Operating and Installation Instructions

Mini Diaphragm Vacuum Pumps

Type range: **UN84.3ANI** **UN84.4ANI**

UN84.3ANDC **UN84.4ANDCB**

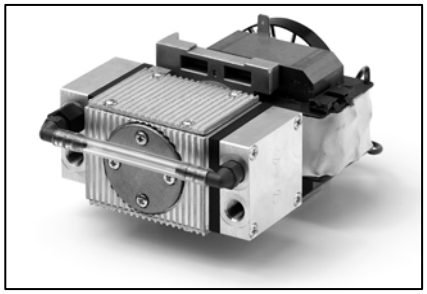

Fig. 1: UN84.3ANI

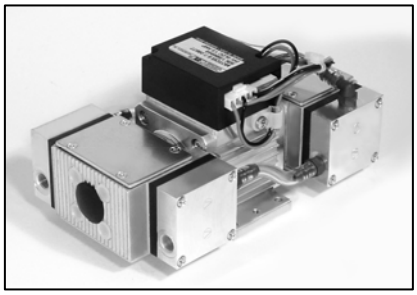

Fig.. 2: UN84.4ANDCB

You have selected a high-quality KNF product; the following tips will help you operate it safely and reliably over a long period of time. Carefully study the Operating and Installation Instructions before using the pumps and observe at all times the relevant instructions to avoid dangerous situations. The manual was produced for the serial pumps stated above. With customer-specified projects (pump types starting with “PU“ or “MPU“) there could be differences in detail. For customer-specified projects please therefore take into account any agreed technical specifications, as well as these instructions.

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1. Description, Operating Conditions

KNF pumps in the UN84 range transfer compress and evacuate 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 IP00.

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 9.

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 9).

KNF pumps in the N 84 range 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 pumps must be protected from the effects of dust and water.
- During operation an adequate supply of air for cooling must be provided.
- The pumps must not be used in areas where there is a danger of explosion.

1.4. Pump materials

See section 9.

2. Safety

The pumps have Protection Class 00, and so offer no protection against contact or foreign bodies. It is therefore essential to provide protection for persons against contact with live parts (e.g. electrical connections, motor windings), and moving parts (e.g. fan). Protection against the entry of foreign bodies must also be provided.

The pump has no protection against water. In this case too, as far as is relevant, measures to protect the pump must be taken before putting it into service.

Note that the pumps may only be used for their intended purpose (see section 1).

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

The pumps are not suitable for aggressive media.

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 a thermal switch:

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 essential requirements of Annex I of Directive 2006/42/EC (general principles) are applied and observed.

CE

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

The following harmonized standards have been used:

UN84.3ANI	UN84.3ANDC UN84.4ANDC	UN84.4ANDCB
DIN EN 55014-1/2	DIN EN 55014-1/2	DIN EN 55014-1
DIN EN 61000-3-2/3	DIN EN 60034-1	DIN EN 61000-6-2
DIN EN 60335-1		

Tab. 1

3. Installation

The pumps are OEM models 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.

Install the pump so as to ensure adequate flow of air cooling.

For pumps with fan: Install the pump so as accidental finger contact is with the fan is impossible.

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.

For pump N84.3ANI: Rubber feet (accessories) may be used to reduce noise, and vibration. They are not suitable for mounting the pump on its side, or suspended.

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 (not necessary on dc motors up to 24 V).

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 (e.g. electrical connection) is impossible.

For pumps with ac motor: We recommend that a fuse is installed in the supply circuit; the operating current is given in Data Sheet.

Pneumatic

Remove the protection plugs from the port threads.

The accessories, silencer, and hose connectors (if available) are screwed into the port threads.

Connect the suction and pressure lines (thread size 1/8”NPT). For flow direction, see the marking on the pump head or data sheet.

Arrange the suction and pressure lines so that condensate cannot run into the pump (sloping lines).

4. Operation

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

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 9).

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 9).
- 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.

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 9) 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.

Diaphragm and valve plates 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

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

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

Always change diaphragm, valve plates and sealing rings at the same time. Service all heads.

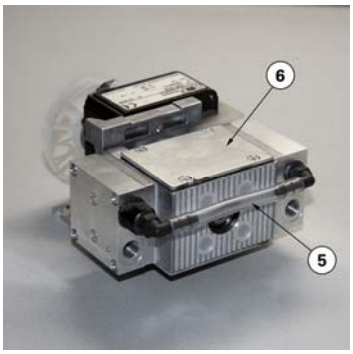

Fig. 4: (for the whole type range)

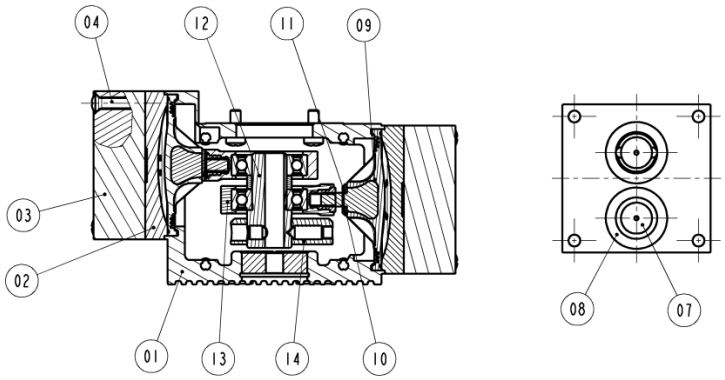

Fig. 3 Sectional view (symbolic)

Specification

Pos. Description

01	Housing	08	Sealing ring
02	Intermediate plate	09	Structured diaphragm
03	Head plate	10	Diaphragm shim ring(s)
04	Screw	11	Diaphragm shim ring(s)
05	Connection	12	Eccentric
06	Cover	13	Connection rod
07	Valve plate	14	Counter Weight

Parts required

Spare part*	Quantity
Valve plates	2 (per pump head)
Structured diaphragm	1 (per pump head)
Sealing rings	2 (per pump head)

Tab. 2 ** According to Spare parts list, section 8*

Tools required

Tools/Material
Phillips screwdriver No. 1
Felt-tip pen

Tab. 3

Change the diaphragms, valve plates and sealing rings in the following sequence:

a) Removing the pump head

b) Changing structured diaphragm

c) Changing valve plates and sealing rings

d) Refitting pump head

With the exception of removal and refitting of the cover plate (**6**) (twin headed pumps) or of two cover plates (four headed pumps) all operations are to be carried out separately for each head. This prevents the parts getting mixed up (the head plates are not identical).

The position numbers in the following text refer to figs. 3 and 4. Proceed as follows:

a) Removing the pump head

1. Only for models with dc motors (no cooling fan): undo the 4 screws securing the cover (**6**) to the pump housing (**1**), and remove the cover (**6**).
   - On these models, which have no fan, where reference is made to turning or holding the cooling fan, the necessary operations must be carried out by turning or holding the counterweight (**14**).
2. For one head: Mark the position of the head plate (**3**), intermediate plate (**2**), and housing (**1**) relative to each other by a drawing line (**M**) with a felt-tip pen. This helps avoid incorrect assembly later.
3. Undo the 4 screws (**4**) in the head plate and lift the head plate (**3**) with the intermediate plate (**2**) off the pump housing.

b) Changing the structured diaphragm

1. Turn the fan to bring the structured diaphragm (**9**) to top dead centre.
2. Lift the edge of the diaphragm, and gripping it on opposite sides, unscrew it by turning counter-clock-wise. Please take care that the diaphragm shim ring(s) (**10 & 11**), on the threaded portion of the diaphragm, do not fall into the housing.
3. Take the diaphragm shim ring(s) (**10 & 11**) off the threaded portion of the diaphragm and retain them.
4. Check that all parts are free from dirt and clean them if necessary (see section 6. Cleaning).
5. Put the diaphragm shim ring(s) onto the thread of the new diaphragm.
   - Please note that the same diaphragm shim ring(s) must be used for new structured diaphragm.
6. Turn the fan until the connecting rod (**13**) is at top dead centre.

7. Screw the structured diaphragm, complete with the diaphragm shim ring(s), into the connecting rod (clockwise) and tighten it by hand.

c) Changing the valve plates and sealing rings

1. Separate the head plate (**3**) from intermediate plate (**2**).
2. Remove the valve plates (**7**) and sealing rings (**8**) from the intermediate plate.
3. Check that the valve seats in the head plate and intermediate plate are clean. If scratches, distortion, or corrosion are evident on these parts they should be replaced.
4. Lay the new valve plates in the recesses in the intermediate plate. The valve plates for the suction and the pressure sides are identical, as are upper and lower sides of the plates.
5. Check that the valve plates are not deformed by moving them gently sideways in their recesses.
6. Lay the sealing rings on the intermediate plate.

d) Refitting the pump head

1. Turn the fan to bring the structured diaphragm (**9**) to top dead centre.
2. Place the intermediate plate (**2**) (with valve plates (**7**) and sealing rings (**8**)), and head plate (**3**) on the housing, in the position indicated by the marking (**M**).
3. Check that the head plate is centred by moving it gently sideways.
4. Gently tighten the screws (**4**), evenly and diagonally.
5. Turn the fan to check that the pump rotates freely.
6. Turn the fan again to bring the diaphragm to top dead centre.
7. Now tighten screws (**4**) firmly.

e) Second pump head

1. Repeat operations a) (2.,3.) and b) to d) for the second pump head.
2. Reaffix the cover (**6**) to the housing (**1**).

Only for type range UN84.4:

Repeat operations a) to e) for the both remaining pump heads.

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

6. Cleaning

When changing valve plates and wave 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 and 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

- For pumps with thermal switch:
  Thermal switch has opened due to over-heating.
  - ▸ Disconnect pump from mains and allow cooling. Trace cause of over-heating and eliminate it.
- 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 an inert gas.)
  - ▸ Install the pump at the highest point in the system.
- Diaphragms or valve plates are worn.
  - ▸ Section 5 Servicing.

Flow, pressure, or vacuum too low

- Compare the actual performance with the figures in section 9 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.
  - ▸ The pump is not designed for this condition.
- 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 plate are worn, or dirt is in the head:
  - ▸ Section 5 Servicing.

- After changing the diaphragms or valve plates, a head has been reassembled in the wrong position.

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 10 of these operating instructions.

8. Spare parts and accessories

Spare parts

Pos. No*	Spare part	Order No.
(**2**)	Intermediate plate	055334
(**7**)	Valve plate	055353
(**8**)	Sealing ring	055354
(**9**)	Structured diaphragm	027578
(**10**)	Diaphragm shim ring (1.0mm)	027556
(**11**)	Diaphragm shim ring (0.1mm)	024986

Tab. 4 **according Fig. 3 and 4*

Accessories

Description	Order No.
Silencer/Filter	072233
Hose Connector 1/8 MPTM, ¼ HID	072235
Rubber feet (for N 84.3 ANE) (2 pieces are necessary)	024435

Tab. 5

9. Tables

Pump type	Max. permissible operating pressure (bar g)	Ultimate vacuum (mbar abs.)	Delivery rate* (l/min) at atm. pressure
UN84.3ANI	0.3	7	4.2
UN84.3ANDC	0.3	7	5
UN84.4ANDC	0.3	2	4.8
UN84.4ANDCB	0.3	2	4.8

Tab. 6: Pneumatic Data **Litre at STP (1013 mbar);*

Pump type	Material*		
	Pump head	Structured diaphragm	Valve
UN84.3ANI	Aluminium alloy	Neopren/PTFE	EPDM
UN84.3ANDC	Aluminium alloy	Neopren/PTFE	EPDM
UN84.4ANDC	Aluminium alloy	Neopren/PTFE	EPDM
UN84.4ANDCB	Aluminium alloy	Neopren/PTFE	EPDM

Tab. 7: Pump Materials **Material abbreviations according DIN ISO 1629*

10. Product Return

➔ KNF provides warranty and non-warranty repair services for all products.

➔ A Return Material Authorization (RMA) number is required for all product returns.

- To receive an RMA number, submit a completed Decontamination Declaration form to rma@knf.com

➔ The Decontamination Declaration form can obtained from our website or by contacting KNF Technical Services.

- http://www.knf.com/pdfs/decontamdec.doc
- Phone: 609-890-8600

➔ Product return instructions will be provided when the RMA is issued.

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