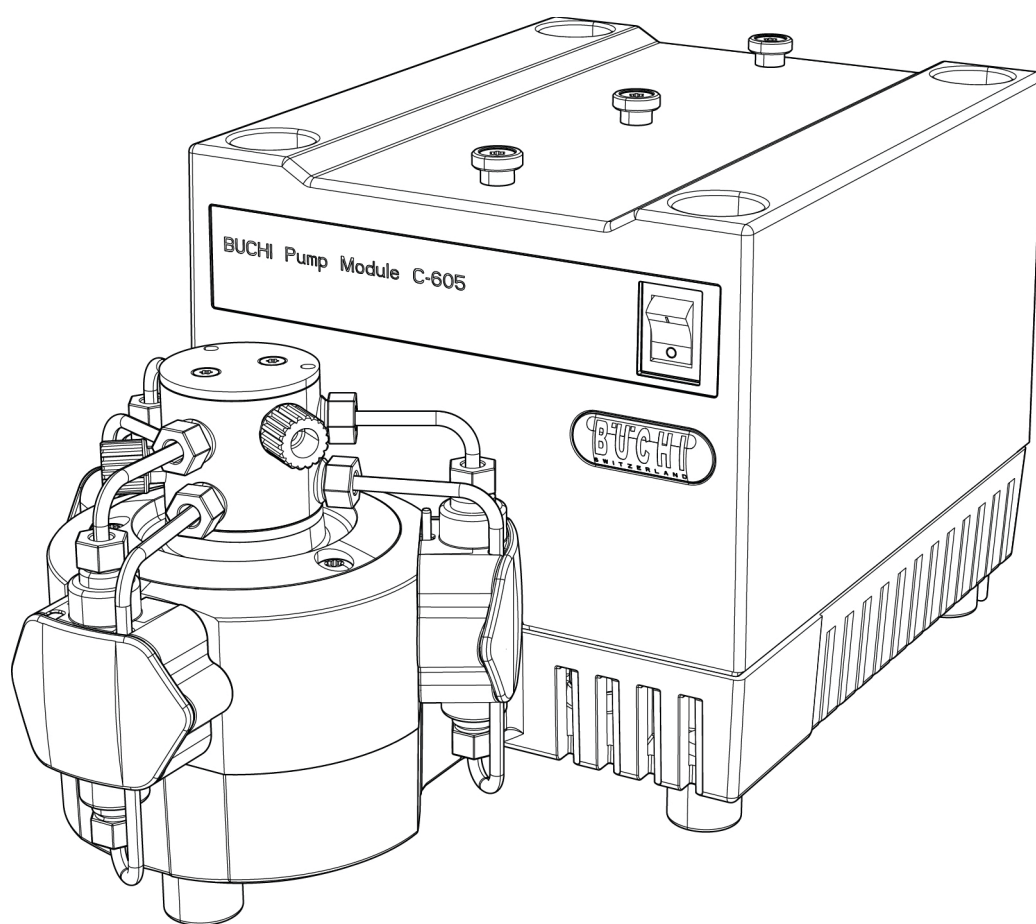




Pumpmodul C-601 & C-605 Pumpkontroller C-610/ Pumpmanager C-615 Operation Manual



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BUCHI reserves the right to make changes to the manual as deemed necessary in the light of experience, especially with respect to structure, illustrations and technical details.

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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.

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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 Pump Modules C-601 and C-605, the Pump Controller C-610 and the Pump Manager C-615 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

For information on the SepacoreControl software, please refer to the corresponding manuals available in English, German, French, Spanish and Italian:

- Installation Guide SepacoreControl
- Fraction Collector C-660, Operation Manual numbers 96968 – 96972
- UV-Monitor C-630, Operation Manual numbers 96950 – 96953 and 96966
- UV-Photometer C-635, Operation Manual numbers 96957 – 96960 and 96967
- Cartridge 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
- Cartridge® is a registered trademark of BÜCHI Labortechnik AG

1.3 Abbreviations

ETFE: Ethylene/Tetrafluoroethylene Copolymer

FEP: Fluorinated Ethylene Propylene

PTFE: Polytetrafluoroethylene

PEEK: Polyetheretherketone

POM: Polyoxymethylene

PP: Polypropylene

PUR: Polyurethane

2 Safety

This chapter highlights the safety concept of the Pump Systems 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 pump system and its modules have been conceived of and constructed as a lab device. It serves for the optimal and reliable pumping of solvents to chromatography columns in the specified pressure range.

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.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.
- Pumping of samples which can explode or inflame due to shock, friction, heat or spark formation.
- Extended operation without supervision.
- 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

Hot surface.



WARNING

Electrical hazard.



WARNING

Biohazard.



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 implosion risk in case of damaged glassware.

- Beware of shivering glass parts.
- Beware of defective solvent tubing.
- Beware of leaky connections.
- Beware of worn and damaged seals.
- Beware of the fire hazard.



WARNING

Potential risk if solvent vapors accumulate within the instrument housing.

- Beware of damaged or cracked glass parts.
- Beware of the fire hazard.
- Beware of dangerous, flammable or explosive samples.
- Operate the instrument in a fume hood.

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.



2.5.4 Safety elements

- Integrated overpressure sensor to avoid pressure above 10 bar.

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 Pump Systems 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 Basic instruments

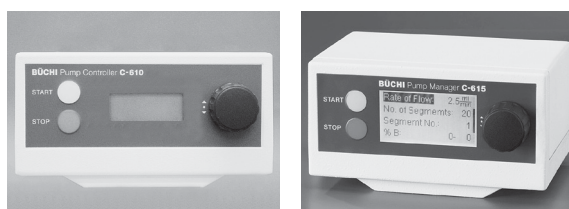


Table 3-1: Pump Modules

Product	Order number
Pump Controller C-610	54111
Pump Manager C-615	54115
Control unit C-620	54110
Pump Module C-601	54101
Pump Module C-605	54105

3.1.2 Standard accessories

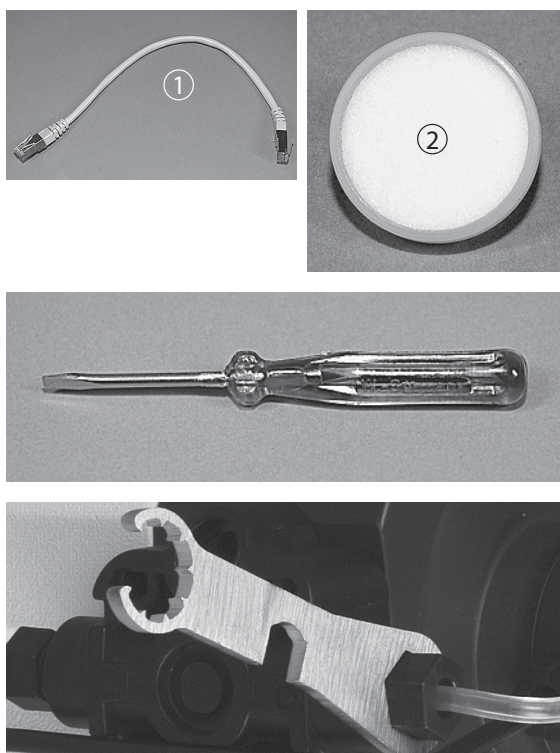


Table 3-2: Standard accessories for Pump Module C-601 and C-605

Product	Order number
① Connection cable RJ45, 0.3 m	44288
② Solvent filter	44340
Screwdriver	-
Turixwrench(fitsfittingandpipefitting)	44304
Green fittings and ferrules, 1/8"	-
White fittings and ferrules, Ø 4.0 mm	-
FEP pressure tubing 1/8"×1/16", 1.5 m	-
FEPsuctiontubing4mm×2.5mm,length 1.5 m	-
Torx allen wrench TX10	-
Torx allen wrench TX20	-
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	96961
English	96962
Spanish	96963
French	96964
Italian	96965

Table 3-3: Standard accessories for Pump Controller C-610

Product	Order number
Green fittings and ferrules	-
Overpressure sensor	54060
Torx allen wrench TX6	-

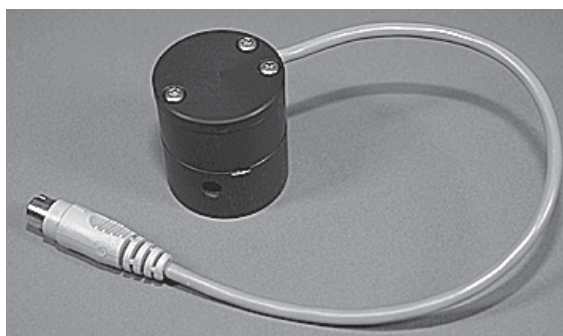


Table 3-4: Standard accessories for Pump Manager C-615

Product	Ordernumber
Mixer (pressure sensor with integrated mixing chamber)	54050
Green fittings and ferrules	-
Torx allen wrench TX6	-

3.1.3 Optional accessories

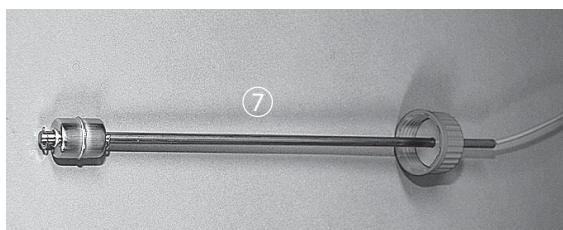
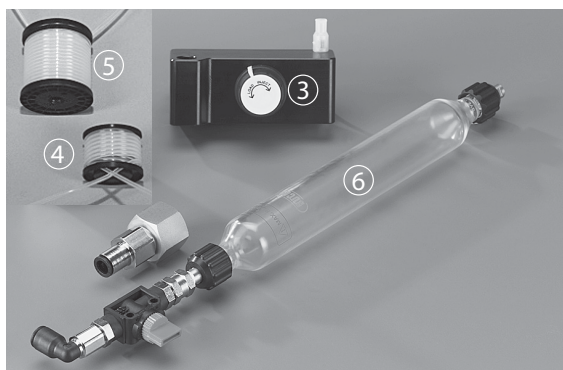
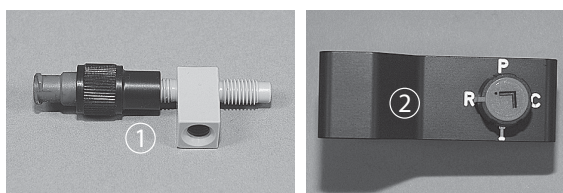


Table 3-5: Optional accessories

Product	Ordernumber
① Injection valve	44850
② 4-way injection/ purge device	45256
③ Injection unit, 6/4, complete	44851
④ Sample loop 5 mL	45222
⑤ Sample loop 20 mL	44852
⑥ Sample chamber 100 mL	44853
100 mL glass for sample chamber	28193
250 mL glass for sample chamber	54854
500 mL glass for sample chamber	54859
1000 mL glass for sample chamber	54864
⑦ Solvent level sensor float type	45285

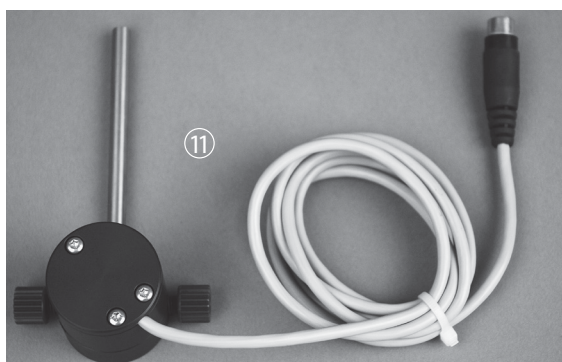
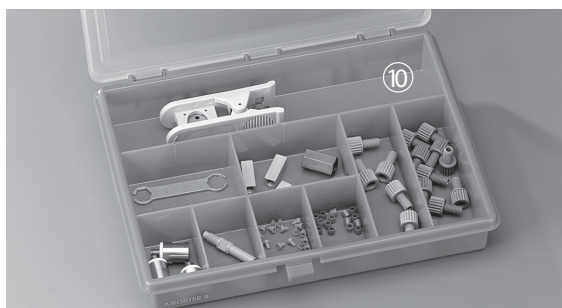
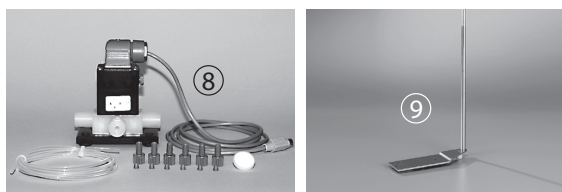


Table 3-6: Optional accessories

Product	Ordernumber
⑧ Solvent valve set	44854
⑨ System stand for pump module	44855
⑩ Tubing fitting set	44021
⑪ External pressure sensor without mixing chamber. Needed only for very pressure sensitive columns, enables to measure direct at the column inlet.	54040
Glass column, 15/100 / Prep Elut	44030
Glass column, 26/100 / Prep Elut	44035

3.2 Materials used

Table 3-7: Materials used

Component	Material designation
Housing (Pump Manager, Pump Controller, Pump Module)	PUR foam
Pump excenter housing	Aluminium
Housing C-620	Stainless steel
Pump head	PEEK
Pump cover	PP
Tubings	FEP / 1x silicone
Fitting	POM
Valve screw fitting	POM
Ferrule	ETFE
Cone ring	POM
Radial seal	PTFE
Pistons	Ceramic

3.3 Technical data overview

Table 3-8: Technical data of the Pump Controller C-610 and Pump Manager C-615		
	Pump Controller C-610	Pump Manager C-615
Dimensions (W×H×D)	150×80×120 mm	150×80×120 mm
Weight	< 1 kg	< 1 kg
Connection voltage	24 V DC	24 V DC
Function	Control unit for isocratic separation with one Pump Module C-601. Simple entry via selector switch and display of flow rate on backlit display. With integrated overpressure sensor to avoid pressure above 10 bar.	Intelligent control unit for challenging separating jobs. Simple operation and programming via the selector switch. Generously sized, backlit LCD graphic display. Control of up to two Pump Modules C-601/605, which enable the simple creation of precise, binary solvent gradients. Various inputs and outputs for: 2 valves for the selection of a max. of four solvents, 2 level sensors for solvent monitoring, 1 pressure sensor for precise pressure regulation and limiting. Opportunity to save programs. Automatic calculation of time and solvent requirement.
Gradient function	none	With two Pump Modules C-601/605 from 0% – 100% B for total flow rate of 2.5 – 250 mL, linearity ±2 %.
Display	Illuminated 3×7-, segment LCD display	Illuminated LCD display, 128×64 pixels (58×29 mm)
Dialog languages	none	E / G / Sp / F / I / Jp
Interfaces	1x RS-485 (Systembus) 1x Mini Din (TTL In/Out for alarm supervision and/or extern. start)	1x RS-232 (process data output) 1x Mini DIN (TTL in/out for alarm supervision and/or extern. start) 1x Mini DIN (pressure sensor) 2x Mini DIN (optional level sensor) 2x Mini DIN (solvent valves)

Table 3-9: Technical data of the Pump Module C-601 and C-605	
Dimensions (W×H×D)	160×153×305 mm
Weight	4 kg
Connection voltage	100 – 230 VAC ±15%
Power consumption	max. 75 W
Frequency	50/60 Hz
Installation category	II
Degree of protection	IP20
Pollution degree	2
Environmental conditions	for indoor use only
Temperature	5 – 40 °C
Altitude	up to 2000 m
Humidity	maximum relative humidity 80% for temperatures up to 31 °C, and then linearly decreasing to 50% at 40 °C
Function	Compact, pulsation-poor 3-piston pump. Chemically inert and biocompatible
Pressure range	0 – 10 bar (0 – 145 psi) or 0 – 50 bar (0 – 725 psi)
Pump Type	Radially arranged 3-piston pump
Flow rate	2,5 mL/min – 250 mL/min
Flow rate accuracy	±2% of the set flow rate, calibration option for specific solvents and temperatures
Reproducibility	±0.5 % of the set flow rate
Material in contact with solvent	PEEK, sapphire, ceramic, FEP, ruby
Pump head	Integrated piston backflushing

4 Description of function

This chapter explains the basic principle of the Pump Systems and provides a functional description of the assemblies.

The design of the pump systems enables the delivery of organic as well as aqueous media without metal contact through a pulsation-poor, 3-piston pump. The modular design of the pump systems offers various combination options:

Pump system 1:

Pump Controller C-610 and 1 Pump Module C-601

Pump system 2:

Pump Manager C-615 and 1 Pump Module C-601 or C-605

Pump system 3:

Pump Manager C-615 and 2 Pump Modules C-601 or C-605

Pump system 4:

Control Unit C-620 and 2-4 Pump Modules C-601 or C-605

4.1 Functional principle

Pump Controller C-610:

Control unit for isocratic separations with one Pump Module C-601.

Communication with an optional Fraction Collector

C-660.

Simple entry via dial and display of delivery amount on a backlit LCD display.

Pump Manager C-615:

Control unit for one or two pump modules (C-601/605).

Communication with an optional Fraction Collector C-660.

Pressure monitoring.

Control of two optional valves for solvent selection.

Optional level monitoring.

Control Unit C-620:

Control Unit in combination with the software SepacoreControl is able to control your chromatography system.

Pump Module C-601:

Compact, pulsation-poor, 3-piston pump to a max. of 10 bar, chemically inert and biocompatible.

Pump Module C-605:

Compact, pulsation-poor, 3-piston pump to a max. of 50 bar, chemically inert and biocompatible.



Fig. 4.1: Example of System 3

The use of two pump modules A and B enables the formation of a binary gradient. The solvents enter the pump heads via the suction tubing (input). The FEP tubing guide the solvents to the mixing chamber with integrated pressure sensor and from there via the injection system on to the column via the pressure tubing (output). The Pump Manager C-615 regulates the flow rate of the pump modules A and B and monitors the current pressure. The maximum pressure for Pump Module C-601 is 10 bar and for Pump Module C-605 50 bar. In addition, a variety of programs and settings enables to select the flow rate of the solvent, the pressure, time and gradient of the solvents.

4.2 Operative range of the pump systems

The Pump Module C-601 pumps 2.5 to 250 mL/min of solvent at a maximum pressure of 10 bar. The Pump Module C-605 pumps 2.5 to 250 mL/min of solvent at a maximum of 50 bar.



ATTENTION

Do not connect the Pump Module C-605 to the Pump Controller C-610, otherwise an error message appears on the display.

If a Pump Manager C-615 or a Control Unit C-620 is used make sure that the same Pump Modules C-601 or C-605 are used.

5 Putting into operation

This chapter describes the installation of the Pump Combination 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 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 pump systems are not explosion proof. Potential explosion risk.

- Never position potential ignition sources near the pump modules.
- Use the pumps in a fume hood or ensure a good ventilation.

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.

NOTE

To cut the power in case of an emergency by unplugging, the instrument or any other item must not block the mains plug! In this case, the plug must be able to be pulled out instantly.

5.3 Installation

In order to make things clearer, the following descriptions do not contain the complete names of the modular pump systems, but rather the general name.

Pump Controller C-610: Pump controller

Pump Manager C-615: Pump manager

Pump Module C-601/605: Pump module

Mixer (pressure sensor with integrated mixing chamber): Pressure sensor

Control Unit C-620: Control unit

5.3.1 Installing the standard accessories

Suction tubing 4 mm×2.5 mm, length 1.5 m



ATTENTION

The pump module may never be operated without the suction filter, since otherwise impurities may enter the pump system.

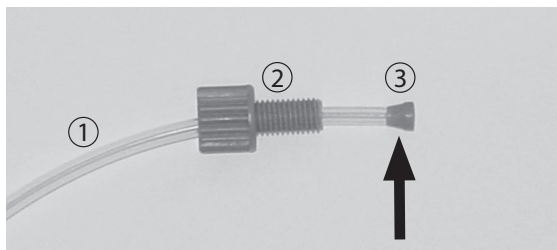


Fig. 5.1: Installing fitting and ferrule

Cut the suction tubing ① to the desired length and fasten it to the suction filter. Place the fitting ② and the ferrule ③ on the other end of the suction tubing ①. Attach the fitting ② and the ferrule ③.

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

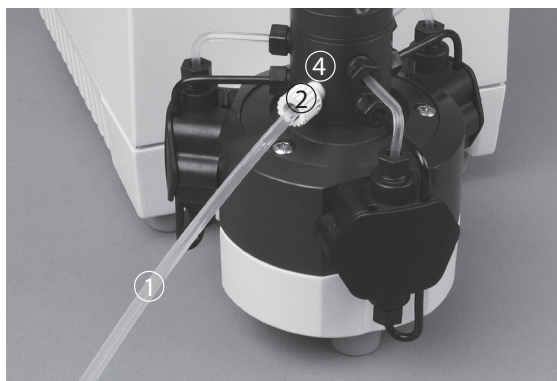
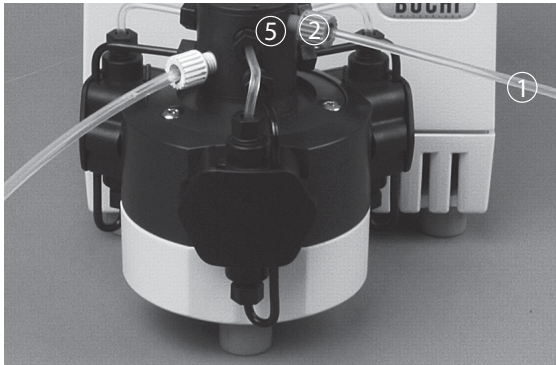


Fig. 5.2: Pump head with connected suction tubing

Remove the protective foil from the input and output of the pump head. Screw the white fitting ② into the lower input ④ of the separator head. Make sure that all fittings are hand-tight. The end of the tubing ① with the solvent filter goes into the solvent vessel.

Pressure tubing 1/8"×1/16":

Cut the pressure tubing to the desired length. Attach the fitting ② and the ferrules to one end of the tubing ① as described.

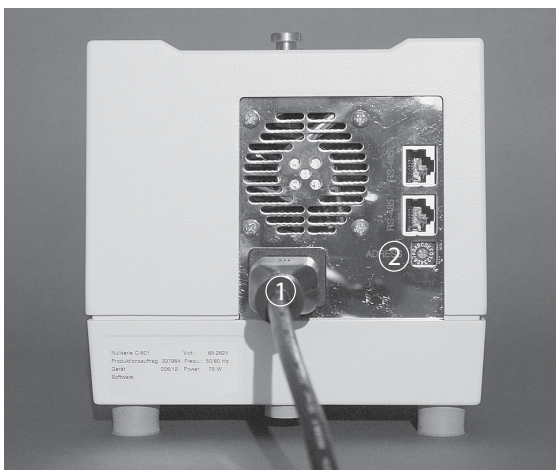
Screw the fitting ② into the upper output ⑤ of the separator head. Make sure that all fittings are hand-tight.

Fig. 5.3: Pump head with connected pressure tubing

5.3.2 Pump system 1: Pump Controller C-610 and 1 Pump Module C-601

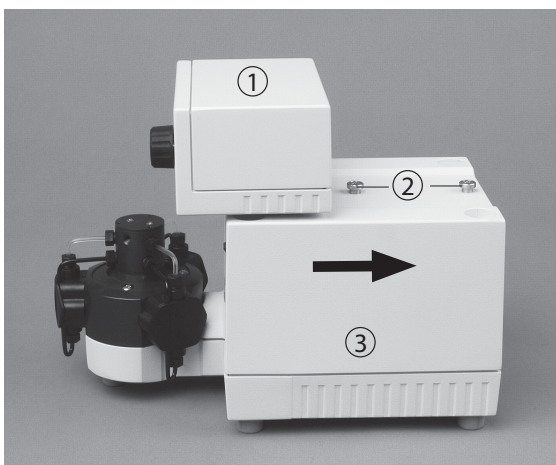
NOTE

The Pump Controller C-610 can only be connected to the Pump Module C-601.



Place the pump module on a level surface. Make sure the address bus is set to A ②. If not, take the screwdriver and turn the small white dot to A. Connect the power cord ①.

Fig. 5.4: Rear connections of the pump module

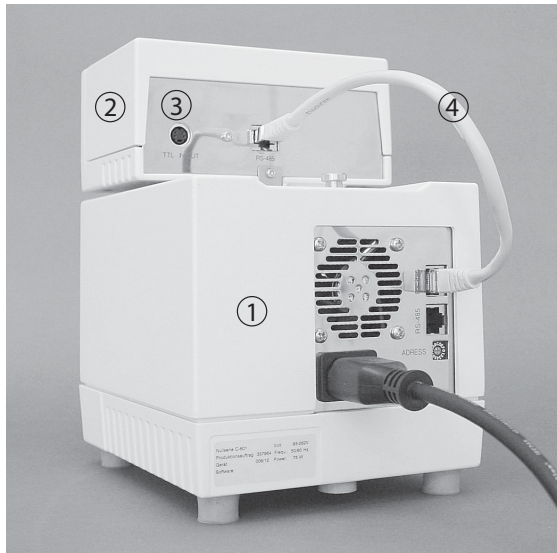


A holding angle is located in the center at the back of the pump controller ①. Remove it.

There is a rail located at the bottom of the pump controller ①. Slide it from the front to the end of the stop ② on the pump module ③.

Attach the holding angle.

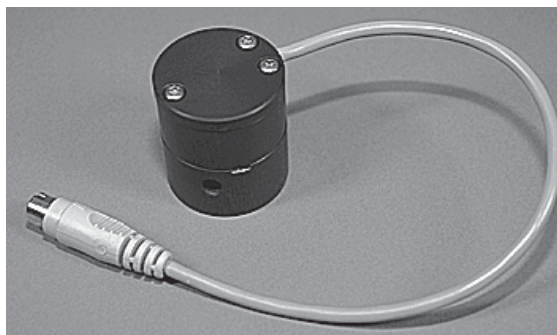
Fig. 5.5: Installing the pump controller and the pump module



Connect the pump module ① to the pump controller ② via data bus RS-485 by means of the cable RJ45 ④.
③ TTL IN/OUT.

Fig. 5.6: Rear connections of pump controller and pump module

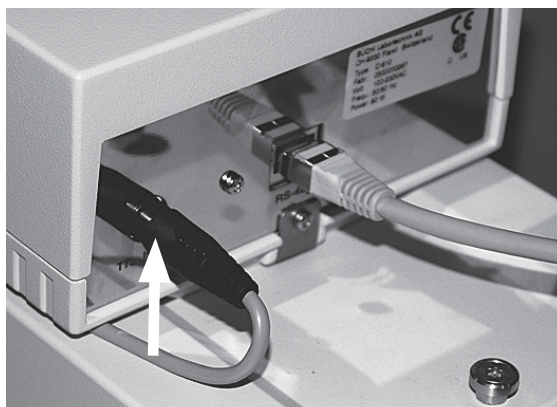
The overpressure sensor switches off the pump if the pressure exceeds 10 bar. This maximum pressure of 10 bar cannot be changed. The installation of the overpressure sensor is easy to do and explained in the following:



Overpressure sensor



Clip the overpressure sensor onto the Pump Module C-601.



Connect the overpressure sensor to the corresponding connector TTL IN/OUT at the back of the Pump Controller C-610.

Fig. 5.7: Installing the overpressure sensor

5.3.3 Pump system 2: Pump Manager C-615 and 1 Pump Module C-601 or C-605

The “or” between 601 and 605 indicates that operation is either possible with Pump Module C-601 up to 10 bar or with Pump Module C-605 up to 50 bar.

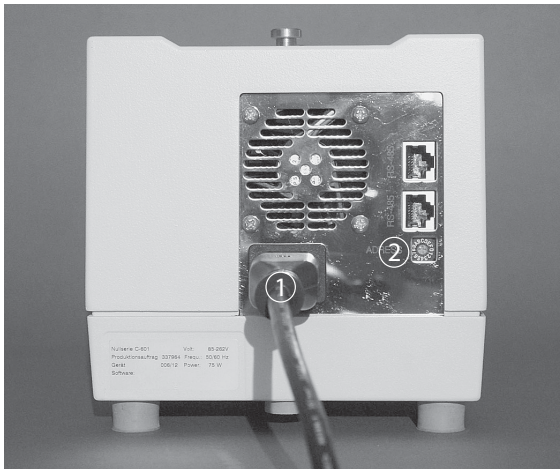


Fig. 5.8: Rear connections of the pump module

Place the pump module on a level surface. Connect the power cord. Make sure that the address selector switch is set to A ①. If not, take the screwdriver and turn the small white dot to A. Connect the power cord ②.

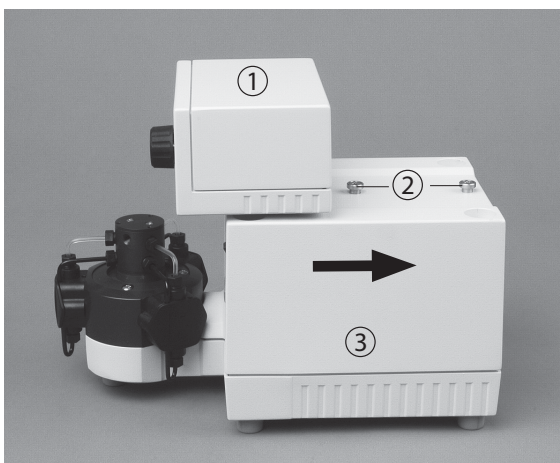


Fig. 5.9: Installing the pump manager and the pump module

A holding angle is located in the center at the back of the pump manager ①. Remove it.

There is a rail located at the bottom of the pump manager ①. Slide it from the front to the end of the stop ② on the pump module ③.

Attach the holding angle.



Fig. 5.10: Rear connections of the pump manager and the pump module

Connect the pump module ① to the pump manager ② by means of the cable RJ45 ⑦.

- ③ LEVEL: Port for optional solvent level sensor
- ④ VALVE: Port for optional solvent valve
- ⑤ PRESSURE: Port for pressure sensor
- ⑥ TTL IN/OUT
- ⑧ RS 232

Installation of the mixer



Click the mixer ② to the pump module ①. Make sure that all fittings are hand-tight.

Place the mixer cable ③ on the left side between pump module and pump manager, and attach it to the PRESSURE input of the pump manager (position ⑥ in Fig. 5.10).

Fig. 5.11: Pump module with attached mixer

For information on the installation of the standard accessories (suction tubing), please see chapter 5.3.1.

Suction tubing between the lower separator head and the mixer



Click the fitting and ferrule to the two ends of the tubing, so that one of the ends is attached to the output of the separator head ①, the other to the input of the mixer ②.

Fig. 5.12: Installing the suction tubing

Pressure tubing 1/8"×1/16":

Fig. 5.13: Pump head with connected pressure tubing

Cut the pressure tubing to the desired length. Attach the fitting and the ferrules to one end of the tubing as described.

Screw the fitting into the upper output of the separator head ①. Make sure that all fittings are hand-tight.

Inlet ② is only needed if two pump modules are used. If only one pump module is used it has to be shut with a blind plug.

5.3.4 Pump system 3: Pump Manager C-615 and 2 Pump Modules C-601 or C-605

NOTE

You can connect two pump modules to the pump manager if both modules are of the same type.

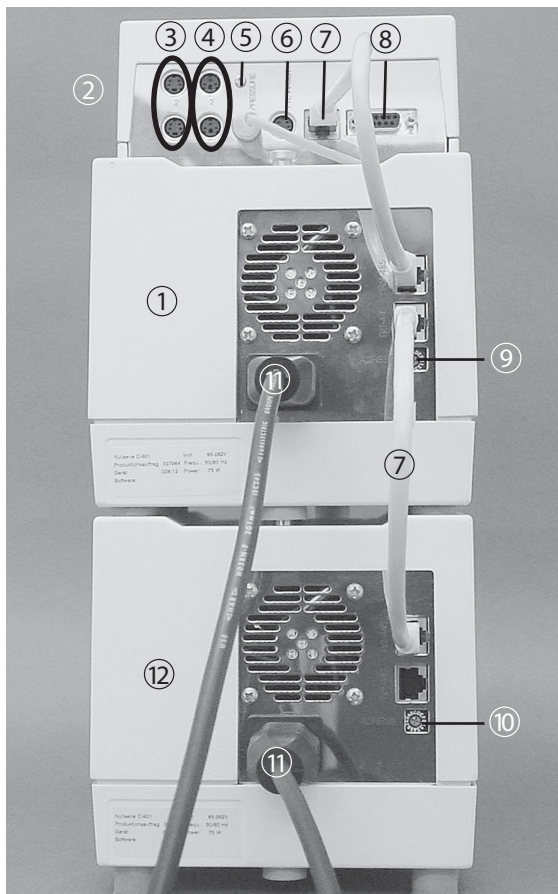


Fig. 5.14: Electrical installation

One pump module has the address selector switch set to A (factory setting), the other has the selector switch set to B.

Place the first pump module ⑫ on a level surface. Make sure the address selector switch is set to B ⑩. If not, take the screwdriver and turn the small white dot to B. Make sure the selector switch of the second pump module ⑫ is set to A ⑨. Place the pump module on top, and press firmly from the back, or place it next to the other. Connect both pump modules to the power supply ⑪.

A holding angle is located in the center back of the pump manager ②. Remove it.

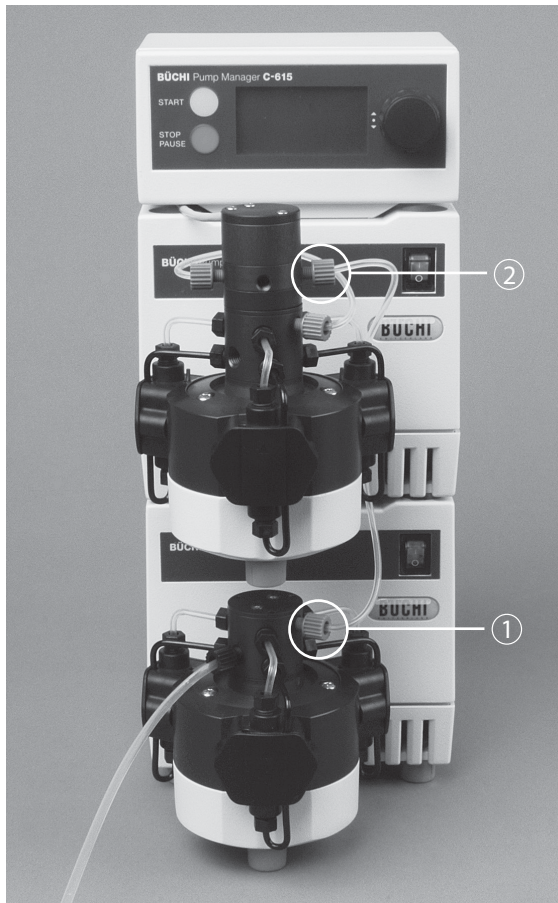
There is a rail located at the bottom of the pump manager. Slide it from the front to the end of the stop on the pump module. Attach the holding angle.

Connect the two pump modules ⑫ ① to the pump manager ② by means of the cable RJ45 ⑦.

- ③ LEVEL: Port for optional solvent level sensor
- ④ VALVE: Port for optional solvent valve
- ⑤ PRESSURE: Port for level sensor
- ⑥ TTL IN/OUT: TTL connection
- ⑧ RS 232: Serial output signal

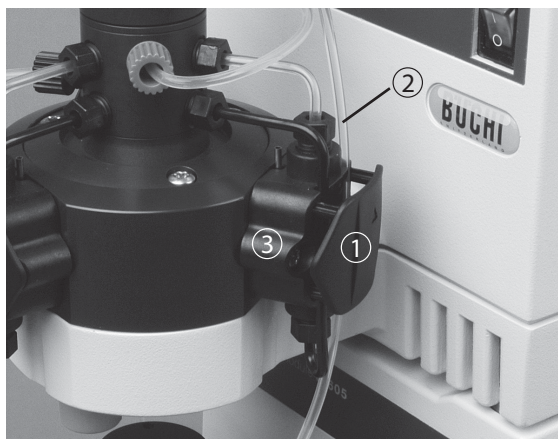
For the installation of the mixer and the suction tubing, see chapter 5.3.3.

Connection tubing between the separator heads of the pumps:



The fitting and ferrule are attached to both tubing ends.

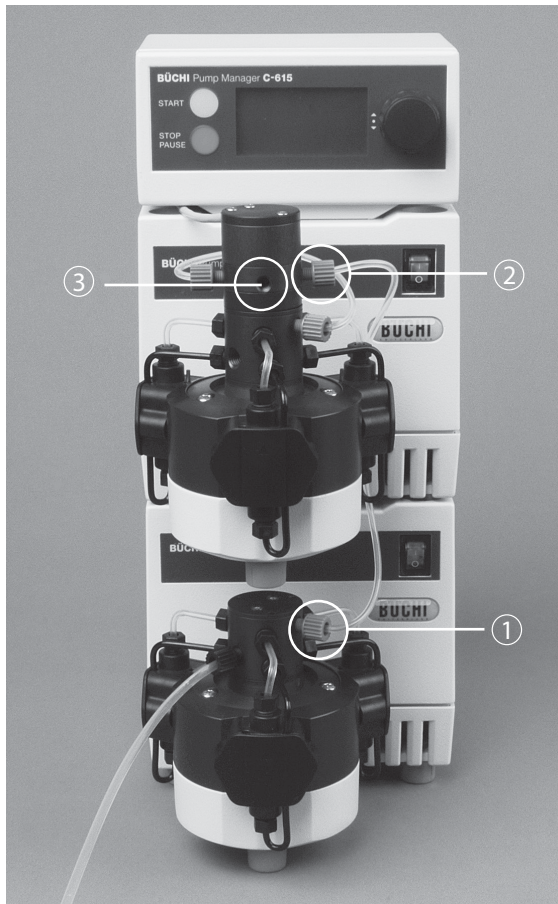
Attach one end of the connection tubing to the input of the lower separator head ① and the other into the output of the upper separator head ②.



Remove the right rear separator head cover ① from the lower pump. Remove the two small nubs on the inside by pushing them towards the inside and outside. Now press the connection tubing ② into the slit of the open separator head ③ and replace the separator head cover ①.

Fig. 5.15: Installing the connection tubing between the separator heads of the pumps

For a description on the installation of the connection tubing between the lower separator head and the mixer, see chapter 5.3.3.

Pressure tubing 1/8"×1/16":

Cut the pressure tubing to the desired length. Attach the fitting and the ferrules to one end of the tubing as described.

Screw the fitting into the upper output of the separator head. Make sure that all fittings are hand-tight.

Between the connections ① and ② runs the connection tubing between the lower head and the mixer.

③ Outlet mixer mixed solvent

Fig. 5.16: Pump head with connected pressure tubing

5.3.5 Pump system 4: Control Unit C-620 and 2 - 4 Pump Modules C-601 or C-605

For detailed information on this system see the Installation Guide of SepacoreControl.

6 Operation

This chapter explains the operating elements and possible operating modes. It gives instructions on how to operate the Pump Combination 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 Pump system 1: Pump Controller C-610 and 1 Pump Module C-601

6.1.1 Controls of the Pump Controller



- ① START button (green): Starts the pump
- ② STOP button (red): Stops the pump
- ③ Display: Displays the flow rate (in mL/min)
- ④ Dial without press function: Sets the flow rate in (mL/min)

Fig. 6.1: Control arrangement on the Pump Controller

6.1.2 Operation

Switch on the pump using the power switch at the pump module. The software version appears on the pump controller display ③ for approx. 2 seconds. Then it switches to the last flow rate used. In this mode, the pump is not in operation.

Using the dial ④, select the desired flow rate. Values of 2.5 to 250 mL/min are possible.

Press the START button ①.

The pump starts and the display ③ shows the current flow rate in mL/min. A blinking “÷” - sign indicates that the pump is running. The value can also be changed while the pump is running, using the dial ④. It will be directly implemented, and needs no confirmation. The pump can also be started with the Fraction Collector C-660 by remote control.

Pressing the STOP button stops the pump.

6.2 Pump system 2, 3: Pump Manager C-615 and 1 - 2 Pump Modules C-601/605

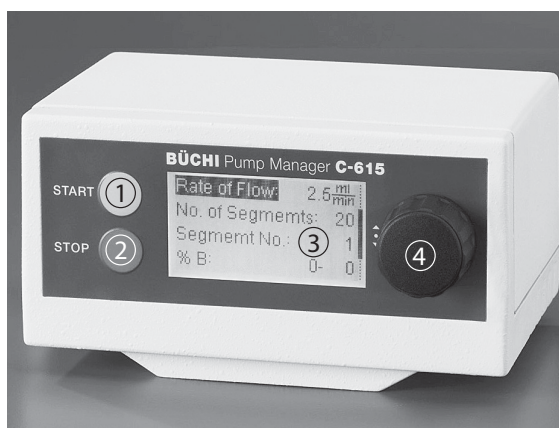
Pump Manager C-615 can be operated with one or two Pump Modules C-601 or one or two Pump Modules C-605. Since the pump modules only differ with regard to the maximal pressure, they will be described collectively.



ATTENTION

Note that two Pump Modules of different types must not be mixed.

6.2.1 Controls of the Pump Manager



- ① START button (green): Starts the pump
- ② STOP/PAUSE key (red): Press once for pause mode; press again to abort
- ③ Display: Displays parameters and values.
- ④ Selector switch (lockdown switch): Operation of menu by rotating and pressing.

Fig. 6.2: Control arrangement on the Pump Manager

6.2.2 Display

The display is divided into two areas. The first line (= status line) shows the status of the pump module; it is fixed. The other lines display the parameters. The left column of the status line shows the current mode of the pump modules.

There are three possible modes:

Stop: The pump modules are not running.

Pause: The pump modules are pausing. The time display is stopped. The program can be continued at any time from the point at which it was paused by pressing the START button.

Pumping: The pump modules are pumping according to the set parameters.

The middle column of the status line shows the name of the running program and the number of the current segment. The latter is not displayed during manual operation. The right column displays the time. The upper value indicates the remaining time until the end of the program and the lower indicates the remaining time of the current segment.

The bottom lines contain the current parameters of the pump module. The scroll bar on the right shows where you are within the menu display.

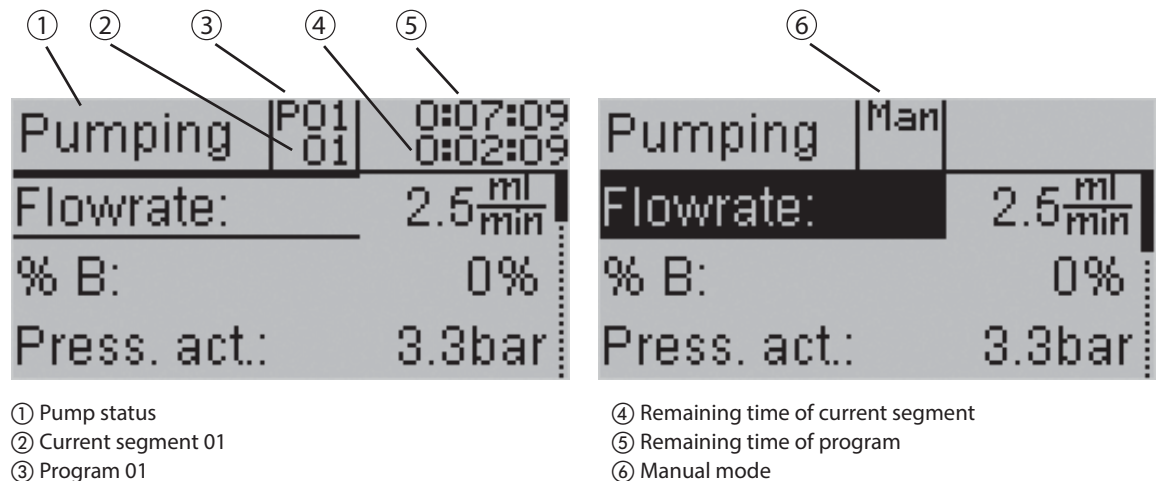


Fig. 6.3: Overview over the display

NOTE

When the pump system is pumping, parameters highlighted in a dark color can be changed and selected. Parameters displayed between two black lines cannot be changed anymore (see also picture above).

Using the selector switch you can navigate through the menu. Turning the selector switch allows you to select the desired parameter and pressing it confirms your selection. The cursor jumps to the right, to the alterable value or, if it is already there, onto the next line (in program mode, it only advances to stop mode). By turning the selector switch, you can set the desired values. Press the selector switch to confirm the new value. If no confirmation follows after 10 seconds, the cursor returns to the old parameter and the left column.

6.2.3 Operation

Switch on the pump using the power switch at the pump module.

The software version appears on the pump controller display for approx. 2 seconds. Then, the Main menu automatically appears with the last values and parameters used.

The Main menu is identical for manual and programmed operation.

You can scroll through the menu by turning the selector switch.

Select your parameters.

6.2.4 Systematics of the Menu Mode

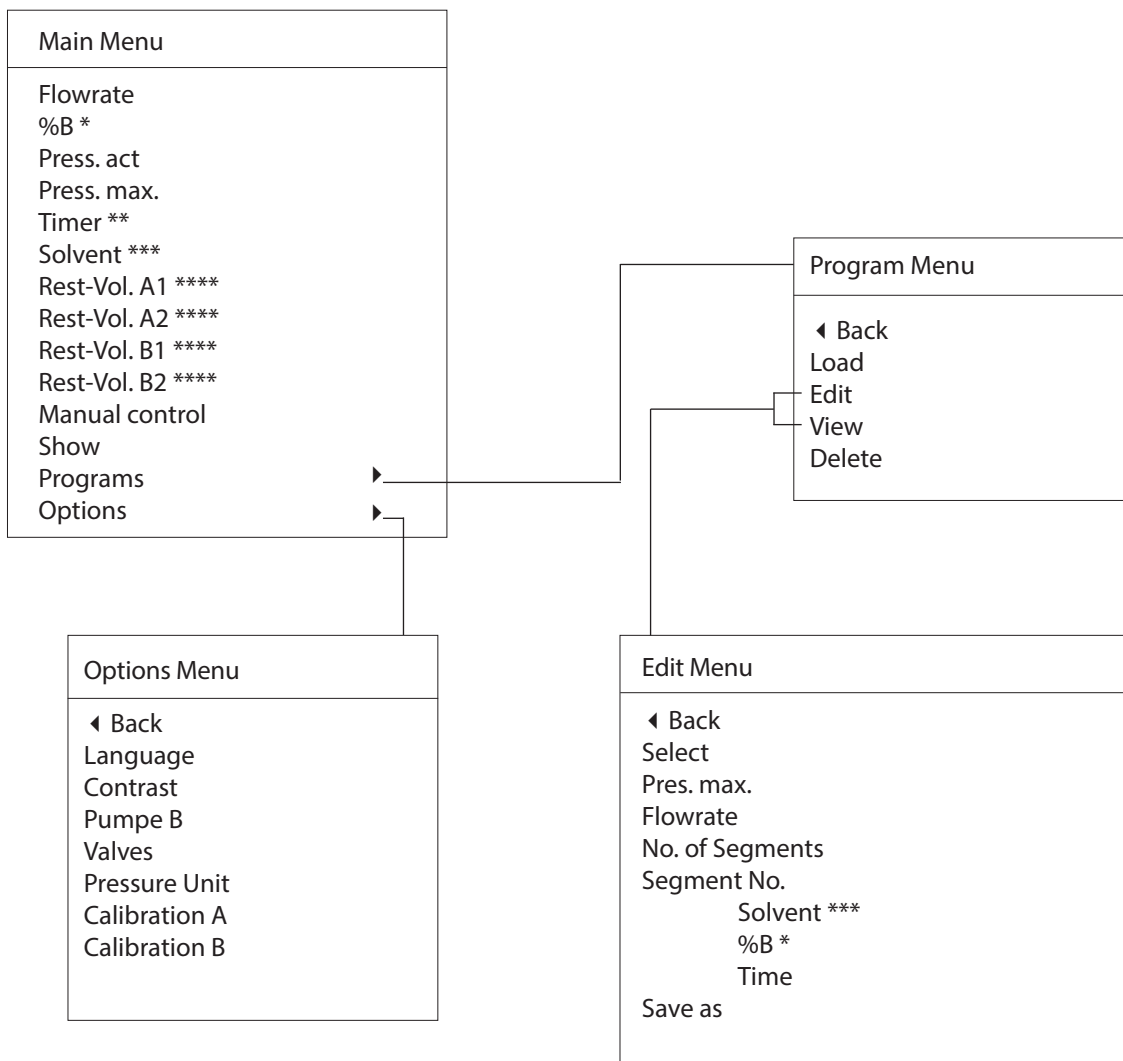


Fig. 6.4: Systematics of the Menu Mode

- * is only displayed when Pump B is set to Yes within the Options Menu.
- ** is only displayed in the Manual mode
- *** is only displayed when Valves is set to Yes within the Options Menu.
- **** is not displayed in the Manual mode if the Timer is set to 00:00:00 (continuous pumping)

6.2.5 Parameters

Table 6-1: Functions of the Main Menu	
Main Menu	Description
Flow rate	Shows currently set total flow rate of eluent (2.5 – 250 mL).
%B	Shows currently set total flow rate of pump B (0 – 100 %).
Press. act.	Shows current pressure (0-50 bar) (0 -725 psi).
Press. max.	Shows selected maximum pressure.
Timer 00:00:00 (h:min:sec)	If the time limit is zero, the unit is in continuous operation (only in manual operation mode). In programmed operation mode, no "Timer" line is displayed.
Timer 00:10:00 (h:min:sec)	The unit is in manual mode. It will stop the pump in 10 minutes.
Rest-Vol. A1	Shows the calculated consumption of Eluent A1 until the end of the program.
Rest-Vol. A2	Shows the calculated consumption of Eluent A2 until the end of the program; however, this line only appears when an optional solvent valve is used.
Rest-Vol. B1	Shows the calculated consumption of Eluent B1 until the end of the program.
Rest-Vol. B2	Shows the calculated consumption of Eluent B2 until the end of the program; however, this line only appears when an optional solvent valve is used.
Manual Control	Switches to Manual mode. %B and maximum pressure can be changed. In addition, a running program can be interrupted to be continued manually. It is not possible to return to the program.
Show ▶	This line only appears in programmed operation mode. It causes a jump to the graphic display of the program progression. It shows an overview of the temporary progression of the gradient in %B over the entire duration of the program.
Programs ▶	see Program menu
Options ▶	Access to Options menu

Table 6-2: Functions of the Program Menu	
Program Menu	Description
◀ Back	Back to the Main Menu.
Load	The previously defined programs P01 - P10 may be loaded.
Edit	Existing programs can be changed or new ones created. If no programs have been stored, yet "empty" is displayed; otherwise the defined programs P01 - P10 are displayed with all program parameters. They can be changed.
View	If no programs have been saved, yet "empty" is displayed; otherwise the defined programs P01 - P10 are displayed with all program parameters. They cannot be changed.
Delete	If no programs have been saved, yet "empty" is displayed; otherwise the previously defined programs P01 - P10 can be deleted and confirmed with yes/no. If you have a tubing in Delete by accident wait for 10 seconds until the cursor jumps to the left.

Table 6-3: Functions of the Edit Menu

Edit Menu	Description
◀ Back	Jumps back to Program Menu.
Select	The programs P01 - P10 or "new" can be selected.
Pres. max.	Displays the previously set maximum pressure.
Flowrate	Shows the current eluent flow rate (2.5 – 250 mL)
No. of Segments	Every program can consist of up to 12 segments.
Segment No.	Segment numbers can be selected.
Solvent	Only when solvent valves are used pump combinations A1/B1, A2/B1, A1/B2, A2/B2 of the eluents can be selected.
%B	Only in the case of two pump modules, start and end point of the mixture ratio of Pump B (0 – 100 %) can be entered.
Time	Time limit in h:min:sec
Save	The new program or alterations to existing programs can be saved.

Table 6-4: Functions of the Options Menu

Options Menu	Description
◀ Back	Jumps back to Main Menu.
Language	The corresponding operating language can be selected.
Contrast	Display contrast (0 – 100%)
Pump B	When two pump modules are triggered, the address selection switch of one pump module must be set to A (factory setting) and the other to B.
Valves	When solvent valve sets are used, they must be activated here.
Pressure Unit	Selection of pressure units MPa, bar or psi (1 MPa corresponds to 10 bar corresponds to 145 psi)
Calibration A	Pump A can be calibrated ± 20 %
Calibration B	Pump B can be calibrated ± 20 %.

6.2.6 Programming

Fundamentals:

A gradient program is programmed by lining up individual segments.

Each segment is defined by

- an start concentration %B
- a end concentration %B
- one or two pump modules
- valves (if applicable)
- time limit

When solvent valves are used, the pump combinations A1/B1, A2/B1, A1/B2, A2/B2 of the eluents can be selected.

Start and end concentrations are entered in %B. The time is entered in 00:01:02 (hh:mm:ss). The starting and end point of the mixture ratio of Pump B (0 – 100%) can only be entered if two pump modules are used. The increase from the start to the end concentration is linear.

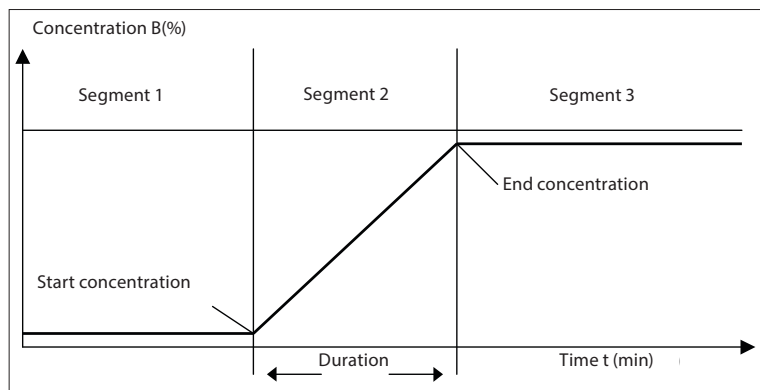


Fig. 6.5: Systematical gradient

The program number under which the program is to be saved can be selected at will between P 01 and P 10. This option allows an existing program to be loaded, edited and/or viewed and saved under a new number, whereby the original program remains unchanged.

Creating a new program, example:

Prerequisites:

Two pump modules, e.g. C-605, are installed, each with a solvent. No solvent Valve Set is installed. A gradient program P02 is created that initially runs for 25 minutes isocratically with pure Eluent A, then, for 30 minutes, the concentration of Eluent B is continuously increased to 35% and finally this concentration B is maintained for 20 minutes. Eluent A could e.g. be hexane, and Eluent B ethyl acetate.

The pressure is 50 bar and the flowrate is 10 mL/min.

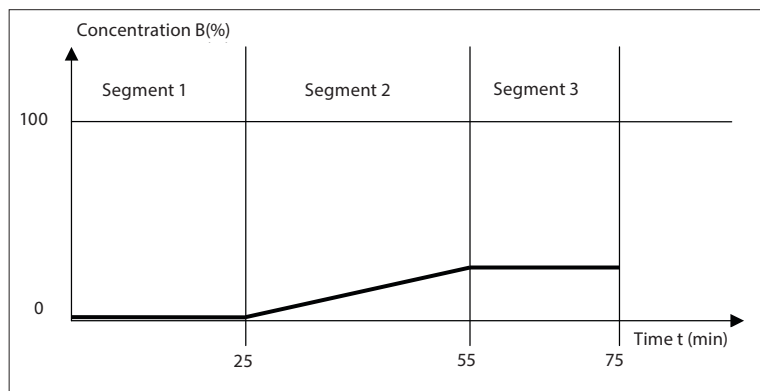


Fig. 6.6: Systematical gradient, example

To create a new program, the following settings are necessary:

- Pump B is selected: Pump B Yes
- No valve is connected : Valve No

Table 6-5: Creating a new program in three steps

Step	Menu/Confirmation	Entry/Confirmation
1	Programs Edit	New
2	Select	New
	Pres. max.	50 bar
	Flow rate	10 mL
	No. of Segments	3
	Segment No. (automatic)	1
	% B	0 - 0
	Time	00:25:00
	Segment No. (automatic)	2
	% B	0 - 35
	Time	00:30:00
	Segment No. (automatic)	3
	%B	35 - 35
	Time	00:20:00
	--> Save	P02
The program is loaded automatically		
3	Show	Gradient is shown

NOTE

When your presettings change your programs might make no sense anymore. In this case, redefine or adapt your programs.

6.3 Pump system 4: Control Unit C-620 and 2,3 or 4 C-601 or C-605

When the Pump Module C-601/605 is used, the address switches must be set to 1 and 2. In case further Pump Modules C-601/605 are used, the address switches must be set to 3 and 4. For further information see the Installation Guide of SepacoreControl.

6.4 Calibration



ATTENTION

Before carrying out the calibration make sure that the system is free of air. Always calibrate the system under your actual working conditions (flow rate, backpressure, column). After calibration carry out the measurement again to check the current pump flow rate.

The pump flow rate can be influenced by the following factors:

- The length of the suction tubing.
- The location of the solvent vessel above or below the pump.
- The viscosity of the solvent.
- The backpressure of the chromatography column.
- When using a suction tubing of which the inner diameter is too small.

6.4.1 Calibration of the Pump Controller C-610

Requirements:

For the calibration of Pump Controller C-610 you need a graduated cylinder and a stopwatch. Set the pump flow rate to 100 mL. Place the suction tubing into the graduated cylinder and start the pump. After exactly one minute take the tubing out of the cylinder.

If the graduated cylinder contains exactly 100 mL, the pump is calibrated. If too little or too much solvent is in the cylinder, the pump flow rate is accordingly too low or too high.

If this is the case, recalibrate the pump.

Proceed as follows:

Switch off the pump. Hold the START button pressed while you switch the pump on again. Continue pressing the START button for another 3 seconds. The display will read "+ C 00": You are now in Calibration mode. Increase or decrease the flow rate using the selector switch. Press the STOP button to confirm the new value.

The pump will now deliver less or more solvent, accordingly. Perform the one-minute measurement of 100 mL again to check the current pump flow rate.

6.4.2 Calibration of the Pump Manager C-615

Requirements:

To calibrate the Pump Manager C-615 you need a graduated cylinder and a stopwatch.

Set the pump flow rate to 100 mL/min and the time to one minute. Place the pressure tubing into the graduated cylinder and start the pump. If the cylinder contains exactly 100 mL, the pump is calibrated. If too little or too much solvent is in the cylinder, the flow rate is too low or too high. If this is the case, recalibrate the pump.

Proceed as follows:

Select the function Calibration A and Calibration B in the Main Menu > Settings and increase or decrease the percentage accordingly. Confirm by pressing the selector switch. The pump will now deliver more or less solvent, accordingly. Repeat the measurement and check the current pump performance.

If you have changed the pump flow rate during calibration, the correction values for A and B are displayed on start-up of the Pump Manager.

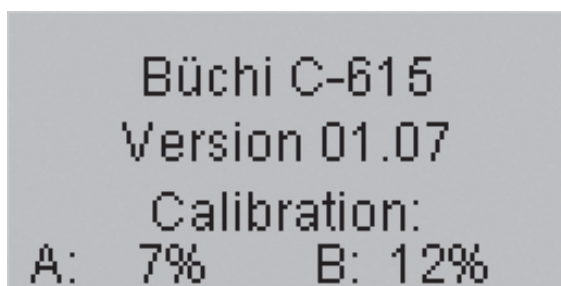


Fig. 6.7: Correction values displayed at the bottom of the start-up screen

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 System cleaning

Solvent and sample residue in valves, connections or tubings can greatly impede the performance of the system as well as greatly endanger your own health, e.g. when replacing a tubing. Thus, it is essential to flush the entire system with clean solvent.

7.2 Housing

Check the housing for defects (display, controls, plugs) and clean it regularly with a moist cloth.



ATTENTION

Never use solvents as cleaning agents as this may damage the instrument.

7.3 Tube connections

Visually examine the tube connections regularly, if tubes become cracked and brittle replace them with new ones.

7.4 Sealing system



ATTENTION

When replacing the seals, take care not to damage them.

To prevent damaging the seals never apply grease and never touch them with sharp objects.

7.5 Pressure sensors

- For safety reasons it is recommended to check the mixer and the overpressure sensor from time to time.

7.5.1 Cleaning the seals

To prolong the lifetime of the seals and in case of unwanted sample contamination (foaming or boiling retardation) rinse the seals with water or ethanol. Dry the cleaned seals with a soft cloth.

7.5.2 Changing the seals

Visually examine the seals regularly, if seals become cracked and brittle replace them with new ones. For this purpose, proceed as follows:



Fig. 7.1: Removing the radial seal

Remove the pump head cover. Loosen the pump head screws and remove it. Inside the head, there is a radial seal ①. Remove it.

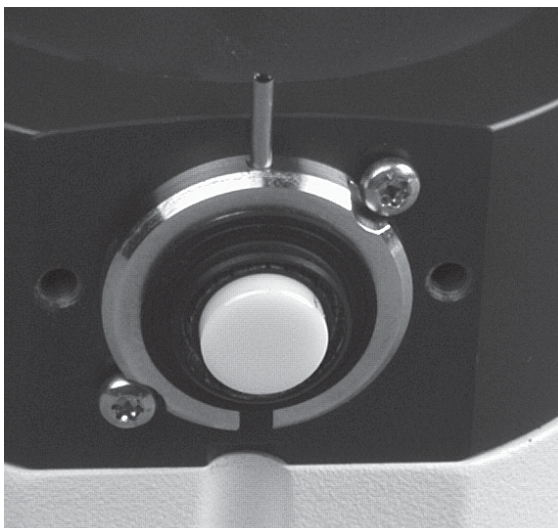


Fig. 7.2: Installing the radial seal

Attach the new seal to the piston at the pump housing, and not, as you might expect, to the inside of the pump head, so that the new seal does not become bent and/or damaged. Attach the pump head with the flat side first straight onto the piston, so that the seal is straight; otherwise it may be damaged. Tighten the screws uniformly. Place the pump head cover onto the pump head with the arrow pointing up.

7.6 Piston backrinsing



ATTENTION

When working with aqueous saline solutions, residues might collect behind the piston seal. These residues must be removed since they can contribute to a faster wearing of the seals.

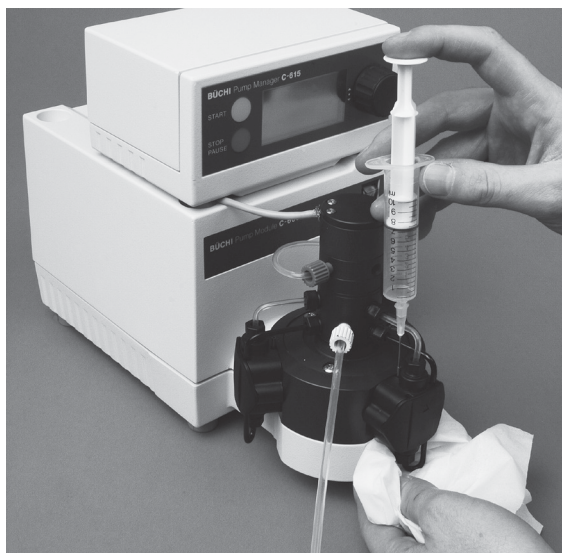


Fig. 7.3: Piston backrinsing with spraying device and tissue

The system can be rinsed with a spraying device filled with water. We recommend to use a tissue at the outlet of the backrinsing to collect the water drops.

7.7 Changing the valves



Fig. 7.4: Uninstalling the fitting

Always replace the valves in all pump heads. For this purpose, proceed as follows:

- Remove the pump head cover.
- Loosen the screws of the pump head and remove it.
- Using the turix wrench, loosen the valve screw fittings on the suction and pressure tubing on the upper and lower side of the pump head.

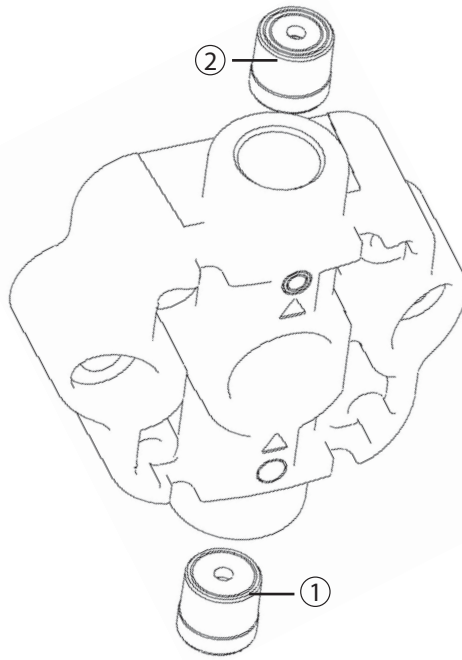


Fig. 7.5: Installing the new valves

- Remove the valve screw fittings and tubing.
- Remove the valves and insert the new valves. The inlet valve is marked by one ring ① at the head end, and is attached with that ring facing the pump head in the direction of the arrow. The outlet valve is marked by two rings ② at the head end and is inserted into the pump with the unmarked side first. The valves are positioned loosely in the pump head. To prevent them from falling out:
 - Take the pump head between thumb and index finger and keep the valve opening shut.
 - Hold the pump in a horizontal position.
 - Screw the suction tubing onto the inlet valve.
 - Screw the pressure tubing onto the outlet valve and attach the pump head vertically onto the piston of the pump housing with the arrows facing upward.
 - Screw on the pump head tightly.
- Mount the suction tubing and the pressure tubing to the distributor with the turix wrench.
- Press the suction tubing into the depression of the pump head.
- Attach the pump head cover to the pump head.

7.8 Changing the suction and pressure tubing

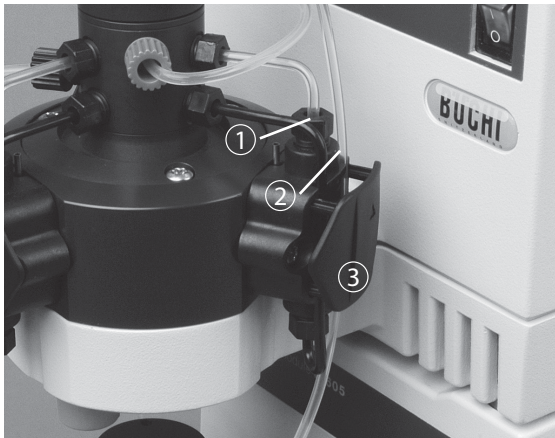


Fig. 7.6: Installing the connection tubing at the pump head

To change the suction and pressure tubing, proceed as follows:

- Using the turix wrench, loosen both valve screw fittings of the suction and pressure tubing and pull them out.
- Remove the ferrule, cone ring and valve screw fittings on all tubing. The ferrule must be replaced; the cone ring and valve screw fittings may be reused if they are not damaged.
- Attach the valve screw fitting, with the square side first, to the ends of the suction and pressure tubings.
- Mount the cone ring and ferrule according to figure 5.5.
- Proceed as above for the ends of all tubings that you wish to replace.
- Screw the tubings back into their mountings.
- Tighten the valve screw fitting ① using the turix wrench.
- Press the suction tubing into the depression of the pump head ②, and attach the pump head cover ③ to the top.

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.

In the event of an error, the pump will stop and an acoustic alarm will sound. The acoustic alarm can be stopped by pressing the START or STOP button once. If the error has been eliminated, the alarm can be stopped by pressing the START or STOP button twice.

The beeping noise will not sound if the system has been externally stopped by the Fraction Collector C-660 or the TTL input.

The Pump Module C-610 shows the error message on the display in the form "Exy" whereby "xy" stands for the error number.

Error "01" of the pump module can either be confirmed with the START or the STOP button. When the START button is pressed, the error message display disappears, and the pump restarts with the current value. If the STOP button is pressed, the error message display disappears, and the current value is shown, as usual. If the flow rate has still not been achieved, error "01" will be displayed again. If the waste container is full or the connected Fraction Collector C-660 shows an error, the pump will stop without displaying an error. The error message will be displayed on the fraction collector. The pump cannot be switched on again until the cause has been eliminated and the error has been confirmed at the fraction collector.

8.1 Malfunctions and their remedy

Error number	Possible cause	Remedy
01	Pump cannot reach desired flow rate. The pump electronics has 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

Table 8-1: Error messages of the Pump Controller C-610 (cont.)

Error number	Possible cause	Remedy
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	Transfer error to RS485.	Contact the BUCHI customer service
31	The wrong pump is connected (C-605 instead of C-601).	Replace C-601 with C-605.

Table 8-2: Error messages of the Pump Manager C-615

Error number	Possible cause	Remedy
01	Pump A: Flow rate out of tolerance.	Control backpressure Contact the BUCHI customer service
02	No answer from Pump A.	Check RJ 485 connections. Check main power. Check switch + connections. Check selector switch at the back side of the pump module.
03, 14, 25	Communication failure on RS485.	Contact the BUCHI customer service
04	EEPROM pump A.	Contact the BUCHI customer service
05	Pump A: Temperature out of tolerance.	Contact the BUCHI customer service
06	Pump A: Main voltage above tolerance.	Contact the BUCHI customer service
07	Pump A: Main voltage below tolerance.	Contact the BUCHI customer service
08	Pump A: Invalid data in memory.	Contact the BUCHI customer service
09, 10	Failure in pump A.	Contact the BUCHI customer service
11	Cooling fan in Pump A not working.	Contact the BUCHI customer service
12	Pump B: Flow rate out of tolerance.	Contact the BUCHI customer service
13	No answer from Pump B.	Check RJ 485 connections. Check main power. Check switch + connections. Check selector switch at the back side of pump module.
15	EEPROM pump B.	Contact the BUCHI customer service
16	Pump B: Temperature out of tolerance.	Contact the BUCHI customer service
17	Pump B: Main voltage above tolerance.	Contact the BUCHI customer service
18	Pump B: Main voltage below tolerance.	Contact the BUCHI customer service
19	Pump B: Invalid data in memory.	Contact the BUCHI customer service
20, 21	Failure in pump B.	Contact the BUCHI customer service

Table 8-2: Error messages of the Pump Manager C-615 (cont.)

Error number	Possible cause	Remedy
22	Cooling fan in pump B not working.	Contact Customer Service.
23, 24	EEPROM C-615.	Contact Customer Service.
26	Pressure higher than max. pressure settings.	Lower the flow rate, if possible, increase the max. pressure
27	Unexpected restart.	Restart.
28	Check solvent level A.	Refill solvent bottle A. Check level sensor position. Check level sensor adjustment.
29	Check solvent level B.	Refill solvent bottle B. Check level sensor position. Check level sensor adjustment.
30	No pressure sensor connected.	Check connection; otherwise, contact the BUCHI customer service

8.2 Pulsation of a pump module

A repeated strong pulsation of the pumps suggests that the opening or closing times of the inlet or outlet valves are not correct.

Possible causes:

Improper use:

- The solvent filter is not used. When the filter is not used, particles, dust and fibers can enter the valves and affect their functionality.
- The sample mixture is introduced to the separating column with the pumps. The pumps are exclusively designed to pump solvents.

Using technical solvents:

Technical solvents are normally not free of polar residues. Especially during extended standstill periods these residues can adhere to the polar surface of the sapphire valve seat or the ruby valve ball and influence the closing speed. In the worst case the valve can jam.

Possible sealing abrasion in the outlet valve

Each sealing is subject to a permanent abrasion during its service life. This abrasion is especially high at the beginning during the so-called running in phase of the sealing. For small flow rates the flow speed within the valve might be too low for a self-purification of the valves. For continuous flow rates of under 10 mL/min we recommend to rinse the pumps at least once a week according to the procedure described below.

Solving the problem:

- Rinsing the pump module:
 - Disconnect the pressure tubing between the pressure sensor and the injection system, so that the rinsing solution does not contaminate the separating column.
 - Rinse the pump module with a high flow rate with ethanol or chloroform (>150 mL/min for two minutes).



ATTENTION

Do not pump the solvent round in circles. The solvent may only be reused after distillation.

When the measures above are not successful, continue as follows:

- Localizing the defective valve:
 - Let the pump module run with low flow rate (10 mL/min) and pull the suction tube out of the solvent bottle for a short time (about 1 second).
 - Observe, at which of the three suction tubes the air bubble does not disappear after 1 minute.
 - Switch off the pump.
 - Dismount the inlet valve. Make sure that the thin PTFE sealing does not get lost.
 - Blow out the valve with compressed air.
 - Remount the inlet valve.
 - Let the pump run again.
 - Blow out the valve with compressed air

If this procedure is not successful:

- Dismount the inlet valve again and make sure that the thin PTFE sealing does not get lost.
- Rinse it with solvents, e.g. acetone.
- Remount the inlet valve.
- Let the pump run again.

If this procedure is not successful:

- Dismount the inlet valve and exchange it with a new one.
- Let the pump run again.

Now the inlet valves should function properly. Restart the pump. It should also function properly now. If not, carry out the same procedure for the outlet valves as carried out for the inlet valves. Thereby always consider the thin PTFE sealing.

After all valves have been checked successfully the pump operates correctly. If all attempts to eliminate pulsating flow rates fail, contact the BUCHI Customer Service.

8.3 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



WARNING
Biohazard:

- Remove all dangerous substances from the instrument and clean it thoroughly by flushing it with dry air or nitrogen.

Store and transport the instrument in its original packaging.



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.

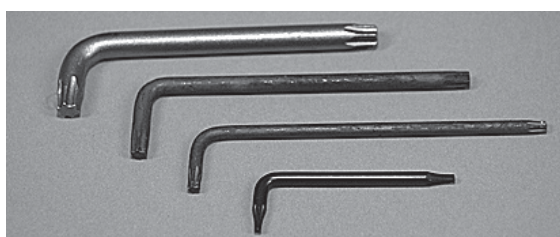
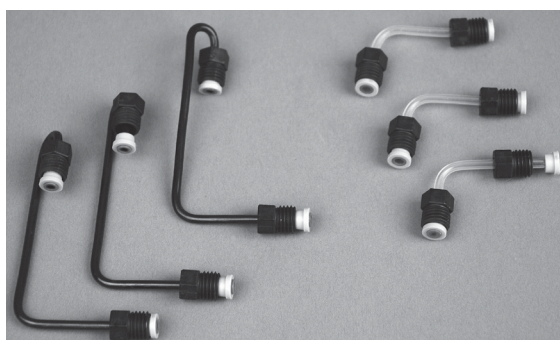
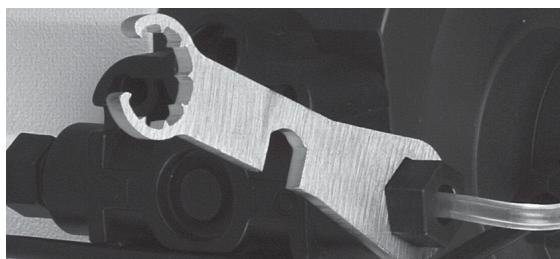
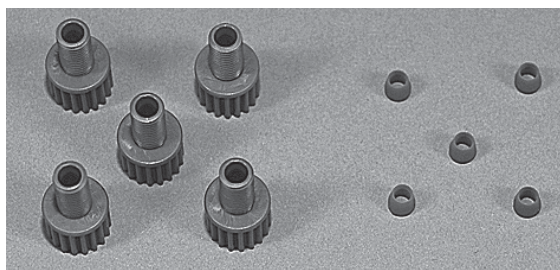
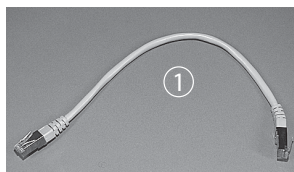


Table 10-1: Spare parts

Product	Ordernumber
① Connection cable RJ45, 0.3 m	44288
② Solvent filter	44340
25 fittings, 1/8" green	40961
25 ferrules, 1/8", green	40956
25 fittings, Ø 4.0, white	54044
5 ferrules, Ø 4.0, white	54056
Turixwrench(fitsfittingandpipefitting)	44304
Set of suction tubings/pressure tubings, complete	51905
Torx set TX6, TX10, TX20, TX30	45271



Table 10-1: Spare parts (cont.)

Product	Ordernumber
⑤ Mixer (pressure sensor with integrated mixing chamber)	54050
Overpressure sensor	54060
FEP pressure tubing 1/8"×1/16", length 5 m	44354
FEP suction tubing 4mm×2.5mm, length 5 m	54059

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.

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