

## Micro Diaphragm Gas Sampling Pumps

NMP 015.1.2 KN L

NMP 015.1.2 KT L

NMP 015.1.2 KN B

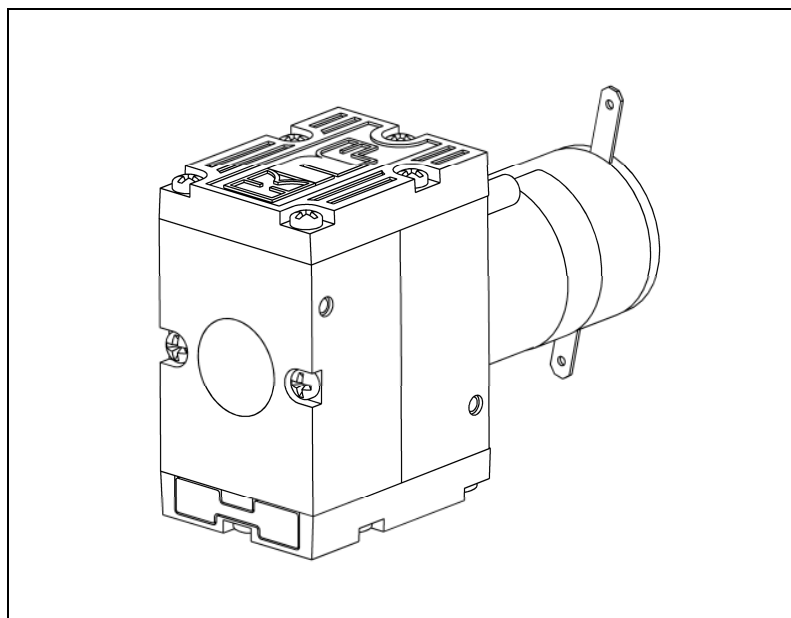
NMP 015.1.2 KT B

NMP 015.1.2 KN S

NMP 015.1.2 KN M

### Operating and Installation Instructions

Read and observe these  
Operating and Installation  
Instructions!



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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 pumps

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 warning 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.

**i** This symbol refers to important information.

## 2. Use

### 2.1. Proper use

The pumps are exclusively intended for transferring gases.

#### Owner's responsibility

Operating parameters 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.

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, pump housing, diaphragms, 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 pumping dusts.

The pumps are not suitable for pumping vapors and liquids.

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 sections 5. *Installation and connection*, and 6. *Operation*.

The pumps are built according to the generally recognized rules of technology and in accordance with the occupational safety and accident prevention regulations. Nevertheless, dangers can result during its 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 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.

Personnel	<p>Make sure that only trained and instructed personnel or specially trained personnel work on the pump. This especially applies to assembly, connection and servicing work.</p> <p>Make sure that the personnel has read and understood the operating instructions, and in particular the "Safety" chapter.</p>
Working in a safety-conscious manner	Observe the accident prevention and safety regulations when performing any work on the pump and during operation.
Handling dangerous media	When transferring dangerous media, observe the safety regulations when handling these media.
Handling combustible media	<p>Be aware that the pumps are not designed to be explosion-proof.</p> <p>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.</p> <p>Note that the temperature of the medium increases when the pump compresses the medium.</p> <p>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).</p> <p>If necessary, consider any external sources of energy, such as radiation, that may add heat to the medium.</p> <p>In case of doubt, consult the KNF customer service.</p>
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.
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. / 1.5.8. / 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 pumps conform to the Directive 2011/65/EU (RoHS2).

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

The following harmonized standards have been used:

NMP 015.1.2 KN L NMP 015.1.2 KT L	NMP 015.1.2 KN M	NMP 015.1.2 KN B NMP 015.1.2 KT B
DIN EN 55022	DIN EN 55014-1	DIN EN 55014-1/2
DIN EN 61000-4-2/3/4/5/6/8		DIN EN 61000-6-1/3

*Tab. 2*

Customer service and repairs      Only have repairs to the pump carried out by the KNF Customer Service responsible.

## 4. Technical Data

### Pump materials

NMP 015.1.2 KN

Assembly	Material
Head plate; housing	PEEK
Valve plate	EPDM
Diaphragm	EPDM
Sealing of housing	FPM

Tab. 3

NMP 015.1.2 KT

Assembly	Material
Head plate; housing	PEEK
Valve plate	FFPM
Diaphragm	PTFE
Sealing of housing	FPM

Tab. 4

### Pneumatic values

NMP 015.1.2 KN

Parameter	Value
Max. permissible operating pressure [bar g]	0.6
Ultimate vacuum [mbar abs.]	600
Delivery rate at atm. pressure [l/min]*	2.1

Tab. 5

\*Liters in standard state (1,013 mbar)

NMP 015.1.2 KT

Parameter	Value
Max. permissible operating pressure [bar g]	0.55
Ultimate vacuum [mbar abs.]	650
Delivery rate at atm. pressure [l/min]*	1.5

Tab. 6

\*Liters in standard state (1,013 mbar)

### Electrical data

Parameter	Value
Electrical data	See type plate

Tab. 7

**Other parameters**

Parameter	Values
Pneumatic connections NMP 015.1.2 L NMP 015.1.2 S NMP 015.1.2 M	For tube ID 3 mm
Pneumatic connections NMP 015.1.2 B	For tube ID 3 x 1 mm
Permissible ambient temperature	+ 5 °C to + 40 °C
Permissible media temperature	+ 5 °C to + 40 °C

*Tab. 8*

## 5. Design and function

### Design

- 1 Inlet
- 2 Outlet
- 3 Pump head
- 4 Motor

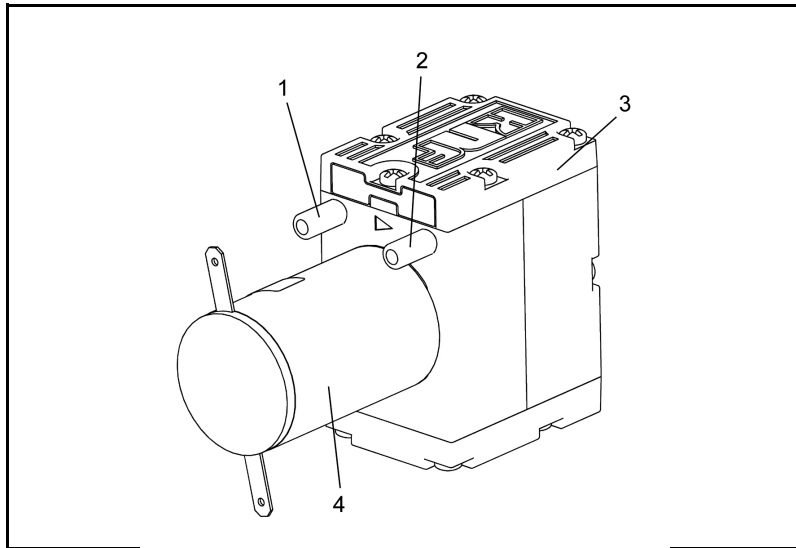


Fig. 1: Diaphragm pump NMP 015.1.2 KN L

### Function

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

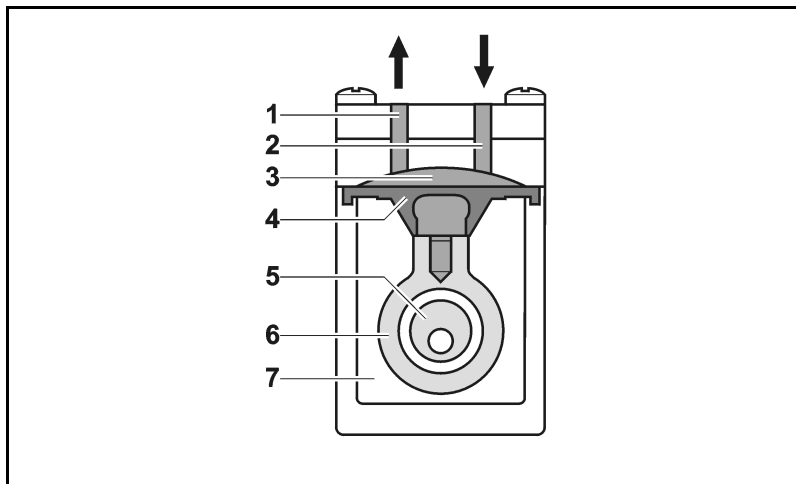


Fig. 2: Pump head

The pumps transfer, compress and evacuate gases.

The elastic diaphragm (4) is moved up and down by the eccentric (5) and the connecting 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 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.
- See the data sheet for the mounting dimensions.
- Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water.
- 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.

### 6.2. Electrical connection

- Only have the pump connected by an authorized specialist.
- Only have the pump connected when the power supply is disconnected.
- In the electrical installation, arrangements (complying with EN 60335-1) must be made for disconnecting the pump motor from the electrical supply.

#### Connecting pump

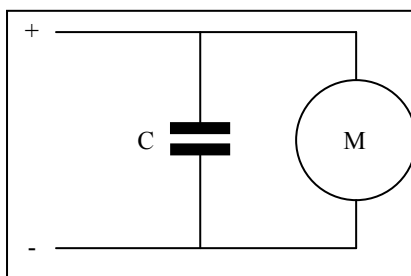
1. Compare the supply data with the data on the motor-plate. For operating current see type plate.
  - i** The voltage must not vary by more than + 10% and - 10% from that shown on the type-plate.
2. Motors with 2 wires (standard configuration):
  - Connect the positive and negative pole.
  - i** Note the proper polarity (see marking on the motor). Incorrect lead connection will damage motor.
3. Motors with 4 wires:
  - Connect wires:
    - red: V+
    - blue: Ground
    - white: Vctrl 0-5 V DC
    - green: Frequency output (6 pulses per revolution)
  - i** Note the proper polarity (see marking on the motor). Incorrect lead connection will damage motor.

**EMC-compatible Installation (for NMP 015.1.2 K\_ B)**

In order to remove the electrical interference according to EN 55014-1:1993 + A1:1997 all pumps with brushless DC motor must be equipped with an additional electronic circuit. This electronic circuit has to be installed as close to the motor as possible.

The supplemental circuit must be structured according to the following electrical diagram and the components defined therein in order to achieve the required level of suppression.

C: Capacitor 68  $\mu$ F



*Fig. 3: Electrical diagram of the supplemental circuit*

### 6.3. Pneumatic connection

- |                      |  |
|----------------------|--|
| 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.                    |

#### Connecting pump

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

1. Remove the protective plugs from the hose connectors.
2. Connect the suction line and pressure line.
3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

## 7. 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 section 2.1).

Make sure the pumps are not used improperly (see section 2.2).

Observe the safety precautions (see Chapter 3).



**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 8. 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.

**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 (see front page for telephone number).

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

Switching pump on **i** The pump may not start up against pressure or vacuum during switch-on. This also applies in operation following a brief power failure.

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

Inspection → Regularly inspect the pump for external damage or leaks.

## 8. Troubleshooting

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

Check the pump (see Tab. 9 and 10).

<b>Pump does not transfer</b>	
Cause	Fault remedy
Connections or lines blocked.	<ul style="list-style-type: none"> <li>➔ Check connections and lines.</li> <li>➔ Remove blockage.</li> </ul>
External valve is closed or filter is clogged.	➔ Check external valves and filters.
Condensate has collected in pump head.	➔ Install pump at highest point in system.
Diaphragm or valve plates are worn.	➔ Replace pump.

Tab. 9

<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 pump head.	➔ 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.	<ul style="list-style-type: none"> <li>➔ Disconnect pump from system to determine output values.</li> <li>➔ Eliminate throttling (e.g. valve) if necessary.</li> <li>➔ Use lines or connection parts with larger cross section if necessary.</li> </ul>
Leaks occur on connections, lines or pump head.	➔ Eliminate leaks.
Connections or lines completely or partially jammed.	<ul style="list-style-type: none"> <li>➔ Check connections and lines.</li> <li>➔ Remove the jamming parts and particles.</li> </ul>
Head parts are soiled.	➔ Clean head components.
Diaphragm or valve plates are worn.	➔ Replace pump.

Tab. 10

### Fault cannot be rectified

If you are unable to determine any of the specified causes, send the pump to KNF Customer Service (see last page for the address).

1. Flush the pump to free the pump head of dangerous or aggressive gases.
2. Remove the pump
3. Clean the pump

4. Send the pump, together with completed Health and Safety Clearance and Decontamination Form (Chapter 10), to KNF stating the nature of the transferred medium.

## 9. Returns

Pumps and systems used in laboratories and process-based industries are exposed to a wide variety of conditions. This means that the components contacting pumped media could become contaminated by toxic, radioactive, or otherwise hazardous substances.

For this reason, customers who send any pumps or systems back to KNF must submit a Health and safety clearance and decontamination form in order to avoid a hazardous situation for KNF employees. This Health and safety clearance and decontamination form provides the following information, among other things:

- physiological safety
- whether medium-contacting parts have been cleaned
- whether the equipment has been decontaminated
- media that have been pumped or used

and must declare physiological safety. To ensure worker safety, work may not be started on pumps or systems without a signed Health and safety clearance and decontamination form.

For optimal processing of a return, a copy of this declaration should be sent in advance via e-mail, regular mail, or fax to KNF Customer Service (refer to final page for address). In order to avoid endangering employees who open the shipment's packaging, despite any residual hazards, the original version of the Health and safety clearance and decontamination form must accompany the delivery receipt on the outside of the packing.

The template for the Health and safety clearance and decontamination form is included with these operating instructions and may also be downloaded from the KNF website.

The customer must specify the device type(s) and serial number(s) in the Health and safety clearance and decontamination form in order to provide for the unambiguous assignment of the Declaration to the device that is sent to KNF.

In addition to the customer's declaration of physiological safety, information about operating conditions and the customer's application are also of importance to ensure that the return shipment is handled appropriately. Therefore, the Health and safety clearance and decontamination form requests this information as well.











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