

Science Together



Azura

## Assistant ASM 2.1L Instructions



# HPLC

Document No. V6815



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

**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.

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# Product information

The AZURA® Assistant ASM 2.1L<sup>1</sup> is a compact combination module which is used in analytical, preparative and continuous liquid chromatography. The concept of flexible combination of device modules combines highest functionality with minimal space requirements.

## 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.

Equipped with up to three modules the assistant fulfills different customized or preset tasks like sample and buffer selection, sample injection, column switching, fraction collection. A selection of four different device types is available: valve, pump, UV detector, degasser. Depending on the selected modules the assistant is either a stand-alone compact system or a part of an advanced system.

### Compact HPLC

With a suitable selection of micro devices the ASM 2.1L can be used as a supplementary module for the HPLC or it can be combined to a compact HPLC system for chromatographic analyses in the high pressure range.

### Operating range

The device can be used in the following areas:

- Biochemistry analyses
- FPLC/Biopurification
- Chemical analyses
- Food analyses
- Pharmaceutical analyses
- Environmental analyses

### Eluents

Small quantities of substances such as additives, modifiers, or salts can influence the durability of the materials. For further reference on chemical compatibility, please consult the instructions of the integrated devices.

## Device overview

### AZURA® L features

As an additional module for the HPLC system, the ASM 2.1L can be equipped with different devices on request. If it is delivered with 2 micro devices and if the left position from front is left empty, the micro device located in the central position is represented as left device in the software. Following devices can be integrated:

### AZURA® Detector UVD 2.1S

The ASM 2.1L can be equipped with a detector on the left side. The AZURA® Detector UVD 2.1S is supplied with a test cell. For the use of the detector, a flow cell has to be installed.

#### Features

- Small variable single wavelength UV detector
- A wide range of flow cells for analytical or preparative LC applications with flow rates from 10 µl/min to 10 l/min.
- Automatic recognition and storing of device-specific information, which are important for Good Laboratory Practice, operation qualifications, or repairing the device.

1. Further described as "ASM 2.1L" or "Assistant"

You find further information in the AZURA® Detector UVD 2.1S instructions (document number V6820): <https://goo.gl/gkoDRW>

## AZURA® Pump P 2.1S/P 4.1S

The ASM 2.1L can be equipped with the AZURA® Pump P 2.1S/P 4.1S. The pump is equipped with an additional pressure sensor.

### Features

- Dual-piston technology
- Liquid transport with stable flow rate and high flow accuracy
- Long service life
- 10 ml and 50 ml pump head selectable
- With or without pressure sensor
- As a material for the pump head interior titanium or stainless steel can be chosen. For the 10 ml pump head ceramic can be chosen.

### Legend

- ① Pressure sensor
- ② Pump head

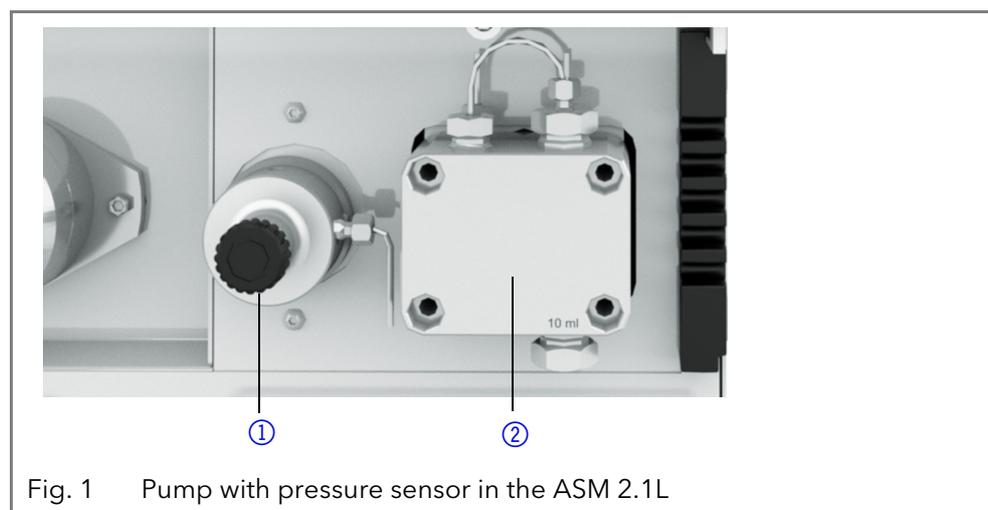


Fig. 1 Pump with pressure sensor in the ASM 2.1L

You find further information in the AZURA® Pump P 2.1S/P 4.1S instructions (document number V6870): <https://goo.gl/sUTdgS>

If the ASM 2.1L is equipped with a Smartline SmartMix mixing chamber, you find further information in the SmartMix instructions (document number V5350A): <https://goo.gl/QhW7j2>

## Valves

Prior to delivery the valve drive can be equipped with KNAUER multiposition valves and 2-position valves. Connections and channels of 2-position valves are described by abbreviations (example 6P/3C=2-position valve with 6 ports and 3 channels). In case of multiposition valves the central port does not count.

### Features

- 2-position valves with 6 ports and 8 ports  
2-position valves are used to inject the sample from the sample loop in the pumps high pressure flow, so that the sample is transported to the column.
- Multiposition valves with 6 ports and 8 ports  
Multiposition valves are used to switch fluid streams, e.g. the selection of eluents, columns or for fractionating of eluate. Bioninert valve heads are available.
- Valve heads available for different applications in UHPLC, analytical HPLC and preparative HPLC.
- Different valves of the company VICI Valco Instruments Co.Inc. can be installed.
- Valve drives 6V, 12V, 16V available.

**Legend**

① Valve head



Fig. 2 Valves in the ASM 2.1L

You find further information in the AZURA® Valve Drive V 2.1S instructions (document number V6860): <https://goo.gl/HSrsdn>

**Degasser**

The ASM 2.1L can be equipped with a degasser. By using a degasser up to two eluents can be degassed simultaneously in a reliable and comfortable way.

**Features**

- The usage of a degasser in front of the pump leads to a stable baseline of the chromatogram.
- Eluents must not be degassed before they be used in the HPLC.
- Analytical flow rate up to 10 ml/min

**Legend**

① Degasser



Fig. 3 2-channel degasser in the ASM 2.1L

**Gas outlet**

If the ASM 2.1L is equipped with a degasser, the gas outlet (exhaust) will be located on the front. Air and possibly solvent vapors will be pumped out here. If necessary, it can be combined with a fume hood or similar extraction device.



Fig. 4 ASM 2.1L gas outlet

You find further information in the AZURA® Degasser DG 2.1S instructions (document number V6880): <https://goo.gl/FMVV7>

# Configuration of modules

## Maximum number of same modules

Three modules can be integrated in an assistant. The number of same device types is limited:

- 1x Degasser
- 1x Detector UVD 2.1S
- 2x Pumps (only with ClarityChrom® or PurityChrom®), HPG is not supported

## Limitation of combination

The AZURA® Pump P 4.1S cannot be placed right of AZURA® Detector UVD 2.1S, because the fittings of the flow cell cannot be mounted.

An assistant with only detector integrated is not supported.

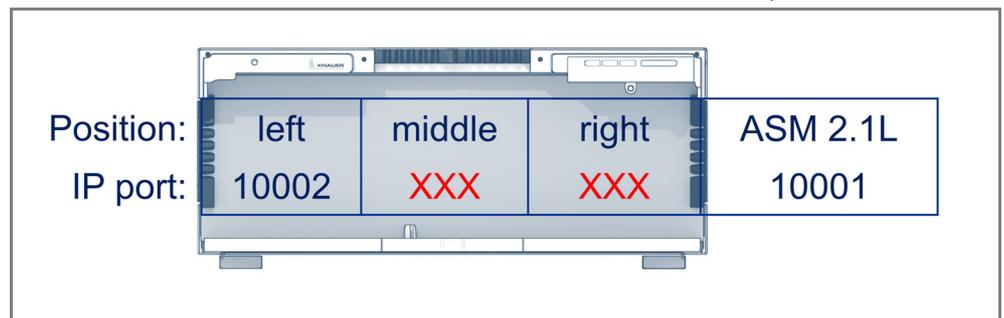
An assistant with only degasser integrated is not supported.

## Position of modules and IP port connections

The positions of the modules are important to address them by IP ports, which is required by the chromatography software PurityChrom® and by single device configuration.

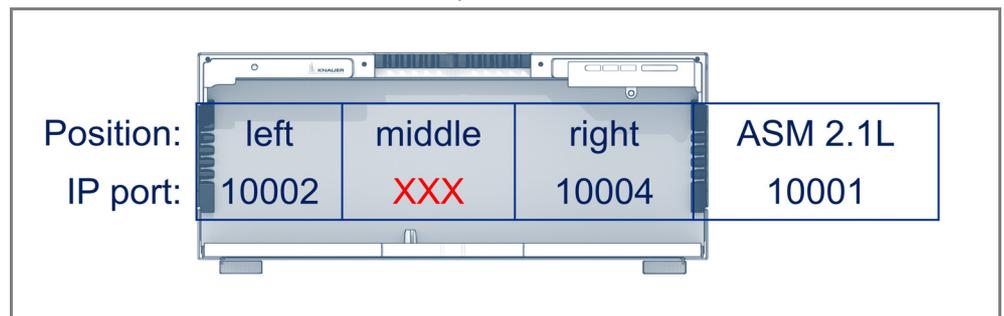
### One module

Is one module in the assistant, it is connected to the left (port 10002).



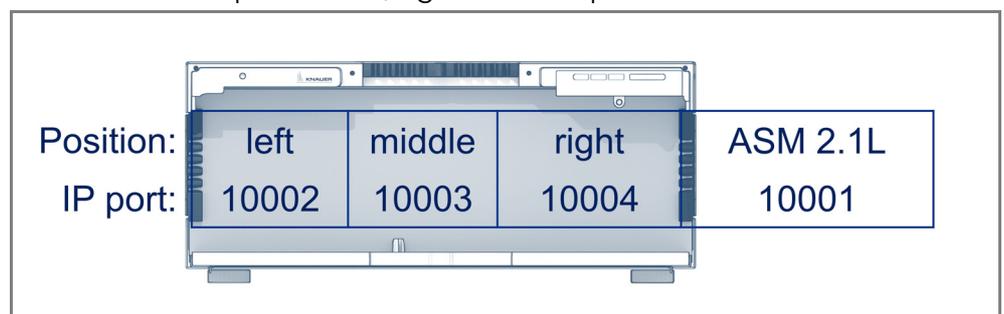
### Two modules

For two modules in the assistant, port 10003 is not connected.



### Three modules

For three modules, the position is as follows: left module: port 10002, middle module: port 10003, right module: port 10004.



## Software functions of different configurations

### ASM 2.1L configuration

Devices	ClarityChrom®	OpenLab®	Mobile Control V5
Two pumps (independent)	yes	no	no
Fraction valve	1	1	no
Injection module <sup>1</sup>	no	no	no

1. An injection module is a combination of one pump and one 6-port 2-position valve.

### Single device configuration

Devices	ClarityChrom®	OpenLab®	Mobile Control V5
Two pumps (independent)	yes	yes	yes
Fraction valve	1	Cascading <sup>1</sup>	1
Injection module	no	yes	no

1. Multi valve fraction collector

## Scope of delivery



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

- AZURA® Assistant ASM 2.1L with micro devices
- Supply cable with cold-device plug
- AZURA® accessories kit
- Accessories kits of the integrated micro devices

Valid documents:

- Instructions (document number V6815)
- Installation Qualification Document ("IQ")
- Declaration of conformity

## Basic safety instructions

### 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 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

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** DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
-  **WARNING** WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
-  **CAUTION** CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
-  **NOTICE** 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.



### 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>

## Safe operation of micro devices

Note the following warning instructions when operating an integrated micro device.

### General

#### Take the device into operation

##### 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.

**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.

**Connecting the pin header****NOTICE****Electronic defect**

Electrostatic discharge can destroy the electronics.

- Wear a protective bracelet against electrostatic discharge and ground.

**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.

**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.

**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.

**Detectors and flow cells****Detector setup****NOTICE****Component defect**

Damage to the flow cell possible due to inaccurate lifting.

- Lift the detector only at the sides of the housing.

**Maintain flow cells****! WARNING****Eye injury**

Irritation of retina through UV light. High-energy UV light can leak out from the flow cell or the fiber optic connectors.

- Switch off the detector or the lamps.

**Cleaning flow cells****NOTICE****Performance decrease**

Oil drops can contaminate the flow cell.

- Do not use compressed air for drying.

**Mounting capillaries****NOTICE****Component defect**

Damage to the ports caused by strongly tightened fittings.

- Use 5 Nm torque for stainless steel fittings.
- Use 0.5 Nm torque for PEEK fittings.

## Pumps

### Connenting eluent tube to pump head

#### NOTICE

#### Device defect

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

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

### Operating the pump

#### NOTICE

#### Device defect

If the pump is operated with pure distilled water, a significant higher wear of the piston and the piston sealing must be expected.

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

#### NOTICE

#### Component defect

Damage to the pump head in case it runs dry.

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

### Setting the flow rate

#### NOTICE

#### Device defect

Danger of high overpressure: If the button is pressed over a longer time, the flow rate is changing rapidly.

- Check the button pressure.

### Removing the pump head

#### 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.

### Mounting the pump head

#### NOTICE

#### Device defect

Damage to the pump head caused by overtightened capillary fittings.

- Note the torque of the fittings.

#### NOTICE

#### Smartline SmartMix

Leakage

Leakage possible.

- Before startup, always replace the red or black PEEK cap fittings in the LPG system with a metal fitting (spare parts kit Z5350A).

### Valves

Mounting valve onto valve drive

#### NOTICE

#### Device defect

Device damage due to blocked eluent flow.

- Check that the number of valve ports is identical with the type of valve drive (6V, 12V, 16V).

Mounting needle seal

**NOTICE****Component defect**

Rotor-seal damage caused from non-fitting seal.

- Only reuse seals in one and the same location.
- Preferably use a new seal.

Operating the valve

**NOTICE****Device defect**

Damage to the rotor seal located inside the valve.

- Never start or operate the valve without fluid.

Injecting the sample

**NOTICE****Component defect**

Valve damage when using pointed injection syringes.

- Use only injection syringes with luer lock and flat-ground cannula.

**Degasser**

Connecting degasser with 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.

## Symbols and signs

The following table explains symbols and labels which are used on the device, on the graphic user interface or in the instructions.

Symbol	Meaning
	Device fulfills the requirements of the Conformité Européenne, which is confirmed by the Declaration of Conformity.
 0.5 kg	Damage to the leak tray or front cover possible while carrying, setting up and installing a device. Grip the device at its sides near the middle when lifting or moving.
	Electrostatic-discharge hazard
	Notes provide useful tips and information worth knowing.

# Unpacking and setup

## 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.
- Leave some space for air circulation: See space requirements.

#### Space requirements

- At least 5 cm space if another device is set up on one side
- At least 10 cm space if further devices are set up on both sides
- At least 15 cm space on the rear panel for the fan.
- Make sure that the power plug on the power supply (wall mounted socket or power strip) is always accessible, so that the device can be disconnected from the power supply..

#### 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 near other machines that cause floor vibrations.
- Keep the detector away from high-frequency sources. High frequencies may compromise measuring values.

#### Power supply

The device is only suitable for alternating current. The supplied power cable is to be used to connect the device to the power supply.

## Unpacking



**Note:** The leak sensor may malfunction if the device stands on a tilted surface. Use a level to check that the device stands horizontally.

Store all packing materials. Included packing list should be kept for repeat orders.

#### Prerequisite

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

#### 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.

#### 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.

# Connectors on the rear side

**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.

### Legend

- ① Label with serial number
- ② LAN port
- ③ Interface for the Technical Support
- ④ Pin header
- ⑤ Fan
- ⑥ Integrator output
- ⑦ Connection and power switch

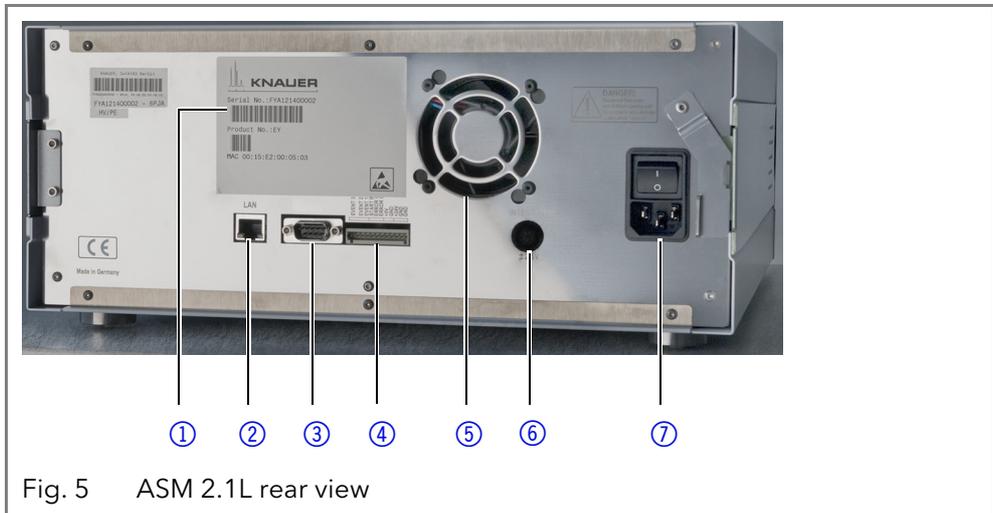


Fig. 5 ASM 2.1L rear view

External devices like computers, fraction collectors, etc. can be connected in 2 different ways to the detector:

- Control with pin header
- Connected to LAN within a network

## Controlling with the pin header

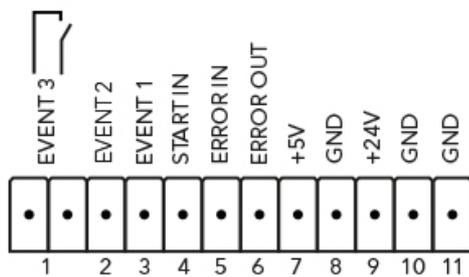
### Electronic defect

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.

### Connector assignments

The single ports exchange start, control and error signals with other devices. Events can only be controlled by software. Also consider the software instructions for controlling the pin header.



Connection	Function
EV 3 (Event 3)	<p><b>Relay contact</b></p> <p>The contact is on a floating basis. Its setting depends on the settings in the software.</p> <p>Steady-rate signal:</p> <ul style="list-style-type: none"> <li>▪ passive = open relay contact</li> <li>▪ active = closed relay contact</li> </ul> <p>Pulse:</p> <ul style="list-style-type: none"> <li>▪ Closed relay contact for at least 1000 ms</li> </ul> <p>Permissible load of the relay contact: 1 A/ 24 V DC</p>

Connection	Function
EV 2 (Event 2)	<p><b>OC output limited to 5 V</b></p> <p>Levels:</p> <ul style="list-style-type: none"> <li>▪ passive 5 V </li> <li>▪ active 0 V </li> </ul> <p>Pulse:</p> <ul style="list-style-type: none"> <li>▪ 0 V for at least 1000 ms </li> </ul>
EV 1 (Event 1)	<p><b>OC output limited to 5 V</b></p> <p>Levels:</p> <ul style="list-style-type: none"> <li>▪ passive 5 V </li> <li>▪ active 0 V </li> </ul> <p>Pulse:</p> <ul style="list-style-type: none"> <li>▪ 0 V for at least 1000 ms </li> </ul>
START IN	<p><b>TTL input</b></p> <ul style="list-style-type: none"> <li>▪ Low active</li> </ul> <p>Secure switching threshold at least 1000 ms 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.</p>
ERROR IN	<p><b>TTL input</b></p> <ul style="list-style-type: none"> <li>▪ Low active</li> </ul> <p>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.</p>
ERROR OUT	<p><b>OC output limited to 5 V</b></p> <p>Levels:</p> <ul style="list-style-type: none"> <li>▪ passive 5 V </li> <li>▪ active 0 V </li> </ul> <p>Pulse:</p> <ul style="list-style-type: none"> <li>▪ 0 V for at least 1000 ms </li> </ul>
+5 V	Not supported.
GND	Reference point of the voltage at the signal inputs
+24 V	Not supported.
GND	Reference point of the voltage at the signal inputs
GND	Reference point of the voltage at the signal inputs

## Integrator output

The integrator output sends measuring signals from the detector.

- non-bipolar
- 1 channel
- 0-5 V
- DAC 16 bit
- Scalable
- Adjustable to offset

# Startup

Optional mounting brackets, a holder for the Mobile Control or AZURA® Click can be attached to ASM 2.1L during initial startup (see "Repeat orders" on page 26). Check the instructions of the micro devices to find all information on initial startup (see "Device overview" on page 1).

## PEEK fittings

**NOTICE**

### Component defect

Damage to the ports caused by strongly tightened fittings.

- Use 5 Nm torque for stainless steel fittings.
- Use 0.5 Nm torque for PEEK fittings.

## ASM 2.1L as Compact HPLC isocratic

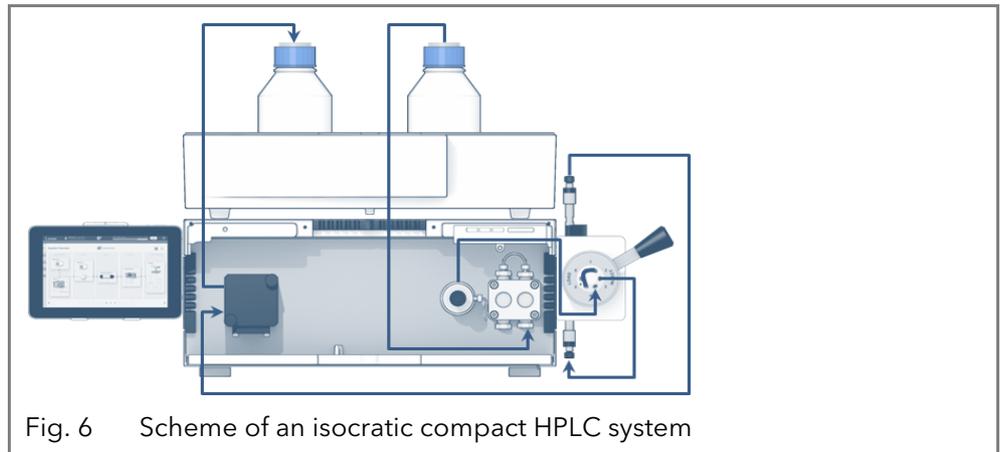


Fig. 6 Scheme of an isocratic compact HPLC system

**Tools** Tool kit A1033

**Procedure**

**Process**

1. Connect the solvent bottles with degasser.
2. Connect the degasser with pump.
3. Connect the pump to the manual valve.
4. Connect the valve with column.
5. Connect the column to the detector.
6. Connect the detector to the waste bottle.

## 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**

1. Carefully push the funnel ① into the center opening of the capillary guide ②.

**Figure**

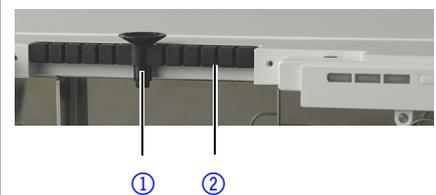


Fig. 7 Funnel and capillary guide

Process	Figure
<p>2. Push the long ending of the first nozzle ④ into the hose ③ .</p>	 <p>Fig. 8 Hose and nozzle</p>
<p>3. Connect the nozzle and the funnel. 4. Push the other end of the hose onto the nozzle ⑤ of the leak tray.</p>	 <p>Fig. 9 Hose connected to device</p>
<p>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>	 <p>Fig. 10 Leak tray with nozzle</p>

**Next step** Attach the front cover.

## Connecting a device to a computer to a Local Area Network (LAN)



**Note:** HPLC devices made by KNAUER work only with IP addresses 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

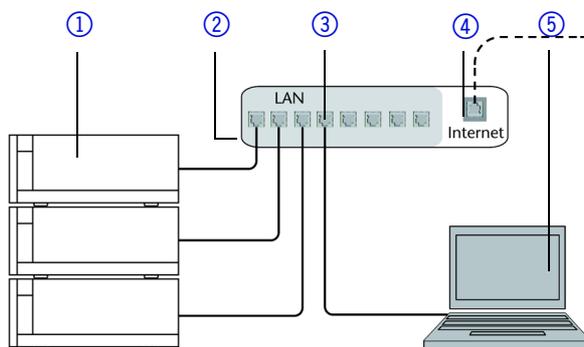
The LAN uses only one server (which is normally the router) from that the devices automatically receive their IP address.

- Prerequisites**
- In Windows, power saving, hibernation, standby, and screen saver must be deactivated.
  - In case you use an USB-to-COM box, the option "Allow the computer to turn off this 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.

- 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**
- Check that the IP address range of the router and of the company network do not overlap.
  - In case of an overlap, change the IP address range of the router.
  - Use the patch cable to connect the router WAN port to the company network.
  - 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**
- Find out port number and change it on the device.
  - Enter the port number in the chromatography software.

**Result** The connection is established.

## Operation

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. The list of supported documents is publicly accessible in the software section on the KNAUER website at Support > Software Information (document number V1663): <https://goo.gl/jz1SyM>

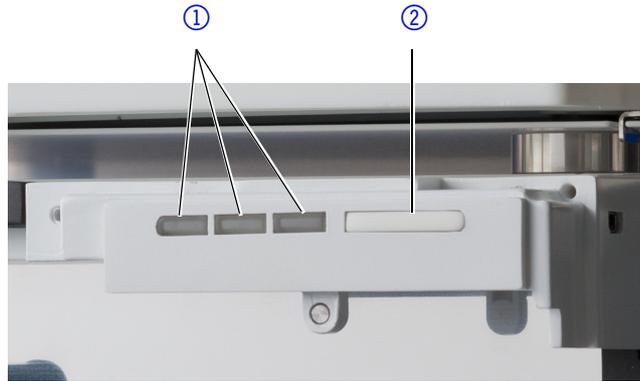
You will find a detailed description on the chromatography software in the software instructions.

### Mobile Control

The Mobile Control is a program for a computer or tablet. To operate via Mobile Control, the computer or tablet needs to be connected to a WLAN router. You will find a detailed description in the Mobile Control instructions V6851: <https://goo.gl/vGxTEZ>

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

## Meaning of the degasser LEDs

Two LEDs at the front of the degasser in the ASM 2.1L inform about the operation condition of the degasser.

- Yellow LED  
Shows that the vacuum has not yet reached the work range. Usually, the yellow LED lights up when the device is switched on and goes out as soon as the vacuum drops below 130 mbar.
- Green LED  
Shows that the vacuum is within the work range. Usually this indicator lights up when the vacuum has been generated and stays on as long as the degasser is in use.

## Startup

### Checklist prior to startup

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

- The modules are at the desired location.
  - The power plugs of the modules are plugged in.
  - The LAN connections between the modules and router are connected.
  - The LAN cable is connected to the workstation and router.
  - The chromatography software has been installed by KNAUER or a company authorized by KNAUER.
  - The capillaries in the solvent bottles have a filter insert.
  - All capillaries are tightly connected.
- Prerequisite**
- Capillaries, tubings and cables are connected.
  - In case of the detector the flow cell is installed.
  - Liquid container is sufficiently filled.
  - Washing container is sufficiently filled.

**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

Process	Figure
<ol style="list-style-type: none"> <li>1. Switch on the device at the power switch ① on the rear side.</li> <li>2. Wait until the device has completed the self-test.</li> <li>3. If the self-test has been successfully completed, the LED ② on the right lights up green.</li> </ol>	 <p>Fig. 11 Power switch on the rear side of the device</p>

### Result

The firmware is successfully initialized if shortly after switching on the device all three LEDs light up for approx. 1 second. If the test fails an error message will be displayed. Contact the Technical Support of KNAUER if the error occurs several times.

# Functionality tests



**Note:** For the ASM 2.1L, the Operation Qualification has to be performed for every micro device separately.



**Note:** Standard processes in single devices may be handled 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).

**Note:** 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

Inform the Technical Support of KNAUER.

## 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, 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 solutions

	<b>Problem</b>	<b>Solution</b>
<b>Assistant</b>	Device will not turn on.	Inspect the power cable to ensure that it is plugged into the power supply.
<b>Detector</b>	Baseline drift	<ul style="list-style-type: none"> <li>▪ Maintain constant temperature conditions during the measurement.</li> <li>▪ Avoid air draft.</li> <li>▪ Avoid vibrations.</li> </ul>
	Device cannot be calibrated.	<ol style="list-style-type: none"> <li>1. Fasten the knurled-head screws on the flow cell to prevent incursion from interfering light or an electronics error.</li> <li>2. Insert the test cell.</li> <li>3. Inspect the calibration with a weak absorbing eluent.</li> </ol>
	Baseline noise	<ol style="list-style-type: none"> <li>1. Inspect the flow-cell assembly.</li> <li>2. Fasten the knurled-head screws on the flow cell to prevent incursion from interfering light or an electronics error.</li> <li>3. Exchange the defective flow cell.</li> <li>4. Inspect the service life of the lamp.</li> </ol>
	The relationship of the signal to the light path reference is very low.	<ol style="list-style-type: none"> <li>1. Flush the flow cell.</li> <li>2. Clean the flow cell window.</li> <li>3. Replace the lamps</li> </ol>
<b>Pump</b>	When purging, the pump switches off	Check if the bleed screw on the pressure sensor is turned open.

	<b>Problem</b>	<b>Solution</b>
	Pump does not transport solvent	<ul style="list-style-type: none"> <li>▪ Purge the pump head to remove the air bubbles.</li> <li>▪ Inspect the eluent filter of the HPLC column and change when blocked</li> <li>▪ Clean check valves.</li> <li>▪ Exchange the check valves.</li> <li>▪ When the pump head seals are defective, solvent enters the piston backflushing. Inform the Technical Support of KNAUER.</li> <li>▪ Exchange the pump head.</li> </ul>
	Pressure and flow rate variations	<ul style="list-style-type: none"> <li>▪ Pump without pressure sensor: Pay attention to the influence of the pressure on the flow rate (will not be compensate).</li> <li>▪ Purge the pump head to remove the air bubbles.</li> <li>▪ Always tighten the inlet screw fittings and outlet screw fittings on the pump head with a torque wrench and 7.5 Nm.</li> <li>▪ Clean the check valves.</li> <li>▪ Exchange the check valves.</li> <li>▪ Exchange the pump head.</li> <li>▪ Inform the Technical Support of KNAUER.</li> </ul>
	Pump head leaks.	<ul style="list-style-type: none"> <li>▪ Inspect the inlet and outlet screw fittings of the pump head.</li> <li>▪ When the pump head seals are defective, solvent enters the piston backflushing. Inform the Technical Support of KNAUER.</li> <li>▪ Exchange the pump head.</li> </ul>
<b>Valves</b>	Valve leaks	Tighten the connections.
	Pressure variations caused by leaking valve head	Exchange the rotor seals.
<b>Degasser</b>	Air bubbles occur in the solvent tubes of the degasser outlet.	Check the inlet and outlet fittings. Replace old fittings, if necessary.
	No eluent flow	<p>If a buffer solution stays in the degasser for an extended period, it can cause clogging.</p> <ol style="list-style-type: none"> <li>1. Use another degasser chamber.</li> <li>2. Carefully let water flow into the clogged degasser chamber to dissolve the buffer.</li> <li>3. If this does not help, contact the Technical support.</li> </ol>

**SmartMix  
mixer**

Problem	Solution
The pump was switched off automatically, because Pmax was exceeded.	Exchange the filter system.
Pressure increase	Replace cartridge.
Filter system inserted wrong	Exchange the filter system.

**Further measures** Inform the Technical Support of KNAUER.

## 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 KNAUER in case the system message repeats itself.

The system messages are sorted alphabetically.

	System message	Solution
<b>A</b>	At least one wavelength must be valid.	Check whether a channel is on. Check whether the wavelengths are within permissible range (190-500 nm).
<b>C</b>	Calibration failed	Switch the device off and on. Check whether lamps, motor and filter are functioning correctly. Inform the Technical Support of KNAUER in case the system message repeats itself. Restart calibration on the device or in the chromatography software.
	Cannot initialize	Check cables and connections in local area network.
	Cannot proceed: D2 lamp heating	Wait for the ignition of the D2 lamp.
	Cannot proceed: D2 lamp is OFF!	Switch D2 lamp on before "RUN".
	Cannot proceed: Lamps are off	Switch the lamps on the device to "ON".
	Cannot read RTC	Switch the device off and on. Inform the Technical Support of KNAUER in case the system message repeats itself.
<b>D</b>	Detector: calibration failed	<ul style="list-style-type: none"> <li>▪ Check lamp.</li> <li>▪ Check piezomotor with filter wheel.</li> </ul>
	Detector: D2 lamp failed	Change the D2 lamp.
	Detector: D2 lamp not detected	Install a D2 lamp.
	Detector: external error detected	Error IN is connected to another device, which is defective.
	Detector: grating drive failed	<ul style="list-style-type: none"> <li>▪ Replace step motor of the grating drive</li> <li>▪ Replace the mainboard.</li> </ul>

	<b>System message</b>	<b>Solution</b>
	Detector: low light	<ul style="list-style-type: none"> <li>▪ Check lamp</li> <li>▪ Clean flow cell</li> </ul>
	Detector: not calibrated	Activate calibration
	Detector: validation failed	Install test cell and activate calibration
<b>E</b>	Error input activated	Device error. Change the device settings.
<b>G</b>	GUI communication failed	Replace the display.
<b>L</b>	Leak sensor not present	Switch the device off and then on. If the leak sensor is still not present, contact the Technical Support of KNAUER.
	Leak was detected	Switch off the device. Remove the leak and start the device afterwards.
<b>M</b>	Maximum pressure! System stopped	<ul style="list-style-type: none"> <li>▪ Reduce the pressure or adjust the upper pressure limit.</li> <li>▪ Restart the system.</li> </ul>
	Minimum pressure! System stopped	<ul style="list-style-type: none"> <li>▪ Increase the pressure or adjust the lower pressure limit.</li> <li>▪ Restart the system.</li> </ul>
<b>P</b>	Pump: external error detected	<ul style="list-style-type: none"> <li>▪ Localize the external error and remove it.</li> <li>▪ Replace the motor.</li> <li>▪ Replace the mainboard.</li> </ul>
	Pump: max. current detected	<ul style="list-style-type: none"> <li>▪ Replace the motor.</li> <li>▪ Replace the mainboard.</li> </ul>
	Pump: max. pressure detected	<ul style="list-style-type: none"> <li>▪ System pressure is too high.</li> <li>▪ Remove the blockage</li> <li>▪ Check the contacts at the motor</li> <li>▪ Replace the motor.</li> </ul>
	Pump: min. motor current detected	<ul style="list-style-type: none"> <li>▪ Replace the motor.</li> <li>▪ Check the motor contacts.</li> </ul>
	Pump: min. pressure detected	Localize leak in the system and remove it.
<b>V</b>	Valves have different types in 'column switch' mode	Correct the settings. Both valves have to be of the same type
	Valve left: failure detected!	<ul style="list-style-type: none"> <li>▪ Left valve is stiff.</li> <li>▪ Drive is defective.</li> </ul>
	Valve middle: failure detected!	<ul style="list-style-type: none"> <li>▪ Middle valve is stiff</li> <li>▪ Drive is defective.</li> </ul>
	Valve right: failure detected!	<ul style="list-style-type: none"> <li>▪ Right valve is stiff</li> <li>▪ Drive is defective.</li> </ul>
<b>W</b>	Wrong valve type	Correct the settings.

# Maintenance and care

Proper maintenance of your HPLC device will ensure successful analyses and reproducible results. Check the instructions of the micro devices to find all information on maintenance (see "Device overview" on page 1).

## 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.
- Removing the hood or the side panels.

## Required system information

### Serial number

The serial number can be found with the Mobile Control (*GLP*⇒*device*) as well as on the rear side of the device.

### Year of manufacture

The year of manufacture forms part of the serial number of the module, example: CDA103252525. The letters designate the device type; the year of manufacture is stated as year and calendar week. In the example, the module was manufactured in calendar week 32 of the year 2010. The last five digits are the identification number for the interface card (**Interface: Serial number**).

## 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.

## Maintenance tasks for users

The following maintenance tasks are recommended by KNAUER and may be performed by the user. The procedures are described in the according instructions.

### WARNING

#### Eye injury

Irritation of retina through UV light. Concentrated UV light can leak out from the flow cell or the fiber optic connectors.

- Switch off the device and pull the power plug.

> 2000 operating hours

Module	Measures
Detector	<ul style="list-style-type: none"> <li>▪ Check light intensity of the D2 lamp</li> <li>▪ Inspect the flow-cell assembly.</li> <li>▪ Clean the flow cell.</li> <li>▪ Replace the flow cell.</li> </ul>
Pump	<ul style="list-style-type: none"> <li>▪ Control the seals.</li> </ul>
Valve	<ul style="list-style-type: none"> <li>▪ Check screw fittings for leak loss.</li> </ul>
Degasser	<ul style="list-style-type: none"> <li>▪ Check screw fittings for leak loss.</li> </ul>
Pump	<ul style="list-style-type: none"> <li>▪ Replace the pistons</li> <li>▪ Replace the check valves</li> </ul>
Valve	<ul style="list-style-type: none"> <li>▪ Check screw fittings for leak loss.</li> </ul>

> 5000 operating hours

> 10000 operating hours

Module	Measures
Pump	<ul style="list-style-type: none"> <li>Replace the O-rings at the plates</li> </ul>

## Technical data



**Note:** Check the Technical Data of the integrated micro devices in the according instructions.

### Communication

Interface	LAN
Operation	<ul style="list-style-type: none"> <li>Mobile Control</li> <li>Software</li> </ul>
Input	Error (IN), Start (IN) both TTL
Output	Event 1-3 (OC, Relay), Error (OUT) (OC), + 5 V, + 24 V
Analog output	Integrator output (detector signal)

### General

Power supply	100-240 V; 50- 60 Hz; maximum 100 W
Dimensions	361 × 158 × 523 mm (Width × Height × Depth)
Weight	ca. 14 kg (depending on configuration)
Leak sensor	yes
Ambient conditions	<ul style="list-style-type: none"> <li>Temperature range: 10-40 °C; 50-104 °F</li> <li>Air humidity: 10-90 %, non-condensing</li> </ul>

## Repeat orders



**Note:** If a compact HPLC was ordered, tools and capillaries are within the scope of delivery. The torque wrench for pumps is not within the scope of delivery.

#### Mobile Control

Name	Order number
ASM 2.1L with micro devices	depending on selection
Accessories kit AZURA®	FZA02
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 mount	A9617

	Name	Order number
<b>Mounting brackets</b>	Mounting bracket AZURA® L Bio LC for manual injection valve, pH flow cell and 2 small prepacked columns	A9854-1
	Mounting bracket AZURA® L for axial compressible columns with 20 mm ID	A9853-3
	Mounting bracket AZURA® L for Hypershear mixing chamber	A9853-8
	Mouting bracket AZURA® L for KNAUER flow cells	A9853-5
	Mouting bracket AZURA® L for KNAUER injection valves	A9853
	Mouting bracket AZURA® L for manual KNAUER multi-position valves	A9853-9
	Mouting bracket AZURA® L for manual Vici/Valco injection valves	A9853-1
	Mouting bracket AZURA® L for preparative sample loop	A9853-6
	Mouting bracket AZURA® L for Vici/Valco valve drive	A9853-2
<b>Compact HPLC</b>	Capillary kit, 1/16" stainless steel	A9849
	Tool kit	A1033
	Solvent tray	AZC00
<b>Accessories</b>	Magnetic clip for column 8 mm	A9847
	AZURA® Click for attaching IFU 2.1, airsensor, pressure control	A70089

## 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](mailto:support@knauer.net)

Internet: [www.knauer.net](http://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.

# Glossary

Here you can find information on the abbreviations and terminology used in these instructions.

Term	Explanations
Backflushing	Backflushing of columns or precolumns to separate heavily retarding substances by changing the flow direction.
Channel	The connection of two valve ports by a special form of rotor seal
Dead volume	The dead volume of an HPLC system is the volume of the mobile phase, which is required to fill all hollow spaces of the HPLC system like capillaries, mixing chamber, valve etc. except the column. The dead volume should be as small as possible.
Degasser	Degasser module for fluids
GLP	Good Laboratory Practice - quality assurance for laboratories
Gradient	Time-dependent composition of solvent (mobile phase) on low-pressure or high-pressure side of system
HPG	Operating mode of HPLC system; separation of sample mixtures using high pressure gradient of pump
HPLC	High performance liquid chromatography
Integration time	The integration time determines how fast the detector reacts to changes in absorbance.
Isocratic	Sample mixtures separated with a constant composition of solvent
IQ	The IQ is the certification on the functionality of the device.
LED	Light-emitting diode
Luer-lock cannula	Standardized connection system between syringes and cannulae
OQ	Comprehensive functionality test of individual components in a system (operation qualification)
Port	Connector on a valve
Retarding	A substance which has a delayed elution caused by an interaction with the column fill material.
Router	Module in computer network that checks data packets and forwards them.
Solvents	Mobile phase (eluent) or carrier for liquid chromatography

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