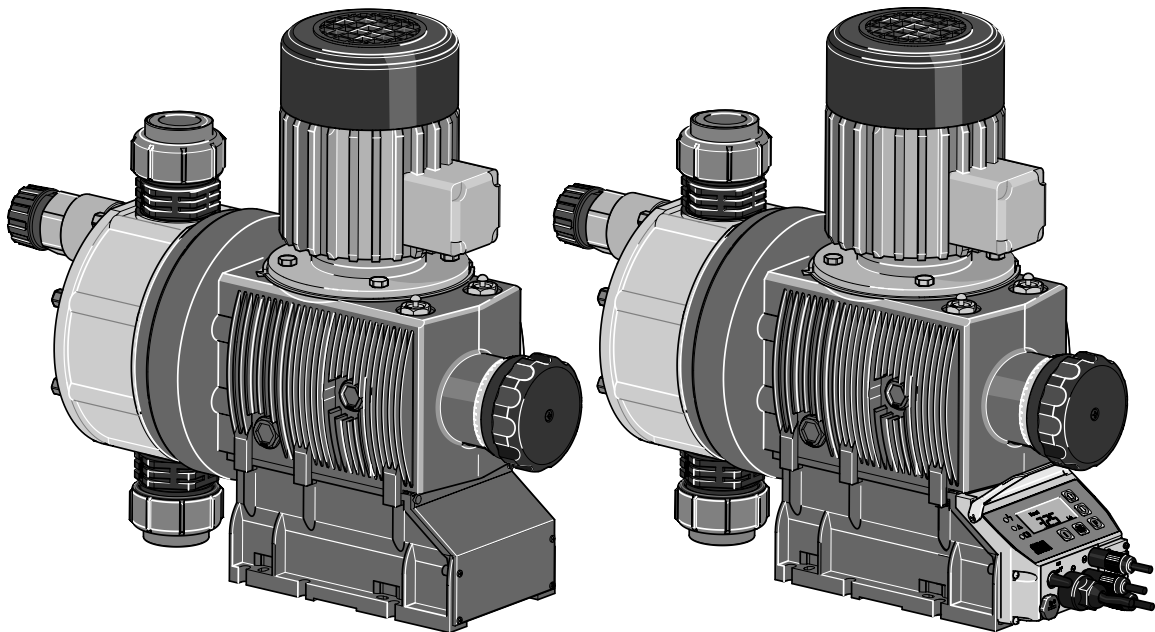


# Operating Instructions

Sigma/ 3

S3Ba (Basic Type)

S3Ca (Control Type)



S3Ba

S3Ca

S3Ca \_\_\_\_\_

S3Ca \_\_\_\_\_

Please enter the identcode of the device here.

Two sets of operating instructions are necessary to ensure the Sigma/ 3 S3Ba or S3Ca metering pumps are operated safely and reliably for their intended purpose:

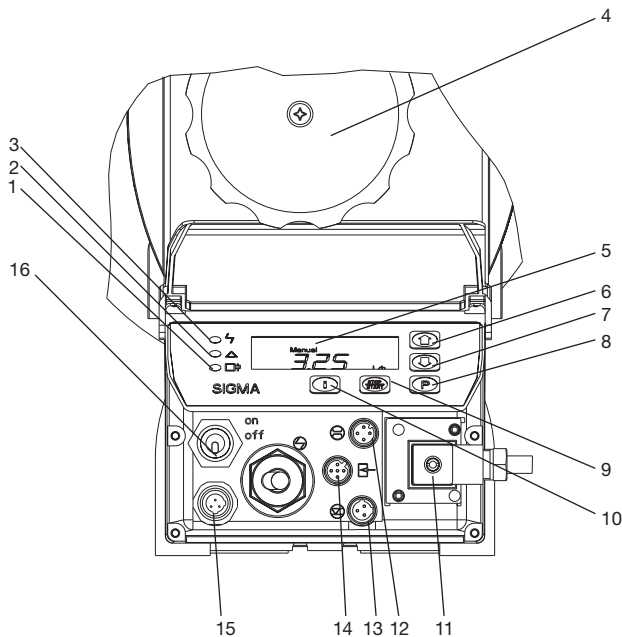
This product specific Sigma/ 3 operating instructions manual and the "General operating instructions ProMinent® motor-driven metering pumps and hydraulic accessories" are only valid if read together!

**Please completely read through these operating instructions first! · Do not discard!**

**The operator shall be liable for any damage caused by installation or operating errors!**

## Control elements and key functions

### Control elements: overview



- 1 Operating light (green)
- 2 Warning light (yellow)
- 3 Error warning light (red)
- 4 Stroke length adjuster
- 5 LCD display
- 6 UP key
- 7 DOWN key
- 8 P key
- 9 STOP/START key
- 10 i key
- 11 Relay output (optional)
- 12 Metering monitor socket
- 13 Float switch socket
- 14 External control socket
- 15 Diaphragm rupture indicator socket
- 16 Mains switch

### Key functions

#### In continuous display mode (operating)

#### In settings mode (settings)

##### STOP/START key



Press briefly

Stop pump,  
start pump

Stop pump,  
start pump

##### P key



Press briefly

Start batch (in "batch" operating mode only),  
Cancel error

Confirm entry- jump to next menu  
option or continuous display

Press for 2 s

Change to settings mode

---

Press for 3 s

---

Jump to continuous display

Press for 10 s

Software version displayed

---

Press for 15 s

Load factory settings (calibration)

---

##### i key



Press x1

Toggle between continuous displays

Toggle between "change individual digits"  
and change a figure"

Press x2

---

For "change individual digits":  
jumps to first digit

##### Arrow keys UP and DOWN



Press separately  
(until "Set" appears)

Change directly alterable values

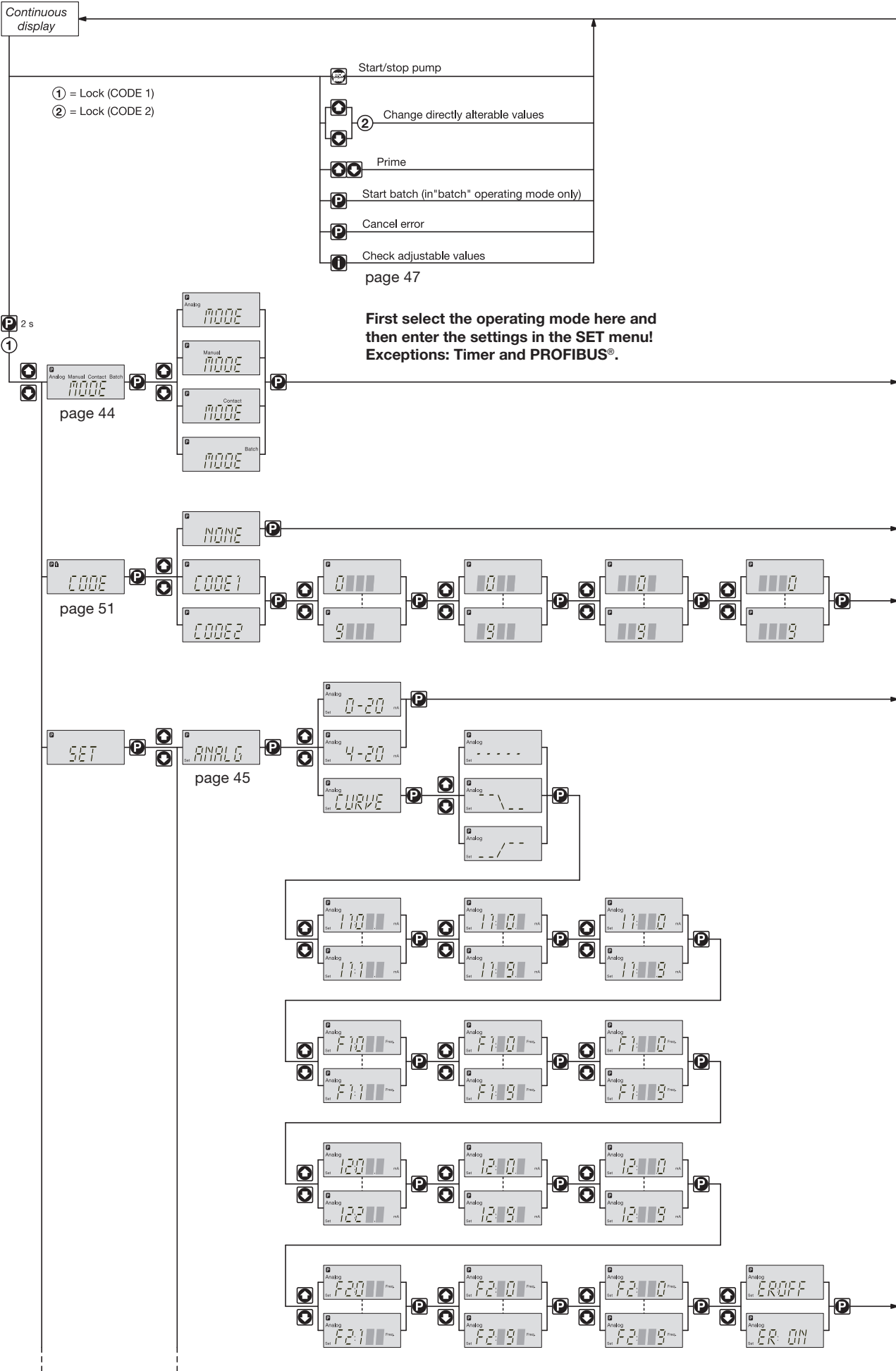
Select other settings,  
change individual digit or figure

Press simultaneously

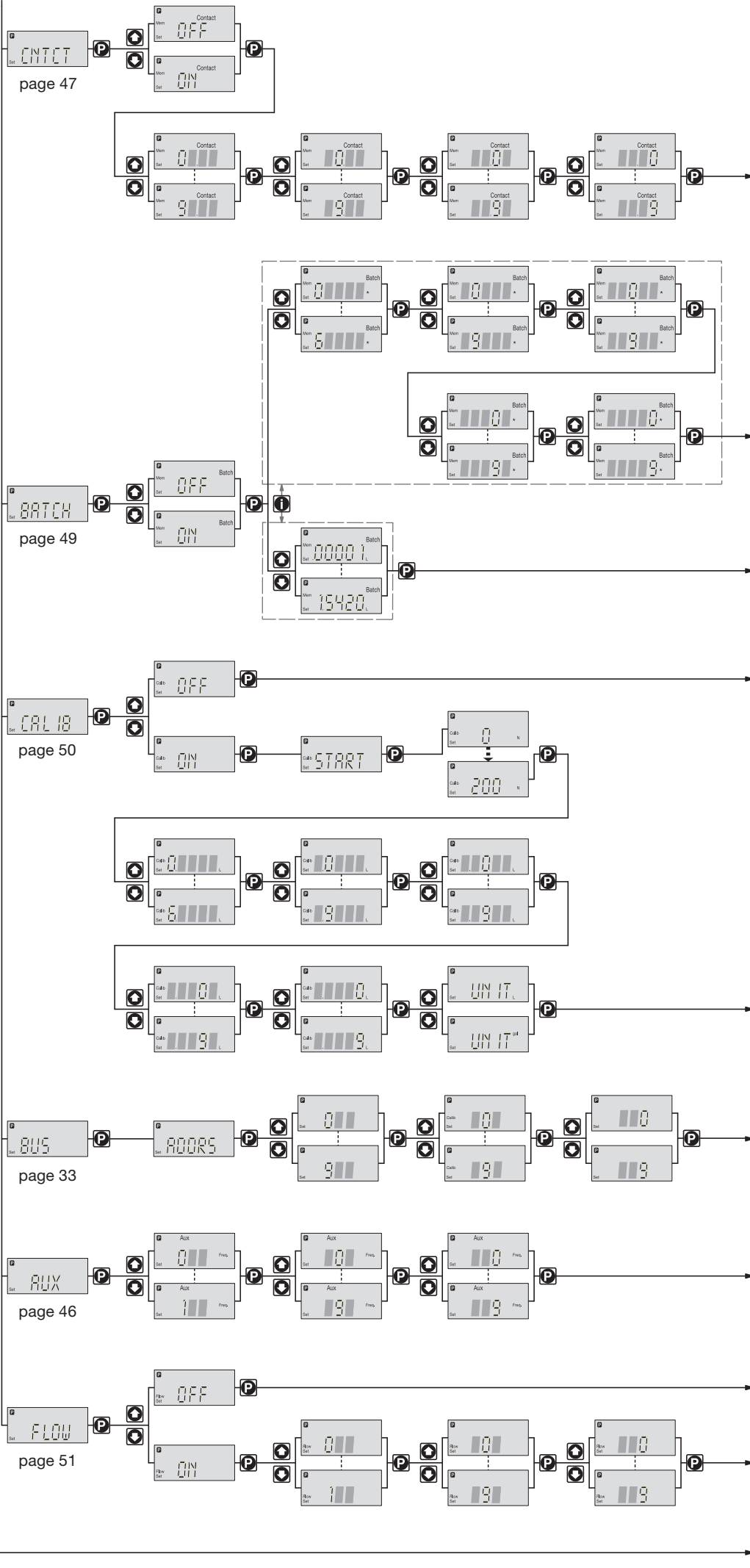
Prime (in "stroke rate" permanent display)

---

## Operating-/Settings Diagram



next page



Continuous display

<div>Continuous display</div>	Operating mode "Analog" 0-20 mA	Operating mode "Manual"	Operating mode "Contact" with memory and transfer factor 5	Operating mode "Batch" with memory and transfer factor 5
Stroke rate	<div><div>Stop Analog</div><div>180</div><div>Hz.</div></div>	<div><div>Stop Manual</div><div>180</div><div>Hz.</div></div>	<div><div>Stop Contact</div><div>180</div><div>Hz.</div></div>	<div><div>Stop Batch</div><div>180</div><div>Hz.</div></div>
Feed rate	<div><div>Stop Analog</div><div>750</div><div>L/h</div></div>	<div><div>Stop Manual</div><div>750</div><div>L/h</div></div>	<div><div>Stop Contact</div><div>356</div><div>N</div></div>	<div><div>Stop Batch</div><div>356</div><div>N</div></div>
Total stroke number	<div><div>Stop Analog</div><div>356</div><div>N</div></div>	<div><div>Stop Manual</div><div>356</div><div>N</div></div>	<div><div>Stop Contact</div><div>12368</div><div>L</div></div>	<div><div>Stop Batch</div><div>12368</div><div>L</div></div>
Total litres (feed quantity)	<div><div>Stop Analog</div><div>EXT</div><div></div></div>	<div><div>Stop Manual</div><div>EXT</div><div></div></div>	<div><div>Stop Contact</div><div>EXT</div><div></div></div>	<div><div>Stop Batch</div><div>EXT</div><div></div></div>
"External" display	<div><div>Stop Analog</div><div>200</div><div>mm</div></div>			
Signal current				
Strokes remaining				<div><div>Stop Batch</div><div>25</div><div>*N</div></div>
Batch size/ Litres remaining				<div><div>Stop Batch</div><div>00010</div><div>L</div></div>
Factor			<div><div>Stop Contact</div><div>500</div><div>*</div></div>	
Stroke length	<div><div>Stop Analog</div><div>65</div><div>mm</div></div>	<div><div>Stop Manual</div><div>65</div><div>N</div></div>	<div><div>Stop Contact</div><div>65</div><div>N</div></div>	<div><div>Stop Batch</div><div>65</div><div>N</div></div>

⬆⬆ = UP and/or DOWN arrow keys, directly alterable values

"Mem" appears only when "memory" function activated

### **Imprint**

Operating Instructions for Sigma/ 3 S3Ba/S3Ca  
© ProMinent Dosiertechnik GmbH, 2000

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Subject to technical modifications.

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## Identcode ordering system

Please enter the identcode on the device label into the grey box below.

S3Ba		Sigma Basic Type (S3Ba)	
	H	Main power end, diaphragm	
		<b>Pump type:</b> (Figures 1 + 2 = back pressure [bar], figures 3 - 5 = feed rate [l/h]): 120145* 12 bar; 145 l/h 120190* 12 bar; 190 l/h 120270* 12 bar; 270 l/h 120330* 12 bar; 330 l/h 070410 7 bar; 410 l/h 070580 7 bar; 580 l/h 040830 4 bar; 830 l/h 041030 4 bar; 1030 l/h *for PVDF max. 10 bar	
		PV	<b>Liquid end material:</b> PVDF
		SS	Stainless steel
		T	<b>Seal material:</b> PTFE seal
		0	<b>Positive displacement element:</b> Standard diaphragm, PTFE version
		1	With membrane rupture signalling (retrofitable)
		0	<b>Liquid end version:</b> No valve springs
		1	With 2 valve springs, Hastelloy C, 0.1 bar
		4	With bypass valve, FPM seal, no valve springs
		5	With bypass valve, FPM seal and valve springs
		0	<b>Hydraulic connector:</b> Standard threaded connector (as technical data)
		1	Union nut and PVC pipe connector insert
		2	Union nut and PP pipe connector insert
		3	Union nut and PVDF pipe connector insert
		4	Union nut and stainless steel pipe connector insert
		7	Union nut and PVDF tubing nozzle
		8	Union nut and stainless steel tubing nozzle
		0	<b>Version:</b> With ProMinent® logo (standard)
		1	Without ProMinent® logo
		M	Modified* <span style="float: right;">* order-related design, pump properties see order documents</span>
		S	<b>Power supply:</b> 3 ph, 230 V/400 V, 0.37 kW
		M	1 ph, 230 V, 0.55 kW
		N	1 ph, 115 V, 0.55 kW
		L	3 ph, 230 V/400 V, 0.37 kW, 50 Hz, (EExe, EExde)
		P	3 ph, 230 V/400 V, 0.37 kW, 60 Hz, (EExe, EExde)
		R	Variable speed stroke control motor, 3 ph, 230 V/400 V, 0.55 kW
		Z	Speed control, 1 ph, 230 V/400 V, 0.55 kW
		1	No motor, with B 14 flange, size 71 (DIN)
		2	No motor, with C 56 flange, (NEMA)
		3	No motor, B 5 flange, size 71 (DIN)
		0	<b>Enclosure rating:</b> IP 55
		1	Exe motor version ATEX-T3
		2	Exde motor version ATEX-T4
		A	Rive ATEX version
		0	<b>Stroke sensor:</b> No stroke sensor (standard)
		2	Pacing relay (read relay)
		3	Stroke sensor (Namura) for potentially hazardous area.
		0	<b>Stroke length adjustment:</b> Manual
		1	With stroke positioning motor, 230 V/50/60 Hz
		2	With stroke positioning motor, 115 V/50/60 Hz
		3	With stroke control motor 0...20 mA 230 V/50/60 Hz
		4	With stroke control motor 4...20 mA 230 V/50/60 Hz
		5	With stroke control motor 0...20 mA 115 V/50/60 Hz
		6	With stroke control motor 4...20 mA 115 V/50/60 Hz

S3Ba

FPM = Fluorine Rubber

## Identcode ordering system

Please enter the identcode on the device label into the grey box below.

S3Ca	Sigma Control Type (S3Ca)									
	H	Main drive, diaphragm								
		<b>Pump type:</b> (figures 1+2 = back pressure [bar], figures 3-5 = feed rate [l/h]): 120145* 12 bar; 174 l/h 120190* 12 bar; 228 l/h 120270* 12 bar; 324 l/h 070410 7 bar; 492 l/h 070580 7 bar; 696 l/h 040830 4 bar; 1000 l/h Note: 60 Hz performance data apply for S3Ca pump types (due to internal 60 Hz operation). * for PVDF max. 10 bar								
		PVT	<b>Liquid end material:</b> PVDF SST Stainless steel							
			0	<b>Positive displacement element:</b> Standard diaphragm, PTFE version						
			1	Double diaphragm with rupture indicator incorporating "Pump stopping" function						
			2	Double diaphragm with rupture indicator incorporating "Pump alarm" function						
			0	<b>Liquid end version:</b> No valve springs						
			1	With 2 valve springs, Hastelloy C 4: 0.1 bar (standard for DN 32)						
			4	With bypass valve, FPM seal, no valve springs						
			5	With bypass valve, FPM seal and valve springs (standard for DN 32)						
			0	<b>Hydraulic connector:</b> Standard threaded connector (as technical data)						
			1	Union nut and PVC insert						
			2	Union nut and PP insert						
			3	Union nut and PVDF insert						
			4	Union nut and stainless steel insert						
			7	Union nut and PVDF hose nozzle						
			8	Union nut and stainless steel hose nozzle						
			0	<b>Version:</b> With ProMinent® logo (standard)						
			1	Without ProMinent® logo						
			W	<b>Power supply:</b> 1 ph 115-230 V ±10 %, 50/60 Hz						
			A	<b>Lead and plug:</b> 2 m Europe						
			B	2 m Switzerland						
			C	2 m Australia						
			D	2 m USA						
			0	<b>Relay:</b> No relay						
			1	Fault indicating relay N/C						
			3	Fault indicating relay N/O						
			4	As 1 + pacing relay						
			5	As 3 + pacing relay						
			F	power relay N/C						
			G	power relay N/O						
			0	<b>Control variants:</b> Manual + external with pulse control						
			1	Manual + external with pulse control + analogue						
			4	as 0 + process-timer						
			5	as 1 + process-timer						
			P	PROFIBUS®						
			0	<b>Access code:</b> No access code						
			1	With access code						
			0	<b>Metering monitor:</b> Input with pulse evaluation						
			1	Input with continuous contact evaluation						
			0	<b>Stroke length adjustment:</b> Manual						
			C	Manual + calibration						

S3Ca

FPM = Fluorine Rubber

## 1 Notes on safety of ProMinent® metering pumps

### General user instructions

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

The following are highlighted in the text:

- Enumerations
- Instructions

Operating guidelines:

#### **NOTE**

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

and safety guidelines:



#### **WARNING**

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



#### **CAUTION**

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



#### **IMPORTANT**

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

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

Please give the order number and the serial number, which you will find on the nameplates of the pump itself, in the event of any query or spare part order. This facilitates identification of the pump.

EX-pump only: The nameplates affixed to the title page are identical to those on the pump supplied to enable clear identification on the correct operating instruction manual for the pump

## 1.1 General notes



### WARNING

- Only EX pump: Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!
- The equipment/devices may only be used for their intended purpose.
- ProMinent® metering pumps must not be assembled with parts which are not tested and recommended by ProMinent otherwise this can lead to injury to persons and damage to property for which no liability will be accepted!
- Pumps must be accessible at all times to facilitate operation and maintenance. Access points must not be obstructed or blocked!
- Before carrying out any maintenance and repair work always drain off and flush out the liquid end first if hazardous or unknown metered media are used!
- When metering hazardous or unknown liquids, always wear safety clothing (safety goggles, gloves, ...) when working on the liquid end!
- You must observe the guidelines in this operating instructions manual and the “General operating instructions manual for ProMinent® motor-driven metering pumps and hydraulic accessories” on assembly, installation and maintenance!

## 1.2 Notes on installation, start-up and operation



### WARNING

- Only EX pump: Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!
- The metering pump can contain water residue in the liquid end as the result of testing at the factory!

If handling media which must not come in contact with water, all traces of water must be removed from the liquid end before start-up! For this purpose, turn the pump through 180° and drain off the liquid end then flush with a suitable medium from above via the intake connection!

- Do not connect mains voltage to the control cable!
- When operating the metering pump against a closed shut-off element on the pressure side or in the event of pressure peaks during the metering stroke, the system pressure can reach a multiple of the maximum permissible operating pressure that can consequently cause the pressure line to burst!  
To avoid this situation, an overflow is recommended for the purpose of limiting the maximum permissible operating pressure of the pump or system.
- Do not connect a metal bypass line to the overflow valve on the PVT delivery unit! This could cause cracks in the delivery unit!
- There must be no metered medium applied at the overflow valve of the delivery unit in the bypass line!  
The overflow valve may leak or parts of it may be corroded.  
Therefore, always install the bypass line with a downward slope and also fit the hose socket facing downward (see illustration)!

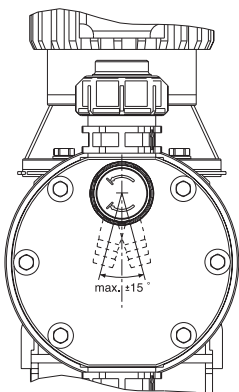


Fig. 1



### IMPORTANT

- Set stroke length only with pump in operation!
- Pull the red plug for venting the gear unit during initial operation of the Sigma/ 3 metering pump (refer to Fig. 1, item 10)!

**NOTE**

- The pump must be secured in such a way that no vibrations can occur! The valves of the liquid end must always be positioned vertically in order to ensure trouble-free operation!
- The intake, pressure and bypass lines must always be installed in such a way as to ensure the connection at the liquid end is free of tension.

The lines must be secured such that no vibrations can occur!

- Only use the clamping rings and hose sockets intended for the relevant hose diameter as well as original hoses with the specified hose dimensions and wall thickness otherwise the stability and durability of the connection will not be guaranteed!

Avoid reducing hose sizes!

Observe the permissible pressure of the hoses!

The pump is supplied with moulded composite seals, which are used for the pump connections. They seal the connections between grooved pump valves and the grooved inserts from ProMinent (Fig. 2).

If one of the two components is not grooved, however, (e.g. non-ProMinent part), use one of the flat seals supplied in this seal set (Fig. 3). This will prevent any leakage which could otherwise occur.

- A vent with return to the supply tank is advisable when metering extremely aggressive or hazardous media!

In addition, a shut-off valve should be provided on the delivery or intake side!

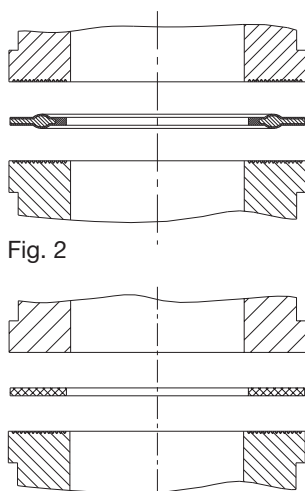


Fig. 2

Fig. 3

### 1.3 Notes on maintenance and repair

**WARNING**

- Only EX pump: Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!
- Only send the equipment for repair or maintenance in a cleaned condition and with the liquid end flushed. However, should any safety precautions be necessary even after careful draining and cleaning of the equipment, the required information must be listed in the Safety Declaration!  
The Safety Declaration forms part of the inspection/repair contract.
- Maintenance or repair work will only be carried out if a Safety Declaration - correctly and fully completed by an authorised and qualified member of the Operator's staff - is available.
- A copy of the form is included in the “General operating instructions for ProMinent motor-driven dosing pumps and hydraulic accessories” or can be downloaded at [www.prominent.com](http://www.prominent.com).
- Only specially trained and authorized persons are permitted to carry out maintenance on metering pumps and their periphery!
- If hazardous or unknown metering media are used, always flush out the liquid end first before carrying out any maintenance and repair work!
- When metering hazardous or unknown liquids, always wear safety clothing (safety goggles, gloves, ...) when working on the liquid end!
- Always depressurize the delivery line first before carrying out any work on the pump!  
Always discharge and flush liquid end! Observe safety data sheets for metered liquid!
- Disconnect power plug or power supply line before opening the plug!  
Isolate relay option if applicable!  
Check to ensure power is disconnected!  
Secure pump while carrying out repairs to ensure it cannot be switched on unintentionally!
- Pumps for metering radioactive media must not be shipped through standard channels!

**NOTE**

The metering pump must be in a cleaned condition with the liquid end flushed if returned for repair!

## 2 Product description S3Ba/S3Ca

### Use for intended purpose

- The pump is designed as a liquid medium metering pump; it serves the purpose of metering liquid medium within the specified line system!
- In explosion-threatened workplaces in zone 1, device category II 2G of explosion group II C the pump may not be operated without the corresponding rating plate (and the corresponding EC conformity declaration) for pumps for explosion-threatened workplaces in accordance with guideline 94/9/EC of the European guidelines.
- From July 1st, 2003 on, only pumps with the corresponding marking according to EC-Ex-directive 94/9 may be used in industrial premises with potentially explosive atmospheres. The explosion group, category and type of protection shown on the marking must correspond to or exceed the conditions prevailing in the intended area of application.
- Operate the pump only within the conditions described in the technical data!
- General restrictions with regard to viscosity limits, chemical resistance and density must be observed (refer to ProMinent chemical resistance list (equipment catalogue or [www.prominent.com](http://www.prominent.com)))!
- All other applications or conversion are prohibited!
- The pump is not designed to meter gaseous media as well as solids.
- The pump is not suitable for metering combustible liquids!
- Pumps may never be operated in explosion-threatened workplaces without a corresponding rating plate (and the corresponding EC conformity declaration) for pumps for explosion-threatened workplaces.
- Only specifically trained and authorized personnel are permitted to operate the pump!
- You are obliged to observe the data in the operating instructions on the various life phases of the device!

### 2.1 Identification of pump type

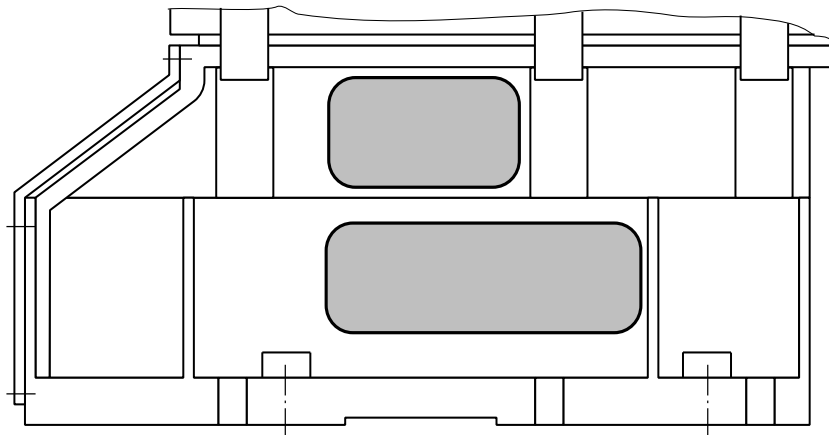


Fig. 4

The identcode and serial number are given in addition to the standard technical specifications. These two numbers must always be quoted when making any enquiries as they enable distinct identification of the type of metering pump.

## 2.2 Design/Functional description

### 2.2.1 Functional description, drive

The ProMinent® Sigma/ 3 diaphragm-type metering pump is an oscillatory displacement pump with the stroke length adjustable in steps of 0.5%. It is driven by electric motor (1). The rotary drive of the electric motor is stepped down by worm gear and transmitted via the eccentric roller (3) to the push rod (4) connected to fork (8) and converted into oscillatory movement. Return spring (5) presses the fork with push rod positively against the eccentric roller thus producing the return stroke. The stroke is adjusted by means of stroke adjustment knob (6) and spindle (7) by limiting the return stroke. Stroke movement is transmitted directly to the displacement diaphragm. Interacting with the valves, this diaphragm produces the overpressure and vacuum in the liquid end necessary for delivery. Flow is pulsating.

In the basic type, the electric motor is normally a 3-ph extended-range AC motor (refer to Section 3 for other options).

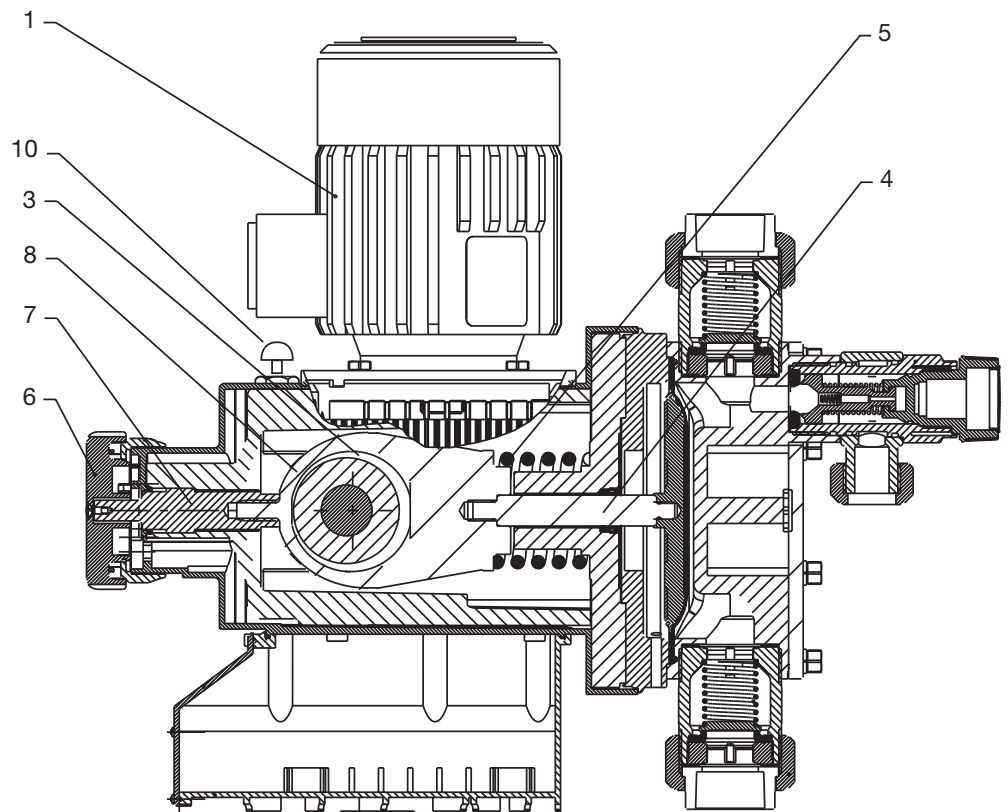


Fig. 5  
61\_01-101\_00\_11-01

### 2.2.2 Stroke movement

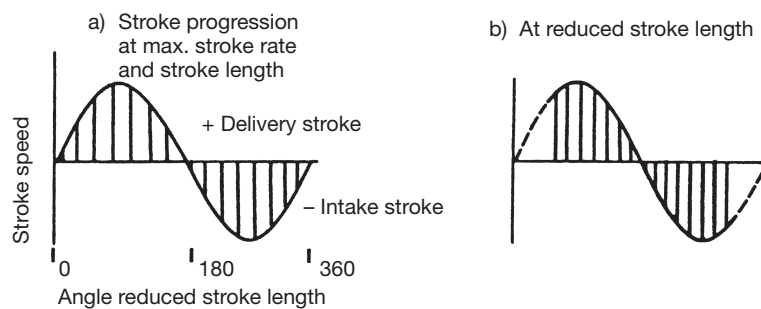


Fig. 6  
S3Ba/S3Ca-006-GB

Set stroke length dependent on the required delivery capacity.

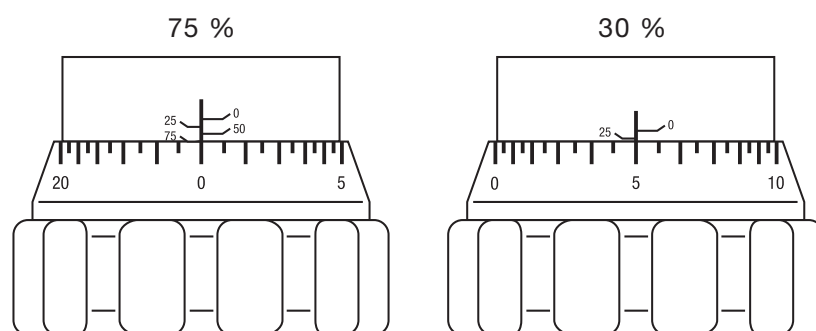


Fig. 7  
S3Ba/S3Ca-007-GB

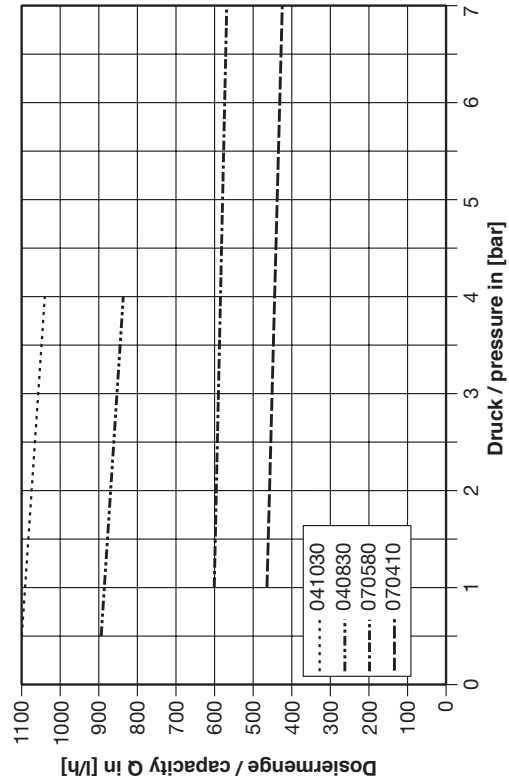
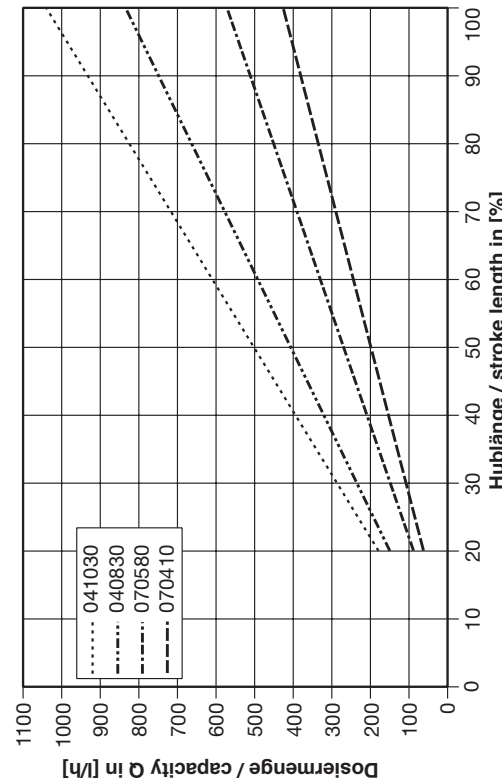
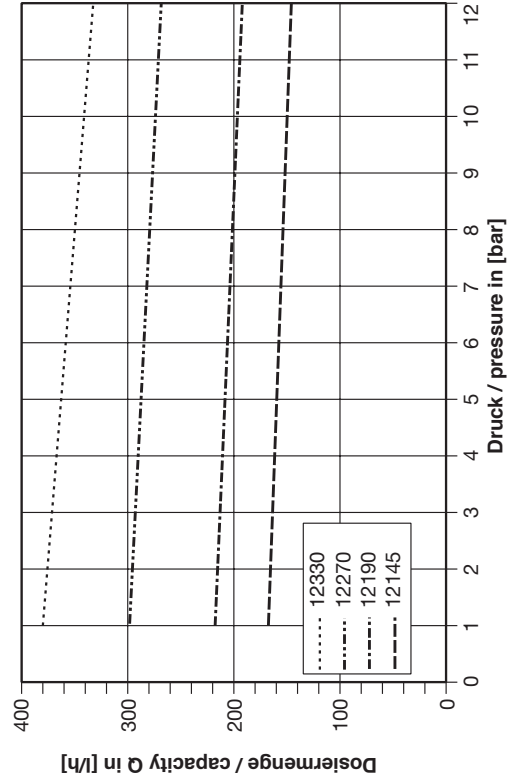
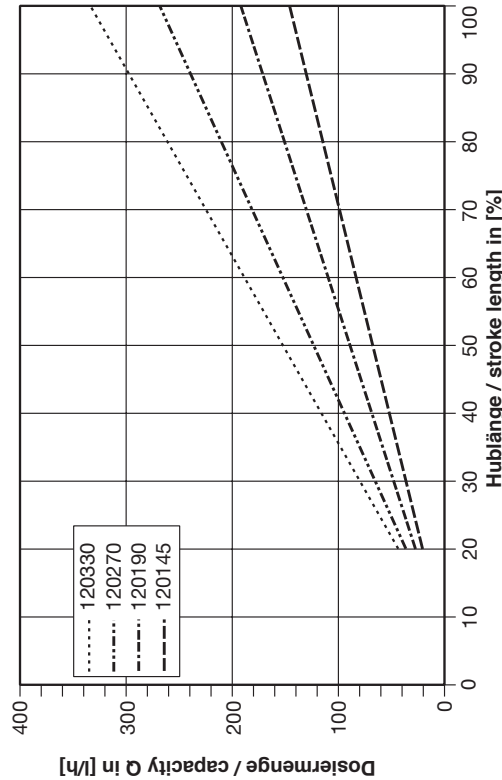
**NOTE**

- Select a stroke length as large as possible for viscous media!
- For outgassing media, please select a stroke length as large as possible!
- For a good mixing, please select a stroke length as large as possible!
- For a precise dosing at quantity-proportional dosing, do not adjust the stroke length below 20%!

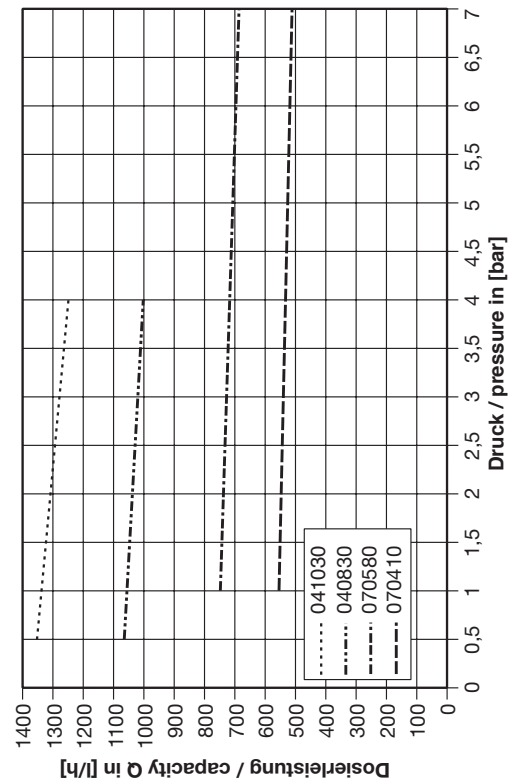
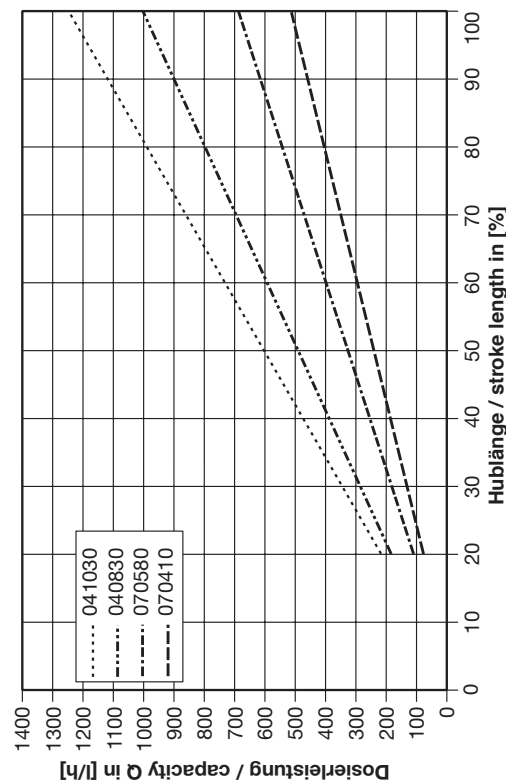
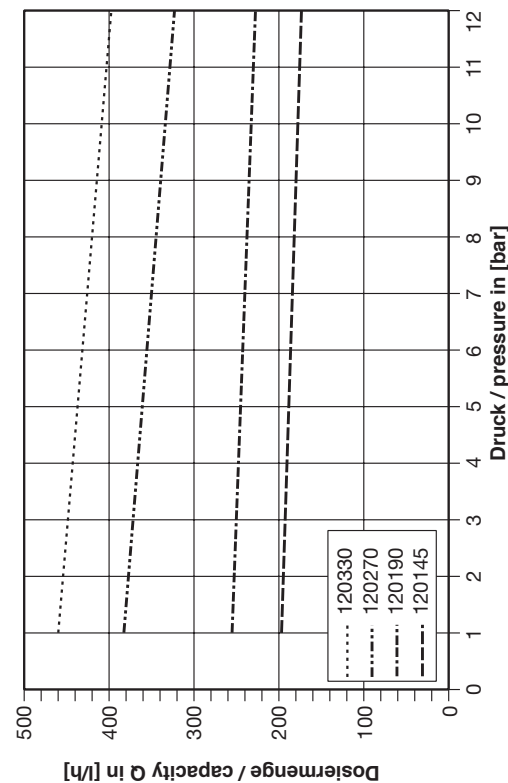
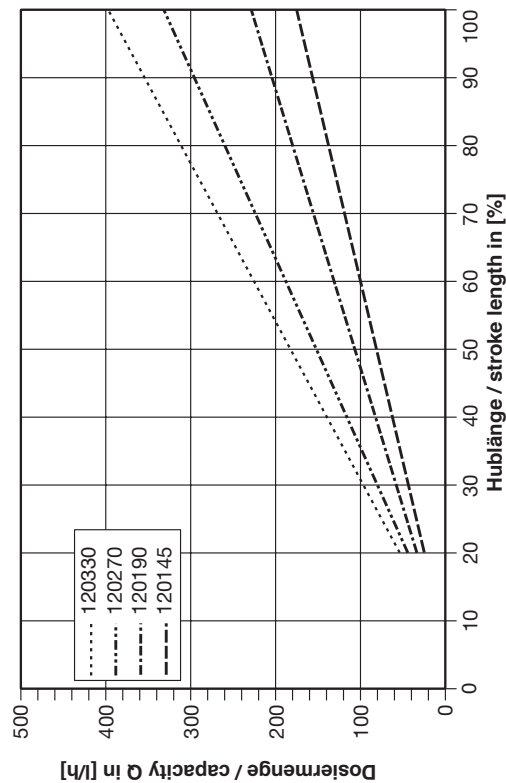


2.2.3 Metering capacity diagram

Performance diagrams Sigma 3 S3Ba at 50Hz



Performance diagrams Sigma 3S3Ba at 60Hz and S3Ca



## 2.2.4 Functional description, delivery unit

The heart of the delivery unit is the DEVELOPAN® metering diaphragm **(2)**. It hermetically seals the delivery chamber of liquid end **(4)** and produces a displacement in the liquid end. The end disc **(5)** made of chemically resistant plastic together with safety diaphragm **(13)** separates the drive housing from the delivery unit and protects the drive from corrosion in the event of the diaphragm failing. Delivery is based on the interaction between intake valve **(1)** and head valve **(3)** of the same design together with the diaphragm movement. The valve balls can be supported with springs for metering viscous media.

The connection dimensions of valves and liquid ends of the same size but with different materials are identical. These parts can be interchanged as required.

Materials and dimensions are specified in Section 3, Technical data.

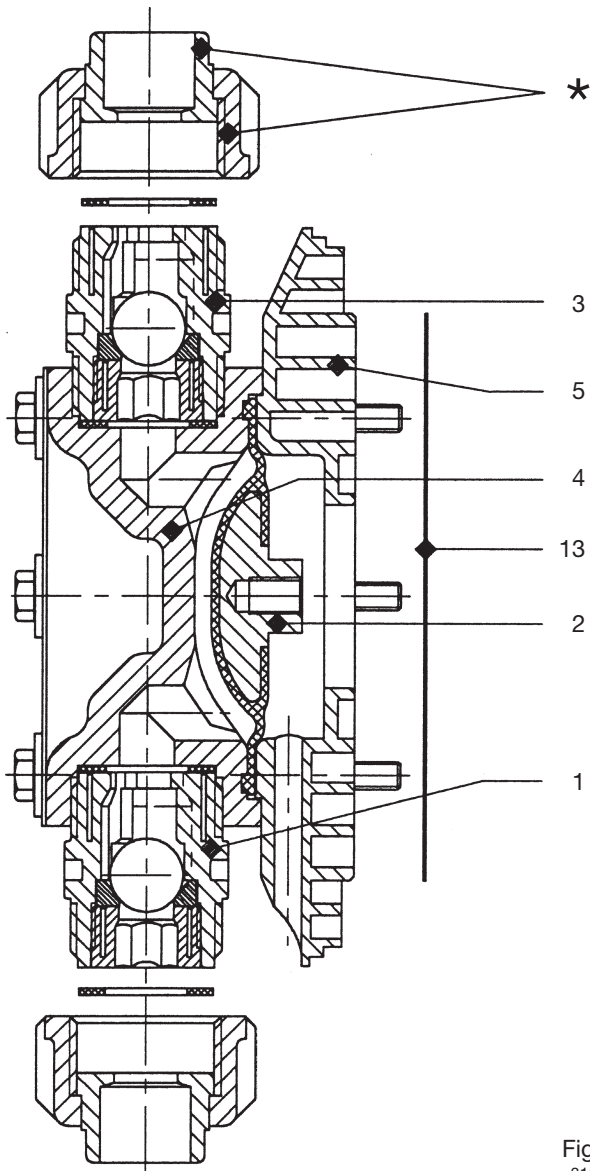


Fig. 8  
3154-4

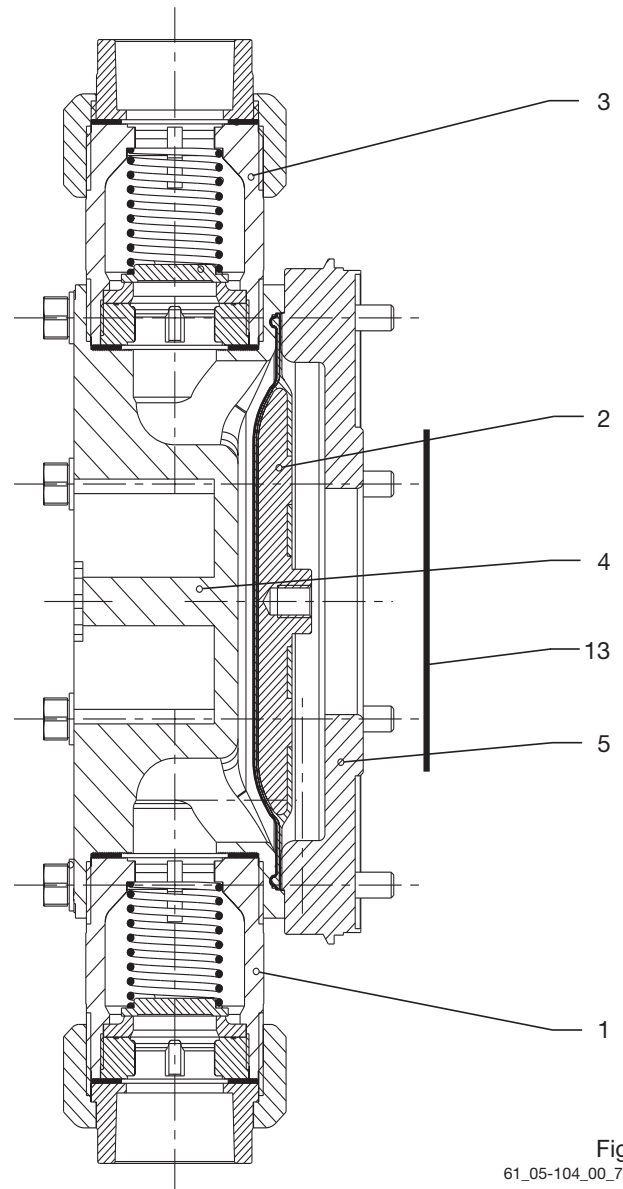


Fig. 9  
61\_05-104\_00\_72-03

## 2.2.5 Integrated overflow valve with bleeder function

### Task:

The task of the overflow valve is to protect the motor and gear unit against impermissible overpressure caused by the metering pump.

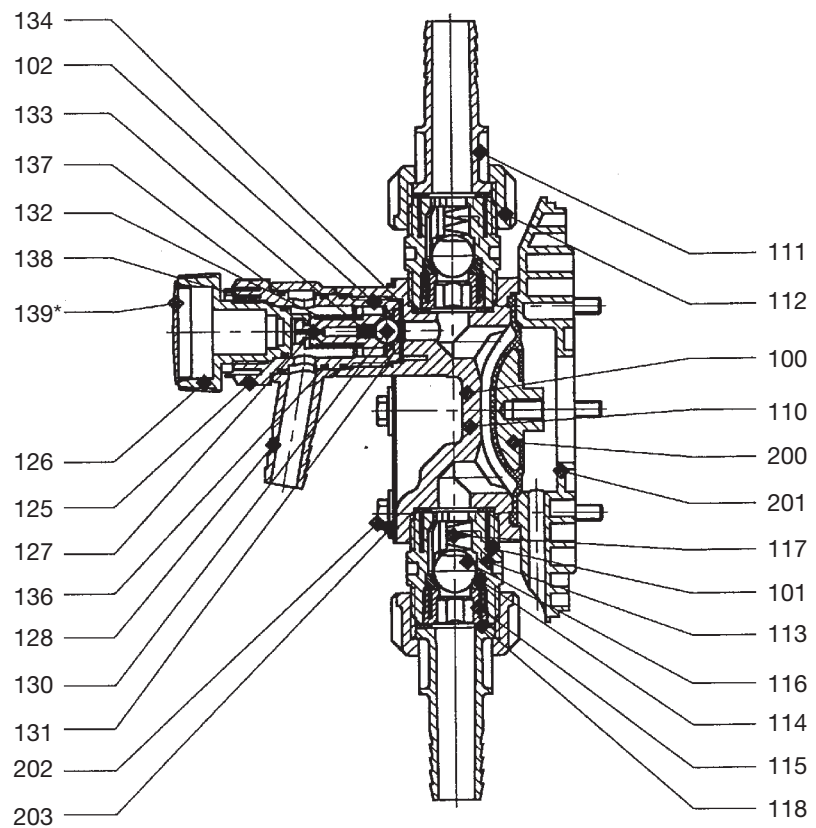
This function is produced by a spring-loaded ball.

A pressure relief mechanism for the bleeder function is provided.

### Design and functional description

(refer to Fig. No. 10 and 11)

Initially, the overflow valve illustrated under item 102 operates as a simple directly control safety valve. As soon as the pressure set with spring item 132 is exceeded, the effective pressure raises ball item 130. The liquid then flows off into the tank via hose connection item 128.



Delivery unit overflow valve Sigma/ 3, 10 bar PVT

Identity code type: 120145, 120190, 120270, 120330

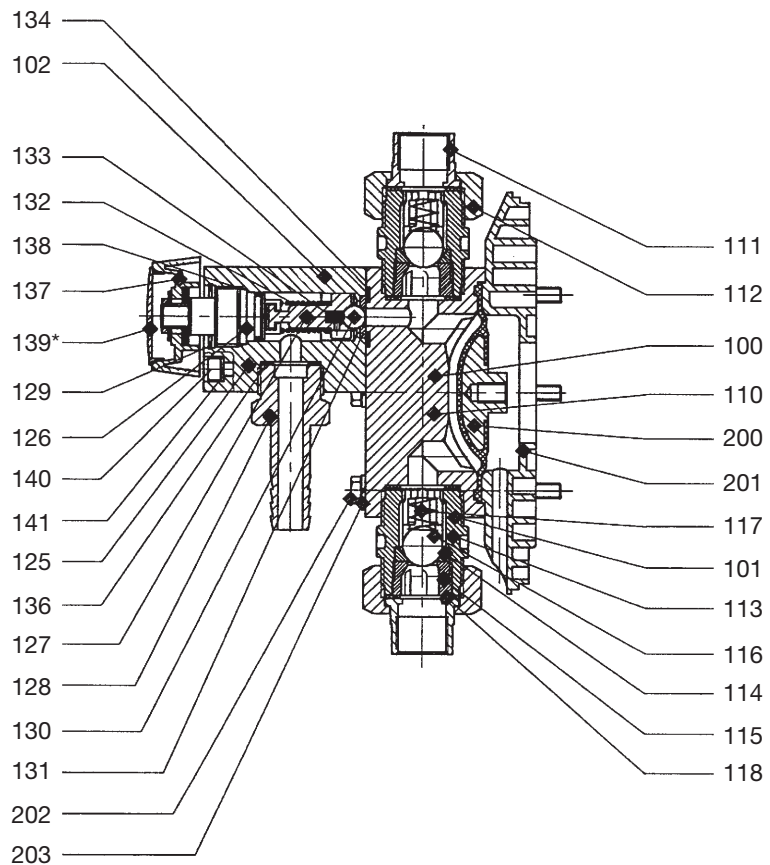
Delivery unit overflow valve Sigma/ 3, 4 bar PVT

Identity code type: 040830, 041030

Delivery unit overflow valve Sigma/ 3, 7 bar PVT

Identity code type: 070410, 070580

Fig. 10  
3160-4



Delivery unit overflow valve Sigma/ 3, 12 bar SST

Identity code type: 120145, 120190, 120270, 120330

Delivery unit overflow valve Sigma/ 3, 4 bar SST

Identity code type: 040830, 041030

Delivery unit overflow valve Sigma/ 3, 7 bar SST

Identity code type: 070410, 070580

Fig. 11  
3161-4



#### **WARNING**

**Only EX pump: Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!**



#### **IMPORTANT**

- Knob item 139 must be turned in clockwise direction as far as it will go “close”.
- The bypass line must always be closed and must be routed back into the supply tank. Connection via hose connection item 128.
- Minimal overflow can occur in the bypass line when the valve operates close to the overpressure function.

The bleeder function is achieved by turning knob item 139 in counterclockwise direction as far as it will go “open”: Priming aid for starting up pump against pressure. The force of spring item 132 relieves ball item 130 which is controlled by the lower spring force of bleeder spring item 133.



#### **IMPORTANT**

**Once the pump has primed, turn knob item 139 in clockwise direction as far as it will go “close”! The pump can now be placed into operation.**

#### Technical data

Corresponding to the type of pump, overflow valves are available for pressure stages  $p_{nom}$  4, 7, 10 and 12 bar with  $(1.05 \dots 1.15) \cdot p_{nom}$  opening pressure.

#### Material in contact with metered medium

Material	Suction/discharge connector Liquid end	DN 25 ball valves			DN 32 plate valves		Valve seats	Integrated relief valve
		Seals	Valve balls	Valve seats	Seals	Valve Plate/ Spring		
<b>PVT</b>	PVDF (Polyvinylidene fluoride)	PTFE	Glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE	PVDF/ FPM
<b>SST</b>	Stainless steel 1.4571/1.4404	PTFE	Stainless steel 1.4401	PTFE	PTFE	Stainless steel 1.4404/Hast.C	PTFE	Stainless steel/ FPM

FPM = Fluorine Rubber

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



#### IMPORTANT

- The overflow valve protects the metering pump against impermissible overpressure caused by the metering pump. It does not protect the system!
- The overflow valve may only be used for liquids having a viscosity of up to maximum 200 mPa s.
- The ceramic ball and ball seat of the overflow valve are wearing parts. Slight leakage can occur at the safety valve after a prolonged period of operation. The ball and ball seat should be replaced if leaks occur.
- The bypass line must always be connected and must be routed back into the supply tank.
- The pump must not be operated without the bypass line connected.
- The bypass line must not be connected in the intake line (the bleeder function will no longer be guaranteed). The bypass line must be routed back into the supply tank.



#### DANGER

When carrying out maintenance work on the overcurrent valve, pay attention to the tensioning state of the pressure spring item 132! Wear safety goggles!

### 2.2.6 Diaphragm rupture sensor

#### Function:

Monitors the seals in the working diaphragm. This liquid end can continue to function for a short period in emergency mode, i.e. full operating pressure, no leakage, even after diaphragm rupture.

#### Design and function description (see Fig. 12)

Liquid ends with diaphragm rupture sensors comprise a standard liquid end (item 100) a working diaphragm (item 200) and an auxiliary diaphragm (item 148) The auxiliary diaphragm is positioned between the back plate (item 201) and the interim plate (item 147) and forms a sealed compartment together with the working membrane (item 200).

The leak tightness of the working diaphragm, Item 200, is monitored with a diaphragm failure detector, Item 104, that triggers a contact signal in the event of diaphragm failure so that the pump is stopped in the S3Ca and the diaphragm failure is indicated on a LCD.

The liquid end can continue to operate in emergency mode, i.e. full operating pressure, no leakage, even after diaphragm rupture, until the diaphragm has been replaced. We offer two versions of the S3Ca with diaphragm rupture sensor:

- After a working diaphragm rupture, the pump stops and an „error“ message/diaphragm sensor signal is given.
- After a working diaphragm rupture, the pump will continue to run. An „error“ message/electrical signal is given.

A function plug is supplied which allows the pump to continue operating after a fault has occurred (diaphragm rupture, failure of the diaphragm rupture sensor).



#### WARNING

- **Only EX pump:** Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!



#### IMPORTANT

- In the case of the S3Ba, the customer should install a diaphragm rupture signal monitor and/or ensure that the pump will stop after a diaphragm rupture.
- In the event of diaphragm failure, a contact signal is triggered as from 2 bar system backpressure.
- Exact pump delivery can no longer be guaranteed after failure of the working diaphragm.
- The auxiliary diaphragm, Item 148, is a wearing part and must be replaced after failure of the working diaphragm. The diaphragm rupture sensor lens should be replaced after every diaphragm rupture.

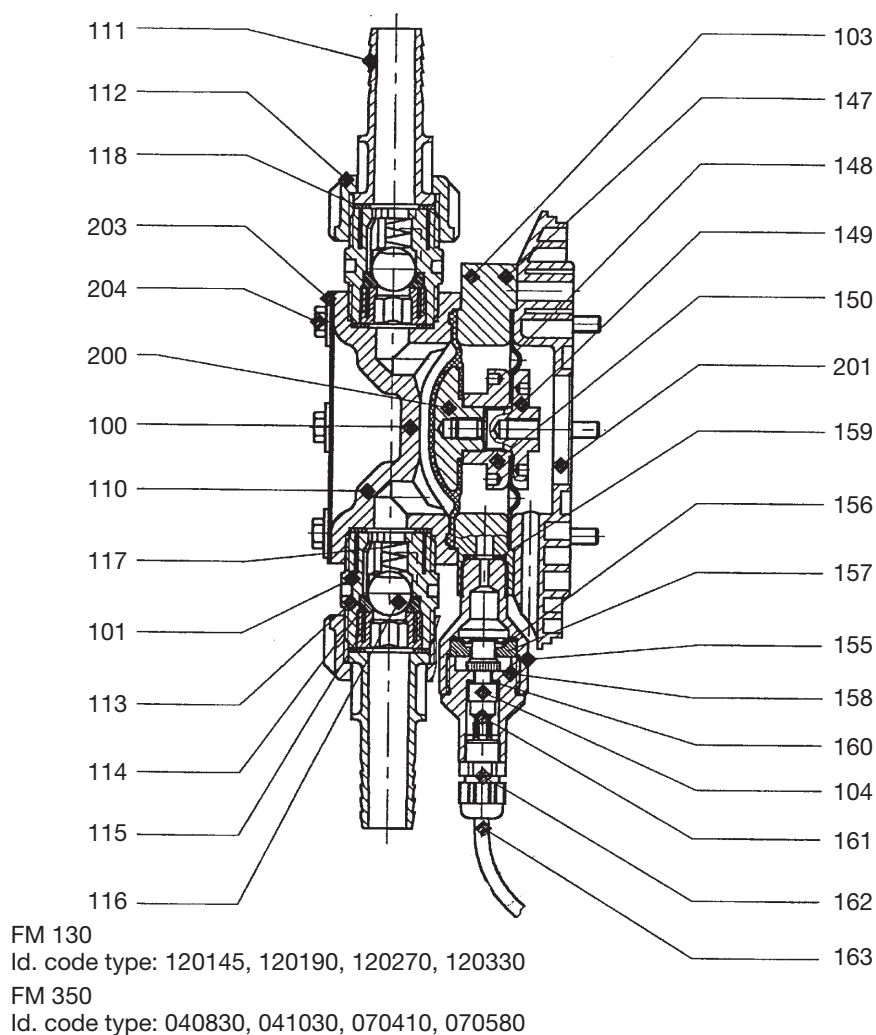


Fig. 12  
3162-4

Material in contact with metered medium

Liquid end:	Parts of diaphragm failure monitor in contact with medium	
	Lens, seals Item 148, 156, 159	Intermediate disc Item 147, intermediate bush Item 150
PVDF	PTFE	PVDF
Stainless steel 1.4571	PTFE	PVDF

a) Electrical data for the diaphragm breakage sensor

30 V DC/1 A or 125 V AC/0.6 A or 250 V AC/0.3 A

The diaphragm sensor is a N/C relay.



**IMPORTANT**

Before commencing operation, install the provided diaphragm breakage sensor together with the gasket (Item159) and make the electrical connections.

**NOTE**

- For safety reasons it is advisable to connect a safe low voltage (e.g. EN 60335-1 (SELV)).
- The cable priority is arbitrary.

b) Namur sensor (Identcode “stroke sensor”: 3), intrinsically

5-25 V DC, Namur type and/or DIN 60947-5-6, zero volt design.

Rated voltage: 8 V DC ( $R_i \sim 1 \text{ k}\Omega$ )

Power consumption:

Active surface, uncovered > 3 mA

Active surface, covered < 1 mA

Rated switching distance: 1.5 mm

The monitor/feeder must be capable of evaluating current changes in order to indicate diaphragm rupture!



**WARNING**

- Only EX pump: Please thoroughly read the chapter “Other important considerations for dosing pumps in ex-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!



**IMPORTANT**

- Before commencing operation, install the provided diaphragm breakage sensor together with the gasket (Item159) and make the electrical connections.
- For safety reasons it is advisable to connect a safe low voltage (e.g. EN 60335-1 (SELV)).



### 3 Technical data



#### WARNING

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

#### 3.1 Technical data Sigma/ 3

##### 3.1.1 Capacity data

##### Technical data S3Ba at 50 Hz operation

Pump type Sigma/ 3	Capacity at max. backpressure			max. stroke frequency	Intake head	Permissible admission pressure intake side	Connection intake/ delivery side	Shipping weight
	bar	l/h	ml/ stroke					
120145 PVT	10	145	31.5	72	5	2	1½"-DN 25	22
120145 SST	12	145	31.5	72	5	2	1½"-DN 25	26
120190 PVT	10	190	31.5	103	5	2	1½"-DN 25	22
120190 SST	12	190	31.5	103	5	2	1½"-DN 25	26
120270 PVT	10	270	31.5	144	5	2	1½"-DN 25	22
120270 SST	12	270	31.5	144	5	2	1½"-DN 25	26
120330 PVT	10	330	31.5	180	5	2	1½"-DN 25	22
120330 SST	12	330	31.5	180	5	2	1½"-DN 25	26
070410 PVT	7	410	95.1	72	4	1	2"-DN 32	24
070410 SST	7	410	95.1	72	4	1	2"-DN 32	29
070580 PVT	7	580	95.1	103	4	1	2"-DN 32	24
070580 SST	7	580	95.1	103	4	1	2"-DN 32	29
040830 PVT	4	830	95.1	144	3	1	2"-DN 32	24
040830 SST	4	830	95.1	144	3	1	2"-DN 32	29
041030 PVT	4	1030	95.1	180	3	1	2"-DN 32	24
041030 SST	4	1030	95.1	180	3	1	2"-DN 32	29

##### Technical data S3Ba at 60 Hz and all S3Ca types

Pump type Sigma/ 3	Capacity at max. backpressure			max. stroke frequency	Intake head	Permissible admission pressure intake side	Connection intake/ delivery side	Shipping weight
	bar	psi	l/h/gph					
120145 PVT	10	145	174/ 46	86	5	2	1½"-DN 25	22
120145 SST	12	174	174/ 46	86	5	2	1½"-DN 25	26
120190 PVT	10	145	228/ 60.2	124	5	2	1½"-DN 25	22
120190 SST	12	174	228/ 60.2	124	5	2	1½"-DN 25	26
120270 PVT	10	145	324/ 85.6	173	5	2	1½"-DN 25	22
120270 SST	12	174	324/ 85.6	173	5	2	1½"-DN 25	26
070410 PVT	7	100	492/ 130	86	4	1	2"-DN 32	24
070410 SST	7	100	492/ 130	86	4	1	2"-DN 32	29
070580 PVT	7	100	696/ 183.9	124	4	1	2"-DN 32	24
070580 SST	7	100	696/ 183.9	124	4	1	2"-DN 32	29
040830 PVT	4	58	1000/ 264	173	3	1	2"-DN 32	24
040830 SST	4	58	1000/ 264	173	3	1	2"-DN 32	29

All performance data applies to water at 20 °C.  
The suction lift applies when the suction line and liquid end are full and correctly installed.

Materials in contact with metered media

Material	Suction/discharge connector Liquid end	DN 25 ball valves			DN 32 plate valves		Integrated relief valve
		Seals	Valve balls	Valve seats	Seals	Valve Plate/ Spring	
PVT	PVDF (Polyvinylidene fluoride)	PTFE	Glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PVDF/ FPM
SST	Stainless steel 1.4571/1.4404	PTFE	Stainless steel 1.4401	PTFE	PTFE	Stainless steel 1.4404/Hast.C	Stainless steel/ FPM

FPM = Fluorine Rubber

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

Temperature specifications

Permissible storage temperature: -10 to +50 °C

Permissible ambient temperature: -10 to +40 °C

Temperature compatibility (medium temperature) of materials

Material:	Long-term at max. backpressure:	Short-term, max. 15 min. at max. 2 bar
PVT	65 °C	100 °C
SST	90 °C	120 °C
PPT	50 °C	100 °C
PCT	45 °C	60 °C

The specified temperatures (see above) can be exceeded temporarily, e.g. for sterilisation or flushing with hot water.

Air humidity: < 92 % relative humidity

Accuracy

Under constant conditions and in minimum stroke length of 30 % corresponding to following notes, the reproducibility of the metered quantity is better than ±2 %.

All specifications refer to metered quantities with water at 20 °C and correct installation of the metering pump.

3.1.2 Dimensions S3Ba (in mm)

[Diameter] M

DN 10 - PVA 16 mm

DN 10 – SSA\* DIN ISO 228 – G 3/4

DN 20 - PVA 25 mm

DN 20 – SSA\* DIN ISO 228 – G 1

\* Connection without hose nozzle

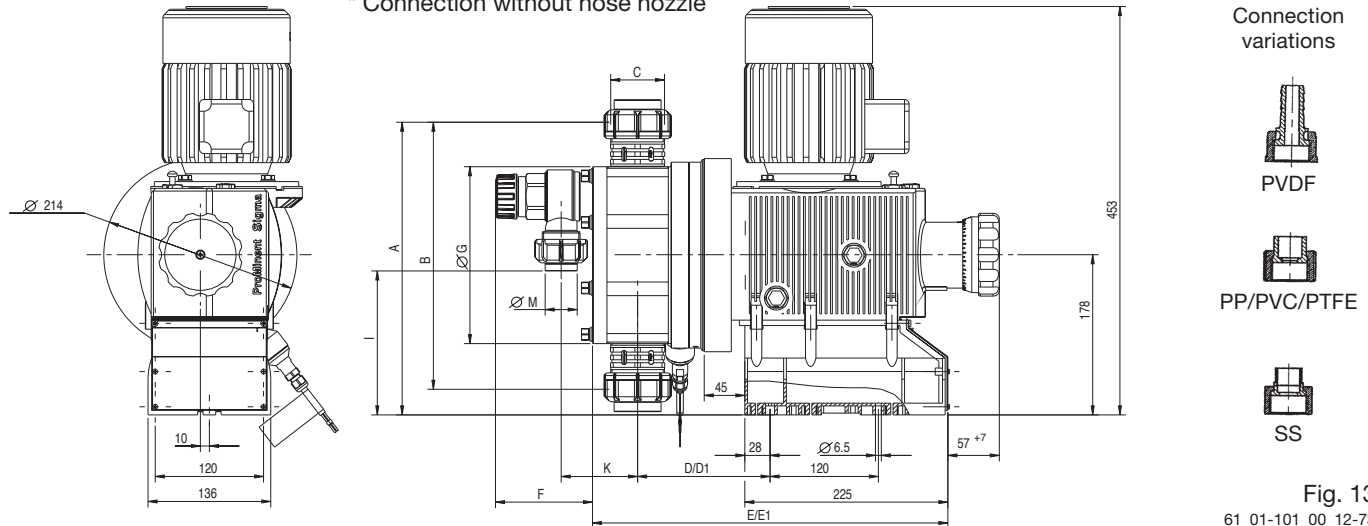


Fig. 13  
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Dimensions Sigma/ 3 (in mm)

Feed unit	Connection	A	B	C	D	D1*	E	E1*	F	Ø G	I	K
FM 330 PVT	DN 25	292	230	G1 1/2" A	120	140	353	373	82	156	174	71
FM 330 SST	DN 25	292	230	G1 1/2" A	121	141	343	363	89	156	148	61
FM 1000 PVT	DN 32	325	297	G2" A	127	147	373	393	121	206	108	85
FM 1000 SST	DN 32	322	291	G2" A	127	147	357	377	121	206	146	70

FM 330 for Sigma/ 3, 120145, 120190, 120270, 120330 FM 1000 for Sigma/ 3, 070410, 070580, 040830, 041030

\* Measurements with diaphragm rupture sensor.

### 3.1.3 Dimensions S3Ca (in mm)

[Diameter] M

DN 10 - PVA 16 mm

DN 10 - SSA\* DIN ISO 228 - G 3/4

DN 20 - PVA 25 mm

DN 20 - SSA\* DIN ISO 228 - G 1

\* Connection without hose nozzle

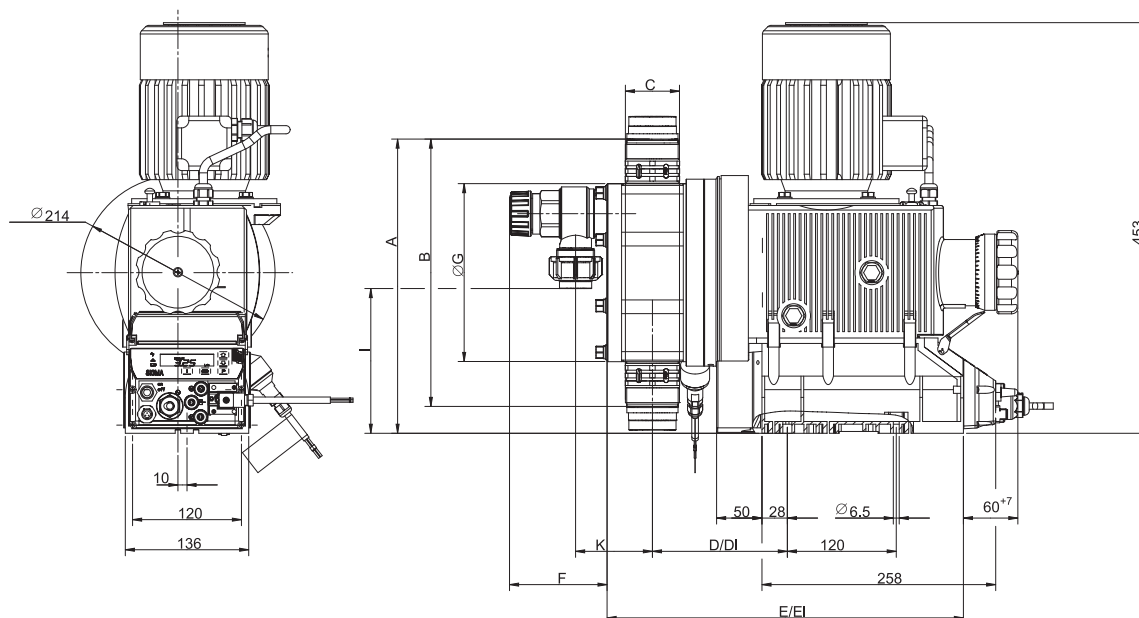


Fig. 14

Table of alternative dimensions, see 3.1.2

61\_01-101\_00\_15-73

### 3.1.4 Dimensions S3Ba with stroke positioning motor (in mm)

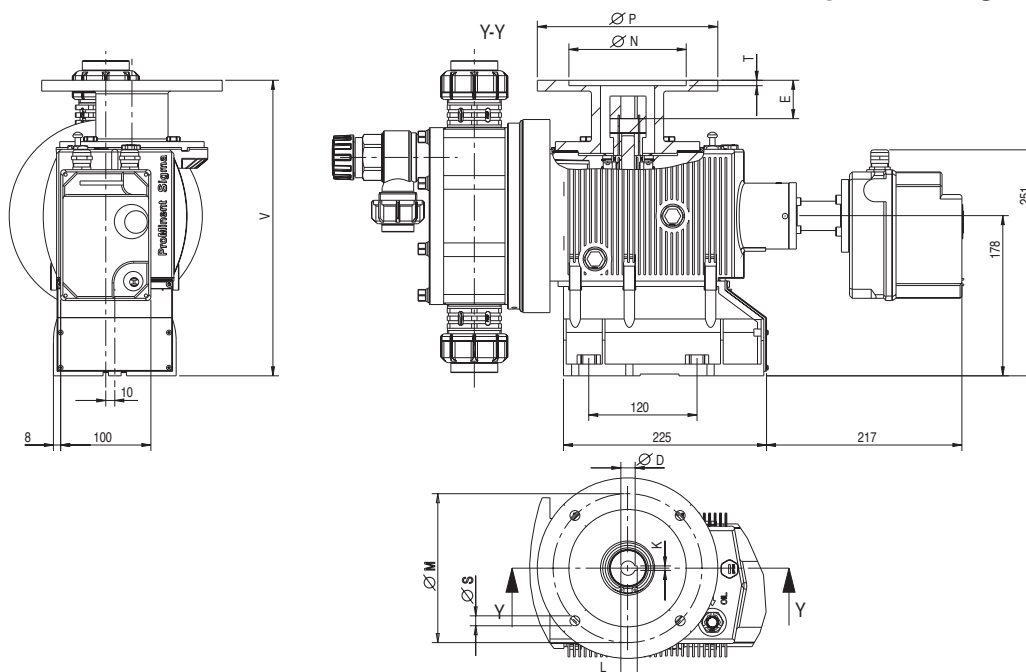


Fig. 15

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#### Dimensions Sigma/ 3 with stroke positioning motor (in mm)

Motor flange	Ø P	Ø M	Ø N	Ø S	Ø D	T	E	K	L	V
B5/200	200	165	130	11	19	6	41.5	6	21.8	328
56 C	6.57"	5.88"	4.5"	0.04"	6.25"	0.24"	2.22"	0.2"	0.72"	13.5"
B5/160	160	130	110	11.8	14	4	35	5	16.3	253

### 3.1.5 Motor data

#### Electrical data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.37 kW	
		250-280 V/440-480 V	60 Hz	0.37 kW	
M	1 ph AC, IP 55	230 V $\pm$ 5 %	50/60 Hz	0.55 kW	
N	1 ph AC, IP 55	115 V $\pm$ 5 %	60 Hz	0.55 kW	
L1	3 ph, II2GEEXelIT3	220-240 V/380-420 V	50 Hz	0.37 kW	
L2	3 ph, II2GEEXdlICT4	220-240 V/380-420 V	50 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEEXelIT3	250-280 V/440-480 V	60 Hz	0.37 kW	
P2	3 ph, II2GEEXdlICT4	250-280 V/440-480 V	60 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.55 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55	230 V $\pm$ 5 %	50/60 Hz	0.55 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEEXdlICT4	400 V $\pm$ 10 %	50/60 Hz	0.55 kW	Ex variable-speed motor with integrated frequency converter

For more details you can request the motor specification sheets. Custom motors and/or custom motor flanges are available on request.



#### WARNING

- **Only EX pump:** Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!

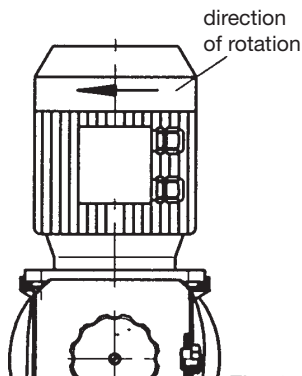


Fig. 16  
S3Ba/S3Ca-026-D

#### Fuse data



#### IMPORTANT

- **No fuse is provided for the 3pH AC motor. Fitting a motor circuit-breaker.**
- **When connecting the motor, make sure that it rotates in the correct direction (see Fig. 16 on the left side).**

#### Protection against accidental contact and moisture (IP)

Motor: IP 55 DIN EN 60034-5 (in accordance with DIN VDE 0470 Part 1, corresponds to EN 60529 and IEC 529).

#### External fan

Notes on the speed-controlled motor with separate fan and temperature monitoring may be found in the “General Operating Instructions ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”.

### 3.1.6 Stroke actuator drive mechanism

230 V $\pm$ 10 %	50/60 Hz	11.7 W
115 V $\pm$ 10 %	60 Hz	11.7 W

### 3.1.7 Stroke adjuster drive mechanism

230 V $\pm$ 10 %	50/60 Hz	6.5 W
115 V $\pm$ 10 %	60 Hz	6.5 W

Cf. “Appendix” for terminal connection diagram.

### 3.1.8 Electrical data, stroke sensor “Sigma”

#### A) Reed contact (Identcode ID “Stroke sensor”: 2)

- Pin 1 (white) = 4.5 V to 24 V, max. 10 mA
- Pin 2 (brown) = OUT, open collector, 24 V, 20 mA
- Pin 3 (green) = GND
- Pulse width (low)  $\geq$  4 ms (depending on gearbox and power frequency)

### B) Namur sensor (Identcode characteristic "Stroke sensor": 3)

5-25 V DC, Namur type and/or DIN 60947-5-6, zero volt design.

Rated voltage: 8 V DC ( $R_i \sim 1 \text{ k}\Omega$ )

Power consumption:

Active surface, uncovered > 3 mA

Active surface, covered < 1 mA

Rated switching distance: 1.5 mm

The monitor/feeder must be capable of evaluating current changes in order to indicate diaphragm rupture!

Blue	-
Brown	+



#### WARNING

- **Only EX pump:** Please thoroughly read the chapter "Other important considerations for dosing pumps in EX-zones" of the "General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories"!



#### IMPORTANT

- Before commencing operation, install the provided diaphragm breakage sensor together with the gasket (Item159) and make the electrical connections.
- For safety reasons it is advisable to connect a safe low voltage (e.g. EN 60335-1 (SELV)).

### 3.1.9 Electrical data, pacing relay "S3Ba" (for basic version)

#### Relay input

(power supply for the relay board)

#### Relay output

Input voltage	Mains frequency	Power consumption
200/230 V AC (180-254 V)	50/60 Hz	10 mA (230 V/50 Hz)
100/115 V AC (90-134 V)	50/60 Hz	15 mA (115 V/60 Hz)
24 V DC (20-23 V)		10 mA at 24 V DC

Voltage, max.	24 V DC
Current, max.	100 mA
Hook up duration	100 ms
Standard	adjustable

The contacts are zero volt.

### 3.1.10 Sound intensity level

The sound intensity level is < 75 dB (A) for diaphragm delivery unit with ball valves and valve springs < 70 dB (A) for all delivery units at maximum stroke, maximum stroking rate, maximum back pressure (water) in accordance with DIN EN 12639 (noise measurement in fluid pumps)

### **3.1.11 Supplement for modified version**

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

**(Affix sticker with modified data here!)**

## 4 Start-up/Maintenance



### IMPORTANT

Observe the safety notes provided in Section 1.

### 4.1 Start-up

All general guidelines in the accompanying "General operating instructions ProMinent® motordriven metering pumps and hydraulic accessories" apply.



### WARNING

- **Only EX pump:** Please thoroughly read the chapter "Other important considerations for dosing pumps in EX-zones" of the "General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories"!

### 4.2 Maintenance



### WARNING

- **Only EX pump:** Please thoroughly read the chapter "Other important considerations for dosing pumps in EX-zones" of the "General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories"!
- **Only send the equipment for repair or maintenance in a cleaned condition and with the liquid end flushed.** However, should any safety precautions be necessary even after careful draining and cleaning of the equipment, the required information must be listed in the Safety Declaration!
- **The Safety Declaration forms part of the inspection/repair contract.** Maintenance or repair work will only be carried out if Safety Declaration – correctly and fully completed by an authorised and qualified member of the Operator's staff – is available.
- **A copy of the form is included in the "General operating instructions for ProMinent motor-driven dosing pumps and hydraulic accessories" or can be downloaded at [www.prominent.com](http://www.prominent.com).**



### IMPORTANT

**After loosening the liquid end screws (e.g. to change the valves or diaphragm), the screws must be retightened crosswise to the specified tightening torque.**

#### What requires maintenance?

- Secure fit of liquid end screws.
- Secure fit of metering lines (intake and delivery sides).
- Secure fit of head valve and intake valve.
- Leakage hole at end disc for moisture (indicates possible diaphragm failure).
- Operate pump continuously for a short period of time in order to check whether it delivers correctly.

#### Maintenance intervals

General recommendation for maintenance intervals - every 3 months.

Shorter intervals are recommended if operated under load conditions (e.g. continuous operation).

The gear oil should be changed after approx. 5000 duty hours.

Gear oil ISO viscosity class VG 460, e.g. Mobil Gear 634,

ProMinent Order No. 555325 (Amount of oil approx. 0.9 l).

The metering diaphragm is a wearing part whose service life is dependent on following parameters:

- System backpressure.
- Operating temperature.
- Properties of medium to be metered.

The service life of the diaphragm is restricted in the case of abrasive media. In such cases, it is recommended to check the diaphragm more frequently and to install a diaphragm failure monitor.

### 4.3 Replacement of wearing parts



#### **WARNING**

Replacing diaphragm (see exploded diagrams in appendix!)



#### **IMPORTANT**

- **Flush liquid end first in the case of hazardous media. For this purpose, force water or a suitable flushing agent through the intake connection of the liquid end with a wash bottle.**
- **Always use original spare parts.**
  - ▶ Set stroke length to zero with the pump running. Switch off pump.
  - ▶ Release the six screws holding the liquid end, detach liquid end together with screws.
  - ▶ Release diaphragm from the push rod by jolting in counterclockwise direction and unscrew.
  - ▶ Screw on new diaphragm until it is firmly seated on the push rod. Mount the dosing head with screws such that the suction connection lies at the bottom (observe the flow through direction / arrow marks on the valves). Switch on pump. Set stroke length to 100 % and turn in screws then tighten crosswise to  $7.5 \pm 0.5 \text{ Nm}$  (FM 330) resp.  $12 \text{ Nm} \pm 1 \text{ Nm}$  (FM 1000). Check pump for leaks at max. pressure.



**NOTE**

The tightening torque of the liquid end screws should be rechecked after 24 hours of operation.

The tightening torques of the liquid end screws should be checked every 3 months for the PVT material version.

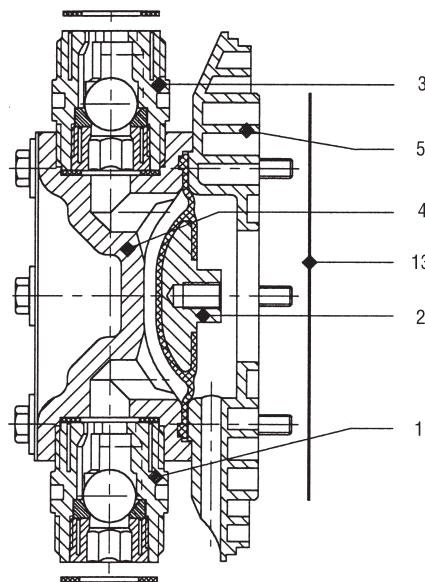


Fig. 17  
S3Ba/S3Ca-014-GB

**GUIDELINE ON VALVE INSTALLATION (DN 25 ball valve)**

In the case of suction problems during installation, place the valves on a firm surface and tap the PTFE ball seat disk lightly with a brass rod and a hammer weighing about 300 g. Let the valves such in the wet state.

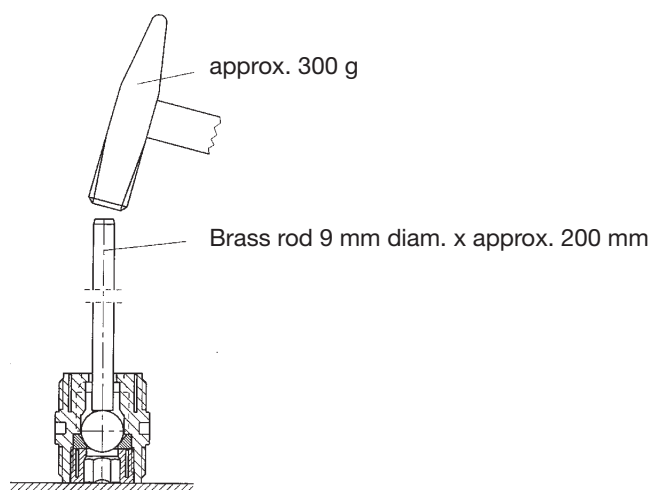


Fig. 18  
S3Ba/S3Ca-019-GB

**IMPORTANT**

- If suction problems with the pump or leakage at the overcurrent valve are encountered, first clean the ball and the ball seat disc.

**NOTE**

- For media containing particles larger than 0.3 mm it is absolutely essential to install a filter in the suction line.

## 5 Features of the S3Ca metering pumps

### 5.1 Function description, motors

All pump versions are fitted with integrated motor overload circuit breaker. This responds as soon as the maximum admissible power consumption is reached and the motor stops running.

- ▶ The electronic controller recognises when a motor is stopped due to a system overload and indicates a fault on the display and at the pump.
- ▶ The fault signal can be cancelled by pressing the „P“ key, altering the level for a brief period at the pause input (switch function) or by reconnecting the pump to the mains.



#### IMPORTANT

If the motor has been switched off via the electronic overload protection, check that the pump is not being continuously overloaded.

#### NOTE

- The motor is electrically installed on delivery.
- The performance data in section. 3.1.1 for the S3Ba are measured with a 3-phase motor. If the S3Ba is fitted with a single phase motor the speed may be up to 5 % less due to the different motor characteristic i.e. resulting in up to 5 % lower feed rate!
- The controller changes over to digital stroking mode at low stroke frequencies! This takes place at stroke frequencies below 1/3 of the maximum stroke frequency. This function is designed to ensure sufficient cooling of the motor and low stroke frequencies.

Type: 115 – 230 V ± 10 %, 50/60 Hz

	at 115 V	at 230 V
Nominal output	420 W	420 W
Nominal current	6.0 A	3.4 A
Peak current (in operation)*	20 A	13 A
Making peak current	12 A	24 A
Fuse, internal**	6.3 AT (1.5kA)	6.3 AT (1.5kA)

\* internal switch function

\*\* Only genuine fuses of ProMinent, item no. 732379, may be used!

### 5.2 Function description, controller

#### Operating modes

Operating modes are selected using the MODE menu (depending upon identity code, some operating modes may be absent).

**“Analogue” operating mode:** (Ident code, control variant: analogue)

The stroke rate is controlled via an analogue electrical signal via the “external control” terminal. Signal processing is pre-selected at the controller.

**“Manual” operating mode:**

The stroke rate is controlled manually via the controller.

**“Contact” operating mode:**

This operating mode offers the opportunity to make fine adjustments with small increase/decrease factors. Dosing can be activated by a pulse via the “external control” terminal or by a semiconductor element. With the “pulse control” option it is possible to pre-set a feed quantity (batch) or number of strokes (factor 0.01 to 99.99) via the control unit.

**“Batch” operating function:**

This operating mode offers the option of working with larger transfer factors (up to 65535). Metering can be triggered by pressing the P key or a pulse from the “external control” terminal via a contact or semiconductor element. A batching quantity or number of strokes can be pre-selected via the control unit.

**“PROFIBUS®” mode:** (Ident code, control variant: PROFIBUS®)

This operating mode provides the option of controlling the pump via the PROFIBUS® (see “Supplementary instructions for ProMinent® gamma/ L and ProMinent® Sigma versions with PROFIBUS®”).

<p><i>Functions</i></p>	<p>The following functions can be selected using the SET menu:</p> <p><b>“Calibrate” function (Identcode, Stroke length adjustment: manual + calibration):</b>  The S3Ca can be operated in all operating modes including in calibrating mode. The corresponding continuous displays can show the actual feed quantity or the feed rate. Calibration is maintained within the stroke frequency range 0-180 strokes/ min. Calibration is also maintained when a stroke frequency is altered up to <math>\pm 10</math> scale points.</p> <p><b>“Auxiliary frequency” function:</b>  It is possible to set a stroke rate in the SET menu, which may be activated via the “external control” terminal. This auxiliary frequency overrides all other pre-set stroke rate frequencies.</p> <p><b>“Flow” function:</b>  Stops the S3Ca when the flow is insufficient. In the SET menu, the number of failed strokes is entered after which the pump will be turned off.</p> <p>The following functions are available as standard:</p> <p><b>“Float switch” function:</b>  Information on the liquid level in the feed chemical container is transmitted to the S3Ca. This option requires the installation of a 2-stage float switch. This is connected to the “float switch” terminal.</p> <p><b>“Pause” function:</b>  The S3Ca can be stopped by remote control via the “external control” terminal. The “pause” function operates only via the “external control” terminal.</p> <p>The following functions are activated by keystrokes:</p> <p><b>“Stop” function:</b>  The S3Ca can be stopped by pressing the STOP/START key without disconnecting from the mains power supply.</p> <p><b>“Prime” function:</b>  Priming (short term feed at maximum frequency) is activated by pressing both arrow keys at the same time (in permanent display “Stroke rate”).</p> <p><i>Optional relay</i></p> <p>The S3Ca has two connection options (not with PROFIBUS®).</p> <p><b>“Fault indicating relay or power relay” option:</b>  In the event of fault signals, warning signals or float switch activation signals, connects an electrical circuit to trigger alarm sirens etc. The relay is retrofitted via an aperture in the power end.</p> <p><b>“Fault indicating and pacing relay” option:</b>  In addition to the fault-indicating relay the pacing relay make a contact with every stroke. The relay is retrofitted via an aperture in the power end.</p> <p><i>Function and error indicators</i></p> <p>The operating and error status is shown via the three LEDs and the “error” indicator on the LCD (see also section 9):</p> <p><i>LCD indicator</i></p> <p>If a fault occurs “error” will appear along with an additional fault warning.</p>
-------------------------	--

### LED indicator

#### Operating indicator (green)

This indicator is lit as long as the S3Ca is operating correctly. It is cancelled briefly at every stroke.

#### Warning indicator (yellow)

This warning light appears if the S3Ca electronics detect a situation that could lead to a fault, e.g. "liquid levels low 1st stage".

#### Warning indicator (red)

This warning light appears if a fault occurs, e.g. "liquid levels low 2nd stage".

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

The different operating modes, functions and fault statuses each have a differing effect on whether and how the S3Ca functions. These effects are given below:

1. **Prime**
2. **Fault, stop, pause**
3. **Auxiliary frequency**
4. **Manual, analogue, contact, batch**

i.e.

1. "Priming" is possible in the "Stroke rate" permanent display in any pump mode.
2. "Fault", "stop" and "pause" stop all system parts up to "prime".
3. The "Auxiliary frequency" stroke rate always takes priority over the stroke rate specified by an operating mode set as under 4.

### 5.3 Sockets, symbols and wiring diagram

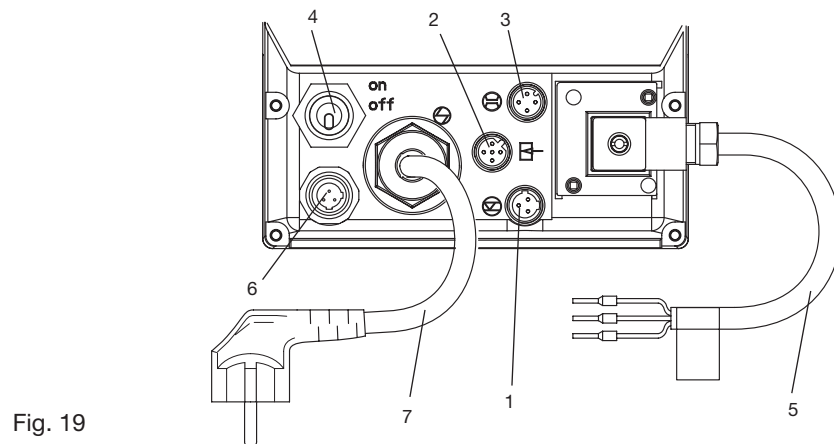




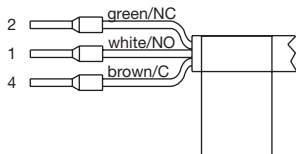
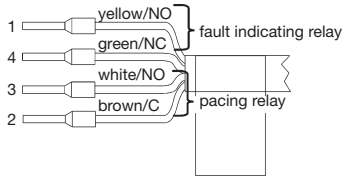
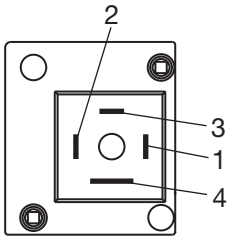


Fig. 19

-  (1) Socket for two-stage float switch with advance warning and de-activate function
-  (2) External socket for contact or analogue controller with zero volts deactivation via pause function
-  (3) Metering monitor socket for connection of ProMinent metering monitor
- (4) Mains switch (1-pin)
- (5) Relay cable (fault indicating and/or pacing relay)
- (6) Socket for diaphragm rupture sensor
-  (7) Mains lead with plug

\*Must be plugged in unless cable attached.



## Technical data, relay (control version)

### Pump type S3Ca

Relay	Fault-indicating relay	Fault-indicating relay + pulse generator	
Relay type	Fault-indicating relay	pulse generator	Fault-indicating relay
Voltage, max:	250 V 50/60 Hz	24 V DC	24 V 50/60 Hz
Current, max.	2 A (ohmic)	100 mA	100 mA
Hook up duration		100 ms	
Behaviour	see Identcode	see Identcode	see Identcode
Service life	> 200 000 cycles	> 50 x 10 <sup>6</sup> (10 V 10 mA)	> 200 000 cycles

Relay type	Power relay
Voltage, max:	250 V 50/60 Hz
Current, max.	16 A (ohmic)
Hook up duration	
Behaviour	see Identcode
Service life	> 30 000 switching cycles

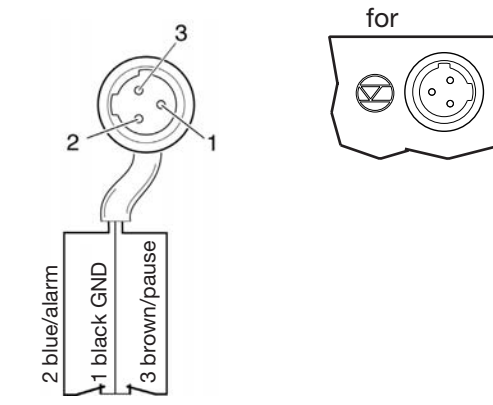
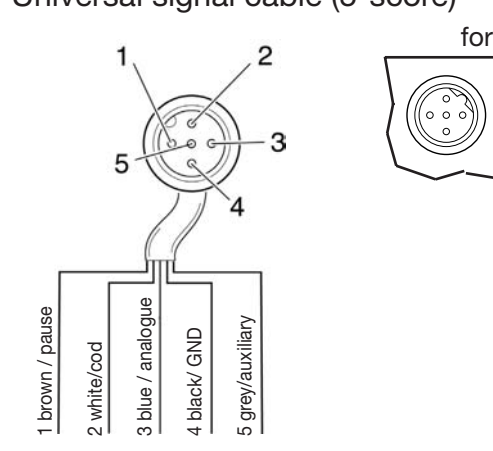
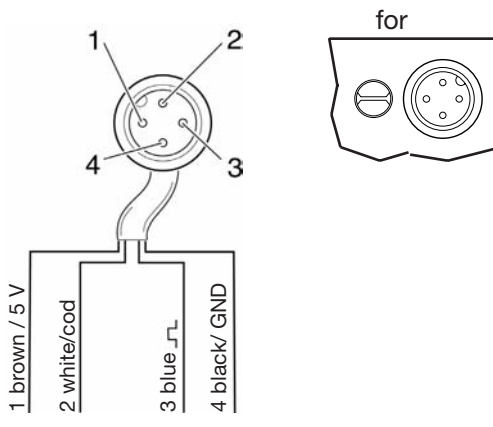
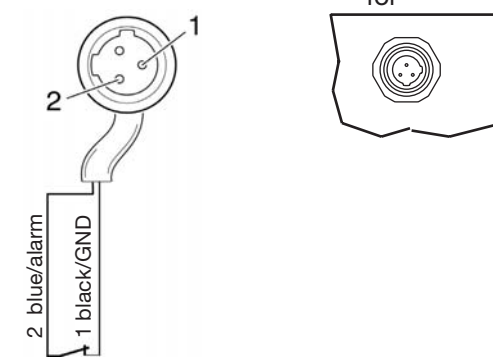
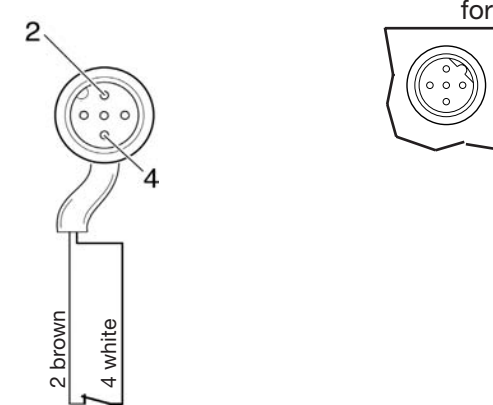
\* in the case of nominal load

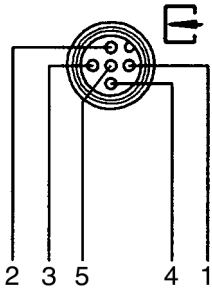
The contacts are zero volt.

N/C fault indicating relay - the relay closes immediately after the power is switched on and opens in the event of a fault.

N/O fault indicating relay, the relay closes in the event of a fault.

Use suitable interference suppression (e.g. RC glands) when connecting inductive loads.

Wiring diagram	
View of cable connectors from front	
<div><div>Float switch cable</div><div></div><div><p>Blue and black open -&gt; alarm signal Brown and black open -&gt; alarm signal + pump stops</p></div></div>	<div><div>Universal signal cable (5-score)</div><div></div><div><p>Pause function: brown and black closed -&gt; pump metering brown and black open -&gt; pump stopped</p><p>External/contact: white and black closed -&gt; start contact for pump (note pause function: brown and black closed)</p><p>Analogue: blue, black -&gt; analogue output 0/4-20 mA (note pause function: brown and black closed)</p><p>Auxiliary frequency: grey and black closed -&gt; pump metering at pre-set stroking rate</p><p>➔ Circuit examples page 37</p></div></div>
<div><div>Metering monitor cable</div><div></div></div>	
<div><div>Diaphragm rupture cable</div><div></div><div><p>Contact open -&gt; alarm -&gt; pump stops with controller type 0</p></div></div>	<div><div>External/contact cable (2 core)</div><div></div><div><p>Contact closed -&gt; metering stroke</p></div></div>



### Technical data, external contact

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

#### Controller type 0 (see identity code)

Pin 1 = Pause input (activating function)

Voltage at open contacts: approx. 5 V

Input resistance: 10 k $\Omega$

Controller: – zero volts contact (approx. 0.5 mA)  
– semi-conductor (residual voltage:  $< 0.7$  V)

Pin 2 = Contact input

Voltage at open contacts: approx. 5 V

Input resistance: 10 k $\Omega$

Controller: – zero volts contact (approx. 0.5 mA)  
– semi-conductor (residual voltage:  $< 0.7$  V)

Min. contact duration: 20 ms

Max. pulse frequency: 25 pulses/s

Pin 3 = unused

Pin 4 = GND

Pin 5 = Auxiliary input

Voltage at open contacts: approx. 5 V

Input resistance: 10 k $\Omega$

Controller: – zero volts contact (approx. 0.5 mA)  
– semi-conductor (residual voltage:  $< 0.7$  V)

#### Controller type 1 (see identity code)

Pin 1 = Pause input (activating function)

Voltage at open contacts: approx. 5 V

Input resistance: 10 k $\Omega$

Controller: – zero volts contact (approx. 0.5 mA)  
– semi-conductor (residual voltage:  $< 0.7$  V)

Pin 2 = Contact input (not active during analogue operation)

Voltage at open contacts: approx. 5 V

Input resistance: 10 k $\Omega$

Controller: – zero volts contact (approx. 0.5 mA)  
– semi-conductor (residual voltage:  $< 0.7$  V)

Min. contact duration: 20 ms

Max. pulse frequency: 25 pulses/s

Pin 3 = Identical to input\*

Input load: approx. 120  $\Omega$

Pin 4 = GND

Pin 5 = Auxiliary input

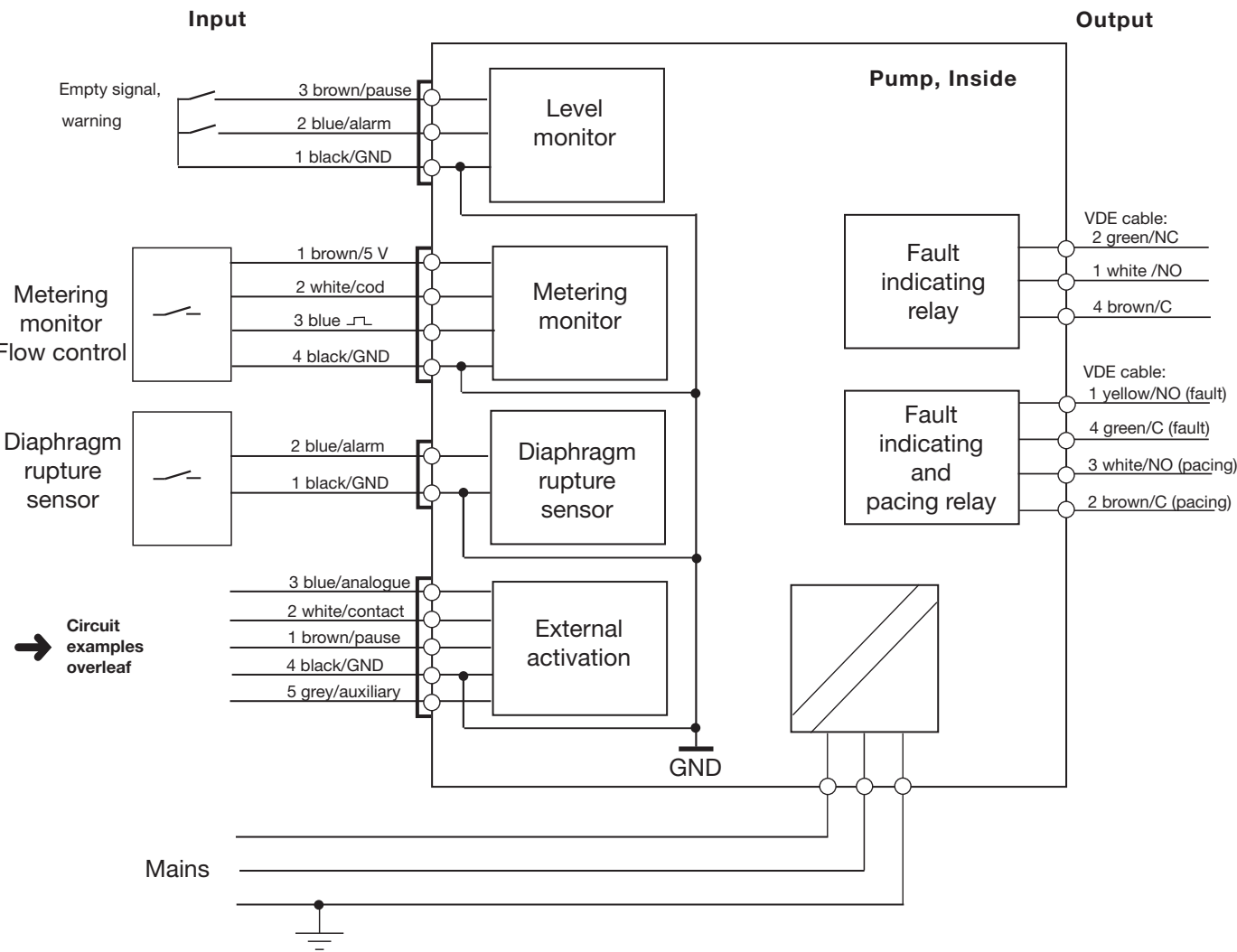
Voltage at open contacts: approx. 5 V

Input resistance: 10 k $\Omega$

Controller: – zero volts contact (approx. 0.5 mA)  
– semi-conductor (residual voltage:  $< 0.7$  V)

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

Block circuit diagram S3Ca

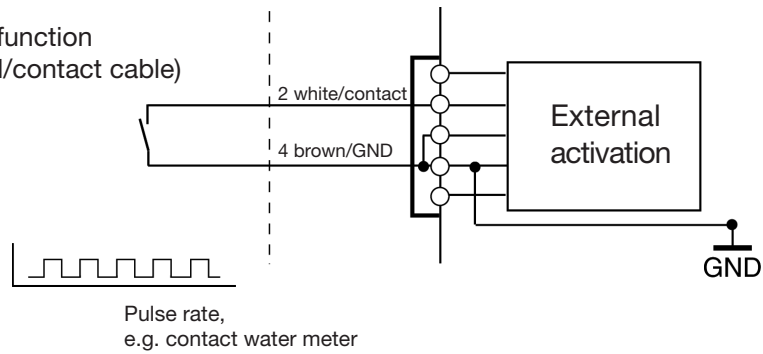




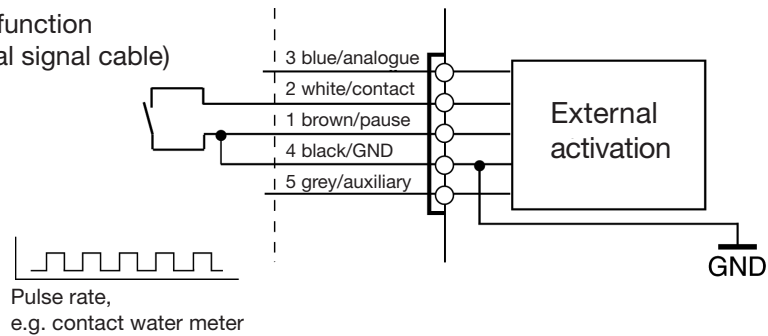
### Circuit examples: universal signal cable

by customer      Cable      Pump, inside

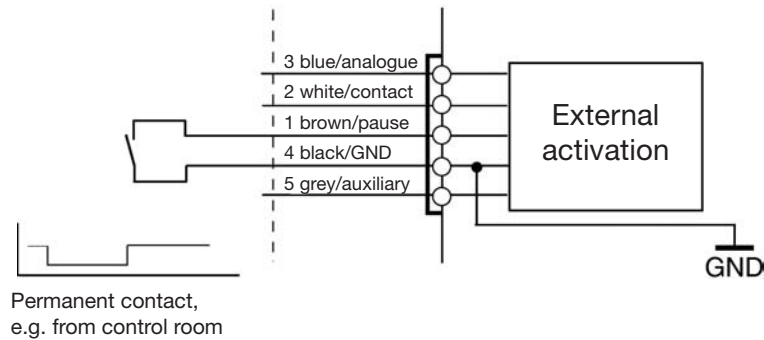
„External contact“ function  
(ProMinent external/contact cable)



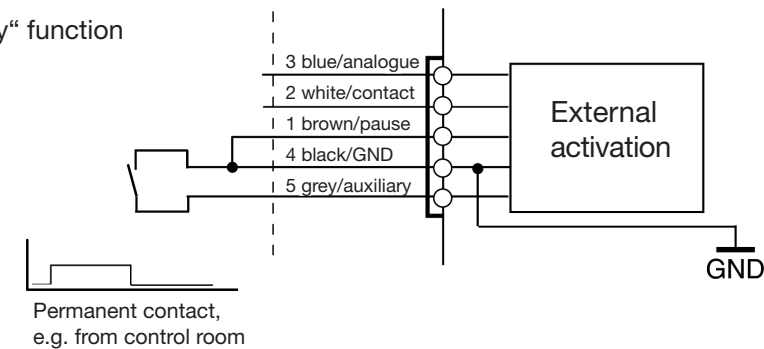
„External contact“ function  
(ProMinent universal signal cable)



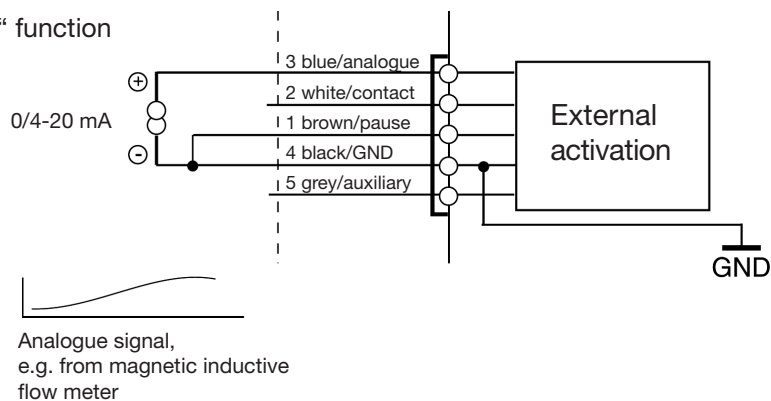
„Pause“ function



„Auxiliary frequency“ function



„External analogue“ function





### IMPORTANT

- The universal signal cable, the external/contact cable and the level monitor cable should not be less than 1.20 m long, otherwise cable recognition will fail.

## 5.4 Retrofitting relays

(not with PROFIBUS®)

### Delivery range:

- 1 relay circuit set with 2 screw fasteners
- 1 relay cable set with socket
- 1 seal

*Press-out relay opening*



### WARNING

Disconnect the S3Ca from the mains power supply and rinse liquid end before commencing work (see section 10)!



### IMPORTANT

When preparing the opening, ensure that the punch is not forced through the entire pump base!

**Pump circuits may become damaged.**

- ▶ Place the S3Ca on a firm surface with the relay opening press-out section at the top (see fig. 20)
- ▶ Place a punch (dia. 8-15 mm) in the centre of the relay opening press-out section, and strike briefly and sharply with a hammer (approx. 250 g)
- ▶ If necessary clean up the edges of the opening
- ▶ Remove the pressed out section from the S3Ca

*Inserting the relay component*

- ▶ Hold the relay component with your right hand gripping the left and right hand edges of the relay cover, and tilt the front end slightly to the left (see fig. 21)
- ▶ Push the relay component through the relay opening, holding the upper corner of the lower edge against the guide rail on the pump base, until the contact of the relay component has reached the controller contact. (test: can you still move the end of the circuit back and forth?)
- ▶ Gently push the relay component right into the opening
- ▶ Screw the relay cover firmly onto the housing using the screws provided
- ▶ Insert the relay cable plug seal into the relay cover and screw on the plug (see fig. 22)
- ▶ The pump is generally programmed ex-factory to „drop-out action alarm relay“ and – if fitted – „pull-up action clock pulse generator relay“. If a switching function is required, the pump can be reprogrammed at the Heidelberg plant.

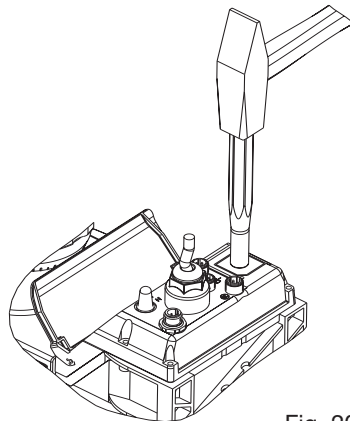


Fig. 20

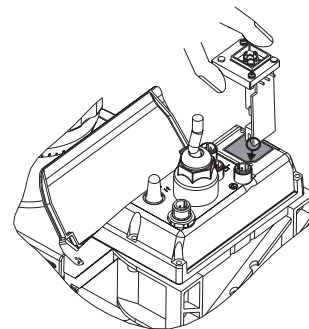


Fig. 21

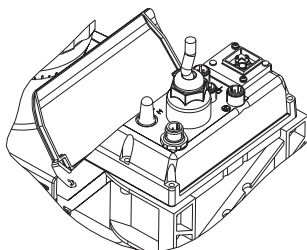


Fig. 22

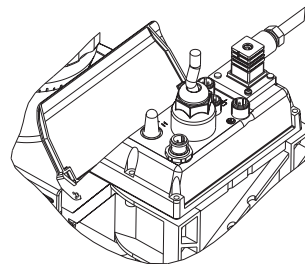
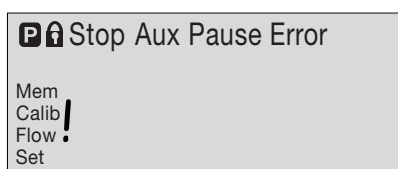


Fig. 23

## 6 Control elements

Please acquaint yourself with the S3Ca control elements with the help of the “control elements and key functions” overview!

*Indicators* The LCD display supports the operation and setting of the S3Ca with a range of indicators:



The indicators are interpreted as follows:

<b>Symbol for P key:</b>	The S3Ca is in settings mode.
<b>Close symbol:</b>	In a continuous display: lock (if code has been set). In settings mode: indicates access to code menu.
<b>Stop:</b>	The S3Ca has been stopped using the STOP/START key.
<b>Pause:</b>	The S3Ca has been stopped using the “pause” function (external).
<b>Aux:</b>	The S3Ca is pumping at the auxiliary frequency. In AUX menu: the S3Ca is in the AUX menu.
<b>Error:</b>	A fault has occurred and the pump has been stopped.
<b>Mem:</b>	An additional “memory” function has been set in the “contact” and “batch” operating modes. In CNTCT or BATCH menus (“mem” flashes): the memory function can be set.
<b>Calib:</b>	The S3Ca is in the CALIB menu. In a continuous display (“calib” flashes): Deviation of the stroke length by more than 10 scale points (e.g. at a stroke length of 40 %, if set smaller than 30 % or greater than 50 %).
<b>Flow:</b>	The S3Ca is in the FLOW menu.
<b>Set:</b>	The S3Ca is in the SET menu.
<b>Exclamation mark:</b>	The number of strokes reached is above the maximum value (99999) that can be shown in the LCD display.

### NOTE

The S3Ca indicates the metering volume and the metering rate in l or l/hor gal or gal/h only when calibrated.


## 7 Settings

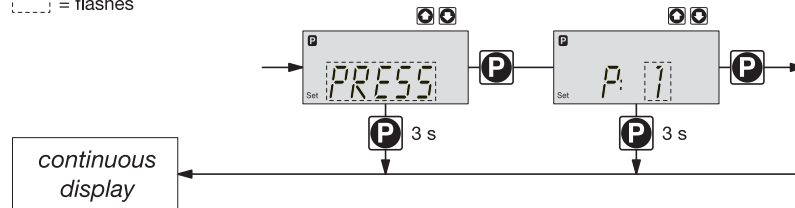
### NOTE

- Open out the fold-out page following the title page fully! There you will find the overviews “control elements and key functions” and “operating settings diagram”.
- If no keys are pressed within a period of 1 minute, the S3Ca will return to a continuous display.

### Basic information for setting up the S3Ca

  = Settings option

 = flashes

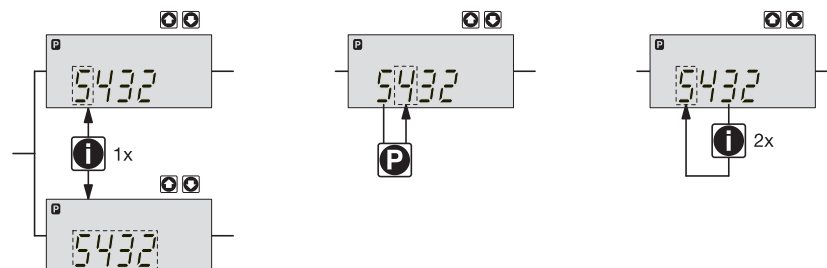


#### Confirm entries

Press the P key briefly;  
you will automatically move to the next menu option or to a continuous display.

#### Exit menu option without confirming

Press the P key for 3 s:  
The entry is cancelled and you will return to a continuous display.



#### Incremental change of a value

Press the i key 1x;  
you can toggle between altering the digits of a value (“change individual digits” = standard) or incremental alteration of a value (“change a figure”).

#### Change adjustable values

Press UP or DOWN arrow key;  
The flashing digit or figure will start to increase or decrease incrementally.

#### Confirm adjustable values

For “change individual digits”: confirm each digit using the P key. When the last digit has been confirmed you will automatically move to the next menu option or to a continuous display.  
For “change a figure”; press the P key 1x; you will simultaneously move to the next menu option or to a continuous display.

#### Correct wrongly set digits

Press the i key 2x;  
you will go back to the first digit.

## 7.1 Check adjustable values

Before setting up the S3Ca you can check the current settings of adjustable values:

Press the i key (“i” as in “info”) when the S3Ca is in continuous display mode (There is no P key symbol in the LCD display).

Each time you press the i key you will see a different continuous display. The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories (see overview “continuous displays”).

## 7.2 Change to settings mode

If you hold down the P key for 2 seconds in any continuous display, the S3Ca will change to the settings mode.

If CODE 1 is set, the code must be entered after pressing the P key.

The following menu options appear first in the settings mode (see also overview “operating/ settings diagram”):

- MODE menu
- CODE menu (optional)
- SET menu
- CLEAR window

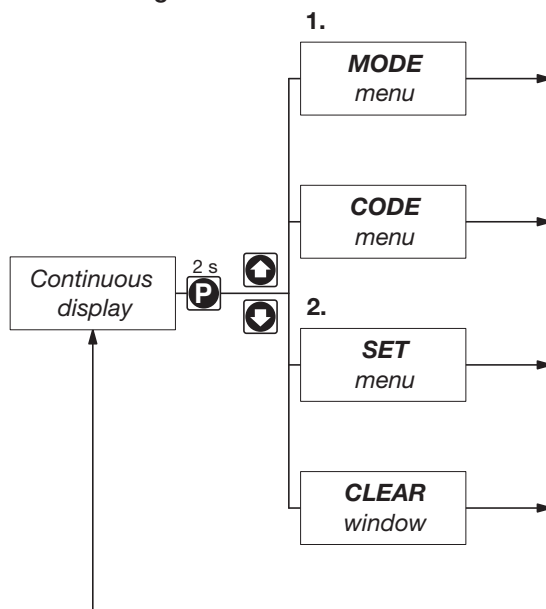
**In order to adapt the S3Ca to your process requirements you must:**

1. Select the operating mode in the **MODE** menu.
2. If necessary enter the settings for this operating mode in the **SET** menu.  
Exceptions: Timer + Profibus®.



### IMPORTANT

Note the diagram below!

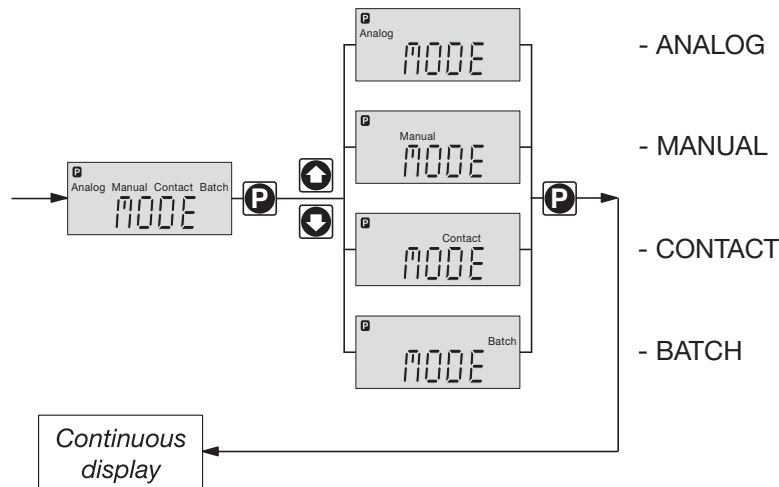


## 7.3 Select operating mode (MODE menu)

The following operating modes are selected via the MODE menu (depending upon identity code, some operating modes may be absent):

- Manual: for operation by hand  
(Identity code, control variant: manual, standard option)
- Analogue: for electronic control  
(Identity code, control variant: analogue current)

- Contact: for contact operation  
(Identity code, control variant: external 1:1 / external with pulse control)
- Batch: for batch operation  
(Identity code, control variant: external with pulse control)



### 7.4 Settings for operating mode (SET menu)

#### NOTE

First select the operating mode in the **MODE** menu!

Exceptions: **Timer** and **PROFIBUS®**.

In the SET menu you can adjust various settings depending upon the selected operating mode.

The following programmable function settings menus appear in all operating modes:

- Calibrate (CALIB menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu, available only if flow monitor is connected)

See also section 7.5!

Further settings menus depend upon the selected operating mode.

#### 7.4.1 Settings for “manual” operating mode

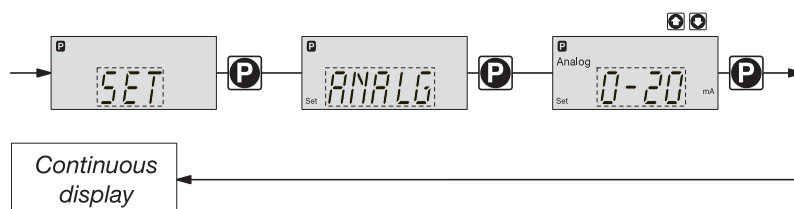
There are no other settings menus in the overall SET menu for the “manual” operating mode apart from those described in 7.5.

#### 7.4.2 Settings for “analogue” operating mode (ANALG menu)

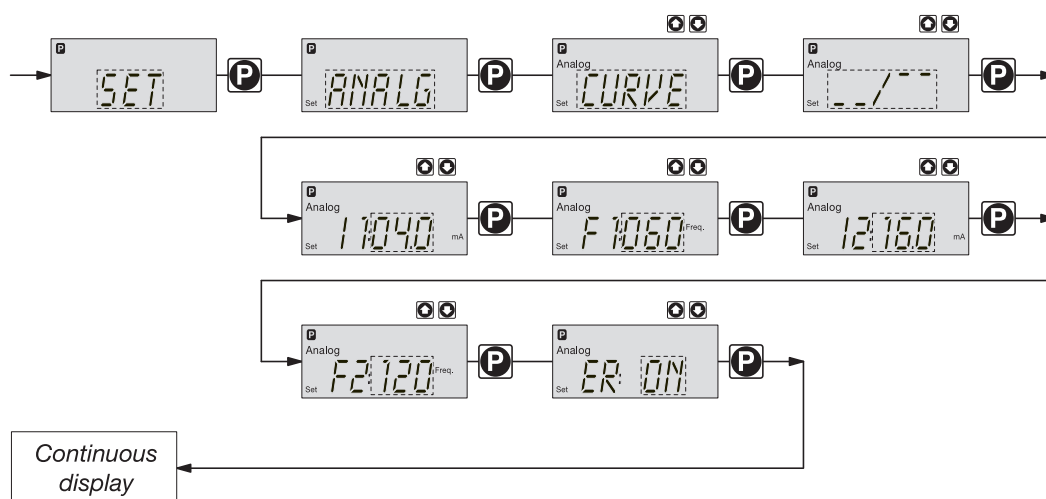
In addition to those settings menus described in 7.5, there is an additional ANALG menu in the overall SET menu for the “analogue” operating mode.

The stroke rate is controlled by an analogue electrical signal via the “external control” terminal. You can select three signal-processing methods:

- 0 - 20 mA: at 0 mA the S3Ca does not operate  
at 20 mA the S3Ca operates at max. stroke frequency.  
Between these two extremes the stroke rate is proportional to the electrical signal.



- 4 - 20 mA: at 4 mA the S3Ca does not operate  
 at 20 mA the S3Ca operates at max. stroke frequency.  
 Between these two extremes the stroke rate is proportional to the electrical signal.  
 For signals of below 3.8 mA a fault will be detected and the S3Ca will stop (e.g. cable break).
- Curve: In the "curve" processing mode you can programme the S3Ca ratios.  
 There are 3 options available:
  - = straight line
  - \--- = lower band
  - /\--- = upper band



### Straight line:

The following symbol appears in the LCD display: ----- .

You can enter any stroke frequency ratio for the S3Ca in proportion to the electrical signal. You must enter two points P1 (I1, F1) and P2 (I2, F2). F1 is the stroke rate at which the pump should operate at current I1: the straight line and the ratio are fixed accordingly:

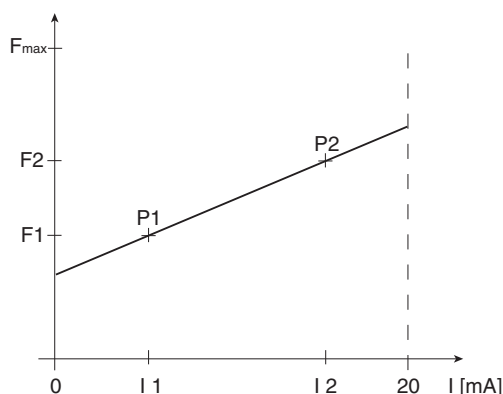


Fig. 24

### NOTE

Draw a diagram like the one above - with values for (I1, F1) and (I2, F2) - in order to set the S3Ca to your required stroke rate!

### Lower/upper band:

This processing mode allows you to control a pump via an electrical signal as shown in the diagrams below.

#### Lower band e.g. Alkali pump

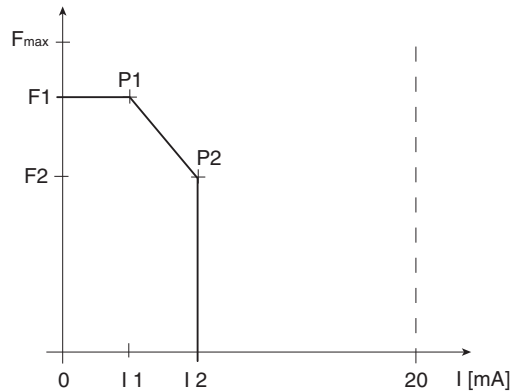


Fig. 25

#### Upper band e.g. acid pump

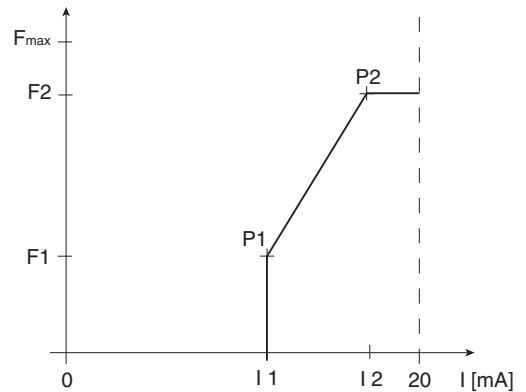


Fig. 26

### Lower band:

The symbol  $\text{---}\backslash\text{---}$  appears in the LCD display. The S3Ca will operate below I1 at F1. Above I2, the S3Ca ceases to operate. Between I1 and I2 the stroke rate is between F1 and F2, proportional to the signal current.

### Upper band:

The signal  $\text{---}/\text{---}$  appears in the LCD display. The S3Ca will cease to operate below I1. Above I2, the S3Ca will operate at F2. Between I1 and I2 the stroke rate between is F1 and F2, proportional to the signal current.

The smallest processable difference between I1 and I2 is 4 mA.

#### Error processing

In the "ER" (error) menu option you can activate an error processing function for the "curve" mode. An error message appears for signals below 3.8 mA and the S3Ca stops.

### 7.4.3 Settings for "contact" operating mode (CONTCT menu)

In addition to those settings menus described in 7.5, there is an additional CONTCT in the overall SET menu for the "contact" operating mode.

The operating mode "contact" allows you to activate a single stroke or a series of strokes. The strokes can be activated by a pulse or via the "external control" terminal. This operating mode is intended to transfer input pulses into a reduction (break) or small increase in strokes.

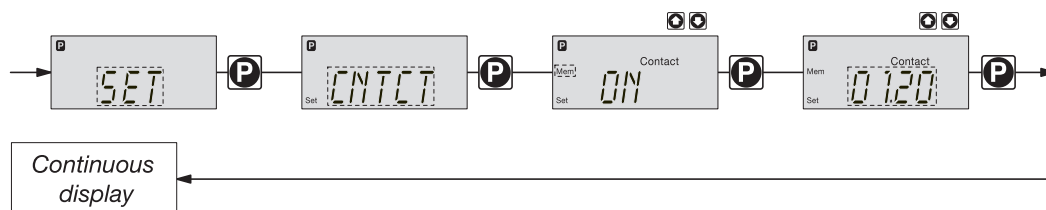


#### IMPORTANT

The factor resets to "1" if you change to a different operating mode!



In the “contact - identity code: external with external pulse control” you can enter the number of pulses after which a stroke should be carried out. “Contact - identity code: external with external pulse control” is intended for small dosing quantities.



The number of strokes per pulse depends upon the factor, which you can enter. This allows you to vary to a certain extent the input pulses by a factor of 1.01 to 99.99 and/or reduce by a factor of 0.01 to 0.99:

“Number of strokes activated = factor x number of input pulses”

#### Examples

	Factor	Pulse (sequential)	Stroke number (sequential)
<b>Increase</b>	1	1	1
	2	1	2
	25	1	25
	99,99	1	99,99
	1.50	1	1.5 (1 / 2)
	1.25	1	1.25 (1 / 1 / 1 / 2)
<b>Reduction</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)

#### Explanation of increase

At a factor of 1	For every 1 pulse, 1 stroke is activated
At a factor of 2	For every 1 pulse, 2 strokes are activated
At a factor of 25	For every 1 pulse, 25 strokes are activated

#### Explanation of decrease

At a factor of 1	After 1 pulse, 1 stroke is activated
At a factor of 0.5	After 2 pulses, 1 stroke is activated
At a factor of 0.1	After 10 pulses, 1 stroke is activated
At a factor of 0.75	After 2 pulses, 1 stroke is activated, then after 1 pulse, 1 stroke is activated, then after 2 pulses, 1 stroke is activated etc.

### NOTE

If a remainder occurs when the factor is processed, the S3Ca counts up the remainder values. When the sum reaches or exceeds “1” the S3Ca will activate a stroke. This ensures that the stroke number corresponds exactly to the factor throughout the dosing operation.

The number of input pulses which have not been processed are stored by the S3Ca in the stroke memory. The stroke memory is limited to the batch size if “Memory” is not activated (- with “Memory” at 65535 strokes). You can cancel it by changing to a different operating mode.

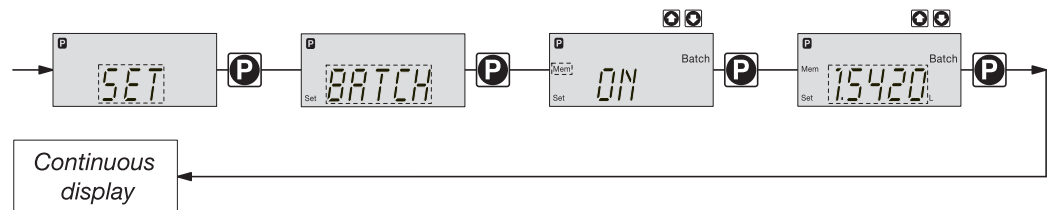
You can optimally adapt the S3Ca to the respective process, e.g. in connection with contact water meters.

### “Memory” extension function

The “memory” extension function can be optionally activated (“mem” appears in the LCD display). Is active gamma/ L adds the remaining unperformed strokes up to a maximum stroke memory capacity of 65535 strokes. If this maximum capacity is exceeded the pump will go into fault mode.

## 7.4.4 Settings for “batch” operating mode (BATCH menu)

In addition to those settings menus described in 7.5, there is an additional BATCH menu in the overall SET menu for the “batch” operating mode.



The “batch” operating mode is a variant of the “contact” operating mode (see 7.4.3). You can pre-select a stroke number (no breaks, whole numbers only from 1 to 65535) as well as a feed quantity (batch). To switch between entries for “stroke number” and “feed quantity” press the i key 1x in the corresponding menu option (see also overview “operating/settings diagram”, fold-out page).

The “batch” operating mode is intended for large dosing quantities.

Metering can be actuated by pressing the P-key or via a pulse from the “external control socket”.

The number of input pulses which have not been processed are stored by the S3Ca in the stroke memory. The stroke memory is limited to the batch size if “Memory” is not activated (- with “Memory” at 65535 strokes). You can cancel it by changing to a different operating mode.

### “Memory” extension function

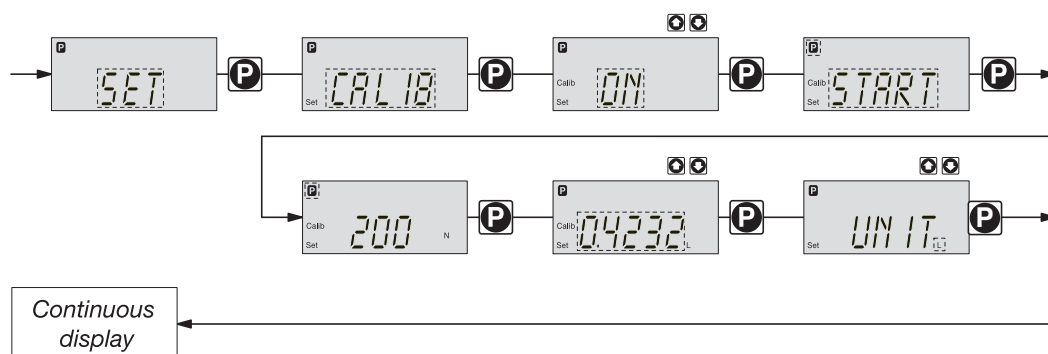
The “memory” extension function can be optionally activated (“mem” appears in the LCD display). If “Memory” is active gamma/ L adds the remaining unperformed strokes up to a maximum stroke memory capacity of 65535 strokes. If this maximum capacity is exceeded the pump will go into fault mode.

## 7.5 Settings for programmable functions (SET menu)

The following programmable function settings menus appear in all operating modes:

- Calibrate (CALIB menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu, available only if flow monitor is connected)

### 7.5.1 Settings for “calibration” function (CALIB menu)



The S3Ca can also run in calibration mode. The corresponding continuous displays show the current dosing quantities or the feed rate.

The calibration is retained if the stroke length is changed by up to  $\pm 10$  scale points (at a preset stroke length of 40 % the range is 30 % - 50 %). If the stroke rate is altered more than  $\pm 10$  scale points the yellow warning light is lit, the continuous display flashes and the flashing message “calib” appears.

#### NOTE

- **Do not go below 30 % stroke length (SEK type: 50 %).**  
This will significantly affect accuracy of calibration.
- **Calibration becomes increasingly accurate the more strokes made by the S3Ca during calibration (recommended: at least 200 strokes).**



#### WARNING

**If using a hazardous feed chemical, the following setting instructions ensure adequate safety precautions have been taken!**

#### Calibration

- ▶ Insert the suction tube into a measuring cylinder containing the feed chemical - the discharge tubing must also be correctly installed (operating pressure,...!)
- ▶ Suck up the feed chemical (press both arrow keys at the same time) when the suction tube is empty
- ▶ Note the liquid level in the measuring cylinder and the stroke length
- ▶ Select the CALIB menu and go the first menu option using the P key
- ▶ Select “ON” using an arrow key and change to the next menu option using the P key
- ▶ To commence calibration, press the P key. The S3Ca starts to pump and displays the number of strokes (“STOP” appears at regular intervals)
- ▶ After a sufficient number of strokes, stop the S3Ca with the P key
- ▶ Calculate the dosed quantity (difference between the original quantity and the quantity remaining)
- ▶ Enter this quantity in the next menu and then go to the next menu option using the P key
- ▶ Select the unit (“L” or “gal”) in the “UNIT” menu with an arrow key and using the P key

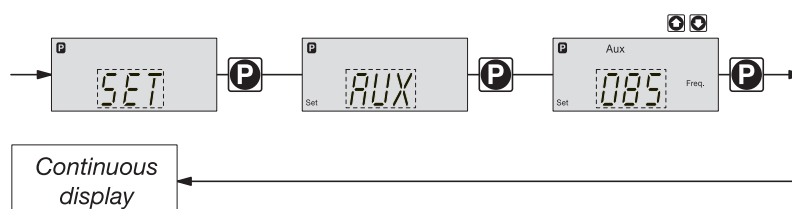
The S3Ca is calibrated.

The corresponding continuous displays show the calibrated values.

The total stroke number and total litres are set during calibration to “0”.

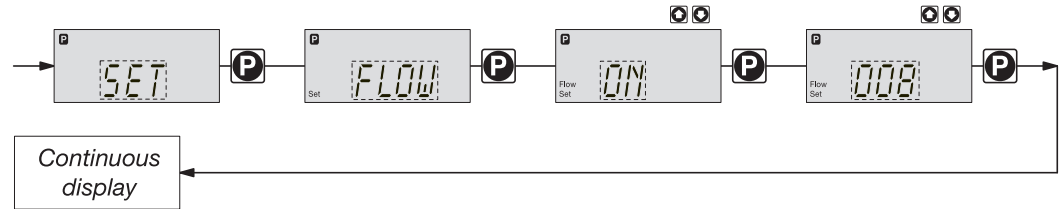
The S3Ca is in STOP mode.

### 7.5.2 Settings for “auxiliary frequency” function (AUX menu)



The programmable function “auxiliary frequency” allows switching to a different stroke frequency, which can be set in the AUX menu. It can be activated via the “external control” terminal. When the auxiliary frequency is activated, “aux” appears in the LCD display. This auxiliary frequency overrides the current stroke frequency set for the selected operating mode.

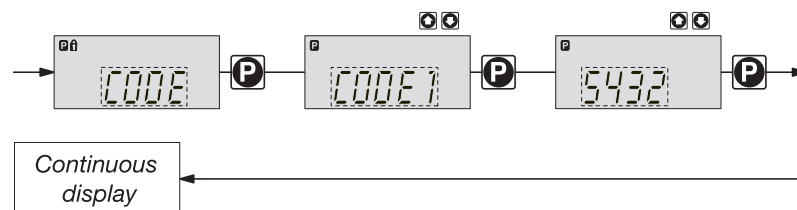
### 7.5.3 Settings for the “flow” function (FLOW menu)



The flow menu only appears when a dosing monitor is connected to the “dosing monitor” terminal. This dosing monitor registers each discharge stroke of the S3Ca at the discharge connector and transmits it back to the S3Ca. If this response transmission is serially omitted for a period set in the FLOW menu (due to failure or below-minimum dosing) the S3Ca stops.

### 7.6 Setting code (CODE menu)

The code menu is used to select whether you want to prevent access to parts of the settings options.



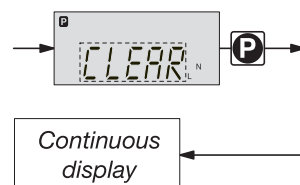
In the first menu option you can choose CODE 1 or CODE 2 (both use the same number).

- Select CODE 1 to prevent access to the settings mode (① in the overview “operating/ settings diagram”, fold-out page). In the next menu option, enter the number you wish to use as the code.
- Select CODE 2 to prevent access to the settings options for directly alterable values in the continuous displays (② in the overview “operating/settings diagram”, fold-out page). In the next menu option, enter the number you wish to use as the code.
- Select NONE to remove a pre-set security lock.

### 7.7 Cancel total stroke number or total litres (CLEAR window)

In the CLEAR window you can delete the stored total stroke number and simultaneously the total litres (= set to “0”). You may then press the P key briefly to exit this window.

The values displayed are counted incrementally from the point of commissioning the pump, or from the last delete action.



## 8 Operating

This section describes all operating options available to you when the S3Ca is in continuous display mode (no P key symbol in the LCD display).

### NOTE

- **Open out the fold-out page following the title page fully! There you will find the overviews “control elements and key functions” and “operating/settings diagram”.**
- **Look at the overview “continuous displays”. This page shows you which displays are available in which operating mode, and which values are directly alterable in the corresponding continuous displays.**

### 8.1 Manual operation

*Set stroke length* Stroke length is continually adjustable within a range of 0-100 %. The recommended stroke length range, which will practically guarantee technical reproducibility, is 30-100 % (SEK type: 50-100 %).

### NOTE

**At low stroking rates (less than 1/3 maximum stroking rate) the controller switches to digital stroking mode. This ensures adequate cooling of the motor at low stroking rates.**

The following operating options are available via the different keys (see also figure on the next page):

*Stop/Start S3Ca* To stop S3Ca: press STOP/START key.  
To start S3Ca: press STOP/START key.

*Start batch* Press the P key briefly in “batch” operating mode.

*Load factory settings* Press the P key for 15 s to load factory calibration settings!  
Current settings will be deleted.

*Change to settings mode* When you press the P key for 2 s in any continuous display the S3Ca will change to settings mode (see section 7).  
If CODE 1 is set, the code must be entered after pressing the P key.

*Check adjustable values* Each time you press the i key you will see a different continuous display. The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories.

*Change directly alterable values* To change a value (see below) directly in the corresponding continuous display, press one of the arrow keys until “set” appears in the LCD display. The delay has been programmed in to prevent inadvertent changing of values.

If CODE 2 has been set, this code must be entered after pressing the arrow key.

Directly alterable values are as follows:

*Stroke rate* In “manual”, “contact” and “batch” operating modes:  
The stroke rate can be altered in the “stroke rate” display.

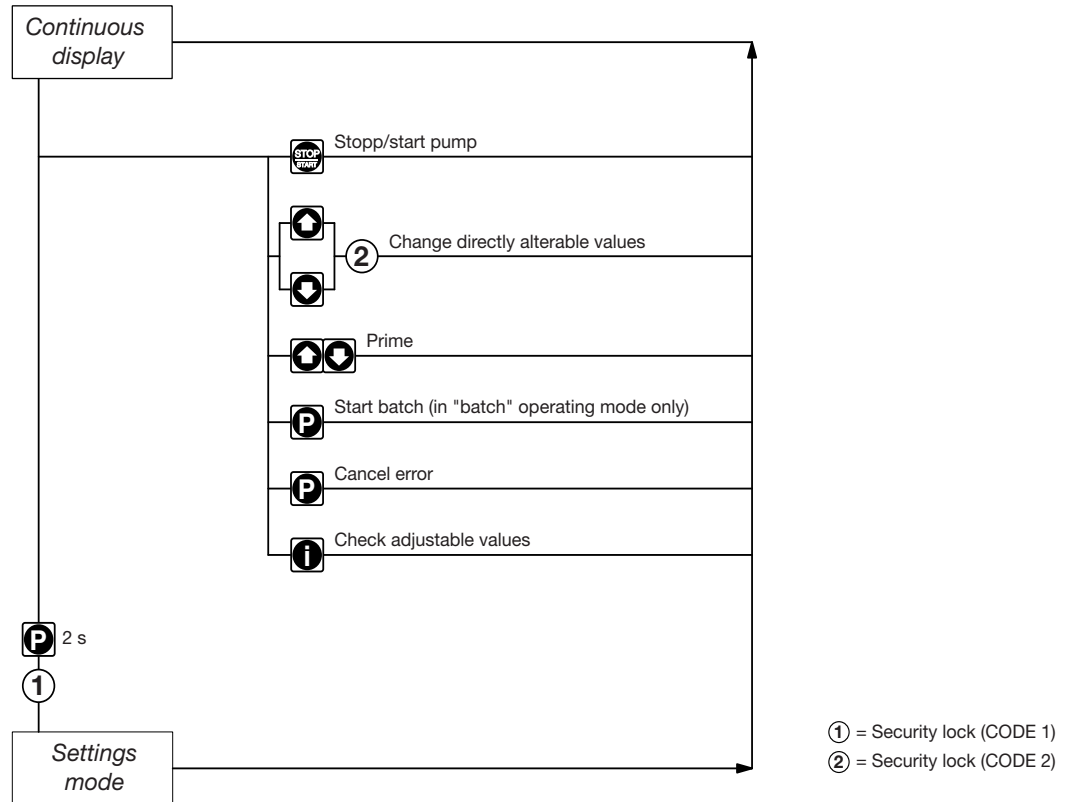
*Feed rate* In “manual” operating mode  
The feed rate can be altered in the “feed rate” display.

*Factor* The factor is the number of strokes activated by an external pulse or a press of the P key (in “batch” mode only).

In “batch” operating mode:  
You can alter the factor from the “remaining strokes” display.  
The S3Ca returns to the original continuous display a few seconds after the factor has been reset.

*Display program version* Press the P-key for 10 seconds to display the program version.  
Example: “V 1052” + “X 1010”. Release key immediately if “LOAD 3” appears !

<i>Batch size</i>	In "batch" operating mode: The batch size can be changed from the "batch size/remaining litres" display. The S3Ca returns to the original continuous display a few seconds after the batch size has been reset. In the permanent display "Stroke rate"
<i>Priming</i>	The "priming" function is activated by pressing both arrow keys at the same time.
<i>Cancel error</i>	Error messages are cancelled by pressing the P key briefly.



## 8.2 Remote control

Remote control of the S3Ca is possible via a control cable or PROFIBUS® (see Section 5.3 and Chapter 7, „Supplementary instructions for ProMinent® gamma/ L and ProMinent® Sigma versions with PROFIBUS®“ as well as your documentation in the annex).

## 9 Troubleshooting



### WARNING

- **Only EX pump:** Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!
- **Always take suitable precautions when using hazardous chemicals!**
- **Ensure the equipment is de-pressurised before working on the pump!**

### The pump does not prime despite full stroke and ventilation

<i>Cause</i>	Crystalline deposits on the ball seat because valves have dried out.
<i>Remedy</i>	<ul style="list-style-type: none"> <li>▶ Remove the suction sleeve from the chemical supply container and rinse out the liquid and thoroughly.</li> <li>▶ If still unsuccessful, dismantle valves and clean.</li> </ul>

### Fluid is seeping from the top plate

<i>Cause</i>	The liquid end is not sealed against the pump diaphragm.
<i>Remedy</i>	<ul style="list-style-type: none"> <li>▶ Tighten screws in the liquid end.</li> <li>▶ If unsuccessful, replace the diaphragm (see section 4.3).</li> </ul>

### Green LED indicator (operating display) is not lit

- Cause* Incorrect or no mains voltage.
- Remedy* ► Use the recommended mains voltage as given in the voltage specification on the nameplate.

### Error Messages

#### Red LED display is lit, "Error" and "MINIM" flash in the display

- Cause* Fluid level in the chemical storage tank has reached "liquid level low, stage 2".
- Remedy* ► Fill the chemical supply container.

#### Red LED display is lit, "Error" and "ANALG" flash in the display

- Cause* S3Ca is in "analogue" operating mode, a fault routine has been programmed in the ANALG menu and the operating current has fallen below 3.8 mA.
- Remedy* ► Remedy low operating current.  
► Switch fault routine "OFF" (see section 7.4.2.).

#### Red LED display is lit, "Error" and "CNTCT" flash in the display

- Cause* S3Ca is in "contact" or "batch" operating mode and the extended function "memory" has been set.  
In addition a very large factor has been entered, too many contacts have been input or the P-key has been pressed too often, resulting in an overflow of the stroke memory.
- Remedy* ► Press the P-key, saved data will be deleted.  
► Change S3Ca set up.

#### Red LED display is lit, "Error" and "FLOW" flash in the display

- Cause* Dosing monitor not properly connected.
- Remedy* ► Connect dosing monitor properly.  
► Press P-key.
- Cause* Dosing monitor has reported more defective strokes than have been set in the FLOW menu.
- Remedy* ► Press P-key.  
► Investigate the cause and remedy.

#### Red LED is lit. "Error" appears in the display and "MOTOR" is flashing

- Cause* The motor is not operating accurately because the backpressure is too high.
- Remedy* ► Reduce backpressure.  
► Press the P key (reset key).
- Cause* The motor is overheating.
- Remedy* ► Check ambient temperature (max. 40 °C).  
► Allow motor to cool down.  
► Press the P key (reset key).
- Cause* Other motor fault.
- Remedy* ► Call ProMinent.  
► Press the P key (reset key).

#### Red LED is lit. "Error" appears in the display and "TEMPERATURE" is flashing

- Cause* The temperature in the pump housing is too high because the ambient temperature is too high.
- Remedy* ► Reduce ambient temperature.  
► Allow motor to cool down.  
► Press the P key (reset key).
- Cause* The temperature in the pump housing is too high because the pump is consuming too much power.
- Remedy* ► Check installation, rectify if necessary.  
► Allow motor to cool down.  
► Press the P key (reset key).

#### Red LED display is lit, "Error" appears in the display and "FAN" is flashing

- Cause* Fault related to fan in pump housing.
- Remedy* ► Check fan and replace if necessary.  
► Press the P key (reset function).

- Red LED is illuminated, the display shows “Error” and “DIAPH” flashes.**
- Cause* Metering diaphragm is fractured
- Remedies* ► Replace metering diaphragm according to chapter 4.3
- Red LED display is lit, “Error” appears in the display and “SYSTEM” is flashing**
- Cause* Controller fault.
- Remedy* ► Disconnect the pump from the mains and reconnect.  
If the error message continues, send the pump back to ProMinent.
- Red LED lit, “Error” appears in the display and “Mem” flashes**
- Cause* Stroke memory full
- Remedy* Eliminate causes  
Press P-key (consider the consequences on your process)
- All other Errors**
- Please contact your ProMinent branch or representative!

### Fault Signals

- Yellow LED display is lit**
- Cause* Liquid level in chemical storage tank has reached “liquid level low, stage 1”.
- Remedy* ► Fill chemical storage tank.
- Yellow LED Display is lit and “calib” flashes**
- Cause* The pump is calibrated and the stroke length deviates by more than  $\pm 10$  % from the value at the time of calibration.
- Remedy* ► Reset the stroke length or calibrate the pump again to the desired stroke length.

## 10 Decommissioning and disposal

### Decommissioning



#### WARNING

- **Only EX pump:** Please thoroughly read the chapter “Other important considerations for dosing pumps in EX-zones” of the “General Operating Instructions ProMinent Motor Metering Pumps and Hydraulic Accessories”!
  - **When decommissioning the pump the housing and, in particular, the liquid end must be thoroughly cleaned to remove chemicals and dirt!**
  - **Always take suitable precautions when using hazardous chemicals!**
  - **Ensure that the equipment is de-pressurised!**
- Disconnect the pump from the power supply.
- Empty the liquid end by turning the pump upside down and allow the feed chemical to pour out.
- Rinse the liquid end with a suitable material, thoroughly rinse the liquid end after use with hazardous materials!

If decommissioning is only temporary, maintain the correct storage conditions:

Storage temperature: -10 to +50 °C

Air humidity: < 92 % relative humidity

### Disposal



#### WARNING

**Spring under tension!**

**Take particular care when disassembling the pump as the return spring (Item 5, Chapter 2.2) is under considerable mechanical tension!**



#### IMPORTANT

**Observe your locally applicable regulations (particularly with regard to electronic waste and transmission fluid)**



## 11 Spare parts and accessories



### CAUTION

The assembly and installation of ProMinent® metering pumps with other-make parts that are not tested and recommended by ProMinent are not permitted and can lead to personal injury and damage to property for which no liability shall be accepted!

### Spare parts

You will find the order numbers for the wearing parts in the exploded view drawings in the annex. If you require further parts, please order the "Spare parts list ProMinent Sigma/ 3".

**Actuator** for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, 1  $\Omega$  response signal potentiometer, enclosure rating IP 54.

**Controller** consists of actuator with servomotor and integrated servo control for stroke length adjustment via a standard signal. Standard signal input 0/4-20 mA, corresponds to stroke length 0 - 100 %. Automatic/manual operation selection key for manual stroke adjustment. Mechanical status display of actual stroke length value output 0/4-20 mA for remote display.

### Variable speed motors with integrated speed controller (identcode characteristic V)

Power supply 1 ph 230 V, 50/60 Hz, 0.55 kW  
External control with 0/4-20 mA

### Speed controllers in metal housing (identcode characteristic Z)

The speed controller assembly consists of a speed controller and a 0.55 kW variable speed motor.

### Float switches

2-stage, with 2 m connection cable

### Alarm relays

For signalling faults

### Alarm and clock pulse generator relays

For cyclic timing of other devices and for signalling faults.

### Control cables

Universal control cable 5-core/2.5 and 10 m  
External contact cable 2-core/2.5 and 10 m

### Foot valves

With intake filter and non-return ball for connection at end of intake line.

### Metering valves

With spring-loaded non-return ball for metering in open or closed systems and for mounting the metering line.

### Backpressure valves

For exact metering at low operating pressure or as overflow safety valve.

### Accumulators

For pulsation damping in long metering lines.

### Metering monitors

For monitoring metering operations. After an adjustable number of non-acknowledged metering strokes, a fault is indicated and the metering pump shut down.

### Intake assemblies

With foot valve and float switch for expendable packing drums or metering tanks.

### Metering tanks

From 35 to 1000 l capacity with lockable screw cover and necessary accessories.

### Manual/electric stirrers

For mixing and preparing metering solutions.

# Motor Datenblatt / Motor data sheet / Fiche technique pour moteur

<b>Bestell Nr.</b> order no. / no. de commande	<b>1003455/A</b>	<b>Hersteller</b> producer / fabricant	<b>ATB</b>
---	------------------	---	------------

<b>Motor-Typ</b> motor type type du moteur	AF71/4B-7	<b>Leistungsfaktor</b> power factor facteur de puissance	0,70/0,70	
<b>Maschinenart</b> type of machine désignation	3-Ph. Motor	<b>Wirkungsgrad</b> efficiency rendement	70 %	
<b>Schutzart</b> protection class 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	1420/1720	U/min rpm t/mn
<b>Bemessungsleistung</b> rated output puissance nominale	0,370 kW	<b>Wärmeklasse</b> temperature class classe d'isolement	F	
<b>Bemessungsspannung</b> rated voltage tension nominale	▲ / Δ 400/230 V	<b>Anzugsstrom</b> starting current courant de démarrage	4,4	fach fold fois
<b>Bemessungsstrom</b> rated current courant nominale	1,30/2,30 (50 Hz) 1,10/1,90 (60Hz)	<b>Anzugsmoment</b> starting torque couple de démarrge	2,4	fach fold fois
<b>Geprüft nach</b> tested in acc. with contrôlé selon	/	<b>Kippmoment</b> pull-out torque couple de décrochage	3,2	fach fold fois
<b>PTB Nr.</b>	/	<b>Umgebungstemperatur</b> ambient temperature température ambiante	40 °C	
		<b>Schaltung</b> connection branchement	▲ / Δ	
<b>Anmerkung</b> comments abservation	400/230 V 380-420/220-242 V (50 Hz) 380-460/220-265 V (60 Hz)			
<b>ProMinent</b>  Pumpentyp	S3Ba _____ S ____ HP2a _____ S ____			

For pumps without Ex-protection:

## EC Declaration of Conformity

We,

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

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.

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

Product description : ***Metering pump, Series Sigma***

Product type : ***S3Ba... / S3Ca...***

Serial number : ***see type identification plate on device***

Relevant EC regulations : ***EC - machine regulation (98/37/EC)***  
***EC - low voltage regulation (2006/95/EC)***  
***EC - EMC - regulation (2004/108/EC)***

Harmonised standards used,  
in particular : ***EN ISO 12100-1, EN ISO 12100-2, EN 809,***  
***EN 60034-1/7/18, EN 60335-1, EN 60335-2-41,***  
***EN 55014-1/2, EN 61000-3-2/3, EN 61000-6-2***

Date/manufacture's signature :

11.10.2007

Dr. Johannes Hartfiel

The undersigned :

*Dr. Johannes Hartfiel, assistant development manager*

For pumps with Ex-protection:

## EC Declaration of Conformity

We,

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

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.

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

Product description :

***Metering pump, Series Sigma 3***  
***Version "Ex-proof" according to "ATEX 95"***

Product type :

***S3Ba...,***  
***characteristic value "electrical connection" = "P" or "L",***  
***and characteristic value "motor version" = "1" or "2" or***  
***"electrical connection" = "1, 2 or 3" and "motor version" = "A" or***  
***"electrical connection" = "V" and "motor version" = "2"***

Serial number :

***see type identification plate on device***

Relevant EC regulations :

***EC - machine regulation (98/37/EC)***  
***EC - low voltage regulation (2006/95/EC)***  
***EC - EMC - regulation (2004/108/EC)***  
***EC - Ex - directive (94/9/EEC)***

Harmonised  
standards  
used

Pump without motor:

Motor Ex "e":

Motor Ex "d":

in particular:

stroke sensor:


***DIN EN ISO 12100-1/2, DIN EN 809, DIN EN 13463-1/5***  
***DIN EN 50014, DIN EN 50019, DIN EN 60034***  
***DIN EN 50014, DIN EN 50018+50019, DIN EN 60034-1/5/6/7/9/12/14***  
***DIN EN 50014, DIN EN 50020, DIN EN 60947-5-2, DIN EN 60947-5-6***

National standards and other  
technical specifications used,  
in particular :

***DIN 44081 (thermo protection Ex "d" - motor)***

Date/manufacturer's signature :

19.11.2007

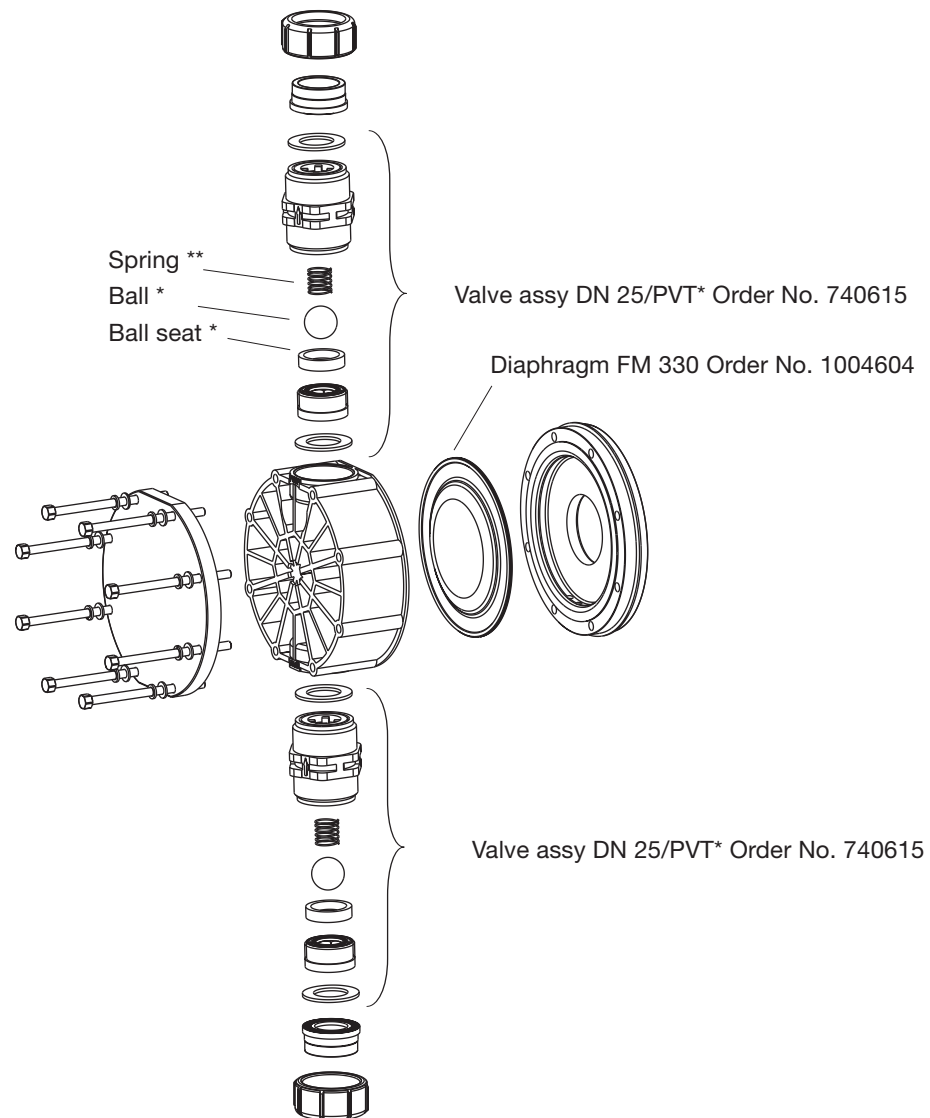


The undersigned :

***Joachim Schall, director research and development***

The EC conformity declarations, the EC series prototype test reports and the operating manuals for the individual components are also supplied with the pump.

Delivery unit Sigma/ 3 330 PVT for identity code types: S3Ba/S3Ca 120145, 120190, 120270, 120330



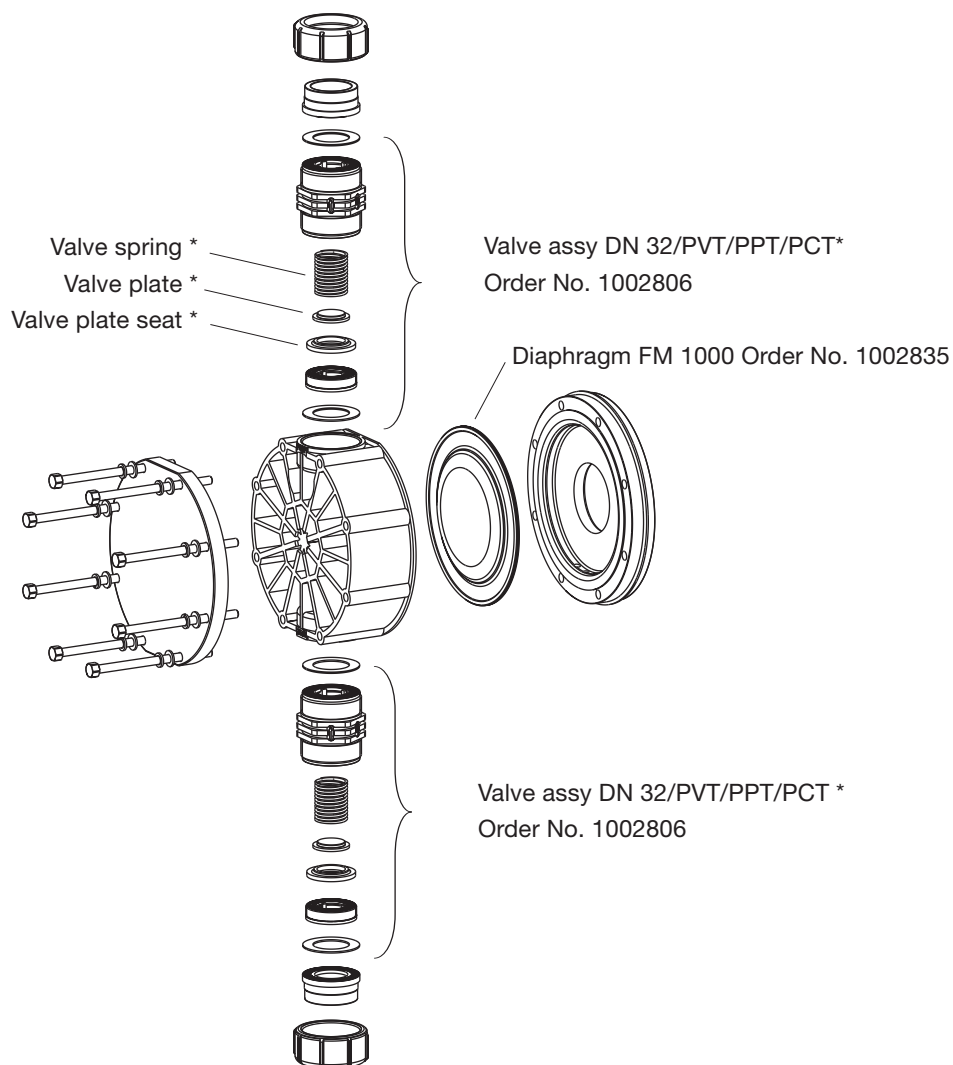
Spare parts kit FM 330 PVT/PPT/PCT Order No. 1005308.

\* The listed items are constituent parts of the spare part kit.

\*\* Special accessories (not included in spare part kit).  
Subject to technical modifications.

Fig. 27  
61\_05-104\_0\_72-03\_330

Delivery unit Sigma/ 3 1000 PVT/PPT/PCT for identity code types: S3Ba/S3Ca 070410, 070580, 040830, 041030

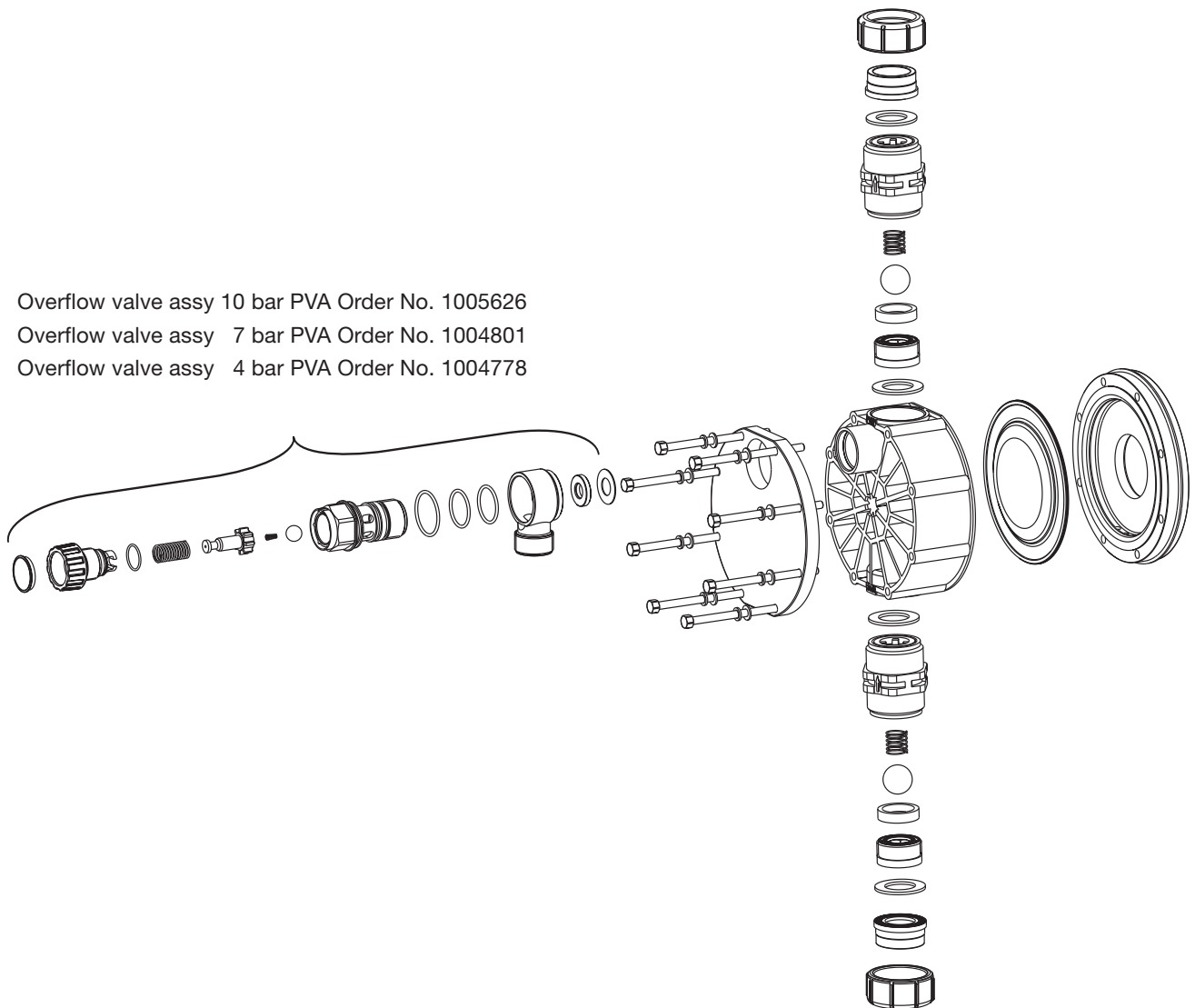


Spare parts kit FM 1000 PVT/PPT/PCT Order No. 1005309.

\* The listed items are constituent parts of the spare parts kit.  
Subject to technical modifications.

Fig. 28  
61\_05-104\_0\_72-03

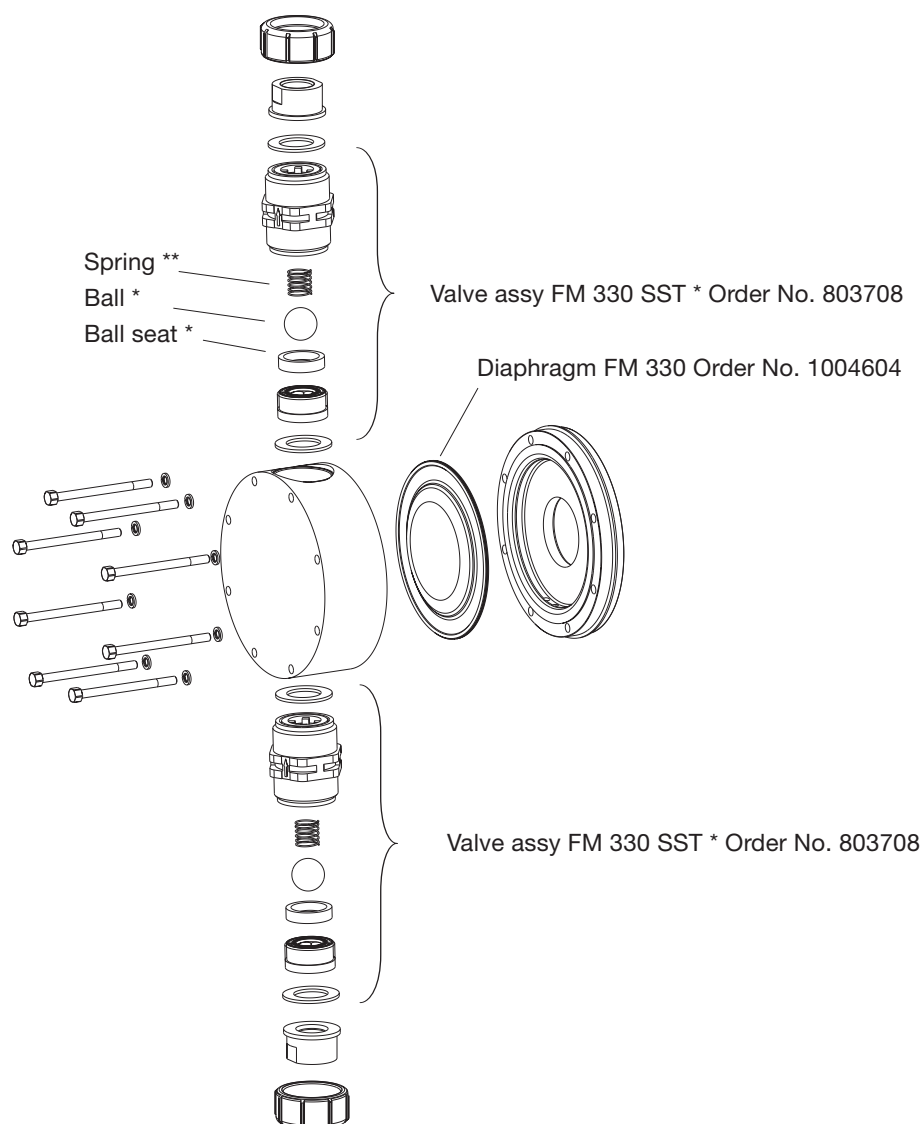
Delivery unit Sigma/ 3 330 PPT/PCT/PVT ÜV-A for identity code types: S3Ba/S3Ca 120145, 120190, 120270, 120330  
 Delivery unit Sigma/ 3 1000 PVT/PPT/PCT ÜV-A for identity code types: S3Ba/S3Ca 070410, 070580, 040830, 041030



For other spare parts see delivery unit without overflow valve (see P. 54 and 55).  
 Subject to technical modifications.

Fig. 29  
 61\_05-104\_0\_74-03\_330

Delivery unit Sigma/ 3 330 SST for identity code types: S3Ba/S3Ca 120145, 120190, 120270, 120330



Spare parts kit FM 330 SST without valve Order No. 1005310.

Spare parts kit FM 330 SST with valve Order No. 1005312.

\* The listed items are constituent parts of the spare parts kit.

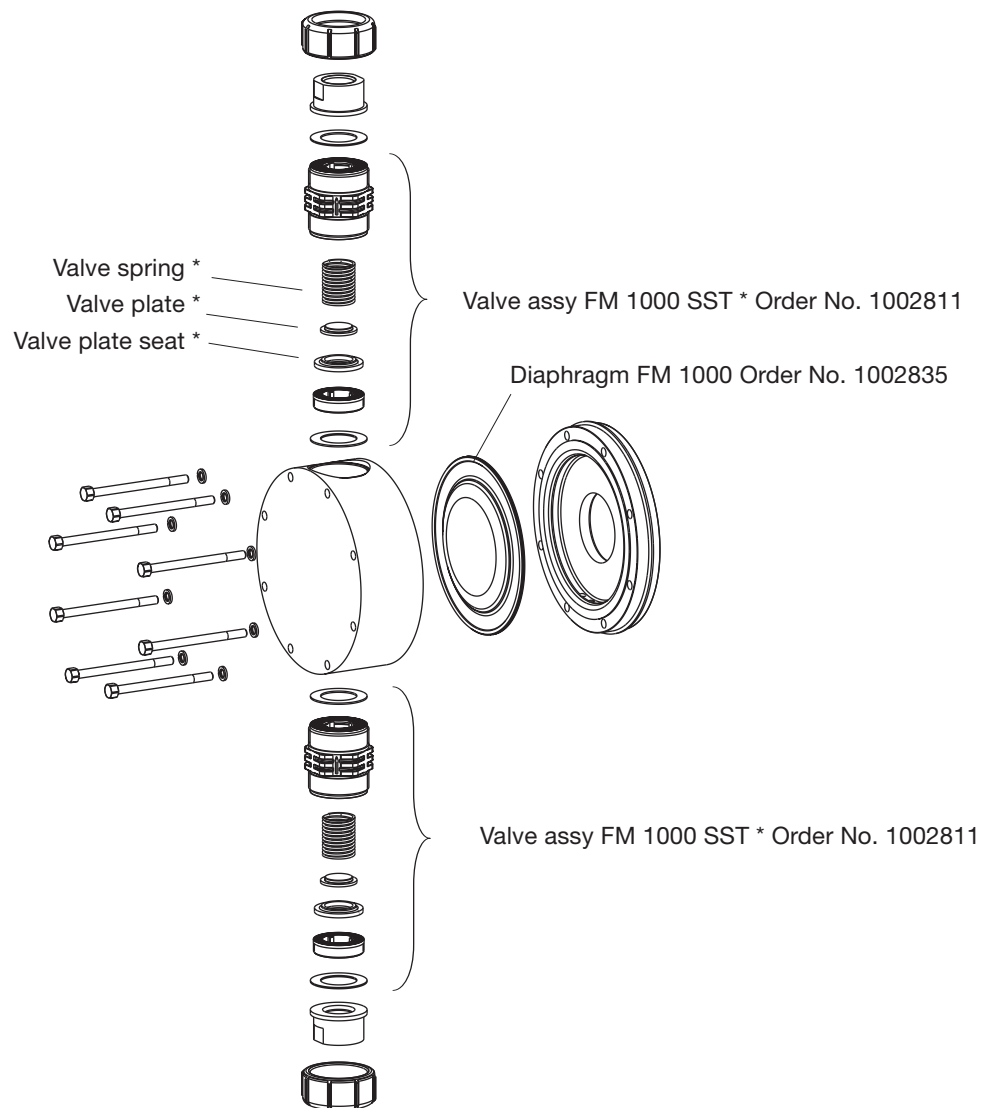
\*\* Special accessories (not included in spare parts kit).  
Subject to technical modifications.

Fig. 30

61\_05-104\_0\_73-03\_330



Delivery unit Sigma/ 3 1000 SST for identity code types: S3Ba/S3Ca 070410, 070580, 040830, 041030



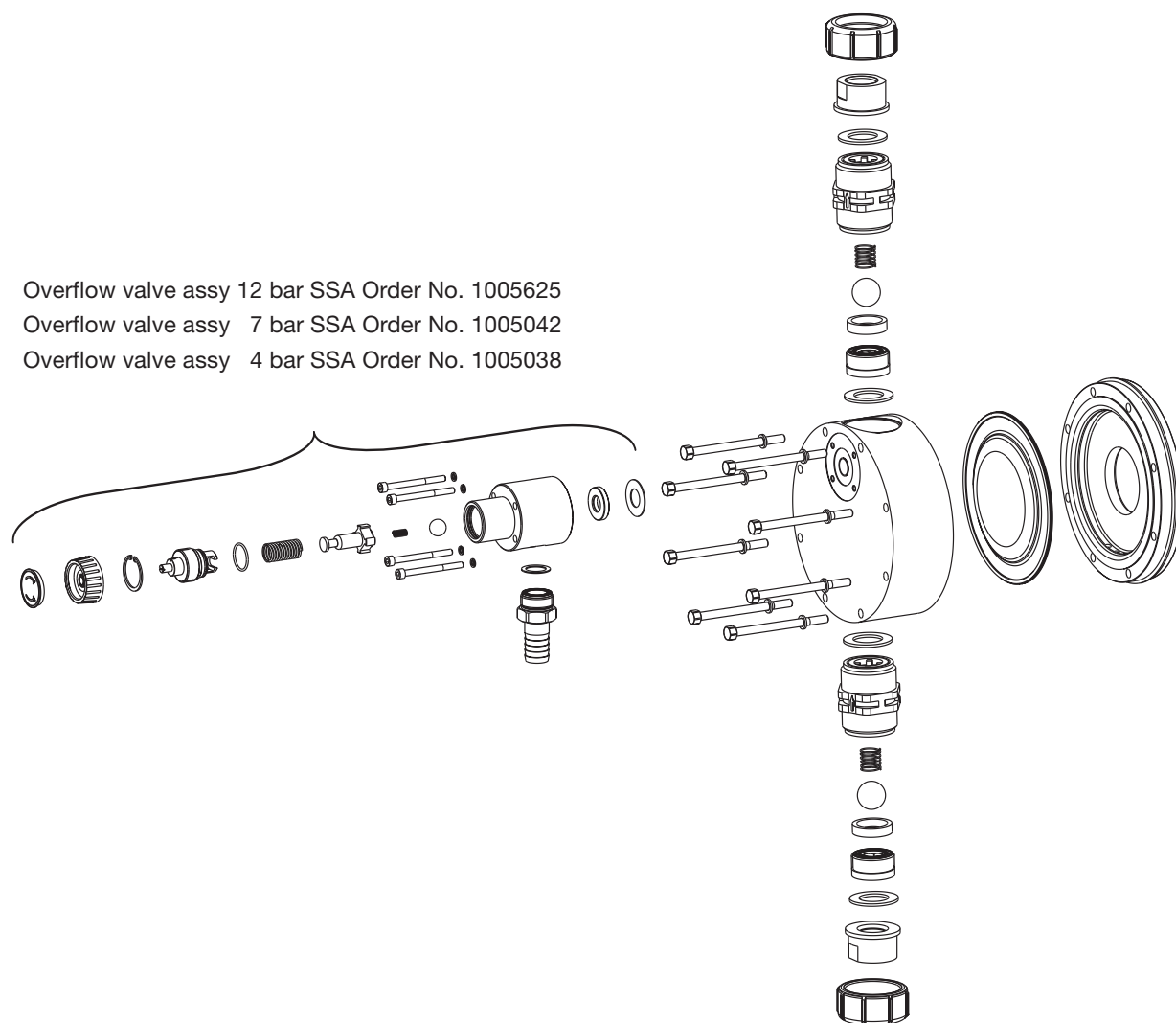
Spare parts kit FM 1000 SST without valve Order No. 1005311

Spare parts kit FM 1000 SST with valve Order No. 1005313

\* The listed items are constituent parts of the spare parts kit.  
Subject to technical modifications.

Fig. 31  
61\_05-104\_0\_73-03

Liquid end Sigma/ 3 330 SST ÜV-A for identity code types: S3Ba/S3Ca 120145, 120190, 120270, 120330  
Liquid end Sigma/ 3 1000 SST ÜV-A for identity code types: S3Ba/S3Ca 070410, 070580, 040830, 041030



For other spare parts see delivery unit without overflow valve (see P. 57 and 58).  
Subject to technical modifications.

Fig. 32  
61\_05-104\_0\_75-03\_330

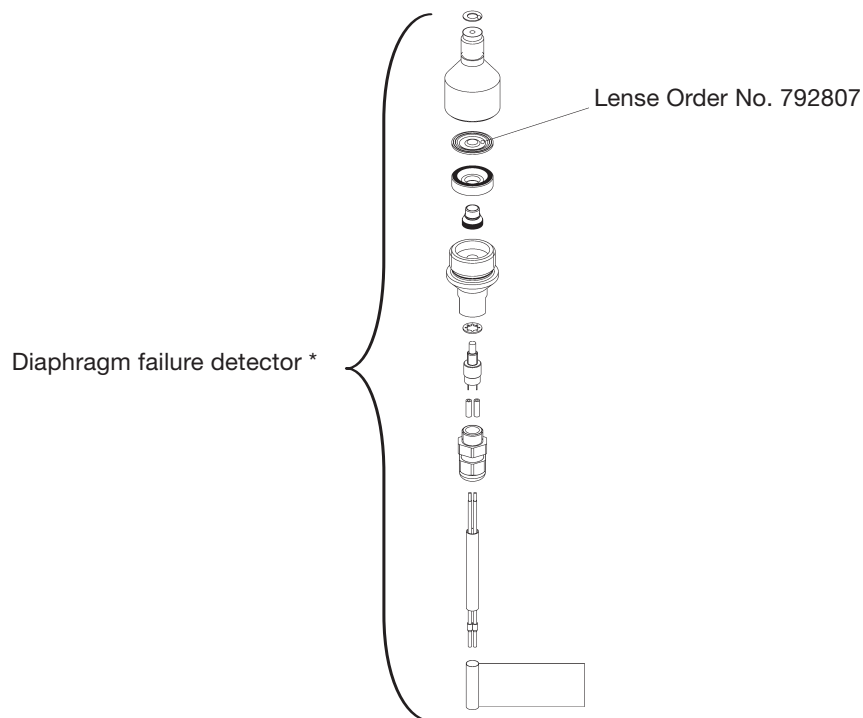
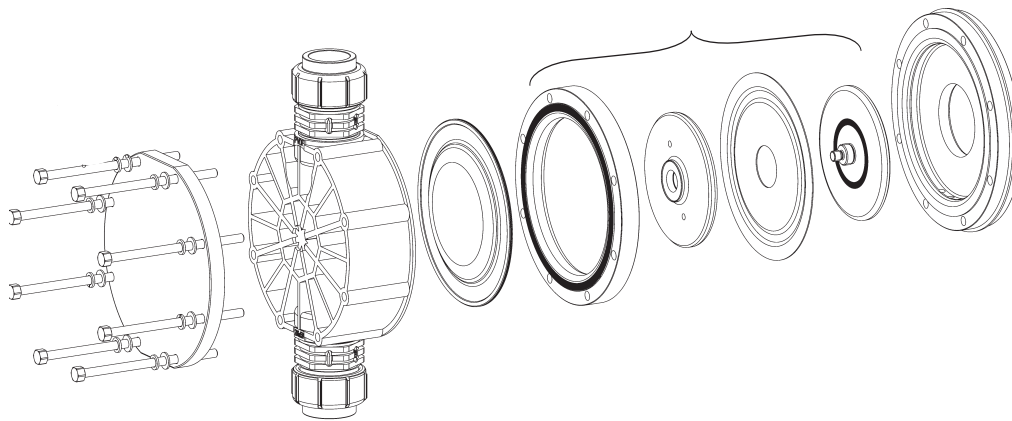
## Retrofit kit double diaphragm S3Ba/S3Ca

S3Ba Retrofit kit double diaphragm FM 330 Order No. 1004596

S3Ba Retrofit kit double diaphragm FM 1000 Order No. 1004594

S3Ca Retrofit kit double diaphragm FM 330 Order No. 1004597

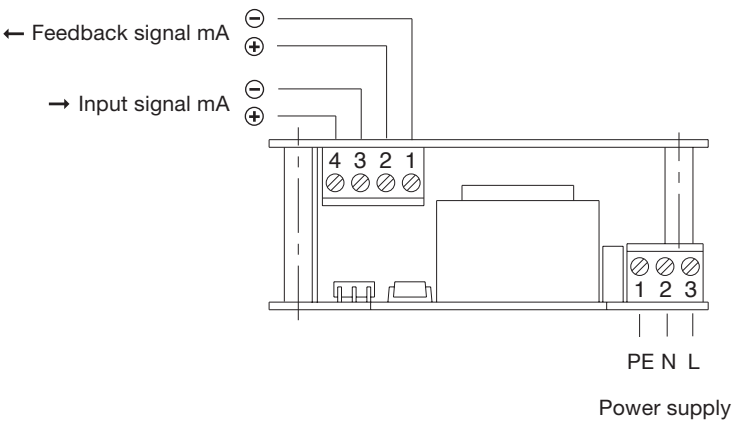
S3Ca Retrofit kit double diaphragm FM 1000 Order No. 1004595



\* These items belong to the retrofit kit.  
Subject to technical modifications.

Abb. 33  
61\_05-104\_00\_53-03\_2

Stroke actuator wiring diagram









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