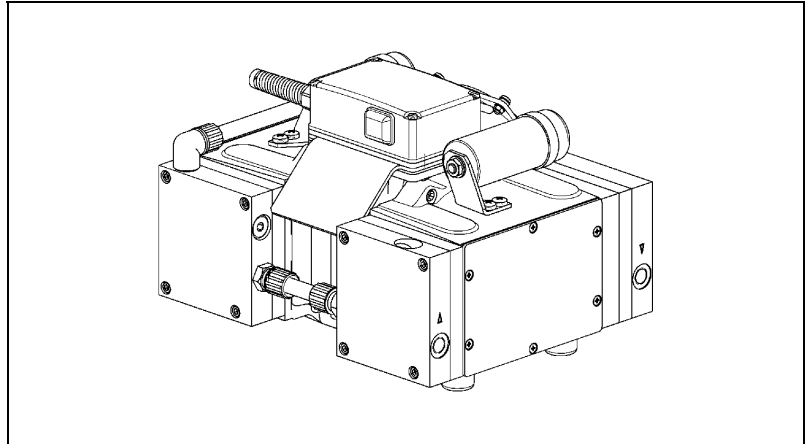


## Diaphragm Vacuum Pumps

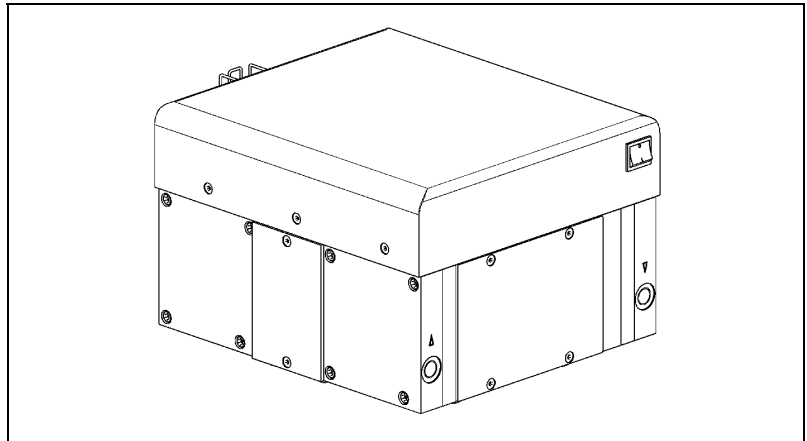
### N 940.5 APE

#### Operating Instructions

Read and observe these operating instructions!



### N 940.5 APE-W



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## 1. About this Document

### 1.1. Using the operating instructions

The operating instructions are part of the pump.

→ Pass on the operating instructions to the next owner.

Project pumps

Customer-specific project pumps (pump models which begin with "PJ" or "PM") may differ from the operating instructions.

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

### 1.2. Symbols and markings

#### Warning



**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

| Signal word    | Meaning                                 | Consequences if not observed   |
|----------------|---|--|
| <b>DANGER</b>  | warns of immediate danger               | Death or serious injuries and/or serious damage are the consequence. |
| <b>WARNING</b> | warns of possible danger                | Death or serious injuries and/or serious damage are possible.        |
| <b>CAUTION</b> | warns of a possibly dangerous situation | Minor injuries or damage are possible.                               |

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

Operating parameters and conditions

Only install and operate the pumps under the operating parameters and conditions described in chapter 4, Technical data.

Requirements for transferred medium

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

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

#### If combustible media are used:



**DANGER**

Hazard of fires and explosions due to excessively high media temperature

- 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.
- 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.

Only transfer gases which remain stable under the pressures and temperatures occurring in the pump.

### 2.2. Improper use



**WARNING**

Hazard of explosion when the surrounding atmosphere is explosive

- The pumps may not be operated in an explosive atmosphere.

The pumps are not suitable for transferring liquids.

### 3. Safety

**i** 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 in proper technical condition and in accordance with their intended use in a safety and danger-conscious manner while observing the operating instructions.

| 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 the personnel has read and understood the operating instructions, and in particular the "Safety" chapter.</p>   |             |               |          |              |              |              |              |          |                |            |            |  |
|--------------------------------------|---|-------------|---------------|----------|--------------|--------------|--------------|--------------|----------|----------------|------------|------------|--|
| Working in a safety-conscious manner | Observe the accident prevention and safety regulations when performing any work on the pump and during operation.   |             |               |          |              |              |              |              |          |                |            |            |  |
| Handling dangerous media             | When transferring dangerous media, observe the safety regulations when handling these media.  |             |               |          |              |              |              |              |          |                |            |            |  |
| Environmental protection             | 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.  |             |               |          |              |              |              |              |          |                |            |            |  |
| Standards                            | <p>The pumps conform to the safety regulations of the EC Low Voltage Directive 73/23 EEC, and the EC Directive 89/336 EEC concerning Electromagnetic Compatibility.</p> <p>The following harmonized standards have been used:</p>   |             |               |          |              |              |              |              |          |                |            |            |  |
|                                      | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">N 940.5 APE</th> <th style="text-align: left;">N 940.5 APE-W</th> </tr> </thead> <tbody> <tr> <td>EN 55014</td> <td>EN 61000-6-2</td> </tr> <tr> <td>EN 61000-6-1</td> <td>EN 61000-6-3</td> </tr> <tr> <td>EN 61000-6-3</td> <td>EN 61326</td> </tr> <tr> <td>EN 61000-3-2/3</td> <td>EN 60204-1</td> </tr> <tr> <td>EN 60204-1</td> <td></td> </tr> </tbody> </table> | N 940.5 APE | N 940.5 APE-W | EN 55014 | EN 61000-6-2 | EN 61000-6-1 | EN 61000-6-3 | EN 61000-6-3 | EN 61326 | EN 61000-3-2/3 | EN 60204-1 | EN 60204-1 |  |
| N 940.5 APE                          | N 940.5 APE-W   |             |               |          |              |              |              |              |          |                |            |            |  |
| EN 55014                             | EN 61000-6-2  |             |               |          |              |              |              |              |          |                |            |            |  |
| EN 61000-6-1                         | EN 61000-6-3  |             |               |          |              |              |              |              |          |                |            |            |  |
| EN 61000-6-3                         | EN 61326  |             |               |          |              |              |              |              |          |                |            |            |  |
| EN 61000-3-2/3                       | EN 60204-1  |             |               |          |              |              |              |              |          |                |            |            |  |
| EN 60204-1                           |   |             |               |          |              |              |              |              |          |                |            |            |  |
|                                      | <p><i>Tab. 2</i></p>  |             |               |          |              |              |              |              |          |                |            |            |  |
| Customer service and repairs         | <p>Only have repairs to the pumps carried out by the KNF Customer Service responsible.</p> <p>Use only genuine parts from KNF for servicing work.</p>   |             |               |          |              |              |              |              |          |                |            |            |  |

## 4. Technical Data

### Pump materials

| Assembly              | Material* |
|-----------------------|-----------|
| Pump head             | Aluminium |
| Molded diaphragm      | EPDM      |
| Valves, O-rings       | EPDM      |
| Pneumatic connections | PP/PTFE   |

Tab. 3

\*according to DIN ISO 1629 and 1043.1

### Pneumatic values

| Parameter                                   | Value |
|---|-------|
| Max. permissible operating pressure [bar g] | 0.5   |
| Ultimate vacuum [mbar abs.]                 | < 1.5 |
| Delivery rate at atm. pressure [l/min]*     | 50    |

Tab. 4

\*Liters in standard state (1,013 mbar)

### Electrical data N 940.5 APE

| Parameter                        | Value |       |          |       |
|----------------------------------|-------|-------|----------|-------|
| Voltage                          | 230 V | 115 V | 100 V    | 220 V |
| Frequency                        | 50 Hz | 60 Hz | 50/60 Hz | 60 Hz |
| Power consumption P <sub>1</sub> | 250 W |       |          |       |
| Operating current                | 1.7 A | 2.9 A | 4.8 A    | 1.8 A |
| Protection class                 | IP 54 |       |          |       |
| Fuses (2x) T(A)                  | 3.15  | 6.3   | 6.3      | 3.5   |

Tab. 5

### Electrical data N 940.5 APE-W

| Parameter         | Value    |
|-------------------|----------|
| Voltage*          | 90-264 V |
| Frequency*        | 50-60 Hz |
| Power consumption | 180 W    |
| Operating current | 1.85 A   |
| Protection class  | IP 20    |

Tab. 6

\* Automatic adaptation to mains power

The ac motor of pump N 940 is fitted as standard with a thermal-switch to protect against overloading.

Pump N 940.5 APE-W has electronic overload protection.

**Other parameters**

| Parameter                                   | Wert                            |
|---|---------------------------------|
| Permissible ambient temperature             | + 5 °C to + 40 °C               |
| Permissible media temperature               | + 5 °C to + 40 °C               |
| Gas-tightness of pump head*<br>(not tested) | < 6 x 10 <sup>-3</sup> mbar l/s |

Tab. 7

\* After opening the pump head or the pump heads, or replacing the diaphragm and valve plates the gas tightness is no longer guaranteed. A leak test is able to verify that the original standard of gas-tightness has been achieved.

**Additional equipment**

- a.) The pumps are equipped with a diaphragm-stabilization system that significantly increases the pumps' suction speed.
- b.) Adjustable flow rate is optional on pump N 940.5 APE-W. It works by altering motor speed either via a potentiometer or by external control via an analog signal input.

## 5. Design and Function

### Design N 940.5 APE

- 1 On/off switch
- 2 Pump outlet
- 3 Pump inlet

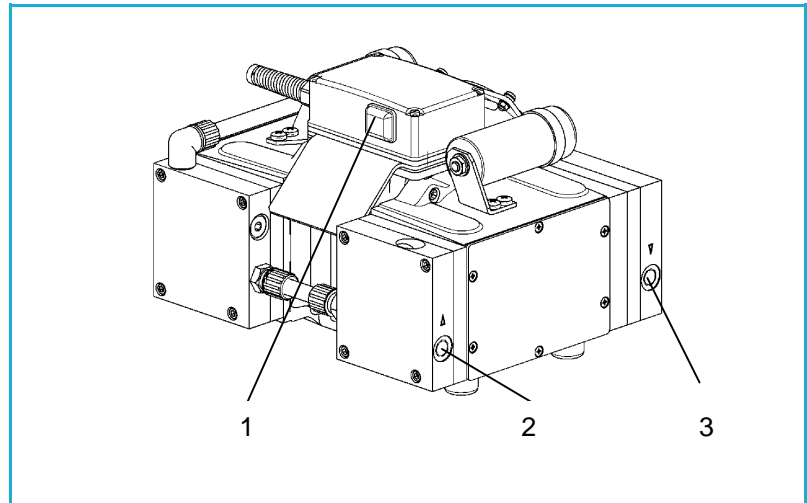


Fig. 1: Diaphragm pump N 940.5 APE

### Design N 940.5 APE-W

- 1 Pump outlet
- 2 Pump inlet
- 3 On/off switch

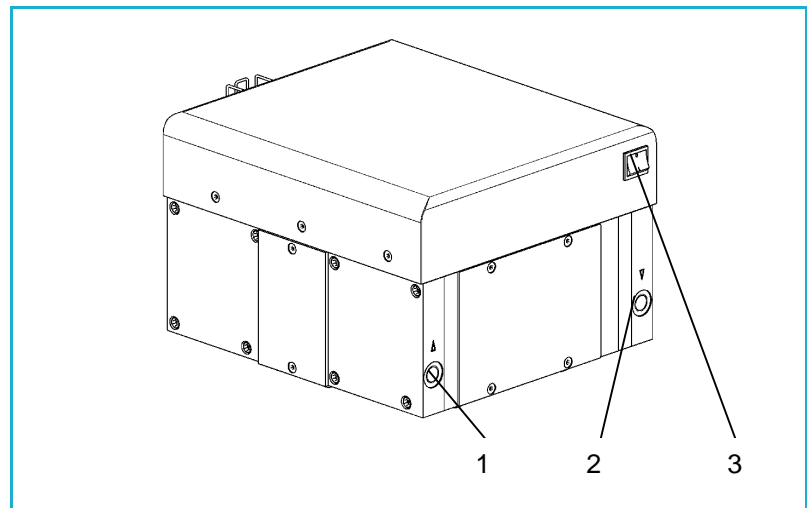


Fig. 2: Diaphragm pump N 940.5 APE-W

### Function diaphragm pump

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

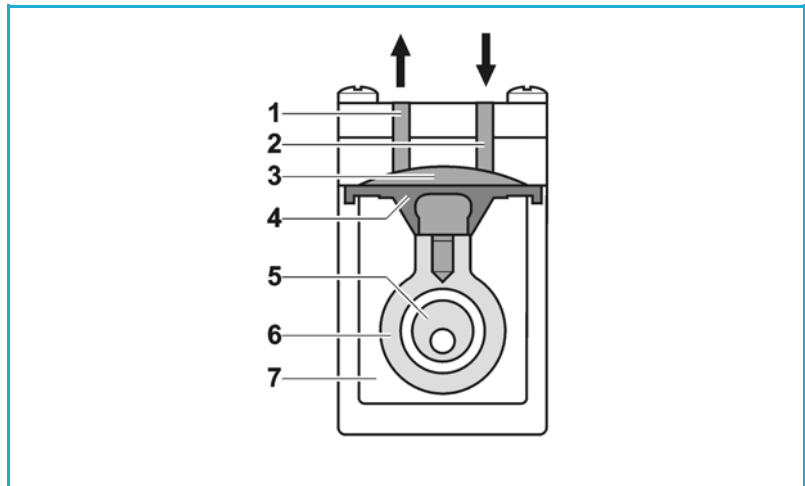


Fig. 3: Pump head

The pumps transfer, compress and evacuate 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.

### Function diaphragm stabilization system

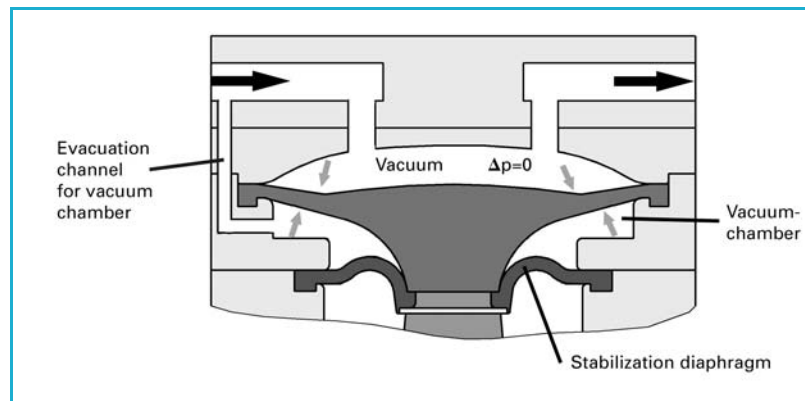


Fig. 4: Function of diaphragm stabilization system

An additional diaphragm, the so-called stabilization diaphragm, separates the underside of the working diaphragm from the “crank” space of the pump (see fig. 4). The space between the two diaphragms (called a vacuum chamber) is connected with the suction side of the pump via an balancing connection. This way, the vacuum chamber has approximately the same pressure as the working space of the diaphragm pump. The pressure difference between the upper and underside of the diaphragm approaches zero. The working diaphragm remains stable, independent of the inlet pressure of the pump. This improves the suction speed of the pump significantly, over its entire working range.



## 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 ambient temperature.

Dimensions

→ For the mounting dimensions see fig. 5 (N 940.5 APE) or fig. 6 (N 940.5 APE-W).

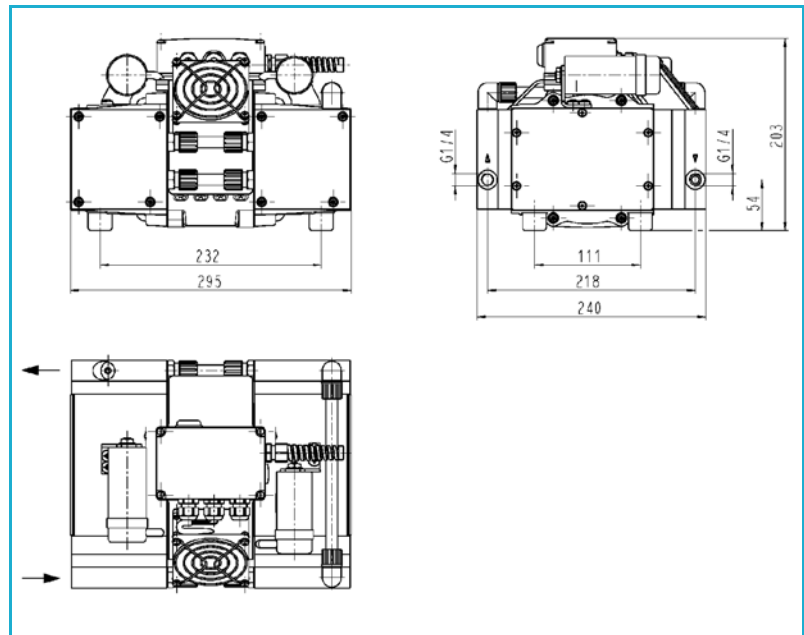


Fig. 5: Dimensions N 940.5 APE

(Dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

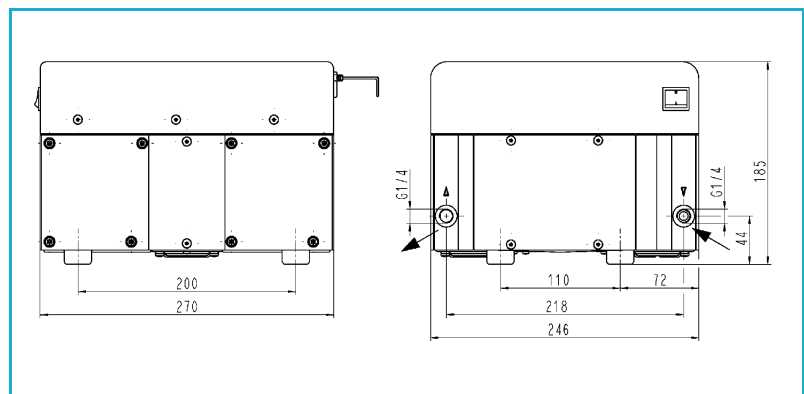


Fig. 6: Dimensions N 940.5 APE-W

(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.

- Pump N 940.5 APE-W: Place the pump only on a solid foundation in order to ensure that the ventilators will work properly.
  - 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.
- Mounting Each pump stands on four rubber feet.
- If you choose to fasten a pump to the foundation you must first unscrew the rubber feet. The pump can then be bolted to the foundation by means of the four boreholes (M6 threads) that are now exposed.

## 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.

### Connecting pump

1. Compare the supply data with the data on the motor-plate.
- i** At pump N 940.5 APE the voltage must not vary by more than + 10 % and - 10 % from that shown on the type-plate.
2. Insert the power cable plug into a properly installed shockproof socket.

## 6.3. Pneumatic connection

- Connected components → Only connect components to the pump which are designed for the pneumatic data of the pump (see chapter 4, Technical data).
- Pump exhaust → If the pump is used as a vacuum pump, safely discharge the pump exhaust at the pump's pneumatic outlet.

### Connecting pump

- i** 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 or hose connectors (where applicable) are screwed into the port threads.
  - i** The silencer is to be mounted on the suction side or pressure side of the pump head. With multiple-head pumps, this relates to the first pump head or last pump head.
  3. Connect the suction line and pressure line (thread size G 1/4).
  4. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

## 7. Operation

- Only operate the pumps 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 and temperature increase

- Do not exceed max. permissible operating pressure (see chapter 4, Technical data).
- Monitor pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure, immediately shut down 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 is not exceeded.

**i** 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 (see front page for telephone number).

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

Thermal switch When the operation of the pump is interrupted by the thermal switch (N 940.5 APE) or the electronics (N 940.5 APE-W), the pump will restart automatically after cooling down.

- Take all necessary care to prevent this leading to a dangerous situation.

Silencer Change the silencer (accessory) if it is dirty.

Switching on and off → Switching the pump on and off with the mains switch (see fig. 1 (N 940.5 APE) or fig. 2 (N 940.5 APE-W) in chapter 5).

**i** N 940.5 APE-W:

Depending on the level of the applied electrical voltage, initialization of the electronics can take up to one second before the pump starts.

**i** The pump may not start up against pressure during switch-on. This also applies in operation following a brief power failure. If a pump starts against pressure, then the thermal switch or pump electronics will be activated and switch the pump off.

**Adjusting the flow rate**

Only for pump N 940.5 APE-W as an option (not standard equipment).

The potentiometer or external control can be used to vary the flow rate.

- Potentiometer The pump's speed can be varied between around 300 and 1,900 RPM, via the potentiometer at the front side of the pump. The flow rate can be adjusted this way.
- External control The pump's speed is regulated via a control voltage. Fig. 7 shows the atmospheric flow rate of the pump as a function of the applied control voltage.

The control voltage is provided via the cables at the front side of the pump.

Control voltages of < 1.0 V are not permitted (fig. 7). This ensures that the pump operates smoothly. The control voltage is only permitted to be between 3.0 V and 4.0 V for short times (fig. 7), as the mechanical and electrical components are stressed, shortening the pump's service life. The control voltage is not allowed to exceed 4.0 V.

The pumps are available with an optional start/stop remote control. Contact your KNF specialist (see first page for contact telephone number).

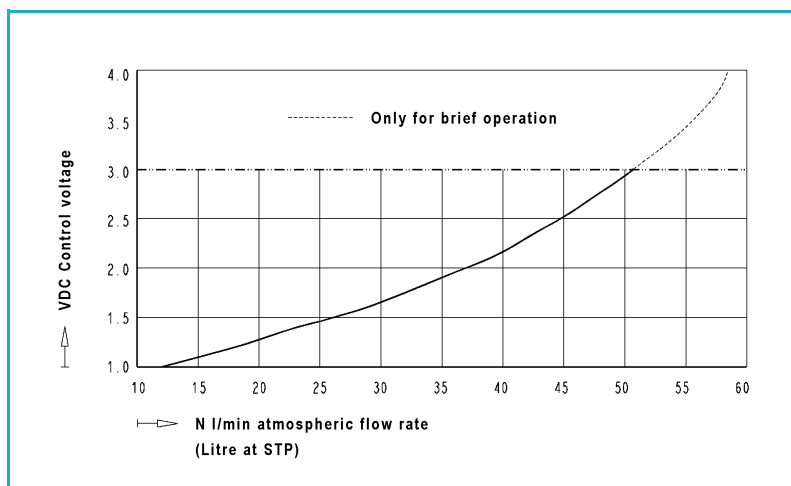


Fig. 7: Atmospheric flow rate of the pump N 940.5 APE-W, as a function of the applied control voltage

## 8. Servicing

### 8.1. Servicing schedule

| Component                          | Servicing interval                                |
|------------------------------------|---|
| Pump                               | Regular inspection for external damage or leaks   |
| Molded diaphragms and valve plates | Replace at the latest, when pump output decreases |

Tab. 8

### 8.2. Cleaning

#### 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. Replacing molded diaphragms and valve plates

#### Conditions

- Motor disconnected from mains and de-energized
- Pump free of dangerous substances

#### Spare parts

| Spare part*      | Position                       | Quantity |
|------------------|--------------------------------|----------|
| Molded diaphragm | (7) in fig. 10, (6) in Fig. 13 | 4        |
| Valve plate      | (3) in fig. 10 and 13          | 8        |
| O-ring d 32 mm   | (4) in fig. 10 and 13          | 8        |
| O-ring d 26 mm   | (5) in fig. 10                 | 2        |
| O-ring d 5.5 mm  | (8) in fig. 10                 | 2        |

Tab. 9

\* According to Spare parts list, chapter 10

#### Tools and material

| Anz. | Tools/material              |
|------|-----------------------------|
| 1    | Allen key 4 mm              |
| 1    | Phillips screwdriver No. 1* |
| 1    | Phillips screwdriver No. 2* |
| 1    | Small screwdriver           |
| 1    | Pair of pliers              |
| 1    | Felt-tip pen                |

Tab. 10

\* only for pump type N 940.5 APE-W

#### Information on procedure

- Always replace the valve plates and molded diaphragms together to maintain the pump performance.

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

- Replace the molded diaphragm and valve plates 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.
- ➔ Clean pump with suitable measures.

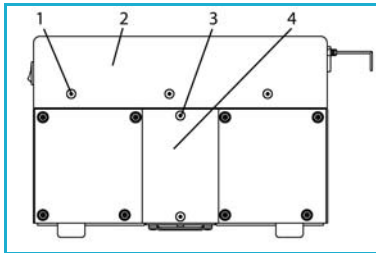


Fig. 8: Covering shroud and covers (N 940.5 APE-W)

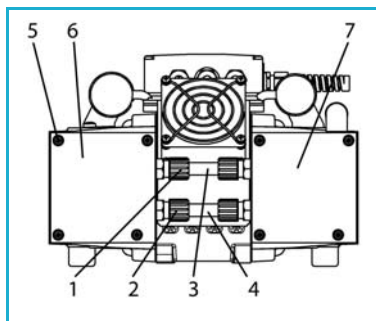


Fig. 9: Removing pump head (example N 940.5 APE)

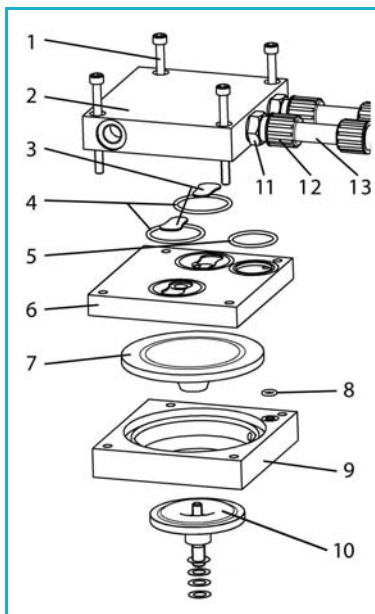


Fig. 10: Replacing molded diaphragm and valve plates (1. and 2. pump head).

**a) Preparatory Steps**

(only for pump type N 940.5 APE-W)

1. Loosen the covering shroud's (2, fig. 8) three screws (1) on each of the pump's front and rear sides.
2. Carefully lift up the covering shroud; then open the mains-switch cable's plug connection and remove the covering shroud.
3. At the front and rear sides of the pump, loosen the two screws (3) for each of the two covers (4) and remove the covers.

**b) Replacing valve plates and the molded diaphragm at the first pump head****Removing pump head**

1. At the pneumatic connections (3, fig. 9) and (4) between the first and second pump head: Use pliers to loosen union nuts (1) and (2) by turning them counterclockwise.
2. At the first pump head (6, fig. 9) mark the position of head plate (2, fig. 10), intermediate plate (6) and adapter (9) relative to each other by a drawing line with a felt-tip pen. This helps to ensure proper assembly.

**i** N 940.5 APE-W:

If the ventilator obstructs when opening the pneumatic connection: On the underside of the pump, loosen the ventilator's three attachment screws and remove the ventilator.

3. At the first pump head unscrew the four screws (1, fig. 10) and remove the head plate (2). Intermediate plate (6) is visible.
4. Take off intermediate plate (6) from adapter (9).

**Replacing valve plates**

1. Remove the two valve plates (3), the two O-rings (4) and the O-ring (5) from the intermediate plate (6).

**i** The O-rings may also stick to the underside of the head plate (2).

2. Check the valve seats, intermediate plate (6) and head plate (2) for soiling and damage. Clean the parts if necessary.
3. Contact KNF in case of roughness, scratches and corrosion. Order and replace damaged parts.

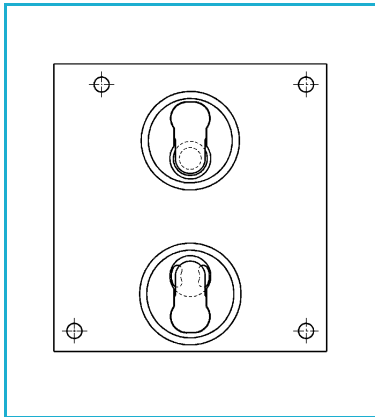


Fig. 11: Position of valve plates

4. Lay new valve plates (3) in the valve seats of the intermediate plate (6). See fig. 11 for position.

**i** The valve plates for the pressure and suction side are identical. The same applies to the upper and lower side of the valve plates.

5. Insert two new O-rings (4) and new O-ring (5) into the seat in the intermediate plate (6).

#### Replacing molded diaphragm

1. Use a small screwdriver to carefully lift up the outside edge of the molded diaphragm (7) from the adapter (9) and grasp the molded diaphragm.
2. Grasp the molded diaphragm (7) by the opposing side edges and unscrew it in the counter-clockwise direction.
3. Remove O-ring (8) from adapter (9).
4. Check all parts for soiling and clean if necessary.
5. Lay new O-ring (8) in the seat of adapter (9).
6. Screw the new molded diaphragm into vacuum diaphragm (10) by hand and tighten hand-tight.

#### Mounting pump head

1. Place the intermediate plate (6) with valve plates (3), O-rings (4) and O-ring (8) on the adapter (9) in accordance with the felt-tip pen marking.
2. Place the head plate (2) on the intermediate plate (6) in accordance with the felt-tip pen marking. In doing so, pull the pneumatic connections (13) onto the two screw fittings (11) in the head plate. Do not yet tighten the union nuts (12).
3. Make sure that the adapter (9), intermediate plate (6), and head plate are flush with each other.
4. Tighten the four screws (1) diagonally hand-tight.

#### c) Replacing valve plates and the molded diaphragm at the second pump head

**i** Second pump head: See position (4) in fig. 9.

Work steps as described under b) for the first pump head:

1. Removing pump head:

Step 1 is not applicable because the pneumatic connection is still open.

Additional step: At the pneumatic connection between pump heads 2 and 3 (2, fig. 12) use pliers to turn union nuts (1) and (3) counterclockwise, thereby loosening them.

2. Replacing valve plates
3. Replacing molded diaphragm
4. Mounting pump head

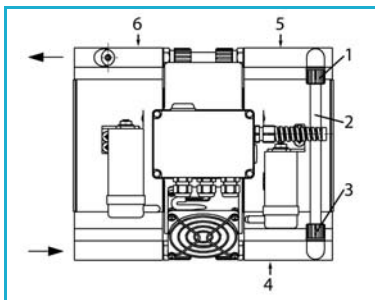


Fig. 12: Pneumatic connection between pump heads 2 and 3 (Example N 940.5 APE)

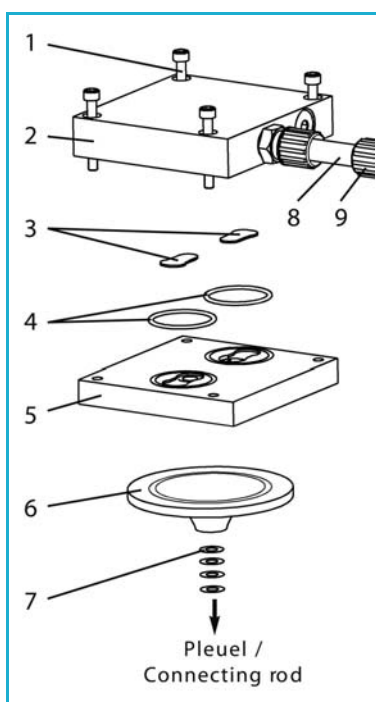


Fig. 13: Replacing molded diaphragm and valve plates (3. and 4. pump head)

Then use pliers to securely tighten (turn in clockwise direction) the two union nuts (**12**, fig. 10) at the two pneumatic connections (**13**) between pump heads 1 and 2.

Pump N 940.5 APE-W:

If you removed the ventilator at the underside of the pump, replace it now.

#### d) Replacing valve plates and the molded diaphragm at the third pump head

##### Removing pump head

1. At the pneumatic connections (**2**, fig. 12) between the second (**4**) and third (**5**) pump head: Use pliers to loosen union nuts (**1**) and (**3**) by turning them counterclockwise.
2. At the third pump head (**5**, fig. 12) mark the position of head plate (**2**, fig. 13), intermediate plate (**5**) and pump housing relative to each other by a drawing line with a felt-tip pen. This helps to ensure proper assembly.

##### i

N 940.5 APE-W:

If the ventilator obstructs when opening the pneumatic connection: On the underside of the pump, loosen the ventilator's three attachment screws and remove the ventilator.

3. At the third pump head unscrew the four screws (**1**, fig. 13) and remove the head plate (**2**). Intermediate plate (**5**) is visible.
4. Take off intermediate plate (**5**) from pump housing.

##### Replacing valve plates

1. Remove the two valve plates (**3**), the two O-rings (**4**) from the intermediate plate (**5**).

##### i

The O-rings may also stick to the underside of the head plate (**2**).

2. Check valve seats and intermediate plate (**5**) for soiling and damage. Clean the parts if necessary.
3. Contact KNF in case of roughness, scratches and corrosion. Order and replace damaged parts.
4. Lay new valve plates (**3**) in the valve seats of the intermediate plate (**5**). See fig. 11 for position.

##### i

The valve plates for the pressure and suction side are identical. The same applies to the upper and lower side of the valve plates.

5. Lay the two new O-rings (**4**, fig. 13) in the seats of intermediate plate (**5**).



### Replacing molded diaphragm

1. Use a small screwdriver to carefully lift up the outside edge of the molded diaphragm (6) from the pump housing and grasp the molded diaphragm.
2. Grasp the molded diaphragm (6) by the opposing side edges and unscrew it in the counter-clockwise direction.

**i** Make sure the connecting rod between the molded diaphragm and the pump drive does not tilt away and that the diaphragm spacers (7) do not fall into the crankcase housing.

3. Check all parts for soiling and clean if necessary.
4. Screw the new molded diaphragm (6) into the connecting rod (connecting part between molded diaphragm and drive shaft) by hand and tighten hand-tight.

**i** Use the same number and arrangement of diaphragm spacers in order to ensure that the pump achieves its rated pneumatic performance.

### Mounting pump head

1. Place the intermediate plate (5) with valve plates (3) and O-rings (4) on the pump housing in accordance with the felt-tip pen marking.
2. Place the head plate (2) on the intermediate plate (5) in accordance with the felt-tip pen marking. In doing so, pull the pneumatic connections (2, fig. 12) onto the two screw fittings in the head plate of the second pump head (4) and the third pump head (5). Do not yet tighten the union nuts (1) and (3).
3. Make sure that the pump housing, intermediate plate (5, fig. 13), and head plate (2) are flush with each other.
4. Tighten the four screws (1) diagonally hand-tight.
5. Use pliers to securely tighten (turn in clockwise direction) the two union nuts (1, fig. 12) and (3) at the pneumatic connection between pump heads 2 and 3.

### e) Replacing valve plates and the molded diaphragm at the fourth pump head

**i** Fourth pump head: See position (6) in fig. 12.

Work steps as described under d) for the third pump head:

1. Removing pump head:  
Step 1 is not applicable because the pneumatic connection is still open.
2. Replacing valve plates
3. Replacing molded diaphragm
4. Mounting pump head

Then use pliers to securely tighten (turn in clockwise direction) the union nuts (9, fig. 13) at the two pneumatic connections (8) between pump heads 3 and 4.

**Final steps**

(only for pump type N 940.5 APE-W)

1. Connect the mains-switch cable's plug and re-install the covering shroud (**2**, fig. 8).

**i** Make sure that no electrical cables are pinched.

2. Re-install the two cover plates (**4**, fig. 8).

## 9. Troubleshooting



Extreme danger from electrical shock!

**DANGER**

→ Disconnect the pump power supply before working on the pump.

→ Make sure the pump is de-energized and secure.

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

| Pump does not transfer  |  |
|---|--|
| Cause   | Fault remedy   |
| Pump is not connected with the power source.                                      | → Connect pump with the power source.  |
| No voltage in the power source  | → Check room fuse and switch on if necessary.  |
| Fuse(s) in the pump defective.<br>(only for pump N 940.5 APE)                     | <ul style="list-style-type: none"> <li>→ Remove pump's mains plug from the socket.</li> <li>→ Release the terminal-box cover on the top side of the pump.</li> <li>→ Select suitable fuse (see section 4) and replace fuse(s).</li> <li>→ Install the terminal-box cover.</li> </ul> |
| Thermal-switch or electronics of pump has/have operated following to overheating. | <ul style="list-style-type: none"> <li>→ Remove pump's mains plug from the socket.</li> <li>→ Allow pump to cool.</li> <li>→ Trace cause of over-heating and eliminate it.</li> </ul>  |
| Connections or lines blocked.   | <ul style="list-style-type: none"> <li>→ Check connections and lines.</li> <li>→ Remove blockage.</li> </ul>   |
| External valve is closed or filter is clogged.                                    | → Check external valves and filters.   |
| Condensate has collected in pump head.  | <ul style="list-style-type: none"> <li>→ Flush the pump with air for several minutes under atmospheric conditions.</li> <li>→ Install pump at highest point in system.</li> </ul>  |
| Molded diaphragms or valve plates are worn.                                       | → Replace molded diaphragms and valve plates (see section 8.3).  |

Tab. 11

| <b>Flow rate, pressure or vacuum too low</b>   |   |
|--|---|
| The pump does not achieve the output specified in the Technical data or the data sheet.  |   |
| Cause  | Fault remedy  |
| Condensate has collected in pump head.   | <ul style="list-style-type: none"> <li>➔ Flush the pump with air for several minutes under atmospheric conditions.</li> <li>➔ Install pump at highest point in system.</li> </ul>   |
| There is gauge pressure on pressure side and at the same time vacuum or a pressure above atmospheric pressure on suction side. | <ul style="list-style-type: none"> <li>➔ Change the pressure conditions.</li> </ul>   |
| Pneumatic lines or connection parts have an insufficient cross section.  | <ul style="list-style-type: none"> <li>➔ Disconnect pump from system to determine output values.</li> <li>➔ Eliminate throttling (e.g. valve) if necessary.</li> <li>➔ Use lines or connection parts with larger cross section if necessary.</li> </ul> |
| Leaks occur on connections, lines or pump head.  | <ul style="list-style-type: none"> <li>➔ Eliminate leaks.</li> </ul>  |
| Connections or lines completely or partially jammed.   | <ul style="list-style-type: none"> <li>➔ Check connections and lines.</li> <li>➔ Remove the jamming parts and particles.</li> </ul>   |
| Head parts are soiled.   | <ul style="list-style-type: none"> <li>➔ Clean head components.</li> </ul>  |
| Molded diaphragms or valve plates are worn.  | <ul style="list-style-type: none"> <li>➔ Replace molded diaphragms and valve plates (see section 8.3).</li> </ul>   |

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 first page for the address).

1. Flush the pump to free the pump head of dangerous or aggressive gases.
2. Remove the pump.
3. Clean the pump.
2. Send the pump to KNF with a filled out decontamination declaration (see chapter 11) and specification of the medium transferred.

## 10. Spare Parts and Accessories

### Spare parts

| Spare part       | Position                          | Order No. |
|------------------|-----------------------------------|-----------|
| Molded diaphragm | (7) in fig. 10,<br>(6) in fig. 13 | 112089    |
| Valve plate      | (3) in fig. 10 and 13             | 112130    |
| O-ring d 32 mm   | (4) in fig. 10 and 13             | 112122    |
| O-ring d 26 mm   | (5) in fig. 10                    | 112121    |
| O-ring d 5.5 mm  | (8) in fig. 10                    | 112123    |

Tab. 13

### Accessories

| Accessories   | Order No.  |
|---|------------|
| Silencer (G 3/8)  | 045993     |
| Adapter for silencer (from G 3/8 to G 1/4)                    | 014757     |
| Small flange stainless steel (G 1/4, DN 16)                   | 048116     |
| Hose connector, brass (G 1/4, for tube ID 13)*                | 049880     |
| Hose connector, PP (G 1/4, for tube ID 10)                    | 045293     |
| Sealing for hose connector, brass                             | 029112     |
| Adjustable delivery through speed regulation at N 940.5 APE-W | on request |

Tab. 14

\* Needed for assembly:

Sealing for hose connector (brass), Order No. 029112

## 11. Decontamination Declaration

- i** The condition for the repair of a pump by KNF is the certification of the customer on the transferred media and on the cleaning of the pump (decontamination declaration).
- ➔ Copy this page.
- ➔ Enter the pump model, the Serial No. and the transferred media in the form below and sent the signed form together with the flushed and cleaned pump to KNF Customer Service.

KNF Neuberger Inc.  
 2 Black Forest Road  
 Trenton, NJ 08691-1810

Tel. 609-890-8600  
 Fax 609-890-8323  
 www.knf.com

### Customer decontamination declaration for repair order

We herewith confirm that the following media have been pumped with the pump listed below, and that the pump has been flushed and cleaned.

|            |  |
|------------|--|
| Pump model |  |
| Serial No. |  |
| Fed media  |  |
|            |  |
|            |  |
|            |  |
|            |  |

The pump contains neither aggressive, biological, radioactive, poisonous nor other dangerous media.

-----  
 Company

-----  
 Date/Signature