

LAB

LIQUIPORT

DIAPHRAGM LABORATORY PUMP

NF 100...18
NF 1.100...18
NF 300...18
NF 1.300...18
OPERATING INSTRUCTIONS



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

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1. General information

1.1 Information about the instructions

Contents	The Operating Instructions contain important notes on how to use the pump. In order to ensure safe working and proper functioning it is essential to observe all the specified safety precautions.
Storage location	These Operating Instructions are part of the product, and must be stored in its immediate vicinity in a location accessible to personnel at all times.
Passing on	These Operating Instructions are part of the product, and must be passed on to the next owner if the device is resold.
Project pumps	Customer-specific project pumps (pump models which begin with "PL" or "PML") may differ from the Operating Instructions, in which case the agreed specification is also applicable. It is listed with the other applicable documents.
Illustrations in the instructions	Illustrations in these Operating Instructions may be to scale, but do not have to be. The illustrations may differ slightly from the actual product.

1.2 Warnings

Warnings in the Operating Instructions are identified with the danger symbol, keywords and colours. These provide an indication of the extent of the danger.



! DANGER

Indicates a dangerous situation which will lead directly to death or serious injury if it is not avoided.



! WARNING

Indicates a dangerous situation which may lead to death or serious injury if it is not avoided.



! CAUTION

Indicates a dangerous situation which may lead to moderate or minor injuries if it is not avoided.

NOTE

Indicates a situation which may cause damage to property if it is not avoided.

1.3 Symbols

The following symbols appear in the Operating Instructions, on labels on the device, and on its packaging:



⚠ WARNING	
	<p>Danger of injuries and property damage caused by illegible labels</p> <p>The labelling on the device may become illegible with time.</p> <ul style="list-style-type: none"> - Maintain labels on the device in a legible condition. - Replace any illegible labels.

The following symbols in the Operating Instructions and on the device and its packaging indicate environmental protection considerations:



Recycling



WEEE

Symbol for separate tracking of electrical and electronic devices. The use of this symbol means that this product must not be disposed of with normal household waste.

The following symbols in safety precautions and on the device indicate the nature of the danger:



General danger symbol

Further details of the nature of the danger are provided in the warning highlighted by this symbol.



Electrical danger



Fire danger



Danger of caustic burns or burns



Danger of automatic start-up



Disconnect device from power supply by pulling out the mains plug

1.4 Disclaimer of liability

In preparing the contents of these Operating Instructions, account has been taken of applicable regulations and the state of the art.

The manufacturer can accept no liability for any damage or malfunctions caused by failure to follow the Operating Instructions.

The manufacturer can accept no liability for any damage or malfunctions caused by modification or conversion of the device or improper handling.

The manufacturer can accept no liability for any damage or malfunctions caused by the use of non-approved spare parts and accessories.

1.5 Manufacturer's address

KNF Flodos AG
Wassermatte 2
6210 Sursee, Switzerland

Tel +41 (0)41 925 00 25

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1.6 Year of manufacture

The year of manufacture is shown on the device's type plate.

1.7 Other applicable documents

The documents listed must also be taken into consideration.

- Chemical resistance list
- Sales documents
- GTCs

1.8 Copyright

The information, texts and illustrations in these Operating Instructions are protected by copyright. The contents of these Operating Instructions must not be copied, translated or passed to third parties without the written consent of the manufacturer.

1.9 Warranty conditions

The applicable warranty conditions are set out in the General Terms and Conditions of Business and the sales documents.

The warranty does not cover the following:

- Malfunctions caused by particles/fibres in the valve system
- Sticking of the valve system as a result of inadequate flushing

2. Safety

2.1 Intended use

This pump is intended exclusively for use as follows:

- For transferring and metering liquids.
- For indoor operation.
- For temporary operation in laboratories for research purposes.
- For operation in accordance with the operating parameters specified in the technical data (see Chapter 3) and other applicable documents.
- For transferring media which meet the requirements in the technical data and other applicable documents.
- For operation in fully assembled condition.
- For upright operation on a firm table top.
- For operation in a basic electromagnetic environment (Residential, light industry, laboratory) according to definition in EN IEC 61326-1.

2.2 Reasonably foreseeable misuse

The pump may not:

- be operated in an explosive atmosphere;
- be used to transfer explosive media;
- be used to produce foodstuffs or pharmacological products (additional certifications are required for this purpose);
- be used to transfer media whose compatibility with the pump head, valves, diaphragm and seals has not been established;

Restrictions:

- When used in an industrial electromagnetic environment, according to definition in EN IEC 61326-1, interference may occur.

2.3 Owner's responsibility

The operator is responsible for compliance with the safety precautions in these Operating Instructions and with any safety, accident prevention and environmental protection regulations which apply to the medium to be transferred and the range of applications of the device.

These include the following in particular:

- The operator must perform a risk assessment to identify any additional risks which may arise from the specific working conditions at the pump's installation location and the nature of the medium to be transferred. The operator must convert these into instructions for operating the device.
- The operator must ensure that any employees working with the pump have read the Operating Instructions.
- The operator must train personnel at regular intervals and inform them of the risks involved.
- The operator must provide personnel with the necessary protective equipment as specified in the safety data sheet for the medium to be transferred.
- The operator must maintain the pump in perfect working order.
- The operator must ensure compliance with the maintenance intervals described in the Operating Instructions.

2.4 Personnel requirements



⚠ WARNING
<p>Danger of injuries and property damage caused by insufficiently qualified staff</p> <p>Improper use of the pump may result in serious injury and damage to property.</p> <ul style="list-style-type: none"> - All activities must be performed only by adequately qualified personnel.

The following qualifications are specified for various activities in the Operating Instructions:

Trained personnel	These have been instructed in the task assigned to them and made aware of potential dangers and risks. This training is the minimum qualification for working on the device. Where no other qualification is specified, the activity must be performed by a trained individual as a minimum.
Specialist personnel	The specialist training, knowledge and experience of such personnel, together with their knowledge of the relevant regulations, standards and directives, allow them to perform their assigned duties correctly, and to independently identify and avoid potential dangers and risks.
Unauthorised personnel	Individuals whose reactions have been impaired by the consumption of medicines, alcohol, drugs or by other causes and conditions are not authorised to perform activities on the device.

2.5 Product-specific dangers

This chapter describes residual risks that have been identified in a risk assessment. Safety precautions and warnings in this chapter and in other chapters in the Operating Instructions must be observed in order to avoid dangerous situations.



DANGER

Danger of injuries and property damage caused by leaks in connections and the pump head

Poisoning and caustic burns, or undesirable reactions caused by escaping hazardous materials

- Maintain the torque of connections (see hydraulic connections)
- Check tightening torque of head screws regularly
- Only use pump if it is in perfect working order
- Operate pump in accordance with the technical data



DANGER

Danger of injuries and property damage caused by medium escaping from the discharge outlet

Poisoning and caustic burns, or undesirable reactions caused by escaping hazardous materials

- Place the pump in a suitable collecting vessel
- Never close the discharge outlet
- If medium escapes from the pump's discharge outlet, stop using the pump and contact your KNF dealer



DANGER

Risk of fire from escaping flammable media

Escaping or leaking flammable media can produce a combustible environment.

- Take fire protection precautions that are appropriate for the transferred media
- Keep ignition sources away
- Keep suitable extinguishers accessible
- Use means of fire detection



WARNING

Danger of serious injuries or property damage caused by escaping media in the event of overpressure on the suction side

Excessive pressure on the suction side will result in uncontrolled escape of fluid, even if the pump is not operating

- Avoid overpressure on the suction side

2.6 Personal protective equipment

Special protective equipment must be used when performing certain tasks. These are indicated separately in the individual chapters.

Where the wearing of protective equipment is concerned it is essential to observe the safety data sheet for the medium to be transferred.

The following symbols appear in the working area or in the Operating Instructions:



Safety gloves

to protect skin from contact with the transferred medium in accordance with the safety data sheet.



Safety glasses

to protect the eyes from contact with the transferred medium in accordance with the safety data sheet.



Face protection

to protect skin and eyes from contact with the transferred medium in accordance with the safety data sheet.

2.7 Safety equipment

2.7.1 Discharge outlet

⚠ DANGER

Danger of injuries and property damage caused by medium escaping from the discharge outlet

Poisoning and caustic burns, or undesirable reactions caused by escaping hazardous materials

- Place the pump in a suitable collecting vessel
- Check the discharge outlet regularly for leaks
- Never close the discharge outlet (see Fig. 1)
- If medium escapes from the pump's discharge outlet, stop using the pump and contact your KNF dealer

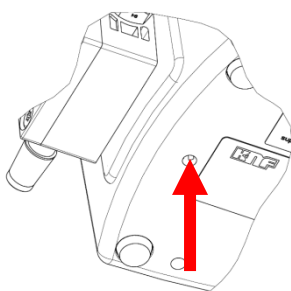


Fig. 1: Discharge outlet

If the pump diaphragm ruptures, the transferred medium is channelled out of the pump through the discharge outlet (see Fig. 1).

2.7.2 Emergency Stop

Pulling out the mains plug acts as an Emergency Stop. If the pump is installed permanently, an Emergency Stop and a maintenance switch must be fitted.

Environmental
protection
WEEE



2.8 Disposal

Store the vacuum system and all replacement parts in accordance with the environmental protection regulations. Observe both the respective national and international regulations here. 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.

2.9 Danger areas

A discharge of aggressive, corrosive, ionizing, flammable or biological liquids can be dangerous.

The pump danger area should be limited by safe workplaces. Safe workplaces should comply with the requirements of local work safety regulations.

2.10 Declaration of conformity



EG/EU/UK – Konformitätserklärung EC/EU/UK Declaration of Conformity

Hiermit erklärt der Hersteller:
Herewith the manufacturer declares:

KNF Flodos AG, Wassermatte 2, CH-6210 Sursee, Schweiz

dass folgende Produkte:
that the following products:

Bezeichnung Denomination	Modell Model	Typ Type
Labor Membran -Dosierpumpen	NF 100	.18S/ .18RC
Labor Membran -Dosierpumpen	NF 1.100	.18S/ .18RC
Labor Membran -Dosierpumpen	NF 300	.18S/ .18RC
Labor Membran -Dosierpumpen	NF 1.300	.18S/ .18RC

(Seriennummer siehe Typenschild)
(Serial number see type label)

allen einschlägigen Bestimmungen folgender Richtlinien / Verordnungen entsprechen:
comply with all relevant provisions of the following Directives / Regulations:

Richtlinie 2006/42/EG (Maschinenrichtlinie)
Directive 2006/42/EC (machinery directive)
UK Regulation S.I. 2008/1597 Supply of Machinery (Safety)

Richtlinie 2014/30/EU (EMV)
Directive 2014/30/EU (EMC)
UK Regulation S.I. 2016/1091 Electromagnetic Compatibility

Richtlinie 2011/65/EU (RoHS)
Directive 2011/65/EU (RoHS)
UK Regulation S.I. 2012/3032 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

Folgende harmonisierte Normen wurden zugrunde gelegt:
The following harmonized standards have been applied:

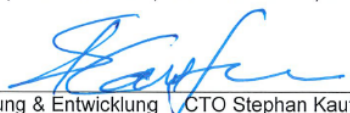
Fundstelle Reference	Ausgabedatum Release date	Titel Title
EN IEC 63000	2018	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe
EN ISO 12100	2011	Sicherheit von Maschinen - Allgemeine Gestaltungsgrundsätze - Risikobeurteilung und Risikominderung
EN IEC 61326-1	2021	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen
EN 61010-1	2010/A1:2019	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 1: Allgemeine Anforderungen

Bevollmächtigte Person für die Zusammenstellung der technischen Unterlagen:
Authorised person to compile the relevant technical documentation:

Daniel Kohli, Product Development, KNF Flodos AG, Wassermatte 2, CH-6210 Sursee, Schweiz

Sursee, 11.07.2024

Ort, Datum (TT.MM.JJJJ)
Place, date, (dd.mm.yyyy)


Leiter Forschung & Entwicklung CTO Stephan Kaufmann
Chief Technology Officer

3. Technical data

3.1 Items included in delivery

- LIQUIPORT pump
- Mains plug
- Operating instructions

3.2 Storage conditions

- Pumps must be stored in a dry place and protected from contamination.
- The storage temperature must be between 5°C and 40°C.
- The pump is supplied with protective caps. These protective caps must be fitted during storage.
- Store pump upright and with protection.

3.3 Pump materials

The type designation **KT** stands for:

Assembly	Material ¹⁾
Pump head	PP
Valve plate / seals	FFKM
Diaphragm	PTFE-coated
Housing	PA, TPE, PC

Tab. 1: KT

¹⁾ according to DIN ISO 1629 and 1043.1

The type designation **TT** stands for:

Assembly	Material ¹⁾
Pump head	PVDF
Valve plate / seals	FFKM
Diaphragm	PTFE-coated
Housing	PA, TPE, PC

Tab. 2: TT

¹⁾ according to DIN ISO 1629 and 1043.1

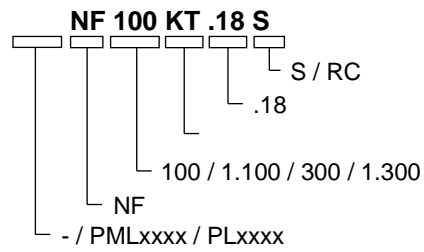
The type designation **FT** stands for:

Assembly	Material ¹⁾
Pump head	PTFE
Valve plate / seals	FFKM
Diaphragm	PTFE-coated
Housing	PA, TPE, PC

Tab. 3: FT

¹⁾ according to DIN ISO 1629 and 1043.1

3.4 Product key



Description	Meaning
PML / PL	Customer-specific designs
NF	Flodos liquid pump
100 / 1.100 / 300 / 1.300	Pump type
KT / TT / FT	Head material
.18	Laboratory device with housing
S / RC	S without external actuation RC with external actuation (remote control)

Tab. 4: Product key

3.5 Dimensions

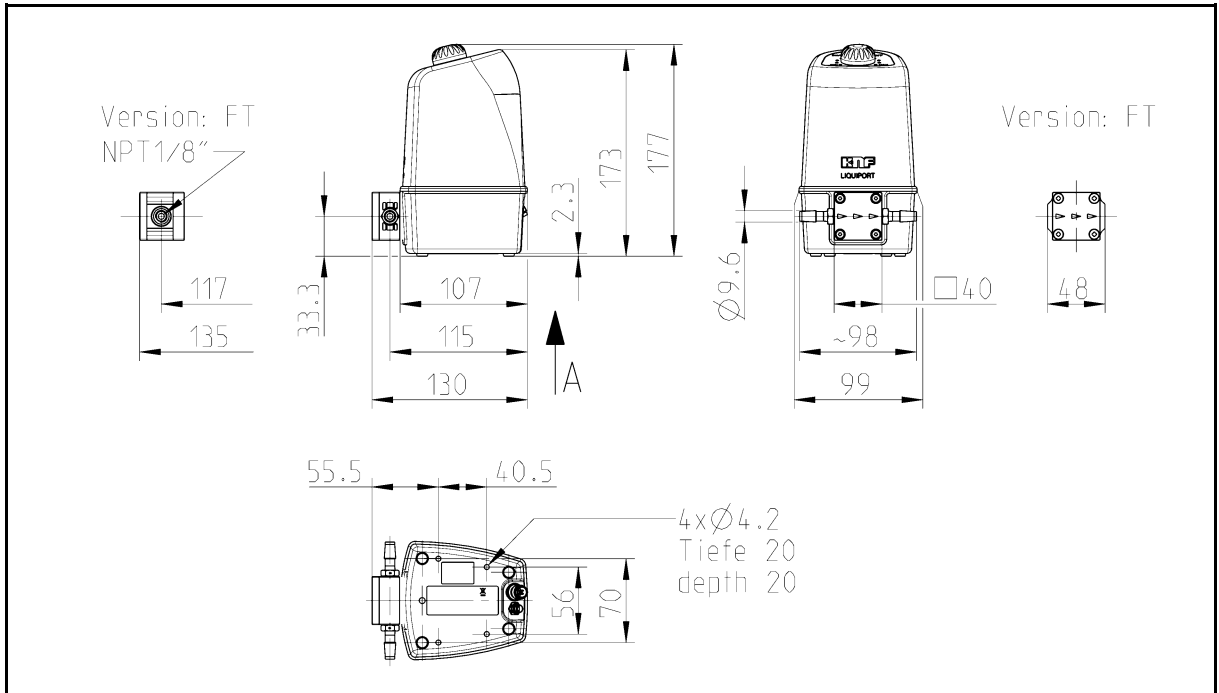


Fig. 2: Mounting dimensions LIQUIPORT 100 / LIQUIPORT 1.100

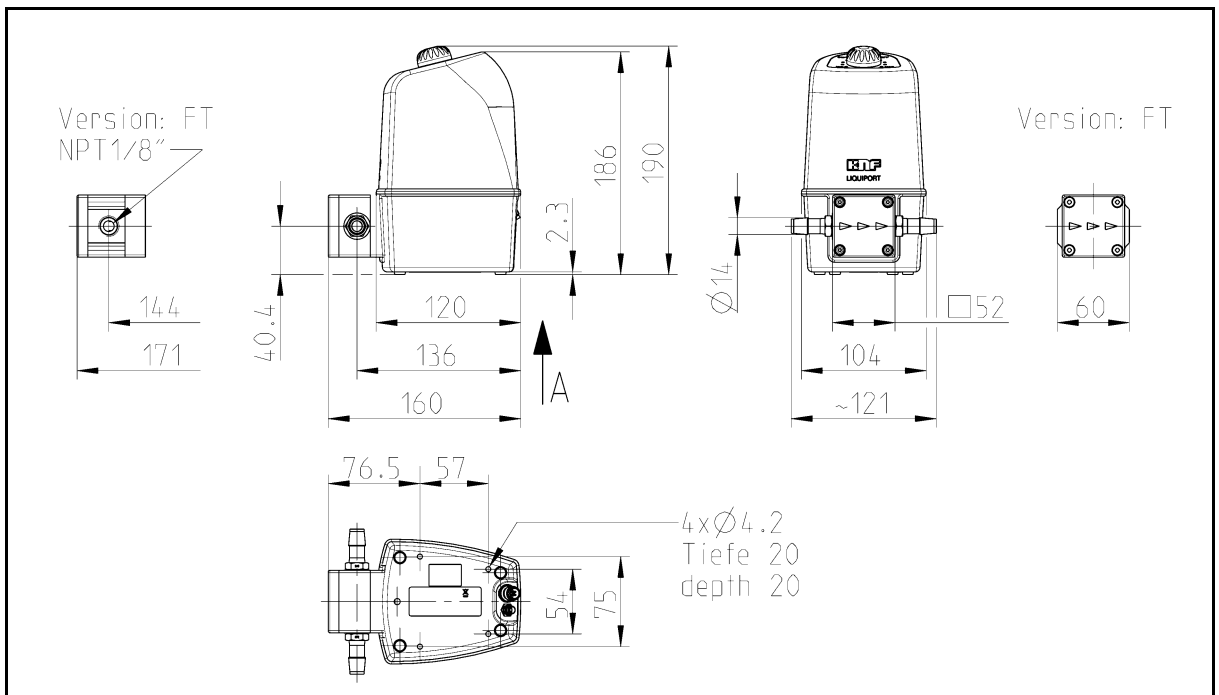


Fig. 3: Mounting dimensions LIQUIPORT 300 / LIQUIPORT 1.300

3.6 Installation location requirements

The pump is designed to be operated in an upright position.

NOTE	
An unsuitable location may cause damage to the device	
<ul style="list-style-type: none"> - Install in a dry place - Protect the installation location of the pump from water in the form of rain, spray, splashes and drips - Do not operate the pump in an aggressive or flammable environment - Choose a safe location (a level, flat surface) for the pump - Place the pump in a suitable collecting pan - If the stability of the pump cannot be ensured, fasten the pump in place using two screws - Make sure that the hose connections can be fitted without strain on the hoses - Protect the pump against shocks, impacts and strong vibrations 	

3.7 Electrical connections and performance data

Pump type	LIQUIPORT 100	LIQUIPORT 1.100
Nominal mains voltage [V]	100 – 240V AC +/- 10%,	
Frequency [Hz]	50-60 Hz	
Max. power consumption AC 100 V / 115 V / 240 V [W]	12 / 12 / 12	15 / 15 / 16
Max. power consumption DC [W]	12	16
Pump DC voltage [V]	24V DC	
Maximum operating current, DC RMS 24 V [A]	0.5	0.65
Max. short-term peak current [A]	0.8	0.9
Power supply fuse	Electronic overload protection	
Pump fuse	Electronic overload protection	

Tab. 5: Electrical data LIQUIPORT 100

Pump type	LIQUIPORT 300	LIQUIPORT 1.300
Nominal mains voltage [V]	100 – 240V AC +/- 10%,	
Frequency [Hz]	50-60 Hz	
Max. power consumption AC 100 V / 115 V / 240 V [W]	25 / 25 / 25	30 / 30 / 30
Max. power consumption DC [W]	29	34
Pump DC voltage [V]	24V DC	
Maximum operating current, DC RMS 24 V [A]	1.2	1.4
Max. short-term peak current [A]	1.4	1.65
Power supply fuse	Electronic overload protection	
Pump fuse	Electronic overload protection	

Tab. 6: Electrical data LIQUIPORT 300

3.8 Other parameters

Pump type	LIQUIPORT 100 LIQUIPORT 1.100	LIQUIPORT 300 LIQUIPORT1.300
Pump weight [kg] 1)	0.8	1.5
Permissible ambient temperature [°C]	+5 to +40	
Permissible media temperature [°C]	+5 to +80	
Permissible working height [m above sea level]	2000	
Max. humidity	90% (non-condensing)	
Nominal speed [rpm]	3000 rpm	
Noise level [dBA]	< 40dBA	
Pump protection type	IP 65	
Power supply protection type	IP 40	
Protection class	III	

Tab. 7: Other parameters

¹⁾ The weight may differ slightly from the stated value, depending on the version.

3.9 External actuation (RC version only)

Parameter	Value
Analog input	
Signal range	0-10V
Signal range optional 1)	0-20mA
Input resistance	133 kΩ at 0-10 V 510 Ω at 0-20mA
Dielectric strength	24V DC
Digital input	
Signal range	Pull up to 24 V
Dielectric strength	24V DC
Voltage level without external wiring	19V typ.
Level low	≤ 4.0V = low
Level high	≥ 14.0V = high
Pull-up resistance	10 kΩ
Resistance to ground/GND	43 kΩ
Digital output – open-collector output (NPN transistor to GND)	
Dielectric strength	24V DC
Loading capacity/output current low level	0...10mA typ. 20mA max.

Tab. 8: External actuation

1) Optional on request.

- 1 Analog input
Brown
- 2 External actuation jumper
White
- 3 Pulse input
Blue
- 4 Open collector output
Black
- 5 Ground
Grey

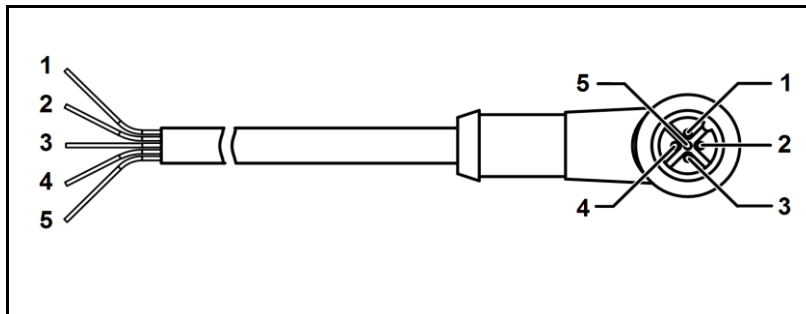


Fig. 4: RC cable pin assignment

Pin no.	Lead colour	Description	Function
1	brown	Analog input	(0%) 15% to 100% flow rate
2	white	External actuation jumper	Switches pump over to external actuation. → Control knob is deactivated
3	blue	Pulse input	Start/Stop via external actuation
4	black	Open collector output	Operating mode output (On/Off)
5	grey	Ground/GND	--

Tab. 9: RC cable pin assignment

3.10 Hydraulic ratings

Type	LIQUIPORT 100	LIQUIPORT 1.100
Flow rate [l/min] ^{1) 2)}	0.2 - 1.3	0.2 - 1.3
Suction head [mWG]	3	3
Max. inlet pressure [bar g] ³⁾	0.4	0.4
Permissible pressure [bar g]	1.0	4.0
Permissible medium viscosity [cSt]	150	150

Tab. 10: Hydraulic ratings LIQUIPORT 100 / LIQUIPORT 1.100

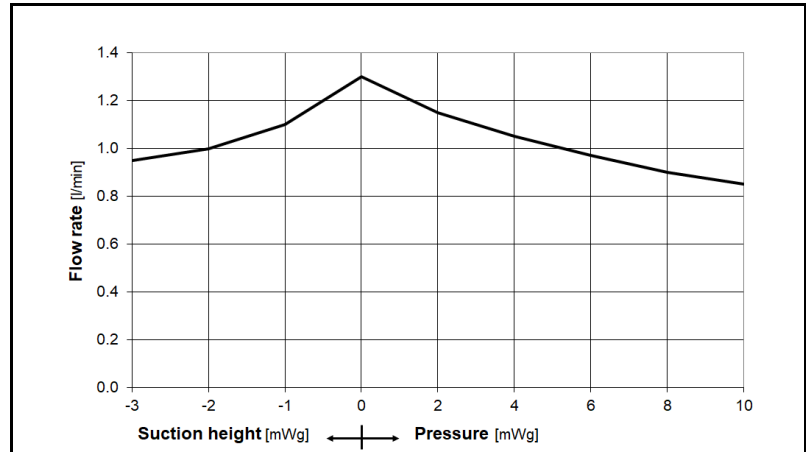


Fig. 5: Flow rate curve LIQUIPORT 100

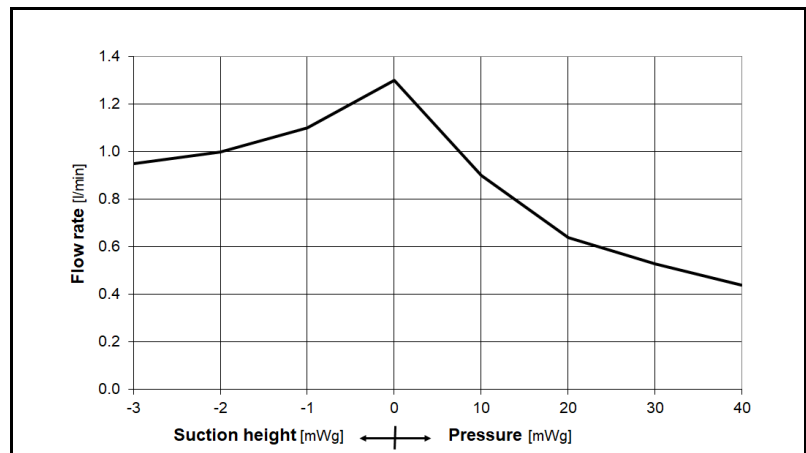


Fig. 6: Flow rate curve LIQUIPORT 1.100

¹⁾ Measured with water at 20°C

²⁾ Flow rates may vary from the values shown, depending on fluid viscosity, pump head material and the hoses / hose connectors used.

³⁾ Overpressure on the suction side will result in uncontrolled escape of fluid, even if the pump is not operating. The pressure increase via the pump must be positive.

Pump type	LIQUIPORT 300	LIQUIPORT 1.300
Flow rate [l/min] ^{1) 2)}	0.5 - 3.0	0.5 - 3.0
Suction head [mWG]	3	3
Max. inlet pressure [bar g] ³⁾	0.4	0.4
Permissible pressure [bar g]	1.0	4.0
Permissible medium viscosity [cSt]	150	150

Tab. 11: Hydraulic ratings

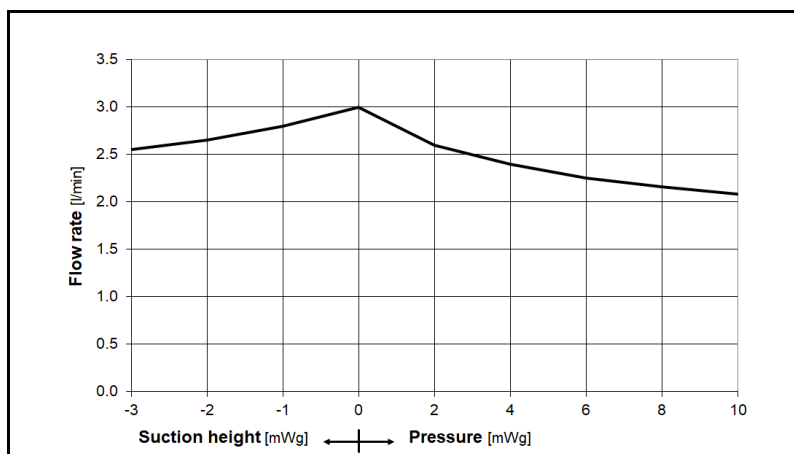


Fig. 7: Flow rate curve LIQUIPORT 300

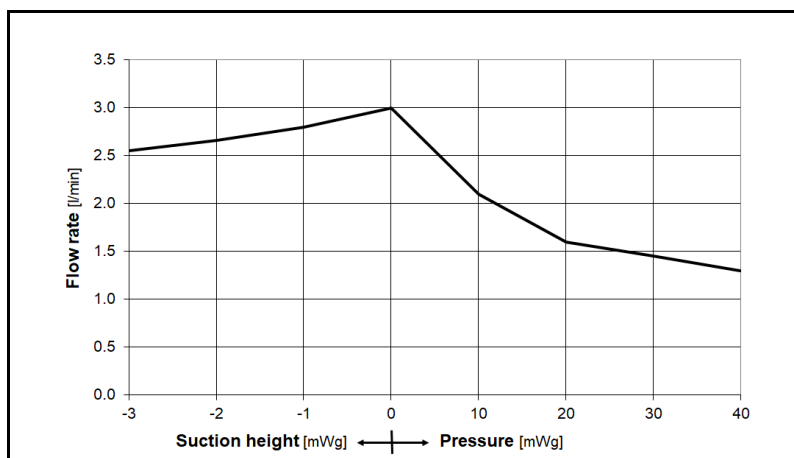


Fig. 8: Flow rate curve LIQUIPORT 1.300

- 1) Measured with water at 20°C
- 2) Flow rates may vary from the values shown, depending on fluid viscosity, pump head material and the hoses / hose connectors used.
- 3) Overpressure on the suction side will result in uncontrolled escape of fluid, even if the pump is not operating. The pressure increase via the pump must be positive.

3.11 Hydraulic connections

Pump type	Connection
LIQUIPORT 100 LIQUIPORT 1.100	Internal thread NPT 1/8" with hose connector for hose ID 8mm
LIQUIPORT 300 LIQUIPORT 1.300	Internal thread NPT 3/8" with hose connector for hose ID 12mm

Tab. 12: Hydraulic connections

3.12 Transferred medium

Parameter	Value
Permissible medium viscosity [cSt]	150
Ideally free of solids, max. particle size [µm]	< 70
Permissible media temperature ¹ [°C]	+5 to +80

WARNING



Poisoning and caustic burns

If corrosive, poisonous, ionising or biological media come into contact with skin, eyes and the respiratory tract they may cause serious injuries

- Observe the safety data sheets for the media to be transferred
- Use personal protective equipment
- Operate the pump in a suitably protected area
- Check the resistance of any parts which come into contact with the fluid (see chemical resistance list or consult your local KNF dealer)

WARNING



Damage caused by ionising radiation

Radioactive materials cause serious damage to health and reduce the service life of the pump.

- Decontaminate the pump
- Wear personal protective equipment
- Mark the pump

NOTE

If the absence of solid material in the pumped material is not ensured, a filter < 70 µm with a sufficiently large filtration surface area must be installed upstream of the pump in order to prevent damage to the pump.

NOTE

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

- Check the resistance, see the resistance list
- Clarify resistance with KNF

¹ Applies to water and low-reactivity media. For aggressive media, resistance is to be checked at a higher medium temperature.

4. Assembly and function

4.1 Metering pump assembly

- 1 On/Off button
- 2 Control knob
- 3 Flow rate indicator
- 4 Standby indicator
- 5 External indicator
- 6 Inlet
- 7 Pump head
- 8 Outlet
- 9 Power supply plug
- 10 External actuation plug (RC version only)

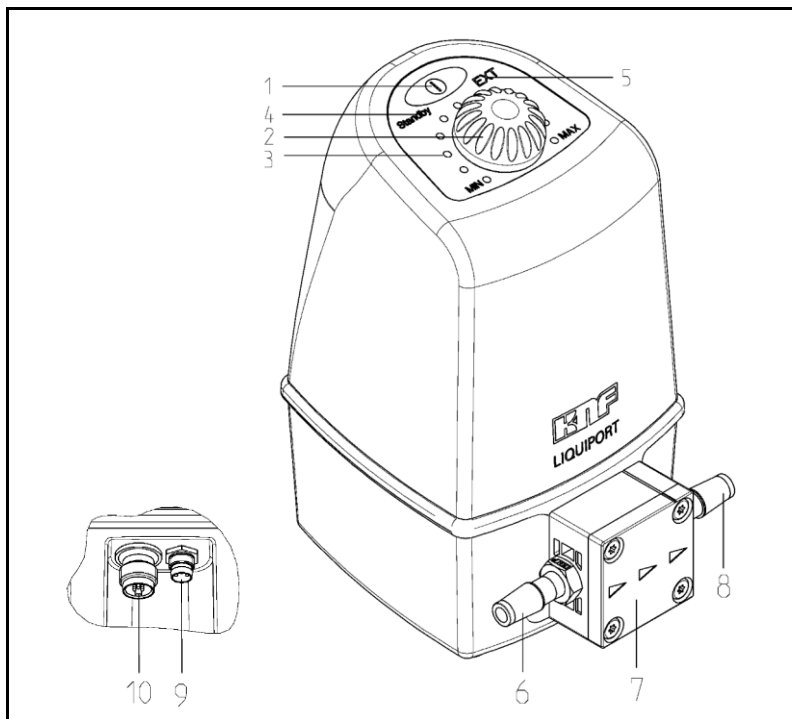


Fig. 9: Diaphragm pump

4.2 Operating principle

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

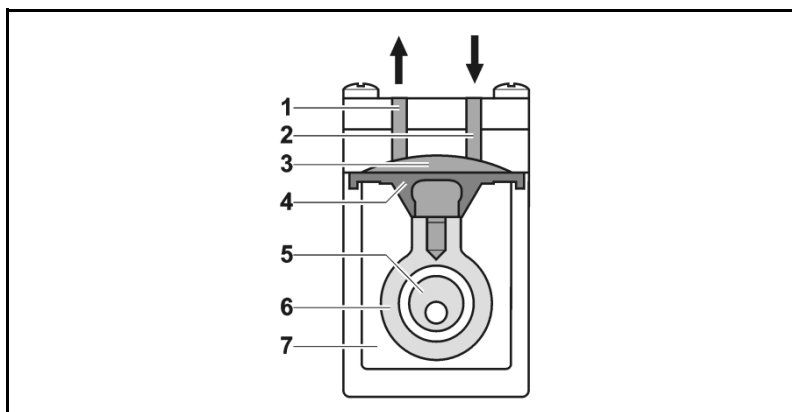


Fig. 10: Pump assembly

The diaphragm liquid pumps are based on reciprocating displacement pump technology. 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 medium to be transferred via the inlet valve (2). In the upward stroke the diaphragm pushes the medium out of the pump head via the outlet valve (1). The diaphragm hermetically seals off the working chamber (3) from the pump drive (7).

5. Shipment

5.1 Checking delivery

Requirements

- Device delivered and packaged

Procedure

1. Check delivery for visible damage
2. Check that delivery is correct and complete using the packing list
3. In the event of a discrepancy, register a complaint.
4. Keep original packaging in case you have to return the item

5.2 Registering a complaint

Requirements

- Device damaged or incomplete

Procedure

1. If there are any visible signs of damage, only accept the delivery with reservations.
2. Damage and complaints of any kind should be recorded on the delivery note
3. Notify the manufacturer of any damage and complaints

5.3 Arranging for return

Requirements

- Device damaged or incomplete

Procedure

1. Contact KNF before returning the device
2. Flush and decontaminate pump
3. Fill out decontamination declaration and attach to the pump
4. Send the pump in its original packaging to a service location or one of our product centres
5. The pump can be sent by parcel service or post in its original packaging



! DANGER

Danger of poisoning, chemical burns, or radioactive contamination through contact with pump parts that are not decontaminated

Contact with pump parts that are not properly decontaminated will result in poisoning, chemical burns, or radioactive contamination.

- Use personal protective equipment
- Flush and decontaminate the pump until the possibility of danger can be eliminated.
- Label any pumps that are used with particularly dangerous media
- Only decontaminated pumps may be sent

NOTE

KNF retains the right to refuse repair of pumps that are used to move hazardous materials.
 This applies particularly to the following materials:

- Poisons
- Radioactive media
- Elementary halogens (e.g. bromine)

6. Installation and initial start-up

6.1 Safety



⚠ WARNING

Danger as a result of incorrect installation
 Injuries or damage to equipment caused by escaping media

- Follow installation instructions
- After assembly, test the system with a harmless liquid
- Only use pump if it is in perfect working order



⚠ WARNING

Danger of serious injuries or property damage caused by escaping media in the event of rupturing of the pump diaphragm
 Poisoning and caustic burns caused by escaping media as a result of rupturing of the pump diaphragm. If the pump diaphragm ruptures, the medium is channelled out of the pump through the discharge outlet.

- When transferring critical media, operate the pump in a collecting tank
- Check discharge outlet for leaks



⚠ WARNING

Danger of serious injuries or property damage caused by escaping media in the event of overpressure on the suction side
 Overpressure on the suction side will result in uncontrolled escape of fluid, even if the pump is not operating.

- Avoid overpressure on the suction side

The following requirements apply to all the activities described in this chapter:

Requirements	<ul style="list-style-type: none"> ▪ Device is in perfect working order ▪ The system is operated with water
Personnel	<ul style="list-style-type: none"> ▪ Must be assembled by specialist personnel
Personal protective equipment	<ul style="list-style-type: none"> ▪ Not required

6.2 Installation

Before installation, store the pump at the installation location to bring it up to ambient temperature.

NOTE

For problem-free, safe operation the following instructions should be followed:

- Install in a dry place.
- Protect the installation location of the pump from water in the form of rain, spray, splashes and drips.
- Do not operate the pump in an aggressive or flammable environment.
- Choose a safe location (a level, flat surface) for the pump.
- If the stability of the pump cannot be ensured, fasten the pump in place using two screws.
- Make sure that the hose connections can be fitted without strain on the hoses.
- Protect the pump against shocks, impacts and strong vibrations.

6.2.1 Connect mains plug

DANGER

Risk of electric shock

- Only operate the pump with the power supply unit supplied.
- Connect the cable from the mains plug to the pump's power supply socket.
- Plug the mains plug into a correctly installed and properly earthed mains socket.
- Ensure that the mains plug is protected from water splashes.
- Do not open pump housing or power supply unit.
- Disconnect pump from power supply during maintenance work.
- If pump is installed permanently, fit a maintenance switch.



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

1. Use suitable adapters in the power supply unit
2. Connect power supply unit to pump

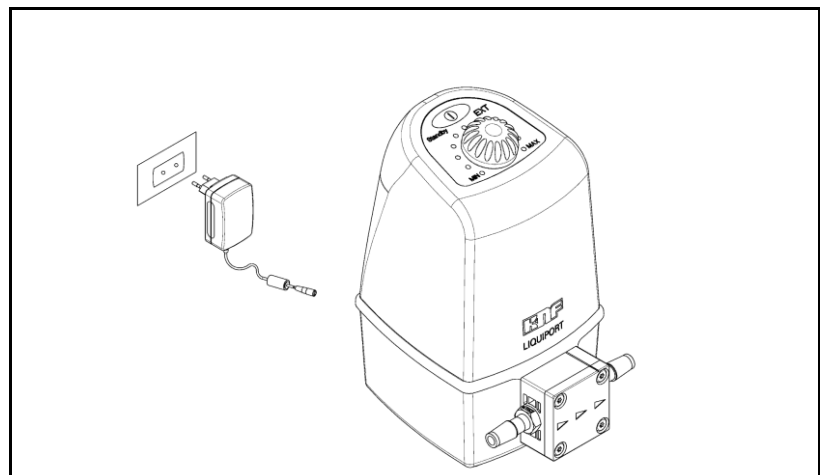


Fig. 11: Electrical connection

6.2.2 Connect hydraulics

- | | |
|-----------------------------------|--|
| Connected components | 1. Only connect components to the pump that are designed to handle the hydraulic data of the pump (see Chapter 3). |
| Hoses | 2. Only use hoses that are suitable for the maximum operating pressure of the pump (see Section 3). |
| Customer-specific pumps (PL, PML) | 3. Only use hoses that are sufficiently chemically resistant to the liquids being transferred. |
| | 4. The connections described below apply to standard products. Different connections may apply for customer-specific projects (PML or PL). |

NOTE

Arrows on the pump head indicate the flow direction.

Use of hose connectors

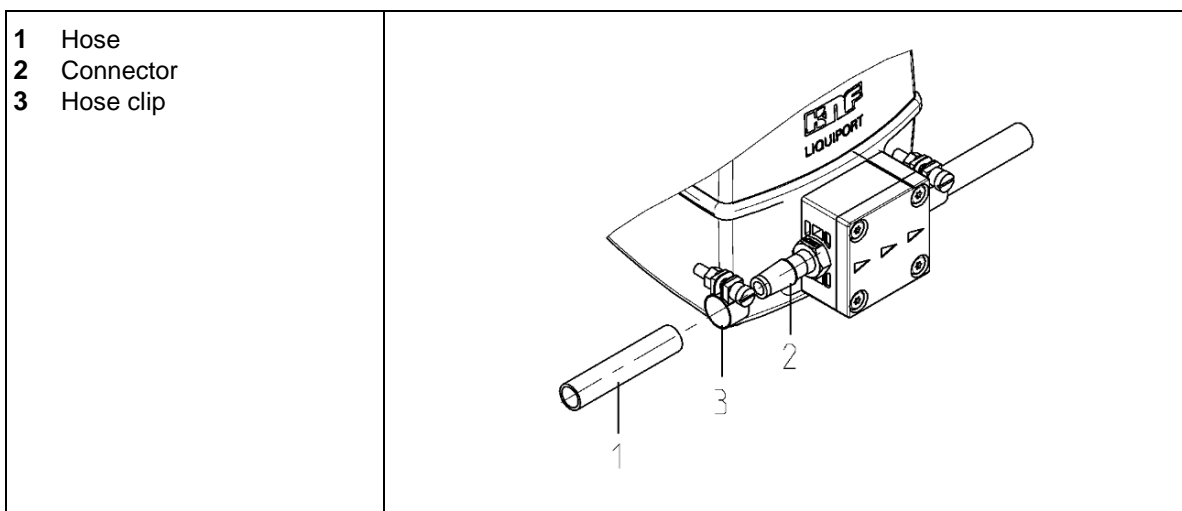


Fig. 12: Hose connector ID 8mm or ID 12mm

1. Remove protective caps from connections.
2. Suction and pressure lines (LIQUIPORT 100 and LIQUIPORT 1.100: hose ID 8mm; LIQUIPORT 300 and LIQUIPORT 1.300: hose ID 12mm), cut off straight with a sharp knife.
3. Push the hoses onto the connectors as far as they will go.
4. For pressure applications with LIQUIPORT 1.100 or LIQUIPORT 1.300, secure hoses with suitable hose clips.
5. Check that the hoses and transition joints (hose connector/hose) are fitted correctly and securely.
6. Check that the system is leak-tight.

Use of internal threads

- 1 Connector
- 2 Teflon sealing tape

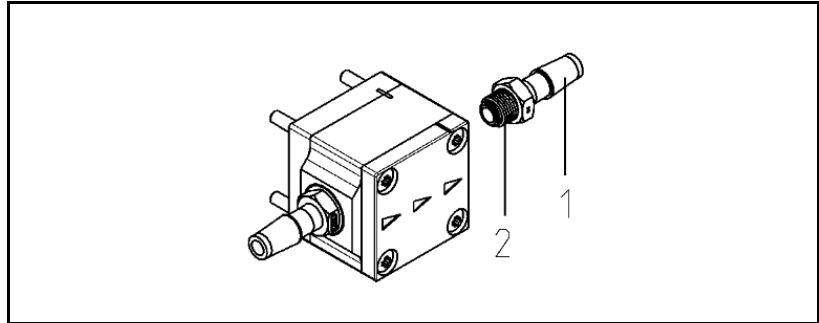


Fig. 13: Internal thread NPT 1/8"

Pump type	Internal thread
LIQUIPORT 100 LIQUIPORT 1.100	NPT 1/8"
LIQUIPORT 300 LIQUIPORT 1.300	NPT 3/8"

Tab. 13: Internal thread

1. Remove protective cap and screwed-in connectors from the connections.
2. Prepare required fitting with corresponding external thread with suitable sealant (e.g. Teflon sealing tape).
3. Screw in fitting and tighten.
4. Check that the fitting is fitted correctly and securely.
5. Check that the system is leak-tight.

6.3 Initial start-up



⚠ CAUTION

Danger of rupture of the fluid system as a consequence of over-pressure

The pump builds up pressure. In a closed system the max. permitted operating pressure may be exceeded, thus causing damage to the pump and/or the system

- In the case of parts that are in contact with the fluid, use only those that are designed for the pump's operating pressure as a minimum
- Do not transfer media against shut-off elements or closed systems, otherwise
- install pressure relief/safety valve and set to 6 bar (in the KNF product range)



⚠ CAUTION

Danger of unexpected chemical reactions with water

Water residues left in the pump from testing in the factory may react with the transferred medium.

- Before putting the pump into service, flush it with a non-critical medium

Before switching on the pump, check the following points:

Prerequisites for start-up

- All hoses attached properly
- Specifications of the power supply must correspond with the data on the pump and mains plug type plates.
- The pump outlet must be clear of any obstruction.
- All cables properly connected

Tab. 14: Prerequisites for start-up

1. Only operate the pump under the operating parameters and conditions described in Section 3.
2. Ensure that the pump is used as intended (see Section 2.1).
3. Avoid improper use of the pump (see Section 2.2).
4. Observe safety precautions.

6.3.1 Test the system

In order to prevent damage, the safety, leak-tightness and functioning of the test set-up should be checked using a suitable harmless medium, such as water.

7. Operation

7.1 Safety



⚠ DANGER

Danger of injuries and property damage caused by hazardous materials

Poisoning and caustic burns, or undesirable reactions caused by escaping hazardous materials

- Observe the safety data sheets for the media to be transferred
- Determine the resistance of the head materials
- Check tightening torque of head screws regularly (see Section 9.4)
- Check that pump and system are leak-tight
- Maintain the pump regularly
- Only use pump if it is in perfect working order
- Operate pump in accordance with the technical data



⚠ WARNING

Danger of undetected diaphragm rupture

The diaphragm may be damaged by aggressive media, and the medium may escape from the discharge outlet

- Operate the pump in a collecting pan
- Flush pump thoroughly after use or if it is not to be used for an extended period (see Chapter 9)
- Check the discharge outlet regularly for leaks
- Observe the service life of the diaphragm and other elastomer parts (see Maintenance)



⚠ WARNING

Danger of splashing media

If corrosive, poisonous, ionising or biological media come into contact with skin, eyes and the respiratory tract they may cause serious injuries

- Observe the safety data sheets for the media to be transferred
- Check that the system is leak-tight before use
- Use personal protective equipment

The following requirements apply to all the activities described in this chapter:

- Requirements
- Personnel
- Personal protective equipment



Special tools required

- Device is in perfect working order.
- The system has previously been operated and tested with a suitable harmless medium (e.g. water).
- Trained personnel
- The type of protective equipment required will depend on the medium to be transferred.
- Observe safety data sheets and regulations for the handling of the media to be transferred.
- At medium temperatures of over 50°C, take safety precautions against burns.
- When transferring very aggressive, biological, flammable or ionising media, a suitable work station with a safety and extraction system is to be used.

- 1 On/Off button
- 2 Control knob
- 3 Flow rate indicator
- 4 Standby indicator
- 5 External indicator

7.2 Operating controls

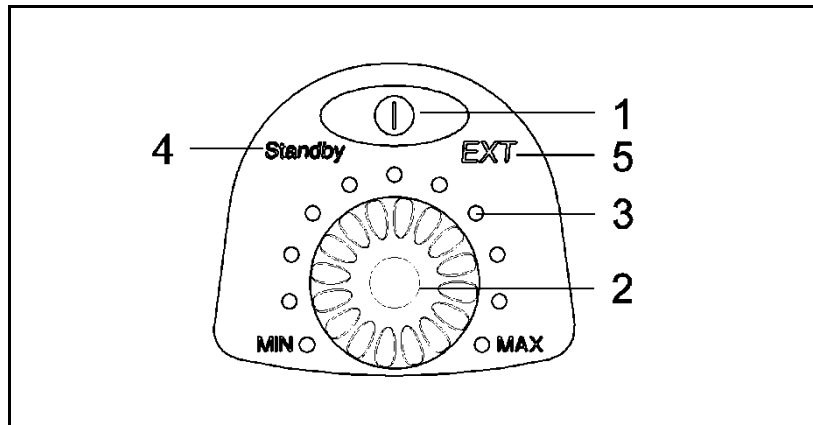


Fig. 14: Operating controls

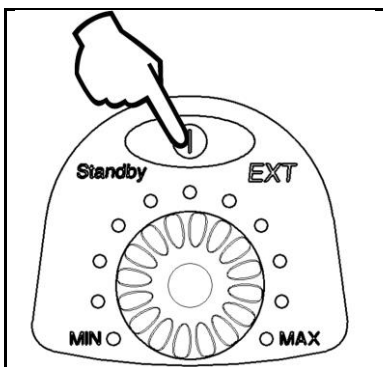


Fig. 15: Starting / stopping the pump

7.3 Starting the pump

When it is connected to the power supply, the pump is in standby mode by default, and the "Standby" indicator illuminates.

➔ Briefly press the "On/Off" button and the pump will start to transfer.

The "Standby" indicator goes off.

i An externally actuated pump will start as soon as a valid control signal is present.

(see Chapter 8).

7.4 Stopping the transferring operation

➔ Briefly press the "On/Off" button and the pump will stop.

The "Standby" indicator goes on.

7.5 Adjusting the flow rate

Set the pump to the required flow rate using the control knob.

The flow rate setting is shown by the flow rate indicator around the control knob.

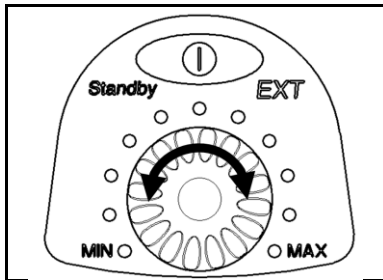


Fig. 16: Adjusting the flow rate

Type	Flow rate [l/min]
LIQUIPORT 100	0.2 to 1.3
LIQUIPORT 1.100	0.2 to 1.3
LIQUIPORT 300	0.5 to 3.0
LIQUIPORT 1.300	0.5 to 3.0

Tab. 15: Specified flow

i If the analog input is active, the "EXT" indicator illuminates and the control knob has no function. The flow rate is then specified by the analog input. See Chapter 8.1

i The flow rate of the pump is reduced by counterpressure, suction head and higher medium viscosity.

i In the event of counterpressure, the pump will not start at low flow rate settings.

Reduce counterpressure or select a higher setting.

Operation in the event of counter-pressure

In the event of counterpressure the pump cannot be set to the lower flow rates. The counterpressure must be reduced or a higher flow rate must be selected.

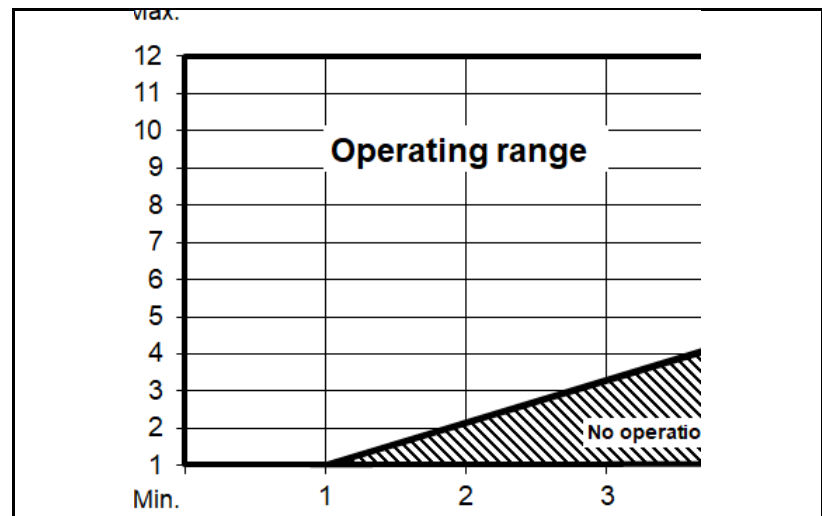


Fig. 17: Operating range

8. RC version – external actuation



⚠ WARNING

Danger of automatic start-up

The pump starts up by itself and without warning.

- Send the start command only when the system has been tested and is ready for operation
- Mark remote-controlled pumps
- Before start-up, check that hoses and equipment are leak-tight and working properly
- Do not operate the pump with hazardous media

i External actuation functions are available only in the RC version.

Connection details and technical data are provided in Chapter 3.9

8.1 External actuation analog input

The analog input can be used to externally control a pump flow rate from (0%) 15% to 100%.

Activating the analog input

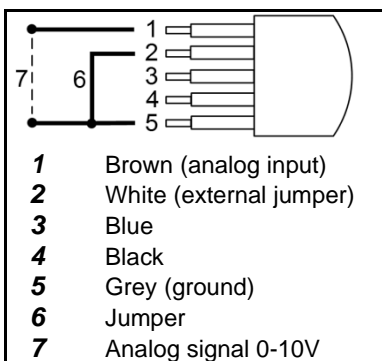


Fig. 18: RC cable jumper

The analog input must be activated by connecting the RC cable.

➔ With the RC cable connect the white lead (jumper) to the grey lead (ground) or with the RC connector, connect pin 2 to pin 5. See Fig. 18

➔ If external actuation is switched on, this is indicated on the pump by the illuminated "EXT" symbol. See Fig. 19

i When the analog input is active, the pump can be started only if a valid analog signal is present.

i The control knob is deactivated. Manual flow rate entry is blocked.

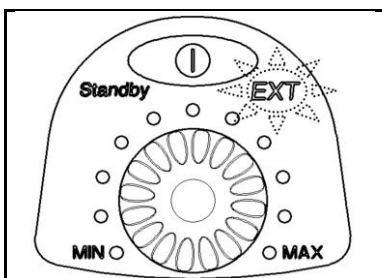


Fig. 19: "EXT" indicator

Control signals

Name	
Voltage range	0 – 10V
On threshold	≥ 0.2V
Off threshold	≤ 0.2V

Tab. 16: Analog input signals

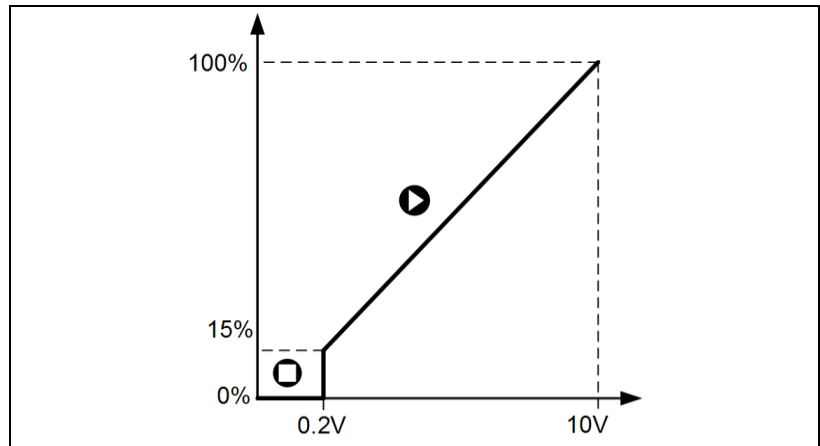


Fig. 20: range analog input

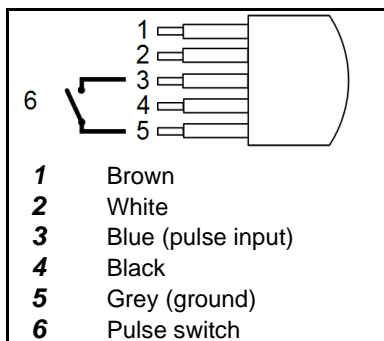


Fig. 21: Pulse input

8.2 Start/Stop pulse input

The pump can be externally started and stopped via the pulse input.

- ➔ The falling signal edge at the pulse input triggers the starting or stopping of the pump.
- ➔ If analog actuation is also used, a valid analog signal must be present.

Control signals

Input	Meaning	Signal
Pulse	Start/Stop on signal pulse	Falling edge below 4.0V
Pulse duration	Maximum pulse duration	200 ms
Activation time	Minimum delay between activation pulse and deactivation pulse	300 ms
Deactivation time	Minimum delay between deactivation pulse and activation pulse	400 ms

Tab. 17: Signal pulse input

- i** Following a pulse, there must be a delay before a new pulse is sent. See Tab 17.
- i** The pulse duration must not be longer than 200 ms.
- i** The use of debounced switches is recommended.

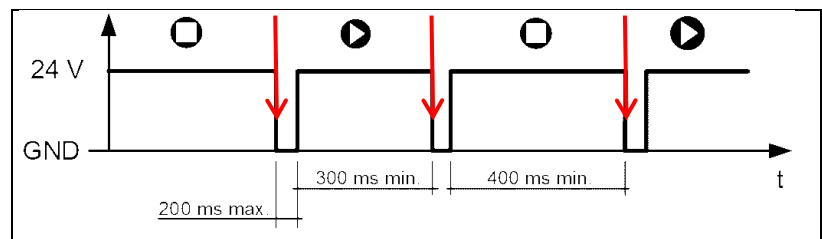


Fig. 22: Start/stop impulse control

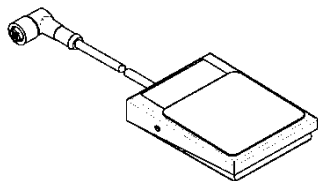


Fig. 23: Foot switch

Foot switch

With the RC version, the pulse foot switch (KNF Id. no. 155872) can be connected to the RC connector as an accessory.

- ➔ When the foot switch is operated, the pulse signal is shorted to ground, which switches the pump on.
- ➔ If it is operated again, the pump is switched off.

i The minimum switching times must be taken into consideration when the foot switch is operated. See Chapter 8.2

i The pump can also be switched on or off using the Start/Stop button at any time.

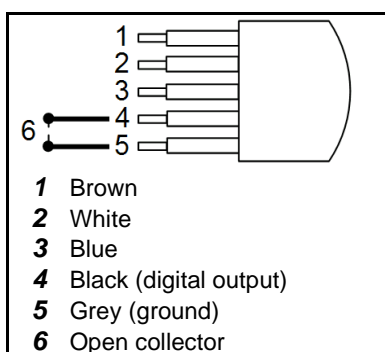


Fig. 24: Digital output

8.3 Digital output

The current operating status of the pump can be read out via the digital output.

The open collector is only switched on if the pump is transferring.

i The open collector output is internally connected to the collector of an NPN transistor (BC817-40) and to the internal 24V feed via a diode.

A maximum of 24V may be connected to the output.

The maximum current via the open collector must be limited to 10mA.

8.4 Shutting down the pump in an emergency

In order to shut the pump down in an emergency, pull out the mains plug. Or shut the pump down using the "Stop" button.

9. Cleaning and maintenance

9.1 Safety



⚠ DANGER

Danger of injuries caused by hazardous materials

Poisoning and caustic burns caused by contact with aggressive, flammable or radioactive media

- Flush the pump thoroughly (see Section 9.3)
- Decontaminate the pump if necessary
- Observe the safety data sheets for the media to be transferred
- Wear suitable protective equipment



⚠ WARNING

Danger of heat build-up as a result of chemical reactions with the flushing liquid

Significant heat build-up will damage the diaphragm, O-rings and valve system, resulting in leaks

- Avoid chemical reactions in the pump
- Observe the safety data sheets for the liquid to be transferred
- Observe the following advice

The following requirements apply to all the activities described in this chapter:

Requirements	<ul style="list-style-type: none"> ▪ None
Personnel	<ul style="list-style-type: none"> ▪ Specialist personnel
Personal protective equipment	<ul style="list-style-type: none"> ▪ The type of protective equipment required will depend on the medium to be transferred. ▪ Observe the safety data sheets for the media to be transferred.
Spare parts	Use only genuine parts from KNF for servicing work.

9.2 Maintenance plan

Component	Servicing interval
Pump	- Regular inspection for external damage or leaks
Pump head	- Clean if the flow rate decreases, the pump does not work or no vacuum is created - Replace parts if necessary See Chapter 12
Pump diaphragm	- Replace pump diaphragm if the pumping capacity decreases or a leak occurs - Replace pump diaphragm in the event of repeated head installation
Filter (accessory)	- Replace if it is dirty

Tab. 18: Servicing schedule

9.3 Cleaning the pump

In order to maintain the service life of the pump, after each use and before any long periods of inactivity the pump must be flushed through with neutral media.

IMPORTANT:

To ensure satisfactory start-up when the unit is restarted, it is important to ensure that the pump is free of any crystallising, adhesive or curing media.

9.3.1 Acids

- Flush pump with a suitable neutralising liquid in a circular flow for 10 minutes
- Then flush with distilled water for 5 minutes

9.3.2 Bases

- Flush pump with a suitable neutralising liquid in a circular flow for 10 minutes
- Then flush with distilled water for 5 minutes

9.3.3 Organic solvents

- Flush pump with isopropyl alcohol (C₃H₈O) in a circular flow for 10 minutes

NOTE

Never flush non-polar solvents immediately with water

9.3.4 Biological solution

- Flush pump with 10% hydrogen peroxide in a circular flow for 10 minutes
- Then flush with distilled water for 10 minutes

NOTE

The procedure described in Section 9.3.4 is not a sterilisation

9.4 Cleaning / replacing valve plates and pump diaphragm



⚠ DANGER

Danger from hazardous materials

Poisoning and caustic burns or undesirable reactions caused by escaping hazardous materials as a result of incorrect maintenance/servicing or the transferring of incompatible media.

- Follow the maintenance instructions
- Ensure cleanliness during maintenance (particles on seal faces cause leaks)
- Check that pump and system are leak-tight after maintenance



⚠ WARNING

Danger of poisoning and caustic burns

If they come into contact with skin and eyes, aggressive media cause poisoning and caustic burns.

- Cleaning the pump according to chapter 9.3
- flashing
- Wear protective equipment, e.g. protective gloves, safety glasses.

Requirements

- The pump must be switched off and disconnected from mains
- The pump must be free of any hazardous substances
- The hoses must be disconnected from the pump head
- Specialist personnel

Personnel

Personal protective equipment

- The type of protective equipment required will depend on the medium to be transferred.
- Observe the safety data sheets for the media to be transferred.

Tools and materials

Qty	Tools/materials
1	T20 Torx screwdriver
1	Phillips screwdriver no. 2
1	Spare parts kit (see Chapter 12)
1	Torque screwdriver that can be set to 1.5 Nm.

Tab. 19: Tools/materials

Information on procedure

Always replace valve disks, valve seats and seals at the same time to maintain a satisfactory flow rate.

9.4.1 Dismantling the pump head

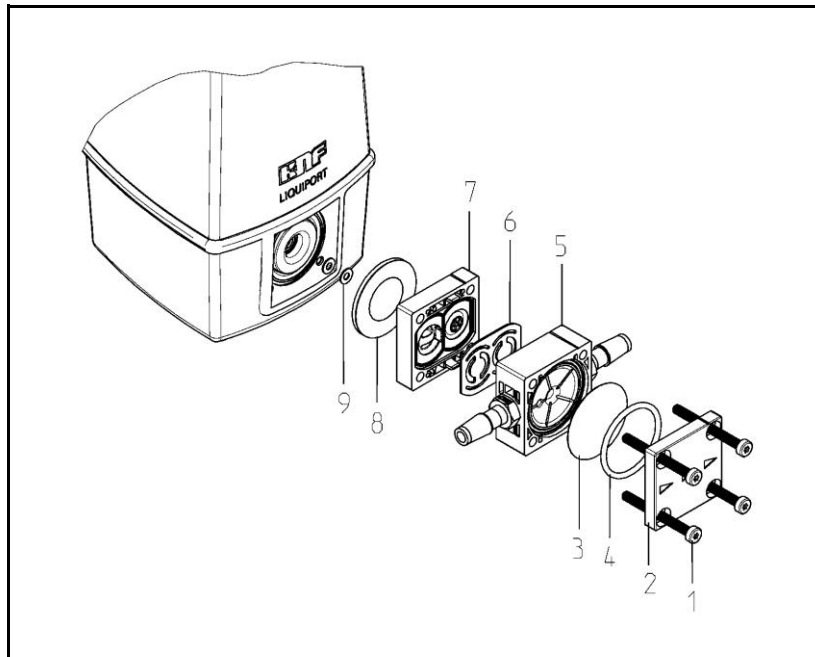


Fig. 25: LIQUIPORT100

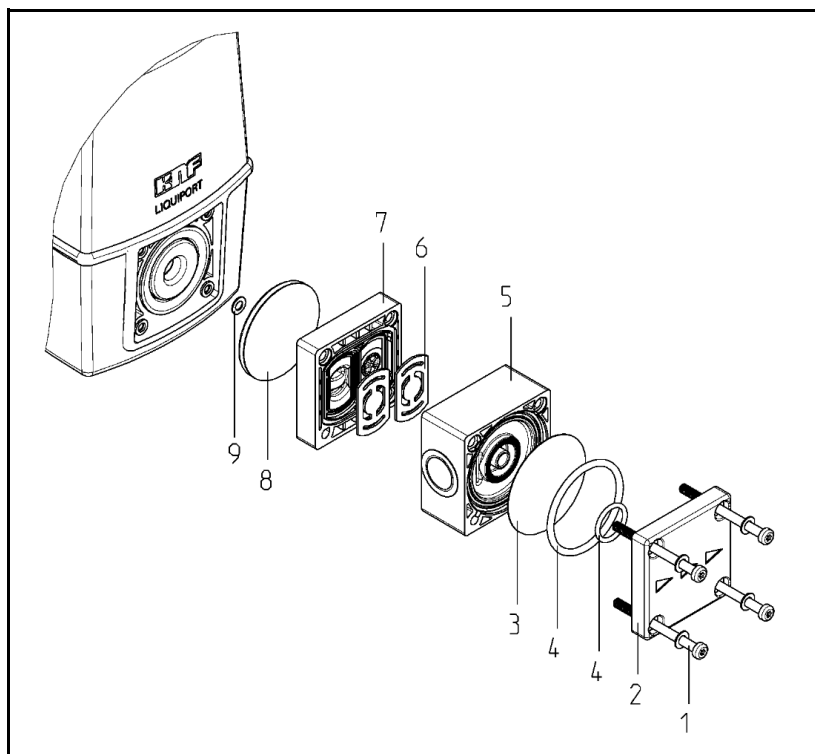


Fig. 26: LIQUIPORT300

1. Loosen the four head screws (1) and remove the entire head.

9.4.2 Removing the valves and seals

2. Remove the connecting plate (5) from the intermediate plate (7).
3. Take the valve plate (6) out of the intermediate plate (7).
4. Remove the resonating diaphragm (3) from the connecting plate (5).
5. Remove the O-ring (4) from the head plate.
6. Carefully grip the diaphragm (8) and remove by turning anti-clockwise. Remove the washers (9) and make sure that no washers 9 fall into the pump housing.

We recommend replacing the diaphragm (8).

9.4.3 Cleaning the parts

7. Clean the diaphragm (8), O-ring (4), resonating diaphragm (3), valve plate (6), intermediate plate (7) and connecting plate (5) with a cloth and then blow off with compressed air.

9.4.4 Installing the diaphragm

8. Place the same number of washers on the connecting rod (9) as were there previously. Make sure that no washers (9) fall into the pump housing.
9. Screw in the diaphragm (8).
10. By lightly pressing on the diaphragm push the ridge on the underside of the diaphragm into the groove of the housing.

9.4.5 Installing the valve plate

11. Place the dust-free valve plate(6) into the intermediate plate (7), making sure it is in the correct position.

9.4.6 Installing the pump head

12. Insert the resonating diaphragm (3) in the connecting plate (5) and cover with the head plate (2) fitted with a new O-ring (4).
13. The positions of the intermediate plate (7), the connecting plate (5) and the head plate (2) with respect to one another are determined by the arrangement of the visible grooves.
14. Insert the four head screws (1) into the through holes of the pump head.
15. Make sure that the flow direction of the pump head (see directional arrow on the head plate (2)) is the same as previously.
16. Place the pump head onto the pump housing and alternately tighten the four head screws (1). The maximum tightening torque is 1.5 Nm.
17. Check that pump and system are leak-tight after maintenance.

9.5 Checking that pump is leak-tight

⚠ WARNING



Danger of fluid system bursting due to overpressure.

The pump builds up pressure. In a closed system the max. permitted operating pressure may be exceeded, thus causing damage to the pump and/or the system.

- In the case of parts that are in contact with the fluid, use only those that are designed for the pump's operating pressure
- Do not transfer media against shut-off elements or closed systems, otherwise
- install pressure relief/safety valve and set to 6 bar (in the KNF product range)

In order to ensure correct assembly and hence reliability, it is essential to perform a leak test.

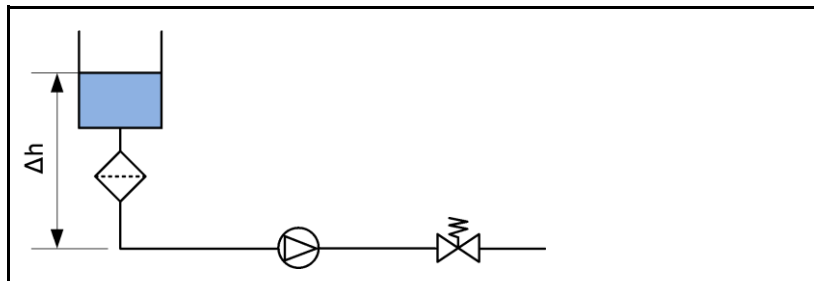


Fig. 27: Pressure test setup

1. Set up the system as shown in Fig. 27.
2. Use distilled water as a test medium.
3. Set pressure control valve to working pressure.
4. Make sure that the fitting is leak-tight (see Section 6.2.2).
5. Operate pump carefully for 5 minutes.
6. Check pump for leaks.

If no traces of medium are visible on the head, the pump can be used in accordance with its specification (see Chapter 3).

Caution!

If it is found that liquid is escaping, under no circumstances should the pump continue to be used.

1. Check that connections are leak-tight.
2. Check tightening torque of head screws.
3. Check that elastomer parts are clean.
4. Check leak-tightness again.

If these actions have no effect, contact your local KNF dealer and do not under any circumstances continue to use the pump.

10. Shutdown

10.1 Safety



⚠ DANGER

Danger of injuries caused by hazardous materials

Poisoning and caustic burns caused by contact with aggressive, flammable or radioactive media

- Flush the pump thoroughly (see Section 9.3)
- Decontaminate the pump if necessary
- Observe the safety data sheets for the media to be transferred
- Wear suitable protective equipment

The following requirements apply to all the activities described in this chapter:

- Requirements
- Personnel
- Personal protective equipment

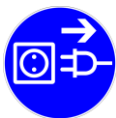
- System depressurised
- Specialist personnel
- The type of protective equipment required will depend on the medium to be transferred.
- Observe the safety data sheets for the media to be transferred.



10.2 Procedure

1. Flush the whole system including the pump with a neutral liquid
2. Pump the pump empty (see Section 9.3)
3. Press the STOP button to end the transferring operation
4. Unplug the pump from the power supply
5. Dispose of pump properly

11. Troubleshooting



11.1 Safety

Disconnect the mains plug from the power supply before working on the pump head.

- | | |
|-------------------------------|---|
| Requirements | ▪ Pump has been thoroughly flushed/decontaminated |
| Personnel | ▪ Specialist personnel |
| Personal protective equipment | ▪ None |

Pump does not transfer

Cause	Remedy
Pump not connected to the power supply.	Connect pump to the power supply.
No voltage in the power supply.	Check room fuse and switch on if necessary.
Connections or hoses are blocked.	Check connections and hoses. Remove blockage.
External valve is closed or filter is clogged.	Check external valves and filters.
Worn diaphragm or valve plates/seals.	Replace diaphragm and valve plates/seals (see Section 9.4).
External actuation connected without a signal	Check external actuation signal.
Pump overload protection has tripped. - Flow rate indicator flashing - Standby indicator not illuminated	Pump unable to build up counterpressure Pump transferring against pressure that is too high Reduce pressure in system Reduce flow rate
Overheating of the pump - The delivery rate display flashes - The standby indicator lights up	The integrated thermal switch has switched off the motor. The pump can be started again after cooling down. This can take a few minutes. Press the start/stop button for restart.

Tab. 20: Pump does not transfer

¹⁾ Maximum pressure build-up depends on flow rate setting.
Please note: Pump not protected from overpressure.

11.2 Rectifying transfer problems

Flow rate, pressure, or vacuum are too low

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

Cause	Remedy
Presence of positive pressure on the pressure side with simultaneous vacuum or positive pressure on the suction side.	Change pressure conditions.
Cross-section of hydraulic hoses or connectors too narrow or restricted.	Disconnect the pump from the 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.	Repair leaks.
Connections or hoses completely or partially obstructed.	Check connections and hoses. Remove any parts or particles causing blockages.
Pump head components are soiled.	Clean head components.
Worn diaphragm or valve plates/seals.	Replace diaphragm and valve plates/seals (see Chapter 9.4).
Materials chemically damaged by transferred media.	Select a type of material that is resistant and suitable.

Tab. 21: Flow rate, pressure, or vacuum are too low

Fault cannot be rectified

If you are unable to identify the cause of the problem, please send the pump to KNF customer service (see address on last page).

1. Flush the pump to clear the pump head of any hazardous or aggressive liquids (see Section 9.4).
2. Dismantle the pump.
3. Clean the pump (see Section 9.3).
4. Send the pump, with completed decontamination declaration (see Chapter 13), to KNF customer service stating the nature of the transferred medium (see arranging for return).

12. Spare parts and accessories

12.1 Spare parts

Spare parts	Order No.
LIQUIPORT 100 spare parts kit KT head	065262
LIQUIPORT 100 spare parts kit TT head	065262
LIQUIPORT 100 spare parts kit FT head 1)	152631
LIQUIPORT 1.100 spare parts kit KT head	065262
LIQUIPORT 1.100 spare parts kit TT head	065262
LIQUIPORT 1.100 spare parts kit FT head 1)	152631
LIQUIPORT 300 spare parts kit KT head	068691
LIQUIPORT 300 spare parts kit TT head	068691
LIQUIPORT 300 spare parts kit FT head 1)	151902
LIQUIPORT 1.300 spare parts kit KT head	069728
LIQUIPORT 1.300 spare parts kit TT head	069728
LIQUIPORT 1.300 spare parts kit FT head 1)	151903

Tab. 22: Spare parts

1) The FT head is not compatible with the KT/TT pump housing.

12.2 Accessories

Connection nipples	Order No.
Spare parts kit screw-in nipples NPT1/8 ETFE/FFKM	168547
Spare parts kit screw-in nipples NPT3/8 ETFE/FFKM	168551
Spare parts kit screw-in nipples NPT1/8 ETFE/EPDM	168555
Spare parts kit screw-in nipples NPT3/8 ETFE/EPDM	168549

Tab. 23: Connection nipples

Foot switch	Order No.
LIQUIPORT pulse foot switch	155872

Tab. 24: Foot switch

Fasteners	Order No.
Tripod holder	160474
Mounting plate	160473

Tab. 25: Fasteners

13. Decontamination declaration

NOTE

KNF shall only undertake to repair the pump on condition that the customer provides certification of the transferred media and the cleaning of the pump (decontamination declaration).

KNF Flodos AG
 Wassermatte 2
 6210 Sursee, Switzerland
 Tel +41 (0)41 925 00 25
 Fax +41 (0)41 925 00 35
 www.knf.com

1. Copy this page, or print out the decontamination declaration from our website <http://www.knf.com/downloads>.
2. Enter the pump model, the serial no. and the transferred media in the form below and send the signed form together with the flushed and cleaned pump to KNF customer service.

Customer decontamination declaration for repair order

We confirm that the pump below has been used to transfer the following media, and that the pump has been flushed and cleaned.

Pump model	
Serial no.	
Transferred media	

The pump does not contain aggressive, biological, radioactive, poisonous, or other dangerous media.

.....
 Company

.....
 Date/Signature

