

# FK 1100

INSTALLATION INSTRUCTIONS

# FK 1.1100

# DIAPHRAGM PUMP



Before operating the pump and the accessories, please read the Installation Instructions and safety precautions.

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## 1 General

### 1.1 Information about the instructions

Content	The Installation Instructions describe the requirements for installing the product correctly and safely into the complete machine.
Storage location	These Installation Instructions are a part of the product. The safety-relevant information should be taken over for the documentation of the complete machine.
Project pumps	With customer-specific project pumps (pump types which begin with "PL" or "PML"), there may be differences from the Installation Instructions.

### 1.2 Warnings

Warnings in the Installation Instructions are marked by the hazard symbol, the keywords, and the color. These features provide information about the extent of the hazard.



#### **DANGER**

This indicates a dangerous situation that will directly cause death or serious injury if not prevented.



#### **WARNING**

This indicates a dangerous situation that may cause death or serious injury if not prevented.



#### **CAUTION**

This indicates a dangerous situation that may cause moderate or slight injuries if not prevented.

#### **NOTICE**

This indicates a situation that may cause damage to property if not prevented.

### 1.3 Disclaimer

The manufacturer accepts no liability for damage or malfunctions that are caused by non-compliance with the Installation Instructions.

The manufacturer accepts no liability for damage or malfunctions that are caused by modifications to or conversions of the device or by improper handling.

The manufacturer accepts no liability for damage or malfunctions that are caused by using spare parts or accessories that are not approved by the manufacturer.

### 1.4 Manufacturer's address

KNF Flodos AG  
Wassermatte 2  
6210 Sursee, Switzerland  
Phone +41 (0)41 925 00 25  
Fax +41 (0)41 925 00 35  
[www.knf.com](http://www.knf.com)

### 1.5 Supporting documents

The listed documents must also be observed. The valid versions are available at [www.knf.com/downloads](http://www.knf.com/downloads).

- Data sheet
- 3D model

The following must also be observed:

- Local T&Cs
- Sales documents and agreement between KNF and the customer
- Drive specification

## 2 Safety

### 2.1 Intended use

The pump is intended solely for the following uses:

- Transferring liquids and gases
- For operation in accordance with the operating parameters specified in the technical data of the supporting documents

### 2.2 Reasonably foreseeable misuse

The pump must not:

- be operated in an explosive atmosphere
- be used to transfer explosive media
- be used to transfer media whose compatibility with the pump head, valves, diaphragm, and seals has not been proven

### 2.3 Responsibility of the user

The user is responsible for ensuring that the safety precautions in these Installation Instructions are complied with. Applicable safety, accident prevention, and environmental protection regulations must be complied with.

### 2.4 Product-specific risks

Remaining risks that were determined in a risk assessment are described in this section. Safety precautions and warnings in this section and in the other sections of the Installation Instructions must be observed to prevent dangerous situations.



#### **⚠ DANGER**

##### **Danger of injuries and damage to property due to dangerous substances**

Poisoning and chemical burns or unintended reactions caused by leaking dangerous substances

- Observe the safety data sheets of the transferred media.
- Before transferring a medium, check whether it can be transferred safely in the specific application case.
- Ensure that the system is not subject to any risks of explosion – not even under extreme operating conditions (temperature, pressure) or in case of malfunctions.
- Ensure the pump is used only by suitably trained, skilled employees.
- Clarify the chemical resistance of the head materials.
- Check that the pump and the system do not leak at the operating temperature of the transferred medium.
- Check the pump for damage regularly.
- Operate the pump only when you are sure it has no technical malfunctions.
- Operate the pump in accordance with the technical data.
- Work on the pump or fluid circulation system only after they have been decontaminated and/or a decontamination declaration is present.

**⚠ DANGER****Danger of injuries and damage to property due to leaks at the interfaces to the pump head**

Poisoning and chemical burns or unintended reactions caused by leaking dangerous substances

- Wear personal protective equipment.
- Connect the pump correctly.
- Operate the pump only when you are sure it has no technical malfunctions.
- Operate the pump in accordance with the technical data.

**⚠ DANGER****Danger of injuries and damage to property due to uncontrolled flow while the pump is not in operation**

Poisoning and chemical burns or unintended reactions caused by leaking dangerous substances

- Construct the fluid system so that the operating pressure at the pressure side of the pump is higher than at the suction side.
- Install a shut-off valve in the fluid circulation system.

The risk analysis indicates a risk of explosion from materials and substances.

**⚠ DANGER****Danger of injuries and damage to property due to an explosion in the pump**

The pump housing is made from aluminum. If the pump diaphragm is damaged, medium can accumulate in the housing and form hydrogen (especially with acids and lyes). This could cause an explosion in the pump housing.

- Check and monitor the reactivity of the medium with aluminum.
- No flammable materials in the direct vicinity of the pump or piping

The pump housing is designed to withstand pressure surges caused by explosions. The probability of a fault that would cause an explosion is deemed to be low. When installed in the system, the risks in the complete system must be assessed.



### **DANGER**

#### **Danger of injuries and property damage caused by an explosion in the connection lines and in the pump**

Evaporation of flammable liquids

- When flammable liquids are transferred, an explosive atmosphere can form in the pump and in the lines during filling and emptying.
- With the hoses that are used, pay attention that no electrostatic charges can form (use conductive materials, grounding and potential equalization).
- The hoses and piping that are used must be able to withstand the expected pressure of explosion.



### **DANGER**

#### **Danger of injuries and property damage caused by the pump exploding**

If the pump has not been used or has been stored for some time, residual medium may evaporate and, together with oxygen, form an explosive atmosphere.

- If the pump has not been used for some time or is stored, empty the pump and rinse with neutral medium to prevent a subsequent reaction.



### **WARNING**

#### **Danger of injuries and property damage caused by leaks to the environment**

Flammable materials

- Keep flammable materials away from the direct vicinity of the pump and piping.

## **2.5 Customer service and repairs**

All repairs to the pumps must be carried out by the responsible KNF customer service team.

Use only genuine parts from KNF for servicing work.

### 3 Installation



#### **⚠ WARNING**

##### **Danger from incorrect installation**

Injuries or damage to property from leaking media

- After installation, check the system for leaks with a safe medium.
- Observe the requirements for intended use.
- Take precautions in the design of the end device so that leaking liquids cannot come into contact with live components.
- Use only connections that are specified in the data sheet. Do not use NPT threads or sealing tape, as cracks can occur at the plastic connections.

The following requirements apply to all activities described in this section:

#### 3.1 Installation location

The installation location must:

- protect the pump against immersion
- keep aggressive and flammable liquids and vapors away
- allow hoses to be connected without tensile or bending stress
- take account of cooling the pump drive
- ensure that any leaks can be handled
- have appropriate precautions if flammable media are used

#### 3.2 Mechanical mounting

- Protect the product against impacts, knocks, and strong vibrations.
- Please refer to the product data sheet for dimensions, installation positions, and fluid connections.



#### **⚠ CAUTION**

##### **Danger due to loss of stability**

Injuries caused by the pump toppling over

- Wear safety shoes with steel caps.
- When the pump is installed in the machine, secure it with screws or clamps.
- When attaching accessories, make sure that the pump cannot topple over.



### 3.3 Connecting the fluid system

Use suitable means to check the fluid connection for leaks.

For more information regarding dimensions, please refer to the data sheet.

### 3.4 Electrical connection

For terminal assignment, output data, and control requirements, please refer to the data sheet.

Observe the regulatory requirements for electrical installations:

- Overload protection and separating protective devices
- Contact protection and additional insulation
- Ground connections
- Protection against vibrations, tensile stress, and corrosion



#### **WARNING**

##### **Danger of electric shock**

If the pump is not installed correctly, there is a risk of electric shock.

- The electrical installation of the pump must be carried out by a trained specialist who has relevant credentials.

## 4 Initial start-up

The product must not be started up until it has been ensured that the machine in which the product is to be installed meets the requirements of the Machinery Directive 2006/42/EC, if applicable.



### **WARNING**

#### **Danger that the fluid system could rupture due to excess pressure**

The pump builds up pressure. With a closed system, the max. permitted operating pressure can be exceeded. This may cause injuries to personnel, or damage to the pump or the system.

- Prevent operation against a closed system.
- In the case of parts that are in contact with the fluid, use only those that are designed to withstand at least the operating pressure of the pump.
- If necessary, take suitable measures to limit the maximum system pressure.



### **CAUTION**

#### **Danger of unexpected chemical reactions with water**

Residues of water in the pump that come from testing in the factory may react with the transferred medium.

- Before starting the pump for the first time, rinse it with a medium that is uncritical as regards water.

**⚠ CAUTION****Danger from hot surfaces**

The pump becomes hot during operation. Burns from hot surfaces or injuries from uncontrolled movements are possible.

- Do not touch the pump while it is operating.
- Ensure a sufficient supply of cool air and keep a safe distance between the pump and neighboring components.
- Operate the pump in accordance with the technical data.
- If the temperature of the medium is above 50°C, take safety precautions to prevent burns of fluid components.

Before switching on the pump, verify the following:

- All hoses are attached properly.
- Pump is mechanically fixed in place.
- Specifications of the power supply correspond with the data on the pump's type plate.
- Pump outlet is not blocked.
- All cables are attached properly.
- Contact protection for electrical connections and moving parts is installed.

**⚠ CAUTION****Danger of scalding from hot medium leaks**

In the terminal system, check the fluid system for leaks at the operating temperature of the medium.

**⚠ CAUTION****Danger from rotating parts**

The pump must not be operated with the housing cover open.

## 5 Maintenance

Ask your KNF representative about the availability of spare parts for this product.

Use only genuine parts from KNF for servicing work.

### 5.1 Cleaning



#### WARNING

##### **Danger due to dangerous substances in the pump**

Depending on the medium transferred, chemical burns or poisoning is possible.

- If necessary, wear protective equipment, such as safety gloves.
- Work on the pump or fluid circulation system only after they have been decontaminated and/or a decontamination declaration is present.
- Rinse the pump with a neutralizing liquid and then pump it empty.



#### WARNING

##### **Danger from medium spraying in the environment**

Due to pressure in the pump and adjacent parts, medium can spray out if hydraulic parts are manipulated or opened.

- Always depressurize the hydraulic parts of the system before carrying out any work.
- Disconnect the pump from the power supply and make sure that it cannot be switched on again inadvertently.

Clean the pump.

1. Clean and dry the parts with a cloth. Do not use solvents for cleaning, as they can harm plastic parts.
2. If compressed air is available, blow out the components.

## 5.2 Preparing for dismantling

1. Rinse the pump with a suitable neutralizing liquid and make sure that there are no dangerous substances left in the pump (see warnings above).
2. Pump the unit empty.
3. Disconnect electrical connections.
4. Remove hoses from pump head.

Tools

Qty	Tools
1	Torx screwdriver T30
1	Slotted screwdriver size 0
1	Allen key size 4mm

Table 1

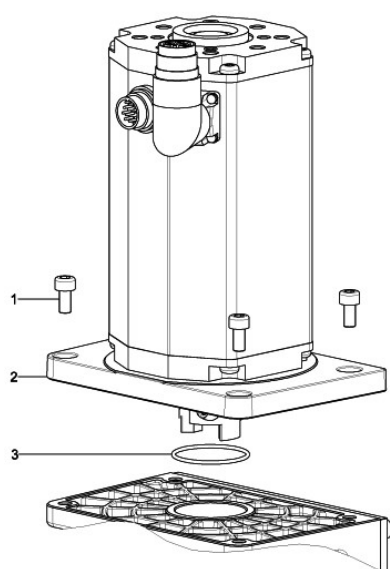


Figure 1: Motor

## 5.3 Dismantling the motor

To clean the pump or replace the elastomer parts, the motor does not necessarily have to be dismantled. In this case, continue with Section 5.5.

1. Undo the four screws (1).
2. Carefully remove the motor from the pump housing.
3. Remove the O-ring (3) from the motor flange (2).

## 5.4 Mounting the motor

1. Insert the O-ring (3) into the motor flange (2).
2. Place the motor on the pump housing. Make sure that the coupling parts engage properly and that the star-shaped damping element is installed.
3. Tighten the four screws (1) to 2.5 Nm.

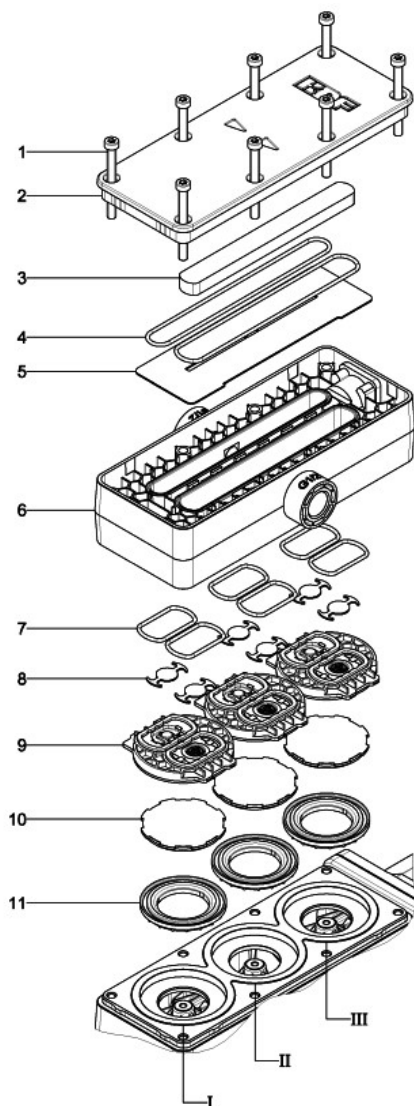


Figure 2: Head parts

- 1 Head screws
- 2 Head plate
- 3 Cellasto
- 4 O-ring resonating diaphragm
- 5 Resonating diaphragm
- 6 Connecting plate
- 7 O-rings valves
- 8 Anchor valves
- 9 Intermediate plate
- 10 Diaphragm
- 11 Insert ring

## 5.5 Dismantling the pump head

1. Undo the eight head screws (1) and remove the complete head from the pump housing.
2. Remove the head plate (2) from the connecting plate (6).
3. Remove the resonating diaphragm (5), both O-rings (4) and Cellasto (3) from the head plate (2).
4. Remove the three intermediate plates (9) according to Figure 3 from the connecting plate (6) using a slot screwdriver (size 0).
5. Remove the six O-rings (7) and anchor valves (8) from the connecting plate (6). Note: Do not use sharp objects to remove the O-rings to avoid damaging them. Use compressed air to blow out the O-rings.
6. Undo the three diaphragms (10) by hand.
7. Remove the three insert rings (11) from the pump housing.
8. Clean all the parts, making sure that all residues are removed. Then blow them out with compressed air and dry them.

To ensure maximum tightness after opening the pump head, we recommend replacing the rubber parts, diaphragms (10), anchor valves (8), O-rings (7), oscillating diaphragm (5), and O-rings (4).

### Cleaning the parts

9. Wipe the following items with a cloth and then blow them out with compressed air: O-Rings resonating diaphragm (4), resonating diaphragm (5), valve O-rings (7), anchor valves (8), and diaphragms (10).
10. Blow out the connecting plate (6) and intermediate plate (9) with compressed air.

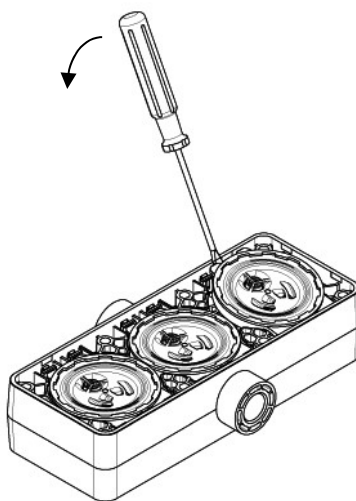


Figure 3: Dismantling the intermediate plate

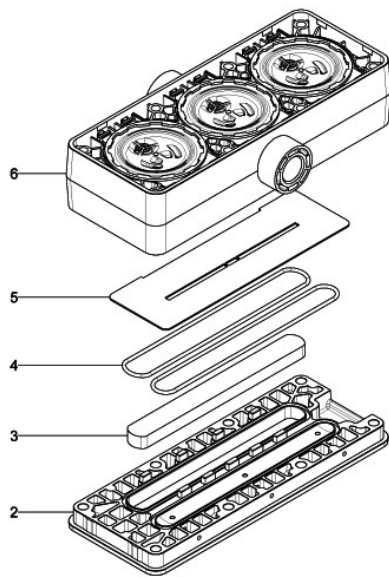


Figure 4: Head installation

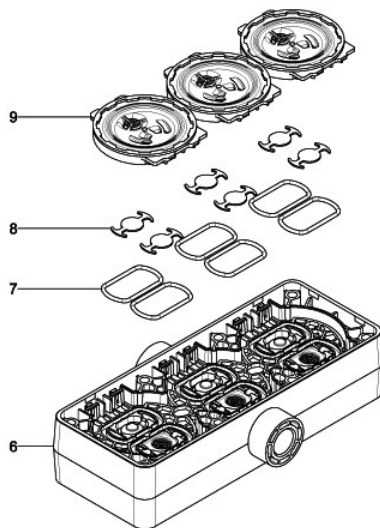


Figure 5: Installing the intermediate

## 5.6 Assembling the pump head

1. Insert the three insert rings (11) in the pump housing; see Figure 2.
2. For easier installation of the diaphragms (10), turn the connecting rod to top dead center, beginning with head I. Tighten the diaphragms well (10) by hand. Repeat the steps for heads II and III.
3. For head II, press the middle diaphragm (10) to bottom dead center with your thumb.
4. Place the head plate (2) according to Figure 4.
5. Insert the Cellasto (3) and the two O-rings (4) into the head plate (2).
6. Place the resonating diaphragm (5) on the head plate (2) according to Figure 6. Make sure that the cut-out in the resonating diaphragm (5) and the cams in the head plate (2) are positioned correctly.
7. Insert the six O-rings (7) and anchor valves (8) in the connecting plate (6) according to Figure 5.
8. Click the three intermediate plates (9) into the connecting plate (6).
9. Place the connecting plate (6) on the head plate (2).
10. Place the complete head on the pump housing. Make sure that the head sits properly to ensure the desired transfer direction (direction of arrow).
11. Insert the eight head screws (1) in the head plate (2), but tighten them only slightly for now.
12. Tighten the four inside head screws (1) in a diagonal sequence by one rotation each.
13. Tighten the four outside head screws (1) in a diagonal sequence by one rotation each.
14. Repeat steps 12. and 13. until all the head screws (1) are tightened to 3.5 Nm. This procedure is important to ensure that the diaphragm is compressed equally, and the pump is leak-tight.

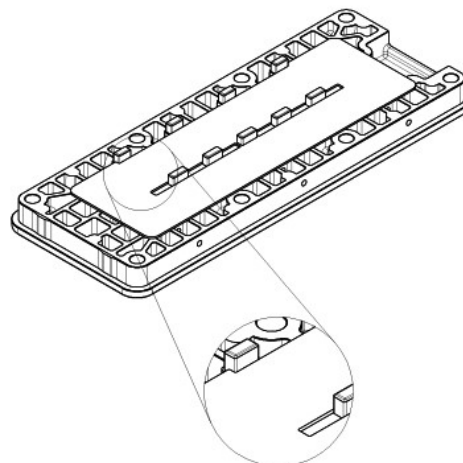


Figure 6: Installing the resonating diaphragm

**⚠ CAUTION****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 the pump for several minutes with a harmless medium at maximum operating pressure.
- Check that the pump is leak-tight.

## 5.7 Mounting the motor

If the motor was dismantled:

1. For correct installation of the motor, refer to Section 5.4.



## 6 Overpressure protection .27

Overpressure protection is available as an option and can be retrofitted by KNF.

### 6.1 Dismantling and cleaning

If the motor is to be dismantled, refer to Section 5.3.

To prepare for dismantling, refer to Section 5.2.

Tools

Qty	Tools
1	Allen key size 4mm
1	Torx screwdriver T10

Table 2

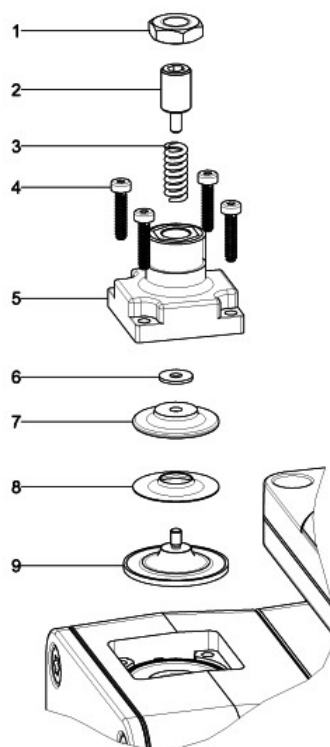


Figure 7: Overpressure protection

- 1 Hex nut
- 2 Setscrew with bolt
- 3 Pressure spring
- 4 Head screws .27
- 5 Top part .27
- 6 Washer
- 7 Support
- 8 Sliding disk
- 9 Diaphragm .27

1. Unscrew the setscrew (2) completely and remove it to relieve the pressure spring (3).

Note: Do not adjust the hex nut (1), as this defines the pressure and position for installation.

2. Undo the four head screws (4) and remove the top part (5).
3. Remove the pressure spring (3), washer (6), support (7), sliding disk (8), and diaphragm (9).

It is recommended that you replace the diaphragm (9).

Cleaning the overpressure protection

4. Clean and dry the parts with a cloth. Do not use solvents for cleaning, as they can harm plastic parts.
5. If compressed air is available, blow out the components.

### 6.2 Assembling

1. Insert the diaphragm (9) in the connecting plate.
2. Place the parts on the diaphragm (9) in the following order. Sliding disk (8), support (7), and washer (6).
3. Place the top part (5) on the connecting plate.
4. Tighten the four head screws (4) in a diagonal sequence to 0.7 Nm.
5. Insert the pressure spring (3) and turn the setscrew (2) to its original position. Secure with the hex nut (1).

If the motor was dismantled, refer to Section 5.4.

### NOTICE

The pressure setting on the overpressure relief valve must be checked.

**⚠ CAUTION****Caution, escaping liquid**

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

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

## 7 Rectifying transfer problems

Symptom	Cause	Remedy
Pump does not work; no movement or sounds are detectable.	No or incorrect control	Check that voltage and signal form comply with the specification.
Pump does not work; drive becomes very hot.	Motor is controlled with an incorrect signal.	Check that voltage and signal form comply with the specification.
The pump does not prime, or vacuum is insufficient.	External valve is closed.	Check external valve.
	Counterpressure on pressure side is too high.	Change the pressure conditions on the pressure side.
	Particles in the pump head	Rinse the pump head. Use a preventive preliminary filter.
Pump does not transfer.	External valve is closed, or filter is clogged or too small.	Check external valves and filter.
	Connections or hoses are blocked.	Check connections and hoses. Remove blockage.
Flow rate is insufficient or unstable.	Incorrect control	Check that voltage and signal form comply with the specification.
	Cross-section of hydraulic hoses or connectors too narrow or restricted	Disconnect the pump from the system and determine performance data. Remove restriction (e.g. valve), if necessary. If applicable, use larger-diameter hoses or connectors.
	Higher counterpressure in the system than assumed for the design	Contact KNF representative.
	Particles in the pump head	Rinse the pump head. Use a preventive preliminary filter. Replace pump head.
	Pump has reached the end of its service life.	Replace the pump.
Leak on pump head	Damage to the valve O-rings	Replace the O-rings.
	Diaphragm damaged	Replace the diaphragm.
	Resonating diaphragm damaged	Replace resonating diaphragm.

If the malfunction cannot be rectified, contact your local KNF representative ([www.knf.com](http://www.knf.com)).

## 8 Spare parts

### Spare parts kit, small

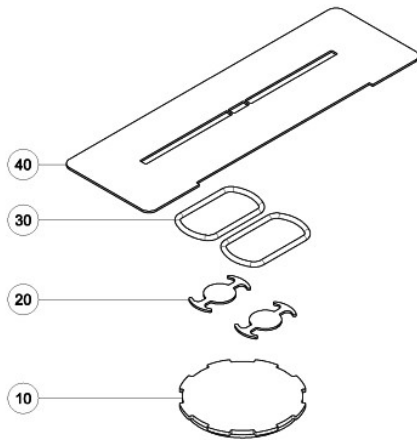


Figure 8: Spare parts kit, small

Pos	Name	Material material	Bestell-Nr. order no.	Stück im Kit pieces in set	Stück im Kit pieces in set
	Kit klein KP <i>kit small KP</i>		177998		
	Kit klein KT <i>kit small KT</i>		177999		
10	Wulstmembrane <i>diaphragm</i>	PTFE		-	1
		PTFE		1	-
20	Ankerventil <i>anchor valve</i>	EPDM		-	2
		FFKM		2	-
30	O-Ring ID34x2.5 <i>O-ring ID34x2.5</i>	EPDM		-	2
		FKM		2	-
40	Schwingmembrane <i>resonating diaphragm</i>	EPDM		-	1
		FKM		1	-

### Spare parts kit, large

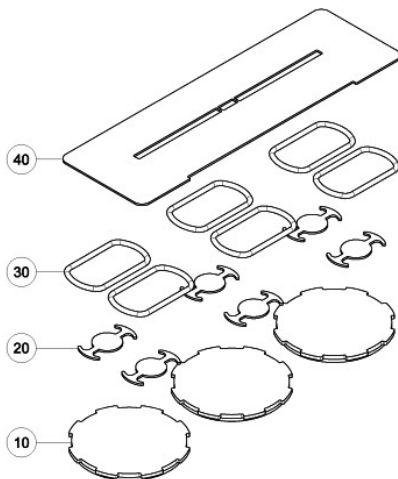


Figure 9: Spare parts kit, large

Pos	Name	Material material	Bestell-Nr. order no.	Stück im Kit pieces in set	Stück im Kit pieces in set
	Kit gross KP <i>kit large KP</i>		178000		
	Kit gross KT <i>kit large KT</i>		178001		
10	Wulstmembrane <i>diaphragm</i>	PTFE		-	3
		PTFE		3	-
20	Ankerventil <i>anchor valve</i>	EPDM		-	6
		FFKM		6	-
30	O-Ring ID34x2.5 <i>O-ring ID34x2.5</i>	EPDM		-	6
		FKM		6	-
40	Schwingmembrane <i>resonating diaphragm</i>	EPDM		-	1
		FKM		1	-

## 9 Returning the pump

KNF undertakes to repair the pump only under the condition that the customer provides a certificate of the pumped medium and cleaning of the pump. For this purpose, please follow the instructions on [www.knf.com/repairs](http://www.knf.com/repairs).

Please contact your KNF sales representative directly if you need additional support for your return service.

