Operating and Installation Instructions

Diaphragm Vacuum Pumps and Compressors

Type range: **UN813.3ANI** **UN813.4ANI**
UN813.3ANDCB **UN813.4ANDCB**
UN813.5ANI

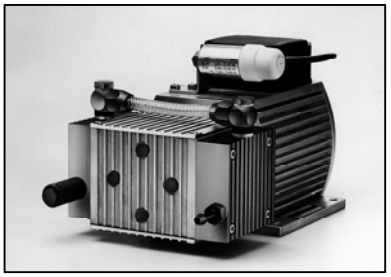

Fig. 1: UN813.3ANI

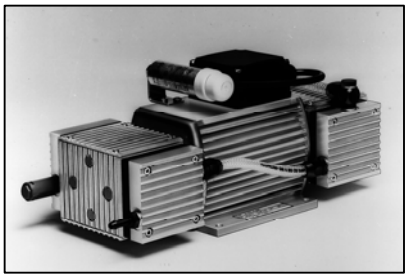

Fig. 2: UN813.4ANI

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.

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

Phone: 609-890-8600
Fax: 609-890-8323

www.knf.com/usa.htm

Ident#121240-211582
Revision (06/12)

List of Contents **Page**

1. Description, Operating Conditions

KNF pumps in the UN813.3AN__, UN813.4AN__, and UN813.5ANE range transfer and evacuate 100% oil-free.

1.1. Electrical Equipment

See the motor-plate for full electrical data.

Protection class of standard version is:

- UN813.3ANI: IP 44
- UN813.3ANDCB: IP 20
- UN813.4ANI: IP 54
- UN813.4ANDCB: IP 20
- UN813.5ANI IP 54

The ac motors used are fitted as standard with a thermal switch to protect against overloading.

The pumps with brushless DC motor are protected against over-heating by a temperature sensor on the motor board and equipped with overcurrent protection.

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 are not suitable for aggressive media. For aggressive media there are other pumps in the KNF product programme – please ask us for detail.

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 UN813.3AN__, UN813.4AN__, and UN813.5ANE 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.

- 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

Note that the pumps may only be used for their intended purpose (see section 9).

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

The pumps are not suitable for aggressive media. For aggressive media there are other pumps in the KNF product program – please ask us for detail.

For vacuum pumps: The discharge of gas on the pressure side of the pump must be safely disposed.

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:

UN813.3ANI UN813.4ANI UN813.5ANI	UN813ANDCB UN813ANDCB
DIN EN 55014-1/2	DIN EN 55014-1/2
DIN EN 61000-3-2/3	
DIN EN 60204-1	

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 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.

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).

With dc motors the wires must be connected to the correct polarity.

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.

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 (where applicable) are screwed into the port threads.

Connect the suction and pressure lines. For flow direction, see marking on the pump head or data sheet.

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

For vacuum pumps: The discharge of gas on the pressure side of the pump must be safely disposed.

4. Operation

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

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 (table 1).
- 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 9).

The pump must not start against pressure. 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.

For vacuum pumps, the exhaust gases must be safely disposed.

When the pump has been 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

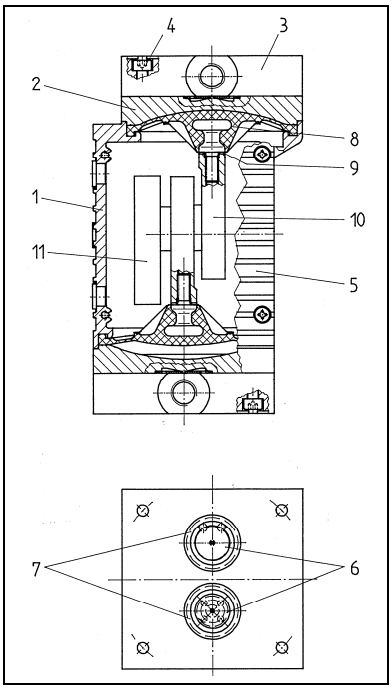

Fig. 3: Pump elements (for all pump types)

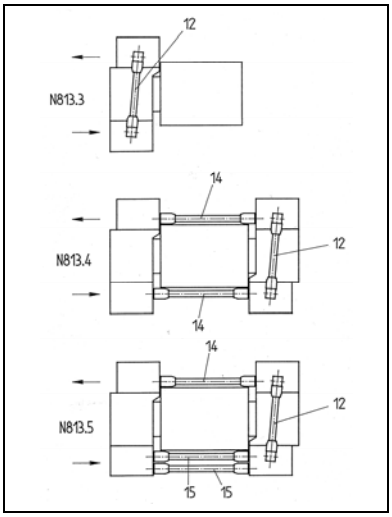

Fig. 6: Pneumatic Connection (principle sketch)

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. In the case of models with two or four heads service all heads.

If a pump has been used for toxic substances or other types of substances which are hazardous, hazardous to health, or injurious, the following points must be observed:

1. Clean the pump and its components before servicing.
2. Ensure that the safety personnel is not subject to health hazard. Apply the safety and protection measures that are necessary for the medium that has been handled by the pump (example: the use of protective gloves).
3. Ensure that discarded parts and materials are safely and correctly disposed of.

Use only original KNF replacement parts.

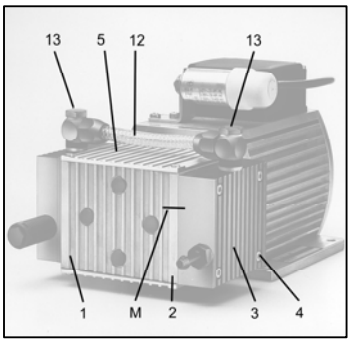

Fig. 4: Two-headed types

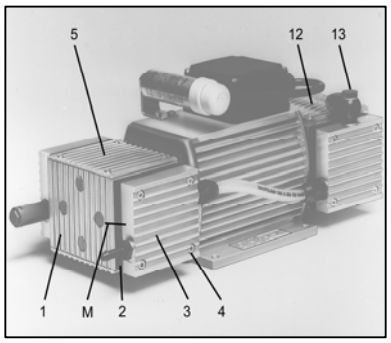

Fig. 5: Four-headed types

Specification

Pos.	Description		
1	Housing	11	Counter weight
2	Intermediate plate	12	Pneumatic connection .3
3	Ribbed plate	13	Union
4	Hexagon socket head cap screw	14	Pneumatic connection .4*
		15	Pneumatic connection .5**
5	Cover plate		
6	Valve plate	*:	UN813.4AN_: 2 pieces UN813.5ANI: 1 piece
7	Sealing ring	**:	UN813.5ANI: 2 pieces
8	Structured diaphragm		
9	Diaphragm Spacer(s)		
10	Connecting rod		

Spare part

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

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

Tools

Type range	Tools/Material
	Ring spanner 14 mm (alternative: open-ended spanner 14 mm)
UN813.4 AN_ and UN813.5 ANI	Open-ended spanner 17 mm
	Phillips screwdriver No. 1
	Felt-tip pen

Tab. 3: Tools and material

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

a) Removing head connection(s)

b) Removing cover plate from housing

c) Removing pump head

d) Changing diaphragm

e) Changing valve plates and sealing rings

f) Refitting pump head

g) Refitting the cover plate

h) Refitting the head connection(s)

With the exception of removal and refitting of the cover plate (or cover plates), and the head connections, all operations are to be carried out separately for each head. This prevents the parts getting mixed up (the ribbed plates are not identical).

The position numbers in the following text refer to figs. 3 to 6. Proceed as follows:

a) Removing pneumatic head connections (once for all pump heads)

UN813.3AN__:

1. Remove pneumatic connection (**12**): Use a 14 mm spanner to release the unions (**13**) on each head, and remove the pneumatic connection upwards.

UN813.4AN__:

1. Remove pneumatic connection (**12**): Use a 14 mm spanner to release the unions (**13**) on each head, and remove the pneumatic connection upwards.
2. Release both pneumatic connections (**14**) with a 17 mm open-ended spanner, and remove them.

UN813.5ANI:

1. Remove pneumatic connection (**12**): Use a 14 mm spanner to release the unions (**13**) on each head, and remove the pneumatic connection upwards.
2. Release both pneumatic connections (**14**) with a 17 mm open-ended spanner, and remove them.
3. Open both pneumatic connections (**15**) with a 17 mm open-ended spanner, and remove them.

b) Removing cover plate

1. Undo the 4 screws and remove the cover plate (**5**) from housing (**1**) (UN813.3AN__: 1 cover plate; UN813.4AN__, and UN813.5ANI: each two cover plates).

c) Removing the pump head (for each head separately)

1. Make a mark (**M**) on the ribbed plate (**3**), intermediate plate (**2**), and housing (**1**) with a felt-tip pen. This helps avoid incorrect assembly later.
2. Undo the 4 screws (**4**) in the ribbed plate and lift the ribbed plate with the intermediate plate off the pump housing.

d) Changing diaphragms

1. Turn the counter weight (**11**) to bring the structured diaphragm (**8**) to top dead centre.
2. Lift the edge of the diaphragm and, gripping it on opposite sides, unscrew it by turning anti-clock-wise.
3. Take the diaphragm spacer(s) (**9**) off the threaded portion of the structured diaphragm and put them on the thread of the new structured diaphragm (**8**).
4. Check that all parts are free from dirt and clean them if necessary (see section 6. Cleaning).
5. Turn the counter weight (**11**) until the connecting rod (**10**) is at the top dead centre.
6. Screw the structured diaphragm, complete with diaphragm spacer(s), into the connecting rod (clockwise) and tighten it by hand.

e) Changing valve plates and sealing rings

1. Separate the ribbed plate (**3**) from intermediate plate (**2**).
2. Remove the valve plates (**6**) and sealing rings (**7**) from the intermediate plate.
3. Check that the valve seats, the ribbed 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 suction and 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.

f) Refitting the pump heads

1. Turn the counter weight (**11**) to bring the structured diaphragm (**8**) to top dead centre.
2. Place the intermediate plate (**2**), with valve plates (**6**) and sealing rings (**7**), and ribbed plate (**3**) on the housing, in the position indicated by the markings (**M**).
3. Gently tighten the screws (**4**), evenly and diagonally.
4. Turn the counter weight to check that the pump rotates freely.
5. Now tighten screws (**4**) firmly.

Repeat operations c), d), e), and f) for the remaining pump head (or heads).

g) Refitting the cover plate

1. Refit the cover plate (**5**) to housing (**1**).

h) Refitting the pneumatic head connection(s)

1. Refit the pneumatic head connection(s).

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, 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

- Overload protection has actuated.
  - ▸ Disconnect pump from mains. Trace cause of overload 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.
- 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.
- 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. Please call our technical advisor (see last page for contact telephone number).
- 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 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 and Installation Instructions.

8. Spare parts and accessories

Spare parts

Pos. No*	Spare part	Order No.
(**2**)	Intermediate plate	200221
(**5**)	Cover plate	026311
(**6**)	Valve plate	024597
(**7**)	Sealing ring	024598
(**8**)	Structured diaphragm	044402
(**9**)	Shim Ring	209483
(**12**)	Pneumatic connection .3	203455
(**14**)	Pneumatic connection .4	206623
(**15**)	Pneumatic connection .5	206625

Tab. 4 **according Fig. 3 to 6*

Accessories

Description	Order No.
Filter/ Silencer	072233
Hose Connector 1/8 MPTM, ¼ HID	072235

Tab. 5: Accessories

9. Tables

Pump type	Max. permissible operating pressure (bar g)	Ultimate vacuum (mbar abs.)	Delivery rate* (l/min) at atm. pressure
UN813.3ANI	1	3	13
UN813.3ANDCB	1	3	13
UN813.4ANI	1	0.5	13
UN813.4ANDCB	1	0.5	13
UN813.5ANI	1	1	19

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

Pump type	Material*		
	Pump head	Wave diaphragm	Valve
UN813.3ANI	Aluminium alloy	EPDM	EPDM
UN813.3ANDCB	Aluminium alloy	EPDM	EPDM
UN813.4ANI	Aluminium alloy	EPDM	EPDM
UN813.4ANDCB	Aluminium alloy	EPDM	EPDM
UN813.5ANI	Aluminium alloy	EPDM	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.

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

Phone 609-890-8600
Fax 609-890-8323

www.knf.com/usa.htm