

memmert

PM - PMP



Manual

Pump module PM - PMP

MADE IN GERMANY.

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Please contact our customer service department before sending appliances for repair or before returning equipment, or the shipment may be refused.

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D39489 I Date 12/2019

Subject to change without notice

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About this manual

Purpose and target audience

This manual, together with the operating manual for the MEMMERT vacuum oven, describes how to use and put into operation the MEMMERT pump module. Pump modules can be purchased with or without a pre-installed vacuum pump.

The manual contains the original maintenance and operating manual for the membrane vacuum pump, which may have been installed, from the company KNF.

The pump module may only be used in combination with the MEMMERT vacuum oven VO or VOOol. All information in terms of safety instructions, assembly, function, transport, putting into operation, troubleshooting, maintenance and decommissioning/disposal can be found in the operating manual for the vacuum oven VO.

This manual is intended for use by trained personnel of the owner, who have the task of operating and/or maintaining the respective appliance. If you are asked to work on the appliance, read this manual carefully before starting.

Familiarise yourself with the safety regulations. Only perform work that is described in this manual. If there is something you do not understand, or certain information is missing, ask your manager or contact the manufacturer. Do not do anything without authorisation.

Other documents to be observed as applicable:

- ▶ The operating manual for the MEMMERT vacuum oven VO
- ▶ The original maintenance and operating manual for the vacuum pump from KNF

Storage and resale

This operating manual belongs with the appliance and should always be stored where persons working on the appliance have access to it. It is the owner's responsibility to ensure that persons who are working on or are going to work on the appliance know where to find the operating manual. We recommend that it is always stored in a protected location close to the appliance. Make sure that the operating manual is not damaged by heat or humidity. If the appliance is resold or transported and then set up again at a different location, the operating manual must remain with it.

The current version of this operating manual in PDF format is also available for download from <http://www.memmert.com/en/service/downloads/user-manual/>.

1. Safety regulations

1.1 Product safety and dangers

The appliances described in this manual are technically sophisticated, manufactured using high-quality materials and subject to many hours of testing in the factory. They reflect the state of the art and comply with recognised technical safety regulations. However, there are still risks involved, even when the appliances are used as intended. These are described below.

WARNING



After removing covers, live parts may be exposed. Touching these can lead to an electric shock. Disconnect the mains plug before removing any covers. Work on the electrical system must only be performed by qualified electricians.



WARNING



Toxic gases or vapours may be produced in certain applications. These can escape from the vacuum pump into the room. This can injure people nearby. The appliance may only be used for such applications if a suction is attached to the vacuum pump used, which reliably keeps toxic gases or vapours away from people. Observe the respective national regulations for occupational safety and environmental protection.

NOTICE



The operating manual of the MEMMERT vacuum oven contains important information and instructions how to use the pump module. Follow all possible information from the related operating manual of the vacuum oven exactly.

1.2 Intended use

The appliance may only be used to accommodate and control a vacuum pump by means of a MEMMERT vacuum oven VO29, VO49 or VO101. Any other use is improper and may result in hazards and damage.

1.3 Changes and alterations

No unauthorised changes or alterations may be made to the appliance. No parts may be added or inserted which have not been approved by the manufacturer.

Unauthorised changes or alterations result in the CE declaration of conformity losing its validity, and the appliance may no longer be operated.

The manufacturer is not liable for any damage, danger or injuries that result from unauthorised changes or alterations, or from non-compliance with the provisions in this manual.

1.4 Requirements of the operating personnel

The appliance may only be operated and maintained by persons who are of legal age and have been instructed accordingly. Personnel who are to be trained, instructed or who are undergoing general training may only work with the appliance under the continuous supervision of an experienced person.

Repairs may only be performed by qualified specialists. The provisions in the operating and installation manual from KNF also need to be observed.

1.5 Behaviour in case of malfunctions and irregularities

The appliance may only be used in a flawless condition. If you as the operator notice irregularities, malfunctions or damage, immediately take the appliance out of service and inform your superior.

1.6 Switching off the appliance in an emergency

Press the main switch on the pump module.

This disconnects the appliance from the power supply at all poles.



2. Putting into operation

When operating the appliance for the first time, do not leave it unattended until it has reached a steady state.

2.1 Connecting the vacuum pump

Connect the vacuum pump's 230 V plug with earthing contact to the internal socket in the pump module.



2.2 Connecting the appliance

NOTICE

For connection, please observe the national regulations. Observe the connection and power ratings (see nameplate and technical data).

Make sure to establish a safe PE conductor connection. Place the power cable so that

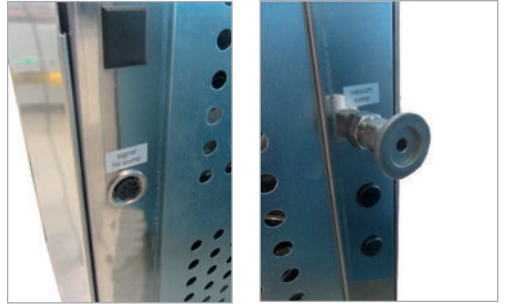
- ▶ It is easily accessible at all times and can be pulled out quickly, for example in case of a malfunction or emergency;
- ▶ It does not represent a trip hazard;
- ▶ It cannot come into contact with any hot parts.



2.3 Connecting the vacuum pump to the VO

The connection for the signal lead (left) and the connection for the vacuum hose (right) can be found at the rear of the PM.

Connect the vacuum oven and the pump module to the signal lead and the vacuum hose as described in the operating manual for the MEMMERT vacuum oven.



2.4 Switching on

1. Press the main switch for the vacuum pump.



2. Press the main switch for the pump module.



3. Technical data

Appliance size	29	49	101
Appliance width D [mm]	550	550	710
Appliance height E [mm]	600	680	760
Appliance depth F [mm]	400	480	550
Depth of door lock [mm]	38		
Weight without/with pump [kg]	25 / 33	30 / 38	41 / 49
Power [W]*	140		
Current consumption [A]*	1,9		

*All other technical data can be found in the operating and installation manual for the KNF pump which follows

4. Spare parts and service

In the event of a malfunction or if the pre-installed membrane vacuum pump requires maintenance or service work, contact the Customer Service department at Memmert.

The spare parts required for complete maintenance of the pump head are available from Memmert under the following order number:

- ▶ E07534 spare parts kit for membrane

5. Maintenance and cleaning

- Depending on the customer process, condensate may accumulate in the collection container of the pump module. No condensate can be sucked in by the pump. Check and empty the container regularly.

5.1 Emptying the collection container

1. Unscrew and remove the ducts from the collection container.
2. Remove the collection container from the holder and empty it.
3. Insert the collection container into the holder and attach the ducts.



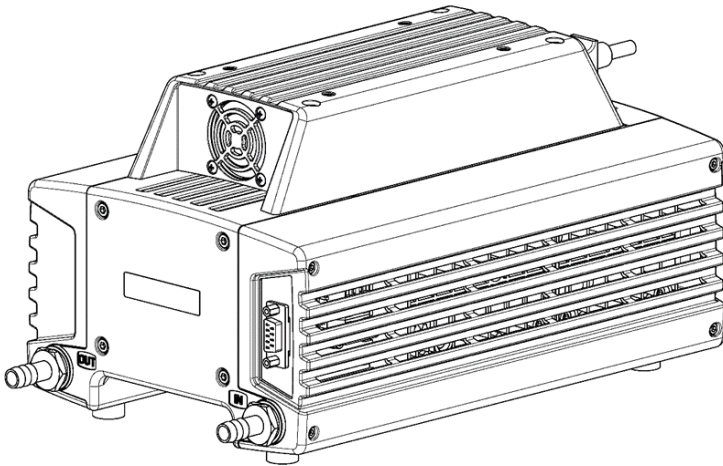
6. Operating and installation information

Information about the assembly and functionality of the pre-installed KNF vacuum pump N950.50 KNE-W can be found in the manufacturer's original operating manual (provided).

LAB

PJ25481-950.50.18
TRANSLATION OF ORIGINAL INSTALLATION
INSTRUCTIONS
ENGLISH

DIAPHRAGM PUMP



Note!

Before operating the pump and the accessories, please read the operating instructions and pay attention to the safety precautions!



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1. About this document

1.1. Using the Installation Instructions

The Installation Instructions are part of the pump.

- ➔ Carefully study the Installation Instructions before using the pump.
- ➔ Always keep the Installation Instructions handy in the work area.
- ➔ Pass on the Installation Instructions to the next owner.

1.2. Symbols and markings

Warning



WARNING

A danger is located here.

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

Warning, indicates the danger level.

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

Danger levels

Signal word	Meaning	Consequences if not observed
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.



This symbol refers to important information.

2. Use

2.1. Proper use

The pumps are exclusively intended for transferring gases and vapors.

Owner's responsibility

Operating parameter and conditions

Only install and operate the pumps under the operating parameters and conditions described in Chapter 4. Technical Data.

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

The gas-tightness of the connections between the application pipes and the pump (or the pump connection) must be checked regularly; with leaky connections, there is a danger that hazardous gases or vapors may escape from the pump system.

Requirements for transferred medium

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

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

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

Accessories

Laboratory equipment or additional components connected to a vacuum pump system have to be suitable for use with the pneumatic capabilities of the pump. (see Chapter 4. Technical Data).

2.2. Improper use

The pumps may not be operated in an explosive atmosphere.

The pumps are not suitable for transferring dusts.

The pumps are not suitable for transferring liquids.

The pumps are not suitable for transferring aerosol.

The pumps are not suitable for transferring biological and microbiological substances.

The pumps are not suitable for transferring fuel.

The pumps are not suitable for transferring explosive and combustible materials.

The pumps are not suitable for transferring fibers.

The pumps are not suitable for transferring oxidizing agent.

The pumps are not suitable for transferring foodstuffs.

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

Pumps designed to create either a vacuum or an overpressure must not be used for these two purposes simultaneously.

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

3. Safety

i Note the safety precautions in Chapter 6. Installation and connection and 7. Operation.

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

Only use the pumps when they are in a good technical and proper working order, in accordance with their intended use, observing the safety advice within the Installation Instructions, at all times.

Components connected to the pump must be designed to withstand the pneumatic performance of the pump.

Take care that safety regulations are observed when connecting the pump to the electricity supply.

Personnel

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

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

Working in a safety conscious manner

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

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

Ensure that the pump is separated from the mains and is de-energized.

The pump heads heat up during operation – avoid contact with them.

Make sure that there are no hazards due to flow with open gas connections, noises or hot gases.

Ensure that an EMC-compatible installation of the pump is ensured at all times and that this cannot lead to a hazardous situation.

Handling dangerous media

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

If the diaphragm ruptures, the transferred medium will mix with the air in the environment.

Take all necessary care to prevent this leading to a dangerous situation.

Handling combustible media

Be aware that the pumps are not designed to be explosion-proof.

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

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

	<p>Hence, make sure the temperature of the medium is sufficiently below the ignition temperature of the medium, even when it is compressed to the maximum permissible operating pressure of the pump. The maximum permissible operating pressure of the pump is stated in the technical specifications (Chapter 4).</p> <p>If necessary, consider any external sources of energy, such as radiation, that may add heat to the medium.</p> <p>In case of doubt, consult the KNF customer service.</p>
Environmental protection	<p>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.</p>
Standards	<p>The pumps conform to the Directive 2011/65/EU (RoHS2).</p> <p>The pumps conform to the safety regulations of the EC Directive 2014/30/EU concerning Electromagnetic Compatibility and the EC Directive 2006/42/EC concerning Machinery.</p> <p>The following harmonized standards have been used:</p> <ul style="list-style-type: none"> ▪ DIN EN 61010-1 ▪ DIN EN 61326-1 Class A ▪ DIN EN 50581 <p>The pumps correspond to DIN EN 60664-1:</p> <ul style="list-style-type: none"> ▪ The overvoltage category II ▪ The pollution degree 2
Customer service and repairs	<p>The pump is maintenance-free. But KNF recommends, checking the pump regularly with regard to conspicuous changes in noise and vibrations.</p> <p>Only have repairs to the pumps carried out by the KNF Customer Service responsible.</p> <p>Housing with voltage-caring parts may be opened by technical personnel only.</p> <p>Use only genuine parts from KNF for servicing work.</p> <p>Use only the original KNF power supply.</p>

4. Technical Data

Pump materials

Assembly	Material
Diaphragm	PTFE coated
Valve plates	FFPM
O-ring	FPM (head 1-3) FFPM (head 4)
Head plate	PPS
Intermediate plate	PPS

Tab. 2

Pneumatic values

Parameter	Value
Max. permissible operating pressure [bar g]	-
Ultimate vacuum [mbar abs.] with closed gas ballast	2.0
Delivery rate at atm. pressure and 5V control voltage [l/min]*	55.0

Tab. 3

*Liters in standard state (1013 mbar)

Pneumatic Connections

Pump type	Value
PJ25481-950.50.18	Hose ID 10

Tab. 4

Electrical data

Parameter	Value
Automatic voltage selection	100-240 V 50 – 60 Hz
Max. current consumption [A]	1.9
Max. power consumption [W]	140
Maximum permitted mains voltage fluctuations	± 10%
Protection class Motor	IP 20
Protection class Pump	IP 20

Tab. 5

- i** The pump is supplied by a universal power supply with integrated overload protection. They are protected against overheating by a temperature sensor on the motor board and equipped with overcurrent protection.
- If one of these safety functions is triggered, the pump will be shut down and must be manually reset, as follows:
- ➔ Separate pump from mains.
 - ➔ Remove the cause(s) of the fault before restarting.

Weight

Pump type	Value
PJ25481-950.50.18	Approx. 7.2 kg

Tab. 6
Other parameters

Parameter	Value
Permissible ambient temperature	+ 10°C to + 40°C
Permissible media temperature	+ 5°C to + 40°C
Dimensions	See Fig. 3, Chapter 6.1
Maximum permissible ambient relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.
Max. altitude of site: [m above sea level]	2000

Tab. 7

5. Design and function

Design

- 1 Inlet (suction side)
- 2 Outlet (pressure side)
- 3 Power switch, removable mains cable
- 4 Sub-D-plug (motor control)

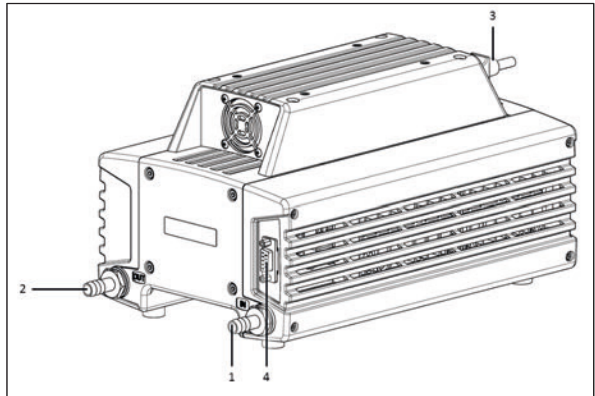


Fig. 1: Design PJ25481-950.50.18

Function Diaphragm Pump

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

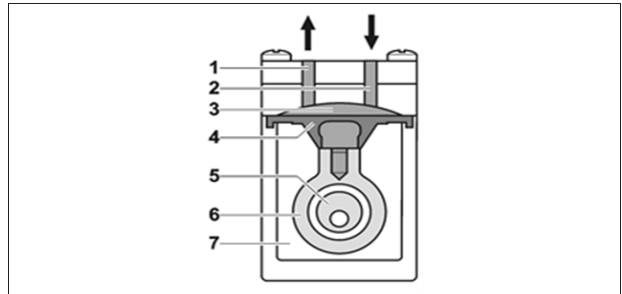


Fig. 2: Pump head

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

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

6. Installation and connection

Only install and operate the pumps under the pneumatic operating parameters and conditions described in Chapter 4, Technical Data. Observe the safety precautions (see Chapter 3).

6.1. Installation of the pump

- ➔ Choose a safe location (flat surface) for the pump.
- ➔ Before installation, store the pump at the installation location to bring it up to ambient temperature.

Mounting dimensions ➔ See Fig. 3 for mounting dimensions.

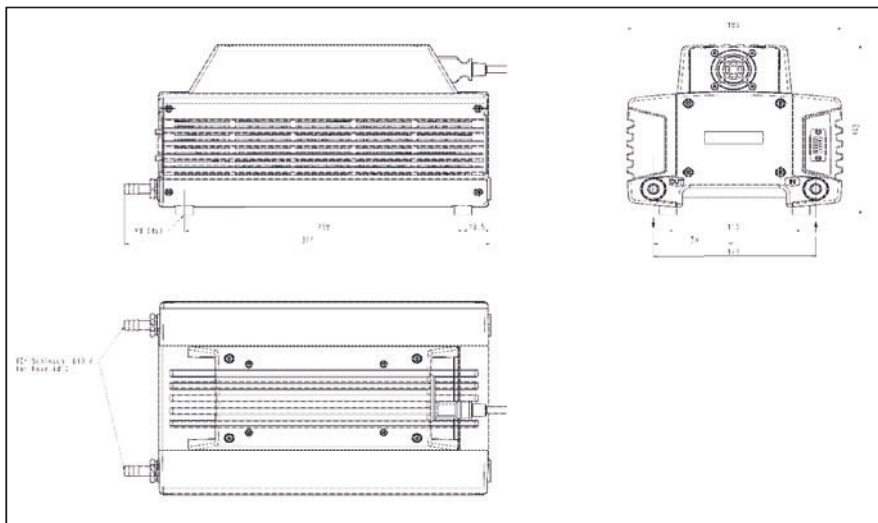


Fig. 3: Mounting dimensions PJ25481-950.50.18 (All dimensional tolerances conform to DIN ISO 2768-1, Tolerance Class V)

- 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 as well as other pollutions.
 - ➔ Make sure, that the installation location is accessible for maintenance and service.
 - i** The IP protection class of the pump motor is indicated on the type plate.
 - ➔ Install the pump at the highest point in the system to prevent condensate from collecting in the pump head.
 - ➔ Protect the pump from dust.

- Protect the pump against grease and oils.
- Protect the pump from vibrations and jolts.

**WARNING**

Personal injury and/or damage to property because of vibration

In conjunction with adjacent components, vibration of the pump may result in crushing and/or damage to these components.

- Make sure that vibrations of the pump do not result in hazards associated with adjacent components.

Foreign matter protection

- Protect the pump against contact and intrusion of foreign matter.

6.2. Electrical connection



DANGER

Extreme danger from electrical shock

- Only have the pump connected by an authorized specialist.
- Only have the pump connected when the power supply is disconnected.

- When connecting the device to a power source, the relevant standards, directives, regulations, and technical standards must be observed.

Connecting pump

1. Compare the supply data with the data on the motor plate. For maximum operating current of the pump see pump's type plate.

i The voltage must not vary by more than + 10% and – 10% from that shown on the type plate.

2. Insert the mains cable plug into a properly installed shockproof socket.

i Ensure sufficient dimensioning of the connection cables.

6.3. Pneumatic connection



CAUTION

Personal injury or damages to property by ejected protective plugs

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

- Remove the protective plug during the installation.

- Connected components → Only connect components to the pump which are designed for the pneumatic data of the pump (see Chapter 4, Technical Data).
- Pump exhaust → If the pump is used as a vacuum pump, safely discharge the pump exhaust at the pump's pneumatic outlet.

Connecting pump

- i** A marking on the pump head shows the direction of flow.
 - i** Confusion between suction and pressure sides can lead to breakage of connected components on the suction and pressure sides.
1. Remove the protective plugs from the hose connection threads.
 2. Connect the suction line and pressure line (see Chapter 4, Tab. 7 for mounting dimensions).
 3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

7. Operation

7.1. Initial start-up

	Operational requirements
Pump	<ul style="list-style-type: none"> ▪ All hoses attached properly. ▪ Fan openings not blocked. ▪ Specifications of the power supply correspond with the data on the pump's type plate. ▪ Ensure that the pump outlet is not closed or constricted.

Tab. 8

7.2. Start up



Danger of burns from hot pump parts or hot medium

During or after operation of the pump, some pump parts may be hot.

WARNING

- Allow the pump to cool after operation.
- Take safety precautions against the contact of hot parts/media.



Injury of the eyes

During excessive approach to the inlet or outlet of the pump, the eyes could be injured by the upcoming vacuum or overpressure.

WARNING

- Don't look into the pump's inlet or outlet during the operation.

- Only operate the pumps under the operating parameters and conditions described in Chapter 4. Technical Data.
- Make sure the pumps are used properly (see Chapter 2.1).
- Make sure the pumps are not used improperly (see Chapter 2.2).
- Observe the safety precautions (see Chapter 3).



WARNING

Hazard of the pump head bursting due to excessive pressure increase

- Do not exceed max. permissible operating pressure (see Chapter 4. Technical Data.
- Monitor pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure, immediately switch off pump and eliminate fault (see Chapter 9. Troubleshooting).
- Only throttle or regulate the air or gas quantity in the suction line to prevent the maximum permissible operating pressure from being exceeded.
- If the air or gas quantity in the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure is not exceeded.
- Ensure that the pump outlet is not closed or constricted.



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

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 or the triggering device for PTC sensors, the pump will restart automatically after cooling down.

- Take all necessary care to prevent this leading to a dangerous situation.

7.3. Switching Pump on/off

Switching pump on

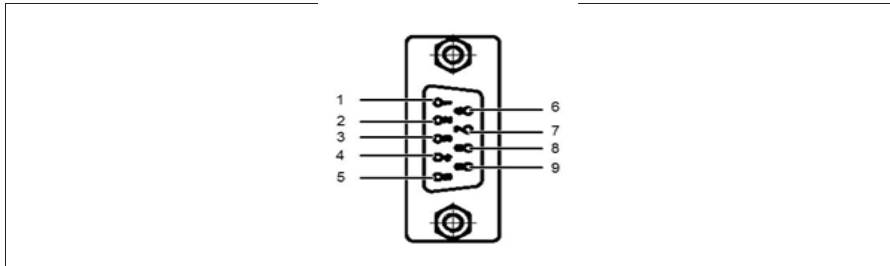


The pump may not start up against pressure during switch-on. This also applies in operating following a brief power failure. If a pump starts against pressure, it may block. This activates the overload switch and the pump switches off.

- Make sure that normal atmospheric pressure is present in the lines during switch-on.
- Pumpe am Netzschalter einschalten (siehe Fig. 1/3 in Kapitel 5).



Depending on the applied electrical voltage, initialization of the electronics may take up to one second before the pump starts.

External actuation

Elektrische Anschlüsse / Electrical connection
Litzenbelegung / lead assignment

Pin Nr.	Funktion / function	Signalname signal name
1	5V Ausgangsspannung 5V power supply	U_{5V}
2	Masse Ground	GND
3	Masse Ground	GND
4	Ausgangssignal Drehzahl Output signal speed	U_{Spd}
5	Versorgung Gasballastventil Supply gas ballast valve	U_{+GB}
6	Eingangssignal Drehzahlregelung Input signal speed control	U_{Ctrl}
7	Ausgangssignal Fehler Output signal fault	U_{Flt}
8	Eingangssignal Remote EIN/AUS Input signal Remote ON/OFF	U_{Rmt}
9	Masse Gasballastventil Ground gas ballast valve	U_{-GB}
5V Ausgangsspannung U_{5V} / 5V Power supply U_{5V}		
Ausgangsspannung DC Output voltage range DC	[V]	5 ± 0.2
Max. Ausgangsstrom Max. current output	[mA]	170

Tab. 9 (part 1): Connection plan motor electronics

Ausgangssignal Drehzahl U_{Spd} / Output signal speed U_{Spd}			
Analog	Pulse pro Umdrehung Pulses per revolution	[-]	1
	Pulstastverhältnis Pulse duty cycle	[%]	50 ± 1
PWM-Signal	PWM Frequenz PWM frequency	[Hz]	50 ± 0.5
Ausgangspegel „high“ Output level „high“		[V]	5 [4.1 ... V_{5V}]
Ausgangspegel „low“ Output level „low“		[V]	0 [0 ... 0.6]
Max. Strombelastbarkeit Max. current carrying capacity		[mA]	10
Ausgangsimpedanz @ 1 kHz Output impedance @ 1 kHz		[k Ω]	≥ 9
Eingangssignal Drehzahlregelung U_{Ctrl} / Input signal speed control U_{Ctrl}			
Analog	Steuerspannungsbereich DC Control voltage range DC	[V]	0 ... 5
	Steuerspannungsbeschreibung: min. → Pumpe min. Förderleistung max. → Pumpe max. Förderleistung Control voltage description min. → pump min. flow max. → pump max. flow	[V]	min. max. 0.1 5
	Max. Eingangsspannung Max. input voltage	[V]	5.5
	Schwellenspannung Treshold voltage	[mV]	25 ± 0.5
	PWM Frequenzbereich PWM frequence range	[Hz]	100 [50 ... 150]
PWM-Signal	Eingangspegel „high“ Input level „high“	[V]	5 [4.2 ... 5.5]
	Eingangspegel „low“ Input level „low“	[V]	0 [0 ... 0.9]
	Tastgradbereich Duty cycle range	[%]	0 ... 100
	Tastgradbeschreibung: min. → Pumpe min. Förderleistung max. → Pumpe max. Förderleistung Duty cycle description min. → pump min. flow max. → pump max. flow	[%]	min. max. 2 100
	Eingangsimpedanz @ 1kHz Input impedance @ 1kHz	[k Ω]	≥ 12

Tab. 9 (part 2): Connection plan motor electronics

Ausgangssignal Fehler U_{Fit} / Output signal fault U_{Fit}		
Eingangsspiegel „high“ → Fehler vorhanden Input level „high“ → error detected	[V]	5 [3.9 ... 5.5]
Eingangsspiegel „low“ → kein Fehler Input level „low“ → no error	[V]	0 [0 ... 0.9]
Max. Strombelastbarkeit Max. current carrying capacity	[mA]	10
Ausgangsimpedanz @ 1kHz Output impedance @ 1kHz	[kΩ]	≥ 9
Eingangssignal Remote EIN/AUS U_{Rmt} / Input signal Remote ON/OFF U_{Rmt}		
Eingangsspiegel „high“ → Motor EIN Input level „high“ → motor ON	[V]	5 [3.9 ... 5.5]
Eingangsspiegel „low“ → Motor AUS Input level „low“ → motor OFF	[V]	0 [0 ... 0.9]
Eingangsimpedanz @ 1 kHz Input impedance @ 1 kHz	[kΩ]	≥ 1.8
Versorgung Gasballastventil U_{+GB} / Supply gas ballast valve U_{+GB}		
Steuerspannung DC Control voltage DC	[V]	24 ± 10%
Max. Stromaufnahme Max. current consumption	[mA]	≤ 50

Tab. 9 (part 3): Connection plan motor electronics

Adjusting the flow rate	<p>The flow rate can be varied by an external actuation (Sub-D-plug, see Tab. 9).</p> <p>The speed of the pump is controlled by a control voltage. Please contact our KNF customer service for further information.</p>
Remote ON/OFF	<p>Remote ON/OFF is through an 9-pin controller connection (Pin 8, see Tab. 9).</p> <p>i To start the motor, Pin 5 must be bridged to the ground of the controller connection. Please contact our KNF customer service for further information.</p> <p>Switching off the pump</p>
Vapors as media	<p>The life of the diaphragm is prolonged the formation of condensate is avoided. Therefore the following precautions should be taken:</p> <ul style="list-style-type: none"> ➔ Run the pump for a few minutes to warm it up before handling saturated or nearly saturated vapors. ➔ KNF recommends: When transferring aggressive media, flush the pump prior to switch off (see Chapter 8.2.1) to increase the service life of the diaphragm. ➔ Switch off pump with power switch (Fig. 1 at Chapter 5). ➔ Restore the system to normal atmospheric pressure (release pneumatic pressure in pump). ➔ Pull out the pump's main plug.

8. Servicing

8.1. Servicing schedule

Component	Servicing interval
Pump	- Regular inspection for external damage or leaks
Hose connections	- Regular inspection for external damage or leaks
Diaphragm and valve plates	- Replace when pumping capacity decreases, or sooner
Silencer	- Change if it is dirty

Tab. 10

8.2. Cleaning

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

8.2.1. Flushing pump

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

8.2.2. Cleaning pump

- Requirements
- Pump disconnected from mains and de-energized.



WARNING

Dangerous substances in the pump can cause a health hazard.

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

- ➔ Wear protective clothing if necessary, e.g. protective gloves.
- ➔ Take the proper steps to clean the pump.



CAUTION

Danger of burns from hot pump parts

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

- ➔ Allow the pump to cool off after operation.

- ➔ Solvent should be used for cleaning only if the head materials are not corroded (ensure compatibility of the material).
- ➔ If compressed air is available, blow out the parts.

8.3. Replacing diaphragm and reed valves

- Requirements
- Pump disconnected from mains and de-energized
 - Pump is clean and free of hazardous materials.
 - Hoses removed from pump's pneumatic inlet and outlet.

Spare parts/tools

Spare part/tool
Spare parts set according to spare parts list, Chapter 10
Allen key 2-mm (hexagon)
Phillips screwdriver No. 2
Allen key 4-mm (hexagon)
Felt-tip pen

Tab. 11

Information on procedure

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



WARNING

Dangerous substances in the pump can cause a health hazard.

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

- Wear protective clothing if necessary, e.g. protective gloves.
- Flush the pump before replacing the diaphragm and valve plates (see Chapter 8.2.1).



CAUTION

Danger of burns from hot pump parts

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

- Allow the pump to cool off after operation.

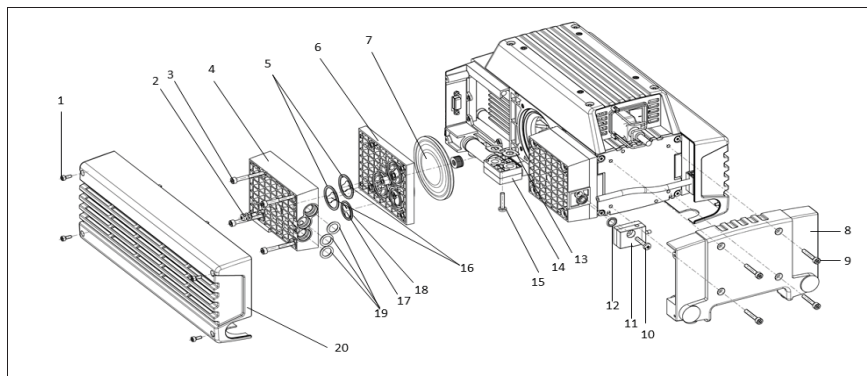


Fig. 4: Exploded drawing PJ25481-950.50.18

1	8x attachment screws (head cover)	11	2x connection blocks .50
2	4x head screws	12	2x O-rings (ø7,65 x1,78)
3	16x attachment screws (head)	13	2x flat seals
4	4x head plates	14	2x connection blocks .1.2
5	8x O-rings (ø24 x 2)	15	2x attachment screws (connection .1.2)
6	4x intermediate plates	16	8x valve plates
7	4x diaphragms	17	6x valve plates
8	1x connection cover	18	6x O-rings (ø18,77 x 1,78)
9	4x attachment screws (connection cover)	19	6x O-rings (ø10 x 2,5)
10	2x attachment screws (connection .50)	20	2x head covers

Removing the pump head

1. Undo the eight screws (Fig. 4/1) and remove the head covers (20).
2. Undo the connection cover's (8) attachment screws (Fig. 5/9) and remove the connection cover.
3. Remove the head connection's (11) and (14) screws (10) and (15) and remove the head connections.

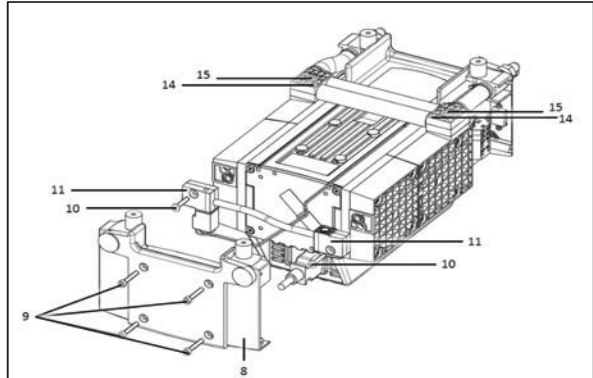


Fig. 5: Disassembling the head connections

4. Remove O-rings (Fig. 6/12) and flat seals (13).

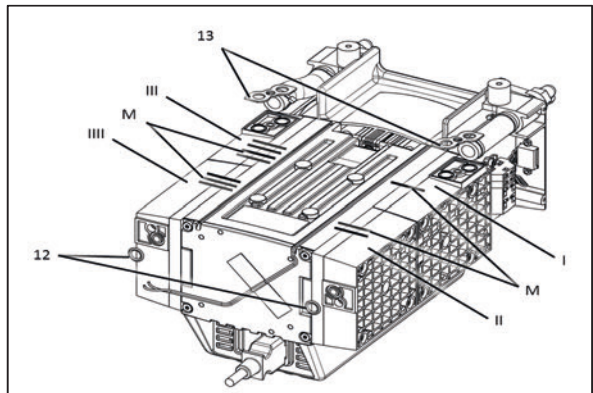


Fig. 6: Marking the pump

5. Head 1 (Fig. 6/I):
Use a felt-tip pen to apply a single mark (M) to the head plate, intermediate plate, and compressor housing.
6. Head 2 (Fig. 6/II):
Use a felt-tip pen to apply two marks (M) to the head plate, intermediate plate, and compressor housing.
7. Head 3 (Fig. 6/III):
Use a felt-tip pen to apply three marks (M) to the head plate, intermediate plate, and compressor housing.

8. Head 4 (Fig. 6/III):
Use a felt-tip pen to apply four marks (**M**) to the head plate, intermediate plate, and compressor housing.
- i** During re-assembly, refer to the marks on the individual heads to ensure that the parts are properly re-assembled.
9. Undo the 16 attachment screws (Fig. 4/3) on the heads (1 to 4) and remove the heads (1 and 2 as well as 3 and 4).
10. Pull apart heads 1 (Fig. 7/I) and 2 (II) and heads 3 (III) and 4 (IIII) and remove O-rings (19).

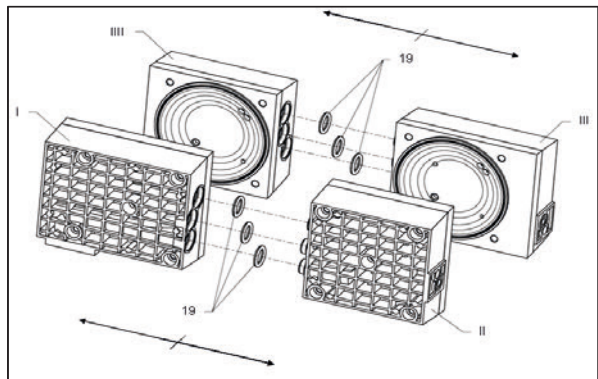


Fig. 7: Removing the o-rings

11. On all four heads, undo the head screw (Fig. 8/2) in the head plate (4) and remove head plate from the intermediate plate (6).

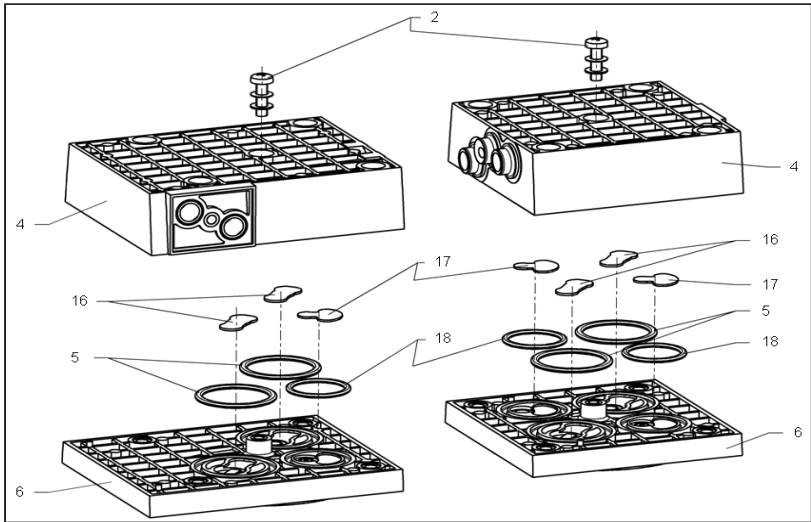


Fig. 8: Exploded drawing of pump heads 1 and 2

Replacing the diaphragms and valve plates

1. Manually remove the four diaphragms (Fig. 9/7) by turning them in the counterclockwise direction.

i Use caution to prevent the diaphragm spacers (21) located between the diaphragm and the connecting rod from falling into the pump housing. The diaphragm and the connecting rod from falling into the housing. The diaphragm spacers (21) must be installed in the same quantity as before in order to ensure the pump's pneumatic performance.

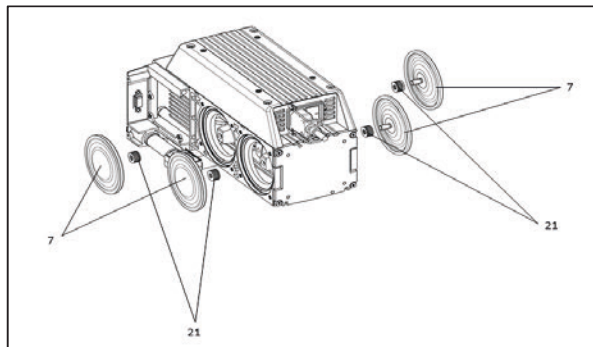


Fig. 9: Replacing diaphragm

2. Remove from the intermediate plates (Fig. 8/6) the valve plates (16) and (17) and the O-rings (5) and (18).
3. Manually screw the ne diaphragms (Fig. 9/7) into the connecting rod's threads and tighten to hand tightness.

i Before you finally tighten the diaphragms, you are recommended to move the diaphragm to the upper dead center.

4. Insert the new valve plates (Fig. 8/16) and (17) and the new O-rings (5) and (18) into the intermediate plates (6).

i The upper and lower sides of the valve plates are identical.

i When inserting the O-rings, make sure that they are the correct size and color (head 4: black O-rings).

Install intermediate plates and head cover

1. Place head plate (Fig. 8/4) onto the intermediate plates (6), observing the felt-tip pen marks (Fig. 6/M).
2. With your hands, carefully and lightly tighten the head plate's head screw (Fig. 8/2) on all four heads (tightening torque: 60 Ncm).

i Refer to for arrangement and alignment of disk springs and the screw's washer.

i When inserting the O-rings, make sure that they are the correct size and color (head 4: black O-rings).

3. Place three O-rings (Fig. 7/19) into each of the head connection holes.
4. Press together heads 1 and 2 (Fig. 6/I and II) and heads 3 and 4 (III and IIII).
5. Place heads 1 and 2 and heads 3 and 4 onto the compressor housing; alternately tighten attachment screws (Fig. 4/3) to hand-tightness (tightening torque: 3.5 Nm).
6. Insert O-rings (Fig. 6/12) and flat seals (13) into the head connection receiver.
7. Reinstall the head connections:
To do this, manually tighten the head connections' attachment screws (Fig. 5/10 and 15).
8. Reinstall the head connection cover (8):
To do this, manually tighten the head connection cover's attachment screws (9).
9. Reinstall the head covers (Fig. 4/20):
To do this, manually tighten the eight attachment screws (1).
10. Properly dispose of the old diaphragms, valve plates, and O-rings.

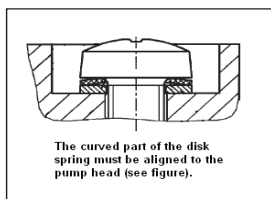


Fig. 10: Aligning the disk spring

2. Remove from the intermediate plates (Fig. 8/6) the valve plates (16) and (17) and the O-rings (5) and (18).
3. Manually screw the ne diaphragms (Fig. 9/7) into the connecting rod's threads and tighten to hand tightness.

i Before you finally tighten the diaphragms, you are recommended to move the diaphragm to the upper dead center.

4. Insert the new valve plates (Fig. 8/16) and (17) and the new O-rings (5) and (18) into the intermediate plates (6).

i The upper and lower sides of the valve plates are identical.

i When inserting the O-rings, make sure that they are the correct size and color (head 4: black O-rings).

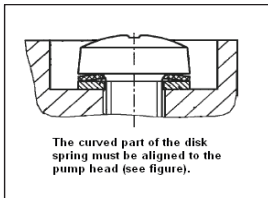
Install intermediate plates and head cover

1. Place head plate (Fig. 8/4) onto the intermediate plates (6), observing the felt-tip pen marks (Fig. 6/M).
2. With your hands, carefully and lightly tighten the head plate's head screw (Fig. 8/2) on all four heads (tightening torque: 60 Ncm).

i Refer to for arrangement and alignment of disk springs and the screw's washer.

i When inserting the O-rings, make sure that they are the correct size and color (head 4: black O-rings).

3. Place three O-rings (Fig. 7/19) into each of the head connection holes.
4. Press together heads 1 and 2 (Fig. 6/I and II) and heads 3 and 4 (III and IIII).
5. Place heads 1 and 2 and heads 3 and 4 onto the compressor housing; alternately tighten attachment screws (Fig. 4/3) to hand-tightness (tightening torque: 3.5 Nm).
6. Insert O-rings (Fig. 6/12) and flat seals (13) into the head connection receiver.
7. Reinstall the head connections:
To do this, manually tighten the head connections' attachment screws (Fig. 5/10 and 15).
8. Reinstall the head connection cover (8):
To do this, manually tighten the head connection cover's attachment screws (9).
9. Reinstall the head covers (Fig. 4/20):
To do this, manually tighten the eight attachment screws (1).
10. Properly dispose of the old diaphragms, valve plates, and O-rings.



The curved part of the disk spring must be aligned to the pump head (see figure).

Fig. 10: Aligning the disk spring

Final steps

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

If you have any questions about servicing, call your KNF technical adviser (contact data: see www.knf.com).

9. Troubleshooting



DANGER

Extreme danger from electrical shock!

- Disconnect the pump power supply before working on the pump.
- Make sure the pump is de-energized and secure.

→ Check the pump (see Tab. 12 and Tab. 13).

Pump does not transfer	
Cause	Fault remedy
Pump not connected to the mains.	→ Connect pump to the mains.
No voltage in the mains.	→ Check room fuse and switch on if necessary.
<ul style="list-style-type: none"> ▪ The motor board's overcurrent protection circuit has activated. ▪ Maximum temperature of motor board is exceeded. ▪ Maximum blocking time of the rotor is exceeded. 	<ul style="list-style-type: none"> → Separate pump from the mains. → Determine and remove the cause of the overcurrent (for example: improper pressure, liquid in the pump heads). <p>i The pump must be separated from the mains for several seconds before the electronics will permit restarting.</p>
Connections or hoses are blocked.	<ul style="list-style-type: none"> → Check hoses and connections. → Remove blockage.
External valve is closed or filter is clogged.	→ Check external valves and filters.
Condensate has collected in the pump head.	<ul style="list-style-type: none"> → Detach the condensate source from the pump. → Flush the pump (see Chapter 8.2.1).
Diaphragm or valve plates are worn.	→ Replace diaphragm and valve plates (see Chapter 8.3).

Tab. 12

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 the pump head.	<ul style="list-style-type: none"> → Detach the condensate source from the pump. → Flush the pump (see Chapter 8.2.1).
Presence of positive pressure on the pressure side with simultaneous vacuum or positive pressure on the suction side.	→ Change the pressure conditions.
Cross-section of pneumatic hoses or connectors too narrow or restricted.	<ul style="list-style-type: none"> → Disconnect the pump from system and determine output values. → Remove restriction (e.g. valve) if necessary. → If applicable, use larger-diameter hoses or connectors.
Leaks in connections, hoses or pump head.	<ul style="list-style-type: none"> → Make sure the hoses and connections. → Remove any parts or particles causing blockages.
Pump head components are soiled.	→ Clean head components.

Pump head components are soiled.	→ Clean head components.
Diaphragm or valves plates are worn.	→ Replace diaphragm and valve plates (see Chapter 8.3).
Diaphragm and valve plates have been replaced.	→ Make sure that the shim rings have been replaced onto the diaphragm screw thread. → Check head connection and hose connections for leaks.

Tab. 13

Fault visualization on motor controller

The excess of the overcurrent limit, the excess of the maximum temperature of the motor board or the blocking of the rotor is shown as a fault. A red LED on the BLDC motor controller signals the cause of the fault.

Optional settings:

If desired, the motor controller can be programmed so that the error output voltage exhibits the same characteristics as the LED. With factory settings, only 1 or 0 are logically outputted as voltage at the fault output.

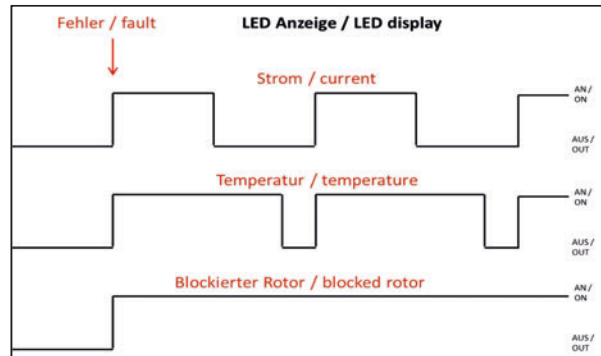


Fig. 11: LED blinking duration according to different faults

To delete the error condition the motor has to be disconnected from the mains.

Fault cannot be rectified

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

1. Flush the pump (see Chapter 8.2.1).
2. Clean the pump (see Chapter 8.2.2).
3. Send the pump, together with completed Health and Safety Clearance and Decontamination Form (Chapter 12), to KNF stating the nature of the transferred medium.

10. Returns

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

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

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

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


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

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

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

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

11. Health and safety clearance and decontamination form



Form Rev. 02 / download manual.pdf/2020

Health and safety clearance and decontamination form

This declaration must be present and complete (the original must accompany the shipment's delivery receipt) before the returned device can be examined.

Device type:

Serial number(s):

Reason for returning the device (please describe in detail):
 (The device(s) was(were) in operation yes no)

We confirm that the above device(s)

has(have) pumped exclusively **physiologically unobjectionable** media and that it(they) are free of hazardous materials and any materials that are harmful to health.

Pumped media:

The device(s) was(were) cleaned yes no

has(have) pumped media of the following category(categories) which are not physiologically unobjectionable and that cleaning of the device(s) (potentially only media-contacting parts) is required.

Name, chemical formula, Material Safety Data Sheet

aggressive

biological

radioactive

toxic

other

The device(s) was(were) decontaminated and work can proceed without special measures yes

Method / proof:

The device(s) was(were) not decontaminated and special measures are required before starting work yes

Measures:

Legally binding declaration

We herewith affirm that the information provided in this form is correct and complete. Shipment of the devices and components is in compliance with statutory regulations.

.....
Company (stamp)
.....
Date
.....
Name
.....
Authorized signature
.....
Position

memmert

Pump modul
PM
PMP

D39489 | Date 12/2019
englisch

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