LAB

FEM1.02_ _.18_ _
OPERATING INSTRUCTIONS

SIMDOS® 02

DIAPHRAGM METERING PUMP



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

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

Contents **Page**

1 General points 5
1.1 Information on the instructions 5
1.2 Warnings 6
1.3 Symbols 7
1.4 Disclaimer of liability 8
1.5 Manufacturer's address 8
1.6 Year of manufacture 8
1.7 Other applicable documents 8
1.8 Copyright 8
1.9 Warranty conditions 8
2 Safety 9
2.1 Intended use 9
2.2 Reasonably foreseeable misuse 9
2.3 Owner's responsibility 10
2.4 Personnel requirements 10
2.5 Product-specific dangers 11
2.6 Personal protective equipment 12
2.7 Safety equipment 13
2.8 Disposal 13
2.9 Danger areas 14
2.10 Compliance 14
2.11 Declaration of conformity 15
3 Technical data 16
3.1 Items included in delivery 16
3.2 Storage conditions 16
3.3 Pump head materials 16
3.4 Product key 17
3.5 Dimensions 18
3.6 Installation location requirements 19
3.7 Electrical connections and performance data 19
3.8 Remote control (RC and RC Plus version only) 20
3.9 Remote control via RS 232 (RC Plus version only) 20
3.10 Flow rates 21
3.11 Other parameters 21
3.12 Hydraulic connections 21
3.13 Transferred medium 22
3.14 Accuracy/ reproducibility 23
4 Assembly and function 25
4.1 Metering pump structure 25
4.2 Operating principle 25
4.3 Valves 26
4.4 Pump diaphragm 28
4.5 Pump head 28
4.6 Operating controls 28
5 Shipment 33
5.1 Checking delivery 33
5.2 Registering a complaint 33
5.3 Arranging for return 33
6 Installation and initial start-up 34
6.1 Safety 34
6.2 Installation 35
6.3 System setup 38
6.4 Initial start-up 40
7 Operation 41
7.1 Safety 41
7.2 Switching pump on / off 42
7.3 Entering settings 43
7.4 Setting the operating mode 44
7.5 Priming the pump 45

7.6 Starting the pump 45
7.7 Interrupting a transferring operation 45
7.8 Stopping the transferring operation 46
7.9 Transferring fluid 47
7.10 Setting metering operation 47
7.11 Setting the fluid type 48
7.12 To calibrate the pump 49
7.13 Cycle metering mode 50
7.14 Setting the system 50
7.15 Back to main menu 50
7.16 Select language setting 51
7.17 Activate autostart 51
7.18 Set contrast 51
7.19 Resetting the pump (Reset) 52
7.20 Shutting down the pump in an emergency 52
8 RC version (remote control) 53
8.1 Remote control analog input 54
8.2 Digital input 1, Start / Stop 56
8.3 Digital input 2 Reset / Prime / Foot Switch 58
8.4 Digital output 60
9 RC Plus version (serial communication) 61
10 Cleaning and maintenance 62
10.1 Safety 62
10.2 Cleaning the pump 63
10.3 Maintenance plan 64
10.4 Cleaning / replacing valve plates and pump diaphragm 65
10.5 Checking that pump is leak-tight 71
11 Shutdown 72
11.1 Safety 72
12 Troubleshooting 73
12.1 Safety 73
12.2 Displaying of error messages 73
12.3 Rectifying transfer problems 74
13 Spare parts and accessories 75
13.1 Spare parts 75
13.2 Hoses 75
13.3 Pressure control valve 75
13.4 Filter 75
13.5 Foot switch 75
13.6 Fastening material 75
14 Decontamination declaration 76
15 Appendix 77
15.1 RoHs Declaration for China 77

1 General points

1.1 Information on 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 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 may 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

Danger of injuries and property damage caused by illegible labels

The labelling on the device may become illegible with time.

- ➢ 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



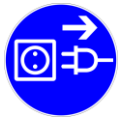
Danger of caustic burns or burns



Fire danger



Danger of automatic start-up



This symbol calls for disconnection from the mains.

1.4 Disclaimer of liability

In preparing the contents of these operating instructions, account has been taken of applicable regulations.

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
Fax +41 (0)41 925 00 35

www.knf.com

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
- General Trade Conditions

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:

- Transferring and metering liquids.
- Temporary operation in laboratories for research purposes.
- Operation in accordance with the operating parameters specified in the technical data (see Chapter 3) and other applicable documents.
- Transferring media which meet the requirements in the technical data and other applicable documents.
- Operation when fully assembled.
- 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 must not be

- operated in an explosive atmosphere.
- used to transfer explosive media.
- used to produce foodstuffs or pharmacological products. Additional certifications are required for this purpose.
- used to transfer media whose compatibility with the pump head, valves and seals has not been demonstrated.

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 the present 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. He/she 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 his personnel at regular intervals and inform them of the risks involved.
- The operator must provide his 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



Danger of injuries and property damage caused by insufficiently qualified staff

Improper use of the pump may result in serious injury and damage to property.

- ➢ Any activities must only be performed 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 tightening 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 escaping of the fluid, even if the pump is not operating

- ➢ Avoid overpressure on the suction side
- ➢ Fit a pressure control valve (see Section 6.3.3)



⚠ CAUTION

Deviating metering accuracy

The metered volume may deviate from the set value due to gases, particles, or cavitation in the fluid system.

- ➢ Use a pre-filter, especially for media containing solid particles or fibers (see Chapter **13**)
- ➢ Clean the valve disc/pump head (see Section 10.4)
- ➢ Ventilate the pump and system well
- ➢ Set the liquid type, for highly viscous and outgassing media, see Section **7.11**



⚠ CAUTION

Deviating metering accuracy

Transferring media containing particles larger than 70 µm may block the valves in the pump head.

- ➢ Use a pre-filter, especially for media containing solid particles or fibers (see Chapter 13)
- ➢ Monitor the metering
- ➢ Clean the valve disc/pump head (see Section 10.4)

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 Safety diaphragm with intermediate flange



⚠ 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

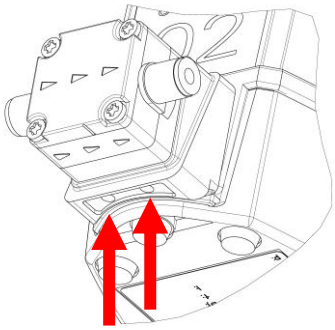


Fig. 1: Discharge outlet

In the event that the pump diaphragm ruptures, the safety diaphragm prevents the transferred medium from penetrating into the pump. 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.

2.7.3 Pressure control valve (optional)

In the event of overpressure on the suction side, the pump allows the medium to flow through it freely. The pressure control valve maintains a counterpressure of 0.5 bar and prevents the transferred medium from escaping. The pressure control valve is to be used on the pressure side (see Section 6.3.3)

2.8 Disposal

Environmental protection WEEE

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

When transferring corrosive, poisonous, ionising, inflammable or biological media, escaping medium may cause a hazard.

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

2.10 Compliance

The declaration of standard SJ-T 11364-2024 “Hazardous Substance Disclosure Table 有害物质含量表” is made in accordance with the specifications detailed in the appendix to this document.

2.11 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	FEM 1.02	.18S/ .18RC/ .18RCP
Labor Membran -Dosierpumpen	FEM 1.10	.18S2/ .18RC2/ .18RCP2
Labor Membran -Dosierpumpen	UFEM 1.10	.18S2/ .18RC2/ .18RCP2

(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 Gestaltungsleitsätze - 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

QFO.0171.05 T
SIMDOS_EC DOC_2024-07-11

Template - Version 05
2024-07-11 / RB / Page 1 / 1

3 Technical data

3.1 Items included in delivery

- SIMDOS metering pump
- Mains plug
- Operating manual
- Abbreviated instructions
- Connection kit: Hose and screw-in fittings
- Filter
- Remote control cable (RC and RCP version only)
- D-sub control cable (RCP version only)

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 head materials

The type designation **KT** stands for:

Assembly	Material[1)]	Medium contact
Pump head	PP	Yes
Valve plate / seals	FFKM	Yes
Diaphragm	PTFE-coated EPDM membrane	Yes
Included Filter	PEEK*	Yes
Housing	PP, TPE, PC	No

Tab. 1: KT materials

[1)] according to DIN ISO 1629 and 1043.1
**material for housing and filter mesh*

The type designation **TT** stands for:

Assembly	Material[1)]	Medium contact
Pump head	PVDF	Yes
Valve plate / seals	FFKM	Yes
Diaphragm	PTFE-coated EPDM membrane	Yes
Included Filter	PVDF*	Yes
Housing	PP, TPE, PC	No

Tab. 2: TT materials

[1)] according to DIN ISO 1629 and 1043.1
**material for housing and filter mesh*

The type designation **FT** stands for:

Assembly	Material[1)]	Medium contact
Pump head	PTFE	Yes
Valve plate / seals	FFKM	Yes
Diaphragm	FFKM	Yes
Included Filter	PEEK*	Yes
Housing	PP, TPE, PC	No

Tab. 3: FT materials

[1)] according to DIN ISO 1629 and 1043.1
**material for housing and filter mesh*

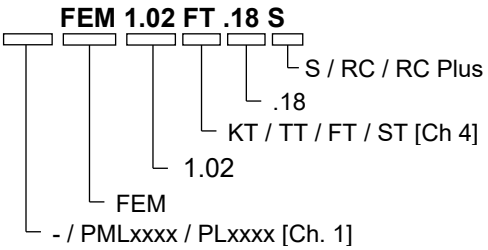
The type designation **ST** stands for:

Assembly	Material	Medium contact
Pump head	1.4404	Yes
Valve plate / seals	FFKM[1)]	Yes
Diaphragm	PTFE-coated EPDM membrane	Yes
Included Filter	PEEK*	Yes
Housing	PP, TPE, PC[1)]	No

Tab. 4: ST materials

[1)] according to DIN ISO 1629 and 1043.1
**material for housing and filter mesh*

3.4 Product key



Description	Meaning	
PML / PL	Customer-specific designs	
FEM	Flodos Electronic Metering (designation for metering pumps)	
1.02	Pump type	
KT / TT / FT / ST	Head material	
.18	Laboratory device with housing	
S / RC / RC Plus	S	without remote control
	RC	with remote control (Remote Control)
	RC Plus	with RS 232 interface and remote control

Tab. 5: Product key

3.5 Dimensions

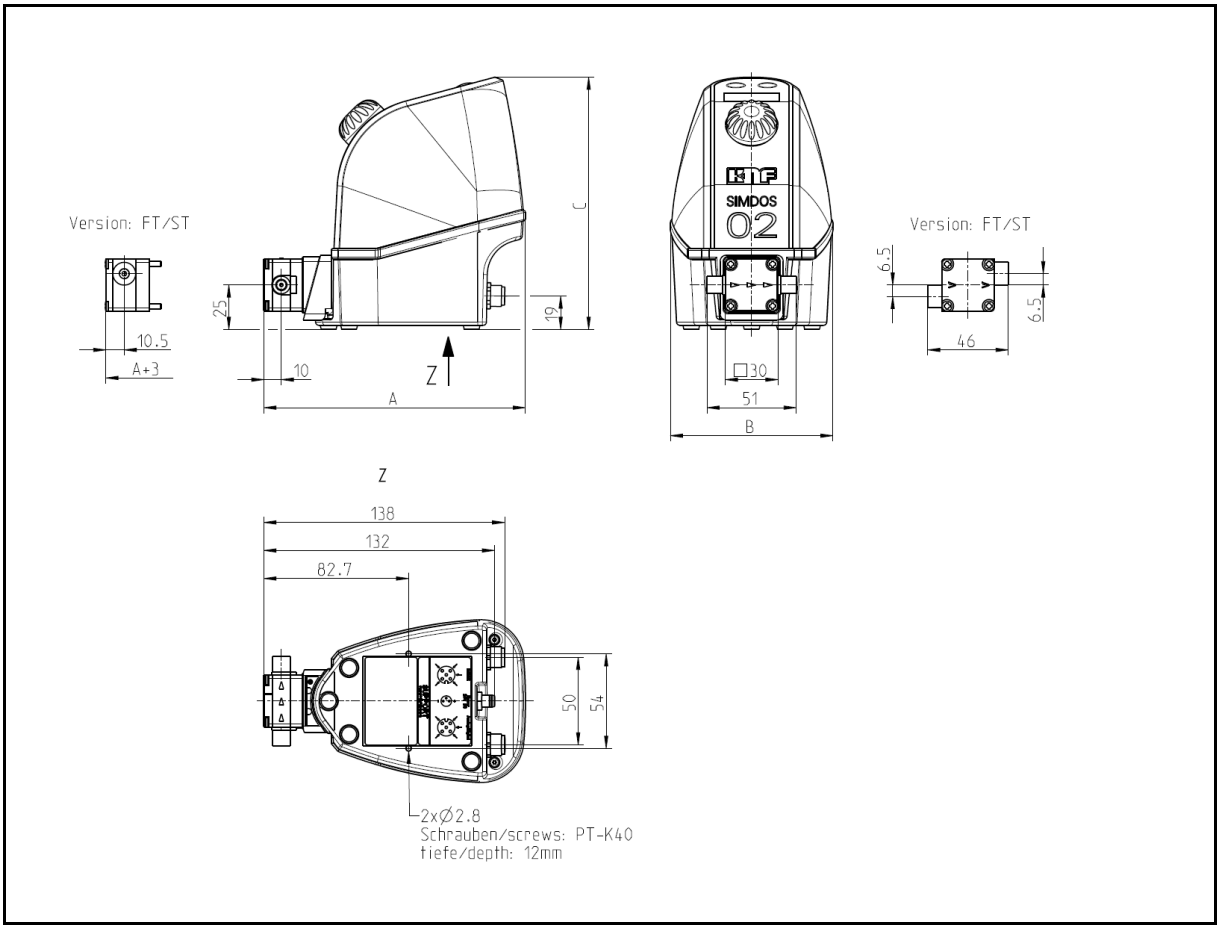


Fig. 2: Mounting measurements (measurement tolerances as per DIN ISO 2768-1, tolerance class V)

Parameter	Value (metric)	Value (imperial)
Width (A)	150 mm	6.102 inches
Depth (B)	93 mm	3.740 inches
Height (C)	144 mm	5.708 inches
Weight of pump [1]	0.9 kg	1.98 lb

Tab. 6: Dimensions

Type plate

The type plate is on the bottom of the device. It contains the following information:

- Manufacturer's address
- Type
- Serial Number
- Design pressure
- CE and UKCA mark
- Year of manufacture
- Electrical connection data

[1] Differences are possible depending on the project

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

- 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 inflammable 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

3.7.1 Power supply unit

Parameter	Value
Nominal mains voltage AC [V]	100 – 240 V AC +/- 10 %
Frequency [Hz]	50 – 60
Max. power consumption [W]	40
Pump DC voltage [V]	24
Pump protection type	IP 40
Power supply protection	Electronic overload protection

Tab. 7: Electrical data power supply unit

3.7.2 Pump

Parameter	Value
Pump DC voltage [V]	24
Max. current consumption, DC RMS 24 V [A]	0.4
Max. short-term peak current [A]	1.7
Pump protection	Electronic overload protection
Pump protection type	IP 65

Tab. 8: Electrical data pump

3.8 Remote control (RC and RC Plus version only)

Parameter	Value
Analog input	
Signal range, (100%) for 1 – 100% of full scale	0 – 5 V, 0 – 10 V, 0 – 20 mA, 4 – 20 mA
Signal range, (30%) for 0.3 – 30% of full scale	0 – 5 V, 0 – 10 V, 0 – 20 mA, 4 – 20 mA
Signal range, (15%) for 0.15 – 15% of full scale	0 – 5 V, 0 – 10 V, 0 – 20 mA, 4 – 20 mA
Input resistance [Ω]	13.9 kΩ at 0 – 10 V 13.9 kΩ at 0 – 5 V 470 Ω at 4 – 20 mA 470 Ω at 0 – 20 mA
Electric strength [V] TTL	24 V DC
Digital input	
Signal range	Pull up at 24 V
Voltage [V] TTL	24 V DC
Low level (ON)	< 0.8 V = low
High level (OFF)	> 2.0 V = high
*Digital output *1*	
Voltage open collector [V] TTL	24 V DC
Load capability open collector [mA] TTL	10 mA

Tab. 9: Remote control

**1 To capture pulse signals like Mot. Pul. And Vol. Pul. with a (1 ms) duration, a sampling rate > 2 kHz or a counter input with edge detection is necessary.*

3.9 Remote control via RS 232 (RC Plus version only)

Parameter	Value
RS 232 interface	
TX – RS232	
RX – RS232	
Ground	
Settings (factory)	
Baud rate	9600 Kbit/s
Data	Bits 8
Parity	No
Stop	Bit 1
Mode	Half duplex

Tab. 10: RS 232 interface

3.10 Flow rates

Parameter	Value
Flow rate [ml/min]	0.03 - 20
Max. metering volume [ml]	0.03 - 1000
Metering time [mm:ss] [hh:mm]	1s – 99h 59min
Permissible pressure [bar g]	6
Suction head [mWG]	2

Tab. 11: Hydraulic ratings

NOTE

The pump has been calibrated to its nominal flow rate in the factory. The specified flow rate is for water at 20°C with free discharge flow. The flow rate may differ from the calibrated value depending on the medium, its viscosity, density and temperature, pressure and installation type (e.g. cross-section constrictions).

- ➢ For accurate metering, calibrate the pump in the system (see Section 7.12)

3.11 Other parameters

Parameter	Value
Permissible ambient temperature [°C]	+5 to +40
Service life [h]	10,000 (100 million strokes) or 5 years
Noise level	< 40 dBA

Tab. 12: Other parameters

3.12 Hydraulic connections

Pump type	Connection type
FEM 1.02 KT.18	Internal thread UNF 1/4" – 28
FEM 1.02 TT.18	Internal thread UNF 1/4" – 28
FEM 1.02 FT.18	Internal thread UNF 1/4" – 28
FEM 1.02 ST.18	Internal thread UNF 1/4" – 28

Tab. 13: Hydraulic connections

3.13 Transferred medium

Parameter	Value
Permissible medium viscosity [cSt][2]	150
Ideally free of solids, max. particle size [µm]	< 70
Permissible media temperature[3] [°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 it cannot be ensured that the transferred medium is free of solids, a < 70 µm filter with a sufficiently large filter area must be fitted upstream of the pump to prevent it from being damaged (see Chapter 13).

NOTE

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

- ➢ Check resistance, see chemical resistance list and Section 4.3
- ➢ Clarify resistance with KNF

[2] Using the fluid type setting "Visc500cSt" allows media with a viscosity of 500 cSt to be transferred at a limited flow rate. (see Section 7.11)

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

3.14 Accuracy/ reproducibility

The accuracy of the metering pump is appropriately characterised by the maximum absolute error A and the maximum relative error B:

➔ max. inaccuracy ≤ A + B

Error	Value
Absolute error A	≤ ± 1‰ nominal value
Relative error B	≤ ±1.9% of setting value
Max. deviation	≤ A+B
Mean accuracy	+/- 2%
Mean reproducibility[4]	+/- 1%

Tab. 14: Error A and error B

Example: SIMDOS 02, nominal value of 20ml/min

For a setting of 5ml/min, the accuracy should therefore be within the following error limits:

Deviation ≤ (±1‰ x 20ml/min) + (±1.9% x 5ml/min)
≤ (±0.02ml/min) + (±0.095ml/min)
≤ ±0.115ml/min
≈ ±2% of setting value

⚠ CAUTION

Deviating metering accuracy

The metered volume may deviate from the set value due to gases, particles, or cavitation in the fluid system.

- Use a pre-filter, especially for media containing solid particles or fibers (see Chapter **13**)
- Clean the valve disc/pump head (see Section 10.4)
- Ventilate the pump and system well
- Set the liquid type, for highly viscous and outgassing media, see Section **7.11**

⚠ CAUTION

Deviating metering accuracy

Transferring media containing particles larger than 70 µm may block the valves in the pump head.

- Use a pre-filter, especially for media containing solid particles or fibers (see Chapter 13)
- Monitor the metering
- Clean the valve disc/pump head (see Section 10.4)

[4] Under constant environmental conditions and with the same hose configuration

NOTE

Greater inaccuracies may occur for fluids with a viscosity of > 150 cSt or with a tendency to gassing out

- ➢ Set "fluid type" (see Section 7.11)
- ➢ Calibrate the pump in the system (see Section 7.12)

NOTE

The flow rate may differ from the calibrated value for some applications, according to the medium, its viscosity, density and temperature, pressure and installation type (e.g. cross-section constrictions)

- ➢ For accurate metering, calibrate the metering pump in the system (see Section 7.12)

4 Assembly and function

4.1 Metering pump structure

1 STOP button
2 START button
3 Display
4 Control knob
5 Inlet
6 Pump head
7 Outlet
8 Power supply connector
9 Remote Control connector (RC and RC Plus version only)
10 Connector for serial communication (RC Plus version only)

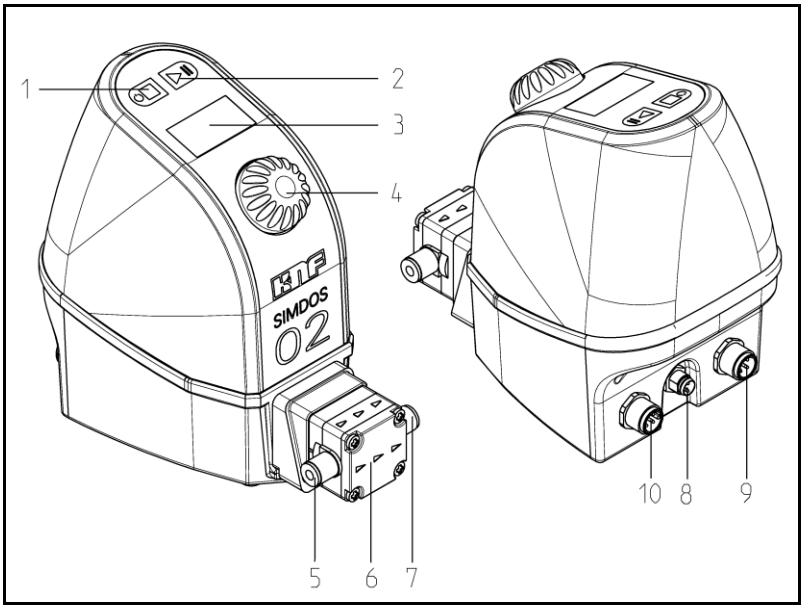


Fig. 3: Diaphragm pump

4.2 Operating principle

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

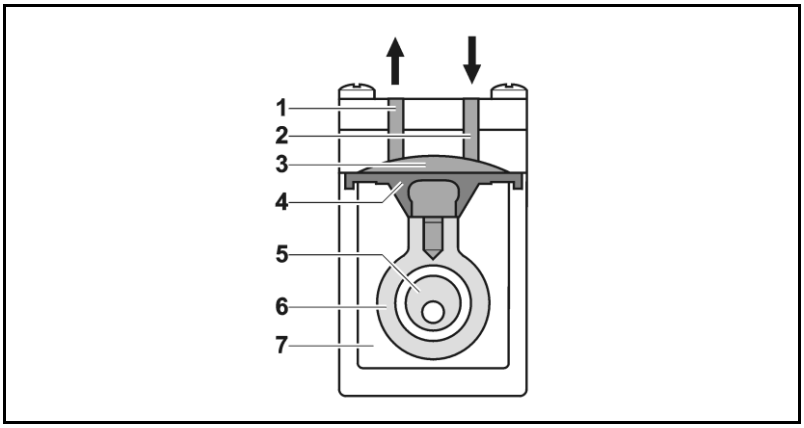


Fig. 4: Pump assembly

Principle: 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**).

Patented drive system

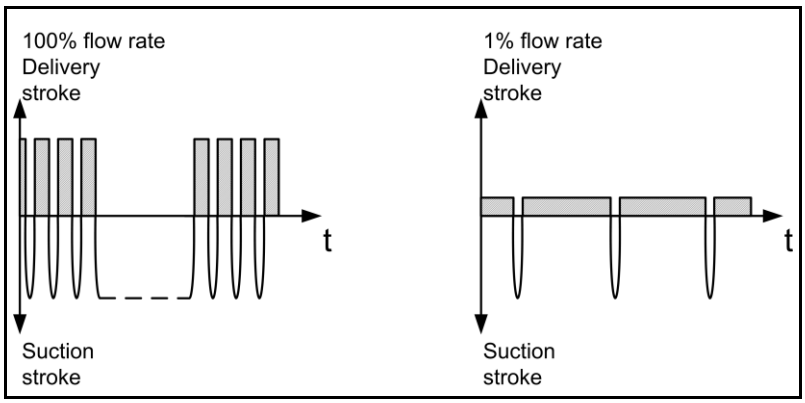


Fig. 5: Low-pulsation operating principle

SIMDOS® diaphragm metering pumps are fitted with a patented drive system. The suction stroke is always driven at maximum speed, but the exhaust process is varied according to the selected speed, ensuring maximum possible uniformity of discharge during the entire stroke (see Fig. 4). This results in a low-pulsation, quasi-continuous transfer process. This is the key difference between SIMDOS® metering pumps and diaphragm metering pumps with linear magnet diaphragm drive or with conventional eccentric diaphragm drive.

The characteristic curve for the suction and exhaust strokes can also be adapted to the medium by setting the appropriate fluid type (see Section 7.11).

4.3 Valves

The SIMDOS is supplied with DuPont™Kalrez®[5] valve disks as standard, but can also be supplied with valve disks made of CHEMRAZ®[6] as an option.

⚠ WARNING

Danger of leaks and inaccurate metering caused by non-resistant valve materials

Using the wrong valve materials will result in inaccurate metering and possibly the complete failure of the valve system

- Check the resistance of any parts which come into contact with the fluid (see chemical resistance list or consult your local KNF dealer, or contact www.knflab.com
- Avoid transferring media containing fluorine
- Regularly check that the pump is working properly and is not leaking, especially when transferring aggressive and corrosive media

[5] DuPont™Kalrez® is a registered trademark of E.I. du Pont de Nemours and Company or one of its subsidiaries. All rights reserved.
[6] CHEMRAZ® is a registered trademark of Greene, Tweed & Co. All rights reserved.

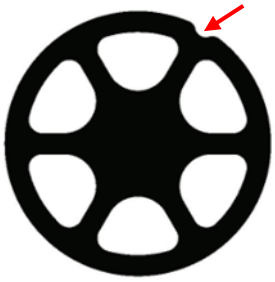


Fig. 6: Kalrez®, standard valve

4.3.1 Standard valve, DuPont™Kalrez®

The SIMDOS is supplied with DuPont™Kalrez® valve disks as standard. This material is resistant to most chemicals.

The optional CHEMRAZ® Valve Kit (see Section 13.1) is required for the liquids in Tab. 15.

- ➢ The resistance of the individual materials can be found in the chemical resistance list provided.
- ➢ In case of doubt, please contact your local KNF dealer.

NOTE

The valve material can be identified from the geometry of the valve disk.

- ➢ DuPont™Kalrez® has one groove in its outer contour (see Fig. 6)
- ➢ CHEMRAZ® has six grooves in its outer contour (see Fig. 7)
- ➢ If CHEMRAZ® valves are used, the pump is to be labelled accordingly
- ➢ The instructions in Section 10.4 are to be followed when removing the valves

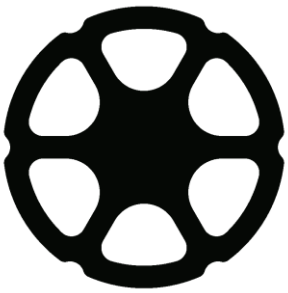


Fig. 7 Chemraz® valve, optional

4.3.2 CHEMRAZ® Valve Kit

Experience shows that CHEMRAZ® valves should be used for the following liquids:

Solvents	
Tetrahydrofuran (THF)	C_4H_8O
Dimethyl sulfoxide (DMSO)	C_2H_6OS
Dimethyl formamide (DMF)	C_3H_7NO
Methyl ethyl ketone (MEK)	C_4H_8O
Cyclohexane	C_6H_{12}
Concentrated acids (75%)	
Hydrofluoric acid	HF
Nitric acid	HNO_3
Sulphuryl dichloride	SO_2CL_2
Trifluouroacetic acid	$C_2HF_3O_2$

Tab. 15: Excerpt from the chemical resistance list for the CHEMRAZ® Valve Kit

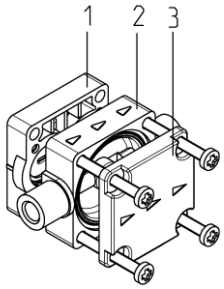


Fig. 8: Pump head

4.4 Pump diaphragm

The pump diaphragm is covered with a layer of PTFE to ensure good chemical resistance. Type "FT" uses a pure FFKM diaphragm.

4.5 Pump head

The pump head comprises an intermediate plate (**1**), a connecting plate (**2**) and a head plate (**3**). The intermediate and connecting plates come into contact with the liquid, so the resistance of the corresponding head materials must be established.

4.6 Operating controls

1 STOP button
- Switch pump on/off
- Stop transfer process

2 START button
- Start and interrupt transfer process

3 Display
- Display operating parameters

4 Control knob
- Set flow rate (turn)
- Navigate through program (turn)
- Confirm (press)

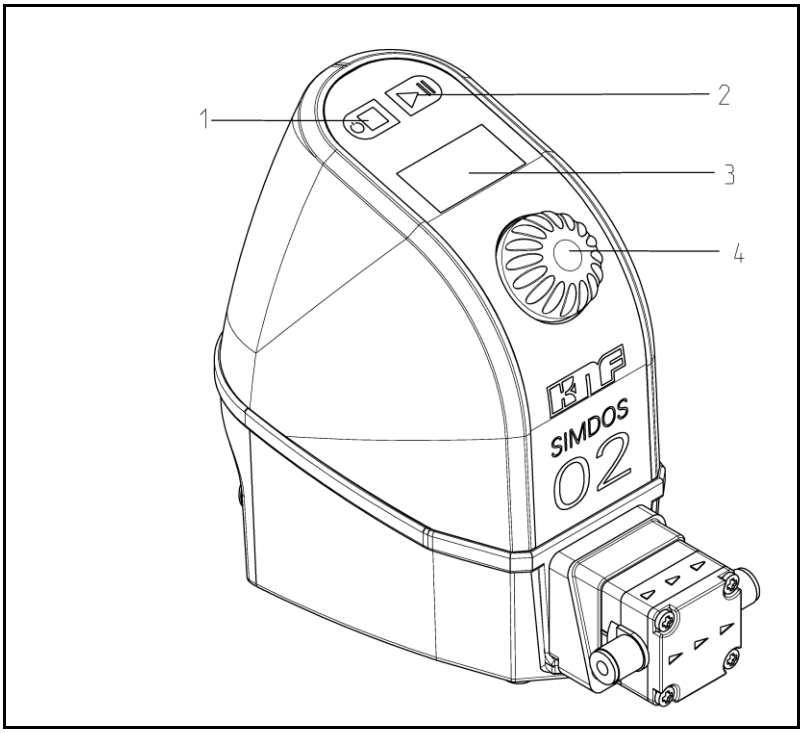


Fig. 9: Operating controls

4.6.1 Display

The main display shows the principal pump settings.

1 Specified flow
2 Cycle metering mode
3 Current cycle
4 Programmed cycles
5 Autostart
6 Remote control
7 Analog input
8 Digital input 1
9 Digital input 2
10 Operating mode display
11 Flow setting unit
12 Volumeter
13 Time counter

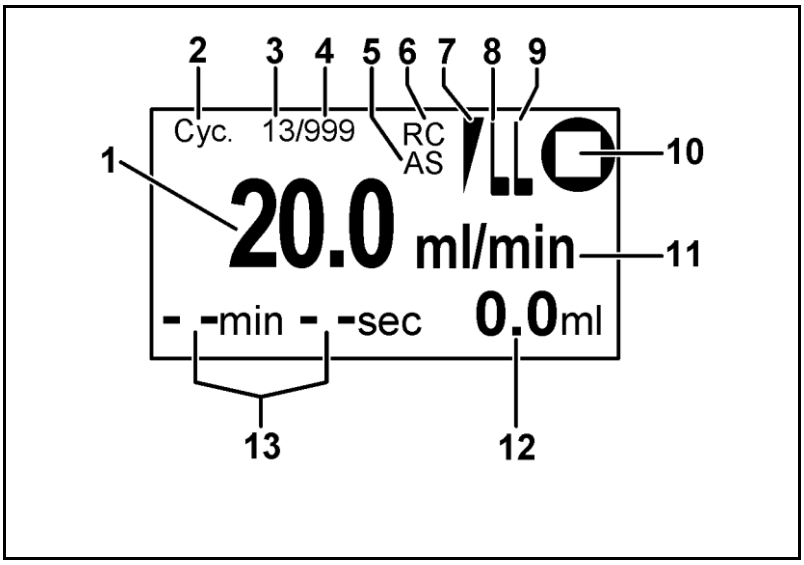


Fig. 10: Main display

Specified flow and unit
Displays the flow rate set (**1**) if the unit (**11**) has been set to "ml/min".
Displays the metering volume (**1**) if the unit (**11**) has been set to "ml".

Time counter
Displays the pump running time.

- Downward count (**13**) if a timeout (metering) has been programmed. Time remaining display.

Volumeter
Display of delivery volume (**12**) since last pump start-up.

Remote control
Displays whether pump external drive has been activated, and the external drive condition (**6**, **7**, **8**, **9**).

Autostart
Displays whether pump has been set to Autostart (**5**).

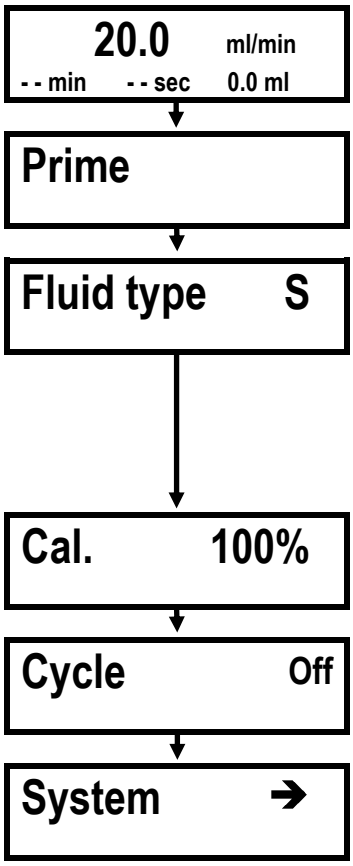
Operating condition
Displays whether the pump is operating, stopped or paused (**10**).

Cycle metering mode
If this display (**2**) is active, the programmed

number of volumes (**3**) is metered. During operation the current cycle number (**3**) is incremented until the programmed cycle number (**4**) is reached.

- During metering, the transfer time remaining for the current dose is displayed.
- During the pause the pump counts down the pause time remaining.

4.6.2 Main menu

Display	Function
	Flow rate 0.03 – 20 ml/min Metering volume 0.03 – 1000 ml and metering time timeout
	High-speed operation for priming or emptying
	Set the pump for the characteristics of the medium to be transferred S = Standard: aqueous media D = Volatile: media with a low boiling point V = Visc100 cSt: media up to 100 cSt H = Visc500 cSt: media up to 500 cSt
	To calibrate the pump
	Set cycle metering mode (several volumes) Quantity: Repetitions (Off, 2…999, Inf) Pause: pause time (1s...99 min 59s)
	Switch to system menu

4.6.3 System menu

Display	Function
Back ←	Switch to main menu
English	select language
A_in Aus	Analog input of pump* ▪ Off ▪ 0 – 5 V, 0-10 V, 0 – 20 mA, 4 – 20 mA
Range 100%	Flow rate range selection for analog input* ▪ 100% 1 – 100% 0.20 – 20 ml/min ▪ 30% 0.3 – 30% 0.06 – 6 ml/min ▪ 15% 0.15-15% 0.03 – 3 ml/min
In1 Off	Digital input 1:* ▪ Off ▪ Start/Stop using level or pulse signal
In2 Off	Digital input 2:* ▪ Off ▪ Reset or high-speed operation
Out Alarm	Digital output:* ▪ Error/alarm ▪ End of metering volume ▪ Volume pulses ▪ Motor running (level) ▪ Motor pulses
Autostart Off	Set autostart ▪ Off ▪ On (pump will start running as soon as mains voltage is applied)
Contrast 40	Set display contrast
Reset Nein	Reset pump to factory settings
Maintenanc.	Maintenance position for diaphragm replacing
Back ←	Switch to main menu

NOTE

* RC functions are available for RC and RC Plus pumps only (see Section 3.4). See Chapter 8 for further details of the external drive system.

Operating modes

Continuous transferring

In this case, the device transfers at a constant flow rate.

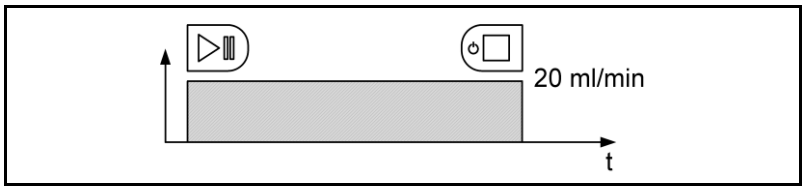


Fig. 11: Continuous transferring

Continuous transferring with timeout

In this case, the device transfers at a constant flow rate, then switches off after a specified time.

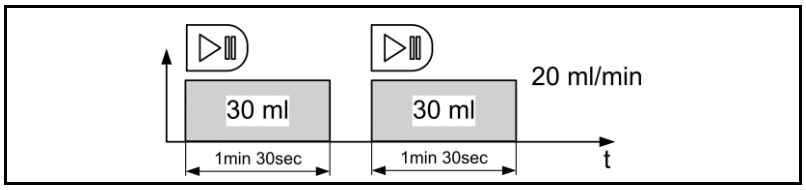


Fig. 12: Continuous transferring with timeout

Metered volume

Transferring of a specified volume in a specified time.

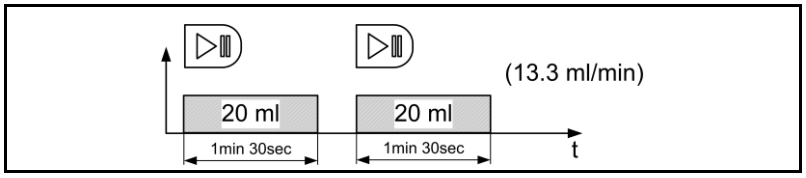


Fig. 13: Metered volume with timeout

Cycle metering mode metering several volumes

The pump meters n repetitions of a defined metering cycle with pause time.

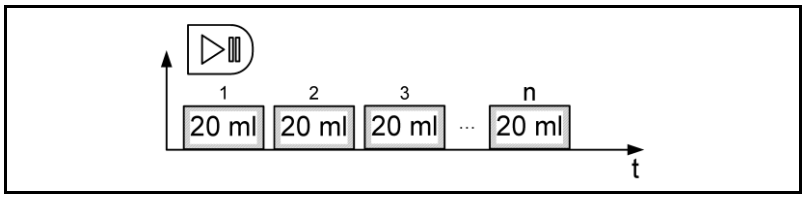


Fig. 14: Cycle metering mode

5 Shipment

5.1 Checking delivery

Prior 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

Prior 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

Prior 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

NOTICE

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 escaping of the fluid, even if the pump is not operating.

- Avoid overpressure on the suction side
- Fit a pressure control valve (see Section 6.3.3)

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

Prior requirements	▪ Device is in perfect working order
	▪ The system is operated with water
Personnel	▪ Must be assembled by specialist personnel
Personal protective equipment	▪ 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 inflammable 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
- Connect 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

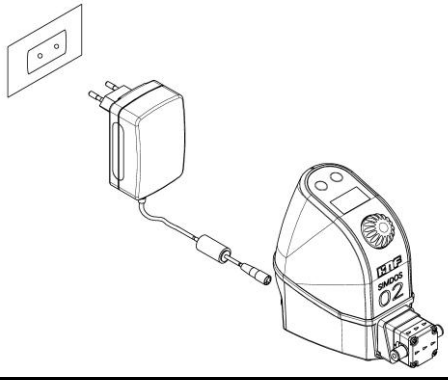


Fig. 15: Electrical connection

6.2.2 Connect filter

⚠ CAUTION

Danger of excessive banking-up pressure (resistance) in the filter as a result of high particle concentration in the medium or a mesh size which is too small

This reduces the flow rate and causes errors in metering accuracy

- ➢ Use filters with a sufficiently large mesh size
- ➢ Filter fluid beforehand where appropriate
- ➢ Check filter penetration regularly, cleaning or replacing the filter where necessary (see filter data sheet)

⚠ CAUTION

Danger of blocked filters as a result of excessive particle concentration in the medium

This reduces the flow rate and causes errors in metering accuracy

- ➢ Filter fluid beforehand where necessary
- ➢ Check filter penetration regularly, cleaning or replacing the filter where necessary (see filter data sheet)

Many media contain solids or fibres that are not visible to the naked eye. In order to maintain reliable pump operation, a filter is to be used on the suction side.

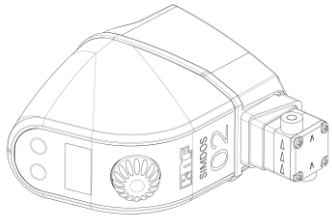


Fig. 16: Prime pump vertically

1. Connect the filters supplied on the suction side (for Order No. see Section 13.4)
2. Set up the system in the following steps
3. Rotate pump 90° anticlockwise
4. Prime pump so that the air can escape from the filter.
5. If there are no air bubbles in the system, the pump can be put into operation.

NOTE

Air in the pump head causes inaccurate metering.

1. Empty pump
2. Refill pump

6.2.3 Connect hydraulics

Connected components

1. Only connect components to the pump that are designed to handle the hydraulic characteristics of the pump (see Chapter 3).

Hoses

2. Only use hoses that are suitable for the maximum operating pressure of the pump (see Section 3.10).
3. Only use hoses that are sufficiently chemically resistant to the liquids being transferred.

Customer-specific pumps (PL, PML)

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.

FEM 1.02 – Screw-in connection fitting with internal thread

1 Connector
2 Clamp ring
3 Hose connector
4 Hose

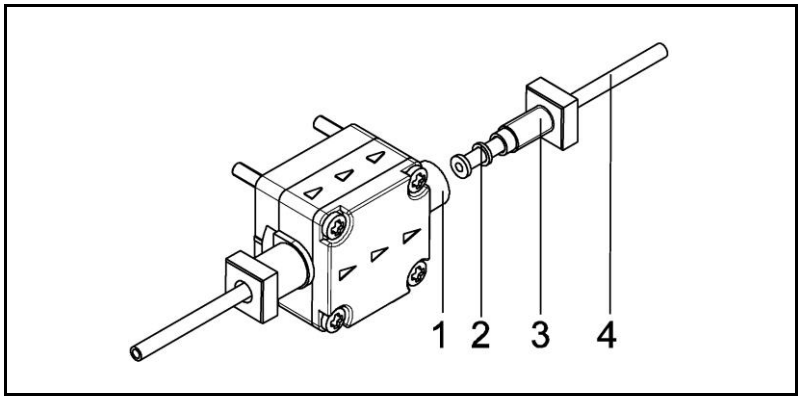


Fig. 17: Hose connection UNF 1/4“-28

1. Remove protective caps
2. Push clamp ring (**2**) onto flanged hose
3. Push hose connector (**3**) onto flanged hose
4. Screw hose connector (**3**) into connector (**1**)
5. **Hand-tighten** hose connector (**3**), tightening a little more if necessary
6. Connect the suction and pressure lines. (Recommendation: UNF 1/4“-28 flanged connection with 1/8“ hose, see accessories list in Section 13.2)
7. Check that the hoses (**1**) and transition joints (hose connector/hose) are connected correctly and securely
8. Check that the system is leak-tight (see Section 10.5)

6.3 System setup

6.3.1 Recommended setup

In order to maintain reliable pump operation, the following setups should be considered.

Description of symbols for the following diagrams:

Symbol	Meaning	Sym-bol	Meaning
	Pump		Pressure control valve (adjustable)
	Filter		Storage container

Tab. 16: Description of symbols

6.3.2 The storage container is level with the pump or underneath it

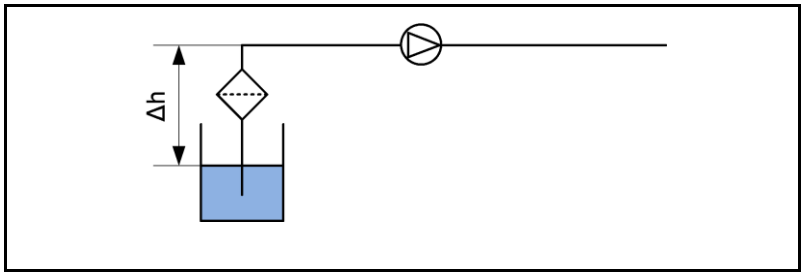


Fig. 18: Storage container underneath pump

In order to achieve the specified metering accuracy (see Section 10.5) the following instructions should be followed:

- Select suction head lower than Δh=1 mWG
- Keep suction hose as short as possible
- Select a suction hose with a large cross-section
- Vent the pump
- For constant results, keep the level of liquid constant (use a container with a large base)

6.3.3 Storage container above the pump

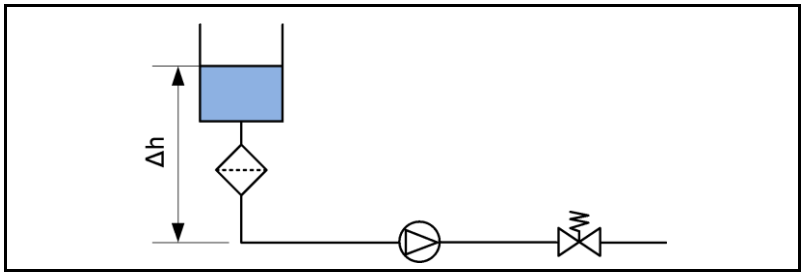


Fig. 19: Storage container above the pump.

NOTE

Overpressure on the suction side reduces the accuracy of the pump

In order to avoid uncontrolled escaping of the medium, a pressure control valve must be used on the pressure side (see Fig. 19).

- ➢ Set up the system as shown in Fig. 19
- ➢ Suitable pressure control valves are available as accessories (see Section 13.3)
- ➢ Set the pressure control valve to 0.5 bar. This allows a Δh of less than 4.5 m to be compensated for

6.3.4 Metering volatile media

For precise metering of liquids with a low vapour pressure, such as solvents, the system should be set up as shown in Fig. 20

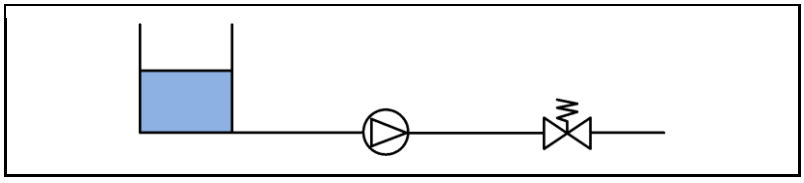


Fig. 20: Volatile media

1. Set up the system as shown in Fig. 20
2. The pressure control valve should be set to 0.5 bar
3. To avoid cavitation, set the fluid type "Volatile" or "Visc500cSt" (see Section 7.11)

6.3.5 Protection against overpressure

In order to protect the system against overpressure, a safety valve must be fitted immediately downstream of the pump (see Fig. 21).

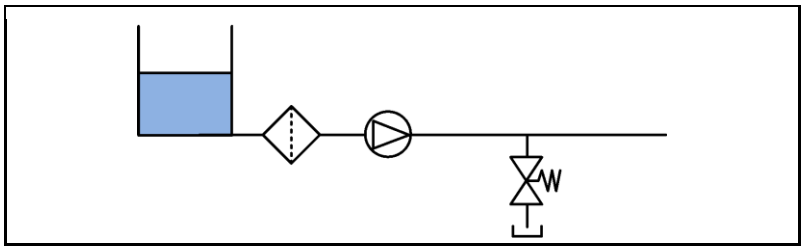


Fig. 21: Overpressure protection

6.4 Initial start-up

⚠ CAUTION

Danger of bursting of the fluid system as a consequence of 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, only select those that are designed for the pump's operating pressure as a minimum
- ➢ Do not transfer against shut-off devices or closed systems, or
- ➢ install pressure relief/safety valves and set them 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. 17: Prerequisites for start-up

1. Only operate the pump under the operating parameters and conditions described in Section 3.10.
2. Make sure the pump is used properly (see Section 2.1).
3. Avoid improper use of the pump (see Section 2.2).
4. Observe all safety precautions (see Chapter 2).

6.4.1 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
- Maintain the tightening torque of connections (see 6.2)
- Check tightening torque of head screws regularly (see Section 10.4)
- Check that pump and system are leak-tight
- Service pump regularly
- Only use pump if it is in perfect working order
- Operate pump in accordance with the technical data

⚠ WARNING

Danger of undetected rupturing of diaphragm

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 10.2)
- Check the discharge outlet regularly for leaks
- Observe the service lives of diaphragms 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

⚠ CAUTION

Danger of cavitation or particles in the fluid circuit

Errors in metering accuracy



- Use a prefilter for media containing particulate matter
- Clean valve disk/pump head (see Section 10.4)
- Vent the pump and system thoroughly
- Set the type of liquid in the case of high-viscosity and volatile media (see Section 7.11)



⚠ CAUTION

Incompatible media will cause valve parts to swell

This swelling will cause errors in metering accuracy

➢ Check the resistance of any parts which come into contact with the fluid (see chemical resistance list or consult your local KNF dealer)

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

Prior requirements

- Device is in perfect working order
- The system has previously been operated and tested with a suitable harmless medium (e.g. water).

Personnel

- Trained personnel

Personal protective equipment



- 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.

Special tools required

- When transferring aggressive, biological, inflammable or ionising media, a suitable work station with a safety and extraction system is to be used.

7.2 Switching pump on / off

The default setting is for the pump to remain off when connected to the mains power supply.



Fig. 22: Switching on the pump

Switch on

1. Hold the “STOP” button down for at least **2 seconds**
   ➔ the pump will now switch itself on
   ➔ The display lights up, and the pump is ready for use.



Fig. 23: Switching off the pump

Switch off

1. Hold the “STOP” button down for at least **2 seconds**.
   ➔ The pump will now switch off completely.

NOTE

When the pump is stopped, after ten minutes without any user input it switches into standby condition (display goes dark). However, the pump is still ready for use immediately when required.

➢ Press “STOP” or any other key to reactivate the pump from standby condition.
➢ The external drive reactivates the pump from standby as soon as a control signal is present.

7.3 Entering settings

➢ Turn the control knob to scroll the display up or down.

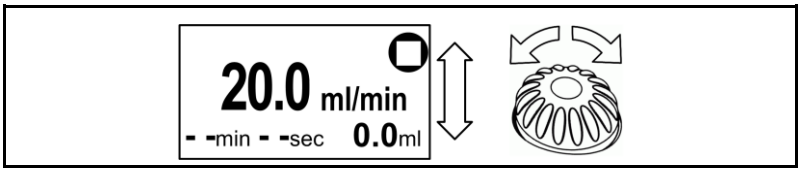


Fig. 24: Moving the operating menu up / down

➢ The lines in the middle of the display are enclosed in a frame, and can now be selected with the control knob.

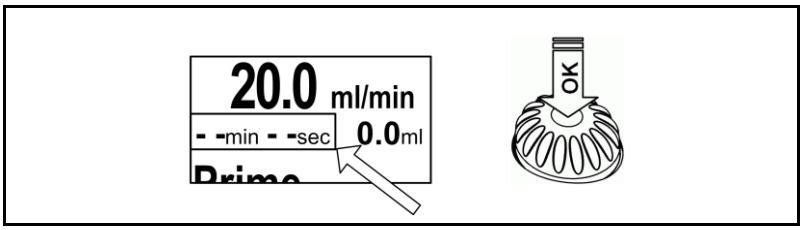


Fig. 25: Select the framed lines by pressing the control knob

➢ The selected settings are marked with an inverted display. Now turn the control knob to change the value as required.

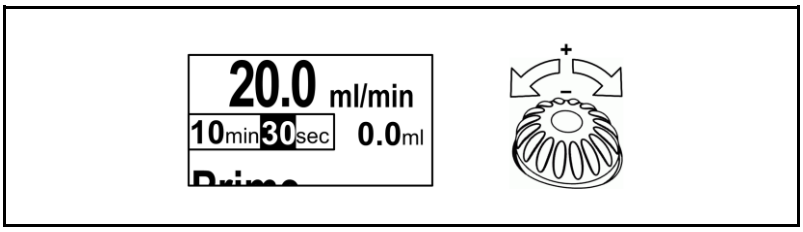


Fig. 26: Inverted display of editable values

➢ Press on the control knob to confirm your input, and move to the next value in the same line, if any.

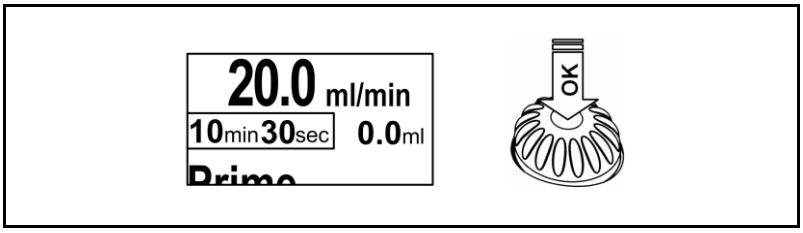


Fig. 27: Confirming the setting value by pressing the control knob

Ending the setting operation:

Method 1

1. Keep pressing the control knob until no values are selected (values marked with inverted display).
2. Turn the control knob until the main display can be seen at the top of the operating menu.
3. Press the “STOP” button:

   ➔ The pump will stop when this operation is carried out. This ends the input operation, and the display switches back to the main display.

Method 2

1. Press the “START” button: this ends the input operation, and the display switches back to the main display.
   ➔ The pump starts when this operation is carried out.

7.4 Setting the operating mode

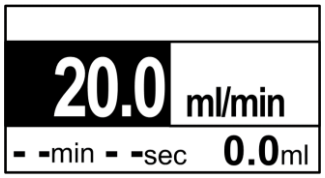


Fig. 28: Specified flow

1. Press control knob, Fig. 28 appears
   ➔ The transfer value can be set by turning the control knob
2. Press the control knob to confirm the input
3. Turn control knob
4. Press control knob, Fig. 29 appears
   ➔ The following operating modes can be set by turning the control knob.
   - [ml/min] for transferring at a fixed flow rate
   - [ml] for metering a volume
5. Press the control knob to confirm the input



Fig. 29: Flow unit

Input	Unit	Setting range
Flow rate	Millilitres per minute [ml/min]	0.03 - 20.0
Metering volume	Millilitres [ml]	0.03 - 1000.0

Tab. 18: Operating mode setting ranges



Fig. 30: Prime

7.5 Priming the pump

This function is for rapidly priming and emptying the pump head and hoses.



1. Press the control knob and hold in place for the duration of the priming / emptying operation.
   ➔ The pump will run at a higher speed during this time.

IMPORTANT

The priming function interrupts any metering operation that is currently in progress.

NOTE

Air bubbles in the hose system prevent precise metering.

- ➢ Prime the system until no more bubbles are visible.
- ➢ Avoid bubble formation in the fluid
- ➢ Hold pump with filter in vertical direction of flow and prime (see Section 6.2.2)

7.6 Starting the pump



Fig. 31: Starting the pump

1. Press the “START” button.
   ➔ The unit will begin transferring. The triangle symbol will appear in the display.

NOTE

An externally actuated pump will only start if the external control signals allow a pump start-up (see Chapter 8).

7.7 Interrupting a transferring operation

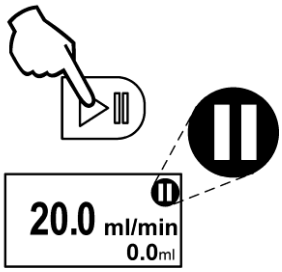


Fig. 32: Interrupting a transferring operation

1. Press the “START” button
   ➔ The transferring operation is interrupted. The pause symbol will appear in the display.

NOTE

In "Pause" operating mode:

- ➢ when restarted, any interrupted transfer is continued.
- ➢ the pump responds to external control signals.

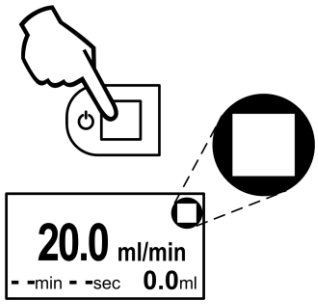


Fig. 33: Stopping the transferring operation

7.8 Stopping the transferring operation

1. Press the “STOP” button,
   ➔ The transferring operation is interrupted. The pause symbol will appear in the display.
2. Press the “STOP” button again
   ➔ The pump will now switch to “Stop” condition, and reset the time counter and volumeter.

NOTE

The first time the user presses the “STOP” button puts the working pump into Pause condition.
The pump goes into “Stop” condition only when the “STOP” button is pressed for the second time.

Master Stop

Stopping the pump with the “STOP” button is called a “Master Stop”.

NOTE

Transferring after a Master Stop is only possible if:

- the Master Stop is manually cancelled using the "START" button;
- or if a "Reset" command is present at digital input 2.

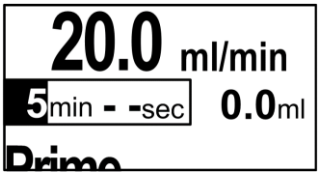


Fig. 34: Time setting in seconds

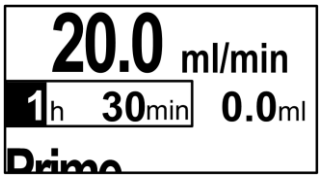


Fig. 35: Time setting in hours

7.9 Transferring fluid

1. Specify the required transfer value (see Section 7.4)
2. Set operating mode to [ml/min] (see Section 7.4)
3. Press the control knob to confirm the input
4. Press the “START” button
   ➔ Pump transfers at the desired flow rate

NOTE

When operating:

- a timeout can be programmed.
  ➔ The pump transfers at a set flow rate until the time has elapsed
- if a timeout is not specified (see Fig. 29),
  ➔ the pump transfers at the set flow rate until stopped by a Pause or Stop command
- the time counter can be switched to hours and minutes. To do this, set the minute setting to more than 59 min

Timeout with time counter

The timeout function can be configured as follows.

Input	Meaning	Setting range
- - min - - sec	Timeout not active	- -
mm min ss sec	Timeout active	1sec – 99h 59min

Tab. 19 Timeout

7.10 Setting metering operation

1. Specify the required transfer value (see Section 7.4)
2. Set operating mode to [ml] (see Section 7.4)
3. Press the control knob to confirm the input
4. Press the “START” button
   ➔ The pump transfers the desired volume

NOTE

When metering a volume [ml]:

- the permissible setting range for the time counter is restricted so that the flow rate will not exceed or fall below the permissible flow rate for the pump.
- the time counter cannot be deactivated. The setting [- - min - - sec] is not possible.

7.11 Setting the fluid type

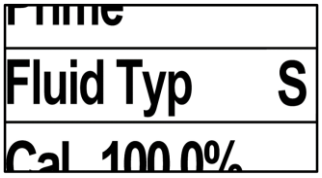


Fig. 36: Fluid type

The "fluid type" setting is used to adjust the pump characteristic curve for different types of fluid.

1. Turn control knob until "Fluid Type" appears in the selection window
2. Press control knob
   - ➔ The current setting is shown by character on the right-hand edge

The following settings are available for selection:

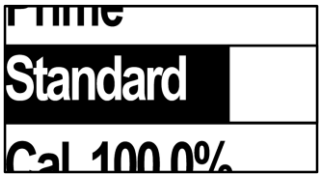


Fig. 37: "Standard" fluid type

Fluid type: Standard

Symbol: S

This is the optimum setting for all media with a viscosity similar to that of water. A uniform flow characteristic curve is obtained with short suction times and appropriate linearisation.

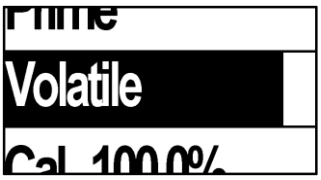


Fig. 38: "Volatile" fluid type

Fluid type: Volatile

Symbol: D

This is the appropriate setting for media with a low boiling point. As these media are sensitive to any pressure drop and deceleration phenomena:

- The pump suction rate is reduced
- The transferring characteristic curve reduces fluid acceleration and deceleration

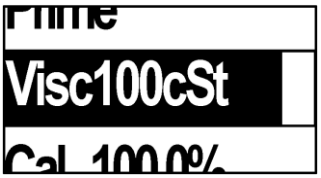


Fig. 39: “Visc100cSt” fluid type

Fluid type: Viscosity up to 100 cSt

Symbol: V

The setting "Visc100cSt" is for media with a viscosity of up to approx. 100 cSt. This setting alters the characteristics of the pump as follows:

- Suction rate is reduced
- Maximum flow rate is limited to 10 ml/min



Fig. 40: "Visc500cSt" fluid type

Fluid type: Viscosity up to 500 cSt

Symbol: H

This setting "Visc500 cSt" is for media with a viscosity of up to approx. 500 cSt. This setting alters the characteristics of the pump as follows:

- ➔ The pump suction rate is significantly reduced
- ➔ The maximum flow rate is limited to 4 ml/min

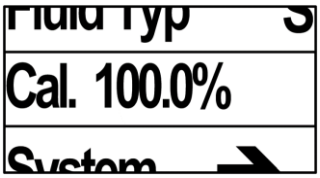


Fig. 41: Calibration

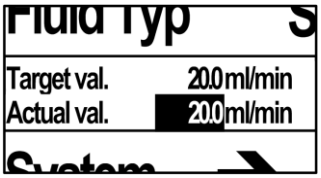


Fig. 42: Inputting the calibration actual value

7.12 To calibrate the pump

The pump has already been precisely adjusted in the factory. However, the device will operate even more precisely if it is calibrated. Calibration eliminates any variances caused by supply lines, back-pressure and viscosity.

Calibration can be used to adjust the pump flow rate by ±20%.

1. Set up system
2. Take an accurate measurement of the flow rate or metering volume
3. Use the control knob to make the required menu selection [Cal. 100.0%]
4. Input the measured actual value with the control knob and confirm (see Fig. 42)
5. Check the calibration with a repeat measurement.

NOTE

The calibration function uses the specified flow setting as the target value. This means the pump can always be calibrated for the current operating point.

NOTE

If the target flow rate still cannot be achieved after several calibration attempts, see "Troubleshooting" (Chapter 12).

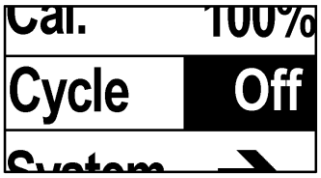


Fig. 43: Cycle display

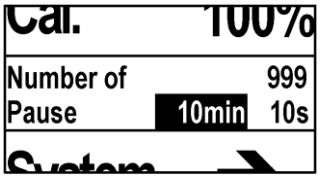


Fig. 44: Setting menu

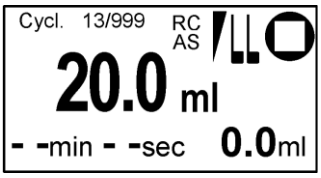


Fig. 45: Main display

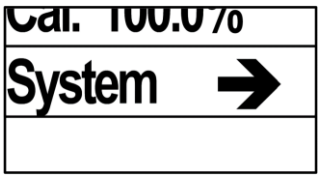


Fig. 46: System menu

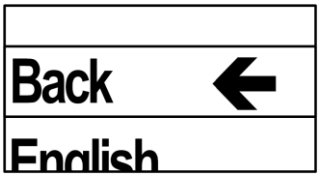


Fig. 47: Back to main menu

7.13 Cycle metering mode

The "Cycle" settings in the main menu allow several volumes to be metered with a specific pause time.

1. Use control knob to set desired volume
   - Set metering volume as volume in [ml].
   - Set metering volume as flow rate and time in [ml/min].
2. Select "Cycle" menu (see Fig. 43)
3. Press control knob
   ➔ The display in Fig. 44 appears
4. Turn control knob
   ➔ Specify number of cycles (Off, 2...999, unlimited)
5. Press control knob
6. Specify pause time
   ➔ The following intervals are possible: 1s...99min 59s
7. Press control knob
   ➔ Main display appears (see Fig. 45)

NOTE

If the pump is disconnected from the mains or switched off, cycle operation is deactivated for safety reasons.

NOTE

The "PAUSE" button can be used to temporarily interrupt the process. The process can be restarted by pressing the "PAUSE" button again.

7.14 Setting the system

Select “System” to call up a second menu allowing the other pump settings to be entered.

7.15 Back to main menu

Click on “Back” to return to the main menu for entering pump default settings.

Other options for returning to the main display are as follows:

- ➢ Press the “STOP” button: this ends the input operation, and the display switches back to the main display
  ➔ The pump will stop when this operation is carried out
- ➢ Press the “START” button: this ends the input operation, and the display switches back to the main display
  ➔ The pump starts when this operation is carried out
- ➢ Wait for 10 seconds without entering any inputs
  ➔ The pump ends the input operation and switches back to the main display



Fig. 48: Language selection

7.16 Select language setting

The language setting operation selects the required language for the operating menu.

7.17 Activate autostart

⚠ WARNING

Automatic start-up when autostart function is activated

The pump starts up by itself and without warning.

- Do not switch on the autostart function until the system has been tested and is ready for operation
- Clearly identify the fact that the autostart option for the pump has been activated
- Before start-up, check that hoses and equipment are leak-tight and correctly connected
- Do not operate the pump with hazardous media



Autostart and external drive

If you want the pump to respond automatically to external signals as soon as the power supply is switched on, you can activate the autostart option.

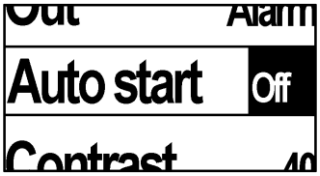


Fig. 49: Autostart

The “Autostart” setting defines the process for switching on the pump.

Input	Meaning
Off	Pump does not start by itself
On	Pump starts automatically when the power supply to the pump is switched on.

Tab. 20: Autostart



Fig. 50: Autostart symbol in display

When the “Autostart” option is on, this is indicated in the main display with the “AS” symbol (see Fig. Fig. 50).

7.18 Set contrast

Display contrast adjustment. Adjust the contrast if the display is difficult to read.

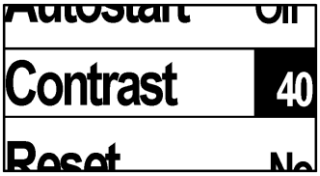


Fig. 51: Contrast

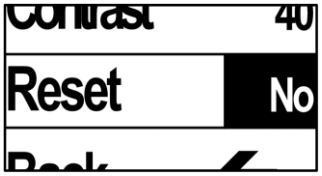


Fig. 52: Reset

7.19 Resetting the pump (Reset)

The “Reset” function is used to reset the pump to its factory settings.

Input	Meaning
No	No reset takes place
Yes	Pump is reset to its factory settings
Code	No function

Tab. 21: Reset

The reset function will restore the following settings:

Value	Setting = factory setting
Flow rate [ml/min]	10.0
Unit	ml/min
Time counter	Off --min -- sec
Fluid type	Standard
Calibration	100%
Language	English
Analog input	Off
Digital input 1	Off
Digital input 2	Off
Digital output	Alarm
Autostart	Off
Contrast	40

Tab. 22: Reset factory settings

7.20 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

8 RC version (remote control)



⚠ WARNING

Danger of automatic start-up

The pump starts up by itself and without warning.

- ➢ Do not switch on the autostart function until the system has been tested and is ready for operation
- ➢ Clearly identify the fact that the autostart option for the pump has been activated
- ➢ Before start-up, check that hoses and equipment are leak-tight and working properly
- ➢ Do not operate the pump with hazardous media

These remote control functions are only available in the RC and RC Plus version.

RC cable

1. Connect cable for remote control (RC cable) to a suitable signal source.
1. Remove protective caps from RC connector plug.
2. Connect RC cable to pump.

1 Analog input
- Brown

2 Digital input 1
- White

3 Digital input 2
- Blue

4 Open collector output
- Black

5 Ground
- Grey

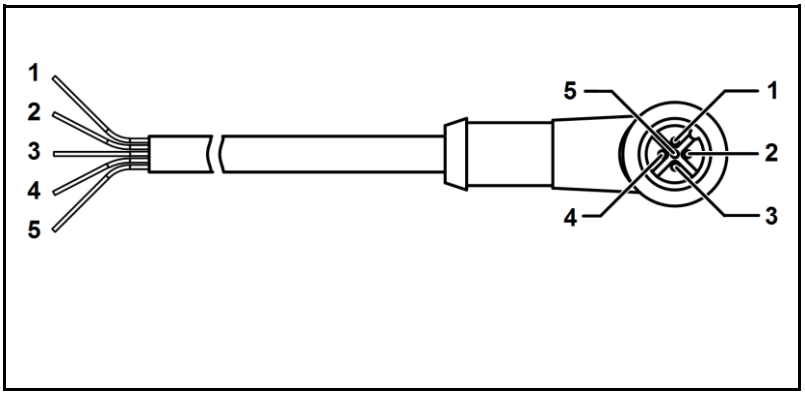


Fig. 53: KNF Flodos RC cable pin assignment

Pin	Wire colour	Description	Function	max. value
1	brown	Analog input	0.15% to 100% up to flow rate, depending on settings	10 V DC
2	white	Digital input 1	Start / stop	24 V DC
3	blue	Digital input 2	Reset / Prime / Foot Switch	24 V DC
4	black	Digital output	Various output signals	open collector max. 10 mA max. 24 V DC
5	grey	Ground	--	

Tab. 23: RC cable pins

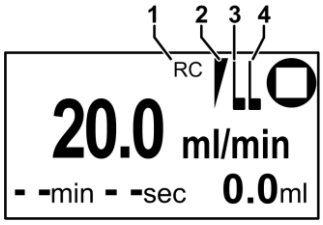


Fig. 54: RC main display

When external drive is activated, this is indicated in the main display by the “RC" symbol (**1**) (see Fig. Fig. 54).

According to the inputs activated, the display also shows symbols for analog input (**2**), digital input 1 (**3**) and digital input 2 (**4**).

8.1 Remote control analog input

The analog input can be used to externally specify a pump flow rate (see Tab. 26).

Activate analog input

The analog input can only be activated in transfer operation [ml/min].

NOTE

When analog input is active:

- the pump can be started only if a valid analog signal is present
- the time counter is deactivated
- manual inputting of flow metering volume is disabled

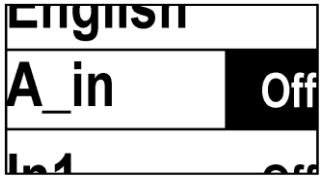


Fig. 55: Analog input

Control signals

Input	Meaning	Signal
Off	Analog input not active	- -
0-5 V	Voltage control [V]	0.05 - 5
0-10 V	Voltage control [V]	0.1 - 10
4-20 mA[7]	Current control [mA]	4.16 - 20
0-20 mA	Current control [mA]	0.2 - 20

Tab. 24: Analog input options

On/off thresholds

In order to obtain clear switching criteria, a switching hysteresis is implemented.

Input	On threshold	Off threshold
0 – 5 V	0.05 V	0.04 V
0 – 10 V	0.1 V	0.09 V
4 – 20 mA	4.16 mA	4.08 mA
0 – 20 mA	0.2 mA	0.18 mA

Tab. 25: On/off thresholds

[7] If the input is less than 2 mA, the pump will go into alarm mode, and the alarm is automatically reset as soon as the input exceeds 2 mA.

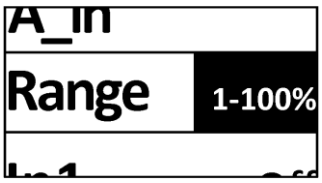
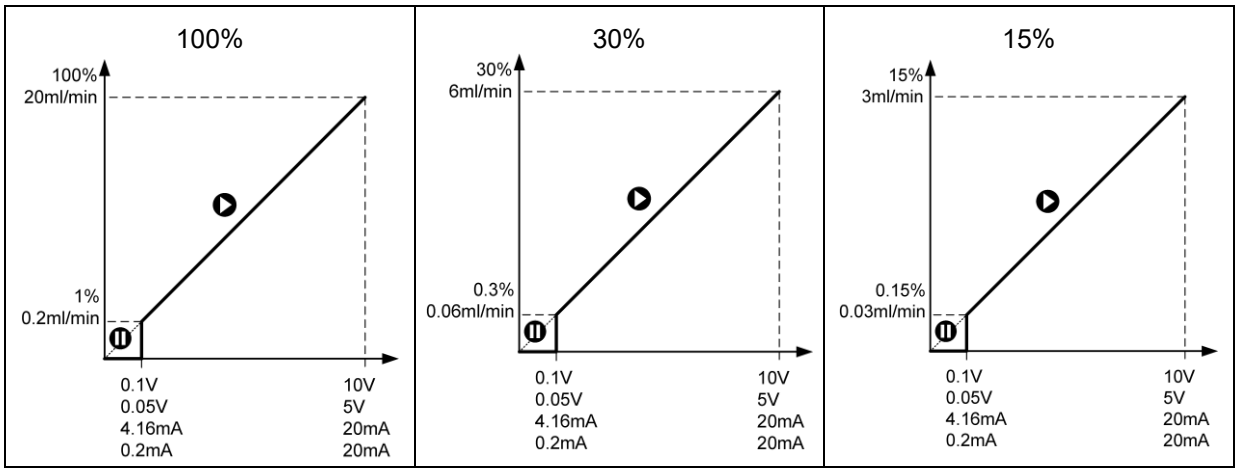


Fig. 56: Flow rate range selection

Flow rate range selection for analog input

There are three flow rate ranges for different set points (see Tab. 26).

▪ 100%:	1 – 100%	0.2– 20 ml/min
▪ 30%:	0.3 – 30%	0.06 – 6 ml/min
▪ 15%:	0.15-15%	0.03 – 3 ml/min



Tab. 26: Analog Input

START / STOP analog signal

Starting and stopping the pump with an analog signal

1. Set analog input to correct signal type
2. Press the “START” button.
   ➔ Pump switches to "Pause" condition.
3. Apply analog signal.
   ➔ The pump now starts operating, and switches to “Run” condition.
4. Reduce analog signal to below cut-off threshold.
   ➔ Pump stops and switches to "Pause" condition.

NOTE

After the pump has been stopped, there is a pause time of 0.2 seconds before it can be restarted.

Master Stop

Stopping the pump with the “STOP” button is called a “Master Stop”. The pump can then only be restarted manually (see Section 7.6).

NOTE

The pump is supplied with Master Stop. For initial start-up with external drive, it is therefore essential to press “START” once to cancel Master Stop.

For an external restart after a power cut, use autostart (see Section 7.17) or Reset on digital input 2 (see Section 8.3).

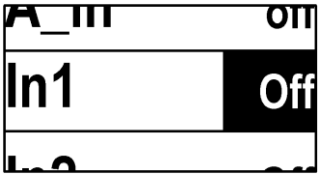


Fig. 57: Digital input 1

8.2 Digital input 1, Start / Stop

The pump can be started and stopped externally via digital input 1.

- If digital input 1 is active, the pump can only be started via the digital input.
- If analog actuation is also used, a valid analog signal must be present.

Control signals

Input	Meaning	Signal
Off	Digital input 1 not active	- -
Level	Start / Stop according to signal level	< 0.8V = On > 2.0V = Off
Pulse	Start / Stop on signal pulse	< 0.8V = On > 2.0V = Off

Tab. 27: Digital input 1 options

NOTE

To ensure that the digital input operates correctly:

- after the pump has been stopped, there must be a pause time of 0.2 seconds
- select a pulse duration of more than 0.1 seconds
- use debounced switches

START / STOP in “Pump ml/min without timeout” condition

Start / Stop level

1. Set digital input 1 "In_1" to Level.
2. Press the “START” button.
   ➔ Pump switches to "Pause" condition.
3. Apply signal 1.
   ➔ The pump will start to operate if the level is below 0.8 V, and stop if it is above 2.0 V (see **Fehler! Verweisquelle konnte nicht gefunden werden.**).

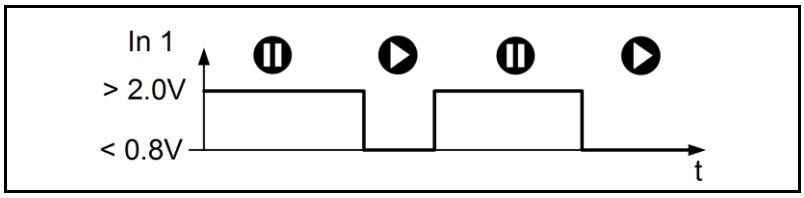


Fig. 58: Start / Stop level actuation

Start / Stop pulse

1. Set digital input 1 "In_1" to Pulse
2. Press the “START” button.
   ➔ Pump switches to "Pause" condition.
3. Apply signal 1.
   ➔ The pump will start to operate when a pulse of less than 0.8V is generated, and stop on the next pulse of more than 2.0V.

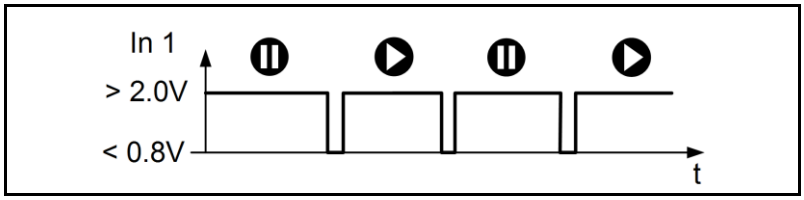


Fig. 59: Start / Stop pulse actuation

Start / Stop level with timeout

Start / Stop level with timeout

1. Set digital input 1 "In_1" to Level.
2. Press the “START” button.
   ➔ Pump switches to "Pause" condition.
3. Apply signal 1.
   ➔ The pump will start to operate when the level is connected to ground, and stop when the level rises above 2.0 V.

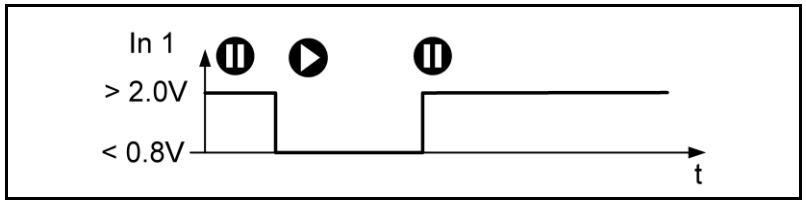


Fig. 60: Start ml/min with time counter level control

NOTE

If timeout / time counter is activated

- to stop the pump, use digital input 2, “Reset” (see Section 88.3)
- For precise dosing use pulse-mode

Start / Stop pulse with timeout

1. Set digital input 1 "In_1" to Pulse
2. Press the “START” button
   ➔ Pump switches to "Pause" condition.
3. Apply signal 1
   ➔ The pump will start to operate when a pulse to ground is generated, and stop when the set time has elapsed.

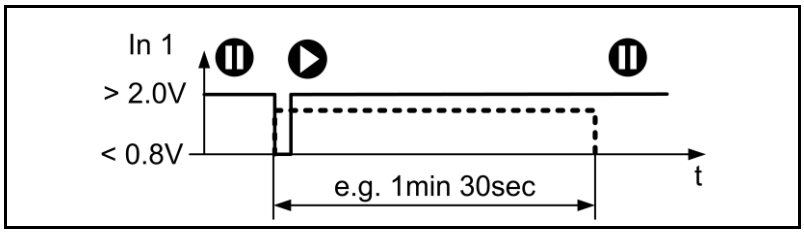


Fig. 61: Start ml/min with time counter pulse control

8.3 Digital input 2 Reset / Prime / Foot Switch

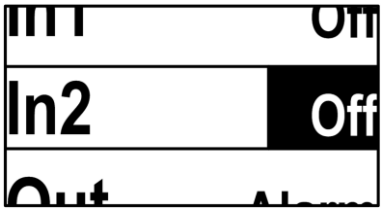


Fig. 62: Digital input 2

Digital input 2 can be used for an externally activated error "Reset" or fluid system "Priming" operation.

The level and pulse settings are the same as for digital input 1.

Digital input 2 is mainly used with a foot switch (see Section 13.5).

Control signals

Input	Meaning	Signal
Off	Digital input 2 not active	- -
Reset	Reset of pump errors and cancel metering with time counter	< 0.8V = Reset
Priming	Rapid priming of pump head and hoses (see Section 7.12)	< 0.8V = Prime
Com-bined	Reset of pump errors and cancel metering with time counter, then prime	< 0.8V reset for falling signal edge Prime after 1 sec-ond < 0.8V
Level	Start / Stop according to signal level	< 0.8V = On > 2.0V = Off
Pulse	Start / Stop on signal pulse	< 0.8V = On > 2.0V = Off

Tab. 28: Digital input 2 options

Reset **Digital input 2 Reset**

The “Reset” setting activates the following functions on application of a signal to digital input 2:

- Interrupt a metering process
- Reset pump errors
- Cancellation of an active Master Stop, pump is now in “Pause” operation condition, and responds to external control signals.

Priming **Digital input 2 Prime**

The “Prime” setting activates the following functions on application of a signal to digital input 2:

- Interrupt a metering process
- Reset pump errors
- Pump runs in high-speed “Prime” mode for the duration of the signal
- Cancellation of an active Master Stop, pump is now in “Pause” operation condition, and responds to external control signals.

Combined **Digital input 2 Combined**

The “Combined” setting activates the following functions on application of a signal to digital input 2:

- Interrupt a metering process
- Reset of pump errors on signal edge
- If the signal is applied for longer than 1 second, the pump will operate in “Prime” at high speed for the duration of the signal
- Cancellation of an active Master Stop, pump is now in “Pause” operation condition, and responds to external control signals.

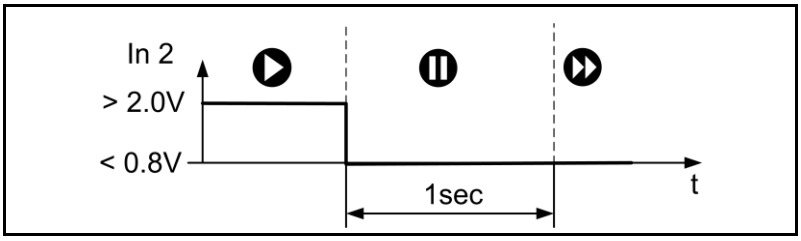


Fig. 63: Combined function sequence

Start / Stop level **START / STOP with foot switch using level**

1. Set digital input 2 "In_2" to Level.
2. Connect foot switch to pump.
3. Press “START” – the pump goes into “Pause” condition.
   ➔ The pump will keep operating as long as the foot switch is pressed.

NOTE
If time counter is switched on, pump will perform a complete metering cycle.

Start / Stop pulse

START / STOP with foot switch using pulse

1. Set digital input 2 "In_2" to Level.
2. Connect foot switch to pump.
3. Press “START” – the pump goes into “Pause” condition.

➔ Each time the foot switch is pressed the pump is started or stopped.

NOTE
If timeout / time counter is switched on, pump will perform a complete metering cycle.

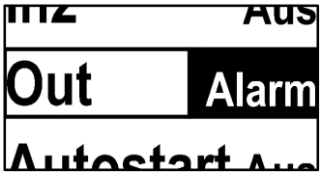


Fig. 64: Digital output

8.4 Digital output

The digital output can be used to feed back a number of messages to the control system.

The output is an open collector output (see Section 3.8).

Output signals

Set output function to:	Meaning	Signal
Alarm	Pump error signal	Level
Motor	Signal when pump motor running	Level
Vol.End	Signal when volume metering ends	Level
Mot.Pul.	10 pulses per revolution of the pump motor	Pulse *1
Vol.Pul.	One pulse per 20 µl of fluid transferred	Pulse *1

Tab. 29: Digital output options

**1 To capture pulse signals like Mot. Pul. And Vol. Pul. with a (1 ms) duration, a sampling rate > 2 kHz or a counter input with edge detection is necessary.*

9 RC Plus version (serial communication)



⚠ WARNING

Danger of automatic start-up

The pump starts up by itself and without warning.

- Do not transmit a start command until 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

The functions for remote control via the RS 232 interface are only available with the RC Plus version.

RC cable

1. Connect cable for remote control (RC cable) to a suitable signal source.
2. Remove protective caps from RC connector plug.
3. Connect the RC cable to the pump.
4. The commands and protocol are available on www.knf.com/downloads (search: “communication protocol”)

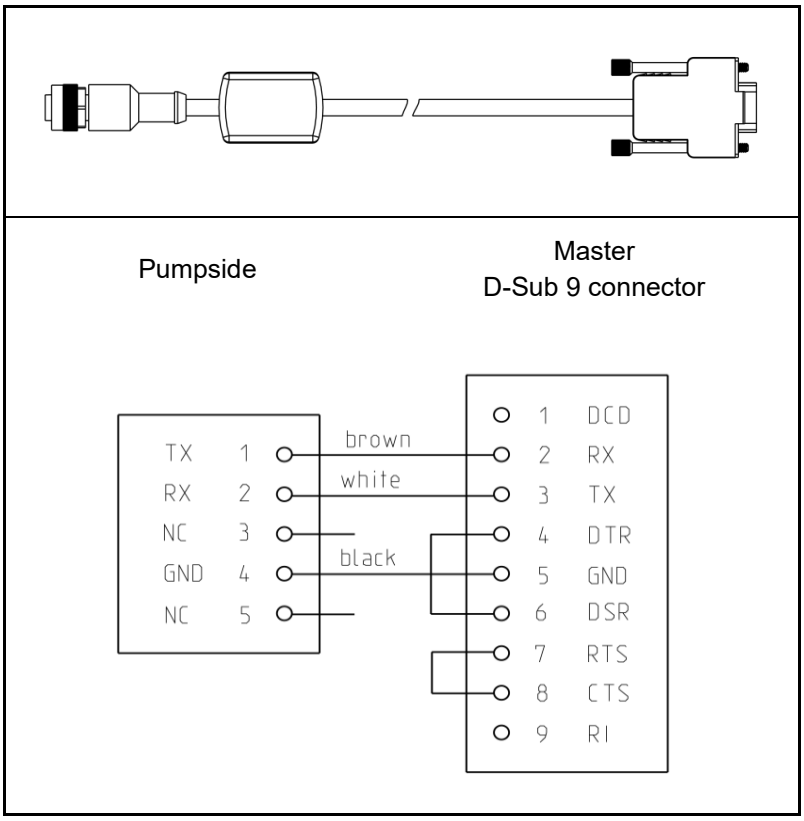


Fig. 65: KNF Flodos RC cable pin assignment

10 Cleaning and maintenance

10.1 Safety

⚠ DANGER

Danger of injuries caused by hazardous materials



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

- ➢ Flush the pump thoroughly (see Chapter 10.2)
- ➢ Decontaminate the pump if necessary
- ➢ Observe the safety data sheets for the media to be transferred
- ➢ Wear suitable protective equipment

⚠ WARNING

Gefahr vor Wärmeentwicklung durch chemische Reaktionen mit der Spülflüssigkeit



Starke Wärmeentwicklung schädigt die Membrane, O-Ringe und das Ventilsystem, dies führt zu Leckagen

- ➢ Chemische Reaktionen in der Pumpe vermeiden
- ➢ Sicherheitsdatenblätter der geförderten Flüssigkeit beachten
- ➢ Nachfolgende Ratschläge beachten

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

Prior requirements
- System depressurised

Personnel
- Specialist 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.

10.2 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 again required, it is important to ensure that the pump is free of any crystallising, adhesive or curing media.

10.2.1 Metering medium: acids

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

10.2.2 Metering medium: bases

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

10.2.3 Metering medium: organic solvents

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

NOTE

Never flush non-polar solvents immediately with water

10.2.4 Metering medium: 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 10.2.4 is not a sterilisation

10.3 Maintenance plan

Interval	Assembly	Action	Personnel
When changing the transfer medium	Complete pump	5. Flushing the pump	Specialist personnel
Daily	Complete pump	6. Visually inspect the pump for pollution/contamination. 7. If pollution/contamination is found, clean the pump. 8. Check the discharge outlet on the intermediate flange for leaks	Trained personnel
	Complete pump	9. Visually inspect the pump for external damage. 10. If damage is found, take corrective action (see Chapter "Troubleshooting")	Trained personnel
	Complete pump	11. Visually inspect the pump for leaks 12. If leaks are found the pump must under no circumstances be used. (see "Troubleshooting")	Specialist personnel
	Complete pump	13. Check pump capacity 14. If pump capacity falls, clean the pump head and replace elastomer parts where necessary.	Specialist personnel
Weekly	Filter (accessory)	15. Check filter for contamination. 16. If contamination is found, clean or replace the filter	Specialist personnel
1,000 hours of operation	Pump diaphragm, valves and seal	17. Replace pump diaphragm, valves and seal	Specialist personnel
as required	Pump head	18. Replace pump head	Specialist personnel

Tab. 30: Servicing schedule

10.4 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.

- ➢ Flush pump as described in Section 10.2, Cleaning the pump.
- ➢ Wear protective equipment, e.g. protective gloves, safety glasses.



Prior requirements

- ▪ Pump switched off and disconnected from mains
- ▪ The pump must be free of any hazardous substances
- ▪ Hoses must be disconnected from the pump head

Personnel

- ▪ Specialist 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	Phillips screwdriver no. 1
1	Spare parts kit (see Section 13.1)
1	Torque screwdriver that can be set to 0.55 Nm.

Tab. 31: Tools/materials

Information on procedure

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

10.4.1 Cleaning the pump head

NOTE

The pump head should only be cleaned if:

- the pump is no longer sucking properly,
- the flow rate is too low,
- reverse suction can be seen, or
- the pump head cannot be cleaned satisfactorily by flushing.

Ensure cleanliness when replacing valves, as pollution/contamination may prevent the valve from working properly.

1. Disassemble the pump head as described in Section 10.4.2
2. Rinse connecting plate (**3**) and intermediate plate (**8**) and wipe with a soft cloth. Blow dry with compressed air
3. Remove valve seats (**5**) carefully. The sealing washers (**4**) are not present in the FT head, see Fig. 66
4. Remove O-Rings (**6**) and valve disk (**7**).

NOTE

Do not damage the sealing rings.

- Do not use any abrasive agents.
- Do not clean head parts with hard materials.
- Check head parts, especially sealing edges and seal faces, for damage
- Replace any damaged parts

5. Wash all parts with flushing agent and blow dry with compressed air
6. Wipe the pump diaphragm with a soft damp cloth
7. Assemble the pump head as described in Section 10.4.2
8. Check that the pump is leak-tight (see Section 10.5)

1 Head screws
2 Head plate
3 Connecting plate
4 Sealing washer
5 Valve seat
6 O-ring
7 Valve disk
8 Intermediate plate

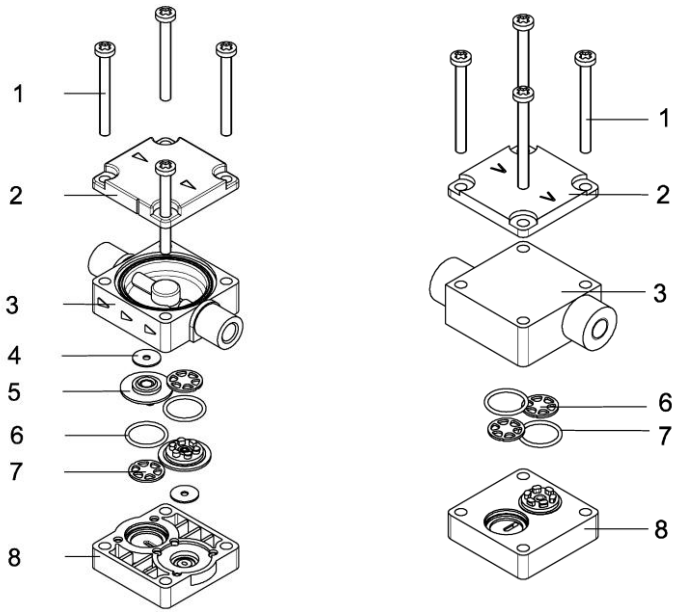


Fig. 66: Head, KT, TT Head, FT

10.4.2 Replacing the valve



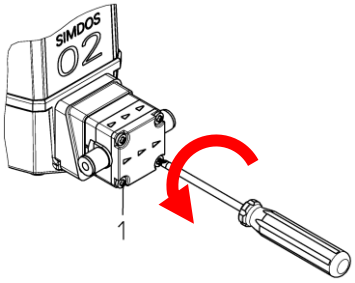
⚠ WARNING

Danger of poisoning/injuries as a result of choosing the wrong valve material

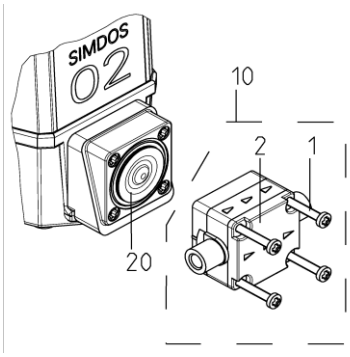
Aggressive media alter valve materials, thus preventing the pump from working properly

- ➢ Determine the resistance of the valve material – see Section 4.3 or the chemical resistance list (www.knf.com/downloads)
- ➢ Use resistant valve materials and mark the pump accordingly, also
- ➢ marking if it deviates from the standard

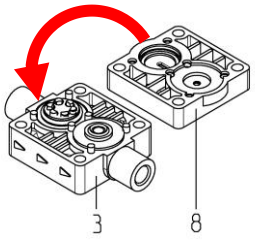
Ensure cleanliness when replacing valves, as pollution/contamination may prevent the valve from working properly.



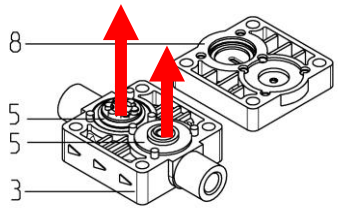
1. Undo head screws (**1**)



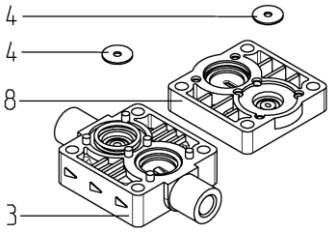
2. Completely remove head (**10**)
3. Remove head plate (**2**) and head screws (**1**)
4. Check diaphragms (**20**) for damage and replace where necessary



5. Fold the connecting plate (**3**) and the intermediate plate (**8**) apart



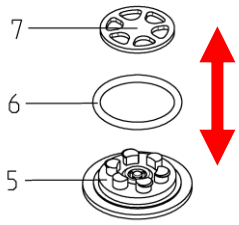
6. Remove valve seats (**5**) carefully



7. Replace sealing washers (**4**)
   The FT head does not contain a sealing washer or valve seats

Caution!

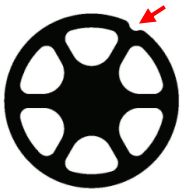
Sealing washer must lie flat in the valve seat, otherwise pump will not be leak-tight



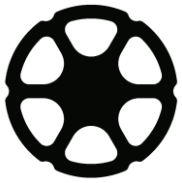
8. Remove valve disks (**7**) and O-rings (**6**)
9. Fit O-rings (**6**) flat on the base, taking care not to twist them
10. Fit valve disks (**7**), which must lie flat on the valve

Caution! Observe material coding (below)

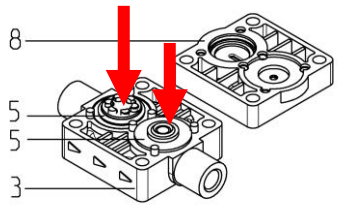
11. Check valve material before using. For further information, see Section 4.3



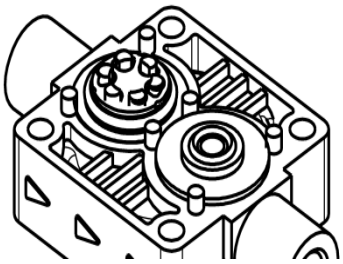
DuPont™Kalrez®

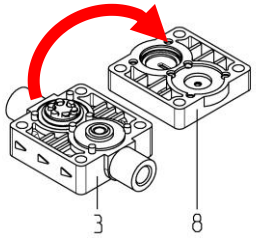


CHEMRAZ®

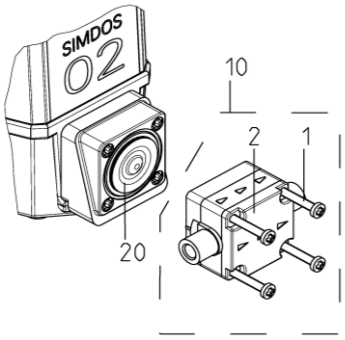


12. Place pre-assembled valve seats (**5**) in connecting plate (**3**)





13. Fit the connecting plate (**2**) and the intermediate plate (**1**) together

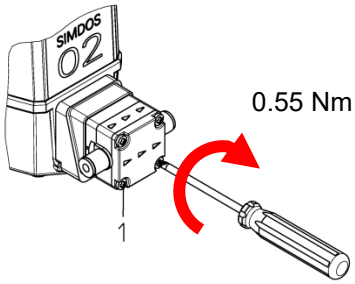


14. Assemble head plate (**2**) and head screws (**1**) with head (following the direction of the arrows)

Caution!

Once fitted together, the seals and O-rings must not be moved again

- ➢ Hold the complete head together



15. Fully assemble head (**10**)
16. Tighten head screws (**1**) to 0.55 Nm.

17. Check that the pump is leak-tight (see Section 10.5)

10.4.3 Replacing the pump diaphragm

Prior requirements
- Pump must be free of any hazardous substances
- Hoses must be disconnected from the pump head
- Pump is connected to the mains

Personnel
- specialist personnel trained by KNF

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.

Ensure cleanliness when replacing diaphragms, as pollution/contamination may prevent the pump from working properly.

1 Support / Connecting rod
2 Insert ring
3 Pump diaphragm

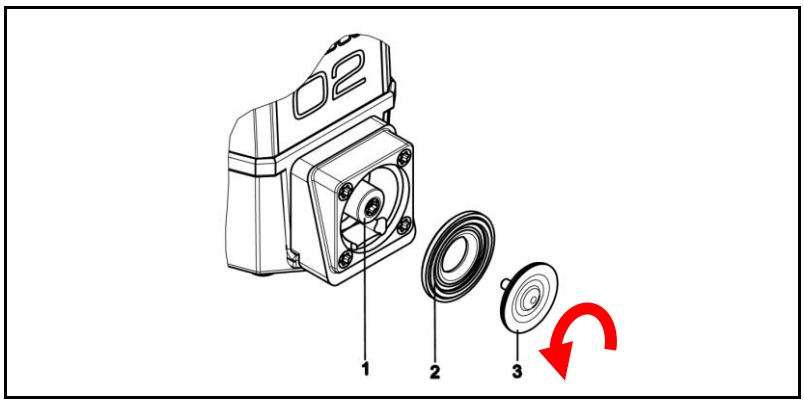


Fig. 67: Replacing the pump diaphragm

Removal

1. Activate the diaphragm maintenance function in the pump system menu
2. Disassemble pump head as described in Section 10.4.2
3. Lift pump membrane (**3**) at opposite side edges, grip and screw out by turning anticlockwise (see arrow in Fig. 67)
4. Inspect all parts for pollution/contamination and damage, cleaning them if necessary

Installation

5. Activate diaphragm maintenance in the pump system menu (if no longer active)
6. Fit insert ring (**2**).
7. Screw pump membrane (**3**) clockwise onto connecting rod (**1**) and hand-tighten.
8. Press the “STOP” button,
9. Activate "Prime" in main menu for 2s
   ➔ Diaphragm moves into housing
10. Assemble the pump head as described in Section 10.4.2.
11. Check that the pump is leak-tight (see Section 10.5)

NOTE

If the pump diaphragm is not fitted correctly, the pump may be mechanically obstructed and become damaged as a result.
- ➢ Screw the pump membrane in properly as far as it will go
- ➢ Do not damage the surface of the diaphragm

10.5 Checking that pump is leak-tight

⚠ WARNING

Danger of bursting of the fluid system as a consequence of 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, only select those that are designed for the pump's operating pressure
- Do not transfer against shut-off devices or closed systems, or
- install pressure relief/safety valves and set them 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.

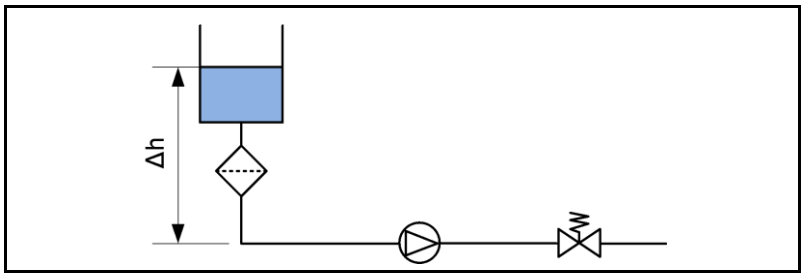


Fig. 68: Pressure test setup

1. Set up the system as shown in Fig. 68.
2. Use distilled water as test medium.
3. Set pressure control valve to working pressure.
4. Make sure that the fitting is leak-tight (see Section 6.2.3).
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.

11 Shutdown

11.1 Safety

⚠ DANGER

Danger of injuries caused by hazardous materials

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

- ➢ Flush the pump thoroughly (see Chapter 10.2)
- ➢ 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:

Prior requirements
- System depressurised

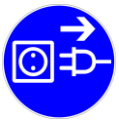
Personnel
- Specialist personnel

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.



1. Flush the whole system including the pump with a neutral liquid
2. Pump the pump empty (see Section 10.2).
3. Press the STOP button to end the transferring operation
4. Unplug the pump from the power supply
5. Dispose of pump properly

12 Troubleshooting



12.1 Safety

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

Prior requirements	▪ Pump has been thoroughly flushed/decontaminated
Personnel	▪ Specialist personnel
Personal protective equipment	▪ none

12.2 Displaying of error messages

Display	Description	Fault remedy
Error 1 Motor	Control deviation too high, motor is overloaded ➢ Pump blocked	➢ Switch pump on / off
Error 2 Temperature	Motor overheating	➢ Allow pump to cool ➢ Reduce ambient temperature
Error 3 Supply	Supply voltage is less than 21 V	➢ Supply with 24 V and sufficient power
Error 4 Encoder	Position measuring malfunction	➢ Switch pump on / off
Error 5 4 – 20 mA	Analog set point setting less than 2 mA	➢ Check control signal ➢ Check cable
Error 6 Flash	Error in memory	➢ Switch pump on / off
Error 7 Overpressure	System pressure exceeds 7 bar	➢ Check pump for closed valves and blocked filters

If the fault cannot be rectified, please contact your local KNF dealer (see last page for address)

12.3 Rectifying transfer problems

Symptom	Possible cause	Fault remedy
Pump cannot be switched on	Pump not connected to the mains.	1. Connect pump to the mains. 2. Check mains voltage
Pump does not work	Connections or hoses are blocked.	1. Check hoses and connections. 2. Remove blockage.
Pump does not work	External valve is closed or filter is clogged or too small.	1. Check external valves and filters.
Flow rate too low Insufficient vacuum	Particles in the pump head	1. Clean valves (see Maintenance) 2. Clean pump head (see Maintenance) 3. Use prefilter
Flow rate too low	Materials chemically damaged by pumped media.	1. Select a type of material that is resistant and suitable (see chemical resistance list). 2. Replace valves (see Section 10.4)
Flow rate too low	Worn diaphragm or valve plates/seals.	1. Replace diaphragm and valve plates/seals (see Section 10.4).
Pump not drawing any vacuum	Pump can only draw vacuum against atmosphere.	1. Change pressure conditions on pressure side.
Unstable flow rate	Cross-section of hydraulic hoses or connectors too narrow or restricted.	1. Disconnect the pump from the system and determine output values. 2. Remove restriction (e.g. valve) if necessary. If applicable, use larger-diameter hoses or connectors.
Leakage in pump head	Worn diaphragm or valve plates/seals.	1. Tighten head screws to 0.55 Nm 2. Replace diaphragm and valve plates/seals (see Section 10.4).
Leakage from discharge port.	Leakage at pump diaphragm	1. Contact KNF dealer 2. Send pump to KNF dealer for safety check

Tab. 32: Pump does not work

If the fault cannot be rectified, please contact your local KNF dealer (see last page for address)

Returning the pump

1. Flush the pump to clear the pump head of any hazardous or aggressive liquids.
2. Disconnect the pump.
3. Send the pump, with completed decontamination declaration (see Chapter 14), to KNF Customer Service stating the nature of the pumped medium (see Arranging for return).

13 Spare parts and accessories

13.1 Spare parts

Spare part		Order No.
SIMDOS 02 KT Complete Head Kit;	Standard Kalrez® (without diaphragm)	166297
SIMDOS 02 TT Complete Head Kit;	Standard Kalrez® (without diaphragm)	166298
SIMDOS 02 FT Complete Head Kit;	Standard Kalrez® (without diaphragm)	164981
SIMDOS 02 FT Complete Head Kit;	Optional, Chemraz® (without dia-phragm)	164982
SIMDOS 02 ST Complete Head Kit;	Standard Kalrez® (without diaphragm)	166299
SIMDOS 02 ST Complete Head Kit;	Optional, Chemraz® (without diaphragm)	166300
SIMDOS Valve Kit	Standard Kalrez®	164983
SIMDOS Valve Kit	Optional, Chemraz®	164984
SIMDOS 02 Diaphragm Kit	Standard PTFE	165442
SIMDOS 02 Diaphragm Kit	Standard FFKM	170867

13.2 Hoses

Hoses		Order No.
Connection set, AD1/8, UNF 1/4“, L=1m;	(2 Ferrules and 2 Fittings)	069790
Hose, FEP, UNF 1/4", screw connection L=1m	(1 Fitting)	166329
Hose, FEP, UNF 1/4", screw connection L=2m	(1 Fitting)	166330
Hose, FEP 1/16", Gripper, UNF 1/4", L=1m	(1 Fitting)	166335

13.3 Pressure control valve

Pressure control valve - kit	Order No.
SIMDOS 02 Accessory Set JFDV 30 KT	166286
SIMDOS 02 Accessory Set JFDV 30 TT	166287
SIMDOS 02 Accessory Set JFDV 30 FT	166288

13.4 Filter

Included Filter	Head material	Mesh size	Material*	Order No.
Filter FS 60 T	TT	70µm	PVDF	346932 (1 pc)
Filter FS 60 T	TT	70µm	PVDF	346933 (10 pcs)
Filter FS 60 X	KT, FT, ST	35µm	PEEK	323625 (1 pc)
Filter FS 60 X	KT, FT, ST	35µm	PEEK	323626 (10 pcs)

**material for housing and filter mesh*

13.5 Foot switch

Foot switch	Order No.
Pulse foot switch	155872

13.6 Fastening material

Fasteners	Order No.
Tripod holder	160474
Mounting plate	160473

14 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).

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.

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

Customer decontamination declaration for repair order

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

Pump model	
Serial No.	
Pumped media	

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

Company Date/Signature

SJ-T 11364-2024 Hazardous Substance Disclosure Table / SJ-T 11364-2024 有害物质含量表

This declaration is valid for the KNF products produced by:
本声明**适**用于由以下KNF公司生产的产品:

KNF Flodos AG CH-6210 Sursee Switzerland

The following information has been made available to comply with SJ-T 11364-2024 the Marking for Control of Pollution Caused by Electronic Information Products as required by China's Management Methods for the Control of Pollution from Electronic Information Products.
提供以下信息旨在遵守中国《电子信息产品污染控制管理办法》所要求的 SJ-T 11364-2024《电子信息产品污染控制标识》标准。

Part Name 部件名称	Hazardous Substances Table 有害物质含量表						EFUP / 环境友好使用期限	China RoHS comment / 中国RoHS注释	EU RoHS compliant / 符合欧盟RoHS指令
	Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 镉 (Cd)	Hexavalent Chromium 六价铬 (Cr(VI))	Polybrominated biphenyls 多溴联苯 (PBB)	Polybrominated diphenyl ethers 多溴二苯醚 (PBDE)			
Pump head / 泵头	X	O	O	O	O	O	20	Lead within EU RoHS exemption limit / 铅含量在欧盟RoHS豁免限值以内	Yes / 是
Pump housing / 泵体	X	O	O	O	O	O	20	Lead within EU RoHS exemption limit / 铅含量在欧盟RoHS豁免限值以内	Yes / 是
Pump motor / 泵的电机	X	O	O	O	O	O	20	Lead within EU RoHS exemption limit / 铅含量在欧盟RoHS豁免限值以内	Yes / 是
Additional components for systems / 系统附加部件	X	O	O	O	O	O	20	Lead within EU RoHS exemption limit / 铅含量在欧盟RoHS豁免限值以内	Yes / 是

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ-T 11364-2024. 表示该有害物质在该部件所有均质材料中的含量均在 SJ-T 11364-2024 规定的限量要求以下。

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ-T 11364-2024. 表示该有害物质至少在该部件的某一均质材料中的含量超出 SJ-T 11364-2024 规定的限量要求。

EFUP /环境友好使用期限: Environment Friendly Using Period / 环境友好使用期