INNOVATIVE
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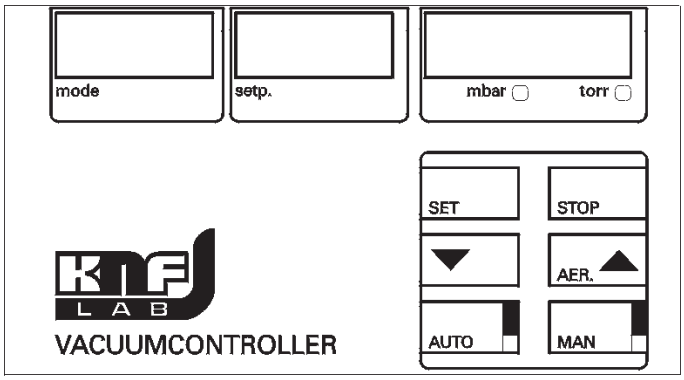
KNF NEUBERGER

Operating Manual 001e



CE

NC 800/NBC 800 Vacuum Controller for Laboratories

Carfully 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.

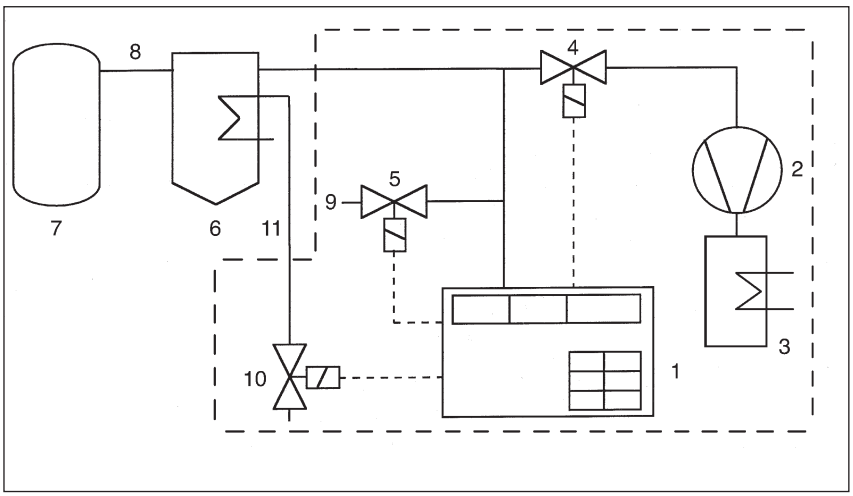
1.5 Pneumatic Connection

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

Fig. 1: Arrangement of vacuum controller in vacuum system

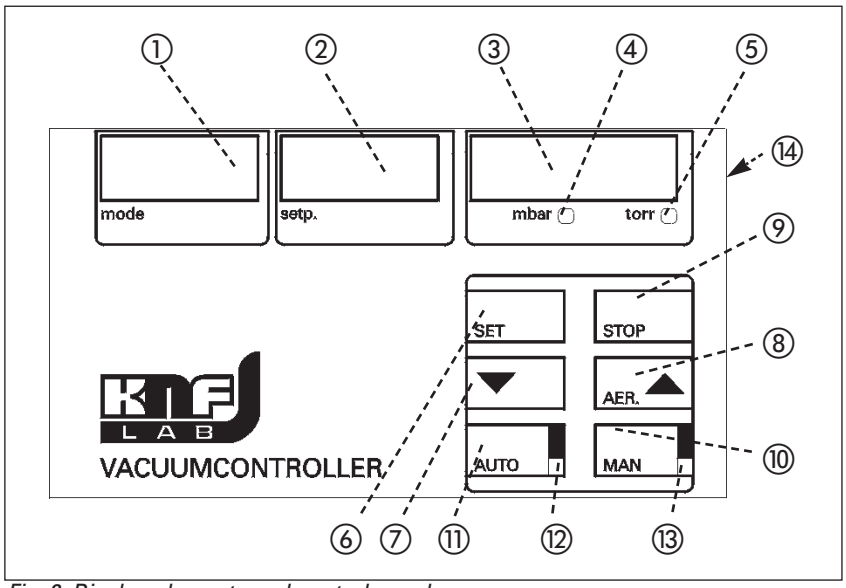


Fig. 2: Display elements and control panel

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 aearation (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

❶ Attach Vacuum Controller to the support
▶ section 1.3

❷ Connect Vacuum Controller electrically
▶ section 1.4

❸ 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:

❶ All clamping connections for tightness.
❷ Tubing for correct connection.
❸ 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

❶ Turn off vacuum controller at switch.
❷ 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).

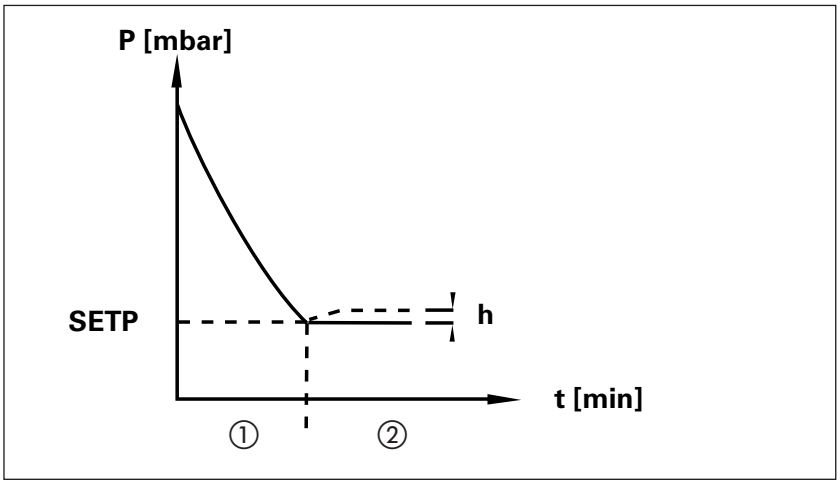


Fig. 3: Controlling profile in manual mode 1

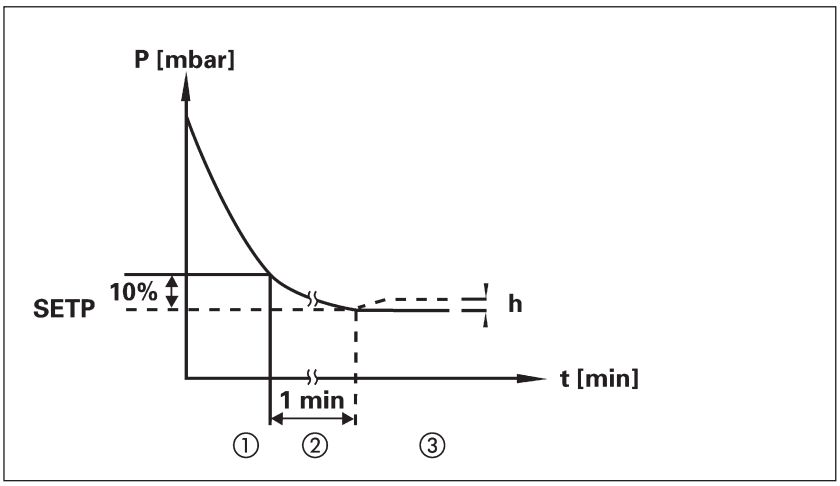


Fig. 4: Controlling profile in manual mode 2: with soft setpoint start

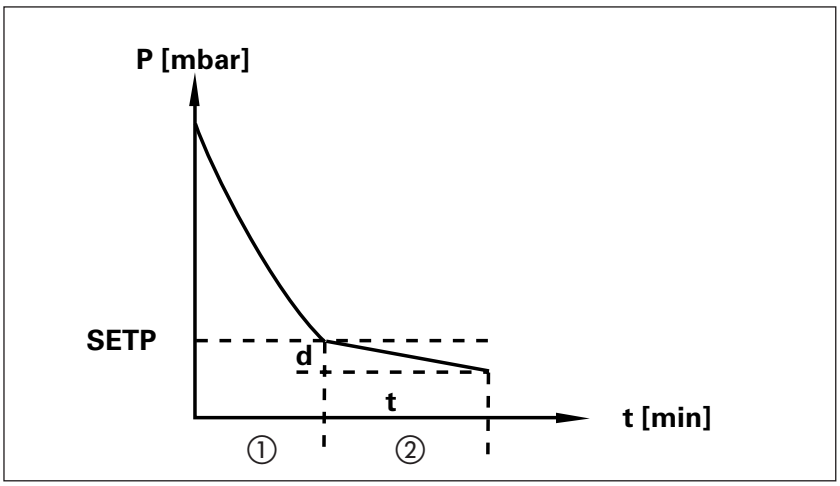


Fig. 5: Controlling profile in manual mode: Controlled pressure reduction

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

❶ If the Vacuum Controller is in H2 mode, it must first be put in H1 mode (see chapter 4.3.2, item ❶).

❷ 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.

❸ 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).

❶ 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 contoller changes to the operating mode.

❷ Press the MAN key.
  ■ System is evacuated to preselected 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.

❸ 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.

❶ Start the process by pressing the MAN key
- System will evacuate to the preset 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.

❷ 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 evacuate 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:

❶ 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.

❷ To end the temporaray mode press the MAN key.
  - ▸ The system will evacuate to the previous pressure setpoint.

4.4.3 Experimental Use

❶ Preset the pressure differential (h) (see section 4.2).

❷ Press MAN key.

❸ Press and hold DOWN key (thereby changing to temporary mode).

❹ 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.

❶ 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“.

❷ Press the STOP key to finish the evacuation.

5. Automatic Operation

The vacuum controller searches automatically for the first boiling point and retaines 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

▸ Boling 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 presssure setpoint has no significance during automatic operation.

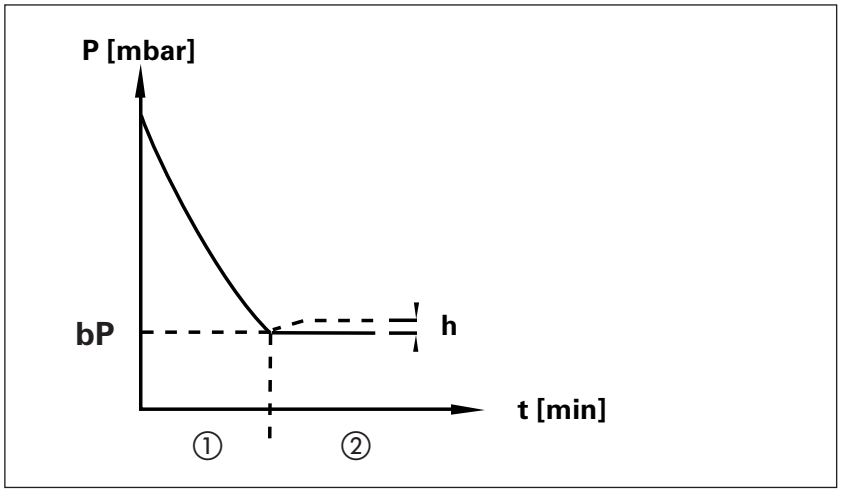


Fig. 6: Controlling profile in automatic mode: Pressure differential

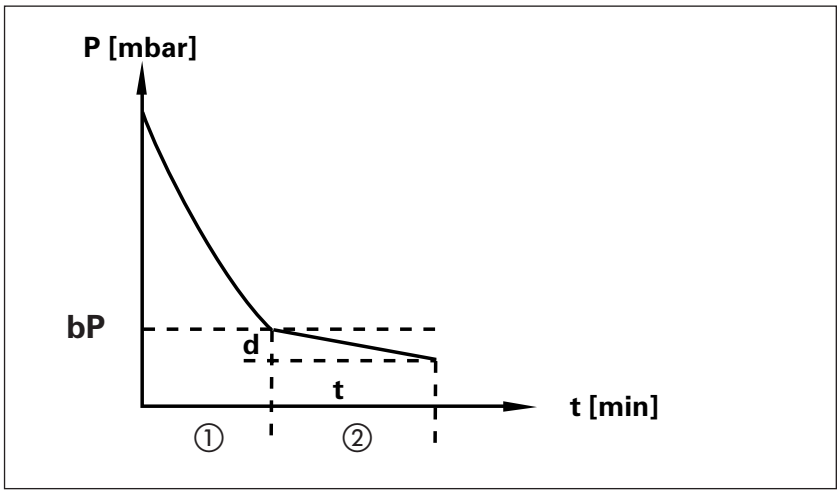


Fig. 7: Controlling profile in automatic mode: Controlled pressure reduction

- 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
- 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 boling 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 contoller 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 ⑪.
   - The new pressure unit will be stored after 5 seconds.
   - The contoller 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 capacity 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-actived 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 LABOPRT® 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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