

Azure

► Pump P 6.1L
User Manual

V6890



HPLC

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

Manuel en français: Si jamais vous préférez un manuel en français pour ce produit, veuillez vous contacter le support technique (Technical Support) par email ou par fax avec le no. de série. Merci beaucoup.

Technical Support: Phone: +49 30 809727-111 (9-17h, Central European Time)
Fax: +49 30 8015010
E-Mail: support@knauer.net
Languages: German, English

Publisher: KNAUER Wissenschaftliche Geräte GmbH
Hegauer Weg 38
D-14163 Berlin
Phone: +49 30 809727-0
Fax: +49 30 8015010
Internet: www.knauer.net
E-Mail: info@knauer.net

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Product Information

Note: Only use the device for applications that fall within the range of the intended use. Otherwise, the protective and safety equipment of the device could fail.

Description The pump P 6.1L is suitable for analytical and semi-preparative applications.

Operating Ranges

Operating ranges The device can be used in the following areas:

- biochemical analysis
- chemical analysis
- food analysis
- pharmaceutical analysis
- environmental analysis

Device Variants

The P 6.1L is available in three different options:

- Isocratic pump
- Binary pump (HDG pump)
- Quaternary Pump (NDG pump)

All variants are available as a standard version made of stainless steel or as a bio-inert version made of ceramics with PEEK capillary, PEEK connectors, and PEEK venting screw.

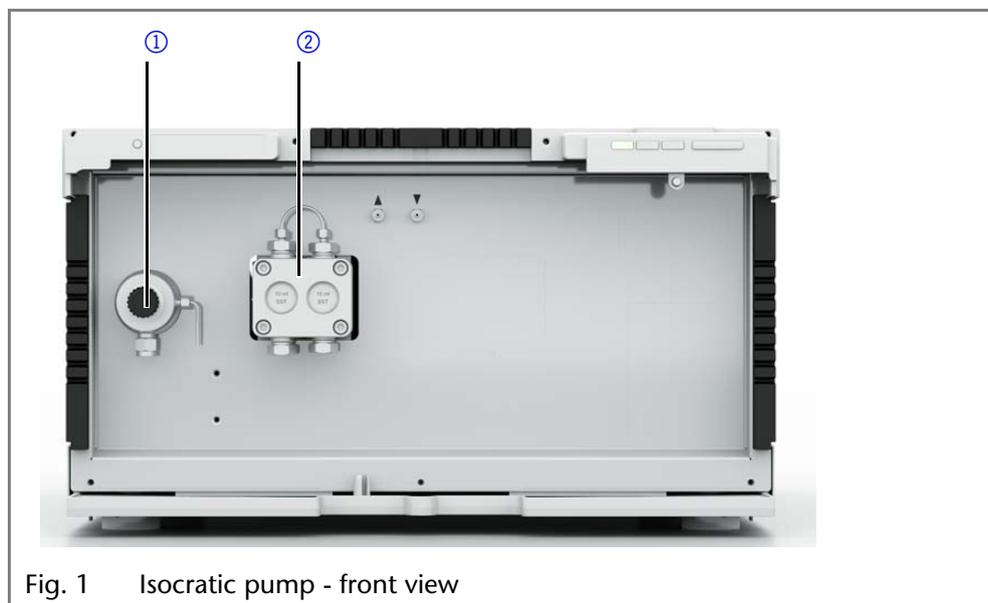
Views

Front View

Isocratic pump The isocratic pump is equipped with a pressure sensor with an integrated inline filter and a venting screw..

Legend

- ① Pressure sensor
- ② Pump head



Binary pump The binary pump consists of two pump drives and a 2-channel degasser with a *Solvent Selection* valve. A pressure sensor with an integrated inline filter and a venting screw are also part of the pump.

Legend

- ① Pressure sensor
- ② Mixer
- ③ Pump head
- ④ Degasser
- ⑤ *Solvent Selection* valve

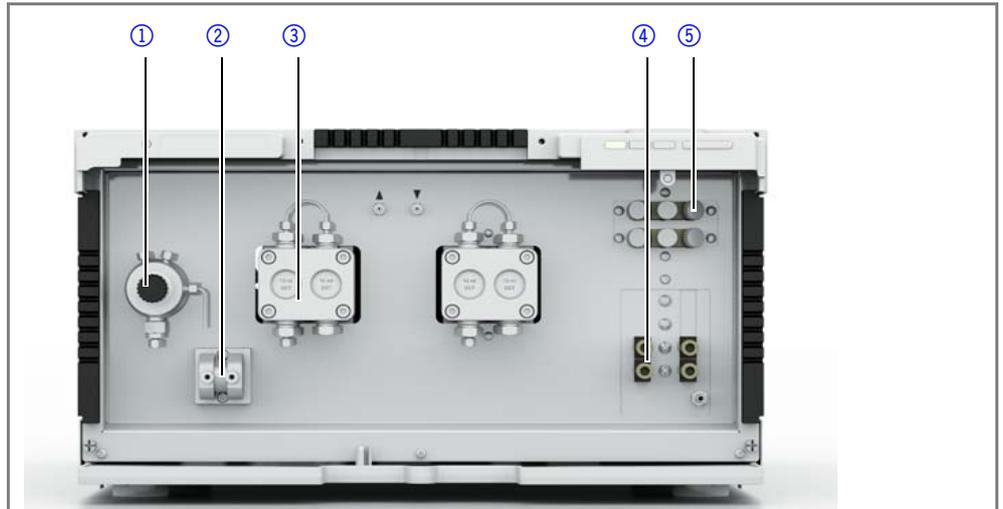


Fig. 2 Binary pump - front view

Quarternary pump The quarternary pump consists of a pump, a valve block and a 4-channel degasser. A pressure sensor with an integrated inline filter, a venting screw, and a mixer are also part of the pump.

Legend

- ① Pressure sensor
- ② mixing chamber
- ③ Pump head
- ④ Valve block
- ⑤ Degasser

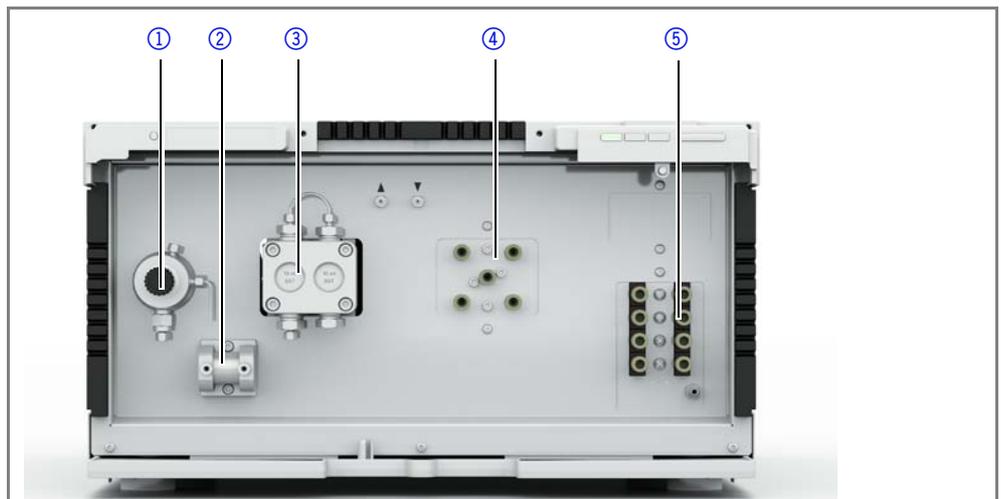


Fig. 3 Binary pump - front view

Rear View

On the back of pump, the connectors for LAN and power chord are located as well as the serial number of the device and the power switch (on/off).

Service Interface

Please note that the service interface is solely used for repair and maintenance tasks performed by service technicians.

Legend

- ① serial number
- ② service interface
- ③ Pin header
- ④ LAN connector
- ⑤ Power connection and power switch

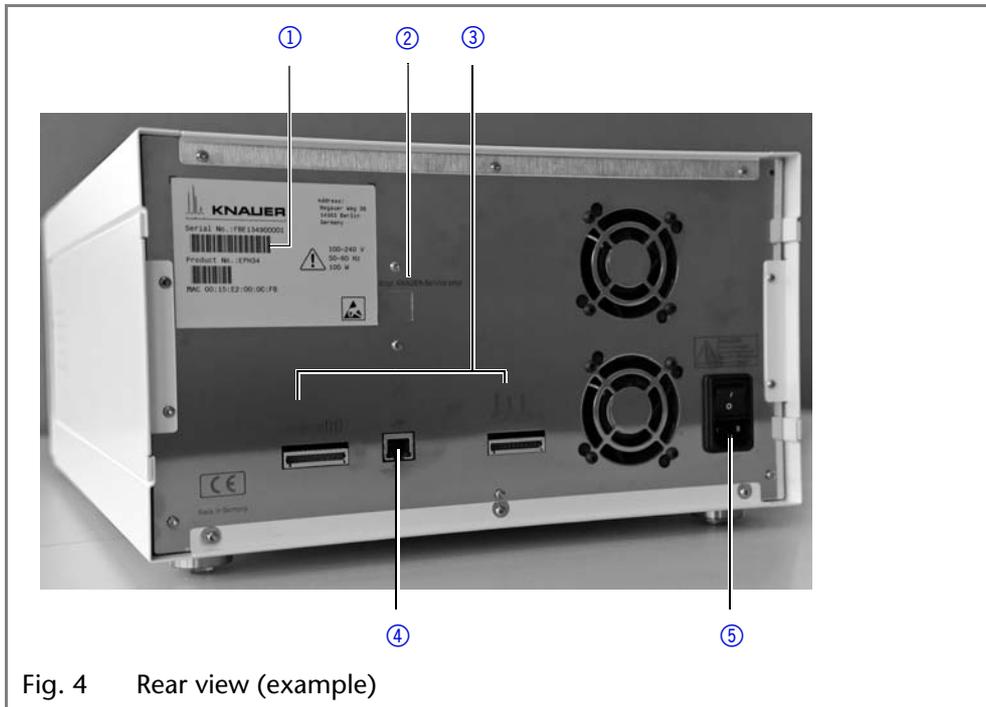


Fig. 4 Rear view (example)

Performance Features

The pump is used to convey liquids, either in an HPLC system or as a stand-alone device. Liquids are conveyed either with constant flow or with constant pressure. The flow and pressure, which liquids can be conveyed with, depend on the pump head.

Pump heads

Pump heads for several areas of application are available for the pump P 6.1L:

	Standard	Bio-inert
Size	5 ml, 10 ml and 50 ml	10 ml and 50 ml
material	Pump head with stainless steel inlays	Pump head with ceramic inlays
Operating Range	<ul style="list-style-type: none"> ▪ HPLC ▪ Dosing applications with non-aggressive media 	<ul style="list-style-type: none"> ▪ Purification/FPLC ▪ Ion chromatography

Every pump head is equipped with an RFID chip. It is used to monitor and save all important parameters and settings. The RFID technology offers the following advantages:

- Software automatically recognizes the parameters of the pump head
- All service-relevant data of the pump head is stored

Mixer

Volume of the mixer is 100 µl. The mixer is exchangeable and can be replaced by mixers with a volume of 50 µl or 200 µl .

The parameters necessary for the mixer are set via Mobile Control or via chromatography software.

Parameter	stainless steel	Bio-Inert
Size	50 µl, 100 µl, 200 µl	250 µl
Pressure	1000 bar	400 bar

Piston backflushing 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 15 seconds.
- In continuous mode: The rear piston area of the pump head is flushed automatically every 15 minutes, for 15 seconds.

PMax Mode This mode protects the column from excessive fluctuations in pressure. If the maximum pressure is reached, the user can decide if the pump should be switched off or continue running with constant pressure. You find a detailed description on chromatography software in the corresponding user manual.

GLP Data The Mobile Control and the different software products (ClarityChrom[®] or OpenLAB[®]) can be used to display or read GLP data. You find a detailed description on how to display or read out GLP data in the respective user manuals.

Optional accessories The following optional accessories are available:

- Pump head cooler for the pump head
- Mobile Control

Eluents

Even small quantities of other substances, such as additives, modifiers, or salts can influence the durability of the materials.

If there is any doubt, contact the Technical Support of the manufacturer.

Unsuitable Eluents

- halogenated hydrocarbons, e.g. Freon[®]
- concentrated mineral and organic acids
- concentrated bases
- eluents containing particles
- perfluorinated eluents, e.g. Fluorinert[®] FC-75, FC-40
- perfluorinated polyether, e.g. Fomblin[®]

Less Suitable Eluents

- diethylamine (0.1 %) (DEA)
- dimethyl sulfoxide (DMSO)
- slightly volatile eluents
- methylene chloride¹
- tetrahydrofuran (THF)¹
- phosphoric dilute acid
- triethylamine (0.1 %) (TEA)
- trifluoroacetic acid (0.1 %) (TFA)

1. not recommended in combination with PEEK components or PEEK capillaries

Suitable Eluents

- acetate buffer solutions
- acetone at 4 °C-25 °C (39.2 °C-77.0 °F)¹
- acetonitrile²
- benzene
- chloroform
- ethyl acetate
- ethanol
- formate buffer solution
- isopropanol
- carbon dioxide (liquid 99.999 % CO₂)
- methanol
- phosphate buffer solutions (0.5 M)
- toluol
- ammoniated dilute solution
- acetic acid (0.1-1 %), at 25 °C
- sodium hydroxide (1 M)
- water

1. valid for the specified temperature range
2. not recommended in combination with PEEK components or PEEK capillaries

Unsuitable Eluents for degassers

- Azides
- benzene
- Hydro fluoro solvents
- halogenated hydrocarbons, e.g. Freon®
- heptane
- Hexafluoroisopropanol (HFIP)
- hexane
- Hydrofluoric acid solutions
- Carbon dioxide (liquid 99.999 % CO₂)
- concentrated mineral and organic acids
- concentrated bases
- eluents containing particles
- perfluorinated eluents, e.g. Fluorinert® FC-75, FC-40
- perfluorinated polyether, e.g. Fomblin®
- Hydrochloric acid
- dilute sodium hydroxide (1 M)

Scope of Delivery

Note: Only use original parts and accessories made by KNAUER or a company authorized by KNAUER.

- Pump P 6.1L
- Power cable
- AZURA accessories kit
- P 6.1L accessories kit
- User manual DE/EN
- Installation Qualification

Safety for Users

Professional Group The user manual addresses persons who are qualified as chemical laboratory technicians or have completed comparable vocational training.

The following knowledge is required:

- Fundamental knowledge of liquid chromatography
- Knowledge regarding substances that are suitable only to a limited extent for use in liquid chromatography
- Knowledge regarding the health risks of chemicals
- Participation during an installation of a device or a training by the company KNAUER or an authorized company.

If you do not belong to this or a comparable professional group, you may not perform the work described in this user manual under any circumstances. In this case, please contact your superior.

Safety Equipment When working with the device, take measures according to lab regulations and wear protective clothing:

- Safety glasses with side protection
- Protective gloves
- Lab coat

What must be taken into account?

- All safety instructions in the user manual
- The environmental, installation, and connection specifications in the user manual
- National and international regulations pertaining to laboratory work
- Original spare parts, tools, and solvents made or recommended by KNAUER
- Good Laboratory Practice (GLP)
- Accident prevention regulations published by the accident insurance companies for laboratory work
- Filtration of substances under analysis
- Use of inline filters
- 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.
- Follow KNAUER or manufacturer's instructions on caring for the columns.

More safety-relevant information is listed below:

- 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.
- solvent tray: Risk of electrical shock or short circuit if liquids get into the device's interior. For this reason, place all bottles in a solvent tray.
- solvent lines: Install capillaries and tubing in such a way that liquids cannot get into the interior in case of a leak.
- leaks: Regularly check if any system components are leaking.
- power cable: Defective power cables are not to be used to connect the device and the power supply system.
- self-ignition point: Only use eluents that have a self-ignition point higher than 150 °C under normal ambient conditions.
- power strip: If several devices are connected to one power strip, always consider the maximum power consumption of each device.
- power supply: Only connect devices to voltage sources, whose voltage equals the device's voltage.
- toxicity: Organic eluents 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!

Where is use of the device prohibited?

Never use the system in potentially explosive atmospheres without appropriate protective equipment. For further information, contact the Technical Support of KNAUER.

Secure decommissioning

At any time, take the device completely out of operation by either switching off the power switch or by pulling the power plug.

Opening the Device

The device may be opened by the KNAUER Technical Support or any company authorized by KNAUER only.

Signal Words

Possible dangers related to the device are divided into personal and material damage in this user manual.



Lethal injuries will occur.



Serious or moderate injuries can occur.



Minor injuries can occur.



Device defects can occur.

Decontamination

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



Life-threatening injuries

Health danger if getting in contact with toxic, infectious or radio-active substances.

→ Before disposing of the device or sending it away for repair, you are required to decontaminate the device in a technically correct manner.

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.

Decontamination Report

Devices without a completed Decontamination Report will not be repaired. If you would like to return a device to KNAUER, make sure to enclose a completed **Decontamination Report** with the device: <http://www.knauer.net/en/downloads/service.html>

Symbols and Signs

The following symbols and signs can be found on the device, in the chromatography software or in the user manual:

Symbol	Meaning
	Electric shock hazard
	Note maximum weight-loading of the leak tray during transport, installation and operation.
	A device or system marked with CE fulfills the product specific requirements of European directives. This is confirmed in a Declaration of Conformity.
	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.

Installation

This chapter describes all preparatory steps prior to start-up. If you encounter difficulties during the installation, contact the Technical Support.

contact

Phone	+49 30 809727-111
Fax	+49 30 8015010
Mail	support@knauer.net

Transport

Carefully prepare the device for transport or storage. If you want to return your device to KNAUER for repairs, enclose the Service Request Form which can be downloaded from our website.

Device Data

For a secure transport, note the weight and dimensions of the device (see Technical Data).



Bruising danger

Damage to the device by carrying or lifting it on protruding housing parts. The device may fall and thus cause injuries.

→ Lift the device only centrally on the side of the housing.

Lifting

Clasp the device at its side panels and lift it out of the packaging. Do not hold onto front cover or leak tray.

Location Requirements

Only if the requirements for ambient conditions of the operating environment are met, can the intended use be ensured. Details on the operating conditions can be found in the Technical Data section.

NOTICE

Device defect

The device overheats at exposure to sunlight and insufficient air circulation. Device failures are very likely.

- Set up the device in such a way that it is protected against exposure to direct sunlight.
- Keep at least 15 cm clear at the rear and 5–10 cm at each side for air circulation.

Space Requirements

- At least 5 cm if another device is set up on one side
- At least 10 cm if further devices are set up on both sides
- At least 15 cm on the rear panel for the fan.
- Leave the power plug on the rear of the device accessible to be able to disconnect the device from the mains.

General requirements

- Position the device on a level and even surface.
- Protect the device against direct exposure to sunlight.
- Set up the device at a location not exposed to air drafts (A/C systems).
- Do not set up the device in the vicinity of other machines that cause floor vibrations.

Cooling room

It is possible to operate the pump in a cooling compartment when the following requirements are fulfilled:

- The pump is switched on.
- The pump is on standby modus.

NOTICE

Device defect

Changes of the environmental temperature cause condensation inside the device.

- Allow device to acclimate for 3 h, before connecting to power supply and taking into operation.

Earthquake Areas

If you are located in an earthquake area, use the bore holes ① in the side panels to secure the device. The bore holes are located on either right or left side panel.

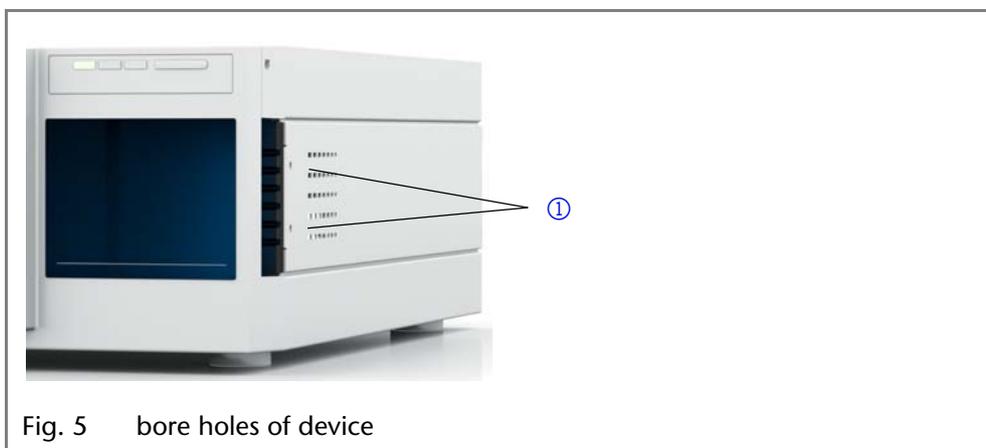


Fig. 5 bore holes of device

Unpacking the Device

Prerequisite

Check packaging for damage caused during transportation. If necessary, put forward any claim for damages to the carrier.

Tools Utility knife



Bruising danger

Damage to the device by carrying or lifting it on protruding housing parts. The device may fall and thus cause injuries.

→ Lift the device only centrally on the side of the housing.

- Process*
1. Set up the package in such a way that you can read the label. Using the utility knife, cut the adhesive tape and open the packaging.
 2. Remove the foam insert. Take out the accessory kit and the manual.
 3. Open the accessory kit and check the scope of delivery. In case any parts are missing, contact the Technical Support.
 4. Clasp the device from below, lift it out of the packaging and place it on its feet. Do not hold onto the front cover.
 5. Check the device for signs of damage that occurred during transport. In case you notice any damage, contact the Technical Support.
 6. Place the device in its site of operation and remove protective foil.

Next steps Store packaging and keep the included packing list for repeat orders.

Capillaries and Fittings

All tubing and capillary, which connect the components of the pump, are pre-installed. Only the solvent bottles have to be connected and the pump has to be integrated into the flow of the HPLC system.

Connecting the Solvent Bottles

To connect the solvent bottles, tubing with pre-installed solvent filters is used. The tubing is connected to the device with flangeless fittings.

Note: Do not use any tools to tighten the fittings.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Slide the flangeless fitting ① over the tubing. 2. Slide the lock ring ② over the tubing, cap with the sealing ring ③. Note the direction of the lock ring, otherwise the sealing ring could be damaged. The thicker end of the lock ring must point into the direction of the fitting. 	<p>Fig. 6 Set-up of a flangeless fitting</p>
<ol style="list-style-type: none"> 3. Manually fasten the flangeless fitting ④ to the device. 	<p>Fig. 7 Fully assembled flangeless fitting</p>

Pre-Installed Capillaries

Pre-installed stainless steel and PEEK capillaries are color-coded according to their inner diameter.

Color	Material	Inner Diameter
red marker	stainless steel	0.1 mm
blue marker	stainless steel	0.25 mm
black marker	stainless steel	0.45 mm
red stripe	PEEK	0.1 mm
blue stripes	PEEK	0.25 mm
orange stripes	PEEK	0.5 mm

Note: PEEK capillaries are not suitable for use with pure acetonitrile. Acetonitrile can cause capillaries to crack or rupture.

Integrating the Pump into an HPLC Flow System

The pump can be integrated into an HPLC flow system by connecting the pressure sensor (isocratic version) or the mixer (binary or quaternary version) and the HPLC system with capillary.

Note: To integrate the pump into a system, note the ambient conditions found in the sections Operating Environment and Technical Data as well as the ambient conditions of other devices to be integrated into that system.

NOTICE

Device defect

Damage to the pump head caused by overtightened capillary fittings. Note the torque of the fittings.

- Use 5 Nm torque for stainless-steel fittings.
- Use 1 Nm torque for PEEK fittings.

Tools Torque wrench

Isocratic pump

The figure shows the installation plan for capillary and tubing on the isocratic version of the pump. If you own a different version of the pump, see the corresponding chapter for installation instructions.

The gray lines represent the connection of the solvents to the pump and the black lines represent the connection of the piston backflushing.

Capillary Layout

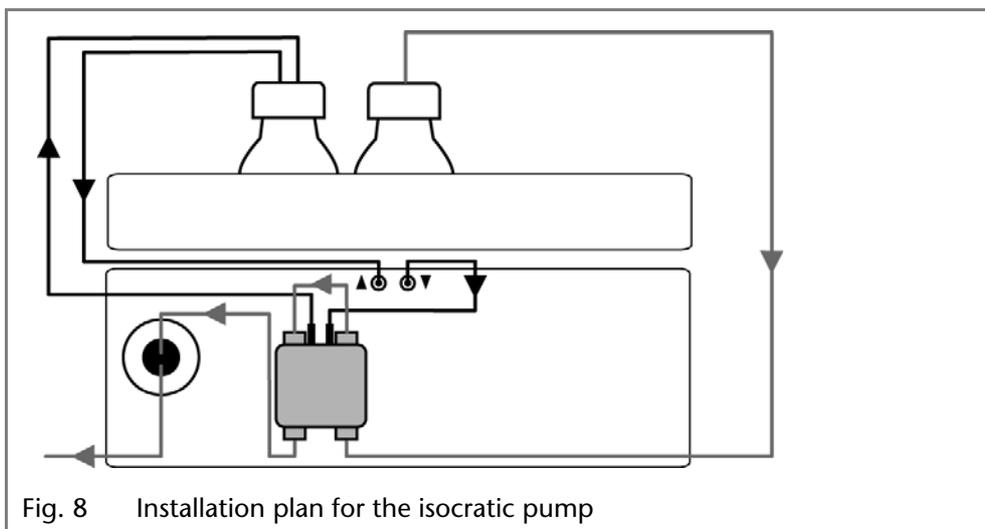


Fig. 8 Installation plan for the isocratic pump

Piston backflushing The flushing solution is re-used. Since the flow path is circular, only one bottle is used for the flushing solution.

Solvent flow path The pump head takes the liquid in from the bottle and conveys it to the pressure sensor.

Connecting the Pump Head to the Solvent

- Prerequisites*
- The device has been switched off.
 - The power plug has been pulled.
 - The front cover has been removed.

material flangeless fitting

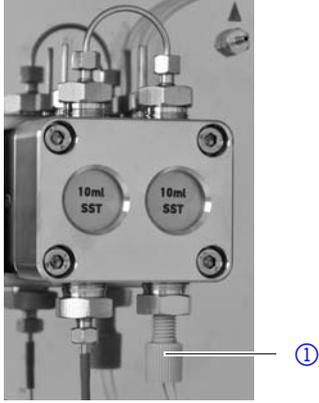
NOTICE

Device defect

The pump head can get damaged when the inlet and outlet are blocked.

- ➔ Remove the cap fittings from the inlet and outlet of the pump head prior to use.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Slide the flangeless fitting over the tubing. 2. Insert the tubing into the free inlet ① on the bottom of the pump head. 3. Tighten the fitting by hand. 	 <p>Fig. 9 Solvent line on pump head</p>

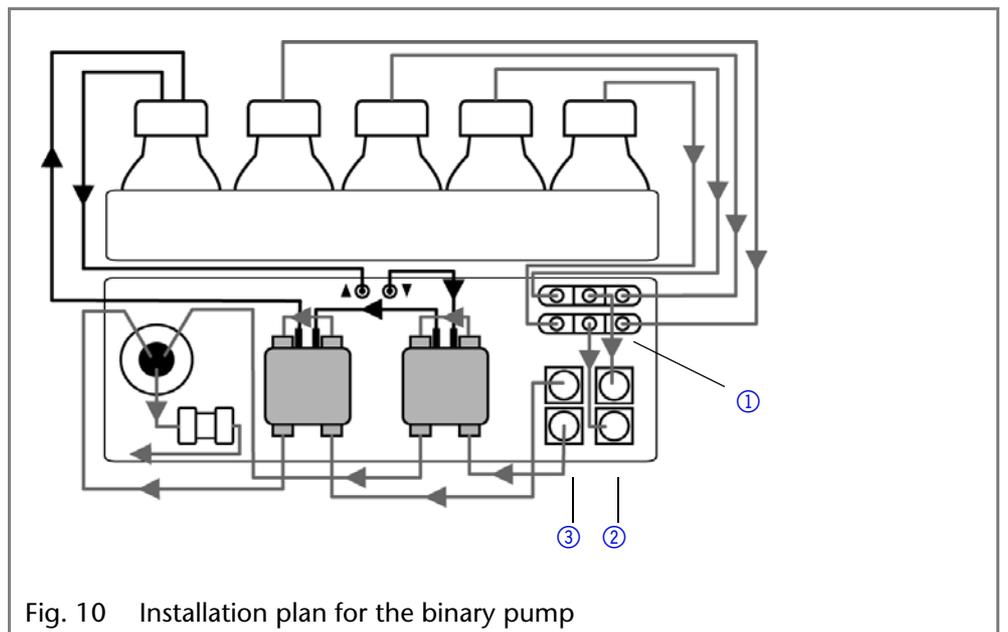
Next Steps Integrate the pump into the HPLC flow system.

Binary pump

The figure shows the installation plan for capillary and tubing on the binary version of the pump. If you own a different version of the pump, see the corresponding chapter for installation instructions.

The gray lines represent the connection of the solvents to the pump and the black lines represent the connection of the piston backflushing.

Capillary Layout



Piston backflushing

The flushing solution is re-used. Since the flow path is circular, only one bottle is used for the flushing solution.

Every pump head can operate with two different solvents. Both solvents are connected with the Solvent Selection valve ①. The solvents are conveyed into one pump head each and combined in the pressure sensor. The pressure sensor is connected to the mixer. The mixer is connected to the HPLC system.

Connecting the Degasser

The degasser inlet ② is readily connected with the solvent selection valve ①. The degasser outlet ③ is readily connected with the pump heads (see Fig. 10).

Solvent flow path

Both solvents are connected with the ② degasser inlet. The solvents are conveyed from the degasser into the pump head. From the pump head it is taken via the pressure sensor to the mixer. The mixer is connected to the HPLC system.

Note: The described flow path is not suitable for Normal Phases.

Connecting the Pump Head to the Solvent

Prerequisites

- The device has been switched off.
- The power plug has been pulled.
- The front cover has been removed.

material

flangeless fitting

NOTICE

Device defect

The pump head can get damaged when the inlet and outlet are blocked.

- ➔ Remove the cap fittings from the inlet and outlet of the pump head prior to use.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Slide the flangeless fitting over the tubing. 2. Insert the tubing into the free inlet ① on the bottom of the pump head. 3. Tighten the fitting by hand. 	

Fig. 11 Solvent line on pump head

Next Steps

Integrate the pump into the HPLC flow system.

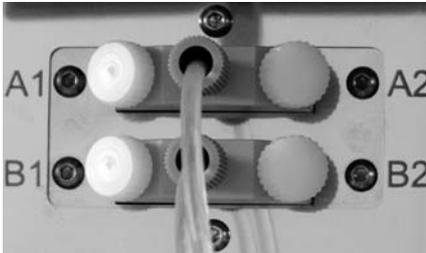
Connecting the Solvent Selection Valve to the Solvent

Note: The Solvent Selection valve is readily connected to the 2-channel degasser.

The Solvent Selection valves allows selecting from two different solvents for each solvent channel, without having to re-install the tubing. For both solvent channels A and B, one of two solvents can be selected. Solvent A is connected to inlets A1 and A2, solvent B is connected to inlets B1 and B2.

- Prerequisites*
- The device has been switched off.
 - The power plug has been pulled.
 - The front cover has been removed.

material Flangeless fitting

<i>Procedure</i>	Process	Figure
	<ol style="list-style-type: none"> 1. Connect the tubing from the four solvent bottles to the inlets A1, A2 and B1, B2. 2. Seal inlets not in use with cap fittings. 	 <p>Fig. 12 Solvent Selection valve with cap fitting</p>

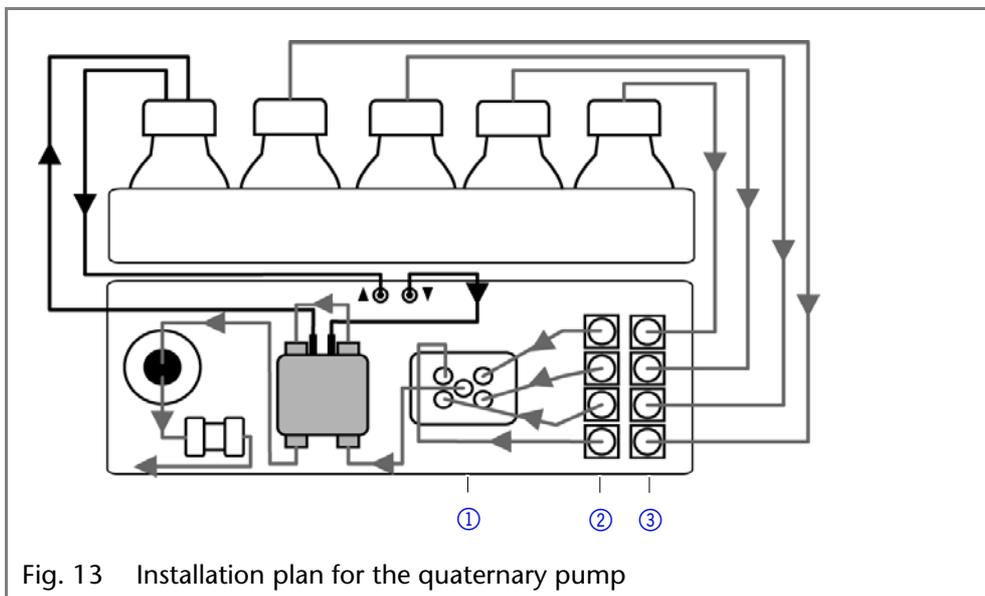
Next Steps Integrate the pump into the HPLC flow system.

Quaternary Pump

The figure shows the installation plan for capillary and tubing on the quaternary version of the pump. If you own a different version of the pump, see the corresponding chapter for installation instructions.

The gray lines represent the connection of the solvents to the pump and the black lines represent the connection of the piston backflushing.

Capillary Layout



Piston backflushing The flushing solution is re-used. Since the flow path is circular, only one bottle is used for the flushing solution.

Connecting the Degasser

The degasser outlet ② is readily connected to the valve block ① (see fig. 13).

Solvent flow path The four solvents are connected with the ③ degasser inlet. The solvent mixture is conveyed from the degasser via the valve block into the pump head. From the pump head it is taken to the mixer. The mixer is connected to the HPLC system.

Note: The described flow path is not suitable for Normal Phases.

Connecting the Pump Head to the Solvent

- Prerequisites*
- The device has been switched off.
 - The power plug has been pulled.
 - The front cover has been removed.

Material Flangeless fitting

NOTICE

Device defect

The pump head can get damaged when the inlet and outlet are blocked.

- Remove the cap fittings from the inlet and outlet of the pump head prior to use.

Procedure

Process

1. Slide the flangeless fitting over the tubing.
2. Insert the tubing into the free inlet ① on the bottom of the pump head.
3. Tighten the fitting by hand.

Figure

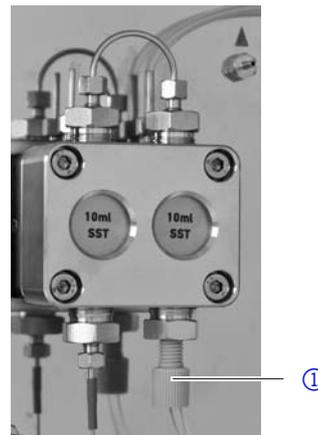


Fig. 14 Solvent line on pump head

Next Steps Integrate the pump into the HPLC flow system.

Connecting the 4-Channel Degasser to the Solvent

The 4-channel degasser contains four degassing chambers. Each degassing chamber has an inlet and an outlet on the front of the pump.

NOTICE

Device defect

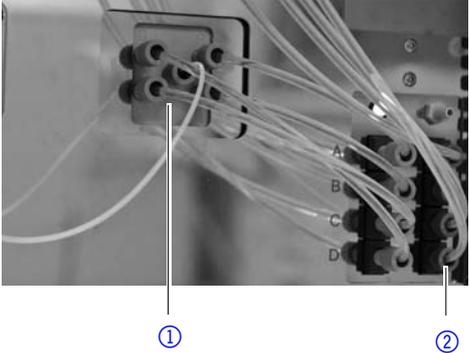
Very high pressures can damage the degasser membrane. The membrane can withstand a maximum pressure of 7 bar.

- Never connect the degasser to the pump outlet.

- Prerequisites*
- The device has been switched off.
 - The power plug has been pulled.
 - The front cover has been removed.

Material Flangeless fitting

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Connect the tubing from the four solvent bottles to the inlets A, B, C, and D of the degasser (see ②). 2. Seal inlets not in use with cap fittings. 	 <p>Fig. 15 4-channel degasser with valve block</p>

Next Steps Integrate the pump into the HPLC flow system.

Connecting the Valve Block

Note: Note the instructions on how to install the flangeless fitting (see “Capillaries and Fittings” on page 15).

The valve block inlets ① are pre-installed. If the central outlet connection has to be changed, e.g. you want to install different capillary, note that at least two of the outer flangeless fittings on the valve block are loosened in order to be able to install connection in the center by hand.

Connecting the Piston Backflushing

The piston backflushing removes salts and other substances from the area behind the pump head seals.

To do this, connect a bottle with flushing solution to the flush pump and the piston backflushing. The silicone tubing between the piston backflushing and the flush pump are pre-installed.

Designation Inlet and outlet of the flush pump are located on the front of the device. The flush pump is inside of the device and not visible from the outside.

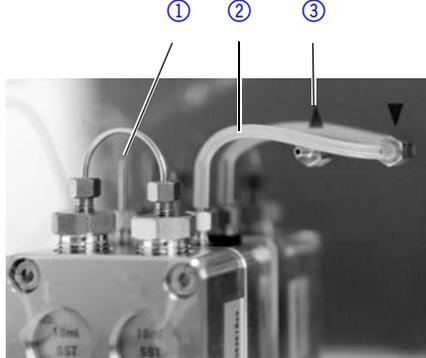
 <p>Fig. 16 Inlet symbol</p>	 <p>Fig. 17 Outlet symbol</p>
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Prerequisite

- The pump has been set-up at the site of operation.
- The pump has been switched off.

Material Silicone tube

Procedure

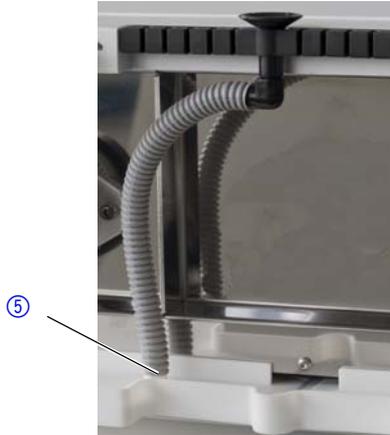
Process	Figure
<ol style="list-style-type: none"> 1. Plug one silicone tube ② onto the inlet ③ of the flush pump and connect to the flushing solution bottle. 2. Plug a second silicone tube onto a vacant capillary connector ① of the flush pump and connect to the flushing solution bottle. 	

Connecting the Leak Management

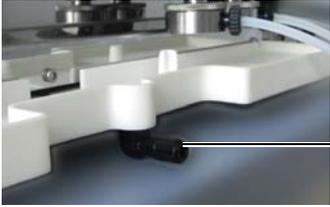
The leak management consists of the leak sensor and the drainage system (funnels, hoses, nozzles). The drainage system ensures that escaping liquids flow into a waste bottle. When leaks are registered by the leak sensor, the LED flashes red. Both the device and the data acquisition via chromatography software are stopped.

Prerequisite The front cover has been removed.

Process

Process	Figure
<ol style="list-style-type: none"> 1. Carefully push the funnel ① into the center opening of the capillary guide ② . 	 <p>Fig. 18 Funnel and capillary guide</p>
<ol style="list-style-type: none"> 2. Push the long ending of the first nozzle ④ into the hose ③ . 	 <p>Fig. 19 Hose and nozzle</p>
<ol style="list-style-type: none"> 3. Connect the nozzle and the funnel. 4. Push the other end of the hose onto the nozzle ⑤ of the leak tray. 	 <p>Fig. 20 Hose connected to device</p>

Process

Process	Figure
<ol style="list-style-type: none"> 5. For the bottom device, push the short end of the nozzle ⑥ into the opening in the collection point of the leak tray. 6. Connect the hose to the nozzle and lead the second ending to the waste bottle. 7. Place the waste bottle below the bottom device. 	 <p>Fig. 21 Leak tray with nozzle</p>

Next steps Attach the front cover.

Control

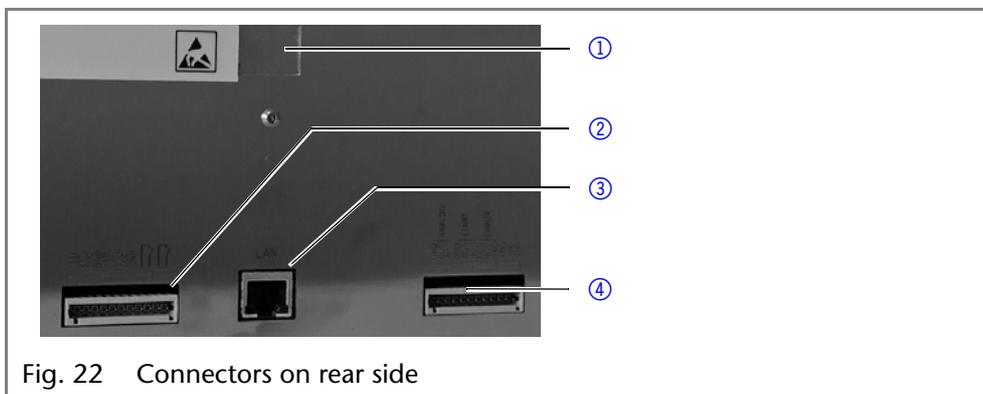
The pump can be operated in two ways:

- Via the pin head
- as part of a LAN, via the LAN connector of the router

All connectors for external control are located on the rear side of the pump.

Legend

- ① Service interface
- ② Events connector
- ③ LAN connector
- ④ Remote connector



Computer Control

This section describes how to set up an HPLC system in a local area network (LAN) and how a network administrator can integrate this LAN into your company network. The description applies to the operating system Windows and all conventional routers.

Note: To set up a LAN, we recommend to use a router. That means the following steps are required:

- Process*
1. On the computer, go to the control panel and check the LAN properties.
 2. Hook up the router to the devices and the computer.
 3. On the computer, configure the router to set up the network.
 4. Install the chromatography software from the data storage device.
 5. Switch on the device and run the chromatography software.

Configuring the LAN Settings

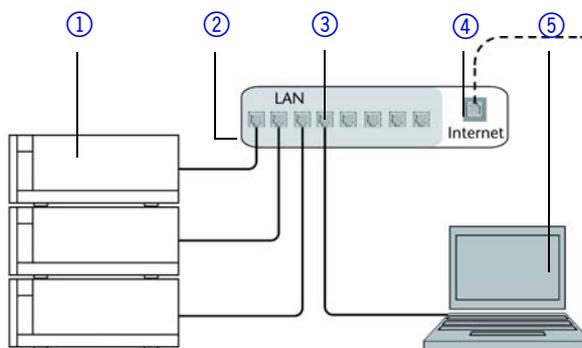
The LAN uses only one server (which is normally the router) from that the devices automatically receive their IP address.

- Prerequisite*
- In Windows, power saving, hibernation, standby, and screen saver must be deactivated.
 - In case you use an USB-to-COM box, the option "Allow the computer to turn off ths device to save power" in the devicemanager must be deactivated for all USB hosts.
 - Only for Windows 7: For the network adapter, the option "Allow the computer to turn off this device to save power" in the Device Manager must be deactivated.

- Process*
1. In Windows 7 choose *Start* ⇒ *Control Panel* ⇒ *Network and Sharing Center*.
 2. Double-click on *LAN Connection*.
 3. Click on the button *Properties*.
 4. Select *Internet Protocol version 4 (TCP/IPv4)*.
 5. Click on the button *Properties*.
 6. Check the settings in the tab *General*. The correct settings for the DHCP client are:
 - a) *Obtain IP address automatically*
 - b) *Obtain DNS server address automatically*
 7. Click on the button *OK*.

Connecting the Cables

A router ③ has several LAN ports ② and one WAN port ④ that can be used to integrate the LAN into a wide area network (WAN), e.g. a company network or the Internet. In contrast, the LAN ports serve to set up a network from devices ① and a computer ⑤. To avoid interference, we recommend operating the HPLC system separately from the company network.



You will find patch cables for each device and the router in the accessories kit. To connect the router to a WAN, an additional patch cable is required, which is not supplied within the scope of delivery.

- Prerequisite*
- The computer has been switched off.
 - There is a patch cable for each device and the computer.
- Process*
1. Use the patch cable to connect the router and the computer. Repeat this step to connect all devices.
 2. Use the power supply to connect the router to the mains power system.

Configuring the Router

The router is preset at the factory. You will find a label at the bottom side of the router, on which IP address, user name, and password are printed. These information help to open the router configuration.

- Process*
1. To open the router configuration, start your Internet browser and enter the IP address (not for all routers).
 2. Enter user name and password.
 3. Configure the router as DHCP server.

4. In the router configuration, check the IP address range and make changes if necessary.

Result Once the router has assigned IP addresses to all devices, the chromatography software can be used to remotely control the system.

Integrating the LAN into a Company Network

A network administrator can integrate the LAN into your company network. In this case you use the WAN port of the router.

Prerequisite There is a patch cable for the connection.

- Process*
1. Check that the IP address range of the router and of the company network do not overlap.
 2. In case of an overlap, change the IP address range of the router.
 3. Use the patch cable to connect the router WAN port to the company network.
 4. Restart all devices, including the computer.

Controlling Several Systems Separately in a LAN

Devices connected to a LAN communicate through ports, which are part of the IP address. If more than one HPLC system is connected to the same LAN and you plan on controlling them separately, you can use different ports to avoid interference. Therefore, the port number for each device must be changed and this same number must be entered into the device configuration of the chromatography software. We recommend to use the same port number for all devices in the same system.

Note: The port is set to 10001 at the factory. You must use the same numbers in the device configuration of the chromatography software as in the device, otherwise the connection fails.

- Process*
1. Find out port number and change it on the device.
 2. Enter the port number in the chromatography software.

Result The connection is established.

Setting a Static IP Address

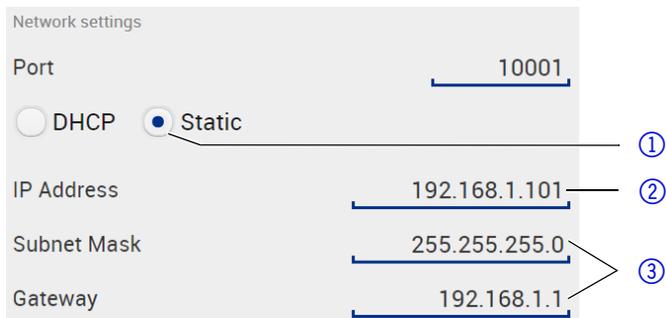
Note: Please inform yourself about the IT safety standards valid for your laboratory, before changing the LAN settings.

The device is factory set to a dynamic IP address (DHCP). To ensure a permanent LAN connection between the chromatography software and the device, we recommend to set a static IP address for certain applications.

- Prerequisites*
- The device has been switched on.
 - Mobile Control has been installed and started.
 - The connection between the Mobile Control and the device has been established.

Note: You find further information on LAN settings in the chapter Device Settings of the Mobile Control User Manual.

- Procedure*
1. In the Mobile Control, choose *Settings* .
 2. On the *General* tab, choose the device name.
 3. Under *Network Settings*, choose the setting *Static* .



4. Enter the IP address into the text box *IP Address* ② .
5. If necessary, change the subnet mask and the gateway ③ .
6. Click in the top right corner.
7. Restart the device.

Next steps In case necessary, go back to the original setting with the [Reset] button that can be found under *Settings > General > Network Settings > LAN Settings*.

Pin Header Connectors

Remote Terminal Strip

- For receiving start, control, and error signals from external devices
- For sending start, control and error signals to external devices

Legend

- ① display
- ② Remote terminal strip

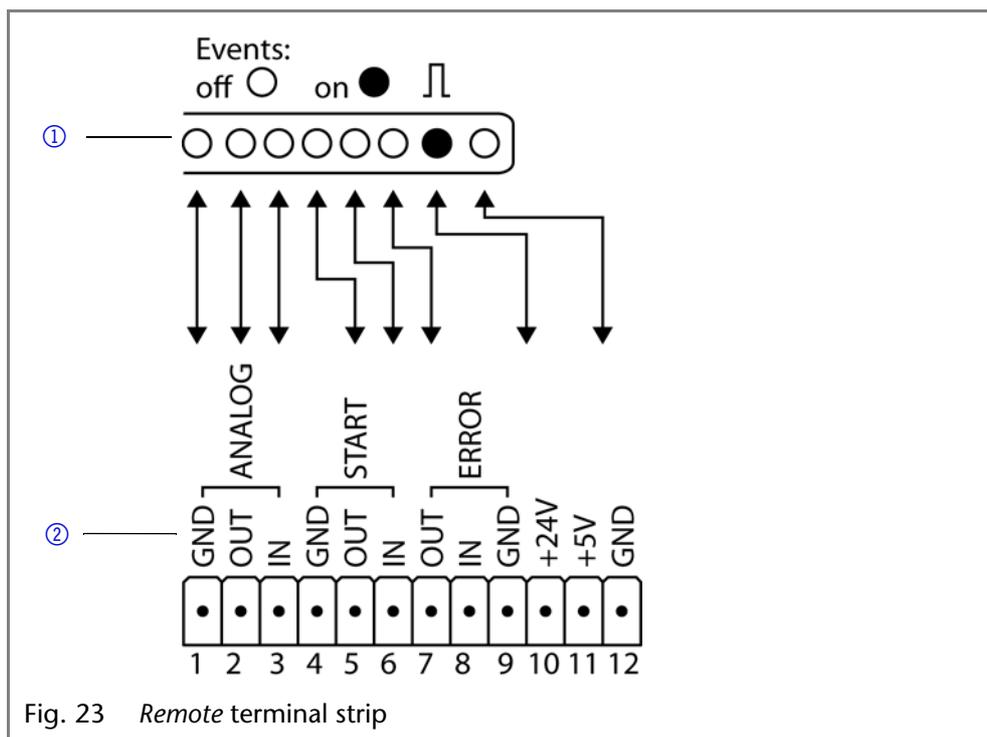


Fig. 23 Remote terminal strip

Signal	Explanation
Analog GND	Reference point of the voltage at the signal inputs.
Analog out	Voltage range 0 – 5 V, scalable
Analog in	Voltage range 0 – 10 V 10 V according to maximum flow rate
Start GND	Reference point of the voltage at the signal inputs.

Signal	Explanation
Start OUT	TTL Output Levels: <ul style="list-style-type: none"> ▪ passive 5 V ▪ active 0 V 
Start IN	TTL Input <ul style="list-style-type: none"> ▪ Low active Secure switching threshold at least 10 mA After receiving a signal (short-circuit to ground) from an external device, the device starts. If controlled with software, an electronic trigger is send through the LAN.
Error OUT	TTL Output Levels: <ul style="list-style-type: none"> ▪ passive 5 V ▪ active 0 V 
Error IN	TTL Input <ul style="list-style-type: none"> ▪ Low active Secure switching threshold at least 10 mA After receiving a signal (short-circuit to ground) from an external device, an error message appears and the device stops.
Error GND	Reference point of the voltage at the signal inputs.
+24V	Event-controlled switching of 24 V against GND Protection: 24 V-200 mA
+5V	Provides a voltage of 5 V with respect to GND. This makes it possible to supply a consumer that is switched by an EVENT. Protection: 5 V-50 mA
GND	Reference point of the voltage at the signal inputs.

Events Connector

For test purposes or in some other cases, it can make sense to manually enter these signals:

- sending control signals (*Events*) to external devices
- opening and closing contacts
- Activating 500 ms pulses

Legend

- ① Display
- ② Events terminal strip

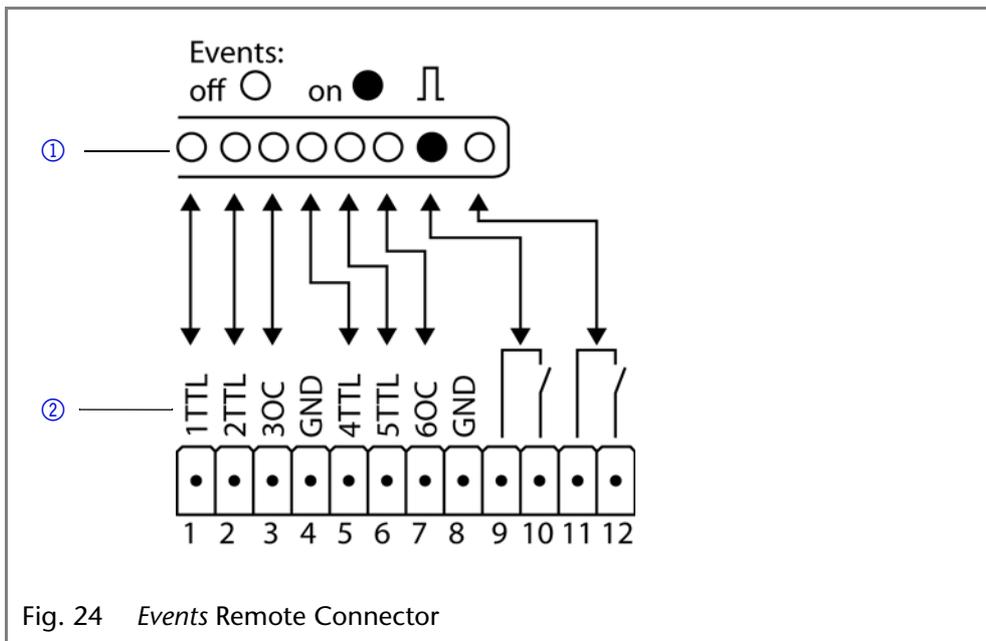


Fig. 24 Events Remote Connector

Assignment

connection	Function
1TTL	TTL Output Levels: <ul style="list-style-type: none"> ▪ passive 0 V ▪ active 5 V Pulse: <ul style="list-style-type: none"> ▪ 5 V for at least 1000 ms
2TTL	TTL Output Levels: <ul style="list-style-type: none"> ▪ passive 0 V ▪ active 5 V Pulse: <ul style="list-style-type: none"> ▪ 5 V for at least 1000 ms
3OC	TTL-compatible output Levels: <ul style="list-style-type: none"> ▪ passive 5 V ▪ active 0 V Pulse: <ul style="list-style-type: none"> ▪ 5 V for at least 1000 ms
GND	Reference point of the voltage at the signal inputs.
4TTL	TTL Output Levels: <ul style="list-style-type: none"> ▪ passive 0 V ▪ active 5 V Pulse: <ul style="list-style-type: none"> ▪ 5 V for at least 1000 ms

Assignment

connection	Function
5TTL	<p>TTL Output Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪ 5 V for at least 1000 ms</p>  
6OC	<p>TTL-compatible output Levels: ▪ passive 5 V ▪ active 0 V Pulse: ▪ 5 V for at least 1000 ms</p>  
GND	Reference point of the voltage at the signal inputs.
	<p>Relay Contact The contact is on a floating basis. Its setting depends on the settings in the software. Steady-rate signal: ▪ passive = open relay contact ▪ active = closed relay contact Pulse: ▪ Closed relay contact for at least 1000 ms Permissible load of the relay contact: 1 A/ 24 V DC</p>  
	<p>Relay Contact The contact is on a floating basis. Its setting depends on the settings in the software. Steady-rate signal: ▪ passive = open relay contact ▪ active = closed relay contact Pulse: ▪ Closed relay contact for at least 1000 ms Permissible load of the relay contact: 1 A/ 24 V DC</p>  

Connecting Cables to the Terminal Strip

To control one device through another, you use the multi-pin connector. To use remote control, you have to connect cables to the terminal strip (both included with delivery). The single ports are used to exchange control signals.

- Prerequisite*
- The device has been turned off.
 - The power plug has been pulled.

Tools Depressor tool

NOTICE

Electronic defect

Connecting cables to the multi-pin connector of a switched on device causes a short circuit.

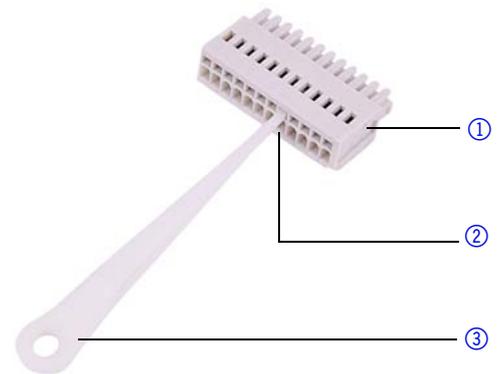
- Turn off the device before connecting cables.
- Pull the power plug.

NOTICE**Electronic defect**

Electrostatic discharge can destroy the electronics.

→ Wear a protective bracelet against electrostatic discharge and ground.

- Process*
1. Push the depressor tool ① into an upper small opening on the front of the terminal strip ③.
 2. Lead the cable into the opening ② below the inserted depressor tool.
 3. Remove the depressor tool.



- Next steps*
- Check if the cables are firmly attached. Push the terminal strip onto the multi-pin connector. Finish the installation. Then put the device into operation.

Analog Control

Analog ports serve for exchanging analog control signals. Reference point for the signals is the connector GND.

- OUT: Device sends signal.
- IN: Device receives signal.

Power Connection

Note: The nominal capacity of the connected devices must be maximum 50 % of the power supply to account for larger inrush currents when switching on the modules.

The maximum power input is 100 W.

- Prerequisites*
- The electrical power supply at the installation site must be connected directly to the nearest main power line.
 - The power must be free from ripple, residual current, voltage peaks and electromagnetic interference.
 - The connectors for the mains voltage are grounded accordingly.
 - The device receives sufficient power with reserve capacity

The device is intended for use with AC power networks of 100-240 V.

- Power Cable*
- Only the supplied power cable is to be used to connect the device to the power supply. Replace defective power cables only with accessories from KNAUER. Only use power cables with a permission for use in your country.

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

- Next Steps*
- Finish the installation and connect the device to the mains.

Initial Start-Up

Note: Prior to switching on the pump, you should bleed it to remove air from capillary and tubing.

Start-Up

Use this checklist to check if the detector is ready for initial start-up:

- Device is positioned in the correct location.
- The power plug has been connected.

If the device is part of an HPLC system, you should also note the following:

- The network connection to the router is established
- The chromatography software has been installed by KNAUER or a company authorized by KNAUER.
- The capillaries have been connected.

Pump Head

To bring a newly installed pump head into service securely, it should run in prior to its first operation. For this purpose, set the following parameters:

Note: If pump heads are used for normal phase applications, only use isopropanol as solvent.

	Pump head 5 ml, 10 ml	Pump head 50 ml
<i>Eluent</i>	H ₂ O (degassed) or ethanol	H ₂ O (degassed) or ethanol
<i>Back pressure</i>	30 MPa (min > 15 MPa)	12 MPa (min > 8 MPa)
<i>Flow rate</i>	2-5 ml/min	5-20 ml/min
<i>Run time</i>	30 min	90 min
<i>Drag</i>	Capillary with inner diameter of 0.1 mm length 2 m	Capillary with inner diameter of 0.1 mm length 1 m

Back pressures higher than 8 MPa are generated by back pressure regulators.

Bleeding the Pump

Before the pump can be used, it must be bled.

Mode "Flow on" The pump can only be bled when switched on because the syringe can only take in liquid in "Flow on" mode. Only then are the valves of a binary pump opened.

Quick suction process For the binary pump, the bleeding process may take a while during initial start-up because the solvent tubes are filled with liquid for the first time.

Prerequisites

- The installation has been completed.
- The capillaries and tubings have been connected.
- The pump has been switched on.

Tools Syringe with Luer lock

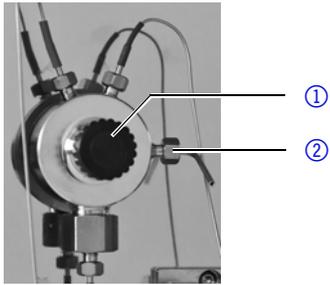
NOTICE

Column defect

Damage to the column due to bleeding.

- Open the venting screw.
- Remove the column.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Open the venting screw ① of the pressure sensor. 2. With the syringe, extract fluid through the bleed port ②. 	 <p>Fig. 25 Venting screw of the pressure sensor</p>

Next Steps Start the pump using the software (option: Purge) with a medium flow rate (50 % of the maximum flow). If the extracted fluid flows continuously, stop suction and close the venting screw.

Result After bleeding, excess air is removed from the pump head and the capillary.

Switch-On

Note: Prior to switching on the pump, you should bleed it to remove air from capillary and tubing.

After switching on the pump, the piston backflushing automatically flushes for 15 seconds.

Prerequisites The installation has been completed.

NOTICE

Device defect

Changes of the environmental temperature cause condensation inside the device.

→ Allow device to acclimate for 3 h, before connecting to power supply and taking into operation.

NOTICE

Component defect

Damage to the pump head in case it runs dry.

→ Ensure that liquid runs through pump head and piston backflushing.

Procedure

1. Connect the power cable of the device to the power supply.
2. Switch the power supply on.
3. Wait until the pump has completed the self-test.
4. Start the pump at a medium flow rate.

Next Steps Operate the pump.

Operation

There are several options for controlling the device:

- with chromatography software
- with Mobile Control

Note: It is not possible to use 2 control methods simultaneously. If the device is connected to the software, it cannot be controlled via Mobile Control.

Operating with Chromatography Software

To operate the device with software, you have to establish a connection between the LAN port and a computer.

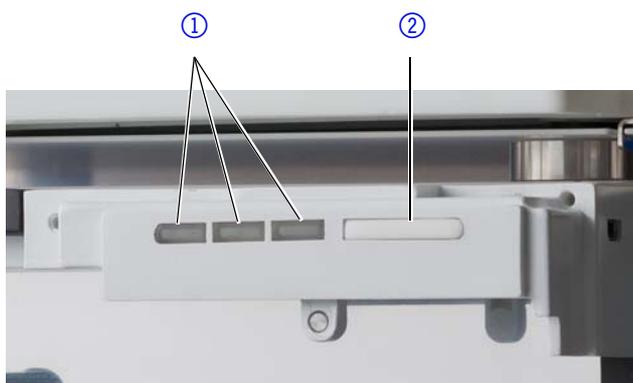
Devices can be controlled with e. g. OpenLAB EZChrom edition version A.04.05 or higher or ClarityChrom version 5.0.2 or higher. You find a detailed description on chromatography software in a corresponding user manual.

Operating with Mobile Control

The Mobile Control is an app which can be installed on your computer or tablet. To control the device using the Mobile Control, connect the computer or tablet with operating system Windows 8 to a wireless LAN router. The firmware version of your P 6.1L must be V01.02 or higher. You find a detailed description on the Mobile Control in its accompanying user manual.

Meaning of the LEDs

On the LED panel there are three LEDs ① and a standby button ②. The figure shows the LED panel when the device is switched off.



The LEDs can have different colors depending on the operating conditions.

	Color	Operating condition	Operation
<i>Left LED</i>	red flashing	Error status	Check the system. Shortly press the switch to deactivate the error message.
	red	Fatal error	Restart the device. If the fatal error status remains, contact Service.
<i>Center LED</i>	green	Program or sequence is running/was loaded.	
	does not light	Not ready	
	green flashing	Equilibration	Wait until the device is ready.
<i>Right LED, Power Status</i>	green	Ready	
	green	Power on	
	blue	Standby	Press the switch to end the standby.

Standby To activate the standby, keep the switch pressed for 5 seconds.

Note: Malfunctioning system after repeated standby possible. After repeatedly using the standby, switch off the power switch and back on again, to reset the data storage.

Functional Tests IQ and OQ

- Installation Qualification (IQ)* The customer may request the Installation Qualification, which is free of charge. In case of a request, the Technical Support of KNAUER or from a provider authorized by KNAUER performs this functionality test during the installation.
- The Installation Qualification is a standardized document that comes as part of the delivery and includes the following:
- confirmation of flawless condition at delivery
 - check if the delivery is complete
 - certification on the functionality of the device
- Operation Qualification (OQ)* The Operation Qualification includes an extensive functionality test according to KNAUER standard OQ documents. The Operation Qualification is a standardized document and free of charge. It is not part of the delivery, please contact the Technical Support in case of request.
- The Operation Qualification includes the following:
- definition of customer requirements and acceptance terms
 - documentation on device specifications
 - device functionality check at installation site
- Test Intervals* To make sure that the device operates within the specified range, you should test the device regularly. The test intervals are dependent on the usage of the device.
- Execution* The test can be carried out either by the Technical Support of KNAUER or from a provider authorized by KNAUER (for a fee).

Troubleshooting

- 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. Pay attention to system messages.

LAN

Go through the following steps, in case no connection between the computer and the devices can be established. Check after each step if the problem is solved. If the problem cannot be located, call the Technical Support.

1. Check the status of the LAN connection in the Windows task bar:

-  Connected
-  Connection not established

If no connection was established, test the following:

- Is the router switched on?
 - Is the patch cable connected correctly to the router and the computer?
2. Check the router settings:
 - Is the router set to DHCP server?
 - Is the IP address range sufficient for all the connected devices?
 3. Check all connections:
 - Are the patch cable connected to the LAN ports and not the WAN port?
 - Are all cable connections between devices and router correct?
 - Are the cables plugged in tightly?
 4. If the router is integrated into a company network, pull out the patch cable from the WAN port.
 - Can the devices communicate with the computer, even though the router is disconnected from the company network?
 5. Turn off all devices, router, and computer. Firstly, turn on the router and secondly turn on the devices and the computer.
 - Has this been successful?
 6. Replace the patch cable to the device with that no connection could be established.
 - Has this been successful?
 7. Make sure that the IP port of the device matches the port in the chromatography software.

Possible Problems and Solutions

Error	Solution
Device cannot be switched on	Inspect the power cable to ensure that it is plugged into the power supply.
When purging, the pump switches off.	Check if the venting screw on the pressure sensor is turned up.

Pump does not transport solvent	<ul style="list-style-type: none"> ▪ Purge the pump head to remove the air bubbles. ▪ Clean the check valves. ▪ Exchange the check valves. ▪ If the pump head seals are defective, solvent enters the piston backflushing; inform the technical support. ▪ Exchange the pump head
Pressure and flow rate variations	<ul style="list-style-type: none"> ▪ Purge the pump head to remove the air bubbles. ▪ Always tighten the inlet screw fittings and outlet screw fittings on the pump head with a torque wrench (see 'Checking the Fittings' auf Seite 41.). ▪ Clean the check valves. ▪ Exchange the check valves. ▪ Exchange the pump head ▪ Inform technical support.
Pump head leaks	<ul style="list-style-type: none"> ▪ Inspect the inlet and outlet screw fittings of the pump head. ▪ If the seals are defective, eluent enters the piston backflushing; inform the technical support. ▪ Exchange the pump head
Flow rate is not correct	<p>Check the following options:</p> <ul style="list-style-type: none"> ▪ Check the data for the solvent compressibility ▪ Clean the check valves. ▪ Exchange the check valves.
System error	<p>Switch off the device to reset the device's data storage and restart it afterwards.</p>

System Messages

If other system messages are displayed besides those listed below, please turn the device off and then on. Inform the technical support in case the system message repeats.

The system messages are in alphabetical order:

	System message	
A	"A line with this time already exists: edit the time please"	Correct the time entry.
C	"Cannot delete active program/link"	Pause the program/link. Only then can the link and, subsequently, the program used in the link be deleted.
	"Cannot edit program from the running link"	Pause the link. Afterwards, the program can be changed.
	"Cannot initialize LAN"	Check cables and connections in local area network.

	System message	
	"Cannot operate with an empty link"	Create a link.
	"Cannot purge during the run"	End method and start purging.
	"Cannot read data from FRAM"	Switch the device off and on. Inform the technical support in case the system message repeats.
	"Cannot start time table"	Check the data on the device's display or in the opened program.
	"Cannot use non-existing component"	Check if the channels to be mixed are set correctly in the <i>Setup</i> section of the device or in the <i>Instrument Setup</i> of the chromatography software.
	"Cannot write data on FRAM"	Switch the device off and on. Inform the Technical Support in case the system message repeats itself.
	"Component settings not compatible with gradient setup"	Change the <i>setup</i> settings or change the gradient in the program or in <i>setup</i> .
E	"Error input activated"	Eliminate the short circuit connected to 'Error In'.
F	"Flow max in the program is not compatible with the current pump head"	When entering the flow, note the maximum flow of the pump head and only enter values inside this range.
G	"GUI communication failed"	Switch the device off and on. Inform the technical support in case the system message repeats itself.
H	"HPG B component not present"	
	"HPG B: Command timeout"	
	"HPG B: incompatible pump head type"	
	"HPG B: Service active"	
I	"Instrument remote controlled"	This entry is not executable. Quit software.
	"Invalid index in time table"	Change the entry in the program line.
	"Invalid line number"	
	"Invalid link"	Create a link or use an existing link.
L	"Leak sensor not present"	Switch the device off and then on. If the leak sensor cannot be found, contact the Technical Support.

	System message	
	"Leak was detected"	Switch off the device. Remove the leak and start the device afterwards.
	"Line in time table is empty"	Edit the program line.
	"Link is running"	Wait until the link has been completed, then change the link or delete it.
M	"Maximum pressure: System stopped"	<ul style="list-style-type: none"> ▪ Check whether the connected capillary and connectors are clogged. ▪ Adjust the maximum pressure limit. ▪ Restart the system.
	"Minimum pressure: System stopped"	<ul style="list-style-type: none"> ▪ Increase the pressure or adjust the lower pressure limit. ▪ Restart the system.
	"Motor failure: max current"	Switch the device off and on. Inform the technical support in case the system message repeats itself.
"Motor failure: position error"		
"Motor failure:"		
N	"No link available. Pls edit link first"	Create a link and edit it.
	"No link available"	
	"No valid pump head type detected; 50 ml pump head is set."	<ul style="list-style-type: none"> ▪ 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.
	"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"	<ul style="list-style-type: none"> ▪ Check the pump ▪ Check the number of program lines - a maximum of 100 program lines are possible.
	"Not enough space to store program"	<ul style="list-style-type: none"> ▪ Check the pump ▪ Check the number of program lines - a maximum of 100 program lines are possible.
	"Not in HPG mode"	Select HPG mode.
P	"Pressure max in the program is not compatible with the current pump head"	Note the maximum pressure of the pump head.

	System message	
	"Program does not exist, please edit the program number"	Create and edit a program.
	"Program is running"	Quit program or wait until program has been completed.
	"Pump head type: head data uninitialized"	<ul style="list-style-type: none"> ▪ 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
	"Pump head type: read failed"	<ul style="list-style-type: none"> ▪ Switch the device off and on ▪ Repeat the automatic configuration step in the chromatography software ▪ Remove pump head, clean it and install it again ▪ Inform the Technical Support in case the system message repeats
	"Pump head type: RFID hardware not present or failed"	Pump head without RFID detection: If necessary, replace pump head.
	"Pump head type: write failed"	<ul style="list-style-type: none"> ▪ Switch the device off and on ▪ Repeat the automatic configuration step in the chromatography software ▪ Remove pump head, clean it and install it again ▪ Inform the Technical Support in case the system message repeats
S	"SetPoint in the program is not compatible with the current PH PMax"	Note the maximum pressure of the pump head.
T	"This link is used in WAKEUP"	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 WAKEUP"	First quit or delete wakeup program (wu = Wake Up), then edit or delete data by means of the chromatography software.
	"Too many lines in program"	Check the number of program lines. A maximum of 100 program lines are possible.
U	"Unable to attain min. flow setpoint"	Confirm, pump continues running
	"Unable to attain pressure setpoint"	<p>The entered pressure cannot be achieved with the maximum flow set in the <i>Constant Pressure</i> mode.</p> <ul style="list-style-type: none"> ▪ Check for leaks. ▪ Increase the upper flow level. ▪ Reduce the working pressure.

System message	
"Unknown pump head type"	<ul style="list-style-type: none"> ▪ Check the pump head. ▪ Check whether a pump head with RFID recognition has been installed ▪ Inform the Technical Support in case the system message repeats
W "Wake up time already passed"	Correct the entry for date or otherwise time.

Maintenance and Care

Organic eluents are toxic above a certain concentration. Ensure that work areas are always well-ventilated! When performing maintenance tasks on the device, always wear safety glasses with side protection, protective gloves, and an overall.

All wetter components of a device, e. g. flow cells of detectors or pump heads and pressure sensors for pumps, have to be flushed with a suitable flushing solution before being maintained, disassembled or disposed.

Opening the Module

The device may only be opened by the KNAUER Technical Support or any company authorized by KNAUER.

NOTICE

Electronic defect

Performing maintenance tasks on a switched on device can cause damage to the device.

- Switch off the device
- Pull the power plug.

NOTICE

Device defect

Leaks can damage the device.

- If leaks occur after maintenance or assembly, replace the capillary connections with new ones.

Users may perform the following maintenance tasks themselves:

- Replacing the pump head
- Replacing the check valves of the pumps
- Replacing the inline filter of the pressure sensor
- Replacing the mixer

Proper maintenance of your HPLC device will ensure successful analyses and reproducible results.

Maintenance Contract

The following maintenance work on the device may only be performed by KNAUER or a company authorized by KNAUER and is covered by a separate maintenance contract:

- Opening the device or removing housing parts

Maintenance Intervals

Operating Hours

The Control Unit, the Mobile Control and the different software products (e.g. ClarityChrom® or OpenLAB®) enable you to display or read out the operating time of the pump. You find a detailed description on how to display or read out GLP data in the respective user manuals.

Operating Hours	Measures
1000	<ul style="list-style-type: none"> ▪ Check the torque of the screw fittings ▪ Clean the pistons of the pump ▪ Check the check valves of the pump head
5000	<ul style="list-style-type: none"> ▪ Replace all seals ▪ Clean the check valves of the pump head
10000	<ul style="list-style-type: none"> ▪ Replace the spare parts in the pump head ▪ Replace the check valves of the pump head

Cleaning and Caring for the Device

NOTICE

Device defect

Intruding liquids can cause damage to the device.

- Place solvent bottles next to the device or in 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.

Checking the Fittings

Check if all fittings are tight. In case you find fittings that are not tight, tighten them up. Note the torque applicable for each fitting in order to not damage any components.

Material & Size	Pump head inlet	Pump head outlet
Stainless steel 5 ml	7.5 Nm	10 Nm
Stainless steel 10 ml, 50 ml	7.5 Nm	7.5 Nm

Inline Filter Fittings	Torque
Stainless steel fittings	7.5 Nm
PEEK fittings	3.5 Nm

Capillary Screw Fittings	Torque
Stainless-steel fittings	5 Nm
PEEK fittings	1 Nm

Flushing the Pump

Generally, the pump and all its components (valves, degasser) should be flushed after each operation. Also, flush the pump to clean the tubing before changing the solvent and to remove air bubbles in the capillary and tubing. If buffer solution has been employed, note that the buffer solution and the flushing solution are compatible.

- When buffers have been used, flush with water.
- When aggressive solvents have been used, flush with isopropanol.

Note: For applications with Normal Phase, only use Isopropanol as flushing solution.

NOTICE**Device defect**

Residuals chemicals can damage the pump head if they are not being removed before storage.

- For reuse, flush the pump head and fill it with isopropanol.
- Before storage, seal the inlets and outlets with cap fittings.

Auxiliary Material flushing solution, silicone tubing

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Immerse the solvent tubing into the flushing solution. 2. Plug a silicone tube onto the venting nozzle ② of the pressure sensor. 3. Open the venting screw ①. 4. Start the pump at a medium flow rate. 	<p>Fig. 26 Pressure sensor</p>

Next Steps Bring the pump into operation again.

Putting the Pump Out of Operation

The pump is designed for the use of different solvents. In case the pump has not been used for several weeks, solvent residues may cause damage. It is therefore recommended that all components of the pump be flushed, the solvent used be removed completely and that all components and tubes of the pump be filled with isopropanol. All open connectors should be sealed. Capillary and tubing which connects single components of the pump should not be removed.

- Prerequisites*
- The pump has been rinsed.
 - The pump has been switched off and disconnected from the power supply.

Tools Open-end wrench, size 10

Procedure

Process
<ol style="list-style-type: none"> 1. Remove the solvent tubing and seal all open connectors with cap fittings. 2. Remove the pump from the HPLC flow system and seal the open connector of the pressure sensor (isocratic version) or the mixer (binary or quaternary version) with cap fittings.

Next Steps Select a storage location according to the requirements, which are listed in the according chapter of this manual.

Storage

Pay attention that all hoses and capillaries have been emptied or filled with flushing solution (e. g. isopropanol) before storage. To prevent algae formation, do not use pure water. Close all inputs and outputs with cap fittings.

The device can be stored under the following ambient conditions:

- temperature range 4-40 °C (39.2-104 °F)
- air humidity below 90 %, non-condensing

Disconnecting the Power Supply

Prerequisites The device has been switched off.

Procedure

Process

1. Pull the power plug out of the socket and afterwards out of the device.
2. Pack the power cable together with the device.

Next Steps

Disconnect all remaining electrical connections, remove the pump head and pack the device for transport or storage.

Preparing the Pump Head for Storage

Prerequisites The power plug has been pulled.

Auxiliary Material

- Syringe
- Flushing solution

NOTICE

Device defect

Residuals chemicals can damage the pump head if they are not being removed before storage.

- For reuse, flush the pump head and fill it with isopropanol.
- Before storage, seal the inlets and outlets with cap fittings.

Procedure

Process

1. Fill the flushing solution into a syringe and inject into the capillary at the pump head inlet. Leave it for 5 minutes.
2. Flush with suitable flushing solution.
3. Flush the pump head with isopropanol.
4. Seal the inlets and outlets with cap fittings.

Next Steps

Dismount the pump head.

Dismounting the Pump Head

Prerequisites

- The pump head has been purged.
- The tubes at the inlet and outlet have been removed.
- The pump head's inlet and outlet have been sealed with cap fittings.

Tools

- Allen wrench 3 mm
- Open-end wrench, size 1/4"
- Open-end wrench, size 13

WARNING

Chemical burns

Aggressive or toxic solvent residue can irritate the skin.

- Wear protective gloves.
- Flush the pump head before exchanging it.

NOTICE**Device defect**

Residuals chemicals can damage the pump head if they are not being removed before storage.

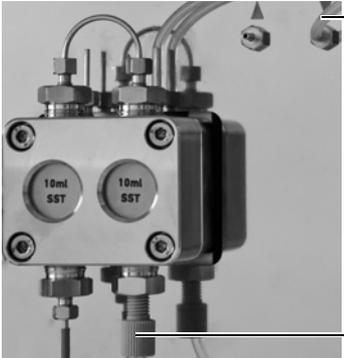
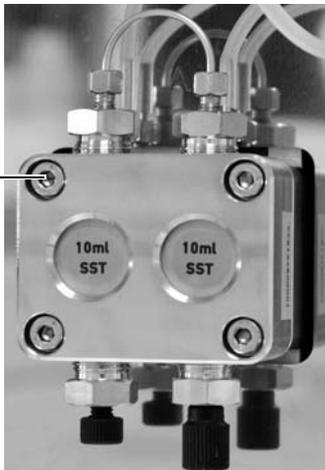
- For reuse, flush the pump head and fill it with isopropanol.
- Before storage, seal the inlets and outlets with cap fittings.

NOTICE**Component defect**

Damage to the pistons if they tilt.

- Undo or tighten diagonally opposite screws evenly by one turn each at a time.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Loosen the capillary connectors ① at the outlet. Remove the capillary. 1. Fixate the outlet fitting ① with an open-end wrench (size 13). 2. Loosen the fitting ② with an open-end wrench (size 1/4"). 	 <p>Fig. 27 Outlet screw fitting</p>
<ol style="list-style-type: none"> 3. Remove the solvent lines ② from the solvent inlets. 4. Disconnect the hoses of the piston backflushing ① from the flush pump and the pump head. 	 <p>Fig. 28 Tubings piston backflushing</p>
<ol style="list-style-type: none"> 5. Using the Allen wrench, unscrew the 4 screws ① subsequently by one turn. 6. Fixate the pump head with your hand and remove the screws. 7. Lift off the pump head. 	 <p>Fig. 29 Screws</p>

Next Steps Maintain the check valves or install a new pump head.

Check Valves

Clogged check valves do not open and close properly. They cause pressure fluctuations and irregular flow. If it is impossible to clean the check valves, replace the whole unit.

- Procedure*
- Removing the Check Valves
 - Cleaning the Check valve
 - Installing the Check Valve

Removing the Check Valves

The pump head is equipped with two check valves.

- Prerequisites*
- The pump head has been purged.
 - The capillaries and tubings have been removed.
 - The pump head has been removed.

- Tools*
- Open-end wrench, size 13

Procedure

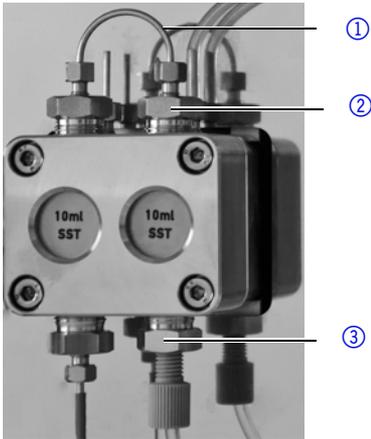
Process	Figure
<ol style="list-style-type: none"> 1. Unscrew and remove the capillary connector ①. 2. Loosen the outlet fitting ② with the open-end wrench.. 3. Remove the first check valve. 4. Loosen the inlet fitting ③ with the open-end wrench.. 5. Remove the second check valve. 	

Fig. 30 Check valve in pump head

Next Steps Clean the check valves.

Cleaning the Check Valve

The check valves are not disassembled for cleaning but they are cleaned as a unit.

Prerequisites Both check valves have been removed.

Procedure

Process
<ol style="list-style-type: none"> 1. Place each check valve into a beaker with solvent, e.g. isopropanol. 2. Put the beaker with the check valve in an ultrasonic bath for at least 10 minutes. 3. Let the check valves dry afterwards.

Next Steps Insert both cleaned check valves.

Installing the Check Valve

Insert the check valves in the direction of the flow. The notch of the check valve points downward.

Normal phase Insert the check valves in the direction of the flow. The arrow on the check valve points upward.

Prerequisites The check valves have dried.

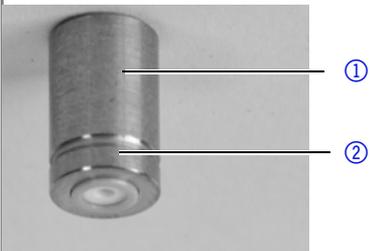
NOTICE

Component defect

Damaging the threads of components caused by overtightened fittings. Pay attention to the torque values.

- Use 5 Nm for stainless steel fittings.
- Use 1 Nm for PEEK fittings.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Insert the check valves ① in such a way that the notch of the check valve ② points downward. 2. Manually screw in inlet and outlet fittings and tighten them with a torque wrench and the respective torque. 	 <p>Fig. 31 Check valve</p>

Next Steps Re-install the pump head.

Inline Filter on the Pressure Sensor

Clogged inline filters inside of the pressure sensor can cause pressure fluctuations and irregular flow. Inline filters are not cleaned but exchanged as an assembly.

- Procedure*
1. Remove the capillary below the inline filter of the pressure sensor.
 2. Loosen the fitting of the inline filter and remove manually.
 3. Insert a new inline filter cartridge.

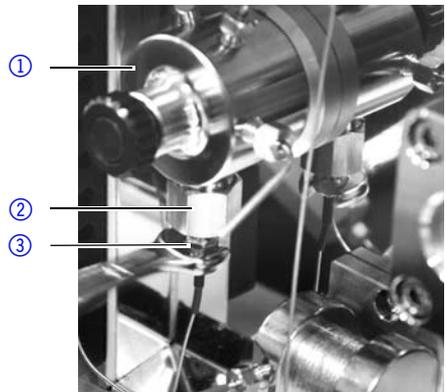
Removing the Inline Filter

Below the pressure sensor, you find the fitting of the inline filter.

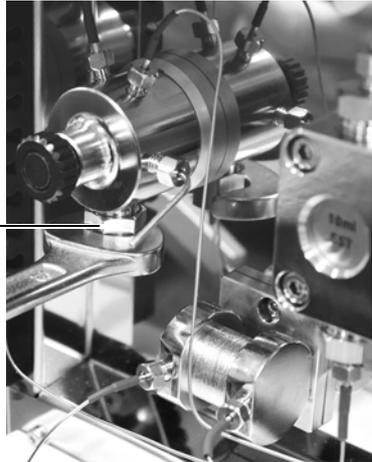
Prerequisites The pump has been rinsed.

- Tools*
- Open-end wrench, size 1/4"
 - Open-end wrench, size 13

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Fixate the outlet fitting ② with an open-end wrench (size 13). 2. Loosen the fitting ③ below the inline filter ② of the pressure sensor ① with the open-end wrench. 	 <p>Fig. 32 Loosen the capillary.</p>

Procedure

Process	Figure
<p>3. Loosen the fitting of the inline filter ① with the open-end wrench (size 13) and remove manually.</p> <p>4. Remove clogged inline filter cartridge.</p>	 <p>Fig. 33 Loosen the screw fitting of the inline filter cartridge</p>

Next Steps Insert the new inline filter cartridge.

Inserting the New Inline Filter Cartridge.

The flow direction is designated on inline filter cartridges. The inline filter and fitting are inserted into the pressure sensor in such a way that the designating notch always points upwards.

Tools ▪ Torque wrench

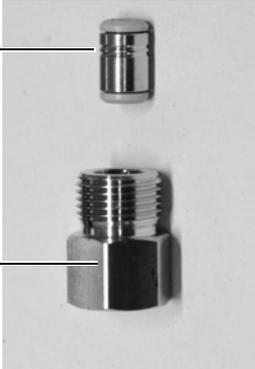
NOTICE

Component defect

Damaging the threads of components caused by overtightened fittings. Pay attention to the torque values.

- Use 5 Nm for stainless steel fittings.
- Use 1 Nm for PEEK fittings.

Procedure

Process	Figure
<p>1. Insert the inline filter cartridge with the designating notch pointing upwards ① into the fitting ② .</p> <p>2. Manually, screw the fitting with the inline filter cartridge in the pressure sensor.</p> <p>3. Using the torque wrench, tighten the fittings with the appropriate torque.</p>	 <p>Fig. 34 Inserting the inline filter cartridge into the fitting</p>

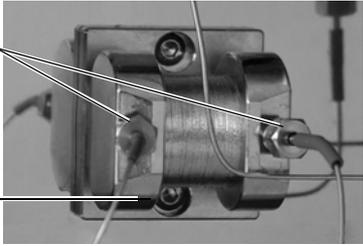
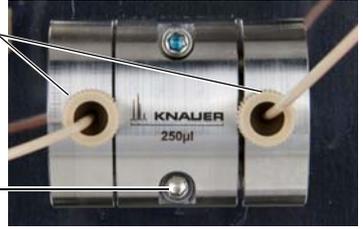
Next Steps Reinstall the capillary at the pressure sensor below the fitting of the inline filter.

Replacing the Mixer

A clogged mixer can cause pressure fluctuations and irregular flow. The mixer is replaced completely as an assembly.

- Voraussetzung*
- The mixer has been rinsed with isopropanol.
 - The sealing plugs are on site.

- Werkzeuge*
- Open-end wrench, size 1/4"
 - Allen wrench, size 2 mm

Ablauf	Abbildungung
<ol style="list-style-type: none"> 1. Remove capillary ① at the inlet and outlet of the mixer by hand or with the open-end wrench. 1. Seal the inlet and the outlet with the sealing plug. 2. Remove the screws ② with the Allen wrench. 3. Detach the mixer and set aside. 4. Install new mixer. 5. Manually, screw the fittings of the capillary in the mixer. 6. Tighten with a torque wrench using the appropriate torque. 	 <p>Fig. 35 HPLC Mixer</p>  <p>Fig. 36 Bio Mixer</p>

- Nächste Schritte*
- Bring the device into operation again.

Removing a Leak

- Prerequisites* If liquid enters the inside the device, switch off the device. If this is not the case, it is not necessary to switch off the device.

- Auxiliary Material* cloth for drying the leak sensor

Procedure

Process

1. Remove the leak.
2. Dry the leak tray.
3. Acknowledge the system error via Mobile Control, or the standby button (only in standalone mode).

- Next Steps* Afterwards take the device into operation.

Technical Data

P 6.1L General Data

Main Features

Solvent conveyance

Variants	Isocratic HPLC pump Quaternary low-pressure gradient pump Binary high-pressure gradient pump
Delivery system	Dual-piston pump
Pulsation compensation	Active pressure and pulsation compensation
Pulsation	< 2 % Amplitude (typically: < 1,3 %) or < 3 bar (0,3 MPa), whatever is greater, at 1 ml/min ethanol, at all pressures > 10 bar (1 MPa, 147 psi)
Flow rate range	0,001–10 ml/min 0,02–10 ml/min (recommended) 0,01–50 ml/min 0,1–40 ml/min (recommended)
Flow rate increment	0.001 ml/min
Flow rate accuracy	< 1 % (measured at 5-80 % of flow range, using ethanol)
Flow rate precision	0.1 % RSD (based on the retention time at constant room temperature)
Flushing piston seal	Standard
System protection	Soft start, P_{\min} und P_{\max} are programmable
Wetted materials	Stainless steel, carbon-fiber-reinforced PTFE, FKM, PEEK, saphire, aluminum oxide (Al_2O_3)

Degasser module

Degasser channels	2 channels, Teflon [®] AF
Degasser max. flow rate	10 ml/min
Degasser method	Gas permeation using Teflon [®] AF amorphous fluoropolymer membrane
Degasser efficiency	< 0.5 ppm dissolved O_2 at 1 ml/min
Degassing chamber volume	480 μ l volume per channel
eluent	Limitations: hydrochloric acid and halogenated hydrocarbons, in particular hexafluoroisopropanol (HFIP)
Wetted materials	PEEK, Tefzel [®] , Teflon [®] AF
Vacuum chamber	Polypropylene and stainless steel
Vacuum pump	Low hysteresis

Communication

Interfaces	<ul style="list-style-type: none"> ▪ LAN ▪ Pin header connectors (Analog IN, Start IN, Error IN)
Control	<ul style="list-style-type: none"> ▪ LAN ▪ Analog and event control ▪ Mobile Control
Analog input	0-10 V
Analog control input	Flow rate
Level / event outputs	8 event outputs (TTL, OC, Relais) and 24 V
programming	19 programs, 9 program links, 1 <i>WAKE UP</i> program
GLP	RFID pump head detection, detailed report
display	3 LEDs
leak sensor	Yes
protection type	IP-20

General

Power supply	Power input: 100-240 V Output: 50-60 Hz Maximum power consumption: 100 Watt
dimensions (W × H × D)	361 mm x 208.2 mm x 523 mm
weight	(see 'Device Variants' auf Seite 50.)
Leak sensor	yes
temperature range	4-40 °C (39.2-104 °F)
air humidity	below 90 %, non-condensing

Device Variants

P 6.1L isocratic

Setup

Pump type	Isocratic analytical HPLC pump
Pump Head Versions	5 ml/min stainless steel 10 ml/min stainless steel 50 ml/min stainless steel 10 ml/min ceramic 50 ml/min ceramic
Delay volume	60 µl (at 10 ml/min)
<i>Weight</i>	weight
	11.5 kg

P 6.1L binary

<i>Setup</i>	Pump type	Binary analytical HPLC pump with degasser
	Pump Head Versions	5 ml/min stainless steel 10 ml/min stainless steel 10 ml/min ceramic 10 ml/min for stainless steel for Normal Phase applications
<i>Weight</i>	degasser	2 channels
	Solvent selection valve	2 x 2 channels
<i>Gradient formation</i>	weight	14.1 kg
	Gradient type	High-pressure gradient
	Gradient range	0–100 % 5–95 % (recommended)
	Minimum increment	0.1 %.
	Gradient precision	± 0,3 % (measured at 1 ml/min, 150 bar, tracer: ethanol/caffeine) ± 1 % (5–95 %, measured at 0.1-10 ml/ min, tracer: water/caffeine)
	Gradient repeat accuracy	< 0.1 % RSD (measured at 1 ml/min, 0.3 % RSD overall, based on retention time at con- stantroom temperature)
	<i>Mixer</i>	Mixing volume
Delay volume		110 µl (dependent of mixer), 410 µl (metal-free)

P 6.1L quaternary

<i>Setup</i>	Pump type	Quaternary analytical HPLC pump with degasser	
	Pump Head Versions	5 ml/min stainless steel 10 ml/min stainless steel 10 ml/min ceramic	
	degasser	4 channels, Teflon [®] AF	
<i>Weight</i>	Special feature	Automatic adaption of LPG cycle time	
	weight	12.7 kg	
	<i>Gradient formation</i>	Gradient type	Low-pressure gradient
		Gradient range	0–100 % 1-99 % (recommended)
		Minimum increment	0.1 %.

<i>Mixer</i>	Gradient precision	± 0,3 % (measured at 1 ml/min, 150 bar, tracer: ethanol/caffeine) ± 2 % (1-99 %, measured at 5-50% of the flow range, tracer: water/caffeine)
	Gradient repeat accuracy	< 0.1 % RSD (measured at 1 ml/min, 0.5 % RSD overall, based on retention time at constant room temperature)
	Mixing volume	50, 100, 200 µl; 250 µl (metal-free)
	Delay volume	210 µl (dependent of mixer), 410 µl (metal-free)

Pump Heads

<i>Flow rate range</i>	5 ml pump head	0.001 ml/min-2 ml/min
	10 ml pump head	0.001 ml/min-10 ml/min 0.02-10 ml/min (recommended).
	50 ml pump head	0.001 ml/min-50 ml/min 0.01-40 ml/min (recommended).
<i>Maximum pressure</i>	5 ml pump head	<ul style="list-style-type: none"> ▪ 1000 bar (100 MPa, 14504 psi) up to 2 ml/min ▪ 700 bar (70 MPa, 10150 psi)
	10 ml pump head	stainless steel <ul style="list-style-type: none"> ▪ 700 bar (70 MPa, 10150 psi) up to 5 ml/min ▪ 400 bar (40 MPa, 5800 psi) Ceramic <ul style="list-style-type: none"> ▪ 400 bar (40 MPa, 5800 psi)
	50 ml pump head	200 bar (20 MPa, 2900 psi)

Repeat Orders

This list for repeat orders is valid for the time the document has been published. Deviations afterwards are possible.

Note: For repeat orders of spare parts use the enclosed packing list. Contact the Technical Support in case there are any questions on spare parts or accessories.

Further Information Further information on spare parts and accessories can be found online: www.knauer.net

Devices

Name	Order number
P 6.1L isocratic with 10 ml stainless steel pump head	APH30EA
P 6.1L isocratic with 10 ml stainless steel pump head for Normal Phase	APH30ED
P 6.1L isocratic with 50 ml stainless steel pump head	APH30FA

Name	Order number
P 6.1L isocratic with 50 ml stainless steel pump head for Normal Phase	APH30FD
P 6.1L isocratic with 10 ml ceramic pump head	APH60EB
P 6.1L isocratic with 50 ml ceramic pump head	APH60FB
P 6.1L binary with 10 ml stainless steel pump head, degasser and mixer (100 µl)	APH35EA
P 6.1L binary with 10 ml stainless steel pump head for Normal Phase, degasser and mixer (100 µl)	APH35ED
P 6.1L binary with 5 ml stainless steel pump head and mixer (100 µl)	APH35GA
P 6.1L binary with 10 ml stainless steel pump head and mixer (100 µl)	APH38EA
P 6.1L binary with 10 ml stainless steel pump head for Normal Phase and mixer (100 µl)	APH38ED
P 6.1L binary with 50 ml stainless steel pump head and mixer (200 µl)	APH38FA
P 6.1L binary with 10 ml ceramic pump head, degasser and mixer (250 µl)	APH65EB
P 6.1L binary with 10 ml ceramic pump head, degasser and mixer (250 µl)	APH68EB
P 6.1L binary with 50 ml ceramic pump head, degasser and mixer (250 µl)	APH68FB
P 6.1L quaternary with 10 ml stainless steel pump head, degasser and mixer (100 µl)	APH34EA
P 6.1L quaternary with 5 ml stainless steel pump head, degasser and mixer (100 µl)	APH34GA
P 6.1L quaternary with 10 ml stainless steel pump head and mixer (100 µl)	APH39EA
P 6.1L quaternary with 10 ml ceramic pump head, degasser and mixer (250 µl)	APH64EB
P 6.1L quaternary with 50 ml ceramic pump head, degasser and mixer (250 µl)	APH69EB

Accessories and Spare Parts

Pump head

Name	Order number
Pump head, 5 ml, stainless steel	AHA60
Pump head, 10 ml, stainless steel	AHB40
Pump head, 10 ml, ceramic	AHB32
Pump head 10 ml, stainless steel for Normal Phase	AHB40BA

	Name	Order number
	Pump head, 50 ml, stainless steel	AHC20
	Pump head 50 ml, stainless steel for Normal Phase	AHC20BA
	Pump head, 50 ml, ceramic	AHC22
<i>Check valves</i>	Check valve unit for AZURA 5, 10 ml pump head, ruby sapphire	G0924B
	Check valve unit for AZURA 5, 10 ml pump head, normal phase, spring-supported, ruby sapphire	G0563-5
	Check valve unit for AZURA 50 ml pump head, ruby sapphire	G0924C
<i>Inline filter cartridge</i>	Filter cartridge, stainless steel, 2 µm (20 µl volume)	A96601
	Filter cartridge, titanium, 2 µm (60 µl volume)	A9661
<i>Mixer</i>	AZURA mixer 50 µl	AZZ00MB
	AZURA mixer 100 µl	AZZ00MC
	AZURA mixer 200 µl	AZZ00MD
	AZURA mixer 250 µl, bio	AZZ10ME
<i>Solvent tray</i>	AZURA solvent tray E 2.1L	AZC00
<i>Drainage System</i>	corrugated hose, 16 cm, PE grey	A9846-1
	corrugated hose, 150 cm, PE grey	A9846-3
	funnel	P6431
	exhaust	P6432
<i>Capillary guide</i>	capillary guide top	P6424
	Capillary guide side	P6425
<i>Mobile Control</i>	Mobile Control license with 10" touchscreen	A9607
	Mobile Control Chrom license with 10" touchscreen	A9608
	Mobile Control license	A9610
	Mobile Control Chrom license	A9612
<i>Accessories Kit</i>	AZURA accessories kit	FZA02
	Accessories kit P 6.1L isocratic	FPH30
	Accessories kit P 6.1L quaternary	FPH34
	Accessories kit P 6.1L binary	FPH35
<i>Tools</i>	AZURA tool kit	A1033
	Capillary cleaning kit	A0137
	Metal capillary cutter	A0681
<i>Product riser</i>	AZURA product riser (28 mm)	A9860

	Name	Order number
<i>Power cable</i>	USA	M1651
	UK	M1278
	Switzerland	M1597
	Europe	M1642
<i>Documents</i>	User Manual Pump P 6.1L	V6890
	Installation Qualification Document	VIQ_INST
	Operation Qualification Document	VOQ_PUMPS

Legal Information

Transport Damage

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

Warranty Conditions

The factory warranty for the device is stipulated by contract. During the warranty period, any components with material or design-related defects will be replaced or repaired by the manufacturer free of charge. Please connect to our website for further information on terms and conditions.

All warranty claims shall expire in the event that any unauthorized changes are made to the device. This warranty also excludes the following:

- accidental or willful damage
- damage or errors caused by third parties that are not contractually related to the manufacturer at the time the damage occurs
- wear parts, fuses, glass parts, columns, light sources, cuvettes and other optical components
- damage caused by negligence or improper operation of the device and damage caused by clogged capillary
- packaging and transport damage

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

KNAUER Wissenschaftliche Geräte GmbH

Hegauer Weg 38

14163 Berlin, Germany

Phone: +49 30 809727-111

Telefax: +49 30 8015010

e-mail: info@knauer.net

Internet: www.knauer.net

Declaration of Conformity

The Declaration of Conformity is part of the delivery and accompanies the product as a separate document.

Warranty Seal

The warranty seal is color-coded. A blue seal is used by the assembly or technical support of KNAUER for devices to be sold. After repair, service technicians affix an orange seal in identical position. If unauthorized persons interfere with the device or the seal is damaged, the warranty claim will forfeit.



Disposal

Hand in old devices or disassembled old components at a certified waste facility, where they will be disposed of properly.

AVV Marking in Germany

According to the German "Abfallverzeichnisverordnung" (AVV) (January, 2001), old devices manufactured 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). The number belongs to category 8 and 9, which, among others, comprise laboratory equipment.

All distributors and importers are responsible for the disposal of old devices, as defined by the WEEE directive. End-users can send their old devices manufactured by KNAUER back to the distributor, the importer, or the company free of charge, but would be charged for the disposal.

Solvents and Other Operating Materials

All solvents and other operating materials must be collected separately and disposed of properly.

All wetted components of a device, e. g. flow cells of detectors or pump heads and pressure sensors for pumps, have to be flushed first with isopropanol and then with water before being maintained, disassembled or disposed.

HPLC Glossary

Here you find definitions for abbreviations and technical terms, which are used in liquid chromatography.

Term	Definition
Binary pump	Pump configured to generate a gradient from two solvents.
Chromatogram	Record of a detector signal, depending on output volume of mobile phase and time
Degasser	Degasser module for fluids
Detector	device measuring the composition or the quantity of a substance.
Pressure sensor	Component for measuring the system pressure
Eluent	mobile phase transporting substances to be separated or isolated through the column
Flangeless fitting	Fitting without a protruding edge, which can be fastened manually.
GLP	Good Laboratory Practice, quality assurance system for laboratories

Term	Definition
Gradient	Time-dependent composition of solvent (mobile phase) on low-pressure or high-pressure side of system
LPG pump	Pump configured to generate a gradient on the high-pressure side. Usually a binary pump with two separate pump units which each convey one solvent. The gradient is generated behind the pump.
High-pressure side	Devices and capillary which are under high pressure in an HPLC system
HPLC	High-Pressure Liquid Chromatography (HPLC) High pressure liquid chromatography
Isocratic	Mode of sample separation where the composition of a solvent remains constant
Capillary	thin metal or PEEK pipe that connects components and devices within the chromatography system
Check valve	Valve unit built into the pump head which guides the flow of liquid from the inlet to the outlet.
LAN	Local area network (LAN). Network in which HPLC devices and a computer are connected, in order to control the devices.
LED	Light-emitting diode
Solvent	mobile solvent transporting substances to be separated or isolated through the column
Ground	Protective measure for electroconductive housing parts
Mixer	Component for the homogenous mixing of solvents for the generation of a gradient
Mobile Control	Mobile application to control and program the whole HPLC system via wireless LAN.
NPG pump	Pump configured to generate a gradient on the low-pressure side. Only one pump unit is used which contains small doses of the different solvents. The solvents are mixed in small mixing cycles by a valve block which is connected upstream. The gradient is generated behind the pump.
Low-pressure side	Devices and capillary which are under high pressure in an HPLC system
pH	Measure for the acidic or alkaline character of an aqueous solution.
Pump	Device which conveys solvents in controlled quantities into a system.
Quaternary pump	Pump configured to generate a gradient from four solvents.
Column	The column is filled with a matrix which separates the single components of a substance spatially by interacting with an analyte transported with the solvent to different degrees.
Solvent selection valve	Component of the pump that allows selecting from two different solvents for every solvent channel. With this mechanism the solvent can be changed without having to manually change the system.
Dead volume	Volume of capillaries and system components between mixing chamber, injector and column as well as between column and detector.
Valve	device to diversify the eluent flow

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KNAUER
Wissenschaftliche Geräte GmbH
Hegauer Weg 38
14163 Berlin

Phone: +49 30 809727-0
Fax: +49 30 8015010
e-Mail: info@knauer.net
Internet: www.knauer.net

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