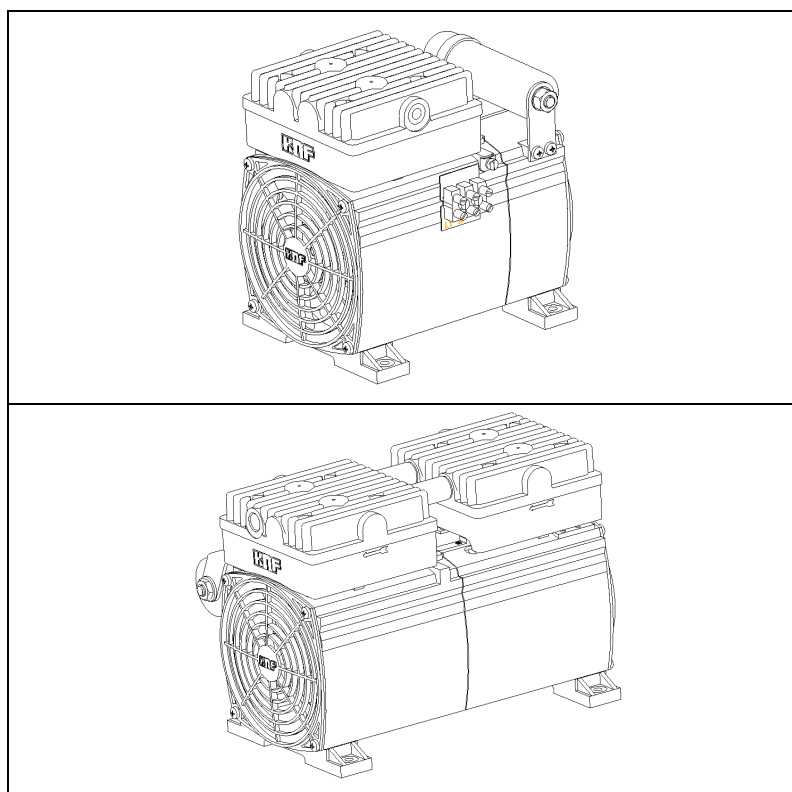


Swing Piston Compressors and Vacuum Pumps

NPK 050
NPK 0100

Operating and Installation Instructions

Read and observe these 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



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
DANGER	warns of immediate danger	Death or serious injuries and/or serious damage are the consequence.
WARNING	warns of possible danger	Death or serious injuries and/or serious damage are possible.
CAUTION	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.

i This symbol refers to important information.

2. Use

2.1. Proper use

The pumps are designed for pumping air.

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 whether the medium can be transferred danger-free in the specific application case.

When using a medium other than air: Before using a medium, check the compatibility of the materials of the pump head, swing piston and piston seal with the medium.

2.2. Improper use

The pumps may not be operated in an explosive atmosphere.

The pumps may not be used to pump combustible or potentially explosive media.

The pumps are not suitable for transferring dusts.

The pumps are not suitable for pumping vapors or liquids.

The pumps must not be used to create vacuum and overpressure simultaneously.

An overpressure must not be applied to the suction side of the pump.

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 its 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 its intended use in a safety and danger-conscious manner while observing the Operating and Installation Instructions.

Personnel Make sure that only trained and instructed personnel or specially trained personnel work on the pump. 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.

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.

EC Directives / Standards 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 pumps conform to the EC Directive 2004/108/EC concerning Electromagnetic Compatibility.

The following harmonized standards have been used:

- DIN EN 55014-1/2
- DIN EN 61000-3-2/3
- DIN EN 60335-1

Customer service and repairs

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

4. Technical data

Pump materials

Assembly	Material
Head plate; cylinder	Aluminium
Valve plate	Stainless steel
Piston seal	PTFE compound
O-ring	NBR
Retainer plate	Aluminium

Tab. 3

Pneumatic values

NPK 050

Parameter	Value
Max. permissible operating pressure [bar g]	2
Ultimate vacuum [mbar abs.]	80
Delivery rate at atm. pressure [l/min]*	50

Tab. 4 *Liters in standard state (1,013 mbar)

NPK 0100

Parameter	Value
Max. permissible operating pressure [bar g]	2
Ultimate vacuum [mbar abs.]	80
Delivery rate at atm. pressure [l/min]*	78

Tab. 5 *Liters in standard state (1,013 mbar)

Electrical data

Parameter	Value
Electrical data	See type plate
Protection class	IP 20
Maximum permitted mains voltage fluctuations	+/- 10 %

Tab. 6

The pumps are fitted as standard with a thermal-switch to protect against overloading.

Weight

Pump type	Value
NPK 050	approx. 5.6 kg
NPK 0100	approx. 7.7 kg

Tab. 7

Dimensions

Pump type	Value
NPK 050: L x H x W [mm]	171 x 174 x 132
NPK 0100: L x H x W [mm]	242 x 174 x 167

Tab. 8

Other parameters

Parameter	Values
Permissible ambient temperature	+ 5 °C to + 40 °C
Permissible media temperature	+ 5 °C to + 40 °C
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C
Max. altitude of site [m above sea level]	2000
Gas-tightness	The gas-tightness of the pump is dependent on the medium used.*
Pneumatic connections	Thread size G1/4

* If you have questions about this, please contact your KNF advisor.

Tab. 9

5. Design and function

Design NPK 050

- 1 Pneumatical outlet
- 2 Pneumatical inlet
- 3 Motor compressor housing
- 4 Base plate
- 5 Front fan cover

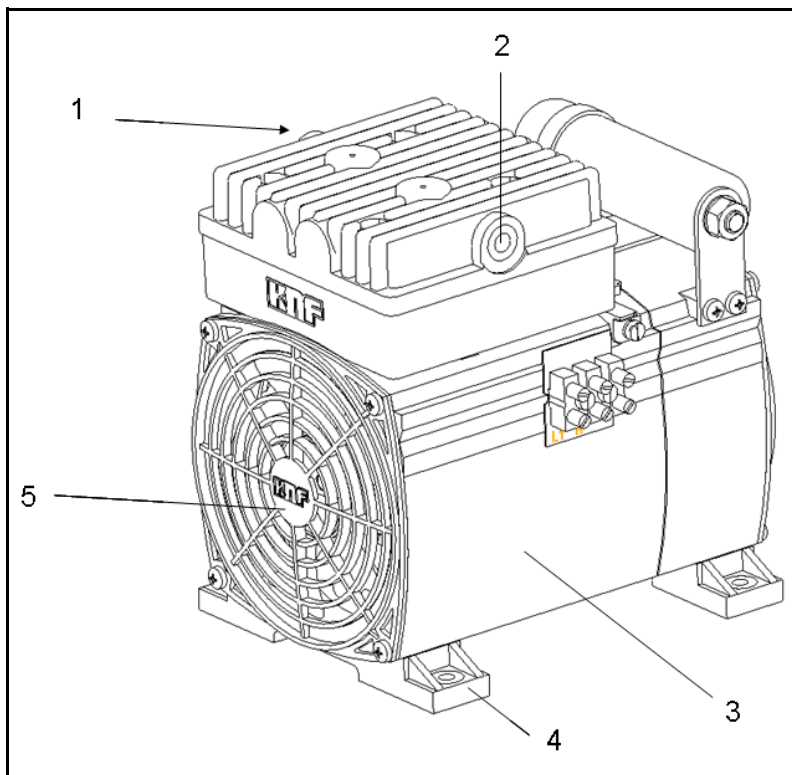


Fig. 1: Swing piston compressor and vacuum pump NPK 050

Design NPK 0100

- 1 Pneumatical outlet
- 2 Pneumatical inlet
- 3 Motor compressor housing
- 4 Base plate
- 5 Front fan cover

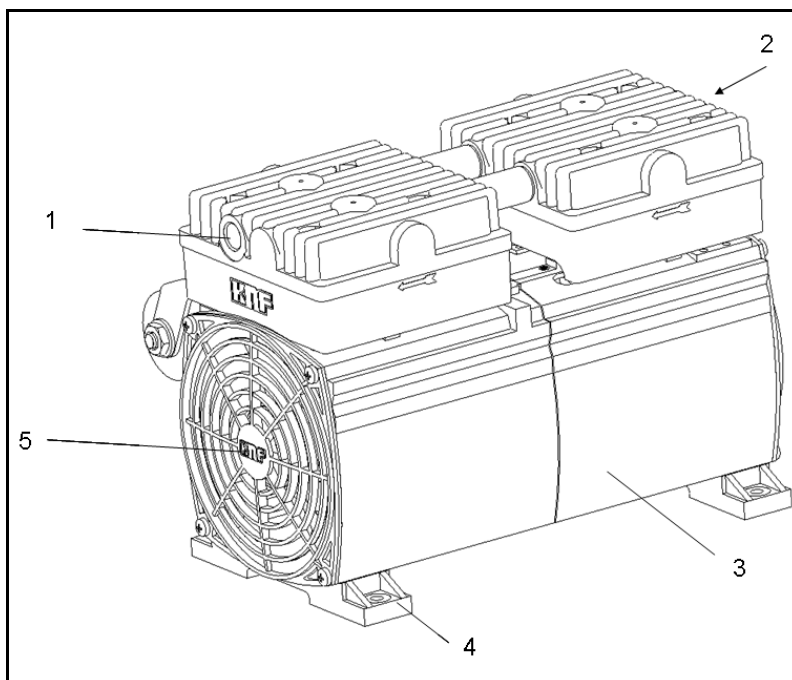


Fig. 2: Swing piston compressor and vacuum pump NPK 0100

Function

- 1 Inlet valve
- 2 Outlet valve
- 3 Transfer chamber
- 4 Retainer plate
- 5 Piston seal
- 6 Eccentric
- 7 Connecting rod
- 8 Compressor housing

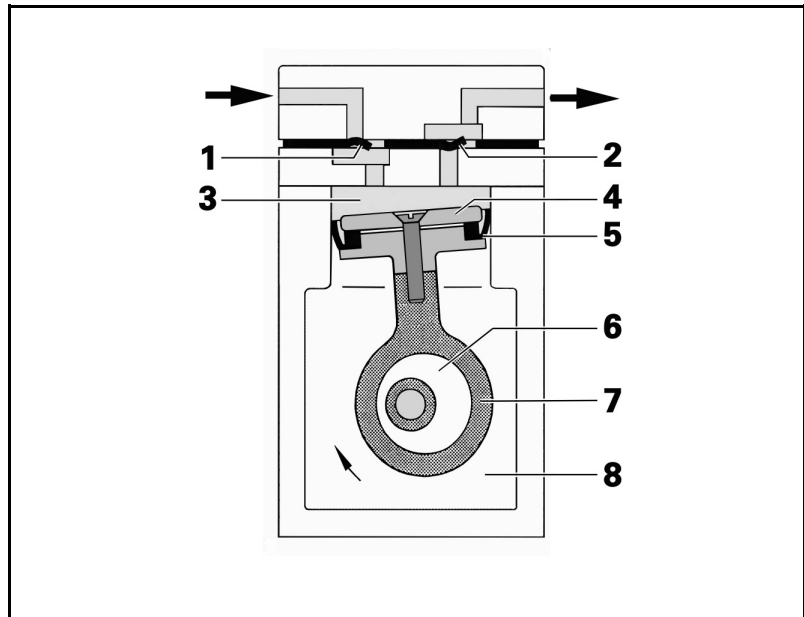


Fig. 3: Function of swing piston pump

The pumps transfer, compress and evacuate air.

The swing piston, consisting of retainer plate (4) and piston seal (5), is moved up and down by the eccentric (6) and the connecting rod (7). In the downward stroke the swing piston aspirates the medium to be transferred via the inlet valve (1). In the upward stroke, the swing piston presses the medium out of the pump head via the outlet valve (2). The swing piston is sealed off from the compressor housing by a piston seal (5) and operates oil-free.

6. Installation and connection

Only install and operate the pump 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.
- ➔ For the mounting dimensions see fig. 4 (NPK 050) or fig. 5 (NPK 0100).

Mounting dimensions

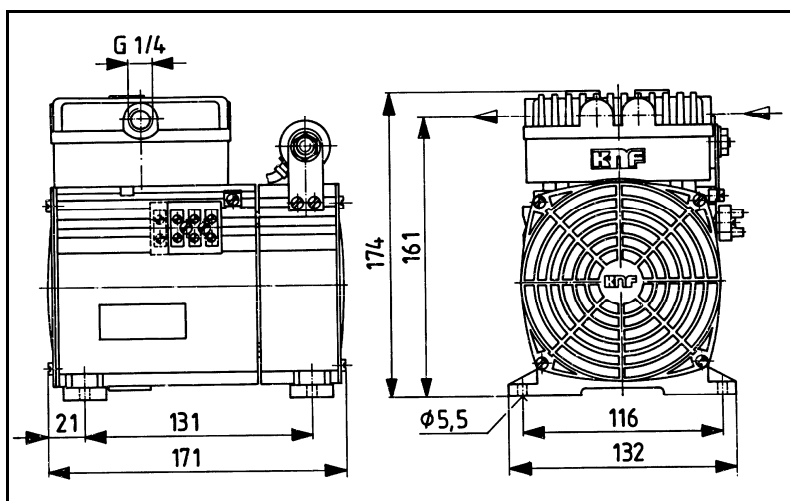


Fig. 4: Mounting dimensions NPK 050
(All dimensions tolerances conform to DIN ISO 2768-1, Tolerance Class V)

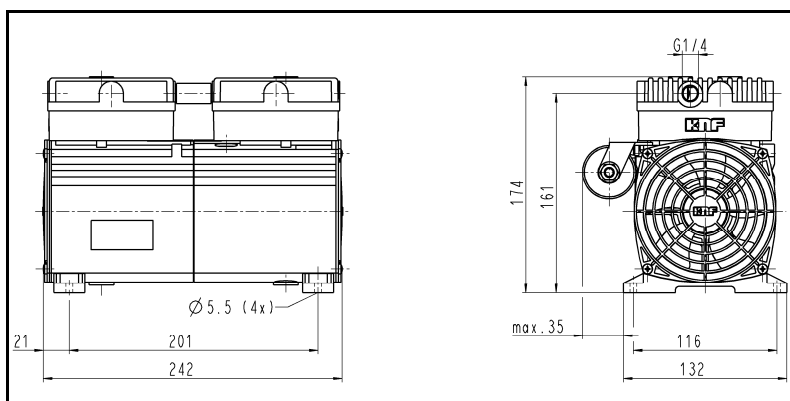


Fig. 5: Mounting dimensions NPK 0100
(All dimensions tolerances conform to DIN ISO 2768-1, Tolerance Class V)

- Immediate environment ➔ When installing the pump, ensure that no flammable objects or objects subject to thermal deformation are located in the immediate vicinity of hot pump parts (head, motor).

- Installation position → The pump may be installed in any position. Use metal screws to fasten the pump at the indicated attachment points.

Protection against touching



WARNING

Hazard of injuries during operation

- Take protective measures against touching parts connected to electrical power (electrical connection).

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 exposure to fats and oils.
- 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).
- i** → For operating current see type plate or data sheet.
- It is recommended that an additional "Emergency Stop" switch is installed.
- The pump must be installed so that contact with live parts is impossible.

Connecting pump

1. Compare the supply data with the data on the motor-plate.
- i** The voltage must not vary by more than + 10% and - 10% from that shown on the type-plate.
2. Connect the mains cables to the connections L1 and N of the pump motor.
3. Connect the earth (ground) wire to the motor.

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. |

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 accessory silencer/filter (where applicable) is screwed into the port thread.
- i** If the pump is used as a vacuum pump, mount the silencer at the pressure side if necessary. If the pump is used a compressor, mount the filter at the suction side if necessary.
3. Connect the suction line and pressure line (threadsize 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).
- The pumps are intended for installation. Before putting them into service it must be established that machinery or equipment in which they are installed meets the relevant regulations.



WARNING

Hazard of the pump head bursting due to excessive pressure increase

- Do not exceed max. permissible operating pressure (see Chapter 4, Technical data).
- Only throttle or regulate the air quantity (the gas quantity) in the suction line to prevent the maximum permissible operating pressure from being exceeded.
- If the air quantity (the gas quantity) in the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure is not exceeded.
- Monitor pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure of the pump, immediately switch off pump and eliminate fault (see Chapter 9. Troubleshooting).
- Ensure that the pump outlet is not closed or constricted.

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 or by a pressure-relief valve. 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.



Automatic starting can cause personal injury and pump damage

WARNING

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.

Silencer/filter

Change the silencer/filter (accessory) if it is dirty.

Switching pump on

Switching pump on

i The pump may not start up against pressure or vacuum during switch-on. This also applies in operation following a brief power failure. If a pump starts against pressure or vacuum, it may block. This activates the thermal switch, and the pump switches off.

- Make sure that normal atmospheric pressure is present in the lines during switch-on.

Switching pump off

- Open pressure and suction lines to normal atmospheric pressure.

8. Servicing

8.1. Servicing schedule

Component	Servicing interval
Pump	- Regular inspection for external damage or leaks
Piston seal and reed valves	- Replace at the latest, when pump output decreases

Tab. 10

8.2. Cleaning



Danger of burns from hot pump parts

The pump head or motor may be hot even after the pump has been shut off.

CAUTION → Allow the pump to cool off after operation.

- 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 piston seal and reed valves

- Conditions
- Motor disconnected from mains and de-energized
 - Pump free of dangerous substances
 - Tubes/pipes removed from pump's pneumatic inlet and outlet

- Information on procedure
- Always replace the piston seal and reed valves together to maintain the pump performance.

Spare parts

Spare part*	Position**	Quantity	
		NPK 050	NPK 0100
Piston seal	(11)	1	2
Reed valves	(7)	2	4
Countersunk screw	(9)	1	2
Sealing	(4)	1	2
O-ring D 70 x 2.0	(13)	1	2

* According to spare parts list, chapter 10

** According to Fig. 6.

Tab. 11

Tools and material

Quantity	Tools/Material
1	Phillips screwdriver No. 2
1	Screwdriver blade width 5.5 mm
1	Allen key 4 mm
1	Felt-tip pen

Tab. 12



Danger of burns from hot pump parts

The pump head or motor may be hot even after the pump has been shut off.

CAUTION → Allow the pump to cool off after operation.

Preparatory steps

1. Remove the front fan cover (Fig. 1/5, see page 6) of the pump together with the restrictor plate after loosening the four fixing screws.

Front fan is visible.

2. Mark the position of head plate (Fig. 6/3), intermediate plate (8) and pump housing relatively to each other by a drawing line with a felt-tip pen to ensure proper assembly.

For NPK 0100:

Carry out step 2 for the second pump head.

Removing pump head

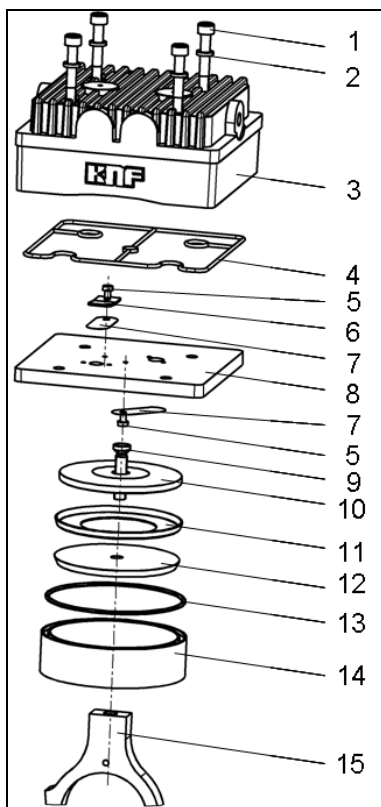


Fig. 6: NPK 050:
Parts of pump head

1. Unscrew the four screws (1) and remove them together with the spring lock washers (2) and the head plate (3).
For NPK 0100:
Carry out step 1 for the second pump head and remove both head plates simultaneously.
2. Remove the sealing (4) from the intermediate plate (8).
3. Remove the intermediate plate (8).
4. Unscrew the screws (5) and remove valve stopper (6) and reed valves (7).
5. Check all parts for soiling and damage. Clean the parts if necessary.
6. Contact KNF in case of roughness, scratches and corrosion. Order and replace damaged parts.
7. Move the retainer plate (10) to the upper point by turning the fan.
8. Pull cylinder (14) upwards.
9. Remove O-ring (13) from cylinder (14).
10. Hold on fan while loosening the countersunk screw (9) of retainer plate (10).
11. Remove countersunk screw (9) and retainer plate (10) with piston seal (11).
12. Remove piston seal (11) from retainer plate (10).
13. Dispose of the old piston seal (11), sealing (4), countersunk screw (9) and O-ring (13) properly.
14. For NPK 0100:
Carry out steps 2 to 13 for the second pump head.

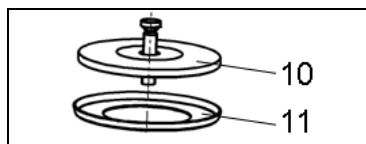


Fig. 7: Orientation of piston seal (11) in relation to retainer plate (10)

Mounting pump head

1. Hold the connecting rod (15) from the front through the fan opening, and replace the cylinder (14) on the pump housing.
2. Lay new O-ring (13) on cylinder (14).
3. Re-assemble the "piston-assembly":
 - a. Lay the new piston seal (11) on the retainer plate (10).

i For orientation of piston seal (11) see fig. 7.
 - b. Push the new countersunk screw (9) through the retainer plate (10).
4. Slide "piston assembly" (consisting of retainer plate (10), piston seal (11) and countersunk screw (9)) into the cylinder (14) from the top and place on connecting rod (15).

i The piston seal must not be distorted during assembly. It must make contact with the cylinder all round its circumference
5. Fasten the "piston assembly" by tightening the countersunk screw (9).
6. Mount new reed valves (7) and valve stopper (6) and tighten the screws (5).
7. Place the intermediate plate (8) on the pump housing in accordance with the felt-tip pen marking.
8. Place sealing (4) on intermediate plate (8).
9. For NPK 0100:
Carry out steps 1 to 8 for the second pump head.
10. Place head plate (3) on intermediate plate (8).
For NPK 0100:
Place both head plates on intermediate plates simultaneously.
11. Tighten the screws (1) together with the spring lock washers (2) at first lightly, then firmly by hand, in a diagonal pattern.
For NPK 0100:
Carry out step 11 for the second pump head.

Final step

1. Refit front fan cover.

9. Troubleshooting



Extreme danger from electrical shock!

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

DANGER

→ Make sure the pump is deenergized and secure.

Check the pump (see Tab. 13 and 14).

Pump does not transfer	
Cause	Fault remedy
Thermal switch has operated following to over-heating.	<ul style="list-style-type: none"> → Disconnect pump from mains. → Allow pump to cool. → Trace cause of over-heating and eliminate it.
Connections or lines blocked.	<ul style="list-style-type: none"> → Check connections and lines. → Remove blockage.
External valve is closed or filter is clogged.	<ul style="list-style-type: none"> → Check external valves and filters.
Condensate has collected in pump head.	<ul style="list-style-type: none"> → Install pump at highest point in system.
Piston seal or valve plate is worn.	<ul style="list-style-type: none"> → Change piston seal and valve plate (see section 8.3).

Tab. 13

The pump does not achieve the output (flow, pressure or vacuum) specified in the Technical data or the data sheet	
Cause	Fault remedy
Condensate has collected in pump head.	<ul style="list-style-type: none"> → 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.	<ul style="list-style-type: none"> → Change the pressure conditions.
Pneumatic lines or connection parts have an insufficient cross section.	<ul style="list-style-type: none"> → 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.	<ul style="list-style-type: none"> → Eliminate leaks.
Connections or lines completely or partially jammed.	<ul style="list-style-type: none"> → Check connections and lines. → Remove the jamming parts and particles.
Head parts are soiled.	<ul style="list-style-type: none"> → Clean head components.
Piston seal or valve plate is worn.	<ul style="list-style-type: none"> → Change piston seal and valve plate (see section 8.3).

Tab. 14

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 gases. For this purpose, flush the pump under atmospheric conditions some minutes with air (if necessary for safety reasons: with an inert gas).
2. Remove the pump.
3. Clean the pump (see Section 8.2)
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

Spare part	Position*	Order No.
Piston seal	(11)	024822
Reed valves	(7)	017592
Countersunk screw NPK 050	(9)	024848
Countersunk screw NPK 0100	(9)	024847
Sealing	(4)	017410
O-ring D 70 x 2.0	(13)	002443

Tab. 13

*according to Fig. 6

Accessories

Accessory	Order No.
Silencer/filter NPK 050	020381
Silencer/filter NPK 0100	020414
Hose connector*	000362
Sealing for hose connector	001818

Tab. 14

* requires Sealing for hose connector Order No. 001818

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(were) 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(were) 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(were) decontaminated and work can proceed without special measures yes

Method / proof:

.....

The device(s) was(were) 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

KNF worldwide
Find your local KNF partner on www.knf.com

