

Operating instructions

Solenoid Metering Pump

gamma/ X, GMXa

EN

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

Supplementary information



Fig. 1: Please read!

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

The following are highlighted separately in the document:

- Enumerated lists

➔ Instructions

⇒ Outcome of the instructions

🔗 *'State the identity code and serial number' on page 2*: Links to points in this chapter

- refer to ... : References to points in this document or another document

[Keys]

'Menu level 1 → Menu level 2 → Menu level ...': Menu paths

'Software interface text'

Information



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

Safety Information

Safety information is identified by pictograms - see "Safety Chapter".

State the identity code and serial number

Please state the identity code and serial number, which you can find on the nameplate or in the menu under *'Setting / Menu → Information'* when you contact us or order spare parts. This enables the unit type and material versions to be clearly identified.

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1 Identity code

Product range gamma/ X	
GMXa	Type

	Performance data and type - see nameplate
	Dosing head material
	PP Polypropylene
	NP Clear acrylic
	PV PVDF
	TT PTFE + carbon
	SS Stainless steel
	Seal material
	B FPM
	E EPDM
	T PTFE
	Dosing head design
	0 Without bleed valve, without valve spring
	1 Without bleed valve, with valve spring
	2 With bleed valve, without valve spring
	3 With bleed valve, with valve spring
	4 Without bleed valve, with valve spring for more high-viscosity media
	9 Self-bleeding with bypass (SEK)
	Hydraulic connector
	0 Standard connection in line with technical data
	5 Connector for 12/6 hose, suction side standard
	9 Connector for 10/4 hose, discharge side only, suction side standard
	Diaphragm rupture indicator
	0 Without diaphragm rupture indicator
	1 With diaphragm rupture indicator, optical sensor
	Design
	0 Hous. RAL5003 / Hood RAL2003
	M modified
	Logo
	0 with ProMinent logo
	Electrical connection
	U Universal control 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 / 115 V
	E 2 m Great Britain

Product range gamma/ X

1	2 m open end	
..	...	
Relay, pre-set to ...		
0	No relay	-
1	1 x changeover contact 230 V – 8 A	Fault indicating relay (N/C)
4	2 x N/O 24 V – 100 mA	as 1 + pacing relay
C	1 x N/O 24 V – 100 mA, and 1 x 4-20 mA output	As 1 + 4-20 mA output
..	...	
Accessories		
0	without accessories	
1	With foot and injection valve, 2 m suction line, 5 m metering line	
4	Multifunctional valve and accessories	
Control version		
0	Manual + external contact with pulse control	
3	Manual + external contact with pulse control + analogue 0/4-20mA	
4	As 0 + 4-week process timer	
5	As 3 + 4-week process timer	
C	As 3 + CANopen	
R	As 3 + PROFIBUS® interface, M12	
Dosing monitor		
0	Dynamic dosing monitor	
Remote stop / Remote control		
0	Without Bluetooth	
1	With Bluetooth	
Language		
EN	German	
EN	English	
ES	Spanish	
FR	French	
IT	Italian	
...	...	

2 About this pump

About this pump

Pumps in the ProMinent gamma/ X product range are microprocessor-controlled solenoid metering pumps with the following characteristics:

- Simple adjustment of the capacity directly in l/h
- Available material combinations: PP, PVDF, clear acrylic, PTFE and stainless steel
- Special dosing head designs for gaseous and high-viscosity media
- Illuminated LC display and 3-LED display for operating, warning and error messages, visible from all sides
- Factor with external contact control 99:1 ... 1:99
- Batch operation with max. 99,999 strokes/start pulse
- Input of concentration for simple adjustment with volume-proportional metering tasks
- Stroke rate adjustment in 1 stroke/hour increments from 0 ... 12,000 strokes/h
- Electronic stroke length adjustment, continuous from 0 ... 100% (recommended 30 ... 100%)
- Connector for 2-stage level switch
- External control via 0/4-20 mA standard signal with adjustable assignment of signal value to stroke rate
- Optional 4-20 mA output for remote transmission of stroke length and stroke rate
- Universal power supply unit 100 V - 230 V, 50/60 Hz
- Optional 230 V relay module, can also be retrofitted easily and securely
- Optional 24 V combined relay, can also be retrofitted easily and securely

The hydraulic parts of the gamma/ X are identical to those of the Beta® (not with types 0220, 0424 and 0245).

3 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 – automatic start-up.
	Warning – high-voltage.
	Warning – danger zone.

Intended Use

- Only use the pump to meter liquid feed chemicals.
- Only use the pump after it has been correctly installed and started up in accordance with the technical data and specifications contained in the operating instructions.
- Observe the general limitations with regard to viscosity limits, chemical resistance and density - see also ProMinent resistance list in the Product Catalogue or at www.prominent.com!
- All other uses or modifications are prohibited.
- The pump is not intended for the metering of gaseous media and solids.
- The pump is not intended for the metering of flammable media without implementing suitable protective measures.
- The pump is not intended for the metering of explosive media.
- The pump is not intended for operation in areas at risk from explosion.
- The pump is not intended for exterior applications without the implementation of suitable protective measures.
- The pump should only be operated by trained and authorised personnel, see the following "Qualifications" table.
- You are obliged to observe the information contained in the operating instructions at the different phases of the unit's service life.

Safety Information

**WARNING!****Warning about personal and material damage**

The pump can start to pump, as soon as it is connected to the mains voltage.

- Install an emergency cut-off switch in the pump power supply line or integrate the pump in the emergency cut-off management of the system.

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

The pump can start pumping as soon as it has cooled down after the error '*temperature*'.

- Take this into account with the pump and your installation.

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

A mains voltage may exist inside the pump housing.

- If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

**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!****Fire danger**

When pumping inflammable media the operator must take suitable safety precautions.

**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

The metering pump can generate a multiple of its rated pressure. Hydraulic parts can rupture if a discharge line is blocked.

- Correctly install a relief valve in the discharge line downstream of the metering pump.



CAUTION!

Warning of feed chemical spraying around

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

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



CAUTION!

Danger of injury to personnel and material damage

The use of untested third party components can result in injury to personnel and material damage.

- Only fit parts to metering pumps that 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.



CAUTION!

Danger from incorrect dosing

The metering behaviour of the pump changes if a different liquid end size is fitted.

- Reprogram the pump in the *'Menu / Information → Settings → System → Change head type'* menu.



CAUTION!

Warning against illegal operation

Observe the regulations that apply where the device is installed.

Isolating protective equipment


- Covers for the slots for relays and optional modules - see the chapter entitled "Overview of Equipment and Control Elements"

Customers should only remove the cover for the slots for relays and optional modules and/or a relay or optional module in line with the supplementary instructions for the relays and optional modules.

Customer should only remove the dosing head in accordance with the "Repair" chapter.

Only the ProMinent Service department is authorised to open the housing and the hood (housing the control elements).

Information in the event of an emergency

In an emergency, either disconnect the mains plug, press  [Start/Stop] or press the Emergency Stop switch installed on the customer's side or disconnect the pump from the mains/power supply in line with the Emergency Stop management guidelines for your system.

If feed chemical escapes, additionally ensure that the pump's hydraulic environment is at atmospheric pressure. Adhere to the material safety data sheet for the feed chemical.

Qualification of personnel

Task	Qualification
Storage, transport, unpacking	Instructed person
Assembly	Technical personnel, service
Planning the hydraulic installation	Qualified personnel who have a thorough knowledge of metering 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 table:

Qualified 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 of employment in the relevant field of work.

Electrical technician

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

The electrical technician should be specifically trained for the working environment in which he is employed and know the relevant standards and regulations.

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

Instructed person

An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/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

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

Sound pressure level

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

4 Storage, Transport and Unpacking

Safety Information

**WARNING!**

Only return metering pumps for repair in a cleaned state and with a flushed liquid end - refer to "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 on our homepage.

**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.
- 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.

Ambient conditions

Ambient conditions - refer to "Technical Data" chapter.

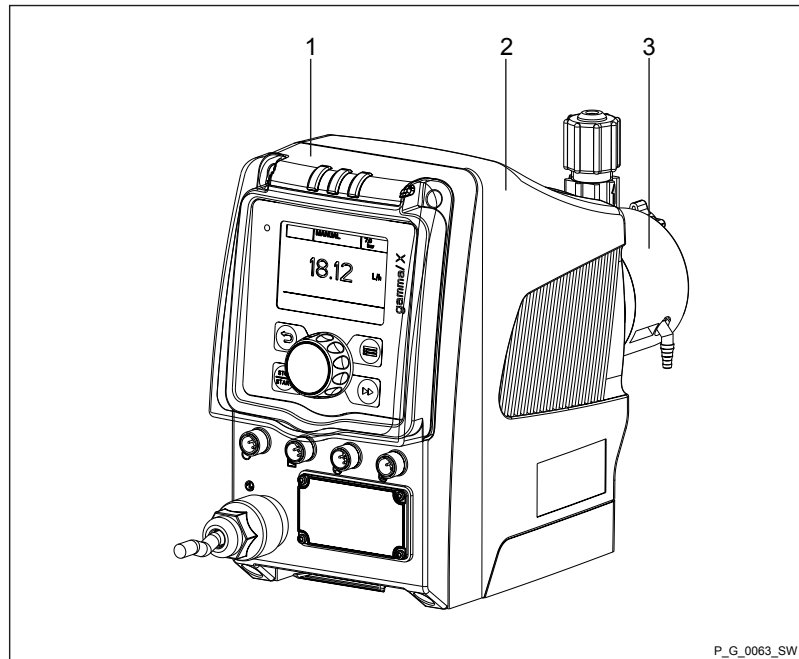
Scope of delivery

Compare the delivery note with the scope of delivery:

- Metering pump with mains cable
- Connector kit for hose/pipe connection (optional)
- Product-specific operating instructions with EC Declaration of Conformity
- Optional accessories

5 Overview of Equipment and Control Elements

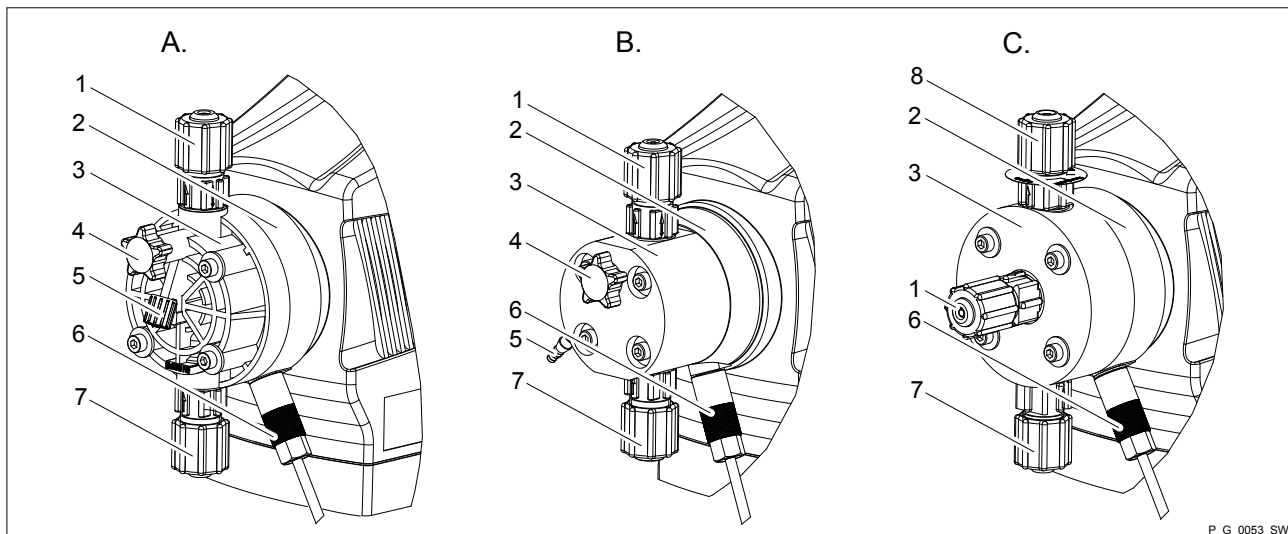
5.1 Overview of Equipment



P_G_0063_SW

Fig. 2: Overview of equipment, complete

- 1 Control unit
- 2 Drive unit
- 3 Liquid end



P_G_0053_SW

Fig. 3: A. Liquid end with PV bleed valve; B. Liquid end with NP bleed valve; C. Self-bleeding liquid end (SEK)

- 1 Discharge valve
- 2 Backplate
- 3 Dosing head
- 4 Bleed valve
- 5 Bypass hose sleeve
- 6 Diaphragm rupture indicator (optional)
- 7 Suction valve
- 8 Bleed valve, self-bleeding

5.2 Control Elements

Control elements, overview

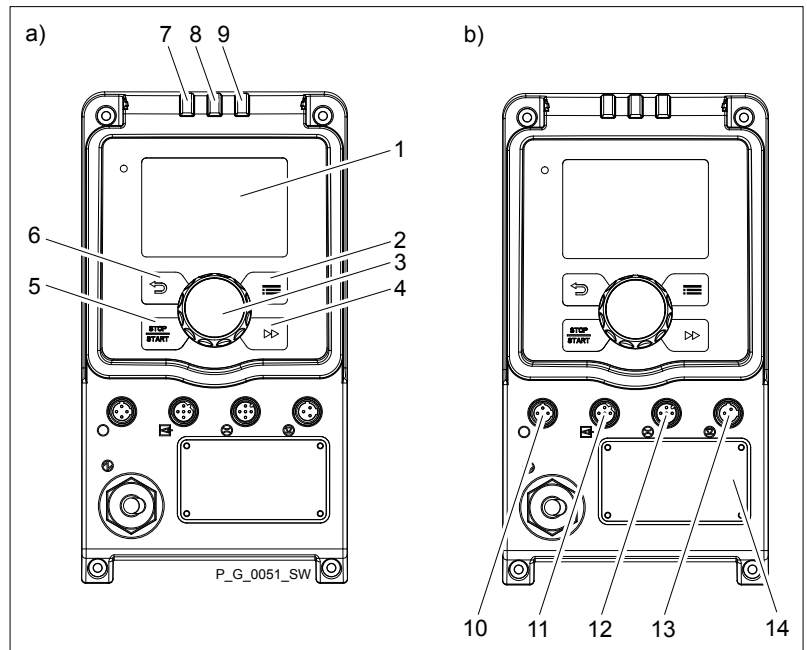


Fig. 4

- 1 LCD screen
- 2 [Menu] key
- 3 Clickwheel
- 4 [Priming] key
- 5 [STOP/START] key
- 6 [Back] key
- 7 Fault indicator (red)
- 8 Warning indicator (yellow)
- 9 Operating indicator (green)
- 10 "Diaphragm rupture indicator" terminal
- 11 "External control" terminal
- 12 "Dosing monitor" terminal
- 13 "Level switch" terminal
- 14 Slot for relay and optional modules

5.2.1 Control Elements



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

Pressure display, identifier and fault displays on the LCD screen

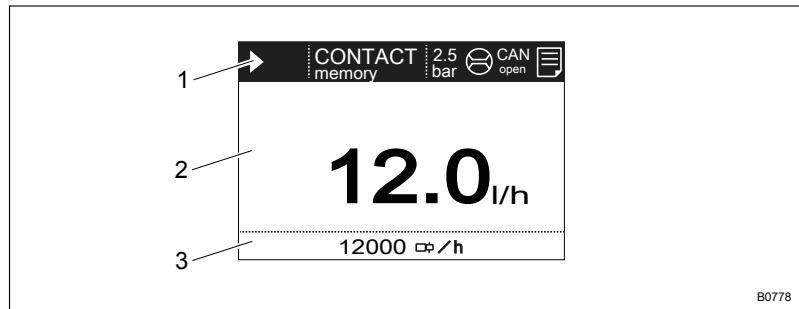


Fig. 5: Construction of continuous display

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

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

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

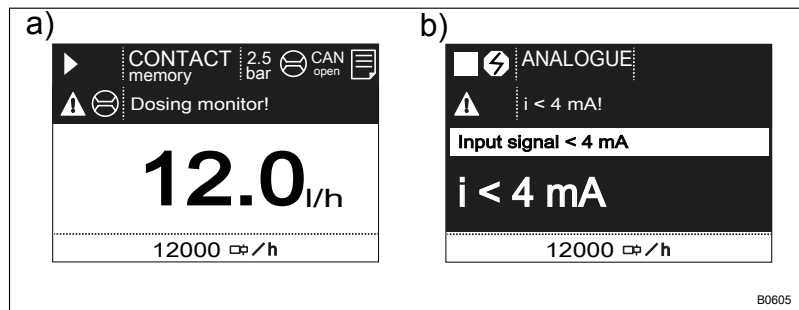


Fig. 6: a) Continuous display with warning message; b) Continuous display with fault message. Explanation of the symbols in the following tables.

















The above Figure, Part a) shows that:






- The pump is in operation
- Is in 'Contact' operating mode with "memory" stroke memory.
- The average system pressure is 2.5 bar
- A dosing monitor is connected
- A CAN module is being used
- A log entry has been made
- A warning message for the 'dosing monitor' is pending
- The capacity of 12.0 l/h has been set
- The stroke rate is 12,000 strokes / h

Pressure display

Display	Meaning
2.5 bar	Displays the average system pressure

Identifier and error displays:

Identifier	Meaning
	The pump is working or waiting for a starting signal.
	The pump was manually stopped using the  [STOP/START] key.
	The pump was remotely stopped (Pause) - via the "External" terminal.
	The pump was stopped by an error.
	Only with cyclical batch metering: the pump waits for the next cycle.
	Only with 'Access. protect': the pump software is locked.
'AUX'	The pump is currently pumping at auxiliary capacity and/or auxiliary frequency.
'memory'	Only in 'CONTACT' and 'BATCH' operating modes: The auxiliary function "Stroke memory" has been set.
	The pump is in 'ANALOGUE' operating mode. The 'Curve → linear' type of processing is set.
	The pump is in 'ANALOGUE' operating mode. The 'Curve → Upper side band' type of processing is set.
	'Metering → Discharge stroke → optimum' metering profile has been set.
	'Metering → Discharge stroke → fast' metering profile has been set.
	'Metering → Discharge stroke → sine mode' metering profile has been set.
	'Metering → Discharge stroke → continuous' metering profile has been set.
	'Metering → Discharge stroke → DFMa' metering profile has been set.
	'Metering → Discharge stroke → normal' metering profile has been set.
	'Metering → Discharge stroke → HV1' metering profile has been set.

Identifier	Meaning
	'Metering → Discharge stroke → HV2' metering profile has been set.
	'Metering → Discharge stroke → HV3' metering profile has been set.
	A dosing monitor "Flow Control" is connected.
	A diaphragm rupture indicator is connected.
	The pump is in the 'Menu' (Set up).









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



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

5.2.2 Key Functions

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



Refer to the "Set-up Basics" chapter to adjust figures

6 Functional Description

6.1 Liquid End

The dosing process is performed as follows: The diaphragm is pressed into the dosing head; the pressure in the dosing head closes the suction valve and the feed chemical flows through the discharge valve out of the dosing head. The diaphragm is now drawn out of the dosing head; the discharge valve closes due to the negative pressure in the dosing head and fresh feed chemical flows through the suction valve into the dosing head. One cycle is completed.

6.2 Drive unit

The diaphragm is driven by an electromagnet, controlled by an electronic control.

Drive technology

The drive technology on the gamma/ X enables the timed progress of the flow to be precisely matched to the requirements of the particular application.

This ensures that the user can set the optimum **discharge stroke** for his application, as required:

Pos.*	Discharge stroke	Application
A.	<i>'optimum'</i>	For maximum accuracy when metering and the very best results with internal pressure measurement and special functions.
B.	<i>'fast'</i>	For as fast a discharge stroke as possible - the duration of the discharge stroke is dependent on the stroke rate.
C.	<i>'Sine mode'</i>	For a long, sine-shaped discharge stroke - the duration of the discharge stroke is dependent on the stroke rate.
D.	<i>'continuous'</i>	For a continuous discharge stroke e.g. for bottling processes. The duration of the discharge stroke is dependent on the stroke rate.
E.	<i>'DFMa'</i>	For optimum operation with a flow meter DulcoFlow® DFMa.

* see following drawing.

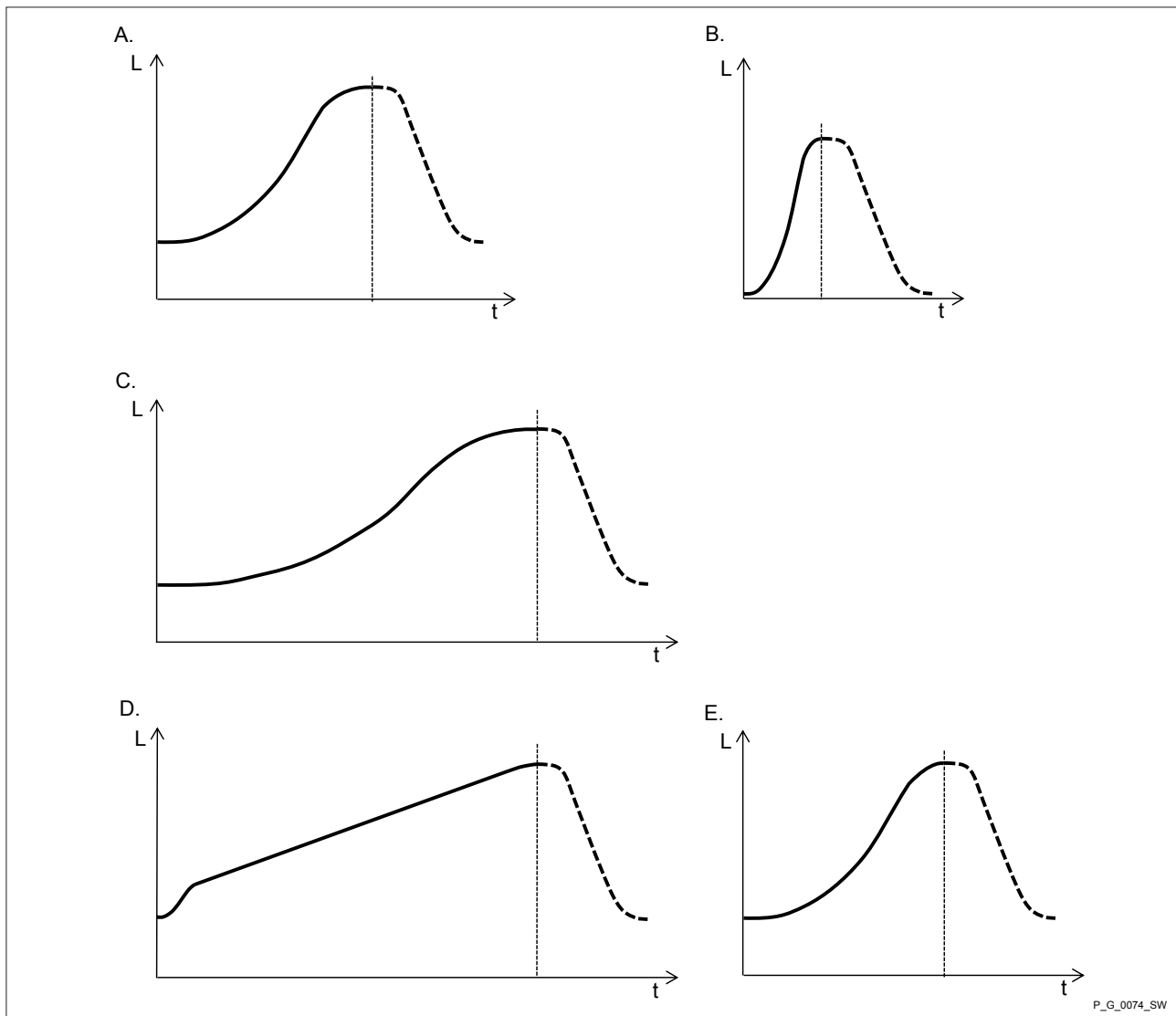


Fig. 7: Discharge stroke metering profiles with stroke L and time t (suction stroke shown as a dotted line)

It is possible to selectively also slow the **suction stroke** with all these metering profiles for the discharge stroke - see . In this way, it is possible to prevent the main cause of inaccurate metering with high viscosity feed chemicals, namely the incomplete filling of the liquid end. With gaseous feed chemicals, the slow suction stroke prevents cavitation and consequently increases dosing precision.

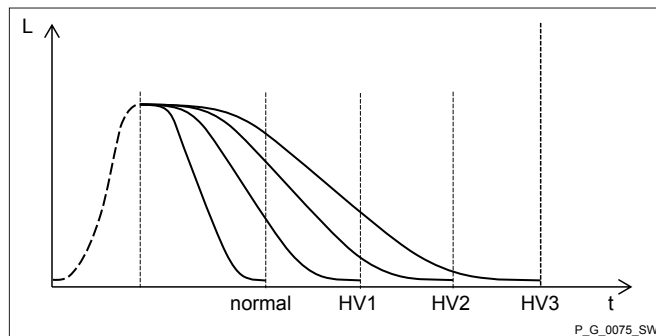


Fig. 8: Suction stroke metering profiles with stroke L and time t

- Normal Normal suction stroke
- HV1 Suction stroke for viscous feed chemical
- HV2 Suction stroke for average viscosity feed chemical
- HV3 Suction stroke for high-viscosity feed chemical

Oscillations in the back pressure in the metering line, which could lead to undesirable variations in the metering volume, are automatically compensated for by the power end/drive. This results in **dosing precision**, which otherwise could only be achieved with complex control circuits.

6.3 Capacity

The capacity set regulates the pump even in *'Automatic'* mode (not with SEK dosing heads).

By contrast, in conventional mode, the stroke length and stroke rate determine the capacity. The stroke length can be adjusted between 0 and 100% via the continuous display or the menu. A metering volume of between 30 to 100% is reproduced as being technically sensible (SEK type: 50 - 100%)! The stroke rate can be set via the menu (not in "Analogue" operating mode) within a range of 0 - 12,000 strokes/h.

6.4 Self-Bleeding

Self-bleeding liquid ends (SEK types) are capable of independent priming when a discharge line is connected and diverting existent air pockets via a bypass. During operation they are also capable of conveying away gases which are produced, independently of the operating pressure in the system. It is also possible to dose precisely in a depressurised state due to the integral back pressure valve.

6.5 Operating Modes

Operating modes are selected via the "Operating modes" menu.

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

"Manual" operating mode

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

"Contact" operating mode

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

"Batch" operating mode

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

"Analogue" operating mode

The capacity and/or stroke rate is controlled via an analogue current signal via the "External control" socket. The processing of the current signal can be preselected via the control unit.

6.6 Functions

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

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

"Calibrate" function

The pump can also be operated in a calibrated state in all operating modes if it is to meter extremely precisely. This can be useful with very viscous feed chemicals but less so with feed chemicals with a similar consistency to water. Calibration is retained over the entire stroke rate range and over a stroke length range from 0 - 100%.

"Auxiliary capacity" / "Auxiliary frequency" function

This facilitates the switch-over to a fixed adjustable capacity / stroke rate in the 'menu' via the "External control" terminal.

"Bleed " function

This permits simple bleeding - without the need for an additional bleed valve. The pump works at maximum stroke rate based on the selected signal in order to transport gas bubbles out of the liquid end.

The following functions are available as standard:

"Flow" function

It monitors the flow after every single stroke, if a dosing monitor is connected and if 'Fast' is set under 'Settings → Metering → Discharge stroke' or 'DFMa' (for the DulcoFlow®). The number of defective strokes, after which the pump is switched off, can be set in the 'Settings' menu.

"Level switch" function

Information about the liquid level in the dosing tank is reported to the pump. A two-stage level switch has to be fitted for this purpose, which is connected to the "Level switch" terminal.


"Pause" function

The pump can be remotely stopped via the "External Control" terminal.

"Stop" function

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

"Priming" function

Priming can be triggered by pressing  [Priming].

6.7 Relay (Options)

The pump has several connecting options available:

"Fault indicating relay" option

The relay can close a connected power circuit (e.g. for an alarm horn) in the event of warnings or fault messages (e.g. 'Warning level').

The relay can be retrofitted through the slot in the front of the pump - refer to the installation instructions for "Retrofitting relays".

"Fault indicating and pacing relay" option

This combined relay can generate a contact with each stroke via its pacing relay in addition to functioning as a fault indicating relay.

The relay can be retrofitted through the slot in the front of the pump.

"Automatic bleed" option

The "Automatic bleed" option is used for controlled bleeding of the liquid end, if the pump has the "Automatic bleed" option. This option can be retrofitted through the slot in the front of the pump and conversion of the dosing head.

There are two versions:

- Version with only 1 relay – to control the electric bleed valve in the dosing head.
- Version with only 2 relays – one relay to control the electric bleed valve in the dosing head and one relay free for other uses.

"mA output" option

The current output I signal indicates the pump's actual calculated metering volume. The relay can be retrofitted through the slot in the front of the pump.

The option also always includes a fault indicating relay or a pacing relay.

6.8 LED Displays

Fault indicator (red)

LED display	Colour	lit	briefly goes out	flashes
Fault indicator	red	A fault message is pending	-	undefined operating status
Warning indicator	yellow	A warning message is pending	-	-
Operating indicator	green	The pump is ready for operation	At each stroke	Stroke rate below 30 strokes / min

6.9 Hierarchy of Operating Modes, Functions and Fault Statuses

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

The following list shows the order:

1. - Stop
2. - Priming
3. - Error, Pause, Level
4. - Auxiliary capacity / Auxiliary frequency
5. - Manual, Analogue, Contact, Batch

Comments:

- re 1 - "Stop" stops everything.
- re 2 - "Priming" can take place in any mode of the pump (providing it is functioning).
- re 3 - "Error", "Pause" and "Level" stop everything apart from "Priming".
- re 4 - The "Auxiliary capacity" and/or "Auxiliary frequency" always has priority over the capacity / stroke rate specified by an operating mode listed under 5.

7 Assembly



Please refer to the online version of the operating instructions on our website for the right dimensional drawings for the pump and mounting plate.



Compare the dimensions on the dimensional drawing with those of the pump and/or mounting plate.



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.



Capacity too low

The liquid end valves can be disturbed by vibrations.

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



Capacity too low

If the valves of the liquid end are not vertical, they cannot close correctly.

- *Ensure that the suction and discharge valves are upright (with self-bleeding liquid ends: the bleed valve).*



Several metering pumps can be arranged closely together as required.

1. ➤ To remove the mounting plate, press down the black flap below the front of the pump a little and press the mounting plate backwards.
2. ➤ Assemble the mounting plate on a **level** and load-bearing base surface (with a minimum of 2 bolts and 2 washers!).

You can also assemble the mounting plate on a **vertical**, level and load-bearing base surface (using 3 bolts and 3 washers!). You then need to rotate the liquid end (vertical valve position!)

You can also assemble the mounting plate on a **wall bracket** (accessories). 3 alignments are possible.
3. ➤ Lock the foot of the metering pump into the mounting plate – see further information Fig. 9.

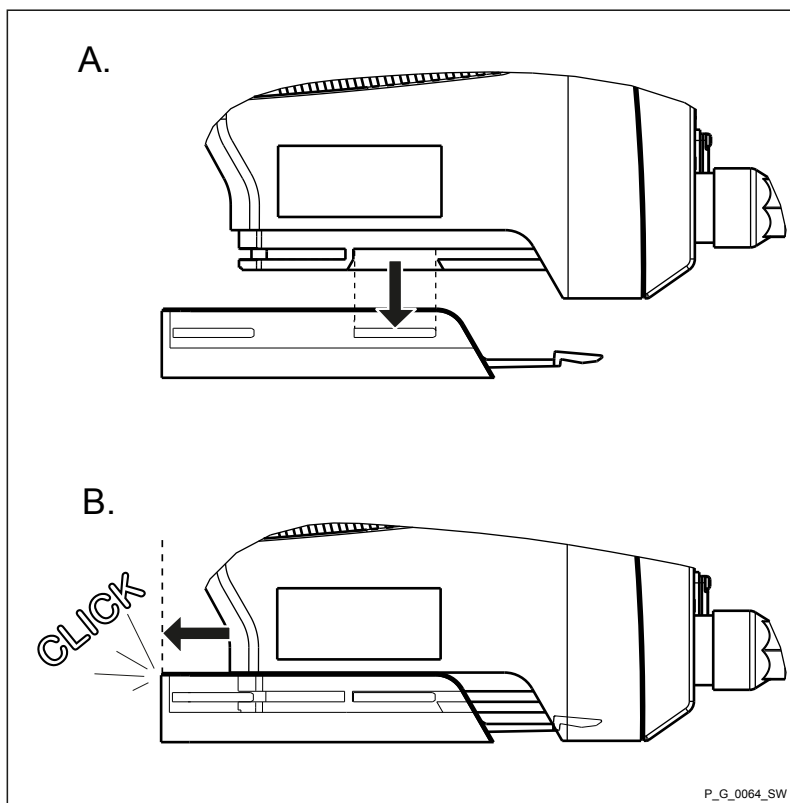


Fig. 9

Suggested bolts and washers for fixing the assembly foot

Bolt	Type	Size	Washer
	DELTA-PT bolt	50 (WN5412/5452)	A5.3 (DIN 125)
	PT bolt	50 (WN1441/1411 KA/B)	-
	Flat-head bolt	M5 (DIN EN ISO 7045)	A5.3 (DIN 125)
	Allen bolt/	M5 (DIN EN ISO 4762)	A5.3 (DIN 125)

8 Installation, hydraulic

Safety Information



CAUTION!

Warning of feed chemical spraying around

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

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



CAUTION!

Warning of feed chemical spraying around

Pumps which are not fully installed hydraulically can eject feed chemicals from the outlet openings of the discharge valves as soon as they are connected to the mains.

- The pump must first be hydraulically installed and then electrically.
- In the event that you have failed to do so, press the *[STOP/START]* button or press the emergency-stop switch.



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 from rupturing hydraulic components

Peak loads during the dosing stroke can cause the maximum permissible operating pressure of the system and pump to be exceeded.

- The discharge lines are to be properly designed.



CAUTION!

Danger of injury to personnel and material damage

The use of untested third party components can result in injury to personnel and material damage.

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

8.1 Installing hose lines

8.1.1 Installation of Metering Pumps Without Bleed Valve

Safety Information

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

The pipes can loosen or rupture if they are not installed correctly.

- Route all hose lines so they are free from mechanical stresses and kinks.
- Only use original hoses with the specified hose dimensions and wall thicknesses.
- Only use clamp rings and hose nozzles that are intended for the hose diameter in question to ensure the long service life of the connections.

**CAUTION!****Danger from rupturing hydraulic components**

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

- Always adhere to the maximum permissible operating pressure of all hydraulic components - please refer to the product-specific operating instructions and system documentation.
- Never allow the metering pump to run against a closed shut-off device.
- Install a relief valve.

**CAUTION!****Hazardous feed chemicals can escape**

Hazardous or extremely aggressive feed chemicals can leak out when using conventional bleeding procedures with metering pumps.

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

**CAUTION!****Hazardous feed chemicals can escape**

Hazardous or extremely aggressive feed chemicals can leak out in the event that the metering pump is removed from the installation.

- Install a shut-off valve on the metering pump's pressure and discharge sides.

**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 chemicals can leak through the metering pump in an uncontrolled manner in the event of excessive priming pressure.

- Do not exceed the maximum permissible priming pressure for the metering pump.



Align the pipes so that the metering pump and the liquid end can be removed from the side if necessary.

Installing hose lines - PP, NP, PV, TT designs

1. ➤ Cut off the ends of the hoses at right angles.
2. ➤ Pull the union nut (2) and clamp ring (3) over the hose (1) - see figure Fig. 10.
3. ➤ Push the hose end (1) up to the stop over the nozzle (4) and widen, if necessary.



Ensure that the O-ring and flat seal (5) is properly fitted to the valve (6).



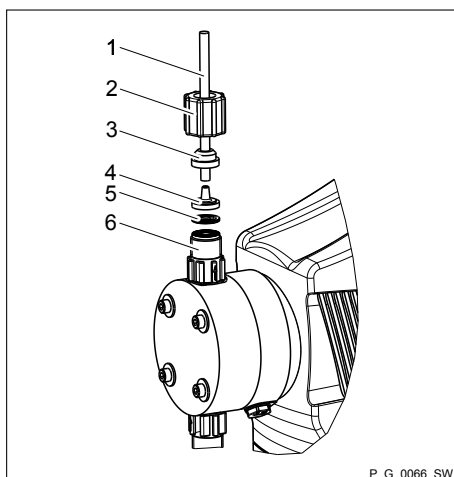
Never re-use used PTFE seals. An installation sealed in this way is not watertight.

This type of seal is permanently distorted when subjected to pressure.



In order to enable it to be distinguished from the EPDM flat seal, the FPM flat seal PV design has a dot.

4. ➤ Place the hose (1) with the nozzle (4) onto the valve (6).
5. ➤ Clamp the hose connector: Tighten the union nut (2) while simultaneously pressing on the hose (1).
6. ➤ Re-tighten the hose connector: Pull on the hose (1) briefly, which is fastened to the dosing head and then tighten the union nut (2) once more.

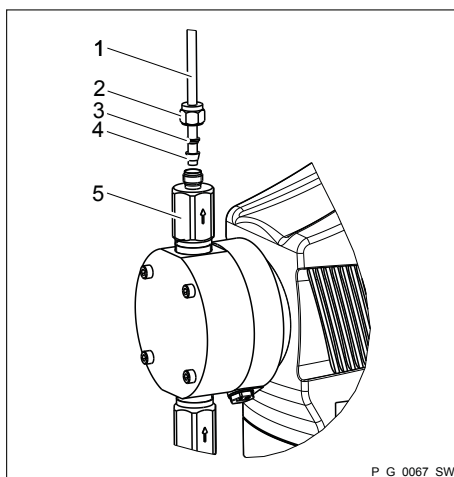


- 1 Hose
- 2 Union nut
- 3 Clamp ring
- 4 Nozzle
- 5 O-ring or flat seal
- 6 Valve

Fig. 10: PP, NP, PV and TT designs

Installing stainless steel pipe - SS design

1. ➔ Pull the union nut (2) and clamp rings (3, 4) over the pipe (1) with approx. 10 mm overhang - see Fig. 11.
2. ➔ Insert the pipe (1) up to the stop in the valve (5).
3. ➔ Tighten the union nut (2).



- 1 Pipe
- 2 Union nut
- 3 Rear clamp ring
- 4 Front clamp ring
- 5 Valve

Fig. 11: SS design

Installing hose lines - SS design



CAUTION!

Warning of feed chemical spraying around

Connections can come loose in the event that hose lines are installed incorrectly on stainless steel valves.

- Only use PE or PTFE hose lines.
- In addition, insert a stainless steel support insert into the hose line.

8.1.2 Installation of Metering Pumps With Bleed Valve

Safety Information



CAUTION!

- All the installation and safety notes for metering pumps without bleed valves also apply.

Installation of the return line

A return line is also connected in addition to the suction and discharge line.

1. Attach the hose line to the return hose nozzle or to the liquid end bleed valve. PVC hose, soft, 6x4 mm is recommended.
2. Feed the free end of the return line back to the storage tank.
3. Shorten the return line so that it is not immersed in the feed chemical in the storage tank.

8.1.3 Installation of Metering Pumps With Self-bleeding (SEK Type)

Safety Information



CAUTION!

- All of the installation and safety notes for metering pumps without self-bleeding also apply.
- Do not exceed the maximum values for priming lift, priming pressure and viscosity of the feed chemical.
- Do not allow the suction side line cross-section to exceed the line cross-section on the suction valve.



Information about priming pressure

- *Make sure that the priming pressure on the suction end is at least equal to the return line pressure.*
- *Back pressure in the return line restricts the bleeding function.*
- *In contrast, it is possible to operate the pump with back pressure in the return line and atmospheric pressure on the suction side.*

Installation of the return line

A return line is also connected in addition to the suction and discharge line.



- *The return line is connected to the vertical valve on the upper side of the liquid end. It is factory-labelled with a red sleeve - see ↗ 'Installation of the return line' on page 30.*
- *The discharge line is connected to the horizontal valve.*

1. Attach the hose line to the return hose nozzle or to the liquid end bleed valve. PVC hose, soft, 6x4 mm is recommended.
2. Feed the free end of the return line back to the storage tank.
3. SEK only: Insert the return line into the anti-kink device on the bleed valve and screw it in place until the anti-kink device engages.



The anti-kink device prevents the return line from kinking, avoiding the risk of self-bleeding failure.

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

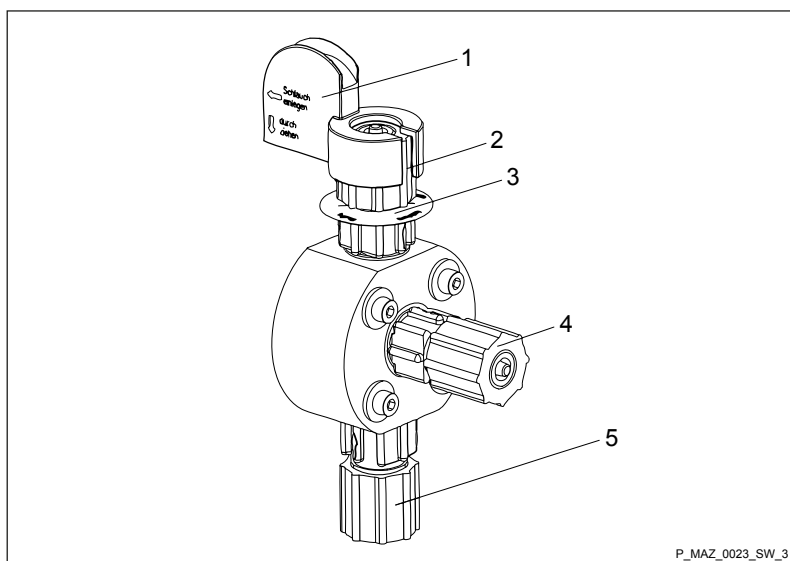


Fig. 12: SEK liquid end

- 1 Anti-kink device
- 2 Bleed valve for the return line into the storage tank, 6/4 mm
- 3 Red sleeve
- 4 Discharge valve for discharge line to the injection point, 6/4 - 12/9 mm
- 5 Suction valve for suction line in the storage tank, 6/4 - 12/9 mm

8.2 Basic installation notes

Safety notes



CAUTION!

Danger resulting from rupturing hydraulic components

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

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



CAUTION!

Hazardous feed chemicals can escape

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

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

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

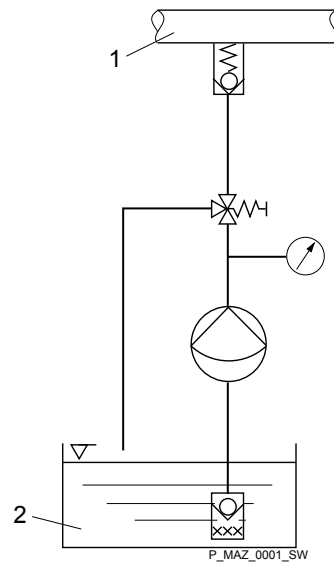


Fig. 13: Standard installation

- 1 Main line
- 2 Storage tank

Legend for hydraulic diagram

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

9 Installation, Electrical

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

A mains voltage may exist inside the device.

- Before any work, disconnect the device's mains cable from the mains.

**WARNING!****Risk of electric shock**

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

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

**WARNING!****Risk of electric shock**

In the event of an electrical accident, the pump must be quickly disconnected from the mains.

- Install an emergency cut-off switch in the pump power supply line or
- Integrate the pump in the emergency cut-off management of the system and inform personnel of the isolating option.

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

Incompletely installed electrical options can allow moisture into the inside of the housing.

- Fit appropriate modules into the slot on the front of the pump or use the original blank cover to seal it in a leak-tight manner.

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

A mains voltage may exist inside the pump housing.

- If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

**CAUTION!****Material damage possible due to power surges**

Should the pump be connected to the mains power supply in parallel to inductive consumers (such as solenoid valves, motors), inductive power surges can damage the controller when it is switched off.

- Provide the pump with its own contacts and supply with voltage via a contactor relay or relay.

➔ Install the pump in line with best working practice and in accordance with the operating instructions and applicable regulations.

9.1 Supply voltage connector - mains voltage



WARNING!

Unexpected startup is possible

As soon as the pump is connected to the mains, the pump may start pumping and consequently feed chemical may escape.

- Prevent dangerous feed chemicals from escaping.
- If you have not successfully prevented this, immediately press the *[STOP/START]* key or disconnect the pump from mains, e.g. via an emergency cu-off switch.



CAUTION!

If the pump is integrated into a system: Design the system so that potential hazardous situations are avoided by pumps starting up automatically subsequent to unintended power interruptions.

Connect the pump to the mains/power supply using the mains cable.

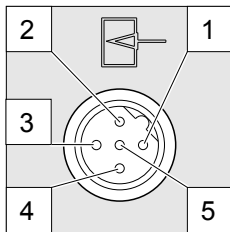
9.2 Description of the Terminals

9.2.1 "External control" Terminal

The "external control" terminal is a 5-pole panel terminal. It is compatible with 2- and 4-pole cables.

Only use a 5-pole cable with the "Auxiliary capacity" / "Auxiliary frequency" and "mA-input" functions.

Electrical interface for pin 1 "Pause" - pin 2 "External contact" - pin 5 "Auxiliary capacity / Auxiliary frequency"



P_BE_0014_SW

Fig. 14: Pump assignment

Data	Value	Unit
Voltage with open contacts	5	V
Input resistance	10	kΩ
Max. pulse frequency	25	pulse/s
Min. pulse duration	20	ms

Control via:

- potential-free contact (load: 0.5 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Electrical interface for pin 3 "mA input" (with identity code characteristic "Control version": 2 and 3)¹

Data	Value	Unit
Input apparent ohmic resistance, approx.	120	Ω

¹ The metering pump makes its first metering stroke at approx. 0.4 mA (4.4 mA) and reaches maximum frequency at approx. 19.6 mA.

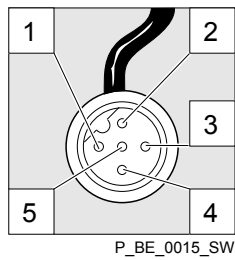


Fig. 15: Cable assignment

Pin	Function	5-wire cable	2-wire cable
1	Pause	brown	bridged at pin 4
2	External contact	white	brown
3	mA input*	blue	-
4	Earth / GND	black	white
5	Auxiliary capacity / Auxiliary frequency	grey	-

* with identity code characteristic "Control version": 3



Refer to the functional description for the hierarchy of functions and operating modes.

"Pause" function

The pump does not work if:

- the cable is connected and pin 1 and pin 4 are open.

The pump works if:

- the cable is connected and pin 1 and pin 4 are connected.
- no cable is connected.

"External contact" operating mode

The pump performs one or more strokes if:

- Pin 2 and pin 4 are connected to each other for at least 20 ms. At the same time, pin 1 and pin 4 must also be connected to each other.

"Analogue" operating mode

The pump capacity and/or stroke rate can be controlled by a current signal. The current signal is connected between pin 3 and pin 4.

In addition, pin 1 and pin 4 must also be connected.

"Auxiliary capacity" / "Auxiliary frequency" operating mode

The pump works at a pre-set capacity / stroke rate if:

- Pin 5 and pin 4 are connected to each other. At the same time, pin 1 and pin 4 must also be connected to each other. The auxiliary capacity / auxiliary frequency is factory-preset to maximum capacity / stroke rate.

9.2.2 "Level switch" terminal

There is a connecting option for a 2-stage level switch with pre-warning and limit stop.

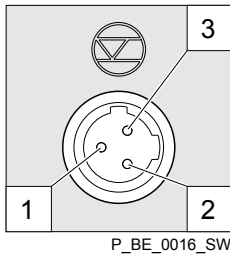


Fig. 16: Pump assignment

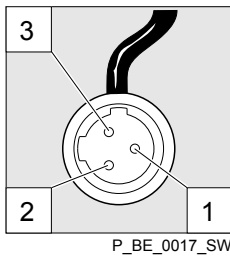


Fig. 17: Cable assignment

9.2.3 "Dosing monitor" terminal

There is a connection option for a dosing monitor.

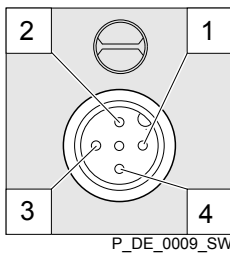


Fig. 18: Pump assignment

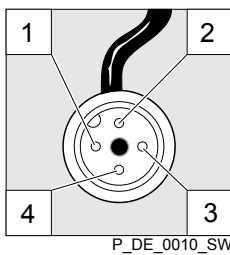


Fig. 19: Cable assignment

9.2.4 "Diaphragm rupture indicator" terminal

There is an option to connect a diaphragm rupture indicator.

Electrical interface

Data	Value	Unit
Voltage with open contacts	5	V
Input resistance	10	kΩ

Control via:

- potential-free contact (load: 0.5 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Pin	Function	3-wire cable
1	Earth / GND	black
2	Minimum pre-warning	blue
3	Minimum limit stop	brown

Electrical interface

Data	Value	Unit
Voltage with open contacts	5	V
Input resistance	10	kΩ

Control via:

- potential-free contact (load: 0.5 mA at 5 V) or

Pin	Function	4-wire cable
1	Power supply (5 V)	brown
2	Coding	white
3	Feedback	blue
4	Earth / GND	black

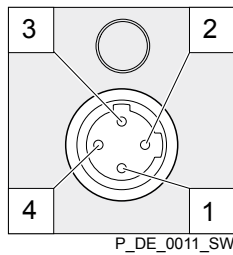


Fig. 20: Pump assignment

Electrical interface

Specification	Value
Supply voltage, approx.:	+5 V, loadable with 20 mA (current limit 150 mA)
Power consumption:	min. 10 mA, max. 20 mA (sensor presence detection)
Sensor signal:	potential-free contact (load: 0.5 mA at +5 V) or Semiconductor switch (residual voltage < 0.3 V)

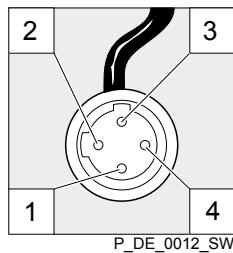


Fig. 21: Cable assignment

Pin	Function	4-wire cable
1	Power supply (5 V)	brown
2	not assigned	white
3	Sensor signal	blue
4	Earth / GND	black

9.2.5 Relay

9.2.5.1 Relay functions

gamma/ X GMXa

Identity code	Description	Type	Maximum voltage	Maximum current	Behaviour of relay type when retrofitting, as standard
0	no relay	-	-	-	-
1	Fault indicating relay	NC changeover contact	230 V	8 A	X
4	fault indicating relay + Pacing relay	N/O	24 V	100 mA	X
		N/O	24 V	100 mA	X
C	fault indicating relay + 4-20 mA output	N/O	24 V	100 mA	X

Relay type switches in the event of...

Relay type*	Level Warning	Level low	Dosing monitor Error	Calibrated stroke length Error	Processor Error
Fault indicating relay:	X	X	X	X	X
Warning relay:	X	-	-	X	-

* Can be reprogrammed in the 'Relay' menu.

9.2.5.2 "Fault indicating relay" output (identity code 1)

A fault indicating relay can be ordered as an option - refer to ordering information in the appendix. It is used to emit a signal when there is a fault with the pump and for the "Liquid level low, 1st stage" warning message and "Liquid level low, 2nd stage" fault message.

The fault indicating relay can be retrofitted and is operational once attached to the relay board - refer to "Retrofitting Relays" supplementary operating instructions.

The behaviour is factory-programmed. If another switching function is required, the pump can be reprogrammed in the 'Relay' menu.

The relay can be retrofitted and operates once it is plugged into the relay board.

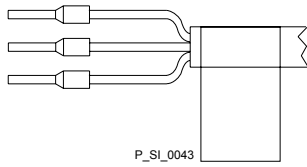


Fig. 22: Cable assignment

Electrical interface

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

Identity code 1

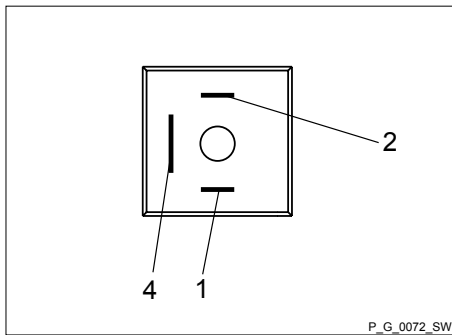


Fig. 23: Pump assignment

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

9.2.5.3 Output for Other Relays (Identity code 4)

A fault indicating and a pacing relay can optionally be ordered - refer to ordering information in the appendix. The pacing output is electrically-isolated by means of an optocoupler with a semiconductor switch. The second switch is a relay (also electrically isolated).

The behaviour is factory-programmed. If another switching function is required, the pump can be reprogrammed in the 'Relay' menu.

The fault indicating/pacing relay can be retrofitted and is operational once attached to the relay board - refer to "Retrofitting Relays" supplementary operating instructions.

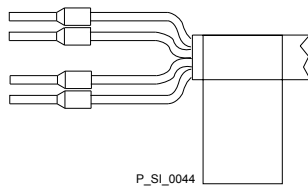


Fig. 24: Cable assignment

Electrical interface

for fault indicating relay output:

Data	Value	Unit
Maximum contact load at 24 V and 50/60 Hz:	2	A
Minimum mechanical lifespan:	20,000,000	switching operations

for semiconductor switch pacing relay:

Data	Value	Unit
Max. residual voltage at $I_{off\ max} = 1\ \mu A$	0.4	V
Maximum current	100	mA
Maximum voltage	24	VDC
Pacing pulse duration, approx.	100	ms

Identity code 4

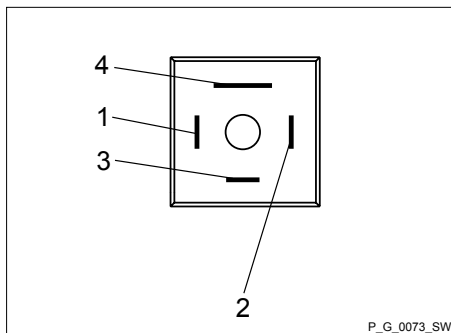


Fig. 25: Pump assignment

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

9.2.5.4 Output "Current output plus relay" (identity code C)

A relay combined with a current output can optionally be ordered. The relay either switches off the pump as a fault indicating relay in the event of a fault on the pump and with "Liquid level low 1st stage" warning message and "Liquid level low 2nd stage" fault messages or is used as a pacing relay.

The behaviour is factory-programmed. If another switching function is required, the pump can be reprogrammed in the 'Relay' menu.

In the 'ANALOG OUTPUT' menu, the variable to be signalled by the current output can be selected.

The current output plus relay can be retrofitted and operates once it is plugged into the board.

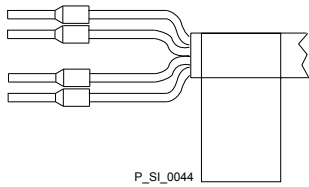


Fig. 26: Cable assignment

Electrical interface
for current output

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

for semiconductor switch ("relay"):

Data	Value	Unit
Max. residual voltage at $I_{off\ max} = 1\ \mu A$	0.4	V
Maximum current	100	mA
Maximum voltage	24	VDC
Pacing pulse duration, approx.	100	ms

Identity code c

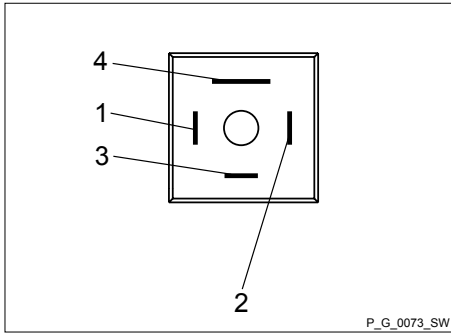


Fig. 27: Pump assignment

To pin	VDE cable	Contact	Relay
1	yellow	"+"	Current output
4	green	"-"	Current output
3	white	NC (normally closed) or NO (normally open)	Relay
2	brown	C (common)	Relay

10 Basic Set-up Principles



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

10.1 Basic Principles for Setting up the Control



Fig. 29 shows using the "Language" example how to set up something - in turn:

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

Fig. 28: Please read

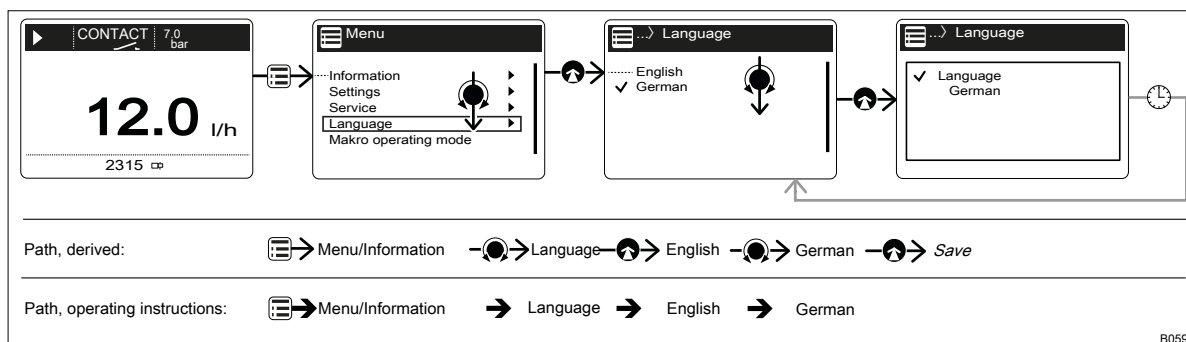



Fig. 29: "Setting up the language": As an example of set-up and path displays


Legend:

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

"Setting up the language" in detail

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

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


Alternatively: wait 15 seconds or exit the 'Menu' via  [Menu] or via 'End'.

Confirming an entry

➔ Briefly press the [Clickwheel].

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

Quitting a menu option without confirming it

➔ Press  [Back].

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

Returning to a continuous display

➔ Press  [Menu].

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

Changing adjustable variables

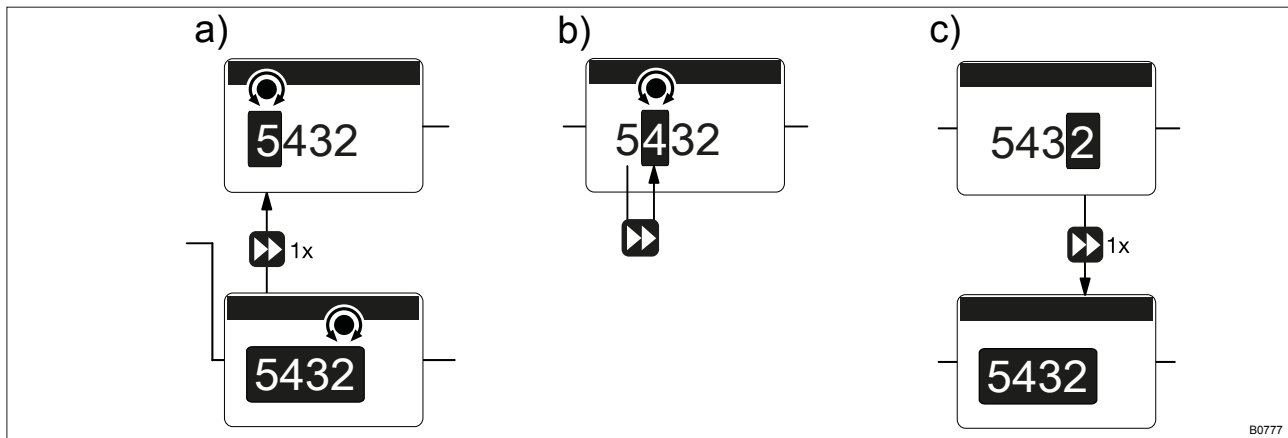



Fig. 30: a) Changing from one figure to its initial figures; b) Changing the figure; c) Returning from the last figure to the (complete) figure (to correct a wrong figure, for example).

Changing a (complete) number

➔ Turn the [Clickwheel].


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


Changing figures

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

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

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

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

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

Confirming adjustable variables

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

10.2 Checking adjustable variables

Continuous displays

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

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



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

Secondary displays

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


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

1. ➔ Press the [Clickwheel] for 3 seconds.

⇒ A frame appears around the secondary display.
2. ➔ Providing there is a frame, you will see a different secondary display each time the [Clickwheel] engages when turned.

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


10.3 Changing to set up mode

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

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

11 Set Up / 'Menu'



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

The 'Menu' is sub-divided as follows:

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

11.1 'Information'

 → 'Menu / Information → ...'

The 'Information' provides information on your pump and certain parameters and counters. The number and type can depend on the pump settings.

11.2 'Settings'

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

The 'Settings' menu generally includes these setting menus:

- 1 - 'Operating mode'
- 2 - 'Automatic'
- 3 - 'Stroke length'
- 4 - 'Metering'
- 5 - 'Concentration'
- 6 - 'Calibration'
- 7 - 'System'
- 8 - 'Inputs/outputs'
- 9 - 'Bleed valve'
- 10 - 'Priming time'
- 11 - 'Time'
- 12 - 'Date'

11.2.1 'Operating Mode'

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


11.2.1.1 'Manual'

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

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

The capacity and/or stroke rate and stroke length can be set in the continuous displays in this operating mode.

11.2.1.2 'Contact'

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

'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 into strokes with a step-down (fractions) or small step-up.

**CAUTION!**

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




The maximum stroke rate can be set in 'Contact' operating mode. It should normally be set to 12,000 strokes/hour.

Memory - Pulses not yet processed

You can also activate the 'Memory' function extension ("memory" identifier). When 'Memory' is activated, the pump adds up the remaining strokes, which could not be processed, up to the maximum capacity of the stroke memory of 4,200,000,000 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.

**CAUTION!**

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

Factor

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

Number of strokes executed = factor x number of incoming pulses

Table of examples

	Factor	Pulse (sequence)	Number of strokes (sequence)
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)
Step-down**			
	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 the conversion ratio**

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

**** Explanation of step-down**

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




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

Contact water meter

Using "Pulse Control" you can ideally adapt the pump to the relevant process, for example in conjunction with contact water meters.

11.2.1.3 'Batch'

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

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

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

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




The stroke rate can be set in 'Batch' operating mode. It should normally be set to 12,000 strokes/hour.

Memory - remaining strokes not yet processed

You can also activate the 'Memory' function extension ("memory" identifier). When 'Memory' is activated, the pump adds up the remaining strokes, which could not be processed, up to the maximum capacity of the stroke memory of 4,200,000,000 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.


**CAUTION!**

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



In operation, the batch size can be changed more easily by using the "Batch size" continuous display.

11.2.1.4 'Analogue' (Option)

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

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

You can select 5 types of current signal processing:

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

'0 - 20 mA'

At 0 mA the pump is stationary –

At 20 mA the pump works at maximum stroke rate.

'4 - 20 mA'

At 4 mA the pump is stationary –

At 20 mA the pump works at maximum stroke rate.

With current signals of less than 3.8 mA, an error message appears and the pump stops (e.g. if a cable has broken).

'Linear curve'

The symbol "Linear curve" appears on the LCD screen. You can enter any pump stroke rate behaviour 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, F2 is the stroke rate at which the pump is to operate at current I2...); this defines a straight line and thus the behaviour is specified:

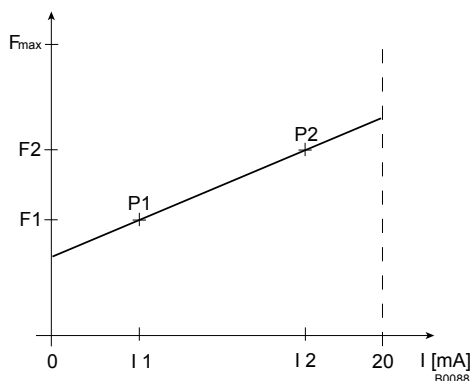


Fig. 31: Frequency-current diagram for "Linear curve"



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



The smallest processable difference between I1 and I2 is 4 mA ($\|I1 - I2\| \geq 4 \text{ mA}$).

Error processing

In the 'Error message' menu item, you can activate an error process for these types of processing.

'Lower side band'

Using this type of processing, you can control a metering pump using the current signal as shown in the diagram below.

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

Error processing

In the 'Error message' menu item, you can activate an error process for these types of processing.

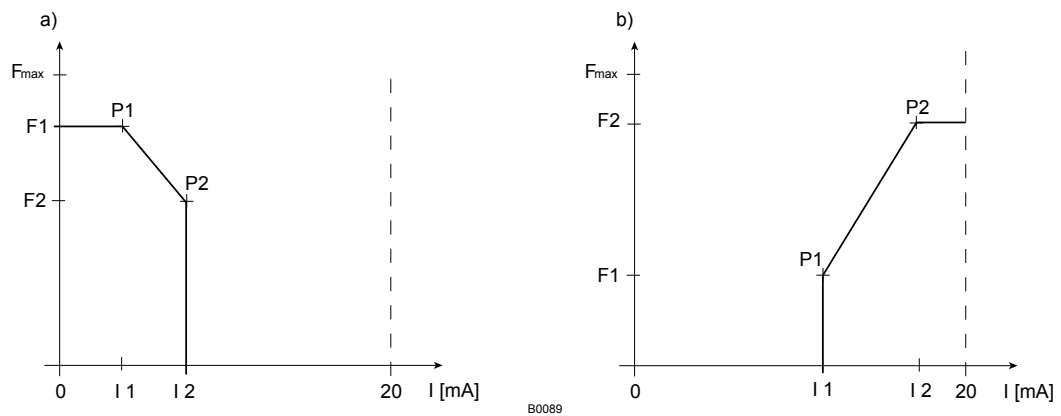


Fig. 32: Frequency-current diagram for a) Lower side band, b) Upper side band

'Upper side band'

Using this processing type, you can control a metering pump using the current signal as shown in the diagram above.

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

11.2.2 'Automatic'

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

In the 'Automatic' menu, you can set whether the unit is to meter automatically or conventionally.

With 'Automatic' - 'on', you set direct values, such as capacity, metering volume or dosing time, instead of stroke length and stroke rate. Other selection points then appear in the operating menu - refer to the chapter "Operating Menu for gamma/ X, complete" (in the appendix) for the selection points highlighted with a "*"1".

In 'Automatic' - 'on' metering mode, the gamma/ X specifies the stroke length and the stroke rate according to the conditions determined in order to meter the set capacity.



'Automatic' - 'on' and 'Automatic' - 'off' metering modes are completely independent of each other. That is to say that 'Automatic' - 'off' metering mode does not carry over settings from 'Automatic' - 'on'.

11.2.3 'Stroke length'

☰ → 'Menu / Information → Settings → Stroke length → ...'

The menu does not appear with 'Automatic' 'on'!

In the 'Stroke length' menu, you can enter the stroke length manually.



In operation, the stroke length can be changed more easily by using the "Stroke length" continuous display:

- Turn the [Clickwheel] to return to the "Stroke length" continuous display.
- Press the [Clickwheel] and then turn it to set the stroke length.
- Press the [Clickwheel] to save the stroke length.

11.2.4 Metering

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

11.2.4.1 'Discharge Stroke'

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

In the 'Settings' - 'Discharge stroke' sub-menu, you can precisely match the pump metering flow over time against the requirements of the particular application.

This ensures that the user can set the optimum **discharge stroke** for his application, as required:

Pos.*	Discharge stroke	Application
A.	'optimum'	For maximum accuracy when metering and the very best results with internal pressure measurement and special functions.
B.	'fast'	For as fast a discharge stroke as possible - the duration of the discharge stroke is dependent on the stroke rate.
C.	'Sine mode'	For a long, sine-shaped discharge stroke - the duration of the discharge stroke is dependent on the stroke rate.
D.	'continuous'	For a continuous discharge stroke e.g. for bottling processes. The duration of the discharge stroke is dependent on the stroke rate.
E.	'DFMa'	For optimum operation with a flow meter DulcoFlow® DFMa.

* see following drawing.

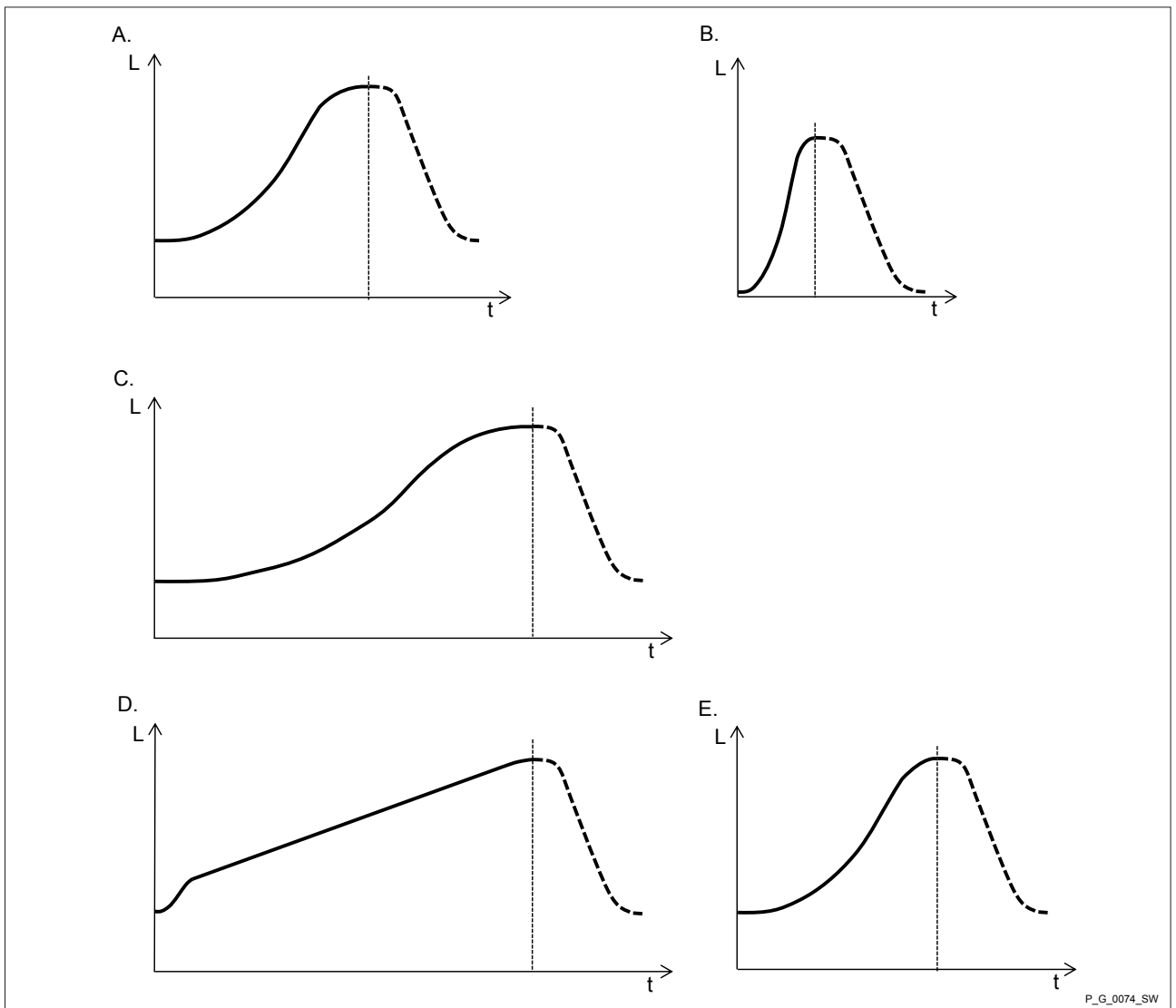


Fig. 33: Discharge stroke metering profiles with stroke L and time t (suction stroke shown as a dotted line)

11.2.4.2 'Suction Stroke'

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

It is possible to selectively also slow the **suction stroke** with all these metering profiles for the discharge stroke - see . In this way, it is possible to prevent the main cause of inaccurate metering with high viscosity feed chemicals, namely the incomplete filling of the liquid end. With gaseous feed chemicals, the slow suction stroke prevents cavitation and consequently increases dosing precision.

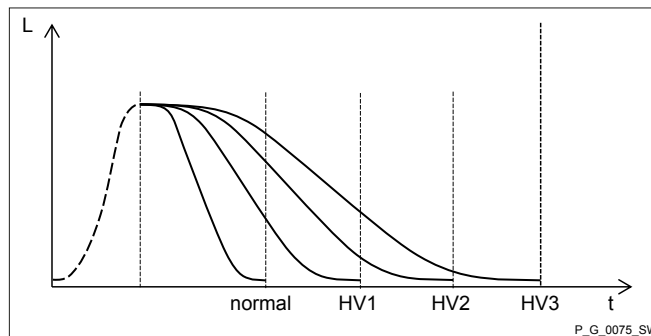


Fig. 34: Suction stroke metering profiles with stroke L and time t

- Normal Normal suction stroke
- HV1 Suction stroke for viscous feed chemical
- HV2 Suction stroke for average viscosity feed chemical
- HV3 Suction stroke for high-viscosity feed chemical

i – Slowing down the suction stroke leads to a lower stroke rate and thus to a lower capacity.

'Suction stroke' setting	Maximum stroke rate Strokes/min
Normal	200
HV1	160
HV2	120
HV3	80

11.2.4.3 'Pressure Stage'

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

You can use the programmable function 'Pressure stage' to reduce the nominal pressure of the pump, thereby minimising the risk of lines rupturing.

The switch-off pressure of the permanently active overpressure monitoring falls at the same time as the pressure stage - see .

Nominal pressures depending on the size of the liquid ends and the pressure stages

Pressure stage /	4	7	10	16	20	25
Size of liquid end						
1602	X	X	X	X	-	-
2002	X	X	X	-	X	-
1604	X	X	X	X	-	-
2504	X	X	X	-	-	X

Pressure stage /	4	7	10	16	20	25
Size of liquid end						
1009	X	X	X	-	-	-
0708	X	X	-	-	-	-
0715	X	X	-	-	-	-
0414	X	-	-	-	-	-
0424	X	-	-	-	-	-

Pressure stage	Switch-off pressure*
2	2.8
4	5.2
7	8.5
10	12.5
16	19
20	23
25	28


* above which the unit is switched off for the medium-term in the event of excess pressure

11.2.4.4 'Monitoring'

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

11.2.4.4.1 'Air lock'

 → 'Menu / Information → Settings → Metering → Monitoring → Air lock → ...'

Should a message and the  "Air lock" symbol appear, this may mean that there is gas in the liquid end (if 'Warning' or 'Error' was set in the 'Air lock' sub-menu).

11.2.4.5 Compensation

Using the 'Compensation' programmable function, you can minimise the influence of back pressure oscillations and thus achieve a high dosing precision.






With difficult hydraulic conditions, it can be better to switch off the 'Compensation' function.

11.2.5 Concentration

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

The desired mass concentration of feed chemical that will subsequently be required in the dissolving medium (e.g. the main flow) can be entered directly in the "Concentration" continuous display.


The principle of entering the concentration:

1.  Select the operating mode.
2.  Set the data for the feed chemical and dissolving medium in the 'Set up'- 'Concentration' menu.
3.  Set the desired concentration in the "Concentration" continuous display.



- The "Concentration" continuous display only appears, if:
 - the pump is calibrated.
 - the 'Concentration' menu was run through in the operating mode used.
 - and 'Concentration control' was switched to 'active' - in the operating mode being used.
- The "Concentration" continuous display switches to the display mode "%" at concentrations above 999.99 ppm.
- When changing between operating modes, the pump saves the settings for each operating mode - providing it is connected to supply voltage.
- If the pump is to display the concentration as a volume concentration, enter "1.00" kg/l for the density of the feed chemical.

11.2.5.1 'Manual' operating mode (settings for the 'Concentration' function)

 → 'Menu / Information → Settings → Concentration → Concentration control → Flow of main medium → ...'

The "Concentration input" in 'Manual' operating mode is intended for metering a substance into pipework containing a medium flowing at a constant rate ('main flow') in such a way that it has a specific mass concentration in the flow.



CAUTION!

Danger of too high concentrations

The metering pump can continue to meter if the flow falls or stops entirely.

- Take system-based precautions to prevent the metering pump from continuing to meter in these circumstances.

The prerequisites are that:

- the flowing medium has the same density as water (1 kg/l $\hat{=}$ g/cm³)
- the mass concentration of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: 35 %)

- the density of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: 1.26 kg/l $\hat{=}$ g/cm³)
- The measurement unit for the liquid volume is set in the 'System' → 'Volume unit' menu.

Procedure



CAUTION!

The precision of the concentration is strongly dependent on:

- the precision of the metering pump calibration.
- the precision of the inputs.

1. → Calibrate the metering pump if it is not yet calibrated - see chapter 'Settings' - 'Calibration' chapter.
2. → Check whether the metering pump is set to 'Automatic' - 'on' metering mode.
3. → Select 'Manual' - 'Operating mode' (possible settings from other operating modes remain saved.).
4. → Select 'Concentration' in the 'Set up' menu.
5. → Actively set 'active' in the 'Concentration control' menu item and press the [Clickwheel].
6. → Set the 'Main medium flow' (in the pipework) and then press the [Clickwheel].
7. → Set the 'Feed chemical mass concentration' and press the [Clickwheel].
8. → Set the (mass) 'Feed chemical density' and press the [Clickwheel].
⇒ The 'Concentration' menu appears.
9. → Press [Menu] [☰].
⇒ A continuous display appears.
10. → Press the [Clickwheel] to go to the "Concentration" continuous display (ppm or %).
11. → Enter the required mass concentration of the feed chemical in the main flow by pressing and turning the [Clickwheel].

Possible values of adjustable variables

Adjustable variable	Lower value	Upper value	Increment
Flow in m ³ /h	0000.1	9999.9	0000.1
Mass concentration in %	000.01	100.00	000.01
Mass density in kg/l	0.50	2.00	0.01

11.2.5.2 'Contact' operating mode (settings on the 'Concentration' function)

[☰] → 'Menu / Information' → Settings → Concentration
→ Concentration control → Contact gap → ...'

The "Concentration input" in 'CONTACT' operating mode is intended for metering a substance into pipework containing a medium flowing at a variable rate in such a way that it has a specific mass concentration in the flow.



CAUTION!

Danger of too high concentrations

The metering pump can continue to meter if the flow falls or stops entirely.

- Take system-based precautions to prevent the metering pump from continuing to meter in these circumstances.

The prerequisites are that:

- the flowing medium has the same density as water ($1 \text{ kg/l} \hat{=} \text{g/cm}^3$)
- the mass concentration of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: 35 %)
- the density of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: $1.26 \text{ kg/l} \hat{=} \text{g/cm}^3$)
- a contact water meter is hydraulically installed and connected to the external input of the metering pump.
- The measurement unit for the liquid volume is set in the 'System → Volume unit' menu.

Procedure



CAUTION!

The precision of the concentration is strongly dependent on:

- the precision of the metering pump calibration.
- the precision of the inputs.

1. ▶ Calibrate the metering pump if it is not yet calibrated - see chapter 'Settings' - 'Calibration' chapter.
2. ▶ Check whether the metering pump is set to 'Automatic' - 'on' metering mode.
3. ▶ Select 'Contact' - 'Operating mode' and simply confirm the associated menu items with the [Clickwheel] (possible settings from other operating modes remain saved.)
4. ▶ Select 'Concentration' in the 'Set up' menu.
5. ▶ Actively set 'active' in the 'Concentration control' menu item and press the [Clickwheel].
6. ▶ Set the 'Contact gap' and press the [Clickwheel].
7. ▶ Set the (mass) 'Feed chemical concentration' and press the [Clickwheel].
8. ▶ Set the (mass) 'Feed chemical density' and press the [Clickwheel].
⇒ The 'Concentration' menu appears.
9. ▶ Press [Menu] (☰).
⇒ A continuous display appears.
10. ▶ Press the [Clickwheel] to go to the "Concentration" continuous display (ppm or %).

11. You can enter the desired mass concentration using the [Clickwheel].

Possible values of adjustable variables

Adjustable variable	Lower value	Upper value	Increment
Contact gap in l/contact	000.10	999.99	000.01
Mass concentration in %	000.01	100.00	000.01
Mass density in kg/l	0.50	2.00	0.01

11.2.5.3 'Batch' operating mode (settings for the 'Concentration' function)

☰ → 'Menu / Information' → Settings → Concentration
 → Concentration control → Volume of main medium → ...'

The "Concentration input" in 'Batch' operating mode, is intended for metering a substance into the medium in a storage tank so that it then has a defined mass concentration in the storage tank (when batching a solution – do not forget to stir!).

The prerequisites are that:

- the medium in the storage tank has the same mass density as water (1 kg/l $\hat{=}$ g/cm³)
- the mass concentration of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: 35 %)
- the density of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: 1.26 kg/l $\hat{=}$ g/cm³)
- The measurement unit for the liquid volume is set in the 'System → Volume unit' menu.

Procedure




CAUTION!

The precision of the concentration is strongly dependent on:

- the precision of the metering pump calibration.
- the precision of the inputs.

1. Calibrate the metering pump if it is not yet calibrated - see 'Set up' - 'Calibration' chapter.
2. Check whether the metering pump is set to 'Automatic' - 'on' metering mode.
3. Select 'Batch' - 'Operating mode' and simply confirm the associated menu items with the [Clickwheel] (possible settings from other operating modes remain saved.)
4. Select 'Concentration' in the 'Set up' menu.
5. Actively set 'active' in the 'Concentration control' menu item and press the [Clickwheel].
6. Set the 'Main medium volume' of the medium in the storage tank and press the [Clickwheel].
7. Set the (mass) 'Feed chemical concentration' and press the [Clickwheel].
8. Set the (mass) 'Feed chemical density' and press the [Clickwheel].
 ⇨ The 'Concentration' menu appears.

9. ▶ Press [Menu] .
 - ⇒ A continuous display appears.
10. ▶ Press the [Clickwheel] to go to the "Concentration" continuous display (ppm or %).
11. ▶ You can enter the desired mass concentration using the [Clickwheel].

Possible values of adjustable variables

Adjustable variable	Lower value	Upper value	Increment
Volume in l	0000.1	9999.9	0000.1
Mass concentration in %	000.01	100.00	000.01
Mass density in kg/l	0.50	2.00	0.01

11.2.5.4 'Analogue' operating mode (settings on the 'Concentration' function)

 → 'Menu / Information' → Settings → Concentration
 → Concentration control → Max. flow of main medium → ...'

The "Concentration input" in 'Analogue' operating mode is intended for metering a substance into pipework containing a medium flowing at a variable rate in such a way that it has a specific mass concentration in the flow.

**CAUTION!****Danger of too high concentrations**

The metering pump can continue to meter if the flow falls or stops.

- Take system-based precautions to prevent the metering pump from continuing to meter in these circumstances.

**CAUTION!****Risk of incorrect concentrations**

- After adjusting, check whether the concentration at various flows corresponds to the required result.

The prerequisites are that:


- the flowing medium has the same density as water ($1 \text{ kg/l} \hat{=} \text{g/cm}^3$)
- the mass concentration of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: 35 %)
- the density of the feed chemical is known - see the feed chemical safety data sheet (e.g. with 35% sulphuric acid: $1.26 \text{ kg/l} \hat{=} \text{g/cm}^3$)
- a flow meter with analogue output is hydraulically installed and connected to the external input of the metering pump.
- The measurement unit for the liquid volume is set in the 'System' → 'Volume unit' menu.

Procedure

**CAUTION!**

The precision of the concentration is strongly dependent on:

- the precision of the metering pump calibration.
- the precision of the inputs.

1. ➤ Calibrate the metering pump if it is not yet calibrated - see chapter 'Settings'- 'Calibration' chapter.
2. ➤ Check whether the metering pump is set to 'Automatic' - 'on' metering mode.
3. ➤ Select 'Analogue' operating mode and confirm with the [Clickwheel].
4. ➤ Set '0...20 mA' or '4...20 mA' in the 'Select analogue' menu item and press the [Clickwheel].
5. ➤ Select 'Concentration' in the 'Set up' menu.
6. ➤ Actively set 'active' in the 'Concentration control' menu item and press the [Clickwheel].
7. ➤ Set the 'Max. main medium flow' (in the pipework) and press the [Clickwheel]. (It is then assigned to the current value of 20 mA).
8. ➤ Set the (mass) 'Feed chemical concentration' and press the [Clickwheel].
9. ➤ Set the (mass) 'Feed chemical density' and press the [Clickwheel].
⇒ The 'Concentration' menu appears.
10. ➤ Press [Menu] .
⇒ A continuous display appears.
11. ➤ Press the [Clickwheel] to go to the "Concentration" continuous display (ppm or %).

12. ➔ You can enter the desired mass concentration using the [Clickwheel].



CAUTION!

- Note the decimal point.
- The mass concentration is affected by changes in the stroke rate and the stroke length.
- The pump limits the upper value of the mass concentration, because otherwise the incremental jumps when adjusting would be unacceptably large. Adjust the stroke length as necessary - do not set it under 30%.



The least significant figures of the value in the continuous display cannot be changed at will using the [Arrow keys], rather only in incremental jumps resulting from the input data.

As necessary, change the stroke length and adjust the concentration; in doing so the pump compensates via the stroke rate.

Possible values of adjustable variables

Adjustable variable	Lower value	Upper value	Increment
Max. flow in m ³ /h	0000.1	9999.9	0000.1
Mass concentration in %	000.01	100.00	000.01
Mass density in kg/l	0.50	2.00	0.01

11.2.6 Calibrate

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



Accuracy of calibration 1

Normally the pump does not have to be calibrated.

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



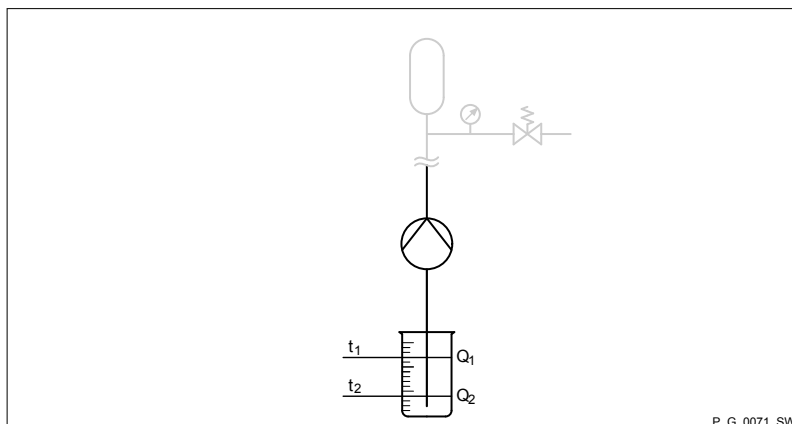
Accuracy of calibration 2

Calibration will not be accurate if these conditions are not adhered to:

- do not allow the stroke length to fall below 30%.
- The pump should perform a minimum of 200 strokes for calibration.

**WARNING!**

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

**Preparation**

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

Calibration process

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

11.2.7 System

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

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

- 1 - 'Dosing head'
- 2 - 'Volume unit'
- 3 - 'Pressure unit'

11.2.7.1 'Dosing head'

☰ → 'Menu / Information → Settings → System → Dosing head → ...'



CAUTION!

- Should a different liquid end size be fitted, then the pump must be reprogrammed in the 'Dosing head' sub-menu.
- Reprogram the pump to 'No dosing head' for demonstration purposes or if operating without feed chemical.



If 'SEK' has been selected as the type of head, the pressure is not displayed and the 'Automatic' menu is hidden. Only 'fast' can be selected for the 'Discharge stroke' and 'normal' for the 'Suction stroke'.

11.2.7.2 Volume unit

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

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

11.2.7.3 Pressure unit

☰ → 'Menu / Information → Settings → System → Pressure unit → ...'

In the 'Pressure unit' sub-menu, you can select another unit for the pressure.


11.2.8 Inputs/Outputs

☰ → 'Menu / Information → Settings → Inputs/Outputs → ...'

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

- 1 - 'Auxiliary Capacity' / 'Auxiliary Frequency'
- 2 - 'Relay1' (optional)
- 3 - 'Relay2' (optional)
- 4 - 'mA output' (optional)
- 5 - 'Diaphragm rupture' (only if connected)
- 6 - 'Flow control' (only if connected)
- 7 - 'Pause input' (Option)
- 8 - 'Level warning'
- 9 - 'Level error'

11.2.8.1 'Auxiliary Capacity' / 'Auxiliary Frequency'

 → 'Menu / Information' → Settings → Inputs/Outputs
→ Auxiliary capacity / Auxiliary frequency → ...'

The programmable function 'Auxiliary capacity' / 'Auxiliary frequency' permits the switch-over to an additional capacity / stroke rate that can be fixed in the 'Auxiliary capacity' / 'Auxiliary frequency' menu.

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

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

11.2.8.2 'Relay1 (Optional)'

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



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

gamma/ X, GMXa

Relay, physical and pre-set to ...

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

Relay type

You can reprogram the relays to these types:

Menu setting	Effect
Inactive	The relay is inactive.
Error	The relay switches in the event of a fault message (red LED*).
Warning	The relay switches in the event of a warning message (yellow LED*).
Warning + error	The relay switches in the event of a warning message (yellow LED*) or a fault message (red LED*).
Pump active	The relay switches as soon as the pump is in standby and not in a state like 'Pause'.
Metering / Batch	The relay changes its state as soon as a batch has been processed.
Stroke rate**	The relay switches at every stroke.
Option	The relay has the option of the module plugged in (e.g. the bleed module).
Bleed	The relay switches upon the internal signal 'Air lock'.

* see the "Troubleshooting" chapter

** only use 'Relay 2' for this relay type (semiconductor relay).

Relay polarity

You can set here how a relay is to switch.

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

11.2.8.3 'Relay2 (Optional)'

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

Relay cycle quantity

Here you can set the metering volume for which the pacing relay is to switch once.

For more information on 'Relay2' - see [Chapter 11.2.8 'Inputs/Outputs' on page 62.](#)


11.2.8.4 'mA Output (Optional)'

☰ → 'Menu / Information → Settings → Inputs/outputs → mA output → ...'


Here you can set which current range is to be used at the mA output.

You can then set whether the current stroke rate (strokes / hour) is to be signalled at the mA output or the capacity (litres / hour) and the corresponding value for 20 mA.

11.2.8.5 'Diaphragm Rupture'


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



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

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

11.2.8.6 'Flow Control'

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



The setting options for the 'Flow control' function only exists if a flow control has been electrically installed. The symbol for flow control appears: .

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

The pump switches to fault mode if this feedback is missing in a sequence, as set under 'Error tolerance'.

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

It is possible to set whether the function is to be deactivated with auxiliary frequency under 'if Auxiliary'.

11.2.8.7 'Pause Input'

 → 'Settings → Inputs/outputs → Pause → ...'

In the 'Pause' menu you can select whether the pump switches to 'Pause' with a "normally-open (NO)" or "normally-closed (NC)" input contact signal.

11.2.8.8 'Level Warning'

 → 'Settings → Inputs/outputs → Level warning → ...'


In the 'Level warning' menu, you can select whether the pump switches to 'Level warning' with a "normally-open (NO)" or "normally-closed (NC)" input contact signal.

11.2.8.9 'Level Error'

 → 'Settings → Inputs/outputs → Level error → ...'

In the 'Level error' menu, you can select whether the pump switches to 'Level error' with a "normally-open (NO)" or "normally-closed (NC)" input contact signal.

11.2.9 Bleed

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

The 'Bleed' function is used for controlled bleeding of the liquid end.

The software solution is always in the pump control. The pump presses the gas bubbles out of the liquid end at maximum stroke rate during bleeding.

If the pump has "Automatic bleed" via the "relay identity code option (retro-fittable), the pump can be bled via a bleed relay.

There are 2 hardware options for automatically bleeding the discharge side:


- via ProMinent's bleed module in the liquid end.
- via a customer implemented bleed facility in the discharge line.

The 'Bleed' function can be triggered in 4 ways:

- 1 - Not ('Off').
- 2 - 'Periodically' by an internal signal - defined by 'Cycle' and 'Duration'.
- 3 - By the 'Air lock' internal signal
- 4 - If one of the two signals occurs ('Both').

Detailed explanation:

- 1 - If 'Off' has been selected in the menu, this function is deactivated.
- 2 - If 'Periodically' was selected in the menu, then the control unit periodically triggers the bleed procedure with an adjustable 'cycle' (10 ... 1440 min = 24 h) and an adjustable 'duration' (5 ... 300 s = 5 min).

Bleeding is always triggered at the start of a period. A bleed process is also started by the  [STOP/START] key or by connecting the pump to mains voltage.







- 3 - If 'Air lock' has been selected in the menu, the 'Air lock' internal signal triggers the bleed procedure.



If the signal appears again within 8 minutes of the bleed procedure being carried out, the control unit repeats the bleed procedure up to a maximum of 3 times. However if the signal still appears, then an error message is generated, which has to be acknowledged via the [dial].


In the event of an 'Air lock' the option of a direct error or warning message disappears for the 'Air lock' signal. The corresponding menu branch in the 'Settings' menu is also hidden. The signal is only available for the 'Bleed' function.

- 4 - If 'Both' has been selected in the menu, then each trigger can trigger a bleed process.

Sequence of the bleed procedure (automatic):


1.  The pump control stops the normal metering operation - the  "Stop Pause" symbol appears on the LCD screen.
2.  Only with bleed relay: After 1 s, the pump control opens the bleed valve on the liquid end (via the bleed relay and the solenoid valve).
3.  1 s later, the pump starts to run at its maximum possible stroke rate (as during priming) - the  "Air lock" symbol appears on the LCD screen instead of the "Stop Pause" symbol.
4.  The pump operates in this way for the total set time.


5. → Once the set time has elapsed, the pump stops – the "Stop Pause"  symbol appears on the LCD screen again.
6. → Only with bleed relay: After 1 s the pump control closes the liquid end bleed valve.
7. → After 1 s the  "Stop Pause" symbol disappears and the pump recommences normal operation.

If the pump was in the "Stop" state at the time of triggering ( [STOP/START], Pause, Error), the start of the bleed procedure is delayed - until this state has been cleared.

If the pump switched to "Stop" state during the bleed procedure, the pump control jumps immediately to phases 5 and 6 - see above. This definitely cancels the bleed procedure. As soon as the "Stop" state is cleared, the bleed procedure starts from the beginning.


11.2.10 'Priming Time'

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


In the 'Priming time' menu, you can select how long the metering pump is to prime once  [Priming] has been pressed.




In operation, the stroke length can be changed more easily using the "Priming time" display:

- Press  [Priming] - the pump starts to prime.
- Turn the [Clickwheel] to set the priming time.
- Press the [Clickwheel] to save the priming time.

11.2.11 'Time'

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


In the 'Time' menu you can set the time.

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

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


You can also input when the pump is to change to and from 'Summer time'.

11.2.12 'Date'


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

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

11.3 Timer

 → 'Menu / Information → Timer → ...'

11.3.1 Timer Activation

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

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

11.3.2 Setting the Timer

 → 'Menu / Information → Timer → Setting the timer → ...'



A program set up in "Automatic" - "on" metering mode will not function in "Automatic" - "off" metering mode and vice versa.

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

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

You can then use the administration functions to manage the commands - [Chapter 11.3.2 'Setting the Timer' on page 68](#).

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

Create the command as follows:

- 1 - Create a command (program line)
- 2 - Select the triggering event and time
- 3 - Selecting the Action and Value
- 4 - Check the command
- 5 - Create the next command if necessary

11.3.2.1 Administration Functions for Commands

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

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

Use 'New' to create a new command.

11.3.2.2 'Init' Initial Conditions

Use 'Init' to specify initial conditions at the start of the program - see [Chapter 11.3.2.4 'Selecting the action and value' on page 69](#).

11.3.2.3 Selecting the 'Time Event' and Time

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

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

**CAUTION!**

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

11.3.2.4 Selecting the action and value

You can select an action and also a value:

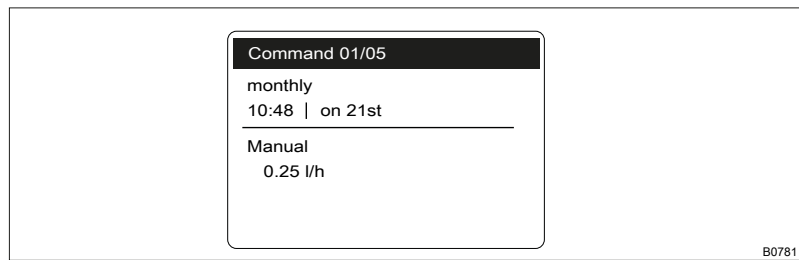
Action	Value
Manual	Litre/h *1
	Strokes/h *2
	Stroke length * 2
Stop	--
Frequency	Litre/h *1
	Strokes/h *2
Relay 1	open
	closed
Relay 2	open
	closed

*1: only available in 'Automatic' operating mode - see Chapter 'Settings' - 'Automatic'

*2: only available, if metering is done the traditional/conventional way.

11.3.2.5 Checking the Finished Command

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



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11.3.3 Clear All

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

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

11.3.4 Example

Example of "Weekday metering"

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

Command	Time event	Time of day	Action	Capacity	Comment
01	workdays 1 (Mo-Fr)	08:30	Manual	12,000 l/h	//Meter with 12,000 l/h//
02	workdays 1 (Mo-Fr)	08:40	Stop		//Stop//
03	workdays 1 (Mo-Fr)	09:30	Manual	12,000 l/h	//Meter with 12,000 l/h//
04	workdays 1 (Mo-Fr)	09:40	Stop		//Stop//
05	workdays 1 (Mo-Fr)	10:30	Manual	12,000 l/h	//Meter with 12,000 l/h//
06	workdays 1 (Mo-Fr)	10:40	Stop		//Stop//

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

11.4 'Service'

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

11.4.1 'Access Protect.'

☰ → 'Menu / Information → Service → Access protect. → ...'

You can lock parts of the setting options here.

The following locking options are available:

Selection	Point ①	Point ②
'none'	-	-
'Lock menu'	X	-
'Lock all'	X	X

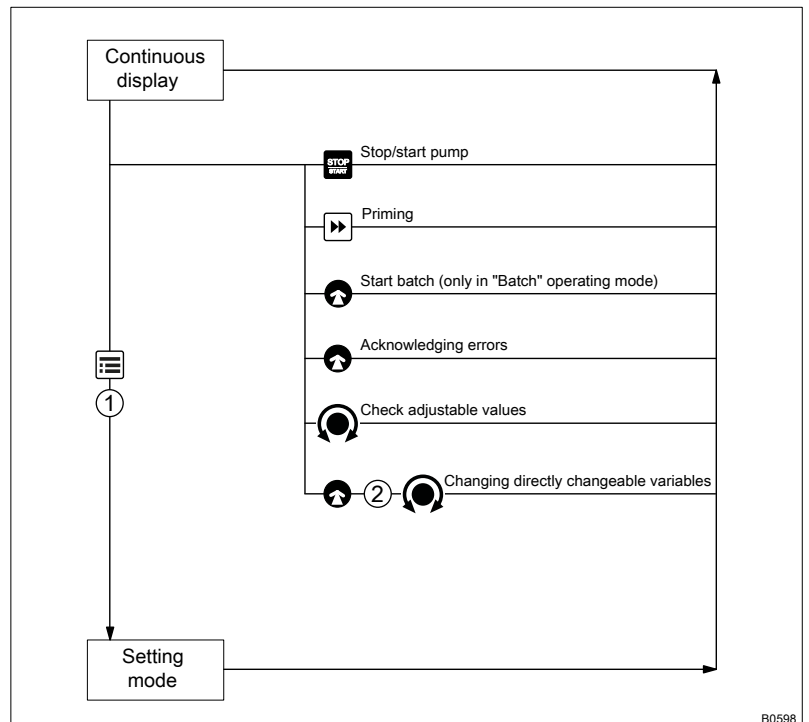




Fig. 35

If you have set a 'Password' - see below, then the identifier  will appear after 1 minute in the top left and the specified areas will be locked, if no key has been pressed in the meantime.


Both locks use the same 'Password'.

11.4.2 'Password'

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

You can enter a password of your choice in the 'Change password' menu.

11.4.3 'Clear Counter'

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

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

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

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

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

11.4.4 'Diaphragm Replacement'

☰ → 'Menu / Information → Service → Diaphragm replacement → ...'

You can move the slide rod into the "replacement position" here with 'To replacement position' to enable the diaphragm to be replaced more easily.

11.4.5 'Display'

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

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

11.4.6 'Reset to Factory Settings'

☰ → 'Menu / Information → Service → Reset to factory settings → ...'

You can reset the pump to its factory settings here with 'Yes'

11.5 'Language'

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

In the 'Language' menu, you can select the desired operating language.

12 Operation



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.

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



- Please also refer to the "Operating/Setting Overview" and "Continuous Displays and Secondary Displays" overviews at the end of the operating instructions and also the "Overview of Equipment and Control Elements" chapter.

12.1 Manual operation

Stop/start pump

Stop the pump: Press  [STOP/START].

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

Priming

Press  [Priming].

Turn the [Clickwheel] to extend or shorten the priming time during priming.

Starting a batch

In 'Batch' operating mode: Press the [Clickwheel] in the 'Push' continuous display.

Acknowledging errors

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


Checking adjustable variables

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

Changing directly changeable variables

Changing a variable in the relevant continuous display:

- Press the [Clickwheel].
⇒ The variable can be changed (highlighted).
- Turn the [Clickwheel].
⇒ The variable is changed.
- Press the [Clickwheel].
⇒ The variable is saved (the highlighting disappears).

If the "lock" - "lock all" has been set - see  'Set Up Overview of the gamma/ X' on page 74, first enter the 'Password' after pressing the [Clickwheel].

List of directly changeable variables:

- Capacity
- Stroke rate
- Stroke length
- Factor
- Contact volume
- Batch dosing time
- Concentration

Set Up Overview of the gamma/ X

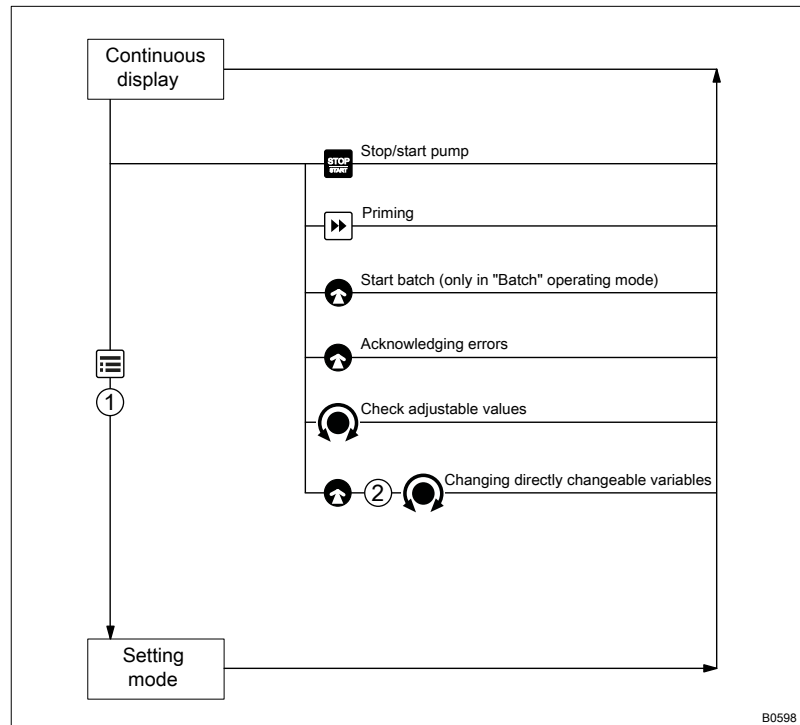


Fig. 36: Control options using keys and locking options

- ⬆️ Press [Clickwheel]
- ⬇️ Turn [Clickwheel]
- ① "Lock menu"
- ② "Lock all"

13 Maintenance



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!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



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.



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

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

Standard liquid ends:

Interval	Maintenance work	Personnel
Quarterly*	<ul style="list-style-type: none"> ■ Check the metering diaphragm for damage** - refer to "Repair". ■ Check that the hydraulic lines are fixed firmly to the liquid end. ■ Check that the suction valve and discharge valve are fitted tightly. ■ Check that the entire liquid end is leak-tight - particularly around the leakage hole - refer to Fig. 37. ■ Check that the flow is correct: Press [Priming] to allow the pump to prime briefly. ■ Check that the electrical connections are intact. ■ Check the integrity of the housing. ■ Check that the dosing head screws are tight. 	Technical personnel

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

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

** Check the diaphragm frequently with feed chemicals that put particular pressure on the diaphragm, e.g. those containing abrasive additives.

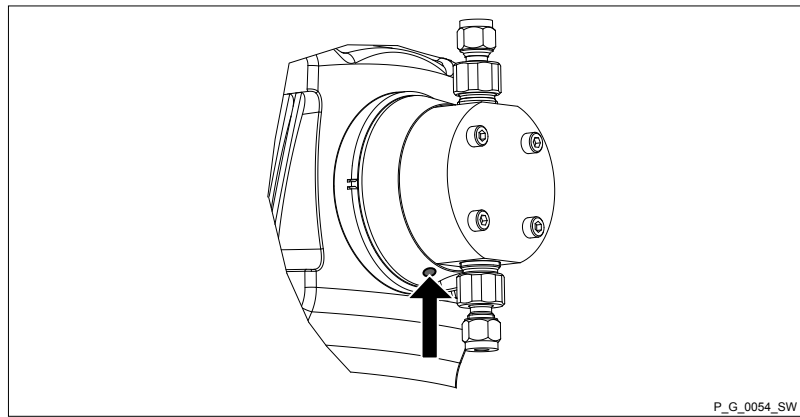


Fig. 37: Leakage hole

Liquid ends with bleed valve:

Interval	Maintenance work
Quarterly*	In addition: <ul style="list-style-type: none"> ■ Check that the bypass line is fixed firmly to the liquid end. ■ Check that the bleed valve is tight. ■ Check the discharge and bypass line for kinks. ■ Check that the bleed valve is operating correctly.

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

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

Tightening torque

Data	Value	Unit
Tightening torque for screws:	4.5 ... 5.0	Nm

14 Repairs

Safety information

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

Unauthorised repairs inside the pump can result in an electric shock.

For this reason, only allow a ProMinent branch or representative to perform repair inside the pump, in particular the following:

- Replacement of damaged mains connection lines
- Replacement of fuses
- Replacement of electronic control

**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!****Contact with the feed chemical**

Parts that come into contact with the feed chemical are exposed and touched during repair work.

- Protect yourself against the feed chemical in case it is hazardous. Read the safety data sheet on the feed chemical.

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

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.


14.1 Cleaning Valves



Warning of faulty operation

Refer to the exploded drawings in the appendix when working on the unit.

14.2 Replacing the Diaphragm

- If necessary take protective measures.
 - Adhere to the material safety data sheet for the feed chemical.
 - Prevent the escape of feed chemical.
 - Ensure that the system is at atmospheric pressure.
1. ➤ Empty the liquid end (turn the liquid end upside down and allow the feed chemical to run out; flush out with a suitable medium; flush the liquid end thoroughly when using hazardous feed chemicals!)
 2. ➤ Set up  ➤ 'Service ➤ Diaphragm replacement ➤ To replacement position'
⇒ The pump moves the diaphragm away from the backplate.



Now leave the pump connected to the mains/ power supply so that this state is maintained.

3. ➤ Unscrew the hydraulic connectors on the discharge and suction side.
4. ➤ With types with coarse/fine bleed valve: Firstly remove the coarse/ fine bleed valve (grip), then lift off the cover of the liquid end with a screw driver.

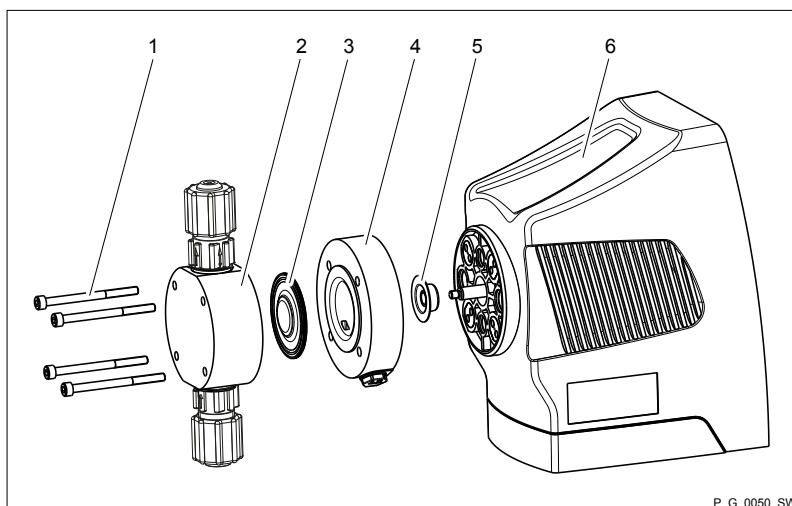


Fig. 38: Partially exploded view of liquid end

- 1 Screws
- 2 Dosing head
- 3 Diaphragm
- 4 Backplate
- 5 Safety diaphragm
- 6 Pump housing

5. ➤ Remove the screws (1).
6. ➤ Remove the dosing head (2) plus screws (1) from the pump - see figure
7. ➤ Loosen the diaphragm (3) from the drive axle with a gentle backwards turn in an anticlockwise direction.
8. ➤ Unscrew the diaphragm (3) completely from the drive axle.
9. ➤ Remove the backplate (4) from the pump housing (6).
10. ➤ Check the condition of the safety diaphragm (5) and replace if necessary.
11. ➤ Push the safety diaphragm (5) onto the drive axle only until it lies flush with the pump housing (6) and no further!

- 12. ▶ Tentatively screw the new diaphragm (3) onto the drive axle up to the stop - ensure that this is successful, otherwise the pump will subsequently not meter correctly!
- 13. ▶ Unscrew the diaphragm (3) again.
- 14. ▶ Place the backplate (4) on the pump housing (6).



CAUTION!


- Make sure that the leakage hole points downwards when the pump is subsequently fitted - see figure in the "Maintenance" chapter!
- Place the backplate (4) immediately into the correct position on the pump housing (6)! Do not twist the backplate on the pump housing to prevent the safety diaphragm (5) becoming warped!

- 15. ▶ Place the diaphragm (3) into the backplate (4).



CAUTION!

- Do not over-tighten the diaphragm (3) in the following step!
- Ensure that the backplate (4) remains in its position so that the safety diaphragm does not become warped!

- 16. ▶ Hold the backplate (4) firmly and screw the diaphragm (3) in a clockwise direction until it is sitting tightly.
- 17. ▶ Place the dosing head (2) with the screws (1) onto the diaphragm (3) and the backplate (4) - ensure that the suction connector points downwards when the pump is in its subsequent fitting position.
- 18. ▶ Set up  → 'Service → Diaphragm replacement → Back'
⇒ The pump moves the diaphragm back to the backplate.
- 19. ▶ Gently tighten the screws (1) and then tighten them diagonally. See below for the tightening torque.
- 20. ▶ With types with coarse/fine bleed valve: Allow the cover of the liquid end to rest in the dosing head, then press the grip of the bleed valve into the coarse/fine bleed valve.



Check the tightening torque of the screws after 24 hours of operation!

Tightening torque

Data	Value	Unit
Tightening torque for screws:	4.5 ... 5.0	Nm

14.3 Cleaning the Diaphragm Rupture Indicator



WARNING!

Warning of unnoticed escaping of feed chemical

After the diaphragm rupture indicator has been triggered, any residue of feed chemical residues can interfere with it.

- After the diaphragm rupture indicator has been triggered, clean and test it.

1. ➤ First replace the liquid end diaphragm - see above!
2. ➤ Unscrew the diaphragm rupture indicator using an SW 14 open-ended spanner.
3. ➤ Clean the diaphragm rupture indicator with suitable liquid - if possible using water (polysulphone material).
4. ➤ Test the connected diaphragm rupture indicator: fully immerse the tapered section at the front in water.
 - ⇒ The continuous display indicates a diaphragm rupture.
5. ➤ Thoroughly dry the diaphragm rupture indicator.
 - ⇒ The continuous display no longer indicates a diaphragm rupture.
6. ➤ Screw the clean and dry diaphragm rupture indicator into the hole until hand-tight and liquid-tight - without using tools!

15 Troubleshooting

Safety information



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.



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.

15.1 Faults Without a Fault Message

Faults without a fault message


Fault description	Cause	Remedy	Personnel
Pump does not prime in spite of full stroke motion and bleeding.	Minor crystalline deposits on the ball seat due to the valves drying out.	Take the suction hose out of the storage tank and thoroughly flush out the liquid end.	Technical personnel
	Serious crystalline deposits on the ball seat due to the valves drying out.	Dismantle the valves and clean them - refer to the "Repair" chapter.	Technical personnel
Fluid is escaping from the backplate.	The screws in the dosing head are too loose.	Tighten the screws in the dosing head crosswise - refer to the "Repair" chapter for the tightening torque.	Instructed personnel
	The diaphragm is not leak-tight.	Replace the diaphragm - refer to the "Repair" chapter. If a diaphragm rupture has been indicated, clean the diaphragm rupture indicator - refer to the "Repair" chapter.	Technical personnel
Green LED display (operating indicator) does not light up.	The wrong mains voltage or no mains voltage is connected.	The specified mains voltage as per the voltage specification can be found on the nameplate.	Electrician

15.2 Fault Messages

In the event of a fault:

- The red LED display lights up.
- A message and a symbol then appear on the LCD screen.
- The pump stops.








Fault description	Cause	Remedy	Personnel
The identifier  appears followed by the message 'Level error!'	The fluid level in the storage tank has reached "Liquid level low 2nd stage".	Fill the storage tank.	Technical personnel
The 'Storage tank overflow' message appears.	The stroke memory has overflowed.	Remedy the cause (such as too low a factor, too high a contact frequency ...), then: Press the <i>[Clickwheel]</i> (think of the consequences for the process!).	Technical personnel
The identifier  appears followed by the message 'Input signal < 4 mA'.	The pump is in 'Analogue' operating mode, a fault behaviour has been programmed in the 'Analogue' menu and the control current has fallen below 4 mA.	Clear the cause of the low control current or switch the programming of the fault behaviour to 'off' - see chapter "Set Up"->"Settings"->"Operating mode"->"Analogue".	Technical personnel
The identifier  appears followed by the message 'Input signal > 20 mA'.	The pump is in 'Analogue' operating mode, a fault behaviour has been programmed in the 'Analogue' menu and the control current has risen above 20 mA.	Clear the cause of the high control current or switch the programming of the fault behaviour to 'off' - see chapter "Set Up"->"Settings"->"Operating mode"->"Analogue".	Technical personnel
The identifier  appears followed by the message 'Control signal < Imin'.	The pump is in 'Analogue' operating mode-"xx side band", a fault behaviour has been programmed in the 'Analogue' menu and the control current has fallen below 4 mA.	Clear the cause of the low control current or switch the programming of the fault behaviour to 'off' - see chapter "Set Up"->"Settings"->"Operating mode"->"Analogue".	Technical personnel
The identifier  appears followed by the message 'Control signal > Imax'.	The pump is in 'Analogue' operating mode-"xx side band", a fault behaviour has been programmed in the 'Analogue' menu and the control current has risen above 20 mA.	Clear the cause of the high control current or switch the programming of the fault behaviour to 'off' - see chapter "Set Up"->"Settings"->"Operating mode"->"Analogue".	Technical personnel
The identifier  appears followed by the message 'Defective stroke metering'.	The dosing monitor reported more defective strokes than was set in the 'Inputs/Outputs' menu.	Press the <i>[Clickwheel]</i> . Investigate and clear the cause.	
The identifier  appears followed by the message 'Diaphragm rupture'.	The diaphragm is broken.	Replace the diaphragm and clean the diaphragm rupture indicator, refer to the "Repair" chapter.	Technical personnel
The identifier  appears followed by the message 'Overload'.	The pump has detected too high a back pressure.	Rectify the cause.	Technical personnel
The identifier  "Temperature" appears followed by the message 'Temperature' and the pump remains idle.	The ambient temperature is too high.	Lower the ambient temperature. The pump starts up automatically.	Technical personnel
	The temperature is too high.	Rectify the cause. The pump starts up automatically.	Technical personnel
The identifier  appears followed by the message 'Air in dosing head'.	Gas bubbles in the liquid end (leaks, gaseous medium, cavitation).	Bleed the liquid end and rectify the cause. Seal the system or slow the suction stroke.	Technical personnel

Fault description	Cause	Remedy	Personnel
The identifier  appears followed by the message 'Mains/ power supply / PFC over-voltage'.	The mains voltage is too high or too low or not connected.	Rectify the cause.	Technical personnel

15.3 Warning Messages

In the event of a warning:

- The yellow LED display lights up!
- A message and a symbol then appear on the LCD screen.

Fault description	Cause	Remedy	Personnel
'Level' and the identifier  appear.	The fluid level in the storage tank has reached "Liquid level low 1st stage".	Fill the storage tank.	Instructed personnel
The identifier  appears followed by the message 'Defective stroke metering'.	The dosing monitor reported more defective strokes than was set in the 'Inputs/ Outputs' menu.	Press the [Clickwheel]. Investigate and clear the cause.	
The identifier  appears followed by the message 'Diaphragm rupture'.	The diaphragm is broken.	Replace the diaphragm and clean the diaphragm rupture indicator, refer to the "Repair" chapter.	Technical personnel
The identifier  appears followed by the message 'Overload'.	The pump has detected too high a back pressure.	Rectify the cause.	Technical personnel
The identifier  "Temperature" appears followed by the message 'Temperature'.	The ambient temperature is too high.	Lower the ambient temperature.	Technical personnel
	The temperature is too high.	Rectify the cause.	Technical personnel
The identifier  appears followed by the message 'Air in dosing head'.	Gas bubbles in the liquid end (leaks, gaseous medium, cavitation).	Bleed the liquid end and rectify the cause. Seal the system or slow the suction stroke.	Technical personnel
The identifier  appears followed by the message 'Invalid metering volume'.	The metering volume cannot be metered.	Adapt the metering parameters.	Technical personnel

15.4 All Other Faults

Please contact the responsible ProMinent branch or representative!

16 Decommissioning

Decommissioning



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 in the "Storage, Transport and Unpacking" chapter are read before shipping or transport.
- Thoroughly clean the liquid end and the housing of chemicals and dirt. Adhere to the material 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.



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



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.



Danger of damage to the device

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

1. ➔ Disconnect the pump from the mains power supply.
2. ➔ Drain the liquid end by turning the pump upside down and allowing the feed chemical to run out.

3. → Flush the liquid end with a suitable medium; flush the dosing head thoroughly when using hazardous feed chemicals!

Disposal



CAUTION!

Risk to the environment from the battery

There is a battery in the pump, which can have a toxic effect on the environment.

- Separate the battery from the remaining parts.
- Note the pertinent regulations currently applicable in your country!



CAUTION!

Environmental hazard due to electronic waste

There are electronic components in the pump, which can have a toxic effect on the environment.

- Separate the electronic components from the remaining parts.
- Note the pertinent regulations currently applicable in your country!

17 Technical Data

17.1 Performance Data

gamma/ X operating at 200 strokes/minute
and 100 % stroke length

Type	Minimum pump capacity at maximum back pressure			Connector size outside Ø x inside Ø	Suction lift**	Priming lift****	Max. priming pressure on the suction side
	bar	l/h	ml/stroke				
gamma/ X							
2002	20	2.05	0.17	6x3	6.0	2.5	5.5
1602	16	2.3	0.19	6x4	6.0	2.5	5.5
1604	16	3.6	0.30	6x4	6.0	3.0	3
0708	7	7.6	0.63	8x5	6.0	2.0	2
0414	4	14.0	1.17	8x5	3.0	2.5	1.5
0220	2	19.7	1.64	12x9	2.0	2.0	1
2504	25	3.8	0.32	8x4	6.0	3.0	3
1009	10	9.0	0.75	8x5	6.0	3.0	2
0715	7	14.5	1.21	8x5	4.0	3.0	1.5
0424	4	24.0	2.00	12x9	3.0	3.0	1
0245	2	45.0	3.70	12x9	2.0	2.0	0.8
gamma/ X metering pumps with self-bleeding dosing head SEK*							
1602	16	1.3	0.11	6x4	2.1	1.8	0.5
1604	16	2.4	0.21	8x5	2.7	1.8	0.5
0708	7	6.8	0.57	8x5	2.0	1.8	0.5
0414	4	12.0	1.00	8x5	2.0	1.8	0.5
0220	2	18.0	1.50	12x9	2.0	1.8	0.5
1009	10	8.0	0.67	8x5	3.0	1.8	0.5
0715	7	12.0	1.00	8x5	2.5	1.8	0.5
0424	4	20.0	1.67	12x9	2.5	1.8	0.5



gamma/ X metering pumps with dosing heads for higher-viscosity media (HV) have a 10 ... 20 % lower capacity and are not self-priming. Connection G 3/4-DN 10 with hose nozzle d16-DN10.

- * - The given performance data constitutes guaranteed minimum values, calculated using water as the medium at room temperature. The bypass connection with a self-bleeding dosing head SEK is 6x4 mm.
- ** - Suction lift with a filled suction line and filled liquid end. With self-bleeding dosing head with air in the suction line.
- *** - The connector width is 6 mm on SST material versions.
- **** - Priming lift with clean and moist valves. Priming lift at 100% stroke length and free outlet or opened bleed valve.

All data calculated with water at 20 °C.

17.2 Accuracy

17.2.1 Standard Liquid End

Data	Value	Unit
Capacity range of the series	-5 ... +10	% *
Reproducibility	±2	% **

* - at max. stroke length and max. operating pressure for all material versions

** - at constant conditions and min. 30 % stroke length

17.2.2 Self-Bleeding Liquid End

As the self-bleeding liquid end is used with outgassing media and when operating with air bubbles, no dosing accuracy or reproducibility can be provided.

The recommended minimum stroke length with self-bleeding dosing pumps is 50 %.

17.3 Viscosity

The liquid ends are suitable for the following viscosity ranges:

Design	Range	Unit
Standard	0 ... 200	mPas
With valve springs	200 ... 500	mPas
With HV head	500 ... 3000*	mPas
Self-bleeding (SEK)	0 ... 50	mPas

* Even significantly higher with corrected adjusted installation. Contact Technical; Support in Heidelberg.

17.4 Material specifications

Standard liquid ends

Design	Dosing head	Suction/pressure connector	Ball seat	Seals	Balls
PPE	Polypropylene	Polypropylene	EPDM	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FKM	FKM	Ceramic
PPT	Polypropylene	Polypropylene	PVDF	PTFE	Ceramic
NPE	Clear acrylic	PVC	EPDM	EPDM	Ceramic
NPB	Clear acrylic	PVC	FKM	FKM	Ceramic
NPT	Clear acrylic	PVC	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	Ceramic	PTFE	Ceramic
SST	Stainless steel 1.4404	Stainless steel 1.4404	Ceramic	PTFE	Ceramic

Self-bleeding design only in material versions PP and NP with a valve spring made of Hastelloy C and a PVDF valve insert.

Diaphragm: with PTFE coating.

FKM = fluorine rubber

Pump

Housing parts: polyphenylene ether (PPE with fibreglass)

17.5 Electrical Data

Design: 100 - 230 V \pm 10 %, 50/60 Hz, gamma/ X GMXa

Parameter	M70	M85
Nominal power**, approx.	25 W	30 W
Current I _{eff}	0.24 ... 0.13 A	0.3 ... 0.17 A
Peak current	3.5 ... 1.3 A	3.7 ... 1.5 A
Switch on peak current (for 3 ...5 ms)	20 A	20 A
Fuse*	2.5 AT	2.5 AT

** with relay closed: The nominal power rises by 1 W.

* Fuses must have VDE, UL and CSA certification. e.g. type 19195 manufactured by Wickmann in compliance with IEC Publ. 127 - 2/3

17.6 Temperatures

Pump, fully assembled

Data	Value	Unit
Storage and transport temperature:	-20 ... +50	°C
Ambient temperature in operation (power end/drive and control):	-10 ... +45	°C
Medium temperature:	-10 °C ... see following table	

Liquid end

Material version	Long term	Temporary *
PP	50 °C	100 °C
NP	45 °C	60 °C
PV	50 °C	120 °C
SS	50 °C	120 °C
TT	50 °C	120 °C

* Max. temp., for 15 min at max. 2 bar, depending on the ambient temperature

17.7 Climate

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

* non-condensing

Test: Humid heat, cyclical

in accordance with EN 680068-2-30: 2005

17.8 Degree of Protection and Safety Requirements

Degree of protection

Protection against accidental contact and humidity:

IP 66 according to DIN EN 60529

NEMA 4X/indoor according to NEMA 250

Safety requirements

Degree of protection:

1 - mains power connection with protective earth conductor

17.9 Compatibility

Unlike the gamma/ L product range, compatibility is guaranteed with the following components:

- Control cable Beta® 5-wire for "External" function.
- Control cable gamma/Vario 2-, 4- and 5-wire for the "External" function
- Level switch 2-stage (gamma / Beta® / delta®)
- Dosing line cross-sections for gamma / Beta®
- Standard connector kit for gamma / Beta®
- Wall brackets for gamma / Beta®

- Dosing tanks and fixing plates
- Distance between suction and pressure connector
- Distance between the connectors and the pump fixing holes
- Distance between the pump fixing holes
- Identical use of accessories, such as back pressure valves, multifunctional valves and flushing assembly
- Compatibility of resistance by the equivalence of the material used for the liquid ends

Compatibility to the gamma/ L product range is not guaranteed for the following points:

- External dimensions of the pump
- Distance between the support surface for the mounting foot and the centre of the dosing head
- Dosing monitor

17.10 Shipping Weight

Shipping weight of gamma/ X types - in kg

Material	Types	
	2002, 1602, 1604, 0708, 0414, 0220	2504, 1009, 0715, 0424, 0245
PP, NP, PV, TT	3.6 .. 3.7	4.9 ... 5.2
SS	4.1 ... 5.0	5.5 ... 7.0

17.11 Sound pressure level

Sound pressure level

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

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

18 Exploded Drawings and Ordering Information

18.1 Exploded drawings

Liquid end gamma/ X 1602 - 1604 PP_2

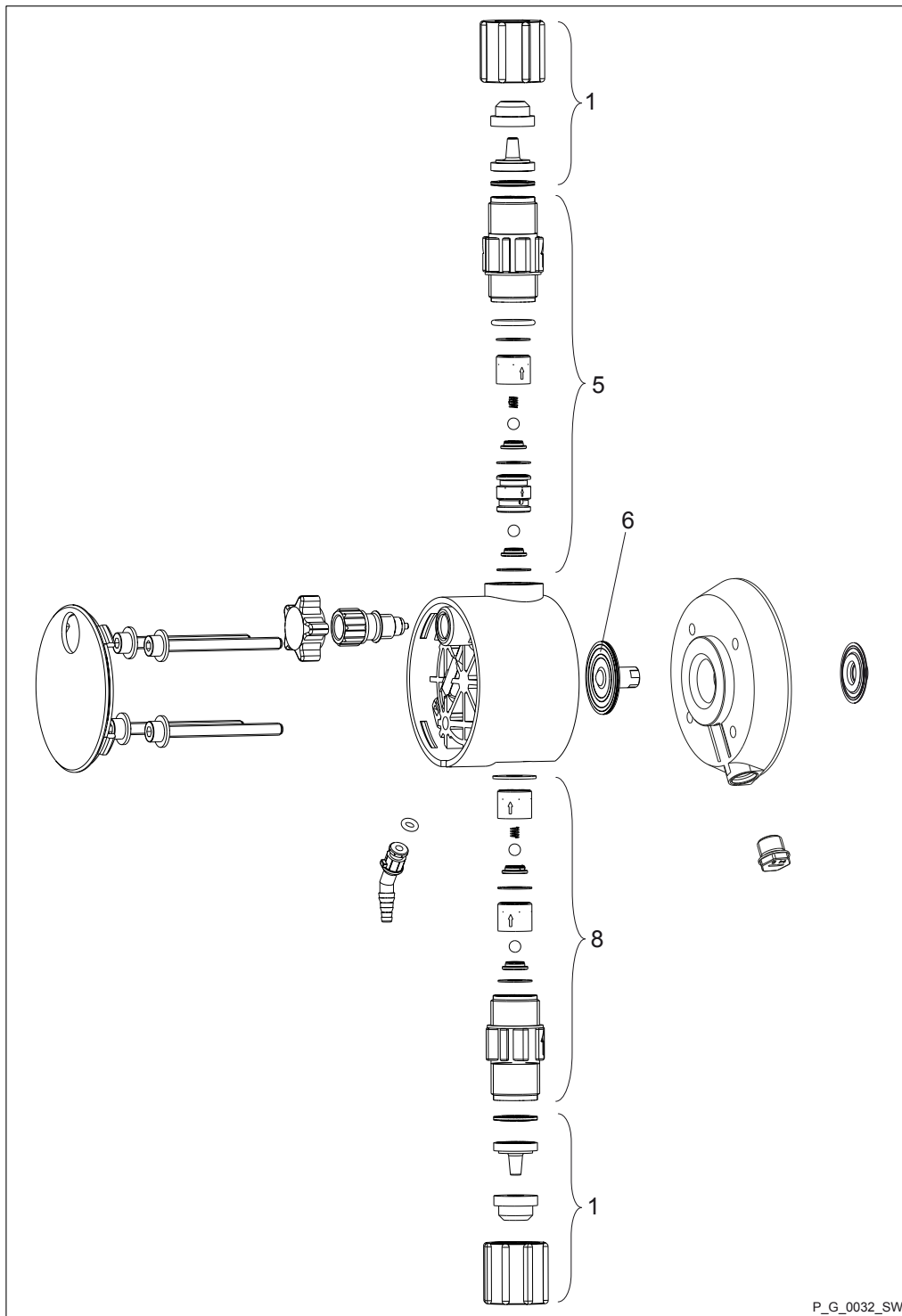


Fig. 39

Spare parts for liquid end gamma/ X 1602 - 1604 PP_2

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

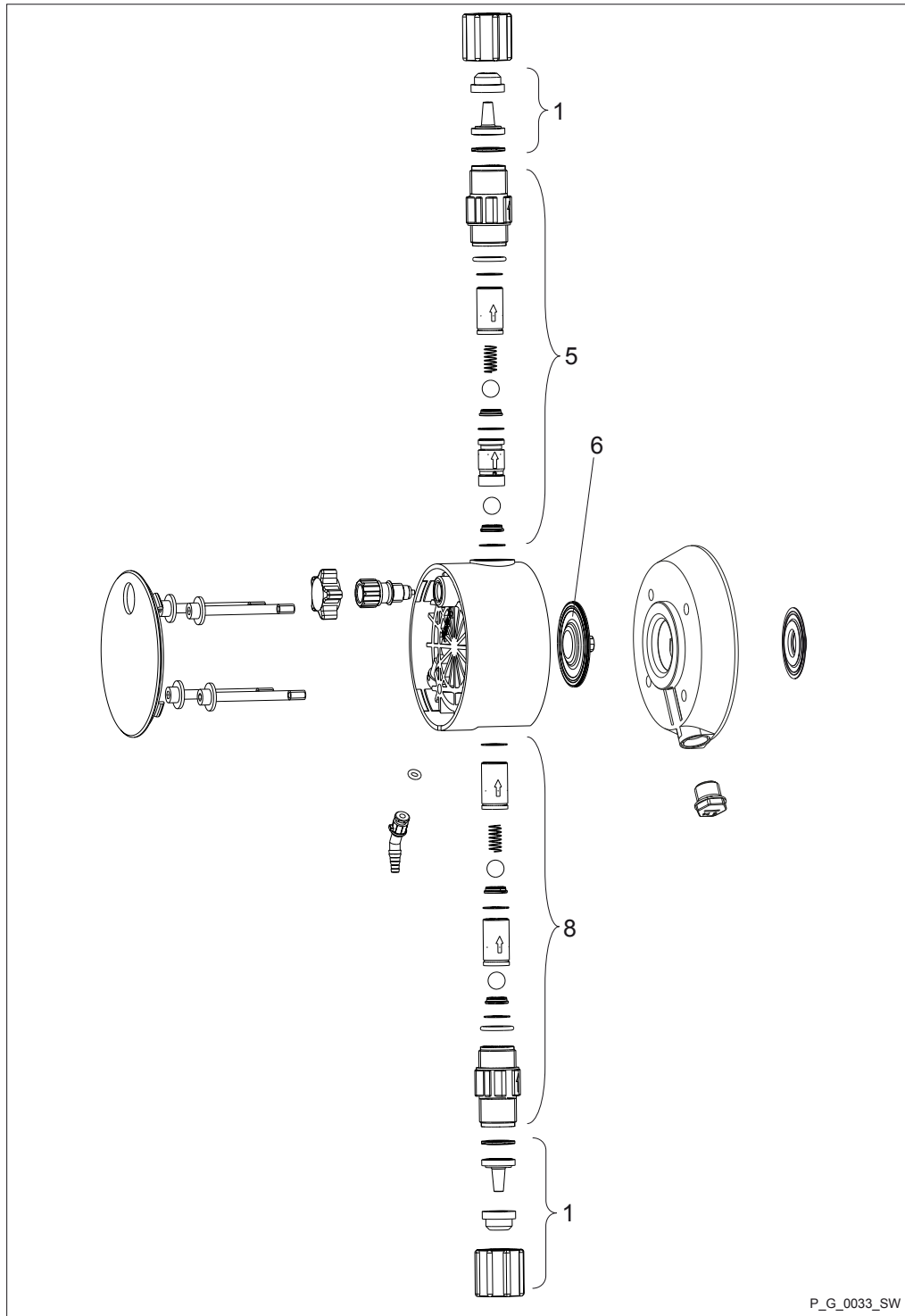
Liquid end gamma/ X 1602 PP_2

	PPE2	PPB2	PPT2
Liquid end	1050931	1050900	1050942
Spare parts kit	1001646	1001654	1023109
Diaphragm	1000246	1000246	1000246

Liquid end gamma/ X 1604 PP_2

	PPE2	PPB2	PPT2
Liquid end	1050932	1050901	1050943
Spare parts kit	1039989	1039987	1035332
Diaphragm	1034612	1034612	1034612

Liquid end gamma/ X 0708 (1009) - 0220
(0424) PP_2



P_G_0033_SW

Fig. 40

Spare parts for liquid end gamma/ X 0708 (1009) - 0220 (0424) PP_2

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 0708 (1009) PP_2

	PPE2	PPB2	PPT2
Liquid end	1050933	1050902	1050944
Spare parts kit	1001648	1001656	1023111
Diaphragm	1000248	1000248	1000248

Liquid end gamma/ X 0414 (0715) PP_2

	PPE2	PPB2	PPT2
Liquid end	1050934	1050903	1050945
Spare parts kit	1001649	1001657	1023112
Diaphragm	1000249	1000249	1000249

Liquid end gamma/ X 0220 (0424) PP_2

	PPE2	PPB2	PPT2
Liquid end	1050935	1050924	1050946
Spare parts kit	1051096	1051085	1051129
Diaphragm	1045456	1045456	1045456

Liquid end gamma/ X 0245 PP without bleed valve

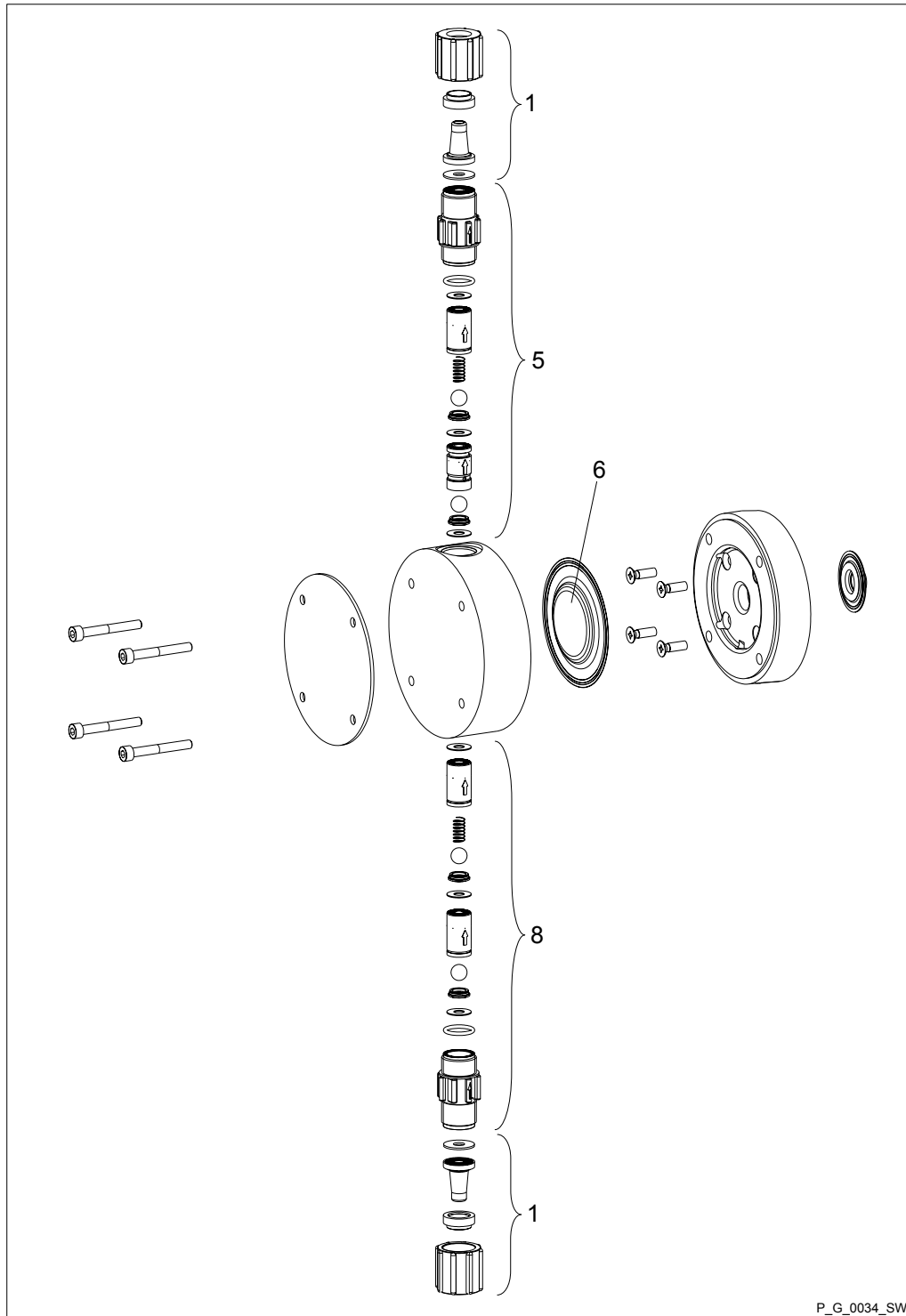


Fig. 41

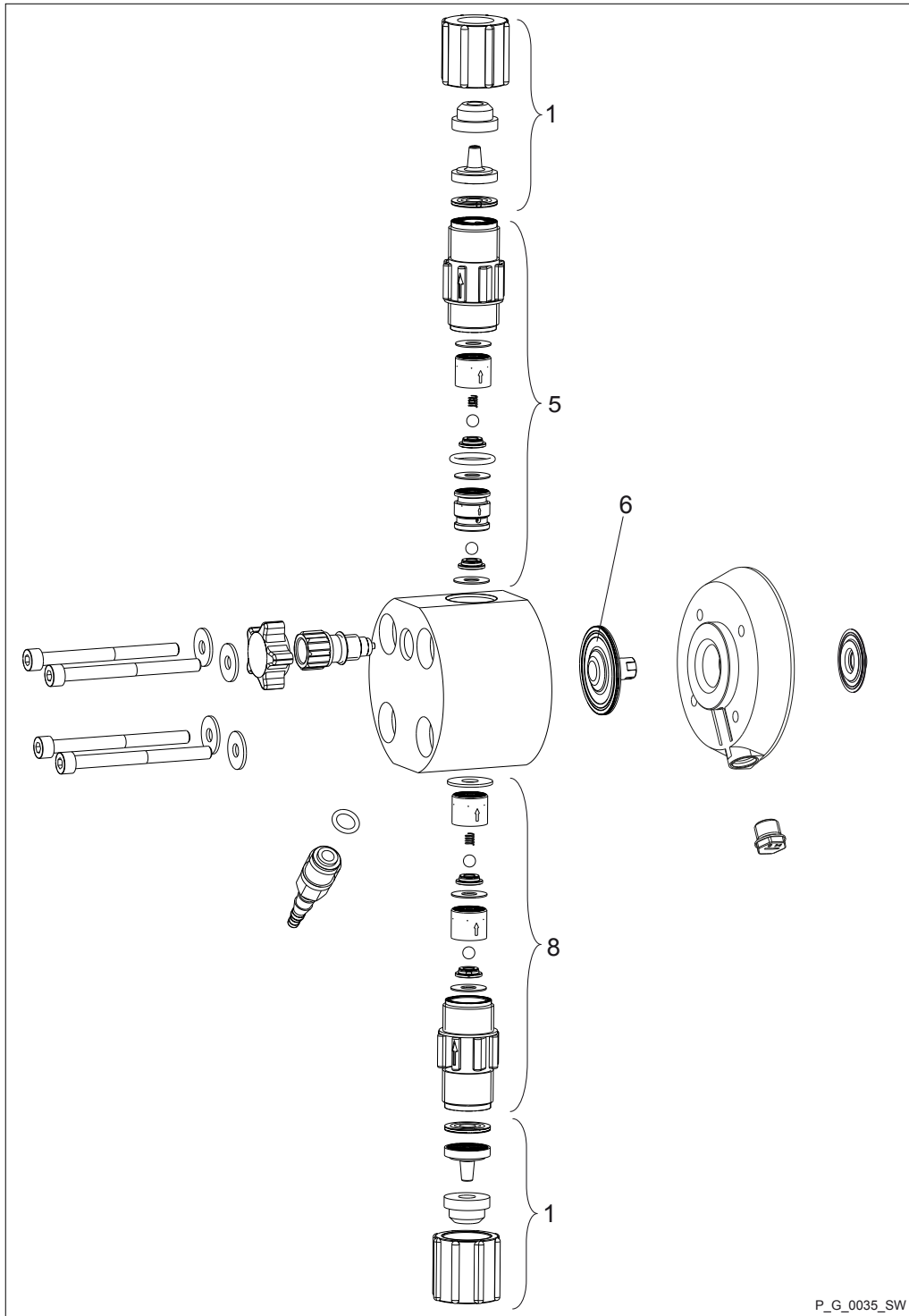
Spare parts for liquid end gamma/ X 0245 PP without bleed valve

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 0245 without bleed valve

	PPE	PPB	PPT
Liquid end	1050936	1050925	1050947
Spare parts kit	1051097	1051086	1051130
Diaphragm	1045443	1045443	1045443

Liquid end gamma/ X 1602 - 2504 NP with and without bleed valve



P_G_0035_SW

Fig. 42

Exploded Drawings and Ordering Information

Spare parts for liquid end gamma/ X 1602 - 2504 NP with and without bleed valve

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 2002 with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1050965	1050948	1050982
Liquid end without bleed valve	1050971	1050954	1050988
Spare parts kit	1001715	1001723	1023109
Diaphragm	1000246	1000246	1000246

Liquid end gamma/ X 1602 with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1051073	1051071	1051087
Liquid end without bleed valve	1051084	1051072	1051088
Spare parts kit	1001715	1001723	1023109
Diaphragm	1000246	1000246	1000246

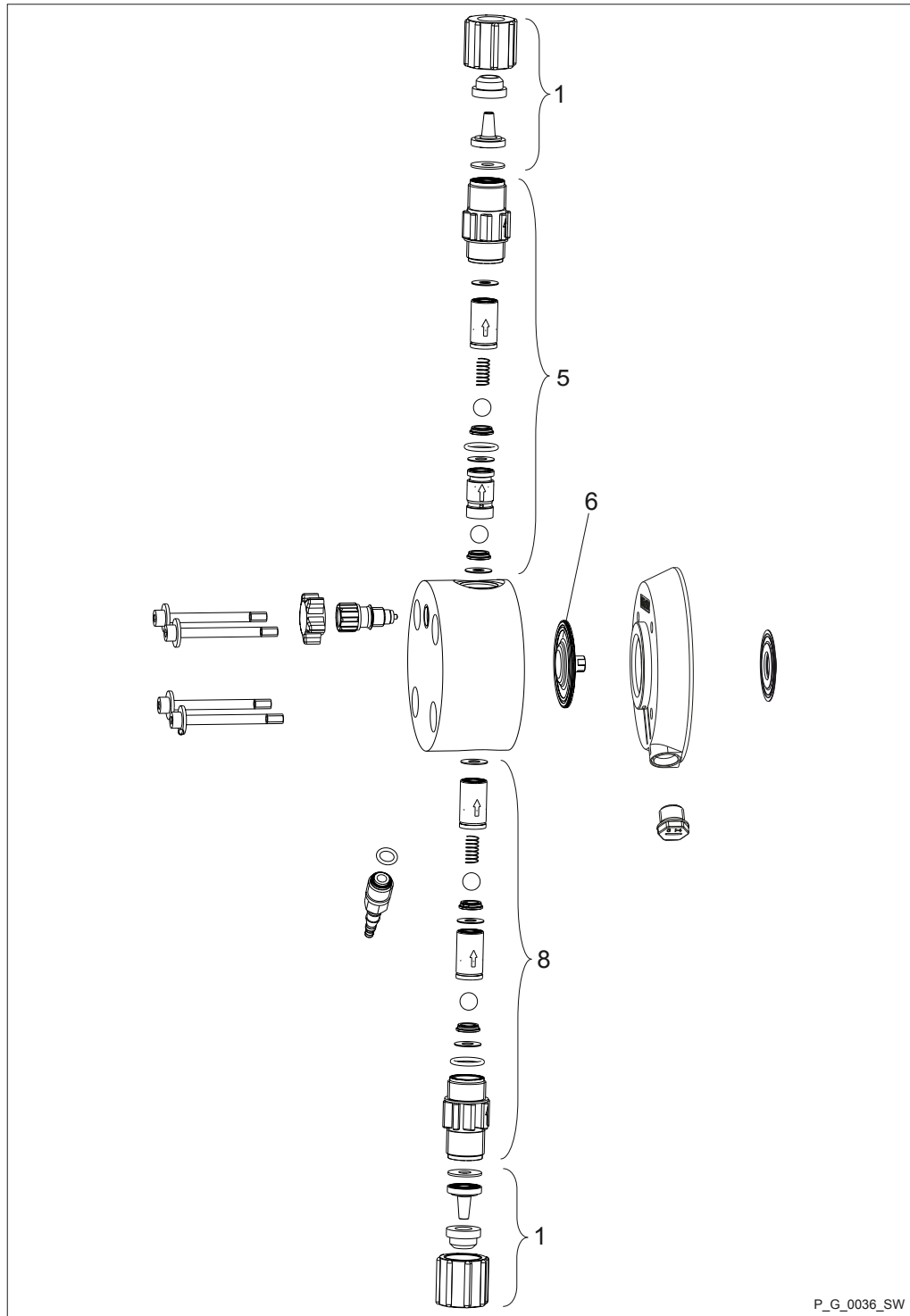
Liquid end gamma/ X 2504 with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1051175	1051163	1051179
Liquid end without bleed valve	1051176	1051174	1051180
Spare parts kit	1039988	1039986	1035332
Diaphragm	1034612	1034612	1034612

Liquid end gamma/ X 1604 with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1050966	1050949	1050983
Liquid end without bleed valve	1050972	1050955	1050989
Spare parts kit	1039988	1039986	1035332
Diaphragm	1034612	1034612	1034612

Liquid end gamma/ X 0708 (1009) - 0220
(0424) NP with and without bleed valve



P_G_0036_SW

Fig. 43

Spare parts for liquid end gamma/ X 0708 (1009) - 0220 (0424) NP with and without bleed valve

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Exploded Drawings and Ordering Information

Liquid end gamma/ X 0708 (1009) with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1050967	1050950	1050984
Liquid end without bleed valve	1050973	1050956	1050990
Spare parts kit	1001717	1001725	1023111
Diaphragm	1000248	1000248	1000248

Liquid end gamma/ X 0414 (0715) with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1050968	1050951	1050985
Liquid end without bleed valve	1050974	1050957	1050991
Spare parts kit	1001718	1001726	1023112
Diaphragm	1000249	1000249	1000249

Liquid end gamma/ X 0220 (0424) with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1050969	1050952	1050986
Liquid end without bleed valve	1050975	1050958	1050992
Spare parts kit	1051118	1051107	1051129
Diaphragm	1045456	1045456	1045456

Liquid end gamma/ X 0245 NP with and without bleed valve

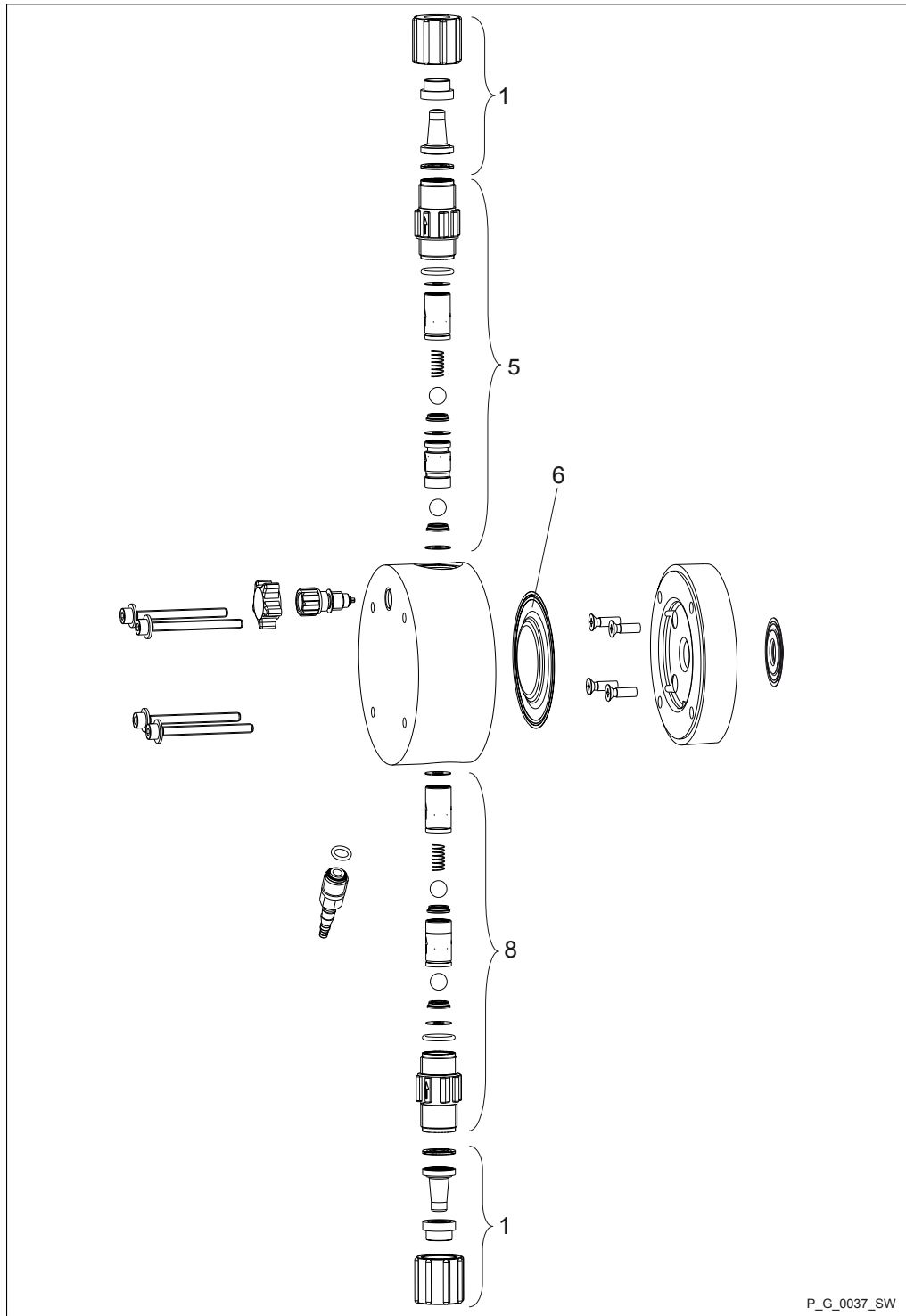


Fig. 44

Spare parts for liquid end gamma/ X 0245 NP with and without bleed valve

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Exploded Drawings and Ordering Information

Liquid end gamma/ X 0245 with and without bleed valve

	NPE	NPB	NPT
Liquid end with bleed valve	1050970	1050953	1050987
Liquid end without bleed valve	1050976	1050959	1050993
Spare parts kit	1051119	1051108	1051130
Diaphragm	1045443	1045443	1045443

Liquid end gamma/ X 1602 -1604 PVT
with bleed valve

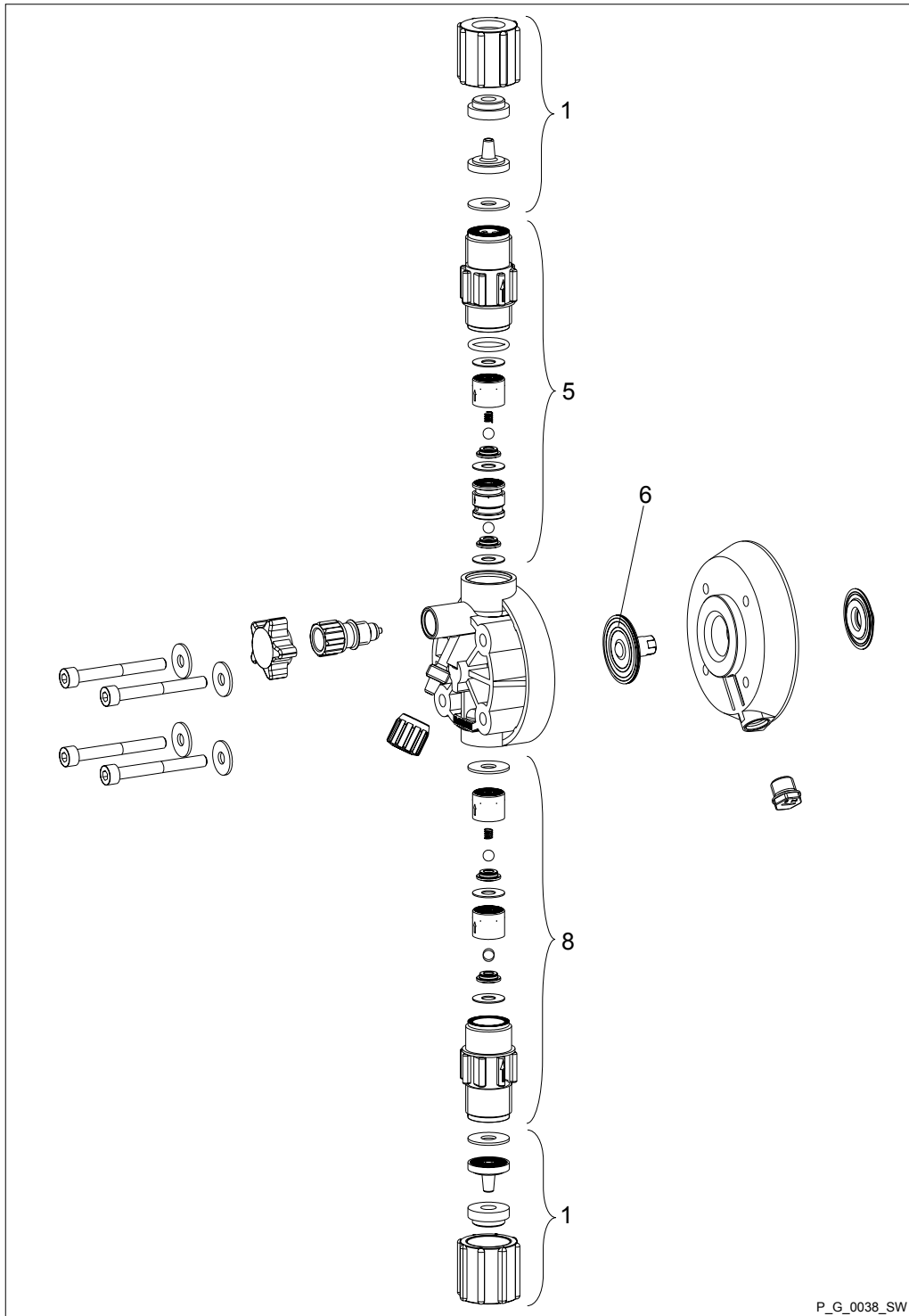


Fig. 45

Spare parts for liquid end gamma/ X 1602 -1604 PVT with bleed valve

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Exploded Drawings and Ordering Information

Liquid end gamma/ X 1602 with bleed valve

	PVT
Liquid end	1050994
Spare parts kit	1023109
Diaphragm	1000246

Liquid end gamma/ X 1604 with bleed valve

	PVT
Liquid end	1050995
Spare parts kit	1035332
Diaphragm	1034612

Liquid end gamma/ X 0708 (1009) - 0220
(0424) PVT with bleed valve

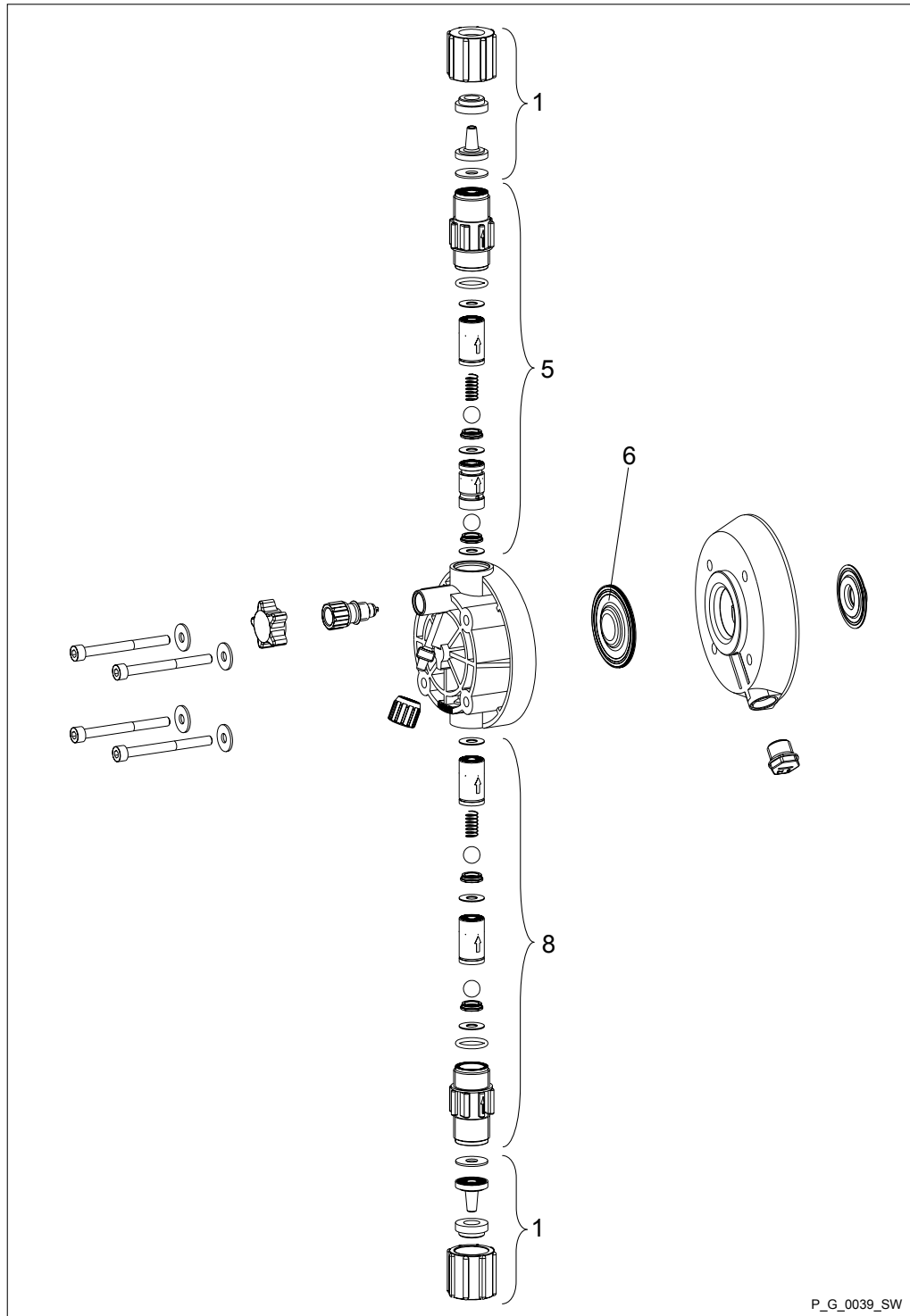


Fig. 46

Spare parts kit for liquid end gamma/ X 0708(1009) - 0220 (0424) PVT with bleed valve

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Exploded Drawings and Ordering Information

Liquid end gamma/ X 0708 (1009) with bleed valve

	PVT
Liquid end	1050996
Spare parts kit	1023111
Diaphragm	1000248

Liquid end gamma/ X 0414 (0715) with bleed valve

	PVT
Liquid end	1050997
Spare parts kit	1023112
Diaphragm	1000249

Liquid end gamma/ X 0220 (0424) with bleed valve

	PVT
Liquid end	1050998
Spare parts kit	1051129
Diaphragm	1045456

Liquid end gamma/ X 0245 PVT without bleed valve

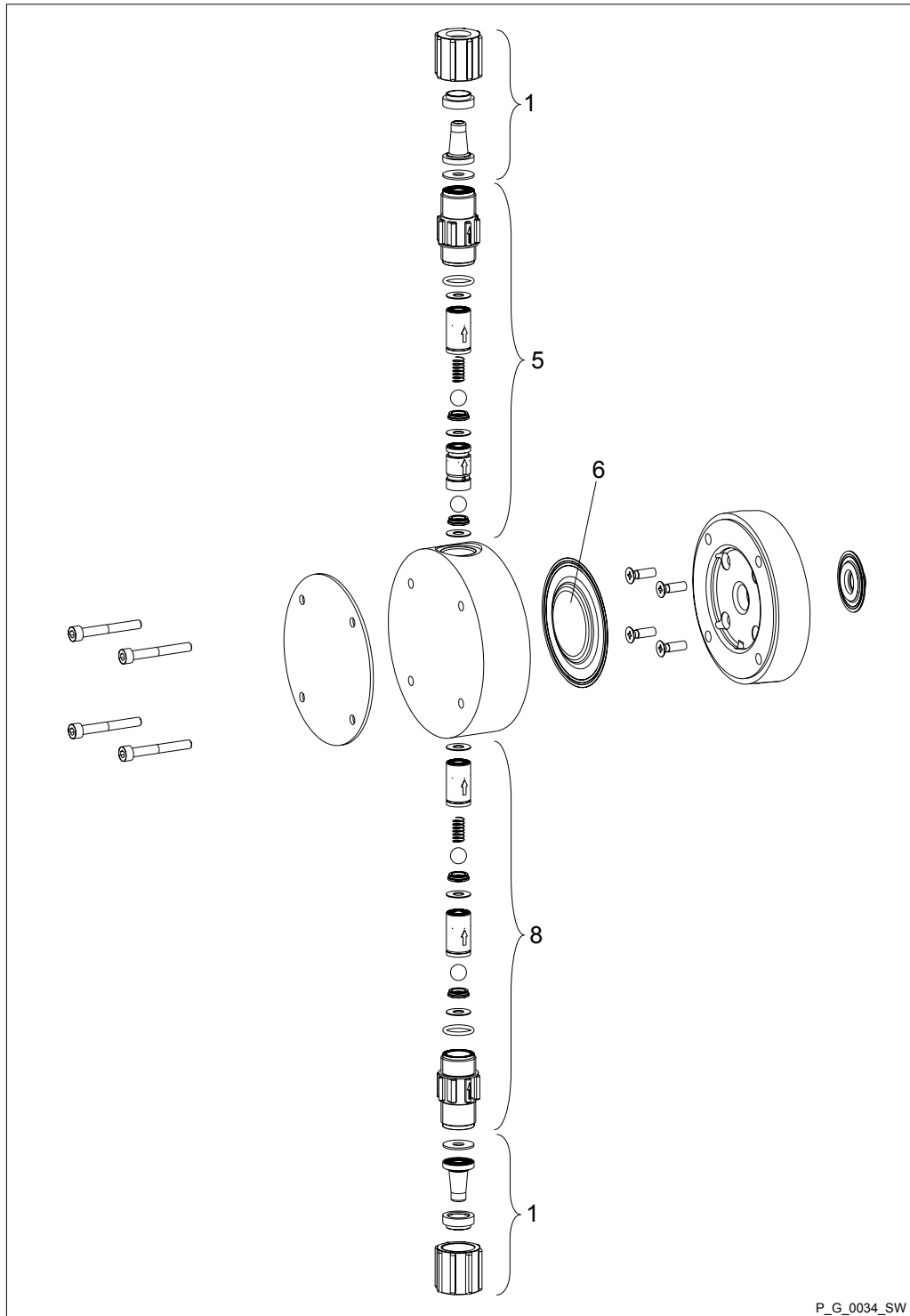


Fig. 47

Spare parts kit for liquid end gamma/ X 0245 PVT without bleed valve

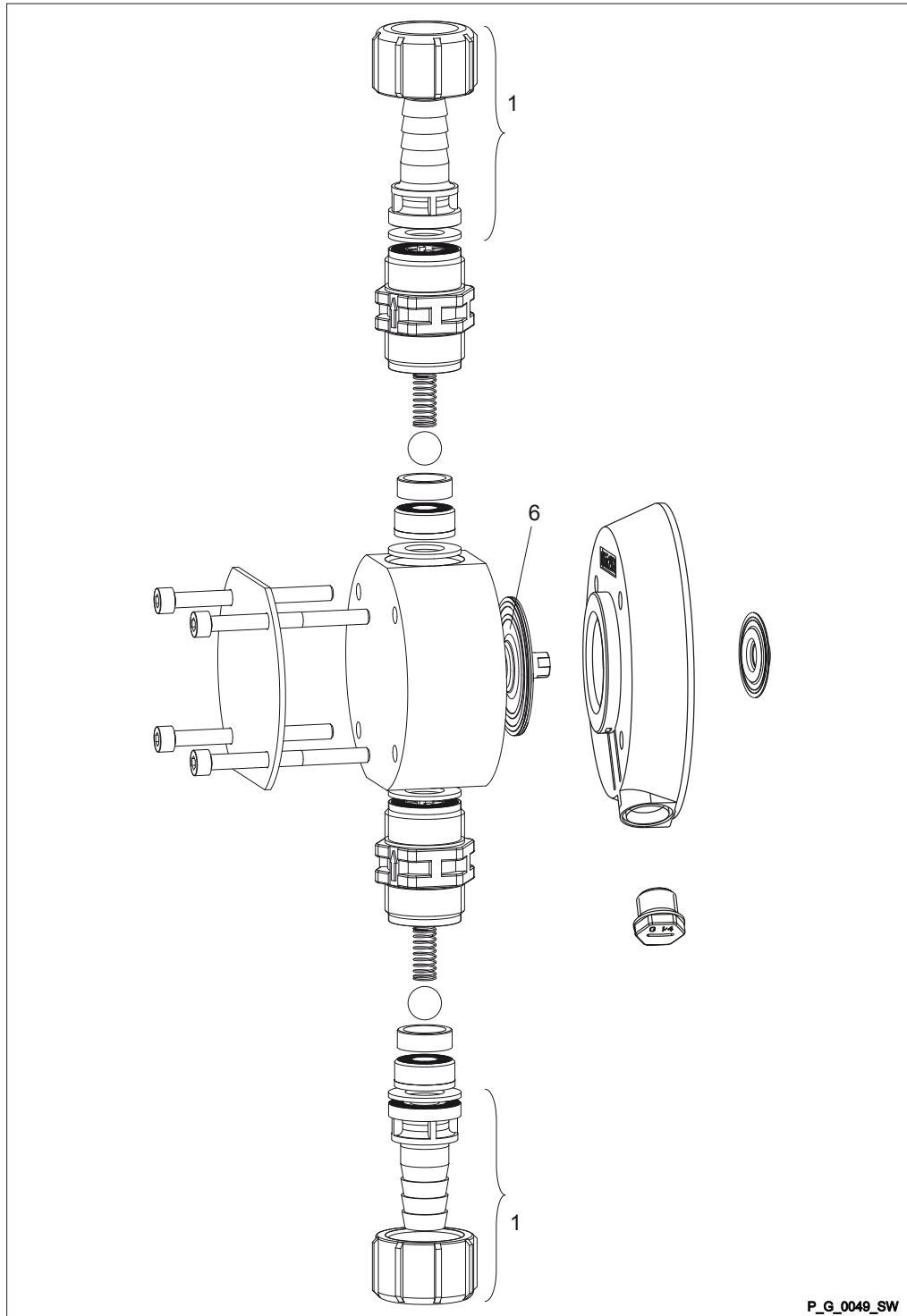
Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Exploded Drawings and Ordering Information

Liquid end gamma/ X 0245 without bleed valve

	PVT
Liquid end	1050999
Spare parts kit	1051130
Diaphragm	1045443

Liquid end gamma/ X 1604 - 0220 (0424)
PV HV, for high-viscosity feed chemicals



P_G_0049_SW

Fig. 48

Spare parts kit for liquid end gamma/ X 1604 - 0220 (0424) PV HV, for high-viscosity feed chemicals

Item	Description
1	Connector kit with hose nozzle
6	Diaphragm

Liquid end gamma/ X 1604

	PV HV
Liquid end	1051000
Spare parts kit	1035342
Diaphragm	1034612

Liquid end gamma/ X 0708 (1009)

	PV HV
Liquid end	1051001
Spare parts kit	1019067
Diaphragm	1000248

Liquid end gamma/ X 0414 (0715)

	PV HV
Liquid end	1051002
Spare parts kit	1019069
Diaphragm	1000249

Liquid end gamma/ X 0220 (0424)

	PV HV
Liquid end	1051003
Spare parts kit	1051134
Diaphragm	1045456

Liquid end gamma/ X 1602 - 1604 TTT

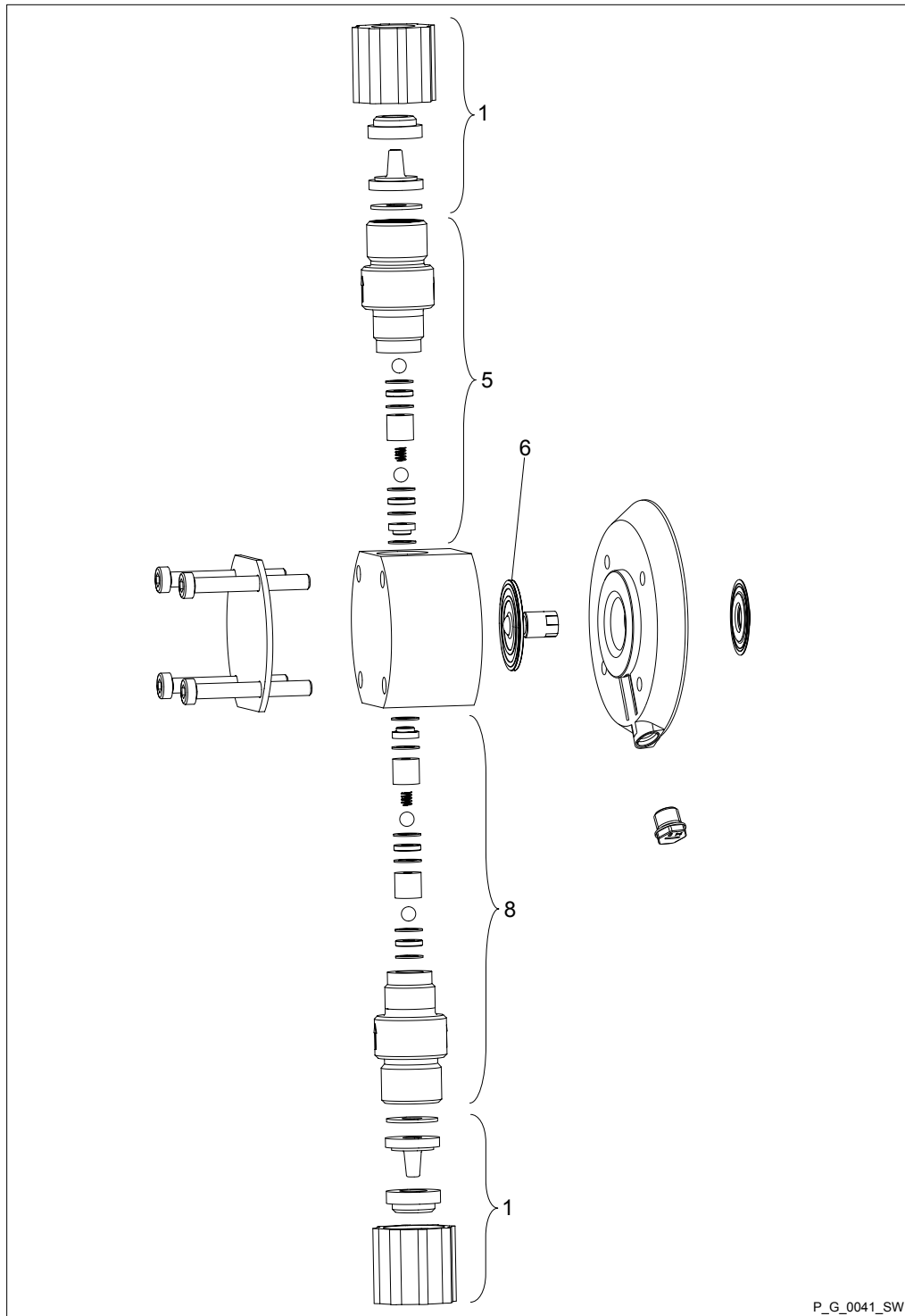


Fig. 49

Spare parts for liquid end gamma/ X 1602 - 1604 TTT

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 1602

	TTT
Liquid end	1051016
Spare parts kit	1001739
Diaphragm	1000246

Liquid end gamma/ X 1604

	TTT
Liquid end	1051017
Spare parts kit	1035331
Diaphragm	1034612

Liquid end gamma/ X 0708 (1009) - 0220
(0424) TTT

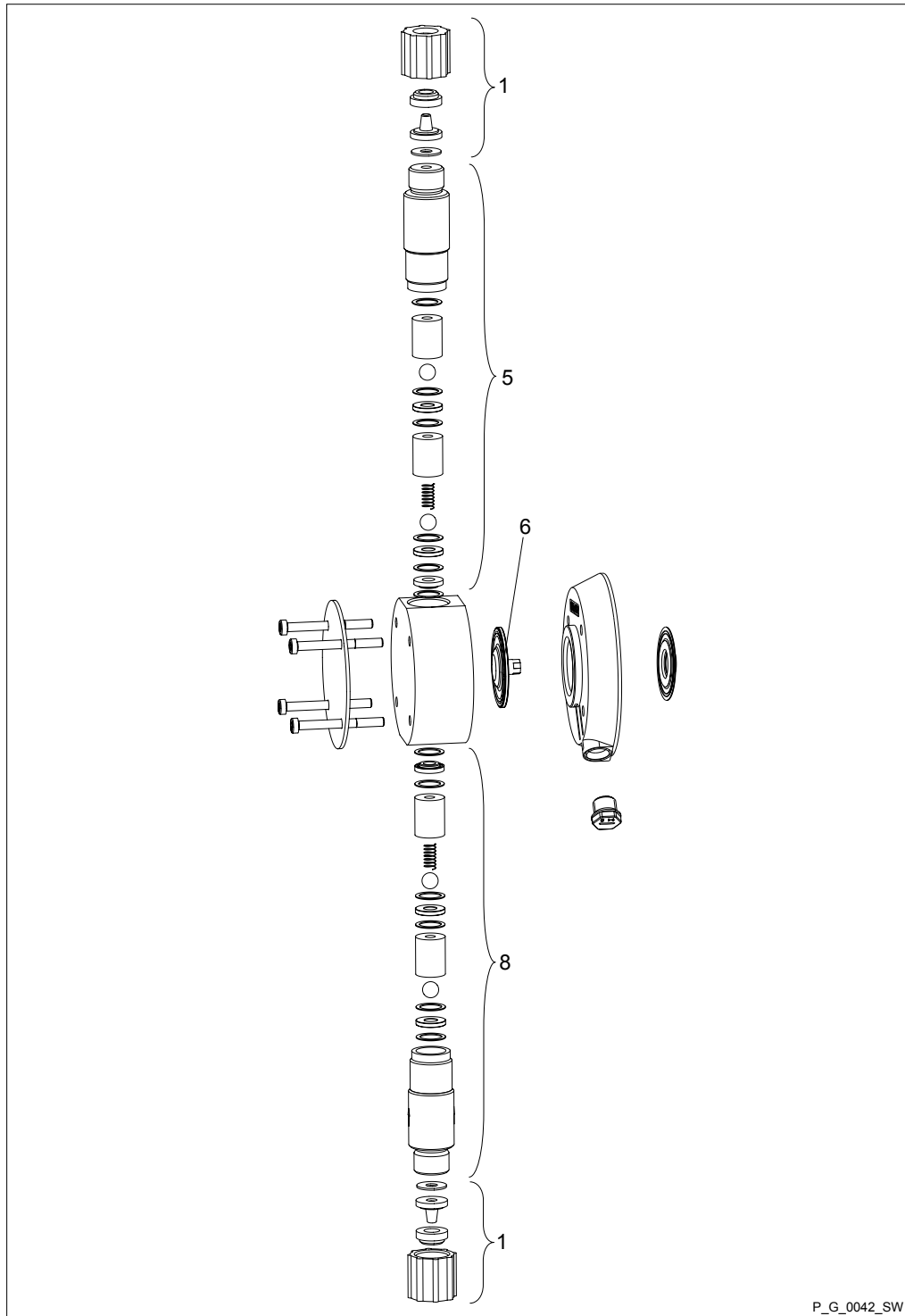


Fig. 50

Liquid end gamma/ X 0708 (1009) - 0220 (0424) TTT

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 0708 (1009)

	TTT
Liquid end	1051018
Spare parts kit	1001741
Diaphragm	1000248

Liquid end gamma/ X 0414 (0715)

	TTT
Liquid end	1051019
Spare parts kit	1001742
Diaphragm	1000249

Liquid end gamma/ X 0220 (0424)

	TTT
Liquid end	1051020
Spare parts kit	1051151
Diaphragm	1045456

Liquid end gamma/ X 0245 TTT

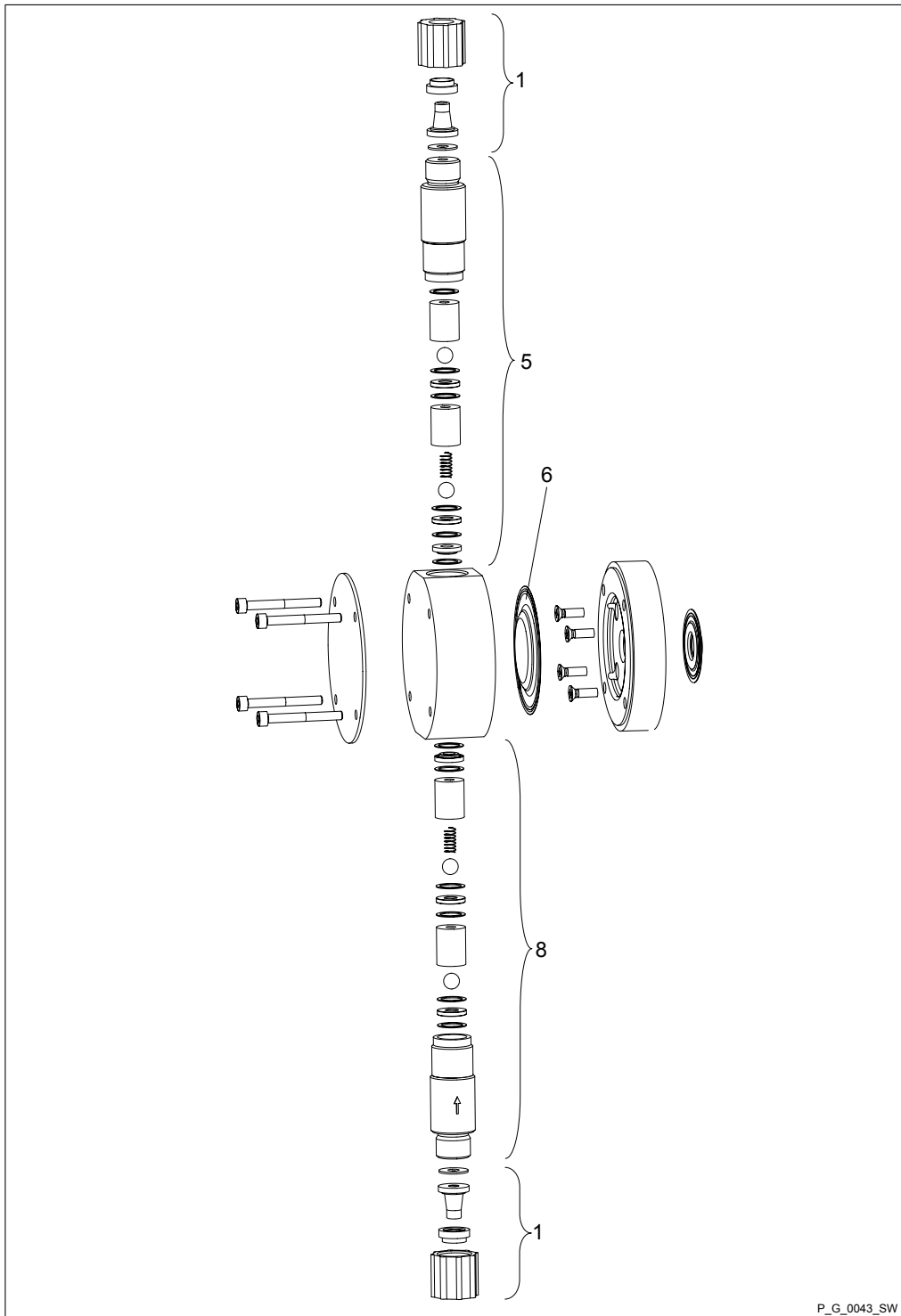


Fig. 51

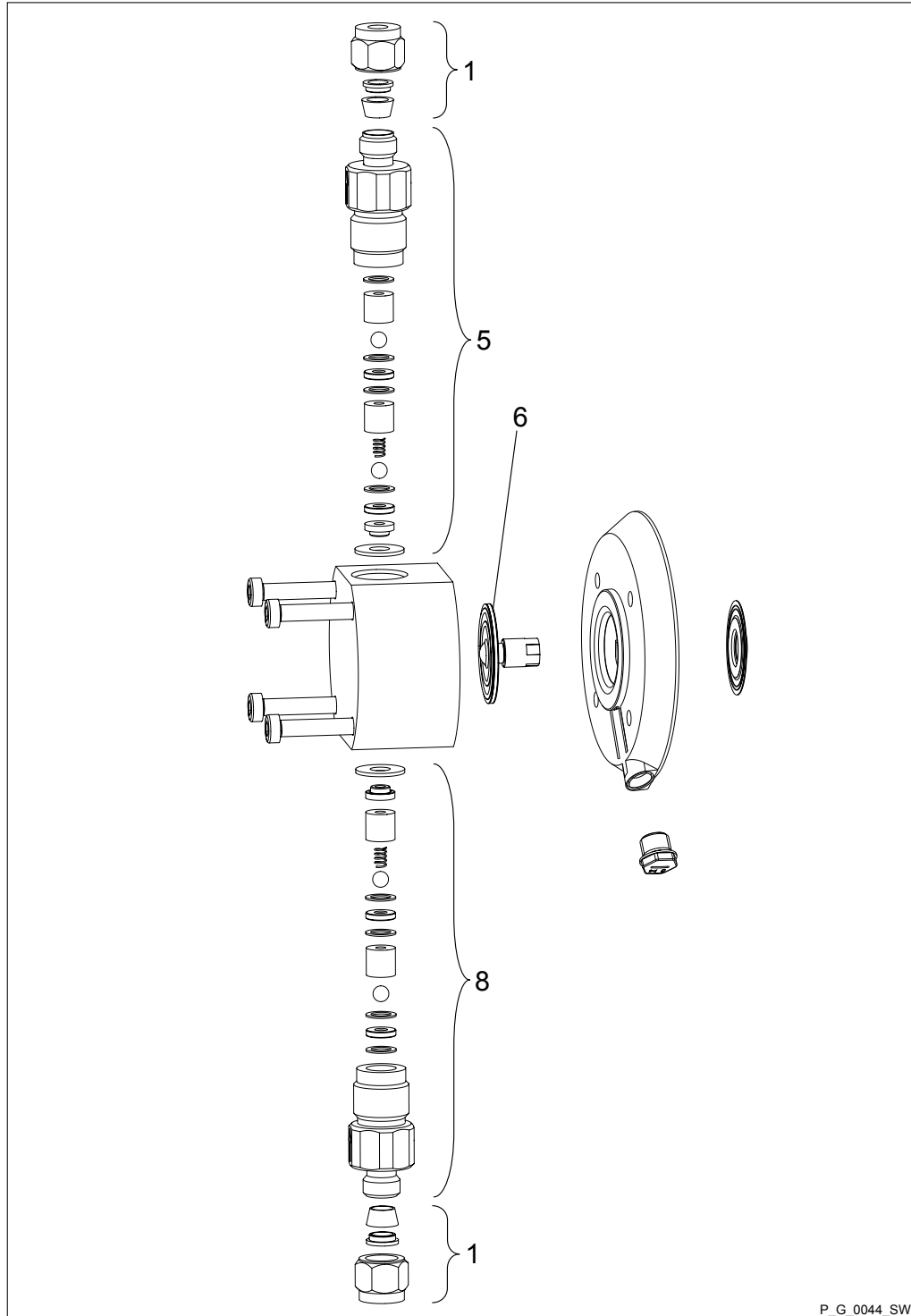
Spare parts kit for liquid end gamma/ X 0245 TTT

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 0245

	TTT
Liquid end	1051021
Spare parts kit	1051152
Diaphragm	1045443

Liquid end gamma/ X 1602 - 2504 SST



P_G_0044_SW

Fig. 52

Spare parts for liquid end gamma/ X 1602 - 2504 SST

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

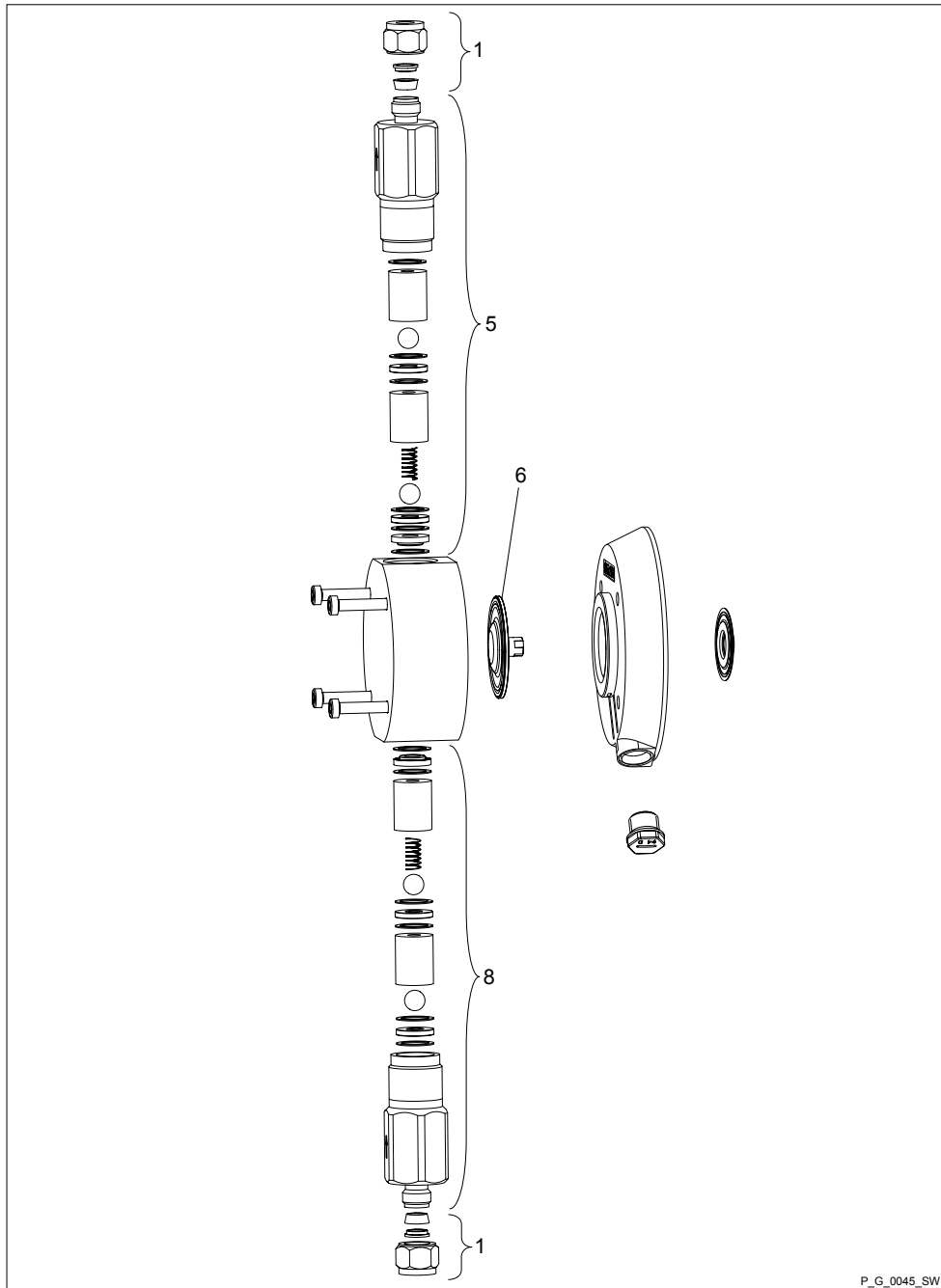
Liquid end gamma/ X 1602 (2002)

	SST
Liquid end	1051004
Spare parts kit	1001731
Diaphragm	1000246

Liquid end gamma/ X 1604 (2504)

	SST
Liquid end	1051005
Spare parts kit	1035331
Diaphragm	1034612

Liquid end gamma/ X 0708 (1009) - 0220
(0424) SST



P_G_0045_SW

Fig. 53

Spare parts kit for liquid end gamma/ X 0708 (1009) - 0220 (0424) SST

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Exploded Drawings and Ordering Information

Liquid end gamma/ X 0708 (1009)

	SST
Liquid end	1051006
Spare parts kit	1001733
Diaphragm	1000248

Liquid end gamma/ X 0414 (0715)

	SST
Liquid end	1051007
Spare parts kit	1001734
Diaphragm	1000249

Liquid end gamma/ X 0220 (0424)

	SST
Liquid end	1051008
Spare parts kit	1051139
Diaphragm	1045456

Liquid end gamma/ X 0245 SST

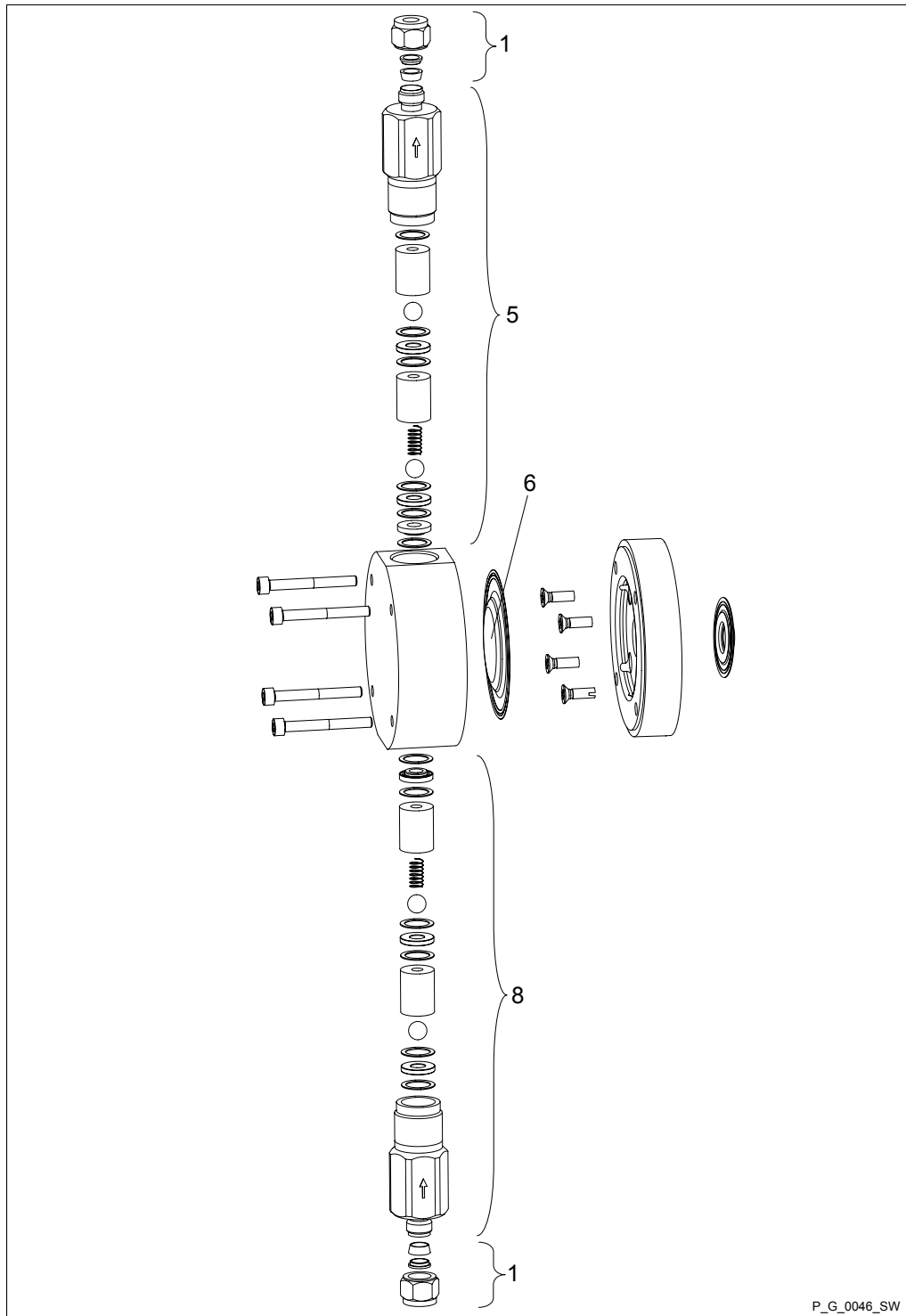


Fig. 54

Spare parts kit for liquid end gamma/ X 0245 SST

Item	Description
1	Connector kit
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid end gamma/ X 0245

	SST
Liquid end	1051009
Spare parts kit	1051140
Diaphragm	1045443

Liquid end gamma/ X 1602 - 1604 PP SEK and 1602 - 1604 NP SEK, self-bleeding

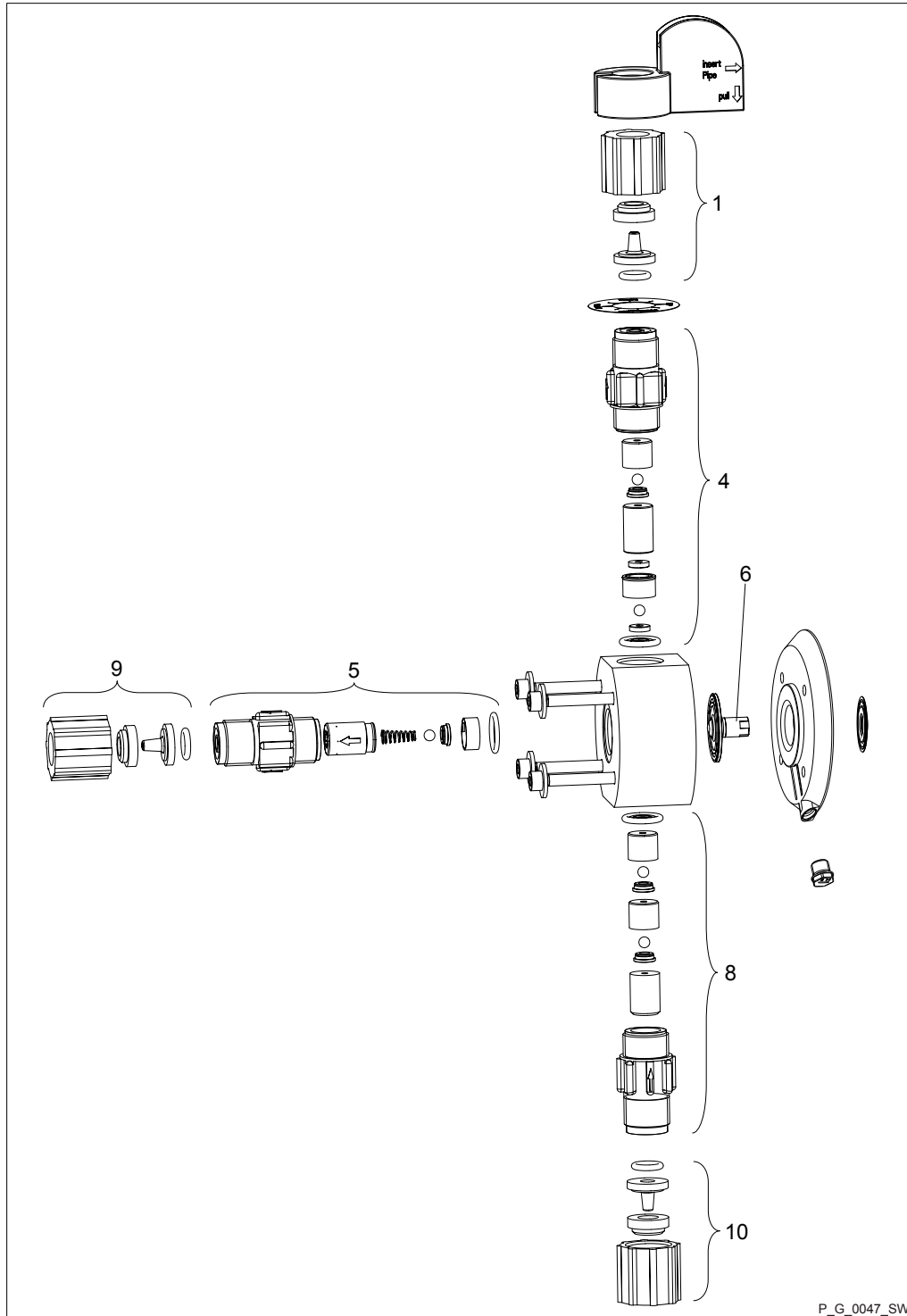


Fig. 55

Item	Part
1, 9, 10	Connector kit
4	Bleed valve
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid ends

Type	Order no:
PPE SEK	-
1602	1050937
1604	1050938
PPB SEK	-
1602	1050926
1604	1050927

Liquid ends

Type	Order no:
NPE SEK	-
1602	1050977
1604	1050978
NPB SEK	-
1602	1050960
1604	1050961

Spare parts kits for type:	Material version	Order no:
1602 with spring	PPE	1001757
1604 with spring	PPE	1035335
1602 with spring	PPB	1001763
1604 with spring	PPB	1035336
1602 with spring	NPE	1001661
1604 with spring	NPE	1035333
1602 with spring	NPB	1001667
1604 with spring	NPB	1035334

Diaphragm for type:	Order no:
1602	1000246
1604	1034612

Liquid end gamma/ X 0708 (1008) - 0220
 (0420) PP / NP SEK, self-bleeding

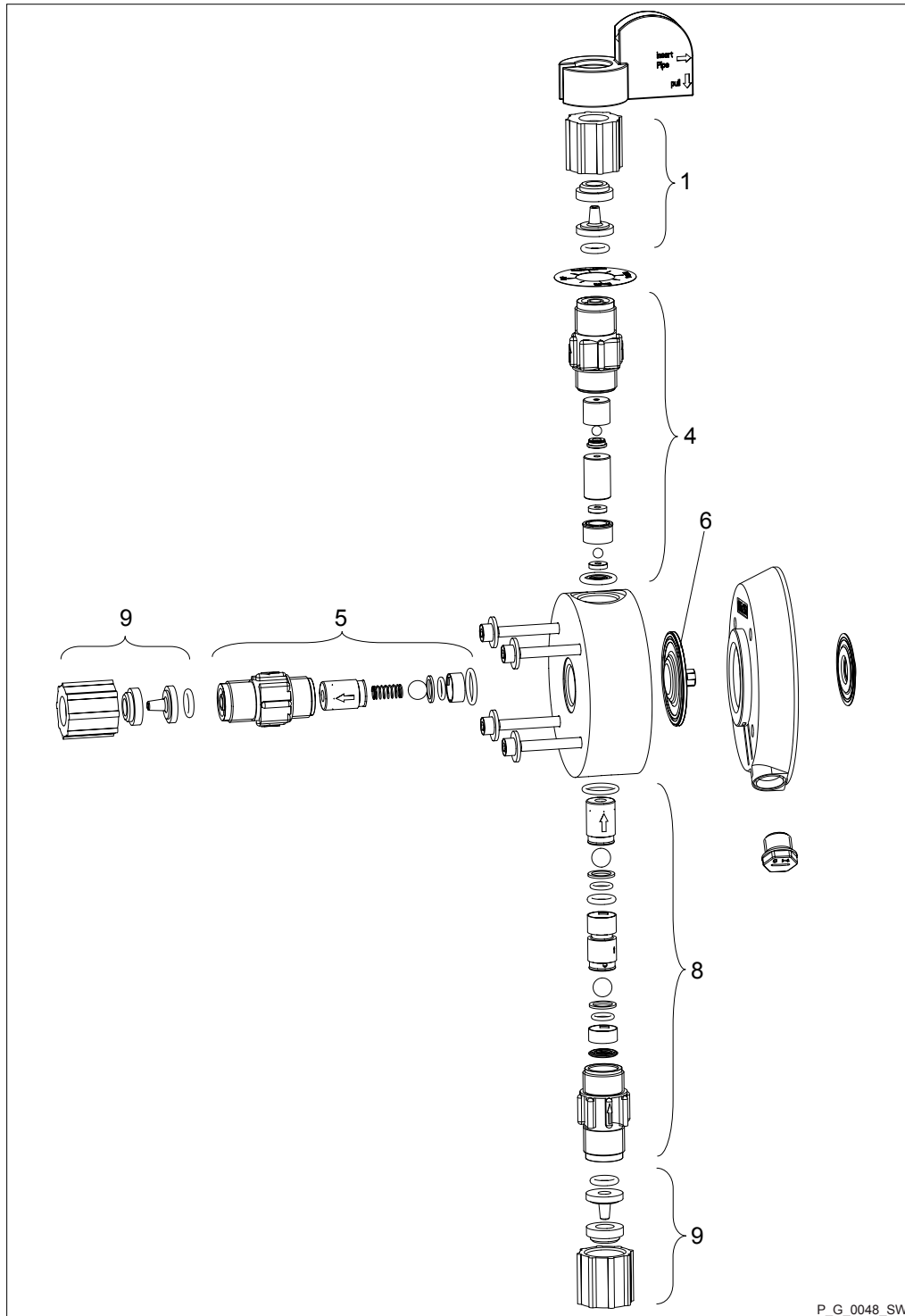


Fig. 56

Item	Part
1, 9, 10	Connector kit
4	Bleed valve
5	Discharge valve
6	Diaphragm
8	Suction valve

Liquid ends

Type	Order no:
PPE SEK	-
0708 / 1009	1050939
0414 / 0715	1050940
0220 / 0424	1050941
PPB SEK	-
0708 / 1009	1050928
0414 / 0715	1050929
0220 / 0424	1050930

Liquid ends

Type	Order no:
NPE SEK	-
0708 / 1009	1050979
0414 / 0715	1050980
0220 / 0424	1050981
NPB SEK	-
0708 / 1009	1050962
0414 / 0715	1050963
0220 / 0424	1050964

Spare parts kits for type:	Material version	Order no:
0708 (1008)	PPE	1001759
0413 (0713)	PPE	1001760
0220 (0420)	PPE	1051102
0708 (1008)	PPB	1001765
0413 (0713)	PPB	1001766
0220 (0420)	PPB	1051091
0708 (1008)	NPE	1001663
0413 (0713)	NPE	1001664
0220 (0420)	NPE	1051124
0708 (1008)	NPB	1001669
0413 (0713)	NPB	1001670
0220 (0420)	NPB	1051113

Diaphragm for type:	Order no:
0708	1000248
0413	1000249
0220	1045456

18.2 Ordering Information

Relay

Retrofit kit	Order no:
Fault indicating relay:	1050643
Fault indicating/pacing relay:	1050654

Further sources of information

Further information on spare parts, accessories and options can be found in:

- the exploded drawings
- the identity code
- under www.prominent.com
- the ProMinent product catalogue

19 Dimensional Drawings

i - Compare the dimensions on the dimensional drawing with those of the pump and mounting foot.
 - All dimensions are in mm.

Dimensional drawing of gamma/ X mounting foot

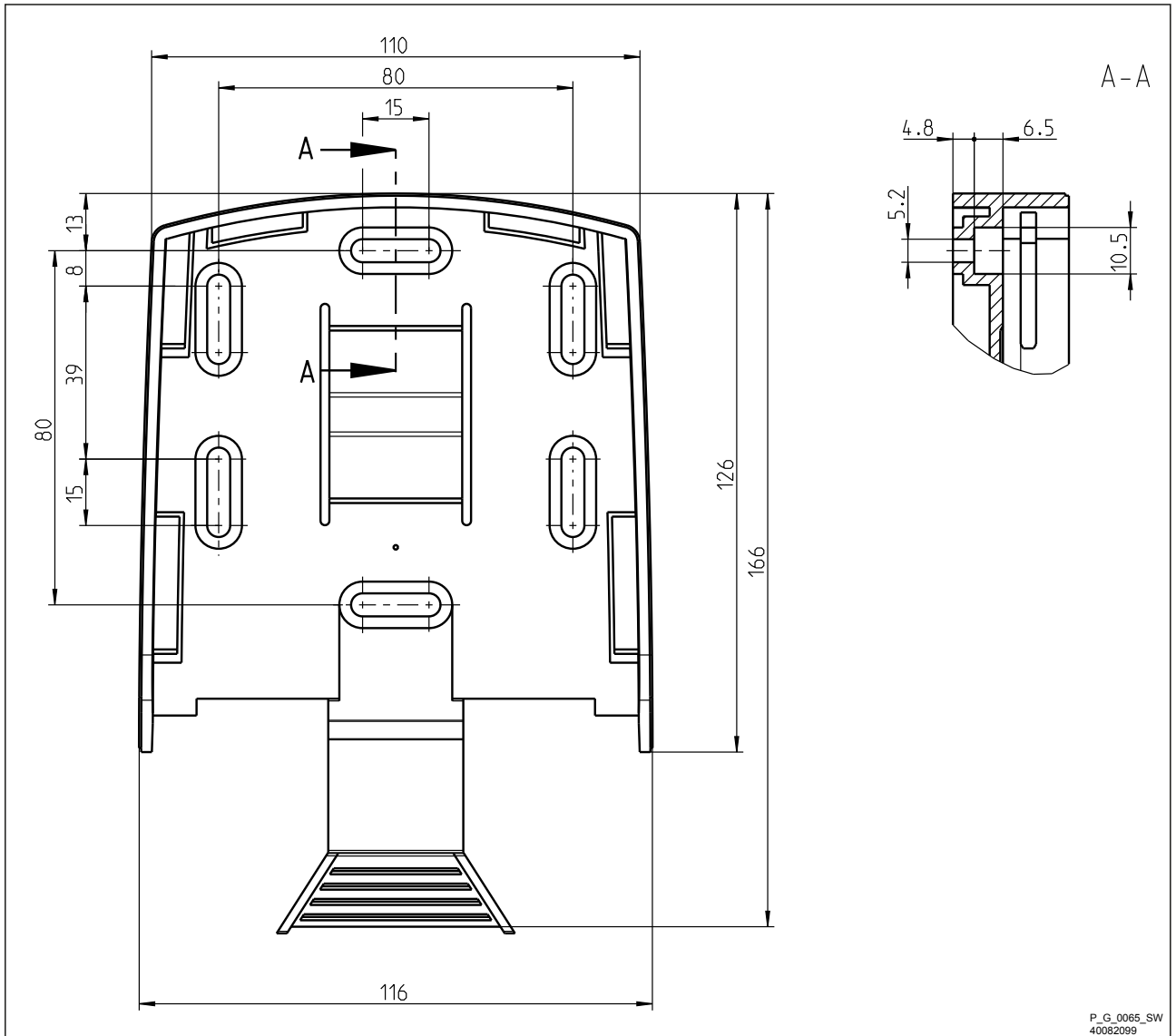
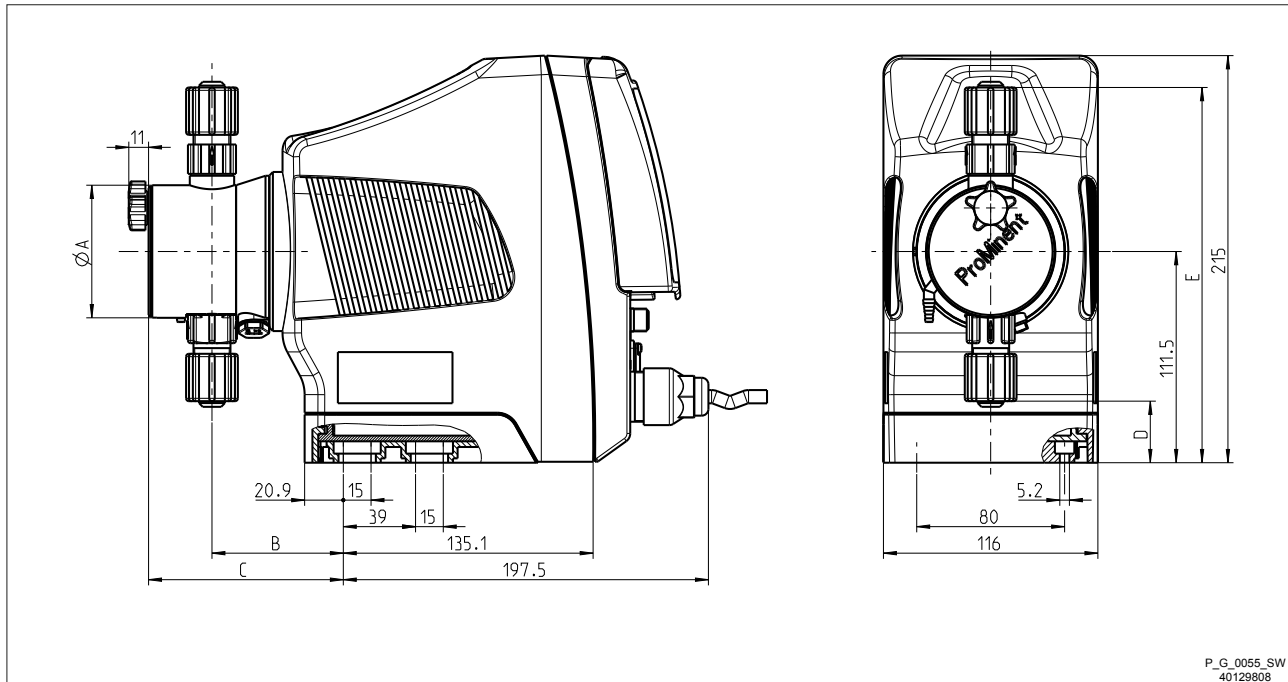


Fig. 57

Dimensional drawing of gamma/ X, material versions PPE, PPB and PPT



P_G_0055_SW
40129808

Fig. 58

	gamma/ X M70			gamma/ X M85		
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414	0245
ØA	70	90	90	70	90	110
B	71	74	76	71	74	76
C (with bleed valve)	106	108	110	106	107	-
C (without bleed valve)	-	-	-	-	-	93
D	32	24	24	32	24	14
E	23	13	15	13	15	5
F	198	202	202	198	202	209

Dimensional drawing of gamma/ X, material versions NPE, NPB and NPT

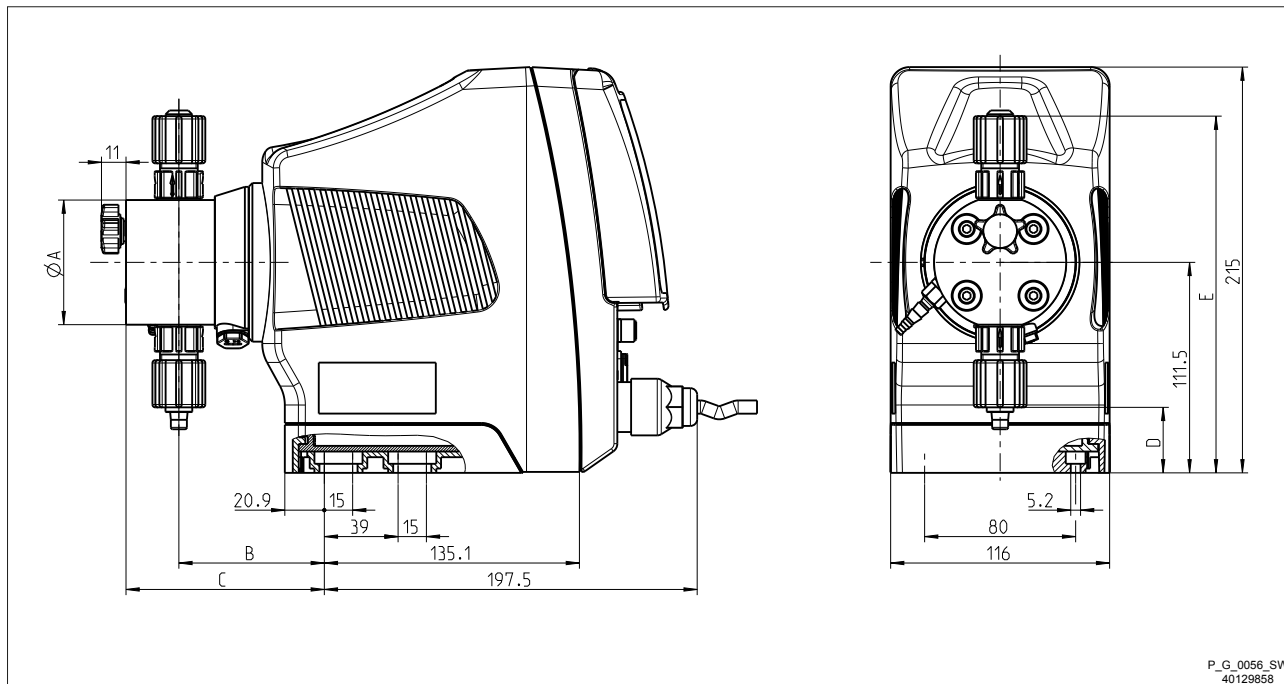


Fig. 59

	gamma/ X M70			gamma/ X M85		
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414	0245
ØA	70	90	90	70	90	110
B	77	74	76	77	76	76
C (with bleed valve)	105	102	104	105	104	105
C (without bleed valve)	92	91	91	92	91	91
D	33	23	23	33	23	14
E	191	200	200	191	200	210

Dimensional drawing of gamma/ X, material version PVT

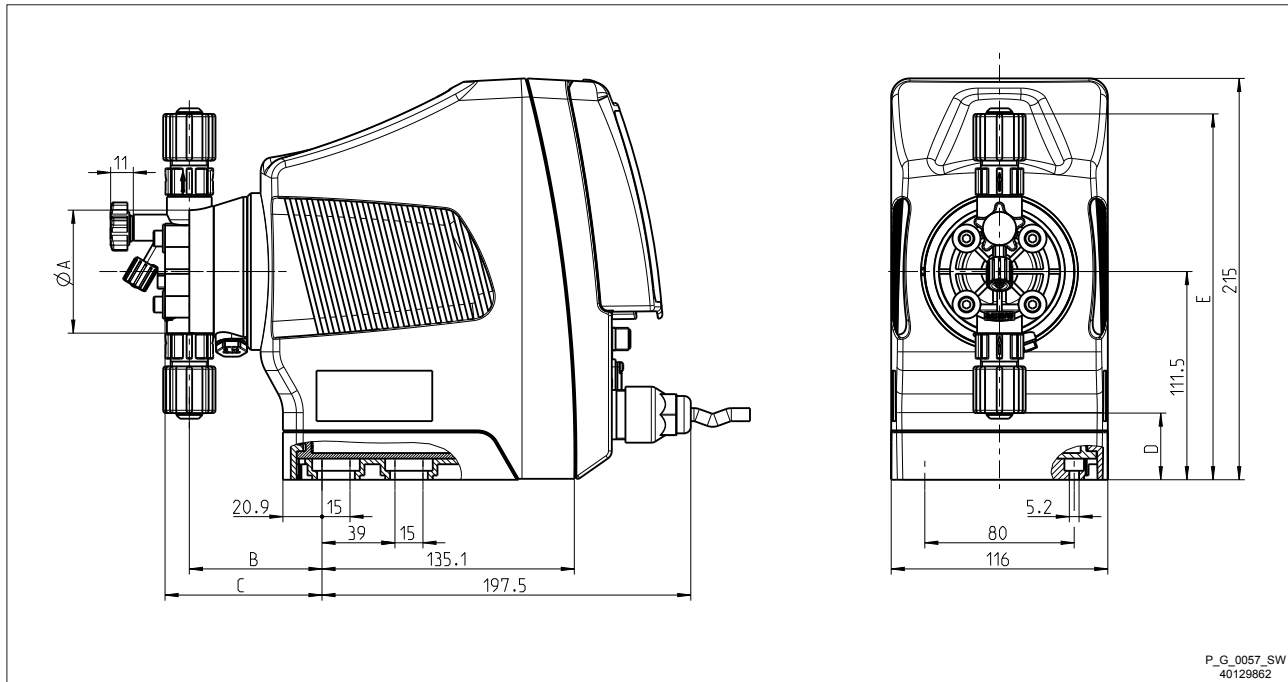


Fig. 60

	gamma/ X M70			gamma/ X M85		
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414	0245
ØA	70	90	90	70	90	110
B	71	75	79	71	73	76
C (with bleed valve)	84	92	90	84	90	-
C (without bleed valve)	-	-	-	-	-	93
D	36	25	25	36	25	14
E	196	203	203	196	203	209

Dimensional drawing of gamma/ X, material version PVT HV

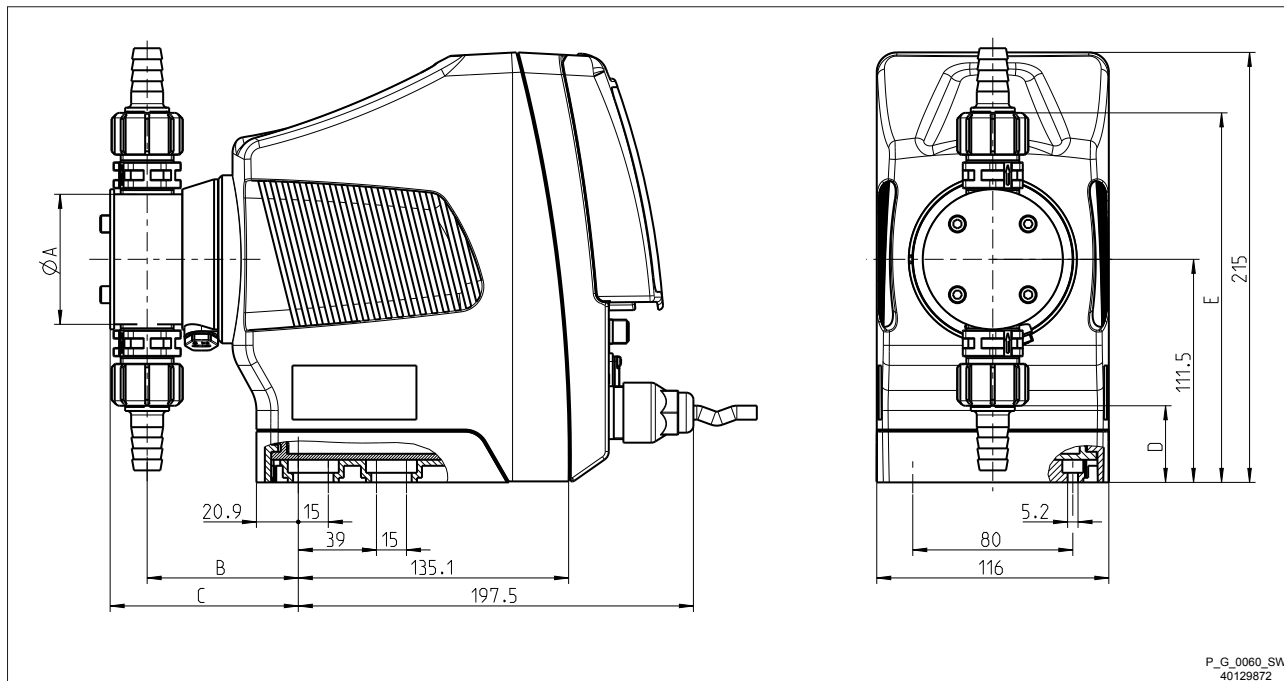


Fig. 61

	gamma/ X M70		gamma/ X M85	
	1009 - 0708	0424 - 220	1604	0715 - 0414
ØA	80	85	70	80
B	78	79	76	78
C	96	97	94	96
D	33	30	38	33
E	190	193	185	190

Dimensional drawing of gamma/ X, material version TTT

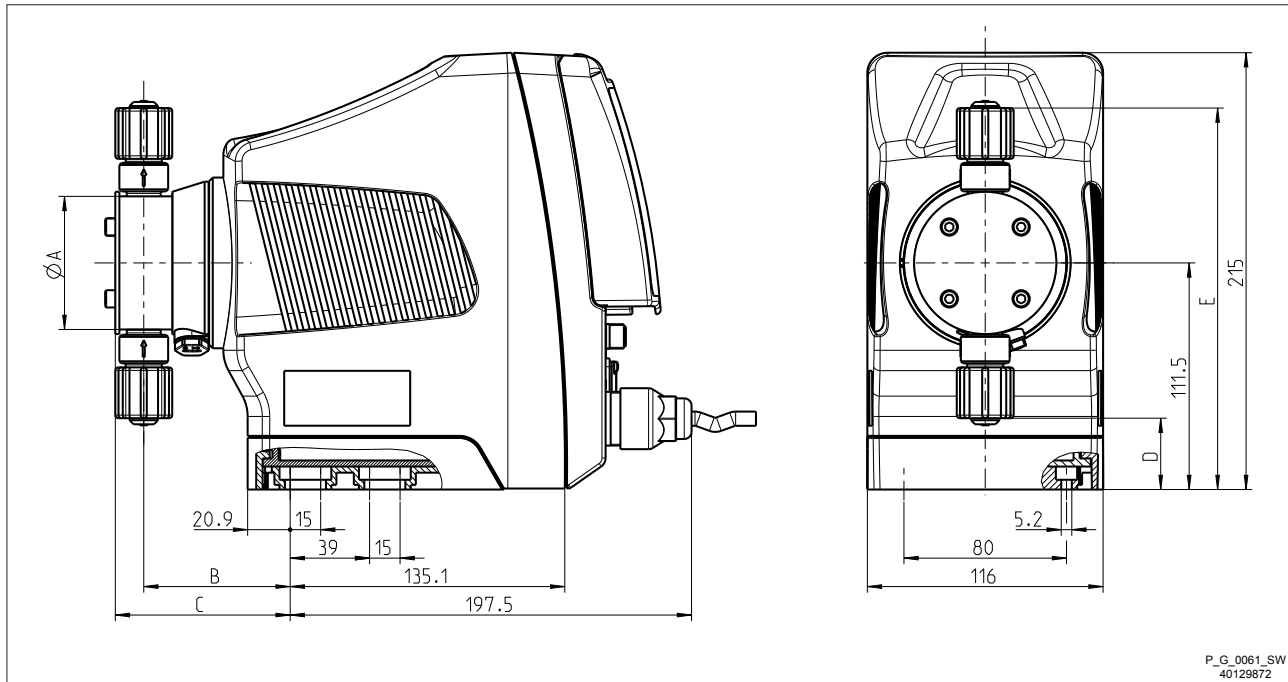


Fig. 62

	gamma/ X M70			gamma/ X M85		
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414	0245
ØA	70	85	85	70	85	100
B	72	79	77	72	77	78
C	86	96	96	86	96	97
D	35	3	3	35	3	-5
E	188	220	202	188	220	227

Dimensional drawing of gamma/ X, material version SST

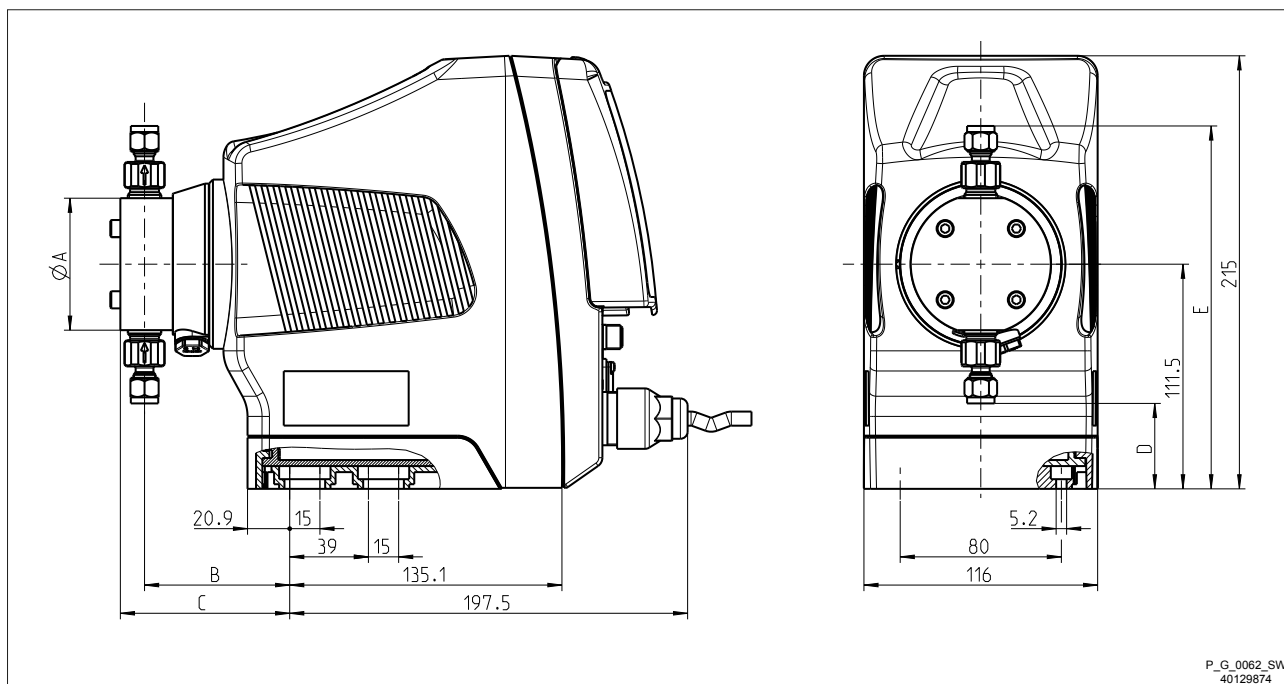


Fig. 63

	gamma/ X M70			gamma/ X M85		
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414	0245
ØA	70	85	85	70	85	100
B	72	79	77	72	77	78
C	84	94	94	84	94	95
D	42	11	11	42	11	4
E	180	211	211	180	211	219

Dimensional drawing of gamma/ X, material version PPB SEK

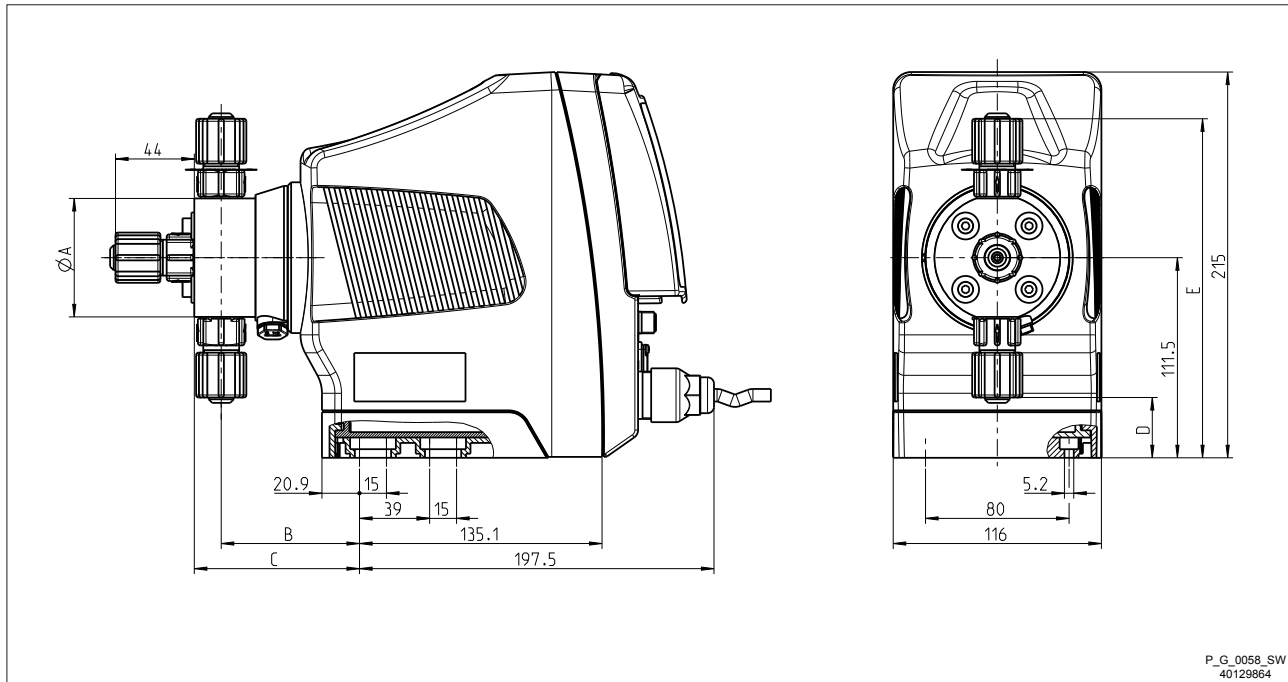


Fig. 64

	gamma/ X M70			gamma/ X M85	
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414
ØA	70	90	90	70	90
B	77	74	76	77	76
C	92	89	91	92	91
D	33	24	24	33	24
E	189	199	199	189	199

Dimensional drawing of gamma/ X, material version NPB SEK

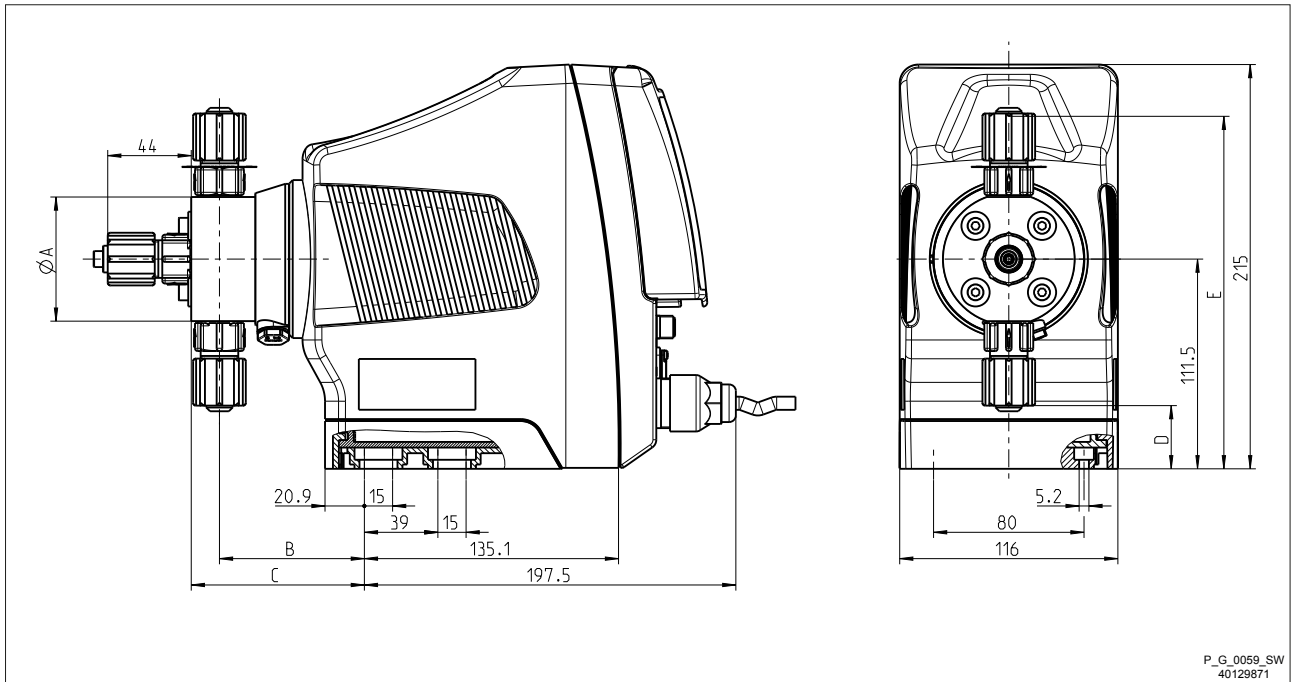


Fig. 65

	gamma/ X M70			gamma/ X M85	
	1602	1009 - 0708	0424 - 220	1604	0715 - 0414
ØA	70	90	90	70	90
B	77	76	76	77	76
C	92	91	91	92	91
D	33	24	24	33	24
E	189	199	199	189	199

20 Diagrams for Setting the Capacity

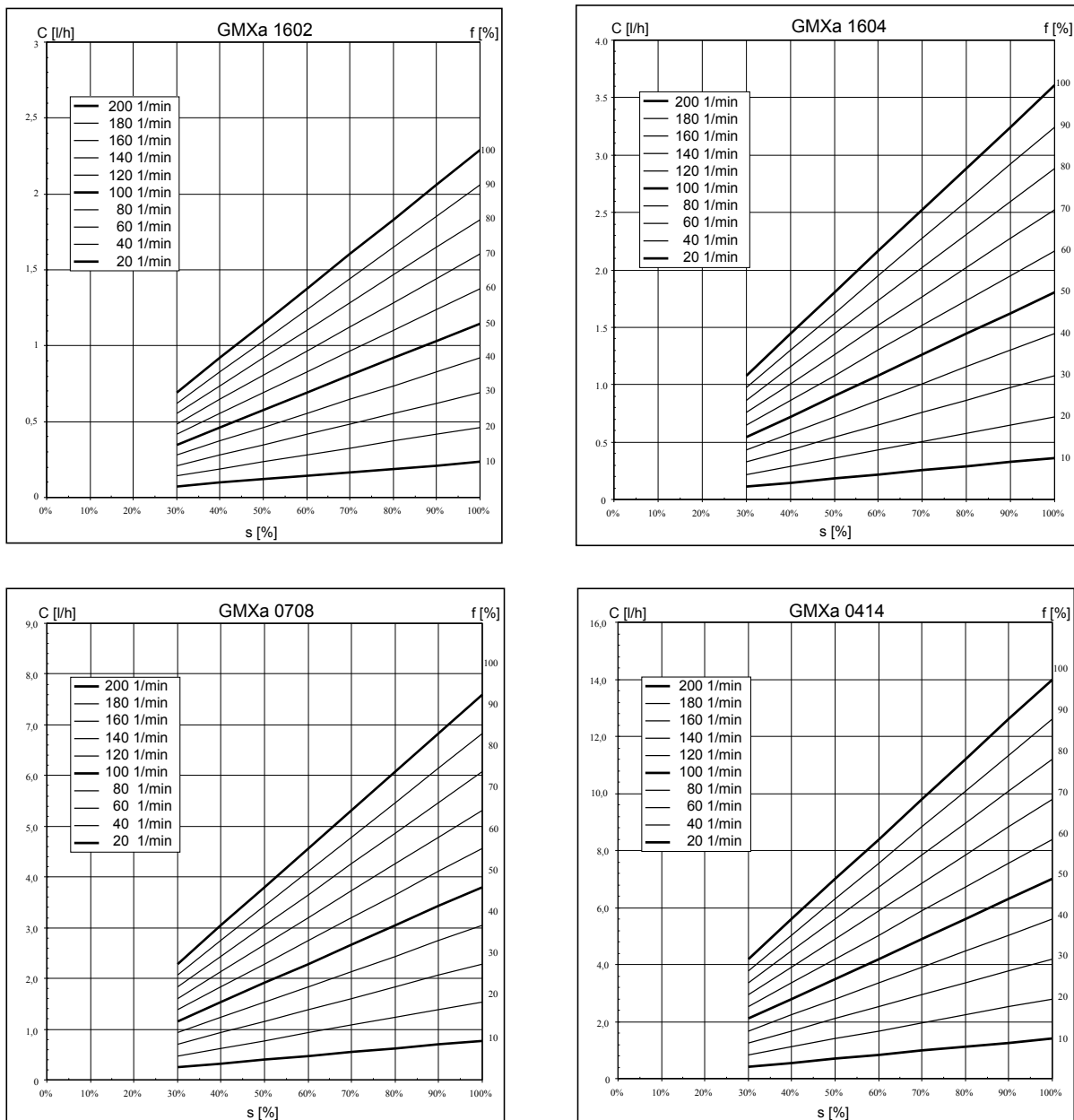


Fig. 66: Capacity C at medium back pressure depending on the stroke length s for different stroke rates f

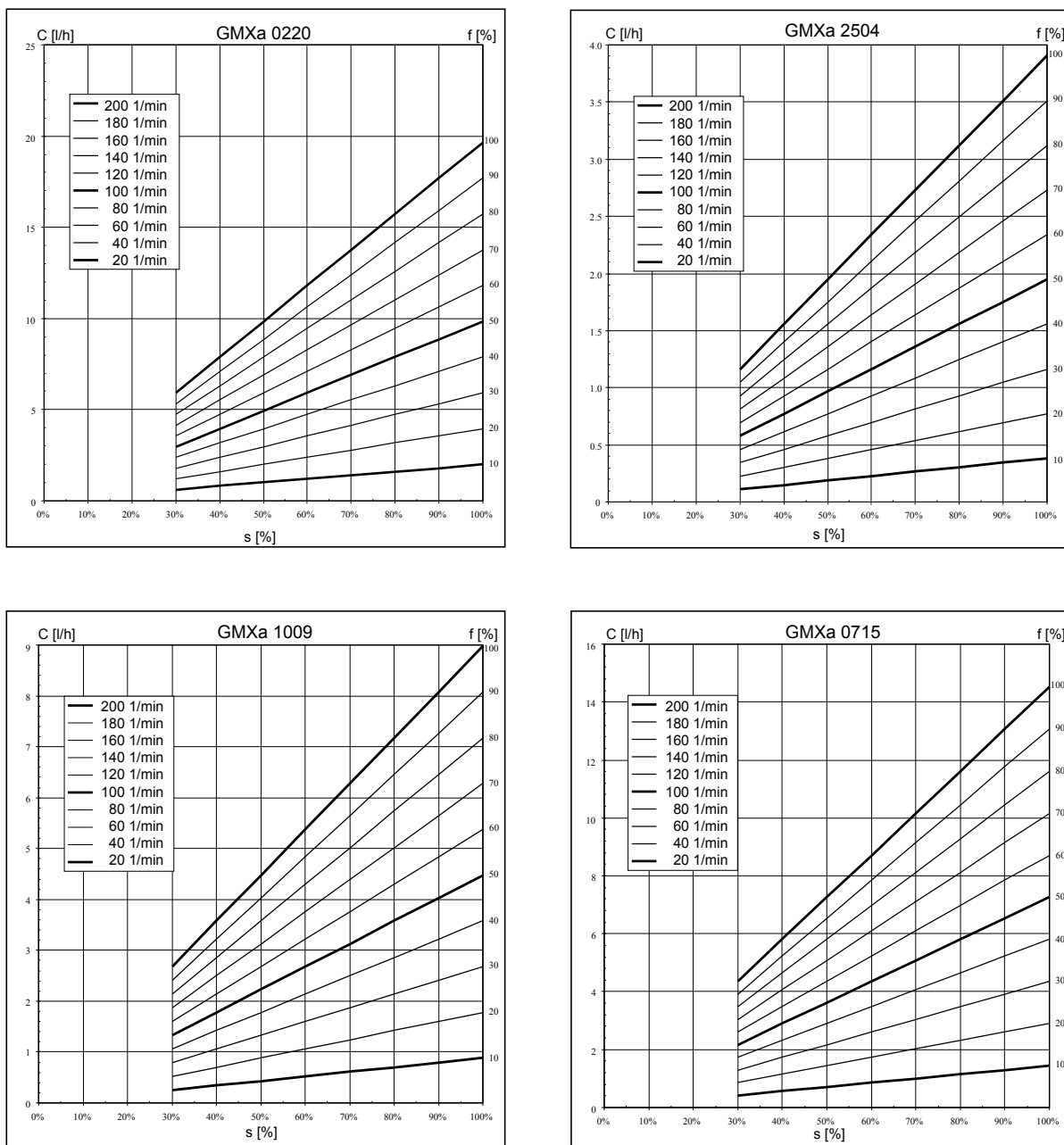


Fig. 67: Capacity C at medium back pressure depending on the stroke length s for different stroke rates f

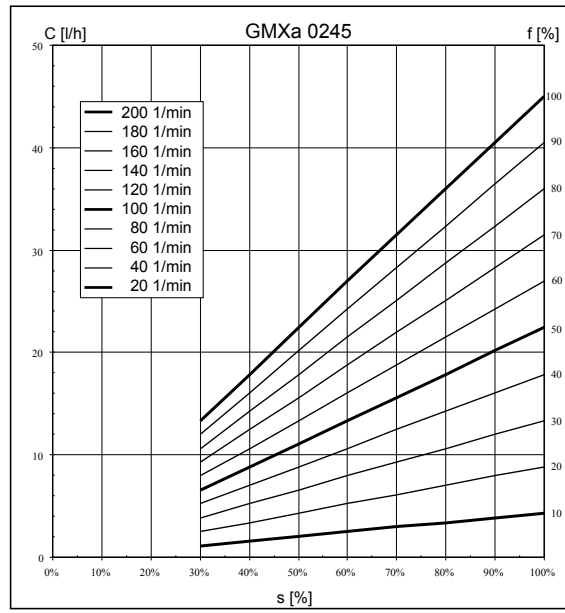
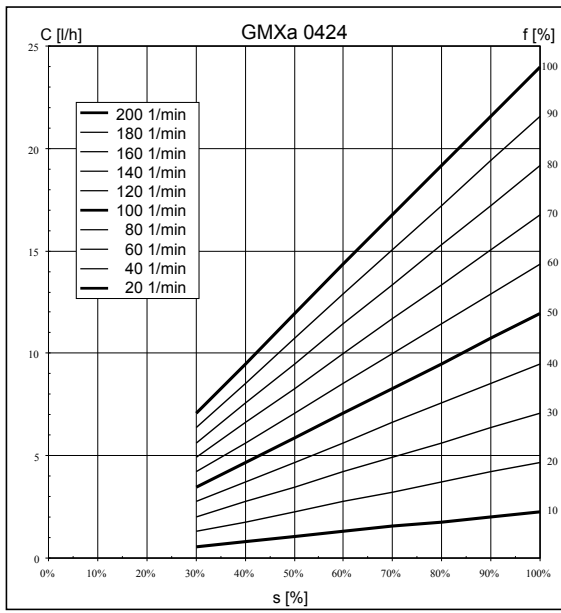


Fig. 68: Capacity C at medium back pressure depending on the stroke length s for different stroke rates f

21 EC Declaration of Conformity for Machinery

For mains voltage pumps:

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

We,

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

hereby declare 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.

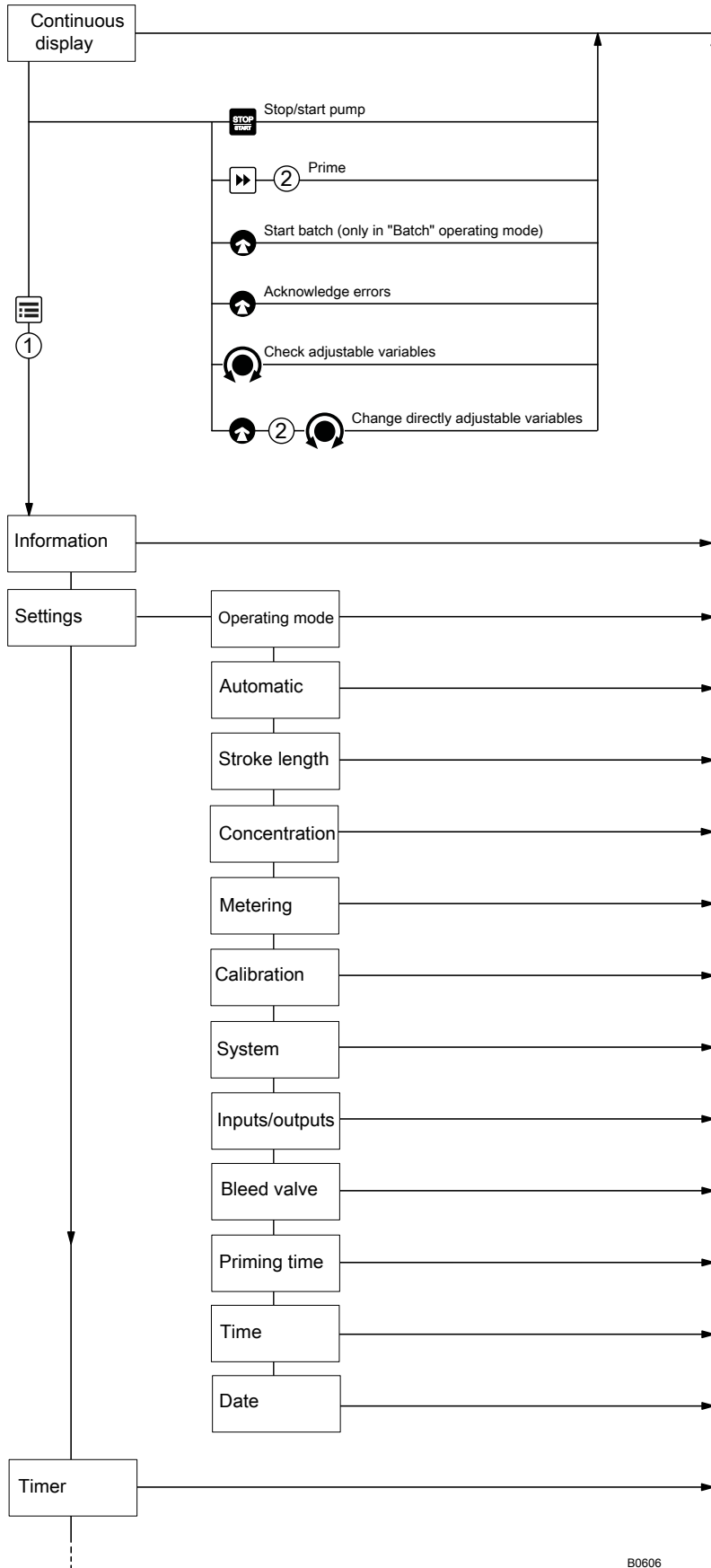
Any modification to the product not approved by us will invalidate this declaration.

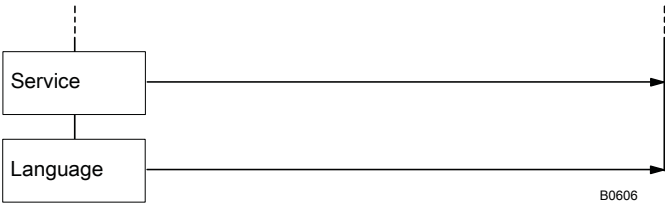
Extract from the EC Declaration of Conformity

Designation of the product:	Metering pump, Gamma/ X product range
Product type:	GMXa _____ U __ Y _ 0 Y = 0, 3, 4, 5
Serial number:	see nameplate on the unit
Relevant EC directives:	Machinery Directive (2006/42/EC) EMC Directive (2004/108/EC) Compliance with the protection targets of the Low Voltage Directive (2006/95/EC) as per Appendix I, No. 1.5.1 of the Machinery Directive (2006/42/EC) RoHS Directive (2011/65/EU)
Harmonised standards applied, in particular:	EN 809: 2010 EN ISO 12100: 2010 EN 61010-1: 2010 EN 61000-6-2: 2005 EN 61000-6-3: 2011 EN 50581: 2012
Date:	16.03.2015

The EC Declaration of Conformity is available to download on our homepage.

22 Operating/Set-up Overview of the gamma/ X





23 Operating Menu of gamma/ X, Entire Unit

1st level	2nd	3rd	4th	5th	xth		
Information	Versions	Hardware					
		Software					
		HMI version					
	Time						
	Date						
	Serial number						
	Identity code						
	Max. capacity *1						
	Max. capacity *2						
	Switch-on counter						
	Total operating time						
	Total metering volume						
	Total number of strokes						
	Current stroke volume						
	Settings	Operating mode	Manual				
Contact				<i>Memory</i> On Off	Metering volume *1		
						Factor *2	
Batch				<i>Memory</i> On Off	Metering volume *1		
						Factor *2	...
Analogue					0..20 mA		
				4..20 mA			
				Linear curve Lower side band Upper side band	Curve point 1 (I1,F1) Error mess. < Imin Error mess. > Imax	...	
Automatic		On Off					
Stroke length *2		1 ... 100%					
Concentration		Concentration control active inactive		Flow of main medium (for Manual)	Concentration of feed chemical	...	
				Contact gap (for Contact)	Concentration of feed chemical	...	
				Volume of main medium (for Batch)	Concentration of feed chemical	...	

1st level	2nd	3rd	4th	5th	xth
			Max. flow of main medium (for Analogue)	Concentration of feed chemical	...
	Metering	Discharge stroke	optimum fast sine mode continuous DFMa		
		Suction stroke	normal HV1 HV2 HV3		
		Pressure stage	x bar		
		Monitoring	Air lock	Inactive Warning Error	
			Message with over-pressure	Warning Error	
		Compensation	active inactive		
	Calibration	Start calibration	Calibration ended	Calibration result	
	System	Dosing head	No dosing head ... 0245		
		Volume unit	Litres Gallons		
		Pressure unit	bar psi		
	Inputs/outputs	Auxiliary capacity *1 Auxiliary frequency *2	...		
		Relay 1	Relay1 type	Inactive Error Warning Warning + error Pump active Metering / Batch Bleed valve	
			Relay 1 polarity	normally-open (NO) normally-closed (NC)	
			Relay cycle quantity	01.000 l	

Operating Menu of gamma/ X, Entire Unit

1st level	2nd	3rd	4th	5th	xth
		Relay 2	Relay type	Inactive Error Warning Warning + error Pump active Metering volume Stroke rate Metering / Batch Bleed valve External	
			Polarity	normally-open (NO) normally-closed (NC)	
		Analogue output	0..20 mA 4..20 mA	Strokes / hour Capacity at 20 mA	
		Flow control	Flow Control	Tolerance / strokes	...
				Activation	...
				if auxiliary	...
		Diaphragm rupture	Inactive Warning Error		
		Pause Input	normally-open (NO) normally-closed (NC)		
		Level warning	normally-open (NO) normally-closed (NC)		
		Level error	normally-open (NO) normally-closed (NC)		
	Bleed valve	Off			
		Periodic	Bleed cycle	Bleed metering time	...
		Air lock	Bleed metering time		
		both	Bleed cycle	Bleed metering time	...
	Priming time	0 ... 60 s			
	Set time	Time	Set	hh.mm.ss	
		Auto. summer time			
		Summer time begins in	February March April		
		Sunday the	1st, 2nd, 3rd, 4th, 5th		

1st level	2nd	3rd	4th	5th	xth
		Summer time ends in	August September October November		
		Sunday the	1st, 2nd, 3rd, 4th, 5th		
	Date	Set	dd.mm.yyyy		
Timer	Activation	Active Inactive			
	Setting the timer	New Display Change Clear	Command 01 Command2 ...	Init Hourly Daily (Mon-Sun) Weekdays1 (Mo-Fr) Weekdays2 (Mo-Sa) Weekend (Sa+Su) Weekly Monthly	...
	Clear all	No Yes			
Service	Access protect.	<i>Password?</i>	None Lock menu Lock all		
	Change password	<i>Password?</i>	0000		
	Clear counter	Stroke counter Volume counter All			
	Diaphragm replacement	Back To change position			
	Display	Brightness			
		Contrast			
	Factory settings	<i>Password?</i>	Yes No		
Language	English German French Spanish				




*1 with 'Automatic' - 'on' - see Chap. 'Set Up' - 'Settings' - 'Automatic'

*2 with 'Automatic' - 'off' / with conventional operating mode

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

24 Continuous Displays and Secondary Displays

Continuous displays

Continuous display	"Manual" operating mode	"Contact" operating mode with transfer factor 5	"Batch" operating mode with transfer factor 5	"Analogue" operating mode
Capacity	12.00 _h **	12000 _h *	12,000 _h *	12.00 _h **
Stroke rate (h)	12,000 _h *	12000 _h *	12,000 _h *	12,000 _h *
Stroke rate (min)	200 _{h/min} *	200 _{h/min} *	200 _{h/min} *	200 _{h/min} *
Stroke length	50.0 _% *	50.0 _% *	50.0 _% *	50.0 _% *
Factor		5 _{h/~/} *	5 _{h/~/} *	
Contact volume		1,250 _{l/~/} **	1,250 _{l/~/} **	
Batch dosing time			90 _s **	
Concentration	03.5 _% **	03.5 _% **	03.5 _% **	03.5 _% **
Trigger batch				
Time	16:12:21	16:12:21	16:12:21	16:12:21

* only with "Automatic" off ** only with "Automatic" on

Auxiliary displays in the continuous display

Auxiliary display	Mode "Manual"	Mode "Batch" with transfer factor 5	Mode "Contact" with transfer factor 5	Mode "Analogue"
Capacity	12.00 L/h			12.00 L/h
Stroke rate	12000 Cp/h	12000 Cp/h	12000 Cp/h	12000 Cp/h
Factor		5 Cp/...	5 Cp/...	
Remaining strokes			25,00 ↓ Cp ¹	
Remaining litres			000,833 ↓ L ¹	
Total number of strokes	86500 Cp	86500 Cp	86500 Cp	86500 Cp
Stroke length	50 %	50 %	50 %	50 %
Signal current (at the input)				12,7 mA ²
Dosing mode	slow HV1	slow HV1	slow HV1	slow HV1
Pressure display	12.5 bar	12.5 bar	12.5 bar	12.5 bar
Time	16:12:21	16:12:21	16:12:21	16:12:21
Date	2015 - 03 - 27	2015 - 03 - 27	2015 - 03 - 27	2015 - 03 - 27

1 = only with "Storage tank" function extension

2 = only with current output

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