of the mould slipping

13.6 Press the "Mould Close" key and close the mould
14 Log off from the control

To prevent unauthorised persons from entering set values, the user must log off from the control unit after quitting the setting mode!

14 Fix mould to the moving platen

14.1 Press the "Mould Close" key and close the mould

14.2 Fix the mould to the moving platen with mould clamps; make sure the bolts are the correct length; see step 14.5

14.3 Remove lifting gear from mould

14.4 Remove the safety strap holding the two mould halves together

14.5 Connect the ejector coupling (mould to hydraulic ejector cylinder)

14.6 Press the "Mould open" key and crack the mould open

14.7 Press the "Setting" key; this avoids damaging the mould on initial opening

14.8 Press the "Mould open" key and open the mould
4.14 Interface

The interfaces and sockets for peripheral equipment are located on the side of the electrical cabinet (Option).

Details of installation, connection and commissioning are to be found in the appropriate Operating manuals.

⚠️

Before operating the IMM with peripheral equipment, its safety regulations and the operating instructions of the peripheral equipment in question must be observed without fail!

Electrical installation may only be carried out by a qualified electrician (qualified to DIN VDE 0105 or IEC 364)!

For some peripheral equipment a dummy plug must be used in the interface when the IMM is operated without the peripheral equipment.

See also the appropriate wiring diagrams in "Spare parts / plans" chapter.

Before switching on the emergency stop buttons should be released by rotating a quarter turn clockwise and program selection switches set to the required position.

The start impulse for automatic operation of a peripheral device is given by starting an automatic cycle of the IMM.

Automatic operation is stopped by operating an emergency stop button or by switching the IMM off or out of automatic mode.
4.15 Checking safety devices

The safety devices can only fulfil their purpose if their faultless operation can be guaranteed. Therefore it is necessary to check the following for effective function before operation:

- Electrical closing interlock: Limit switches securely fixed
- Hydraulic interlock: limit switch securely fixed
- Mechanical scotch (Option): free movement of swinging scotch (flag) on the moving platen and the correct position (teeth) of the stop rod

Caution
If a fault arises on the IMM which causes the mechanical scotch to come into operation, Battenfeld Customer Service or the responsible agent must be contacted!

- Purge guard: free movement and securely fixed limit switches
- Purge guard, safety grid and guarding: security of all fixing bolts and undamaged condition

4.16 Test run and interlock test

Operating and other personnel may only stand in front of the IMM on the operator’s side during operation!

It is forbidden to stand on the IMM or reach into the injection unit during operation!

Install required safety devices. The safety regulations in the "Safety" chapter are to be followed without fail!

- After electrical installation safety devices are to be tested (e.g. earthing resistance)
- Check hydraulic lines and components for leaks
- Check all visible fittings for security
- Close safety gates and check for proper fitting
- Clear inside of IMM of all foreign bodies (forgotten tools, etc.)
- Set peripheral equipment to the starting position, i.e. the position in which no damage to it or to IMM components is possible
- Turn on water supply from cooling water system to oil cooler
- Check the function of the safety systems
**Caution**
It is essential to select "Setting" mode, or else the test run may damage the mould!

**Ejector movements may only be tested with the mould open or else the mould may be damaged!**

Check the movements of the various units as follows:

- Switch on main switch (to "1")
- Open and close the clamping unit's safety grid (to check the safety grid monitoring)
- Switch on hydraulics ("Hydraulics start" key)
- Start the pump without load and run for a few seconds to make sure of adequate lubrication
- Press "Setting mode" key
- If the mould has been left in the "Mould closed" position after mould mounting, open it with the "Mould open" key

The movements of the other units (ejector, screw and nozzle) can now be checked and their functions tested.
5.0 Structure and function

5.1 View of assemblies - PLUS

5.2 Clamping unit
5.3 Injection unit
5.4 Hydraulics
5.5 Pneumatics (option)
5.6 Electrics
5.7 Control unit
5.1 View of assemblies - PLUS-V

5.2 Clamping unit
5.3 Injection unit
5.4 Hydraulics
5.5 Pneumatics
5.6 Electrics
5.7 Control unit
5.2 Clamping unit - PLUS

Technical specification

The clamping unit basically consists of a clamping platen (pos. 1) in a casting design with integrated hydraulic ejector (pos. 2), a nozzle platen (pos. 3) in the casting design with a clearance zone (pos. 4) which also serves as a purge guard for the injection assembly. In addition the guides for the piston rods on the clamping cylinder (pos. 5) are integrated in the nozzle platen.

The two clamping cylinders consist of cylinder pipe (pos. 6), piston rods (pos. 7), quick lifting cylinder piston (pos. 8), seal bush 8 (pos. 9) fixing nuts (pos. 10) and the slide plates (pos. 11) for the clamping platens.
Description of functions:

The connection with the machine body is reached through the nozzle platen. The clamping platen is equipped in accordance with a standard support, which takes the weight in the machine body.

The slide plates of the clamping platen are to be lubricated every 2500 operating hours.

The clamping force is applied by two clamping cylinders. Through the extremely stable structure of the box-shaped clamping and nozzle platen an optimum distribution of the clamping force is achieved.

The quick lifting cylinder piston allows a quick closing movement and also a sensitive mould safety device.

The clamping force build up is implemented via the surface force of the piston rod, which is designed in such a way that the full clamping force is achieved at a hydraulic pressure of 210 bar (3045 psi). This clamping pressure, which is purposefully kept at a low level, enables a long life-span of the seals and guides in the guide bushing.

The piston rod is inserted into the nozzle platen. Special attention is paid to the distance to the seals, so as to ensure that the hydraulic seals are not damaged or destroyed if the piston rods are damaged during the mould mounting.

There is a void between the seals and the guides where oil leakage is collected and can drain away.

The ejector is designed as a double action cylinder and has been integrated in the box-frame-construction of the clamping plate.

Mould mounting

The mould is fixed in the clamping unit from above with the appropriate lifting equipment. The mould is positioned in the nozzle platen by means of alignment (D = 110 f7, 4.33 inch).

The fastening can be carried out in three different ways:

1. Directly screwing down at least two diagonal threads per half mould, in the mounting platen (M12, tightening torque 70 Nm, 98 ft lb)
2. Directly screwing through the mounting platen by means of 4 cap head screws M12 x 95 (tightening torque 70 Nm, 95 ft lb) in the designated clearance holes (D = 14; 0.55 inch)
3. A fastening with at least 2 mould clamps per mould half, which must be diagonally aligned on each mounting platen.
Adjustment instructions for mould height adjustment.

Ex works the minimal mould height is set at 150 mm (5.9 inch). The mould height can be adjusted by the fixing nuts, so that the maximum opening stroke can be used to its full potential. To adjust the mould height proceed as follows:

1. Mark the intended area for the fixing nuts (pos 1) on the clamping platen
2. Remove the fastening screws (pos 2)
3. Unscrew the rear fixing nuts (pos 3) to the end of the piston rod
4. Calculate the required number of rotations of the fixing nuts. The screw thread has a gradient of 4 mm, which determines the setting range:
   If the result is not an even number, it must be rounded up to the next even number
   Set the adjustment of the fixing nuts
5. Unscrew the clamping platen (pos. 4) back to the stop on the fixing nuts. Verify the alignment of the markings
6. Screw the rear fixings nuts (pos 3) to 2 mm (0.08 inches) to the front fixing nuts and check the alignment of the fixing holes
7. Screw in the fastening screws and tighten (torque of 40 Nm; 54ft lb)

The long guiding movement of the piston rods and the clamping platen on the piston rod ensure that no platen parallelism errors occur due to the mould height adjustment.
5. **Mechanical scotch (Option):**

The mechanical scotch prevents the accidental closing of the clamping unit by opening the safety gate.

The main components are the toothed scotch-bar, which is fastened to the clamping platen and the pivoted stop, which is fastened to the nozzle platen.

By opening the safety gate the pivoted stop falls onto the scotch bar because of its own weight. This activates a locking function which closes the clamping unit and which prevents the mould closing.
5.2 View of assemblies - PLUS-V

Technical specification

The main components of the clamping unit are a nozzle platen (pos. 1) in the casting design, a mould mounting platen (pos. 2) in the casting design with an integrated hydraulic ejector (pos. 3) and the two guide tie-bars (pos. 4).

The two clamping cylinders consist of cylinder pipe (pos. 5), piston rods (pos. 6), quick lifting cylinder piston (pos. 7), seal bush (pos. 8) and the fixing nuts (pos. 9).
Description of functions PLUS V

The connection with the machine body is reached via the mould mounting platen.

The clamping force is applied by two clamping cylinders. Through the extremely stable structure of the box-shaped mould mounting and nozzle platen an optimum distribution of the clamping force is achieved.

The quick lifting cylinder piston allows a quick closing movement and also a sensitive mould safety device.

The clamping force build up is implemented via the surface force of the piston rod, which is designed in such a way that the full clamping force is achieved at a hydraulic pressure of 210 bar (3045 psi). This clamping pressure, which is purposefully kept at a low level, enables a long life-span of the seals and guides in the guide bushing.

The piston rod is inserted into the mould mounting platen. Special attention is paid to the distance to the seals, so as to ensure that the hydraulic seals are not damaged or destroyed if the piston rods are damaged during the mould mounting. There is a void between the seals and the guides where oil leakage is collected and can drain away.

The ejector is designed as a double action cylinder and has been integrated in the box-frame-construction of the mould mounting platen.

Mould mounting PLUS V

The mould is introduced laterally or from the front with the appropriate lifting equipment. The mould is positioned in the mould mounting platen by means of alignment (D = 110 f7, 4,33 inch).

The fastening can be carried out in three different ways:

1. Directly screwing down at least two diagonal threads per half mould, in the mounting platen (M12, tightening torque 70 Nm, 98 ft 1b)

2. Directly screwing through the mounting platen by means of 4 cap head screws M12 x 95 (tightening torque 70 Nm, 95 ft 1b) in the designated clearance holes (D = 14; 0.55 inch)

3. A fastening with at least 2 mould clamps per mould half, which must be diagonally aligned on each mounting platen.
Adjustment instructions
Mould height adjustment PLUS V

1. Mark the intended area for the fixing nuts (pos. 1) on the clamping platen
2. Remove the fastening screws (pos. 2)
3. Unscrew the rear fixing nuts (pos. 3) to the end of the piston rod
4. Calculate the required number of rotations of the fixing nuts. The screw thread has a gradient of 4 mm, which determines the setting range:
   - If the result is not an even number, it must be rounded up to the next even number
   - Set the adjustment of the fixing nuts
5. Unscrew the nozzle platen (pos. 4) back to the stop on the fixing nuts. Verify the alignment of the markings
6. Screw the rear fixings nuts (pos. 3) to 2 mm (0.08 inches) to the front fixing nuts and ensure the alignment of the fixing holes
7. Screw in the fastening screws and tighten (torque of 40 Nm; 54ft lb)

Ex works the minimal mould height is set at 200 mm (5.9 inch). The mould height can be adjusted by the fixing nuts, so that the maximum opening stroke can be used to its full potential. To adjust the mould height proceed as follows:

The long guiding movement of the piston rods and the nozzle platen on the piston rod and the additional tie bars ensure that no platen parallelism errors occur due to the mould height adjustment.

The opening and closing movements can only be triggered by a reversing injection unit. The injection unit must be reversed in the operating mode "Manual" until the end of the t1 time "nozzle-removal-time".

In general the injection unit must always be reversed so far, so that a safe opening or closing movement can be carried out.
Mechanical scotch PLUS V

The mechanical scotch prevents the accidental closing of the clamping unit by opening the safety grid.

The main components are the toothed scotch-bar, which is fastened onto the clamping platen and the latch, which is fastened pivoted to the mould mounting platen.

On opening the safety hood the latch locks the toothed rack. This activates a locking function which closes the clamping unit and which prevents the mould closing.

The latch is monitored by the limit switch on each opening-closing cycle of the safety grid.
5.3 Injection unit

Technical specification

The injection unit consists of a plasticating unit (pos. 1), mounting for the plasticating unit (pos. 2), fixing nuts for the screw barrel (pos. 3), the drive unit for metering including hydraulic motor (pos. 4), cylinder block (pos. 5) with integrated nozzle movement cylinders (pos. 6), injection cylinder (pos. 7) and the linear guides.
Description of functions:

The injection assembly is controlled on the linear guides and the nozzle movement cylinders.

The nozzle movement cylinders are directly integrated on the clamping cylinder and are double acting hydraulic cylinders. The nozzle movement cylinder is used to connect the nozzles to the mould and allows access to the nozzle in the rearmost position.

The screw is driven over a slow operating hydraulic motor, which acts over a toothed belt directly on the injection cylinder piston. During metering the injection piston is turned. With this design the bearings, which must be made for the thrust bearing of the screws, can be omitted. This function will be hydraulically carried out. The injection pistons are also used for the screw coupling.

![Warning]

To ensure a long service life for the barrel heater bands, they should be checked when hot at regular intervals, starting with commissioning, for secure fitting.

Nozzle changing

Prerequisites:

1. Barrel purged empty
2. Heat the barrel up to the processing temperature of the last used material

Working cycle

1. Drive the nozzle cylinder of the injection unit back to the stop
2. Unplug and remove the nozzle heater band
3. Unscrew the nozzle with a suitable ring spanner
4. Screw in new nozzle, while ensuring that the screw thread is lubricated with a heat resistant Molykote
5. Screw nozzle home but do not finally tighten
6. Fit nozzle heater band and plug it in
7. After heating the nozzle to operating temperature is should be finally tightened
Adjustment instructions nozzle centre

The nozzle centre is set on the factory premises and after transportation must be controlled, and if necessary adjusted, during commissioning.

According to the installation instructions the machine must be horizontally installed and then the injection unit must be adjusted according to the following instructions.

1. Measure the centre nozzle deviation against the central diameter both vertically and horizontally
2. If a horizontal deviation is detected, it can be corrected by adjusting the guide rails (pos. 1)
3. If a vertical deviation is detected, it must be moved into the prescribed position by the adjusting screws (pos. 2)
4. Fix nut (pos. 3) by lock nut

Finally carry out a control measurement. If the measurement shows a larger deviation than 0.2 mm the injection unit must be newly adjusted.

Changing the tooth belt and pretension

1. Disconnect screws and move the injection cylinder to the rear limit position
2. Loosen fastening screws (pos. 1, 3x) and tighten by hand, so that no gap can occur between the guide plates and the hydraulic motor
3. Move the hydraulic motor to the upper limit position by means of an eccentric disc (pos. 3)
4. Remove the distance screws (pos. 5 4x) and drag the guide plates (pos. 4) from the pulley
5. Remove pulley (pos. 6) from shaft
6. Lay toothed belt over pulley and fit on shaft, so that the toothed belt also slides over the upper pulley
7. Install guide plate with spacer (pos. 5)
8. Preload the toothed belt (note point 2) by means of an eccentric plate (pos. 3). Indentation pressure 140 N on the central toothed belt, indentation depth 2 mm (0.08 inches)
9. Tighten the hydraulic motor with fastening screws (pos. 1, 3x) (max tightening torque 80 Nm, 110 ft lb)

Changing the screws and screw barrel.

Working cycle:
1. Drive carriage cylinders back to rear limit position
2. Drive injection cylinder forward to stop
3. Disconnect the machine from the power supply by switching off main switch
4. Dismantle safety guard on the screw barrel
5. Loosen screw coupling (pos. 1, 2 x M6)
6. Disconnect washer from thrust piece (pos. 2) and remove feather key (pos. 3)
7. Loosen screw barrel nuts (pos. 4) and unscrew from thread
8. Pull screw barrel away towards the nozzle platen and move in and out in upward direction
9. Disconnect hoses for traverse cooling
10. Fit a new screw barrel and tighten with nuts
11. Screw coupling
12. Install safety guards
13. Install heater bands, sensors and hoses
14. Turn on the machine with the main switch and heat up to material temperature

Prerequisites:
1. Barrel purged empty
2. Heat up the screw barrel to the previously chosen temperature of the last used material, disconnect heater bands and sensors
Installation instructions for vertical injection uni.

Prerequisites:
1. Disconnect heater bands and sensors
2. Crane or appropriate lifting equipment

Working cycle:
1. Dismantle guard from above
2. Dismantle material conveyor, reel or material hopper
3. Install base plate on hydraulic block
4. Fasten lifting device (2 x M24) and hang crane under tension
5*. Unscrew grub screw (4 x M20) to adjust height
6*. Loosen screws (4 x M20) on clamping piece and remove horizontally
7. Lift the injection unit with crane, swivel by 90° and screw in the fixing screws (2 x M12) in the connecting tube
8. Lift the injection unit over the clamping unit, lower and tighten
9. Dismantle lifting device

⚠️ The safety gate may not be opened beforehand.

10**. Install all guarding panels and covers
11. Install material conveyors, reels or material hoppers on the base plate
12. Connect heater bands and sensors

* Only with the option of conversion kit
** Dependant on conversion kit
Conversion instructions for horizontal injection unit

Prerequisites:
1. Disconnect heater bands and sensors
2. Crane or appropriate lifting equipment

Working cycle:
1. Open up the nozzle platen completely and move the injection unit into the top position
   The safety gate however remains closed
2. Remove the base plate with material conveyors, reels or material hoppers from the screw barrel
3. Unscrew guard from above
4. Fasten lifting device in the injection unit with crane hooks (2 x M24) and screw in fixing screws (2 x M12) in the connecting tube
5. Dismantle injection unit (4 x M20) and lift with the crane
6. Open the safety gate and check if the clamping piece is fastened onto the tie bars

7. Remove coverplate

8. Move the injection unit in position over the machine body, unscrew the fixing screw and swivel the injection unit by 90° (so that it is in a horizontal position)

9. Connect the injection unit onto the clamping piece and tighten (4 x M20)

10. Adjust the height of the screws (4 x M20) by screwing in nuts to the stop

   Do not tighten

11. Dismantle lifting device

12. Loosen clamping piece on tie bars and set to the required height according to the table by adjusting the height of the screws

13. Tighten clamping piece

   Fix the height of the screws using the nuts. Only adjust the height of the screws if the clamping piece is loose.

14. Install material conveyors, reels or material hoppers on the screw barrel
5.4 Hydraulics

Pump unit

The electromotor, which is in permanent operation, sits on the motor-pump-suspension. This drives the hydraulic pressure pump over the coupling. The hydraulic pressure pump is a variable volume pump which is connected to the central hydraulic block by means of a hose assembly.

The maximum system pressure amounts to 210 bar (3045 psi).

Oil tank

The oil tank is a fixed component of the machine body and equipped with a filter along with a venting filter and an oil level indicator. The control system indicates if oil levels are too low. In this case the oil must be refilled to the marked level on the oil indicator.

In order to thoroughly clean the oil tank the lid of the tank can be removed by looseing some screws in the fitting.

Oil filtering

To improve the reliability and the longevity of the hydraulic components and seals, the hydraulic system is equipped with a backflow filter, which is integrated into the oil tank.

The backflow filter is situated on the reverse side of the machine below the central hydraulic block and is equipped with an electric contamination indicator.

An error message, in the form of a symbol, is displayed on the control panel if the filter becomes contaminated. In case this error occurs the filter element must be changed immediately.

\[\text{To ensure trouble free operation and long service life of the machine, only original filter elements may be used. (Hydac 0165R010BN/HC; article no. MB628)}\]

Oil cooler

An oil-suction-cooler, which lies in the oil tank, ensures adequate cooling of the hydraulic oil. It is essential to pay attention to the water supply, to ensure it does not become contaminated. In this case a water filter must be fitted in the supply to protect the operation of the cooling water valve.

This valve is inserted at the water supply and only takes as much water as is necessary to cool the oil.

Reducing water flow rate does not save any water.
Hydraulic oil preheating

As soon as the hydraulic pump is started the cold hydraulic oil is automatically preheated to a temperature of 40 °C (104 °F).

While the oil temperature is below this value, the screen shows an error message and the IMM can not be moved. On reaching the 40 °C (104 °F) mark the oil preheating switches off and the IMM is ready for use.

While the IMM is running the oil temperature is regulated to a constant 45 °C (113 °F). This is achieved by opening and closing the cooling water valve on the oil cooler.

If the oil temperature exceeds 60 °C (140 °F) an error message is shown on the screen. If the temperature climbs over 65 °C (149 °F), the control switches the IMM hydraulics off.

The reason for the oil's overheating must be established and the fault remedied (e.g. water supply failure, cooling water shut-off valve on oil cooler closed).

After operating the emergency stop button once the hydraulics can be restarted. In this way the hydraulic oil is cooled. No manner of movements (from the clamping and injection unit) are possible during this phase.

Hydraulic core puller

The hydraulic core puller (option) consists of a base plate on which the required hydraulic valves are installed and which includes the user connections (2 x R3/8" - AD/8S).

The hose assemblies and fittings belonging to the mould's core puller cylinder(s) are not included with the IMM.

It should also be noted that the available system pressure is 210 bar (3045 psi). All connections and fittings must be able to withstand this pressure!

Hydraulic core pullers may be connected and put into operation only by a hydraulics expert. The safety regulations in the "Safety" section must be followed without fail!
Control and display

System pressure (M)

The hydraulic system pressure is shown on a pressure gauge on the rear side of the machine.

Back pressure (SPA)

On the rear of the machine is the connection for the hydraulic back pressure. By converting the pressure gauge to the SPA connection the back pressure can be read during the metering phase.

Oil level indicator

The oil level gauge is on the right front side of the tank. If the oil level is too low the hydraulic oil is to be filled (see chapter 7 "Maintenance"). The oil level must be monitored daily to avoid any errors in the production processes.

Oil temperature

The oil temperature is measured in the oil tank. This temperature is indicated on the screen of the machine control unit to the operating personnel.

Setting the variable displacement pump

With a preselected pressure of approximately 70 bar (1015) and a preselected volume of approximately 50% the flow controller of the variable volume pump is set at $\Delta p$ with the movement "Nozzle backward". The connections PP (pressure prior to the flow restrictor) and M (pressure after the flow restrictor) are used as a measuring point on the control block.

The measurement should be carried out with the same pressure transducer and with pending hydraulic pressure.

10 bar (145psi) $\Delta p$ are set on the flow controller of the pump.

All pressure and speed settings are taken at an oil temperature of 45 °C (113 °F).
Proportional valve amplifier

The speed setting of the amplifier must be programmed in the following order:

a) Do not adjust the potentiometer "Dither" = Manufacturer’s setting
b) To move the "metering" preselect the speed to 20 %
c) Activate the movement "metering" and set the potentiometer "P3 - Zero point", so that the following rotational speed is reached at a preselection of 20 %

Standard hydraulic motor OMS 80 -> screw speed 84 rpm (hydraulic motor screw speed 92 rpm)

Special hydraulic motor OMS 100 -> screw speed 66 rpm (hydraulic motor screw speed 72 rpm)

d) To move the "metering" preselect the speed to 100 %
e) Activate the movement "Metering" and set the maximum screw speed with the potentiometer "P2 - sensitivity"

Standard hydraulic motor OMS 80 -> screw speed 420 rpm (hydraulic motor screw speed 462 rpm)

Special hydraulic motor OMS 100 -> screw speed 330 rpm (hydraulic motor screw speed 363 rpm)

P1 Ramp time
P2 Sensitivity
P3 Zero point
P4 Dither frequency
St 1 Main terminals
LED Display U_B

Set the proportional valve amplifier for speed (B. No.: 0.811.405.143; article No.: SG696).

The speed setting is controlled by a proportional speed valve. The command to the valve is controlled by the proportional amplifier.
f) Repeat setting steps b, c, d, until the settings are correct

g) Setting potentiometer "P1 - ramp time" to 0 %
   (Rotate clockwise to the stop = 10 msec = Manufacturer's setting)

Setting proportional valve amplifier for pressure (B. Nr.: 0.811.405.144; part nr.: SG335)

The pressure setting is controlled by a proportional pressure limiting valve. The command to the valve is controlled by the proportional amplifier.

The pressure setting of the amplifier must be programmed in the following order:

a) Do not adjust the potentiometer = Manufacturer's setting

b) To move the "Nozzle back" preselect the speed to 100 %

c) To move the "Nozzle back" preselect the pressure to 10 %

d) Activate the movement "Nozzle back" and set a pressure of 21 bar (304,5 psi) with the potentiometer "P3 - Zero point" at the measuring point MPS

e) To move the "Nozzle back" preselect the pressure at 95 %

f) Activate the movement "Nozzle back" and set the pressure from 200 bar (2893 psi) with the potentiometer "P2 - sensitivity." Maximum system pressure at 100 % is 210 bar (3045 psi)

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### Maximum pressure setting variable setting volume pump

**Attention:**

- **Adjustment is only necessary if 210 bar is not punched on the name plate of the pump at DR.**

a) For the "Nozzle back" movement preselect the pressure at 100 % and the speed at 70 %

b) Activate the movement "Nozzle back" and set the pressure at 220 bar (3190 psi) with the potentiometer "P2 - sensitivity"

c) Activate the movement "Nozzle back" and set the pressure to 210 bar (3045 psi) on the maximum pressure controller of the pump

d) Repeat the setting proportional valve amplifier for pressure
5.5 Pneumatics

UNIFEED Material Feeder

Scope

The UNIFEED material feeder (option) is designed for use on plastics processing machinery and is installed directly on the screw barrel instead of the hopper.

The material feeder is highly reliable as it has no moving parts and it is easy both to use and to service.

The following granular polymers can be conveyed by UNIFFED: PE-HD, PE-LD, PS, PA, PA + GF, PP, ABS, POM, PPO.

Structure and function

If the material level falls below the capacitive proximity switch (6) during metering, the pneumatic valve (2) opens. Compressed air is blown into the venturi tube (11) through the air jet (9) generating a partial vacuum which extends as far as the suction chamber (10) and the feed tube (4).

This vacuum sucks a granule - air mixture through the suction tube (5) and connecting hose (1) into the feed tube (4). A primary filter (8) separates the granules from the conveying air.

Dust is then removed from the conveying air in the secondary filter (12) before the is vented from the material feeder.
When the material level once again reaches the proximity switch, the air valve is closed, the airflow stops and the conveying cycle is finished.

At the end of every conveying cycle a small volume of compressed air is fed in pulses to the suction chamber (10), thereby cleaning the material dust automatically from the primary filter.

**Processing regrind**

The UNIFEED material feeder is well suited to conveying regrind and virgin materials together. The granule size must no be larger than 3 - 4 mm (0.12 - 0.06 inch).

The higher proportion of dust will lead to heavier loading of the filter, so that shorter cleaning intervals must be allowed for.

**Pneumatic core puller**

The pneumatic core puller (option) consists of an electrically actuated 4/2 pneumatic valve and all the consumer connections for a 6 mm bore plastic pipe NW 6 (0.24 inches).

The pneumatic core puller is located on the lefthand side of the machine well. The connection to the mould’s core puller cylinder is not supplied with the IMM.

It should be noted that the compressed air used should be dried and lubricated and limited to a pneumatic pressure of 6 bar (87 psi). All connections and fittings must be able to withstand this pressure!
Pneumatic safety hood (PLUS - V)

The pneumatic safety gate consists of a plexiglass cover (pos. 1), an electronically monitored safety bar (pos. 2), two pneumatic operating lifting cylinders (pos. 3), two check valves (pos. 4), two electronically operated pneumatic valves (pos. 5) and two manually adjustable flow control valves (pos. 6, 7).

The limit position cushioning may be set by means of the adjusting screws at the lifting cylinder.

The opening and closing speed can be set using throttle valves.

To prevent the safety gate from lowering two check valves have been installed.

According to its position, the safety gate can be opened or closed by pressing the "Cycle start" switch on the operator panel.
5.6 Electrics

Electric drive

The pump unit is driven by a three phase asynchronous motor.

The drive motor is coupled directly to the hydraulic pump and connected to suit the operating voltage.

When connected correctly (the phase sequence must give a righthand field, see "Transport - Installation" section) the drive motor will run left (seen from the D-end).

D - End: Drive end
N - End: Non-drive end (fan end)

Caution
Service and connection work on the terminal rail may only be carried out by an authorised electrician!

Switch cabinet

The electrical cabinet is easily accessed on the front of the IMM and contains most of the electrical components necessary for operation.

1 Error lamp
2 Main isolator
3 Control panel
4 EMERGENCY STOP
5 Floppy
6 Printer socket
7 Socket support
8 Lock
Control cabinet side view
1 Error lamp
2 Main isolator
3 Shot counter
4 Specifiction plate
5 Socket support
6 Point of main incoming supply

Control cabinet rear view
1 Reserve
2 Socket band heater zone 2
3 Socket band heater zone 1
4 Socket band heater nozzle
5 Output cable sensor zone 2
6 Output cable sensor zone 1
7 Output cable sensor nozzle (option)
8 Cable output
5.7 Control unit UNILOG B2

General information

UNILOG B2 meets the requirements of an easy to see control. The clamp and injection units are driven by an optimised control. Set value entry using pictograms and quick function selections enable simple operation and universal application anywhere in the world.

Only a few pages are needed for the diagrammatic representation of the injection moulding process. They can be called up directly via function keys. Assigning access levels with a password system ensures reliable operation appropriate to the expertise of the user.

For process evaluation a quality table and good / bad part discrimination are provided. Reproducible setting is guaranteed by data storage on ordinary floppy disks.

The control panel is divided into:

- A back-lit graphics-capable LCD screen with 128 x 240 pixels
- Function keys for selecting the various functions
- Cursor keys for moving the cursor in all four directions within the screen, and the "Previous page" key which can be used to go from page to page through a menu
Structure and function

- Numerical keypad with the "Enter", "C" (clear), "-" (minus) and "." (decimal point) keys
- Main machine function keys
- 16 function keys for moving the various machine parts

Using symbols for input and display reduces the number of menu pages and gives a rapid process overview. Arrangement and organisation of the symbols promote intuitive operation. Only 3 graphic elements are used for input and display.

Rectangular fields indicate actual value displays, rectangles with triangular points symbolise set value entries. Program selections are represented by rectangles with solid triangular points.

**Injection unit**

The arrangement of the strokes and speeds for the injection phase is self-explanatory. Four stroke points can be entered. The profile entered is interpolated to suit the characteristics of the hydraulics. The actual values for screw stroke, injection time and pressure are shown in rectangular fields.

**Holding pressure**

The holding pressure profile is entered with 3 profile points. The entry and display of holding pressure time and cooling time complete the display.

**Quality table**

An important aid in production monitoring and documentation is the quality table. Any four of 36 parameters can be saved and monitored over the last 50 cycles. Any monitoring channel can be selected to control a discrimination flap.
Disk drive / LPT printer port
Customer data can be saved using a 3 1/2" floppy disk drive. A parallel printer port is provided for a printout of these data.

Control unit
The various components of the control are:

The backboard
The standard version of the backboard has 12 slots and a 3 V / 950 mAh buffer battery. It is mounted on a standard top-hat rail.

The PS 465 power supply
The power supply provides power to the whole control system. The output is 18-30 VDC. Operational status is indicated by 4 light diodes.

The IF260 processor with IF672 plug-in module
The 32-bit processor undertakes the control’s communication with the terminal and the regulation and interpretation of the PLC program. On the plug-in module are an RS-232 interface and 2 CAN interfaces.

The AM055 analog module
This module converts the analog signals into digital signals and vice versa. It has 5 analog inputs and 3 analog outputs. The power supply for the stroke transducers is also incorporated here.

The AT660 temperature recording card
This card enables connection of 8 Fe-Co temperature sensors.

The DI475 input module
Connection of 16 digital 24 VDC signals in 4 groups. The status of the digital inputs is indicated by LEDs. Potential separation between groups and to control. Switching threshold in low range <5 V, in switchover range 5 to 15 V and in high range >15 V.

The DO480 output module
This module switches 16 digital 24 VDC loads in 2 groups. The maximum loads are 2 A on a single output, 12 A on a group and 24 A on the whole module. The status of the digital outputs is indicated by status LEDs.
6.0 Operation

6.1 General information

Due to various influences we recommend entrusting Battenfeld staff with the commissioning of the plant. This should not only be done for reasons of warranty but, at the same time:

- The IMM can be checked for any transport damage or installation and connection faults
- To instruct the operating personnel
- Additional advice on operation, maintenance and service can be passed on

6.2 Commissioning

- Observe the operating manual and in particular the safety regulations in the "Safety" chapter
- Unload, transport, install and level the IMM as described in the "Transport - Installation" chapter
- Prepare the hydraulic unit as described in the "Transport - Installation" chapter
- Prepare the water system as described in the "Transport - Installation" chapter
- Turn on water supply from cooling water system to oil cooler
- Prepare the pneumatic unit as described in the "Transport - Installation" chapter
- Open the air supply from the compressed air system to the air supply unit (option), UNIFEED material feeder (option), mechanical scotch (option)
- Prepare the electrical unit as described in the "Transport - Installation" chapter
- Switch on the power supply (low voltage distribution)
- Ensure that there are no highly combustable and explosive air mixtures near the screw barrel heating
- Lubricate lubrication points, as described in the "Transport - Installation" chapter
- Switch on hydraulics ("Hydraulics start" key)

The standard IMM has an oil preheating system, and can not be run until the hydraulic oil’s operating temperature has been reached (after approx. 15 min.)

- Clear any error messages which appear (see "UNILOG B2 User’s Manual, Alarm list" chapter)
- Mount the mould as described in the "Transport - Installation" chapter and set the clamping force and the mould mounting height
- Connect the peripheral equipment (option) as described in the "Transport - Installation" chapter
Operation

6.3 Starting the IMM after EMERGENCY STOP

The emergency stop button is a safety switch for shutting the machine down quickly. If it has been operated it must be released, after the fault or the reason for the external emergency shutdown (peripheral equipment e.g. robot) has been cleared, by rotating in the direction of the arrow. Then the IMM is switched on again as described in the "Operating" paragraph and, if necessary, the mould cleared of the moulding by means of the ejector.

The starting position of the IMM is: Mould fully open, ejector, nozzle and screw back, core puller (if present) moved out.

6.4 Test run without material

After after commission or changing the mould, the movements of the various units should be tested before running a few manual cycles with a mould mounted.

The safety regulations in the "Safety" chapter are to be followed without fail!

1. Check whether the electrical cabinet, safety guards and safety gates have been properly installed or closed
2. Clear inside of IMM of all foreign bodies (forgotten tools, etc.)
3. Switch on the power supply (low voltage distribution) - commissioning only
4 Switch on main switch
5 Release the emergency stop buttons on the IMM by rotating a quarter turn clockwise
6 Open the water supply from the cooling system to the individual users (oil cooler, cooling water flow control, etc.) - commissioning only
7 Open the air supply from the compressed air system to the air supply unit (option), UNIFEED material feeder (option), mechanical scotch (option) - commissioning only
8 Check the safety device as described in the "Transport - Installation" chapter
9 Open and close all safety gates (to test the safety gate monitoring)

Press the "Open safety grid" and "Close safety grid" keys in case of a power-operated safety grid (option)

10 Switch on hydraulics ("Hydraulics start" key)
This starts the oil preheating at the same time. You now have to wait until the hydraulic oil is heated up to a minimum of 40 °C (104 °F).
Start the pump without load and run for a few seconds to make sure of adequate lubrication

Before operating the IMM the safety regulations in the operating manual(s) of any peripheral equipment must be followed without fail!

11 Commission peripheral equipment (option) according to the operating manuals and set them to the starting position, i.e. the position in which no damage to it or to IMM components is possible
12 Clear any error messages which appear (see "UNILOG B2 User’s Manual, Alarm list" chapter)
13 Press the "Manual" key
14 Log on to control (Screen page "Password-System")

Enter password in input field "N1"
15 Press the "ENTER" key
Set the set values for "Injection", "Locking force" and "Ejector" as low as possible for an acceptable injection cycle. Otherwise forces may be present when opening the mould which can possibly exceed the limit range of the clamping elements!

16 Enter the set values for the injection cycle on the appropriate pages
The set values for "Injection" are to be set as low as possible for an respectable injection cycle. Otherwise the mould can possibly be overloaded. When opening the mould the chucking power can be exceeded
For moulds with a smaller base the ejector force may exceed the retention force of the clamping elements which will cause the mould to disengage

Fire hazard! No smoking! Make sure that there are no flammable liquids, open flames, etc. nearby the barrel heating!

17 Remove all materials, liquids and objects which should not be near the injection unit

18 Press "Heating on" key. (Switches on barrel heating)

19 Bring the IMM to the following start position:
- Mould open
- Ejector back
20 Press "Automatic" key

21 Press "Machine general" key (twice if necessary)

Operating and other personnel may only stand in front of the IMM on the operator's side during operation!

22 Enter a set value of "0" in entry field N1 (Select "Automatic" mode) and confirm with the "ENTER" key

23 Press "Mould close" key; an automatic cycle is started

Up to size 2700 the "Semiautomatic 1" and "Semiautomatic 2" modes are started by closing the the safety grid (option)

In case of power-operated safety grids on the clamping unit, these grids will be opened automatically at end of the cycle in the "Semiautomatic 1 and Semiautomatic 2" operating mode.

During the test run, listen for any unusual noises and check the function of the safety grids

The "Fully automatic", "Semiautomatic 1" and "Semiautomatic 2" modes are interrupted by pressing the "Manual" key or an emergency stop button

Any leaks which possibly occur during the first few hours of operation can usually be cured simply by tightening the fittings
6.5 Filling the material hopper

- Make sure that the main switch is switched OFF and secured against unauthorised reconnection

If the material hopper, the material feeder or the stuffing device are located higher than the average body height, climbing aids and working platforms which meet the legal safety requirements must be used for filling!

- Move the climbing aid in front of the IMM
- Clean the material hopper and check for foreign particles. For this reason the use of open material bags should be avoided

Caution

The operator has a duty to ensure no foreign bodies enter the material hopper of barrel throat!

- Swing material hopper to mid position
- Fill in material
- Swing material hopper above the feed throat of the screw barrel
- Remove climbing aid from the working area of the IMM

⚠️

Follow the plastic manufacturers’ instructions!

When processing plastics which give rise to harmful gases dusts or vapours, the operator has a duty to provide suitable extraction for the protection of operating personnel!
6.6 Test run with material

The safety regulations in the "Safety" chapter are to be followed without fail!

- Prepare IMM as described in chapter "Test run without material", steps 1 to 3
- Fill material as described in chapter "Filling the material hopper"
- Prepare IMM as described in chapter "Test run without material", steps 4 to 18
- Check the safety device as described in the "Transport - Installation" chapter
- Open mould; move ejector and nozzle back; move core puller back, if necessary
- Drive screw forward ("Injection" key)
- Press "Automatic" key
- Press "Machine general" key (twice if necessary)
- Enter a set value of "1" or "2" in entry field N1 (Selects "Semiautomatic 1" or "Semiautomatic 2" program) and confirm with "ENTER"
- Depending on the program selection either press the "Close mould" key or close the safety grid (see step 24 in the "Test run without material" section) to start the IMM

In this way several cycles are run.

Thus the movements of the various units, the settings and the quality of the mouldings are checked. Depending on the application, appropriate corrections are made to the various set values in order to achieve the quality required for the moulding.

Once all the set values have been entered they can be saved to avoid unnecessary data loss.
For additional security the set values complete with mould number and part number should be printed out and placed in the Operating Manual.

For procedure see the "UNILOG B2 User’s Manual" chapter 17 "File management".

6.7 Operation

The operation of the IMM does not differ from the procedure described in chapter "Test run without material" and the procedures described in this chapter.

⚠️ To prevent unauthorised persons from set value input, the user must log off from the control unit after quitting the setting mode!

- Press the "Machine in general" key
- Move the cursor with the arrow keys to input field "N1"
- Enter an invalid password, e.g. "0" (this prevents set values from being entered)
- Press the "ENTER" key

After each shutdown and before each start-up of the IMM, the safety devices have to be checked after switching on the main isolator as described in the "Transport - Installation" chapter!

The safety regulations in the "Safety" chapter are to be followed without fail!

For the first few hours in which the IMM is used under production conditions, the following should be monitored in particular:

- The hydraulic oil temperature
  The optimum working temperature of the hydraulic oil is between 45 °C and 50 °C (113 °F and 122 °F)

The current oil temperature is displayed on page 2 of the screen page "Temperature control zones" in the actual value field "T12"
6.8 Shutting the IMM down

1. Press the "Manual" key
2. Set peripheral equipment to the starting position (option) and switch off any peripheral equipment according to its operating manual
3. Switch off the UNIFEED material feeder (option)
4. Pull the hopper away from the feed throat of the barrel
5. Move the core pullers out of the mould if appropriate
6. Move the clamping platen to the starting position (Mould open). If necessary remove the moulding(s) from the mould using the ejector

Burning hazard! Do not touch escaping material!

7. Swing the material hopper from the inlet area of the screw barrel to the mid position
8. Press the "Injection unit back" key
9. Place an appropriate reservoir in front of the nozzle and purge the remaining material at short intervals
10. Switch off hydraulics ("Hydraulics Stop" key)
11. Switch off the heater ("Heater off" key)

Visible defects are to be remedied immediately.

Remedy damage immediately. Hydraulic oils escaping at high pressure can cause severe injuries and fires!

This applies especially to hydraulic fittings and hose assemblies.
12 Close and relief the cooling water supply (add rust preventing agent, if appropriate) from pressure
13 Close and relieve the compressed air system (option) from pressure
14 Turn off the main switch and use a padlock to prevent accidental reconnection. The main switch should be operated whenever possible without applied load

Extended shutdown

1 Shut down the IMM as described in "Shutting the IMM down"
   Swing the material hopper to the emptying position and fill the remaining material into an appropriate container
2 First free the screw barrel and the screw from the remaining melt and purge out with polyethylene
3 Depending on the material to be processed, the nozzle and the screw must be removed and cleaned
4 Preserve the cavities of the mould according to the manufacturer’s instructions
5 Treat all bare parts with a corrosion inhibitor
6 Empty the cooling water system, blow out with compressed air and treat with a corrosion inhibitor

6.9 Shut down procedure

1 Shut down the IMM as described in "Shutting the IMM down", steps 1 to 9
2 Preserve the cavities of the mould according to the manufacturer’s instructions
3 Dismantling the mould

In this paragraph the dismantling of a mould fastened with mould clamps is described

3.1 Press the "Mould close" key and close the mould

The mould may only be dismantled by an authorised skilled technician!

3.2 Disconnect the ejector coupling (mould / hydraulic ejector cylinder)
Burning hazard if touched. At mould temperatures above 60 °C (140 °F) wear appropriate protective clothing!

3.3 Let the mould cool down to a safe temperature (material dependent)
3.4 Prepare the mould for dismantling (Disconnect cooling hoses, heating cables etc)
3.5 Attach the safety strap to prevent the two mould halves from sliding apart

The safe working load of the lifting gear must equal or exceed the weight of the mould!

3.6 Attach sling to the mould
3.7 Slightly tension the lifting equipment
3.8 Press the "Setting" key
3.9 Loosen the mounting elements of the mould on the clamping platen
3.10 Open the mould

3.11 Undo the mounting elements of the mould on the nozzle platen
3.12 Remove them from the centring mechanism in the nozzle platen

Danger! It must be ensured that no persons stand or linger under the suspended load!

3.13 Lift the mould horizontally out of the opened clamping unit

3.14 Preserve the mould according to the manufacturer’s instructions and prepare for storage

4 Let the heating elements and their guardings, mould temperature control units and their flow and return lines and their fittings and mounting elements cool down to a safe temperature

5 Move the piston rods of the hydraulic cylinders in the setting mode as far as possible into the hydraulic cylinder to protect them from corrosion
In case of a possible disassembly, release any remaining pressure by carefully loosening (but not completely undoing) the appropriate hydraulic fitting.

If the place of installation is to be changed, the clamping and the injection unit has to be moved to the transport position as described in "Changing the place of installation".

6 Press "Hydraulics stop" key

7 Turn off the main switch and use a padlock to prevent accidental reconnection.

Cleaning materials are hazardous to health and flammable. The manufacturer’s instructions are to be followed without fail!

8 Dismantle nozzle (and nozzle head), as well as screw and screw barrel, and clean them.

9 Empty hydraulic system

Work at the hydraulic system may only be carried out by a skilled hydraulic technician!

**Burning hazard if touched.** At oil temperatures above 50 °C (122 °F) wear appropriate Protective clothing! Avoid any skin contact! If hydraulic oil gets into the eyes, rinse thoroughly with water and consult a physician!

9.1 Thoroughly clean area around venting filter.

9.2 Thoroughly clean the area around the filler screws and the screw plugs on the transport and storage containers for the hydraulic oil.

9.3 Unscrew the venting filter lock and remove complete venting filter from filler stub.

Fire hazard! No smoking! Make sure that there are no flammable liquids, open flames, etc. nearby!

Environmental hazard! In case of leaking hydraulic oil follow the legal provisions and regulations without fail!
9.4 Empty hydraulic tank with a pump unit via the filler stub. The suction pipe must reach to the bottom of the tank

The pump unit must be permissible for hydraulic units

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**Warning**

When storing and disposing of hydraulic oils or used oil, the local laws and regulations are to be followed without fail. The proprietor of the machine is responsible for proper waste disposal.

- Drain the remaining oil to a suitable container after removing the shut-off plug or opening the shut-off valves (option)

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When disposing of the oil pan and cloths drenched with hydraulic oil the laws and regulations applicable must be followed without fail. The proprietor of the machine is responsible for proper waste disposal.

When storing and disposing of hydraulic oils or used oil the local laws and regulations are to be followed without fail. The proprietor of the machine is responsible for proper waste disposal.

- Remove the housing of the pressure filter. Dispose of the liquid in a suitable container, see chapter "Maintenance", under paragraph "Pressure filter"
Emptying the cooling water supply

*If the pressure in the cooling water system is not released before starting work, this may cause an explosive pressurisation with the risk of damage and injury!*

*Burning hazard if touched! Wear suitable protective clothing with water temperatures above 50 °C (122 °F)!*

- Cut off the water supply to the oil cooler
- Cut off the water supply to the cooling water flow control
- Turn the two hand-wheels of the cooling water flow control clockwise (Close cooling water flow)
- Disconnect the cooling water supply and return lines from the oil cooler
- Drain the cooling water from the supply and return lines of the oil cooler to appropriate systems or containers
- Disconnect the cooling water return (4) from the cooling water flow control and drain the cooling water to appropriate systems or container
- Disconnect the cooling water flow (1) from the cooling water flow control and drain the cooling water to appropriate systems or container

- Turn both hand-wheels (2+3) of the cooling water flow control cw (Open cooling water flow) and drain the cooling water to appropriate systems or containers
- Disconnect the cooling water flow and return (5+6) of the users and drain the cooling water to appropriate systems or containers
- Connect the compressed air hose to the feed lines of the oil cooler and the cooling water flow control and blow out with compressed air
- Drain the remaining cooling water from the supply and return lines to appropriate systems or containers
- Insert plug into the fittings of the supply and return lines to protect them against contamination
Evacuating the compressed air system

If the compressed air system is not relieved from all pressure before work starts, there is a risk of explosive emptying with possible damage or injury!

- Cut off the compressed air supply to the air supply unit
- Turn the pressure adjusting valve (1) counterclockwise until the pressure shown on the gauge (2) sinks to 0 bar
- Turn condensate drain screw (3) counterclockwise; drain condensate to a suitable container; turn condensate drain screw clockwise

Other measures

- Follow the procedures in the respective operating manuals without fail before shutting down the peripheral equipment
- All bare and unplated moving parts and guides (tiebars, piston rods, etc.), and all unpainted, unplated screws must be preserved using an oily rust preventing agent
Disconnecting the electric system

**The IMM may only be disconnected from the power supply by a skilled electrician (according to DIN VDE 0105 or IEC 364). The safety regulations in the "Safety" chapter are to be followed without fail!**

- Switch off the supply voltage (low voltage distribution) to the IMM
- Disconnect the supply lines in the control cabinet from the mains and the heating power terminals
- Secure the cables against interference according to locally applicable regulations
- Place desiccant medium for protection of connections, relays, etc. from corrosion into the control cabinet

Measures after an extended shutdown

- Clean IMM from dust and rust preventing agent, see chapter "Transport - Installation"
- Note the service life of the hydraulic hoses and hose assemblies, see chapter "Maintenance"
- To prevent the hydraulic pumps from being damaged check whether they are filled with hydraulic oil; see chapter "Transport - Installation."
- Replace the "Back flow filter" and "Venting filter" filter elements; see chapter "Maintenance"

**The isolation value may only be checked and wet windings may only be dried by a qualified electrician (according to DIN VDE 0105 or IEC 364). The safety regulations in the "Safety" chapter are to be followed without fail!**

- Check the insulation values of the hydraulic motor’s windings
- Observe the service life of the battery in the control unit; see chapter "Maintenance"
6.10 Changing the place of installation

- Prepare the IMM as described in "Shut down procedure"
- Move the injection unit to its foremost position (into the nozzle platen) before changing the place of installation
- Switch off main switch and secure against accidental reconnection
- If the IMM is to be moved to an external installation site, lift the IMM using the appropriate lifting equipment, see chapter "Transport - Installation" and dismantle the levelling elements
- Attach lifting equipment as described in "Transporting the IMM" in chapter "Transport - Installation"
- Transport the IMM using the appropriate means of transport (fork lifting truck, crane) as described in chapter "Transport - Installation"
- If the IMM is to be moved to an external installation site secure the IMM with ropes suitable for the weight of the IMM on the means of transportation (e.g. truck)

The complete IMM may only be placed on a level surface capable of supporting the appropriate load
-Unload, install, level and commission the IMM at the new installation site as described in chapter "Transport - Installation" and start up
6.11 Disposal

The proprietors of the machine is obliged to dispose of all components, lubricants, hydraulic and gear oil as well as other aids (cleaning cloths, cleaning agents, etc.) according national and international laws and regulations.

This applies especially to those components which have been in contact with products hazardous to the environment (lubricants, hydraulic and gear oils).

Please contact the responsible authorities before disposal. You will receive detailed information on laws and regulations applicable, the facilities for disposal, as well as on authorised waste disposal companies.

Request safety specification sheets according to DIN 52900 for your products from your lubricant supplier. Among others, these contain information on waste disposal.

If possible, the materials and substances should be recycled.

The provisions on waste disposal within the European Union (EU) can be found in the "Europäischen Abfallkatalogverordnung" (EAKV) ("European Waste Disposal Catalogue Regulation"). This regulation is to translate the provisions of the decision 94/3/EC on a waste disposal directory according to Article 1, Chapter a of the Directive of the Council 75/442/EEC on wastes into the German legislation.
7.0 Maintenance

7.1 General information

Careful installation and care are necessary for the reliable functioning of the injection moulding machine (hereinafter IMM).

Daily visual checks help to prevent down times. Checks, maintenance work and the exchange of worn out parts should be undertaken at regular intervals. Only parts of the same quality (strength, material) and design may be used.

Breakdowns caused by inadequate or improper maintenance can result in very high repair costs and long periods of down time. Regular maintenance is therefore essential.

If you have questions about maintenance or servicing, please contact our Technical Service Department or one of our subsidiaries. The addresses can be found in the "Customer service" chapter.

⚠️ The safety regulations in the "Safety" section must be followed without fail!

Before starting any maintenance or repair work the IMM must be switched off using the main switch and secured against accidental reconnection.

7.2 Transport, storage and disposal of lubricants

Lubricants and hydraulic oils are environmentally damaging products. For this reason the local environmental laws and regulations concerning water, building, waste, transport, trade and safety at work must be observed.

These areas of legislation include the fields of transportation, storage and waste disposal.

Even the strict observance of all laws and regulations can not totally exclude accidents involving lubricants. In such cases the appropriate authorities (Water Board, Police, Fire Brigade) must be notified immediately. The amount of lubricant discharged before notification is required varies from place to place.

There is therefore a need to make contingency plans for preventive measures in the case of any incident with oil. This includes the existence of such a plan itself, that sufficient oil absorbing medium is in stock, that drains can be closed off and that tools and materials are available to prevent the spilled oil from escaping.
Request safety specification sheets according to DIN 52900 for your products from your lubricant supplier.

These cover: (among others)

- Chemical and physical properties.
- Protective measures, storage and handling
- Measures to be taken in the event of accidents and fires

7.3 Disposal of electrical and electronic components

When disposing of electrical and electronic components, the local laws and regulations are to be observed.
# 7.4 Hydraulic oil and lubricant table

<table>
<thead>
<tr>
<th>Lubrication point</th>
<th>Hydraulic equipment*)</th>
<th>Gearbox, axial bearing and oil lubrication</th>
<th>Central oil lubrication</th>
<th>Central lubrication grease and+E1 grease</th>
<th>Three phase motors or electric motors**)</th>
<th>Pneumatics and electromagnetic coupling</th>
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<tbody>
<tr>
<td>Designation to DIN 51502</td>
<td>HLP 46</td>
<td>CLP 220</td>
<td>CG 220</td>
<td>K 2 K - 20</td>
<td>K 3 K - 20</td>
<td>HL 10 / CL 10</td>
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<td>DIN 51517 T3</td>
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<td>OsO 46</td>
<td>Agip Blasia 220</td>
<td>Agip ASP 220</td>
<td>Agip GR MU 2</td>
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<td>GF 46</td>
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<td>Aral Aralub HL 2</td>
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<td>AVIA GEAR RSX 220</td>
<td>Slideway oil RSU 220</td>
<td>AVIA AVIALITH 2</td>
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<td>BP Maccurat 220 D</td>
<td>Energrease LS 2</td>
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<td>BP Energol HLP-HM 10</td>
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<td>Castrol Alpha SP 220</td>
<td>Magnaglide D 220</td>
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<td>SLX Grease</td>
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<td>FEBIS K 220</td>
<td>BEACON 2</td>
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<td>GIRAN 220</td>
<td>HYDRAN G 220</td>
<td>MARSON LA 2</td>
<td>Pluton EM</td>
<td>CIRKAN 10</td>
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<td>DTE 25</td>
<td>Mobilgear 630</td>
<td>Mobil Vactra Oil No. 4</td>
<td>Mobil Mobilux 2</td>
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<td>Mobil Velocite Oil No. 6</td>
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<td>on request</td>
<td>LONGBASE PD 2</td>
<td>FIRETEMP XT2</td>
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<td>Hydo 10</td>
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<td>RENEP CGLP 220</td>
<td>RENOLIT FWA 160/GP 2</td>
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<td>Q8 Rembrandt 2</td>
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<td>Shell Tonna S 330</td>
<td>Shell Alvania R 2</td>
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<td>Shell Morina 10</td>
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<td>TRIBOL 943 AW-46</td>
<td>TRIBOL 1100/220</td>
<td>TRIBOL 1060/220</td>
<td>TRIBOL 3030/100</td>
<td>Auf Anfrage</td>
<td>on request</td>
</tr>
</tbody>
</table>

These products have been recommended to us by the mineral oil companies. Products from other companies which can be shown to be of the same quality may also be used.

*Only use prefiltered hydraulic oil of cleanliness class 15/12 to ISO 4406!

*) Hydraulic oil: Only use oil of the cleanliness class 15/12 to ISO 4406; always prefilter!

**) Only for air cooled three-phase motors
7.5 Maintenance chart

Every 8 operating hours

• Install all safety devices or all safety guards
• Oil level in hydraulic tank
• Overall condition of IMM (visual check)
• Replace defective indicator lamps immediately
• Always keep the electrical cabinet closed
• Make sure the electrical cabinet is clean

Every 160 operating hours

• Check the filter mat(s) in the electrical cabinet fans (option) for clogging
• Check hydraulic fittings, hose assemblies, cylinders, valves, pump(s) etc. for leakages

Every 500 operating hours

• Spray all bare parts (tiebars, piston rods, guide rails, linear bearings injection units), where there is no movement with a corrosion inhibitor
• Lubricate grease points on moving platen supports and injection side guide (linear bearings)
• Check for scotch bar for proper function (option)
• Clean filter element of air supply unit (option)

Every 2500 operating hours

• Operating manual present and correct
• Check the rollers of the limit switches for the clamping units safety gate for cleanliness and free movement; check whether the limit switches will be sufficiently activated
• Check heater bands for security and correct position
• Tighten all terminals in the switch cabinet
• Check cables (for damage, scorching)
• Change the filter mats of the electrical cabinet
• Clean electrical cabinet
• Test emergency stop circuit
• Replace hydraulic tank venting filter
Every 5000 operating hours

- Clean electric motor fan with dry compressed air; the cleaning intervals depend on the local levels of airborne dirt
- Check pump motor terminal box for sealing, damaged insulation and secure connections
- Check the stroke transducers on the moving platen and ejector for cleanliness and ease of movement
- Check the stroke transducer of the nozzle and the injection cylinder for cleanliness and free movement
- Visual check of electrical components
- Check nozzle for wear and concentricity
- Test hydraulic oil (replace if necessary)
- Replace back flow filter element
- Check all fittings for security and tighten as necessary

Every 20000 operating hours

- Change hydraulic hose assemblies
- Flush oil cooler and cooling water sight-glasses with a descaler
- Lubricate electric motor bearings
7.6 Hydraulic unit

Work on hydraulic equipment may only be carried out by a hydraulics expert!

If the hydraulic system is not relieved of pressure before work is started it may empty explosively with the risk of damage and injury!

Switch off main switch to secure against accidental reconnection. If the clamping platen, injection unit and screw are not in one of their limit positions then the hydraulic system is relieved from pressure. Any residual pressure can be released by carefully loosening (but not completely undoing) a hydraulic fitting.

Oil change

Burning hazard if touched. At oil temperatures above 60 °C (140 °F) wear appropriate PPE!

When disposing of used oil, legal requirements must be met. The proprietor of the machine is responsible for proper disposal!

Every 5000 operating hours an oil sample should be taken and, depending on the analysis, an oil change be carried out. This is, however, based on an assumed maximum operating temperature of 60 °C (140 °F) and regular oil filter changes. To establish the oil change interval suitable for the local operating conditions it is recommended to test the oil at first after shorter intervals (e.g. monthly).

The test sample can be taken from the pressure or return line at operating temperature (e.g. from the mini test point (M) on the pump block).

Regardless of the usage the hydraulic oil should be changed after one year at the latest. If the oil is not changed or is changed too late the IMM will be unreliable and damaged, especially as a result of abrasive contaminants in the hydraulic oil which can not be removed by the filter.

Caution
Leaked oil is always contaminated and must never be put back into the hydraulic tank!

Ensure greatest cleanliness! The filler on the hydraulic tank and the spouts and bungs on hydraulic oil drums and storage tanks must be thoroughly cleaned before use. The new hydraulic oil must be checked for ingress of water. Oil containing water is spoiled and must not be used.
The oil change should be carried out immediately after the end of a production run on the IMM. This ensures that the oil is at operating temperature (45 °C to 50 °C / 113 °F to 122 °F) and free flowing with the contaminants still in suspension so that they can be pumped out with the oil.

Tank capacity 1251 (33 gal)

- Clean the filler screws and the screw plugs on transport and storage containers
- Check the hydraulic oil grade; see "Oil quality"
- Prefilter the hydraulic oil through a mobile filtration unit

Caution
If the tank is filled above the max. level, hydraulic oil will come out of the venting filter!

Clean the filler screws and the screw plugs on transport and storage containers

- Switch off hydraulics ("Hydraulics Stop" key)
- Switch off main switch and secure against accidental reconnection
- Clean the area round the air venting filter
- Undo cap of air venting filter
- Empty hydraulic tank with a pump unit via the filler stub. The suction pipe must reach to the bottom of the tank

The new hydraulic oil may only be filled through the air venting filters. This must be done through a separate filtration unit (filter mesh size 3 µm / 118.11 µinch), which guarantees a cleanliness class of 15/12 to ISO 4406 (Class 6 to NAS 1638 or CETOP RP 70H) Experience has shown that even new oil is not this clean.

Caution
Only use new hydraulic oil and never mix oils of different grades or from different manufacturers. The type of oil should not be changed without compelling reasons. If this is the case, the system must be flushed out with the new oil first!

To avoid mixing oils it is recommended to mark the oil tank and fillers with the oil type.

- Fill the hydraulic tank to the maximum mark with a mobile filtration unit
  The maximum level is shown by the upper marking on the oil level indicator
  - Install venting filter again
  - Reconnect the bypass filter unit, if fitted

Caution
Before switching on the IMM the hydraulic oil should be allowed to "stand" for approx. 1 hour to let the air trapped during filling escape!
Air bleeding

After filling the oil tank air must be bled from the hydraulic system.

• Press the "Hydraulic start" key to switch on the hydraulics
• Press the "Setting" key
• Drive the moving platen, injection unit and injection piston to and fro over their whole strokes several times

The IMM is effectively bled when no foam appears in the oil tank, movements are smooth and there are no strange noises.

The oil level should be checked after bleeding and topped up if necessary. Care must be taken to use the same oil type.

Check oil level daily

Continuous monitoring of the oil level is required as a drop in the oil level below the marked minimum volume may lead to an increase in operating temperature, undissolved air and pump failure from cavitation.

Back flow filter

The back flow filter has a contamination indicator which sends an error message to the screen if it is triggered.

At the first possible pause in production (e.g. shift change) the filter element (article number MB628) must be replaced. If there are no spare filters available one must be ordered immediately.

The filter must always be changed with the oil. If the above error message or the oil analysis indicates an early oil change, then the oil filter should be changed early too.

The greatest cleanliness must be maintained. The contamination indicator is suppressed at low temperatures; i.e. if the oil temperature is below 27 °C (80.6 °F) the switch does not function.
Changing the filter element

- Switch off IMM and wait for complete pressure loss

**Warning**

*If the hydraulic system is not relieved of pressure before work is started it may empty explosively with the risk of damage and injury!*

**Warning**

*Burning hazard if touched. At oil temperatures above 60 °C (140 °F) wear appropriate PPE!*

- Remove element (2); inspect the mesh surfaces for contamination and large particles. These can be an indication of damaged hydraulic components
- Dispose of filter element (1)
- Before fitting the filter element check that the type designation is the same as that of the filter element removed

**Caution**

*Do not attempt to clean or reuse filter element!*

- Renew filter element. The filter can not be cleaned. Any attempt to clean the filter will damage the filter material which will then allow contaminated oil to reach the "clean" side of the filter element
- Clean filter cover (4) (inside) with a suitable medium (e.g. white spirit or paraffin), taking care not to introduce any contamination into the clean side
- Inspect the filter unit for mechanical damage, especially to sealing faces and seals. Renew damaged parts. Check O-rings and change if damaged

- Unscrew filter cap (3)
- Remove the filter element (1) with the filter cover (4) on the bracket
Caution
If damaged parts are not renewed and if the filter is not maintained in first class condition there will be a risk of damaging or reducing the performance of other components in the system!

Venting filter
Venting filters allow the clean air to pass in and out of the oil tank to compensate for changes in oil level. Its effectiveness depends upon the environment, but it should be checked and if necessary the element renewed after 2500 hours at the latest, paying the greatest attention to cleanliness.

Leaks
Observe any leaks in the hydraulic equipment and remedy them by resealing or tightening fittings.

Oil cooler
Although the oil cooler may be considered maintenance free, it is recommended to give it some preventive maintenance every 20,000 running hours.

Contaminated water must be filtered and if scale is present the cooling lines must be descaled.

See also "Water quality".

Hose assemblies
The safety regulations are laid down in DIN 20066 Parts 4 and 5 as well as in EN 201. They contain regulations on the testing, replacement and storage of hydraulic hose assemblies.

The proprietor of the machine has a duty to ensure that hose assemblies are replaced at the appropriate intervals, even if no technical shortcoming is apparent in the hose assembly.

Service life
Even when stored and used properly are hose assemblies subject to a natural aging process. For this reason, their use is limited.

Improper storage, overloading and mechanical damage are the most common causes of failure.

The service life (including storage time) of hose assemblies may not be exceeded. The production date is permanently marked on each hose.

Damaged hydraulic hoses and hose assemblies must be renewed at once, please refer to the "Hose assemblies" section!

Regular checks of the hydraulic fittings, hose assemblies, cylinders, valves, pump(s) etc. must be carried out every 160 operating hours.
**The hose assemblies must be replaced after 20000 operating hours at the most.**

**Reuse**

Hoses which have already been in service as part of a hose assembly may not be reused as they no longer conform to the requirements of DIN 20066.

If a hose is reused, then the liability lies with the person who fits the hose assembly.

Only hose assemblies with sealing heads can be reused. The length of a hose assembly has to be determined according to the following figure.

---

**Inspection criteria**

The proper function is to be checked every 1000 operating hours by a skilled hydraulic technician.

Hose assemblies are to be replaced immediately if on examination any of the following conditions are found:

- Damage in the outer layer through to the braiding (e.g. abrasion, cuts or tears)
- Brittleness of the outer layer (cracking of the hose material)
- Deformation not consistent with the natural form of the hose assembly, in either the pressurised or the relaxed condition, or in flexure, e.g. delamination or blistering (see also DIN 20066 Part 4)
- Permeability or porosity
- Damage to or deformation of the end fittings which compromises oil-tightness; light superficial damage is not grounds for replacement
- Hose creeping out of the end fitting
- Corrosion which reduces function or security of the end fitting
- Installation guideline not observed (DIN 20066 Part 4)
- Storage times and service life exceeded
7.7 Water system

Caution
When using water piping note the corrosion stability of metallic materials against water in accordance with DIN 50930!

Water piping and the respective fittings are to be checked for corrosion and leakages by a skilled technician at regular intervals.

If the pressure in the cooling water system is not released before starting work, this may cause an explosive pressurisation with the risk of damage and injury!

Burning hazard if touched. At water temperatures above 50 °C (122 °F) wear appropriate protective clothing!

Water quality

If there are deviations from the following guidelines please contact our technical customer service or one of our subsidiaries. The addresses can be found in the “Customer service” chapter.

pH value: 6.5 - 9
Water hardness: < 1,8 mmol / l (681 ppm / gal)
Solids: < 0,03 % (30 ppm)
Filter mesh: < 100 µm (0.004 inch)

In the relation of solids content to water hardness it should be noted that the harder the cooling water is, the lower the solids content has to be. If the solids content is above 0.003 % (30 ppm), a water filter with a mesh size of< 100 µm (0.004 inch) must be installed in the supply line.

It is also recommended to add a corrosion inhibitor to the cooling water (e.g. Ferrophos 8579 from Henkel).

We recommend ethylene glycol type 420 as an antifreeze (60 % water and 40 % ethylene glycol). This is suitable for a temperature range down to -30 °C (-22 °F) and is also a corrosion inhibitor.

Hydraulic oil temperature

Check the hydraulic oil temperature in the oil tank daily. The IMM is most efficient at an oil temperature between 45 ° and 50 °C (113 ° and 122 °F).

The current hydraulic oil temperature will be displayed on the screen (B2 = in the actual value field “T12” on page 2 of the “Temperature control zones” screen page / B4 = ”Barrel temperatures 1” screen page).
7.8 Electrical equipment

For all work involving fitting, removal, modification and repair, the legal rules and regulations and the safety instructions in the "Safety" chapter must be observed without fail!

Work on electrical components may only be carried out by a qualified electrician!

Filter mats
The filter mats can be cleaned as follows:

- Washing in water (up to approx. 40 °C / 104 °F, with mild detergent if desired). Shaking, vacuuming or blowing out with compressed air is also possible
- If the dust is greasy the filter mat must be washed out in water with a grease dispersant additive

Buffer battery
The control unit is protected from data loss by a buffer battery. If the error message "buffer battery empty" appears the battery must be replaced. A first battery change must be carried out after 5 years and consequently every 3 years after.
Battery change
(Type: Lithium battery 3V/950mA A Nr: BR141)

⚠️ Data loss without buffering! A copy of the service and devices data records are saved on disc before the battery change for safety.

• Switch off main switch
  The main switch must be switched back on within 30 seconds of the battery change, to ensure no data is lost
• Carry out electrical discharge at the top hat rail or at the earth connection (do not reach into the power supply unit)
• Open the battery compartment with the help of a screwdriver. The screwdriver is placed in the groove and the compartment opened by levering
• Take the battery out of the mount by removing the cover on the battery compartment
• Take out lithium battery (do not touch battery with tongs or non-insulated tweezers -> shortcut.) The battery may only be manually handled on the front side. To remove the battery insulated tweezers may also be used
• Insert the battery while observing the correct polarity. The removal strip must be located underneath the battery, otherwise it cannot be removed
• Close the cover of the lithium battery
• Switch on main switch again

⚠️ When disposing of the batteries, legal requirements must be met. The proprietor of the machine is responsible for proper disposal!
7.9 Pneumatic system

If the pneumatic system is not relieved of all pressure before work starts, there is a risk of explosive emptying with possible damage or injury!

UNIFEED material feeder

The secondary filter (3) of UNIFEED material feeder (option) should be cleaned as necessary and in any case inspected at least once a week, depending on the amount of dust. Its service life is limited and it should be renewed at the first sign of loose fibres (by simply removing it from its holder).

The primary filter (2) is automatically cleaned by compressed air after every conveying cycle. If it becomes clogged it is cleaned as follows:

- Turn off air supply
- Remove knurled nuts (4)
- Lift off cover (1)
- Clean and replace primary filter (2)
- Replace cover
- Do up knurled nuts (4)

When fitting the filter care must be taken to position the filter O-ring properly in the groove provided.

Filter element (air supply unit).

The interval for cleaning depends on the amount of dirt in the air. An interval of 500 operating hours may be taken as a guide.

- Turn off air supply
- Unscrew oil reservoir (9)
- Unscrew filter cartridge

Mechanical scotch

The mechanical scotch (option) will only work if all components are in faultless condition and moving parts have free movement. Care must be taken that the face of the scotch (or "flag"), against which a tooth of the scotch-bar presses when it is activated, shows no significant wear.
8.0 Spares/ Plans

The Spares / Plans contains parts lists, plans and drawings which give the circumference for the IMM, broken down into assemblies. For every sub assembly an assembly drawing exists. Each spare part can be found here listed under a position number.

In order to avoid misunderstandings, it is necessary to give the Machine Number with every spare parts order. In addition please state the Identification number (ID No.), the description and the desired quantity.

When ordering, please contact the BATTENFELD agency responsible for you or contact BATTENFELD direct (addresses and telephone numbers are given in "Customer Service" chapter).

Spares are to be ordered according to the procedure detailed on the next page.
9.0 Customer Service

9.1 General

The “Customer service” chapter contains all contact addresses of all customer service partners and agencies of Battenfeld Injection moulding technology.
Egypt
MEISCA
Middle East Industrial Services & Commercial Agencies
27 Ahmed Fakhry Str., Apt. 2-Zone 6 Nasr City
Cairo / Egypt
Tel.: 0020-2-2717032
Fax: 0020-2-2717032

Brasilia (VBR)
Battenfeld do Brasil Ltda.
Rod. Castelro Branco, km 30
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Fax: 0055-11-4789-9045
E-mail: battenfeld.brasil@vbr.battenfeld.com

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Deutschland
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E-mail: batt@netrover.com

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1092 Buenos Aires / Argentina
Tel.: 0054-11-4342-7812
Fax: 0054-11-4331-7689
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Agency for: China

Agency for: Colombia
Reprensentations maquinex
Uwe Koch
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Fax: 0057-1-2494581

Agency for: Ecuador
Battenfeld do Brasil Ltda. (VBR)
siehe unter Brasilia

Agency for: Finland

Agency for: Germany

Agency for: Hong Kong (VHK)

Agency for: India

Agency for: Indonesia

Agency for: Israel

Agency for: Italy

Agency for: Japan

Agency for: Korea

Agency for: Mexico

Agency for: The Netherlands

Agency for: Poland

Agency for: Portugal

Agency for: Spain

Agency for: Switzerland

Agency for: Taiwan

Agency for: Thailand

Agency for: Turkey

Agency for: Ukraine

Agency for: United Kingdom

Agency for: United States

Agency for: Vietnam

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