

## 1. System requirements

- Windows XP, Windows Vista, Windows 7, Windows 8
- 200 MHz processor
- Available memory of at least 64 MB

## 2. Operate the vacuum pump system

### 2.1. General functions and displays

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

Fig. 1 shows an example of the software interface.

#### Menus and buttons

- 1 Menu bar
- 2 Administer user-defined functions
- 3 Print chart
- 4 Buttons to export data into Excel or a text file
- 5 Establish/break connection to vacuum pump system
- 6 Start/Stop button
- 7 Actual pressure display
- 8 Pressure unit menu
- 9 Operating mode display
- 10 Operating mode menu
- 11 Ventilation valve button
- 12 Coolant valve button
- 13 Setpoint pressure display<sup>1</sup>
- 14 Buttons to increase/decrease setpoint pressure<sup>1</sup>
- 15 Slider for pump capacity<sup>2</sup>
- 16 Display of pump capacity in percent<sup>2</sup>
- 17 Buttons to increase/decrease pump capacity<sup>2</sup>
- 18 Chart for actual and setpoint pressure
- 19 Break interface to switch to manual process control

<sup>1</sup> not in *Function* operating mode

<sup>2</sup> only in *Evacuate* operating mode

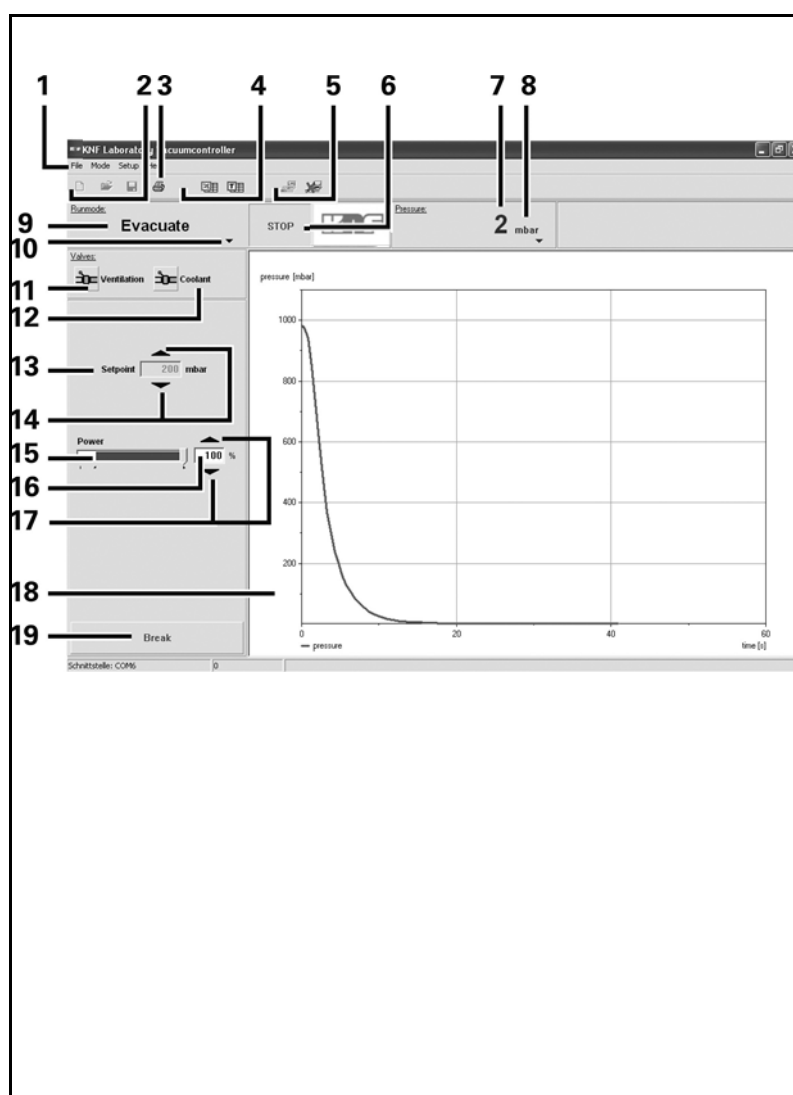


Fig. 1 : Example of software interface showing Evacuate operating mode

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

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

Table 1 lists menu bar options.

| Menu option | Contained functions | Meaning   |
|-------------|---------------------|---|
| File        | New*                | Create new file for user-defined functions.       |
|             | Open*               | Open an existing file for user-defined functions. |
|             | Save*               | Save current file.                                |
|             | Print               | Print chart                                       |
|             | Export...           | Export data                                       |
|             | Stop                | Close software                                    |
| Mode        | Evacuate            | Select Evacuate operating mode                    |
|             | Pressure Control    | Select Pressure Control operating mode            |
|             | Automatic           | Select Automatic operating mode                   |
|             | Function            | Select Function operating mode                    |
| Action      | Start/Stop          | Start/stop process                                |
|             | Ventilation         | Ventilate process                                 |
|             | Cooling             | Open/close coolant valve (accessory)              |
|             | Break               | Switch to manual process control                  |
| Settings    | Language            | Select menu language                              |
|             | Unit of measurement | Select pressure units                             |
|             | Interface           | Establish or interrupt PC connection              |
| Help        | Help                | Help for operation                                |
|             | About...            | Information about the attached vacuum pump system |

Tab. 1: Options on the menu bar

\* only in Function operating mode

## 2.2. Operation

### Installing software

**i** Please read the software license agreement carefully (on the CD: Lizenzvereinbarung.pdf). By using the "KNFLaborSystemX.XXX.exe" software – complete or parts – you accept all the terms and conditions of the agreement. If you do not agree with the terms and conditions, please do not use the software.

1. Insert CD into PC.
2. Open CD.
3. Copy the "PC-Software" folder to a location on the hard disk of the PC.
4. Switch on the vacuum pump system.
5. Use the included USB cable to connect the vacuum pump system to the PC's interface.

**i** The USB connection is located on the back of the vacuum pump system.

Windows finds the new device and starts the installation wizard.

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

The installation wizard will automatically install the driver.

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

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

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

The connection to the vacuum pump system is established and separated by pressing the corresponding button (see 1/5, page 1). If several vacuum pump systems are connected to the PC, select the desired vacuum pump system from the list.

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

### Menu language

On the menu bar you can choose between German, English, French, Italian, Spanish, Dutch, Japanese, and Chinese.

Settings → Language

### Pressure unit

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

The pressure units can be changed as follows:

- through the menu bar:  
Settings → Unit of measurement
- through the chart:  
Pressure unit menu (Fig. 1/8, page 1)

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

## Operating modes

The operating mode can be changed in two different ways:

- Menu bar: Operating mode
- Chart: Operating mode menu (Fig. 1/10, page 1)

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

## Starting and stopping the process

→ Press *START/STOP* button (Fig. 1/6, page 1)

## Open and close the ventilation valve



### WARNING

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

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

→ Press *ventilation valve* button (Fig. 1/11, page 1).

## Opening and closing coolant valve (accessory)

→ Press *coolant valve* button (Fig. 1/12, page 1)

## Entering values in Evacuate operating mode

→ Adjust the pump capacity with the slider (Fig. 1/15, page 1), button (17) or by keyboard entry in the display field (16).

## Entering values in Pressure Control operating mode

→ Adjust setpoint pressure with the *Increase/reduce setpoint pressure* button (Fig. 1/14, page 1) or by keyboard entry in the display field (13).

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

## Entering values in Automatic operating mode

Not necessary to enter value.

If a boiling point is detected in *Automatic* mode, after the system regulates to this pressure, the pressure is reduced automatically to speed up evaporation of the solvent.

## Function operating mode

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

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

- Length of time from previous data point
  - Setpoint pressure
  - Additional options to influence the course of the functions:
    - CV1: Open coolant valve (accessory) (W)
    - CV0: Close coolant valve (accessory) (W)
    - S: Jump – the system evacuates/ventilates to the required pressure as quickly as possible.
    - A: Automatic – Automatic detection of the boiling pressure
- i** If the set limit pressure is reached without a vapor pressure, the program goes to the next function step.
- A+: Automatic Plus – Automatic detection of the vapor pressure with subsequent pressure reduction.

The values can be entered either through the table or through the chart (Fig. 2, page 6).

Entry through the chart:

- Insert data point:  
Right-click on the function curve and select the desired action from the menu that appears.
- Shifting data point:  
Click on the data point and move it as desired.
- Delete data point / specify additional options:  
Right-click on the data point and select the desired action from the menu that appears.

Entry via the table:

Define the additional options by double-clicking the corresponding field in the "Option" column. A menu containing various options opens.

Repeats of the functions are defined in the first blank line underneath the entered data points. Double-click the field in the "Option" column to open a menu with the entry REPEAT. If this function is activated, you can enter the desired number of repeats in the "p [..]" column.

To delete a data point, remove its entry from the dt column. The subsequent data points will be automatically moved up.

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

- i** Changes to the function values (data point table) are applied directly to the hand terminal. Up to 10 different data point tables can be stored and called as required. The number in the display (see Fig. 2/1) indicates the data point table that is currently selected.

- 1 Data point table selection
- 2 Table
- 3 Chart
- 4 Break interface to switch to manual process control

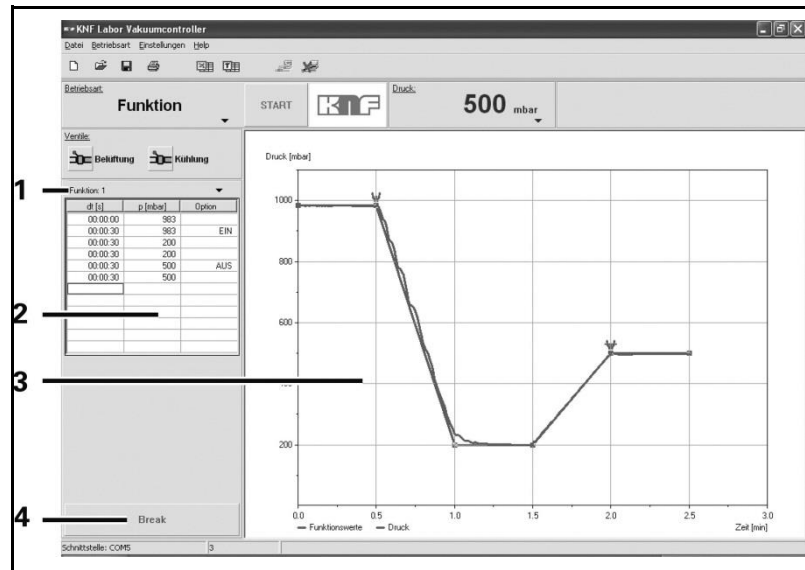


Fig. 2: Function mode

### Switching to manual process control

From any operating mode, briefly press the *Break* button (Fig. 2/4) to switch to manual process control. The actual pressure will be adopted as the setpoint pressure.

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

### Operation in manual process control

- Pressure Control:  
Adjust setpoint pressure with the *Increase/reduce setpoint pressure* button (Fig. 1/14, page 1) or by keyboard entry in the display field (13).
- Evacuate:  
Press *Break* button (Fig. 1/19, page 1) When you release the button, the actual pressure is applied as setpoint pressure for the pressure control.
- Changing to an operating mode:
  1. Press *STOP* button.
  2. Select operating mode through the menu bar or chart (Operating mode menu (Fig. 1/10, page 1)).

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

### 3. Interface protocol

The USB connection between the PC and vacuum pump system is operated as an RS232 interface. Accordingly, in the operating system it is managed as an additional COM connection and can be addressed with conventional terminal software.

#### Interface configuration

- Baud rate: 57600 bits/s
- Data bits: 8
- Parity: none
- Stop bits: 1
- Flow control: none

Tables 2 to 5 contain the necessary command sets, shown as ASCII characters. When transmitting, the commands must be followed by ASCII character <CR> (carriage return, decimal value 013). The underlined expressions are not characters, but symbols. They are explained in Table 4. Spaces are ignored by the controller.

| Parameter                        | Command   | Function                        | Reply                |
|----------------------------------|---|---------------------------------|----------------------|
| Ventilation valve                | dV 1  | open                            | <u>S</u> ; <u>E</u>  |
|                                  | dV 0  | closed                          | <u>S</u> ; <u>E</u>  |
| Coolant valve                    | dW 1  | open                            | <u>S</u> ; <u>E</u>  |
|                                  | dW 0  | closed                          | <u>S</u> ; <u>E</u>  |
| Process                          | dB  | Start                           | <u>S</u> ; <u>E</u>  |
|                                  | dE  | Stop                            | <u>S</u> ; <u>E</u>  |
| Setpoint pressure                | cC <u>ps</u>                                    | Set value [*]                   | <u>ps</u> ; <u>E</u> |
| Capacity                         | cS <u>P</u>                                     | Set value [%]                   | <u>P</u> ; <u>E</u>  |
| Operating mode                   | cM n  | Evacuate                        | <u>M</u> ; <u>E</u>  |
|                                  | cM r  | Pressure control                | <u>M</u> ; <u>E</u>  |
|                                  | cM a  | Automatic                       | <u>M</u> ; <u>E</u>  |
|                                  | cM f  | Function                        | <u>M</u> ; <u>E</u>  |
| Pressure unit                    | cUp 0   | mbar                            | <u>U</u> ; <u>E</u>  |
|                                  | cUp 1   | bar                             | <u>U</u> ; <u>E</u>  |
|                                  | cUp 2   | hPa                             | <u>U</u> ; <u>E</u>  |
|                                  | cUp 3   | Torr                            | <u>U</u> ; <u>E</u>  |
| Data point of the function table | cFd <u>i</u>                                    | Delete                          | <u>i</u> ; <u>E</u>  |
|                                  | cFc <u>i</u>                                    | Delete from here                | <u>i</u> ; <u>E</u>  |
|                                  | cFs <u>i</u> ; <u>Δt</u> ; <u>ps</u> ; <u>K</u> | Set values<br>[ - ; s ; * ; - ] | <u>i</u> ; <u>E</u>  |
| No. of pressure curve            | cFp <u>N</u>                                    | Set value [ - ]                 | <u>N</u> ; <u>E</u>  |

Tab. 2: Control commands

\* pressure unit currently selected

| Parameter                    | Command | Reply  |
|------------------------------|---------|--|
| Ventilation valve            | gV      | <u>V</u>   |
| Coolant valve                | gW      | <u>W</u>   |
| Process<br>[ s ; * ; * ; % ] | pP      | <u>t</u> ; <u>pi</u> ; <u>ps</u> ; <u>P</u> ; <u>S</u> |
| Operating mode               | gM      | <u>M</u> ; <u>E</u>                                    |
| Pressure unit                | gUp     | <u>U</u> ; 0 ; 0                                       |
| Data point                   | gFv i   | <u>i</u> ; <u>Δt</u> ; <u>ps</u> ; <u>K</u> ; <u>E</u> |
| Pressure curve               | gFp     | <u>N</u> ; <u>E</u>                                    |

Tab. 3: Read command

\* pressure unit currently selected

An active process is identified by process time  $\neq 0$ .

| Symbol    | Function                                | Meaning                               |
|-----------|---|---------------------------------------|
| <u>V</u>  | Ventilation valve                       | 0 closed                              |
|           |   | 1 open                                |
| <u>W</u>  | Coolant valve                           | 0 closed                              |
|           |   | 1 open                                |
| <u>ps</u> | Setpoint pressure                       | Number value [*]                      |
| <u>pi</u> | Actual pressure                         | Number value [*]                      |
| <u>P</u>  | Pump capacity                           | Number value [%]                      |
| <u>t</u>  | Process time                            | Number value [s]                      |
| <u>M</u>  | Operating mode                          | 0 Evacuate                            |
|           |   | 1 Pressure control                    |
|           |   | 2 Automatic                           |
|           |   | 3 Function                            |
| <u>U</u>  | Pressure unit                           | 0 mbar                                |
|           |   | 1 bar                                 |
|           |   | 2 hPa                                 |
|           |   | 3 Torr                                |
| <u>E</u>  | Announcement of completion              | 0 command cannot be completed         |
|           |   | 1 command completed                   |
|           |   | ? command unclear                     |
| <u>i</u>  | Line index                              | 0...15                                |
| <u>t</u>  | Length of time from previous data point | Number value [s]                      |
| <u>K</u>  | Cooling action                          | 1 OPEN                                |
|           |   | 2 CLOSED                              |
|           | Jump                                    | 21                                    |
|           | Automatic                               | 22                                    |
|           | Automatic Plus                          | 23                                    |
|           | REPEAT                                  | 10                                    |
|           | None                                    | Different value                       |
| <u>S</u>  | Status message                          | For service only                      |
| <u>N</u>  | No. of pressure curve                   | 0...9<br>(for pressure curves 1...10) |

Tab. 4: Symbols

\* pressure unit currently selected

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



| Parameter                | Set   | Read           |
|--------------------------|---|----------------|
| Ventilation valve [0/1]  | dV _  | gV             |
| Coolant valve [0/1]      | dW _  | gW             |
| Process time [s]         | dB / dE   | pP (1st value) |
| Actual pressure [*]      | -   | pP (2nd value) |
| Setpoint pressure [*]    | cC _____  | pP (3rd value) |
| Capacity [%]             | cS _____  | pP (4th value) |
| Operating mode [n/r/a/f] | cM _  | gM             |
| Pressure units [0/1/2/3] | cUp _   | gUp            |
| Data point               | <u>c</u> Fs <u>i</u> ; <u>Δ</u> t ; <u>p</u> s ; <u>K</u> | gFv <u>i</u>   |
| Pressure curve           | cFp <u>N</u>  | gFp <u>N</u>   |

Tab. 5: Overview

\* pressure unit currently selected