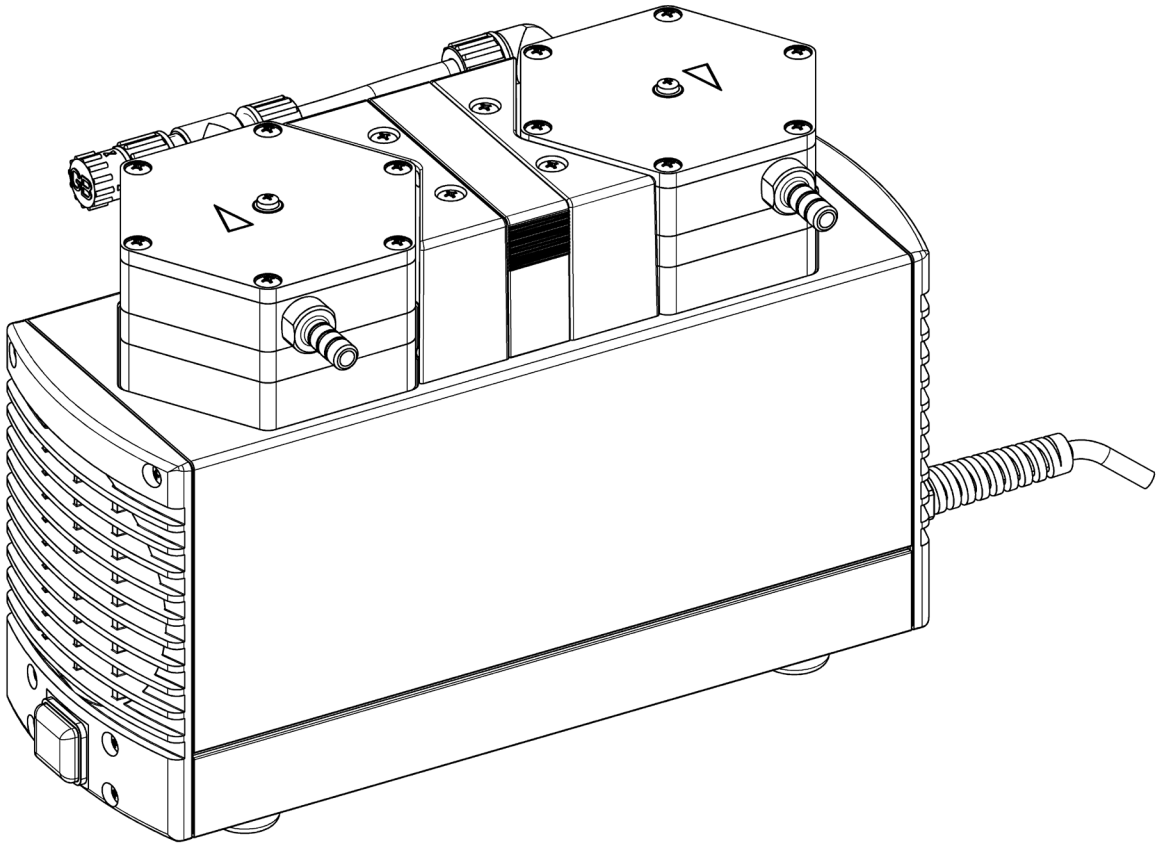
LAB

N 810/820/840.18 EX
TRANSLATION OF ORIGINAL-OPERATING INSTRUCTIONS
ENGLISH

LABOPORT®

CHEMICALLY-RESISTANT LABORATORY PUMPS



Note!
Before operating the pump and the accessories, please read the operating instructions on the web site (www.knf.com/downloads) and pay attention to the safety precautions!

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Content **Page**

1. About this document

1.1. Using the Operating Instructions

The Operating Instructions are part of the pump.

➔ Carefully study the Operating Instructions before using a pump.

➔ Always keep the Operating Instructions handy in the work area.

➔ Pass on the Operating Instructions to the next owner.

Project pumps

Customer-specific project pumps (pump models which begin with “PJ” or “PM”) may differ from the Operating Instructions.

For project pumps, also observe the agreed upon specifications.

1.2. Symbols and Markings

Warning

WARNING

A danger warning is located here.

Possible consequences of a failure to observe the warning are specified here. The signal word, e.g. Warning, indicates the danger level.

➔ Measures for avoiding the danger and its consequences are specified here.

Danger levels

Signal word	Meaning	Consequences if not observed
DANGER	warns of immediate danger	Death or serious injuries and/or serious damage are the consequence.
WARNING	warns of possible danger	Death or serious injuries and/or serious damage are possible.
CAUTION	warns of a possibly dangerous situation	Minor injuries or damage are possible.

Tab. 1

Other information and symbols

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

1. The first step of an activity to be carried out is specified here. Additional, consecutively numbered steps follow.

i This symbol refers to important information.

2. Use

2.1. Proper Use

The pump is exclusively intended for transferring gases and vapors.

Owner's responsibility

Operating parameters and conditions

Only install and operate the pump under the operating parameters and conditions described in chapter 5, Technical data.

Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water.

The pump is suitable for transferring explosive atmospheres in explosion group IIB+H2.

The pump must not be operated in potentially explosive areas. The Ex marking applies only to the working chamber (area in contact with medium).

Requirements for transferred medium

Before using a medium, check the compatibility of the materials of the pump head, diaphragm and valves with the medium.

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

Ensure that the system is not subject to any risks of explosion, also in extreme operating situations (temperature, pressure) or in case of malfunctions.

Only transfer gases which remain stable under the pressures and temperatures occurring in the pump.

Accessories

Laboratory equipment or additional components connected to a pump have to be suitable for use with the pneumatic capabilities of the pump (see chapter 5, page 13).

2.2. Improper Use

The pump may not be operated in an explosive atmosphere.

The pump is not suitable for use underground.

The pump is not suitable for use in potentially explosive areas.

The pump is not suitable for transferring dusts.

The pump is not suitable for transferring liquids.

The pump must not be used to create vacuum and overpressure simultaneously.

An overpressure must not be applied to the suction side of the pump.

The pump must not be used if the gas ballast could result in the reation of reactive, explosive or otherwise hazardous mixtures (e.g. with the medium).

2.3. Use to transfer explosive atmospheres

To transfer explosive atmospheres, use only pumps in the corresponding device category and temperature class.

These pumps have the following explosion protection marking:

Marking	Description
	Symbol for explosion-proof pumps
II	Device group (see Section 2.4.1).
2/-G	Device category (see Section 2.4.2).
IIB + H2	Explosion group (see Section 2.4.3)
T3	Temperature class (see Section 2.4.4)
Gb	Equipment protection level (see Section 2.4.5)
internal atmosphere only	Special conditions (see Section 2.4.6).
	

Tab. 2

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 marking can also be found at the following location:

- Type plate of the pump

2.4. Explanations of the explosion protection marking

2.4.1. Device groups

Device group I — Device group I applies to devices used in the underground and above-ground operations of mines where there is a risk of methane and/or flammable dusts.

Device group II — Device group II applies to devices used in other areas where there is a risk of explosive atmospheres.

2.4.2. Device categories for gas

The device category describes the frequency and duration of the occurrence of an explosive atmosphere in the operations.

Device category	Description*
1 G	Devices for areas in which it is expected that dangerous, explosive atmospheres (gases and vapors) occur constantly, over long periods, or frequently.
1 D	Devices for areas in which it is expected that dangerous, explosive atmospheres (dusts) occur constantly, over long periods, or frequently.
2 G	Devices for areas in which it is expected that dangerous, explosive atmospheres (gases and vapors) occur occasionally.
2/-G	Pump may draw gas from zone 1 but may not be installed in a potentially explosive atmosphere (zone).
2 D	Devices for areas in which it is expected that dangerous, explosive atmospheres (dusts) occur occasionally.
3 G	Devices for areas in which it is not expected that dangerous, explosive atmospheres (gases and vapors) will occur. If, however, they do occur, then only rarely and for short periods.
3 D	Devices for areas in which it is not expected that dangerous, explosive atmospheres (dusts) will occur. If, however, they do occur, then only rarely and for short periods.

Tab. 3 ** according to DIN EN ISO 80079-36*

2.4.3. Explosion groups

Flammable gases and vapors are classified according to explosion groups (I, IIA, IIB, and IIC) and temperature classes. Tab. 4 shows the classification of the most common flammable 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-Butanol Cyclohexanone 1,2-dichloroethane Acetic anhydride	Gasoline Diesel fuel Jet fuel Fuel oils n-Hexane	Acetaldehyde	–	–
IIB	Town gas	Ethylene Ethyl alcohol	Hydrogen sulfide	Diethyl ether	–	–
IIC	Hydrogen	Acetylene	–	–	–	Carbon disulfide

Tab. 4

The classification of gases and vapors into explosion groups and temperature classes applies to the transferred medium.

Transferred medium

The pump may be used only to transfer gases and vapors in explosion groups IIA or IIB+ H2 and temperature class T3 (and lower) (marked area in Tab. 4) or that are not flammable.

Pump environment

The pump must not be installed in potentially explosive areas. It is suitable only to transfer explosive atmospheres.

2.4.4. Temperature classes

Maximum surface temperature

The maximum surface temperature is the highest temperature that the surface of a pump reaches under the least favorable conditions.

Ignition temperature

The maximum surface temperature of the pump must always be lower than the lowest ignition temperature of the gas or vapor/air mixture in which it is used.

Temperature class

The maximum surface temperature is based on the design of the pump and is specified as 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. 5

2.4.5. 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 areas. 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 areas 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 areas. 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. 6 **according to DIN EN ISO 80079-36*

2.4.6. Additional conditions

Marking	Description
internal atmos-phere only	Special additional conditions

Tab. 7

Additional conditions for the diaphragm pump:

- The pump must not be installed outdoors. It may be started up only with suitable weatherproof and corrosion protection cladding.
- The pump must not be installed in potentially explosive areas. It is suitable only to transfer explosive atmospheres.
- The pump must be installed so that it cannot be damaged externally.
- The pumps are to be set up so that they are not exposed to any UV radiation.

3. Information about EX marking

This KNF pump, type:

N 810FT.18	N 810.3FT.18	N 810.3FT.18G
N 820FT.18	N 820.3FT.18	N 820.3FT.18G
N 840FT.18	N 840.3FT.18	N 840.3FT.18G
N 840.1.2FT.18		

has the following device marking according to the latest explosion prevention and protection directive. The marking applies only to the working chamber of the pump (area in contact with medium).

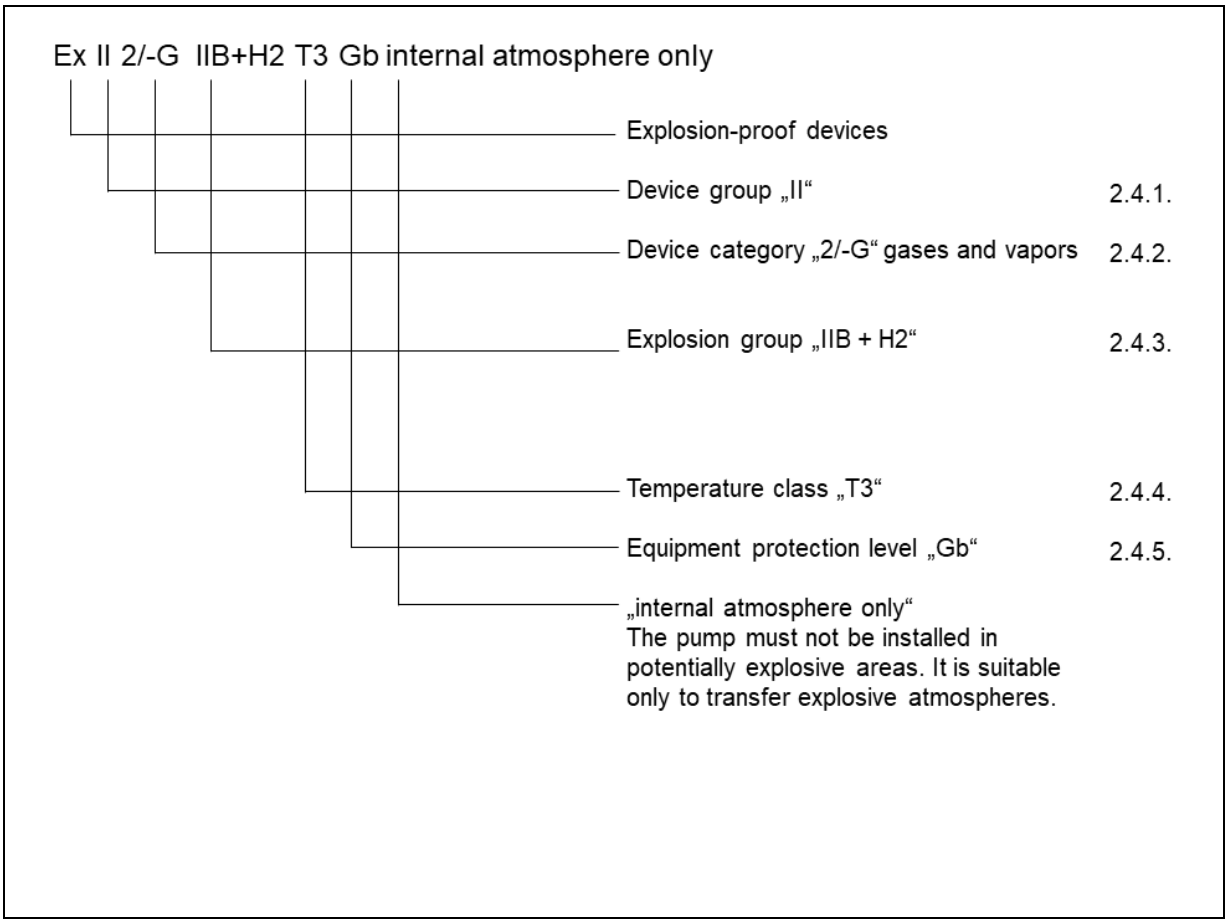

Fig. 1: EX marking of the pumps

Vacuum pumps in category 2/-G are designed to transfer gases, vapors, or aerosols where it is expected that an explosive atmosphere will form occasionally.

The devices must be installed so that they cannot suffer external mechanical damage.

The pumps must not be modified. If a wearing part is replaced, the original function of the pump must be checked by reaching the specified ultimate vacuum (see Operating Instructions, Servicing).

4. Safety

Note the safety precautions in chapters 7. *Installation, mounting and connection,* and 8. *Operation*.

The pump is built according to the generally recognized rules of technology and in accordance with the occupational safety and accident prevention regulations. Nevertheless, dangers can result during their use which lead to injuries to the user or others, or to damage to the pump or other property.

Only use the pump when it is in a good technical and proper working order, in accordance with its intended use, observing the safety advice within the operating instructions, at all times.

Personnel

Make sure that only trained and instructed personnel or specially trained personnel work on the pump. This especially applies to assembly, connection and servicing work.

Make sure that the personnel has read and understood the operating instructions, and in particular the "Safety" chapter.

Working in a safety-conscious manner

Observe the accident prevention and safety regulations when performing any work on the pump and during operation.

Do not expose any part of your body to the vacuum.

Open housing parts with notice sticker (see Fig. 2) only after separating mains plug from power source.

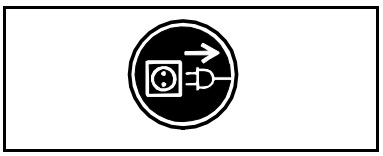

Fig. 2: Notice sticker

Handling dangerous media

When transferring dangerous media, observe the safety regulations when handling these media.

Handling flammable media and explosive atmospheres

Remember that the pump is suitable only for transferring explosive atmospheres and may not be installed in potentially explosive areas.

Make sure the temperature of the medium is always sufficiently below the ignition temperature of the medium, to avoid ignition or explosion. This also applies for unusual operational situations.

Note that the temperature of the medium increases when the pump compresses the medium.

Hence, make sure the temperature of the medium is sufficiently below the ignition temperature of the medium, even when it is compressed to the maximum permissible operating pressure of the pump. The maximum permissible operating pressure of the pump is stated in the technical specifications (see chapter 5, page 13).

If necessary, consider any external sources of energy, such as radiation, that may add heat to the medium.

In case of doubt, consult the KNF customer service.

Environmental protection

Store all replacement parts in a protected manner and dispose of them properly in accordance with the applicable environmental protection regulations. Observe the respective national and international regulations. This especially applies to parts contaminated with toxic substances.

EC/EU directives/standards

The part of the pump that comes into contact with medium corresponds to Directive 2014/34/EU (ATEX).

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

The pumps conform to the safety regulations of the Directive 2014/30/EU concerning Electromagnetic Compatibility and the Directive 2006/42/EC concerning Machinery. The requirements of the following harmonised standards are fulfilled:

- DIN EN 12100
- DIN EN 1012-2
- DIN EN 61010-1
- DIN EN 61326-1 – class A
- DIN EN 50581

The part of the pump that comes into contact with medium is fulfilled by the following harmonized standards:

- DIN EN ISO 80079-36
- DIN EN 1127-1

The pumps correspond to IEC 664:

- the overvoltage category II
- the pollution degree 2

Customer service and repairs

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

Only authorized personnel should open those parts of the housing that contain live electrical parts.

Use only genuine parts from KNF for servicing work.

5. Technical Data

All pumps are secured against overheating with thermal switches and are equipped with a mains fuse.

Pump materials (for all pump types)	
Pump head	PTFE
Diaphragm	PTFE coated
Valve	FFPM
Connections	PVDF/PTFE
Hose connectors	PVDF
Gas ballast only N 8_0.3FT.18G	PVDF

Tab. 8

Refer to the type plate for the pump's electrical configuration.

N 810 FT.18

Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 100		
Delivery rate at atm. pressure [l/min]*	max. 10		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	5.9		
Dimensions: L x H x W [mm]	256 x 187 x 146		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	1.4	1.3	0.6
Power consumption pump [W]	110	110	100
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	2.5	2.5	1.25
Protection class motor	IP44		

Tab. 9 ** Liters in standard state (1,013 mbar)*

N 820 FT.18

Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 100		
Delivery rate at atm. pressure [l/min]*	max. 20		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	7.1		
Dimensions: L x H x W [mm]	268 x 207 x 159		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	2.2	1.9	0.9
Power consumption pump [W]	145	145	130
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	4.0	3.15	2.0
Protection class motor	IP44		

Tab. 10 ** Liters in standard state (1,013 mbar)*

N 840 FT.18

Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 100		
Delivery rate at atm. pressure [l/min]*	max. 34		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	10.3		
Dimensions: L x H x W [mm]	297x 226 x 171		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	4.4	3.2	1.5
Power consumption pump [W]	200	220	180
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	6.3	6.3	3.15
Protection class motor	IP44		

Tab. 11 ** Liters in standard state (1,013 mbar)N 810.3 FT.18*

	N 810.3 FT.18		N 810.3FT.18G
Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 8 (gas ballast closed) ≤ 30 (gas ballast open)		
Delivery rate at atm. pressure [l/min]*	max. 10		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	6.9		
Dimensions: L x H x W [mm]	281 x 187 x140		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	1.4	1.3	0.6
Power consumption pump [W]	100	110	90
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	2.5	2.5	1.25
Protection class motor	IP44		

Tab. 12 **Liters in standard state (1,013 mbar)*

	N 820.3 FT.18		N 820.3FT.18G
Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 8 (gas ballast closed) ≤ 15 (gas ballast open)		
Delivery rate at atm. pressure [l/min]*	max. 20		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	9.3		
Dimensions: L x H x W [mm]	312 x 207 x 144		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	1.8	1.2	0.7
Power consumption pump [W]	130	130	120
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	3.15	2.5	1.6
Protection class motor	IP44		

Tab. 13 **Liters in standard state (1,013 mbar)*

	N 840.3 FT.18		N 840.3FT.18G
Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 8 (gas ballast closed) ≤ 12 (gas ballast open)		
Delivery rate at atm. pressure [l/min]*	max. 34		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	12.6		
Dimensions: L x H x W [mm]	341 x 226 x 166		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	4.4	3.2	1.5
Power consumption pump [W]	220	250	245
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	6.3	6.3	3.15
Protection class motor	IP44		

Tab. 14 **Liters in standard state (1,013 mbar)*

N 840.1.2 FT.18

Pneumatic performance			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 90		
Delivery rate at atm. pressure [l/min]*	max. 60		
Pneumatic connection			
Hose connection [mm]	ID 10		
Ambient and media temperature			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
Other parameters			
Weight [kg]	12.6		
Dimensions: L x H x W [mm]	341 x 226 x 160		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
Electrical Data			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	5.1	4.2	1.9
Power consumption pump [W]	275	280	270
Maximum permitted mains voltage fluctuation	+/- 10 %	+/- 10 %	+/- 10 %
Fuse pump (2x) T [A]	6.3	6.3	3.15
Protection class motor	IP44		

Tab. 15 **Liters in standard state (1,013 mbar)*

6. Design and Function

6.1. Pump

Design

1 Connection piece
2 Pneumatic connection
3 Pump head
4 Outlet (pressure side)
5 Power switch
6 Inlet (suction side)
7 Gas ballast
(only N 8_0.3FT.18G)

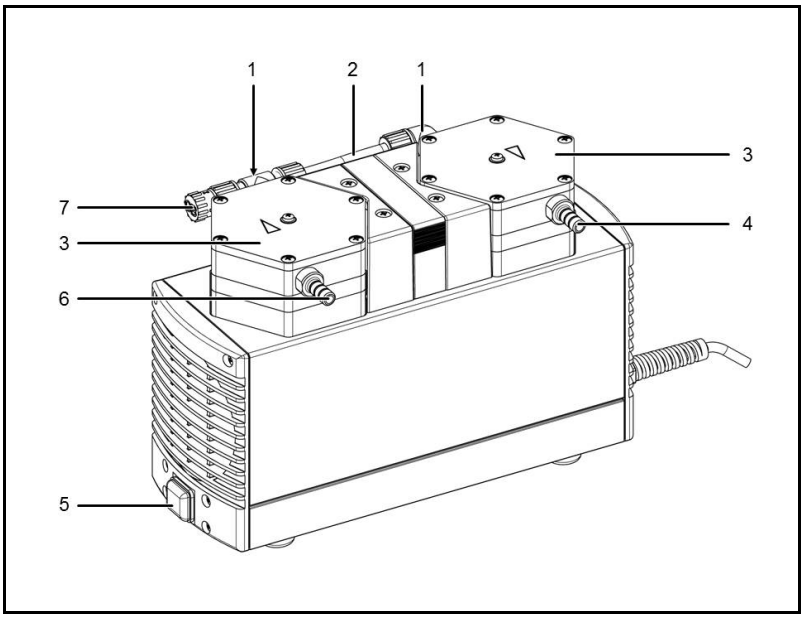

Fig. 3: Diaphragm pump (shown: pump N 840.3 FT.18G)

Function Diaphragm pump

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

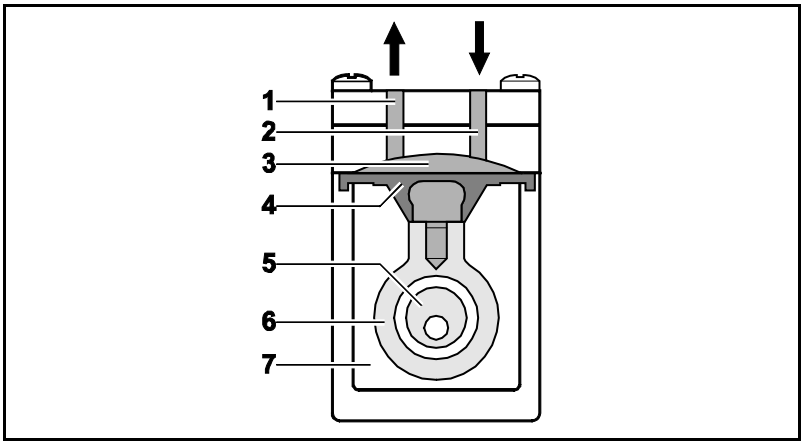

Fig. 4: Pump head

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

The elastic diaphragm (**4**) is moved up and down by the eccentric (**5**) and the connecting rod (**6**). In the downward stroke it aspirates the gas to be transferred via the inlet valve (**2**). In the upward stroke, the diaphragm presses the medium out of the pump head via the outlet valve (**1**). The transfer chamber (**3**) is hermetically separated from the pump drive (**7**) by the diaphragm.

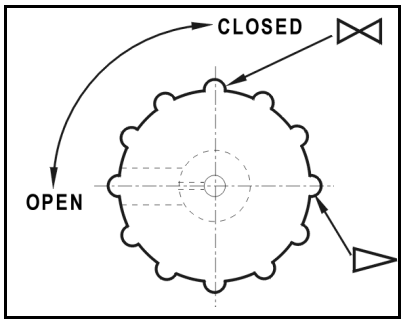

Fig. 5: Gas ballast operating knob

6.2. Gas ballast (only N 8_0.3FT.18G)

DANGER

Personal injury caused by poisoning or explosion and damage to the pump.

➔ Make sure that no reactive or explosive mixtures will be produced when gas ballast valve is open.

➔ If necessary: close gas ballast valve.

➔ Please contact KNF Service if you require an inert gas.

i When pumping vaporous media, opening the gas ballast valve can minimize the formation of condensation in the pump heads.

i Opening the gas ballast valve deteriorates ultimate vacuum performance.

7. Installation, mounting and connection

Only install and operate the pumps under the operating parameters and conditions described in chapter 5, Technical data.

Observe the safety precautions (see chapter 3, page 10).

➔ Before installation, store the pump/the accessories at the installation location to bring it up to room temperature.

Dimensions

➔ See chapter 5, Technical data, for the dimensions of pumps.

Cooling air supply

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

Installation location

➔ Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water.

➔ Choose a safe location (flat surface) for the pump.

➔ Protect the pump from dust.

➔ Protect the pump from vibrations, jolts and external damage.

7.1. Connect pump

Connected components

➔ Only connect components to the pump which are designed for the pneumatic data of the pump (see chapter 5, page 13).

Pump exhaust

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

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

1. Remove the protective plugs from the pneumatic connectors of the pump.
2. Connect the suction line and pressure line.
3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.
4. Insert the power cable's plug into a properly installed shockproof socket.

7.2. Mounting Gas ballast (optional)

Only for two-headed pumps.
Pumps with a „G“ in the type designation are already equipped with a gas ballast as standard.

Condition

- Pump disconnected from mains and de-energized.

Mounting

1. Disconnect the tubes in the inlet (Fig. 3/**6**) and the outlet (**4**) of the pump.
2. Open the connection (**2**) of the pump heads.
3. Screw out the connecting piece (**1**) of the vacuum side head.
4. Screw the gas ballast into the pump head.
5. Remount the connection (**2**) between the both pump heads.

If necessary:
Connect inert gas supply to ventilation connection. Observe the safety instructions in Chapter 4. Please contact KNF Service if you require an inert connection for the gas ballast.

8. Operation

8.1. Pump

8.1.1. Preparing for Start-up

Before switching on the pump, observe the following points:

	Operational requirements
Pump	▪ All hoses attached properly
Pump	▪ Fan openings not blocked ▪ Specifications of the power supply correspond with the data on the pump's/the electrical supply unit's type plate. ▪ The pump outlet is not closed or constricted. ▪ When using a gas ballast: No explosive or poisonous mixtures may be produced when ventilating the pump through the air inlet.

Tab. 16

8.1.2. Starting

➔ Only operate the pump under the operating parameters and conditions described in chapter 5, Technical data.

➔ Make sure the pumps are used properly (see chapter 2.1, page 4).

➔ Make sure the pumps are not used improperly (see chapter 2.2, page 4).

➔ Observe the safety precautions (see chapter 4, page 11).

WARNING

Hazard of the pump head bursting due to excessive pressure increase

➔ Do not exceed max. permissible operating pressure (see chapter 5, page 13).

➔ Monitor pressure during operation.

➔ If the pressure exceeds the maximum permissible operating pressure, immediately shut down pump and eliminate fault (see chapter 10, page 32).

➔ Only throttle or regulate the air or gas quantity in the suction line to prevent the maximum permissible operating pressure from being exceeded.

➔ If the air or gas quantity in the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure of the pump is not exceeded.

Excessive pressure (with all of the related hazards) can be prevented by placing a bypass line with a pressure-relief valve between the pressure and suctions sides of the pump. For further information, contact our technical adviser.

Pump standstill

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

WARNING

Automatic starting can cause personal injury and pump damage

When the operation of the pump is interrupted by the thermal switch, the pump will restart automatically after cooling down.

➔ After triggering of the thermal protection or in the event of power failure, remove the pump's mains plug from the socket so that the pump cannot start uncontrollably.

➔ Attempt work on the pump only if the pump is separated from mains power.

8.2. Switching Pump on and off

Switching pump on

The pump may not start up against overpressure during switch-on. This also applies in operation following a brief power failure. If a pump starts against pressure, it may block. This activates the thermal switch, and the pump switches off.

➔ Make sure that no pressure is present in the lines during switch-on.

➔ Switch on pump with mains switch (see Fig. 3/**5**)

Switching off the pump/removing from operation

➔ When transferring aggressive media, flush the pump prior to switch-off to increase the service life of the diaphragm (see chapter 9.2.1, page 27).

➔ Switch off pump with mains switch (see Fig. 3/**5**).

➔ Open pressure and suction lines to normal atmospheric pressure.

➔ Disconnect the power source.

9. Servicing

9.1. Servicing Schedule

WARNING

Risk of explosion resulting from the formation of an explosive atmosphere

Leaking connections can cause dangerous, explosive atmospheres.

- ➔ Ensure that diaphragms, valve plates/seals are not damaged and are clean and correctly installed.
- ➔ Check pneumatic connections on the pump for leaks.
- ➔ Take care during servicing work.
- ➔ Immediately replace defective parts.

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

Tab. 17

9.2. Cleaning

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

9.2.1. Flushing Pump

WARNING

Risk of explosion when flushing the pump with air

- ➔ If the pump is used with potentially explosive media, have the pump flushed with an inert gas only by an expert.

WARNING

Avoid damage to the pump and personal injury caused by poisoning or explosion

- ➔ When flushing the pump with inert gas, make sure that the gas ballast valve is closed so no reactive or explosive mixtures can form.

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

9.2.2. Cleaning Pump

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

9.3. Changing Diaphragm and Valve Plates/Sealings

Conditions

- Pump is switched off and mains plug is removed from the socket
- Pump is clean and free of hazardous materials
- Tubes removed from pump's pneumatic inlet and outlet

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 2
1	Service Set (see chapter 11.1, page 34)
1	Felt-tip pen

Tab. 18

Information on procedure

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

With multi-head pumps, parts of the individual pump heads can be confused.

➔ Replace the diaphragm and valve plates/sealings of the individual pump heads consecutively.

WARNING

Health hazard due to dangerous substances in the pump!

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

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

➔ Flush pump before replacing the diaphragm and valve plates/sealings (see chapter 9.2.1, page 27).

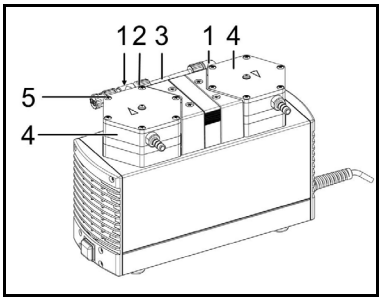

Fig. 6: Removing pump head

Removing pump head

1. For two-headed pumps: On the pneumatic head connection (**3**), loosen the union nuts (**2**) by hand. Then slightly loosen the angle-fitting (**1**) in the pump head (**4**) by turning it anticlockwise, so that the connecting tube can be pulled out.
2. Mark the position of top plate (Fig. 9/**5**), head plate (Fig. 9/**6**), intermediate plate (Fig. 9/**8**) and adapter relatively to each other by a drawing line (for two-headed pumps: at both pump heads) with a felt-tip pen (**1**). This helps to avoid incorrect assembly later.
3. Loosen the outer screws (**5**) on the pump head/pump heads.
4. Carefully remove pump head / pump heads.

Change diaphragm

Replace the diaphragms of two-headed pumps consecutively in order to ensure that the same number of diaphragm spacers is used as before.

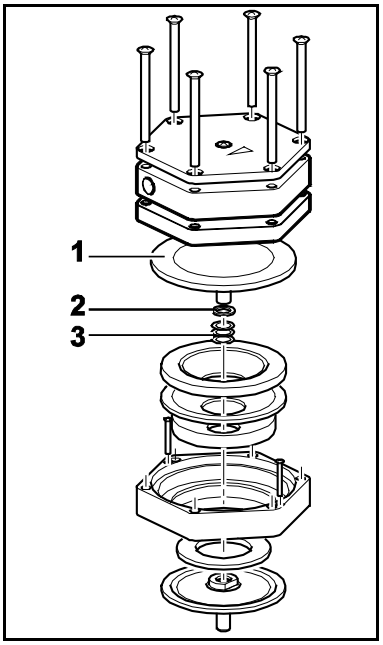

Fig. 7: Changing structured diaphragm

1. For two-headed pumps: Push down one diaphragm until other diaphragm is pushed upwards to its highest position.
2. Carefully unscrew the upper diaphragm (**1**) anti-clockwise using both hands.
3. Replace spacer thick (**2**) and spacers thin (**3**) onto the screw thread of the new diaphragm (same number and order).
4. Screw in the new diaphragm and tighten it by hand.
5. With a two-headed pump: Complete steps 1 through 4 for the second pump head.

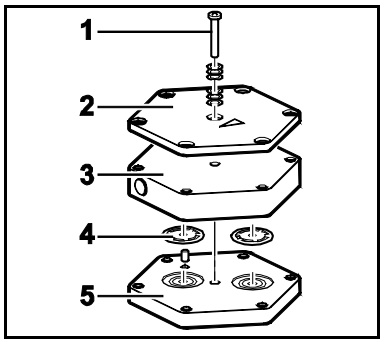

Fig. 8: Changing valve plates/sealings

Change valve plates/sealings

Replacing the valve plates/sealings of two-headed pumps consecutively.

1. Loosen screw(s) (**1**) in the center of the top plate (**2**). With a two-headed pump: loosen the screw(s) from just one pump head.
2. Remove top plate (**2**) and head plate (**3**) from intermediate plate (**5**).
   Valve plates/sealings are visible.
3. Remove old valve plate/sealings.
4. Clean intermediate plate (**5**) carefully (if there should be deposits in the recesses in the intermediate plate).
5. Insert new valve plates/sealings (**4**) in the recesses in the intermediate plate (**5**).
6. For two-headed pumps: Carry out the steps 1 to 5 for the second pump head.
7. Dispose of the old diaphragm(s) and valve plates/sealings properly.

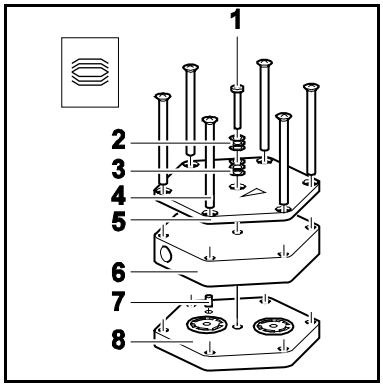

Fig. 9: Refitting pump head

Refitting pump head

1. Apply pressure all around the edge of the diaphragm. With a two-headed pump: Apply pressure to diaphragm on only one pump.
2. Place the intermediate plate (**8**) with valve plates/sealings on the adapter in accordance with the felt-tip pen marking.
3. Place the head plate (**6**) on the intermediate plate (**8**) in the position indicated by the guide pin (**7**).
4. Place the top plate (**5**) on the head plate (**6**) in accordance with the felt-tip pen marking.
5. Gently tighten screws (**4**) in diagonal order.
6. Insert screw(s) (**1**) with disk springs (**2**, **3**) in the center of the top plate (**5**). In doing so, make sure that the disk springs are arranged properly (see Fig. 9).
7. Screw in the screw/screws (**1**) in the centre of the pump top plate (**5**) until it is flush with the top plate (they are flush with the top plate); then screw one final half turn to tighten.
8. For two-headed pumps: Carry out steps 1 to 7 for the second pump head.
9. For two-headed pumps: Refit the pneumatic head connection: Place tube onto the connecting part of the angle fitting, turn angle fitting to a straight position and tighten the union nut.

Final steps

WARNING

Risk of explosion from leaks

➔ Before restarting the pump, check the pump head (twin-head pumps: pump heads) and pneumatic connections for leaks. Leaks may cause an explosion.

1. Functional check
   - Reconnect suction and pressure line to the pump.
   - Reconnect the pump to the electricity supply.
   - Check the functions of the pump (including ultimate vacuum)
   - Disconnect electrical and pneumatic connections from the pump again
2. Integrate the pump in the application
   - Reconnect suction and pressure line to the pump.
   - Reconnect the pump to the electricity supply.
   - Check the functions of the pump

10. Troubleshooting

DANGER

Extreme danger from electrical shock!

➔ Disconnect the pump power supply before working on the pump.

➔ Make sure the pump is de-energized and secure.

➔ Check the pump (see Tab. 18 to 21).

10.1. Pump without Vacuum Controller

Pump does not transfer	
Cause	Fault remedy
No voltage in the power source	➔ Check room fuse and switch on if necessary.
Thermal switch has operated following to over-heating.	➔ Disconnect pump from mains. ➔ Allow pump to cool. ➔ Trace cause of over-heating and eliminate it.
Connections or lines blocked.	➔ Check connections and lines. ➔ Remove blockage.
External valve is closed or filter is clogged.	➔ Check external valves and filters.
Condensate has collected in pump head.	➔ Detach the condensate source from the pump. ➔ Flush pump (see chapter 9.2.1, page 27).
Diaphragm or valve plates/ sealings are worn.	➔ Replace diaphragm and valve plates/sealings (see chapter 9.3, page 28).

Tab. 19

Flow rate, pressure or vacuum too low The pump does not achieve the output specified in the Technical data or the data sheet.	
Cause	Fault remedy
Condensate has collected in pump head.	➔ Detach the condensate source from the pump. ➔ Flush pump (see chapter 9.2.1, page 27). ➔ Open gas ballast and flush pump head.
There is gauge pressure on pressure side and at the same time vacuum or a pressure above atmospheric pressure on suction side.	➔ Change the pressure conditions.
Pneumatic lines or connection parts have an insufficient cross section or they are throttled.	➔ Disconnect pump from system to determine output values. ➔ Eliminate throttling (e.g. valve) if necessary. ➔ Use lines or connection parts with larger cross section if necessary.
Leaks occur on connections, lines or pump head.	➔ Check that tubes sit correctly on hose nozzles. ➔ Replace leaky tubes. ➔ Eliminate leaks.
Connections or lines completely or partially jammed.	➔ Check connections and lines. ➔ Remove the jamming parts and particles.
Head parts are soiled.	➔ Clean head components.
Diaphragm or valve plates/sealings are worn.	➔ Replace diaphragm and valve plates/sealings, (see chapter 9.3, page 28).

Flow rate, pressure or vacuum too low The pump does not achieve the output specified in the Technical data or the data sheet.	
Cause	Fault remedy
After diaphragm and valve plates/sealings have been replaced.	➔ Check that the spacers have been replaced onto the diaphragm screw thread. ➔ Check head connection and hose connections. ➔ Possibly carefully tighten the outer screws (Fig. 6/**5**, page 29) of the top plate crosswise.
Gas ballast still open.	➔ Close gas ballast.

Tab. 20

Pump is switched on, but does not run, the on/off-switch on the pump is not lit	
Cause	Fault remedy
Pump is not connected with the power source.	➔ Connect pump to mains power.
No voltage in the power source	➔ Check room fuse and switch on if necessary.
Fuse in the pump is defective.	➔ Remove pump's mains plug from the socket. ➔ Loosen marked lid on underside of the pump. ➔ Select and replace suitable fuse (see chapter 5, page 13).

Tab. 21

Pump is switched on, but does not run, the on/off-switch on the pump is lit	
Cause	Fault remedy
The thermal switch has opened due to overheating.	➔ Remove pump's mains plug from the socket. ➔ Allow pump to cool. ➔ Trace cause of over-heating and eliminate it.

Tab. 22

10.2. Fault cannot be rectified

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

1. Flush the pump to free the pump head of dangerous or aggressive gases (see chapter 9.2.1, page 27).
2. Remove the pump.
3. Clean the pump (see chapter 9.2.2, page 27).
4. Send the pump, together with completed Health and Safety Clearance and Decontamination Form, to KNF stating the nature of the transferred medium.

11. Ordering Information

11.1. Pumps and Spare Parts

A service set contains:

- 1 diaphragm and 2 valve plates/sealings for one-headed pumps
- 2 diaphragms and 4 valve plates/sealings for two-headed pumps

Pump type	Order-No. pump	Order-No. Service Set
N 810 FT.18	309574	058077
N 820 FT.18	309576	058078
N 840 FT.18	309578	058079
N 810.3 FT.18	309575	057357
N 820.3 FT.18	309577	057358
N 840.3 FT.18	309579	057359
N 840.1.2 FT.18	309580	057359

Tab. 23

11.2. Head plates and intermediate plates

Pump type	Order-No. head plate		Order-No. intermediate plate
	Head 1	Head 2	
N 810 FT.18	304248	-	304245
N 820 FT.18	304249	-	304246
N 840 FT.18	304250	-	304247
N 810.3 FT.18	304248	304251	304245 (2x)
N 820.3 FT.18	304249	304252	304246 (2x)
N 840.3 FT.18	304250	304253	304247 (2x)
N 840.1.2 FT.18	304250 (2x)	-	304247 (2x)

Tab. 24

11.3. Accessories

Accessory	Order-No.
Gas ballast N 810	028476
Gas ballast N 820/840	028477

Tab. 25

12. Returns

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

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

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

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