

# Operating instructions

Diaphragm motor-driven metering pump  
Sigma X Control type — Sigma/ 2 - S2Cb

EN



Please carefully read these operating instructions before use. · Do not discard.  
The operator shall be liable for any damage caused by installation or operating errors.  
The latest version of the operating instructions are available on our homepage.

### Supplementary information



Fig. 1: Please read!

Read the following supplementary information in its entirety! Should you already know this information, you will benefit more from referring to the operating instructions.

The following are highlighted separately in the document:

- Enumerated lists

- ➔ Handling instructions

- ⇒ Outcome of the operation guidelines

- see (reference)

#### Information



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

#### Safety notes

Safety notes are identified by pictograms - see Safety Chapter.

### Validity

At the time of going to press, these operating instructions conformed to the current EU regulations.

### State the identity code and serial number

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

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# 1 Identity code

## Sigma X Control type – Sigma/ 2 - S2Cb

### Product range

S2Cb

#### Drive type

H Main power end, diaphragm

Type	Output	
----	Performance data at maximum back pressure and type: refer to nameplate on the pump housing	
<b>Dosing head material</b>		
PV	PVDF	
SS	Stainless steel	
<b>Seal material</b>		
T	PTFE	
F	FDA-compliant	FDA No. 21 CFR §177.1550 (PTFE)
G	1935/2004 (10/2011)	
H	Hygienic design	
<b>Displacement body</b>		
W	Multi-layer safety diaphragm with optical rupture indicator	
A	Multi-layer safety diaphragm with rupture signalling by electrical signal	
<b>Dosing head version</b>		
0	without bleed valve, without valve springs	
1	without bleed valve, with valve springs	
2	with bleed valve, without valve springs	
3	with bleed valve, with valve springs	
4	with relief valve, FPM, without valve springs	
5	with relief valve, FPM, with valve springs	
6	with relief valve, EPDM, without valve springs	
7	with relief valve, EPDM, with valve springs	
8	with bleed valve, EPDM, without valve springs	
9	with bleed valve, EPDM, with valve springs	
H	Hygienic pump head with tri-clamp connectors (max. 10 bar)	
<b>Hydraulic connector</b>		
0	Standard threaded connector (in line with the technical data)	
1	Union nut and PVC insert	
2	Union nut and PP insert	
3	Union nut and PVDF insert	
4	Union nut and SS insert	
7	Union nut and PVDF hose sleeve	
8	Union nut and SS hose sleeve	
9	Union nut and SS welding sleeve	

## Sigma X Control type – Sigma/ 2 - S2Cb

C	Aseptic clamp fitting DIN 11864-3 (Standard for hygienic design)	
	<b>Design</b>	
0	with ProMinent logo	
1	without ProMinent logo	
	<b>Electric power supply</b>	
U	1-phase 100-230 V ± 10%, 50/60 Hz	
	<b>Cable and plug</b>	
A	2 m European	
B	2 m Swiss	
C	2 m Australian	
D	2 m USA	
	<b>Relay</b>	
0	no relay	
1	Fault indicating relay (230 V - 8 A)	
3	Fault indicating relay + pacing relay (24 V - 100 mA)	
8	0/4-20 mA analogue output + fault indicating / pacing relay (24 V - 100 mA)	
	<b>Control version</b>	
0	Manual + external contact with Pulse-Control + timer	
1	Manual + external contact with Pulse-Control + analogue	
6	as 1 + PROFIBUS® DP interface (M12 plug)	
7	as 1 + CANopen (M12 plug) **	
	<b>Overload shut-down</b>	
0	without overload shut-down	
	<b>Operating panel (HMI)</b>	
0	HMI (0.5 m cable)	
4	HMI + 2 m cable	
5	HMI + 5 m cable	
6	HMI + 10 m cable	
X	without HMI	
	<b>Safety options</b>	
0	without access control, dynamic metering monitor	
1	with access control, dynamic metering monitor	
	<b>Language</b>	
	DE	German

Sigma X Control type – Sigma/ 2 - S2Cb

EN	English
CS	Czech
DA	Danish
EL	Greek
ES	Spanish
ET	Estonian
FI	Finnish
FR	French
HR	Croatian
HU	Hungarian
IT	Italian
KO	Korean
LT	Lithuanian
LV	Latvian
NL	Dutch
PL	Polish
PT	Portuguese
RO	Romanian
RU	Russian
SK	Slovakian
SL	Slovenian
SV	Swedish
ZH	Chinese

\*\* Pump without HMI control unit

FPM = fluorine rubber



## 2 Safety chapter

### 2.1 Markings and warning symbols



#### Identification of safety notes

The following signal words are used in these operating instructions to denote different severities of danger:

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

#### Warning signs denoting different types of danger

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

Warning signs	Type of danger
	Warning – high-voltage.
	Warning – danger zone.

### 2.2 Intended use

- Only use the pump to meter liquid feed chemicals.
- Only start up the pump once it has been correctly installed and started up in accordance with the technical data and specifications contained in the operating instructions.
- Only pumps with the identity code option "Multi-layer safety diaphragm with rupture signalling by electrical signal" are approved for use with flammable feed chemicals, with back pressures of over 2 bar, software setting '*Diaphragm rupture*' - '*Error*', and if the operator takes appropriate safety measures.
- Only "G - EU physiologically safe" design of pumps may be used for applications in accordance with the hygiene requirements for closed processes and wet cleaning without dismantling.
- Only "F - FDA physiologically safe with regard to the wetted material" design of pumps may be used for physiologically harmless applications.
- Only "H - Hygienic head" design of pumps may be used for applications in accordance with the hygiene requirements of closed processes and wet cleaning without dismantling.
- Only "H - Hygienic head" design of pumps may be used for applications in accordance with EHEDG hygienic requirements ([www.ededg.org](http://www.ededg.org)).
- Observe the general limitations with regard to viscosity limits, chemical resistance and density - see also the ProMinent Resistance List (in the Product Catalogue or at [www.prominent.com](http://www.prominent.com))!
- All other uses or modifications are prohibited.
- The pump is not designed to meter gaseous media and solids.

- The pump is not intended for operation in areas at risk from explosion.
- The pump is not intended for unprotected use outdoors.
- The pump is only intended for industrial use.
- Only allow the pump to be operated by trained and authorised personnel - see the following "Qualifications" table.
- You have a duty to observe the information contained in the operating instructions during the different phases of the unit's service life.

## 2.3 Qualification of personnel

Task	Qualification
Storage, transport, unpacking	Instructed person
Assembly	Technical personnel, service
Planning the hydraulic installation	Qualified personnel with a thorough knowledge of oscillating displacement pumps
Hydraulic installation	Technical personnel, service
Electrical installation	Electrical technician
Operation	Instructed person
Maintenance, repair	Technical personnel, service
Decommissioning, disposal	Technical personnel, service
Troubleshooting	Technical personnel, electrical technician, instructed person, service

### Explanation of the table:

#### Technical personnel

Technical personnel are deemed to be people who are able to assess the tasks assigned to them and recognise possible dangers based on their technical training, knowledge and experience, as well as knowledge of pertinent regulations.

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

#### Electrical technician

An electrical technician is able to complete work on electrical systems and recognise and avoid possible dangers independently based on their technical training and experience as well as knowledge of pertinent standards and regulations.

The electrical technician must be specifically trained for the working environment in which they are employed and be conversant with the relevant standards and regulations.

The electrical technician must comply with the provisions of the applicable statutory directives on accident prevention.

#### Instructed person

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

#### Service

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

## Safety information

**WARNING!****Warning of hazardous feed chemical**

Should a dangerous feed chemical be used: it may escape from the hydraulic components when working on the pump, material failure or incorrect handling of the pump.

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

**WARNING!****Danger from hazardous substances!**

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

**CAUTION!****Warning of feed chemical spraying around**

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

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

**CAUTION!****Warning of feed chemical spraying around**

An unsuitable feed chemical can damage the parts of the pump that come into contact with the chemical.

- Take into account the resistance of the wetted materials and the ProMinent Resistance List when selecting the feed chemical - see the ProMinent Product Catalogue or visit ProMinent.

**CAUTION!****Danger of personnel injury and material damage**

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

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



**CAUTION!**

**Danger from incorrectly operated or inadequately maintained pumps**

Danger can arise from a poorly accessible pump due to incorrect operation and poor maintenance.

- Ensure that the pump is accessible at all times.
- Adhere to the maintenance intervals.



**WARNING!**

An on/off switch may not be fitted on the pump, dependent on the identity code and installation.

The pump can therefore start up immediately when it is connected to the mains power supply.

## 2.4 Isolating protective equipment

All isolating protective equipment must be installed for operation:

- Power end front cover
- Motor fan cowling
- Motor terminal box cover
- Hood

In exactly the same way, plug all relays, modules and options into the hood - if fitted.

Only remove isolating protective equipment when the operating instructions request you to do so.

### Information in the event of an emergency

In the event of an electrical accident, disconnect the mains cable from the mains/power supply or press the emergency cut-off switch fitted on the side of the system.

If feed chemical escapes, ensure that the hydraulic environment around the pump is at atmospheric pressure as well. Refer to the material safety data sheet for the feed chemical.

### Sound pressure level

Sound pressure level  $L_{pA} < 70$  dB according to EN ISO 20361 at maximum stroke length, maximum stroke rate, maximum back pressure (water)

### 3 Storage, Transport and Unpacking

#### Safety information



#### WARNING!

Only return the metering pump for repair in a cleaned state and with a flushed liquid end - refer to the chapter "Decommissioning"!

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

The "Decontamination Declaration Form" can be found at [www.prominent.com](http://www.prominent.com).



#### WARNING!

#### Slings can tear

ProMinent only supplies "non-reusable slings" in accordance with DIN EN 60005. They can tear with repeated use.

- Destroy and remove the slings as soon as the pump has been lifted into its final position.



#### CAUTION!

#### Danger of material damage

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

- The unit should only be stored or transported in a well packaged state - preferably in its original packaging.
- Only transport the unit when the red gear bleeding plug is pushed in.
- The packaged unit should also only be stored or transported in accordance with the stipulated storage conditions.
- The packaged unit should be protected from moisture and the ingress of chemicals.

#### Scope of delivery

Compare the delivery note with the scope of supply:

#### Storage

Personnel:  Technical personnel

1. Plug the caps on the valves.
2. Check if the red gear bleeding plug is pushed in.
3. Preferably place the pump standing vertically on a pallet and secure against falling over.
4. Cover the pump with a tarpaulin cover - allowing rear ventilation.

Store the pump in a dry, sealed place under the ambient conditions according to chapter "Technical Data".

## 4 Overview of equipment and control elements

### Overview of equipment

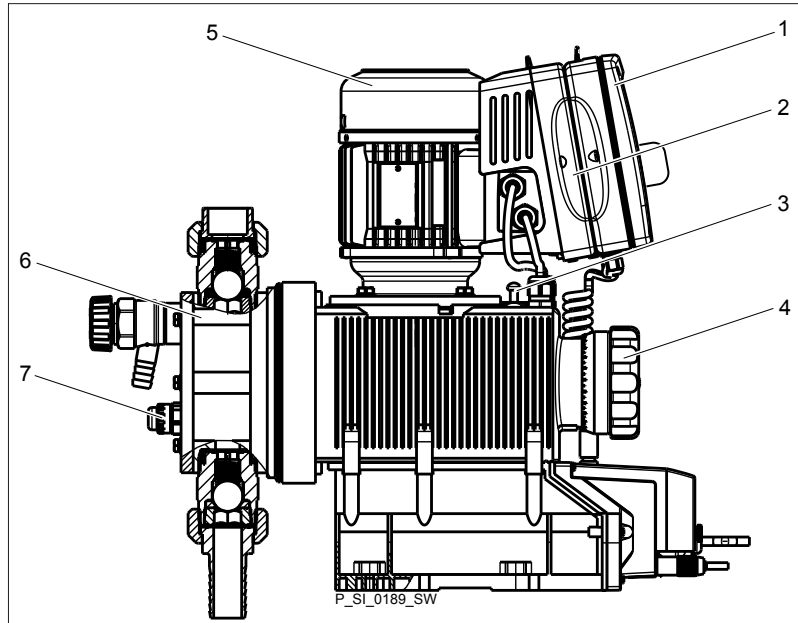


Fig. 2: Overview of Sigma X - S2Cb equipment

- 1 HMI control unit
- 2 Frequency converter
- 3 Drive unit
- 4 Stroke length adjustment wheel
- 5 Drive motor
- 6 Liquid end
- 7 Diaphragm rupture sensor

### Control elements

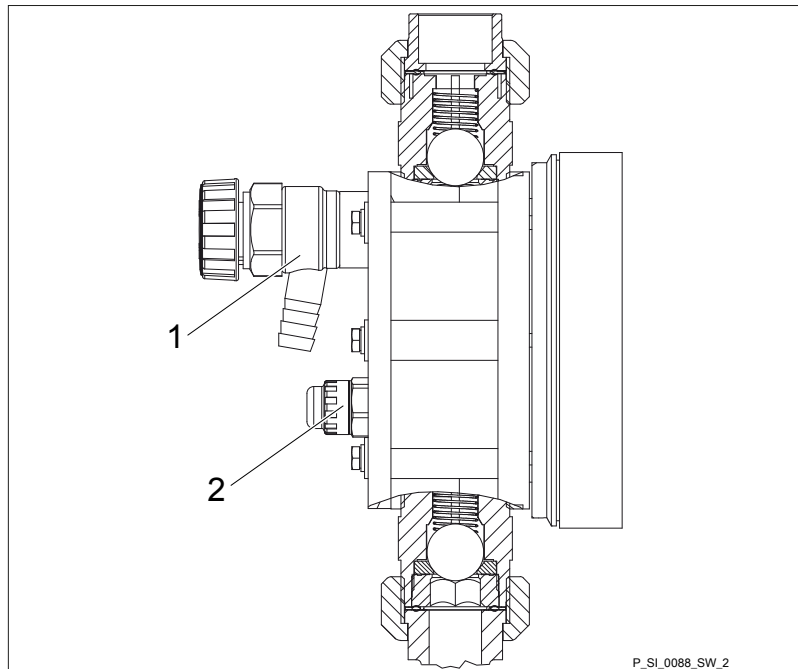


Fig. 3: Sigma control elements

- 1 Bleed valve (optional)
- 2 Diaphragm rupture sensor (visual)

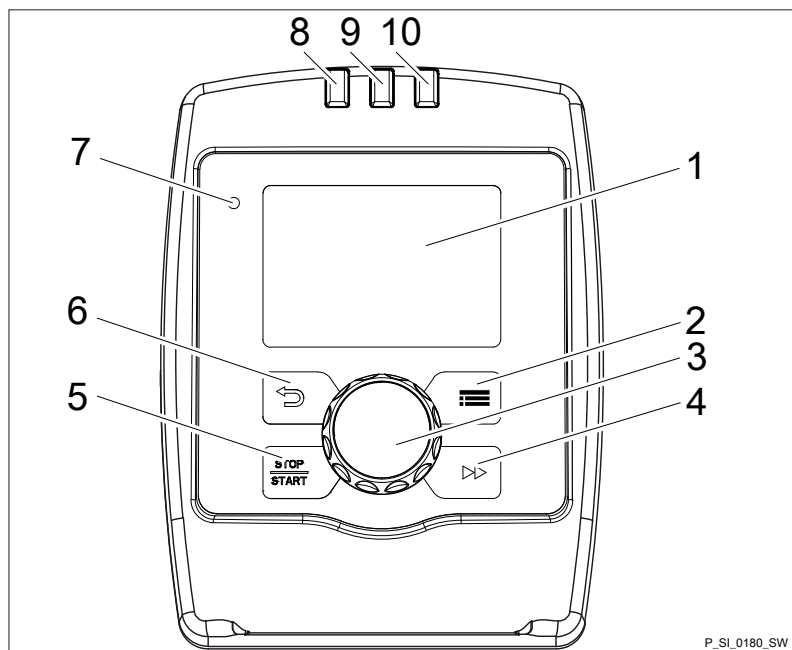


Fig. 4: Control elements for HMI Sigma X Control type

- 1 LCD screen
- 2 [Menu] key
- 3 Clickwheel
- 4 [Priming] key
- 5 [STOP/START] key
- 6 [Back] key
- 7 "Bluetooth active" display (blue)
- 8 Fault indicator (red)
- 9 Warning indicator (yellow)
- 10 Operating indicator (green)

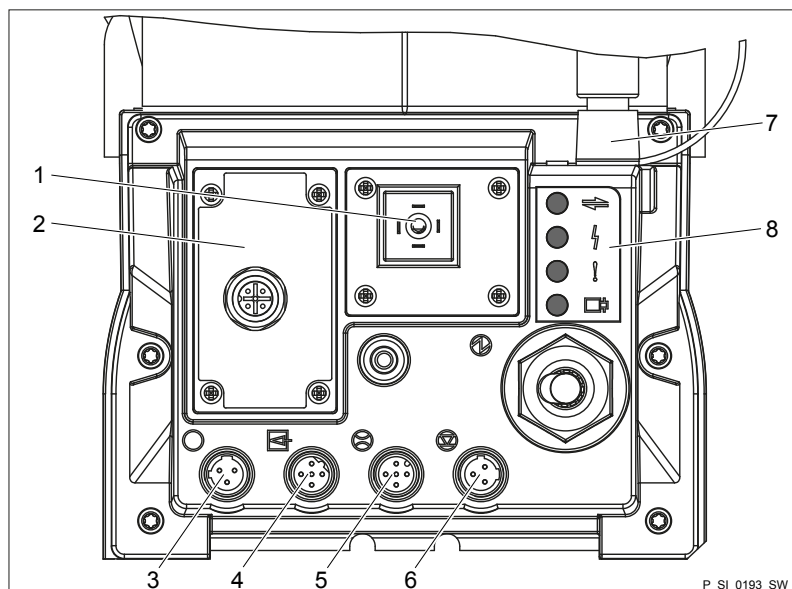


Fig. 5: Connector cover control elements

- 1 Relay and mA-output (option)
- 2 Slot for optional module (PROFIBUS®, ...)
- 3 "Diaphragm rupture" socket
- 4 "External control" terminal
- 5 "Metering monitor" terminal
- 6 "Level switch" terminal
- 7 "CAN bus" socket (external)
- 8 LEDs (as Fig. 4) and CAN bus status LED (external)
- not shown Stroke length adjustment wheel

## 4.1 Control elements



Use this overview to familiarise yourself with the keys and the other control elements on the pump!

Pressure display, identifier and fault displays on the LCD screen

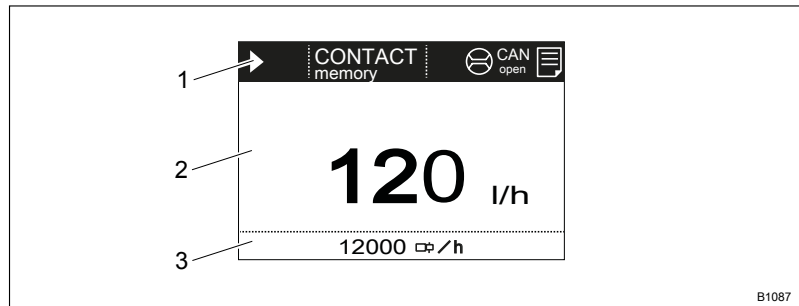


Fig. 6: Construction of continuous display

- 1 Status bar
- 2 Continuous display, central area
- 3 Secondary display

Refer to the chapter entitled "Main displays and secondary displays" in the Appendix for the different main displays and secondary displays.

The LCD screen supports the operation and adjustment of the pump by providing different information and identifiers:

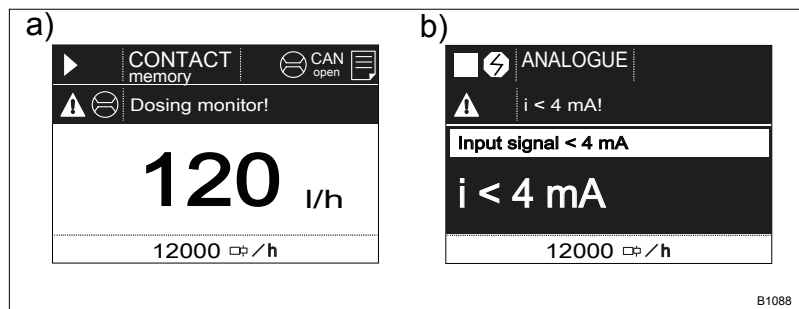


Fig. 7: a) Continuous display with warning message; b) Continuous display with fault message. Explanation of the symbols in the following tables.













The above Figure, Part a) shows that:

- The pump is in operation
- Is in 'Contact' operating mode with "memory" stroke memory
- A metering monitor is connected
- A log entry has been made
- A warning message for the 'metering monitor' is pending
- The capacity of 12.0 l/h has been set
- The stroke rate is 12,000 strokes / h

Tab. 1: Identifier and error displays:

Identifier	Meaning
	The pump is working or waiting for a starting signal.



Identifier	Meaning
	The pump was manually stopped using the  [STOP/START] key.
	The pump was remotely stopped (Pause) - via the "External" socket.
	The pump was stopped by an error.
	Only with cyclical batch metering: the pump is waiting for the next cycle.
'memory'	Only in 'CONTACT' and 'BATCH' operating modes: The "Stroke memory" auxiliary function has been set.
	The pump is in 'ANALOGUE' operating mode. The 'Curve → linear' type of processing is set.
	The pump is in 'ANALOGUE' operating mode. The 'Curve → Upper side band' type of processing is set.
'AUX'	The pump is currently pumping at auxiliary capacity and/or auxiliary frequency.
<b>dia off</b>	The diaphragm rupture warning system is disabled.
	A "Flow Control" metering monitor is connected.
	The timer is active.
	Only with 'Password': the pump software is locked.
	Only with 'Password': the pump software has been temporarily unlocked.
	The pump is in the 'Menu' (Set up).



Further explanations can be found in the "Troubleshooting" chapter.



*The pump only shows the metering volume and the capacity in the calibrated state in l or l/h or in gal or gal/h.*

## 4.2 Key functions

Key	Application	In the continuous displays	In the menu
[Back]	press	-	Move back to the previous menu point (or a continuous display) - without saving
[STOP/START]	press	Stop pump, Start pump	Stop pump, Start pump
[Menu]	press	Move to the menu	Move back to a continuous display
[Priming]	press	Priming *	Priming *
[Clickwheel]	press	Start batch (only in 'Batch' operating mode), Acknowledge errors	Move to next menu option (or a continuous display) Confirm entry and save
[Clickwheel]	turn	Switch between the continuous displays	Change figure or change selection



*\* When priming the pump does not run at maximum stroke rate.*

*If [Priming] is pressed in 'Stop' state, then [Priming] has top priority as long as the button is pressed.*



*Refer to the "Set-up basics" chapter to adjust figures*

## 5 Functional description

### 5.1 Pump

The metering pump is an oscillating diaphragm pump, the stroke length of which can be adjusted. An electric motor drives it. The slide rod transmits the stroke motion to the diaphragms.

#### Illustration of the stroke movement

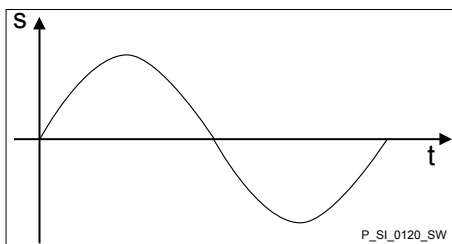
The stroke movement of the displacement body is continuously detected and regulated so that the stroke is performed according to a previously set metering profile - see chapter. 'Metering' 'setting'.

The following metering profiles are available:

- Normal
- Metering optimised
- Priming optimised



Every metering profile is ineffective below the switch-over frequency for Start/Stop mode.



#### Normal

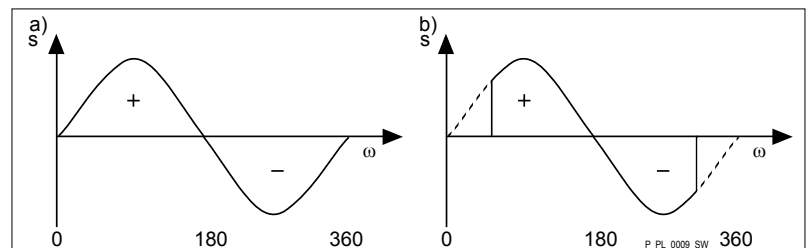
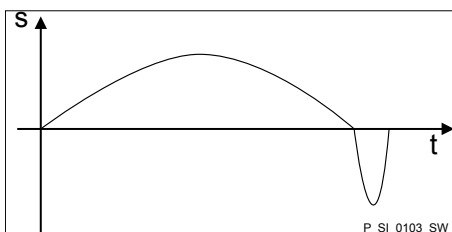


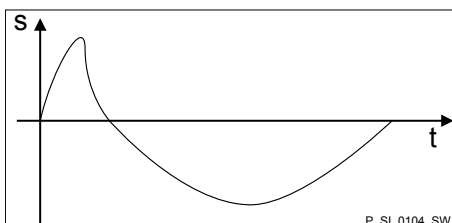
Fig. 8: Stroke movement at a) maximum stroke length and b) reduced stroke length.

- s Stroke velocity
- ω Cam rotational angle
- + Discharge stroke
- Suction stroke



#### Metering optimised

With a metering optimised metering profile, the discharge stroke is elongated and the suction stroke is executed as quickly as possible. This setting is for example suitable for those applications that require optimum mixing ratios and the most continuous chemical mixing possible.



#### Priming optimised

With a priming optimised metering profile, the suction stroke is elongated as much as possible, which facilitates the precise and problem-free metering of viscous and gaseous media. Select this setting to minimise the NPSH value as well.

## 5.2 Liquid end

The diaphragm (2) hermetically shuts off the pump volume of the dosing head (4) towards the outside. The suction valve (1) closes as soon as the diaphragm (2) is moved in to the dosing head (4) and the feed chemical flows through the discharge valve (3) out of the dosing head. The discharge valve (3) closes as soon as the diaphragm (2) is moved in the opposite direction due to the vacuum pressure in the dosing head and fresh feed chemical flows through the suction valve (1) into the dosing head. One cycle is thus completed.

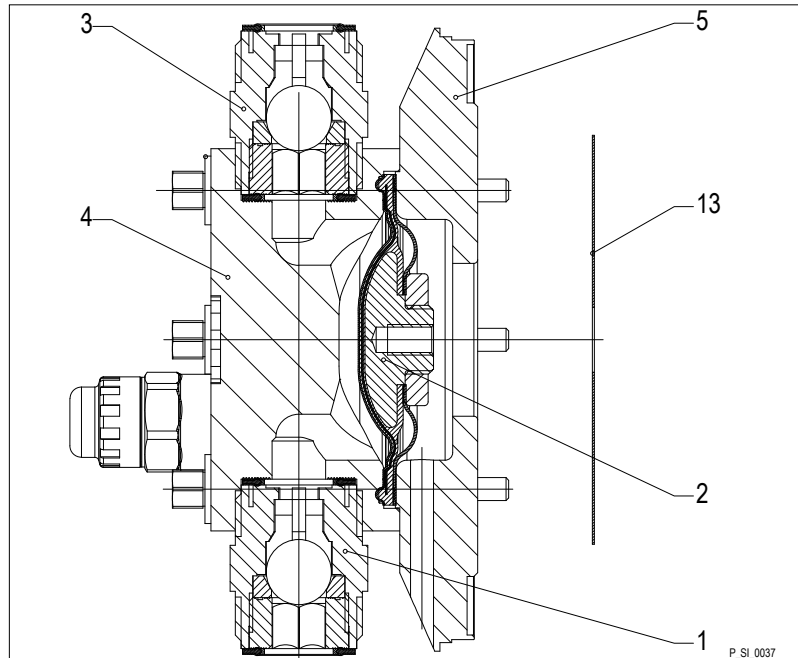


Fig. 9: Cross-section through the liquid end

- 1 Suction valve
- 2 Diaphragm
- 3 Discharge valve
- 4 Dosing head
- 5 Backplate
- 13 Safety diaphragm

## 5.3 Bleed valve and integrated relief valve

### Bleed valve

Turning the rotary dial (3) on the bleed valve to "open" causes it to open and the liquid end can be bled. Or it is used as a priming aid for priming against pressure. The feed chemical flows out through the hose connection (5), e.g. into a storage tank.

### Integral relief valve

The integral relief valve operates in the "close" position as a simple, directly controlled **relief valve**. As soon as the pressure exceeds the pressure value, which is preset using the large spring (1), it lifts the ball (2). The feed chemical flows out through the hose connection (5), e.g. into a storage tank.

The integral relief valve can only protect the motor and the gear, and then only against impermissible positive pressure that is caused by the metering pump itself. It cannot protect the system against positive pressure.

The integral relief valve works as a **bleed valve** as soon as the rotary dial (3) is turned to "open": The valve opens and the liquid end can be bled. Or it is used as a priming aid for priming against pressure.

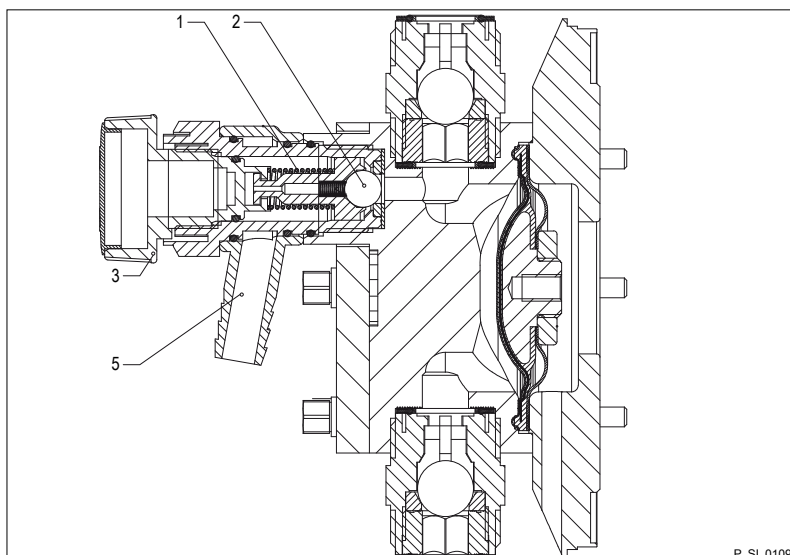


Fig. 10: Relief valve and integrated relief valve

- 1 Spring, large
- 2 Ball
- 3 Rotary dial
- 5 Hose connection

## 5.4 Multi-layer safety diaphragm

With the **visual** diaphragm rupture sensor, the lowered red cylinder (6) springs forward beneath the transparent cover (7) so that it then becomes clearly visible Fig. 11.

With the **electrical** diaphragm rupture sensor, a switch is switched. A connected signalling device must signal the diaphragm rupture.

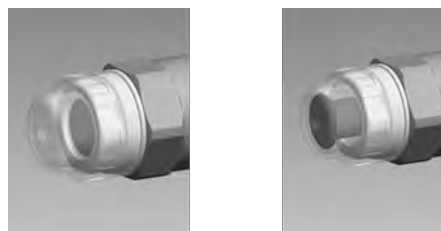


Fig. 11: Visual diaphragm rupture sensor, triggered and untriggered

The electrical diaphragm rupture sensor is connected to the "diaphragm rupture indicator" terminal. If a diaphragm ruptures, the red LED "Fault" display lights up on the pump and the identifier "Error" and 'dia' flash on the LCD screen.

## 5.5 Operating modes

The operating modes are selected via the '*Operating mode*' menu (some operating modes may not be present depending on the identity code.)

**'Manual' operating mode:** The stroke rate is set manually on the control unit.

### **'Batch' operating mode**

This operating mode provides the option of working with large transfer factors (up to 99,999). Metering can be triggered either by pressing the *[Clickwheel]* or by a pulse received via the "External control" terminal or via a contact or a semiconductor switching element. It is possible to pre-select a metering volume (batch) or a number of strokes using the *[Clickwheel]* in the *'Settings'* menu.

### **'Contact' operating mode**

This operating mode provides the option of controlling the pump externally by means of potential-free contacts (e.g. by means of a contact water meter). The "Pulse Control" option enables you to preselect the number of strokes (a scaling or transfer factor of 0.01 to 99.99) in the *'Settings'* menu.

**'Analogue' operating mode** The stroke rate is controlled using an analogue current signal via the "External control" terminal. The processing of the current signal can be preselected using the control unit.

**'BUS' operating mode:** (Identity code, control version: CANopen or PROFIBUS® DP interface). This operating mode provides the option of controlling the pump via BUS – see "Supplementary instructions for Sigma Control type SxCb pumps with Can connector" or "Supplementary instructions for delta® DLTa and Sigma SxCb with PROFIBUS®".

## 5.6 Functions

The following function can be ordered via the identity code:

The following functions can be selected using the *'Settings'* menu:

**"Calibrate" function:** the pump can also be operated in a calibrated state in all operating modes. In this case, the corresponding continuous displays can then indicate the metering volume or the dosing rate directly. Calibration is maintained throughout the stroke rate range. Calibration is also maintained when the stroke length is altered by up to ±10% scale divisions.

**"Auxiliary frequency" function:** enables a freely selectable and programmable stroke rate to be switched on in the *'Settings'* menu, which can be controlled via the "External control" terminal. This auxiliary frequency has priority over the operating mode stroke rate settings.

**"Flow" function:** stops the pump when the flow is insufficient, provided a metering monitor is connected. The number of defective strokes, after which the pump is switched off, can be set in the *'Settings'* menu.

The following functions are available as standard:


**"Level switch" function:** information about the liquid level in the dosing tank is reported to the pump control. To do this, a two-stage level switch must be fitted, which is connected to the "Level switch" terminal.

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

The following functions are triggered by pressing a key:

**"Stop" function:** the pump can be stopped without disconnecting it from the mains/power supply by pressing  [STOP/START].

**"Priming" function**

Priming can be triggered by pressing  [Priming].

## 5.7 Options

**Relay option**

The pump has several connection possibilities for the following options:

**"Output relay" option:** In the event of fault signals, warning signals, stopping of the pump or tripped level switches, the relay connects to complete an electric circuit (for alarm horns etc.).

The relay can be retrofitted via a knock-out in the drive unit.

The various functions can be adjusted – see "Settings" - "Relays" chapters.

**"Fault indicating relay and semiconductor relay" option:** In the event of fault signals, warning signals, stopping of the pump or tripped level switches, the fault indicating relay connects to complete an electric circuit (for control panel etc.).

In addition to the fault indicating relay, the pacing relay can be used to make a contact every stroke.

Other functions can be adjusted – see "Settings" - "Relays" chapters. The option can be retrofitted via a knock-out in the drive unit.

**"0/4-20 mA analogue current output and fault indicating relay" option**

The current output I signal indicates the pump's actual calculated metering volume.

The "0/4-20 mA analogue current output and fault indicating relay" option can be retrofitted via a knock-out in the control unit.

The option also always includes a semiconductor relay - see above. Other functions can be adjusted – see "Settings" - "Relays" chapters.

## 5.8 Function and fault indicator

The operating and fault statuses are indicated by the 3 or 4 LED displays and the 'Error' identifier on the LCD screen:

### 5.8.1 LCD screen

If a fault occurs, the identifier 'Error' appears with an additional error message – see "Troubleshooting" chapter

### 5.8.2 LED displays

**Pump device LEDs**

- see "Troubleshooting" chapter

**Fault indicator (red)**

The fault indicator lights up if the fluid level in the dosing tank falls below the second switching point of the level switch (20 mm residual filling level in the dosing tank).

It also lights up with all other faults - refer to "Troubleshooting" chapter.

**Warning indicator (amber)**

The warning indicator lights up if the fluid level in the dosing tank falls below the first switching point of the level switch.

It also lights up with all other warnings - refer to "Troubleshooting" chapter.

**Operating indicator (green)**

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

**CAN bus status LED (external)**

This LED on the power end is the top one in the row of 4 LEDs.

Colour	Flash code	Cause	Consequence	Remedy
green	lit	Bus status OPERATIONAL	Normal bus mode	-
green	flashing	Bus status PRE-OPERATIONAL	currently no measured value transmission	wait briefly. Disconnect then reconnect the HMI
red	any	Bus error	no measured value transmission	Check whether the CAN connection is faulty. Notify service

## 5.9 Hierarchy of operating modes, functions and fault statuses

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

The following list shows the order:

1. - Priming
2. - Fault, Stop, Pause
3. - Auxiliary frequency (external frequency changer)
4. - Manual, External contact, Batch, External analogue

Comments:

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

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

re 3 - The "Auxiliary frequency" stroke rate always has priority over the stroke rate specified by an operating mode listed under 4.



## 6 Assembly

Compare the dimensions on the dimensional drawing with those of the pump. Clarify any deviations before assembling.

### 6.1 Base

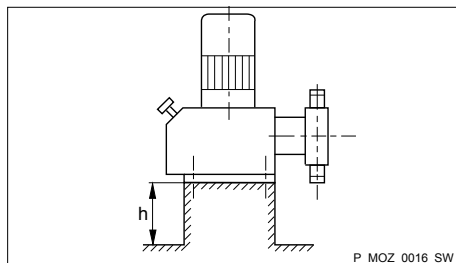


Fig. 12: Base



**WARNING!**

**Danger of electric shock**

If water or other electrically conducting liquids penetrate into the drive housing, in any other manner than via the pump's suction connection, an electric shock may occur.

- Position the pump so that it cannot be flooded.



**WARNING!**

**The pump can break through the base or slide off it**

- Ensure that the base is horizontal, flat and permanently load-bearing.



**CAUTION!**

If your Sigma S2Cb is to be installed in place of a Sigma S2Ca, a base plate order no. 1044841 is possibly needed to lift the liquid end.



**Dosing rate too low**

*Vibrations can disturb the liquid end valves.*

- Do not allow the base to vibrate.

### 6.2 Space requirement

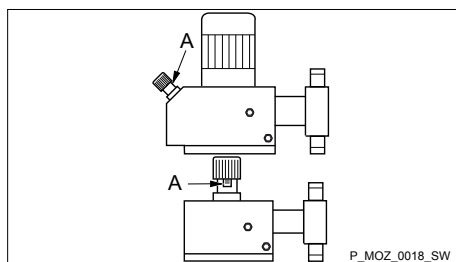


Fig. 13: Space requirement



**CAUTION!**

**Danger from incorrectly operated or inadequately maintained pumps**

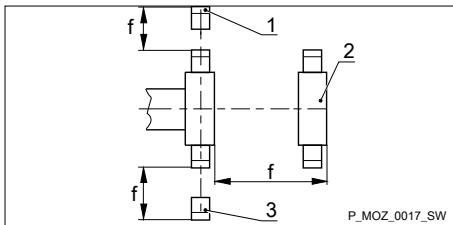
Danger can arise from a poorly accessible pump due to incorrect operation and poor maintenance.

- Ensure that the pump is accessible at all times.
- Adhere to the maintenance intervals.

Position the pump so that control elements, such as the stroke length adjustment knob, the indicating dial A or the oil inspection windows, are accessible.

In doing so, ensure there is sufficient clearance to carry out an oil change (vent screws, oil drain plugs, oil trough ...).

If the HMI is mounted remotely from the pump, fit a clearly marked Stop mechanism in the direct vicinity of the pump in the event of an emergency.



- 1 Discharge valve
- 2 Dosing head
- 3 Suction valve

Ensure there is sufficient clearance (f) around the dosing head as well as the suction and discharge valve so that maintenance and repair work can be carried out on these components.

Fig. 14: Clearance (f)

## 6.3 Fastening

### Liquid end alignment

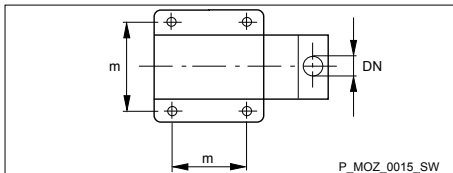
Dosing rate too low.

The valves of the liquid end cannot close correctly if the valves of the liquid end are not upright.

- Ensure that the discharge valve is upright.

Vibrations can disturb the liquid end valves.

- Secure the metering pump so that no vibrations can occur.



Take the dimensions (m) for the fastening holes from the appropriate dimensional or data sheets.

Use appropriate screws to fix the pump base to the foundation.

Fig. 15: Dimensions (m)

## 6.4 Mounting the HMI user control

You can mount the HMI on a wall if the pump has been ordered with a wall fixing.

Install the HMI in the direct vicinity of the pump. If that is not provided for, then you will need to fit a circuit breaker there. When doing so, consider the available cable length.

Refer to the relevant dimensional drawing for the dimensions of the HMI and the fixing holes.



### CAUTION!

#### Warning of faulty operation

- Do not install the HMI and the cable too close to equipment and cabling that emit strong electrical interference.

## 7 Installation

### 7.1 Installation, hydraulic



#### WARNING!

##### Risk of fire with flammable feed chemicals

- Only metering pumps with the identity code option "Multi-layer safety diaphragm with rupture signalling with electrical signal" are permitted to meter flammable media, with back pressures over 2 bar and if the operator puts in place the appropriate safety precautions.



#### WARNING!

##### Warning of feed chemical reactions to water

Feed chemicals that should not come into contact with water may react to residual water in the liquid end that may originate from works testing.

- Blow the liquid end dry with compressed air through the suction connector.
- Then flush the liquid end with a suitable medium through the suction connector.



#### WARNING!

##### Product can be dangerously contaminated

Only with designs "F" or "G" - "Physiologically safe with regard to the wetted material ...":

The feed chemical will come into contact with seals that are not physiologically safe if the integral vent valve or the integral relief valve opens.

- Do not route the feed chemical that escapes from the integral vent valve or the integral relief valve back into the process.



#### WARNING!

##### Product can be dangerously contaminated

Only with designs "F", "H" or "G" - "Physiologically safe with regard to the wetted material ...":

The feed chemical will come into contact with seals that are not physiologically safe if the diaphragm ruptures.

- Stop the pump safely and as quickly as possible if a diaphragm rupture is indicated. Replace the diaphragm before the second diaphragm can rupture.

The following measures are beneficial when working with highly aggressive or hazardous feed chemicals:

- Install a vent valve with a return into the tank.
- Install a shut-off valve on the discharge or suction side.



#### CAUTION!

##### Warning of feed chemical spraying around

PTFE seals, which have already been used / compressed, can no longer reliably seal a hydraulic connection.

- New, unused PTFE seals must always be used.



### CAUTION!

#### Particles larger than 0.3 mm

The valves may no longer close properly with feed chemicals with particles larger than 0.3 mm.

- Install an appropriate filter in the suction line.



### CAUTION!

#### Warning of the pressure line rupturing

With a closed pressure line (e.g. by a clogged pressure line or by a valve closing), the pressure that the metering pump generates may reach several times more than the permissible pressure of the system or the metering pump. This could lead to lines rupturing resulting in dangerous consequences with aggressive or hazardous feed chemicals.

- Install a relief valve that limits the pressure of the pump to the maximum permissible operating pressure of the system.



### CAUTION!

#### Uncontrolled flow of feed chemical

Feed chemical can press through the metering pump in an uncontrolled manner in the event of excessive priming pressure on the suction side of the metering pump.

- Do not exceed the maximum permissible priming pressure of the metering pump or set up the installation properly for this.

Hose lines with an insufficient pressure rating may rupture.

- Only use hose lines with the required pressure rating.

Suction, pressure and relief lines installed incorrectly can come loose from the pump connector.

- Only use original hoses with the specified hose diameter and wall thickness.
- Only use clamp rings and hose sleeves that fit the respective hose diameter.
- Always connect the lines without mechanical tension.

Leaks can occur at the pump connector depending on the insert used.

- The pump is supplied with PTFE moulded composite seals with a flare, which are used for the pump connectors, and which seal the connectors between grooved pump valves and ProMinent grooved inserts, see [Further information on page 27](#).
- However, a new elastomer flat seal must be used in the event that a smooth insert is used (e.g. third-party component), see [Further information on page 27](#).

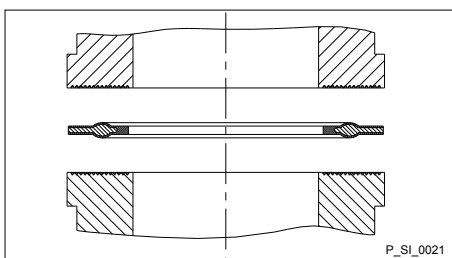


Fig. 16: Moulded composite seals with grooved insert

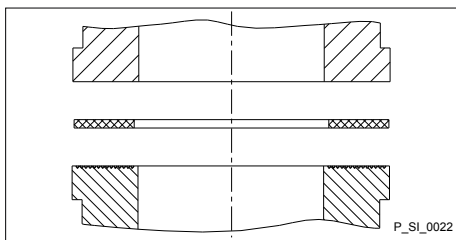


Fig. 17: Elastomer flat seal with a smooth insert

**i**

- Precise metering is only possible when the back pressure is maintained above 1 bar at all times.
- If metering at atmospheric pressure, a back pressure valve should be used to create a back pressure of approx. 1.5 bar.

A back pressure valve, a spring-loaded injection valve, a relief valve, a foot valve or a liquid end do not represent absolutely leak-tight shut-off elements.

- Use a shut-off valve, a solenoid valve or a vacuum breaker for this purpose.

To check the pressure conditions in the pipework system, we recommend providing connecting options for a manometer close to the suction and pressure connector.

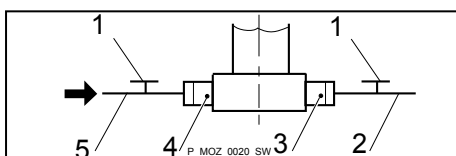


Fig. 18: Manometer connector options

- 1 Manometer sleeve
- 2 Pressure line (pipe)
- 3 Discharge valve
- 4 Suction valve
- 5 Suction line (pipe)

Connect the pipework to the pump ensuring that no residual forces act on the pump, e.g. due to shifting, weight or expansion of the line.

Only connect steel or stainless steel pipework to a plastic liquid end using a flexible section of pipe.

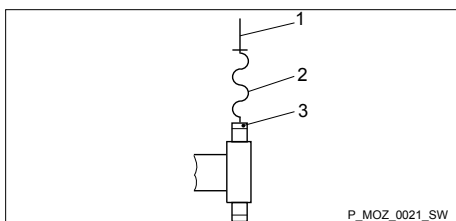


Fig. 19: Steel pipeline at the liquid end

- 1 Steel pipeline
- 2 Flexible pipe section
- 3 Plastic liquid end

### 7.1.1 Relief valve/bleeder valve

#### Integral relief valve or integral bleeder valve

**CAUTION!**

**Danger due to incorrect use of the integral relief valve**

The integral relief valve can only protect the motor and the gear, and then only against impermissible positive pressure that is caused by the metering pump itself. It cannot protect the system against positive pressure.

- Protect the motor and gear of the system against positive pressure using other mechanisms.
- Protect the system against illegal positive pressure using other mechanisms.

**CAUTION!**

**Warning of feed chemical spraying around**

If no overflow line is connected to the integral relief valve or the integral bleeder valve, feed chemical will spray out of the hose connector as soon as the relief valve opens.

- Always connect an overflow line to the integral relief valve or the integral bleeder valve and feed it back into the supply tank or - if required by the regulations - into a special tank.

**CAUTION!****Danger of cracking**

Cracks on the PVT liquid end can occur if a metal overflow line is connected to the relief valve.

- Never connect a metal overflow line to the relief valve.

**CAUTION!****Danger of the integral relief valve failing**

The integral relief valve no longer operates reliably with feed chemicals that have a viscosity of greater than 200 mPa s.

- Only use the integral relief valve with feed chemicals that have a viscosity of up to 200 mPa s.

**CAUTION!****Warning of leaks**

Feed chemical, which remains in the overflow line at the relief valve or bleeder valve, can attack the valve or cause it to leak.

- Route the overflow line with a continuous slope and moreover with the hose sleeve pointed downwards, see .

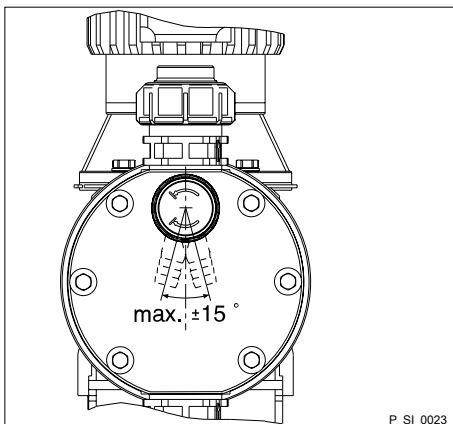


Fig. 20: Permissible alignment of the relief valve

**INFORMATION!** The bleed function is blocked if the overflow line is fed into the suction line. Therefore lead the overflow line back into the supply tank.

Minimal overflow into the overflow line can occur when operating the integral relief valve close to the opening pressure.

## 7.1.2 Diaphragm rupture sensor

### Diaphragm rupture sensor

**CAUTION!****Danger resulting from unnoticed diaphragm rupture**

If the pump has been ordered with an electric diaphragm rupture sensor, it still has to be installed.

- Screw the enclosed diaphragm rupture sensor into the liquid end.

**CAUTION!****Warning of unnoticed diaphragm rupture**

Only above approximately 2 bar system back pressure is a signal generated in the event of the rupture of a diaphragm.

- Only rely on the diaphragm rupture sensor with back pressures of greater than 2 bar.  
Or install a back pressure valve and set it to a minimum of 2 bar – if the installation permits this.

### 7.1.3 Basic installation notes

#### Safety information



**CAUTION!**

**Danger from rupturing hydraulic components**

Hydraulic components can rupture if the maximum permissible operating pressure is exceeded.

- Never allow the metering pump to run against a closed shut-off device.
- With metering pumps without integral relief valve: Install a relief valve in the discharge line.



**CAUTION!**

**Hazardous feed chemicals can escape**

With hazardous feed chemicals: Hazardous feed chemical can leak out when using conventional bleeding procedures with metering pumps.

- Install a bleed line with return line into the storage tank.

→ Shorten the return line so that it is not immersed in the feed chemical in the storage tank.

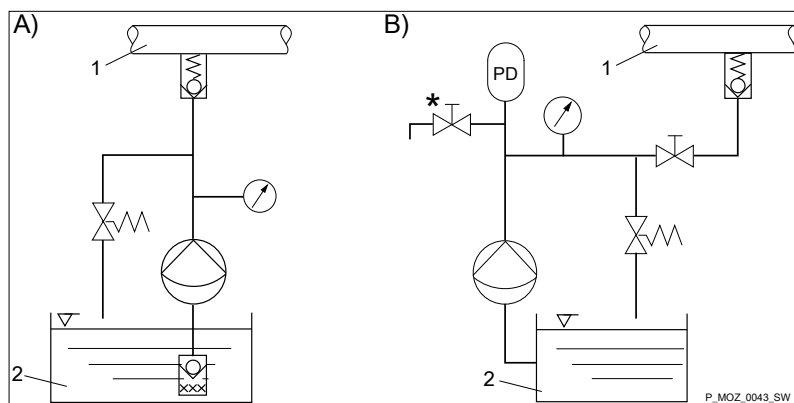


Fig. 21: (A) standard installation, (B) with pulsation damper

- 1 Main line
- 2 Storage tank

#### Legend for hydraulic diagram

Symbol	Explanation	Symbol	Explanation
	Metering pump		Foot valve with filter mesh
	Injection valve		Level switch
	Back pressure valve or safety valve		Manometer

## 7.2 Installation, electrical

### 7.2.1 General

#### General safety notes



#### WARNING!

##### Danger of electric shock

Unprofessional installation can lead to electric shocks.

- Crimp cable end sleeves onto all stripped cable cores.
- Make sure that only technically trained personnel are authorised to undertake the electrical installation of the unit.



#### WARNING!

##### Danger of electric shock

There can be mains voltage live inside the motor or electrical ancillaries.

- Immediately disconnect the housing of the motor or electrical ancillaries from the mains/power supply if they have been damaged. Only return the pump to operation after a repair.

Use ProMinent cables to avoid problems.

#### What requires electrical installation?

What requires electrical installation:

- Level switch
- Diaphragm rupture sensor, electrical (optional)
- Metering monitor (optional)
- Relay (optional)
- External control
- mA output (optional)
- Bus connector (optional)
- Pump, power supply

### 7.2.2 Control connectors



#### CAUTION!

##### Incoming signals can remain without effect

If the universal control wire, the external/pacing cable or the level monitoring cable is shortened below 1.20 m, the pump does not detect that it is connected. Consequently a warning message (for example) can be suppressed.

- Do not shorten this cable below 1.20 m.

#### Level switch, diaphragm rupture sensor (optional) and metering monitor (optional)

Connect the plugs of the level switch, diaphragm rupture sensor and metering monitor to the corresponding sockets on the front side of the control. If in doubt - refer to the "Overview of equipment and control elements" chapter.

If the pump has been ordered with an electric diaphragm rupture sensor, it must also be electrically installed.

- Electrically connect the diaphragm rupture sensor provided.



Only with flammable media:



**WARNING!**

**Fire danger**

The electric diaphragm rupture sensor must trigger an alarm and safely stop the pump as quickly as possible in the event of a diaphragm rupture.

Only return the pump to service once a new diaphragm has been fitted.

**7.2.2.1 Relays**

**7.2.2.1.1 Fault indicating relay 230 V**

If another switching function is required, the pump can be reprogrammed in the 'Relay' menu.

The relay can be retrofitted and is operational once it has been inserted into the relay board.

**Fault indicating relay 230 V**

Data	Value	Unit
Maximum contact load at 230 V and 50/60 Hz:	8	A (ohms)
Minimum mechanical service life:	200,000	switching operations

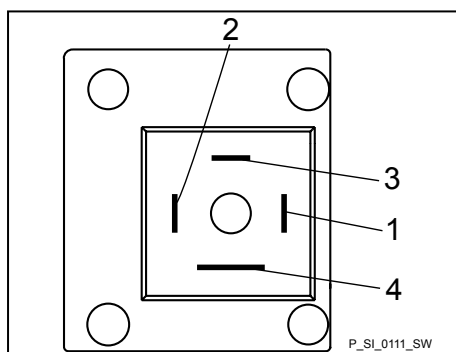


Fig. 22: Pin assignment on the pump

Tab. 2: Pin assignment

To pin	VDE cable	Contact	CSA cable
1	white	NO (normally open)	white
2	green	NC (normally closed)	red
4	brown	C (common)	black

**7.2.2.1.2 Fault indicating and pacing relay**

The first switch is a relay. The pacing output is electrically isolated by an optocoupler with a semiconductor switch.

If another switching function is required, the pump can be reprogrammed in the 'Relay' menu.

The relay can be retrofitted and is operational once it has been inserted into the relay board.

### Fault indicating relay (24 V)

Data	Value	Unit
Maximum contact load at 24 V and 50/60 Hz:	100	mA
Minimum mechanical service life:	200,000	switching operations

### Pacing relay

Data	Value	Unit
Residual voltage max. at $I_{\text{off max}} = 1 \mu\text{A}$	0.4	V
Maximum current	100	mA
Maximum voltage	24	V DC
Closing time	100	ms

### Fault indicating and pacing relay

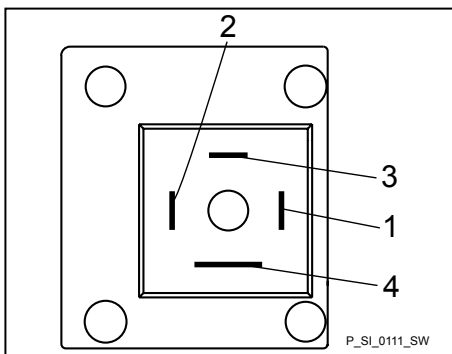


Fig. 23: Pin assignment on the pump

Tab. 3: Pin assignment

To pin	VDE cable	Contact	Relays
1	yellow	NC (normally closed) or NO (normally open)	Fault indicating relay
4	green	C (common)	Fault indicating relay
3	white	NC (normally closed) or NO (normally open)	Pacing relay
2	brown	C (common)	Pacing relay

#### 7.2.2.1.3 Current output and fault indicating / pacing relay (24 V)

The module can be retrofitted and operates once it has been inserted into the module board.

The variable to be signalled for the current output can be selected in the 'ANALOGUE OUTPUT' menu.

If another switching function is required, the relay can be reprogrammed in the 'Relay' menu.

**Current output**

Data	Value	Unit
Open circuit voltage:	8	V
Current range:	4 ... 20	mA
Ripple, max.:	80	µA ss
Load, max.:	250	Ω

**Fault indicating / pacing relay (24 V)**

Data	Value	Unit
Residual voltage max. at $I_{off\ max} = 1\ \mu A$	0.4	V
Maximum current	100	mA
Maximum voltage	24	V DC
Closing time	100	ms

**Current output and fault indicating / pacing relay (24 V)**

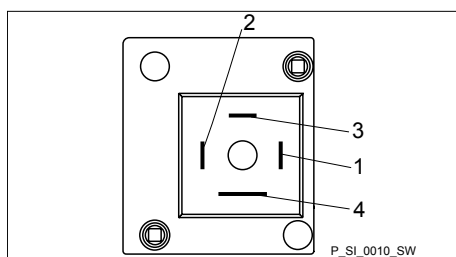


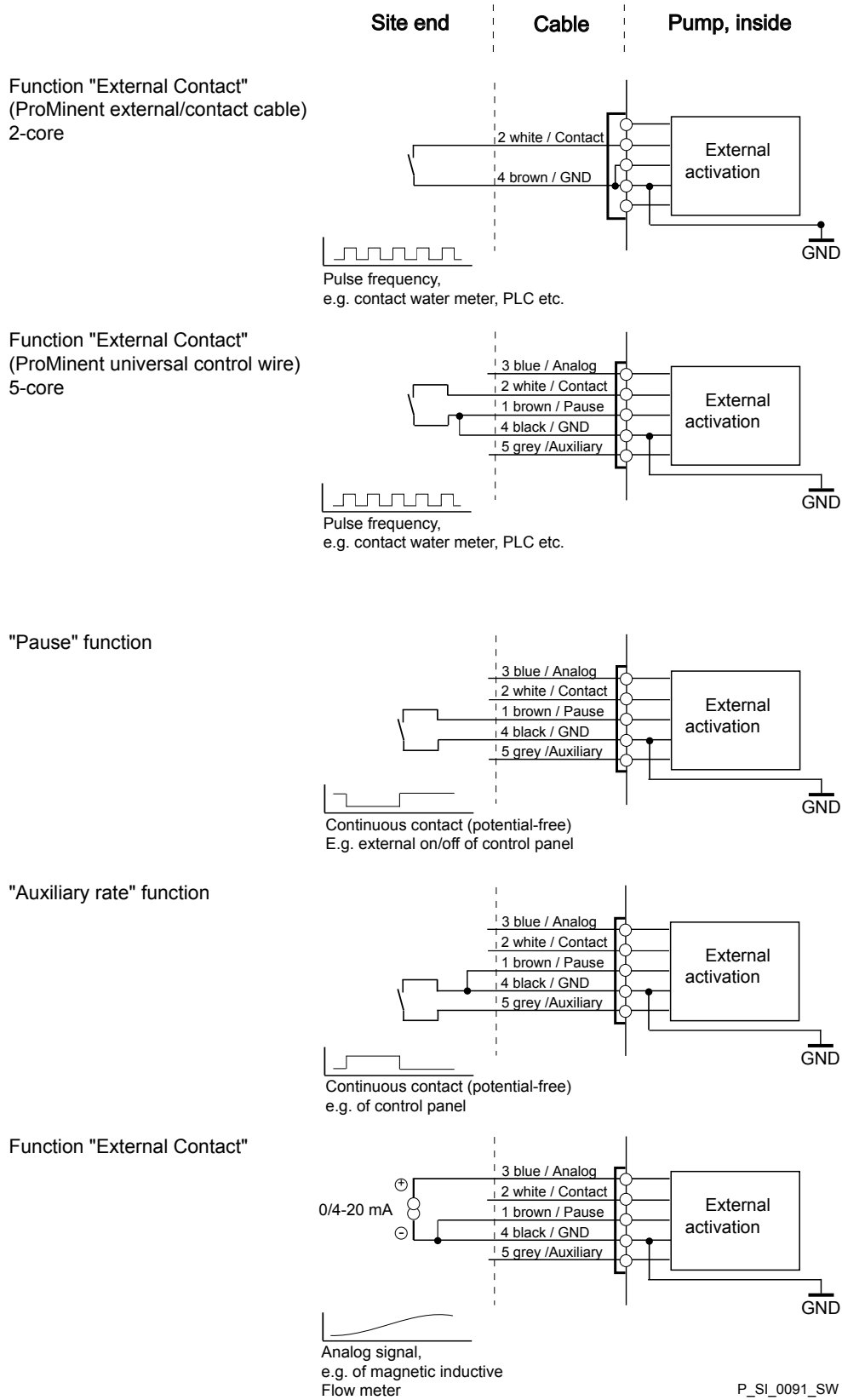
Fig. 24: Pin assignment on the pump

Tab. 4: Pin assignment

To pin	VDE cable	Contact	Relays
1	yellow	"+"	Current output
4	green	"_"	Current output
3	white	NC (normally closed) or NO (normally open)	Fault indicating/pacing relay
2	brown	C (common)	Fault indicating/pacing relay

7.2.2.2 External control

Universal control wire connection diagram



Technical data "External control"

Semi-conductor switch elements with a residual voltage of  $-0.7\text{ V}$  (e.g. transistors in open-collector circuits) or contacts (relays) can be used as input switch elements.

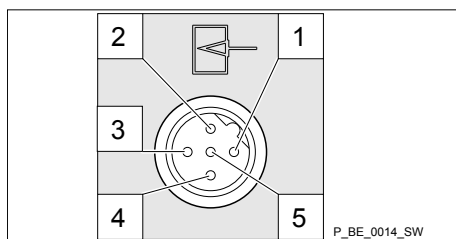


Fig. 25: Pin assignment

Pin	Function	Parameter
1 = Pause input (activating function)	Voltage with open contacts:	approx. 5 V
	Input resistance:	10 kΩ
	Control:	<ul style="list-style-type: none"> <li>■ Potential-free contact (approx. 0.5 mA)</li> <li>■ Semiconductor switch (residual voltage &lt; 0.7 V)</li> </ul>
2 = contact input	Voltage with open contacts:	approx. 5 V
	Input resistance:	10 kΩ
	Control:	<ul style="list-style-type: none"> <li>■ Potential-free contact (approx. 0.5 mA)</li> <li>■ Semiconductor switch (residual voltage &lt; 0.7 V)</li> </ul>
	Min. contact duration:	20 ms
	Max. pulse frequency:	25 pulses/s
3 = Analogue input	Input load:	approx. 120 Ω
4 = GND		
5 = Auxiliary input	Voltage with open contacts:	approx. 5 V
	Input resistance:	10 kΩ
	Control:	<ul style="list-style-type: none"> <li>■ Potential-free contact (approx. 0.5 mA)</li> <li>■ Semiconductor switch (residual voltage &lt; 0.7 V)</li> </ul>

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

Block diagram Sigma Control

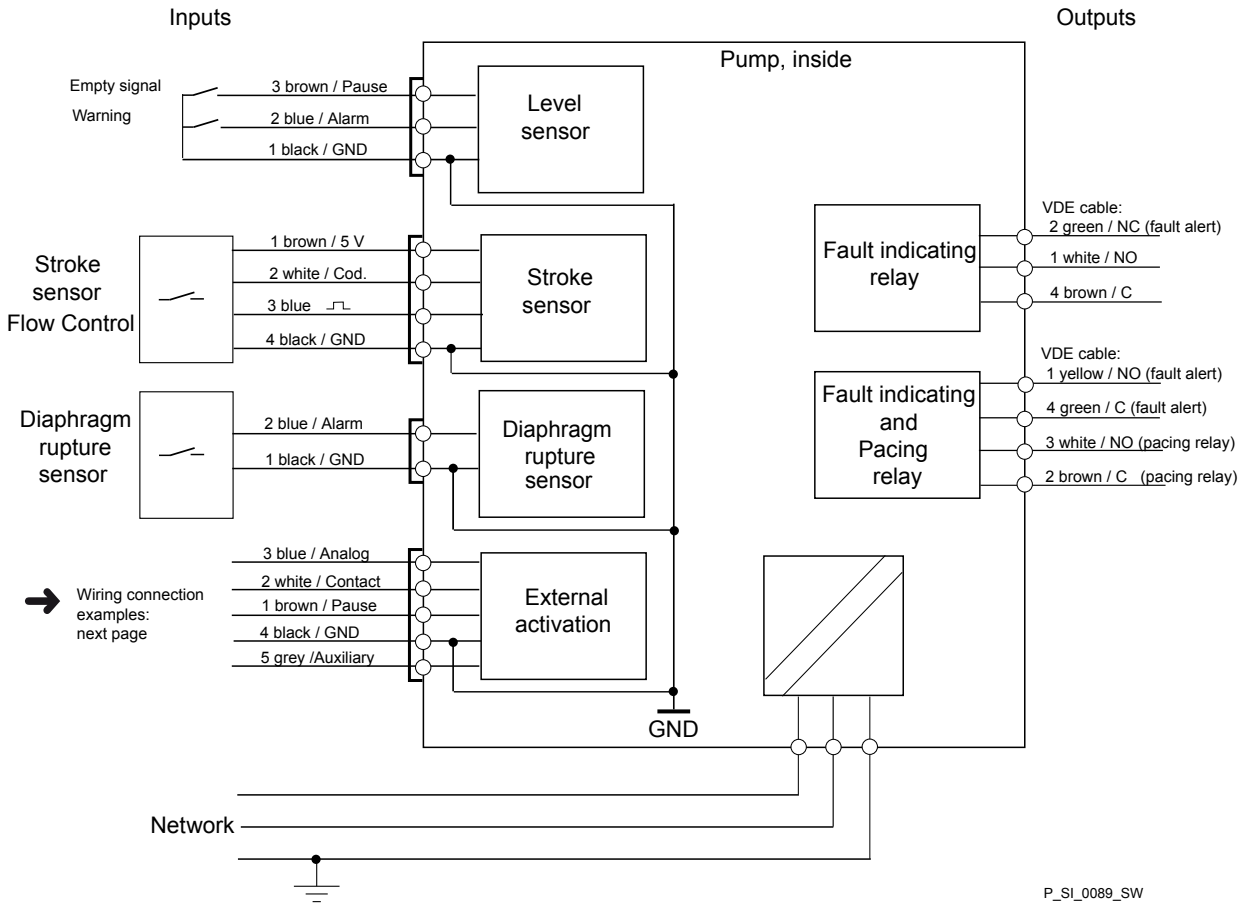
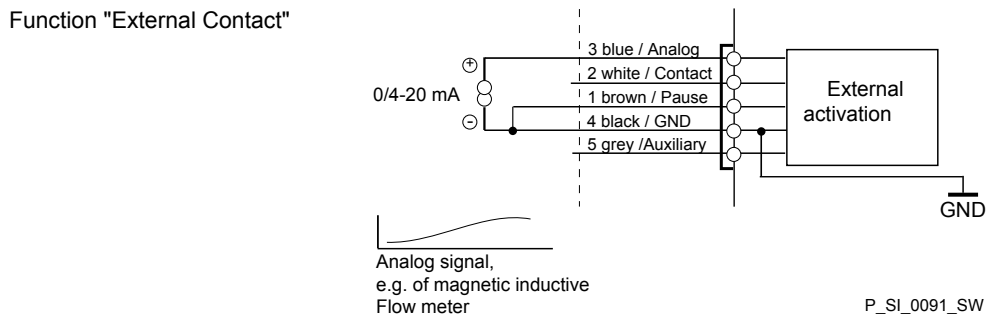
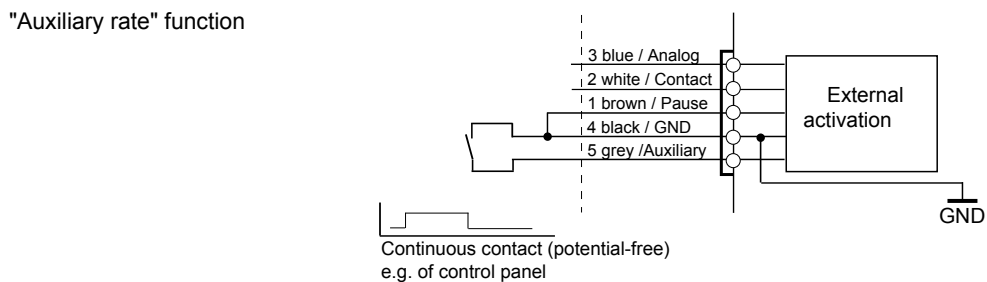
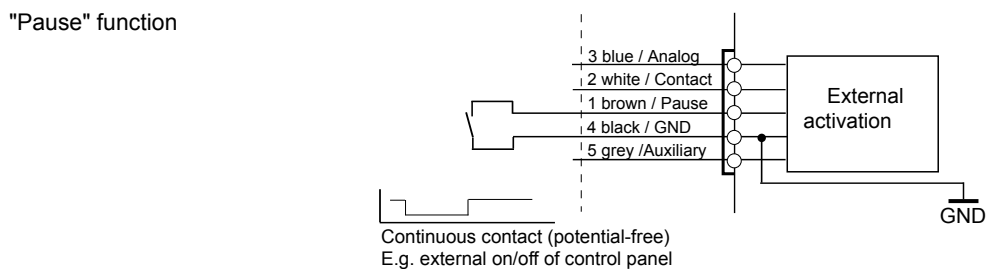
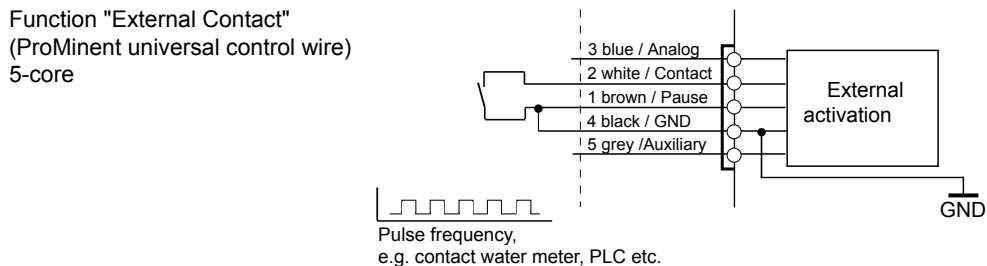
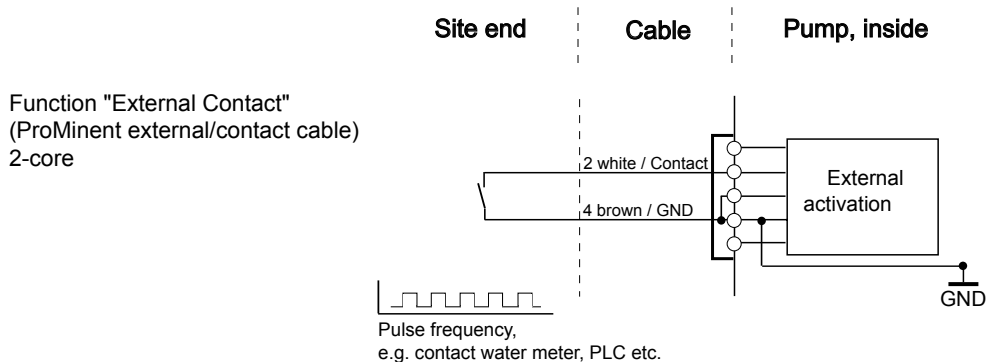


Fig. 26: Sigma Control block switching diagram

### Universal control wire connection diagram



P\_SI\_0091\_SW

### 7.2.3 HMI operating unit



#### CAUTION!

##### Danger of malfunctions

Incorrect operation via the CAN bus will lead to malfunctions.

- Do not connect any other control (e.g. DXCa) to the CAN socket when operating with the HMI connected.

Connect the HMI to the CAN socket above the LEDs of the pump base if the pump is operated with HMI.

Among other things, a short circuit may occur in the pump if liquid penetrates into the CAN socket.

- Always insert a CAN plug or the sealing cap supplied into the CAN socket.

If the pump is operated without the HMI, then plug the sealing cap supplied into the CAN socket above the LEDs of the pump base.

### 7.2.4 Pump, power supply



#### WARNING!

##### Danger of electric shock

In the event of an electrical accident, it must be possible to quickly disconnect the pump, and any electrical ancillaries which may possibly be present, from the mains.

- Install an emergency cut-off switch in the mains supply line to the pump and any electrical ancillaries which may be present or
- Integrate the pump and electrical ancillaries which may be present in the emergency cut-off management of the system and inform personnel of the isolating option.



#### CAUTION!

##### Pump can be damaged

The pump can only be stopped when running by an:

- External cable
- *[Stop]* key.

Do not stop the pump using the mains cable. Use a relay or a contactor if the pump is to be definitively controlled via the mains cable. Take into account the starting current of the pump.

—▶ Install the pump cable. Use the original cable supplied.

Key electrical data can be found on the nameplate of the pump.

### 7.2.5 Other assemblies

#### Other assemblies

—▶ Install the other assemblies on the basis of the documentation supplied.



## 8 Basic set-up principles



- Please also refer to all the overviews covering "Operating/set-up overview for Sigma X Control types" and "Operating menu for Sigma X Control types, complete" in the appendix and the "Overview of equipment and control elements" and "Control elements" chapters.
- The pump exits the menu and returns to a continuous display if [Menu] is pressed or no key is pressed for 60 seconds.

### 8.1 Basic principles for setting up the control



shows using the "Language" example how to set up something - in turn:

- Sequence of displays
- The path derived from this
- The path as presented in the operating instructions

Fig. 27: Please read

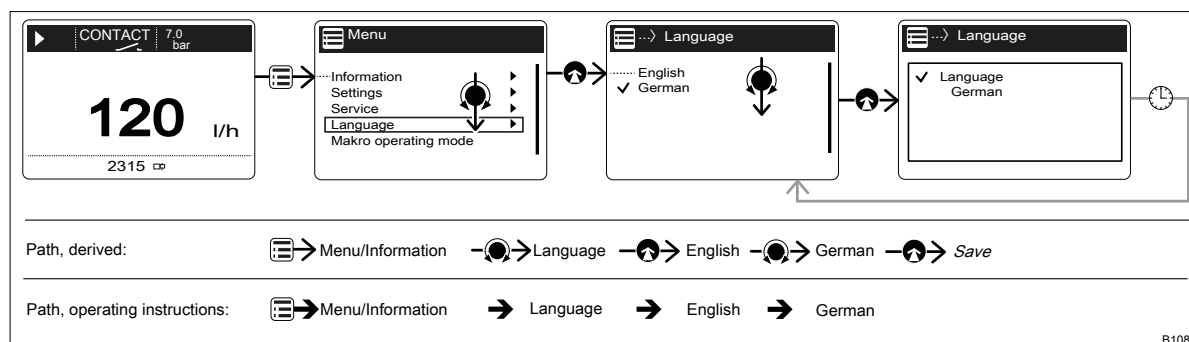



Fig. 28: "Setting up the language": As an example of set-up and path displays


Tab. 5: Legend:

Symbol	Explanation
	Press [Menu]
	Turn the [Clickwheel]
	Press the [Clickwheel]

#### "Setting up the language" in detail

- To access the 'Menu': press the [Menu] key.  
⇒ The cursor immediately points to 'Information'.
- To switch from 'Information' to 'Language': turn the [Clickwheel].
- To return to the 'Language' menu: press the [Clickwheel].  
⇒ The cursor points to a language.
- To switch to 'Deutsch': turn the [Clickwheel].
- To save: press the [Clickwheel].  
⇒ The software shows a display by way of confirmation.  
After 2 seconds, it returns to the higher-level 'Menu'.

6. ➔ To complete the setting: press  [Menu].

Alternatively: wait 60 seconds or exit the 'Menu' via the  [Menu] key or using 'End'.

### Confirming an entry

➔ Briefly press the [Clickwheel].

⇒ The software switches to the next menu point or back to the menu and saves the entry.

### Exiting a menu option without confirming it

➔ Press  [Back].

⇒ The software switches to the next menu point or back to the menu without saving anything.

### Returning to a continuous display

➔ Press  [Menu].

⇒ The software cancels the entry and switches to a continuous display without saving anything.

### Changing adjustable variables

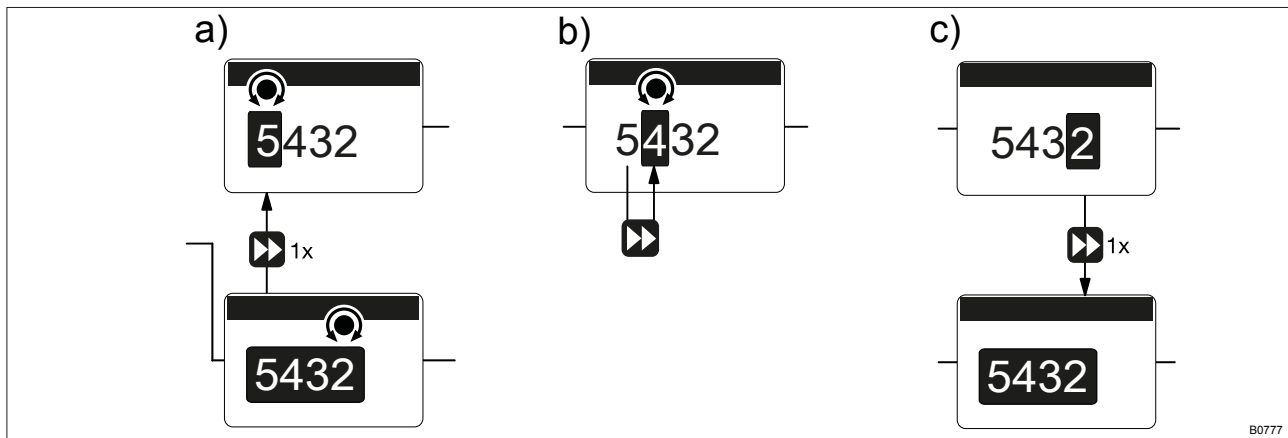



Fig. 29: a) Changing from one figure to its initial figures; b) Changing the figure; c) Returning from the last figure to the (complete) figure (to correct a wrong figure, for example).

### Changing a (complete) number

➔ Turn the [Clickwheel].


⇒ The value of the figure highlighted is raised or lowered.



### Changing figures

1. ➔ To adjust the value of a figure digit-by-digit, press  [Priming].


⇒ The first figure is highlighted - see Figure above, point a)

2. ➔ To adjust the value of a figure, turn the [Clickwheel].

3. ➔ To move to the next figure, press  [Priming] - see above Figure, point b).

4.  To run through the figures again, if necessary (possibly because of an incorrect figure), when you get to the last figure press  [Priming] again - see above Figure, point c).
  - ⇒ Now you can start from the beginning again.


### Confirming adjustable variables

-  Press the [Clickwheel] 1x.
  - ⇒ The software saves the entry.

## 8.2 Checking adjustable variables

### Continuous displays

Before adjusting the pump, you can check the current settings of the adjustable variables:

-  Simply turn the [Clickwheel] if the pump is showing a continuous display.
  - ⇒ Each time the [Clickwheel] engages when you turn it, you will see a different continuous display.





*The number of continuous displays depends on the identity code, the selected operating mode and the connected additional devices – see overview of "Continuous displays" in the appendix.*

### Secondary displays


The lowest line of a continuous display shows different information (which cannot be adjusted in the secondary display) - see "Continuous displays and secondary displays" overview in the appendix.


You can access secondary displays via any continuous display as follows:

1.  Press the [Clickwheel] for 3 seconds.
  - ⇒ A frame appears around the secondary display.
2.  Providing there is a frame, you will see a different secondary display each time the [Clickwheel] engages when turned.


When you reach the secondary display you wish, leave the [Clickwheel] and wait briefly.

## 8.3 Changing to Setting mode

In a continuous display, if you press  'Menu', the pump in Setting mode changes to 'Menu'. For more information refer to the following chapter entitled "Set up / Menu".

If under 'Access protect.' only 'Menu' or 'All' has been set up (top right  lock symbol), then after pressing the [Clickwheel], first enter the 'Password'.


## 9 Set up/ 'Menu'

- Please also refer to all overviews covering "Operating/set up overview" and "Operating menu for Sigma X Control type, complete" in the appendix and the "Overview of equipment" and "Control elements" chapters.
- The pump exits the menu and returns to a continuous display if  [Menu] is pressed or if no key is pressed for 60 seconds.

The 'Menu' is sub-divided as follows:


- 1 - 'Information'
- 2 - 'Operating mode'
- 3 - 'Settings'
- 4 - 'Timer'
- 5 - 'Service'
- 6 - 'Language'

### 9.1 'Information'

 → 'Menu / Information → ...'

You can find out different information about your pump in the 'Information' menu. The number and type can depend on the pump settings.

### 9.2 'Operating mode'

 → 'Menu / Information → Operating mode → ...'

You can switch between the operating modes in the 'Operating mode' menu. You can enter the settings for this in the 'Settings' menu.

- 'Manual'
- 'Batch'
- 'Contact'
- 'Analogue'

### 9.3 'Settings'

 → 'Menu / Information → Settings → ...'


The 'Settings' menu generally includes these setting menus:

- 1 - The operating mode set (exception: 'Manual')
- 2 - 'Metering'
- 3 - 'Calibrate'
- 4 - 'Inputs/outputs'
- 5 - 'System'
- 6 - 'Set time'
- 7 - 'Date'

### 9.3.1 'Operating mode'

 → 'Menu / Information → Settings → Operating mode → ...'


#### 9.3.1.1 'Manual'

 → 'Menu / Information → Settings → Operating mode → Manual'

'Manual' operating mode allows you to operate the pump manually.

The stroke rate can be set in the continuous display of this operating mode.

#### 9.3.1.2 'Batch'

 → 'Menu / Information → Settings → Operating mode → Batch → ...'

The 'Batch' operating mode enables you to pre-select large metering volumes.

You can only select whole numbers but no fractions as the number of strokes (figures 1 to 99,999).


You can trigger the strokes using the [Clickwheel] if you have already switched to the 'Push' continuous display. You can also trigger them via a pulse using the "External control" terminal.

#### Memory - remaining strokes not yet processed


You can also activate the 'Memory' function extension ("memory" identifier). When 'Memory' is activated, the pump adds up the remaining strokes, which could not be processed, up to the maximum capacity of the stroke memory of 99,999 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.



#### CAUTION!

- The pump maintains its stroke rate when changing over from 'Manual' operating mode to 'Batch' operating mode.
- When you press  [STOP/START] or the "Pause" function is activated, the 'Memory' is cleared.

#### 9.3.1.3 'Contact'

 → 'Menu / Information → Settings → Operating mode → Contact → ...'

'Contact' operating mode allows you to trigger individual strokes or a series of strokes.

You can trigger the strokes via a pulse sent via the "External control" terminal.

The purpose of this operating mode is to convert the incoming pulses into strokes with a step-down (fractions) or small step-up.



#### CAUTION!


The pump maintains the stroke rate when changing over from 'Manual' operating mode to 'Contact' operating mode.

### Memory - Pulses not yet processed

You can also activate the 'Memory' function extension ("memory" identifier). When 'Memory' is activated, the pump adds up the remaining strokes, which could not be processed, up to the maximum capacity of the stroke memory of 99,999 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.



#### CAUTION!

- Only with 'Memory' - 'off': If you press  [STOP/START] or empty the contact memory ('Menu / Information → Service → Clear counters') or the "Pause" function is activated, the 'Memory' is cleared.

### Factor

The number of strokes per pulse depends on the factor which you can input. By using a factor you can multiply incoming pulses by a factor between 1.01 and 99.99 or reduce them by a factor of 0.01 to 0.99:

Number of strokes executed = factor x number of incoming pulses

Table of examples

	Factor	Pulse (sequence)	Number of strokes (sequence)
<b>Step-up*</b>			
	1	1	1
	2	1	2
	25	1	25
	99.99	1	99.99
	1.50	1	1.50 (1 / 2)
	1.25	1	1.25 (1 / 1 / 1 / 2)
<b>Step-down**</b>			
	1	1	1
	0.50	2	1
	0.10	10	1
	0.01	100	1
	0.25	4	1
	0.40	2.5 (3 / 2)	(1 / 1)
	0.75	1.33 (2 / 1 / 1)	(1 / 1 / 1)

Tab. 6: \* Explanation of the conversion ratio

With a factor of 1	... 1 stroke is executed per 1 pulse
With a factor of 2	... 2 strokes are executed per 1 pulse
With a factor of 25	... 25 strokes are executed per 1 pulse

Tab. 7: \*\* Explanation of step-down

With a factor of 1	... 1 stroke is executed per 1 pulse.
With a factor of 0.5	...1 stroke is executed after 2 pulses.
With a factor of 0.1	...1 stroke is executed after 10 pulses.
With a factor of 0.75	...1 stroke is executed once after 2 pulses, then 1 stroke is executed twice after 1 pulse, and then again 1 stroke after 2 pulses etc.



If a remainder is obtained when dividing by the factor, then the unit adds the remainders together. As soon as this sum reaches or exceeds "1", the pump executes an additional stroke. Therefore on average during the metering operation, the resultant number of strokes precisely matches the factor.

#### 9.3.1.4 'Analogue' (optional)

☰ → 'Menu / Information → Settings → Operating mode → Analogue → ...'

The secondary display "Signal current" indicates the incoming current.

You can select 5 types of current signal processing:

- '0 - 20 mA'
- '4 - 20 mA'
- 'Linear curve'
- 'Lower side band'
- 'Upper side band'

### 'Standard'

#### '0 - 20 mA'

At 0 mA the pump is stationary –

At 20 mA the pump works at maximum stroke rate.

#### '4 - 20 mA'

At 4 mA the pump is stationary –

At 20 mA the pump works at maximum stroke rate.

### 'Extended'

#### Curve

##### 'Linear curve'

The symbol "Linear curve" appears on the LCD screen. You can enter any pump stroke rate behaviour proportional to the current signal. You can enter the curve points I and F in the 'Curve points' menu. You define a straight line here and thus the behaviour:

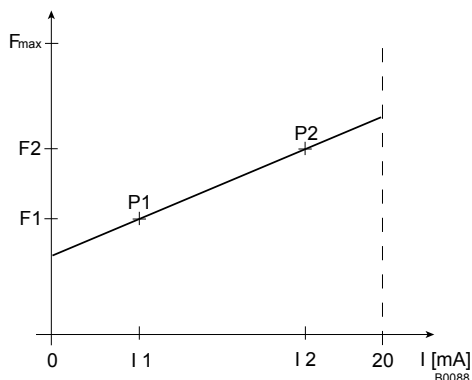


Fig. 30: Frequency-current diagram for "Linear curve"



Plot a diagram similar to the one above – with values for (I1, F1) and (I2, F2) – so that you can set the pump as desired!



The smallest processable difference between I1 and I2 is 4 mA (|| I1-I2 || ≥ 4 mA).

##### 'Lower side band'



Using this type of processing, you can control a metering pump using the current signal as shown in the diagram below. You can enter the curve points I and F in the 'Curve points' menu.

However, you can also control two metering pumps for different feed chemicals via a current signal (e.g. one acid pump and one alkali pump using the signal of a pH sensor). To do this, connect the pumps electrically in series.

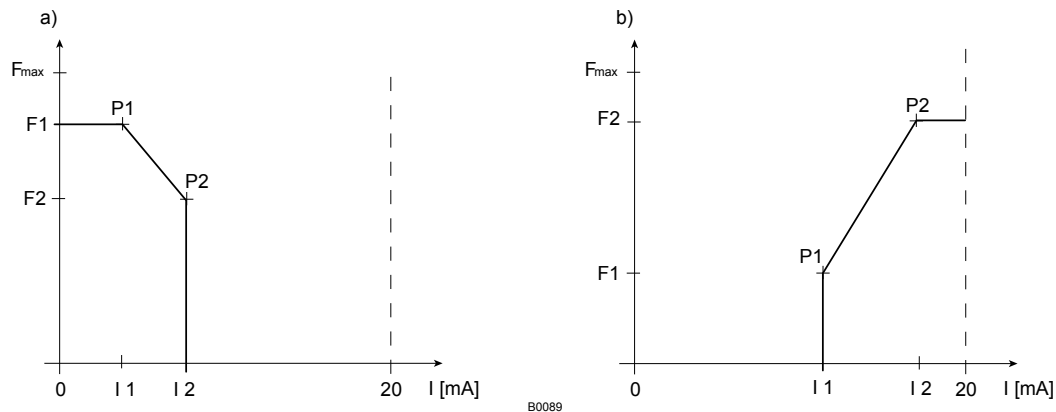


Fig. 31: Frequency-current diagram for a) Lower side band, b) Upper side band

#### 'Upper side band'

Using this processing type, you can control a metering pump using the current signal as shown in the diagram above. You can enter the curve points I and F in the 'Curve points' menu.

Everything functions according to the 'Lower side band' type of the processing.

#### Curve points

To define the above curves, enter any two points P1 (I1, F1) and P2 (I2, F2) in the 'Curve points' menu (F1 is the stroke rate at which the pump is to operate at current I1, F2 is the stroke rate at which the pump is to operate at current I2...).

#### Error mess. $i < 4$ mA

You can select in the 'Error message  $i < 4$  mA' menu item whether the pump should issue an error message and stop with current signals below 3.8 mA (Standard).

## 9.3.2 'Metering'

☰ → 'Menu / Information → Settings → Metering → ...'

### 9.3.2.1 'Metering profile'

☰ → 'Menu / Information → Settings → Metering → Dosing profile → ...'

Under 'Metering → Dosing profile' you can precisely match the pump metering flow over time against the requirements of the particular application - see "Functional description" chapter.

### Metering optimised

With 'Dosing profile' - 'Discharge optimized', the pressure stroke is elongated and the suction stroke is executed as quickly as possible. This setting is suitable, among other things, for applications that require optimum mixing ratios and chemical mixing that is as continuous as possible.

### Priming optimised

Under 'Dosing profile' - 'Suction optimized', the suction stroke is elongated as much as possible, which makes it possible to meter viscous or outgassing media precisely and problem-free. Select this setting to minimise the NPSH value as well.

### Standard

With 'Dosing profile' - 'standard' the pump meters as usual.

## 9.3.3 'Calibration'

☰ → 'Menu / Information → Settings → Calibration → ...'



### Accuracy of calibration

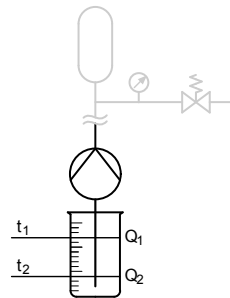
Normally the pump does not have to be calibrated.

The pump can be calibrated if viscous feed chemicals are used or extremely high accuracy is required.



### WARNING!

If the feed chemical is hazardous, take appropriate safety precautions when performing the following calibration instructions. Observe the material safety data sheet for the feed chemical!



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### Preparation

1. Use the [Clickwheel] to scroll through the continuous display to check whether litres or gallons have been selected.
2. If the incorrect volume unit has been selected, correct it in the 'Menu / Information → Settings → System → Unit' menu.
3. Check whether the stroke rate in the continuous display is not too low for calibration.
4. Lead the suction hose into a measuring cylinder containing the feed chemical – make sure that the discharge hose is installed permanently (operating pressure, ...!).
5. Prime the feed chemical (press [▶▶]) [Priming] if the suction hose is empty.

**Calibration process**

1. ➤ Record the level in the measuring cylinder.
2. ➤ Select the 'Menu / Information → Settings → Calibrate' menu and press the [Clickwheel].
  - ⇒ The 'Start calibration' (PUSH) menu item appears.
3. ➤ To start calibration, press the [Clickwheel].
  - ⇒ The 'Calibrate ...' menu item appears, the pump starts to pump and indicates the number of strokes.
4. ➤ After a reasonable number of strokes (a minimum of 200), use the [Clickwheel] to stop the pump.
  - ⇒ The 'Calibration ended' menu item appears. It requests you to enter the calibration volume.
5. ➤ Determine the required metering volume (difference between initial volume - remaining volume in the measuring cylinder).
6. ➤ Use the [Clickwheel] to enter this volume in the 'Calibration ended' menu items and close.
  - ⇒ The pump switches to the 'Calibration result' menu item - the pump is calibrated.
7. ➤ Press the [Clickwheel].
  - ⇒ The pump returns to the 'Menu / Information → Settings' menu.

**9.3.4 'Inputs/outputs'**

☰ ➤ 'Menu / Information → Settings → Inputs/outputs → ...'

The 'Inputs/outputs' menu splits into the following sub-menus:

- 1 - 'Auxiliary frequency'
- 2 - 'Relay1' (optional)
- 3 - 'Relay2' (optional)
- 4 - 'mA-Output' (optional)
- 6 - 'Flow monitor' (only if connected)
- 5 - 'Diaphragm rupture' (only if connected)

**9.3.4.1 'Auxiliary frequency'**

☰ ➤ 'Menu / Information → Settings → Inputs/outputs  
➔ Auxiliary frequency → ...'

The programmable function 'Auxiliary frequency' facilitates the switchover to an auxiliary stroke rate, which can be set in the 'Auxiliary frequency' menu.

It can be activated via the "External control" terminal. If the 'Auxiliary frequency' is present, then the identifier "AUX" appears on the LCD screen.

Refer to the "Hierarchy of Operating Modes, Functions and Fault Statuses" for the order of the various operating modes, functions and fault statuses.

**9.3.4.2 'Relay1 (optional)'**

☰ ➤ 'Menu / Information → Settings → Inputs/outputs → Relay1 → ...'



The setting options for the 'Relay' function only exist if a relay is fitted.

Tab. 8: Relay, physical and pre-set to ...

Identity code specification	Relay, physical	Pre-set to ...
1	1 x changeover contact 230 V – 8 A	Fault indicating relay, N/C
3	2 x N/O 24 V – 100 mA	Fault indicating relay, N/C, and pacing relay
8	1 x N/O 24 V – 100 mA, + 4...20 mA output	Fault indicating relay, N/C

### Relay type

You can reprogram the relays to these types:

Tab. 9: Relay type / relay reactions setting

Menu setting	Warning message yellow LED*	Error message red LED*	Manual stop	Stop via bus	Pause	Stroke rate
'Warning'	X					
'Error'		X				
'Warning + error'	X	X				
'Warning + error + stop'	X	X	X	X	X	
'Stop'		X	X	X	X	
'Stroke rate**'						X
'Pump inactive'		X	X			

\* see the "Troubleshooting" chapter

\*\* only use 'Relay 2' for this relay type (semiconductor relay). The relay switches with every stroke.

### Relay polarity

You can set here how a relay is to switch.

Menu setting	Effect
normally-closed (NC)	The relay is closed in normal mode and opens with a triggering event.
normally-open (NO)	The relay is open in normal mode and opens with a triggering event.

#### 9.3.4.3 'Relay2 (optional)'

☰ → 'Menu / Information → Settings → Inputs/outputs → Relay2 → ...'

### Relay cycle quantity

You can set the metering volume for which the pacing relay is to switch once here.

For more information on 'Relay2' - see [Chapter 9.3.4 'Inputs/outputs'](#) on page 51.


#### 9.3.4.4 'mA-Output (optional)'

 → 'Menu / Information → Settings → Inputs/outputs → mA-Output → ...'


You can set which current range is to be used at the mA output here.

Under 'Function', you can then set whether the current stroke rate ('strokes / minute') is to be signalled at the mA output or the capacity (litres / hour).

#### 9.3.4.5 'Flow control'

 → 'Menu / Information → Settings → Inputs/outputs → Flow control → ...'



The setting options for the 'Flow control' function are only available if a flow control is electrically installed. The symbol for flow control appears: .

A metering monitor, such as a Flow Control (also DulcoFlow®), can register the individual pressure impacts of the pump and report them back to the pump.


It is possible to switch the function on and off under 'Activation'.

The pump switches to fault mode if this feedback isn't provided a certain number of times in succession as set under 'Tolerance / strokes'.


Under 'at Auxiliary', it is possible to set whether the function is to be deactivated with auxiliary frequency.

Under 'Signalling', you can set whether the control is to trigger an error or a warning when the tolerance is exceeded.

#### 9.3.4.6 'Diaphragm rupture'


 → 'Menu / Information → Settings → Inputs/outputs → Diaphragm rupture → ...'



The setting options for the 'Diaphragm rupture' function only exist if a diaphragm rupture indicator is electrically installed. The symbol for diaphragm appears .

In the 'Diaphragm rupture' sub-menu you can select whether the pump generates a warning message or an error message in the event of a diaphragm rupture.


### 9.3.5 'System'

 → 'Menu / Information → Settings → System → ...'

The 'System' menu splits into the following sub-menus:

- 1 - 'Bluetooth'
- 2 - 'Volume unit'

### 9.3.5.1 'Bluetooth'

 → 'Menu / Information → Settings → System → Bluetooth → ...'

You can switch the pump's Bluetooth communication on and off in the 'Bluetooth' sub-menu. The blue "Bluetooth active" LED lights up on the HMI.

### 9.3.5.2 'Volume unit'




 → 'Menu / Information → Settings → System → Volume unit → ...'

You can select another unit for the volume in the 'Volume unit' sub-menu.

### 9.3.6 'Set time'

 → 'Menu / Information → Settings → Set time → ...'

You can set the time in the 'Set time' menu.


1.  Use the dial to adjust a figure.
2.  Use  [Priming] to move to the next figure.

Under 'Auto. Summertime' you can select whether you wish to change over to 'Summertime'.

You can also state when the pump is to change to and from 'Summertime'.

Check under 'Location' whether the pump is also set to your 'hemisphere' of the world.

### 9.3.7 'Date'

 → 'Menu / Information → Settings → Date → ...'

You can set the date in the 'Date' menu.


## 9.4 'Timer'

 → 'Menu / Information → Timer → ...'

The process timer can do the following to the pump at a predefined time:

- start
- stop
- change operating mode
- open the relay (with "CTRL software" higher than 01.01.03.01)
- close the relay (with "CTRL software" higher than 01.01.03.01)

### 9.4.1 Timer 'activation'


 → 'Menu / Information → Timer → Activation → ...'

To activate the timer, set 'Activation' to 'active'.

### 9.4.2 'Setting the timer'



*A program set up with an uncalibrated pump will not function with the calibrated pump – and vice versa.*

 → 'Menu / Information → Timer → Set timer → ...'

You can create commands (program lines) for a timer program in the 'Set timer' menu.

You can create up to 32 commands (program lines).

You can then use the administration functions to manage the commands -  
 ↪ Chapter 9.4.2 'Setting the timer' on page 55.

Use the 'Clear all' function to clear all commands (the program).

Create the command as follows:

- 1 - Create a command (program line)
- 2 - Select the triggering event and time
- 3 - Select the action and value
- 4 - Check the command
- 5 - Save command by pressing the Clickwheel
- 6 - Create the next command if necessary

#### 9.4.2.1 Administration functions for commands

The following administration functions are available to manage the commands (program lines):

- 'Display' (only if commands entered)
- 'Change' (only if commands entered)
- 'Clear' (only if commands entered)
- 'New'

Use 'New' to create a new command.

#### 9.4.2.2 'Init' Initial conditions

Use 'Init' to specify initial conditions at the start of the program - see  
 ↪ Chapter 9.4.2.4 'Select the action and value' on page 56.

#### 9.4.2.3 Selecting the 'Time event' and Time

You can select a time event (cycle) and a time as well:

Time event	Time
'Hourly'	hourly at the xth minute
'Daily (Mon-Sun)'	daily at the time mm.ss, Monday to Sunday
'Weekdays1 (Mo-Fr)'	daily at the time mm.ss, Monday to Friday
'Weekdays1 (Mo-Sa)'	daily at the time mm.ss, Monday to Saturday
'Weekend (Sa+Su)'	daily at the time mm.ss, Saturday and Sunday
'Weekly'	weekly at the time mm.ss on the day dd.
'Monthly'	weekly at the time mm.ss on the x. day of the month



**CAUTION!**

If you wish to use automatic summer time adjustment ('Settings' - 'Time') avoid any triggering events between 02:00 a.m. and 03:00 a.m.

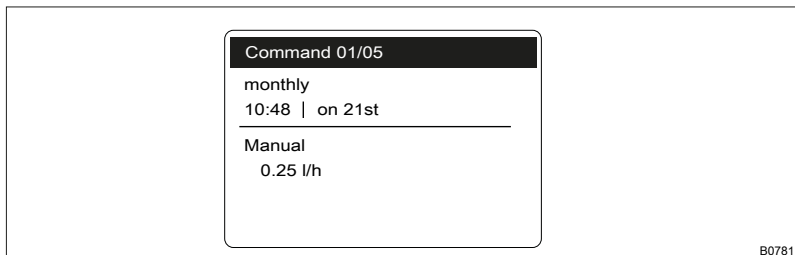
**9.4.2.4 Select the action and value**

You can select an action and also a value:

Action	Value
Manual	Strokes/h
Stop	--
Frequency	Strokes/h
Contact	--
Batch (input)	--
Batch (time)	hh:mm

**9.4.2.5 Checking the finished command**

The pump displays the finished command (program line) as soon as you have finished programming the command:



B0781

**9.4.3 'Clear all'**

☰ → 'Menu / Information → Timer → Clear all → ...'



Use the 'Clear all' menu to clear all commands (the program).

## 9.4.4 Example

### Example of "Weekday metering"

The pump is to meter 2 litres every half hour every weekday (Mon-Fri) between 8:00 and 11:00:


Com-mand	Time event	Time of day	Action	Capacity	Comment
01	Init	-	Stop	-	// Ensure that the pump is at a standstill at the start.//
02	workdays 1 (Mo-Fr)	08:30	Manual	12,000 l/h	//Meter with 12,000 l/h//
03	workdays 1 (Mo-Fr)	08:40	Stop	-	//Stop//
04	workdays 1 (Mo-Fr)	09:30	Manual	12,000 l/h	//Meter with 12,000 l/h//
05	workdays 1 (Mo-Fr)	09:40	Stop	-	//Stop//
06	workdays 1 (Mo-Fr)	10:30	Manual	12,000 l/h	//Meter with 12,000 l/h//
07	workdays 1 (Mo-Fr)	10:40	Stop	-	//Stop//

Explanation: At a capacity of 12 l/h, the pump has to work for 10 minutes to meter 2 litres.


## 9.5 'Service'

 → 'Menu / Information → Service → ...'

### 9.5.1 'Password'


 → 'Menu / Information → Service → Password → ...'

You can lock the setting options here.

If you have set a 'Password' - see below, then the identifier  appears after 1 minute in the top left and the setting options are locked - if no key has been pressed in the meantime.

In the meantime, a key appears there and a small progress bar.

### 9.5.2 'Clear counter'

 → 'Menu / Information → Service → Clear counter → ...'

You can reset the counter to "0" in the 'Clear counter' menu:

- 'All'
- 'Stroke counter' (total number of strokes)
- 'Volume counter' (total litres)
- 'Contact memory'

➔ To clear: exit the menu by briefly pressing the [Clickwheel].

The values have increased since commissioning of the pump, the last calibration or the last deletion.

### 9.5.3 'Log book'

☰ → 'Menu / Information → Service → Log book → ...'

You can view the list of 'Log entries' here.

A 'Filter' helps with the overview.



For a factual list of possible 'Log book entries' - see  
🔗 Chapter 14.6 'Log book' on page 78.

Tab. 10: Input information

Line	Information
1	Line number
2	Date/time
3	Type of entry (fault, warning ...)
4	Input number
5	Explanation of the input

### 9.5.4 'Display'

☰ → 'Menu / Information → Service → Display → ...'

You can set the 'Contrast' and the 'Brightness' of the LCD screen here.

### 9.5.5 'HMI logout'

☰ → 'Menu / Information → Service → HMI logout → ...'


You can log off the HMI from the internal pump CAN bus here.

### 9.5.6 'Diaphragm part number: XXXXXXXX'

☰ → 'Menu / Information → Service  
→ Diaphragm part number: XXXXXXXX → ...'

You can read off the part number (order number) of the correct diaphragm here.

### 9.5.7 'Spare parts kit part number: XXXXXXXX'

 → 'Menu / Information → Service  
→ Spare parts kit part number: XXXXXXXX → ...'

You can read off the part number (order number) of the correct spare parts kit here.

### 9.6 'Language'

 → 'Menu / Information → Language → ...'

You can select and set the operating language you require in the 'Language' menu.

# 10 Start up

## Safety information

**WARNING!****Fire hazard with flammable media**

Only with flammable media: They can be ignited by oxygen.

- The pump may not work if there is a mixture of feed chemical with oxygen in the liquid end. A specialist may need to take appropriate actions (using inert gas, ...).

**WARNING!****Only motors with a frequency converter: Danger of electric shock**

The danger of electric shock remains for 3 minutes after the mains voltage has been switched off on conducting parts of the motor with an integrated frequency converter and on the lines themselves.

- After switching off, allow the device to stand for 3 minutes before opening the terminal box.

**CAUTION!****Warning of personal injury and material damage**

The metering pump may only be operated by trained personnel. The operator is responsible for ensuring that under the given operating conditions (pressure, temperature, corrosiveness, etc.) danger to the operating personnel is avoided by use of appropriate accident prevention measures.

**CAUTION!****Only motors with a frequency converter: The motor can be damaged**

The input current limiter could be damaged if a motor with an integrated frequency converter is restarted within 3 minutes of the mains voltage being switched off.

- After switching off, allow the device to stand for at least 3 minutes before restarting.

**CAUTION!****Feed chemical could escape**

- Check suction and discharge lines, and liquid end with valves, for leak-tightness and tighten if necessary.
- Check whether the necessary flushing pipes or bleed lines have been connected.

**CAUTION!****Liquid end may be damaged**

- Always fit a filter in the suction line with feed chemicals with a particle size greater than 0.3 mm

**CAUTION!**

Prior to commissioning, check that the pump and corresponding ancillary equipment is connected in compliance with the regulations!

Observe the technical data

**CAUTION!****Danger of material damage**

Observe the details in the chapter "Technical data" (pressure, viscosity, resistance, etc.).

Checking for regulation-compliant installation

Check that the installation complies with the regulations

Diaphragm rupture sensor

**CAUTION!****Danger resulting from unnoticed diaphragm rupture**

If the pump has been ordered with an electric diaphragm rupture sensor, it still has to be installed.

- Screw the enclosed diaphragm rupture sensor into the liquid end.

**CAUTION!****Warning of unnoticed diaphragm rupture**

Only above approximately 2 bar system back pressure is a signal generated in the event of the rupture of a diaphragm.

- Only rely on the diaphragm rupture sensor with back pressures of greater than 2 bar.  
Or install a back pressure valve and set it to a minimum of 2 bar – if the installation permits this.

**CAUTION!****Possible environmental and material damage**

In event the red gear bleeding plug is sealed, during operation it prevents any pressure compensation between the drive housing and the surroundings. This ensure that oil can be pushed from the drive housing.

- Remove the gear bleeding plug before commissioning.

Remove the gearbox vent stopper

Before start up, remove the red gearbox vent stopper, see "Overview of equipment and control elements" chapter.

Checking the oil level

When the pump is idle, check whether the oil level in the pump is in the middle of the oil level indicator.

This will rule out the pump losing oil and suffering damage.

### Avoid particles



*The valves may no longer close properly with feed chemicals with a particle size of greater than 0.3 mm.*

- *Install a suitable filter in the suction line.*

### Using the integral relief valve



#### **CAUTION!**

##### **Danger due to incorrect use of the integral relief valve**

The integral relief valve can only protect the motor and the gear, and then only against impermissible positive pressure that is caused by the metering pump itself. It cannot protect the system against positive pressure.

- Protect the motor and gear of the system against positive pressure using other mechanisms.
- Protect the system against illegal positive pressure using other mechanisms.



#### **CAUTION!**

##### **Danger of the integral relief valve failing**

The integral relief valve no longer operates reliably with feed chemicals having a viscosity of greater than 200 mPa s.

- Only use the integral relief valve with feed chemicals having a viscosity up to 200 mPa s.

### Priming against pressure

1. ➤ Hydraulically isolate the discharge line from the pump using an isolation device.
2. ➤ Turn the rotary dial on the integral relief valve in a counter-clockwise direction as far as the "open" stop.
  - ⇒ The excess pressure escapes through the hose connector.
3. ➤ Run the pump until the feed chemical coming out of the hose connector is free from bubbles.
4. ➤ Turn the rotary dial on the integral relief valve in a clockwise direction up to the "close" stop.
  - ⇒ **The pump can be started.**

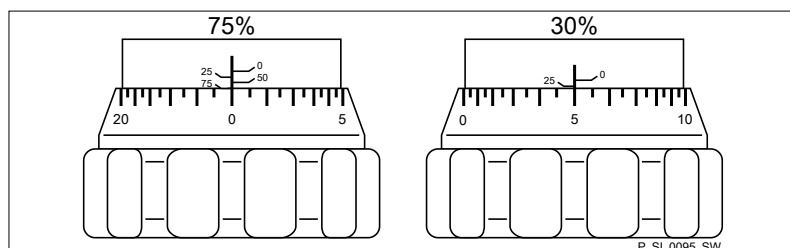


*When operating the integral relief valve close to the opening pressure, a minimal overflow into the overflow line can occur.*

## Adjusting the stroke length



*Only adjust the stroke length when the pump is running.  
This is easier and also better for the pump.*



*Fig. 32: Adjusting the stroke length*

- 100% = 4 rotations
- 25 % = 1 rotation
- 0.5 % = 1 scale mark on stroke adjustment dial

## Earthing lines

Check whether the earthing lines in the pump's electrical units are correctly connected and connected to a clean earth wire - see earthing diagrams in the appendix.

## Potential equalisation lines (mandatory with ATEX)

Check whether the potential equalisation lines are sitting correctly on the pump and connected to a clean potential equalisation point.

## Auxiliary equipment

Check for the correct function of the auxiliary equipment and for correct interplay.

# 11 Operation



**WARNING!**

**Fire hazard with flammable media**

Only with flammable media: They can be ignited by oxygen.

- The pump may not work if there is a mixture of feed chemical with oxygen in the liquid end. A specialist may need to take appropriate actions (using inert gas, ...).

This chapter describes all the operating options in a continuous display (several symbols and the pressure display appear at the top in the black bar) for the trained person at the pump.



- Please also refer to the "Operating/Setting overview" and "Continuous displays and secondary displays" overviews at the end of the operating instructions and also the "Overview of equipment and control elements" chapter.

## 11.1 Manual operation

### Stop/start pump

Stop the pump: Press  [STOP/START].

Start the pump: Press  [STOP/START] again.

### Priming

Press  [Priming].

### Starting a batch

In 'Batch' operating mode: Turn the [Clickwheel] in a continuous display until the 'Push' continuous display appears and then press the [Clickwheel].

### Acknowledge errors




Press the [Clickwheel] to acknowledge error messages that require acknowledgement.


### Check adjustable variables

In a continuous display: Another continuous display appears each time the [Clickwheel] engages when turned. (The number depends on the configuration).

### Change directly adjustable variables

#### Changing a variable in the relevant continuous display:

1.  Press the [Clickwheel].  
 ⇨ The variable can be changed (highlighted).
2.  Turn the [Clickwheel].  
 ⇨ The variable is changed.
3.  Press the [Clickwheel].  
 ⇨ The variable is saved (the dark highlighting disappears).

If the "lock" - "lock all" has been set - see  'Set-up overview of the Sigma X Control type' on page 65, first enter the 'Password' after pressing the [Clickwheel].



List of directly changeable variables:

- Capacity
- Stroke rate
- Factor
- Contact volume
- Batch volume

Set-up overview of the Sigma X Control type

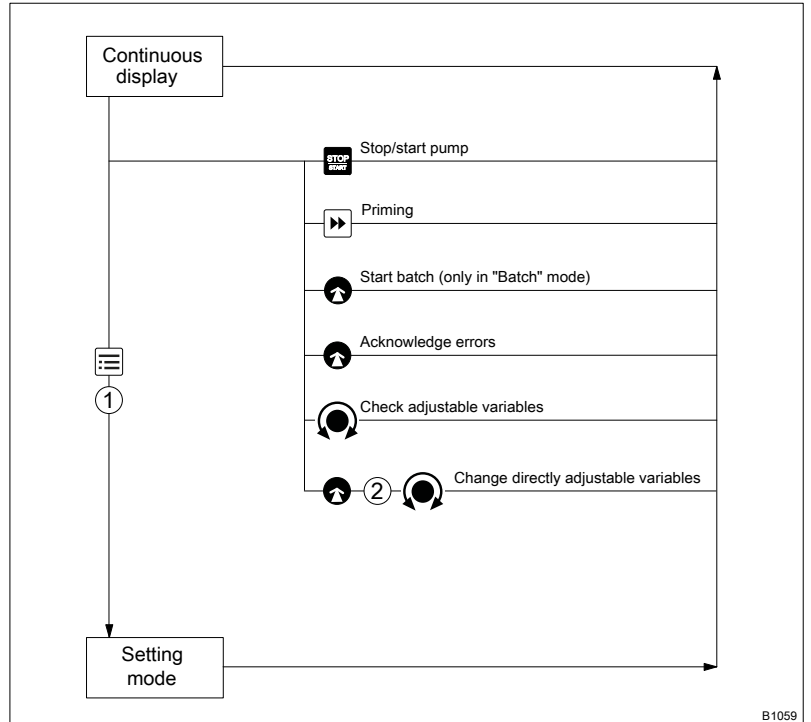


Fig. 33: Control options using the keys

- ➡ Press the [Clickwheel]
- ⌚ Turn the [Clickwheel]
- ① "Lock menu"
- ② "Lock all"

## 12 Maintenance

### 12.1 Maintenance safety notes



#### **CAUTION!**

##### **Warning of feed chemical spraying around**

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

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



#### **WARNING!**

##### **Warning of hazardous feed chemical**

Should a dangerous feed chemical be used: it may escape from the hydraulic components when working on the pump, material failure or incorrect handling of the pump.

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



#### **WARNING!**

##### **Danger of an electric shock**


When working on the motor or electrical auxiliary equipment, there is a danger of an electric shock.

- Before working on the motor, take note of the safety instructions in its operating instructions!
- Should external fans, servomotors or other auxiliary equipment be installed, these should also be disconnected and checked that they are voltage free.

Third-party spare parts for the pumps can lead to problems when pumping.

- Only use original spare parts.
- Use the correct spare parts kits. In the event of doubt, refer to the exploded views and ordering information in the appendix.

## 12.2 Standard liquid ends:

Interval	Maintenance work	Personnel
After approx. 5,000 operating hours	Change gear oil - refer to "Changing gear oil" in this chapter.	Instructed personnel
Quarterly	Check the oil level.	
Quarterly*	<ul style="list-style-type: none"> <li>■ Check that the metering lines are tight at the liquid end and check for leak-tightness.</li> <li>■ Check that the suction valve and discharge valve are firmly fixed in place and tightly sealed.</li> <li>■ Check that the dosing head screws are tight.</li> <li>■ Check the condition of the metering diaphragm, see  'Check the condition of the metering diaphragm' on page 67.</li> <li>■ Check that the flow is correct: Allow the pump to prime briefly.</li> <li>■ Check that the electrical connections are intact.</li> </ul>	Technical personnel

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

With heavy loading (e.g. continuous operation, aggressive feed chemicals etc.): shorter intervals.

### Check the condition of the metering diaphragm

The diaphragm is a wearing part, the service life of which is dependent on the following parameters:

- Back pressure of the system,
- Operating temperature,
- Feed chemical properties.

The diaphragm service life is reduced when using abrasive feed chemicals. In these cases, more frequent checking of the diaphragm is recommended.

### Tightening torques

Data	Value	Unit
Tightening torque for screws:	7.5±0.5	Nm

### Liquid ends with integral relief valve



#### WARNING!

#### Warning of eye injuries

When opening the relief valve, a spring under high tension can jump out.

- Wear protective glasses.

### Changing gear oil

#### Draining gear oil

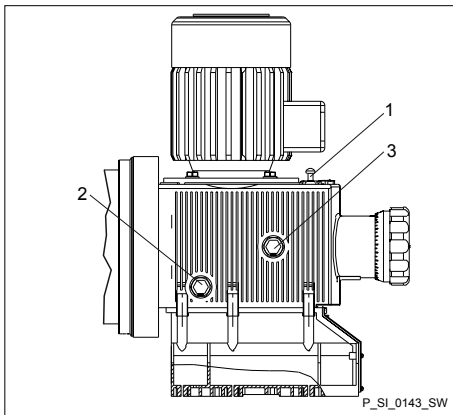


Fig. 34: Vent screw (1)

1. ➤ Unscrew the vent screw (1).
2. ➤ Place an oil trough under the oil drainage plug (2).
3. ➤ Unscrew the oil drainage plug (2) from the power end housing.
4. ➤ Allow the gear oil to drain out of the power end.
5. ➤ Screw in the oil drainage plug (2) with a new seal.

#### Filling with gear oil

Requirement: Gear oil in line with the "Ordering information" chapter is available.

1. ➤ Start the pump.
2. ➤ Slowly pour gear oil through the vent screw (1) opening until the oil inspection window (3) is half covered.
3. ➤ Allow the pump to run slowly for a further 1... 2 minutes.
4. ➤ Replace the vent screw (1).

## 13 Repair

### 13.1 Safety information, repair

**WARNING!****Fire hazard with flammable media**

Only with flammable media: They can be ignited by oxygen.

- The pump may not work if there is a mixture of feed chemical with oxygen in the liquid end. A specialist may need to take appropriate actions (using inert gas, ...).

**WARNING!**

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

**CAUTION!****Warning of feed chemical spraying around**

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

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

**WARNING!****Warning of hazardous feed chemical**

Should a dangerous feed chemical be used: it may escape from the hydraulic components when working on the pump, material failure or incorrect handling of the pump.

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

### 13.2 Cleaning valves



*Unsuitable spare parts for the valves may lead to problems for the pumps.*

- *Only use new components that are especially adapted to fit your valve (both in terms of shape and chemical resistance).*
- *Use the correct spare parts kits. In the event of doubt, refer to the exploded views and ordering information in the appendix.*

Only with "Physiologically safe" design:



**WARNING!**

**Product can be dangerously contaminated**

Only use the spare parts from the "Physiologically safe" spare parts kits.

Personnel:

- Technical personnel

## Repairing ball valves



**CAUTION!**

**Warning of personal injury and material damage**

Feed chemical may escape from the liquid end, for example, if ball valves are not repaired correctly.

- Only use new components which fit your valve, both in terms of shape and chemical resistance!
- Note the flow direction of the pressure and suction connectors when fitting the valve.

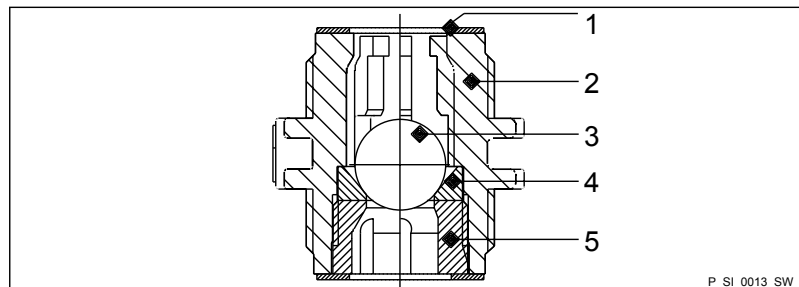


**CAUTION!**

**Warning of feed chemical spraying around**

PTFE seals, which have already been used / compressed, can no longer reliably seal a hydraulic connection.

- New, unused PTFE seals must always be used.



P\_SI\_0013\_SW

*Fig. 35: Ball valve, simple, cross-section*

- 1 Flat seal
- 2 Valve body
- 3 Valve ball
- 4 Valve seat
- 5 Valve cap

## 13.3 Replacing the diaphragm



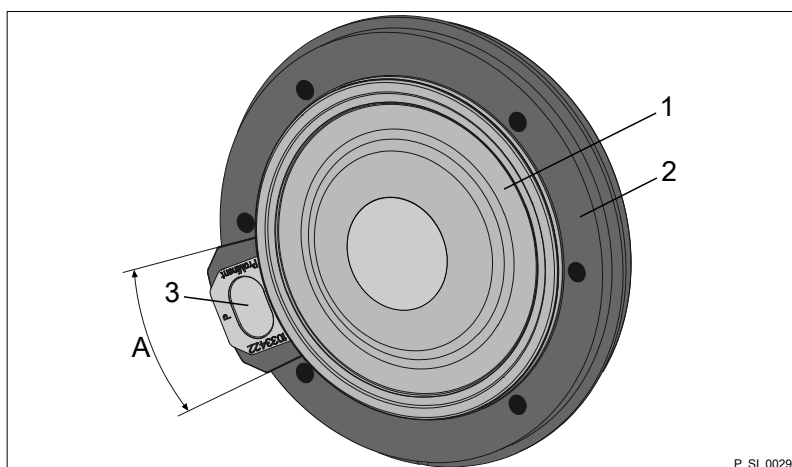
*Third-party spare parts for the pumps can lead to problems when pumping.*

- Only use original spare parts.
- Use the correct spare parts kits. In the event of doubt, refer to the exploded views and ordering information in the appendix.

Personnel:                   ■ Technical personnel

### Requirements:

- Put in place protective measures, if necessary.
  - Adhere to the material safety data sheet for the feed chemical.
  - Ensure that the system is at atmospheric pressure.
1. ➤ Drain the liquid end: turn the liquid end upside down and allow the feed chemical to drain; use a suitable medium to thoroughly flush the liquid end.
  2. ➤ With the pump running, move the stroke adjustment dial to the stop at 0% stroke length.
    - ⇒ The drive axle is now difficult to turn.
  3. ➤ Switch off the pump.
  4. ➤ Unscrew the hydraulic connectors from the pressure and suction side.
  5. ➤ Unscrew the diaphragm rupture sensor from the dosing head.
  6. ➤ Remove the 6 screws on the dosing head.
  7. ➤ Remove the dosing head.
  8. ➤ Check the condition of the diaphragm rupture sensor - see [☞ 'Checking the condition of the diaphragm rupture sensor' on page 72.](#)
  9. ➤ Loosen the diaphragm from the drive axle with a gentle backwards turn in an anti-clockwise direction.
  10. ➤ Completely unscrew the diaphragm from the drive axle.
  11. ➤ Tentatively screw the new diaphragm anticlockwise up to the stop on the drive axle.
    - ⇒ The diaphragm is now seated at the stop of the thread while the diaphragm flap is within the tolerance range.



*Fig. 36: Tolerance range of the flap on the backplate*

- 1 Diaphragm
- 2 Backplate
- 3 Flap
- A Tolerance range

12. ▶ Should this not work, remove dirt or swarf from the thread and screw the diaphragm correctly onto the drive axle this time.
  - ⇒ If this is still unsuccessful, contact ProMinent-ProMaqua Service.
13. ▶ Place the dosing head with the screws onto the diaphragm - the suction connector should be pointing downwards when the pump is subsequently installed.
14. ▶ Tighten the screws gently to start with.
15. ▶ Screw the diaphragm rupture sensor into the dosing head.
16. ▶ Start the pump and adjust the stroke length to 100%.
17. ▶ Stop the pump and tighten the screws crosswise. Tightening torque - see .
18. ▶ Start the pump and check for leaks at maximum pressure.



### CAUTION!

#### Warning of escaping feed chemical

The liquid end may leak should it not be possible to check the tightening torque of the screws.

- Check the tightening torque of the screws after 24 hours of operation!
- Re-check the tightening torques quarterly with PP, PC and TT dosing heads!

### Checking the condition of the diaphragm rupture sensor

1. ▶ Replace the diaphragm rupture sensor if its inside has become damp or dirt has penetrated it.

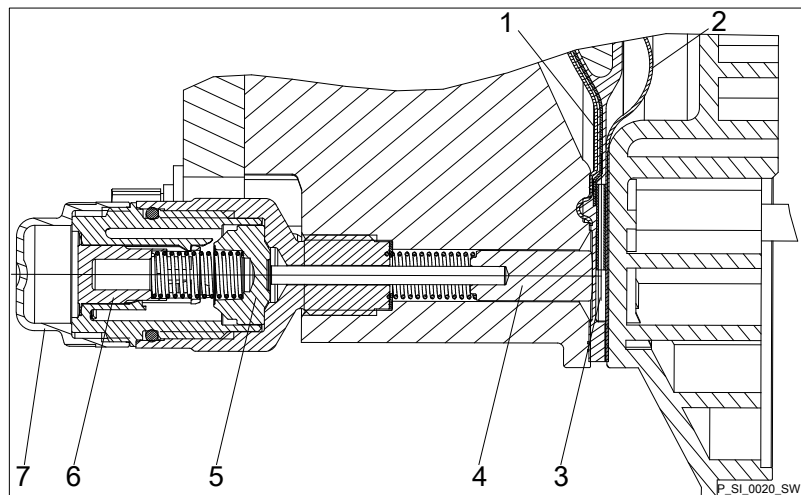


Fig. 37: Section through the Sigma diaphragm rupture warning system ("Visual rupture indicator" design)

- 1 Working layer ( $\hat{=}$  operating diaphragm)
  - 2 Safety layer ( $\hat{=}$  safety diaphragm)
  - 3 Flap
  - 4 Piston
  - 5 Diaphragm rupture sensor
  - 6 Cylinder, red
  - 7 Cover, transparent
2. ▶ If the piston of the diaphragm rupture sensor - see Fig. 37, item 4 - should have become dirty or damp, clean both it and the hole in which it runs.
  3. ▶ Check whether the piston can move freely in the hole.



4. ➤ Reassemble the clean diaphragm rupture sensor with the clean piston.
5. ➤ Test the diaphragm rupture sensor:

#### Optical diaphragm rupture sensor

1. ➤ Unscrew the transparent cover from the diaphragm rupture sensor.
2. ➤ Press the red cylinder into the diaphragm rupture sensor until the cylinder engages.
3. ➤ Press the piston on the other side of the diaphragm rupture sensor into the dosing head (approximately 4 mm) using a blunt, smooth object until it triggers.



#### CAUTION!

##### Feed chemical may escape

Feed chemical can escape in the event of a diaphragm rupture if the expandable flap of the diaphragm is damaged.

Make sure that the piston is not scratched. It must remain completely smooth so that the piston does not damage the expandable flap of the diaphragm during operation.

4. ➤ Press the red cylinder into the diaphragm rupture sensor again and repeat the test.
5. ➤ If it does not trigger both times, replace the diaphragm rupture sensor.
6. ➤ After a successful test, screw the transparent cover onto the diaphragm rupture sensor and then continue at the top by assembling the diaphragm.

#### Electrical diaphragm rupture sensor

1. ➤ Press the piston of the diaphragm rupture sensor into the dosing head (approximately 4 mm) using a blunt, smooth object until the monitor triggers an alarm.



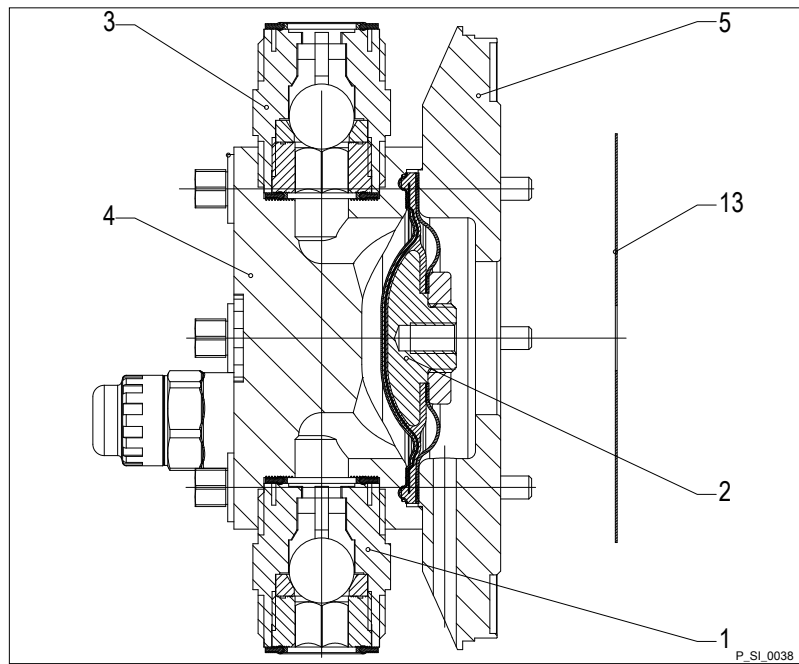
#### CAUTION!

##### Feed chemical may escape

Feed chemical can escape in the event of a diaphragm rupture if the expandable flap of the diaphragm is damaged.

Make sure that the piston is not scratched. It must remain completely smooth so that the piston does not damage the expandable flap of the diaphragm during operation.

2. ➤ Repeat the test.
3. ➤ Replace the diaphragm rupture sensor if the monitor does not trigger an alarm both times.
4. ➤ After a successful test, continue at the top by assembling the diaphragm.



*Fig. 38: Cross-section through the liquid end*

- 1 Suction valve
- 2 Diaphragm
- 3 Discharge valve
- 4 Dosing head
- 5 Backplate
- 13 Safety diaphragm

## 14 Troubleshooting

### 14.1 Safety information, troubleshooting

**WARNING!****Fire hazard with flammable media**

Only with flammable media: They can be ignited by oxygen.

- The pump may not work if there is a mixture of feed chemical with oxygen in the liquid end. A specialist may need to take appropriate actions (using inert gas, ...).

**WARNING!****Danger of an electric shock**

Personnel working on electrical parts can be electrocuted if all electrical lines carrying current have not been disconnected.

- Disconnect the supply cable before working on the motor and prevent it from being reconnected accidentally.
- Any separately driven fans, servo motors, speed controllers or diaphragm rupture sensors fitted should also be disconnected.
- Check that the supply cables are de-energised.

**WARNING!****Warning of hazardous feed chemical**

Should a dangerous feed chemical be used: it may escape from the hydraulic components when working on the pump, material failure or incorrect handling of the pump.

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

**CAUTION!****Warning of feed chemical spraying around**

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




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




## 14.2 Faults without error message

Fault description	Cause	Remedy	Personnel
Pump does not prime despite full stroke motion and venting.	Minor crystalline deposits on the ball seat due to the valves drying out.	Take the suction hose out of the supply tank and thoroughly flush out the liquid end.	Technical personnel
	Serious crystalline deposits on the ball seat due to the valves drying out.	Dismantle the valves and clean them - refer to the "Repair" chapter.	Technical personnel
Fluid escapes from the backplate.	The screws in the dosing head are too loose.	Tighten the screws in the dosing head in a diagonal pattern - referring to the "Maintenance" chapter for the tightening torque.	Technical personnel
	The metering diaphragm is not leak-tight.	Replace the diaphragm - refer to the "Repair" chapter.  If a diaphragm rupture has been indicated, clean the diaphragm rupture indicator - see the "Repair" chapter.	Technical personnel
The CAN LED flickers after the HMI has been connected to the pump.	The software version of the pump differs from that of the HMI.	Wait. In the long term, arrange for Service to update the pump software.	Customer Service department
Green LED display (operating indicator) does not light up.	The wrong supply voltage or no supply voltage is connected.	Connect the pump correctly to the specified mains voltage - according to the specification on the nameplate.	Electrician

## 14.3 Fault messages





Red "Fault indicator" LED display lights up.

Fault description	Cause	Remedy	Personnel
The "Level" symbol  appears flashing on the LCD screen, plus the error message 'Level error' 33, and the pump stops.	The fluid level in the supply tank has reached "Liquid level low 2nd stage".	Top up the supply tank.	Technical personnel
The "External"  MEM symbol appears flashing on the LCD screen plus the 'Memory overflow' 34 error message, and the pump stops.	The stroke tank has overflowed.	Rectify the cause, then Press [P/OK] (think through the consequences for the process!).	Technical personnel
The $i < 4\text{mA}$ symbol appears flashing on the LCD screen plus the error message '4 mA undershot' 35, and the pump stops.	The pump is in 'Analog' 'operating mode', a fault behaviour has been programmed in the 'ANALOG' menu and the control current has fallen below 4 mA.	Eliminate the cause of the low control current or	Technical personnel
The $i > 20\text{mA}$ symbol appears flashing on the LCD screen plus the error message '20 mA exceeded' 36, and the pump stops.	The pump is in 'Analog' 'operating mode', a fault behaviour has been programmed in the 'ANALOG' menu and the control current has risen above 23 mA.	Eliminate the cause of the high control current or	Technical personnel
The  FLOW symbol appears flashing on the LCD screen plus the error message 'Defective stroke met.' 37, and the pump stops.	The metering monitor is not correctly connected.	Connect the metering monitor correctly and Press [P/OK].	Electrician
	The metering monitor reported too few strokes – more than are set in the 'FLOW' menu.	Press [P/OK]. Investigate and clear the cause	Technical personnel

Fault description	Cause	Remedy	Personnel
The } <b>DIA</b> "Diaphragm" symbol appears flashing on the LCD screen plus the 'Diaphragm rupture' 38 error message, and the pump stops.	The diaphragm is ruptured.	Replace the diaphragm and check the diaphragm rupture sensor - refer to the "Repair" chapter.	Technical personnel
The  <b>STRK</b> "Stoke length adjustment" symbol appears flashing on the LCD screen plus the error message 'Stroke length adjusted' 39, and the pump stops.	The stroke adjustment dial was rotated by more than 10% while the menu was locked.	Turn back the stroke adjustment dial or enter the password.	Technical personnel
The "Temperature" symbol  appears flashing on the LCD screen plus the error message 'Temperature' 47, and the pump stops.	The pump is overloaded.	Rectify the cause, then Press <b>[P/OK]</b> (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then Press <b>[P/OK]</b> (think through the consequences for the process!).	Technical personnel
The  <b>PWR</b> "Power" symbol appears on the LCD screen plus the 'Power supply' 51 error message, and the pump stops.	No or incorrect supply voltage.	Connect the correct supply voltage.	Technical personnel
The <b>BLC</b> "Blockage" symbol appears flashing on the LCD screen plus the error message 'Pump blocked' 57, and the pump stops.	A constriction or a closed shut-off valve on the pressure side.	Open the shut-off valve or clear the constriction, then Press <b>[P/OK]</b> (think through the consequences for the process!).	Technical personnel
The <b>p+</b> "Excess pressure" symbol appears flashing on the LCD screen plus the error message 'Overload' 59 or 60, and the pump stops.	A constriction or a closed shut-off valve on the pressure side.	Open the shut-off valve or clear the constriction, then Press <b>[P/OK]</b> (think through the consequences for the process!).	Technical personnel

## 14.4 Warning messages

Yellow LED "Warning indicator" display lights up:

Fault description	Cause	Remedy	Personnel
The "Level" symbol  appears flashing on the LCD screen, plus the error message 'Level warning' 1.	The fluid level in the supply tank has reached "Liquid level low 1st stage".	Top up the supply tank.	Instructed personnel
The "Calibrate" <b>cal</b>  symbol appears on the LCD screen, plus the error message 'Calibration warning' 2.	The stroke adjustment dial of the calibrated pump was rotated by more than 10% when the menu was blocked.	Turn back the stroke adjustment dial or recalibrate the pump.	Instructed personnel
The "Flow" symbol  appears flashing on the LCD screen, plus the error message 'Defective stroke met.' 3.	The metering monitor is not correctly connected.	Connect the metering monitor correctly and Press <b>[P/OK]</b> .	Electrician
	The metering monitor reported too few strokes – more than are set in the 'FLOW' menu.	Press <b>[P/OK]</b> . Investigate and clear the cause.	Technical personnel
The "Diaphragm" <b>dia</b>  symbol appears on the LCD screen, plus the error message 'Diaphragm rupture' 4.	The diaphragm is ruptured.	Replace the diaphragm and check the diaphragm rupture sensor - refer to the "Repair" chapter.	Technical personnel

Fault description	Cause	Remedy	Personnel
The "Stroke length adjustment" symbol !Ⓢ appears flashing on the LCD screen, plus the error message 'Stroke length adjusted' 5.	The stroke adjustment dial was rotated by more than 10% while the menu was locked.	Turn the stroke adjustment dial back or enter the code.	Technical personnel
The "Overload" p+! symbol appears flashing on the LCD screen plus the error message 'Overload' 6.	A constriction or a closed shut-off valve on the pressure side.	Open the shut-off valve or rectify the constriction.	Technical personnel
The "Temperature" symbol !⊡ appears flashing on the LCD screen, plus the error message 'Temperature FC' 7.	The frequency converter is overloaded.	Rectify the cause, then Press [P/OK] (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then Press [P/OK] (think through the consequences for the process!).	Technical personnel
The "Temperature" symbol !⊡ appears flashing on the LCD screen, plus the error message 'Temperature PFC' 7.	The pump is overloaded.	Rectify the cause, then Press [P/OK] (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then Press [P/OK] (think through the consequences for the process!).	Technical personnel
The 'BUS' ! symbol appears flashing on the LCD screen, plus the error message 'CANopen pump' 8.	The HMI was connected to a CANopen pump.	Disconnect the HMI from the pump.	Technical personnel

### 14.5 All other faults

Please contact the responsible ProMinent subsidiary or representative - see [www.prominent.com](http://www.prominent.com) - "Contact" - "Your contacts worldwide" or possibly the Legal Notices in these operating instructions.

### 14.6 Log book

Tab. 11: Input information

Line	Information
1	Line number
2	Date/time
3	Type of entry (fault, warning ...)
4	Input number
5	Explanation of the input

## 14.6.1 Warning messages in the log book

Tab. 12

No.	Description
1	Float switch input reports feed chemical nearing an end
2	Calibration warning: Appears if the stroke length is adjusted above the tolerance and the pump therefore has to be recalibrated
3	The number of defective strokes permitted has been exceeded
4	The diaphragm rupture sensor reports a diaphragm rupture
5	The stroke length has been modified beyond the tolerance limit with the pump locked
6	Overload warning
7	Temperature warning
8	An HMI is connected to a CANopen pump - bus operation and HMI are not permitted simultaneously

## 14.6.2 Fault messages in the log book

Message no.	Description
33	The float switch input reports no feed chemical
34	In 'Batch' or 'Contact' operating mode, a memory overload has been reached when the memory is switched on. (Memory counter $\geq$ 100 000)
35	The analogue current is $\leq$ 3.8 mA when current monitoring is switched on. (Monitoring is always switched on in Standard operating mode 4..20 mA).
36	The analogue current is $>$ 23 mA when current monitoring is switched on. (Monitoring is always switched on in Standard operating mode 4..20 mA).
37	The number of defective strokes permitted has been exceeded
38	The diaphragm rupture sensor reports a diaphragm rupture
39	The stroke length has been modified beyond the tolerance limit with the pump locked
40	Different version statuses of the CTRL, PFC and FC communication software
41	The HMI version is not compatible
42	System, EEPROM error
43	Communication between the pump and operating unit is not working although an operating unit has been configured
44	Missing ongoing connection to the optional module (Bus fail e.g. PROFIBUS or CANopen not active)
45	The optional module is missing or no communication is established with the optional module
46	One of the signals needed from the frequency converter (FC) is missing or no communication is established between the FC and CTRL
46	One of the signals needed from the power unit (PFC) is missing or no communication is established between the PFC and CTRL
47	Over-temperature error
48	Shut-down in the event of overpressure
49	Error in the power end
50	Missing or defective position sensor
51	Mains voltage missing and/or over-/undervoltage
52	Fan error

Message no.	Description
53	Error in the intermediate circuit voltage
54	The 5 V at the DFM input has short circuited
55	An optional module was inserted into the pump, which cannot be used.
56	Subscriber software is incompatible with the other subscribers
57	The pump is blocked and is not running
58	Missing or defective hall sensor
59	Shut-down in the event of overpressure, slow
60	Shut-down in the event of overpressure, fast
-	Missing data stored in the CTRL in the HMI
-	The data coming from the CTRL is faulty

### 14.6.3 Events in the log book

Message no.	Description
4	The stroke length was adjusted by more than 5%
8	Calibration was performed
9	The pump was started or stopped by the HMI
13	The timer has performed a timer program step



# 15 Decommissioning

## Decommissioning

**WARNING!****Fire hazard with flammable media**

Only with flammable media: They can be ignited by oxygen.

- The pump may not work if there is a mixture of feed chemical with oxygen in the liquid end. A specialist may need to take appropriate actions (using inert gas, ...).

**WARNING!****Danger of an electric shock**

When working on the motor or electrical auxiliary equipment, there is a danger of an electric shock.

- Before working on the motor, take note of the safety instructions in its operating instructions!
- Should external fans, servomotors or other auxiliary equipment be installed, these should also be disconnected and checked that they are voltage free.

**WARNING!****Danger from chemical residues**

There is normally chemical residue in the liquid end and on the housing after operation. This chemical residue could be hazardous to people.

- It is mandatory that the safety note relating to the "Storage, Transport and Unpacking" chapter is read before shipping or transporting the unit.
- Thoroughly clean the liquid end and the housing of chemicals and dirt. Adhere to the safety data sheet for the feed chemical.

**WARNING!****Warning of hazardous feed chemical**

Should a dangerous feed chemical be used: it may escape from the hydraulic components when working on the pump, material failure or incorrect handling of the pump.

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

**CAUTION!****Warning of feed chemical spraying around**

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

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



### WARNING!

#### Warning of eye injuries

When opening the relief valve, a spring under high tension can jump out.

- Wear protective glasses.



### CAUTION!

#### Danger of damage to the device

The device may be damaged by incorrect and improper storage and transport.

- Take into account the information in the "Storage, transport and unpacking" chapter if the system is decommissioned for a temporary period.

### (Temporary) decommissioning

1. ➤ Disconnect the pump from the mains/power supply.
2. ➤ Depressurise and bleed the hydraulic system around the pump.
3. ➤ Drain the liquid end by turning the pump upside down and allowing the feed chemical to run out.
4. ➤ Flush the liquid end with a suitable medium - observe the material safety data sheet! Flush the dosing head thoroughly when using hazardous feed chemicals!
5. ➤ Possible additional work - refer to the "Storage, transport and unpacking" chapter.

### Final decommissioning

- Also drain the gear oil - refer to the "Maintenance" chapter.

### Disposal



### CAUTION!

#### Environmental hazard due to incorrect disposal

- Note the local guidelines currently applicable in your country, particularly with regard to electronic waste!



### CAUTION!

#### Environmental hazard due to gear oil

The pump contains gear oil, which can cause damage to the environment.

- Drain the gear oil from the pump.
- Note the local guidelines currently applicable in your country!

## 16 Technical data

### 16.1 Performance data

S2Cb

Type	Minimum pump capacity at maximum back pressure				Max. stroke rate	ml/stroke	Suction lift	Permissible priming pressure, suction side	Connector size
	bar	psi	l/h	gph					
16050 PVT	10	145	61	16	90	11.4	7	2	1 male - 15
16050 SST	16	232	56	14	90	11.4	7	2	1 male - 15
16090 PVT	10	145	109	28	160	11.4	7	2	1 male - 15
16090 SST	16	232	99	26	160	11.4	7	2	1 male - 15
16130 PVT	10	145	131	34	200	10.9	7	2	1 male - 15
16130 SST	16	232	129	33	200	10.9	7	2	1 male - 15
07120 PVT	7	102	150	39	90	27.4	5	1	20*
07120 SST	7	102	150	39	90	27.4	5	1	20*
07220 PVT	7	102	271	71	160	27.7	5	1	20*
07220 SST	7	102	271	71	160	27.7	5	1	20*
04350 PVT	4	58	353	93	200	29.4	5	1	20*
04350 SST	4	58	353	93	200	29.4	5	1	20*

All figures apply to water at 20 °C.

The suction lift applies to a filled suction line and filled liquid end when correctly installed.

**INFORMATION!:** With Sigma types 07120, 07220 and 04350, the valves in the dosing head are configured as DN 25 (G1 1/2 male). As DN 20 is generally sufficient for the pipework with these types (see technical data, suction/pressure side connector), the connector parts that can be ordered with the identity code (e.g. inserts) are already reduced to DN 20, and so DN 20 pipework and accessories can be installed.

#### Precision

Data	Value	Unit
Reproducibility	±2	% *

\* - when installed correctly, under constant conditions, at least 30% stroke length and water at 20 °C

## 16.2 Viscosity

Tab. 13: The liquid ends are suitable for the following viscosity ranges:

Design	Stroke rate, max.	Viscosity
	Strokes/min	mPas
Standard	200	0 ... 200
With valve springs	130	200 ... 500
With valve springs and suction-side feed	90	500 ... 1000*

\* Only when the installation is correctly adjusted.

## 16.3 Shipping weight

Types	Material version	Shipping weight
		kg
16050; 10090; 16130	PVT	17.2
	SST	20.0
07120; 07220; 04350	PVT	18.8
	SST	24.8

## 16.4 Wetted materials

Material version	Liquid end	Suction/pressure connector	Seals* / ball seat	Balls	Springs	Integral relief valve
PVT	PVDF	PVDF	PTFE / PTFE	Ceramic / glass **	Hastelloy C	PVDF / FPM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE / PTFE	Stainless steel 1.4404	Hastelloy C	Stainless steel / FPM or EPDM

\* Diaphragm is PTFE-coated.

\*\* with types 07120, 07220, 04350.

## 16.5 Ambient conditions

### 16.5.1 Ambient temperatures

Pump, compl.

Data	Value	Unit
Storage and transport temperature	-10 ... +50	°C
Ambient temperature in operation (drive + motor):	-10 ... +45	°C

### 16.5.2 Media temperatures

PVT liquid end

Data	Value	Unit
Max. temperature long-term at max. operating pressure	65	°C
Max. temperature for 15 min at max. 2 bar	100	°C

Data	Value	Unit
Minimum temperature	-10	°C

SST liquid end

Data	Value	Unit
Max. temperature long-term at max. operating pressure	90	°C
Max. temperature for 15 min at max. 2 bar	120	°C
Minimum temperature	-10	°C

### 16.5.3 Air humidity

**Air humidity** Air humidity, max. 95% relative humidity, non-condensing.

### 16.5.4 Degree of protection and safety requirements

**Degree of protection**

Protection against contact and moisture:

The pump is designed in compliance with IP65 / NEMA4X Indoor (IEC 60529, EN629).

**INFORMATION!:** A CAN plug or the sealing cap provided needs to be attached to the CAN socket for the HMI to guarantee protection against contact and moisture.

**Safety requirements**

Degree of protection:

1 - Mains connection with protective earth conductor


### 16.6 Installation height

Data	Value	Unit
Maximum installation height*:	1000	m above standard zero

\* with standard pumps: Fit at higher installation heights at your own risk.

with ATEX pumps: We urgently advise that you contact a specialist for ATEX motors at higher installation heights!

### 16.7 Electrical connection



*The electrical data does not relate to the motor, but the pump, which is connected as a whole unit.*

*Use the motor data sheet in the appendix for the motor electrical data.*

**Electrical data for the S2Cb pump**

Identity code specification "Electrical power supply" - "U": 100 - 230 V ± 10%, 240 V ± 6%, 50/60 Hz

Data	Value	Unit
Output	220	W
Max. starting current	8.5	A

**Electrical data at 100 V**

Data	Value	Unit
Effective current	3.3	A
Switch on peak current, (for approx. 100 ms)	4	A

**Electrical data at 230 V**

Data	Value	Unit
Effective current	1.5	A
Switch on peak current, (for approx. 100 ms)	8	A

\* internal switchover

Tab. 14: Fuses

Fuse	Value	Order no.
Fuse, internal	6.3 AT - (1.5 kA)	732379

**INFORMATION!:** Only use the original ProMinent fuses. It is not sufficient to use a fuse with the above fuse rating.

## 16.8 Diaphragm rupture sensor

### Contact (standard)

Tab. 15: Contact loading, max.

at voltage	Maximum current
30 V DC	1 A

The contact is an opener.

The contact is an potential-free.



- For safety reasons we recommend connecting to a protective low voltage, e.g. in accordance with EN 60335-1 (SELV).
- The cable can be poled as required.

### Namur sensor (Specified for EX zones)

5–25 V DC, in accordance with Namur or DIN 60947-5-6, potential-free design.

Specification	Value
Nominal voltage *	8 V DC
Power consumption - active surface uncovered	> 3 mA
Power consumption - active surface covered	< 1 mA
Rated switching distance	1.5 mm

\* Ri ~ 1 kΩ

Cable colour	Polarity
blue	-
brown	+

## 16.9 Relays

**INFORMATION!** The technical data for the relays is contained in the chapter "Installation, electrical".

## 16.10 Gear oil

Manufacturer	Name	Viscosity class (ISO 3442)	Order no.	Volume	Volume, required approx.
Mobil	Mobil Gear 634	VG 460	1004542	1.0 l	0.5 l ... 0.7 l

Or comparable gear oil.

## 16.11 Sound pressure level

### Sound pressure level

Sound pressure level  $L_{pA} < 70$  dB according to EN ISO 20361

at maximum stroke length, maximum stroke rate, maximum back pressure (water)

# 17 Dimensional drawings

**i** - Compare the dimensions on the dimension sheet and pump.  
- All dimensions are in mm.

## HMI and wall bracket

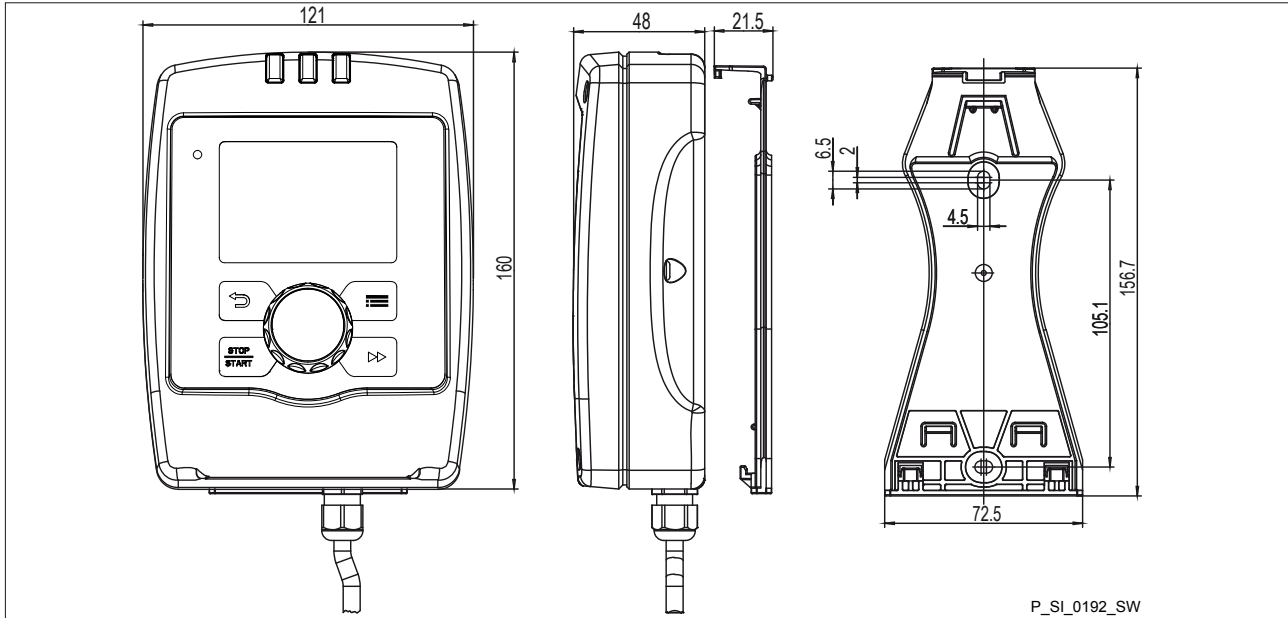


Fig. 39: Dimensions in mm



Sigma X Control type - Sigma/ 2 - S2Cb

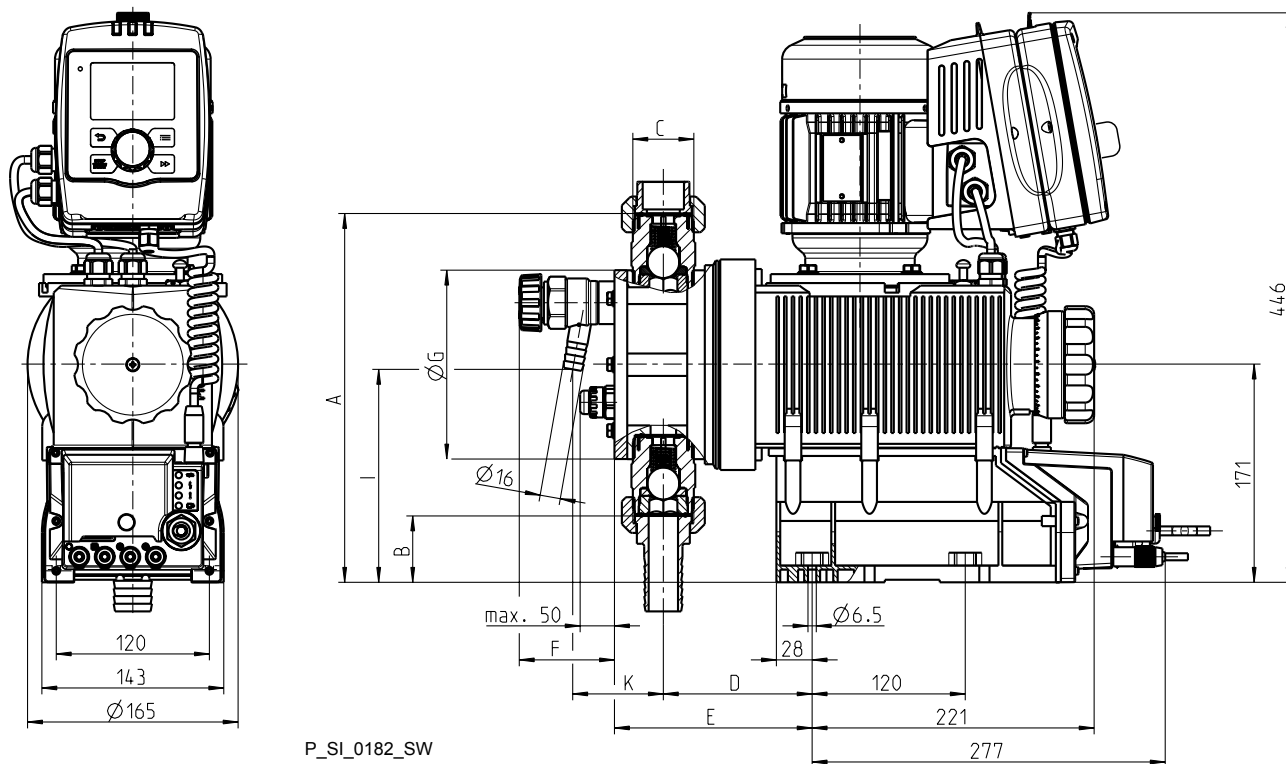


Fig. 40: View is not strictly binding - dimensions in mm

Type	Connector	A	B	C	D	E	F	ØG	I	K
16050, 16090, 16130 PVT	DN 15	253	89	G1 M	111	144	72	122	149	63
16050, 16090, 16130 SST	DN 15	253	88	G1 M	110	133	88	124	123	53
04350, 07120, 07220 PVT	DN 25	289	52	G1 1/2 M	117	155	75	156	168	71
04350, 07120, 07220 SST	DN 25	289	53	G1 1/2 M	117	147	88	162	141	60

Tab. 16: Hose nozzle relief valve with thread

Thread	ØS
G 3/4 A	16

# 18 Motor data sheets

**ProMinent®**

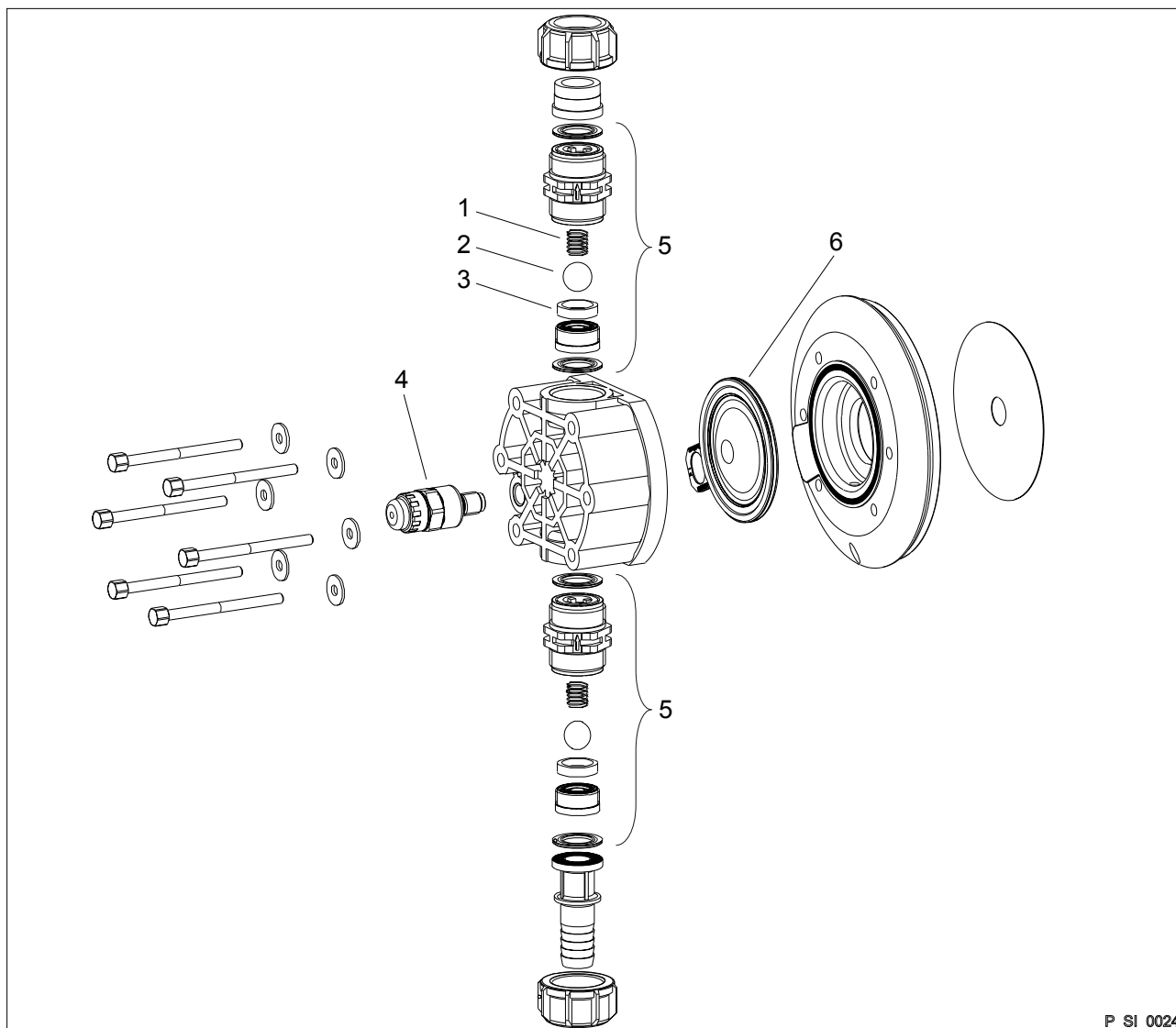
<b>Motor Datenblatt / Motor data sheet / Fiche technique pour moteur</b>				
<b>Bestell Nr.</b> order no. / no. de commande		<b>1040790</b>	<b>Hersteller</b> producer / producteur	
			<b>ATB</b> Mat.Nr. 570671	
<b>Motor- Typ</b> motor type type du moteur	AF63/4E-11	<b>Leistungsfaktor</b> power factor facteur de puissance	0,7 0,69	
<b>Maschinenart</b> type of machine désignation	3-Ph. Motor	<b>Wirkungsgrad</b> efficiency rendement	66% 70%	
<b>Schutzart</b> degree of protection degré de protection	IP55	<b>Bemessungsfrequenz</b> rated frequency fréquence nominale	50/60 Hz	
<b>Bauform</b> mounting construction	IMB5	<b>Bemessungsdrehzahl</b> rated speed vitesse nominale	1390/1690	U/min rpm t/mn
<b>Bemessungsleistung</b> rated output puissance nominale	0,25 kW	<b>Wärmeklasse</b> temperature class class d'isolement	F	
<b>Bemessungsspannung</b> rated voltage tension nominale	△ / Δ 380-420/220-240 V (50 Hz) 380-480/220-280 V (60 Hz)	<b>Anzugsstrom</b> starting current courant de démarrage	4,1/4,8	fach fold fois
<b>Bemessungsstrom</b> rated current courant nominale	0,80/1,38 A 0,70/1,20 A	<b>Anzugsmoment</b> starting torque couple de démarrage	2,4/2,9	fach fold fois
<b>Geprüft nach</b> tested in acc. with contrôlé selon	DIN EN 60034	<b>Kippmoment</b> pull-out torque couple de décrochage	2,5/3,0	fach fold fois
<b>ATEX Nr.</b>		<b>Umgebungstemperatur</b> ambient temperature température ambiante	40°C	
<b>Ex-Schutzklasse</b> ex-protective system		<b>Schaltung</b> connection branchement	△ / Δ	
		<b>Drehzahlregelbereich</b> speed ajustment range		
<b>Anmerkung</b> comments observation	* auf Anfrage beim Hersteller * upon request at manufacturer * sur demande auprès du producteur			
<b>ProMinent</b>				
Pumpentyp	S2CbH _____ U ____			
<p>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.</p>				

ProMinent Dosierttechnik GmbH . 69123 Heidelberg . Germany Nr./No. MD-1040790

Datum/Date Juni 2012

## 19 Liquid ends Sigma/ 2

Liquid end Sigma/ 2 130-DN 15 and 350-DN 25 PVT



P\_SI\_0024

Fig. 41: Liquid end Sigma/ 2 130-DN 15 and 350-DN 25 PVT

Pos.	Description
1	Spring *
2	Ball
3	Ball seat
4	Diaphragm rupture sensor, visual *
5	Valve
6	Multi-layer diaphragm

The items listed are included in the spare parts kit.

\* Special accessories (not included in the spare parts kit). Technical changes reserved.

Tab. 17: Order no. for liquid end for Sigma/ 2, 130-DN 15 PVT

Spare part	16050	16090	16130
Liquid end	1029763	1029763	1029763
Spare parts kit	1035951	1035951	1035951
Diaphragm rupture sensor, visual	1033323	1033323	1033323
Valve	792517	792517	792517
Multi-layer diaphragm	1029771	1029771	1029771

Tab. 18: Order no. for liquid end for Sigma/ 2, 350-DN 25 PVT

Spare part	07120	07220	04350
Liquid end	1029762	1029762	1029762
Spare parts kit	1035953	1035953	1035953
Diaphragm rupture sensor, visual	1033323	1033323	1033323
Valve	740615	740615	740615
Multi-layer diaphragm	1033422	1033422	1033422

Sigma/ 2 PVT bleed valve

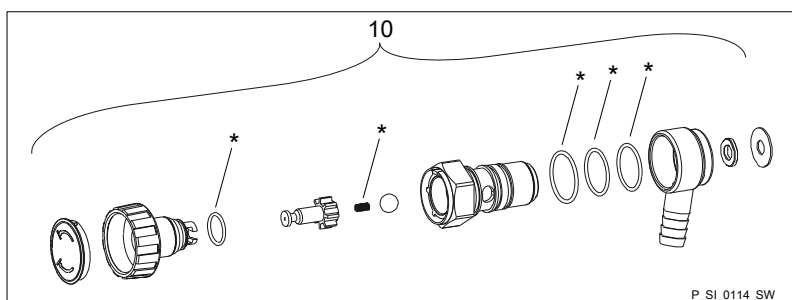


Fig. 42: Sigma/ 2 PVT bleed valve

Pos.	Description	Order no.
10	Integrated bleed valve, complete, DN10 PVA	1041067
10	Integrated bleed valve, complete, DN10 PVE	1041068

\* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM. Technical changes reserved.

Sigma/ 2 PVA relief valve-A

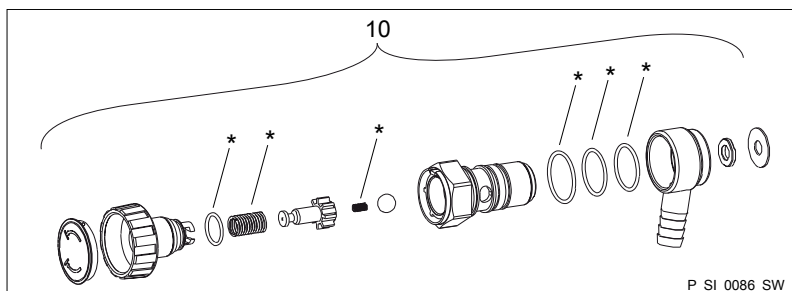


Fig. 43: Sigma/ 2 PVA relief valve-A

Pos.	Description	Type 16050, 16090, 16130	Type 07120, 07220	Type 04350
10	Relief valve, complete 10 bar PVA	1018947		
10	Relief valve, complete 7 bar PVA		740811	
10	Relief valve, complete 4 bar PVA			740812

\* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM.  
Technical changes reserved.

Liquid end Sigma/ 2 130 and 350 SST

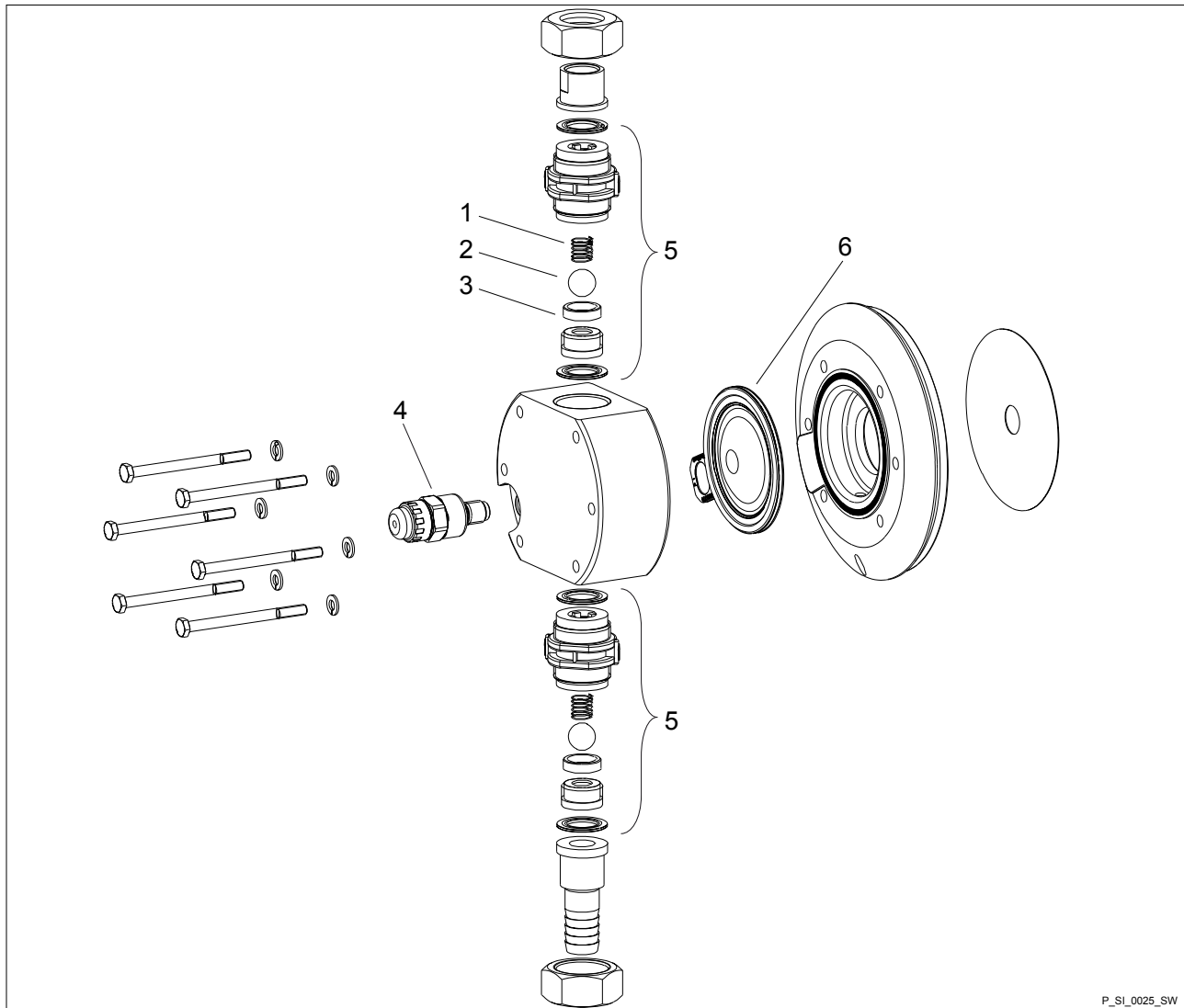


Fig. 44: Liquid end Sigma/ 2 130 and 350 SST

Pos.	Description
1	Spring *
2	Ball
3	Ball seat
4	Diaphragm rupture sensor, visual *
5	Valve *
6	Multi-layer diaphragm

The items listed are included in the spare parts kit.

\* Special accessories (not included in the spare parts kit). Technical changes reserved.

Tab. 19: Order no. for liquid end for Sigma/ 2, 130-DN 15 SST

Spare part	16050	16090	16130
Liquid end	1029764	1029764	1029764
Spare parts kit	1035951	1035951	1035951

Spare part	16050	16090	16130
Diaphragm rupture sensor, visual	1033323	1033323	1033323
Valve	809404	809404	809404
Multi-layer diaphragm	1029771	1029771	1029771

Tab. 20: Order no. for liquid end for Sigma/ 2, 350-DN 25 SST

Spare part	07120	07220	04350
Liquid end	1029762	1029762	1029762
Spare parts kit	1035953	1035953	1035953
Diaphragm rupture sensor, visual	1033323	1033323	1033323
Valve	803708	803708	803708
Multi-layer diaphragm	1033422	1033422	1033422

Sigma/ 2 SST bleed valve

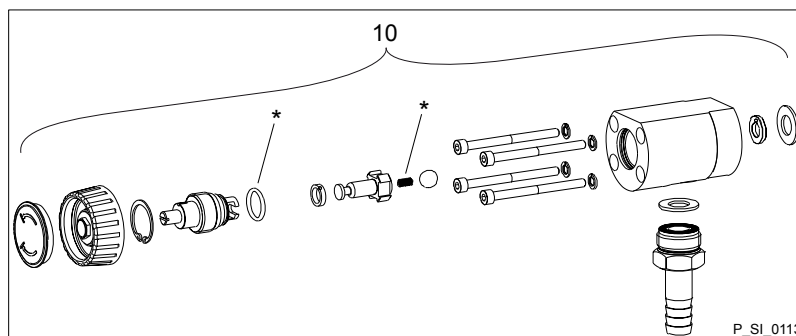


Fig. 45: Sigma/ 2 SST bleed valve

Pos.	Description	Order no.
10	Integrated bleed valve, complete, DN10 SSA	1041071
10	Integrated bleed valve, complete, DN10 SSE	1041072

\* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM. Technical changes reserved.

Sigma/ 2 SSA relief valve-A

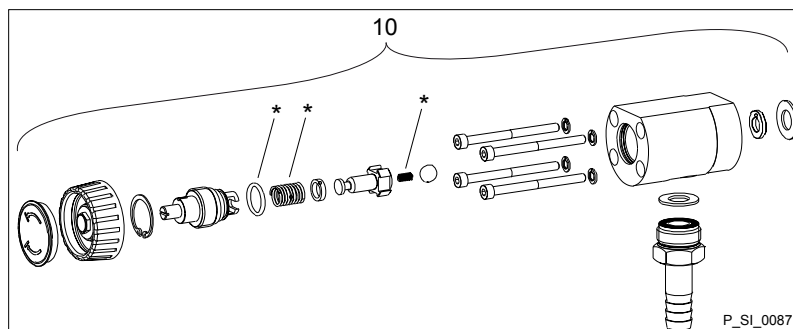


Fig. 46: Sigma/ 2 SSA relief valve-A

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**Liquid ends Sigma/ 2**

---

Pos.	Description	Type 16050, 16090, 16130	Type 07120, 07220	Type 04350,
10	Relief valve, complete 16 bar SSA	1019246		
10	Relief valve, complete 7 bar SSA		740815	
10	Relief valve, complete 4 bar SSA			740814

\* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM.  
Technical changes reserved.



## 20 Wearing parts for S2Cb

Refer also to the previous chapter.

### 20.1 Standard

#### HMI spare parts

Spare part	Order no.
HMI wall bracket	1036683
HMI protective film	1083680

### 20.2 Physiological safety

#### Spare parts kits

Tab. 21: Scope of delivery with PVT material version

1 x diaphragm, 2 x valve balls, 1 x suction valve complete, 1 x discharge valve complete

1 x elastomer sealing set (EPDM)

2 x ball seat housings, 2 x ball seat discs, 4 x composite seals

1x sealing washer (for bleed valve or relief valve)

Tab. 22: Scope of delivery with SST material version

1 x diaphragm, 2 x valve balls

2 x cover rings

4 x composite seals

1x sealing washer (for bleed valve or relief valve)

#### Ordering information

Tab. 23: Spare parts kits PVT (liquid ends)

Liquid end	Types 16050, 16090, 16130	Types 07120, 07220, 04350
FM 130 - DN 15	1046472	-
FM 350 - DN 25	-	1046475

Tab. 24: Spare parts kits SST (liquid ends)

Liquid end	Types 16050, 16090, 16130	Types 07120, 07220, 04350
FM 130 - DN 15	1046473	-
FM 130 - DN 15 with 2 complete valves	1046474	-
FM 65 - DN 10	-	1046476
FM 65 - DN 10 with 2 complete valves	-	1046477

**Wetted materials – "Physiologically safety with regard to wetted materials" design**

---

## Wearing parts for S2Cb

---

Material version	Liquid end	Suction / pressure connector	Seals* / ball seat	Balls	Integrated bleed valve or relief valve
PVT	PVDF	PVDF	PTFE / PVDF	Ceramic / glass **	PVDF / EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE / PVDF	Stainless steel 1.4404	Stainless steel / EPDM

\* Metering diaphragm is PTFE-coated; seals are PTFE composite seals

PTFE: FDA No. 21 CFR §177.1550

PVDF: FDA No. 21 CFR §177.2510

\*\* with 07120, 07220, 04350

## 21 Diagrams for Setting the Capacity

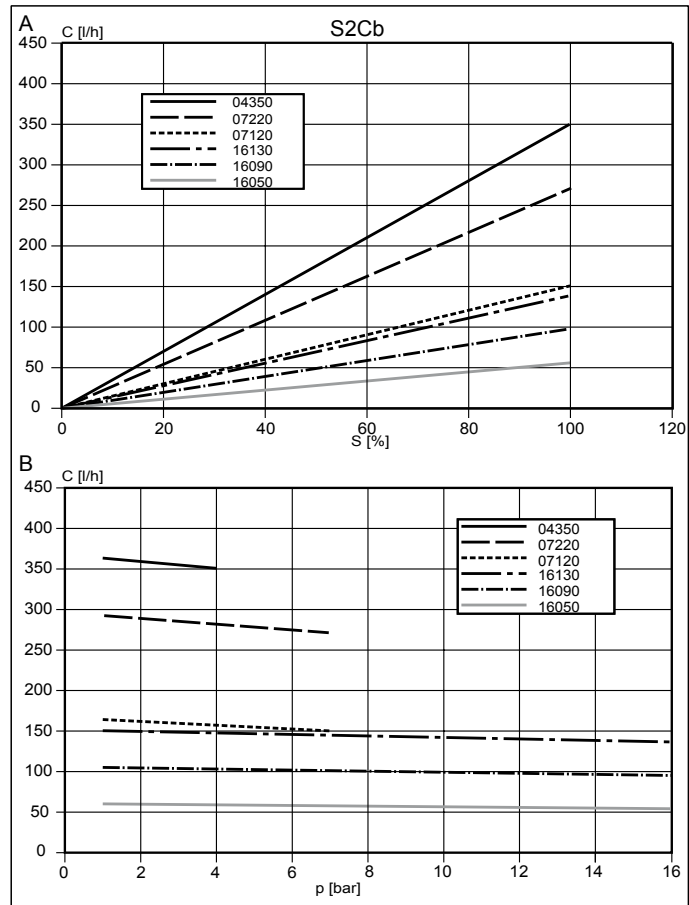


Fig. 47: A) Capacity  $C$  at maximum back pressure dependent on the stroke length  $s$ . B) Capacity  $C$  dependent on the back pressure  $p$ .

## 22 Declaration of Conformity for Machinery

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

We,

- ProMinent GmbH
- Im Schuhmachergewann 5 - 11
- D - 69123 Heidelberg, Germany,

hereby declare that the product specified in the following, complies with the relevant basic health and safety requirements of the Directive, on the basis of its functional concept and design and in the version distributed by us.

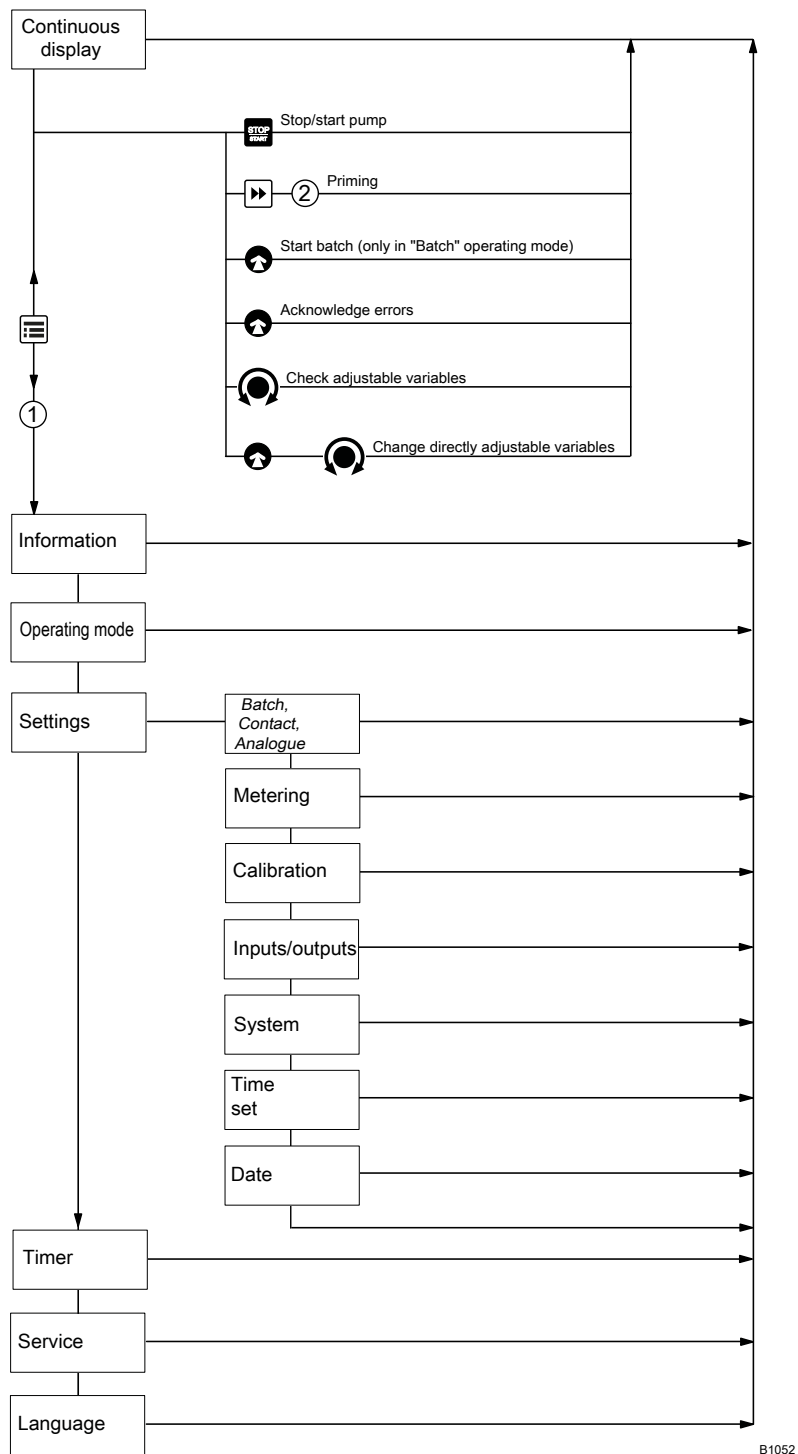
Any modification to the product not approved by us will invalidate this declaration.

Tab. 25: Excerpt from the Declaration of Conformity

Designation of the product:	Metering pump, Sigma product range
Product type:	S2Cb...
Serial number:	see nameplate on the unit
Relevant directives:	Machinery Directive (2006/42/EC) Compliance with the protection targets of the Low Voltage Directive (2014/30/EU) according to Appendix I, No. 1.5.1 of the Machinery Directive EMC Directive (2014/35/EU)
Harmonised standards applied, in particular:	EN ISO 12100:2010 EN 809:1998 + A1:2009 + AC:2010 EN 61010-1:2010 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + AC:2011
Date:	20.04.2016

View the EC Declaration of Conformity at [www.prominent.com](http://www.prominent.com).

## 23 Operating/Set-up overview of the Sigma X Control type



B1052

## 24 Operating menu of Sigma X Control type, complete

1st level	2nd	3rd	4th	5th	xth	
Information	Versions	CTRL hardware				
		CTRL software				
		HMI software				
		...				
	Time					
	Date					
	Serial number					
	Identity code					
	Part name					
	Part device address					
Operating mode	Manual					
	Batch					
	Contact					
	Analogue					
Settings	<i>Operating mode</i>	Manual				
		Contact	<i>Memory</i> On Off			
				Factor		
		Batch	<i>Memory</i> On Off			
				Factor		
			Analogue	Standard	0...20 mA 4...20 mA	
				Extended	Curve	...
					Curve points	...
					Error message I < 4 mA	...
		Metering	Metering profile	Standard		
	Metering optimised Priming optimised					
			Pressure stage	Error Warning	none Stufe_10 Stufe_07 Stufe_04	
		Calibration	Calibration	Start calibration	Calibration ended	Calibration result
			Calibration factor			
		Inputs/outputs	Auxiliary frequency	...		

1st level	2nd	3rd	4th	5th	xth
		Relay 1	Relay1 type	Warning Error Warning + error Warning + Error + Stop Stop. Stroke rate Pump inactive	
			Relay 1 polarity	normally open (NO) normally closed (NC)	
		Relay 2	Relay 2 type	Warning Error Warning + error Warning + Error + Stop Stop. Stroke rate Pump inactive	
			Relay 2 polarity	normally open (NO) normally closed (NC)	
		mA output	Range	0...20 mA 4...20 mA	
			Function	Strokes / minute Capacity Capacity at 20 mA	
		Flow monitor	Activation	Off On	
			Tolerance / strokes		
			if auxiliary	Off On	
			Signalisation	Warning Error	
		Diaphragm rupture	Inactive Warning Error		
	System	<i>Radio module</i>	Inactive Active		
		Unit	Litres Gallons (U.S.)		
	Set time	Time	Setting	hh.mm.ss	
		Auto. summer time	Yes No		

## Operating menu of Sigma X Control type, complete

1st level	2nd	3rd	4th	5th	xth
		Summer time begins in	February March April		
		Sunday the	1st, 2nd, 3rd, 4th, 5th		
		Summer time ends in	August September October November		
		Sunday the	1st, 2nd, 3rd, 4th, 5th		
		Town	Northern Hemisphere Southern Hemisphere		
	Date	yyyy.mm.dd			
Timer	Activation	Active Inactive			
	Setting the timer	Displays Change Clear New	Command 01 Anweisung2 ...	Hourly Daily (Mon-Sun) Weekdays1 (Mo-Fr) Weekdays2 (Mo-Sa) Weekend (Sa+Su) Weekly Monthly Init	...
	Clear all	No Yes			
Service	Password	<i>Password?</i>	0000		
	Clear counter	All Stroke counter Volume counter Contact memory			
	Log book	Displays	...		
		Filter	None Warn.+error only Error only Warnings only Events only		
	Display	Contrast			
		Brightness			
	HMI logout				



1st level	2nd	3rd	4th	5th	xth
	Diaphragm part number: XXXXXXX				
	Spare parts kit part number: XXXXXXX				
Language	English German Frenchç Spanishñ Italian ...				

Menus may be missing or added depending on the design and equipment on the pump.

# 25 Continuous displays and secondary displays

## Continuous displays

Continuous display	mode "Manual"	mode "Contact" with transfer factor 5	mode "Batch" with transfer factor 5	mode "Analogue"
Capacity	350 <sup>in</sup> *			350 <sup>in</sup> *
Stroke rate (h)	7200 <sup>h</sup>	7200 <sup>h</sup>	7200 <sup>h</sup>	7200 <sup>h</sup>
Stroke rate (min)	120 <sup>min</sup>	120 <sup>min</sup>	120 <sup>min</sup>	120 <sup>min</sup>
Factor		5 <sup>h/min</sup>	5 <sup>h/min</sup>	
Contact volume		1,250 <sup>l/h</sup> *	1,250 <sup>l/h</sup> *	
Trigger batch			PUSH	
Time	17:12:21	17:12:21	17:12:21	17:12:21

\* only with calibration

Auxiliary displays in the continuous display

Auxiliary display	mode "Manual"	mode "Contact" with transfer factor 5	mode "Batch" with transfer factor 5	mode "Analogue"
Capacity	350 L/h			350 L/h
Stroke rate (h)	7200 CP/h	7200 CP/h	7200 CP/h	7200 CP/h
Stroke rate (min)	120 CP/min	120 CP/min	120 CP/min	120 CP/min
Factor		5 CP/L	5 CP/L	
Remaining strokes			25,00 ↓ CP <sup>1</sup>	
Remaining litres			000,833 ↓ L <sup>1</sup>	
Total number of strokes	86500 CP	86500 CP	86500 CP	86500 CP
Stroke length	50 %	50 %	50 %	50 %
Signal current (at the input)				12,7 mA <sup>2</sup>
Dosing mode	~ Standard	~ Standard	~ Standard	~ Standard
Time	17:12:21	17:12:21	17:12:21	17:12:21
Date	2018 - 03 - 27	2018 - 03 - 27	2018 - 03 - 27	2018 - 03 - 27

1 = only with "Storage tank" function extension

2 = only with current output

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