Diaphragm Vacuum Pumps and Compressors

Operating and Installation Instructions

Read and observe these Operating and Installation Instructions!

Operating and Installation Instructions

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1. About this document

1.1. Using the Operating and Installation Instructions

The Operating and Installation Instructions are part of the pump.

⇒ Pass on the Operating and Installation Instructions to the next owner.

Project pumps

Customer-specific project pumps (pump models which begin with “PJ” or “PM”) may differ from the Operating and Installation Instructions.

⇒ For project pumps, also observe the agreed upon specifications.

1.2. Symbols and Markings

Warning

A danger warning is located here.

Possible consequences of a failure to observe the warning are specified here. The signal word, e.g. Warning, indicates the danger level.

⇒ Measures for avoiding the danger and its consequences are specified here.

Danger levels

<table>
<thead>
<tr>
<th>Signal word</th>
<th>Meaning</th>
<th>Consequences if not observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td>warns of immediate danger</td>
<td>Death or serious injuries and/or serious damage are the consequence.</td>
</tr>
<tr>
<td>WARNING</td>
<td>warns of possible danger</td>
<td>Death or serious injuries and/or serious damage are possible.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>warns of a possibly dangerous situation</td>
<td>Minor injuries or damage are possible.</td>
</tr>
</tbody>
</table>

Tab. 1

Other information and symbols

⇒ An activity to be carried out (a step) is specified here.

1. The first step of an activity to be carried out is specified here. Additional, consecutively numbered steps follow.

● This symbol refers to important information.
2. **Use**

2.1. **Proper use**

The pumps are exclusively intended for transferring gases and vapors.

**Owner's responsibility**

- Only install and operate the pumps under the operating parameters and conditions described in Chapter 4, Technical data.
- Only complete pumps may be taken into service.
- Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water.

**Operating parameters and conditions**

**Requirements for transferred medium**

- Before using 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, structured diaphragm and valves with the medium.
- Only transfer gases which remain stable under the pressures and temperatures occurring in the pump.

2.2. **Improper use**

- The pumps may not be operated in an explosive atmosphere.
- The pumps are not suitable for transferring dusts.
- The pumps are not suitable for transferring liquids.
- Pumps designed to create either a vacuum or an overpressure must not be used for these two purposes simultaneously.
- An overpressure must not be applied to the suction side of the pump.
3. **Safety**

Note the safety precautions in sections 6. *Installation and connection*, and 7. *Operation*.

The pumps are built according to the generally recognized rules of technology and in accordance with the occupational safety and accident prevention regulations. Nevertheless, dangers can result during their use which 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.

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.

Make sure that the personnel has read and understood the Operating and Installation Instructions, and in particular the “Safety” chapter.

Observe the accident prevention and safety regulations when performing any work on the pump and during operation.

The pump heads heat up during operation – avoid contact with them.

When transferring dangerous media, observe the safety regulations when handling these media.

Be aware that the pumps are not designed to be explosion-proof.

Make sure the temperature of the medium is always sufficiently below the ignition temperature of the medium, to avoid ignition or explosion. This also applies for unusual operational situations.

Note that the temperature of the medium increases when the pump compresses the medium (compressor operation).

Hence, make sure the temperature of the medium is sufficiently below the ignition temperature of the medium, even when it is compressed to the maximum permissible operating pressure of the pump. The maximum permissible operating pressure of the pump is stated in the technical specifications (chapter 4).

If necessary, consider any external sources of energy, such as radiation, that may add heat to the medium.

In case of doubt, consult the KNF customer service.

Store all replacement parts in a protected manner and dispose of them properly in accordance with the applicable environmental protection regulations. Observe the respective national and international regulations. This especially applies to parts contaminated with toxic substances.

For the purposes of the Machinery Directive 2006/42/EC, 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 is in conformity with the provisions of the Machinery Directive 2006/42/EC. The following essential requirements of Annex I of Directive 2006/42/EC (general principles) are applied and observed:

- General Principles No. 1
- No. 1.1.2. / 1.1.3. / 1.3.1. / 1.3.3. / 1.3.4. / 1.4.1. / 1.5.1. / 1.5.2. / 1.5.8. / 1.5.9. / 1.7.4. / 1.7.4.1. / 1.7.4.3.

As these partly completed machinery are OEM-models the power supplies and the equipment for disconnecting and switching-off the partly completed machinery respectively have to be considered when mounting as well as over-current and overload protective gear.

In addition a protection against mechanical parts in motion and hot parts, if existing, has to be provided when mounting.

The pumps conform to the Directive 2011/65/EU (RoHS2).

The following harmonized standards have been used:

- DIN EN 50581
- DIN EN 55014-1/2
- DIN EN 61000-3-2/3
- DIN EN 60204-1

Customer service and repairs

Only have repairs to the pump carried out by the KNF Customer Service responsible.

Use only genuine parts from KNF for servicing work.
4. Technical Data

## Pump materials

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Material Pump head</th>
<th>Diaphragm</th>
<th>Valve</th>
<th>Gasket</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 145 ANE</td>
<td>Aluminium</td>
<td>CR</td>
<td>Stainless steel</td>
<td>CR</td>
</tr>
<tr>
<td>N 145 AN.9 E</td>
<td>Aluminium</td>
<td>PTFE-coated</td>
<td>Stainless steel</td>
<td>FPM</td>
</tr>
<tr>
<td>N 145 ATE</td>
<td>Stainless steel</td>
<td>CR</td>
<td>CR</td>
<td>-</td>
</tr>
<tr>
<td>N 145 SNE</td>
<td>Stainless steel</td>
<td>PTFE-coated</td>
<td>PTFE</td>
<td>-</td>
</tr>
<tr>
<td>N 145 SVE</td>
<td>Stainless steel</td>
<td>FPM</td>
<td>FPM</td>
<td>-</td>
</tr>
</tbody>
</table>

### Tab. 2

## Pneumatic values

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Delivery rate* (l/min) at atm. pressure</th>
<th>Max. permissible operating pressure (bar g)</th>
<th>Ultimate vacuum (mbar abs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 145 ANE</td>
<td>30</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>N 145 AN.9 E</td>
<td>30</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>N 145 SNE</td>
<td>30</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>N 145 SVE</td>
<td>30</td>
<td>7</td>
<td>100</td>
</tr>
</tbody>
</table>

*Liters in standard state (1,013 mbar)
### Technical Data

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Delivery rate* (l/min) at atm. pressure</th>
<th>Max. permissible operating pressure (bar g)</th>
<th>Ultimate vacuum (mbar abs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 145.2 ATE</td>
<td>49.5</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>N 145.2 ATE 3 phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 145.2 STE</td>
<td>55</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>N 145.2 STE 3 phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 145.2 AVE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 145.2 AVE 3 phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 145.2 SVE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 145.2 SVE 3 phase</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*See type plate

**Tab. 3 (2nd part)** *Liter in standard state (1,013 mbar)*

### Electrical data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N 145 ANE</td>
<td>230</td>
<td>50</td>
<td>320</td>
<td>2.1</td>
</tr>
<tr>
<td>N 145 AN.9 E</td>
<td>230/400</td>
<td>50</td>
<td>300</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 ATE</td>
<td>230/400</td>
<td>50</td>
<td>350</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 SNE</td>
<td>230</td>
<td>50</td>
<td>350</td>
<td>2.1</td>
</tr>
<tr>
<td>N 145 ST.9 E</td>
<td>230</td>
<td>50</td>
<td>350</td>
<td>2.1</td>
</tr>
<tr>
<td>N 145 SVE</td>
<td>230</td>
<td>50</td>
<td>350</td>
<td>2.1</td>
</tr>
<tr>
<td>N 145 ANE 3 phase</td>
<td>230/400</td>
<td>50</td>
<td>300</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 AN.9 E 3 phase</td>
<td>230/400</td>
<td>50</td>
<td>350</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 ATE 3 phase</td>
<td>230/400</td>
<td>50</td>
<td>350</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 SNE 3 phase</td>
<td>230/400</td>
<td>50</td>
<td>300</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 ST.9 E 3 phase</td>
<td>230/400</td>
<td>50</td>
<td>300</td>
<td>2.0/1.0</td>
</tr>
<tr>
<td>N 145 SVE 3 phase</td>
<td>230/400</td>
<td>50</td>
<td>300</td>
<td>2.0/1.0</td>
</tr>
</tbody>
</table>

*See type plate

**Tab. 4**

Protection class: IP 44

Thermal-switch: The pumps with capacitor motor are fitted as standard with a thermal-switch to protect against overloading.
Other parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible ambient temperature</td>
<td>+ 5 °C to + 40 °C</td>
</tr>
<tr>
<td>Permissible media temperature</td>
<td>+ 5 °C to + 40 °C</td>
</tr>
<tr>
<td>Gas-tightness of pump head (leak rate)* for all pumps except .9 versions (not tested)</td>
<td>approx. $6 \times 10^{-3}$ mbar l/s</td>
</tr>
<tr>
<td>Gas-tightness of pump head (leak rate)* for N 145_.9 E</td>
<td>$&lt; 6 \times 10^{-4}$ mbar l/s</td>
</tr>
</tbody>
</table>

* After opening pump head or replacing the diaphragm and reed valves (or valve plate) the gas tightness is no longer guaranteed. A leak test is able to verify that the original standard of gas-tightness has been achieved.
5. Design and Function

Design N 145 ___E

Fig. 1: Diaphragm Pump N 145 ANE

Design N 145.2 ___E

Fig. 2: Diaphragm Pump N 145.2 ANE
Function diaphragm pump

Fig. 3: Pump head

The pump transfers, compresses (depending on pump version) and evacuates gases and vapors.

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 gas to be transferred via the inlet valve (2). In the upward stroke, the diaphragm presses the medium out of the pump head via the outlet valve (1). The transfer chamber (3) is hermetically separated from the pump drive (7) by the diaphragm.
6. **Installation and connection**

Only install and operate the pumps under the operating parameters and conditions described in chapter 4, Technical data. Observe the safety precautions (see chapter 3).

6.1. **Installation**

- Before installation, store the pump at the installation location to bring it up to room temperature.

| Mounting dimensions | Mounting dimensions (see figs. 4 to 7). |

Fig. 4: Mounting dimensions N 145 A_E including .9 versions
(All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

Fig. 5: Mounting dimensions N 145 S A_E including .9 versions
(All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)
Installation and connection

Fig. 6: Mounting dimensions N 145.2 A_E including .9 versions
(All dimensional tolerances conform to DIN ISO 2768-1,
Tolerance Class V)

Fig. 7: Mounting dimensions N 145.2 S_E
(All dimensional tolerances conform to DIN ISO 2768-1,
Tolerance Class V)

Cooling air supply ➔ Install the pump so that the motor fan can intake sufficient
cooling air.

Installation location ➔ Make sure that the installation location is dry and the pump is
protected against rain, splash, hose and drip water.

➔ Install the pump at the highest point in the system to prevent
condensate from collecting in the pump head.

➔ Protect the pump from dust.

➔ Protect the pump from vibrations and jolts.

6.2. Electrical connection

![DANGER]

Extreme danger from electrical shock

➔ Only have the pump connected by an authorized
specialist.

➔ Only have the pump connected when the power
supply is disconnected.
When connecting the device to a power source, the relevant standards, directives, regulations, and technical standards must be observed.

In the electrical installation, arrangements (complying with EN 60335-1) must be made for disconnecting the pump motor from the electrical supply.

KNF recommends that a fuse is installed in the motor supply circuit (overcurrent release).

For operating current see type plate or data sheet.

Connecting pump

1. Compare the supply data with the data on the motor-plate. For operating current see type plate.

   The voltage must not vary by more than +10% and -10% from that shown on the type-plate.

2. Open terminal box cover.

3. All pumps except versions with 3 phase motor:
   Connect the mains cables to the connections L1 and N of the pump motor.

4. Connection of pumps with 3 phase motor according to figs. 8 or 9.

5. Connect the earth (ground) wire to the motor.

6. Close the terminal cover box.

---

**Fig. 8: Y-Connection (high voltage)**

**Fig. 9: Δ-Connection (low voltage)**
6.3. **Pneumatic connection**

**Connected components** ➔ Only connect components to the pump which are designed for the pneumatic data of the pump (see section 4).

**Pump exhaust** ➔ If the pump is used as a vacuum pump, safely discharge the pump exhaust at the pump’s pneumatic outlet.

**Connecting pump**

A marking on the pump head shows the direction of flow.

1. Remove the protective plugs from the hose connection threads.

2. The accessories silencer, filter, and hose connectors (where applicable) are screwed into the port threads.

3. Connect the suction line and pressure line (thread size G ¼)

4. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.
7. **Operation**

- Only operate the pump under the operating parameters and conditions described in chapter 4, Technical data.
- Make sure the pumps are used properly (see section 2.1).
- Make sure the pumps are not used improperly (see section 2.2).
- Observe the safety precautions (see chapter 3).

---

**WARNING**

- Hazard of the pump head bursting due to excessive pressure increase
  - Do not exceed max. permissible operating pressure (see section 4).
  - Monitor pressure during operation.
  - If the pressure exceeds the maximum permissible operating pressure, immediately shut down the pump and eliminate fault (see chapter 9, Troubleshooting).
  - Only throttle or regulate the air or gas quantity in the suction line to prevent the maximum permissible operating pressure from being exceeded.
  - If the air or gas quantity in the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure of the pump is not exceeded.

---

**Excessive pressure (with all of the related hazards) can be prevented by placing a bypass line with a pressure-relief valve between the pressure and suction sides of the pump. For further information, contact our technical adviser.**

**Pump standstill**

- With the pump at a standstill, open pressure and suction lines to normal atmospheric pressure.

For pumps with thermal-switch:

---

**WARNING**

- Automatic starting can cause personal injury and pump damage
  - When the operation of the pump is interrupted by the thermal switch, the pump will restart automatically after cooling down.
  - Take all necessary care to prevent this leading to a dangerous situation.
Switching pump on

The pump may not start up against pressure or vacuum during switch-on. This also applies in operation following a brief power failure.

➔ Make sure that no pressure or vacuum is present in the lines during switch-on.

Switching off the pump

➔ KNF recommends: When transferring aggressive media, flush the pump prior to switch-off to increase the service life of the diaphragm (see section 8.2.1).

➔ Open pressure and suction lines to normal atmospheric pressure.
8. Servicing

8.1. Servicing Schedule

<table>
<thead>
<tr>
<th>Component</th>
<th>Servicing interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>Regular inspection for external damage or leaks</td>
</tr>
<tr>
<td>Diaphragm, reed valves (valve plate)</td>
<td>Replace at the latest, when pump output decreases</td>
</tr>
<tr>
<td>Silencer/filter (accessory)</td>
<td>Change if it is dirty</td>
</tr>
</tbody>
</table>

Tab. 6

8.2. Cleaning

When cleaning, make sure that no liquids enter the inside of the housing.

8.2.1. Flushing Pump

Before switching off the pump, flush it with air (if necessary for safety reasons: with an inert gas) for about five minutes under atmospheric conditions (ambient pressure).

8.2.2. Cleaning Pump

Only use solvents for cleaning if the head materials cannot be attacked (check the resistance of the material!).

If compressed air is available, blow out the components.
8.3. Changing Diaphragm and Valves

8.3.1. Pumps with aluminium head

N 145 ANE  N 145.2 ANE
N 145 AN.9 E  N 145.2 AN.9 E
N 145 ATE  N 145.2 ATE
N 145 AVE  N 145.2 AVE

Conditions
- Pump is switched off and mains plug is removed from the socket
- Pump is clean and free of hazardous materials
- Tubes removed from pump's pneumatic inlet and outlet

Spare parts

<table>
<thead>
<tr>
<th>Spare part*</th>
<th>Position**</th>
<th>Quantity per pump head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm (F)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Countersunk screw*** (D)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Reed valve (L,P)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Gasket (V)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 7
* According to Spare parts list, chapter 10
** According to Fig. 10
*** Not for .9 versions

Tools

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Tools/Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allen key 3 mm</td>
</tr>
<tr>
<td>1</td>
<td>Allen key 4 mm</td>
</tr>
<tr>
<td>1</td>
<td>Allen key 5 mm</td>
</tr>
<tr>
<td>1</td>
<td>Screwdriver blade width 6.5</td>
</tr>
<tr>
<td>1</td>
<td>Screwdriver blade width 4.0</td>
</tr>
<tr>
<td>1</td>
<td>Fork wrench 16 mm (only for two-headed pumps)</td>
</tr>
<tr>
<td>1</td>
<td>Pencil</td>
</tr>
<tr>
<td>1</td>
<td>Adjustable pin–wrench for two-hole nuts or KNF wrench for retainer plate (see accessory, section 10) (only for .9 versions)</td>
</tr>
</tbody>
</table>

Tab. 8

Information on procedure
With multi-head pumps, parts of the individual pump heads can be confused.

⇒ Replace the diaphragm and reed valves of the individual pump heads consecutively.
Diaphragm Pump N 145 E

Translation of original Operating Instructions, English, KNF 121586-121589 07/16

WARNING

Health hazard due to dangerous substances in the pump!

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

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

⇒ Flush pump before replacing the diaphragm and reed valves (see section 8.2.1).

![Diagram of pump parts]

*Fig. 10: Pump parts for versions with aluminium head

*not for .9 versions

1. For pumps N 145.2 A_E:
   On the pneumatic head connection, open the head connection union nut on one pump head and pull the hose off.

2. Mark the position of the diaphragm head W in relation of the housing A with a pencil.

3. Loosen the four allen screws B and remove the diaphragm head W.

4. For all pumps except .9 versions: Unscrew the countersunk screw D, remove the retainer plate E and the diaphragm F.
5. For pumps N 145__.9 E: To undo the retainer plate E use the wrench for retainer plate to turn it anti-clockwise; remove retainer plate and diaphragm F.

6. Remove the fan cover of motor.

7. Turn the fan blade so that the connection rod K is in the mid-position; fit the new diaphragm F.

8. For all pumps except .9 versions: Place the retainer plate E on the diaphragm F and tighten the new countersunk screw D (torque: 6.0 Nm).

   The self-locking screw D can only be used once.

9. For pumps N 145__.9 E: Place the retainer plate E on the diaphragm F. Screw on the retainer plate E with the wrench for retainer plate uniformly and diagonally (torque: 6.0 Nm).

10. Change lower reed valve:
   - Undo the cheese head screw N and exchange the reed valve L.

11. Change upper reed valve:
    - Loosen the allen screws S, remove the cover plate T and the gasket V.
    - Undo the cheese head screw U and exchange the reed valve P; tighten the cheese head screw U.
    - Replace the cover plate T with a new gasket V and tighten the allen screws S.

12. Place the diaphragm head W on the diaphragm F according to the marks made previously and tighten the screws B uniformly and diagonally (torque: 10.0 Nm).

13. Turn the fan blade to check that the pump run freely.

14. For pumps N 145.2 A_E:
    Carry out steps 2 to 13 for the second pump head.

15. Replace fan cover of motor.

16. For pumps N 145.2 A_E:
    Reattach the tube of pneumatic head connections onto the hose connector and tighten the union nut.
8.3.2. Pumps with stainless steel head

N 145 SNE  N 145.2 SNE
N 145 SN.9 E  N 145.2 STE
N 145 STE  N 145.2 SVE
N 145 ST.9 E
N 145 SVE

Conditions
- Motor disconnected from mains and de-energized
- Pump is clean and free of hazardous materials

<table>
<thead>
<tr>
<th>Spare part*</th>
<th>Position**</th>
<th>Quantity per pump head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>1</td>
</tr>
<tr>
<td>Countersunk screw***</td>
<td>(D)</td>
<td>1</td>
</tr>
<tr>
<td>Valve plate</td>
<td>(Z)</td>
<td>1</td>
</tr>
</tbody>
</table>

Tab. 9  * According to Spare parts list, chapter 10
** According to Fig. 11
*** Not for .9 versions

Tools

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Tools/Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allen key 4 mm</td>
</tr>
<tr>
<td>1</td>
<td>Allen key 5 mm</td>
</tr>
<tr>
<td>1</td>
<td>Screwdriver blade width 6.5</td>
</tr>
<tr>
<td>1</td>
<td>Pencil</td>
</tr>
<tr>
<td>1</td>
<td>Adjustable pin–wrench for two-hole nuts or KNF wrench for retainer plate (see accessory, section 10) (only for .9 versions)</td>
</tr>
</tbody>
</table>

Tab. 10

Information on procedure
With multi-head pumps, parts of the individual pump heads can be confused.

⇒ Replace the diaphragm and valve plate of the individual pump heads consecutively.

**WARNING**

Health hazard due to dangerous substances in the pump!

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

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

⇒ Flush pump before replacing the diaphragm and the valve plate (see section 8.2.1).
1. For the pumps N 145.2 S_E:
   Loosen the hose clip and pull the pneumatic head connection hose off one pump head.

2. Mark the position of the head plate W and intermediate plate X in relation of the housing A with a pencil.

3. Loosen the six allen screws Y and remove the head plate head W, valve plate Z and intermediate plate X.

4. For all pumps except .9 versions: Unscrew the countersunk screw D, remove the retainer plate E and the diaphragm F.

5. For pumps N 145 __.9 E: To undo the retainer plate E use the wrench for retainer plate to turn it anti-clockwise; remove retainer plate and diaphragm F.

6. Remove the fan cover of motor.

7. Turn the fan blade so that the connection rod K is in the mid-position; fit the new diaphragm F.

8. For all pumps except .9 versions: Place the retainer plate E on the diaphragm F and tighten the new countersunk screw D (torque: 6.0 Nm).

   The self-locking screw D can only be used once.
9. For pumps N 145 __.9 E: Place the retainer plate E on the diaphragm F. Screw on the retainer plate E with the wrench for retainer plate uniformly and diagonally (torque: 6.0 Nm).

10. Place the intermediate plate X on the top of the diaphragm F so that it corresponds to the marks on the housing.

11. Place the new valve plate Z on the intermediate plate X.

12. Place the head plate head W on the diaphragm F according to the marks made previously and tighten the screws Y uniformly and diagonally (torque: 10.0 Nm).

13. Turn the fan blade to check that the pump runs freely.

14. For two-headed pumps:
   Carry out steps 2 to 13 for the second pump head.

15. Replace the fan cover of motor.

16. For two-headed pumps:
   Pull the pneumatic head connection hose back onto the hose connector, retighten the hose clip.
9. Troubleshooting

**Extreme danger from electrical shock!**

- Disconnect the pump power supply before working on the pump.
- Make sure the pump is de-energized and secure.

- Check the pump (see Tab. 11 and 12).

### Pump does not transfer

<table>
<thead>
<tr>
<th>Cause</th>
<th>Fault remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No voltage in the power source</td>
<td>➔ Check room fuse and switch on if necessary.</td>
</tr>
</tbody>
</table>
| For pumps with thermal-switch: Thermal switch has operated following to over-heating. | ➔ Disconnect pump from mains.  
 ➔ Allow pump to cool.  
 ➔ Trace cause of over-heating and eliminate it. |
| Connections or lines blocked. | ➔ Check connections and lines.  
 ➔ Remove blockage. |
| External valve is closed or filter is clogged. | ➔ Check external valves and filters. |
| Condensate has collected in pump head. | ➔ Flush pump (see Section 8.2.1).  
 ➔ Install pump at highest point in system. |
| Diaphragm or reed valves (valve plate) are worn. | ➔ Replace diaphragm and reed valves (valve plate), (see Section 8.3). |

*Tab. 11*

### Flow rate, pressure or vacuum too low

The pump does not achieve the output specified in the Technical data or the data sheet.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Fault remedy</th>
</tr>
</thead>
</table>
| Condensate has collected in pump head. | ➔ Flush pump (see Section 8.2.1).  
 ➔ Install pump at highest point in system. |
| There is gauge pressure on pressure side and at the same time vacuum or a pressure above atmospheric pressure on suction side. | ➔ Change the pressure conditions. |
| Pneumatic lines or connection parts have an insufficient cross section. | ➔ Disconnect pump from system to determine output values.  
 ➔ Eliminate throttling (e.g. valve) if necessary.  
 ➔ Use lines or connection parts with larger cross section if necessary. |
| Leaks occur on connections, lines or pump head. | ➔ Eliminate leaks. |
| Connections or lines completely or partially jammed. | ➔ Check connections and lines.  
 ➔ Remove the jamming parts and particles. |
| Head parts are soiled. | ➔ Clean head components. |
| Diaphragm or reed valves (valve plate) are worn. | ➔ Replace diaphragm and reed valves (valve plate), (see Section 8.3). |

*Tab. 12*
**Fault cannot be rectified**

If you are unable to determine any of the specified causes, send the pump to KNF Customer Service (see last page for the address).

1. Flush the pump to free the pump head of dangerous or aggressive gases (see Section 8.2.1).
2. Remove the pump.
3. Clean the pump (see Section 8.2.2).
4. Send the pump, together with completed Health and Safety Clearance and Decontamination Form (Chapter 12), to KNF stating the nature of the transferred medium.
## 10. Spare parts and accessories

### Spare parts

**N 145 ANE**

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position*</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004241</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Reed valve</td>
<td>(L, P)</td>
<td>001328</td>
</tr>
<tr>
<td>Gasket</td>
<td>(V)</td>
<td>001326</td>
</tr>
</tbody>
</table>

*According to Fig. 10  **Not for .9 versions

**N 145.2 ANE**

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position*</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004237</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Reed valve</td>
<td>(L, P)</td>
<td>001328</td>
</tr>
<tr>
<td>Gasket</td>
<td>(V)</td>
<td>011796</td>
</tr>
</tbody>
</table>

*According to Fig. 10  **Not for .9 versions

**N 145 ATE**

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position*</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004237</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Reed valve</td>
<td>(L, P)</td>
<td>001328</td>
</tr>
<tr>
<td>Gasket</td>
<td>(V)</td>
<td>011796</td>
</tr>
</tbody>
</table>

*According to Fig. 10  **Not for .9 versions

**N 145.2 ATE**

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position*</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004240</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Reed valve</td>
<td>(L, P)</td>
<td>001328</td>
</tr>
<tr>
<td>Gasket</td>
<td>(V)</td>
<td>011796</td>
</tr>
</tbody>
</table>

*According to Fig. 10  **Not for .9 versions

**N 145 AVE**

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position*</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004241</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Reed valve</td>
<td>(L, P)</td>
<td>001328</td>
</tr>
<tr>
<td>Gasket</td>
<td>(V)</td>
<td>011796</td>
</tr>
</tbody>
</table>

*According to Fig. 11  **Not for .9 versions

**N 145.2 AVE**

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position*</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004241</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Reed valve</td>
<td>(L, P)</td>
<td>001328</td>
</tr>
<tr>
<td>Valve plate</td>
<td>(Z)</td>
<td>001528</td>
</tr>
</tbody>
</table>

*According to Fig. 11  **Not for .9 versions
**Diaphragm Pump N 145 E**

**Spare parts and accessories**

**Translation of original Operating Instructions, English, KNF 121586-121589 07/16**

---

### N 145 STE

#### N 145.2 STE

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004237</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Valve plate</td>
<td>(Z)</td>
<td>004248</td>
</tr>
</tbody>
</table>

**Tab. 17**

*According to Fig. 11

**Not for .9 versions**

### N 145 SVE

#### N 145.2 SVE

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Position</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>(F)</td>
<td>004240</td>
</tr>
<tr>
<td>Countersunk screw**</td>
<td>(D)</td>
<td>110711</td>
</tr>
<tr>
<td>Valve plate</td>
<td>(Z)</td>
<td>004234</td>
</tr>
</tbody>
</table>

**Tab. 18**

*According to Fig. 11

**Not for .9 versions**

### Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silencer/filter (G ¼)</td>
<td>000352</td>
</tr>
<tr>
<td>Pressure relief valve 4 bar</td>
<td>047601</td>
</tr>
<tr>
<td>Pressure relief valve 7 bar</td>
<td>047602</td>
</tr>
<tr>
<td>Fine control valve with pressure gauge, pressure side</td>
<td>000356</td>
</tr>
<tr>
<td>Fine control valve with vacuum gauge, suction side (not for .2 versions)</td>
<td>000354</td>
</tr>
<tr>
<td>Hose connectors (G ¼)</td>
<td>000362</td>
</tr>
<tr>
<td>Hose connectors, stainless steel (G ¼)</td>
<td>020234</td>
</tr>
<tr>
<td>Wrench for retainer plate (.9 versions)</td>
<td>018812</td>
</tr>
</tbody>
</table>

**Tab. 19**
11. Returns

Pumps and systems used in laboratories and process-based industries are exposed to a wide variety of conditions. This means that the components contacting pumped media could become contaminated by toxic, radioactive, or otherwise hazardous substances.

For this reason, customers who send any pumps or systems back to KNF must submit a Health and safety clearance and decontamination form in order to avoid a hazardous situation for KNF employees. This Health and safety clearance and decontamination form provides the following information, among other things:

- physiological safety
- whether medium-contacting parts have been cleaned
- whether the equipment has been decontaminated
- media that have been pumped or used

To ensure worker safety, work may not be started on pumps or systems without a signed Health and safety clearance and decontamination form.

For optimal processing of a return, a copy of this declaration should be sent in advance via e-mail, regular mail, or fax to KNF Customer Service (refer to final page for address). In order to avoid endangering employees who open the shipment's packaging, despite any residual hazards, the original version of the Health and safety clearance and decontamination form must accompany the delivery receipt on the outside of the packing.

The template for the Health and safety clearance and decontamination form is included with these Operating Instructions and may also be downloaded from the KNF website.

The customer must specify the device type(s) and serial number(s) in the Health and safety clearance and decontamination form in order to provide for the unambiguous assignment of the Declaration to the device that is sent to KNF.

In addition to the customer's declaration of physiological safety, information about operating conditions and the customer's application are also of importance to ensure that the return shipment is handled appropriately. Therefore, the Health and safety clearance and decontamination form requests this information as well.
12. Health and safety clearance and decontamination form

Health and safety clearance and decontamination form

This declaration must be present and complete (the original must accompany the shipment's delivery receipt) before the returned device can be examined.

Device type: ..................................................................................................................

Serial number(s): ........................................................................................................

.................................................................................................................................

Reason for returning the device (please describe in detail):

(The device(s) was(ware) in operation □ yes □ no)

.................................................................................................................................

.................................................................................................................................

.................................................................................................................................

We confirm that the above device(s)

□ has(have) pumped exclusively physiologically unobjectionable media and that it(they) are free of hazardous materials and any materials that are harmful to health.

Pumped media: .............................................................................................................

The device(s) was(ware) cleaned □ yes □ no

□ has(have) pumped media of the following category(categories) which are not physiologically unobjectionable and that cleaning of the device(s) (potentially only media-contacting parts) is required.

Name, chemical formula, Material Safety Data Sheet

□ aggressive ................................................................................................................

□ biological ................................................................................................................

□ radioactive ..............................................................................................................

□ toxic .........................................................................................................................

□ other .........................................................................................................................

The device(s) was(ware) decontaminated and work can proceed without special measures □ yes

Method / proof:

.................................................................................................................................

.................................................................................................................................

The device(s) was(ware) not decontaminated and special measures are required before starting work □ yes

Measures:

.................................................................................................................................

.................................................................................................................................

Legally binding declaration

We herewith affirm that the information provided in this form is correct and complete. Shipment of the devices and components is in compliance with statutory regulations.

.................................................................................................................................

Company (stamp) Date Name Authorized signature Position

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