KNF 121435-121438 02/23

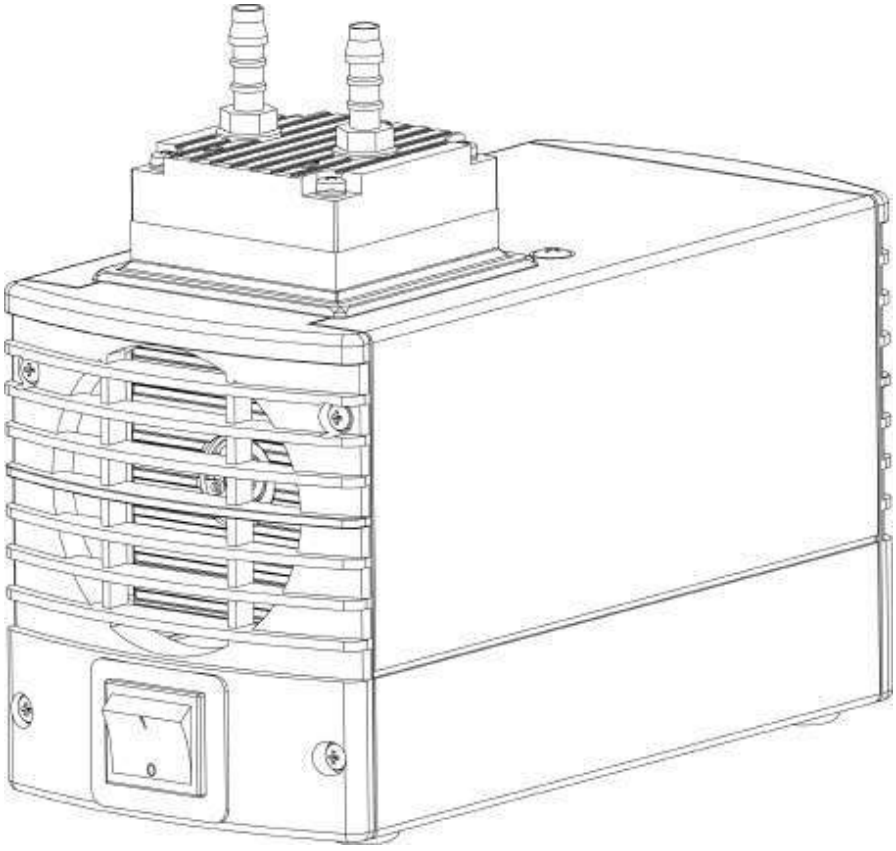
Labor

N86.18 / N811.18

TRANSLATION OF ORIGINAL OPERATING AND INSTALLATION INSTRUCTION ENGLISH

EN

DIAPHRAGM PUMP



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

Contents

1 Scope of delivery

- LABOPORT ® N86.18
- LABOPORT ® N811.18
- 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 *6 Transport [▷ 19]*.

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

WARNING

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.

EN

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 poisonous substances
	Warning of hand injuries through crushing
	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

3 Safety

Observe the safety notices in Chapters *7 Setup and connection [21]* and *8 Operation [27]*.

EN

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 [▷ 9]* and *4 Technical data [▷ 13]*.

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.

EN

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

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

Take note of any change in the state of matter (condensation, crystallization).

Before using a medium, check the compatibility of the media-contacting components (see *4 Technical data [▷ 13]*) with the medium.

Only transfer gases that remain stable under the pressures and temperatures that arise in the pump.

Handling of hazardous media

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.

When pumping hazardous media, follow the safety regulations that apply for working with these media.

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 *4 Technical data [▷ 13]*.

Make certain that the permissible ambient temperature (see *4 Technical data [▷ 13]*) 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 Foreseeable misuse

The pumps must not be operated in explosive atmospheres.

The pumps are not suitable for transferring the following:

- Dusts
- Liquids
- Aerosols
- Biological and microbiological substances
- Fuels
- 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 following harmonized/listed standards are met:

- EN 1012-2
- EN ISO 12100
- EN 61010-1
- EN 61326-1
- EN IEC 63000

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 Technical data

4.1 Technical data

Thermal switch

The motors are equipped standard with a thermal switch for monitoring against overheating.

Pump materials

Assembly	Material KN	Material KT
Pump head	PPS	PPS
Diaphragm	EPDM	PTFE-coated
Valve plates/seals	FPM	FFPM

Tab.5: Pump materials KN/KT variant

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Pneumatic data

Parameter	Value of KN version	Value of KT version
Max. permissible operating pressure [bar rel*]	2.4	2.5
Ultimate vacuum [mbar abs.]	100	160
Flow rate at atm. pressure [l/min]**	6.0	5.5

*Tab.6: *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

Pump type	Value
Laboport N86.18	Hose connection ID 4

Tab.7: Pneumatic connections

Electrical data

Parameter	Value		
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Max. current draw [A]	1.8	1.1	0.65
Power P [W]	60	55	60
Max. permissible line voltage fluctuations	± 10%	± 10%	± 10%
Pump fuse (2 each) T [A]	3.15	3.15	1.0
Motor protection class (DIN EN 60529 / IEC 60529)	IP 20		

Tab.8: Electrical data

Weight

Pump type	Value [kg]
Laboport N86.18	1.9

Tab.9: Weight

Other parameters

Parameter	Value of KN version	Value of KT version
Permissible ambient temperature [°C]	+ 5 to + 40	+ 10 to + 40
Permissible media temperature [°C]	+ 5 to + 40	
Dimensions [L x H x W] [mm]	164 x 141 x 90	
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	

Tab.10: Other parameters

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Pneumatic data

Parameter	Value of KN version	Value of KT version
Max. permissible operating pressure [bar rel*]	2.0	2.0
Ultimate vacuum [mbar abs.]	240	290
Flow rate at atm. pressure [l/min]**	11.5	11.5

*Tab.11: *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

Pump type	Value
Laboport N811.18	Hose connection ID 6

Tab.12: Pneumatic connections

Electrical data

Parameter	Value		
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Max. current draw [A]	1.5	1.3	0.8
Power P [W]	70	75	65
Max. permissible line voltage fluctuations	± 10%	± 10%	± 10%
Pump fuse (2 each) T [A]	3.15	3.15	1.0
Motor protection class (DIN EN 60529 / IEC 60529)	IP 20		

Tab.13: Electrical data

Weight

Pump type	Value [kg]
Laboport N811.18	2.5

Tab.14: Weight

Other parameters

Parameter	Value
Permissible ambient temperature [°C]	+ 5 to + 40
Permissible media temperature [°C]	+ 5 to + 40
Dimensions [L x H x W] [mm]	187 x 157 x 90
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

Tab.15: Other parameters

5 Product description

1 Outlet
2 Inlet
3 Pump head
4 Power switch

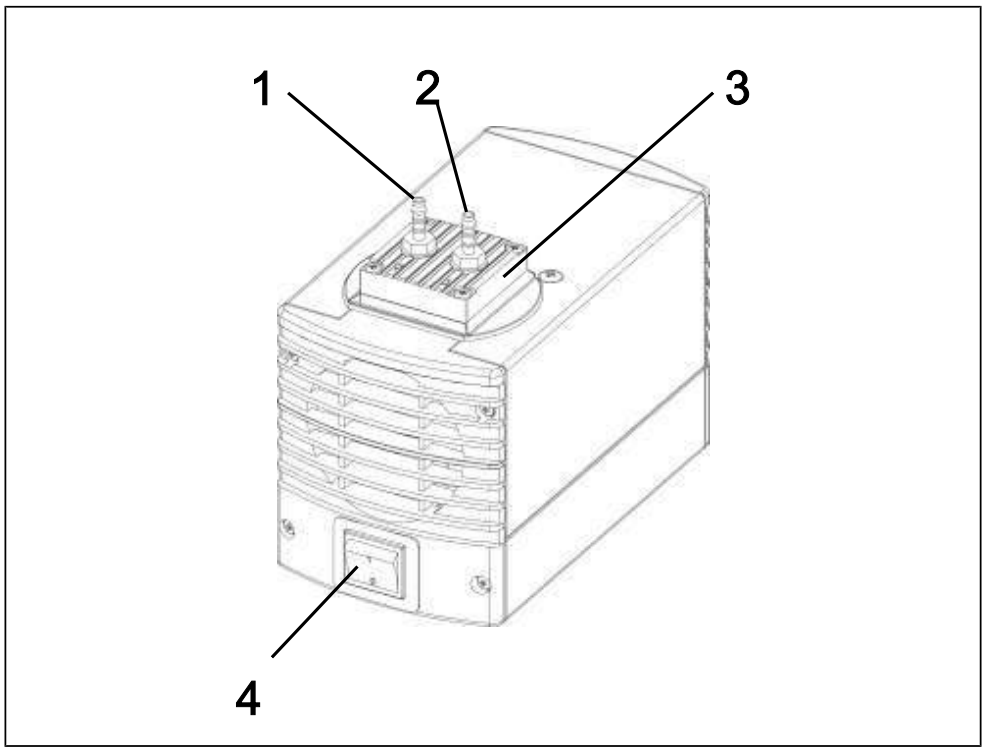

Fig.1: Design N86.18

1 Outlet
2 Inlet
3 Pump head
4 Power switch

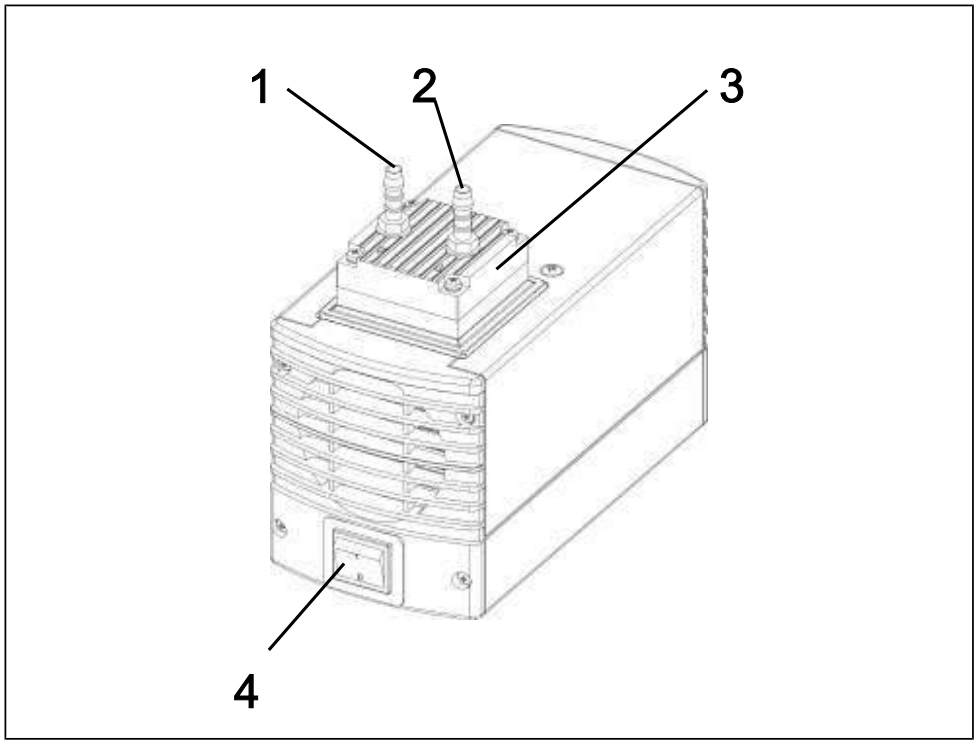

Fig.2: Design N811.18

Function of a diaphragm pump

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

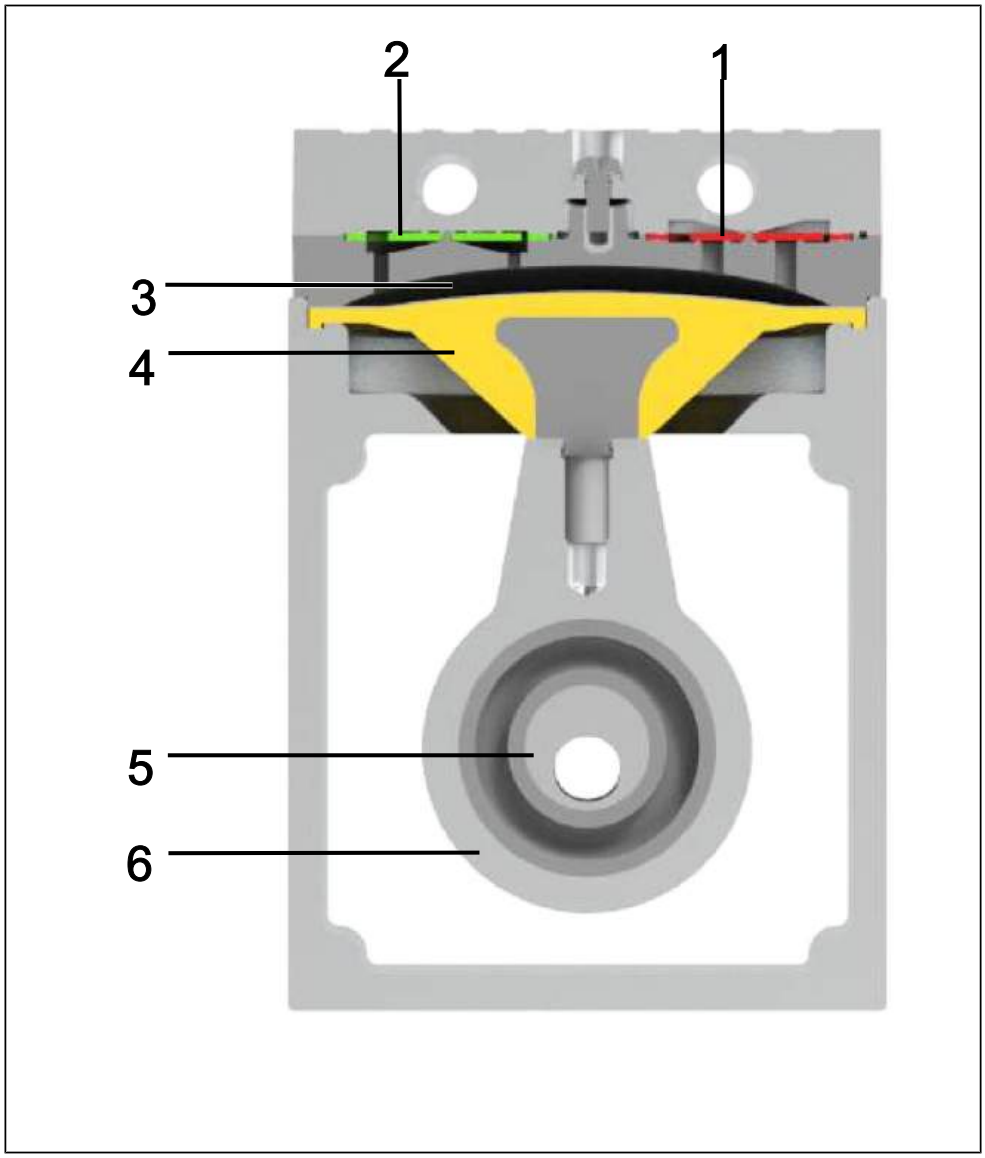

Fig.3: Function of a diaphragm pump

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 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
Permissible humidity (non-condensing) [%]	30 to 85

Tab.16: Transport parameters and storage parameters

NOTICE

Prior to commissioning, make sure that the pump has reached the ambient temperature (*4 Technical data [▷ 13]*).

7 Setup and connection

→ Only connect the pump in accordance with the operating parameters and conditions described in Chapter *4 Technical data [▷ 13]*.

→ 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 infeed 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.

7.1 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.
Pump	- Data of the voltage supply system are consistent with the details on the type plate of the power supply. - Pump outlet not closed or restricted.

Tab.17: Operating requirements for commissioning

7.2 Perform commissioning

WARNING

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.

CAUTION

Risk of injury from bursting hoses during pressure applications due to excessively high temperatures

When operating the pump in pressure applications, hoses that are not designed for the head temperatures of the pump at the respective operating point could become porous and burst.

→ Use temperature-resistant pressure hoses at the pneumatic connections.

→ Wear protective equipment if necessary (e.g., safety gloves, hearing protection).

WARNING

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 *4 Technical data [▷ 13]*.

→ Ensure the proper use of the pump (See Chapter Proper use).

→ Eliminate the possibility of improper use of the pump (see Chapter Improper use).

→ Note and follow the safety instructions (see chapter *3 Safety [▷ 7]*).

WARNING

Risk of pump head bursting due to excessive pressure increase

→ Do not exceed the maximum permissible operating pressure (see *4 Technical data [▷ 13]*).

→ 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 *4 Technical data [▷ 13]*) with the medium.

NOTICE

Excessive pressure, with all of the associated hazards, can be prevented by means of a bypass line with a pressure relief valve between the pressure side and suction side of the pump. Further information is available from KNF Customer Service (contact data: see www.knf.com).

Pump standstill

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

Connecting the pump

A marking on the pump head indicates the flow direction.

1. Remove the protective caps from the pneumatic connections of the pump.
2. Mount suction filter or silencer accessory parts (if present).

NOTICE

Before mounting the inlet filter or the silencer, unscrew the corresponding hose connector from the thread in the pump head.

3. Connect the lines to the pneumatic inlet and outlet.
4. Connect the lines to the pneumatic inlet and outlet. Use a hose with ID 4 mm.
5. Connect the lines to the pneumatic inlet and outlet. Use a hose with ID 6 mm.

Connected components

6. Only connect components to the pump that are designed for the pneumatic data of the pump (see Chapter *4 Technical data [▷ 13]*).

Pump discharge

7. When using as a vacuum pump: Safely drain the pump discharge at the pneumatic outlet of the pump.
8. Lay the line at the pneumatic inlet and the line at the pneumatic outlet in a downward slope so that no condensate can run into the pump.

NOTICE

Hose radii selected too small can affect the stability of the pump.

9. Plug the plug of the power cable into a properly installed, grounded socket.

8 Operation

8.1 Information on switching the pump on and off

Switching on the pump

NOTICE

The pump must not be started up against pressure or vacuum during switch-on. This also applies after a brief power interruption during operation. If a pump starts up against pressure or vacuum, the pump may block, causing the thermal switch to respond and the pump to switch off.

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

→ Switch the pump on with the power switch.

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 *9 Servicing [▷ 28]*).

→ 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.

9 Servicing

NOTICE

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.

9.1 Servicing schedule

Component	Servicing interval
Pump	→ Perform periodic inspections for external damage or leakage. → Periodically check for noticeable changes to noises and vibrations.
Diaphragms and valves	→ At the latest, replace when the performance decreases.
Inlet filter (accessories)	→ Replace if soiled

Tab.18: Servicing schedule

9.2 Cleaning

NOTICE

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

EN

9.2.1 Flushing the pump

→ 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).

9.2.2 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.

9.3 Replacing diaphragm and valve plates

Requirements

→ Disconnect the pump from power and ensure that it is voltage-free.

→ Clean the pump and free the pump of hazardous materials.

→ Remove the hoses from the pneumatic pump inlet and pump outlet.

→ If necessary, remove attachment parts such as silencer, suction filter, etc., from the gas connections.

Spare parts/tools

Spare part/tool	Quantity
Spare part set*	1
Size 1 Phillips screwdriver	1
Small screwdriver, blade width 0.5 mm	1
Pencil	1

Tab.19: Spare parts/tools
**acc. to Chapter 10 Spare parts and accessories [▶ 38]*

Information on the procedure

Diaphragm and valve plates/seals are the only wearing parts in the pumps. They are easy to replace.

Valve plates/seals and diaphragm should generally be replaced at the same time. If the diaphragm is not replaced at the same time as the valve plates/seals, the specified output of the pump can no longer be ensured after the maintenance is performed.

WARNING

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.

CAUTION

Risk of burns from hot pump parts

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

→ Allow the pump to cool after operation.

9.3.1 Replacing diaphragm and valve plates [N86.18]

The diaphragm and valve plates/seals are to be replaced in the following order:

a.) Remove pump head

3 Head plate
4 Head plate screw
5 Cover
6 Housing cover

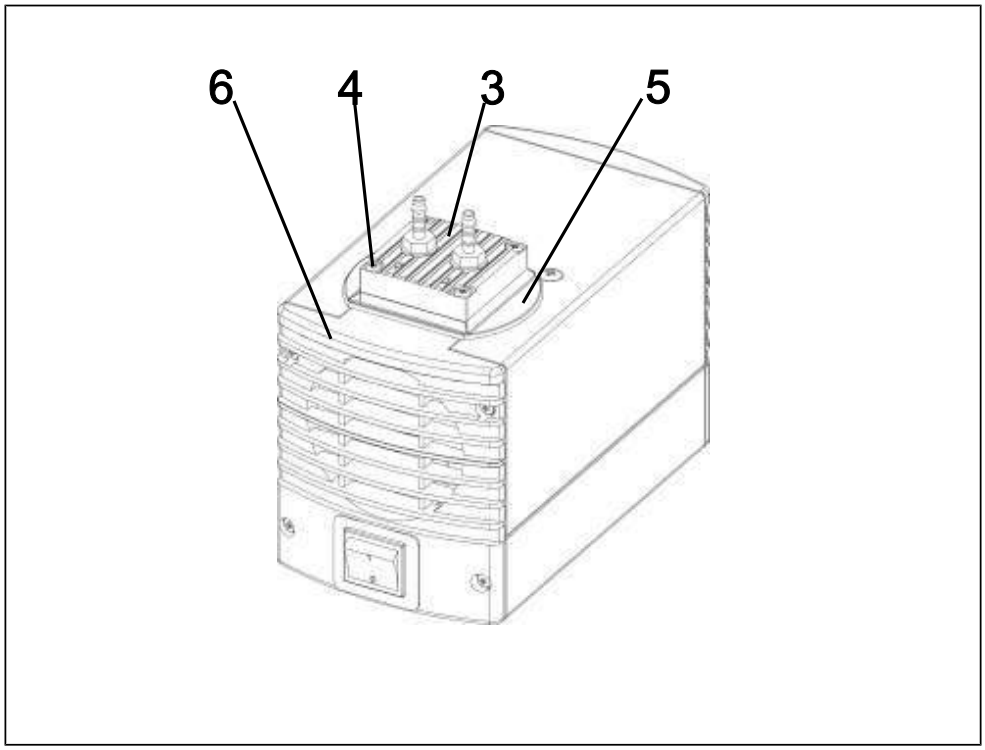

Fig.4: Remove pump head

1. Mark the head plate (**3**), cover (**5**) and housing cover (**6**) with a continuous pencil stroke. This helps to avoid incorrect assembly later.
2. Loosen the four head plate screws (**4**) and remove the head plate (**3**) from the pump housing together with the cover (**5**).
3. Mark the intermediate plate (**2**) and the housing (**1**) with a continuous pencil stroke.
4. Remove the intermediate plate (**2**) from the housing (**1**).

b.) Replacing the diaphragm

1 Housing
2 Intermediate plate
3 Head plate
4 Head plate screw
7 Valve plates/seals
9 Diaphragm
10 Diaphragm support
11 Shim ring(s)

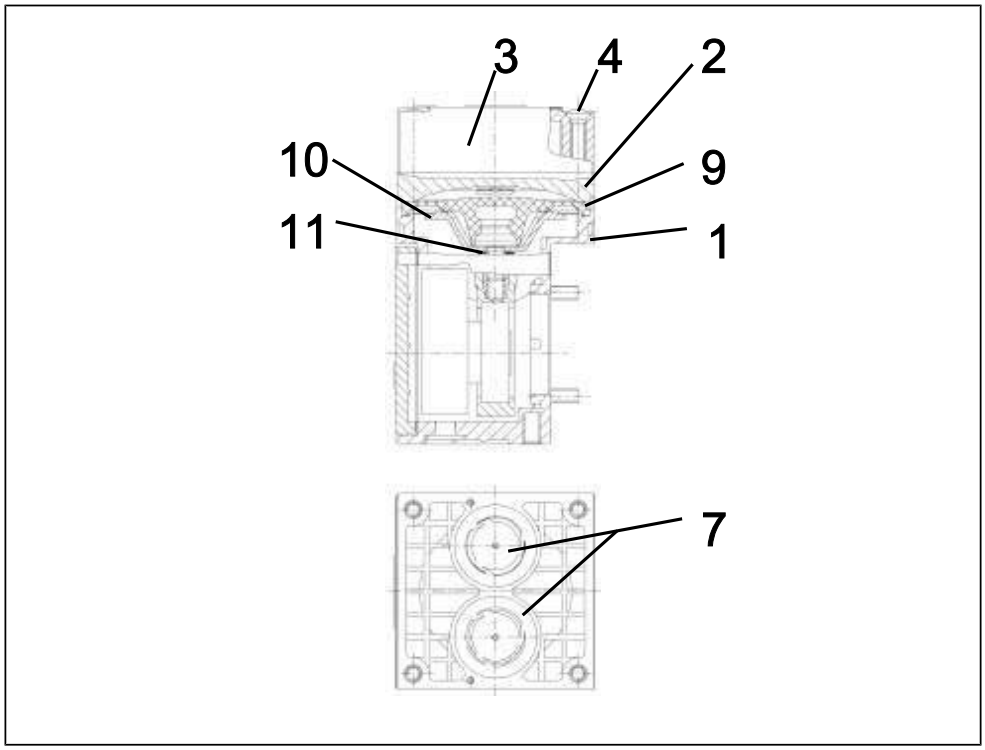

Fig.5: Replacing the diaphragm

1. Carefully insert a small screwdriver between the housing (**1**) and the outer edge of the diaphragm (**9**). Then lever up the edge of the diaphragm slightly.
2. Lift the diaphragm (**9**) on opposing side edges. Then grasp the diaphragm (**9**) and unscrew it counterclockwise by about two turns.
3. Hold the pump in one hand so that the pump head points downwards. Then turn the diaphragm (**9**) all the way out counterclockwise.
4. Remove the diaphragm support (**10**) and the shim(s) (**11**) from the threaded bolt of the diaphragm (**9**) and put them to one side.
5. Check all parts for soiling and clean the parts if necessary (for further information, see Chapter *9.2 Cleaning [▷ 29]*).
6. Push the diaphragm support (**10**) and the shim ring(s) (**11**) onto the threaded bolt of the new diaphragm (**9**).

7. Screw the new diaphragm (**9**) with diaphragm support and shim(s) (**11**) clockwise onto the connecting rod and hand-tighten.

i When screwing in the diaphragm (**9**), ensure that it is not overtightened.
If the diaphragm is overtightened, there is a risk that it could be damaged.

c.) Replacing the valve plates/seals

1. Remove the valve plates/seals (**7**) from the intermediate plate (**2**).
2. Check the valve seats, intermediate plate (**2**) and head plate (**3**) for cleanliness; if they are uneven, scratched or corroded, replace these parts (contact KNF Customer Service for this).
3. Insert the new valve plates/seals (**7**) in the valve seats of the intermediate plate (**2**).

i The valve plates/seals (**7**) for the pressure and suction sides are identical; the same applies to the top and bottom of the valve plates/seals (**7**).

4. By slightly moving the valve plates/seals (**7**) horizontally, make certain that they are not under tension.
5. Make certain that the valve plates/seals (**7**) are centered in the valve seats of the intermediate plate (**2**).
6. Properly dispose of the replaced diaphragm, valve plates/seals.

Fitting the pump head

1. Place the intermediate plate (**2**) with the valve plates/seals (**7**) on the housing according to the pencil marking.
2. Place the head plate (**3**) together with the cover (**5**) on the housing (**1**) in accordance with the marking.
3. With a slight lateral movement of the head plate (**3**), check its centering.
4. Tighten the screws (**4**) crosswise (tightening torque: 70 Ncm).

Final steps

1. Reconnect the suction line and the pressure line to the pump.
2. Connect the pump to the electrical mains.

If you have questions with regard to maintenance, please contact your KNF Customer Service (contact data: see www.knf.com).

9.3.2 Replacing diaphragm and valve plates [N811.18]

The diaphragm and valve plates/seals are to be replaced in the following order:

a.) Remove pump head

2 Intermediate plate
3 Head plate
4 Head plate screw
5 Cover
6 Housing cover

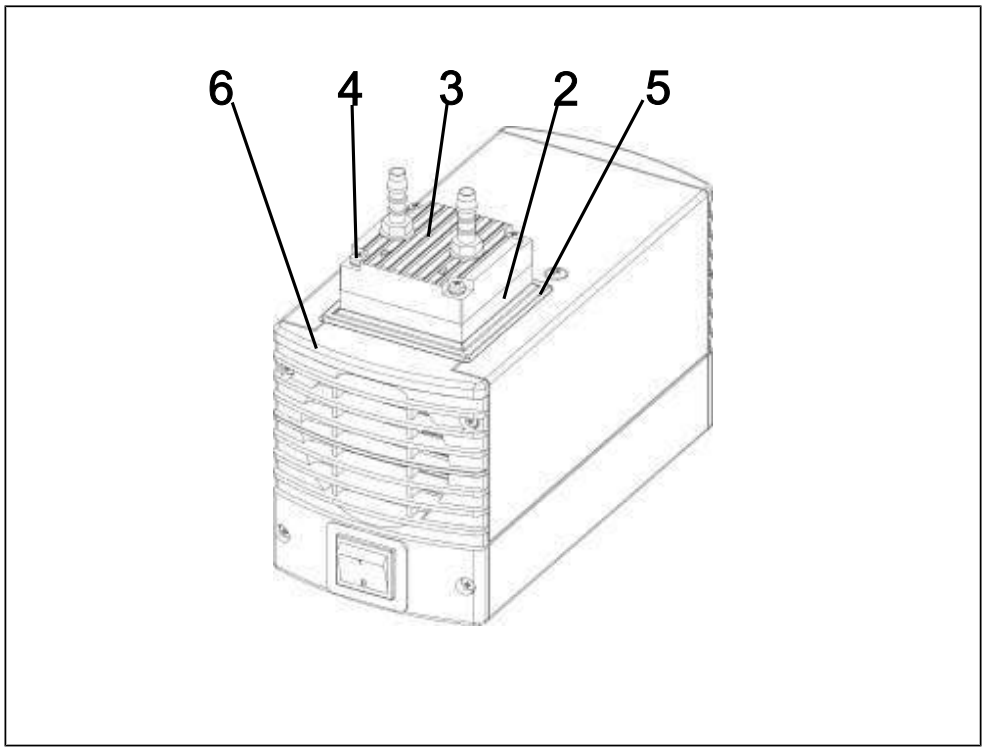

Fig.6: Remove pump head

1. Mark the head plate (**3**), intermediate plate (**2**), cover (**5**) and housing cover (**6**) with a continuous pencil stroke. This helps to avoid incorrect assembly later.
2. Loosen the four head plate screws (**4**) and remove the head plate (**3**) from the pump housing together with the intermediate plate (**2**).

b.) Replacing the diaphragm

1 Housing
2 Intermediate plate
4 Head plate screw
7 Valve plates/ seals
8 Diaphragm
9 Conrod plate
10 Shim ring(s)

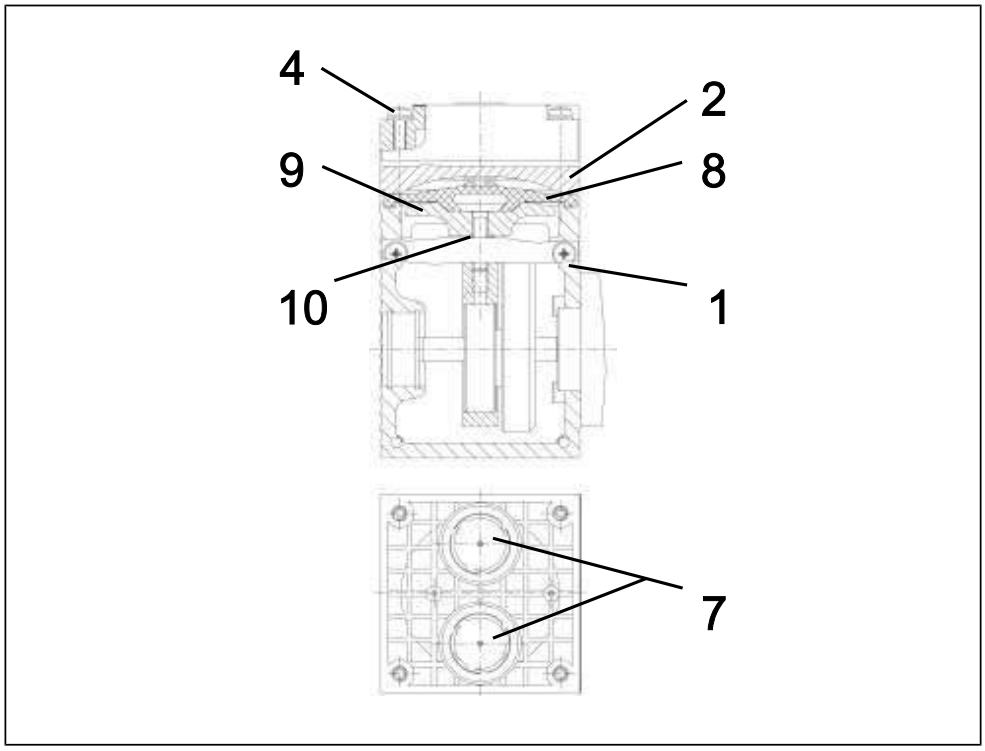

Fig.7: Replacing the diaphragm

1. Carefully insert a small screwdriver between the housing (**1**) and the outer edge of the diaphragm (**8**). Then lever up the edge of the diaphragm slightly.
2. Lift the diaphragm (**8**) on opposing side edges. Then grasp the diaphragm (**8**) and unscrew it counterclockwise by about two turns.
3. Hold the pump in one hand so that the pump head points downwards. Then turn the diaphragm (**8**) all the way out counterclockwise.
4. Remove the conrod plate (**9**) and the shim(s) (**10**) from the threaded bolt of the diaphragm (**8**) and put them to one side.
5. Check all parts for soiling and clean the parts if necessary (for further information, see Chapter *9.2 Cleaning [▷ 29]*).
6. Push the conrod plate (**9**) and the shim ring(s) (**10**) onto the threaded bolt of the new diaphragm (**8**).
7. Screw the new diaphragm (**8**) with conrod plate (**9**) and shim(s) (**10**) clockwise onto the connecting rod and hand-tighten.

When screwing in the diaphragm (**8**), ensure that it is not overtightened.
If the diaphragm is overtightened, there is a risk that it could be damaged.

c.) Replacing the valve plates/seals

1. Remove the valve plates/seals (**7**) from the intermediate plate (**2**).
2. Check the valve seats, intermediate plate (**2**) and head plate (**3**) for cleanliness; if they are uneven, scratched or corroded, replace these parts (contact KNF Customer Service for this).
3. Insert the new valve plates/seals (**7**) in the valve seats of the intermediate plate (**2**).

The valve plates/seals (**7**) for the pressure and suction sides are identical; the same applies to the top and bottom of the valve plates/seals (**7**).

4. By slightly moving the valve plates/seals (**7**) horizontally, make certain that they are not under tension.
5. Make certain that the valve plates/seals (**7**) are centered in the valve seats of the intermediate plate (**2**).
6. Properly dispose of the replaced diaphragm, valve plates/seals.

Fitting the pump head

1. Place the intermediate plate (**2**) with the valve plates/seals (**7**) on the housing according to the pencil marking.
2. Place the head plate (**3**) together with the cover (**5**) on the intermediate plate (**2**) in accordance with the marking.
3. With a slight lateral movement of the head plate (**3**), check its centering.
4. Tighten the screws (**4**) finger-tight in a crosswise pattern.

Final steps

1. Reconnect the suction line and the pressure line to the pump.
2. Connect the pump to the electrical mains.

If you have questions with regard to maintenance, please contact your KNF Customer Service (contact data: see www.knf.com).

10 Spare parts and accessories

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

10.1 Spare parts

Spare part set

A spare part set consists of:

N86.18

Spare part set

Spare part set	Order number
Laboport N86 KN.18	043241
Laboport N86 KT.18	043242

Tab.20: Spare part set

A spare part set consists of:

Parts	Quantity
Diaphragm	1
Valve plates/seals	2

Tab.21: Spare parts

Fuses*

Pump series	Order number
Laboport N86 K_.18, 230 V	025250
Laboport N86 K_.18, 115 V	020085
Laboport N86 K_.18, 100 V	020085

Tab.22: Fuses
**Each pump contains two fuses.*

N811.18

Spare part set

Spare part set	Order number
Laboport N811 KN.18	044066
Laboport N811 KT.18	044067

Tab.23: Spare part set

A spare part set consists of:

Parts	Quantity
Diaphragm	1
Valve plates/seals	2

Tab.24: Spare parts

Fuses*

Pump series	Order number
Laboport N811 K_.18, 230 V	025250
Laboport N811 K_.18, 115 V	020085
Laboport N811 K_.18, 100 V	020085

Tab.25: Fuses
**Each pump contains two fuses.*

10.2 Accessories

N86.18

Designation	Order number
Silencer	000345
Inlet filter	000346
Hose connector made of PVDF	025671

Tab.26: Accessories

N811.18

Designation	Order number
Silencer	000345
Inlet filter	000346
Hose connector made of PVDF	123363

Tab.27: Accessories

11 Troubleshooting

DANGER

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.

EN

→ 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 *9 Servicing [▷ 28]*).

Tab.28: 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.	→ 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.	→ Change the pneumatic conditions.
Pneumatic lines or connection parts have insufficient cross-sections or are constricted.	→ 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.	→ 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.	→ Check the connections and lines. → Remove any parts or particles that are causing blockages.
Head parts are soiled.	→ Clean the head components.
Diaphragm or valves are worn.	→ Replace the diaphragms and the valve plates/seals (see Chapter *9 Servicing [▶ 28]*).

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.

Tab.29: Troubleshooting: Flow rate, pressure or vacuum too low

Pump is switched on and not running; power switch is not illuminated	
Cause	**Troubleshooting**
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.
Fuse of pump is defective.	→ Pull power cable of the pump out of the socket. → Loosen the marked cover on the bottom of the pump. → Select the appropriate fuse and change it (see chapter *4 Technical data [▶ 13]*).

Tab.30: Troubleshooting: Pump is switched on and not running; power switch is not illuminated

Pump is switched on and not running; power switch is illuminated	
Cause	**Troubleshooting**
Pump has overheated, thermal switch has tripped.	→ Pull power cable of the pump out of the socket. → Allow the pump to cool down. → Determine the cause of the overheating and rectify.

Tab.31: Troubleshooting: Pump is switched on and not running; power switch is not illuminated

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.

12 Returns

Preparing for return

1. Flush the pump with air for a few minutes (if necessary for safety reasons: with inert gas) at atmospheric pressure to free the pump head of dangerous or aggressive gases (see Chapter *9.2.1 Flushing the pump [▷ 29]*).

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 *9.2.2 Cleaning the pump [▷ 29]*).
4. Send the pump together with the completed Health and Safety Clearance and Decontamination Form to KNF, stating the nature of the transferred medium.
5. Pack the device securely to prevent further damage to the product. If necessary, request original packaging for a fee.

Returns

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

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