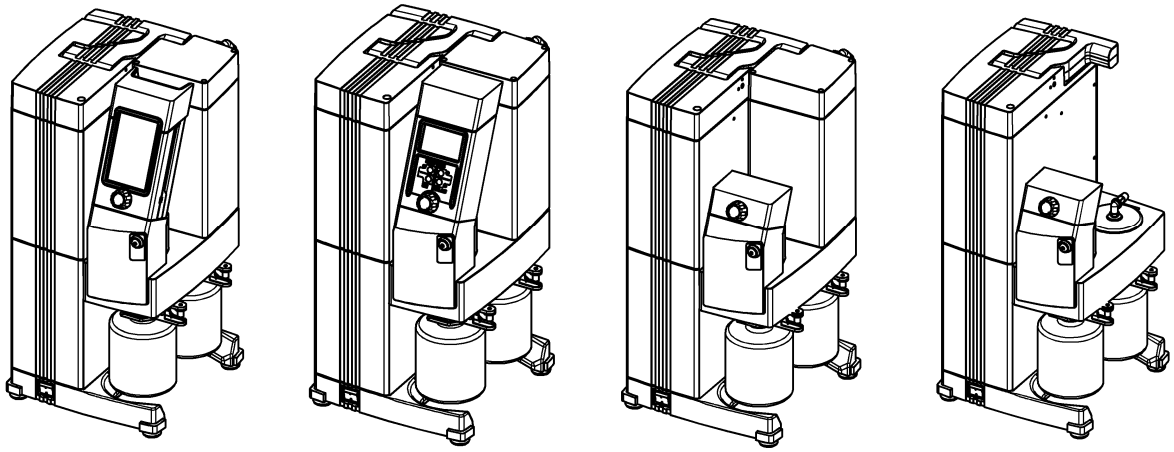
Operating Instructions
Read and observe these Operating Instructions!

Vacuum pump systems

SC950 SEM950 SH950 SR950



CE

KNF Neuberger GmbH
Alter Weg 3
D-79112 Freiburg
Germany
Phone ++49 / (0)7664 / 5909-0
Fax ++49 / (0)7664 / 5909-99
E-Mail: info@knf.de
www.knf.de

KNF 125549-125552 11/12
Translation of original Operating Instructions, English

Items including delivery SC950:

- Vacuum pump system including hand terminal (batteries included)
- Coated collection flasks (2 x)
- Flask clamps (2 x)
- Mains cable
- USB cable for connecting vacuum pump system to PC
- Power supply for hand terminal
- Operating Instructions
- CD with digital Operating Instructions and software for operating the vacuum pump system with a PC

Items including delivery SEM/SH/SR950:

- Vacuum pump system
- Coated collection flasks (2 x)
- Flask clamps (2 x)
- Mains cable
- Operating Instructions
- CD with digital Operating Instructions

Transport fastener (only SC950)

The hand terminal is fastened in place at the factory, to prevent damage during transport.

To remove the hand terminal, it is first necessary to release the transport fastener. For further details, see chapter *6. Installation and connection*.

Content Page

1. About this document

1.1. Use of the Operating Instructions

The Operating Instructions are part of the vacuum pump system.

➔ Carefully study the Operating Instructions before using a vacuum pump system.

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

➔ Forward the Operating Instructions to any subsequent owners of the vacuum pump system.

Project systems

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

➔ In case of project systems, take note of any additionally agreed specifications.

i Compliance with the Operating Instructions is essential for the safe and reliable operation of the vacuum pump system. Failure to do so may result in damage or injury.

1.2. Symbols and markings

Warning

WARNING

A danger warning is located here.

It also indicates the possible consequences of failure to observe the warning. The signal word (i.e. “Warning”) indicates the level of danger.

➔ Here you will see actions for avoiding the danger and potential consequences.

Danger levels

Signal word	Meaning	Consequences if not observed
	warns of immediate danger	Consequences include death or serious injuries and/or serious property damage.
	warns of potential danger	Death or serious injuries and/or serious property damage are possible.
	warns of a potentially dangerous situa-tion	Minor injuries or damage to property are possible.

Tab. 1

Other information and symbols

➔ This indicates an activity (step) that must be carried out.

1. This indicates the first step of an activity to be carried out. Any additional steps are consecutively numbered.

i This symbol indicates important information.

2. Use

2.1. Intended use

The vacuum pump systems SC/SEM/SH/SR950 are designed for use in chemical, pharmaceutical, and biological laboratories. They are exclusively intended for transferring gases and vapors.

Make sure that the installation location is dry and the pump/system is protected against water in the form of rain, spray, splashes and drips.

Vacuum pump system is solely for use in indoor areas.

Owner's responsibility

Operating parameters and conditions

Only install and operate the vacuum pump system under the operating parameters and conditions described in chapter 4, Technical data.

Protect vacuum pump system against humidity.

Requirements for transferred medium

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

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

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

High performance condenser

Only SC/SEM/SH950:
The high performance condenser must be installed on the outlet side of the pump; if it is installed on the inlet side there is a danger of implosion.

Observe the correct usage of the gas- and cooling liquid-connections on the high performance condenser. Inlet and outlet connections for the gas are not interchangeable.

Accessories

Laboratory equipment or additional components connected to a vacuum pump system have to be suitable for use with the pneumatic capabilities of the vacuum pump system (see chapter 4, page 8).

2.2. Improper use

The vacuum pump system must not be operated in an explosive atmosphere.

The vacuum pump system is not suitable for transferring dusts.

The vacuum pump system is not suitable for transferring liquids.

The vacuum pump system must not be used if the entry of air or gas into the vacuum pump system during venting (vent valve) or an open gas ballast valve could result in the creation of reactive, explosive or otherwise hazardous mixtures (e.g. with the medium).

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

Never apply positive pressure to the suction side of the vacuum pump system.

3. Safety

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

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

Personnel

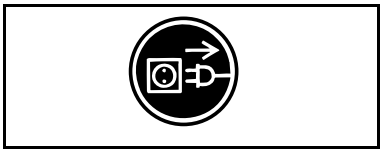
Make sure that only trained and instructed personnel or specially trained personnel work on the vacuum pump systems. This especially applies to assembly, connection and servicing work.

Make sure that all personnel have read and understood the Operating Instructions, especially the "Safety" chapter.

Working in a safety-conscious manner

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

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



Open housing parts with notice sticker (see fig. 1) only after separating mains plug from power source.

Fig. 1: Notice sticker

Correct match between hand terminal and vacuum pump system

Only SC950:
Ensure that personnel check that the hand terminal is the right one for this particular system before using a SC950 vacuum pump system. Vacuum pump systems are equipped with a paging system for this purpose (see Actuating the vacuum pump system, page 36).

Handling dangerous media

When transferring dangerous media, observe the safety regulations for handling such media.

Handling flammable media

Be aware that the vacuum pump systems are not designed to be explosion-proof.

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

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

Hence, make sure the temperature of the medium is sufficiently below the ignition temperature of the medium, even when it is compressed to maximum permissible operating pressure of the vacuum pump system. The maximum permissible operating pressure of the vacuum pump system is stated in the technical specifications (see chapter 4, page 9).

If necessary, consider any external sources of energy, such as sources of radiation, that could additionally heat the medium.

In case of doubt, consult the KNF customer service.

Ventilating the vacuum pump system

When ventilating the vacuum pump system with air or inert gas, be sure to prevent formation of reactive or explosive media. The maximum permissible operating pressure at the ventilation connection (Fig. 2/**18**, p. 13 (SC950) or Fig. 4/**15**, p. 17 (SEM950)) is 0.1 bar g.

Environmental protection

All replacement parts should be properly stored and disposed of in accordance with the applicable environmental protection regulations. Ensure adherence to the pertinent national and international regulations. This applies especially to parts contaminated with toxic substances.

Standards

The vacuum pump systems SC/SEM/SH/SR950 conform to the Directive 2011/65/EU (RoHS2).

The vacuum pump systems SC/SEM/SH/SR950 conform to the safety regulations of the EC Directive 2004/108/EC concerning Electromagnetic Compatibility and the EC Directive 2006/42/EC concerning Machinery. The requirements of the following harmonised standards have been used:

- DIN EN 61010-1
- DIN EN 61326-1

The systems correspond to IEC 664:

- the overvoltage category II
- the pollution degree 2

Customer service and repairs

All repairs to the vacuum pump system must be carried out by the relevant KNF Customer Service team.

Housings with voltage-caring parts may be opened by technical personnel only.

Use only genuine parts from KNF for servicing work.

4. Technical data

4.1. Vacuum pump system

*Materials for parts contacting the medium**	
Pump head	PPS
Connection parts	PPS
Diaphragms	PTFE-coated
Valve plates	FFPM
Flat seals	FFPM
O-rings, green	FPM
O-rings, black	FFPM
Hose connector gas inlet	PTFE / PVDF
Jose connector gas outlet	PP / PVDF
Hose connector inert gas connection	POM / PA
Tubing	Norprene®
Only SC/SEM950: Tubing inert gas connection	PVC
Adaptor separator	PP
Only SC/SEM950: Pressure sensor	Ceramics / 1.4404
Venting valve / Gas ballast valve: Piston seal O-ring Tube	 FFPM FPM 1.4301
Pneumatic performance	
Max. permissible operating pressure [bar g]	0
Ultimate vacuum [mbar abs.]	≤ 2 mbar ≤ 4 mbar with opened gas ballast
Flow rate at atm. pressure [l/min]**	50 (controllable)
Max. permissible pressure at the inert gas connection [bar g]	0.1
Ambient and media temperature	
Permissible ambient temperature	+ 10 °C to + 40 °C
Permissible media temperature	+ 10 °C to + 40 °C

**according to DIN ISO 1629 and 1043.1*

**Liters in standard state (1,013 mbar at 0 °C)

Tab. 2 (part 1)

Other parameters	
Vacuum connection and gas outlet	For tube ID 10 mm
Ventilation connection	For tube ID 4 mm
Weight [kg]: - SC950 (including hand terminal) - SEM950 - SH950 - SR950	 14 13.5 13 12.5
Dimensions W x H x D [mm]: SC/SEM/SH950: SR950:	 246 x 487 x 313 246 x 487 x 264
Maximum permissible ambient relative humidity	80 % for temperatures up to 31°C, decreasing linearly to 50 % at 40°C
Maximum altitude of installation [m above sea level]	2000
Only SC/SEM/SH950: *Operating parameters of coolant (high-performance condenser)*	
Max. permissible pressure [bar g]	3
Permissible temperature	- 15 °C to + 20 °C
Coolant connections on high-performance condenser	For tube ID 8 mm
Coolant-wetted surface [cm^2]	Min. 470
Electrical data vacuum pump system	
Voltage*** [V]	100-240 V +/- 10 %
Frequency [Hz]	50-60 Hz
Max. current consumption [A]	1.7
Max. watt consumption [W]	150
Protection class	IP20
Fuse vacuum pump system [A]	2 x T2.5
Drive motor fusing	Electronic overcurrent protection

Tab. 2 (part 2) **** Automatic voltage selection*

The pumps of the vacuum pump systems are supplied by a universal power supply with integrated overload protection. They are protected against overheating by a temperature sensor on the motor board and equipped with overcurrent protection.
If one of these safety functions is triggered, the pump will be shut down and must be manually reset, as follows:

➔ Separate pump from the mains.

➔ Remove the cause(s) of the fault before restarting.

4.2. Vacuum pump system's hand terminal (only SC950)

Dimensions: W x H x D [mm]	91 x 190 x 65
Weight [kg]	0.5
Operating voltage [V DC]	12
Current consumption [A]	1.25
Wireless connection's frequency band [GHz]	2.4
Wireless range	About 50 m without obstacles, about 10 m through walls
Power supply	Through integrated batteries or power supply (in delivery included)
DC charging socket	 External diameter: 6.3 mm Inside diameter: 2 mm
Chargeable batteries	4 x round AA 1.2 V 2300 mAh, fast-charging; see spare parts list in chapter 11
Battery service life*	Up to 12 hours, depending on number of entries and data transmission
Charging time*	approx. 7 h

Tab. 3 ** Applies to standard included batteries*

When charging the SC950 vacuum pump system's hand terminal, use only the original power supply from KNF.

Several different vacuum pump systems SC590 may be operated simultaneously with their respective hand terminals within the wireless connection range.

The wireless connection between hand terminal and vacuum pump system SC590 is robustly resistant to operation of mobile telephones and Bluetooth devices in the immediate area.

4.3. Software (only SC950)

System requirements for operating the vacuum pump system SC950 via PC software:

- Windows 98 SE, Windows ME, Windows NT, Windows 2000, Windows XP, Windows Vista, Windows 7
- 200 MHz processor
- Available memory of at least 64 MB

The USB connection between the PC and vacuum pump system SC950 is operated as an RS-232 interface. Accordingly, in the operating system it is managed as an additional COM connection and can be addressed with conventional terminal software. The interface protocol contains all necessary information. See chapter 13, page 65.

5. Assembly and function

5.1. SC590

5.1.1. Assembly of the vacuum pump system

1 Carrying handle
2 Transport fastener for hand terminal
3 High-performance condenser
4 Hand terminal (removable; signals transmitted wirelessly)
5 Hand terminal dock
6 Gas ballast switch
7 Flask clamp for **8** and **9**
8 Pressure-side condensation collection flask (coated)
9 Suction-side condensation collection flask (coated)
10 Base
11 Mains switch

12 Top fan
13 Bottom fan
14 Coolant valve connection
15 USB port for connecting vacuum pump system to PC
16 Mains plug connection
17 Fuse drawer
18 Ventilation connection
19 Vacuum chamber connection (gas inlet)
20 Coolant connection on high-performance condenser (feed)
21 Coolant connection on high-performance condenser (return)
22 Gas outlet

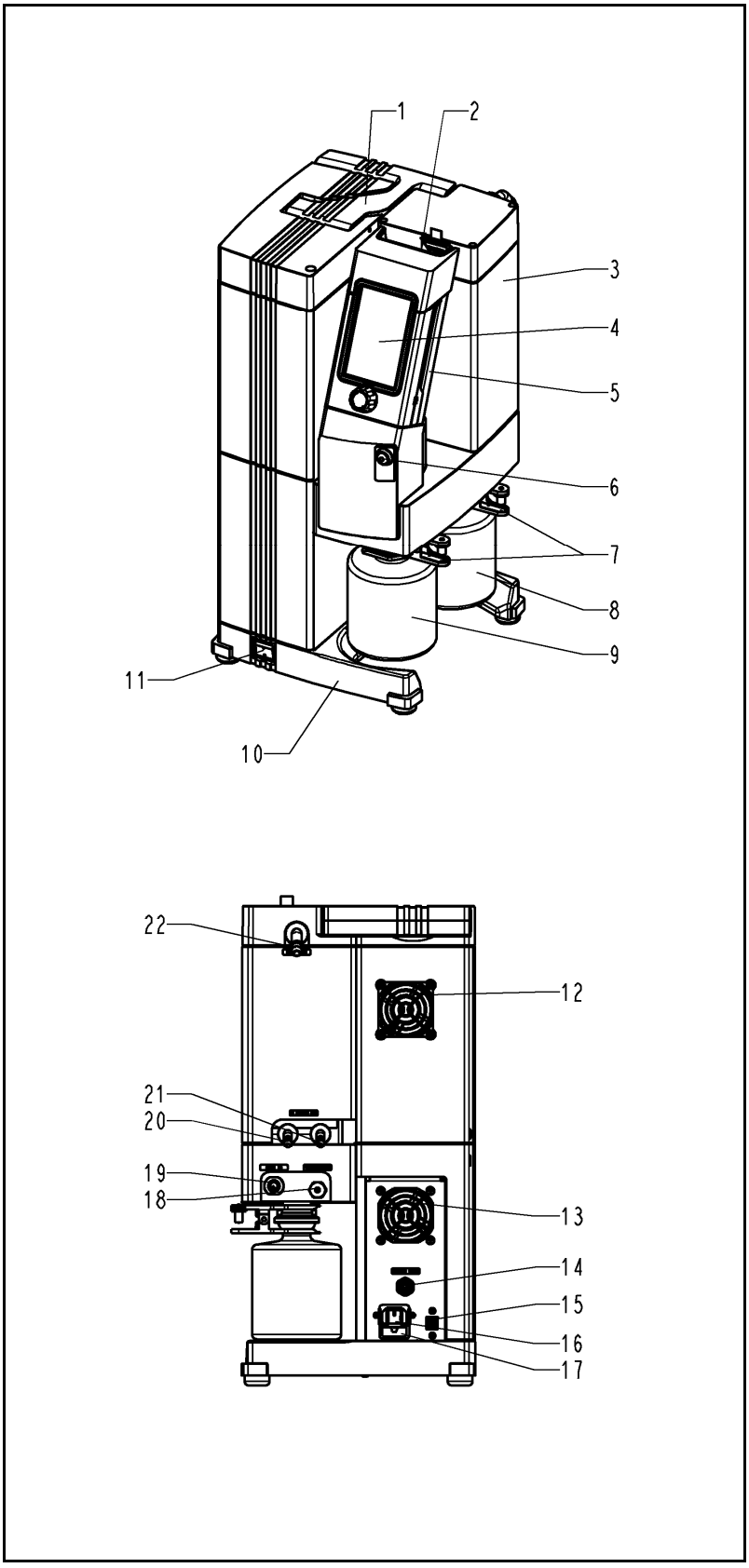


Fig. 2: Vacuum pump system SC950

The vacuum pump system generates a vacuum that can be controlled either through the hand terminal (see Fig. 2/**4**, p. 13) or a PC.

Collection flask (Fig. 2/**9**) collects on the suction side of the pump particles and drops that were, contrary to the requirements of the pump, suctioned from the vacuum chamber. The collection flask is coated (implosion protection) and fastened to the vacuum pump system via a flask clip (**7**).

The high-performance condenser (**3**) at the pump outlet once again recollects solvents from the pumped gas instead of allowing it exit into the environment or fume hood. The high-performance condenser is surrounded by a shell for temperature insulation and explosion protection.

Solvents deposited in the high-performance condenser are collected in the coated (for explosion protection) collection flask (**8**). A flask clip (**7**) secures the glass flask to the condenser flange. A recirculating cooler or continuously flowing cold water (or another cooling media) cools the high-performance condenser to the condensation temperature.

5.1.2. Vacuum pump system functions

The vacuum pump system can be operated in four different modes:

- **Evacuate**
  The vacuum pump system evacuates a vacuum chamber with adjustable pump capacity.
- **Pressure control**
  The vacuum pump system controls system pressure to the setpoint pressure value (constant pressure).
- **Automatic**
  The vacuum pump system independently finds the sample's vapor pressure and adjusts process pressure accordingly.
- **Function**
  The vacuum pump system controls pressure according to the entered pressure curve. The following process parameters can be entered:
  - Setpoint pressure at various time points after starting the process
  - Coolant valve (accessory) ON and OFF with time point after start of process

At any time during an active process, you can switch to **manual process control**. Functions for Evacuate and Pressure control will be available simultaneously. When activating manual process control, the current actual pressure will be adopted as the first setpoint pressure. In other words, process pressure will be initially "frozen" at the current value.

The operating modes can be **combined in any way** for the purposes of intelligent process control. For example, after successful

boiling point detection in the automatic mode, the following opera-- ting modes are available for specific distilling off of the solvent recovered:

- Evacuation
  (constant vaporization rate for optimum condenser capacity utilization)
- Function
  (Following a preset pressure ramp provided in order to attain a separation from components with higher boiling points)
- Manual process control
  (active control of the distillation using the setpoint pressure)

In order to change to another operating mode, the process is first stopped and then restarted in the new operating mode.

Gas ballast

The gas ballast switch (Fig. 2/**6**) can be used to open and close the gas ballast valve on the vacuum pump system's pump (see Chapter 5.6).

5.1.3. Hand terminal

Basic elements

1 Upper grip
2 Touchscreen
3 I/O switch
4 DC input 12 V
5 Rotary knob for
- adjusting pump speed and setpoint pressure
- switching to manual operation

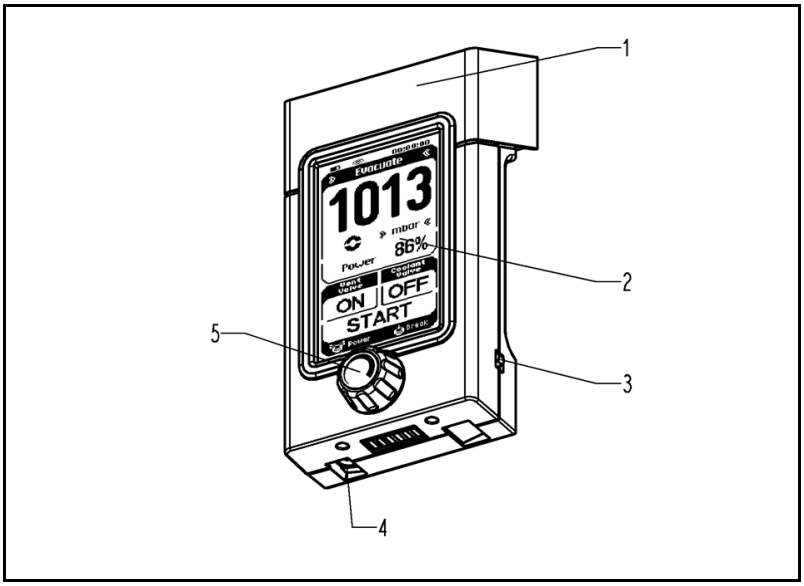


Fig. 3: Hand terminal SC950

Function

The hand terminal is used to set process parameters with which the vacuum pump system SC950 will control pressure.

Settings can be made on the hand terminal's touchscreen (**2**) and with the rotary knob (**5**).

To operate the vacuum pump system remotely, remove the hand terminal from the holder (see chapter 5.1.1, page 13) on the vacuum pump system. This provides a convenient way to operate the vacuum pump system when it is in a cabinet or under a closed fume hood.

Whenever the hand terminal is located in the holder while the vacuum pump system is turned on, the batteries in the hand terminal will charge automatically. This happens even when hand terminal is switched off. Alternatively, the batteries can be charged through the hand terminal's power supply (see DC input (**4**)). As a result, it is not necessary to place the vacuum pump system where it is easily accessible for the user.

The power supply also makes it possible to supply the hand terminal with electrical power directly from a mains connection.

An acoustic alarm sounds on the hand terminal when the battery charge levels are low.

5.2. SEM950

5.2.1. Assembly of the vacuum pump system

1 Carrying handle
2 High-performance condenser
3 Control terminal
4 Gas ballast switch
5 Flask clamp for **6** and **7**
6 Pressure-side condensation collection flask (coated)
7 Suction-side condensation collection flask (coated)
8 Base
9 Mains switch

10 Top fan
11 Bottom fan
12 Coolant valve connection
13 Mains plug connection
14 Fuse drawer
15 Ventilation connection
16 Vacuum chamber connection (gas inlet)
17 Coolant connection on high-performance condenser (feed)
18 Coolant connection on high-performance condenser (return)
19 Gas outlet

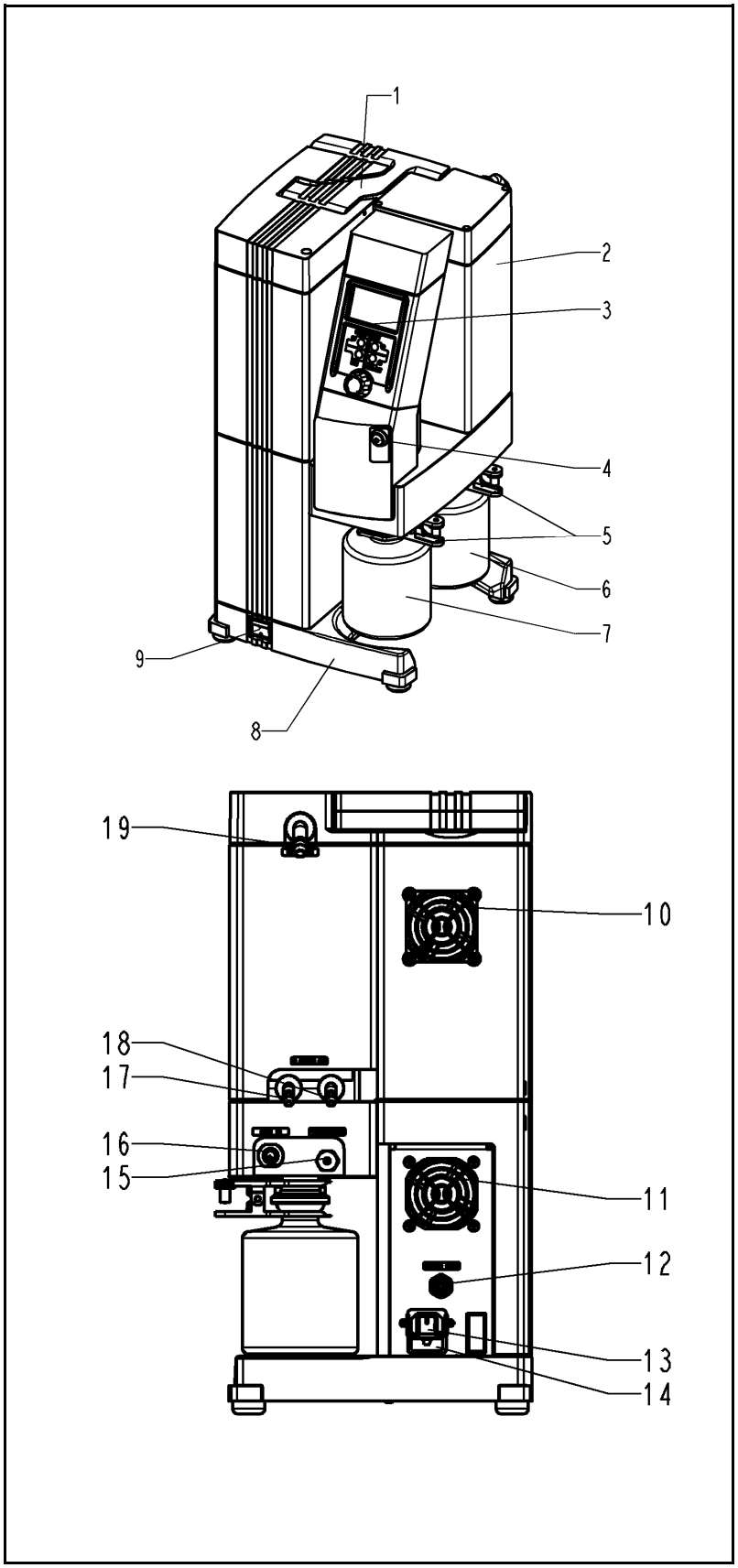


Fig. 4: Vacuum pump system SEM950

Collection flask (Fig. 4/**7**) collects on the suction side of the pump particles and drops that were, contrary to the requirements of the pump, suctioned from the vacuum chamber. The collection flask is coated (implosion protection) and fastened to the vacuum pump system via a flask clip (**5**).

The high-performance condenser (**2**) at the pump outlet once again recollects solvents from the pumped gas instead of allowing it exit into the environment or fume hood. The high-performance condenser is surrounded by a shell for temperature insulation and explosion protection.

Solvents deposited in the high-performance condenser are collected in the coated (for explosion protection) collection flask (**6**). A flask clip (**5**) secures the glass flask to the condenser flange. A recirculating cooler or continuously flowing cold water (or another cooling media) cools the high-performance condenser to the condensation temperature.

5.2.2. Vacuum pump system functions

The flow of the pump (15% - 100%) can be set via the rotary knob on the control terminal (**3**).

Gas ballast

The gas ballast switch (**4**) can be used to open and close the gas ballast valve on the vacuum pump system's pump (see Chapter 5.6).

5.3. SH950

5.3.1. Assembly of the vacuum pump system

1 Carrying handle
2 High-performance condenser
3 Rotary knob
4 Gas ballast switch
5 Flask clamp for **6** and **7**
6 Pressure-side condensation collection flask (coated)
7 Suction-side condensation collection flask (coated)
8 Base
9 Mains switch

10 Top fan
11 Bottom fan
12 Mains plug connection
13 Fuse drawer
14 Vacuum chamber connection (gas inlet)
15 Coolant connection on high-performance condenser (feed)
17 Coolant connection on high-performance condenser (return)
17 Gas outlet

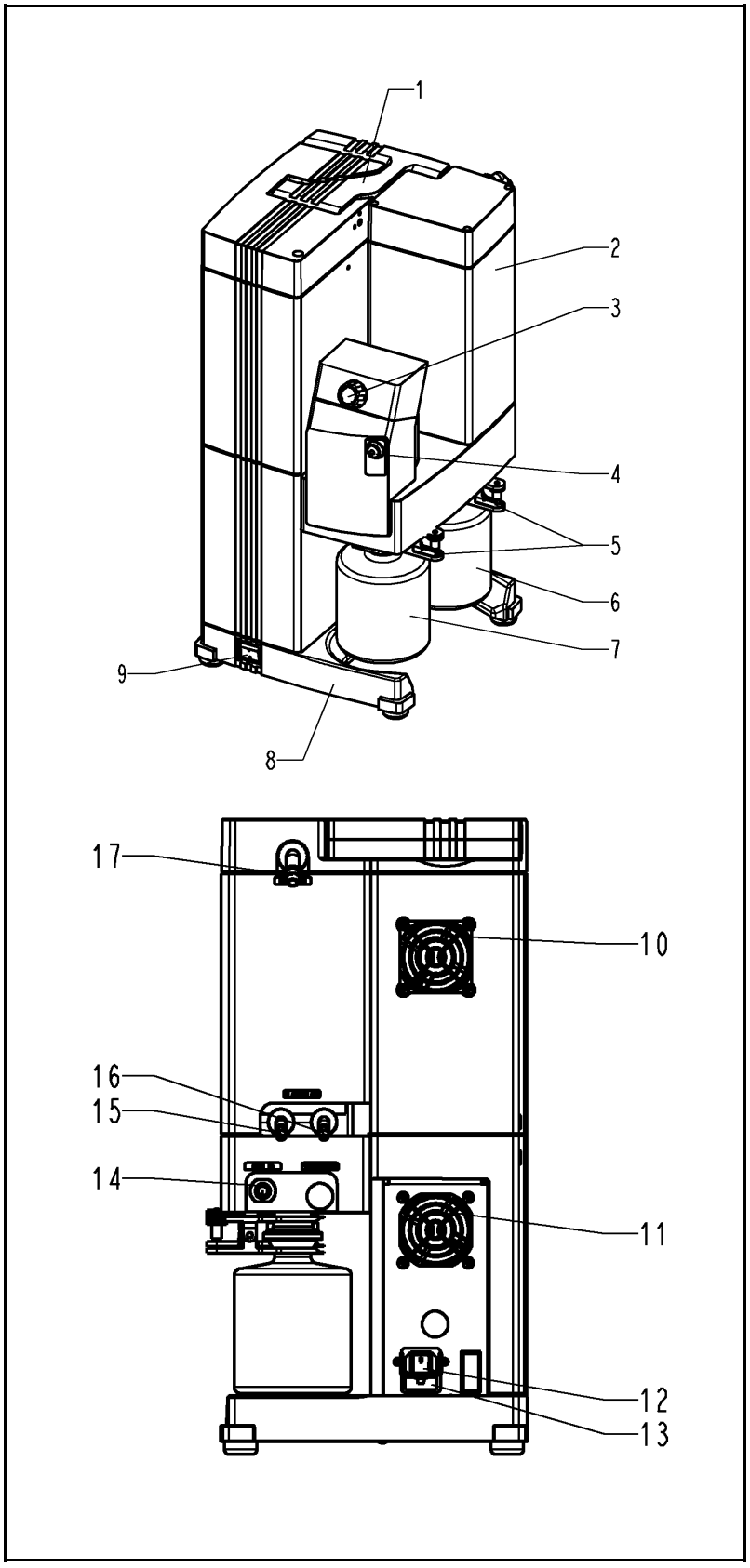


Fig. 5: Vacuum pump system SH950

Collection flask (Fig. 5/**7**) collects on the suction side of the pump particles and drops that were, contrary to the requirements of the pump, suctioned from the vacuum chamber. The collection flask is coated (implosion protection) and fastened to the vacuum pump system via a flask clip (**5**).

The high-performance condenser (**2**) at the pump outlet once again recollects solvents from the pumped gas instead of allowing it exit into the environment or fume hood. The high-performance condenser is surrounded by a shell for temperature insulation and explosion protection.

Solvents deposited in the high-performance condenser are collected in the coated (for explosion protection) collection flask (**6**). A flask clip (**5**) secures the glass flask to the condenser flange. A recirculating cooler or continuously flowing cold water (or another cooling media) cools the high-performance condenser to the condensation temperature.

5.3.2. Vacuum pump system functions

The flow of the pump can be set via the rotary knob on the control terminal (**3**).

I If the rotary knob is rotated to the left until it engages the mechanical indent, the pump will rotate with a minimum flow rate of 15%.
If the rotary knob is then rotated farther to the left (past the mechanical indent), the vacuum pump system's pump will be switched off.

Gas ballast

The gas ballast switch (**4**) can be used to open and close the gas ballast valve on the vacuum pump system's pump (see Chapter 5.6).

5.4. SR950

5.4.1. Assembly of the vacuum pump system

1 Carrying handle
2 Rotary knob
3 Gas ballast switch
4 Flask clamp for **6** and **7**
5 Pressure-side condensation collection flask (coated)
6 Suction-side condensation collection flask (coated)
7 Base
8 Mains switch

9 Top fan
10 Bottom fan
11 Mains plug connection
12 Fuse drawer
13 Vacuum chamber connection (gas inlet)
14 Gas outlet

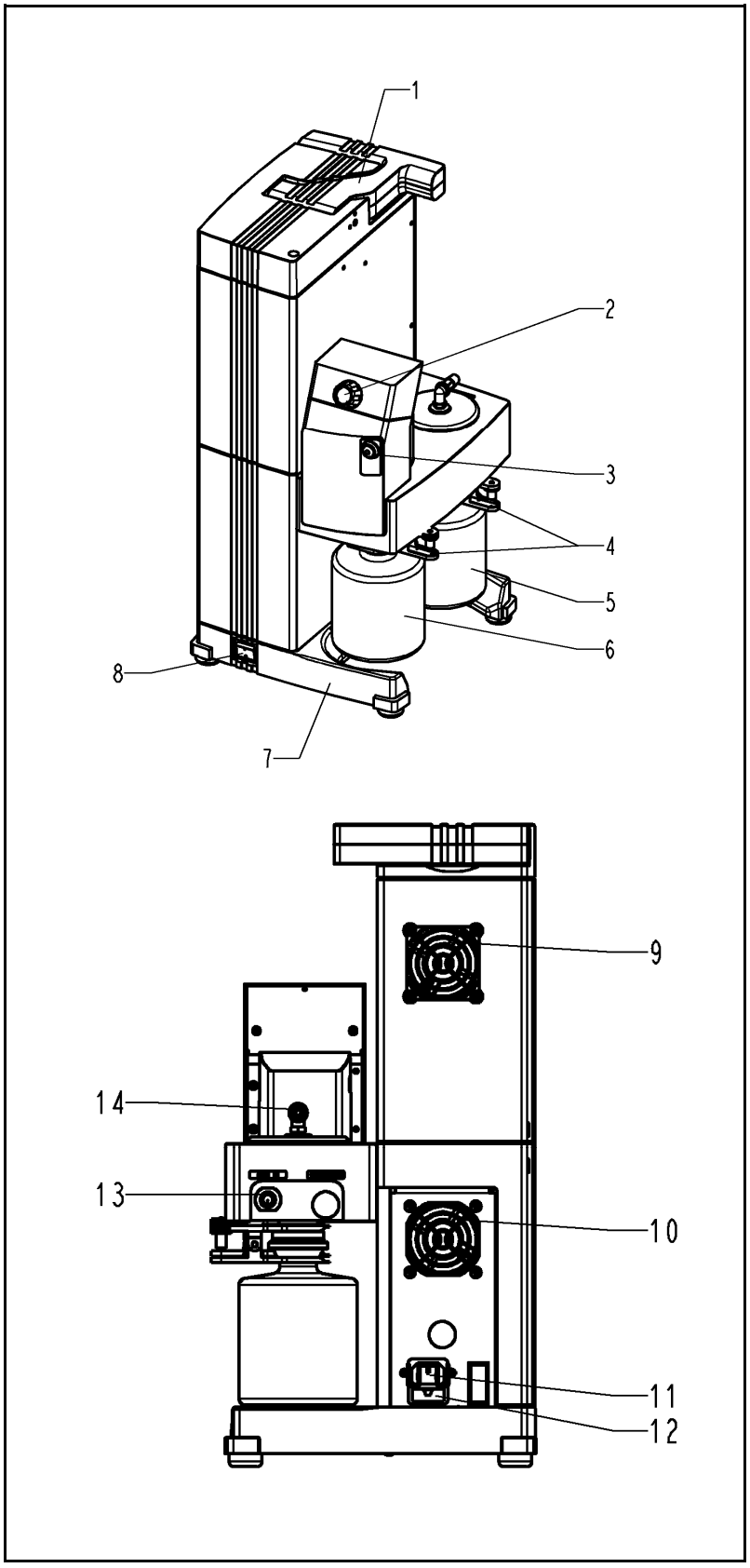


Fig. 6: Vacuum pump system SR950

Collection flask (Fig. 6/**6**) collects on the suction side of the pump particles and drops that were, contrary to the requirements of the pump, suctioned from the vacuum chamber. The collection flask is coated (implosion protection) and fastened to the vacuum pump system via a flask clip (**4**).

Solvents deposited on the pressure side of the pump are collected in the collection bulb (coated for explosion protection) (**5**). A bulb clip (**4**) fastens the glass bulb to the separator adapter.

5.4.2. Vacuum pump system functions

The flow of the pump can be set via the rotary knob on the control terminal (**2**).

If the rotary knob is rotated to the left until it engages the mechanical indent, the pump will rotate with a minimum flow rate of 15%.
If the rotary knob is then rotated farther to the left (past the mechanical indent), the vacuum pump system's pump will be switched off.

Gas ballast

The gas ballast switch (**3**) can be used to open and close the gas ballast valve on the vacuum pump system's pump (see Chapter 5.6).

5.5. Pump

Assembly

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

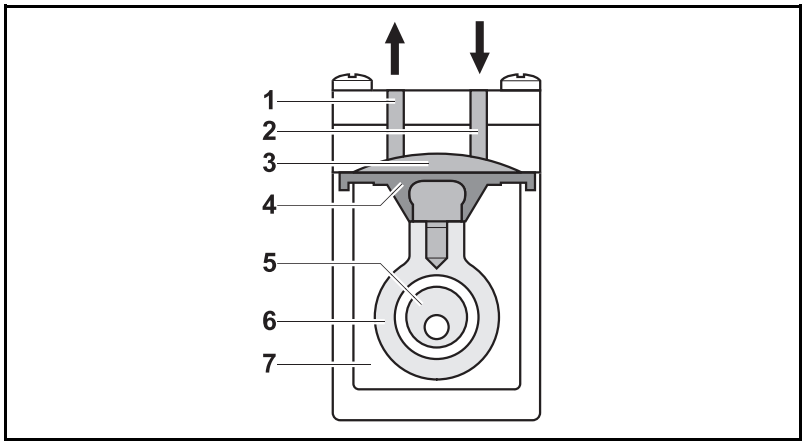


Fig. 7: Pump design

How diaphragm pumps work

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

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

5.6. Gas ballast

Assembly

1 Gas ballast valve

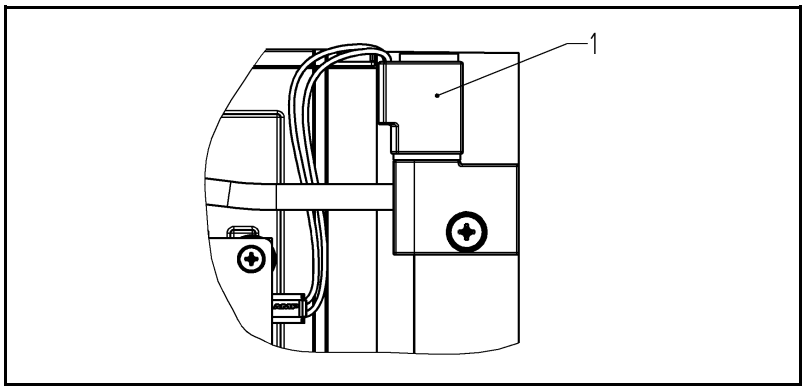


Fig. 8: Gas ballast of the pump

Function gas ballast

WARNING

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

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

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

Opening the gas ballast valve deteriorates ultimate vacuum performance.

The gas ballast valve can be opened and closed via the gas ballast switch (Fig. 2/**6**, p. 13 or Fig. 4/**4**, p. 17, Fig. 5/**4**, p. 19 and Fig. 6/**3**, p. 21):

- push once
  → open gas ballast valve, blue LED on
- push again
  → close gas ballast valve again, blue LED off

Please contact KNF Service if you require an inert connection for the gas ballast.

6. Installation and connection

➔ Always install the vacuum pump system under the operating parameters and conditions described in chapter 4, Technical data, page 9).

➔ Observe the safety precautions (see chapter 3, page 7).

6.1. Installation

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

Cooling air supply

➔ Install the vacuum pump system so that the two motor fans of the vacuum pump system are not blocked.

Installation location

➔ Make sure that the installation location is dry and the vacuum pump system is protected against water in the form of rain, spray, splashes and drips.

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

➔ Protect the vacuum pump system against dust.

➔ Protect the vacuum pump system against vibrations and jolts.

Connected components

➔ Only connect components to the vacuum pump system which are designed for the pneumatic data of the vacuum pump system (see chapter 4, page 9).

Coolant for high-performance condenser

Only SC/SEM/SH950:
A recirculating cooler or flowing cold water (or another cooling media) is needed to cool the high-performance condenser to the condensation temperature.

Removing the transport fastener

Only SC950:
The hand terminal of the vacuum pump system SC950 is fastened in place at the factory, to prevent damage during transport. To remove the hand terminal, it is first necessary to release the transport fastener. To do this, rotate the knurled knob (Fig. 2/**2**, p. 13) out until the hand terminal can be removed.

i The transport fastener can be screwed in again for any future transport operations.

Installing the collection bulb

Install the collection bulbs (Fig. 2/**8** and **9**, p. 13 or Fig. 4/**6** and **7**, p. 17, Fig. 5/**6** and **7**, p. 19 and Fig. 6/**5** and **6**, p. 21) with the bulb clips (Fig. 2/**7**, p. 13 or Fig. 4/**5**, p. 17, Fig. 5/**5**, p. 19 and Fig. 6/**4**, p. 21). The bulbs and clips are included as loose parts.

6.2. Connection

1. Connect the vacuum chamber to the gas inlet's hose connector (Fig. 2/**19**, p. 13 or Fig. 4/**16**, p. 17, Fig. 5/**14**, p. 19 and Fig. 6/**13**, p. 21, for hose inside diameter of 10 mm). For this, vacuum tubing must be used.
2. Connect hose to high-performance condenser in order to discharge gas exhaust (Fig. 2/**22**, p. 13 or Fig. 4/**19**, p. 17, Fig. 5/**17**, p. 19 and Fig. 6/**14**, p. 21, for hose inside diameter of 10 mm).

Only SC/SEM/SH950:

CAUTION

Danger of high performance condenser bursting.
The high-performance condenser is not pressure-proof.

➔ Do not reduce or regulate the quantity of gas at the gas outlet, and do not install any components that hinder the gas flow.

Safely discharge gas exhaust so that no gas can escape into the ambient air.

Only SC/SEM/SH950:
Make sure that the high-performance condenser's gas outlet is not blocked (high-performance condenser is not pressure-proof).

3. Only SC/SEM/SH950:
   Attach coolant feed and return to high-performance condenser (Fig. 2/**20** and **21**, p. 13 or Fig. 4/**17** and **18**, p. 17 and Fig. 5/**15** and **16**, p. 19, for hose inside diameter of 8 mm).

SC/SEM950 only:
Connect only the KNF coolant valve (see Chapter 11.2, Accessories) to the coolant valve connection (Fig. 2/**14**, p. 13 or Fig. 4/**12**, p. 17). Consult with KNF before using any other valves.

4. Only SC/SEM950:
   If necessary: Connect inert gas supply to ventilation connection (Fig. 2/**18**, p. 13 or Fig. 4/**15**, p. 17). Observe the safety instructions in chapter 3. Please contact KNF Service if you require an inert connection for the gas ballast.
5. Insert the power cable plug into a properly installed shockproof socket.

7. Operation

7.1. Start up

Before switching on the vacuum pump system, observe the following points:

Operational requirements
▪ All hoses attached properly ▪ Fan openings not blocked ▪ Specifications of the power supply correspond with the data on the vacuum pump system's type plate. ▪ Only SC/SEM/SH950: Recirculating cooler or cold water connection ready on high-performance condenser. ▪ Only SC/SEM/SH950: The high-performance condenser's gas outlet is not blocked (high-performance condenser is not pressure-proof). ▪ Vacuum pump system is at room temperature. ▪ Only SC950: Vacuum pump system and hand terminal belong together. ▪ Only SC/SEM950: No reactive, explosive or otherwise hazardous mixtures may be produced when ventilating the vacuum system through the air inlet (Fig. 2/**18**, p. 13 or Fig. 4/**15**, p. 17) (if necessary, use an inert gas) ▪ When the gas ballast valve is open (blue LED illuminates) do not allow reactive, explosive, or otherwise hazardous mixtures to form (contact KNF Service when in doubt).

Tab. 4

➔ Only operate the vacuum pump system under the operating parameters and conditions described in chapter 4, Technical data (page 9).

➔ Make sure the vacuum pump system is used properly (see chapter 2.1, page 5).

➔ Make sure the vacuum pump system is not used improperly (see chapter 2.2, page 6).

➔ Observe the safety precautions (see chapter 3, page 7).

Only SC950:

DANGER

Uncontrolled operation may result in personal injury and damage to the vacuum pump system.

When using several vacuum pump systems SC950, there is the danger of confusing them, which can result in undesired interference into other processes: The transmission of commands from the wrong hand terminal for the vacuum pump system may trigger an uncontrolled response in the vacuum pump system that the terminal controls.

- ➔ Every time a vacuum pump system SC950 is used with a hand terminal, it is essential to ensure a correct match between the two components. Use the paging function for this purpose (see Actuating the vacuum pump system, page 36).
- ➔ Additionally it is possible to use color stickers to indicate which hand terminal belongs to which vacuum pump system SC950 (see chapter *11. Spare parts and accessories*).

Only SC950:

WARNING

Uncontrolled operation may result in personal injury and damage to the vacuum pump system SC950.

If the wireless connection between the hand terminal and vacuum pump system SC950 is broken, the vacuum pump system will continue to operate with the current settings.

- ➔ Immediately determine and remove the cause of the interruption between the hand terminal and vacuum pump system (chapter 10, page 57).
- ➔ If you are not able to reestablish wireless contact, replace the hand terminal back to the vacuum pump system (chapter 8.1.1, page 31). The vacuum pump system can also be operated directly and the ventilation valve and coolant valve can be opened and closed directly (chapter 8.2, page 38).

Only SC/SEM950:

WARNING

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

➔ Make sure that no reactive or explosive mixtures will be produced when ventilating the vacuum pump system through the air inlet or when gas ballast valve is opened.

WARNING

Hazard of the vacuum pump system bursting due to excessive pressure increase

➔ Do not exceed max. permissible operating pressure (0 bar).

➔ Monitor pressure during operation.

➔ If the pressure exceeds the maximum permissible operating pressure, immediately shut down vacuum pump system and eliminate fault (see chapter 10, page 57).

Only SC/SEM/SH950:

CAUTION

Danger of high performance condenser bursting. The high-performance condenser is not pressure-proof.

➔ Make sure that the high performance condenser's gas outlet is not blocked.

i In order for the high-performance condenser to recover solvent from the delivered gas, it must be cooled by means of a cold water supply or recirculating cooler.

Only SC/SEM950:

When using a coolant valve:

WARNING

Danger of the high performance condenser bursting

➔ Make sure that the coolant valve is mounted between the coolant supply and the coolant inlet port of high performance condenser.

Pump standstill

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

Inspect and empty collection flasks

At appropriate intervals, inspect the fill level in the condensation collection flasks located on the suction and pressure sides of the vacuum pump system (Fig. 2/**8** and **9**, p. 13 or Fig. 4/**6** and **7**, p. 17). When needed, empty the collection flasks; properly dispose contents.

Switching vacuum pump system on

The vacuum pump system may not start up against overpressure during switch-on. During operation as well, there may be no overpressure in the pneumatic lines. If a pump starts against pressure, it may block. This activates the overload protection, and the pump switches off.

➔ Switch on vacuum pump system at mains switch (Fig. 2/**11**, p. 13 or Fig. 4/**9**, p. 17, Fig. 5/**9**, p. 19 and Fig. 6/**8**, p. 21).

➔ Only SC950:
Switch on hand terminal at its I/O switch (see Fig. 3/**3**, page 15).

Refer to chapter 8, page 31, for information on operating the vacuum pump system.

7.2. Taking system out of operation

➔ Stop the ongoing process.

➔ When transferring aggressive media, flush the vacuum pump system prior to switch-off to increase the service life of the diaphragms (see chapter 9.2.1, page 47).

➔ Switch off vacuum pump system with mains switch (see Fig. 2/**11**, p. 13 or Fig. 4/**9**, p. 17, Fig. 5/**9**, p. 19 and Fig. 6/**8**, p. 21).

➔ Only SC950:
Switch off hand terminal at its I/O switch (see Fig. 3/**3**, page 15).

Only SC950:

WARNING

Uncontrolled operation may result in personal injury and damage to the vacuum pump system SC950.

If the hand terminal is switched off while the vacuum pump system SC950 remains switched on, the vacuum pump system will continue to operate with the current settings.

➔ Always switch the vacuum pump system off when done working.

8. Operating vacuum pump system

8.1. Hand terminal (only SC950)

8.1.1. General functions and displays

1 Upper grip
2 Touchscreen
3 I/O switch
4 DC input 12 V
5 Rotary knob for
- adjusting pump speed and setpoint pressure
- switching to manual operation

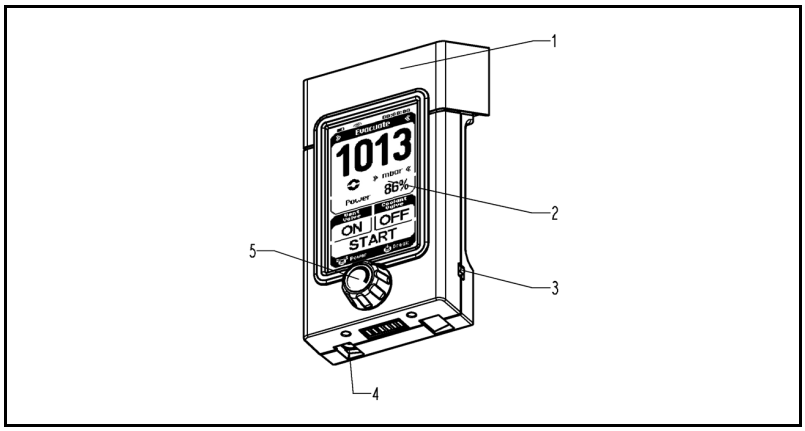


Fig. 9: Hand terminal

The vacuum pump system is operated via the hand terminal with the aid of:

- a rotary knob (Fig. 9/**5**) and
- a touchscreen (Fig. 9/**2**).

The **rotary knob** has the following functions:

- Rotate: Changes pump capacity or the selected pressure setting (depending on selected operating mode).
- Press: Interrupts the active process and switches into manual process control (pressing effects an evacuation in this case).

Touchscreen contents:

- Display of the most important process variables (Fig. 10, page 32).
- Menu for selecting operating mode and units for pressure display (Fig. 11, page 32).
- Operating buttons (Fig. 11, page 32) with the following functions:
  - Start and stop the process;
  - open and close the ventilation valve;
  - open and close the high-performance condenser's coolant valve (accessory).

Removing and replacing the hand terminal

To remove the hand terminal from the vacuum pump system: grasp the upper grip of the hand terminal (Fig. 9/**1**) and pull until it releases, and then remove it.

Replacing the hand terminal:
Insert the bottom of the terminal into the holder provided in the vacuum pump system (Fig. 2/**5**, page 13); then push firmly on the upper grip of the terminal (Fig. 9/**1**) until it clicks into place.

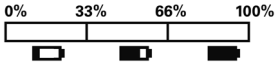
Whenever the hand terminal is located in the holder while the vacuum pump system is turned on, the batteries in the hand terminal will charge automatically. This happens irrespective of whether the hand terminal is switched on or off.

Every time you use a hand terminal, check to ensure a correct match between the terminal and the vacuum pump system. Use the paging system for this purpose (see Actuating the vacuum pump system, page 36).

Displays

1 Battery:
- Charging

- Charging status



2 Connection to vacuum pump system
- Direct connection
- Wireless connection

3 Process time

4 Actual pressure in selected pressure unit (or „No connection“, if no wireless connection to vacuum pump system)

5 Process active

6 Capacity in percent or setpoint pressure in selected pressure unit (depending on operating mode)

7 Explanation of rotary knob functions
(Rotate: change capacity; Press: interrupt operating mode and switch to manual process control)

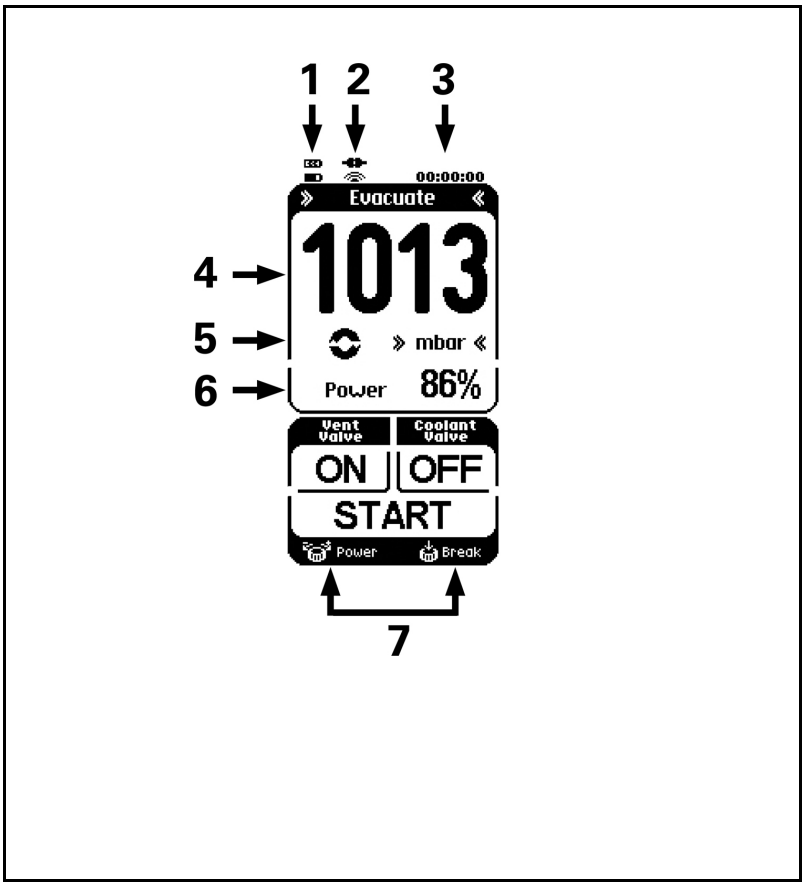


Fig. 10: Display on the touchscreen

Menus and buttons

1 Operating mode menu

2 Pressure units menu

3 Button Actuating the vacuum pump system (Paging)

4 Button for ventilation valve:
ON = To open
OFF = To close

5 Button for coolant valve (accessory) at high-performance condenser:
ON = To open
OFF = To close

6 Button for the process:
START = To start
STOP = To stop

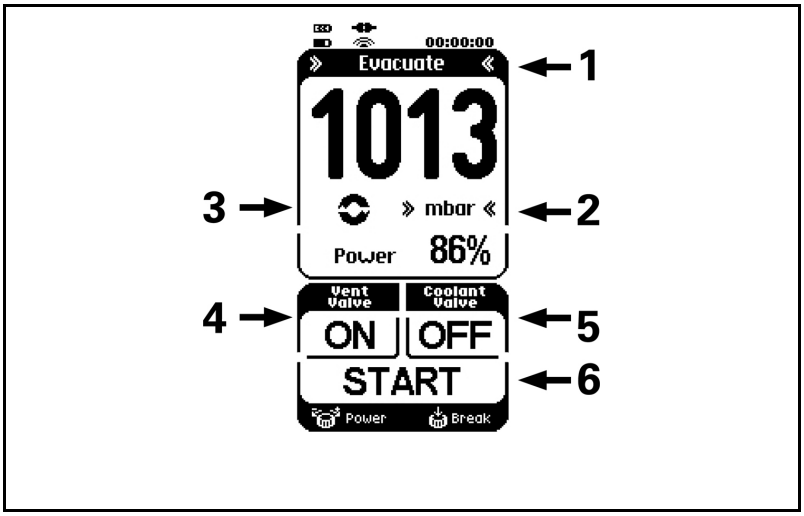


Fig. 11: Menus and buttons on the touchscreen

8.1.2. Operation

Menu language

When the start page appears after switching the hand terminal on, choose between the following languages: English, German, French, Italian, Spanish and Chinese. The selection can be made only immediately after switching on.

Pressure unit

Process pressure can be displayed on the hand terminal in mbar, bar, hPa, or Torr.

Use the Pressure units menu to select the pressure units (button on touchscreen; see Fig. 12).

Pressure units can be changed only when no process is active.

In order to change the unit of pressure, it is necessary to temporarily switch to another operating mode.

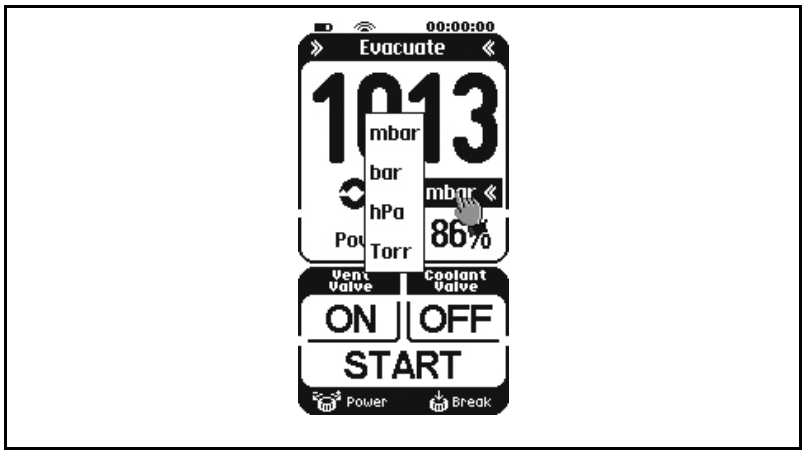


Fig. 12: Pressure units menu

Operating modes

The current operating mode is displayed at the top of the hand terminal's touchscreen. Press on this line of the touchscreen to open the menu for changing operating mode (see Fig. 13, at the top).

Operating mode can be changed only when no process is active.

Switching to manual process control (Break)

- Press briefly on the rotary knob:
  Manual process control; actual pressure will be adopted as the setpoint pressure and actively controlled.

Within the manual process control

- Press on the rotary knob:
  Vacuum pump system will evacuate.
- Let go:
  Actual pressure will be adopted as setpoint pressure.

- Rotate:
  Changes setpoint pressure.

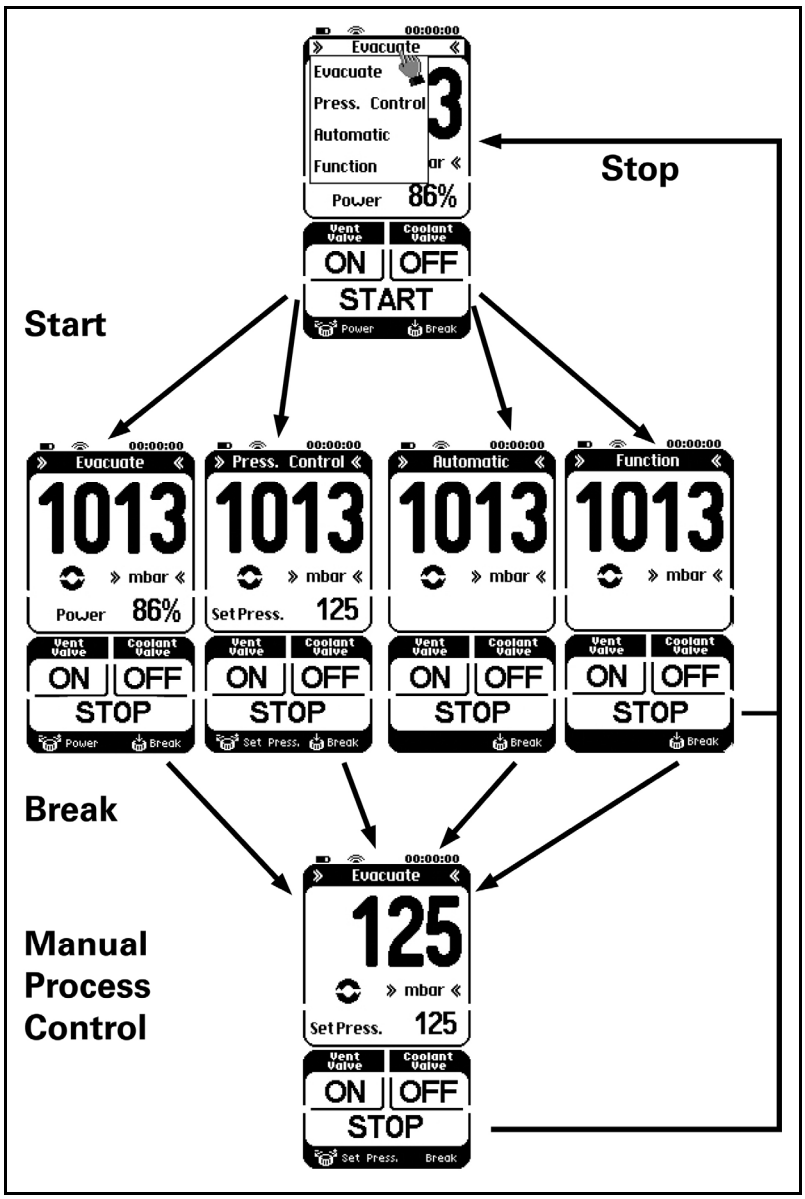


Fig. 13: Operating mode menu

Starting and stopping the process

Pressing the START button starts a process.

Pressing the STOP button stops a process.

Open and close the ventilation valve

WARNING

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

➔ Ensure that the creation of reactive, explosive or otherwise hazardous mixtures during the supply of air is prevented.

Pressing the ON button for ventilation valve (left button below) opens the ventilation valve.

Pressing the OFF button for the ventilation valve closes the ventilation valve.

Opening and closing coolant valve (accessory)

Pressing the ON button for coolant valve (right button below) opens the coolant valve on the high-performance condenser.

Pressing the OFF button for the coolant valve closes the coolant valve on the high-performance condenser.

Entering value in Evacuate operating mode

Use the rotary knob to set pump capacity.

Entering value in Pressure control operating mode

Use rotary knob to set desired pressure.

Entering value in Automatic operating mode

Not necessary to enter value.

Entering value in Function operating mode

The desired pressure curve is entered via data points that connect the vacuum pump system to pressure ramps.

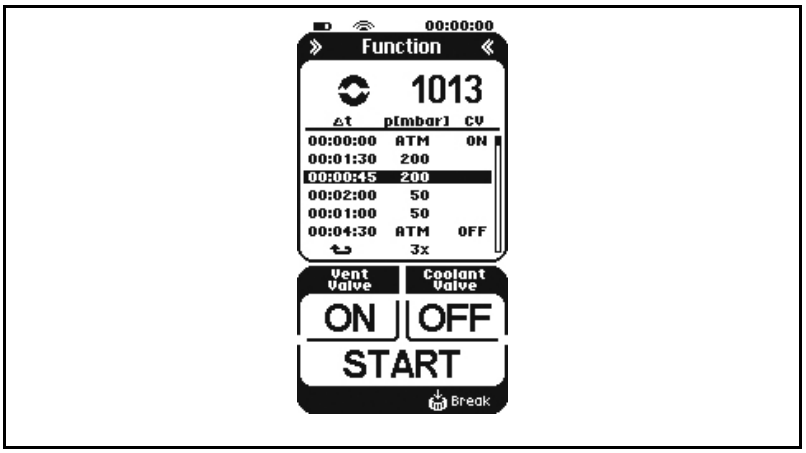


Fig. 14: Menu for Function operating mode

Entering data points (up to 12):

1. Time interval since the last data point: Δ t
2. Setpoint pressure: p (mbar) / p (bar) / p (hPa) / p (Torr)
3. Command for coolant valve (accessory):
   CV ON: to open valve; CV OFF: to close valve

Line selection (see Fig. 14):

- To change the line:
  Turn the rotary knob.
- To select a line for editing:
  Press the rotary knob.

To edit a selected line:

- To change columns:
  (e.g. from ∆ t to p (mbar):
  Press the rotary knob.
- To change an entry:
  Turn the rotary knob.

After the last column (CV), the display automatically returns to line selection and jumps to the next line.

If you are in input mode and have not entered any data within 3 seconds, the display automatically returns to line selection.

The function values of the data point table are stored in the internal memory of the vacuum pump system when the process starts, and are available again when there is a restart.

Changes to the function values (sampling point table) are carried over directly from the PC software, which may be used simultaneously.

Repeating/deleting sampling points:

The following symbols may be set in the column for the time intervals under the value 00:00:00:

- ↺ = Repetition. The desired number of repetitions can now be specified in the field for the setpoint pressure.
- **…** = Deletion of the data point.

In both cases, all subsequent sampling points are automatically deleted.

Actuating the vacuum pump system (Paging)

When you press the circle symbol for the active process (Fig. 10/**5**, page 32) in the hand terminal display, the LED next to the page button (Fig. 16, page 38) on the vacuum pump system will blink.

The other way around, the hand terminal will answer with a signal tone if you press the paging button of the vacuum pump system (see chapter 8.2, page 38).

No wireless connection

If there is no wireless connection between the hand terminal and the related vacuum pump system (for example if the vacuum pump system is not switched on or the wireless connection is being established or is interrupted):

- The message "No connection" will blink in the hand terminal's display (see Fig. 15);
- An audible warning will be emitted if a button on the touch-screen is pressed.

Refer to chapter 10, table 9 for tips on resolving this problem.

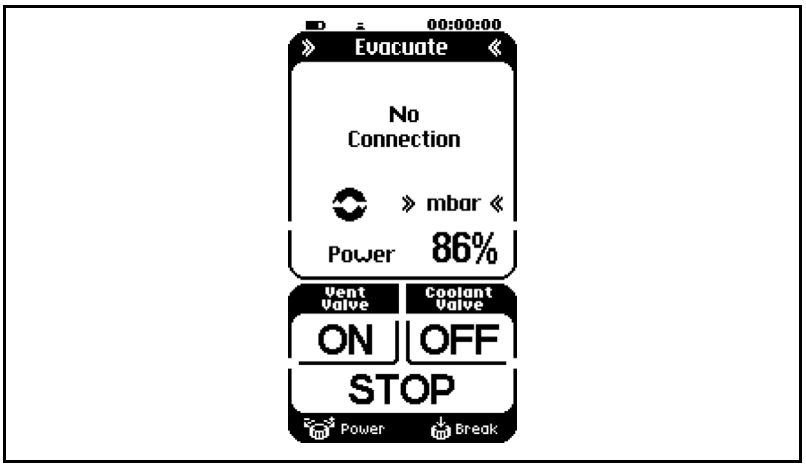


Fig. 15: Display „No connection“

8.1.3. Changing batteries on the hand terminal

Necessary tool

Qty.	Material
1	Phillips-head screwdriver No. 2

Tab. 5

1. Loosen the six screws on the underside of the hand terminal.
2. Remove the rear cover plate.
3. Replace the batteries.

i Refer to chapter 4.2, page 11, for required battery specifications.

i Never use new and used batteries together. Batteries must always be replaced all at the same time.

4. Re-install cover plate.
5. Dispose of batteries according to regulations.

8.2. Operation without hand terminal

8.2.1. SC950

The following actions can be taken directly on the vacuum pump system when the hand terminal is removed (Fig. 16):

- Stop the process;
- Open and close the ventilation valve;
- Open and close the high-performance condenser's coolant valve (accessory).
- Call the hand terminal (paging); the hand terminal will answer with a signal tone.
- Open/Close gas ballast valve via gas ballast switch (**6**)
  (also possible with put on hand terminal):
  - push once → open gas ballast valve, blue LED on
  - push again → close gas ballast valve again, blue LED off

1 Stop process button
2 To open/to close ventilation valve button
3 Call the hand terminal button (paging)
4 Button to open/to close coolant valve (accessory) on the high-performance condenser
6 Gas ballast switch

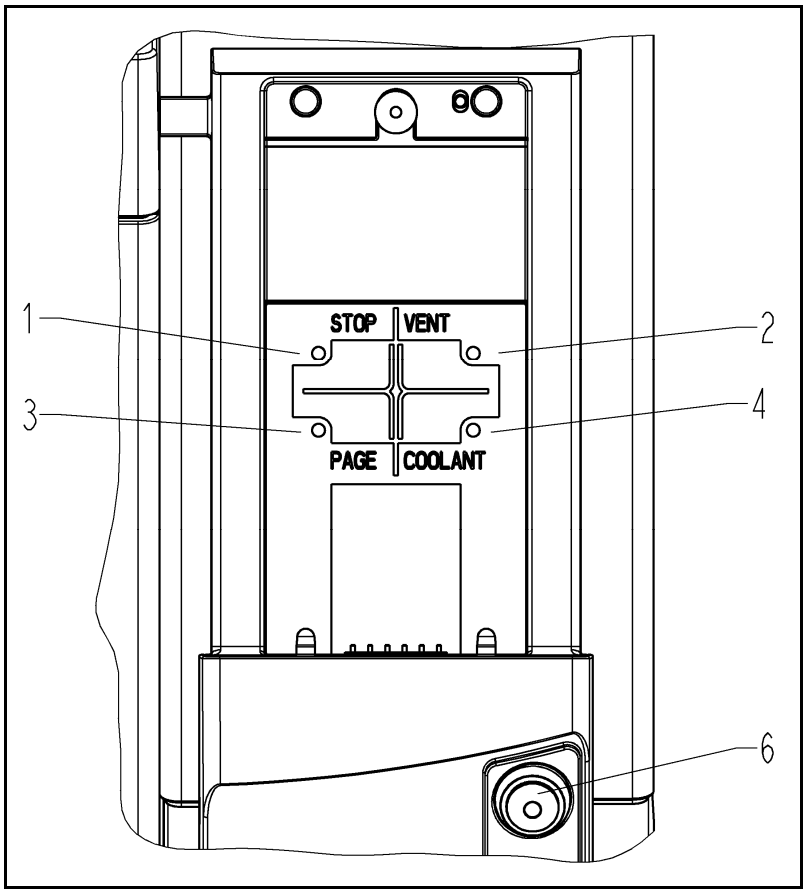


Fig. 16: Buttons on vacuum pump system SC950

8.2.2. SEM950

The following actions can be taken directly on the vacuum pump system (Fig. 17):

- Switch on/off pump (**1**)
- Open and close the ventilation valve (**2**)
- Switch units on display (**3**)
  mbar → hPa → Torr → mbar
- Open and close coolant valve (accessory) for the high-performance condenser (**4**)
- Set flow of the pump via rotary knob (**5**) (15% - 100%)
- Open/Close gas ballast valve via gas ballast switch (**6**):
  - push once → open gas ballast valve, blue LED on
  - push again → close gas ballast valve again, blue LED off

1 Button on/off pump
2 To open/to close ventilation valve button
3 Button to switch units on display
4 Button to open/to close coolant valve (accessory) on the high-performance condenser
5 Rotary knob (setting the flow)
6 Gas ballast switch

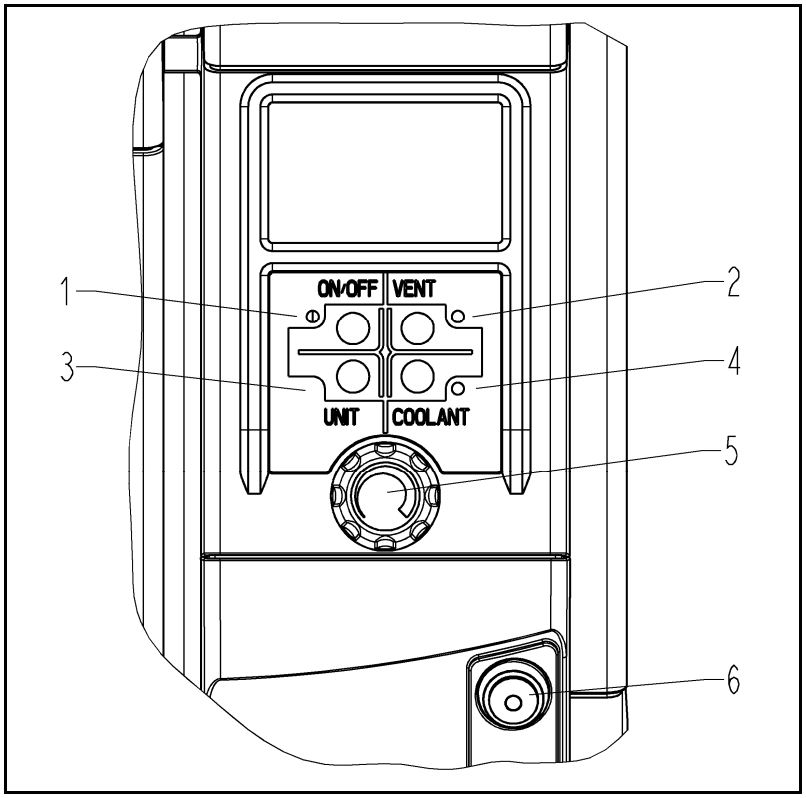


Fig. 17: Buttons on vacuum pump system SEM950

8.2.3. SH/SR950

The following actions can be taken directly on the vacuum pump systems SH950 and SR950 (Fig. 18):

- Set flow of the pump via rotary knob (**5**):

  If the rotary knob is rotated to the left until it engages the mechanical indent, the pump will rotate with a minimum flow rate of 15%.
  If the rotary knob is then rotated farther to the left (past the mechanical indent), the vacuum pump system's pump will be switched off.

- Open/Close gas ballast valve via gas ballast switch (**6**):
  - push once → open gas ballast valve, blue LED on
  - push again → close gas ballast valve again, blue LED off
- Switch off pump (i.e. also complete system) via the green rocker switch at the bottom left of the base (see Fig. 5/**9**, p. 19 and Fig. 6/**8**, p. 21).

5 Rotary knob (setting the flow)
6 Gas ballast switch

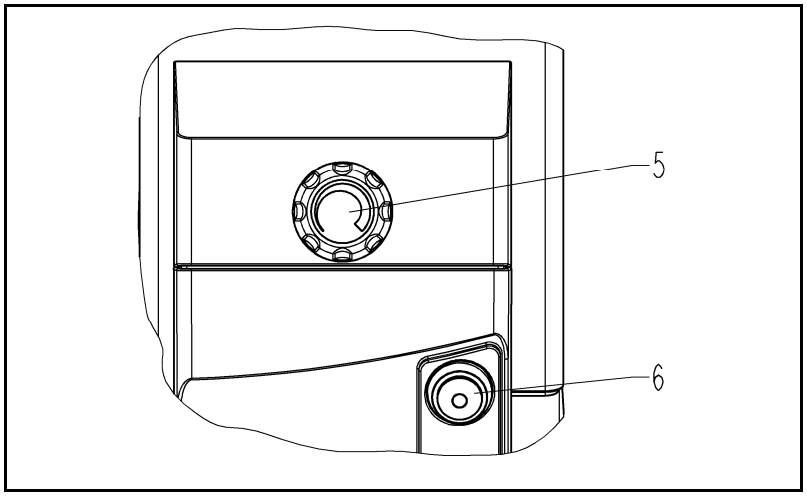


Fig. 18: Buttons on vacuum pump systems SH950 and SR950

8.3. Software

8.3.1. General functions and displays

The software included with the delivery enables you to control the vacuum pump system from a PC.

Fig. 19 displays an example of the software interface.

Menus and buttons

1 Menu bar
2 Administers user-defined functions
3 Print chart
4 Buttons to export data as Excel file or text file
5 Establish/break connection to vacuum pump system
6 Start/Stop button
7 Actual pressure display
8 Pressure units menu
9 Operating mode display
10 Operating mode menu
11 Ventilation valve button
12 Coolant valve (accessory) button
13 Setpoint pressure display[1]
14 Buttons to increase/reduce setpoint pressure[1]
15 Pump capacity slide control[2]
16 Display of pump capacity in percent[2]
17 Buttons to increase/reduce pump capacity[2]
18 Chart for actual and setpoint pressure
19 Break button for switching to manual process control

[1] not in *Function* operating mode

[2] only in *Evacuate* operating mode

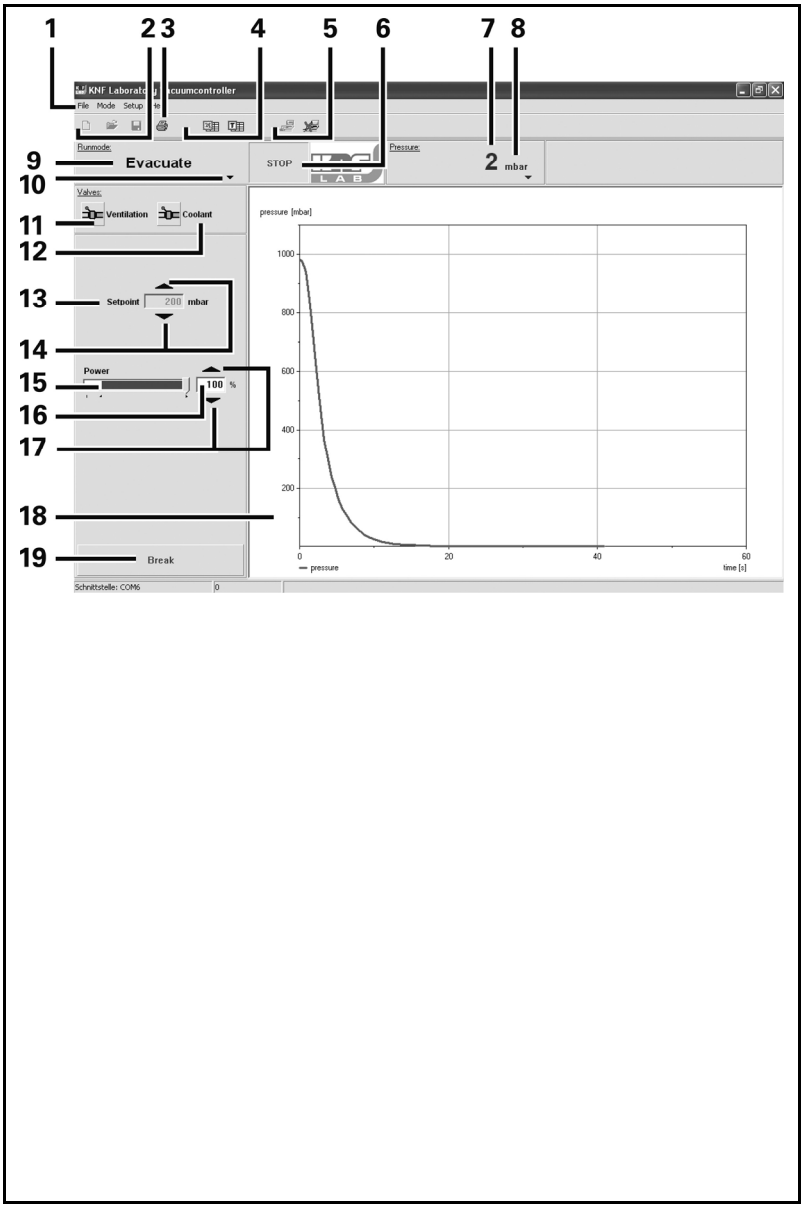


Fig. 19: Example of software interface showing Evacuate operation mode

In addition to the hand terminal options, the software contains the following options:

- Display pressure curves as chart (setpoint and actual pressure)
- Export pressure curves in Excel or text files (setpoint and actual pressure)
- Save and open entered setpoint pressure functions.

Table 6 lists menu bar options.

Menu option	*Contained functions*	*Meaning*
File	New*	Create new file for user-defined functions
	Open*	Open an existing file for user-defined functions
	Save*	Save current file
	Save as…*	Create a copy of a file for user-defined functions or save the file to a new location
	Page view	Page view
	Print	Print chart
	Export …	Export data
	Stop	Close software
Mode	Evacuate	Select Evacuate operating mode
	Pressure control	Select Pressure control operating mode
	Automatic	Select Automatic operating mode
	Function	Select Function operating mode
Settings	Language	Select menu language
	Unit of measurement	Select pressure unit
	Interface	Establish or interrupt PC connection
Help	Help	Help for operating the vacuum pump system
	About…	Information about the attached vacuum pump system

Tab. 6: Menu bar options ** only in Function operating mode*

8.3.2. Operation

Install software

Refer to chapter 4.3, page 12 for system requirements for operating the vacuum pump system from a PC.

Please read the license agreement (on CD: license_agreement.pdf) for the software carefully. By using all or any portion of the software you accept all terms and conditions of the agreement. If you do not agree, do not use the software.

1. Insert CD into PC.
2. Open CD.
3. Copy "KNFLab" folder to any location on the PC's hard drive.
4. Switch on the vacuum pump system.
5. Use the included USB cable to connect the vacuum pump system to the PC's interface.

The USB port is located on the rear of the vacuum pump system's base (see Fig. 2/**15**, page 13).
Windows will announce the presence of a new device and start the installation wizard.

➔ Use the CD-ROM drive as the source for the driver.

The installation wizard will automatically install the driver.

6. Remove the CD from the PC and store it in a safe place.
7. Start the software by double-clicking on the file "KNFLab.exe"; this file is located on the hard drive in the new folder "KNFLab". You may wish to place a shortcut to the file on your desktop.

Software functions are described under the *Help* menu entry.

Establishing and separating a connection from the PC to the vacuum pump system

The connection to the vacuum pump system is established and separated by pressing the corresponding button (see Fig. 19/**5**, page 41). If several vacuum pump systems are connected to the PC, select the desired vacuum pump system from the list.

The connection to the vacuum pump system can also be established through the toolbar "Settings → Interface → Connect". In the dialog that appears you can directly select the communication connection (if known) or click on the button "Test" to search with the software. If several vacuum pump systems are connected, select the desired vacuum pump system from the list.

Menu language

In the menu bar, choose between the following languages: English, German, French, Italian, Spanish and Chinese.

Settings → Language

Pressure units

Process pressure can be displayed in mbar, bar, hPa, or Torr.

The pressure units can be changed as follows:

- through the menu bar:
  Settings →Measurement units
- through the program:
  Pressure units menu (Fig. 19/**8**, page 41)

Pressure units can be changed only when no process is active.

Operating modes

The operating mode can be changed in two different ways:

- Menu bar: Operating mode
- Diagram: Operating mode menu (Fig. 19/**10**, page 41)

Operating mode can be changed only when no process is active.

Starting and stopping the process

➔ Press START/STOP button (Fig. 19/**6**, page 41).

Open and close the ventilation valve

WARNING

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

➔ Make sure that no reactive or explosive mixtures will be produced when ventilating the vacuum pump system through the air inlet.

➔ Press Ventilation valve button (Fig. 19/**11**, page 41).

Open and close the coolant valve (accessory)

➔ Press Coolant valve button (Fig. 19/**12**, page 41).

Entering value in Evacuate operating mode

➔ Adjust pump capacity by moving slide control (Fig. 19/**15**, page 41), button (**17**) or display (**16**).

Entering value in Pressure control operating mode

➔ Set setpoint pressure with the Increase/decrease setpoint pressure button (Fig. 19/**14**, page 41) or enter data into display (**13**) via keyboard.

i Setpoint pressure can be changed only when no process is active.

Entering value in Automatic operating mode

Not necessary to enter value.

Function operating mode

The desired pressure curve is entered via data points that connect the vacuum pump system to pressure ramps.

The following entries must be made for each data point (up to 12):

- Time interval since the last data point
- Setpoint pressure
- Coolant valve (accessory):
  - No action
  - Open (W)
  - Close (~~W~~).

The values can be entered either through the table or through the chart (Fig. 20, page 45).

Entry through the diagram:

- Insert data point:
  Right-click on the function curve and select the desired action from the menu that appears.
- Shifting data point:
  Left-click on the data point and move it as desired.

- Delete data point / specify action for coolant valve (accessory): Right-click on the point and select the desired action from the menu that appears.

The action of the coolant valve is set by double-clicking in the corresponding field of the “Cooling” column. A menu opens containing the selectable actions ON (open valve) and OFF (close valve).

Repetitions of the function are set in the first empty line below the sampling points entered. Double-clicking in the field in the “Cooling” column opens a menu containing the REPEAT option. If this is activated, the desired number of repetitions can then be entered in the field of the “p [...]” column.

In order to delete a data point, remove the corresponding entry in the dt column. The subsequent sampling points are automatically moved up in the column.

Start the user-defined function by clicking on the START button. The process will stop automatically after reaching the end of the setpoint pressure curve.

Changes to the function values (sampling point table) are adopted directly from the hand terminal.

1 Table
2 Curve
3 Break button for switching to manual process control

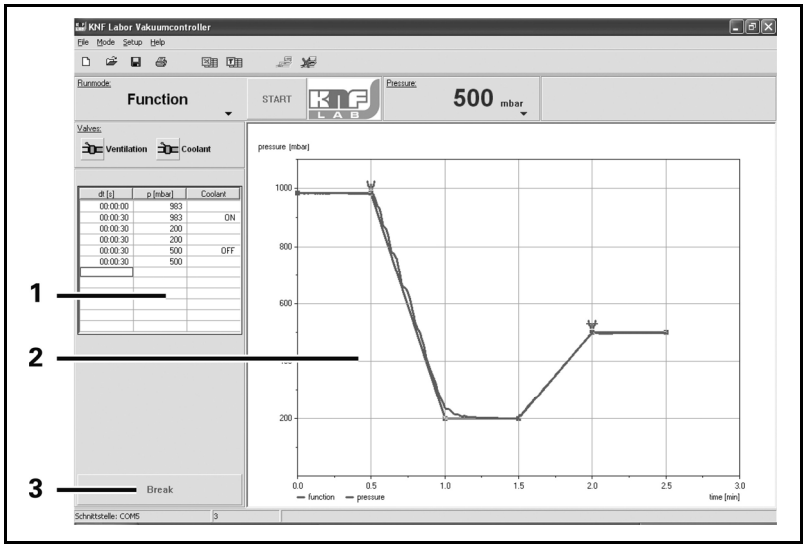


Fig. 20: Function mode

Switching to manual process control

From any operating mode, briefly press the Break button (Fig. 20/**3**) to switch to manual process control. The actual pressure will be adopted as the setpoint pressure.

You can switch to manual process control only during an active process.

Operation in manual process control

- Change setpoint pressure:
  Press Increase/reduce setpoint pressure button (Fig. 19/**14**, page 41) or enter data via keyboard into display (**13**).

- Evacuation:
  Press the break button (Fig. 19/**19**, page 41). When the button is released, the actual pressure will in turn be adopted as the setpoint pressure for the pressure regulation.
- Changing to an operating mode:

1. Press STOP button.
2. Select operating mode through the menu bar or chart (Operating mode menu (Fig. 19/**10**, page 41)).

You can switch to an operating mode only when no process is active.

9. Servicing

9.1. Servicing schedule

Component	Servicing interval
Vacuum pump system	Regular inspection for external damage or leaks
Diaphragms and valve plates	Replace when pumping capacity decreases, or sooner

Tab. 7

9.2. Cleaning

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

9.2.1. Flushing vacuum pump system

WARNING

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

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

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

Only SC/SEM950:
If inert gas is used: connect the inert gas feed to the gas inlet (Fig. 2/**18**, p. 13 or Fig. 4/**15**, p. 17) of the vacuum pump system and close the gas ballast valve. Observe the safety instructions in chapter 3.

9.2.2. Cleaning vacuum pump system

➔ Only clean vacuum pump system with a damp cloth and non-flammable cleaning agents.

9.2.3. Emptying collection flask on the suction and pressure sides

Suction side

1. Grasp the collection flask (Fig. 2/**9**, p. 13 or Fig. 4/**7**, p. 17, Fig. 5/**7**, p. 19 and Fig. 6/**6**, p. 21) and simultaneously remove attachment clamp **7** (or **5**, **5** and **4**); pull out collection flask.
2. Dispose of contents in collection flask according to local regulations. Then rinse out collection flask.
3. Reattach collection flask.

Pressure side

1. Grasp the collection flask (Fig. 2/**8**, p. 13 or Fig. 4/**6**, p. 17, Fig. 5/**6**, p. 19 and Fig. 6/**5**,p. 21) and simultaneously remove attachment clamp **7** (or **5**, **5** and **4**); pull out collection flask.
2. Dispose of contents in collection flask according to local regulations. Then rinse out collection flask.
3. Reattach collection flask.

9.3. Replacing diaphragms and valve plates

Conditions

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

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 2
1	3-mm hexagon screwdriver
1	2.5-mm hexagon screwdriver
1	Open end wrench 7 mm
1	Service Set (see chapter 11, page 62)
1	Pencil

Tab. 8

Information on procedure

➔ Always replace diaphragms and valve plates together to maintain the pump performance.

WARNING

Health hazard due to dangerous substances in the vacuum pump system and pump!

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

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

➔ Flush vacuum pump system before replacing the diaphragms and valve plates (see chapter 9.2.1, page 47).

CAUTION

Danger of burns from hot pump parts

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

➔ Allow the pump to cool off after operation.

9.3.1. Removing the pump

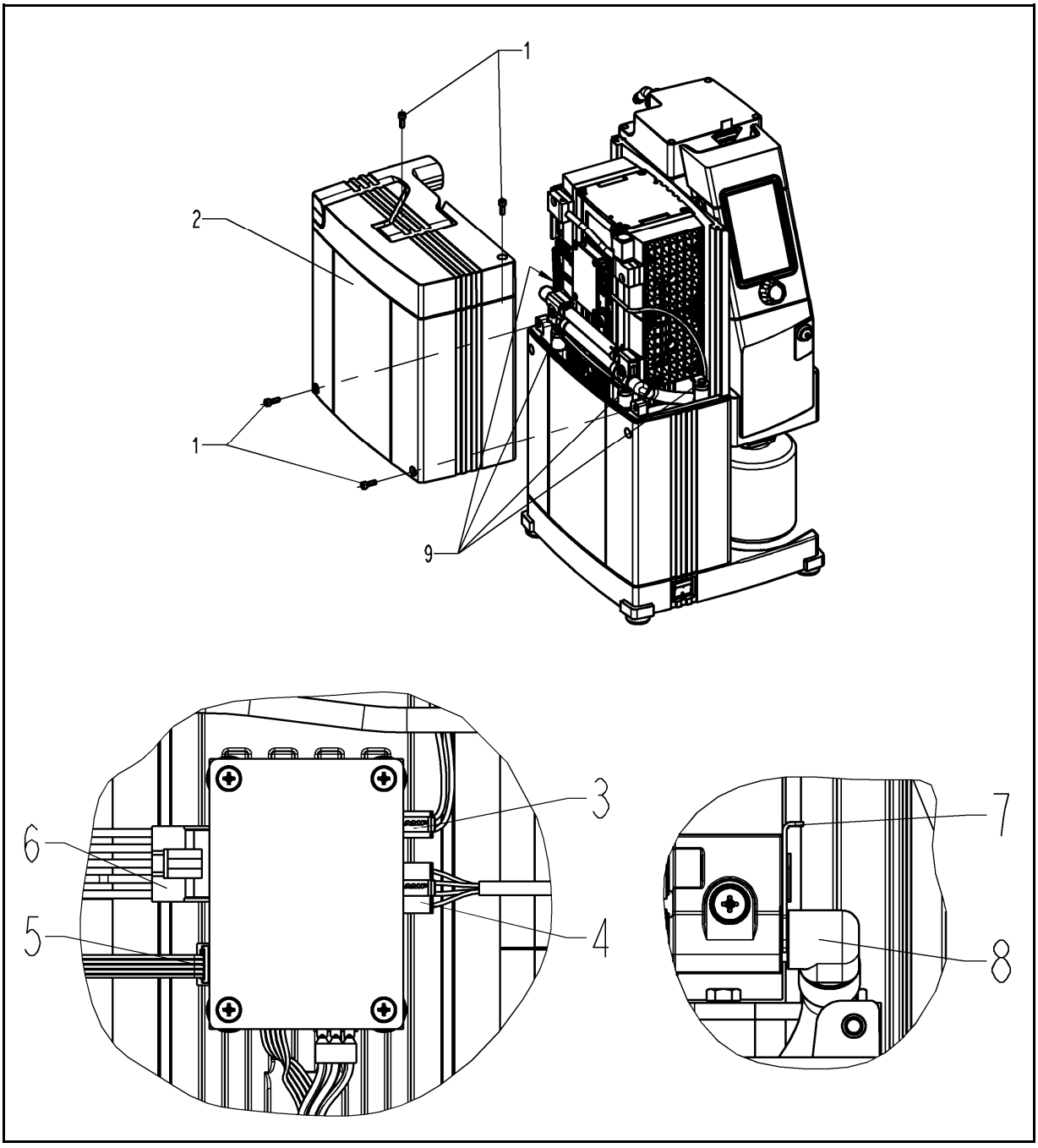


Fig. 21: Accessing the pump in the SC950 vacuum pump system

1 4x attachment screws (grip assembly)
2 1x grip assembly
3 1x plug for gas ballast valve
4 1x plug for pressure switch
5 1x plug for resonance sensors
6 1x plug for voltage supply
7 2x spring steel clips
8 2x head connection fittings
9 4x attachment screws (pump)

1. Loosen the four attachments screws (Fig. 21/**1**) and remove the grip assembly (**2**).

In order to remove the grip assembly, you must first lift it approximately 5 mm and then pull it away laterally over the pump.

2. Loosen plugs **3**, **4**, **5** and **6** at the pump's electrical connection.
3. Loosen the suction-side and pressure-side head connections from the pump:
   To do this, first pull the two spring steel clips (**7**) from the head connection fittings (**8**), then pull the two head connection fittings out of the connection blocks.
4. Replace the O-rings (ø10 x 1.8) in the two connection fittings (**8**) and properly dispose of the old O-rings.
5. Loosen the four attachment screws (**9**) and remove the pump.

9.3.2. Overview of pump parts

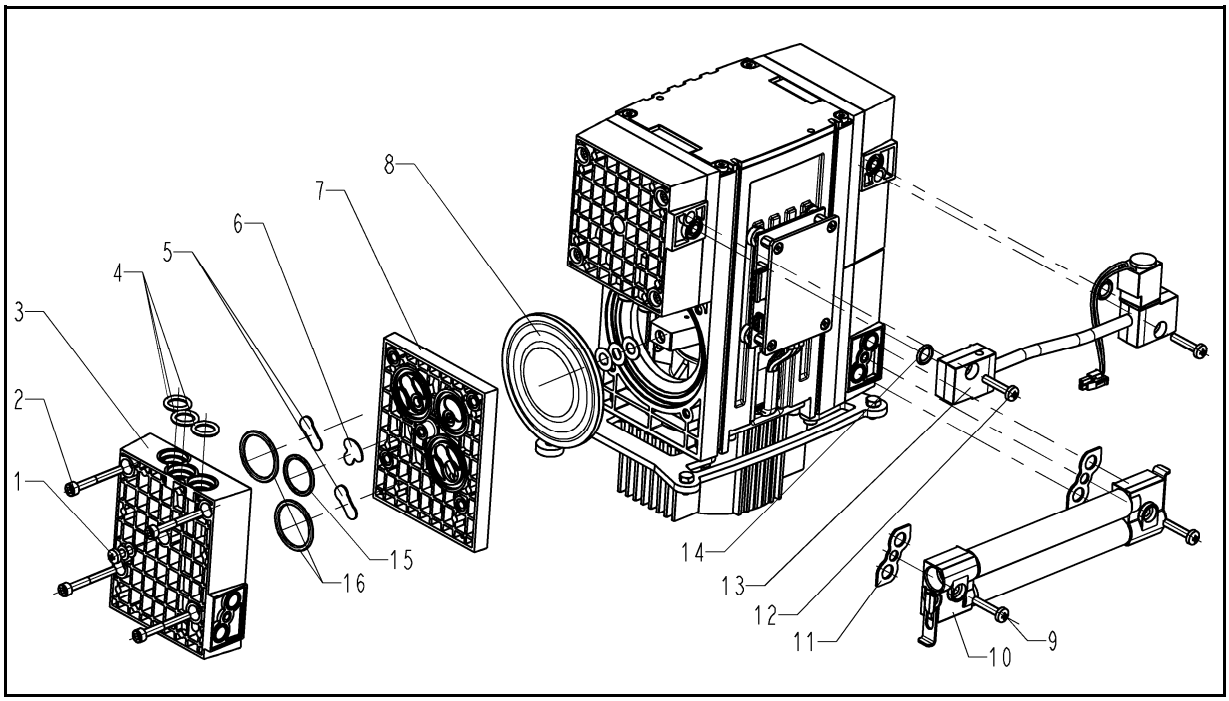


Fig. 22: Exploded drawing of pump SC950

1 4x head screws
2 16x attachment screws (head)
3 4x head plates
4 6x O-ring (ø10 x 2.5)
5 8x valve plates
6 6x valve plates
7 4x intermediate plates
8 4x diaphragms
9 2x attachment screws (connection .1.2)
10 2x connection blocks .1.2
11 2x flat seals
12 2x attachment screws (connection .50)
13 2x connection blocks .50
14 2x O-rings (ø7.65 x 1.78)
15 6x O-rings (ø18.77 x 1.78)
16 8x O-rings (ø24 x 2)

9.3.3. Disassembling head connection

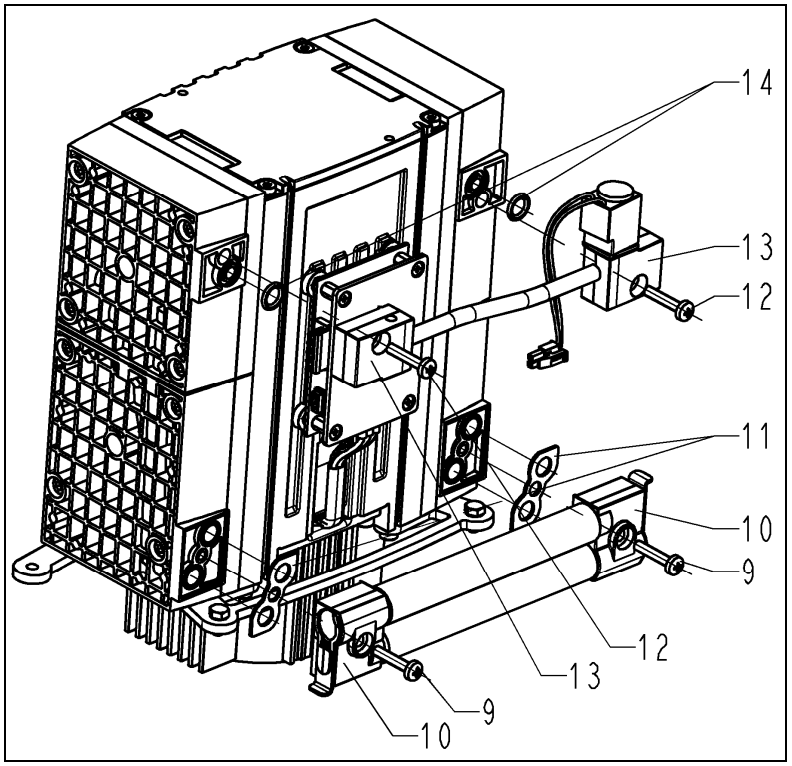


Fig. 23: Disassembling the head connections

1. Remove the head connections' (**10**) and (**13**) attachment screws (Fig. 23/**9**) and (**12**) and remove the head connections.
2. Remove O-rings (**14**) and flat seals (**11**).

9.3.4. Disassembling pump heads

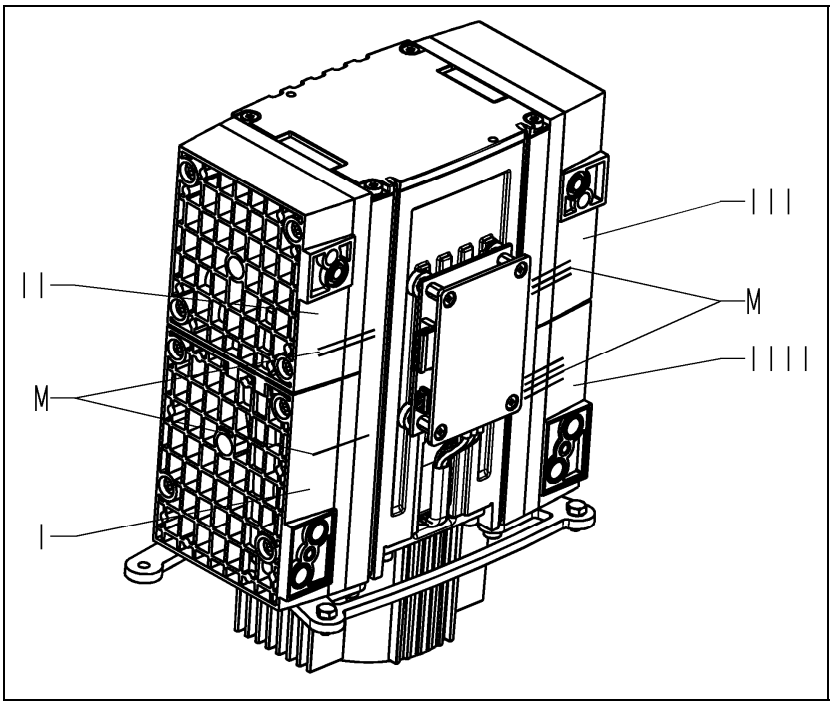


Fig. 24: Marking the pump

3. Head 1 (Fig. 24/**I**):

   Use a lead pencil (**M**) to apply a single mark across the head plate, intermediate plate, and compressor housing.

4. Head 2 (Fig. 24/**II**):

   Use a lead pencil (**M**) to apply two marks across the head plate, intermediate plate, and compressor housing.

5. Head 3 (Fig. 24/**III**):

   Use a lead pencil (**M**) to apply three marks across the head plate, intermediate plate, and compressor housing.

6. Head 4 (Fig. 24/**IIII**):

   Use a lead pencil (**M**) to apply four marks across the head plate, intermediate plate, and compressor housing.

i During re-assembly, refer to the marks on the individual heads to ensure that the parts are properly re-assembled.

7. Loosen the 16 attachment screws (Fig. 22/**2**) on the heads (**1** to **4**) and remove the heads (**1** and **2** as well as **3** and **4**).

8. Pull apart heads 1 (Fig. 25/**I**) and 2 (**II**) and heads 3 (**III**) and 4 (**IIII**) and remove O-rings (**4**).

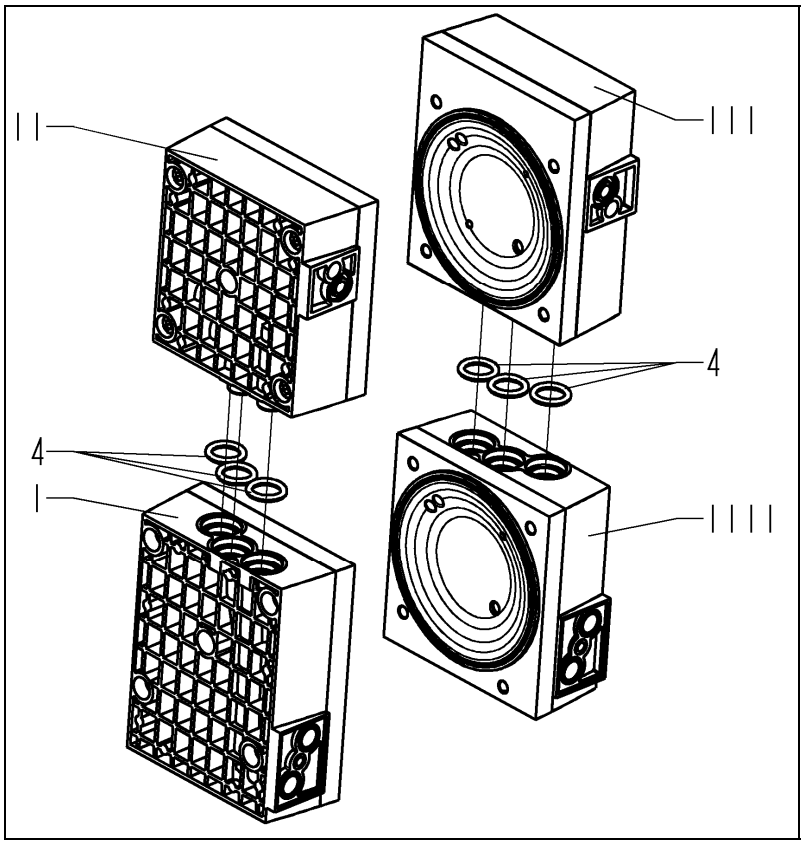


Fig. 25: Removing the O-rings

9. On all four heads, loosen the head screw (Fig. 26/**1**) in the head plate (**3**) and remove the head plate from the intermediate plate (**7**).

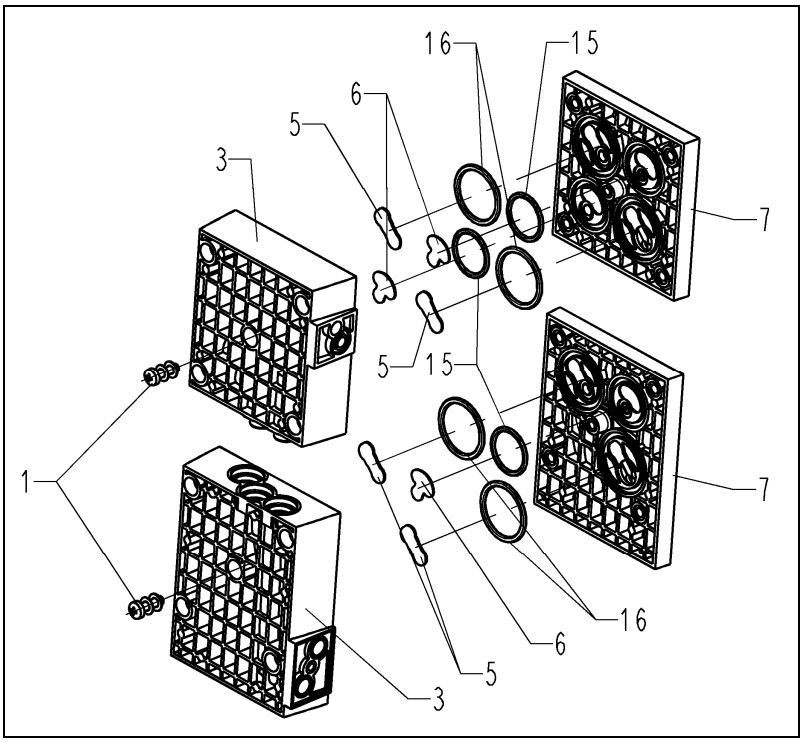


Fig. 26: Exploded drawing of pump heads 1 and 2

9.3.5. Replacing the diaphragms and valve plates

1. Manually remove the four diaphragms (Fig. 27/**8**) by turning them in the counterclockwise direction.

i Use caution to prevent the shim rings (**17**) located between the diaphragm and the connecting rod from falling into the pump housing. The shim rings (**17**) must be installed in the same quantity as before in order to ensure the pump's pneumatic performance.

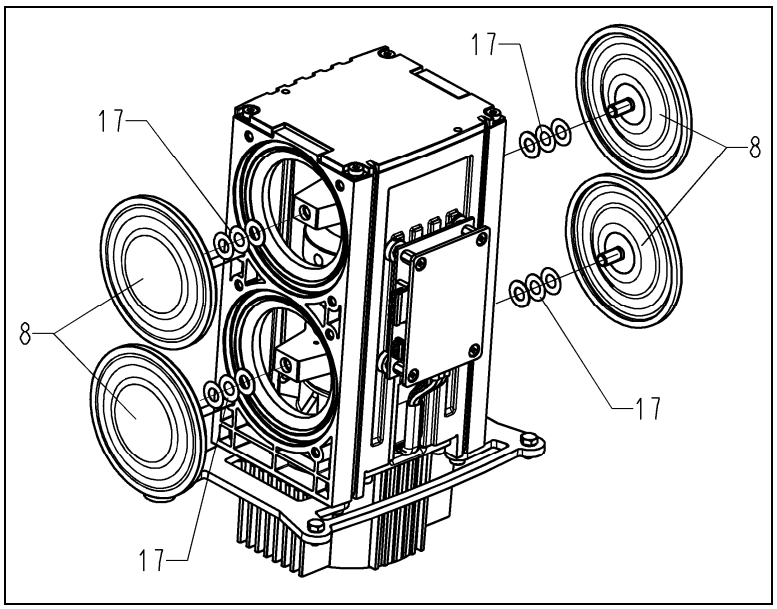


Fig. 27: Replacing the diaphragm

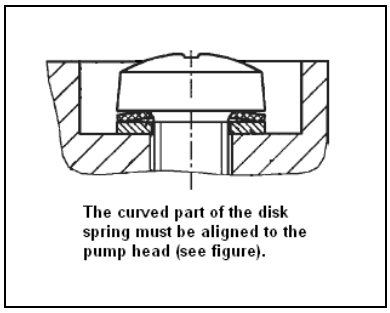


Fig. 28: Aligning the disk spring

2. Remove from the intermediate plates (Fig. 26/**7**) the valve plates (**5**) and **(6)** as well as the O-rings (**15**) and (**16**).
3. Manually screw the new diaphragms (Fig. 27/**8**) into the connecting rods' threads and tighten to hand tightness.

i Before you fully tighten the diaphragms, you are recommended to move the diaphragm to the peak position (before it reverses).

4. Insert the new valve plates (Fig. 26/**5**) and **(6)** and the new O-rings (**15**) and (**16**) into the intermediate plates (**7**).

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

i The black O-rings (**15**) and (**16**) must be placed into the intermediate plate of head 4 (see Fig. 25)!

5. Place head plate (Fig. 26/**3**) onto the intermediate plates (7**),** observing the pencil marks (Fig. 24/**M).**
6. Carefully tighten the head screw of each head plate (Fig. 26/**1**). Use light force and tighten only to hand-tightness**.**

i Refer to Fig. 28 for arrangement and alignment of disk springs and the screw's washer.

9.3.6. Assembling heads and head connection

1. Place three O-rings (Fig. 25/**4**) into each of the head connection holes.

i The three black O-rings (**4**) must be placed into the connection holes between head 3 and head 4!

2. Press together heads 1 and 2 (Fig. 24/**I** and **II**) and heads 3 and 4 (**III** and **IIII**).
3. Place heads 1 and 2 and heads 3 and 4 onto the compressor housing; alternately tighten attachment screws (Fig. 22/**2**) to hand-tightness.
4. Insert O-rings (Fig. 24/**14**) and flat seals (**11**) into the grooves or depressions in the head plates.
5. Reinstall the head connections:
   To do this, manually tighten the head connections' attachment screws to hand-tightness.
   (Fig. 23/**9** and **12**).

i Before assembling the head connections, make sure that the two front attachment screws (Fig. 21/**9**) are inserted into the foot plate. This is required in order to later re-fasten the pump in the vacuum pump system.

6. Properly dispose of the old diaphragms, valve plates, and O-rings.

9.3.7. Final steps

10. Place the pump back into the vacuum pump system and tighten the four attachment screws (Fig. 21/**9**) to hand-tightness.
11. Install the suction-side and pressure-side head connections back onto the pump:
    To do this, first insert the two head connection fittings (**8**) into the connection blocks and then fasten them with the two spring steel clips (**7**).
12. Put plugs **3**, **4**, **5** and **6** back onto the pump's electrical connection.
13. Put the grip assembly (**2**) back onto the vacuum pump system and tighten the four attachment screws (**1**) to hand-tightness.
14. Reconnect suction and pressure lines to the vacuum pump system.
7. Reconnect the vacuum pump system to the mains power.

If you have any questions about servicing, call your KNF technical adviser (see last page for contact telephone number).

10. Troubleshooting

DANGER

Extreme danger from electrical shock!

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

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

- Vacuum pump system as a whole: see table 9.
- Only SC950:
  Hand terminal: see table 10.
- Only SC950:
  Software operation: see table 11.

Vacuum pump system as a whole		
Problem	**Cause**	**Solution**
Vacuum pump system is switched on, but the mains switch does not light up.	Mains cable not plugged in.	➔ Plug the mains cable for the vacuum pump system into a properly grounded power socket.
	No current in electricity network.	➔ Check the electricity supply.
	Vacuum pump system fuses blown.	1. Find and eliminate the cause of the overload. 2. Replace the mains fuse(s) of the vacuum pump system: ▪ Push the locking clip on the fuse drawer down (Fig. 2/**17**, p. 13 or Fig. 4/**14**, p. 17, Fig. 5/**13**, p. 19 and Fig. 6/**12**, p. 21) and pull the drawer out. ▪ Replace the defective fuse(s) (for fuse specifications see chapter 4.1, page 9f; for fuse order numbers see chapter 11, p. 62). ▪ Push the fuse drawer back in until it clicks into position.
Required vacuum not generated even though pump is running.	Leaks in vacuum chamber.	1. Run a test by closing the gas inlet (Fig. 2/**19**, p. 13 or Fig. 4/**16**, p. 17, Fig. 5/**14**, p. 19 and Fig. 6/**13**, p. 21). If the pump reaches the required vacuum, this confirms the presence of leaks in the vacuum chamber. 2. Eliminate leaks in the vacuum chamber.
	O-ring is not sitting correctly in the slot on the suction side of the collection flask.	➔ Adjust O-ring. ➔ Replace if defective (for order number for O-ring, see chapter 11, p. 62).

Vacuum pump system as a whole		
Problem	**Cause**	**Solution**
	Leaks in hose connection.	➔ Check hoses are sitting correctly on hose nipples. ➔ Replace any leaky hoses. ➔ Replace any damaged hose nipples. ➔ For ordering numbers see chapter 11, page 62.
	Only SC/SEM950: Leaks in venting valve.	➔ Temporarily close the ventilation connection (Fig. 2/**18**, p. 13 or Fig. 4/**15**, p. 17). If this stops the leak, leaks are present in the venting valve. In this case: ➔ Flush the venting valve: 1. Close the gas inlet (Fig. 2/**19** or Fig. 4/**16**). 2. If necessary for safety reasons: Connect inert gas to ventilation connection. Observe the safety instructions in chapter 3. 3. Run the vacuum pump system (SC950 in *evacuation* mode) at 100% pump capacity. 4. Re-open the gas inlet. ➔ If problem persists, contact KNF Service.
	Condensation in pump head.	➔ Open gas ballast and flush pump heads ➔ Dry system with fresh air or, if necessary for safety reasons, with an inert gas: 1. Using inert gas: Connect inert gas source with gas inlet (Fig. 2/**19**, p. 13 or Fig. 4/**16**, p. 17, Fig. 5/**14**, p. 19 and Fig. 6/**13**, p. 21) and start system up in *evacuation* mode (100% capacity). Observe the safety instructions in chapter 3. 2. Using air: Open gas line (Fig. 2/**19**, p. 13 or Fig. 4/**16**, p. 17, Fig. 5/**14**, p. 19 and Fig. 6/**13**, p. 21) to the surrounding environment and start system up in *evacuation* mode (100% capacity). 3. Close the gas inlet after 30 seconds, and leave the vacuum pump system running for 30 seconds under vacuum. 4. Repeat this process 3–5 times. ➔ If this problem occurs frequently, place the vacuum pump system at a higher level than the vacuum chamber.

Vacuum pump system as a whole		
Problem	**Cause**	**Solution**
	Only SC/SEM/SH950: Gas outlet blocked on high-performance condenser.	Risk of bursting of high-performance condenser! ➔ Eliminate blocking of gas outlet.
	Worn diaphragms or valve plates.	➔ Replace diaphragms and valve plates (chapter 9.3).
	Replaced diaphragms and valve plates.	➔ Check that the correct diaphragm spacers are placed under the diaphragms. ➔ If necessary, carefully tighten the pump head fixing screws (Fig. 22/**2**, p. 51) in diagonally opposite sequence.
	Gas ballast still open	➔ Close gas ballast
Pump not activated on process start-up, in spite of pressure decrease command.	Only SC950: Hand terminal or software not connected to vacuum pump system.	➔ Make connection.
	Overcurrent protection of vacuum pump system has been activated.	➔ Reset by switching the vacuum pump system off and back on. ➔ Check that there is no object blocking the vacuum pump system fans (Fig. 2/**12** and **13**, p. 13 or Fig. 4/**10** and **11**, p. 17, Fig. 5/**10** and **11**, p. 19 and Fig. 6/**9** and **10**, p. 21) and make sure that adequate supply and removal of cool air is provided. ➔ Find and eliminate any other cause of pump overload.

Tab. 9

Only SC950:

Hand terminal		
Problem	**Cause**	**Solution**
Hand terminal cannot be removed from vacuum pump system.	Transport fastener has not been removed.	➔ Remove transport fastener (see chapter 6.1).
Hand terminal display fails to light up.	Hand terminal not switched on.	➔ Switch hand terminal on.
	Batteries of hand terminal have run down.	➔ Charge batteries by placing the terminal in the holder provided on the vacuum pump system, with the system switched on. ➔ Alternatively, operate the terminal via the power supply.
The hand terminal display keeps showing "No connection"; if a button of the touch-screen is actuated a signal tone sounds.	Vacuum pump system is switched off.	➔ Switch the vacuum pump system on at the mains switch. The mains switch should light up.
	The hand terminal is designed for use with a different SC950 vacuum pump system.	➔ Use the page function (see Actuating the vacuum pump system, p. 36) to check whether the right hand terminal is being used.

Hand terminal		
Problem	**Cause**	**Solution**
	Problem with wireless connection.	➔ Check whether the hand terminal is being operated outside the wireless connection range. ➔ Check that the wireless connection is not obstructed by any electrical devices or metal objects. ➔ Otherwise, to confirm that the problem lies in the wireless connection, place the hand terminal in the holder provided on the vacuum pump system.
	Defective wireless module.	➔ Contact KNF Service.
Vacuum pump system does not respond to commands input at the hand terminal after removal from the system, even though the "No connection " is no longer lit up and a pressure is displayed.	The hand terminal is designed for use with a different SC950 system, which is currently in operation.	➔ Use the page function (see Actuating the vacuum pump system, p. 36) to check whether the right hand terminal is being used.
Acoustic alarm sounds on hand terminal.	Batteries low.	➔ Charge batteries by placing the terminal in the holder provided on the vacuum pump system, with the system switched on. ➔ Alternatively, operate the terminal via the power supply.
Marked decrease in operating time for the hand terminal in wireless mode.	Batteries have reached limit of their useful life.	➔ Change batteries (see chapter 8.1.3, p. 37).
Vacuum pump system cannot be activated, even with the hand terminal placed in the holder provided.	Soiled contacts on the bottom of the hand terminal or in the holder for the terminal on the vacuum pump system.	➔ Clean contacts.
Pressure display shows implausible values.	Unit of pressure for display has been changed.	➔ Set desired unit of pressure.
	Leaks in system.	➔ See Tab. 9, "Required vacuum not generated even though pump is running”.
	Recalibration of pressure sensor required.	➔ Contact KNF Service.

Tab. 10

Only SC950:

Software operation		
Problem	**Cause**	**Solution**
PC software unable to connect to vacuum pump system.	Vacuum pump system not switched on.	➔ Switch vacuum pump system on.
	USB connection between system and PC is not operating correctly.	➔ Check correct connection of USB cable. If necessary, pull out the USB cable and reinsert (USB interface reset).
Pressure display shows implausible values.	Unit of pressure for display has been changed.	➔ Set desired unit of pressure.
	Leaks in system.	➔ See Tab. 9, "Required vacuum not generated even though pump is running”.
	Recalibration of pressure sensor required.	➔ Contact KNF Service.

Tab. 11

Fault cannot be rectified

If you are unable to identify the cause of the problem, please send the vacuum pump system to KNF Customer Service (see last page for the address).

1. Flush the vacuum pump system to free the pump head, tubing and glas vessels of dangerous or aggressive gases (see chapter 9.2.1, page 47).
2. Clean the vacuum pump system (see chapter 9.2.2, page 47).
3. Send the vacuum pump system to KNF customer services along with the completed decontamination declaration (see chapter 12, page 64). Please indicate the medium that the vacuum pump system is used to transfer.

11. Spare parts and accessories

11.1. Spare parts

Spare parts Pump

A spare parts kit contains all parts needed for complete overhaul of the pump head:

- 4x diaphragms
- 8x valve plates
- 6x valve plates
- 2x flat seals
- 8x O-rings (ø 24 x 2)
  - 6 x green
  - 2 x black
- 6x O-rings (ø 18.77 x 1.78)
  - 5 x green
  - 1 x black
- 6x O-rings (ø 10 x 2.5)
  - 3 x green
  - 3 x black
- 2x O-rings (ø 7.65 x 1.78), green
- 2x O-rings (ø 10 x 1.8), black

Spare parts kit for system type	Order-No.
SC/SEM/SH/SR950	126111

Tab. 12

Other spare parts

Spare part	Order-No.
Battery set for hand terminal (see chapter 8.1.3, page 37)	117427
Power supply for hand terminal	125524
USB cable	117428
Mains cable D	026363
Mains cable CH	027523
Mains cable GB	029866
Mains cable USA/JP	027524
Spare parts kit tubes SC950	126331
Spare parts kit tubes SEM950	126332
Spare parts kit tubes SH950	126333
Spare parts kit tubes SR950	126334
Hose nipple gas inlet (ID 10)	124548
Only SC/SEM950: Hose nipple ventilating (ID 4)	057594
Only SC/SEM/SH950: Hose nipple gas outlet for high performance condenser: gas connection (ID 10)	026237
Only SC/SEM/SH950: Hose nipple for high performance condenser: coolant connection (ID 8)	025981
O-ring adapter on collection flask	047744
Collection flask 500 ml (coated)	121415
Flask clamp	025968
Fuse T 2.5	027575

Tab. 13

11.2. Accessories

Accessory	Order-No.
Coolant valve	117121
Color sticker for indicating correct match between hand terminal and vacuum pump system*	117433
Chemical-resistant protective film for hand terminal display	117407
Contact cover set (SC950 only)**	126335

** For situations in which several SC950 vacuum pump systems are operated within the wireless connection range.*
*** The contact cover is used to protect the hand terminal contacts from contamination when the hand terminal is taken off.*
Tab. 14

12. Decontamination Declaration

The condition for the repair of a the vacuum pump system by KNF is the certification of the customer on the transferred media and on the cleaning of the vacuum pump system (decontamination declaration).

➔ Copy this page.

➔ Enter the vacuum pump system model, the Serial No. and the transferred media in the form below and sent the signed form together with the flushed and cleaned vacuum pump system to KNF Customer Service (see last page for the address).

Customer decontamination declaration for repair order

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

Vacuum pump system model	
Serial No.	
Fed media	

The vacuum pump system does not contain aggressive, biological, radioactive, poisonous nor other dangerous media.

Company Date/Signature

13. Annex: Interface protocol

The USB connection between the PC and vacuum pump system is operated as an RS-232 interface. Accordingly, in the operating system it is managed as an additional COM connection and can be addressed with conventional terminal software. Special configuration of baud rate, etc. is not required.

Tables 13 to 16 contain the necessary command sets, shown as ASCII characters. When transmitting, the commands must be followed by ASCII character <CR> (carriage return, decimal value 013). The underlined expressions are not characters, but symbols as explained in table 16. Spaces are ignored by the controller.

Parameter	Command	Function	Reply
Ventilation valve	dV 1	open	S ; E
	dV 0	closed	S ; E
Coolant valve	dW 1	open	S ; E
	dW 0	closed	S ; E
Process	dB	Start	S ; E
	dE	Stop	S ; E
Setpoint pressure	cC ps	Set value [*]	ps ; E
Capacity	cS P	Set value [%]	P ; E
Operating mode	cM n	Evacuate	M ; E
	cM r	Pressure control	M ; E
	cM a	Automatic	M ; E
	cM f	Function	M ; E
Pressure units	cUp 0	mbar	U ; E
	cUp 1	bar	U ; E
	cUp 2	hPa	U ; E
	cUp 3	Torr	U ; E
Data point of function table	cFd i	Delete	i ; E
	cFc i	Delete from here	i ; E
	cFs i ; Δt ; ps ; K	Set values [- ; s ; * ; -]	i ; E

Tab. 15: Control commands ** currently selected pressure unit*

Parameter	Command	Reply
Ventilation valve	gV	V
Coolant valve	gW	W
Process [s ; * ; * ; %]	pP	t ; pi ; ps ; P; S
Operating mode	gM	M ; E
Pressure unit	gUp	U ; 0 ; 0
Data point	gFv i	i ; Δt ; ps ; K; E

Tab. 16: Read commands **currently selected pressure unit*

An active process is identified by Process time ≠ 0.

Symbol	Interpretation	Meaning
V	Ventilation valve	0 closed
		1 open
W	Coolant valve	0 closed
		1 open
ps	Setpoint pressure	Value [*]
pi	Actual pressure	Value [*]
P	Pump capacity	Value [%]
t	Process time	Value [s]
M	Operating mode	0 pump out
		1 pressure control
		2 automatic
		3 function
U	Pressure units	0 mbar
		1 bar
		2 hPa
		3 Torr
E	Announcement of completion	0 command cannot be completed
		1 command completed
		? command unclear
i	Line index	0…11
Δt	Length of time from previous data point	Value [s]
K	Acting cooling	1 OPEN
		2 CLOSED
		10 REPEAT
		Other value = none
S	Status message	For service only

Tab. 17: Symbols **currently selected pressure unit*

The symbols represent the ASCII codes of sequences of digits any length. The floating decimal point is shown as a period. The controller rounds input values where applicable.

Parameter	Set	Read
Ventilation valve [0/1]	dV _	gV
Coolant valve [0/1]	dW _	gW
Process time [s]	dB / dE	pP (1.Wert)
Actual pressure [*]	-	pP (2.Wert)
Setpoint pressure [*]	cC _____	pP (3.Wert)
Capacity [%]	cS _____	pP (4.Wert)
Operating mode [n/r/a/f]	cM _	gM
Pressure units [0/1/2/3]	cUp _	gUp
Data point	cFs i ; Δt ; ps ; K	gFv i

Tab. 18: Overview **currently selected pressure unit*

KNF worldwide

Benelux
Netherlands
KNF Verder B.V.
Utrechtseweg 4a
NL-3451 GG Vleuten
Tel. 0031 (0)30 677 92 40
Fax 0031 (0)30 677 92 47
E-mail: info@knf-verder.nl
www.knf-verder.nl

Benelux
Belgium, Luxembourg
KNF Verder N.V.
Kontichsesteenweg 17
B-2630 Aartselaar
Tel. 0032 (0)3 8719624
Fax 0032 (0)3 8719628
E-mail: info@knf.be
www.knf.be

China
KNF Neuberger Trading
(Shanghai) Co., Ltd
No. 36 Lane 1000
Zhang Heng Road
Shanghai 201203, P.R. China
Tel. 0086 (0)21 685 965 66
Fax 0086 (0)21 339 006 26
E-mail: info@knf.com.cn
www.knf.com.cn

Germany
KNF Neuberger GmbH
Alter Weg 3 D-79112 Freiburg
Tel. 0049 (0)7664 5909-0
Fax 0049 (0)7664 5909-99
E-mail: info@knf.de
www.knf.de

France, Morocco, Algeria
KNF Neuberger
4, Bld. d'Alsace Z.I.
F-68128 Village-Neuf
Tel. 0033 (0)389 70 35 00
Fax 0033 (0)389 69 92 52
E-mail: info@knf.fr
www.knf.fr

Great Britain
KNF Neuberger U.K. Ltd.
Avenue 2
Station Lane
Industrial Estate
Witney Oxon OX28 4FA
Tel. 0044 (0)1993 77 83 73
Fax 0044 (0)1993 77 51 48
E-mail: info@knf.co.uk
www.knf.co.uk

India
KNF Pumps + Systems (India) Pvt. Ltd.
RAJIV GANDHI INFOTECH PARK
Phase 1
Ganga Estate, Survey No. 152/2/2
Above AXIS BANK
Hinjewadi
Pune 411 057
Tel. 0091 (0)20 640 13 923
0091 (0)20 640 08 923
Fax 0091 (0)20 229 33 923
E-mail: info@knfpumps.in
www.knfpumps.in

Italy
KNF ITALIA S.r.l.
Via Flumendosa, 10
I-20132 Milano
Tel. 0039 02 27 20 38 60
Fax 0039 02 27 20 38 48
E-mail: info@knf.it
www.knf.it

Japan
KNF Japan Co.Ltd.
Chichibu, Bldg. 7F
1-8-6 Shinkawa, Chuo-ku,
Tokyo, Japan 104-0033
Tel. 0081 (0)3 3551-7931
Fax 0081 (0)3 3551-7932
E-mail: info@knf.co.jp
www.knf.co.jp

Korea
KNF Neuberger Ltd.
Woosan Bldg.RM#202,
336-4, Hwikyung-Dong
Dongdaemun-Ku.,
130-090, Seoul
Tel. 0082 (0)2 959-0255/6
Fax 0082 (0)2 959-0254
E-mail: knf@knfkorea.com
www.knfkorea.com

Sweden, Denmark, Finland, Norway
KNF Neuberger AB
Mejerivägen 4,
P.O. Box 44060
SE-10073 Stockholm
Tel. 0046 (0) 87445113
Fax 0046 (0) 87445117
E-mail: info@knf.se
www.knf.se

Switzerland
Sales
KNF Neuberger AG
Stockenstrasse 6
CH-8362 Bichelsee-Balterswil
Tel. 0041 (0)71 973 993 0
Fax 0041 (0)71 973 993 1
E-mail: knf@knf.ch
www.knf.ch

Taiwan
KNF Neuberger Ltd.
9-2 FL., No., 24, Lane 123,
Section 6,
Ming Chuan East Road
Taipei City, Taiwan
Tel. 00886-2-2794-1011
Fax 00886-2-8792-1648
E-mail: knftwn@knftwn.com.tw
www.knftwn.com.tw

USA, Canada, South America
KNF NEUBERGER, INC.
Two Black Forest Road
Trenton, New Jersey
08691-1810
Tel. 001 (609) 890 86 00
Fax 001 (609) 890 83 23
E-mail: knfusa@knf.com
www.knf.com/usa.htm
South America
Direct Phone: 001 609 649 1010
E-mail: gb@knf.com

KNF product centres

Product centre for gas pumps:
Germany
KNF Neuberger GmbH
Alter Weg 3
D-79112 Freiburg
Phone 0049(0)7664 5909-0
Fax 0049(0)7664 5909-99
E-mail: info@knf.de
www.knf.de

Product centre for fluid pumps:
Switzerland
KNF FLODOS AG
Wassermatte 2
CH-6210 Sursee
Phone 0041(0)41 925 00 25
Fax 0041(0)41 925 00 35
E-mail: info@knf-flodos.ch
www.knf-flodos.ch

Product centre for micro pumps:
Switzerland
KNF Micro AG
Zelglimatte 1b
CH-6260 Reiden
Tel. 0041(0)62 787 88 88
Fax 0041(0)62 787 88 99
E-mail: info@knf-micro.ch
www.knf-micro.ch