Operating instructions
Solenoid Metering Pump
Beta® b BT4b and BT5b

Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!
Technical changes reserved.
Supplementary information

Read the following supplementary information in its entirety! Should you already know this information, you have an even greater need of the Operating Instructions.

The following are highlighted separately in the document:

- Enumerated lists

Instructions

⇒ Outcome of the instructions

Information

This provides important information relating to the correct operation of the device or is intended to make your work easier.

Safety notes

Safety notes are identified by pictograms - see Safety Chapter.

General user instructions

Two sets of operating instructions are required for the safe, correct and proper operation of the metering pumps: The product-specific operating instructions and the "General Operating Instructions for ProMinent® Solenoid Metering Pumps".

Both sets of operating instructions are only valid when read together.

Please read these operating instructions carefully before use! Do not discard!

State the identity code and serial number

Please state identity code and serial number, which you can find on the nameplate when you contact us or order spare parts. This enables the device type and material versions to be clearly identified.

General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.
# Table of contents

1. Identity code .......................................................... 6  
2. About this pump .................................................... 8  
3. Safety chapter ......................................................... 9  
4. Storage, transport and unpacking ............................... 14  
5. Overview of equipment and control elements .............. 16  
5.1 Overview of equipment ........................................... 16  
5.2 Control elements .................................................. 17  
5.2.1 Pulse Control Switch .......................................... 17  
5.2.2 Stroke length adjustment knob ............................. 17  
5.2.3 Multifunctional switch ........................................ 17  
5.2.4 Functional and Fault Indicators ............................ 18  
5.2.5 "External control" terminal .................................. 18  
5.2.6 "Level Switch" terminal ..................................... 18  
6. Functional description ............................................ 19  
6.1 Liquid End ........................................................... 19  
6.2 Drive Unit ........................................................... 19  
6.3 Capacity .............................................................. 19  
6.4 Self-Bleeding ....................................................... 19  
6.5 Operating Modes .................................................. 19  
6.6 Functions ............................................................ 20  
6.7 Relay ................................................................. 20  
6.8 Hierarchy of Operating Modes, Functions and Fault Statuses ......................................................... 20  
7. Assembly ................................................................. 21  
8. Installation, hydraulic .............................................. 22  
8.1 Install hose lines ................................................... 23  
8.1.1 Installation for metering pumps without bleed valve 23  
8.1.2 Installation for metering pumps with bleed valve ...... 25  
8.1.3 Installation for metering pumps with self-bleeding (SEK type) .................................................. 26  
9. Electrical installation ............................................... 28  
9.1 Supply voltage connector ....................................... 29  
9.2 Description of the sockets ........................................ 29  
9.2.1 "External control" terminal .................................. 29  
9.2.2 "Level Switch" terminal ...................................... 31  
9.3 Relay ................................................................. 31  
9.3.1 "Fault indicating relay" output (identity code 1 + 3 or 4 + 5) ......................................................... 31  
9.3.2 Output pacing relay (identity code 4 + 5) ................. 32  
10. Operation ............................................................... 33  
10.1 Manual .............................................................. 33  
10.1.1 Capacity ........................................................ 33  
10.1.2 Functions ....................................................... 33  
10.1.3 External contact .............................................. 34  
10.2 Remote operation ............................................... 34  
11. Maintenance .......................................................... 35  
12. Repairs ................................................................. 37  
12.1 Cleaning valves .................................................. 37  
12.2 Replacing the metering diaphragm .......................... 39  
13. Troubleshooting .................................................... 42  
13.1 Faults without a fault alert ..................................... 42  
13.2 Fault alerts ......................................................... 42
### Table of contents

13.3 Warning Alerts........................................................................................................... 43
13.4 All Other Faults........................................................................................................ 43

14 Decommissioning......................................................................................................... 44

15 Technical data............................................................................................................... 46
  15.1 Performance data..................................................................................................... 46
  15.2 Accuracy.................................................................................................................. 47
    15.2.1 Standard Liquid End.......................................................................................... 47
    15.2.2 Self-Bleeding Liquid End.................................................................................... 48
  15.3 Viscosity.................................................................................................................... 48
  15.4 Material Data............................................................................................................ 48
  15.5 Electrical data.......................................................................................................... 49
  15.6 Temperatures............................................................................................................ 49
  15.7 Climate..................................................................................................................... 50
  15.8 Protection class and Safety Requirements............................................................... 50
  15.9 Compatibility.............................................................................................................. 50
  15.10 Sound pressure level............................................................................................... 51
  15.11 Shipping weight....................................................................................................... 51

16 Declaration of Conformity............................................................................................ 52

17 Index............................................................................................................................. 53
## 1 Identity code

### Product range Beta b

<table>
<thead>
<tr>
<th>Identity code</th>
<th>Type</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>10</td>
<td>0.74</td>
</tr>
<tr>
<td>1601</td>
<td>16</td>
<td>1.10</td>
</tr>
<tr>
<td>1602</td>
<td>16</td>
<td>2.20</td>
</tr>
<tr>
<td>1604</td>
<td>16</td>
<td>3.60</td>
</tr>
<tr>
<td>0708</td>
<td>7</td>
<td>7.10</td>
</tr>
<tr>
<td>0413</td>
<td>4</td>
<td>12.30</td>
</tr>
<tr>
<td>0220</td>
<td>2</td>
<td>19.00</td>
</tr>
<tr>
<td>BT5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2504</td>
<td>25</td>
<td>2.90</td>
</tr>
<tr>
<td>1008</td>
<td>10</td>
<td>6.80</td>
</tr>
<tr>
<td>0713</td>
<td>7</td>
<td>11.00</td>
</tr>
<tr>
<td>0420</td>
<td>4</td>
<td>17.10</td>
</tr>
<tr>
<td>0232</td>
<td>2</td>
<td>32.00</td>
</tr>
</tbody>
</table>

**Material of dosing head/valves**

- **PP**: Polypropylene/PVDF. With the self-bleeding version (SEK): polypropylene/polypropylene
- **NP**: Clear acrylic/PVDF. With the self-bleeding version (SEK): Clear acrylic/PVC
- **PV**: PVDF/PVDF
- **TT**: PTFE/PTFE
- **SS**: Stainless steel 1.4404/1.4404

**Material of seals/diaphragm**

- **T**: PTFE/PTFE coated
- **E**: EPDM/PTFE coated, only for PP and NP self-bleeding (SEK)
- **B**: FPM-B/PTFE coated, only for PP and NP self-bleeding (SEK)
- **S**: Diaphragm additionally with FPM coating for media containing silicate

**Dosing head version**

- **0**: without bleed valve, without valve spring only for NP, TT, SS and type 0232
- **1**: without bleed valve, with valve spring only for NP, TT, SS and type 0232
- **2**: with bleed valve, without valve spring only for PP, PV, NP not for type 0232
- **3**: with bleed valve, with valve spring only for PP, PV, NP not for type 0232
- **4**: version for higher-viscous media only for PVT, type 1604, 2504, 0708, 1008, 0413, 0713, 0220, 0420
- **9**: self-bleeding (SEK) only for PP/NP, not for types 1000 and 0232

**Hydraulic connector**

- **0**: Standard connection in line with technical data
- **5**: Connector for 12/6 tube, discharge side only
- **9**: Connector for 10/4 tube, discharge side only
<table>
<thead>
<tr>
<th>Design</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logo</td>
<td>with ProMinent logo</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>100-230 V ± 10 %, 50/60 Hz</td>
</tr>
<tr>
<td>Cable and plug</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2 m European</td>
</tr>
<tr>
<td>B</td>
<td>2 m Swiss</td>
</tr>
<tr>
<td>C</td>
<td>2 m Australian</td>
</tr>
<tr>
<td>D</td>
<td>2 m USA</td>
</tr>
<tr>
<td>1</td>
<td>2 m open end</td>
</tr>
<tr>
<td>Relay</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>No relay</td>
</tr>
<tr>
<td>1</td>
<td>fault indicating relay (NC) (change-over relay)</td>
</tr>
<tr>
<td>3</td>
<td>fault indicating relay (NO) (change-over relay)</td>
</tr>
<tr>
<td>4</td>
<td>as 1 + pacing relay, (ONE each)</td>
</tr>
<tr>
<td>5</td>
<td>as 3 + pacing relay, (ONE each)</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>No accessories</td>
</tr>
<tr>
<td>1</td>
<td>with foot and injection valve, 2 m PVC suction line, 5 m metering line</td>
</tr>
<tr>
<td>Control type</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>no lock</td>
</tr>
<tr>
<td>1</td>
<td>with lock: manual operation locked when external cable plugged in</td>
</tr>
<tr>
<td>Control versions</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Standard</td>
</tr>
<tr>
<td>Options</td>
<td></td>
</tr>
<tr>
<td>00</td>
<td>no options</td>
</tr>
</tbody>
</table>
2 About this pump

Properties of the device

This solenoid metering pump Beta b is equipped with all adjustment and activation functions for modern water treatment and the dosing of chemicals. It has pulse step-up and pulse step-down compared with the preceding model. This enables it to adapt more precisely to external signal generators. The result is the simpler and more precise adjustment of chemical consumption to the actual need. It also has a 10 percent increase in efficiency and energy efficiency over the preceding model. The Beta b can be simply adjusted during operation.
3 Safety chapter

Explanation of the safety information

The following signal words are used in these operating instructions to identify different severities of a hazard:

<table>
<thead>
<tr>
<th>Signal word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING</td>
<td>Denotes a possibly hazardous situation. If this is disregarded, you are in a life-threatening situation and this can result in serious injuries.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>Denotes a possibly hazardous situation. If this is disregarded, it could result in slight or minor injuries or material damage.</td>
</tr>
</tbody>
</table>

Warning signs denoting different types of danger

The following warning signs are used in these operating instructions to denote different types of danger:

<table>
<thead>
<tr>
<th>Warning signs</th>
<th>Type of danger</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Warning icon]</td>
<td>Warning – automatic start-up.</td>
</tr>
<tr>
<td>![Warning icon]</td>
<td>Warning – high-voltage.</td>
</tr>
</tbody>
</table>

Correct and proper use

- The pump may only be used to meter liquid metering chemicals.
- The pump may only be started up after it has been correctly installed and commissioned in accordance with the technical data and specifications contained in the operating instructions.
- Observe the general limitations with regard to viscosity limits, chemical resistance and density - see also ProMinent® resistance list (In the product equipment catalogue or at www.prominent.com).
- Any other uses or modifications are prohibited.
- The pump is not intended for the metering of gaseous media or solids.
- The pump is not intended for the metering of explosive media.
- The pump is not intended for operation in hazardous locations.
- The pump is not intended for exterior applications without use of suitable protective equipment.
- The pump should only be operated by trained and authorised personnel, see the following "Qualifications" table.
- You are obliged to observe the information contained in the operating instructions at the different phases of the device's service life.
Safety notes

**WARNING!**
**Warning about personal and material damage**
The pump can start to pump, as soon as it is connected to the mains voltage.
- Install an emergency cut-off switch in the pump power supply line or integrate the pump in the emergency cut-off management of the system.

**WARNING!**
**Danger of electric shock**
A mains voltage may exist inside the pump housing.
- If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

**WARNING!**
**Fire danger**
Combustible media may only be transported using stainless steel dosing heads. In exceptional cases where this is not possible, PTFE with carbon can be used, whereby our TT versions are manufactured from this conducting plastic. Here, the operator is urged to take special care due to the low mechanical strength.

**WARNING!**
**Warning of dangerous or unknown feed chemical**
Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.
- Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
- Drain and flush the liquid end before working on the pump.

**WARNING!**
**Danger from hazardous substances!**
Possible consequence: Fatal or very serious injuries.
Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.
The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.
CAUTION!
Warning of feed chemical spraying around
Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.
- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

CAUTION!
Warning of feed chemical spraying around
An unsuitable feed chemical can damage the parts of the pump contacted by the chemical.
- Take into account the resistance of the materials which will come into contact with the chemical when selecting the feed chemical - see the ProMinent product catalogue or under www.prominent.com.

CAUTION!
Warning of feed chemical spraying around
The metering pump can generate a multiple of its rated pressure. If a discharge line is blocked, hydraulic parts may burst.
- Correctly install a relief valve in the discharge line downstream of the metering pump.

CAUTION!
Danger of personnel injury and material damage
The use of untested third party parts can result in personnel injuries and material damage.
- Only fit parts to metering pumps, which have been tested and recommended by ProMinent.

CAUTION!
Danger from incorrectly operated or inadequately maintained pumps
Danger can arise from a poorly accessible pump due to incorrect operation and poor maintenance.
- Ensure that the pump is accessible at all times.
- Adhere to the maintenance intervals.

CAUTION!
Danger from incorrect metering
Should a different liquid end size be fitted, this will change the metering behaviour of the pump.
- Have the pump reprogrammed in the works.
CAUTION!
Warning of illegal operation
Observe the regulations that apply where the unit is to be installed.

Fixed separating protective equipment
- Dosing head
- Housing
- Hood (houses the control elements)
The dosing head may only be removed by the customer in accordance with the “Repair” chapter.
The housing and the hood may only be removed by ProMinent customer service department.

Information in the event of an emergency
In an emergency, either pull out the mains plug or press the customer installed emergency-off switch or disconnect the pump according to the emergency-off management for your system!
If feed chemical escapes, also depressurise the hydraulic system around the pump. Adhere to the safety data sheet for the feed chemical.

Qualification of personnel

<table>
<thead>
<tr>
<th>Activity</th>
<th>Qualification level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage, transport, unpacking</td>
<td>Instructed person</td>
</tr>
<tr>
<td>Assembly, installation of hydraulic system</td>
<td>Technical personnel, service</td>
</tr>
<tr>
<td>Installation, electrical</td>
<td>Electrical technician</td>
</tr>
<tr>
<td>Operation</td>
<td>Instructed person</td>
</tr>
<tr>
<td>Maintenance, repair</td>
<td>Technical personnel, service</td>
</tr>
<tr>
<td>Decommissioning, disposal</td>
<td>Technical personnel, service</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>Technical personnel, electrical technician, instructed person, service</td>
</tr>
</tbody>
</table>

Explanation of the terms:

**Technical personnel**
A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognise possible dangers based on his/her technical training, knowledge and experience, as well as knowledge of pertinent regulations.

Note:
A qualification of equal validity to a technical qualification can also gained by several years employment in the relevant work area.

**Electrical technician**
Electrical technicians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible dangers independently based on their technical training and experience, as well as knowledge of pertinent standards and regulations.
Electrical technicians should be specifically trained for the working environment in which they are employed and know the relevant standards and regulations.
Electrical technicians must comply with the provisions of the applicable statutory directives on accident prevention.

**Instructed person**
An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/her and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.

**Service**

Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent or ProMaqua to work on the system.

**Sound pressure level**

Sound pressure level $L_{pA} < 70 \text{ dB}$ in accordance with EN ISO 20361:2010-10

at maximum stroke length, maximum stroke rate, maximum back pressure (water)
Storage, transport and unpacking

Safety notes

WARNING!
The transporting of pumps which have been used with radioactive feed chemicals is forbidden!
They will also not be accepted by ProMinent!

WARNING!
Only return the metering pump for repair in a cleaned state and with a flushed liquid end - refer to the section on decommissioning!

Only send metering pumps with a filled in Decontamination Declaration form. The Decontamination Declaration constitutes an integral part of an inspection / repair order. A unit can only be inspected or repaired if a Decontamination Declaration is submitted that has been completed correctly and in full by an authorised and qualified person on behalf of the pump operator.

The "Decontamination Declaration" form can be found in the General Operating Instructions or under www.prominent.com.

CAUTION!
Danger of material damage

The device can be damaged by incorrect or improper storage or transportation!

– The unit should only be stored or transported in a well packaged state - preferably in its original packaging.
– The packaged unit should also only be stored or transported in accordance with the stipulated storage conditions.
– The packaged unit should be protected from moisture and the ingress of chemicals.

Personnel: Technical personnel

Ambient conditions

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum storage and transport temperature</td>
<td>-20</td>
<td>°C</td>
</tr>
<tr>
<td>Maximum storage and transport temperature</td>
<td>+60</td>
<td>°C</td>
</tr>
<tr>
<td>Maximum air humidity *</td>
<td>95%</td>
<td>% rel. humidity</td>
</tr>
</tbody>
</table>

* non-condensing
<table>
<thead>
<tr>
<th><strong>Scope of supply</strong></th>
<th>Compare the delivery note with the scope of supply:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>■ Metering pump with mains power cable</td>
</tr>
<tr>
<td></td>
<td>■ Connector kit for tube/pipe connection</td>
</tr>
<tr>
<td></td>
<td>■ Product-specific operating instructions with EC Declaration of Conformity</td>
</tr>
<tr>
<td></td>
<td>■ CD with order information, exploded diagrams, performance diagrams and data sheets</td>
</tr>
<tr>
<td></td>
<td>■ Optional accessories if ordered</td>
</tr>
</tbody>
</table>
5 Overview of equipment and control elements

5.1 Overview of equipment

![Diagram of equipment and control elements](P_BE_0013 SW)

**Fig. 2: Complete overview**

1. Control unit
2. Drive unit
3. Liquid end

![Diagram of liquid end (PV)](P_BE_0008 SW)

**Fig. 3: Overview of liquid end (PV)**

- a Discharge valve
- b Backplate
- c Dosing head
- d Bleed valve
- e Bypass hose nozzle
- f Suction valve
5.2 Control elements

Fig. 4
1 Pulse Control Switch
2 Stroke length adjustment knob
3 Fault indicator (red)
4 Warning indicator (yellow)
5 Operating indicator (green)
6 Multifunctional switch
7 "External control" terminal
8 Relay connection (optional)
9 "Level Switch" terminal

5.2.1 Pulse Control Switch

In Extern Contact operating mode via the pulse control switch a single contact (at the "external control" terminal) can be used to trigger a series of strokes or to support an incoming series of contacts.

5.2.2 Stroke length adjustment knob

The stroke length adjustment knob can be used to adjust the stroke length.

5.2.3 Multifunctional switch

The multifunctional switch can be used to set the following functions, operating modes and stroke rate.

The operating modes that can be set are:
- Test (priming function)
- Stop
- Extern (Contact)
- Manual (setting stroke rate in 10 % increments)
5.2.4 Functional and Fault Indicators

**Fault indicator (red)**

The fault indicator lights up if the liquid level in the chemical feed container falls below the second switching point of the level switch (20 mm residual filling level in the chemical feed container).

This LED flashes in the event of an undefined operating mode.

**Warning indicator (yellow)**

The warning indicator lights up if the fluid level in the chemical feed container falls below the first switching point of the level switch.

**Operating indicator (green)**

The operating indicator lights up if the pump is ready for operation and there are no fault or warning alerts. It goes out quickly as soon as the pump has performed a stroke.

5.2.5 "External control" terminal

The "external control" terminal is a five-pole panel terminal. It enables the following functions and operating modes to be used:

- Pause
- External contact
- Auxiliary frequency (external frequency changeover)

The two- and four-pole cables used to date can continue to be used. The "Auxiliary frequency" function can, however, only be used with a five-pole cable.

5.2.6 "Level Switch" terminal

A 2-stage level switch with pre-warning and end switch-off can be connected.
6  Functional description

6.1 Liquid End

The dosing process is performed as follows: The diaphragm is pressed into the dosing head; the pressure in the dosing head closes the suction valve and the feed chemical flows through the discharge valve out of the dosing head. The diaphragm is now drawn out of the dosing head; the discharge valve closes due to the negative pressure in the dosing head and fresh feed chemical flows through the suction valve into the dosing head. One cycle is completed.

6.2 Drive Unit

The diaphragm is driven by an electromagnet, which is controlled by an electronic controller.

6.3 Capacity

The capacity is determined by the stroke length and the stroke rate.

The stroke length is adjusted by the stroke length adjustment knob within a range of 0 ... 100 %. A stroke length of between 30 ... 100 % (SEK type: 50 ... 100 %) is recommended to achieve the specified reproducibility!

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended stroke length, standard type</td>
<td>30 ... 100</td>
<td>%</td>
</tr>
<tr>
<td>Recommended stroke length, SEK type</td>
<td>50 ... 100</td>
<td>%</td>
</tr>
</tbody>
</table>

The stroke rate can be set within a range of 10 ... 100 % using the multifunctional switch.

6.4 Self-Bleeding

Self-bleeding liquid ends (SEK types) are capable of independent priming when a discharge line is connected and diverting existent air pockets via a bypass. During operation they are also capable of conveying away gases which are produced, independently of the operating pressure in the system. It is also possible to dose precisely in a depressurised state due to the integral back pressure valve.

6.5 Operating Modes

The operating modes are selected by means of the multifunctional switch.

"Manual" operating mode

As soon as the stroke rate has been set by the multifunctional switch, the pump finds itself in "Manual" operating mode. 100 % corresponds to 180 strokes/min.

"Extern" operating mode:

The "Extern" operating mode is described below in the "Operation" chapter.
Functional description

6.6 Functions

The functions are described below in the "Operation" chapter.

6.7 Relay

The pump has two connecting options.

Fault indicating relay option

The relay can switch a connected power circuit (e.g. for an alarm horn) in the event of warnings or fault messages (e.g. warning levels).

The relay can be retrofitted with the retrofit kit via a knock-out opening in the pump foot - refer to "Retrofitting relays".

Fault indicating and pacing relay option

This combined relay can generate a contact with each stroke via its pacing relay in addition to its function as a fault indicating relay.

The relay can be retrofitted with the retrofit kit via a knock-out opening in the pump foot - refer to "Retrofitting relays".

6.8 Hierarchy of Operating Modes, Functions and Fault Statuses

The different operating modes, functions and fault statuses have a different effect on if and how the pump reacts.

The following list shows the order:

1. - Test (priming)
2. - Fault, Stop, Pause
3. - Auxiliary frequency (external frequency changeover)
4. - Manual, Extern Contact

Comments:

re 1 - "Priming" can take place in any mode of the pump (providing it is functioning).

re 2 - "Fault", "Stop" und "Pause" stop everything apart from "Priming".

re 3 - The stroke rate of "Auxiliary frequency" always has priority over the stroke rate specified by an operating mode in 4.
7 Assembly

**WARNING!**
**Danger of electric shock**
If water or other electrically conducting liquids penetrate into the drive housing, in any other manner than via the pump’s suction connection, an electric shock may occur.
- Position the pump so that it cannot be flooded.

**CAUTION!**
**Danger from incorrectly operated or inadequately maintained pumps**
Danger can arise from a poorly accessible pump due to incorrect operation and poor maintenance.
- Ensure that the pump is accessible at all times.
- Adhere to the maintenance intervals.

**Capacity too low**
The liquid end valves can be disrupted by vibrations.
- Secure the metering pump so that no vibrations can occur.

**Capacity too low**
If the valves of the liquid end do not stand vertically upwards, they cannot close correctly.
- Suction and discharge valves must stand vertically upwards (for self-bleeding liquid end, the bleed valve).

Mount the metering pump with the pump foot on a horizontal, level and load-bearing supporting surface.
CAUTION!
Warning of feed chemical spraying around
An unsuitable feed chemical can damage the parts of the pump contacted by the chemical.

- Take into account the resistance of the materials which will come into contact with the chemical when selecting the feed chemical – see the ProMinent product catalogue or under www.prominent.com.

CAUTION!
Warning of feed chemical spraying around
Pumps which are not fully installed hydraulically can eject feed chemicals from the outlet openings of the discharge valves as soon as they are connected to the mains.

- The pump must first be hydraulically installed and then electrically.
- In the event that you have failed to do so, press the [STOP/START] button or press the emergency-stop switch.

CAUTION!
Warning of feed chemical spraying around
Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

CAUTION!
Danger from rupturing hydraulic components
Peak loads during the dosing stroke can cause the maximum permissible operating pressure of the system and pump to be exceeded.

- The discharge lines are to be properly designed.

CAUTION!
Danger of personnel injury and material damage
The use of untested third party parts can result in personnel injuries and material damage.

- Only fit parts to metering pumps, which have been tested and recommended by ProMinent.

CAUTION!
Warning of illegal operation
Observe the regulations that apply where the unit is to be installed.
8.1 Install hose lines

8.1.1 Installation for metering pumps without bleed valve

Safety notes

CAUTION!
Warning of feed chemical spraying around
If the pipes are improperly installed, they can come lose or burst.
- Route all hose lines so they are free from mechanical stresses and kinks.
- Only use original hoses with the specified hose dimensions and wall thicknesses.
- To ensure high durability of the connections, only use clamp rings and hose nozzles that are intended for the hose diameter in question.

CAUTION!
Danger resulting from rupturing hydraulic components
Hydraulic components can rupture if the maximum permissible operating pressure is exceeded.
- Always maintain the maximum permissible operating pressure of all hydraulic components - please refer to the product specific operating instructions and system documentation.
- Never allow the metering pump to run against a closed shut-off device.
- Install a relief valve.

CAUTION!
Hazardous feed chemicals can escape
Hazardous or extremely aggressive feed chemicals can leak out when using conventional bleeding procedures with metering pumps.
- Install a bleed line with recirculation into the storage tank.

CAUTION!
Hazardous feed chemicals can escape
Hazardous or extremely aggressive feed chemicals can leak out in the event that the metering pump is removed from the installation.
- Shut-off valves must be installed on the metering pump's pressure and discharge sides.

CAUTION!
Uncontrolled flowing feed chemicals
Feed chemicals can leak through a stopped metering pump in the event of back pressure.
- For this purpose, use an injection valve or vacuum breaker.
CAUTION!
Uncontrolled flowing feed chemicals
Feed chemicals can leak through the metering pump in an uncontrolled manner in the event of excessive priming pressure.
- The maximum priming pressure for the metering pump may not be exceeded - please refer to the product-specific operating instructions.

The pipes are to be aligned in such a way as the metering pump and the liquid end can be removed from the side, if necessary.

Install hose lines - design PP, NP, PV, TT

1. Cut off the ends of the hoses at right angles.
2. Pull the union nut (2) and clamp ring (3) over the tube (1) - see figure Fig. 5.
3. Push the tube end (1) up to the stop over the nozzle (4). Widen it, if necessary.

Ensure that the O-ring and flat seal (5) is properly fitted to the valve (6).

Used PTFE seals may never be re-used. An installation sealed in this way will not be watertight.
The reason for this is that this type of seal is permanently distorted when subjected to pressure.

In order to enable it to be distinguished from the EPDM flat seal, the FPM flat seal design PV has a dot.

4. Place the tube (1) with the nozzle (4) onto the valve (6).
5. Clamp the hose connector: Screw the union nut (2) tight while simultaneously pressing on the tube (1).
6. Re-tighten the hose connector: Pull on the hose (1) briefly, which is fastened to the dosing head, and tighten up the union nut (2) once more.
1. Pull the union nut (2) and clamp rings (3, 4) over the pipe (1) with approx. 10 mm overhang - see Fig. 6.

2. Insert the pipe (1) up to the stop in the valve (5).

3. Tighten the union nut (2).

1. Fasten the tube line to the return line tube nozzle or to the liquid end bleed valve. PVC tube, soft, 6x4 mm is recommended for this.

2. Feed the free end of the return line back to the storage tank.
8.1.3 Installation for metering pumps with self-bleeding (SEK type)

Safety notes

CAUTION!
- All of the installation and safety notes for metering pumps without self-bleeding also apply.
- The maximum values for priming lift, priming pressure and the viscosity of the feed chemical may not be exceeded.
- The suction end hose line cross section may not exceed the hose line cross section of the suction valve.

Information about priming pressure
- The priming pressure on the suction end must be at least equal to the return line pressure.
- Priming pressure in the return line restricts the bleeding function.
- However, operation with priming pressure in the return line and the suction end at atmospheric pressure is possible.

Installation of the return line

A return line is connected in addition to the suction and discharge lines.

- The return line is connected to the vertical valve on the upper side of the liquid end. It is labelled with a red sleeve from factory - see Fig. 7.
- The discharge line is connected to the vertical valve.

1. Fasten the tube line to the return line tube nozzle or to the liquid end bleed valve. PVC tube, soft, 6x4 mm is recommended for this.

2. Feed the free end of the return line back to the storage tank.

3. SEK only: Insert the return line into the anti-kink device on the bleed valve and screw it in place until the anti-kink device engages.

The anti-kink device prevents the return line from kinking, thereby avoiding the risk of self-bleeding system failure.

4. Shorten the return line hose so that it cannot submerge into the feed chemical in the storage tank.
Fig. 7: SEK liquid end

1 Anti-kink device
2 Bleed valve for the return line in the storage tank, 6/4 mm
3 Red sleeve
4 Discharge valve for discharge line to injection point, 6/4 - 12/9 mm
5 Suction valve for suction line in storage tank, 6/4 - 12/9 mm
9 Electrical installation

WARNING!
Danger of electric shock
A mains voltage may exist inside the device.
- Before any work, disconnect the device's mains cable from the mains.

WARNING!
Risk of electric shock
This pump is supplied with a grounding conductor and a grounding-type attachment plug.
- To reduce the risk of electric shock, ensure that it is connected only to a proper grounding-type receptacle.

WARNING!
Risk of electric shock
In the event of an electrical accident, the pump must be quickly disconnected from the mains.
- Install an emergency cut-off switch in the pump power supply line or
- Integrate the pump in the emergency cut-off management of the system and inform personnel of the isolating option.

WARNING!
Danger of electric shock
A mains voltage may exist inside the pump housing.
- If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

CAUTION!
Material damage possible due to power surges
Should the pump be connected to the mains power supply in parallel to inductive consumers (such as solenoid valves, motors), inductive power surges can damage the controller when it is switched off.
- Provide the pump with its own contacts and supply with voltage via a contactor relay or relay.

Personnel: Electrician

Install the pump technically correctly and in accordance with the operating instructions and applicable regulations.
9.1 Supply voltage connector

WARNING!
Unexpected startup is possible
As soon as the pump is connected to the mains, the pump may start pumping and consequently feed chemical may escape.
- Prevent dangerous feed chemicals from escaping.
- If you have not successfully prevented this, immediately press the [STOP/START] key or disconnect the pump from mains, e.g. via an emergency cut-off switch.

CAUTION!
If the pump is integrated into a system: The system must be designed so that potential hazardous situations are avoided by pumps starting up automatically subsequent to unintended power interruptions.

Connect the pump to the mains/power supply using the mains cable.

Parallel connection to inductive consumers
Should the pump be connected to the mains in parallel to inductive consumers (e.g. solenoid valves, motor), the pump must be electrically isolated when these consumers are switched off.
- Supply the pumps with voltage via a contactor relay or relay using separate contacts for the pump.
- If this is not possible then connect a varistor (part no. 710912) or an RC member, 0.22 µF / 220 Ω in parallel.

Interference suppression aids

<table>
<thead>
<tr>
<th>Product</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varistor:</td>
<td>710912</td>
</tr>
<tr>
<td>RC Gate, 0.22 µF / 220 Ω:</td>
<td>710802</td>
</tr>
</tbody>
</table>

9.2 Description of the sockets
9.2.1 "External control" terminal

The "external control" socket is a five-pin panel jack. It is compatible with two- and four-conductor cables.

The "Auxiliary rate" function can only be used with a five conductor cable.
Electrical interface for pin 1 "Pause" - pin 2 "External contact" - pin 5 "Auxiliary frequency"

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage with open contacts</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Input resistance</td>
<td>10</td>
<td>kΩ</td>
</tr>
<tr>
<td>Max. pulse frequency</td>
<td>25</td>
<td>pulse/s</td>
</tr>
<tr>
<td>Minimum pulse duration</td>
<td>20</td>
<td>ms</td>
</tr>
</tbody>
</table>

Control via:
- potential-free connection contact (load: 0.5 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Electrical interface for pin 3 "mA output" (identity code characteristic "Control variant": 3, 5 and R)

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input apparent ohmic resistance, approx.</td>
<td>120</td>
<td>Ω</td>
</tr>
</tbody>
</table>

1 The metering pump makes its first metering stroke at approx. 0.4 mA (4.4 mA) and starts continuous operation at approx. 19.2 mA.

Pin | Function          | 5-conductor cable | 2-conductor cable |
--- |-------------------|-------------------|-------------------|
1   | Pause             | brown             | bridged at pin 4  |
2   | External contact  | white             | brown             |
3   | mA output*        | blue              | -                 |
4   | Earth / GND       | black             | white             |
5   | Auxiliary frequency | grey         | -                 |

* with identity code characteristic "Control version": 3, 5 and R

Refer to the functional description for the hierarchy of functions and operating modes.

"Pause" function

The pump does not work if:
- the cable is connected and pin 1 and pin 4 are open.

The pump works if:
- the cable is connected and pin 1 and pin 4 are connected.
- no cable is connected.

"External contact" operating mode

The pump performs one or more strokes if:
- Pin 2 and pin 4 are connected to each other for at least 20 ms. At the same time, pin 1 and pin 4 must also be connected to each other.

"Auxiliary frequency" operating mode

The pump works at a pre-set stroke rate if:
- Pin 5 and pin 4 are connected to each other. At the same time, pin 1 and pin 4 must also be connected to each other. The auxiliary frequency is factory-preset to the maximum stroke rate.
9.2.2 "Level Switch" terminal

There is a connecting option for a 2-stage level switch with pre-warning and limit stop.

**Electrical interface**

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage with open contacts</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Input resistance</td>
<td>10</td>
<td>kΩ</td>
</tr>
</tbody>
</table>

Control via:
- potential-free connection contact (load: 0.5 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

**Pin assignment**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>3-conductor cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earth / GND</td>
<td>black</td>
</tr>
<tr>
<td>2</td>
<td>Minimum pre-warning</td>
<td>blue</td>
</tr>
<tr>
<td>3</td>
<td>Minimum limit stop</td>
<td>brown</td>
</tr>
</tbody>
</table>

9.3 Relay

9.3.1 "Fault indicating relay" output (identity code 1 + 3 or 4 + 5)

A fault indicating relay can be ordered as an option - refer to ordering information in the appendix. It is used to emit a signal when there is a fault with the pump and for the "Liquid level low, 1st stage" warning alert and "Liquid level low, 2nd stage".

A cut-off relay works when there are fault alerts from the pump and in the event of the "Liquid level low 2nd stage" alert.

The fault indicating relay can be retrofitted and is operational once attached to the relay board - refer to "Retrofitting Relays" in the Appendix.

**Electrical interface**

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum contact load at 230 V and 50/60 Hz:</td>
<td>8</td>
<td>A</td>
</tr>
<tr>
<td>Minimum mechanical lifespan:</td>
<td>200 000</td>
<td>Switching operations</td>
</tr>
</tbody>
</table>

**Pin assignment**

Identity code 1 + 3
9.3.2 Output pacing relay (identity code 4 + 5)

A fault indicating and a pacing relay can optionally be ordered - refer to ordering information in the appendix. The pacing output is electrically-isolated by means of an optocoupler with a semiconductor switch. The second switch is a relay.

The fault indicating/pacing relay can be retrofitted and is operational once attached to the relay board - refer to "Retrofitting Relays" in the Appendix.

### Electrical interface
for semiconductor switch pacing relay:

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual voltage max. at $I_c = 1\ mA$</td>
<td>0.4</td>
<td>V</td>
</tr>
<tr>
<td>Maximum current</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>24</td>
<td>VDC</td>
</tr>
<tr>
<td>Pacing pulse duration, approx.</td>
<td>100</td>
<td>ms</td>
</tr>
</tbody>
</table>

### Pin assignment

<table>
<thead>
<tr>
<th>To pin</th>
<th>VDE cable</th>
<th>Contact</th>
<th>Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>yellow</td>
<td>NO (normally open)</td>
<td>Fault indicating relay</td>
</tr>
<tr>
<td>4</td>
<td>green</td>
<td>C (common)</td>
<td>Fault indicating relay</td>
</tr>
<tr>
<td>3</td>
<td>white</td>
<td>NO (normally open)</td>
<td>Pacing relay</td>
</tr>
<tr>
<td>2</td>
<td>brown</td>
<td>C (common)</td>
<td>Pacing relay</td>
</tr>
</tbody>
</table>
10 Operation

**WARNING!**
Danger of electric shock
Incompletely installed electrical options can allow moisture into the inside of the housing.
- Knock-out openings in the pump housing must be equipped with matching modules or be sealed in a leak-tight manner.

**WARNING!**
Danger of electric shock
A mains voltage may exist inside the pump housing.
- If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

10.1 Manual

Personnel:  ■ Instructed personnel

10.1.1 Capacity

The capacity is determined by the stroke length and the stroke rate. The stroke length is adjusted by the stroke length adjustment knob within a range of 0 ... 100 %. A stroke length of between 30 ... 100 % (SEK type: 50 ... 100 %) is recommended to achieve the specified reproducibility!

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended stroke length, standard type</td>
<td>30 ... 100</td>
<td>%</td>
</tr>
<tr>
<td>Recommended stroke length, SEK type</td>
<td>50 ... 100</td>
<td>%</td>
</tr>
</tbody>
</table>

The stroke rate can be set within a range of 10 ... 100 % using the multifunctional switch.

10.1.2 Functions

The pump has the following functions:

*"Pause" function*
The pump can be remotely stopped via the "External Control" terminal. The *"Pause" function only works via the "External Control" terminal.

*"Stop" function*
The pumps can be stopped by turning the multifunctional switch to "Stop" without disconnecting it from the mains power supply.

*"Priming" function*
Priming (transient conveyance at maximum frequency) can be provided by turning the multifunctional switch to "Test".
"Level switch" function
Information about the liquid/powder level in the feed chemical container is reported to the pump. To do so, a two-stage level switch must be fitted; it is connected to the "Level switch" terminal.

"Auxiliary rate" function
Enables switching of a stroke rate via the "External control" jack. This auxiliary frequency has priority over the operating mode stroke rate settings. In the standard version, the "Auxiliary frequency" function is programmed to 100 % stroke rate.

10.1.3 External contact
"Extern" operating mode:
In the Extern Contact operating mode, either a series of strokes can be triggered or an inbound series of contacts can be stepped down via the pulse control switch by a single contact on the "External control" terminal. To do so, the multifunctional switch has to be turned to "Extern".

Explanation of the stepped-down values:

<table>
<thead>
<tr>
<th>Settable values</th>
<th>Incoming contacts</th>
<th>Strokes performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1:2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1:4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1:8</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>1:16</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>1:32</td>
<td>32</td>
<td>1</td>
</tr>
<tr>
<td>1:64</td>
<td>64</td>
<td>1</td>
</tr>
</tbody>
</table>

Explanation of stepped-up values:

<table>
<thead>
<tr>
<th>Settable values</th>
<th>Incoming contacts</th>
<th>Strokes performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2:1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4:1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>8:1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>16:1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>32:1</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>64:1</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

10.2 Remote operation
There is an option to control the pump remotely via a signal cable - refer to your system documentation and to "Electrical Installation".
11 Maintenance

**WARNING!**
It is mandatory that you read the safety information and specifications in the "Storage, Transport and Unpacking" chapter prior to shipping the pump.

**CAUTION!**
**Warning of feed chemical spraying around**
Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.
- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

**Further data on CD**
All product-specific operating instructions include a CD with order details, exploded diagrams and dimensions sheets, if they are not included in the operating instructions.

### Standard liquid ends:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Maintenance work</th>
<th>Personnel</th>
</tr>
</thead>
</table>
| Quarterly* | - Check the metering diaphragm for damage** - refer to "Repair".  
- Check that the hydraulic lines are fixed firmly to the liquid end.  
- Check that the suction valve and discharge valve are correctly seated.  
- Check the tightness of the entire liquid end - particularly around the leakage hole - please refer to !  
- Check that the flow is correct: Allow the pump to prime briefly - turn the multifunctional switch briefly to "Test"  
- Check that the electrical connections are intact  
- Check the integrity of the housing.  
- Check that the dosing head screws are tight | Technical personnel |

* Under normal loading (approx. 30 % of continuous operation)

Under heavy loading (e.g. continuous operation): Shorter intervals.

** For feed chemicals which particularly load the diaphragm, e.g. those containing abrasive additives, check the diaphragm frequently.
Liquid ends with bleed valve:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Maintenance work</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarterly*</td>
<td>In addition:</td>
<td>Technical personnel</td>
</tr>
<tr>
<td></td>
<td>- Check that the bypass line is fixed firmly to the liquid end</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Check that the bleed valve is tight.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Check the discharge and bypass line for kinks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Check that the bleed valve is operating correctly.</td>
<td></td>
</tr>
</tbody>
</table>

* Under normal loading (approx. 30 % of continuous operation)

Under heavy loading (e.g. continuous operation): Shorter intervals.

Tightening torque

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening torque for screws:</td>
<td>4.5 ... 5.0</td>
<td>Nm</td>
</tr>
</tbody>
</table>
12 Repairs

Safety notes

WARNING!
Danger of an electric shock
Unauthorised repairs inside the pump can result in an electric shock.
For this reason, repairs inside the pump may only be performed by a ProMinent branch or representative, in particular the following:
- Replacement of damaged mains connection lines
- Replacement of fuses
- Replacement of electronic control

WARNING!
It is mandatory that you read the safety information and specifications in the "Storage, Transport and Unpacking" chapter prior to shipping the pump.

WARNING!
Contact with the feed chemical
Parts that come into contact with the feed chemical are uncovered and handled during overhaul work.
- Protect yourself against the feed chemical in case it is hazardous. Read the safety data sheet on the feed chemical.

CAUTION!
Warning of feed chemical spraying around
Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.
- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

12.1 Cleaning valves

Personnel:
- Technical personnel

Warning of faulty operation
The exploded views on the CD should be referred to when working on the unit.
Cleaning a discharge valve or a suction valve on types (PP, PV, NP) 1000, 1601, 1602, 1604, 2504

**Warning of faulty operation**

- Discharge and suction valves differ from each other! Only take them apart one after each other, so that you do not confuse the components!
- Only use new components which fit your valve - both in terms of shape and chemical resistance!
- Recalibrate the pump after replacing a valve!
- Using an Allen key or similar, insert it into the smaller hole of the discharge connector and push the valve inserts out of it.

A suction valve is constructed in almost the same way as a discharge valve.

Please note, however, that:
- the two valve inserts are identical here
- There is an additional spacer between the valve inserts.
- There is a shaped seal in the dosing head instead of an O-ring.
- The flow direction of the suction connector is the opposite of that of the discharge connector.

Cleaning a discharge valve or a suction valve on types (PP, PV, NP) 0708, 1008, 0220, 0420, 0413, 0713, 0232

**Warning of faulty operation**

- Discharge and suction valves differ from each other! Only take them apart one after each other, so that you do not confuse the components!
- Only use new components which fit your valve - both in terms of shape and chemical resistance!
- On the PVT material version, the ball seat is integrated in the dosing head and so has to be cleaned separately!
- On the PVT material version, the discharge valve is a double ball valve!
- Using an Allen key or similar, insert it into the smaller hole of the discharge connector and push the valve inserts out of it.

A suction valve is constructed in almost the same way as a discharge valve.

Please note, however, that:
- The flow direction of the suction connector is the opposite of that of the discharge connector.
12.2 Replacing the metering diaphragm

WARNING!
A few cubic centimetres of feed chemical may have accumulated behind the metering diaphragm in the backplate following a leak - depending on the design!
- Take this feed chemical into consideration when you are planning a repair - especially if it is hazardous!

Personnel:
- Technical personnel
- If necessary take protective measures.
- Observe the safety data sheet for the feed chemical.
- Depressurise the system.

1. Empty the liquid end (turn the liquid end upside down and allow the feed chemical to run out; flush out with a suitable medium; flush the liquid end thoroughly when using hazardous feed chemicals!)

2. Turn the stroke adjustment dial until the stop at 0 % stroke length if the pump is running (the drive axle is then difficult to turn).

3. Switch off the pump.

4. Unscrew the hydraulic connectors on the discharge and suction side.

5. With PP types with bleed valve: Firstly remove the bleed valve (star handle), then lift off the cover of the liquid end with a screw driver.

6. Remove the screws (1).

7. Loosen the dosing head (2) and the backplate (4) from the pump housing (6) - but only loosen!

8. Hold the pump housing (6) with one hand and clamp the diaphragm (3) with the other hand between the dosing head (2) and the backplate (4).

9. Loosen the diaphragm (3) from the drive axle with a gentle backwards turn of the dosing head (2), diaphragm (3) and backplate (4) in an anticlockwise direction.

10. Unscrew the diaphragm (3) completely from the drive axle.

11. Remove the backplate (4) from the pump housing (6).

12. Check the condition of the safety diaphragm (5) and replace if necessary.

13. Push the safety diaphragm (5) onto the drive axle only until it lies flush with the pump housing (6) and no further!

14. Tentatively screw the new diaphragm (3) onto the drive axle until its stop position.
   - The diaphragm (3) is now sitting at the stop of the thread.

15. Should this not work, remove dirt or swarf out of the threads and screw the diaphragm (3) onto the drive axle correctly this time.
   - The diaphragm must be screwed exactly onto the drive axle otherwise the pump will subsequently not meter correctly!

16. Unscrew the diaphragm (3) again.

17. Place the backplate (4) onto the pump housing (6).
CAUTION!
Leakage may become apparent at a later stage.
- The leakage hole must point downwards when the pump is installed later - please refer to!
- Place the backplate (4) immediately into the correct position on the pump housing (6)! Do not twist the backplate on the pump housing so that the safety diaphragm (5) becomes warped!

18. Place the diaphragm (3) into the backplate (4).

CAUTION!
Leakage may become apparent at a later stage.
- Do not over-tighten the diaphragm (3) in the following step!
- The backplate (4) must remain in its position so that the safety diaphragm does not become warped!

19. Hold the backplate (4) firmly and screw the diaphragm (3) in a clockwise direction until it is sitting tightly (the twisting resistance of the return spring can be felt).

20. Set the stroke length to 100 %.

21. Place the dosing head (2) with the screws (1) onto the diaphragm (3) and the backplate (4) - the suction connector must be pointing downwards in the pump's subsequent fitting position.

22. Gently tighten the screws (1) and then tighten in a diagonal pattern. See below for tightening torque.

23. With PP types with bleed valve: Allow the cover of the liquid end to rest in the dosing head, then press the knob on the bleed valve into the dosing head.

CAUTION!
Leakage possible
- Check the tightening torque of the screws after 24-hours of operation!
- With PP dosing heads, recheck the tightening torque again after three months!

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening torque for screws:</td>
<td>4.5 ... 5.0</td>
<td>Nm</td>
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</table>
Fig. 18: Partially exploded view of liquid end
# Troubleshooting

## Safety notes

**WARNING!**

**Warning of dangerous or unknown feed chemical**

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

- Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
- Drain and flush the liquid end before working on the pump.

**CAUTION!**

**Warning of feed chemical spraying around**

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

## 13.1 Faults without a fault alert

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump does not prime in spite of full stroke motion and bleeding</td>
<td>Minor crystalline deposits on the ball seat due to the valves drying out</td>
<td>Take suction hose out of the storage tank and thoroughly flush out the liquid end</td>
<td>Technical personnel</td>
</tr>
<tr>
<td></td>
<td>Major crystalline deposits on the ball seat due to the valves drying out</td>
<td>Dismantle the valves and clean them - refer to “Repair”</td>
<td>Technical personnel</td>
</tr>
<tr>
<td>Fluid is escaping from the backplate</td>
<td>The screws in the dosing head are too loose</td>
<td>Tighten the screws in the dosing head crosswise - refer to “Repair” for tightening torque.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>The metering diaphragm is not tight</td>
<td>Replace the metering diaphragm - refer to “Repair”.</td>
<td>Technical personnel</td>
</tr>
<tr>
<td>Green LED display (operating display) does not light up</td>
<td>The wrong mains voltage or no mains voltage is connected</td>
<td>Connect the pump correctly to the specified mains voltage - according to the specification on the nameplate</td>
<td>Electrician</td>
</tr>
</tbody>
</table>

## 13.2 Fault alerts

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red LED indicator (fault indicator) lights up and the pump stops</td>
<td>The liquid level in the storage tank has reached &quot;liquid level low 2nd stage&quot;.</td>
<td>Fill the storage tank</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>The multifunctional switch is not turned to &quot;Extern&quot; but an external cable is connected and the pump has the identity code feature &quot;Control type&quot; - &quot;1&quot; &quot;with lock&quot;.</td>
<td>Either turn the multifunctional switch to &quot;Extern&quot; or remove the Extern cable from the pump</td>
<td>Technical personnel</td>
</tr>
</tbody>
</table>
13.3 Warning Alerts

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow LED indicator (warning indicator) lights up</td>
<td>The liquid level in the storage tank has reached &quot;liquid level low 1st stage&quot;.</td>
<td>Fill the storage tank</td>
<td>Instructed personnel</td>
</tr>
</tbody>
</table>

13.4 All Other Faults

Please contact the responsible ProMinent branch or representative.
Decommissioning

14 Decommissioning

WARNING!
Danger from chemical residues
There is normally chemical residue in the liquid end and on the housing after operation. This chemical residue could be hazardous to people.
- It is mandatory that the safety information relating to the “Storage, transport and unpacking” chapter is read before shipping or transporting the unit.
- Thoroughly clean the liquid end and the housing of chemicals and dirt. Adhere to the safety data sheet for the feed chemical.

WARNING!
Warning of dangerous or unknown feed chemical
Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.
- Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
- Drain and flush the liquid end before working on the pump.

CAUTION!
Warning of feed chemical spraying around
Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.
- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

Danger of damage to the device
Take into account the information in the "Storage, Transport and Unpacking" chapter if the system is decommissioned for a temporary period.

Personnel:
- Technical personnel

1. Disconnect the pump from the mains power supply.
2. Empty the liquid end by turning the pump upside down and allowing the feed chemical to run out.
3. Flush the liquid end with a suitable medium; flush the dosing head thoroughly when using hazardous feed chemicals!
Disposal

**CAUTION!**  
**Warning of feed chemical spraying around**  
Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

**Personnel:**  
- Technical personnel

**CAUTION!**  
**Environmental hazard due to electronic waste**  
There are electronic components in the pump, which can have a toxic effect on the environment.

- Separate the electronic components from the remaining parts.
- Note the pertinent regulations currently applicable in your country!
## 15 Technical data

### 15.1 Performance data

Beta b operating at 180 strokes/minute and 100 % stroke length

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum pump capacity at maximum back pressure</th>
<th>Minimum pump capacity at medium back pressure</th>
<th>Connector size outside $\varnothing \times$ inside $\varnothing$</th>
<th>Suction lift*</th>
<th>Priming lift**</th>
<th>Maximum priming pressure on suction side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bar</td>
<td>l/h</td>
<td>ml/ stroke</td>
<td>bar</td>
<td>l/h</td>
<td>ml/ stroke</td>
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<td>Beta b</td>
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</table>

Beta b Metering pumps with self-bleeding dosing head SEK***

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum pump capacity at maximum back pressure</th>
<th>Minimum pump capacity at medium back pressure</th>
<th>Connector size outside $\varnothing \times$ inside $\varnothing$</th>
<th>Suction lift*</th>
<th>Priming lift**</th>
<th>Maximum priming pressure on suction side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bar</td>
<td>l/h</td>
<td>ml/ stroke</td>
<td>bar</td>
<td>l/h</td>
<td>ml/ stroke</td>
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### Technical data

<table>
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<th>Type</th>
<th>Minimum pump capacity at maximum back pressure</th>
<th>Minimum pump capacity at medium back pressure</th>
<th>Connector size outside Ø x inside Ø</th>
<th>Suction lift*</th>
<th>Priming lift**</th>
<th>Maximum priming pressure on suction side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum pump capacity</td>
<td>Minimum pump capacity</td>
<td>Connector size outside Ø x inside Ø</td>
<td>Suction lift*</td>
<td>Priming lift**</td>
<td>Maximum priming pressure on suction side</td>
</tr>
<tr>
<td></td>
<td>at maximum back pressure</td>
<td>at medium back pressure</td>
<td>Connector size outside Ø x inside Ø</td>
<td>Suction lift*</td>
<td>Priming lift**</td>
<td>Maximum priming pressure on suction side</td>
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<td></td>
<td>bar l/h ml/ stroke</td>
<td>bar l/h ml/ stroke</td>
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</tr>
</tbody>
</table>

* - Suction lift with a filled suction line and filled liquid end. With self-bleeding dosing head with air in the suction line.

** - Priming lift with clean and moist valves. Priming lift at 100 % stroke length and free outlet or opened bleed valve.

*** - The given performance data constitutes guaranteed minimum values, calculated using medium water at room temperature. The bypass connection with a self-bleeding dosing head is 6x4 mm.

¹ - The connector width is 6 mm on SST material versions.

Beta b Metering pumps with dosing heads for higher-viscosity media have a 10-20 % lower metering capacity and are not self-priming. Connection G 3/4-DN 10 with tube nozzle d16-DN10.

### 15.2 Accuracy

#### 15.2.1 Standard Liquid End

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity range of the series</td>
<td>-5 ... +10</td>
<td>% *</td>
</tr>
<tr>
<td>Reproducibility</td>
<td>±2</td>
<td>% **</td>
</tr>
</tbody>
</table>
15.2.2 Self-Bleeding Liquid End

As the self-bleeding liquid end is used with outgassing media and when operating with air bubbles, no dosing accuracy or reproducibility can be provided.

The recommended minimum stroke length with self-bleeding dosing pumps is 50%.

15.3 Viscosity

The liquid ends are suitable for the following viscosity ranges:

<table>
<thead>
<tr>
<th>Version</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
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<td>standard</td>
<td>0 … 200</td>
<td>mPas</td>
</tr>
<tr>
<td>With valve springs</td>
<td>200 … 500</td>
<td>mPas</td>
</tr>
<tr>
<td>Self-bleeding (SEK)</td>
<td>0 … 50</td>
<td>mPas</td>
</tr>
<tr>
<td>HV (highly viscous)</td>
<td>500 … 3000*</td>
<td>mPas</td>
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* Only when the installation is correctly adjusted

15.4 Material Data

### Standard liquid ends

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<th>Dosing head</th>
<th>Suction/Discharge connector</th>
<th>Seals</th>
<th>Valve balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>Polypropylene</td>
<td>Polypropylene</td>
<td>EPDM</td>
<td>Ceramic</td>
</tr>
<tr>
<td>PPB</td>
<td>Polypropylene</td>
<td>Polypropylene</td>
<td>FPM</td>
<td>Ceramic</td>
</tr>
<tr>
<td>PPT</td>
<td>Polypropylene</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Ceramic</td>
</tr>
<tr>
<td>NPE</td>
<td>Acrylic glass</td>
<td>PVC</td>
<td>EPDM</td>
<td>Ceramic</td>
</tr>
<tr>
<td>NPB</td>
<td>Acrylic glass</td>
<td>PVC</td>
<td>FPM</td>
<td>Ceramic</td>
</tr>
<tr>
<td>NPT</td>
<td>Acrylic glass</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Ceramic</td>
</tr>
<tr>
<td>PVT</td>
<td>PVDF</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Ceramic</td>
</tr>
<tr>
<td>TTT</td>
<td>PTFE with carbon</td>
<td>PTFE with carbon</td>
<td>PTFE</td>
<td>Ceramic</td>
</tr>
<tr>
<td>SST</td>
<td>Stainless steel 1.4404</td>
<td>Stainless steel 1.4404</td>
<td>PTFE</td>
<td>Ceramic</td>
</tr>
</tbody>
</table>

Only the self-bleeding version in PPE, PPB, NPE and NPB material models with a valve spring made of hastelloy C and a valve insert made of PTFE. Diaphragm with a PTFE coating.

FPM = fluororubber
### 15.5 Electrical data

**Version: 100 - 230 V ±10 %, 50/60 Hz, Beta b BT4b**

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal power, approx.</td>
<td>6.4 ... 16.5</td>
<td>W</td>
</tr>
<tr>
<td>Current I\textsubscript{eff}</td>
<td>0.65 ... 0.1</td>
<td>A</td>
</tr>
<tr>
<td>Peak current</td>
<td>4.2 ... 1.3</td>
<td>A</td>
</tr>
<tr>
<td>Switch on peak current, (within approx. 50 ms falling)</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>Fuse*</td>
<td>0.8</td>
<td>AT</td>
</tr>
</tbody>
</table>

**Version: 100 - 230 V ±10 %, 50/60 Hz, Beta b BT5b**

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal power, approx.</td>
<td>20 ... 25</td>
<td>W</td>
</tr>
<tr>
<td>Current I\textsubscript{eff}</td>
<td>0.9 ... 0.3</td>
<td>A</td>
</tr>
<tr>
<td>Peak current</td>
<td>5.9 ... 2.3</td>
<td>A</td>
</tr>
<tr>
<td>Switch on peak current, (within approx. 50 ms falling)</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>Fuse*</td>
<td>0.8</td>
<td>AT</td>
</tr>
</tbody>
</table>

* Fuses must have VDE, UL and CSA certification. E.G. type 19195 manufactured by Wickmann in compliance with IEC Publ. 127 - 2/3.

### Power consumption

<table>
<thead>
<tr>
<th>Type</th>
<th>Performance</th>
<th>Type</th>
<th>Performance</th>
<th>Type</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>7.6 W</td>
<td>1602</td>
<td>12.2 W</td>
<td>0408</td>
<td>12.7 W</td>
</tr>
<tr>
<td>0700</td>
<td>6.4 W</td>
<td>1002</td>
<td>10.6 W</td>
<td>0413</td>
<td>16.5 W</td>
</tr>
<tr>
<td>0400</td>
<td>5.7 W</td>
<td>0702</td>
<td>9.3 W</td>
<td>0220</td>
<td>16.5 W</td>
</tr>
<tr>
<td>2001</td>
<td>10.5 W</td>
<td>0402</td>
<td>7.9 W</td>
<td>2504</td>
<td>21.2 W</td>
</tr>
<tr>
<td>1601</td>
<td>10.0 W</td>
<td>1604</td>
<td>16.5 W</td>
<td>1008</td>
<td>20.3 W</td>
</tr>
<tr>
<td>1001</td>
<td>8.3 W</td>
<td>1004</td>
<td>12.7 W</td>
<td>0713</td>
<td>21.2 W</td>
</tr>
<tr>
<td>0701</td>
<td>7.5 W</td>
<td>0704</td>
<td>11.1 W</td>
<td>0420</td>
<td>21.2 W</td>
</tr>
<tr>
<td>0401</td>
<td>6.9 W</td>
<td>0404</td>
<td>9.5 W</td>
<td>0232</td>
<td>24.9 W</td>
</tr>
<tr>
<td>2002</td>
<td>13.5 W</td>
<td>0708</td>
<td>16.5 W</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

### 15.6 Temperatures

**Pump, compl.**

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage and transport temperature</td>
<td>-20 ... +60</td>
<td>°C</td>
</tr>
<tr>
<td>Ambient temperature in operation (drive and control):</td>
<td>-10 ... +45</td>
<td>°C</td>
</tr>
</tbody>
</table>
## Technical data

### 15.7 Climate

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum air humidity *:</td>
<td>95</td>
<td>% rel. humidity</td>
</tr>
</tbody>
</table>

* non-condensing

Exposure in a humid and alternating climate:

FW 24 according to DIN 50016

### 15.8 Protection class and Safety Requirements

**Degree of protection**

Protection against contact and humidity:

IP 65 in accordance with IEC 529, EN 60529, DIN VDE 0470 Part 1

**Safety requirements**

Degree of protection:

1 - mains power connection with protective earth conductor

### 15.9 Compatibility

Some hydraulic parts of the Beta® b are identical to those of the Beta® a, gamma/ L and delta®.

There is most compatibility with pumps of the Beta® a, gamma/ L and delta® series with the following components and accessories:

- Signal cable gamma/Vario 2-, 4- and 5-wire for the "Extern" function
- Level switch 2-stage (gamma / Vario / Beta®)
- Dosing line cross-sections
- Standard gamma connector kit
- Chemical feed container
- Overall height (distance between the suction and discharge connector)
- Same use of accessories, such as back pressure valves, multifunctional valves, dosing monitor and flushing equipment

### 15.10 Sound pressure level

**Sound pressure level**

Sound pressure level $L_{pA} < 70$ dB in accordance with EN ISO 20361:2010-10 at maximum stroke length, maximum stroke rate, maximum back pressure (water)

### 15.11 Shipping weight

**Shipping weight of Beta b types - in kg**

<table>
<thead>
<tr>
<th>Material</th>
<th>BT4b</th>
<th>BT5b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000, 0700, 0400</td>
<td>2001, 1001, 0701, 0401</td>
</tr>
<tr>
<td>PP, NP, PV, TT</td>
<td>2.5</td>
<td>2.9</td>
</tr>
<tr>
<td>SS</td>
<td>3.0</td>
<td>3.6</td>
</tr>
</tbody>
</table>
EC Declaration of Conformity for Machinery

We, ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5 - 11
D - 69123 Heidelberg

hereby declare that the product identified below conforms to the basic health and safety requirements of the EC Directive, by virtue of its design and construction, and in the configuration placed on the market by us.
This declaration is no longer applicable if changes are made to the product without our authorisation.

Product description: Dosing pump, Beta 4 and Beta 5 series

Product type:
BT4b _ _ _ _ _ _ _ _ _ _ _ U
BT5b _ _ _ _ _ _ _ _ _ _ _ U

Serial no.: see type plate on the unit

Applicable EC Directives:
- EC Machinery Directive (2006/42/EC)
The safety objectives of the Low Voltage Directive 2006/95/EC were complied with in accordance with Appendix 1, No. 1.5.1 of the Machinery Directive 2006/42/EC

Applied harmonised standards, especially:
- EN ISO 12100, EN 809,
- EN 60335-1, EN 61010-1, EN 50106, EN 55014-1, EN 55014-2,
- EN 61000-3-2/3, EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-3

Technical documentation was compiled by the authorised representative for documentation:
Dr. Johannes Hartfiel
Im Schuhmachergewann 5-11
D - 69123 Heidelberg

Date / Manufacturer signature: 25.04.2012
Name / position of the signatory: Joachim Schall, Manager Innovation and Technology
Index

A
About this pump.............................................................. 8
Accuracy........................................................................... 47
Anti-kink device................................................................... 27
Assembly........................................................................... 21
Auxiliary frequency.......................................................... 18, 20, 30
Auxiliary rate....................................................................... 34

B
Backplate........................................................................... 16
Bleeding............................................................................. 25, 26
Bleed valve.......................................................................... 16, 27
Bypass hose nozzle............................................................ 16

C
Capacity............................................................................. 19, 33
Cleaning valves................................................................... 37
Compatibility........................................................................ 50
Connector size...................................................................... 46
Contacter relay...................................................................... 29
Contacts............................................................................... 34
Control elements................................................................... 17
Control type.......................................................................... 42
Correct and proper use....................................................... 9

D
Declaration of Conformity................................................... 52
Decommissioning............................................................... 44
Degree of protection.......................................................... 50
Discharge valve................................................................... 16, 27
Disposal............................................................................... 45
Dosing head.......................................................................... 16

E
Electrical data....................................................................... 49
Emergency.......................................................................... 12
Emptying the liquid end...................................................... 44
Explanation of the safety information.................................. 9
External contact..................................................................... 17, 18, 30
External frequency changeover......................................... 18, 20
Extern Contact..................................................................... 20, 34

F
Fault.................................................................................... 20
Fault alerts.......................................................................... 42
Fault indicating and pacing relay option............................. 20
Fault indicating relay.......................................................... 20, 31, 32
Fault indicator (red)............................................................ 17, 18
Fault Statuses...................................................................... 20
Functions............................................................................. 17, 18, 20, 33

H
Hierarchy of Operating Modes........................................... 20

I
Identity code........................................................................ 6
Inductive consumers.......................................................... 29
Information in the event of an emergency.............................. 12
Installation, electrical........................................................ 28
Installation, hydraulic........................................................ 22
Install hose lines.................................................................. 23
IP....................................................................................... 50

L
Leakage hole....................................................................... 35
Level.................................................................................... 31
Level switch......................................................................... 18, 31, 34

M
Mains............................................................................... 33
Mains Cable......................................................................... 29
Maintenance......................................................................... 35
Manual............................................................................... 17, 19, 20
Manual operation................................................................... 33
Material Data........................................................................ 48
Metering pumps with bleed valve....................................... 25
Metering pumps without self-bleeding................................ 23
Metering pumps with self-bleeding..................................... 26
Minimum Stroke Length...................................................... 47
Multifunctional switch......................................................... 17, 19, 33

O
Operating indicator (green)................................................. 17, 18
Operating modes................................................................... 17, 18, 19, 20
Operation............................................................................. 33
Overview of equipment....................................................... 16

P
Pacing relay......................................................................... 32
Parallel connection............................................................. 29
Pause................................................................................... 18, 20, 30, 33
Performance data................................................................. 46
Power consumption............................................................. 49
Priming............................................................................... 20, 33
Priming function.................................................................... 17
Priming pressure................................................................... 26
Protection against contact and humidity............................... 50
Protection class....................................................................... 50
Pulse Control Switch......................................................... 17, 34

Q
Qualification of personnel.................................................... 12

R
Radioactive......................................................................... 14
RC member.......................................................................... 29
Relay................................................................................... 20, 31
Relay connection................................................................. 17
Remote operation............................................................... 33, 34
Repairs............................................................................... 37
Index

Replacing the Diaphragm.............................................. 39
Replacing the metering diaphragm............................... 39
Reproducibility................................................... 19, 33, 47
Return line......................................................... 23, 25, 26
Safety chapter................................................................. 9
Safety declaration form................................................. 14
Scope of supply.............................................................. 15
SEK............................................................................... 26
SEK types..................................................................... 19
Self-Bleeding................................................................. 19
Semiconductor switch................................................... 32
Shipping weight............................................................. 51
Sleeve........................................................................... 27
Sound pressure level...................................................... 13, 51
Stop......................................................................... 20, 33
Storage.......................................................................... 14
stroke length............................................................ 19, 33
Stroke length adjustment knob...................................... 17
Stroke rate...................................................................... 17, 19, 33
Strokes........................................................................... 34
Suction valve................................................................. 16
Supply Voltage............................................................. 29
Technical data............................................................... 46
Test (function).............................................................. 17, 20, 33
Transport....................................................................... 14
Troubleshooting............................................................ 42
Unpacking..................................................................... 14
Varistor.......................................................................... 29
Viscosity........................................................................ 48
Warning alert........................................................... 31, 43
Warning indicator (yellow)....................................... 17, 18
Warning sign................................................................... 9