



User's guide

# ECSxx P

**COMPACT PREPARATIVE SYSTEM**



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04	11.3.2022	Dominika Pavlová	Jakub Hodaň	Adding new optional racks (EC60 and F12A).

Related documents	

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## 1. GENERAL INFORMATION

This unit is intended for use in laboratories for performing chromatographic methods (preparative HPLC). The compact system includes a UV-VIS detector, preparative gradient pump, automatic injection valve and fraction collector.

### 1.1. Product Function

The unit allows the collection of samples of liquid outflowing from the detector, which is supplied by the pump, measurement of light absorbance at up to four wavelengths at one time or scanning through the entire spectrum. The sample is collected into a collection of tubes. The sample collection is based on the selected collection mode. An electromagnetic valve is located on the movable arm that switches between collecting a portion of the sample liquid into the tubes or drains the unnecessary portion of the liquid to waste. Separate collection can take place in a time mode where everything is collected or based on a signal from the connected unit. The unit is controlled by a built-in touch screen computer. Depending on the version, it can be equipped with one of three detectors with the wavelength 200-400/600/800 nm. A deuterium lamp combined with a halogen lamp is used as the light source. It is equipped with one of two pump types with flow rates up to 50 or 250 ml/min. The pump is double-acting with two pump blocks connected in parallel. Both working heads are fitted with inlet and outlet check valves. Smooth flow of the mobile phase is ensured by suitable shaping of the driving cams, by means of which a uniform movement of the ceramic pistons pumping under counterpressure and at the same time precise control of the motor rotation is achieved. The pump works in the system as isocratic and gradient. The gradient valve is standardly a 6-channel valve.




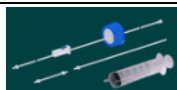

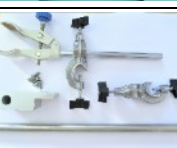
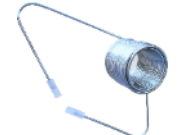






### 1.2. Produced Versions

ECS28 P – Compact preparative system 250 ml/min, 800 nm	Cat. No.: ECS28P0X
ECS54 P – Compact preparative system 50 ml/min, 400 nm	Cat. No.: ECS54P0X
Default racks type:	
Racks for 24 tubes, OD 20 mm, volume 40 ml	Cat. No.: AFAR040X
Other racks type possible to order:	
Racks for 36 tubes, OD 16 mm, volume 21 ml	Cat. No.: AFAR021X
Racks for 48 tubes, OD 12 mm, volume 8 ml	Cat. No.: AFAR008X
Rack for 20 vials, OD 27.5 mm, volume 60 ml	Cat. No.: AFAUV000
Rack for 12 funnels, 30 mm	Cat. No.: AFARF120








### 1.3. Accessories

#### BASIC ACCESSORIES

P/N	Qty	Picture	Description
EKAB-011	1		Mains supply cord 10A-250V 2 m EU (certified cable type is inserted according to order)
EKAB-031	1		Mains supply cord 10A-250V 2 m US/CAN (certified cable type is inserted according to order)
EKAB-060	1		Mains supply cord 10A-250V 2 m UK (certified cable type is inserted according to order)
23986000	1		Tube fuse T – 6,3A/250V, CSA (main unit fuse; for combined power socket with main switch and main fuse)
EKAB-041	1		LAN cable 3 m (to connector ETHERNET)
ECS90110	1		Touch screen stylus (to control the display of the unit)
AFAR040X	2		Rack for 24 tubes, OD 20 mm, volume 40 ml
AFAJ0080	1		Needle OD 1/16", ID 1mm, L=57 mm stainless steel (for AFAR008X, a substitute needle when changing rack type)
AFAT040X	1		Tube 40 ml, OD 20 mm, L 180 mm with round bottom (packing 50pcs, for AFAR040X)
ANA95000	1		Testing cell in bracket ZK04L (for testing detector and cell functionality)
414321950	6		GL 45 Media/Storage Bottles 2000 ml

P/N	Qty	Picture	Description
ACE98001	6		<b>FEP Tubing 3/16" 2000 mm with filter 20 um and lid</b> (FEP tubing, ID=1/16", volume = 3078 µL only tubing, 2x PEEK nut 3/16", thread 5/16"-24, PP lid on tray GL45 with PA plug with tubing holes, PE filter 20 µm No-Met with reduction UNF 5/16", 2x Tefzel ferrule 3/16", marking set 2x4pc)
PN000080	1		<b>Waste tubing with adapter 3/32"</b> (Silicone tubing 1 m, adapter Male Luer 3/32"Barb; (from by-pass valve to waste)
ECS90080	1		<b>Waste set Compact system</b> (Long waste tubing – silicone tubing ID 0.25" x OD 0.375", connector L ¼"Qosina)
ECS90100	1		<b>Piston back washing set Compact system</b>
58606000	1		<b>GL 45 Media/Storage Bottles 1000 ml</b> (use for back flushing of pistons)
ECS90090	1		<b>Column holder set Compact system</b> (rod holder, a rod for a clamp holding, double cross clamp, laboratory clamp for compact system, 5 pcs. M4x10 Torx pan head screw A2)
AVVSL2KC	1		<b>Sample loop 2 ml, UW type, 1/16" with nuts and ferrules</b>
ECS90170	1		<b>Capillary loop valve-column PEEK 1/16" 1 m, 1,00mm, LUER LOCK</b> (can be used instead of stainless-steel capillaries)
ECS90180	1		<b>Capillary column-detector PEEK 1/16" 0.6 m, 1,00mm, LUER LOCK</b> (can be used instead of stainless-steel capillaries)
00000201	1		<b>SS Union 1/16", UNF 10-32</b> (possibility to use instead of a column)
YY007000	1		<b>Syringe LUER 50ml, plastic</b> (for loop injection into sample loop 10 ml)
YY005000	1		<b>Syringe LUER 10ml, plastic</b> (for loop injection into sample loop 2 ml)
18329000	1		<b>Screwdriver Torx T10 S2 FESTA</b> (for halogen lamp exchange)



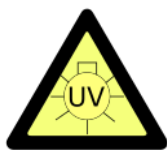
P/N	Qty	Picture	Description
18331000	1		<b>Screwdriver Torx T20 S2 FESTA</b> (for mounting the column holder and fixing the column rod; mounting the heads when replacing seals)
E1132890	1		<b>Open End Wrench 1/4" – 5/16"</b> (for metal nuts on capillaries; mounting of valve holders)
990395	1		<b>Open End Wrench 3/8" – 7/16"</b> (loosing capillary while replacing check valves)
99038300	1		<b>Open End Wrench 8-10 mm</b> (loosing nuts while replacing seals, check valves, o-ring or needle)
99040300	1		<b>Open End Wrench 5,5 – 7 mm</b> (when mounting halogen lamps)
990397	1		<b>Allen wrench 7/64"</b> (for mounting switching valve)
DOC00004	1		<b>Flash disk with User Manual</b>
DOC00002	1	-	Production protocol
DOC00006	1	-	Quick startup guide

*Preparative cell in bracket PLCC 07 L (P/N 25L0000X) is supplied with the unit.*

## 2. GENERAL OPERATING INSTRUCTIONS

Caution:	If the unit is used in a manner not specified by the manufacturer, the protection provided by the unit may be impaired!
Caution:	The unit may not be used, if it is leaking.
Caution:	Not replacing detachable mains supply cords by inadequately rated cords.
Caution:	Do not place unit or any other equipment so that disconnecting power cord is difficult.
Caution:	Never dismount unit cover. There is nothing needing customer service or maintenance.
Caution:	The pump is filled with isopropanol after construction or service.
Caution:	When using buffers or other crystalizing agents in mobile phases, manual backwash of pistons must be proceeded.
Caution:	UV light is dangerous for eyes. During regular operation of the detector is UV light perfectly shielded. While exchanging the cell, never look in the cell area. Always put in at least test cell. Exchange of deuterium lamp must be carried out with disconnected power cord.
Caution:	Viewing the screen too close for a long time may impair your vision. Let your eyes rest for more than 5 minutes or aim at objects in the distance every 1 hour of using the unit.
Caution:	Do not use sharp objects when handling the display of the unit, as this may damage the unit.
Caution:	If the unit emits unusual noises, a burning odor or smoke, unplug the power cord and contact customer service immediately.
Caution:	The unit may only be used in accordance with the precautions for handling liquids. For information on precautions when handling liquids, see the safety data sheets for each liquid.

### 2.1. Safety Symbols on Unit



**UV light is dangerous to your eyes.** If the flow-cell is installed in unit then UV light is perfectly shielded. **In case of any manipulation with flow-cell is very important to protect the eyes with glasses absorbing UV light.**



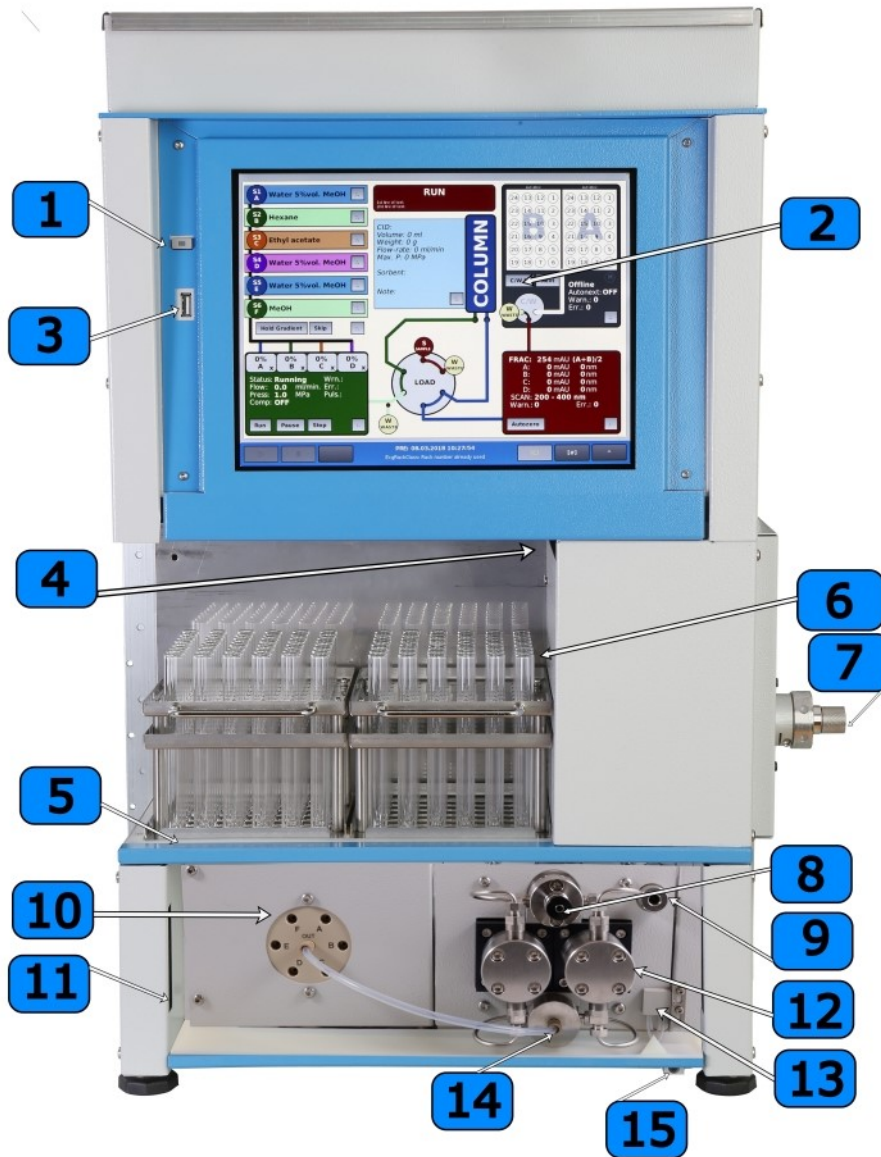
**Attention electrical equipment! Unplug the power cord before servicing the unit.**



**Electrical unit! Disconnect power cord before servicing. Read the operational guide before replacing fuse!**

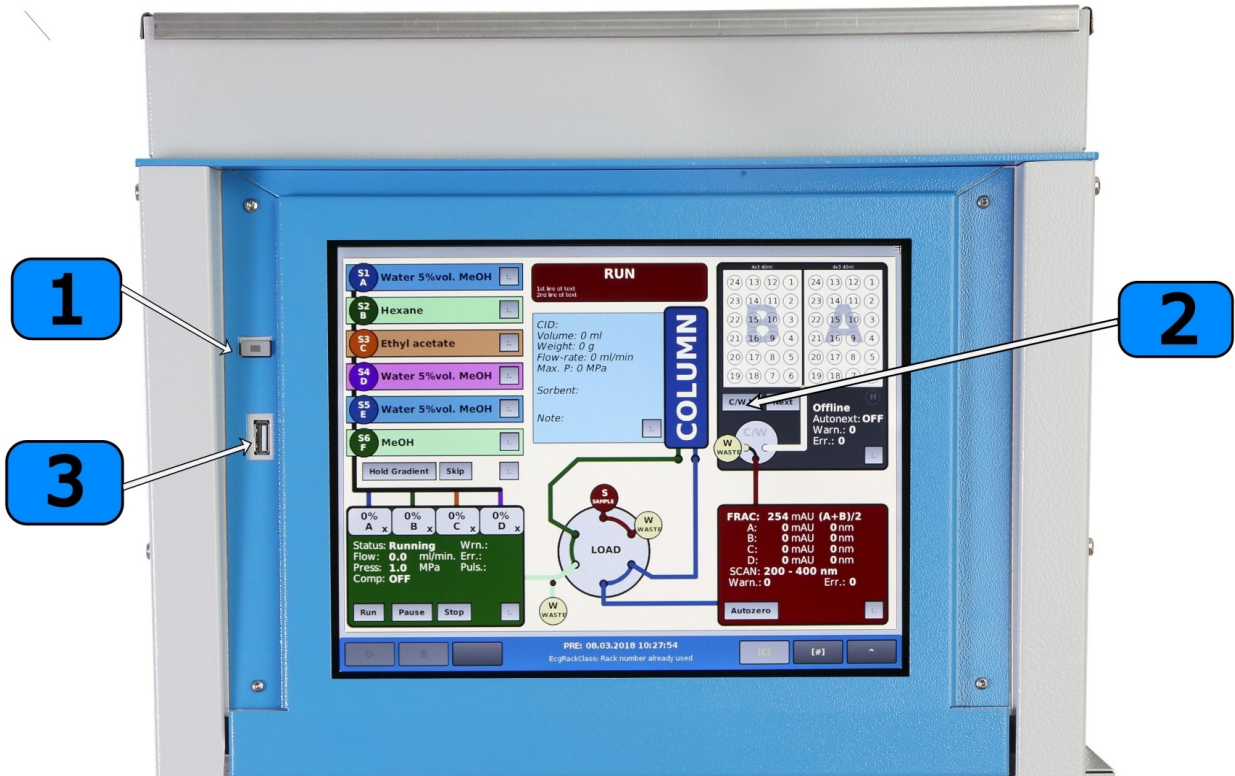
### 3. DESCRIPTION

FRONT VIEW



Compact preparative system – summary picture

PC DISPLAY PART



No.	Description
1	Front switch.
2	PC display.
3	USB connector.



No.	Description
4	Injection needle.
5	Space for racks (Rack A is on the right).
6	Removable racks with tubes.
7	Loop valve.

PREPARATIVE PUMP AND GRADIENT VALVE PART

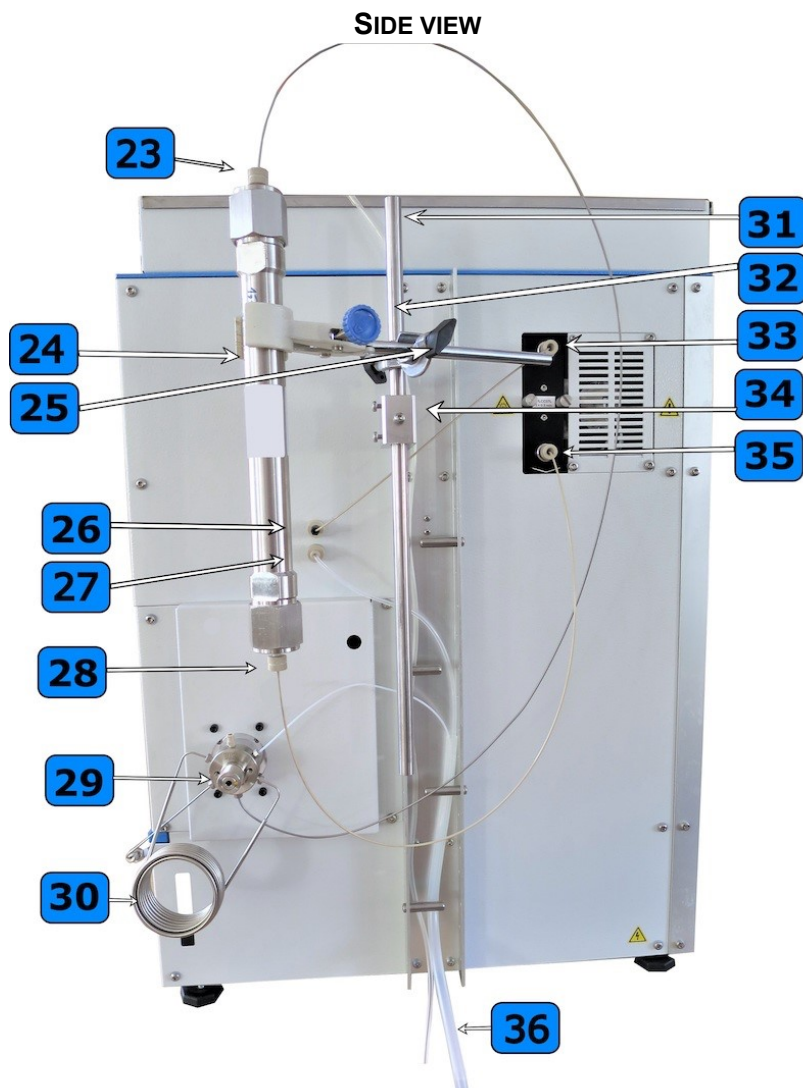


No.	Description
8	Flushing/venting (by-pass) valve.
9	Connection for outlet capillary (pump outlet).
10	Channels for connecting tubings to the gradient valve.
11	Space for tubing from the storage bottles.
12	Pumping and working head of the pump.
13	Leakage sensor.
14	Connection for inlet tubing (pump suction).
15	Emergency drain with cone for connection of waste system coupling.
16	Gradient valve outlet.

**BACKGROUND VIEW**



No.	Description
17	Coupled power socket with main switch and main fuse.
18	RS232 connector.
19	VGA connector.
20	USB connector.
21	HDMI connector.
22	Ethernet/LAN connector.



No.	Description
23	Column inlet.
24	Column.
25	Cross clamp mounted on a laboratory clamp.
26	Input to the fraction collector from the detector.
27	Output from the fraction collector to the waste tubing.
28	Column Outlet.
29	Loop valve.
30	Loop 10 ml.
31	A rod for a laboratory clamp holding.
32	A laboratory clamp.
33	Detector outlet.
34	Column holder.
35	Detector inlet.
36	Waste tubing.



## 4. INSTALLATION

### 4.1. Unit Placement

Place the unit in a suitable location that satisfies the following conditions:

- Horizontal place.
- Keep at least 10 cm space behind the rear of the system.
- Keep away from equipment generating strong magnetic field.
- Equipment is intended for use in regular laboratory environment only - see *Technical parameters – operating environment conditions*.

### 4.2. Connection of Inlet Tubing



The inlet tubing with a filter (ACE98001) is inserted into the reagent bottle and screwed on with the cap. The tubing is marked with a colored marker clip. Everything is included in accessories.

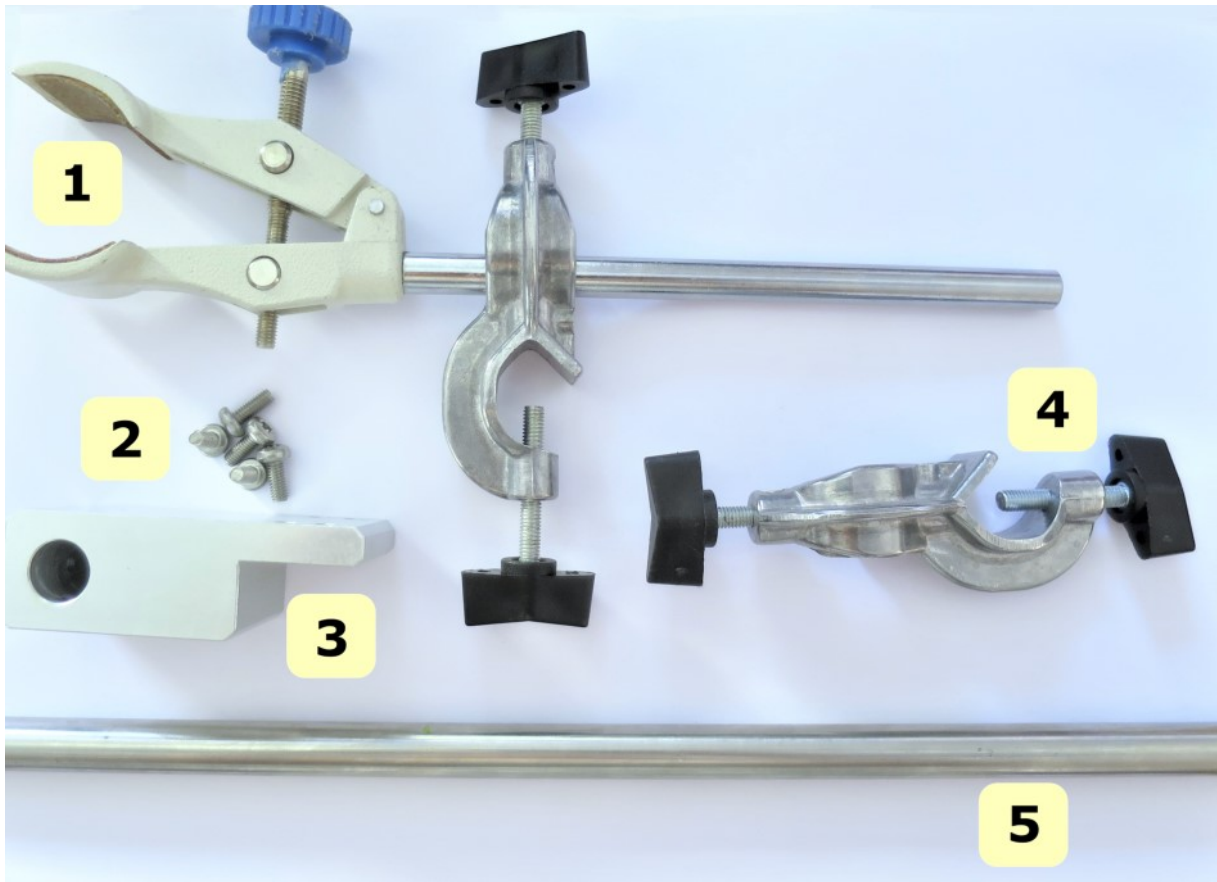
The same procedure applies to all other inlet tubing. The opposite end of the tubing is threaded through the metal U-profile from the side of the unit and the tubing is passed through the side opening into the instrument compartment where the gradient valve is located.



The channel plugs will be removed and the individual tubing screwed into the appropriate channels.



### 4.3. Column Holder Construction



1- Laboratory clamp, 2- Screw TX M4x20 (5 pcs), 3- Column Holder, 4- Crossed clamp, 5- A rod for a clamp holding

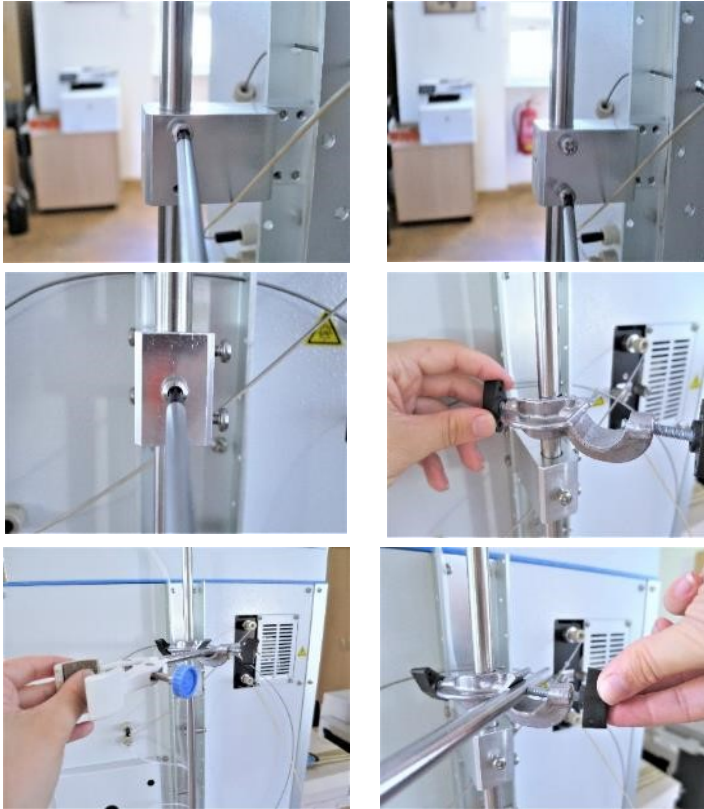
Note: All used parts are included in the accessories.



The column holder is used to attach the outer column to the side of the compact system. The holder is screwed with a TX20 screwdriver to the side of the U-profile using two TX M4x20 screws.

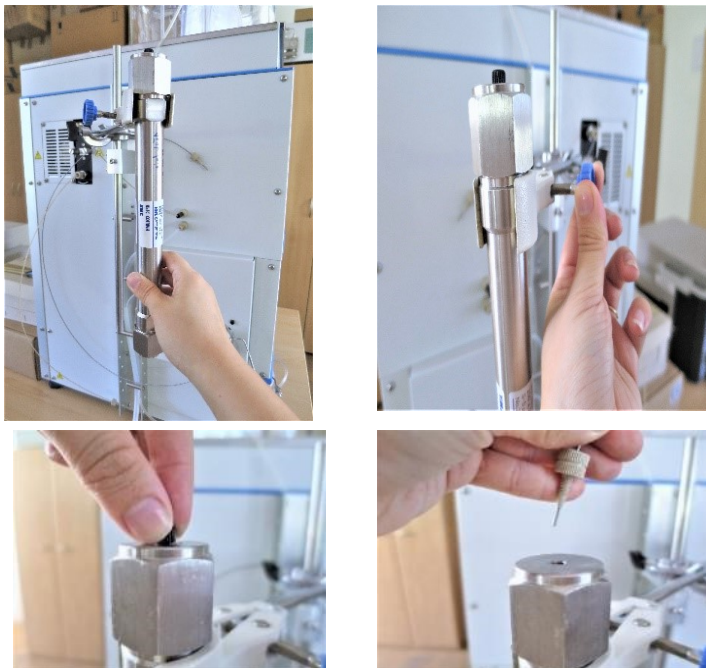


The clamp rod is inserted into the bracket, which is fastened in the bracket again using three TX M4x20 screws and a TX20 screwdriver.



The cross clamp is fastened to the attached rod using a screw. The laboratory clamp is then mounted in the cross clamp.

#### 4.4. Installation of the Column





Attach a column that is not a part of the accessory to the laboratory clamp.

Unscrew the plug from the column inlet and screw in a stainless steel capillary OD 1/16 "x ID 1 mm, L = 1m (S6099300) with a PEEK hand screw 1/16" UNF 10-32 (00000121), which comes out of a loop valve.



The procedure is similar for the plug from the column outlet. PEEK capillary OD 1/16 "x ID 1mm, L = 0.6m (S6099400) with hand PEEK screw 1/16" UNF 10-32 (00000121).

#### 4.5. Connection of Fraction Collector Needle

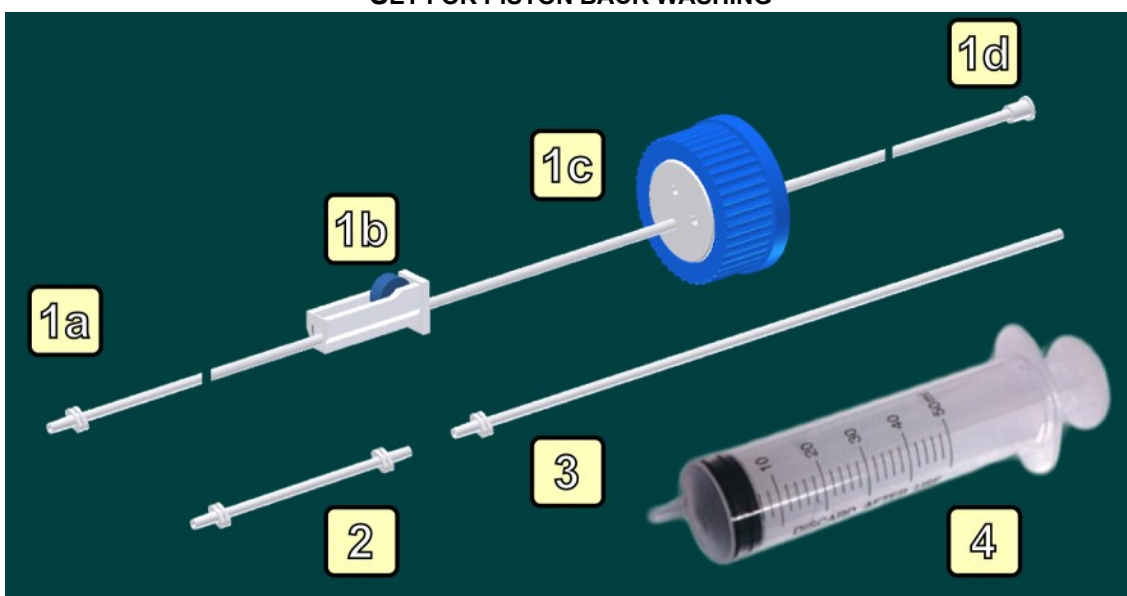
P/N	Rack Type	Appropriate	Picture
AFAR021X	Rack for 24 tubes, OD 20 mm, volume 40 ml (default)  Rack for 36 tubes, OD 16 mm, volume 21 ml  Rack for 20 vials, OD 27.5 mm, volume 60 ml  Rack for 12 funnels, 30 mm	Needle OD 1/8", ID 2,1 mm, L=57 mm (AFAJ0400) with 1/8" PEEK through screw (00000450) and 1/8" KEL-F ring (00000470).	
AFAR008X	Rack for 48 tubes, OD 12 mm, volume 8 ml	Needle OD 1/16 ", ID 1mm, L = 57 mm (AFAJ0080) with 1/16" PPS through screw (J0055070) and 1/16 "Tefzel™ ring (J0000041).	

## 4.6. Piston Backwash

**Caution:** When using buffers or other crystallizing substances in mobile phases, the piston backwash must be rinsed.

Each pumping block (left and right) has two heads – pumping and washing. Pumping heads are farther from the unit. Washing heads have in upper- and lower-part slot with LUER cone, for connection of piston backwash. Both heads are equipped with a seal (piston padding) and during work with buffer solutions may buffer crystals adhering to the piston may damage the seal and pump can start leaking.

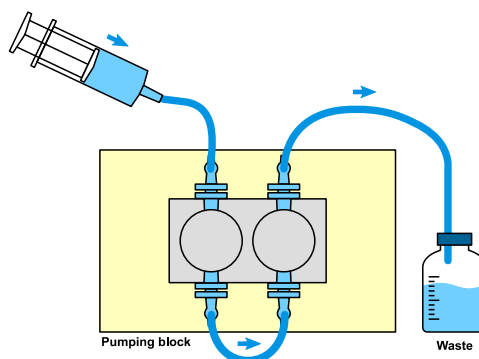
### SET FOR PISTON BACK WASHING



1. Inlet part; 1a. Luer cone for connecting to backwashing head; 1b. Flow regulator; 1c. Lid GL45 with plug; 1d. Luer cone for syringe connection; 2. Coupling of washing heads; 3. Outlet into waste system; 4. Syringe 50ml

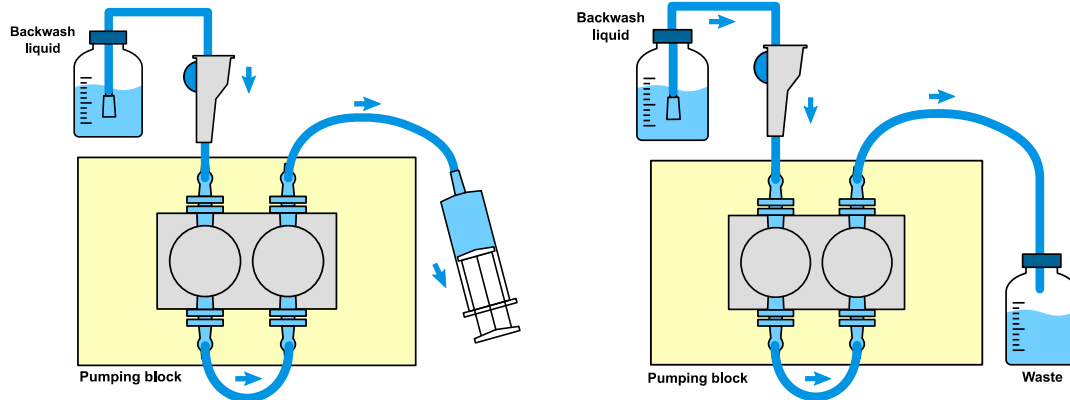
### 4.6.1. Simple Manual Use

Both **Washing heads** are connected in series using tubing and LUER adapters. A syringe is filled with HPLC water (or mobile phase dissolving buffers) and the heads are washed. Washing heads are now filled with liquid, rinsing the pistons from rear side. Now once in a while during work with the pump some liquid is pushed through the pump to the washing system (approx. 1x per hour).



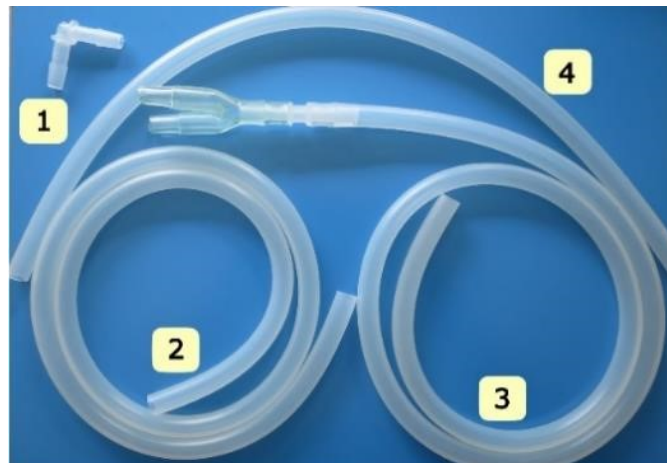
#### 4.6.2. Automatic Backwash

Both **Washing heads** are connected in series using tubing and LUER adapters. The tubing with flow regulator is inserted into the reservoir with HPLC water (or mobile phase dissolving buffers). The flow regulator is loosened, and the liquid is sucked into the system using plastic syringe connected to the other end of the system (left picture). The syringe will be disconnected, and the tubing end will be placed into the waste reservoir. Now the liquid is flowing through the system by gravity (right picture). The flow regulator is set so that at the end of the tubing escapes approx. 5-7 drops per minute.

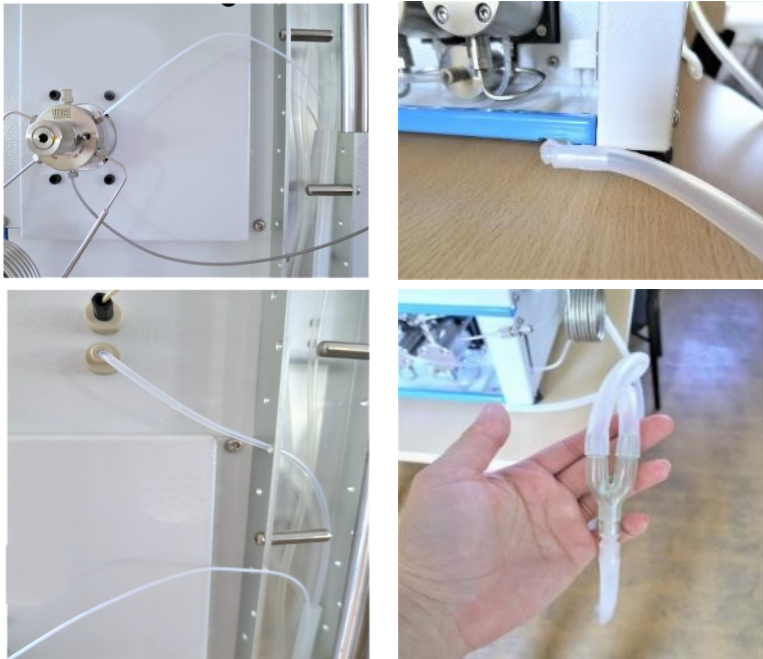


#### 4.7. Waste System Assemblage

The waste liquids of the compact system are discharged from three parts - a loop (injection and loop washing), a gradient pump and a fraction collector, possibly from a flush/by-pass valve to a common waste tubing, which then leads to a waste reservoir. A leakage sensor is located near the pump block (see 4.7.1). Leaking liquid from the cell is trapped in a trough located below the cell and flows out of the instrument.



1-L connector, 2- Tubing, 3- Tubing, 4-Tubing with I and Y connector



Tubing No. 2 and 4 are formed by cutting off, if necessary, from the end of tubing No. 3 so that the Y-connector of part 3 is placed below the working surface level of at least 10 cm. This prevents liquid accumulation in the tubing. The two tubings are attached to the

Y-connector. The shorter tubing is connected to the No. 1 connector which forms a 90° angle to the deskop and is inserted horizontally into the emergency drain channel of the pump with the deskop. The longer tubing serves as a drain for the waste tubing from the loop valve and fraction collector which is passed in the metal U-profile of the instrument

**Caution:** Place the connector Y of part 3 at least 10 cm below the deskop.

#### 4.7.1. Leakage

The liquid leak sensor consists of a reference and a measuring sensor. If the measuring sensor is immersed in a liquid, the sensor gives a signal. The *Control Screen* and status bar will display the message: "Paused, pump leakage" - the method will be paused. If a liquid leak occurs, the liquid leak must first be eliminated, then the liquid drain area and especially the measuring sensor should be dried. Wait at least 1 minute after drying the sensor, then the error message in the *Control Screen* background and status bar should disappear. The error will not be corrected until the pump is started. The error log is displayed in *Menu/Main/Control/Status*.

#### 4.8. Mains Voltage Connection



The power supply is plugged into the instrument socket on the rear panel. The main power switch is located next to the power cord. It is turned on only after the system has been fully installed.

#### 4.9. Start up and Quit the Unit

##### 4.9.1. Start up the Unit

The switch on the rear panel connects the unit to the mains voltage (230 V, 50 Hz). The unit is switched on by pressing the button on the front panel, which glows red when the power supply is off and green when it is on. If the power supply is interrupted, the power supply will remember the last state of this switch and the last state will be restored when power is restored. The screen lights up and the system automatically enters the menu.

- 
- Caution:** After turning on the instrument, wait approximately 15-30 minutes before starting the analysis to allow the detector lamp to warm up sufficiently (to stabilize the signal). Failure to do so may lead to erroneous analysis.
- Caution:** It is recommended to run in and stabilize the gradient pump before starting the analyzes or after a longer shutdown of the instrument at 100 ml/min pressure 5-10 MPa for about 30 min.
- Caution:** It is recommended to start the gradient pump also with a 25 % concentration setting for each valve for approximately 10 min.
- 

#### 4.9.2. Quit the Unit

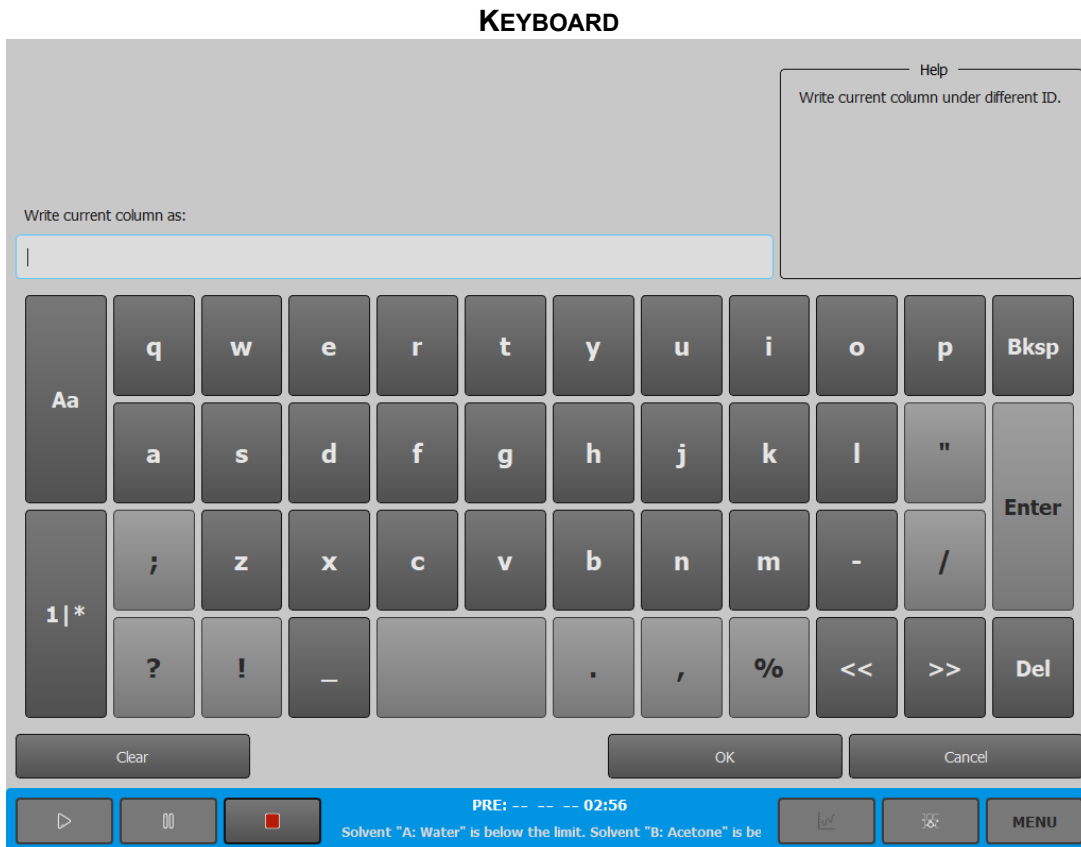
The unit is switched off by default by pressing the Quit button in the *Main Menu*. If the instrument is turned off by the front panel button, unsaved changes in the system will not be retained and analysis data may be lost.

### 4.10. Basic Control of Screen and Keyboard

The unit contains a built-in PC display and is touch-controlled. The unit menu is in English.

#### 4.10.1. Keyboard Control

The keyboard is a part of a PC display. Light gray colored buttons are disabled (unavailable).





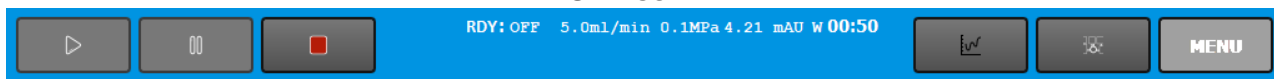
**KEYBOARD SCREEN**

Value/Symbol	Meaning
Aa	Switching between uppercase and lowercase letters.
1 *	Passes on numbers and characters keyboard.
Bksp	Characters after the cursor are removed.
Enter	Confirmation.
Del	Characters before the cursor are removed.
<< /	Moves the cursor forward/backward between characters.
Clear	Removes all characters from the line.
Ok	The name/note is saved and the keyboard screen closes.
Cancel	The action is terminated and the keyboard screen closes.




**4.10.2. Status Bar**




In the status bar there are buttons for the basic controls. It shows the current system status and information about the test method. The status bar is displayed at the bottom part of the display.

**STATUS BAR**



**STATUS BAR CONTROL**

Value/Symbol	Meaning
	RUN button. It is primarily used to run the method (to switch to <i>WAIT FOR A LOAD</i> and <i>RUN</i> mode).
	PAUSE button. It is primarily used to pause the method (to switch to <i>PAUSE</i> mode).
	STOP button. Switches to <i>PAUSE</i> and <i>POST RUN</i> mode.
XX:	Operating mode in which the system persists (see chapter 0).
OFF/ON	Indicates the pump status. <i>OFF</i> indicates that the pump is not pumping. <i>ON</i> indicates that the pump is pumping.
XX ml/min	Current flow rate.
XX.XX MPa	Current pressure.
XX.XX mAU	Current absorbance.

Value/Symbol	Meaning
W / C	C/W valve state. <b>W</b> (W=Waste): fractions are sent to the waste container. <b>C</b> (C=Collect): fractions are collected into the tubes.
MM:SS	The current time of the system state. After the start of the analysis, the calculation starts from 0:00 and equals the length of the method.
	CONTROL SCREEN button, pass to the <i>Control Screen</i> (see 4.10.4)
	SCHEME SCREEN button, pass to <i>Scheme Screen</i> (see 4.10.5)
	MENU button, pass to the Menu screen (see 4.10.3).

### 4.10.3. Menu

Menu is the main screen of the system. It is possible to create, edit and store the necessary data for proper operation of the compact system after switching to other screens. The individual menu items are described in chapter 6.

**MENU SCREEN**



**Note:** The selected button is highlighted in green.

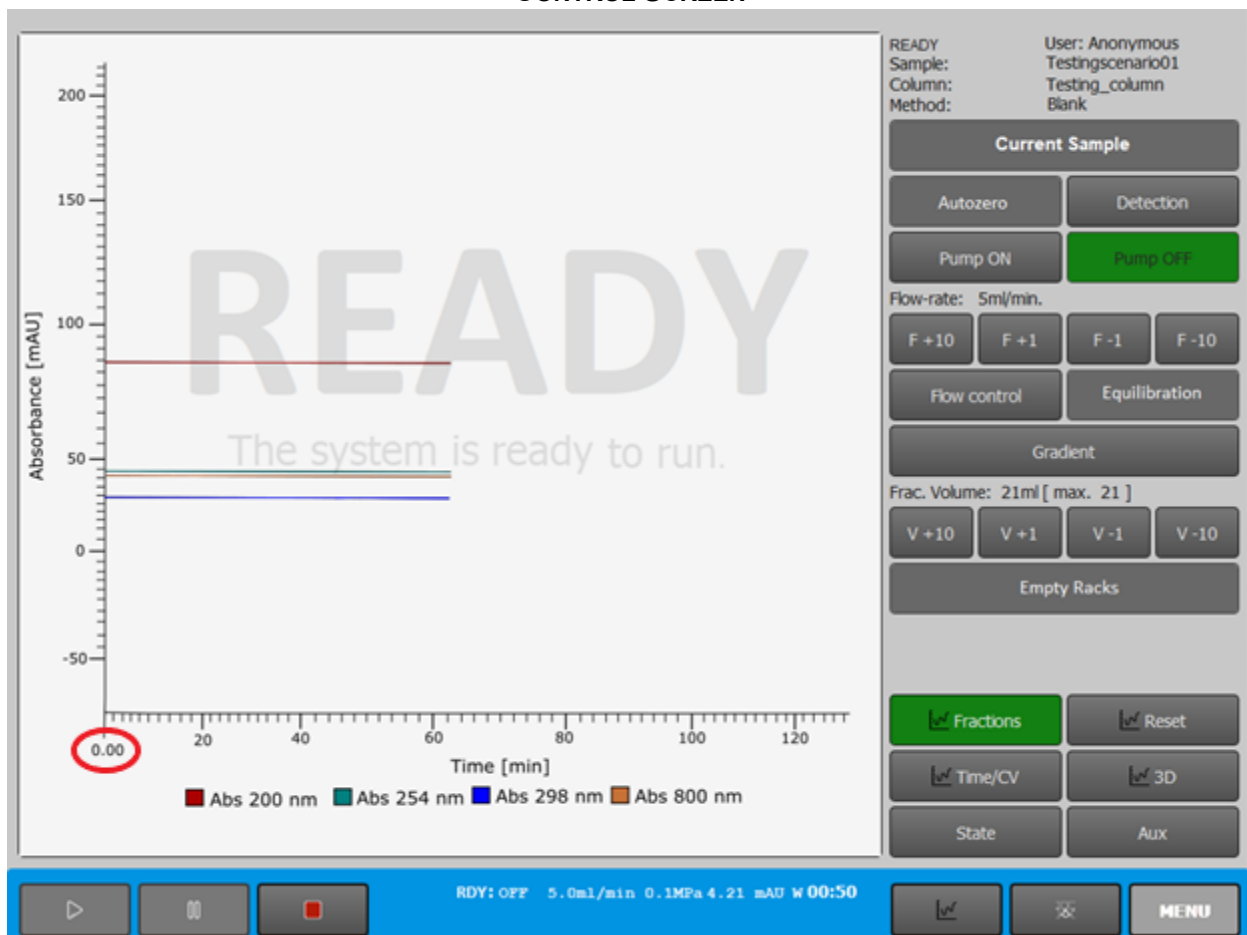
Value/Symbol	Meaning
Main Menu	A field containing items - Main, Files, Setup, and Quit. This field remains constant at all times. Allows access to the next menu structure. <b>Pressing the Quit button switches the unit off.</b> The other buttons are described in chapter 6.
Main	A field name changes depending on the selection of the item's sub-item from the <i>Main Menu</i> .
Control/Settings/Method	A field whose name and menu of other possible buttons changes depending on the selected item in <i>Main</i> .

Value/Symbol	Meaning
Fast Actions	A field that display frequently used buttons, used to quickly navigate to individual screens. The field name does not change.

#### 4.10.4. Control Screen

*Control Screen* graphically shows the progress of the method. The progress messages are displayed in the background of the chromatogram. It also controls individual parts of the unit, functions for controlling the graphical form of the chromatogram, information on the sample, user, method, column, etc. Individual items are called up by clicking on the button. Zoom in the chromatogram is performed by clicking on the selected zoom location in the chromatogram. To return to the original size, click in the empty space to the left of point 0.00 (see *Control Screen picture* below).

CONTROL SCREEN



**Note:** Buttons on the screen change according to the state of the system.

Value/Symbol	Meaning
Current Sample	Basic information of sample, user, fraction collector, test method and column that can be edited (see 6.1.1.2) is displayed.
Autozero	Reset the signal of the detector.

Value/Symbol	Meaning
Detection	The detector settings screen and fraction collector options will open.
Pump on / Pump off	Starting/stopping pumping.
F+10 / F-10 / F+1 / F-1	Fast selection of current flow rate change by +10, -10, +1 and -1 ml/min buttons.
Flow Control	The setup and <i>Control Screen</i> open. It is possible to set up loop valve, flow rate, gradient valve and pump.
Equilibration	The mobile phases <i>S1</i> and <i>S2</i> and the initial and final concentrations of the mobile phases <i>S1</i> in <i>S2</i> or <i>S2</i> in <i>S1</i> are set. Six options (mobile channels) are available for both mobile phases. Pressing the RUN button initiates the equilibration, which is primarily used to exchange the mobile phases in the column, which prepares the column for further analysis.
Gradient (Gradient)	A gradient table, where the percentage of mobile phases at a specific time and flow rate are set, is displayed.
V+10 / V-10/ V+1/ V-1	Quick selection of change of actual volume of collected fraction into tubes by +10, -10, +1 and -1 ml buttons.
Empty Racks	Informing the system about rack replacement/emptying. <b>Racks have to be replaced/emptied manually!</b>
Fractions	The button is automatically turned on during analysis, but can be turned off. If switched on, the filled tubes are displayed in color on the chromatogram during analysis.
Reset	The chromatogram is deleted and is displayed from the beginning.
Time/CV	Switches between the time display and the column volume on the x-axis.
3D	The 3D chromatogram is displayed on the screen.
State	A table showing the current status of the unit's devices is displayed on the screen.
Aux	The pressure record is displayed in the chromatogram.

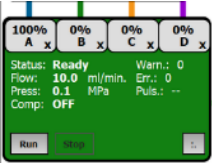
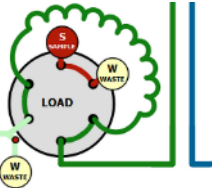
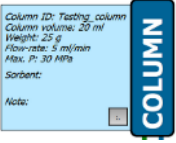
### 4.10.5. Scheme Screen

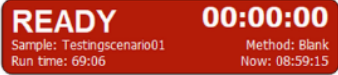

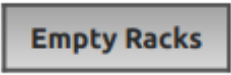
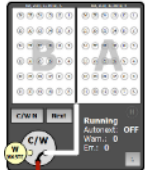
The *Scheme Screen* shows the wiring diagram of the compact system and the current status of its components.

SCHEME SCREEN


The screenshot displays the Scheme Screen interface. On the left, a vertical stack of gradient valve channels (S1-S4) is shown, all set to 'None'. Below this is a 'Hold Gradient' and 'Skip' button. The central status area shows 'READY' with a timer at '00:00:00'. A red box provides column details: 'Column ID: Testing\_column', 'Column volume: 20 ml', 'Weight: 25 g', 'Flow-rate: 5 ml/min', and 'Max. P: 30 MPa'. A wiring diagram in the center shows the 'LOAD' area with 'S SAMPLE' and 'W WASTE' ports. On the right, a control panel shows 'Running' status as 'OFF' and 'Autonext' as 'OFF'. Below this is a 'METH: Collect All' table with detector settings for channels A, B, C, and D. The bottom status bar shows 'RDY: OFF 5.0ml/min 0.1MPa 4.21 mAU W 00:50'.

Value/Symbol	Meaning
	<p>Field showing the state of the gradient valve. It is possible to set up to six mobile phases (A-F channels) and solvent name in each channel.</p> <p><b>Hold Gradient:</b> The current concentration in the gradient table will be extended and will remain constant until the Hold button is clicked again.</p> <p><b>Skip:</b> The next step in the gradient table is skipped.</p>

Value/Symbol	Meaning
	<p>Fields showing pump status: Actual concentration of individual mobile phases</p> <p><b>Status:</b> The current status of the pump. The pump may be in the following state: <i>Ready:</i> pump does not pump. <i>Running:</i> pump is pumping.</p> <p><b>Flow:</b> current pump flow.</p> <p><b>Press:</b> current pump pressure.</p> <p><b>Comp:</b> pulsation compensation - not supported yet.</p> <p><b>Warn.:</b> warning messages in the unit. The number of alerts is displayed in integers, the default alert state is 0.</p> <p><b>Err.:</b> unit error messages. The number of errors is displayed in integers, the default error-free state is 0.</p> <p><b>Pulse. (Pulsation):</b> pulsation report. The RUN/STOP buttons start or stop pumping.</p>
	<p>Loop valve diagram. When the sample is injected, <i>LOAD</i> changes to <i>INJECT</i> and the mobile phase flow display changes.</p>
	<p>Marking of the column. Information about the used column is displayed in a blue box:</p> <p><b>Column ID</b></p> <p><b>Column volume:</b> The volume is listed in ml.</p> <p><b>Weight:</b> maximum weight of liquid that the column can hold. Weight is listed in g.</p> <p><b>Flow-rate:</b> current flow rate of the column.</p> <p><b>Max. P (Maximum pressure):</b> the maximum pressure that can be applied to the column. The pressure value is listed in MPa.</p> <p><b>Sorbent</b></p> <p><b>Note</b></p>

Value/Symbol	Meaning
	<p>Fields showing analysis information:</p> <p><b>Operating mode of the method</b> (see chapter 0)</p> <p><b>Sample:</b> the name entered in <i>Menu/Main/Control/Current Sample</i></p> <p><b>Run time:</b> indicates the amount of time the system will remain in the operating mode. Time is in MM:SS format (M = minute, S = second).</p> <p><b>Time:</b> count down the time until the end of the method. The timer is shown in bold and is in HH:MM:SS format (H=hour).</p> <p><b>Method:</b> name of the method.</p> <p><b>Now:</b> HH:MM:SS</p>
	<p>Fields showing detector status and collection mode:</p> <p><b>METH:</b> Collection modes are set in <i>Menu/Main/Method/ Detection</i></p> <p>Absorbance and wavelength for up to 4 channels (A-D)</p> <p><b>Warn. (Warning):</b> warning messages in the unit.</p> <p>The number of alerts is displayed in integers, the default alert state is 0.</p> <p><b>Err. (Error):</b> unit error messages.</p> <p>The number of errors is displayed in integers, the default error-free state is 0.</p> <p>The button AUTOZERO is used to reset the absorbances in the chromatogram.</p>
	<p>By clicking the button, the system is informed about rack replacement/emptying. <b>Racks have to be replaced/emptied manually!</b></p>
	<p>The field displays the status of the fraction collector:</p> <p><b>C/W button N:</b> toggles the valve between sample collection (C = Collect) and waste (W = Waste). After switching back to C, the needle automatically moves to the next tube.</p> <p><b>Next button:</b> the needle will move to the next tube automatically.</p> <p><b>Changeover valve diagram C/W:</b> Flow display changes between C and W.</p> <p><b>Scheme of seagulls A, B:</b> information about tubes and their filling during the method.</p> <p><b>Autonext:</b> not yet supported.</p>



Value/Symbol	Meaning
	<p>Pressing the button opens the window for editing field.</p> <p><b>In the mobile phase field:</b> switches to the Solvents screen.</p> <p><b>In the pump field:</b> switches to the gradient table screen.</p> <p><b>In the column field:</b> switches to the Current Column screen to set or edit the parameters of the currently used column.</p> <p><b>In the fraction collector field:</b> Not supported yet.</p> <p><b>In the detector field:</b> switches to the Detection screen, where the wavelengths for measurement and the mode of collecting fractions in time mode are set.</p>

#### 4.10.6. Date, Time and Other Parameters Settings

General parameters are set in *Menu/Setup/System/General Settings*.

Settings	Is set
Delay volume Detector – Fraction collector	Dead volume of tubing (volume of tubing between the detector and the fraction collector).
Loop volume	Volume of the loop.
Upper Pressure limit	Maximum pressure limit.
Startup state	Not supported yet.
System date	Year, month and day (YY:MM:DD).
System time	Hours and minutes (MM:SS).

Pressing the Apply button will overwrite the set parameters and then press the OK button to go back to the *Menu*.

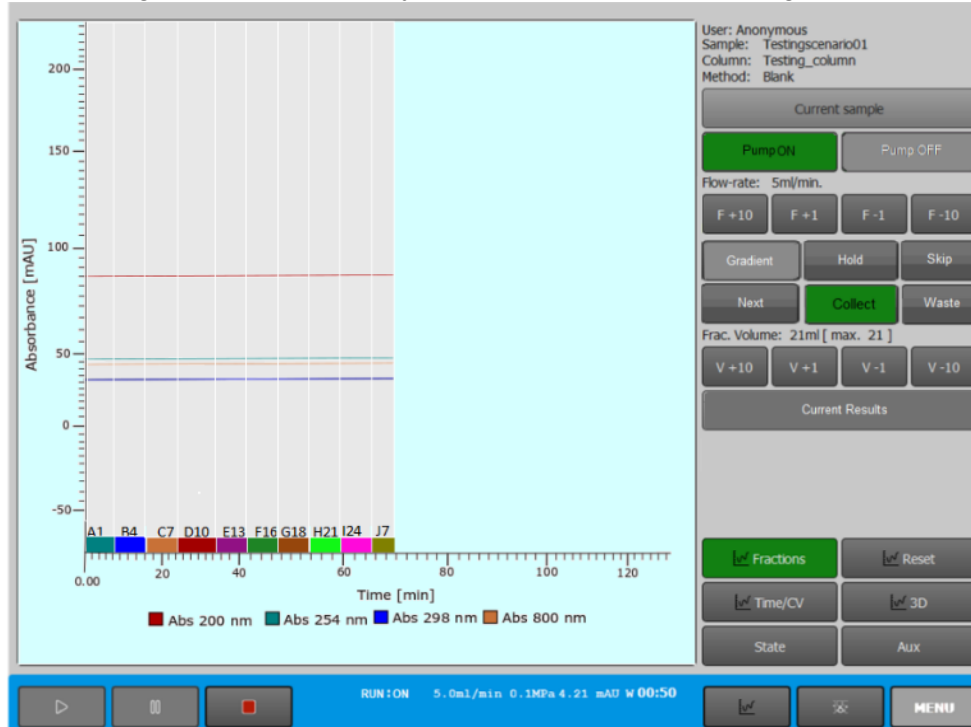
### 4.11. Collection in Time Mode

The described sample collection in the chapters below proceeds without connection to a higher control system (e.g. PC).

#### 4.11.1. Collection in Collect All Mode

Fraction collecting in time mode is done by moving the fraction collector needle over the tubes according to the set parameters in the instrument, which are entered in *Menu/Main/Control*, *Menu/Main/Settings*, *Menu/Main/Method*. Disabled (unavailable) buttons are light gray.

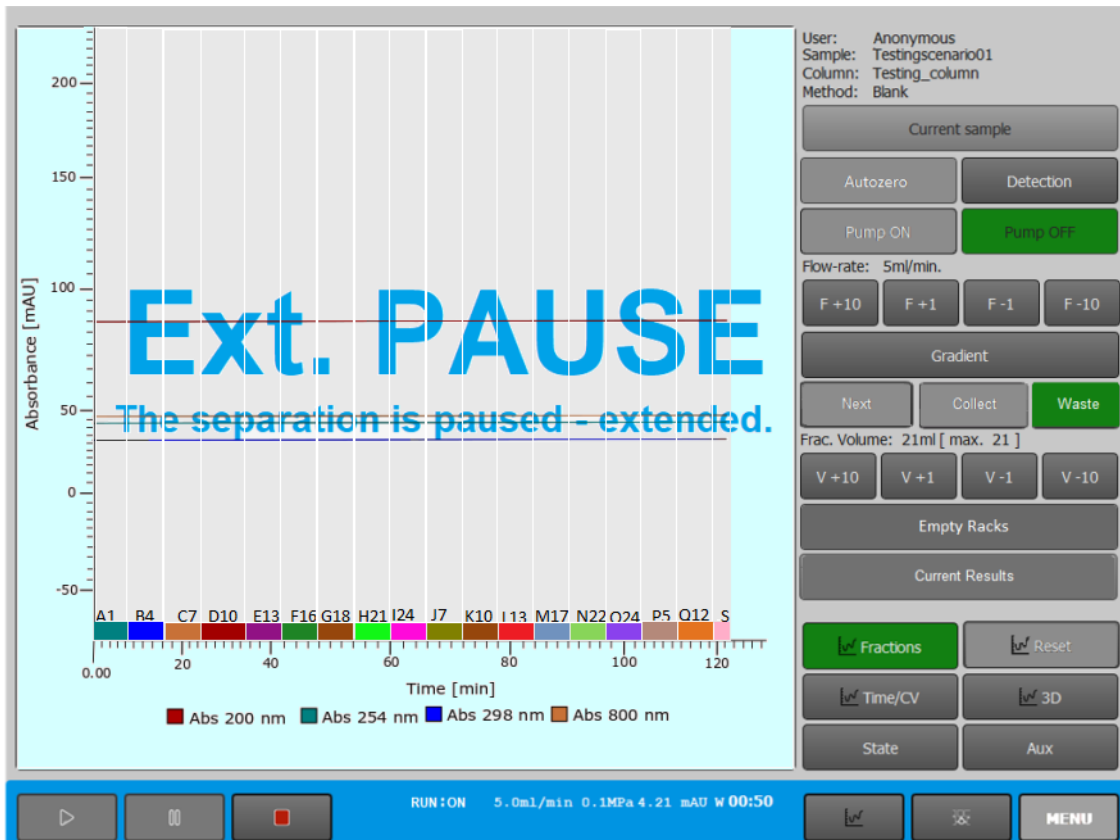
To start sampling, press the RUN key. The *Control Screen* changes as follows:



The fraction collector needle is automatically set above the first tube of the set rack type in *Menu/Main/Control/Current Sample*. The time starts counting. The fraction collector valve is switched to waste (W). Collection begins by switching the C/W valve into the tube (C) and visually begins to fill the tubes

on the *Scheme Screen* in the upper right gray box showing the Fraction collector (see 4.10.5).

Fraction collection ends and the switching valve switches to waste (W) after the set time (quantity) in the gradient table in *Menu/Main/Method/Gradient* has elapsed. The message "*Extended Pause - The separation is paused - extended*" appears on the *Control Screen* background.



Fraction collection of the collected volume ends. Time countdown stops. The needle returns above the first rack tube. Then, either the STOP button is pressed, and the system enters *POSTRUN* mode or the RUN button is pressed, and the system enters *EXTENDED RUN* mode.

**Changing the screen after selecting the next step and describing the operation of the unit**

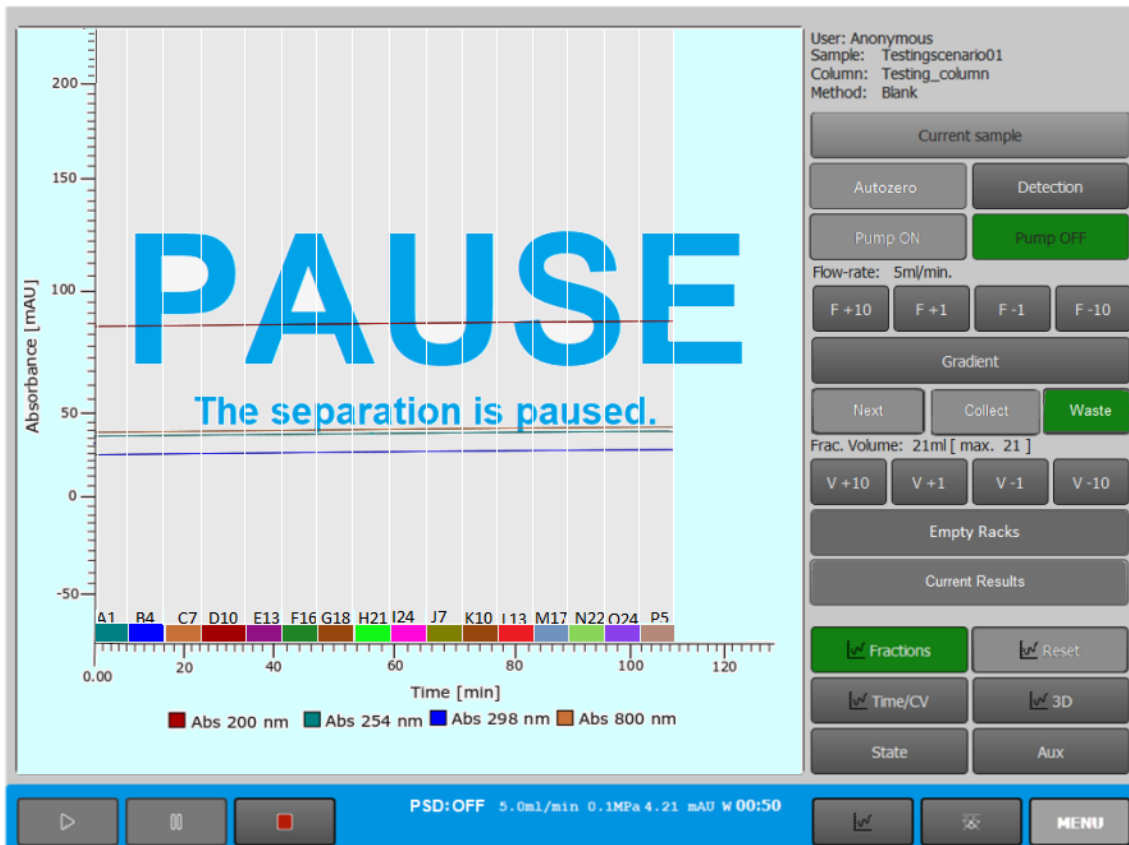
**1 IN POSTRUN MODE:**

The run ends and the arm is returned to the Home position. The countdown of the time after pressing the STOP button stops. Pressing the Current Results button displays a file with the results of the measurement.

**2 IN EXTENDED RUN MODE:**

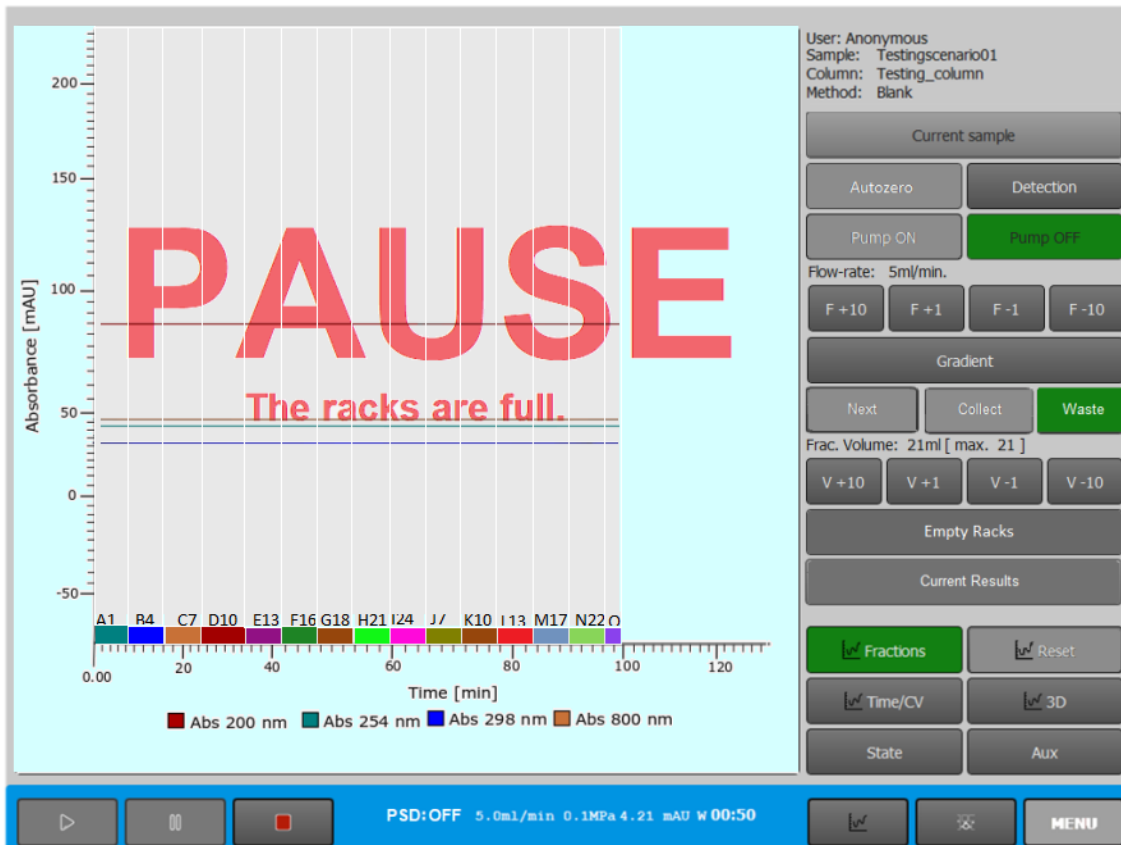
The run is terminated and the arm returns to the Home position. Fraction collection starts again from the selected tube according to the set parameters.

The collection is paused and the valve is switched to the waste by pressing the PAUSE button.



The fraction collector needle stays above the last filled tube. Loading of collected volume and time will be paused. By pressing the RUN button will return the system to the fraction collection mode. Press NEXT button to change the needle position above the tubes.

After filling all tubes in racks A and B, the system will pause the fraction collection and switch the switching valve to the waste. The message "PAUSED - The racks are full," appears on the *Control Screen* background.



The fraction collection needle stays above the last filled tube. Loading of collected volume and time will be paused. Press the NEXT button to change the needle position above the tubes. By pressing the Empty Racks button on the *Control Screen*, the system will receive a message that the racks have been emptied or replaced, and the method will start again.

The collection can be stopped at any time by pressing the C/W button (pressing again will start the collection again). The C/W valve is switched to waste (W) (to tube (C)). The arm stays above the last filled tube or moves to the next one (according to the Autonext setting). Pressing the NEXT button moves the arm to the next tube. Pressing the RUN button will stop the collection and follow the next menu.

Even while the fraction collector is running, you can press the NEXT button to move the arm to the next tube regardless of the fill level.

Press the RUN button to start the collection. The collection ends and the switching valve switches to waste with the same commands as in the *Collect All* mode.

Again, there is the possibility of control by the C/W and NEXT buttons.

#### 4.11.2. Based on the signal from the detector

Collection based on the signal from the detector takes place in various collection modes, which are set in *Menu/Main/Method/Detection* (see 6.1.5).

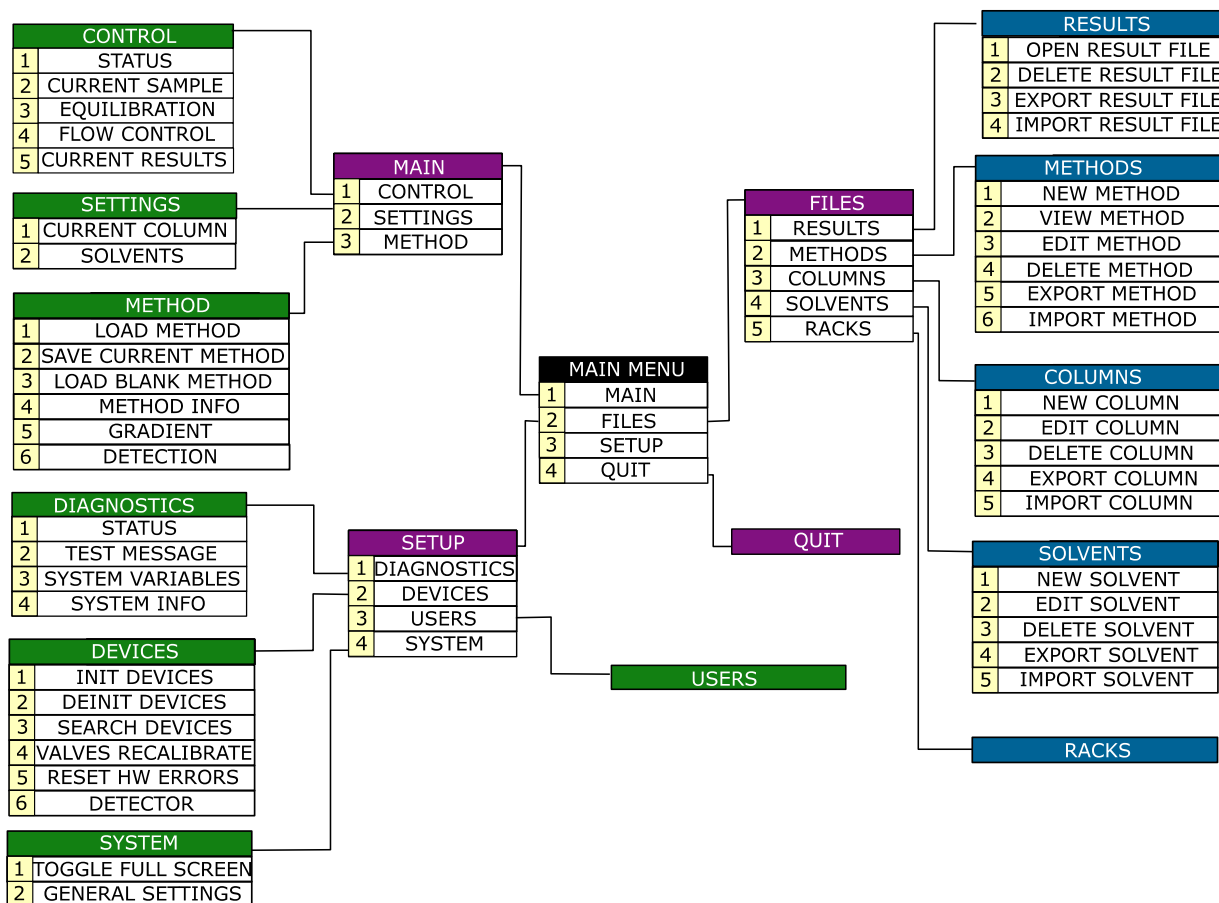
## 5. STARTUP OF THE UNIT

After switching the unit on, the main menu for operating the unit is displayed. Calibration of individual parts of the unit in the system is not necessary.

## 6. WORKING WITH MENU

The menu field is called up by pressing the Menu button. The description and the dependence between individual fields is described in 4.10.3.

MENU DIAGRAM



### 6.1. Main

Primarily, the parameters of the method that will be used in the analysis of samples are set, as well as the column settings, sample information and results.

### 6.1.1. Control

In the item Control you can find the sub-items Status, Current Sample, Equilibration, Flow Control and Current Results.

#### 6.1.1.1. Status

A screen showing actions, errors, and system state logs. If an error occurs, a red error message appears on the status screen.

#### 6.1.1.2. Current Sample

The screen is used to set information about the sample, the user, used racks (both racks must be the same), as well as to select or create or edit the column and the methods to be used in the measurement.

#### CURRENT SAMPLE SCREEN

Current sample setup

Sample

Sample:  System ID:  System time:

User:  Inj. Type:  Estimated:

Note:

Fraction collector

Rack type:  Frac. volume:

Gradient Flow-rate: 20 ml/min; CV: 20 ml; Expected Collect Duration: 20 min. || 1\*Rack: 960ml / 48.0CV / 48min. || Needed: 1

Column

Column:

Column ID: ColumnOmega; Column volume [ml]: 20; Weight [g]: 0; Flow-rate [ml/min]: 20; Max. P [MPa]: 2; Sorbent: ; Note:

Method

Method:

Desc: Initial waste: 0.00 [CV], Signal: AbsorbanceA, Method: Level, Fractionation: Valley. File: gama.mth  
Gradient: 2 rows, Solvents: Water TFA, Methanol, Acetonitrile, iso-Propanol, Acetone, Chlorophorm  
Detection: Initial waste: 0.00 [CV], Signal: AbsorbanceA, Method: Level, Fractionation: Valley. ...

RDY: OFF 20ml/min 0.0MPa 201nm -26mAU W 04:13

Value/Symbol	Meaning
Sample	The sample name will be filled.
System ID	Identification number assigned to each system by the manufacturer.
System Time	Corresponds to the set time in <i>Menu/Setup/General Settings</i> . Not supported yet.

Value/Symbol	Meaning
User	Enter the name of the user operating the instrument when performing the analyzes.
Inj. Type	The injection method is selected <b>Loop:</b> The sample will be injected into the loop and then loaded onto the column. <b>Column:</b> The sample will be injected onto the column. More detailed information in 8.9.4.
Estimated	Estimated time of analysis.
Note	A note will be filled in..
Rack Type	The roller shutter needs to be used to select the rack type: <b>4x6</b> tubes, OD 20 mm, volume 40 ml <b>6x6</b> tubes, OD 16 mm, volume 21 ml <b>8x6</b> tubes, OD 12 mm, volume 8 ml <b>4x5</b> vials, OD 27.5 mm, volume 60 ml <b>3x4</b> funnels, 30 mm
Frac. Volume	Use the +10, -10, +1, -1 buttons to adjust the volume of the fraction collected into the tubes in ml.
Column	The buttons are used to select the desired action: <b>Select:</b> An existing column is selected from the list. <b>Blank:</b> A new column is added. <b>Save as:</b> The new column is saved under the selected name. <b>Edit:</b> A column is selected from the list and can be edited subsequently.
Method	The buttons are used to select the desired action: <b>Select:</b> An existing method is selected from the list. <b>Blank:</b> A new method is added. <b>Save as:</b> The new method is saved under the selected name. <b>Edit:</b> A method is selected from the list and can be edited subsequently.
Detection/Gradient/Solvents	The user will be moved to the selected screen.
Return	Return back to the menu.



### 6.1.1.3. Equilibration

Equilibration is used primarily for the exchange of mobile phases in the column. This will prepare the column for further analysis.

**EQUILIBRATION SCREEN**

Value/Symbol	Meaning
Solvent S1/S2	Mobile phase S1/S2. Six options (mobile channels) are available for both mobile phases.
Flow-rate	Current flow in equilibration.
Begin step	Concentration of the mobile phase S2 in S1 in the initial equilibration step.
Gradient Pass	Gradient pass between mobile phases S1 and S2.
End step	Concentration of the mobile phase S1 in S2 in the final equilibration step.
Duration	The duration of equilibration is given in CV (Column volume).
State	Current equilibration state.
Phase	Current equilibration phase (step) (Begin step/Gradient Pass/End step).
Estimated	Estimated time to the end of the current equilibration phase.
Concentration	Current concentration of mobile phase S1 in S2 given in %.
Loop valve	The loop valve position is selected. ( <i>LOAD/INJECT</i> ).
Column valve	The column valve position is selected. ( <i>COLUMN/BYPASS</i> ). This field is disabled for the preparative system.
Run button	Press to start equilibration.
Pause button	Press to pause equilibration.
Skip button	Press to skip from the current equilibration step to the next step.
Stop button	Press to stop equilibration.

Press the Return button to return back to the Menu. Pressing the Solvents button takes the system to the Solvents screen (see 6.1.2.2).

#### 6.1.1.4. Flow Control

The screen is primarily used to edit the parameters of the gradient valve and pump flush.

**FLOW CONTROL SCREEN**

Value/Symbol	Meaning
Loop valve	<b>Load:</b> the loop valve will be in the pre-injection state. <b>Inject:</b> the loop valve will be in the injected state.
Column Valve	For a preparative system, the fields in this row should be disabled.
Flow-rate	Use +10; +1; -1, -10 buttons to change the flow rate (in ml). Pressing the ignore Pressure button ignores the column limit pressure. Pressing the from Gradient button overwrites the flow rate set in the gradient table (see 6.1.4). Pressing the from Column button overwrites the flow rate set in the information about the currently used column (see 6.1.2.1). The Purge button is unavailable.
Solvent Names	Mobile phase names are displayed.
Remaining	Remaining volume of the mobile phase.
Set 100 %	The A-D button set the concentration of 100% mobile phase on respective channel. The 25 % and 50 % buttons are used to quickly select concentrations.
Concentration	The current concentration of the mobile phases on the respective channels is displayed.
Gradient starts at:	Concentration of mobile phases corresponding to the zero row in the gradient table.
from Gradient	The concentration of the mobile phases is set, which corresponds to the zero row in the gradient table.
Custom conc.	Button is disabled.
Reset counter	The counter is reset.
Total	The sum of the volumes of the mobile phases flowing through the pump.
Pump ON/OFF	The pump starts/stops pumping.

### 6.1.1.5. Current Results

The current results of the method are displayed. There are optional buttons in the right column of the screen. Depending on the selection, the selected data are displayed/disappeared on the screen. Optional Data - **Options, Chart Fractions, Chart Gradient, Chart Auxiliary, Gradient Table, Racks, Time / CV), Export to PDF**. Press the desired button to select. To cancel the selection, press the button again. The selected button is displayed in green.

### 6.1.2. Settings

Set up and adjustment of the currently used column and mobile phases (see 6.1.2.1 and 6.1.2.2)

#### 6.1.2.1. Current Column

The parameters of the selected column are set – Column ID, Column volume, Weight, Flow-rate, Max. Pressure, Sorbent and Note.

#### 6.1.2.2. Solvents

The parameters of the mobile phases, storage bottles and waste container are set.

**SOLVENTS SCREEN**

Value/Symbol	Meaning
Solvent A-F	The mobile phase is selected from the menu after clicking the roller shutter. The current volume of the used mobile phase (0-100000 ml) is written in the field of the row. When working with the same mobile phases, it is not necessary to re-write the current volume of mobile phases when the new method is started; based on a gradient table, the system calculates the mobile phase consumption during the method and then subtracts it from the existing volume. The volume in the gray box of the row is the same as <i>Reservoir</i> . If the current volume of the mobile phase equals the volume of the Reservoir, pressing the gray box overwrites the value of the storage bottle volume to the field with the current volume of the mobile phase. Check to select the desired channels. <b>The maximum number of checked channels (mobile phases used) is 4.</b>
Minimum	Minimum mobile phase volume (0-100000 ml).
Reservoir	Volume of the storage bottle in which the mobile phase is stored (0-100000 ml).

Value/Symbol	Meaning
Reaction	<p>In the event that the mobile phase falls below the minimum volume of the mobile phase, the system reacts in the selected manner in the roller shutter.</p> <p><b>Off:</b> The system is not responding.</p> <p><b>Warning:</b> The status bar displays the message "Solvent" A: <i>Name of solvent "is below the limit."</i></p> <p><b>Pause:</b> The system enters PAUSE state. On the <i>Control Screen</i> and in the status bar is displayed message: "Pause - Solvent A: <i>Name of the solvent is below the limit."</i> Subsequently, the message: "Pause - An error has been detected, look into status and continue, " is displayed.</p>
Maximum	Maximum volume of waste container (0-100000 ml).
Volume	Actual volume of waste liquid in the waste container (0-100000 ml).
Empty	After removing the waste liquid from the waste container, press the button. The value in the Volume field is overwritten to 0.

### 6.1.3. Method

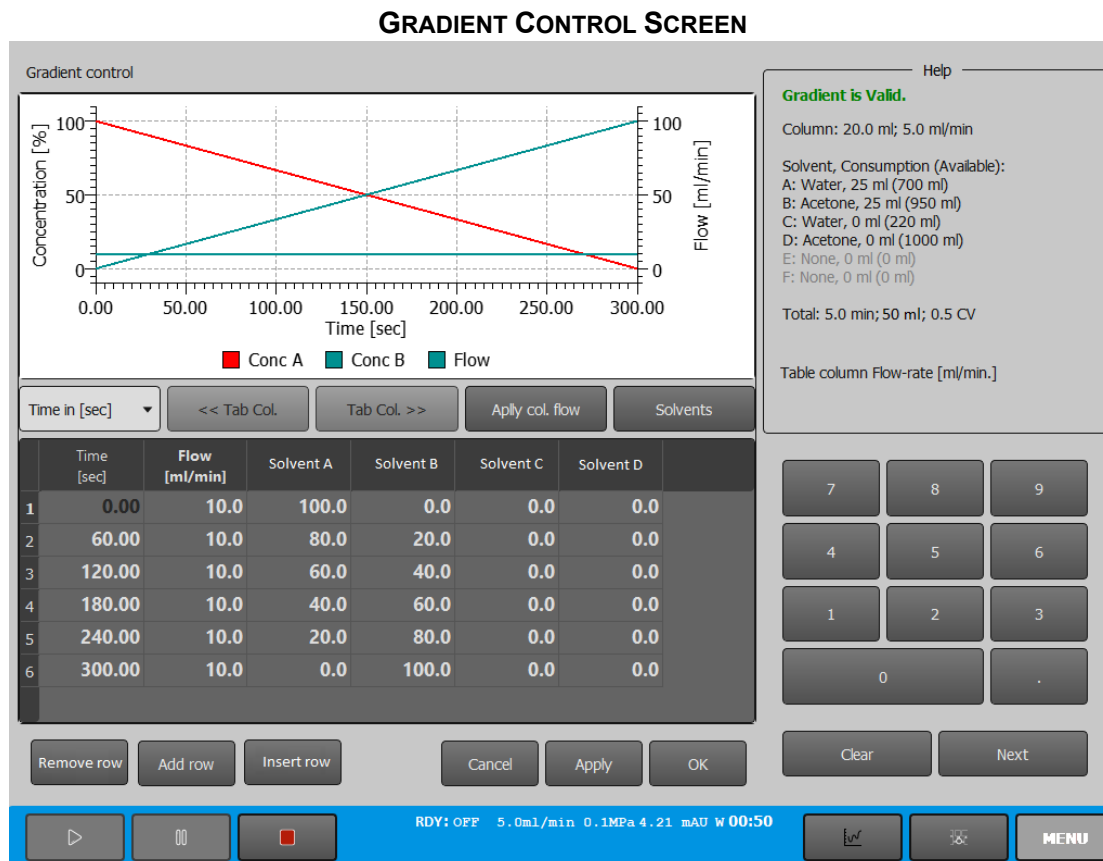
This item performs work operations related to the creation, retrieval and information about used methods.

#### METHOD SCREEN

Value/Symbol	Meaning
Load method	The method menu opens.
Save current method	Save the newly created method.
Load blank method	A new method is loaded and automatically saved as Blank. Subsequently, other parameters are entered in the menu (see 6, 6.1.4,6.1.5,)
Method info	A screen with information about the currently used method appears.

### 6.1.4. Gradient

The gradient table is displayed, along with a preview of the gradient.



### GRADIENT SCREEN

Value/Symbol	Meaning
Time in [ ] / Span in [ ]	A menu roller shutter is displayed with a menu of time entry options for each step. <b>Time in [sec]:</b> time in seconds. <b>Time in [min]:</b> time in minutes. <b>Time in [ml]:</b> time in milliliters. <b>Time in [CV]:</b> time in column volume. <b>Span in [sec]:</b> interval in seconds. <b>Span in [min]:</b> interval in minutes. <b>Span in [ml]:</b> interval in milliliters. <b>Span in [CV]:</b> interval in column volume.
Tab Col.	The button only works if one of the solvent columns is selected. The volume concentrations of the two columns are substituted.
Apply col. flow	Possibility to set actual column flow rate. The flow rate is given in ml/min.

Value/Symbol	Meaning
Solvents	The screen for setting up or editing the mobile phases is displayed. The screen is the same as <i>Menu/Main/Settings/Solvents</i> .
Time	A column showing the time at which the concentration of each mobile phase changes. The units and column name vary depending on the selected item in the Time in [ ] roller shutter.
Flow	Pump flow rate from 0.0-300.0 ml/min.
Solvent A-D (A-F)	Column indicating concentration of mobile phases at a certain time, volume, etc. Concentration is given in percent, in the range 0-100 %. The sum of the concentrations of all mobile phases in one row of the gradient table must be equal to 100 %. When 100 % is exceeded/not reached, the row turns red.
Remove row	The selected gradient table row is deleted.
Add row	A new gradient table row is added to the end of the table.
Insert row	A new gradient table row is inserted between two existing rows.
Help	Field showing basic information about the column and its current flow rate, mobile phases and calculated total run time of the method, the volume of mobile phases that will be consumed in the method and the volume that will flow through the column in the method.

### 6.1.5. Detection

In this sub-item it is possible to open, edit, delete or move files in its sub-items.

#### DETECTION SCREEN

Value/Symbol	Meaning
Signal A-D	Any wavelength in the range of 200-800 nm is set.
Sum () in range	Check to add all signals in the entered range. Not supported yet.
Visible	Check to display the signal graphically in the chromatogram record on the <i>Control Screen</i> .
Math	Mathematical operations performed between wavelengths. Not supported yet.

**COLLECTING**

Value/Symbol		Meaning
Initial Waste		Dead volume.
Method	Manual	The start and end of the sample collection are performed by the user. The collection is driven only by the C/W valve.
	Collect All	After initial waste the system starts to collect everything. Default settings.
	Level	Collection is controlled by a signal from the detector based on the mAU signal level. Collection starts/is stopped when the detector signal is at or above the selected value.
	Slope	Collection is controlled by a signal from the detector based on the mAU signal level and the mAU/CV signal slope. Collection will start running (stop), if the detector signal increase (decrease) is at the same level or higher (lower) than the selected value.
	Slope over Level	Collection is controlled by a signal from the detector based on the mAU signal level and the mAU/CV signal slope. Collection will start running (stop), if the detector signal is at the same level or higher than the selected value and at the same time if the detector signal increase (decrease) is at the same level or higher (lower) than the selected value.
Level		The absorbance value from 0-1000 mAU is entered.
on signal		The level, slope, slope over level signal is set for channel A, B, AB.
Slope		The signal slope value from 0-1000 mAU/CV is entered.

**FRACTIONATION**

Value/Symbol		Meaning
Method	Volume	The fractionation is driven by the set volume of the collected fraction (fraction volume).
	Shoulder	When the system detects the shoulder, it automatically moves to the next tube and begins collecting the sample. It fractionates on rising/falling shoulders and double fractionates on valleys.
	Valley	Collection takes place in the valley (local minimum) of the peak -fractionates on valleys.
Shoulder		The signal slope value from 0-1000 mAU/CV is entered.

Value/Symbol	Meaning
Valley	The signal slope value from 0-1000 mAU/CV is entered.

## Method of collecting samples

### Manual Collection

Manual collection is started and stopped manually by operating with a C/W valve. Fractionation is driven by a selected fractionation method, but the default setting is the *Volume* method – a test tube is filled with a collected sample with an identical volume, which was set (written) in the *Menu/Main/Control/Current Sample* in a *Fraction collector* section in a *Frac. Volume field*. It is possible to switch to another test tube at any time by pressing Next button in the *Control* and *Scheme Screen* (see 4.10.4 and 4.10.5).

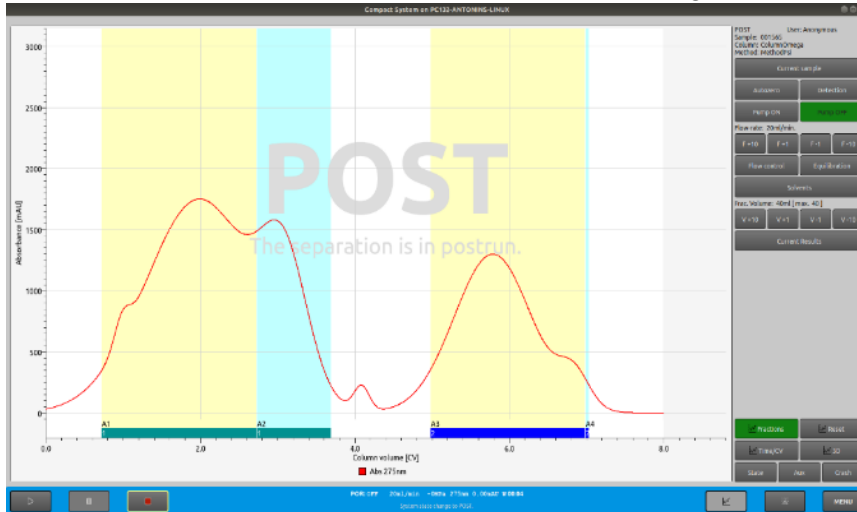
### Collect All

The collection of everything is started after the initial waste.



### Level

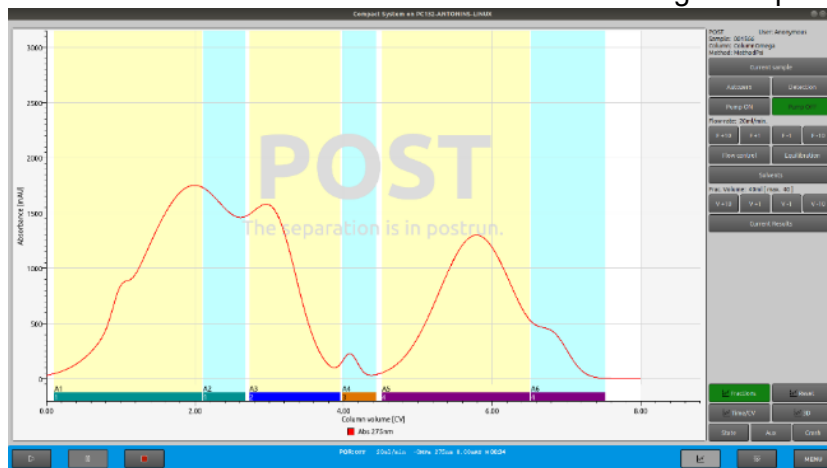
When the collection is started depends on the calculated level that is based on the signal from the UV detector. The minimum signal level is set (written) in *Menu/Main/Method/Detection* in the *Collection* section in the *Level* field (1-6000 mAU). The collection is stopped when the signal slope is below the set minimum. The default value of the signal level is 30 mAU.



Mode-Level, Fraktionace-Volume

### Slope

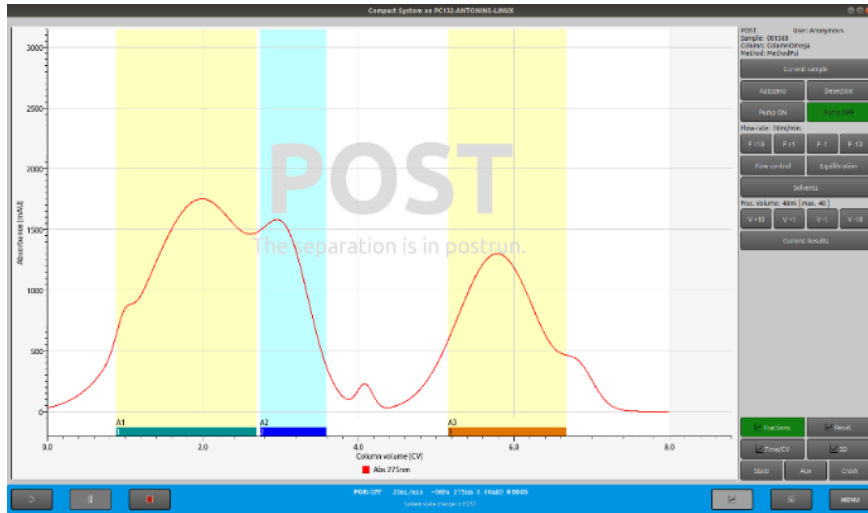
When the collection is started depends on the calculated slope that is based on the signal from the UV detector. The minimum signal slope is set (written) in *Menu/Main/Method/Detection* in the *Collection* section in the *Slope* field (1-6000 mAU/CV). The collection is stopped when the signal slope is below the set minimum. The default value of the signal slope is 100 mAU/CV.



Mode-Slope, Fraktionace-Volume

### Slope over level

When the collection is started depends on the calculated slope and level that are based on the signal from the UV detector. The minimum signal slope and level are set (written) in *Menu/Main/Method/Detection* in the *Collection* section in the *Level* and *Slope* field (1-6000 mAU/CV). The collection is stopped when the signal level or slope falls below the set minimum. The default value of the signal level is 30 mAU and of the slope is 100 mAU/CV.



Mode-Slope over level, Fraktionace-Volume

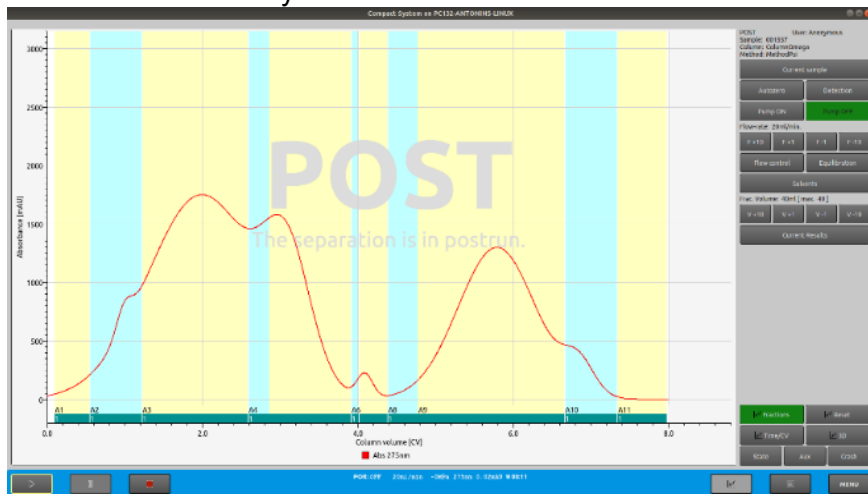
### Fractionation methods

#### Volume

A test tube is filled with a collected sample with an identical volume, which was set (written) in the *Menu/Main/Control/Current Sample* in a *Fraction collector* section in a *Frac. Volume* field. It is possible to switch to another test tube at any time by pressing Next button in the *Control* and *Scheme Screen* (see 4.10.4 and 4.10.5).

#### Shoulder

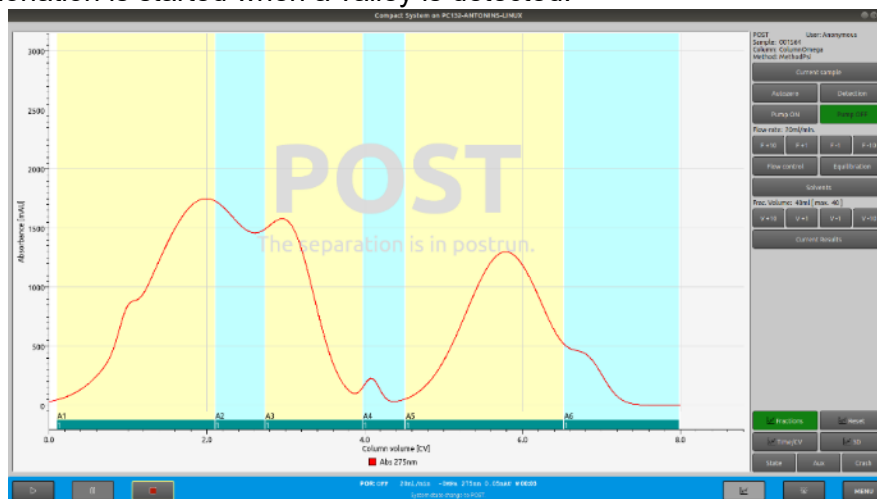
The fractionation is started when a rising/falling shoulder is detected and the double fractionation is started when the valley is detected.



Mode-Collect All, Fraktionace-Shoulder

### Valley

The fractionation is started when a valley is detected.



Mode-Collect All, Fraktionace-Valley

## 6.2. Files

In this item it is possible to open, edit, delete or move files in its sub-items.

### 6.2.1. Results

In this sub-item you can open, edit, delete or move files in its sub-items.

#### RESULTS SCREEN

Value/Symbol	Meaning
Open result file	The measurement results menu opens. Clicking on the selected file opens the same screen as for <i>Current Results</i> , only with the completed method. Press OK button to confirm.
Delete result file	The measurement results menu opens. After clicking on the selected file and confirming the action by pressing the OK button, the file will be deleted.
Export result file	A USB drive is connected to the unit. The desired file is selected and exported by pressing Export to PDF button. The following screen displays: "PDF was successfully exported to: /xxx/XXXXX/XXxxx/as file: xxxxx.pdf"
Import result file	A USB drive is connected to the unit. The desired USB file is selected from the connected USB disk and then imported into the system. Not supported yet.

### 6.2.2. Methods

This sub-item performs operations related to creating, displaying, editing, deleting, and moving files in its sub-items.

#### METHODS SCREEN

Value/Symbol	Meaning
New method	Not supported yet.
View method	A list of available methods in the system is displayed. The desired method is selected and confirmed by pressing the OK button. Relocation is performed automatically from the menu to the <i>Method Info</i> screen, where you can find all information about a specific method.
Edit method	A list of available methods in the system is displayed. The desired method is selected and press OK to confirm. The menu is automatically moved to the table, where the required parameters are modified.
Delete method	A list of available methods in the system is displayed. The desired method is selected, confirmed by pressing the OK button for deletion and selection. The method will then be removed.
Export method	A USB drive is connected to the unit. Select the desired method to export and click the Export to USB Drive button.
Import method	A USB drive is connected to the unit. Select the desired method to import. Not supported yet.

### 6.2.3. Columns

This sub-item performs operations related to opening, editing, deleting and moving files in its sub-items.

#### COLUMNS SCREEN

Value/Symbol	Meaning
New column	The screen for creation of a new column is displayed. Enter the required parameters of the used column - column identification name (ID), column volume, flow rate, maximum column pressure, solvent and note. Press APPLY to overwrite. After pressing the OK button, a column for entering the column ID is displayed. After typing, the system automatically returns to the menu.
Edit column	The editing screen for editing the parameters of the selected column is displayed.
Delete column	A list of available methods in the system is displayed. The desired column is selected and the selection is confirmed by pressing the OK button. The column is then removed.
Export column	Not supported yet.
Import column	Not supported yet.

### 6.2.4. Solvents

This sub-item performs the operations associated with creating, editing, deleting, and moving files in its sub-items.

#### SOLVENTS SCREEN

Value/Symbol	Meaning
New solvent	Not supported yet.
Edit solvent	Not supported yet.
Delete solvent	Not supported yet.
Export solvent	Not supported yet.
Import solvent	Not supported yet.

### 6.2.5. Racks

Not supported yet.

### 6.3. Setup

In the setup it is possible to set basic parameters of the unit - date, time, connected devices, etc., or to display system information.

#### 6.3.1. Diagnostics

##### DIAGNOSTICS SCREEN

Value/Symbol	Meaning
Status	A screen showing actions, errors, and system state logs. If an error occurs, a red error message appears on the status screen.
System variables	System information for possible service.
System info	System information - unit name, system type, serial number, network information, and hard disk information is displayed.

#### 6.3.2. Devices

This subitem carries out the operations associated with the connection, disconnection, search and service settings in its subitems.

##### 6.3.2.1. Init Devices

The searched devices (pump, detector and fraction collector) that have been added to the list are connected. A message displays in the status bar.

##### 6.3.2.2. Deinit Devices

The devices inside the unit - the detector, pump, and fraction collector are disconnected. The message: „*System state change to deinit*” displays on the status bar.

##### 6.3.2.3. Search Devices

The device search table appears. From the roller shutter is possible to select the searched device and the manner of the device connection. By pressing the Search button, the device will search the connected devices. After selecting a device from the list of found devices and pressing the Add button, the device will be added. The Remove button removes the device. The message: „*Added advice: xxxx*” will be shown up at the status bar.

##### 6.3.2.4. Valves Recalibrate

The loop valve is recalibrated.

##### 6.3.2.5. Reset HW Errors

Hardware errors are removed.

##### 6.3.2.6. Detector Configuration

A screen used as diagnostic info for the detector when used by a service technician.

### 6.3.2.7. Fraction Collector Configuration

A screen used as diagnostic info for the fraction collector when used by a service technician.

### 6.3.2.8. Loop Valve Configuration

A screen used as diagnostic info for the loop valve when used by a service technician.

### 6.3.2.9. Set to Default

Pressing the Set to Default button restores all devices of the compact system to their default settings.

### 6.3.3. Users

Not supported yet.

### 6.3.4. System

This subitem carries out the operations associated with working with the screen and general settings.

#### 6.3.4.1. General Settings

A screen used as diagnostic info for the compact system when used by a service technician.

#### 6.3.4.2. System Update

A flash drive with an updated software version is inserted into the switched-on compact system. The message: "*Update file found. For restart and update press Update button*" is displayed in *Menu/Setup/System/System Update*. item. Pressing the Update button restarts and updates the compact system.

## 7. OPERATING MODES

### 7.1. PRERUN Mode (PRE)

At startup, the system enters *PRERUN* mode, which is displayed in the status bar as an "*PRE*" shortcut. Waiting approximately 13 seconds for the system to go from *PRERUN* to *READY* mode, which is displayed in the status bar when the abbreviation changes from "*PRE*" to "*RDY*". The detector lamp is turned on and remains on for as long as the instrument is turned on.

### 7.2. READY Mode (RDY)

In *READY* mode, the abbreviation has changed from "*PRE*" to "*RDY*". The system is ready to run the analysis. When the system is in *READY* mode, the status bar displays the following information (in this order, numbers that change are written as XXX).

***RDY: OFF XX ml/min X.XMP and XXX nm XX.X mAU W MM:SS***

### 7.2.1. Control Screen

The chromatogram is recorded on the *Control Screen*. The message “*READY - System is ready to run*” displays in the background of the chromatogram and *READY* is displayed in the right column at the top of the screen. The pump is not pumping.

### 7.2.2. Scheme Screen

The *Scheme Screen* displays information in the top red box. The method displays *READY*, *RUN TIME* runs and does not deduct the remaining time until the end of the analysis. *READY* is displayed in the lower left green box showing the pump part of the pump and the pump output is drawn in light green. *RUNNING* is displayed in the upper right gray box showing the fraction collector and the C/W valve is switched to *WASTE*. The loop valve loop is drawn red and the valve is in the *LOAD* state.

When all analysis parameters are set, pressing the RUN button switches the system from *READY* mode to *WAIT FOR A LOAD* mode, which is displayed in the status bar when the abbreviation changes from “*RDY*” to “*WLO*”.

## 7.3. WAIT FOR A LOAD Mode (WLO)

In *WAIT FOR A LOAD* mode, the abbreviation has changed from “*RDY*” to “*WLO*”. In this mode, the system waits for the sample to be injected into the loop or column. After the sample has been injected, pressing the RUN button again will start the analysis run.

### 7.3.1. Control Screen

The chromatogram is recorded on the *Control Screen*. “*WAIT - The separation is waiting for sample*” is displayed in the background of the chromatogram and *WAIT* is displayed in the right column at the top of the screen. The pump is not pumping.

### 7.3.2. Scheme Screen

The *Scheme Screen* displays information in the top red box. The method displays *WAIT*, runs *RUN TIME* and does not deduct the remaining time until the end of the analysis. *READY* is displayed in the lower left green box showing the pump part of the pump and the pump output is drawn in light green. *RUNNING* is displayed in the upper right gray box showing the fraction collector and the C/W valve is switched to *WASTE*. The loop valve loop is drawn red and the valve is in the *LOAD* state.

When the RUN button is pressed, the pump starts pumping and the system goes out of *WAIT FOR A LOAD* to *RUN* mode, which is displayed in the status bar where the abbreviation changes from “*WLO*” to “*RUN*”.

## 7.4. RUN Mode (RUN)

The analysis starts in the *RUN* state. The pump starts pumping.

### 7.4.1. Control Screen

On the *Control Screen*, the chromatogram will be recorded from the beginning. *RUN* is displayed in the right column at the top of the screen. The pump is pumping. After running the analysis, the results of the analysis can be continuously monitored on the *Current Results* screen, which can be displayed by pressing the Current Results button.



### 7.4.2. Scheme Screen

On the *Scheme Screen*, *RUN* is displayed in the upper red box displaying method information, *RUN TIME* is running and the remaining time is subtracted to the end of the method. In the lower left green box showing the part of the machine with the pump. *RUNNING* is displayed and the currently used mobile phase (s) in use are colored. *RUNNING* is displayed in the upper right gray box showing the fraction collector. Color changes to the tubes in the pantograph during filling into tubes. The C/W valve is switched to *COLLECT*.

**COLOR CHANGE OF FILLED TUBES**

Color of the tube	Meaning
Deep colored (turquoise, purple, etc.)	Already filled tube.
Deep colored in red circle	Currently filling tube.
Light colored tube (beige)	The next tube to be filled.

The loop valve loop is drawn in green and the valve is in the *Inject* state.

## 7.5. PAUSED Mode (PSD)

Press PAUSE button to enter *PAUSED* mode and to pause the analysis. The system switches from *RUN* to *PAUSED* mode, which is displayed in the status bar, where the abbreviation changes from “*RUN*” to “*PSD*”.

### 7.5.1. Control Screen

On the *Control Screen*, the chromatogram is no longer recorded but doesn't disappear. The background of the chromatogram shows the message: „*PAUSE - The separation is paused*” and the right column at the top of the screen shows *PAUSE*. The pump is not pumping.

### 7.5.2. Scheme Screen

On the *Scheme Screen*, *PAUSE* is displayed in the upper red box displaying method information, *RUN TIME* is not running, and the remaining time until the end of the method is not displayed. The *READY* is shown in the lower left green box showing the part of the pump and the currently used mobile phase (s) used are color-coded. *PAUSED* is shown in the upper right gray box showing the fraction collector and the Home Position indicator is green (the letter H in a circle). The C/W valve is switched to *WASTE*. The loop valve loop is drawn in green and the valve is in the *Inject* state. Press the RUN button to restart.

## 7.6. EXTENDED PAUSE Mode (EXP)

When the method is complete, the system will switch from *RUN* to *EXTENDED PAUSE* mode, which is shown in the status bar, where the abbreviation will change from “*RUN*” to “*EXP*” and at the time in the end of the bar is 00:00.

### 7.6.1. Control Screen

On the *Control Screen*, the chromatogram is no longer recorded but doesn't disappear. The background of the chromatogram shows the message: „*Ext. PAUSE - The separation is paused – extended.*” The pump is not pumping.

### 7.6.2. Scheme Screen

On the *Scheme Screen*, *PAUSE* is displayed in the upper red box displaying method information, *RUN TIME* is not running, and the remaining time until the end of the method is 00:00. *READY* is shown in the lower left green box showing the part of the pump and the pump output is drawn in light green. *PAUSED* is shown in the upper right gray box showing the fraction collector and the Home Position indicator is green (the letter H in a circle). The C/W valve is switched to *WASTE*. The loop valve loop is drawn in green and the valve is in the *Inject* state.

## 7.7. EXTENDEN RUN Mode (EXR)

Pressing the RUN button again will start the extended run of the analysis, so it will enter Extended Run mode, which will be displayed in the status bar, where the abbreviation will change from "EXP" to "EXR". The essence of the mode is to extend the last step in the gradient table if the length of the analysis is not long enough and needs to be extended.

### 7.7.1. Control Screen

On the *Control Screen*, the chromatogram is again recorded from the point where it was stopped in the previous mode. *Ext. RUN* is shown in the right column at the top of the screen. The pump is pumping.

### 7.7.2. Scheme Screen

On the *Scheme Screen*, *Ext. RUN* is displayed in the upper red box displaying method information, *RUN TIME* is running, and the remaining time until the end of the method is subtracted. *RUNNING* is shown in the lower left green box showing the part of the pump and the currently used mobile phase (s) in use are color-coded. *RUNNING* is shown in the upper right gray box showing the fraction collector, the C/W valve is switched to *COLLECT* and the needle position above the tube is plotted. The loop valve loop is drawn in green and the valve is in the *Inject* state.

## 7.8. POST RUN Mode (POR)

When changing from *Extended Pause* to *Post Run mode*, the STOP button is pressed. When changing from *Extended Run* to *Post Run mode*, the STOP button is pressed twice. The transition to *Post Run mode* shows in the status bar, where the abbreviation changes from "EXP" or "EXR" to "POR".

### 7.8.1. Control Screen

On the *Control Screen*, the chromatogram is no longer recorded but doesn't disappear. In the background of the chromatogram, the message: "*POST - The separation is in postrun*" shows and the right column at the top of the screen shows *POST*. The pump is not pumping.

### 7.8.2. Scheme Screen

On the *Scheme Screen*, *POSTRUN* is displayed in the upper red box displaying method information, *RUN TIME* is running, and the remaining time until the end of the method is restored. *READY* is shown in the lower left box showing the part of the pump and the pump output is drawn in light green. *READY* is shown in the upper right gray box showing the fraction collector, the C/W valve is switched to *WASTE*. The loop valve loop is drawn in green and the valve is in the *Inject* state.

## 8. SETTING UP AND STARTING ANALYSIS

### Starting the Analysis in Points

1. Switching the unit on.
2. Creation, saving and editing columns.
3. Creation, saving and editing methods.
4. Gradient table settings.
5. Wavelength and collection mode settings.
6. Loading of the column.
7. Loading of the method.
8. General parameters settings (sample name, user name, note, injection method, rack type and volume of collected fraction).
9. Start separation.

**Caution:** To save all changes made to the screens, press the button **Apply** - changes are written to the system. Then press the button **OK** confirms saving and closes the screen.

### 8.1. Switching the Unit On

Switching on the unit is described in chapter 4.9.1.

### 8.2. Creation, Saving and Editing Columns.

#### 8.2.1. Creation and Saving a New Column

To add a new column, *Menu/Main/Settings/Current Column* from the *MENU* main screen has to be opened and the **NEW** button pressed. The required parameters of the used column - volume and column weight, column flow rate, maximum pressure for the column, sorbent, or note have to be filled in. The column is saved in *Menu/Main/Settings/Current Column* by pressing the **SAVE AS** button and the desired column name is entered. The status bar displays the message: "*Column written as XX.*"

#### 8.2.2. Editing of the Column

In *Menu/Main/Settings/Current Column*, pressing the **OPEN** button will display a list of all stored columns in the system. The column is highlighted and the selection is confirmed with the **OK** button. The status bar displays: "*Column XX loaded.*" The column parameters are edited. Saving the edited column is described in the chapter 8.2.1.

### 8.3. Creation, Saving and Editing Methods

#### 8.3.1. Creation of a New Method

To create a new method, *Menu/Main/Method* from the *MENU* screen has to be opened. By clicking the **Load Blank Method** sub-item an empty method will be loaded.

The message: "*The blank method is prepared*" shows in the status bar. Then set the gradient table (see 8.4), the sampling method and up to four wavelengths for detector measurement (see 8.5).

### 8.3.2. Saving of the Method

The method is saved by clicking the Save Current Method sub-item in *Menu/Main/Method* under the desired name. In the status bar shows a message: "*Method XY was written as XY*".

### 8.3.3. Editing Method

Clicking the Load Method sub-menu item under *Menu/Main/Method* will list all stored methods in the system. The method is highlighted and the selection is confirmed with the OK button. The message "*The Method "XY" was loaded.*" Saving the edited method is described in chapter 8.3.2.

## 8.4. Gradient Table Settings

A gradient table is displayed in *Menu/Main/Method/Gradient*. The individual mobile phases are set by pressing the Solvents button (see 8.6), the time course of the analysis, the required flow rate and the percentage volume concentration of individual mobile phases at a given time (see 6.1.4). The sum of the individual percent volume concentrations in a given row must always be 100 %.

## 8.5. Setting wavelengths and collecting mode

### 8.5.1. Wavelength Settings

In the *Menu/Main/Method/Detection* item in the *Signals* section, an optional wavelength in the range 0-800 nm at which the analysis will be performed is written in the individual channel fields (A-D). In the *Math* field, you can select math operations to be performed between signals (see 6.1.5). By checking the *Sum () in range* field, the channel fields (A-D) become disabled and two sub-fields are opened to fill the wavelength interval at which the measurement will take place. By checking the *Visible* button displays the wavelength record in the chromatogram on the *Control Screen*.

### 8.5.2. Collecting Mode Settings

In the *Menu/Main/Method/Detection* in the *Collecting* section, the dead volume between the loop/column and the detector is written in the *Initial waste* field. Use the roller shutter to select the method of collection in the *Method* field and the signal on the A, B or AB channels in the *on signal* field (see 6.1.5). If you select the *Level* method, you must enter the absorbance level in the *Level* field at which the system starts or stops collecting fractions. If the *Slope* method is selected, the *Slope* field must be filled with the slope value at which the system starts or stops collecting fractions. If the *Slope over Level* method is selected, the absorbance level value must be entered in the *Level* field and the Slope value must be entered in the *Slope* field.

In the *Fractionation* section the method of collecting individual fractions is selected.

## 8.6. Mobile Phases Settings

In *Menu/Main/Settings/Solvents*, the desired mobile phase (at least one mobile phase should be different), the minimum volume of mobile phases for the method operation, the volume of storage bottles in which the mobile phases are stored, system reaction, if the volume of the mobile phase falls below the set minimum volume, maximum waste volume and its current volume during the measurement (see 6.1.2.2). When the Empty button is pressed, the system receives a signal that the waste container has been emptied/replaced. Pressing the Return button returns you to the *MENU*.

## 8.7. Loading of the Column

In *Menu/Main/Control/Current Sample* in the *Column* section by pressing the *Select* button the desired column will be selected. A list of all stored columns in the system will display. The column will be selected by clicking on the desired displayed column file and confirmed by the *OK* button. The status bar displays the message: "*Column XX loaded.*"

## 8.8. Loading of the Method

In *Menu/Main/Control/Current Sample* in the *Method* section by pressing the *Select* button the desired method will be selected. A list of all stored methods in the system is displayed. The method will be selected by clicking on the desired displayed method file and confirmed with *OK*. The status bar displays the message: "*The Method*" *XX* "*was loaded.*"

## 8.9. General Parameters Settings

### 8.9.1. Sample Name Settings

The name of the testing sample is set up in *Menu/Main/Control/Current Sample* in the *Sample* section. The name of the sample is entered in the *Sample* field.

### 8.9.2. User Settings

The sample user is set up in *Menu/Main/Control/Current Sample* in the *Sample* section. The name of the user currently operating the unit is entered in the *User* field.

### 8.9.3. Adding a Note

A note can be added in *Menu/Main/Control/Current Sample* in the *Sample* section. Any note can be written in the *Note* field.

### 8.9.4. An Injection Method Setting

The sample injection method is set in *Menu/Main/Control/Current Sample* in the *Sample* section. In the *Inj. Type* field is from the roller shutter selected the desired injection method.

INJ. TYPE ROLLER SHUTTER

Injection method	Meaning
Loop	The injected sample passes through the loop into the column.
Column	The injected sample does not pass through the loop but passes straight through the column.

### 8.9.5. Rack Type and a Volume of the Collected Fractions Settings

#### 8.9.5.1. Rack Type Setting

In the *Menu/Main/Control/Current Sample* item in the *Fraction collector* section in the *Rack type* field, the roller shutter is used to select the rack type inserted in the rack space.

#### 8.9.5.2. Volume of the Collected Fractions Setting

In *Menu/Main/Control/Current Sample* in the *Fraction collector* section in the *Frac. volume* field, using the buttons *+10*, *+1*, *-10*, *-1* the desired volume of the fraction collected in the tubes is set.

## 8.10. Run the Analysis

The analysis is started when the system changes from *WAIT FOR A LOAD* to *RUN* mode (see 7.3 and 7.4).

## 9. SERVICE

**Caution:** The unit must be disconnected from the power supply before servicing!!!

### 9.1. Replacement of Line Fuse



Using a flat-tip screwdriver release the fuse holder from its bottom.

Take out the fuse holder.

Remove old line fuse.

Insert in the holder new line fuse **noted on the product label**, which is a part of detector accessories.

Insert the fuse holder back.

Push the fuse holder all the way inside.

## 9.2. Check Valves

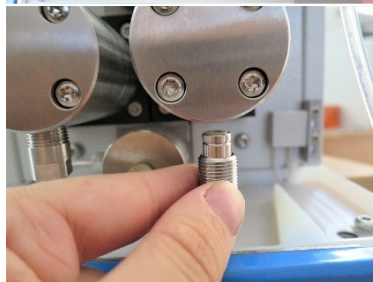


The basis of check valve is precise **ball and seat** placed in a case made of PEEK with stainless steel reinforcement. Liquid flow pushes the ball into the seat and this way it seals. With regard to high pressures in the pump any **slight impurity** stuck on the ball or seat may cause **pressure fluctuation** or the pump cannot start at all. If it is not possible to eliminate this problem by repeated purge, it is necessary to exchange or clean the check valves.

Flow direction through the valve is according to the arrows on check valve side.



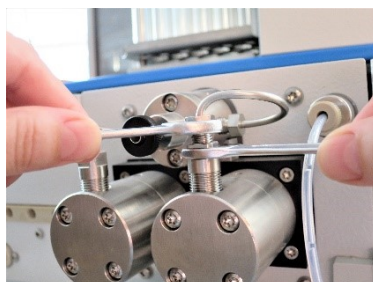
Disconnect inlet tubing.  
Loosen capillary on outlet valve holder using side wrench 3/8" and bend it slightly. Or you can dismantle the connecting capillary completely.



To exchange inlet valve, loosen its holder using side wrench 10 mm.

Remove the holder with inlet valve.

Take out inlet valve from the holder.



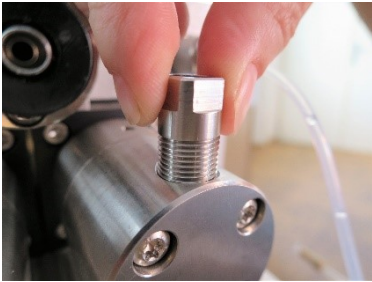
Replace the inlet valve with a new one.

The whole capillary is dismantled on the outlet valve holder using side wrench 3/8" and bend it slightly.

To exchange the outlet valve, loosen its holder using side wrench 10 mm.



Remove the outlet valve holder.



Take out outlet valve from the head by using a tweezer.

Replace the outlet valve with a new one.

Insert the new valve in the same way as the old one, four holes must head up. Continue the same way as during dismounting, but in reverse order. Tight all screws strongly and after starting the pump, check all connections for any leakage.

**Caution:** After replacing check valves, purge/degass the unit

### 9.3. Seals

**Caution:** Pump piston is made of fragile material. Improper manipulation may cause irreversible harm or piston fracture!



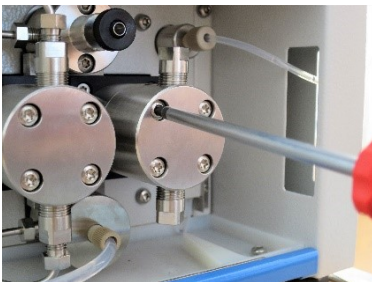
Disconnect inlet tubing.

Loosen nut on left head using side wrench 1/4".



Dismount output capillary.

Remove the capillary on the outlet valve holder with a 3/8 "wrench and bend it slightly.

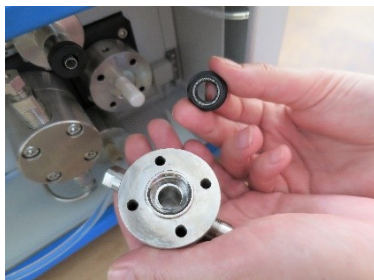


Loosen four M4x20 screws in left head using TX20 screwdriver from unit accessories.

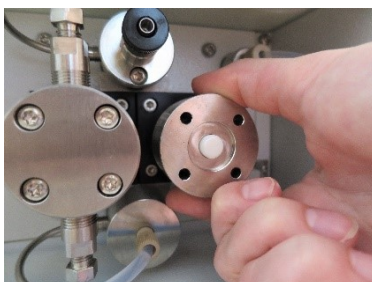
Pull the head straight out of the piston.

**Leaning the head to sides may cause piston damage!**





Remove the seal using a suitable tool. Wash and clean the piston and interior of the head with isopropanol. Usually it is not necessary to exchange the seal in washing heads, but in case it is needed, follow the same steps as with working heads.



Wet new seal in isopropanol and place it on the piston carefully. The spring is facing toward the head.



Pushing the head back on the piston must be straight. **Leaning the head to sides may cause seal damage.** Fasten the screws and mount tubing and capillary back on their place.

After seal replacement are the steps for mounting the same as during dismounting, but in reverse order.

Pushing the head with new seal back on the piston must be straight. **Leaning the head to sides may cause seal damage.**

**Caution:** Screw in the left and right screw alternately into the heads of each blocks. Each screw must be screwed with the same number of turns.

**New seals should be run in before first use.** Disconnect all equipment connected to the pump output. Connect reduction valve (or another reliable hydrodynamic resistor) directly to the pump output. Put the inlet tubing and output capillary into same reservoir with solvent isopropanol: water 1:1.

**ECS28 P** - Flow rate is set to 250 ml/min, start pumping and set pressure at 2MPa using reduction valve. Let the pumping for at least 30 min (optimal 2 h). Keep the flow rate at 300 ml/min and set pressure at 5MPa. Let the pumping for at least 30 min (optimal 2h). Keep the flow rate at 100 ml/min and set pressure at 25MPa. Let the pumping for at least 10 min (optimal 30 min). Keep the flow rate at 30 ml/min and set pressure at 5MPa. Let the pumping for at least 10 min (optimal 30 min).

**ECS54 P** - Flow rate is set to 50 ml/min, start pumping and set pressure at 10MPa using reduction valve. Let the pumping for at least 30 min (optimal 2 h). Keep the flow rate at 50 ml/min and set pressure at 20MPa. Let the pumping for at least 30 min (optimal 2h). Keep the flow rate at 50 ml/min and set pressure at 25MPa. Let the pumping for at least 10 min (optimal 30 min). Keep the flow rate at 10 ml/min and set pressure at 20MPa. Let the pumping for at least 10 min (optimal 30 min).

Seals are now set and run-in. Pump is ready for standard operation. Do not forget to wash the isopropanol from the pump using your mobile phase. If the pressure decreases during operation, it is necessary to run the pump in for a longer time (optimally). If you do not have a reduction valve, you can use an old column, which meets the above stated parameters).

**Caution:** Watch washing heads and all connections during run-in for any leakage. Correct every uptightness!

### 9.4. Needle of Degassing/Purging Valve



Unscrew needle.

Screw new needle.

### 9.5. O-ring in Degassing/Purging Valve



Unscrew two screws M4X20 using screwdriver TX20 from unit accessories.

Take out the degassing/purging valve. Under head, there is white or transparent seal.



Unscrew needle, take out metal ring and O-ring.

Take in new O-ring.



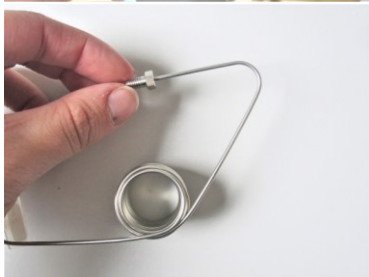
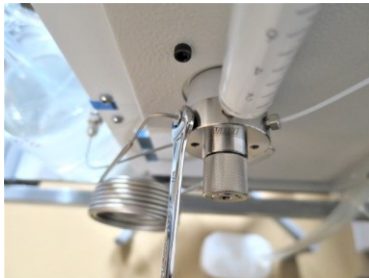
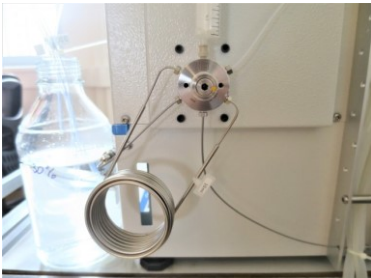
Remove the seal using a suitable tool and carefully insert a new seal into the sealing space. Pushing the head back on the piston must be straight. **Leaning the head to sides may cause seal damage.**

Fasten the screws and screw the needle back properly.

After replacement of O-ring, steps for mounting are the same as for dismounting, only in reverse order.

**Caution:** Needle is screwed into head of degassing/purging valve so that it does not go out and then screw head of valve with needle onto compensating block.

## 9.6. Sample Loop



Loosen the nuts on the injection valve with the side wrench ¼ “.

The loop, including the nuts and ferrules, is removed.

The protective rubber plugs are removed from the loop ends. A nut and a ferrule are fitted to the end of both arms of the loop. The upper part of the ferrule should face the screw.

Steps for mounting the new sample loop are the same as for dismantling the original one, only in reverse order.

## 9.7. Pistons

Replacement of a piston can be done only by a qualified person.

## 9.8. Three Position Switch

The unit is turned on by main switch on the rear panel (see 4.9). The unit has three position switch which is used for service by qualified person and placed under display. The switch allows you to manually control the status of the main power supply (450W) (e.i. turn on/off the device in the compact system) independently of the PC status.



### MEANING OF EACH SWITCH POSITION

Value/Symbol	Meaning
0	The main source is ON (turn on the device) if the PC is running and OFF if it is unsafe (standby) – default status.
I	The main power supply is always ON (turn off the device) regardless of the PC status.
II	The main power supply is always OFF (turn on the device) regardless of the PC status.

**Caution:** The switch should not be used during normal operation of the device. The switch should only be handled when servicing the device by qualified person.

## 10. TROUBLESHOOTING

Problem	Caused by / Conditions	Solution
Leaking liquid from washing heads.	Damaged seal in pumping head.	Replace the seal immediately. The pump must not be used with damaged seal.

Problem	Caused by / Conditions	Solution
Pressure pulsation. Pressure sometime suddenly decreases.	Column, injection valve or other equipment connected after the pump.	Test if the problem persists without any equipment after the pump. Then try to connect any reliable source of hydrodynamic resistance (column, reduction valve).
	Bubbles.	Check all connections on capillaries and tubing before, in and after the pump. Try to purge the pump again and watch tubing after connected mobile phase filter, for bubble formation. If any bubbles are formed there, exchange/rinse this filter. You can use degassing unit.
	Bad check valve.	Try to replace check valve (see 9.2).
	Impurity in check valve.	Purge it with air flow or insert in ultrasound bath.
	Damaged seal – esp. when using solvents as Acetonitrile. It may seem like that bubbles are formed inside the pumping system. It is convenient to exclude other source of bubbles using degasser.	Try to replace seals (see 9.3).
	The pump is not run-in properly after seals replacement.	Run-in the pump under optimal conditions (see 4.9.1).
	Electronic failure.	Contact service centre.
Flowrate is lower then set value.	Pressure stability.	Problems with lower flow rate occur and usually relate to problems with pressure stability – see solution above.
	Solution agent.	Solution agents with very high or very low viscosity may cause these problems. As well as not degassed solvents.
	Electronic failure.	Contact service centre.
Motor works hardly/loudly, there isn't indicated any pressure and flow rate is low or none.	Clogged frit of outlet valve. Only if check valves with frit are used.	Check the frit, try to clean it or replace the check valve.
	Electronic/mechanic failure.	Contact service centre.

Problem	Caused by / Conditions	Solution
Higher noise and drift	Leaking cell, dirty cell, gas bubbles, nontransparent mobile phase, old/defective lamp, flow and temperature fluctuations.	Perform <i>Lamp test and Cell test</i> Check cell connection. Check mobile phase. Check cell purity manually. Check pump. Stabilize the external environment. Heat the lamp sufficiently.
	Electronic / optic failure	Contact service.
Leaking cell	Broken cell window, Defective seal.	Repair or exchange cell, see <i>chapter</i>
Leaking liquid from tubing joints.	Damaged tightening elements.	Shorten the tubing by a few mm, with a straight cut, and use new tightening ferules. <b>Replace switching valve.</b>
	Damaged thread on switching valve.	Call service centre.
Stammering run of needle trolley.	Small clearance of distance guidance on guiding bar.	Adjust clearances. Call service centre.
	Seized guiding bearing.	Clean any impurities from the guiding bar. Call service centre.
	Defective step motor.	Call service centre.
	Electronic failure.	Call service centre.
Needle is not moving.	Damaged belt of relevant direction.	Call service centre.
	Defective step motor.	Call service centre.
	Electronic failure.	Call service centre.
Needle trolley is interfering with mechanical endstops, step motor is still running	Error on optical end bolts.	Replace DPS with optical end bolts. Call service centre.
	Damaged shutters on optical switches.	Call service centre.
	Electronic failure.	Call service centre.

## 11. MAINTENANCE

### 11.1. Periods

Minimal period for check valve and seal exchange is one year. This period may be shorter if there are used buffers, high pressure/flow rate, aggressive solvents or other aggravating conditions. In case of such difficult environment it is recommended to exchange the check valves and seals every 6 months.

Piston replacement can be done approximately once per 5 years when conditions are hard, or when they are damaged after inappropriate replacement of other parts. When the unit is used under common conditions, replacement is done approximately once per 10 years.

Periodic control of pumping blocks (working and washing) screws tightness is recommended once per month.

It is recommended to check lubrication of moving parts of pump mechanics once per year.

Recommended period for replacing mobile phase filters on inlet tubing is one year.

Checking unit function (Operational qualification OQ, unit validation) under heavy-duty operating conditions is recommended to be done once per 6 months, or once per 1 year, if the working conditions are optimal, max. once per 2 years. During unit validation a complete unit control is proceeded, and according to observed unit condition can be replaced damaged parts.

### 11.2. Cleaning and Decontamination

Follow safety instructions of agents used in chromatography process.

Use dry or moistened cotton cloth for cleaning or unit surface.

### 11.3. Storage and Transport

If the unit shall be put out of service for a longer period of time or it shall be transported, it is advisable to purge it with isopropanol and plug it afterwards. Remove unit door before transportation and pack it to avoid damage during transportation.

### 11.4. Checking Tubing

Check all tubing connections for leaks before starting the process. Any liquid leaks must be removed.

### 11.5. Cleaning Check Valves











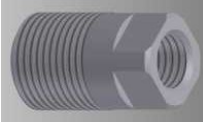
Remove the valves (see 9.2) and clean them using ultrasound in distilled water or other solution agent, dissolving used buffers. You may also try a combination of water bath with inorganic/organic or polar/nonpolar solvent.

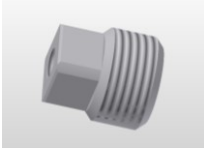
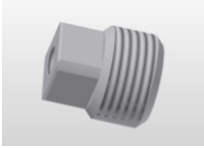





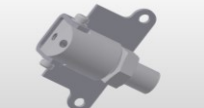




## 12. SPARE PARTS A ACCESSORIES







### SPARE PARTS

P/N	Picture	Description
<b>Spare parts</b> (basic spare parts)		
58606000		GL 45 Media/Storage Bottle 1000mL
AFAR021X		Rack for 36 tubes OD 16 mm, volume 21 ml
AFAR008X		Rack for 48 tubes OD 12 mm, volume 8 ml
AFAUV000		Rack for 20 vials OD 27.5 mm, volume 60 ml
AFARF120		Rack for 12 funnels, 30 mm
AFAT021X		Tube 21ml (100pcs)
AFAT040X		Tube 40ml (50pcs)
AFAT008X		Tube 8ml (100pcs)
5480640		Vial 60 ml (1 pc)





P/N	Picture	Description
5480161		Cap for vial 60ml (1pc) (it is necessary to order a cap for the vial separately)
2052B90000		Halogen lamp with a cable and connector
L6999 MOD3		Deuterium lamp for TOYDAD-L + TOY14 + TOY18
ACE98100		PE Mobile Phase Filter 20 µm No-Met with reduction UNF 5/16"-24 (ECS28 P)
ACC16100		PE Filter 20u No-Met with reduction UNF1/4" (EC54 P)
99043600		Piston seal 3/8" U-R325 HB (CC)-204-GFP-HST (working head seal; Teflon with graphite; high chemical resistance; lower abrasion resistance, ECS28 P, ECS54 P)
99043700		Piston seal 3/8" U-325 MB-204-T-316 (PTFE washing head seal, ECS28 P, ECS54 P)
99043000		Piston seal 3/8" U-R325 HB (CC)-204-UHMWPE40-HST (working head seal; high molecular weight polyethylene; lower chemical resistance; high abrasion resistance, ECS28 P, ECS54 P)
PJ250000		High-flow check valve 1/8" (for high flow rate, EC28 P)
53381000		Check valve (inlet and outlet check valve, EC54 P)
PJ200070		Check valve holder UNF 5/16"-24 (ECS28 P)

P/N	Picture	Description
53380012		Holder of outlet check valve UNF-10 (ECS54 P)
63000070		Holder of inlet check valve UNF 1/4"-28 (EC54 P)
PJ230000		Piston with holder (piston diameter 3/8, ECS28 P)
PM014000		Piston with holder (piston diameter 3/8", ECS54 P)
ART05477		O – ring ID 4,47 mm, cross section 1,78 mm, Kalrez® (Bypass Valve Seal, ECS28 P, ECS54 P)
PG252000		Needle of degassing/purging valve, PEEK (ECS28 P, ECS54 P)
ACE21001		Pressure sensor preparative 60 MPa (ECS28P)
ACA61001		Pressure sensor 600 bar (EC54 P)
A 6R 3M066095		Single sided timing belt 9.5 mm 66 teeth (ECS28 P)
A 6R 3M058095		Single sided timing belt 9.5 mm 58 teeth (ECS54 P)
ACC21001		Motor K 50, 100, 300 (when ordering, note unit serial number and system type, ECS28 P, ECS54 P)
EKAB-024		Crossed serial cable 9pin RS232 (2x DB9 female, length approx. 2 m)



P/N	Picture	Description
SL10KCUW		Sample loop 10ml UW 1/16" topped with nuts and ferrules
JRZLAPK1		Adapter, PEEK 1/16" female Luer (by inserting a syringe into the adapter, an injection of the sample is performed)
S6099100		Stainless steel capillary pump-injection valve 1/8" - 1/16", L=302 mm (with reduction, volume = 0.68 ml)
S6099900		Pump inlet tubing FEP OD 3/16" x ID 1/8", L=260 mm (volume = 2.06 ml)
S6099300		Stainless steel capillary injection valve-column OD 1/16" x ID 1 mm, L=1 m (volume = 0.79 ml)
S6099400		PEEK capillary column-detector OD 1/16" x ID 1 mm, L=0.6 m (volume = 4.71 ml)
S6099500		PEEK capillary detector-fraction collector OD 1/16" x ID 1 mm, L=310 mm (volume = 0.24 ml)
S6099600		FEP tubing fraction collector-waste OD 1/8"x ID 1/16", L=0.4 m (volume = 0.79 ml)
S6099700		FEP tubing fraction collector inlet OD 1/8"x ID 1/16", L=0.65 m (volume = 1.29 ml)
S6099800		FEP tubing fraction collector outlet OD 1/8"x ID 1/16", L=0.7 m (volume = 1.39 ml)
ECS90030		PTFE waste tubing from injection valve OD 1/16" x ID 0.75 mm, L=0.3 m (volume = 0.53 ml)

## PREPARATIVE CELLS

Cell	P/N	Picture	Description
<b>Optional Accessories</b>			
<b>Low Pressure (up to 2 MPa)</b>			
PLCC 3L L	ANA9203X		<b>Optical path:</b> 0.3 mm <b>Internal volume:</b> 80 µl <b>OD:</b> 3/16" <b>Thread:</b> 5/16"-24
PLCC 07 L	25L0000X		<b>Optical path:</b> 0.3 mm <b>Internal volume:</b> 40 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 15 L	ANA9400X		<b>Optical path:</b> 0.3 mm <b>Internal volume:</b> 40 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 17 L	ANA9300X		<b>Optical path:</b> 1.3 mm <b>Internal volume:</b> 55 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 19 L	ANA9400X		<b>Optical path:</b> 2.4 mm <b>Internal volume:</b> 70 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 07 L PEEK	25LP000X		<b>Optical path:</b> 0.3 mm <b>Internal volume:</b> 40 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 15 L PEEK	ANA94L0X		<b>Optical path:</b> 0.3 mm <b>Internal volume:</b> 40 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 17 L PEEK	ANA93L0X		<b>Optical path:</b> 1.3 mm <b>Internal volume:</b> 55 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min
PLCC 19 L PEEK	ANAL000X		<b>Optical path:</b> 2.4 mm <b>Internal volume:</b> 70 µl <b>OD:</b> 1/8" <b>Thread:</b> 1/4" – 28 <b>Max. flow rate:</b> 500 ml/min

Cell	P/N	Picture	Description
<b>High Pressure (up to 30 MPa)</b>			
PLCC HP08 L PEEK	ANAHP080		<b>Optical path:</b> 1 mm <b>Internal volume:</b> 8 $\mu$ l <b>OD:</b> 1/8" <b>Thread:</b> 5/16"-24
PLCC HP16 L PEEK	ANAHP160		<b>Optical path:</b> 1 mm <b>Internal volume:</b> 18 $\mu$ l <b>OD:</b> 1/16" <b>Thread:</b> UNF 10-32

#### ANALYTICAL CELLS

Cell	P/N	Picture	Description
<b>Optional Accessories</b>			
<b>Low Pressure (up to 2 MPa)</b>			
HPLC 09 PEEK	ANA97000		<b>Optical path:</b> 10mm <b>Internal volume:</b> 8 $\mu$ l <b>OD:</b> 1/16" <b>Thread:</b> UNF 10-32 <b>Max. flow rate:</b> 50 ml/min
HPLC 09 PEEK (Sapphire glass)	ANA970S0		<b>Optical path:</b> 10 mm <b>Internal volume:</b> 8 $\mu$ l <b>OD:</b> 1/16" <b>Thread:</b> UNF 10-32 <b>Max. flow rate:</b> 50 ml/min

## 13. WARRANTY AND POST-WARRANTY REPAIRS

Warranty and post-warranty repairs are provided by the manufacturer or dealer organization authorized by company ECOM to do this.

Repair of products in the warranty period carried out by other person than that authorized by the service organization is a reason for warranty nullification.

The scope of the warranty and its duration is given in the certificate of warranty.

Manufacturer:

**ECOM spol. s r.o.**

Trebonicka 239

252 19, Chrastany u Prahy

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Tel.: + 420 221 511 310

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[www.ecompro.com](http://www.ecompro.com)

## 14. CELLS

### 14.1. Preparative Cell PLCC07L

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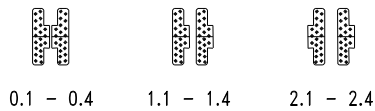
**Note:** Optical path can be adjusted by different orientation of windows, as shown earlier. Optical path 0.3 mm was adjusted in the manufacturing plant by combination of FEP sealing of various thickness (there may be even two on one side), and by special testing. **Therefore, when adjusting this optical path, address to your supplier.**

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A unique design of the cell allows you to change optical path according to particular conditions of analysis from 0.1 to 2.4 mm. Cell volume is 40, 55, and 70  $\mu$ l, respectively, according to the adjusted optical path. Maximum flow rate is 500 ml/min. The cell is designed for preparative or TOY applications. Inlet tubing of OD 1/8", or 1/16" can be connected using a threaded screw 1/4"-28 and a ferrule.

**Required test cell for PLCC07L is ZK04L.**



Stepwise arrangement of the cell windows makes possible to change the optical path of the cell in a simple way, by means of changing the positions of the windows and the gasket thickness. A by-pass formed by the windows and internal diameter of the cell forms free space securing a high flow through the measuring cell even in this arrangement. We recommend not to replace the cell windows. If it's necessary to change the optical path of the cell, please contact your distributor.

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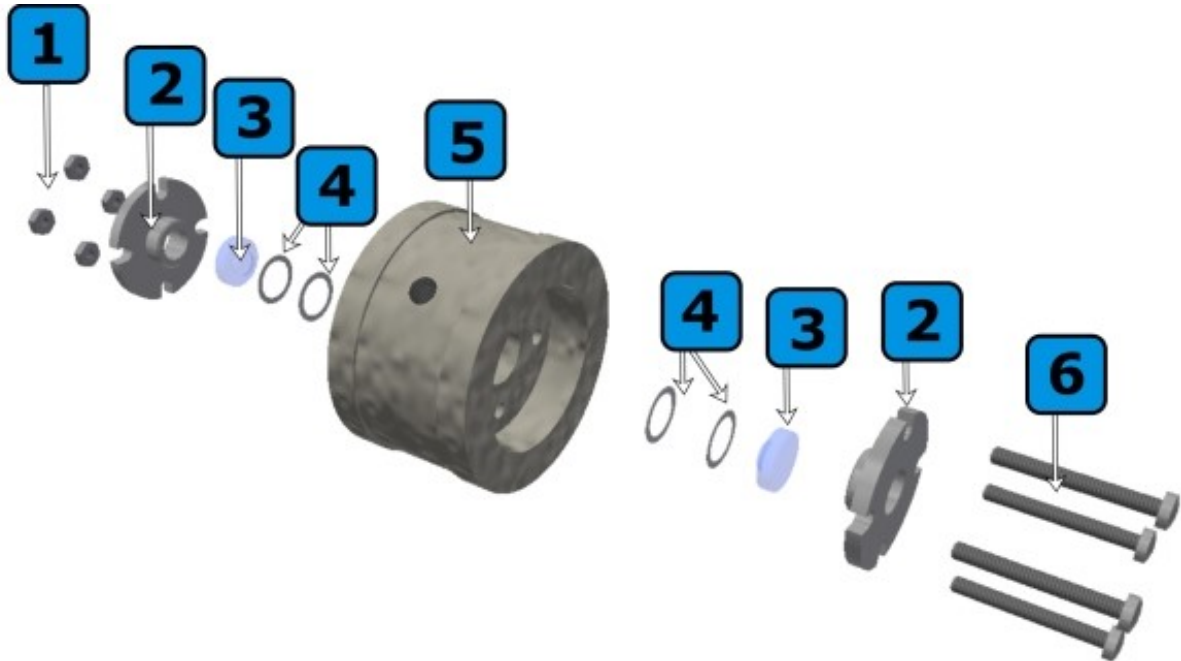
If you need to purchase a cuvette with a different optical path, please contact your distributor or manufacturer.

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In order to restrict formation of bubbles a hydrodynamic resistor is supplied with the cell to be connected to the outlet capillary. Decrease of the effect of changing flow rate and temperature is achieved by conical shape of the cell and a heat exchanger at the cell inlet.

Test cell ZK04L is a cell without windows and serves for verification of correct detector function, for indication of lamp wear, and for checking cell cleanness. This cell is a part of delivery.

ORDER OF CELL COMPONENTS



Components of the **preparative** cell in the order as they are assembled:

1. 4x nut,
2. cell cover,
3. PLCC window,
4. PTFE sealing,
5. cell body,
6. 4x screws



## 15. TECHNICAL PARAMETERS

The Compact system consists of these parts:

### DETECTOR TOY18DAD800L (SCANNING)

Parameter	Value
Wavelength range	200-800 nm (256 elements of CCD)
Number of channels	4
Scan	200-800 nm, up to 20 Hz, step 1 nm
Typical spectral half-width	10 nm
Accuracy of adjustment / Reproducibility	± 1 nm / ± 0.5 nm
Noise level at test cell (254 nm, TC 0.75 s)	5 x 10 <sup>-5</sup> AU
Drift at test cell (254 nm after 1 hour.)	1 x 10 <sup>-3</sup> AU/ hr
Materials in contact with mobile phase	FEP; fused silica, stainless steel, PEEK
Time constant	0.5 s, 0.75 s, 1.0 s, 2.0 s, 4.0 s, 8.0 s, 16.0 s, 0.2 s, 0.1 s
Volume of PEEK inlet capillary of the detector (from the column) OD 1/16 "x ID 1 mm, L = 0.6 m	4.71 ml
Volume of PEEK detector output capillary (to fraction collector) OD 1/16 "x ID 1 mm, L = 310 mm	0.24 ml

### PUMP ECP2200/ECP2050

Parameter	Value	
	ECP2200	ECP2050
Flow rate	0.5-250 ml/min	0.1-50 ml/min
Pumping system	two plungers dia. 3/8" connected in parallel	
Maximum operating pressure	30 MPa (4351 psi) up to 100 ml/min, 15 MPa (1450.5 psi) up to 250 ml/min	30 MPa (4351 psi, 300 bar)
Precision of the pressure measurement	± 2 %	
Flow rate setting	0.1 ml/min steps	
Repeatability of flow-rate adjusting <b>ECP2200</b> - (100 ml/min, 15 MPa, H <sub>2</sub> O) <b>ECP2050</b> – (10 ml/min, 12 MPa, H <sub>2</sub> O)	± 1 %	± 0.5 %
Accuracy of flow rate setting	± 2 %	
Upper pressure limit (MPa)	1-30 (4351 psi)	
Wetted materials	Stainless steel, PEEK, Tefzel™, PE, ceramic, seals*	
Output capillary volume from the pump (to the injection valve) OD 1/8 "x ID 1/16", L = 302 mm	0.68 ml	

\*Seals material: default is GFP (PTFE), optional is UHMW-PE, more information upon request.

**FRACTION COLLECTOR ECF2096**

Parameter	Value
Available racks (two racks per unit)	<b>EC08</b> 48 tubes, tube volume 8 ml <b>EC21</b> 36 tubes, tube volume 21 ml <b>EC40</b> 24 tubes, tube volume 40 ml <b>EC60</b> 20 vials, vial volume 60 ml <b>F12A</b> 12 funnels, 30 mm
Maximum operating pressure	1.3 bar (0.13 MPa, 20 psi)
Maximum flow rate for tubes 8 ml	max. 50 ml/min
Maximum flow rate for tubes 21, 40 ml	max. 300 ml/min
Maximum flow rate for vials 60 ml	max. 300 ml/min
Maximum flow rate for funnels	max. 500 ml/min
Wetted materials	FEP, Tefzel®, PPS, KEL-F, PTFE, PEEK, stainless steel, glass SIMAX
Needle speed between tubes	approx. 50 mm/s
Switching time of valve	approx. 10 ms
FEP fraction collector inlet tubing volume OD 1/8 "x ID 1/16", L = 0.65 m	1.29 ml
FEP fraction collector waste tubing volume OD 1/8 "x ID 1/16", L = 0.4 m	0.79 ml
FEP fraction collector outlet tubing volume OD 1/8 "x ID 1/16", L = 0.7 m	1.39 ml
Operational environment conditions	Indoor use only. Altitude: do 2000 m Temperature: 5-40 °C Humidity: max. relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % rel. humidity at 40 °C. Voltage fluctuations: up to ± 10 % of nominal voltage. Overvoltage category II. Pollution degree 2.

**GRADIENT VALVE**

Parameter	Value
Number of valves	6 (A, B, C, D, E, F)
Volume of one valve	0.97 ml
Wetted materials	PEEK, Kalrez®
Setting of components concentration	0 – 100 %
Maximum operating pressure	0.3 MPa (43.5 psi)
Liquid temperature	0 to 50 °C

**COMPACT SYSTEM**

<b>Parameter</b>	<b>Value</b>
Column inlet tubing volume (from injector valve) OD 1/16" x ID 1 mm, L = 1 m	0.79 ml
Volume of the injection valve	17.6 µl
Injection valve wetted material	Stainless steel, Vespel®
Communication	3x USB, 2x LAN, RS232
Power supply	100–240 V AC, 50/60 Hz
Power input	490 W
Dimensions (W x H x D)	500 x 678 x 482 mm (19.69 x 26.69 x 18.98")
Weight	55 kg (121.3 lb)

## 16. APPENDIX 1 – DECLARATION OF CONFORMITY

We,  
**ECOM spol. s r.o.**  
**Trebonicka 239, CZ-252 19, Chrastany**  
**Czech Republic**  
**Company ID No.: 41 192 192**

as manufacturer declare, that the product meets all applicable provisions of the EU directive on electromagnetic compatibility Government Decree No.117/2016 Coll. (Directive 2014/30/EU) and as well as all applicable provisions of the EU low voltage directive Government Decree No.118/2016 Coll. (Directive 2014/35/EU)

**Product: Compact Preparative System**  
**Type: ECS28 P**

Contextual models: ECS18 F, ECS18 P, ECS38 F, ECS38 P, ECS54 P

Application of the product: Equipment is intended for use in a laboratory for sample collection, measuring light absorption in liquids and solvent delivery in chromatographic analysis.

Manufacturer: ECOM spol. s r.o., Trebonicka 239, CZ-252 19, Co. ID No.: 41192192

The following technical standards were applied when evaluating conformity:

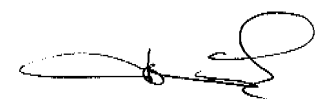
EN 61010-1 ed.2:2011+ A1:2019 (idt IEC 61010-1:2010 + A1:2016 + COR1:2019),  
EN 61000-6-3 ed.2:2007+ A1:2011+ COR1:2013 (idt EN 61000-6-3:2007/A1:2011/AC:2012),  
EN 61000-3-2 ed.5:2019 (idt IEC 61000-3-2:2018),  
EN 61000-3-3 ed.3:2014 (idt IEC 61000-3-3:2013),  
EN 61000-6-1 ed.3:2019 (idt IEC 61000-6-1:2018),  
EN 61000-4-2 ed.2:2009 (idt IEC 61000-4-2:2009),  
EN 61000-4-8 ed.2:2010 (idt IEC 61000-4-8:2010),  
EN 61000-4-11 ed.2:2005 + A1:2017 (idt IEC 61000-4-11:2004/A1:2017),  
EN 61000-4-4 ed.3:2013 (idt IEC 61000-4-4:2012),  
EN 61000-4-5 ed.3:2015 + A1:2018 (idt IEC 61000-4-6:2014-A1:2018),  
EN 61000-4-6 ed.4:2014 (idt IEC 61000-4-6:2014),  
EN 61000-4-6 ed.3:2009 + Z1:14 (idt IEC 61000-4-4:2012),

Evaluation of conformity was performed by company TÜV SÜD Czech, s.r.o with certified quality system according to ČSN EN ISO 17020 which issued the followings reports:

13.01. 2020 Test Report No. 12.861.985

13.01. 2020 Test Report No. 12.861.982

Prague 20.01.2020



**Ing. Jaroslav Formánek**  
*director*