

Operating Instructions

LABOCOL Vario-4000 Fraction Collector



LABOCOL Vario-4000 Plus



LABOCOL Vario-4000



LABOCOL Vario-4000 X-Plus

Fig. 1: The illustration shows the LABOCOL Vario-4000 series

Safety symbols used in these instructions



Warning: Indicates a hazardous situation which can lead to death or serious injuries if not avoided.



Caution: Indicates a hazardous situation which can lead to mild to moderately severe injuries if not avoided.



Caution: Indicates procedures or a procedure which can lead to the damage or destruction of equipment in the case of incorrect implementation.



Note: Identifies additional information. Offers the user hints and tips for easier use of the device.

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1. Field of operation of LABOCOL Vario-4000

1.1 Proper use

The devices of the LABOCOL Vario-4000 Fraction Collector Series are designed for use in scientific laboratories or similar facilities. The Vario-4000 devices can be used to capture and collect fluids in appropriate containers - controlled by either time or volume. The devices are resistant to the solvents and buffers commonly used, for example, in chromatography and can be used at the customary temperatures (4-40°C) for the fractionation of fluids. If the devices are used under extreme conditions (e.g. very high or very low temperatures, highly acidic or basic pH values, extremely high flow rates, etc.), please contact the manufacturer.



By default, the device is not suitable for operation in areas classified according to ATEX guidelines. It must not be used in areas in which potentially explosive atmospheres may prevail. The manufacturer assumes no warranty or liability for damage to property and personal injuries resulting from improper use of the LABOCOL Vario-4000 Fraction Collector.

2. Safety instructions

2.1 General safety instructions

The LABOCOL Vario-4000 Series fraction collectors are designed for use in scientific laboratories or similar establishments. The devices are safe under the usual conditions in these places. A prerequisite, however, is that the devices be operated by trained, qualified personnel who have received instruction in the principles of operation of the equipment, as well as the corresponding safety regulations.

See the following sections of this section for the most important safety instructions for safe working in the laboratory. The user is responsible for compliance with these rules and, if applicable, also for the necessary additional training or safety training of the operating staff.

2.2 Pressure warning



The LABOCOL Vario-4000 Fraction Collector can be used together with, for example, chromatography systems which can produce significant pressures. Especially under pressure, suddenly detaching hose connections present a high risk of injury. Therefore, make sure that all system components, in particular the tubing/piping of the individual components of the device are connected correctly and professionally, as well as firmly and securely. Higher than maximum allowable pressures can cause extreme dysfunction, which can cause serious injuries and damage to property. If you are unsure in dealing with the components, please contact the manufacturer before you continue.

The user must ensure that the LABOCOL Vario-4000 Fraction Collector is only operated within the allowable pressures. At this point, please note the explicit warranty terms and conditions.

Because the application and handling of the LABOCOL Vario-4000 Fraction Collector lies outside of the control of the manufacturer, the responsibility for safe operation lies solely with the user.

The warranty is void if the user or other persons modify or tamper with the safety mechanisms. The same applies to modifications and manipulations of components of the device by unauthorized or untrained staff.

The manufacturer of the device shall not be liable for any damages or injuries arising as a result of unauthorized alterations to the device (especially manipulations and replacement of components, parts and hardware, as well as maintenance and repairs by personnel not expressly and officially authorized by the manufacturer). 3.3 Warning of crushing hazard



Avoid all places where there is a risk of crushing or pinching. The LABOCOL Vario-4000 Fraction Collector has an XY-axis system for the positioning of the fractions. Thus, an arm moves along a track in the horizontal direction (X-axis) over the entire floor space of the unit. In addition, a slide on this arm moves backwards and forwards (Y-axis). Thus user must ensure that there are no objects within the range of motion of the XY-axis system. It is forbidden in particular to reach in during operation of the Vario-4000 in the area of the XY axis movement so as to avoid injury to the operating personnel.

2.3 Warning of chemical hazards

Many solvents used in chromatography are flammable and/or toxic. Carefully read the safety data sheet (MSDS) made available by the chemical manufacturer before you store, handle or work chemicals or hazardous substances.



At any time, make sure that the collecting vessels are large enough to safely catch the quantities of liquids arising during the task to be executed. Include a "safety volume" in the planning. Also make sure that all vessels are secured against falling over, and especially that there is no danger of glass breakage for glass vessels.

Only use the LABOMATIC Vario-4000 Fraction Collectors in areas authorized for this purpose or in well-ventilated rooms or under a fume hood.

Insofar as possible, avoid direct contact with and the inhalation of chemicals. When working, wear appropriate personal protective equipment (PPE), such as safety glasses, lab coat, gloves, etc.. For additional safety guidelines regarding the chemicals you are using, see the corresponding MSDS.



The separating materials used in chromatography pump systems like the LABOMATIC HD-5000 (e.g. silica-, polymer-, sugar-, aluminum-based, etc.) can cause irritation of the skin, eyes and respiratory tract. Inform yourself about the safe handling of these substances before working with these materials by contacting the manufacturers or by reading the associated MSDS.

Keep in mind that, under certain circumstances - especially in the field of preparative chromatography - large quantities of solvents can evaporate during fractionation. Therefore, use closed vessels if at all possible for collecting and storing fractionated liquids or work under a hood corresponding to the regulations.

2.4 Warning against inhalation



Avoid inhaling solvent vapors which may arise during the fractionation of eluents and buffers in open containers. The LABOCOL Vario-4000 Fraction Collector should only be used in well-ventilated spaces/areas approved for this work or under a hood.

2.5 Warning against electric shock



Since open, current-carrying parts are installed inside the LABOCOL Vario-4000 Fraction Collector, the user is strictly forbidden to open the housing of these devices. Risk of death! If you suspect that your device has an electrical defect, disconnect the affected device by switching it off (see section 6.1) and disconnect the mains plug from the mains and contact the manufacturer. The manufacturer declines all responsibility for injury to persons and property damage if the device housing has been opened by unauthorized personnel.

3. Operating principle

3.1 Operating principle of the LABOCOL Vario-4000 Fraction Collector

The devices of the LABOCOL Vario-4000 Fraction Collector Series have been developed for the automatic collection of liquids. They are usually connected to the end of systems that promote a flow of fluid (e.g. pump or chromatography systems).

The fluids are introduced through a capillary/tube into the fraction collector and flow through a tube system, at the end out of a capillary again and out of the device.

As an option, the liquid can be directed through a 3-way valve in two different directions - for example "Waste" and "Fractionation" - into appropriate vessels which usually sit on the base plate (optional fractionation valve known as a "waste-fraction valve" - see section 4.4).

The LABOCOL Vario-4000 Fraction Collector can control almost any position on the floor space of the unit via an XY-axis system in order to draw liquids into suitable vessels. The XY intervals, as well as the order in which the fraction vessels are filled, can be freely programmed (see also sections 6.2.2. Rack configuration and 6.2.2.4 Teach function).

The fractionation of fluids can be controlled on the basis of time or volume - both nearly unlimited.

3.2 LABOCOL Vario-4000 – 4000 Plus – 4000 XPlus

The difference between the LABOMATIC Vario-4000, 4000 Plus and 4000 X Plus systems is in the dimension of the base plate and thus the number of possible fractions. The operation is the same for all 3 devices.

3.3 The funnel system – funnel rack

As an option, the fraction Vario-4000 Fraction Collector can also be equipped with a funnel system ("funnel rack") to collect nearly any type of large fraction, e.g. in barrels. To do this, a frame with funnels is mounted on the base plate. The funnels are equipped with hoses on the bottom that direct the collected fluids into suitable vessels, e.g., underneath the system. For additional information, please contact the manufacturer.

3.4 The fractionation valve (waste-fraction valve – "WFV")

The standard LABOCOL 4000 is delivered without valves. As an option, a fraction valve (waste-fraction valve: "WFV") can be delivered and installed. The WFV is a 3-way valve that can be switched into operation between the positions of "Waste" and "Fractionate". When unswitched, the valve is in the "Waste" position. In this way, the fluid flow is directed into a waste container, e.g. during equilibration. Only if the fractions are to be collected does the valve switch to the "Fractionate" position.

The WFV can be manually switched (in the "Manual Control" menu), or it is switched at a certain time in a programmed method (in the "Run Method" menu). In addition, the WFV always switches from the "Waste" position to the "Fractionate" position if, for example, the threshold value is exceeded during a programmed peak fractionation. The valve automatically switches back to the "Waste" position if the value returns to below the threshold again (see also section 6.2.1.4).

The WFV is located - depending on the version of the Vario - either directly on the Y-arm or at the foot of the mechanical unit (see also Fig. 4)

3.5 The flow interruption valve (flow-switch valve - FSV)

In order to prevent the occurrence of brief high pressures throughout the entire system during high flow rates when switching the fractionation valve (WFV), a so-called flow-switch valve (FSV) can be switched in advance of the actual fractionation valve (optional). This additional 2-way valve switches for a very short period of time to the "Waste" position at the moment in which the actual fractionation valve switches from the "Waste" position to the "Fractionate" position and the fluid flow accumulates, which would lead to a brief but intense pressure build-up in the system.

If the fractionation valve (WFV) has switched to the "Fractionate" position, the flow-switch valve also switches again from the "Waste" position to the "Flow" position.

The flow-switch valve - like the WFV - is located either on the Y-arm or at the foot of the mechanical unit (see Fig. 4), if it is installed.)

3.6 Wall mounting

To collect very large fractions, the upper part of the LABOCOL 4000 can be taken off the base plate and fastened to a wall or similar structure at any height desired. If this option is desired, please contact the manufacturer or distributor.

4. Setting up and connecting

4.1 Delivery and accessories

The LABOCOL Vario-4000 Serie is delivered with the following accessories as standard:

Item-no.	Description	Quantity
	LABOCOL device	
0.247006.0	4000	1
0.247014.0	4000 Plus	1
0.247023.0	4000 X Plus	1
n.a.	Operating Manual	1
105862-16	Power supply 100-230V	1
	Power cable (country-specific)	
0.200062.0	CH	1
0.200065.0	DE	1
0.200070.0	USA	1
0.247989.0	Input/output cable (Sub-D 25-pole)	1
105957	Ethernet cable, RJ45 (2m)	1
105603	Fitting for ferrule 1/8", black	1
105602	Ferrule for 1/8" fitting, black	1
0.247871.0	Drop former, large with threading	1
	Optional, if ordered	
0.247045.0	Touch panel	1
	Cable touch panel (RS232 9-pole)	1
	Rack	



Fig.2: The illustration shows the accessories delivered with a Vario device: 1. Power cable DE (depending on country of delivery) 2. Power cable CH (depending on country of delivery) 3. Sub-D 9-pole RS232 cable for controlling via touch panel 4. RJ45 cable (LAN cable) for controlling via the LaboChrom software 5. Sub-D 25-pole cable 6. Drop former, large, including fitting and ferrule.

4.2 Setting up and connecting



The devices of the LABOCOL Series are delivered in specially made boxes which allow the safe and damage-free transport of the equipment. We therefore recommend keeping the transport packaging for later transport.

LABOCOL devices must be connected to the power supply to be operated. The delivered power supply unit must therefore be connected to the device via the round socket/plug and with the appropriate power cable to a suitable power supply.

When using the device with the LaboChrom software, the control cable (input/output) is connected to the PC (Fig. 2 and 5). Alternatively, the device can be connected to the PC via the LAN connection.

If the Vario device is controlled via a touch panel, the touch panel is connected via the corresponding cable (Fig. 2) to connector 2 (Fig. 4).

With connections 5a and 5b (Fig. 4), an optional fractionation valve (see also section 4.4) and a flow-switch valve (see also section 4.5) can be connected. The connecting cables are firmly connected to the respective valve and are therefore not included in the accessories.

Ensure a proper and secure connection for all connections in order to exclude functional errors during operation.



If all connections are made, the LABOCOL Fraction Collector can be operated after switching on through either the LaboChrom software or a touch panel.

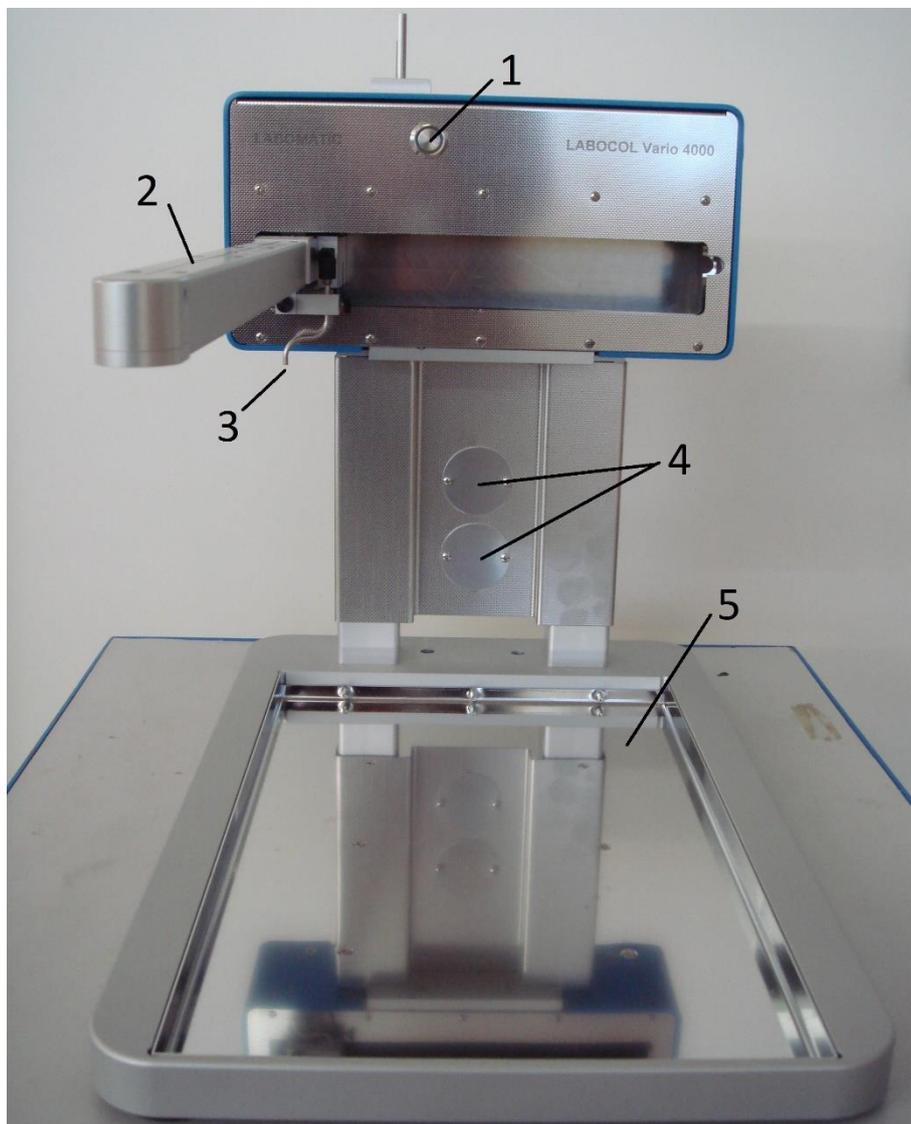


Fig. 3: The illustration shows the front view of a Vario-4000 Fraction Collector. The following, in particular, can be seen: 1. On/off switch (lights up as blue after switching on) 2. Y-axis (movable arm), 3. Drop former (outlet) 4. Places for the waste-fraction valve and/or flow-switch valve 5. Base plate with tub.

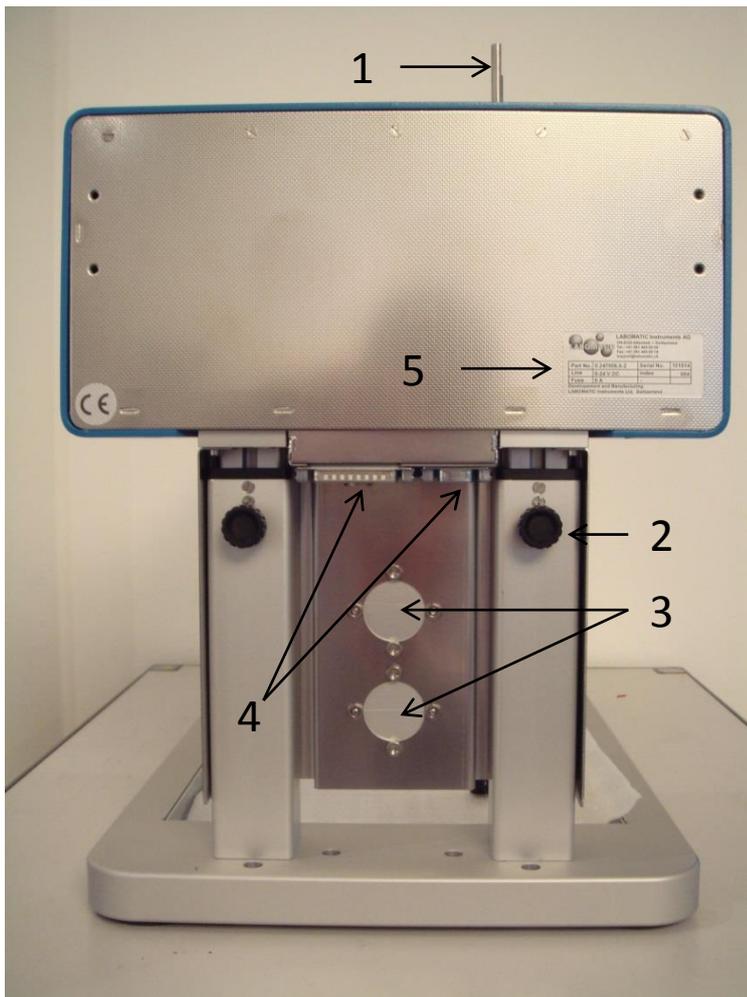


Fig.4: On the back of the Vario-4000 device are connection 4 (see also Fig. 5) on the underside of the housing for connecting the Vario to a PC or touch panel. You can also see: 1. Fastening bolts for the touch panel (if present) 2. Screw for adjustment of the height of the control panel to adjust to the height of the fractionation vessels 3. Recesses for optional waste-fraction valve and flow-switch valve 4. Connection sockets 5. Identification plate.



Abb. 5: The connections of the Vario-4000 devices (see also position 4 in Fig. 4):

1. Sub-D 25-pole: Input/output line: control and supply line (including the RS 232)
2. Sub-D 9-pole: touch panel connection
3. DIN 5-pole: Power line for external power supply
4. RJ 45: Ethernet connection for control via the LaboChrom software
- 5a. Socket: connection for optional solenoid valve 1 (waste-fraction valve)
- 5b. Socket: connection for optional solenoid valve 2 (flow-switch valve)

5. Operation

5.1 Switching the Vario-4000 on

The Vario-4000 Fraction Collector is switched on after connecting to a suitable mains supply via the push button on the front of the unit (see Figure 3).

The touch panel is powered by the fraction collector unit. After switching on, there is a triple beep which signals the initializing of the device. The title screen with the date and version number of the firmware appears on the touch panel. The fraction collector initializes the arm with short movements on both axes and then goes to the reference position at coordinates $X = 0.0$ mm and $Y = 0.0$ mm.

Tapping on the screen opens the menu screen of the main menu. Inputs on the screen are confirmed with a short signal tone.

The main menu is divided into 4 menu items:



In the **"Run Method"** menu, created methods can be executed.

In the **"Edit Method"** menu, up to 10 time-based programs for the fraction collector and connected peripheral devices can be created.

In the **"System Settings"** menu, the parameters for the fraction collector, the interfaces for external control and the control outputs are configured.

In the **"Manual Control"** menu, the fraction collector and any connected peripheral devices can be manually operated.

5.2 System settings



By tapping on the "System Settings" menu in the main menu, you will enter the system settings menu.



The menu item "System Settings" is divided into four areas - the area for the fraction collector settings, the area for the rack configuration, the area for network configuration and a service area. You enter the areas by tapping on the respective items. The "Exit" item will bring you back to the main menu.

5.2.1 Fraction collector settings (Collector Settings)



In the fraction collector settings area, general parameters for the operation of the fraction collector can be established.

Control Port	<input type="radio"/> Winsock	1st Valve Address	1	...
	<input type="radio"/> USB	2nd Valve Address	2	...
	<input checked="" type="radio"/> RS-232			
Switching Valve 1 while moving	<input checked="" type="checkbox"/> Enabled			
Switching Valve 2 while moving	<input checked="" type="checkbox"/> Enabled			
Threshold Value	150 mV		...	
Threshold Hysteresis	5 mV		...	
Signal Averaging	1 Measurements		...	
Signal Dead Time	0 sec		...	
Save Configuration & Exit				

The following parameters can be configured:

- Interfaces for external control.
- Addresses of the valves for the external control.
- Automated switching options for the valves.
- Parameters for the threshold value for signal-dependent fractionation.

Tapping on an option field activates the respective option (green checkmark), or deactivates it (empty circle). The entry of parameters is opened with the button behind the respective text field.



By tapping on the "Save Configuration & Exit" button, the current configuration is saved and you will return to the "System Settings" menu display.

5.2.1.1 Interface (Control Port)

The available interfaces for the Vario-4000 are Winsock, USB and RS 232. The selection is activated by simply tapping the corresponding area on the screen.

Control Port	<input checked="" type="radio"/> Winsock
	<input type="radio"/> USB
	<input type="radio"/> RS-232

Winsock

With **Winsock** activated, the fraction collector can be controlled via an Ethernet network connection. Through the network configuration, an identity in the network can be assigned to the fraction collector so that an existing network can be used to transfer data or to control by means of control software.

Control Port	<input type="radio"/> Winsock
	<input checked="" type="radio"/> USB
	<input type="radio"/> RS-232

USB

With **USB** activated, the fraction collector can be controlled via a USB 2.0 interface. A virtual COM port is generated on the computer which then serves as an interface for the control software.

Control Port	<input type="radio"/> Winsock
	<input type="radio"/> USB
	<input checked="" type="radio"/> RS-232

RS 232

With an activated **RS 232 interface**, the fraction collector can be controlled via a COM port configured in the control software (e.g. LaboChrom).

5.2.1.2 Address of the first/second valve (1st/2nd Valve Address)

It is possible to connect 2 solenoid valves (24VDC). The valve can be separately activated through control software via the entered address and configured interface.

Valve 1 is thus configured as a waste/fraction valve and shows the corresponding status indicators (Waste, Fraction) in manual operation and when executing a method.

5.2.1.3 Switching valve at change of fraction (Switching Valve while moving)

By activating this function, the corresponding valve is automatically switched to position 1 during a fraction change (step). This option prevents fractionation between the fraction glasses or interrupts the flow to the fraction glasses.

5.2.1.4 Parameters for signal-dependent fractionating

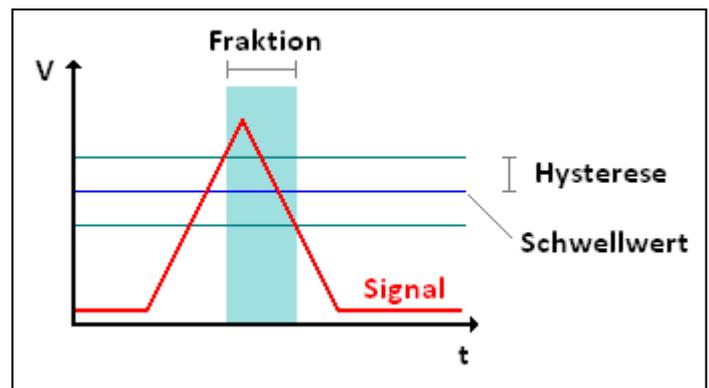
The Vario-4000 supports signal-dependent fractionation using a threshold value. A UV detector, for example, can be connected via the analogue entry to the device. The analog input range is 0 – 3.3 Volt. The threshold value for signal-dependent fractionation can be defined in this range. A threshold value of 0 mV deactivates the function.

Threshold value (Threshold Value)

This threshold value is used as the default value. In a method, it can be programmed at any time with the "Threshold" function.

Threshold value hysteresis (Threshold Hysteresis)

The threshold hysteresis prevents a restless analogue signal at the level of the threshold value from constantly falling either above or below the threshold value. If a hysteresis value is specified, the threshold value is not considered to have been exceeded until the input signal has exceeded the threshold value + hysteresis value. Likewise, the value is not considered to have fallen below the threshold value until the input signal has fallen below the threshold value – hysteresis value.



Signal averaging (Signal Averaging)

Signal averaging is used to smooth out the analogue signal. The parameter indicates the number of measured values by which an average is calculated. The measured values of the analogue signal are generated at intervals of 500 milliseconds. The value range of the signal averaging lies between 1 (no averaging) and 10 (averaging of 10 measured values or 5 seconds). It should be noted that the signal form also becomes slower with an increasing number of measuring points for the averaging. If the slope of the signal edges is an important criterion, it is recommended that the selected parameters not be too large.

Signal dead time (Signal Dead Time)

The signal dead time is used to offset the time required for the extracted medium for the distance between the output detector cell and fractionation valve. The switching of the fractionation valve triggered by the threshold and the execution of position change are executed in a delayed manner by the indication of a dead time. The manual control of the fraction collector is not delayed.

5.2.2 Rack configuration (Create / Edit Rack)



Under this menu point, symmetrical rack files can be generated or altered. There are 10 memory locations for rack files available.

These are selected using the arrow keys.  

Rack Geometry		
Vials in X	12	...
Vials in Y	20	...
Left Top X	2.0 mm	...
Left Top Y	3.0 mm	...
Right Bottom X	222.0 mm	...
Right Bottom Y	383.0 mm	...
Offset Odd Columns	0.0 mm	...
Limiter Default	30 sec	...



The "Exit" interface is used to save the current rack data and takes you back to the "System Settings" menu screen.

5.2.3 Rack geometry

In the lines for the rack geometry, the data for the creation of a symmetrical rack are specified. The input is done via the touch screen keyboard, which is opened via the interface behind the respective lines. 

Vials in X	Number of fractions in X-direction
Vials in Y	Number of fractions in Y-direction
Left Top X/Y	Coordination of the upper left fraction in millimeters from the initialization point. The position can be determined via the "Teach function" (section 2.2.4).
Right Bottom X/Y	Coordinates of the right bottom fraction in millimeters from the reference point. The position can be determined via the "Teach function" (section 2.2.4).
Offset Even Column	If the rack is indented every second row in the Y-direction, this offset can be defined here.
Limiter Default	The limiter value indicates the time for an automatic fraction change. The limiter is only active if the fractionation valve (V1) is in the « Fraction » position

5.2.3.1 Starting position (Start Position)

The Start (Home) Position of the rack can be freely selected. The following options are possible:



Start position top left



Start position top right



Start position bottom left



Start position bottom right

5.2.3.2 Travel path (Movement)

Travel path of the fraction collector during filling of the fractions. The following options are possible:



Column by column (X-direction) alternating between top-to-bottom and bottom-to-top movement. Short path when changing the column.



Row by row (Y-direction) alternating between left-to-right and right-to-left movement. Short path when changing the row.



Column by column (X-direction) always from top to bottom. Long path when changing the column.

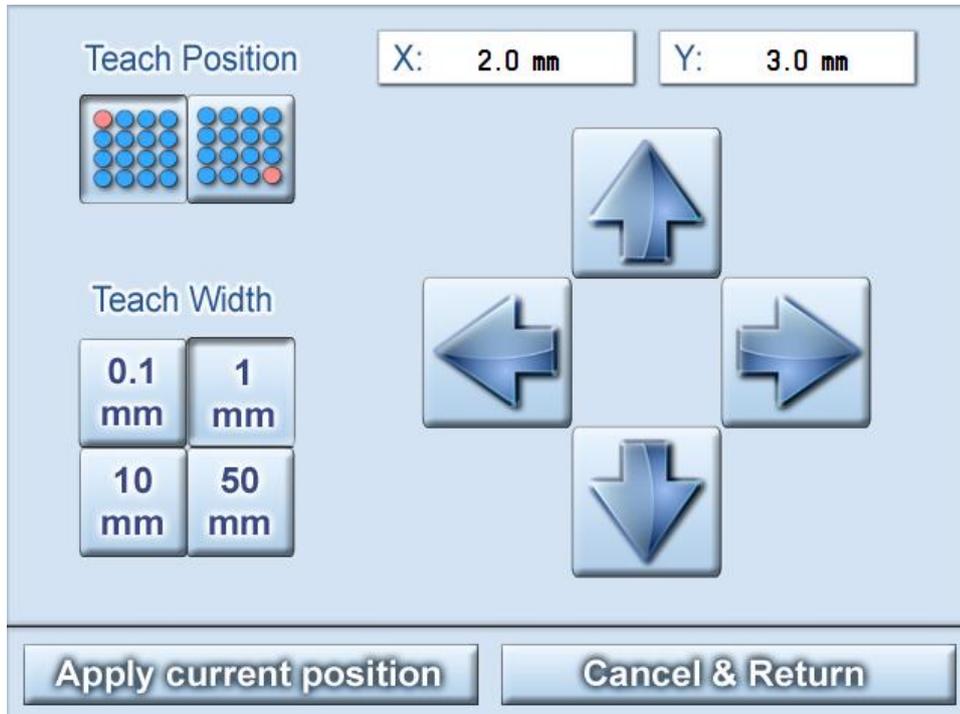


Row by row (Y-direction) always from left to right. Long path when changing the row.

5.2.3.3 Teach function



With the Teach function, the key data for a symmetrical rack can be determined. The key data consist of the coordinates of the top left position and the bottom right position.



The position to be learned is selected via the "Teach Position" buttons. The corresponding position is attained using the arrow buttons. Each tap on an arrow button moves the fraction collector arm by the selected step width in the corresponding direction. The step width can be varied using the "Teach Width" button. The current position is shown in the "X" and "Y" fields in millimeters.

If the desired position is reached, this is transferred to the selected rack file by pressing the "Apply current position" button. The acquired values are then displayed on the "Create / Edit Rack" screen in the appropriate fields.

The "Cancel & Return" button will leave the Teach interface without accepting the coordinates.

5.2.4 Network configuration settings "Network"

MAC Address	00:1E:C0:B5:E5:83	...
Host Name	VARIO-5000	...
Winsock Port	100	...
DHCP	<input type="radio"/> Enabled	
IP Address	192.168.000.101	...
Subnet Mask	255.255.255.000	...

Cancel & Exit

Save & Reboot

By tapping the "Network" button, you will arrive at the screen for network settings. Changes made here require a new start (reboot) of the fraction collector. With the "Save & Reboot" button, the current parameters are saved, and the firmware of the fraction collector is restarted. With the "Cancel & Edit" button, the interface is left without the parameters being saved.

To input values and names, the button behind the text field is used to open the on-screen keyboard.

The Shift key can be used to switch between upper and lower case letters.







5.2.4.1 MAC address (MAC Address)

Hardware address of the integrated network adaptor is used to identify within the network.

5.2.4.2 Device name (Host Name)

Name or label with which the fraction collector logs onto the network when the DHCP function is enabled.

5.2.4.3 Winsock port

Port number for the Winsock protocol with which possible control software can access the fraction collector.

5.2.4.4 Dynamic Host Configuration Protocol (DHCP)

With the DHCP function enabled, an IP address is assigned to the fraction collector by the router. This prevents double addresses in the network. Furthermore, the fraction collector can be addressed with a host name.

5.2.4.5 Internet Protocol Address (IP Address)

IP address of the fraction collector in the network

5.2.4.6 Subnet mask

The network description is dictated by the existing network.

5.2.5 Installation and maintenance settings (Service Settings)

Serial Number		...
Username		...
Password		...
Max. Range X		...
Max. Range Y		...
Max. Range Z		...

	Inactive	Active
Motor Current X
Motor Current Y
Motor Current Z

Save Configuration & Exit

This area is access-protected and should only be used by authorized skilled personnel.

In this area, basic settings are managed whose improper alteration could impair the proper operation of the fraction collector.

5.2.5.1 Serial number (Serial Number)

The serial number of the fraction collector is specified by the manufacturer and is usually also found on the device label.

5.2.5.2 Username (Username)

User name for accessing the protected service area.

5.2.5.3 Password (Password)

Password for accessing the protected service area

5.2.5.4 Maximum travel path (Max. Range)

These parameters define the maximum travel path for each axis of the fraction collector. The size is specified according to device type by the manufacturer.

5.2.5.5 Motor phase current (Motor Current)

With these parameters, the motor phase current for each axis can be adjusted. In the "Inactive" column, the holding current or even the standby current is defined (motors stopped). In the "Active" column, the operating current is defined (motors running). The maximum current can be 2500 mA. The factory setting corresponds to 500 mA for standby current and 2000 mA for operating current.

5.2.6 Configuration via a web browser

Vario-5000
 Firmware: V1.04
 Build Date: 09.03.2015

I/O Configuration

Control Port:	<input checked="" type="radio"/> Winsock <input type="radio"/> USB <input type="radio"/> RS-232	Addresses:	Valve 1: <input type="text" value="1"/> [1-99]
			Valve 2: <input type="text" value="2"/> [1-99]

Network Configuration

MAC Address:	<input type="text" value="D8:80:39:04:02:F1"/>	DHCP:	<input type="checkbox"/> Enabled
Host Name:	<input type="text" value="VARIO-5000"/>	IP Address:	<input type="text" value="192.168.0.107"/>
Winsock Port:	<input type="text" value="100"/>	Subnet Mask:	<input type="text" value="255.255.255.0"/>

Device Configuration

Switching Valve 1 while moving:	<input checked="" type="checkbox"/> Enabled		
Switching Valve 2 while moving:	<input checked="" type="checkbox"/> Enabled		
Threshold Value:	<input type="text" value="150"/> [mV]	Signal Averaging:	<input type="text" value="1"/>
Threshold Hysteresis:	<input type="text" value="5"/> [mV]	Signal Dead Time:	<input type="text" value="0"/> [sec]

Save Configuration and Reboot Service Menu

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All settings described in section 2.2 through section 2.5 can also be configured via a web browser.

The fraction collector is connected to the computer network for this purpose. By entering the IP address, or if DHCP is enabled, the host name of the fraction collector in the address line of the browser, all fraction collector parameters are shown in the HTTP interfaces and can be changed.

Vario-5000
 Firmware: V1.04
 Build Date: 09.03.2015

Service Menu

Serial No:	<input type="text" value="101"/>	Max Range X:	<input type="text" value="385.0"/> [mm]
Username:	<input type="text" value="*****"/>	Max Range Y:	<input type="text" value="383.0"/> [mm]
Password:	<input type="text" value="*****"/>	Max Range Z:	<input type="text" value="400.0"/> [mm]

	Inactive	Active
Motor Current X:	<input type="text" value="500"/> [mA]	<input type="text" value="2000"/> [mA]
Motor Current Y:	<input type="text" value="500"/> [mA]	<input type="text" value="2000"/> [mA]
Motor Current Z:	<input type="text" value="500"/> [mA]	<input type="text" value="2000"/> [mA]

Save Configuration and Exit

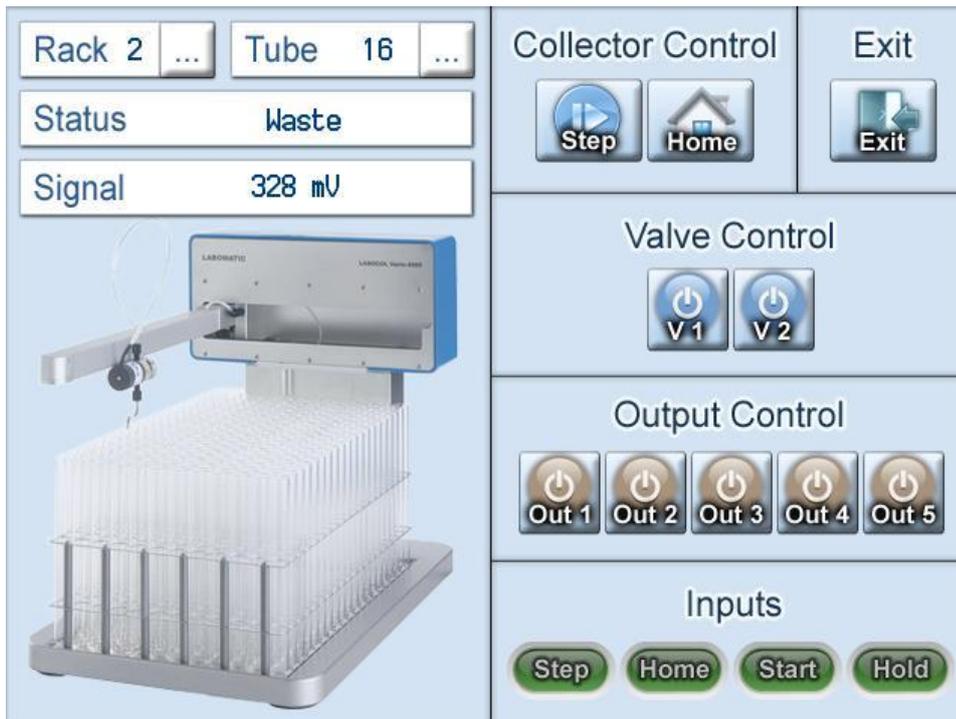
Copyright © 2015 Labomatic AG

5.3 Manual control (Manual Control)



By using the "Manual Control" button, you arrive at the main menu on the screen for the manual control of the fraction collector.

The screen is divided into the following areas:



- **Status** overview
- Fraction collector control (**Collector Control**)
- **Valve Control**
- **Output Control**
- Signal inputs (**Inputs**).

You arrive back at the main menu via the "Exit" button.

5.3.1 Status overview

The status overview contains information on the selected rack type (Rack), the current fraction number (Tube), the current device status and the current signal at the analogue input. By activating the button,  the rack type and fraction number can be entered via the on-screen keyboard. After entering, the fraction collector arm moves to the selected fraction in the selected rack.

The following status reports can be displayed:

- Homing:** The fraction collector arm moves to the reference position $X = 0.0$ mm and $Y = 0.0$ mm.
- Moving:** The fraction collector arm is moved for a fraction change. This switches valve 1 and/or valve 2 to position 1 if the function is activated (see section 2.1.3) for the duration of the movement.
- Waste:** Valve 1 is in position 1, no fractionation.
- Fraction:** Valve 1 is in position 2, fractionation is taking place.

5.3.2 Fraction collector control (Collector Control)



The "Step" button is used for switching to the next fraction. If the last fraction is reached, an error signal is generated if there is another attempt.



The "Home" button is used to reset the collector arm to the starting position (Fraction 1).

5.3.3 Valve control (Valve Control)



By tapping the respective button, the corresponding valve is activated or deactivated.

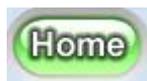
5.3.4 Signal output (Output Control)



The Vario-4000 has five switchable, potential-free relay contacts. These can be closed and opened via the manual control.

5.3.5 Control inputs (Inputs)

The Vario-4000 has 4 control inputs associated with the following functions:



Returns the fraction collector to position 1



Change to the next fraction



Starts the selected method



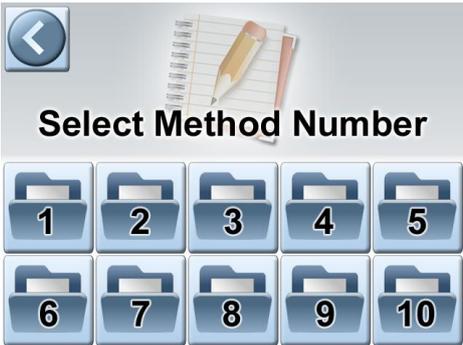
Pauses the method or continues it.

The displays of the signal inputs have no control function.

5.4 Method editor (Edit Method)



The "Edit Method" button in the main menu is used to arrive at the screen for selecting a method.



The Vario-4000 offers the possibility of programming 10 methods. After selecting a method number, the editor appears and shows the content of the respective method.

No 1
Method Editor
Exit

Time	Function	Parameter		
0.00	Rack No	Rack 2	▲	Rack No
0.00	Position	Fraction No 1		Home
0.00	Valve Pos	Valve 1 = Pos 1		Step
0.00	Limiter	30 seconds		Position No
0.00	Threshold	150 mV		Valve Pos
0.10	Valve Pos	Valve 1 = Pos 2		Relay Out
30.00	Valve Pos	Valve 1 = Pos 1		Limiter
30.10	Beep Signal	5 seconds	▼	Threshold
				Beep Signal

0.00	Rack No	Rack 2
------	---------	--------

✓
✗

All entries are made in the bottom editing line. The selected function is chosen on the right side, whereby the editing line automatically contains the associated input fields for the parameters. By tapping the field in the "Time" column or "Parameter" column, the on-screen keyboard opens for entering the desired values. The content of the editing line is entered by tapping the checkmark in the method. Lines of the method can be called up and changed at any time by tapping in the table or can also be deleted by tapping the cross. The programming does not have to be performed in chronological order; the content of a method is automatically sorted.



The method is saved via the "Exit" button, and the method editor is closed. You arrive back at the main menu.

5.4.1 Rack type (Rack No)

0.00	Rack No	Rack 3
------	---------	--------

The "Rack No" function defines the current rack type for the fraction collector. If no rack type is defined in a method, the one selected last is used. The programmed value range is between rack 1 and rack 10.

5.4.2 Start position (Home)

0.00	Home	
------	------	--

The "Home" function moves the fraction collector arm to the starting position (fraction 1) at the programmed time.

5.4.3 Fraction change (Step)

0.00	Step	
------	------	--

The "Step" function moves the fraction collector arm to the following position at the programmed time.

5.4.4 Fraction number (Position No)

0.00	Position	Fraction No 1
------	----------	---------------

The "Position No" function moves the fraction collector arm to the specified position at the programmed time. The programmed value range is between position 1 and the last position in the rack used.

5.4.5 Valve positions (Valve Pos)

0.00	Valve Pos	Valve 1 = Pos 2
------	-----------	-----------------

The "Valve Pos" function switches the corresponding valve to the specified position at the programmed time. Valve 1 is the fractionation valve with positions "1" for "Waste" and "2" for "Fraction".

5.4.6 Signal outputs (Relay Out)

0.00	Relay Out	Output 1 = Pulse
------	-----------	------------------

The "Relay Out" function switches the corresponding potential-free relay output to the specified state at the programmed time. The possible programmable states are:

- On:** The potential-free relay contact is closed
- Off:** The potential-free relay contact is open
- Pulse:** The potential-free relay contact is closed for 1 second

5.4.7 Limiter

0.00	Limiter	30 seconds
------	---------	------------

The "Limiter" function defines the time interval for an automatic fraction change (Step). The limiter function is activated by switching valve 1 to position 2 (Fraction). Once the time interval has run out, a

fraction change to the next position is automatically performed. By switching valve 1 to position 1 (Waste), the limiter function is deactivated again. The last limiter value is hereby retained and would be continued with another switch to the Fraction position. Not until there is a position change to another fraction is the limiter value reset. The programmed value range is between 1 and 999 seconds.

5.4.8 Threshold (Threshold)

0.00	Threshold	30 seconds
------	-----------	------------

The "Threshold" function defines the level of the threshold value for the signal-dependent fractionation (see section 2.1.4) of the fraction collector.

The programmable value range is between 0 and 3300 millivolts.

5.4.9 Acoustic signal (Beep Signal)

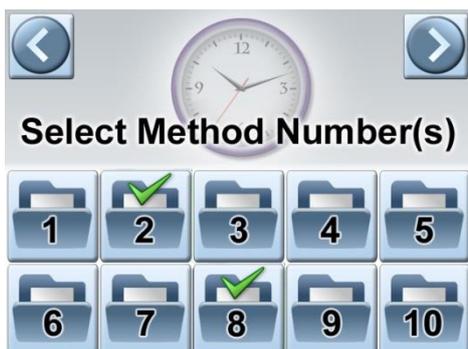
0.00	Beep Signal	10 seconds
------	-------------	------------

The "Beep Signal" function starts an acoustic signal for the specified duration at the programmed time. The programmed value range is between 1 and 999 seconds.

5.5 Execute methods (Run Method)



The "Run Method" button in the main menu is used to arrive at the selection window for the method sequence.



In this window, one or more methods can be selected by tapping.



Use the left arrow to go back to the main menu.



After selecting the method(s), the right-pointing arrow is used to arrive at the execution window.

When selecting several methods, these are processed in increasing order. After running the last command line in a method, the next selected method is automatically started.

Method	Number	2	Elapsed Time	4.32
--------	--------	---	--------------	------

Rack 3
 Tube 8
 432 mV

0.00	Rack No 3
0.00	Valve 1 = Pos 1
0.00	Limit 30 sec
0.00	Threshold 150 mV
0.10	Valve 1 Pos 2
5.00	Valve 1 Pos 1

In the upper part of the window, method numbers as well as the elapsed time of the running method are displayed. In the left field are two buttons for manual operation during the procedure. The left "Step" button moves the fraction collector into the next possible position. The "Waste/Fraction" button on the right shows the current state of valve 1 and enables manual switching between the two positions. The display fields in the fraction collector screen show the current rack, the current fraction number and the current level of the signal at the analogue input.

The scroll bar on the right beside the fraction collector illustration is a graphic representation of the fractionation time of the

current fraction in proportion to the programmed fraction limit (Limiter).

In the right field, the programmed sequence table is shown. After executing a function line, the font color changes from black to blue. Functions that were programmed at the time 0.00 minutes are run directly by calling up the method.



The "Method" display shows the number of the current method.



The "Elapsed Time" display shows the elapsed time of the current method.



With the "Start" button, the current method is started or an interrupted method continued.



With the "Hold" button, a method is interrupted/paused.



With the "Stop" button, a running or interrupted method is stopped. At a subsequent restart, the lowest selected method number is started from the beginning.



With the "Exit" button, you will be returned to the main menu.

6. Decommissioning

6.1 Shutdown – re-starting

To decommission the Vario-4000 Fraction Collector, it is sufficient to rinse the device intensively with water or 20% ethanol/water (v/v). After rinsing, the device can be switched off at the on/off switch on the front plate. After removing the connecting cable on the back or underside, the Vario-4000 can be stored in a dry, cool room.

If the fraction collector is to be used again, it can be connected with the touch panel or a pump system, as described in section 4. Then it is recommended that the device be rinsed with water or 20% ethanol/water (v/v) and inspected for leakage.

The optional 3-way valve (WFV) can be manually switched to ensure its functionality.

To guarantee full functionality of the Vario-4000, the arm should be moved to the maximum possible positions. In doing so, flawless functioning of the moving parts must be ensured.

After the tests listed above, the Vario-4000 Fraction Collector is once again available for the automatic collection of fluid fractions.

7. Maintenance

7.1 Maintenance work

The Vario-4000 Fraction Collector is largely maintenance-free for the user. Maintenance work is limited to:

- the regular inspection of mechanical functionality (free movement of the arm)
- inspection of the functionality of the optional 3-way valve (WFV)
- responsiveness of the Vario-4000 to the software and the flawless control via manual commands on the touch panel and via the LaboChrom software

7.2 Retrofitting



The Vario-4000 Fraction Collector can be adapted to different conditions (e.g. mains voltage, greater flow rates, etc.). If you have questions, please contact one of the contractual partners named in section 11.3. Modifications by non-authorized personnel may lead to injuries to the operating personnel or permanently damage the device. We therefore urgently advise against users making repairs or modifications to the Vario-4000 themselves.

7.3 Wear parts



The Vario-4000 Fraction Collector is designed for long-term operation. There are no wearing parts on or in the device which must be replaced by the user. Delivered parts are listed in section 5.1.

If you notice malfunctions of the device, please contact one of the contractual partners named in section 11.3. Do not attempt to perform repairs yourself.

7.4 Spare parts

Spare parts can be obtained from the contractual partners named in section 11.3 or from the manufacturer.

8. Eliminating problems

8.1 General

The Vario-4000 Fraction Collector has been designed for long-term operation. Therefore, no malfunctions are to be expected with intended use and careful care/maintenance. Listed below are some potential malfunctions with possible causes and troubleshooting information provided.

Troubleshooting LABOCOL Vario-4000 Series		
Error	Cause	Solution
The device cannot be switched on or operated	Mains plug not plugged in	Connect mains plug to a suitable power supply
	On/off switch on the device not switched on	Switch on the on/off switch on the front plate of the device
	The mains adaptor of the Vario-4000 is defective	Contact the manufacturer
	The fuse of the Vario-4000 is defective	Contact the manufacturer
	other errors	Contact the manufacturer
The arm (X-axis) does not move	Travel path of the X-axis blocked	Check the travel path of the X-axis and remove obstacle if necessary
	other errors	Contact the manufacturer
The Y-axis does not move	Travel path of the Y-axis blocked	Check the travel path of the Y-axis and remove obstacle if necessary
	other errors	Contact the manufacturer
No fluid escapes from the outlet capillary	Capillary is bent or clogged	Inspect the capillary of the supply line to the Vario-4000 up to the outlet
	other errors	Contact the manufacturer

9. Technical data

9.1 Physical specifications

Physical specifications for the LABOCOL Vario-4000 Series			
	4000	4000 Plus	4000 X-Plus
External dimensions in cm			
Width	30	46	48
Depth	50	50	57
Min. height*	52	52	52
Max. height*	67	67	67
*incl. Touch Panel			
Individual height	The height of the Vario-4000 can be adjusted individually for different fractionation vessels.		
Height over fractionation vessel in cm			
min	21.5	21.5	21.5
max	35.5	35.5	35.5
Maximum floor space in cm x cm (WxD)	24 x 41	40 x 41	49 x 57
Weight in kg	8	10	15
Materials in contact with product	PTFE,PEEK	PTFE,PEEK	PTFE,PEEK
Ventilation/distance	at least 5 cm on each side		
Maximum fraction number	unlimited		
Maximum fraction size	unlimited		
Available rack types	see separate rack list		
Number of possible racks	3 individual	5 individual	individual

9.2 Environmental specifications

Environmental specifications for the LABOCOL Vario-4000 Series			
	4000	4000 Plus	4000 X-Plus
suitable environmental temperature in °C	4 - 40		
permissible operating environment	inside		
Relative humidity in %	Maximum relative humidity 85% for temperatures up to 31°C. Decreasing linearly to 50% at 40°C		
Storage temperature in °C	0 - 50		

9.3 Electrical specifications

Electrical specifications for the LABOCOL Vario-4000 Series			
	4000	4000 Plus	4000 X-Plus
Power supply	external power unit		
Fuse			
Power supply output	24V, 5A		
Power supply input	100-240V, 2.5A		
Frequency	50-60Hz		

10. Service/guarantee

10.1 Service and guarantee – general

The LABOCOL Vario-4000 Fraction Collector is sold by authorized dealers or representatives. The respective companies are listed under 11.3 and can be contacted, if necessary, for service or customer service. For repairs or questions about the product, please always indicate the serial number on the side wall of the device.

10.2 Guarantee and warranty

LABOMATIC Instruments AG, as the manufacturer and distributor of the LABOCOL Vario-4000 Fraction Collector, assumes a warranty of 1 year from the delivery date for all parts for which it can be proven that they were already defective at the time of delivery or within a period of 1 year after delivery if a defect appears which was not caused by improper or unintended operation. The warranty extends to the replacement of the defective parts, including the associated labor costs. Wearing parts are excluded from this regulation.



The standard device is not suitable for operation in areas classified according to ATEX guidelines and is not suitable for operation with flammable liquids. It must not be used in areas in which potentially explosive atmospheres may prevail.

Warranty extensions and maintenance contracts are available on request and can be individually adjusted.



10.3 Authorized LABOMATIC Instruments AG subsidiaries and distribution partners

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