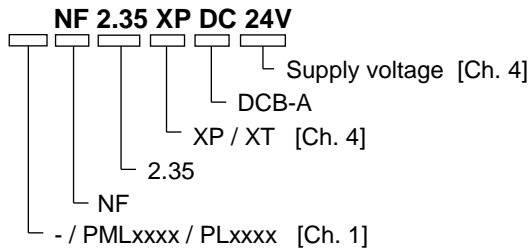


# DIAPHRAGM LIQUID PUMP

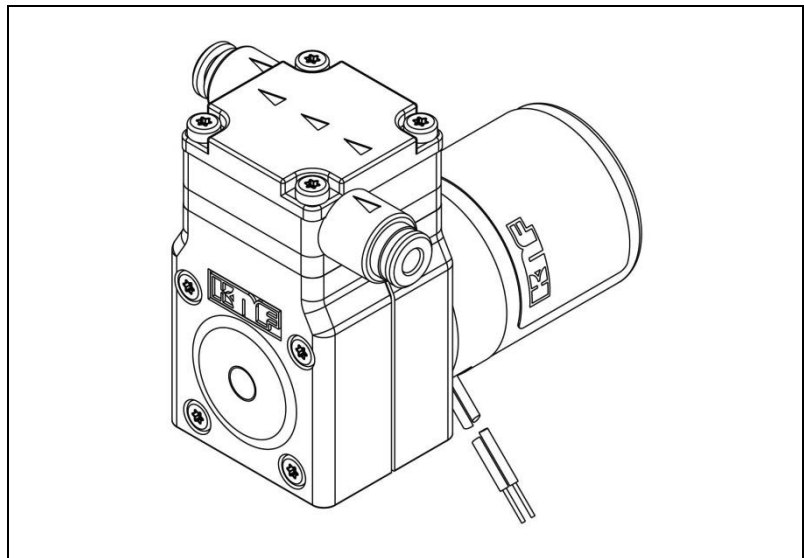
## NF 2.35



### Operating and Installation Instructions

Read and observe these Operating and Installation Instructions!

An additional letter prefixing the NF model code is a country-specific designation, with no technical relevance.



KNF Flodos AG  
 Wassermatte 2  
 6210 Sursee, Switzerland  
 Tel +41 (0)41 925 00 25  
 Fax +41 (0)41 925 00 35  
 www.knf-flodos.ch  
 info@knf-flodos.ch

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## 1. About this document

### **i** Disclaimer of liability

KNF accepts no liability for any damage caused by failure to follow the operating instructions.

### 1.1. Use of the Operating and Installation Instructions

The Operating and Installation Instructions are part of the pump.

→ Forward the Operating and Installation Instructions to any subsequent owners of the pump.

Project pumps

Customer-specific project pumps (pump models which begin with "PL" or "PML") may differ from the Operating and Installation Instructions.

→ In the case of project pumps, take note of any additionally agreed specifications.

### 1.2. Symbols and markings

#### Warning



**This symbol indicates a potential danger.**

**WARNING**

It also indicates the possible consequences of failure to observe the warning. The signal word (e.g. "Warning") indicates the level of danger.

→ Here you will see actions for avoiding the danger and potential consequences.

#### Danger levels

Signal word	Meaning	Consequences if not observed
<b>DANGER</b>	warns of immediate danger	Consequences include death or serious injuries and/or serious property damage
<b>WARNING</b>	warns of potential danger	Death or serious injuries and/or serious property damage are possible
<b>CAUTION</b>	warns of a potentially dangerous situation	Minor injuries or damage to property are possible

Tab. 1

#### Other information and symbols

→ This indicates an activity (step) that must be carried out.

1. This indicates the first step of an activity to be carried out. Any additional steps required are numbered consecutively.

**i** This symbol indicates important information.

## 2. Use

### 2.1. Intended use

The pumps are intended for transferring liquids.

#### Owner's responsibility

Operating parameters and conditions

The pumps must only be installed and operated under the operating parameters and conditions described in Chapter 4, Technical data.



#### The pump and hoses generate vibrations

→ The pump and hoses must be secured before the pump is switched on.

**CAUTION**

→ Only completely installed pumps may be taken into service.

Requirements for transferred medium

Before transferring or metering a medium, check whether the medium can be transferred danger-free in the specific application case.

Before using a medium, check the compatibility of the materials of the pump head, pump housing, diaphragm and valves with the medium.

The temperature of the medium must lie within the permissible temperature range (see Chapter 4).

The transferred medium should not contain particles as these can prevent the pump from working correctly. If this cannot be guaranteed, a filter < 50 µm with sufficiently large filter area must be used upstream of the pump.

### 2.2. Improper use

Risk of explosion



The pumps must not be operated in an explosive atmosphere.

**DANGER**

Risk of bursting



The pumps must not be used to transfer liquids in systems in which there is a risk of bursting due to overpressure.

**DANGER**

For special modifications outside the standard technical specifications, please contact your KNF technical adviser.

### 3. Safety

- i** Observe the safety precautions in Chapters 6. Installation and connection and 7. Operation.

The pumps are built according to the generally recognised rules of technology and in accordance with the pertinent occupational safety and accident prevention regulations. Nevertheless, dangers may occur during their use which may lead to injuries to the user or others, or to damage to the pump or other property.

Only use the pumps when they are in a good technical and proper working order, in accordance with their intended use, observing the safety advice within the Operating and Installation Instructions, at all times.

Personnel	<p>Make sure that only trained and instructed personnel or specially trained personnel work on the pumps. This especially applies to assembly, connection and servicing work.</p> <p>Make sure that all personnel have read and understood the Operating and Installation Instructions, and in particular the "Safety" chapter.</p>
Working in a safety-conscious manner	Always ensure adherence to all pertinent accident prevention and safety regulations when working on and operating the pump.
Handling dangerous media	When transferring dangerous media, observe the safety regulations for handling such media and read and observe the safety data sheets.
Information	Always ensure adherence to all information stickers on the pumps, such as flow direction arrows and type plates, and keep stickers in legible condition.
Environmental protection	All replacement parts should be properly stored and disposed of in accordance with the applicable environmental protection regulations. Ensure adherence to the pertinent national and international regulations. This especially applies to parts contaminated with toxic substances.
Disposal	<p>Dispose of all packaging in an environmentally-appropriate manner. The packaging materials are recyclable.</p> <p>Ensure that the old appliance is disposed of in an environmentally-appropriate manner. Use appropriate waste collection systems for the disposal of end-of-life equipment. Used pumps contain valuable recyclable materials.</p>



---

EU directives/standards	<p>The pumps comply with the fundamental requirements of Directive 2011/65/EU (RoHS2).</p> <p>The pumps comply with the safety requirements regarding electromagnetic compatibility in Directive 2004/108/EG.</p> <p>For the purposes of the Machinery Directive 2006/42/EG, pumps are "partly completed machinery", and are therefore to be regarded as not ready for use. Partly completed machinery may not be commissioned until such time as it has been determined that the machine in which the partly completed machinery is to be assembled conforms to the provisions of the Machinery Directive 2006/42/EG. The essential requirements of Annex I of Directive 2006/42/EG (general principles) are applied and observed.</p> <p>The following harmonised standards are met:</p> <p><b>NF 2.35 DCB-A</b></p> <ul style="list-style-type: none"><li>▪ EN 55014-1</li><li>▪ EN 55014-2</li><li>▪ EN 61000-6-1</li><li>▪ EN 61000-6-3</li></ul>
Customer service and repairs	<p>All repairs to the pump(s) must be carried out by the relevant KNF Customer Service team.</p> <p>Only use genuine parts from KNF for servicing work.</p>

## 4. Technical data

### Pump materials

The pump type **XP** stands for:

Parts in contact with media	Material <sup>1)</sup>
Pump head <sup>2)</sup>	PEEK
Valve plate	EPDM
O-ring	EPDM
Diaphragm	EPDM
Resonating Diaphragm	PTFE

Tab. 2

The pump type **XT** stands for:

Parts in contact with media	Material <sup>1)</sup>
Pump head <sup>2)</sup>	PEEK
Valve plate	FFPM
O-ring	FFPM
Diaphragm	PTFE
Resonating diaphragm	PTFE

Tab. 3

<sup>1)</sup> according to DIN ISO 1629 and 1043.1

<sup>2)</sup> The pump head comprises an intermediate plate and a connecting plate

### Hydraulic ratings

Parameter	Value
PN (nominal pressure) [bar g] <sup>3)</sup>	16
Flow rate [ml/min] <sup>4)</sup>	350
Max. suction head [mWG]	3
Max. inlet pressure [bar] <sup>3)</sup>	0.5

Tab. 4

<sup>3)</sup> Higher pressures are possible on a project basis

<sup>4)</sup> Measured with water at 20 °C. Flow rates may vary from the values shown, depending on fluid viscosity, pump head material and the hoses/hose connectors used.

### Hydraulic connections

Parameter	Value
Push-in fittings external Ø [mm]	4 ± 0.1
Push-in fittings external Ø [inches]	5/32 ± 0.004
Recommended hose OD x ID [mm]	4.0 x 2.5

Tab. 5

**Specifications NF 2.35 DCB-A**

Motor voltage	12V	24V
Power consumption [W]	10	10
Max. I load [A]	0.8	0.4
Max. permissible current consumption [A]	1.0	0.5
Lead size [-]	AWG24 (0.2mm <sup>2</sup> )	
Protection class [-]	IP54 ( <i>only motor / housing on request</i> )	
Weight [g] <sup>1)</sup>	200	

Tab. 6

<sup>1)</sup> The weight may differ slightly from the stated value, depending on the version.

**i** Electrostatic sensitive components (ESD)

**Other parameters**

Parameter	Value
Permissible ambient temperature range [°C]	+ 5 to + 40
Permissible media temperature range [°C]	+ 5 to + 80
Permissible kinematic viscosity of medium [cSt]	≤ 150

Tab. 7

**CAUTION****Risk of burns when transferring hot media**

- Do not touch the pump or the media transfer system.
- Avoid contact with flammable materials.

## 5. Assembly and function

### Assembly

- 1 Outlet
- 2 Inlet
- 3 Head plate
- 4 Connecting plate
- 5 Intermediate plate
- 6 Motor
- 7 Connecting lead

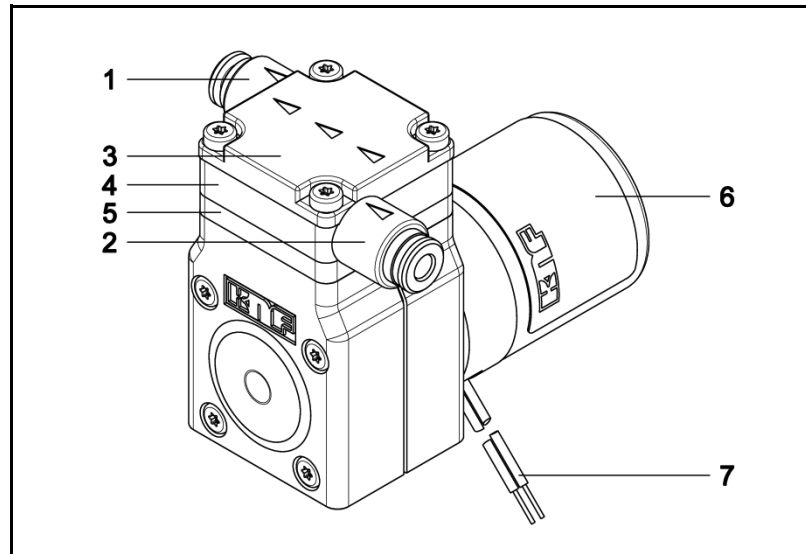


Fig. 1: Diaphragm liquid pump

- 1 Outlet valve
- 2 Inlet valve
- 3 Working chamber
- 4 Diaphragm
- 5 Eccentric
- 6 Connecting rod
- 7 Pump drive

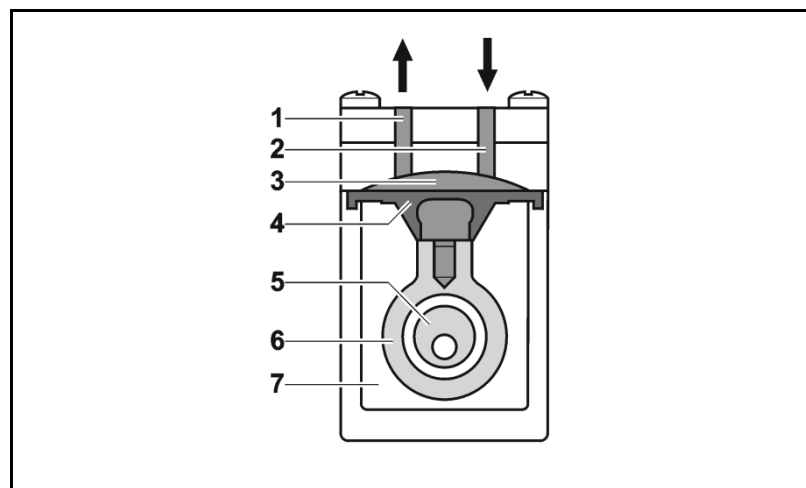


Fig. 2: Pump assembly

The diaphragm liquid pumps are based on reciprocating displacement pump technology. The elastic diaphragm (4) is moved up and down by the eccentric (5) and the connecting rod (6). In the downward stroke it aspirates the medium to be transferred via the inlet valve (2). In the upward stroke, the diaphragm pushes the medium out of the pump head via the outlet valve (1). The diaphragm hermetically seals off the working chamber (3) from the pump drive (7).



## 6. Installation and connection

Please note:

Chapter 2 Use

Chapter 3 Safety

Chapter 4 Technical data

Only install the pumps under the operating parameters and conditions permitted in these instructions.

→ Before installation, store the pump at the installation location to bring it up to ambient temperature.

Mounting dimensions

→ Mounting dimensions (see Fig. 3)

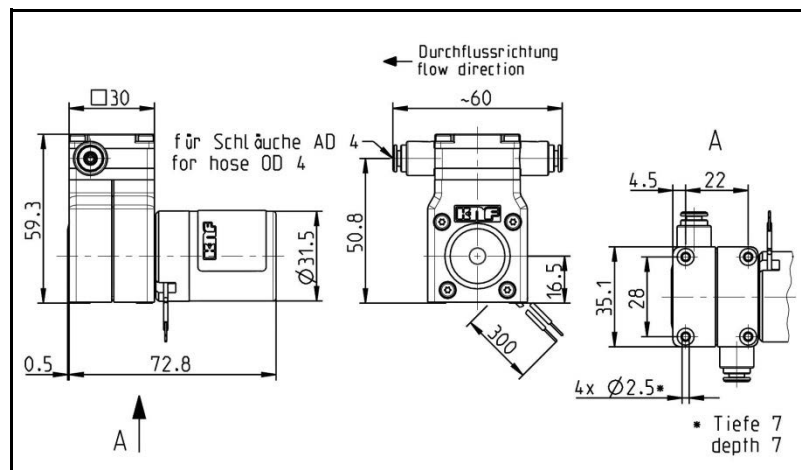


Fig. 3: Mounting dimensions NF 2.35 DCB-A

Installation location

→ Make sure that the installation location is dry and the pump is protected against water in the form of rain, spray, splashes and drips.

→ Protect the pump against dust.

→ Protect the pump against vibration and impact.

Installation position

→ The pump can be mounted in any orientation.

### 6.1. Electrical connection

→ Only have the pump connected by an authorized specialist.

→ Only connect the pump when the power supply is disconnected.

→ When connecting the device to a power source, the applicable norms, directives, regulations and technical standards must be observed.

#### Connecting the pump

1. Make sure that the power supply data match the data on the motor's type plate. The current consumption can be found on the type plate.

2. Connect motor lead For electrical data see Chapter 4.



Note the proper polarity.

red motor lead: +

black motor lead: -

## 6.2. Hydraulic connection

Connected components

→ Only connect components to the pump that are designed to handle the hydraulic data of the pump (see Chapter 4, Technical data).

Hoses

→ Only use hoses that are suitable for the maximum possible operating pressure and the maximum possible operating temperature of the liquids to be transferred.

→ Only use hoses that are sufficiently chemically resistant to the liquids being pumped.

### 6.2.1. Connecting the pump

**i** Arrows on the pump head indicate the flow direction.

1. Remove the protective caps from the connections.
2. Connect the suction and pressure lines. (See Installing the plug-in coupling on the next page)

**i** Keep the suction line as short as possible in order to facilitate the priming process.

3. Check that the hoses and transition joints are fitted correctly and securely.
4. Check that the system is leak-tight.

Protect against overpressure



**WARNING**

**The bursting of unprotected parts of the system may cause fatal injury.**

The pump has no built-in pressure limitation. When the pump is transferring liquids in closed systems, the pressure can increase to a very high level, and this may result in the bursting of pressure vessels, pipes or other parts of the system.

The pump will be permanently damaged if operated against pressures which exceed those stated in the technical data.

→ It is essential to protect any system in which the pump is installed against overpressure by means of a suitable safety device.

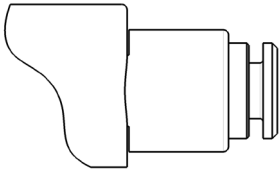
**i** **One means of preventing excessive pressure and the inherent dangers thereof is to place a bypass line with a pressure relief valve between the pressure and suction sides of the pump. For further information, contact your KNF technical adviser (for contact details, see last page).**

Installing the plug-in coupling

Plug-in couplings are a particularly easy way of permanently connecting the pump to pressure-resistant plastic hoses and plastic pipes.

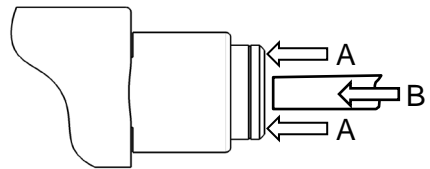
- i** The hoses or plastic pipes must be cut straight and have a smooth, undamaged surface.
- i** If one or both of the plug-in couplings is unfastened during servicing, it is recommended to use a new head plate with new rubber part to ensure continued maximum leak-tightness.

*Service Kit Pump Head NF2.35 XP item no. 165 704  
NF2.35 XT item no. 165 705*



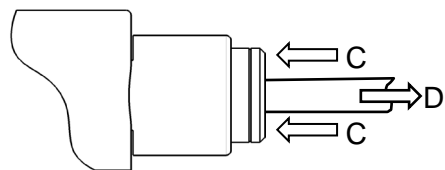
Plug-in connector not actuated

**Correct fitting:**



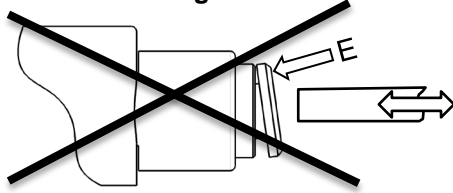
Keep release ring pressed in as far as it will go on both sides (A). Push hose in as far as it will go (B). Let go of release ring.

**Correct releasing:**



Keep release ring pressed in as far as it will go on both sides (C). Remove hose (D). Let go of release ring.

**Incorrect fitting and removal:**



If release ring is pressed in on one side only (E), the hose can neither be fitted nor released.

## 7. Operation

- Only operate the pumps under the operating parameters and conditions permitted in these instructions (see especially Chapter 4, Technical data).
- Make sure that the pumps are being used properly (see Chapter 2.1).
- Avoid improper use of the pumps (see Chapter 2.2).
- Observe the safety precautions (see Chapter 3).
- The pumps are components that are intended to be incorporated into another machine. Before putting them into service it must be established that the machinery or systems in which they are installed meet the relevant regulations.



Risk of burning  
The motor heats up.

→ Avoid contact with the pump motor.

**CAUTION** → Avoid contact with flammable materials.

**i** **One means of preventing excessive pressure and the inherent dangers thereof is to place a bypass line with a pressure relief valve between the pressure and suction sides of the pump. For further information, contact your KNF technical adviser (for contact details, see last page).**

Pump standstill → If the pump stops running, restore the system to normal atmospheric pressure.

For pumps with thermal switch or electronic overload protection:



**Personal injury or damage to pumps or the connected system as a result of automatic start-up**

**WARNING**

If the pump overheats and pump operation is stopped by the thermal switch / electronics, the pump will restart automatically as soon as it has had time to cool down.

→ Take steps to ensure that this cannot produce a hazardous situation.

Filter Replace filter (accessory) if dirty.

Check the pump Check the pump regularly for external damage or leaks.

### Switching the pumps on and off

Setting and regulating motor speed The motor speed of the pump, and thus the flow rate, is adjustable and can also be regulated to some extent.

## Impulse operation

**Duty cycle / short cycle operation**

KNF pumps are designed for continuous operation.

**i** If the pump is operated with short cycles in your application, please contact a KNF technical adviser for further information (for contact details, see last page).

**Switching on the pump**

→ In order to guarantee that the pump can start every time it is advisable to reduce the counterpressure to an acceptable level. If you experience a brief power interruption, check for the presence of pressure or vacuum before restarting.

**i** For more specific information contact your KNF technical adviser.

**Switching off the pump**

→ KNF recommends: If transferring aggressive liquids, the pump should be flushed thoroughly prior to switch off (see Chapter 8.2.1), as this will help to lengthen the service life of the diaphragm.

→ Restore the system to normal atmospheric pressure (release hydraulic pressure in pump).

**CAUTION**

**Overpressure on the suction side causes medium to flow through the switched-off pump**

→ Take steps to ensure that this cannot produce a hazardous situation.

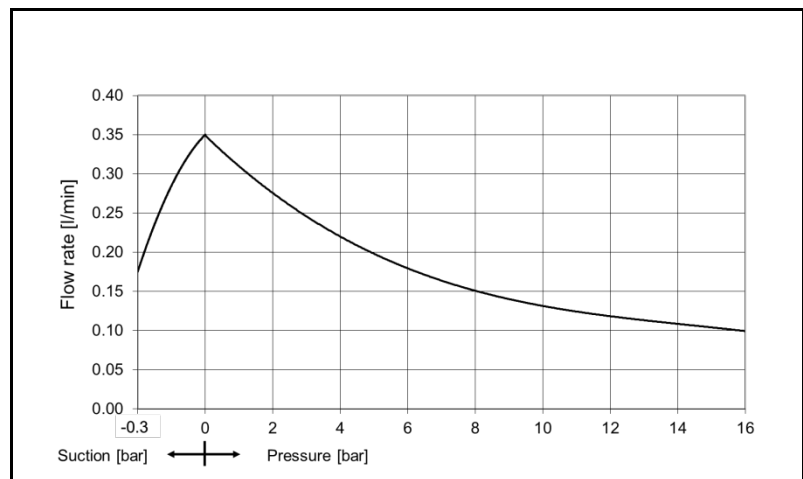
**Flow rate NF2.35**

Fig. 6: Flow rate of the pump NF 2.35 DCB-A

## 8. Servicing

### 8.1. Servicing schedule

Component	Servicing interval
Pump	- Regular inspection for external damage or leaks
Pump head	- Clean if the flow rate decreases, the pump does not work or no vacuum is created (Chapter 8.2)
Diaphragm, valve plates and seals	- Change as soon as pumping capacity decreases, preferably sooner
Filter (accessory)	- Change if it is dirty

Tab. 8

### 8.2. Disassemble pump head

Information on procedure



#### WARNING

Health hazard due to dangerous substances in the pump

Depending on the medium transferred, caustic burns or poisoning are possible.

→ Wear protective clothing if necessary, e.g. protective gloves.

→ Flush the pump with a neutralising liquid and pump empty.

#### 8.2.1. Preparations for disassembly

1. Flush the pump with a suitable neutralising liquid, and make sure that no dangerous substances are left in the pump
2. Empty the pump
3. Separate electrical connections
4. Disconnect hoses from pump head

Tool

Qty	Tool
1	T10 Torx screwdriver

Tab. 9

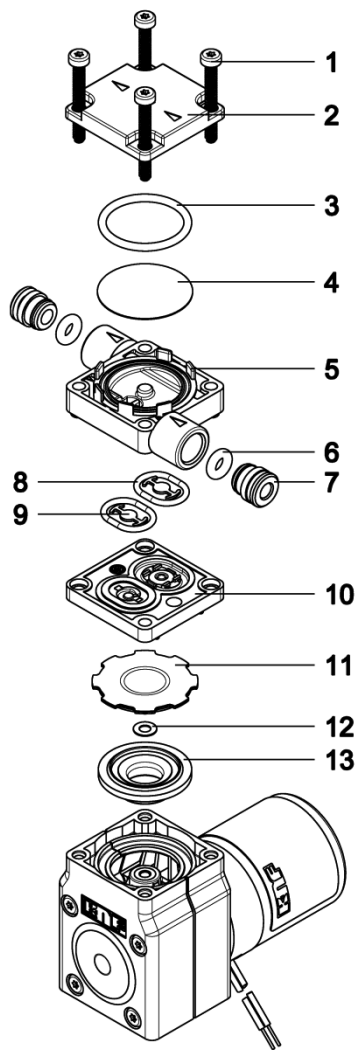


Fig. 4: Head parts

- 1 Head screws
- 2 Head plate
- 3 Seal
- 4 Resonating diaphragm
- 5 Connecting plate
- 6 Seals
- 7 Plug insert
- 8 Seals
- 9 Anchor valves
- 10 Intermediate plate
- 11 Pump diaphragm
- 12 Washers
- 13 Insert ring

### 8.2.2. Disassembling the pump head

1. Loosen the four head screws (1).
2. Remove resonating diaphragm (4) and seal (3) from the connecting plate (5).
3. Take both O-rings (8) and anchor valves (9) out of the connecting plate (5), together with the intermediate plate (10).
4. Remove diaphragm (11) by hand. Make sure that no washers (12) fall into the pump housing.
5. Remove insert ring (13).
6. Clean any residues thoroughly off all parts. Purge and dry with compressed air.

**i** For maximum leak-tightness it is recommended that, after opening the pump head, the rubber parts { diaphragm (11), anchor valves (9), seals (8), seal(3) }, resonating diaphragm (4) and connecting plate (5) should be replaced and new hoses used.

### 8.2.3. Assembling the pump head

1. Place insert ring (13) in pump housing.
2. Screw diaphragm (11) with washer (12) into connecting rod. Make sure that no washers (12) fall into the pump housing.
3. Fully tighten the diaphragm by hand.
4. Place O-rings (8) and anchor valves (9) in intermediate plate (10) and connecting plate (5).
5. Bring together intermediate plate (10) and connecting plate (5), making sure that they are aligned correctly with one another.
6. Place intermediate plate (10) and connecting plate (5) on the pump housing together.
7. Place resonating diaphragm (4) and seal (3) in connecting plate (5).
8. Place head plate (2) on connecting plate (5) and secure using the 4 head screws (1).



#### CAUTION

#### Escaping liquid

After assembly the pump may not be leak-tight due to incorrect assembly, damaged or soiled seal faces, or other reasons.

- ➔ Run pump for several minutes with a harmless liquid at maximum operating pressure.
- ➔ Check that pump is leak-tight.

## 9. Troubleshooting

- Disconnect the pump from the power supply before working on the pump.

<b>Pump does not work</b>	
Possible cause	Fault remedy
Pump not connected to power supply	→ Connect pump to power supply
Power supply is not switched on	→ Switch on power supply
Thermal switch or pump electronics have tripped	→ Disconnect pump from the mains → Allow pump to cool → Identify and eliminate cause of overheating/overload
Connections or hoses are blocked	→ Check connections and hoses → Remove blockage
External valve is closed or filter is clogged	→ Check external valves and filters
Diaphragm, valve plates or seals are worn	→ Replace diaphragm, valve plates and seals (see Chapter 8.2) → Replace pump

Tab. 10

<b>Pump is not priming</b>	
Possible cause	Fault remedy
Suction side of pump not connected	→ Connect the suction side of the pump
Liquid in the priming container is too low	→ Fill priming container
Hose connections are not leak-tight	→ Secure transition joints between hose and connections with clamps or other clamping elements
System valve is closed or filter is clogged	→ Open system valve → Clean filter
Pump head is filled with gas. The system is unable to handle the pressure on the pressure side	→ Reduce pressure at pressure side
Particles in the pump	→ Clean the pump head (see Chapter 8.2)
The pump parts are not resistant to the medium to be pumped	→ Replace the pump head with a compatible version
Incorrect interchange of pressure and suction line connections	→ Remove pressure and suction lines and re-connect correctly

Tab. 11



<b>Flow rate, suction head or pressure head is too low</b>	
The pump does not achieve the performance stated in the technical data or on the data sheet.	
Possible cause	Fault remedy
Components in the system connected to the suction and pressure sides, such as hoses, valves or filters, are causing too much resistance	➔ Modify installation, check cross-sections of components
Hose connections are not leak-tight	➔ Secure transition joints between hose and hose connectors with clamps or other clamping elements
Particles in the pump	➔ Clean the pump head, install suction-side filter if required (see Chapter 8.2).
Viscosity of the transferred medium is too high	➔ Contact KNF
Incorrect interchange of pressure and suction line connections	➔ Remove pressure and suction lines and re-connect correctly
The pump parts are not resistant to the medium to be pumped	➔ Replace the pump head with a compatible version

Tab. 12

**Fault cannot be rectified**

If you are unable to identify any of the above causes, please send the pump to KNF customer service (see address on last page).

1. Flush the pump with a suitable neutralising liquid to free the pump head of dangerous or aggressive substances.
2. Dismantle the pump.
3. Clean the pump.
4. Make sure that no dangerous substances are left in the cleaned pump.
5. Send the pump, with completed decontamination declaration (see Chapter 11), to KNF customer service stating the nature of the pumped medium.

### 10. Decontamination declaration

**i** KNF shall only undertake to repair the pump on condition that the customer provides certification of the transferred media and the cleaning of the pump (decontamination declaration).

➔ Copy this page or download it from [www.knf.com/downloads](http://www.knf.com/downloads).

Enter the pump model, the Serial No. and the transferred media in the form below and send the signed form together with the flushed and cleaned pump to KNF customer service (see last page for address).

#### Customer decontamination declaration for repair order

We confirm that the pump below has been used to pump the following media, and that the pump has been flushed and cleaned.

Pump model	
Serial No.	
Pumped media	

The pump does not contain aggressive, biological, radioactive, poisonous, or other dangerous media.

\_\_\_\_\_ Company

\_\_\_\_\_ Date/Signature



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