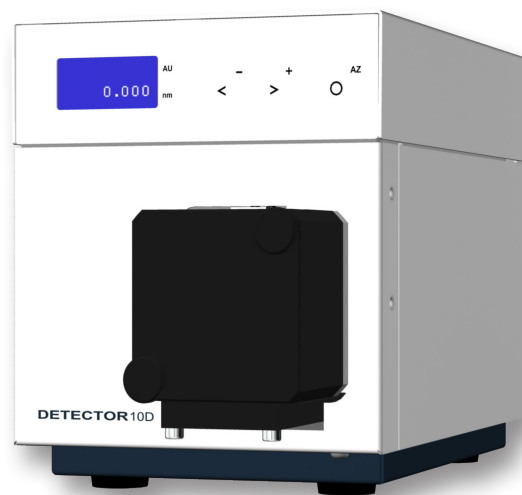


BlueShadow

▶ Detector 10D User Manual

V7670



HPLC

Table of Contents

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

Intended Use	5
Device Overview	5
Features	6
Eluents	7
Scope of Delivery	9
Safety for Users	10
Definition of Personal and Material Damage	12
Symbols and Signs	13
Unpacking and Setup	14
Contacting the Technical Support	14
Location Requirements	14
Space Requirements	15
Unpacking	15
Connectors on the Rear Side	16
Spring Strip for Remote Control	16
Plug Connector Assignments	16
Connecting Cables to the Pin Header	17
Analog Port	18
Ground	18
Initial Startup	20
Inserting the Flow Cell	20
Setting the Optical Path Length of a Preparative Flow Cell	21
Connecting the Capillaries	22
Startup of the Device	23
Operation	24
Basic Operation of the Device	24
Control of the Device	24
Menu Structure	25
Control	26
Activating/Deactivating the Lamp	26
Adjusting the Chromatogram	27
Smoothing output signal	27
Adjusting V/AU ratio	27
Checking on the Deuterium Lamp	28
Displaying Operating Hours	28
Using the Analog Port	28
Setting the Zero Point	28

Entering a Scaling Value	29
Control with Chromatography Software	29
Local Area Network (LAN)	30
Serial interface	30
Functionality Tests	31
Maintenance and Care	32
Maintenance Contract	32
Cleaning and Caring for the Device	32
What Maintenance Tasks can Users Perform on the Device?	32
Cleaning the Flow Cell	33
Rinsing the Flow Cell	33
Cleaning the Lens of an Analytical Flow Cell	34
Cleaning the Light Guide of a Preparative Flow Cell	35
Replacing the Flow Cell	36
Replacing the Fiber Optic	36
Removing the Fiber Optics	37
Technical Data	38
Legal Information	40
Warranty Conditions	40
Transport Damage	40
Disposal	41
Decontamination	41
Index	42
Declaration of Conformity	44

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

The detector is a measuring device that is used for measuring UV spectra quickly and precisely.

- ① Display
- ② Function button 1
- ③ Function button 2
- ④ Autozero button
- ⑤ Flow cell

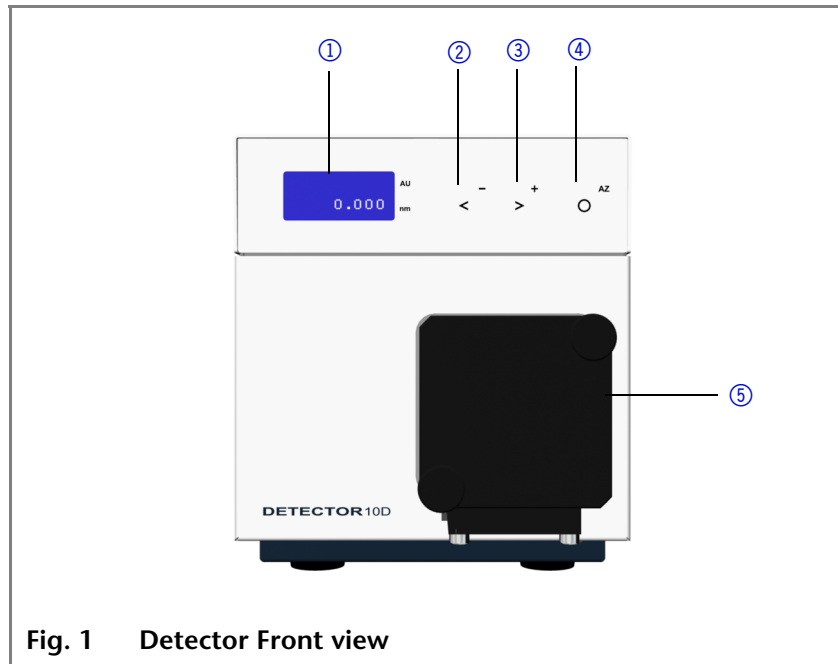


Fig. 1 Detector Front view

- ⑥ RS-232 port
- ⑦ LAN port
- ⑧ Spring strip
- ⑨ Integrator output
- ⑩ Power connection
- ⑪ Ground connection
- ⑫ Fan opening on rear panel

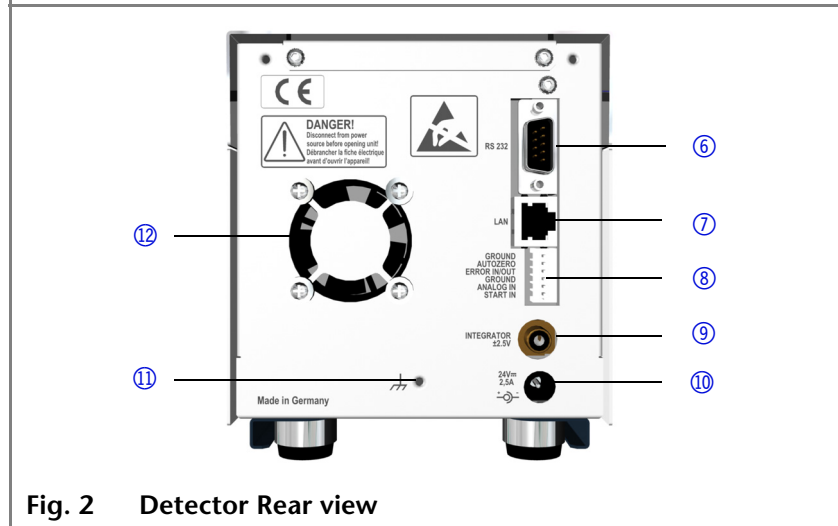


Fig. 2 Detector Rear view

Operating range The detector can be used in analytical and preparative HPLC system. It is used in laboratories to analyze substance mixtures. In an HPLC system, the detector serves to detect substances in liquids and show their concentration.

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

- Separation of chiral substances

- Separation of proteins
- Separation of fine chemicals
- Separation of active pharmaceutical ingredients (API)

The detector is, e. g., used at universities, research institutions, and routine laboratories.

Features

- This detector is one of the smallest HPLC detectors on the market.
- With the deuterium lamp spectra from 190 nm – 500 nm can be measured.
- Flexible use in the entire range of HPLC: Analytical flow cells with $\approx 10\text{-}\mu\text{l}/\text{min}$ flow rates and preparative flow cells with $10\text{-l}/\text{min}$ flow rates.
- Automatical recognition and storing of device-specific information, which are important for Good Laboratory Practice, operation qualifications, or repairing the device (Operation Qualification) or for repairing the device
- Automatic and current diagnosis of the device.
- External control with chromatography software or membrane keyboard
- Easy integration of the detector into complex chromatography systems

Options Various types of flow cells are available to the user. Pay attention to the compatibility of the flow cells.

A test cell is preassembled to the detector. Before the detector can be used, the test cell has to be replaced by a flow cell. The fiber optics detector is delivered without a test cell.

Eluents

Even small quantities of other substances, such as additives, modifiers, or salts can influence the durability of the materials. The solvent list contains the solvents KNAUER recommends for use. If there is any doubt, contact the Technical Support of the manufacturer.

Suitable solvents

- Acetic acid (10–50 %) at 25 °C/77.0 °F
- Acetone at 4 °C–25 °C (39.2 °F–77.0 °F)¹
- Acetonitrile
- Ammonia
- Benzene
- Carbon dioxide (liquid 99.999 % CO₂)
- Chloroform
- Dilute ammonia solution
- Dilute sodium hydroxide (1 M)
- Ethyl acetate
- Ethanol
- Hexane/heptane
- Isopropanol
- Methanol
- Phosphate buffer solutions (0.5 M)
- Phosphoric acid
- Sodium hydroxide
- Toluol
- Water

1. valid for the specified temperature range

Less suitable solvents

- Dimethyl sulfoxide (DMSO)
- Methylene chloride
- Slightly volatile solvents
- Tetrahydrofuran (THF)

Not suitable solvents

- Bases
- Halogenated hydrocarbons, e.g. Freon[®]
- Mineral and organic acids (except in buffer solutions)
- 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 KNAUER or a company authorized by KNAUER.

Delivery	Detector with flow cell ¹
	Power Cable
	Power unit
	Accessories kit UV-Detector 10D
	User manual (DE/EN)
	Installation Qualification Document (DE/EN)
	transportation securing device (standard detector)

1. A test cell is not included with the fiber optics detector delivery.

Safety for Users

Professional group The user manual is addressed to persons that are qualified as chemical laboratory technicians or have completed comparable vocational training.

The following knowledge is required:

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

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

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

- safety glasses with side protection
- protective gloves
- overall

What must be taken into account?

- All safety instructions in the user manual
- The environmental, installation and connection specifications in the user manual
- National and international regulations pertaining to laboratory work
- Original spare parts, tools, and eluents made or recommended by KNAUER
- Good Laboratory Practice (GLP)
- For development of methods and validation of devices: Protocol for the Adoption of Analytical Methods in the Clinical Chemistry Laboratory, American Journal of Medical Technology, 44, 1, pages 30-37 (1978)
- Accident prevention regulations published by the accident insurance companies for laboratory work

More safety-relevant information is listed in alphabetical order in the following table:

Topic	Explanations
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. All contaminated devices must be properly decontaminated. All materials or fluids used for decontamination must be collected separately and disposed of properly.

Topic	Explanations
Flammability	Organic eluents are highly flammable. Since capillaries can detach from their screw fittings and allow eluent to escape, it is prohibited to have any open flames near the analytical system.
Leaks	Regularly check if any system components are leaking.
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.
Eluent lines	Install capillaries and hoses in such a way that liquids cannot get into the interior in case of a leak.
Power strip	If several devices are connected to one power strip, always consider the maximum power consumption of each device.
Power cable	Defective power cables are not to be used to connect the device and the mains power.
Self-ignition point	Only use eluents that have a self-ignition point higher than 150 °C under normal ambient conditions.
Power supply	Only connect devices to voltage sources, whose voltage equals the device's voltage.
Toxicity	Organic solvents are toxic above a certain concentration. Ensure that work areas are always well-ventilated! Wear protective gloves and safety glasses when working on the device!
UV light	Concentrated UV light can disperse from a detector without flow cell or from the optical fiber, which leads to irritation of the retina. When the flow cell or the fiber optic are replaced, switch the device off and pull the power plug.

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 (see See "Contacting the Technical Support" on page 13.).

Take the device out of operation

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

Opening the module

The device may only be opened by the Technical Support of the manufacturer or any authorized person (see See "Contacting the Technical Support" on page 13.).





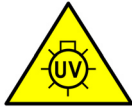

Definition of Personal and Material Damage

Possible dangers related to the device are distinguished in personal and material damages in this user manual.

Type of damage	Category	Explanations
Personal damages	DANGER!	Lethal or very serious injuries can occur.
	WARNING!	Serious injuries can occur.
Personal and material damage	CAUTION!	Moderate injuries can occur.

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
	High-voltage hazard
	Electric shock hazard
	Electrostatic discharge hazard, damages to system, device, or components can occur.
	General warning sign, moderate injuries can occur and also damages to system, device, or components.
	UV-light hazard, eye injuries can occur.
	A device or system marked with CE fulfills the product specific requirements of European directives. This is confirmed in a Declaration of Conformity.

Unpacking and Setup

Contacting the Technical Support

You have various options to contact the Technical Support:

Phone +49 30 809727-111

Fax +49 30 8015010

E-mail support@knauer.net

You can make your requests in English and German.

Location Requirements

Power supply The device is only suitable for 24 V direct current.

Only the supplied power unit is to be used to connect the device to the mains supply. Replace defective power unit only with original accessories from KNAUER.

Only use power units with a permission for use from your country. In case of queries contact the Technical Support.

Power Plug

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

Requirements The location for the device must meet the following requirements:

- level surface for device or system
- Protect from heavy ventilation
- Weight 1.5 kg
- Dimensions 121 x 129 x 187 mm
(width x height x depth)
- Power Supply 24 V DC
- Air humidity below 90 %, non condensing
- Temperature range 4 – 40 °C
39.2 – 104 °F



CAUTION!

Defect of the device due to overheating possible! Protect the device against exposure to direct sunlight.

Keep clear at least 15 cm at the rear and 5–10 cm at each side for air circulation.

Space Requirements

- Side clearance to other devices:
 - At least 5 cm, if there is another device on one side.
 - At least 10 cm, if there are devices set up on both sides.
- At least 15 cm on the rear panel for the fan.

Unpacking

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

Tool Utility knife



CAUTION!

Schäden an der Durchflussszelle durch falsches Heben möglich!

Den Detektor seitlich am Gehäuse hochheben.

- 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 in such a way that the label is in the correct position. 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.
 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 protective foil and transportation securing device (standard detector).

Connectors on the Rear Side

All connectors are located on the rear side of the detector.

Legend

- ① RS-232 port
- ② LAN port
- ③ Spring strip
- ④ Analog port
- ⑤ Power connection
- ⑥ Ground
- ⑦ Fan

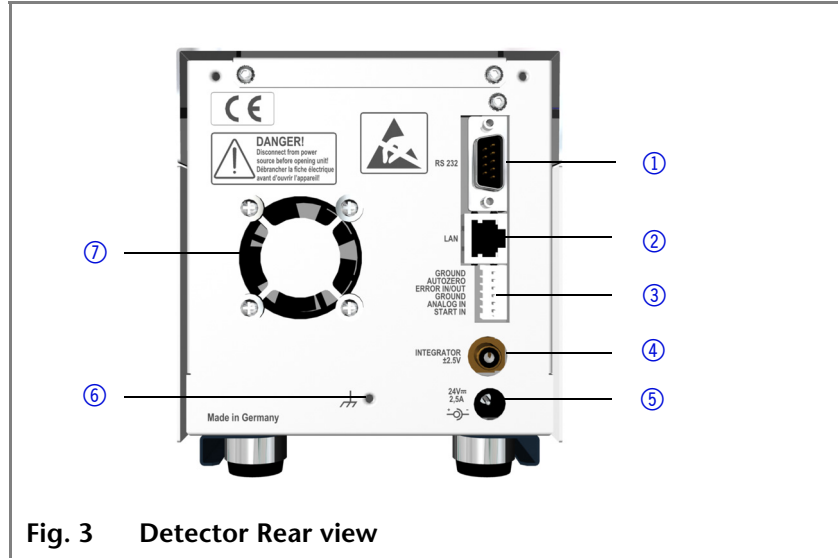


Fig. 3 Detector Rear view

External devices like computers, fraction collectors, etc. can be connected in 3 different ways to the detector:

- Connected via the spring strip (remote connector)
- Connected via LAN within a network
- Connected via RS-232

Spring Strip for Remote Control



CAUTION!

Zerstörung der Elektronik durch elektrostatische Entladung!

Geerdetes Armband tragen.

The spring strip is used for remote control. The single ports transport start, control and error signals.

Plug Connector Assignments

Connector	Function
GROUND	Reference point of the voltage at the signal inputs.
AUTOZERO	A signal (short-circuit to GROUND) sets the measuring signal to zero.

Connector	Function
ERROR IN/OUT	IN: After receiving a signal (short-circuit to GROUND) from an external device, an error message appears and the device stops. OUT: An error signal is active for as long as an error is displayed e.g. the lamp does not start.
GROUND	Reference point for external analog control of the detector.
ANALOG IN	Allows external analog control of the detector when the option ANALOG has been selected in the SETUP menu. The control voltage must be applied against GROUND.
Start IN	After receiving a signal (short-circuit to GROUND) from an external device, the device starts. If controlled via software, an electronic trigger is sent via LAN.

Connecting Cables to the Pin Header

To control one device through another, you use the pin header. The single ports are used to exchange control signals.

To use remote control, you have to connect cables to the pin header. Therefore, connect the cables firstly to the spring strip and push the spring contacts of the spring strip secondly onto the pins of the pin header.

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

Tools Depressor tool

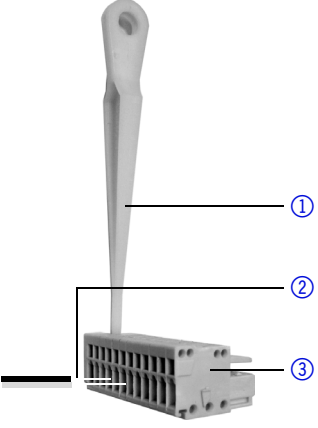


CAUTION!
Short-circuit hazard.
Turn off the device before connecting it to the pin header. Pull the power plug.



CAUTION! Electrostatic discharge can destroy the electronics!
Wear protective bracelet against electrostatic discharge and ground.

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Place the spring strip ③ on a suitable surface. 2. Push the depressor tool ① into the opening on the spring strip. 3. Continue pushing the depressor tool down and lead the cable ② into the front end of the spring strip. 4. Remove the depressor tool. 5. Check whether the cables are tightly attached. 6. Plug the spring strip onto the pin header. 	 <p>Fig. 4 Spring strip</p>

Next steps Finish the installation and perform the initial startup.

Analog Port

Using the analog port (ANALOG-IN), you can control the wavelength by changing the applied voltage. Before connecting the analog port, you have to choose analog in the setup menu. The control voltage must be applied against GROUND. (see See "Using the Analog Port" on page 27.)

Example To use the analog port for controlling the detector, you have to set a zero point and enter a scaling value.

- Zero point at 0 V = 000 nm
- Scaling: 100 nm per Volt

If 5-V voltage is applied, the wavelength is 500 nm.

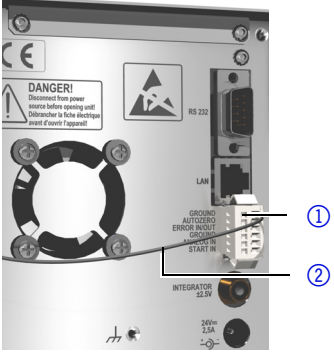

Ground

Note The detector is not grounded if it is connected with a 24-V power supply to a 220-V outlet.

Voltages, which may influence the measuring result, can be discharged if the device is detected to a grounded KNAUER device, e. g., a thermostat.

Tool Depressor tool

Procedure

Process	Figure
<ol style="list-style-type: none"> 1. Remove 5 mm of insulation from the ends of the cable ② . 2. Using the depressor tool, open the port <i>Ground</i> ① on the spring strip. 3. Insert the first cable end. 	
<ol style="list-style-type: none"> 4. Connect the second cable end to the port <i>Ground</i> on the remote connector of a grounded 220-V KNAUER device ③ . 	
Result	The physical connection is established.

Initial Startup

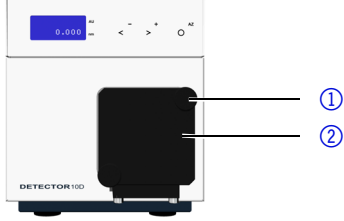
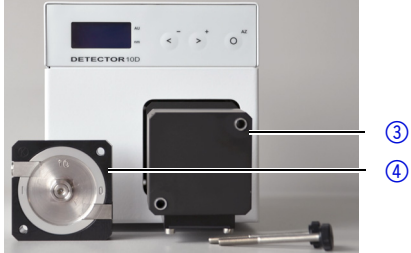
Note Before the detector is ready to use, a flow cell must be installed. Before installing the flow cell, the optical path length can be changed. The optimal path length depends on type and quantity of the sample.

Inserting the Flow Cell

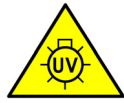
The test cell has no connectors for capillaries and must therefore be replaced by a flow cell before first usage.

Note The test cell is used during operation qualifications and must be stored.

- Prerequisite**
- Detector has been switched off.
 - Power plug is pulled out.

Process	Figure
<p>Procedure</p> <ol style="list-style-type: none"> 1. Unscrew the 2 knurled-head screws ①. 2. Pull out the slide ②. 3. Remove the test cell. 	 <p>Fig. 5 Removing the slide</p>
<ol style="list-style-type: none"> 4. Insert the flow cell ④ into the slide ③. 5. Push the slide into the detector. 6. Insert the knurled-head screws and screw tight. 	 <p>Fig. 6 Assembling the flow cell</p>
<p>Result</p>	<p>Flow cell is assembled. The next step is connecting the capillaries.</p>

Setting the Optical Path Length of a Preparative Flow Cell



WARNING!

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.

Depending on type, the path length is factory set to 2 mm, 3 mm, or 10 mm. You can remove the spacers on one or both sides and hence change the path length to 1.25 mm or 0.5 mm.

Prerequisite Flow cell has been disassembled.

Tool Allen wrench size 3

Legend

- ① Threaded ring
- ② Cover
- ③ Spacer
- ④ Seal holder (compression bushing)
- ⑤ Light guide with PTFE seal

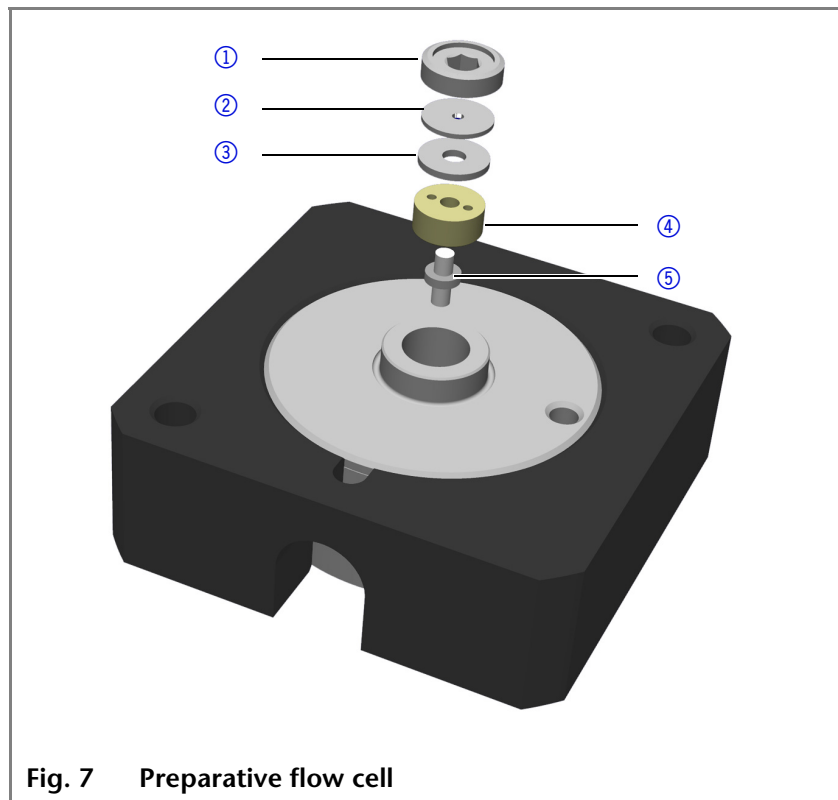


Fig. 7 Preparative flow cell

- Procedure**
1. Using the allen screwdriver, unscrew and remove the threaded ring ①.
 2. Remove the cover ② and spacer ③. Put the spacer aside.
 3. Insert the cover.
 4. Using the wrench, tighten the threaded ring.

Extending the Optical Path Length

To enlarge the optical path length, put in one or both spacers.

Connecting the Capillaries

Capillaries connect the detector to other devices and lead liquids.

Prerequisite Flow cell has been assembled.

Procedure Attach capillary with screw fitting.

Tool Torque wrench



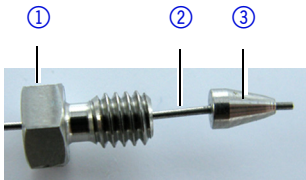
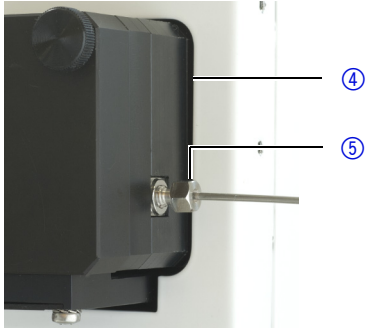
CAUTION!

Damage to the flow cell caused by strongly tightened fittings!

Check the torque of screw fittings:

- 5 Nm for stainless steel fittings
- 0.5 Nm for PEEK fittings

Connecting the capillary

Steps	Figure
<ol style="list-style-type: none"> 1. Push the capillary ② through the fitting ①. 2. Push the clamping ring ③ onto capillary. 	 <p>Fig. 8 Capillary fitting</p>
<ol style="list-style-type: none"> 3. Manually, screw together the capillary and the flow cell ④. To avoid leaks, tighten the fitting ⑤ with a maximum torque of 5 Nm by using the open-end wrench. 	 <p>Fig. 9 Capillary and flow cell</p>

Note PEEK fittings withstand a maximum pressure of 50 bar.

Result Capillaries have been connected and the detector is ready for operation.

Startup of the Device

**CAUTION!**

Possible damage to the device caused by condensed water!

Allow device to acclimate for 3 h, before it is connected to power supply and taken into operation.

- Prerequisite**
- Installation has been completed.
 - Flow cell has been assembled.

- Procedure**
1. Switch off the power supply.
 2. Plug the power supply into the device.
 3. Connect the power supply and the plug.
 4. Plug in the power supply.
 5. Using the power-supply switch, switch on the detector.

Result The detector starts its self-calibration. The display shows the progress that has been made. When the self-calibration has finished, the status display appears. If the self-calibration fails, switch the detector off and back on.

Practical Tip Regularly check the capillaries for leaks.

Operation

The detector can be operated in two ways:

- Control via the buttons on the front panel
- Control with chromatography software

Basic Operation of the Device

Display The status display shows the values for absorption and wavelength.

Legend

- ① Absorption
- ② Wavelength



Fig. 10 Status display

Note When the deuterium lamp has been turned off or is heating, the absorption values are substituted by OFF or HEAT, respectively.

Buttons There are 3 buttons on the detector that can be used for basic operation. Using the buttons, you can monitor the device and change the settings.

Note To avoid falsifying measuring values, KNAUER recommends to press the Autozero button before every measurement and after exchanging eluents.

Figure	Function
<p>Fig. 11 Arrow keys</p>	<ul style="list-style-type: none"> ▪ Hold down left arrow key. Scroll using the right arrow key. ▪ Press any of the arrow keys to set values and to change settings.
<p>Fig. 12 Autozero</p>	<ul style="list-style-type: none"> ▪ Initiating an autozero: Absorption is set to 0.000.

Control of the Device

You can control the device using the buttons on the front panel. Handle the buttons in the following manner:

- Handling**
1. Hold down left arrow key. Scroll through the menu using the right arrow key.
 2. Let go of left arrow key and, using both arrow keys, set the values.

Menu Structure

Legend

- ① Start-up routine
- ② Status display
- ③ Lamp status
- ④ Time constant
- ⑤ Integration time
- ⑥ Light intensity
- ⑦ Control
- ⑧ Analog-Out
- ⑨ Analog-In
Zero point
- ⑩ Analog-In
Scaling
- ⑪ Lamp Operatin
hours
- ⑫ Serial number
- ⑬ Firmware

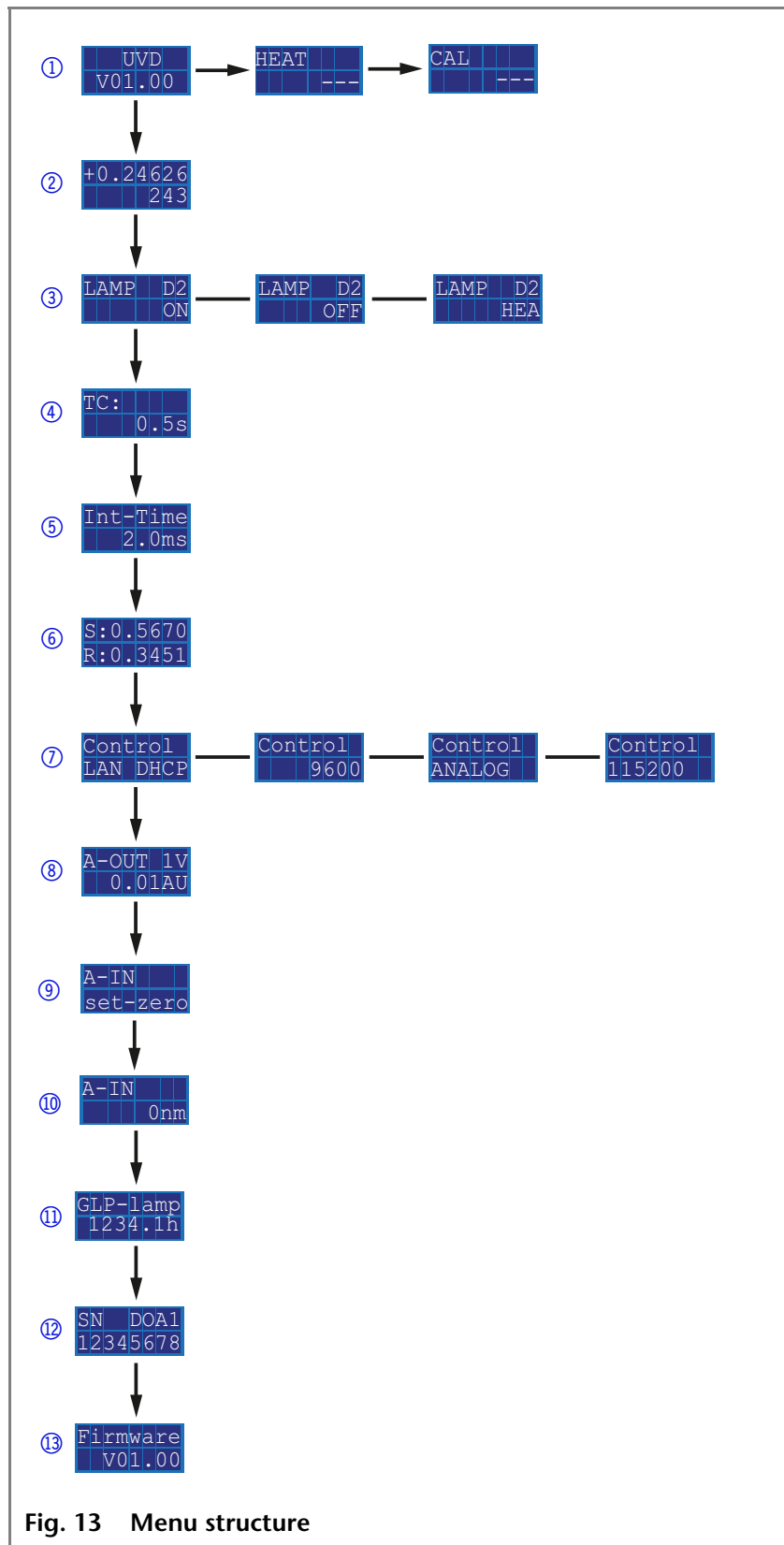



Fig. 13 Menu structure

Control

Choose between analog or digital ports to control the device accordingly.

- Ports**
- LAN DHCP: Control with LAN, IP address is obtained automatically (recommended)
 - RS-232 9600: Serial port for cables longer than 2 m
 - RS-232 115200: Serial port for cables with up to 2 m length
 - ANALOG: Control with applied voltage

- Prerequisite**
- Where applicable: a physical connection has been established.
 - Status display is active.


	Steps	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, choose a port. 	 <p>Fig. 14 Display port</p>
Result	When setting is finished, the status display appears.	

Activating/Deactivating the Lamp

The status display shows not only absorption and wavelength, but also indicates the status of the lamp.

- HEA: deuterium lamp lights up
- OFF: Deuterium lamp is inactive.
- ON: Deuterium lamp is active.

Prerequisite Status display is active.

	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, activate or deactivate the deuterium lamp. 	 <p>Fig. 15 Display Lamp</p>
Result	When setting is finished, the status display appears.	

Adjusting the Chromatogram

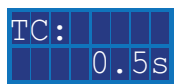
To get a better representation of the chromatogram, you can either smooth the output signal or adjust the voltage/absorption ratio.

Smoothing output signal

To smooth the output signal, you have to change the values of the time constant.

- 0.00 s, 0.02 s, 0.05 s, 0.1 s, 0.2 s, 0.5 s, 1 s, 2 s

Prerequisite Status display is active.

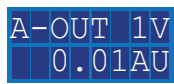
	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, set a value. 	 <p>Fig. 16 Display time constant</p>
Result	When setting is finished, the status display appears.	

Adjusting V/AU ratio

By assigning different absorption values to a voltage value of 1 V, you can stretch or compress the chromatogram. You can choose the absorption value out of 3 values:

- 0.01 AU
- 0.1 AU
- 1 AU

Prerequisite Status display is active.

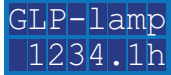
	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, set a value. 	 <p>Fig. 17 Display Analog Out</p>
Result	When setting is finished, the status display appears.	

Checking on the Deuterium Lamp

Note The deuterium lamp should be checked on a regular basis. According to Good Laboratory Practice (GLP), a deuterium lamp should not be operated for longer than 2000 operating hours.

Displaying Operating Hours

Prerequisite Status display is active.

	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 	 <p>Fig. 18 Display operating hours of lamp</p>
Result	The number of operating hours is displayed and afterwards the status display appears.	

Next steps If the deuterium lamp has been operating for approximately 2000 hours consider lamp replacement.

Using the Analog Port


To use the analog port for controlling the detector, you have to set a zero point and enter a scaling value.

Setting the Zero Point

The zero point is predefined by the applied voltage.

Prerequisite


- Device has been connected to GROUND.
- ANALOG port has been selected.

	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of the arrow keys. 3. Press Autozero. 	 <p>Fig. 19 Display Analog-In set zero</p>
Result	The applied voltage is set as the zero point and is adjusted to 0 nm wavelength.	

Entering a Scaling Value

It is recommended to set 500 nm at an applied voltage of 5 V.

- Prerequisite**
- Device has been connected to GROUND.
 - ANALOG port has been selected.
 - Zero point has been set.

	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Apply voltage. 2. Keep left arrow key pressed. Press right arrow key until the correct display appears. 3. Let go of left arrow key. 4. Using the arrow keys, set a value. Do not press Autozero. 	 <p>Fig. 20 Display Analog-In Scaling</p>
Result	When setting is finished, the status display appears.	

Control with Chromatography Software

The detector 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.

There are two advantages to the use of software:


- Continuous operation for triggered measurement is possible.
- System status can be checked in the software.

To be able to control the device using chromatography software, the computer must be connected to the device either with a RS-232 cable or a LAN cable.

Local Area Network (LAN)

A detector connected to a LAN is recognized by the software and automatically receives an IP address because it is set to Dynamic Host Configuration Protocol (DHCP) at the factory.


- Prerequisite**
- Device has been connected to LAN.
 - Status display is active.

	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using the arrow keys, set to LAN DHCP. 	 <p>Fig. 21 Display control</p>
Result	When setting is finished, the status display appears.	

Serial interface

The user can choose between two ports:

- 115200: Serial port for cables with up to 2-m length
 - 9600: Serial port for cables longer than 2 m
- Prerequisite**
- Detector is connected to a computer.
 - Status display is active.

	Process	Figure
Procedure	<ol style="list-style-type: none"> 1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using the arrow key, select the baud rate. 	 <p>Fig. 22 Display control</p>
Result	When setting is finished, the status display appears.	

Functionality Tests

Installation Qualification (IQ) Certification on the functionality of the device. During installation of the device, an installation report (*IQ* document) is created upon request in coordination with the Technical Support of KNAUER.

This installation report needs to be completed in full and signed by both parties. It serves as proof of the properly executed installation and functionality of the device.

Operation Qualification (OQ) Extensive test of the device's functionality. A successfully executed OQ ensures that the device functions properly.

Test Intervals Run the extensive functionality test at the following time intervals:

Average use	Device test
1 to 5 days/week:	Every 6 months
More than 5 days/week or 24 hours/day:	Every 3 months
Operation with buffer solutions or other salt solutions:	Every 3 months

Execution The test can be carried out either by KNAUER's Technical Support or by a technical service authorized by KNAUER.

The OQ documentation required for executing the OQ is with costs (once) and can be ordered separately from KNAUER.

Maintenance and Care

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

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
- Removing the hood or the side panels.

Cleaning and Caring for the Device



VORSICHT!

Geräteschäden durch eintretende Flüssigkeiten möglich!

Lösungsmittelflaschen neben das Gerät oder in eine Flaschenwanne stellen. Reinigungstücher nur anfeuchten.

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

What Maintenance Tasks can Users Perform on the Device?

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 wetter 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.



WARNUNG!

Reizung der menschlichen Netzhaut durch UV-Licht. Gebündeltes UV-Licht kann an der Durchflusszelle oder am Lichtwellenleiter austreten. Gerät ausschalten und Netzstecker ziehen!



VORSICHT!

Wartungsarbeiten an eingeschalteten Geräten können zu Geräteschäden führen. Netzschalter ausschalten und Netzstecker ziehen.

Users may perform the following maintenance tasks themselves:

- Regularly check the operating hours of the deuterium lamp. According to Good Laboratory Practice (GLP), a deuterium lamp is to be in operation for no longer than 2000 operating hours.
- Inspect the flow cell assembly.
- Clean the flow cell.
- Replace the flow cell.
- Replace the fiber optic connectors (Fiber Optics Version only).

Order numbers of the required spare parts can be found in the chapter *Accessories and Spare Parts*.

Cleaning the Flow Cell

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

Note Dirty lenses or fiber optic connectors could falsify the measurement. Do not touch the lens or the fiber optic connector lenses with bare hands. Wear gloves.

Rinsing the Flow Cell



CAUTION!
Contamination of the flow cell caused by oil drops! Do not use compressed air for drying.

Flushing solution: The following solvents are recommended for flushing:

- HCl
- NaOH
- Ethanol
- Acetone

Tools Syringe

- Procedure**
1. Fill the syringe with flushing solution.
 2. Inject it into the inlet of the flow cell and allow it to act for 5 minutes.
 3. Fill the syringe with water and inject again.
 4. Remove the flow cell from the detector and use a nitrogen stream to dry it.

Result Flow cell is clean.

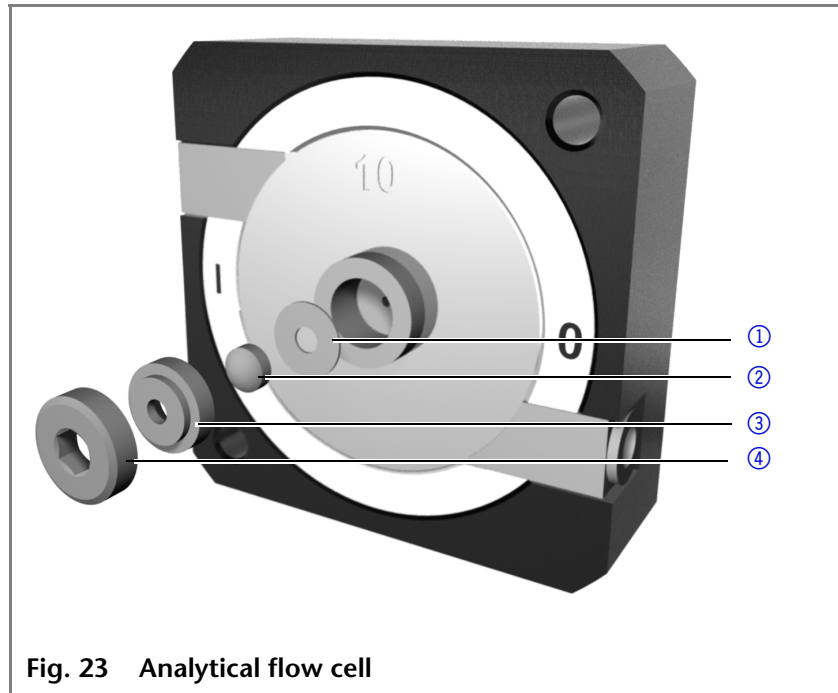
Next steps Check, if the baseline noise has disappeared.

If the flushing does not have the desired effect, all flow cells can be disassembled to clean the lens.

Cleaning the Lens of an Analytical Flow Cell

Legend

- ① Seal ring
- ② Lens
- ③ Compression part
- ④ Threaded ring



- Prerequisite**
- Device has been switched off.
 - Power plug has been pulled.
 - Flow cell has been removed.
- Tools**
- Tweezers
 - Allen screwdriver, size 3
- Procedure**
1. Using the allen screwdriver, loosen the threaded ring ④.
 2. Using tweezers or by gently tapping on a clean surface, remove the compression part ③.
 3. The lens ② is protected by a seal ring ①. This must be renewed every time the lens is disassembled.
 4. Remove the lens and clean with a clean, soft cloth or with water in an ultrasonic bath.
 5. Afterwards, assemble the flow cell and make sure that the new seal ring does not interrupt the light path.
 6. Using the allen screwdriver, tighten the threaded ring.
- Result** Flow cell can be assembled.
- What to do when...** If the cleaning of the lens does not have the desired effect, the lens has to be replaced.

Cleaning the Light Guide of a Preparative Flow Cell

Legend

- ① Threaded ring
- ② Cover
- ③ Spacer
- ④ Compression bushing
- ⑤ Light guide with seal ring

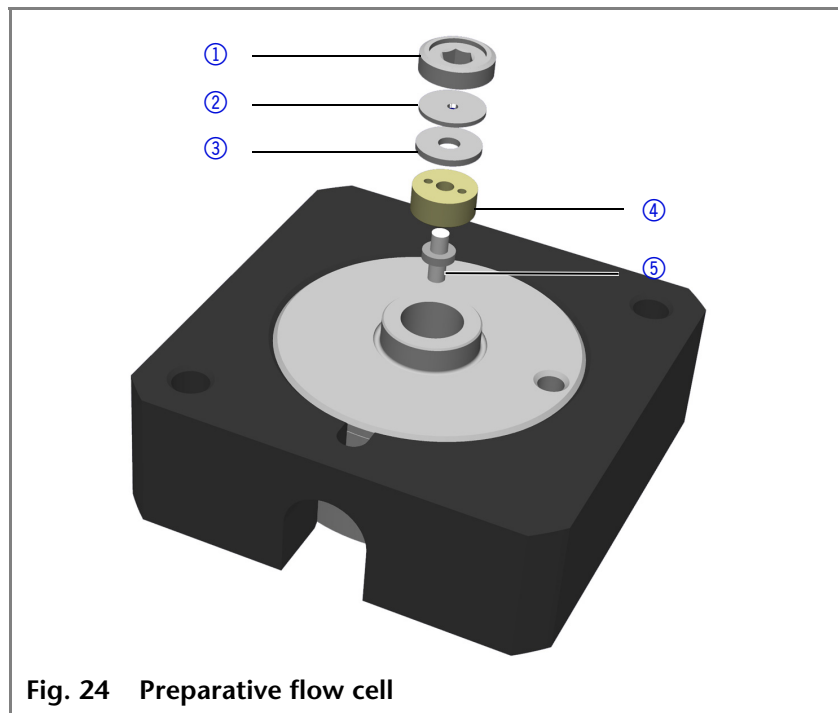


Fig. 24 Preparative flow cell

- Prerequisite**
- Device has been switched off.
 - Power plug has been pulled.
 - Flow cell has been removed.

- Tools**
- Tweezers
 - Allen screwdriver, size 3

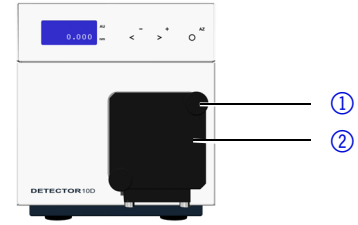
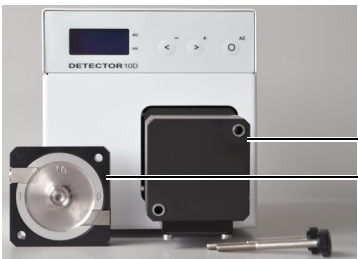
- Procedure**
1. Using the screwdriver, loosen the threaded ring ①.
 2. Remove the cover ② and the spacer ③ (not part of all flow cells).
 3. Using the tweezers, pull out the compression bushing ④ and the light guide ⑤.
 4. Carefully push the light guide out of the holder and strip off the seal. The seal ring needs to be renewed during every cleaning of the fiber optics.
 5. Clean the light guide with a clean, soft cloth or with an appropriate solvent in an ultrasonic bath. Make sure that the clean light guide is not touched by fingers.
 6. Afterwards, assemble the flow cell and make sure that the new seal ring does not interrupt the light path.
 7. Using the screwdriver, tighten the threaded ring ①.

Result Flow cell can be assembled.

What to do when... If the cleaning does not have the desired effect, the light guide has to be replaced.

Replacing the Flow Cell

- Prerequisite**
- Detector has been switched off.
 - Power plug has been pulled.
 - Capillaries are disconnected.

Procedure	Steps	Figure
	<ol style="list-style-type: none"> 1. Unscrew the 2 knurled-head screws ①. 2. Pull out the slide ②. 3. Remove the flow cell. 	 <p>Fig. 25 Removing the slide</p>
	<ol style="list-style-type: none"> 4. Insert the flow cell ④ into the slide ③. 5. Push the slide into the detector. 6. Tighten the knurled-head screws. 	 <p>Fig. 26 Assembling the flow cell</p>
Result	Flow cell is assembled. The next step is connecting the capillaries.	

Replacing the Fiber Optic

UV light will cause the optical fiber to become blind with time (solarization), making them no longer suitable for use.

Observe the following regarding the use of UV fiber optics:

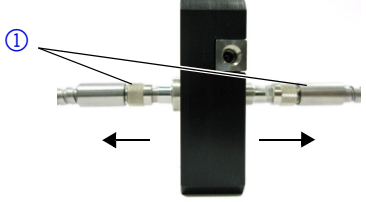

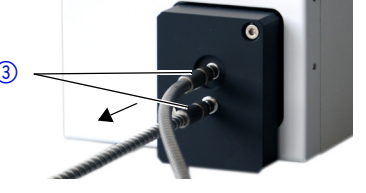
- Do not touch the ends of the fiber optics with your fingers, as this could falsify the measurement.
- Handle the fiber optics with care, avoid impacts or hard actions.
- Move the fiber optics carefully without using pressure or bending it.

Removing the Fiber Optics

Prerequisites The device has been switched off.

Tools Cap fittings for the fiber optics

Note Do not touch the ends of the fiber optics with your fingers, as this could falsify the measurement

Procedure	Process	Figure
	1. Manually, unscrew the fittings① of the fiber optic from the flow cell.	 <p>Fig. 27 Fitting of the fiber optics on the flow cell</p>
	2. Seal the fiber optic connectors with caps ②.	 <p>Fig. 28 Cap fitting on the fiber optics</p>
	3. Manually unscrew the fiber optic ③ from the detector.	 <p>Fig. 29 Fitting of the fiber optics on the detector</p>

Technical Data

Detection	Product type	Small variable single wavelength UV detector. Small variable single wavelength UV detector with fiber optics connectors.
	Detection channels	1
	Light source	Deuterium (D ₂) lamp with integrated GLP chip
	Wavelength range	190-500 nm (D ₂)
	Spectral bandwidth	13 nm at H _α line (FWHM)
	Wavelength accuracy	± 3 nm
	Wavelength precision	0.7 nm (ASTM E1657-94)
	Noise	± 2.0 × 10 ⁻⁵ AU at 254 nm ± 2.5 × 10 ⁻⁵ AU at 254 nm (fiber optics version) (ASTM E1657-98)
	Drift	± 3.0 × 10 ⁻⁴ AU at 254 nm ± 4.0 × 10 ⁻⁴ AU at 254 nm (fiber optics version) (ASTM E1657-98)
	Linearity	> 2.0 AU at 270 nm (ASTM E1657-98)
	Time constants	0.00/ 0.02/ 0.05/0.1/ 0.2/ 0.5/1.0/ 2.0 s
	Integration time	Automatic
	Communication	Maximum data rate
Inputs		Autozero, Start (IN), Error (either IN or OUT), 0–10 V Analog IN
Outputs		Error (either IN or OUT)
Analog outputs		1 × ± 2.5 V scalable, 20 bit
Control		Digital: RS-232, LAN-DHCP, remote connector Analog: wavelength control Manual: front panel
Technical parameters	GLP	Lamp operating hours
	Display	LED
Ambient conditions	Temperature range	4 – 40 °C, 39.2 – 104 °F

General

Air humidity	Below 90 %, non condensing
Power supply	External: input 100–240 V, output 24 V DC, 60 W
Dimensions (Width × Height × Depth)	121 x 129 x 187 mm 121 x 129 x 236 (with flow cell)
Weight	1.5 kg
Protection type	IP 20
Height above sea level	maximum 2000 meters

Legal Information

Warranty Conditions

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

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

This warranty excludes the following:

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

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

KNAUER Wissenschaftliche Geräte GmbH

Hegauer Weg 38

14163 Berlin, Germany

Phone: +49 30 809727-111

Telefax: +49 30 8015010

e-mail: info@knauer.net

Internet: www.knauer.net

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 any damage, contact the Technical Support and the forwarder company within three workdays.

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 "Elektroaltgerätereister" (EAR). The number belongs to category 8.
- 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 with isopropanol first and water afterwards before being maintained, disassembled or disposed.

Decontamination

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



DANGER!

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

Before disposing off or sending away contaminated devices, commission an expert with the decontamination.

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.

Index

A

Absorption **24, 27**
Accessories **9**
Additives **7**
ANALOG IN, see spring strip **17**
Analog port **18**
 Example **18**
 Scaling **29**
 Zero point **28**
Autozero (Button) **24**
AVV marking **41**

C

Capillaries **22**
Capillary
 Clamping ring **22**
 Fitting **22**
 Torque **22**
Care **32**
CE marking, see Declaration of conformity **44**
Checking on the Deuterium Lamp **28**
Chromatogram **27**
 Axis scale **27**
 Output signal **27**
Cleaning the Device **32**
Cleaning the lens **34**
Cleaning the light guide **35**
Connectors **16**

D

Declaration of Conformity **44**
Decontamination **10**
Detector
 Basic operation **24**
 Front view **5**
 Rear view **5, 16**
Deuterium lamp
 Maximum operating hours **28**
 Status **26**
Display
 A-OUT **25**
 Control **25**
 Firmware **25**
 GLP lamp **25**
 Int-Time **25**
 LAMP **25**
 Menu structure **25**
 Signal and reference value **25**

SN DOA1 **25**
Status display **24**
TC **25**

E

Eluent **7**
Eluents
 flammability **11**
 self-ignition point **11**
 toxicity **11**
Error IN/OUT, see spring strip **17**

F

Flow Cell
 Cleaning **33**
Flow cell **6**
 Disassembly **36**
 Installation **20**
 Optical path length **21**
 Rinsing **33**

G

Ground **18**
GROUND, see spring strip **16**
Grounding **18**

I

Installation location, see location **14**
Installation qualification **31**
Integrator, see analog port **18**

L

Location **14**

M

Maintenance **32**
Maintenance Tasks **32**
Modifiers **7**

O

Operation **24**
 Arrow keys **24**
 Autozero **24**
 Handling **24**
Operation qualification **31**

P

Pin header
 Autozero **16**
 Start-IN port **17**
Port

- Analog **26**
- LAN **26**
- RS-232 **26**
- Serial with 115200 baud rate **26**
- Serial with 9600 baud rate **26**
- Power Supply **11, 14**
- Power supply
 - power cable **11**
 - Power strip **11**

R

- Remote control, see spring strip **16**

S

- Salts **7**
- Self-calibration **23**
- Setup **24**
- Software **24**
 - Local Area Network **30**
 - Serial port **30**
- Solvents
 - Flushing solution **33**
- Spare parts **9**
- Spring strip **16**
 - ANALOG-IN port **17**
 - Error-IN/OUT port **17**
- Start IN, see pin header **17**
- Supply voltage, see power supply **14**

T

- Technical Support **14**
- Test cell **6, 20**
- Tests
 - intervals **31**
- Time constant **27**
- Transport damage **40**

U

- UV light **11**

W

- Warranty **40**
- Wavelength **24**

Declaration of Conformity

Producer KNAUER Wissenschaftliche Geräte GmbH
Hegauer Weg 38
14163 Berlin, Germany

Product Detector 10D
E6630, E6631

The product complies with the following requirements and specifications:

- Europe**
- DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)
 - IEC 60799:1998 Electrical accessories - Cord sets and interconnection cord sets
 - IEC 61000-3-2 (2010) Electromagnetic compatibility (EMC) – Part 3-2: Limits - Limits for harmonic current emissions (equipment input current \leq 16 A per phase)
 - EMC standard (2004/108/EC)
 - IEC 61010-1 (2011) Safety requirements for electrical equipment for measurement, control and laboratory use
 - Low voltage directive (2006/95/EC)
 - IEC 61326-1 (2006) Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 1: General requirements
 - Directives for an environmentally sound use of equipment:
 - RoHS directives 2002/95/EC (2003) on the restriction of the use of certain hazardous substances in electrical and electronic equipment
 - WEEE directive 2002/96/EC (2003) on waste electrical and electronic equipment

The product was tested with a typical configuration. The mark of conformity has been applied to the rear panel:



Date Berlin, 2012-11-01



Alexandra Knauer (CEO and owner)

© KNAUER Wissenschaftliche Geräte GmbH
All rights reserved.
Technical data are subject to change without notice.
Please check our website for latest updates and changes.
Translation of the original German edition of this
manual, version 2.3
Last manual update: 2015-02-05
Printed in Germany on environmentally friendly paper
from sustainable forests.

® BlueShadow are registered trademarks of:
KNAUER Wissenschaftliche Geräte GmbH

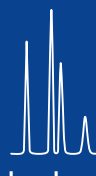
► See up-to-date manuals online:
www.knauer.net/downloads

www.knauer.net

HPLC · SMB · Osmometry

KNAUER
Wissenschaftliche Geräte GmbH
Hegauer Weg 38
D-14163 Berlin, Germany

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



KNAUER

© KNAUER 2013 V7670A/0.02/10.13/Koe