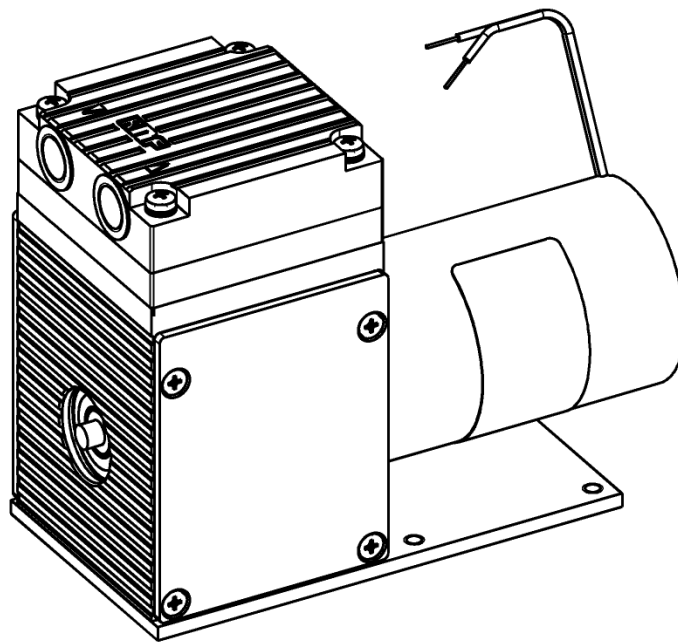


**OEM**

**N 89 / N 811 / N 814 / N 815  
TRANSLATION OF ORIGINAL OPERATING AND  
INSTALLATION INSTRUCTIONS  
ENGLISH**

# MINI DIAPHRAGM VACUUM PUMP AND COMPRESSORS



**Note!**

*Before operating the pump and the accessories, please read the operating instructions on the web site ([www.knf.com/downloads](http://www.knf.com/downloads)) 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.

- ➔ 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
<b>DANGER</b>	warns of immediate danger	Death or serious injuries and/or serious damage are the consequence.
<b>WARNING</b>	warns of possible danger	Death or serious injuries and/or serious damage are possible.
<b>CAUTION</b>	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.

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

**i** 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.

**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 (compressor operation).

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.

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.

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.  
(*\*only for pumps with AC motor*)

As these partly completed machinery are OEM-models the power supplies and the equipment for disconnecting and switching-off the partly completed machinery respectively have to be considered when mounting as well as over-current and overload protective gear.

In addition a protection against mechanical parts in motion and hot parts, if existing, has to be provided when mounting.



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

The following harmonized standards have been used:

N 89 K_E	N 89 K_DC
N 811 K_E	N 811 K_DC
N 814 K_E	N 814 K_DC
N 815 K_E	N 815 K_DC
DIN EN 55014-1/2	DIN EN 55014-1/2
DIN EN 61000-3-2/3	DIN EN 60034-1
DIN EN 60335-1	DIN EN 61000-6-1/2
DIN EN 50581	DIN EN 50581

Tab. 2

## 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 89 KN\_

N 811 KN\_

Assembly	Material
Pump head	PPS
Wave diaphragm	EPDM
Valve	CR

Tab. 3

N 89 KT\_

N 814 KT\_

N 811 KT\_

N 815 KT\_

Assembly	Material
Pump head	PPS
Wave diaphragm	PTFE-coated
Valve	FFPM

Tab. 4

N 814 KN\_

Assembly	Material
Pump head	PPS
Wave diaphragm	EPDM
Valve	FPM

Tab. 5

N 815 KN\_

Assembly	Material
Pump head	PPS
Wave diaphragm	CR
Valve	EPDM

Tab. 6

**Pneumatic values**

Pumpentyp	Max. permissible operating pressure [bar g]	Ultimate vacuum [mbar abs.]	Delivery rate [l/min]*
N 89 KNE	0,5	100	9,5
N 89 KNDC	0,5	100	9
N 89 KTE	0,5	170	9,5
N 89 KTDC	0,5	170	9
N 811 KNE	0,5	100	11,5
N 811 KNDC	0,5	100	11
N 811 KTE	0,5	170	11,5
N 811 KTDC	0,5	170	11
N 814 KNE	2,0	240	11,5
N 814 KNDC	2,0	240	12
N 814 KTE	2,0	290	11,5
N 814 KTDC	2,0	290	12
N 815 KNE	-	100	15
N 815 KNDC	-	100	16
N 815 KTE	-	160	14
N 815 KTDC	-	160	15

Tab. 7

\*Liters in standard state (1013 mbar)

**Pneumatic Connections**

Pump type	Value
All pumps	G 1/8

Tab. 8

**Electrical data**

Parameter	Value
Electrical data	See type plate
Protection class Motor	IP 00
Protection class Pump	IP 00

Tab. 9

**Thermal switch**

For pumps with a thermal switch:

The pumps are fitted as standard with a thermal-switch to protect against overloading.

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
N 89 K_E; N 811 K_E	Approx. 1.3 kg
N 89 K_DC; N 811 K_DC	Approx. 0.9 kg
N 814 K_E	Approx. 2.1 kg
N 815 K_E	Approx. 1.5 kg
N 814 K_DC; N 815 K_DC	Approx. 1.0 kg

Tab. 10

**Other parameters**

Parameter	Value
Permissible ambient temperature	+ 5°C to + 40°C
Permissible media temperature	+ 5°C to + 40°C
Dimensions	
N 89/811 K_E	See Fig. 3, Chap. 6.1
N 89/811 K_DC	See Fig. 4, Chap. 6.1
N 814 K_E	See Fig. 5, Chap. 6.1
N 814 K_DC	See Fig. 6, Chap. 6.1
N 815 K_E	See Fig. 7, Chap. 6.1
N 815 K_DC	See Fig. 8, Chap. 6.1
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

Tab. 11

## 5. Design and function

- 1 Pneumatic outlet
- 2 Pneumatic inlet
- 3 Motor

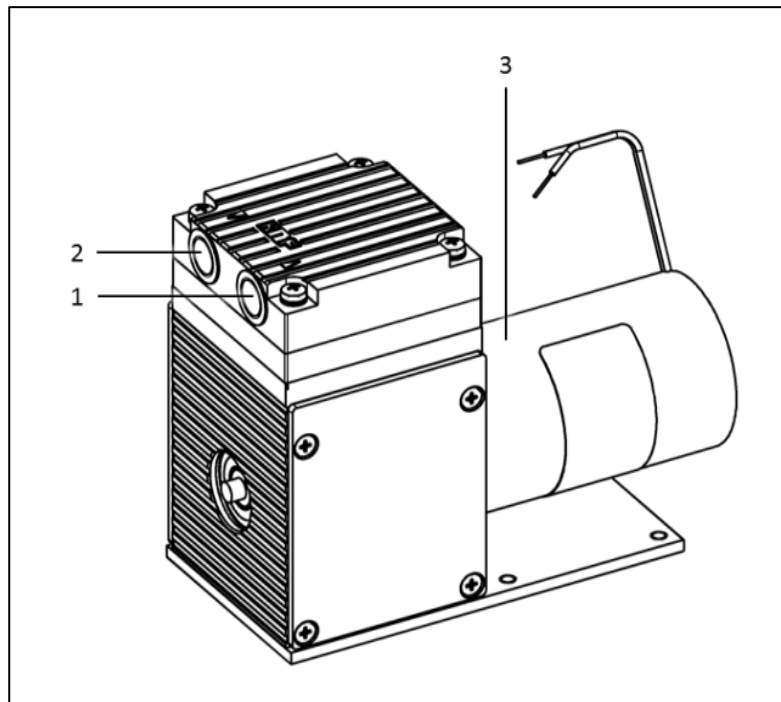


Fig. 1: Diaphragm vacuum pump N 89 K\_DC

### Function Diaphragm Pump

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

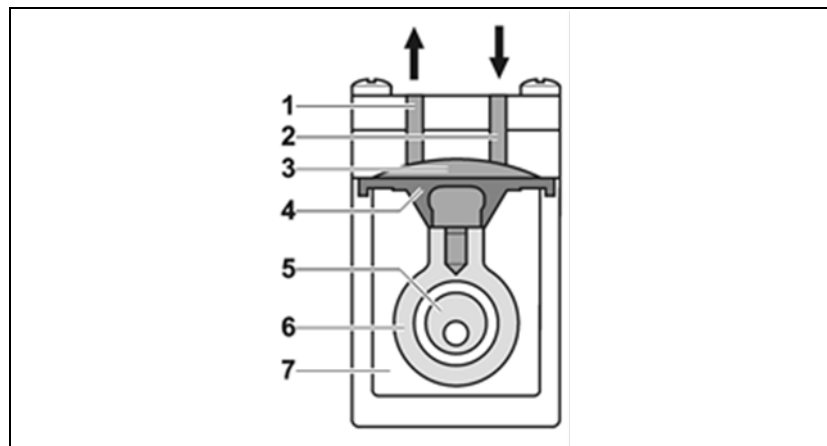


Fig. 2: Pump head

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.
- ➔ Install the pump so that accidental finger contact with the fan is impossible.

Mounting dimensions See Fig. 3 and Fig. 4 (pump series N 89/ N 811), Fig. 5 and Fig. 6 (pump series N 814) and Fig. 7 and Fig. 8 (pump series N 815) for mounting dimensions.

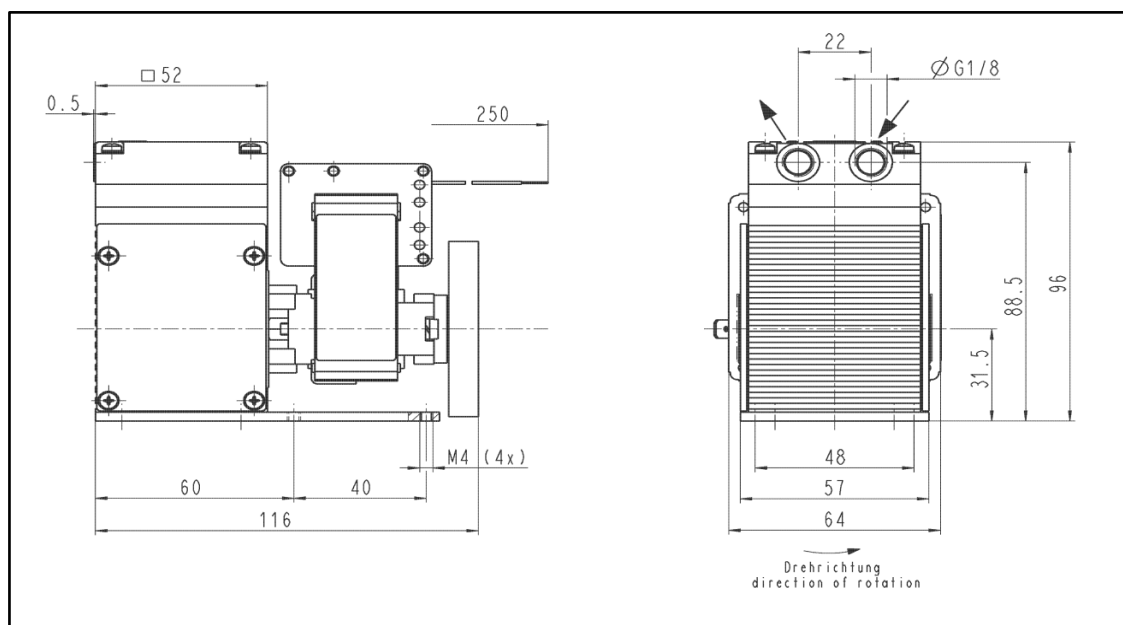


Fig. 3: Mounting dimensions pump series N 89/811 K\_E (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

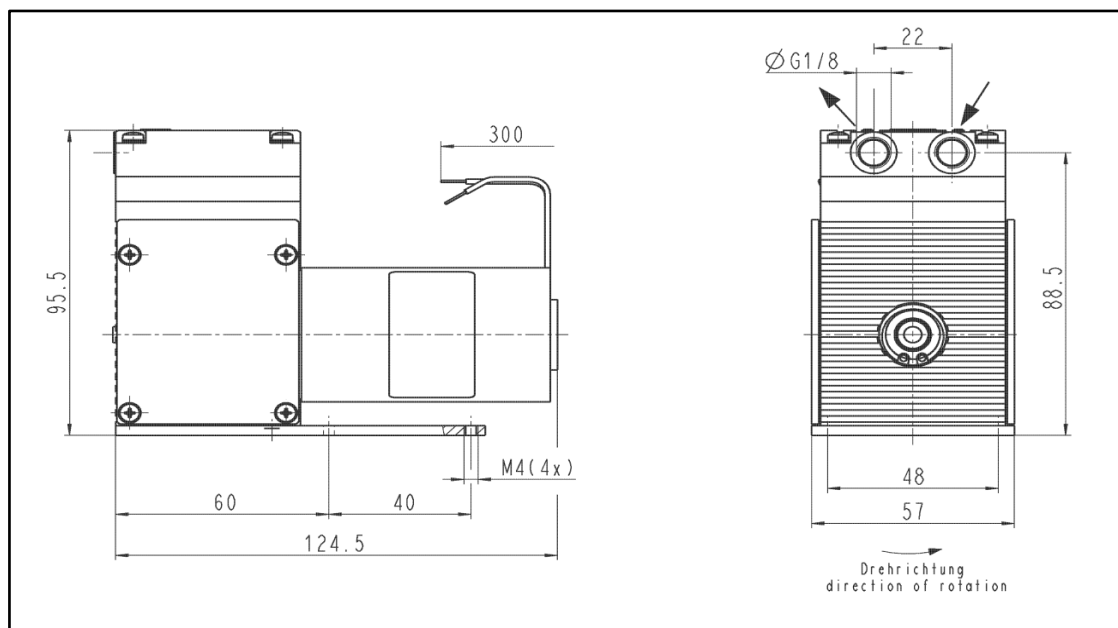


Fig. 4: Mounting dimensions pump series N 89/811 K\_DC (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

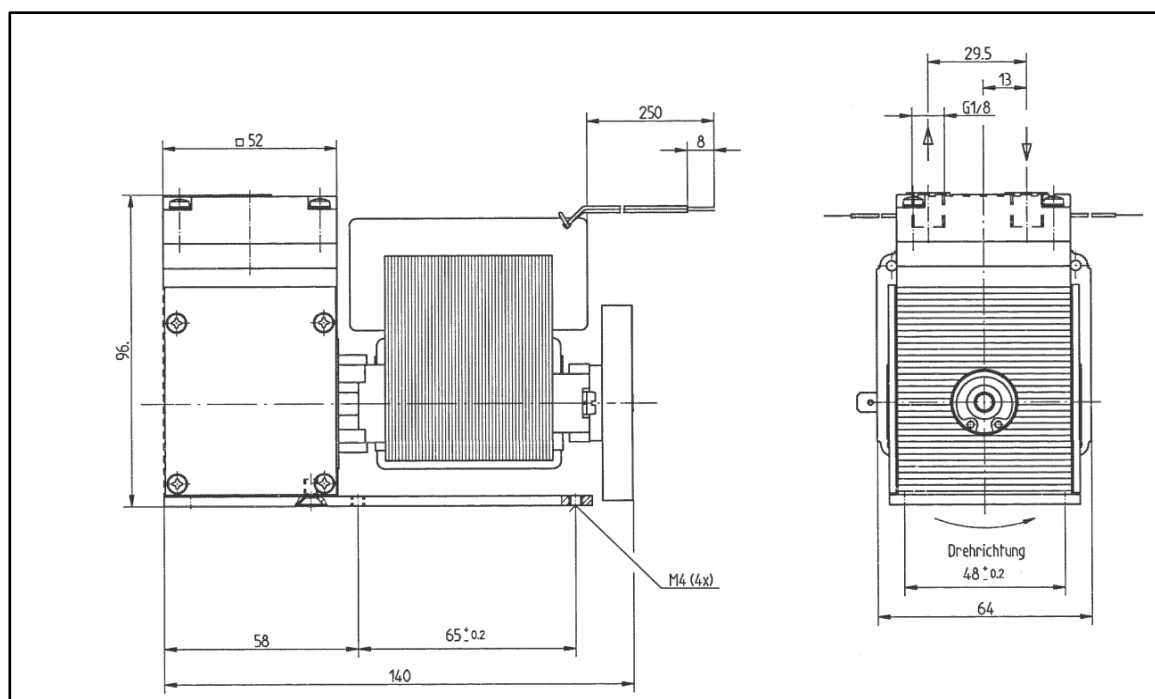


Fig. 5: Mounting dimensions pump series N 814 K\_E (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

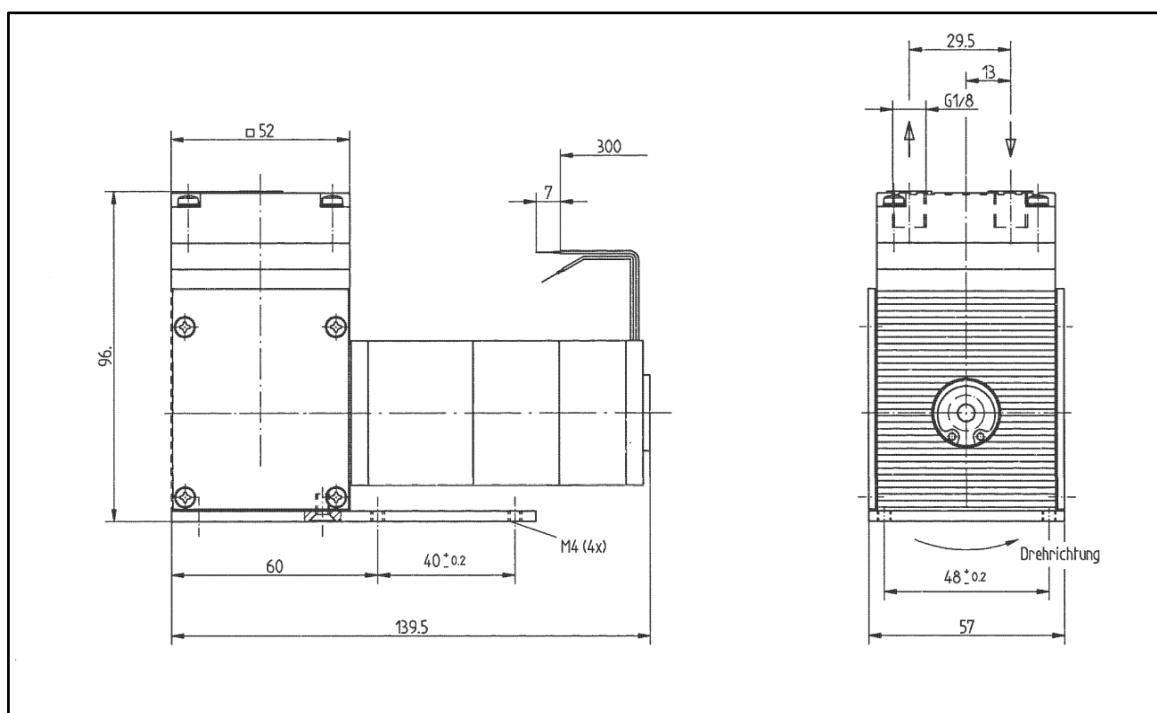


Fig. 6: Mounting dimensions pump series N 814 K\_DC (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

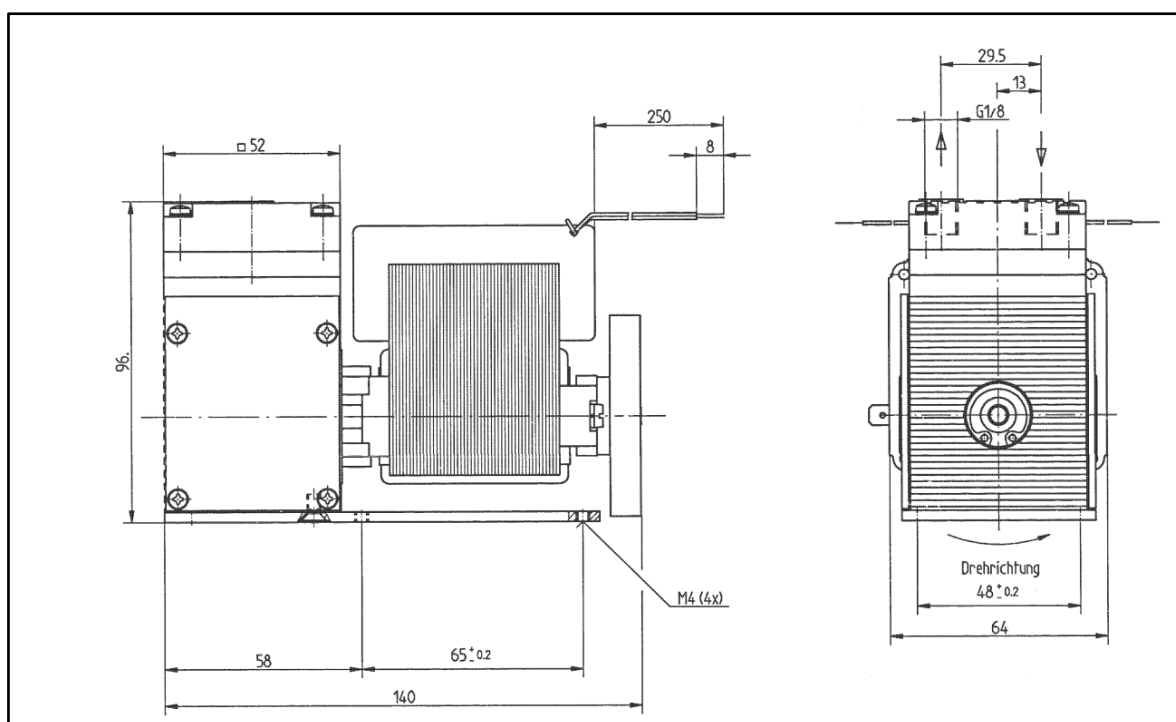


Fig. 7: Mounting dimensions pump series N 815 K\_E (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

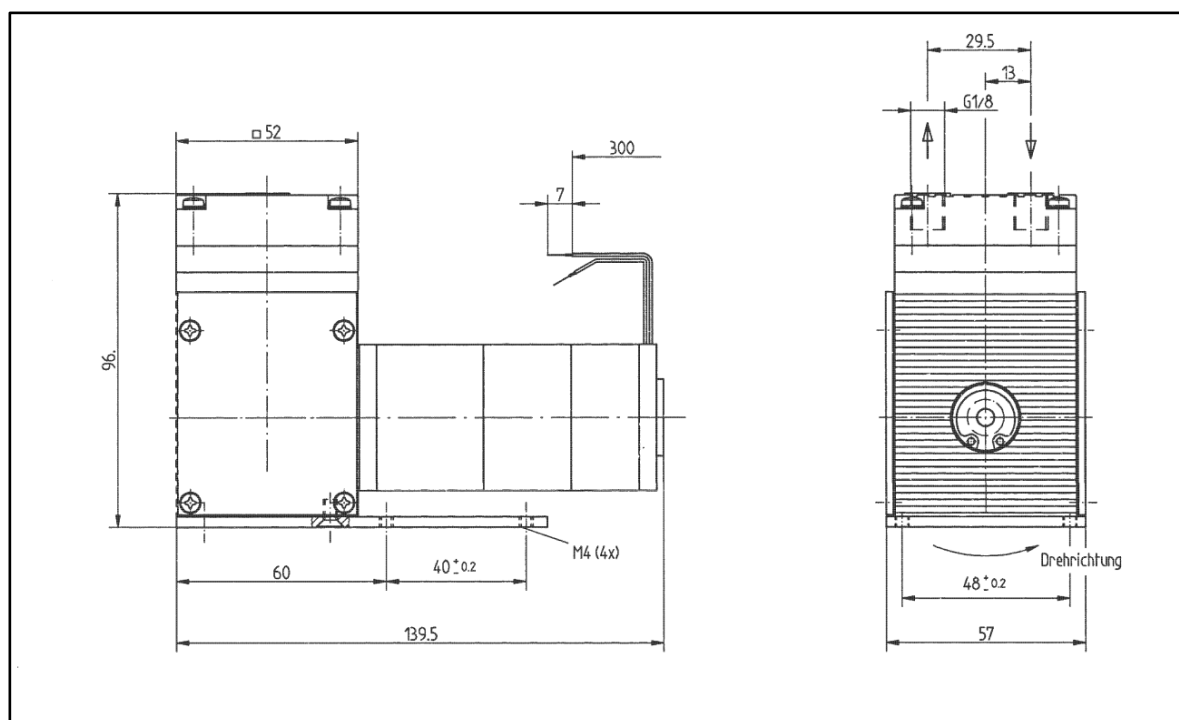


Fig. 8: Mounting dimensions pump series N 815 K\_DC (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

#### Cooling air supply



Danger of burns from hot surfaces

Hot surfaces may be caused by overheating of the pump.

#### **WARNING**

→ 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.
- 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.
- For pumps with fan: Install the pump so that accidental finger contact with the fan is impossible.



**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.

## 6.2. 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).

**i** For pumps with a thermal switch:  
The pumps are fitted as standard with a thermal switch (1~ motor) 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. Open terminal box cover.
3. Connect the earth (ground) wire to the motor.

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

4. Connect the mains cables according to the operating instruction of the motor.
5. Close the terminal cover box.

## EMC-compatible Installation

Only pumps with dc motors:

The Tests:

- Magnetic field with energy-technical frequency
- Electromagnetic HF field, amplitude-modulated
- Electromagnetic HF-field, pulse-modulated
- Discharging of static electricity
- High frequency, asymmetric
- Fast transients

were not carried out, cause the products do not contain electronic modules, which can be affected by these tests.

The Surge-test can only be passed with additional means, or is not mandatory, if: Form EN 61000-6-1 technical norm for EMC protection, part 1,10 test demands for EMC protection, table 3, EMC protection, D.C.-power in- and outputs. Remark 3: (quotation) Not to be used with input connections which are foreseen for a connection with a battery or a rechargeable battery which has to be removed or disconnected from the device for the recharge.

Devices with a D.C. power input which are foreseen to be operated with an A.C. /D.C. converter have to be tested at an A.C. power input of an A.C. /D.C. converter fixed by the manufacturer. In case the converter was not fixed they have to be tested at an A.C. power input of typical (usual) A.C. /D.C. converter.

The test is applicable for D.C. power inputs which are foreseen for a permanent connection to cables which are longer than 10m.

### 6.3. Pneumatic connection



#### CAUTION

Personal injury or damages to property by ejected plugs

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

➔ Remove the 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 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. The accessories silencer, filter, and hose connectors (where applicable) are screwed into the port threads.



Mount the silencer at the pressure side if necessary.

3. Connect the suction line and pressure line (see Chapter 4, Tab. 11 for mounting dimensions).
4. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

## 7. 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 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.

- 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](http://www.knf.com)).

For pumps with a thermal switch:



**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 thermal switch (1~ motor), 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	- Inspect regularly for external damage or leaks
Hose connection	- Inspect regularly for external damage or leaks
Diaphragm and valve plates/sealings	- Change as soon as pumping capacity decreases, preferably sooner - Replace at latest, when pump output decreases

Tab. 12

### 8.2. Cleaning

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

#### 8.2.1. Flushing pump

➔ Before switching off the pump, flush it with air (or with inert gas if required for safety reasons) under atmospheric conditions (ambient pressure) for about five minutes.

#### 8.2.2. Cleaning pump

Conditions    ▪ Motor disconnected from mains and de-energized



Danger of burns from hot pump parts

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

**CAUTION**

➔ Allow the pump to cool after operation.



Health hazard due to dangerous substances in the pump

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

**WARNING**

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

➔ Clean pump with suitable measures.

➔ As far as possible, clean the parts with a dry cloth. 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 valve plates/sealings

- 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.



Danger of burns from hot pump parts

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

**CAUTION**

→ Allow the pump to cool after operation.

- Always replace diaphragm and valve plates/sealings together to maintain the pump performance and safety.



Health hazard due to dangerous substances in the pump

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

**WARNING**

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

→ Clean pump with suitable measures.

Spare parts

Spare part*	Quantity
Diaphragm	1
Valve plates/sealings	2

Tab. 13

\*according to spare part list, Chapter 10

Tool and Material

Quantity	Tool/Material
1	Phillips screwdriver No. 1 (N 89, N 811, N 814)
1	Phillips screwdriver No. 2 ( N 815)
1	Felt-tip pen

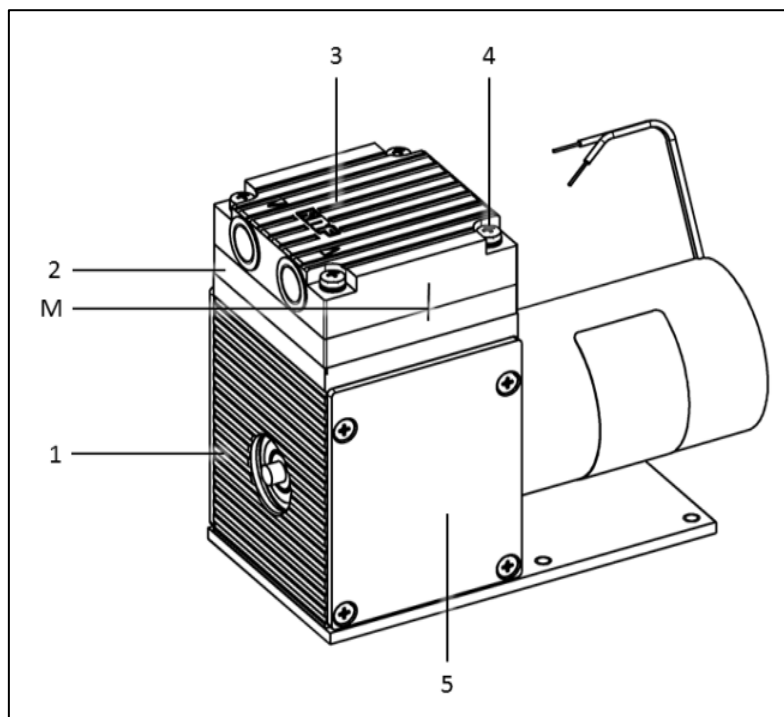
Tab. 14

\*according to accessories, Chapter 10



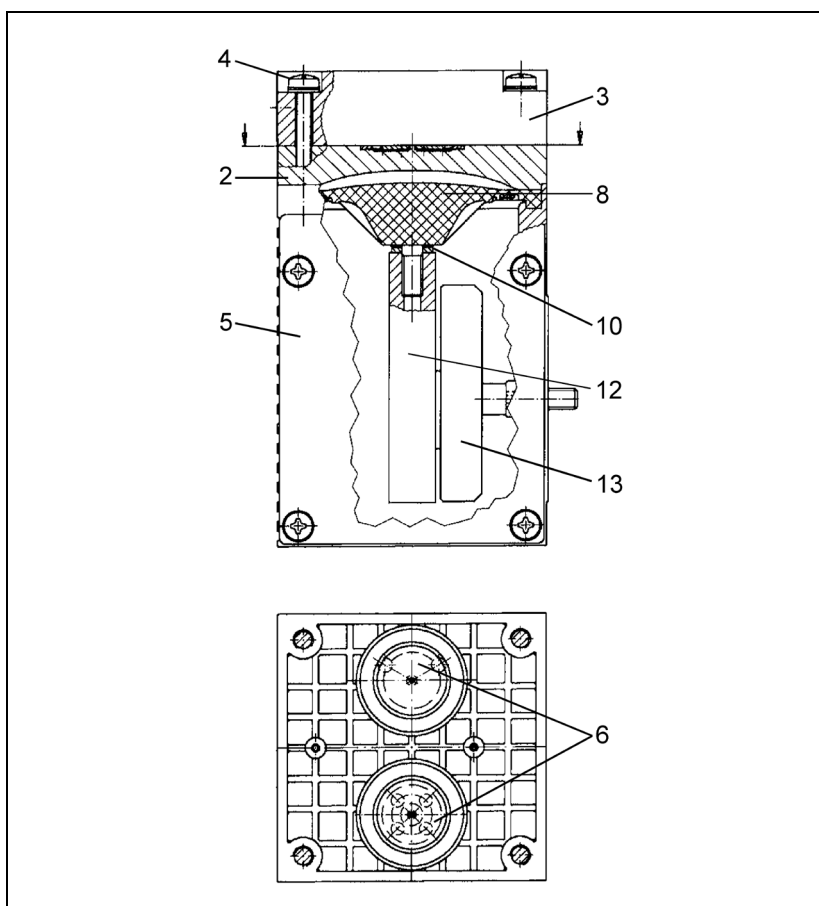
- 1 Housing
- 2 Intermediate plate
- 3 Head plate
- 4 Screw
- 5 Cover

**M** Mark



*Fig. 9: Design of the pump (for all pump types)*

- 6 Valve plate/sealing
- 8 Diaphragm
- 9 Diaphragm support (N 814/  
N 815)
- 10 Diaphragm spacer(s)
- 11 Disc spring (N 815)
- 12 Connection rod
- 13 Counter weight



*Fig. 10: Cross-section view N 89/811*

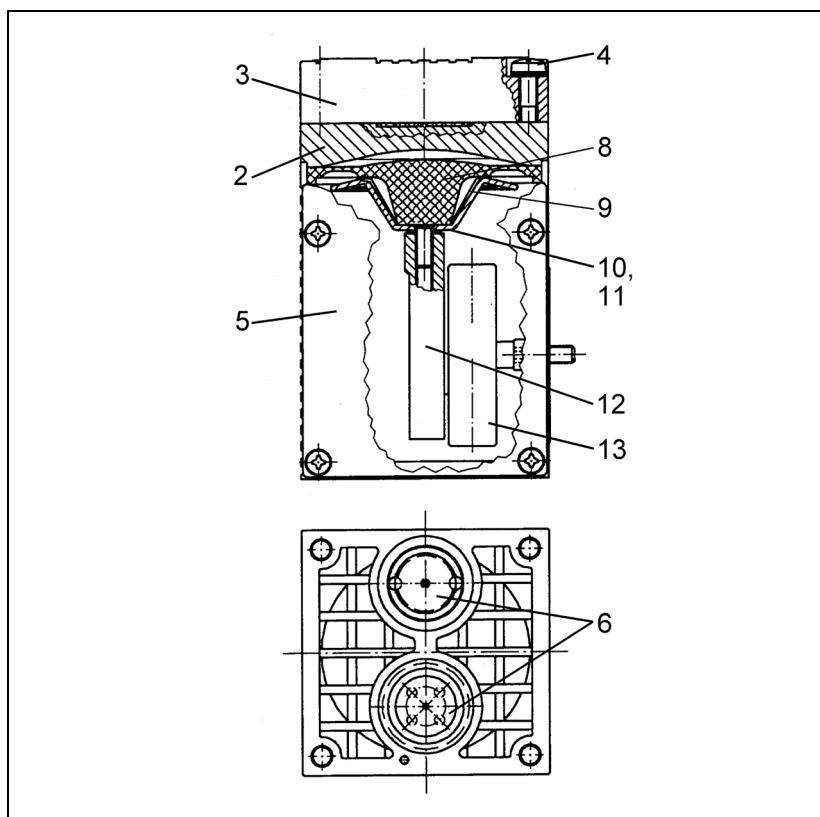


Fig. 11: Cross-section view N 815

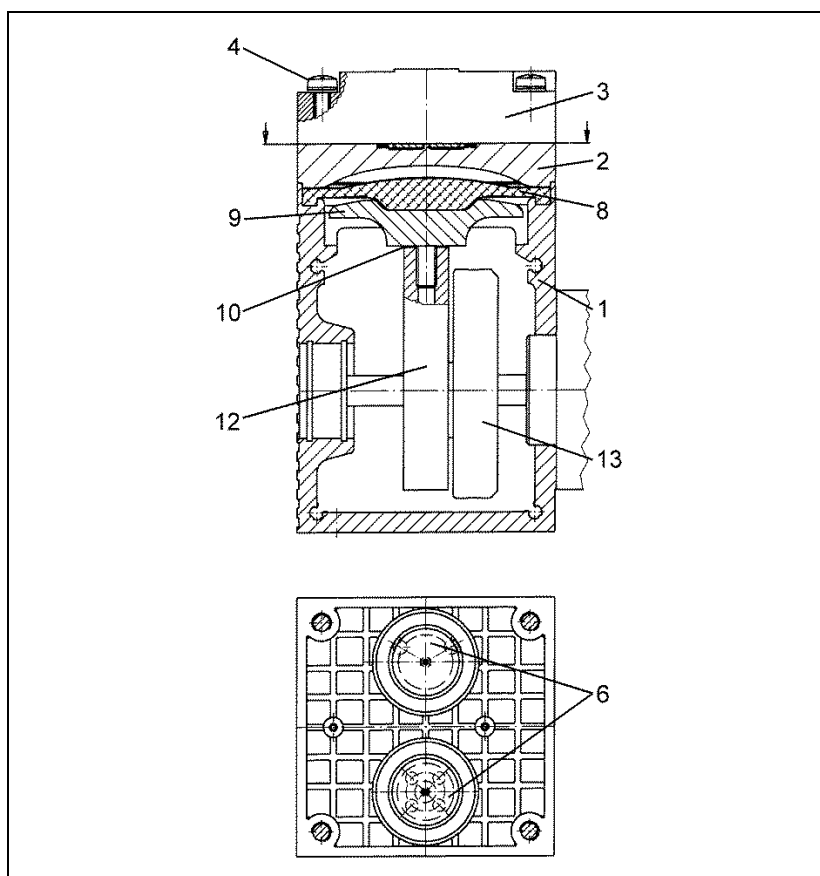


Fig. 12: Cross-section view N 814

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

- a) Remove pump head
- b) Change diaphragm
- c) Change valve plates/sealings
- d) Refit pump head

Proceed as follows (see Fig. 9 and Fig. 10 for type ranges N 89 / N 811, Fig. 9 and Fig. 12 for type ranges N 814, or Fig. 9 and Fig. 11 for type range N 815):

#### **a) Remove pump head**

1. Make a mark (**M**) on the head plate (**3**), Intermediate plate (**2**) and housing (**1**). This helps avoid incorrect assembly later.
2. Undo the 4 screws (**4**) in the head plate and lift the head plate with the intermediate plate off the pump housing.
3. Only for models with dc models with dc motors (o cooling fan): Remove cover (**5**) from pump housing after loosening the four screws.
  - On these models, which have no fan, where reference is made to turning or holding the cooling fan, the necessary operations must be carried out by turning or holding the counterweight (**13**).

#### **b) Change diaphragm**

1. Turn the fan to bring the diaphragm (**8**) to top dead center.
2. Lift the edge of the diaphragm and, gripping it on opposite sides, unscrew it by turning anti-clockwise.
3. Type ranges N 89/ N 811:  
Take the diaphragm spacer(s) (**10**) off the threaded portion of the diaphragm and retain them.  
  
Type range N 814:  
Take the diaphragm support (**9**) and the diaphragm spacer(s) (**10**), off the threaded portion of the structured diaphragm and retain them.  
  
Type range N 815:  
Take the diaphragm support (**9**) and the diaphragm spacer(s) (**10**), and disc spring (**11**), off the threaded portion of the structured diaphragm and retain them.
4. Check that all parts are free from dirt and clean them if necessary (see Chapter 8.2. Cleaning).
5. Type ranges N 89/ N 811:  
Put the diaphragm spacer(s) (**10**) on the thread of the new diaphragm.

Type range N 814:

Put the diaphragm support **(9)**, and the diaphragm spacer(s) **(10)** on the thread of the new structured diaphragm.

Type range N 815:

Put the diaphragm support **(9)**, and the diaphragm spacer(s) **(10)**, and the disc spring **(11)**, in that order, on the thread of the new structured diaphragm.

The concave side of the disc spring must be towards the structured diaphragm.

6. Turn the fan until the connecting rod **(12)** is at top dead center.
7. Screw the structured diaphragm, complete with diaphragm support (only type ranges N 814 and N 815), diaphragm spacer(s), and disc spring (only type range N 815) into the connecting rod (clockwise) and tighten it by hand.

#### **c) Change valve plates/sealings**

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

#### **d) Refit pump head**

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

If you have any questions about servicing call our technical adviser (contact data: see [www.knf.com](http://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. 15 and Tab. 16).

<b>Pump does not transfer</b>	
Cause	Fault remedy
For pumps with a thermal switch: Thermal switch has opened due to over-heating of motor.	<ul style="list-style-type: none"> <li>→ Disconnect pump from power supply.</li> <li>→ Allow pump to cool.</li> <li>→ Identify and eliminate cause of overheating.</li> </ul>
Connections or hoses are blocked.	<ul style="list-style-type: none"> <li>→ Check connections and hoses.</li> <li>→ Remove blockage.</li> </ul>
External valve is closed or filter is clogged.	<ul style="list-style-type: none"> <li>→ Check external valves and filters.</li> </ul>
Condensate has collected in the pump head.	<ul style="list-style-type: none"> <li>→ Detach the condensate source from the pump.</li> <li>→ Flush the pump with air (or with inert gas if required for safety reasons) under atmospheric conditions for a few minutes.</li> </ul>
Diaphragm or valve plates/sealings are worn or defective.	<ul style="list-style-type: none"> <li>→ Replace diaphragm and valve plates/sealings (see Chapter 8.3).</li> </ul>

Tab. 15

<b>Flow rate, pressure or vacuum too low</b>	
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.	<ul style="list-style-type: none"> <li>→ Detach the condensate source from the pump.</li> <li>→ Flush the pump with air (or with inert gas if required for safety reasons) under atmospheric conditions for a few minutes.</li> </ul>
	→
Cross-section of pneumatic hoses or connectors too narrow or restricted.	<ul style="list-style-type: none"> <li>→ Disconnect the pump from the system and determine output values.</li> <li>→ Remove restriction (e.g. valve) if necessary.</li> <li>→ If applicable, use larger-diameter hoses or connectors.</li> </ul>
Leaks in connections, hoses or pump head.	<ul style="list-style-type: none"> <li>→ Repair leaks.</li> </ul>
Pump head components are soiled.	<ul style="list-style-type: none"> <li>→ Clean head components.</li> </ul>
Diaphragm or valve plates/sealings are worn or defective.	<ul style="list-style-type: none"> <li>→ Replace diaphragm and valve plates/sealings (see Chapter 8.3).</li> </ul>

Tab. 16

**Fault cannot be rectified**

If you are unable to identify the cause of the problem, please send the pump to KNF customer service (contact data: see [www.knf.com](http://www.knf.com)).

1. Flush the pump with air (or with inert gas if required for safety reasons) under atmospheric conditions for a few minutes to remove dangerous or aggressive gases from the pump head (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

#### Pump range N 89

Pos. Nr.*	Spare part	Pump type	Order No.
(2)	Intermediate plate	N 89 KNE, N89 KNDC	028789
(2)	Intermediate plate	N 89 KTE, N89 KTDC	044408
(3)	Head plate		028791
(6)	Valve plate/sealing	N 89 KNE, N89 KNDC	113947
(6)	Valve plate/sealing	N 89 KTE, N89 KTDC	113950
(8)	Diaphragm	N 89 KNE, N89 KNDC	029231
(8)	Diaphragm	N 89 KTE, N89 KTDC	029232

Tab. 17

\*according to Fig. 9 and Fig. 10

#### Pump range N 811

Pos. Nr.*	Spare part	Pump type	Order No.
(2)	Intermediate plate	N 811 KNE, N811 KNDC	028789
(2)	Intermediate plate	N 811 KTE, N811 KTDC	044408
(3)	Head plate		028791
(6)	Valve plate/sealing	N 811 KNE, N811 KNDC	113947
(6)	Valve plate/sealing	N 811 KTE, N811 KTDC	113950
(8)	Diaphragm	N 811 KNE, N811 KNDC	029231
(8)	Diaphragm	N 811 KTE, N811 KTDC	029232

Tab. 18

\*according to Fig. 9 and Fig. 10

#### Pump range N 814

Pos. Nr.*	Spare part	Pump type	Order No.
(2)	Intermediate plate		043259
(3)	Head plate		029148
(6)	Valve plate/sealing	N 814 KNE, N814 KNDC	113949
(6)	Valve plate/sealing	N 814 KTE, N814 KTDC	113950
(8)	Diaphragm	N 814 KNE, N814 KNDC	043262
(8)	Diaphragm	N 814 KTE, N814 KTDC	043261

Tab. 19

\*according to Fig. 9 and Fig. 12

**Pump range N 815**

Pos. Nr.*	Spare part	Pump type	Order No.
(2)	Intermediate plate	N 815 KNE, N815 KNDC	024970
(2)	Intermediate plate	N 815 KTE, N815 KTDC	044534
(3)	Head plate		024986
(6)	Valve plate/sealing	N 815 KNE, N815 KNDC	059267
(6)	Valve plate/sealing	N 815 KTE, N815 KTDC	057172
(8)	Diaphragm	N 815 KNE, N815 KNDC	024489
(8)	Diaphragm	N 815 KTE, N815 KTDC	024490
(9)	Diaphragm support		025064

Tab. 20

\*according to Fig. 9 and Fig. 11

**10.2. Accessories**

N 89

N811

N 814

Accessories	Order No.
Filter/Silencer	000346
Hose connection PA, G 1/8	000360

Tab. 21

N 815

Accessories	Order No.
Silencer G 1/8	000346
Hose connection PA, G 1/8	000360
90° Hose connection PA, G 1/8	001858
Hose connection PVDF, G 1/8	014052

Tab. 22



## 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](http://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](http://www.knf.com)).





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