

Operating Instructions
Read and observe these Operating Instructions!

Laboport[®] Chemically-resistant Laboratory Pumps and Systems

Operating Instructions
for Laboratory Pumps N 810, N 820, N 840, N 842
and for Laboport[®] Systems SR..., SH..., SC..., SCC...

Operating Instructions
Vacuum Controller NC 800 / NBC 800



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Operating Instructions
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Laboport[®] Chemically-resistant Laboratory Pumps and Systems

N 810 FT.18
N 820 FT.18
N 840 FT.18
N 840.1.2 FT.18

N 810.3 FT.18
N 820.3 FT.18
N 840.3 FT.18
N 842.3 FT.18

SR...
SH...
SC...
SCC...



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1. About this document

1.1. Using the Operating Instructions

The Operating Instructions are part of the pump/system.

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

Project systems and pumps

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

For project systems and pumps, also observe the agreed upon specifications.

1.2. Symbols and Markings

Warning



WARNING

- A danger warning is located here.
- Possible consequences of a failure to observe the warning are specified here. The signal word, e.g. Warning, indicates the danger level.
- ➔ Measures for avoiding the danger and its consequences are specified here.

Danger levels

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

Tab. 1

Other information and symbols

- ➔ An activity to be carried out (a step) is specified here.
- 1. The first step of an activity to be carried out is specified here. Additional, consecutively numbered steps follow.
- i** This symbol refers to important information.

2. Use

2.1. Proper Use

The pump/system is exclusively intended for transferring gases and vapors.

Owner's responsibility

Operating parameters and conditions	<p>Only install and operate the pump/system under the operating parameters and conditions described in chapter 5, Technical data.</p> <p>Make sure that the installation location is dry and the pump/system is protected against rain, splash, hose and drip water.</p>
Requirements for transferred medium	<p>Before using a medium, check the compatibility of the materials of the pump head, diaphragm and valves with the medium.</p> <p>Before using a medium, check whether the medium can be transferred danger-free in the specific application case.</p> <p>Only transfer gases which remain stable under the pressures and temperatures occurring in the pump.</p>
High performance condenser	<p>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.</p> <p>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.</p>
Accessories	<p>Laboratory equipment or additional components connected to a pump/system have to be suitable for use with the pneumatic capabilities of the pump (see chapter 5.1, page 10).</p>

2.2. Improper Use

The pump/system may not be operated in an explosive atmosphere.

The pump/system is not suitable for transferring dusts.

The pump/system is not suitable for transferring liquids.

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

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

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

3. Safety

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

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

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

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

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

Working in a safety-conscious manner

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

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

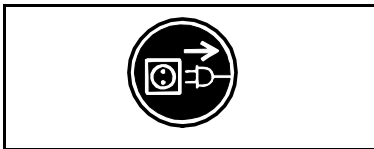


Fig. 1: Notice sticker

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

Handling dangerous media

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

Handling flammable media

Be aware that the pump/system is not designed to be explosion-proof.

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

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

Hence, make sure the temperature of the medium is sufficiently below the ignition temperature of the medium, even when it is compressed to the maximum permissible operating pressure of the pump. The maximum permissible operating pressure of the pump is stated in the technical specifications (see chapter 5.1, page 10).

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

In case of doubt, consult the KNF customer service.

Environmental protection

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

Standards	<p>The pumps conform to the Directive 2011/65/EU (RoHS2).</p> <p>The pumps conform to the safety regulations of the Directive 2014/30/EU concerning Electromagnetic Compatibility and the Directive 2006/42/EC concerning Machinery. The requirements of the following harmonised standards are fulfilled:</p> <ul style="list-style-type: none">▪ DIN EN 61010-1▪ DIN EN 61326-1 – class A▪ DIN EN 50581 <p>The pumps correspond to IEC 664:</p> <ul style="list-style-type: none">▪ the overvoltage category II▪ the pollution degree 2
Customer service and repairs	<p>Only have repairs to the pump/system carried out by the KNF Customer Service responsible.</p> <p>Only authorized personnel should open those parts of the housing that contain live electrical parts.</p> <p>Use only genuine parts from KNF for servicing work.</p>

4. System overview

- 1 Electrical supply unit
- 2 Vacuum controller
- 3 Vent valve at vacuum controller
- 4 On/off switch of vacuum controller
- 5 Pump vent valve
- 6 Vacuum valve
- 7 High performance condenser
- 8 Hose connector
- 9 Angled nozzle for coolant
- 10 Spring clamp
- 11 Flask for condenser
- 12 Support for high performance condenser
- 13 Locating pin for pump
- 14 Separator
- 15 Holder for Separator
- 16 Support for vacuum controller
- 17 Baseplate
- 18 Vacuum pump
- 19 On/off switch of pump

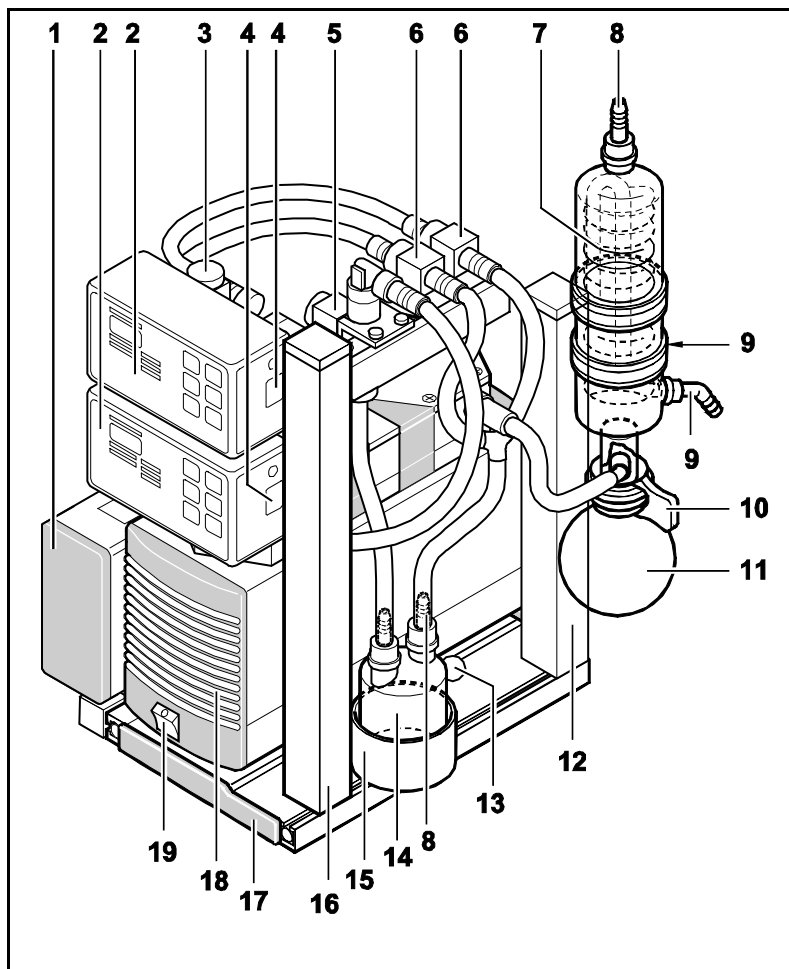


Fig. 2: Full expanded LABOPORT System SCC..., for example pump model N 840.3 FT.18 (symbolic)

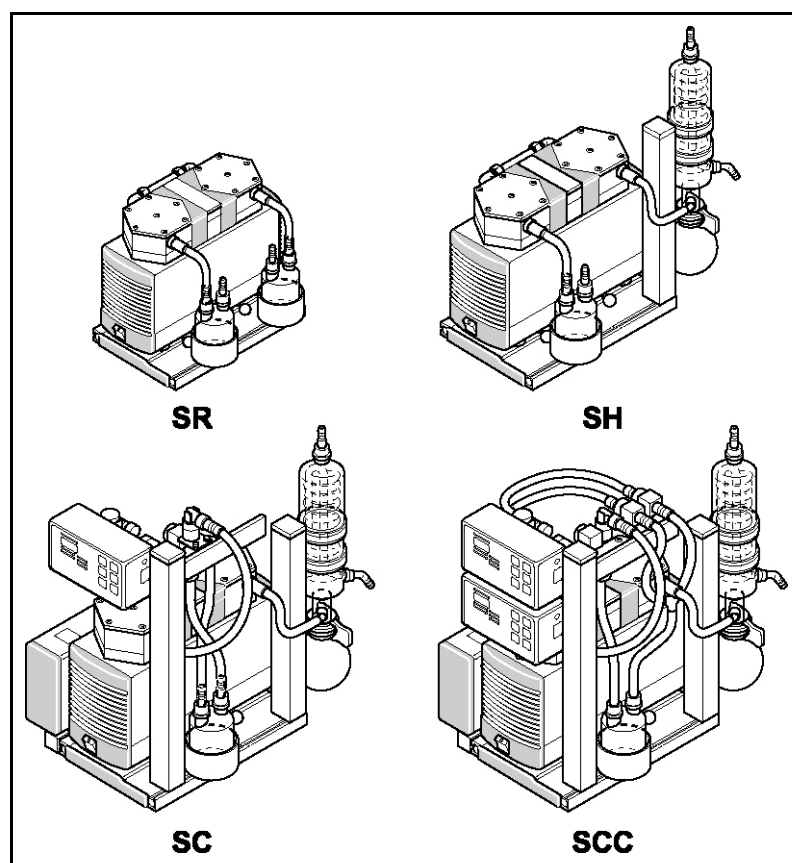


Fig. 3: LABOPORT Systems

Module	System			
	SR...	SH...	SC...	SCC...
Pump	X	X	X	X
Baseplate	X	X	X	X
2 separators	X			
1 separator		X	X	X
High performance condenser		X	X	X
Electrical supply unit			X	X
1 vacuum controller			X	
2 vacuum controllers				X

Tab. 2

i Each pump and all systems can be expanded modularly up to a full system SCC... (see chapter 7.7, page 28).

5. Technical Data

5.1. Pumps

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

<i>Pump materials (for all pump types)</i>	
Pump head	PTFE
Diaphragm	PTFE coated
Valve	FFPM

Tab. 3

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

N 810 FT.18

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

Tab. 4

* Liters in standard state (1,013 mbar)

N 820 FT.18

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

Tab. 5

* Liters in standard state (1,013 mbar)

N 840 FT.18

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

Tab. 6

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

N 810.3 FT.18

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

Tab. 7

*Liters in standard state (1,013 mbar)

N 820.3 FT.18

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

Tab. 8

*Liters in standard state (1,013 mbar)

N 840.3 FT.18

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

Tab. 9

*Liters in standard state (1,013 mbar)

N 840.1.2 FT.18

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

Tab. 10

*Liters in standard state (1,013 mbar)

N 842.3 FT.18

<i>Pneumatic performance</i>			
Max. permissible operating pressure [bar g]	1.0		
Ultimate vacuum [mbar abs.]	≤ 2		
Delivery rate at atm. pressure [l/min]*	max. 34		
<i>Pneumatic connection</i>			
Hose connection [mm]	ID 10		
<i>Ambient and media temperature</i>			
Permissible ambient temperature	+ 5 °C to + 40 °C		
Permissible media temperature	+ 5 °C to + 40 °C		
<i>Other parameters</i>			
Weight [kg]	13.4		
Dimensions: L x H x W [mm]	341 x 223 x 167		
Maximum permissible ambient relative humidity	80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C		
Maximum altitude of site [m above sea level]	2000		
<i>Electrical Data</i>			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Maximum current consumption [A]	4.4	3.2	1.5
Power consumption pump [W]	260	290	245
Fuse pump (2x) T [A]	6.3	6.3	3.15
Protection class motor	IP44		

Tab. 11

*Liters in standard state (1,013 mbar)

5.2. Electrical Supply Unit

<i>Electrical Data</i>			
Voltage [V]	100	115	230
Frequency [Hz]	50/60	60	50
Power consumption* [W]	270	300	295
Fuse pump (2x) T [A]	6.3	6.3	3.15

Tab. 12

* includes the power consumption of the whole system (inclusive pump and vacuum controller); for pumps N 840.1.2 FT.18 and N 842.3 FT.18 power consumption raises by approx. 50 W.

5.3. Vacuum Controller

See Operating Manual of the vacuum controller.

5.4. Vacuum Systems

<i>Ambient temperature</i>	
Permissible ambient temperature	+ 5 °C to + 40 °C
<i>Operating parameters of coolant (only for high performance condensers)</i>	
Permissible pressure [bar g]	3
Permissible temperature	- 15 °C to + 20 °C
Condenser connectors	For tube 8mm ID

Tab. 13

6. Design and Function

6.1. Pump

Design

- 1 Connection piece
- 2 Pneumatic connection
- 3 Pump head
- 4 Outlet (pressure side)
- 5 Inlet (suction side)
- 6 Power switch

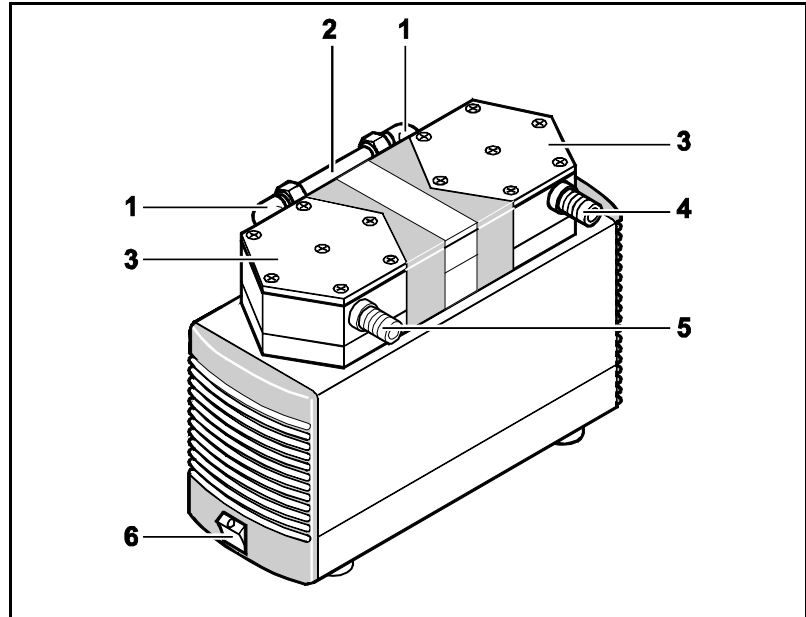


Fig. 4: Diaphragm pump (shown: pump N 840.3 FT.18)

Function Diaphragm pump

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

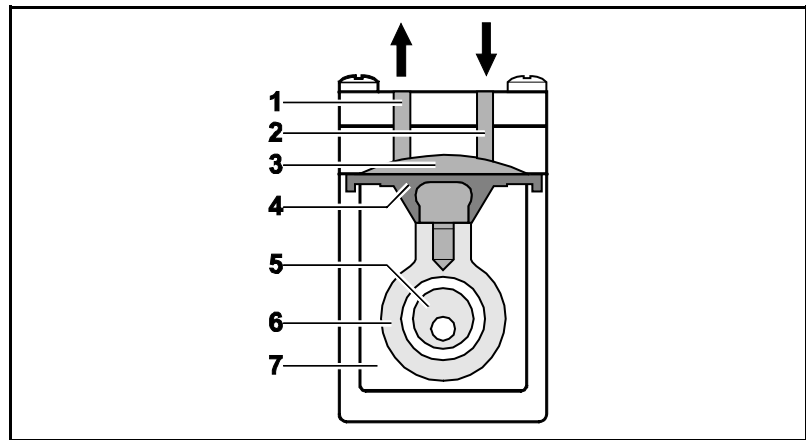


Fig. 5: Pump head

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

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

6.2. Separator

Design

- 1 Tubing
- 2 Hose nozzle
- 3 Separator container
- 4 Holder for separator

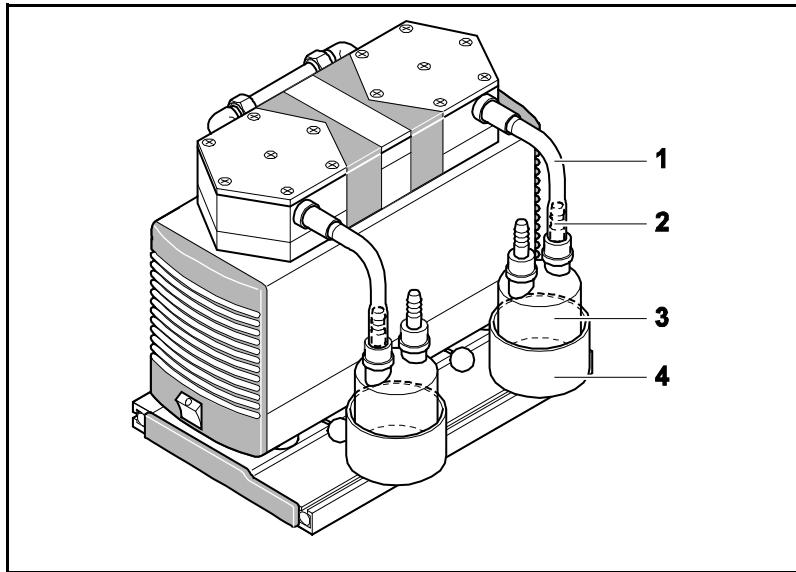


Fig. 6: Separator (shown: LABOPORT system SR with pump N 840.3 FT.18 as example)

Function

Condensable components in the gas can be separated on the pressure side of the pump. On the suction side the separator collects particular matter and droplets. This protects the pump from contamination.

The separator is made of a specially treated glass and features implosion protection.

6.3. High Performance Condenser

Design

- 1 Hose nozzle
- 2 High Performance Condenser
- 3 Angled nozzle for coolant
- 4 Tubing
- 5 Spring clamp
- 6 Flask
- 7 Support

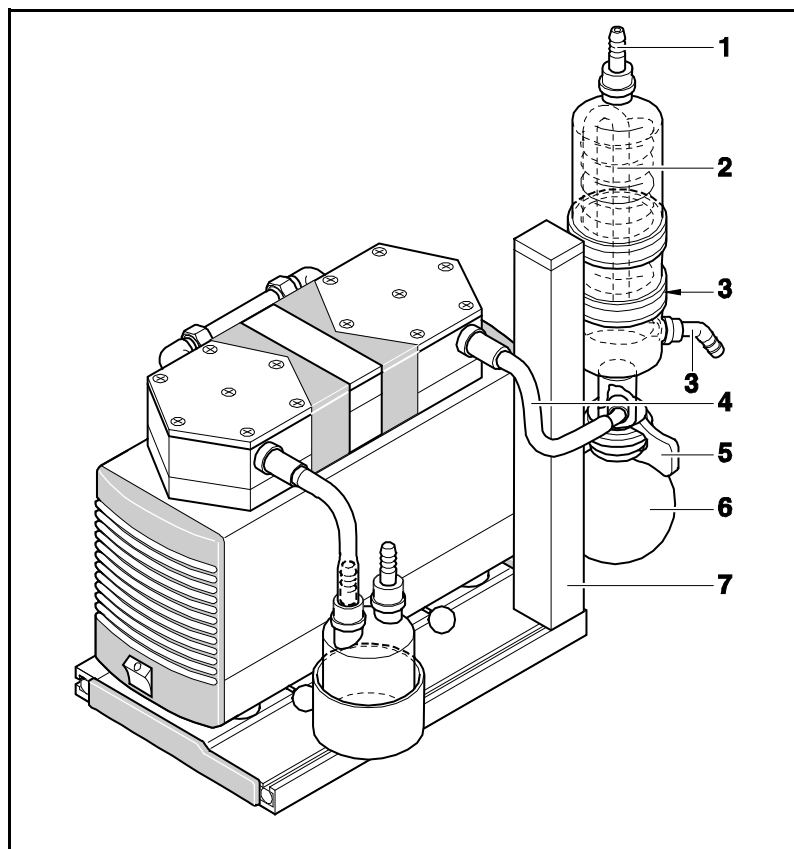


Fig. 7: High performance condenser (shown: LABOPORT system SH with pump N 840.3 FT.18 as example)

Function

The high performance condenser at pump outlet enables condensable components in the vapour to be separated out.

The condensate is collected in a glass flask. The flask is attached to the condenser flange with a clamp. The condensation temperature is maintained by running cold water or recirculated coolant through the condenser.

6.4. Vacuum Controller

- 1 Tubing
- 2 Power switch
- 3 Support
- 4 Electrical supply unit
- 5 Vacuum controller

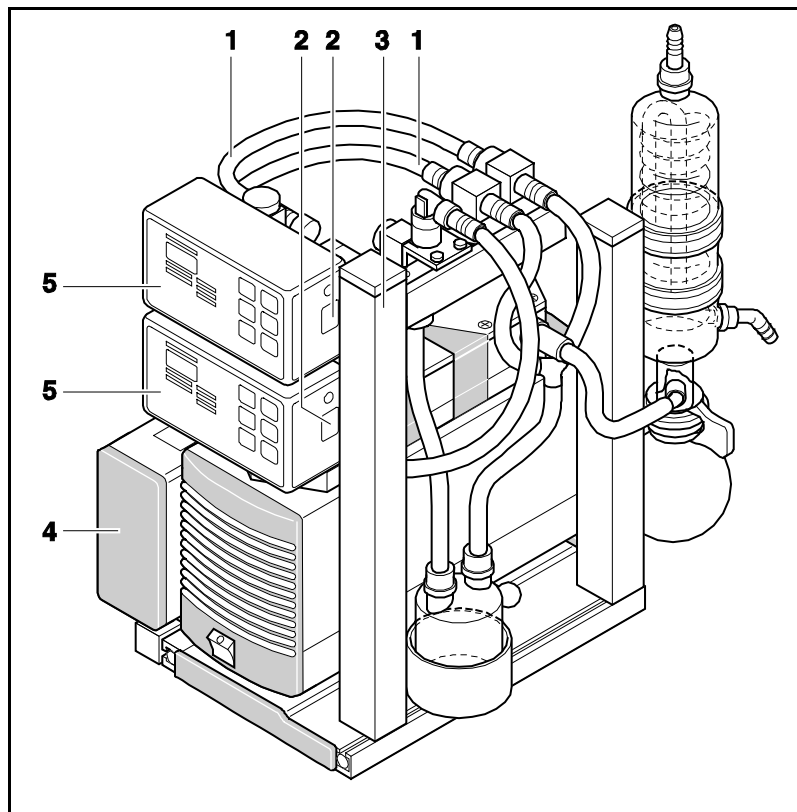


Fig. 8: Vacuum controller (shown: LABOPORT system SCC with pump N 840.3 FT.18 as example)

Function

In laboratory systems without a vacuum controller the pump runs continuously and works against its vacuum. If there is a vacuum controller, it will switch the pump off once the selected target vacuum has been reached.

With two vacuum controllers it becomes possible to simultaneously run two different and independent processes with just one pump.

Once one vacuum controller's set point has been reached, that vacuum controller will close the valve it is controlling. If two vacuum controllers are used, the pump will continue to work until the second controller's set point has been reached. Then the second vacuum controller will close the valve it is controlling. The pump switches off and the pump vent valve is opened.

If one of the two vacuum values falls below the hysteresis range, the pump will switch back on.

Refer to the vacuum controller's operating instructions for more information.

7. Installation, mounting and connection

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

Observe the safety precautions (see chapter 3, page 6).

- Before installation, store the pump/the accessories at the installation location to bring it up to room temperature.
- Dimensions → See chapter 5, Technical data, for the dimensions of system.
- Cooling air supply → Install the pump/system so that the motor fan can intake sufficient cooling air.
- Installation location → Make sure that the installation location is dry and the pump/system is protected against rain, splash, hose and drip water.
- Choose a safe location (flat surface) for the pump/system.
- Protect the pump/system from dust.
- Protect the pump/system from vibrations and jolts.

7.1. Connect pump

- Connected components → Only connect components to the pump which are designed for the pneumatic data of the pump (see chapter 5.1, page 10).
 - Pump exhaust → If the pump is used as a vacuum pump, safely discharge the pump exhaust at the pump's pneumatic outlet.
- i** A marking on the pump head shows the direction of flow.
1. Remove the protective plugs from the pneumatic connectors of the pump.
 2. Connect the suction line and pressure line.
 3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.
 4. Insert the power cable's plug into a properly installed shockproof socket.

7.2. Baseplate

Condition

- Pump disconnected from mains
1. Unscrew the pump's rubber feet (1) anti-clockwise.
 2. Install the mounts (2) onto the pump.
 3. Stand the pump (fitted with the mounts) onto the baseplate
 4. Align the mounts on the pump and the baseplate.
 5. Slide the locating pin (see fig. 2/13) through the mount holes on the baseplate and on the pump until they are fully engaged.
 6. Check that the pump is securely fastened to the baseplate via both mounts.

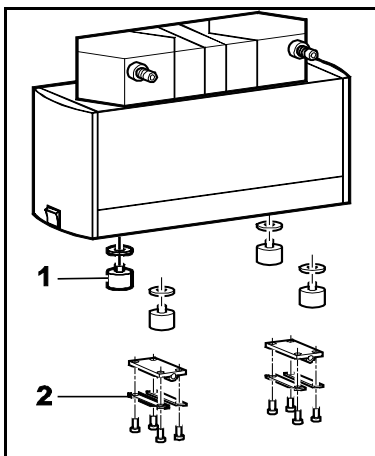


Fig. 9: Installation of the mounts at the pump

Conditions

- Baseplate mounted (see chapter 7.2)
- Pump disconnected from mains

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 3

Tab. 14

1. Slide the container for the separator (see fig. 6/4) into the baseplate's upward-pointing slotted bar.
2. Fix the holders by tightening the screw in the bottom of them.
3. Place the glass separators into the holders.

i Laying hoses: depending on system configuration see chapter 7.7.1 (system SR), 7.7.2 (system SH), 7.7.3 (system SC), 7.7.4 (system SCC) or 7.7.5 (retrofitting from system SC to system SCC).

7.4. High Performance Condenser

i The high performance condenser is delivered installed on a support.

- Conditions
- Baseplate mounted (see chapter 7.2, page 24)
 - Pump disconnected from mains and de-energized

Tools and material

Qty	Material
1	Allen key 5 mm

Tab. 15

Installing the high performance condenser



WARNING

Danger of implosion if installed improperly

There is a danger of implosion if the high performance condenser is installed on the pump inlet.

→ Connect the high performance condenser to the pump outlet only.

1. Slide the support of high performance condenser (see fig. 7/7) into the baseplate's upward-pointing slotted bar.
2. Fix the support to the baseplate by tightening the allen screw.
3. Align the high performance condenser so that the hose connection at the inlet is lower than the pump outlet.

i Laying hoses: depending on system configuration see chapter 7.7.2 (system SH), 7.7.3 (system SC), 7.7.4 (system SCC) or 7.7.5 (retrofitting from system SC to system SCC).

7.5. Electrical Supply Unit and Vacuum Controller

i The vacuum controller(s) is (are) delivered with the ventilation valve and pump vent valve installed on a support.

i When retrofitting from system SC to system SCC, the second vacuum controller is delivered complete with the ventilation valve installed on a new support. Install the existing vacuum controller on the new support. For more information about retrofitting from system SC to system SCC, refer to chapter 7.7.5, page 32.

- Conditions
- Baseplate mounted (see chapter 7.2, page 24)
 - Pump disconnected from mains

Tools and material

Qty	Material
1	Allen key 4 mm
1	Allen key 5 mm

Tab. 16

Mounting the electrical supply unit

1. Slide the electrical supply unit (see fig. 8/4) with both tightening nuts into the baseplate's lateral slotted bar.

2. Tighten the allen screws at the bottom of the electrical supply unit.

Mounting the vacuum controller

1. Slide the support's attachment part (see fig. 8/3) into the baseplate's lateral, upward-pointing slotted bar.
2. Tighten the allen screw at the bottom of the support.

Wire and connect with each other the electrical supply unit and the vacuum controller

i Figures 11 and 12 provide an overview of the electrical connections for LABOPORT systems SC and SCC.

1. Connect signal socket of the vacuum controller with the electrical supply unit socket marked VC 1 (fig. 10/5) using the connection cable.
2. When using two vacuum controllers, connect the second vacuum controller's signal socket to the electrical supply unit's VC2 connection (6).
3. Insert the vacuum controller power cord plug into the designated electrical supply unit socket (2).
4. When using two vacuum controllers, insert the vacuum valves' plugs into the electrical supply unit's VV1 (4) und VV2 (3) connections.
5. Insert the pump vent valve plug into the electrical supply unit socket marked PRV (7).
6. Insert the vacuum pump power cord plug into the designated electrical supply unit socket (1).
7. Tuck all of the wires into the electrical supply unit and secure the cover.
8. Make sure power switches on the pump and on the vacuum controller(s) are switched off.
9. Insert the electrical supply unit's system power cord plug into a shockproof socket.

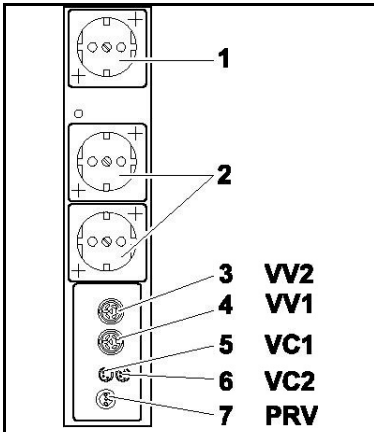


Fig. 10: Connections of the electrical supply unit

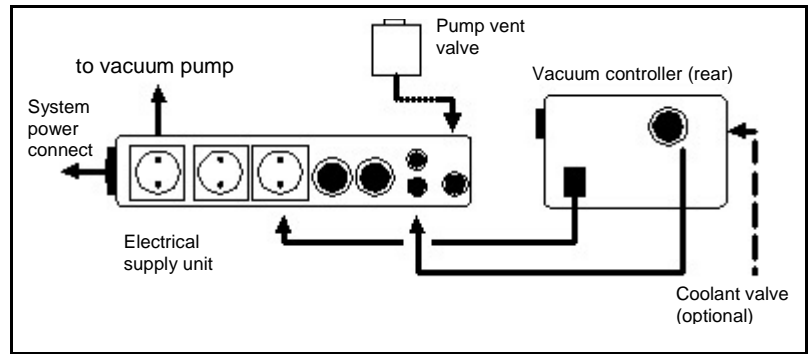


Fig. 11: Electrical connection LABOPORT System SC

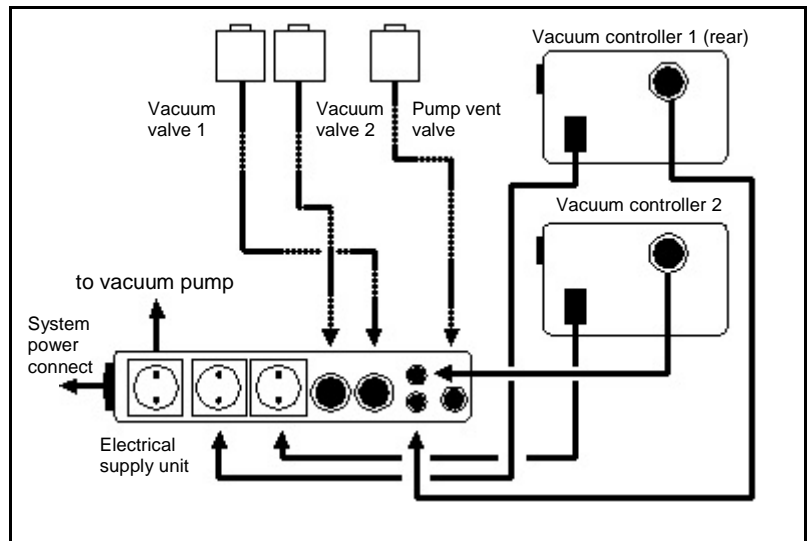


Fig. 12: Electrical connection LABOPORT System SCC

i Laying hoses: depending on system configuration see chapter 7.7.3 (system SC), 7.7.4 (system SCC) or 7.7.5 (retrofitting from system SC to system SCC).

Mounting coolant valve for high performance condenser (optional)

i With a coolant valve it becomes possible to stop the flow of coolant if the system's control operation is interrupted or terminated.



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.

1. Connect the coolant valve to the coolant supply.
2. Insert the coolant valve's plug into the vacuum controller's VV1 socket (see fig. 10/4).

i See fig. 16, page 29 for coolant inlet and outlet.

7.6. Gas Ballast

i Only for two-headed pumps.

Condition

- Motor disconnected from mains and de-energized

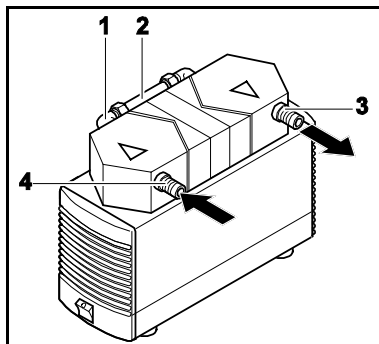


Fig. 13: Mounting the gas ballast

Mounting

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

7.7. Mounting of Systems

i The displayed system tube configuration is for two-headed pumps only.

Contact KNF Service for information about laying tubes for one-headed pumps and pumps with aluminum heads ("A" in the type designation).

7.7.1. System SR

- i** The system SR consists of:
- baseplate
 - two separators

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 3
2	Tubes (see fig. 14) <ul style="list-style-type: none"> ▪ Resistant to the medium employed ▪ Inside diameter 10 mm ▪ Length: approx. 150 mm

Tab. 17

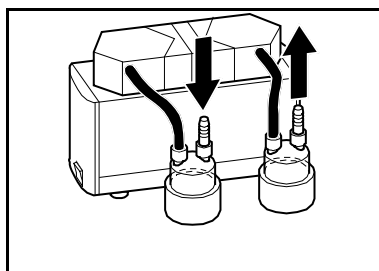


Fig. 14: Tubing system SR

1. Attach pump to the baseplate (see chapter 7.2, page 24).
2. Install the separators (chapter 7.3, page 24).
3. Lay tubes for separators (see fig. 14).

7.7.2. System SH

- i** The system SH consists of:
- Baseplate
 - 1 separator
 - 1 high performance condenser

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 3
1	Allen key 5 mm
2	Tubes (see fig. 15) <ul style="list-style-type: none"> ▪ Resistant to the medium employed ▪ Inside diameter 10 mm ▪ Length: (1) approx. 150 mm, (2) approx. 220 mm

Tab. 18



Danger of the high performance condenser bursting

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

WARNING



Improper laying of hoses will result in damage to the pump

- Correctly assign gas and coolant hose connections.
→ Do not reverse the gas connections' inlets and outlets.

DANGER

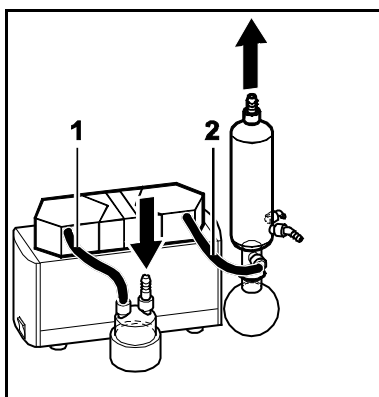


Fig. 15: Tubing system SH

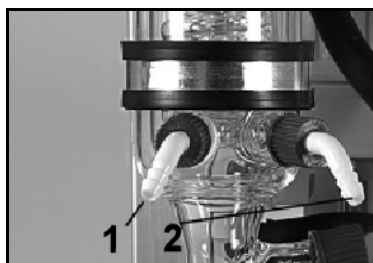


Fig. 16: Coolant supply of high performance condenser

- i** The condenser-connectors for the coolant require connection tubing with an inside diameter of 8 mm.
Coolant inlet and outlet see fig. 16.

When using a coolant valve:



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.

WARNING

- 1 Coolant inlet
2 Coolant outlet

7.7.3. System SC

- i** The system SC consists of:
- Baseplate
 - 1 separator
 - 1 high performance condenser
 - Electrical supply unit with 1 vacuum controller

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 3
1	Allen key 4 mm
1	Allen key 5 mm
4	Tubes (see fig. 17) <ul style="list-style-type: none"> ▪ Resistant to the medium employed ▪ Inside diameter 10 mm ▪ Length: (1,4) approx. 220 mm, (2) approx. 300 mm, (3) approx. 150 mm

Tab. 19

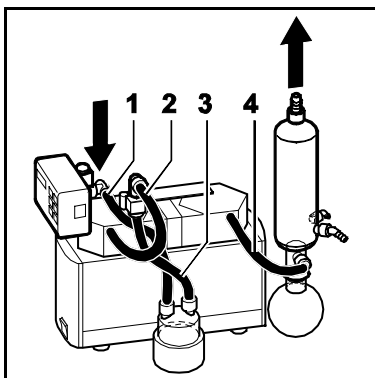


Fig. 17: Tubing system SC

1. Attach pump to the baseplate (see chapter 7.2, page 20).
2. Install the separator (see chapter 7.3, page 20).
3. Install the high performance condenser (see chapter 7.4, page 21).
4. Install the electrical supply unit and the vacuum controller (see chapter 7.5, page 21).
5. Lay hoses for system (see fig. 17).

i Coolant inlet and outlet see fig. 16.

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.

6. Wire and connect with each other the electrical supply unit and the vacuum controller (see chapter 7.5, page 21).

7.7.4. System SCC

- i** The system SCC consists of:
- Baseplate
 - 1 separator
 - 1 high performance condenser
 - Electrical supply unit with 2 vacuum controllers

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 3
1	Allen key 4 mm
1	Allen key 5 mm
8	Tubes (see fig. 18) <ul style="list-style-type: none"> ▪ Resistant to the medium employed ▪ Inside diameter 10 mm ▪ Length: (1) approx. 320 mm, (2) approx. 260 mm, (3,4) approx. 120 mm, (5) approx. 220 mm, (6) approx. 135 mm, (7) approx. 175 mm, (8) approx. 350 mm

Tab. 20

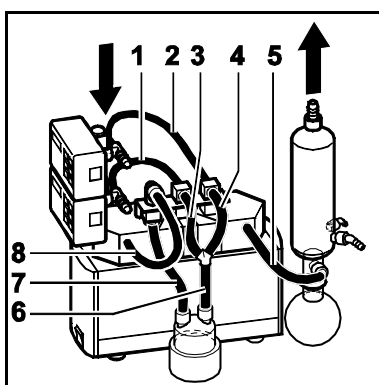


Fig. 18: Tubing system SCC

1. Attach pump to the baseplate (see chapter 7.2, page 20).
2. Install the separator (see chapter 7.3, page 20).
3. Install the high performance condenser (see chapter 7.4, page 21).
4. Install the electrical supply unit and both vacuum controllers (see chapter 7.5, page 21).
5. Lay hoses for system (see fig. 18).

- i** Coolant inlet and outlet see fig. 16.

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.

6. Wire and connect with each other the electrical supply unit and the vacuum controller (see chapter 7.5, page 21).

7.7.5. Retrofitting from System SC to System SCC

i The second vacuum controller is delivered complete with the vent valve installed on a new support (length: 410 mm). Install the existing vacuum controller on the new support.

- Conditions
- Pump removed from operation (see chapter 8.2, page 35)
 - Pump disconnected from mains

Tools and material

Qty	Material
1	Allen key 4 mm
1	Allen key 5 mm
	See chapter 7.7.4 for the required hoses

Tab. 21

Removing the existing vacuum controller

i The following item numbers refer to fig. 2, page 8.

1. Disconnect the tubes from the pump vent valve (5) as well as from the controller (2) vent valve (3).
2. Pull out all plugs from the electrical supply unit (1).
3. Remove the vacuum controller from the support (16) after loosening the clamp assembly.
4. Remove the lateral support from the main support after loosening the clamp assembly.
5. Loosen the allen screw at the foot of the main support.
6. Slide the support out of the baseplate (17) mounting slot assembly.

Mount new vacuum controller

i The following item numbers refer to fig. 2, page 8.

1. Slide the removed vacuum controller (2) into the slot on the new support (16) and fix it in place with the clamp connection.
2. Slide the support's attachment part into the baseplate's (17) lateral upward-pointing slotted bar.
3. Tighten the allen screw at the foot of the support.
4. Mount the lateral support onto the main support.
5. Slide two additional vacuum valves(6) onto the lateral support mounting slot and fix the device with help of the clamping assembly.
6. Lay hoses for system (see fig. 19).
7. Wire and connect with each other the electrical supply unit and the vacuum controller (see chapter 7.5, page 25).

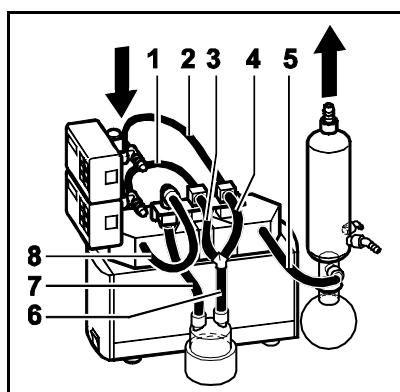


Fig. 19: Tubing system SCC

8. Operation

8.1. Pump

8.1.1. Preparing for Start-up

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

	Operational requirements
Pump	<ul style="list-style-type: none"> ▪ All hoses attached properly
Pump/ System	<ul style="list-style-type: none"> ▪ Fan openings not blocked ▪ Specifications of the power supply correspond with the data on the pump's/the electrical supply unit's type plate. ▪ The pump outlet is not closed or constricted. ▪ When using two vacuum controllers: The media are compatible with each other (when running two different processes simultaneously) ▪ When using a gas ballast: No explosive or poisonous mixtures may be produced when ventilating the vacuum system through the air inlet.
System	<ul style="list-style-type: none"> ▪ Clamp connections are tight ▪ All cables attached properly

Tab. 22

8.1.2. Starting

- ➔ Only operate the pump under the operating parameters and conditions described in chapter 5, Technical data.
- ➔ Make sure the pumps are used properly (see chapter 2.1, page 5).
- ➔ Make sure the pumps are not used improperly (see chapter 2.2, page 5).
- ➔ Observe the safety precautions (see chapter 3, page 6).

**WARNING**

Hazard of the pump head bursting due to excessive pressure increase

- Do not exceed max. permissible operating pressure (see chapter 5.1, page 10).
- Monitor pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure, immediately shut down pump and eliminate fault (see chapter 10, page 42).
- Only throttle or regulate the air or gas quantity in the suction line to prevent the maximum permissible operating pressure from being exceeded.
- If the air or gas quantity in the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure of the pump is not exceeded.



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

Pump standstill

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

**WARNING**

Automatic starting can cause personal injury and pump damage

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

- After triggering of the thermal protection or in the event of power failure, remove the pump's mains plug from the socket so that the pump cannot start uncontrollably.
- Attempt work on the pump or system only if the pump/system is separated from mains power.

8.2. Switching Pump/System on and off

Switching pump on

- i** The pump may not start up against overpressure during switch-on. This also applies in operation following a brief power failure. If a pump starts against pressure, it may block. This activates the thermal switch, and the pump switches off.
- Make sure that no pressure is present in the lines during switch-on.
- Switch on pump with mains switch (see fig. 2/19)

Switching off the pump/removing from operation

- When transferring aggressive media, flush the pump prior to switch-off to increase the service life of the diaphragm (see chapter 9.2.1, page 37).
- Switch off pump with mains switch (see fig. 2/19).
- Open pressure and suction lines to normal atmospheric pressure.
- Disconnect the power source.

8.3. Notices related to System Operation

8.3.1. Separators

- i** You can move the holders for the separator vessels after loosening the attachment screw.

8.3.2. High Performance Condenser



Danger of high performance condenser bursting

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

CAUTION

- i** A high performance condenser may be used only with a cold-water connection or recirculated cooling system.

Adjustment of the high performance condenser altitude level

Tools and material

Qty	Material
1	Allen key 5 mm

Tab. 23

1. Loosen the both allen screws at the foot of the high performance condenser.
2. Remove the high performance condenser's clamp assembly in the support mounting slot.
3. Retighten the allen screws.

8.3.3. Vacuum Controller



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 ventilating the vacuum system through the air inlet.
- Make sure that the media are compatible with each other (when running two different processes simultaneously).

- i** Use the mains switch to switch the vacuum controller on and off.

Each vacuum controller can be set individually and will work independently of the other.

Refer to the vacuum controller's operating instructions for more information.

8.3.4. Gas Ballast



WARNING

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

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

- i** If the gas ballast valve is open the maximum achievable vacuum level is reduced. The gas ballast is adjusted with the button (see fig. 20).

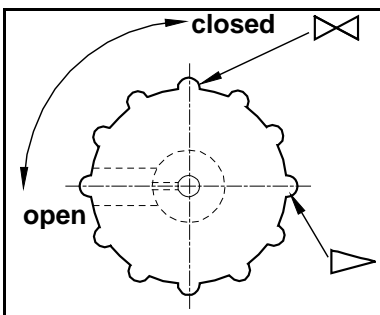


Fig. 20: Gas ballast operating knob

9. Servicing

9.1. Servicing Schedule

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

Tab. 24

9.2. Cleaning

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

9.2.1. Flushing Pump

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

9.2.2. Cleaning Pump

→ Only clean pump with a damp cloth and non-flammable cleaning agents.

9.2.3. Emptying and Cleaning the Separator

1. Unscrew the connecting nozzles (fig. 2/8, page 8).
2. Remove separator (fig. 2/14) from the holder (fig. 2/15) and dispose of contents according to applicable regulations in your area. Then rinse out the separator.
3. Replace separator into the holder.
4. Screw the connecting nozzles back on.

9.2.4. Emptying and Cleaning the Condenser

1. Carefully remove the spring clamp (fig. 2/10) while supporting the flask (fig. 2/11).
2. Empty and clean the flask – observing safety precautions.
3. Re-connect the flask to the condenser and replace the spring clamp.

9.3. Changing Diaphragm and Valve Plates/Sealings

- Conditions
- Pump is switched off and mains plug is removed from the socket
 - Pump is clean and free of hazardous materials
 - Tubes removed from pump's pneumatic inlet and outlet
 - Pump is removed from baseplate (if pump is integrated into a system)

Tools and material

Qty	Material
1	Phillips-head screwdriver No. 2
1	Service Set (see chapter 11.1, page 46)
1	Felt-tip pen

Tab. 25

Information on procedure

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

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

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



WARNING

Health hazard due to dangerous substances in the pump!

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

- ➔ Wear protective clothing if necessary, e.g. protective gloves.
- ➔ Flush pump before replacing the diaphragm and valve plates/sealings (see chapter 9.2.1, page 37).

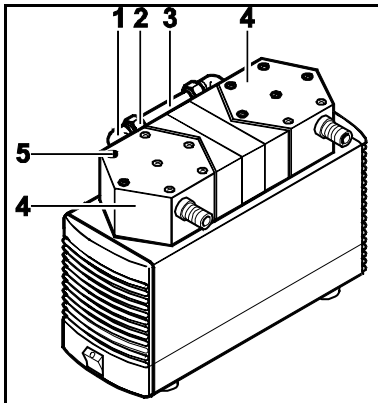


Fig. 21: Removing pump head

Removing pump head

i Pump N 842.3 FT.18 has a round shape of head, not a hexagonal.

1. For two-headed pumps: On the pneumatic head connection (3), loosen the union nuts (2) by hand. Then slightly loosen the angle-fitting (1) in the pump head (4) by turning it anticlockwise, so that the connecting tube can be pulled out.
2. Mark the position of top plate (fig. 24/5), head plate (fig. 24/6), intermediate plate (fig. 24/8) and adapter relatively to each other by a drawing line (for two-headed pumps: at both pump heads) with a felt-tip pen (1). This helps to avoid incorrect assembly later.

i In version N 842.3 FT.18, twelve (instead of six) screws must be loosened in the next work step.

3. Loosen the outer screws (5) on the pump head/pump heads.
4. Carefully remove pump head / pump heads.

Change diaphragm

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

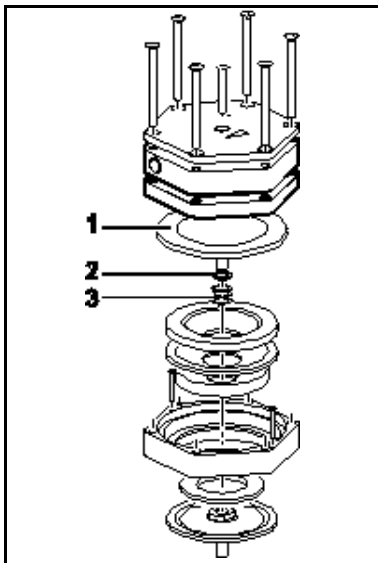


Fig. 22: Changing structured diaphragm

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

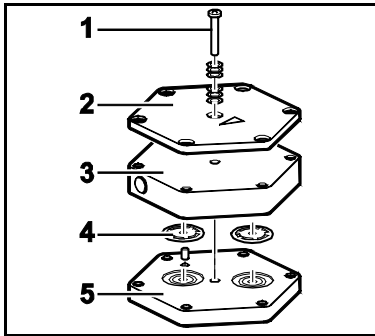


Fig. 23: Changing valve plates/sealings

Change valve plates/sealings

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

i In version N 842.3 FT.18, three (instead of one) screws must be loosened in the first work step.

1. Completely unscrew the screw(s) (1) in the center of the top plate (2) and take off the disk springs (Fig. 24/2 and 3). With a two-headed pump: Unscrew the screw(s) and take off the disk springs from just one pump head.
2. Remove top plate (2) and head plate (3) from intermediate plate (5).
Valve plates/sealings are visible.
3. Remove old valve plate/sealings.
4. Clean intermediate plate (5) carefully (if there should be deposits in the recesses in the intermediate plate).
5. Insert new valve plates/sealings (4) in the recesses in the intermediate plate (5).
6. For two-headed pumps: Carry out the steps 1 to 5 for the second pump head.
7. Dispose of the old diaphragm(s) and valve plates/sealings properly.

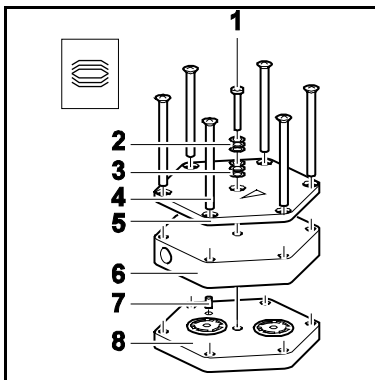


Fig. 24: Refitting pump head

Refitting pump head

1. Apply pressure all around the edge of the diaphragm. With a two-headed pump: Apply pressure to diaphragm on only one pump.
 2. Place the intermediate plate (8) with valve plates/sealings on the adapter in accordance with the felt-tip pen marking.
 3. Place the head plate (6) on the intermediate plate (8) in the position indicated by the guide pin (7).
 4. Place the top plate (5) on the head plate (6) in accordance with the felt-tip pen marking.
 5. Gently tighten screws (4) in diagonal order.
- i** In version N 842.3 FT.18, three (instead of one) screws must be tightened in the next work step.
6. Insert screw(s) (1) with disk springs (2, 3) in the center of the top plate (5). In doing so, make sure that the disk springs are arranged properly (see fig. 24).
 7. Screw in the screw/screws (1) in the centre of the pump top plate (5) until the bottom of the screw head is flush with the top plate; then screw one final half turn to tighten. (tightening torque: N810: 20 Ncm; tightening torque: N 820/ N 840/ N 842: 25 Ncm).
 8. For two-headed pumps: Carry out steps 1 to 7 for the second pump head.

9. For two-headed pumps: Refit the pneumatic head connection:
Place tube onto the connecting part of the angle fitting, turn angle fitting to a straight position and tighten the union nut.

Final steps

1. Remount the pump to the baseplate (if applicable).
2. Reconnect suction and pressure line to the pump.
3. Reconnect the pump to the electricity supply.

10. Troubleshooting



Extreme danger from electrical shock!

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

DANGER

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

→ Check the pump (see Tab. 26 to 35).

10.1. Pump/System without Vacuum Controller

Pump does not transfer	
Cause	Fault remedy
No voltage in the power source	→ Check room fuse and switch on if necessary.
Thermal switch has operated following to over-heating.	→ Disconnect pump from mains. → Allow pump to cool. → Trace cause of over-heating and eliminate it.
Connections or lines blocked.	→ Check connections and lines. → Remove blockage.
External valve is closed or filter is clogged.	→ Check external valves and filters.
Condensate has collected in pump head.	→ Detach the condensate source from the pump. → Flush pump (see chapter 9.2.1, page 37).
Diaphragm or valve plates/sealings are worn.	→ Replace diaphragm and valve plates/sealings (see chapter 9.3, page 38).

Tab. 26

Flow rate, pressure or vacuum too low	
The system/the pump does not achieve the output specified in the Technical data or the data sheet.	
Cause	Fault remedy
Condensate has collected in pump head.	→ Detach the condensate source from the pump. → Flush pump (see chapter 9.2.1, page 37).
There is gauge pressure on pressure side and at the same time vacuum or a pressure above atmospheric pressure on suction side.	→ Change the pressure conditions.
Pneumatic lines or connection parts have an insufficient cross section or they are throttled.	→ Disconnect pump from system to determine output values. → Eliminate throttling (e.g. valve) if necessary. → Use lines or connection parts with larger cross section if necessary.
Leaks occur on connections, lines or pump head.	→ Check that tubes sit correctly on hose nozzles. → Replace leaky tubes. → Eliminate leaks.
Connections or lines completely or partially jammed.	→ Check connections and lines. → Remove the jamming parts and particles.
Head parts are soiled.	→ Clean head components.
Diaphragm or valve plates/sealings are worn.	→ Replace diaphragm and valve plates/sealings, (see chapter 9.3, page 38).

Flow rate, pressure or vacuum too low	
The system/the pump does not achieve the output specified in the Technical data or the data sheet.	
Cause	Fault remedy
After diaphragm and valve plates/sealings have been replaced.	<ul style="list-style-type: none"> ➔ Check that the spacers have been replaced onto the diaphragm screw thread. ➔ Check head connection and hose connections. ➔ Possibly carefully tighten the outer screws (fig. 21/5, page 39) of the top plate crosswise.

Tab. 27

Pump is switched on, but does not run, the on/off-switch on the pump is not lit	
Cause	Fault remedy
Pump is not connected with the power source.	➔ Connect pump to mains power.
No voltage in the power source	➔ Check room fuse and switch on if necessary.
Fuse in the pump is defective.	<ul style="list-style-type: none"> ➔ Remove pump's mains plug from the socket. ➔ Loosen marked lid on underside of the pump. ➔ Select and replace suitable fuse (see chapter 5.1, page 10).

Tab. 28

Pump is switched on, but does not run, the on/off-switch on the pump is lit	
Cause	Fault remedy
The thermal switch has opened due to overheating.	<ul style="list-style-type: none"> ➔ Remove pump's mains plug from the socket. ➔ Allow pump to cool. ➔ Trace cause of over-heating and eliminate it.

Tab. 29

10.2. System with one Vacuum Controller

i See also chapter 10.1, pump/system without vacuum controller, table 26 and 27.

Sufficient vacuum is not reached	
Cause	Fault remedy
Solid particles in the pump vent valve	➔ Clean pump vent valve.
Condensate in pump head	➔ Let the pump run to the ultimate vacuum (Drying Mode, see Operating Manual of Vacuum Controller).

Tab. 30

Vacuum Controller is switched on and set on "Regulation Mode", the desired vacuum level is not reached, pump does not run, the on/off-switch on the pump is not lit	
Cause	Fault remedy
Pump is not switched on.	➔ Switch on pump.
Incorrect electrical connection of controller	➔ Switch off system and separate from power supply. ➔ Check cabling.
Fuse in the pump is defective.	➔ Remove pump's mains plug from the socket. ➔ Loosen marked lid on underside of the pump. ➔ Select and replace suitable fuse (see chapter 5.1, page 10).

Tab. 31

Vacuum Controller is switched on and set on "Regulation Mode", the desired vacuum level is not reached, pump does not run, the on/off-switch on the pump is lit	
Cause	Fault remedy
The thermal switch has opened due to overheating.	➔ Remove pump's mains plug from the socket. ➔ Allow pump to cool. ➔ Trace cause of over-heating and eliminate it.

Tab. 32

Vacuum Controller is switched on, no LED-indication	
Cause	Fault remedy
In the electrical supply unit the vacuum controller plug is plugged into the socket for the pump.	➔ Make sure that the vacuum controller's mains plug is plugged into the socket (on the electrical supply unit) for vacuum controllers (see fig. 10, page 26, position 2).
The fuse in the vacuum controller is defective.	➔ Switch off system and separate from power supply. ➔ Select an appropriate fuse (refer to the vacuum controller's operating instructions). ➔ Replace fuse above the circuit closer/circuit breaker.
The fuse in the electrical supply unit is defect.	➔ Switch off system and separate from power supply. ➔ Select suitable fuse (see chapter 5.2, page 17). ➔ Replace fuse on the front side, below the mains connection.

Tab. 33

Vacuum Controller shows unrealistic values	
Cause	Fault remedy
The factory-set pressure equalization has changed.	➔ Contact KNF (see last page for the address).
Sensor is defective	➔ Contact KNF (see last page for the address).

Tab. 34

10.3. System with two Vacuum Controllers

i See also chapter 10.2, system with one vacuum controller.

System does not work, despite one Vacuum Controller (both controllers) being set on "Regulation Mode"	
Cause	Fault remedy
In the electrical supply unit the connecting wires for the vacuum controllers are plugged in incorrectly.	→ Exchange the plugs between vacuum controller 1 and vacuum controller 2.
In the electrical supply unit the connecting wires for the vacuum valve are plugged incorrectly.	→ Exchange the plugs between vacuum valve 1 and vacuum valve 2.

Tab. 35

10.4. Fault cannot be rectified

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

1. Flush the pump to free the pump head of dangerous or aggressive gases (see chapter 9.2.1, page 37).
2. Remove the pump.
3. Clean the pump (see chapter 9.2.2, page 37).
4. Send the pump, together with completed Health and Safety Clearance and Decontamination Form (Chapter 13), to KNF stating the nature of the transferred medium.

11. Ordering Information

11.1. Pumps and Spare Parts

- i** A service set contains:
- 1 diaphragm and 2 valve plates/sealings for one-headed pumps
 - 2 diaphragms and 4 valve plates/sealings for two-headed pumps

Pump type	Order-No. pump for system	Order-No. Service Set
N 810 FT.18	-	058077
N 820 FT.18	-	058078
N 840 FT.18	-	058079
N 810.3 FT.18	311214	057357
N 820.3 FT.18	311215	057358
N 840.3 FT.18	311216	057359
N 840.1.2 FT.18	-	057359
N 842.3 FT.18	-	057359

Tab. 36

11.2. Head plates and intermediate plates (white)

Pump type	Order-No. head plate		Order-No. intermediate plate
	Head 1	Head 2	
N 810 FT.18	026123	-	057256
N 820 FT.18	025848	-	057278
N 840 FT.18	025883	-	057176
N 810.3 FT.18	026123	027093	057256 (2x)
N 820.3 FT.18	025848	027108	057278 (2x)
N 840.3 FT.18	025883	027195	057176 (2x)
N 840.1.2 FT.18	025883 (2x)	-	057176 (2x)
N 842.3 FT.18	042370	042369	058088 (2x)

Tab. 37

11.3. Head plates and intermediate plates (black)

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

Tab. 38

11.4. Accessories for Pump Systems

Accessory	Type									Order-No.
		N 810 FT.18	N 820 FT.18	N 840 FT.18	N 810.3 FT.18	N 820.3 FT.18	N 840.3 FT.18	N 840.1.2 FT.18	N 842.3 FT.18	
Baseplate and mounting	NP 810/820	X	X		X	X				028129
Baseplate and mounting	NP 840			X			X	X	X	028128
Separator complete including tray	NR 800	X	X	X	X	X	X	X	X	026225
High performance condenser (including support)	NH 800	X	X	X	X	X	X	X	X	026231
Gas ballast	NG 810				X					028476
Gas ballast	NG 820/840					X	X		X	028477
Vacuum controller (including support and electrical supply unit)	NC 800A	X	X	X	X	X	X	X	X	046380
Vacuum controller (including support) *	NC 800B	X	X	X	X	X	X	X	X	046381
Two vacuum controllers (complete including support and electrical supply unit)	NC 800A/B	X	X	X	X	X	X	X	X	046382
Vacuum chemical tubing for pneumatic connection** (yard ware***)		X	X	X	X	X	X	X	X	028187

Tab. 39

* For retrofitting from system SC to SCC

** Material: Norprene A60G

*** Please specify the required length (in whole meters).

12. Returns

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

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

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

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

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

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

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

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

13. Health and safety clearance and decontamination form



Form: Rev. 02 / download www.knf.com

Health and safety clearance and decontamination form

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

Device type:

Serial number(s):

.....

.....

Reason for returning the device (please describe in detail):

(The device(s) was(were) in operation yes no)

.....

.....

.....

.....

.....

We confirm that the above device(s)

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

Pumped media:

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

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

Name, chemical formula, Material Safety Data Sheet

aggressive

biological

radioactive

toxic

other

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

Method / proof:

.....

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

Measures:

.....

Legally binding declaration

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

.....
Company (stamp)

.....
Date

.....
Name

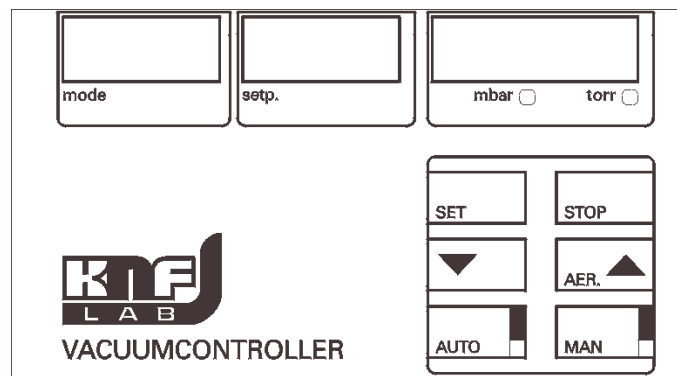
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Position

KNF worldwide

Please find our local KNF partners at: www.knf.com

Operating Manual



NC 800/NBC 800 Vacuum Controller for Laboratories

Carefully study the Operating Instructions and observe at all times the relevant instructions to avoid dangerous situations.

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1. Description

NC 800: For use at LABOPORT vacuum systems.

NBC 800: Workstation vacuum controller for use e. g. at vacuum supply points.

Technical data: see chapter 8.

1.1 Unit Functions

The vacuum controller NBC 800 regulates vacuum on an individual basis in the laboratory working place. Several different functions are possible:

- Evacuation at pressure setpoint;
- regulation by pressure setpoint and pressure differential (manual operation);
- defined post distillation;
- experimental use;
- automatic search for distillation point (automatic operation).

1.2 Arrangement in Vacuum Systems

See fig. 1.

1.3 Mechanical Attachment

The Vacuum Controller NBC 800 can be attached to a round support by means of the connection on its back side (maximum support diameter: 13 mm). Other types of connection on request.

► Attachment in LABOPORT® Systems: see LABOPORT Operating Manual.

1.4 Electrical Connection

- Electrical supply: The socket is located on the back of the unit.
- Cooling water valve and vacuum valve: Both can be connected either to the side socket or the socket on the back (6-pin). Proper connections are ensured by means of different pin arrangements.
- Insert plug into a properly installed safety socket.

► Electrical Connection in LABOPORT® Systems: see LABOPORT Operating Manual.

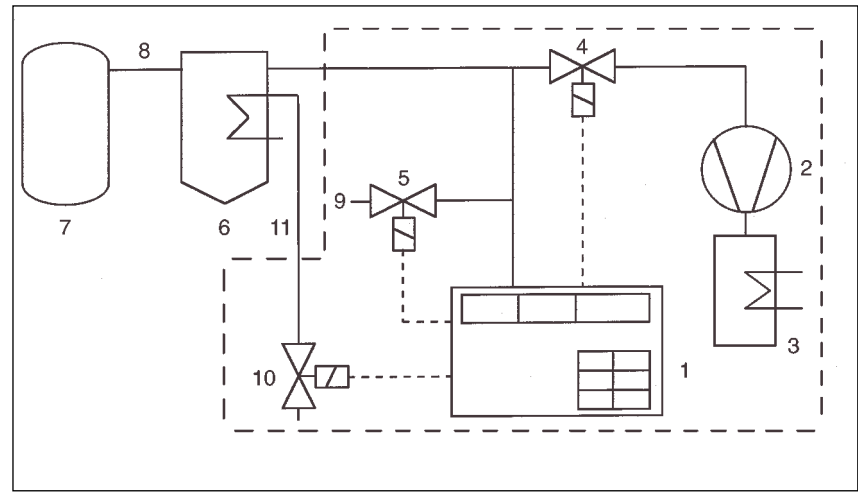
1.5 Pneumatic Connection

- The pneumatic connection is made at the valve block on the hose shaft (tube ID 10mm).

► Pneumatic Connection in LABOPORT® Systems: see LABOPORT Operating Manual.

1.6 Switching on/off

- The vacuum controller is switched on and off by the switch on the side.



- Specification:
- | | |
|---|------------------------------------|
| 1 Vacuum controller NBC 800 | 6 Condensate recipient |
| 2 Vacuum pump | 7 Vacuum installation |
| 3 High Performance Condenser of Vacuum System | 8 Suction line |
| 4 Vacuum valve | 9 Cleaning gas connection/Aeration |
| 5 Venting valve (internal) | 10 Coolant valve (accessory) |
| | 11 Cooling water tubing |

Fig. 1: Arrangement of vacuum controller in vacuum system

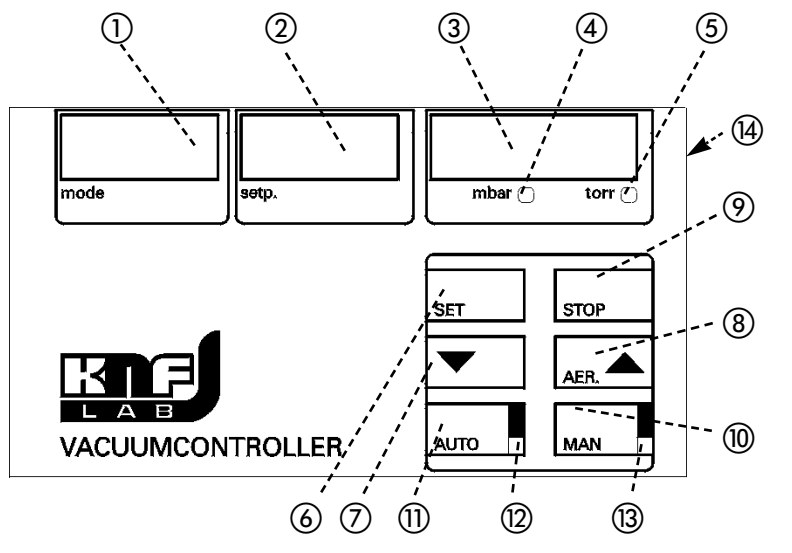


Fig. 2: Display elements and control panel

1.7 Explanation of Display Elements

See fig 2.

- ① „mode“:
- Displays operating mode
 - Changing of pressure unit see section 6.
 - Changing of pressure unit see section 6.
 - OFF: No mode entered.
 - A 1: Automatic Mode (see section 5).
 - bP: Boiling Point - distillation point (see section 5).
 - H 1: Manual Mode 1: (see section 4).
 - H 2: Manual Mode 2: Pressure differential with soft setpoint start (only NBC 800) (see section 4).
 - PU: Uncontrolled evacuation (see section 4.5).
- ② „setp“:
- Displays pressure setpoint in mbar.
- ③ „mbar“:
- Displays actual pressure in mbar and operating parameters.
- Description of operating parameters:
- h: Pressure differential;
 - d: Defined post distillation;
 - t: Post distillation time.
- ④ LED for pressure display in mbar
- Changing of pressure unit see section 6.
- ⑤ LED for pressure display in torr
- Changing of pressure unit see section 6.

1.8 Explanation of Control Panel

See fig. 2.

- ⑥ SET-Key
- To view and change currently inserted values.
- ⑦ DOWN-Key (for inserting values):
- One-touch: Single step adjustment.
 - Hold down: Running adjustment.
- ⑧ UP-Key/Aeration (for inserting values):
- One-touch: Single step adjustment.
 - Hold down: Running adjustment.
- Keep key held down for aeration (see section 4.4.2).
- ⑨ STOP-Key
- Stops the programm running. The venting valve is opened until atmospheric pressure is reached. Then the valve closes.
- ⑩ MAN-Key
- Starts manual mode.
- ⑪ AUTO-Key
- Starts automatic mode.
- ⑫ Status LED for AUTO
- ⑬ Status LED for MAN
- ⑭ Power switch

2. General Safety Precautions

- ⚠ Observe all applicable accident prevention regulations as well as generally recognised Health & Safety rules.
 - Carefully study the operating instructions before using the vacuum controller and observe at all times the relevant instructions to avoid dangerous situations.
 - Always keep the operating manual handy in the work area.
 - Ensure that the vacuum controller is used only for those applications for which it is intended.
 - Plug the vacuum controller only into properly installed grounded outlets.
 - ⚠ The vacuum controller must not be used in areas where there is the danger of explosion.
 - ⚠ The vacuum controller must not be used if the entry of air into the system during venting could result in the creation of reactive, explosive or otherwise hazardous mixtures (e.g. with the medium).
- Prior to any use of the vacuum controller, ensure that the creation of reactive, explosive or otherwise hazardous mixtures during the supply of air is prevented.
- When cleaning the unit make sure that no fluids come into contact with the inside of the casing
- ⚠ The coolant valve (accessory) must be connected to a water supply. It must on no account be installed in the water drain line, or after the condenser (danger of pressure build-up in condenser).

3. General Operating Instructions

3.1 Operating Conditions

- Permissible ambient : +0... +40 °C.
- ⚠ The vacuum controller must not be used in areas where there is the danger of explosion.
- ⚠ The vacuum controller must not be used if the entry of air into the system during venting could result in the creation of reactive, explosive or otherwise hazardous mixtures (e.g. with the medium).
- Protect vacuum controller against humidity.

3.2 Starting

- ① Attach Vacuum Controller to the support
 - ▶ section 1.3
- ② Connect Vacuum Controller electrically
 - ▶ section 1.4
- ③ Connect Vacuum Controller pneu-

matically
▶ section 1.5

▶ Attachment and connection in LABOPORT® Systems: see LABOPORT Operating Manual.

Before the vacuum controller is taken into service, the following points are important:

- ⚠ The vacuum controller must not be used in areas where there is the danger of explosion.
- ⚠ The vacuum controller must not be used if the entry of air into the system during venting could result in the creation of reactive, explosive or otherwise hazardous mixtures (e.g. with the medium).
Prior to any use of the vacuum controller, ensure that the creation of reactive, explosive or otherwise hazardous mixtures during the supply of air is prevented.
- ⚠ Specific safety instructions for the media being handled must be observed.
- ⚠ Within the system only simultaneously use those gases which can be mixed safely.

Check:

- ① All clamping connections for tightness.
- ② Tubing for correct connection.
- ③ Electrical connections for correct connection.
- The controller is switched on and off by the switch on the side.
- After switching on the controller display shows:
 - "mode"-Display: "OFF";
 - "setp"-Display: pressure setpoint;
 - "mbar"-Display: actual pressure.
- ▶ The plugs of valves or other parts must not be plugged in or removed during operation.

3.3 Shutdown

- ① Turn off vacuum controller at switch.
- ② Pull out mains plug.

4. Manual Operation

Once pressure setpoint and pressure differential have been set, the controller controls with these values. In addition, for post distillation the pressure setpoint can be lowered precisely according to a pre-set time.

4.1 Controlling Profiles

The following controlling profiles can be carried out:

A Controlling
(see fig. 3):

This controlling profile is preferably suited for LABOPORT systems (Controller NC 800).

- ① Rapid reduction of pressure down to desired boiling point (setp.).
- ② Pressure differential operation.

B Controlling with soft setpoint start
(see fig. 4):

- ▶ This controlling profile is only available for Vacuum Controllers NBC 800 (vacuum controllers for individual workstations).

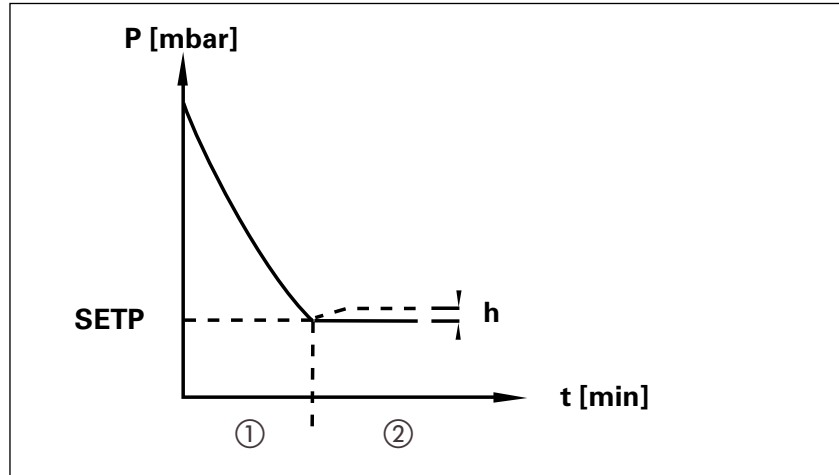


Fig. 3: Controlling profile in manual mode 1

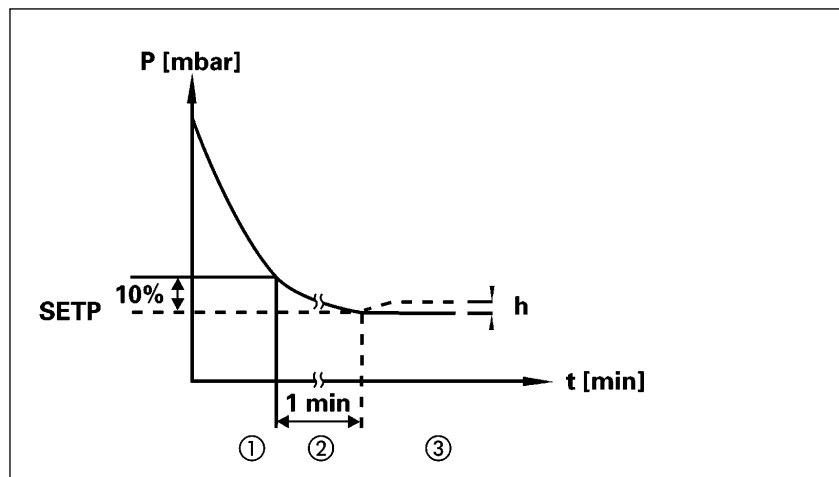


Fig. 4: Controlling profile in manual mode 2: with soft setpoint start

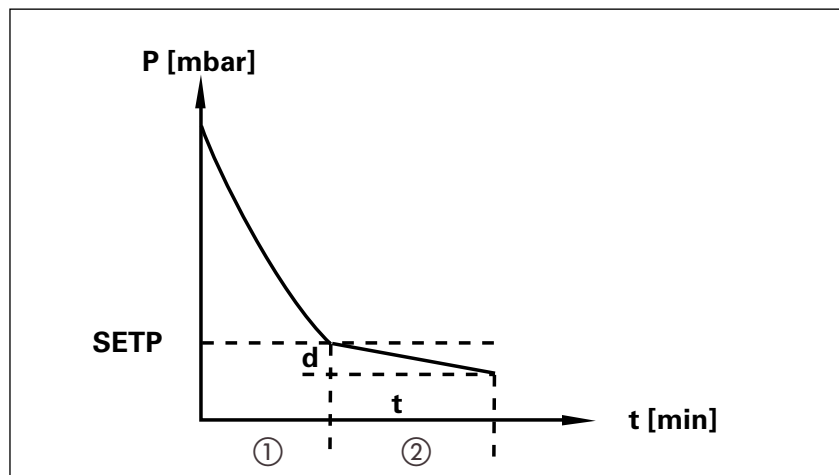


Fig. 5: Controlling profile in manual mode: Controlled pressure reduction

With the vacuum controllers for individual workstations, there is a very high vacuum in the vacuum connection. In order to ensure that the desired pressure setpoint is triggered exactly in extreme cases, it can be started slowly.

- ① Rapid reduction of pressure down to the desired boiling point (setpoint) + 10 %.
Example:
If the setpoint is 600 mbar, pressure is lowered to 660 mbar (=600 + 60 mbar).
- ② Within one minute, the desired boiling point (setpoint) is started.
- ③ Pressure differential operation.

C Controlled Pressure Reduction (see fig. 5).

▶ Vacuum Controller NC 800:
This controlling profile can only be set in H1 operating mode.

- ① Rapid reduction of pressure down to desired boiling point (setp.).
- ② From boiling point a gradual reduction of pressure; reduction rate can be set by pressure reduction d and post distillation time t.

▶ Setting values:
see section 4.2

▶ Running:
see section 4.3

4.2 Setting Values

The following operational parameter can be set for manual operation:

- Pressure setpoint (SETP);
- Pressure differential (h) for vacuum valve;
- pressure reduction (d);
- post distillation time (t).
- The "mbar" displays functions as a dialogue display (flashing) for entries; the "mode" and "setp" displays remain unchanged.
- Set-up is carried out by using the SET-key and the UP and DOWN keys:
 - SET-key:
Changing readings in this order:
 - ▶ Pressure setpoint
 - ▶ Pressure differential h
 - ▶ pressure reduction d

- ▶ post distillation time t
- ▶ actual value.

- UP and DOWN-keys:
for changing values.

Run of entering values:

- SET
- Input pressure setpoint (mbar)
- SET
- Input pressure differential (mbar)
- SET
- Input pressure reduction (mbar)
- SET
- Input post distillation time (min)
- SET
- For pressure differential operation, the post distillation time has to be set „off“ (tOFF).

Range for the input is:

- Pressure setpoint:
1- 999 mbar;
- Pressure differential:
1 - 100 mbar;
- Pressure reduction:
0 - 100 mbar;
- Post distillation time:
tOFF - 99 min.
- Values entered are automatically retained after 10 seconds if no further entries are made; the display "mbar" changes to the actual pressure.
- Pressure setpoint, pressure differential, pressure reduction and post distillation time can be changed in manual mode at any time.

- ▶ The last entered values are retained once the system is switched off.
- The value inputs can be viewed at any time (in "mbar" display flashing):
 - Pressure setpoint:
Press the SET key once;
 - Pressure differential:
Press the SET key twice;
 - Pressure reduction:
Press the SET key three times;
 - Post distillation time:
Press the SET key four times.

4.3 Running

4.3.1 Controlling

- ① If the Vacuum Controller is in H2 mode, it must first be put in H1 mode (see chapter 4.3.2, item ①).
- ② Press MAN key.
 - The system will evacuate to the pre-set pressure setpoint and regulate this level within the set pressure differential.
 - ▶ Mode, pressure setpoint and actual pressure are displayed.
- ③ Press the STOP key to finish.

4.3.2 Controlling with soft setpoint start

▶ This controlling profile is only available for Vacuum Controllers NBC 800 (vacuum controllers for individual workstations).

- ① Set to H2 mode:
 - Turn off the Vacuum Controller.
 - Press AUTO key and simultaneously turn on the Vacuum Controller.
 - ▶ Display ③ shows „hpa“.
 - Press SET key.
 - ▶ Display ③ shows the current modus (H1 or H2).
 - ▶ Do not press the SET-Key instead of the STOP-Key, because basic settings could change. However, if you happen to press the SET-Key, please press the STOP-Key afterwards.
 - Toggle between H1 and H2 with the up and down keys.
 - Press the STOP key.
 - ▶ The new pressure unit will be stored after 5 seconds.
 - ▶ The controller changes to the operating mode.
- ② Press the MAN key.
 - System is evacuated to pre-selected pressure setpoint + 10 %.
 - The pressure setpoint is started within one minute.
 - The system will regulate within the set pressure differential.
 - ▶ Mode, pressure setpoint and actual pressure are displayed.
- ③ Press the STOP key to finish.

4.3.3 Controlled Pressure Reduction

- ▶ Vacuum Controller NC 800:
This controlling profile can only be set in H1 operating mode.

- 1 Start the process by pressing the MAN key
 - System will evacuate to the pre-set pressure setpoint
 - ▶ "Mode" display shows status "H1". If a post distillation time is entered numerically, the remaining time appears in minutes flashing alternately with "H1".
 - Defined post distillation according to the entered values.
 - When the pressure has been reduced:
 - the controller switches off;
 - display „mode“ shows „End“;
 - a signal sounds (3 x 10 seconds)
 - the vacuum valve closes, the system remains under vacuum.
- 2 Press the STOP key to finish.

4.4 Temporary Mode

4.4.1 Function and Operation

In the temporary mode, you can interrupt the current program at any point, and enter a temporary vacuum setpoint which is not retained.

- Press DOWN key once:
 - ▶ The actual pressure is temporarily set as pressure setpoint.
 - ▶ LED in MAN display flashes.
- If the DOWN key is held pressed, evacuation continues until ultimate vacuum is reached. The actual pressure will be temporarily set as pressure setpoint. Once contact is released from the DOWN key the system will evacuate to the momentary pressure setpoint.
- By pressing the UP key the venting valve is phased in and the pressure in the system is increased.
- By further pressing the UP key the venting valve is opened three times briefly and then as long as the key is pressed.
 - ▶ Switching to temporary mode occurs only after the venting valve has been activated three times.
 - ▶ Once contact is released from the UP key the system will eva-

cuate to the momentary pressure setpoint.

- The temporary mode is stopped by pressing the MAN-Key. The system will regulate to the previous pressure setpoint.

4.4.2 Aeration during Distillation

Aeration is possible during manual distillation:

- 1 Press AER key.
 - Short tapping of the key produces short venting.
 - Key held down: after 4 short venting periods, the system is continuously vented.
- ▶ The indicated actual pressure becomes the temporary setpoint, the current pressure differential value is retained.
- ▶ After releasing the AER key the system evacuates to the new temporary setpoint.
- 2 To end the temporary mode press the MAN key.
 - ▶ The system will evacuate to the previous pressure setpoint.

4.4.3 Experimental Use

- 1 Preset the pressure differential (h) (see section 4.2).
- 2 Press MAN key.
- 3 Press and hold DOWN key (thereby changing to temporary mode).
- 4 When desired level is indicated by vapour, release the DOWN arrow key.
 - ▶ The actual pressure is retained as temporary pressure setpoint automatically.

4.5 Uncontrolled Evacuation/ Drying Mode

This function is started in the manual mode.

- 1 Press MAN key again
 - ▶ Regulation of the pressure setpoint is switched off and the system will evacuate to the final vacuum.
 - ▶ The display „mode“ shows „PU“.
- 2 Press the STOP key to finish the evacuation.

5. Automatic Operation

The vacuum controller searches automatically for the first boiling point and retains the value found as the pressure setpoint. In addition, a reduction gradient can be entered, as in manual mode. The reduction process begins once boiling point has been achieved.

5.1 Controlling Profiles

The following controlling profiles can be carried out:

A Pressure Differential (see fig. 6):

- 1 Rapid reduction of pressure down to the first boiling point, which will be found automatically.
- 2 Pressure Differential Operation.

B Controlled Pressure Reduction (see fig. 7).

- 1 Rapid reduction of pressure down to the first boiling point, which will be found automatically.
- 2 From boiling point a gradual reduction of pressure; reduction rate can be set by pressure reduction d and post distillation time t.

- ▶ Setting values:
see section 5.2

- ▶ Running:
see section 5.3

- ▶ Boiling points above 600 mbar must be started manually (see section 4.4.3 *Experimental Use*).

- ▶ The amount of liquid to be distilled must be at least 20% of the piston volume.

5.2 Setting Values

The following operational parameter can be set for automatic operation:

- Pressure differential (h) for vacuum valve;
- pressure reduction (d);
- post distillation time (t).

- ▶ The pressure setpoint has no significance during automatic operation.

- The "mbar" displays functions

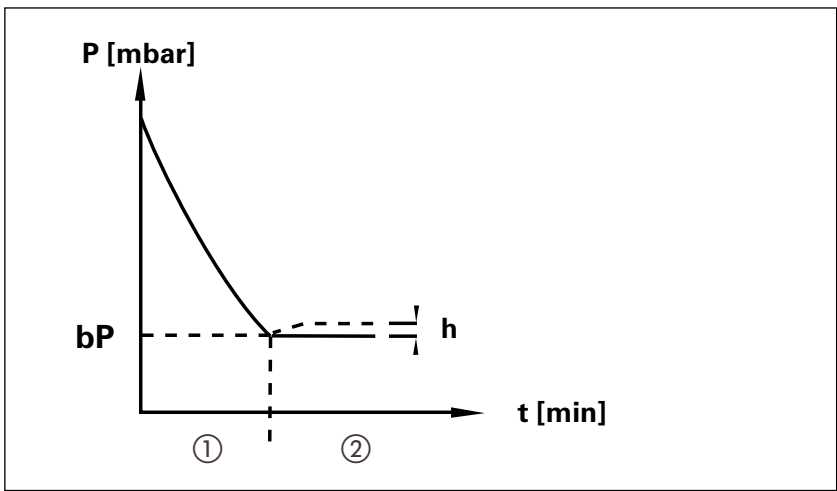


Fig. 6: Controlling profile in automatic mode: Pressure differential

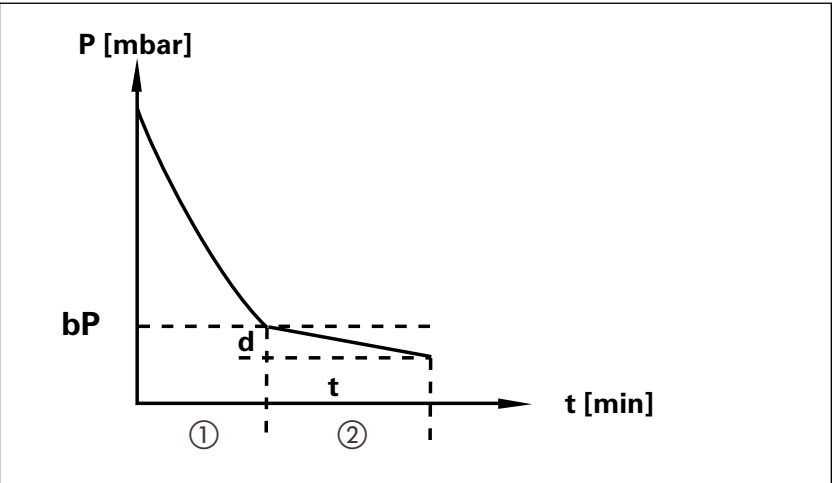


Fig. 7: Controlling profile in automatic mode: Controlled pressure reduction

as a dialogue display (flashing) for entries; the "mode" and "setp" displays remain unchanged.

- Set-up is carried out by using the SET-key and the UP and DOWN keys:
 - SET-key:
 - ▶ Changing readings in this order:
 - ▶ Pressure setpoint
 - ▶ Pressure differential h
 - ▶ pressure reduction d
 - ▶ post distillation time t
 - ▶ actual value.
 - UP and DOWN-keys:
 - ▶ for changing values.

Run of entering values:

- SET
- SET
- Input pressure differential (mbar)
- SET
- Input pressure reduction (mbar)
- SET
- Input post distillation time (min)
- SET

- For pressure differential operation, the post distillation time has to be set „off“ (tOFF).

Range for the input is:

- Pressure setpoint*: 1 - 999 mbar;
- Pressure differential: 1 - 100 mbar;
- Pressure reduction: 0 - 100 mbar;
- Post distillation time: tOFF - 99 min.

* insignificant during automatic operation.

- Values entered are automatically retained after 10 seconds if no further entries are made; the display "mbar" changes to the actual pressure.
- Pressure differential, pressure reduction and post distillation time can be altered in automatic mode, however not until the first boiling point has been achieved.

- ▶ The last entered values are retained once the system is switched off.

- The value inputs can be viewed at any time (in „mbar“ display flashing):

- Pressure differential:
 - ▶ Press the SET key twice;
- Pressure reduction:
 - ▶ Press the SET key three times;
- Post distillation time:
 - ▶ Press the SET key four times.

5.3 Running

- ① Press AUTO key.
 - ▶ In the "mode" display "A1" appears and the start-up level of 600 mbar.
 - ▶ The SET key, the UP key and the DOWN key can not operated.
 - The vacuum controller searches for the first boiling point step by step and with short gaps.
 - ▶ Once the first boiling point has been achieved, the code "bP" for "boiling point" appears on the "mode" display.
 - ▶ The value found (first boiling point) becomes the pressure set-point.
 - If no values for pressure reduction d and post distillation time t have been stored, the controller regulates the new pressure setpoint until this process is halted by pressing the STOP button.
 - If values for pressure reduction d and post distillation time t are stored, the pressure will be reduced after the distillation point has been found.
 - ▶ "Mode" display shows status "bP". Alternating with "bP" the remaining post distillation time appears in minutes.
 - When the pressure has been reduced:
 - the controller switches off;
 - display „mode“ shows „End“;
 - a signal sounds (3 x 10 seconds)
 - the vacuum valve closes, the system remains under vacuum.
- ② Press the STOP key to finish.
 - ▶ If the system is to be restarted eg. in order to distill the solvent using the next lowest boiling pressure, after having pressed the STOP key (and possibly changing the d and t values), the AUTO key has to be

pressed once again.

- ▶ Once the first boiling point has been found an exchange on the manual mode is possible by pressing the MAN key. The „bP“ value will be retained as temporary pressure setpoint.
- ▶ The automatic mode can be stopped by pressing the STOP key at any time.

6. Changing of Pressure unit

The physical unit indicating the pressure can be chosen between mbar and torr.

- ① When the controller is switched off, press the AUTO-Key ⑪ and switch on the controller with the On/Off-Switch ⑭ at the same time.
- ② With the DOWN-Key ⑦ and the UP-Key ⑧ you can choose between the units hPA (mbar) and torr.
 - ▶ The LEDs for mbar ④ and torr ⑤ show the selected pressure unit.
- ③ Press STOP-Key ⑨.
 - ▶ The new pressure unit will be stored after 5 seconds.
 - ▶ The controller changes to the operating mode.

7. Calibration

- ① Whilst pressing the SET key, switch on the Vacuum Controller.
 - ▶ The "mode" display shows "CAL".
 - ▶ If the "mode" display does not show "CAL", press SET key.
 - ▶ The "mode" display shows "CAL".
- ② Press the UP key.
 - ▶ The "setp" display shows "H1" .
- ③ Insert the actual atmospheric pressure, using the UP or DOWN key.
- ④ Press SET key to override.

8. Trouble Shooting

▶ Sufficient vacuum is not reached

Possible reasons:

- ① Tube connections are not tight, or an external valve is open.

LABOBASE® Systems

- ① All workstations together demand a flow rate that exceeds the capa-

city of the pump.

- ② Fault of central vacuum system/vacuum pump (see LABOBASE Operating Manual).
LABOPORT®-Systems
See LABOPORT Operating Manual.

▶ Vacuum controller does not work Possible reasons:

- ① Vacuum controller is not switched on.
- ② Mistake in operating the vacuum controller.
- ③ The fuse of the vacuum controller has been triggered.
 - ▶ After a short period the vacuum controller is re-activated automatically.
- ④ For LABOPORT Systems: see LABOPORT Operating Manual.

▶ Vacuum Controller shows unrealistic values

Please contact KNF.

9. Specifications

- Pressure range: 1400 - 1 mbar (absolute)
- Measuring accuracy: Linearity typ. +/- 0,15 % FS; max. +/- 0,35 % FS; consistency +/- 0,1 % FS
- Warm-up time to reach the above figures: 10 mins
- Definition: 1 mbar
- Working temperature: 0 to 40 °C
- Storing temperature: -10 °C to + 50 °C
- Dimension: about. 145 x 85 x 55 mm
- Weight: about. 380 g (without fastening)
- Power supply: 90 - 260 V, 50/60 Hz, 10 VA
- Fuse protection: 280 mA (internal)
- Electrical connections: 2 circular connectors (six channels) for external valves or control print (24 V DC).

10. Ordering Information

10.1 Accessories

	Order-No.
Coolant valve PP with flange connector G 1/2 and hose connector for tube ID 8	045075

10.2 Vacuum Controller and Vacuum Valves

For LABOPORT® Systems: see LABOPORT Operating Manual.

	Order-No.
Vacuum Controller NBC 800 complete, without Vacuum Valve	045258
Vacuum Valve PP with two hose connectors for tube ID 10	046007
Vacuum Valve PP with flange connector G 1/2 and hose connector for tube ID 10	045078

The vacuum controller NBC 800 is available on option with a RS232 interface.

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