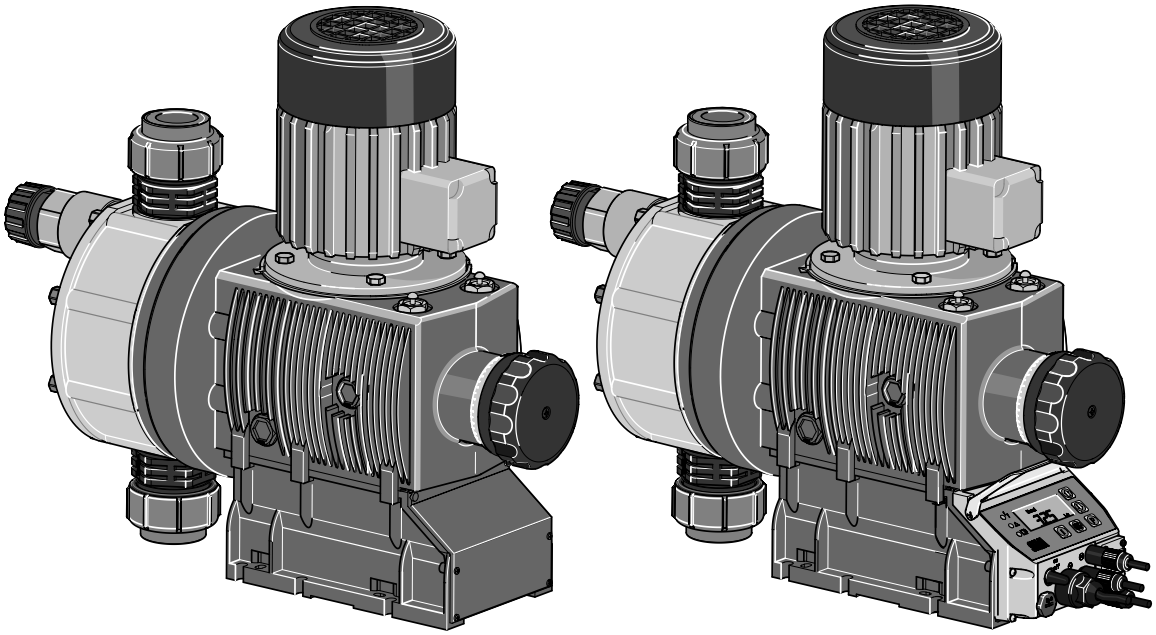
Version 10.03

Operating Instructions

ProMinent® Sigma/ 3
S3Ba (Basic Type)
S3Ca (Control Type)



S3Ba S3Ca

S3Ca ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

S3Ca ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Please enter the identity code of the device here.

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

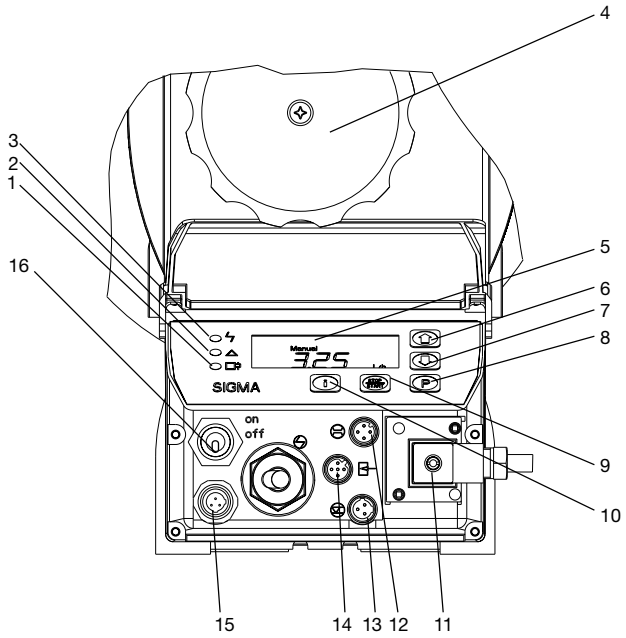
This product specific Sigma/ 3 operating instructions manual and the "General operating instructions ProMinent® motor-driven metering pumps and hydraulic accessories" are only valid if read together!

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

The warranty shall be invalidated by damage caused by operating errors!

Control elements and key functions

Control elements: overview

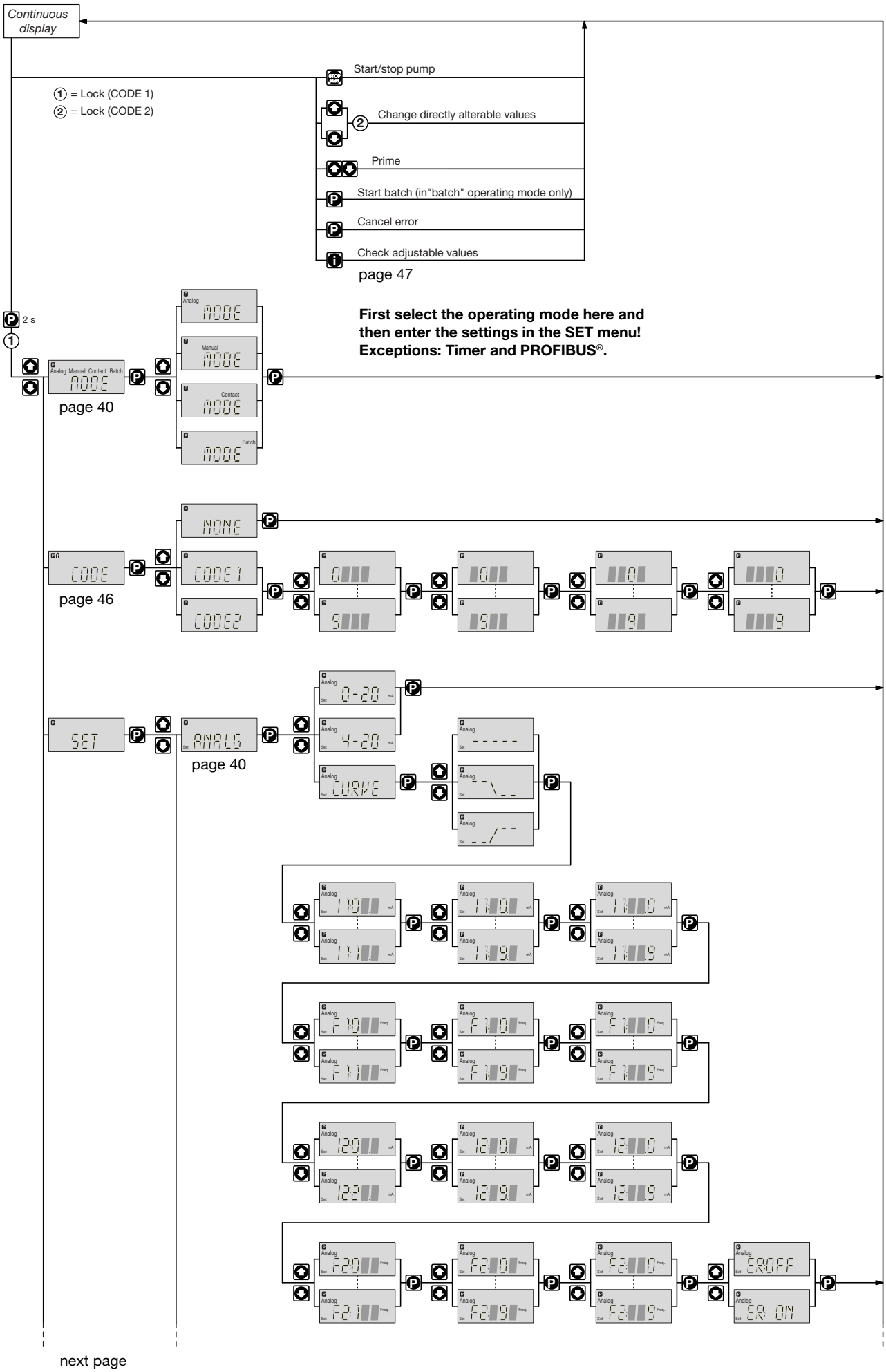


1 Operating light (green)
2 Warning light (yellow)
3 Error warning light (red)
4 Stroke length adjuster
5 LCD display
6 UP key
7 DOWN key
8 P key
9 STOP/START key
10 i key
11 Relay output (optional)
12 Metering monitor socket
13 Float switch socket
14 External control socket
15 Diaphragm rupture indicator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



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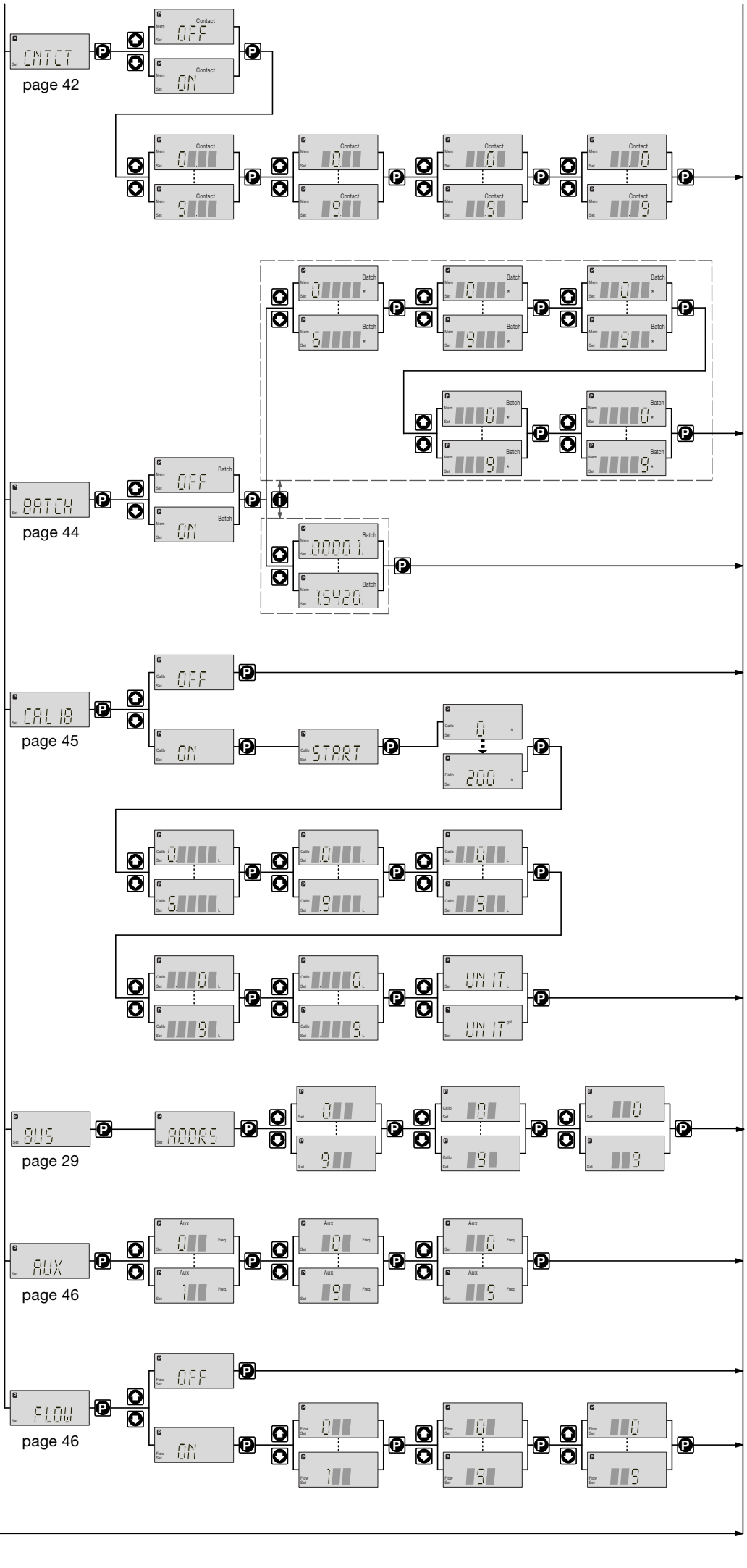
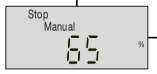
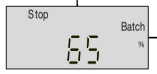


Continuous display

Continuous display	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				
Feed rate				
Total stroke number				
Total litres (feed quantity)				
"External" display				
Signal current				
Strokes remaining				
Batch size/ Litres remaining				
Factor				
Stroke length				

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

"Mem" appears only when "memory" function activated

Imprint

Operating Instructions for ProMinent® Sigma/ 3 S3Ba/S3Ca

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Subject to technical modifications.

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Identity code ordering system

Please enter the identity code on the device label into the grey box below.

S3Ba | **Sigma Basic Type (S3Ba)**

H | Main power end, diaphragm

Pump type: (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

Liquid end material:

PV	PVDF
SS	Stainless steel

Seal material:

T	PTFE seal

Positive displacement element:

0	Standard diaphram, PTFE version
1	With membrane rupture signalling (retrofittable)

Liquid end version:

0	No valve springs
1	With 2 valve springs, Hastelloy C, 0.1 bar
4	With bypass valve, Viton® seal, no valve springs
5	With bypass valve, Viton® seal and valve springs

Hydraulic connector:

0	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

Version:

0	With ProMinent® logo (standard)
1	Without ProMinent® logo

Power supply:

S	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)

Enclosure rating:

0	IP 55
1	Exe motor version (EExe II T3)
2	Exde motor version (EExde IIC T4)

Stroke sensor:

0	No stroke sensor (standard)
2	Pacing relay (read relay)
3	Stroke sensor (Namur) for potentially hazardons area.

Stroke length adjustment:

0	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 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Viton® is a registered trademark of DuPont Dow Elastomers.

Identity code ordering system

Please enter the identity code on the device label into the grey box below.

S3Ca — **Sigma Control Type (S3Ca)**

H — Main drive, diaphragm

Pump type: (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	Note:
120270*	12 bar; 324 l/h	60 Hz performance data apply
070410	7 bar; 492 l/h	for S3Ca pump types
070580	7 bar; 696 l/h	(due to internal 60 Hz operation).
040830	4 bar; 1000 l/h	* for PVDF max. 10 bar

Liquid end material:

PVT	PVDF
SST	Stainless steel

Positive displacement element:

0	Standard diaphram, PTFE version
1	Double diaphragm with rupture indicator incorporating “Pump stopping” function
2	Double diaphragm with rupture indicator incorporating “Pump alarm” function

Liquid end version:

0	No valve springs
1	With 2 valve springs, Hastelloy C 4: 0.1 bar (standard for DN 32)
4	With bypass valve, Viton® seal, no valve springs
5	With bypass valve, Viton® seal and valve springs (standard for DN 32)

Hydraulic connector:

0	Standard thr eaded 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 nozzel
8	Union nut and stainless steel hose nozzel

Version:

0	With ProMinent® logo (standard)
1	Without ProMinent® logo

Power supply:

A	1 ph 200-230 V ±10 %, 50/60 Hz
B	1 ph 100-115 V ±10 %, 50/60 Hz
W	1 ph 115-230 V ±10 %, 50/60 Hz

Lead and plug:

A	2 m Europe
B	2 m Switzerland
C	2 m Australia
D	2 m USA

Relay:

0	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

Control variants:

0	Manual + external with pulse control
1	Manual + external with pulse control + analogue
4	as 0 + process-timer
5	as 1 + process-timer
P	PROFIBUS®

Access code:

0	No access code
1	With access code

Metering monitor:

0	Input with pulse evaluation
1	Input with continuous contact evaluation

Stroke length adjustment:

0	Manual
C	Manual + calibration

S3Ca _ _ _ _ _ _ _ _ _ _ _ _ _ _

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1 Notes on safety of ProMinent® metering pumps

Notes on safety and important operating notes are divided into classes accompanied with pictograms. Please familiarize yourself with the following definitions and pictograms.

DANGER

Danger to life or risk of serious injury!

WARNING

Danger of injury or serious damage to the device!

IMPORTANT

These situations require complete attention!

NOTE

Information which must be followed!

1.1 General notes

WARNING

- **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 accessoires" on assembly, installation and maintenance!**

1.2 Notes on installation, start-up and operation

WARNING

- **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!**

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. 2, 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 and delivery lines must always be arranged such as to ensure connection at the liquid end free of mechanical stress!**

  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!
- **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!

1.3 Notes on maintenance and repair

WARNING

- **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!**

DANGER

- **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

WARNING

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!**
- **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 (catalogue or homepage))!**
- **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!**
- **Only specifically trained and authorized personnel are permitted to operate the pump!**

2.1 Identification of pump type

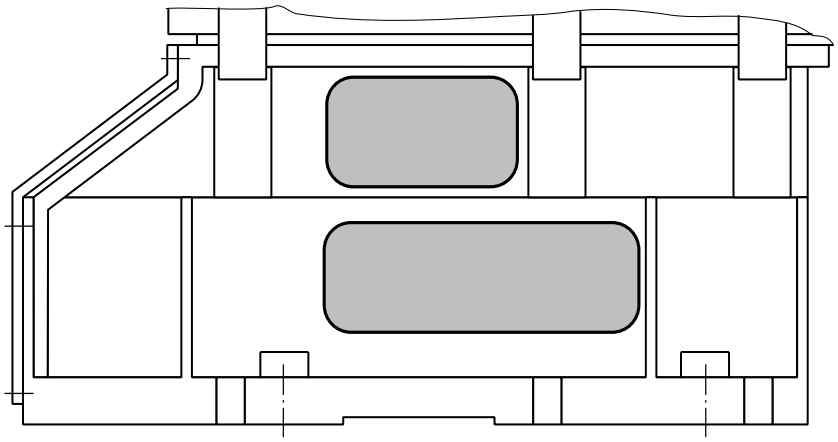


Fig. 1

The identity code 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).

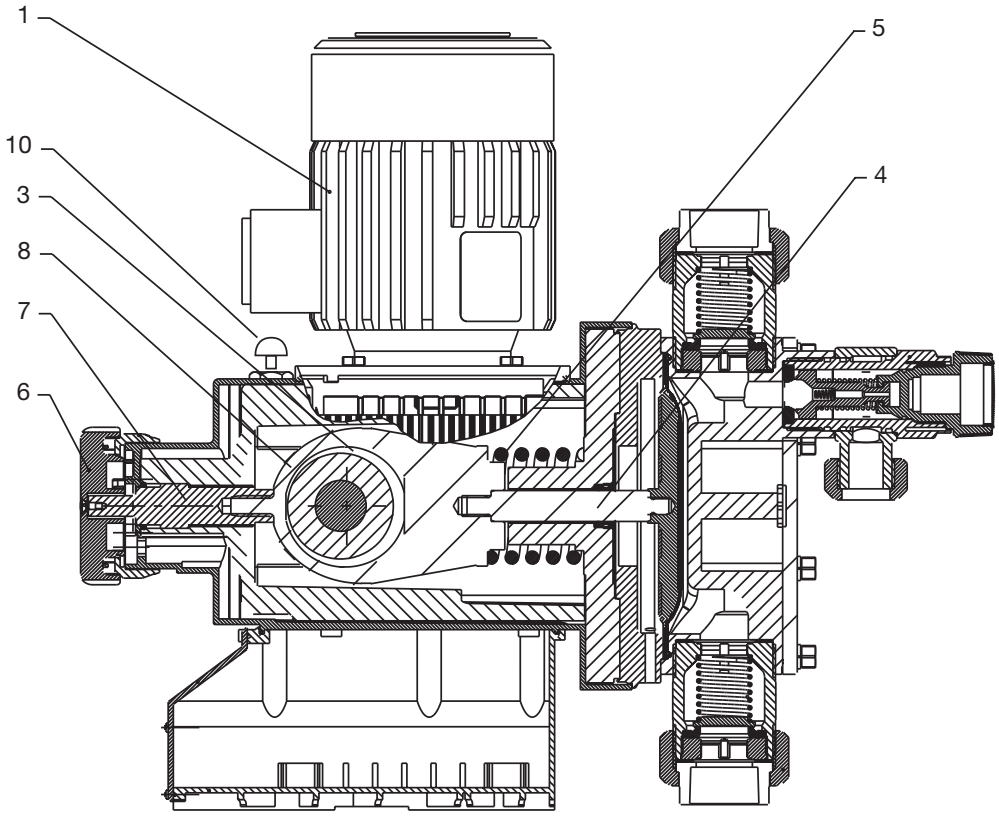


Fig. 2
61_01-101_00_11-01

2.2.2 Stroke movement

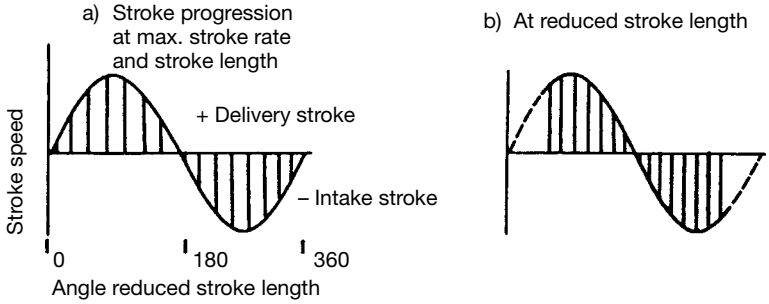


Fig. 3
S3Ba/S3Ca-006-GB

Set stroke length dependent on the required delivery capacity.

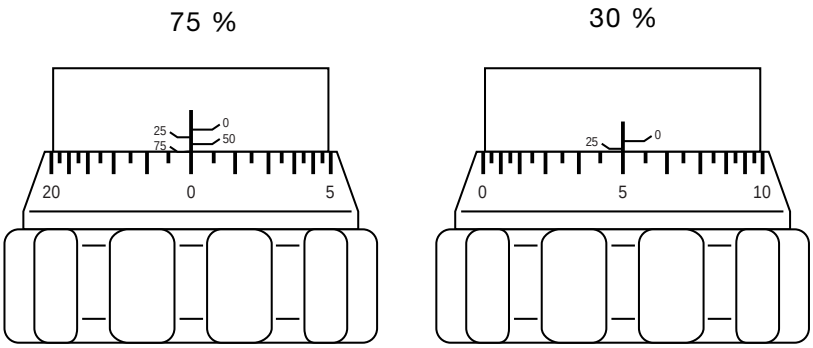


Fig. 4
S3Ba/S3Ca-007-GB

NOTE

A large stroke length and low metering frequency should be selected for very viscous media!
A shorter stroke length and high frequency should be selected to achieve good mixing properties!

2.2.3 Metering capacity diagram

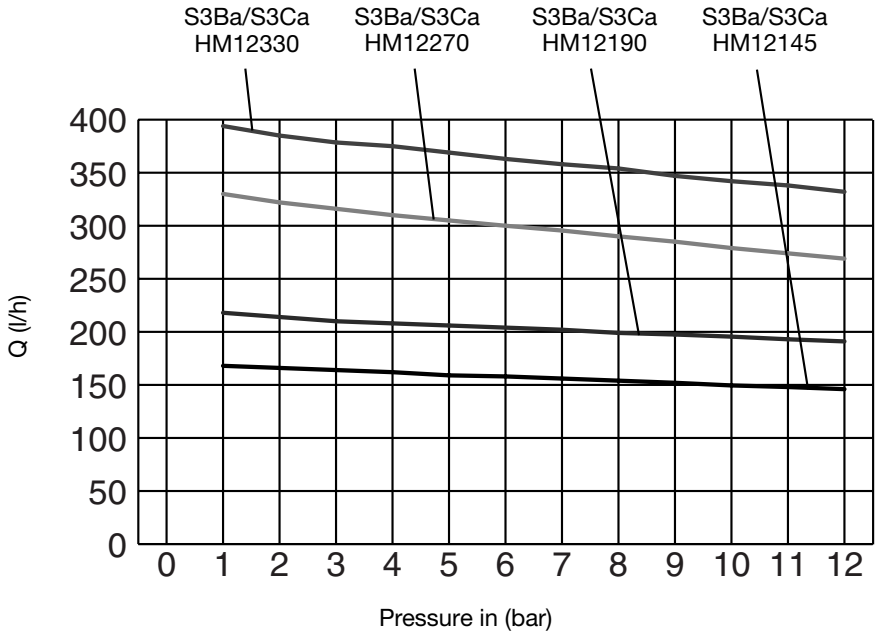


Fig. 5
HM12_Druck

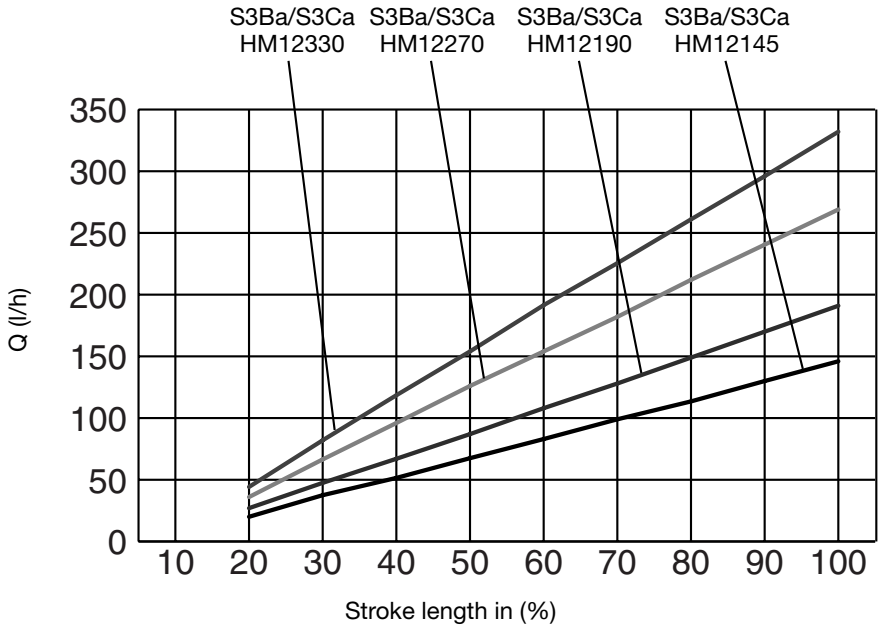


Fig. 6
HM_12 Hub

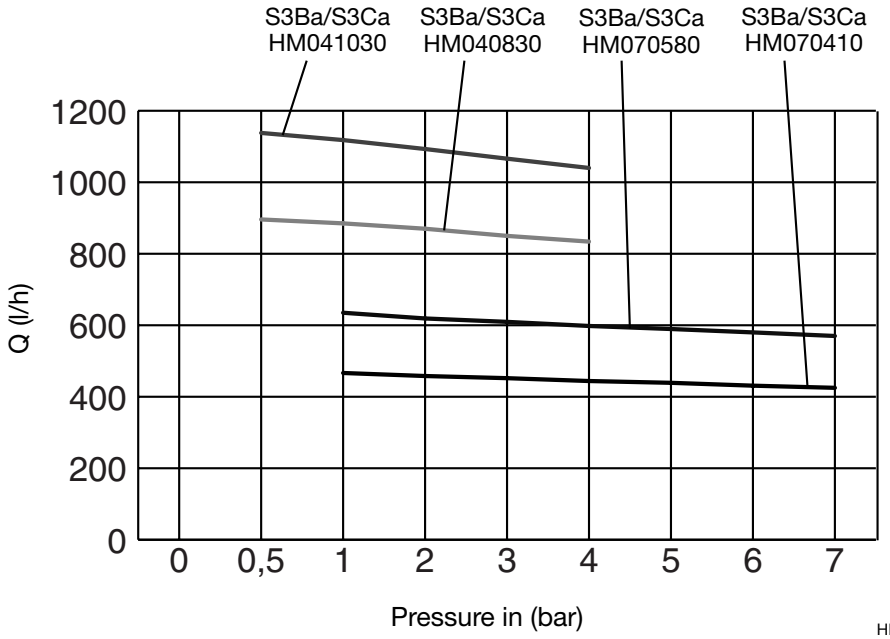


Fig. 7
HM07_Druck

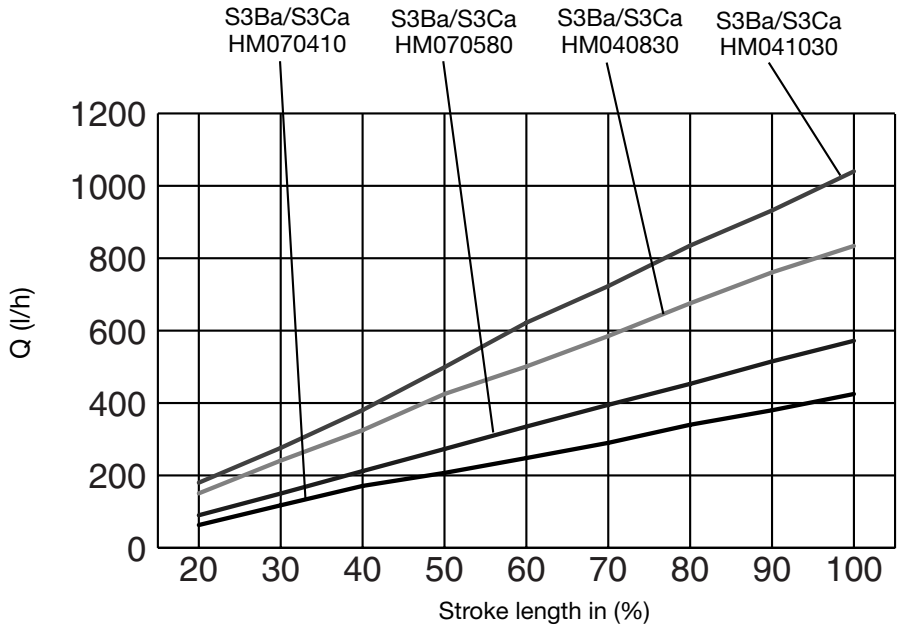


Fig. 8
HM07_Hub

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.

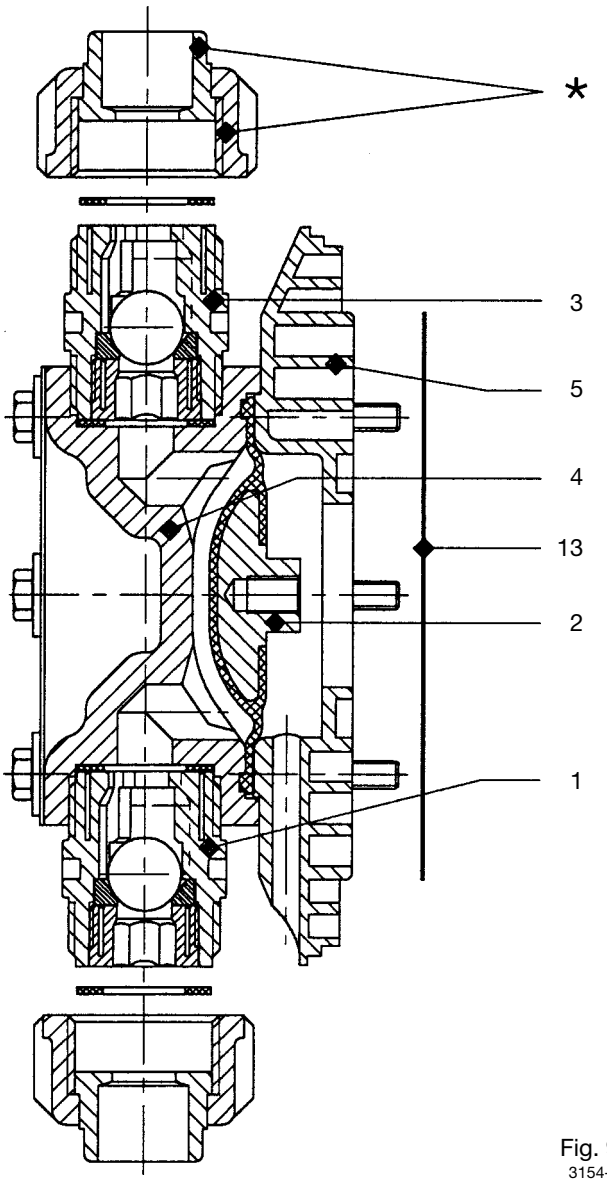


Fig. 9
3154-4

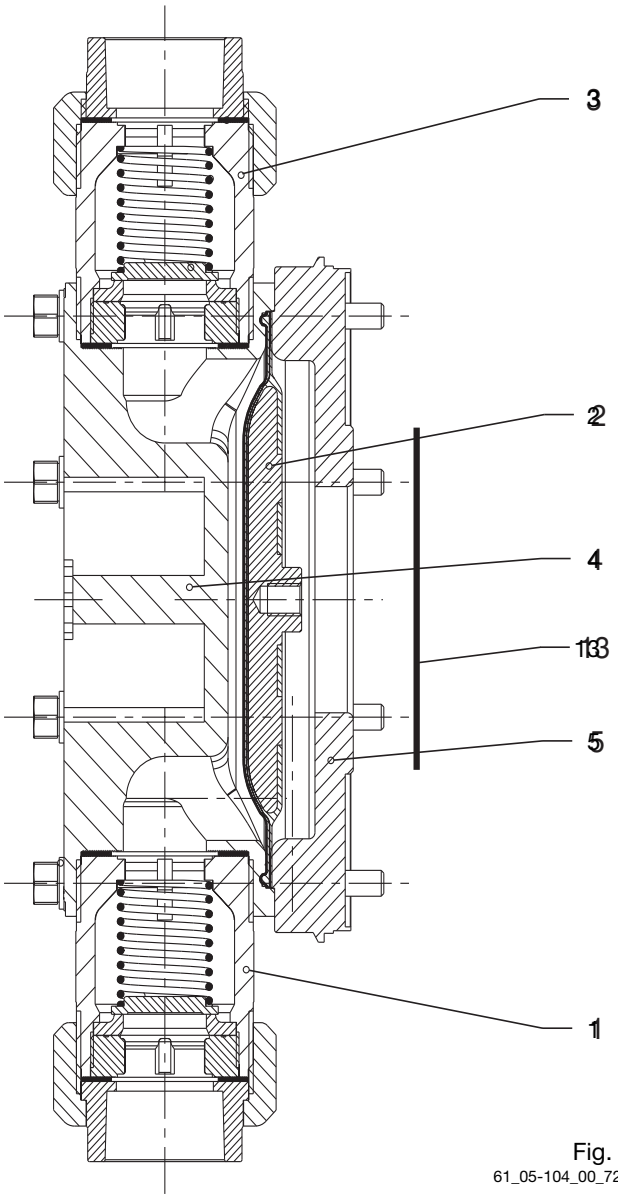


Fig. 10
61_05-104_00_72-03

2.2.5 Integrated overflow valve with bleeder function

Task:

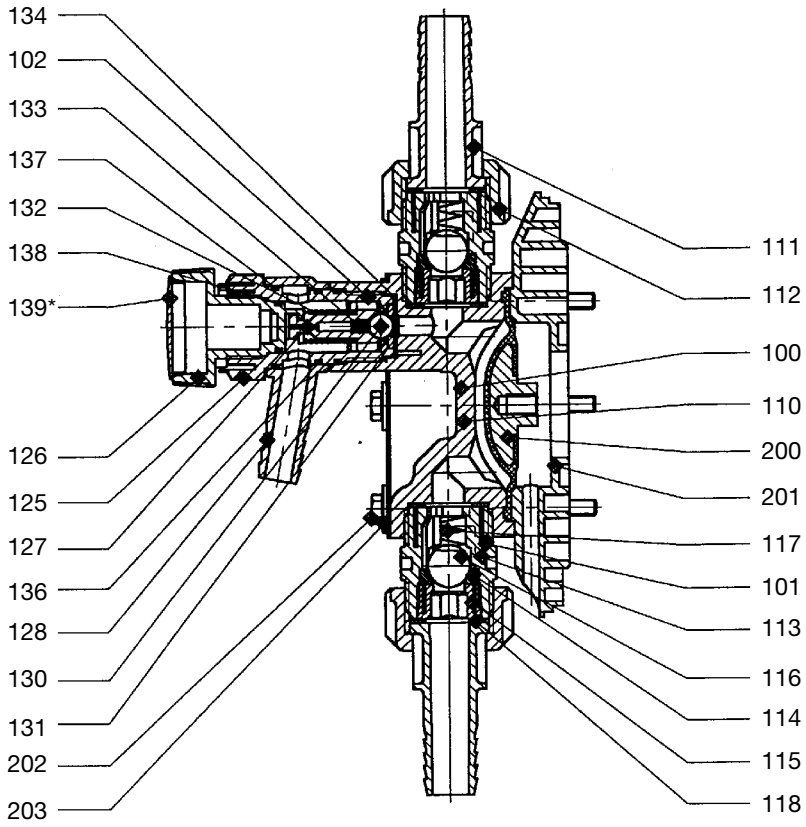
The task of the overflow valve is to protect the motor and gear unit against impermissible overpressure caused by the metering pump.

This function is produced by a spring-loaded ball.

A pressure relief mechanism for the bleeder function is provided.

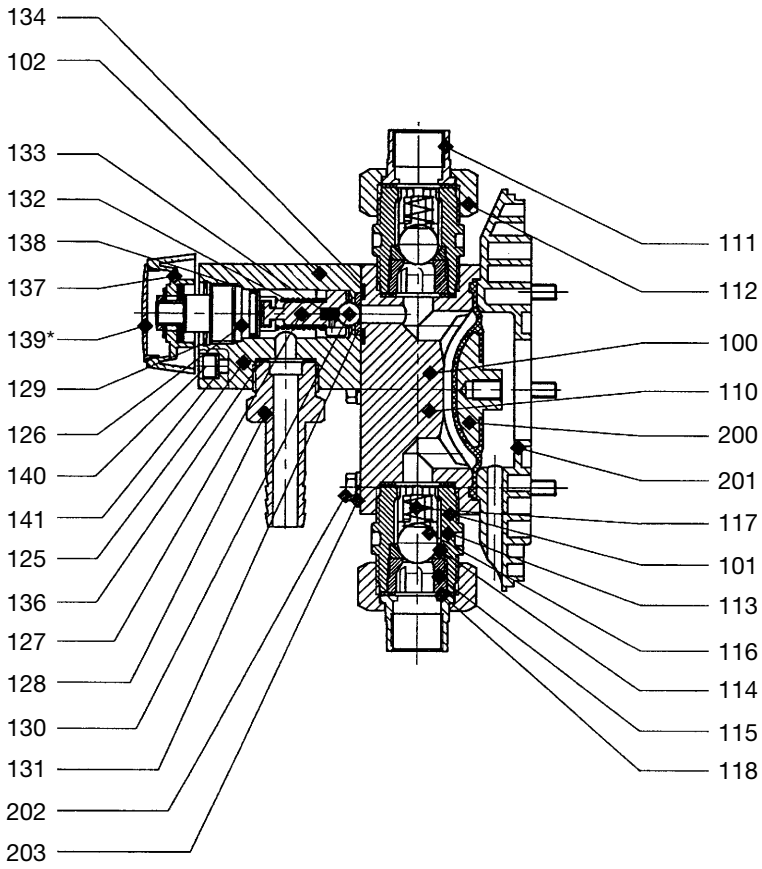
Design and functional description
(refer to Fig. No. 11 and 12)

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. 11
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. 12 3161-4

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 ... 1.15) xp_{nom} opening pressure.

Material in contact with metered medium

Liqiud end:	Overflow valve:	Seals in overflow valve:	Balls (DN25):	Plates (DN 32):	Springs:
PVDF	PVDF	Viton® O-rings*, PTFE	Glass	Hastelloy C	Hastelloy C
Stainless steel 1.4571	Stainless steel 1.4571	Viton® O-rings*, PTFE	Stainless steel 1.4571	Hastelloy C	Hastelloy C

*Viton® is a registered trademark of DuPont Dow Elastomers.

Use for intended purpose/Use not for intended purpose

Use for intended purpose

To protect the motor and gear unit against impermissible overpressure caused by the metering pump.

If the pump is the only pressure generator in the system, the overflow valve will also protect the system automatically.

IMPORTANT

- **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.**

Use not for intended purpose

To protect the system from impermissible overpressure which has other causes than the pressure generated by the metering pump.

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 item132! 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. 13)

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.

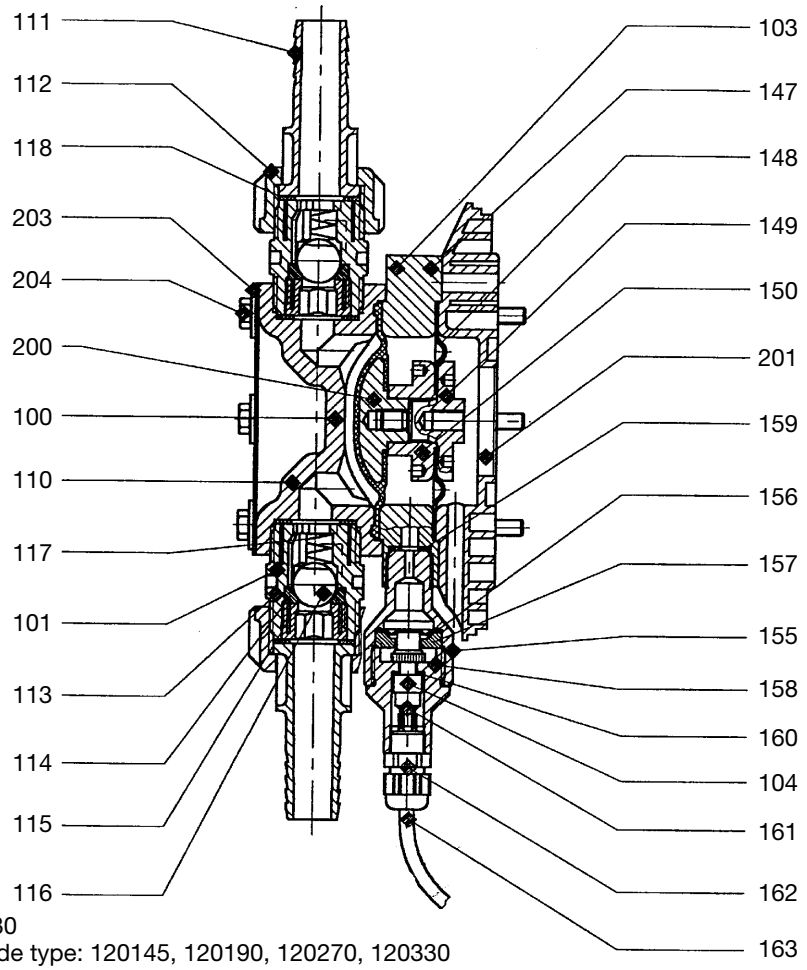
The liquid end can continue to operate in emergency mode, i.e. full operating pressure, no leakage, even after diaphragm rupture, until the diaphragm has been replaced. We offer two versions of the S3Ca with diaphragm rupture sensor:

- 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).

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.**



FM 130
Id. code type: 120145, 120190, 120270, 120330
FM 350
Id. code type: 040830, 041030, 070410, 070580

Fig. 13
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

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.**

3 Technical data

3.1 Technical data Sigma/ 3

3.1.1 Capacity data

Technical data S3Ba at 50 Hz operation

		Capacity at max. backpressure		max. stroke frequency	Intake head	Permissible admission pressure intake side	Connection intake/ delivery side	Shipping weight
Pump type Sigma/ 3	**bar**	**l/h**	**ml/ stroke**	**Strokes/ min.**	**m water column**	**bar**	**G-DN**	**kg**
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

		Capacity at max. backpressure		max. stroke frequency	Intake head	Permissible admission pressure intake side	Connection intake/ delivery side	Shipping weight
Pump type Sigma/ 3	**bar**	**psi**	**l/h/gph**	**Strokes/ min.**	**m water column**	**bar**	**G-DN**	**kg**
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 connection:	Liqiud end:	Intake/delivery connection:	Seal:	Balls FM 330:	Plates FM 1000:
PVT	PVDF	PVDF	PTFE	Glass	Hastelloy C
SST	Stainless steel 1.4571	Stainless steel 1.4571	PTFE	Stainless steel 1.4571	Hastelloy C

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

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

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)

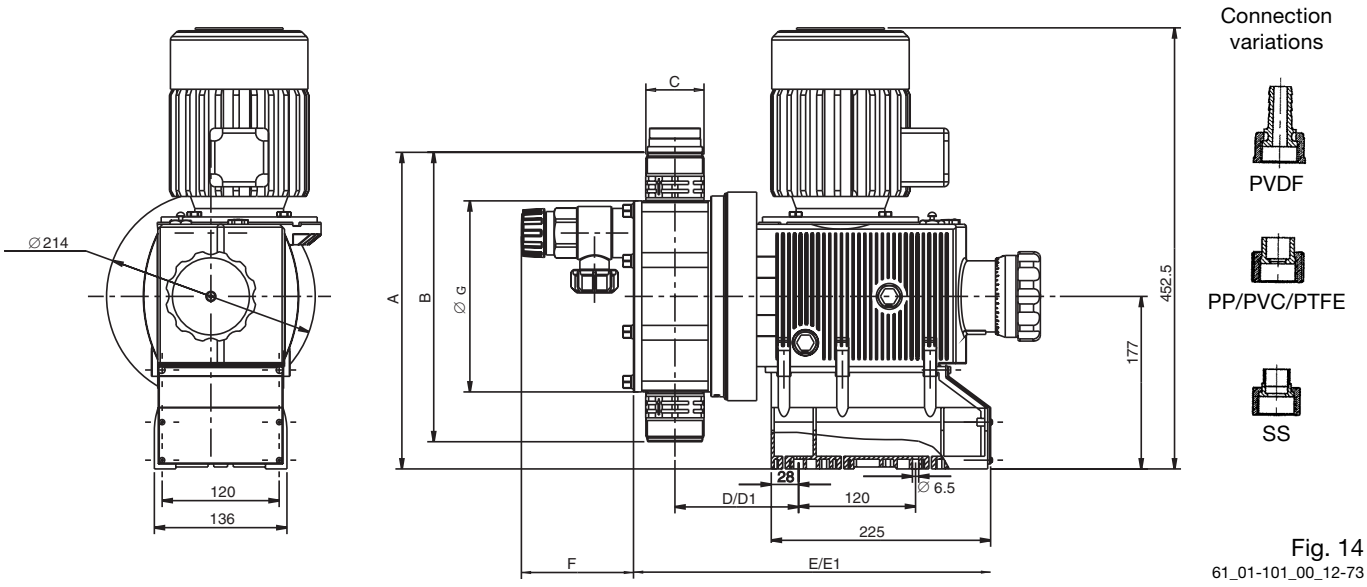


Fig. 14
61_01-101_00_12-73

Dimensions Sigma/ 3 (in mm)

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

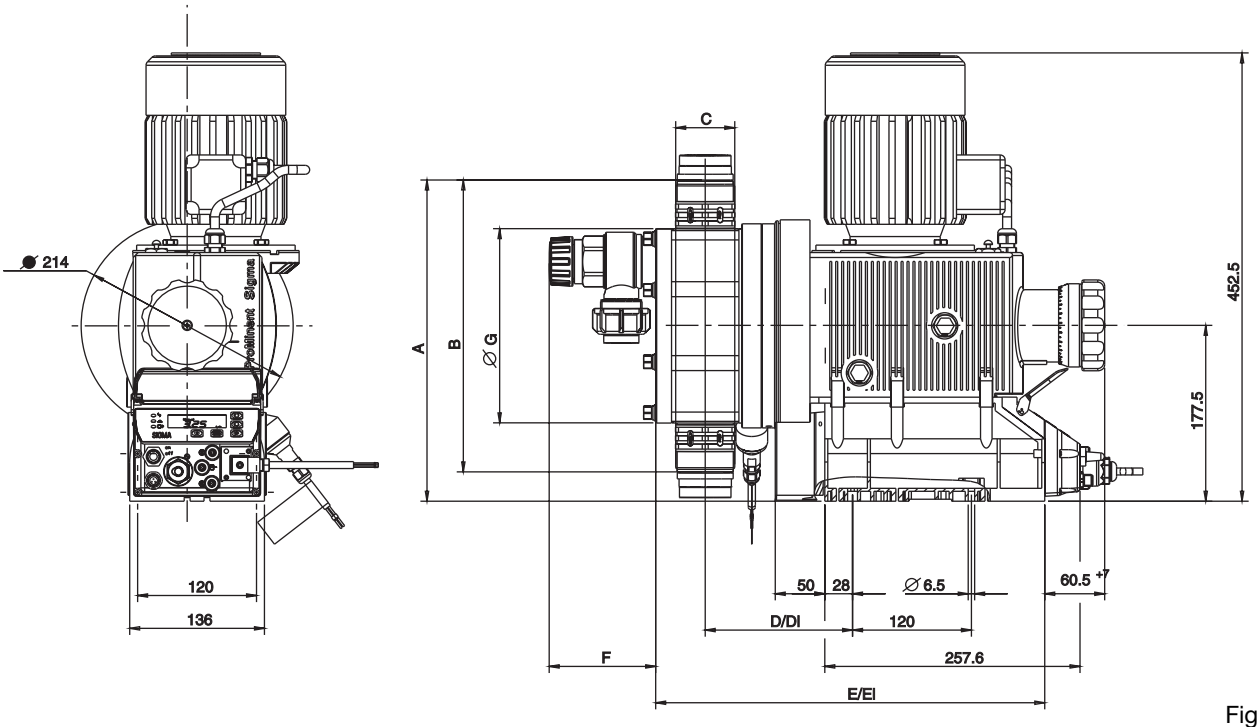


Fig. 15
61_01-101_00_15-73

Table of alternative dimensions, see 3.1.2

3.1.4 Dimensions S3Ba with stroke positioning motor (in mm)

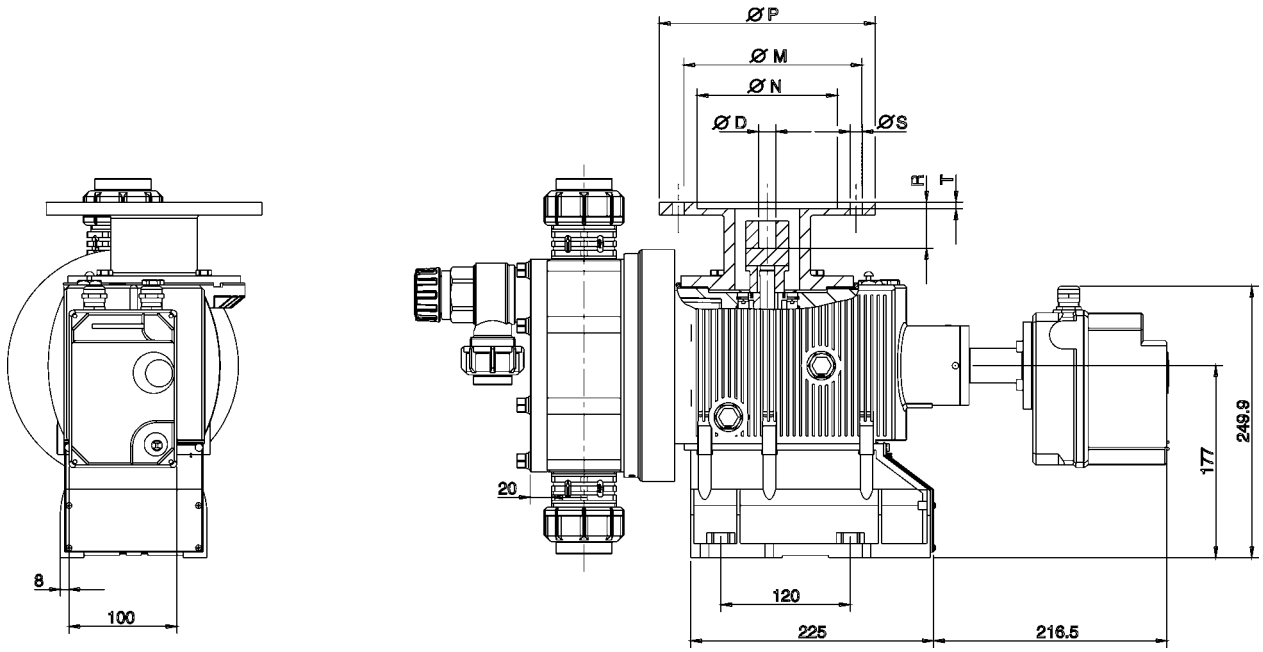


Fig. 16
61_01-101_00_12-73

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

Motor flange	Ø P	Ø M	Ø N	Ø S	Ø D	T	R
B14 160/200	200	165	130	11	19	6	41.5
56 C	167	149.3	114.3	11	15.87	6	56.5
B14 160	160	130	110	11.8	14	4	35

3.1.5 Motor data

Electrical data

Motors:				Ident code letter	
3 ph IP 55	230 V/400 V	50/60 Hz	0.37 kW	S	
1 ph AC	230 V	50/60 Hz	0.55 kW	M	
1 ph AC	115 V	60 Hz	0.55 kW	N	
3 ph EEXe o. EEXde	230 V/400 V	50 Hz	0.37 kW	L	
3 ph EEXe o. EEXde	230 V/400 V	60 Hz	0.37 kW	P	
3 ph IP 55	230 V/400 V	50/60 Hz	0.55 kW	R	Version with external fan 1 ph 230 V: 50/60 Hz and PTC

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

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).**

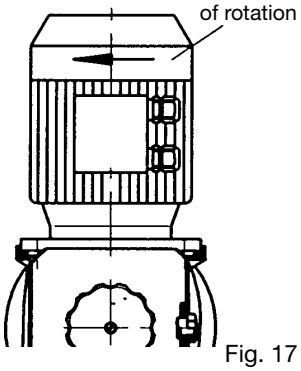


Fig. 17
S3Ba/S3Ca-026-D

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

External fan for speed controlled motor with external fan and temperature monitor:
Note information in “General operating instructions for ProMinent® metering pumps and hydraulic accessories”.

3.1.6 Stroke actuator drive mechanism

230 V ± 10 %	50/60 Hz	11.7 W
115 V ± 10 %	60 Hz	11.7 W

Cf. “Appendix” for terminal connection diagram.

3.1.7 Stroke adjuster drive mechanism

230 V ± 10 %	50/60 Hz	6.5 W
115 V ± 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) ≥ 4 ms (depending on gearbox and power frequency)

B) Namur sensor (Identcode characteristic “Stroke sensor”: 3)

Blue	-
Brown	+

5-25 V DC, Namur type and/or DIN 19234, zero volt design.

Rated voltage: 8 V DC (R_i ~ 1 kΩ)

Power consumption:
Active surface, uncovered > 3 mA
Active surface, covered < 2 mA

Rated switching distance: 1.5 mm

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

Enclosure rating: EEx ia II C T 6 and/or EEx ib C T 6
Can be used in explosive areas with suitable power supply unit.

3.1.9 Electrical data, pacing relay “S3Ba”

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

The contacts are zero volt.

3.1.10 Sound intensity level

The sound intensity level is < 70 dB (A)
at maximum stroke, maximum stroking rate, maximum back pressure (water) in accordance with DIN EN 12639 (noise measurement in fluid pumps)

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.

4.2 Maintenance

IMPORTANT

After loosening the liquid end screws (e.g. to change the valves or diaphragm), the screws must be retightend corsswise 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

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.

▶ 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 ± 0.5 Nm (FM 330) resp. 12 Nm ± 1 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.

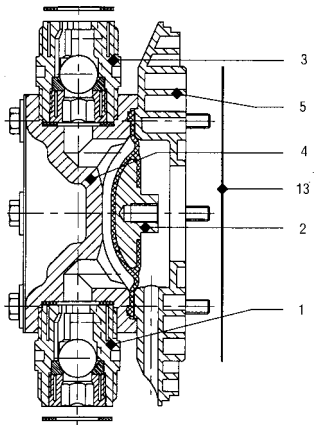


Fig. 18
S3Ba/S3Ca-014-GB

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.

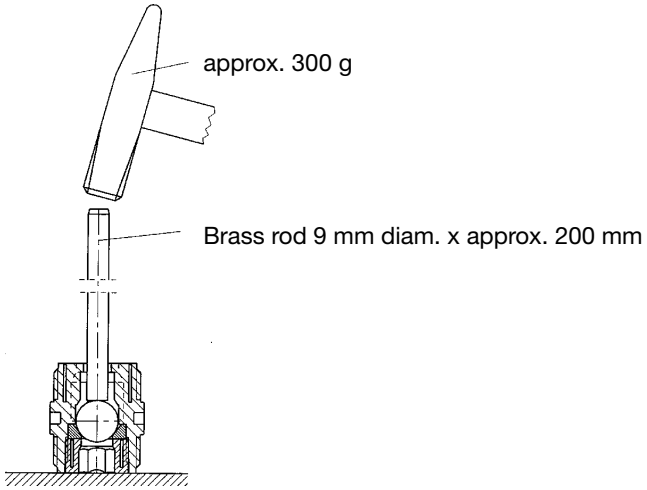


Fig. 19
S3Ba/S3Ca-019-GB

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: (Identity 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: (Identity 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®”).

Functions

The following functions can be selected using the SET menu:

“Calibrate” function (Identcode, Stroke length adjustment: manual + calibration):
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 ±10 scale points.

“Auxiliary frequency” function:

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.

“Flow” function:

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.

The following functions are available as standard:

“Float switch” function:

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.

“Pause” function:

The S3Ca can be stopped by remote control via the “external control” terminal. The “pause” function operates only via the “external control” terminal.

The following functions are activated by keystrokes:

“Stop” function:

The S3Ca can be stopped by pressing the STOP/START key without disconnecting from the mains power supply.

“Prime” function:

Priming (short term feed at maximum frequency) is activated by pressing both arrow keys at the same time (in permanent display “Stroke rate”).

Optional relay

The S3Ca has two connection options (not with PROFIBUS®).

“Fault indicating relay or power relay” option:

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.

“Fault indicating and pacing relay” option:

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.

Function and error indicators

The operating and error status is shown via the three LEDs and the “error” indicator on the LCD (see also section 9):

LCD indicator

If a fault occurs “error” will appear along with an additional fault warning.

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

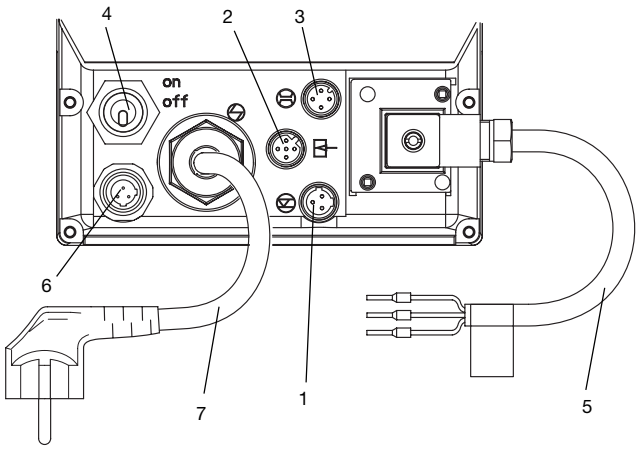


Fig. 20

(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

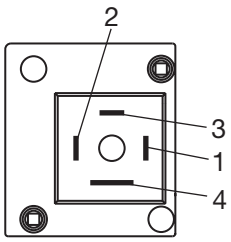
(4) Mains switch (1-pin)

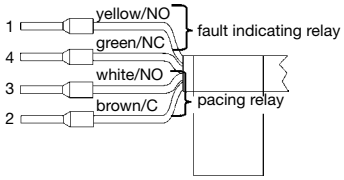
(5) Relay cable (fault indicating and/or pacing relay)

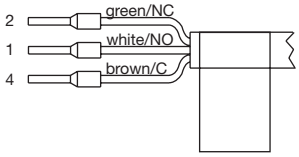
(6) Socket for diaphragm rupture sensor

(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 10^6 (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.

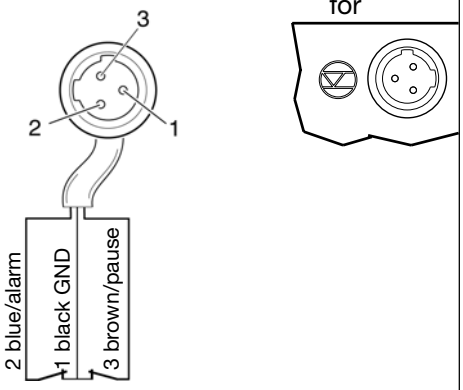
N/O fault indicating relay, the relay closes in the event of a fault.

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

Wiring diagram

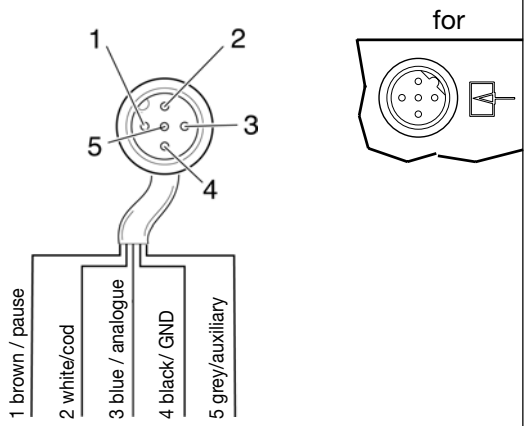
View of cable connectors from front

Float switch cable



Blue and black open
-> alarm signal
Brown and black open
-> alarm signal + pump stops

Universal signal cable (5-score)



Pause function:
brown and black closed
-> pump metering

brown and black open
-> pump stopped

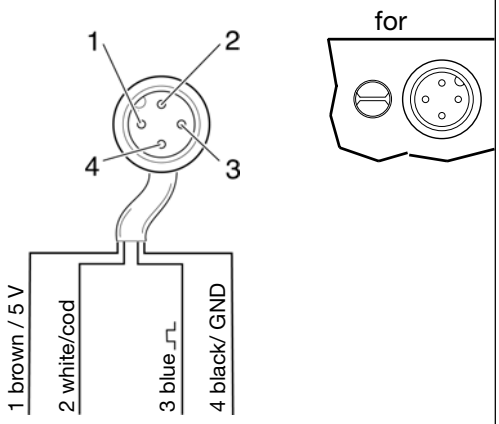
External/contact:
white and black closed
-> start contact for pump
(note pause function:
brown and black closed)

Analogue:
blue, black
-> analogue output 0/4-20 mA
(note pause function:
brown and black closed)

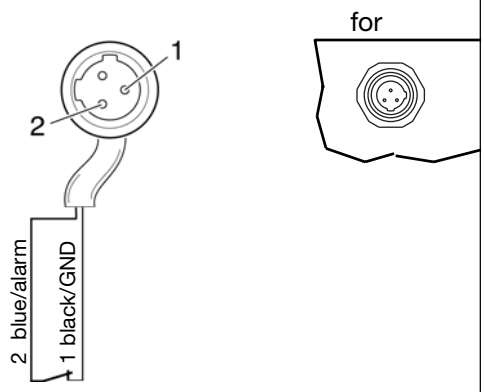
Auxiliary frequency:
grey and black closed
-> pump metering at pre-set stroking rate

➜ Circuit examples page 37

Metering monitor cable

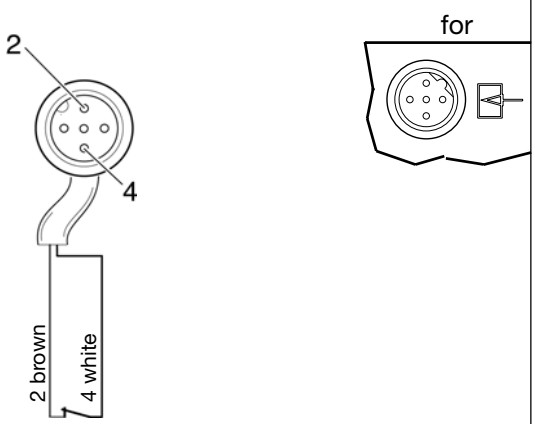


Diaphragm rupture cable

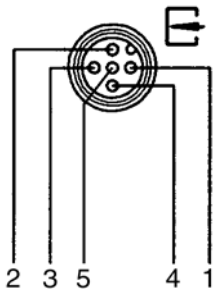


Contact open -> alarm
-> pump stops with controller type 0

External/contact cable (2 core)



Contact closed -> metering stroke



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 kΩ
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 kΩ
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 kΩ
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 kΩ
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 kΩ
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 Ω

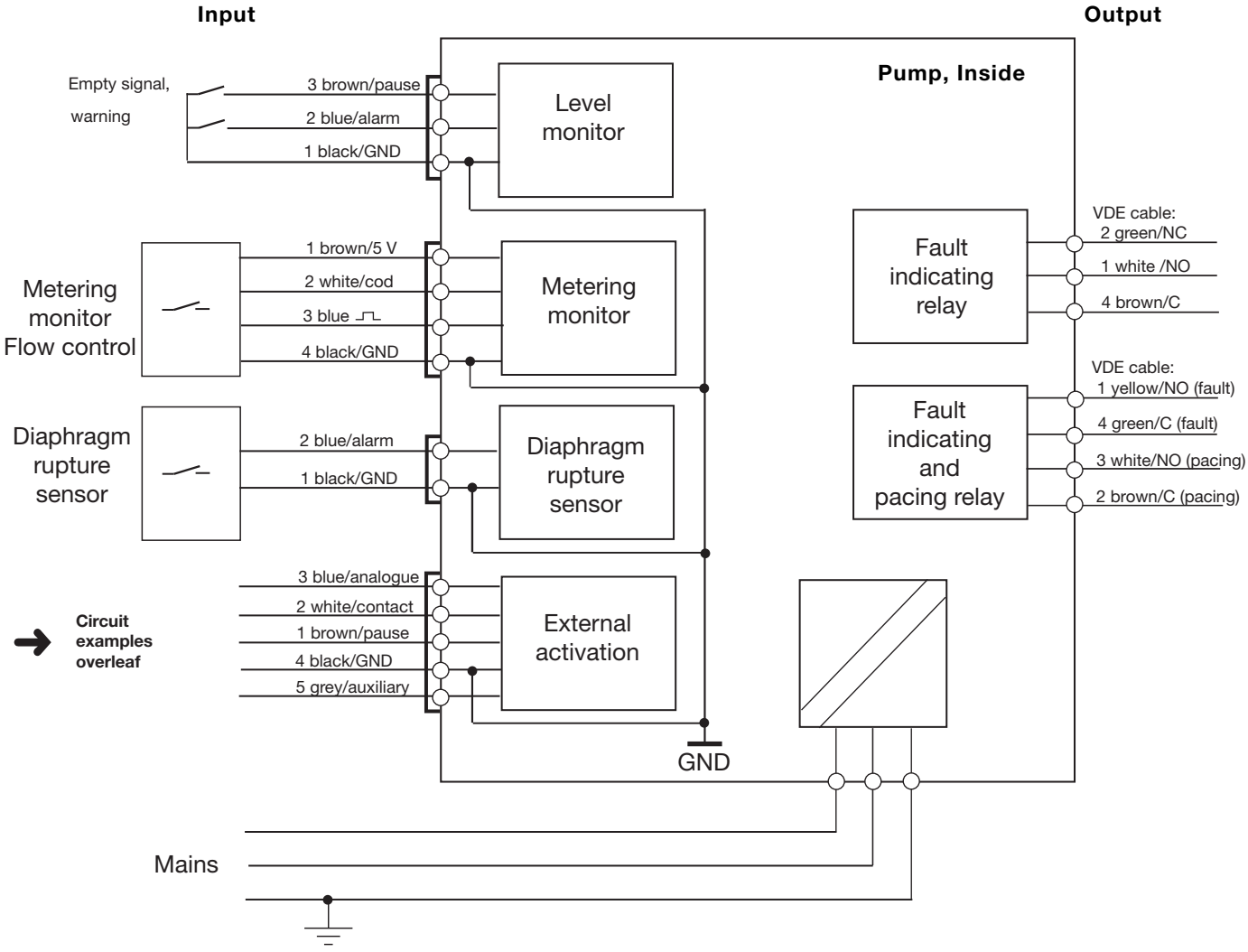
Pin 4 = GND

Pin 5 = Auxiliary input

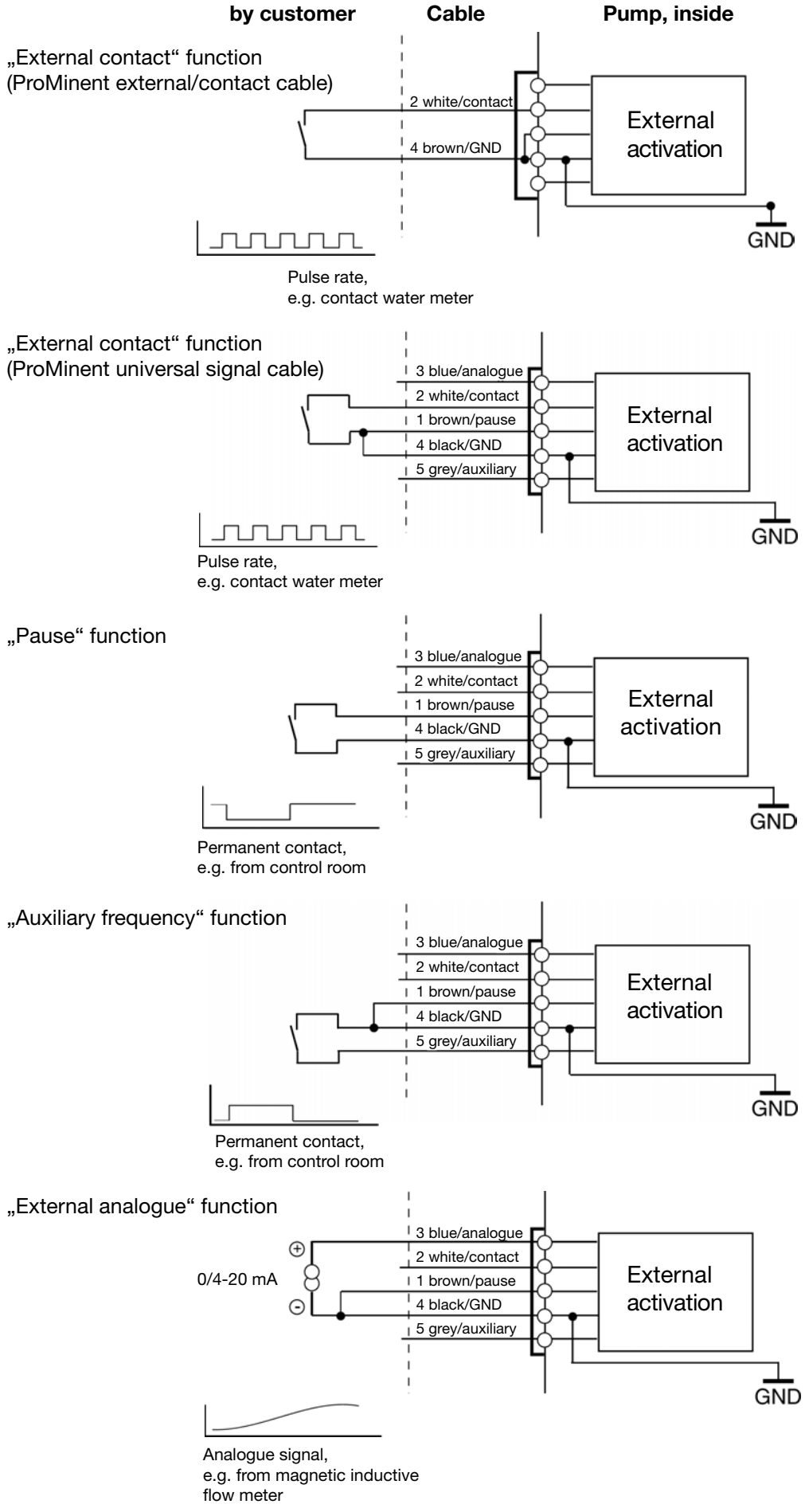
Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)

* 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



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. 21)
- ▶ 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. 22)
- ▶ 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. 24)
- ▶ 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.

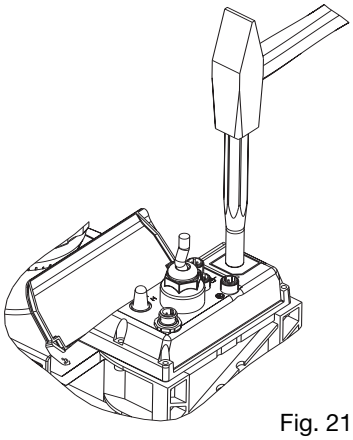


Fig. 21

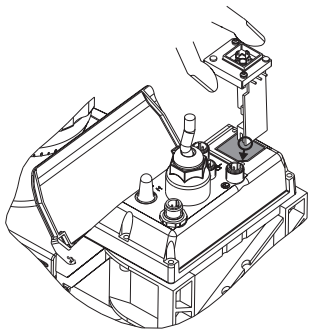


Fig. 22

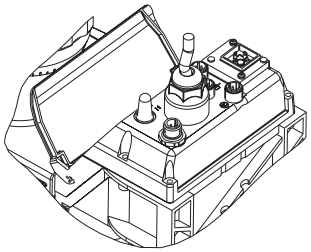


Fig. 23

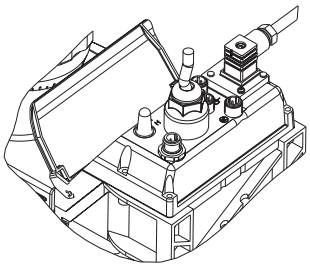
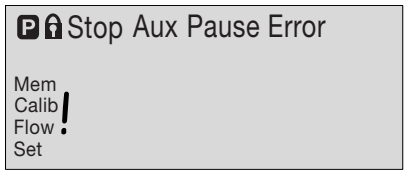


Fig. 24

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:

Symbol for P key:	The S3Ca is in settings mode.
Close symbol:	In a continuous display: lock (if code has been set). In settings mode: indicates access to code menu.
Stop:	The S3Ca has been stopped using the STOP/START key.
Pause:	The S3Ca has been stopped using the “pause” function (external).
Aux:	The S3Ca is pumping at the auxiliary frequency. In AUX menu: the S3Ca is in the AUX menu.
Error:	A fault has occurred and the pump has been stopped.
Mem:	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.
Calib:	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 %).
Flow:	The S3Ca is in the FLOW menu.
Set:	The S3Ca is in the SET menu.
Exclamation mark:	The number of strokes reached is above the maximum value (99999) that can be shown in the LCD display.

NOTE

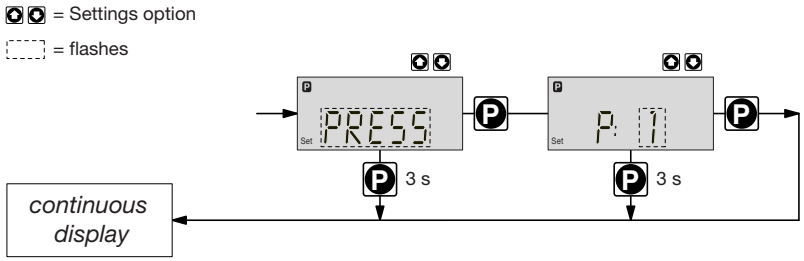
The S3Ca indicates the metering volume and the metering rate in l or l/hor gal or gal/h only when calibrated.

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

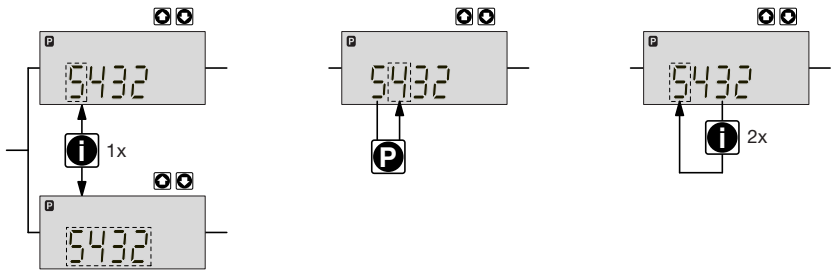


Confirm entries

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”):

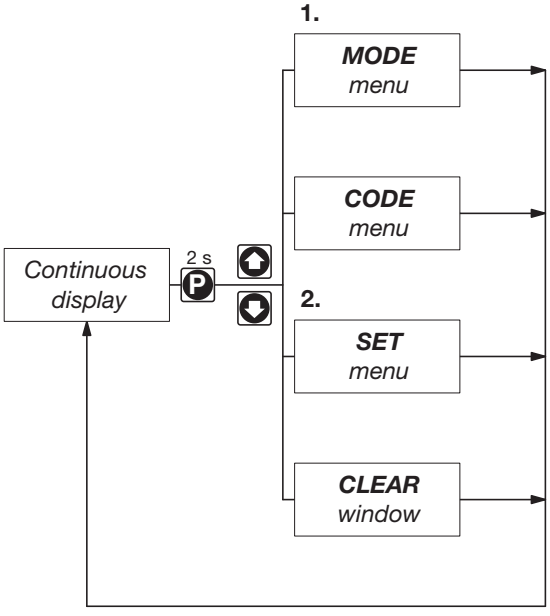
- MODE menu
- CODE menu (optional)
- SET menu
- CLEAR window

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!

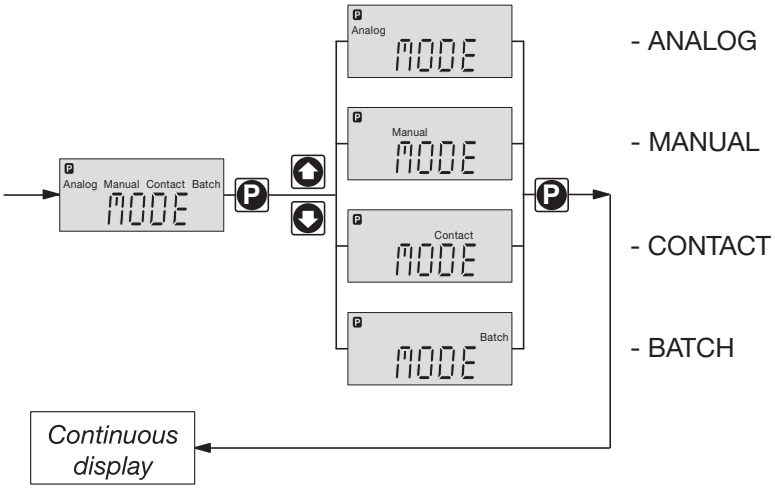


7.3 Select operating mode (MODE menu)

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.

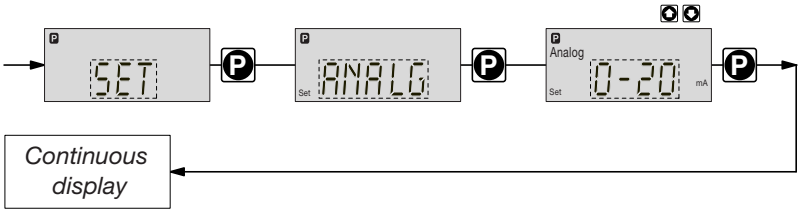
7.4.2 Settings for “analogue” operating mode (ANALG menu)

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.

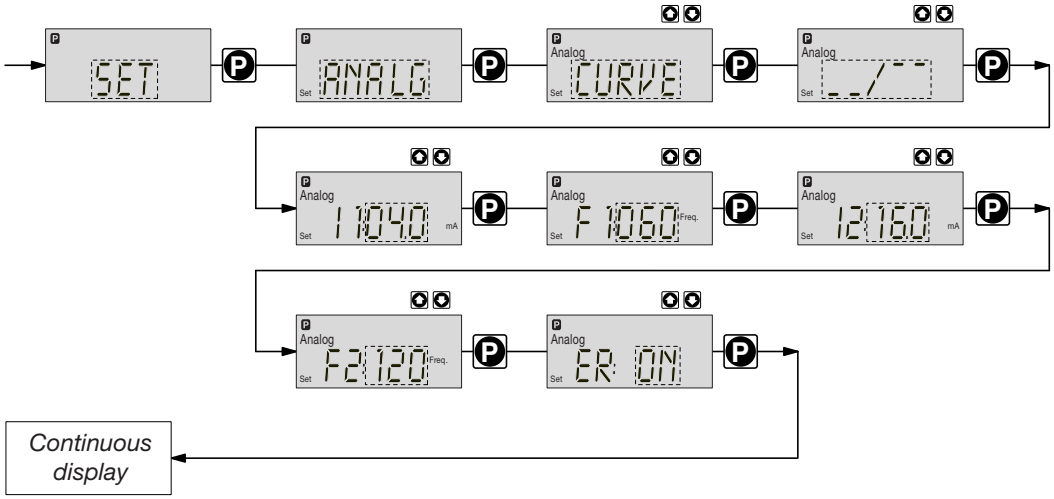
The stroke rate is controlled by an analogue electrical signal via the “external control” terminal.

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 180 strokes/min.
  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 180 strokes/min.
  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:

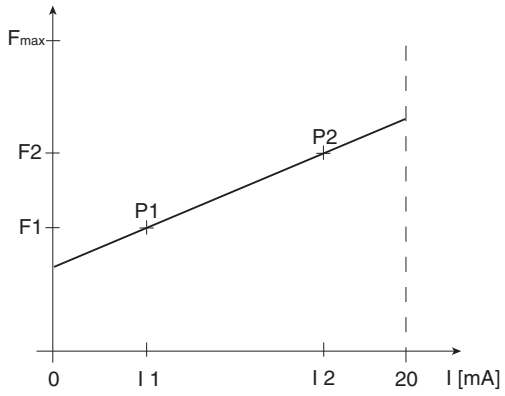


Fig. 25

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

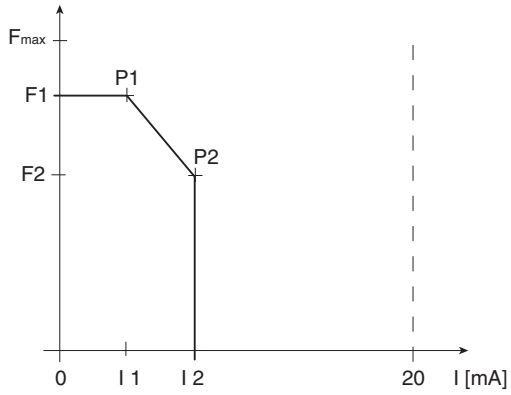


Fig. 26

Upper band
e.g. acid pump

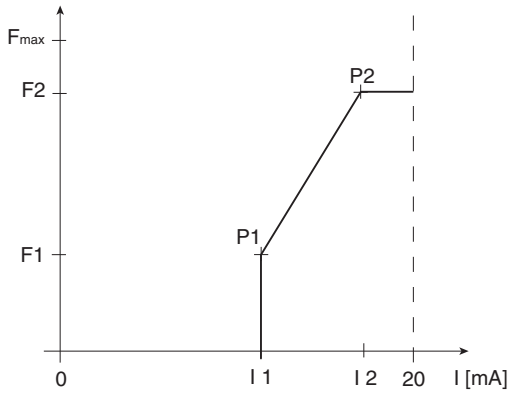


Fig. 27

Lower band:

The symbol 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 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)

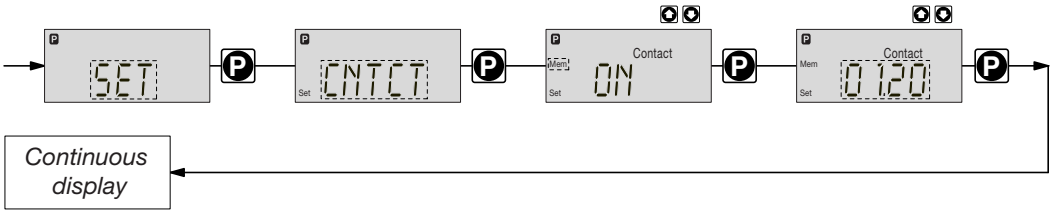
In addition to those settings menus described in 7.5, there is an additional CONTCT in the overall SET menu for the “contact” operating mode.

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)
Increase	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)
Reduction	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.

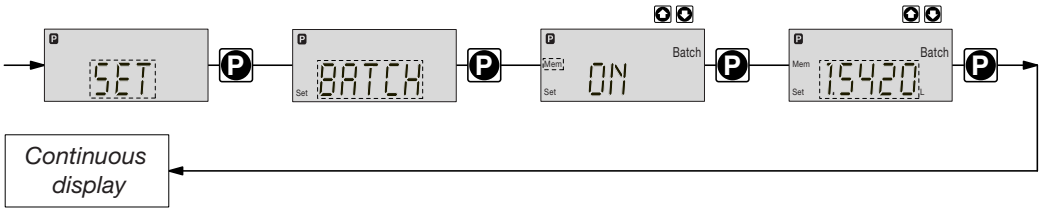
You can optimally adapt the S3Ca to the respective process, e.g. in connection with contact water meters.

“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.

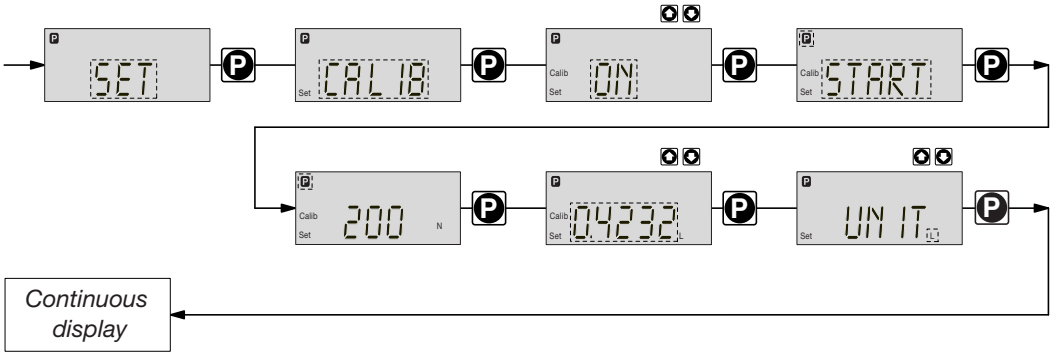
“Memory” extension function
The “memory” extension function can be optionally activated (“mem” appears in the LCD display). If “Memory” is active gamma/ L adds the remaining unperformed strokes up to a maximum stroke memory capacity of 65535 strokes. If this maximum capacity is exceeded the pump will 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 +/- 10 scale points (at a preset stroke length of 40 % the range is 30 % - 50 %). If the stroke rate is altered more than ±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!

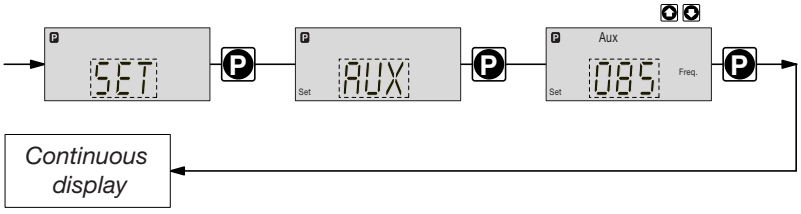
Calibration

- ▶ 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.

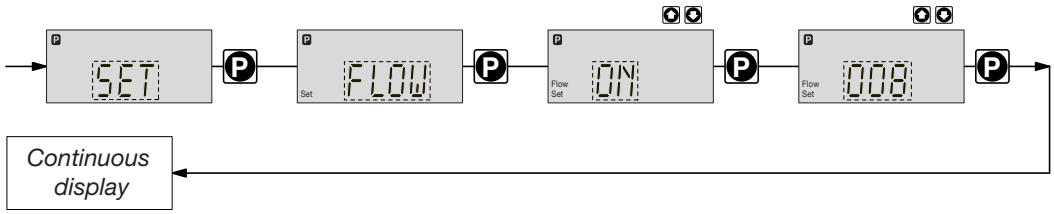
7.5.2 Settings for “auxiliary frequency” function (AUX menu)



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.

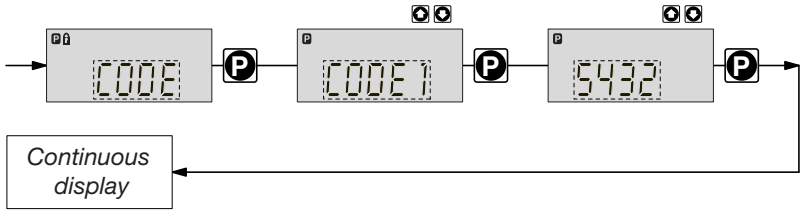
7.5.3 Settings for the “flow” function (FLOW menu)



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.



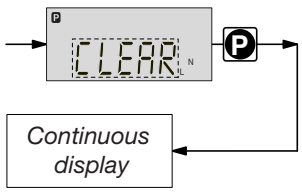
In the first menu option you can choose CODE 1 or CODE 2 (both use the same number).

- 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

Welf 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.

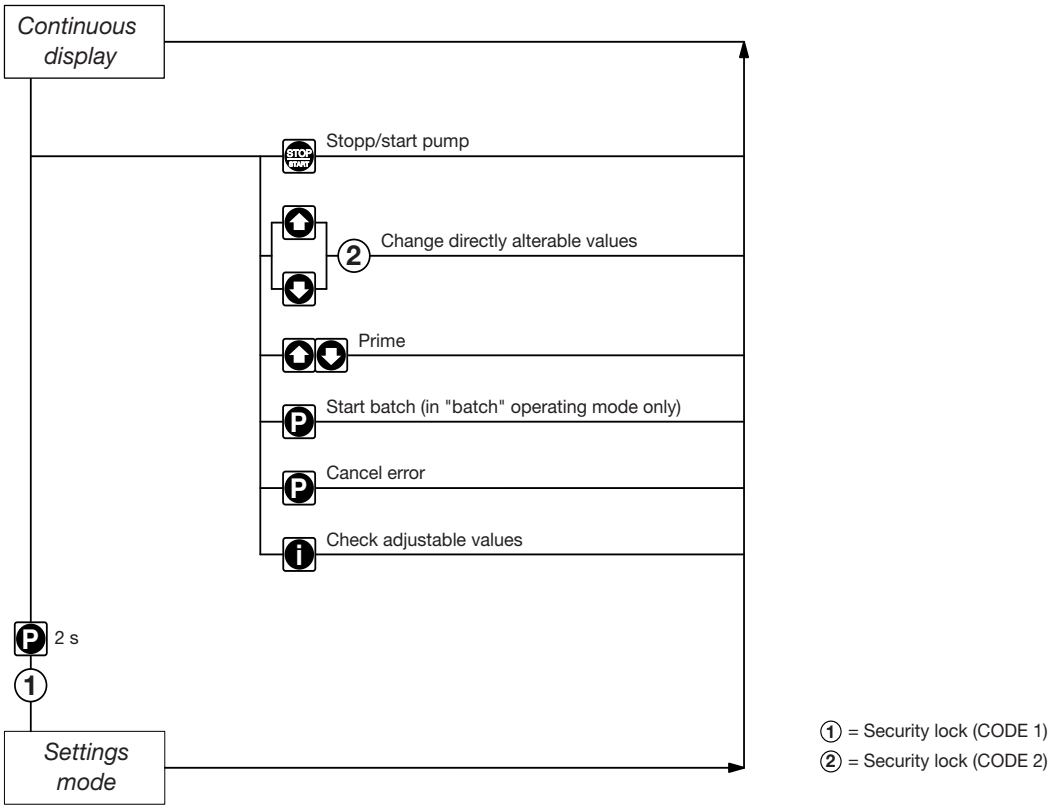
Display program version

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

Batch size In “batch” operating mode:
The batch size can by 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”

Priming The “priming” function is activated by pressing both arrow keys at the same time.

Cancel error 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

- **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

Cause Crystalline deposits on the ball seat because valves have dried out.

Remedy
- ▶ Remove the suction sleeve from the chemical supply container and rinse out the liquid and thoroughly.
- ▶ If still unsuccessful, dismantle valves and clean.

Fluid is seeping from the top plate

Cause The liquid end is not sealed against the pump diaphragm.

Remedy
- ▶ Tighten screws in the liquid end.
- ▶ If unsuccessful, replace the diaphragm (see section 4.3).

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 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 ±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

- **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 Ω 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

Bestell Nr. **order no. / no. de commande**	**1003455/A**	**Hersteller** **producer / fabricant**	**ATB**

Motor-Typ motor type type du moteur	AF71/4B-7	**Leistungsfaktor** power factor facteur de puissance	0,70/0,70	
Maschinenart type of machine désignation	3-Ph. Motor	**Wirkungsgrad** efficiency rendement	70 %	
Schutzart protection class degré de protection	IP55	**Bemessungsfrequenz** rated frequency fréquence nominale	50/60 Hz	
Bauform mounting construction	IMV1	**Bemessungsdrehzahl** rated speed vitesse nominale	1420/1720	U/min rpm t/mn
Bemessungsleistung rated output puissance nominale	0,370 kW	**Wärmeklasse** temperature class classe d'isolement	F	
Bemessungsspannung rated voltage tension nominale	⅄ / Δ 400/230 V	**Anzugsstrom** starting current courant de démarrage	4,4	fach fold fois
Bemessungsstrom rated current courant nominale	1,30/2,30 (50 Hz) 1,10/1,90 (60Hz)	**Anzugsmoment** starting torque couple de démarrge	2,4	fach fold fois
Geprüft nach tested in acc. with contrôlé selon	/	**Kippmoment** pull-out torque couple de décrochage	3,2	fach fold fois
PTB Nr.	/	**Umgebungstemperatur** ambient temperature température ambiante	40 °C	
		Schaltung connection branchement	⅄ / Δ	
Anmerkung comments observation	400/230 V 380-420/220-242 V (50 Hz) 380-460/220-265 V (60 Hz)			
ProMinent Pumpentyp	S3Ba _ _ _ _ _ _ _ _ S _ _ _ HP2a _ _ _ _ _ _ _ _ S _ _ _			

Motor datasheets are available for further information.
Special motors and special motor flanges are possible on request.

EC Declaration of Conformity

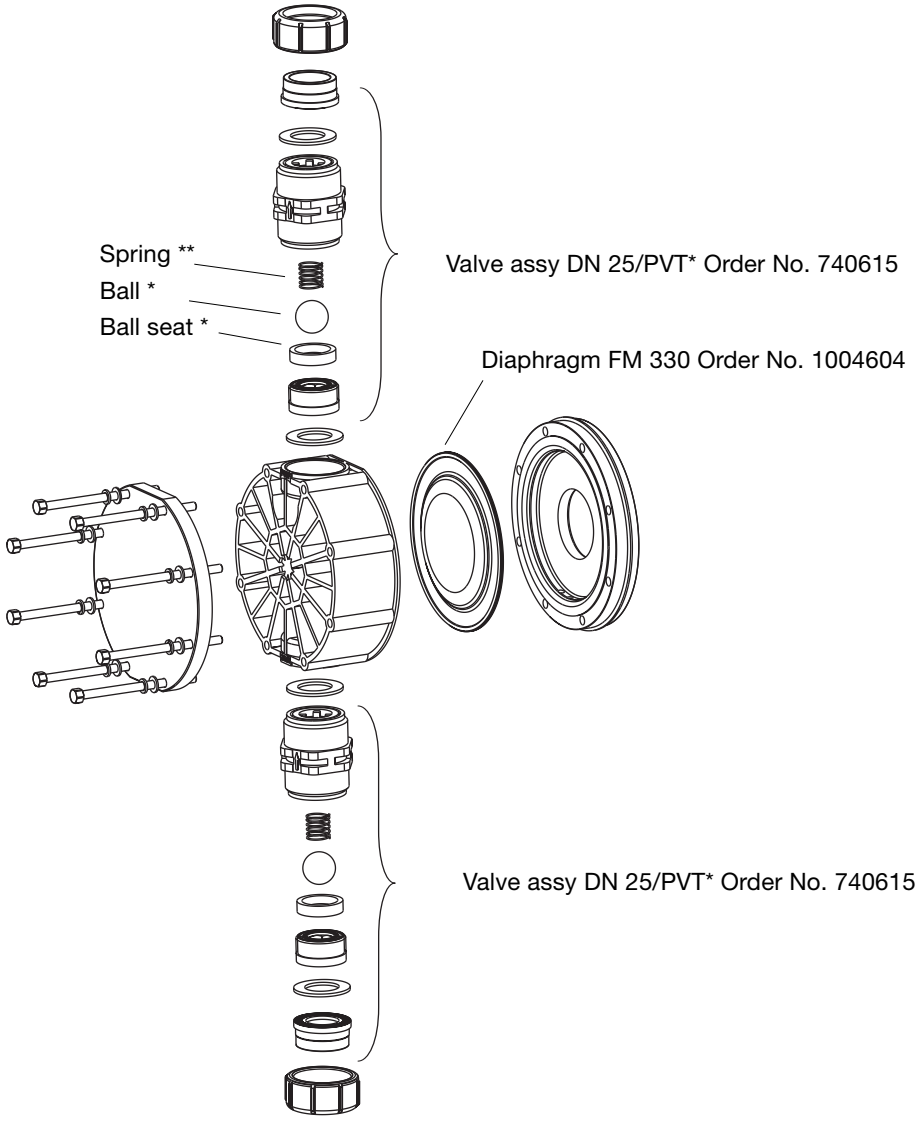
We,

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***
Product type :	***S3Ba... / S3Ca...***
Serial number :	***see type identification plate on device***
Relevant EC regulations :	***EC - machine regulation (98/37/EEC)*** ***EC - low voltage regulation (73/23/EEC)*** ***EC - EMC - regulation (89/336/EEC subsequently 92/31/EEC)***
Harmonised standards used, in particular :	***DIN EN 292-1, DIN EN 292-2, DIN EN 809*** ***DIN EN 60034-1/7/18, DIN EN 63335-1, DIN EN 60335-2-41*** ***DIN EN 50081-1/2, DIN EN 50082-1, DIN EN 55014-1/2*** ***DIN EN IEC 61000-3-2, DIN EN IEC 61000-3-3*** ***DIN EN IEC 61000-6-2***
National standards and other technical specifications used, in particular :	***DIN VDE 0530 T1/T5/T7/T18*** ***EN 60034-5, IEC 60034-1/5/7/18, IEC 38***
Date/manufacturer´s signature :	***May 28, 2001***
The undersigned :	*Dr.Rainer V. Dulger, Executive Vice President R&D and Production*

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



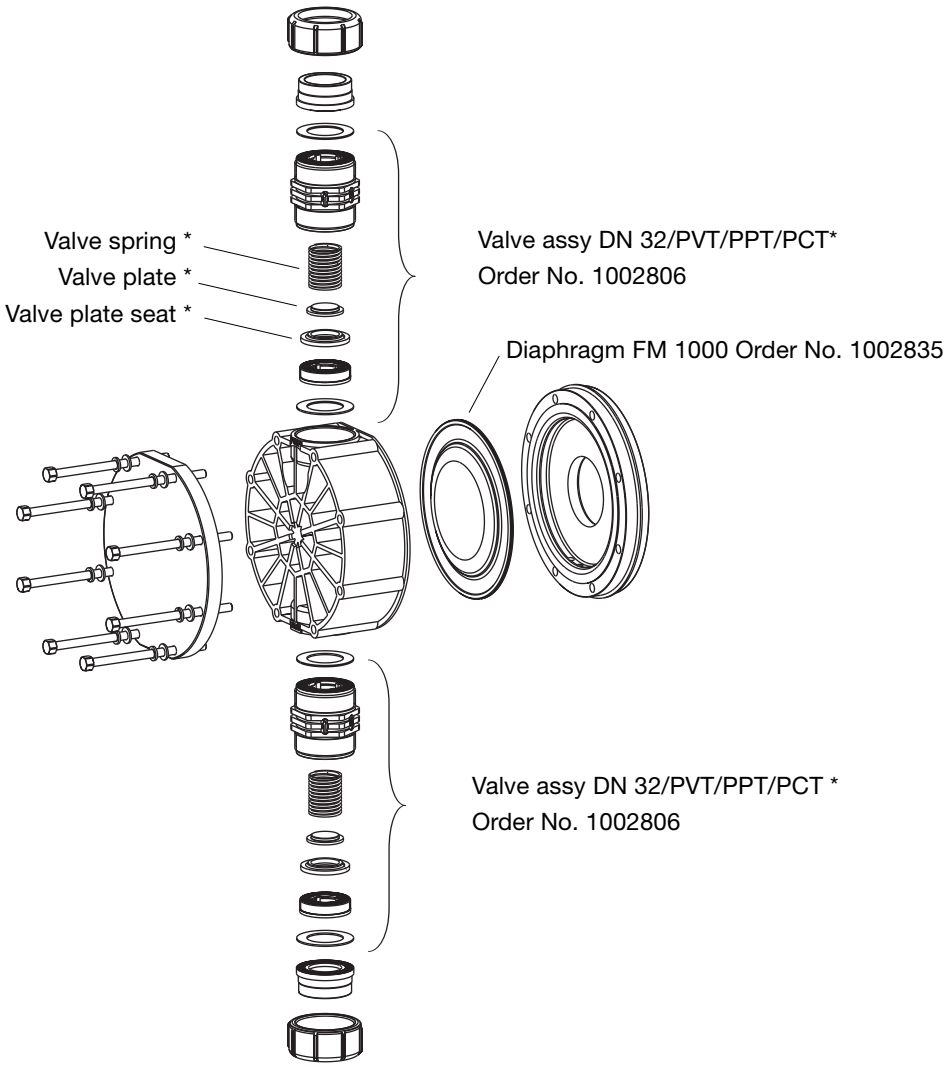
Spare parts kit FM 330 PVT/PPT/PCT Order No. 1005308.

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

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

Fig. 28
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



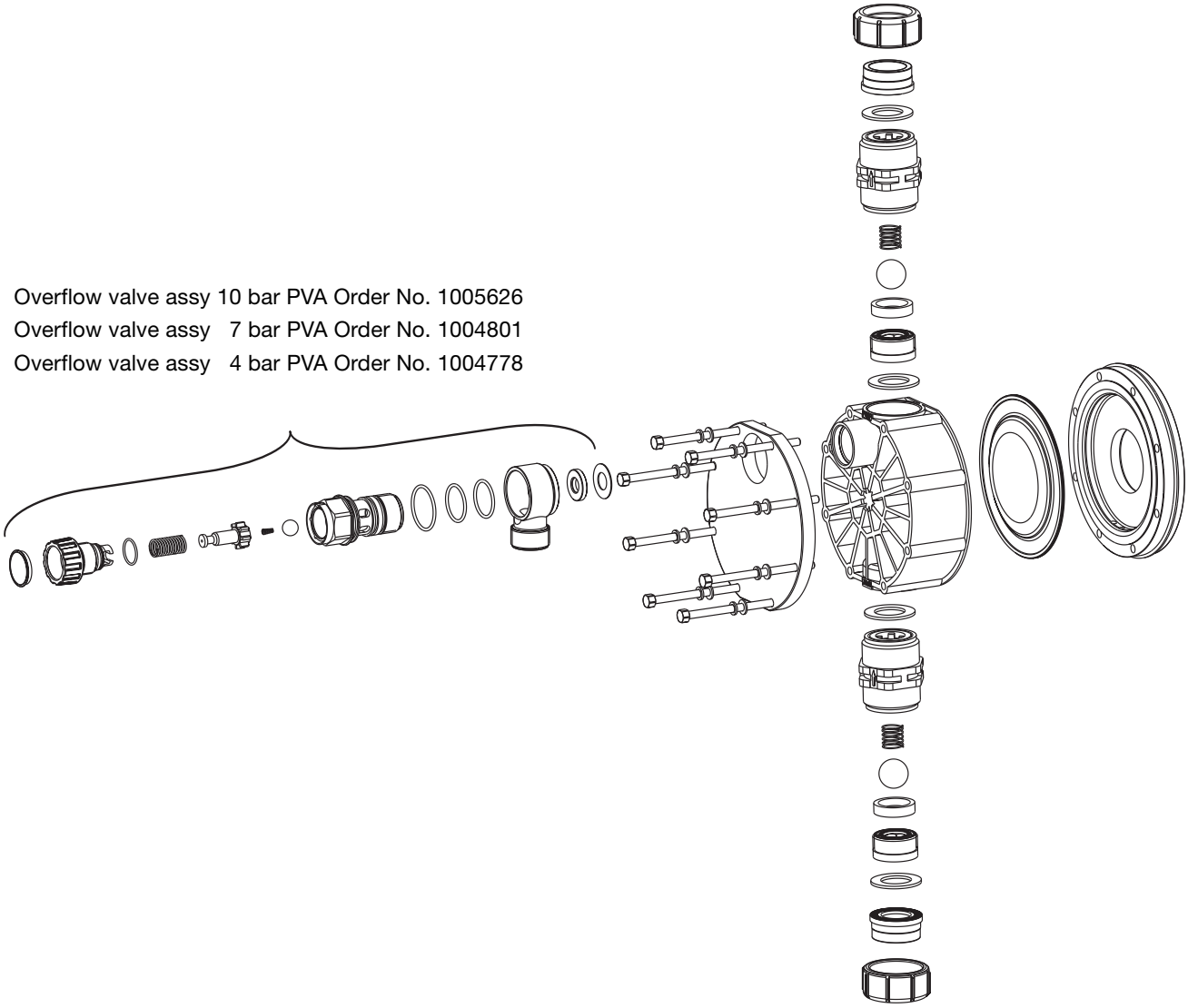
Spare parts kit FM 1000 PVT/PPT/PCT Order No. 1005309.

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

Fig. 29
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

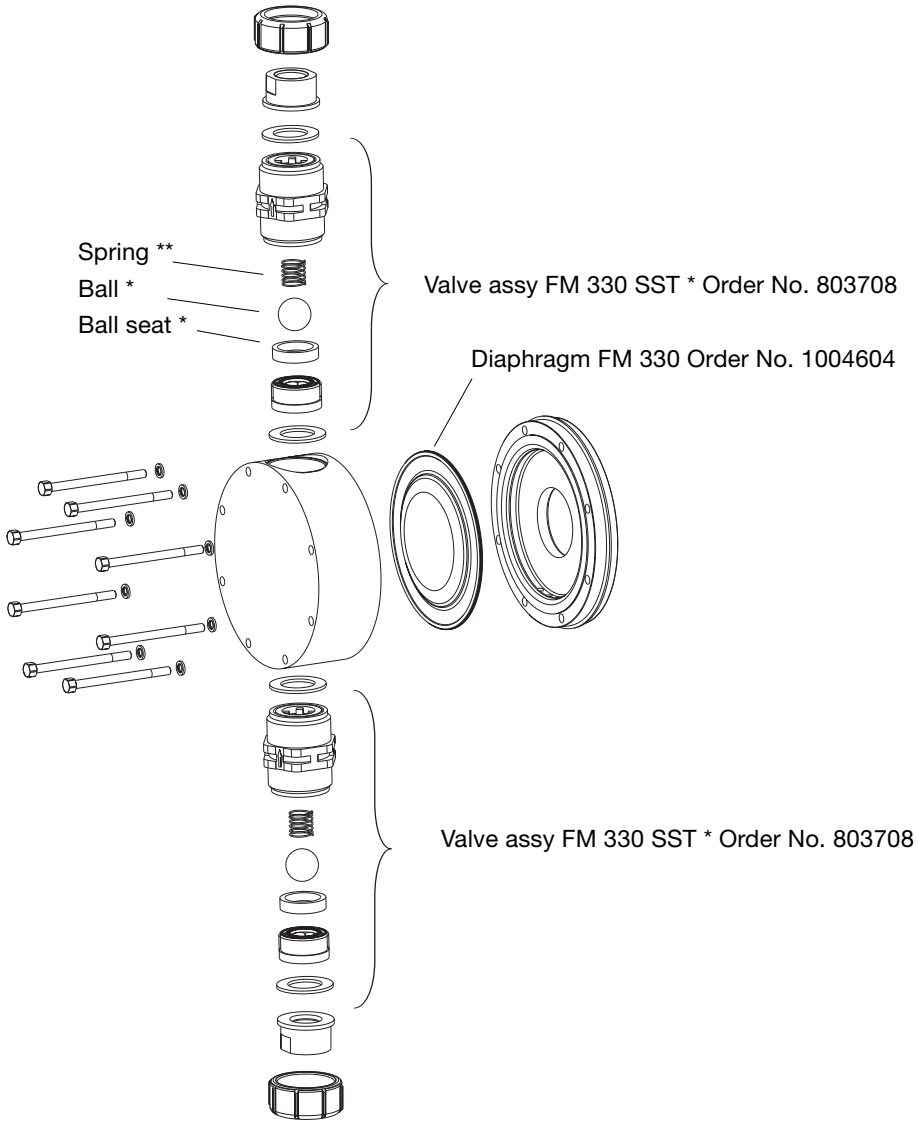
Overflow valve assy 10 bar PVA Order No. 1005626
Overflow valve assy 7 bar PVA Order No. 1004801
Overflow valve assy 4 bar PVA Order No. 1004778



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

Fig. 30
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.

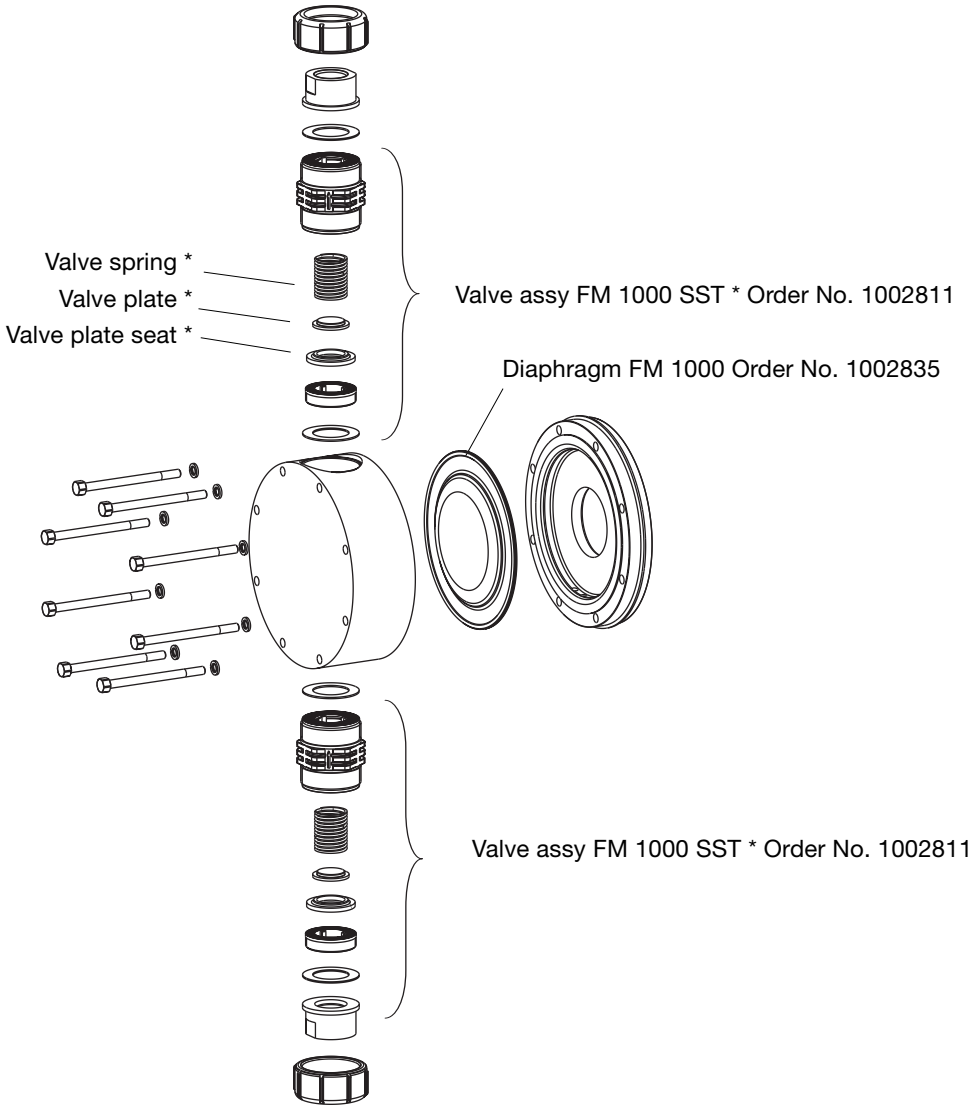
Spare parts kit FM 330 SST with valve Order No. 1005312.

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

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

Fig. 31
61_05-104_0_73-03_330

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



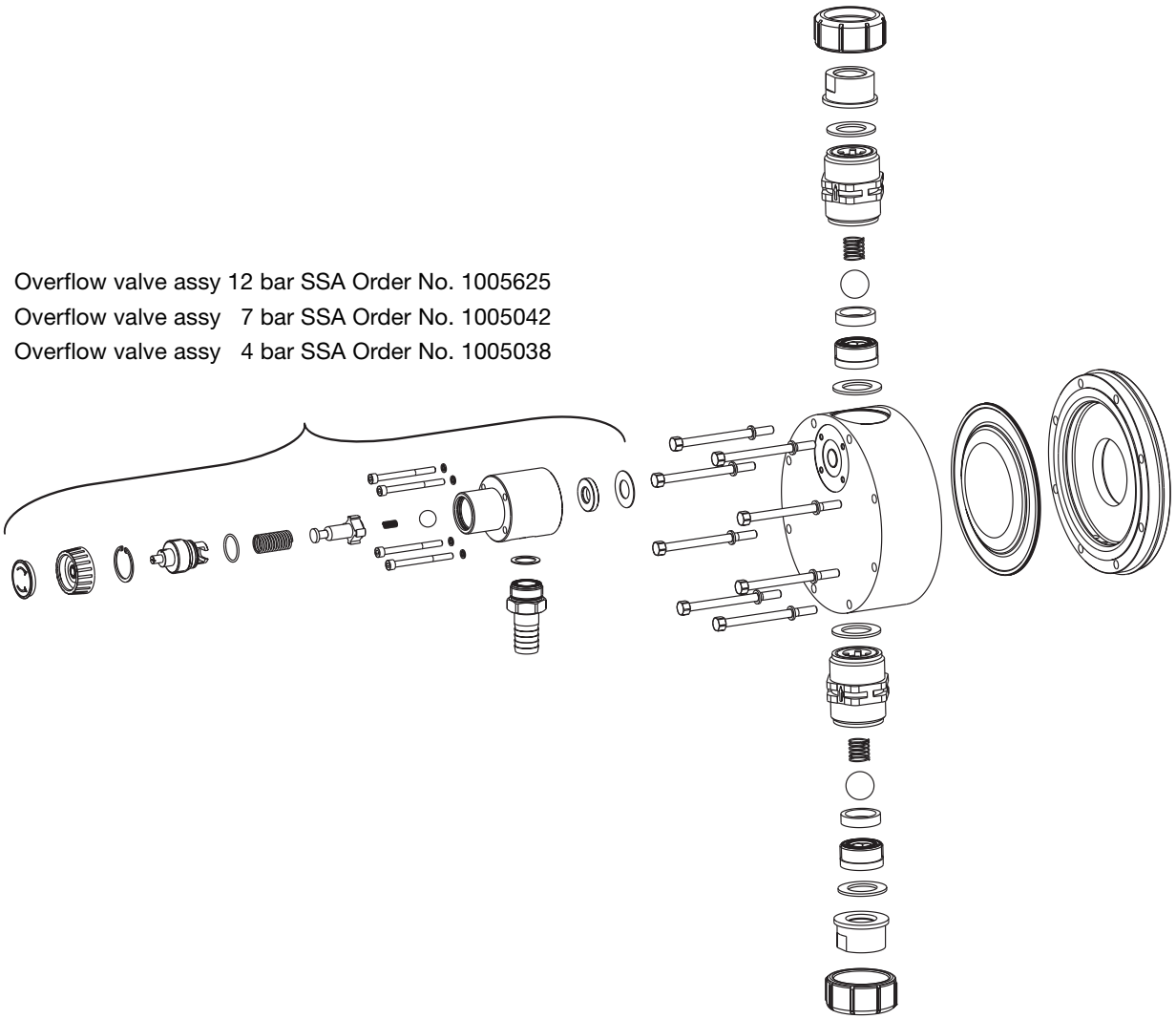
Spare parts kit FM 1000 SST without valve Order No. 1005311
Spare parts kit FM 1000 SST with valve Order No. 1005313

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

Fig. 32
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

Overflow valve assy 12 bar SSA Order No. 1005625
Overflow valve assy 7 bar SSA Order No. 1005042
Overflow valve assy 4 bar SSA Order No. 1005038

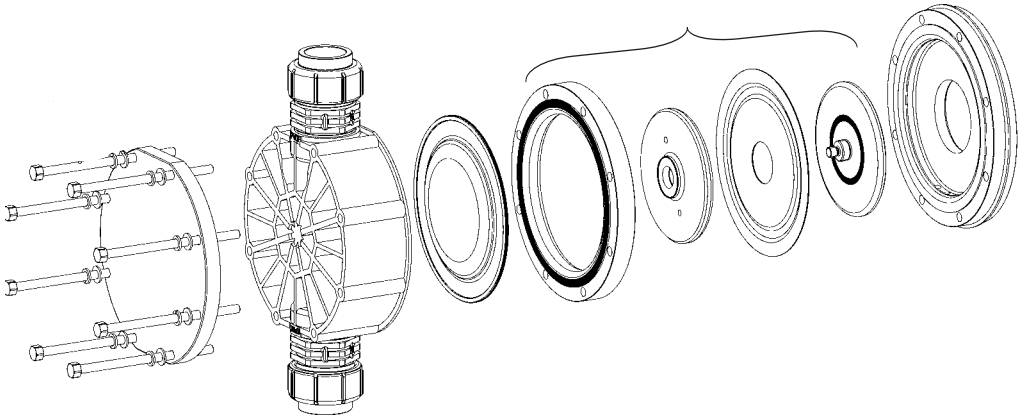


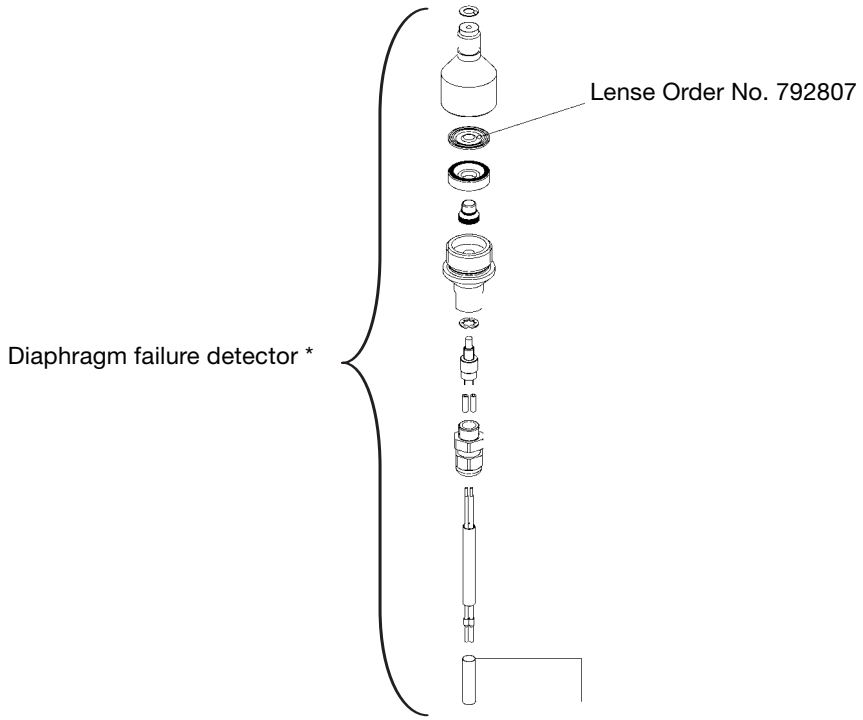
For other spare parts see delivery unit without overflow valve (see P. 57 and 58).
Subject to technical modifications.

Fig. 33
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

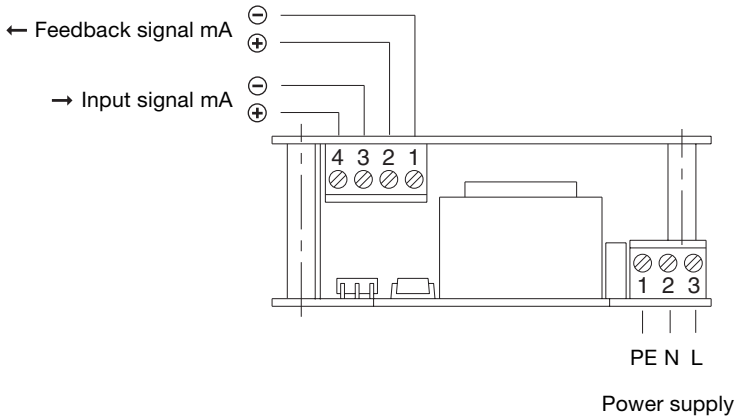




* These items belong to the retrofit kit.
Subject to technical modifications.

Abb. 34
61_05-104_00_53-03_2

Stroke actuator wiring diagram



Wiring diagram for stroke length adjuster