



QF5K

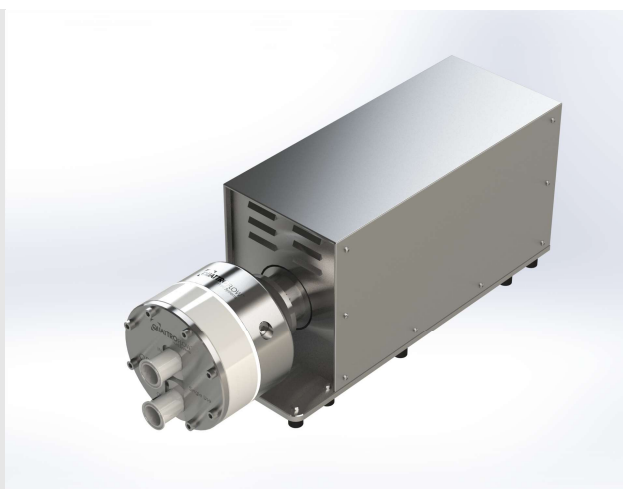
QF5K-HT

QF5KQcon

QF5KCD

**Stainless-steel 4-piston diaphragm pump
Multiple use (MU) and Single use (SU)**

Operating Manual



Translation of original operating manual

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1 General

Read this operating manual carefully before putting the pump into operation. See the data in the operating manual. Keep the operating manual close at hand in the vicinity of the pump.

PSG Germany GmbH also manufactures pumps 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

PSG Germany GmbH

Hochstrasse 150-152

47228 Duisburg, Germany

Phone: +49 (0) 2065 89205-0

Fax: +49 (0) 2065 89205-40

E-mail: psg-germany@psgdover.com

Internet: www.quattroflow.com

1.2 Exclusion of liability

All warranty rights will be void in case of incorrect operation or misuse, failure to observe the information in the operating manual - especially the safety notes - as well as unauthorised modification of the pump 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 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:

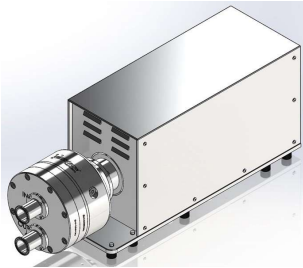
Running text contains descriptions and explanations.

- Primary level lists start with a dot and list elements.
 - Secondary level lists start with a circle and list elements that belong to an element of a primary level.
- ▶ Handling instructions guide you in operation of the pump.

⚠ WARNING NOTICES – Warning notices warn of dangers and give you instructions how to avoid the danger (see chapter 2.5 Warning notices on page 6).

1.4 Pumps

This manual applies for the following pumps:



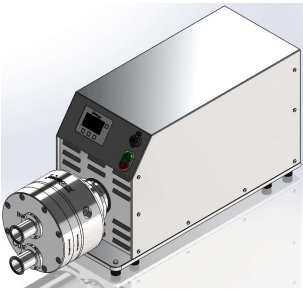
Pump QF5K

- Standard motor
- Drive: Three-phase current motor 2.2 kW, 400 V
- Speed control: external frequency converter (not included in the standard scope of delivery)
- Eccentric shaft: 5°
- Flow rate: 200 - 6,000 lph



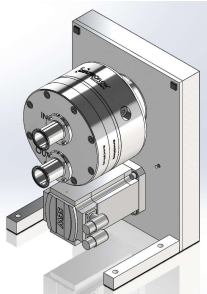
Pump QF5K-HT

- Integrated control panel
- Drive: Servo motor 230V/400 V
- Speed control: Control panel or external via analogue input
- Eccentric shaft: 5°
- Flow rate: 50 - 6,000 lph



Pump QF5KQcon

- Integrated control panel
- Drive: Servo motor 230V/400 V
- Speed control: Control panel or external via analogue/digital input
- Eccentric shaft: 5°
- Flow rate: 50 - 6,000 lph



Pump QF5KCD

- Compact design
- Drive: Servo motor 230V/400 V
- Speed control: optional external frequency converter (not included in the standard scope of delivery)
- Eccentric shaft: 5°
- Flow rate: 50 - 5,000 l/h

1.5 Version history

Edition

2021-10

2022-11

2023-05

Contents and revisions

- First edition
- Extension SU (Single use)
- Assembly sequence (chapter 6.5.2), rated speed AC-motor & neg. inlet pressure (chapter 3.3)

2 Safety

This chapter contains important information for safe operation of the pump.

2.1 Intended use

- Pumping water-like fluids for industrial applications in batch mode.
- For interior use only

2.2 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 in explosion-protected areas.

2.3 Residual risks

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

2.3.1 Pressure

The pump can be operated up to a maximum permissible pressure. The maximum permissible pressure depends on the temperature of the fluid. The values for the maximum permissible pressure are specified in the technical data and on the pump.

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

- Always maintain the maximum permissible pressure or use a pressure relief valve.
- Make sure that the suction and pressure lines are adequately dimensioned and fastened.
- Only apply pressure to the pump chamber when the the pump chamber is mounted on the drive.

2.3.2 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 and the lines (>72°C). There is a risk of burns when touching.

- Do not touch the pump chamber when the pump is in operation.
- Allow hot parts to cool down.
- Keep the air vents and filter free. Make sure that the heat can escape.

2.3.3 Fluid

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

- Read the safety data sheet of the fluid and wear the protective equipment and take the protective measures described therein.
- 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 of 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).

2.3.4 Electric current

Touching electrical components can cause fatal electric shock.

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

2.3.5 Crushing and cutting

The eccentric shaft rotates in a housing. There is a risk of crushing in the space in between.

- Only operate the pump with the pump chamber mounted.
- Disconnect the power supply to the pump when working on the pump.

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 shoes.

2.3.6 Noise

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

- It is recommended to wear suitable hearing protection.

2.4 Personnel requirements

Persons who work with the pump 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 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 persons who work with the pump at all times.

2.5 Warning notices

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

- ⚠ DANGER** – Danger of fatal or severe injuries.
- ⚠ WARNING** – warning of possibly fatal or severe injuries.
- ⚠ CAUTION** – Beware of minor injuries.
- ATTENTION** – Property damage.

3 Description

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

The diaphragm consists of 4 segments. 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.

The single-use pump chambers (made of plastic) are intended for single use.

The multiple-use pump chambers (made of stainless steel) can be re-used.

3.1 Water-like fluids

The pump only delivers water-like fluids such as:

- solutions containing protein (albumin, IgG, coagulation factors, monoclonal antibodies, enzymes, vaccines)
- solutions or suspensions containing polymers
- cell suspensions (bacteria, yeasts, algae, fungi, mammal cells)
- colloidal solutions
- virus suspensions, phage suspensions

3.2 Labelling

The type label is affixed to the housing or the base plate.

The serial number is affixed to the top.

3.3 Technical data

The technical data refer to the standard version of the pump. **Special pump versions (e.g. special connections) can have different data.**

Data of the different variants are marked by “MU” or “SU”.

See the extended documentation.

| Description | Unit | QF5K | QF5K-HT | QF5KQCon | QF5KCD |
|--|-----------------|---------------------------------------|---------|----------|--------|
| Delivery rate eccentric shaft 5° | | | | | |
| max. | lph | 6,000 | | | 5,000 |
| min. | lph | 200 | 50 | | |
| Pressure according to temperature of fluid | | | | | |
| < 40°C | bar | MU 6 (4 continuous)/SU 4 continuous | | | |
| > 40°C | bar | 4 | | | |
| Minimum vacuum pressure at the pump inlet | | | | | |
| Pumped fluid | bar | -0,2 | | | |
| Maximum temperatures | | | | | |
| Pumped fluid | °C | MU 80 (short-term)/SU 60 (short-term) | | | |
| CIP | °C | MU 90 (short-term) | | | |
| SIP | °C | MU 130 | | | |
| Autoclave | °C | MU 130/SU 125 | | | |
| Gamma | kGy | SU 50 | | | |
| Suction lift dry at optimum speed | | | | | |
| Height | m | 2 at 1,000 rpm | | | |
| Volume data | | | | | |
| Approximated volume per revolution at free output | ml | 91 | | | |
| Filling volume without connections | ml | ~788 | | | |
| Residual volume (after idle with high-speed motor) | ml | ~6 | | | |
| Product-wetted surface (approx.) | | | | | |
| Surface area | cm ² | 1,586 | | | |
| Product wetted materials (standard): | | | | | |
| Pump housing | | MU 1.4435/SU PP | | | |
| Valve plate | | MU 1.4435/SU PP | | | |
| Diaphragms | | TPE | | | |
| Valves | | EPDM | | | |
| O-rings | | EPDM | | | |

| Description | Unit | QF5K | QF5K-HT | QF5KQCon | QF5KCD |
|--|------|---|---------------------------|--------------|------------|
| Non-product wetted materials (standard): | | | | | |
| Diaphragm housing cover | | MU 1.4404/SU PETP | | | |
| Bearing housing | | 1.4404 | | | |
| Base plate | | 1.4301 | | | |
| Shroud | | 1.4301 | | | |
| Pump speed range | rpm | 30-1,200 | 13-1,200 | | 13-1,050 |
| Connection specification (standard): | | | | | |
| Connection | " | 1.5" TC | | | |
| Flange diameter | mm | 50.5 | | | |
| Inside diameter | mm | 34.8 | | | |
| Position of connectors | | Front | | | |
| Drive shaft diameter | mm | 28h7 | | | |
| Pump dimensions with motor and housing | | | | | |
| Length [L] | mm | 870 | 851 | 950 | 310 |
| Width [W] | mm | 250 | 275 | 275 | 320 |
| Height [H] | mm | 333 | 384 | 405 | 440 |
| Pump weight incl. chamber | kg | MU 95/SU85 | MU 110/SU100 | MU 115/SU105 | MU 70/SU60 |
| IP protection class (whole pump): | IP | 55 | 54 | 54 | 55 |
| Operating temperature | °C | -20...40 | 10...30 | | |
| Operating humidity | | Max 55% | 30...75% (non-condensing) | | |
| Storage and transport temperature | °C | -20...50 | -10...55 | | |
| Storage and transport humidity | | Max 60% | 10...95% (non-condensing) | | |
| Customs tariff number | | 84138100 | | | |
| Certificates/proofs (optional): | | | | | |
| Elastomers (product wetted) | | USP <87>, USP<88> Cl. VI; FDA21CFR177; BSE/TSE Safe | | | |
| Stainless steel parts (product wetted) | | MU 3.1; surface roughness; ferrite (EN10204) | | | |

| Description | Unit | QF5K | QF5K-HT | QF5KQCon | QF5KCD |
|-------------------------|-------------------|---|------------------------|----------|---|
| Motor/gear: | | | | | |
| Manufacturer (standard) | | Siemens | SEW | | |
| Type | | 1LE1003 | CMP80M | | CMP71M |
| Rated speed | rpm | 1,455 (50 Hz)* | 3,000 | | 3,000 |
| Voltage | V | 230/400 | 230 | 400 | 230 400 |
| Rated current | A | 7.7/4.4 | 23.5 | 13.4 | 23.5 13.4 13.1 7.5 |
| Power | KW | 2.2 | - | | |
| Shaft diameter | mm | 28 | 25 | | 24 |
| IP protection class | IP | 55 | 65 | | |
| Colour | RAL | 7030 | 9005 | | 9001 |
| External fan | | Mounted on motor | Integrated into shroud | | - |
| Clutch | | KTR (Rotex-GS24) | | | - |
| Gear transmission | | | - | | 1 : 2.67 (belt drive integrated into housing) |
| Motor fan | | | | | |
| Manufacturer (standard) | | Siemens | - | | - |
| Type | | B32 IL-2-2 | - | | - |
| Voltage | V | 1 ~ Δ 220-277 3 ~ Δ 200-303 3 ~ Y 346-525 | - | | - |
| Rated frequency | Hz | 50-60 | - | | - |
| Rated current | A | 0.29 0.37 0.21 | - | | - |
| Rated power | W | 62 80 80 | - | | - |
| Max. air flow rate | m ³ ph | - | - | | - |
| IP protection class | IP | 66 | - | | - |

| Description | Unit | QF5K | QF5K-HT | | QF5KQCon | | QF5KCD | |
|--------------------------------------|-----------------------|--|---|--------------------|----------------------|--------------------|--|--------------------|
| Control panel/frequency converter: | | | | | | | | |
| Type | | Optional: Control Separate Control Box (PQ44P) | Control Integrated into the housing | | | | Optional: Control Separate Control Box (PQ50T) | |
| Rated voltage | V | 400 | 200- 240 | 380- 500 | 200- 240 | 380- 500 | - | 380- 500 |
| Rated power | kW | 2.2 | 3.7 | 4 | 3.7 | 4 | - | 3 |
| Rated frequency | Hz | 50-60 | | | | | | |
| Rated current | A | 10.6 | 14 | 9.5 | 14 | 9.5 | - | 7 |
| Net shape | | TN-S | | | | | | |
| Mains supply | | 3L+N+PE | 3L+PE | | | | | |
| Fuse | A | 16 | | | | | | |
| Length, cross-section power cable | m, mm ² | 5, 5x2.5 | | | | | | |
| Mains connection | | 16A CEE plug | free cable end | 16A CEE plug | free cable end | 16A CEE plug | - | 16A CEE plug |
| Length connecting cable for pump | m | 5 | - | | | | 5 (Resolver + Motor) | |
| Analogue input | | 4-20 mA (standard) 0-10 V (optional) | 4-20 mA (standard) 0-10 V (optional) | | 4-20 mA 0-10 V | | 4-20 mA (standard) 0-10 V (optional) | |
| IP protection class | IP | 54 | See IP protection class (whole pump) | | | | 54 | |
| Dimensions (L x W x H) | mm | 210x380x390 | Pump dimensions with motor and housing | | | | 540x450x220 | |
| Weight | kg | 20 | See pump weight incl. chamber | | | | 20 | |
| Housing material | | 1.4301 | See Non-product wetted materials | | | 1.4301 | | |

*

3.4 Performance charts

The performance charts show the approximate delivery rates depending on the pump speed.

The pump speed is equal to the motor speed when the motor is coupled directly to the pump. With gear motors, the pump speed is equal to:

$$n_P = n_M * i$$

- n_P pump speed
- n_M motor speed
- i transmission

Conditions

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

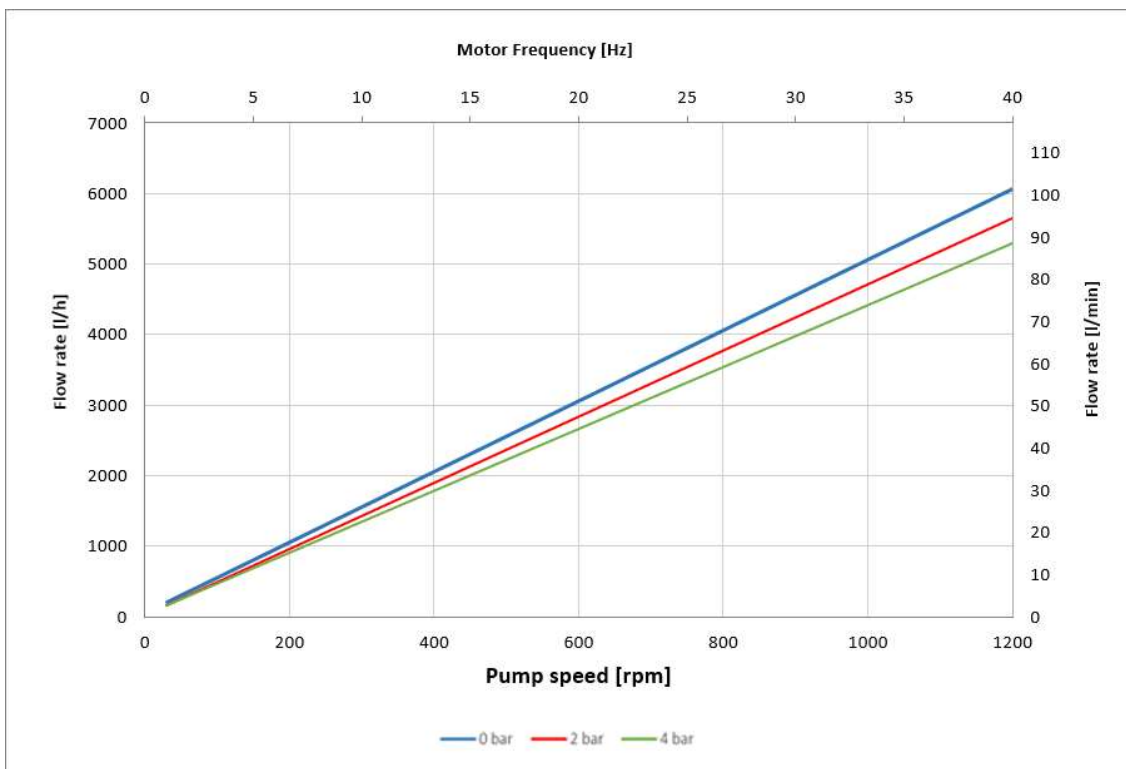


Figure 1 Performance chart SU-STD (AC-motor)

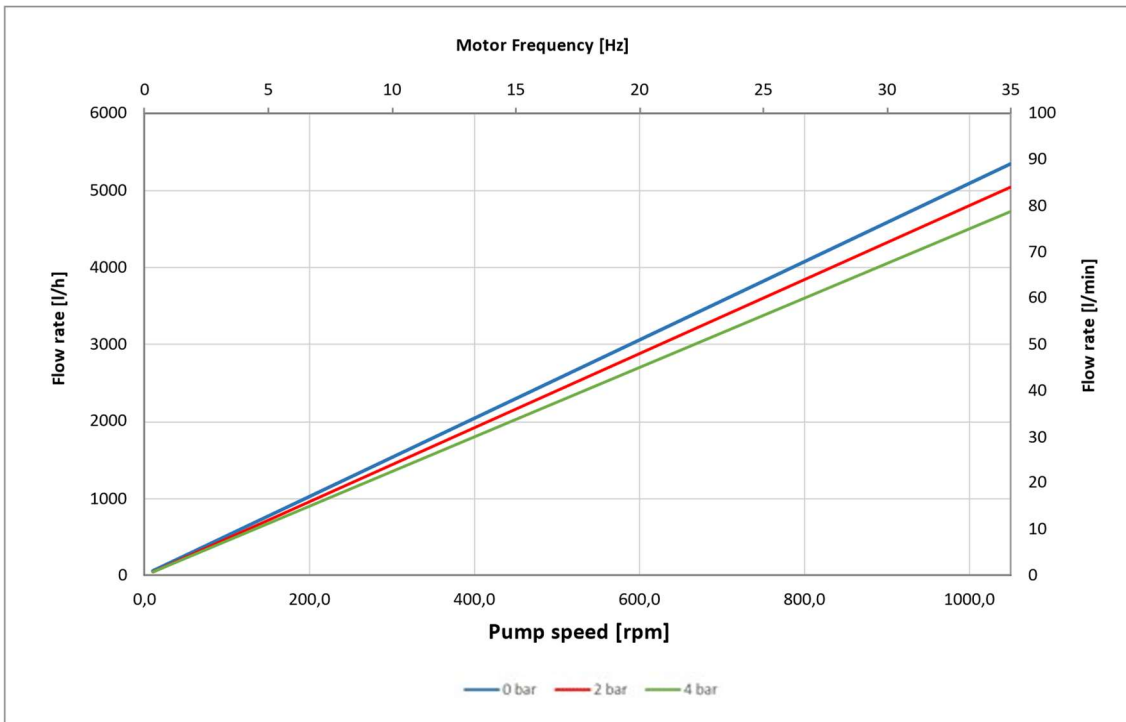


Figure 2 Performance chart SU-CD

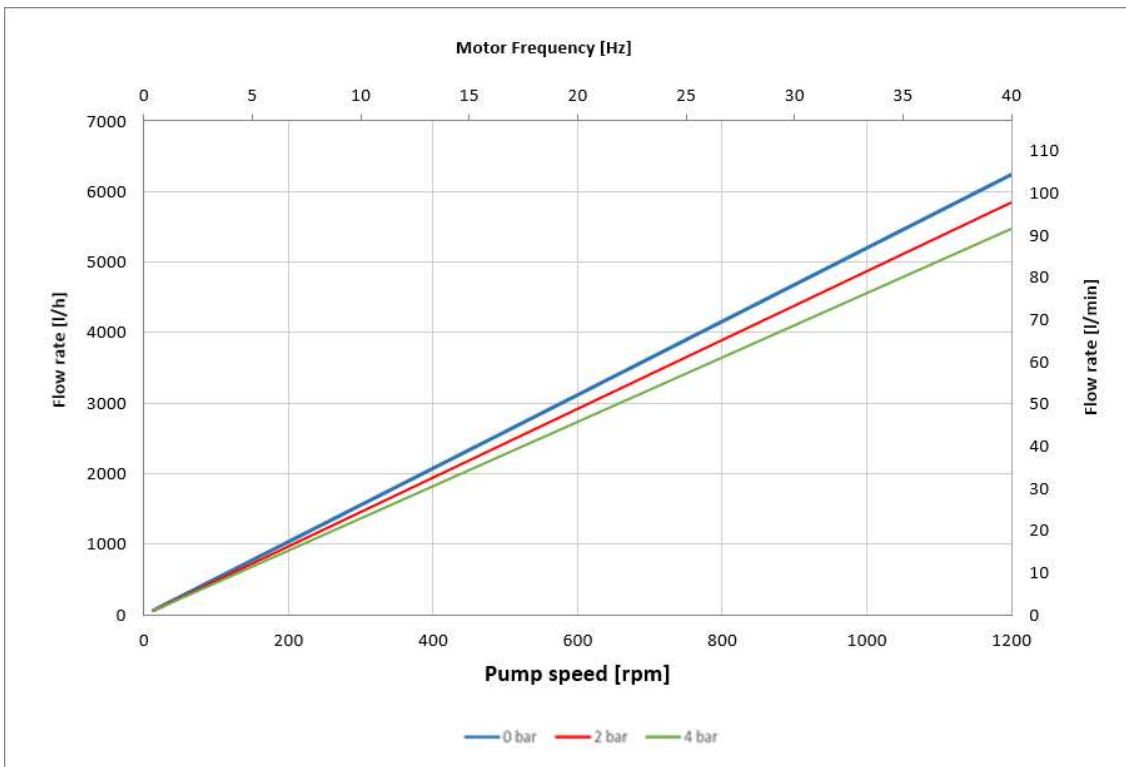


Figure 3 Performance chart SU-HT/QCON

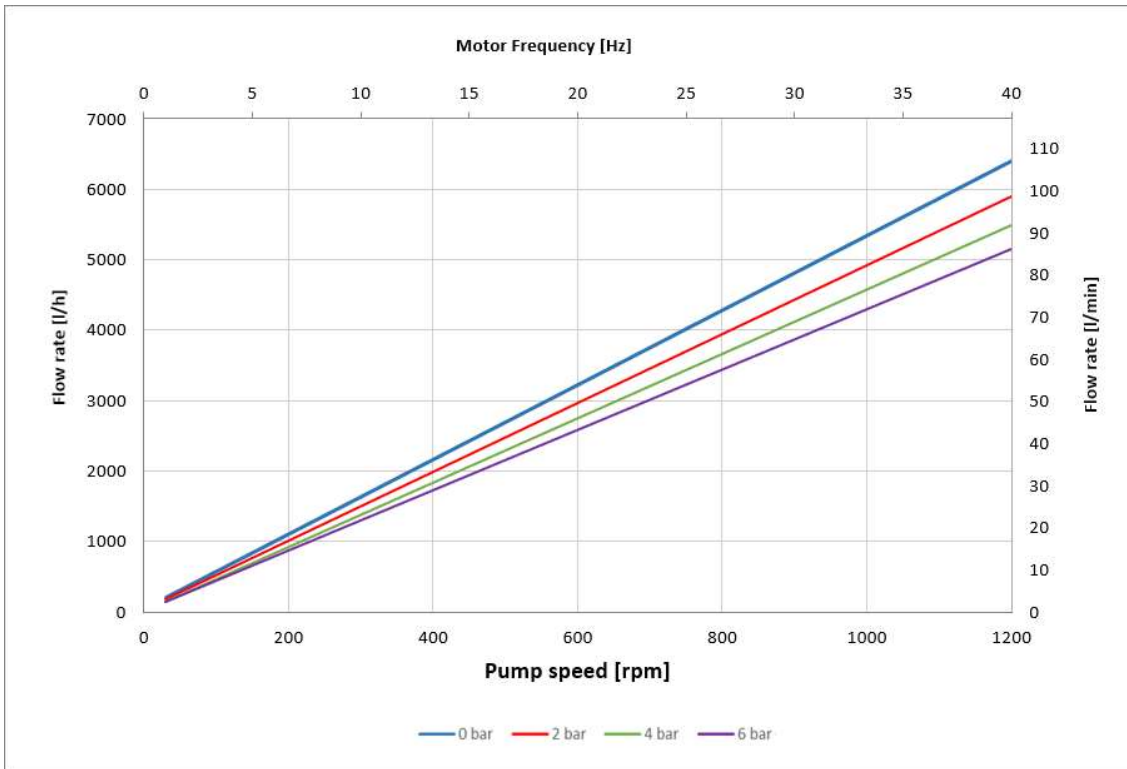


Figure 4 Performance chart MU-STD (AC-motor)

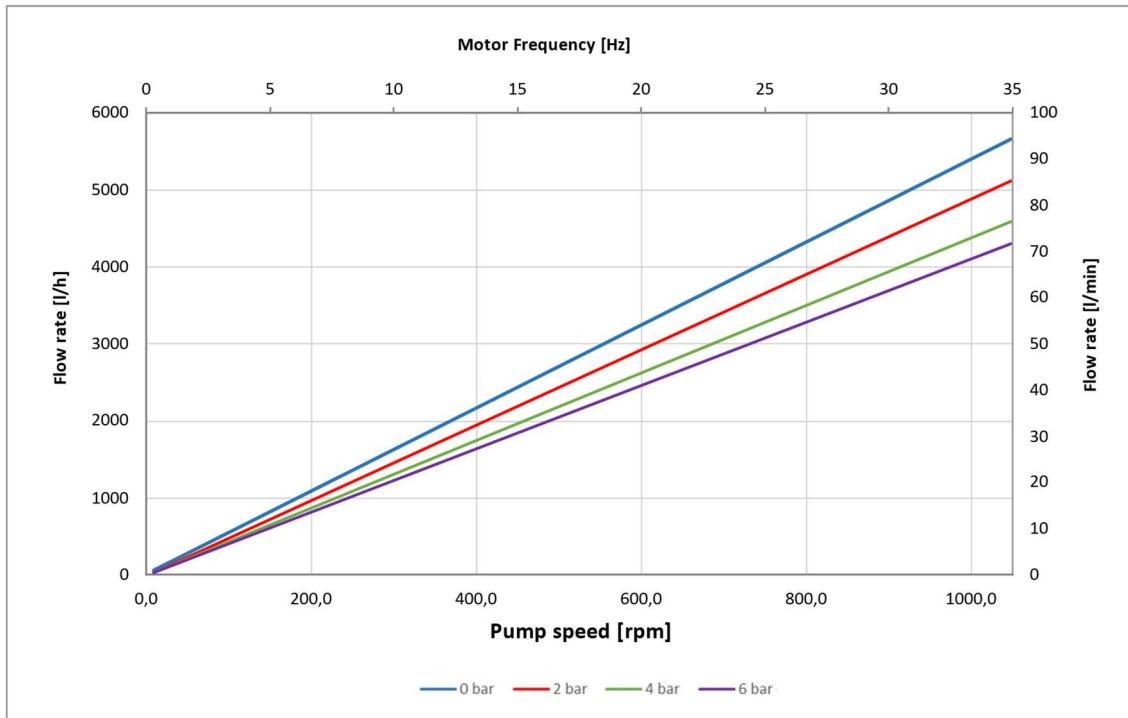


Figure 5 Performance chart MU-CD

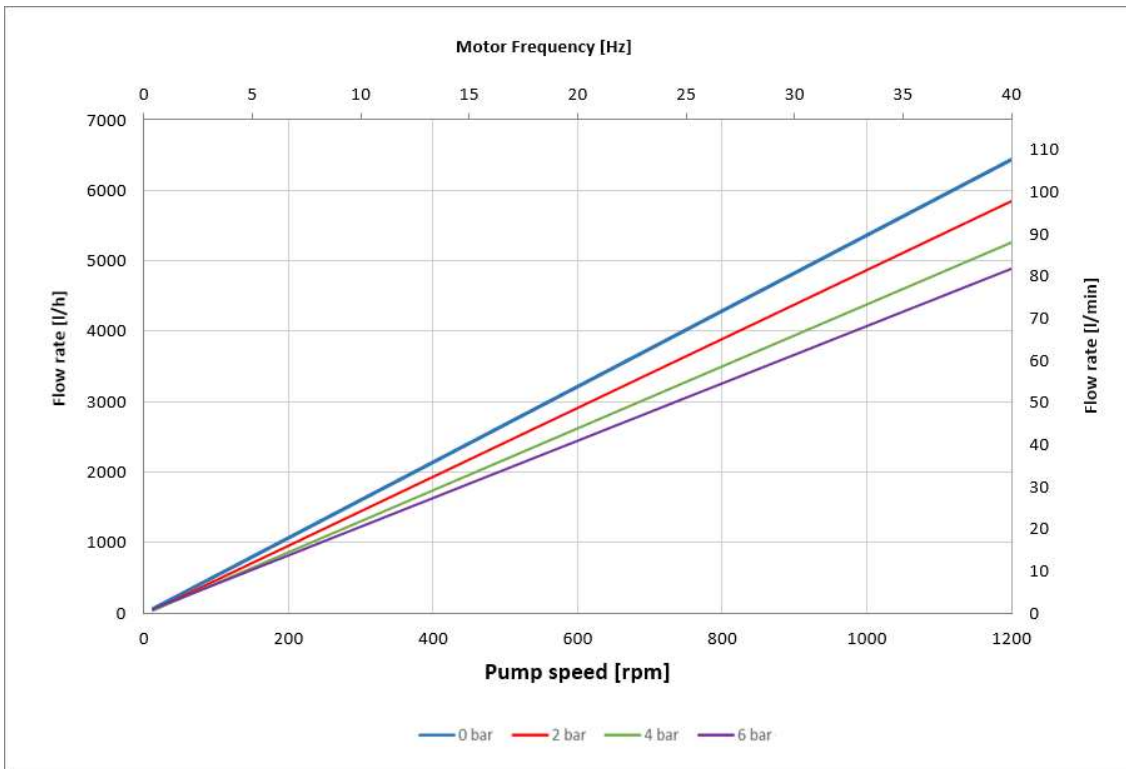


Figure 6 Performance chart MU-HT/QCON

3.5 Sub-assemblies

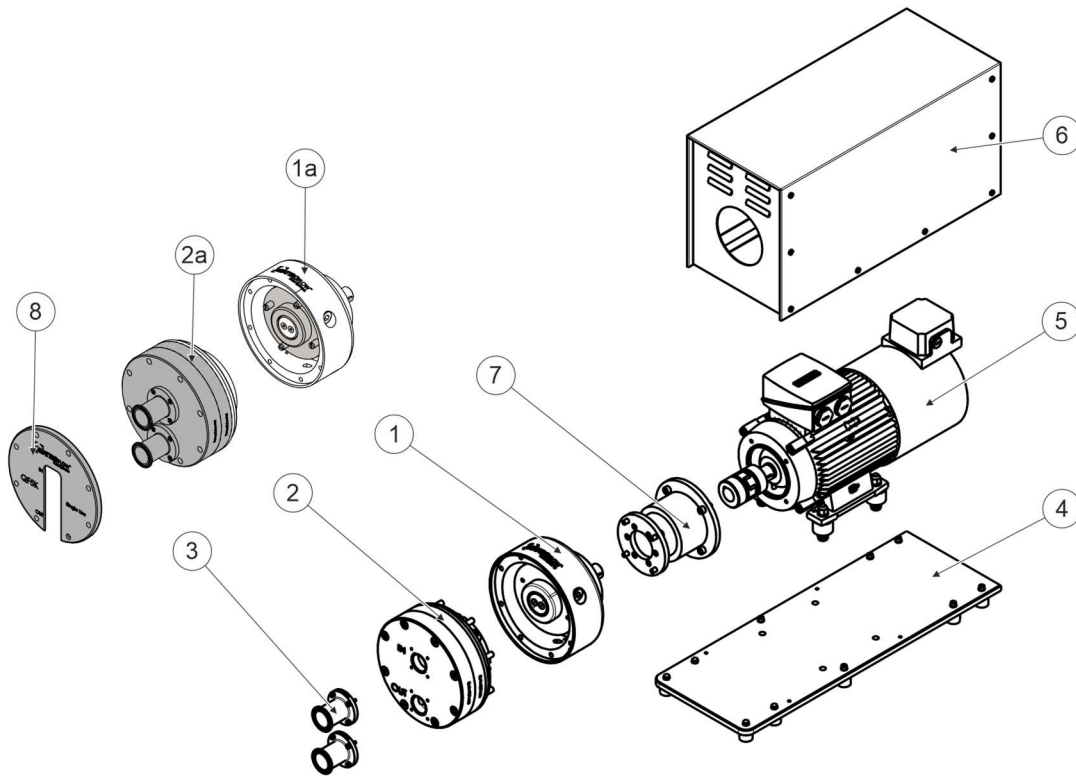


Figure 7 Sub-assemblies QF5K - QF5KACUEGNT/QF5kPDEGNTW

| Item | Designation | |
|------|-------------|--|
| 1 | PQ5A | Ring drive (Figure 11 Ring drive PQ5A) |
| 2 | QF5C | Pump chamber MU (Figure 12 Pump chamber QF5C sub-assembly) |
| 3 | PQ5U | Connecting nozzle MU (Figure 15 Connecting nozzle PQ5U sub-assembly) |
| 4 | PQ5E | Base plate (Figure 16 Base plate PQ5E, PQ5E-HT, PQ5E-Q sub-assembly) |
| 5 | PQ5G | Drive unit (Figure 18 Drive unit PQ5G sub-assembly) |
| 6 | PQ5N | Housing MU (Figure 21 Housing PQ5N sub-assembly) |
| 7 | PQ5T | Motor flange (Figure 24 Motor flange PQ5T sub-assembly) |

Variant Single Use (SU)

| Item | Designation | |
|------|-------------|-------------------|
| 1a | PQ5P | Ring drive SU |
| 2a | QF5D | Pump chamber SU |
| 8 | PQ5W | Pressure plate SU |

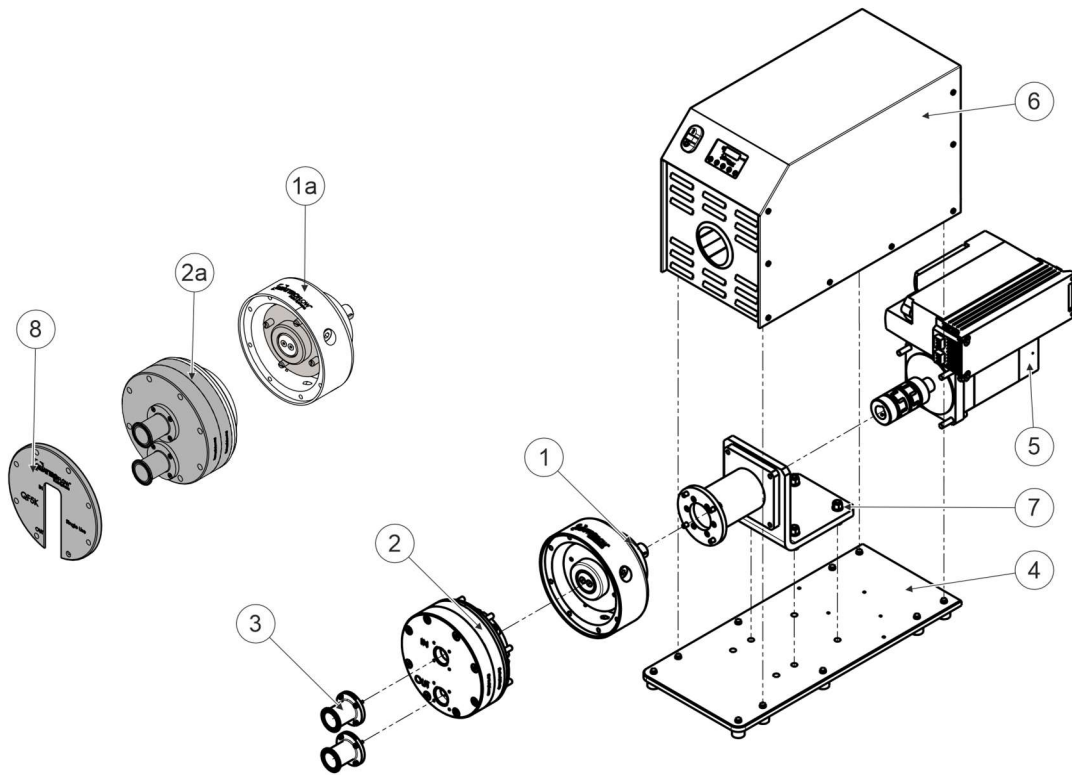


Figure 8 Sub-assemblies QF5K-HT - QF5KHT-ACUEGNT/QF5KHT-PDEGNTW

| Item | Designation | |
|------|-------------|--|
| 1 | PQ5A | Ring drive (Figure 11 Ring drive PQ5A) |
| 2 | QF5C | Pump chamber MU (Figure 12 Pump chamber QF5C sub-assembly) |
| 3 | PQ5U | Connecting nozzle MU (Figure 15 Connecting nozzle PQ5U sub-assembly) |
| 4 | PQ5E-HT | Base plate (Figure 16 Base plate PQ5E, PQ5E-HT, PQ5E-Q sub-assembly) |
| 5 | PQ5G-HT | Drive unit (Figure 19 Drive unit PQ5G-HT sub-assembly) |
| 6 | PQ44N-HT | Housing MU (Figure 22 Housing PQ44N-HT sub-assembly) |
| 7 | PQ5T-HT | Motor flange (Figure 25 Sub-assembly motor flange PQ5T-) |

Variant (SU)

| Item | Designation | |
|------|-------------|-------------------|
| 1a | PQ5P | Ring drive SU |
| 2a | QF5D | Pump chamber SU |
| 8 | PQ5W | Pressure plate SU |

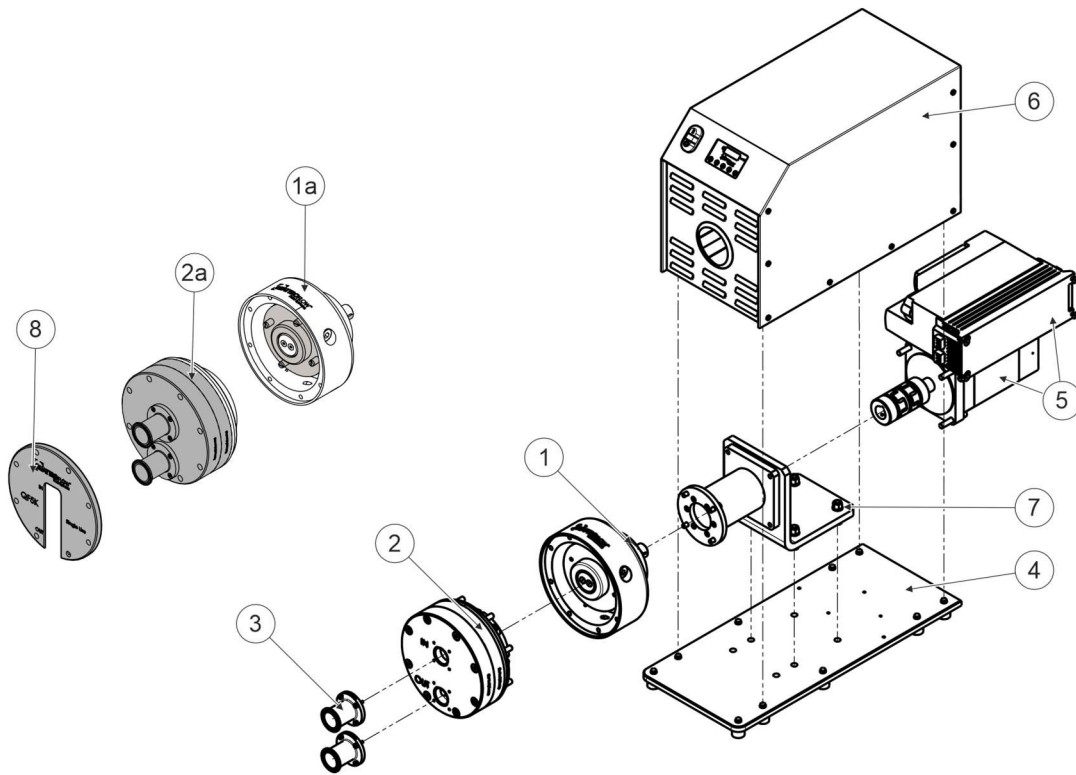


Figure 9 Sub-assemblies QF5KQCon - QF5KQCON- ACUEGOT/QF5kQCON-PDEGOTW

| Item | Designation | |
|------|-------------|--|
| 1 | PQ5A | Ring drive (Figure 11 Ring drive PQ5A) |
| 2 | QF5C | Pump chamber MU (Figure 12 Pump chamber QF5C sub-assembly) |
| 3 | PQ5U | Connecting nozzle MU (Figure 15 Connecting nozzle PQ5U sub-assembly) |
| 4 | PQ5E-Q | Base plate Drive unit PQ5G sub-assembly |
| 5 | PQ5G-HT | Drive unit (Figure 25 Sub-assembly motor flange PQ5T-) |
| 6 | PQ44N-Q | Housing MU (Figure 23 Housing PQ44O-Q sub-assembly) |
| 7 | PQ5T-HT | Motor flange (Figure 25 Sub-assembly motor flange PQ5T-) |

Variant (SU)

| Item | Designation | |
|------|-------------|-------------------|
| 1a | PQ5P | Ring drive SU |
| 2a | QF5D | Pump chamber SU |
| 8 | PQ5W | Pressure plate SU |

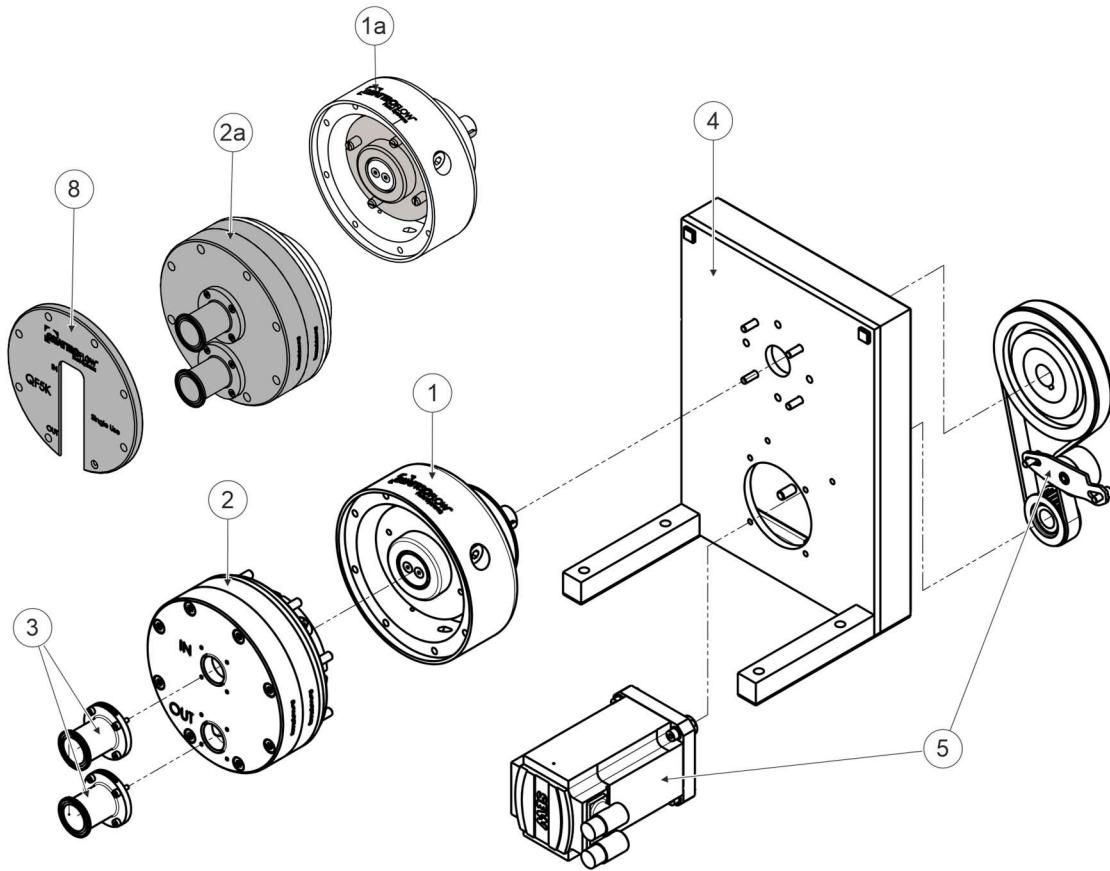


Figure 10 Sub-assemblies QF5KCD - QF5KCD-ACUHG/QF5kCD-PDHGW

| Item | Designation | |
|------|-------------|---|
| 1 | PQ5A | Ring drive (Figure 11 Ring drive PQ5A) |
| 2 | QF5C | Pump chamber (Figure 12 Pump chamber QF5C sub-assembly) |
| 3 | PQ5U | Connecting nozzle (Figure 15 Connecting nozzle PQ5U sub-assembly) |
| 4 | PQ50H | Rack (Figure 17 Rack PQ50H sub-assembly) |
| 5 | PQ50G | Drive unit (Figure 18 Drive unit PQ5G sub-assembly) |

Variant Single Use (SU)

| Item | Designation | |
|------|-------------|-------------------|
| 1a | PQ5P | Ring drive SU |
| 2a | QF5D | Pump chamber SU |
| 8 | PQ5W | Pressure plate SU |

3.5.1 Ring drive PQ5A / PQ5P

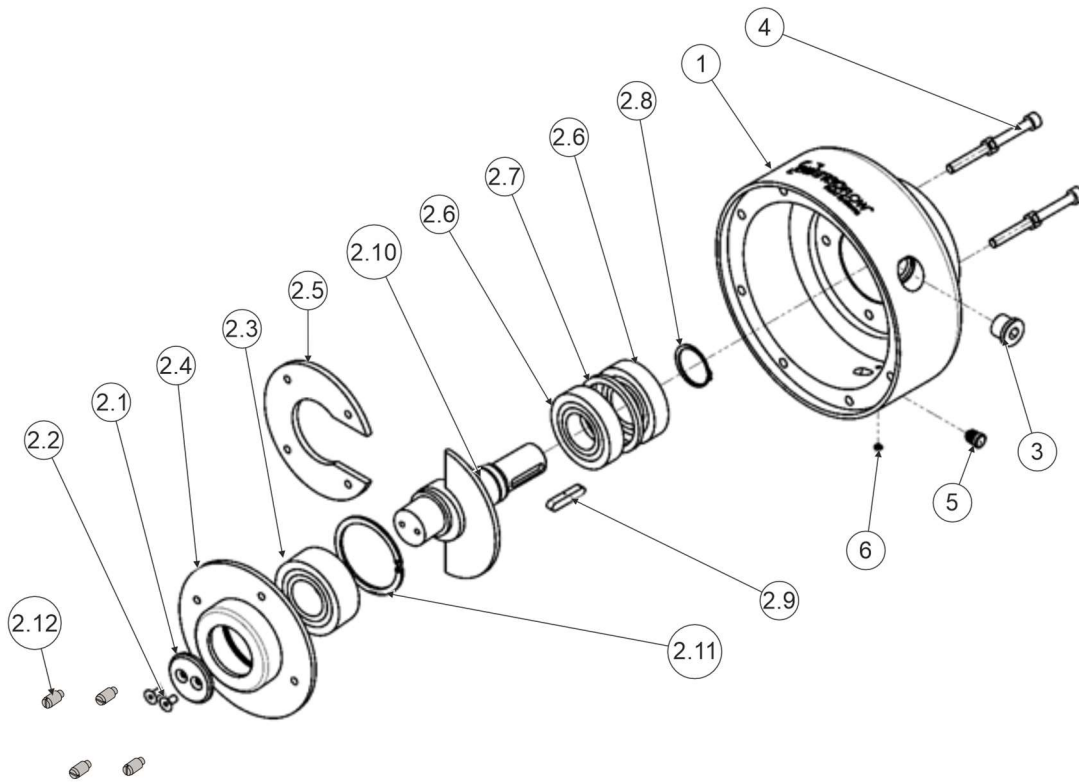


Figure 11 Ring drive PQ5A/PQ5P sub-assembly

Designations correspond to the enclosed parts list

3.5.2 Pump chamber QF5C (MU)

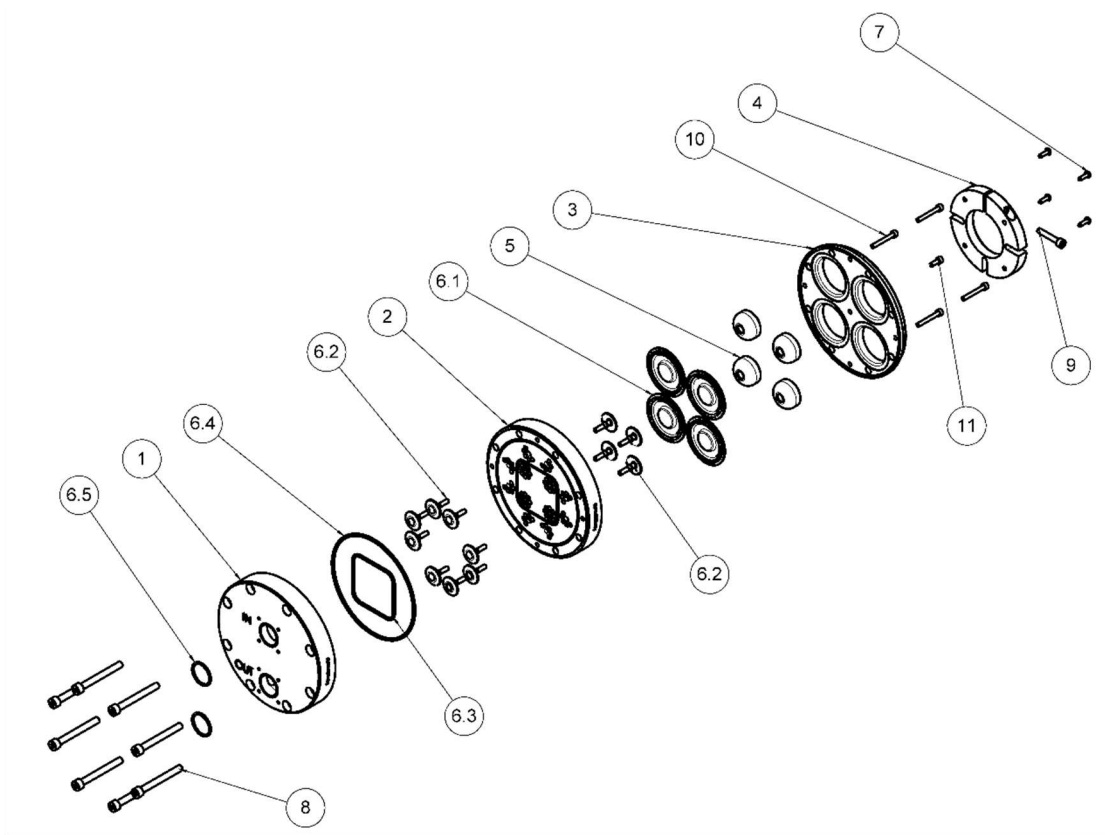


Figure 12 Pump chamber QF5C sub-assembly (MU)
Designations correspond to the enclosed parts list

Torques

Figure 12 Pump chamber QF5C sub-assembly (MU)

| Item | Designation | Nm |
|------|---------------------------------------|----|
| 9 | Clamping ring screw | 18 |
| 8 | Pump housing screws | 35 |
| 7 | Diaphragm support screw | 6 |
| 10 | Diaphragm housing lid to pump housing | 10 |
| 11 | Diaphragm housing lid to valve plate | 10 |

3.5.3 Pressure plate PQ5W

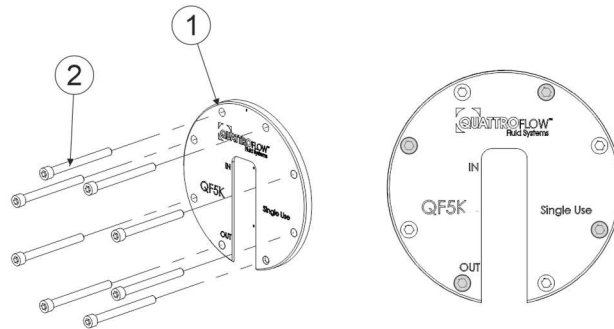


Figure 13 Pressure plate PQ5W sub-assembly
Designations correspond to the enclosed parts list

The pressure plate is delivered as standard with 8 screws. If assembly is not possible, e.g. when using elbow connections, the pump chamber can also be fastened with 4 screws, see the four grey or four white screws in the figure on the right.

Torques

Figure 13 Pressure plate PQ5W sub-assembly

| Item | Designation | Nm |
|------|--|----|
| 2 | Cylindrical hexagon socket head screws | 28 |

Pump chamber QF5D (SU)

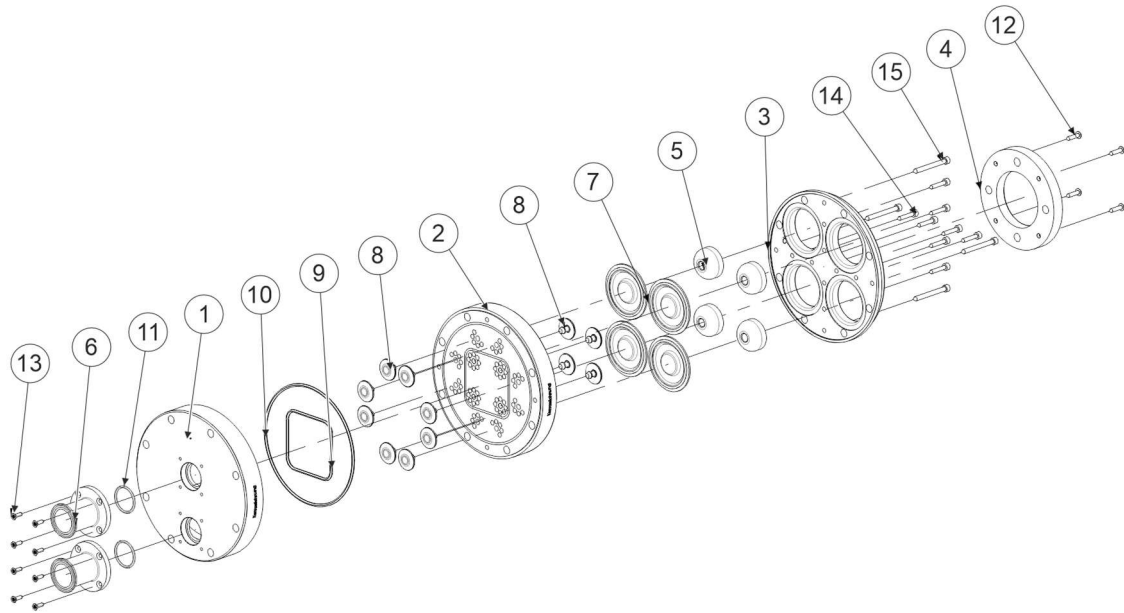


Figure 14 Pump chamber QF5D sub-assembly
Designations correspond to the enclosed parts list

3.5.4 Connecting nozzle PQ5U (MU)

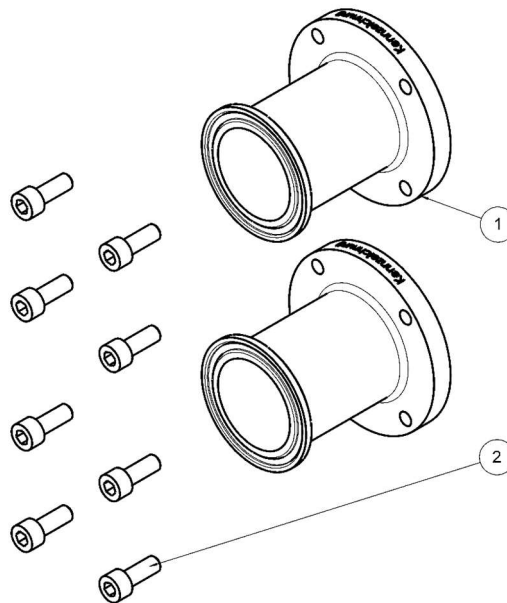


Figure 15 Connecting nozzle PQ5U sub-assembly
Designations correspond to the enclosed parts list

3.5.5 Base plate PQ5E, PQ5E-HT, PQ5E-Q

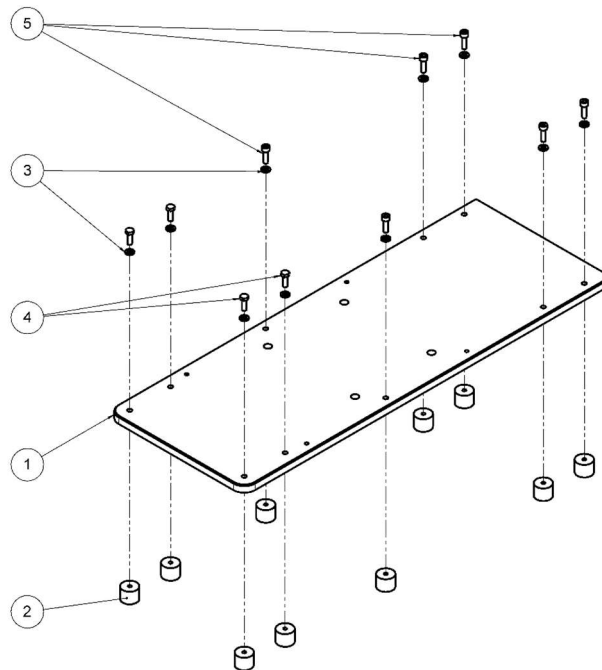


Figure 16 Base plate PQ5E, PQ5E-HT, PQ5E-Q sub-assembly
Designations correspond to the enclosed parts list

3.5.6 Rack PQ50H

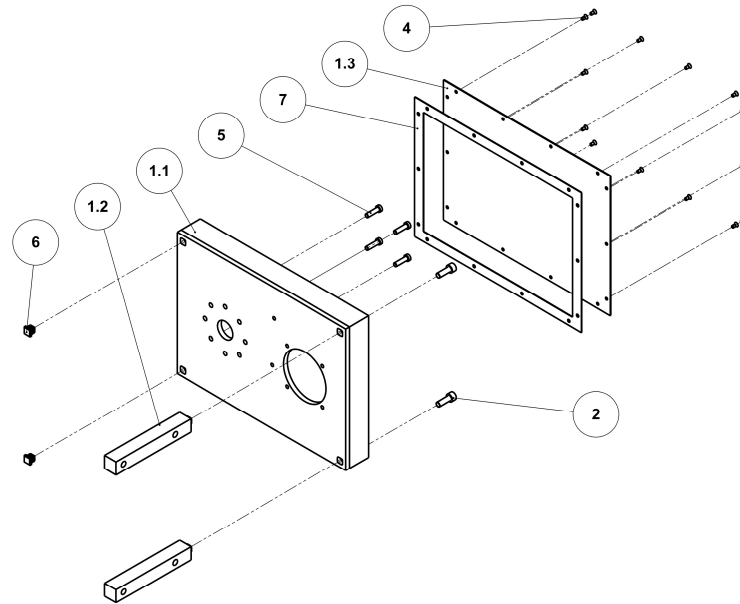


Figure 17 Rack PQ50H sub-assembly
Designations correspond to the enclosed parts list

3.5.7 Drive unit PQ5G

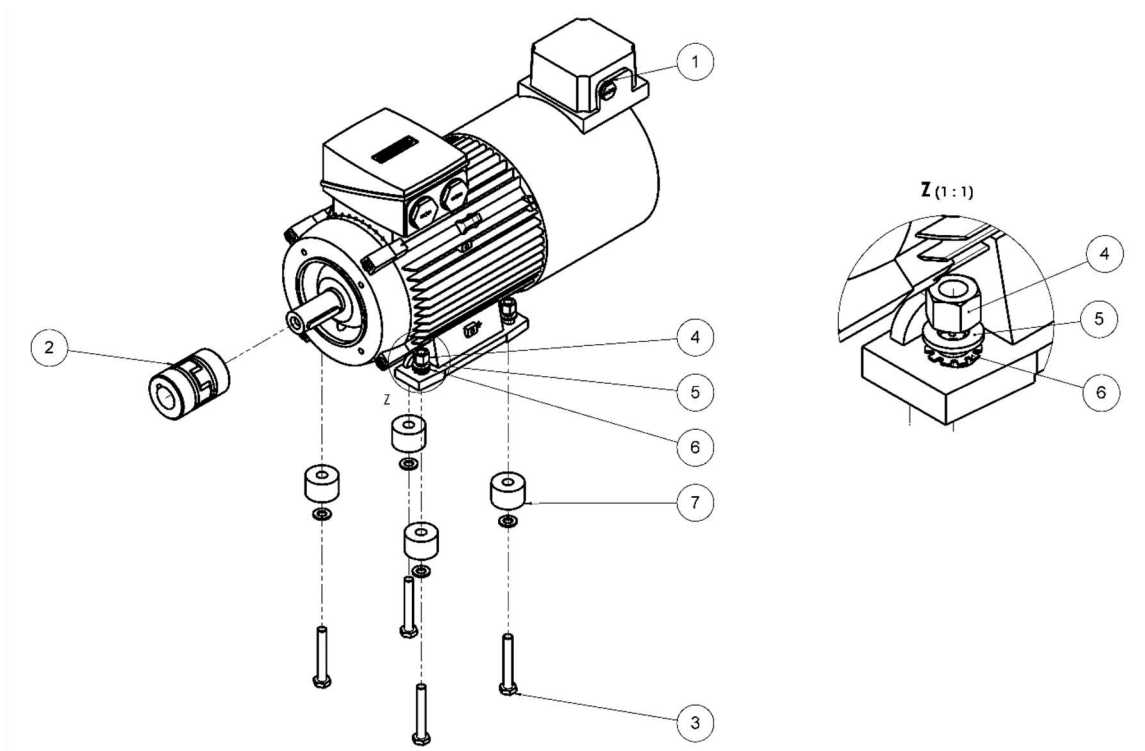


Figure 18 Drive unit PQ5G sub-assembly
Designations correspond to the enclosed parts list

3.5.8 Drive unit PQ5G-HT

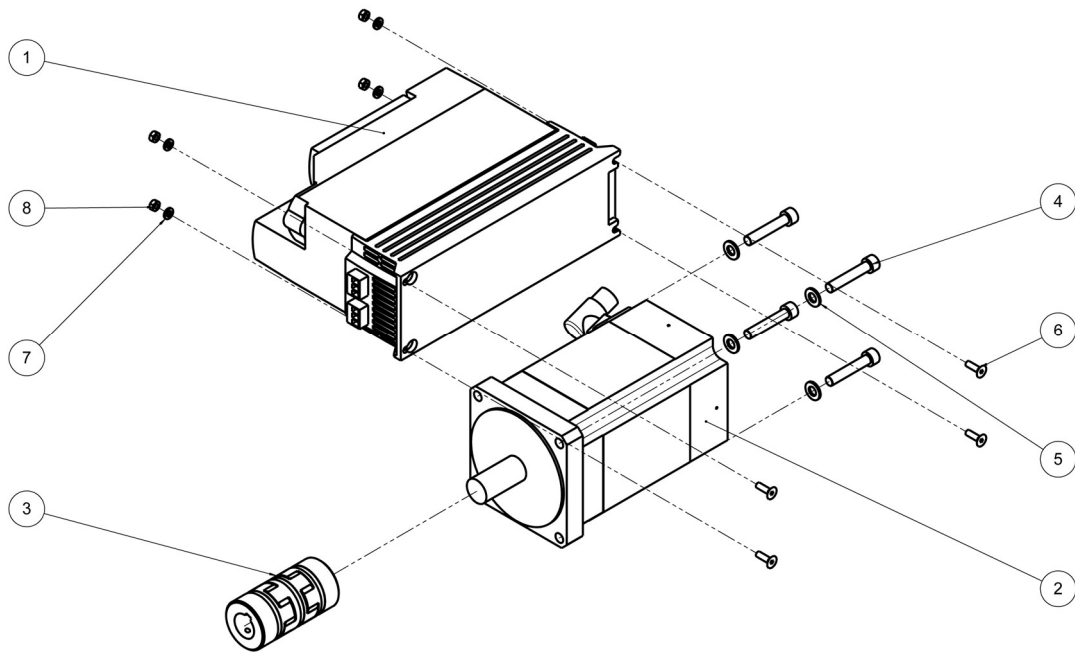


Figure 19 Drive unit PQ5G-HT sub-assembly
Designations correspond to the enclosed parts list

3.5.9 Drive unit PQ50G

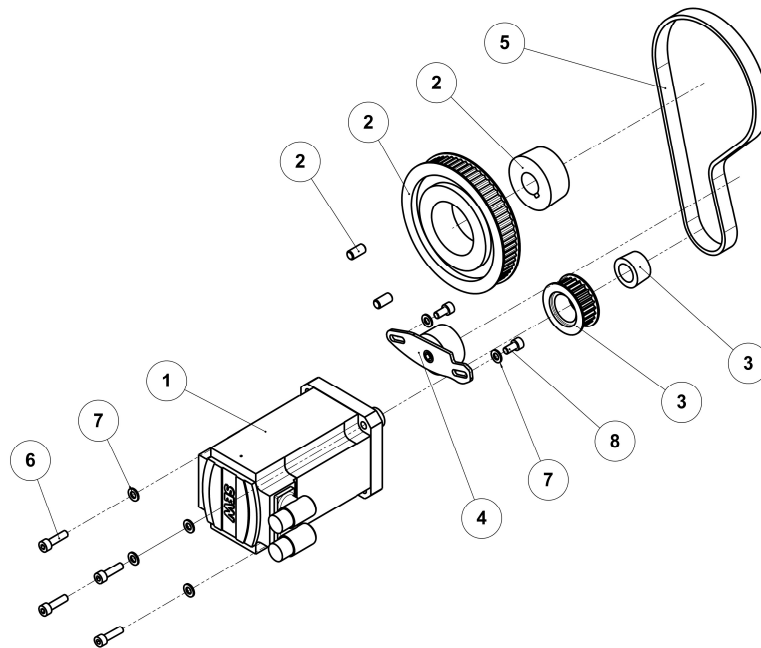


Figure 20 Drive unit PQ50G sub-assembly
Designations correspond to the enclosed parts list

3.5.10 Housing PQ5N

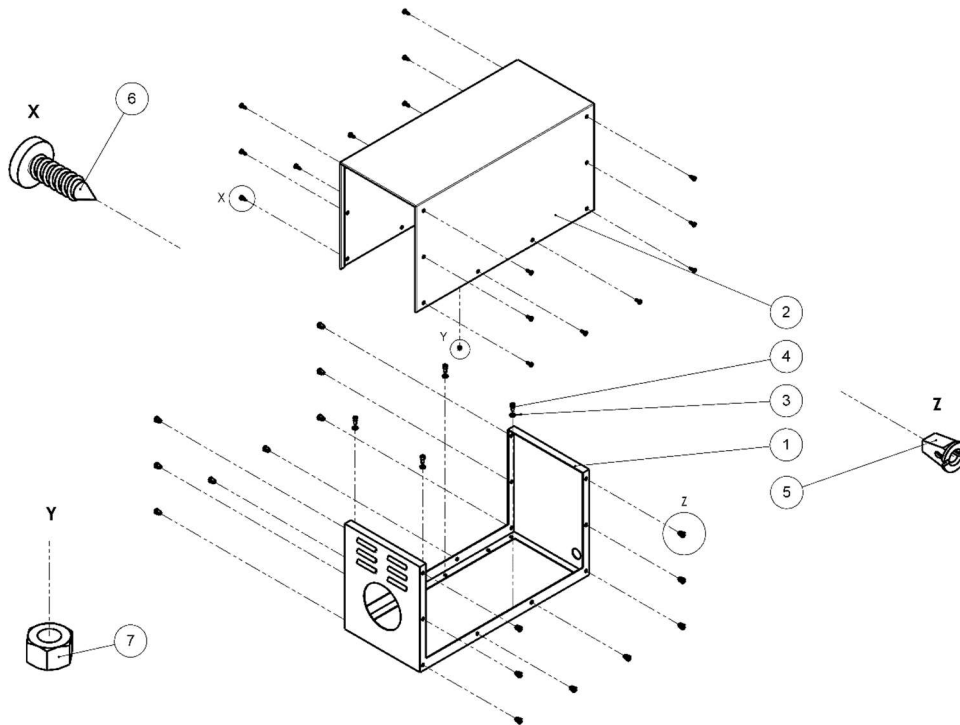


Figure 21 Housing PQ5N sub-assembly
Designations correspond to the enclosed parts list

3.5.11 Housing PQ44N-HT

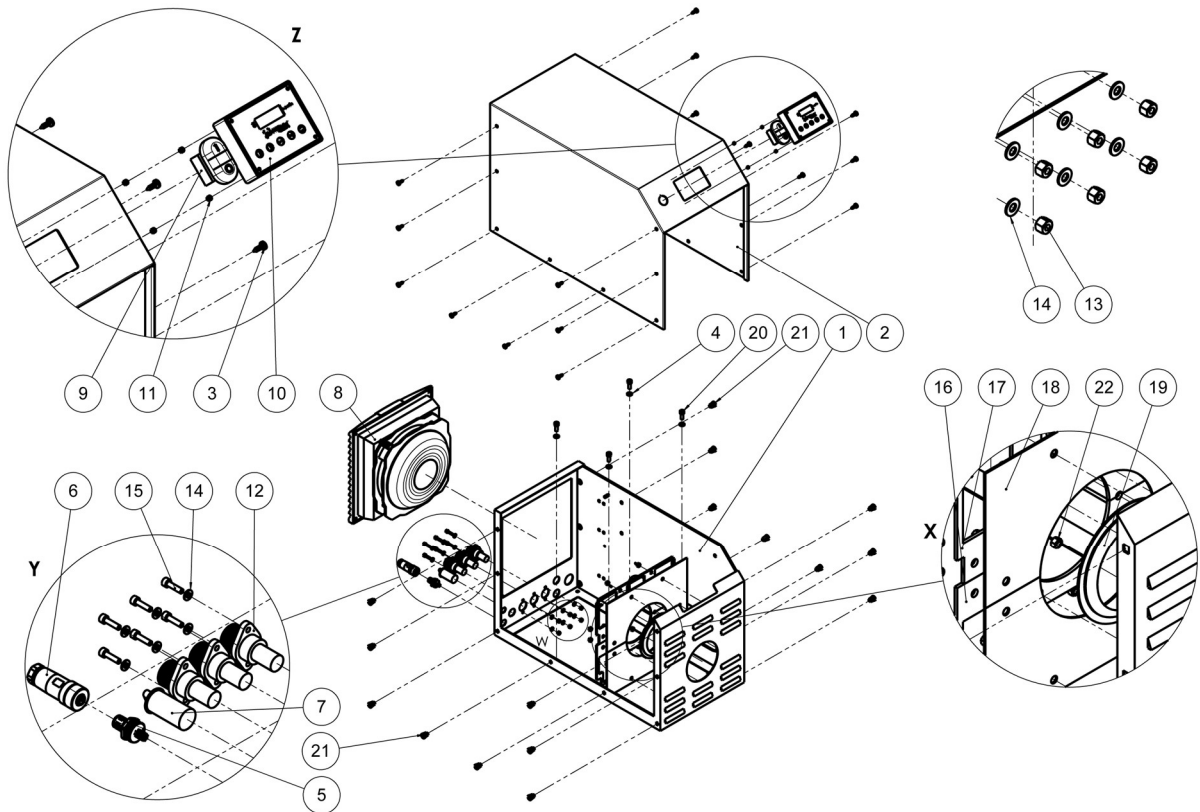


Figure 22 Housing PQ44N-HT sub-assembly
Designations correspond to the enclosed parts list

3.5.12 Housing PQ440-Q

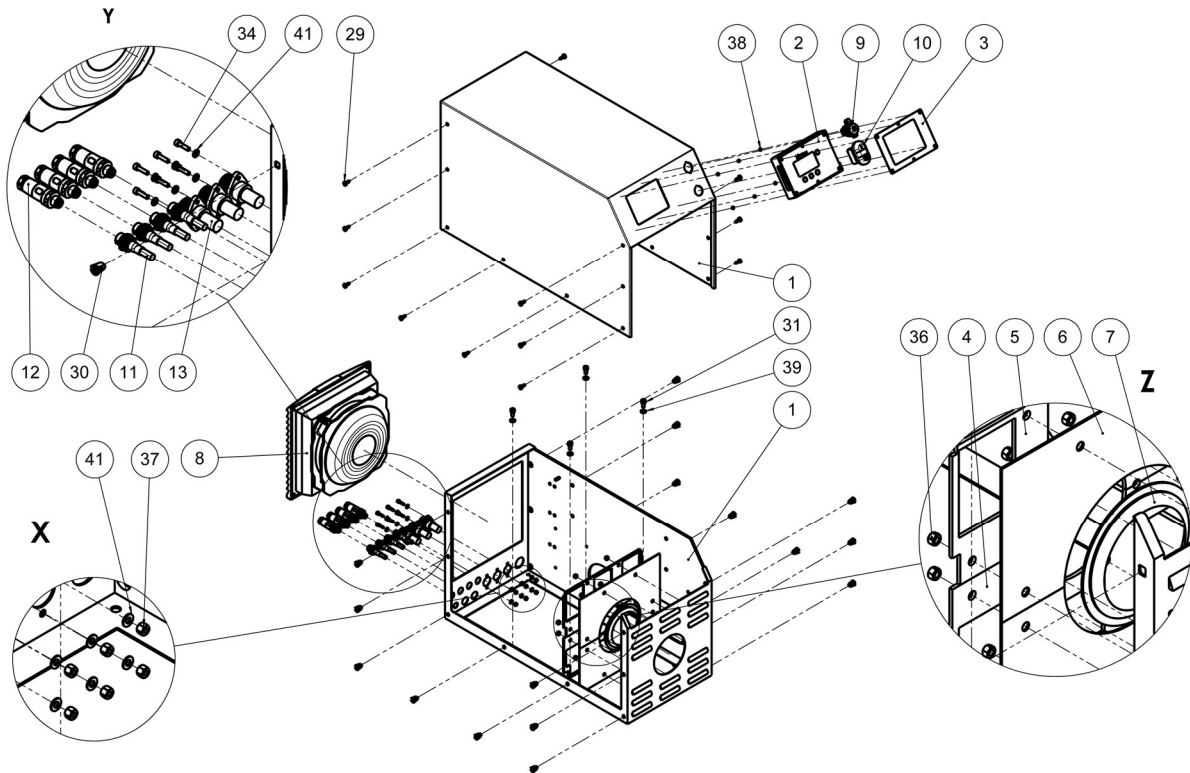


Figure 23 Housing PQ440-Q sub-assembly
Designations correspond to the enclosed parts list

3.5.13 Motor flange PQ5T

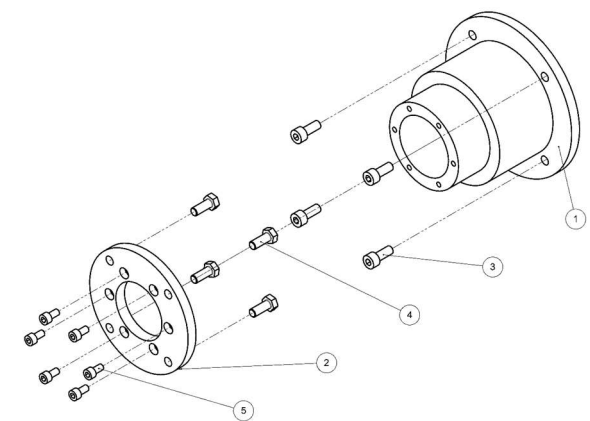


Figure 24 Motor flange PQ5T sub-assembly
Designations correspond to the enclosed parts list

3.5.14 Motor flange PQ5T-HT

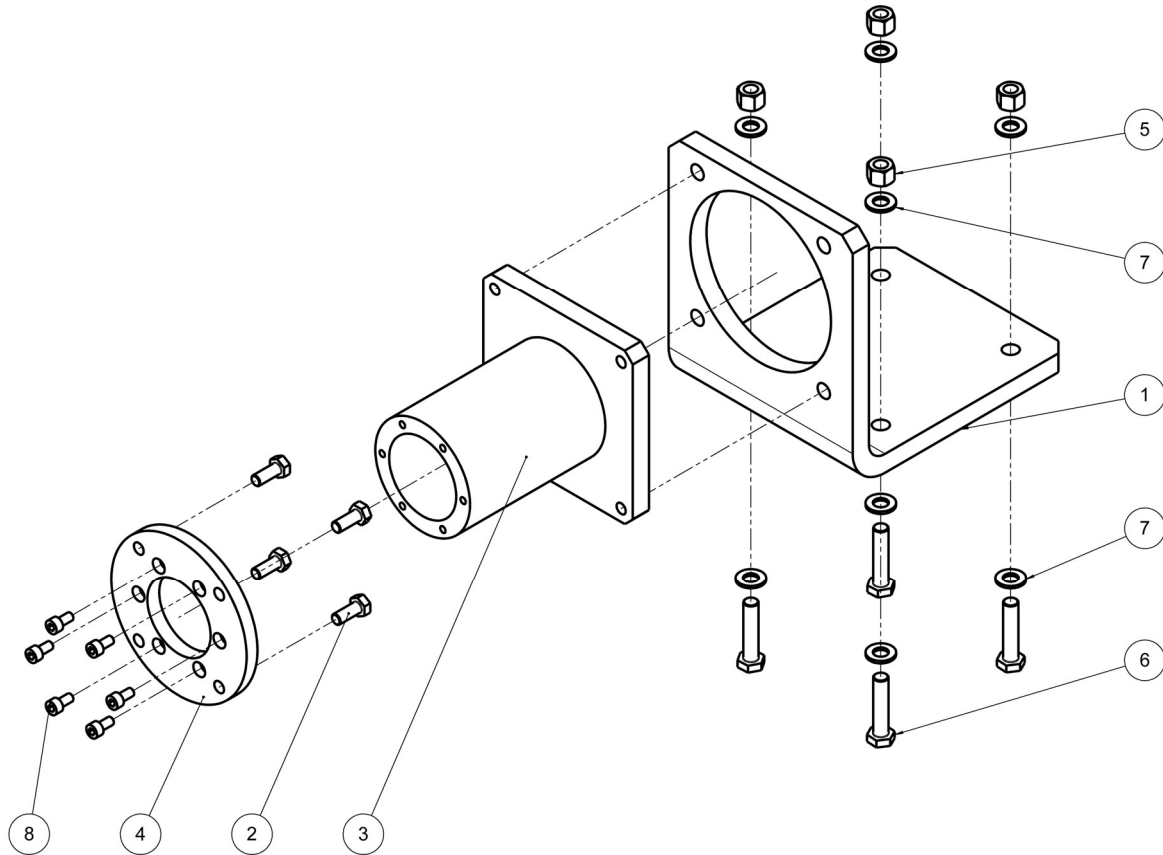


Figure 25 Sub-assembly motor flange PQ5T-HT
Designations correspond to the enclosed parts list

3.6 Control units

Pumps can be delivered with or without a separate control panel. In addition, compact versions with Code HT and QCON with integrated control panel are available.

3.6.1 Control panel HT

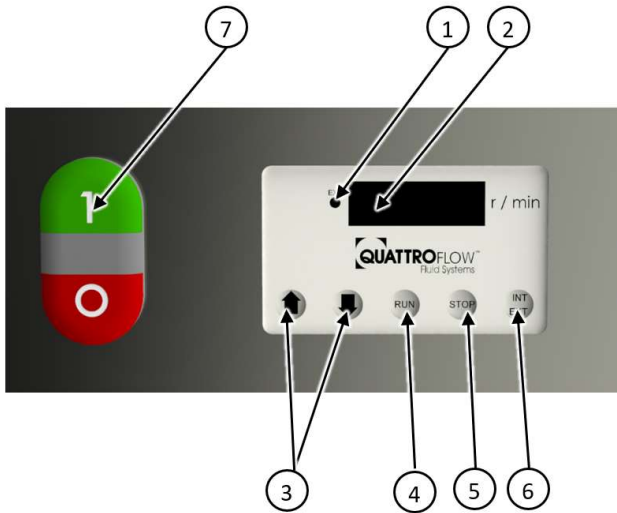


Figure 26 Control panel HT

| Item | Designation |
|------|-----------------------------------|
| 1 | External LED |
| 2 | Display shows actual speed in rpm |
| 3 | Arrow buttons UP/DOWN |
| 4 | RUN button |
| 5 | STOP button |
| 6 | Control source INT/EXT |
| 7 | Main switch I/O |

3.6.2 QControl

All pumps with an article code containing “QCON” are equipped with the “QControl” control panel. The control panel is covered by a separate operating manual, therefore see the “QControl manual” for further information.

3.7 Optional accessories

These optional accessories are available for the QF5K and QF5KCD:

- Leakage sensor (diaphragm monitoring)
- External control panel with integrated frequency converter (FC)

3.8 Information on the pump

This information is affixed to the pump:

- Maximum delivery pressure and hot surfaces
- Labelling of connections
- Labelling of delivery direction
- Connecting cables, fuses, digital/analogue inputs and outputs (only HT/QControl)

Always keep the information in perfectly legible condition.

4 Assembly/installation

- ▲ **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.

Install the pump in this way:

- Securely and stably on a non-slip surface able to bear the weight of the pump.
- Outside a humid or aggressive atmosphere (e.g. in air containing steam, salt or acid) to avoid corrosion on the motor and the control panel.

4.1 Transport and storage

The pump MU is generally shipped ready to use and packed.

The pump chamber for the pump SU is delivered separately.

- ▶ Leave the pump and pump chamber in the packaging until it is used.
- ▶ Protect the pump and pump chamber against wet, cold, dirt, UV radiation and mechanical influences.
 - Uniformly ventilated room free from dust and vibrations
 - ▲ **WARNING** – Store only under the conditions specified in the technical data chapter.
 - No exposure to heat (sun, heating)
- ▶ Lift the pump evenly at the base plate. The pump is heavy. Carry the pump together with another person or with suitable lifting gear.

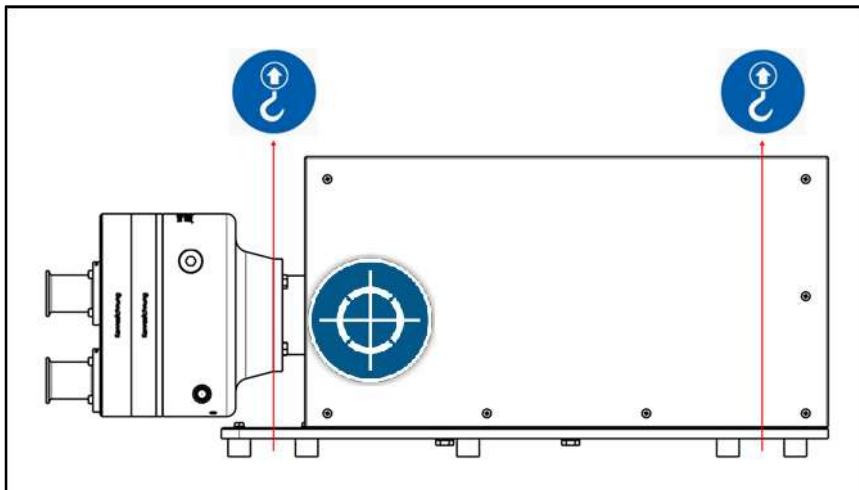


Figure 27 Attachment points and centre of gravity of the pump

4.2 Assembly SU pump chamber

The pump chamber of the SU variant is delivered separately and must be fitted before using for the first time. For assembly of the pump chamber, see chapter 6.7.1 Assembling the pump chamber SU

4.3 Space requirement

Leave enough room around the pump for operation and maintenance. Observe the space required for assembly and disassembly of the components (see chapter 6.5 Replacement of on page 38).

Leave enough room for bleeding the pump.

Position the control panel so that you can reach it easily. Protect the control panel from damp (splashing or jets of water) and heat.

4.4 Installation

The pump is mounted on a stainless steel base plate. If the pump is not to be operated on this base plate, but, for example, in a rack, make sure that the drive unit and pump unit are aligned correctly.

4.5 Connections

4.5.1 Pipes

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

Connect the pump with pipes and hoses like this

- Suction side
 - Pipes are sufficiently 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
 - the operating and fluid temperature

4.5.2 Electric cables

NOTE – Operate the pump only with the specified mains voltage and mains frequency to avoid damage to the control panel and the pump drive (see chapter 3.2 Labelling on page 7).

▲ DANGER – Electric current, fatal electric shock. Have the pump connected by experts only and disconnect from the power supply when working on the electrical system.

- ▶ Connect the pump to a protective earth system.
 - Minimum cross-section 2.5 mm² (AWG14)
 - Protected against mechanical damage over the whole length.
- ▶ Install the pump with a suitable preliminary fuse.
- ▶ RCCBs must be type B or B+.
- ▶ Plug connections must be suitable for industrial applications in accordance with IEC 60309.
- ▶ If the risk analysis demands, integrate the pump into an emergency stop system via its electrical connection.

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.

If the pump 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.

4.6 Test run

NOTE – A test run is recommended before using the pump for the first time:

- ▶ Carry out a test run with a safe fluid, e.g. water. In this way you can acquaint yourself with the function of the pump.
- ▶ Check the suitability of the pump by 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 especially:

- QF5C (chapter Pump chamber QF5C (MU)3.5.2): Item 1, item 2, items 6.1 – 6.5
- PQ5U (chapter Connecting nozzle PQ5U (MU)3.5.4): Item 1
- ▶ Consult the Material-and-Certification-Guide or contact our Service if in doubt.

4.7 Parameter settings

A separate operating manual is available for pumps with the QCON control panel.

5 Commissioning

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

6 Operation

6.1 Safety

⚠ WARNING – The pumped fluid and cleaning products can be dangerous. There is a risk of serious damage to health by contact. See the safety data sheet of the fluid and wear the appropriate protective equipment.

⚠ WARNING – The pumped fluid and cleaning products may be hot and heat up parts of the pump. There is a risk of burns when touching. Allow hot parts to cool down.

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.

6.2 Switching on

⚠ WARNING – Overpressure can lead to leakages and spillage of the fluid. You could expose yourself to or scald yourself on a dangerous fluid. Never switch the pump on if the pressure side might be closed.

- ▶ Check the system in advance - especially for possible leakages and visible damages.
- ▶ Open the pressure line.
- ▶ Flush the pump thoroughly and condition the pump with a product-compatible solution (e.g. buffer) if necessary.

6.3 Operation

6.3.1 Control panel QF5KHT

You can operate the QF5KHT pump in 2 ways:

- Manual operation (speed setting and start/stop) of the pump by the control panel (see Figure 26 Control panel HT on page 31)
- External operation of the pump by means of an analogue input signal (4-20mA). The buttons of the control panel are locked.

6.3.1.1 Starting the pump

Manual operation

See Figure 26 Control panel HT on page 31.

- ▶ Press the main switch.
- ▶ Press the control source button (6) until the external LED (1) no longer lights.
- ▶ Press the arrow buttons (5) to set the desired speed. The desired speed appears as a target value on the display (2).
- ▶ When you have set the desired speed, press the RUN button (4).
- ▶ Press the STOP button (5) to stop the pump.

External operation

- ▶ Press the main switch.
- ▶ Press the control source selection button (6) until the external LED (1) lights.
- ▶ Signal connection (8-pin plug) + start/stop signal
Note! The start and stop signal must always be used! See the chapter "Technical data" for the plug specification.

6.3.1.2 Stopping the pump

- ▶ Press the STOP button (5).
- ▶ Wait until no more fluid is pumped.

6.3.1.3 Switching off the pump

- ▶ Stop the pump.
- ▶ Empty the pump.
- ▶ For QF5K-HT and QF5KQcon pumps: Switch the pump off with the main switch (7).

The display switches off.

⚠ WARNING – The fluid can heat up parts of the pump. You could suffer burns!

- ▶ Let the pump cool down, if necessary.
- ▶ Clean the pump.

6.3.1.4 Speed control panel HT

Arrow up (Figure 26 Control panel HT item 3) increases the speed.

Arrow down (Figure 26 Control panel HT item 3) reduces the speed.

The pump performance can be taken from the chart (Figure 1 Performance chart SU-STD (AC-motor)).

6.3.2 Operation with the frequency converter

The pump is started, controlled and stopped with the external frequency converter.

6.4 Cleaning

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

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

6.4.1 CIP (cleaning) (only MU)

The pump chamber is cleaned when the pump chamber is installed on the drive.

⚠ DANGER – Strong alkaline solutions are used for cleaning. They could cause burns. Wear protective goggles, safety gloves and protective clothing. Observe the safety data sheet.

⚠ WARNING – Strong alkaline solutions are pumped when cleaning. They could cause burns in case of leakages. Make sure that the whole system withstands maximum pressure.

⚠ WARNING – Parts of the pump can heat up when cleaning. You could suffer burns. Do not touch the pump. Let the pump cool down.

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

6.4.2 SIP (steaming) (only MU)

The pump chamber is steamed when the pump chamber is installed on the drive.

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

⚠ WARNING – Parts of the pump can heat up when cleaning. You could suffer burns!

- ▶ Only perform with the pump chamber installed.
- ▶ Do not touch the pump.
- ▶ Let the pump cool down.
- ▶ Steam at a maximum temperature of 130°C and not for longer than 30 minutes.
- ▶ Allow the pump chamber to cool down slowly.

6.4.3 Gamma radiation (only SU)

In the gamma sterilisation process, cobalt-60 or X-radiation is used to kill micro-organisms on and in the product.

6.4.4 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.
- ▶ Disassemble the pump chamber (see chapter 6.5.2 Disassembling the pump chamber on page 39).
- ▶ Close the inlet and outlet openings of the pump, e.g. by connecting hoses. Make sure that a free gas and steam 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 (Figure 28) during autoclaving.

- ▶ Position the pump chamber in the autoclave as shown.

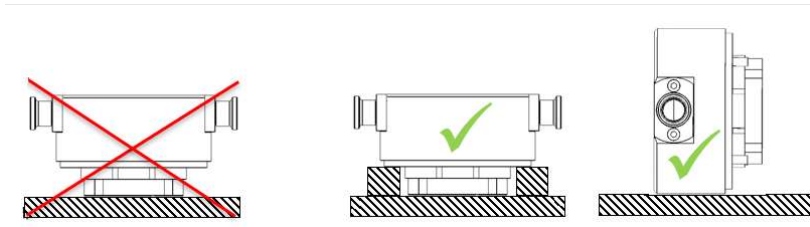


Figure 28 Position of the dismantled pump chamber in autoclaves

- ▶ Autoclave the pump chamber in the vacuum autoclave according to the values specified in the technical data chapter. See also the autoclave manufacturer's instructions.

6.5 Replacement of elastomers (only MU)

Requirement maintenance kit: PSKITQF5K.

6.5.1 Safety

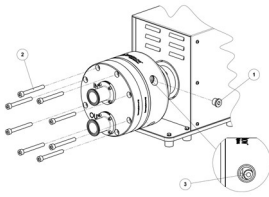
⚠ WARNING – Electrical and mechanical hazards. Establish a safe condition of the pump:

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

The suction and pressure side lines are closed and emptied if necessary.

If the pump is removed, a note about the last pumped fluid or a decontamination certificate must be enclosed.

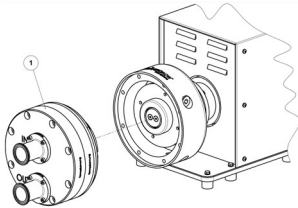
6.5.2 Disassembling the pump chamber (MU)



⚠ DANGER – Touching electrical components can cause fatal electric shock. Disconnect the pump from the power supply.

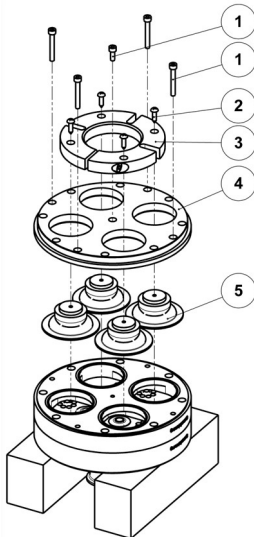
⚠ WARNING – The fluid can heat up parts of the pump. You could suffer burns. Let the pump cool down.

- ▶ Remove the locking screw (1 / PQ5A, item 3 Figure 11).
- ▶ Remove the screws (2 / QF5C item 8 Figure 12) from the housing.
- ▶ Loosen the clamping ring screw (3 / QF5C, item 9 Figure 12).



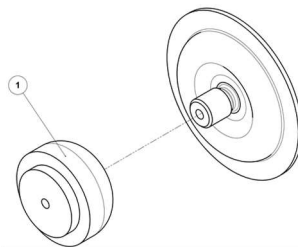
- ▶ Remove the pump chamber (1).

6.5.3 Replacing the elastomers (MU)



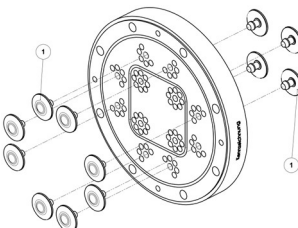
⚠ DANGER – Strong alkaline solutions are used for cleaning. They could cause burns. Wear protective goggles, safety gloves and protective clothing. Observe the safety data sheet.

- ▶ Disassemble the pump chamber (see chapter 6.5.2 Disassembling the pump chamber on page 39).
- ▶ Set down the pump chamber so that there is no load on the connecting nozzles.
- ▶ Remove the screws (1 / QF5C, item 10; 11 Figure 12).
- ▶ Remove the screw (2 / QF5C, item 7 Figure 12).
- ▶ Remove the clamping ring (3 / QF5C, item 4 Figure 12).
- ▶ Remove the diaphragm housing cover (4 / QF5C, item 3 Figure 12).
- ▶ Remove the diaphragm together with the diaphragm support (5 / QF5C, item 3; 6.1 Figure 12).

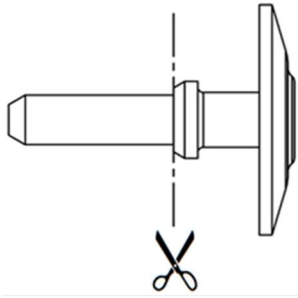


Replacing the diaphragm

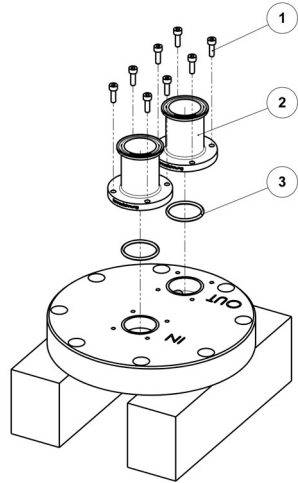
- ▶ Turn out the diaphragm.
- ▶ Tighten the diaphragm support (1 / QF5C, item 3; 6.1 Figure 12).



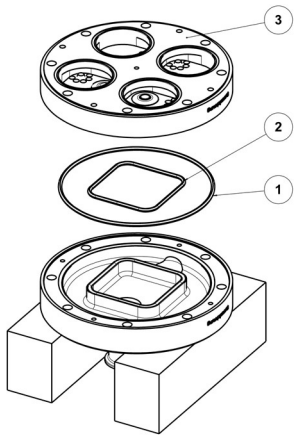
- ▶ Replace the valves (1). Use the assembly shaft valve (QF5C, item 6.2 Figure 12).



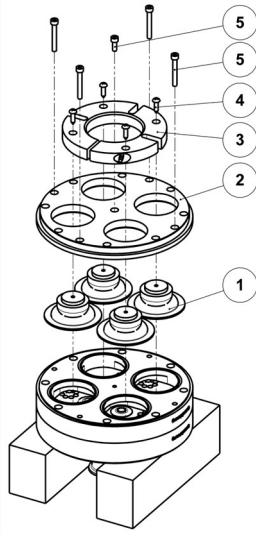
- ▶ Cut off the assembly shaft at the marked position on the valve (✂ / QF5C, item 6.2 Figure 12).



- ▶ Remove the screws (1 / PQ5U, item 2 Figure 15).
- ▶ Remove the connecting nozzles (2 / PQ5U, item 1 Figure 15).
- ▶ Replace the O-rings (3 / QF5C, item 6.5 Figure 12).
- ▶ Mount the connecting nozzles (2 / PQ5U, item 1 Figure 15).
- ▶ Fasten the screws (1 / PQ5U, item 2 Figure 12).

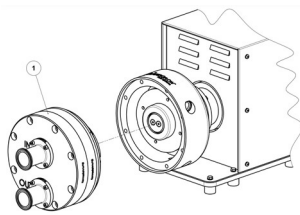


- ▶ Mount the O-ring (1 / QF5C, item 6.4 Figure 12).
- ▶ Mount the profile O-ring (2 / QF5C, item 6.3 Figure 12).
- ▶ Mount the valve plate together with the valves (3 / QF5C, item 2; 6.4 Figure 12).



- ▶ Mount the diaphragm together with the diaphragm support (1 / QF5C, item 3; 6.1 Figure 12).
- ▶ Mount the diaphragm housing cover (2 / QF5C, item 3 Figure 12).
- ▶ Fasten the screws (5 / QF5C, item 10; 11 Figure 12).
- ▶ Mount the clamping ring (3 / QF5C, item 4 Figure 12).
- ▶ Fasten the screw (4 / QF5C, item 7 Figure 12).

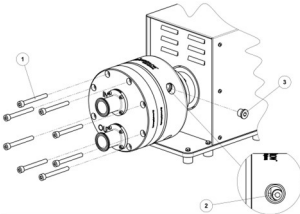
6.5.4 Disassembling the pump chamber MU



- ▶ Disconnect the pump from the power supply.
- ▶ Mount the pump chamber (QF5C Figure 12).

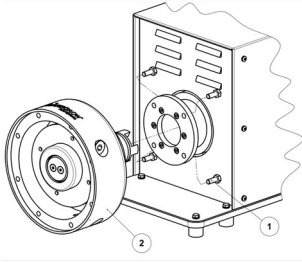
NOTE – You can turn the pump chamber (QF5C Figure 12) in 90° steps so that the position of the connectors on the suction and pressure side fit optimally in the machine. Hereby, also turn the clamping ring (QF5C, item 4 figure 9) so that the clamping ring screw (QF5C, item 9 figure 9) is accessible.

However, optimum emptyability of the pump only exists with standard alignment (discharge connection facing downwards).



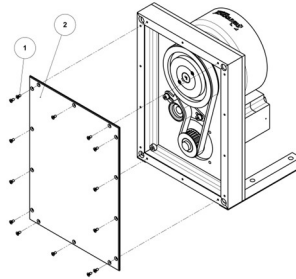
- ▶ Fasten the screws (1 / QF5C, item 8 Figure 12).
- ▶ Fasten the clamping ring screw (2 / QF5C, item 9 Figure 12).
- ▶ Fasten the locking screw (3 / PQ5A, item 3 Figure 11).

6.6 Replacing the WLC

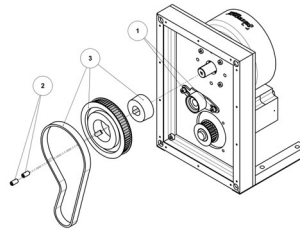


- ▶ Disassemble the pump chamber (see chapter 6.5.2 Disassembling the pump chamber on page 39).
- ▶ Remove the screws (1 / PQ5T, item 4 Figure 24).
- ▶ Disassemble the ring drive together with the coupling half (2 / PQ5A; PQ5G, item 2 Figure 18).

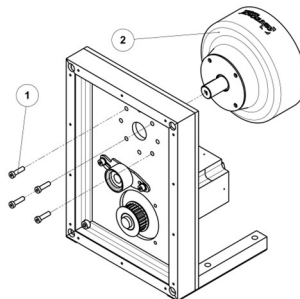
For QF5KCD pump:



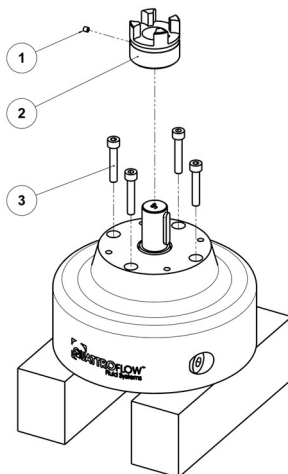
- ▶ Remove the screws (1 / PQ50H, item 4 Figure 17).
- ▶ Disassemble the cover together with the seal (2 / PQ50H, item 1.3, 7 Figure 17).



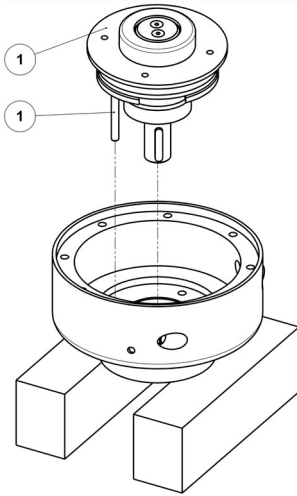
- ▶ Loosen the screws (1 / PQ50G, item 8 Figure 20).
- ▶ Unscrew the threaded pins (2 / PQ50G, item 2 Figure 20).
- ▶ Disassemble the toothed disc incl. bush and toothed belt (3 / PQ50G item 2; 5 Figure 20).



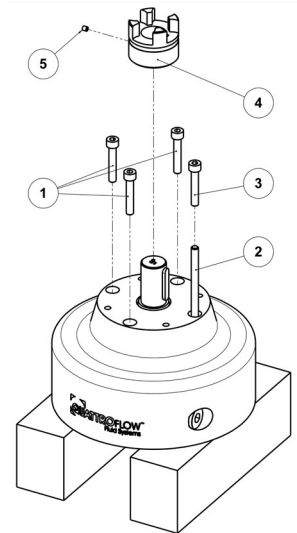
- ▶ Loosen the screws (1 / PQ50H, item 5 Figure 17).
- ▶ Disassemble the ring drive (2 / PQ5A-CD Figure 11).



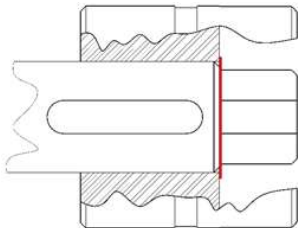
- ▶ Remove the threaded pin (1 / PQ5G, item 2 Figure 18) from the coupling half (2).
- ▶ Disassemble the coupling half (2 / PQ5G, item 2 Figure 18).
- ▶ Remove the screws (3 / PQ5A, item 4 Figure 11).



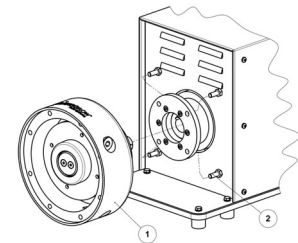
- ▶ Turn the ring drive over.
- ▶ Set down the ring drive so that there is no load on the shaft.
- ▶ Replace the maintenance kit WLC unit (1).
- ▶ Mount the assembly bolt (PQ5A, item 2 Figure 11) on the new unit.
- ▶ Insert the new unit into the ring drive.



- ▶ Fasten the first three screws (1 / PQ5A, item 4 Figure 11).
- ▶ Unscrew the assembly bolt (2).
- ▶ Fasten the last screw (1 / PQ5A, item 4 Figure 11).
- ▶ Fasten the screws (3 / PQ5A, item 4 Figure 11).
- ▶ Mount the coupling half (4 / PQ5G, item 2 Figure 18).
- ▶ Fasten the coupling half with the threaded pin (5 / PQ5G, item 2 Figure 18).

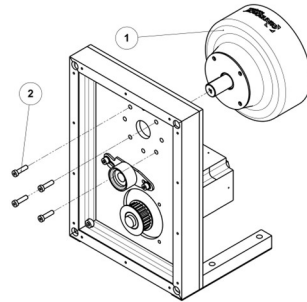


- ▶ Align the coupling or toothed disc (QF5kCD).
The end of the shaft should be in line with the end of the coupling half (red marking) as far as possible.

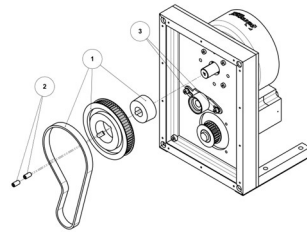


- ▶ Mount the ring drive together with the coupling half (1 / PQ5A Figure 11; PQ5G, item 2 Figure 18).
- ▶ Fasten the screws (2 / PQ5T, item 4 Figure 24).
- ▶ Assemble the pump chamber (see chapter 6.5.4 Disassembling the pump chamber on page 41).

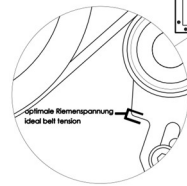
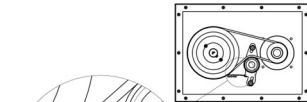
For QF5KCD pump:



- ▶ Mount the ring drive (1 / PQ5A-CD Figure 11).
- ▶ Fasten the screws (2 / PQ50H, item 5 Figure 17).

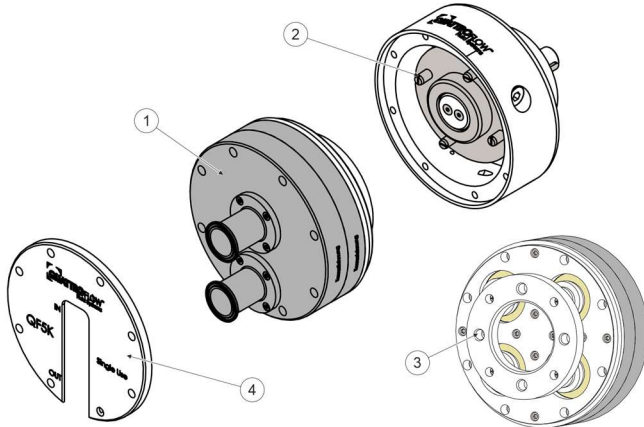


- ▶ Mount the toothed disc incl. bush and toothed belt (3 / PQ50G item 2; 5 Figure 17).
- ▶ Tighten the threaded pins (2 / PQ50G, item 2 Figure 17).
- ▶ Align the tensioning roller. Observe the "optimum belt tension" marking on the base plate.
- ▶ Fasten the screws (3 / PQ50G, item 8 Figure 17)



6.7 Assembling/disassembling the SU pump chamber

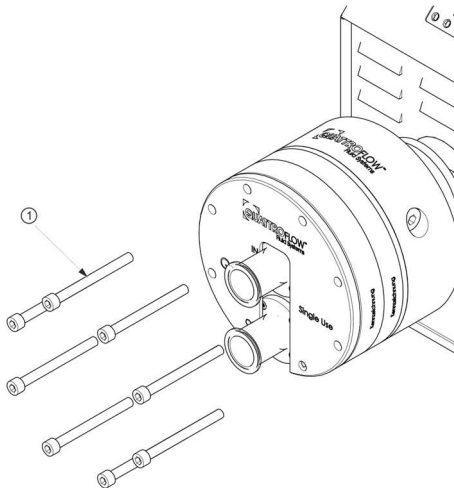
6.7.1 Assembling the pump chamber SU



⚠ DANGER – Touching electrical components can cause fatal electric shock. Disconnect the pump from the power supply.

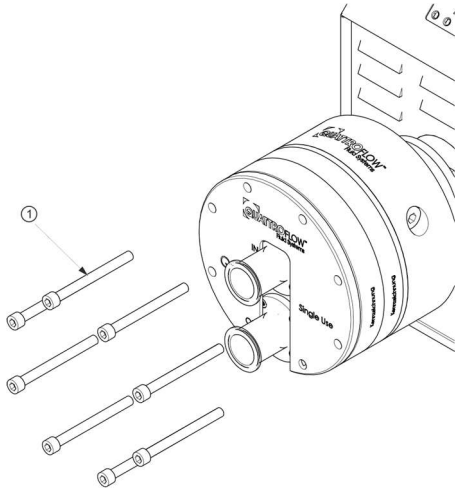
⚠ WARNING – The fluid can heat up parts of the pump. You could suffer burns. Let the pump cool down.

- ▶ Place and press the pump chamber (1) with bore holes (3) onto the bolts (2) of the ring drive.
- ▶ Mount the pressure plate (4).



- ▶ Fasten the screws (1 / QF5C, item 8 Figure 12).

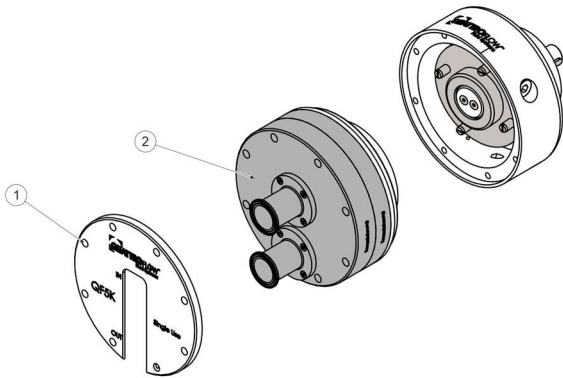
6.7.2 Disassembling the pump chamber (SU)



⚠ DANGER – Touching electrical components can cause fatal electric shock. Disconnect the pump from the power supply.

⚠ WARNING – The fluid can heat up parts of the pump. You could suffer burns. Let the pump cool down.

- ▶ Remove the screws (1 / QF5C, item 8 Figure 12).



⚠ DANGER – Touching electrical components can cause fatal electric shock. Disconnect the pump from the power supply.

⚠ WARNING – The fluid can heat up parts of the pump. You could suffer burns. Let the pump cool down.

- ▶ Remove the pressure plate (1).
- ▶ Pull the pump chamber (2) off the bolts of the ring drive.

7 Maintenance

Wearing parts such as the 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 5,000 lph, 4 bar counter-pressure). Different conditions (e.g. higher fluid temperatures, aggressive fluids) and all after-treatments of the parts (e.g. CIP, SIP) influence the life expectancy.

- ▶ 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 (MU) <ul style="list-style-type: none"> • Diaphragm • Valves • O-rings | Replace (available as a replacement kit) |
| After diaphragm breakage | SU pump chamber/ MU elastomers <ul style="list-style-type: none"> • Diaphragm • Valves • O-rings | Replace (available as a replacement kit) |
| | WLC unit <ul style="list-style-type: none"> • Eccentric shaft • Bearing • Connector plate | Replace (available as a pre-assembled replacement kit) |
| 1,000 operating hours or at least once a year | MU elastomers <ul style="list-style-type: none"> • Diaphragm • Valves • O-rings | Replace (available as a replacement kit) |
| | WLC unit (SU/MU) <ul style="list-style-type: none"> • Eccentric shaft • Bearing • Connector plate | Check and replace if necessary (available as a pre-assembled replacement kit) |

See the maintenance instructions in the respective operating manual for the following components

- Motor
- Clutch
- Gear (if available)

8 Elimination of faults

8.1 Elimination of faults

| 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 | Delivery volume is uneven | Running noises get louder | Pump is leaking | Motor too hot | Display shows error code or is off | |
| | | | | | | | | | | The 4-piston diaphragm pump works very reliably and error-free when it is used, serviced and operated according to the operating manual. |
| 1 | | X | | | | | X | | | The screws connecting the individual components are not tightened correctly – Please re-tighten! |
| 2 | | X | | | | | | | | The delivery direction of the pump is wrong. Please switch the suction and pressure sides! |
| 3 | | X | X | X | X | | | | | Air in the pumped fluid, e.g. due to a leaking TC seal - Please check the pipes for leaks. |
| 4 | | X | X | X | X | X | | | | The components in the suction side are not laid correctly – Please check all pipes, hoses and valves. |
| 5 | | X | X | | X | | | | | Check the viscosity of the fluid. |
| 6 | X | | | | | | | | X | Please check the power cables, power supply and fuse. |
| 9 | | | X | | | | X | | | The pressure side is sealed. Check the components of the pressure line(s). |
| 10 | | | X | | X | X | | | | The pipe cross-sections are too small. |
| 11 | | | | | | X | | | | The coupling is not aligned correctly. |
| 12 | | | | | | X | | | | The connecting element of the coupling is worn – Please replace! |
| 13 | | X | X | | X | X | | | | Check whether foreign bodies have gotten into the pump. |
| 14 | X | | | | | | | X | X | Thermal protection switch in the motor has tripped - Please allow to cool down and possibly reduce the motor power. |
| 15 | | | | | | X | | | | Shaft bearings are defective and must be replaced. |
| 16 | | X | | | | | | | | Valves are dry (long standstill), deformed or otherwise defective. |
| 17 | | | | | | | X | | | Pump diaphragm is torn (usually pumping pressure too high) – Please replace! |
| 18 | | X | X | X | | | X | | | O-rings between valve plate and pump housing are defective. |
| 20 | | | X | | | X | | | | Diaphragm support screw connections not tight – Please re-tighten! |

8.2 Return

- ▶ Fully decontaminate the pump.
- ▶ Fill in the decontamination certificate.
Enclose the decontamination certificate with the pump.
Observe the safety notes on the decontamination certificate.
The manufacturer will not accept the pump without a decontamination certificate.
- ▶ Contact Service (see chapter 1.1 Manufacturer and Service on page 3).

9 Disposal

The pump consists basically of the following materials:

- Steel and stainless steel
- Non-ferrous metal
- Plastic - especially elastomers (see Technical data in chap. ...)
- Electronic modules

Improper disposal of materials (e.g. metals, plastics, electrical and electronic modules) leads to environmental pollution. Recycle materials in an environmentally friendly way.

Consult the manufacturer about taking them back.

See chapter 8.2 Return

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

10 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**
Displacement pumps deliver defined volumes per revolution independently of the pressure conditions at the input and output of the dosing pump.
- **Depyrogenisation**
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.
- **Residual volume**
Medium volume that can remain in the pump after running empty.
- **Recirculation pump**
Pump for delivering and circulating certain fluids
- **Single-/Multiple-Use (SU/MU)**
Single-Use, single use of the pump chamber.
Multiple-Use, multiple use of the pump chamber.
- **SIP**
Sterilisation in Place (SIP) 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.
- **Suction lift dry**
Suction height of the pump with unfilled pump chamber.
- **Displacement pump**
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.



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PSG Germany GmbH

Hochstraße 150-152 · D-47228 Duisburg, Germany

Telefon +49 (0) 2065 89205-0 · Fax +49 (0) 2065 89205-40

www.quattroflow.com · psg-germany@psgdover.com