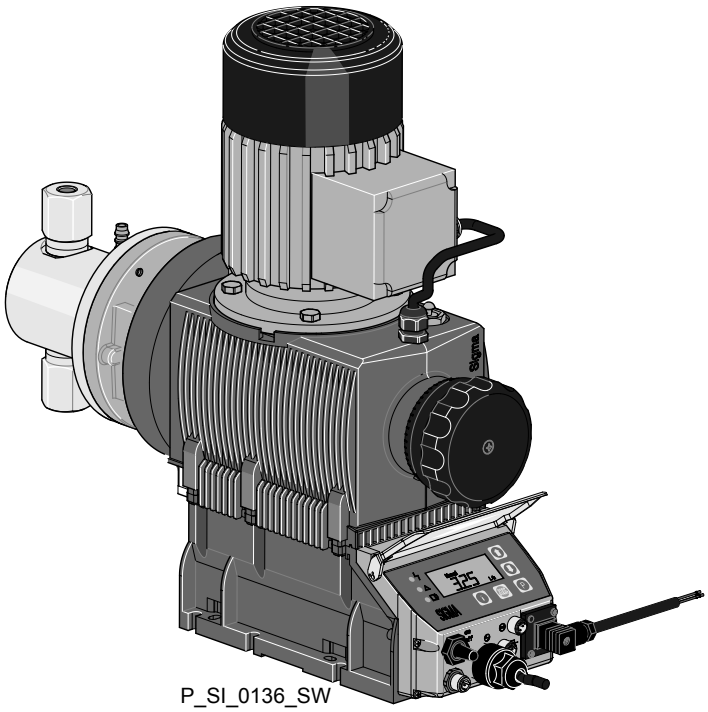
Operating instructions

Piston Metering Pump
Sigma/ 2 Control type SCKa



P_SI_0136_SW

Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!
Technical changes reserved.

Supplementary information

Fig. 1: Please read!

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

The following are highlighted separately in the document:

- Enumerated lists

→ Operating guidelines

⇨ Outcome of the operating guidelines

- see (reference)

Information

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

Safety notes

Safety notes are identified by pictograms - see Safety Chapter.

Validity

These operating instructions conform to current EU regulations applicable at the time of publication.

State the identity code and serial number

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

Table of contents

1 Identity code

SCKa	**Sigma 2 control type**
HK	Main power end, piston
Type:	Capacity
_ _ _ _ _	Performance data at maximum back pressure and type: refer to nameplate on the pump housing
	Dosing head material
SS	Stainless steel
	Seal material
T	PTFE
	Displacement body
4	Piston (oxide ceramic)
	Dosing head design
0	no valve springs
1	with 2 valve springs, Hastelloy C; 0.1 bar
	Hydraulic connector
0	Standard threaded connector (in line with technical data)
	Design
0	With ProMinent® logo (standard)
1	Without ProMinent® logo
	Electric power supply
U	1 ph, 100-230 V, ± 10 %, 50/60 Hz
	Cable and plug
A	2 m European
B	2 m Swiss
C	2 m Australian
D	2 m USA
	Relay
0	No relay
1	Fault indicating relay N/C 1x changeover contact 230 V- 2 A
3	Fault indicating relay N/O 1x changeover contact 230 V- 2 A
4	as 1 + pacing relay 2x N/O 24 V - 100 mA
5	as 3 + pacing relay 2x N/O 24 V - 100 mA
A	Cut-off and warning relays N/C 2x N/O 24 V - 100 mA
F	Power relay N/C 1x changeover contact 230 V- 8 A
	Control version
0	Manual + external with pulse control
1	Man. + external + pulse control + analog

SCKa	Sigma 2 control type																
													Access code				
													0	no access code			
													1	with access code			
														Dosing monitor			
														0	Input with pulse evaluation		
														1	Input with continuous evaluation		
															Stroke length adjustment		
															0	Manual	

2 Safety chapter

Identification of safety notes

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

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

Warning signs denoting different types of danger

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

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

Intended use

- Only use the pump to meter liquid metering chemicals.
- Only use the pump after it has been correctly installed and started up in accordance with the technical data and specifications contained in the operating instructions.
- Observe the general restrictions with regard to viscosity limits, chemical resistance and density - see also ProMinent Resistance List (in the Product Catalogue or at www.prominent.com/en/downloads)!
- All other uses or modifications are prohibited.
- The pump is not intended for the metering of gaseous media or solids.
- The pump is not intended for the metering of flammable feed chemicals.
- The pump is not intended for operation in hazardous locations.
- The pump is not intended for unprotected outside use.
- The pump is only intended for industrial use.
- The pump should only be operated by trained and authorised personnel, see the following "Qualifications" table.
- Observe the information contained in the operating instructions at the different phases of the device's service life.

Qualification of personnel

Action	Qualification
Storage, transport, unpacking	Instructed person
Assembly	Technical personnel, service

Action	Qualification
Planning hydraulic installation	Qualified personnel who have a thorough knowledge of oscillating diaphragm pumps.
Hydraulic installation	Technical personnel, service
Installation, electrical	Electrical technician
Operation	Instructed person
Maintenance, repair	Technical personnel, service
Decommissioning, disposal	Technical personnel, service
Troubleshooting	Technical personnel, electrical technician, instructed person, service

Explanation of the terms:

Technical personnel

A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognise possible dangers based on his/her technical training, knowledge and experience, as well as knowledge of pertinent regulations.

Note:

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

Electrical technician

Electrical technicians are deemed to be people, who are able to complete work on electrical systems and recognise and avoid possible dangers independently based on their technical training and experience, as well as knowledge of pertinent standards and regulations.

Electrical technicians should be specifically trained for the working environment in which they are employed and know the relevant standards and regulations.

Electrical technicians must comply with the provisions of the applicable statutory directives on accident prevention.

Instructed person

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

Service

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

Safety notes

WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

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

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

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

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

CAUTION!

Warning of feed chemical spraying around

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

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

CAUTION!

Warning of feed chemical spraying around

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

– Take into account the resistance of the wetted materials when selecting the feed chemical - see the ProMinent product catalogue or visit www.prominent.com/en/downloads.

CAUTION!

Danger of personnel injury and material damage

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

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

CAUTION!

Danger from incorrectly operated or inadequately maintained pumps

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

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

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

Isolating protective equipment

All isolating protective equipment must be installed for operation:

- Drive front cover
- Motor fan cowling
- Terminal box cover, motor
- Hood

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

Only remove them when the operating instructions request you to do so.

Information in the event of an emergency

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

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

Sound pressure level

Sound pressure level LpA < 70 dB according to EN ISO 20361

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

3 Storage, transport and unpacking

Safety notes

WARNING!

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

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

The "Decontamination Declaration Form" can be found at www.prominent.com/en/downloads.

WARNING!

Slings can tear

ProMinent only supplies non-reusable slings. These can tear with repeated use.

– Only use the slings once.

CAUTION!

Danger of material damage

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

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

Scope of supply

Compare the delivery note with the scope of supply:

Storage

Personnel: ■ Technical personnel

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

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

4 Overview of equipment and control elements

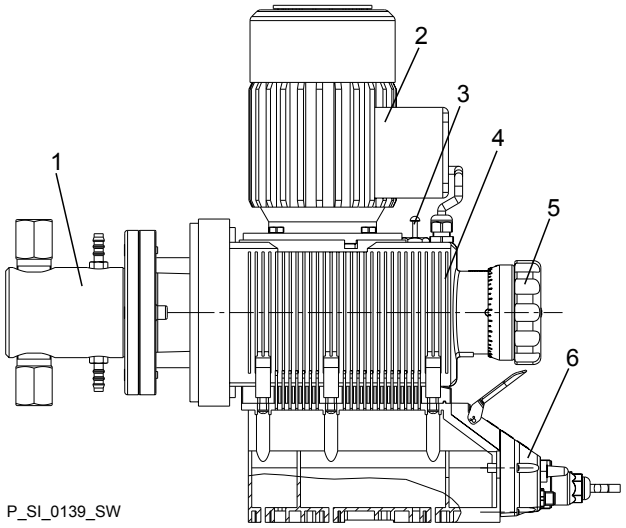


Fig. 2: Overview of equipment and control elements SCKa

1 Liquid end
2 Drive motor
3 Gear bleeding plug
4 Drive unit
5 Stroke length adjustment knob
6 Control unit

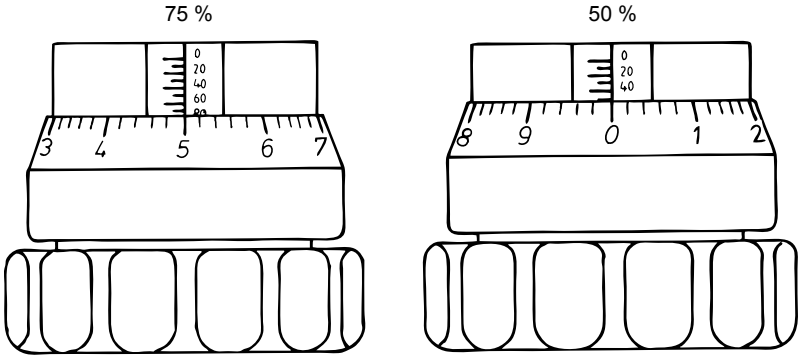


Fig. 3: Adjusting the stroke length

- 100 % = 10 rotations
- 10 % = 1 rotation
- 0.2 % = 1 scale mark on stroke adjustment dial

5 Functional description

The metering pump is an oscillating diaphragm pump, the stroke length of which can be adjusted. An electric motor drives the pump.

5.1 Liquid End

The heart of the liquid end is a highly resistant piston (4) made from coated stainless steel. The suction valve (1) closes as soon as the piston (4) is moved in to the dosing head and the feed chemical flows through the discharge valve (3) out of the dosing head. As soon as the piston moves in the opposite direction, the discharge valve (3) closes due to the negative pressure in the dosing head and fresh feed chemical flows through the suction valve (1) into the dosing head.

Use the flushing collar (6) to flush the sealing surface of the piston.

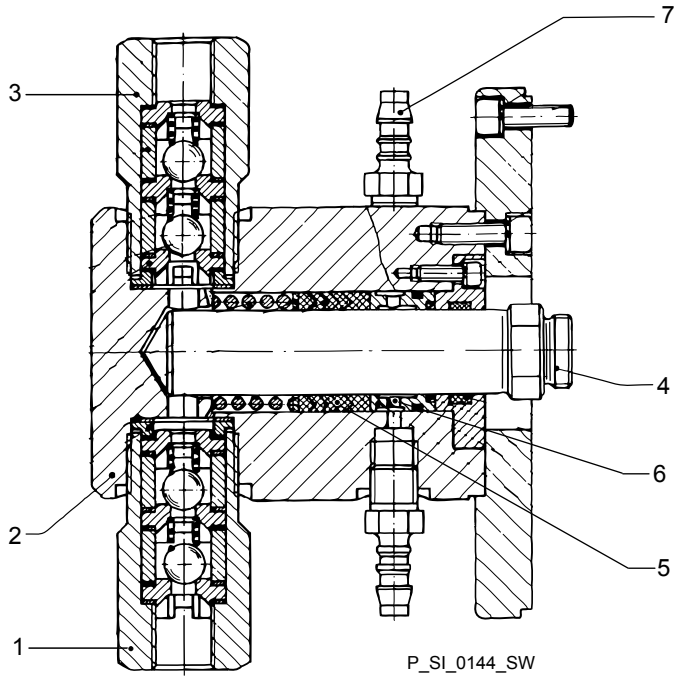


Fig. 4: Cross-section through the liquid end

1 Suction valve
2 Dosing head
3 Discharge valve
4 Piston
5 Packing collar
6 Flushing collar
7 Flushing connector

5.2 Operating modes

The operating modes are selected via the *'MODE'* menu (dependent on the identity code, some operating modes may not be present):

'Analog' **operating mode** (Identity code, control variant: analog). The stroke rate is controlled using an analog current signal via the "External control" terminal Processing of the current signal can be preselected via the control unit.

'Manual' **operating mode** The stroke rate is set manually via the control unit. 100 % corresponds to 180 strokes/min.

'Contact' **operating mode:** This operating mode provides the option of making fine adjustments using small scaling or transfer factors. The metering can be triggered either by a pulse received via the "External control" terminal or through a contact or a semiconductor switching element. A metering quantity (batch) or a number of strokes (scaling or transfer factor 0.01 to 99.99) can be pre-selected via the control unit using the "Pulse Control" option.

'Batch' **operating mode:** This operating mode provides the option of working with large transfer factors (up to 65535). The metering can be triggered either by pressing the *[P]* key or by a pulse received via the "External control" terminal or through a contact or a semiconductor switching element. It is possible to pre-select a metering quantity (batch) or a number of strokes via the control unit.

'BUS' **operating mode** (Identity code, control variant: CANopen or PROFIBUS® This operating mode provides the option of controlling the pump via a BUS (see “Supplementary instructions for ProMinent® gamma/ L and ProMinent Sigma versions with PROFIBUS®".

5.3 Functions

The following functions can be selected using the SET menu:

"Calibrate" function: (Identity code, stroke length adjustment: Manual + calibration): The pump can also be operated in the calibrated state in all operating modes. In this case, the corresponding continuous displays can then indicate the metering volume or the capacity directly. Calibration is maintained within a stroke rate range of 0 - 180 strokes/min. The calibration is also maintained when the stroke length is altered by up to ±10 % scale divisions.

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

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

The following functions are available as standard:

"Level switch" function: Information about the liquid/powder level in the chemical feed container is reported to the pump control. To do so, a two-stage level switch must be fitted; it is connected to the "Level switch" terminal.

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

The following functions are triggered by a key press:

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

"Priming" function: Priming (short-term transport at maximum frequency) can be triggered by simultaneous pressing of the two arrow keys in the "Stroke rate" continuous display.

5.4 Options

Relay option

The pump has two connecting options (not with PROFIBUS® or timer):

Option "Fault indicating relay" or "Output relay": In the event of fault signals, warning signals or tripped level switches, the relay connects to complete an electric circuit (for alarm horns etc.). The relay can be retrofitted via a knock-out in the drive unit.

"Fault indicating and pacing relay" option In addition to the fault indicating relay, the pacing relay can be used to make a contact every stroke. The relay can be retrofitted via a knock-out in the drive unit.

5.5 Function and fault indicator

The operating and fault statuses are indicated by the three LED indicators and the *'Error'* identifier on the LCD screen, see also the "Troubleshooting" chapter.

5.6 LCD screen

If a fault occurs, the identifier *'Error'* appears and an additional error message.

5.7 LED displays

Operating indicator (green): The operating indicator illuminates if during pump operation there are no incoming fault or warning messages. It goes out briefly with every stroke.

Warning indicator (yellow): The warning indicator illuminates if the pump electronics detect a condition which may lead to a fault, e.g. "liquid level low 1st stage".

Fault indicator (red): The fault indicator illuminates if a fault occurs e.g. liquid level low 2nd stage".

5.8 Hierarchy of operating modes, functions and fault statuses

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

The following list shows the order:

1. - Priming
2. - Fault, Stop, Pause
3. - Auxiliary frequency (external frequency changeover)
4. - Manual, external contact

Comments:

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

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

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

6 Assembly

Compare the dimensions on the dimension sheet and pump.

Base

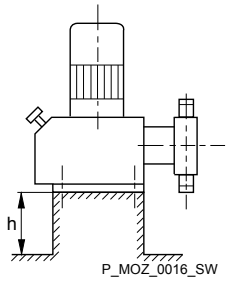


Fig. 5

WARNING!

Danger of electric shock

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

– Position the pump so that it cannot be flooded.

WARNING!

The pump can break through the base or slide off it

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

Capacity too low

Vibrations can disrupt the liquid end valves.

– *The supporting floor must not vibrate.*

Space requirement

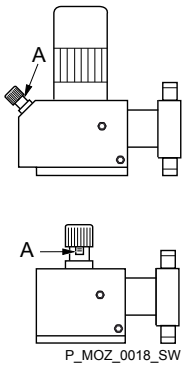


Fig. 6

CAUTION!

Danger from incorrectly operated or inadequately maintained pumps

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

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

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

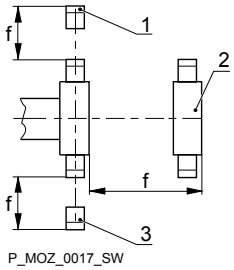


Fig. 7

1 Discharge valve
2 Dosing head
3 Suction valve

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

Liquid end alignment

Capacity too low

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

– *Ensure that the discharge valve is upright.*

Fastening

Capacity too low

Vibrations can disrupt the liquid end valves.

– *Secure the metering pump so that no vibrations can occur.*

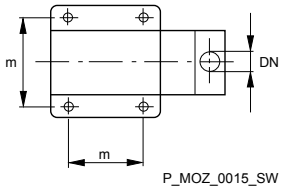


Fig. 8

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

Fix the pump base to the base with suitable screws.

7 Installation

CAUTION!

Danger of injury to personnel and material damage

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

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

7.1 Installation, hydraulic

WARNING!

Warning of feed chemical reactions to water

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

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

WARNING!

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

– Install a bleed valve with recirculation in the storage tank.
– Install an additional shut-off valve on the discharge or suction ends.

CAUTION!

Warning of feed chemical spraying around

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

– New, unused PTFE seals must always be used.

CAUTION!

Suction problems possible

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

– Install a suitable filter in the suction line.

CAUTION!

Warning against the discharge line bursting

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

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

CAUTION!

Uncontrolled flow of feed chemical

Feed chemicals can leak through a stopped metering pump if there is back pressure.

– Use an injection valve or a vacuum breaker.

CAUTION!

Uncontrolled flow of feed chemical

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

– Do not exceed the maximum permissible priming pressure for the metering pump.
– Configure the installation correctly for this purpose.

CAUTION!

Warning of backflow

Liquid ends, foot valves, back pressure valves, relief valves or spring-loaded injection valves do not constitute absolutely leak-tight sealing elements.

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

Standard installation

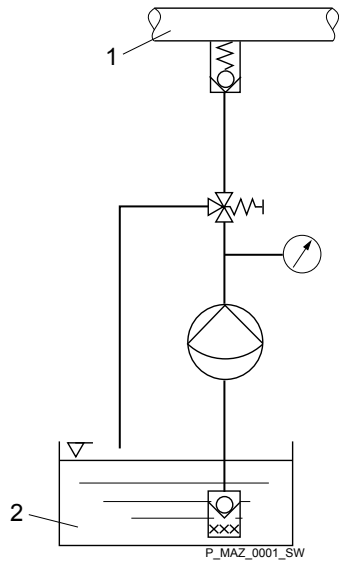


Fig. 9: Standard installation

1 Main line
2 Storage tank

Symbols for the components

Symbol	Explanation	Symbol	Explanation
	Injection valve		
	Multifunctional valve		Manometer
	Relief valve (alternatively a multifunction valve can be used)		Metering pump
	Level switch		Foot valve with filter meshes

Route the leakage liquid drainage line

CAUTION!

If you do not connect any flushing equipment, then you must ensure that no dust and no foreign bodies can enter through the top hose nozzles!

Otherwise this may result in damage to the liquid end. For example, fit a sealing stopper (order no. 359585).

The leakage liquid is drained off via the flushing collar and a hose nozzle, without other parts of the liquid end coming into contact with the medium.

1. Connect a hose to the lower hose nozzle.
2. Route the hose into a collection vessel for the leakage liquid.

Connecting the flushing equipment

CAUTION!

- A flushing equipment must be connected when using very aggressive or toxic media or when using media with a poor lubricating effect.
- The flushing agent must be compatible with the feed chemical and the wetted materials of the liquid end.
- The flushing medium pressure must not exceed 0.5 bar.

Connect the flushing equipment to the hose nozzles via two hoses.

7.2 Installation, electrical

General safety notes

WARNING!

Danger of electric shock

Unprofessional installation may lead to electric shocks.

– Cable end sleeves must be crimped onto all cut-to-length cable conductors.
– Only technically trained personnel are authorised to undertake the electrical installation of the device.

What requires electrical installation?

What requires electrical installation?

- Level switch
- Dosing monitor (option)
- Relay (option)
- External control (option)
- mA output (option)
- Bus connector (option)
- Timer (option)
- Pump, power supply

7.2.1 Control connectors

CAUTION!

Incoming signals can remain without effect

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

– Do not shorten this cable below 1.20 m.

Pacing relay (option)

1. Install the cable which originates from the pacing relay - see the figure in the chapter entitled "Overview of equipment and control elements": Cable A, left.

The cable polarity is unimportant.

2. Install the power supply cable to the pacing relay PCB - see the figure in the chapter entitled "Overview of equipment and control elements": Cable B, right.

CAUTION!

Warning of overload

If the current through the relay becomes too high, both it and the pump could be destroyed by overheating.

– Fit a circuit breaker.

Relay technical data

The contacts are potential-free.

As a NC fault indicating relay the relay closes immediately after the power is switched on and opens in the event of a fault.

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

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

Fault indicating relay

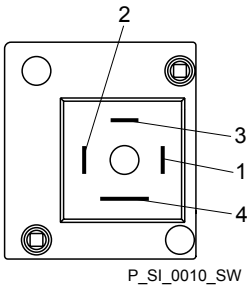


Fig. 10: Pump pin assignments

Data	Value	Unit
Maximum voltage	250	VDC (50/60 Hz)
Maximum current	2	A (resistive)
Closing duration	-	
Service life *	> 200 000	Play

* at rated load

Behaviour: - see identity code

The contacts are potential-free.

Fault indicating relay

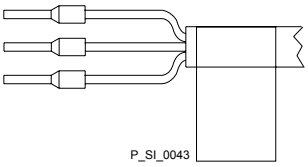


Fig. 11: Cable conductor assignments

Pin assignment

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

- *As a NC fault indicating relay - the relay closes immediately after the power is switched on and opens in the event of a fault.*
- *As a N/O fault indicating relay, the relay closes in the event of a fault.*

Fault indicating and pacing relay option

Fault indicating relay

Data	Value	Unit
Maximum voltage	24	VAC (50/60 Hz)
Maximum current	100	mA
Closing duration	100	ms
Service life *	> 200 000	Play

* at rated load

Behaviour: - see identity code

The contacts are potential-free.

Pacing relay

Data	Value	Unit
Maximum voltage	24	VDC
Maximum current	100	mA
Closing duration	100	ms
Service life *	50 x 10^6 (10 V, 10 mA)	Play

* at rated load

Behaviour: - see identity code

The contacts are potential-free.

Fault indicating and pacing relay option

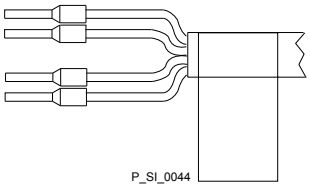


Fig. 12: Cable conductor assignments

Pin assignment

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

- *As a NC fault indicating relay - the relay closes immediately after the power is switched on and opens in the event of a fault.*
- *As a N/O fault indicating relay, the relay closes in the event of a fault.*

Output relay

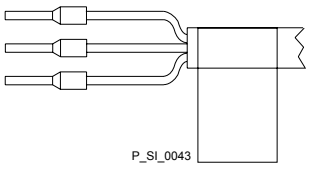
Data	Value	Unit
Maximum voltage	250	VDC (50/60 Hz)
Maximum current	16	A (resistive)
Closing duration	-	
Service life *	> 30 000	Play

* at rated load

Behaviour: - see identity code

The contacts are potential-free.

Output relay



Pin assignment

Fig. 13: Cable conductor assignments

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

Fault indicating and pacing relay option

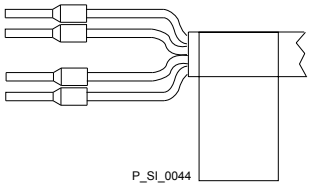


Fig. 14: Cable conductor assignments

Pin assignment

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

7.2.2 Pump, power supply

1. Install an emergency cut-off switch or include the pump in the emergency cut-off management of the system.
2. Install the pump cable.

– *Key electrical data can be found on the pump nameplate.*

7.2.3 Other units

Other units

Install the other units according to their supplied documentation.

8 Set up

For supplementary information see "Control elements and key functions" in the chapter "Overview of equipment and control elements" and "Operating/setting overview" in the appendix.

The pump control returns to the continuous display, as soon as no key has been pressed for one minute.

8.1 Basic principles of pump adjustment

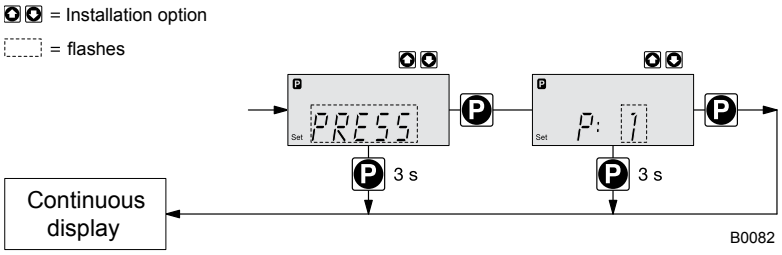


Fig. 15

Confirming an entry

Briefly press the *[P]* key

⇨ The display simultaneously changes to the next menu option or into a continuous display.

Quitting a menu option without confirming it

Press and hold the *[P]* key for 3 seconds

⇨ Entry is cancelled and you jump back to a continuous display.

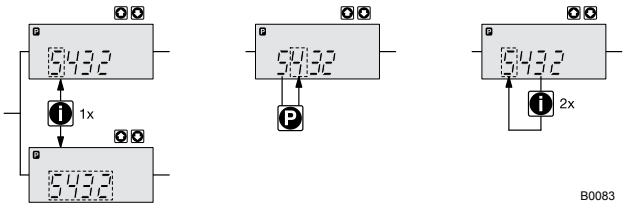


Fig. 16: a) Toggle between changing of individual digits and changing a number; b) Changes the position within the number; c) jump back in the number. More detailed explanations are given in the following text.

Incremental changing of a value

Press the *[i]* key once.

You can toggle between altering the digits of a value (“change individual digits” = standard) and incremental changing of a value (“change a number”).

Changing adjustable values

→ Press the arrow keys *[UP]* or *[DOWN]*.

⇨ The flashing digit or number counts up or down.

Confirming adjustable values

→ Under "change individual digits": confirm each digit by pressing the *[P]* key.

⇨ Upon confirming the last individual digit, the display simultaneously changes to the next menu option or into a continuous display.

→ Under "change a number": Press the *[P]* key 1x.

⇨ The display simultaneously changes to the next menu option or into a continuous display.

Correcting incorrectly set digits

→ Press the *[i]* key 2x.

⇨ You jump back to the first digit.

8.2 Checking adjustable values

Before you adjust the pump control, you can check the actual settings of the adjustable values:

→ Press the *[i]* key ("i" for "Info"), if the LCD screen shows a continuous display (The display does not contain the *[P]* key symbol).

⇨ Each press of the *[i]* key toggles the continuous display output to the screen to another continuous display.

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

8.3 Changing to adjustment mode

1. In a continuous display press the *[P]* key for at least 2 seconds.

⇨ The pump control changes to adjustment mode.

2. If *'CODE 1'* was set, then after pressing the *[P]* key, the code must first be entered.

The following menus can initially be chosen in adjustment mode - see also "Operating/setting overview" in the appendix:

- *'MODE'* menu
- *'CODE'* menu (option)
- *'SET'* menu
- *'CLEAR'* window

To match the pump to your process requirements, you must observe the following procedure:

1. In the *'MODE'* menu select the operating mode.
2. If necessary make the settings for this operating mode in the *'SET'* menu.

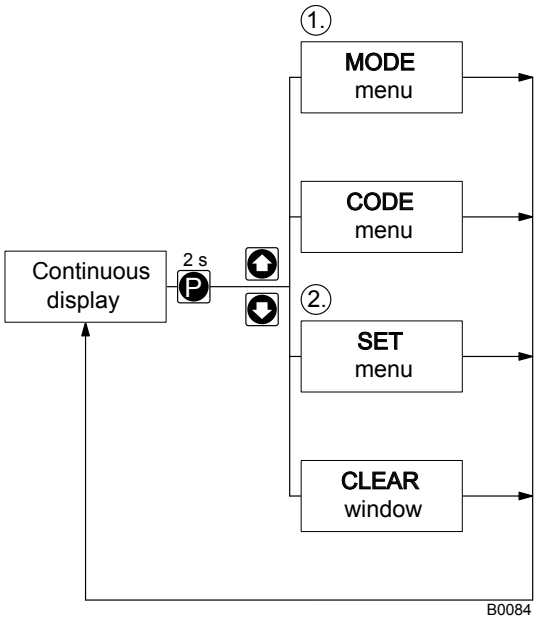


Fig. 17

Exceptions: Timer and PROFIBUS®.

Note the diagram.

8.4 Selecting the operating mode (MODE menu)

In the *'MODE'* menu (dependent on the identity code, some operating modes may not be present):

- *'Manual'*: for manual operation (identity code control variant: "Manual", available as standard)
- *'Analog'*: for current control (identity code control variant: "Analog 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")

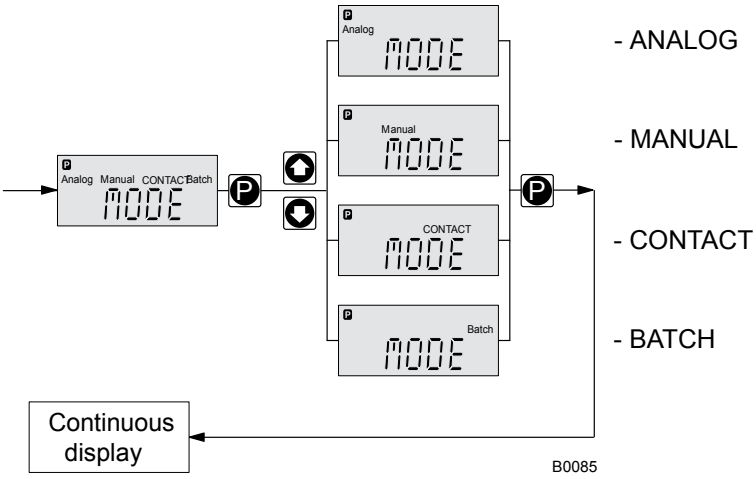


Fig. 18

8.5 Operating mode settings (SET menu)

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

Exceptions: Timer and PROFIBUS®.

In the *'SET'* menu, you can make various settings dependent on the selected operating mode.

Setting menus are available in all operating modes for the following programmable functions:

- Calibrate (*'CALIB'* menu)
- Auxiliary rate (*'AUX'* menu)
- Flow (*'FLOW'* menu; only available if a dosing monitor is connected) - see also the chapter "Programmable function settings (SET menu)".

As to whether or not a further setting menu is available, depends on the selected operating mode.

8.5.1 "Manual" operating mode settings

Other than those described in more detail in the chapter "Programmable function settings (SET menu)" there are no other setting menus available in *'Manual'* operating mode via the *'SET'* menu.

8.5.2 "Analog" operating mode settings (ANALG menu)

Overview

Alongside those described in more detail in the chapter "Programmable function settings (SET menu)" the *'ANALG'* menu is also available in *'Analog'* operating mode via the *'SET'* menu.

The stroke rate is controlled using an analog current signal via the "External control" terminal

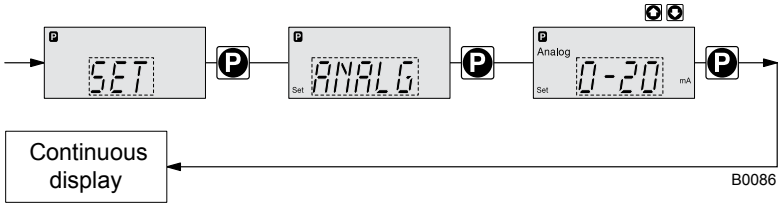


Fig. 19

You can select three types of current signal processing:

- *'0 - 20 mA'*:
  - At 0 mA the pump is stationary.
  - At 20 mA the pump works at the maximum stroke rate.
  - Between these values, the stroke rate is proportional to the current signal.
- *'4 - 20 mA'*:
  - At 4 mA the pump is stationary.
  - At 20 mA the pump works at the maximum stroke rate.
  - Between these values, the stroke rate is proportional to the current signal.
  - For current signals less than 3.8 mA a fault message appears and the pump stops (e.g. if a cable has broken).
- *'Curve'*: Under the *'Curve'* processing type, you can freely program the pump behaviour. There are three options:
  - Linear ·····
  - Lower sideband --__
  - Upper sideband __/--

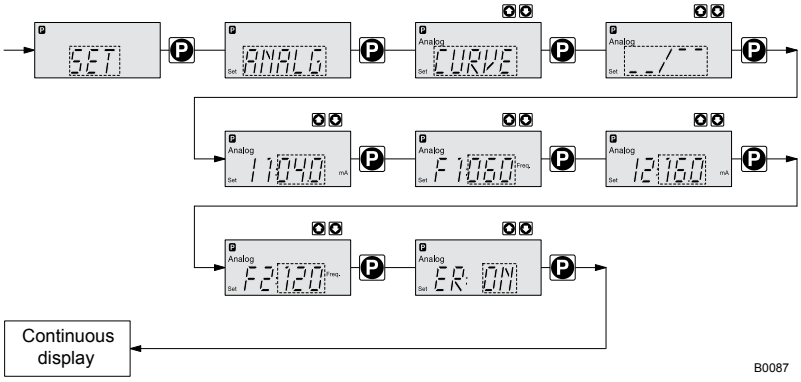


Fig. 20

Linear

The symbol ····· appears on the LCD screen. You can enter any stroke rate- behaviour of the pump proportional to the current signal. For this purpose, enter any two points P1 (I1, F1) and P2 (I2, F2) (F1 is the stroke rate at which the pump is to operate at current I1); this defines a straight line and thus the behaviour is specified:

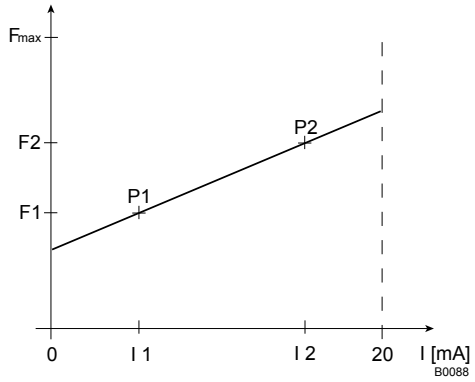


Fig. 21

F1 Stroke rate at which the pump should operate with current I1
F2 Stroke rate at which the pump should operate with current I2

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

Upper/lower sideband

Using these processing types, you can control a metering pump using the current signal as shown in the diagrams below.

Lower sideband:

The symbol ⁻⁻_ _ appears on the LCD screen. Below I1, the pump works at a rate of F1 - above I2 it stops. Between I1 and I2 the stroke rate varies between F1 and F2 in proportion to the signal current.

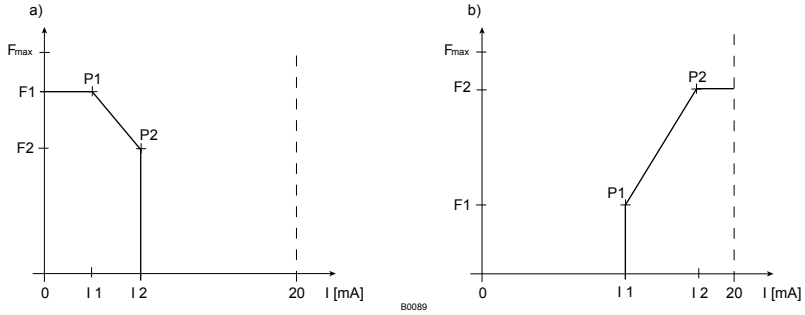


Fig. 22: Lower sideband, e.g. alkali pump

Upper sideband:

The symbol _ _/⁻⁻ appears on the LCD screen. Below I1, the pump is stationary - above I2 the pump works at rate F2. Between I1 and I2 the stroke rate varies between F1 and F2 in proportion to the signal current.

The smallest processable difference between I1 and I2 is 4 mA

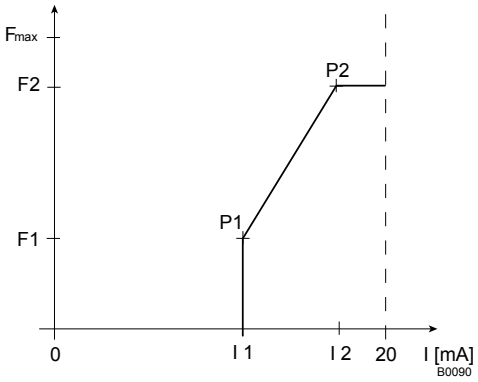


Fig. 23: Upper sideband, e.g. acid pump

Error processing

Under menu option *'ER'* (Error) you can activate error processing for the *'Curve'* processing type. For current signals below 3.8 mA, an error message appears and the pump stops.

8.5.3 "Contact" operating mode settings (CNTCT menu)

Alongside those described in more detail in the chapter "Programmable function settings (SET menu)" the *'CNTCT'* menu is also available in *'Contact'* operating mode via the *'SET'* menu.

'Contact' operating mode allows you to trigger individual strokes or a stroke series. You can trigger the strokes via a pulse sent via the "external control" terminal. The purpose of this operating mode is to convert the incoming pulses with a reduction (fractions) or small step-up into strokes.

CAUTION!
If you change into another operating mode, the factor is reset to "1".

With identity code version "Contact - identity code: External with pulse control", you can enter after how many pulses a stroke should occur. "Contact - identity code: External with pulse control" is intended for small metering quantities.

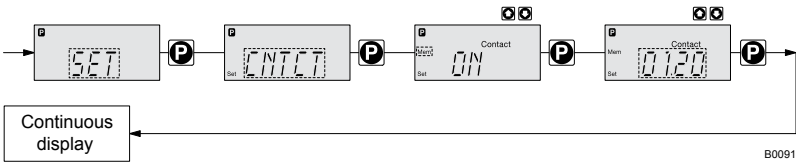


Fig. 24

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

Number of strokes executed = factor x number of incoming pulses

Example

Example table

	Factor	Pulse (sequence)	Number of strokes (sequence)
Step-up	1	1	1
	2	1	2
	25	1	25
	99.99	1	99.99
	1.50	1	1.50 (1 / 2)
	1.25	1	1.25 (1 / 1 / 1 / 2)
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 step-up

Factor	Pulse and strokes
with a factor 1 ...	1 stroke is executed per pulse
with a factor 2 ...	2 strokes are executed per pulse
with a factor 25 ...	25 strokes are executed per pulse

Explanation of reduction

Factor	Pulse and strokes
with a factor 1 ...	1 stroke is completed after 1 pulse
with a factor 0.5 ...	1 stroke is completed after 2 pulses
with a factor 0.1 ...	1 stroke is completed after 10 pulses
with a factor 0.75 ...	1 stroke is completed after 2 pulses once, then 1 stroke is completed after 1 pulse twice and then (repeating) 1 stroke after 2 pulses, etc...

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

"Memory" function extension

You can also activate the "Memory" function extension (identifier *'Mem'* appears on the LCD screen; *'Mem'* = memory). When "Memory" is activated, the pump software adds up the remaining strokes , which could not be processed, up to the maximum capacity of the stroke memory of 65,535 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.

You can thus optimally match the pump to the process in question, for example in conjunction with contact water meters.

8.5.4 "Batch" operating mode settings (BATCH menu)

Alongside those described in more detail in the chapter "Programmable function settings (SET menu)" the *'BATCH'* menu is also available in *'Batch'* operating mode via the *'SET'* menu.

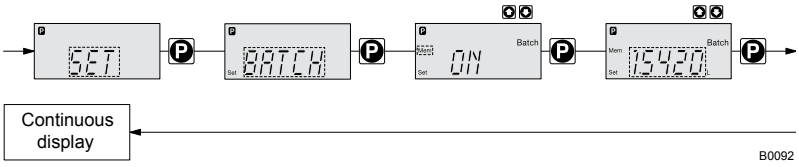


Fig. 25

The operating mode *'Batch'* is a variant of the operating mode *'Contact'* - in the first place see " *'Contact'* operating mode settings". Here also, you can select a number of strokes (no fractions, only integers from 1 to 65535), but also a metering quantity (Batch). To change between the input "Number of strokes" and "Metering quantity" press the *[i]* key 1x under the corresponding menu option (see "Operating / adjustment overview" in the appendix).

'Batch' operating mode is intended for large metering quantities.

The metering can be triggered either by pressing the *[P]* key or by a pulse received via the "External control" terminal.

The number of received pulses, which could not yet be processed, is stored by the pump control in the stroke memory. The stroke memory is limited to the Batch size if "Memory" is not activated, with "Memory" to 65535 strokes.

You can delete it by changing to another operating mode.

"Memory" function extension

You can also activate the "Memory" function extension (identifier *'Mem'* appears on the LCD screen; *'Mem'* = memory). When "Memory" is activated, the pump software adds up the remaining strokes , which could not be processed, up to the maximum capacity of the stroke memory of 65,535 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.

You can thus optimally match the pump to the process in question, for example in conjunction with contact water meters.

8.6 Programmable function settings (SET menu)

Setting menus are available in the SET menu in all operating modes for the following programmable functions:

- Calibrate (*'CALIB'* menu)
- Auxiliary rate (*'AUX'* menu)
- Flow (*'FLOW'* menu; (only available if a dosing monitor is connected)

8.6.1 “Calibrate” function settings (CALIB menu)

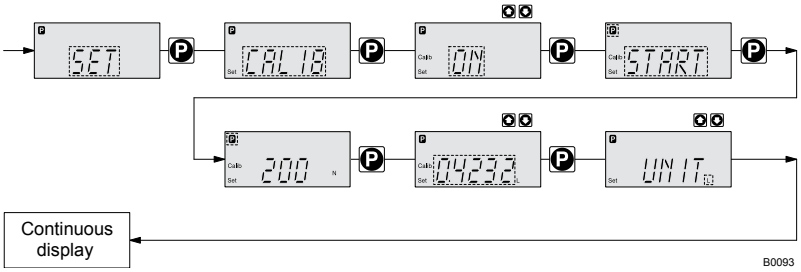


Fig. 26

The pump can also be operated in the calibrated state. In this case, the corresponding continuous displays then indicate the metering volume or the capacity directly. The calibration is maintained when the stroke length is altered by up to ±10 scale divisions (for a set stroke length of 40 % this corresponds to a range from 30 % ... 50 %. If the stroke length is changed by more than ±10 scale divisions, the yellow warning light illuminates, the continuous display flashes and the flashing identifier *‘Calib’* appears.

- *Do not allow the stroke length to fall below 20 %! Otherwise the calibration becomes inaccurate.*
- *The calibration becomes more accurate, the more strokes the pump makes during calibration. Recommendation: at least 200 strokes.*

Calibration

CAUTION!

Danger with dangerous feed chemicals

Provided the following handling instructions are followed, contact with the feed chemical is possible.

- If the feed chemical is dangerous, take appropriate safety precautions when carrying out the following handling instructions.
- Observe the feed chemical safety data sheet.

1. Lead the suction hose into a measuring cylinder containing the feed chemical - the discharge hose must be installed in a permanent manner (operating pressure, ...!).
2. Prime the feed chemical (press both arrow keys simultaneously), should the suction hose be empty.
3. Record the level in the measuring cylinder and the stroke length.
4. Select the *‘CALIB’* menu and press the *[P]* key to change to the first menu option.
5. With an arrow key select *‘ON’* and press the *[P]* key to change to the next menu option.
6. To start the calibration, press the *[P]* key. The pump starts to pump and indicates the stroke rate - at certain intervals *‘STOP’* appears. The pump works with the stroke rate set under *‘MANUAL’*.
7. After a reasonable number of strokes, stop the pump with the *[P]* key.
8. Determine the required metering volume (difference initial volume - residual volume).
9. Enter this amount under the next menu option and then press the *[P]* key to change to the next menu option.

10. Under menu option *'UNIT'* select the units (*'L'* or *'gal'*) using the arrow keys and press the *[P]* key.

    ⇨ The pump is calibrated.

Consequence:

- The corresponding continuous displays indicate the calibrated values.
- Total number of strokes and total litres are set to "0" by calibrate.
- The pump is in the STOP state.

8.6.2 "Auxiliary frequency" function settings (AUX menu)

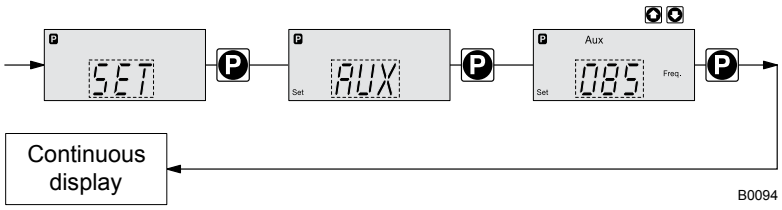


Fig. 27

The programmable function "Auxiliary frequency" facilitates the activating of an auxiliary stroke rate, which can be set in the *'AUX'* menu. It can be activated via the "External control" terminal. If the auxiliary frequency is being used, then the identifier *'Aux'* appears in the LCD screen.

This auxiliary frequency has priority over the stroke rate, which is specified by the currently selected operating mode.

8.6.3 "Flow" function settings (FLOW menu)

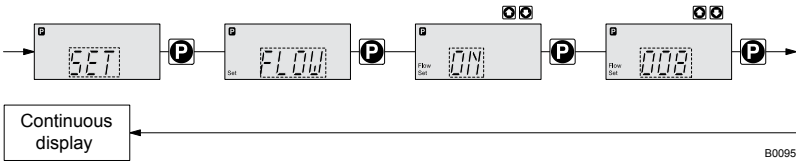


Fig. 28

The *'FLOW'* menu only appears if a dosing monitor is connected to the "Dosing monitor" terminal. The metering monitor records the individual metering strokes of the pump at the pressure connector and reports them back to the pump control. If this feedback is sequentially missing for as often as set in the *'FLOW'* menu (after a fault or too low metering), the pump is stopped.

8.7 Setting the code (CODE menu)

In the *'CODE'* menu, you can enter whether you want to block parts of the adjustment options.

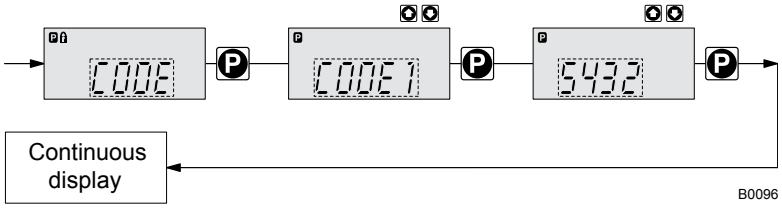


Fig. 29

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

- Select *'CODE 1'*, to block adjustment mode (① in "Operating / adjustment overview" in the appendix). In the next menu option, enter the number you want to use as the code.
- Select *'CODE 2'*, to block the option to adjust the directly changeable values in the continuous displays (① in "Operating / adjustment overview" in the appendix). In the next menu option, enter the number you want to use as the code.
- Select *'NONE'*, to clear a set security lock.

8.8 Deleting the total number of strokes or total litres (CLEAR window)

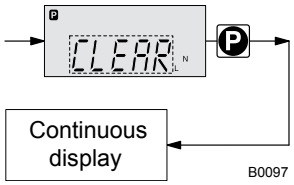


Fig. 30

In the *'CLEAR'* window, you can delete the stored total number of strokes and simultaneously the total litres (= reset to "0"). To do this quit the Window by quickly pressing the *[P]* key.

The values have been counted since pump commissioning or since they were last deleted.

9 Operation

This chapter describes all the operating options available to you if the pump control is showing a continuous display - then the display does not contain the symbol for the *[P]* key.

- *For supplementary information, please read the overviews "Control elements and key functions" and see the "Operating/setting diagram" at the end of the operating instructions.*
- *Also take note of the overview "Continuous displays". It shows which continuous displays are available in which operating mode and which variables are directly changeable in the relevant continuous display.*

9.1 Manual operation

Adjusting the stroke length

Adjusting the stroke length

The stroke length can be continuously adjusted using the stroke length adjustment wheel in the range 0 ... 100 %. The recommended stroke length range, in which the set metering quantity can, from a technical point of view, be accurately reproduced, is 10 ... 100 %.

At low stroke rates the pump control switches to stop and go operation. This occurs with stroke rates, which are less than 1/3 of the maximum stroke rate.

This ensures adequate cooling of the motor at low stroke rates.

The following operating options are available via the keys - see the figure on the next page:

Stopping/starting the pump

Stop the pump: Press the *[START/STOP]* key.

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

Starting batch

In operating mode *'Batch'*: Briefly press the *[P]* key.

Loading factory settings

Press the [P] key for 15 s, if you want to reload the factory settings prior to calibration!

This deletes the current settings.

Changing to adjustment mode

In continuous display if you keep the *[P]* key pressed for 2 s, the pump control switches into adjustment mode - see "Adjustment" chapter.

If *'CODE 1'* was set, then after pressing the *[P]* key, the code must first be entered.

Checking adjustable values

Each press of the *[i]* key toggles the continuous display output to the screen to another continuous display. The number of continuous displays depends on the identity code, the selected operating mode and the connected additional devices.

Change directly changeable variables

To change a value, see below, directly in the corresponding continuous display, press one of the *[arrow keys]* until the *[Set]* identifier appears.

(The delay period has been programmed in to prevent unintentional changing of values.)

If *'CODE 2'* was set, then after pressing an *[arrow key]*, the code must first be entered.

The **directly changeable variables** are in detail:

Stroke rate

In operating modes *'Manual'*, *'Contact'* and *'Batch'*:

You can change the stroke rate in the *'Stroke rate'* continuous display.

Capacity

In operating mode *'Manual'*:

You can change the capacity in the "Capacity" continuous display.

Factor

The factor is the number of strokes which are triggered upon an external pulse or pressing of key *[P]* (only in *'Batch'* operating mode).

In operating mode *'Batch'*:

You can change the factor from the "Remaining strokes" continuous display. A couple of seconds after your have set the factor, the pump control jumps back to the initial continuous display.

Displaying the program versions

Press the *[P]* key for 10 s to display the program versions.

'V1052' + *'X1010'*

Under 'LOAD3' release the [P] key immediately!

Batch size

In operating mode *'Batch'*:

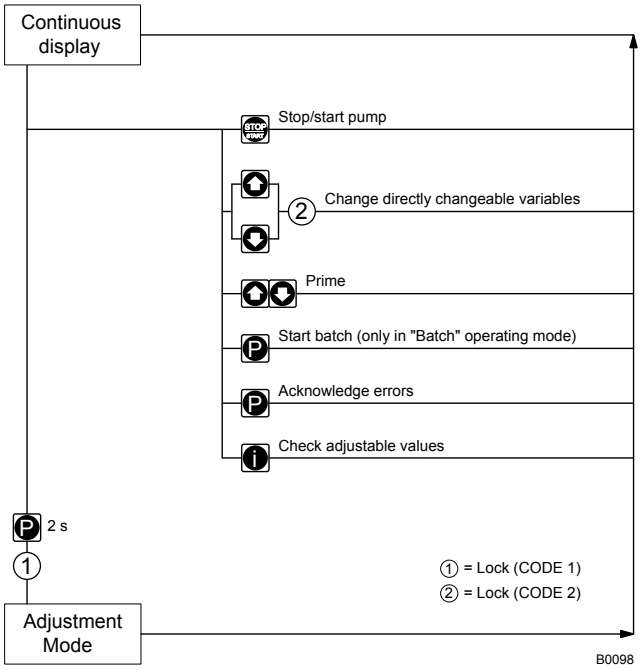
You can change the batch size from the "Batch size/Remaining litres" continuous display. A couple of seconds after your have set the factor, the pump control jumps back to the initial continuous display.

Priming

Simultaneous pressing of the two *[arrow keys]* triggers the "Priming" function.

Acknowledging errors

Fault displays are acknowledged by brief pressing of the *[P]* key.



9.2 Remote operation

There is an option to control the pump remotely via a signal cable, PROFIBUS® or CAN bus - see chapter "Settings - selecting the operating mode (MODE menu)" and chapter "Operation", in the "Supplementary instructions for ProMinent® gamma/ L and ProMinent® Sigma versions with PROFIBUS®" as well as your system documentation.

10 Maintenance

Safety notes

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

WARNING!
Warning of dangerous or unknown feed chemical
Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

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

WARNING!
Risk of fingers being crushed
Under unfavourable conditions, the stroke axle or displacement body can cause crushing of the fingers.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.

WARNING!
Risk of injury from the fan impeller
The fan impeller beneath motor's fan cowling can cause severe injuries while it is turning.

- The pump must only be connected to the mains voltage with the fan cowling closed.

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

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

Maintenance work

Under heavy loading (e.g. continuous operation) shorter maintenance intervals are recommended than those given.

Keep a spare parts kit in stock ready for maintenance work.

Order numbers are given in the appendix.

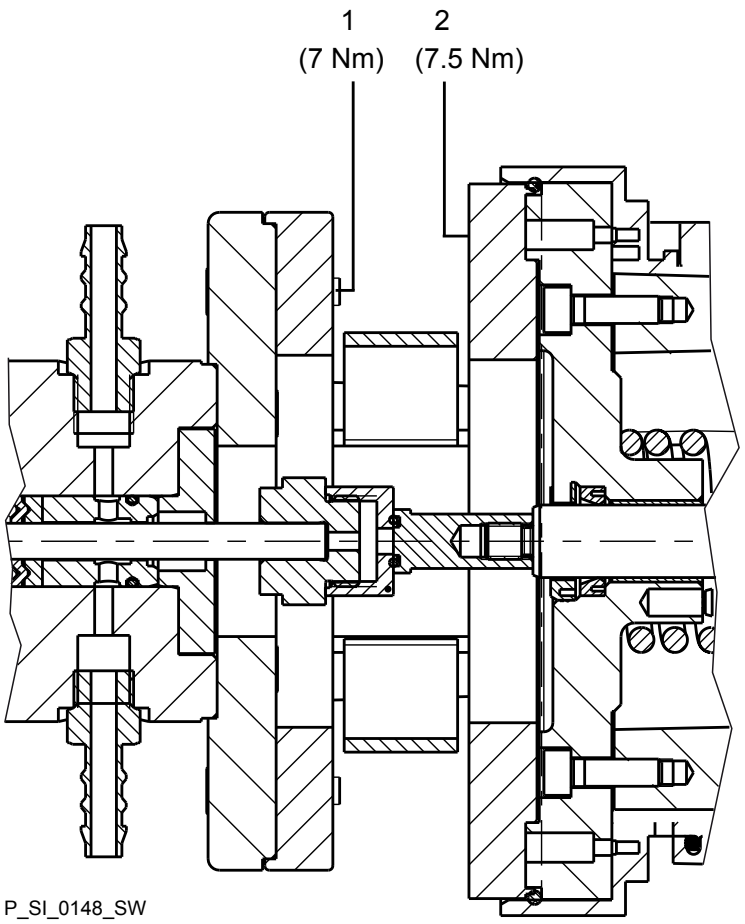


Fig. 31: Liquid end tightening torques

1 Dosing head screws
2 Turret flange screws

Interval	Maintenance work
Quarterly*	Check the starting torque torques for the dosing head flange screws (1) (7 Nm) and the turret flange screws (2) (7.5 Nm).
	Check that the discharge valve and suction valve are correctly seated.
	Check the correct seating and state of the metering lines at both discharge and suction ends.
	Check the leak-tightness of the entire liquid end!
	Check whether the leakage level is OK: 10 ... 120 drops / min.
	Check the oil level.
	Check that the electrical connections are intact.
	Check whether the pump is transporting media correctly - run briefly at high power. Observe the maximum permissible operating pressure!

Interval	Maintenance work
After approx. 5,000 operating hours *	Change the gear oil.

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

Under heavy loading (e.g. continuous operation): Shorter intervals.

Changing the gear oil

WARNING!
Risk of burns due to hot gear oil
The gear oil may become very hot when the pump is heavily loaded

– When draining oil, avoid contact with the oil running out.

Gear oil

Gear oil	Supplied quantity	Part no.
Mobilgear 634 VG 460	1.0 l	1004542

Gear oil filling volumes

Types	Volume, approx.
All	0.5 l

Changing gear oil

Draining gear oil

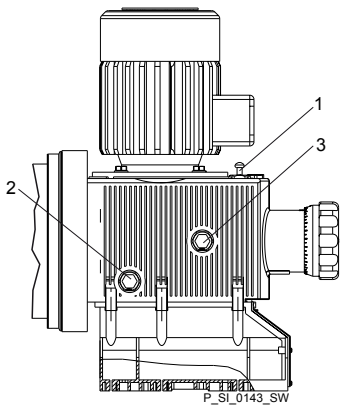


Fig. 32

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

Filling with gear oil

Prerequisites: Gear oil according to the "Ordering information" chapter is available.

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

11 Repairs

Safety notes

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

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

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

WARNING!
Risk of fingers being crushed
Under unfavourable conditions, the stroke axle or displacement body can cause crushing of the fingers.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.

WARNING!
Risk of injury from the fan impeller
The fan impeller beneath motor's fan cowling can cause severe injuries while it is turning.

- The pump must only be connected to the mains voltage with the fan cowling closed.

WARNING!
Warning of dangerous or unknown feed chemical
Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

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

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

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

11.1 Cleaning double ball valves

Cleaning a discharge valve

Taking the discharge valve apart

1. Unscrew the discharge valve from the dosing head and rinse out.
2. Dismantle the discharge valve.
3. Rinse and clean all parts.
4. Replace the worn parts and seals.

Assembling the discharge valve

When assembling, take note of the orientation of the valve seats (3). The valve seats (3) are used as a ball seat on the fine machined side and as a ball cage and spring guide on the other side. The fine machined side must point in the flow direction with all valve seats.

When assembling the valves, take note of the sequence:

Teflon – Metal – Teflon – Metal - ...

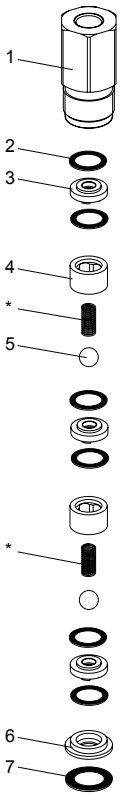


Fig. 33: Discharge valve (double ball valve).

1. Slide into the valve body (1) one after another:
   - one seal (2) and one valve seat (3) - correct!
   - one seal (2) and one valve bushing (4)
   - (If fitted: one spring (*) into the spring guide of the valve seat (3)
   - one ball (5) into the valve body (1)
   - one seal (2) and the second valve seat (3, correct!)
   - one seal (2) and the second valve bushing (4)
   - (If fitted: the second spring (*) into the spring guide of the valve seat (3))
   - the second ball (5) into the valve body (1)
   - one seal (2), the third valve seat (3) - (correct!) and a further seal (2)
2. Position the insert disc (6) with the flare on the packing.

The distance between the edge of the valve body and the insert disk (6) is due to the construction.

3. Place the larger seal (7) between the insert disk (6) and the dosing head.
4. Screw in the valve until the stop.

Cleaning a suction valve

A suction valve is dismantled, cleaned and assembled in the same way as a discharge valve.

Please note, however, that when assembling, the valve seat (3) must be aligned in the other direction. The fine machined side must point in the flow direction with all valve seats (3).

11.2 Changing the piston

WARNING!
Observe the safety notes at the beginning of the chapter.

Removing the liquid end

1. Flush the suction line, discharge lines and liquid end (activate flushing equipment or immerse suction lance in a suitable medium and pump for a while (consider the effect of the medium on your system first!)) or proceed, as described below.
2. Stop the pump so that the lock nuts on the slide rod can both be accessed using an open-ended spanner.
3. Switch off the pump and secure it to prevent it being switched on again.
4. If the liquid end has not been flushed according to the above processes, then protect yourself against the feed chemical - protective clothing, safety glasses, ...

   After dismantling immediately place parts that have been wetting with the medium in a trough with a suitable medium for flushing, in dangerous media were used flush and rinse thoroughly.
5. Unscrew the hydraulic connectors on the discharge and suction side.
6. Take off the clear acrylic upper protective cover from the turret.
7. Loosen the locking nuts on the slide rod and disconnect the piston (2) from the slide rod.
8. If fitted: Remove the leakage or flushing tubes from the tube nozzles (6).
9. Remove the turret flange retaining screws (3).

   CAUTION!
   The piston is breakable.
   – Secure the piston to prevent it falling out.
10. Remove the liquid end and place onto a solid, even surface with the labelled side facing down.

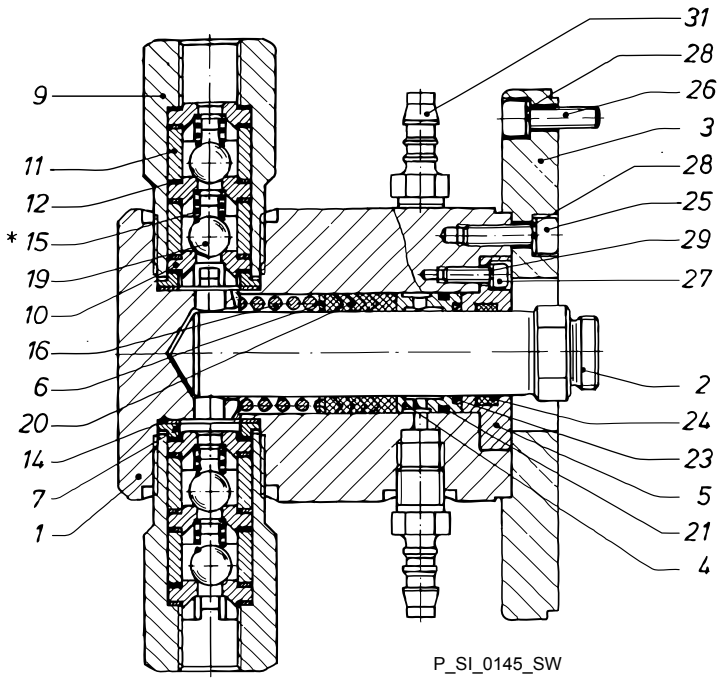


Fig. 34: Cross-section through the liquid end

1 Dosing head
2 Piston
3 Dosing head flange
4 Flushing collar
5 Guide ring
6 Washer
16 Spring
20 V-sleeve packing
21 O-ring
23 FOI ring
24 Guide band
25 Dosing head flange screws
26 Liquid end retaining screws
27 Guide ring screws
31 Tube nozzles for leakage/flushing connector

Repairing the liquid end

1. Remove the piston (2)
2. Loosen the screws (25) of the dosing head flange (3) and remove the dosing head flange.
3. Loosen the screws (27) of the guide ring (5) and remove it.
4. Remove the flushing collar (4), the V-sleeve packing (20), the washer (6) and spring (16).
5. Thoroughly clean the sealing area in the dosing head.
6. Clean the piston (2), the guide sleeves (6) and the flushing collar (7)
7. Dispose of the V-sleeve packing (20), the O-ring (21) from the flushing collar, the FOI ring (23) and the guide band (24).
8. Clean the other removed parts.

Now reassemble the parts using a reverse sequence of steps:

1. Push the spring (16) and the washer (6) into the dosing head.

CAUTION!
The piston may be damaged
– Do not damage the sealing lips of the V-sleeve packing (20).

2. Push the V-sleeve packing (20) into the dosing head. The thicker ring comes last!
3. Align the V-type rings with the open side towards the dosing head, as for the FOI ring (23), see Fig. 35.
4. Pull a new O-ring (21) on to the flushing collar (4).
5. Press a new FOI sealing ring (23) into the flushing collar (4). Observe direction! - refer to Fig. 35.
6. Push the flushing collar (4) into the dosing head.
7. Place and tighten the guide ring (5) with a new guide band (24) on the dosing head.
8. Tighten the screws (27):

Tightening torque	5 Nm

9. Place the dosing head flange (3) on the liquid end and tighten:

Tightening torque	7 Nm

10. Carefully push the piston (2) into the liquid end.

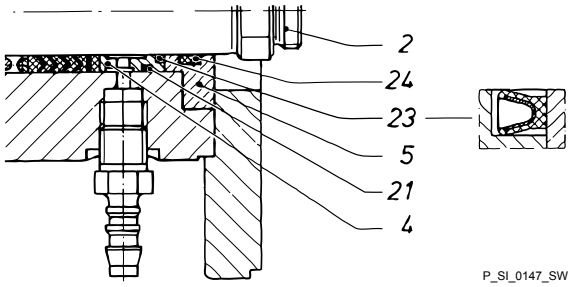


Fig. 35: Section through the liquid end

2 Piston
4 Flushing collar
5 Guide ring
21 O-ring
23 FOI ring
24 Guide band

Fitting the liquid end

1. Place the liquid end with the discharge valve upwards on the drive flange and secure using the retaining screws (26).

Tightening torque	7.5 Nm

CAUTION!
The piston is breakable.
– Secure the piston to prevent it falling out.

2. Check that the small O-ring sits on the end of the slide rod.
3. Screw the piston (2) tightly to the slide rod.

4. Attach the upper protective cover to the turret.
5. If fitted: Connect the flushing tubes to the hose nozzles.

12 Troubleshooting

Safety notes

WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

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

CAUTION!

Warning of feed chemical spraying around

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

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

12.1 Faults without a fault alert

Faults without a fault alert

Fault description	Cause	Remedy	Personnel
Green LED display (operating display) does not light up	The wrong mains voltage or no mains voltage is connected.	The specified mains voltage can be found on the nameplate.	Electrician

Fault description	Cause	Remedy	Personnel
The optical diaphragm rupture sensor has triggered.	The operating diaphragm of the metering diaphragm has ruptured.	Replace the metering diaphragm.	Technical personnel

WARNING!

Warning of escaping feed chemical

When metering critical or combustible feed chemicals or in hazardous locations, under no circumstances must the second diaphragm also rupture.

– If the pump membrane rupture sensor triggers, stop the pump immediately and only restart once a new multi-layer safety diaphragm is fitted.

12.2 Faults with error message

12.2.1 Fault alerts

Fault description	Cause	Remedy
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'MINIM'* flash.	The fluid level in the storage tank has reached "liquid level low 2nd stage".	Fill storage tank.
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'ANALG'* flash.	The pump control is in *'Analog'* operating mode, a fault behaviour has been programmed in the *'ANALG'* menu and the control current has fallen below 3.8 mA.	Clear the cause of the low control current. Switch the programming of the fault behaviour to *'OFF'* - see chapter "Adjustment - Operating mode settings (SET menu)".
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'CNTCT'* flash.	Pump control is in the operating mode *'Contact'* or *'Batch'* and the function extension "Memory" has been set. Also a very large factor was set, too many contacts have been received or the key *[P]* has been pressed too often: Consequently a stroke memory overflow has occurred!	Press the *[P]* key, the memory content is deleted. Set up the pump again.
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'FLOW'* flash.	Dosing monitor not correctly connected.	Connect the dosing monitor correctly. Press the *[P]* key.
	The dosing monitor reported more defective strokes than was set in the *'FLOW'* menu.	Press the *[P]* key. Investigate and clear the cause.
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'MOTOR'* flash.	Due to too high back pressure, the motor cannot work accurately enough.	Reduce the back pressure. Press the *[P]* key (reset function).
	Motor has overheated.	Check the ambient temperature (max. 40 °C). Allow the motor to cool. Press the *[P]* key (reset function).
	Other motor faults.	Contact ProMinent Press the *[P]* key (reset function).
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'TEMPERATURE'* flash.	The temperature inside the pump housing is too high due to too high outside temperature.	Ensure lower outside temperatures. Allow the pump to cool. Press the *[P]* key (reset function).
	The temperature inside the pump housing is too high due to too high pump power consumption.	Check the installation, change if necessary. Allow the pump to cool. Press the *[P]* key (reset function).
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'DIAPH'* flash.	Metering diaphragm is ruptured.	Replace metering diaphragm according to chapter "Repairs".
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'SYSTEM'* flash.	Fault on the control.	Disconnect the pump from the mains/power supply then reconnect. If the error message continues to appear, send the pump to ProMinent.
The red LED indicator illuminates, on the display, the identifiers *'Error'* and *'MEM'* flash.	Stroke memory overflow has occurred.	Eliminate cause.

Fault description	Cause	Remedy
		Press *[P]* key - bear in mind the consequences for your process.

12.2.2 Warning Alerts

Fault description	Cause	Remedy
Green LED indicator illuminates.	The liquid level in the storage tank has reached "liquid level low 1st stage".	Fill storage tank.
Green LED indicator illuminates and the identifier *'Calib'* flashes.	The pump is calibrated and the stroke length varies by more than ±10 scale divisions from the value at the time of the calibration.	Reset the stroke length or recalibrate the pump at the desired stroke length.

12.3 All Other Faults

Please contact the responsible ProMinent branch or representative.

13 Decommissioning

Decommissioning

WARNING!

Danger of an electric shock

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

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

WARNING!

Danger from chemical residues

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

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

WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

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

CAUTION!

Warning of feed chemical spraying around

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

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

CAUTION!

Danger of damage to the device

The device can be damaged by incorrect and improper storage or transportation.

– Take into account the information in the "Storage, Transport and Unpacking" chapter if the system is decommissioned for a temporary period.

(Temporary) decommissioning

Personnel: ■ Technical personnel

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

Final decommissioning

Personnel: ■ Technical personnel

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

Disposal

Personnel: ■ Technical personnel

CAUTION!

Environmental hazard due to incorrect disposal

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

CAUTION!

Environmental hazard due to gear oil

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

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

14 Technical data

Only for "M - modified" design:

WARNING!

Risk of personal injuries

Please observe the ”Supplement for modified version“ at the end of the chapter!

It replaces and supplements the technical data!

14.1 Performance data

SCKa

Type	Minimum pump capacity at maximum back pressure				Maximum stroke rate	Suction lift	Permissible priming pressure, suction side	Connector size
	bar	psi	l/h	gph	Strokes/ min	m WS	bar	R"-DN
32002	320	4660	2.3	0.60	84	5	160	1/4
23004	230	3335	4.8	1.20	154	5	115	1/4
10006	100	1450	6.4	1.7	200	5	50	1/4
14006	140	2030	7.1	1.80	84	4	70	1/4
10011	100	1450	13.1	3.40	154	4	50	1/4
05016	50	725	16.7	4.4	200	4	25	1/4
07012	70	1015	14.8	3.90	84	4	35	1/4
04522	45	652	26.7	7.00	154	4	22.5	1/4
02534	25	362	34.1	9.00	200	4	12.5	1/4
04022	40	580	26.5	7.00	84	4	20	3/8
02541	25	362	49.2	13.00	154	4	12.5	3/8
01264	12	174	64.0	16.90	200	4	6	3/8

All figures refer to water at 20 °C.

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

Precision

Data	Value	Unit
Reproducibility FK 08	±1.0	% *
Reproducibility, other	±0.5	% *

* - when installed correctly, under constant conditions, at least 10 % (FK 08: 30 %) stroke length and water at 20 °C and 1 bar back pressure

14.2 Shipping weight

Types		Shipping weight
		kg
04022 ... 01264		25
Others		24

14.3 Viscosity

The liquid ends are generally suitable for the following viscosity ranges:

Design	Range	Unit
no valve springs	0 ... 200	mPas
with valve springs	200 ... 500	mPas
with appropriately laid out installation	500 ... 1000	mPas
with appropriately laid out installation and advice from ProMinent	> 1000	mPas

14.4 Wetted materials

Liquid end	Suction/pressure connector	Seals / ball seat	Balls	Ball seat	Piston
Stainless steel 1.4571/1.4404	Stainless steel 1.4571/1.4404	PTFE or PTFE with graphite	Oxide ceramic	Stainless steel 1.4571/1.4404	Stainless steel/ ceramic

14.5 Ambient conditions

14.5.1 Ambient temperatures

Pump, compl.

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

14.5.2 Media temperatures

SST liquid end

Data	Value	Unit
Max. temperature long-term at max. operating pressure	90	°C
Max. temperature for 5 min at max. 2 bar	150	°C
Minimum temperature	-10	°C

14.5.3 Air humidity

Air humidity

Data	Value	Unit
Maximum air humidity *:	92	% rel. humidity

* non-condensing

14.6 Relay

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

14.7 Gear oil

Manufacturer	Name	Viscosity class (ISO 3442)	Part no.	Oil volume, supplied	Oil volume, needed
Mobil	Mobil Gear 634 *	VG 460	1004542	1.0 l	0.5 l

* or comparative gear oil

14.8 Sound pressure level

Sound pressure level

Sound pressure level LpA < 70 dB according to EN ISO 20361

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

14.9 Supplementary information for modified versions

(With identity code specification "Version": "M" - "modified")

Technical data

Technical data of pumps in the modified version can deviate from those of the standard pumps. They can be queried by stating the details of the serial number.

During operation with an automatic stroke length adjustment control together with a variable speed motor, the stroke rate must not fall below 30 strokes / min. Otherwise technical problems occur, because the mechanical resistance of the stroke adjustment spindle becomes too high.

motor

The motor data sheets for the modified version are valid. They may deviate from the standard motor data sheets.

Spare parts

With a modified version, it is absolutely necessary to specify the details of the serial number requesting and ordering the spare and replacement parts.

15 Diagrams for adjusting the capacity

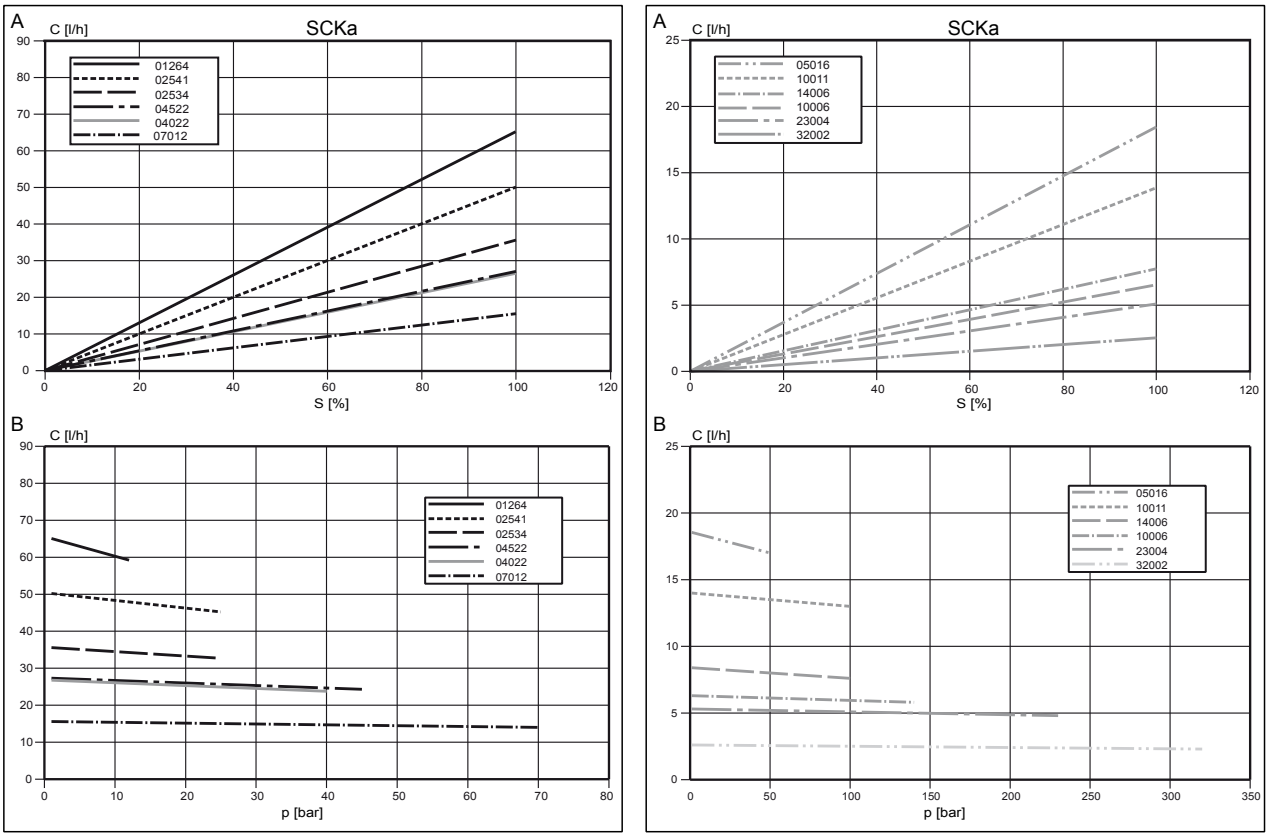


Fig. 36: A) Capacity C at minimum back pressure dependent on the stroke length s. B) Capacity C dependent on the back pressure p.

16 Dimensional drawings

Dimensional drawing Sigma SCKa

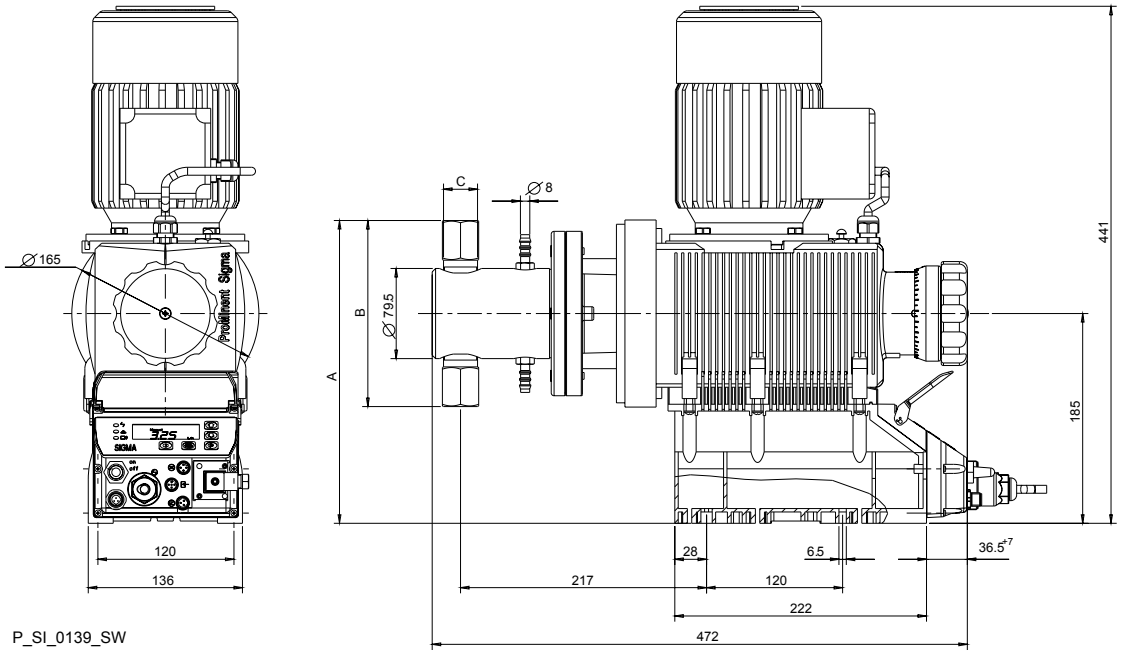


Fig. 37: Dimensional drawing Sigma SCKa - dimensions in mm

Type	Liquid end	A	B	C
32002, 23004, 10006	FK 08	267	164	Rp 1/4 (DN8)
14006, 10011, 05016	FK 12.5	267	164	Rp 1/4 (DN8)
07012, 04522, 02534	FK 25	267	164	Rp 1/4 (DN8)
04022, 02541, 01264	FK 50	274	178	Rp 3/8 (DN10)

17 Exploded drawing Sigma piston metering pump

Liquid end

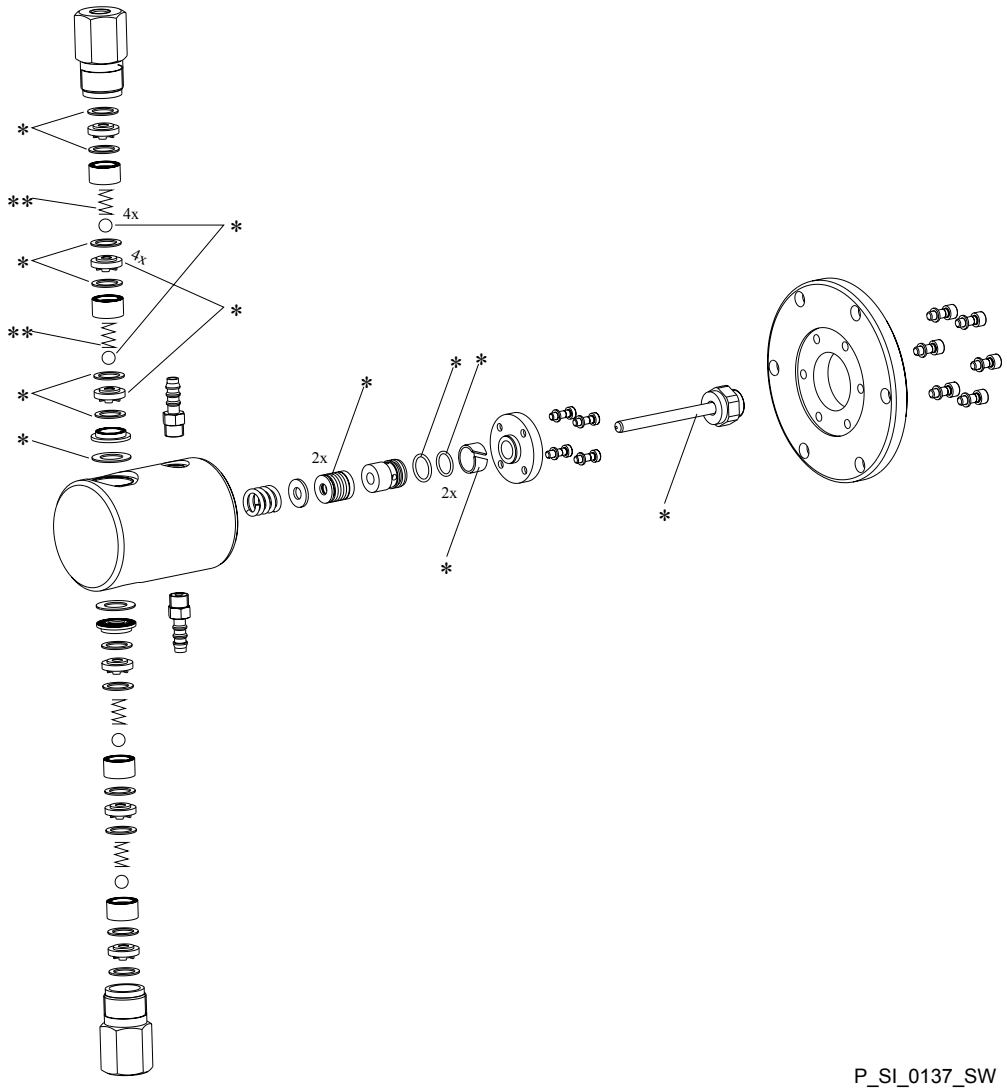


*Fig. 38: * The items listed are included in the spare parts kit.*

18 Sigma/ 2 piston ordering information

Spare parts kits normally include the wearing parts of a liquid end.

Other locations where ordering information can be found: Exploded drawings, ProMinent® product catalogue, www.prominent.com/en/downloads.

Spare parts kits SST (liquid ends)

Spare parts kit	Types 32002, 23004, 10006	Types 14006, 10011, 05016	Types 07012, 04522, 02534	Types 04022, 02541, 01264
FK 08	1001572			
FK 12.5		910470		
FK 25			910471	
FK 50				910472

Scope of supply: see exploded view drawings.

19 EC Declaration of Conformity for Machinery

For pumps without explosion protection:

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

We,

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

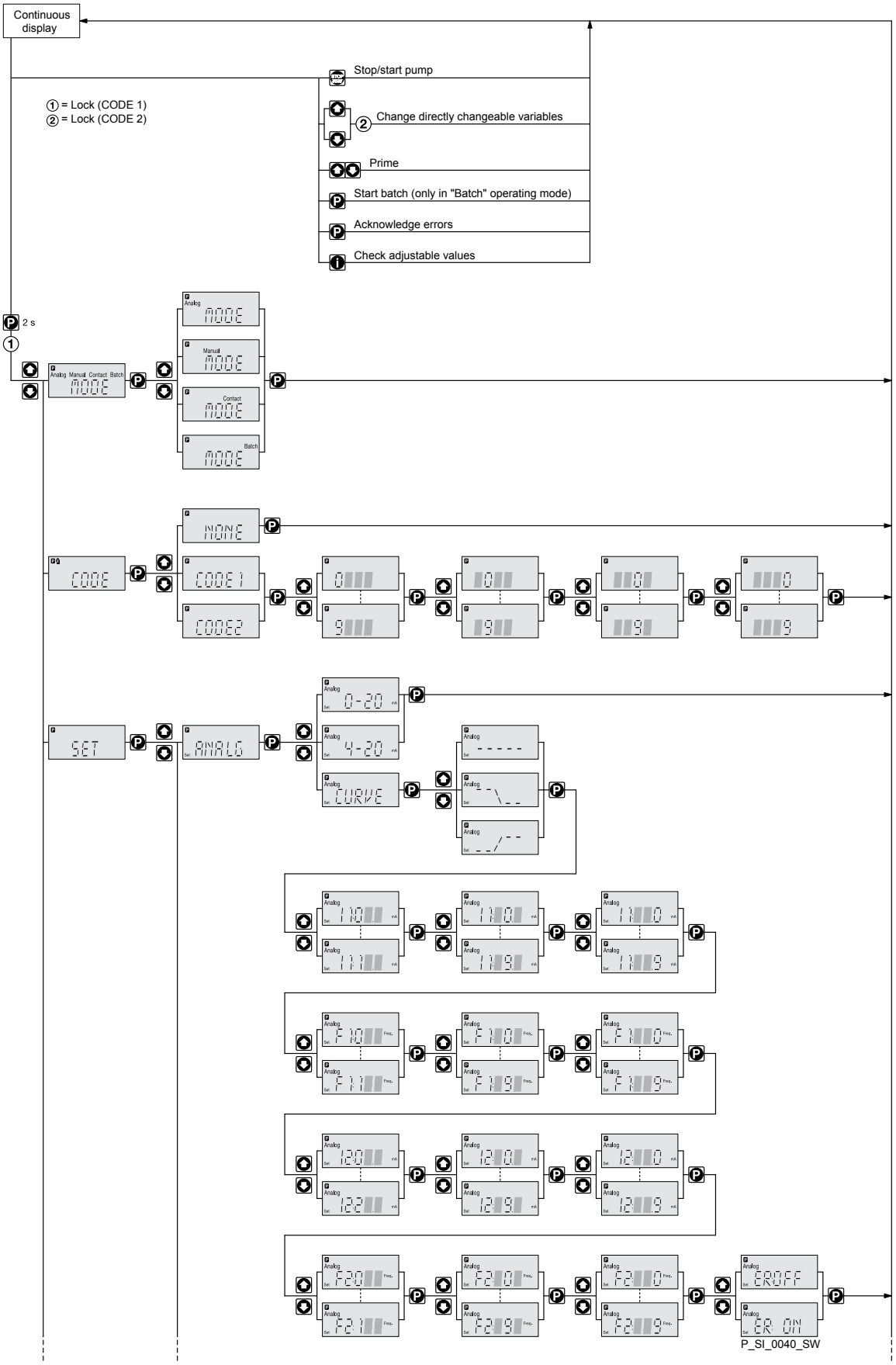
hereby declares that the product specified in the following, complies with the relevant basic health and safety requirements of the EC Directive, on the basis of its functional concept and design and in the version distributed by us. This declaration loses its validity in the event of a modification to the product not agreed with us.

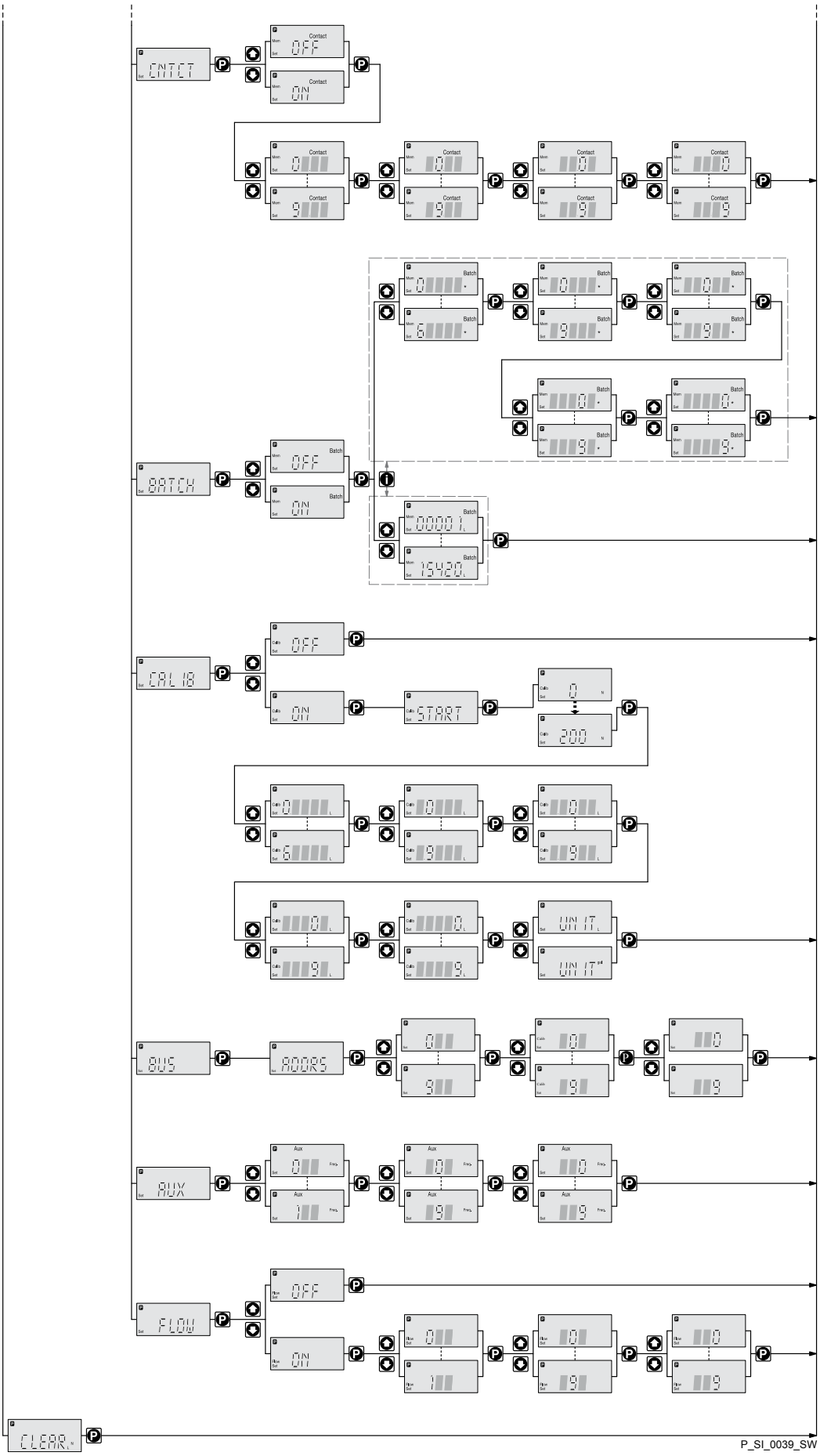
Extract from the EC Declaration of Conformity

Designation of the product:	Metering pump, Sigma product range
Product type:	SBKa…and SCKa…
Serial number:	refer to nameplate on the device
Relevant EC directives:	EC Machinery Directive (2006/42/EC) EC EMC Directive (2004/108/EC) Compliance with the protection targets of the Low Voltage Directive (2006/95/EC) according to Appendix I, No. 1.5.1 of the Machinery Directive 2006/42/EC
Harmonised standards applied, in particular:	EN ISO 12100 EN 809 EN 61010-1 EN 61000-6-2/4
Date:	12/11/2013

You can find the EC Declaration of Conformity as a download under www.prominent.com/en/downloads

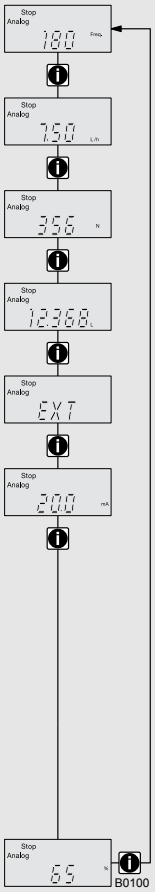
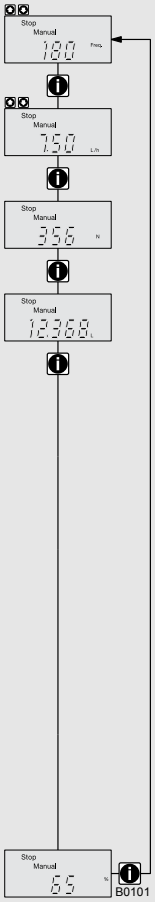
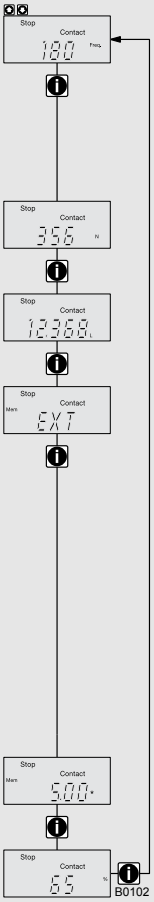
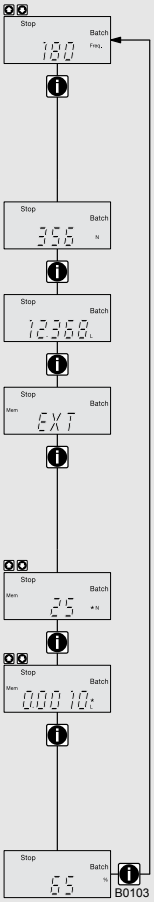
20 Operating / adjustment overview




CONTCT
Contact
OFF
Contact
ON
BATCH
Batch
OFF
Batch
ON
CAL IB
OFF
ON
START
BUS
ADDRS
AUX
Aux
FLOW
OFF
ON
CLEAR
P_SI_0039_SW

21 Continuous displays

Continuous displays

Continuous display	Operating mode "Analog" 0...20 mA	"Manual" operating mode	Operating mode "Contact" with memory and transfer factor 5	"Batch" operating mode with memory
Stroke rate				
Capacity				
Total number of str				
Total litres (metering quantity)				
"External" display				
Signal current				
Remaining strokes				
Batch size / Remaining litres				
Factor				
Stroke length				

B0100 B0101 B0102 B0103

= values which can be changed directly using the UP or DOWN arrow keys

Identifier "Mem" only in the event that function extension "Memory" is activated

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