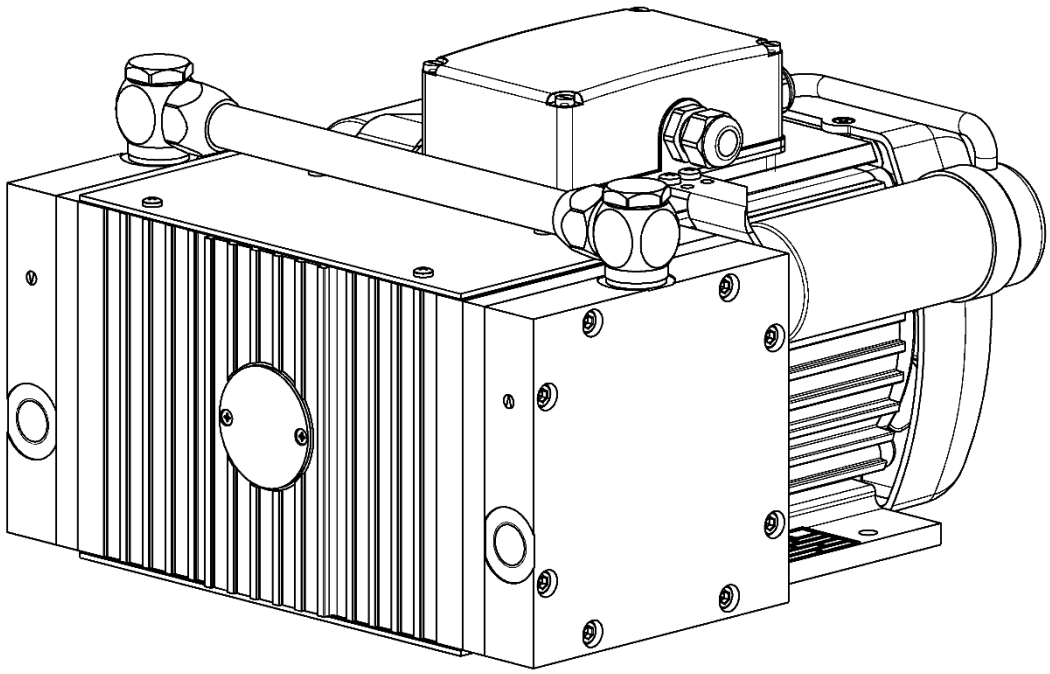
OEM

N 860, N 880
TRANSLATION OF ORIGINAL OPERATING AND INSTALLATION INSTRUCTIONS
ENGLISH

DIAPHRAGM VACUUM PUMP



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.

The pumps are not suitable for transferring liquids.

The pumps are not suitable for transferring aerosol.

The pumps are not suitable for transferring biological and microbiological substances.

The pumps are not suitable for transferring fuel.

The pumps are not suitable for transferring explosive and combustible materials.

The pumps are not suitable for transferring fibers.

The pumps are not suitable for transferring oxidizing agent.

The pumps are not suitable for transferring 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

Note the safety precautions in Chapter 6. Installation and connection and 7. 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.

For pumps with dynamic mass balancing (.22-versions):
If the pump is mounted on a platform that is itself a vibrating system, or contains one, care must be taken that the two systems do not interfere each other.

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.

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.

CE

The pumps conform to the Directive 2011/65/EU.

The following harmonized standards have been used:

- DIN EN 55014-1/2
- DIN EN 61000-3-2/3
- DIN EN 50581
- DIN EN 60204-1

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-caring parts may be opened by technical personnel only.

Use only genuine parts from KNF for servicing work.

4. Technical Data

Pump materials

N 860, N 860.3

Assembly	Material AN	Material AT	Material FT
Pump head	Aluminum alloy	Aluminum alloy	PTFE
Structured diaphragm	EPDM	PTFE	PTFE
Valves	EPDM	FFPM	FFPM

Tab. 2

N 880.3

Assembly	Material
Pump head	Aluminum alloy
Structured diaphragm	EPDM
Valves	FPM

Tab. 3

Pneumatic values

Parameter	Value N 860	Value N 860.3	Value N 880.3
Max. permissible operating pressure [bar g]	1.0	1.0	1.0
Ultimate vacuum [mbar abs.]	80	2.0	2.0
Delivery rate [l/min]*	60	60	80

Tab. 4 **Liters in standard state (1013 mbar)*

Pneumatic Connections

Pump type	Value
Thread size	G 3/8

Tab. 5

Electrical data

Parameter	Value
Electrical data	See type plate
Protection class Motor	IP 54
Maximum permitted mains voltage fluctuations	+/- 10%

Tab. 6

Thermal switch

The pumps are fitted as standard with a thermal-switch to protect against overloading (see operating instructions of the motor).

Weight

Pump type	Value
N 860 A_E	12.7 kg
N 860 FTE	12.7 kg
N 860.3 A_E	14.7 kg
N 860.3 FTE	14.2 kg
N 880.3 AN.22E	18.0 kg

Tab. 7

Other parameters

Parameter	Value
Permissible ambient temperature	+ 10°C bis + 40°C
Permissible media temperature	+5 °C bis + 240°C
Dimensions: N 860 A_E N 860 FTE N 860.3 A_E N 860.3 FTE N 880.3 AN.22E	 see Fig. 3, Chapter 6.1 see Fig. 4, Chapter 6.1 see Fig. 5, Chapter 6.1 see Fig. 6, Chapter 6.1 see Fig. 7, Chapter 6.1
Maximum permissible ambient relative humidity	80% for temperatures up to 31 °C, linearly decreasing to 50% at 40°C.
Max. altitude of site: [m above sea level]	See operating instruction motor

Tab. 8

Additional equipment (only .22-versions)

Pumps with the model code .22 (e.g. N 880.3 AN.22E) are fitted with the patented dynamic mass balancing. This system eradicates the imbalance that results from gas forces.

5. Design and function

Design

1 Pneumatic pump outlet
2 Pneumatic pump inlet
3 Pump head
4 Motor
5 Fan cover
6 Electrical terminal box
7 Pneumatic head connection

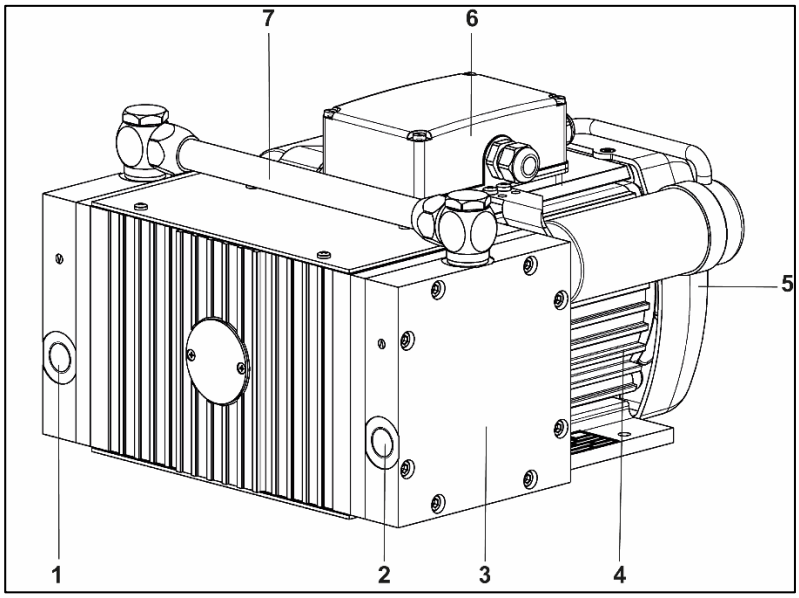


Fig. 1: Design N 880.3 AN.22E

Function Diaphragm Pump

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

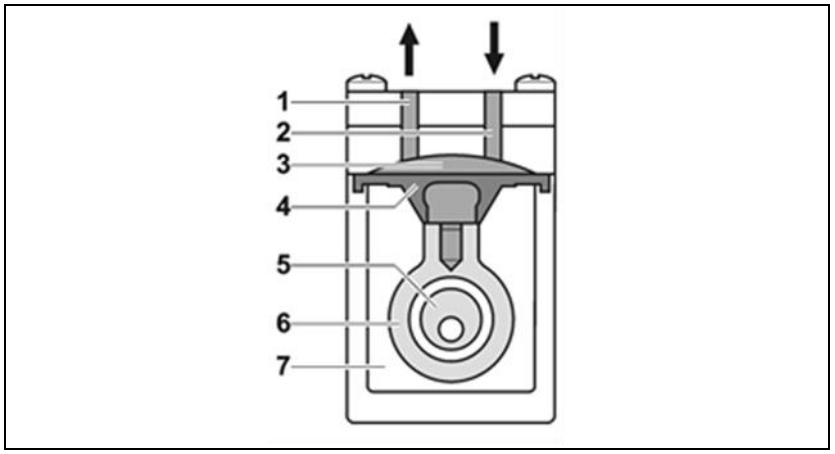


Fig. 2: Pump head

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. Installation and connection

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

Observe the safety precautions (see Chapter 3).

6.1. Installation of the pump

➔ Before installation, store the pump at the installation location to bring it up to ambient temperature.

Mounting dimensions

➔ See Fig. 3 to Fig. 7 for mounting dimensions.

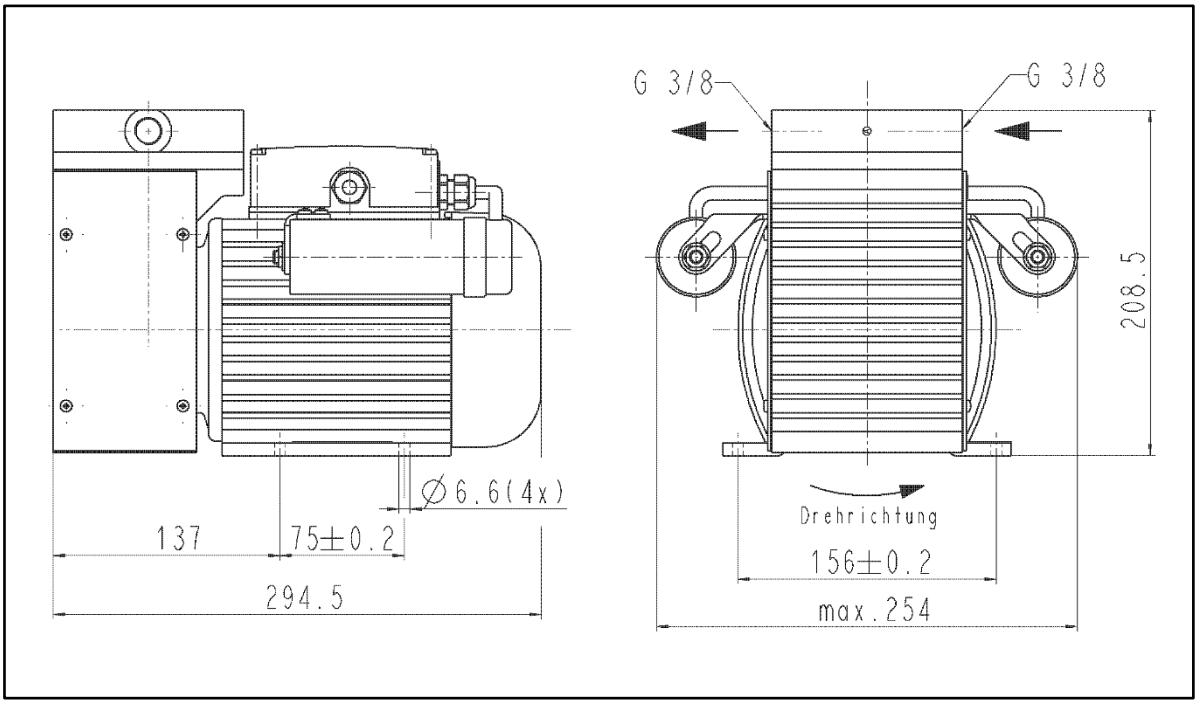


Fig. 3: Mounting dimensions pump series N 860 A_E (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

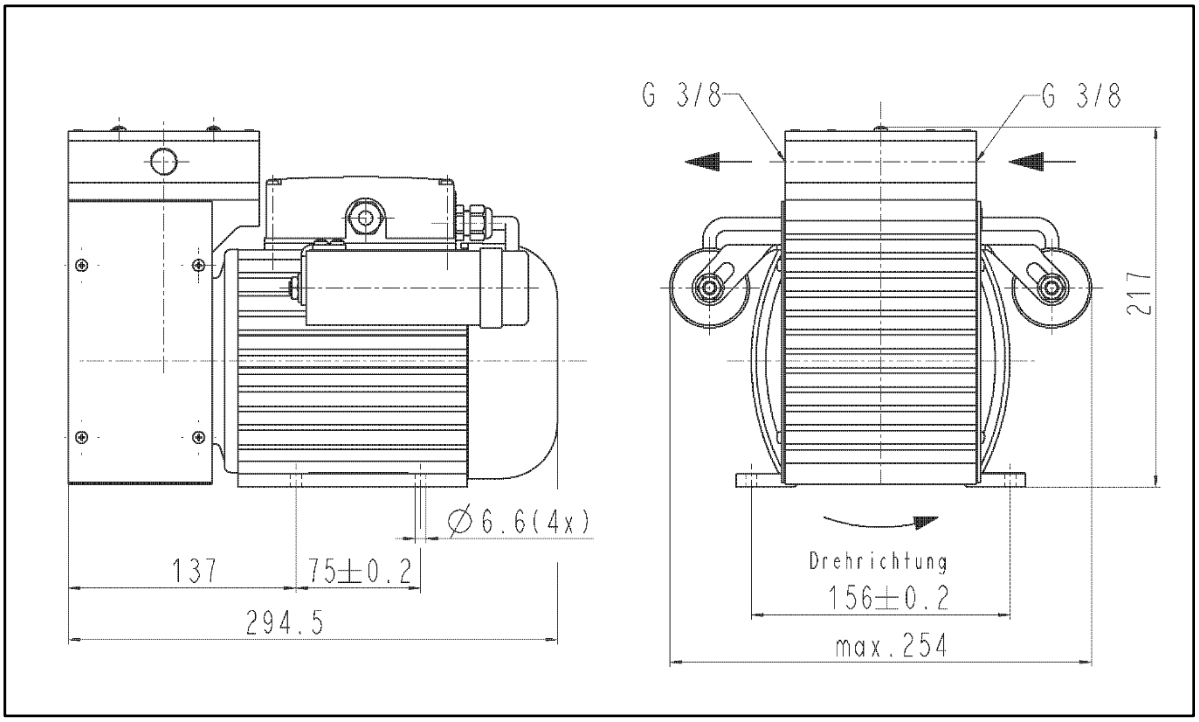


Fig. 4: Mounting dimensions pump series N 860 FTE (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

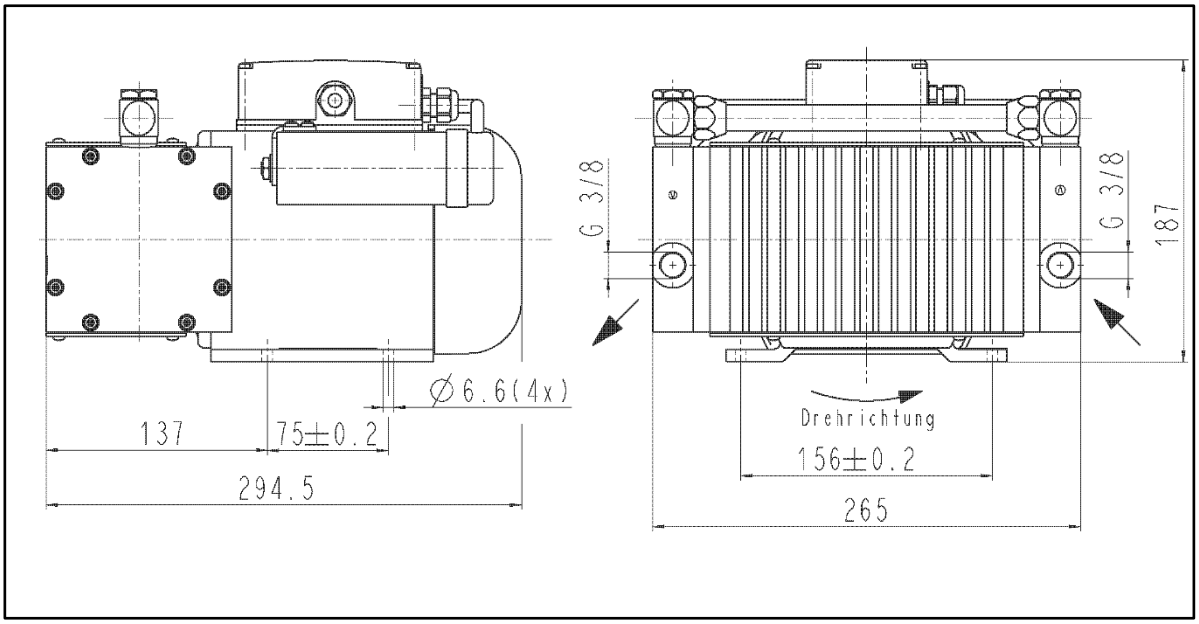


Fig. 5: Mounting dimensions pump series N 860.3 A_E (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

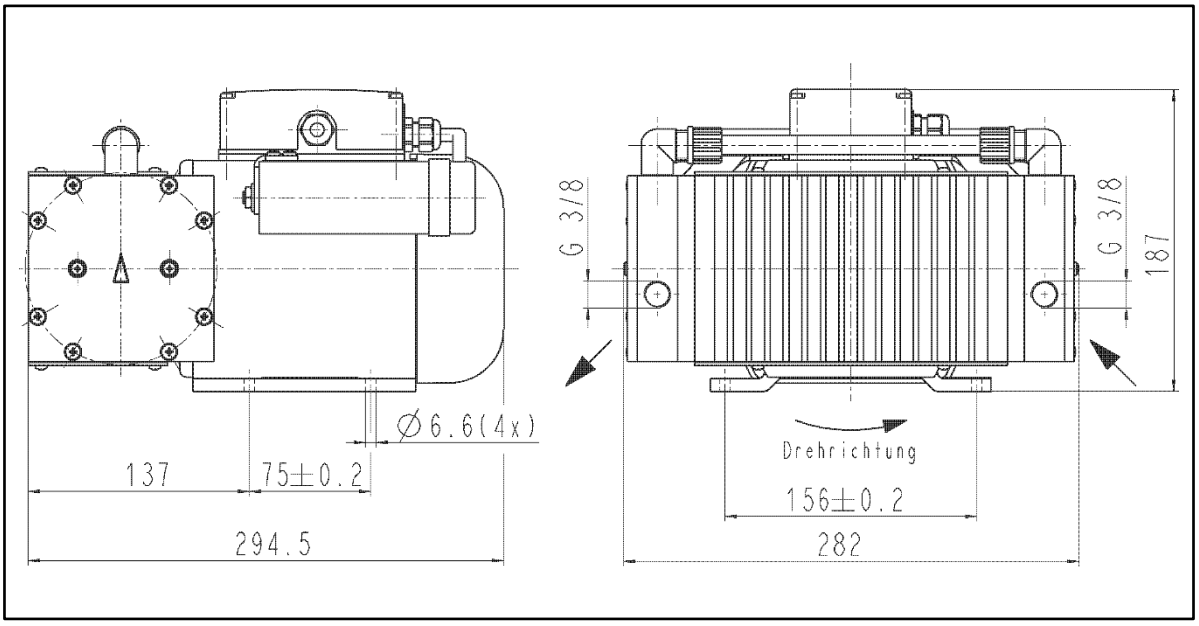


Fig. 6: Mounting dimensions pump series N 860.3 FTE (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

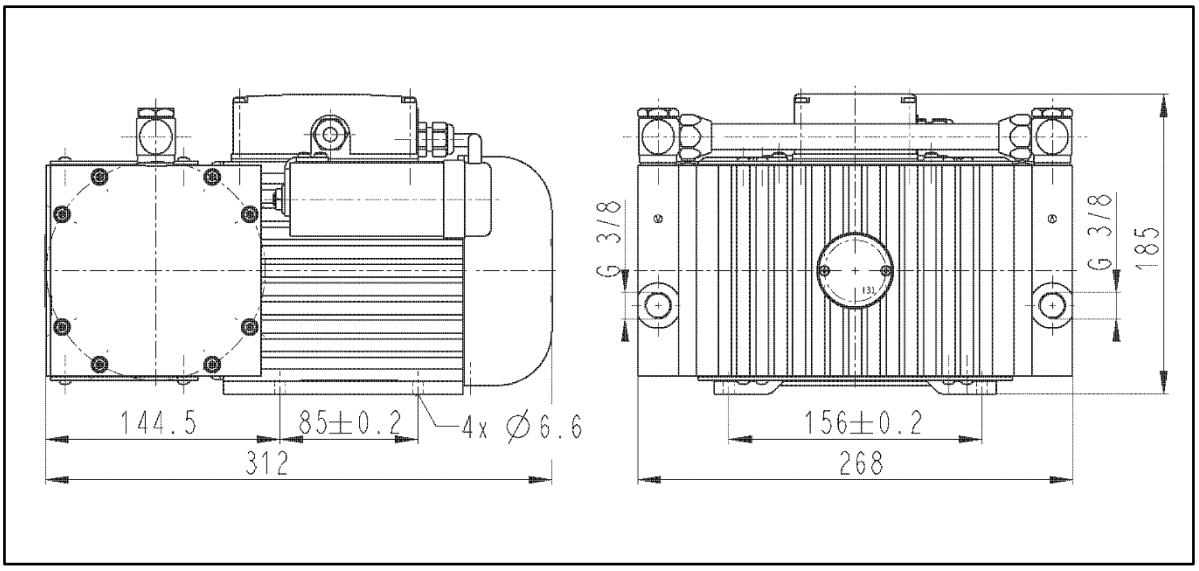


Fig. 7: Mounting dimensions pump series N 880.3 AN.22E (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

Cooling air supply

WARNING

Danger of burns from hot surfaces

Hot surfaces may be caused by overheating of the pump.

➔ Install the pump so that the motor fan can intake sufficient cooling air.

Immediate ambient of the hot pump parts

➔ 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).

Installation location

➔ 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.

➔ Make sure, that the installation location is accessible for maintenance and service.

The IP protection class of the pump motor is indicated on the type plate.

➔ Install the pump at the highest point in the system to prevent condensate from collecting in the pump head.

➔ Protect the pump from dust.

➔ Protect the pump from vibrations and jolts.



WARNING

Personal injury and/or damage to property because of vibration

In conjunction with adjacent components, vibration of the pump may result in crushing and/or damage to these components.

➔ Make sure that vibrations of the pump do not result in hazards associated with adjacent components.

Foreign matter protection

➔ Protect the pump against contact and intrusion of foreign matter.

For pumps with dynamic mass balancing (.22-versions):

1. If the pump is mounted on a platform that is itself a vibrating system, or contains one, care must be taken that the two systems do not interfere each other.
2. The pump must be supported on rubber mounts, or springs so that the natural frequency of the systems is $f_{ei} > 1.7$ Hz. For lower values of f_{ei} correct operation of the dynamic mass balancing cannot be guaranteed.

6.2. Electrical connection



DANGER

Extreme danger from electrical shock

➔ Only have the pump connected by an authorized specialist.

➔ Only have the pump connected when the power supply is disconnected.

➔ When connecting the device to a power source, the relevant standards, directives, regulations, and technical standards must be observed.

➔ In the electrical installation, arrangements (complying with EN 60204-1) 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).

i The pumps are fitted as standard with a thermal switch to protect against overloading (connection according to operating instructions of the motor).

i The 3~ motors are provided for the operation with frequency converter.

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. Open terminal box cover.
3. Connect the earth (ground) wire to the motor.
4. Connect the mains cables according to the operating instruction of the motor.

5. Close the terminal cover box.

6.3. 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).

Pump exhaust

➔ If the pump s used as a vacuum pump, safely discharge the pump exhaust at the pump's pneumatic outlet.

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. 8 for mounting dimensions).
3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

7. Operation



WARNING

Danger of burns from hot pump parts or hot medium

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

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



WARNING

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.

➔ 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.



WARNING

Hazard of the pump head bursting due to excessive pressure increase

➔ 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 9. 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.

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 suctions 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.

Pump standstill

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

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 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 8.2.1) 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).

8. Servicing

8.1. Servicing schedule

Component	Servicing interval
Pump	- Regular inspection for external damage or leaks
Diaphragm and valve plates	- Replace at the latest, when pump output decreases

Tab. 9

8.2. Cleaning

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

8.2.1. Flushing pump

➔ When transferring aggressive media, flush the pump under atmospheric conditions some minutes with air (or, if necessary for safety reasons, with an inert gas) prior to switch-off to increase the service life of the diaphragm.

8.2.2. Cleaning pump

Conditions

- Pump disconnected from mains and de-energized



WARNING

Health hazard due to dangerous substances in the pump!

Depending on the substance transferred, caustic burns or poisoning are possible.

➔ Wear protective clothing if necessary, e.g. protective gloves.



CAUTION

Danger of burns from hot pump parts

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

➔ Allow the pump to cool off after operation.

➔ Solvent should be used for cleaning only if the head materials are not corroded (ensure compatibility of the material).

➔ If compressed air is available, blow out the parts.

8.3. Replacing diaphragm and reed valves

For two-headed pumps:
The process of replacing diaphragms and valve plates/sealings should be completed separately for each individual head before starting work on the next one. This will prevent from mixing up parts.

8.3.1. AN_ and AT_-versions

Conditions

- Pump disconnected from mains and de-energized
- Pump is clean and free of hazardous materials.
- Hoses removed from pump's pneumatic inlet and outlet.

Spare parts/tools

Spare part/tool	Quantity
Spare part kit*	1
Allen key 4mm	1
Screwdriver blade with 2 mm	1
Phillips screwdriver No. 2	1
Ring spanner 22 mm (alternative: open-ended spanner 22 mm) and open-ended spanner 24 mm	1
Felt tip pen	1

Tab. 10 **see Chapter 10*

Information on procedure

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

Always change diaphragm and valve plates/sealings at the same time. If the diaphragm and the valve plates/sealings are not changed at the same time the nominal performance of the pump is not guaranteed after the servicing.



WARNING

Health hazard due to dangerous substances in the pump!

Depending on the substance transferred, caustic burns or poisoning are possible.

➔ Wear protective clothing if necessary, e.g. protective gloves.



CAUTION

Danger of burns from hot pump parts

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

➔ Allow the pump to cool off after operation.

Change the diaphragms and valve plates/sealings in the following sequence:

a.) Preparatory steps

b.) Removing pump head

c.) Changing diaphragm

d.) Changing valve plates/sealings

e.) Refitting pump head

f.) Final steps

The position numbers in the following text refer to Fig. 8 and Fig. 9.

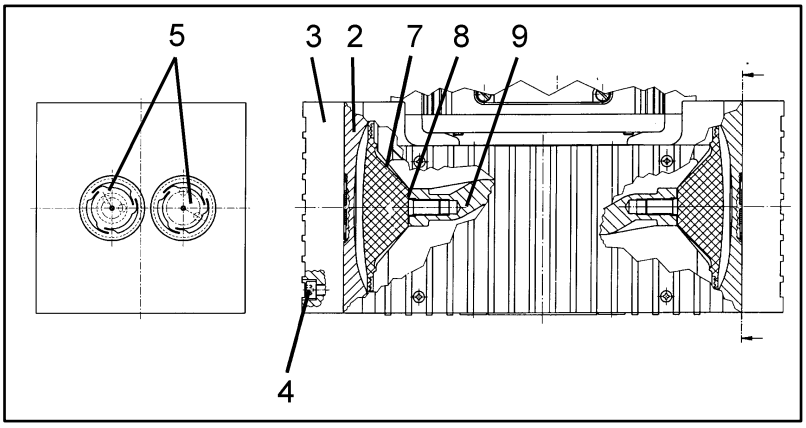


Fig. 8: Pump heads ANE and ATE types (symbolic)

1 Housing
2 Intermediate plate
3 Ribbed plate
4 Hexagon socket head cap screw
5 Valve plates/sealings
6 Does not exist
7 Structured diaphragm
8 Diaphragm spacer(s)
9 Connecting rod
10 Pneumatic connection
11 Union
12 Fan cover

M Marking

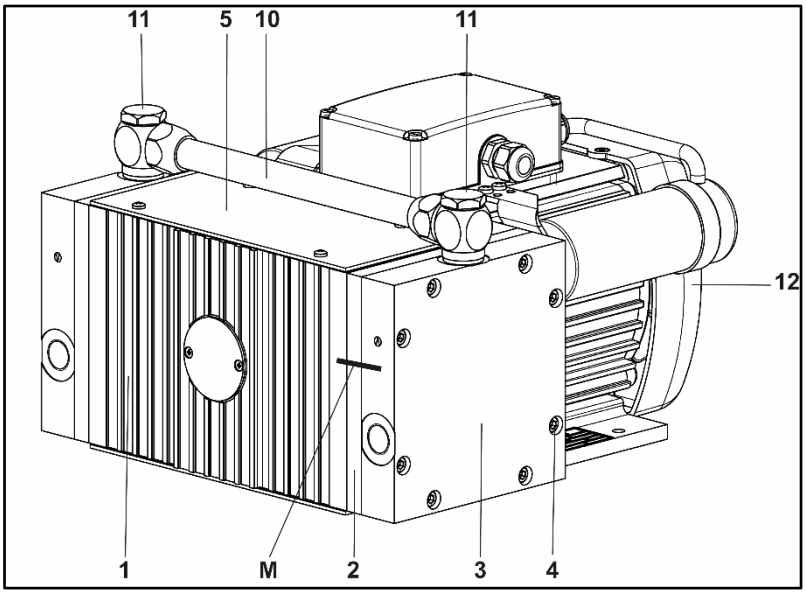


Fig. 9:

a.) Preparatory steps

1. Turn off power, check and test that the lines are not live.
2. For two-headed pumps:
   Unscrew the fittings (11) of the pneumatic head connections (10) and pull the connection upwards.
3. Undo the screws that hold the fan cover (12) and remove the fan cover from the motor.

b.) Removing pump head (for each head separately)

1. Mark a mark (M) on the ribbed plate (3), intermediate plate (2), and housing (1) with a felt-tip pen. This is to ensure that the parts will be reassembled correctly at a later stage.
2. Undo the four screws (4) in the ribbed plate and lift the ribbed plate with the intermediate plate off the pump housing.

c.) Changing diaphragm

1. Position the pump so that the diaphragm surface is upwards.
2. Turn the fan to bring the structured diaphragm (7) to top dead centre.
3. Using a small screwdriver, between the housing and the outer edge of the structured diaphragm, carefully lift the edge of the diaphragm lightly upwards at one point (marking sure not to damage the housing). Now grip the edge of the diaphragm on opposite sides, unscrew it by turning anti-clockwise.
4. Take the diaphragm spacer(s) (8) off the connecting rod (9) and retain them.
5. Check that all parts are free from dirt and clean them if necessary (see Chapter 8.2 Cleaning).
6. Put the diaphragm spacer(s) on the thread of the new diaphragm.
7. Fit the new structured diaphragm (7): hold the connecting rod (9) with one finger, and gently screw in (clockwise) the structured diaphragm with diaphragm spacers.
8. Turn the fan until the structured diaphragm is at the top dead centre. Using a small screwdriver, between the housing and the outer edge of the structured diaphragm, carefully lift the edge of the diaphragm lightly upwards at one point. Now grip the edge of the diaphragm on opposite sides and tighten the structured diaphragm clock-wise (hand-tight).

d.) Changing valve plates/sealings

1. Separate the ribbed plate (3) from intermediate plate (2).
2. Remove the valve plates/sealings (5) 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 plate/sealings (5) in the recesses in the intermediate plate. The valve plates/sealings for suction and pressure sides are identical, as are upper and lower sides of the valve plates/sealings.

e.) Refitting pump head

1. Turn the fan to bring the structured diaphragm (7) to medium position.
2. Place the intermediate plate (2), with valve plates/sealings (5) and ribbed plate (3) on the housing, in the position indicated by the marking (M).
3. Gently tighten the screws (4), evenly and diagonally.
4. Turn the fan to check that the pump rotates freely.

5. Now tighten screws (4) firmly (tightening-torque: 8 Nm).

For two-headed pumps:
Repeat operation b.), c.), d.) and e.) for the second pump head.

f.) Final steps

1. For two-headed pumps:
   Refit the pneumatic head connection (10). When tightening the union (11), prevent the unit from slewing by using a spanner.
2. Refit the fan cover (12).
3. Reconnect the pump to the electricity supply.

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

8.3.2. FTE-versions

Conditions

- Pump disconnected from mains and de-energized
- Pump is clean and free of hazardous materials.
- Hoses removed from pump's pneumatic inlet and outlet.

Spare parts/tools

Spare part/tool	Quantity
Spare part kit*	1
Screwdriver blade with 2 mm	1
Phillips screwdriver No. 2	1
Felt tip pen	1

Tab. 11 **see Chapter 10*

Information on procedure

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

Always change diaphragm and valve plates/sealings at the same time. If the diaphragm and the valve plates/sealings are not changed at the same time the nominal performance of the pump is not guaranteed after the servicing.



WARNING

Health hazard due to dangerous substances in the pump!

Depending on the substance transferred, caustic burns or poisoning are possible.

➔ Wear protective clothing if necessary, e.g. protective gloves.



CAUTION

Danger of burns from hot pump parts

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

➔ Allow the pump to cool off after operation.

Change the diaphragms and valve plates/sealings in the following sequence:

a.) Preparatory steps

b.) Removing pump head

c.) Changing diaphragm

d.) Changing valve plates/sealings

e.) Refitting pump head

f.) Final steps

The position numbers in the following text refer to Fig. 10.

1 Top plate
2 Head plate
3 Intermediate plate
4 Housing
5 Cross recessed raised countersunk head screw
6 Structured diaphragm
7 Diaphragm spacer(s)
8 Connecting rod
9 Cross recessed raised cheese head screw
10 Disk spring
11 Valve plate/sealing

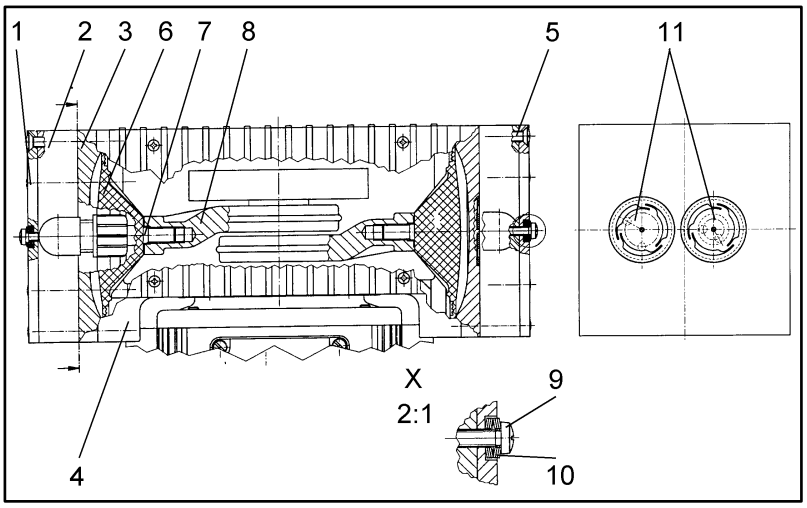


Fig. 10: Pump heads FTE types (symbolic)

a.) Preparatory steps

1. Turn off power, check and test that the lines are not live.
2. For two-headed pumps:
   On the pneumatic head connections, loosen one of the union nuts by hand. Then slightly loosen the angle-fitting in the pump head by turning it anti-clockwise, so that the connecting tube can be pulled out.
3. Undo the screws that hold the fan cover (see Fig. 9/12) and remove the fan cover from the motor.

b.) Removing pump head (for each head separately)

1. Make a mark (M) on the top plate (1), head plate (2), intermediate plate (3) and housing (4) with a felt-tip pen. This is to ensure that the parts will be reassembled correctly at a later stage.
2. Undo the eight screws (5) and lift the pump head off the housing (4).

c.) Changing diaphragm

1. Position the pump so that the diaphragm surface is upwards.
2. Turn the fan to bring the structured diaphragm (6) to top dead centre.
3. Using a small screwdriver, between the housing and the outer edge of the structured diaphragm, carefully lift the edge of the diaphragm lightly upwards at one point (making sure not to damage the housing). Now grip the edge of the diaphragm on opposite sides, unscrew it by turning anti-clockwise.
4. Take the diaphragm spacer(s) (7) off the connecting rod (8) and retain them.
5. Check that all parts are free from dirt and clean them if necessary (see Chapter 8.2 Cleaning).
6. Put the diaphragm spacer(s) (7) on the thread of the new diaphragm.
7. Fit the new structured diaphragm (6): hold the connecting rod (8) with one finger, and gently screw in (clockwise) the structured diaphragm with diaphragm spacers.
8. Turn the fan until the structured diaphragm is at the top dead centre. Using a small screwdriver, beween the housing and the outer edge of the structured diaphragm, carefully lift the edge of the diaphragm lightly upwards at one point. Now grip the edge of the diaphragm on opposite sides (do not over-stretch the diaphragm!) and tighten the structured diaphragm clockwise.

d.) Changing valve plates/sealings

1. Undo the two screws (9).
2. Separate the head plate (2) with top plate (1) from intermediate plate (3).
3. Remove the valve plates/sealings (11) from the intermediate plate.
4. Check that the valve seats, the head plate and intermediate plate are clean. If scratches, distortion, or corrosion are evident on these parts they should be replaced.
5. Lay the new valve plates/sealings (11) in the recesses in the intermediate plate. The valve plates (sealings for suction and pressure sides are identical, as are upper and lower sides of the valve plates/sealings.

e.) Refitting pump head

1. Turn the fan to bring the structured diaphragm (6) to medium position.
2. Place the intermediate plate (3), with valve plates/sealings (11) on the housing, in the position indicated by the marking (M).
3. Place the head plate (2) on the intermediate plate (3) in the position indicated by the marking (M).
4. Place top plate (1) in position and insert screws (9) with disk springs (10), and tighten them until the screw heads are just fully seated (do not completely tighten them!).
   - The concave side of the first three disk springs must point away from the screw head, the next three towards it (see Fig. 10, detail X).
5. Gently tighten the screws (5), evenly and diagonally.
6. Turn the fan to check that the pump rotates freely.
7. Now tighten screws (5) firmly (tightening-torque: 8 Nm).
8. Tighten each of the screws (9) a half turn more (tightening-torque: 20 Ncm).

For two-headed pumps:
Repeat operation b.), c.), d.) and e.) for the second pump head.

f.) Final steps

1. For two-headed pumps:
   Refit the pneumatic head connection:
   Place tube onto the connecting part of the angle fitting, turn angle fitting to a straight position and tighten the nut.
2. Refit the fan cover.
3. Reconnect the pump to the electricity supply.

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

9. 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 not connected to the mains.	➔ Connect pump to the mains.
No voltage in power source.	➔ Check room fuse and switch on if necessary.
Thermal switch of the pump has operated.	➔ Disconnect pump from mains. ➔ Allow pump to cool. ➔ Trace cause of over-heating and eliminate it.
Connections or lines blocked.	➔ Check connections and lines. ➔ Remove blockage.
External valve is closed or filter is clogged.	➔ Check external valves and filters.
Condensate has collected in pump head.	➔ Detach the condensate source from the pump. ➔ Flush pump (see Chapter 8.2.1). ➔ Install pump at highest point in system.
Diaphragm or valve plates/sealings are worn.	➔ Replace diaphragm and valve plates/sealings (see Chapter 8.3).

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 pump head.	➔ Detach the condensate source from the pump. ➔ Flush pump (see Chapter 8.2.1). ➔ Install pump at highest point in system.
There is gauge pressure on pressure side and at the same time vacuum or a pressure above atmospheric pressure on suction side.	➔ Change the pressure conditions.
Pneumatic lines or connection parts have an insufficient cross section or are throttled.	➔ Disconnect pump from system to determine output values. ➔ Eliminate throttling (e.g. valve) if necessary. ➔ Use lines or connection parts with larger cross section if necessary.
Leaks occur on connections, lines or pump head.	➔ Eliminate leaks.
Connections or lines completely or partially jammed.	➔ Check connections and lines. ➔ Remove the jamming parts and particles.
Head parts are soiled.	➔ Clean head components.
Diaphragm or valve plates/sealings are worn.	➔ Replace diaphragm and valve plates/sealings (see Chapter 8.3).

Tab. 13

Fault cannot be rectified

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

1. Flush the pump to free the pump head of dangerous or aggressive gases (see Chapter 8.2.1).
2. Remove the pump.
3. Clean the pump (see Chapter 8.2.2).
4. Send the pump, together with completed Health and Safety Clearance and Decontamination Form, to KNF stating the nature of the transferred medium.

10. Spare parts and accessories

10.1. Spare parts

A spare parts kit contains all parts needed for complete overhaul of the pump head:

- 1x Diaphragm
- 2x Valve plates/sealings

Spare parts kit	Order No.
N 860 ANE	047496
N 860 _TE	047497
N 860.3 ANE	047498
N 860.3 _TE	047499
N 880.3 AN.22E	045387

Tab. 14

11. Returns

Prerequisite for repairing a pump by KNF is a completed Decontamination Form.

This is made available on the KNF website as a download. To find the form, select your country on the overview page (www.knf.com). You can find the Decontamination Form in the download area.

If you have questions, please contact your sales partner (contact data: see www.knf.com).

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