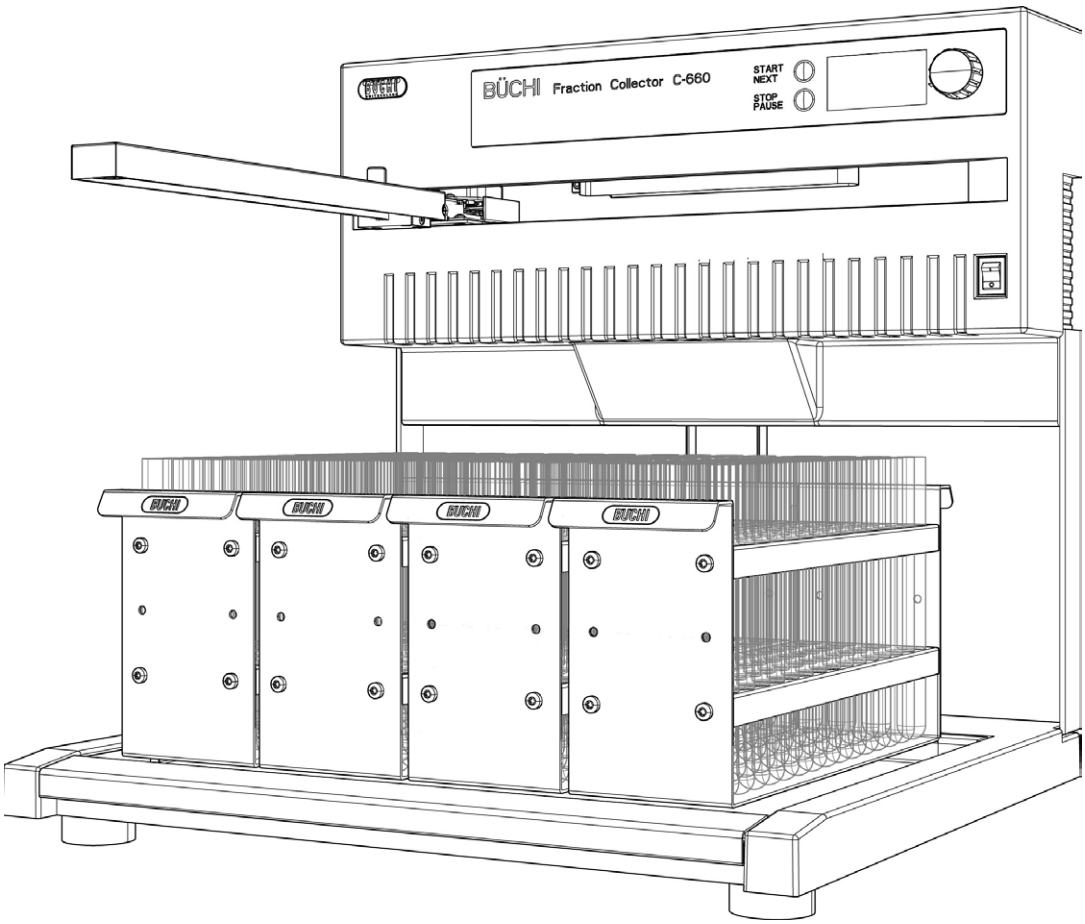
Fraction Collector C-660
Operation Manual



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Read this manual carefully before installing and running your system and note the safety precautions in chapter 2 in particular. Store the manual in the immediate vicinity of the instrument, so that it can be consulted at any time.

No technical modifications may be made to the instrument without the prior written agreement of BUCHI. Unauthorized modifications may affect the system safety or result in accidents.

The English manual is the original language version and serves as basis for all translations into other languages. Other language versions can be downloaded at www.buchi.com.

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1 About this manual

This manual describes the Fraction Collector C-660 and provides all information required for its safe operation and to maintain it in good working order.
It is addressed in particular to laboratory personnel and operators.

NOTE
The symbols pertaining to safety (WARNINGS and ATTENTIONS) are explained in chapter 2.

1.1 Reference documents

- Installation Guide SepacoreControl
- Pump Modules C-601 & C-605, Pump Controller C-610 / Pump Manager C-615, Operation Manual numbers 96961 – 96965
- UV-Monitor C-630, Operation Manual numbers 96950 – 96953 and 96966
- UV-Photometer C-635, Operation Manual numbers 96957 – 96960 and 96967
- Cartridger C-670, Operation Manual numbers 96945 – 96949

1.2 Trademarks

The following product names and any registered and unregistered trademarks mentioned in this manual are used for identification purposes only and remain the exclusive property of their respective owners:

- Sepacore® is a registered trademark of BÜCHI Labortechnik AG
- Syncore® is a registered trademark of BÜCHI Labortechnik AG
- Cartridger® is a registered trademark of BÜCHI Labortechnik AG

1.3 Abbreviations

ETFE: Ethylene/Tetrafluoroethylene Copolymer
FEP: Fluorinated Ethylene Propylene
POM: Polyoxymethylene
PUR: Polyurethane

2 Safety

This chapter highlights the safety concept of the fraction collector and contains general rules of behavior and warnings from hazards concerning the use of the product.
The safety of users and personnel can only be ensured if these safety instructions and the safety-related warnings in the individual chapters are strictly observed and followed, therefore, the manual must always be available to all persons performing the tasks described herein.

2.1 User qualification

The instrument may only be used by laboratory personnel or other persons who on account of training or professional experience have an overview of the dangers which can develop when operating the instrument.
Personnel without this training or persons who are currently being trained require careful supervision. The present Operation Manual serves as a basis for training.

2.2 Proper use

The Fraction Collector C-660 has been conceived of and constructed as a laboratory instrument. Its correct usage is the optimal and reliable collection of individual aqueous and/or organic fractions in predetermined or customized racks (e.g. chromatography or Syncore racks).

Correct usage of the Fraction Collector C-660 also includes its maintenance and careful handling of the instrument on the basis of the specifications given in the Operation Manual.

2.3 Improper use

Applications beyond those described above are improper. Furthermore, applications which do not comply with the technical data are also considered improper. The operator bears the sole risk for any damages caused by such improper use.

The following applications are expressly forbidden:

- Use of the instrument in rooms which require ex-protected instruments.
- Collection of samples which can explode or inflame due to shock, friction, heat or spark formation or that are combustible (e.g. explosive substances, etc.)
- Use in human medicine diagnostics.
- Preparation of food.

2.4 Warning notices used in this manual

WARNING
Generally, the triangular warning symbol indicates the possibility of personal injury or even loss of life if the instructions are not followed.

WARNING
Electrical hazard.

WARNING
Harmful to life forms.

WARNING
Inhalation of harmful substances.

ATTENTION
With the “Read this” symbol, ATTENTION indicates the possibility of equipment damage, malfunctions or incorrect process results if the instructions are not followed.

NOTE
Useful tips for the optimum operation of the instrument.

2.5 Product safety

The Pump System is designed and built in accordance with current state-of-the-art technology, however, risks to users, property, and the environment can arise when the instrument is used carelessly or improperly.

The manufacturer has determined residual dangers emanating from the instrument

- if the instrument is operated by insufficiently trained personnel.
- if the instrument is not operated according to its proper use.

Appropriate warnings in this manual serve to make the user alert to these residual dangers.

2.5.1 Instrument-related hazards

Pay attention to the following safety notices:

WARNING
Potential risk in case of damaged glassware.

- *Beware of shivering glass parts.*
- *Beware of defective FEP tubing.*
- *Beware of leaky connections and insufficiently long connection tubings.*
- *Beware of defective valves.*
- *Beware of a false positioning of the collector arm*

WARNING

Potential risk if solvent vapors accumulate within the instrument housing.

- *Beware of damaged or cracked glass parts.*
- *Beware of dangerous, flammable or explosive samples.*
- *Operate the instrument in a fume hood or in an adequately ventilated work area.*

2.5.2 Other hazards

WARNING

Certain solvents within or in the vicinity of the Pump Systems can form peroxides and/or are highly inflammable.

- Always be aware of the explosion risk when working with hazardous substances or with substances of unknown composition.
- Always use the instrument in an adequately ventilated work area.

2.5.3 Safety measures

Always wear personal protective equipment such as protective goggles, protective clothing and gloves when working with the instrument.

2.6 General safety rules

Responsibility of the operator

The head of laboratory is responsible for training his personnel.
The operator shall inform the manufacturer without delay of any safety-related incidents which might occur during the operation of the instrument. Legal regulations, such as local, state and federal laws applying to the instrument must be strictly followed.

Duty of maintenance and care

The operator is responsible for ensuring that the instrument is only operated in proper manner and that maintenance, service, and repairs are performed with care, on schedule and by authorized personnel only.

Spare parts to be used

Use only recommended consumables and spare parts for maintenance to ensure continued optimum system performance and reliability. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

Modifications

Modifications to the instrument are only permitted after prior consultation with and written approval obtained from the manufacturer. Modifications and upgrades should only be carried out by an authorized BUCHI technical engineer. The manufacturer reserves the right to decline any claim resulting from unauthorized modifications.

3 Technical data

This chapter introduces the reader to the fraction collector and its main components. It contains technical data, requirements and performance data.

3.1 Scope of delivery

Check the scope of delivery according to the order number.

NOTE

For detailed information on the listed products, see www.buchi.com or contact your local dealer.

3.1.1 Standard instrument

Table 3-1: Standard instrument

Product	Order number
Fraction Collector C-660	44900

3.1.2 Standard accessories

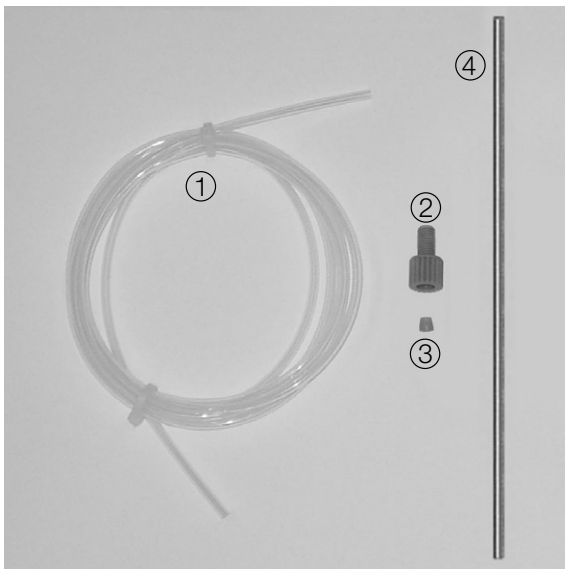


Table 3-2: Standard accessories

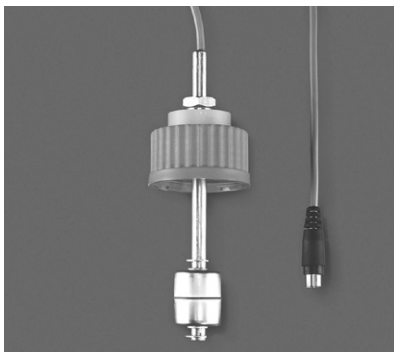
Product	Order number
① FEP tubing, 1/8”×1/16”, 5 m, green	44354
FEP tubing thin, 1/16”×1/32”, 5 m, gray	44357
② 25 fittings, 1/8”, green	40956
25 fittings, 1/16”, gray	44816
③ 25 ferrules, 1/8” green	40961
25 ferrules, 1/16” gray	44269
④ Tubing guide	20780

Table 3-2: Standard accessories (cont.)	
Product	Order number
Regional power cord, 1.5 m:	
Type CH	10010
Type Schuko (D,F)	10016
Type GB	17835
Type USA	10020
Type AUS	17836
Operation Manual:	
German	96968
English	96969
Spanish	96970
French	96971
Italian	96972

3.1.3 Optional accessories

Table 3-3: Optional accessories	
Product	Order number
Waste valve, valve for the Fraction Collector. Prevents dripping during the fraction change.	51114

Tubing fitting set for connecting the waste valve.	44021



Waste level sensor, optimal accessory for the Fraction Collector. Mounted at the top of the waste bottle the float type switch prevents the running over of the waste reservoir. Connector for GL 45 glass threads.	45288

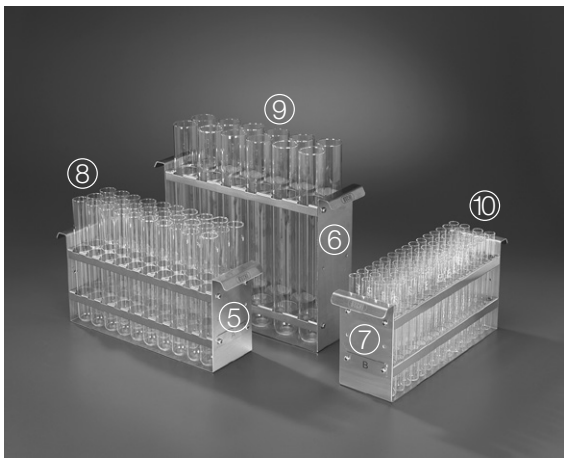
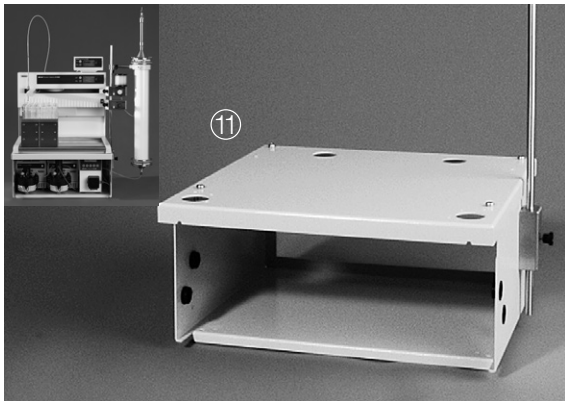
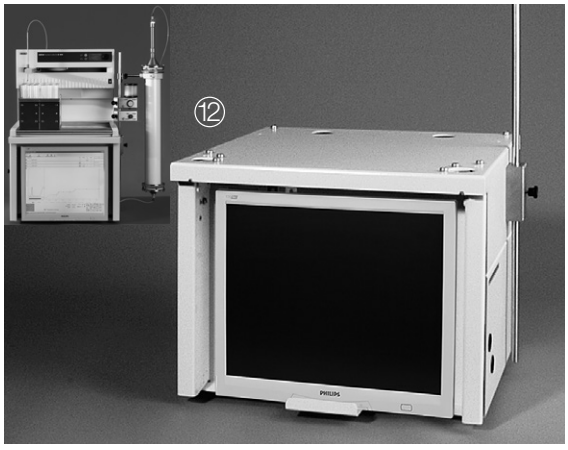


Table 3-3: Optional accessories (cont.)

Product	Order number
⑤ 4 racks FC 12, set of 4 racks FC 12 – each for 12 tubes at 250 mL with a diameter of 40 mm (without tubes).	44957
⑥ 4 racks FC 30, set of 4 racks FC 30 – each for 30 tubes at 50 mL with diameter of 26 mm (without tubes).	44958
⑦ 4 racks FC 60, Set of 4 racks FC 60 – each for 60 tubes at 20 mL with diameter of 17 mm (without tubes).	44959
⑧ 10×250 mL tubes for rack FC 12, diameter of 39 mm; height of 300 mm	44960
⑨ 20×50 mL tubes for rack FC 30, diameter of 25 mm; height of 185 mm	44961
⑩ 100×20 mL tubes for rack FC 60, diameter of 16 mm; height of 160 mm	44962



Chromatography table Pivoting table for the integration of two pump modules, detectors, fraction collector including support rod holder.	54290



Chromatography table with monitor holder Pivoting table for the compact integration of the Control Unit C-620, two pump modules, detectors, fraction collector and PC including monitor. Easy access and safe working due to clearly visible tubing guides. PC and monitor are not included.	54292

3.2 Materials used

Table 3-4: Materials used

Component	Material designation
Housing	PUR foam
Tubing	FEP
Fitting	POM
Ferrule	ETFE
Drip tray	Steel
Chromatography table	Aluminum

3.3 Technical data overview

Table 3-5: Technical data

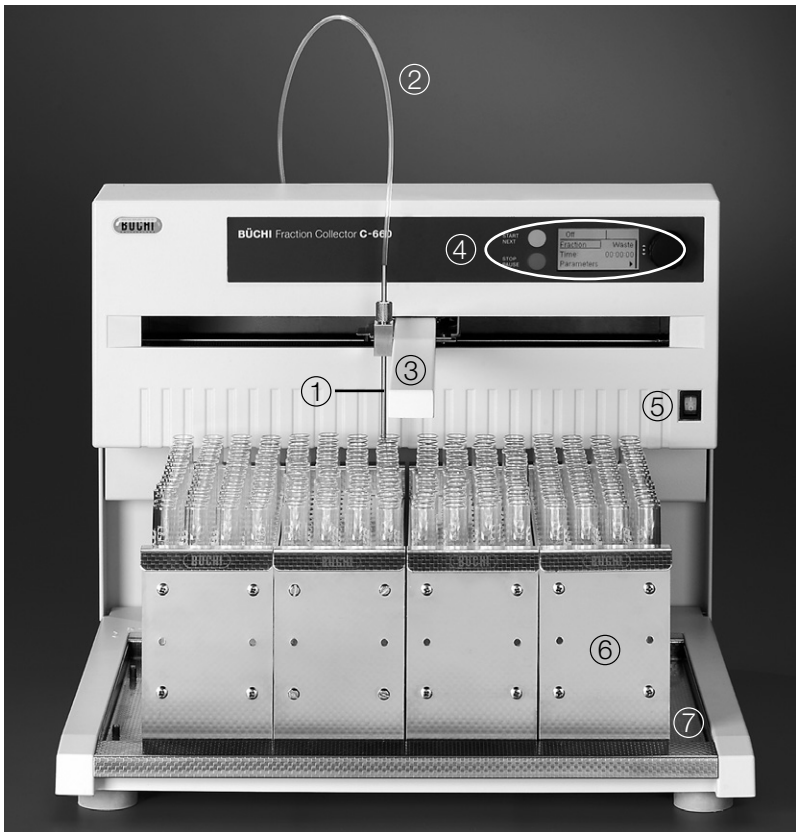
Dimensions (W×D)	465×470 mm
Height (H)	Adjustable from 370 mm to 460 mm
Weight	14 kg
Connection voltage	100 – 230 VAC ± 15%
Power consumption	max. 25 W
Frequency	50/60 Hz
Installation category	II
Degree of protection	IP20
Pollution degree	2
Environmental conditions Temperature Altitude Humidity	for indoor use only 5 – 40 °C up to 2000 m maximum relative humidity 80% for temperatures up to 31 °C, and then linearly decreasing to 50% at 40 °C
Support racks	4× FC60: 4×(60×20 mL tubes)
	4× FC30: 4×(30×50 mL tubes)
	4× FC12: 4×(12×250 mL tubes)
	Syncore racks (R4, R6, R12, R24, R48, R96)
	Teach-in-function of 11 user-specific racks
Collection area (W×D)	440 mm×350 mm
Collection modes	Time (interval timer 1 s – 100 h)
	Volume (only with BUCHI Sepacore pumps)
	Peak threshold (together with a detector)

Table 3-5: Technical data (cont.)	
Fuse	T500 mA L 250 V
Peak detection types	Peak threshold
Peak detection, number	Monitoring of 1 or 2 detector signals
Display	Back-lit LCD graphic display 28×64 pixels (58×29 mm)
Dialog languages	en / de / fr / it / es / jp
Interfaces	2× RS - 485 (system bus)
	1× RS - 232 (process data output)
	1× Mini-DIN (waste valve)
	1× Mini-DIN (TTL In / alarm monitoring and/or ext. start)
	1× Mini-DIN (level sensor for waste container)
	2× Cinch In (detector signal input)
	2× Cinch Out (detector signal and fraction change marker)
Certificate	CSA C, US

4 Description of function

This chapter explains the basic principle of the fraction collector and provides a functional description of the assemblies.
The design of the fraction collector enables the automatic collection of both organic and aqueous fractions without metal contact.

4.1 Overview over the instrument



① Tubing guide
② FEP tubing
③ Collector arm
④ Controls
⑤ ON/OFF switch
⑥ FC 60 rack with glass tubes
⑦ Drip tray

Fig. 4.1: Example of System 3

4.2 Function principle

The fraction collector is characterized by the following features:

- Up to 12 liters (48×250 mL) or up to 240 fractions of 20 mL can be collected.
- All Syncore racks are predefined.
- A simple teach-in enables the definition of up to 11 user-specific rack types.

Other features include:

- Fractionation with or without detector.
- Integrated RS-232 interface for data transfer to PC.
- Integrated peak detector.
- Two detector inlets and two recorder outlets.
- Optional monitoring of the waste bottle level.
- Optional waste diverter valve recommended for flow rates > 10 mL/min.

5 Putting into operation

This chapter describes the installation of the fraction collector and gives instructions on initial start-up.

NOTE

Inspect the instrument for damages during unpacking. If necessary, prepare a status report immediately to inform the postal company, railway company or transport company. Keep the original packaging for future transport.

5.1 Installation site

Place the instrument on a stable, horizontal surface, so that the rear side remains accessible and consider the maximum product dimensions.
To avoid annoyance caused by bad smells or possible damage to health caused by volatile solutions, we recommend setting up the Fraction Collector C-660 with an exhaust system. It should thereby be ascertained that the instrument is not exposed to aggressive substances such as acids, bases and solvents, which can have a negative influence on the useful life.

WARNING

The fraction collector is not explosion proof. Potential explosion risk.

- *Never position potential ignition sources near the Fraction collector.*
- *Operate the instrument in a fume hood or in an adequately ventilated work area.*

5.2 Electrical connections

ATTENTION

Make sure that the voltage on the socket corresponds to the voltage given on the type plate of the instrument.

Ensure that the instrument is earthed. External connections and extension cables must be provided with an earthed conductor lead (3-pole couplings, cable or plug equipment) as the mains lead has a molded plug to avoid risks due to inadvertent defective wiring.

Make sure that no electric sparks form in the instrument or its surroundings as they might damage the instrument.

An electrostatic discharge can damage the instrument and lead to fire.

5.3 Installation

5.3.1 Power connection

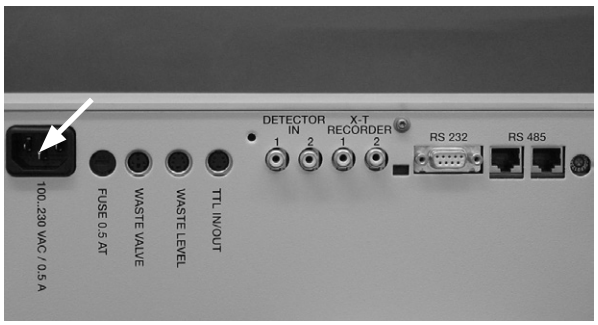


Fig. 5.1: Connecting the power cord

Connect the power cord.

5.3.2 Fitting and ferrule

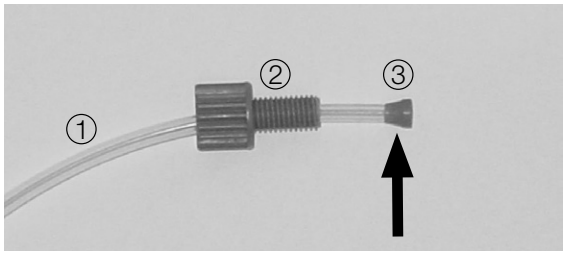


Fig. 5.2: Installing fitting and ferrule

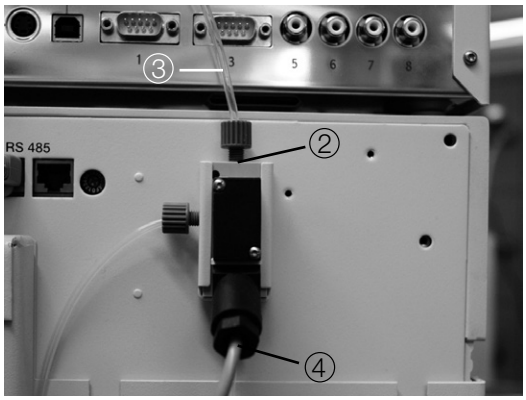
The tubing ① containing the fraction comes from the chromatography column. The fitting ② and ferrule ③ are attached to the free end. Mount the fitting ② and ferrule ③.

Press the suction tubing ① and the ferrule ③ against a table surface to firmly seal the tubing end with the ferrule.

5.3.3 Optional waste diverter valve

If the flow rate of the pumps exceeds 10 mL/min a waste diverter valve is recommended. To install the waste diverter valve, proceed as follows:

Screw the tubing coming from the detector into the inlet ①. Outlet ② leads to the collection arm of the fraction collector.



Ensure that the FEP tubing ③ is long enough to reach even the farest corner position of the collector arm ⑧. Outlet ④ leads to the waste bottle.
The waste diverter valve can be fixed at the back side of the fraction collector.

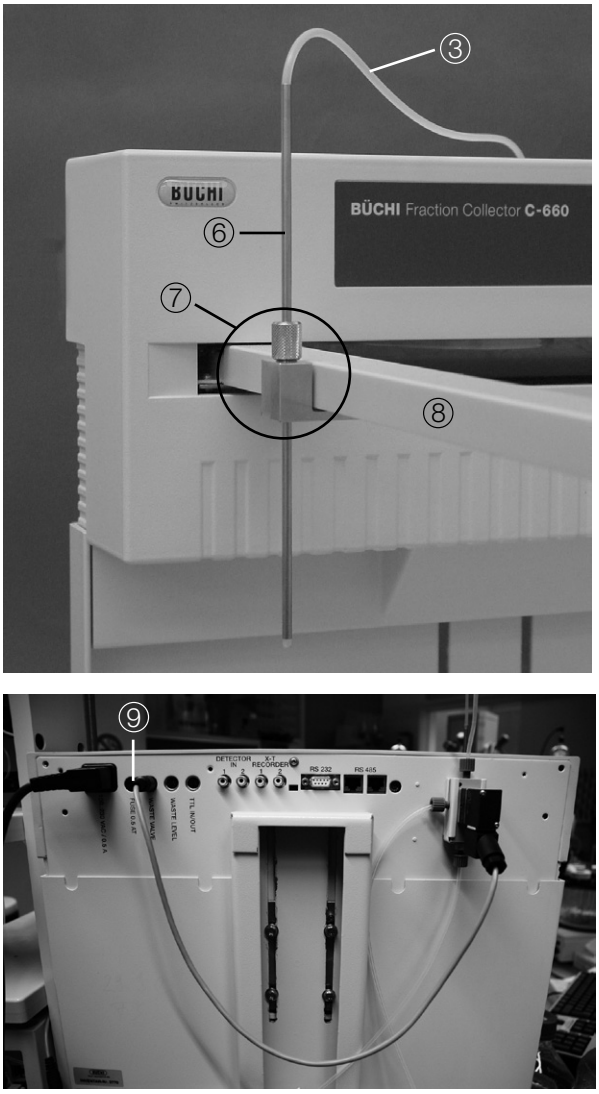


Fig. 5.3: Installating the waste diverter valve

The collector head e is found on the collector arm ⑧ of the fraction collector. Clamp the tubing guide ⑥ (metal pipe) tightly into the collector head ⑦.

Ensure that the height of the tubing guide ⑥ is correct. It should be at least 1 cm above the tube rim, so that it will not damage the tubing during operation.

Now direct the FEP-tubing ③ from valve outlet ② and afterwards through the tubing guide ⑥, so that it pokes out approximately 3 mm.

Connect the valve to the WASTE VALVE connection ⑨.

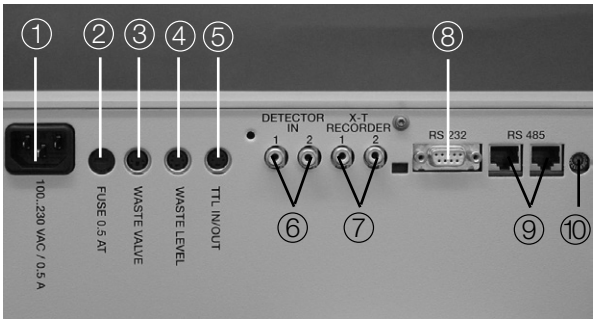


Fig. 5.4: Control arrangement on the Pump Controller

① Power cord
② FUSE 0.5 AT: Fuse
③ WASTE VALVE: Valve control
④ WASTE LEVEL: Monitoring of valve bottle level
⑤ TTL IN/OUT: TTL connection
⑥ DETECTOR IN 1,2: Detector inputs 1 + 2
⑦ X-T RECORDER 1,2: Chart recorder outlets 1 + 2
⑧ RS 232: Series data interfaces
⑨ RS 485: 2× bus interface for peripheral devices (fraction collector, pumps, etc.)
⑩ Address bus switch for remote control position 1 or 2 for SepacoreControl, position 0 for manual mode

6 Operation

This chapter explains the operating elements and possible operating modes. It gives instructions on how to operate the Fraction collector properly and safely.

ATTENTION

Check the glassware for damages prior to each operation and use only glassware in perfect condition. Glassware with cracks, stars or other damages can fail during operation.

Make sure that all fittings and tubings are hand-tight.

6.1 Control elements

① START/NEXT button
② STOP/PAUSE button
③ Display
④ Selector switch (turn and press knob)
⑤ ON/OFF (Power switch)

Fig. 6.1: Control elements of the fraction collector

Table 6-1: Functions of the Main Menu

Control	Function
START/NEXT button (green)	Starts the fraction collector from the rest or pause status. Simultaneously starts the connected pump system. Carries out a tube change when the instrument is running.
STOP/PAUSE button (red)	Pressing once results in pause, pressing twice stops the program.
Display	Displays parameters and values.
Selector switch (turn and press knob)	Menu operation by turning and pressing.
ON OFF	Power ON/OFF switch

6.2 Display

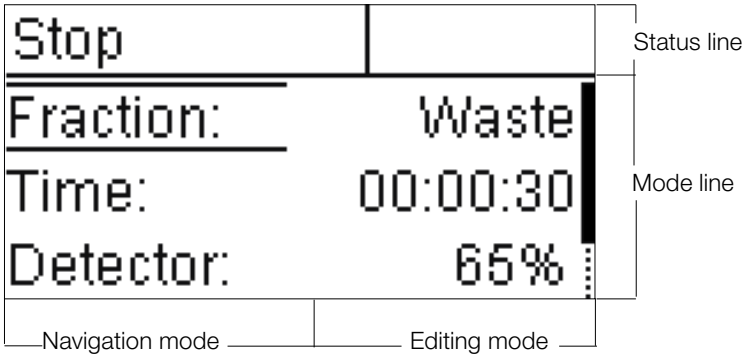


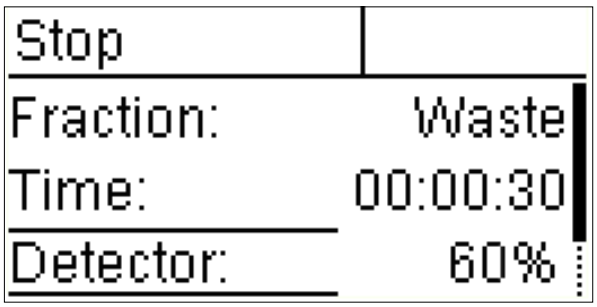
Fig. 6.2: Overview of the display

The display is divided into Status and Mode lines. The status line is fixed. On the left side it shows the five potential states of the Fraction Collector. On the right side the status line shows the remaining lead time, the remaining collection time or the residual volume of the relevant fraction.
The following states are possible:

Table 6-2: Instrument states

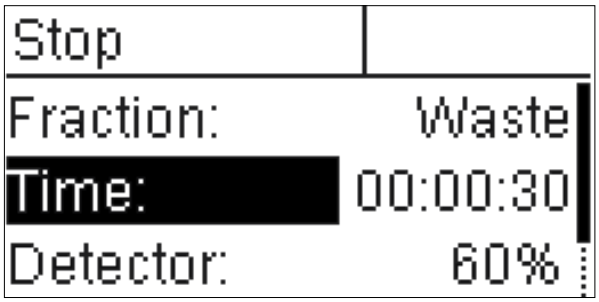
Status	Description	
Collect	The fractions can be collected according to time, or volume.	
Delay	The solvent is directed into the waste container. The actual collection procedure begins only after the end of the lead time.	
The fraction collector is in collection status:		
PAUSE	Pressing the STOP/Pause button once	The program sequence is interrupted and the BUCHI pump modules are stopped (no reset). Other brand pumps will not be stopped. The program sequence is continued with the START key.
STOP	Pressing the STOP/Pause button twice	The fraction collector stops and the collector arm returns to its initial position. Running programs are permanently aborted. The pump modules are stopped.
START	Pressing the START/NEXT button once	The collector arm changes to the next tube.
The fraction collector is in pause status:		
STOP	Pressing the STOP/Pause button once	The fraction collector stops and the collector arm returns to its initial position. Running programs are permanently aborted. The pump modules are stopped.
START	Pressing the START/NEXT button once	The program sequence is continued.
ERROR	The error number is displayed and the START/STOP keys are locked. Report the incidence to the BUCHI customer service.	

The mode line shows the navigation and editing mode you are in. It can be controlled with the selector switch by rotating and pressing.



Parameters surrounded by lines cannot be changed.

Fig. 6.3: Parameters surrounded by lines



Parameters highlighted with black background can be selected and changed. The scroll bar on the right indicates your position within the menu.

Fig. 6.4: Parameters highlighted with black background

With the selector switch you can navigate through the menu. You select the desired parameters by turning the knob, and confirm your selection by pressing it. The cursor jumps into the editing mode or, if it is already in the editing mode, into the next line (for program operation only in the stop mode). You set the desired values by turning the selector switch. Press the selector switch in order to confirm the new value. After 10 seconds without confirmation the cursor jumps back to the old parameters and into the navigation mode.

6.3 Operating the instrument

Turn on the fraction collector with the Power ON/OFF switch. The display shows the software version for a few seconds. The main menu with the last used values and parameters now appears automatically.
You can move through the menu by turning the selector switch. Select your parameters or compose a new program.

6.3.1 Remote Control

If the fraction collector is part of a system controlled by SepacoreControl, “Remote Control” is indicated on the display. In this mode no menu is accessible.
For this purpose set the address bus switch to position 1 or 2 (see Fig. 5.4). Now all settings have to be done within the SepacoreControl software (see Installation Guide SepacoreControl).

6.3.2 Manual control / manual mode

Overview of the menu navigation

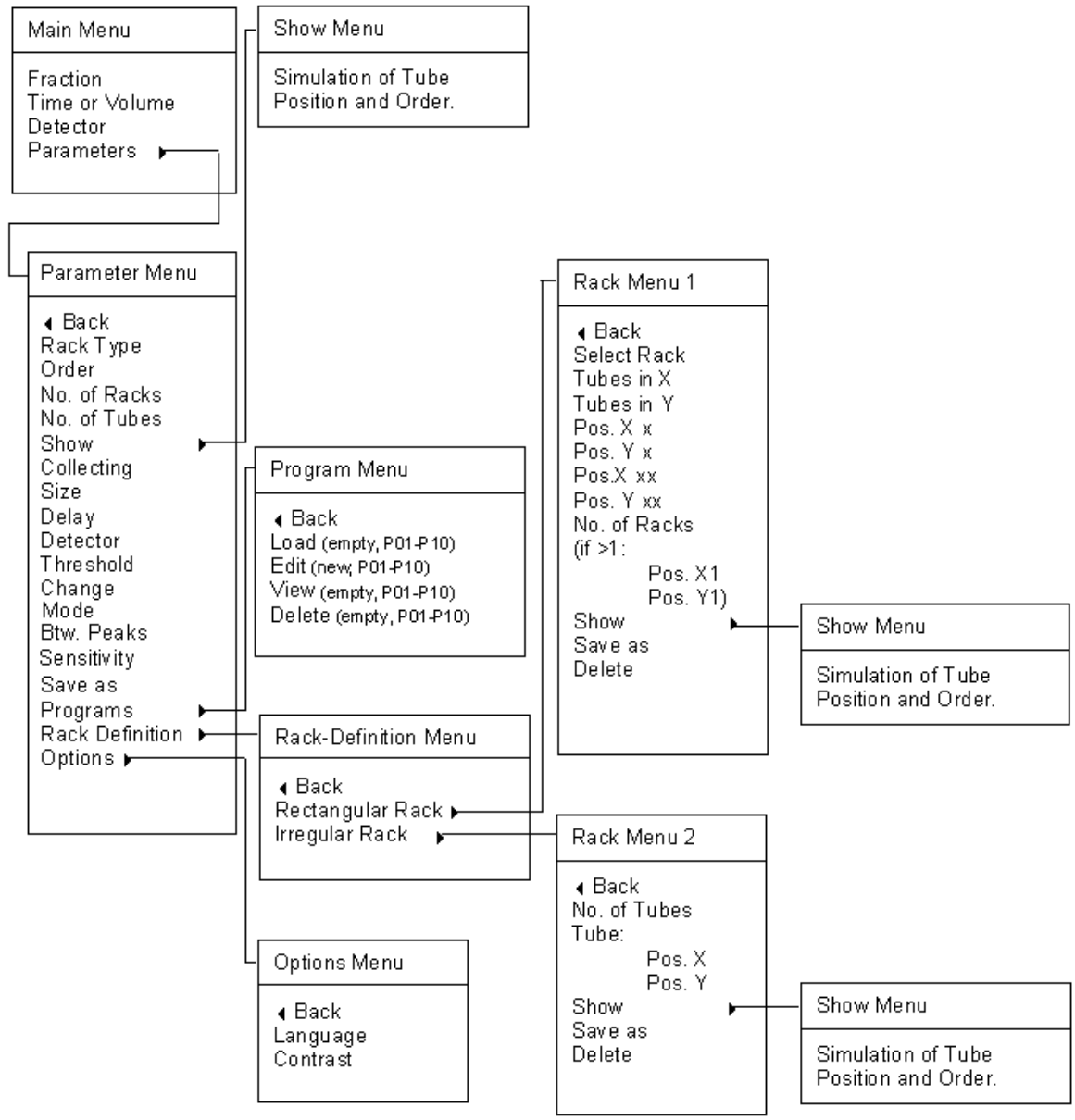


Fig. 6.5: Overview of the menu navigation

Parameters

Table 6-3: Main menu

Main menu	Description
Fraction	Displays the current fraction.
Time or volume	It is possible to collect according to time and volume. This setting is selected in the Parameter menu under the Collect point.
Detector	The line appears when a detector has been selected.
Parameter	Jumps into the Parameter Menu.

Table 6-4: Parameter menu

Parameter menu	Description
◂ back	Jumps back into **Main menu**.
Rack type	The predefined rack types FC4 – FC60 and Syncore Racks R4 – R96 can be selected. Customized racks are saved under C01 - C10 and U11.
Order	The sequence according to which the individual fractions are filled into the tubes can be entered.
	 This is the best choice for the racks FC12, 30 and 60 as this order corresponds to the rack numeration. The collector arm works within one rack by column from left to right and viceversa. Same time intervals between fraction change.
	 The collector arm works within one rack line by line from left to right and vice versa. Same time intervals between fraction change.
	 The collector arm works within one rack line by line only from left to right.
	 The collector arm works within one rack by column only from left to right.
	If customized racks are used whose collection starts in another corner, the pictogram does not reproduce the path precisely.
No. of racks	Number of racks on the drip tray of the Fraction Collector.
No. of tubes	Enter how many tubes are currently in the racks (see also the free positions in the Show mode)
Show ▸	Shows the position of the individual tubes in the rack in the display and simulates the progression of the collector arm.
Collecting	It is possible to set whether collection should take place in fixed time intervals or according to volume (only in connection with a BUCHI pump).
Size	Determines total time or volume according to which the tubes are filled.
Delay	The time prior to the start of the collection function can be entered. During the delay time the flow goes into the waste.
Detector	Activates the peak collection function according to detector 1 or detector 2. Default: No detector.
Threshold	Defines the signal strength in % of the end-scale deflection at which the peak collection function is activated. A tube change occurs whenever this threshold is exceeded or is fallen short of.
Sensitivity	Defines the sensitivity of the peak defection. According to the noise of detector. Sensitivity 4 is the most sensitive and 1 the setting with the lowest sensitivity.
Change	Defines the criteria for a tube change:
	 A tube change takes places after threshold is exceeded and upon detection of minima.
	 A tube change takes places after threshold is exceeded and upon detection of minima, and also upon detection of maxima.
Mode	 Collection occurs only during the detected peaks. The fractions between the peaks below the threshold are directed to the waste container, as well as substances not recorded by the detector.
	 Collection occurs during and between the peaks. All fractions are thus collected.

Table 6-4: Parameter menu (cont.)

Parameter menu	Description
Between peaks	Fractionation time or volume, if the detector signal is below threshold.
Save as	The entered parameters can be saved under P01 – P10.
Programs ▸	Jumps into the **Program menu**.
Rack definition ▸	Jumps into the **Rack Definition menu**.
Options ▸	Jumps into the **Options menu**.

Table 6-5: Program menu

Program menu	Description
◂ back	Jumps back into the **Parameter menu**.
Load (empty, P01-P10)	The previously saved programs P01 - P10 can be loaded.
Edit (new, P01-P10)	New programs can be created and saved or existing programs changed.
View (empty, P01-P10)	"Empty" is displayed when no programs have yet been saved. Otherwise, existing programs can be selected and viewed. However, they can not be changed in this mode.
Delete (empty, P01-P10	"Empty" is displayed when no programs have yet been saved. Otherwise, the previously defined programs P01 - P10 are deleted.

Table 6-6: Rack definition menu

Rack definition menu	Description
◂ back	Jumps back into the **Parameter menu**.
Rectangular rack ▸	Jumps into Rack Menu 1 (Ractangular rack).
Irregular rack ▸	Jumps into Rack Menu 2 (Irregular rack).

Table 6-7: Options menu

Options menu	Description
◂ back	Jumps back into the **Parameter menu**.
Language	The appropriate operating language can be selected.
Contrast	Contrast of the graphical display.

Table 6-8: Rack menu 1 (rectangular rack)

Rack menu 1	Description
◂ back	Jumps back into the **Rack definition menu**.
Select rack	You can select the predefined rack types FC4 – FC60 and Syncore Racks R4 – R96 or your own racks under C01 - C10 and U11.
Tubes in X	Number of tubes in X-direction.
Tubes in Y	Number of tubes in Y-direction.
Pos. X 1	Position of the 1st tube in the X-direction (0.1 mm steps).
Pos. Y 1	Position of the 1st tube in the Y-direction (0.1 mm steps).
Pos. X xx	Position of the last tube (xx) in the X-direction (0.1 mm steps).
Pos. Y xx	Position of the last tube (xx) in the Y-direction (0.1 mm steps).
No. of racks	The number of racks used is shown when the number of racks is >1:

	Rack	Shows the selected rack.
		Pos. X 1The starting point of the first tube in the X-direction is given.
		Pos. Y 1The starting point of the first tube in the Y-direction is given.

Table 6-8: Rack menu 1 (rectangular rack) (cont.)

Rack menu 1	Description
Show ▸	Shows the position of the individual tubes in the rack on the display and simulates the progression of the collector arm.
Save as	The entered parameters can be saved under C01 – C10.
Delete (empty, C01-C10)	“Empty” is displayed if no racks have yet been saved. Otherwise, the previously defined (empty, C01 – C10) racks C01 – C10 can be deleted with a yes/no query.

6.3.3 Setting the height of the collector arm

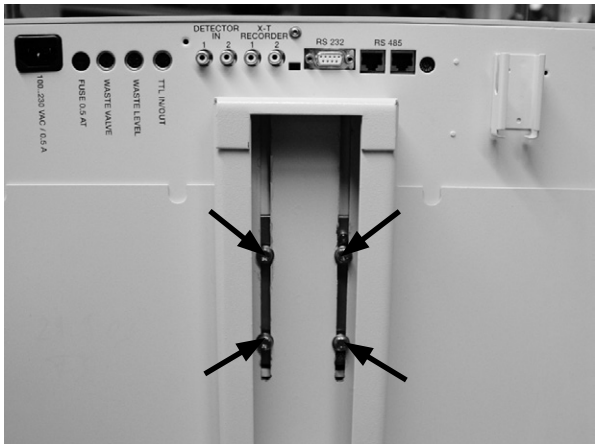


Fig. 6.6: Vertically adjustable height of the fraction collector

Setting the height

The distance between the collector arm and the tubes can be regulated on the rear of the fraction collector.
Hold the upper part of the fraction collector tightly at the housing and loosen the four screws on the rear side. Position the collector arm at the desired height and tighten the screws.

ATTENTION

Never hold the Fraction Collector tightly on the collector arm. This can damage the sensitive controls.

Please ensure that the distance between the collector arm and the tube rim is at least 1 cm to prevent damage to the tubes.

6.3.4 Interface RS 232

The interface works with 9600 Baud, straight parity, 8 data bits and 1 stop bit.
Output is provided via a PC or a printer. An example is shown in Figure 5.8.

The header of the table is always written in English and appears when a program is started (transition from rest status into collecting status). Data lines are then written in an interval of one second until the program is finished or the rest status has been reached again.

Time (s)	Flow A (ml/min)	Flow B (ml/min)	Rack R4	X	Y	Tube	Waste	Det 1 (%) 100% = 1 V	Det 1 (%) 100% = 1 V	Pressure (bar)
1	100	0	1	760	470	0	X	123	8	0
2	100	0	1	760	470	1		121	8	0.5
3	100	0	1	760	470	2		123	8	1.1
4	100	0	1	2260	1560	3		130	7	1.2
5	100	0	1	2260	1560	4		131	6	1.2
6	100	0	1	760	1560	5		133	7	1.2

The „Time“ column displays the time passed since the beginning of the program in seconds. The range extends from 0 to 999999s (app. 15 days). It subsequently starts again at zero.

The tube number („Tube“) is given as 0 and the character „x“ is written in the „Waste“ column in the Wait, Pause and Error states. While the arm is moving from one position to the next, the new tube number and tube position are entered and the „Waste“ column is not marked.

The „Flow A“ and „Flow B“ columns indicate the flow in milliliters per minute with two places after the decimal. The resolution is thus 10 µ/min.
If work is carried out without a BUCHI pump, the low entry is always 0.
The position of the collector arm is given in columns „X“ and „Y“ in 0.1 mm steps.

The flow rate in the protocol corresponds to the value displayed on the pump. However, the rotational speed of the pump can deviate by up to 20 % due to the calibration. The actual rotational speed of the pump is not given in the protocol.

6.3.5 Peak detection

General:

The fraction collector is normally set to the detector signal of 1 V end-scale deflection.
A calm detector signal is the prerequisite for a problem-free peak collection function. Most detectors have adjustable time constants, which serve to smoothen the signal.

Function:

The integrated peak detector enables an automatic fraction change on the basis of the minima and maxima of the peak. The following definitions are necessary for the configuration of the fraction collector:

Table 6-9: Parameters for configuration

Parameter	Description
Detector 1 or 2	A detector must be selected and connected to the correct socket. This definition determines which detector signal will be evaluated for a fraction change. If no detector has been selected, the peak collection function is turned off. The peak collection function is automatically activated at the start when a detector is selected.
Threshold	The threshold value defines the signal strength at which the peak collection function is activated. The peak collection function is shut off at signal strengths below the threshold value. The threshold value is entered as a % of the end-scale deflection (with a detector signal of 1 V end-scale deflection,1% corresponds to a signal level of 10 mV) and serves to suppress occurring noise signals. A tube change occurs each time the signal exceeds or falls below the threshold value.
Change	Here you can define whether a fraction change should only be triggered at a peak minimum or both at peak minimum and maximum. A fraction change at the peak maximum allows for an automatic division of peak into 'front' and 'rear' halves. Especially in the case of only slightly separated peaks, this procedure allows the multiple extraction of a fraction with sufficient purity for the subsequent analysis.
	 A tube change takes place when crossing the threshold line and at every minimum.
	 A tube change takes place when crossing the threshold line and at every minimum and maximum.
Mode	Here you define whether the solvent of the entire chromatographic run or only the fractions are collected in the prepared tubes during a peak. In the second case the solvent is directed to the waste container between the peaks. The optional waste diverter valve 044964 is necessary for this function.
	 Collection occurs only during the detected peaks. The fractions between the peaks as well as substances not detected are directed to the waste container.
	 Collection occurs during and between peaks, meaning that all fractions are collected.
Between peaks (only mode )	Fraction sizes between peaks (Signal<Threshold): Serves to define different fraction sizes during and between the peaks. The time defined in the main menu or the corresponding volume is the valid maximum fraction size during a peak. Both times or volumes can differ. This makes it possible to break a peak down into smaller fractions but still makes it possible to fill the tubes to the maximum between the peaks. Both times are independent of each other and must be defined individually.

Table 6-9: Parameters for configurationm (cont.)

Parameter	Description
Sensitivity	The adjustment of various switching sensitivities. Range 4 shows the most sensitive, Range 1 the most sluggish switching behavior. This function enables adjustment of the collection function to the relevant slope of the peak. Peaks with short elution times have steep flanks and the switching decision must be correspondingly quick. Conversely, peaks with longer elution times have considerably flatter flanks and are usually somewhat more agitated; such peaks require a more sluggish switching decision. The following serves as a rule of thumb: - Use Range 3 for separations on small columns with diameters of 12...15, range 2 for larger columns. - Switch over to the next lower range if the peak detector switches too often. Switch over to the next highest range if it switches too sluggishly or 'overlooks' unambiguous switching criteria.

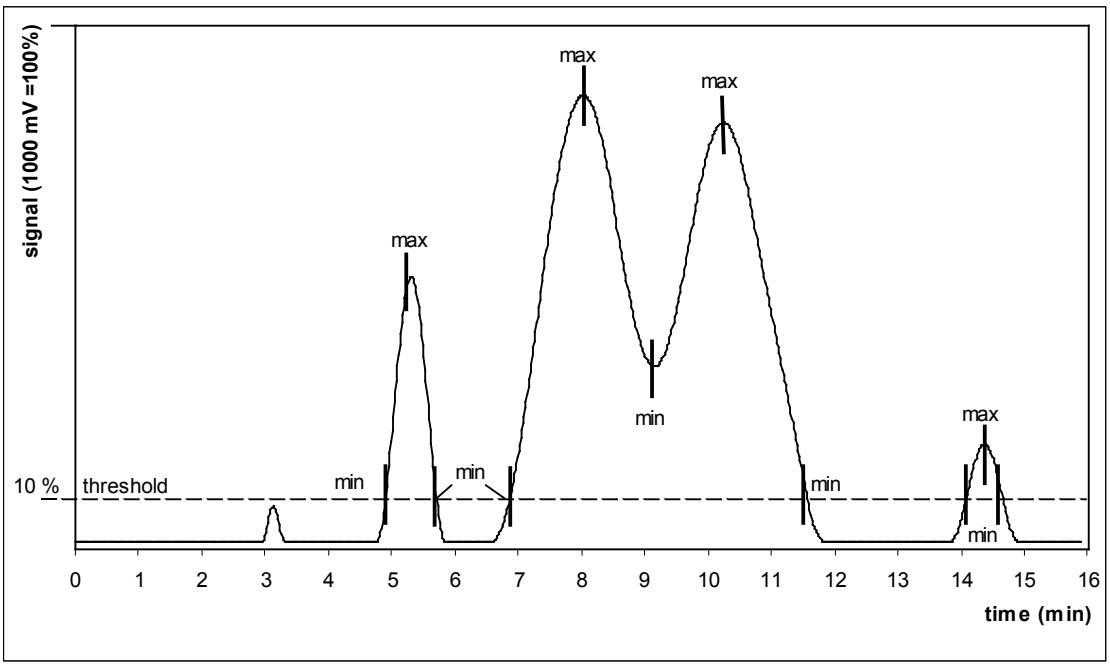


Fig. 6.7: Example diagram of a detection after peak minimum (min) and peak maximum (max) with a threshold of 10%.

7 Maintenance

This chapter provides instructions on all required maintenance to keep the instrument in good working condition.

WARNING

All maintenance and repair work requiring the opening or removal of instrument covers and lids must be carried out by trained personnel and only with the tools provided for this purpose.

WARNING

Electrical hazard:

- *Prior to any maintenance work on the instrument switch off the power supply and remove all sources of flammable vapor.*

ATTENTION

Use only genuine consumables and spare parts for any maintenance and repair work in order to assure continued system performance and reliability. Any modifications to the spare parts used should only be carried out with the prior written permission of the manufacturer.

7.1 Cleaning

Clean the fraction collector with a damp cloth (water or diluted soap-suds).

Clean the tubes with clean compressed air or nitrogen.

Visually inspect the operating elements and the plug for damages.

8 Troubleshooting

The following chapter describes how to resume operation of the instrument in the event of any minor problem. It will list some possible occurrences, their probable cause and suggests how to remedy the problem. The troubleshooting table below lists possible malfunctions and errors of the instrument and describes operator enabled courses of action to correct some of tubing problems by him or herself. The appropriate course of action is listed in the column “Corrective measure”.
The elimination of more complicated malfunctions or errors is usually performed by a BUCHI technical engineer who has access to the official service manuals. In this case, please refer to your local BUCHI customer service agent.

There is an optical and acoustical alarm in case of an error. Pressing the selector switch one time stops the alarm tone. You can now read the alarm text on the display. Pressing the selector switch again quits the error. If the error is not existing anymore you can continue working.

There are several error codes existing for a quick and easy diagnosis. Only a few codes are relevant for the customer.
Please contact the BUCHI customer service if the error codes 07 – 32 appear.

Shut off the fraction collector and switch it on again if “Arm is jammed” appears in the display, thus enabling the collector arm to reposition itself.
Please contact the BUCHI customer service if this measure does not help.

8.1 Malfunctions and their remedy

Table 8-1: Error messages

Error number	Possible cause	Remedy
01	Pump cannot reach desired flow rate. The pump electronics have switched off the pump, since the pressure is too high.	Control backpressure Contact the BUCHI Customer Service.
02	No connection to pump (timeout).	Check RJ 485 connections. Check main power. Check switch + connections. Check selector switch at the back side of pump module.
03	Check sum false or unintelligible response from pump.	Contact the BUCHI customer service
04	Error while writing in the pump electronics EEPROM.	Contact the BUCHI customer service
05	Temperature of pump electronics too high.	Contact the BUCHI customer service
06	Line voltage too high.	Contact the BUCHI customer service
07	Line voltage too low.	Contact the BUCHI customer service
08	Invalid data in pump electronics EEPROM.	Contact the BUCHI customer service
09	RS-485 bus voltage too low.	Contact the BUCHI customer service
10	Internal auxiliary voltage not within tolerance of pump electronics.	Contact the BUCHI customer service
11	Pump electronics fan defective.	Contact the BUCHI customer service
23	EEPROM C-605.	Contact the BUCHI customer service
25	Parity error at RS232.	Contact the BUCHI customer service
31	The wrong pump is connected (C-605 instead of C-601).	Replace C-601 with C-605.

8.2 Customer service

Only authorised service personnel are allowed to perform repair work on the instrument. These persons have comprehensive technical training and knowledge of possible dangers which might arise from the instrument.
Contacts for official BUCHI customer service offices are given on the BUCHI website at: www.buchi.com. If malfunctions occur on your instrument or you have technical questions or application problems, please contact one of these offices.

The customer service offers the following:

- Spare part delivery
- Repairs
- Technical advice

Before calling us

Our service personnel will be able to service you more efficiently if you have the following information:

- The serial number and the model number of the instruments involved
- The installation procedure that you used
- A list of concise symptoms
- A list of operating procedures and conditions that you were using when the problem arose
- A list of other devices connected to the system and a description of those connections
- A list of other electrical connections on the same circuit in the room

9 Shutdown, storage, transport and disposal

This chapter instructs on how to shut down the instrument, how to pack it for storage or transport and specifies the storage and shipping conditions.

9.1 Storage and transport

Switch off the instrument and remove the power cord. Disconnect all cables and tubings and remove all liquids and dusty residues before packaging the instrument.

WARNING

Death or serious poisoning by contact or incorporation of harmful substances.

- *Clean the instrument and all accessories thoroughly to remove possibly dangerous substances.*
- *Do not clean dusty parts with compressed air.*
- *Store the instrument and its accessories at a dry place in its original packaging.*
- *Always wear personal protective equipment such as protective goggles, protective clothing and gloves when working with the instrument.*

WARNING

Electrical hazard:

- *Always remove mains lead from the socket first to avoid having live cables in the laboratory.*

9.2 Disposal

To dispose of the instrument in an environmentally friendly manner a list of materials is given in chapter 3, please ensure that the components are separated and recycled correctly. Please follow current regional and local laws concerning disposal.

10 Spare parts

This chapter lists spare parts, accessories, and optional extras, including all of the relevant order information for ordering from BUCHI. Always state the product designation and part number when ordering any spare parts.

Use only genuine BUCHI consumables and spare parts for maintenance and repair to ensure optimum system performance and reliability. Prior written permission of the manufacturer should be obtained before any modifications are made to the spare parts used.

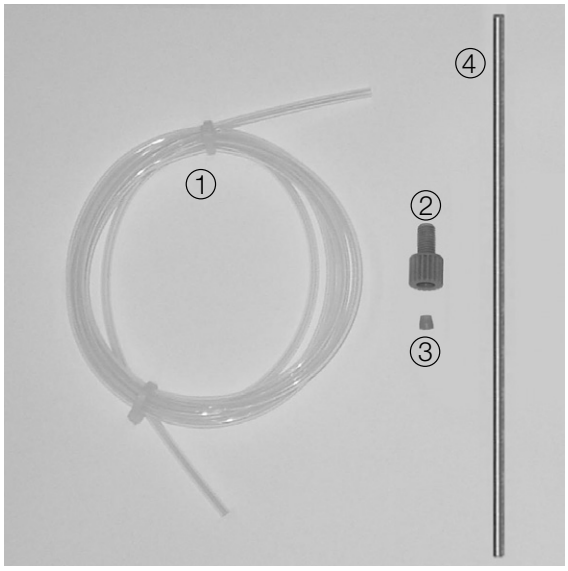


Table 10-1: Spare parts

Product	Order number
① FEP tubing, 1/8”×1/16”, 5 m, green	44354
FEP tubing thin, 1/16”×1/32”, 5 m, gray	44357
② 25 fittings, 1/8”, green	40956
25 fittings, 1/16”, gray	44816
③ 25 ferrules, 1/8” green	40961
25 ferrules, 1/16” gray	44269
④ Tubing guide	20780
⑤ Tubing guide nut	44938
⑥ Tubing guide collet	22121
FEP tubing 1/16”×1/32”, 5 m	44357
25 ferrules, 1/16”, grey	44269
25 fittings, 1/16”, grey	44816

11 Declarations and requirements

11.1 FCC requirements (for USA and Canada)

English:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to both Part 15 of the FCC Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Français:

Cet appareil a été testé et s'est avéré conforme aux limites prévues pour les appareils numériques de classe A et à la partie 15 des réglementations FCC ainsi qu'à la réglementation des interférences radio du Canadian Department of Communications. Ces limites sont destinées à fournir une protection adéquate contre les interférences néfastes lorsque l'appareil est utilisé dans un environnement commercial.
Cet appareil génère, utilise et peut irradier une énergie à fréquence radioélectrique, il est en outre susceptible d'engendrer des interférences avec les communications radio, s'il n'est pas installé et utilisé conformément aux instructions du mode d'emploi. L'utilisation de cet appareil dans les zones résidentielles peut causer des interférences néfastes, auquel cas l'exploitant sera amené à prendre les dispositions utiles pour palier aux interférences à ses propres frais.

11.2 Declaration of conformity

Declaration of conformity
Konformitätserklärung
Déclaration de conformité
Dichiarazione di conformità
Declaración de conformidad

BÜCHI Labortechnik AG
Meierseggstrasse 40
CH-9320 Flawil 1
Switzerland

Declares, that the product / Erklärt, dass das Produkt / Déclare par la présente que le produit / Dichiara che il prodotto / Declara que el producto:

Fraction Collector C-660

complies with the requirements of the European Directives / den Anforderungen der Richtlinien / est conforme aux exigences des directives européennes / soddisfa i requisiti delle norme europee / cumple los requerimientos de las Directivas Europeas:

2006/95/EEC (low voltage directive)
2004/108/EEC (EMC directive)
2006/42/EC (machinery directive)

and is in accordance with the following standards / und den folgenden Normen entspricht / ainsi qu'aux normes suivantes / ed è conforme ai seguenti standard / y está conforme a los estándares siguientes:

EN 61010-1:2001
(Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.)

EN 61010-2-081:2002 + A1:2003
Safety requirements for electrical equipment for measurement, control, and laboratory use: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes.

EN 61326-1:2006
(Electrical equipment for measurement, control and laboratory use. EMC Requirements: General requirements.)

Flawil, November 16th, 2009

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