KNAUER

PLATINblue

System Manual

V6900A

UHPLC/HPLC

Table of contents

Note For your own safety, **read** the manual and **always** observe the warnings and safety information on the device and in the manual!

System overview

The product family PLATINblue consists of three chromatographic analysis systems in the ultra-high pressure range and for conventional HPLC applications.

HPG system

This system is suitable for applications using high-pressure gradients (HPG), and consists of the following modules:

- High-pressure pump with degasser module and pressure sensor
- High-pressure pump with mixing chamber and pressure sensor
- Photodiode array detector (PDA-1), alternatively a UV-Vis detector for up to 6 wavelengths (MW-1) or a mass spectrometer
- Autosampler for auto-injection with special injection valve (6/3-way valve)
- Column thermostat
- Columns kit

LPG system

This system is suitable for applications using low-pressure gradients (LPG), and consists of the following modules:

- Pump with mixing chamber and pressure sensor
- Manager including degasser module, quaternary LPG module, and digital-to-analog interface module
- Photodiode array detector (PDA-1), alternatively a UV-Vis detector for up to 6 wavelengths (MW-1) or a mass spectrometer
- Autosampler for auto-injection with special injection value (6/3-way valve), or manual valve with system bracket for installation
- Column thermostat
- Columns kit

System for isocratic analyses

The system can be used for chromatographic analysis without gradients.

Local area network and automatic configuration

The modules of the product family can be started up using the programs on the module touchscreens or using the chromatography software.

Special programs

Special touchscreen programs for operating the modules include:

- LAN configuration
- Flushing programs
- Wake-up program (WU = wake up)

Remote control In continuous operation, the modules are controlled via a local area network (LAN), using the remote mode of the chromatography software.

Pump head is automatically detected The pump automatically recognizes the pump head by means of the RFID chips.

Automatic configuration The modules connected in the local area network (LAN) are automatically recognized by the chromatography software, including their serial number, operating system and module name.

System status When used in a local area network (LAN), the system status of the modules can be verified by means of chromatography software.

Features

PLATINblue is a module system by KNAUER, for ultra-high performance liquid chromatography and conventional HPLC.

Advantages of the system

Advantages of the system as compared to conventional HPLC:

Higher separating capacity

- Higher separating capacity of columns
  - Columns with 1.8 µm particles have a smaller column volume than conventional HPLC columns
  - Separation of complex compounds
  - Faster separation of sample compounds, thanks to shorter retention times and higher flow rates, with no negative effect on resolution

Improved sensitivity

- Higher detection limits because narrower peaks result in better peak resolution, allowing for higher sensitivity.
- Potential for achieving faster gradients in UHPLC by tuning various system components.
- Potential for achieving highly accurate and reproducible flow rates using an electronic pulsation controller for selected solvents.

Shorter analysis times

- Shorter analysis times
  - Use of higher and more constant flow rates in columns < 2 µm through Van Deemter curve at same resolution
  - Reduction of solvent in use
- Shorter equilibration times that allow system to prepare more quickly for subsequent measurements
- Lower dead volume in system compared with conventional HPLC system

Faster modules

- Fast detectors with high data acquisition rates of 100 Hz (PDA-1 detector) and 200 Hz (UV-Vis detector MW-1)
- Autosampler with short cycle times of 15–30 s, short cleaning times and faster response times on injection valve

Higher pressures

- Design of entire system to account for existing back pressure of 1000 bar in front of column

Combination with mass spectrometers

- Like the HPLC, the system can also be combined with a mass spectrometer (LC-MS) and used for MS analyses.

Example: Rapid separation of steroids

Standard HPLC With standard HPLC methods, a total of approximately 25 minutes is required to analyze steroids.

UHPLC With UHPLC methods, a total of approximately 2 minutes is required to analyze steroids.

Legend

① Cortisone

② Corticosterone

③ Testosterone

④ Deoxycorticosterone

⑤ Norgestrel

⑥ Progesterone

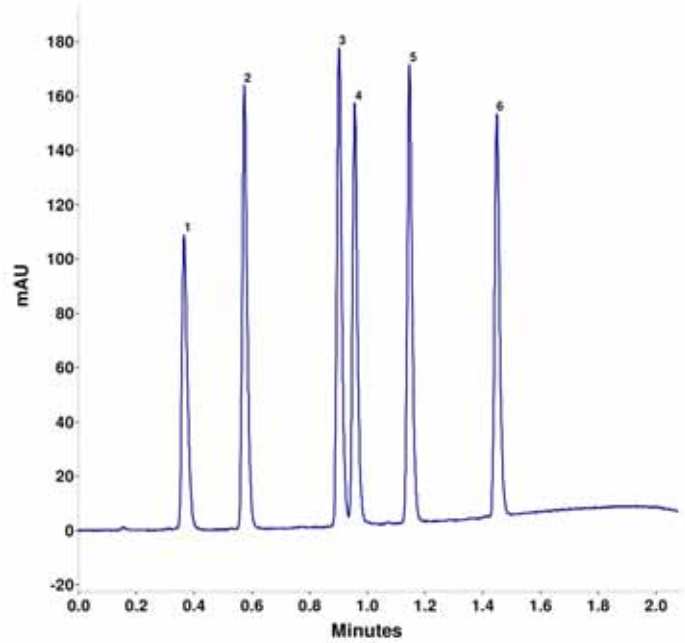


Fig. 1 UHPLC separation of steroids in less than two minutes

Sample method for separating steroids:

Parameters		Details
UHPLC column	BlueOrchid 50 x 2 mm	C18 1.8 µm
Solvents	A: H_2O + 0.1 % formic acid B: Acetonitrile + 0.1 % formic acid	-
Gradients	0–1.5 min 1.5–2 min	35–75 % B 75 % B
Flow rate	1 ml/min	-
Injection volume	1 µl	With autosampler AS-1, full loop
Column tempera- ture	30 °C	-
Detector	PDA-1, 254 nm, 100 Hz, 0.005 s	10 mm, 2 µl measuring cell
Pressure	approx. 650 bar	
Analysis time	2.00 min	

Flexible, thin, stainless steel capillaries and PEEK fittings

The thin, flexible, stainless steel capillaries are supplied ready-to-use in PVC sleeves.

- Thin, flexible, stainless steel capillaries
  - 0.12 mm inner diameter
  - 0.25 mm inner diameter for higher flow rates e. g. in conventional HPLC
  - 0.5 mm outer diameter
  - Flexible system setup
  - Lengths: 20, 35, 50 and 60 cm
- Disposable PEEK fittings
  - One-piece disposable polyetheretherketone fittings (PEEK) for easier installation of flexible, thin capillaries
  - Bolting torque: hand-screwed (approx. 0.5 Nm)

Gradient modes

HPG The gradient is formed on the high-pressure side of the pump (high-pressure gradient)

Legend

① HPG pump with degasser module and pressure sensor

② HPG pump with pressure sensor and mixing chamber

③ Mixing chamber for SmartMix

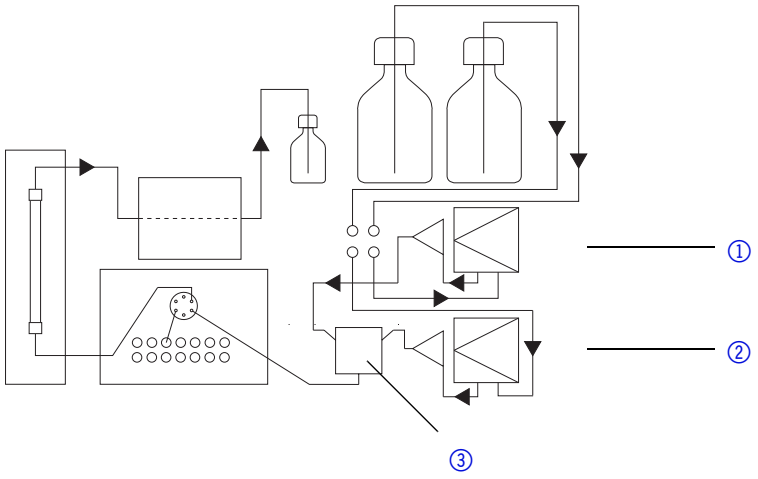


Fig. 2 Operating mode with high-pressure gradients

LPG The gradient is formed on the low-pressure side of the pump (low-pressure gradient)

Legend

① Manager with degasser and gradient module

② Pump with pressure sensor and mixing chamber

③ Mixing chamber for SmartMix

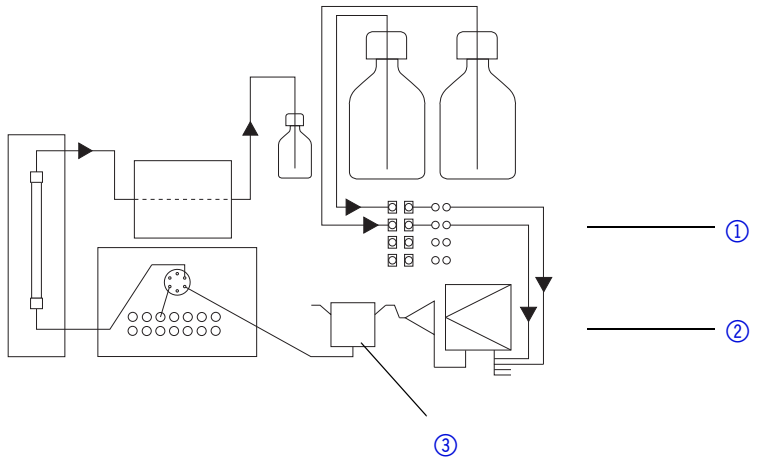


Fig. 3 Operating mode with low-pressure gradients

Isocratic

- The solvent composition is constant during the analysis
- The solvent can be recycled

Intended use

PLATINblue system

PLATINblue is suitable for high-pressure liquid chromatography. It is a measuring system for laboratory use, for analyzing compounds that can be dissolved in a solvent or solvent mixture. All system components are perfectly matched to fulfill the following requirements:

- Maximum pressure

5 ml pump head UHPLC	10 ml pump head HPLC
1000 bar (< 2 ml/min) 800 bar (> 2 ml/min and < 5 ml/min)	750 bar (< 5 ml/min) 400 bar (> 5 ml/min and > 10 ml/min)

- Dead volume of 15 µl with thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm and 115 µl with SmartMix mixing chamber
- Autosampler with injection rates of 15 s or < 60 s with flushing
  - Cooler box that blocks light for thermally instable and/or optically active substances
- High-resolution peaks with high data rates for UV-Vis detectors
  - Up to 200 Hz when using a MW-1 detector
  - Up to 100 Hz when using the PDA-1 detector for wavelengths of 190–1000 nm (UV-Vis)

Laboratory use

- Biochemistry analyses
- Chiral analyses
- Food analyses
- Pharmaceutical analyses
- Environmental analyses

LC-MS coupling

The system can be combined with a mass spectrometer as the detector.

Room ventilation, AC system, sunlight

Always use the system in rooms that are well-ventilated and preferably equipped with an air-conditioning system. Set up the system so that it is protected against exposure to direct sunlight.

Checking intended use

Only use the system for applications that fall within the range of the intended use. Else the protective and safety equipment of the device could fail.

Operating the system

The system can be operated using the chromatography software at the workstation or using the various touchscreens on the modules.

KNAUER workstation or client/server system

- Automatic configuration of devices in system
- Programmable methods for the system
- In order to control all functions, the analytical system requires chromatography software.
  - KNAUER ChromGate®
  - XCalibur®
  - Chromeleon®

Module touchscreens

- LAN configuration (local area network)
- Wake-up program
- GLP data
- Setting the module parameters without chromatography software

Where is it prohibited to use the system?

DANGER! Explosion hazard, if the device is used in potentially explosive atmospheres without appropriate protective equipment! Let specialists carry out protective measures.

Safety

Autosampler

The speed of the auto-injection valve has been increased to fulfill the requirements of ultra-high pressure liquid chromatography. However, be aware that the high speed of the auto-injection valve can cause physical injuries when handled inappropriately!

Use of autosampler

Always operate the autosampler with its front door closed!

CAUTION! Personal injuries can occur when the front panel is open or has been removed. Always operate the autosampler with its front panel closed.

Detectors

DANGER! High-voltage hazard caused by the deuterium lamp!
Only authorized service technicians are allowed to replace the lamp.

Thermostat

WARNING! Back injuries while lifting or carrying the device caused by its heavy weight.
To avoid injuries, you should ask a second person for help.

Technical literature

Technical literature on liquid chromatography:

- Troubleshooting in der HPLC, N. Vonk et al, Birkhäuser Verlag, Basel
- HPLC: A Practical User's Guide, M. McMaster, J. Wiley and Sons, Somerset, US distribution center
- Practical HPLC Method Development, L. R. Snyder, J. L. Glajch, J. Wiley and Sons, Somerset, US distribution center
- High Performance Liquid Chromatography, P. R. Brown, R. A. Hartwick, Edinburgh University Press, Edinburgh

Thin, flexible, stainless steel capillaries for UHPLC

Back pressures as high as 1000 bar can develop in the UHPLC system. As a result, the stainless steel capillaries can work them-

selves loose in the screw fittings. There is a risk of being stabbed or cut when working with the thin, flexible stainless steel capillaries. The thin, sharp, flexible stainless steel capillaries are difficult to see against the light.

Wear safety glasses Wear safety glasses to prevent eye injuries!

Lab regulations

Observe the laboratory regulations

- Observe national and international regulations on laboratory work!
- Good Laboratory Practice (GLP) of the American Food & Drug Administration
- For development of methods and validation of modules: Protocol for the Adoption of Analytical Methods in the Clinical Chemistry Laboratory, American Journal of Medical Technology, 44, 1, pages 30–37 (1978)
- On the Internet: Accident prevention regulations published by the accident insurance companies for laboratory work

Solvents

Note Even small quantities of other substances, such as additives, modifiers, or salts can influence the durability of the materials. The list of selected solvents was compiled based on research in the pertinent literature and is only a recommendation by the manufacturer. If there is any doubt, contact the technical support department of the manufacturer.

Solvent tray To avoid damage from leaks, always place solvent bottles in a solvent tray on the device.

Ultra-pure solvents The UHPLC requires filtered and ultra-pure solvents labeled ‘gradient grade’ or ‘hypergrade’.

Toxicity Organic solvents are toxic above a certain concentration. Ensure that work areas are always well-ventilated! Wear protective gloves and safety glasses when working on the device!

Combustibility Organic solvents are highly flammable. Since capillaries can detach from their screw fittings and allow solvent to escape, it is prohibited to have any open flames near the system

Flammability Organic solvents are highly flammable.
Since capillaries can detach from their screw fittings and allow solvent to escape, it is prohibited to have any open flames near the analytical system!

Leaks and clogged capillaries Regularly check for leaks and clogged capillaries – test back pressure without column!

Suitable solvents Solvents suitable for use in HPLC:

- Acetone
- Acetonitrile
- Benzene

- Chloroform, at 25 °C
- Acetic acid (10–50%), at 25 °C (77 °F)
- Ethyl acetate
- Ethanol
- Hexane/heptane
- Isopropanol
- Methanol
- Phosphoric acid
- Toluol
- Water

Unsuitable solvents

- The following solvents can attack the components of the pump and are therefore not suitable:
- Mineral and organic acids (except in buffer solutions)
- Bases (except in buffer solutions)
- Liquids containing particles

Suitable to only a limited extend

Substances that are suitable to only a limited extend for use in the HPLC:

- Methylene chloride
- Tetrahydrofuran (THF)
- Dimethyl sulfoxide (DMSO)
- Sightly volatile solvents
- Fluorinated hydrocarbons

Self-ignition point

Only use solvents that have a self-ignition point higher than 150 °C under normal ambient conditions!

Protective measures

You are only permitted to perform the maintenance tasks described in this manual. All other maintenance tasks are to be performed exclusively by KNAUER or a company authorized by KNAUER.

Without exception, the following applies to all maintenance tasks that can be performed by the user: Switch off the module; pull the power plug! Never open a module! The high-voltage components in the modules pose a lethal hazard!

Fuses

If the fuses blow repeatedly, consult with KNAUER Technical Support for replacements and help in identifying the cause.

Note

The T-1 thermostat is also equipped:

- With a temperature fuse. In case of a malfunction, the power is cut off.
- With a leak sensor. If liquid escapes from the thermostat, the thermostat module is switched off. The sensitivity of the leak

sensor can be adjusted. A warning symbol is shown on the touchscreen.

- With a microswitch on the door. If the door of the column thermostat is opened, the fan and the heating of the column thermostat are switched off automatically. A warning symbol is shown on the touchscreen.

Power supply and connection

The modules are equipped with universal AC/DC switching power supplies rated for 100-240 V AC. Ground the power connection according to the pertinent regulations! Use a three-conductor line cord! Switch off the module and pull the power plug to completely isolate it from the supply voltage.

UV light

Danger to the human eye

UV fiberoptics bundles the UV light. This poses a potential danger to the cornea and lens of the human eye. Turn off the device when working on the flow cells to avoid looking directly into the light path of the bundled UV light.

Ozone formation

UV light can generate ozone out of oxygen at a wavelength smaller than 180 nm. All detectors use safety glass, and are constructed to prevent UV light from escaping and creating ozone inside the device.

Target group

To what should the user pay particular attention?

To make your HPLC separations as efficient as possible, pay close attention to the following:

Avoiding additional dead volumes

- Once they have been used, never re-use capillaries in other areas of the HPLC system.
- Only use a given PEEK fitting for one specific port and never re-use it for other ports. Always install new PEEK fittings on each separate port.

Using special columns

When using special columns, obey the manufacturer's instructions on caring for the columns!

Using filtered solvents

- Use ultra-pure, filtered solvents for HPLC – gradient grade
- Filtration of substances under analysis
- Use of inline filters

Devices are to be opened by the technical service department only

Only allow the technical service department of the manufacturer or a company authorized by the manufacturer to open the devices for maintenance and repair work.

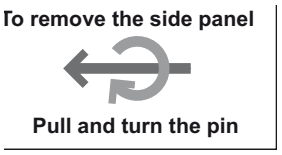
What expertise should users have to safely operate a HPLC device?

- Completed degree as chemical laboratory technician or comparable vocational training
- Fundamental knowledge of liquid chromatography
- Participation in an installation of the system performed by the manufacturer or a company authorized by the manufacturer, or suitable training on the system and chromatography software
- Basic knowledge of Microsoft Windows®
- Knowledge regarding substances that are suitable only to a limited extent for use in liquid chromatography

Symbols and labels

Explanations of the symbols and labels on the system

	Symbol	Meaning
Conformity labels	CE	CE (Conformité Européenne) mark for equipment that complies with the pertinent EU directives and comes with a declaration of conformity from the manufacturer.
	C 1	Marking for devices that comply with the Canadian requirements for laboratory equipment: CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version.
	TÜV Rheinland c us	Testing seals in Canada and the USA at nationally recognized testing centers (NRTL). The certified device or system has successfully passed the quality and security tests.
Warning signs		Hazard warning for the inner part of the UV-Vis or PDA detectors: danger of burns caused by hot deuterium or halogen lamps.
		For your own safety, read the manual and observe the warnings and safety information on the device and in the manual.
		Leak hazard
		Open door hazard
		Hot surface hazard
		Heavy weight hazard

	Stabbing hazard
	Electrostatic discharge hazard
	Hazard generated by materials and substances
	High voltage hazard
	Stabbing hazard
Mandatory signs 	Wear protective gloves.
General signs ▲	Flow direction symbol for piston back-flushing: inlet to waste pump
▼	Flow direction symbol for piston back-flushing: outlet to pump head
	Symbol indicating flow direction through a column
	Symbol for quick-release fastener used to open side panel on PDA-1 or MW-1 detector

Installation

Packaging and transport

At the factory, the devices are carefully and safely packed into special aluminum shipping boxes.

Checking for signs of damage during transport

Check the devices for signs of damage during transport. If the shipment is incomplete or damaged, inform the manufacturing factory within three work days. Also inform the freight carrier about any transport damage.

All individual devices, except the autosampler, can be carried by one person.

Carrying the modules

To lift and carry a module, hold it by its sides near the front panel.

Note

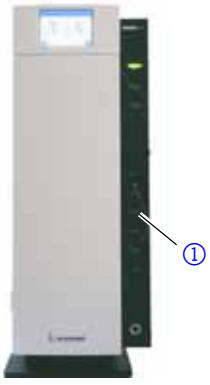
Together with the cooling option, the autosampler weighs approx. 18 kg without packaging. Therefore we recommend getting a second person to assist when transporting and setting up the autosampler.

Carrying the device

WARNING! Back injuries while lifting or carrying the device caused by its heavy weight.
To avoid injuries, you should ask a second person for help.

- The column thermostat with valves weighs approx. 24 kg in total, without packaging.
- Together with the cooling option, the autosampler weighs approx. 18 kg without packaging.

ATTENTION! Damage to the door hinges of the door sensor.
Do not lift the device by the door!
To life and carry a device, hold it by its sides near the front panel. For thermostats, always carry the device by the front support frame ①.



Fastening material and shipping boxes

In the aluminum shipping box, the devices are fastened and protected by foam inserts at the top and bottom. If possible, retain the aluminum shipping box and foam inserts for future use.

Removing the fastening material

Remove the foam insert on the top of the module

Removing device from packaging

Grip the device at its sides, near the front panel, and take it out of the packaging.

Protective film on touchscreen

During transport, a protective film prevents scratches to the touchscreen.

Removing the protective film

Remove the protective film from the touchscreen.

Scope of delivery

HPG system

Pumps

- Pump P-1 with degasser module
- Pump P-1 with mixing chamber

UV-Vis detectors

- Photodiode array detector PDA-1
- Multiple wavelength detector MW-1

Column thermostat

- T-1 Basic column thermostat
- T-1 column thermostat touchscreen and valves, for connecting multiple separating columns, with RFID for up to 6 separating columns (UHPLC)
- T-1 column thermostat without touchscreen, without valves, for connecting one separating column (HPLC plus)

Valves supported by the software

Supported valves in the T-1 with touchscreen

The variant of the T-w with a touchscreen is delivered with two multiposition valves.

In the T-1 column thermostat, multiposition valves are always installed in pairs. The following valves are supported by the T-1 column thermostat software:

Multiposition valves	2 position valves
With 6 valve positions	With 6 valve positions
With 8 valve positions	With 8 valve positions
With 10 valve positions	With 10 valve positions

Note

You can find out about other combination options of valves and upgrade kits by contacting the manufacturer technical support.

Column kit

- Column kit for UHPLC
- Column kit for HPLC

Autosampler

- Autosampler AS-1

KNAUER chromatography workstation

- LAN configuration with Ethernet-capable router
- Operating system: Windows® XP™ Professional (recommended) or Windows® 7™
- Chromatography software
- KNAUER ChromGate® for PLATINblue

Chromatography software

- KNAUER ChromGate® for PLATINblue

Accessories

- Cables
  - Power supply cables for the modules
  - LAN cables for the modules
  - RS-232 port cable
  - Connector cable for the integrator output
- Fastening system
  - KNAUER KIT for installing measuring cell/mixing chamber
  - Capillary KIT and PEEK screw fittings
  - WAGO plug connector for remote control and reception of trigger signals
- Union 1/32" incl. ferrules for 0.5 nn OD
- Tools
- CD with maintenance software (service tool)
- Manual

Note Only use original parts and accessories made by the manufacturer or a company authorized by the manufacturer.

Checking the scope of supply

1. Check whether the supplied modules and accessories are complete.
2. If anything is missing, consult with KNAUER Technical Support.

Commissioning of the PLATINblue system

The system is set up, installed and commissioned by KNAUER or a company authorized and contracted by KNAUER.

Practical Tip KNAUER recommends that future users are present during setup and commissioning of the module, to familiarize themselves with the system and its handling.

Space required for system

- Laboratory table with adequate load capacity
  - approx. 95 kg (including safety margin but without mass spectrometer)
- Laboratory table for safe and comfortable working
  - Analysis system plus workstation, flat screen monitor and router, W x H x D: approx. 150 x 95 x 70 cm
  - Ventilation: At least 30 cm clearance around the system

Note Make sure that the power plug on the rear of the device is always accessible, so that the device can be disconnected from the power supply.

Installation site

Ambient conditions of the installation site

- Air humidity: below 90% (non-condensing)
- Temperature range: 4–40 °C; 39.2–104 °F
- Sunlight: Set up the system so that it is protected against exposure to direct sunlight.

Power supply and line voltage

The modules are equipped with universal AC/DC switching power supplies rated for 100-240 V AC. The modules can be switched on or off using the ON/OFF switch on their rear panel.

DANGER! Electric shock hazard caused by an improperly grounded power connection.
Ground the power connection according to the pertinent regulations!
Use a three-conductor line cord!
Switch off the module and pull the power plug to completely isolate it from the supply voltage.

Installation of HPG system

The HPG system for operating with gradients on the high-pressure side of the pump consists of the following modules:

Overview of the HPG system

Legend

① Solvent tray

② HPG pump with degasser module and pressure sensor

③ HPG pump with HPG mixing chamber and pressure sensor

④ PDA-1 detector or MW-1 detector

⑤ Autosampler

⑥ Column thermostat and column

⑦ Workstation with chromatography software

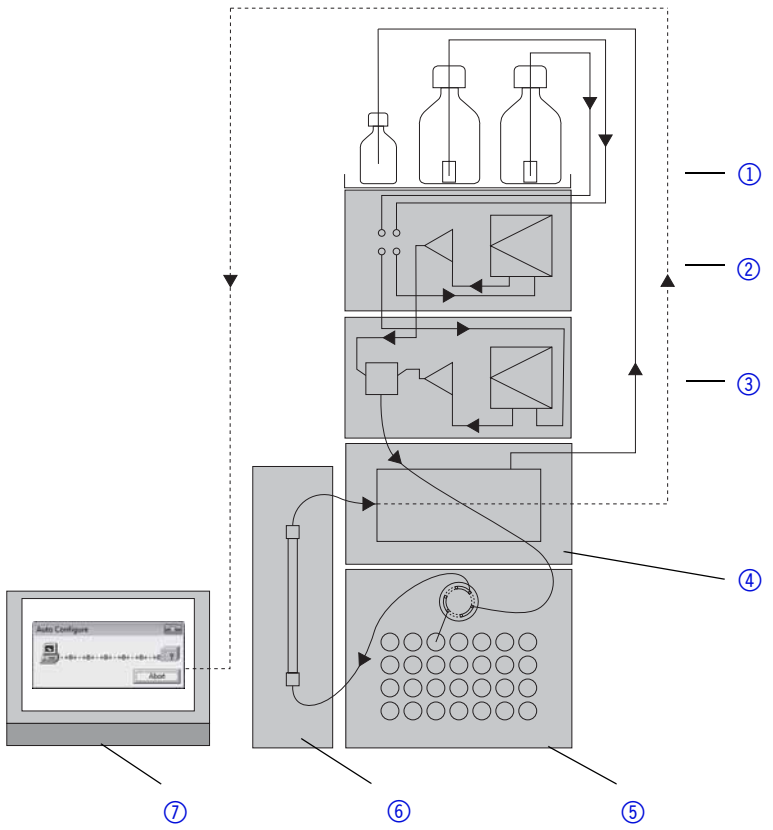


Fig. 4 PLATINblue system in HPG operating mode with recommended installation of capillaries

Pumps

- Pump for gradients, with degasser module
- Pump for gradients, with integrated mixing chamber
  - Active pressure and pulsation control
  - Pump head with RFID chip for automatic pump head detection (GLP) for pumps
  - Automatic configuration within the LAN
  - Automatic transmission of the RFID pump head data to the chromatography software
  - Automatic archiving of the RFID pump head data, compliant with good laboratory practice (GLP)
  - Entry of solvent compressibility into KNAUER ChromGate® software

Detectors

- PDA-1 photodiode array detector for the UV-Vis range from 190–1000 nm
  - Deuterium or halogen lamp
  - Full resolution, with 1024-pixel photodiode line
  - Low noise and drift during flow
  - 100 Hz for full spectrum acquisition; preset method duration: 10 minutes, to limit the amount of data to be saved on the hard disk
  - Automatic configuration within the LAN
- UV-Vis detector MW-1 for UV-Vis range of 190–900 nm
  - Faster switching between up to 6 different wavelengths
  - Measuring cells
  - Low noise and drift during flow
  - 200 Hz
  - Automatic configuration within the LAN
- Mass spectrometer
  - MSQ plus MS detector
  - Ionization: ESI or APCI
  - Mass range 17 - 20000 Da
  - Software Xcalibur™

Column thermostats

- T-1 column thermostats for the 5–80 °C temperature range
- *T-1 Basic* column thermostat for the 5–85 °C temperature range

UHPLC column kit

BlueOrchid® Reversed Phase

1.8 µm, 50 x 2 mm	C18, C8, C18 A	A66050
1.8 µm, 100 x 2 mm	C18, C8, C18 A	A66100
1.8 µm, 100 x 2 mm	Phenyl, PFP, C4	A66100S

Bluespher® Reversed Phase

2 µm, 50 x 2 mm	C18, C8, C18 A	A66050BS
2 µm, 100 x 2 mm	C18, C8, C18 A	A66100BS

HPLC plus column kit

Eurospher II®
Reversed Phase

3 µm, 100 x 3 mm ID	A0934
3 µm, 150 x 4 mm ID	A0937-1

Autosampler

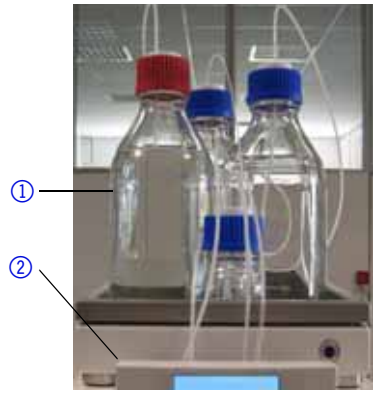
- Autosampler AS-1 for automatic injection from microtiter plates and sample vials
- Automatic configuration within the LAN
- Cooling for sample rack

Accessories

- ET-1 stainless steel tray for safely storing the solvent supply bottles, referred to as “solvent tray”
- Ethernet router for connecting to a LAN

Overview of individual modules in HPG system

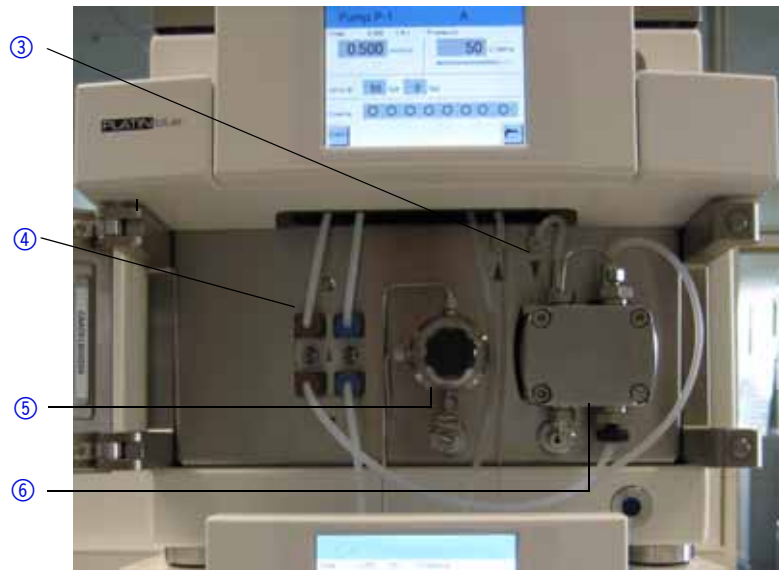
The modules are listed in the order of the capillary connections, from the top to bottom:



Legend

Solvent tray ② with solvent bottles ①, waste bottle, flushing bottle for the piston back-flushing

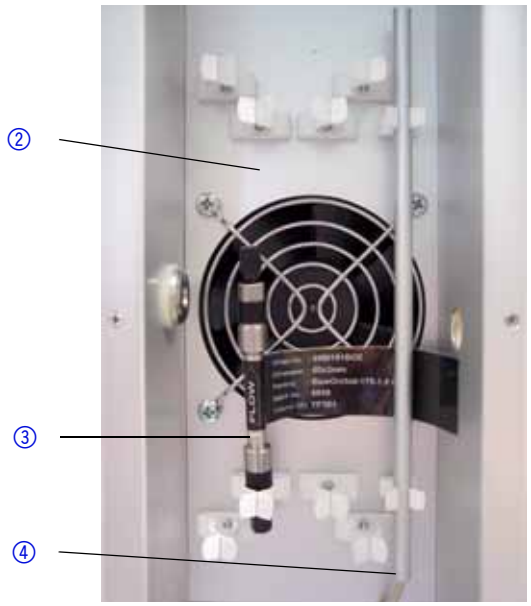
HPC pump P-1 with piston backflushing ③, degasser module for solvent ④, pressure sensor with venting valve ⑤ and pump head ⑥



HPG pump P-1 with HPG mixing chamber ⑦, pressure sensor, venting valve and pump head

Autosampler AS-1 ① with interior retractable door;
Injection valve,
see S. 52

Column thermostat ② with column ③ and thermosensor ④



PDA-1 detector ⑤ with PEEK connectors ⑥ on optical cell for thin, flexible, stainless steel capillaries

Installation diagram

To keep the thin, flexible, stainless steel capillary connections and other tube connections as short as possible, arrange the modules in the correct order!

Vertical HPG system

Lift the pump and degasser module (4) – preferably with two persons – and position it.

Legend

① Column thermostat

② Autosampler

③ Solvent tray

④ Pump with degasser module

⑤ Pump with mixing chamber

⑥ PDA-1 detector

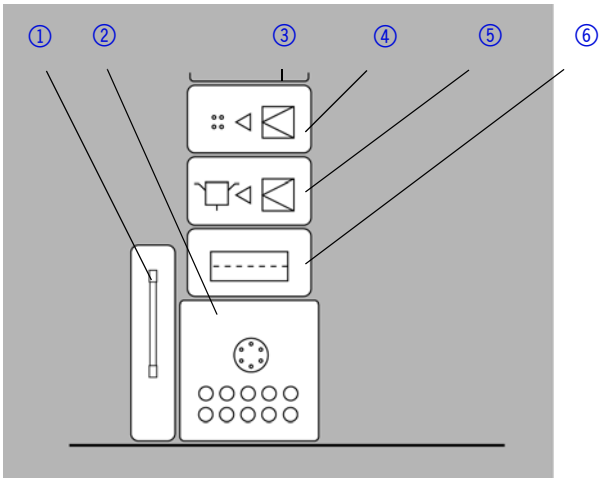


Fig. 5 Vertical HPG system without PC

Horizontal HPG system

Legend

① Column thermostat

② Autosampler

③ PDA-1 detector

④ Solvent tray

⑤ Pump with degasser module

⑥ Pump with mixing chamber

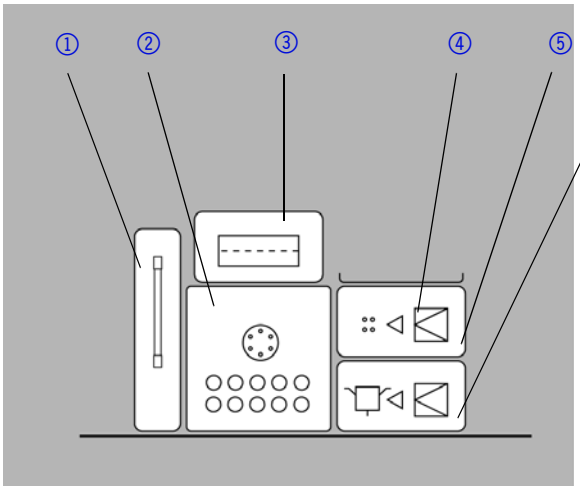


Fig. 6 Horizontal HPG system without PC

Installation requirements

Using a multi-outlet power strip

Use a laboratory table equipped with a multi-outlet power strip with on/off switch and rotated outlets to connect all modules to a single power strip.

Connecting to power supply

Connecting power to modules

Rear panel

The electrical connections are located at the rear of the modules.

Power connection

Automatic setting

The modules are equipped with a universal AC/DC switching power supply for a voltage range of 100-240 V AC. The universal AC/DC switching power supply automatically selects the correct supply voltage.

Connecting to a local area network (LAN)

Setting up a workstation, analysis system and router to create a local area network (LAN)

Overview

The following steps are required for setting up a local area network:

- Connect the cables of the modules in the local area network.
  - Check default Internet and server settings in Windows®
  - What steps need to be taken when a chromatography PC other than the KNAUER workstation is used?
- Configure router using Web server
- Check LAN settings on the system
- Switch on the module and start the chromatography software
  - Run automatic system configuration
  - Remote control of system by means of chromatography software

Local area network (LAN) and HPG system

Automatic configuration uses LAN

The HPG system requires the LAN configuration and control by the chromatography software for full functionality. In the LAN, the automatic configuration function of the chromatography software recognizes the serial number, the operating system and the module name.

Practical Tip

KNAUER recommends operating the system separately from the company network.

Remote control

The analysis system, workstation and router are interconnected to form a LAN. Once the router has assigned IP addresses to all modules, the chromatography software can be used to remotely control the system.

Network connection

The network connections are located at the rear of the modules.

Cable layout of the network equipment

Legend

① LAN connection from modules to router

② LAN connection of router

③ KNAUER Chromatography workstation: LAN connection on router

④ Internet connection/ company network

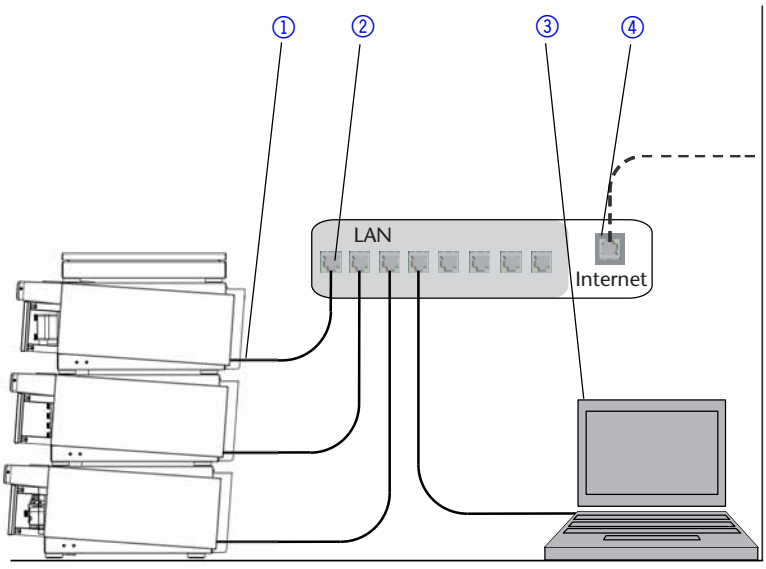


Fig. 7 Connection from modules to router

Connecting the local network

1. Set up and cable the local area network (LAN) as shown in fig. 7. Create a local network by using network cables to connect the LAN port of the workstation with the LAN ports on the various modules.
2. Check the Internet settings in Windows®. The local area network should contain only one server (normally your router) and automatically obtain the IP address from the router.

Note Do not confuse the local network ports with similarly labeled ports on routers from other manufacturers, such as Internet ports, WAN (wide-area network) ports or ports for other communication networks in your building.

Power-saving functions and hibernate mode

If you want to run the chromatography software on a different PC (i.e., other than the KNAUER workstation), observe the following:

Chromatography PC other than KNAUER workstation

1. Switch off power-save functions, hibernate mode and standby features in Windows®
2. Do not use a screensaver
3. Use a dedicated graphics card with at least 64 MB RAM
4. Check LAN connection and Internet settings in Windows®
5. Install sufficient hard drive memory to record large amounts of data with a photodiode array detector

Checking the Internet and server settings

The Internet protocol settings for the IP address and DNS server can be found in the Ethernet card properties (LAN connection) in Windows®.

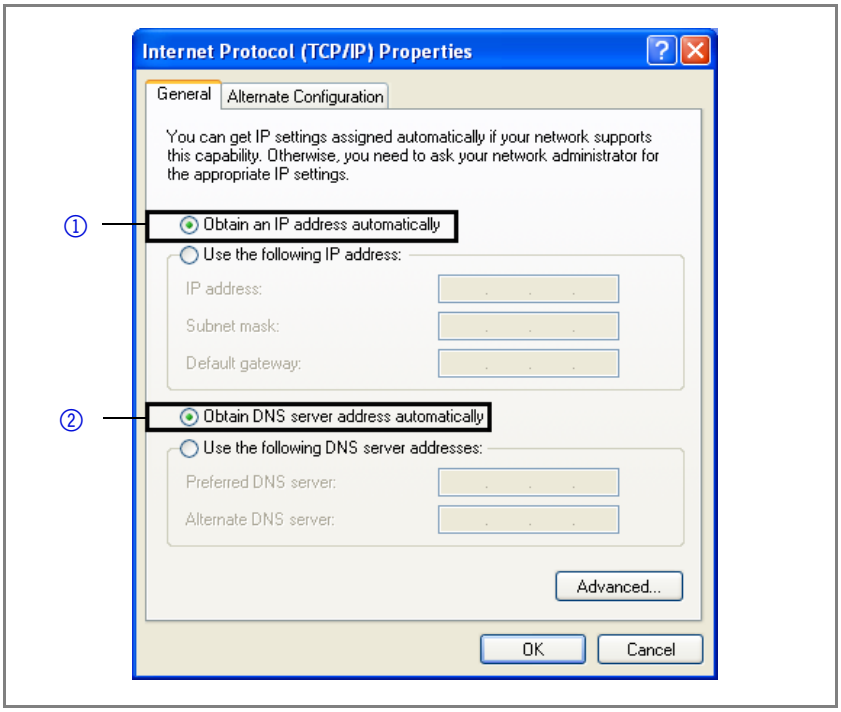
Checking Internet settings in Windows®

1. Select *Start⇒Control Panel*
2. Double-click *Network Connections* to open it
3. Double-click to open *LAN connection*
4. Select *Properties*
5. Select *Internet Protocol (TCP/IP)*
6. Click *[Properties]*. On the *General* tab, check the settings. The correct settings for the DHCP client are:
   a) *Obtain an IP address automatically*
   b) *Obtain DNS server address automatically*

Legend

① Automatic IP address

② Automatic DNS server address



Configuring the router using a Web server

Router

The router automatically detects the IP address of the company network or the Internet. It is configured using the router's Web server and therefore no software needs to be installed.

Analysis system

You have to set the IP address of the system and LAN address range manually.

Configuring the LAN

Checking the IP address and Setting the address range

The local area network settings are made during the configuration by KNAUER or a company authorized by KNAUER:

1. Manually enter the IP addresses into the LAN setup while making sure that these do not overlap with other IP addresses such as 172.16.5.1
2. Configure the router as DHCP server

3. Configure the address range of the DHCP server in the LAN so that it does not overlap with other networks, e.g.,172.16.5.2 - 254

Automatic restart of router

4. Transfer the modified basic router settings and the advanced LAN settings to the router by using *[Apply]*. The router restarts automatically. The chromatography workstation is automatically assigned an IP address from the specified address range.

What happens after you switch on the router?

After connecting the modules, you can switch on the system. The LEDs on the front panel of the router indicates whether the modules are ready for operation.

- The standby LED is lit
- The test mode LED is lit and goes out after approx. 1 minute
- The LEDs of the initialized modules are lit

LAN settings on analytical system

Before configuring the system automatically with the chromatography software, first make sure that the modules have logged in correctly to the LAN. In each module's LAN settings, check the IP address that has been assigned by the router.

Checking the IP address

Go to *Setup⇒Network* in the menu. The following settings are shown:

Legend

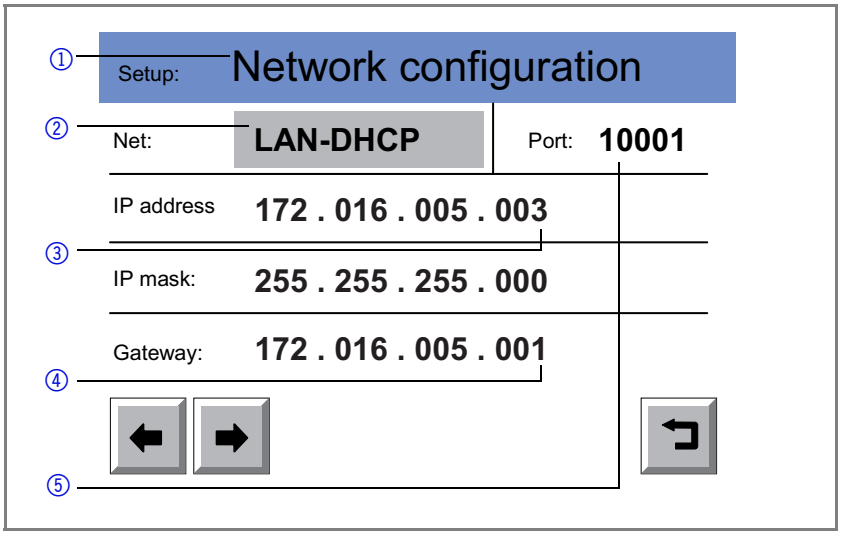
① Network settings

② Local computer network with automatic configuration

③ IP address, starting with 172

④ IP address of router

⑤ Internet address of LAN port



Port in local area network

What is a port?

Network-compatible KNAUER modules receive internal port addresses for the local area network. At the factory, the port is preset to 10001 and is used to identify the various modules. Several KNAUER systems can be operated together in a LAN and identified using different ports.

Changing the port

How do I change the port for the system?

Using identical ports Use identical ports for each of the modules in the system.

Note To automatically configure all of the modules, the chromatography software requires identical ports.

Configuration menu and password If there are technical problems with the router configuration, the network administrator can use an Internet browser to open the configuration menu and log in:

User name: admin

Password: password

What if the local area network (LAN) does not function properly?

If the system is not communicating properly with the router and chromatography workstation, check the following:

1. Check the status of the LAN connection in the Windows taskbar
2. Check the router configuration
3. Disconnect the chromatography workstation from the company network for test purposes
4. Check whether the chromatography software is correctly controlling the system. If it is working properly, *Remote* will appear in the status bar. If the module name appears in the status bar (e.g., *PDA-1 Detector*), this indicates that the chromatography software has not correctly detected this module
5. Check the LAN-DHCP settings for the modules
6. Switch the modules off and turn them back on
7. Repeat automatic configuration in the chromatography software
8. Replace the network cable

Connecting additional modules to the system

External devices Third-party analog modules that output the measurement signal as a voltage can be connected to the RS-232 (EIA-232) port and then connected to the system via an A/D converter (like the one integrated in Manager M-1). In this way, data can be transferred to the chromatography software.

RS-232 In RS232 mode, only the basic functionality is available.

Integrator The integrator refers to the two analog signal outputs of the detector.

Remote and event control Connections for remote and event control are located on the rear panels of the pump, the detector and the column thermostat, with the following functions:

- Connections for events
- START OUT
- START IN and ERROR IN

GJC flow sensor This flow meter, which is required for validating the measuring results, is automatically installed by the software.

Terminal strip: event and remote control of the T-1 column thermostat

The electric terminal strip for event and remote control on the pack of the T-1 is used to exchange start, control and error signals with other devices.

The connections have the following functions:

Connection	Function
EVENT 1–3	Connection of external devices for remote control
START IN	Column thermostat waits for a trigger signal from an external device to start. The column thermostat itself is not controlled. Only the on/off function is active.
ERROR IN	In case of an error signal from an internal device, the column thermostat stops operation.
ERROR OUT	In case of a malfunction, the column thermostat sends a signal to an external device.
+5 V	Provides a voltage of 5 V with respect to GND. This makes it possible to supply a consumer that is switched by an EVENT.
+24 V Valve	Event-controlled switching of 24 V against GND.
GND	Reference point of the voltage at the signal inputs.

Integrating the system into your company's network

To integrate the system into your company's network, we recommend the following:

Assigning permanent IP addresses Assign fixed IP addresses to the modules and enter each address into each module's touchscreen.

Solvent connection

Overview of fluid transport through the system

Layout for capillaries

In UHPLC, one distinguishes between thin, flexible capillaries and firm capillaries. The reason for this is that thin, flexible capillaries with low dead volume have a decisive effect on the analysis results.

Legend

① From solvent to pump 1 with degasser module

② From pump 1 to mixing chamber of pump 2

③ From pump 2 to autosampler

④ From autosampler to column in column thermostat

⑤ From column to detector

⑥ From detector to waste bottle

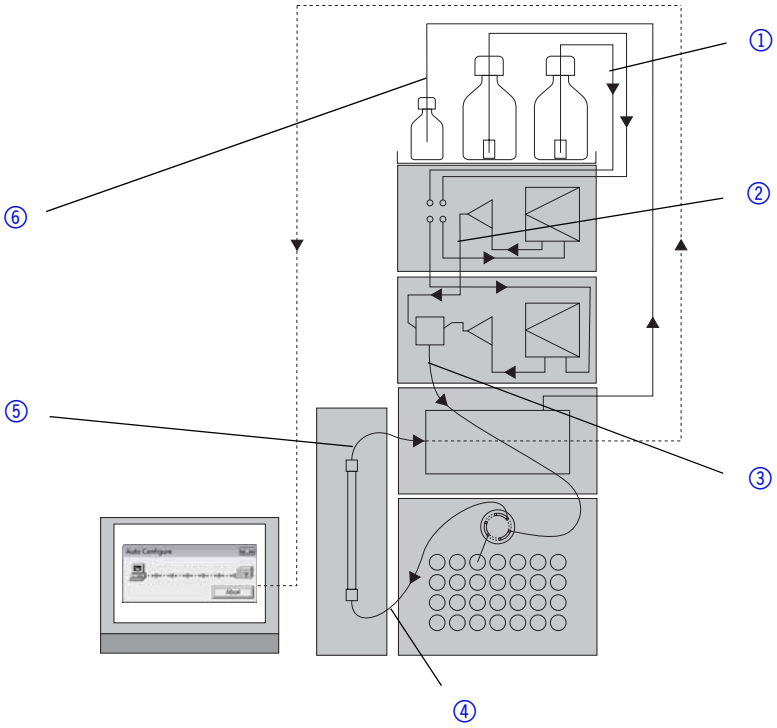


Fig. 8 Layout for capillaries

Details on stainless-steel capillaries in HPG system

Minimum requirements for UHPLC applying to use of thin, flexible capillaries.

Legend

① Thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm from column to detector

② Thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm from port 1 of autosampler to column

③ Thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm from mixing chamber of pump 2 to port 6 of autosampler

④ Thin, flexible, stainless steel capillaries with an inner diameter 0.25 mm from detector to waste bottle

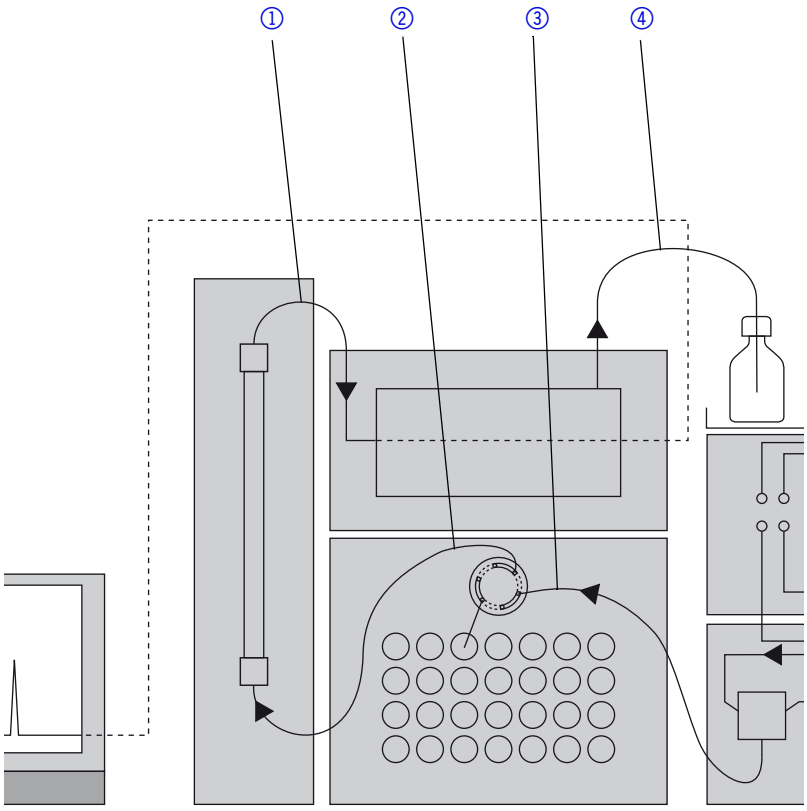


Fig. 9 Excerpt from capillary layout for HPG system

Thin, flexible, stainless steel capillaries

Short, thin and flexible capillaries are one of the requirements for minimizing the dead volume in UHPLC systems.

Details

- 0.12 mm
- Pre-cut lengths: 20, 35, 50 and 60 cm
- Tested quality

Note Flexible, thin, stainless steel capillaries with an inner diameter of 0.12 mm for use in UHPLC must never be cut to length by hand. This can otherwise impair throughput and the high back pressures of up to 1000 bar.

Practical Tip Connect the thin, flexible, stainless steel capillaries to the system in a step-by-step manner and flush them with solvent to check for throughput and leaks.

Capillaries, tubing and tools

Materials

Material	Explanations
Silicon tubing material	Suitable for conducting solvent to the waste bottles; from the flushing bottle to the piston backflushing of the pump
PTFE tube material	From the solvent bottle to degasser module, from degasser module to pump 1, from outlet of pump 1 to inlet of pump 2
Permanently installed stainless steel capillaries	From pump to module, from module to pressure sensor, from pressure sensor to mixing chamber
Thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm	From mixing chamber outlet to autosampler inlet, from autosampler output to column, from column to detector
Flexible stainless steel capillaries with larger diameter of 0.25 mm	From detector to waste bottle: hard tubing is pushed over the end of the flexible capillaries to fasten them securely to the waste bottle

Tools

Tools	Explanations
Small pliers	Using small pliers, push the thin, flexible, stainless steel capillaries through the PEEK fittings.
Wrench	Set of wrenches: 1/4" for PEEK fittings 10 mm 13 mm
Allen key	Set of Allen keys

On the front panel

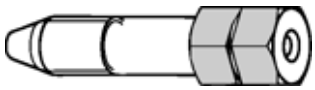
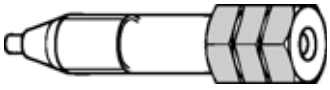
To make sure that none of the connections are forgotten or switched around, connect the capillaries and tubing to the modules in the sequence that the solvent is to flow through the system.

Modules	Explanations
Connect solvent bottle 1 to pump	Attach tube material for solvent 1 to degasser module of pump
Connect the pump to the mixing chamber	1/16" stainless steel capillaries

Modules	Explanations
Connect the mixing chamber with the autosampler	Thin, flexible, stainless steel capillaries with PEEK fitting P3860 at port 6 of 6/3-way valve
Connect the autosampler to the column in the column thermostat	Thin, flexible, stainless steel capillaries with PEEK fitting at port 1 of 6/3-way valve
Connect the column to the detector	Thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm
Connect the detector to the waste bottle	Stainless steel capillaries with an inner diameter of 0.25 mm plus silicon tubing

PEEK fitting

Variants The PEEK fittings are disposable. Four versions are available:

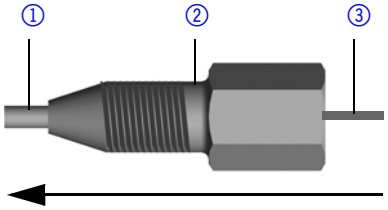
Figure	Type	Explanation
	P3860 with short head	PEEK fitting P3860 with short head for fastening to columns
	P3860V1 with long head	PEEK fitting P3860V1 with long head, particularly suitable for fastening to valves and measuring valves of MW-1 detector
	P3860V2 with long head but without tip	PEEK fitting P3860V2 with long head but without tip for fastening to output of measuring cell on PDA-1 detector
	P3860V3 with long head and shortened tip	PEEK fitting P3860V3 with long head and shortened tip for fastening to input of measuring cell on PDA-1 detector

Note The PEEK fitting for the output of the measuring cell on the PDA-1 detector is specially marked.

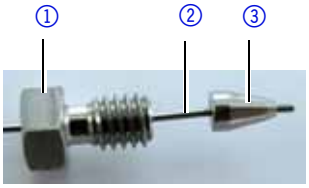
Insert the capillary into the PEEK fitting

Note Be sure to handle the thin, flexible stainless steel capillaries very carefully. The slightest amount of permanent bending or deformation will prevent them from fitting into the tip of the PEEK fit-

ting. Make sure that the ends of the capillaries do not protrude out of the tip of the PEEK fitting and are instead flush.

Steps	Figure
1. Carefully insert the end of the thin, flexible, stainless steel capillary ③ into the PEEK screw fitting ② until you feel resistance. 2. Gently press the end of the thin, flexible, stainless steel capillary into the tip of PEEK screw fitting ① until it is flush with the fitting.	 **Fig. 10 PEEK fitting P3860**

Connecting the stainless steel capillary

	Figure
1. Push the fitting ① onto the thin, flexible stainless steel capillary ② . 2. Push the thin, flexible stainless steel capillary onto the clamping ring ③ .	 **Fig. 11 Stainless steel capillary with clamping ring and screw fitting**

Pumps

Pump heads

Two pump head versions are available for the HPG system:

- 5 ml
- 10 ml

Special pump heads for UHPLC and HPLC plus

In the UHPLC and HPLC plus pump heads, the mechanical piston components have been manufactured with a high level of precision. This results in very stable and low-wear piston movements. The HPG pump heads have the following characteristics:

- More stable and faster gradient formation
- Suitable for high flow rates
- Constant flow rates
- Suitable for high back pressures of up to 1000 bar

RFID detection

The pump head is equipped with an RFID chip that allows the system to control and monitor all of the important parameters and settings.

Legend

① RFID designation

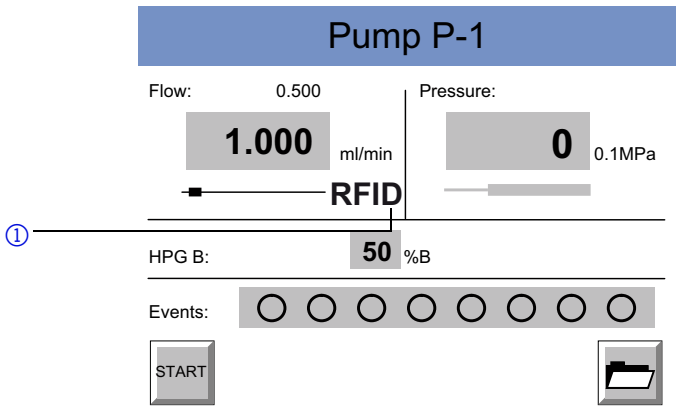


Fig. 12 RFID on touchscreen of HPG pump

Provided that the RFID chip is recognized by the software, RFID technology offers the following advantages:

- The chromatography software automatically detects the important pump parameters via Radio Frequency IDentification (RFID).
  - Type of pump and pump head
  - Serial number and year of manufacture
  - Number of cycles and operating times
  - Limit values of the pump parameters
- All measuring data archived in acc. with GLP (good laboratory practice)
- All data transferred to the software and displayed on the touchscreen.

Pulsation dampening

The pumps are equipped with active pulsation dampening, to keep the baseline constant during analysis.

Automatic flow correction

The UHPLC pumps have automatic flow correction, to keep the solvent speed constant.

Integrated degasser module

One of the two high-pressure pumps for UHPLC has an integrated degasser module.

Connecting the pumps

Systems for HPG applications require at least two pumps:

- High-pressure pump with degasser module
- High-pressure pump with high-pressure mixing chamber

High-pressure pump with degasser module

Legend

① Degasser module

② Venting valve and pressure transducer

③ Designation of the direction of flow for piston backflushing

④ High-pressure pump head

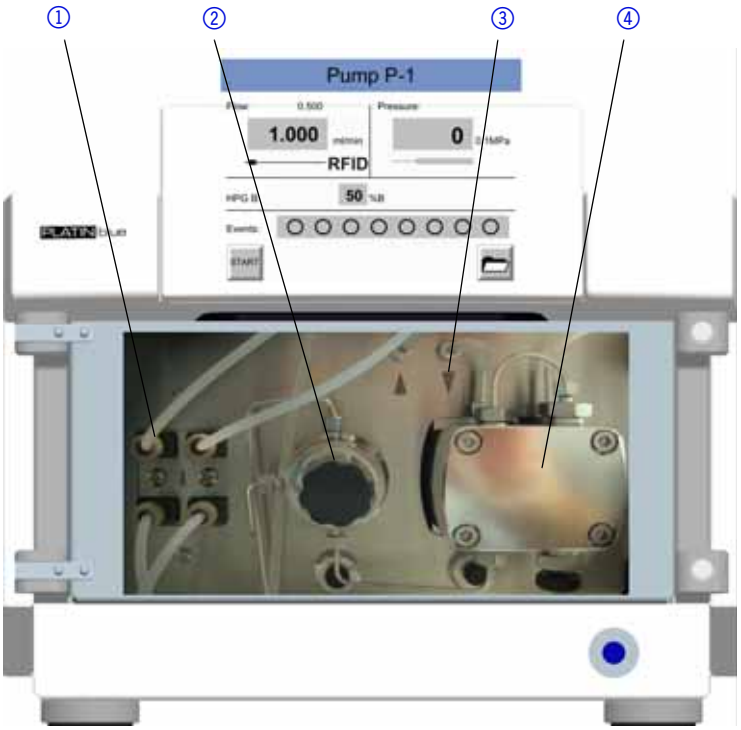


Fig. 13 HPG pump with degasser module and pressure sensor

HPG pump with mixing chamber

Legend

① Mixing chamber with capillaries installed

② Venting valve and pressure transducer

③ Designation of the direction of flow for piston backflushing

④ High-pressure pump head

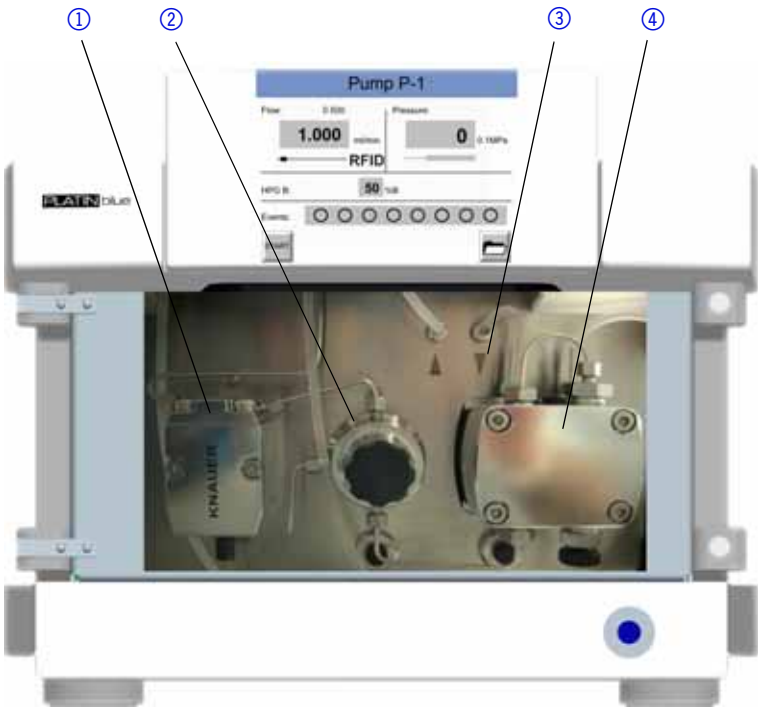


Fig. 14 HPG pump with pressure sensor, mixing chamber and steel capillaries from mixing chamber to autosampler

Pump configuration window in chromatography software

Legend

① Device name and serial number

② Manual search for device in network

③ Gradient and pump head

④ Special configuration menu

⑤ Device detection via serial number

⑥ Device detection in local network

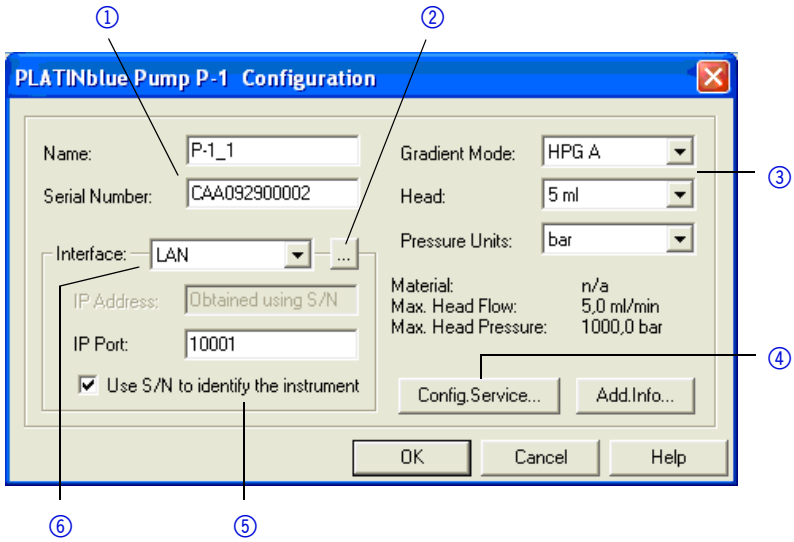


Fig. 15 Settings of the pump

Piston backflushing

The pump is equipped with automatic piston backflushing. It increases the service life of the seals and pistons, and removes contaminants from the area behind the seals.

Functional principle

The piston backflushing function automatically flushes the rear piston area of the pump head upon switch-on and in continuous mode.

- Upon switch-on: The rear piston area of the pump head is automatically flushed for 8 seconds.
- In continuous mode: The rear piston area of the pump head is flushed automatically every 15 minutes, for 15 seconds. The flushing interval can be changed in the chromatography software.

Note

The parameters of the piston backflushing are adjustable using the maintenance software (service tool).

Recommended flushing solution

The rear piston area is either flushed with water, with an 80:20 mixture of water and methanol or with isopropanol.

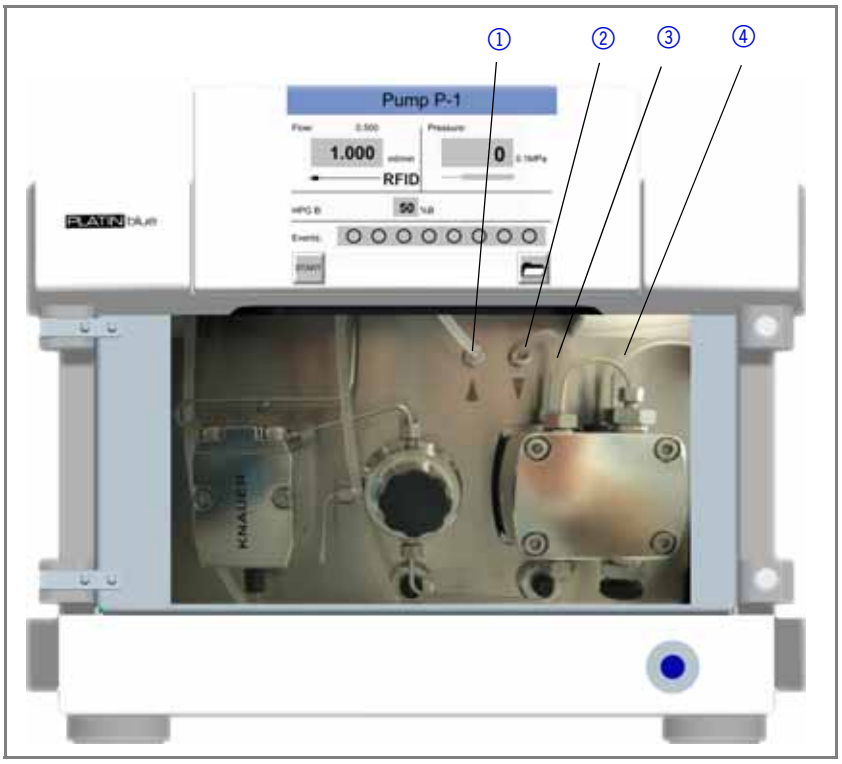
Legend

① From the storage container of the flushing solution to the inlet of the flush pump ❶

② Outlet of the flush pump ❷

③ From the outlet of the flush pump to the pump head ❸

④ Outlet of the pump head to the storage container of the flushing solution ❹



Autosampler

Performance features

The UHPLC autosampler has the following features:

- High-speed sample injection
- Fast flushing cycles to prevent sample carryover

Note Only KNAUER or a company authorized by KNAUER is permitted to carry out maintenance work on the UHPLC autosampler!

Legend

① Sample door: open and retracted on inside

② Transport and washing container

③ Cooling for sample rack

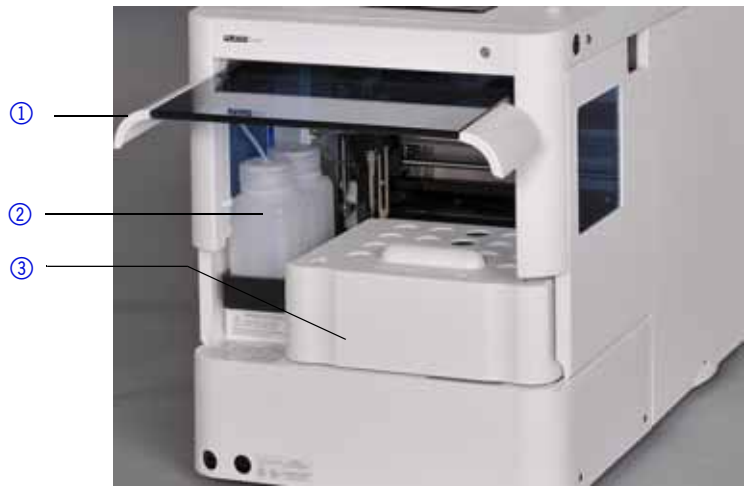


Fig. 16 Autosampler with additional container for transporting samples

Injection modes

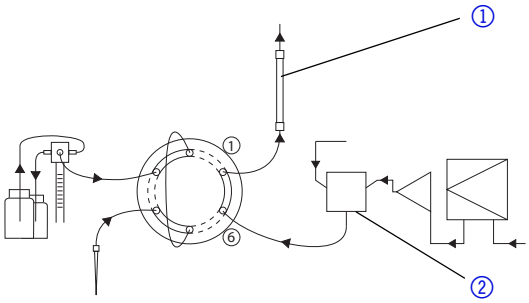
- µl (microliter) pick-up to save sample volume. Operating principle: The sample is transported between the two portions of a transport solution
- Partial loop filling
- Full-loop filling

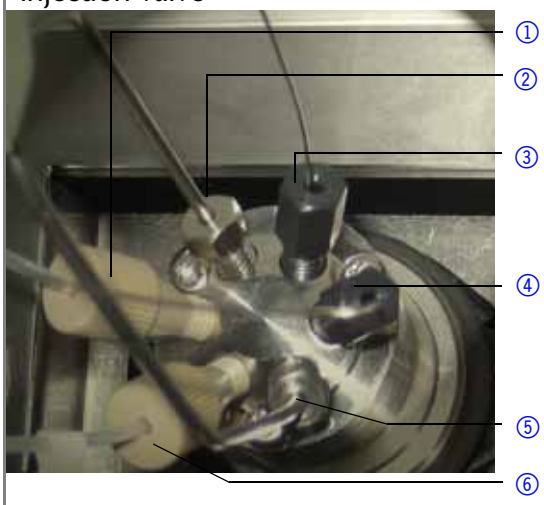
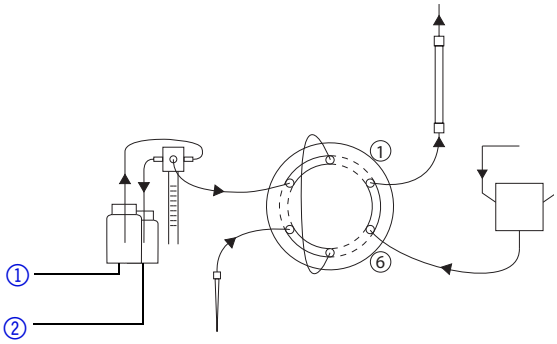
Practical Tip Since UHPLC generally uses columns with an inner diameter of 2 mm, we recommend using an injection volume of 1–5 µl for these applications.

Connecting the autosampler

Connect the thin, flexible capillaries between the pump mixing chamber and the injection valve inlet on the autosampler.

CAUTION! Personal injuries can occur when the front panel is open or has been removed. Always operate the autosampler with its front panel closed.

Component	Explanations
Front panel: ① Press down against both sides of autosampler. This opens the locking mechanism on the front panel	The front panel of the autosampler can be removed to install the capillaries. 
Connecting to the injection valve: ① Connecting to the column at position ① of the special injection valve (6/3 way valve) ② Connection to pump at position ⑥ of special injection valve (6/3 way valve)	The inlet and outlet of the injection valve of the autosampler are labeled with numbers. An illustration inside the autosampler shows the correct connection layout. 

Component	Explanations
Injection valve: ① On flushing bottle ② Sample loop ③ Connection from capillary to column ④ Connection from capillary to pump ⑤ Sample loop ⑥ Injection needle	Connection between PEEK fittings on injection valve 
Connection to syringe: ① Transport fluid can be activated for µl pickup using the chromatography software ② Flushing fluid	Connect the transport fluid and flushing fluid to the syringe of the autosampler 

Checking and configuring the parameters of the autosampler

The chromatography software can be used to configure the parameters of the autosampler:

1. Select autosampler in LAN
2. Set the syringe volume of the injection valve to either 250 ml (default) or 500 ml
3. Set the option for identifying the autosampler using the serial number
4. Configure the cooling option

Configuration window for autosampler in chromatography software

Legend

① Module detection in local network

② Manual search for module in network

③ Serial number

④ Volume of sample loop

⑤ Volume of syringe

⑥ Module detection via serial number

⑦ Module options, e.g., sample cooling

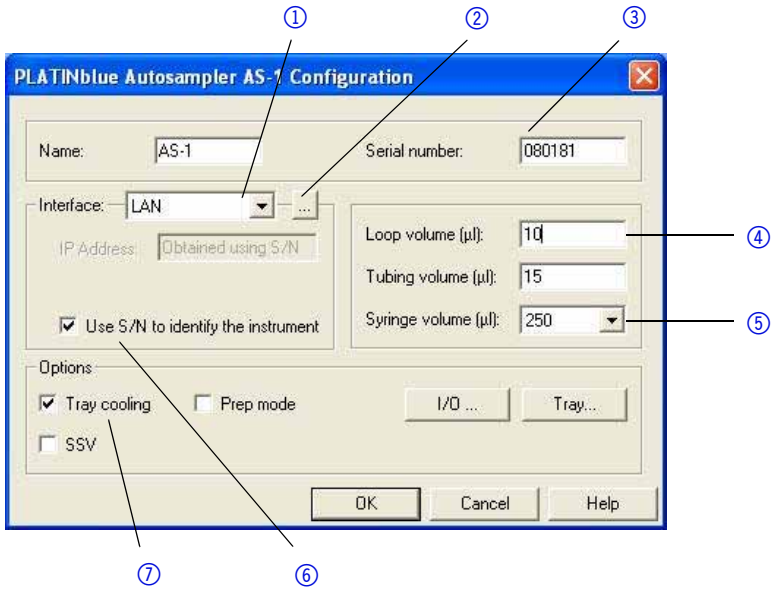


Fig. 17 Autosampler settings

Reordering spare parts

AS-1

Component	Comment	Order number
Kit for upgrade 1/32"	For valve 1/32", sample needle, tubings, sample loop 10 µl	A64710
Kit for sample needle	For valve 1/32"	A64711
Valve 1/32"	Port inner diameter 0.25 mm, 1000 bar	A64712
Rotor seal	Valve 1/32", port inner diameter 0.25 mm, 1000 bar	A64713
Buffer tubing	1/32", PEEK 250 µl	A64714
10 screw fittings for capillaries	Outer diameter 0.5 mm, short	A64450
20 clamping rings for capillaries	Outer diameter 0.5 mm	A64451
Sample loop	1 µl; 1/32"	A64716
Sample loop	2 µl; 1/32"	A64717
Sample loop	5 µl; 1/32"	A64718

AS-1

Component	Comment	Order number
Sample loop	10 µl; 1/32"	A64719
Sample loop	50 µl; 1/32"	A64720
Sample loop	100 µl; 1/32"	A64721

T-1 column thermostat

After it is switched on, the column thermostat runs a self-test.

Connecting the column thermostat

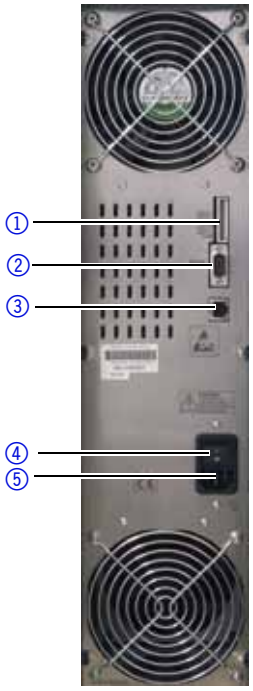
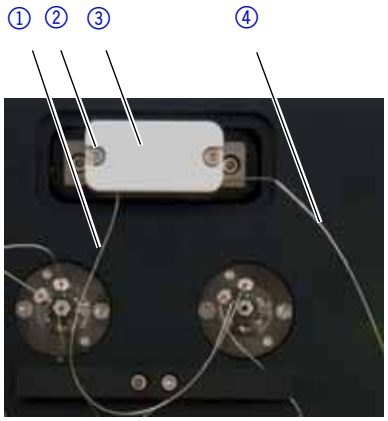
Steps	Figure
1. Connect WAGO terminal strip ①. 2. Connect the RS232 interface ② on the back of the device. 3. Connect the LAN interface ③. 4. Connect the power cable ⑤ below the on/off switch ④.	

Fig. 18 Connections for column thermostat

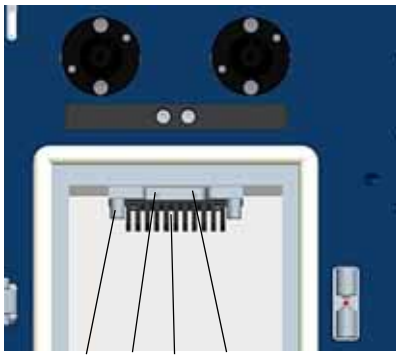
Installing the cartridge of the postcolumn tempering

Installing the postcolumn tempering

Steps	Figure
1. Tighten the cartridge ③ with two screw ② on the postcolumn tempering with a size 2.5 Allen wrench. 2. Connect capillary ① of the cartridge ② to the valve. 3. Connect capillary ④ to the detector.	 **Fig. 19 Post-column tempering**
4. Attach condensed water protection to the postcolumn tempering	 **Fig. 20 Condensed water protection**

Installing the cartridge of the precolumn tempering

Connecting the column thermostat

Steps	Figure
1. Tighten the cartridge ③ with two screw ① with a size 2.5 Allen wrench. 2. Connect the autosampler to one of the two capillaries ② of the precolumn tempering. 3. Connect the valve to the capillary of the inline filter ④.	 ① ② ③ ④ **Fig. 21 Precolumn tempering**

Connecting the separating columns

The following figure shows the connection schematic for the T-1 with touchscreen and with two 6-position multiposition valves.

Legend

① Precolumn tempering

② Connection on the left valve

③ Separating columns

④ Connections on the right valve

⑤ Post-column tempering

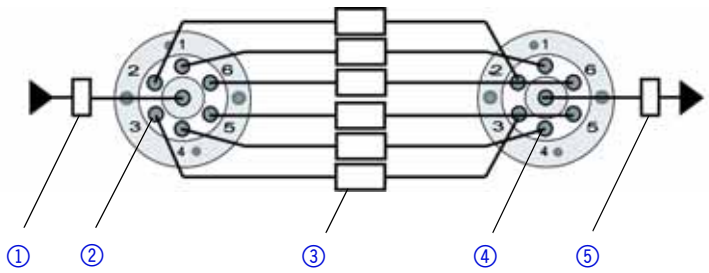


Fig. 22 Connection schematic within the T-1 with valves

Connecting to column

Legend

① Separating column

② Label with flow direction marking

③ Magnet holder

④ RFID screw fitting

⑤ Mounting wire for RFID screw fitting

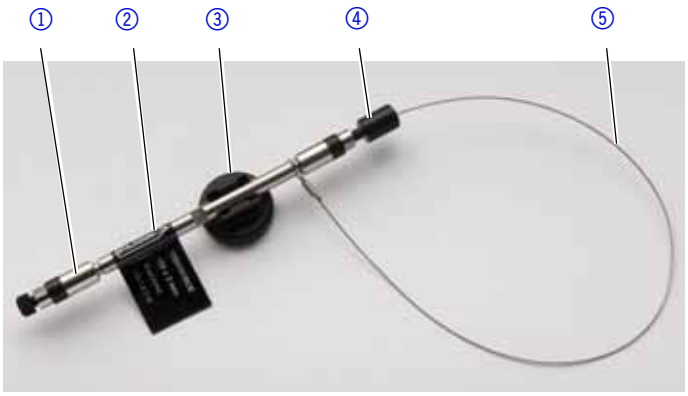
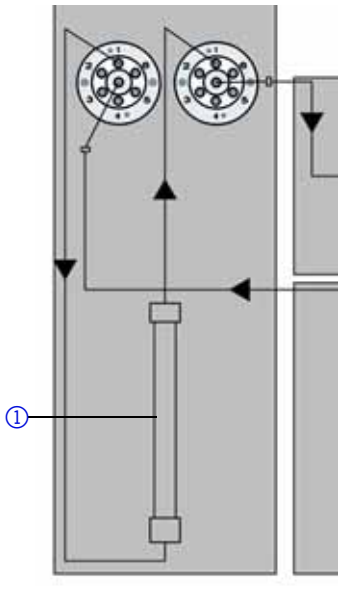


Fig. 23 Column with label and flow direction marking

Practical tip! At high pressures up to 1000 bar, tighten the PEEK screw fitting using a suitable wrench. If there any leaks, make sure to install a new PEEK fitting.

Connecting the column

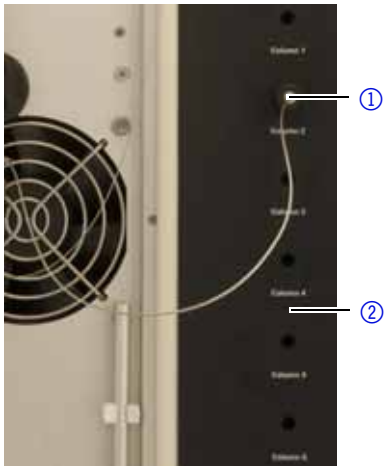
Steps	Figure
1. Open the door of the column thermostat. 2. Secure the magnet clip on the separating column ①. 3. Remove the covering cap. 4. Connect a thin, flexible, stainless steel capillaries with PEEK fitting P 3860 or P 3860V1. When securing the column to the wall of the column thermostat, make sure that the arrow indicating the flow direction *FLOW* points upwards. 5. Screw in the wire for the RFID to the RFID terminal strip.	 **Fig. 24 Flow direction in the column:** *FLOW*

Connecting the RFID

ATTENTION! Damage to the electronics in the RFID terminal strip due to liquid. Do not connect any capillaries to the RFID terminal strip!

Note When connecting the RFID ensure that the separating column is assigned correctly in the software.

Connecting the column

Steps	Figure
1. Screw in the RFID of the column ① into the RFID terminal strip ②. 2. Close the door of the column thermostat.	 **Fig. 25 RFID terminal strip**

Note Check whether the door of the column thermostat is closed properly.

T-1 column thermostat without touchscreen and valves

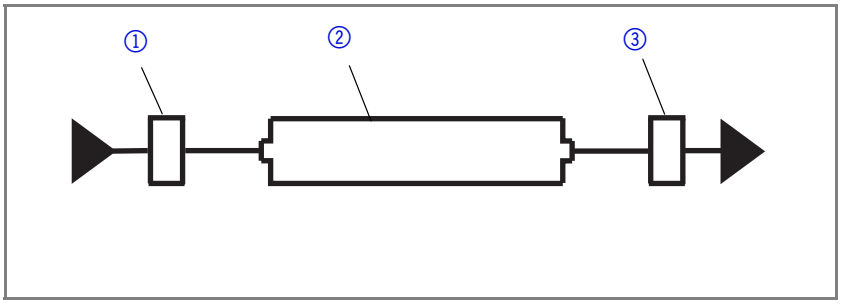
T-1 without valves The separating column is connected directly to the precolumn and postcolumn tempering. One separating column can be connected.

Legend

① Precolumn tempering

② Separating column

③ Post-column tempering

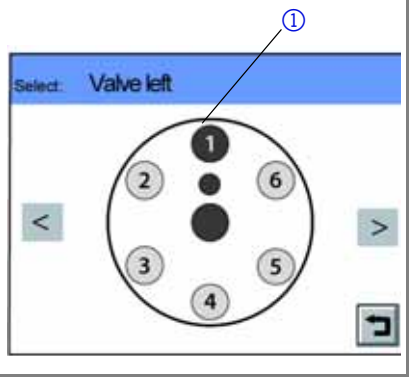


Configuration of the valves

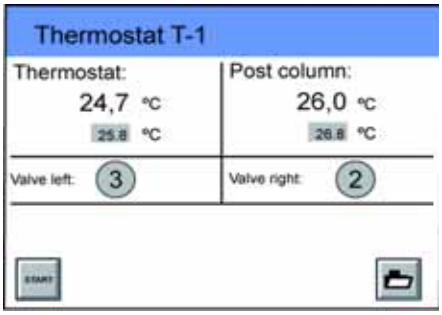
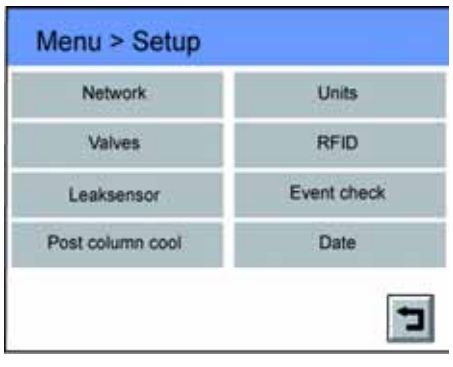
Note In remote operating mode, the touchscreen cannot be used.

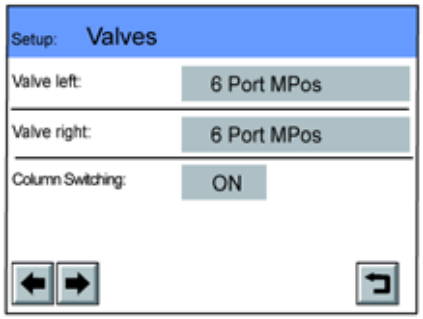
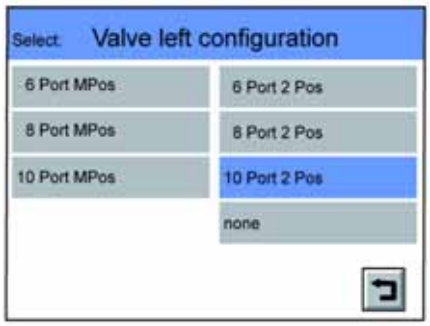
Operate the column thermostat using the software.

Select valves using the touchscreenI

Steps	Figure
Select the desired valve position, for example, valve position 1.	

Configuring the valves using the touchscreen

Steps	Explanation
1. Tip  .	
2. Tip *Valves*.	

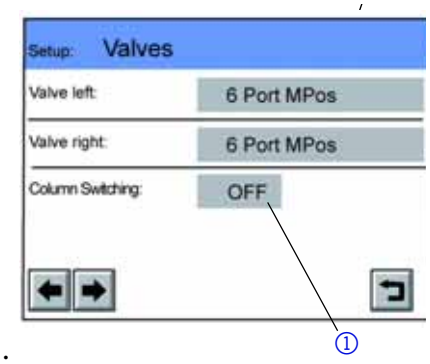
Steps	Explanation
3. Tip the desired valve using *Valve left* or *Valve right*.	
4. In *Valve right configuration* or *Valve left configuration*, tip the valve type that is installed in the T-1. If there is no valve, select *None*.	

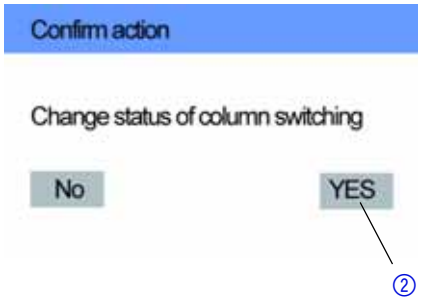
Switching on '*Column Switching*'

Valves are switched synchronously

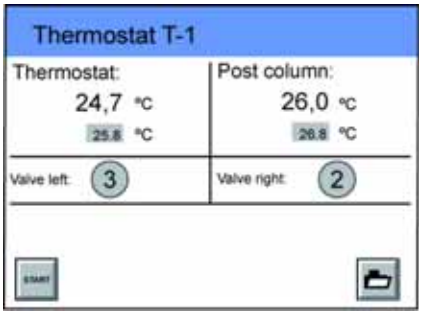
When the option *Column Switching* is active, both valves are switched synchronously. If one valve is switched, the other valve is automatically switched to the same valve position.

When *Column Switching* is disabled, the valves are switched indepdent of one another.

Steps	Explanation
1. In the *Column Switching* line, tip the grey field ①. A query window opens.	

Steps	Explanation
2. Tip *YES* ②. *Column Switching* is enabled.	

Setting the T-1 temperature manually

Steps	Explanation
3. Tip the temperature.	
4. Enter the temperature by tipping the numbers.	

Operating terminal of *T-1 Basic* column thermostat

Legend

① Display

② Buttons

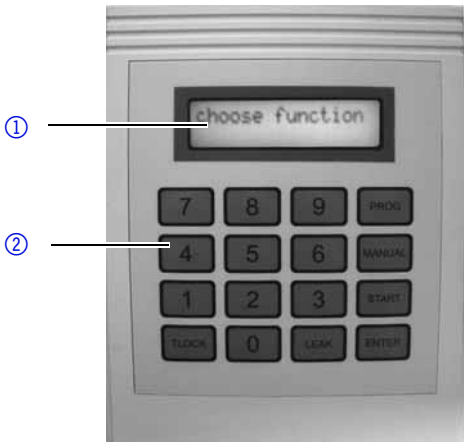


Fig. 26 Display and buttons on operating terminal

Setting the *T-1 Basic* temperature manually

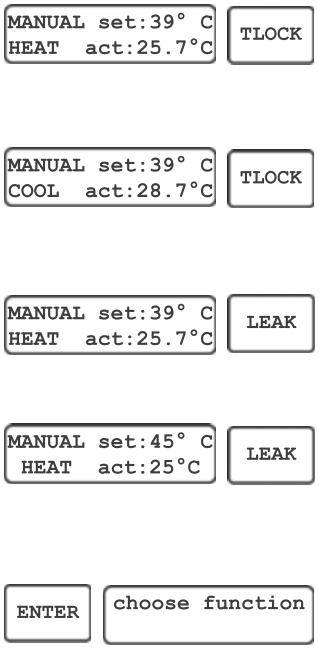
Set the temperature

Steps	Figure
1. When *choose function* appears, press *MANUAL* key. 2. In *Manual Mode*, enter temperature by pressing number keys, e.g., 39 °C. 3. Press *ENTER*. This heats up the column thermostat. 4. As soon as the temperature is reached, press the *ENTER* key to display *choose function* again.	choose function MANUAL * Manualmode * set :00° C 3 9 * Manualmode * set :39° C ENTER MANUAL set:39° C HEAT act:25.7°C ENTER choose function

Fig. 27 Setting the temperature

Changing the temperature on the *T-1 Basic* operating terminal

Changing the temperature

Steps	Figure
1. When *MANUAL HEAT* appears, press the *TLOCK* key to reduce the temperature by 1 °C. 2. Hold down the *TLOCK* key to further reduce the temperature in steps. 3. When *MANUAL HEAT* appears, press the *LEAK* key to increase the temperature by 1 °C. 4. Hold down the *LEAK* key to continue increasing the temperature in steps. 5. As soon as the temperature is reached, press the *ENTER* key to display *choose function* again.	 **Fig. 28 Changing the temperature**

Configuration window for T-1 column thermostat in chromatography software

Legend

① Serial number

② LAN or RS-232 communication interface

③ Manual search for device in network

④ Type of the left valve

⑤ Type of the right valve

⑥ Temperature unit

⑦ Activating/deactivating of column switching/synchronous switching of valves

⑧ Activation/deactivation of postcolumn tempering

⑨ Sensitivity of the leak sensor

⑩ Device detection via serial number

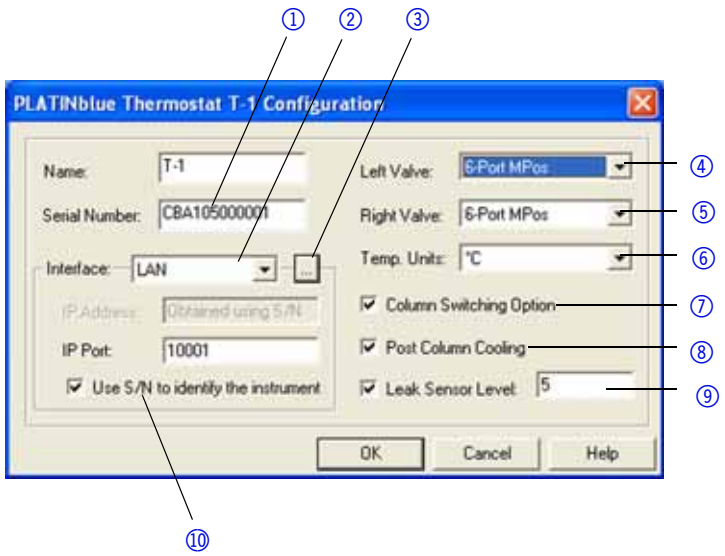


Fig. 29 Settings on column thermostat

Manually configuring the T-1 column thermostat in the chromatography software

Devices connected to the analytical system can be manually copied to the list of successfully configured devices. Next, they are opened and separately configured. Procedure for manually configuring modules in the chromatography software:

Legend

① Module selection

② Buttons for copying into software controller

③ Double-clicking opens configuration dialog for modules

④ Manual selection of system port

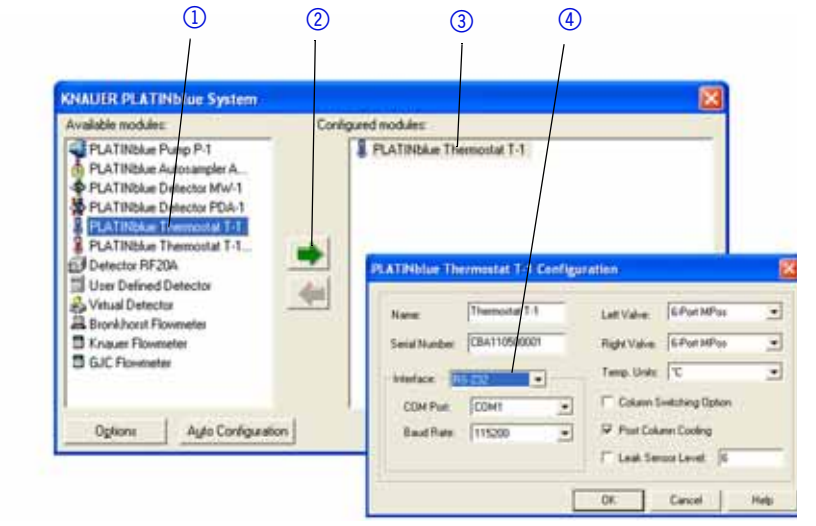


Fig. 30 Manual configuration of devices

Procedure

1. Choose the required module from the *Available modules* list, e.g. *PLATINblue T-1 Thermostat*.
2. Click *[➡]* to copy the module to the list of successfully configured modes (*Configured modules*).
3. In the *Configured modules* list, double-click the module (e.g. *PLATINblue T-1 Thermostat*) to access the configuration settings.
4. In the *Interface* field, select the communication interface.
5. When LAN is the selected interface, click [...] to manually search for a device in the network. If the RS-232 interface is selected, choose the COM port.

UV-Vis detector PDA-1

As with UV-VIS detectors, the photodiode array detector measures the light absorption of the sample in the ultraviolet and visual spectra. In contrast to UV-VIS detectors, the entire spectrum is sent through the sample and afterwards split by a grating. The split light falls onto a geometric array of 1024 separate photodiodes – the photodiode array.

Legend

① 2D spectrum plus maximum of intensity

② Spectrum at a specific time

③ Chromatogram

④ 3D spectrum with time axis

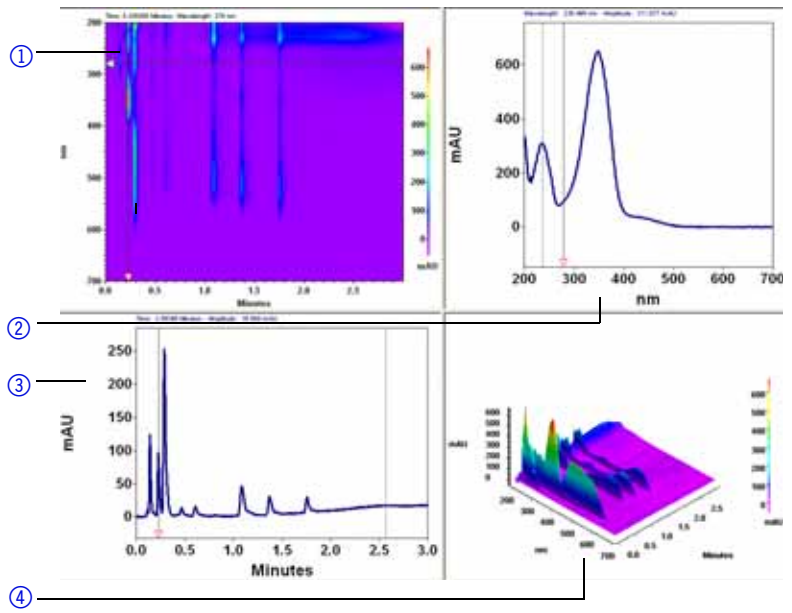


Fig. 31 UHPLC separation with 3D spectrum in PDA-1

Spectra per second

The PDA-1 measures at a rate of 100 Hz. In practice, this means that approx. 100 spectra are recorded per second.

Connecting capillaries to PDA-1

Note At high pressures up to 1000 bar, tighten the PEEK screw fitting using a suitable wrench.

Legend

① Thin, flexible, stainless steel capillaries with an inner diameter of 0.12 mm

② PEEK screw fitting with shortened tip for the input of the measuring cell (order number: P3860V3)

③ PEEK fitting (specially marked) without tip for output of measuring cell (order number: P3860V2)

④ Capillary with inner diameter of 0.25 mm

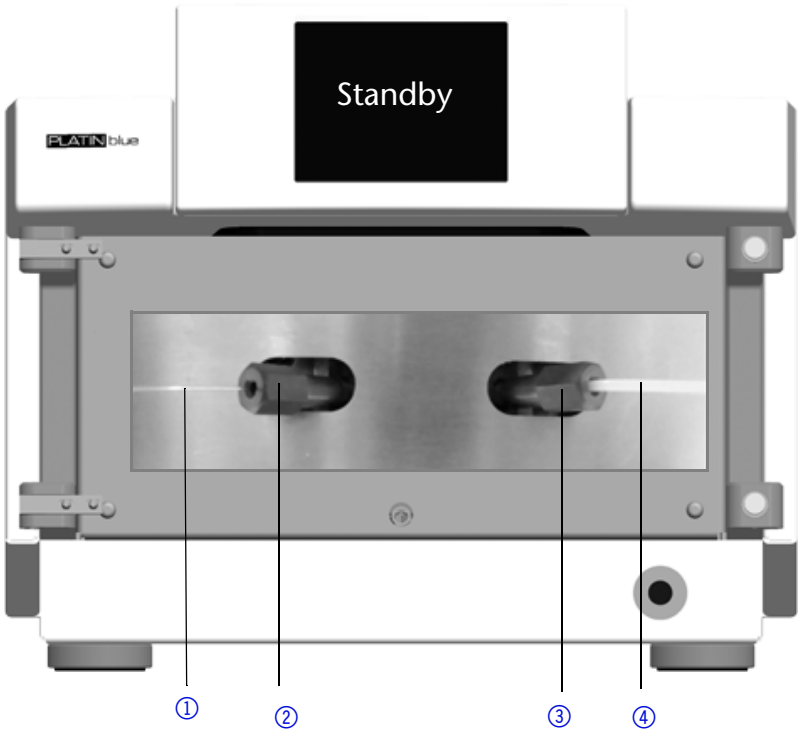


Fig. 32 Different PEEK connectors for input/output of measuring cell on PDA-1

Configuration window for PDA-1 in chromatography software

Legend

① Module name and serial number

② Number of measurement channels

③ Module detection in local network

④ Manual search for module in network

⑤ Module detection via serial number

⑥ Options of detector

⑦ Measuring cell

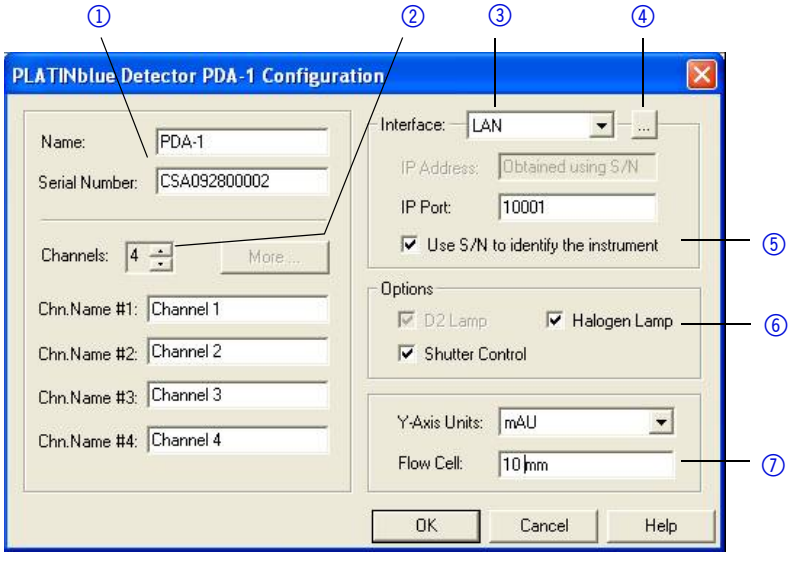


Fig. 33 Settings of PDA-1

MW-1 UV-Vis detector

The MW-1 detector can measure up to 6 wavelengths. The 200 Hz data rate applies to operation with one wavelength. For UHPLC separations ≤ 3 min, a minimum data rate of 50 Hz is required for all measuring channels.

Chromatography software

To measure the wavelengths, the chromatography software requires a stable data rate. The actual data rate first and foremost depends on the difference between the wavelengths. Therefore, the actual data rate is integrated into the chromatography software display so that the user can check whether the method is suitable for UHPLC.

Checking the wavelength accuracy

Calibration

The software uses holmium filters to check the accuracy of the wavelengths and calibrates them automatically. If the PDA-1 or MW-1 detector determines that the calibration is no longer correct, a message window appears to inform the user that the module needs to be recalibrated.

Monitoring deuterium lamp according to good laboratory practices (GLP)

Lamps are monitored

The GLP data for the lamps in the PDA-1 or MW-1 detector are monitored by EPROM chips:

- Number of lamp ignitions
- Hours in operation
- Settings regarding noise and sensitivity
- Serial number

Checking the D2 lamp

To check the functionality of the deuterium lamp in the PDA-1 or MW-1 detector, proceed as follows:

1. Open *Menu⇒Setup⇒Signal*
2. Read the value for the light intensity in the *ref* reference beam.

If the noise increases and reduced sensitivity or faulty ignition is observed, this indicates that the D2 lamp should be replaced.

Wolfram halogen lamps

Practical Tip

Wolfram halogen lamps need not be checked, because the light intensity does not decrease over time.

Configuration window for MW-1 UV-Vis detector in chromatography software

Legend

① Module name and serial number

② Number of measurement channels

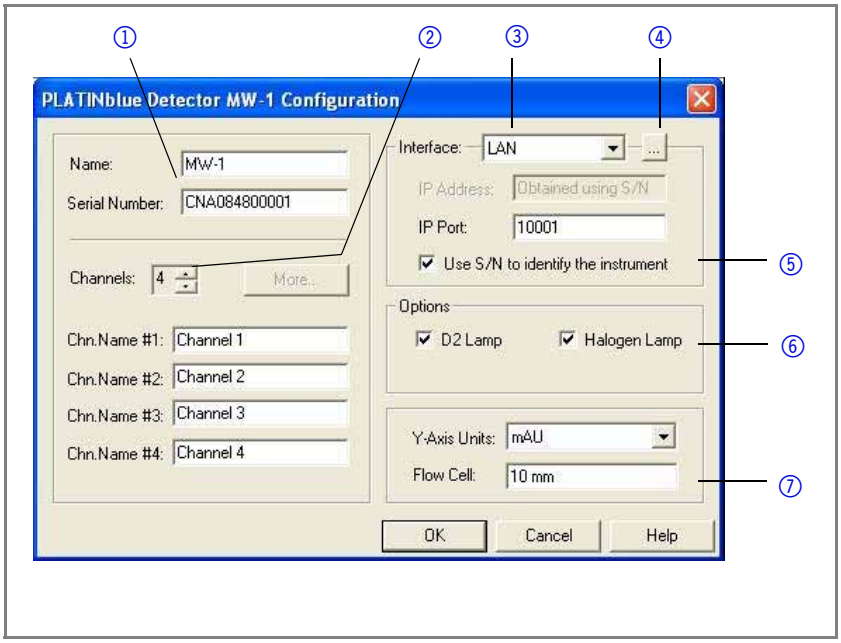
③ Module detection in local network

④ Manual search for module in network

⑤ Module detection via serial number

⑥ Lamp selection

⑦ Measuring cell



Connecting a mass spectrometer

Connecting mass spectrometer and system

Installing a local area network

The analysis system, workstation and router are interconnected to form a LAN. Once the router has assigned an IP address to all modules, the Xcalibur software can begin configuring the modules (remote control). For instructions on how to set up and connect a local area network (LAN), see page 35.

Network connection

The network connections are located at the rear of the modules.

Connecting the LC-MS modules

The mass spectrometer is connected to the autosampler using a contact cable. The contact cable transfers a start signal issued by the autosampler to the mass spectrometer.

If no autosampler is used, the high-pressure pump can be connected to the mass spectrometer. As soon as the high-pressure pump starts up, it sends the start signal to the mass spectrometer.

Connecting the mass spectrometer to the autosampler

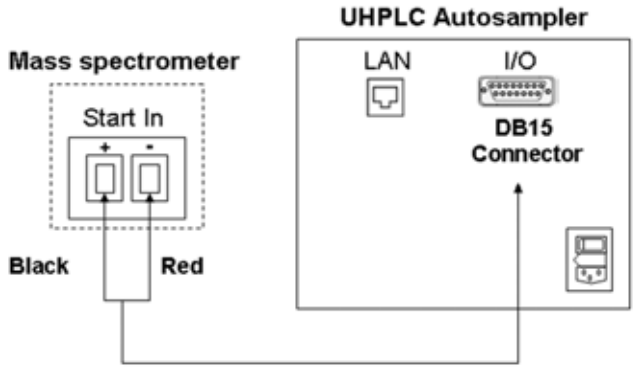


Fig. 34 Schematic display of connections for mass spectrometer and autosampler

Connecting the mass spectrometer to the high-pressure pump

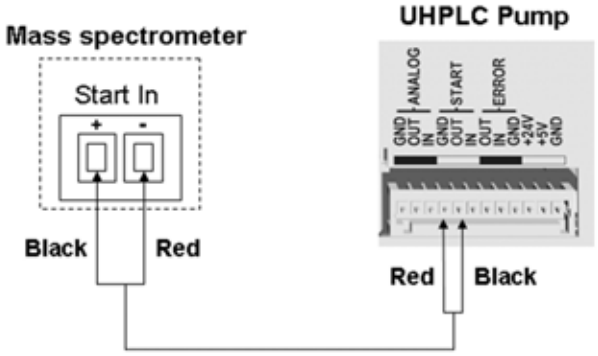


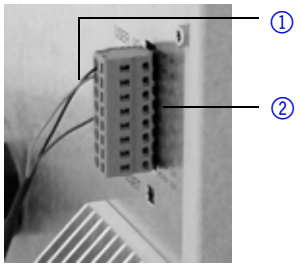
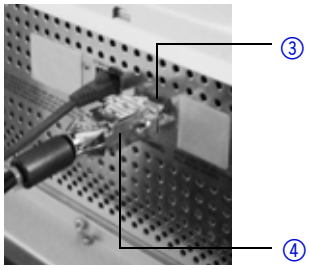
Fig. 35 Schematic display of connections for mass spectrometer and high-pressure pump

Accessories

- Multicore contact cable, A1467
- WAGO terminal strip, A1421
- WAGO microstrip, A1420
- Network cable, A5255

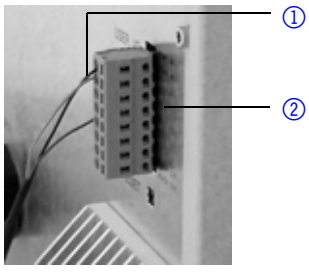
Note The contact cable is fitted with a DB15 connector at one end and three sheathed wires in different colors at the other.

Connecting the autosampler to the mass spectrometer

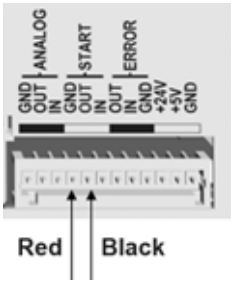
Steps	Figure
1. Plug the black and red wires of the contact cable into the WAGO terminal strip ① 2. On the rear side of the mass spectrometer, insert the WAGO terminal strip into the female connector ② so that the black wire is connected to *START IN +* and the red wire is connected to *START IN -*	 **Fig. 36 Connection Mass spectrometer**
3. On the rear side of the autosampler, insert the DB15 connector ④ into the *IN/OUT* female connector ③	 **Fig. 37 Connection Autosampler**

Note The two ends of the multicore contact cable are connected by a WAGO terminal strip.

Connecting high-pressure pump to mass spectrometer

Steps	Figure
1. Plug the black and red wires of the contact cable into the WAGO terminal strip ① 2. On the rear side of the mass spectrometer, insert the WAGO terminal strip into the female connector ② so that the black wire is connected to *START IN +* and the red wire is connected to *START IN -*	 **Fig. 38 Connection mass spectrometer**

Connecting high-pressure pump to mass spectrometer

Steps	Figure
3. On the rear side of the pump, insert the terminal strip into the female connector for remote control so that the black-encased wire is connected to *OUT (START)* and the red-encased wire is connected to *GND (START)*	 **Fig. 39 Connection High-pressure pump**

Switching on the system

Checklist prior to switch-on

Use this checklist to determine whether the system is ready for initial startup:

- The modules are at the desired location
- The power plugs of the modules are plugged in
- The LAN connections between the modules and router are connected
- The LAN cable is connected to the workstation and router
- The KNAUER ChromGate® software has been installed by Knauer or a company authorized by KNAUER
- The capillaries in the solvent bottles have a filter insert
- All capillaries are tightly connected from:
  - Bottle to pump (with degasser module, if applicable)
  - Pump to autosampler (to manual injection valve, if applicable)
  - Autosampler to column in column thermostat
  - From column to PDA-1 detector (MW-1 detector, if applicable)
  - From UV-Vis detector to waste bottle

Switch-on procedure

At the KNAUER workstation, the order in which the modules or chromatography software are switched on does not play a role.

Switching on modules Turn modules on using the on/off switch located on the back. The initialization message appears on the various module touchscreens.

Next steps The LAN settings of the modules can be checked on the touchscreen.

Automatic configuration The modules can be automatically configured using the software.

Detector in standby mode

Practical Tip To keep the analysis times in the lab as short as possible, KNAUER recommends always leaving the UV-Vis detector switched on or in standby mode, if possible.

Control of the system or devices

Note Operator errors and clogged capillaries can cause high pressure spikes.

Control with chromatography software

The device can be controlled individually, or as part of a high-pressure gradient system or low-pressure gradient system, by means of a computer and chromatography software.

Remote control using chromatography software

'*Remote*' operation

If the chromatography devices are to be operated using the chromatography software, then touchscreen control is switched off. For remote control using the chromatography software, *Remote* is shown on the display in the status bar.

Control via touchscreen

Working without chromatography software

The touchscreen is suitable for the following procedures without chromatography software:

- Monitoring the module functions
- Using special programs for laboratory work:
  - Scan Program, e.g. for a detector
  - Temperature for safety shutdown of the thermostat and a precooling and postcooling of the columns
  - RFID detection of the columns at the thermostat
  - LAN configuration program
  - Combination of programs (in the *Link* menu)
  - Checking the system conditions as part of quality assurance measures in accordance with good laboratory practices (in the *GLP* menu)
- Standby and wake-up programs (Wake Up)
- Programs for configuring the modules (*Setup* menu)

- The pumps and the thermostat can be switched off at any time using the [*STOP*] button on the touchscreen. This function can also be used in remote mode in the chromatography software.

Using the *touchscreen*

With the *touchscreen* it is possible to input data and commands by tipping certain areas on the screen with a finger or with a blunted object. These areas are highlighted in gray.

The *touchscreen* is divided into various areas:

Legend

① Status bar

② Parameters, in part with color high-lighted buttons, for settings

③ Animated informa-tion graphics, in part with color high-lighted buttons, for settings

④ Information bar with warnings or graphic displays

⑤ Button for starting or stopping the function

⑥ To main menu

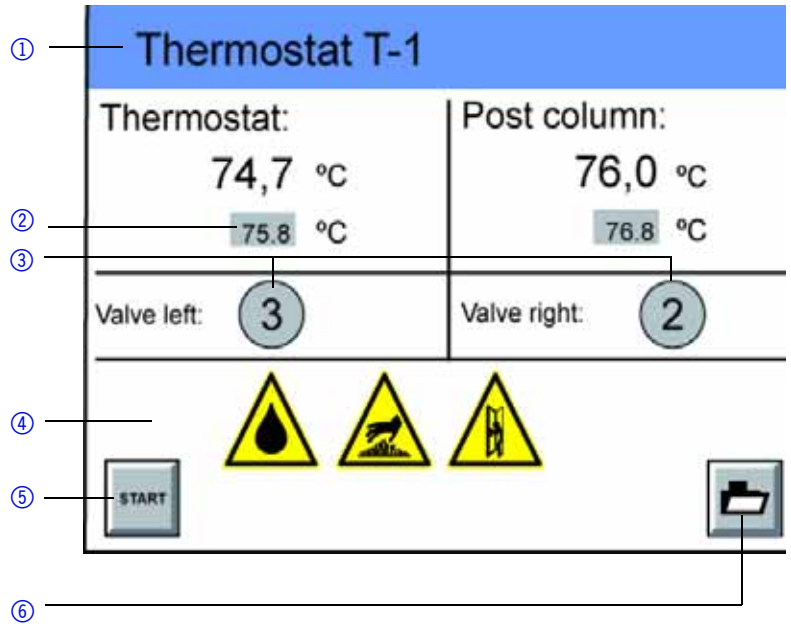


Fig. 40 Touchscreen layout, thermostat example

Operating the touchscreen

The buttons for setting or modifying functions are always labeled, e.g., *START*. In the example, the pump starts to work when you press the button and the label on the button changes to *STOP*.

Overview of *touchscreen buttons*

Navigation

In order to navigate the display has buttons with the following meanings:

Button	Function	Explanation
	Emergency OFF switch on pump touchscreen or thermostats	This function can also be used in remote mode in the chromatography software.
	Scroll	Through all functions Scroll

Button	Function	Explanation
	One level higher up	Tip briefly to move up one level
	Go to device status display	Press and hold for 2 seconds
	To Main menu	Tip to go to the Main menu
	Saves the entry	A target is shown on the button, e.g. *Minute* if the value can be saved as a minute value

Controlling the program

Further buttons help control the program:

Button	Function	Explanation
	Running a program	Starts previously configured program in *Program* menu
	Pause program	-
	Stop program	-

Other buttons have their functions displayed in plaintext:

Button	Function	Explanation
Autozero	Carry out zero balance	Function of the detector
Day	Confirm the day	-
Del/Delete	Deleting the program	-
Disable	Deactivate, skip	Function of the detector
Edit	Edit the program	-
Finish	Exit loaded program	Back to main menu
Load	Load program	-
Month	Confirm month	-
New	Create a new program line with time indicator	-
Restart	Repeat the program	-
Scan	Acquire spectra	Function of the detector
Scan Out	Move spectra to the integration output	Function of the detector
Start	Start module	Starts the module, e.g. a pump begins pumping.
Tab	Table	Program line display
Year	Confirm the year	-

Menu structure of the module GUIs

The graphical user interfaces (GUIs) of the various modules in the system all use the following layout:

- Module programming
- Creation of combination programs (links)
- Detector programs (scan)
- Module presets (setup)
- Module status displayed according to good laboratory practices (GLP)
- Function to set touchscreen in Standby mode

Legend

① Programming menu

② Combination program

③ Detector program

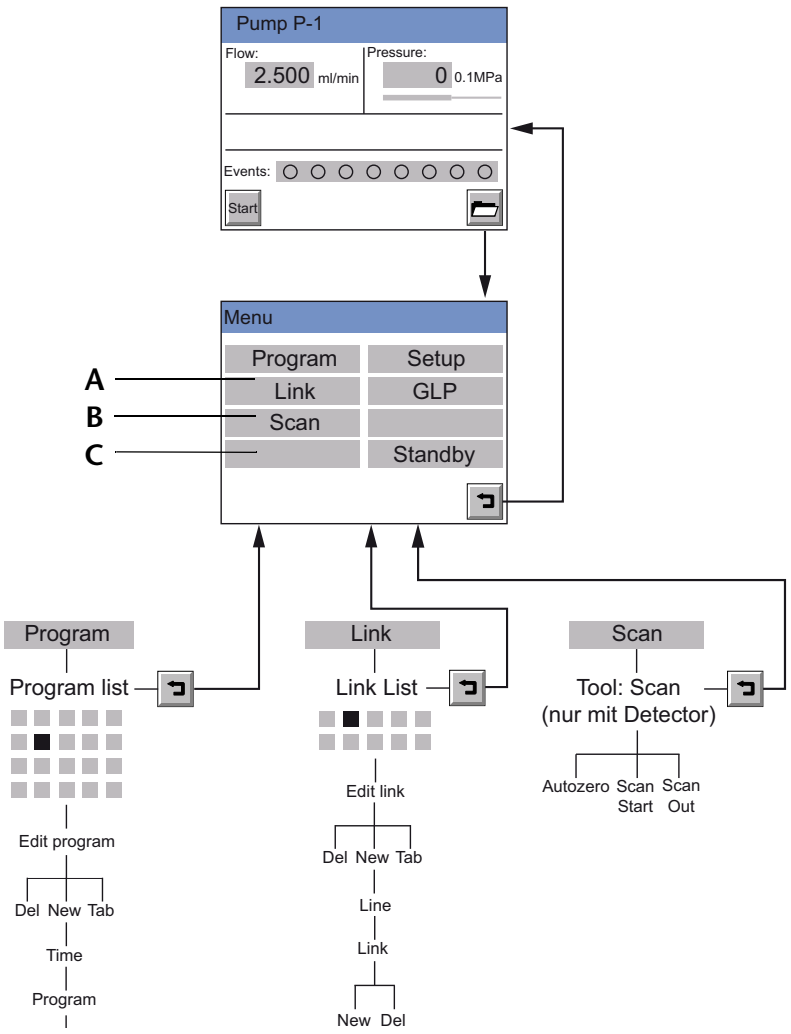


Fig. 41 Overview of module GUIs, part 1

Graphical user interface (continued)

Legend

① Module configuration

② Status of modules according to good laboratory practice (GLP)

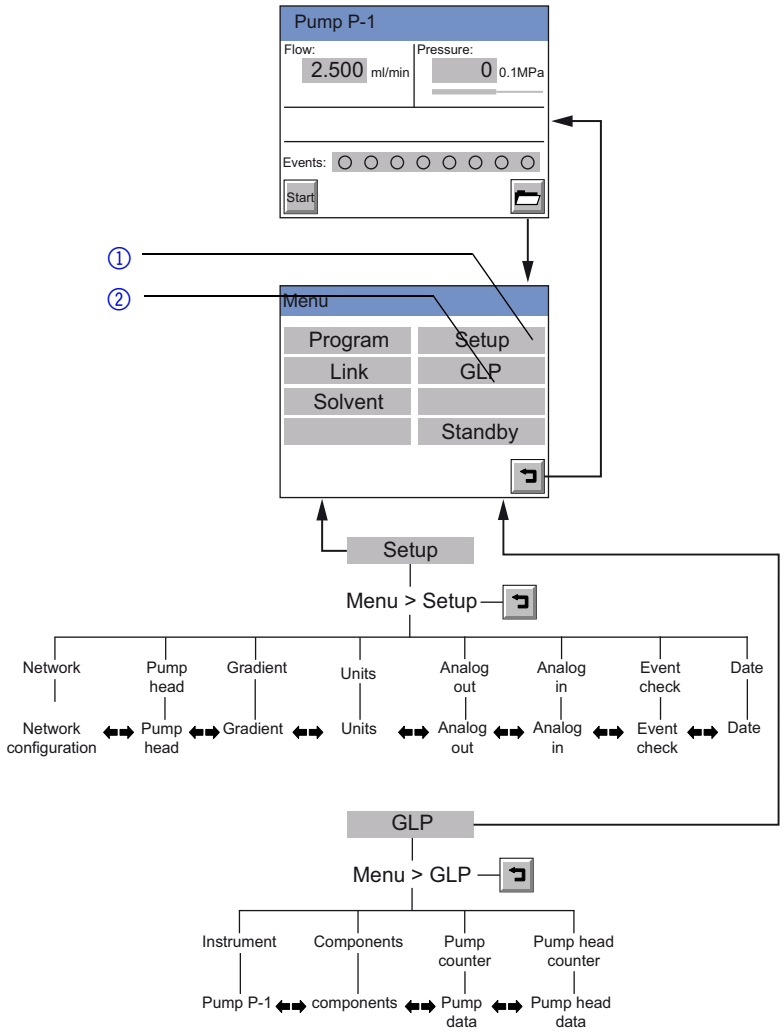


Fig. 42 Overview of module GUIs, part 2

Legend

① Programming menu

② Combination program

③ Separating columns

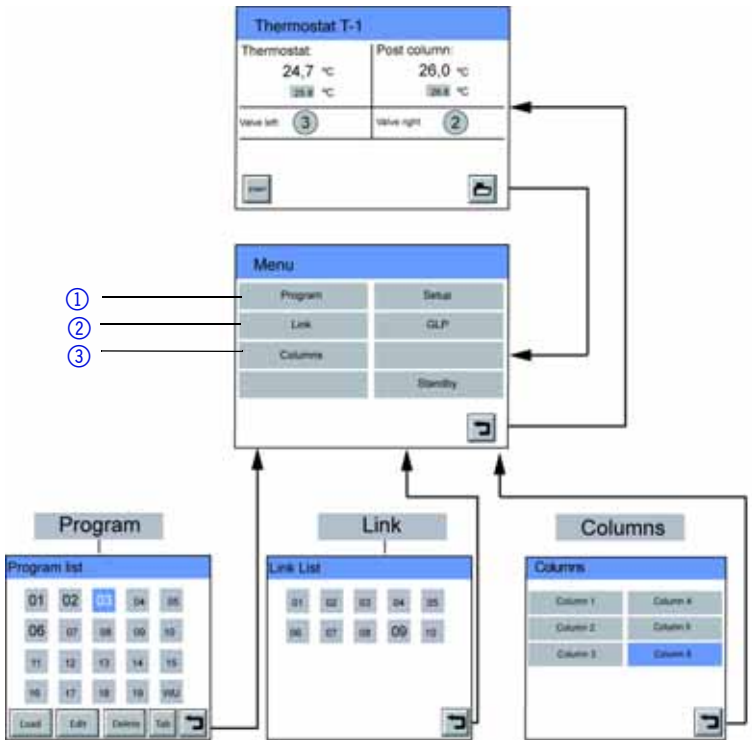


Fig. 43 Graphic user interface of the thermostat, part 1

Legend

① Module configuration

② Status of modules according to good laboratory practice (GLP)

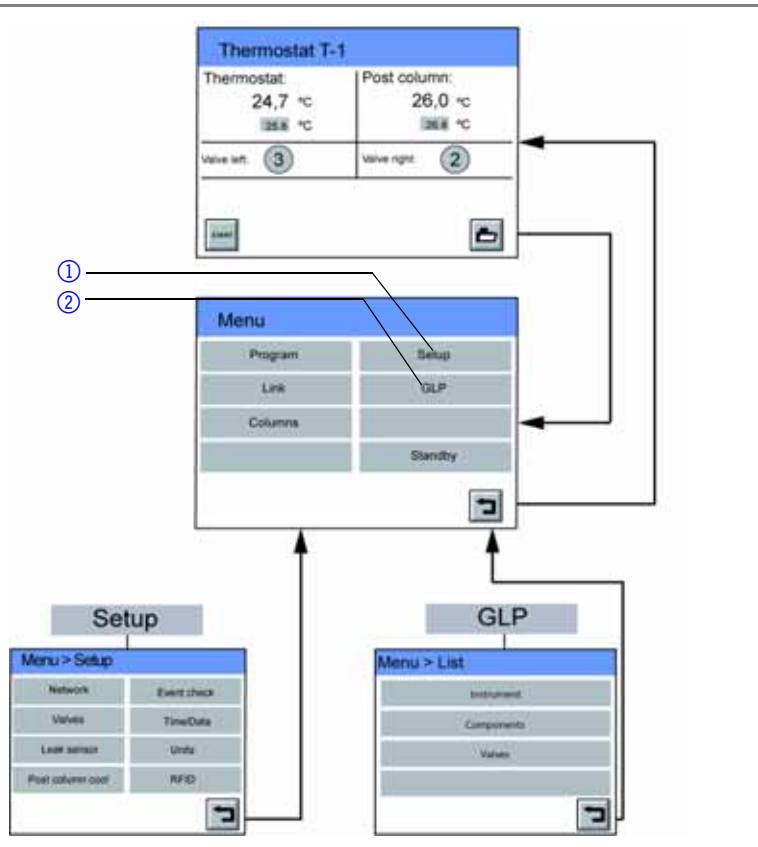


Fig. 44 Graphic user interface of the thermostat, part 2

Status displays of the devices

Legend

① MW-1 detector

② PDA-1 detector

③ P-1 pump

④ T-1 thermostat

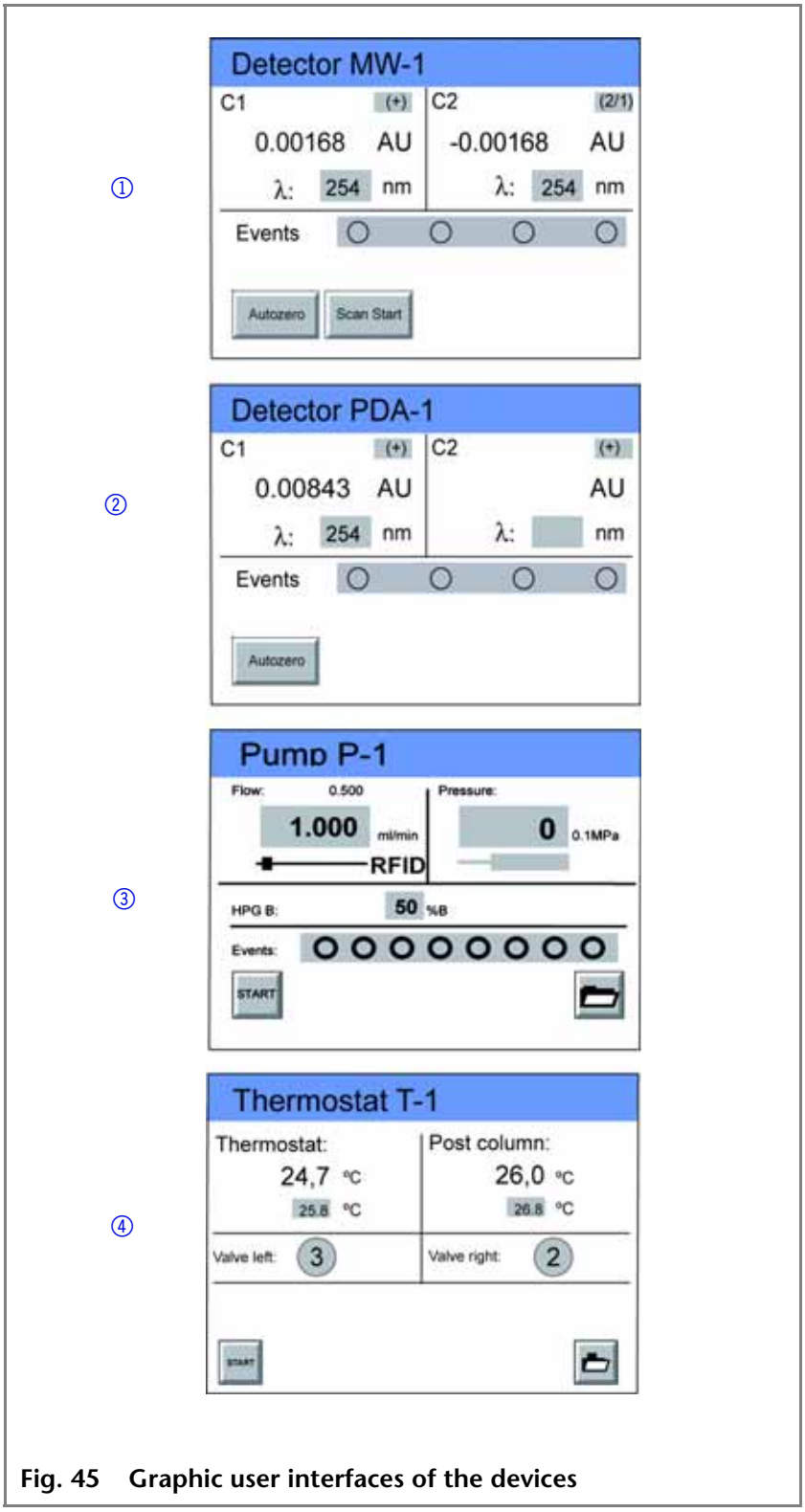


Fig. 45 Graphic user interfaces of the devices

Switching on the device

The device is switched by the power switch on the back of the device. It initializes itself, then proceeds through a self-test and then registers itself as ready to operate with the *status display*.

Result The device is ready for operation.

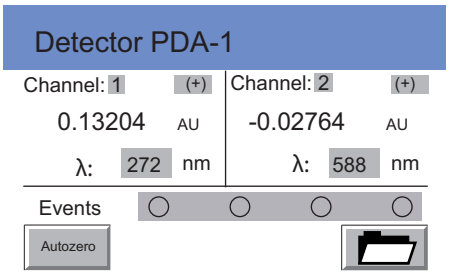


Fig. 46 Status display using the example of a detector

Setting the date and time

1. Open *Menu⇒Setup⇒Date* to set the time and date.
2. Confirm the date, month and year by clicking the corresponding button. To change the date, first press *Del*.
3. Open *Menu⇒Setup⇒Time* to set the time.

Displaying the GLP information

To view information from the quality assurance system on good laboratory practices, go to *Menu⇒GLP*.

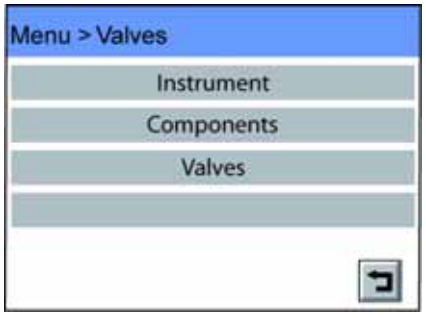


Fig. 47 Displaying GLP information

Standby mode

Switching on standby mode on the touchscreen

Select *Menu⇒Standby*. The touchscreen displays *Standby* and the standby LED is lit.

Legend

① Standby LED on the device

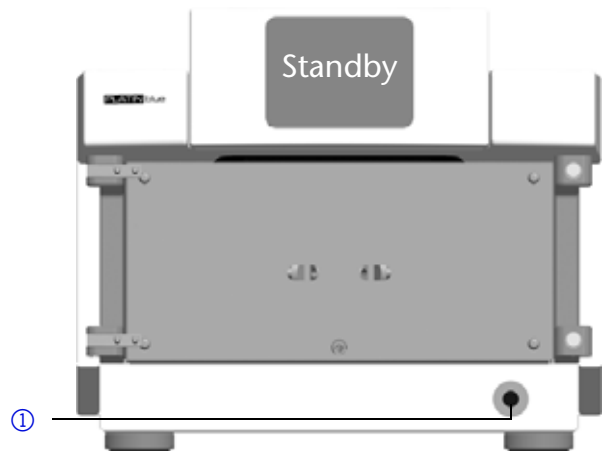


Fig. 48 Standby display on the device, PDA detector example

Switching off standby mode

Briefly tip the touchscreen of the module. The name of the module is shown in the status bar on the touchscreen and the standby LED goes out.

Valid for T1 thermostat

For the T1 thermostat without a display, the switch is made to the low-power standby mode using the chromatography software. The LED for display of standby operation is blue.

In thermostat standby mode, all device components are switched off, including the postcooling of the columns and valve switching.

Standby in remote operation mode

In remote operation, all devices are set to standby by software.

Main menu

Navigating the Main menu

Tipping the button in the *status display* calls up the Main menu:

Fig. 49 Main menu, thermostat example

The individual menus are opened by tipping the correspondingly labeled buttons.

'Program' menu

Depending on the device type, the device can store up to 20 programs with 99 program lines each. A program *WU* is reserved for a *wakeup* program, to be able to run a program or a link on a time delay.

The individual programs are labeled with numbers.

Program menu navigation

1. Tip the *Program* menu in order to display the program list.
2. Tip the desired program number to edit, open or delete the program.
3. Tip *Load* to run a program.
4. Tip *Edit* to enter the edit mode.
5. Tip *Delete* to delete a program.
6. Tip *Tab* to display a program line in a table.
7. ⮌ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

Fig. 50 Program menu

Creating a program

Note Occupied programs are represented by large displayed numbers, and free programs are represented by small displayed numbers.

Fig. 51 *'Program list'*

Procedure

1. Tip the *Program* menu in order to display the program list.
2. Tip the desired program number and *Edit* to edit the program.
3. Enter the desired signal options.
4. Enter the desired wavelengths and save them with .
5. Enter the event settings.
6. Tip *New* to specify the time.
7. Enter the value and time and tip Time to save the settings.
8. should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

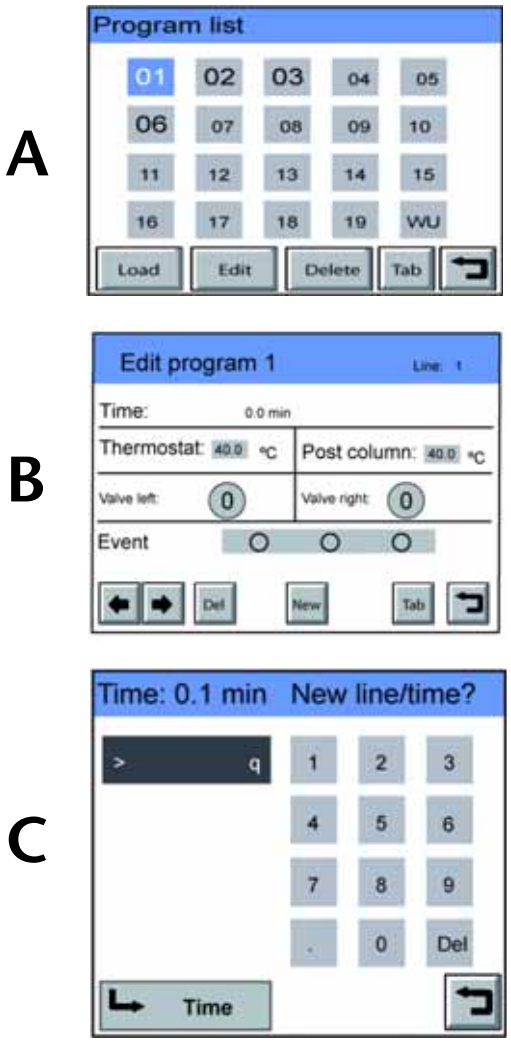


Fig. 52 Creating a program

Creating program lines

New program lines can be created while creating a program.

1. Tip *Tab* in the program's editing window to display the program lines.
2. Tip *New* to create a new program line.
3. Enter the time value.
4. Save setting.
5. Enter value of desired channel.

6. Save setting.

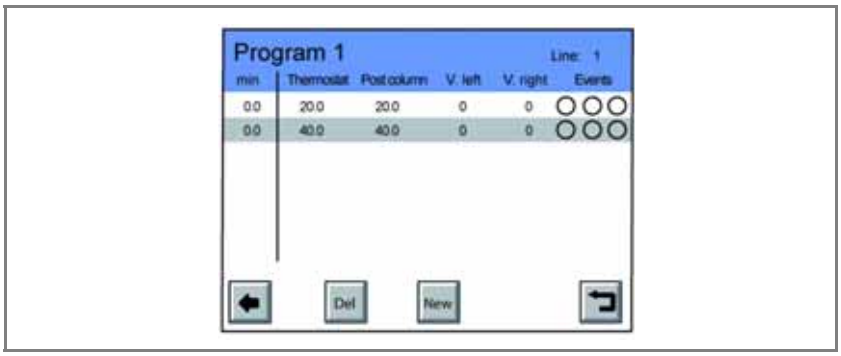


Fig. 53 Creating program lines

Deleting program lines

Program lines can be deleted while creating a program.

1. Tip *Tab* in the program's editing window to display the program lines.
2. ⬅ ➡ should be tipped to mark the desired program line.
3. Tip *Del* to delete the desired program line.
4. Confirm the query.
5. ↩ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

Running a program

1. Tip the *Program* menu in order to display the program list.
2. Tip the desired program number and *Load* to load the program.
3. ▶ should be tipped to start the program (Diagram A).
4. ⏸ should be tipped to interrupt the program.
5. ■ should be tipped to stop the program.
6. **Restart** should be tipped to repeat the program (diagram B).
7. **Finish** should be tipped to exit the loaded program.

Temperature of the thermostat not yet reached

If the target temperature has not been achieved in the thermostat, then a security prompt is displayed when the program is started, asking whether the program should be started anyway.

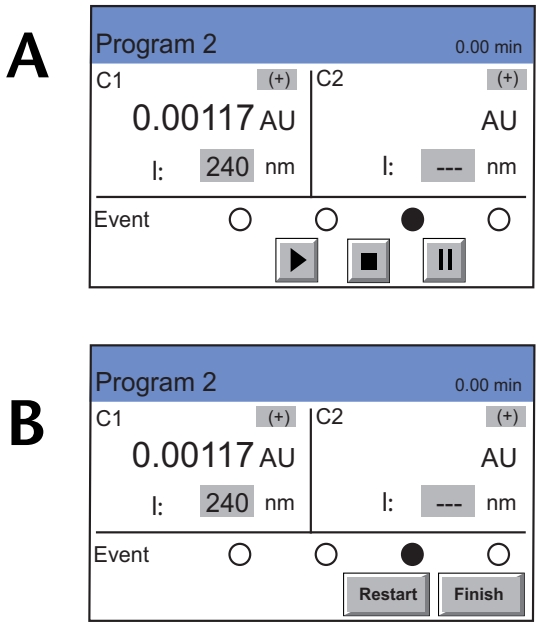


Fig. 54 Executing the program, detector example

Changing a program

1. Tip the *Program* menu in order to display the program list.
2. Tip the desired program number and *Edit* to edit the program.
3. Change the desired value.
4. Save setting.
5. ⮌ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

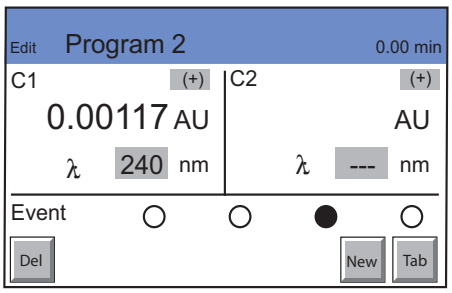


Fig. 55 Changing a program

Displaying the program lines

1. Tip the *Program* menu in order to display the program list.
2. Tip the desired program number and *Tab* to reach the program line display.
3. ◄┐ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

Deleting the program

1. Tip the *Program* menu in order to display the program list.
2. Tip the desired program number and *Delete* to delete the program.
3. Confirm the query.
4. ◄┐ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

Creating a program with start time/wakeup time

The wake-up time is linked with the operating system (BIOS) to ensure that it complies with daylight savings time.

Start time or wakeup time: *Wakeup* program

The program labeled WU serves as a *wakeup program*. It can be used to load a program or link and can be started at a predetermined time, for instance as a wakeup time.

Note: Make sure that the date and time configured in the *Setup* menu are correct.

Procedure

1. Tip the *Program* menu in order to display the program list.
2. Tip *WU* and *Edit* to edit the program.
3. Chose the program or link to be run at the wake-up time in the *wake-up* line and confirm it with  .
4. Enter the program start-date and confirm it with  .
5. Enter the program start-time and confirm it with  .
6. ◄┐ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

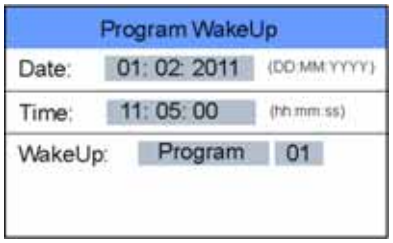


Fig. 56 Setting the start or wakeup time of the system

WU ⇒ Load

The *WakeUp* control mode can be started with *WU ⇒ Load* after answering the security query "*Load wakeup program?*". The screen will display the characters *WakeUp*, as well as the device's wake-up time and the current time. The low-power mode of the display is activated.

Link menu

Links contain connections between existing programs, which can be defined and edited, like the programs themselves.

Depending on the device type, a maximum of 10 links between defined programs can be created and saved.

Navigating through the Link menu

1. Tip the *Link* menu to display the Link list.
2. Tip the desired link number to edit, open or delete the link.
3. Tip *Load* to run a link.
4. Tip *Edit* to enter the edit mode.
5. Tip *Delete* to delete a link.
6. Tip *Tab* to display the program line.
7. ⮌ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

Fig. 57 *'Link'* menu

Creating a link

A link can contain up to 99 lines (*line*).

Each link contains

- the number of a to be connected program (line *program*, 1 through 9),
- the number of repetitions (line *repeat,* 1 through 99)
- the *wait status* i.e. waiting for an external signal (*for external signal)* or continue without interruption (*no wait*).

Procedure

1. Tip the *Link* menu to display the Link list (diagram A).
2. Tip the desired link number to edit the link.
3. Enter program number (diagram B).
4.  should be tipped to save the settings.
5. Enter the number of repetitions (*Repeat*) for the previously specified program.
6.  should be tipped to save the settings.
7. Select the desired option for *wait* (diagram C).
8.  should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

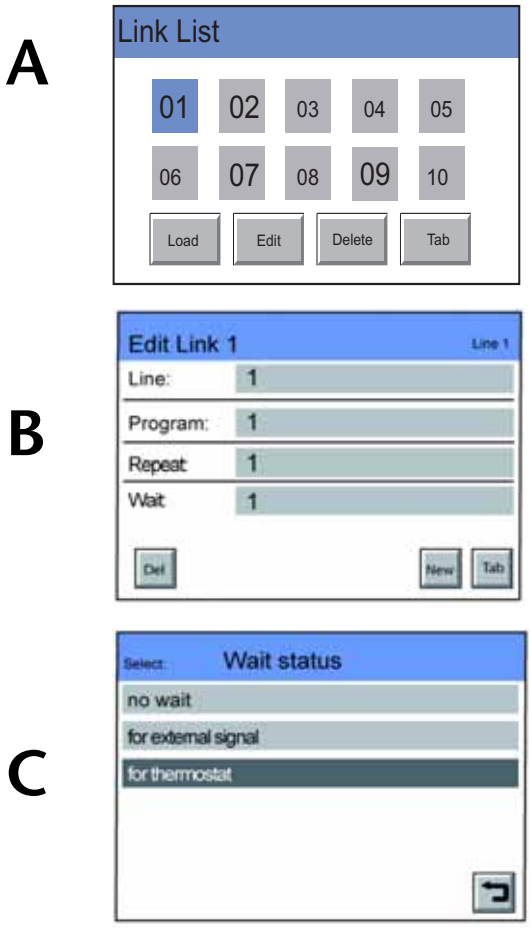
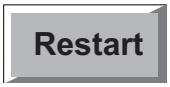
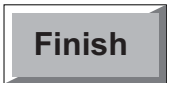


Fig. 58 Create program link (*link*).

Executing a link

1. Tip the *Link* menu to display the Link list.
2. Tip the desired link number and *Load* to load the link.
3.  should be tipped to start the link.
4.  should be tipped to interrupt the link.
5.  should be tipped to stop the link.
6.  should be tipped to be able to repeat the link.
7.  should be tipped to exit the loaded link.

Deleting a link

1. Tip the *Link* menu to display the Link list.
2. Tip the desired link number and *Delete* to delete the link.
3. Confirm the query.
4. should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

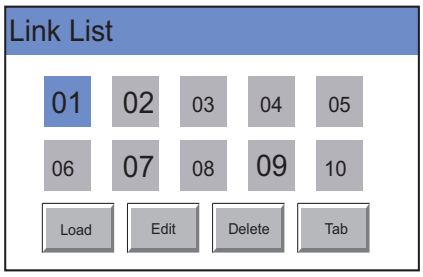


Fig. 59 Deleting a link

Scan menu

Navigating the detector's Scan menu

1. Tip on the *Scan* menu in the Main menu to display options.
2. Tip the gray highlighted values in the *Range* line to determine the wavelength range for autozero and scan.
3. Enter the desired wavelength values and confirm each with  .
4. Tip the gray highlighted values in the *short key* line to determine the scan start area display in the status display.

Option	Explanation
< Scan Start>	The button *Scan Start* appears in the status display.
< Enter screen Scan>	The button *Scan* appears in the status display.
Disable	Removes the scan button

5. Tip the gray highlighted area of the *Monitor* line to make the following selections:
   - *absorption*
   - *intensity of signal channel*
   - *intensity of reference*

Now there are the following options:

6. Tip *Autozero* button to carry out the zero balance of the measuring signal.
7. Tip the *Scan Start* button to start the scan.
8. Tip the *Scan Out* button to output the scan data to the selected integrator output (RCA port on the back of the device).

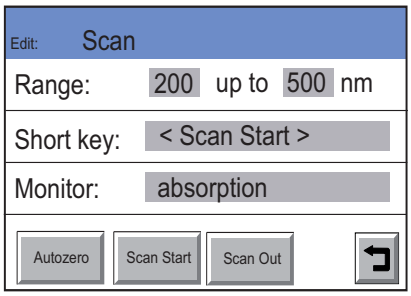


Fig. 60 *'Scan'* menu

Setup menu

In the Setup menu, fundamental parameters for controlling the device are specified.

Navigating the *Setup* menu

1. Tip the *Setup* menu to display options.
2. Tip the desired parameters.
3. ⬅ ➡ should be tipped to scroll through the other options in the setup menu.
4. ↵ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

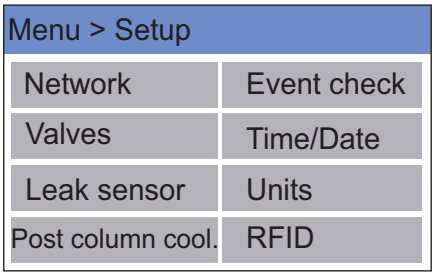


Fig. 61 *'Setup'* menu, thermostat example

Parameters of the thermostat

Parameter	Explanations
Network	Configuring the device in the network
Valves	Setting valves and valve positions
Leak sensor	Set the sensitivity of the leak sensor from 0–100% sensitivity for aromatic hydrocarbons: ▪ Smaller value > low sensitivity ▪ Large value > high sensitivity
Post column cool.	Setting the temperature for postcooling of the columns
Event check	Evaluates incoming signals
Time/Date	Setting the date and time

Parameter	Explanations
Units	Sets the unit of temperature display in degrees Celsius or degrees Fahrenheit
RFID	Sets automatic detection of columns via RFID chips

Setup menu parameters

Network The network configuration is displayed:

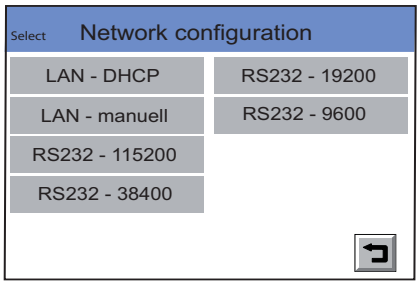


Fig. 62 Configuring the network

Tipping the gray areas opens a list of further configuration options.

Lamps The deuterium and halogen lamps can be switched and calibrated.

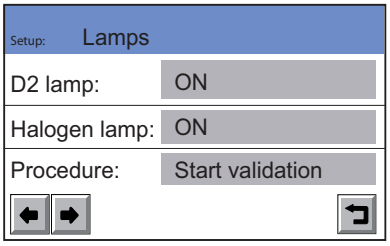


Fig. 63 Setting the detector lamps

T-const. Here a time constant can be selected from prescribed values from 0.1 s to 10.0 s, to smooth the analog output signal. Smaller time constants can only be set using LAN control with the chromatography software.

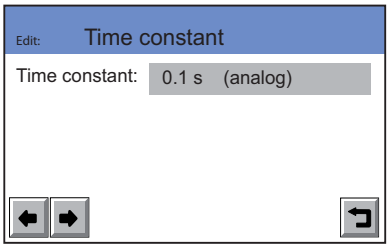


Fig. 64 Selecting time constants for detectors

Intensity The intensities in channel C1 are displayed. *Monitor source* can be selected (absorption, signal channel, reference channel).

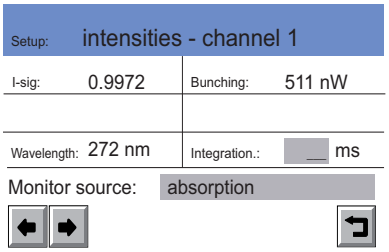


Fig. 65 Displaying the channel intensity for detectors

For check the functionality of the lamp, the two light intensity values **I-sig** and **I-ref** provide useful information. The right column notes the absolute light intensity that the signal and reference channels in the UV-maximum measure after a calibration. The values are independent from the integration time default setting and can, therefore, be used as a spectra sources quality gauge. The value **I-sig** allows you to draw conclusions about the measurement situation (installed flow cell type, solvent used, bubble free, etc.).

Scan Here the integrator channel and the speed can be specified for the scan output. The detector offers two integrator outputs that are accessible at the RCA ports on the back of the device.

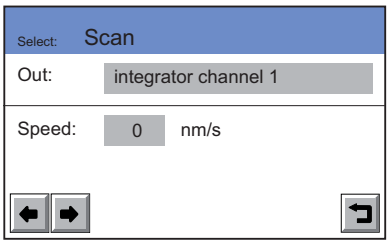


Fig. 66 *'Scan'* settings in the *Setup* menu of a detector

Analog out Here the offset (moving the baseline) and scaling (in AU/V) of both integrator outputs can be set.

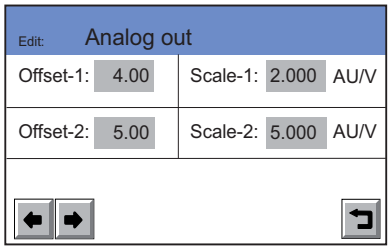


Fig. 67 Setting the baseline and scaling for detectors

Analog in The *external λ* input on the back of the device enables external control of the detector through a positive analog voltage that is applied against AGND.

By selecting *Set to zero* a voltage can be defined as the spectral zero point for the wavelength 000 nm. Typically, a voltage of 0 is used in this case.

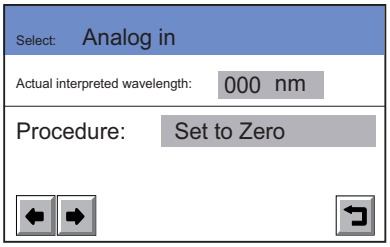


Fig. 68 Settings for external control of detectors

If the control voltage is raised, then the *actual interpreted wavelength* field shows the corresponding wavelength with a scaling of 100 nm/V. The scaling can be changed with the number keys that appear after tipping the field.

Note: For optimal linearity a scaling of 100 nm/V is recommended. The greatest wavelength (900 nm) is then reached with a control voltage of 9 V.

Date/Time

Fig. 69 Setting the date and time

Here the date and time for the detector can be entered, after tipping the gray buttons next to *Date* and *Time*.

Temperature units

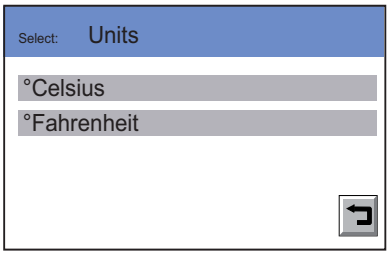


Fig. 70 Setting the temperature display for T-1 column thermostats

After tipping the gray buttons next to *Temperature*, the temperature display can be entered here for the thermostat in degrees Celsius or Fahrenheit.

Pressure units

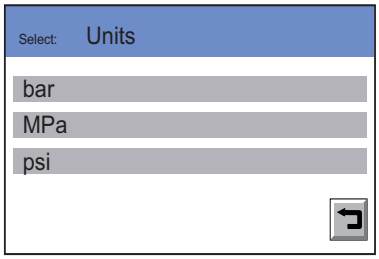


Fig. 71 Setting the pressure units for the P-1 pump

'GLP' menu

The GLP menu is for information purposes only. The submenus provide information about the use of the device, deliver an overview of the configuration and inform as to the condition of the device. The data can be viewed by tipping the corresponding buttons.

Navigating through the *GLP* menu

1. Tip the *GLP* menu to display operating parameters.
2. Tip the parameters to display all available options.
3. ⬅ ➡ should be tipped to scroll through the other options in the *GLP* menu.
4. ↵ should be tipped to go to the superordinate level, or hold for two seconds to go to the Main menu.

GLP

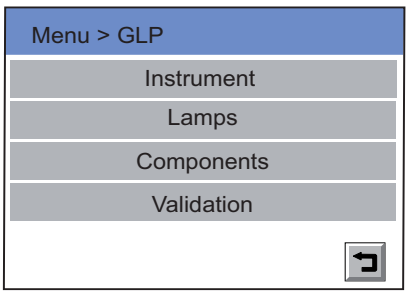


Fig. 72 *'GLP'* menu, detector example

Chromatography software

Prerequisites

- All of the devices to be configured are switched on.
- The devices are configured for the local network.
- The devices are logged in to the local network.
- The chromatography software has been installed by KNAUER or a company authorized by KNAUER.

Starting the KNAUER chromatography software

Starting the ChromGate® software

1. Open *Start⇒All Programs⇒Chromatography⇒EZChrom Elite.* This starts the PLATINblue Edition of the ChromGate® chromatography software from KNAUER. The window of the client/server software opens, for example.

Creating users

2. Select *Tools⇒Enterprise Login …* and log in at the system with your user name and password. The user name appears on the status bar of the client/server software.

Creating a new module configuration

Opening the "Instrument" window

1. Open *File⇒New⇒Instrument*. The window for the new device configuration opens.
2. Enter a name for the module and press *[Configure]* to start the configuration of the system.

Automatic device configuration by the software

To use the automatic configuration and check whether the modules are correctly controlled by the software:

Prerequisite

A new module configuration (*Instrument*) has been created.

Using automatic configuration

1. Click *[Auto configure]* ① to automatically configure the modules in the local network. All PLATINblue devices in the network will be detected with the correct port settings. The successfully configured modules are listed under *Configured modules*.

2. Even with automatic configuration it may still be necessary to make or check a few of the system settings manually of individual devices, such as the sample volume *Loop volume* or the *Syrigne volume* in the automsampler.Module not found

Legend

① Device detection in local network

② Manual search for device in network

③ Serial number

④ Sample volume

⑤ Syringe volumes

⑥ Device detection via serial number

⑦ Device options, e.g. sample cooling

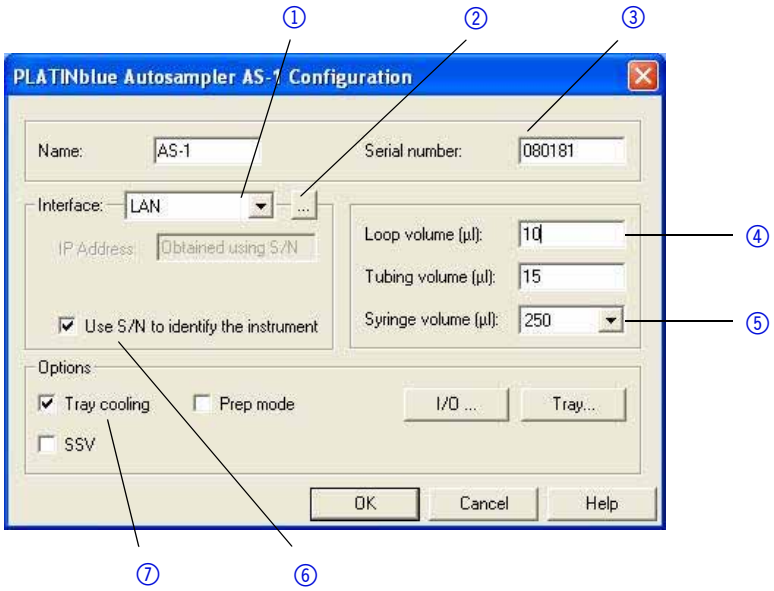


Fig. 73 Settings, e.g. autosampler

What if a module is not found during the automatic configuration process?

Procedure

1. Check the module cabling.
2. Switch the modules off and turn them back on.

3. Check the system error messages.
4. Check the LAN configuration of the modules on the touch-screen (LAN-DHCP).
5. Check and/or replace the network cables.
6. Check the router settings.
7. For details on how to manually add a module to the chromatography software, see T-1 Basic column thermostat.

Manual configuration of the T-1 column thermostat

Devices connected to the analytical system can be manually copied to the list of successfully configured devices. Next, they are opened and separately configured. Procedure for manually configuring modules in the chromatography software:

Legend

① Module selection

② Buttons for copying into software controller

③ Double-clicking opens configuration dialog for modules

④ Manual selection of system port

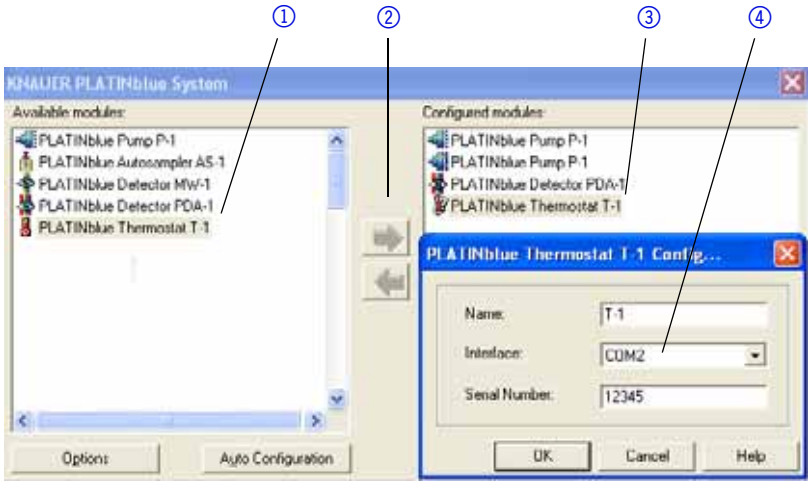


Fig. 74 Manual configuration of modules connected via serial port

1. Select the required device from the *Available modules* list, e.g. *PLATINblue T-1 Thermostat*.
2. Click *[➡]* to copy the module to the list of successfully configured mode *(Configured modules)*.
3. In *Configured modules* list, double-click the device, (e.g. *PLATINblue T-1 Thermostat*) to access the configuration settings.
4. Select a port, e.g., COM2. The serial number can be entered optionally.

Remove the device from the analytical system

Click *[⬅]* to remove the module from the *(Configured modules)* list, e.g. when single modules are to be removed from the analysis system.

'Remote'-controlling the devices

If the chromatography software has fully taken over control of the modules, the *Remote* status appears in the status bar of the touchscreen.

Switching on standby mode

Choose *Control⇒Standby* and one of the standby settings.

System presets

Practical tip!

To minimize the setup and configuration times for various applications, save the system settings or module combinations as presets in the software.

Compressibility of solvents

Enter the compressibility of the solvents into the Method window of the chromatography software as solvent types. The compressibility factor can be adapted to various different types of solvents to obtain more accurate results at higher pressures.

Procedure

Procedure for setting the compressibility of the solvent in an analysis method:

- Select the solvent type in the analysis method
- Store the analysis method together with the modified solvent type
- When downloading the methods, the chromatography software transfers all of the data to the analysis system.
- The measurement can be started using the configured compressibility factors

Setting the solvent type

1. Open *Method⇒Solvent Type*. A window appears where you can set the solvent type.
2. Select the solvent type, e.g., *[Acetonitrile]* to set the compressibility.

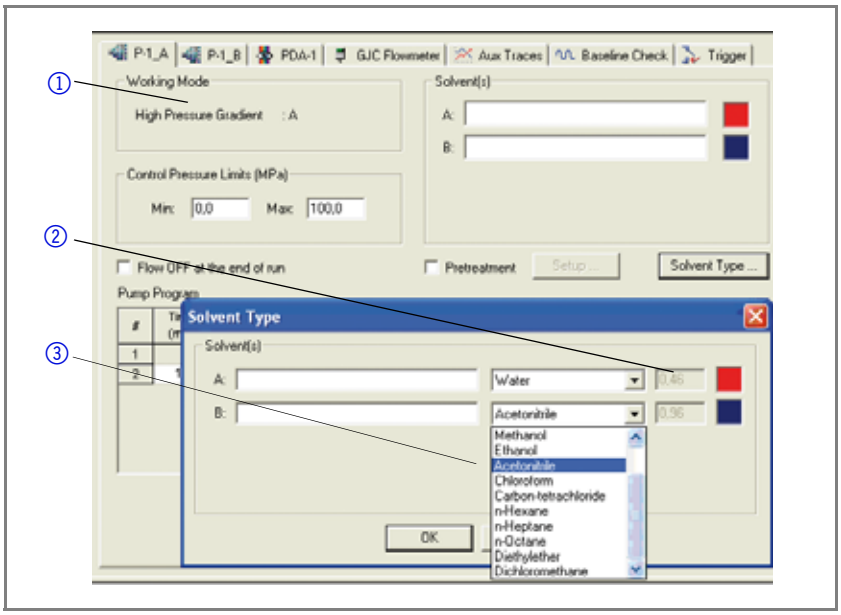
3. Check the factor or enter a different value in *[Custom]*.

Legend

① Gradient

② Compression factor

③ Solvent type

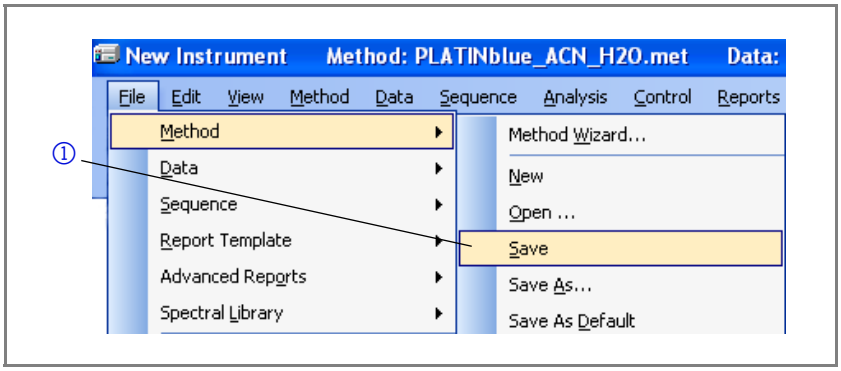


Storing the analysis method

Select *File⇒Method⇒Save* to store the analysis method using the selected solvent type.

Legend

① Stores the analysis method using the configured solvent type

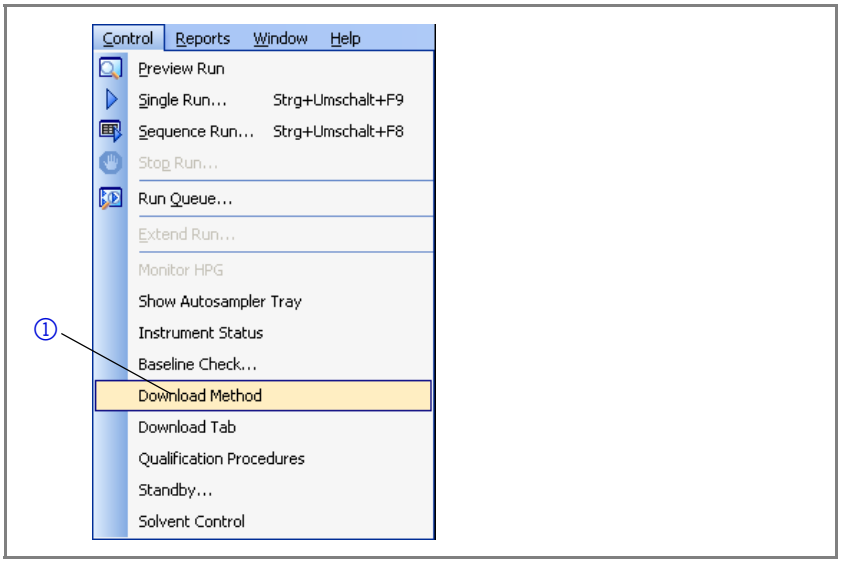


Transferring the analysis method

Choose *Control⇒Download method* to transfer the analysis method from the chromatography software to the analysis system.

Legend

① Transfers the analysis method using the configured solvent type



Control of the T-1 with chromatography software

The T-1 column thermostat can be controlled using the chromatography software and in T-1 version A63410 it can also be manually operated using a touchscreen.

If the T-1 is connected, activated and switched by the software via an interface, then “Remote” appears automatically on the display of the T-1. In this case, the column thermostat can no longer be controlled manually. Only the stop function can be activated.

A number of requirements must be fulfilled for control of the T-1 using the chromatography software:

Requirements

- The column thermostat must be connected to the computer via an interface.
- The columns within the column thermostat must be properly secured and connected.
- The column thermostat must be switched on with the power switch on the back of the device.
- The T-1 column thermostat must be configured successfully within the ChromGate® software.

Procedure

1. In the *Client Server*, select the configured T-1 column thermostat by double clicking it. The ChromGate software opens for the selected device.

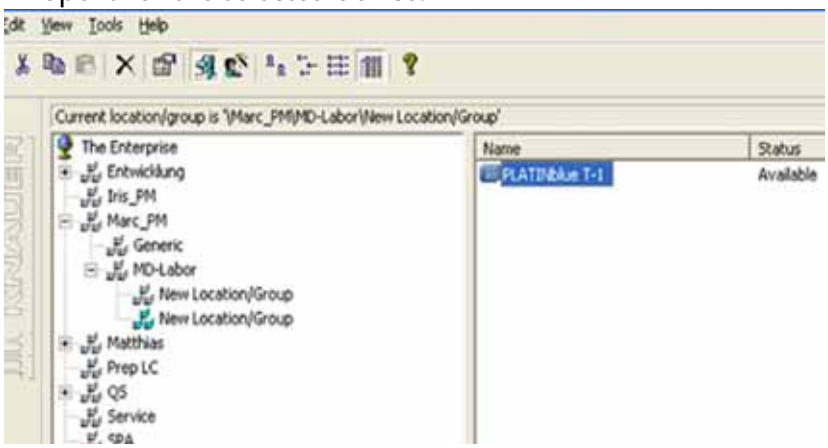


Fig. 75 Double click on the configured device in the client server

2. By selecting *Control⇒Instrument Status* you will go to the *Instrument Status* window.
3. In the *Instrument Status* window of the ChromGate® chromatography software, open the T-1 tab. From there the device can be controlled directly.

Legend

① Monitor: transmitted, current data of the T-1

② Selection of the valve position of the right valve

③ Selection of the valve position of the left valve

④ Setting of the post-cooling temperature

⑤ Setting of the temperature in the column thermostat

⑥ Switching off the column thermostat

⑦ Selection of events (event switching/ short-circuit signals)

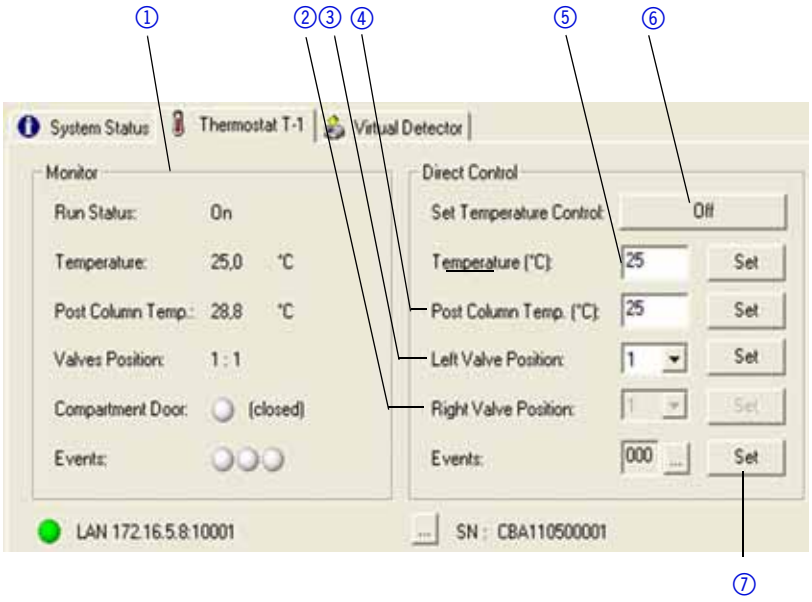


Fig. 76 Tab of the T-1 column thermostat

Legend

⑧ Update of device and column parameters

⑨ Opens the view of the column parameters

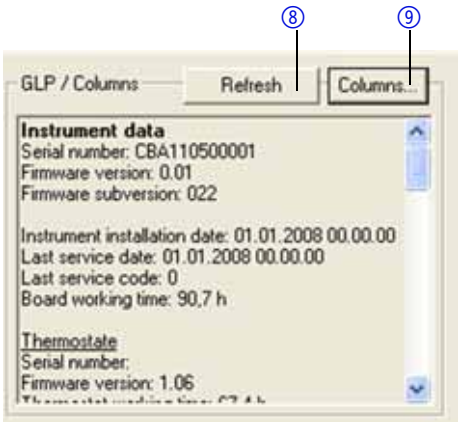


Fig. 77 *'GLP/Columns'* **status display**

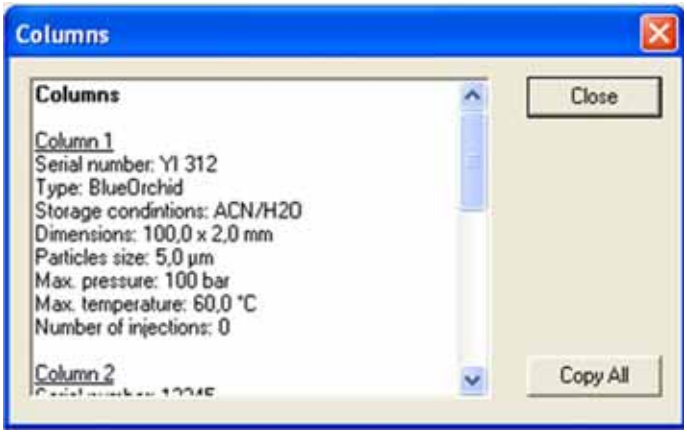


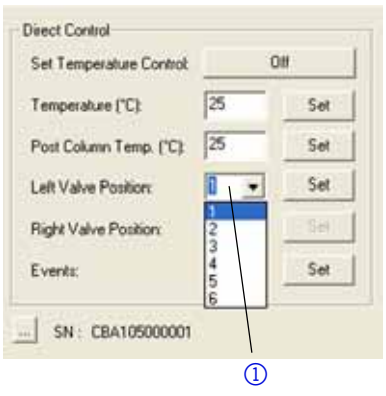
Fig. 78 **View of the column parameters**

Valid for the T1 thermostat

Selecting the valve position

Legend

① Selection of the valve position

Steps	Figure
1. Click *Control T-1 Instrument status* T1 thermostat. 2. In *Left Valve Position* or *Right Valve Position*, select the valve position. If *Column Switching* is enabled, the setting of one valve is automatically applied for the other valve as well.	

Setting the temperature

Under *Temperature* (E) in the tab of the T-1, enter the desired temperature and click *Set*. This will transmit the temperature directly to the device.

Switching the temperature off

Behind *Set Temperature Control* (F) in the tab of the column thermostat, click *Off*. This will shut off the heating module and the postcooling in the thermostat.

Setting the postcooling

Under *Post Column Temperature* (E) in the tab of the T-1, enter the desired temperature of the postcooling and click *Set*. This will transmit the postcooling temperature directly to the device.

Selection of the valve positions

Under *Right Valve Position* (B) and *Left Valve Position* (C) in the tab of the T-1, the selection of the corresponding valve position can be entered. If column switching is activated in the instrument configuration, the valve position can only be specified for the left valve, as the right valve will automatically be switched to the same position at the same time.

Defining '*Events*'

Under *Events* (G) in the tab of the T-1, enter the desired event switching and click *Set*. The specification is transmitted directly to the WAGO terminal of the T-1.

'GLP/Columns'

In the column *GLP/Columns* (H), all important parameters of the T-1 are listed. Clicking *Columns* opens a window and the parameters of the installed columns are shown. Clicking *Refresh* will update all parameters, for example if the columns are exchanged.

Note In order for the parameters of a column to be recognized by the software, the RFID chip must be screwed into the RFID terminal strip of the column thermostat. The RFID chip is in a screw fitting, which is connected with the column at delivery.

Note In the method window (*Instrument Setup* window), in the *Selected Column* field the column must be selected for which the parameters are to be recognized by the software. Only in this manner is it possible to display the parameters in the software and make changes if necessary.

Enter the storage conditions of the column in the RFID chip

By clicking the button below '*GLP/Columns*', the information for the storage conditions of the column will open ('*column information*'). The used eluent and the user name of the selected column can be entered.

By clicking '*Set*' the informations will be transferred to the RFID chip.

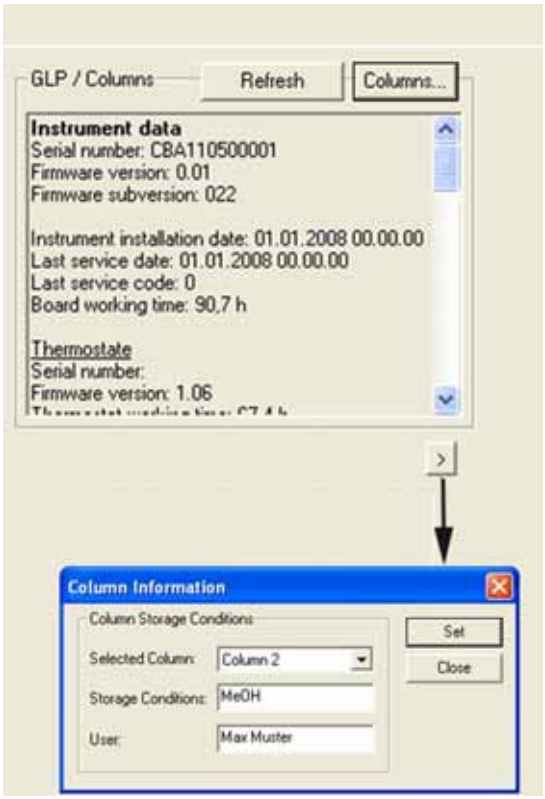


Fig. 79 Entering eluent and user name

Settings on the column thermostat within a method

By selecting *Method⇒Instrument Setup* you go to the method window (*Instrument Setup* window) of the T-1.

Legend

① Time table to define device settings at certain times

② Wait before injection

③ Setting the protection temperature

④ Setting of the post-cooling temperature

⑤ Selection of a column

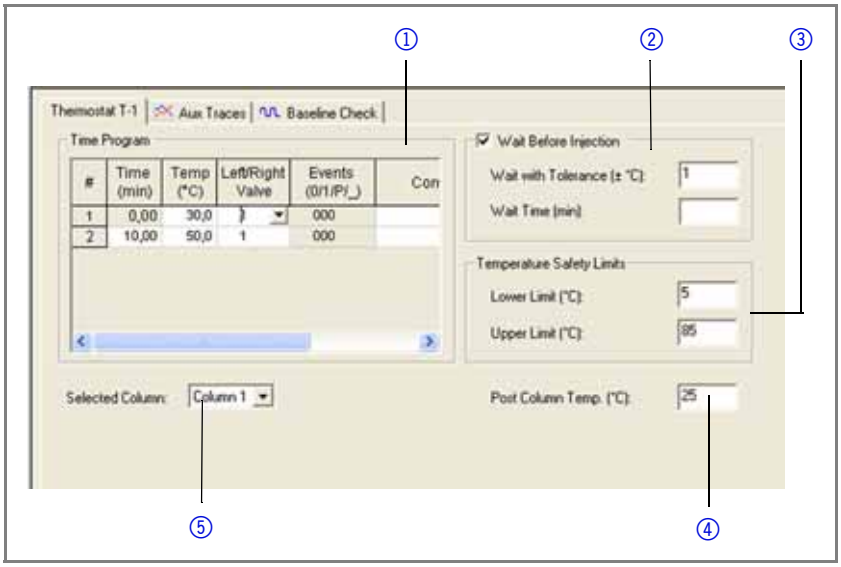


Fig. 80 Method window (*'Instrument Setup'* window) of the T-1 column thermostat

Practical tip By selecting *Control⇒Download Tab* the start parameters can be transmitted from the software to all devices connected to the system.

'Wait before injection'

'Wait with tolerance' The system is only ready for operation if the column thermostat has achieved the temperature specified in the time table. The tolerance range for this temperature is defined here.

'Wait time (min)' Wait time in minutes.

If the system should be conditioned before the injection at the temperature specified in the time table, the corresponding time can be entered here.

Setting the protection temperature

In the '*Temperature Safety Limits'* the minimum *('Lower Limit')* and maximum *('Upper Limit')* temperatures can be defined. Once these temperatures are reached, the column thermostat will be shut down automatically for safety reasons.

Selecting the column

Under '*Selected Column'*, the column is chosen that is to be recognized by the software to display its parameters. Only when the column has been selected can the parameters be checked by the software and then the data can be modified if necessary.

LPG system

This UHPLC system is suitable for applications using low-pressure gradients (LPG) in the mobile phase (solvent). It consists of the following modules:

Legend

① Solvent tray

② Manager with degassing and gradient module

③ Pump with pressure sensor and mixing chamber

④ PDA-1 detector or MW-1 detector

⑤ Autosampler

⑥ Column thermostat and UHPLC column

⑦ Workstation with chromatography software

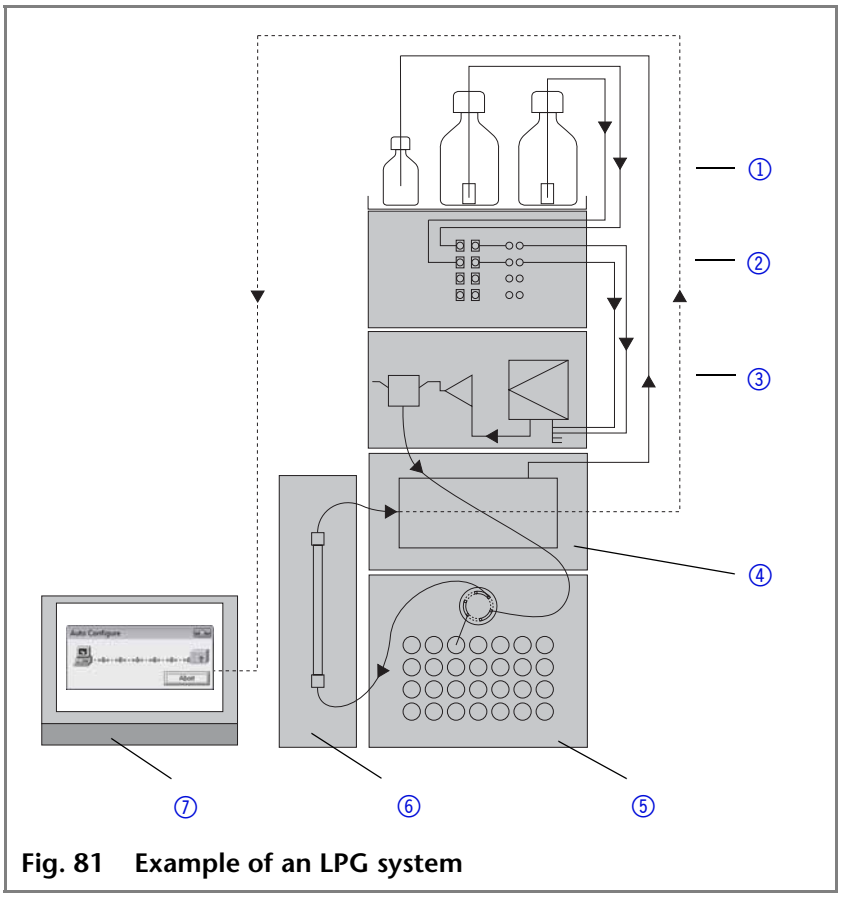


Fig. 81 Example of an LPG system

Manager

The manager module is a multipurpose module that can be used to supplement the high-pressure pump with a gradient function for up to four solvents. Furthermore, additional modules can be connected using an analog port.

Legend

① Status indicator

② Degasser module

③ Gradient module

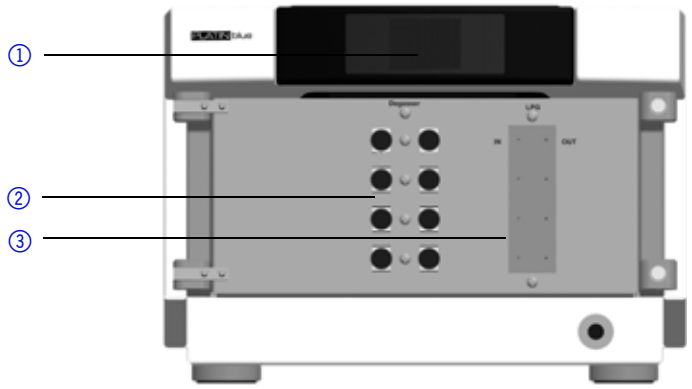
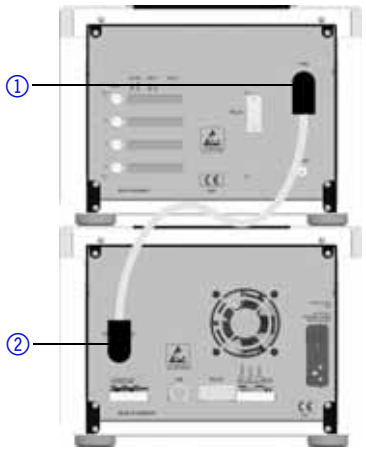
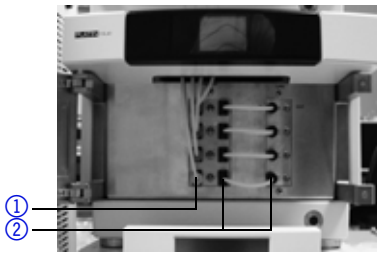


Fig. 82 Manager M-1

Connecting manager to pump

Steps	Figure
1. Place manager on UHPLC pump 2. Push the female connector of the cable ① onto the male connector on the rear panel of the Manager and turn the retainer ring 3. Push the male connector of the cable ② into the female connector on the rear panel of the UHPLC pump and turn the retainer ring	 **Fig. 83 Manager connection for UHPLC pump**

Connecting the degasser module to the gradient module

Steps	Figure
1. Remove filler cap from input/output of degasser module 2. Fasten the fitting of the tube that connects the solvent bottle with the Manager to the input of the degasser module ① 3. Fasten the fitting of the tube leading towards the gradient module to the degasser module output and the gradient module input ②	 **Fig. 84 Connecting the degasser module**

Configuration of the manager M-1

Process

Two steps are necessary for the configuration of the interface card of the manager (*Interface* Card) to make possible communication between the device and the software:

- The interface is configured in the window of the ChromGate® client/server software.
- The interface card is configured manually via the standard interface (*User Defined Detector*) in the chromatography software.

Procedure

1. Start the chromatography software and configure the interface card.
2. In the chromatography software, use the default settings of the standard interface (user defined detector).
3. Specify the interface.
4. Check the status of the device in the chromatography software.

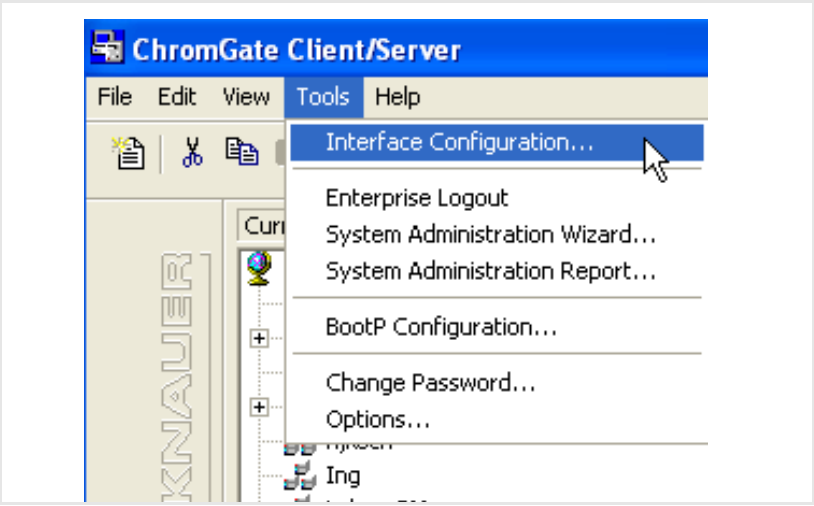
Prerequisites

The following is required to be able to configure the manager with the pump via software:

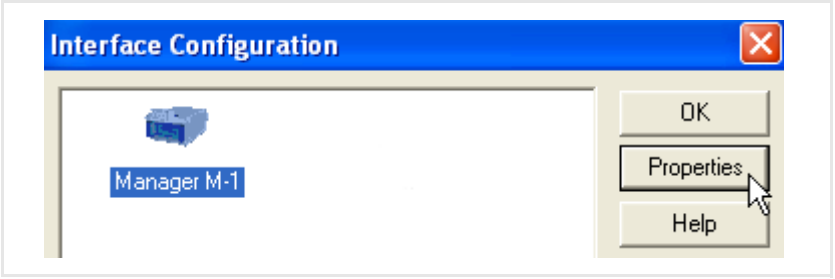
- The manager is connected to the serial RS-232 interface (EIA-232) of the system or an interface box.
- The manager is connected with a pump via a connection cable.
- The serial number of the device is known.
  - Example: CDA 1032 52525
    CDA: Device ID
    1032: Production ID
    52525: Identification number for the interface card
- The following is indicated on the manager touchscreen:
  - The manager is switched on.
  - The interface card has been recognized.
- The chromatography software has been started.

Configuring the interface

1. Start the KNAUER chromatography software. The window of the client/server software opens. Select *Tools* ⇒ *Interface Configuration ...* to configure the manager.



2. The window opens with all devices that are configured via an interface (*Interface Configuration*). Select *Manager M-1* and then click *[Properties]*.



3. The window opens with interface settings (*Interface Setup*).
4. Enter the last 5 digits from the serial number of the device (example: CDA103252525 for *C: Serial number)*.

Legend

① Number of interface cards (*Number of boxes)*

② Actual interface card to be configured (*Configure box*)

③ Serial number

④ Connection for the serial interface

⑤ Data acquisition rate for UHPLC

⑥ Measurement range for UHPLC

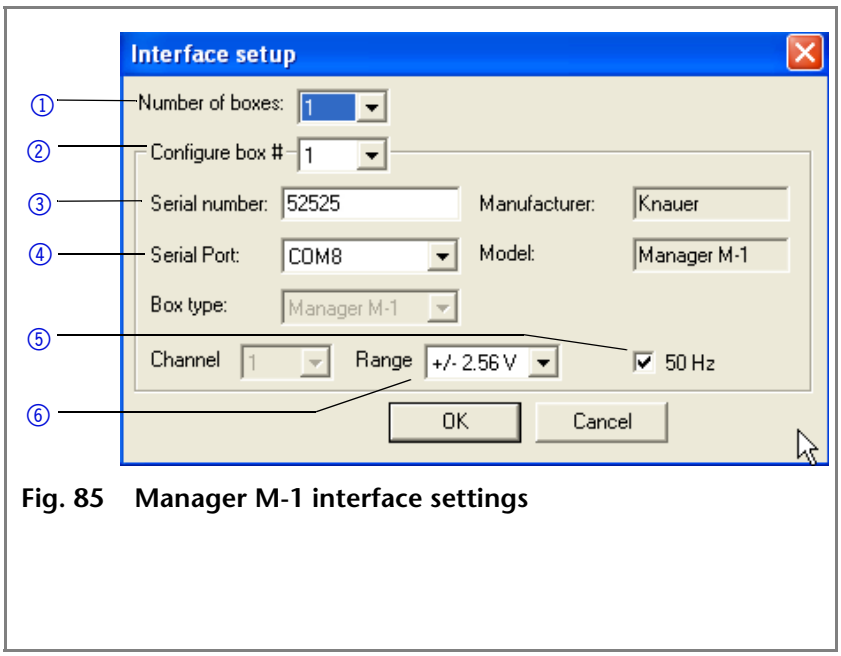


Fig. 85 Manager M-1 interface settings

Checking or changing the interface settings

The data acquisition rate, measurement range, the serial number and the serial interface are checked or modified in the *Interface Setup* window.

1. If there is only one interface card, then select *1* in the *Configure Box*.
2. Enter the serial number ② of the manager.
3. Select the serial interface ③, e.g. COM 8.
4. Set the measurement range ⑤ (*Range*) to 2.56 V for UHPLC.
5. Select the option ④ for the data acquisition rate of 50 Hz for UHPLC. The data acquisition rate of 50 Hz applies only for one measurement channel (*Channel*).
6. Confirm the settings with *[OK]*.

Using the standard device driver (user defined detector)

The manager is configured via the standard interface (*User Defined Detector*).

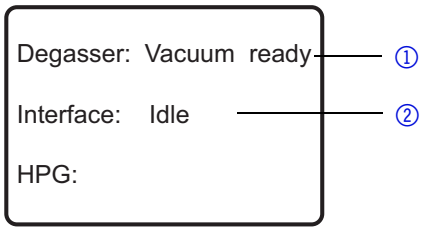
Configuring devices

You are in the client/server configuration of the ChromGate® software and have selected the analytical system ①:

Fig. 86 Standard device drivers

1. Open *Configure* ⇒ *Instrument* with a right mouse click.
2. Using the arrow keys, move *User Defined Detector* to *Configured Modules* and confirm with *[OK]*.
3. Double click *User Defined Detector Configuration*.
   The window opens for configuration of the (*Interface*).
4. Enter the last 5 digits from the serial number of the device (Example: CDA1032**52525** for *Serial number)* and select *Manager M1*.
5. Modify the default settings of the interface in the manager and confirm with *[OK]* to select the interface.

The connection between the manager M-1 and the PLATINblue system is activated. On the touchscreen of the manager you can see that the degasser module is ready for operation ① and that the interface has been recognized ②.



Checking the device status

1. Select *Method* ⇒ *Instrument Setup* ⇒ *Instrument Status*.
2. Select the *User Defined Detector* ① tab. The communication settings of the manager M-1 are displayed by the system.
3. In the *Communication* ② section, an LED lights up green when the interface and serial number are valid. The version number of the software is displayed.
4. Open additional settings ③. A window opens with additional device information. The serial number is displayed.

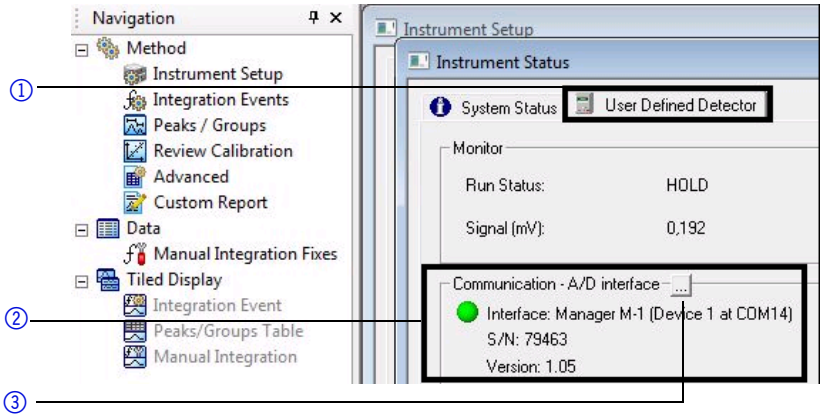


Fig. 87 Device information of the Manager

What to do when...

If communication between the manager and the software is not functioning properly, check the following:

- Electrical and data cables
- Serial interface
- Replacement of the serial interface cable
- Software restart
- Has the cable to the pump been connected?
- Is the touchscreen of the manager on (mains connection)?
- Have changes been made to the configuration in the client/ server window of the software?
- Has the option 50 Hz been set for the UHPLC?

Purging the pump

Procedure

The following procedure is recommended for purging the pump:

- Only purge without pressure, meaning only purge with the bleed screw on the pump pressure sensor open. Otherwise the pump is switched off automatically.
- The flow rate for the purge function is set.
- In the HPG system, the pumps are purged individually and sequentially.
- In the LPG system, you can select between the gradients A–D or a mixture of the gradients.

Note

The purging process of the pump is limited to a max. pressure of 5 MPa (50 bar). If this value is exceeded during the purging process, the pump switches off automatically.

Purging the pump via software

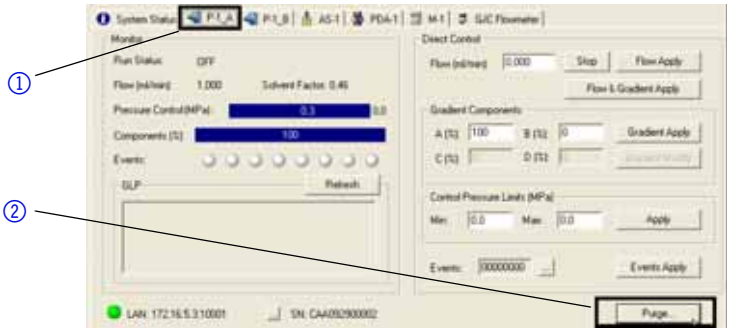
Prerequisites

- Before the purging process, bleed screw has been opened to prevent excess pressure and damage to the column.
- A drainage tube or syringe was connected to the bleed valve

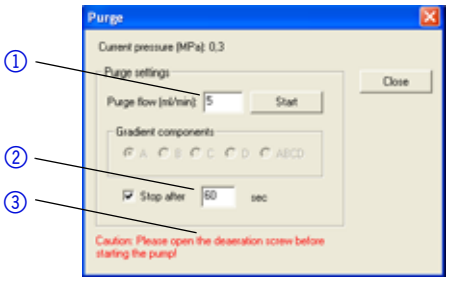
If in the setup menu of the pump the HPG mode *A, B, C* or *D* has been selected, then in the purge mode only the value for the flow rate can be set.

Configuring the ChromGate® software

1. Open *Control* ⇒ *Instrument Status*.
2. Using the tabs, select the pump that is to be purged, e.g. *P-1_A*.



3. Select *[Purge...]* to configure the purge function ② .
4. Enter the value for the flow rate ① .



5. Enter automatic switch-off ② of the purge function after 60 seconds.

Note A note in the window of the purge function ③ will be displayed if the bleed screw has not yet been opened.

Purging the pump

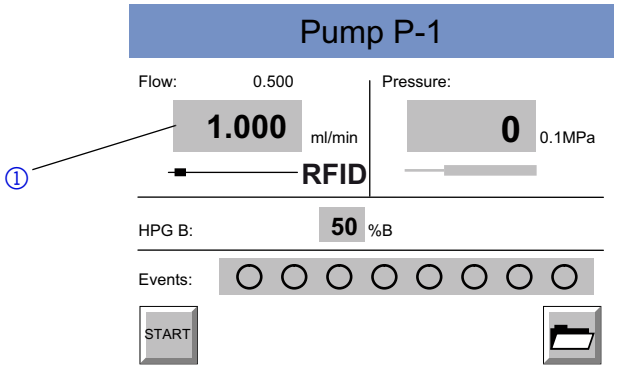
1. Open the bleed screw.
2. Click *[Purge Start]* to start the purging process.
3. Click *[Purge Stop]* to stop the purging process or wait for it to turn off automatically.
4. Close the bleed screw.

Purging the pump via touchscreen

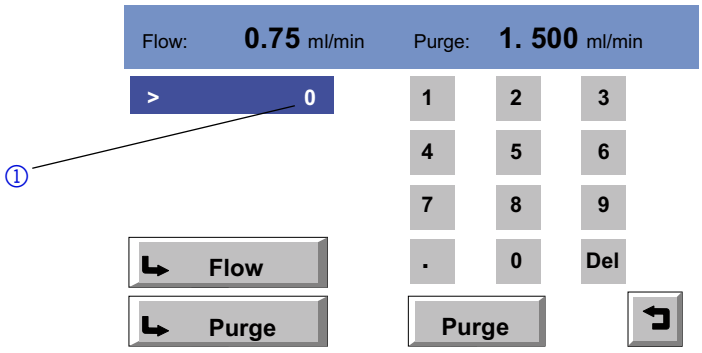
Note Before the purging process, open the bleed screw to prevent pressure surge and damage to the column.

Procedure

1. Open the bleed screw.
2. Tip the gray field ① to open the set-up window.



3. Set a value ① for the flow of the solvent, e.g. 4.2 ml. In the status bar, the change of the status to *Purge B*, for example, is displayed.



4. Tip  to make the settings for the purge function.
5. Tip *[PURGE A]*, for instance, to start the purging process.
6. Tip *[PURGE STOP]* to stop the purging in the middle of the process.
7. Close the bleed screw.

Note If the pump has been switched off automatically, then repeat the purge process.

Purging in the LPG system

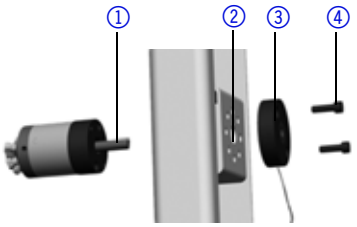
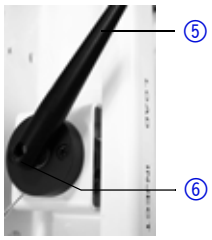
If in the setup menu of the pump the LPG mode has been selected, then in the purge mode it is possible to select between the gradients A, B, C or D or a mixture of the gradients (*channel:MIX*).

Manual injection valve

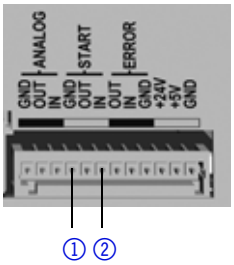
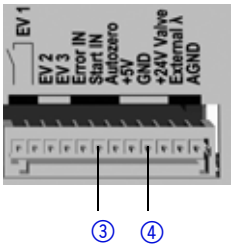
Note There is a magnet ② on one side of the control lever ① of the injection valve. To ensure the induction current can flow, check that the magnet side of the control lever is facing the induction plate of the injection valve.

Fig. 88 Control kever of injection valve

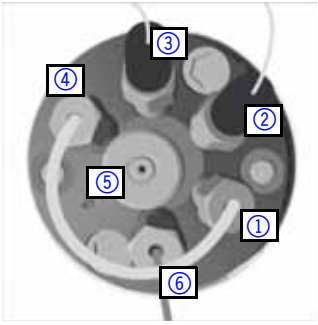
Fastening the manual injection valve and the control lever

Steps	Figure
1. Insert the valve with the pin ① through the round hole in the rail and through the central hole ② in the fastening plate 2. Tighten the valve until the two bolts ④ can be screwed through the induction disk ③ into the valve	 **Fig. 89 Fastening for the manual injection valve**
3. Push the induction disk onto the pin and tighten the screws 4. Check whether the control lever ⑤ can be set to the LOAD or INJECT positions 5. Place the control lever on the pin and tighten the recessed screw ⑥ in the head of the control lever	 **Fig. 90 Connecting the control lever**

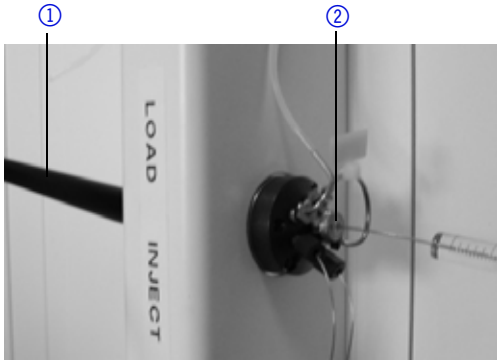
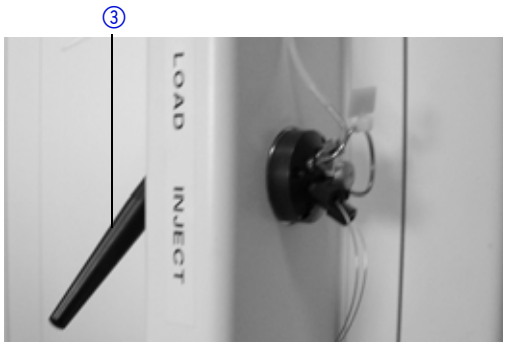
Connecting the cable for the trigger signals

Steps	Figure
1. On the rear of the module, connect the valve's trigger signal cable to the remote control connection of the pump (①, ②)	 **Fig. 91 Connecting the trigger cable to the pump**
2. On the rear of the module, connect the valve's trigger signal cable to the remote control connection of the detector (③, ④)	 **Fig. 92 Connecting the trigger cable to the detector**

Connecting the manual injection valve

Steps	Figure
1. Connect the sample loop between ports ① and ④. 2. Connect the column to port ②. 3. Connect the mixing chamber to port ③. 4. Connect the flushing capillaries to port ⑤. 5. Connect the sample injection to port ⑥.	 **Fig. 93 Connections for manual injection valve**

Manually injecting the sample

Steps	Figure
1. Turn the lever to *LOAD* ① 2. Insert the syringe into the valve ② and inject the sample into the sample loop	 **Fig. 94 The sample is injected into the sample loop**
3. Turn the lever to *INJECT* ③. Washing the sample into the column	 **Fig. 95 Washing the sample into the column**

Performance qualification for system

The performance qualification for the system is a component of the chromatography software and, at the end, yields clear test results in a standardized test environment.
The performance qualification is divided into two sections:

PQ test

Fast system test

- Fast system test of performance qualifications (performance qualification, PQ)
  - Prerequisite: The system is equilibrated.
  - Duration: approx. 10 minutes in total, 3 minutes per injection, at least 3 injections per measurement
  - Injection volume settings
  - Determining the deviation
  - Determining the peak search window

What are the results of the PQ?

The PQ returns the following results:

- System is functioning correctly.
- Reproducibility of the test readings performed with the test column and test mixture (UHPLC test kit; order number A66110) from KNAUER
- Consistency with test readings in acc. with relative standard deviations (RSD)

Open PQ

1. Select *Control⇒Qualification procedures*. The window for selection of a performance qualification opens under *Available Procedures*.
2. Select *System PQ* to execute the PQ.
3. Select *New session* or *Unfinished session* and open the settings of the PQ with *[Start session]*.

Legend

① Settings for detector and pump/gradient

② Selecting the PLATINblue test mixture

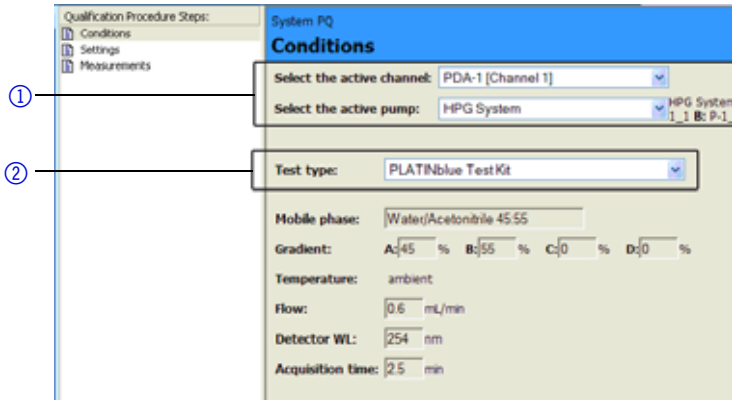


Fig. 96 Selecting the PLATINblue test mixture

Checking the test results

1. In the *Conditions* window, choose the boundary conditions of the system for the detector and pump, e.g., channel measurement on the PDA-1 or MW-1 detector at 254 nm (see fig. 96).
2. Choose the *Test type⇒PLATINblue test kit*. The solvent, gradient, flow, wavelength and recording time are selected automatically and cannot be modified.
   To use your own test mixture, configure it using *Custom test*.
3. Select *[Continue]* to apply the settings from your selection.

Defining the PQ parameters

1. For the autosampler, enter the injection volume and the vial quantity/positions under *Injection configuration.* Enter the positions of the vials in the rack using a combination of digits and letters;
   1A1: left rack with sample vials at position A1;
   2A1: right rack with sample vials at position A1.
2. Enter the start and stop retention times under *Peak detection configuration*.
3. Confirm the chosen settings for the injection, retention time and statistical analyses by clicking *[Continue]*. All PQ settings and parameters are shown in an overview window.

Starting PQ

Select *[Start]* to execute the PQ. During the PQ, the chromatography software displays the chromatograms of the individual injections. You can print out the test results. You can find the chromatograms for various injections under *Measurement*.

Printing the results of the PQ

Select *[Print report]* to print out the results of the PQ.

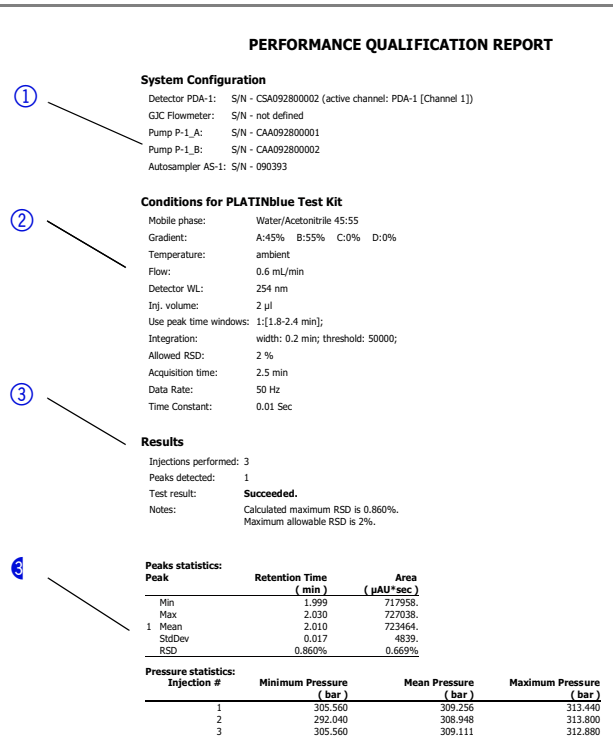
Legend

① System configuration with serial numbers

② Test parameters

③ Test results

④ Statistical analysis



PERFORMANCE QUALIFICATION REPORT

System Configuration

Detector PDA-1:	S/N - CSA092800002 (active channel: PDA-1 [Channel 1])
GJC Flowmeter:	S/N - not defined
Pump P-1_A:	S/N - CAA092800001
Pump P-1_B:	S/N - CAA092800002
Autosampler AS-1:	S/N - 090393

Conditions for PLATINblue Test Kit

Mobile phase:	Water/Acetonitrile 45:55
Gradient:	A:45% B:55% C:0% D:0%
Temperature:	ambient
Flow:	0.6 mL/min
Detector WL:	254 nm
Inj. volume:	2 µl
Use peak time windows:	1:[1.8-2.4 min];
Integration:	width: 0.2 min; threshold: 50000;
Allowed RSD:	2 %
Acquisition time:	2.5 min
Data Rate:	50 Hz
Time Constant:	0.01 Sec

Results

Injections performed:	3
Peaks detected:	1
Test result:	**Succeeded.**
Notes:	Calculated maximum RSD is 0.860%. Maximum allowable RSD is 2%.

Peaks statistics:

Peak		Retention Time (min)	Area (µAU*sec)
	Min	1.999	717958.
	Max	2.030	727038.
1	Mean	2.010	723464.
	StdDev	0.017	4839.
	RSD	0.860%	0.669%

Pressure statistics:

Injection #	Minimum Pressure (bar)	Mean Pressure (bar)	Maximum Pressure (bar)
1	305.560	309.256	313.440
2	292.040	308.948	313.800
3	305.560	309.111	312.880

Fig. 97 PQ test result

Quit PQ

Select *[Exit]* to quit the PQ.

OQ test

Comprehensive functionality test of individual devices

- Extensive functionality test of individual modules (Operation qualification, OQ)
  - Duration: approx. 60 minutes, e.g., for the pump
  - Extensive functionality test of pump, PDA and other detectors
  - Prerequisites: The system is equilibrated and a flow meter module that has been configured for the automatic test.

When should an OQ test be performed?

There are two cases where it may be necessary to test the functionality of each module:

- After replacing components in a device
  Always run an OQ test after replacing key measuring components in a module such as detector lamps or pump heads
- During each regular inspection every 3 or 6 months
  The required inspection intervals for the individual modules are shown in the chromatography software in the *Introduction* window of the OQ test

What are the results of the OQ?

The functionality test of each system module provides the following results:

- Detailed information on module
- Detailed functionality test of module

Start OQ

1. Select *Control⇒Qualification procedures*. The window for selection of a performance qualification opens under *Available Procedures*.
2. Select an OQ test for a single module, e.g., *P1 Pump OQ*.
   The *Introduction* window opens for the function test.
3. Select *Continue* to display the required materials in the chromatography software
4. Click *[Continue]* to display the settings for the OQ test in the chromatography software.

Legend

① Automatic setting

② Settings for detector and pump/gradient

Fig. 98 Settings for OQ test

Select automatic test

1. Select *Perform all tests automatically*.
2. Select *Active channel* of the detector.
3. Select the pump or gradient and click *[Continue]* to apply the settings of your selection.

Start OQ

Click *[Continue]* to perform the function test.
The chromatography software sets the flow rate to 1 ml/min and

the wavelength of the detector to 274 nm. You can print out the test results.

Printing out the results of the function test

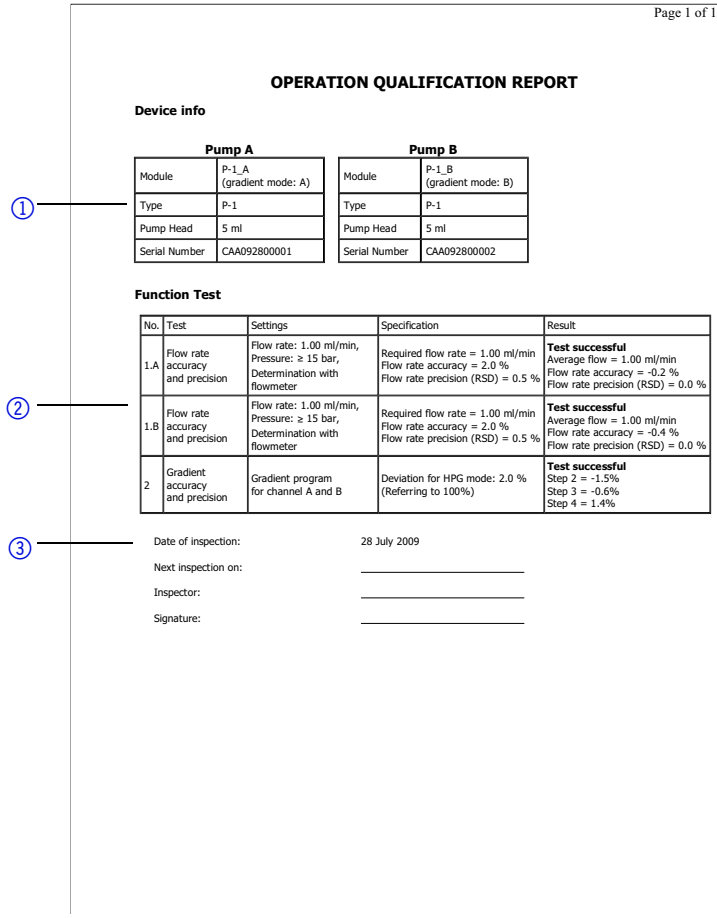
Select *[Print report]* to print out the results of the function test on the single module.

Legend

① Detailed information on module

② Detailed function test

③ Date and fields for signature and other information



Page 1 of 1

OPERATION QUALIFICATION REPORT

Device info

	Pump A		Pump B
Module	P-1_A (gradient mode: A)	Module	P-1_B (gradient mode: B)
Type	P-1	Type	P-1
Pump Head	5 ml	Pump Head	5 ml
Serial Number	CAA092800001	Serial Number	CAA092800002

Function Test

No.	Test	Settings	Specification	Result
1.A	Flow rate accuracy and precision	Flow rate: 1.00 ml/min, Pressure: ≥ 15 bar, Determination with flowmeter	Required flow rate = 1.00 ml/min Flow rate accuracy = 2.0 % Flow rate precision (RSD) = 0.5 %	**Test successful** Average flow = 1.00 ml/min Flow rate accuracy = -0.2 % Flow rate precision (RSD) = 0.0 %
1.B	Flow rate accuracy and precision	Flow rate: 1.00 ml/min, Pressure: ≥ 15 bar, Determination with flowmeter	Required flow rate = 1.00 ml/min Flow rate accuracy = 2.0 % Flow rate precision (RSD) = 0.5 %	**Test successful** Average flow = 1.00 ml/min Flow rate accuracy = -0.4 % Flow rate precision (RSD) = 0.0 %
2	Gradient accuracy and precision	Gradient program for channel A and B	Deviation for HPG mode: 2.0 % (Referring to 100%)	**Test successful** Step 2 = -1.5% Step 3 = -0.6% Step 4 = 1.4%

Date of inspection: 28 July 2009

Next inspection on: _____

Inspector: _____

Signature: _____

Fig. 99 Example of an OQ for pumps

Quit OQ

Select *[Exit]* to exit the device function test.

Buttons and options for system and function test

PQ/OQ buttons

Button	Function	Explanation
Exit	Quit PQ or OQ	All PQ or OQ tests are ended and the results are stored as an *Unfinished session*
Continue	Continue or automatically begin the functionality test	Page through the system or module test procedure or through the automatically executed functionality test, then begin to measure the flow rate and gradients
Cancel	Cancel	Go back one step in the PQ or OQ test
Start session	Open PQ	Prepare the system test, all data and folders are created automatically
Start	Start PQ	Start the system test
Start test	Manually begin the OQ	Begin the extensive functionality test while manually testing the modules
Skip	Skip	Skips the PQ or OQ test and returns to the window where a performance qualification can be selected under *Available procedures*

PQ/OQ selection areas

Selection	Function	Explanation
New session	Open new PQ or OQ	Open a completely new PQ or OQ test
Unfinished session	Opens an aborted PQ or OQ	Open an aborted PQ or OQ test, print it, re-execute it or change it
Report of finished sessions	Open results from OQ	Open completed OQ test

Maintenance and care

Proper maintenance of your UHPLC system will ensure successful analyses and reproducible results.

Contact with the technical support

Contact with the technical support

If you have any technical questions regarding KNAUER hardware or software, please use one of the contact options below:

KNAUER technical support hotline:

European hotline

Languages: Available by telephone
in German or English: 8 am to 5 pm (CET/CEST)
Phone: +49-(0)30-809727-0
Fax: +49-(0)30-8015010

E-mail contact:

E-mail: platinblue@knauer.net

Requisite information on system

Serial number

The serial number can be retrieved on the touchscreen by pressing (*Menu⇒GLP*) and it is also printed inside the glass door of each unit.

What maintenance work can users carry out on the system?

Users trained by KNAUER may perform the following maintenance tasks themselves:

- Replacing the pump head
- Replacing the mixing chamber of a pump
  - Replacing the filter system in the mixing chamber
- Replacing the flow cell of the detector
  - PDA-1
  - MW-1

Replacing the pump head

Prerequisite The pump has been rinsed.

Legend

① Connectors for piston backflushing

② Assembly screws

③ Pressure sensor inlet

④ Pump head outlet

⑤ Pump head inlet

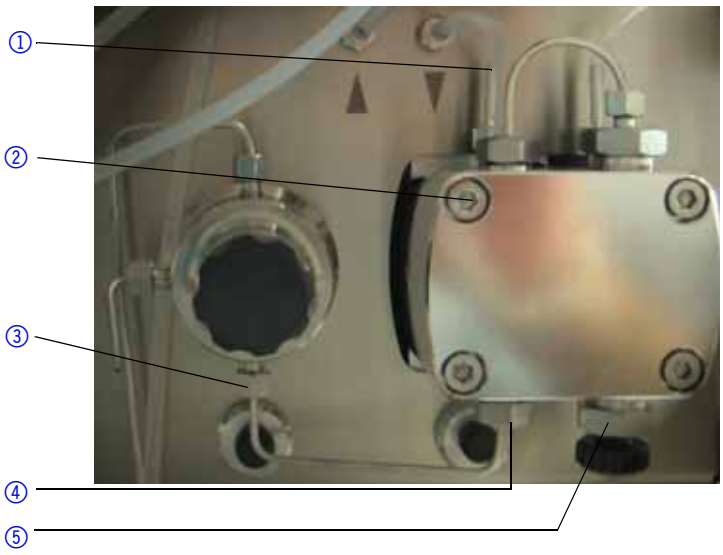


Fig. 100 Replacing the pump head

Removing the pump head

WARNING! Aggressive or toxic solvent residue can irritate the skin!
Wear protective gloves.

1. Remove the silicon tubes from the piston backflushing ①.
2. To remove the capillaries, loosen the screws at the pump head outlet ③ and pressure sensor inlet ②, see fig. 100.
3. Using an Allen wrench, loosen the opposite pairs of the pump screws evenly and alternately to prevent the pump piston from jamming.
4. Hold the pump head by hand, and consecutively pull out all assembly screws.
5. Remove the pump head.

Installing the pump head

1. Align the pump head parallel to the pump housing and manually tighten all assembly screws by a few turns, see fig. 100.
2. Using an Allen wrench, tighten the opposite pairs of the screws evenly and alternately to prevent the pump piston from jamming.
3. Tighten all assembly screws evenly.

4. Connect the capillaries between the pump head and pressure sensor, and tighten the screws at the inlet of the pump head ③ and at the inlet of the pressure sensor ② .

Replacing the mixing chamber of a pump

Basics

The mixing chamber (SmartMix) can be replaced from the front of the device. The filter system in the upper part of the mixing chamber can be replaced.

The Allen screws of the upper part of the mixing chamber are tightened with a torque wrench and 5 Nm.

Prerequisite

- The power plug has been pulled.
- The housing of the pump has been opened.

Procedure

- Take the quantity of solvent in the pump into account and place a receptacle underneath.
- Detach the capillaries.
- Loosen the screw fitting for the mixing chamber.

Tools

- Allen wrench for hexagon socket screws (Allen screws), 3.0 mm diameter
- Pin for the filter replacement (A0137), alternatively a pair of very pointy tweezers made of stainless steel
- Combination pliers for the tube holders on the piston back-flush pump

Duration

- Approx. 15 min.

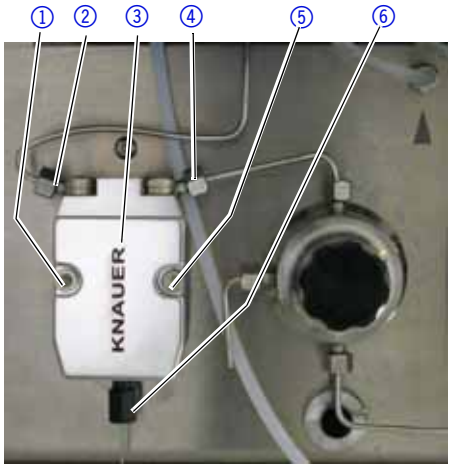
Level of difficulty

- Level 3 (from 1 to 7, very easy to very difficult)

Removing the mixing chamber

The mixing chamber is secured with two screws on the housing of the pump.

Removing SmartMix

Steps	Figure
1. Loosen the screw fittings of the capillaries ②, ④, ⑥. 2. Unscrew both Allen screws ①, ⑤ of the mixing chamber ③ with a 2.5 mm Allen wrench.	 **Fig. 101 Mixing chamber**

Replacing the filter system in the mixing chamber

Functional principle

Multiple filters are inserted into the mixing chamber in a specific order.

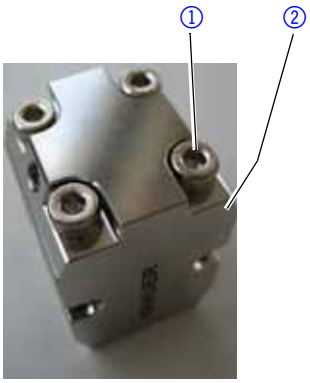
Prerequisite

The mixing chamber has been removed.

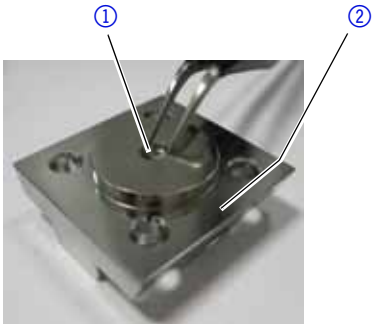
Procedure

- Detach the upper part of the mixing chamber.
- In the upper part, remove the filter with a pin or with a pair of pointed tweezers.
- Insert new filters in the following order: sieve, glass fiber filter, sieve.
- Tighten the screws for closing the upper part with 5 Nm.

Opening the upper part of the mixing chamber

Steps	Figure
1. Clamp the removed mixing chamber in a mounting fixture. 2. Unscrew the four Allen screws ① of the upper part ② of the mixing chamber with a 3.0 mm Allen wrench.	 **Fig. 102 Mixing chamber**

Replacing the filter system

Steps	Figure
1. Remove the filter system ① in the upper part ② of the mixing chamber with a pin or a pair of pointed tweezers. 2. Insert the new filter system at position ① in the following order: - Sieve M1892 - Glass-fiber filter M1894 - Sieve M1893	 **Fig. 103 Removing the filter system in the upper part of the mixing chamber with a pin or a pair of pointed tweezers**

Spare parts

Figure	Component	Comment	Order number
	SmartMix 100 for the UHPLC	Complete mixing chamber	A5350
	SmartMix 350 for the HPLC	Complete mixing chamber	A5351
	Upper part of the mixing chamber	-	P3429
	Cartridge	Complete	G0845V1
	Seal	PEEK	P7023
	Allen screws 3 mm	ISO 4762-M4x12	R0550
	Filter set for SmartMix	Sieve, glass-fiber filter, sieve	A0164-1

Replacing the flow cell on the PDA-1 detector

Overview

The flow cell for the photodiode array detector is encapsulated, meaning it can only be replaced completely. A test cell from KNAUER for inspecting the PDA detector is included with the device. All flow cells can be cleaned with a flushing procedure either in the chromatography or service software, and it is possible to check whether the flow cell is ready for operation.

UV light will cause the optical fibers to become blind with time (solarization), making them no longer suitable for use. KNAUER recommends exchanging the optical fibers in the PDA detector after about 6000 operating hours or 2 ½ years.

The details of the following are described:

- Flushing and cleaning the flow cell
- Removing the front panel from the PDA detector
- Removing the flow cell
- Installing the flow cell
- Use of a test cell
- Troubleshooting
- Reordering spare parts

Note

The flow cell is always replaced entirely. Replacing the optical fibers is a task to be performed exclusively by the KNAUER technical support.

Practical tip!

Observe the following regarding the UV optical fibers:

- Do not touch the tip of the UV optical fiber with your fingers.
- Move the optical fiber carefully without using pressure or bending it.

Tools

- 1.0, 2.0 and 2.5 mm Allen wrench
- Isopropanol
- Cotton swab
- Filler caps/closures for the flow cell

Duration

- approx. 25 min

Level of difficulty

- Level 3 (from 1 to 7, very easy to very difficult)

Technical data for the flow cell

The flow cells are intended for a specific quantity of fluid and a specific pressure.

Parameter	Value	Value
Optical path length	10 mm	50 mm
Volume of the flow cell	2.4 µl	10.0 µl
Wavelength range	190 to 1000 nm	190 to 1000 nm
Maximum pressure	100 bar	100 bar
Materials	PEEK, synthetic quartz glass, Teflon	PEEK, synthetic quartz glass, Teflon

Flow cell order numbers

Flow cells of the PDA detector	Order number
10 mm/2.4 µl	A64150
50 mm/10.0 µl	A64151
Test cell (dummy)	A64155

Flushing and cleaning the flow cells

Prerequisite

Check the integration time via system test (OQ) in the chromatography software

Increased noise of the baseline and reduced sensitivity can be a result of a dirty flow cell. Often it is sufficient to flush the flow cell to restore sensitivity.

The flow cell can be cleaned with flushing solutions commonly used in liquid chromatography. After cleaning has been completed, inspect the function of the cleaned flow cells. KNAUER recommends recording a spectrum by turning on the D2 lamp once and the halogen plus D2 lamp once. The results can be evaluated in the chromatography software in the analysis of chromatograms section.

Flushing the flow cell

Flush flow cell using pump or a syringe

Flushing solutions

The following solvents are recommended for purging:

- Isopropanol
- 1 mol/l HCl
- Ethanol
- Methanol

Storing a flow cell

Prerequisite The flow cell has been flushed.

Fill the flow cell with isopropanol and close with filler caps. This will protect the flow cell from germs.

Removing the flow cell

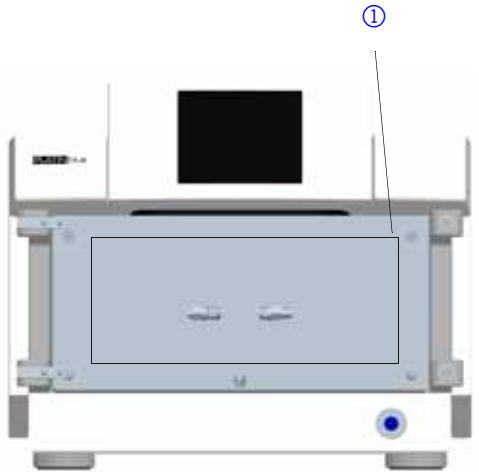
Prerequisites

- The flow cell has been flushed.
- The device has been switched off.
- The front panel has been removed.

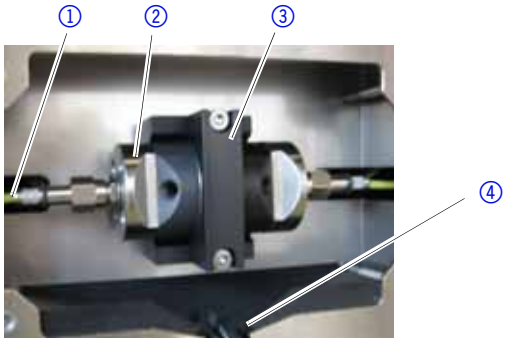
Removing the front panel of the PDA detector

WARNING! Irritation of retina through UV light!
Concentrated UV light can leak out from the flow cell or the fiber optics.
Switch off the device and pull the power plug.

Removing the front panel

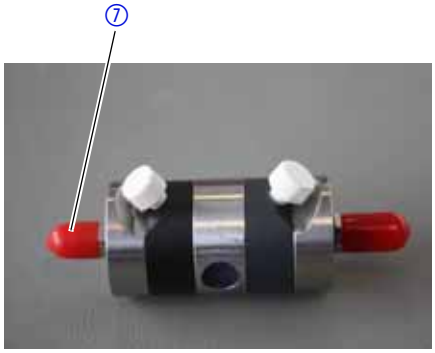
Steps	Figure
1. Loosen the 4 Allen screws (∅ 2 mm) of the cover of the front panel ① .	

Result The flow cell ② , the flow cell holder ③ and the fiber optics ① are visible. A sensor ④ for leaks is built-in.



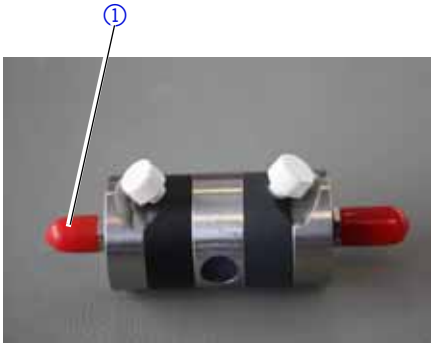
Note Do not touch the tip of an optical fiber with your fingers, as this could falsify the measurement.

Removing the flow cell

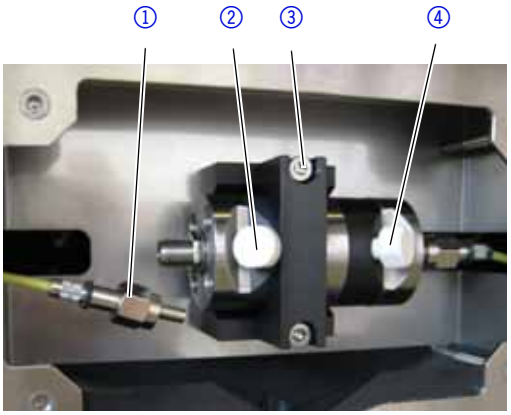
Steps	Figure
1. Unscrew the two PEEK fittings ①, ② by hand (not visible in the figure).	
2. Insert the filler caps ④, ⑥ so that the flow cell does not get dirty. 3. Loosen the screw fittings of the optical fiber ③ manually, pull out the optical fiber and allow it to hang. 4. Hold the flow cell by hand, unscrew the Allen screws ⑤ (∅ 2.5 mm) of the flow cell holder and remove the flow cell.	
5. Place closures ⑦ on the flow cell and store the flow cell in a safe location.	

Inserting the flow cell

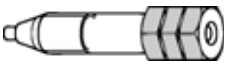
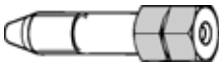
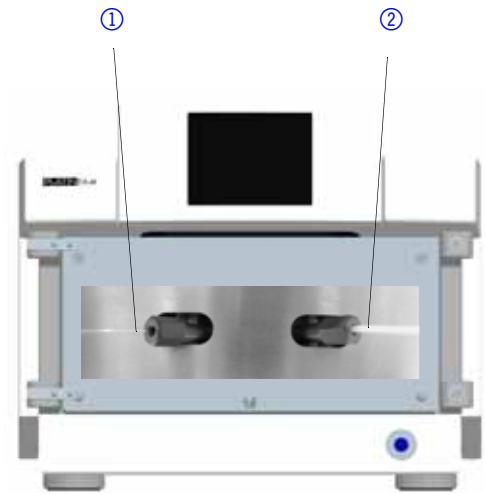
Practical tip! Remove the end caps ① of the flow cell before inserting the cell.



Inserting the flow cell

Steps	Figure
1. Insert the flow cell so that the filler caps ②, ④ for the PEEK fitting point forward. 2. Align the flow cell in the center and gently tighten the holder ③ of the flow cells with a 2.0 mm Allen wrench. 3. Insert the optical fiber ① and tighten by hand.	

Connecting PEEK capillaries

Steps	Figure
1. Tighten the PEEK connection with capillary to the input ① of the P3860V3 flow cell by hand with a wrench (approx. 0.5 Nm).  2. Tighten the PEEK connection to the input ② of the P3860V2 flow cell by hand with a wrench (approx. 0.5 Nm). 	

Inspecting the flow cell

OQ test With the replaced flow cell, run the comprehensive function test (operation qualification test) of the device in the chromatography software.

Practical tip! The integration time must not be greater than 100 ms.

Use of a test cell

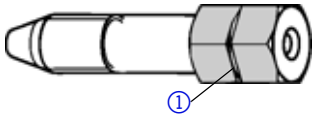
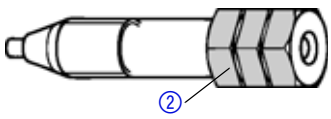
The included test cell is always used when the functionality of the device or the flow cell is to be tested.

Fig. 104 Built-in test cell on the PDA detector

Troubleshooting

Problem	Possible cause	Remedy
Defective peaks in the baseline	Air bubbles	Check the intake side of the pump.
		Increase the flow through the flow cell.
		Insert test cell and check detector.
		Use degasser.
High integration time (> 100 ms)	Flow cell dirty	Have flow cell cleaned by the technical support; have sapphire rings exchanged.
	Air bubbles	See above
	Solvent absorbs too much	Change solvent
	Deuterium lamp too old	Replace deuterium lamp.
Measurement drift	Leak in the flow cell	Check device for leaks.
	Temperature change	Ensure constant temperature conditions.

Reordering spare parts

Component	Comment	Order number
10 mm UHPLC flow cell	2.4 µl	A64150
50 mm UHPLC flow cell	10 µl	A64151
Test cell (dummy)	Without capillary connections	A64155
 PEEK fitting With long head without tip	Attachment at the output of the flow cell of the detector; marked by a notch ①	P3860V2
 PEEK fitting With long head and short tip	Attachment at the input of the flow cell of the detector; marked by two notches ②	P3860V3

Column thermostat T-1 with valves

Cleaning the valves

The valves can be flushed with isopropanol or methanol.

Replacing the valve seal on the T-1 column thermostat

What should you do if the valve leaks?

If the valve leaks, the seal must be replaced. To be able to replace the valve seal, the valve head (stator) must be removed.

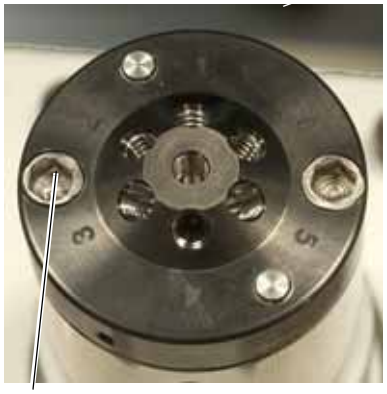
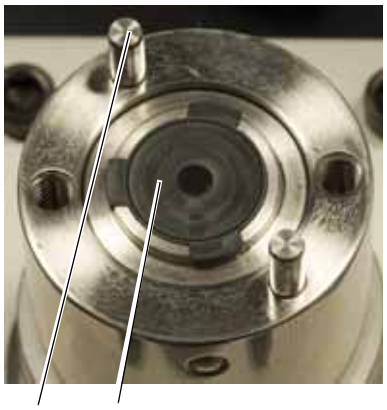
Steps	Figure
1. Using a 9/64" Allen wrench, loosen the two Allen screws ①. 2. Remove the valve head (stator).	 ①
3. Replace the valve seal ③. 4. Put the valve head (stator) back onto the guide pins ②. 5. Using a 9/64" Allen wrench, tighten the two Allen screws.	 ② ③

Fig. 105 Multi-position valve with 6 valve positions

Fig. 106 Multi-position valve without valve head

Replacing the flow cell of the MW-1 detector

Overview

The measuring cells on the MW-1 detectors can be replaced.

Measuring cells with changed geometry

Depending on the required measurement sensitivity and resolution, you can choose between different flow cells.

- 10 µl measuring cell with optical path length of 10 mm for the HPLC

Note

Do not use compressed air for drying. Miniscule, microscopic droplets of oil in the compressed air can contaminate the measuring cells

Inserting the measuring cell into MW-1

During installation, pay attention to the orientation pin!

All flow cells require light back pressure of 1–2 bar to ensure that no air bubbles are formed. For this reason, on the output of the detector flow cell a 60 cm long capillary with an inner diameter of 0.25 mm is attached. Flow cells are replaced after about 6000 operating hours (2.5 years). The details of the following are described:

Loosening the knurled-head screws of the flow cell

Removing the flow cell to the side

Opening the signal board holder

Reordering spare parts

Note

Special tools are required to disassemble the flow cell, meaning that cleaning and reassembling the flow cell is a task for the KNAUER technical support.

Practical tip!

If the diode on the signal board has to be cleaned, set the detector on the edge of a table as this facilitates access to the screw fitting.

Tools

- 1.0, 2.0 and 2.5 mm Allen wrench
- Tweezers
- Ultrasonic bath
- Isopropanol
- Cotton swab

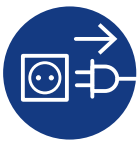
Duration

- approx. 25 min

Level of difficulty

- Level 3 (from 1 to 7, very easy to very difficult)

Loosening the knurled-head screws of the flow cell



WARNING!Danger of electric shock!
Switch off the device and pull the power plug!

1. Open the device door.
2. Disconnect side capillary connections.
3. Loosen both knurled-head screws by hand.
4. Hold the flow cell ③ with one hand and remove the knurled-head screws.

Legend

① Assembly carriage

② Knurled-head screw

③ Flow cell, in the picture a test cell without capillary connections

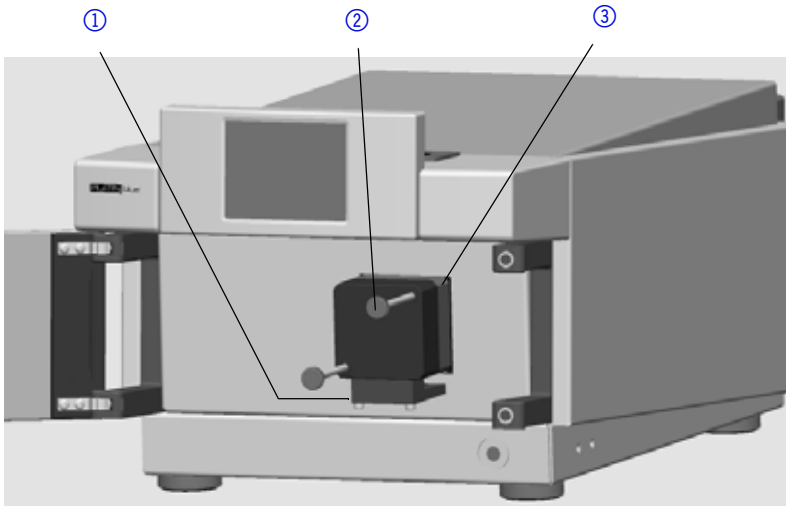


Fig. 107 The flow cell (3) is behind the carriage.

Removing the flow cell to the side

1. Remove the flow cell to the side. To do so, hold the flow cell with one hand and pull out the carriage with the other hand.
2. Insert the new flow cell so that the capillary connections point forward parallel to the carriage and the engraved layer thickness, e.g. 2 µl.

3. Tighten the P3860V1 PEEK fitting (capillary, ∅ 0.12 mm) on the input of the flow cell by hand.
4. Tighten the P3860V1 PEEK fitting on the output of the flow cell (60 cm capillary, ∅ 0.25 mm) by hand.
5. Insert both knurled-head screws so that the flow cell no longer needs to be held by hand.
6. Carefully push the carriage with the flow cell inward onto the housing.

7. Tighten both knurled-head screws by hand.

Legend

① Signal board and measurement diode holder

② Flow cell input: P3860V1 PEEK fitting

③ HPLC plus flow cell

④ Output, flow cell with P3860V2 PEEK fitting

⑤ Carriage for assembly of the flow cell

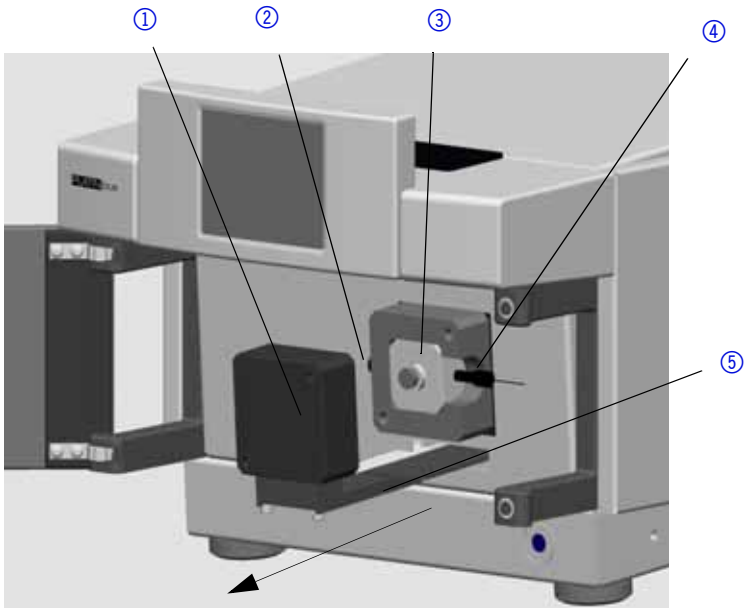


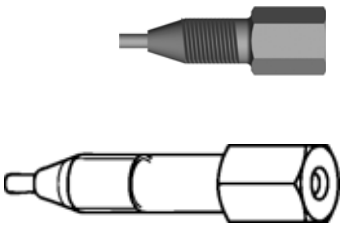
Fig. 108 MW-1 detector with flow cell, capillary connections and assembly carriage

Result The flow cell has been replaced.

Next steps Use the system test (OQ) in the chromatography software to inspect the detector.

Reordering spare parts

Component	Comment	Order number
HPLC 10 µl flow cell	Complete	A4061
Test cell	Without capillary connections	P2640
PEEK fitting With short head and tip	Suitable for attachment to columns	P3860
PEEK fitting With long head and tip	Suitable for the attachment to the input and output of the flow cell of the MW-1 detector	P3860V1



Cleaning and caring for the device

CAUTION! Intruding liquids can cause damage to the device!
Place solvent bottles next to the device or on a solvent tray.
Moisten the cleaning cloth only slightly.

All smooth surfaces of the device can be cleaned with a mild, commercially available cleaning solution, or with isopropanol.

Display or touchscreen

The display or touchscreen of the devices can be cleaned with isopropanol and wiped dry with a soft, lint-free cloth.

Column regeneration

The columns for chromatography should be regularly flushed to restore them to their original separation capacity. After flushing, the column must be re-equilibrated before the next analysis can be run.

Flushing procedure

Regeneration procedure in the event of high back pressure caused by the column:

Flushing steps	**Reversed phase columns**, C18, C18A, C8, PFP, phenyl, CN	**Normal phase columns**, Si
1.	Flush 20 x volume of column with water	Flush 20 x volume of column with heptane
2.	Flush 20 x volume of column with acetonitrile	Flush 5 x volume of column with isopropanol
3.	Flush 5 x volume of column with isopropanol	Flush 20 x volume of column with acetonitrile
4.	Flush 20 x volume of column with heptane	Flush 20 x volume of column with water
5.	Flush 5 x volume of column with isopropanol	Flush 20 x volume of column with acetonitrile
6.	Flush 20 x volume of column with acetonitrile	Flush 5 x volume of column with isopropanol
7.	-	Flush 20 x volume of column with heptane

Return the column to equilibrium

After regeneration, the column must be re-equilibrated before the next analysis can be run.

Equilibration times

Column equilibration times

Columns	**Column volume**	**Time required for equilibration**	
Length and inner diameter in mm	Volume in µl	Time in min for 250 µl/min flow	Time in min for 500 µl/min flow

Columns	Column volume	Time required for equilibration	
50 x 2	157	6	3
100 x 2	314	12	6

Caring for the columns

To maintain the homogeneity of the column bed, avoid heavy mechanical stresses (shocks, vibrations, fast pressure changes) and large temperature fluctuations. The maximum back pressure on the column should not exceed 1000 bar (15000 psi), a back pressure of < 800 bar extends the operating life of the column.

The water used for the separations must be freshly distilled, i.e., HPLC grade.

The analysis quality of the solvents and the reagents used to prepare the samples should be at least HPLC grade (gradient grade) and they should be filtered through a membrane filter (≤ 0.45 µm) and have a pH between 2–8.

Legend

① Filtering of solvents

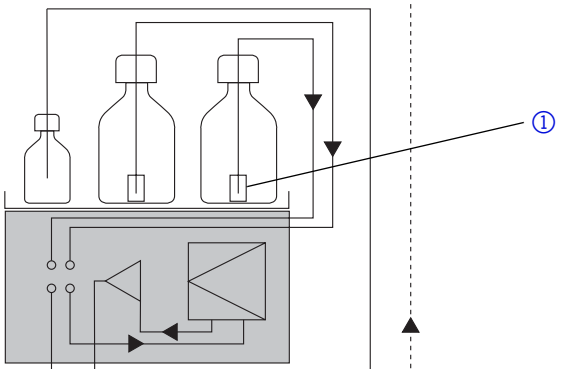


Fig. 109 Solvent filter

The columns should only be subjected to temperature changes when filled with solvent. As a rule, temperature changes should be performed in steps up to a maximum temperature of 60 °C.

If the column will not be used for an extended period, make sure that it has been properly closed and is thus protected against drying out.

Environmental protection

Reducing the consumption of solvents

KNAUER Eluent Savings Handbook

If UHPLC can be used in place of an HPLC method in the laboratory, one of the main benefits is lower solvent costs.

Example: Compared to the optimized HPLC method, an 80% reduction in acetonitrile consumption can be achieved when separating paracetamol with the UHPLC method.

More information can be found in KNAUER's Solvent Savings Handbook.

Disposal

Drop-off old devices at the certified waste facilities, where they will be disposed of properly.

AVV marking

According to the German "Abfallverzeichnisverordnung" (AVV) (January, 2001), old devices manufactred by KNAUER are marked as waste electrical and electronic equipment: 160214

WEEE registration

KNAUER as a company is registered by the WEEE number DE 34642789 in the German "ElektroAltgeräteRegister" (EAR). It belongs to category 8, under which fall all medical devices and laboratory equipment.

Within the meaning of the WEEE directive, all distributors and importers are responsible for the disposal of old devices. End-users can send their old devices, which must have been manufactured by KNAUER, back to the distributor, the importer, or the company free of charge, but would be charged for their disposal.

Decontamination

Contamination of devices with toxic, infectious or radio-active substances poses a hazard for all persons during operation, repair, sale and disposal of a device.

WARNING! Aggressive or toxic solvent residue can irritate the skin!
Wear protective gloves.

All contaminated devices must be properly decontaminated by a specialist company or the operating company before they can be recommissioned, repaired, sold or disposed of.

All materials or fluids used for decontamination must be collected separately and disposed of properly.

Ambient conditions for storage

Temperature range: 4–40 °C; 39.2–104 °F

Air humidity: Below 90% humidity (non-condensing)

Columns Before putting columns into storage, flush them with isopropanol. Do not leave buffer solutions in the columns for extended periods, because crystallizing substances can damage or destroy the column.

Technical data

Ambient conditions

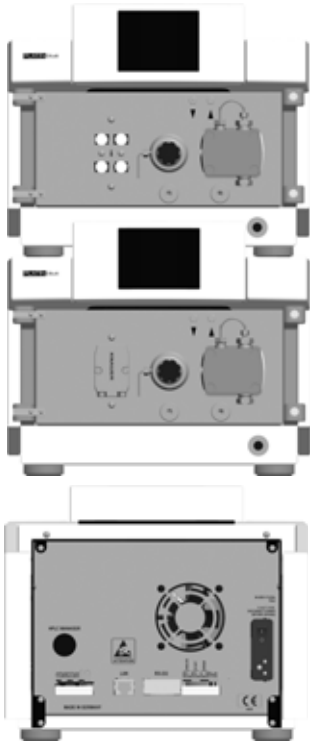
Temperature range	4–40 ˚C, 39.2–104 ˚F
Air humidity	below 90% humidity (non-condensing)
CO2-emission per sample injection	< 4,6 g [This value is calculated using equivalents (CO2e) and includes manufacturing of the PLATINblue system and typical operation over a six year period.]

Radio frequency

RFID label of the pump head	The system pump head is detected automatically using a radio frequency identification (RFID)
Radio frequency	125 kHz
Range	Less than 5 cm

PLATINblue P-1

High-pressure pump

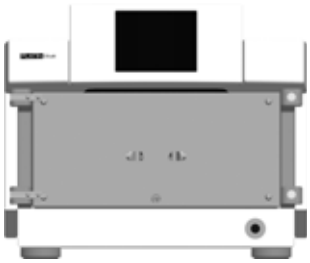


Pump heads	Special construction both for UHPLC (5 ml) and analytic UHPLC (10 ml)
Flow rate range	0.01–5.00 ml/min (UHPLC pump head) 0.01–10.00 ml/min (analytic UHPLC pump head)
Maximum pressure	1000 bar (< 2 ml/min) (UHPLC pump head) 800 bar (< 5 ml/min) (UHPLC pump head) 750 bar (< 5 ml/min) (analytic pump head) 400 bar (< 10 ml/min) (analytic pump head)
Flow rate precision	< 1% throughout entire flow range
Reproducibility of the flow rate	< 0.1% throughout entire flow range
Number of pumps for binary HPG/ Quaternary LPG	2 x pumps P-1 1 x pump P-1
Precision of gradient composition	± 0.5% throughout entire flow range, at flow rates > 0.5 ml/min for HPG system

Precision of gradient composition	± 0.3% acetonitrile:water 10:90 (with degasser module)
Degasser module/ manager	2 channels, Teflon® AF, 480 µl volume per channel for HPG system 4 channels, Teflon® AF, 480 µl volume per channel for LPG system with manager
Mixture	SmartMix integrated into the high-pressure pump
Characteristics	SmartMix mixing chamber, degasser, touchscreen, active pressure and pulsation compensation, RFID for automatic detection of pump head (GLP), variable pump heads
Supply voltage range	100-240 V
Supply frequency	50–60 Hz
Active power consumption	Maximum 40 W
Weight kg (with degasser)	11.9 kg
Weight kg (w/o degasser, with SmartMix)	11.1 kg
Dimensions in mm (length x width x height)	465 x 263 x 191 mm (223 mm with touchscreen)

PLATINblue PDA-1

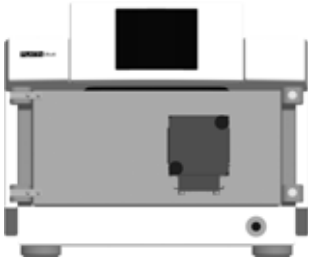
Photodiode array detector



Measuring cell	2 µl measuring cell with optical path length of 10 mm
Lamps	High brightness D_2, tungsten-halogen
Wavelength bandwidth	190–1000 nm (UV-Vis)
Wavelength precision	< 1 nm
Maximum data rate	100 Hz
Diodes	1024
Maximum number of channels	6
Noise	± 7.5 µAU
Linearity	0–2 AU
Drift as per ASTM	< 300 µAU/h
Drift, measured	Methanol, 22 °C, for 254 nm
Spectral width	< 2.5 nm
Characteristics	Touchscreen
Supply voltage range	100-240 V
Supply frequency	50–60 Hz
Active power consumption	Maximum 75 W
Weight kg	12.3 kg
Dimensions in mm (length x width x height)	465 x 263 x 191 mm (223 mm with touchscreen)

PLATINblue MW-1

UV-Vis detector



6 wavelengths	Up to 6 wavelengths can be measured almost in parallel.
Wavelength bandwidth	190–900 nm (UV-Vis)
Wavelength precision	< 1 nm
Maximum data rate	200 Hz
Measuring cell	1 µl flow cell with a path length of 6 mm Pre-installed ex works: 2 µl flow cell with a path length of 10 mm
Lamps	High brightness D_2, 1 x tungsten halogen
Maximum number of channels	6
Noise	± 5 µAU
Linearity	0–3 AU
Drift as per ASTM[a]	< 50 µAU/h
Characteristics	Touchscreen, replaceable flow cell, scan modus
Supply voltage range	100-240 V
Supply frequency	50–60 Hz
Active power consumption	Maximum 75 W
Weight	10.8 kg
Dimensions in mm (length x width x height)	465 x 263 x 191 mm (223 mm with touchscreen)

a. Laboratory measuring values as per ASTM E-1657, with measuring cell, without solvent

PLATINblue T-1

Column thermostat with valves and with touchscreen

Ventilation type	Air circulation
Temperature range	5–80 °C, 41–176 °F
Temperature precision	Reproducibility of the temperature ('precision'): ±0.1 °C, ±32.9 °F Accuracy of the temperature under same conditions: ±0.5 °C, ±32.18 °F
Heating rate	5 °C/min, 41 °F/min in the temperature range 15–80 °C, 59–176 °F; temperature range 15–60°, approx. 5 °C/min; above 60 °C, >5 °C/min
Cooling rate	4 °C/min, 39,2 °F/min temperature range 10–80 °C, 50–176 °F; dependent on the ambient temperature
Pre-heating of solvent	Passive tempering; replaceable cartridges 2 µl and 15 µl
Leak sensor	Gas sensor for solvent
RFID	For up to 6 columns; RFID chip in the screw fitting of the column
Columns	Maximum length of the columns: 300 mm plus precolumn Number of UHPLC columns: max. 6 Inner diameter of the columns: 10 µm to 8 mm
Post-column tempering	Active post-column tempering from 15–35 °C, 59–95 °F; replaceable 2 µl and 30 µl cartridge
Valves	Maximum 2 automatic switching valves (multi-position and 2 position switching valve)
Touchscreen	3.5" touch-sensitive display for manual operation
Housing door	The housing door opens to the left; door sensor; door opens up to an angle of 110°
Supply voltage range	100–120 V/ 200-240 V
Supply frequency	50–60 Hz
Active power consumption	maximum 300 W
Weight	23.7 kg (with 2 valves)

Connections	Digital inputs and outputs • LAN • RS232 Analog inputs/outputs • 3 Events, Start in/out, Error in/out • 5 V
Capillaries	1/32" 1/16"
Dimensions (width x height x depth)	211 x 567 x 487 mm

Column thermostat T-1 without valves and touchscreen

Column thermostat without valves and touchscreen

Ventilation type	Air circulation
Temperature range	5–80 °C, 41–176 °F
Temperature precision	Reproducibility of the temperature ('precision'): ±0.1 °C, ±32.9 °F Reproducibility of the temperature under same conditions ('accuracy'): ±0.5 °C, ±32.18 °F
Heating rate	5 °C/min, 41 °F/min in the temperature range 15–80 °C, 59–176 °F; temperature range 15–60°, approx. 5 °C/min; above 60 °C, >5 °C/min
Cooling rate	4 °C/min, 39,2 °F/min temperature range 10–80 °C, 50–176 °F; dependent on the ambient temperature
Pre-heating of solvent	Passive tempering; replaceable cartridges 2 µl and 15 µl
Leak sensor	Gas sensor for solvent
RFID	RFID chip in the screw fitting of the column
Columns	Maximum length of the columns: 300 mm plus precolumn Number of HPLC plus columns: 1 Inner diameter of the columns: 10 µm to 8 mm
Post-column tempering	Active post-column tempering from 15–35 °C, 59–95 °F; replaceable 2 µl and 30 µl cartridge

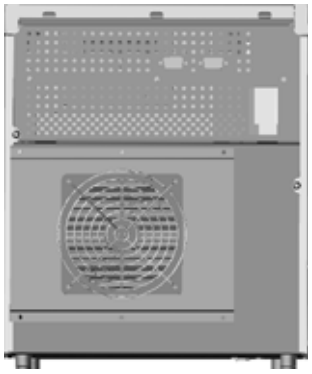
Housing door	The housing door opens to the left; door sensor; door opens up to an angle of 110°
Supply voltage range	100–120 V/ 200-240 V
Supply frequency	50–60 Hz
Active power consumption	maximum 300 W
Weight	22 kg
Connections	Digital inputs and outputs • LAN • RS232 Analog inputs/outputs • 3 Events, Start in/out, Error in/out • 5 V
Capillaries	1/32" 1/16"
Dimensions (width x height x depth)	211 x 567 x 487 mm

T-1 Basic column thermostat

Temperature range	5–85 °C
Temperature constancy	0.1 °C
Maximum heating rate	5 °C/min
Weight	7.3 kg
Dimensions (width x height x depth)	209 x 564 x 485 mm

PLATINblue AS-1

Autosampler



UHPLC injections	up to 1000 bar
Sample capacity	max. 768 samples (microtiter plates) or 96 standard autosampler vials
Injection volume	1–5000 µl for UHPLC: 1–100 µl
Standard sample loop	10 µl
Injection time	15 s, < 60 s incl. cleaning
Injection modes	Full-loop injection, partial loop injection, µl pick-up mode
Precision	RSD < 0.3% full-loop injection
Carryover	< 0.05% with needle cleaning
Sample cooling	4–22 °C
Supply voltage range	100-240 V
Supply frequency	50–60 Hz
Weight	18 kg
Dimensions in mm (width x height × depth)	300 mm x 377 mm x 577 mm
Syringe	250 µl, standard
Sample vials	Eppendorf vials, 1.8 ml

PLATINblue M-1

Manager

Gradient module	4 LPG solenoid valves
Degasser module	4 channels, Teflon® AF, 480 µl volume per channel
A/D-D/A interface	24 bit
Weight	9.7 kg
Dimensions (length x width x height)	465 x 263 x 191 mm

KNAUER Chromatography workstation

HP personal computer	HP personal computer with 500 GB hard drive, DVD burner drive and 19" TFT monitor, 8-port Ethernet/LAN router

Chromatography software

Software package for instrument checks and data processing (CDS)	Software for controlling modules and data analysis software (CDS), 32-bit client server with CDS software, 1 license (client server, second system license optional), PDA option, System diagnosis

Solvent tray

Bottles	6 x 1 l bottles
Weight	3.3 kg

System messages and troubleshooting tips

First measures

1. Check all cabling
2. Check all screw fittings
3. Check whether air has gotten into the supply lines
4. Check device for leaks
5. Observe system messages on the display

Possible problems and rectifications

Detectors

Problem	Solution
Baseline drift	▶ Maintain constant temperature conditions during the measurement
Device will not turn on	▶ Inspect the power cable to be sure it is plugged into the power supply
Device cannot be calibrated	1. Maneuver the knurled-head screws on the flow cell holder to prevent incursion from interfering light or an electronic error. 2. Insert the test cell 3. Inspect the calibration with a weak absorbing eluent
Baseline noise	1. Inspect the flow cell 2. Maneuver the knurled-head screws on the flow cell to prevent incursion from interfering light or an electronic error. 3. Exchange the defective flow cell 4. Inspect the service life of the display lamp 5. Reduce the air in the flow cell by using a degasser
The relationship of the signal to the light path reference is very low	1. Flushing the flow cell 2. Clean the flow cell window 3. Exchange lamp (spectrum source)

Further measures

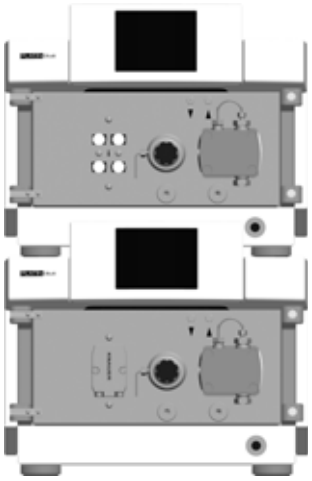
1. Use maintenance software (service tool)
2. Saving device information and send to manufacturer
3. Inform the technical support of the manufacturer.

System messages and troubleshooting tips

The system messages are explained on the device touchscreen:

- High-pressure pump
- Multiple wavelength detector MW-1
- PDA-1 detector
- Column thermostat T-1

High-pressure pump



The system messages are in alphabetical order:

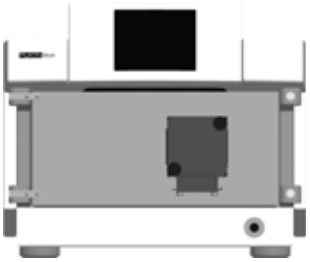
System message	Solution
Auto pump head type: head data uninitialized!	Switch the device off and on. Check whether a pump head with RFID recognition has been installed. Repeat the automatic configuration step in the chromatography software. Remove pump head, clean it and install it again.
Auto pump head type: no head detected!	Switch the device off and on. Repeat the automatic configuration step in the chromatography software. Remove pump head, clean it and install it again. Check whether a pump head with RFID recognition has been installed.
Cannot delete active program/ link	Pause active program or link. Afterwards, delete the link.
Cannot edit program from the running link	First pause link, then edit the data on the module touchscreen or using the chromatography software.
Cannot initialize LAN	Check cables and connections in local area network.
Cannot operate with an empty link	The link is empty. First create a link.
Cannot read data from FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot read RTC	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot start time table	Edit the data on the module touchscreen or using the chromatography software.

System message	Solution
Cannot use non-existing component!	Change the setup settings or change the gradient in the program or in setup.
Cannot write data on FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Error input activated	Module error, change module settings
Wrong Line number	Change the line index in the link.
GUI communication failed (internal)!	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C failed for panel	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C Init failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C operation failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Insufficient access	Change the entry.
Invalid command	Change the entry. Check the cable connections.
Invalid parameter(s)	Check the validity of the parameters.
Invalid time in time table	Correct the time entry.
Invalid time table index	Change the entry in the program line.
Link is loaded	First unload the link then change the link or delete it.
Link is running	Wait until the link has been completed, then change the link or delete it.

System message	Solution
Maximum pressure! System stopped	Reduce the pressure or adjust the upper pressure limit. Restart the system.
Minimum pressure! System stopped	Increase the pressure or adjust the lower pressure limit. Restart the system.
No components are available in isocratic mode	Since the pump can only be operated using a specific valve, the entered data has to be adapted to isocratic mode.
No link available	Create a link and edit it.
No link available Pls edit link first	Create a link and edit it.
No time table to start	Edit the data by means of the chromatography software.
Non-existing component is set to non-0 value	Switch on the channel or edit the data using the chromatography software.
Not enough space to store link	Check the pump. Check the number of program lines. A maximum of 100 program lines are possible.
Not enough space to store program	Check the pump. Check the number of program lines. A maximum of 100 program lines are possible.
Not supported	Change the Entry.
Prg not compatible with pump head!	Modify the program or replace the pump head.
Program does not exist	Create and edit a program.
Program is running.	Quit program or wait until program has been completed.
The gradient component is used!	The setup data can only be edited when no program has been loaded or started. First unload the program.
this link is used in WAKEUP	First quit or delete wakeup program (wu=wakeup), then edit or delete link.
This program is used in a link	First pause or delete the link, then edit or delete data by means of the chromatography software.

System message	Solution
this program is used in WAKEUP	First quit or delete wakeup program (wu=wakeup), then edit or delete data by means of the chromatography software.
Time already exists	Correct the time entry.
Time table line is empty	Edit the program line.
Too many lines in program	Check the number of program lines. A maximum of 100 program lines are possible.
Unknown pump head type!	Check the pump head. Check whether a pump head with RFID recognition has been installed.
used!*/, CRC failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Wrong link	Check the link number. Values from 1–10 are possible. Correct the entry.

Multiple wavelength detector MW-1



The system messages are in alphabetical order:

System message	Solution
5-phase motor init failed	Switch the device off and on. Check cable connection. Inform the technical support in case the system message repeats itself.
At least one wavelength must be valid.	Check whether at least one channel is on. Check whether the wavelengths are within permissible range (119 to 900 nm).
Calibration failed	Switch the device off and on. Check whether lamps, motor and filter are functioning correctly. Inform the technical support in case the system message repeats itself. Restart calibration at the module or in the chromatography software.
Cannot delete active program/ link	First pause link, then delete program.
Cannot edit program from the running link	First pause link, then edit data using chromatography software.

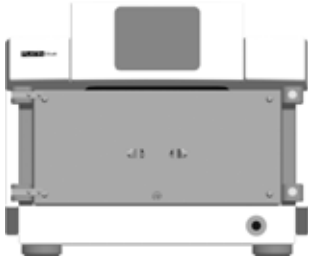
System message	Solution
Cannot execute the command during calibration	Wait until calibration is finished before entering command.
Cannot initialize LAN	Check cables and connections in local area network.
Cannot operate an uncalibrated instrument	Switch the device off and on. Wait until calibration is completed.
Cannot operate with an empty link	Create a link.
Cannot proceed: D2 lamp heating.	Wait until D2 lamp has preheated.
Cannot proceed: lamps are off.	Test whether the lamps have been switched on.
Cannot read data from FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot read RTC	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot set acquisition parameters	Modify the entry.
Cannot start time table	Edit the data by means of the chromatography software.
Cannot write data to FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
CRC failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
D2 Lamp read failure Ignition counter	Inform the technical support in case the system message repeats itself. The lamp has to be replaced.
D2 Lamp read Ignition counter	Inform the technical support in case the system message repeats itself. The lamp has to be replaced.

System message	Solution
D2 Lamp read lamp lifetime	Inform the technical support in case the system message repeats itself. The lamp has to be replaced.
D2-Lamp does not start!	Switch off lamp on touchscreen and turn it on again. Inform the technical support in case the system message repeats itself. Replace the lamp unit.
Data acquisition active	No entries are possible. First stop acquiring measurement data, afterwards you can make a new entry.
Error input activated	Check the external devices and cable connections.
Error programming flash	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Filter move error	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C failed for lamp(s)	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C failed for panel	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C Init failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C operation failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Instrument remote controlled	This entry is not executable. Quit software.
Insufficient access	Change the entry.
Invalid command	Check the cable connections. Change the entry.

System message	Solution
Invalid parameter(s)	Check the validity of the parameters.
Invalid time in time table	Correct the time entry.
Invalid time table index	Change the entry in the program line.
Link is loaded	First unload the link then change the link or delete it.
Link is running	Wait until the link has been completed, then change the link or delete it.
Memory error	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
No link available	Create a link and edit it.
No link available Pls edit link first	Create a link and edit it.
No space for scan is available	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
No stored scans available	Edit the data by means of the chromatography software. Save the scan.
No time table to start	Edit the data by means of the chromatography software.
Not enough space to store link	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
Not enough space to store program	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
Not supported	Change the Entry.
Program does not exist	Create a program.
Program is running.	Quit program or wait until program has been completed.
Scan is already active.	Cancel scan procedure or wait until scan procedure has been completed.
This link is used in Wake up	First quit or delete wakeup program (wu = Wake Up), then edit or delete link.

System message	Solution
This program is used in a link	First pause or delete the link, then edit or delete data by means of the chromatography software.
This program is used in Wake Up	First quit or delete wakeup program (wu = Wake Up), then edit or delete data by means of the chromatography software.
Time already exists	Correct the time entry.
Time table is not active	The device is in *Standalone mode*, no program is running. If you try to quit a non-existent program sequence, this message appears.
Time table is not loaded	First load the program, then start the program.
Time table line is empty	Edit the program line.
Too many lines in program	Check the number of program lines. A maximum of 100 program lines are possible.
Wrong Line number	Change the entry in the program line.

PDA-1 detector



The system messages are in alphabetical order:

System message	Solution
At least one wavelength must be valid.	Check whether at least one channel is on. Check whether the wavelengths are within permissible range (119 to 900 nm).
Cannot delete active program/ link	First pause link, then delete program.
Cannot edit program from the running link	First pause link, then edit data using chromatography software.
Cannot execute the command during calibration	Wait until calibration is finished before entering command.
Cannot initialize LAN	Check cables and connections in local area network.

System message	Solution
Cannot operate an uncalibrated instrument	Switch the device off and on. Wait until calibration is completed.
Cannot operate with an empty link	Create a link.
Cannot proceed: D2 lamp heating.	Wait until D2 lamp has preheated.
Cannot proceed: lamps are off.	Test whether the lamps have been switched on.
Cannot read data from FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot read RTC	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot set acquisition parameters	Modify the entry.
Cannot start time table	Edit the data by means of the chromatography software.
Cannot write data on FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Communication failed	Check the cable connections. Check the configuration. Switch the device off and on.
CRC failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
D2 Lamp read failure Ignition counter	Inform the technical support in case the system message repeats itself. The lamp has to be replaced.
D2 Lamp read Ignition counter	Inform the technical support in case the system message repeats itself. The lamp has to be replaced.

System message	Solution
D2 Lamp read lamp lifetime	Inform the technical support in case the system message repeats itself. The lamp has to be replaced.
D2-Lamp does not start!	Switch off lamp on touchscreen and turn it on again. Inform the technical support in case the system message repeats itself. Replace the lamp unit.
Data acquisition active	No entries are possible. First stop acquiring measurement data, afterwards you can make a new entry.
Diode Array Detector failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Error input activated	Check the external devices and cable connections.
Error programming flash	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Error reading a spectrum	Check the consistency of the data in the chromatography.
Filter move error	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C failed for lamp(s)	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C failed for panel	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C Init failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I2C operation failed	Switch the device off and on. Report if the system message repeats itself.
Instrument remote controlled	This entry is not executable. Quit software.

System message	Solution
Insufficient access	Change the entry.
Invalid command	Check the cable connections. Change the entry.
Invalid detector configuration	Check or modify the configuration of the detector.
Invalid integration time	Insert test cell, clean flow cell.
Invalid parameter(s)	Check the validity of the parameters.
Invalid time in time table	Correct the time entry.
Invalid time table index	Change the entry in the program line.
Leak error	Unscrew cover plate, fix leaks.
Leak sensor	Unscrew cover plate, fix leaks.
Link is loaded	First unload the link then change the link or delete it.
Link is running	Wait until the link has been completed, then change the link or delete it.
Memory error	Switch the device off and on. Report if the system message repeats itself.
No link available	Create a link and edit it.
No link available Pls edit link first	Create a link and edit it.
No space for scan is available	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
No stored scans available	Edit the data by means of the chromatography software. Save the scan.
No time table to start	Edit the data by means of the chromatography software.
Not enough space to store link	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
Not enough space to store program	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.

System message	Solution
Not supported	Change the Entry.
Program does not exist	Create a program.
Program is running.	Quit program or wait until program has been completed.
Scan is already active.	Cancel scan procedure or wait until scan procedure has been completed.
Set detectors mode command failed	Check cabling. Check configuration of the detector. Switch the device off and on.
This link is used in Wake up	First quit or delete wakeup program (wu = Wake Up), then edit or delete link.
This program is used in a link	First pause or delete the link, then edit or delete data by means of the chromatography software.
This program is used in Wake Up	First quit or delete wakeup program (wu = Wake Up), then edit or delete data by means of the chromatography software.
Time already exists	Correct the time entry.
Time table is not active	The device is in *Standalone mode*, no program is running. If you try to quit a non-existent program sequence, this message appears.
Time table is not loaded	First load the program, then start the program.
Time table line is empty	Edit the program line.
Too long run time for the given data rate	Adjust the data rate of the detector.
Too low intensity of incoming light	Insert test cell, clean flow cell.
Too many lines in program	Check the number of program lines. A maximum of 100 program lines are possible.
Wrong Line number	Change the entry in the program line.

Column thermostat T-1 with valves and touchscreen

The system messages are in alphabetical order:

System message	Solution
Cannot delete active program/ link	First pause link, then delete program.
Cannot edit program from the running link	First pause link, then edit data using chromatography software.
Cannot initialize LAN	Check cables and connections in local area network.
Cannot operate with an empty link	Create a link.
Cannot read data from FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Cannot read RTC	
Cannot start time table	Edit the data by means of the chromatography software.
Cannot write data on FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Column RFID: failed	Check RFID connection. If the system message repeats itself, switch the device off and then on.
Column RFID: GLP read failed	Check RFID connection. If the system message repeats itself, switch the device off and then on.
Column RFID: GLP write failed	Check RFID connection. If the system message repeats itself, switch the device off and then on.
CRC failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Error input activated	Check the external devices and cable connections.
I2C operation failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.

System message	Solution
Instrument in standalone mode	In the *remote* operating mode, the device cannot be operated via the touchscreen.
Instrument remote controlled	This entry is not executable. Quit software.
Invalid command	Check the cable connections. Change the entry.
Invalid line number	Check or modify the configuration of the detector.
Invalid integration time	Insert test cell, clean flow cell.
Invalid link	Check and modify entry
Invalid parameter(s)	Check the validity of the parameters.
Invalid time in time table	Correct the time entry.
Invalid time table index	Change the entry in the program line.
Leak sensor is not present	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Leakage error	A leak has occurred. Check the seal of the connections. Keep device dry.
Left valve type invalid	Check the device configuration. Switch the device off and on again. Reconfigure the device.
Line in time table is empty	Check and modify entry.
Link is loaded	First unload the link then change the link or delete it.
Link is running	Wait until the link has been completed, then change the link or delete it.
No link available	Create a link and edit it.
No link available Pls edit link first	Create a link and edit it.
No time table to start	Edit the data by means of the chromatography software.

System message	Solution
Not enough space to store link	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
Not enough space to store program	Check the detector. Check the number of program lines. A maximum of 100 program lines are possible.
Not supported	Change the Entry.
Program does not exist	Create a program.
Program is running.	Quit program or wait until program has been completed.
Right valve type invalid	Check the device configuration. Switch the device off and on again. Reconfigure the device.
System error	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Thermostat failure	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
Thermostat temperature exceeds in the safety limit	Temperature too high. Set temperature lower.
Thermostat temperature exceeds the safety limit for column 1	Temperature too high for separating column 1. Adjust temperature for separating column 1.
Thermostat temperature exceeds the safety limit for column 2	Temperature too high for separating column 2. Adjust temperature for separating column 2.
Thermostat temperature exceeds the safety limit for column 3	Temperature too high for separating column 3. Adjust temperature for separating column 3.

System message	Solution
Thermostat temperature exceeds the safety limit for column 4	Temperature too high for separating column 4. Adjust temperature for separating column 4.
Thermostat temperature exceeds the safety limit for column 5	Temperature too high for separating column 5. Adjust temperature for separating column 5.
Thermostat temperature exceeds the safety limit for column 6	Temperature too high for separating column 6. Adjust temperature for separating column 6.
This link is used in Wake up	First quit or delete wakeup program (wu = Wake Up), then edit or delete link.
This program is used in a link	First pause or delete the link, then edit or delete data by means of the chromatography software.
This program is used in Wake Up	First quit or delete wakeup program (wu = Wake Up), then edit or delete data by means of the chromatography software.
Time already exists	Correct the time entry.
Time table is not active	The device is in *Standalone mode*, no program is running. If you try to quit a non-existent program sequence, this message appears.
Time table is not loaded	First load the program, then start the program.
Too many lines in program	Check the number of program lines. A maximum of 100 program lines are possible.
Wake up time already passed	Wakeup time is in the past. Adjust wake-up time.

Error list

The following list contains error numbers and their indexes, which will appear on the display in case of an error.

Error number	Index
Error_1	System error
Error_2	System error
Error_3	System error
Error_10	Leakage error
Error_15	System error
Error_16	Invalid command
Error_17	Invalid parameter
Error_18	CRC failed
Error_19	access denied
Error_20	Instrument in standalone mode
Error_21	Cannot initialize LAN
Error_22	12C Init failed
Error_23	Cannot read RTC
Error_24	12C operation failed
Error_25	Cannot write data on FRAM
Error_26	Cannot read data from FRAM
Error_27	Instrument remote controlled
Error_28	Error input activated
Error_29	Time already exists
Error_30	Too much lines in program
Error_31	Invalid line number
Error_32	Invalid link
Error_33	Not enough space to store link
Error_34	Program does not exist
Error_35	Program is running
Error_36	Link is loaded
Error_37	Link is running
Error_38	Not enough space to store link
Error_39	Cannot operate with an empty link

Error number	Index
Error_40	Cannot delete active program/link
Error_41	This program is used in a link
Error_42	This program is used in WAKEUP
Error_43	This link is used in WAKEUP
Error_44	Cannot edit program from the running link
Error_45	No link available. Pls edit link first
Error_46	No link available
Error_47	Wake up time already passed!
Error_48	Not supported
Error_49	Line in time table is empty
Error_50	Invalid index in time table
Error_51	Invalid time in time table
Error_52	No time table to start
Error_53	Cannot start time table
Error_54	Time table is not active
Error_55	Time table is not loaded
Error_56	No gradient is available in isocratic mode
Error_57	Non-existing component is set to non-0 value
Error_58	Sum of components is not 100
Error_59	Maximum pressure! System stopped
Error_60	Minimum pressure! System stopped
Error_61	Cannot use non-existing component!
Error_62	Program not compatible with pump head
Error_63	Component settings not compatible with gradient setup!
Error_64	Unknown pump head type!
Error_65	Auto pump head type: no valid head detected!
Error_66	Auto pump head type: head data uninitialized!

Error number	Index
Error_67	Auto pump head type: RFID hardware not present or failed!
Error_68	Auto pump head type: read failed!
Error_69	Auto pump head type: write failed!
Error_70	Motor failure
Error_71	Motor failure: max current
Error_72	Motor failure: position error
Error_99	I2C failed for panel
Error_122	GUI internal error!
Error_123	GUI communication failed (internal)
Error_124	GUI communication failed (external)

Delivery program

UHPLC

UHPLC systems

Name	Order number
PLATINblue UHPLC system, LPG, M-1, PDA-1 detector, autosampler, column thermostat, software and PC	A69320
PLATINblue UPHPLC system; HPG, integrated degasser, autosampler, column thermostat, software and PC	A69400
PLATINblue UHPLC system; HPG, integrated degasser, PDA-1 detector, autosampler, column thermostat, software and PC	A69420
PLATINblue UHPLC system; HPG, integrated degasser, PDA-1 detector, autosampler, column thermostat, for MS	A69420MS
PLATINblue UHPLC system; HPG, integr. degasser, PDA-1 detector, man. valve, column thermostat, software and PC	A69421
PLATINblue UHPLC system; HPG, integr. degasser, FL detector, autosampler, column thermostat, software and PC	A69440
PLATINblue UHPLC-MS system, HPG, integr. degasser, MS autosampler and column thermostat	A69450

HPLC plus

HPLCplus systems

Name	Order number
PLATINblue HPLC plus system, LPG, M-1, MW-1 detector, autosampler, column thermostat without valves, software and PC	A69310PH
PLATINblue HPLC plus system, LPG, integr. degasser, MW-1 detector, manuel valve, software and PC	A69311PH
PLATINblue HPLC plus system, LPG, M-1, PDA-1 detector, autosampler, column thermostat without valves, software and PC	A69320PH

HPLCplus systems

Name	Order number
PLATINblue HPLC plus system, HPG, integr. degasser, autosampler, column thermostat without valves, software and PC	A69400PH
PLATINblue HPLC plus system, HPG, integr. degasser, autosampler, column thermostat without valves	A69400PHMS
PLATINblue HPLC plus system, HPG, integr. degasser, MW-1 detector, autosampler, column thermostat without valves, software and PC	A69410PH
PLATINblue HPLC plus system, HPG, integr. degasser, MW-1 detector, manual valve, column thermostat without valves, software and PC	A69411PH
PLATINblue HPLC plus system, HPG, integr. degasser, PDA-1 detector, autosampler, column thermostat without valves, software and PC	A69420PH
PLATINblue HPLC plus system, HPG, integr. degasser, PDA-1 detector, autosampler, column thermostat without valves	A69420PHMS
PLATINblue HPLC plus system, HPG, integr. degasser, FL detector, autosampler, column thermostat without valves, software and PC	A69440PH

Upgrade kits

	Name	Order number
UHPLC-Kits	PLATINblue UHPLC upgrade kit for PDA-1, 50 mm cell 5 ml pump heads Smartmix 100, Cap. kit Columns	A697101
	PLATINblue UHPLC upgrade kit without measuring cell 5 ml pump heads Smartmix 100, Cap. kit Columns	A697102
T-1-Kits	T-1 Upgrade Kit two valve drives incl. accessories	A63460
	T-1 Upgrade Kit single valve drive incl. accessories	A63461

Repeat orders

Name	Order number
PLATINblue P-1 UHPLC pump with Smartmix 100	A60013
PLATINblue P-1 UHPLC pump with degasser	A60014
PLATINblue PDA-1 photo diode array detector	A62031
PLATINblue P-1 HPLC plus pump with Smartmix	A60015
PLATINblue P-1 HPLC plus pump with degasser	A60016
PLATINblue MW-1 multiple wavelength detector	A61031
PLATINblue AS-1, 15.000 psi UHPLC / HPLCplus autosampler standard	A63501
PLATINblue AS-1, 15.000 psi UHPLC / HPLCplus autosampler cool/heat	A63502
PLATINblue T-1 column thermostat with valves touch screen incl. accessories	A63410
PLATINblue T-1 column thermostat without valves, incl. accessories only remote control	A63412
Magnetic column holders OD 1/4'' kpl.	A63470
Magnetic column holders OD 8 mm	A63471
Magnetic column holders OD 12 mm	A63472
Cartridge for T-1 Post column thermostat ID 0.12 mm, 2 µl incl. condensation protection	A63450
Cartridge for T-1 HPLC plus Post column thermostat ID 0.25 mm, 30 µl incl. condensation protection	A63451
Cartridge for T-1 Eluent Pre-heating ID 0.12 mm, 2 µl	A63453
Cartridge for T-1 HPLC plus Eluent Pre-heating ID 0.25 mm, 15 µl	A63454
PLATINblue ET-1 Modular Eluent Tray	A60900
PLATINblue UHPLC 5 ml pump head	A64001
PLATINblue HPLC plus 10 ml pump head	A64021

Name	Order number
UHPLC flow cell UV, 10 mm, 2.4 µl, 1/16" LWL for PDA-1	A64150
UHPLC flow cell UV, 50 mm, 10 µl, 1/16" LWL for PDA-1	A64151
Flow cell UV, 10 mm 10 µl, 1/16", stainless steel, with heat exchanger	A4061
Halogen lamp kit for MW-1 E²PROM Connector SND	A64200
Halogen lamp kit for PDA-1 E²PROM Connector SND	A64201
Deuterium lamp type HBST for UV/VIS	A5194
ChromGate PLATINblue Edition V. 3.3.2 Client/Server license for one system incl. method converter	A65111
Control and Scan Option for Diode Array Detectors	A1460
Scan Option for KNAUER Fast Scanning Spectro-Photometer	A1459
Premium PC German Windows 7 downgrade Win XPP	A1322
Monitor TFT 19"	A1612
patch cable CAT5e RJ45/RJ45 3m, blue	A5255
PLATINblue System Manual German	V6900
PLATINblue System Manual English	V6900A

Power supply cable

Name	Order number
Power supply cable for Germany	M1479
Power supply cable for United Kingdom (UK)	M1277
Power supply cable for USA	M1279

Legal information

Trademarks This documentation contains references to the following products from other manufacturers:

- PEEK is a trademark of Victrex plc.
- Windows is a trademark of Microsoft Corporation
- EZChrom Elite is a trademark of Agilent Technologies.
- Xcalibur is a trademark of Thermo Fisher Scientific Inc.

Warranty Conditions

The factory warranty for the device is valid for 12 months after the date of dispatch. All warranty claims shall expire in the event that any unauthorized changes are made to the device.

During the warranty period, any components with material or design-related defects will be replaced or repaired by the manufacturer free of charge.

This warranty excludes the following:

1. Accidental or willful damage
2. Damage or errors caused by third parties that are not contractually related to the manufacturer at the time the damage occurs
3. Wear parts, fuses, glass parts, columns, light sources, cuvettes and other optical components
4. Damage caused by negligence or improper operation of the device and damage caused by clogged capillaries
5. Packaging and transport damage

In the event of device malfunctions, directly contact the manufacturer.

Manufacturer

Wissenschaftliche Gerätebau
Dr. Ing. Herbert KNAUER GmbH
Hegauer Weg 38
14163 Berlin, Germany
Phone: +49 30 809727-0
Fax: +49 30 8015010
E-Mail: info@knauer.net
Internet: www.knauer.net

Transportation Damages

The packaging of our devices provides the best possible protection against transportation damage. Check the devices for signs of transportation damages. In case you notice any damage, contact the technical support and the forwarder company within three workdays.

Declaration of conformity

Manufacturer name and address

Wissenschaftliche Gerätebau
Dr. Ing. Herbert KNAUER GmbH
Hegauer Weg 38
14163 Berlin, Germany

UHPLC system PLATINblue

Order numbers A69320, A69410, A69420

comply with the following requirements and product specifications:

- DIN EN 60799 (June 1999) Electrical accessories – Cord sets and interconnection cord sets
- DIN EN 61010-1 (August 2002) Safety requirements for electrical equipment for measurement, control and laboratory use
  - Low voltage directive (2006/95/EC)
- DIN EN 61000-3-2 (October 2006) Electromagnetic compatibility (EMC) Part 3-2
  - EMC directive (2004/108/EC)
- DIN EN 61326-1 (October 2006) Electrical equipment for measurement, control and laboratory use - EMC requirements
- Directives for an environmentally sound use of electrical and electronic equipment
  - RoHS directive 2002/95/EC (February 2003) on the restriction of the use of certain hazardous substances in electrical and electronic equipment
  - WEEE directive 2002/96/EC (February 2003) on waste electrical and electronic equipment

Date

The product was tested with a typical configuration.

Berlin, 2009-06-29

Signature

Dr. Alexander Bünz (Managing Director)

The mark of conformity has been applied to the rear panel of the module.

CE

Abbreviations and terminology

Here you can find information on the abbreviations and terminology used in this system manual on liquid chromatography.

Terminology	Explanations
CN	Cyanopropyl phase in adsorption chromatography
Dead volume	Volume of thin, flexible, stainless steel capillaries between mixing chamber, injector and column as well as between column and detector. The dead volume should be kept as small as possible.
Degasser	Degasser module for fluids, e.g., in a high-pressure pump
Gateway	Connection between computer networks, usually a router
GLP	Good Laboratory Practice – quality assurance for laboratories
Gradient	Time-dependent composition of solvent (mobile phase) on low-pressure or high-pressure side of system
Gradient grade	Quality designation for ultra-pure and filtered solvents in liquid chromatography
GUI	Module GUIs
HPG	Operating mode of UHPLC or HPLC system; separation of sample mixtures using high pressure gradient of pump
IP address	Unique address of transmitter or receiver in local networks or Internet (Internet protocol)
Isocratic	Sample mixtures separated by constant composition of solvent
LAN-DHCP	Local computer network with automatic configuration (local area network – dynamic host configuration protocol) consisting of Ethernet card and LAN patch cable
LC-MS	Combination of an analysis system for liquid chromatography together with a mass spectrometer
LED	Light-emitting diode
LINK	Combination of multiple chromatography programs in a single UHPLC system

Terminology	Explanations
LPG	Operating mode of UHPLC or HPLC system; separation of sample mixtures using gradient on low-pressure side of pump
Manager	Multipurpose unit consisting of degasser module, gradient module and analog-to-digital converter
MW	UV-Vis detector that can measure several wavelengths in parallel
NP	Normal phase in adsorption chromatography
OQ	Comprehensive functionality test of individual components in an analysis system (operation qualification)
p. a.	Analysis quality for substances (pro analysi)
PDA	Photo diode array – detector; UV-VIS detector with 1024 photo diodes in an array for synchronous recording of spectra; synonym: DAD (diode array detector)
PFP	Pentafluorphenyl phase in adsorption chromatography
Port	Internal computer address to interface of local network (LAN)
PQ	Performance qualification for system, performed in a standardized test environment
Rack	Sample rack in autosampler
Remote	The system is completely controlled by the chromatography software.
RFID	Automatic identification of components in systems by means of Radio Frequency IDentification (RFID)
Router	Module in computer network that checks data packets and forwards them
RP	Reversed phase in adsorption chromatography
RSD	Relative standard deviation in the retention times and the size of peak surface, as determined during system test
Solvents	Mobile phase (eluent) or carrier for liquid chromatography

Terminology	Explanations
UHPLC	Liquid chromatography in the ultra-high pressure or ultra-high performance range.
UNF	US standard for screw fittings

Table of figures

Index

▶ Visit our website for more information
www.platinblue.com

www.knauer.net

HPLC · SMB · Osmometry

Wissenschaftliche Gerätebau
Dr. Ing. Herbert Knauer GmbH
Hegauer Weg 38
14163 Berlin, Germany

Phone: +49-(0)30-809727-0
Fax: +49-(0)30-8015010
email: info@knauer.net
Internet: www.knauer.net

KNAUER