

Labor

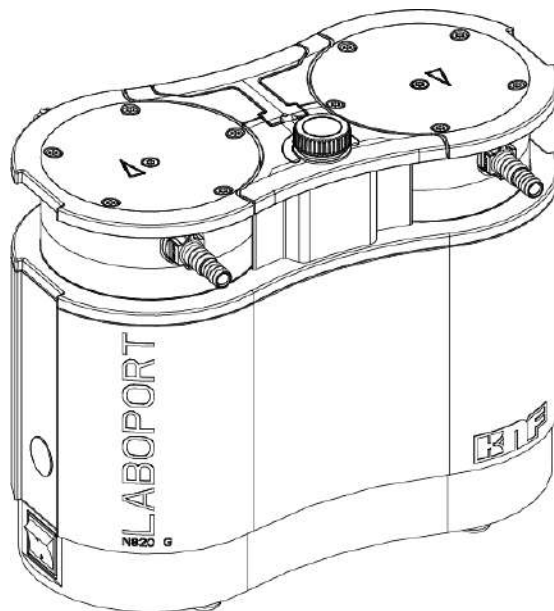
N820.18 / N840.18

**TRANSLATION OF ORIGINAL
OPERATING INSTRUCTION
ENGLISH**

EN

LABOPORT®

CHEMICALLY- RESISTANT LABORATORY PUMP



Notice!

Before operating the pump and accessories, read and observe the operating and installation instructions as well as the safety information!

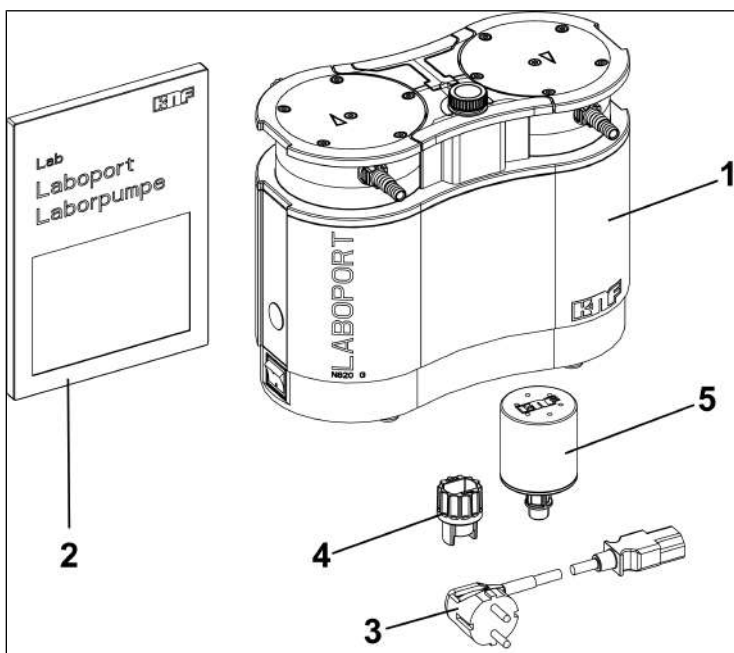
Index

1	Scope of delivery.....	4
2	About this document	5
2.1	Using the operating instructions.....	5
2.2	Exclusion of liability.....	5
2.3	Symbols and markings.....	6
2.4	List of abbreviations	8
3	Safety.....	9
3.1	Personnel and target group	9
3.2	Responsibility of the operator	10
3.3	Working in a safety conscious manner	10
3.4	Operating conditions	11
3.5	Media	11
3.6	Use.....	12
3.7	Directives and standards	13
3.8	Customer service and repair.....	14
3.9	Disposal	14
4	Explosion protection.....	16
4.1	Using for transferring explosive atmospheres.....	16
4.2	Information on the Ex-designation	17
4.3	Explanations of the explosion protection designation	18
5	Technical data.....	24
	Technical data.....	24
6	Product description	27
6.1	Gas ballast	29
7	Transport.....	31
	General	31
8	Setup and connection	33
8.1	Preparing for commissioning	34
8.2	Perform commissioning	35
9	Operation	39
9.1	Information on switching the pump on and off	39
10	Servicing	42
10.1	Servicing schedule.....	42
10.2	Cleaning.....	44
10.3	Replace diaphragm, valve plates/seals and O-rings.....	45

11 Spare parts and accessories.....	52
11.1 Spare parts	52
11.2 Accessories.....	53
12 Troubleshooting	54
13 Returns.....	58
14 Index	59

1 Scope of delivery

- LABOPORT® N820/840 (1)
- Key for hose connector (WAF 14) (4)
- Power cable (3)
- Silencer (5)
- Operating instructions (2)
- QuickStart
- Safety brochure



Unpacking the pump

1. Inspect the pump and the included accessories for transport damage after unpacking.
2. If the packaging is damaged, inform the responsible forwarding agent so that a damage report can be prepared. For further information, read Chapter 7 *Transport* [► 31].

2 About this document

2.1 Using the operating instructions

The operating instructions are part of the pump.

- In the event of uncertainties with regard to the content of the operating instructions, please contact the manufacturer (contact data: see www.knf.com). Please have the type and serial number of the pump ready.
- Read the operating instructions before you commission the pump.
- Only pass on the full and unchanged operating instructions to any subsequent owner.
- Keep the operating instructions within reach at all times.

2.2 Exclusion of liability

The manufacturer assumes no liability for damages and malfunctions resulting from failure to observe the operating instructions.

The manufacturer assumes no liability for damages and malfunctions resulting from changes or modifications to the device and improper handling.

The manufacturer assumes no liability for damages and malfunctions resulting from impermissible spare parts and accessories.

2.3 Symbols and markings

Warning notice



A notice that warns you of danger is located here.

Possible consequences of a failure to observe the warning notice 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 injury or serious damage will result.
WARNING	warns of possible danger	Death, serious injury or serious damage is possible.
CAUTION	warns of a possibly dangerous situation	Minor injury or damage is possible.
NOTICE	Warns of possible damage	Damage is possible.

Tab.1: Danger levels






Other notices and symbols

→ An activity to be carried out is specified here (a step).

1. The first step of an activity to be carried out is specified here.
Other sequentially numbered steps follow.

i This symbol indicates important information.

Explanation of pictograms

Pictogram	Meaning
	General warning symbol
	Warning of hot surface
	Warning of electrical voltage
	Warning of explosive atmosphere
	Warning of poisonous substances
	ESD protected area
	Observe the operating instructions
	General mandatory sign
	Unplug mains plug
	Use foot protection
	Use hand protection
	WEEE Symbol for separate tracking of electrical and electronic devices. The use of this symbol means that this product must be disposed of with normal household waste.
	Recycling

Tab.2: Explanation of pictograms

2.4 List of abbreviations

Abbreviation	Term
PTFE	Polytetrafluoroethylene
FFPM	Perfluoro rubber
PVDF	Polyvinylidene fluoride
PP	Polypropylene
FPM	Fluororubber
FEP	Fluoroethylene propylene
Tab.	Table
Fig.	Figure
a/o.	And/or
e.g.	For example
Perm.	Permissible
et al.	And the like
opt.	If necessary
Max.	Maximum
Min.	Minimum

3 Safety

i Observe the safety notices in Chapters 8 *Setup and connection* [► 33] and 9 *Operation* [► 39].

3.1 Personnel and target group

Personnel Ensure that only personnel who have received the appropriate training and instruction carry out work on the pumps. This applies in particular to commissioning and maintenance work.

Make sure that the personnel have read and understood the operating instructions, particularly the chapter on safety.

Target group

Target group	Definition
User	Laboratory worker
Specialized personnel	Specialized personnel are personnel who - have relevant professional training in the field covered in the particular section of text; - have current knowledge of the field covered in the particular section of text.

Tab.3: Target group

Who-does-what matrix

Lifecycle phase	User	Specialized personnel
Transport		X
Setup	X	X
Preparing for commissioning	X	X
Commissioning	X	X
Operation	X	X
Servicing		X
Troubleshooting		X
Disposal		X

Tab.4: Who-does-what matrix

3.2 Responsibility of the operator

The pumps are produced in accordance with the generally recognized rules of engineering, as well as the occupational health, safety and accident prevention regulations. Nevertheless, dangers can arise during their use that lead to injuries to the user or third parties or to damage to the pump or other property.

Make sure that no hazardous situation, physical harm or impairment of the pump can occur.

Operating
parameter

Only operate and install the pump under the operating parameters and operating conditions described in Chapters 3.4 *Operating conditions* [► 11] and 5 *Technical data* [► 24].

3.3 Working in a safety conscious manner

Observe the regulations on accident prevention and safety during all work on the pumps and during operation.

Avoid contact with the pump heads and housing parts because the pump heats up during operation.

Make sure that the pump has been disconnected from the mains and is de-energized while work is carried out on it.

When connecting the pump to the electrical mains, observe the corresponding safety rules.

Do not expose any body parts to the vacuum.

Ensure that no hazards arise from gas flowing when gas connections are open, from the effects of noise or from hot, corrosive, dangerous and environmentally hazardous gases.

Ensure that EMC-compliant installation of the pump is guaranteed at all times, and that no hazardous situations can arise therefrom.

Avoid the release of hazardous, toxic, explosive, corrosive, harmful or environmentally hazardous gases or vapors, e.g. by using suitable laboratory equipment with fume cupboard and ventilation control.

3.4 Operating conditions

Do not use the pumps if they are not in technically perfect working order; pumps must be operated in accordance with their intended use, with attention to safety and hazard considerations, and in conformance with the operating instructions at all times.

The pumps must only be operated in the fully assembled and supplied condition.

Make sure that the installation location is dry and that the pump is protected from rain, splash water, gushing water, dripping water and other contamination.

Check the tightness of the connections between the pipes of the application and the pump (or the connection of the pump) at regular intervals. Leaky connections carry the risk of releasing dangerous gases and vapors from the pump system.

The components that are to be connected to the pumps must be designed according to the pneumatic data of the pumps.

3.5 Media

Requirements of pumped media	<p>Before transferring a medium, check whether the medium can be transferred danger-free in the specific application.</p> <p>Take note of any change in the state of matter (condensation, crystallization).</p> <p>Before using a medium, check the compatibility of the media-contacting components (see 5 <i>Technical data</i> [▶ 24]) with the medium.</p> <p>Only transfer gases that remain stable under the pressures and temperatures that arise in the pump.</p>
Handling of hazardous media	<p>Upon breakage of the diaphragm and/or leaks, the transferred medium mixes with the air in the surroundings and/or in the pump housing. Make sure that a dangerous situation cannot arise as a result.</p> <p>When pumping hazardous media, follow the safety regulations that apply for working with these media.</p>
Working with combustible media and explosive atmosphere	<p>Note that the pump is only suitable for pumping explosive atmosphere within the limits of its designation (see type plate), and must not be set up in potentially explosive areas.</p>

Make certain that the temperature of the medium is always sufficiently below the ignition temperature of the medium so as to prevent ignition or explosion. This also applies for abnormal operating situations.

At the same time, note that the temperature of the medium rises as the pump compresses the medium.

Therefore, make certain that the temperature of the medium also remains sufficiently below the ignition temperature of the medium even when it is compressed to the maximum permissible operating pressure of the vacuum system. The maximum permissible operating pressure of the vacuum system is given in Chapter 5 *Technical data* [► 24].

Make certain that the permissible ambient temperature (see 5 *Technical data* [► 24]) is not exceeded.

Where applicable, also take into account external energy sources (such as radiated heat sources) that might heat the medium further.

In case of doubt, contact KNF Customer Service.

3.6 Use

3.6.1 Proper use

The pumps are intended exclusively for delivering gases and vapors.

The pumps are intended exclusively for operation in indoor areas and in non-explosive atmospheres. The Ex designation is valid only for the pumping chamber (media-contacting area).

i Vacuum systems with ATEX designation do not always conform to the regulations governing potentially explosive atmospheres in countries outside the EU.

3.6.2 Foreseeable misuse

The pumps must not be operated in explosive atmospheres.

The pumps are not suitable for use below ground.

The pumps are not suitable for transferring the following:

- Dusts

- Liquids
- Aerosols
- Biological and microbiological substances
- Fuels
- Explosives
- Fibers
- Oxidizing agents
- Foodstuffs.

As standard, the pumps must not be used for simultaneous generation of a vacuum and positive pressure.

No overpressure may be applied to the suction side of the pump.

The pump must not be used if reactive explosive, or otherwise dangerous mixtures can occur (e.g. with the medium) when the gas ballast valve of the pump is open.

3.7 Directives and standards

EU/EC
Directives /
Standards



The pumps conform the following directives/ordinances:

- 2011/65/EU (RoHS)
- 2014/30/EU (EMC)
- 2006/42/EC (MD)



The part of the pump that comes into contact with the media complies with Directive 2014/34/EU (ATEX).

- UK Regulation S.I. 2008/1597 Supply of Machinery (Safety)
- UK Regulation S.I. 2016/1091 Electromagnetic Compatibility
- UK Regulation S.I. 2012/3032 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

The following harmonized/listed standards are met:

- EN 1012-2
- EN ISO 12100

- EN 61010-1
- EN 61326-1

The part of the pumps that comes into contact with the media satisfies the following harmonized standards:

- EN ISO 80079-36
- EN ISO 80079-37
- EN 1127-1



The pumps are inspected by TÜV according to:

- UL 61010-1
- CSA-C22.2 No. 61010-1

Certificate: No. U8 045055 0029 Rev. 00

Per IEC 664, the pumps comply with:

- Overvoltage category II
- Degree of soiling 2

3.8 Customer service and repair

Customer service and repairs

The pumps are maintenance-free. However, KNF recommends that the pumps be checked regularly for noticeable changes in noise and vibration.

Have repairs to the pumps carried out solely by the KNF customer service personnel responsible for such tasks.

Housings with electrically live components may only be opened by specialist personnel.

Use only genuine spare parts from KNF when performing servicing work.

3.9 Disposal

Environmental protection
WEEE

Store the pump and all accessories in accordance with the environmental provisions. Observe the national and international regulations. This applies in particular to parts that are contaminated with toxic substances.



If you no longer need your packaging materials (e.g. for return shipment or other transport of the vacuum system), dispose of them in an environmentally friendly manner.





This product is marked in conformance with the EU directive on the disposal of waste electrical and electronic equipment (WEEE). Old devices must not be disposed of with household waste. Proper disposal and recycling help to protect natural resources and the environment. The end user is responsible for disposing of old devices according to the national and international regulations. Alternatively, KNF products (old devices) may also be returned to KNF for a fee (see chapter Returns).

4 Explosion protection

4.1 Using for transferring explosive atmospheres

To transfer explosive atmospheres, only use pumps of the appropriate device category and temperature class.

These pumps have the following EU explosion protection designations:

Designation	Description
	Symbol for explosion-protected devices
II	Device group (see 4.3.1 <i>Device groups</i> [► 18])
2/-G	Device category (see 4.3.2 <i>Device categories for gas</i> [► 19])
Ex	Symbol indicates that the device satisfies one or more ignition protection types.
h	Symbol for ignition protection type (see 4.3.5 <i>Ignition protection type</i> [► 21])
IIB + H2	Explosion groups (see 4.3.3 <i>Explosion groups</i> [► 20])
T3	Temperature class (see 4.3.4 <i>Temperature classes</i> [► 21])
Gb	Equipment protection level (See Chapter 4.3.6 <i>Equipment protection level for gas</i> [► 22])
	Special operating conditions (See Chapter Special operating conditions)
Internal atmosphere only	Special conditions (see 4.3.7 <i>Special operating conditions</i> [► 22])

Tab.5: Explosion protection designation

An ignition hazard assessment in accordance with standards DIN EN ISO 80079-36 and DIN EN ISO 80079-37 was performed for the pumps.

The explosion protection designation can also be found at the following location:

- Pump type plate

4.2 Information on the Ex-designation

This KNF pump is designated with the following device designation in accordance with the latest explosion protection directive. The designation is only valid for the pumping chamber (area that comes into contact with the medium) of the pump:

Ex II 2/-G Ex h IIB+H2 T3 Gb internal atmosphere only

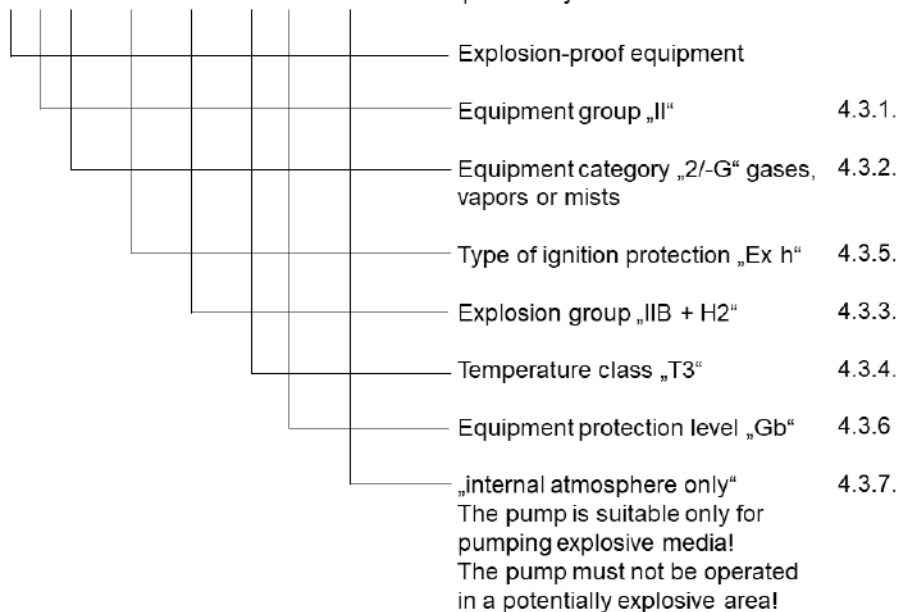


Fig. 1: Ex-designation of the pumps

Vacuum pumps of category "2/-G" are designed for transferring gases, vapors or mists for which it is to be expected that an explosive atmosphere forms occasionally.

The devices are to be arranged so that they cannot be mechanically damaged from the outside.

No changes may be made to the pumps. After replacing a wear part, the original function of the pump must be tested by achieving the specified ultimate vacuum (see operating instructions, Chapter 10 Servicing [▶ 42]).

4.3 Explanations of the explosion protection designation

4.3.1 Device groups

- Device group I Device group I applies for devices that are used in underground plants of mines as well as their underground systems that could be endangered by methane and/or combustible dusts.
- Device group II Device group II applies for devices that are used in other areas that could be endangered by an explosive atmosphere.

4.3.2 Device categories for gas

The device category describes the frequency and the duration of the occurrence of explosive atmospheres during operation.

Device category	Description
1G	Devices of this category are designed for use in areas in which an explosive atmosphere consisting of a mixture of air and gases, vapors or mists is present constantly or for long periods of time or often.
1D	Devices of this category are designed for use in areas in which an explosive atmosphere consisting of a dust/air mixture is present constantly or for long periods of time or often.
2G	Devices of this category are designed for use in areas in which it is to be expected that an explosive atmosphere consisting of gases, vapors or mists forms occasionally.
2/2G	Devices that extract from zone 1 and are designed for use in areas in which it is to be expected that an explosive atmosphere consisting of gases, vapors or mists forms occasionally.
2/-G	Devices that extract from zone 1 but are not designed for installation in a potentially explosive atmosphere (zone).
2D	Devices of this category are designed for use in areas in which it is to be expected that an explosive atmosphere consisting of a dust/air mixture forms occasionally.
3G	Devices of this category are designed for uses in areas in which it is to be expected that an explosive atmosphere resulting from gases, vapors or mists occurs, though in all likelihood occurs only seldom and for a very short length of time.
3/-G	Devices that extract from zone 2 but are not designed for installation in a potentially explosive atmosphere (zone).
3D	Devices of this category are designed for uses in areas in which it is to be expected that an explosive atmosphere resulting from stirred-up dust occurs, though in all likelihood occurs only seldom and for a very short length of time.

Tab.6:

4.3.3 Explosion groups

Combustible gases and vapors are classified according to explosion groups (I, IIA, IIB and IIC) and temperature classes. The following table shows the classification of the most common combustible gases and vapors.

	T1	T2	T3	T4	T5	T6
I	Methane	—	—	—	—	—
IIA	Acetone Ethane Ethyl acetate Ammonia Ethyl chloride Benzene Acetic acid Carbon monoxide Methane Methanol Methyl chloride Naphthalene Phenol Propane Toluene	i-amyl acetate n-butane n-butyl alcohol Cyclohexanone 1,2-dichloroethane Acetic anhydride	Gasoline Diesel fuel Jet fuel Heating oils n-hexane	Acetaldehyde	—	—
IIB	Town gas	Ethylene Ethyl alcohol	Hydrogen sulfide	Ethyl ether	—	—
IIC	Hydrogen	Acetylene	—	—	—	Carbon disulfide

Tab.7:

The classification of gases and vapors into groups with respect to explosion group and temperature class applies for the transferred medium.

Transferred
medium

The device must only be used to transfer gases and vapors that belong to the respective explosion group and the corresponding temperature class (or lower), (see designation on the type plate) or which are not explosive and not combustible.

- Surroundings of the device The device must not be set up in potentially explosive atmospheres. It is only suitable for the transfer of explosive atmosphere corresponding to its designation (see type plate).

4.3.4 Temperature classes

- Maximum surface temperature The maximum surface temperature is the highest temperature reached by a surface of the device under the most unfavorable conditions.
- Ignition temperature The maximum surface temperature of the device must always be lower than the lowest ignition temperature of the gas/air or vapor/air mixture in which it is used.
- Temperature class The maximum surface temperature is derived from the construction of the device and is stated as the temperature class.

Temperature class	Max. surface temperature [°C]	Ignition temperature [°C]
T1	450	> 450
T2	300	> 300
T3	200	> 200
T4	135	> 135
T5	100	> 100
T6	85	> 85

Tab.8:

4.3.5 Ignition protection type

Designation	Description
h	Constructional safety "c"
h	Ignition source monitoring "b"
h	Liquid immersion "k"

Tab.9:

An ignition hazard evaluation according to the standards DIN EN ISO 80079-36 and DIN EN ISO 80079-37 was carried out for the devices. The protective goals were reached by applying the ignition protection type of constructional safety "c".

4.3.6 Equipment protection level for gas

The equipment protection level describes the frequency and the duration of the occurrence of explosive atmospheres in an area.

Equipment protection level	Description*	Constructional safety
Ga	Devices with very high protection level for use in potentially explosive atmospheres. With these devices, there is no risk of ignition during normal operation or in the event of foreseeable or infrequent faults/malfunctions.	Very high
Gb	Devices with high protection level for use in potentially explosive atmospheres in which there is no risk of ignition during normal operation or in the event of foreseeable or infrequent faults/malfunctions.	High
Gc	Device with increased protection level for use in potentially explosive atmospheres. There is no risk of ignition during normal operation. The devices have a number of additional protection measures which ensure that, in the event of commonly foreseeable faults in the device, no danger of ignition exists.	Increased

Tab.10: *According to ISO 80079-36

4.3.7 Special operating conditions

Designation	Description
Internal atmosphere only	Special operating conditions

Additional conditions for the devices:

- Do not set up the device outdoors. Commissioning may only be performed with suitable weather- and corrosion-protection paneling.
- Do not set up the device in potentially explosive atmospheres. It is only suitable for the transfer of explosive atmosphere corresponding to its designation (see type plate).

- Set the device up in such a way that it cannot be damaged from outside.
- Set the device up in such a way that it is not exposed to UV radiation.

5 Technical data

Technical data

Materials of media-contacting components

Assembly	Material
Pump head	Modified PTFE
Diaphragm	PTFE-coated
Valve	FFPM
Connection	PTFE/FFPM
Hose connector	PVDF/FFPM
Gas ballast	PTFE/FFPM

Tab.11: Materials of media-contacting components

Pneumatic data

N820G

Parameter	Value
Max. permissible operating pressure [bar rel*]	0.1
Ultimate vacuum [mbar abs.]	
At min. speed:	
Gas ballast closed	≤ 6
Gas ballast open	≤ 17
At max. speed:	
Gas ballast closed	≤ 8
Gas ballast open	≤ 15
Flow rate at atm. pressure [l/min]**	
At min. speed:	10 ± 10%
At max. speed:	20 ± 10%

Tab.12: Pneumatic data N820G

*Bar rel related to 1013 hPa

**Liters in the standard state based on ISO 8778 and ISO 21360-1/2 (1013 hPa, 20°C)

N840G

Parameter	Value
Max. permissible operating pressure [bar rel*]	0.1
Ultimate vacuum [mbar abs.]	
At min. speed:	
Gas ballast closed	≤ 6
Gas ballast open	≤ 17
At max. speed:	
Gas ballast closed	≤ 8
Gas ballast open	≤ 15
Flow rate at atm. pressure [l/min]**	
At min. speed:	18 ± 10%
At max. speed:	34 ± 10%

Tab.13: Pneumatic data N840G

*Bar rel related to 1013 hPa

**Liters in the standard state based on ISO 8778 and ISO 21360-1/2 (1013 hPa, 20°C)

Pneumatic connections

Parameter	Value
Hose connection [mm] (stepped hose nipple)	ID 8 / 9.5

Tab.14: Pneumatic connections

Electrical data

Parameter	Value N820G	Value N840G
Voltage [V]	100 – 240	
Frequency [Hz]	50/60	
Power consumption [W]	60	100
Max. current draw [A]	0.66 – 0.35	1.0 – 0.6
Max. permissible line voltage fluctuation	± 10%	

Tab.15: Electrical data

Weight

Pump type	Weight [kg]
N820G	8.8
N840G	11.1

*Tab.16: Weight***Other parameters**

Parameter	Value
Permissible ambient temperature [°C]	+ 5 to + 40
Permissible media temperature [°C]	+ 5 to + 40
Highest permissible relative air humidity of the environment	80% for temperatures to 31°C, decreasing linearly to 50% at 40°C (non-condensing).
Maximum installation altitude [m above sea level]	2000
Pump protection class (DIN EN 60529 / IEC 60529)	IP30
Dimensions L x H x W [mm] N820G	259 x 220 x 163
Dimensions L x H x W [mm] N840G	289 x 240 x 177
Equipment protection	<ul style="list-style-type: none"> ■ Overcurrent protection ■ Overtemperature protection (drive) ■ Blocking protection (drive)

Tab.17: Other parameters

6 Product description

Design

- 1 Pneumatic pump inlet
- 2 Handle
- 3 Rotary/push knob for:
 - Switching the pump on and off
 - Setting the pump speed
- 4 Pneumatic pump outlet
- 5 Power switch
- 6 Status display
- 7 Interface*

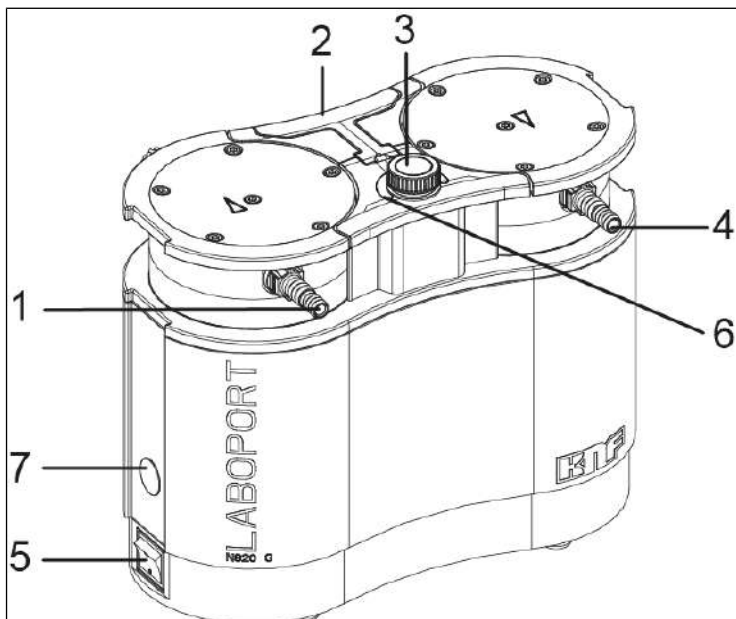


Fig. 2: Diaphragm pump (pump N820G shown)

*Interface:



NOTICE

Damage to equipment due to use of unauthorized accessories at the interface

This interface is provided to allow connection of KNF accessories.

- Upon request, you will be given an exact description of the interface.
- Only ever use accessories that are authorized by KNF (see the chapter entitled 11.2 Accessories [► 53]).

Function of a diaphragm pump

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

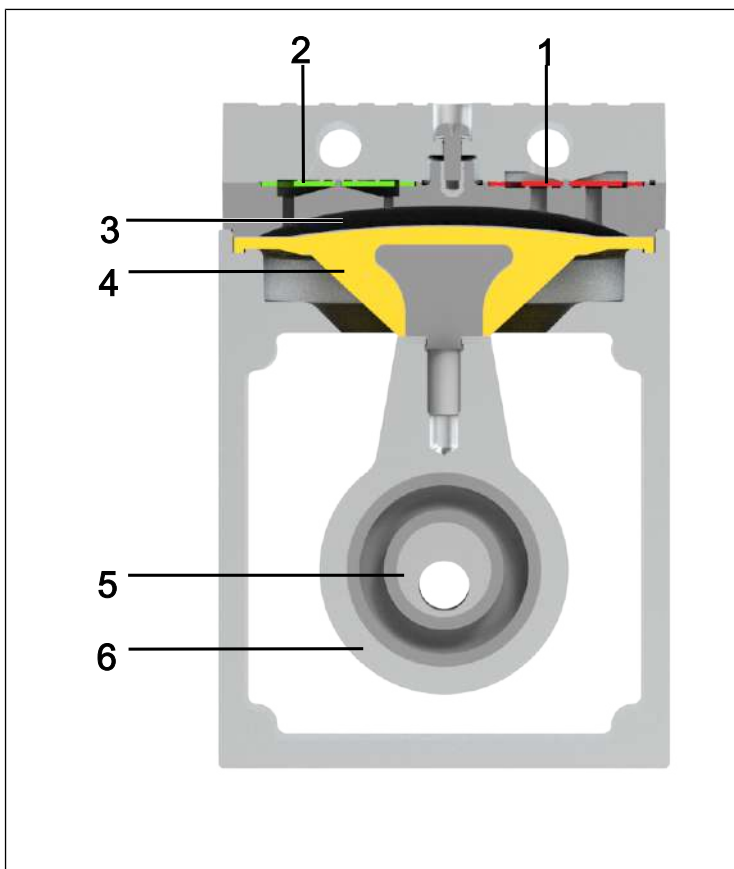


Fig.3: Function of a diaphragm pump

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

The elastic diaphragm (4) is moved up and down by the eccentric (5) and the connecting rod (6). In the downwards stroke, it aspirates the gas to be transferred via the inlet valve (2). In the upwards stroke, the diaphragm presses the medium out of the pump head via the outlet valve (1). The transfer chamber (3) is separated from the pump drive by the diaphragm.

6.1 Gas ballast

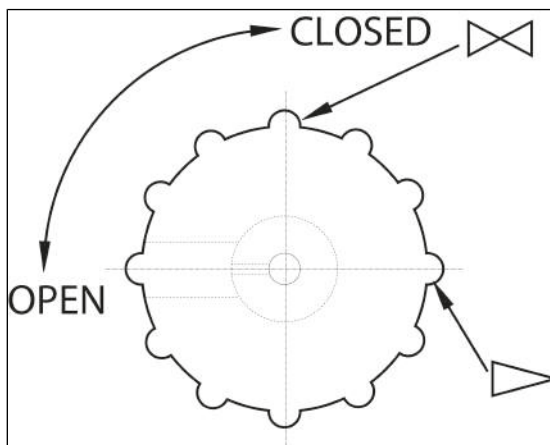


Fig. 4: Operating button for gas ballast



Personal injury through poisoning or explosion and damage to the pump

- When the gas ballast valve is open, make sure that no reactive or explosive mixtures can form.
- Close the gas ballast valve if necessary.
- If inert gas is necessary, contact KNF Service.



If vaporous media are transferred, the formation of condensate in the pump heads can be minimized by opening the gas ballast valve.

**NOTICE**

The ultimate vacuum that can be achieved is worse when the gas ballast valve is open (see the Chapter 5 *Technical data* [► 24]).

7 Transport

General



CAUTION

Personal injury and/or property damage due to incorrect or improper transport of the pump

In the event of incorrect or improper transport, the pump can fall down, be damaged or injure persons.

- Use suitable auxiliary means if necessary (carrying strap, lifting gear, etc.).
- Where appropriate, wear suitable personal protective equipment (e.g., safety shoes, safety gloves).



CAUTION

Risk of injury from sharp edges on the packaging

There is a risk of injury from cutting on the sharp edges when grabbing corners or when opening the packaging.

- Where appropriate, wear suitable personal protective equipment (e.g., safety shoes, safety gloves).

- Transport the pump in the original packaging to the installation location.
- Keep the original packaging of the pump (e.g. for later storage).
- Inspect the pump for transport damage after receiving it.
- Document any transport damage in writing.

→ Remove any transport safeguards on the pump prior to commissioning.

Parameter

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

Tab.18: Transport parameters and storage parameters



NOTICE

Prior to commissioning, make sure that the pump has reached the ambient temperature (5 *Technical data* [► 24]).

8 Setup and connection

- Only connect the pump in accordance with the operating parameters and conditions described in Chapter 5 *Technical data* [p. 24].
- Observe the safety instructions (see Chapter Safety).
- Before connecting, store the pump at the installation location to allow it to reach the room temperature (no condensate may form).

Cooling air supply



WARNING

Danger of burning on hot surfaces
Hot surfaces could occur if the pump overheats.

- When installing the pump, make sure that sufficient cooling air in-feed and discharge is ensured.

Installation location

- Make sure that the installation location is dry and that the pump is protected against rain, splash, gushing, and drip water as well as from other contamination.
- Select a secure location (flat surface) for the pump.
- Protect the pump from dust.
- Protect the pump from vibration, impact and external damage.
- Make sure that it is easy to operate the power switch.

8.1 Preparing for commissioning

Before turning on the pump, make sure of the following points:

	Necessary operating requirements
Pump	- Connect all hoses correctly
Pump	- The voltage supply system is consistent with the details on the type plate of the pump. - Pump outlet not closed or restricted. - When operating with gas ballast: When venting the pump through the air inlet, no explosive or poisonous mixtures can occur.

Tab.19: Operating requirements for commissioning

8.2 Perform commissioning



Risk of burns from hot pump parts and/or hot medium

Some pump parts may be hot during or after operation of the pump.

- Allow the pump to cool after operation.
- Take protective measures to protect against touching hot parts.



Injury to eyes

Coming too close to the inlet/outlet of the pump may result in injury to the eyes due to the present vacuum/operating pressure.

- Do not look into the pump inlet/outlet during operation.

-
- Only operate the pump in accordance with the operating parameters and operating conditions described in Chapter 5 *Technical data* [► 24].
 - Ensure the proper use of the pump (See Chapter 3.6.1 *Proper use* [► 12]).
 - Eliminate the possibility of improper use of the pump (see Chapter 3.6.2 *Foreseeable misuse* [► 12]).
 - Observe the safety instructions (see Chapter 3 *Safety* [► 9]).



Risk of pump head bursting due to excessive pressure increase

- Do not exceed the maximum permissible operating pressure (see 5 *Technical data* [p. 24]).
- Monitor the pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure of the pump: immediately switch off the pump and remedy the fault (see Chapter Troubleshooting).
- Only throttle or regulate the air or gas quantity on the suction line to prevent the maximum permissible operating pressure from being exceeded.
- If the air quantity or gas quantity on the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure at the pump is not exceeded.
- Ensure that the pump outlet is not closed or restricted.

**DANGER**

Risk of dangerous gas mixtures during pump operation

Depending on the medium being transferred, breakage of the media-contacting components can result in a dangerous mixture if the medium mixes with the air in the compressor housing or the surroundings.

- Before using a medium, check the compatibility of the media-contacting components (see *5 Technical data* [► 24]) with the medium.

- Pump standstill → Establish normal atmospheric pressure in the lines while the pump is at a standstill (relieve pump pneumatically).

Connecting the pump

i A marking on the pump head indicates the flow direction.

1. Remove the protective caps from the pneumatic connections of the pump.

Vacuum operation with silencer

1. Remove the hose connector on the pneumatic outlet with the supplied tool (see *1 Scope of delivery* [► 4]).
2. Finger-tighten the silencer or its vacuum system component on the pneumatic outlet.
3. Connect the line to the pneumatic inlet.

**NOTICE**

When using a silencer, KNF recommends operating the pump in a safe environment, e.g., fume cupboard, to avoid dangers posed by harmful gases.

Vacuum operation without silencer

- | | |
|----------------------|---|
| Connected components | 1. Connect the lines to the pneumatic inlet and outlet. |
| | 2. Only connect components to the pump that are designed for the pneumatic data of the pump (see Chapter 5 <i>Technical data</i> [► 24]). |
| Pump discharge | 3. When using as a vacuum pump: Safely drain the pump discharge at the pneumatic outlet of the pump. |
| | 4. Plug the plug of the power cable into a properly installed, grounded socket. |
- i** Replace the detachable power cables with power cables that are adequately dimensioned.
Use a C14 power cable for device plugs conforming to IEC/EN 60320-1, UL 498, CSA C22.2 no. 42, with protection class 1.

9 Operation

9.1 Information on switching the pump on and off

Switching on the pump

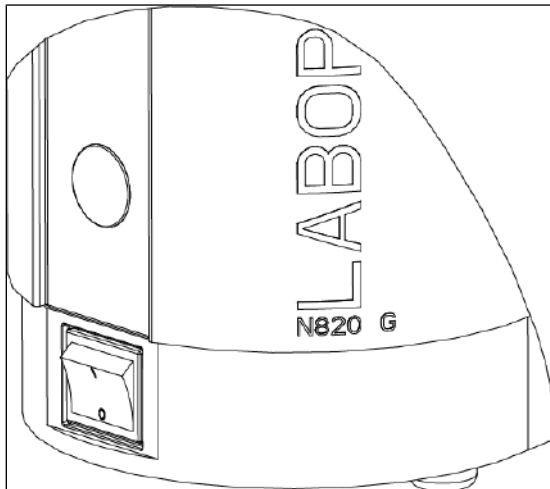


Fig. 5: Switching the pump on and off with power switch

i The pump must not be started up against operating pressure during switch-on. This also applies during operation after a brief power failure. If a pump starts up against pressure, the pump may block, thereby activating blocking protection (drive) and switching off the pump.

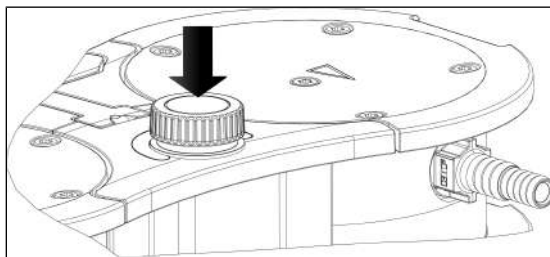


Fig. 6: Switching the pump on and off with rotary/push knob

→ Ensure that no pressure is present in the lines when switching on.

- Switch the pump on with the power switch.
- Switch on the pump by pushing the rotary/push knob (see Fig. 6).

Set flow rate

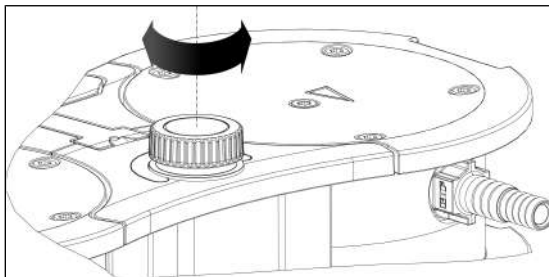


Fig. 7: Set flow rate

You can vary the speed of the pump with the rotary/push knob. This allows you to set the flow rate (see Setting the flow rate).

- The speed setting of the rotary/push knob is retained when the pump is switched off.

Switching off/decommissioning the pump

- When transferring aggressive media, flush the pump before switching off to extend the service life of the diaphragm (see Chapter 10 Servicing [▶ 42]).
- Switch the pump with the rotary/push knob (see chapter Switching the pump on/off).
- Switch the pump off with the power switch.
- Establish normal atmospheric pressure in the lines (relieve pump pneumatically).
- Pull out power plug of the pump.



Status display (see Fig. 2/6)

- Illuminates green if the pump was switched on via the power switch.

- Illuminates blue if the pump was also switched on via the rotary/push knob.
Pump is running:
The higher the speed is set, the brighter the status display lights up.
- Illuminates red if there is a fault:

Signal duration	Fault type
100% ON (continuous light)	Drive blocked
50% ON; 50% OFF	Temperature too high (drive)
90% ON, 10% OFF	Other fault

Tab.20: Fault signal via status display

For further information, see Chapter 12 *Troubleshooting* [▶ 54].

10 Servicing



Servicing the pump

Damage to the pumps can result from failure to observe the applicable legal regulations and procedures for the location or intervention by untrained or uninstructed personnel.

- Servicing may only be performed according to the legal regulations (e.g. work safety, environmental protection) and provisions.
- Servicing may only be performed by specialized personnel or trained and instructed personnel.

10.1 Servicing schedule



Risk of explosion from the formation of potentially explosive atmosphere

Leaky connections can result in dangerous potentially explosive atmospheres.

- Ensure that diaphragms and valve plates/seals are installed undamaged, cleanly and correctly.
 - Check the pneumatic connections of the pump for leaks.
 - Work with care during service work.
 - Replace defective parts immediately.
-



Risk of injury when not using original parts

Failure to use original parts will result in a loss of pump functionality and safety.

The validity of the CE conformity is rendered void if genuine parts are not used.

- Use only genuine spare parts from KNF when performing maintenance/repair work.

Component	Servicing interval
Pump	<ul style="list-style-type: none">→ Perform periodic inspections for external damage or leakage.→ Periodically check for noticeable changes to noises and vibrations.
Diaphragms and valves	<ul style="list-style-type: none">→ At the latest, replace when the performance decreases.

Tab.21: Servicing schedule

10.2 Cleaning



NOTICE

During cleaning work, ensure that no fluids enter the interior of the housing.

10.2.1 Flushing the pump



WARNING

Risk of explosion by flushing the pump with air

- When using the pump with explosive media, only permit specialist to flush the pump with inert gas.
-



WARNING

Personal injury through poisoning or explosion and damage to the pump

- When flushing the pump with inert gas, ensure that the gas ballast valve is closed and that no reactive or explosive mixtures form.
-

- Before switching off, flush the pump with air at atmospheric conditions (ambient pressure) for about 5 minutes (if necessary for safety reasons: with an inert gas).

10.2.2 Cleaning the pump

- Only clean the pump with a damp cloth and non-flammable cleaning agents.
- If compressed air is present, blow out the parts.

10.3 Replace diaphragm, valve plates/seals and O-rings

Requirements

	Necessary requirements
Pump	<ul style="list-style-type: none">- Pump switched off and power cable pulled out of socket- Pump cleaned and free of hazardous materials- Hoses removed from pneumatic inlet and outlet

Tab.22:

Material and tools

Quantity	Material
1	TORX® screwdriver T20
1	TORX® T25 screwdriver (only for N840.3FT.29.18G)
1	Spare parts set (see Chapter Spare parts)
1	Pencil

Tab.23:

Information on the procedure

- ➔ Always replace diaphragms, valve plates/seals, and O-rings together to maintain the performance of the pump.
- ➔ Replace the diaphragms and valve plates/seals of the individual pump heads one after the other.



Risk of injury due to moving parts

If the pump is not properly disconnected from the mains, the pump may restart if the on/off switch is pressed.

→ Pull mains plug out of the socket.



Health hazard due to dangerous substances in the pump

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

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

→ Clean the pump with suitable measures.

Preparatory steps

- 1 Handle
- 2 Screw
- 3 Cover
- 4 Head screw

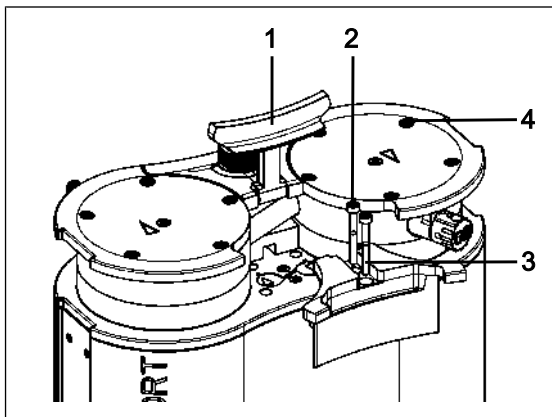


Fig.8: Dismount cover

1. Set the handle (1/Fig. 8) to a vertical position.
2. Loosen the screws (2/Fig. 8) on the cover (3/Fig. 8).
3. Remove the cover (3/Fig. 8).

4. Loosen the external head screws (4/Fig. 8).

i The two internal head screws (1/Fig. 9) remain tightened for the time being.

Removing pump head

- 1 Screw
- 2 Pressure plate
- 3 Head cover
- 4 Valve plates/seals
- 5 Locating pin
- 6 Intermediate plate
- 7 Diaphragm
- 8 Shim rings

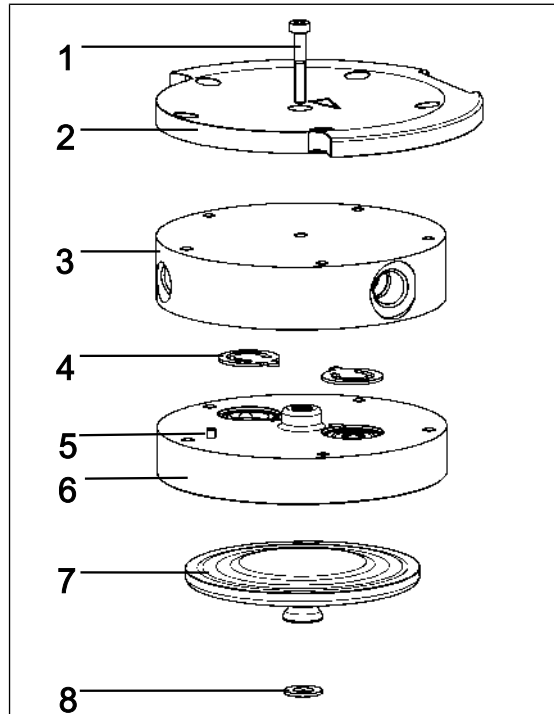


Fig.9: Pump head (pump N820 shown)

i The following item numbers refer to Fig. 9 unless specified otherwise.

1. Mark the pressure plate (2), head plate (3) and intermediate plate (6) with a continuous pencil stroke. This prevents the parts from being incorrectly mounted later on.
2. Loosen the external screws (4/Fig. 8) of the pump heads.
3. Carefully remove the pump heads.

Replacing the diaphragm

i On the pump, the diaphragms (7) are changed successively to ensure that the shim rings (8) are used in the same quantity as previously.

1. Press down one diaphragm (7) so that the other diaphragm is in the upper change point.
2. Carefully turn the upper diaphragm (7) counterclockwise by hand and remove it.

i Make sure that the shim rings located between the diaphragm and connecting rod do not fall into the pump housing.

Remove any shim rings stopping on the diaphragms and fit them on the associated connecting rod thread.

Prerequisite for ensuring the pneumatic performance of the pump is that the same number of shim rings be mounted as before.

3. Screw in the new diaphragm (7) by hand and tighten it by hand.
4. Perform steps 1 – 4 for the second pump head.
5. Dispose of the replaced diaphragms (7) properly.

Changing O-rings

- 9 Gas ballast valve
- 10 Connection tube
- 11 Hose connections

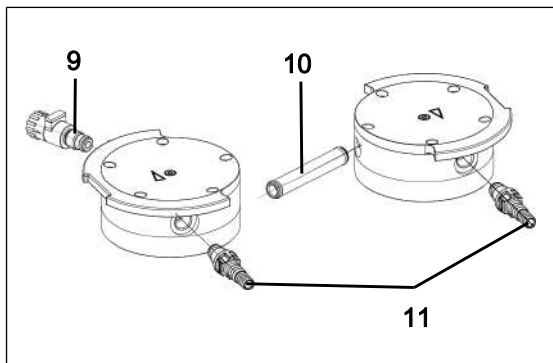


Fig.10: Changing O-rings

1. Pull the two pump heads apart.
2. Pull the connection tube (10/ Fig. 10) out of the head plate (3).

3. Replace the two O-rings on the connection tube (**10**/Fig. 10).
4. Loosen the internal head screw (**1**) on both pump heads.
5. Remove the two pressure plates (**2**) together with the two internal head screws (**1**).
6. Unscrew the gas ballast (**9**/Fig. 10) from the head plate (**3**).
7. Replace the O-ring on the gas ballast (**9**/Fig. 10).
8. Screw the gas ballast (**9**/Fig. 10) into the corresponding head plate (**3**) as far as it will go. Then turn it back again until the surface is oriented upwards.
9. Unscrew the hose connections (**11**/Fig. 10) from the head plate (**3**) using the tool supplied.
10. Replace the O-rings on the hose connections (**11**/Fig. 10).
11. Screw the hose connections (**11**/Fig. 10) into the head plate (**3**) hand-tight using the tool supplied.
12. Dispose of the replaced O-rings properly.

Replacing valve plates/seals

i With the pump, the valve plates/seals (**4**) are replaced successively.

1. Remove the head plate (**3**) from the intermediate plate (**6**).
2. Remove the old valve plates/seals (**4**).
3. Carefully clean the intermediate plate (**6**) (if there are deposits on it).
4. Insert the new valve plates/seals (**4**) into the corresponding seats on the intermediate plate (**6**).

i The valves and O-rings for the pressure side and suction side are identical; the same applies for the top and bottom of the valves and O-rings.

5. Perform steps 1 – 4 for the second pump head.
6. Dispose of the old diaphragm (**7**) and valve plates/seals (**4**) properly.
7. Insert the connection tube (**10**/Fig. 10) into the head plate (**3**).

Fitting the pump head

1. Move the diaphragms (7) to the center position.
2. Press on the entire perimeter of the diaphragm (7). Only press on the diaphragm (7) on one pump head.
3. Place the intermediate plate (6) with valve plates/seals (4) on the mount according to the pencil line.
4. Place the head plate (3) on the intermediate plate (6) in line with the locating pin (5).
5. Place the pressure plate (2) on the head plate according to the pencil line.
6. Tighten the screws, working in a crosswise pattern (tightening torque: N820: 4 Nm; N840: 5 Nm).
7. Tighten the screw (1) in the center of the pressure plate (tightening torque: 1 Nm).
8. Perform steps 1 – 7 for the second pump head.
9. Place the pump heads (consisting of head plate (3), intermediate plate (6) with valve plates/seals (4) and pressure plate (2)) together with the connection tube on the pump housing according to the pencil line.
10. Mount the handle cover (3/Fig. 8).
11. Tighten the screws (2/Fig. 8) of the handle cover (3/Fig. 8) (tightening torque: 2 Nm).

Final steps



WARNING

Risk of injury and poisoning from leaks

- Before recommissioning the pump, check the pump heads and pneumatic connections for leaks. Leaks can cause poisoning, chemical burns or similar injuries.
-



WARNING

Risk of explosions from leaks

- Before recommissioning the pump, check the pump heads and pneumatic connections for leaks. Leaks may lead to a risk of explosion.
-

1. Function test

- Connect the suction and pressure sides on the pump.
- Electrically connect the pump.
- Test the pump for proper function (among other things, ultimate vacuum).
- Again disconnect the pump electrically and pneumatically.

2. Pump integrated in application

- Connect the suction and pressure sides on the pump.
- Electrically connect the pump.
- Test the functionality of the pump.

11 Spare parts and accessories

i To order spare parts and accessories, please contact your KNF sales partner or KNF Customer Service (contact data: see www.knf.com).

11.1 Spare parts

Spare part set

A spare part set consists of:

Parts	Quantity
Diaphragm	2
Valve plates/seals	4
O-ring connection tube (Ø 10 x 1.8)	2
O-ring hose connection and gas ballast valve (Ø 8 x 1.8)	3

Tab.24: Spare parts

**see Chapter 10.3 Replace diaphragm, valve plates/seals and O-rings [► 45]*

Spare parts set	Order number
N820G	317435
N840G	317436

Tab.25: Spare parts set

11.2 Accessories

Accessories	Order number
Silencer	322528
Hose connector with O-ring	317278
Wrench for hose connector	316279
Interface cable (for combination with VC900) 2 m	323829
Interface cable (for combination with VC900) 5 m	323830
Small flange DN16 with O-ring	342031

Tab.26: Accessories

12 Troubleshooting



Danger: electric shock can be life-threatening.

- All work on the pump may only be performed by an authorized specialist.
- Before working on the pump: Disconnect the pump from the power supply.
- Check and ensure that no voltage is present.

→ Check the pump (see following tables).

Pump not delivering	
Cause	Troubleshooting
No voltage in the electrical mains.	→ Check the circuit breaker for the room and switch it on if necessary.
Thermal switch or overtemperature protection of the pump has tripped	→ Disconnect the pump from electrical mains. → Allow the pump to cool down. → Determine the cause of the overheating and rectify.
Connections or lines are blocked.	→ Check the connections and lines. → Remove the blockage.
External valve is closed or filter clogged.	→ Check external valves and filters.
Condensation has collected in the pump head.	→ Separate the source of the condensation from the pump. → Flush the pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with an inert gas).
Diaphragm or valves are worn.	→ Replace the diaphragms and the valve plates/seals (see Chapter 10 Servicing [► 42]).

Tab.27: Troubleshooting: Pump not delivering

Flow rate, pressure or vacuum too low

The pump does not reach the performance stated in the technical data or data sheet.

Cause	Troubleshooting
Condensation has collected in the pump head.	<ul style="list-style-type: none"> → Separate the source of the condensation from the pump. → Flush the pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with an inert gas). → If present, open the gas ballast and flush the pump head.
There is overpressure on the pressure side and at the same time vacuum or pressure above atmospheric pressure on the suction side.	<ul style="list-style-type: none"> → Change the pneumatic conditions.
Pneumatic lines or connection parts have insufficient cross-sections or are constricted.	<ul style="list-style-type: none"> → Disconnect the pump from the system to determine the output values. → Eliminate any constriction (e.g. valve). → Use lines or connection parts with a larger cross-section if necessary.
Leaks occur at connections, lines or pump head.	<ul style="list-style-type: none"> → Ensure the correct seating of the hoses on the hose connectors. → Ensure that the connections are correctly mounted. → Replace the leaky hoses. → Eliminate the leaks.
Connections or lines are completely or partially clogged.	<ul style="list-style-type: none"> → Check the connections and lines. → Remove any parts or particles that are causing blockages.
Head parts are soiled.	<ul style="list-style-type: none"> → Clean the head components.
Diaphragm or valves are worn.	<ul style="list-style-type: none"> → Replace the diaphragms and the valve plates/seals (see Chapter 10 Servicing [▶ 42]).

Flow rate, pressure or vacuum too low

The pump does not reach the performance stated in the technical data or data sheet.

Cause	Troubleshooting
Replaced diaphragm and valve plates/seals.	→ Ensure that shim rings were fitted on the diaphragm thread. → Check the hoses for leaks. → If necessary, carefully tighten the outer screws of the pressure plate crosswise.
Rotary/push knob is not set to max. speed.	→ Set the rotary/push knob to max. speed.
Gas ballast still open.	→ Connect the gas ballast.

Tab.28: Troubleshooting: Flow rate, pressure or vacuum too low

Pump is switched on and not running; status display is not illuminated

Cause	Fault remedy
Pump is not connected to the electrical mains.	→ Connect the pump to the electrical mains.
No voltage in the electrical mains.	→ Check the circuit breaker for the room and switch it on if necessary.

Tab.29: Troubleshooting: Pump is switched on and not running; status display is not illuminated

Pump is switched on and not running; status display flashes red (50% ON, 50% OFF)

Cause	Fault remedy
Pump has overheated, overtemperature protection has tripped.	→ Pull power cable of the pump out of the socket. → Allow the pump to cool. → Determine the cause of the overheating and rectify.

Tab.30: Troubleshooting: Pump is switched on but not running; status display is flashing red

Pump is switched on and not running; status display illuminates red (100% ON)	
Cause	Fault remedy
Drive of the pump has blocked.	→ Pull power cable of the pump out of the socket.
	→ Allow the pump to cool.
	→ Determine the cause of the blockage and rectify.

Tab.31: Troubleshooting: Pump is switched on but not running; status display lights up red

Pump is switched on and not running; status display flashes red (90% ON, 10% OFF)	
Cause	Fault remedy
Other fault	→ Pull power cable of the pump out of the socket.
	→ Allow the pump to cool.
	→ Contact KNF Customer Service.

Tab.32: Troubleshooting: Pump is switched on but not running; status display is flashing red

Fault cannot be rectified

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

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

13 Returns

Preparing for return

1. Flush the pump with air for a few minutes (if necessary for safety reasons: with inert gas) at atmospheric pressure to free the pump head of dangerous or aggressive gases (see Chapter 10.2.1 *Flushing the pump* [▶ 44]).

i Please contact your KNF sales partner if the pump cannot be flushed due to damage.
2. Remove the pump.
3. Clean the pump (see Chapter 10.2.2 *Cleaning the pump* [▶ 44]).
4. Send the pump together with the completed Health and Safety Clearance and Decontamination Form to KNF, stating the nature of the transferred medium.
5. Pack the device securely to prevent further damage to the product. If necessary, request original packaging for a fee.

Returns

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

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

14 Index

A		
Accident prevention	10	
Additional conditions		
Conditions	22	
C		
Category 2/-G	17	
Cleaning	44	
Commissioning	35	
Operating requirements	34	
Connecting rod	28	
Connection	10	
Customer service	14	
D		
Designation		
EU explosion protection designations	16	
Explosion protection designation	16	
Device category	19	
Device designation	17	
Device group	18	
Diaphragm	28	
Directives	13	
Disposal	14	
E		
Eccentric	28	
Electrical data	25	
Environmental protection	14	
Equipment protection	26	
Equipment protection level	22	
Explosion groups	20	
explosive atmosphere	11	
F		
Fault signal	41	
FEP	8	
FFPM	8	
Flow rate	24, 40	
Set flow rate	40	
FPM	8	
G		
Genuine spare parts	14	
I		
Inlet valve	28	
Installation location	33	
Interface	27	
Internal atmosphere only	22	
M		
maintenance-free	14	
Medium	11, 20	
combustible media	11	
Hazardous media	11	
Misuse	12	
Mounting	33	
O		
Open gas ballast valve	13	
Operating conditions	11	
Operation	12	
Ordinances	13	
Outlet valve	28	
P		
packaging	4	
Parameter		

Operating parameters	10
Storage parameter	32
Transport parameter	32
Parameters	
Operating parameters	35
Personnel	9
Pictogram	7
Pneumatic connections	25
Pneumatic data	24
power cable	38, 45
Power switch	27, 40
PP	8
protective caps	37
PTFE	8
pump discharge	38
Pump head	47
Pump inlet	27
Pump materials	24
Pump outlet	27
pump standstill	37
PVDF	8

R

Repairs	14
Responsibility of the operator	10
Rotary/push knob	27, 40

S

Scope of delivery	4
Servicing	14
Silencer	4, 37
Spare part	52
Spare part set	52
Specialist personnel	14
Standards	13
Status display	27, 40
Surroundings of the pump	21

T

Target group	9
Temperature	

Ambient temperature	26
Ignition temperature	21
Maximum surface temperature	21
Media temperature	26
Storage temperature	32
Transport temperature	32
Temperature class	21
Temperature classes	20
Tool	45
Transfer chamber	28
Transport	31
Troubleshooting	54

U

Ultimate vacuum	24
-----------------------	----

V

Vacuum operation	37
------------------------	----

W

Warning notice	6
Weight	26
Working in a safety conscious man- ner	10

KNF Neuberger GmbH
Alter Weg 3
79112 Freiburg
Germany
Tel. +49 (0)7664/5909-0

E-mail: info.de@knf.com
www.knf.com

KNF worldwide

You can find our local KNF partners at: www.knf.com

