

# Operating instructions

## Diaphragm Motor-Driven Metering Pump Sigma X Control type — Sigma/ 3 - S3Cb

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/ 3 - S3Cb							
Product range							
S3Cb							
<b>Power end type</b>							
H	Main power end, diaphragm						
	<table border="1"> <thead> <tr> <th>Type</th> <th>Capacity</th> </tr> </thead> <tbody> <tr> <td>-----</td> <td>Performance data at maximum back pressure and type: refer to nameplate on the pump housing</td> </tr> <tr> <td>-</td> <td></td> </tr> </tbody> </table>	Type	Capacity	-----	Performance data at maximum back pressure and type: refer to nameplate on the pump housing	-	
Type	Capacity						
-----	Performance data at maximum back pressure and type: refer to nameplate on the pump housing						
-							
<b>Dosing head material</b>							
PP	Polypropylene						
PC	PVC						
PV	PVDF						
SS	Stainless steel						
<b>Seal material</b>							
T	PTFE						
<b>Displacement body</b>							
S	Multi-layer safety diaphragm with optical rupture indicator						
A	Multi-layer safety diaphragm with rupture signalling by electrical signal						
H	Diaphragm for hygienic pump head						
<b>Dosing head design</b>							
0	without bleed valve, without valve springs						
1	without bleed valve, with valve springs						
2	with bleed valve, FPM, without valve springs ***						
3	with bleed valve, FPM, 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 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 nozzle						
8	Union nut and SS hose nozzle						
9	Union nut and SS welding sleeve						

Sigma X Control type - Sigma/ 3 - S3Cb

		<b>Design</b>	
0		with ProMinent® logo	
1		without ProMinent® logo	
N		Seal according to NEMA 4x	
		<b>Electric power supply</b>	
U		1-phase, 100-240 V, 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 (230V - 8A)	
3		Fault indicating relay + pacing relay (24V - 100mA)	
8		0/4-20 mA analogue output + fault indicating / pacing relay (24V - 100mA)	
		<b>Control version</b>	
0		Manual + external contact with PulseControl + timer	
1		Manual + external contact with PulseControl + analogue + metering profiles	
2		Manual + controller + PulseControl + analogue + dosing profile + extreme profile	
5		as 1 + timer	
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 unit (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		Metering monitor, dynamic, without access control	



## 2 Safety Chapter

### 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.

### Intended use

- Only use the pump to meter liquid feed chemicals.
- Only use the pump after 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, at back pressures of over 2 bar, software setting 'Diaphragm rupture' - 'Error' and if the operator takes appropriate safety measures.
- Only pumps with the design "F - Physiological safety with regard to wetted materials" are approved for use with physiologically harmless applications.
- Only "H - Hygienic head" design pumps may be used for applications in accordance with the hygienic requirements of the EHEDG ([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 intended for the metering of gaseous media and solids.
- The pump is not intended for operation in areas at risk from explosion.
- The pump is not intended for unprotected outside use.
- The pump is only intended for industrial use.
- The pump should only be operated by trained and authorised personnel, see the following "Qualifications" table.
- You have a responsibility to adhere to the information contained in the operating instructions at the different phases of the unit's service life.

## Qualification of personnel

Task	Qualification
Storage, transport, unpacking	Instructed person
Assembly	Technical personnel, Service
Planning the hydraulic installation	Qualified personnel who have a thorough knowledge of oscillating diaphragm 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**

A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognise possible dangers based on his 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 his 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 he is 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 him and any possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.

**Service**

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

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

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



#### **CAUTION!**

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

An unsuitable feed chemical can damage the parts of the pump 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.

**Safety equipment**



Fig. 2: Hot surface

**Warning labels**

This warning sign is affixed to the motor:

Ensure that the warning sign is always fitted and clearly visible.

**Isolating protective equipment**

All isolating protective equipment must be installed for operation:

- Drive 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 available.

Only remove them 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 or press the emergency cut-off switch fitted on the side of the system!

If feed chemical escapes, also depressurise the hydraulic system around the pump as necessary. Adhere to the 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

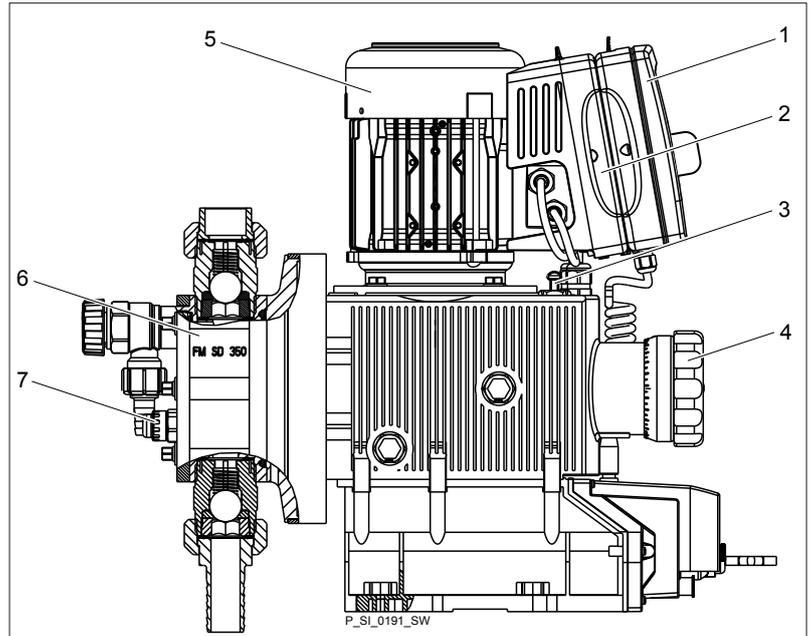


Fig. 3: Overview of Sigma X - S3Cb equipment

- 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

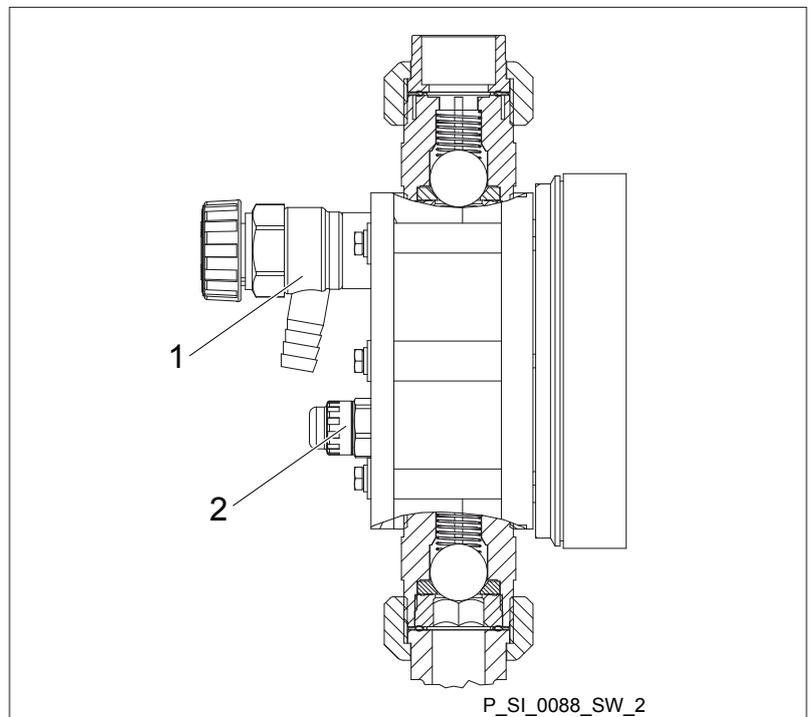


Fig. 4: Sigma control elements

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

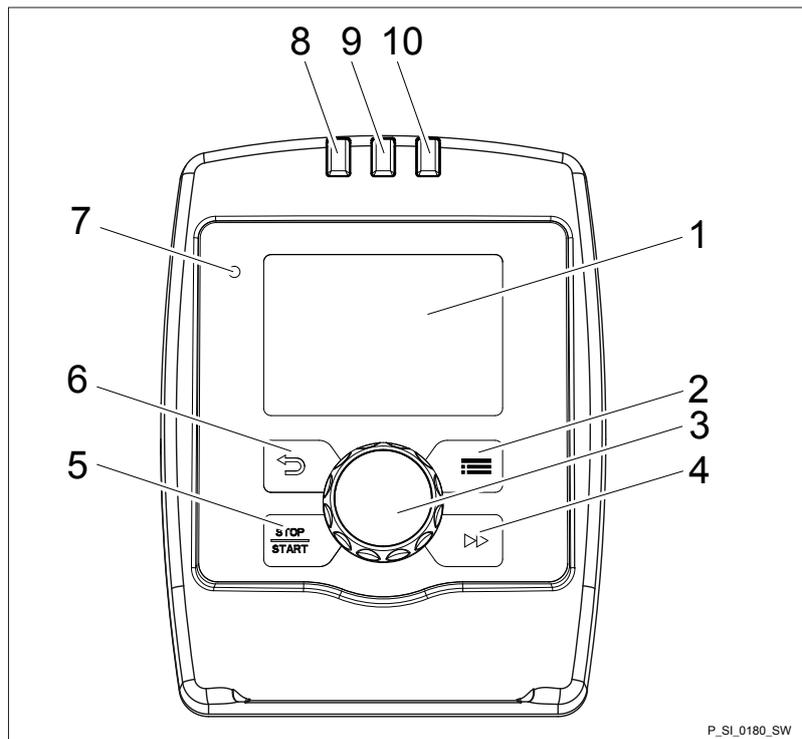


Fig. 5: Control elements for HMI Sigma X Control type

- 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)

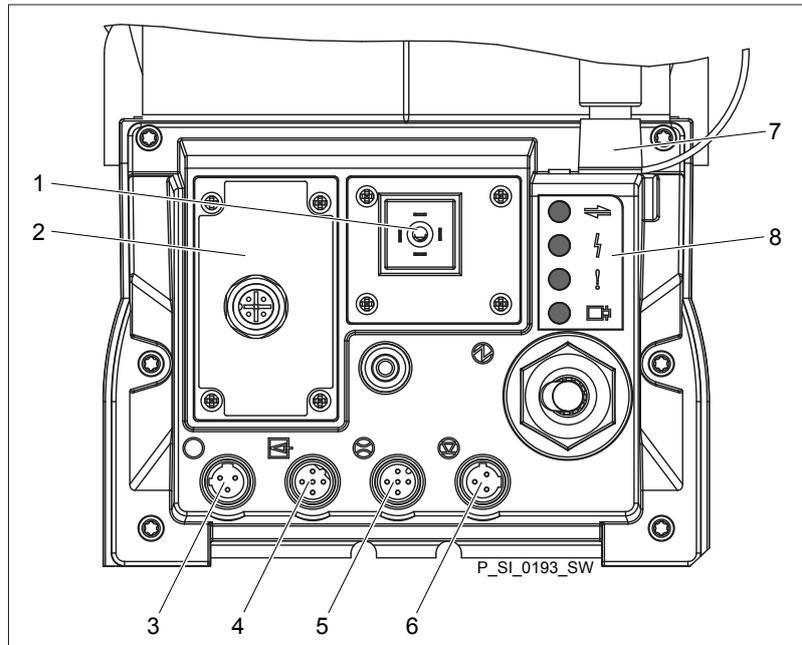
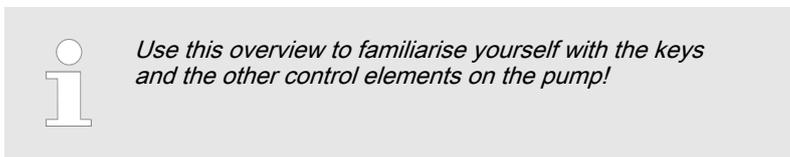


Fig. 6: Connector cover control elements

- 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. 5) and CAN bus status LED (external)
- not shown Stroke length adjustment wheel

## 4.1 Control elements



Pressure display, identifier and fault displays on the LCD screen

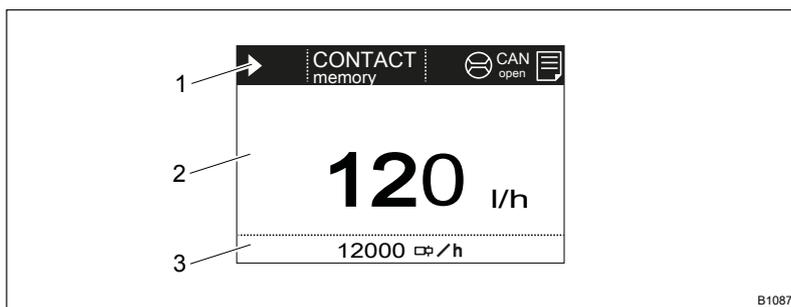


Fig. 7: Construction of continuous display

- 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:

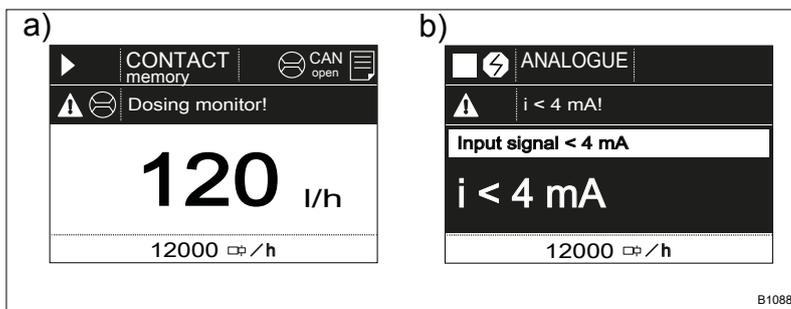


Fig. 8: a) Continuous display with warning message; b) Continuous display with fault message. Explanation of the symbols in the following tables.

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.
	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.
	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

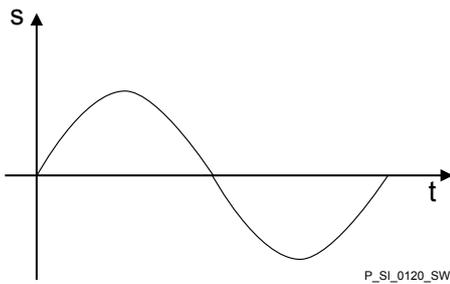
The stroke movement of the displacement body is continuously detected and regulated so that the stroke is performed according to a previously set metering profile - see chapter. 'Metering' 'setting'.

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

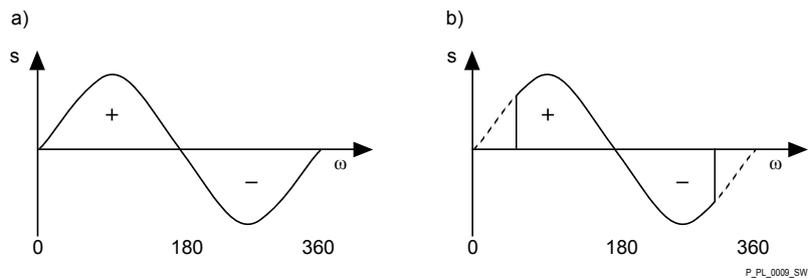
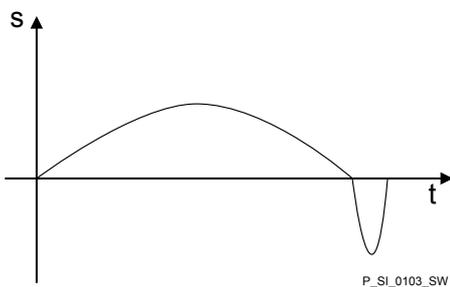


Fig. 9: Stroke movement at a) maximum stroke length and b) reduced stroke length.

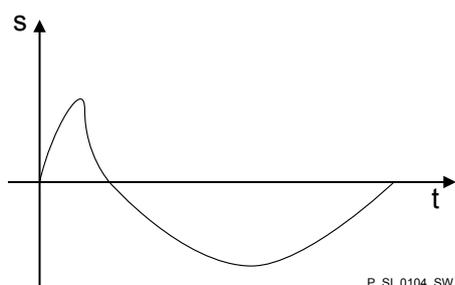
- s Stroke velocity
- ω Cam rotational angle
- + Discharge stroke
- Suction stroke



#### 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.

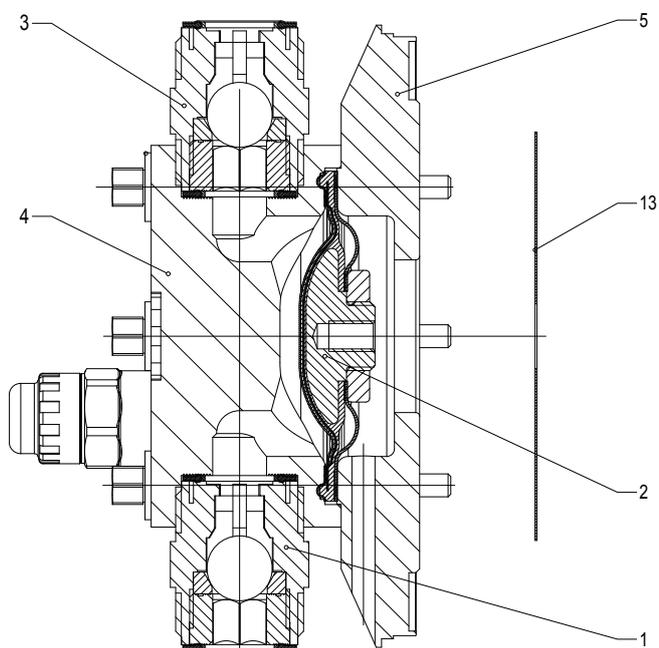


Fig. 10: Cross-section through the liquid end

- 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.

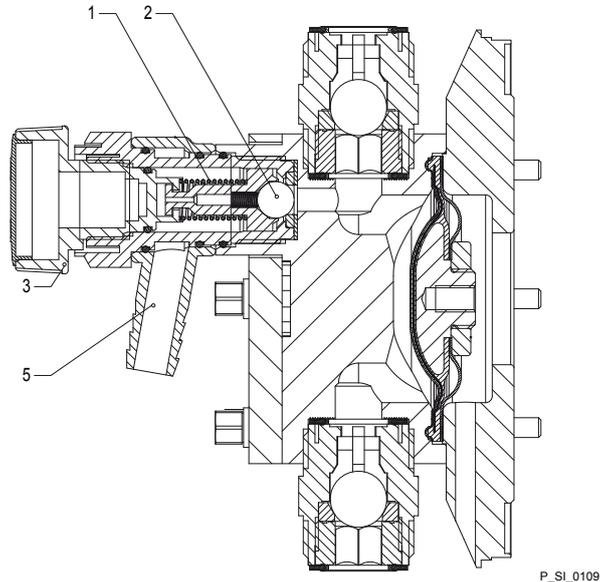


Fig. 11: Relief valve and integrated relief valve

- 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. 12.

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



Fig. 12: 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 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 capacity directly. Calibration is maintained throughout the stroke rate range. The calibration is also maintained when the stroke length is altered by up to  $\pm 10\%$  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 a key press:

**"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 three or four LED displays and the 'Error' identifier on the LCD screen:

### 5.8.1 LCD screen

If a fault occurs, the identifier 'Error' appears and 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 (yellow)

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 communication	wait briefly. Disconnect HMI then reconnect
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 dimension sheet with those of the pump.

### Base

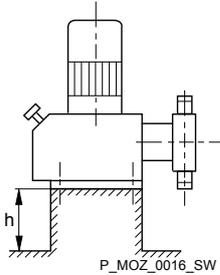


Fig. 13



#### 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.



#### Capacity too low

Vibrations can disturb the liquid end valves.

- Do not allow the base to vibrate.

### Space requirement

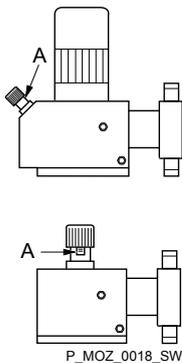


Fig. 14



#### 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 window, are accessible.

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

If the HMI is mounted remotely from the pump: a clearly marked Stop mechanism must be installed in the direct vicinity of the pump for emergencies!

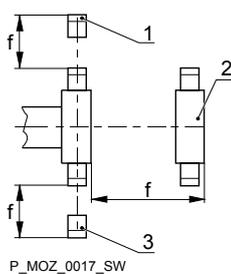


Fig. 15

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

Ensure there is sufficient free space (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.

### Liquid end alignment



#### Capacity too low

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

- Ensure that the discharge valve is upright.

### Fastening



#### Capacity too low

Vibrations can disturb the liquid end valves.

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

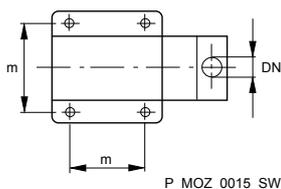


Fig. 16

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

Use appropriate bolts to fix the pump base to the supporting floor.

### Mounting the HMI user control

If ordered with the wall mounting, the HMI can be mounted directly on a wall.

Install the HMI in the immediate vicinity of the pump. If not provided for, fit a circuit breaker there - refer to the "Installation, electrical" chapter. Ensure that the system is arranged ergonomically.

When doing so, consider the available cable length.

Prevent tripping hazards.

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



#### CAUTION!

#### Warning of faulty operation

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

## 7 Installation



### CAUTION!

#### Danger of injury to personnel and material damage

Disregard of technical data during installation may lead to personal injuries or damage to property.

- Observe the technical data - refer to the "Technical data" chapter and, where applicable, the operating instructions for the accessories.

### 7.1 Installation, hydraulic



### WARNING!

#### Danger 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!

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

- Install a bleed valve with recirculation in the storage 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!****Suction problems are possible**

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.

**CAUTION!****Warning of the discharge line rupturing**

With a closed discharge line (e.g. from a clogged discharge line or by closing a valve), the pressure that the metering pump generates can 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!****Warning against rupturing of suction or discharge lines**

Hose lines with insufficient pressure rating may rupture.

- Only use hose lines with the required pressure rating.

**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 for the metering pump or
- Set up the installation properly.

**CAUTION!****Warning about lines coming loose**

If suction, discharge and relief lines are installed incorrectly, they can loosen / disconnect from the pump connection.

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

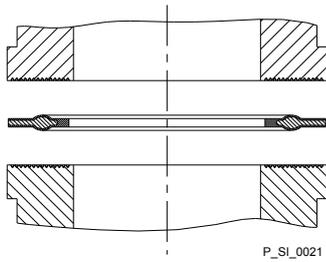


Fig. 17: Moulded composite seals with corrugated insert

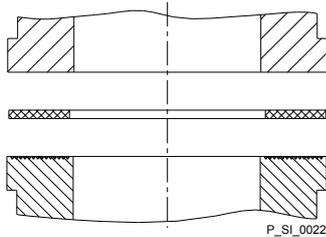


Fig. 18: Elastomer flat seal for a smooth insert

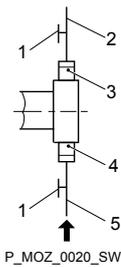


Fig. 19: Manometer connector options

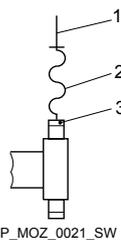


Fig. 20: Steel pipeline at the liquid end



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

Leaks can occur on the pump connection depending on the insert used.

- The pump is supplied with PTFE moulded composite seals with a flare, which are used for the pump connectors, which seal the connectors between grooved pump valves and ProMinent grooved inserts - see [Further information on page 26](#).
- Use an elastomer flat seal in the event that an unflared insert is used (e.g. third party part) - see [Further information on page 26](#).



- *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.*



**CAUTION!**  
**Warning of backflow**

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 closing elements.

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



**CAUTION!**

To check the pressure conditions in the piping system it is recommended that connecting options for a manometer are provided close to the suction and pressure connector.

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



**CAUTION!**

Connect the pipelines to the pump so that no residual forces act on the pump, e.g. due to the offsetting, weight or expansion of the line.

Only connect steel or stainless steel piping via a flexible piping section to a plastic liquid end.

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

**Integral relief valve or integral bleeder valve****WARNING!****Product can be dangerously contaminated**

Only with "Physiologically safety with regard to wetted materials" version:

If the integral bleed valve or the integral relief valve opens, the feed chemical comes into contact with physiologically harmful seals.

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

**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 storage tank or - if required by the regulations - into a special storage 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.

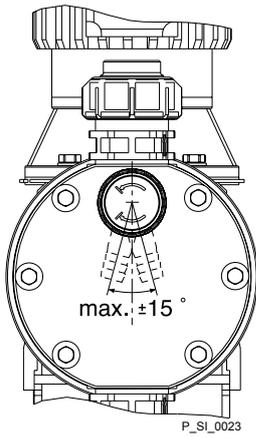


Fig. 21: Permissible alignment of the relief valve



### 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 nozzle pointed downwards - see .



*If the overflow line is fed into the suction line, the bleed function is blocked.*

*Therefore lead the overflow line back into the storage tank.*



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

## 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.

## 7.1.1 Basic installation notes

### Safety notes



### CAUTION!

#### Danger resulting 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 a return into the storage tank.

➔ Shorten the return line so that it does not dip into the feed chemical in the storage tank.

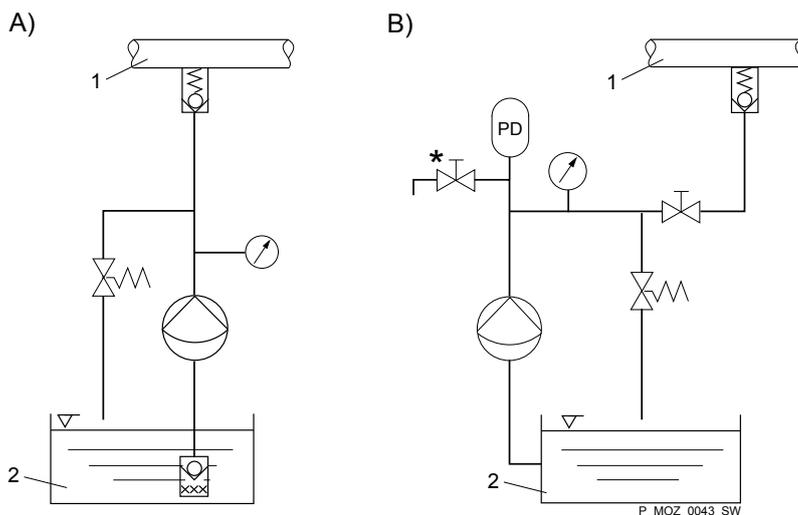


Fig. 22: (A) standard installation, (B) with pulsation damper

- 1 Main line
- 2 Storage tank

**Legend for hydraulic diagram**

Symbol	Explanation	Symbol	Explanation
	Metering pump		Foot valve with filter meshes
	Injection valve		Level switch
	Multifunctional valve		Manometer

**7.2 Installation, electrical**

**General safety notes**



**WARNING!**

**Danger of electric shock**

Unprofessional installation may lead to electric shocks.

- Crimp cable end sleeves onto all shortened cable cores.
- Only technically trained personnel are authorised to undertake the electrical installation of the device.



### WARNING!

#### Danger of electric shock

A mains voltage may exist inside the motor or electrical ancillaries.

- If the housing of the motor or electrical ancillaries has been damaged, you must disconnect it from the mains immediately. Only return the pump to service after an authorised repair.



### CAUTION!

Use ProMinent cables to avoid unnecessary 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

## 7.2.1 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 (option) and metering monitor (option)

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.



### CAUTION!

#### Danger resulting from unnoticed diaphragm rupture

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

- Electrically connect the enclosed diaphragm rupture sensor.

Only with flammable media:



**WARNING!**

**Fire danger**

The electric diaphragm rupture sensor must stop the pump immediately after a diaphragm rupture and trigger an alarm.

The pump must only be returned to Service once a new diaphragm has been fitted.

**7.2.1.1 Relay**

**7.2.1.1.1 Fault indicating relay 230 V**

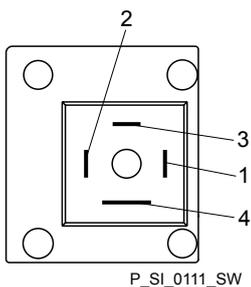


Fig. 23: Pump assignment

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 plugged into the relay board.

**Fault indicating relay 230 V**

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

**Fault indicating relay 230 V**

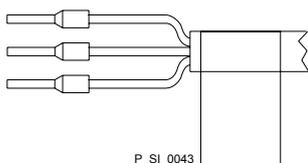


Fig. 24: Cable assignment

**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

## 7.2.1.1.2 Fault indicating and pacing relay option

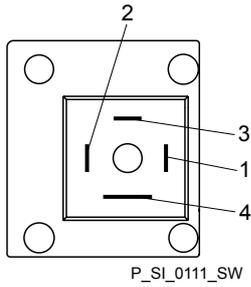


Fig. 25: Pump assignment

The first switch is a relay. The pacing output is electrically-isolated by means of 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 plugged 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 $I_{off\ max} = 1\ \mu A$	0.4	V
Maximum current	100	mA
Maximum voltage	24	VDC
Closing time	100	ms

### Fault indicating and pacing relay option

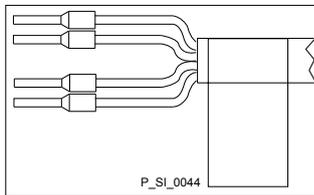


Fig. 26: Cable assignment

### Pin assignment

To pin	VDE cable	Contact	Relay
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

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

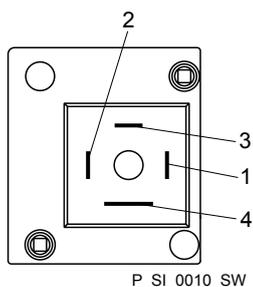


Fig. 27: Pump assignment

The module can be retrofitted and operates once it is plugged 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	VDC
Closing time	100	ms

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

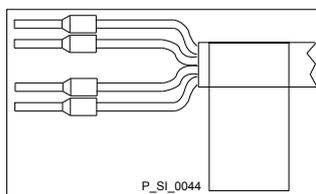


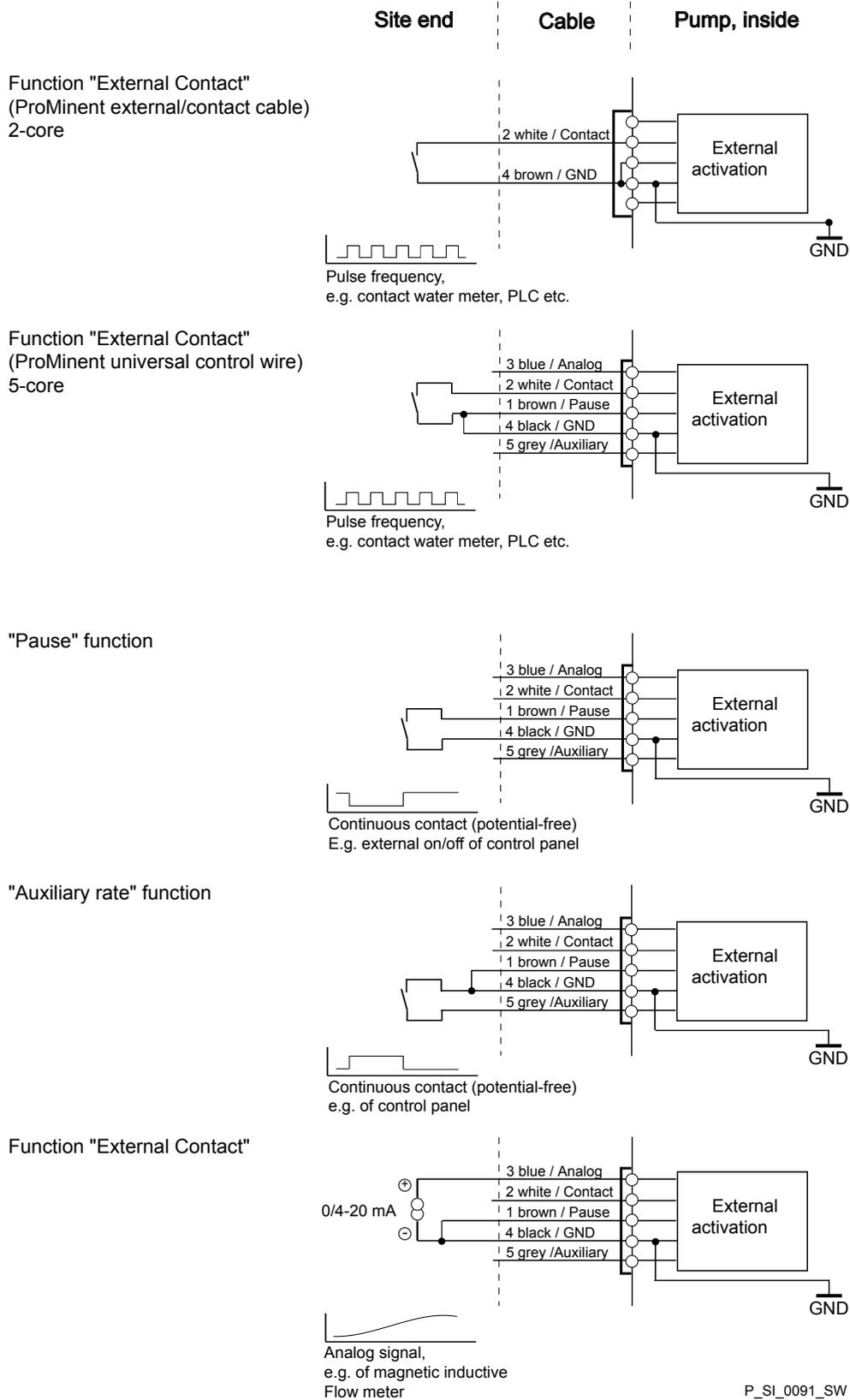
Fig. 28: Cable assignment

To pin	VDE cable	Contact	Relay
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

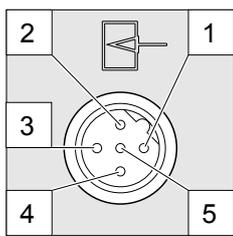
7.2.1.2 External control

External control

Universal control wire connection diagram



Technical data "External control"



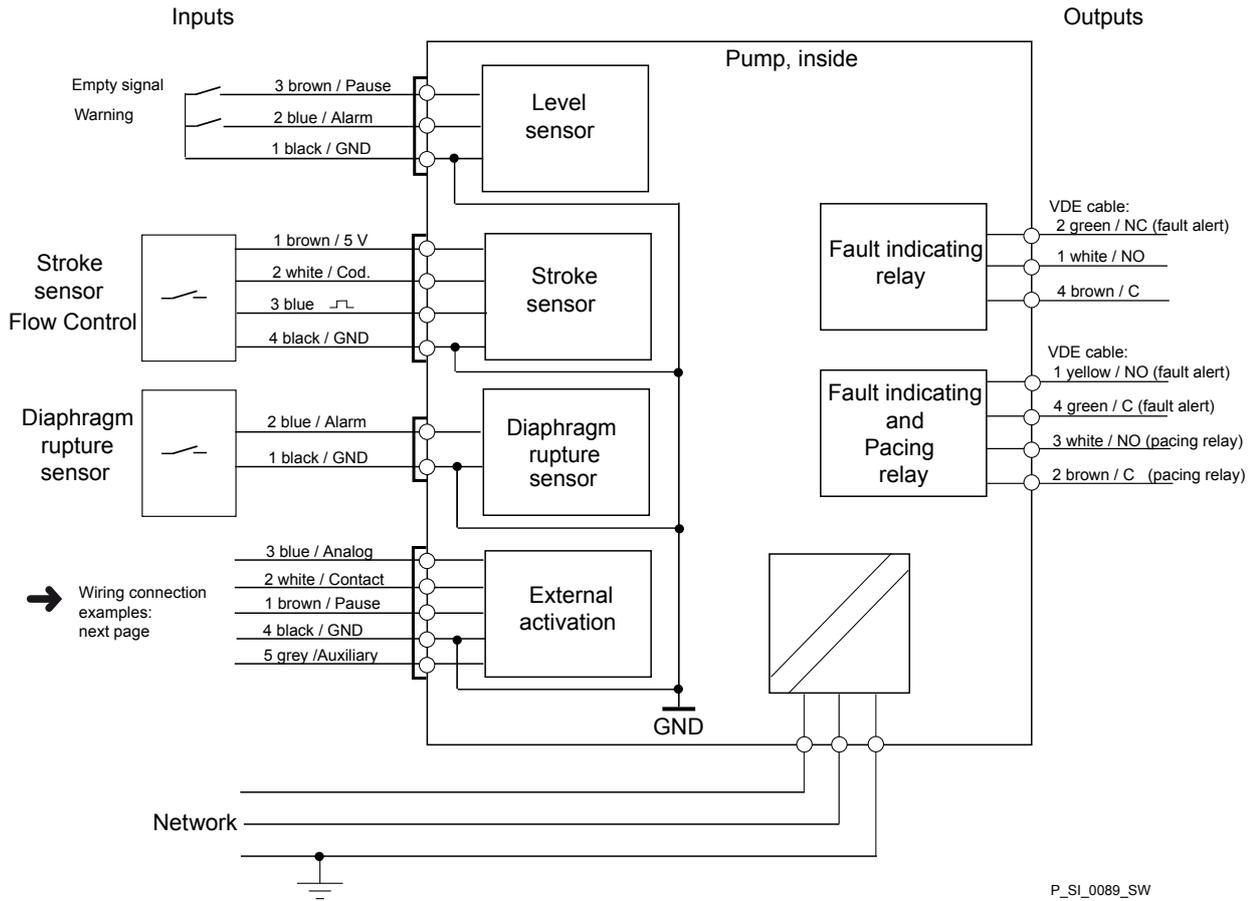
P\_BE\_0014\_SW

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

Pin		
Pin 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 enters into continuous operation at approx. 19.2 mA.

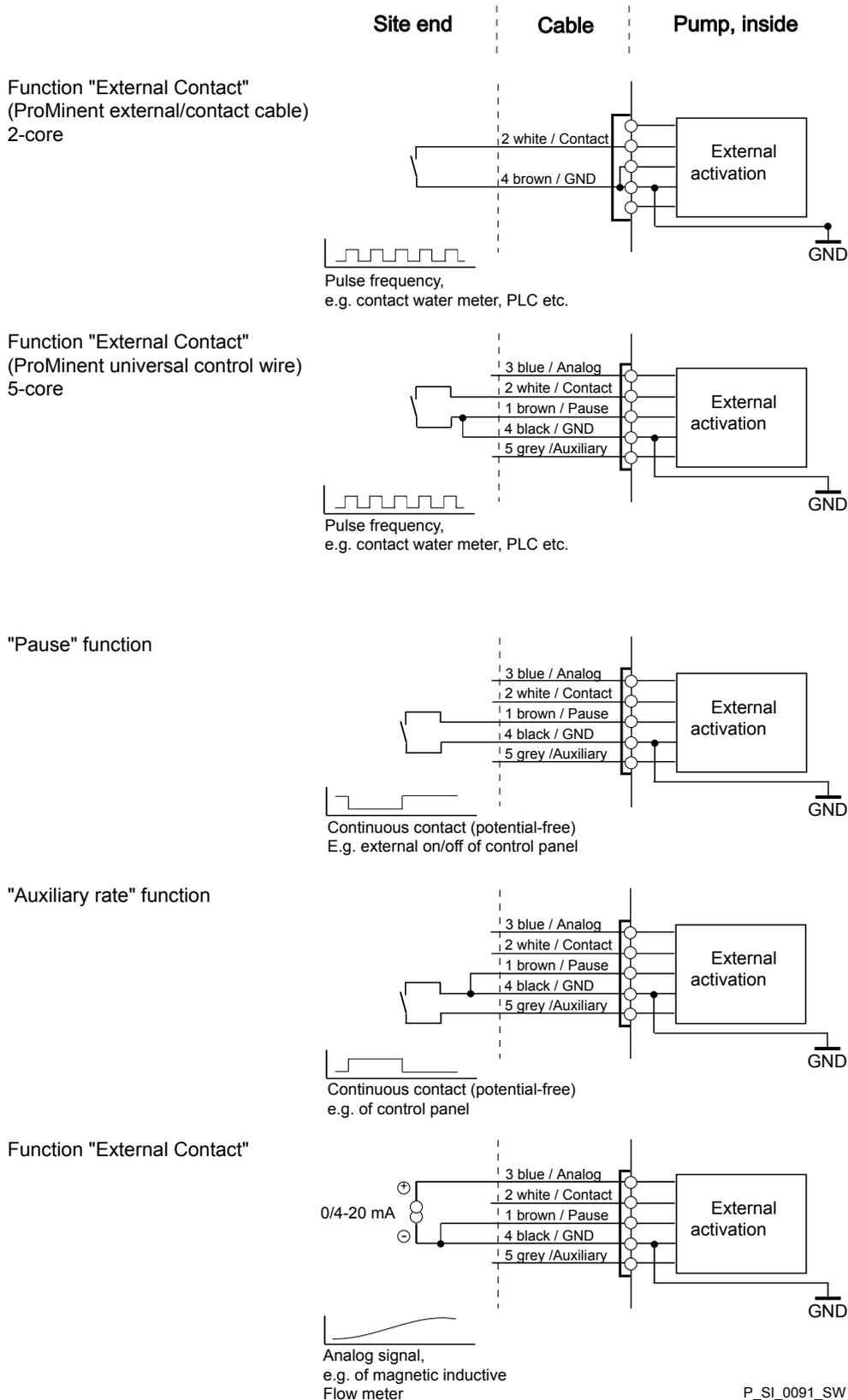
Block diagram Sigma Control



P\_SI\_0089\_SW

Fig. 29: Sigma Control block switching diagram

### Universal control wire connection diagram



## 7.2.2 HMI operating unit

The HMI must be connected to the CAN socket above the LEDs of the pump base if the pump is operated via the HMI.

If the pump is operated without the HMI, the sealing cap supplied must be plugged into the CAN socket above the LEDs of the pump base.



### CAUTION!

#### Risk of short circuit

A short circuit may occur in the pump if liquid penetrates into the CAN socket.

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



### CAUTION!

#### Danger of malfunctions

Incorrect operation via the CAN bus leads to malfunctions.

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

### 7.2.3 Pump, power supply



### WARNING!

#### Risk of electric shock

This pump is supplied with a grounding conductor and a grounding-type attachment plug.

- To reduce the risk of electric shock, ensure that it is connected only to a proper grounding-type receptacle.



### WARNING!

#### 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.



### WARNING!

If the HMI cannot be operated directly from the pump (specifically with versions with a cable longer than 2 m), provide an option to disconnect the pump from the mains power supply in the event of an emergency. Clearly assign and label this option to the pump.



### WARNING!

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

**CAUTION!****Pump can be damaged**

The pump can only be stopped when running via an:

- External cable
- [Stop] key.

Use a relay or a contactor if the pump is to be definitively actuated via the mains cable. However, take into account the pump's starting current.



*To be able to switch off the pump (to a zero-volts state) independently from the entire installation (e.g. for repair), use an electrical isolating device in the mains supply cable, e.g. a mains switch or a plug / socket combination. Clearly identify this isolating device as such.*

➔ Install the pump cable. Use the original cable supplied!



- *Key electrical data can be found on the pump's nameplate.*

## 7.2.4 Other units

### Other units

➔ Install the other units 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. 30: Please read

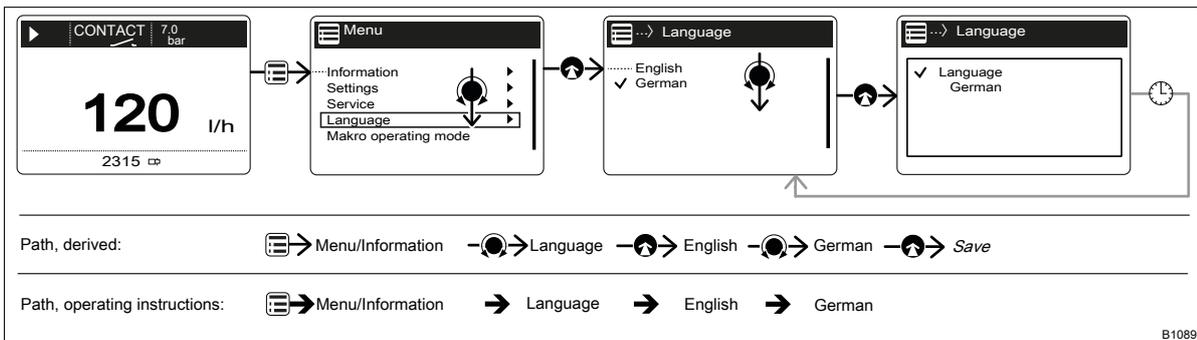


Fig. 31: "Setting up the language": As an example of set-up and path displays

Tab. 2: Legend:

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

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

1. To access the 'Menu': press the [Menu] key.  
⇒ The cursor immediately points to 'Information'.
2. To switch from 'Information' to 'Language': turn the [Clickwheel].
3. To return to the 'Language' menu: press the [Clickwheel].  
⇒ The cursor points to a language.
4. To switch to 'Deutsch': turn the [Clickwheel].
5. 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

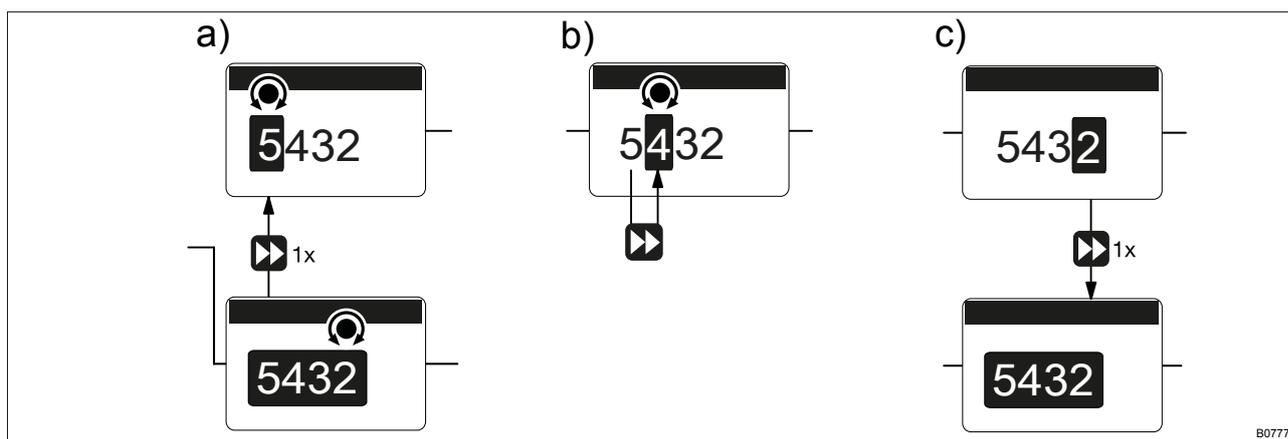


Fig. 32: a) Changing from one figure to its initial figures; b) Changing the figure; c) Returning from the last figure to the (complete) figure (to correct a wrong figure, for example).

### 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 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'
- 'Analog'

### 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. 3: \* 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. 4: \*\* 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:

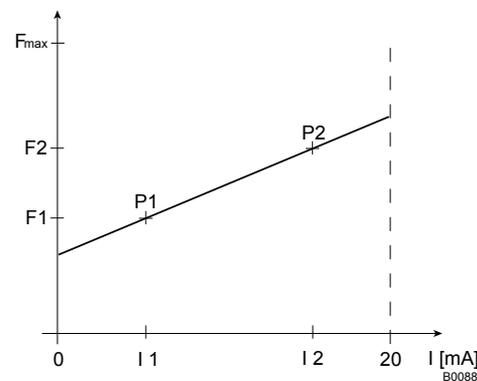


Fig. 33: Frequency-current diagram for "Linear curve"



Plot a diagram similar to the one above – with values for  $(I_1, F_1)$  and  $(I_2, F_2)$  – so that you can set the pump as desired!



The smallest processable difference between  $I_1$  and  $I_2$  is 4 mA ( $\| I_1 - I_2 \| \geq 4$  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.

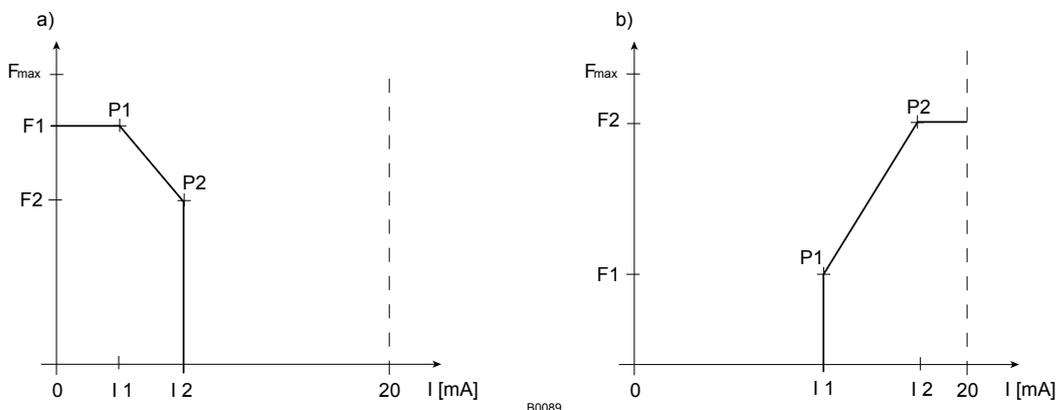


Fig. 34: Frequency-current diagram for a) Lower side band, b) Upper side band

#### '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 → Metering profile → ...'

Under 'Metering → Metering 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 'metering optimised' 'metering profile', the discharge stroke is elongated, 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 'Metering profile' - 'priming optimised', the suction stroke is elongated as much as possible, which makes possible the precise and problem-free metering of viscous and gaseous media. Select this setting to minimise the NPSH value as well.

**Standard**

With 'Metering profile' - 'Standard' the pump meters as usual.

**9.3.2.2 'Pressure stage'**

 → 'Menu / Information → Settings → Metering → Pressure stage → ...'

**Pressure stage**

With 'Metering → Pressure stage' you can reduce the nominal pressure of the pump via the pressure stages – refer to the "Functional description" chapter.

When selecting a pressure stage, you are simultaneously selecting the error behaviour.

Tab. 5: Nominal pressures depending on the size of the liquid ends and the pressure stages

Pressure stage /	4	7	10	12
Size of liquid end				
120145 *	X	X	X	X
120190 *	X	X	X	X
120270 *	X	X	X	X
070410	X	X	-	-
070580	X	X	-	-
040830	X	-	-	-

\* the pressure of the plastic liquid ends is reduced to 10 bar.

**9.3.3 'Calibration'**

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

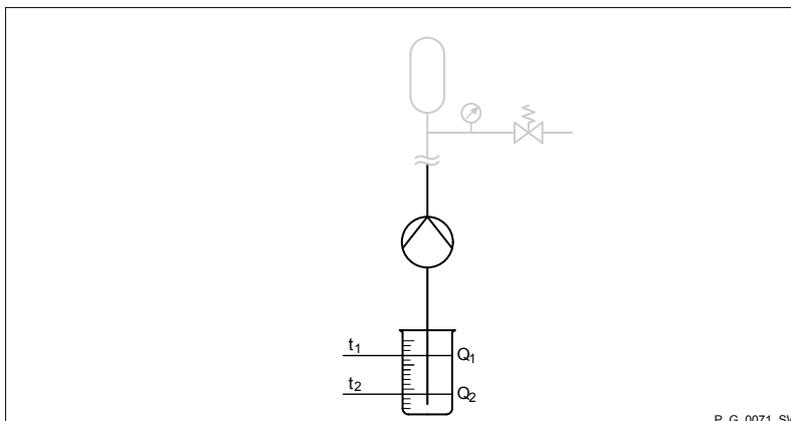
**Accuracy of calibration**

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!

**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. 6: 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. 7: 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 53.

**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 input when the pump is to change to and from 'Summertime'.

Check under 'Location' whether the pump is also set to its own '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'

 → '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 56.*

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 58.*

#### 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 x 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.

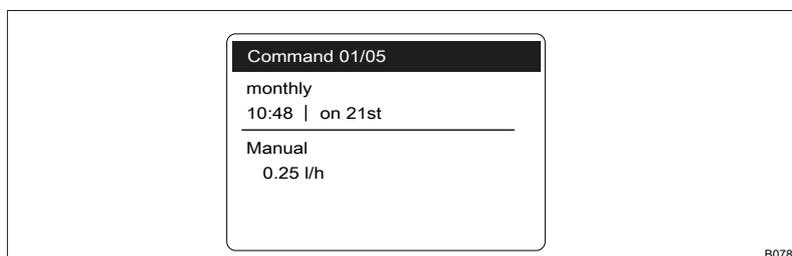
**9.4.2.4 Select the action and value**

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:



**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

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//

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

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 14.5 'Log book' on page 80.

Tab. 8: 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 the desired operating language 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.

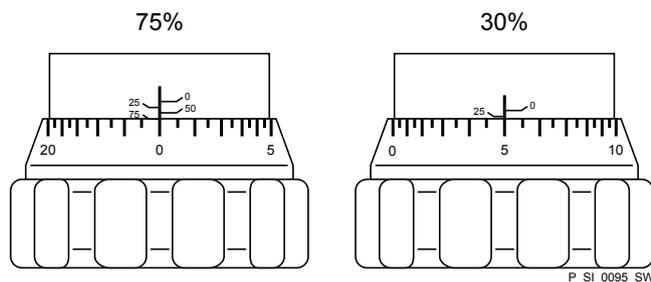


Fig. 35: Adjusting the stroke length

- 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 67, 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

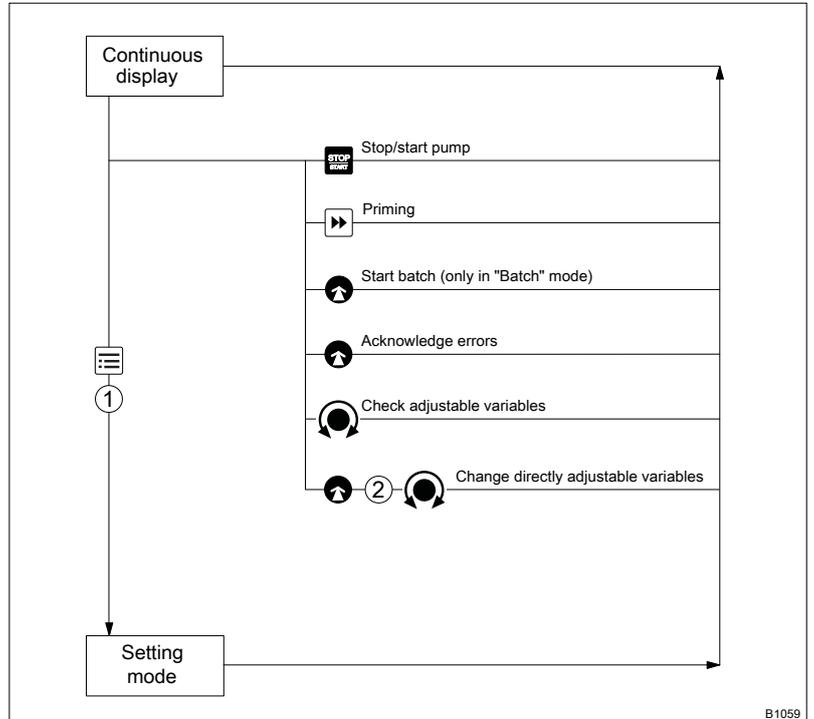


Fig. 36: Control options using the keys

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

## 12 Maintenance

### 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!**

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



**CAUTION!**

**Warning of feed chemical spraying around**

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

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



**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 may 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.

**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.</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 69.</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

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

Under 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:

- System back pressure
- Operating temperature
- Feed chemical properties

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

**Tightening torques**

Data	Value	Unit
Tightening torques for dosing head screws:	12 ... 12.0	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

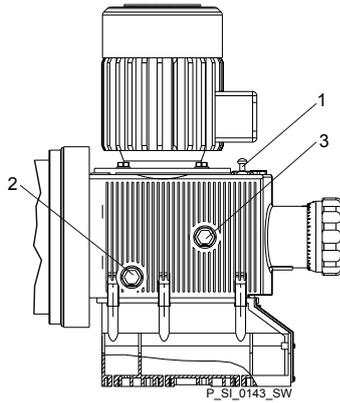


Fig. 37

### Draining gear oil

1. ➤ Remove 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 run out of the power end.
5. ➤ Screw in the oil drainage plug (2) with a new seal.

### Filling with gear oil

Prerequisite: 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 Carrying out repairs

### 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!

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



#### CAUTION!

##### Warning of feed chemical spraying around

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

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



#### 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.

### 13.1 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 the "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 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 discharge and suction connectors when fitting the valve.

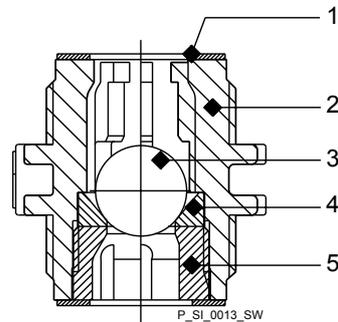


**CAUTION!**

**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.



*Fig. 38: Simple cross-section through ball valve*

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

## 13.2 Replacing the diaphragm



*Third-party spare parts for the pumps may 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:

- If necessary take protective measures.
  - Adhere to the material safety data sheet for the feed chemical.
  - Ensure that the system is at atmospheric pressure.
1. ➤ Drain the liquid end: Place the liquid end on its head and allow the feed chemical to run out; flush out with a suitable medium; flush the liquid end thoroughly when using hazardous feed chemicals!
  2. ➤ 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 on the discharge 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 74.
  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 now is now seated against the stop of the thread while the diaphragm flap is within the tolerance range.

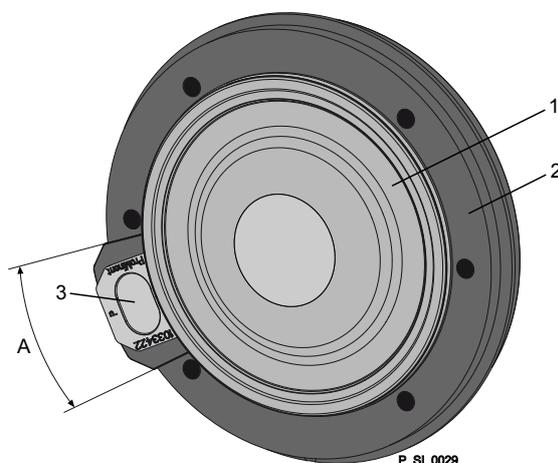


Fig. 39: Tolerance range of the flap on the backplate

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

12. ▶ Should this not work, remove dirt or swarf out of the thread and screw the diaphragm correctly onto the drive axle this time.
  - ⇒ If this is still unsuccessful, contact ProMinent-ProMaqua customer service.
13. ▶ Place the dosing head with the screws onto the diaphragm - the suction connector should be pointing downwards in the pump's fitting position.
14. ▶ Tighten the screws gently to start with.
15. ▶ Screw the diaphragm rupture sensor into the dosing head.
16. ▶ Start up 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!
- With PP, PC and TT dosing heads also re-check the tightening torques quarterly!

### Checking the condition of the diaphragm rupture sensor

1. ▶ If the inside of the diaphragm rupture sensor has become damp or dirt has penetrated it: replace.

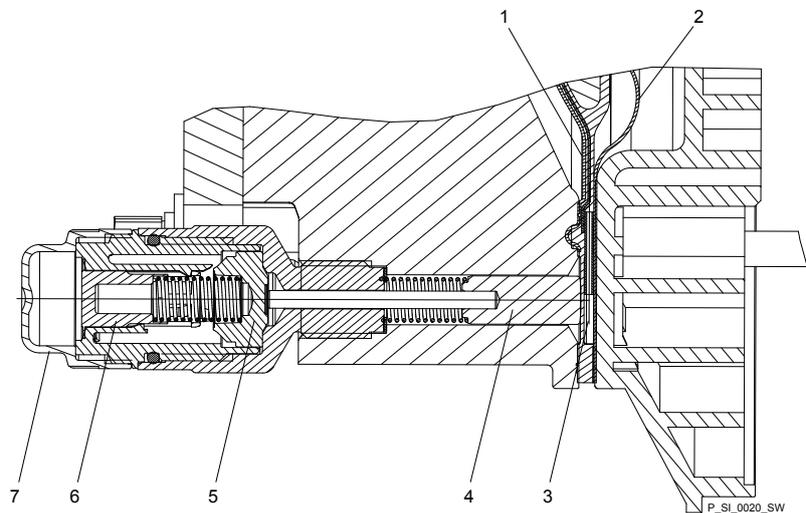


Fig. 40: Section through the Sigma diaphragm rupture warning system ("Visual break indicator" version)

- 1 Working layer ( $\hat{=}$  operating diaphragm)
- 2 Safety layer ( $\hat{=}$  safety diaphragm)
- 3 Flap
- 4 Plunger
- 5 Diaphragm rupture sensor
- 6 Cylinder, red
- 7 Cover, transparent

2. ▶ If the piston of the diaphragm rupture sensor - see Fig. 40, item 4 - should have become dirty or damp, clean both it and the hole in which it runs.

3. ➤ Check whether it can move freely in the hole.
4. ➤ Refit 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 it engages.
3. ➤ Press the piston on the other side of the diaphragm rupture sensor with a blunt, smooth object into the dosing head (approximately 4 mm) until it triggers.



#### CAUTION!

##### Feed chemical may escape

If the expandable flap of the diaphragm is damaged, then feed chemical can escape when there is a diaphragm rupture.

The piston must not be scratched, it must remain completely smooth so that during operation it does not damage the expandable flap of the diaphragm.

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 membrane rupture sensor.
6. ➤ After a successful test, screw the transparent cover onto the diaphragm rupture sensor and then continue at the top by fitting the diaphragm.

#### Electrical diaphragm rupture sensor

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



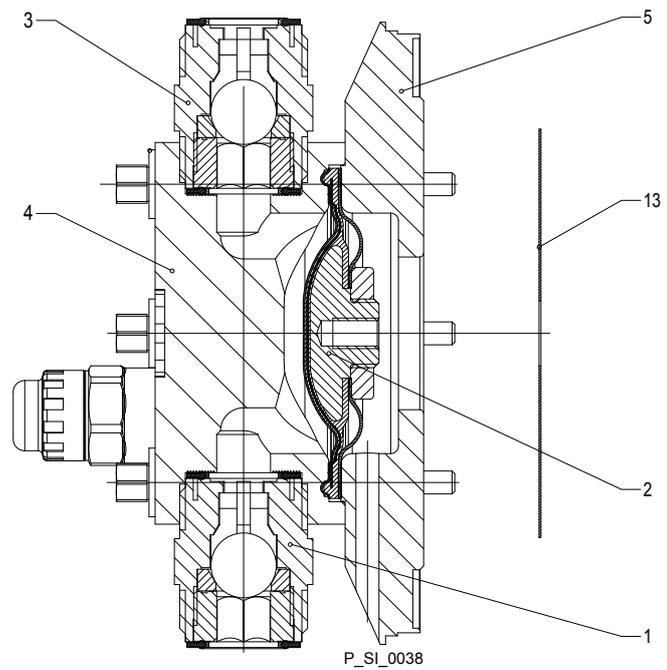
#### CAUTION!

##### Feed chemical may escape

If the expandable flap of the diaphragm is damaged, then feed chemical can escape when there is a diaphragm rupture.

The piston must not be scratched, it must remain completely smooth so that during operation it does not damage the expandable flap of the diaphragm.

2. ➤ Repeat the test.
3. ➤ If the monitor does not trigger an alarm both times, replace the membrane rupture sensor.
4. ➤ After a successful test, continue at the top by fitting the diaphragm.



*Fig. 41: Cross-section through the liquid end*

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

# 14 Troubleshooting

## 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!**

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

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

### 14.1 Faults without a fault message

Fault description	Cause	Remedy	Personnel
Pump does not prime in spite of full stroke motion and bleeding.	Minor crystalline deposits on the ball seat due to the valves drying out.	Take the suction hose out of the storage tank and thoroughly flush out the liquid end.	Technical personnel

Fault description	Cause	Remedy	Personnel
Pump does not prime in spite of full stroke motion and bleeding.	Heavy 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 - refer to the "Maintenance" chapter for the tightening torque.	Technical personnel
	The 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, refer to the "Repair" chapter.	Technical personnel
The CAN LED flickers after the HMI has been connected to the pump.	The software versions of the pump and HMI are different.	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 mains voltage or no mains voltage is connected.	Connect the pump correctly to the specified mains voltage - according to the specification on the nameplate.	Electrician

## 14.2 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 storage tank has reached "Liquid level low 2nd stage".	Top up the storage 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 'Analogue' 'operating mode', a fault behaviour has been programmed in the 'ANALOGUE' 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 'Analogue' 'operating mode', a fault behaviour has been programmed in the 'ANALOGUE' 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 metering strokes' 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
The } DIA "Diaphragm" symbol appears flashing on the LCD screen plus the 'Diaphragm rupture' 38 error message, and the pump stops.	The diaphragm is broken.	Replace the diaphragm and check the diaphragm rupture sensor - refer to the "Repair" chapter.	Technical personnel

Fault description	Cause	Remedy	Personnel
The  STRK "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 <i>[P/OK]</i> (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then Press <i>[P/OK]</i> (think through the consequences for the process!).	Technical personnel
The  PWR "Power" symbol appears on the LCD screen plus the 'Mains voltage' 51 error message, and the pump stops.	No or incorrect mains voltage.	Connect the correct mains 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 discharge side.	Open the shut-off valve or clear the constriction, then Press <i>[P/OK]</i> (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 discharge side.	Open the shut-off valve or clear the constriction, then Press <i>[P/OK]</i> (think through the consequences for the process!).	Technical personnel

### 14.3 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 storage tank has reached "Liquid level low 1st stage".	Top up the storage tank.	Instructed personnel
The <b>cal</b> "Calibration" 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 strokes metering' 3.	The metering monitor is not correctly connected.	Connect the metering monitor correctly and Press <i>[P/OK]</i> .	Electrician
	The metering monitor reported too few strokes – more than are set in the 'FLOW' menu.	Press <i>[P/OK]</i> . Investigate and clear the cause.	Technical personnel
The <b>dia</b> "diaphragm" symbol appears on the LCD screen, plus the error message 'Diaphragm rupture' 4.	The diaphragm is broken.	Replace the diaphragm and check the diaphragm rupture sensor - refer to the "Repair" chapter.	Technical personnel
The "Stroke length adjustment" symbol  appears flashing on the LCD screen, plus the error message 'Stroke length wrongly 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

Fault description	Cause	Remedy	Personnel
The <b>p+</b> ! "Overload" symbol appears flashing on the LCD screen plus the error message 'Overload' 6.	A constriction or a closed shut-off valve on the discharge 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 <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 "Temperature" symbol ! appears flashing on the LCD screen, plus the error message 'Temperature PFC' 7.	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 ! '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

### 14.4 All other faults

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

### 14.5 Log book

Tab. 9: Input information

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

#### 14.5.1 Warning messages in the log book

Tab. 10

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

No.	Description
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

## 14.5.2 Fault messages in the log book

Message no.	Description
33	The float switch input reports no feed chemical
34	In <i>'Batch'</i> or <i>'Contact'</i> 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
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

Message no.	Description
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

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

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



### 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



### WARNING!

#### Warning of powerful spring

A powerful spring is located on the slide rod in the power end - underneath the plate behind the backplate - which could injure personnel when removed.

- Additionally secure the plate behind the backplate before removing this plate. Carefully release the spring using this securing mechanism.

**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!

Sign indicating EU collection system



In accordance with the European Directive 2012/19/EU on waste electrical and electronic equipment, this device features the symbol showing a waste bin with a line through it. The device must not be disposed of along with domestic waste. To return the device, use the return and collection systems available and observe the local legal requirements.

## 16 Technical data

### 16.1 Performance data

S3Cb

Type	Minimum pump capacity at maximum back pressure				Max-imum stroke rate	ml/stroke	Suction lift m WS	Permis-sible pri-ming pres-sure, suction side	Connector size
	bar	psi	l/h	gph					
120145 PVT	10	145	182	48	90	33.7	5	2	1 1/2" - DN25
120145 SST	12	174	182	48	90	33.7	5	2	1 1/2" - DN25
120190 PVT	10	145	243	64	120	33.7	5	2	1 1/2" - DN25
120190 SST	12	174	243	64	120	33.7	5	2	1 1/2" - DN25
120270 PVT	10	145	365	96	180	33.8	5	2	1 1/2" - DN25
120270 SST	12	174	365	96	180	33.8	5	2	1 1/2" - DN25
070410 PPT, PCT, PVT	7	102	500	132	90	95.1	4	1	2" - DN32
070410 SST	7	102	500	132	90	95.1	4	1	2" - DN32
070580 PPT, PCT, PVT	7	102	670	176	120	95.1	4	1	2" - DN32
070580 SST	7	102	670	176	120	95.1	4	1	2" - DN32
040830 PPT, PCT, PVT	4	58	1040	274	180	95.1	3	1	2" - DN32
040830 SST	4	58	1040	274	180	95.1	3	1	2" - DN32

All figures refer to water at 20 °C.

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

#### 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

The liquid ends are suitable for the following viscosity ranges:

Version	Stroke rate, max.	Viscosity
	Strokes/min	mPas
Standard	180	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
120145; 120190; 120270	PVT	26.1
	SST	32.5
070410; 070580; 040830	PPT, PCT, PVT	29.5
	SST	41.5

## 16.4 Wetted materials

Tab. 11: DN 25 ball valves

Material version	Liquid end	Suction/pressure connector	Seals*	Valve balls	Valve seats	Integral relief valve
PVT	PVDF	PVDF	PTFE	Glass	PTFE	PVDF / FPM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	PTFE	Stainless steel / FPM or EPDM

Tab. 12: DN 32 plate valves

Material version	Liquid end	Suction/pressure connector	Seals*	Valve plates / valve springs	Valve seats	Integral relief valve
PPT	PP	PP	PTFE	Ceramic / hast. C + CTFE**	PTFE	PVDF / FPM or EPDM
PCT	PVC	PVC	PTFE	Ceramic / hast. C + CTFE**	PTFE	PVDF / FPM or EPDM
PVT	PVDF	PVDF	PTFE	Ceramic / hast. C + CTFE**	PTFE	PVDF / FPM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4404 / Hast. C	PTFE	Stainless steel / FPM or EPDM

\* Diaphragm is PTFE-coated

\*\* The valve spring is coated with CTFE (resistance similar to PTFE)

## 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

PP liquid end

Data	Value	Unit
Max. temperature, long-term at max. operating pressure	50	°C
Max. temperature, for 15 min at max. 2 bar	100	°C
Minimum temperature	-10	°C

PC liquid end

Data	Value	Unit
Max. temperature long-term at max. operating pressure	45	°C
Max. temperature for 15 min at max. 2 bar	60	°C
Minimum temperature	-10	°C

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
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

Data	Value	Unit
Maximum air humidity*:	95	% relative humidity

\*non-condensing

## 16.5.4 Degree of Protection and Safety Requirements

### Degree of protection

Protection against contact and humidity:

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



*A CAN plug or the supplied sealing cap must always be plugged into the CAN port for the HMI.*

### Safety Requirements

Degree of protection:

1 - mains power 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 do not relate to the motor, but the pump, which is connected as a whole unit.*

*For the motor electrical data use the motor data sheet in the appendix.*

### Electrical data S3Cb pump

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

Data	Value	Unit
Capacity	420	W
Max. starting current	8.5	A

#### Electrical data at 100 V

Data	Value	Unit
Effective current	8.3	A
Switch on peak current, (for approx. 100 ms)	4	A

#### Electrical data at 230 V

Data	Value	Unit
Effective current	3.4	A
Switch on peak current, (for approx. 100 ms)	8	A

Tab. 13: Fuses

Fuse	Value	Order No.
Fuse, internal	10 AT - (1.5 kA)	733855



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

## 16.8 Diaphragm rupture sensor

### Contact (standard)

Tab. 14: 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 19234, potential-free design.

Data	Value	Unit
Rated voltage *	8	VDC
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 Relay



*The technical data for the relay are contained in the chapter "Installation, electrical".*

## 16.10 Gear oil

Manufacturer	Name	Viscosity class (ISO 3442)	Order No.	Quantity	Quantity, required
Mobil	Mobil Gear 634 *	VG 460	1004542	1.0 l	0.9 l

\* or comparative gear oil

## 16.11 Sound pressure level

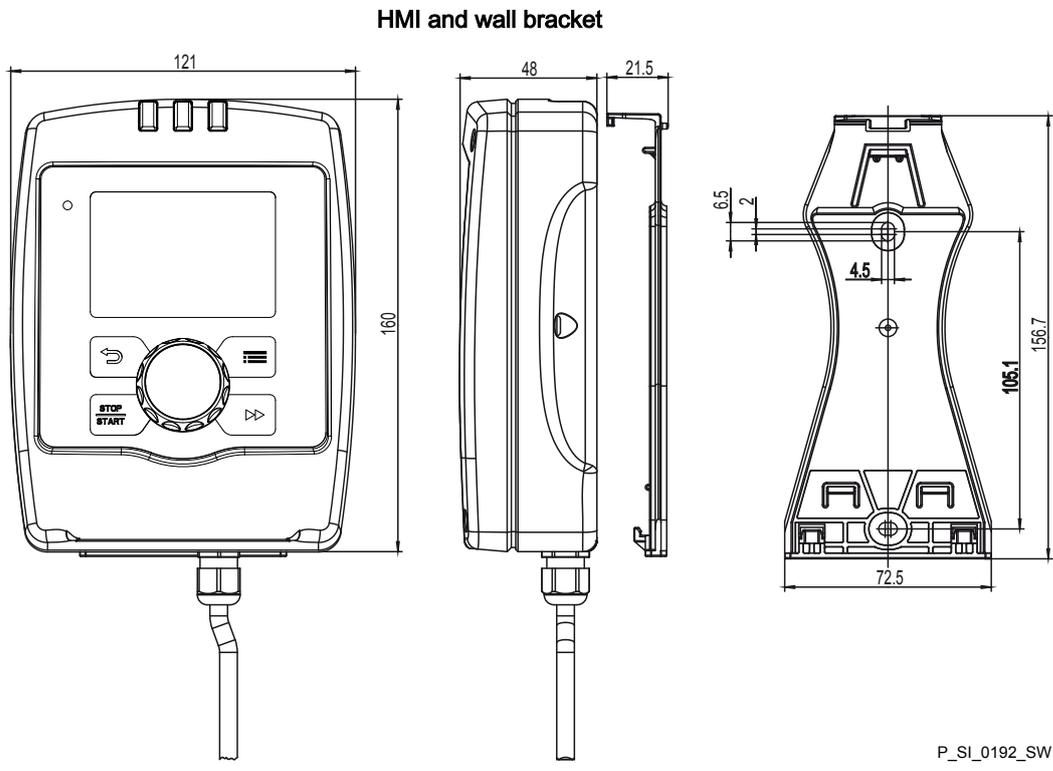
### Sound pressure level

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

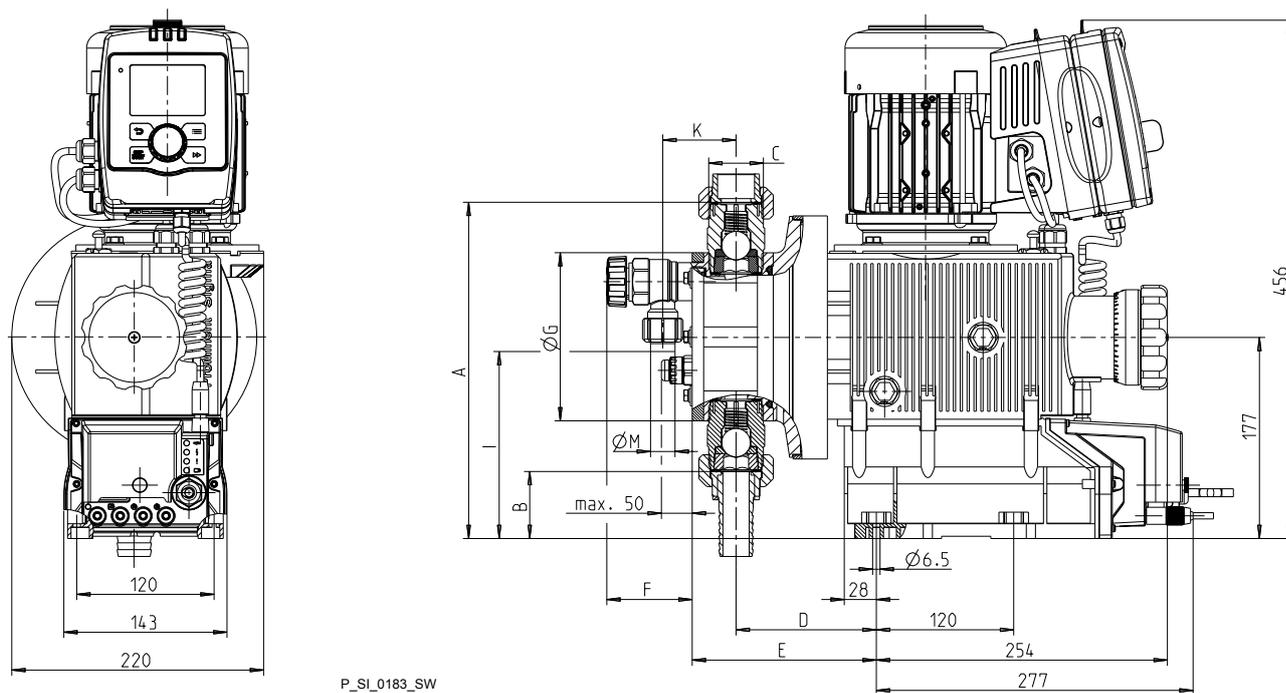
**i** - Compare the dimensions on the dimension sheet and pump.  
- All dimensions are in mm.



P\_SI\_0192\_SW

Fig. 42: Dimensions in mm

Sigma X Control type – Sigma/ 3 - S3Cb



P\_SI\_0183\_SW

Fig. 43: Representation is not strictly binding - dimensions in mm

Type	Conne- ction	A	B	C	D	E	F	ØG	I1 *	I2 *	K
120145, 120190, 120270 PVT	DN 25	296	59	G1 1/2 M	123	161	75	156	140	166	64
120145, 120190, 120270 SST	DN 25	296	60	G1 1/2 M	123	153	88	162	147	-	60
070410, 070580, 040830 PVT	DN 32	327	29	G2 M	129	175	112	206	109	160	85
070410, 070580, 040830 PPT, PCT	DN 32	327	29	G2 M	129	175	112	217	109	160	85
070410, 070580, 040830 SST	DN 32	330	26	G2 M	129	162	120	217	146	-	70

\* I1: Hose nozzle; I2: Insert

Tab. 15: Dimensions M - Bleed valve

	Union nut + hose nozzle	Union nut + insert	Standard
	ØM	ØM	M
DN10-PVA/PVE	16	21.4	G3/4 M
DN10-SSA/SSE	16	-	G3/4 M

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## Dimensional drawings

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	Union nut + hose nozzle	Union nut + insert	Standard
	ØM	ØM	M
DN20-PVA/PVE	25	35.5	G1 1/4 M
DN20-SSA/SSE	25	-	G1

## 18 Motor data sheets

Motor Datenblatt / Motor data sheet / Fiche technique pour moteur					
<b>Bestell Nr.</b> order no. / no. de commande		<b>1040040</b>	<b>Hersteller</b> producer / producteur		<b>ATB</b> Mat.Nr. 570750
<b>Motor- Typ</b> motor type type du moteur	LF71/4C-11	<b>Leistungsfaktor</b> power factor facteur de puissance	0,74 0,76		
<b>Maschinenart</b> type of machine désignation	3-Ph. Motor	<b>Wirkungsgrad</b> efficiency rendement	73% 71%		
<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	IMV1	<b>Bemessungsdrehzahl</b> rated speed vitesse nominale	1400/1700	U/min rpm t/mn	
<b>Bemessungsleistung</b> rated output puissance nominale	0,55 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) 380-460/220-265 V (60 Hz)	<b>Anzugsstrom</b> starting current courant de démarrage	4,4	fach fold fois	
<b>Bemessungsstrom</b> rated current courant nominale	1,60/2,80 A 1,45/2,50 A	<b>Anzugsmoment</b> starting torque couple de démarrage	2,4	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	2,4	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	S3CbH _____ U ____				
Die Daten entsprechen den Angaben der Motorenhersteller. Kenndaten funktionsgleicher Motoren anderer Hersteller ändern sich nur unwesentlich. Angaben ohne Gewähr. The data correspond to the details given by the motor manufacturers. Ratings of motors with the same functions made by other producers show insignificant changes only. This information is supplied without liability. Les données techniques correspondent au descriptif du fabricant des moteurs. Les données techniques des moteurs similaires chez d' autres fabricants varient très peu. Données sont d' ordre général.					

ProMinent Dosiertechnik GmbH . 69123 Heidelberg . Germany Nr./No. MD-1040040

Datum/Date Juni 2012

ProMinent®

# 19 Liquid ends for Sigma/ 3

Liquid end for Sigma/ 3 330 PVT

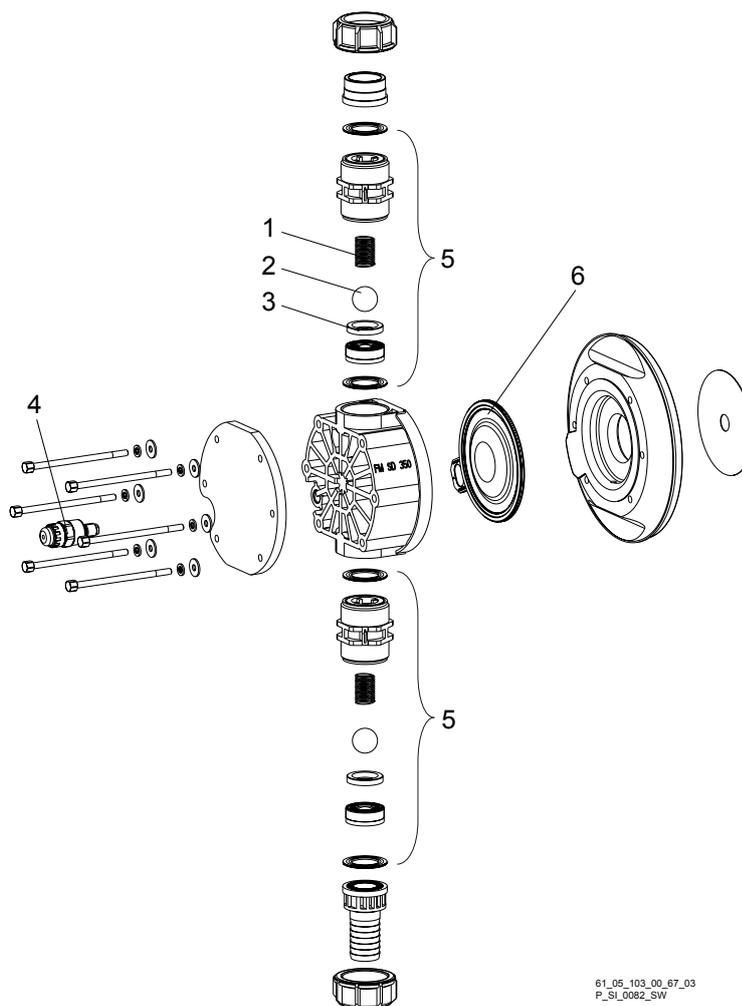


Fig. 44: Liquid end for Sigma/ 3 330 PVT

Pos.	Description
1	Spring *
2	Ball
3	Ball seat
4	Diaphragm rupture sensor, optical *
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. 16: Order no. for liquid end for Sigma/ 3, 330-DN 25 PVT

Spare part	Type 120145, 120190, 120270
Liquid end	1029585
Spare parts kit	1035951

Spare part	Type 120145, 120190, 120270
Diaphragm rupture sensor, optical	1033323
Valve	740615
Multi-layer diaphragm	1029604

Liquid end for Sigma/ 3 1000 PVT, PCT, PPT

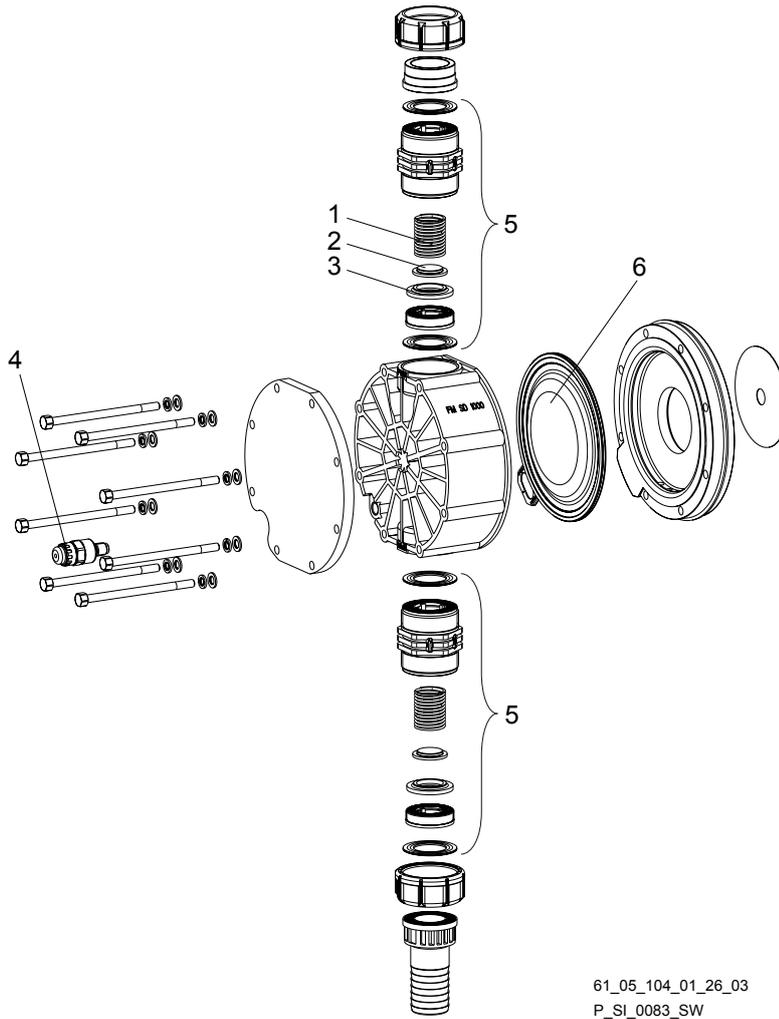


Fig. 45: Liquid end for Sigma/ 3 1000 PVT, PCT, PPT

Pos.	Description
1	Spring *
2	Ball
3	Ball seat
4	Diaphragm rupture sensor, optical *
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/ 3, 1000-DN 32 PVT

Spare part	Type 070410, 070580, 040830
Liquid end	1029578
Spare parts kit	1035951

Spare part	Type 070410, 070580, 040830
Diaphragm rupture sensor, optical	1033323
Valve	1002806
Multi-layer diaphragm	1029603

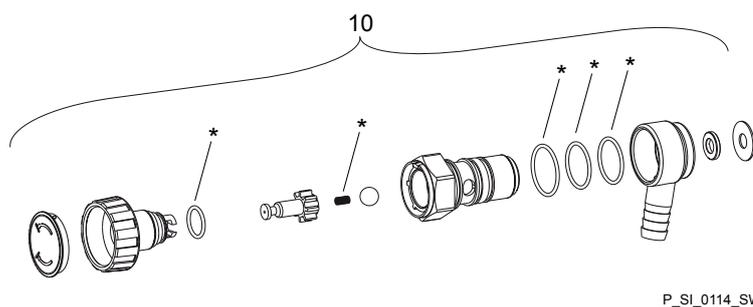
Tab. 18: Order no. for liquid end for Sigma/ 3, 1000-DN 32 PCT

Spare part	Type 070410, 070580, 040830
Liquid end	1034829
Spare parts kit	1035951
Diaphragm rupture sensor, optical	1033323
Valve	1002806
Multi-layer diaphragm	1029603

Tab. 19: Order no. for liquid end for Sigma/ 3, 1000-DN 32 PPT

Spare part	Type 070410, 070580, 040830
Liquid end	1034830
Spare parts kit	1035951
Diaphragm rupture sensor, optical	1033323
Valve	1002806
Multi-layer diaphragm	1029603

Sigma/ 3 PVT bleed valve



P\_SI\_0114\_SW

Fig. 46: Sigma/ 3 PVT bleed valve

Pos.	Description	Type 120145, 120190, 120270	Type 070410, 070590, 040830
10	Integrated bleed valve DN10 PVA	1041069	
10	Integrated bleed valve DN10 PVE	1041070	
10	Integrated bleed valve DN20 PVA		1041073

## Liquid ends for Sigma/ 3

Pos.	Description	Type 120145, 120190, 120270	Type 070410, 070590, 040830
10	Integrated bleed valve DN20 PVE		1041074

\* 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/ 3 PVT relief valve-A

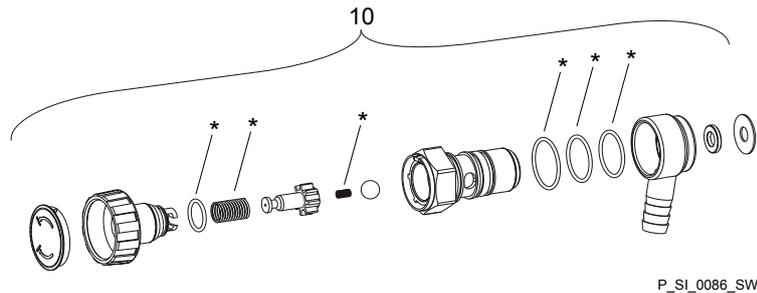


Fig. 47: Sigma/ 3 PVT relief valve-A

Pos.	Description	Type 120145, 120190, 120270, 120330	Type 070410, 070580	Type 040830, 041030
10	Relief valve, complete 10 bar PVA	1005626		
10	Relief valve, complete 7 bar PVA		1004801	
10	Relief valve, complete 4 bar PVA			1004778

\* 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 for Sigma/ 3 330 SST

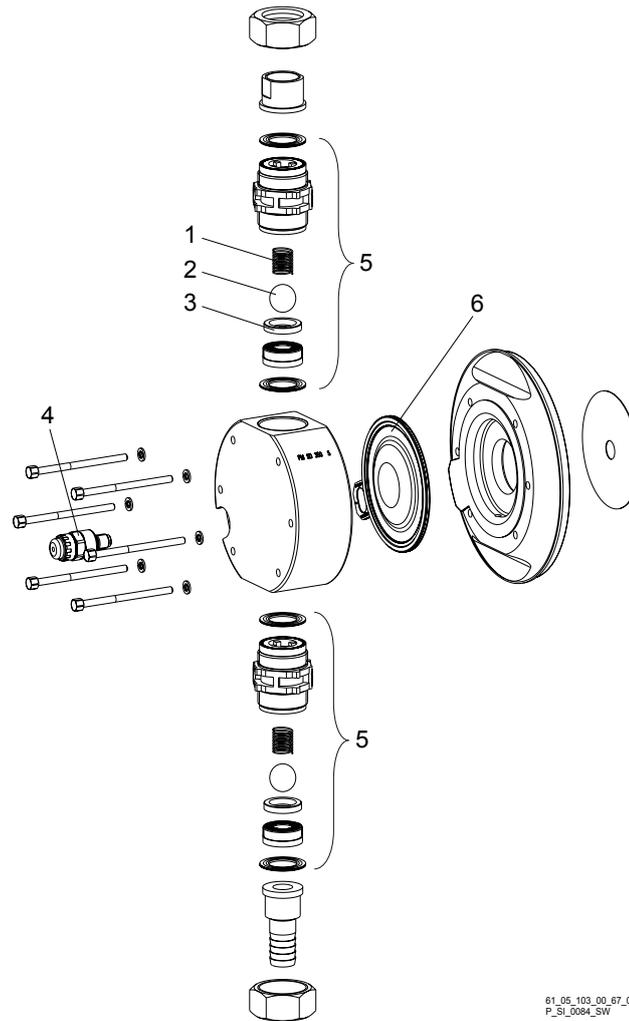


Fig. 48: Liquid end for Sigma/ 3 330 SST

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

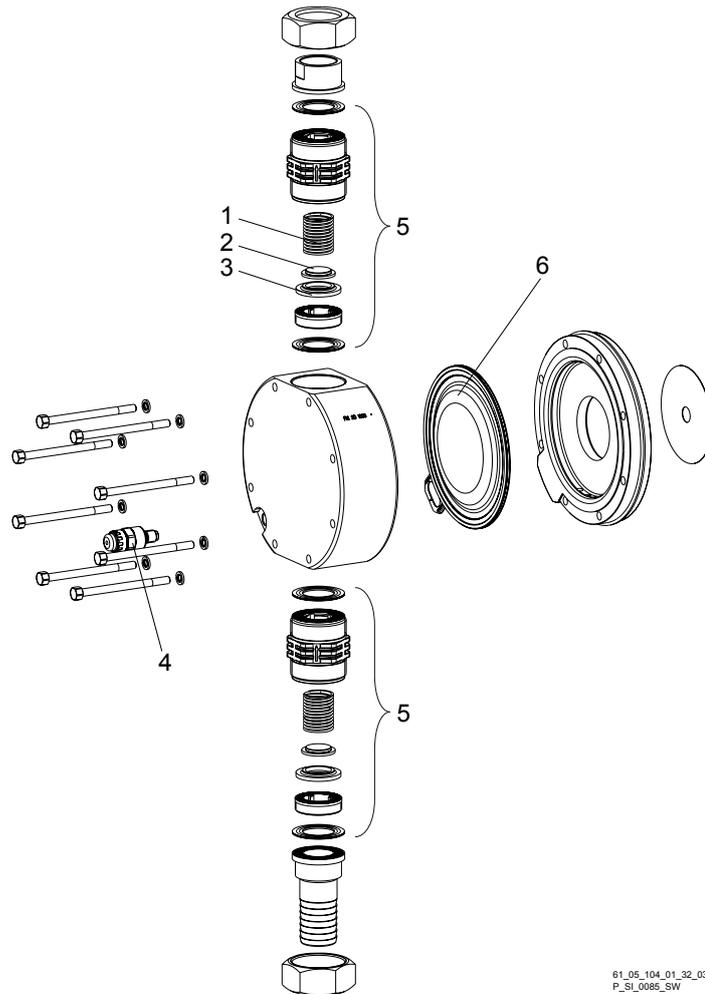
The items listed are included in the spare parts kit. \* Special accessories (not included in the spare parts kit). Technical changes reserved.

Tab. 20: Order no. for liquid end for Sigma/, 330-DN 25 SST

Spare part	Type 120145, 120190, 120270
Liquid end	1029586
Spare parts kit	1034679
Spare parts kit with 2 valves	1034680
Diaphragm rupture sensor, optical	1033323

Spare part	Type 120145, 120190, 120270
Valve	803708
Multi-layer diaphragm	1029604

Liquid end for Sigma/ 3 1000 SST



61\_05\_104\_01\_32\_03  
P\_SL\_0085\_SW

Fig. 49: Liquid end for Sigma/ 3 1000 SST

Pos.	Description
1	Spring *
2	Ball
3	Ball seat
4	Diaphragm rupture sensor, optical *
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. 21: Order no. for liquid end for Sigma/ , 1000-DN 32 SST

Spare part	Type 070410, 070580, 040830
Liquid end	1029587
Spare parts kit	1034682
Spare parts kit with 2 valves	1034683

Spare part	Type 070410, 070580, 040830
Diaphragm rupture sensor, optical	1033323
Valve	1002811
Multi-layer diaphragm	1029603

**Sigma/ 3 SST bleed valve**

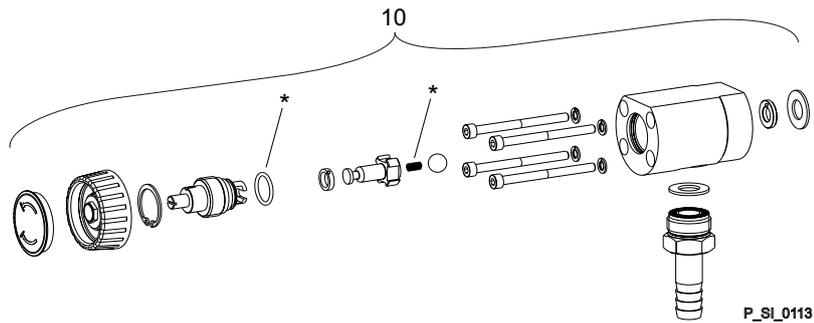


Fig. 50: Sigma/ 3 SST bleed valve

Pos.	Description	Type 120145, 120190, 120270	Type 070410, 070580, 040830
10	Integrated bleed valve DN10 SSA	1041071	
10	Integrated bleed valve DN10 SSE	1041072	
10	Integrated bleed valve DN20 SSA		1041075
10	Integrated bleed valve DN20 SSE		1041076

\* 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/ 3 SST relief valve-A**

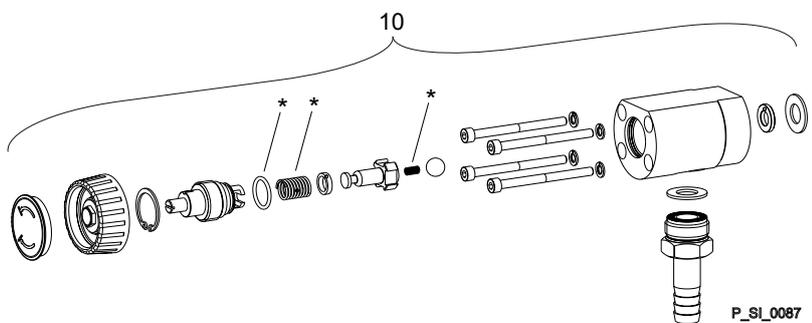


Fig. 51: Sigma/ 3 SST relief valve-A

Pos.	Description	Type 120145, 120190, 120270, 120330	Type 070410, 070580	Type 040830, 041030
10	Relief valve, complete 12 bar SSA	1005625		
10	Relief valve, complete 7 bar SSA		1005042	
10	Relief valve, complete 4 bar SSA			1005038

\* 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 Wear parts for S3Cb

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. 22: 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. 23: 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. 24: Spare parts kits PVT (liquid ends)

Liquid end	Types 120145, 120190, 120270
FM 330	1046478

Tab. 25: Spare parts kits SST (liquid ends)

Liquid end	Types 120145, 120190, 120270
FM 330	1046479
FM 330 with 2 complete valves	1046480

#### Wetted materials – only with the design "Physiological safety with regard to wetted materials"

Material version	Liquid end	Suction / pressure connector	Seals* / ball seat	Balls	Integrated bleed valve or relief valve
PVT	PVDF	PVDF	PTFE / PVDF	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

## 21 Diagrams for adjusting the capacity

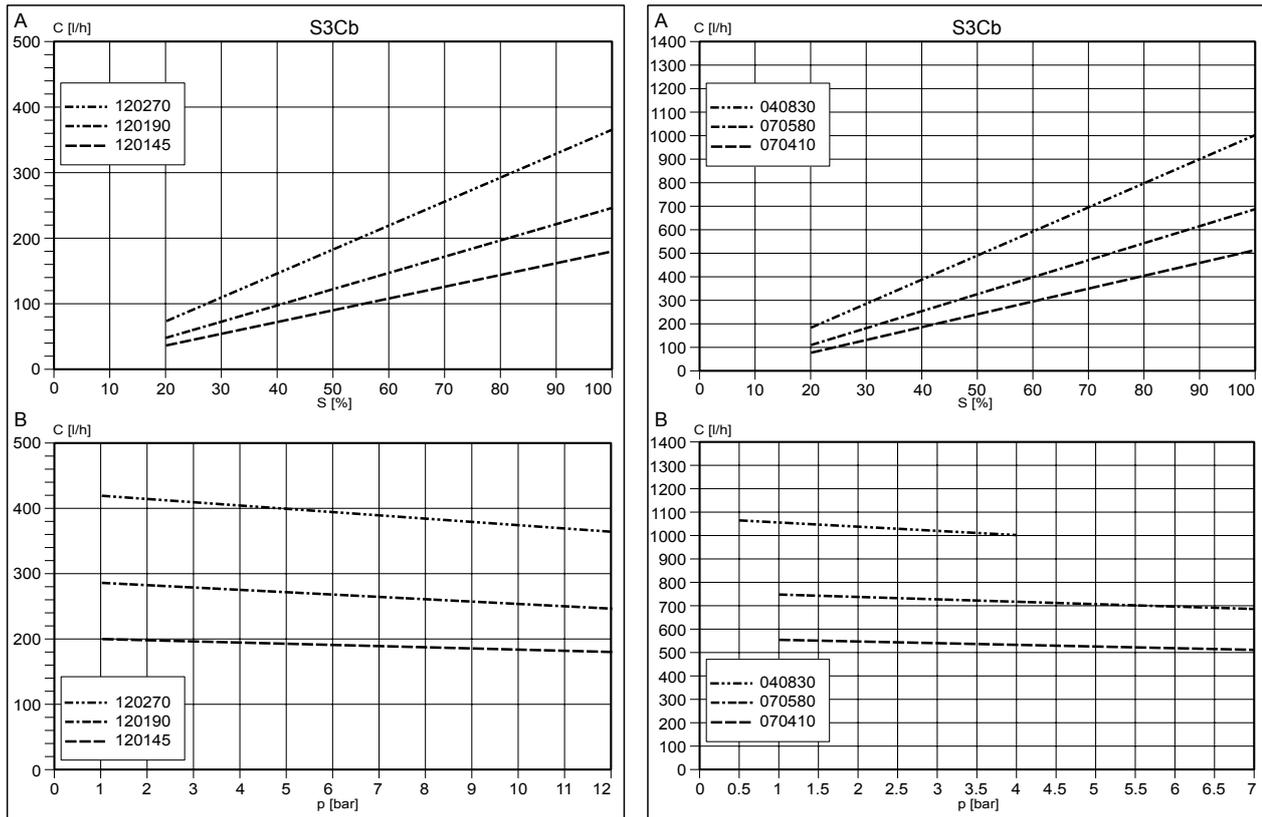


Fig. 52: A) Capacity C at maximum back pressure dependent on the stroke length s. B) Capacity C dependent on the back pressure p.

## 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 rules of the EC Directive, on the basis of its functional concept and design and in the version marketed by us.

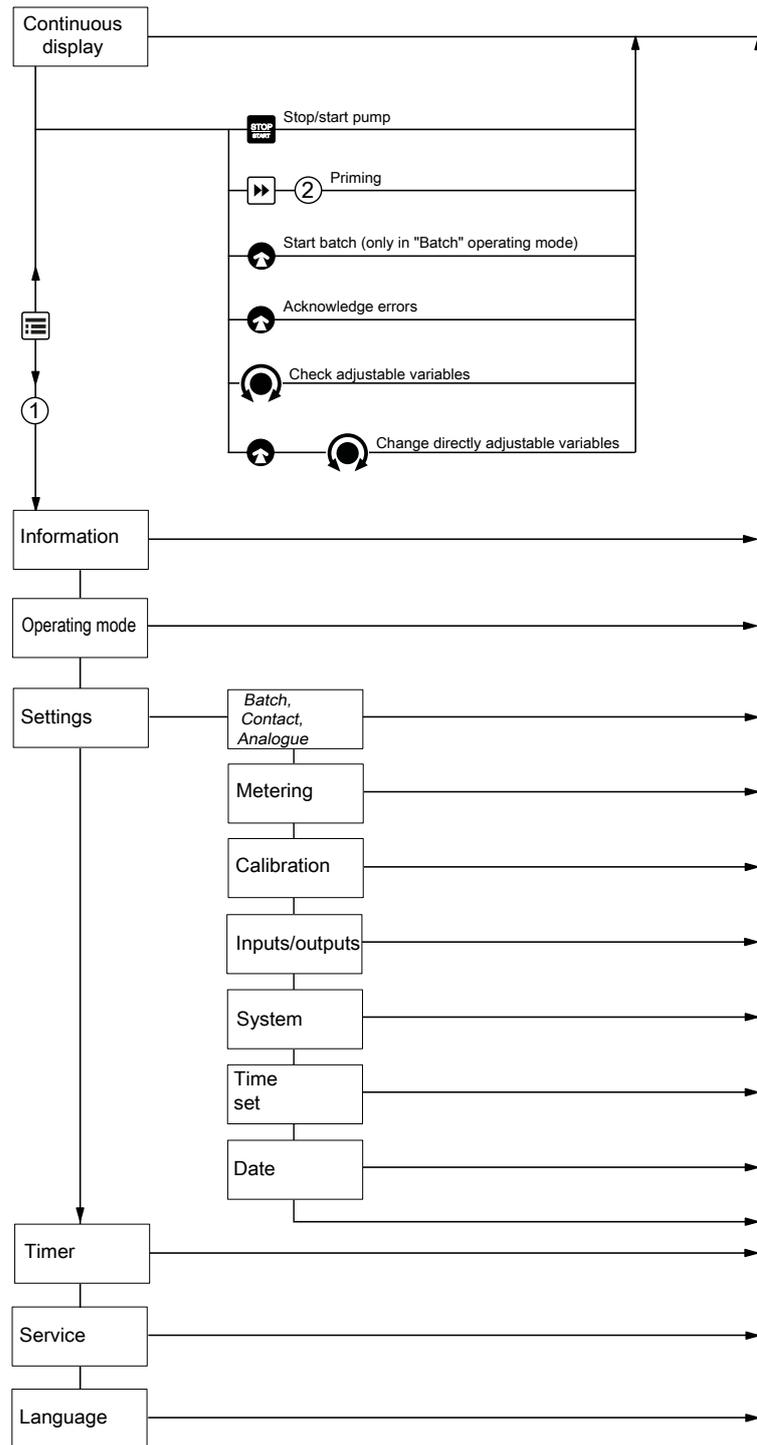
Any modification to the product not approved by us will invalidate this declaration.

Tab. 26: Excerpt from the Declaration of Conformity

Designation of the product:	Metering pump, Sigma product range
Product type:	S3Cb...
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

You can download the 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	...		

## Operating menu of Sigma X Control type, complete

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		

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				

---

## Operating menu of Sigma X Control type, complete

---

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 "Analyse"
Capacity	350 <sup>*</sup> <sub>h</sub>			350 <sup>*</sup> <sub>h</sub>
Stroke rate (h)	7200 <sub>h</sub>	7200 <sub>h</sub>	7200 <sub>h</sub>	7200 <sub>h</sub>
Stroke rate (min)	120 <sub>min</sub>	120 <sub>min</sub>	120 <sub>min</sub>	120 <sub>min</sub>
Factor		5 <sub>h/∞</sub>	5 <sub>h/∞</sub>	
Contact volume		1,250 <sub>∞/∞</sub> <sup>*</sup>	1,250 <sub>∞/∞</sub> <sup>*</sup>	
Trigger batch				
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 CB/h	7200 CB/h	7200 CB/h	7200 CB/h
Stroke rate (min)	120 CB/min	120 CB/min	120 CB/min	120 CB/min
Factor		5 CB/s	5 CB/s	
Remaining strokes			25,00 ↓ CB <sup>1</sup>	
Remaining litres			000, 833 ↓ L <sup>1</sup>	
Total number of strokes	86500 CB	86500 CB	86500 CB	86500 CB
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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