Science Together

KNAUER

AZURA

Pump P 2.1L

Instructions

Document no. V6840

HPLC

Note: For your own safety, read the instructions and observe the warnings and safety information on the device and in the instructions. Keep the instructions for future reference.

Note: In case you require this instruction in another language, please submit your request including the corresponding document number via e-mail or fax to KNAUER.

Support: Do you have questions about the installation or the operation of your instrument or software?

International Support:

Contact your local KNAUER partner for support:

www.knauer.net/en/Support/Distributors-worldwide

Support in Germany

(Austria & Switzerland on case-to-case basis):

Phone: +49 30 809727-111 (workdays 9-17h CET)

Fax : +49 30 8015010

Email: support@knauer.net

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

Version information: Document number: V6840
Version number: 3.7
Release date: 2020/12/03
Translation of the original edition

The information in this document is subject to change without prior notice. For the latest version of the instructions, visit our website: www.knauer.net/library.

Sustainability: The printed versions of our instructions are printed according to Blue Angel standards (www.blauer-engel.de/en/uz195).

Table of Contents

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

Intended Use

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.

Device Overview

P 2.1L is a self-priming pump with automatic piston backflushing that is used in preparative HPLC systems.

Legend
① Status LEDs
② Pump head
③ Pressure sensor

Fig. 1 Pump P 2.1L Front view

Legend
① Left LED
② Center LED
③ Right LED
④ Power switch

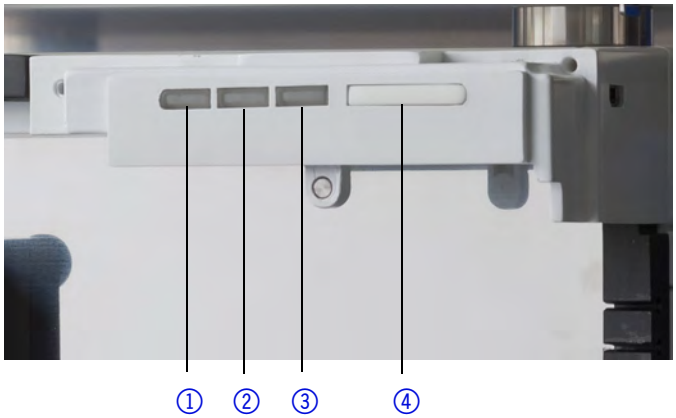


Fig. 2 LEDs and switch on the front of the device

Legend
① USB connector

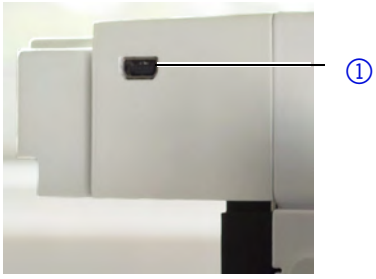


Fig. 3 USB connector

Legend
① Serial number
② Pin header
③ LAN port
④ Interface for the Technical Support
⑤ Mains power connection and power switch

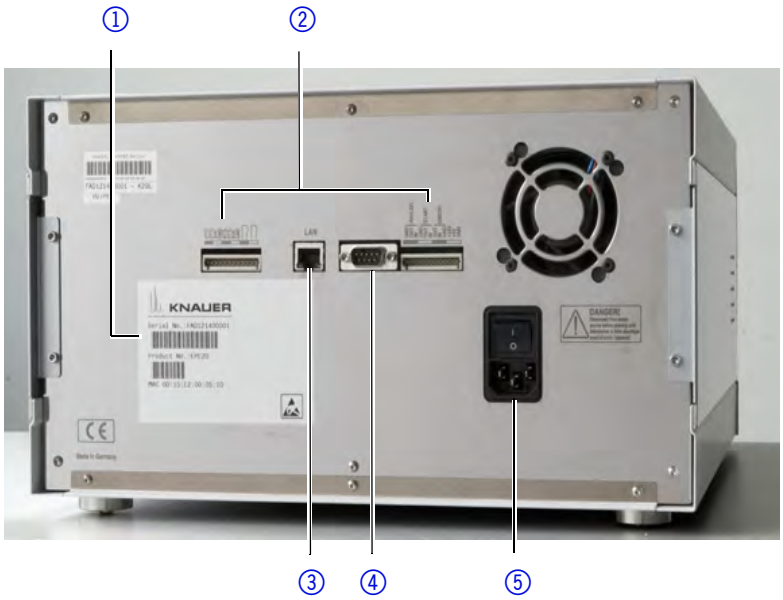


Fig. 4 P 2.1L rear view

Operating range

As part of a HPLC system, the pump takes part in separating substance mixtures and in filtering substances. It can alternatively be used as a single module. The pump transports the mobile phase within the chromatography system. For transportation there are two operating modes possible:

- Standard mode: Fluid transportation with a flow rate of up to 1000 ml/min
- Dosing mode Fluid transportation with a dose flow

Location

In laboratories the device can be used in the following areas:

- Separation of chiral substances
- Separation of biomolecules
- Separation of fine chemicals
- Separation of active pharmaceutical ingredients (API)

Features

The pump transports the fluid. By choosing the pump head accordingly, it is possible to reach the following maximum values:

- Pressure up to 400 bar at a 100 ml/min flow rate
- Flow rate of 1000 ml/min at a 50 bar pressure

P 2.1L offers the following features:

- Self-priming pump
- Prolonged operating time because of the automatic piston backflushing
- Leak management

Options

KNAUER offers the following accessories:

- Stainless-steel pump heads
- titanium pump heads for biocompatible applications
- Display control
- Heating/cooling elements for the pump head
- Valve block for binary or ternary low pressure gradients

Pump Heads

The pump automatically recognizes the pump head by means of the RFID chips. The pump head is equipped with an RFID chip. It is used to monitor and save all important parameters and settings of the pump and pump head.

Pump head for use in preparative applications:

- Standard model, stainless steel
- Pump heads with titanium or ceramic inlays for biocompatible applications. 100 ml, 250 ml, 500 ml, 1000 ml

Eluents

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

Note: The solvent list contains the solvents KNAUER recommends for use. If there is any doubt, contact the Technical Support of the manufacturer.

Suitable solvents
▪ Acetone at 4 °C–25 °C (39.2 °F–77.0 °F)[1] ▪ Acetonitrile[2] ▪ Benzene ▪ Dilute acetic acid (e.g. 10–50 %) at 25 °C/77.0 °F ▪ Dilute ammonia solution ▪ Dilute sodium hydroxide (1 M) ▪ Ethanol[1] ▪ Ethyl acetate ▪ Hexane/heptane at 4–25 °C (39.2–77.0 °F)[1] ▪ Isopropanol ▪ Methanol ▪ Phosphate buffer solutions (0.5 M) ▪ Toluol ▪ Water

1. Valid for the specified temperature range.
2. Not recommended in combination with PEEK small parts and PEEK capillary.

Less suitable solvents
▪ Carbon dioxide (liquid 99.999 % CO_2) ▪ Dilute phosphoric acid ▪ Dimethyl sulfoxide (DMSO) ▪ Methylene chloride[1] ▪ Slightly volatile solvents ▪ Tetrahydrofuran (THF)[1]

1. Not recommended in combination with PEEK small parts and PEEK capillary.

Not suitable solvents
▪ Chloroform ▪ Concentrated mineral and organic acids ▪ Concentrated bases ▪ Halogenated hydrocarbons, e.g. Freon® ▪ Perfluorinated solvents, e.g. Fluorinert® FC-75, FC-40 ▪ Perfluorinated polyether, e.g. Fomblin® ▪ Solvents containing particles

Scope of Delivery

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

- AZURA® Pump P 2.1L
- 24 V power supply power cable
- User manual DE/EN
- Declarations of conformity
- Accessories kit AZURA®
- Accessories kit pump

Safety for Users

Target group

This document address 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 these instructions 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 the user take into account?

- All safety instructions in this document
- The environmental, installation, and connection specifications in this document
- 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 the capillaries have been used, never re-use them 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 colums.

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

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.

Warning notifications

Possible dangers related to the device are divided into personal and material damage in these instructions.

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE is used to address practices not related to physical injury.

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.

DANGER

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/knowledge/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 Before opening the housing, switch the device off and unplug from electrical power.
	Electrostatic discharge hazard, damages to system, device, or components can occur.
	Heavy weight hazard, damage to leak tray can occur.
CE mark 	A device or system marked with CE fulfills the product specific requirements of European directives. This is confirmed in a Declaration of Conformity.

Installation

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

Contact Data

Phone	+49 30 809727-111
Fax	+49 30 8015010
E-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).

⚠ CAUTION

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.

Lifiting 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

The location for the device must meet the following requirements:

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.

➜ Leave some space for air circulation: See space requirements.

Note: The leak sensor may malfunction it the device is placed on an inclined surface. Use a level to check that the device is in an horizontal position.

- position device or system on level surface
- protect from heavy ventilation
- Weight 19 kg
- Dimensions (width x height x depth) 361 × 208 × 523 mm
- Power supply 100 – 240 V DC
- Air humidity < 90 %, non-condensing
- Temperature 4 – 40 °C/39.2 – 104 °F

Power Supply

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 mains supply. Replace defective power cables only with accessories from KNAUER. Only use power cables with a permission for use from 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.

Unpacking

Store all packing material. Retain included packing list carefully for repeat orders.

Tool Utility knife

⚠ CAUTION

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.

Procedure

1. Check for damage caused during transportation. In case you notice any damage, contact the technical support and the forwarder company.
2. Setup the delivery so you are able to read the label. Using the utility knife, cut the adhesive tape. Open the packaging.
3. Remove the foam insert. Take out the accessories kit and the manual.
4. Open the accessories kit and take out all accessories. Check the scope of delivery. In case any parts are missing, contact the technical support.
5. Clasp the device at its side panels and lift it out of the packaging. Do not hold onto front cover or leak tray.
6. Remove the foam inserts from the device.
7. Check for damage caused during transportation. In case you notice any damage, contact the technical support.
8. Set-up the device in its location.
9. Remove the protective foil.

Connecting the Piston Backflushing

The piston backflushing removes salts and other substances from the area behind the seals. To do this, connect a bottle with flushing solution to the flush pump and to the pump head. The connection between pump head and flush pump is preinstalled at the factory.

Functional principle

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

- Upon switch-on: The rear piston area of the pump head is automatically flushed for 15 seconds.
- In continuous mode: The rear piston area of the pump head is flushed automatically every 30 minutes, for 15 seconds.

Designation

Inlet and outlet of the flush pump are located on the front of the device.

Fig. 5 Inlet symbol

Fig. 6 Outlet symbol

Flushing solution:

These are suitable flushing solutions:

- Water
- Mixture of 80 % water and 20 % ethanol
- Isopropanol

Note: KNAUER recommends the use of pure isopropanol as flushing solution for piston backflushing.

NOTICE

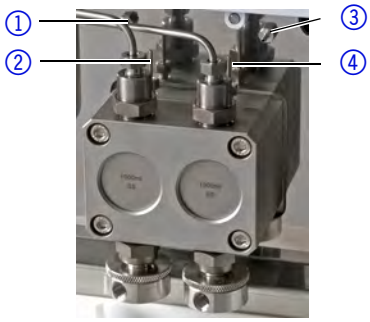
Device defect

Damage to the pump head caused by overtightened capillary fittings.

➜ Note the torque of the fittings.

Note: PEEK fittings can withstand pressures up to 400 bar for 1/16" and 200 bar for 1/8".

Procedure

Process	Figure
1. Use the first hose to connect the inlet ① of the flush pump to the bottle containing the flushing solution. 2. Lead a tube from the flush pump's outlet ③ to the pump head's inlet ④ and fasten. 3. Use the second hose to connect the pump head ② to the bottle containing the flushing solution.	 Fig. 7 Connectors of pump head and flush pump

Eluent Inlet

The eluent lines are connected by the eluent inlet to the pump head. Before the eluent lines are connected, the eluent inlet must be attached to the pump head.

Legend
① Knurled-head screw
② Eluent inlet
③ Olive-type tube fitting

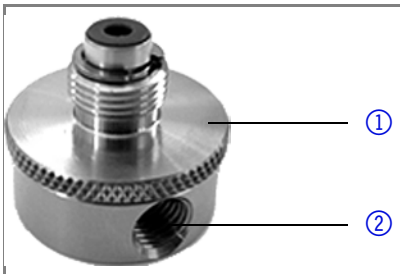
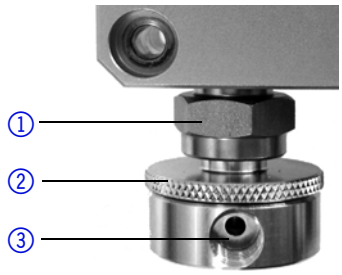


Fig. 8 Eluent inlet for 100-500 ml pump heads

Fig. 9 Eluent inlet for 1000 ml pump head

Connecting the Eluent Inlet to the Pump Head

Procedure

Process	Figure
1. With the knurled-head screw ② , screw the eluent inlet into the inlet screw fitting ① of the pump head. 2. Turn the eluent inlet until the intake manifold input ③ points forward. 3. Tighten the knurled-head screw.	 Fig. 10 Eluent inlet, variant 1

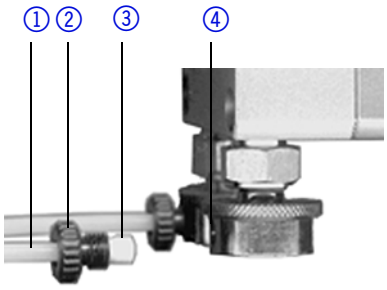
Connecting the Eluent Line

Prerequisite The eluent inlet has been connected.

Note: If connecting a pump head from 100 – 500 ml, make sure that the tapered side of the cutting ring is pointed towards the fastening screw of the Teflon tube.

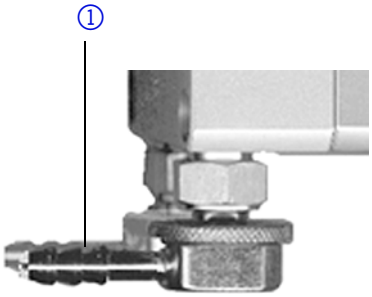
Procedure

Pump head:
- 100 ml
- 250 ml
- 500 ml

Process	Figure
1. Push the Teflon hose ① through the fastening screw ② and the cutting ring ③ . 2. Insert the hose end as far as possible into the eluent inlet fitting ④ of the pump head. 3. Tighten the fastening screw by hand.	 Fig. 11 Connecting the eluent line to the pump head

Procedure

Pump head:
1000 ml

Process	Figure
1. Push the Teflon hose directly on the olive-type tube fitting ① . 2. Fasten the Teflon hose with hose clamp.	 Fig. 12 Eluent line on 1000 ml pump head

Next steps Check whether the connectors and lines are tight.

Changing the Setup to LPG

By assembling a valve block, the setup of the system is changed to low pressure gradient (LPG). The valve block is mounted to the front of the pump. There are 2 types of valve blocks:

Types
- Ternary valve block for flow rates from 10 – 250 ml
- Binary valve block for flow rates from 10 – 800 ml/min

Note: The manufacturer recommends to employ the binary LPG valve block for flow rates in the range of 100 – 800 ml/min.

*Legend*Legend
① Valve block
② Screw with seal ring

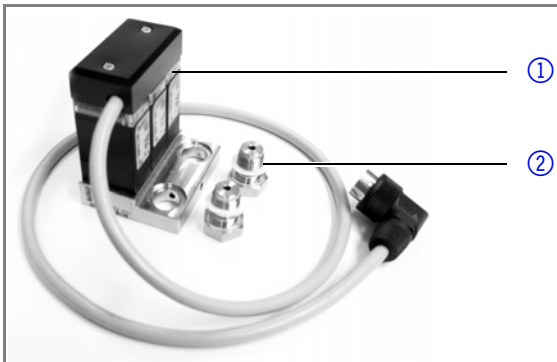


Fig. 13 Ternary valve block

You can not use the front cover after having mounted the valve block.

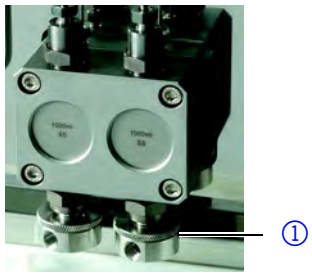
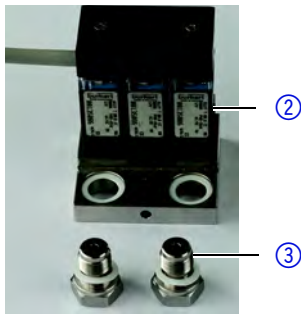
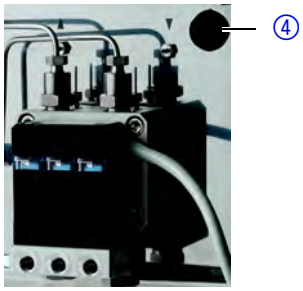
Mounting the Valve Block

Prerequisite
- The pump has been switched off.
- The power plug has been pulled.

Tool
- Open-end wrench, size 17
- Torque wrench

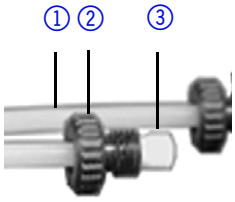
Note: Always place seals in pairs on both fastening screws.

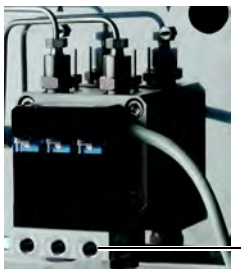
Procedure

Process	Figure
1. Unscrew the inlet ① from the pump head.	 Fig. 14 Inlet on the pump head
2. Place the seal rings ③ on the screws and valve block. 3. Using the torque wrench, tighten the screws of the valve block ② with a 7.5 Nm torque.	 Fig. 15 Valve block
4. Insert the plug into the female connector ④ .	 Fig. 16 Socket for the LPG valve block

Connecting the Eluent Line to the Pump Head

Procedure

Process	Figure
1. Push the Teflon hose ① through the fastening screw ② and the cutting ring ③ . 2. Insert the hose end as far as possible into the eluent inlet fitting ④ of the pump head.	 Fig. 17 Cutting ring with Teflon hose

3. Tighten the fastening screw by hand. 4. Plug a cap fitting into the unused inlet.	 ④ Fig. 18 Inlets of the valve block

Next steps Connect the plug of the valve block.

Bleeding the Pump

Prerequisite The capillaries have been connected.

Tool Syringe

NOTICE

Column defect

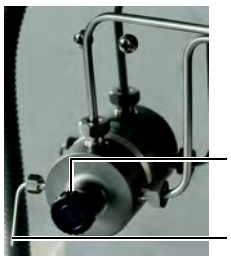
Damage to the column due to bleeding.

➜ Open the venting screw.

➜ Remove the column.

Note: Before the pump can be used, it must be bleeded.

Procedure

Process	Figure
1. Open the venting screw ① of the pressure sensor. 2. With the syringe, extract fluid through the bleed port ② . 3. If the extracted fluid flows continuously, stop suction and close the venting screw.	 ① ② Fig. 19 Venting screw of the pressure sensor

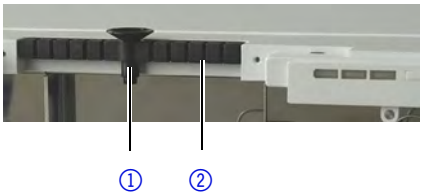
Result No air bubbles in the pump head and in the capillaries.

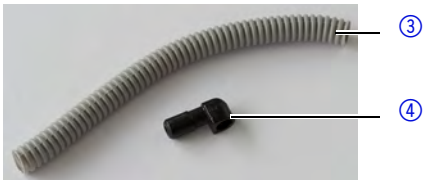
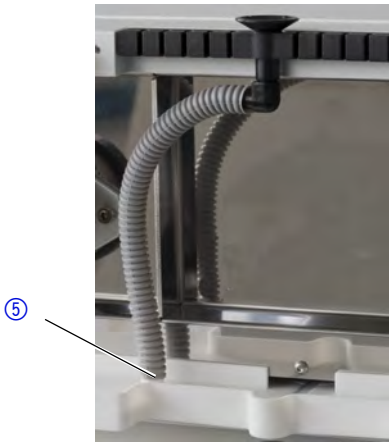
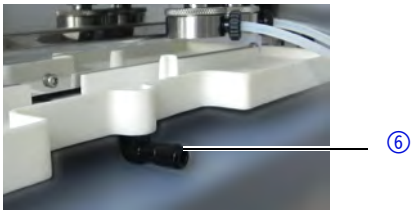
Leak Management

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	Figure
1. Carefully push the funnel ① into the center opening of the capillary guide ② .	 ① ② Fig. 20 Funnel and capillary guide

Process	Figure
2. Push the long ending of the first nozzle ④ into the hose ③ .	 Fig. 21 Hose and nozzle
3. Connect the nozzle and the funnel. 4. Push the other end of the hose onto the nozzle ⑤ of the leak tray.	 Fig. 22 Hose connected to device
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.	 Fig. 23 Leak tray with nozzle

Next step Attach the front cover.

Remote Control

Remote control means to operate the pump via the terminal strip. The connector is located on the rear side.

Legend
① Terminal strip

Fig. 24 P 2.1L rear view

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 *Events* Remote Connector

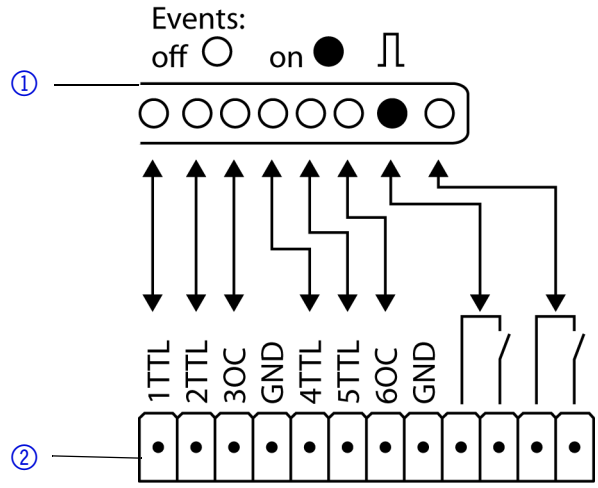


Fig. 25 Remote terminal strip

Signal	Explanation
ANALOG: OUT	Analog output signal. Either outputs the measured system pressure or a control voltage for Pump B. The output range can be set to values of max. 1, 2, 5 and 10 V.
ANALOG: IN	Analog input signal for controlling the flow rate, e.g.: ▪ 1 V for 10 ml/min in case of the 100 ml pump head ▪ 1 V for 25 ml/min in case of the 250 ml pump head ▪ 1 V for 50 ml/min in case of the 500 ml pump head ▪ 1 V for 100 ml/min in case of the 1000 ml pump ▪ head
START: OUT	Output is active for 500 ms when the program starts.
START: IN	Activated by a voltage of 0 V against GND.
ERROR: OUT	Output is active until the Error condition has been eliminated.
ERROR: IN	A voltage of 0 V against GND stops the pump.

Events Remote 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* Remote Connector

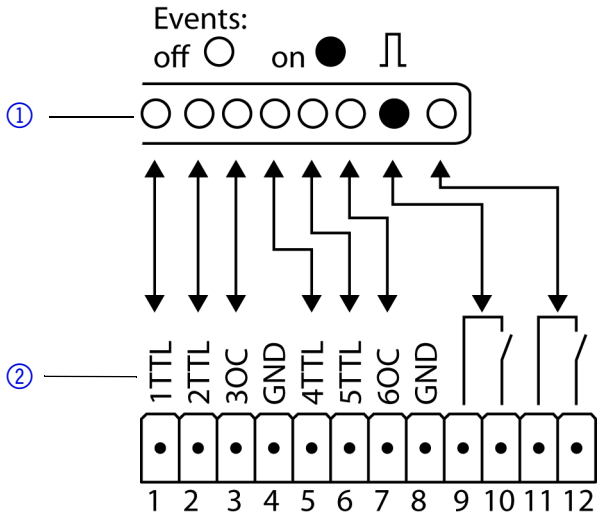


Fig. 26 Relation between display and *Events* terminal strip

Assignment

Connection	Function
1TTL	TTL-compatible output Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪ 5 V for at least 1000 ms
2TTL	TTL-compatible output Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪ 5 V for at least 1000 ms
3OC	**TTL output** Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪ 5 V for at least 1000 ms
GND	Reference point of the voltage at the signal inputs.
4TTL	TTL-compatible output Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪ 5 V for at least 1000 ms
5TTL	TTL-compatible output Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪ 5 V for at least 1000 ms

Assignment

Connection	Function
6OC	**TTL output** Levels: ▪ passive 0 V ▪ active 5 V Pulse: ▪5 V for at least 1000 ms
GND	Reference point of the voltage at the signal inputs.
	**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
	**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
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.
Start OUT	**TTL output** Levels: ▪ passive 5 V ▪ active 0 V
Start IN	**TTL input** ▪ 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.

Assignment

Connection	Function
Error OUT	**TTL output** Levels: ▪ passive 5 V ▪ active 0 V
Error IN	**TTL input** ▪ 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.

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

Operating 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

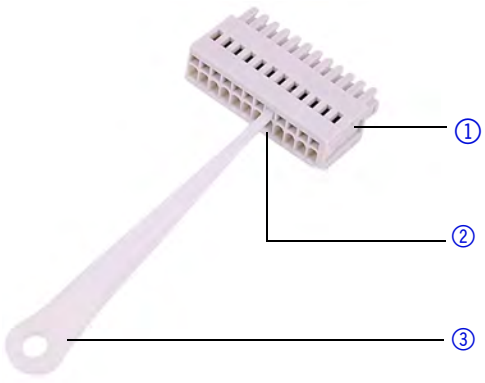
Electronic defect

Electrostatic discharge can destroy the electronics.

➜ Wear a protective bracelet against electrostatic discharge and ground.

Process

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



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

Computer Control

Computer control means to operate the device within a local network through a router. The connector is located on the rear side.

Legend
① LAN port

Fig. 27 P 2.1L rear view

Note: HPLC devices made by KNAUER work only with IP adresses which are assigned via IPv4. IPv6 is not supported.

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.

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.

Prerequisites

- In Windows, power saving, hibernation, standby, and screen saver must be deactived.
- 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.
- For all LAN devices: For the network adapter, the following option in the Device Manager must be deactivated: "Allow the computer to turn off this device to save power".

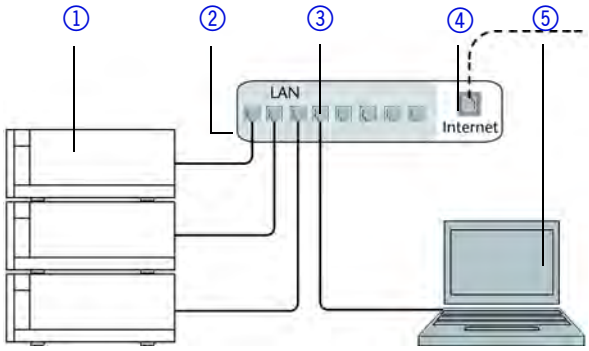
Process

1. In Windows open the *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 ② has several LAN ports ③ 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.

Prerequisites

- 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 find information about IP address, user name and password in the router instructions: https://goo.gl/ahGhmG.

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.

Note: If the IP address range has been changed, it is necessary to note it down.

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

Tow options are given to set the device IP address to fixed (static) or dynamic (DHCP) via software: Mobile Control or Firmware Wizard.

Mobile Control: Setting a static IP address

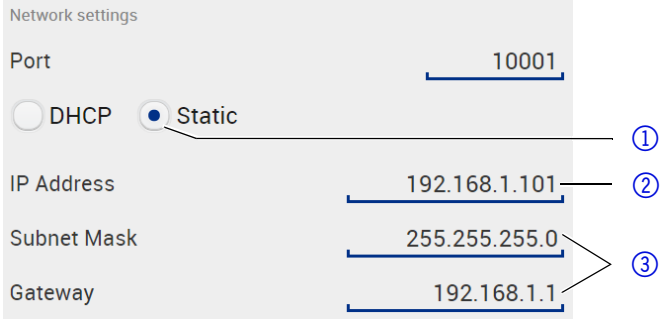
Note: The device is factory set to a dynamic IP address (DHCP). To ensure a permanent LAN connection between the chromatography software and the device, we recommend to set a static IP address for certain applications. You find further information on LAN settings in the chapter “Device Settings” of the Mobile Control Software Instructions.

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.

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*> ① .
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 Apply in the top right corner.
7. Restart the device (recommended).



Result The device is now accessible via the static IP address.

Mobile Control: Setting IP address to DHCP via device name

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.

Procedure

1. In the Mobile Control, choose <*Settings*> .
2. On the <*General*> tab, choose the device name.
3. Under <*Network Settings*>, go back to the original setting by clicking the <Reset> button.
4. Click Apply in the top right corner.
5. Restart the device (recommended).

Result

The device is now accessible via a dynamic IP address.

Mobile Control: Setting IP address to DHCP via device serial number

Prerequisites

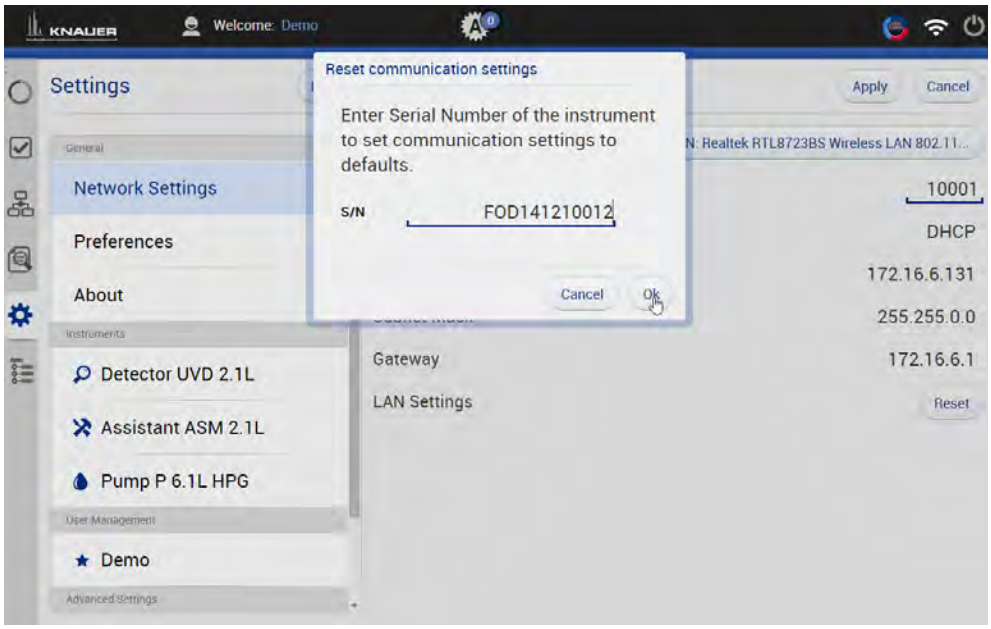
- The device has been switched on.
- Mobile Control has been installed and started.
- The connection between the Mobile Control and the device has been established.

Procedure

1. In the Mobile Control, choose <*Settings*> .
2. Under <*Network Settings*>, click the <Reset> button. The window <Reset communication settings> opens.
3. Enter the serial number of the device into the text field.
4. Click <OK>.
5. Restart the device (recommended).

Result

The device is now set to DHCP.



Firmware Wizard: Setting a static IP address

Note: You find further information on LAN settings in the chapter “Firmware Wizard” of the Mobile Control User Manual.

Prerequisites

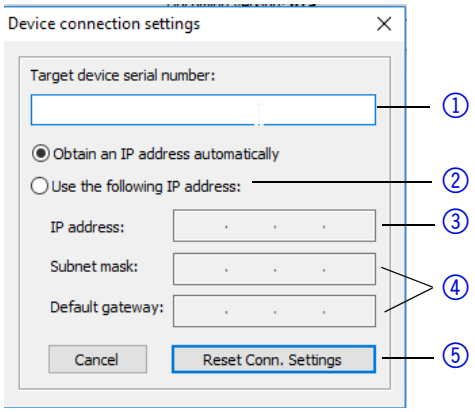
- The device has been switched on.
- Firmware Wizard has been installed and started.
- The connection between Firmware Wizard and the device has been established.

Procedure

1. In Firmware Wizard, click <Reset LAN Settings...>.
2. The window <Device connection settings> opens. Enter serial number of the AZURA® device into the text field <Target device serial number> ① .

3. Select option <Use the following IP address> ② .
4. Enter the IP address into the text field <IP address> ③ .
5. Optionally, adjust subnet mask and gateway ④ .
6. Click <Reset Conn. Settings> ⑤ to accept changes.
7. Restart the device (recommended).

Result The device is now accessible via the static IP address.



Firmware Wizard: Setting an IP address to DHCP

Prerequisites

- The device has been switched on.
- Firmware Wizard has been installed and started.

Procedure

1. In Firmware Wizard, click <Reset LAN Settings...>.
2. The window <Device connection settings> opens. Enter serial number of the device into the text field <Target device serial number> ① .
3. Select option <Obtain an IP address automatically> ② .
4. Click <Reset Conn. Settings> ⑤ to accept changes.
5. Restart the device (recommended).

Result The device is now set to DHCP.

Analog Control

Note: Contact the KNAUER Customer Support to change the default settings and to select the option *ANALOG CONTROL* in the *SETUP* menu.

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.

Operation

Running-in Procedure

Note: It is mandatory to perform a running-in procedure after a pump head maintenance, or if new pump heads are installed on a pump.

Note: All pump heads were filled with Isopropanol prior to delivery. Make sure to connect the correct solvent as described in the specification table found in the supplement "Running-in procedure for pump heads" (V6894).

If a pump was not in operation for a long time, e.g. after shipment, a running-in procedure might be necessary to obtain the best pump performance. The pump head underwent this procedure during the manufacturing process.

If the pump is performing within specification, or during intensive operation, it is not necessary to perform this procedure.

NOTICE

Component defect

Damage to the pump head in case running-in procedure was not performed correctly.

➜ Set the correct backpressure and flowrate for the running-in procedure of the pump head. Specific running-in parameters and the general procedure can be found in the supplement „Running-in procedure for pump heads (V6894)".

NOTICE

Device defect

If the pump is operated only with pure distilled water, significantly higher wear of the piston and the piston seals can be expected.

➜ If possible, only operate the pump with water together with the added additive or modifier.

Switching on the Pump

Prerequisite

- Liquid container is sufficiently filled.
- Piston backflushing is connected.
- Washing container is sufficiently filled.

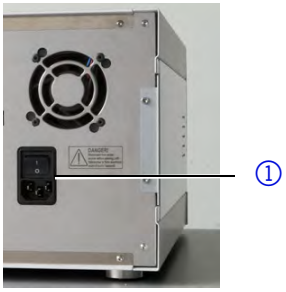
NOTICE

Component defect

Damage to the pump head in case it runs dry.

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

Procedure

Process	Figure
1. Switch on the pump at the power switch ① on the rear side. 2. Wait until the pump has completed the self-test. 3. If the self-test has been successfully completed, the LED on the right lights up green.	 Fig. 28 Power switch

Result

The pump is now ready for operation. If the test fails an error message will be displayed. Contact the Technical Support of the manufacturer if the error occurs several times.

Next steps

Forestall pressure fluctuations by letting the pump run for 1 h.

Flushing the Pump

To flush the pump, insert the inlet hoses into the storage containers and start the pump with an intermediate flow rate. As the pump is self-priming, the venting screw can be open. In case necessary, draw liquid through the dry feed hoses up to the pump head with the provided syringe. If you are working without the pump head inlet, pay attention that both feed hoses are filled with solvent.

NOTICE

Column defect

Damage to the column due to bleeding.

➜ Open the venting screw.

➜ Remove the column.

When is flushing required?

Flush the pump in the following cases:

- At initial startup to eliminate air bubbles in hoses and capillaries.
- When changing solvents.
- After using buffer solutions to eliminate salt residues.

- Before turning off, if you do not plan to restart the device within shortly.

Use the solvent for flushing that is to be used in the subsequent application.

Note: If you used a buffer solution, pay attention to choosing a solvent for flushing in which the buffer solution is soluble.

The purging process of the pump is limited to a maximum pressure of 5 MPa. If this value is exceeded during the purging process, the pump switches off automatically. If you are using very small hoses and capillaries, the pressure can be too high.

For how long is flushing required?

If there are air bubbles in the capillaries, the flow pulsates. As soon as the flow is constant, the pump is bleeded and flushing can be stopped. The duration for flushing depends on capillary and hose length as well as the flow rate.

Control

A device can be operated in different ways:

- with chromatography software
- with Mobile Control

Chromatography Software

To control the device with chromatography software, it must be connected to the computer through the LAN interface.

Devices can be controlled with e. g. OpenLAB EZChrom edition version A.04.05 or higher, ChromGate version 3.3.2 or higher and ClarityChrom version 3.0.7 or higher.

You will find a detailed description on the chromatography software in the software manual.

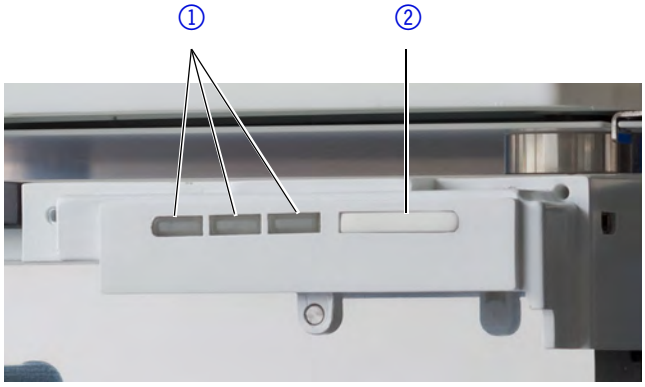
Mobile Control

The Mobile Control is a software for your computer or tablet.

To control the device with the Mobile Control, you need to connect your PC or tablet with operating system Windows 10 to a WLAN router. The firmware version of your P 2.1L must be V01.09 or higher. You will find a detailed description of the Mobile Control on the website www.knauer.net/mobilecontrol.

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
Left LED	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.
	green	Program or sequence is running/was loaded.	
Center LED	does not light	Not ready	
	green flashing	Equilibration	Wait until the device is ready.
	green	Ready	
Right LED, power status	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.

Switching Off the Pump

If you want to switch off the pump for a longer term, flush the pump head with isopropanol.

Prerequisite The pump has been flushed (see page 23). Use isopropanol if you are to taking the device out of operation for a longer period of time or as preparation for storage.

The device has stopped operating (only the LED to the right lights green).

Process
1. Stop the flow.
2. Set the power switch on the rear side to OFF:

Result The LED goes out.

Functionality Tests

Note: Standard processes in single devices may be handeled differently in individual cases.

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.

Further Measures

1. Install the maintenance software (service tool).
2. Save device information and send to manufacturer.

- Inform the Technical Support of the manufacturer.

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 DCHP 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, switch on the router and wait until its self-test is finished. Secondly, switch 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 Rectifications

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	▪ Purge the pump head to remove the air bubbles. ▪ Clean the ball valves. ▪ Exchange the ball valves. ▪ If the pump head seals are defective, solvent enters the piston backflushing; inform the technical support of the manufacturer. ▪ Exchange the pump head
Pressure and flow rate variations	▪ Purge the pump head to remove the air bubbles. ▪ Let the pump run for 1 h. ▪ Always tighten the inlet screw 1 and outlet screw 1 on the pump head with a torque wrench and 15 Nm. ▪ Clean the ball valves. ▪ Exchange the ball valves. ▪ Exchange the pump head ▪ Inform the Technical Support of the manufacturer.
Pump head leaks	▪ 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 of the manufacturer. ▪ Exchange the pump head
Flow rate is not correct	Check the following options: ▪ Check the data for the solvent compressibility ▪ Cleaning the Check Valves ▪ Exchange the ball valves

System Messages

If other system messages are displayed besides those listed below, please turn the device off and then on. Inform the Technical Support of the manufacturer in case the system message repeats itself.

The system messages are in alphabetical order:

	System message	Solution
A	Auto pump head type: head data uninitialized!	▪ Switch the device off and on ▪ Check whether a pump head with RFID recognition has been installed ▪ Repeat the automatic configuration step in the chromatography software ▪ Remove pump head, clean it and install it again
	Auto pump head type: no valid head detected!	▪ Switch the device off and on ▪ Check whether a pump head with RFID recognition has been installed ▪ Repeat the automatic configuration step in the chromatography software ▪ Remove pump head, clean it and install it again
	Auto pump head type: RFID hardware not present or failed!	Pump head without RFID detection: If necessary, replace pump head.
	Auto pump head type: read failed!	▪ 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 of the manufacturer in case the system message repeats itself.
	Auto pump head type: write failed!	▪ 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 of the manufacturer in case the system message repeats itself.
C	Cannot edit program from the running link	First stop the *link* and then edit the data on the device display or with the chromatography software.
	Cannot delete active program/link	First pause link, then delete program.
	Cannot edit program from the running link	First pause link, then edit data using chromatography software.

	System message	Solution
	Cannot initialize LAN	Check cables and connections in local area network.
	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 of the manufacturer in case the system message repeats itself.
	Cannot read RTC	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
	Cannot start time table	Edit the data on the device display or in the chromatography software.
	Cannot use non-existing component!	Change the *setup* settings or change the gradient in the program or in *setup*.
	Cannot write data on FRAM	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
	Component settings not compatible with gradient setup!	Change the *setup* settings or change the gradient in the program or in *setup*.
E	Error input activated	Device error, change device settings.
G	GUI communication failed	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
I	Instrument in standalone mode	▪ Change the entry in the Setup menu. ▪ Change the entry in the chromatography software.
	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	Change the entry in the program line.
	Invalid time in time table	Correct the time entry.
L	Leak sensor not present	Switch the device off and then on. If the leak sensor is still not present, contact the Technical Support of the manufacturer.
	Leak was detected	Switch off the device. Remove the leak and start the device afterwards.

	System message	Solution
	Line in time table is empty	Edit the program line.
	Link is loaded	First unload the link then change the link or delete it.
	Link is running	Wait until the link has been completed, then change the link or delete it.
M	Max. flow limit reached	Confirm, pump continues running
	Maximum pressure! System stopped	▪ Reduce the pressure or adjust the upper pressure limit. ▪ Restart the system
	Minimum pressure! System stopped	▪ Increase the pressure or adjust the lower pressure limit. ▪ Restart the system
	Motor failure: max current	Switch the device off and on. Inform the technical support of the manufacturer in case the system message repeats itself.
N	No gradient is available in isocratic mode	Change the *setup* settings or change the gradient in the program or in *setup*.
	No link available	Create a link and edit it.
	No link available. Pls edit link first	Create a link and edit it.
	No time table to start	Edit the data by means of the chromatography software.
	Non-existing component is set to non-0 value	Switch on the channel or edit the data using the chromatography software.
P	Program does not exist	Create a program.
	Program is running	Quit program or wait until program has been completed.
	Program not compatible with pump head	Modify the program or replace the pump head.
S	Sum of components is not 100	Change the entry.
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.

	System message	Solution
	Time already exists	Correct the time entry.
	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 set point	Confirm, pump continues running
	Unknown pump head type!	▪ Check the pump head. ▪ Check whether a pump head with RFID recognition has been installed
W	Wake up time already passed	Correct the entry for date or otherwise time.

Maintenance and Care

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

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 ball valves of the pumps

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

Contact with the Technical Support

Contact Technical Support

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

Technical Support hotline:

European hotline

Languages: Available by telephone
in German or English: 8 am to 5 pm (CET)
Phone:+49-(0)30-809727-111
Fax:+49-(0)30-8015010

E-mail contact:

support@knauer.net (manufacturer)

Maintenance Contract

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

- Opening the device or removing housing parts

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.

Pump Head

Depending on the requirements of the user, different pump heads are used. The chapter accessories and spare parts contains a pump head overview.

Screw Fittings on the Pump Head

Legend

① Capillary fitting
② Allen screws
③ Outlet fittings
④ Inlet fittings
⑤ Eluent Inlet

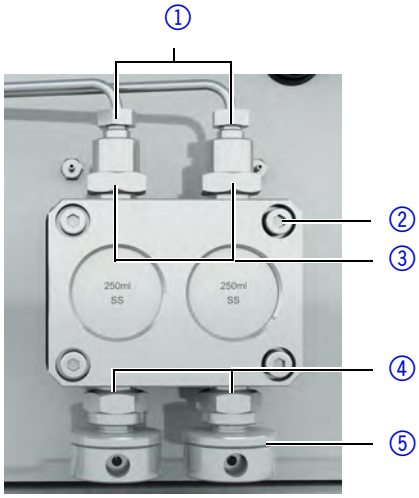


Fig. 29 Screw fittings on the pump head

Dismounting the Pump Head

Prerequisite

- The pump head has been purged.
- The tubes and hoses have been removed.

Tools

- Allen wrench
- Open-end wrench, sizes 10, 17

⚠ WARNING

Chemical burns

Aggressive or toxic solvent residue can irritate the skin.

➜ Wear protective gloves.

➜ Flush the pump head before exchanging it.

NOTICE

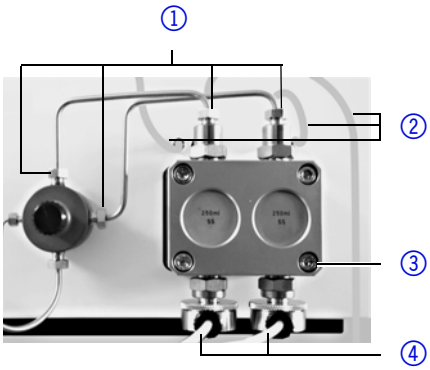
Component defect

Damage to the pistons if they tilt.

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

Procedure

Process	Figure

1. To remove the capillary, loosen the capillary screw fittings ① at the pump head outlet and pressure sensor inlet. 2. Disconnect the hoses of the piston backflushing ② from the flush pump and the pump head. 3. Remove the eluent lines ④ from the eluent inlets. 4. Unscrew the Allen screws ③ . 5. Hold the pump head by hand, and consecutively pull out all Allen screws. 6. Lift off the pump head.	 Fig. 30 Removing the Pump Head

Intermediate result The pump head is dismounted. To mount the pump head, proceed the steps in reverse order.

Next steps Mounting a pump head.

Attaching Capillaries to the Pump Head

Pay attention to the torques in the chapter Installation (see page 34).

Prerequisite The pump head has been removed.

Tool Open-end wrench, sizes 10, 17

NOTICE

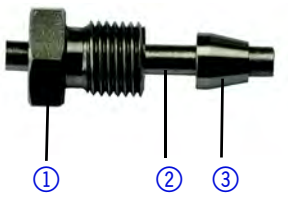
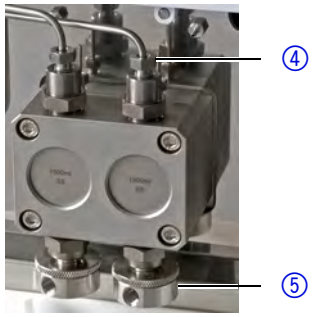
Device defect

Damage to the pump head caused by overtightened capillary fittings.

➔ Note the torque of the fittings.

Note: PEEK fittings can withstand pressures up to 400 bar for 1/16" and 200 bar for 1/8".

Procedure

Process	Figure
1. Slide the fitting ① onto the capillary ② . 2. Slide the clamping ring ③ onto the capillary, so the capillary comes out.	 Fig. 31 Screw fitting
3. Using an open-end wrench, hold the inlet fitting ⑤ in place. 4. Tighten the fitting ④ at the pump head. 5. If the capillary cannot be screwed tight, then use a new clamping ring!	 Fig. 32 Pump head

Check Valves

Dirty 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.

Torque

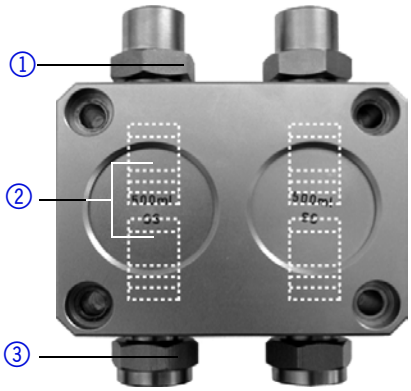
Pump head stainless steel	Torque for inlet and outlet fitting
100 ml	15 Nm
250 ml	15 Nm
500 ml	12 Nm
1000 ml	12 Nm

Removing the Check Valves

Prerequisite

- The pump head has been purged.
- The capillaries have been removed.
- The pump head has been dismounted.

Tools Open-end wrench, sizes 10, 17

Process	Figure
1. Unscrew the outlet fittings ①. 2. Remove the check valve ②. 3. Unscrew the inlet fittings ③. 4. Remove the check valve.	 Fig. 33 Removing the check valve

Next steps You can either replace or clean the check valves.

Cleaning the Check Valve

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

1. Put the valve in a beaker with solvent e. g. isopropanol.
2. Put the beaker in an ultrasonic bath for at least 10 minutes.

Installing the Check Valves

Prerequisite

- The pump head has been purged.
- The capillaries have been removed.
- The pump head has been dismounted.

Tools Open-end wrench, sizes 10, 17

NOTICE

Device defect

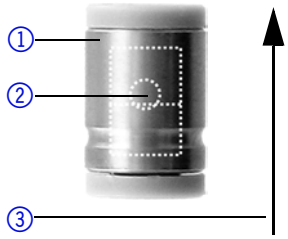
Damage to the pump head caused by overtightened capillary fittings.

➜ Note the torque of the fittings.

Note: PEEK fittings can withstand pressures up to 400 bar for 1/16" and 200 bar for 1/8".

Note: The ball and position of the valves have been harmonized to each other. Insert the valves in the direction of flow!

Procedure

Process	Figure
1. Insert the check valves ① . 2. Manually screw in inlet and outlet fittings and tighten them with a torque wrench and the respective torque.	 Fig. 34 Check valve

Technical Data

Solvent delivery

Pump type	Preparative HPLC pump
Delivery system	Dual-piston pump
Flow rate range	▪ 100 ml pump head: 0.1 - 100 ml/min ▪ 250 ml pump head: 0.1 - 250 ml/min ▪ 500 ml pump head: 0.1 - 500 ml/min ▪ 1000 ml pump head: 0.1 - 1000 ml/min
Maximum pressure	▪ 100 ml pump head: ▫ 400 bar to 100 ml/min ▪ 250 ml pump head: ▫ 225 bar to 100 ml/min ▫ Linear reduction: 225-200 bar of 100-150 ml/min ▫ 200 bar of 150-250 ml/min ▪ 500 ml pump head: ▫ 100 bar to 500 ml/min ▪ 1000 ml pump head: ▫ 75 bar to 350 ml/min ▫ Linear reduction: 75-50 bar of 350-600 ml/min ▫ 50 bar of 600-1000 ml/min
Flow rate accuracy	±2 % at 2 – 50 % of the flow range with methanol-water mixture (10/90, v/v)
Flow rate precision	< 0,1 % RSD
Gradient support	▪ Isocratic HPLC pump ▪ binary or ternary LPG system ▪ binary HPG system with additional pump
System protection	P_{min} and P_{max} adjustable

Communication	Control	▪ LAN ▪ Pin header connectors (Analog IN, Start IN, Error IN)
	Programming	19 programs, 9 links, WAKE UP program
	Supply frequency	50 – 60 Hz
	Power consumption	▪ Pump: maximum 320 W ▪ Binary or ternary valve block: 5 W
	Protection type	IP 20
Technical parameters	Temperature range	4 – 40 °C; 39.2 – 104 °F
	Air humidity	below 90 %, non-condensing
	Leak sensor	Yes
General	Power Supply	▪ Pump: 100 – 240 V, 50 – 60 Hz ▪ Binary valve block: 24 V ▪ Ternary valve block: 12 V
	Dimensions	361 x 208 × 523 mm (width x height x depth)
	Weight	19 kg
	Height above sea level	maximum 2000 meters

Accessories and Spare Parts

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

For reorders 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

Device and Accessories

Name	Order no.
Pump P 2.1L	APE20
Pump P 2.1L with 100 ml pump head stainless steel	APE20KA
Pump P 2.1L with 100 ml pump head titanium	APE20KB
Pump P 2.1L with 250 ml pump head stainless steel	APE20LA
Pump P 2.1L with 250 ml pump head titanium	APE20LC
Pump P 2.1L with 500 ml pump head stainless steel	APE20MA
Pump P 2.1L with 500 ml pump head titanium	APE20MC
Pump P 2.1L with 1000 ml pump head stainless steel	APE20NA
Pump P 2.1L with 1000 ml pump head titanium	APE20NB

Name	Order no.
Mobile Control license with 10" touchscreen	A9607
Mobile Control Chrom license with 10" touchscreen	A9608
Mobile Control license	A9610
Mobile Control Chrom license	A9612
Tablet lock with stand	A9615
Tablet lock	A9616
Flexible tablet mount	A9617
Accessories kit pump	FPE
AZURA accessories kit	FZA02
User manual	V6840

Pump Heads with Accessories

	Name	Order no.
Pump heads	Pump head, 100 ml, stainless steel	A4029-1
	Pump head, 100 ml, titanium	A4029V2
	Pump head, 250 ml, stainless steel	A4021-1
	Pump head, 250 ml, titanium	A4021V2
	Pump head, 500 ml, stainless steel	A4038-1
	Pump head, 500 ml, titanium	A4038V2
	Pump head, 1000 ml, stainless steel	A4022-1
	Pump head, 1000 ml, titanium	A4022V2
Pump head inlet	1/4" (NPT), stainless steel	A9861
	1/2"–20 UNF, PEEK with CTFE	A9868
Inlet merging	Inlet merging device for Peak Recycling and SMB applications for 100 ml and 250 ml pump heads	A1121

Documents

Name	Order no.
User manual	V6840
Installation qualification	VIQ_INST
Operation qualification	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: support@knauer.net
Internet: www.knauer.net

Warranty seal

A warranty seal is attached on some devices. 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 stick an orange seal in identical position. If unauthorized persons interfere with the device or the seal is damaged, the warranty claim becomes void.

Declaration of conformity

The Declaration of Conformity accompanies the product as a separate document and is available online: https://www.knauer.net/de/Support/Declarations-of-conformity

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.

Index

Science Together

Latest KNAUER instructions online:
www.knauer.net/library

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