Operating Instructions
Makro TZ
Metering Pumps

Two operating instruction manuals are required for the safe and correct use of ProMinent® Makro TZ metering pumps:
This product-specific Makro TZ operating instruction manual and the "General Operating Instructions
for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories" applies only when read in conjunction
with the other!

Please read through operating instruction manual carefully! Do not discard!
The guarantee is void in the event of damage caused by misuse!

Please enter identcode of the device here.

Part no. 981681
ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany

BA MA 006 10/06 GB
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Identcode

Please transfer the identity code listed under "Type" on the rating plate into the frame below

**TZMb Makro TZ 10 Motor-Driven Metering Pump**

<table>
<thead>
<tr>
<th>Drive type</th>
<th>H Main drive</th>
<th>A Add-on power end</th>
<th>D Double main drive</th>
<th>B Double add-on power end</th>
</tr>
</thead>
</table>

**Pump type:**
- (digits 1+2 = back pressure [bar], digits 3-6 = feed rate [l/h])
- 120360 070430 040840
- 120430 070707 041400
- 120510 070860 041670
- 120650 071070 042100

**Liquid end material:**
- PC PVC
- PP Polypropylene
- SS Stainless steel
- TT PTFE + 25% carbon
- HC Hastelloy C

**Liquid end material:**

<table>
<thead>
<tr>
<th>Seal material</th>
<th>T PTFE</th>
</tr>
</thead>
</table>

**Positive displacement element:**
- Standard composite diaphragm with rupture indicator

**Liquid end version:**
- 0 No valve springs
- 1 With valve springs

**Hydraulic connection:**
- 0 Standard connection
- 1 PVC union nut and insert
- 2 PP union nut and insert
- 3 SS union nut and insert

**Version:**
- 0 with ProMinent® logo
- A 0 with ProMinent® logo, with frame, simplex
- B 0 with ProMinent® logo, with frame, duplex
- C 0 with ProMinent® logo, with frame, triplex
- M Modified

**Electrical power supply:**
- S 3 ph. 230/400 V 50/60 Hz (dual wound)
- P 3 ph. 265/480 V 60 Hz (Exe, Exde)
- L 3 ph. 230/480 V 50 Hz (Exe, Exde)
- N 1 ph. 115 V 60 Hz
- R Variable speed motor 4 pole 230/400 V
- V Variable speed motor with integrated speed changer
- Z Speed control kit
- 4 No motor, with SS C flange
- 7 No motor, with SS O flange
- 8 No motor, with SS O flange
- 9 No motor, with 200/90 flange

**Enclosure rating:**
- 0 IP 55 (Standard) ISO class F
- 1 Exe version ATEX-T3
- 2 Exe version ATEX-T4
- A ATEX power end

**Stroke sensor:**
- 0 No stroke sensor
- 1 With stroke sensor (Namur)

**Stroke length adjustment:**
- 0 Standard
- 1 230 V stroke actuator
- 2 115 V stroke actuator
- 3 230 V 0-20 mA stroke controller
- 4 230 V 4-20 mA stroke controller
- 5 115 V 0-20 mA stroke controller
- 6 115 V 4-20 mA stroke controller

**Applications:**

<table>
<thead>
<tr>
<th>Applications</th>
<th></th>
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<tbody>
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<td></td>
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</table>
Identcode

Please transfer the identity code listed under "Type" on the rating plate into the frame below

<table>
<thead>
<tr>
<th>Drive type:</th>
<th>H</th>
<th>Main drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Add-on drive</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Main drive double</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Add-on drive double</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump type:</th>
<th>Drive type: H/A/D + E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1 + 2 = ) back pressure, (3-6 = ) capacity [l/h]</td>
</tr>
<tr>
<td></td>
<td>120190 060397 031875</td>
</tr>
<tr>
<td></td>
<td>120254 060529 031050</td>
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<tr>
<td></td>
<td>120317 060661 031990</td>
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<tr>
<td></td>
<td>120381 060793 031395</td>
</tr>
<tr>
<td></td>
<td>030750 031000 032500</td>
</tr>
<tr>
<td></td>
<td>031250</td>
</tr>
<tr>
<td></td>
<td>031500</td>
</tr>
</tbody>
</table>

Material version PCA/PPE/TTT 10 bar max.

Liquid end material

| PC | PVC |
| PP | Polypropylene |
| SS | Stainless steel |
| TT | PTFE + 25% carbon |

Seals material

| A | FPM |
| E | EPDM |
| T | PTFE |

Positive displacement material

| A | FPM |
| E | EPDM |
| T | PTFE |

Hydraulic connection

| A | Standard connection |
| B | Union nut and insert PVC |
| C | Union nut and insert PP |
| D | Union nut and insert PVDF |
| E | Union nut and insert SS |

Version

| A | With ProMinent® logo |
| B | Without ProMinent® logo, with frame, single |
| C | With ProMinent® logo, with frame, double |
| D | With ProMinent® logo, with frame, triple |
| M | Modified* |

Electrical supply

| S | 3 ph, 230/400 V 50/60 Hz (multi-voltage) |
| P | 3 ph, 265/480 V 60 Hz (Exe, Exde) |
| L | 3 ph, 230/400 V 50/60 Hz (Exe, Exde) |
| R | 3 ph, 4 pole speed-controlled motor 230/400 V |
| V | 3 ph, pole speed-controlled motor with integral FC |
| Z | Speed control system, complete |
| 4 | Without motor, with flange 56 C |
| 7 | Without motor, with flange 120/80 |
| 8 | Without motor, with flange 160/90 |
| 9 | Without motor, with flange 200/90 |

Protection class

| 0 | IP 55 (standard) ISO Class F |
| 1 | Exe version ATEX-T3 |
| 2 | Exde version ATEX-T4 |
| A | ATEX drive |

Stroke sensor

| 0 | Without stroke sensor |
| 1 | With stroke sensor (Namur) |

Stroke length adjustment

| 0 | Manual stroke length adjustment |
| 1 | Actuator 230 V |
| 2 | Actuator 115 V |
| 3 | Positioning motor 230V 0-20 mA |
| 4 | Positioning motor 230 V 4-20 mA |
| 5 | Positioning motor 115 V 0-20 mA |
| 6 | Positioning motor 115 V 4-20 mA |

Application

| 0 | Standard |

Pr :Minent®
Identcode

Please transfer the identity code listed under "Type" on the rating plate into the frame below.

**TZHa Makro TZ 20 Hydraulic Diaphragm Pump**

**Drive type:**
- H Main drive
- D Double main drive
- B Double add-on power end
- A Add-on power end

**Pump type:**
- 160300
- 160400
- 160600
- 160750
- 101004
- 101034
material version PCA/PPE/TTT max. 10 bar

**Liquid end material:**
- PC PVC
- PP Polypropylene
- SS Stainless steel
- TT PTFE + 25% carbon

**Seal material:**
- A FPM
- B EPDM
- T PTFE seal

**Positive displacement element:**
- PTFE coating composite diaphragm, with rupture indicator

**Liquid end version:**
- 0 No valve springs
- 1 With valve springs

**Hydraulic connection:**
- 0 Standard connection
- 1 PVC union nut and insert
- 2 PPP union nut and insert
- 3 POF union nut and insert
- 4 SS union nut and insert

**Version:**
- 0 With ProMinent® logo, no frame
- 2 No ProMinent® logo, no frame
- A With ProMinent® logo, with frame, simplex
- B With ProMinent® logo, with frame, duplex
- C With ProMinent® logo, with frame, triplex
- M Modified*

**Electrical power supply:**
- S 3 ph. 230/400 V 50/60 Hz (dual wound)
- P 3 ph. 230/400 V 60 Hz (Exe, Exde)
- L 3 ph. 230/400 V 50 Hz (Exe, Exde)
- R Variable speed motor 4 pole 230/400 V
- V Variable speed motor with integr. speed control
- 1 ph. 230 V, 50/60 Hz
- Z variable speed control set 230/400 V
- 0 No motor, with 56 C flange
- 7 No motor, with 120/80 flange
- 8 No motor, with 160/90 flange
- 9 No motor, with 200/90 flange

**Enclosure rating:**
- 0 IP 55 (Standard) ISO class F
- 1 Exe version ATEX-T3
- 2 Exde version ATEX-T4
- A ATEX power end

**Stroke sensor:**
- 0 No stroke sensor
- 1 With stroke sensor (Namur)

**Stroke length adjustment:**
- 0 Stroke length adjustment, man.
- 1 230 V stroke actuator
- 2 115 V stroke actuator
- 3 230 V 0-20 mA stroke controller
- 4 230 V 4-20 mA stroke controller
- 5 115 V 0-20 mA stroke controller
- 6 115 V 4-20 mA stroke controller

**Applications:**
- 0 Standard
- 2 Low temperature to -25 °C

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* order-related version, refer to purchase order paperwork for pump characteristics

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TZHa

FPM = Fluorine rubber
# Identcode

Please transfer the identity code listed under "Type" on the rating plate into the frame below.

## TZKa Makro TZ 20 Motor-Driven Metering Pump (Plunger Metering Pump)

<table>
<thead>
<tr>
<th>Drive type</th>
<th>H Main drive</th>
<th>B Double add-on power end</th>
<th>A Double main drive</th>
<th>Add-on power end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump type: digits 1 - 3 = back pressure [bar], digits 4 - 6 = feed rate [litre/h]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>320009</td>
<td>320018</td>
<td>192033</td>
<td>113058</td>
<td>063104</td>
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<tr>
<td>320012</td>
<td>320024</td>
<td>192044</td>
<td>113077</td>
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</tr>
<tr>
<td>320014</td>
<td>320030</td>
<td>192055</td>
<td>113096</td>
<td>063174</td>
</tr>
<tr>
<td>320017</td>
<td>313035</td>
<td>168066</td>
<td>096115</td>
<td>052208</td>
</tr>
</tbody>
</table>

### Liquid end material:
- SS Stainless steel

### Seal material:
- T PTFE seal

### Positive displacement element:
- S Stainless steel plunger, chromoxide coated

### Liquid end version:
- 0 No valve springs
- 1 With valve springs

### Hydraulic connection:
- 0 Standard connection
- 4 SS union nut and insert

### Version:
- 0 With ProMinent® logo, no frame
- 1 No ProMinent® logo, no frame
- A With ProMinent® logo, with frame, simplex
- B With ProMinent® logo, with frame, duplex
- C With ProMinent® logo, with frame, triplex
- M Modified

### Electrical power supply:
- S 3 ph. 230/400 V 50/60 Hz (dual wound)
- P 3 ph. 230/400 V 60 Hz (Exe, Exde)
- L 3 ph. 230/400 V 50 Hz (Exe, Exde)
- R Variable speed motor 4 pole 230/400 V
- V with integral speed control
- Z Variable speed control set 230/400 V
- 4 No motor, with 56 C flange
- 7 No motor, with 120/80 flange
- 8 No motor, with 160/90 flange
- 9 No motor, with 200/90 flange

### Enclosure rating:
- 0 IP 55 (Standard) ISO class F
- 1 Exe version ATEX-T3
- 2 Exde version ATEX-T4
- A ATEX power end

### Stroke sensor:
- 0 No stroke sensor
- 1 With stroke sensor (Namur)

### Stroke length adjustment:
- 0 Stroke length adjustment, man.
- 1 230 V stroke adjustment motor
- 2 115 V stroke adjustment motor
- 3 230 V 0-20 mA stroke controller
- 4 230 V 4-20 mA stroke controller
- 5 115 V 0-20 mA stroke controller
- 6 115 V 4-20 mA stroke controller

### Applications:
- 0 Standard
General user instructions

Please read through the following user instructions carefully! They will help you get the best use out of the operating instruction manual.

The following are highlighted in the text:

- Enumerated points
- Instructions

Operating guidelines:

**IMPORTANT**
Notices are intended to make your work easier.

and safety guidelines:

**WARNING**
Describes a potentially dangerous situation. If not avoided, could cause fatal or serious injury.

**CAUTION**
Describes a potentially dangerous situation. If not avoided, could cause slight or minor injury or damage to property.

**NOTICE**
Describes a potentially damaging situation. If not avoided, could cause damage to property.

Please also note the guidelines in “General Operating Instruction Manual for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!

The nameplates affixed to the title page are identical to those on the pump supplied to enable a clear allocation of the correct operating instruction manual to the pump.

**Nur EX-Pumpe:** Please give the order number and the serial number, which you will find on the nameplates of the pump itself, in the event of any query or spare part order. This facilitates identification of the pump.
1 About this pump

ProMinent® Makro TZ dosing pumps are supplied with a 1.5 kW multi-voltage three-phase motor as standard (TZMb, TZMa: 0.75 kW). The stroke length can be adjusted between 0...20 mm (TZMb: 0...10 mm, TZMa: 0...6/9 mm). The acrylic resin coated cast housing can be combined with up to 16 liquid ends and 5 reduction ratios. Liquid ends are available in different material combinations to suit the particular dosing media. The Makro TZMb is fitted with a composite diaphragm with diaphragm rupture indicator as standard. Under defined conditions and with correct installation, the reproducibility of the dosing with the TZKa is better than ± 0.5 % in the stroke length range from 10 % - 100 % and better than ± 1 % for the TZHa (TZMb, TZMa: ± 2 % between 30 % - 100 %).

Add-on pumps

The ProMinent® Makro TZ add-on metering pump can be combined with the Makro TZ main power end to produce a duplex/multiplex pump. A main power end can be combined with up to four add-on power ends. One power end can be used as both a single and a double head version.

Double-head version

The double head versions are fitted with a second liquid end which operates in counter cycle (Boxer principle).

2 Safety

Correct use of equipment

- The pump may be used for metering liquid media only!
- The pump can be operated with the appropriate motor (TZMb, TZMa, TZHa, TZKa) and the appropriate float switch and cable on the diaphragm rupture indicator (TZHa) in areas with potentially explosive atmospheres in Zone 1, device category II 2G of explosion group II C in accordance with the European Directives. In this case, the pumps must have the appropriate identifications in accordance with ATEX Directive 94/9/EC. The explosion group, category and protection class on the identification must correspond with or be better than the given conditions in the envisaged application.
- All other applications and modifications are prohibited!
- Pumps without the appropriate rating plate and the appropriate EC Declaration of Conformity for areas with potentially explosive atmospheres must never be operated in areas with potentially explosive atmospheres.
- The pumps with piston liquid ends are not suitable for metering life-threatening liquids.
- The pump is not suitable for metering gaseous media or solids.
- The pump may be used only within the stated pressure range.
- Please observe general limitations with regard to viscosity limits, chemical resistance and density and the stated ambient conditions.
- It is essential that you read this operating instruction manual together with the “General Operating Instructions for ProMinent® Metering Pumps and Hydraulic Accessories” concerning assembly, installation and maintenance!
- The pump is to be operated by appropriately trained personnel only.

Safety instructions

WARNING

- EX pump only: Always observe the “Important supplements for dosing pumps in EX areas" section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!
- The pump starts to operate as soon as it is connected to the mains. Ensure that hazardous media cannot leak out.
- The pump has no on/off switch.
- In the event of an electrical fault, unplug the mains cable or switch off the system at the emergency off-switch.
- Unplug the cable from the mains before working on the pump!
- Always depressurise the liquid end before working on the pump!
- Before working on the pump, empty the liquid end and rinse out if it has been used with hazardous or unknown chemicals.
- Always wear suitable protective equipment when working on a liquid end which has been used with hazardous or unknown chemicals.
- Pumps must be accessible at all times for operation and maintenance. Access should never be impeded or blocked.
Safety

- Pumps which have been used with radioactive media cannot be sent.
- Before commissioning the pump, connect the overpressure sensor and the diaphragm rupture sensor.

**CAUTION**

- It is prohibited to assemble and install ProMinent® metering pumps with parts which have not been approved or recommended by ProMinent. Damage to persons and property may ensue.
- When metering aggressive media, check the resistance of the pump materials (See ProMinent® resistance list in the Equipment Catalogue or on www.prominent.com)
- Danger of burns from hot power end in the event of a fault.
- Observe all national directives which apply to installation!

![Diagram](image)

**Protective equipment:**
1. Protective cover (piston and diaphragm version)
2. Flange cover

![Diagram](image)

**Fig. 2 Safety relief valve (*) on T2Ha liquid end**

![Diagram](image)
Sound intensity level

The sound intensity level is < 70 dB (A) at max. strokes, max stroke rate, max back pressure (water) in accordance with: DIN EN 12639 (Noise measurement, fluid pumps)

3 Storage, transport, unpacking

The pump is delivered on a pallet.

NOTICE

• The pump is filled with oil on delivery.
• Never lift the pump by the turret or the liquid end.
• The pump must be placed on a level, stable base.

Ambient conditions for storage and transport

Temperature: -10 °C to 50 °C
Humidity: max. 95 % relative humidity, non-condensing

Shipping weight: see "Technical data" table

4 Device overview, controls

![Diagram of the pump with labels:
A Power end
C Liquid end
1 Vent screw
2 Stroke adjustment wheel
3 Oil inspection window
4 Motor
5 Oil drain plug]
Device overview, controls

**Fig. 4** Makro TZMaD

1. Vent screw
2. Stroke adjustment wheel
3. Oil inspection window
4. Motor
5. Oil drain plug

**Fig. 5** Diaphragm liquid end (for TZMb)

1. Discharge valve
2. Liquid end
3. Diaphragm rupture sensor (TZMb only)
4. Suction valve
5. Leakage hole
6. Protective cover
Device overview, controls

Fig. 6 Hydraulic diaphragm liquid end (for TZHa)

1. Discharge valve
2. Liquid end
3. Suction valve
4. Oil drain plug, liquid end
5. Oil drain plug, feed tank
6. Filler opening, feed tank
7. Overpressure sensor terminal
8. Bleed valve

9. Bleed hose
10. Pressure relief valve
11. Oil inspection window – hydraulic oil
12. Diaphragm rupture sensor terminal

Fig. 7 Hydraulic diaphragm liquid end (for TZHa)
Device overview, controls

1 Suction valve
2 Liquid end
3 Discharge valve
4 Hose nozzle for leakage/flushing connector
5 Protective cover

Fig. 8 Piston liquid end (for T2Kd)
5 Function description

Function description, power end

The ProMinent® MAKRO-TZ is an oscillating, pulse-free adjustable displacement pump. It is driven by a standard three phase motor whose drive rotation is reduced by a worm gear (1), transmitted to the push rod (4) via an adjustable eccentric cam (2) and a connector rod (3) and thus converted into an oscillating movement. This drive principle guarantees precise control positive execution of forward and reverse strokes, which is of particular benefit in overcoming high suction lifts or when metering highly viscous media.

The stroke length is set by finely adjusting the eccentricity of the shift ring (TZ)(5), which produces the oscillating stroke action. This drive principle guarantees a harmonious, purely sinus-form stroke action at any stroke length. The smooth-running power end emits a minimum of running noise.

The MAKRO-TZ power end series is available in two versions. The TZ Mb version has a maximum stroke length of (TZMa: 6/9 mm) and is designed for operation with mechanically actuated diaphragm liquid ends. The TZKa version has a maximum stroke length of 20 mm and is designed for operation with piston or piston-diaphragm liquid ends. Both versions are also available as power ends for double head metering pumps (TZMaD, TZMbD, TZHaD and/or TZKaD).

Fig. 9

1 Worm gear
2 Eccentric cam
3 Connector rod
4 Push rod
5 Shift ring
Function description

Function description of a diaphragm liquid end (for TZMb and TZMa)

The diaphragm (2) hermetically seals the pump volume inside the liquid end (3). When the diaphragm (2) is moved into the liquid end (3) the suction valve (4) closes and the metering chemical flows out of the liquid end via the discharge valve (1). When the pump diaphragm (2) moves in the opposite direction the discharge valve (1) closes due to the negative pressure in the liquid end and fresh feed chemical flows into the liquid end via the suction valve (4).

1 Discharge valve
2 Pump diaphragm
3 Liquid end
4 Suction valve
5 Diaphragm rupture indicator (TZMb only)
Function description

Operation of the diaphragm rupture indicator (for TZMb)

The diaphragm rupture indicator monitors the soundness of the composite diaphragm. The composite diaphragm combined with the diaphragm rupture sensor and switch make up the diaphragm rupture indicator.

The composite diaphragm has an expandable position (4) on its bolt circle. If an outer layer of the composite diaphragm ruptures, dosing medium under pressure penetrates into it and causes the expandable position to bulge out (4). In so doing, it presses the pin (2) of the safety piston (1) on to the diaphragm (3) of the diaphragm rupture indicator, so that a contact signal switches the pump off or initiates an alarm signal (to be installed by the customer).

The composite diaphragm also prevents any escape of the dosing medium if the diaphragm ruptures.

---

1. Safety piston
2. Pin
3. Lens
4. Expandable position of composite diaphragm

Fig. 11: Operation of diaphragm rupture TZMb (the composite diaphragm is shown smaller)
Description of the liquid end function

The TZHa liquid end has a hydraulically actuated displacement element in the form of a highly durable composite diaphragm (2). It hermetically seals the feed cavity in the liquid end (3) and creates the displacement action within the liquid end at each pump stroke. The suction valve (4) and the discharge valve (1) together with the diaphragm action perform the feed process.

As the diaphragm is hydraulically actuated – it is permanently connected to the piston (7) – it is always pressure-compensated and is therefore suitable for high feed pressures.

As with a conventional motor-driven metering pump the motor moves the piston (7) forwards and backwards. As it moves forwards the piston pushes in the hydraulic end and increases the pressure in the hydraulic oil. The hydraulic oil then pushes the composite diaphragm (2) towards the liquid end (3).

The stroke length of the composite diaphragm is adjusted by altering the stroke length of the connecting rod.

The bleed valve (10) vents the hydraulic end and passes the gas bubble with a small amount of oil into the storage tank (8). In this way the quantity of hydraulic oil in the hydraulic end decreases and the composite diaphragm (2) moves slowly towards the piston (7). When contact with the diaphragm position sensor (5) is made, the compensation valve (6) opens and hydraulic oil is sucked out of the storage tank, thereby correcting the diaphragm position.
The pump has a fixed setting pressure control valve (see Fig. 12) in the hydraulic end. The pressure control valve protects the pump (not the system!) together with the overpressure sensor (9) and switches off the pump when the feed pressure is too high (=overpressure fuse). If the discharge side of the liquid end is blocked, the pressure control valve opens at the preset pressure and allows the hydraulic oil to flow back into the storage tank (8). The overpressure sensor (9) behind the pressure regulating valve then opens and its contact signal switches off the pump immediately (to be carried out by the customer!). Once the system is running within the correct pressure range the hydraulic end is refilled after a few strokes via the compensation valve (6).

**Description of the function of the diaphragm rupture warning system**

The diaphragm rupture warning system monitors the composite diaphragm seal. The composite diaphragm and the diaphragm rupture sensor and evaluation electronics connected downstream together form the diaphragm rupture warning system.

The composite diaphragm (1) has a contact (2) on one side. If an outer layer of the composite diaphragm ruptures, metering chemical is forced into it under pressure, inflating the contact. The contact then pushes against the diaphragm rupture sensor (3), whose contact signal switches off the pump immediately (to be carried out by the customer!).

The composite diaphragm also prevents feed chemical from mixing with hydraulic oil in the event of a diaphragm rupture.

**Fig. 13 TZHa diaphragm rupture system function**

1. Diaphragm
2. Contact
3. Rupture sensor
Function description of a piston liquid end (for TZKa)

The heart of the liquid end is a highly resistant, coated stainless steel piston (2). When the piston (2) moves into the liquid end the suction valve (1) closes and the feed chemical flows out of the liquid end via the discharge valve (3). When the piston (2) moves in the opposite direction the discharge valve (3) closes due to the negative pressure in the liquid end and fresh feed chemical flows into the liquid end via the suction valve (1).

The flushing collar (5) enables the user to rinse the piston sealing surface or drain off leakage fluid.

Fig. 14

1 Suction valve
2 Piston
3 Discharge valve
4 Packing collar
5 Flushing collar
6 Assembly

Ambient temperature
-10 °C to 40 °C

Humidity
Max. 95 % rel. humidity, non-condensing

The pump must be bolted to an even, stable base. The base must be capable of permanently bearing the weight of the pump. Bolt the pump with the four bolts (M8) through the four bore holes in the frame into the pump feet or base if applicable.

When fixed, the pump must not vibrate.

**NOTICE**
Contact ProMinent® if retrofitting an add-on pump.

7 Installation

**WARNING**
EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!

**NOTICE**
Also note “General Operating Instruction Manual for ProMinent® Motor-Driven Metering pumps and Hydraulic Accessories”!

7.1 Installation, hydraulic

Liquid end

**WARNING**
• The liquid ends may still contain traces of water from the factory tests! If using with media which must not come into contact with water, ensure that the liquid ends are dried before installation. Dry with compressed air. Then rinse out by inserting a suitable rinse aid through the suction connection.

• The discharge line should be arranged to ensure that the maximum admissible pump and system operating pressures are not exceeded during the discharge stroke.

**NOTICE**
• It is necessary to install a filter in the suction line for the piston liquid end if using with media with particle sizes greater than 0.3 mm.

• Accurate metering is possible only at a constant back pressure above 1 bar. If metering at atmospheric pressure, use a back pressure valve to generate a back pressure of approx. 1.5 bar.

**Priming pressure:** Maximum permissible priming pressure (suction side): 1 bar

**Viscosity**
The liquid ends are designed for a maximum viscosity of:
- 200 mPa s valves without valve springs
- 500 mPa s valves with valve springs
- 1000 mPa s correspondingly designed installation

> 1000 mPa s correspondingly designed installation and after consultation with ProMinent

**Leakage discharge (TZMb, TZMa and TZKa only)**
Leakage fluid is drained off via the flushing collar and a hose nozzle. No other liquid end parts come into contact with the fluid.

▶ Connect a hose to the lower hose nozzle
▶ Feed the hose into a leakage fluid bund.
Installation

NOTICE
Ensure that dust and foreign bodies cannot penetrate through the upper hose nozzle. The liquid end may otherwise be damaged.

Connection of flushing collar (TZKa only)

NOTICE
- The flushing medium pressure may not exceed 0.5 bar.
- The rinse aid must be suitable for the feed chemical and the liquid end materials.
- It is essential to fit a flushing assembly if using very aggressive and poisonous media, or media with low lubrication properties.
  ▶ Connect the flushing assembly to the hose nozzles via two hoses.

7.2 Installation, electrical

WARNING
- EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!

NOTICE
- Observe the relevant directives for electrical installation.
- Observe applicable national directives.
- The device must be electrically installed by a trained and qualified person with corresponding certification.
- Take suitable interference precautions when connecting ohmic/inductive loads.
- The motor must stop immediately if the overpressure sensor is triggered, the liquid end may otherwise be seriously damaged.
- The diaphragm rupture sensor must be connected electrically!
  The customer must install suitable evaluation electronics for the diaphragm rupture signal and it must be ensured that the dosing pump is switched off after a diaphragm rupture signal!
- When the drive motor has been stopped by the diaphragm rupture sensor or the overpressure sensor, it must not restart automatically!
- For safety reason only protective low voltages may be connected to the diaphragm rupture sensor and the overpressure sensor (SELV according to EN 60335-1).

Motor
- The nameplate contains important motor data.
- The wiring diagram is in the terminal box.

External fan
- Notes on electrical connection of the motor, of the external fan in the case of variable speed motors with external fan and the temperature monitor can be found in the “General Operating Instruction Manual for ProMinent® Motor Driven Metering Pumps and Hydraulic Accessories”!

Stroke sensor (optional)
- intrinsically safe
  - 5 - 25 V DC, in accordance with Namur and/or DIN 19234 zero volts design.
  - Voltage rating: 8 V DC (R ≈ 1 kΩ)
  - Power consumption:
    - active surface uncovered >3 mA
    - active surface covered <1 mA
  - Nominal switch interval: 1.5 mm
- The evaluation/power supply unit must be able to evaluate current changes in order to signal a diaphragm rupture.
Installation

Cable assignment:

<table>
<thead>
<tr>
<th>Option</th>
<th>blue</th>
<th>brown</th>
</tr>
</thead>
</table>

Diaphragm rupture sensor
(for TZMb)

Standard: 30 V DC/ 1A, volt-free contact (closed in normal condition).
For safety reasons, the application of a separated extra-low voltage is required (SELV in accordance with EN 60335-1).
Cable assignment: any

Intrinsically safe option: observe the enclosed operating instructions of the sensor (EX pump only)!
5 – 25 V DC, in accordance with Namur and DIN 19234, volt-free arrangement.
Nominal voltage: 8 V DC (Ri ~ 1 kΩ)
Current consumption:
active surface clear > 3 mA
active surface covered < 1 mA
Nominal contact spacing: 1,5 mm
The evaluation / supply device must be able to evaluate the changes in current in order to indicate a diaphragm rupture.

Cable assignment:

<table>
<thead>
<tr>
<th>Option</th>
<th>blue</th>
<th>brown</th>
</tr>
</thead>
</table>

IMPORTANT
• The diaphragm rupture sensor must be connected electrically!
The customer must install suitable evaluation electronics for the diaphragm rupture signal and it must be ensured that the dosing pump is switched off after a diaphragm rupture signal!

Diaphragm rupture sensor
(for TZHa)

Contact rating: 0.1 A, 250 V AC/DC
Contact type: normally closed (microswitch)
Protection class: IP67

Cable assignment:

| blue | brown |

Overpressure sensor
(TZHa only)

Contact rating: 10 W / 12 VA
Switching current: 0.5 A
Switching voltage: 48 V
Contact type: normally closed (reed contact)
Protection class: IP67

Cable assignment:

| white | brown |
WARNING
• EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General operating instructions for ProMinent dosing pumps and hydraulic accessories”!

CAUTION
• Danger of burns from hot power end motor in the event of a fault!

NOTICE
• The pump is designed to meter liquid media within the stated capacity limits.
• Note the limitations regarding high viscosity or density of the medium.
• No life-threatening metering chemicals to be used with piston liquid end. Because of their manufacturing method, piston liquid ends are never hermetically sealed!
• Ensure that the liquid end materials are resistant to the feed chemical. (See ProMinent® resistance list in the Product Catalogue or on www.prominent.com)
• The pump must be operated in accordance with the operating conditions stated in the “Technical data” section.
• It is necessary to install a filter in the suction line for the piston liquid end if using with media with particle sizes greater than 0.3 mm.
• Only TZHa: If no hydraulic oil flows through the hose to the bleed valve, switch off the pump immediately and contact customer service.
• Before commissioning the pump, connect the overpressure sensor and the diaphragm rupture sensor.
• The pressure control valve (TZHa) is designed to protect only the motor and the gearbox against inadmissible overpressure caused by the pump.
• The pressure control valve (TZHa) must not be used to bypass metering stoppages while the pump is running. It is a safety element.
• Do not use the pressure regulating valve (TZHa) to protect the system. It cannot protect the system.

Setting stroke length
The stroke length can be adjusted via the stroke adjustment wheel or an actuator (optional).

IMPORTANT
• It is possible to adjust the stroke length when the pump is at rest only when the liquid ends have been depressurised.
• If the diaphragm rupture warning system signals a diaphragm rupture, you may continue metering for a short period at your own risk. However, metering reproducibility is impaired.

TZMb

10 mm = 100 % stroke length
(10 turns)

6.3 mm = 63 % stroke length
(6 turns and 3 long scale divisions)

On the stroke adjustment wheel:
1 turn = 10 %
1 long scale division = 1 %
1 short scale division = 0.5 %
Commissioning

TZMa

6 mm = 100 % stroke length
(10 revolutions)
3.78 mm = 63 % stroke length
(6 revolutions and 3 long increments)

Stroke adjustment wheel: note the following:
1 revolution = 10 %
1 long increment = 1 %
1 short increment = 0.5 %

TZKa, TZHa

20 mm stroke length = 100 %
(10 revolutions)
12.6 mm = 63 % stroke length
(6 revolutions and 3 long increments)

Stroke adjustment wheel: note the following:
1 revolution = 10 %
1 long increment = 1 %
1 short increment = 0.5 %

NOTE
• For viscous media, select a stroke length as long as possible!
• For effervescent media, select a stroke length as long as possible!
• For good intermixing, select a stroke frequency as high as possible!
• For precise dosing with volume-proportional dosing, do not set the stroke length below 30 % (TZKa: 10 %)!
IMPORTANT with regard to ball valve installation (single ball valve with Teflon ball seat only)

If experiencing priming problems during installation:

- Ensure that there are no foreign bodies in the valve
- Place valve on a stable surface
- Tap the ball seat lightly with an approx. 300 g hammer and a brass rod
- Allow valves to prime while wet. The pump is now ready for operation.

![Diagram](approx. 300 g hammer and brass rod)

Fig. 15

The pump is now ready for operation.

9 Operation

**WARNING**

EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!

**NOTICE**

- Note the instructions in the “Commissioning” section and in the operating manuals for the other machine components.
- HMH only: If hydraulic oil is not flowing through the hose to the bleed valve, stop the pump immediately and contact customer service. The liquid end may otherwise be seriously damaged.

10 Maintenance

**WARNING**

- EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!
- Always depressurise the suction and discharge lines before working on the pump!
- Always empty and rinse the liquid end before maintenance or repair work if the pump has been used with unknown or hazardous media.
• Always wear suitable protective clothing to work on the liquid end when the pump has been used with hazardous or unknown media.
• Metering pumps and their periphery must be maintained by qualified or authorised personnel.
• Read the safety guidelines in the operating instruction manual before working on the motor.
• Always disconnect external fans, stroke positioning motor or auxiliary equipment where present.
  Check that the power is disconnected.
• Ensure that the pump cannot be switched on by unauthorized personnel while maintenance or repair work is being carried out.

IMPORTANT
Always stock spare parts kits for maintenance work.
(Order numbers in “Technical data” under “Spare parts kits”)

Services
Every 3 months:
• On diaphragm liquid ends (TZMb and TZMa) (see Fig. 16):
  check the tightening torque of the dosing head bolts (1) (30 Nm) and the drive flange bolts (2) (25 Nm)
• On hydraulic diaphragm liquid ends (TZHa) (see Fig. 17):
  check the tightening torque of the dosing head bolts (1) (30 Nm) and the spacer flange bolts (2) (25 Nm)
• On piston liquid ends (TZKa) (see Fig. 18):
  check the tightening torque of the dosing head flange bolts (1) (15 Nm) and the spacer flange bolts (2) (25 Nm)
• Check that the discharge valve and the suction valve are firmly seated
• Check that the diaphragm rupture sensor is firmly seated
• Check that the dosing lines (suction and discharge sides) are firmly seated
• Check the oil level
• Check that the pump is pumping correctly (let it run at high power for a short period but bear in mind the max. permissible operating pressure)
• On diaphragm liquid ends (TZMb and TZMa), check whether any moisture is evident at the leakage hole (3) (if moisture is present, there is probably a diaphragm rupture).
• On piston liquid ends (TZKa), check whether the leakage rate is acceptable (10 to 12 drops/min).

Under onerous duty conditions (e.g. continuous operation), shorter maintenance intervals are recommended.
Maintenance

Fig. 16 Makro TZ diaphragm liquid end (TZMb and TZMa)
1 Liquid end screws
2 Power end flange screws
3 Leakage hole

Fig. 17 Makro TZ diaphragm liquid end (TZHa)
1 Liquid end screws
2 Turret flange screws

Fig. 18 Makro TZ piston liquid end (TZKa)
1 Liquid end flange screws
2 Turret flange screws
After approx. 5000 operating hours:

Change gear oil.

Gear oil Mobilgear 634 VG 460. ProMinent part no. 1004542 (1 l oil canister).

Required oil quantity: 3.5 l

Draining gear oil:

- Unscrew bleed screw (1)
- Place an oil trough under the oil drain plug (2)
- Unscrew the oil drain plug (2) from the power end housing
- Allow the gear oil to drain out of the power end (approx. 3.5 l oil)
- Replace the seal on the oil drain plug (2).

Replenishing gear oil:

- Start the pump
- Slowly pour gear oil into the bleed screw opening (1) until the oil inspection window (3) is covered
- Run the pump for a further 1-2 min
- Screw in bleed screw (1).
11 Repair

**WARNING**
- EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!
- Protect yourself against hazardous feed chemicals.
- Always depressurise the suction and discharge lines before working on the pump!
- Always empty the liquid end and rinse before starting maintenance and repair work if using dangerous or unknown media.
- Always wear suitable protective equipment to work on the liquid end when the pump has been used with hazardous or unknown media.
- Isolate the supply before working on the motor and secure it against unauthorised reconnection!

If an external fan, speed control or diaphragm rupture sensor are provided, isolate these as well!

Check that no voltage is present!

11.1 Diaphragm liquid end (TZMb and TZMa)

- Rinse out the feed line, suction line - and the liquid end (activate flushing assembly or immerse in a suitable medium and pump for a while (remember to check that the medium is suitable for your system) or proceed as follows):
  - Set the stroke length to 0 % while the pump is running.
  - Stop the pump.

**WARNING**
- Ensure that the pump cannot be switched on again.
- If the liquid end has not been rinsed out using one of the above methods you should take suitable precautions to protect yourself from the feed chemical (protective goggles, clothing . . . ) and immerse the parts in contact with the feed chemical immediately after dismantling into a trough containing a suitable rinse aid (rinse thoroughly in the case of hazardous media).
Unscrew the hydraulic connections of the discharge and suction side.

Slacken the locking screw and take the protective cover off the spacer.

Screw the diaphragm rupture indicator out of the dosing head.

Screw the bush (3) out of the dosing head.

Remove the safety piston (1) with the spring (2) from the dosing head.

Slacken the bolts (4) on the armoured disc.

Remove the dosing head with the bolts from the spacer (8).

Unscrew the diaphragm (2) from the connecting rod (6) and remove it.

Clean the sealing surfaces.

Smear a little thread locking gel on the threads of the diaphragm connecting rod screwed connection.

Screw the new diaphragm (2) onto the connecting rod (6) up to the stop – this must be done successfully as otherwise the pump will not dose accurately afterwards.

Fit the dosing head (1), the armoured disc (3) and the head disc (9) on the spacer (8).

Fit the bolts.

Push the safety piston (1) with the spring (2) into the channel of the dosing head.

Screw the bush into the dosing head (O-ring (4)) and tighten hand-tight.

Screw the diaphragm rupture indicator into the dosing head until hand-tight.

**NOTICE**

Make sure that the safety piston (1) and its pin can move freely!
Otherwise the diaphragm rupture sensor can fail later on!

Start the pump and tighten the bolts in opposite pairs at 100 % stroke (tightening torque 30 Nm).

Fit the protective cover on the spacer (8) and screw in the locking screw.

**NOTE**

Check the tightening torque of the bolts after 24 hours operation!
In addition, with PP dosing heads, re-check the tightening torques after 3 months!
Repair

Repairing the diaphragm rupture sensor (TZMb only)

The diaphragm rupture sensor must be checked after each diaphragm rupture and the separating diaphragm replaced if necessary (e.g. if dosing medium has escaped), and if the dosing medium is crystallising out or has entrained dirt and other particles.

Checking the diaphragm rupture sensor (30 V version):

- Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- Check that there is electrical continuity
- Press in the channel of the diaphragm rupture sensor with a blunt insulated rod (2 – 3 mm diam. with no sharp edges)
- Check that the electrical continuity is lost
- Release the rod again
- Check that there is electrical continuity again
- If everything is in order, screw the diaphragm rupture sensor into the dosing head with a new seal (1)
- If not, go to the next step.

Replacing the diaphragm rupture sensor (30 V version)

**WARNING**

- Isolate the diaphragm rupture sensor from the supply!
- If hazardous or unknown dosing media are being used, protect yourself from the dosing medium!
- After a diaphragm rupture, dosing medium can be present in the diaphragm rupture sensor and the delivery channel in the dosing head! (see Fig. 20)

- Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- Mount the diaphragm rupture sensor on the top section (2)
- Lock the body (5) in position with an open-ended spanner
- Unscrew the diaphragm rupture sensor
- Clean the contaminated parts
- Fit the new separating diaphragm (3) in the top section (2) with the bright side (PTFE) first
- Fit the plate (4) into the top section (2) with the uneven side first
- Screw the body (5) into the top section and tighten securely
- Check the diaphragm rupture sensor as described in “Checking the diaphragm rupture sensor (30 V version)” above.

---

**Fig. 22**

1 Seal
2 Top section
3 Separating diaphragm
4 Plate
5 Body
Repair

Checking the diaphragm rupture sensor (EX version)

- Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- Check that there is electrical continuity
- Press in the channel of the diaphragm rupture sensor with a blunt insulated rod (2 – 3 mm diam. with no sharp edges)
- Check that the electrical continuity is lost
- Release the rod again
- Check that there is electrical continuity again
- If everything is in order, screw the diaphragm rupture sensor into the dosing head with a new seal (1)
- If not, go to the next step.

Replacing the diaphragm rupture sensor (EX version)

WARNING

- If hazardous or unknown dosing media are being used, protect yourself from the dosing medium!
- After a diaphragm rupture, dosing medium can be present in the diaphragm rupture sensor and the delivery channel in the dosing head! (see Fig. 20)!

- Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- Mount the diaphragm rupture sensor on the top section (2)
- Lock the body (5) in position with an open-ended spanner – not the nut locked with lacquer!
- Unscrew the diaphragm rupture sensor
- Clean the contaminated parts
- Fit the new separating diaphragm (3) in the top section (2) with the bright side (PTFE) first
- Fit the disc (4) in the top section (2)
- Insert the spring in the body (5)
- Bring the body (5) up to the top section (2)
- Check that the spring (6) is correctly seated in the spring seat (3a)
- Screw the body (5) into the top section and tighten securely
- Check the diaphragm rupture sensor as described in “Checking the diaphragm rupture sensor (EX version)” above.
11.2 Hydraulic diaphragm liquid end (TZHa)

- Set stroke adjustment knob to 0 %
- Unfasten union nuts and/or flange on valves and detach lines
- Empty liquid end and rinse is necessary
- Place an oil trough underneath the liquid end and hydraulic end
- Drain out the hydraulic oil from the hydraulic end via the acrylic glass stopper (3) (see Fig.)
- Lightly screw in the acrylic glass stopper (3)
- Unscrew the orange cover from the diaphragm rupture warning system (see Fig.)
- Untighten the 6 nuts (1) on the liquid end (oil trough?)
- Carefully remove the liquid end from the stud bolts

**NOTICE**

Contaminants must never be allowed to enter the hydraulic end.

- Remove the diaphragm (3) (oil trough?)
- Clean the sealing surfaces on the liquid end and the hydraulic end (using a suitable cleaning agent if necessary)
- Place the new diaphragm (3) with the light grey coating facing outwards onto the hydraulic end
- Tighten the orange cover for the diaphragm rupture warning system until the diaphragm is loosely held in position
- Push the liquid end over the stud bolts onto the hydraulic end (is the cut-out on the side of the liquid end located on the side of the diaphragm rupture warning system?)
- Check that the diaphragm contact is resting easily in the diaphragm rupture warning system housing
- Tighten the 6 nuts (1) on the liquid end to 30 Nm (torque wrench)
- Screw the orange cover onto the diaphragm rupture warning system
Remove the hose (4) from the bleed valve (5) and unscrew the valve. Carefully remove the O-ring and the three filter meshes below the bleed valve. Push a highly flexible hose (e.g., electrical shrink tubing) deep into the revealed opening to act as breather hose. Push a very flexible hose (e.g., electronic shrinkable tubing) deep into the opening which is now visible. Slowly fill the hydraulic end via this opening with hydraulic oil up to the support surface of the bleed valve (approx. 0.65 l hydraulic oil Mobil oil DTE 11, 1.0 l, order no. 555332). Thoroughly clean the outside of the bleed valve (5) with compressed air. Fit O-ring and sieve. Screw in the bleed valve (5). Attach the bleed hose (4). Unfasten the union nut on the PG threaded connector on the housing of the diaphragm rupture warning system. Unscrew the housing diaphragm rupture warning system. Unscrew the diaphragm rupture sensor a few turns (see Fig. 24). Screw in the diaphragm rupture sensor until it switches. Now unscrew the diaphragm rupture sensor until it closes (use continuity tester) then screw on nut (do not mount housing yet). Reconnect liquid end on the suction and discharge sides (check seals). Switch on the pump. Set desired stroke. If feeding against pressure, hydraulic oil must start to flow slowly along the hose to the bleed valve after a few minutes.

NOTICE

If hydraulic oil does not flow through the hose (4) to the bleed valve, stop the pump immediately and contact customer service. The liquid end may otherwise be seriously damaged.

Operate pump against pressure.
Repair

- If the diaphragm rupture sensor opens at every stroke, unscrew it until it remains just open and then screw on nut
- Screw the housing back on (is the O-ring seated correctly beneath?)
- Tighten the union nut on the PG threaded connector (must be sealed.)

11.3 Piston liquid end (TZKa)

Disassembling liquid end
- Remove the protective cover (4) from the turret (see Fig. 25)
- Remove circlip (2) from the bolt on the coupling head and remove bolt (1)
- Place a sling around the liquid end and attach to a crane.

**WARNING**
- A helper should steady the liquid end by hand. It could slip out of the sling if allowed to swing freely.
- Ensure that the pistons cannot fall out!

- (Where applicable: remove leakage or flushing hoses from the hose nozzles (5))
- Remove locking screws (3)
- Remove the liquid end and place on a firm, level base.

Servicing liquid end
- Unfasten the tensioning screw (3) with the face spanner and remove (see Fig. 26)
- Unfasten screws on liquid end flange (4) and remove liquid end flange
- Remove piston (1)

**IMPORTANT**
Make a note of the order in which you remove the parts.
Repair

► Remove the guide sleeves (5) and the guide bands (6), the packing collars (8) and the flushing collar (7)
► Clean the sealing area thoroughly
► Clean the piston (1), the guide sleeves (5) and the flushing collar (7)
► Dispose of the packing rings and the guide bands
► Insert the piston (1)

Reassemble the parts in reverse order:
► Replace packing collars

⚠️ NOTICE
Never push in packing collars with pointed instrument.
This will deform packing collars or damage the piston.

► Push in the guide sleeve (5) evenly with a new guide band and packing collar

► Push in further packing collars with cut ends each offset by 180°
► Push flushing collar (7), one more packing ring and the guide sleeve (5) with a new guide band one after the other into the sealing cavity
► Place the liquid end flange (4) onto the liquid end and screw tight (tightening torque 24 Nm)

⚠️ NOTICE
• Tighten tensioning screw finger tight!
The packing collars and the piston might otherwise become damaged.
• After assembling the liquid end, proceed according to section “Installing stuffing box packing”!

► Replace tensioning screw and tighten finger tight only.

Assembling liquid end
► Place a sling around the liquid end and attach to a crane.

⚠️ WARNING
• A helper should steady the liquid end by hand.
It could slip out of the sling if allowed to swing freely.
• Ensure that the pistons cannot fall out!
Commissioning

Allow pump to run for the first 10–15 min with a leakage of 50–200 drops/min. 
Then:
1. Stop the pump
2. Remove protective cover
3. Carefully tighten tensioning screw
4. Clamp the protective cover above the turret bolt
5. Start the pump
6. Check the leakage
Repeat steps 1-6 until the minimum leakage is achieved (10 and 120 drops/min.).
(Depends on the feed chemical, the pressure of the chemical, the temperature and the piston speed.)

**NOTICE**

Do not over-tighten the tensioning screw.
If it is too tight, the system might run dry which would cause damage to the piston and the packing collars.

Result of over-tightened tensioning screw:
The feed chemical can no longer penetrate through the packing collars – the liquid lubrication is suppressed. The piston is not lubricated. The packing collars will burn and the piston will be damaged. Leakage will increase sharply.
11.4 Valve servicing

Servicing ball valves

- Screw valve cover (5) onto the suction side
- Take the parts carefully out of the valve body (2)
- Replace worn parts
- Clean remaining parts
- Check all parts
- (Where applicable: place the compression springs into the valve body (2))
- Insert the valve body (3) and the valve seat (4)
- Screw in the valve cover (5).

**NOTICE**

Note the flow direction for the discharge and suction connections when installing the valve.

**Double ball valves - servicing**

Cleaning a discharge valve

**IMPORTANT**

Clean the suction and discharge valves one after another as they are not distinguishable from one another.

Use only new parts which fit your valve (shape and chemical resistance)

Dismantling discharge valve:

- Unscrew the discharge valve from the liquid end and rinse. Clean and rinse all dismantled parts
- Replace worn parts and all seals.
Reassembling discharge valve:

**IMPORTANT**

Check the alignment of the valve seat (2) when assembling. The valve seat (2) acts as the ball seat on the smooth side and on the other it acts as the ball cage and spring guide. The smooth side should point in the direction of flow in all valve types.

Slide the following one after another into the valve body (1):

- one seal (5) and one valve seat (2) (direction!)
- one seal (5) and one valve housing (4) (direction!)
- (where applicable: slide one spring (6) into the valve seat’s spring guide (2))
- one ball (3)
- one seal (5) and the second valve seat (2) (direction!)
- one seal (5) and the second valve housing (4) (direction!)
- (where applicable: slide the second spring (6) into the valve seat’s spring guide (2))
- the second ball
- one seal (5) and the third valve seat (direction!) and one further seal (5)
- place the insert disc (7) onto the packing with the bowed side up
**IMPORTANT**

The distance between the edge of the ball body and the insert disc depends on the design.

- Lay the large seal (8) between the insert disc (7) and the liquid end
- Screw the valve up to the stop.

**Cleaning a suction valve:**

The suction valve is basically dismantled, cleaned and reassembled in precisely the same way as the discharge valve.

However, note when assembling the valve seat (2) that it should face the opposite direction. (The smooth side should point in the direction of flow for all valve seats (2).)

---

**Fig. 32: Suction valve (arrow = direction of flow)**

1. Valve body
2. Valve seat
3. Valve ball
4. Valve housing
5. Seal
6. Spring (optional)
7. Insert disc
8. Seal (liquid end)
Repair

Servicing plate valves

**NOTICE**

Do not scratch the finely finished seal surfaces on the valve plates (3) or the valve inserts (4)!

- Screw the valve body bush (5) onto the suction side
- Take the parts carefully out of the valve body (2)
- Replace worn parts
- Clean remaining parts
- Check all parts
- Place the compression springs (1) into the valve body (2)
- Insert the valve plate (3)
- Screw in the valve cover (4).

**NOTICE**

Note the flow direction for the discharge and suction connections when installing the valve.

---

**Fig. 33**

1. Compression spring
2. Valve body
3. Valve plate
4. Valve insert
5. Valve body bush
12 Troubleshooting

WARNING

- EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!
- Metering pumps and their peripherals must be maintained and repaired by qualified or authorised personnel.
- For all dosing pumps for dosing flammable media, the following applies: start up and draining only under specialist supervision.
- Always depressurise the suction and discharge lines before working on the pump!
- Always empty and rinse the liquid end before maintenance or repair work if the pump has been used with unknown or hazardous media.
- Always wear suitable protective equipment to work on the liquid end when the pump has been used with hazardous or unknown media.
- Ensure that the pump cannot be switched on by unauthorized personnel before working on the motor. Always disconnect external fan, actuator, speed controller or diaphragm rupture sensor where present.
- Check that the power is disconnected.

The pump does not prime despite full stroke action and bleeding

- Cause: Valve dirty/worn
- Remedy: Service valve (see “Repair” section)

Pump does not reach high pressure

- Cause: Valve dirty/worn
- Remedy: Service valve (see “Repair” section)

- Cause: Motor connected incorrectly
- Remedy: 1. Check voltage and frequency
  2. Reconnect motor correctly

- Cause: Power supply failure
- Remedy: Remedy cause

- Cause: Composite diaphragm ruptured without initiating alarm
- Remedy: 1. Replace composite diaphragm without delay (see “Changing the diaphragm” in the “Maintenance” section.)
  2. TZMbs only: change the separating diaphragm of the diaphragm rupture sensor if necessary (see “Renewing the diaphragm rupture sensor separating diaphragm” in the “Repair” section.)

Diaphragm rupture indicator gives alarm

- Cause: Composite diaphragm ruptured
- Remedy: 1. Replace composite diaphragm without delay (see “Changing the diaphragm” in the “Maintenance” section.)
  2. TZMbs only: change the separating diaphragm of the diaphragm rupture sensor if necessary (see “Renewing the diaphragm rupture sensor separating diaphragm” in the “Repair” section.)

TZHa only: No hydraulic oil is flowing through the hose on the vent valve

- Cause: ---
- Remedy: Shut the pump down immediately and inform customer service!

Drive motor very hot

- Cause: Discharge line severely constricted
- Remedy: Remove restriction from discharge line
13 Decommissioning and disposal

Decommissioning

WARNING

- EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!
- Metering pumps and their peripherals must be decommissioned by qualified or authorised personnel.
- For all dosing pumps for dosing flammable media, the following applies: start up and draining only under specialist supervision.
- When the pump is taken out of service, the pump housing and especially the liquid end must be thoroughly cleansed of chemicals and dirt!
- Always depressurise the discharge and suction line first before working on the pump!
- When hazardous or unknown media are used, suitable protective equipment must be worn when working on the liquid end.
- Isolate the supply before working on the motor!
- If an external fan, speed control or diaphragm rupture sensor are provided, isolate these as well!
  - Check that no voltage is present!
- Always secure the supply against unauthorised reconnection during work on the pump!

Final decommissioning

- Disconnect pump from mains
- Rinse out the liquid end with a suitable rinse aid, rinse thoroughly if used with hazardous materials
- Drain out gear oil
- TZHa: drain out hydraulic oil (2 drain plugs)

Temporary decommissioning also:

- Attach caps to valves
- Place hose nozzle caps on hose nozzles
- Ideally place the pump on a pallet
- Cover the pump with a tarpaulin (allow ventilation from the back).

Store pump in a dry, closed warehouse at
- storage temperature: -10°C to 50°C
- humidity: max. 95 % rel. humidity, non-condensing

Disposal

NOTICE

Observe all currently applicable local directives!
(particularly with regard to oils)
Technical data

WARNING

Only for modified version: Please observe the “Supplement for modified version” at the end of the section! It replaces and supplements the technical data!

Table of main pumps diaphragm liquid ends (TZMb)

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Capacity at max. back pressure</th>
<th>Max. stroke frequency</th>
<th>Stroke count at max. back pressure</th>
<th>Suction lift</th>
<th>Connection suction/discharge side</th>
<th>Shipping weight</th>
<th>Pressure side</th>
<th>DN</th>
<th>Weight</th>
<th>kg</th>
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<td>120250</td>
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<td>260</td>
<td>60 72</td>
<td>174</td>
<td>309 81.8 86 5 1 1/2 - 25 46/54</td>
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<td>174</td>
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<td>2100</td>
<td>194 180</td>
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<td>–  –  –     3 2 1/4 - 40 56/80</td>
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</tbody>
</table>

Material version PPT/PCT/TTT 10 bar max.
The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.
With dual head pumps, the maximum permissible back pressure is reduced from 7 to 5.5 bar and from 4 to 3 bar respectively (from 101.5 psi to 80 psi and from 58 psi to 43.5 psi respectively).
All figures apply for water at 20 °C.
The suction lift applies for filled suction line and liquid end - with correct installation.
The priming lift of 2 m applies for clean and wetted valves and free discharge (the values reduce with valve springs!).

Technical data

with 1500 rpm motor at 50 Hz

<table>
<thead>
<tr>
<th>Identity Code</th>
<th>Capacity at max. back pressure</th>
<th>Max. stroke frequency</th>
<th>Stroke count at max. back pressure</th>
<th>Suction lift</th>
<th>Connection suction/discharge side</th>
<th>Shipping weight</th>
<th>Pressure side</th>
<th>DN</th>
<th>Weight</th>
<th>kg</th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>3 ph, IP 55</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz 0.75 kW</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>250-280 V/440-480 V</td>
<td>60 Hz 0.75 kW</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>3 ph, I2GEEExIIIT3</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz 0.75 kW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>3 ph, I2GEEExIICT4</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz 0.75 kW with PTC thermistor, speed control range 1:5</td>
<td></td>
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</tr>
<tr>
<td>P1</td>
<td>3 ph, I2GEEExIIIT3</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz 0.75 kW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>3 ph, I2GEEExIICT4</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz 0.75 kW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>3 ph, IP 55</td>
<td>230 V/400 V</td>
<td>50/60 Hz 1.5 kW with PTC thermistor, speed control range 1:20</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>V0</td>
<td>3 ph, I2GEEExIICT4</td>
<td>400 V ± 10 %</td>
<td>50/60 Hz 1.5 kW variable-speed motor with integrated frequency converter</td>
<td></td>
<td></td>
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<tr>
<td>V2</td>
<td>3 ph, I2GEEExIICT4</td>
<td>400 V ± 10 %</td>
<td>50/60 Hz 1.5 kW Ex-variable-speed motor with integrated frequency converter</td>
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</tbody>
</table>

Please request motor data sheets for more information.
Special motors and motor flanges are possible on request.

Pr: Minent
Technical data

Table of main pumps diafragm liquid ends (TZMa)

<table>
<thead>
<tr>
<th>Pump type TZMa</th>
<th>Bar l/h</th>
<th>ml/ strokes/min</th>
<th>psi l/h/ gph</th>
<th>Strokes/min</th>
<th>G-DN kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 3 ph, IP-55</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
<td>0.75 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 3 ph, II2GEE1s1T3</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
<td>0.75 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2 3 ph, II2GEE1s1CT4</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
<td>0.75 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 3 ph, II2GEE1s1T3</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz</td>
<td>0.75 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2 3 ph, II2GEE1s1CT4</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz</td>
<td>0.75 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R 3 ph, IP-55</td>
<td>230 V/400 V</td>
<td>50/60 Hz</td>
<td>1.5 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V0 3 ph, IP-55</td>
<td>400 V +10 %</td>
<td>50/60 Hz</td>
<td>1.5 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V2 3 ph, II2GEE1s1CT4</td>
<td>400 V +10 %</td>
<td>50/60 Hz</td>
<td>1.5 kW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Material version PPE/PCA/TTT 10 bar max.
The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

All figures apply for water at 20 °C.
The suction lift applies for filled suction line and liquid end - with correct installation.
The priming lift of 2 m applies for clean and wetted valves and free discharge (the values reduce with valve springs!).

Makro TZ (TZMa) motor data table

<table>
<thead>
<tr>
<th>Identity Code special feature</th>
<th>Supply</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 3 ph, IP-55</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
</tr>
<tr>
<td>L1 3 ph, II2GEE1s1T3</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
</tr>
<tr>
<td>L2 3 ph, II2GEE1s1CT4</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
</tr>
<tr>
<td>P1 3 ph, II2GEE1s1T3</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz</td>
</tr>
<tr>
<td>P2 3 ph, II2GEE1s1CT4</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz</td>
</tr>
<tr>
<td>R 3 ph, IP-55</td>
<td>230 V/400 V</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>V0 3 ph, IP-55</td>
<td>400 V +10 %</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>V2 3 ph, II2GEE1s1CT4</td>
<td>400 V +10 %</td>
<td>50/60 Hz</td>
</tr>
</tbody>
</table>

Please request motor data sheets for more information.
Special motors and motor flanges are possible on request.
### Technical data

#### Table of main pumps hydraulic diaphragm liquid ends (TZHa)

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Stroke</th>
<th>Max. stroke frequency</th>
<th>Capacity at max. back pressure</th>
<th>Max. Capacity at max. stroke back pressure</th>
<th>Suction lift at max. stroke frequency</th>
<th>Connection at max. stroke frequency</th>
<th>Shipping weight</th>
<th>Hydraulic back pressure</th>
<th>Weight</th>
<th>Ø mm</th>
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</thead>
<tbody>
<tr>
<td>160300</td>
<td>400</td>
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<td>69.4</td>
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<td>3</td>
<td>1/2-2/5</td>
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<td>70</td>
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<td>160400</td>
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<td>16</td>
<td>69.4</td>
<td>400</td>
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<td>1/2-2/5</td>
<td>80</td>
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<td>600</td>
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<td>69.4</td>
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<td>1004</td>
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<td>116.2</td>
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<td>2/4-4/10</td>
<td>81</td>
<td>90</td>
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<td>10</td>
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<td>3</td>
<td>2/4-4/10</td>
<td>81</td>
<td>90</td>
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</table>

**Special versions on request**

**Material version PPE/PCA/TTT 10 bar max.**

* stainless steel version 95 kg

The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

All figures apply for water at 20°C.

The suction lift applies for filled suction line and liquid end - with correct installation.

The priming lift of 2 m applies for clean and wetted valves and free discharge (the values reduce with valve springs).

#### Makro TZ (TZHa) motor data table

<table>
<thead>
<tr>
<th>Identity Code</th>
<th>Supply</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>3 ph, IP 55</td>
<td>220-240 V/380-420 V, 50 Hz, 1.5 kW</td>
</tr>
<tr>
<td>L1</td>
<td>3 ph, II2GEExIT3</td>
<td>220-240 V/380-420 V, 50 Hz, 1.5 kW</td>
</tr>
<tr>
<td>L2</td>
<td>3 ph, II2GEExdICT4</td>
<td>220-240 V/380-420 V, 50 Hz, 1.5 kW with PTC thermistor, speed control range 1:5</td>
</tr>
<tr>
<td>P1</td>
<td>3 ph, II2GEExIT3</td>
<td>220-240 V/380-420 V, 50 Hz, 1.5 kW</td>
</tr>
<tr>
<td>P2</td>
<td>3 ph, II2GEExdICT4</td>
<td>220-240 V/380-420 V, 50 Hz, 1.5 kW with PTC thermistor, speed control range 1:5</td>
</tr>
<tr>
<td>R</td>
<td>3 ph, IP 55</td>
<td>230 V/400 V, 50/60 Hz, 2.2 kW</td>
</tr>
<tr>
<td>V0</td>
<td>3 ph, IP 55</td>
<td>400 V ± 10 %, 50/60 Hz, 2.2 kW variable-speed motor with integrated frequency converter</td>
</tr>
<tr>
<td>V2</td>
<td>3 ph, II2GEExdICT4</td>
<td>400 V ± 10 %, 50/60 Hz, 2.2 kW Ex-variable-speed motor with integrated frequency converter</td>
</tr>
</tbody>
</table>

Please request motor data sheets for more information.

#### Table of main pumps piston liquid ends (TZKa)

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Stroke</th>
<th>Max. stroke frequency</th>
<th>Capacity at max. back pressure</th>
<th>Max. Capacity at max. stroke back pressure</th>
<th>Suction lift at max. stroke frequency</th>
<th>Connection at max. stroke frequency</th>
<th>Shipping weight</th>
<th>Hydraulic back pressure</th>
<th>Weight</th>
<th>Ø mm</th>
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<td>320009</td>
<td>8.7</td>
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<td>72</td>
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<td>320012</td>
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<td>96</td>
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<td>2</td>
<td>1/4-1/2</td>
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<td>12</td>
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</table>

**Please request motor data sheets for more information.**

* Pr: Minei®
### Technical data

<table>
<thead>
<tr>
<th>Pump type TZKa</th>
<th>Capacity at max. stroke frequency</th>
<th>Max. stroke frequency</th>
<th>Suction back pressure</th>
<th>Max. suction weight</th>
<th>Shipping Hydraulic weight</th>
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<td>11</td>
<td>951.1</td>
<td>110</td>
<td>96</td>
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</tbody>
</table>

** The Rp 1/4 and Rp 3/8 suction and discharge side connections have female threaded connections and are constructed as double ball valves.

The permissible priming pressure on the suction side is approx. 50% of the max. permissible back pressure.

If figures apply for water at 20 °C.
The suction lift applies for filled suction line and liquid end - with correct installation.
The priming lift of 2 m applies for clean and wetted valves and free discharge (the values reduce with valve springs!).

The permissible priming pressure on the suction side is approx. 50% of the max. permissible back pressure.

If figures apply for water at 20 °C.
The suction lift applies for filled suction line and liquid end - with correct installation.
The priming lift of 2 m applies for clean and wetted valves and free discharge (the values reduce with valve springs!).

### Makro TZ (TZKa) motor data table

<table>
<thead>
<tr>
<th>Identity Code</th>
<th>Special feature</th>
<th>Makro TZ (TZKa) motor data</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>3 ph, IP 55</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
</tr>
<tr>
<td>L1</td>
<td>3 ph, II2GEEXeIT3</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
</tr>
<tr>
<td>L2</td>
<td>3 ph, II2GEEXeITC4</td>
<td>220-240 V/380-420 V</td>
<td>50 Hz</td>
</tr>
<tr>
<td>P1</td>
<td>3 ph, II2GEEXeIT3</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz</td>
</tr>
<tr>
<td>P2</td>
<td>4 ph, II2GEEXeITC4</td>
<td>250-280 V/440-480 V</td>
<td>60 Hz</td>
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<tr>
<td>R</td>
<td>3 ph, IP 55</td>
<td>230 V/400 V</td>
<td>50/60 Hz</td>
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<tr>
<td>V0</td>
<td>3 ph, IP 55</td>
<td>400 V x 10 %</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>V2</td>
<td>3 ph, II2GEEXeITC4</td>
<td>400 V x 10 %</td>
<td>Ex-variable-speed motor with integrated frequency converter</td>
</tr>
</tbody>
</table>

Please request motor data sheets for more information.
Technical data

Accuracies

- The reproducibility for the TZKa is better than ± 0.5 % in the stroke length range from 10 - 100 % and better than ± 1 % for the TZHa (TZMa: ± 1 % at 30 % - 100 %) (with measurements under constant conditions with water at 20 °C – with correct installation, p > 1 bar).
- The dosing accuracy is approx ± 1 % at maximum stroke length and maximum back pressure.

Viscosity

The liquid ends are generally suitable for use up to a maximum viscosity of:

- 200 mPa s with valves without springs
- 500 mPa s with valves with valve springs
- 1000 mPa s with suitably designed installation
- > 1000 mPa s with suitably designed installation and discussions with ProMinent

Diaphragm liquid ends - materials in contact with media (TZMb)

<table>
<thead>
<tr>
<th>Dosing head</th>
<th>Suction/ discharge connection</th>
<th>DN 25 ball valves</th>
<th>Valve balls</th>
<th>Valve seals</th>
<th>DN 32/DN 40 plate valves**</th>
<th>Valve plates</th>
<th>Valve seals</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPT</td>
<td>Polypropylene</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Borosilicate glass</td>
<td>PTFE</td>
<td>Ceramic/ Haste. C + CTFE**</td>
<td>PTFE</td>
</tr>
<tr>
<td>PCT</td>
<td>PVC</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Borosilicate glass</td>
<td>PTFE</td>
<td>Ceramic/ Haste. C + CTFE**</td>
<td>PTFE</td>
</tr>
<tr>
<td>TTT</td>
<td>PTFE with carbon</td>
<td>PTFE</td>
<td>PTFE</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>Ceramic/ Haste. C + CTFE**</td>
<td>PTFE</td>
</tr>
<tr>
<td>SST</td>
<td>Stainless steel W. Nr. 1.4404</td>
<td>Stainless steel W. Nr. 1.4401</td>
<td>PTFE</td>
<td>Stainless steel</td>
<td>PTFE</td>
<td>Stainless steel 1.4401/ Haste. C</td>
<td>PTFE</td>
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<tr>
<td>HCT</td>
<td>Hastelloy C4</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>Hastel. C</td>
<td>PTFE</td>
</tr>
</tbody>
</table>

DEVELOPAN® pump diaphragm with PTFE coating.
** The valve spring is coated with CTFE (similar to PTFE)
Special versions on request.

Diaphragm liquid ends - materials in contact with media (TZMa and TZHa)

<table>
<thead>
<tr>
<th>Version</th>
<th>Dosing head</th>
<th>Suction/ discharge connection</th>
<th>DN 20/DN 25 ball valves</th>
<th>Valve balls</th>
<th>Valve seals</th>
<th>DN 40 plate valves**</th>
<th>Valve plates</th>
<th>Valve seals</th>
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<td>EPDM</td>
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<td>Haste. C</td>
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<td>PVC</td>
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<td>Borosilicate glass</td>
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<td>FPM</td>
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<td>PTFE</td>
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<tr>
<td>TTT</td>
<td>PTFE with carbon</td>
<td>PTFE with carbon</td>
<td>PTFE</td>
<td>PTFE</td>
<td>Karamik</td>
<td>PTFE</td>
<td>PTFE Haste. C</td>
<td>PTFE</td>
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<tr>
<td>SST</td>
<td>Stainless steel W. Nr. 1.4404</td>
<td>Stainless steel W. Nr. 1.4401</td>
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<td>Stainless steel</td>
<td>PTFE</td>
<td>Stainless steel 1.4401/ Haste. C</td>
<td>PTFE</td>
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<tr>
<td>HCT</td>
<td>Hastelloy C4</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>PTFE Haste. C</td>
<td>PTFE</td>
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</table>

DEVELOPAN® pump diaphragm with PTFE coating.
** The DN 40 valves of the ...1500 and 2100 liquid ends are plate valves.
Special versions on request.

Piston liquid ends - materials in contact with media (TZKa)

<table>
<thead>
<tr>
<th>Piston diam. mm</th>
<th>Dosing head</th>
<th>Suction/discharge connection</th>
<th>Ball seat/seals</th>
<th>Closing components</th>
<th>Piston</th>
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<tbody>
<tr>
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<td>SS/PTFE</td>
<td>Osidkaramik</td>
<td>Stainless steel/Ceramic</td>
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<tr>
<td>... 40 S bis 70 S</td>
<td>Stainless steel 1.4404</td>
<td>1.4581</td>
<td>PTFE/PTFE</td>
<td>Stainless steel 1.4401</td>
<td>Stainless steel/Ceramic</td>
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<tr>
<td>... 85 S</td>
<td>Stainless steel 1.4404</td>
<td>1.4581</td>
<td>PTFE/PTFE</td>
<td>Hastelloy C (Valve plate)</td>
<td>Stainless steel/Ceramic</td>
</tr>
</tbody>
</table>
Technical data

Electrical data

Stroke sensor (option)  intrinsically safe 5-25 V DC, in accordance with Namur and DIN 19234, volt-free arrangement.

Nominal voltage: 8 V DC (Ri ~ 1 kΩ)
Current consumption:
- active surface clear > 3 mA
- active surface covered < 1 mA
Nominal contact spacing: 1.5 mm
The evaluation / supply device must be able to evaluate the changes in current in order to indicate a diaphragm rupture.

Cable assignment:

<table>
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</thead>
</table>

Diaphragm rupture sensor (TZMb only)

Standard: 30 V DC/ 1A, volt-free contact (closed in normal condition).
For safety reasons, the application of a separated extra-low voltage is required (SELV in accordance with EN 60335-1).
Cable assignment: any

Intrinsically safe option: observe the enclosed operating instructions of the sensor (EX pump only)/
5 – 25 V DC, in accordance with Namur and DIN 19234, volt-free arrangement.
Nominal voltage: 8 V DC (Ri ~ 1 kΩ)
Current consumption:
- active surface clear > 3 mA
- active surface covered < 1 mA
Nominal contact spacing: 1.5 mm
The evaluation / supply device must be able to evaluate the changes in current in order to indicate a diaphragm rupture.

Cable assignment:  

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Diaphragm rupture sensor (TZHa only)

Contact rating: 0.1 A, 250 V AC/DC
Contact type: normally closed (microswitch)
Protection class: IP67
Cable assignment:

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</thead>
</table>

Overpressure sensor (TZHa only)

Contact rating: 10 W / 12 VA
Switching current: 0.5 A
Switching voltage: 48 V
Contact type: normally closed (reed contact)
Protection class: IP67
Cable assignment:

<table>
<thead>
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</table>

NOTICE

For safety reasons, only apply separated extra-low voltage to the diaphragm rupture sensor, the overpressure sensor and the stroke sensor (SELV in accordance with EN 60335-1)!
Environmental conditions
Storage temperature: -10 °C to 50 °C
Ambient temperature: -10 °C to 45 °C
Humidity: 95 % rel. humidity, non-condensing

Maximum feed chemical temperatures for liquid ends:

<table>
<thead>
<tr>
<th>Material</th>
<th>long term at max back pressure</th>
<th>short term at max 2 bar (15 min)</th>
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</thead>
<tbody>
<tr>
<td>PC</td>
<td>45 °C</td>
<td>60 °C</td>
</tr>
<tr>
<td>PE</td>
<td>60 °C</td>
<td>100 °C</td>
</tr>
<tr>
<td>PTFE</td>
<td>90 °C</td>
<td>120 °C</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>90 °C</td>
<td>120 °C</td>
</tr>
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Transmission oil
Gear oil Mobilgear 634 VG 460. Order no. 1004542 (1 l oil canister).
Required oil quantity: 3.5 l

Hydraulic oil
Hydraulic oil Mobiloil DTE 11. Order no. 555332. (1 l oil canister)
Required oil quantity:

<table>
<thead>
<tr>
<th>Diaphragm replacement</th>
<th>Oil change kit</th>
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<tbody>
<tr>
<td>TZHa</td>
<td>approx. 0.65 l</td>
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<tr>
<td></td>
<td>approx. 2.6 l</td>
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</table>

Compatibility
The hydraulic accessories for the Makro TZ metering pump are compatible with those for the piston pumps Sigma and Makro/ 5.

Spare parts
Type TZMb
Spare parts kits Makro TZ (TZMb)
The spare parts kit generally contains all the liquid end parts subject to wear
1 pump diaphragm
1 suction valve set
1 discharge valve set
2 valve balls (DN 40 with plate and spring
1 set of seals (O-rings and flat seal, valve seats, valve seat bushes

Identcode: 120260, 120340, 120430, 120510, 120650
Liquid end FM 650 - DN 25
| PP | 1025166 |
| P  | 1025164 |
| T  | 1025172 |
| S  | 1023896 |
| S (without valve set) | 1023995 |

Identcode: 070430, 070570, 070720, 070860, 071070
Liquid end FM 1070 - DN 32
| PP | 1025168 |
| P  | 1025167 |
| T  | 1025173 |
| S  | 1022917 |
| S (without valve set) | 1022916 |
## Technical data

<table>
<thead>
<tr>
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<tr>
<td><strong>Liquid end FM 2100 - DN 40</strong></td>
<td>Order No.</td>
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<tr>
<td><strong>PP</strong></td>
<td>1025170</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>1025169</td>
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<tr>
<td><strong>T</strong></td>
<td>1025174</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>1022930</td>
</tr>
<tr>
<td><strong>S (without valve set)</strong></td>
<td>1022929</td>
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</tbody>
</table>

### PTFE composite pump diaphragm for TZMb

ProMinent® DEVELOPAN® pump diaphragm made from EPDM with a woven inlay, generous integrally vulcanised steel core and PTFE Teflon coating on the surface in contact with the medium.

### Description for pump type

<table>
<thead>
<tr>
<th>Identcode: 120260, 120340, 120430, 120510, 120650</th>
<th></th>
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<tbody>
<tr>
<td><strong>Makro TZ FM 650</strong></td>
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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Makro TZ FM 1070</strong></td>
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</table>

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Makro TZ FM 1500/FM 2100</strong></td>
<td>Order No.</td>
</tr>
<tr>
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</tbody>
</table>

### Type TZMa

#### Spare parts kits Makro TZ (TZMa)

The spare parts kit generally contains all the liquid end parts subject to wear:

- 1 pump diaphragm
- 1 suction valve set
- 1 discharge valve set
- 2 valve balls (DN 40 with plate and Hast. C spring)
- 1 set of seals (O-rings, valve seats, valve seat bushes)

<table>
<thead>
<tr>
<th>Identcode: 120190, 120254, 120317, 120381</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquid end FM 260 - DN 20</strong></td>
<td>910452</td>
</tr>
<tr>
<td><strong>PP</strong></td>
<td>910455</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>910458</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>910475</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>910461</td>
</tr>
<tr>
<td><strong>S (without valve set)</strong></td>
<td>910462</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identcode: 060397, 060529, 060661, 060793</th>
<th>Order No.</th>
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<tbody>
<tr>
<td><strong>Liquid end FM 530 - DN 25</strong></td>
<td>910463</td>
</tr>
<tr>
<td><strong>PP</strong></td>
<td>910466</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>910469</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>910476</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>910462</td>
</tr>
<tr>
<td><strong>S (without valve set)</strong></td>
<td>910462</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquid end FM 1500/2100 - DN 40</strong></td>
<td>1001573</td>
</tr>
<tr>
<td><strong>PP</strong></td>
<td>1001574</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>1001575</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>1001577</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>1001576</td>
</tr>
<tr>
<td><strong>S (without valve set)</strong></td>
<td>1001576</td>
</tr>
</tbody>
</table>

### PTFE pump diaphragm

ProMinent® DEVELOPAN® pump diaphragm made from EPDM with a woven inlay, generous integrally vulcanised steel core and PTFE Teflon coating on the surface in contact with the medium.

### Description for pump type

<table>
<thead>
<tr>
<th>Identcode: 100190, 120190, 100254, 100317, 120381, 100381, 120381</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Makro TZ FM 260</strong></td>
<td>811471</td>
</tr>
<tr>
<td><strong>Makro TZ FM 530</strong></td>
<td>811472</td>
</tr>
<tr>
<td><strong>Makro TZ FM 1500/FM 2100</strong></td>
<td>811473</td>
</tr>
</tbody>
</table>
**Technical data**

**Type TZHa**

Spare parts kits Makro TZ (TZHa)

The spare parts kit generally contains all the liquid end parts subject to wear:

- 1 pump diaphragm
- 1 suction valve set
- 1 discharge valve set
- 2 valve balls (DN 40 with plate and Hast. C spring)
- 1 set of seals (O-rings, valve seat, valve seat bushes)

<table>
<thead>
<tr>
<th>IdentiCode: 160300, 160400, 160500, 160600, 160750</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid end FMH 70 - 20</td>
<td>PPT : 911903</td>
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<td>Liquid end FMH 70 - 20</td>
<td>PCT : 911901</td>
</tr>
<tr>
<td>Liquid end FMH 70 - 20</td>
<td>TTT : 911905</td>
</tr>
<tr>
<td>Liquid end FMH 70 - 20</td>
<td>SST : 911907</td>
</tr>
<tr>
<td>Liquid end FMH 70 - 20</td>
<td>SST (without valve set) : 911908</td>
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</table>

<table>
<thead>
<tr>
<th>IdentiCode: 100502, 100669, 100836, 10100, 101204</th>
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<tr>
<td>Liquid end FMH 90 - 20</td>
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<tr>
<td>Liquid end FMH 90 - 20</td>
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<tr>
<td>Liquid end FMH 90 - 20</td>
</tr>
<tr>
<td>Liquid end FMH 90 - 20</td>
</tr>
<tr>
<td>Liquid end FMH 90 - 20</td>
</tr>
</tbody>
</table>

**Makro TZ 20 (TZHa) pump diaphragm for FMH 70 - 20; 90 - 20**

- 1 pump diaphragm (patented composite diaphragm, vacuum-packed) : 1007298

**Type TZKa**

Spare parts kits Makro TZ (TZKa)

Spare parts kit contents:
- Valve balls
- Valve plate with spring
- Ball seat discs
- PTFE/graphite piston packing rings
- Piston guide rings
- Flat seals/O-rings

<table>
<thead>
<tr>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spare parts kit Makro' TZ FK 12/20 S DN 8 : 1019106</td>
</tr>
<tr>
<td>Spare parts kit Makro' TZ FK 17/20 S DN 8 : 1019107</td>
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<tr>
<td>Spare parts kit Makro' TZ FK 23/20 S DN 10 : 1019108</td>
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<tr>
<td>Spare parts kit Makro' TZ FK 30/20 S DN 10 : 1019109</td>
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<tr>
<td>Spare parts kit Makro' TZ FK 45/20 S DN 20 : 1019110</td>
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<tr>
<td>Spare parts kit Makro' TZ FK 50/20 S DN 20 : 1019111</td>
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<tr>
<td>Spare parts kit Makro' TZ FK 60/20 S DN 25 : 1019112</td>
</tr>
<tr>
<td>Spare parts kit Makro' TZ FK 70/20 S DN 25 : 1019113</td>
</tr>
<tr>
<td>Spare parts kit Makro' TZ FK 85/20 S DN 40 : 1019124</td>
</tr>
</tbody>
</table>
Technical data

Accessories

- stroke length actuator/control motor (on request)
- actuator with positioning motor for automatic stroke length adjustment (on request)
- variable-speed motor with integrated frequency converter (on request)
- speed control systems (on request)
- universal dosing control system Dose control (on request)

Type TZMa

Mounting frames for Makro TZ TZMaA and TZMaB, TZMbA and TZMbB, TZKaA and TZKaB

A mounting frame must be provided for combinations of main and add-on pumps:

<table>
<thead>
<tr>
<th>Weight kg</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.7</td>
<td>804535</td>
</tr>
<tr>
<td>12.0</td>
<td>804536</td>
</tr>
<tr>
<td>14.7</td>
<td>804537</td>
</tr>
</tbody>
</table>

Type TZMb

Mounting frames for Makro TZ TZMaA and TZMaB, TZMbA and TZMbB, TZKaA and TZKaB

A mounting frame must be provided for combinations of main and add-on pumps:

<table>
<thead>
<tr>
<th>Weight kg</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.7</td>
<td>804538</td>
</tr>
<tr>
<td>12.0</td>
<td>804539</td>
</tr>
<tr>
<td>14.7</td>
<td>804540</td>
</tr>
</tbody>
</table>
Supplement for modified version:

(Identity code item "Version": "M-modified")
Appendix

Technical specification Makro TZ (TZMbH)

Main power end

Dimensions Makro TZ TZMb (in mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>120260, 120340, 120430, 120510, 120650 PP, P, T</th>
<th>120260, 120340, 120430, 120510, 120650 PP, P, T</th>
<th>070430, 070570, 070720, 070860, 071070 PP, P, T</th>
<th>070430, 070570, 070720, 070860, 071070 PP, P, T</th>
<th>040840, 041100, 041400, 041670, 42100 PP, P, T</th>
<th>040840, 041100, 041400, 041670, 42100 PP, P, T</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>290</td>
<td>290</td>
<td>308</td>
<td>308</td>
<td>306</td>
<td>306</td>
</tr>
<tr>
<td>B</td>
<td>261</td>
<td>261</td>
<td>295</td>
<td>295</td>
<td>347</td>
<td>347</td>
</tr>
<tr>
<td>C</td>
<td>DN25* G 1 1/2 A</td>
<td>DN25* G 1 1/2 A</td>
<td>DN32* G 2 A</td>
<td>DN32* G 2 A</td>
<td>DN40* G 2 1/4 A</td>
<td>DN40* G 2 1/4 A</td>
</tr>
<tr>
<td>D</td>
<td>435</td>
<td>435</td>
<td>442</td>
<td>442</td>
<td>447</td>
<td>447</td>
</tr>
<tr>
<td>E</td>
<td>423</td>
<td>431</td>
<td>438</td>
<td>446</td>
<td>448</td>
<td>458</td>
</tr>
<tr>
<td>F</td>
<td>215</td>
<td>215</td>
<td>222</td>
<td>222</td>
<td>227</td>
<td>227</td>
</tr>
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</table>

* External thread
### Technical specification Makro TZ (TZMbH and TZMbD)

Main power end with add-on power end  
Double head version

<table>
<thead>
<tr>
<th>Dimensions Makro TZ TZMbH and TZMbD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>H</td>
</tr>
</tbody>
</table>
### Technical specification Makro TZ (TZMaH)

#### Main power end

**Dimensions Makro TZ TZMa (in mm)**

<table>
<thead>
<tr>
<th>Type</th>
<th>120190, 120254, 120317, 120381</th>
<th>120190, 120254, 120317, 120381</th>
<th>060397, 060529, 060661, 060709</th>
<th>060397, 060529, 060661, 060709</th>
<th>030750, 031000, 031250, 031500</th>
<th>030750, 031000, 031250, 031500</th>
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<th>031050, 031395, 031740, 032100</th>
<th>031050, 031395, 031740, 032100, 032500</th>
</tr>
</thead>
</table>

* External thread
Appendix

Technical specification Makro TZ (TZMaA, TZMaB und TZMaD)

Main power end with add-on power end  Double head version

![Diagram of Makro TZ Pumps]

** Measurement with handwheel

Dimensions Makro TZ TZMaH and TZMaD (in mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>HM ..130</th>
<th>HM ..260</th>
<th>HM ..260</th>
<th>HM ..530</th>
<th>HM ..530</th>
<th>HM ..1500/2100</th>
<th>HM ..1500/2100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>H</td>
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<tr>
<td>F</td>
<td>204</td>
<td>608</td>
<td>682</td>
<td>204</td>
<td>608</td>
<td>704</td>
<td>208</td>
</tr>
<tr>
<td>G</td>
<td>204</td>
<td>608</td>
<td>682</td>
<td>204</td>
<td>608</td>
<td>704</td>
<td>208</td>
</tr>
<tr>
<td>H</td>
<td>204</td>
<td>608</td>
<td>682</td>
<td>204</td>
<td>608</td>
<td>704</td>
<td>208</td>
</tr>
</tbody>
</table>

** Measurement with handwheel
Appendix

Technical specification Makro TZ (TZHaH)

Main power end

Dimensions Makro TZ TZHaH (in mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>HMH. ..-70/20</th>
<th>HMH. ..-70/20</th>
<th>HMH. ..-90/20</th>
<th>HMH. ..-90/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>319</td>
<td>319</td>
<td>339</td>
<td>339</td>
</tr>
<tr>
<td>B</td>
<td>318</td>
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<td>358</td>
<td>358</td>
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<tr>
<td>C</td>
<td>DN25&quot;</td>
<td>DN25&quot;</td>
<td>DN40&quot;</td>
<td>DN40&quot;</td>
</tr>
<tr>
<td></td>
<td>G 1/2 A</td>
<td>G 1/2 A</td>
<td>G 2 1/4 A</td>
<td>G 2 1/4 A</td>
</tr>
<tr>
<td>D</td>
<td>471</td>
<td>471</td>
<td>481</td>
<td>481</td>
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<tr>
<td>E</td>
<td>572</td>
<td>583</td>
<td>597</td>
<td>606</td>
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<td>F</td>
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<td>251</td>
<td>261</td>
<td>261</td>
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* External thread
Technical specification Makro TZ (TZHaA, TZHaB und TZHaD)

Main power end with add-on power end  Double head version

** Measurement with handwheel

Dimensions Makro TZ TZHaH and TZHaD (in mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>HMH. _70/20</th>
<th>HMH. _70/20</th>
<th>HMH. _90/20</th>
<th>HMH. _90/20</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>G</td>
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<td>F</td>
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<td>723</td>
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<td>723</td>
<td>854</td>
<td>261</td>
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</table>
Appendix

Technical specification Makro TZ (TZKaH)

Main power end

Dimensions Makro TZ TZKaH (in mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>HK ..-12 B</th>
<th>HK ..-17 B</th>
<th>HK ..-23 B</th>
<th>HK ..-30 B</th>
<th>HK ..-40 B</th>
<th>HK ..-50 B</th>
<th>HK ..-60 B</th>
<th>HK ..-70 B</th>
<th>HK ..-85 B</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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<td>257</td>
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<td>247</td>
<td>247</td>
<td>266</td>
<td>271</td>
<td>293</td>
</tr>
<tr>
<td>B</td>
<td>183</td>
<td>183</td>
<td>193</td>
<td>193</td>
<td>173</td>
<td>187</td>
<td>206</td>
<td>216</td>
<td>265</td>
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<tr>
<td>C</td>
<td>DN8*</td>
<td>DN8*</td>
<td>DN10*</td>
<td>DN10*</td>
<td>DN20*</td>
<td>DN20*</td>
<td>DN25*</td>
<td>DN25*</td>
<td>DN40*</td>
</tr>
<tr>
<td></td>
<td>Rp 1/4</td>
<td>Rp 1/4</td>
<td>Rp 3/8</td>
<td>Rp 3/8</td>
<td>G 1 1/4 A</td>
<td>G 1 1/4 A</td>
<td>G 1 1/2 A</td>
<td>G 1 1/2 A</td>
<td>G 2 1/4 A</td>
</tr>
<tr>
<td>D</td>
<td>551</td>
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<td>553</td>
<td>563</td>
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</tr>
<tr>
<td>E**</td>
<td>615</td>
<td>615 / 630</td>
<td>615 / 630</td>
<td>620 / 635</td>
<td>619 / 634</td>
<td>619 / 634</td>
<td>620 / 635</td>
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<td>336</td>
<td>328</td>
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<td>326</td>
<td>333</td>
<td>343</td>
</tr>
</tbody>
</table>

* Rp-internal thread
  G-internal thread

** 0.75 kW-motor / 1.5 kW-motor
Technical specification Makro TZ (TZKaA, TZKaB and TZKaD)
Main power end with add-on power end  Double head version

** Measurement with handwheel

Dimensions Makro TZ TZKaH and TZKaD (in mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>HK ..12 S</th>
<th>HK ..17 S</th>
<th>HK ..23 S</th>
<th>HK ..30 S</th>
<th>HK ..40 S</th>
<th>HK ..50 S</th>
<th>HK ..60 S</th>
<th>HK ..70 S</th>
<th>HK ..85 S</th>
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</thead>
<tbody>
<tr>
<td>F</td>
<td>330</td>
<td>330</td>
<td>330</td>
<td>335</td>
<td>328</td>
<td>328</td>
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<td>G</td>
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<td>870</td>
<td>856</td>
<td>856</td>
<td>853</td>
<td>861</td>
<td>880</td>
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<tr>
<td>H</td>
<td>902</td>
<td>902</td>
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<td>910</td>
<td>910</td>
<td>912</td>
<td>920</td>
<td>956</td>
</tr>
</tbody>
</table>
## Motor Datenblatt / Motor data sheet

<table>
<thead>
<tr>
<th>Bestell Nr.</th>
<th>741229</th>
<th>Hersteller</th>
<th>ATB</th>
</tr>
</thead>
<tbody>
<tr>
<td>order no. / no. de commande</td>
<td></td>
<td>producer / fabricant</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor-Typ</th>
<th>AF 80/4B – 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>motor type</td>
<td>type du moteur</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leistungsfaktor</th>
<th>0,80/0,73</th>
</tr>
</thead>
<tbody>
<tr>
<td>power factor</td>
<td>facteur de puissance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maschinenart</th>
<th>3-ph. Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>type of machine designation</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Wirkungsgrad</th>
<th>68/67 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>efficiency</td>
<td>rendement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bauform</th>
<th>IMB14</th>
</tr>
</thead>
<tbody>
<tr>
<td>mounting construction</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wärmeklasse</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>temperature class</td>
<td>classe d' isolement</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsleistung</th>
<th>0,75kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>rated output</td>
<td>puissance nominale</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Anzugsstrom</th>
<th>4,8/4,8</th>
</tr>
</thead>
<tbody>
<tr>
<td>starting current</td>
<td>courant de démarrage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schutzart</th>
<th>IP55</th>
</tr>
</thead>
<tbody>
<tr>
<td>protection class</td>
<td>degré de protection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anzugsmoment</th>
<th>2,5/2,5</th>
</tr>
</thead>
<tbody>
<tr>
<td>starting torque</td>
<td>couple de démarrage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsspannung</th>
<th>▲ / ▲</th>
</tr>
</thead>
<tbody>
<tr>
<td>rated voltage</td>
<td>tension nominale</td>
</tr>
<tr>
<td>400/410-230-242 V (50Hz)</td>
<td>380-400/220-265 V (60Hz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kippmoment</th>
<th>2,5/2,5</th>
</tr>
</thead>
<tbody>
<tr>
<td>pull-out torque</td>
<td>couple de décrochage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungssstrom</th>
<th>2,00/3,50 A (50Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rated current</td>
<td>courant nominale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Umgebungs temperatur</th>
<th>max. 40 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>ambient temperature</td>
<td>température ambiante</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsfrequenz</th>
<th>50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>rated frequency</td>
<td>fréquence nominale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schaltung</th>
<th>▲ / ▲</th>
</tr>
</thead>
<tbody>
<tr>
<td>connection</td>
<td>branchement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsdrehzahl</th>
<th>1400/1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>rated speed</td>
<td>vitesse nominale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U/min</th>
<th>10/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpm</td>
<td>t/min</td>
</tr>
</tbody>
</table>

| Pumpentyp | TZAa – –– – – – – S – – – – |
|----------|----------------|---|
| pump type | type de pompe | |

| Anmerkung | Die Daten entsprechen den Angaben der Motorenhersteller. Kenndaten funktionsgleicher Motoren anderer Hersteller ändern sich nur unwesentlich. Angaben ohne Gewähr. The data correspond to the details given by the motor manufacturers. Ratings of motors with the same functions made by other producers show insignificant changes only. This information is supplied without liability. Les données techniques correspondent au descriptif du fabricant des moteurs. Les données techniques des moteurs similaires chez d'autres fabricants varient très peu. Données sont d' ordre général. |

---

ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany Nr./No. MD - 741229 Datum/Date 01.02.2001
## Motor Datenblatt / Motor data sheet

<table>
<thead>
<tr>
<th>Bestell Nr.</th>
<th>741230</th>
<th>Hersteller</th>
<th>ATB</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Motor-Typ / motor type</th>
<th>Leistungsfaktor / power factor</th>
<th>Leistungsfaktor / facteur de puissance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF 90L/4I – 11</td>
<td>0,82/0,84</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maschinenart / type of machine designation</th>
<th>Wirkungsgrad / efficiency</th>
<th>Wirkungsgrad / rendement</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-ph. Motor</td>
<td>75/75 %</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bauform / construction</th>
<th>Wärmeklasse / temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMB14</td>
<td>F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsleistung / rated output</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsstrom / starting current</th>
<th>Leistungsfaktor / facteur de puissance</th>
<th>Anzugsstrom / courant de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,5 kW</td>
<td>0,82/0,84</td>
<td>5,3/5,8 fach</td>
<td>75/75 %</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schutzart / protection class</th>
<th>Anzugsmoment / starting torque</th>
<th>Anzugsmoment / couple de démarrage</th>
<th>Schutzart / protection class</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP55</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
<td>IP55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsstrom / rated current / courant nominale</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,6/5,3 A 50Hz / 3,4/5,9 A 60Hz</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsspannung / rated voltage / tension nominale</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>380/420-220/240 V (50Hz) / 380/460-220/265 V (60Hz)</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Umgebungstemperatur / ambient temperature / température ambiante</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>max. 40 °C</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsfrequenz / rated frequency / fréquence nominale</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/60 Hz</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schaltung / connection / branchement</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲ / ▲</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bemessungsdrehzahl / rated speed / vitesse nominale</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1405/1690 rpm / t/min</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pumptyp / pump type / type de pompe</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>TZHa</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
<tr>
<td>TZKa</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anmerkung / comment / remarque</th>
<th>Leistungsfaktor / power factor</th>
<th>Anzugsmoment / starting torque / couple de démarrage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Die Daten entsprechen den Angaben der Motorenhersteller. Kenndaten funktionsgleicher Motoren anderer Hersteller ändern sich nur unwesentlich. Angaben ohne Gewähr.</td>
<td>2,5/1,9 fach</td>
<td>2,5/1,9 fach</td>
</tr>
</tbody>
</table>

The data correspond to the details given by the motor manufacturers. Ratings of motors with the same functions made by other producers show insignificant changes only. This information is supplied without liability.

Les données techniques correspondent au descriptif du fabricant des moteurs. Les données techniques des moteurs similaires chez d'autres fabricants varient très peu. Données sont d'ordre général.

ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany Nr./No. MD · 741230 Datum/Date 02.02.2001
EC Declaration of Conformity

For pumps without EX-protection:

We,

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

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations. Any modification to the product not approved by us will invalidate this declaration.

Product description: Metering pump, Series Makro TZ

Product type: TZMa..., TZKa..., TZHa..., TZMb...

Serial number: see type identification plate on device

Relevant EC regulations: EC - machine regulation (98/37/EC)
EC - low voltage regulation (73/23/EEC, subsequently 93/68/EEC)
EC - EMC - regulation (89/336/EEC, subsequently 93/68/EEC)

Harmonised standards used, in particular: DIN EN ISO 12100-1, DIN EN ISO 12100-2, DIN EN 809, DIN EN 553
DIN EN 982, DIN EN 1050,
DIN EN 60034-1/5/6/6, DIN EN 60204-1,
DIN EN 61000-6-1/2/3/4

National standards and other technical specifications used, in particular: VDE 0700 T1 (Servomotor)

Date/manufacturer’s signature: 23.03.2005

The undersigned: Dr. Andreas Höhler, director research and development
For pumps with EX-protection:

EC Declaration of Conformity

We,

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

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations. Any modification to the product not approved by us will invalidate this declaration.

Product description: Metering pump, Series Makro TZ
Version "explosion-proof" according to "ATEX 95"

Product type: TZMa, TZKa, TZHa, TZMb,...
characteristic value 'el. connection' = "P" oder "L"
and characteristic value motor version = "1" or "2"
or "electric connection" = "0, 4, 7, 8 or 9" and motor version = "A"

Serial number: see type identification plate on device

Relevant EC regulations:
EC - machine regulation (98/78/EC)
EC - low voltage regulation (73/24/EEC subsequently 93/68/EEC)
EC - EMC - regulation (89/336/EEC subsequently 93/68/EEC)
EC-Ex-regulation (94/9/EC)

Harmonised Pump without motor:
standards Motor Ex "a": DIN EN ISO 12100-1, DIN EN ISO 12100-2, DIN EN 809, DIN EN 13463-1
used, Motor Ex "d": DIN EN 60079-0, DIN EN 60079-1, DIN EN 60034
in particular Motor Ex "d": DIN EN 60079-0, DIN EN 60079-1, DIN EN 60079-7, DIN EN 60034
Stroke sensor: DIN EN 60947-5-2, DIN EN 60947-5-6, DIN EN 50020
Clutch: DIN EN 1127-1, DIN EN 13463-1, DIN EN 13463-5

National standards and other technical specifications used, in particular:
DIN 44081 (thermo-protection Ex "d" - motor)

Date/manufacturer’s signature: 29.03.2005

The undersigned: Dr. Andreas Höhler, director research and development
Performance diagrams Makro TZ diaphragm dosing pumps TZMb per liquid end at 50 Hz

Diagram 1: Hublänge / stroke length in [%] vs. Dosierleistung / capacity Q in [l/h]

Diagram 2: Druck / pressure in [bar] vs. Dosierleistung / capacity Q in [l/h]
Performance diagrams of Marko TZ diaphragm dosing pumps on TZMb per liquid end at 50 Hz

- Hublänge / stroke length in [%]
- Dosierleistung / capacity Q in [l/h]

- Druck / pressure in [bar]
- Dosierleistung / capacity Q in [l/h]
Appendix

Performance diagrams for Makro TZ diaphragm dosing pumps TZMb per liquid end at 60 Hz.
Performance diagrams Makro TZ diaphragm dosing pumps TZMb per liquid end at 60 Hz.

- Hublänge / stroke length in [%]
- Dosierleistung / capacity Q in [l/h]

- Druck / pressure in [bar]
- Dosierleistung / capacity Q in [l/h]
Performance diagrams Makro TZ diaphragm dosing pumps TZMa per liquid end at 50 Hz
NOTE
Performance diagrams Makro TZ piston dosing pumps TZKa available on request
Performance diagrams Makro TZ TZHa per liquid end at 50 Hz
Appendix

Performance diagrams for Makro TZ hydraulic diaphragm dosing pumps TZHa per liquid end at 60 Hz.

- Hublänge / stroke length in [%]
- Dosiermenge / capacity Q in [l/h]
- Druck / pressure in [bar]
Die ProMinent Firmengruppe / The ProMinent Group

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