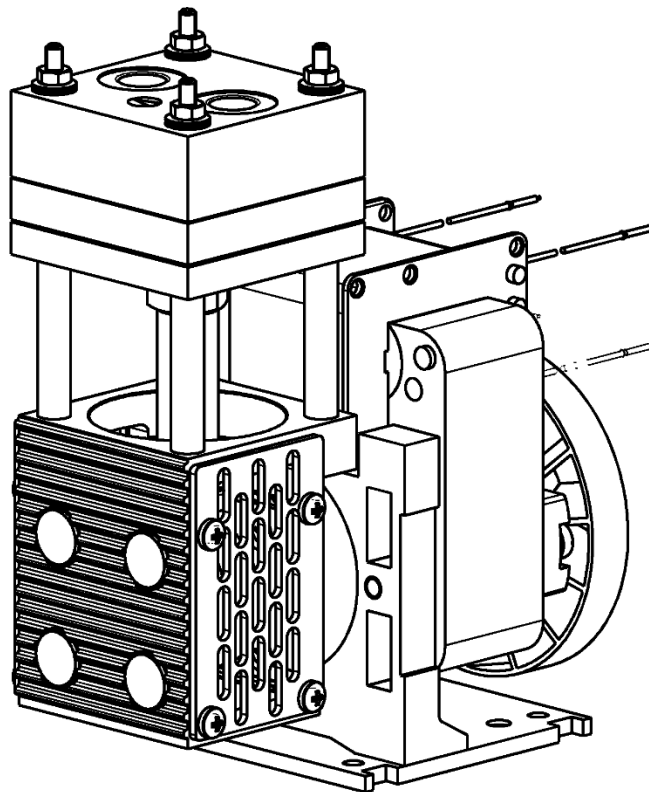


OEM

**N86.16
TRANSLATION OF ORIGINAL OPERATING AND
INSTALLATION INSTRUCTIONS
ENGLISH**

DIAPHRAGM VACUUM PUMPS AND COMPRESSORS



Note!

Before operating the pump and the accessories, please read the operating instructions and pay attention to the safety precautions!

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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.

- ➔ Always keep the Operating and Installation Instructions handy in the work area.
- ➔ Pass on the Operating and Installation Instructions to the next owner.

Project pump

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 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.



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 parameter and conditions

Only install and operate the pumps under the operating parameters and conditions described in Chapter 4. Technical Data.

Only complete pumps may be taken into service.

Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water as well as other pollutions.

The gas-tightness of the connections between the application pipes and the pump (or the pump connection) must be checked regularly; with leaky connections, there is a danger that hazardous gases or vapors may escape from the pump system.

Requirements for transferred medium

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

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

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

2.2. Improper use

The pumps may not be operated in an explosive atmosphere.

The pumps are not suitable for transferring:

- dusts
- liquids
- aerosol
- biological and microbiological substances
- fuel
- explosive and combustible materials
- fibers
- oxidizing agent
- foodstuffs.

The pumps are not suitable for use with aggressive media. Other pumps in the KNF product line are designed for use with aggressive media. Please contact us for more information.

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 Chapter 7. Installation and connection and 8. Operation.

The pumps are built according to the generally recognized rules of the 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 when they are in a good technical and proper working order, in accordance with their intended use, observing the safety advice within the Operating and Installation Instructions, at all times.

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.

Personnel 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.

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.

Ensure that the pump is separated from the mains and is de-energized.

The pump heads heat up during operation – avoid contact with them.

Make sure that there are no hazards due to flow with open gas connections, noises or hot gases.

Ensure that an EMC-compatible installation of the pump is ensured at all times and that this cannot lead to a hazardous situation.

Handling dangerous media When transferring dangerous media, observe the safety regulations when handling these media.

If the diaphragm ruptures, the transferred medium will mix with the air in the environment.

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

Handling combustible media 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 (Chapter 4).

If necessary, consider any external sources of energy, such as radiation, that may add heat to the medium.

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.

Project-specific pumps that are **not** fitted with a thermal switch must be protected by the user against the risk of overheating.

In case of doubt, consult the KNF customer service.

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.

EU/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 safety objectives of the following Directive(s) have been met:

- Directive 2014/35/EU on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits in accordance with Annex I, No. 1.5.1. of the Directive 2006/42/EC.
- Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (Annex II amended by Commission Delegated Directive (EU) 2015/863).

The following harmonized standards were taken as a basis:

- EN IEC 63000
- EN IEC 55014-1/2
- EN IEC 61000-3-2
- EN 61000-3-3
- EN 60335-1

Customer service and
repairs

The pump is maintenance-free. But KNF recommends, checking the pump regularly with regard to conspicuous changes in noise and vibrations.

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

Housing with voltage-carrying parts may be opened by technical personnel only.

Use only genuine parts from KNF for servicing work.

4. Technical Data

Pump materials

Assembly	Material N86AT.16E	Material N86ST.16E
Pump head	Aluminium alloy	Stainless Steel
Diaphragm	PTFE	PTFE
Valve plate	PTFE	PTFE

Tab. 2

Pneumatic values

Parameter	Value
Max. permissible operating pressure [bar]	1.5
Ultimate vacuum [mbar abs.]	290
Delivery rate at atm. pressure [l/min]*	6.0

Tab. 3

*Liters in standard state (1013 mbar)

Pneumatic Connections

Pump type	Value
N86AT.16E	Thread size G 1/8"
N86ST.16E	Thread size G 1/8"

Tab. 4

Electrical data

Parameter	Value
Electrical data	See type plate
Protection class Motor	See type plate
Protection class Pump	IP00
Maximum permitted mains voltage fluctuations	See type plate

Tab. 5

Thermal switch

- i** The pumps are fitted as standard with a thermal-switch to protect against overloading.
- i** Project-specific pumps that are **not** fitted with a thermal switch must be protected by the user against the risk of overheating.

Weight

Pump type	Value [kg]
N86AT.16E	1.3
N86ST.16E	1.5

Tab. 6

Other parameters

Parameter	Value
Permissible ambient temperature [°C]	+ 5 bis + 40
Permissible media temperature [°C]	+ 5 bis + 240
Dimensions	See Fig. 3, Chapter 7.1
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* of pump head	$< 6 \times 10^{-3}$ mbar l/s**

Tab. 7

**After opening the pump head or replacing the diaphragms 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.*

***Values valid for helium leak test*

5. Design and function

Design

- 1 Pneumatic pump outlet
- 2 Pneumatic pump inlet
- 3 Electrical connection
- 4 Fan

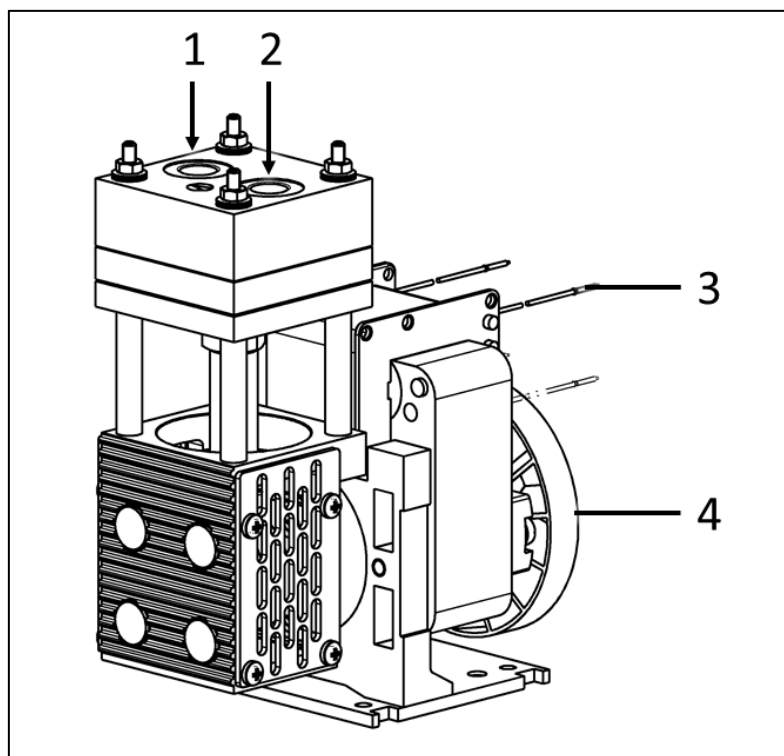


Fig. 1: Design N86.16

Function Diaphragm Pump

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

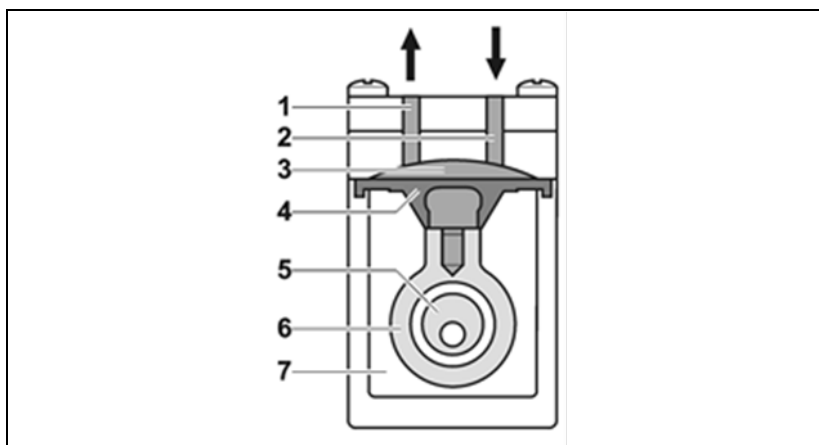


Fig. 2: Pump head

Diaphragm pumps transfer, compress (depending on pump version) and evacuate gases and vapors.

The elastic diaphragm (4) is moved up and down by the eccentric (5) and the connection 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.

6. Transportation



CAUTION

Personal injury and/or damage to property because of false or improper transportation of the pump

Due to false or improper transportation the pump can fall down, become damaged and injure people.

- ➔ If necessary, use suitable aids (eyebolt, harness, lifting device, etc.).
- ➔ If necessary, wear proper personal protective equipment (e.g. safety gloves, safety shoes).



CAUTION

Danger of injury due to sharp edges on the package

When handling or opening the package there is the possibility of injury by cutting at sharp edges.



- ➔ If necessary, wear proper personal protective equipment (e.g. safety gloves).

- ➔ Carry the pump in the original packaging up to its place of installation.
- ➔ Retain the original packaging of the pump (e.g. for later storage).
- ➔ Check the pump for transport damages after receipt.
- ➔ Document occurred transport damages in writing and with pictures.
- ➔ If necessary, remove the transport safety devices before commissioning the pump.

Parameter

Parameter	Value
Storage temperature	+ 5°C to + 40°C
Transport temperature	- 10°C to + 60°C
Permiss. humidity (non-condensing)	30% to 85%

Tab. 8

Cooling air supply	 <p>Danger of burns from hot surfaces</p> <p>Hot surfaces may be caused by overheating of the pump.</p> <p>WARNING → Install the pump so that the motor fan can intake sufficient cooling air.</p>
Immediate ambient of the hot pump parts	<p>→ When installing, make sure that there are no combustible or thermally malleable objects placed in the immediate ambient of the hot pump parts (head, motor).</p>
Installation location	<p>→ Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water as well as other pollutions.</p> <p>→ Make sure, that the installation location is accessible for maintenance and service.</p> <p>→ Make sure that reaching into the fan is avoided.</p> <p>i The IP protection class of the pump motor is indicated on the type plate.</p> <p>→ Install the pump at the highest point in the system to prevent condensate from collecting in the pump head.</p> <p>→ Protect the pump from dust.</p> <p>→ Protect the pump from vibrations and jolts.</p>
	 <p>Personal injury and/or damage to property because of vibration</p> <p>In conjunction with adjacent components, vibration of the pump may result in crushing and/or damage to these components.</p> <p>→ Make sure that vibrations of the pump do not result in hazards associated with adjacent components.</p>
Foreign matter protection	<p>→ Protect the pump against contact and intrusion of foreign matter.</p>

7.2. Electrical connection



Extreme danger from electrical shock

DANGER

- 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.
- The motors of the pump must be protected according to EN 60204-1 (protection against excess current, or overloading).
- i** For max. operating current of the pump see pump's type plate.
- It is recommended that an additional "Emergency Stop" switch is installed.
- The pump must be installed so that contact with live parts is impossible.

Attach connection cables

- Fasten the connection cables so that:
 - the cables do not contact moving or hot parts.
 - the cables will not chafe or be damaged on sharp edges or corners.
 - no pulling or pushing forces are exerted on the cable's connection points (strain relief).

Thermal switch

- i** The pumps are fitted as standard with a thermal switch to protect against overloading.
- i** Project-specific pumps that are **not** fitted with a thermal switch must be protected by the user against the risk of overheating.

Connecting pump

1. Compare the supply data with the data on the motor plate. For maximum operating current of the pump see pump's type plate.
- i** The voltage must not vary by more than + 10% and – 10% from that shown on the type plate.
2. Connect the earth (ground) wire to the motor.
3. Connect the mains cables.

7.3. Pneumatic connection



CAUTION

Personal injury or damages to property by ejected protective plugs

If the protective plug at the pressure side of the pump hasn't been removed, it could be ejected because of the overpressure during operation.

➔ Remove the protective plug during the installation.

Connected components	➔ Only connect components to the pump which are designed for the pneumatic data of the pump (see Chapter 4, Technical Data).
Pressure relief device	➔ Protect the pump with a pressure relief device between the pressure connection of the pump and the first shut-off valve.
Pump exhaust	➔ If the pump is used as a vacuum pump, safely discharge the pump exhaust at the pump's pneumatic outlet.
Disengaging	➔ KNF recommends mechanically disengaging the pump from the piping system. This can be achieved with flexible tubing or pipes, for example. This will avoid transferring to the system any pump oscillations that may arise.

Connecting pump



A marking on the pump head shows the direction of flow.



Confusion between suction and pressure sides can lead to breakage of connected components on the suction and pressure sides.

1. Remove the protective plugs from the hose connection threads.
2. Connect the suction line and pressure line (see Chapter 4, Tab. 7 for mounting dimensions).
3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

8. Operation



Danger of burns from hot pump parts or hot medium

During or after operation of the pump, some pump parts may be hot.

WARNING

- Allow the pump to cool after operation.
- Take safety precautions against the contact of hot parts/media.



Injury of the eyes

During excessive approach to the inlet or outlet of the pump, the eyes could be injured by the upcoming vacuum or overpressure.

WARNING

- Don't look into the pump's inlet or outlet during the 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 Chapter 2.1).
- Make sure the pumps are not used improperly (see Chapter 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.



Hazard of the pump head bursting due to excessive pressure increase

WARNING

- 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 switch off pump and eliminate fault (see Chapter 10. 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.
- 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. For further information, contact our technical adviser (contact data: see www.knf.com).

**WARNING**

Automatic starting can cause personal injury and pump damage

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.

- i** Project-specific pumps that are **not** fitted with a thermal switch must be protected by the user against the risk of overheating.

Pump standstill

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

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

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

Vapors as media

The life of the diaphragm is prolonged the formation of condensate is avoided. Therefore the following precautions should be taken:

- ➔ Run the pump for a few minutes to warm it up before handling saturated or nearly saturated vapors.
- ➔ KNF recommends: When transferring aggressive media, flush the pump prior to switch off (see Chapter 9.2.1) to increase the service life of the diaphragm.

Switching off the pump / removing from operation

- ➔ Restore the system to normal atmospheric pressure (release pneumatic pressure in pump).

9. Servicing

9.1. Servicing schedule

Component	Servicing interval
Pump	<ul style="list-style-type: none"> - Periodic inspection for external damage or leakage. - Periodic inspection for noticeable changes to noises and vibrations
Diaphragm and valve plates	<ul style="list-style-type: none"> - Replace no later than if there is a decrease in the pump flow rate. - Replace if the pressure or flow rate of the pump changes without apparent reason.

Tab. 9

9.2. Cleaning

i When cleaning, make sure that no liquids enter the inside of the housing.

9.2.1. Flushing pump

When transferring dangerous and environmentally hazardous media, KNF recommends flushing the pump at atmospheric pressure for a few minutes prior to switch-off (if necessary for safety reasons: with an inert gas) to extend the service life of the diaphragm.

→ Discharge the media safely.

9.2.2. Cleaning pump



Risk of burns from hot pump parts

The pump head or motor may still be hot after operation of the pump.

CAUTION

→ Allow pump to cool after operation.



Health hazard due to dangerous substances in the pump

Depending on the medium being transferred, caustic burns or poisoning is possible.

WARNING

→ Wear protective equipment if necessary, e.g. protective gloves, goggles.

→ Clean pump with suitable measures.

→ Solvents should only be used during cleaning if head materials are not affected (ensure resistance of the material).

→ If compressed air is available, blow out parts.

9.3. Replacing diaphragm and valve plates

- Requirements
- Disconnect the motor from mains and ensure that it is voltage-free.
 - Allow the pump and the motor to cool
 - Clean the pump and free the pump of hazardous materials.
 - Remove the hoses/pipes from the pneumatic pump inlet and outlet.

Spare parts	Spare part*	Quantity
	Valve plate	1
	Wave diaphragm (assembly consisting of two equivalent parts)	1
	O-ring	1

Tab. 10

according to spare parts list, Chapter 11.1

Tools/material	Tools/Material
	Fork wrench or socket wrench 5.5 mm
	Pin-wrench for two hole nuts, pin diameter 4 mm (available as "wrench for retainer plate", a KNF accessory, see Chapter 11.2)
	Holding tool (see accessory, Chapter 11.2).
	Heat-resistant thread adhesive (e.g. DELO ML 5327)
	Felt-tip pen

Tab. 11

- Information on procedure
- ➔ Always replace the diaphragm and valve plate together to maintain the pump performance.

Change the diaphragm and valve plate in the following sequence:

- a) Preparatory step
- b) Removing pump head
- c) Changing diaphragm
- d) Changing valve plate and sealing ring
- e) Refitting pump head
- f) Final step

- 1 Carrier
- 2 Wave diaphragm
- 3 Intermediate plate
- 4 Head plate
- 5 Disk spring
- 6 Nut
- 7 Retainer plate
- 8 Diaphragm support
- 9 Connecting rod extension
- 10 O-ring
- 11 Valve plate
- 12 Washer
- 13 Fan

M Mark

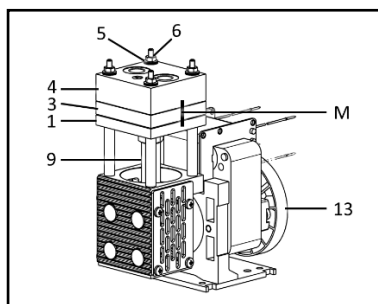


Fig. 4: N86.16

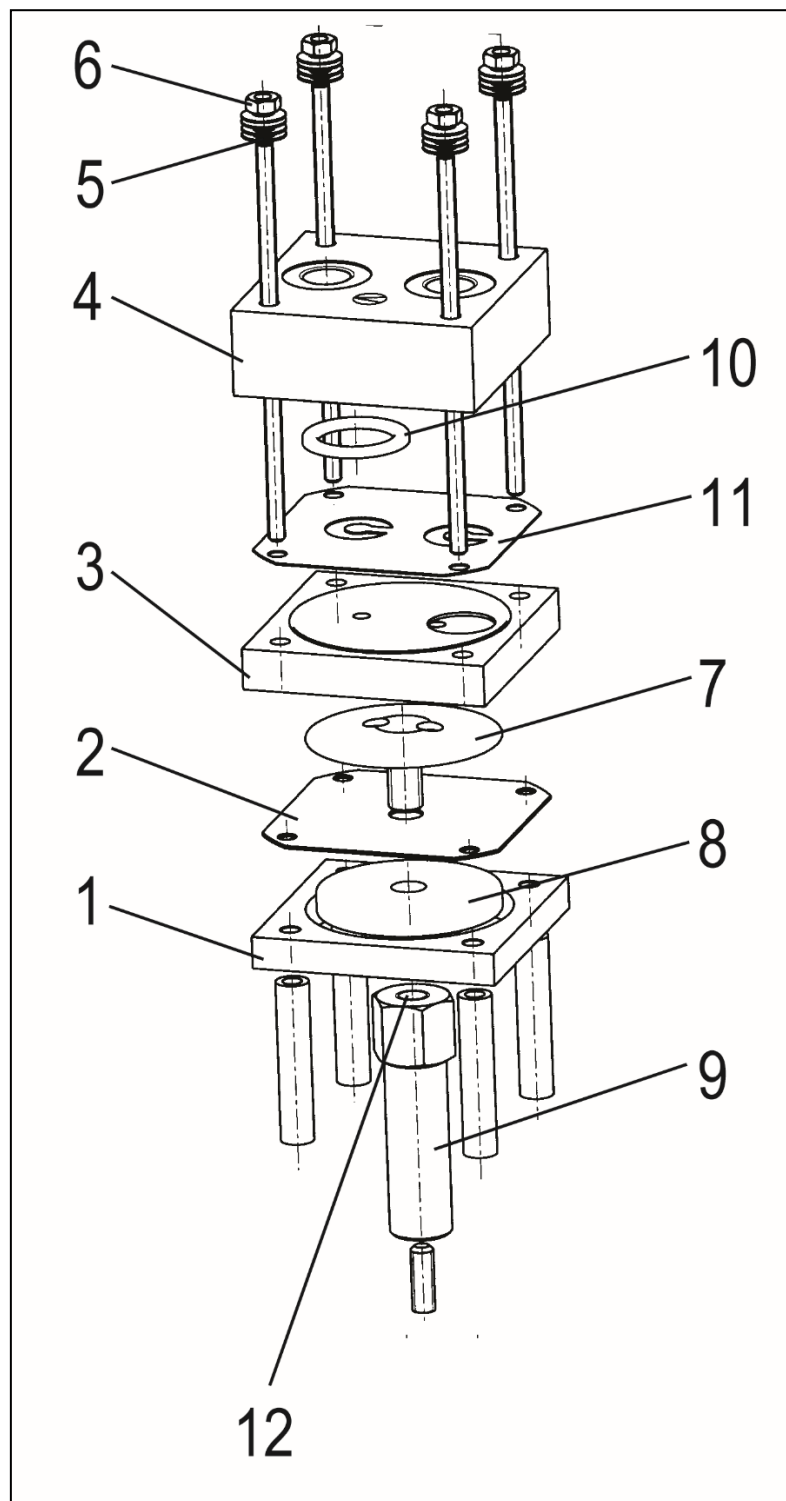


Fig. 5: Pump head (exploded drawing)

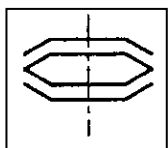


Fig. 6: Orientation
of disk springs (5)



The following item numbers refer to Fig. 4 - Fig. 6 unless specified otherwise.

a) Preparatory step

1. Disconnect the pump from the power supply; check that the pump is electrically dead and secure this.

b) Removing pump head

1. Mark the position of carrier (1), intermediate plate (3), and head plate (4) relative to each other by a drawing line (M) with a felt-tip marker. This is to ensure that the parts will be reassembled in correct position at a later stage.
2. Release the nuts (6) and remove them together with the disk springs (5).
The disk springs are fitted in order to maintain the tension of the wave diaphragm right across the temperature range of the pump.
3. Remove head plate (4).
4. Remove O-ring (10) from head plate (4).
5. Remove the valve plate (11) and the intermediate plate (3).

c) Changing diaphragm

1. Release the retainer plate (7) by turning it anti-clockwise with a pin wrench or a wrench for retainer plate. While doing so, hold the connecting rod extension (9) in place with holding tool. Take care to ensure that the washer (12) does not slip under the diaphragm support (8).
2. Remove wave diaphragm (2).
3. Check that all parts are free from dirt and clean them if necessary (see Chapter 9.2.2).
4. Slide a new wave diaphragm (2) onto the threaded bolt of the retainer plate (7).
The wave diaphragm assembly consists of two equivalent parts placed on top of one another; the top and bottom are identical.
5. Apply a small amount of heat-resistant thread adhesive to the thread of the retainer plate (7).
6. Screw the retainer plate (7) with wave diaphragm (2) into the connecting rod extension (9); to tighten the retainer plate, use the wrench for retainer plate/the pin wrench to turn it clockwise (tightening-torque: 4.6 Nm). While doing so, hold the connecting rod extension (9) in place with the holding tool; and hold the wave diaphragms so that they do not twist.

d) Changing valve plate and sealing

1. Check that intermediate plate and head plate are clean. If damages, distortion, or corrosion are evident on these parts they should be replaced.

2. Place the intermediate plate (3) on the carrier (1) in the position indicated by the felt tip pen mark (M).
3. Lay the new valve plate (11) onto the intermediate plate (3).
Regarding the placement of the valve plate:
The notch on outer edge of the valve plate must be at the left rear, when looking at the pump from the motor.
4. Fit the new O-ring (10) in the head plate (4).

e) Refitting pump head

1. Place the head plate (4) on the intermediate plate (3) in the position indicated by the felt-tip pen marking.
2. Place disk springs (5).
For position see Fig. 6.
3. Put the nuts (6) in place and tighten them diagonally, until each of them lies level on the top spring washer; realign the pump head.
From when you start applying pressure on the disk springs, tighten the nuts through an angle of 340°. That is equivalent to a tightening-torque of 80 Ncm.

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

f) Final step

1. Reconnect the pump to the electricity supply.
2. Ensure that the discarded parts and materials are safely and correctly disposed of.

If you have any questions about servicing call our technical adviser (contact data: see www.knf.com).

10. Troubleshooting



DANGER

Extreme danger from electrical shock!

- ➔ Disconnect the pump power supply before working on the pump.
- ➔ Make sure the pump is de-energized and secure.

➔ Check the pump (see Tab. 12 and Tab. 13).

Pump does not transfer	
Cause	Fault remedy
Pump is not connected to the electrical mains.	➔ Connect pump to the electrical mains.
No voltage in the electrical mains.	➔ Check room fuse and switch on if necessary.
Connections or lines are blocked.	➔ Check connections and lines. ➔ Remove blockage.
External valve is closed or filter is clogged.	➔ Check external valves and filters.
Condensate has collected in the pump head.	➔ Separate the source of the condensate from the pump. ➔ Flush the pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with an inert gas). ➔ Install the pump at the highest point in the system.
Thermal switch of the motor has tipped.	➔ Disconnect pump from electrical mains. ➔ Allow pump to cool. ➔ Determine cause of the overheating and rectify.
Diaphragm or valve plates are worn or defective.	➔ Replace working diaphragm, safety diaphragm and reed valves (see Chapter 9.3).

Tab. 12

Flow rate, pressure or vacuum too low	
The pump does not achieve the output specified in the Technical data or the data sheet.	
Cause	Fault remedy
Condensate has collected in the pump head.	→ Separate the source of the condensate from the pump. → Flush the pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with an inert gas). → Install the pump at the highest point in the system.
There is overpressure on the pressure side and at the same time vacuum or pressure above atmospheric pressure on the suction side.	→ Change the pneumatic conditions.
Pneumatic lines or connection parts have insufficient cross section or are throttled.	→ Disconnect pump from the system to determine the output values. → Eliminate throttling (e.g. valve) if necessary. → Use lines or connection parts with larger cross section if necessary.
Leaks occur at connections, lines or pump head.	→ Eliminate leaks.
Connections or lines are completely or partially plugged.	→ Check connections or lines. → Remove the parts and particles that are causing the plugging.
Head parts are soiled.	→ Clean head components.
Diaphragm broken.	→ Stop pump immediately.
Diaphragm or valve plates are worn or defective.	→ Replace working diaphragm, safety diaphragm and reed valves (see Chapter 9.3).

Tab. 13

Fault cannot be rectified

If you are unable to identify any of the specified causes, send the pump to KNF Customer Service (contact data: see www.knf.com).

1. Flush pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with inert gas) to free the pump head of dangerous or aggressive gases (see Chapter 9.2.1).
2. Clean the pump (see Chapter 9.2.2).
3. Send the pump together with completed Health and Safety Clearance and Decontamination Form to KNF, stating the nature of the transferred medium.

11. Spare parts and accessories

11.1. Spare part set

A spare part set consists of:

Spare part	Position number	Quantity
Valve plate	(11)	1
Wave diaphragm	(2)	1
O-ring	(10)	1

Tab. 14

Spare part set	Order number
N86.16	032522

Tab. 15

11.2. Accessories

Accessories	Order number
Wrench for retainer plate	018812
Holding tool	055662

Tab. 16

12. Returns

Preparing for return

1. Flush the pump with air for a few minutes (if necessary for safety reasons: with inert gas) at atmospheric pressure to free the pump head of dangerous or aggressive gases (see Chapter 9.2.1).
- i** Please contact your KNF sales partner if the pump cannot be flushed due to damage.
2. Remove the pump.
3. Clean up the pump (see chapter 9.2.2).
4. Send the pump together with the completed Health and Safety Clearance and Decontamination Form to KNF, stating the nature of the transferred medium.
5. Pack the device securely to prevent further damage to the product. If necessary, request original packaging for a fee.

Returns

KNF shall undertake to repair the pump only under the condition that the customer presents a certificate regarding the medium that is pumped and the cleaning of the pump. In this case too, old devices can be returned. Please follow the instructions at knf.com/repairs here.

Contact your KNF sales partner directly if you require additional support for your return service.

KNF worldwide

Find your local KNF partner on www.knf.com