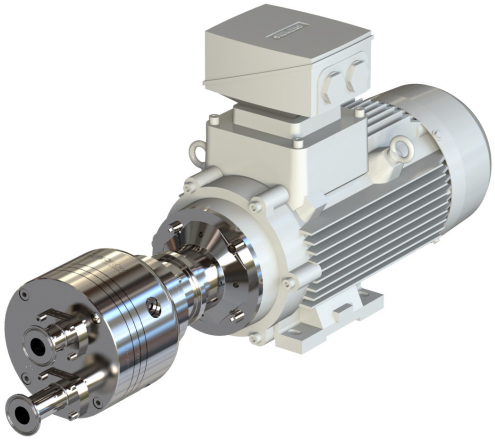
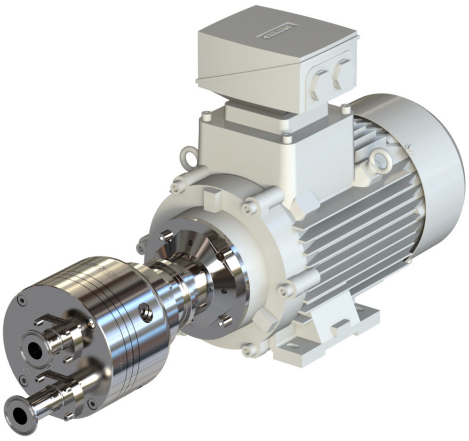
QUATTROFLOW® Fluid Systems

QF25EX

Stainless Steel 4-Piston Diaphragm Pump

Operation Manual





Original operation manual

1 General

Read this operating manual carefully before putting the pump or the pump unit into operation. Always follow the instructions contained in this operating manual. Keep the operating manual close at hand in the vicinity of the pump.

PSG Germany GmbH also manufactures pumps and pump units according to specific customer requirements and adapted to special applications. The descriptions in this operating manual can differ from your actual pump.

Also observe the operating manuals for the motor and other installed components or optional accessories.

1.1 Manufacturer and Service

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1.2 Exclusion of liability

All warranty rights will be void in case of incorrect operation or misuse, failure to observe the operation manual, in particular the safety notes, as well as unauthorised modification of the pump unit or installation of non-genuine spare parts. The manufacturer will accept no liability for damages and consequential damages resulting from this.

Quattroflow is a trade name of PSG Germany GmbH.

PSG Germany GmbH endeavours to continuously improve the product and reserves the right to make modifications to the technology and/or design without prior notice.

1.3 Presentation conventions

This operating manual uses the following presentation conventions:

Running text contains descriptions and explanations.

- First level bulleted lists are preceded by dots and list elements.
  - Second level bulleted lists are preceded by circles and list elements belong to a first-level element.

► Handling instructions are indicated by an arrow and guide your actions.

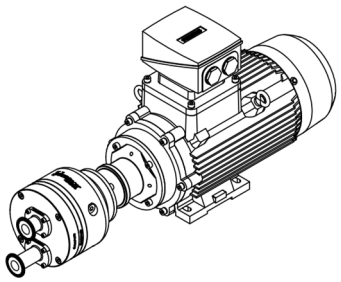
Handling instructions are listed in the order in which they are performed.

⚠ **WARNING NOTICES** – Warning notices warn against dangers and give handling instructions to avoid the danger. (Further information can be found in chapter Warning notices on page 6.).

The manual uses the term pump for the pump body and the term pump unit for the entire functional unit motor with coupling and pump body.

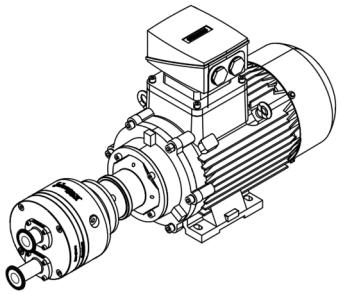
1.4 Pump unit

This manual applies for the following pump units:



Pump unit QF25EX (QF25EX-ACUJT)

- Three-phase current motor: Siemens (6-pole) 1MB1563-1AC39-0NB4-Z_B32+B43+M4A+R15+Y56
- Drive: 1.1 kW, 230/400 V
- Speed control: external frequency converter (not included in the standard scope of delivery)
- Eccentric shaft: 5°
- Flow rate: 160-2500 l/h



Pump unit QF25EX (QF25EX-ACUJT-X01)

- Three-phase current motor: Siemens (8-pole) 1MB1563-1BD29-0NB4-Z_B32+B43+M4A+R15+Y56
- Drive: 1.5 kW, 230/400 V
- Speed control: external frequency converter (not included in the standard scope of delivery)
- Eccentric shaft: 5°
- Flow rate: 120-2300 l/h

1.5 Version history

Edition	Contents and revisions
2024-07	● first edition
2024-12 - Rev. 2	● information added and updated
2025-03 – Rev 2.2	● Klüberpaste added

1.6 Conformity

The following EU regulations apply to the device:

- 2014/34/EU
- 2006/42/EC
- 2014/30/EU
- 2011/65/EU

2 Safety

2.1 General safety information

This chapter contains important information for safe operation as well as safe installation and maintenance of the pump unit.

- Failure to comply with the instructions and warnings in this manual can result in considerable danger to people and damage to the pump unit.
- The pump unit is safe to operate and is designed and constructed in accordance with the state of the art and recognised safety guidelines and standards. Nevertheless, danger to life and limb of the user or third parties or damage to the pump unit and other property may occur during use.
- The pump unit may only be used when it is in perfect technical condition and in accordance with its intended use, in a safety- and hazard-conscious manner and in compliance with the instructions. In particular, malfunctions that impair safety must be rectified immediately.
- Always follow all safety instructions. Compliance is for your safety.

2.2 Intended use

- Pumping alcohol solvents and water-like fluids for industrial applications.
- For indoor use only.
- Use in potentially explosive atmospheres in accordance with the labellings.

2.3 Prohibited use

- Pumping of unsuitable media or fluids, especially media which attack the diaphragm or other parts of the pump. Consult the Material and Certification Guide or contact Service if in doubt.
- Operation outdoors and in private households
- Operation in in-vitro diagnostics
- Operation with fluids for the food sector

2.4 Warning notices

These warning notices warn against dangers. Heed the warning notices to avoid dangers.

⚠ **DANGER**	– Danger of fatal or severe injuries.
⚠ **WARNING**	– Warning against possibly fatal or severe injuries.
⚠ **CAUTION**	– Beware of minor injuries.
ATTENTION	– Property damages.
NOTE	– General information and advice

2.5 Use in potentially explosive atmospheres (X conditions)

2.5.1 General

When working in potentially explosive atmospheres, the explosion protection guidelines in this chapter must be followed. Only pumps/pump units with the appropriate labelling may be used in potentially explosive atmospheres.

Observe the safety instructions for electrical and non-electrical equipment for potentially explosive atmospheres in accordance with Directive 2014/34/EU (ATEX) and e.g. IEC 60079-14 (Installation of electrical systems in potentially explosive atmospheres).

To ensure safe operation, ATEX 99/92/EC, national operator regulations, and technical rules for personnel protection must be followed.

Explosion protection is only guaranteed when the pumps/pump units are used as intended.

Never exceed or fall below the limit values specified in the data sheet and on the type plates.

Impermissible operating conditions must be avoided at all costs.

2.5.2 Authorised fluids

Authorised fluids: Alcohol solvents and water-like fluids.

Other fluids may only be conveyed after consultation with PSG Germany GmbH.

2.5.3 EX labelling

The ATEX labelling of the pump unit is as follows:

EX labelling	Motor	**II 2G Ex db eb IIB T4 Gb**
	Clutch	**II 2G Ex h IIC T6 to T4 Gb**
	Pump	**II 2G Ex h IIC T4 Gb X**

NOTE – The motor and clutch are labelled individually. Individual component labelling can be located on the components themselves.

The overall labelling results from the individual labels.

Explanation of ATEX labelling:

Symbol	Explanation	For this unit
II	Unit group	Industry (except mining)
2	Unit category	Unit category 2 for zone 1 and zone 2
Ex h	Ignition protection type	Construction safety
IIB	Explosion subgroup with subdivision of the properties of the gas atmosphere	Gas (II) and subdivision in Group B
T4	Temperature class	Classification in temperature class T4; the unit reaches a maximum surface temperature of 135°C
Gb	Equipment protection level (EPL)	Safe for anticipated errors
X	Special conditions	Observe special operating conditions

2.5.4 Special pump conditions

2.5.4.1 Material resistance

The operator must ensure that the fluids and detergents are compatible with the materials installed in the pump.
The manufacturer will assist in determining compatibility.

2.5.4.2 Pump dry run

Pump dry run (when priming or draining) generates friction and thus heat in the pump.
The pump is safe to operate dry as per ATEX and does not generate temperatures greater than those specified for the temperature class, even when operating without fluids for extended periods of time.

2.5.4.3 Overpressure

The pump operator must ensure that the maximum permissible operating pressure of the pump is not exceeded in accordance with chapter Technical data, page 13.
The operating pressure can be limited, for example, by a pressure sensor on the pump. Alternatively, the operator can use a pressure relief valve (bypass) to limit the operating pressure as part of the risk assessment.

2.5.4.4 Exothermic reaction due to different pumping fluids

There is a risk of explosion due to exothermic reactions of the pumped fluid. Mixing different pumped fluids can lead to an impermissible temperature increase in the pumped fluid.
The operator must ensure that pumped fluids are not mixed.

- ► Clean the pump and the pipe system before changing the pumped fluid.
- ► Check compatibility of different pumped fluids and detergents.

2.5.4.5 Motor

The pump may only be fitted to the following motors with EX approval:

Manufacturer	Type
Siemens	6-pole: 1MB1563-1AC39-0NB4-Z_B32+B43+M4A+R15+Y56 or 8-pole: 1MB1563-1BD29-0NB4-Z_B32+B43+M4A+R15+Y56

The motor has its own EX approval.

2.5.4.6 Temperature data

Temperature class	T4
Permissible ambient temperature	10 … 25 °C Ensure that the ambient temperature does not exceed 25°C.
Permissible fluid temperature	10 - 80°C

The operator must ensure that the temperature of the pumped fluid and the ambient temperature do not exceed the specified maximum temperatures.

2.5.5 Special conditions of the motor manufacturer

NOTE – The motor manufacturer's technical documentation must be observed in full.

The flameproof gap lengths of this equipment are partly longer and the flameproof gap widths are partly smaller than those specified in Table 2 of EN 60079-1:2014. Information on the dimensions can be obtained from the manufacturer.

Screws with a yield strength of 450 N/mm² or better must be used.

If the rotating electrical machine is not self-cooled, either safe external cooling must be provided or the machine must be monitored using the built-in temperature sensors and an appropriate triggering device.

The motor may only be powered by a voltage intermediate circuit inverter with pulse width modulation that meets the criteria described in section 15.3.1.2 of the motor documentation.

Before commissioning, ensure that no impermissibly high overvoltages occur at the motor terminals when the inverter is powered.
The maximum permissible peak voltages are 1500 Vpk (standard) and 2200 Vpk (optional).

Motor variants with a temperature above 70°C at the cable glands and above 80°C at the core junction are identified with an additional information plate.

2.5.6 Special conditions of the coupling manufacturer

NOTE – The coupling manufacturer's technical documentation must be observed in full.

1 Temperature labelling indicates that a temperature increase ΔT compared to the ambient or operating temperature T_a must be considered when determining the maximum surface temperature occurring at the coupling. The temperature increase ΔT is specified in the operating manual of the coupling documentation.

2 ROTEX GS backlash-free shaft couplings may only be used if their materials are so resistant to mechanical and/or chemical influences or corrosion under the respective operating conditions that the explosion protection is not compromised.

3 ROTEX GS backlash-free shaft couplings must be fitted with fixed covers by the user to protect the couplings especially against the impact of falling objects. Openings for the required heat dissipation can be provided in the covers. When used in mining operations (equipment group I), the coupling cover must be capable of withstanding higher mechanical loads than standard for other industries (equipment group II). Detailed information on the design of the cover is provided in the operating/assembly instructions in the coupling documentation.
The cover must be electrically conductive and included in the potential equalisation.

4 When using the coupling in areas where there is a risk of dust explosion, the operator must ensure that dangerous amounts of dust do not accumulate between the cover and the coupling. The coupling must not operate in a dust bed.

5 When assembling screw connections, only use screws specified by the manufacturer. When tightening the screws, use the torque indicated by the manufacturer.

6 All screw connections for fastening the hub to the shafts must be secured to ensure that they do not become loose.

7 When used in mining operations, the specifications of the national mining regulations applicable to the respective area of use must be observed.

2.6 Personnel requirements

Devices in potentially explosive atmospheres may only be installed, commissioned, maintained and repaired by appropriate trained personnel.

Work may only be performed by persons who have been trained in various types of ignition protection and installation techniques, the applicable rules and regulations and general zoning concepts.

The person must have the relevant skills for the kind of work to be performed.

Persons who work with the pump unit must meet these requirements:

- Competent planning and execution of processes according to the pumped fluid
- Competent use of instrumental-analytical work methods according to the pumped fluid
- Competent handling of the pumped fluid

Persons who service the pump or the pump unit must meet these requirements:

- Competent assembly and disassembly of mechanical, electrical and electronic components.
- Understanding of the interaction and assembly of the components.

The owner must ensure that all the information in this operating manual is fully available to all persons who work with the pump unit at all times.

2.7 Residual risks

Observe the valid rules for the protection of accidents and protection measures.

2.7.1 Electric current

Touching electrical components can cause fatal electric shock.

- ► Disconnect the pump unit from the power supply before working on it.
  - ○ Pull out the mains plug.
  - ○ Disconnect all phases of the pump unit from the mains.
- ► Never open the motor housing or control panel and do not change any electrical components in the pump unit.
- ► Ensure that all cables are undamaged.

2.7.2 Harmful media

The pump can deliver fluids that are toxic, caustic, aggressive or otherwise harmful to persons or hazardous to the environment. Strong and hot alkaline solutions are sometimes used for cleaning (CIP, SIP). There is a risk of serious damage to health by contact.

- ► Observe the safety data sheet for the fluid used and wear the protective equipment or take the protective measures specified in the data sheet.
- ► Make preparations for possible leakages. When working on the pump, always behave as if there were fluid in the pump.
- ► Avoid chemical and biological reactions in the pump (mixing of different substances).
- ► Avoid freezing the fluid.
- ► Avoid contact of corrosive fluids (e.g. NaCl, HCl) with the outer stainless steel surfaces of the pump (e.g. shroud, base plate).

2.7.3 Pressure

The pump can be operated up to a maximum permissible pumping pressure. The maximum permissible pumping pressure depends on the temperature of the fluid. The values for the maximum permissible pumping pressure are specified in the chapter Technical data, page 13, and on the pump unit.

On exceeding the maximum permissible pressure, the diaphragm can tear and fluid can spill and injure persons.

- ► Always comply with the maximum permissible pumping pressure or use an overpressure protection device.
- ► Make sure that the suction and pressure lines are adequately dimensioned and fastened.
- ► Only apply pressure to the pump chamber when the pump chamber is mounted on the drive.

2.7.4 Hot surfaces

The pump can carry hot fluids. Strong and hot alkaline solutions are used for cleaning (CIP, SIP). These can heat up parts of the pump unit and the lines (>72°C). There is a risk of burns when touching.

- ► Do not touch the pump when the pump unit is in operation.
- ► Allow hot parts to cool down.
- ► Keep the air vents and filter clear. Ensure that the heat can escape

2.7.5 Crushing and cutting

The eccentric shaft rotates in a housing (ring drive). There is a risk of crushing fingers in the space in between.

- ► Only operate the pump with the pump chamber mounted.
- ► Disconnect the pump unit from the power supply before working on it.

There is a danger of being cut by sharp edges and corners and crushed by falling, heavy parts during maintenance and assembly.

► Wear cut-proof protective gloves for maintenance and assembly work.
► Wear safety gloves.

2.7.6 Noise

The pump unit can contribute to noise pollution (<80 dB).

► It is recommended to wear suitable hearing protection.

2.7.7 Stainless steel screws

All stainless steel screws must be protected against damage with assembly paste, e.g. with

Klüberpaste UH1 84-201.

3 Description

3.1 Structure and mode of operation

The pump is a machine for delivering fluids which is particularly insensitive to continuous stress and contamination in the fluid. Designed as a piston diaphragm pump, the pump delivers the fluid in self-enclosed volumes.

The pump has 4 individual diaphragms. A connecting ring that is moved back and forth from its centre position by an eccentric shaft activates the segments and creates the stroke movement. An electric motor drives the eccentric shaft.

The motor speed determines the pump performance. The direction of flow of the pump is independent of the direction of rotation of the motor.

The pump is self-priming and dry run-protected. There are no rotating parts in the pump head that can rub against each other. As a displacement pump, the pump already builds up the required pressure at low speeds.

3.2 Technical data

The technical data refer to the standard version of the pump.

Special pump versions (e.g. special connectors) may have different data.

Please also refer to the detailed documentation supplied.

Description	Unit	QF25EX 6-pole	QF25EX 8-pole
Overvoltage category		II	
Degree of soiling		2	
Protection class		I	
Max. altitude	m	1000	
Delivery rate eccentric shaft 5°:			
max.	lph	2300	
min.	lph	120	
Pressure according to temperature of fluid:			
<40°C	bar	6	
> 40°C	bar	4	
Maximum temperatures:			
Pumped fluid	°C	80	
CIP	°C	80	
SIP	°C	130	
Autoclave	°C	130	
Suction lift dry at optimum speed:			
Height	m	4.5 at 1800 rpm	4.5 at 1440 rpm

Description	Unit	QF25EX 6-pole	QF25EX 8-pole
Volume data:			
Approximate displacement volume	ml/U	27	
Filling volume without connection	ml	210	
Residual volume (free outlet)	ml	0	
Product-wetted surface (approx.):			
Surface area	cm²	793	
Product wetted materials (standard):			
Pump housing		1.4435	
Valve plate		1.4435	
Diaphragms		TPE	
Valves		EPDM	
O-rings		EPDM	
Non-product wetted materials (standard):			
outer case		1.4301	
Diaphragm housing lid		1.4571	
Bearing housing		1.4404	
Speed range:			
Pump	rpm	30-1800	
Pump unit	rpm	97-1800	72-1440
Connection specification (standard):			
Connection	"	1" (TriClamp)	
Flange diameter	mm	50.5	
Inside diameter	mm	22	
Position of connectors		Front	
Drive shaft diameter	mm	20h7	
Pump unit dimensions			
Length [L]	mm	807	831
Width [W]	mm	240	205
Height [H]	mm	391	360
Pump unit weight	kg	133	126
IP protection class (pump unit)	IP	56	
Customs tariff number		84138100	

Description	Unit	QF25EX 6-pole	QF25EX 8-pole
Temperature			
Operation	°C	10 to 40	
Transport	°C	-10 to 50	
Storage	°C	15 to 50	
Humidity:			
Operation	%	30 to 55	
Transport	%	30 to 60	
Storage	%	10 to 60	
Motor/gear:			
Manufacturer (standard)		Siemens	
Type		1MB1563-1AC39-0NB4-Z B32+B43+M4A+R15+Y56	1MB1563-1BD29-0NB4-Z B32+B43+M4A+R15+Y56
Rated speed	rpm	975	720
Voltage	V	230/400 (Δ / Y)	400 (Y)
Rated current	A	2.75	4.15
Power	kW	1.1	1.5
Shaft diameter	mm	28J6	
IP protection class	IP	65	
Colour	RAL	9002	
Clutch		KTR Rotex GS24 (ATEX)	
Noise			
L_{pA}	dB	74,3	72,3
L_{WA}	dB	71,9	69,9
U_{PA}	dB	1,8	1,3
U_{WA}	dB	-0,6	-1,1
L_{PfA}	dB	74,23	72,19
Certificates/proofs (optional):			
Elastomers (product wetted)		USP <87>, <88> Cl. VI; FDA21CFR177; BSE/TSE Safe	
Stainless steel parts (product wetted)		3.1; surface roughness; ferrite (EN10204)	

3.3 Sub-assemblies

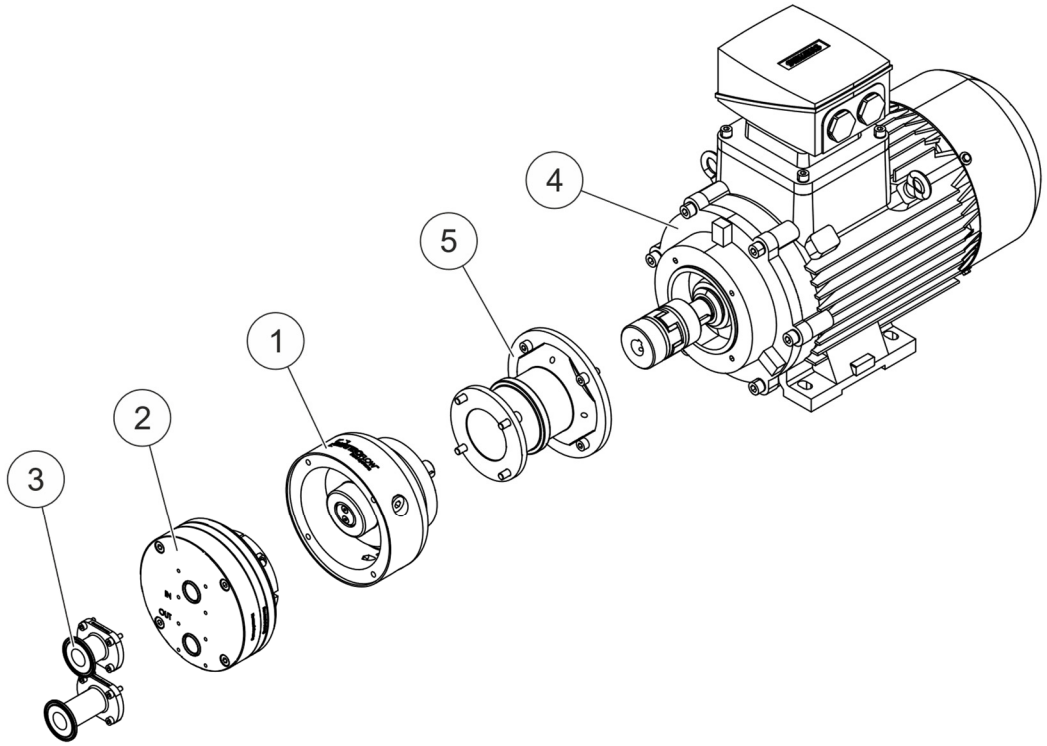


Fig. 1: Sub-assemblies QF25EX

Item	Quantity	Designation	
1	1	PQ25A-EX	Ring drive ATEX
2	1	QF25C-EX	Pump chamber ATEX
3	1	PQ25U-EX	Connections ATEX, TC, DIN32676, series C, 1.5"
4	1	PQ25J-BG112-8P-EX	Drive unit ATEX, AC motor, BG100, 1.5 kW, 8-pole, 400 V 50 Hz, IEC
5	1	PQ25T-EX	Motor flange assembly ATEX, IEC, BG100/112

3.3.1 Ring drive PQ25A-EX

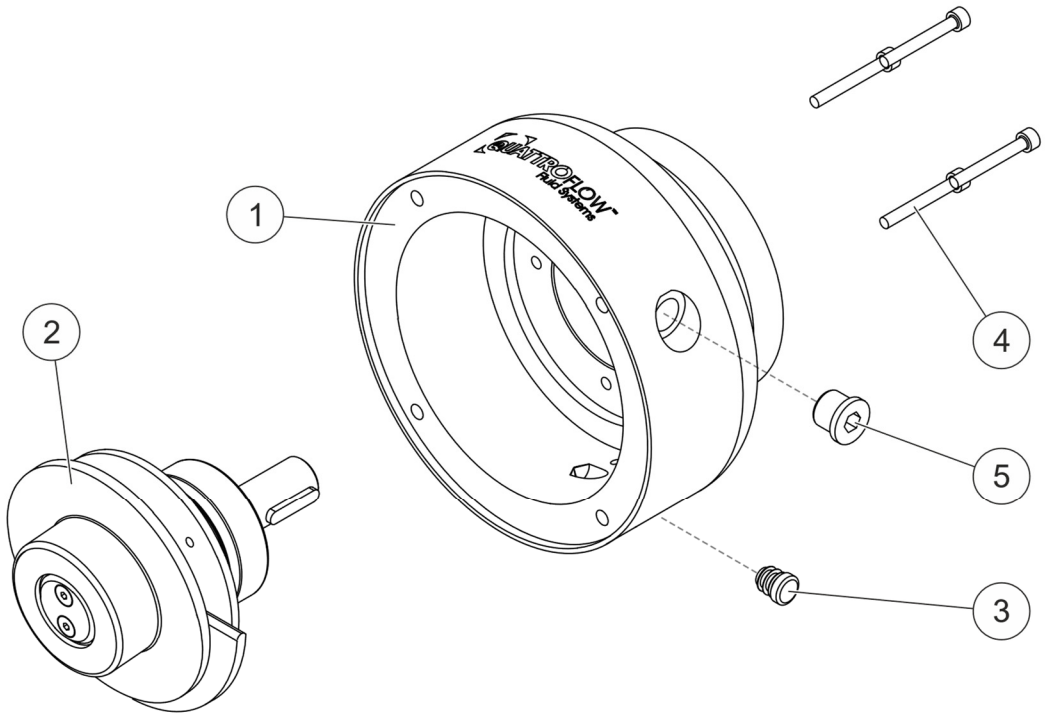


Fig. 2: Sub-assembly ring drive PQ25A-EX

Item	Quantity	Designation		Material	Torque
1	1	Q25-022-02	Bearing housing, BG100, BG112	1.4404	
2	1	PSKITWLC255-MU-EX	Quattroflow QF25 maintenance kit, shaft bearing cap unit, 5° eccentric shaft, with bearing seal		
3	1	GPN320-GL13	Sealing plugs	PA	
4	4	DIN912M5x40	Cylinder head screw	A2-70	4.9 Nm
5	1	DIN908M16x1.5	Locking screw	A2-70	5 Nm

3.3.2 Pump chamber QF25C-EX

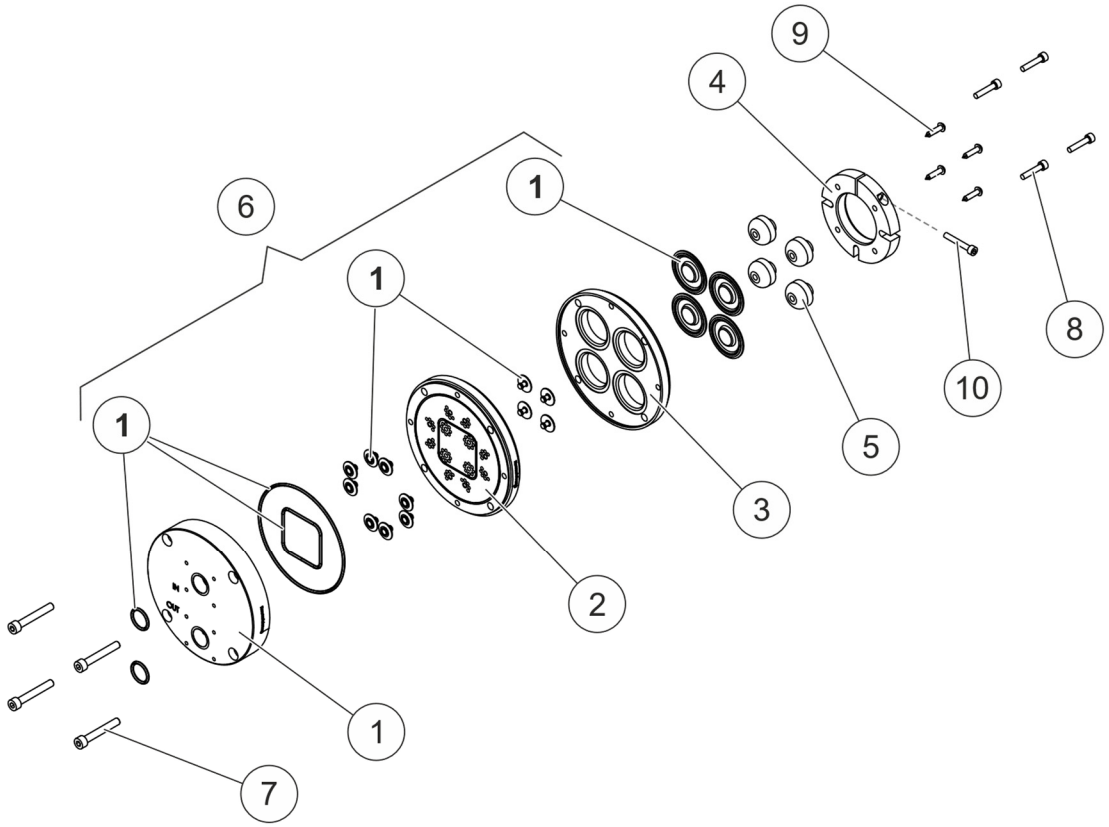


Fig. 3: Sub-assembly pump chamber QF25C-EX

Item	Quantity	Designation		Material	Torque
1	1	Q25-001-01	Pump housing	1.4435	
2	1	Q25-002-01	Valve plate	1.4435	
3	1	Q25-003-01	Diaphragm housing lid	1.4571	
4	1	Q25-004-01	Clamping ring	1.4301	
5	4	Q25-006-01	Diaphragm support	PETP	
6	1	PSKITQF25MU	Quattroflow 2500 S maintenance kit (diaphragm, valves, O-rings)		
1					
2					
3					
4					
5					
7	4	DIN912M8X55	Cylinder head screw DIN912 M8x55	A2-70	20 Nm

Item	Quantity	Designation		Material	Torque
8	4	DIN912M6X30	Cylinder head screw DIN912 M6x30	A2-70	10 Nm
9	4	DIN7981 5.5x25	Tapping screw with raised countersunk head H form C	A2-70	3 Nm
10	1	DIN912M6X40	Cylinder head screw DIN912 M6x40	A2-70	12 Nm

3.3.3 Connecting nozzle PQ25U-EX

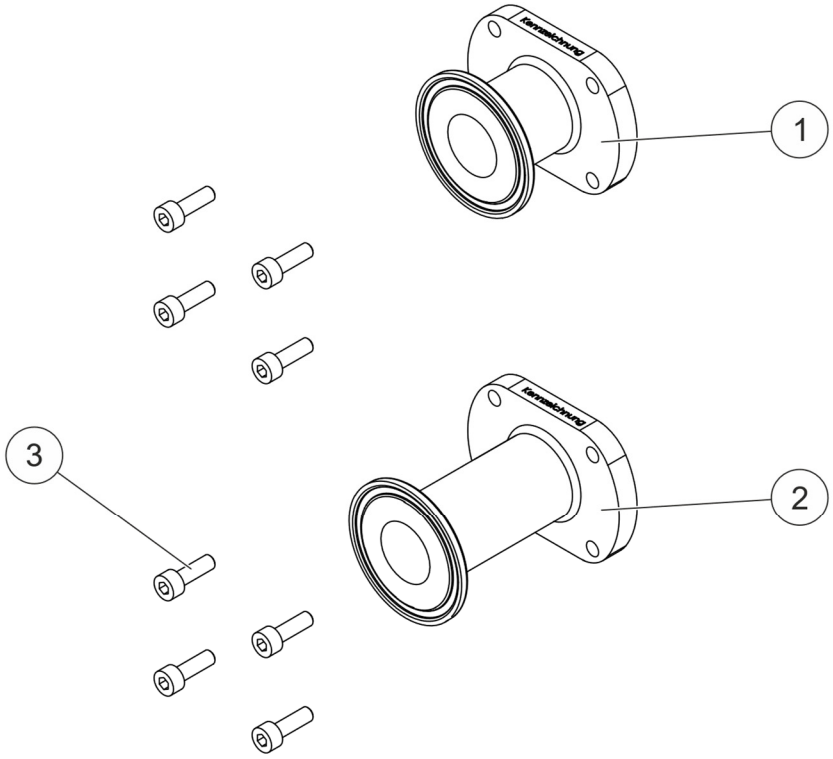


Fig. 4: Sub-assembly connecting nozzle PQ25U-EX

Item	Quantity	Designation		Material	Torque
1	1	Q25-010-01	TriClamp DIN32676, series C, 1”, L40		
2	1	Q25-010-02	TriClamp DIN32676, series C, 1”, L70		
3	8	DIN912M5X16	Cylinder head screw DIN912 M5x16		4.9 Nm

3.3.4 Drive unit PQ25J-BG100-6P-EX/PQ25J-BG112-8P-EX

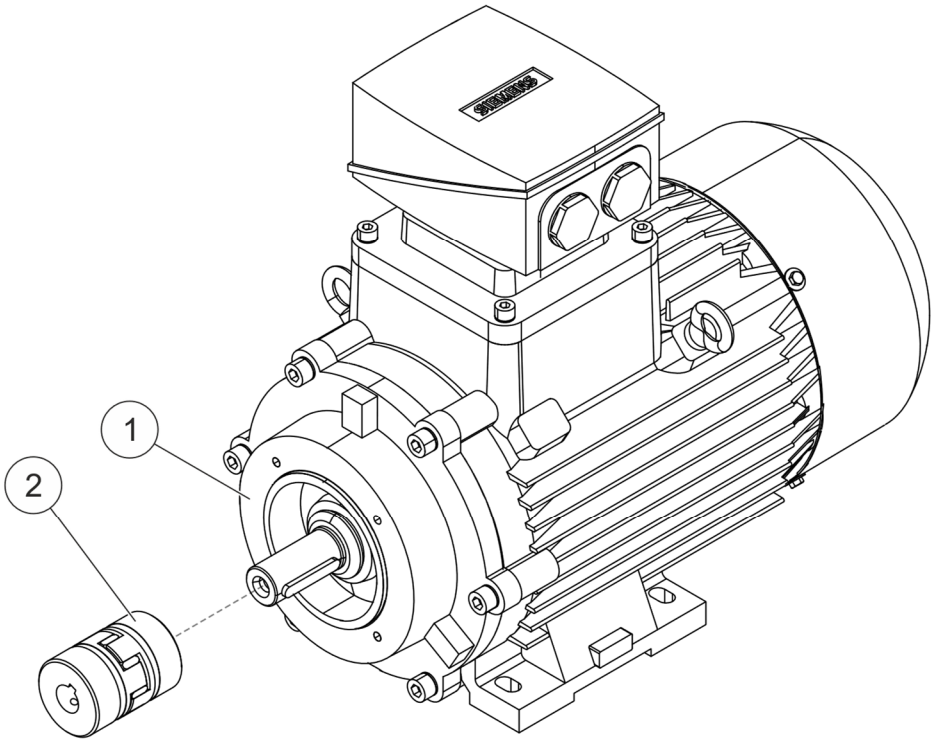


Fig. 5: Drive unit assembly PQ25J-BG100-6P-EX / PQ25J-BG112-8P-EX

Item	Quantity	Designation		Material	Torque
1 (Option)	1	Q25-M11KW-6P-IEC100-EX	ATEX motor, IEC-BG100, B34, 1.1 kW, 6-pole, 400 V 50 Hz, IE3		
1 (Option)	1	Q5K-M15KW-8P-IEC112-EX	ATEX motor, BG112, B34, 1.5 kW, 8-pole, 400 V 50 Hz, IE3		
2	1	KULUØ28-Ø20-ATEX	Coupling Rotex GS24, ATEX version		

3.3.5 Motor flange PQ25T-EX

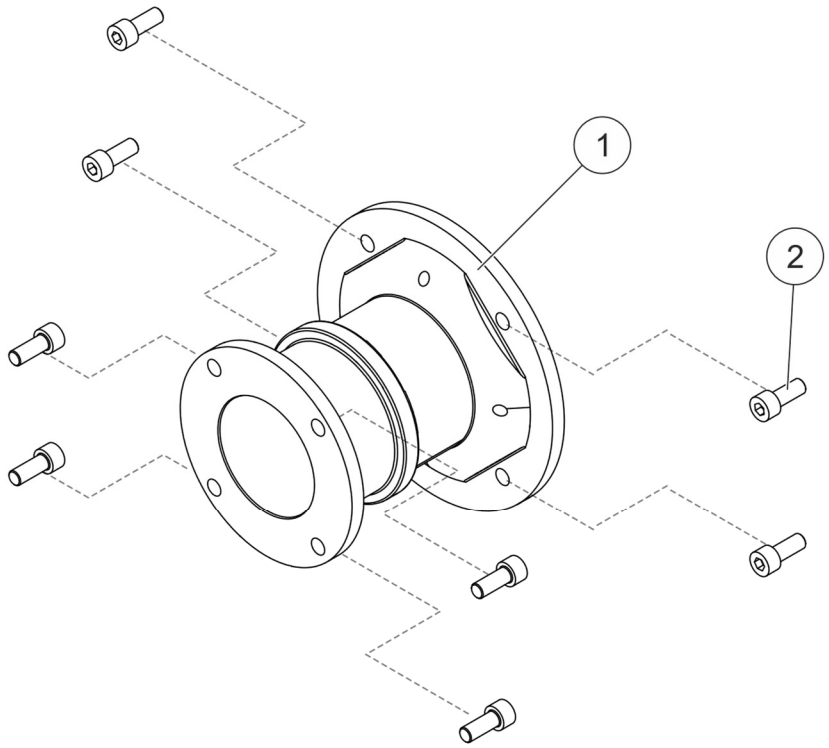


Fig. 6: Sub-assembly motor flange PQ25T-EX

Item	Quantity	Designation		Material	Torque
1	1	Q25-016-09	Motor flange, IEC BG100&BG112	see drawing	
2	8	DIN912M8x20	Cylinder head screw	A2-70	20 Nm

3.4 Performance chart

The performance chart shows the approximate delivery rate depending on the pump speed.
The pump speed is equal to the motor speed when the motor is coupled directly to the pump.

Conditions

- Test fluid water at room temperature
- Eccentric shaft 5°
- Pressures 0 to 6 bar
- New diaphragms and new valves
- Under standard conditions

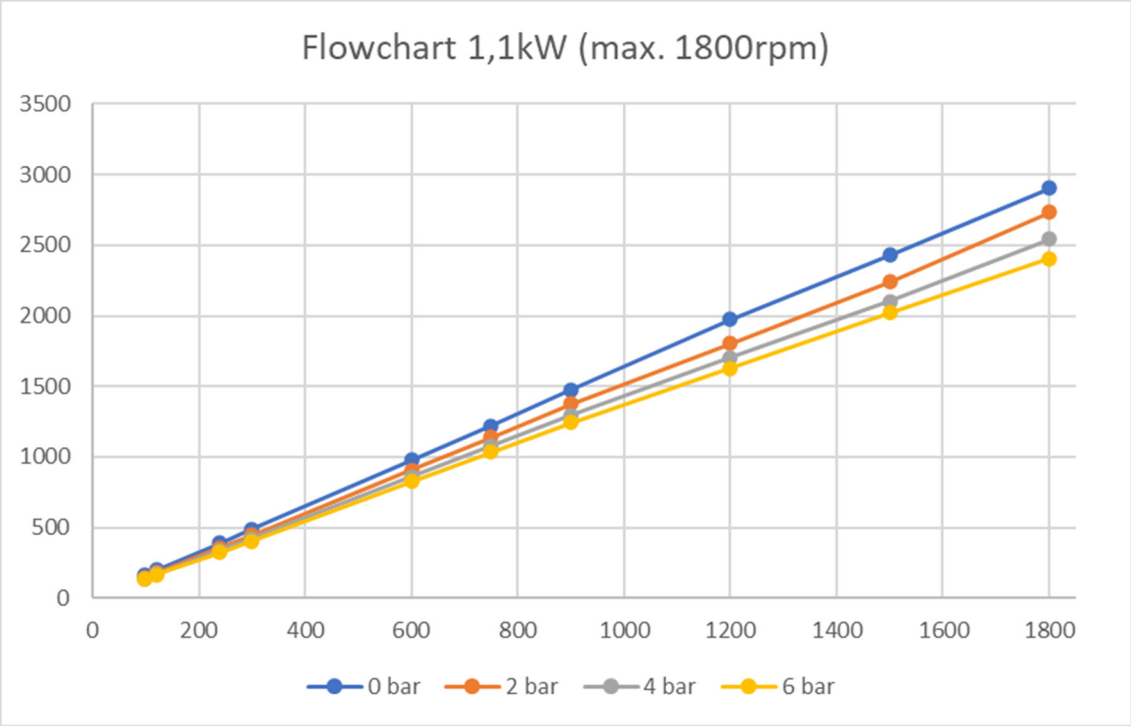


Fig. 7: Performance chart QF25EX-ACUJT (6-pole)

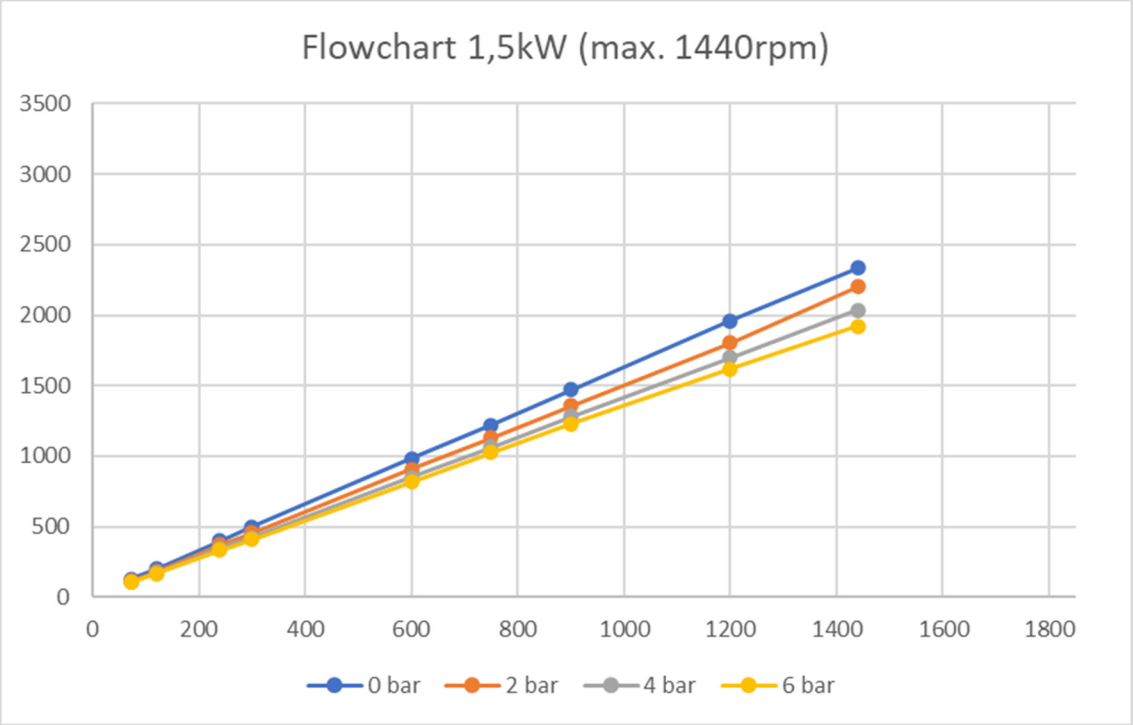


Fig. 8: Performance chart QF25EX-ACUJT-X01 (8-pole)

3.5 Labelling

This information is affixed to the pump:

- Pump type
- ATEX labelling
- Construction year
- Protection class
- Maximum pumping pressure and hot surfaces
- Speed
- Labelling of connections
- Labelling of direction of flow
- Labelling the pump unit

► Always keep the information in perfectly legible condition.

The type plate can be found on the flange and the pump.
The serial number can be found on the front.

3.5.1 Pump unit type label

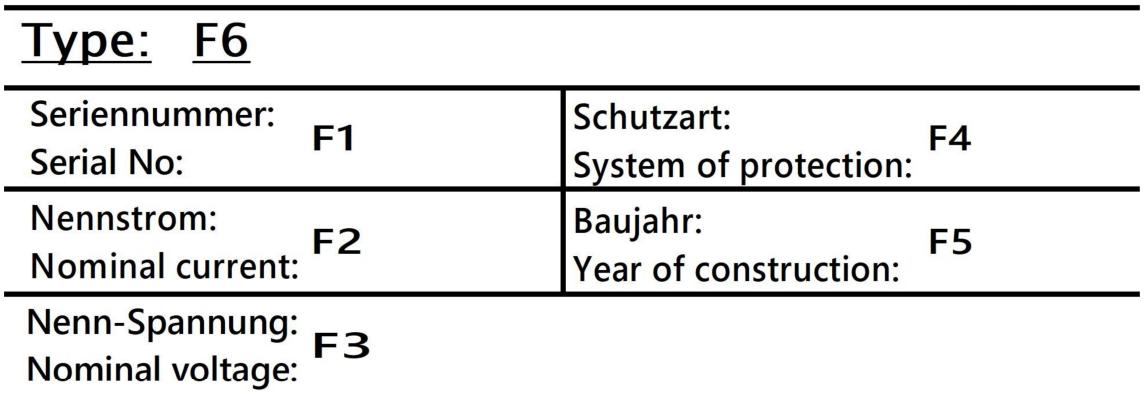


Fig. 9: Example type label at pump unit

Abbreviation	Specification
F1	Serial number
F2	Rated current in A
F3	Rated voltage in V
F4	IP protection class
F5	Year of construction (month/year)
F6	Pump type

Tab. 1: Information on the type label at the pump unit

3.5.2 Pump type label

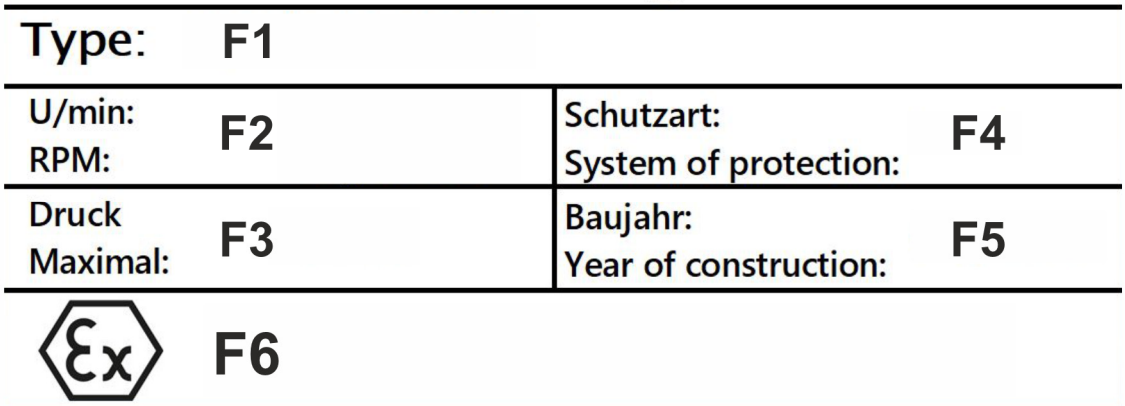


Fig. 10: Example type label at pump

Abbreviation	Specification
F1	Pump type
F2	Revolutions per minute
F3	Maximum pressure in bar
F4	IP protection class
F5	Year of construction (month/year)
F6	ATEX labelling

Tab. 2: Information on the type label at the pump

4 Assembly/installation

4.1 Safety

⚠ **WARNING** – The eccentric shaft rotates in a housing. There is a risk of crushing in the space in between. Disconnect the pump from the power supply.

Observe the following when setting up the pump unit:

- Set up securely and stably on a non-slip surface able to bear the weight of the pump unit.
- Do not operate in a humid or aggressive atmosphere (e.g. in air containing steam, salt or acid) to avoid corrosion on the motor and the control panel.

Pipes and accessories must be earthed separately.

4.2 Transport

The pump unit is delivered ready for use and packaged.

⚠ **WARNING** – There is a risk of injury if the pump unit falls. Ensure that the pump unit cannot fall during transport and that it has a secure stand when it is parked.

⚠ **WARNING** – Risk of crushing. Crushing may occur when lifting, lowering or assembling the pump. Appropriate aids and protective equipment must be used. Larger and heavy assemblies must be carefully attached to lifting gear and secured during transportation/replacement.

⚠ **WARNING** – Risk of injury. The pump unit is heavy. Carry the pump together with another person or with suitable lifting gear.

► Raise the pump unit evenly as shown below.

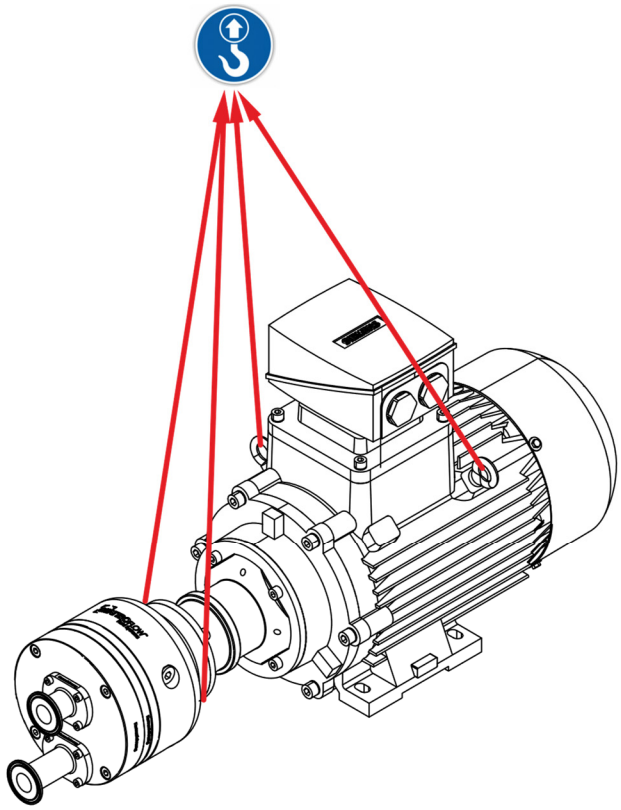


Fig. 11: Pump unit attachment points

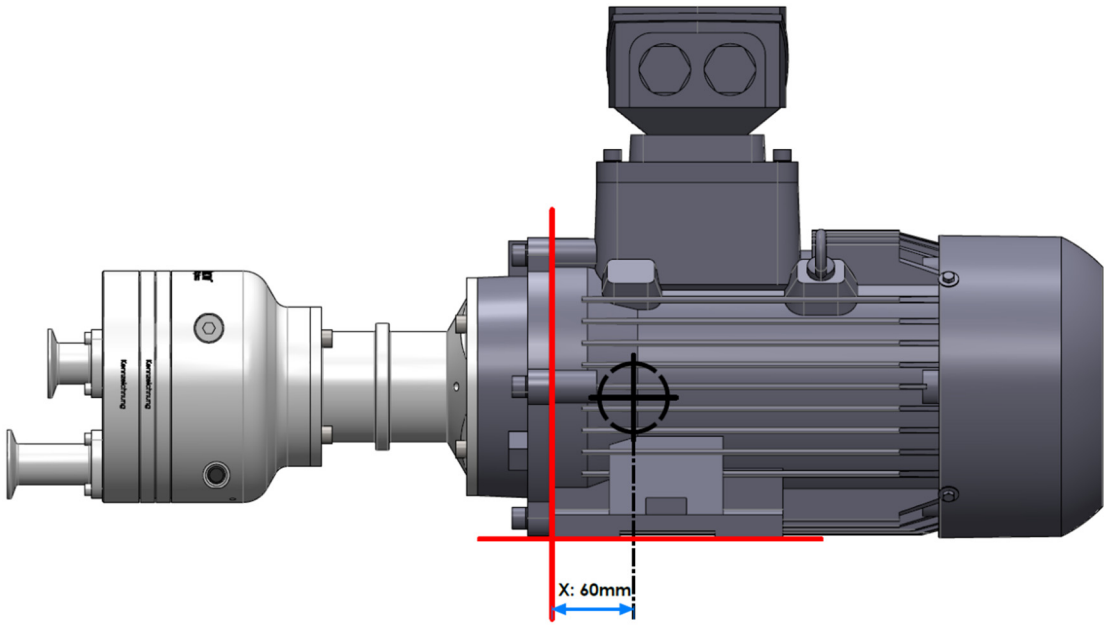


Fig. 12: Pump unit centre of gravity

4.3 Storage

⚠ **WARNING** – Only store the pump unit under the conditions specified in the technical data in order to prevent damage and leakage of the fluid (see Technical data, page 13).

► Leave the pump unit and pump in the packaging until the pump unit is used.

► Protect the pump unit and pump from wet, cold, soiling, UV radiation and mechanical influences.

- consistently aired, dust and vibration-free room
- no exposure to heat (sunlight, heating)

4.4 Space requirement

Sufficient space must be provided around the pump unit for:

- Ventilation
- Operation
- Maintenance
  - see Replacing the WLC unit, page 39
  - see Replacing the elastomers, page 43

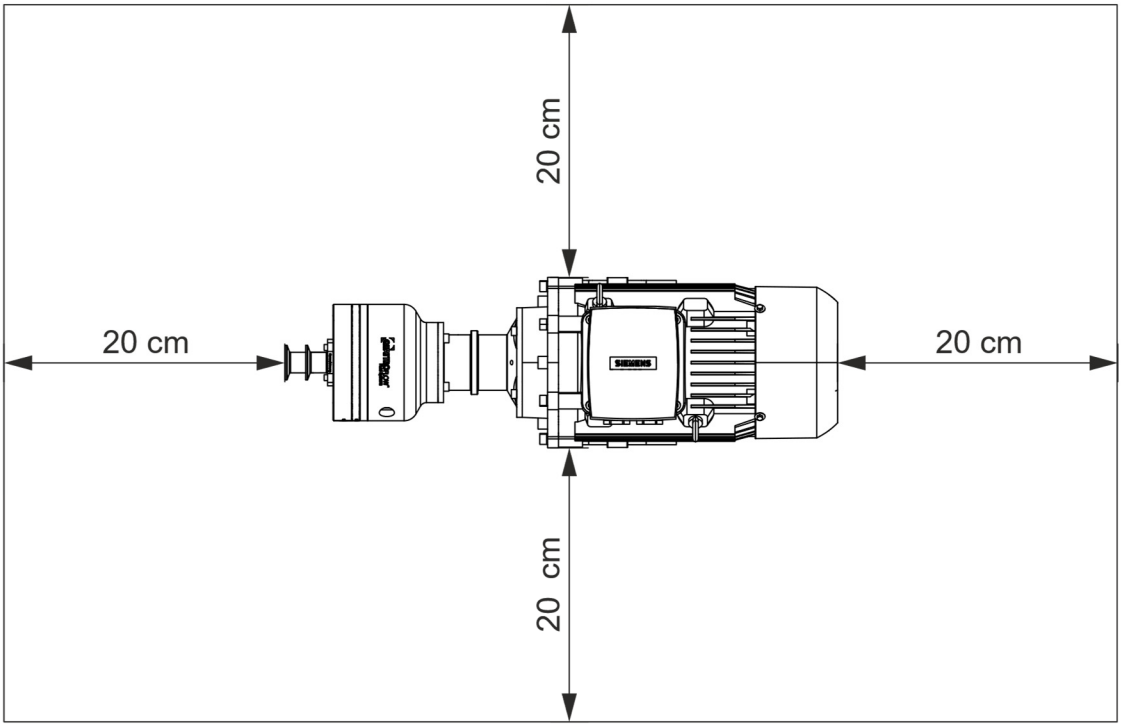


Fig. 13: Space requirement

4.5 Connections

4.5.1 Pipes

⚠ **WARNING** – If the pressure can rise above the maximum permissible pressure of the pump, a pressure relief valve or automatic pressure cut-out is required.

The pump must be connected with pipes and hoses as follows:

- suction side
  - pipes are adequately dimensioned Too small a pipe cross-section and/or an unfavourable mechanical flow design (e.g. many pipe elbows) can lead to a reduced pump performance and to cavitation.
  - pipes withstand the vacuum pressure and do not collapse
  - pipes withstand the temperatures of the fluid and the cleaning (CIP and SIP).
- pressure side

  Pipes are sufficiently dimensioned:
  - for the pumping and operating pressure
  - for the operating and fluid temperature

4.5.2 Electric cables

⚠ **DANGER** – Electric shock due to electrical voltage. Touching electrical components can cause fatal electric shock. The pump may only be connected by experts. Disconnect the pump from the power supply before working on it.

► Pull out the mains plug.

► Disconnect all phases of the pump unit from the mains.

NOTE – Only operate the pump unit with the mains voltage and mains frequency specified in the technical data (see Technical data, page 13) to prevent damage to the control unit and drive (see Labelling, page 24).

4.5.3 Collection vessel

⚠ **CAUTION** – Fluid can spill if the diaphragm bursts. The fluid escapes through a hole in the ring drive. Place a collection vessel under the ring drive.

NOTE – If the pump unit is operated unsupervised for a long period of time, the special leakage sensor accessory is recommended for diaphragm monitoring. This applies especially for pumping dangerous fluids.

► If you have any further questions regarding diaphragm monitoring, contact the Service Department.

5 Installation/removal

5.1 Safety

⚠ **DANGER** – Electric shock due to electrical voltage. Touching electrical components can cause fatal electric shock. Disconnect the pump from the power supply before working on it.

► Pull out the mains plug.

► Disconnect all phases of the pump unit from the mains.

⚠ **DANGER** – Risk of chemical burns. Contact with strong alkalis may cause chemical burns. Before dismantling components, close the suction and discharge lines and drain if necessary. If the pump is removed, a note about the last pumped fluid or a decontamination certificate must be enclosed.

⚠ **WARNING** – Electrical and mechanical hazards. Ensure that the pump unit is in a safe condition:

- emptied
- flushed
- depressurised
- cooled
- voltage-free

⚠ **WARNING** – Risk of burns. The pumped fluid and cleaning products can heat up parts of the pump. Do not touch the pump. Allow the pump to cool down.

⚠ **WARNING** – Risk of injury. After completing the work, all safety and protective equipment must be reinstalled or put back into operation. Before starting up again, the points listed in the chapter Commissioning, page 34, must be observed and the pump must be checked for leaks.

⚠ **CAUTION** – When using pressure-side hoses, ensure that these hoses are approved for the pumping pressure and operating temperature to prevent damage to the hoses and escaping fluids.

NOTE – Torques can be found in the information contained in chapter Sub-assemblies, page 16.

5.2 Pump drive

Pump and drive alignment:

When mounting the pump on the drive, the coupling alignment must be verified to avoid mechanical strains acting on the pump.

- Before installation, check the correct position of the coupling hub on the motor and pump side.

Flexible coupling:

The flexible coupling is part of the ATEX approval; only the supplied coupling or original spare parts may be used.

NOTE – Observe the separate instructions of the clutch manufacturer.

5.2.1 Potential equalisation

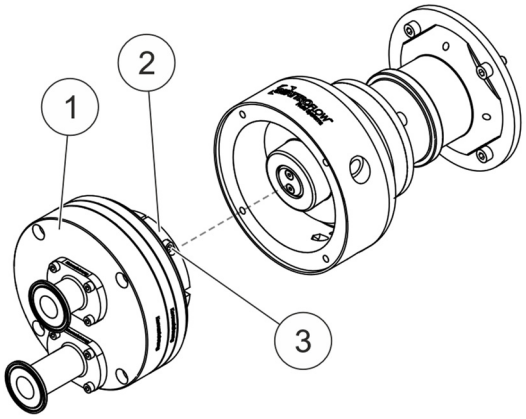
After installation, ensure that there is no potential between the motor's potential equalisation connection and that of the pump.

This must be less than 1 Ohm at 10 A test current.

5.3 Assembling the pump chamber

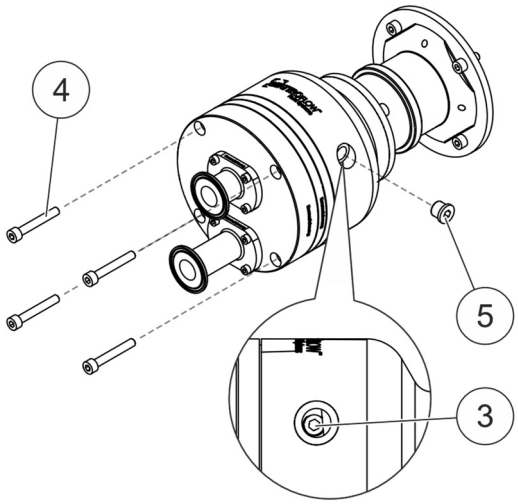
Required tools:

- Allen key (8 mm, 6 mm, 5 mm)



► Install the pump chamber (1).

NOTE – You can turn the pump chamber in 90°steps so that the position of the connectors on the suction and pressure sides fit optimally in the machine. The clamping ring (2) must be adjusted to the rotation of the pump chamber so that the clamping ring screw (3) can be reached through the opening in the ring drive.

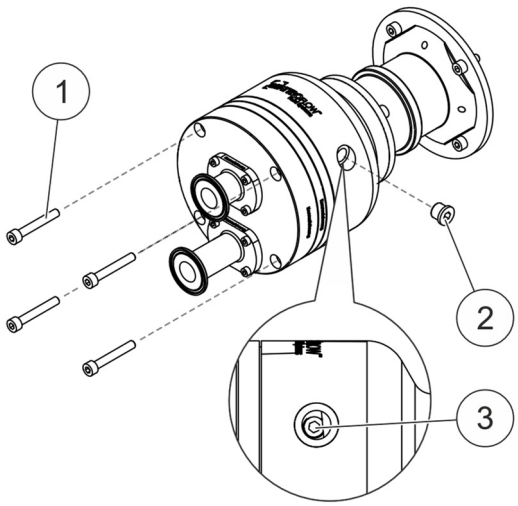


► Fasten the screws (4).
► Tighten the clamping ring screw (3).
► Fasten the locking screw (5).

5.4 Disassembling the pump chamber

Required tools:

- Allen key (8 mm, 6 mm, 5 mm)

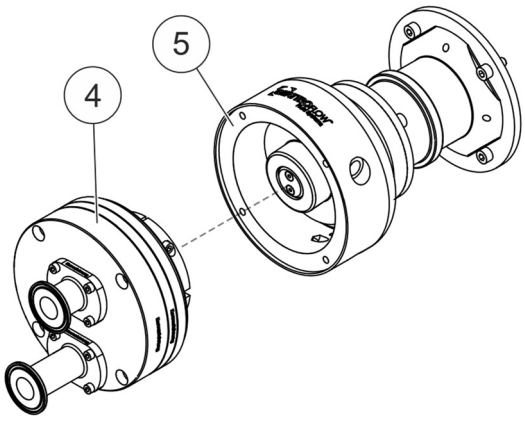


► Remove the screws (1) from the housing.

► Remove the locking screw (2).

⚠ **CAUTION** – Risk of crushing. After loosening the last screw, the pump chamber can detach from the drive and fall off. Hold the pump chamber when loosening the last screw.

► Tighten the clamping ring screw (3).



► Pull the pump chamber (4) forwards off the ring drive (5).

6 Commissioning

6.1 Safety

⚠ **DANGER** – Risk of explosion if the ignition temperature of the pumped fluid is exceeded. Pump dry run is not permitted if the pumped fluid can produce an explosive atmosphere with an ignition temperature lower than the specified T class.

The pump can also run dry without pumped fluid in the pump for a short time, e.g. during suction at commissioning, without exceeding the surface temperature according to the temperature class.

However, this operating state is only permitted under the conditions specified in the technical data.

Before operating for the first time, fill the pump with 0.1 N to 0.5 N NaOH solution and allow the solution to soak in. The soaking time depends on the desired result (e.g. depyrogenation 10 to 20 hours). Adapt the flushing and cleaning procedure to the respective application and check the effect by suitable analytical processes.

6.2 Commissioning in potentially explosive atmospheres

Commissioning of the pump unit in potentially explosive atmospheres is prohibited until conformity with this directive has been verified by an appropriate certificate.

Do not operate the pump unit until system conformity with the applicable directive has been confirmed.

When using the pump unit outside the European Community, observe the country-specific regulations.

6.3 Test run

NOTE – A test run must be carried out before using the pump for the first time.

- ► Carry out a test run with a safe fluid, e.g. water.
- ► Check the suitability of the pump by performing representative preliminary tests.
- ► Check the compatibility of the pump with the fluid to be pumped. Fluids containing oil or solvents can lead to swelling or destruction of the elastomer materials. Check these components in particular:
  - ○ Pump chamber (see Pump chamber QF25C-EX, page 18)
  - ○ Connecting nozzle (see Connecting nozzle PQ25U-EX, page 20)
- ► Consult the Material-and-Certification-Guide or contact our Service if in doubt.

7 Operation

7.1 Safety

⚠ **DANGER** – Risk of explosion due to exceeding or falling below the permissible speed. Exceeding or falling below the permissible speed can lead to an increase in temperature in/on the pump. Only operate the pump at the permissible speed.

⚠ **DANGER** – Risk of chemical burns. The use of strong alkaline solutions can lead to chemical burns. Wear protective goggles, safety gloves and protective clothing. Observe the safety data sheet of the fluid used.

⚠ **WARNING** – Risk of burns. The pumped fluid and cleaning products can heat up parts of the pump. Do not touch the pump. Allow the pump to cool down.

⚠ **WARNING** – Only operate the pump with the pump chamber and housing mounted. Do not operate the pump if the pump or one of its components is damaged.

⚠ **WARNING** – Operation in a closed circuit at low flow rates can result in an impermissible temperature increase in the pumped fluid. Only operate the pump with a sufficient flow rate (see Technical data, page 13, minimum flow rate).

⚠ **WARNING** – Do not fall below the permissible negative pressure on the suction side as specified in the chapter Technical data, page 13.

⚠ **WARNING** – On exceeding the maximum permissible pressure, the conveying diaphragm can tear and fluid can spill. Make sure that the suction and pressure lines are adequately dimensioned. Only apply pressure to the pump chamber when the pump chamber is mounted on the drive.

The maximum permissible pumping pressure depends on the temperature of the pumped fluid (see Technical data, page 13).

⚠ **WARNING** – Risk of injury Never operate the pump unit without a coupling guard or motor shroud.

ATTENTION – Property damage. If the permissible negative pressure on the suction side is exceeded, the pump may be damaged by cavitation. Observe the information on operating pressure in the chapter Technical data, page 13.

ATTENTION – Property damage. Operation at incorrect mains voltage and mains frequency can damage the control unit or the drive of the pump unit. Only operate the pump unit at the mains voltage and mains frequency specified in the chapter Technical data, page 13.

7.2 Switching on

⚠ **WARNING** – Overpressure can lead to leakages and spillage of the fluid. It is possible to be exposed to a dangerous fluid or to be scalded. Never switch the pump unit on if the pressure side might be closed.

► Check the system in advance for possible leakages and visible damage.

► Open the pressure line.

► Flush the pump before each use and condition it with a product-compatible solution (e.g. buffer).

7.3 Emptying

⚠ **DANGER** – Explosion hazard. Empty the pump of flammable liquids in particular.

7.4 Shutdown

Shut down the pump unit if necessary.

► Empty the pump.

► Disconnect the pump unit from the power source.

⚠ **WARNING** – The operator must provide a suitable device for disconnecting the pump unit from the power source.

8 Maintenance

8.1 Safety

⚠ **DANGER** – Risk of chemical burns. The use of strong alkaline solutions can lead to chemical burns. Wear protective goggles, safety gloves and protective clothing. Observe the safety data sheet of the fluid used.

⚠ **DANGER** – Risk of chemical burns. Contact with strong alkalis may cause chemical burns. Before dismantling components, close the suction and discharge lines and drain if necessary. If the pump is removed, a note about the last pumped fluid or a decontamination certificate must be enclosed.

⚠ **DANGER** – Electric shock due to electrical voltage. Touching electrical components can cause fatal electric shock. Disconnect the pump from the power supply before working on it.

► Pull out the mains plug.

► Disconnect all phases of the pump unit from the mains.

⚠ **WARNING** – Electrical and mechanical hazards. Ensure that the pump unit is in a safe condition:

- emptied
- flushed
- depressurised
- cooled
- voltage-free

⚠ **WARNING** – Risk of burns. The pumped fluid and cleaning products can heat up parts of the pump. Do not touch the pump. Allow the pump to cool down.

⚠ **WARNING** – Risk of injury. After completing the work, all safety and protective equipment must be reinstalled or put back into operation. Before starting up again, the points listed in the chapter Commissioning, page 34, must be observed and the pump must be checked for leaks.

⚠ **WARNING** – Loss of explosion protection approval due to non-approved parts or improper maintenance. Only original spare parts from the manufacturer may be used. All repair or maintenance work may only be carried out by suitably qualified specialist personnel (see chapter Personnel requirements, page 10).

ATTENTION – Bearing wear. A diaphragm rupture can result in increased wear of the bearing as well as heating. Replace the pump bearings after diaphragm rupture.

⚠ **CAUTION** – Repairs in potentially explosive atmospheres may only be carried out after performing a thorough feasibility check, only using appropriate tools. For labelling, see the enclosed declaration of conformity and the corresponding sticker on the pump.

8.2 Dust

See IP protection class labelling of the individual pump unit components.

⚠ **DANGER** – Fire hazard. Dust deposits can catch fire. Prevent the formation of dust deposits on the units.

8.3 Maintenance intervals

Wear parts, such as diaphragms, valves and O-rings, must be checked at regular intervals and replaced regularly in the course of preventive maintenance.

The recommended intervals were determined under standardised conditions.

- Fluid: Water
- Fluid temperature: 20°C
- Ambient temperature: 20°C
- Flow rate: 2000 lph
- Counter pressure: 4 bar

If conditions are different, e.g. higher fluid temperatures, the diaphragm service life must be determined by the operator in process-related preliminary tests and a regular visual inspection or detailed inspection must be carried out. Depending on the application, it may be necessary to shorten the maintenance interval for the diaphragm.

► Check the intervals close to the process and adapt the recommended intervals to the application and the pumped fluid.

► Use only original spare parts.

Recommended interval	Component	Activity
After opening the pump chamber	Elastomers ● Diaphragm ● Valves ● O-rings	Replace (available as a replacement kit)
After diaphragm breakage or 1000 operating hours or at least once a year	Elastomers ● Diaphragm ● Valves ● O-rings	Replace (available as a replacement kit)
	WLC unit ● Eccentric shaft ● Bearings ● Connector plate	Replace (available as a pre-assembled replacement kit)
In the event of corrosion, fluid in the bearing shell or a clearly audible running noise	WLC unit ● Eccentric shaft ● Bearings ● Connector plate	Replace (available as a pre-assembled replacement kit)

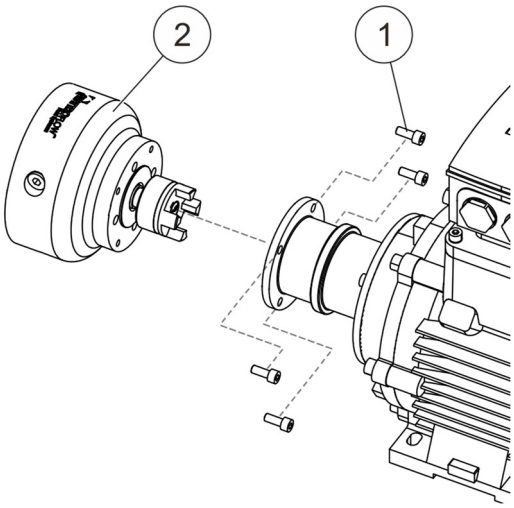
Please see the maintenance instructions in the respective operating manual for the following components:

- Motor
- Coupling

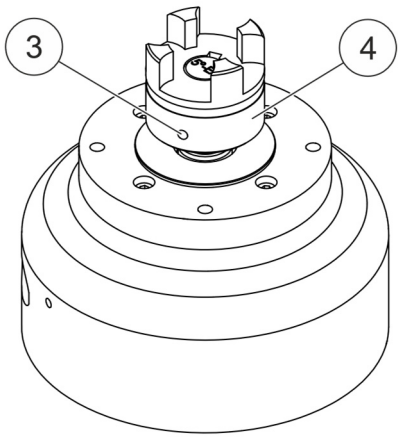
8.4 Replacing the WLC unit

Required tools:

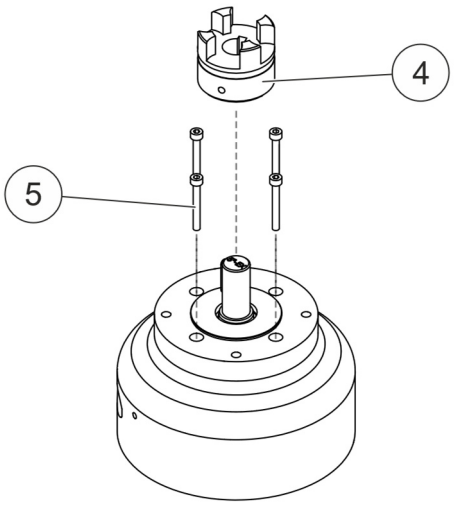
- Allen key (4 mm, 2.5 mm)
- Screwdriver with cross recess
- Open-end wrench (SW 13)
- ► Assembly bolt
- Soft-face hammer



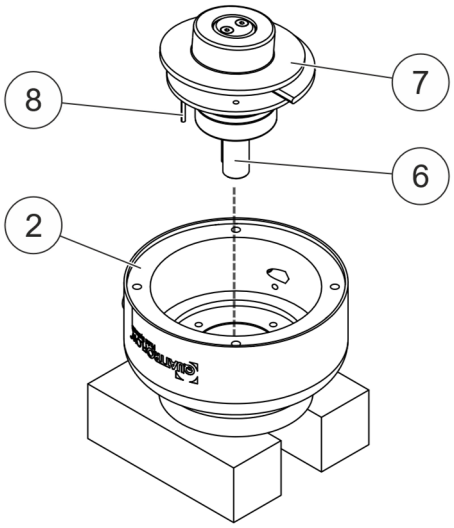
► Dismantle the pump chamber (see Disassembling the pump chamber, page 33).
► Remove the screws (1).
► Pull off the ring drive (2) towards the front.



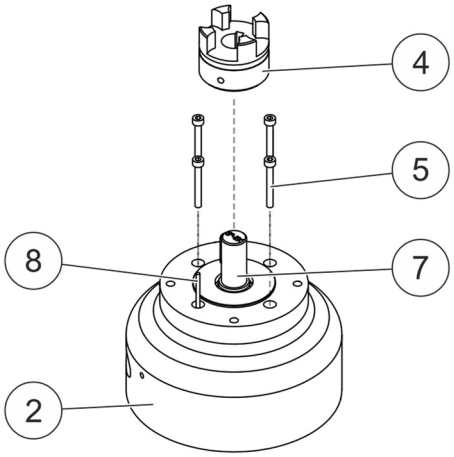
► Loosen the screw (3) in the coupling half (4).



- ► Remove the coupling half (4).
- ► Remove the screws (5).



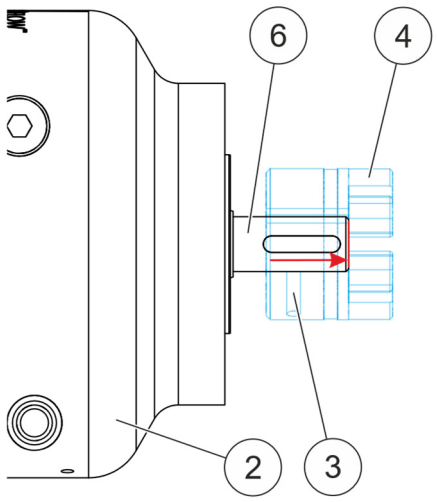
- ► Turn the ring drive (2).
- ► Place the ring drive (2) so that the shaft (6) is not under load.
- ► Dismantle the WLC unit (7).
- ► Mount the assembly bolt supplied (8) on the new unit.
- ► Insert the new WLC unit (7) into the ring drive (2).



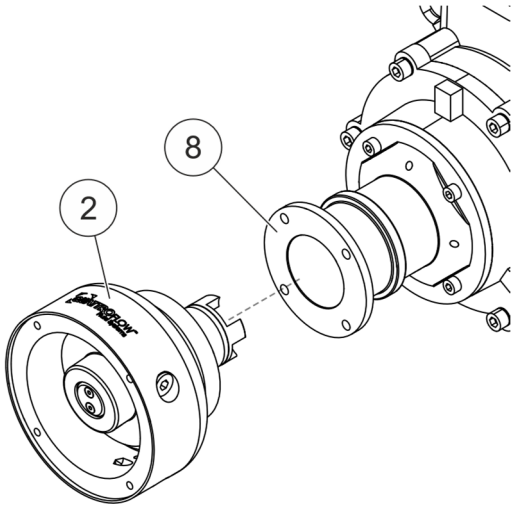
- ► Turn the ring drive (2).

ATTENTION – The WLC unit (7) may fall out and be damaged. Hold the WLC unit (7) in place.

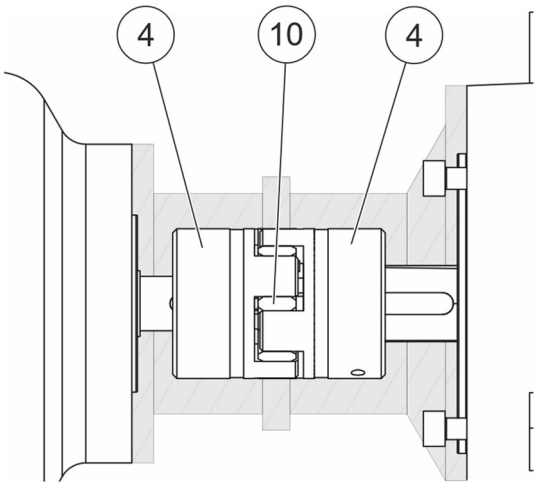
- ► Secure the WLC unit (7) using the assembly bolt (8).
- ► Tighten the first screw (5).
- ► Unscrew the assembly bolt (8).
- ► Tighten the remaining screws (5).
- ► Tighten the screws (5).
- ► Push the coupling half (4) onto the shaft.



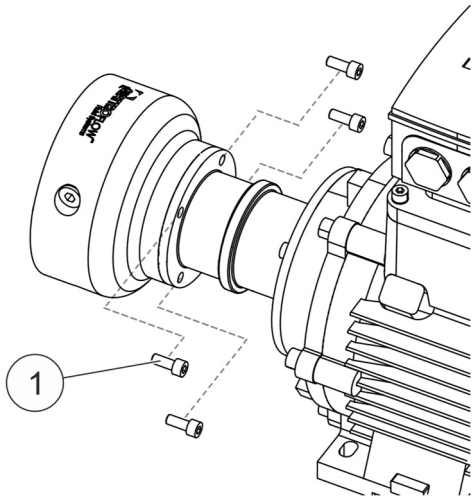
- ► Fit the coupling halves (4) onto the shaft (6) of the ring drive (2). The ends of the shafts should match the ends of the coupling halves (see red marking).
- ► Tighten the locking screw (3) at 10.5 Nm.



- ► Fit the ring drive (2) onto the motor flange (8).



- ► Fit the sprocket wheel (10) onto one of the coupling halves (4).
- ► Insert the two coupling halves (4) into each other as shown.

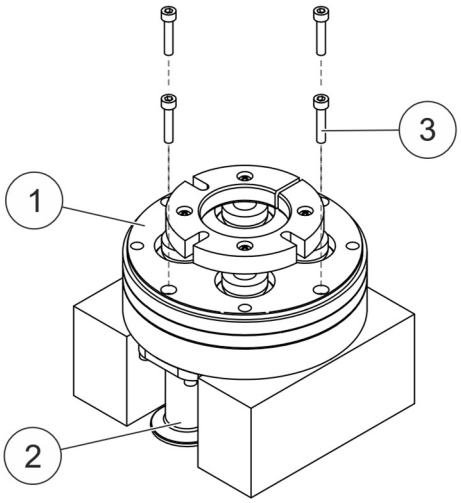


- ► Fasten the screws (1).
- ► Assemble the pump chamber (see Assembling the pump chamber, page 32).

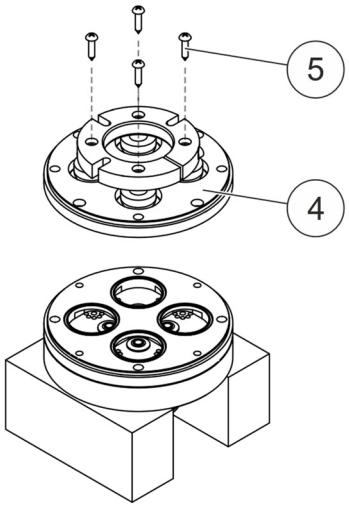
8.5 Replacing the elastomers

Required tools:

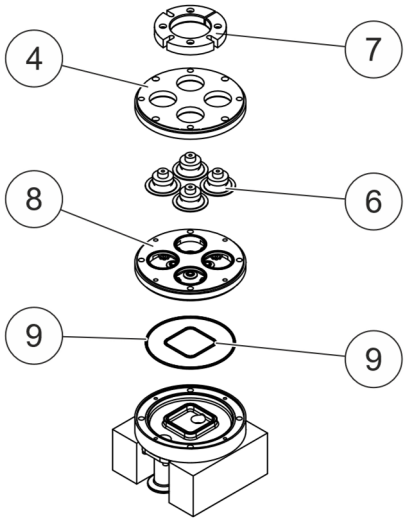
- Allen key (5 mm, 4 mm)
- Screwdriver with cross recess
- Small side cutter
- Angled nose pliers



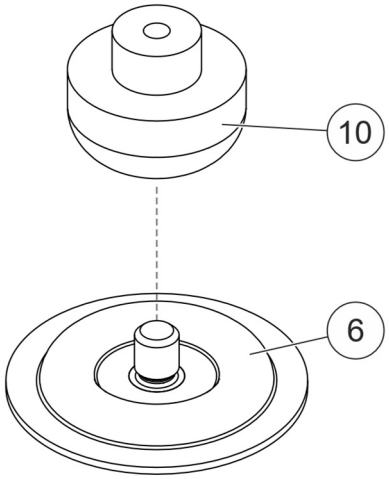
- ► Dismantle the pump chamber (see Disassembling the pump chamber, page 33).
- ► Place the ring drive (1) so that the connecting nozzles (2) are not under load.
- ► Remove the screws (3).



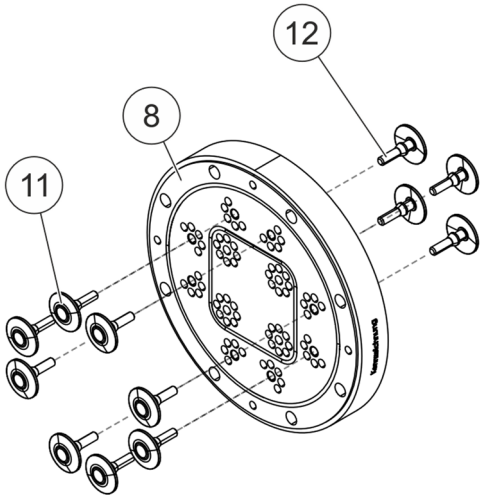
- ► Remove the diaphragm housing cover (4) together with the clamping ring and the diaphragms.
- ► Remove the screws (5).



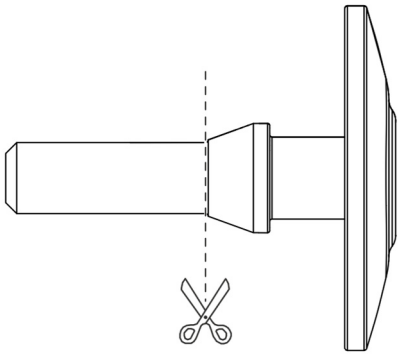
- ► Remove the diaphragms (6) from the clamping ring (7) and the diaphragm housing cover (4).
- ► Remove the valve plate (8).
- ► Remove the O-rings (9).



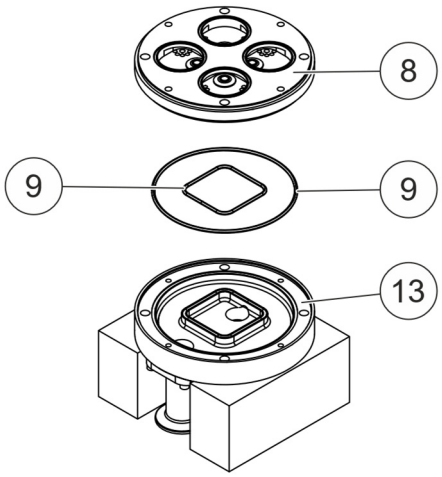
- ► Unscrew the diaphragm supports (10) from the diaphragms (6) by hand.
- ► Install the diaphragm supports (10) on new diaphragms (6).



- ► Remove the inlet and outlet valves (11).
- ► Pull the new inlet and outlet valves (11) through the valve plate (8) using the mounting shafts (12).

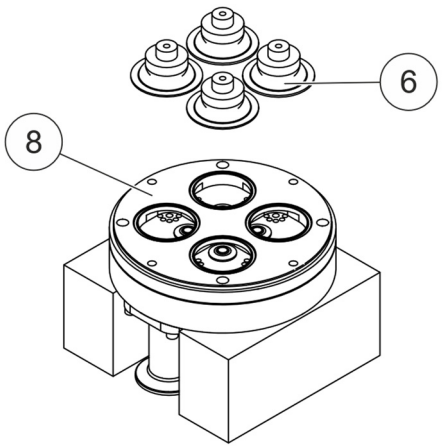


► Cut off the protruding mounting shafts at the marked point (✂).

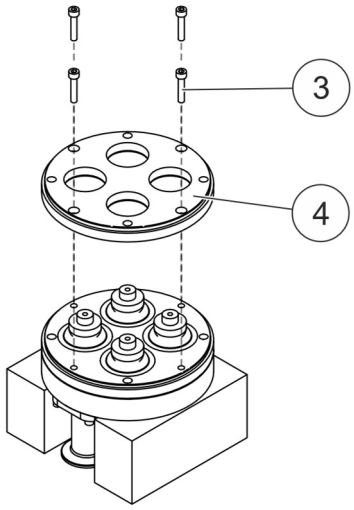


► Insert new O-rings (9) into the pump housing (13).

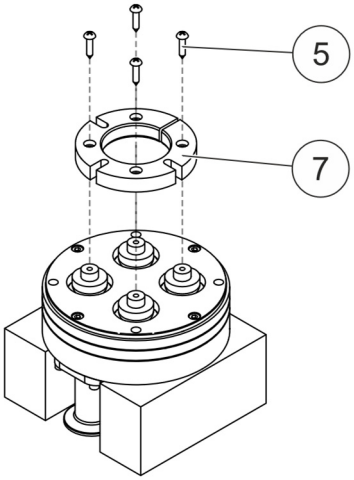
► Attach the valve plate (8).



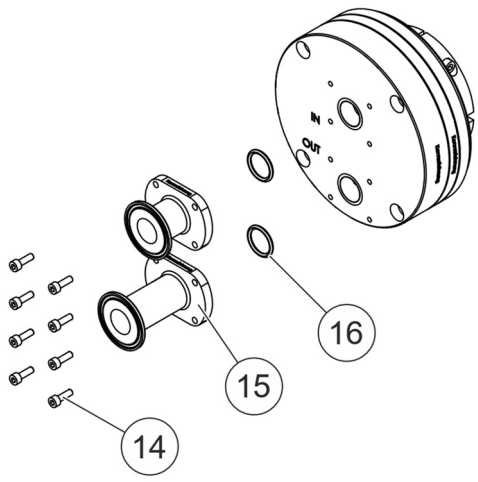
► Fit the diaphragms (6) with the diaphragm support mounted on the valve plate (8).



- ► Fit the diaphragm housing cover (4).
- ► Fasten the screws (3).



- ► Fit the clamping ring (7).
- ► Fasten the screws (5).



- ► Remove the screws (14).

ATTENTION – The connecting nozzles (15) can fall off and be damaged. Hold the connecting nozzle (15) firmly.

- ► Remove the connecting nozzle (15).
- ► Replace the O-rings (16) of the connecting nozzles.
- ► Fit the connecting nozzles (15).
- ► Fasten the screws (14).
- ► Assemble the pump chamber (see Assembling the pump chamber, page 32).

8.6 Cleaning

8.6.1 Cleaning process

The cleaning procedure must be adapted accordingly to the used products and the prevailing conditions. The user is responsible for checking the cleaning result.

NOTE – Depending on the conditions and frequency of cleaning, it may be necessary to check and replace the elastomers more frequently.

8.6.2 CIP cleaning

⚠ **DANGER** – Risk of chemical burns. The use of strong alkaline solutions can lead to chemical burns. Wear protective goggles, safety gloves and protective clothing. Observe the safety data sheet of the fluid used.

⚠ **DANGER** – Risk of chemical burns. In the event of leaks, strong alkaline solutions can escape. Ensure that the whole system withstands maximum pressure.

⚠ **WARNING** – Risk of burns. The pumped fluid and cleaning products can heat up parts of the pump. Do not touch the pump. Allow the pump to cool down.

The pump may only be cleaned if the pump is installed on the pump unit.

- ► Pre-flush the pump with water until fluid residues are removed.
- ► Clean with 0.5 M NaOH (approx. 50°C) at 80% of the maximum speed for 30 minutes.
- ► Flush the pump with water afterwards until neutrality is achieved (by measuring the pH value or conductivity of the flushing water).

8.6.3 SIP steaming)

⚠ **WARNING** – Risk of burns. The pumped fluid and cleaning products can heat up parts of the pump. Do not touch the pump. Allow the pump to cool down.

The pump may only be steamed if the pump is installed on the pump unit.

The pump may not be operated during the SIP process and while it is cooling down.

- ► Steam at a maximum temperature of 130°C and not for longer than 30 minutes.
- ► Allow the pump to cool down slowly.

8.6.4 Autoclaving of the pump chamber

Autoclaving is a method of sterilisation by thermal treatment under excess pressure. The pump chamber may only be autoclaved when the pump chamber has been removed.

- ► Empty the pump completely.
- ► Clean the pump according to the fluid.
- ► Dismantle the pump chamber (see Disassembling the pump chamber, page 33).
- ► Close the inlet and outlet openings of the pump chamber, e.g. by connecting hoses. Make sure that free gas and steam exchange is possible directly or indirectly via a sterile barrier (e.g. sterile filter) at the inlet and outlet openings.

ATTENTION – The diaphragms can be deformed in the autoclave. Do not exert pressure on the clamping ring (see Fig. 14: Position of the dismantled pump chamber in the autoclave, page 48) during autoclaving.

- ► Position the pump chamber in the autoclave as shown:

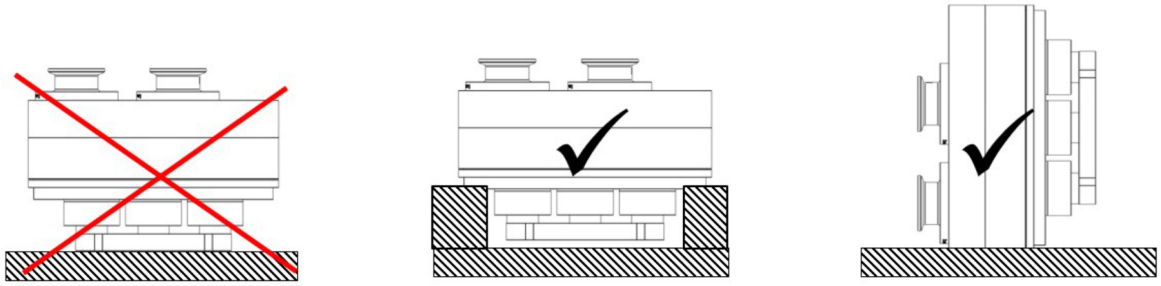


Fig. 14: Position of the dismantled pump chamber in the autoclave

- ► Autoclave the pump chamber in the vacuum autoclave according to the values specified in the technical data. Further information can be found in chapter Technical data on page 13.
- ► Follow the autoclave manufacturer's instructions.

9 Malfunctions

9.1 Elimination of faults

The 4-piston diaphragm pump works very reliably and error-free when it is used, serviced and operated according to the operating manual.

	Troubleshooting								Cause of fault/remedy
	Pump does not start.	**Pump sucks poorly or not at all**	**Delivery volume is not achieved**	**Counter-pressure is not achieved**	**Flow rate is uneven**	**Running noises get louder**	**Pump is leaking**	**Motor too hot**	
1		X					X		The screws connecting the individual components are not tightened correctly. – Re-tighten the screws.
2		X							The direction of flow of the pump is wrong. – Switch the suction and pressure sides.
3		X	X		X				Air is present in the pumped fluid, e.g. due to a leaking TC seal. – Please check the pipes for leaks.
4		X	X	X	X				The components in the suction side are not laid correctly. – Check all pipes, hoses and valves.
5		X	X		X				Check the viscosity of the fluid.
6	X								Check supply lines, power supply and fuses and replace if necessary.
7			X	X	X				Air in the pumped fluid – Tighten all clamps.
8			X		X				Check components in the pressure side.
9							X		The pressure side is closed. – Check all components of the pressure line(s).

	Troubleshooting								Cause of fault/remedy
	Pump does not start.	**Pump sucks poorly or not at all**	**Delivery volume is not achieved**	**Counter-pressure is not achieved**	**Flow rate is uneven**	**Running noises get louder**	**Pump is leaking**	**Motor too hot**	
10			X						The pipe cross-sections are too small. – Use cables with larger cross-sections.
11						X			The connecting element of the coupling is worn. – Replace the connecting element.
12						X			The coupling is not aligned correctly – Correct the alignment.
13		X	X		X				Check whether foreign bodies have entered the pump.
14	X							X	If the thermal circuit breaker in the motor has tripped, allow the engine to cool down.
15	X					X			Shaft bearings are defective. – Replace the shaft bearings.
16		X							Valves are dry (long standstill), deformed or otherwise defective. – Replace valves.
17							X		Conveying diaphragm is torn (usually the pumping pressure is too high). – Replace the conveying diaphragm.
18		X	X	X			X		O-rings between valve plate and pump housing are defective – Replace O-rings.
19						X			Alignment of the pump with the drive is not correct. – Adjust the alignment.

	Troubleshooting								Cause of fault/remedy
	Pump does not start.	**Pump sucks poorly or not at all**	**Delivery volume is not achieved**	**Counter-pressure is not achieved**	**Flow rate is uneven**	**Running noises get louder**	**Pump is leaking**	**Motor too hot**	
20			X			X			If the screw connections of the diaphragm supports are not tight, tighten the screws.
21			X			X			The screw of the clamping ring is not tightened properly. – Retighten the screw.
22							X		Pump cooled down too quickly after steaming (SIP). – Allow the pump to cool down slowly to ambient temperature.

Tab. 3: Malfunctions

9.2 Return

► Decontaminate the pump completely.
► Fill in the decontamination certificate.
  ○ The decontamination certificate is enclosed with the pump unit.
  ○ Observe the safety notes on the decontamination certificate.
  ○ The manufacturer will not accept the pump without a decontamination certificate.
► Contact the Service Department (see Manufacturer and Service, page 4).

10 Disposal

The pump unit basically consists of the following materials:

- Steel and stainless steel
- Non-ferrous metal
- Plastic - especially elastomers (see Technical data, page 13)
- Electronic modules

Improper disposal of materials (e.g. metals, plastics, electrical and electronic modules) leads to environmental pollution. Recyclable materials must be recycled in an environmentally friendly manner.

Consult the manufacturer to return them. Further information can be found in chapter Return on page 52.

Alternatively, disposal can also be carried out by a commercial disposal company and in accordance with national regulations.

The pump unit was marketed under the WEEE number 97509452.

11 Glossary

- 4-piston diaphragm pump
  Pump with a diaphragm containing 4 enclosed volumes which deliver one after another in a revolution to reduce the pulsation.
- CIP
  The term Cleaning in Place (CIP) describes a process for cleaning process plants.
- Dosing pump
  Positive displacement pumps deliver defined volumes per revolution independently of the pressure conditions at the input and output of the dosing pump.
- Depyrogenation
  Removal of pyrogens from a solution
- Pump chamber
  Parts of the pump that come into contact with the fluid.
- Gamma radiation
  In the gamma sterilisation process, cobalt-60 or X-radiation is used to kill micro-organisms on and in the product.
- Enclosed volume
  Space created by movement of the diaphragm which serves to displace the fluid.
- Diaphragm
  Force-transmitting seal to deliver liquid media
- Diaphragm support
  Component mounted on the back of the diaphragm and connecting the clamping ring to the diaphragm

► Assembly bolt
  Extra long diaphragm end to ensure easier installation

- Pump (pump head)
  Pump with free shaft end
  Oscillating positive displacement pump without drive
- Pump unit
  Liquid pump connected to a drive, including power transmission unit, base plate and additional equipment
- Residual volume
  Fluid volume that can remain in the pump after running empty
- Recirculation pump
  Pump for delivering and circulating certain fluids
- Multiple use (MU)
  Multiple-Use, multiple use of the pump chamber, stainless steel
- SIP
  Sterilisation in Place Sterilisation in Place refers to a cleaning method in process plants, especially in pharmaceutical production plants and biological plants. All product-wetted areas of the plant are sterilised hereby without major disassembly.

- Dry suction height

  Suction lift of the pump with unfilled pump chamber
- Positive displacement pump

  Positive displacement pump is the generic term for all pumps that work according to the displacement principle. It is also referred to as volumetric pump and delivers the fluid in a self-enclosed volume.
- WLC unit

  Pump spare part

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