

1. Description, Operating Conditions

The pumps transfer, evacuate and compress 100% oil-free. In operation they are gas-tight, and maintenance-free.

1.1. Electrical Equipment

See the motor-plate for full electrical data.

Protection class of standard version is IP20.

1.2. Operating Conditions

Handling air, gases, and vapours at temperatures between + 5 °C + 40 °C.

For maximum permissible operating pressure, ultimate vacuum, and flow capacity see section 10.

The pumps must not be used in areas where there is a danger of explosion.

Before pumping a medium, the compatibility of materials of pump head, diaphragm and valves with the medium must be checked (for pump materials: see section 10).

The pumps must not be used for liquids. You will find suitable liquid pumps in our Product Program.

If your potential application lies outside the above limits discuss it with our technical adviser (see last page for contact telephone number).

1.3. Ambient Conditions

When the pump is operating the following ambient conditions must be maintained:

- Ambient temperature during operation: between + 5 °C + 40 °C.
- The pump must be protected from the effects of dust and water.
- The pumps must not be used in areas where there is a danger of explosion.
- During operation an adequate supply of air for cooling must be provided.

1.4. Pump materials

See section 10.

2. Safety

Note that the pumps may only be used for their intended purpose.

The pumps must not be used in areas where there is a danger of explosion.

Components connected to the pump must be designed to withstand the pneumatic performance of the pump.

Take care that safety regulations are observed when connecting the pump to the electricity supply.

For pumps with thermal switch (option): When the operation of the pump is interrupted by the thermal switch, the pump will re-start automatically after cooling down. Take all care necessary to prevent this leading to a dangerous situation.

Specific safety instructions for the media being handled must be observed.

Use only original KNF spare parts.

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 following harmonized standards have been used:

- DIN EN 50581
- DIN EN 55014-1/2
- DIN EN 61000-3-2/3
- DIN EN 60335-1

3. Installation

The pumps are intended for installation in equipment. When installing them make certain that accident prevention regulations, and safety instructions, including those for subsequent operation are observed. The safety instructions in section 2 must be observed.

- Mechanical** The dimensions of the mountings are given in Data Sheet E 025.
Install the pump so that the fan can draw in sufficient cooling air.
Fit the pump at the highest point in the system, so that condensate cannot collect in the head of the pump - that prolongs working life.
The pumps can operate in any position, but if they are installed inclined, vertically, or suspended, the rubber feet must be removed.
- Electrical** **When making the electrical installation the safety regulations must be observed. In particular make sure that the electricity supply is isolated before trying to connect the pump.**
Compare the supply data with the data on the motor-plate. The voltage must not vary by more than +10% and -10% from that shown on the type-plate.
The motor must be connected to earth (ground) wire.
In the electrical installation, arrangements (complying with EN 60335-1) must be made for disconnecting the pump motor from the electrical supply.
The pump must be installed so that contact with live parts is impossible.
We recommend that a fuse is installed in the motor supply circuit; the operating current is given in Data Sheet.
- Pneumatic** The accessories filter/silencer, and hose connectors (if available) are screwed into the port threads.
Connect the suction and pressure lines.
Arrange the suction and pressure lines so that condensate cannot run into the pump.

4. Operation

Specific safety instructions for the media being handled must be observed.

If combustible media are used:

- Hazard of fires and explosions due to excessively high media temperature.
- 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.
- 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 (section 10).
- 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.

Before pumping a medium, the compatibility of materials of pump head, diaphragm and valves with the medium must be checked (for pump materials: see section 10).

The pumps must not start against pressure or vacuum. When it is switched on the pressure in the suction and pressure lines must be atmospheric. This must be so even when the pump restarts after the power has been cut off for a short period.

The maximum permissible operating pressure (see section 10) must not be exceeded.

To prevent the maximum permissible operating pressure being exceeded, restriction or control of the air or gas flow should only be carried out in the suction line.

If restriction or control of the air or gas flow is made on the pressure side ensure that the maximum permissible operating pressure is not exceeded.

When the pump is at a standstill the inlet and exhaust must be at normal atmospheric pressure.

Change the filter (accessories) if it is dirty.

Diaphragm and valve plates/sealings (valve plate) are the only parts subject to wear. Wear is usually indicated by a drastic reduction in the pneumatic performance. When replacing parts proceed as described in section 5.

Ambient conditions: see section 1.3.

5. Servicing

5.1. Pump range N 023_ANE

Before working on the pump, isolate the power supply securely, then check that the lines are not live.

Diaphragm and valve plate are the only parts of the pump subject to wear. They are simple to change.

Always change diaphragm and valve plate at the same time. In the case of models with two heads service both heads at the same time.

Parts required

Spare part*	Quantity
Diaphragm	1 (per pump head)
Valve plate	1 (per pump head)
Countersunk screw	1 (per pump head)

Tab. 1: Parts

* According to Spare parts list, section 8

Tools/material required

Tools/Material
Allen key 4
Screwdriver blade width 4.5 mm (or similar size)
Pencil

Tab. 2: Tools/Material

Change the diaphragm and valve plate in the following sequence (see fig. 3):

1. For pump types N 023.1 ANE and N 023.3 ANE: Pull the pneumatic head connection hose off at one pump head.
2. For pump type N 023.1.2 ANE: On the pneumatic connection between the pump heads on the suction side, pull the hose off one pump head.
On the pneumatic connection on the pressure side, loosen the hose clip on one pump head and pull the hose off.
3. For pump type N 023.2 ANE:
At one pump head loosen the hose clip of pneumatic head connection and pull the hose off.
4. Mark the relative positions of the crankcase (**A**), the intermediate plate (**X**), and the head (**W**), with a pencil.
5. Undo the 4 cap head screws (**Y**), and lift off the head (**W**), the valve plate (**Z**), and the intermediate plate (**X**).
6. Unscrew the countersunk screw (**D**), and take off the retainer plate (**E**) and diaphragm (**F**), together with the diaphragm support (**M**) and shims (**B**).
Important: Take care not to lose the shims (**B**).

7. Use a small screwdriver to push in the retaining clips and remove the fan guard **(H)**.
8. Mount the retainer plate **(E)**, new diaphragm **(F)**, diaphragm support **(M)** and shims **(B)** on the new countersunk screw **(D)**. Screw this assembly into the conrod **(K)**, and tighten firmly.
9. Turn the fan **(G)** until the conrod **(K)** is in mid-stroke. Place the intermediate plate **(X)** on the housing **(A)** according to the marks made previously.
10. Place the new valve plate **(Z)** on the intermediate plate **(X)** as shown in figure 3. Fit the head **(W)**, according to the markings.
11. Tighten the cap heads screws **(Y)** uniformly and diagonally.
12. Check that the pump runs freely by turning the fan **(G)** by hand.
13. Refit the fan guard **(H)**.
14. For pump types N 023.1 ANE and N 023.3 ANE:
Pull the pneumatic head connection hose back onto the hose connector.
15. For pump type N 023.1.2 ANE:
Pull the pneumatic head connection hoses back onto the hose connector. Retighten the hose clip on the pneumatic head connection on the pressure side.
16. For pump type N 023.2 ANE:
Pull the pneumatic head connection hose back onto the hose connector; retighten the hose clip.

If you have any questions about servicing call our technical adviser (see last page for contact telephone number).

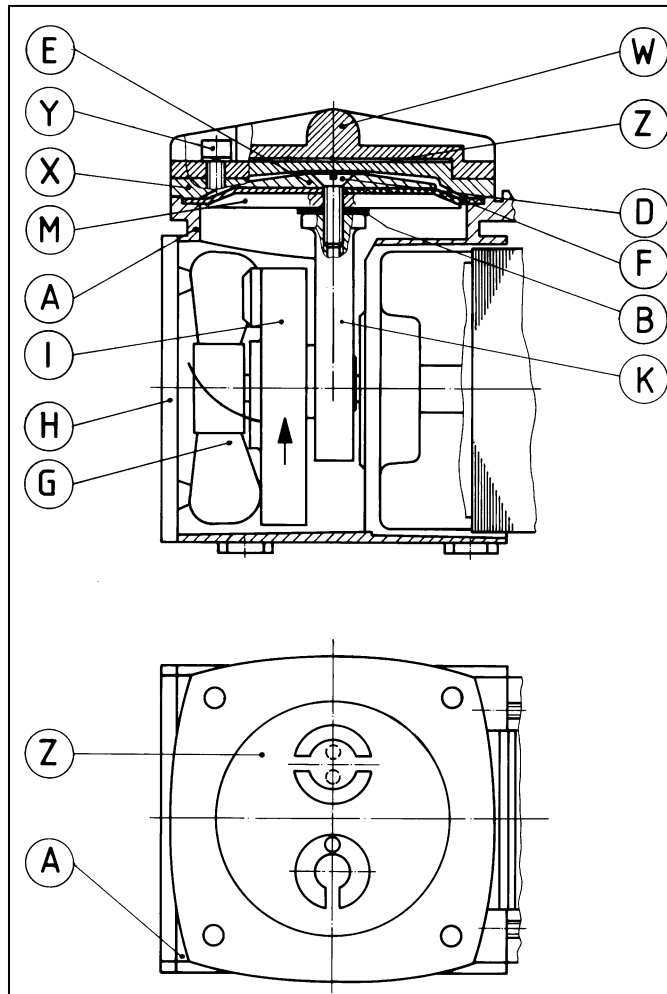


Fig. 3: Cross section N 023_ANE

5.2. Pump range N 023_AN.30 E:

Before working on the pump, isolate the power supply securely, then check that the lines are not live.

Diaphragm and valve plate are the only parts of the pump subject to wear. They are simple to change.

Always change diaphragm and valve plate at the same time. In the case of models with two heads service both heads at the same time.

Parts required

Spare part*	Quantity
Diaphragm	1 (per pump head)
Valve plate	1 (per pump head)
Countersunk screw	1 (per pump head)

Tab. 3: Parts

* According to Spare parts list, section 8

Tools/material required

Tools/Material
Allen key 4
Screwdriver blade width 4.5 mm (or similar size)
Pencil

Tab. 4: Tools/Material

Change the diaphragm and valve plate in the following sequence (see fig. 4):

1. For pump types N 023.1 AN.30 E and N 023.3 AN.30 E: Pull the pneumatic head connection hose off at one pump head.
2. For pump type N 023.1.2 AN.30 E: On the pneumatic connection between the pump heads on the suction side, pull the hose off one pump head. On the pneumatic connection on the pressure side, loosen the hose clip on one pump head and pull the hose off.
3. For pump type N 023.2 AN.30 E: At one pump head loosen the hose clip of pneumatic head connection and pull the hose off.
4. Mark the relative positions of the crankcase (**A**), intermediate ring (**S**), the intermediate plate (**X**), and the head (**W**), with a pencil or other marker.
5. Undo the 4 cap head screws (**Y**), and lift off the head (**W**), the valve plate (**Z**), and the intermediate plate (**X**).
6. Unscrew the countersunk screw (**D**), and take off the retainer plate (**E**) and diaphragm (**F**), together with the diaphragm support (**M**).
(If necessary remove the intermediate ring (**S**), damping ring (**R**) and spacer (**N**), and renew the damping diaphragm (**L**) and damping ring (**R**).)
7. Use a small screwdriver to push in the retaining clips and remove the fan guard (**H**).

8. Turn the fan (**G**) until the conrod (**K**) is in mid-stroke.
9. Replace the intermediate ring (**S**), damping ring (**R**) and spacer (**N**), if they have been removed.
10. Mount the retainer plate (**E**), new diaphragm (**F**), diaphragm support (**M**) and shims (**B**) on the new countersunk screw (**D**). Screw this assembly into the conrod (**K**), and tighten firmly.
11. Place the intermediate plate (**X**) on the housing (**A**) according to the marks made previously.
12. Place the new valve plate (**Z**) on the intermediate plate (**X**) as shown in figure 4.
13. Fit the head (**W**), according to the markings together with the cap heads screws (**Y**) and tighten them uniformly and diagonally.
14. Check that the pump runs freely by turning the fan (**G**) by hand.
15. Refit the fan guard (**H**).
16. For pump types N 023.1 AN.30 E and N 023.3 AN.30 E:
Pull the pneumatic head connection hose back onto the hose connector.
17. For pump type N 023.1.2 AN.30 E:
Pull the pneumatic head connection hoses back onto the hose connector. Retighten the hose clip on the pneumatic head connection on the pressure side.
18. For pump type N 023.2 ANE:
Pull the pneumatic head connection hose back onto the hose connector; retight the hose clip.

If you have any questions about servicing call our technical adviser (see last page for contact telephone number).

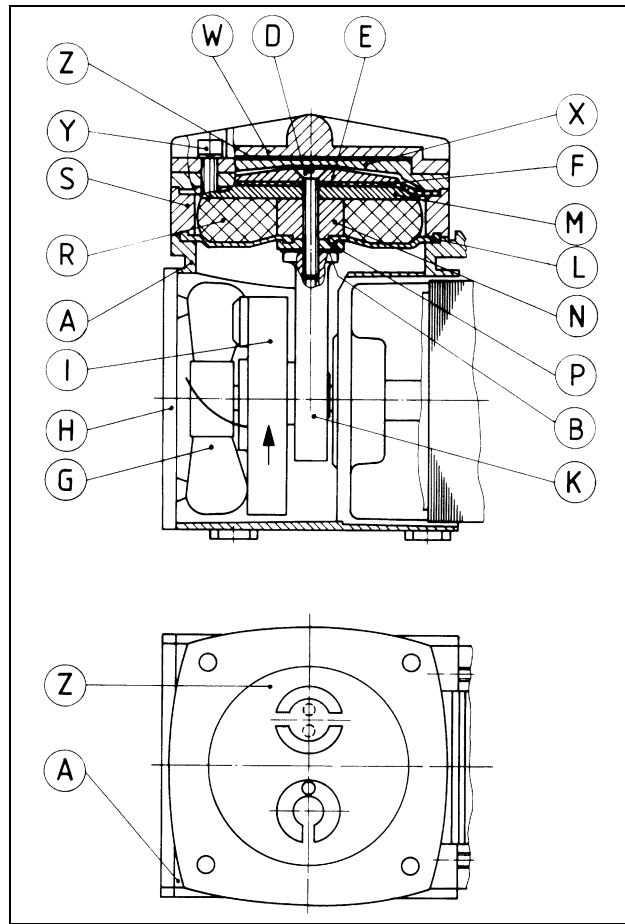


Fig. 4: Cross section N 023_AN.30 E

6. Cleaning

When changing valve plates/sealings or valve plate and diaphragm, inspect all parts for dirt before assembling the pump head, and clean them if necessary.

If a compressed air line is available, blow the parts out with it.

7. Trouble Shooting

Before working on the pump isolate the power supply securely, then check that the lines are not live.

The following tips for fault-finding are best employed in the sequence shown.

Pump produces no flow

- Connections or lines are blocked
- An external valve is closed, or a filter blocked.
- Liquid (condensate) has collected in the pump head.
 - ▶ Let the pump run for a few minutes pumping air (if necessary for safety reasons: pumping with an inert gas.)
 - ▶ Install the pump at the highest point in the system.
- Diaphragms or valve plates/sealings (valve plate) are worn.
 - ▶ Section 5 Servicing.

Flow, pressure, or vacuum too low

- Compare the actual performance with the figures in section 10 or the data sheet.
- There is pressure on the pressure side, and at the same time vacuum, or a pressure above atmospheric, on the suction side.
 - ▶ Change atmospheric conditions.
- The cross-section of pneumatic lines, or connected components is too small, or they are restricted.
 - ▶ To measure the performance, disconnect the pump from the system (small diameter tubing or a valve can significantly affect performance).
- There is a leak at a connector, in a line, or in the pump head.
- Diaphragm or valve plates/sealings (valve plate) are worn, or dirt is in the head:
 - ▶ Section 5 Servicing.

If the pump does not operate properly and you cannot find any of the above faults, send it to the KNF Service Department.

In order for KNF to repair the pump, the customer must provide a statement on the media which were pumped and on pump cleaning. Please fill out the corresponding KNF form, and submit it together with the pump. A sample statement for copying can be found in section 11 of these Operating and Installation Instructions.

8. Spare parts

023_ANE:

Ident.*	Description	Part No.
D	Countersunk Screw	110712
F	Diaphragm	016712
Z	Valve plate	016709
Not shown	Connection .1	017522
Not shown	Connection .2	017519
Not shown	Connection .3	018964

Tab. 5

*according fig. 3

N 023_AN.30 E:

Ident.*	Description	Part No.
D	Countersunk Screw	110731
F	Diaphragm	016712
L	Damping Diaphragm	016717
R	Damping ring	016715
Z	Valve plate	016709
Not shown	Connection .1	017522
Not shown	Connection .2	017519
Not shown	Connection .3	018964

Tab. 6

*according fig. 4

9. Tables

Pump type	Max. permissible operating pressure (bar g)	Ultimate vacuum (mbar abs.)	Delivery rate* (l/min) at atm. pressure
N 023 ANE	2	213	23
N 023.1 ANE	-	213	39
N 023.2 ANE	2	-	39
N 023.3 ANE	1	52	23
N 023.1.2 ANE	2	213	39
N 023 AN.30 E	2	213	23
N 023.1 AN.30 E	-	213	39
N 023.2 AN.30 E	2	-	39
N 023.3 AN.30 E	1	52	23
N 023.1.2 AN.30 E	2	213	39

Tab. 7: Pneumatic Data

*Liter at STP

Pump type	Material		
	Pump head	Diaphragm	Valves
Pump range N 023_ANE and N 023_AN.30 E	Aluminium alloy	CR	CR

Tab. 8: Pump materials

10. 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.

11. Health and safety clearance and decontamination form



Form: Rev. 02 / download: www.knf.com

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

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