

Operating Manual

SPECORD PLUS

UV/Vis Spectrophotometer



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For a proper and safe use of this product follow the instructions. Keep the operating manual for future reference.

General Information <http://www.analytik-jena.com>

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1 About this operating manual

Content	This user manual provides information on the design and function of the SPECORD PLUS and the necessary know-how for safe handling of the device and its components. Furthermore, the user manual includes information on the maintenance and care of the device as well as indications for potential causes for malfunctions and their correction.
User requirements	These instructions are intended for qualified users with knowledge of UV/VIS analysis. These instructions are limited to describing the functionality of the SPECORD PLUS. For safe operation of the SPECORD PLUS, knowledge of the "ASpect UV" and "SPECORD PLUS accessories" operating manuals is also required.
Conventions	Instructions for actions are combined into action units and marked with a triangle (▶). Warnings are indicated by a warning triangle and signal word. The type, source and consequences of the hazard are stated together with notes on preventing the hazard. Elements of the control and analysis program are indicated as follows: <ul style="list-style-type: none"> ▪ Program terms are in bold (e.g., the File menu). ▪ Menu items are separated by vertical lines (e.g., File Load)
Symbols and signal words used in this manual	The user manual uses the following symbols and signal words to indicate hazards or instructions. These warnings are always placed before an action.



WARNING

This signal word indicates medium risk hazards which can lead to death or serious injuries if not avoided.



CAUTION

This signal word indicates low risk hazards which can lead to minor or moderate injuries if not avoided.



NOTICE

Provides information on potential material or environmental damage.

2 Intended use of the SPECORD PLUS

The spectrophotometers of the SPECORD PLUS series have been designed for measuring the transmission, extinction, reflectance and energy of liquid, solid and gaseous samples.

The individual devices have different optical concepts and implement different spectral resolutions:

SPECORD 50 PLUS	1.4 nm, split beam with internal reference channel
SPECORD 200 PLUS	1.4 nm, double-beam spectrophotometer
SPECORD 210 PLUS	0.2; 0.5; 1; 2 and 4 nm, double-beam spectrophotometer with extended measurement range
SPECORD 250 PLUS	0.2; 0.5; 1; 2 and 4 nm, double-beam spectrophotometer with upstream monochromator

The SPECORD PLUS is compliant with DAB (German pharmacopoeia) regulations as well as international regulations, such as Ph. Eur., BP, USP or JPXIII.

Together with the ASpect UV software, the SPECORD PLUS is especially suited for use in routine laboratories with high sample throughput, but also provides solutions for special applications with its versatile accessories.

The SPECORD PLUS may only be used for the analyses listed in the user manual. Only this specified use is regarded as the intended use, ensuring the safety of the user and the device.

3 Security

For your own safety and to ensure error-free and safe operation of the device, please read this chapter carefully before commissioning.






Observe all safety instructions listed in this user manual and all messages and information displayed on the monitor by the control and analysis software.

3.1 Safety labeling on the device

Warning and mandatory action labels have been attached to the device and must always be observed.

Damaged or missing warning and mandatory action labels can cause incorrect actions leading to personal injury or material damage. The labels must not be removed. Damaged warning and mandatory action labels must be replaced immediately!

The following warning and mandatory action labels have been attached to the device:

Warning symbol	Meaning	Comment
	Warning against hot surface	The lamp covers become very hot when the lamps are switched on. Switch off the lamps and allow them to cool down before replacing the lamps or opening the lamp covers.
	Warning against UV radiation	The lamp radiation can cause eye damage. Do not look into the beam of the UV lamp directly or indirectly via a mirror.
Mandatory signs/ information symbols	Meaning	Comment
	Disconnect the power supply before opening the device cover.	On the power switch/power input: Before opening the device cover, switch off the device and disconnect the mains plug from the mains socket.
	Observe the operating manual	Before starting work, read the operating manual.
	For People's Republic of China only	The device contains controlled substances. Analytik Jena GmbH+Co. KG warrants that these substances will not be released from the device within the next 25 years provided the device is employed as intended.

3.2 Requirements for the operating personnel

The device must only be operated by qualified specialist personnel instructed in the use of the device. This instruction also include teaching the contents of this user manual and of the user manuals of the connected system components. We recommend training by qualified employees of Analytik Jena or its representatives.

In addition to the safety instructions in this user manual, the general applicable safety and accident prevention regulations of the respective country the device is operated in must be observed and adhered to. The operator must ensure the latest version of these regulations.

The user manual must be accessible to the operating and service personnel.

3.3 Safety instruction – explosion protection

The device may not be operated in an explosive environment.

3.4 Safety instructions: during operation

3.4.1 General safety instructions during operation

The operator must make sure that the device and its safety equipment is in sound condition each time before starting up the device. This applies especially after any modification or adaptation of the device or any repair.

Observe the following:

- The device may only be operated if all protective equipment (e.g., covers for electronic components) is in place, properly installed and fully operational.
- The sound condition of the protection and safety equipment must be checked regularly. Any defects must be corrected as soon as they occur.
- Protective and safety equipment must never be removed, modified or switched off during operation.
- Ensure that no liquid enters the interior of the device, for example at cable connections. There is a danger of electric shock.
- Caution when handling glass components. Risk of broken glass and therefore risk of injury!
- Never look into the lamp directly or indirectly, e.g., via a mirror. For this reason, switch off the device when replacing the lamp. A risk of eye damage due to UV radiation is present.

3.4.2 Safety instructions – electrical equipment

Lethal voltages may occur in the device! Contact with live components may cause death, serious injury or painful electrical shock.


- The power plug must be connected to a proper power outlet to ensure that the device meets protection class I (ground connector). The device may only be connected to power sources whose nominal voltage is the same as that on the rating plate of the equipment. Do not replace the removable power cable of the device with a power cable that does not meet the specifications (with no protective ground conductor). Extensions of the supply cable are not permitted!

- The device, the accessories and the PC may only be connected to the mains network when the device is switched off.
- Electrical connection cables between the device and the system components may only be connected or disconnected when the device is switched off.
- Before opening the device, the device must be switched off via the main switch and the power plug must be disconnected from the power outlet!
- Work on the electronics may only be carried out by the customer service of Analytik Jena and specially authorized technicians.

3.4.3 Handling of samples and reagents

- The operator is responsible for the selection of substances used in the process, as well as for their safe handling. This is particularly important for radioactive, infectious, poisonous, corrosive, combustible, explosive and otherwise dangerous substances.
- The operator is responsible for carrying out suitable decontamination should the device be contaminated with dangerous substances on the outside or in the sample chamber.
- Splashes, drops or larger reagent spills must be removed and cleaned using an absorbent material such as laboratory wipes or paper towels.

3.5 Safety instructions – maintenance and repair

- Maintenance of the SPECORD PLUS is always carried out by the customer service department of Analytik Jena or its authorized and trained personnel.
- The user may only perform the maintenance tasks described in this operating manual (→ "Care and maintenance"  31).
- The exterior of the SPECORD PLUS may only be cleaned with a damp, not dripping, cloth after the device has been switched off.
- Always only carry out any maintenance and repair work on the device when it is switched off (unless otherwise indicated).
- A risk of burns from hot lamps and surfaces is present. Only carry out maintenance tasks and the replacement of system components (e.g., lamps) after a sufficiently long cooling phase.
- If necessary, remove the protective cap from the VIS lamp after insertion. A risk of fire is present!
- Use only original spare parts, wear parts and consumables. They have been tested and ensure safe operation. Glass parts are wear parts and are not subject to the warranty.

3.6 Behavior during emergencies

If there is no immediate risk of injury and if this is possible, immediately switch the device switch of the SPECORD PLUS and the connected system components (PC, accessories) to the "0" position during dangerous situations or in case of accidents and disconnect the mains plugs from the mains outlets!

Note: For the PC, there is a risk of data loss and damage to the operating system!

4 Design and function

4.1 Connections and display elements

The connections and display elements of the SPECORD PLUS are attached to the front face and the right side wall of the device for easy access. The folding cover of the sample chamber sits on the sample chamber walls and seals the sample chamber light-proof. On the bottom side, there are two ducts sealed with plugs for the waste hose of the sipper system and the hoses of the temperature-controlled accessories.

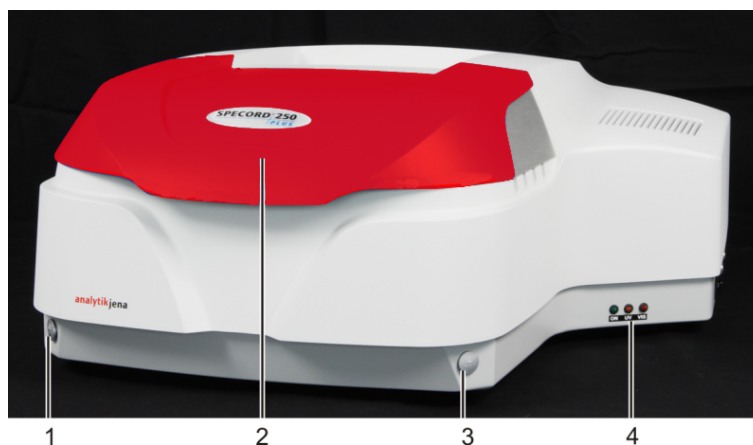


Fig. 1 Connections on the device front

- 1, 3 Ducts for the waste hose of the sipper system and the hoses of temperature-controlled cell holders and changers
- 2 Sample chamber cover
- 4 Status lights for mains voltage, UV and VIS lamps

The status lamps (LEDs) indicating mains voltage and lamp operation are located on the right front side of the SPECORD PLUS. The status lamps are lit when the SPECORD PLUS is switched on or the UV/VIS lamps are on:

- Green: Mains voltage on
- Yellow: UV lamp on
- Red: VIS lamp on

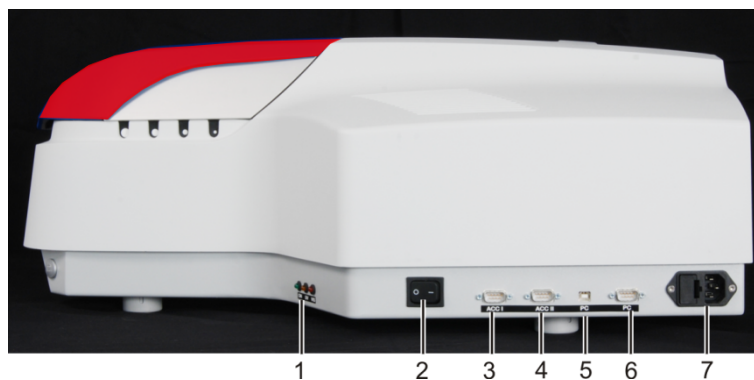


Fig. 2 Connections and display elements on the right side of the device

- | | |
|---|--|
| 1 Status lamps | 2 Mains switch |
| 3 Connection for Peltier-controlled accessories (ACC 1) | 4 Connection for a second Peltier-controlled accessory and the autosampler (ACC 2) |
| 5 USB-B PC connection | 6 RS 232 PC connection |
| 7 Socket for mains connection and fuse holder | |



Fig. 3 Lamp housing and type plate on the rear of the device

- 1 Type plate
- 2 Service flap for lamp and desiccant cartridge replacement

The type plate contains the following information:

- manufacturer address, trademark
- Designation of the device, serial number
- Electrical connection data
- Conformity markings
- WEEE marking

4.2 Device configuration and function

SPECORD PLUS modules

The SPECORD PLUS consists of the following modules:

Module	Function
Radiation sources	The UV lamp (deuterium lamp) and the VIS lamp (halogen lamp) generate the light that irradiates the sample after monochromatization.

Module	Function
Upstream monochromator (SPECORD 250 PLUS only)	The upstream monochromator is a holographic grid moving synchronously with the monochromator grid. By first dispersing the light, the stray light is reduced.
Spectrometer system	The spectrometer system includes the monochromator which disperses the light of the radiation sources. After this, the light emitted from the monochromator is split into a measuring and a comparison channel. The optics generate the beam cross-section in the sample chamber. The spectrometer system is protected against extraneous light and dust by its cover.
SPECORD 200/210/250 PLUS sample chamber	The samples are measured in the sample chamber. The sample chamber has two sample chamber rods to hold various accessory units. The two adapter plates for the cell holders are attached to the front sample chamber wall.
SPECORD 50 PLUS sample chamber	Only the measuring beam path is directed through the sample chamber. The accessories are mounted on the sample chamber rods. The adapter plate for the cell holder is attached to the front sample chamber wall.
Receiver circuit board	Two photodiodes serve as radiation receivers. The photodiodes are Peltier-controlled on SPECORD 210/250 PLUS devices.
Power supply modules	The power supply modules provide the electrical voltage for the electronics and the fans for the thermoelectric temperature control of the receivers in the SPECORD PLUS.
Device controller PC	The device controller coordinates the modules involved in the measuring process.

Spectrometer system

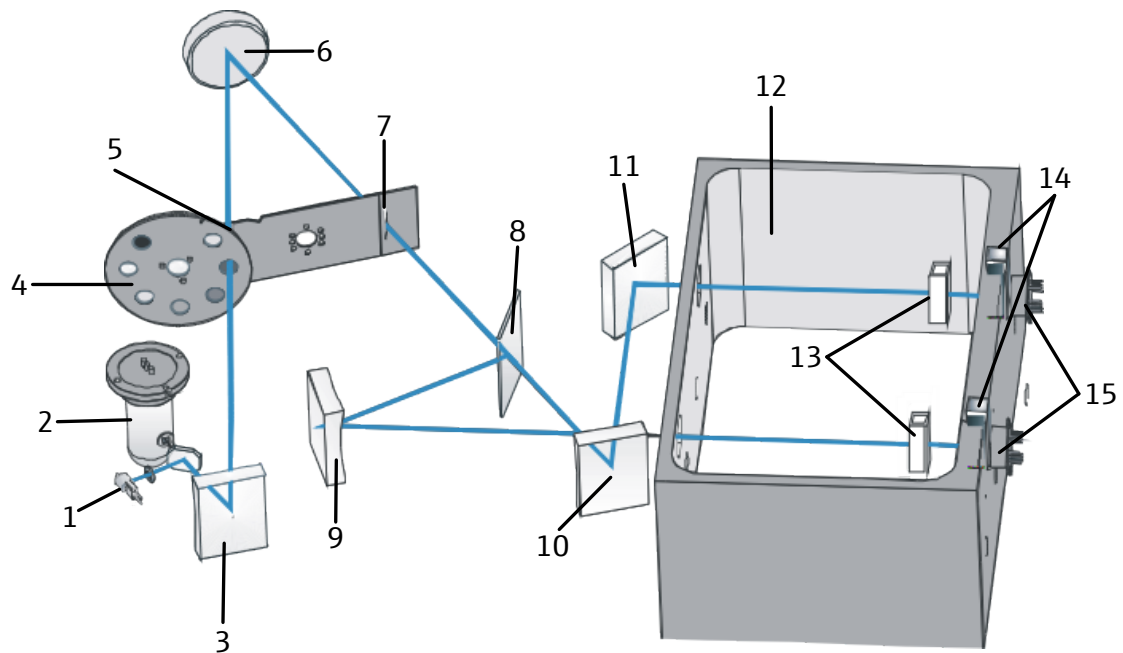


Fig. 4 SPECORD 200/210/250 PLUS general design

- | | |
|--|---|
| 1 VIS lamp | 2 Deuterium lamp |
| 3 Upstream monochromator grid or toric lighting mirror | 4 Filter wheel |
| 5 Entrance slit | 6 Concave grid |
| 7 Exit slit | 8 Beam splitter |
| 9 Toric mirror | 10 Toric mirror |
| 11 Plane mirror | 12 Sample chamber |
| 13 Cells | 14 Measuring locations for opaque samples |
| 15 Receiver | |

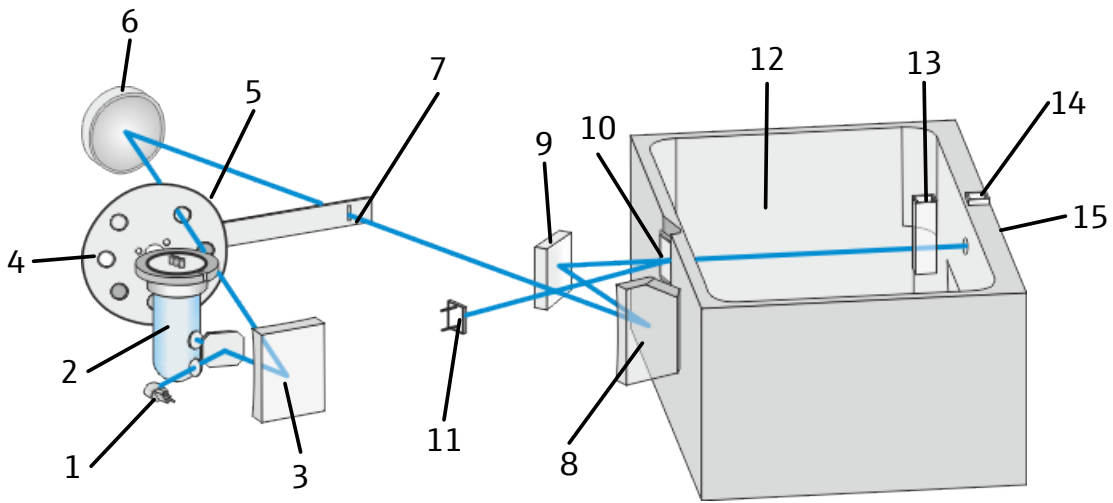


Fig. 5 SPECORD 50 PLUS general design

- 1 VIS lamp
- 2 UV lamp
- 3 Toric mirror
- 4 Filter wheel
- 5 Entrance slit (hidden)
- 6 Concave grid
- 7 Exit slit
- 8 Spherical mirror
- 9 Plane mirror
- 10 Quartz plate
- 11 Comparison channel receiver
- 12 Sample chamber
- 13 Cell
- 14 Measuring location for opaque samples
- 15 Measuring channel receiver

The spectrometer system with the filter wheel, concave grid and slit group elements shown above functions as a monochromator.

The following filters are mounted on the filter wheel:

Filter	Function
Colored glass filters	Suppression of the undesired radiation in the monochromator
Holmium filter	Standard for the automatic recalibration of the wavelengths
2 empty slots	Allows undispersed light to pass through
Locking cone	Dark signal measurement

The inlet and outlet slits of the spectrometer system are mounted on the slit carrier. The following spectral slit widths are implemented in this manner on the various device types:

Device	Slit widths
SPECORD 50 PLUS	1.4 nm
SPECORD 200 PLUS	1.4 nm
SPECORD 210/250 PLUS	0.2; 0.5; 1; 2; 4 nm.

The imaging grid disperses the incoming light and fans out the spectrum.

Computer-controlled step motors drive the filter wheel, slit carrier and linear actuator for the grid movement. The low number of moving parts in the spectrometer system leads to high reliability of the optical parameters of the SPECORD PLUS.

In the photometer chamber of the SPECORD 200/210/250 PLUS, the fixed 50/50 beam divider splits the beam arriving from the monochromator into a measuring and reference beam. The SPECORD 50 PLUS uses the portion of the radiation reflected on a quartz plate as an internal reference to compensate for intensity fluctuations. The imaging mirrors generate the necessary beam cross-sections in the sample chamber.

Sample chamber

The large sample chamber of the SPECORD PLUS has a variable design. The measuring and reference beam enter the sample chamber of the SPECORD 200/210/250 PLUS from the rear. Two windows protect the photometer chamber against dust and contamination from reagents.

In the SPECORD 50, the high energy measuring beam goes through the middle of the sample chamber. The reference beam for compensating energy fluctuations is directed internally to the receiver diode.

The holders for standard cells are slid directly into the adapter plates on the front sample chamber wall and are located close to the receiver. Cells with opaque samples of 10 mm layer thickness can be placed in special cuvette ducts directly in front of the receiver.

As an optical bench, the support rod system provides space for large accessories, e.g., the 8-cell changer or the integrating sphere. Additionally, your own experimental constructs can be placed in the sample chamber in an optically reproducible manner and exchanged.

In the right sample chamber wall are the connection sockets for the electrical accessories or the identification connectors for the accessories.

Two large ducts closed with plugs are located at the bottom of the front sample chamber wall. The waste hose of the sipper system or the hoses for temperature-controlled accessories can be routed through these ducts. Other ducts of varying sizes are located in both the left and right sample chamber walls. These are closed via white plugs in a rubber plug. The connection hoses for the sipper system, temperature-controlled accessories and optical cables for external sample probes can be routed through these ducts.

After removing the attachment screws, the side components of the sample chamber can be removed and exchanged to convert the spectrometer to a flow measurement system or to use air-cooled Peltier accessories.

The beam paths in the SPECORD PLUS and the connections for the electrical accessories are marked:

- "M" – Measuring beam path or connection for accessories in the measuring beam path
- "R" – Reference beam path or connection for accessories in the reference beam path

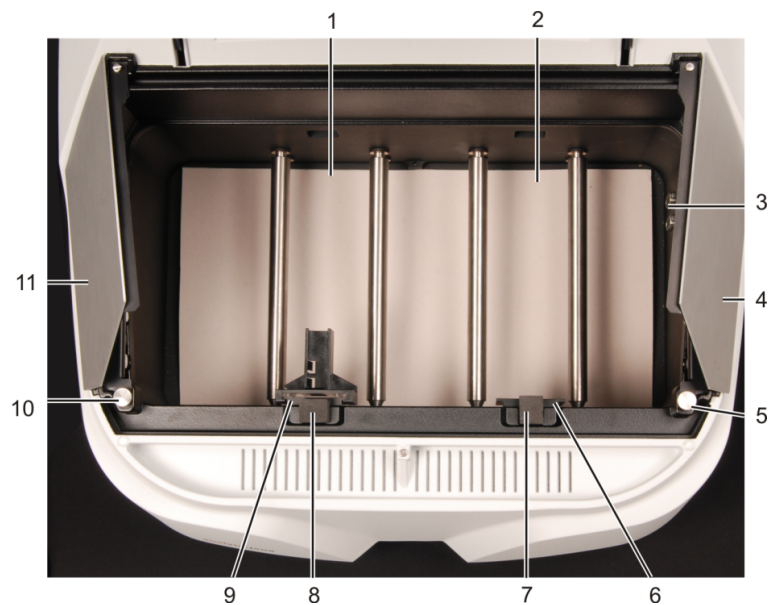


Fig. 6 SPECORD 200/210/250 PLUS sample chamber

- | | |
|---|--|
| 1 Measuring beam path | 2 Reference beam path |
| 3 Connections for electrical accessories | 4, 11 Removable side components |
| 5, 10 Attachment screws for side components | 6, 9 Plates for holding the cell holders |
| 7, 8 Cell ducts for dispersing samples | |

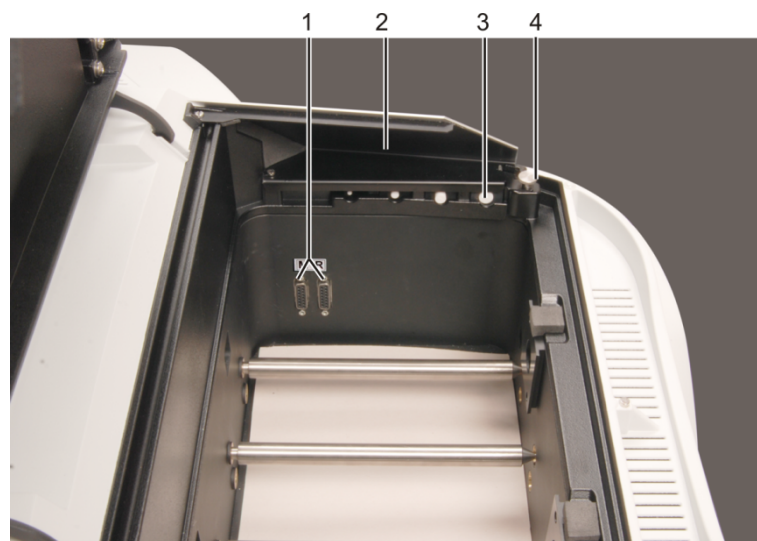


Fig. 7 Right sample chamber wall

- | | |
|--|-----------------------------------|
| 1 Connections for electrical accessories | 2 Removable side component |
| 3 Ducts for accessory hoses and cables | 4 Side component attachment screw |



Fig. 8 SPECORD 200/210/250 PLUS sample chamber dimensions



Fig. 9 SPECORD 50 PLUS sample chamber

- | | |
|-------------------------------------|--|
| 1 Measuring beam path | 2 Connections for electrical accessories |
| 3, 8 Removable side components | 4, 7 Side component attachment screws |
| 5 Plate for holding the cell holder | 6 Cell duct to hold dispersing samples |



Fig. 10 SPECORD 50 PLUS sample chamber dimensions

5 Installation and commissioning

5.1 Installation conditions

5.1.1 Installation location requirements

- Ambient conditions The climate conditions for the installation location are listed in the technical specifications (→ "General technical data of the SPECORD PLUS" 43). If required, ensure that the room is temperature-controlled.

- Laboratory conditions The device is only approved for indoor use. The installation location should have the characteristics of a chemical laboratory. It must meet the following conditions:
 - Environment with low dust levels
 - No vibrations

- Installation location requirements The requirements for the installation location of the device are as follows:
 - No caustic vapor in the immediate vicinity of the device and its system components. These can corrode the device connections and modules.
 - No drafts; do not install the device close to windows or doors
 - Away from electromagnetic sources of interference
 - No direct sunlight and away from radiant heaters
 - Do not obstruct the air vents of the device with other equipment

5.1.2 Power supply



WARNING

Risk of electric shock

The device may only be connected to a properly earthed power outlet in accordance with the voltage specifications on the type plate.

The SPECORD PLUS operates on single-phase alternating current.

Electrical connection requirements

Operating voltage	85 to 264 V/AC
Line frequency	50 to 60 Hz
Power consumption	200 VA
Device fuses	T 3.15 AH/250 V, type 19181

5.1.3 Spatial requirements



Fig. 11 SPECORD PLUS dimensions

The device is designed as a tabletop device and weighs approximately 22 kg. A stable table with a load capacity of 50 kg is recommended as the installation location.

The device requires a minimum installation surface area of 680 x 720 mm due to its dimensions and the required approx. 10 cm clearance on the side of the electrical connections. Also, provide sufficient space for possible accessories and the control computer

The ventilation slits on the top and bottom sides of the device must not be covered.

Device dimensions

Device	Width x length x height
SPECORD PLUS	590 x 690 x 290 mm
APG autosampler (optional)	500 x 540 x 470 mm
Temperature control device for Peltier-controlled accessories (optional)	225 x 200 x 130 mm
Heat exchanger for Peltier-controlled accessories (optional)	225 x 200 x 175 mm

The temperature control device and the heat exchanger can be stacked upon each other to save space.

5.2 Installing the device



WARNING

Risk of electric shock

Check that the mains connection conditions match those indicated on the type plate on the rear of the device.

- ▶ Remove the SPECORD PLUS and accessories from the transport packaging. Remove the protective sleeve from the device.
Caution! Transport the SPECORD PLUS in upright position only and do not overturn it when unpacking. Observe the markings on the transport packaging.
- ▶ Place the device and the PC on a suitable surface (laboratory desk).
- ▶ Allow the device to acclimatize until it has reached the ambient temperature.
- ▶ Remove the transport lock (→ "Removing and fastening the transport locks" 20).
- ▶ Connect one mains cable each to the SPECORD PLUS and the PC. Connect mains connectors to sockets connected to the same power supply phase (if possible via socket strips).
Do not connect the USB cable yet.

- ▶ Switch on the PC and install the ASpect UV program (see "ASpect UV software for SPECORD PLUS" operating manual).
- ▶ Connect the USB port of the SPECORD PLUS and the PC with the supplied USB cable. Switch on the SPECORD PLUS and start ASpect UV.
When the SPECORD PLUS is connected for the first time, a device detection procedure is performed and the AJ driver is assigned after the device is switched on.
- ▶ After initialization of the SPECORD PLUS and activation of the lamps, wait for a run-in time of 2 hours and then adjust the device with the aid of the software (→ "Checking and correcting the adjustment" 21).
 - ✓ The SPECORD PLUS is now ready for operation.

5.3 Removing and fastening the transport locks



NOTICE

Before commissioning the SPECORD PLUS, remove or disable all transport locks!

The SPECORD PLUS has been fitted with transport locking screws on the monochromator and with foam blocks in the sample chamber for transport to prevent damage to the device and its optics. The locking screw of the monochromator is located on the right rear device side on the base plate. The SPECORD 250 PLUS has a second locking screw to protect the upstream monochromator on the left rear device side. The Allen key for removing the locking screw is inserted in one of the foam blocks in the sample chamber.

Removing the transport locks

- ▶ Remove the white foam blocks between the sample chamber rods and take the Allen key out of the block.

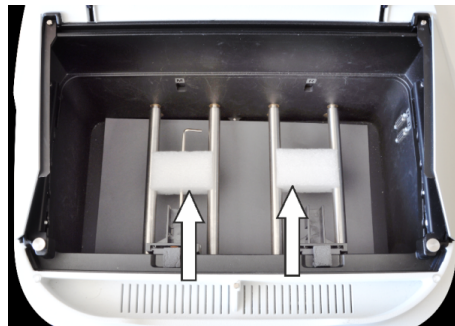


Fig. 12 Foam blocks protecting the support rods

- ▶ Turn the transport locking screw on the left rear side counterclockwise (to "free" on the sticker) with the Allen key until it stops.
- ▶ *SPECORD 250 PLUS only*
Turn the second transport locking screw protecting the upstream monochromator on the right rear side counterclockwise with the Allen key until it stops.

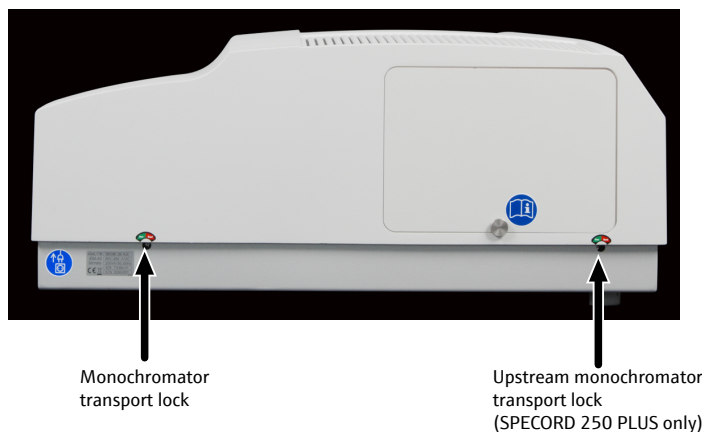


Fig. 13 Transport locking screws on the rear of the SPECORD PLUS

Fastening the transport locks

- ▶ Switch off the SPECORD PLUS with the aid of the software to bring the monochromator into the correct position:
 - Switch on the SPECORD PLUS.
 - Switch on the computer and start the ASpect UV program.
 - Wait for the initialization message to disappear. The SPECORD PLUS must be in measuring mode.
 - Select menu item **File | Close** in the main ASpect UV window.
 - Wait until the ASpect UV program has ended.
- ▶ Switch off the SPECORD PLUS.
- ▶ Turn the transport locking screw(s) clockwise (to "fixed" on the sticker) with the Allen key until it stops.
- ▶ Place the Allen key back into one of the foam blocks and fasten the blocks between the support rods.

5.4 Checking and correcting the adjustment

The SPECORD PLUS is fully adjusted and set up ex factory. Changes in the adjustment caused by transport and temperatures are corrected by the ASpect UV program without requiring mechanical intervention in the device.

Correction must be carried out in the following situations:

- Initial installation
- Lamp replacement
- Regularly every 3 months

The following parameters are checked during the basic correction and corrected if necessary:

- Offset (dark current)
- Zero order of the lamps
- Amplifier stages of the receivers
- Wavelength correction using internal holmium filter and UV lamp

On the SPECORD 250 PLUS, a grid correction is additionally performed and the grid of the upstream monochromator is aligned with the grid of the main monochromator.



Basic and grid correction

NOTICE

Only perform the basic correction after 2 hours warm-up time. During this period both lamps must be switched on.

In the SPECORD 250 PLUS, start the grid correction first and then the basic correction.

- ▶ Remove samples and accessories that influence the beam path (globe photometer, flow cell, etc.) from the beam paths in the sample chamber.
- ▶ Only SPECORD 250 PLUS:
Select menu item **Instrument | Correction | Grating correction**.
The grid correction starts immediately.
- ▶ Select menu item **Instrument | Correction | Basic correction**.
The basic correction starts immediately.

At the end of the correction process, the new correction data is permanently saved in SPECORD PLUS and on the computer. The data remains in place until the correction values are next recorded and are used for the correction of all subsequent measurements.

6 Operation

6.1 Switching the device on and off



WARNING

Risk of short-circuit if liquid is allowed to penetrate the device!

No liquid may get into the openings of the SPECORD PLUS.

- Do not place any vessels containing liquids on the device.
- Wipe off any spilled liquid immediately.



NOTICE

Keep the ventilation slits clear!

The ventilation slits on the top and bottom sides of the SPECORD PLUS must be kept clear. These openings must not be obstructed by objects.

Switching the device on

- ▶ Install the accessories for the measurement in the sample chamber and switch on the SPECORD PLUS via the mains switch on the right side of the housing. The green "Mains voltage on" LED is lit.
- ▶ Start ASpect UV by clicking on the desktop icon, or select menu item **ASpect UV | ASpect UV** in the windows task bar.



- ▶ Only if using module ASpect UV FDA 21 CFR Part 11:
Enter your **Login** (user name) and **Password** in the login window.
 - ✓ ASpect UV starts and connects to the SPECORD PLUS. The monochromator of the SPECORD PLUS moves and the message "Initialization" is displayed on the monitor. The SPECORD PLUS is now ready to measure.

Note:

If there is no connection to the SPECORD PLUS, check the settings in the **Options | Start | Start ASpect UV** window. The **Initialize instrument** checkbox must be activated there. Connect subsequently by selecting menu item **Instrument | Initialization**.



NOTICE

Observe the run-in period

The SPECORD PLUS achieves thermal stability after a 2-hour run-in period. Only start high-precision long-term measurement after the run-in period. Analyses with short durations between reference and sample measurements can be started immediately.

Switching the device off

During the software-assisted shut-down routine, the monochromator of the spectrometer is moved into the original position. The transport lock of the monochromator can be locked in this position (→ "Removing and fastening the transport locks" 20).

- ▶ Close all document windows.

- ▶ In the main window, select menu item **File | Close**.
The system displays the message "Shut down routine is running."
- ▶ After exiting the ASpect UV program, switch off the SPECORD PLUS via the mains switch.
 - ✓ The SPECORD PLUS is shut down.

If the measurements on the SPECORD PLUS have been completed and only the analysis of the data in the ASpect UV remains, you can switch to the simulation mode. This cuts the connection to the device. You can switch off the device after this and exit the ASpect UV program later.

6.2 Switching the lamps on and off

The lamps are switched on with the device. The activation routine for the lamps can be configured in the **Options | Start | SPECORD PLUS** window. The following options and button are available:

Option	Description
UV off / UV on	Switches the UV lamp on or off.
Vis off / Vis on	Switches the VIS lamp on and off.
Switch on the UV lamp	When active, the UV lamp is switched on with the device.
Switch on the Vis lamp	When active, the VIS lamp is switched on with the device.

If the lamp corresponding to the lamp replacement is not lit during the start of a measurement, a prompt will appear asking if the lamp should be switched on. The measurement start must be repeated after this.

Switching the lamps on and off manually

If necessary, the lamps can be switched on and off manually to extend the service life of the lamps. Observe that the lamps require some time after being lit to reach a stable energy state. Before long-term measurements, the lamps should be switched on for at least 2 hours to keep the drift caused by the lamps as low as possible. More information on the service life of the lamps can be found in the section on lamp replacement (→ "Replacing lamps and dessicant cartridges" 31).

- ▶ Select menu item **Settings | Options**.
- ▶ Click on **UV on** or **Vis on** in the **Start | SPECORD PLUS** tab.
The UV or VIS lamp is switched on.
- ▶ To switch the respective lamp off, click **UV off** or **Vis off**.
The lamps are switched off.

6.3 Example measurement in the Spectrum module

The SPECORD PLUS is operated via the ASpect UV program. The program is modular and provides measurement parameter settings and data analysis for various applications. The description can be found in the "ASpect UV software for UV/VIS spectrophotometers" operating manual.

A spectral measurement in the range of 250 to 700 nm is used as an example. The holmium oxide glass filter from the Hellma standard filter set can be used as a sample, if necessary. Measurement is carried out with the holder for standard cells.

The following steps must be carried out:


1. Create the document in the module.
2. Open method and enter parameter.
3. Start measurement.

Preparing a document

- ▶ Select the menu item **Modules | Spectrum** or click on the icon in the task bar.



Defining method parameters

- ▶ Click on  **Method setup** in the document window.
- ▶ Enter the parameters on the screens of the **Spectrum - Settings** method window (see below).
- ▶ Confirm the parameters by clicking on **Ok** and return to the document window.

Parameter entries

Enter the parameters as shown in the screenshot.

General screen

General																			
<i>Setup spectra and instrument parameters for current method</i>																			
Title	Holmium oxide																		
Parameters	<table> <tr> <td>Measurement mode</td> <td>Absorption</td> <td>▼</td> </tr> <tr> <td>Range [nm]</td> <td>300</td> <td>- 900</td> </tr> <tr> <td>Measuring points [nm]</td> <td>1,0</td> <td>▼</td> </tr> <tr> <td>Speed [nm/s]</td> <td>10,0</td> <td>▼</td> </tr> <tr> <td>Lamp change at</td> <td>320 nm *</td> <td>▼</td> </tr> <tr> <td></td> <td>Integration time [s]</td> <td>0,1</td> </tr> </table>	Measurement mode	Absorption	▼	Range [nm]	300	- 900	Measuring points [nm]	1,0	▼	Speed [nm/s]	10,0	▼	Lamp change at	320 nm *	▼		Integration time [s]	0,1
Measurement mode	Absorption	▼																	
Range [nm]	300	- 900																	
Measuring points [nm]	1,0	▼																	
Speed [nm/s]	10,0	▼																	
Lamp change at	320 nm *	▼																	
	Integration time [s]	0,1																	
Multiple measurement	<table> <tr> <td>Reference</td> <td>1</td> <td>▲▼</td> </tr> <tr> <td>Sample</td> <td>1</td> <td>▲▼</td> </tr> <tr> <td>Blank</td> <td>1</td> <td>▲▼</td> </tr> <tr> <td>Standard</td> <td>1</td> <td>▲▼</td> </tr> <tr> <td>Manual start</td> <td><input type="checkbox"/></td> <td></td> </tr> </table>	Reference	1	▲▼	Sample	1	▲▼	Blank	1	▲▼	Standard	1	▲▼	Manual start	<input type="checkbox"/>				
Reference	1	▲▼																	
Sample	1	▲▼																	
Blank	1	▲▼																	
Standard	1	▲▼																	
Manual start	<input type="checkbox"/>																		

Measurement cycles screen

Make no entries.

Start measurement screen

Make no entries.

Accessory screen

Make no entries.

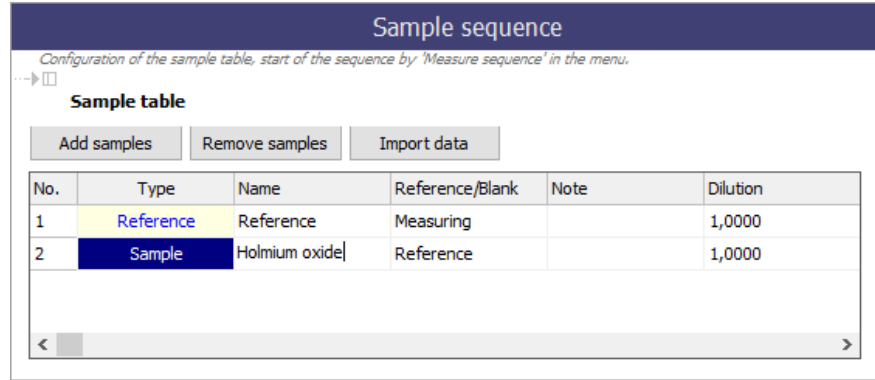
Evaluation screen

Make no entries.

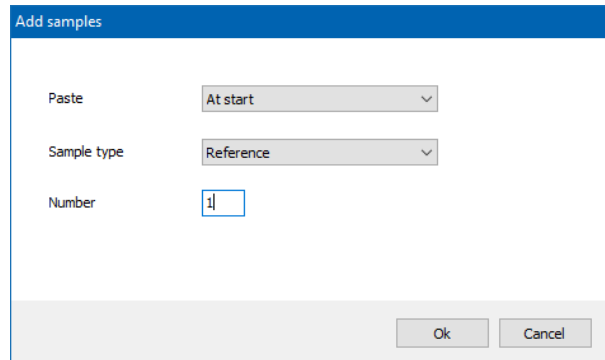
Calibration screen

Make no entries.

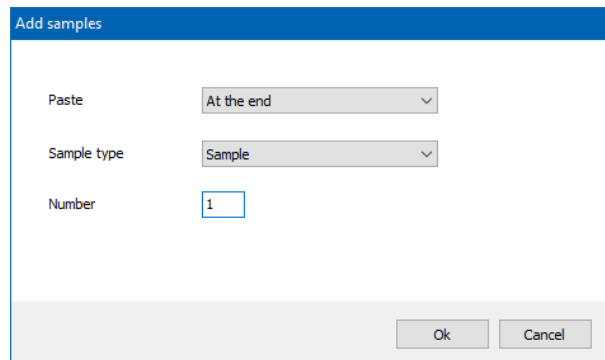
Page Sample sequence



▶ Click on **Add samples** and set a reference at the start of the sample table:



▶ Click on **Add samples** again and add a sample to the end of the sample table:



- ▶ In the first row of the sample table, enter "Reference" in the **Name** field and confirm with the ENTER key.
- ▶ Enter "Holmium oxide" as the name in the second row of the sample table and confirm with the ENTER key.

Archive automatically screen

Make no entries.

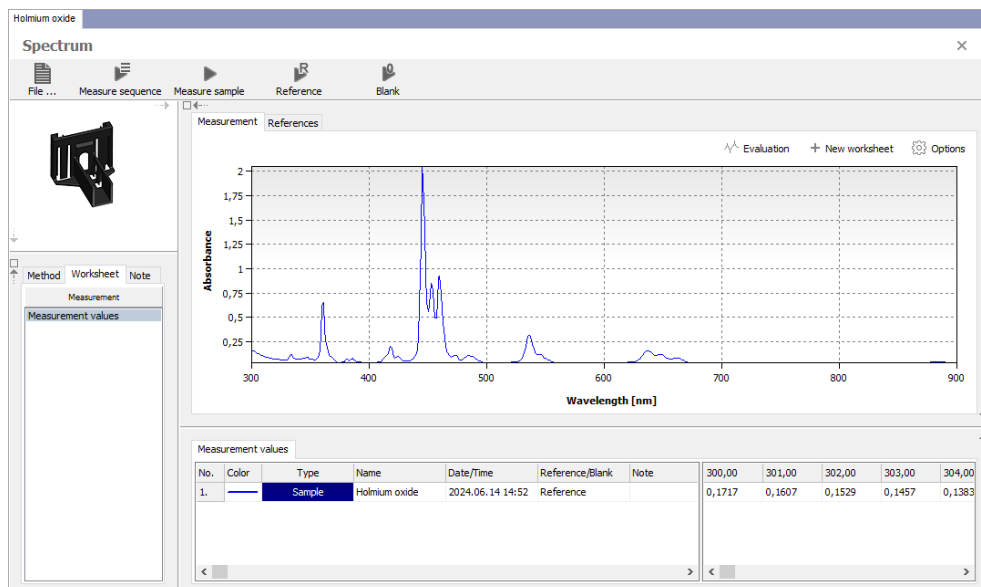
Note screen

Enter "Spectral scan example".

Performing the measurement

- ▶ Click on in the document window. The start information for measuring the reference is displayed.
- ▶ Insert the reference sample and click on **Yes** to start the measurement.
- ▶ The reference measurement is performed. A prompt to measure sample 1 is displayed.
- ▶ Insert sample 1 and click on **Yes** to start the measurement.

The spectrum and the measured values are output on the **Measurement** worksheet.



6.4 Accessories

Accessories are detected automatically during initialization of the SPECORD PLUS and are taken into account in the method parameters. The accessories must be installed before switching on the SPECORD PLUS for this reason.

Observe the information on assembly, adjustment and function of the accessories in the "SPECORD PLUS accessories" operating manual.

6.4.1 Cell holders for standard cells

Design

The standard delivery scope of the SPECORD PLUS includes cell holders already installed in the device. The double-beam devices are delivered with two cell holders, the SPECORD 50 PLUS with one cell holder. The cell holders are designed for standard cells with a layer thickness of 50 mm and a width of 12.5 mm.

The cells are irradiated at a height of approx. 5 to 15 mm above the support level of the cell holder.

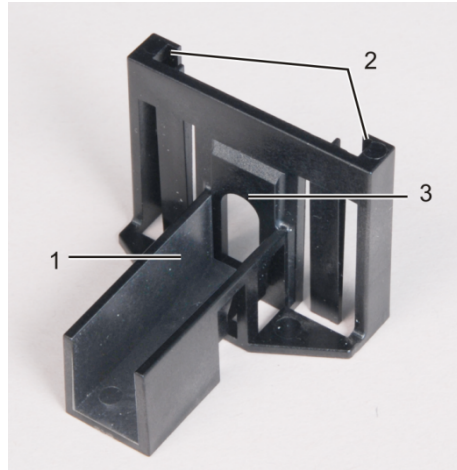


Fig. 14 Cell holders for standard cells

- | | |
|-----------------------------|---------|
| 1 Cell adapter | 2 Guide |
| 3 Contact surface for cells | |

Mounting cell holders

The cell holders are pushed onto the adapter plates on the front sample chamber wall with the guide, thus positioning them near the receivers.

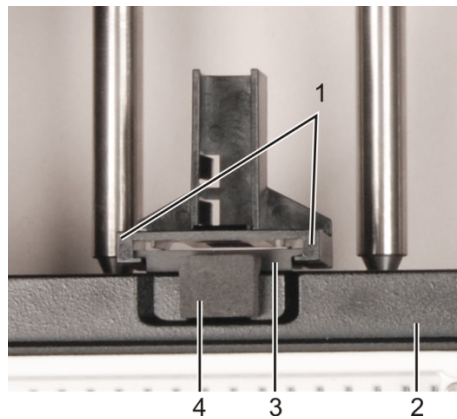


Fig. 15 Mounting the cell holder in the sample chamber

- | | |
|----------------------------|-----------------------------|
| 1 Guide of the cell holder | 2 Front sample chamber wall |
| 3 Adapter plate | 4 Closure of the cell duct |

Inserting the cell in the cell holder

The optical surfaces of the cell (bare surfaces with plastic cells) must be vertical to the measuring or reference beam path. The layer thickness is a decisive factor for the absorption measurement. It is therefore important to place all samples (sample and reference) in the same position and orientation for a measurement. Avoid wedge or angle errors or parallel misalignments of the beam which could cause measuring errors.

- ▶ Fill the cell at least 20 mm high with analyte.
- ▶ Insert the cell to be flush against the contact surface of the cell holder (arrow in image below).

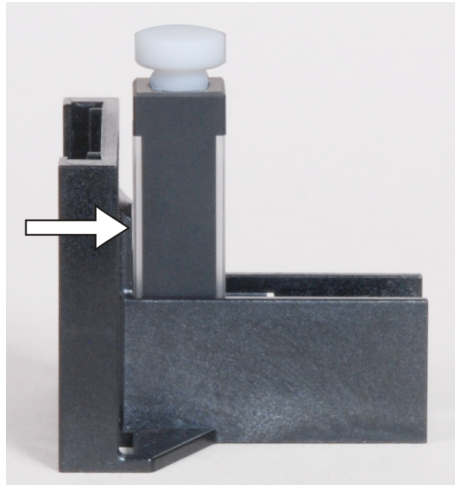


Fig. 16 Proper insertion of the cell in the cell holder

6.4.2 Measuring location for opaque samples

With strongly dispersing samples, a considerable portion of the radiation does not leave the cell in a straight line but is dispersed at an angle. For a photometric measurement, all of the radiation must be absorbed by the receiver. For this purpose, the sample and reference substances must be moved as close as possible to the receiver. The measuring locations for opaque samples have therefore been placed in the front sample chamber wall. When the cells are inserted in these ducts they are located directly in front of the receiver diodes. The measuring locations are suitable for standard cells with a layer thickness of 10 mm.

Using the measuring location

- ▶ Remove the foam closures from the cell ducts in the front sample chamber wall.
- ▶ Insert the cells in the cell ducts and begin measurement.
- ▶ After the measurement is complete, remove the cells from the cell ducts and close the duct openings with the foam closures. This prevents extraneous light from reaching the receiver and distorting measurement results.

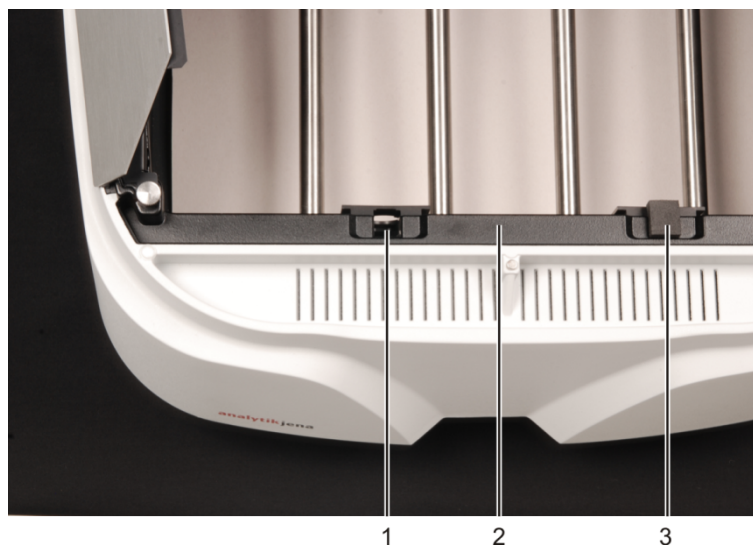


Fig. 17 Measuring locations for opaque samples

- 1 Measuring location for opaque samples in the measuring beam path, open
- 2 Front sample chamber wall
- 3 Measuring location for opaque samples in the reference beam path, closed with plug

6.4.3 Additional accessories

The SPECORD PLUS features a wide range of accessories covering all applications in UV/VIS spectroscopy. In addition to various cell holders and changers, some of which can be temperature-controlled, sippers and autosamplers are also available to automate analysis processes. Accessories for solids analysis to determine transmission, reflectance and color complete the application range.

You can find information on the individual accessories in the "SPECORD PLUS accessories" operating manual.

7 Care and maintenance

You must carry out the following care and maintenance tasks:

- Cleaning the sample chamber and casing
- Lamp replacement
- Replacement of mains fuses
- Replacement of the desiccant cartridge (optional)

Spare parts

Only use replacement parts from Analytik Jena. Only these have been tested and ensure safe operation of the device.

You can order consumables or wear parts from your contact partner at Analytik Jena.

Service

In case of faults or defects of the device please contact our customer service or your customer representative.

Before sending the device back to Analytik Jena, you must decontaminate the device properly in accordance with the previous use and document this. Notify our customer service department of the return. You will receive information on the return and on decontamination there.

7.1 Cleaning the device

General information

Observe the following information on the cleaning and maintenance of the SPECORD PLUS:

- Do not allow filled cells to remain in the sample chamber longer than necessary to avoid contamination of the spectrometer from acidic, alkaline and solvent vapors. If highly volatile solvents are used, use vapor-proof cells with lids.
- Wipe up spilled samples in the sample chamber or on accessories immediately with blotting paper.
- Use a soft, clean cloth to wipe away any contamination from the device. A commercially available neutral cleaning agent can be used for maintenance of the casing.
- Do not use dripping cloths. Do not allow liquids to enter into the device.

Infectious samples

If the SPECORD PLUS is used for the analysis of infectious material, great care must be taken, because the SPECORD PLUS cannot be decontaminated as a whole device.

We recommend Incidin solution as a possible disinfection agent.

The Incidin solution is only to be used for wiping disinfection. If using a spray head, first apply the disinfection agent to a suitable cloth.

7.2 Replacing lamps and dessicant cartridges



WARNING

Risk of electric shock!

Before opening the service flap, switch off device via the mains switch and disconnect the mains cable from the device connection.



CAUTION

Risk of burns from hot lamps!

Allow the lamps sufficient cooling time before replacement.



CAUTION

Risk of eye damage from UV radiation

Do not look into the radiation of the lamp either directly or indirectly through a mirror! The emitted UV radiation can result in eye damage.



NOTICE

Contamination can impair the lamp properties!

Do not touch the glass parts of the new lamps with your fingers. Exercise particular caution with the UV lamp and do not touch the exit window of the beam! If the glass has been touched by fingers, wipe the lamps with a clean, lint-free cloth and pure alcohol.

The lamp chamber is located on the device rear behind the service flap.

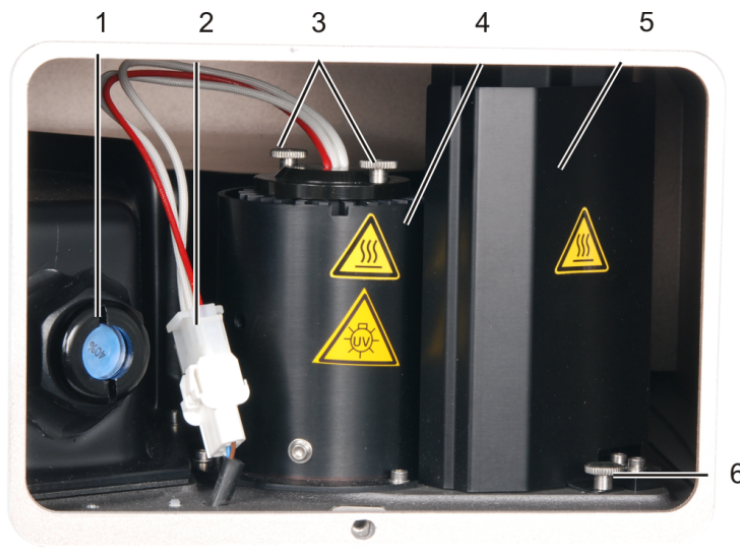


Fig. 18 Lamps and the dessicant cartridge in the lamp chamber

- | | |
|---|---|
| 1 Desiccant cartridge (optional) | 2 Plug connector of the UV lamp |
| 3 Knurled head screws for fastening the UV lamp | 4 UV lamp holder |
| 5 Front VIS lamp cover | 6 Knurled head screw for fastening the VIS lamp cover |

Lamp service life

The lamps are consumable items. Their radiation intensity decreases over the course of their service life. Frequent switching on and off of the SPECORD PLUS reduces the service life of the lamps, especially for the deuterium lamp. The expected average service life of the halogen lamp is 2000 hours for the VIS range. The expected average energy of the deuterium lamp for the UV range is 50 – 60 % after 2000 hours.

The lamp properties can be checked via the software. To do this, select menu item **In-strument | Test | Lamp check** in ASpect UV.

Opening the service flap

To access the lamps and the dessicant cartridge, you must open the service flap.

- ▶ Switch off the device via the mains switch and disconnect the mains plug from the device connection.
- ▶ Turn the device around so that the rear device side points forward.
- ▶ Wait for approx. 30 minutes for the lamps to cool down. Otherwise, there is a risk of burns from the hot lamps or their covers.
- ▶ Undo the knurled head screw of the service flap on the rear of the SPECORD PLUS and remove the service flap.

Replacing the UV lamp

- ▶ Push the side tabs of the plug connector of the UV lamp together and pull the plug connector apart.
- ▶ Unscrew the knurled head screws.
- ▶ Carefully pull the UV lamp out of the holder.

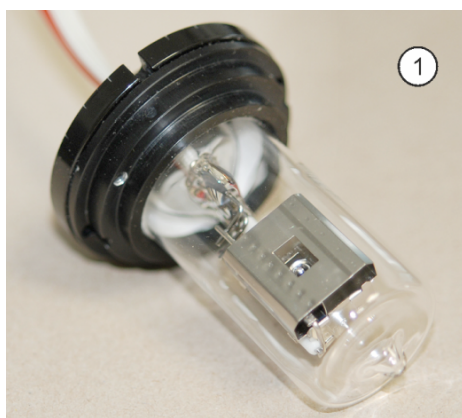
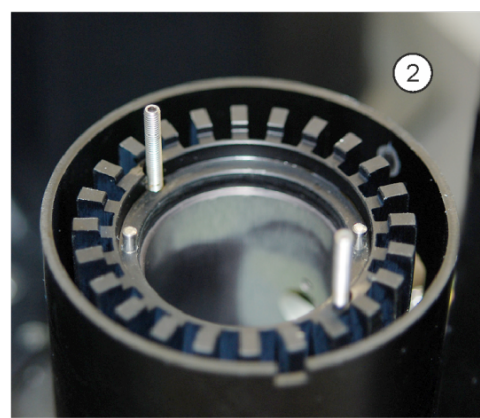


Fig. 19 UV lamp

1 UV lamp



2 Lamp holder with alignment pins and studs

- ▶ Insert the new lamp in the holder.
The alignment pins and studs on the holder must fit in the lamp base.
- ▶ Fasten the UV lamp in the holder with the knurled head screws.
- ▶ Put together the plug connector on the UV lamp.

Replacing the VIS lamp

- ▶ Remove the front VIS lamp cover.

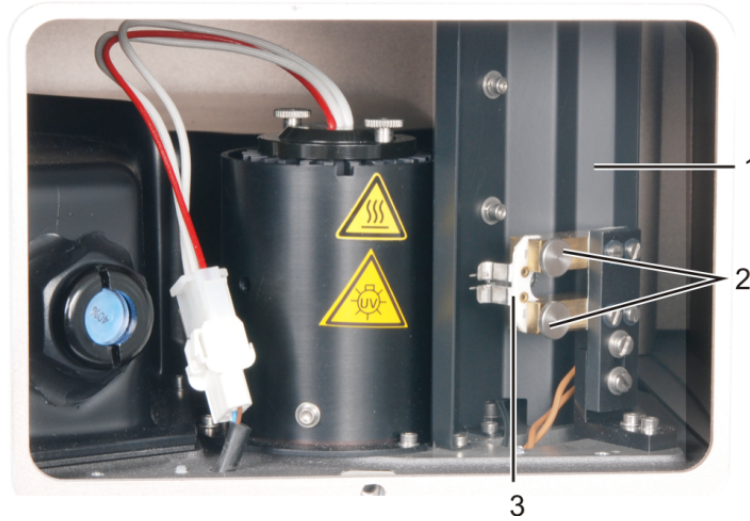


Fig. 20 VIS lamp

- 1 Rear VIS lamp cover
- 2 Knurled head screws for fastening the VIS lamp cover
- 3 VIS lamp with base

- ▶ Loosen the knurled head screws fastening the VIS lamp.
- ▶ Hold the lamp by the base and pull it out of the socket.
- ▶ Insert the new VIS lamp in the socket and screw it in hand tight. Observe that the pin in the lower socket protrudes into the notch on the lamp base.
- ▶ If this has not yet been done, pull the cardboard shell protecting the lamp body off of the lamp.
- ▶ Position the front VIS lamp cover and screw it on.

Inserting or replacing the desiccant cartridge (optional)

- ▶ Remove the foam plug or unscrew the desiccant cartridge from the monochromator hood. Use the protective cap of the desiccant cartridge as a tool.
- ▶ Screw the new desiccant cartridge into the monochromator hood.




Fig. 21 Protective cap of the desiccant cartridge

Recommissioning the device

- ▶ Close the service flap and fasten it with the knurled head screw.
- ▶ Turn the device back to its original position and connect the mains cable to the mains connection of the device.
- ▶ Switch on the device, start ASpect UV and initialize the device.
- ▶ After a lamp replacement, allow the device to run for 2 hours and then carry out the basic correction, and, on the SPECORD 250 PLUS, also the grid correction (→ "Checking and correcting the adjustment" 21).

7.3 Replacing the fuses

- ▶ Switch off the SPECORD PLUS via the mains switch and disconnect the mains plug from the device connection.
- ▶ Pull on the cover of the fuse holder and open it (→ "Connections and display elements on the right side of the device"  11).
- ▶ Replace defective mains fuses.
Only use the following fuses: T 3.15 AH/250 V, type 19181
- ▶ Close the fuse holder.
- ▶ Connect the mains cable to the mains connection on the SPECORD PLUS.
- ▶ Switch on the SPECORD PLUS.
 - ✓ The SPECORD PLUS is now ready to measure.

8 Transport and storage

8.1 Moving the device in the laboratory



CAUTION

Risk of injury during transport

Dropping the device poses a risk of injury and damage to the device.

- Proceed carefully when moving and transporting the device. Two persons are required to lift and carry the device.
- Grip the device firmly at the bottom with both hands and lift it simultaneously.

Observe the following when moving the device within the laboratory:

- Insufficiently secured components pose a risk of injury!
Before moving the device, remove all loose parts and disconnect all connections from the device.
- For safety reasons, two persons are required to transport the device, one person on each side of the device.
- As the device does not have carrying handles, grip the device firmly with both hands at the lower end. Lift the device simultaneously.
- Observe the guide values and adhere to the legally mandated limits for lifting and carrying loads without auxiliary means.
- Observe the installation conditions at the new location.

8.2 Transport

When transporting the device, observe the safety instructions in the "Safety instructions" section.

Avoid the following during transport:

- Impact and vibration
Risk of damage due to shock, impact or vibration!
- Large temperature fluctuations
Risk of condensation!

8.3 Storage



NOTICE

Risk of device damage due to environmental conditions

Environmental influences and condensation can destroy individual components of the device.

- Only store the device in air-conditioned rooms.
 - Ensure that the atmosphere is free of dust and corrosive vapors.
-

If the device is not installed immediately after delivery or not required for longer periods, it should be stored in its original packaging. A suitable desiccant should be added to the equipment to prevent damage from moisture.

The requirements for the climatic conditions of the storage location can be found in the specifications.

9 Disposal

The operator of the SPECORD PLUS must dispose of the waste materials created during measurement (sample materials) in accordance with the statutory and local regulations.

Dispose of the device and its electronic components in accordance with the applicable regulations as electronic waste after its service life has expired.

Before disposal, the device must be properly decontaminated.

10 Specifications

10.1 Physical/optical performance data

10.1.1 Optical system

Spectrometer system	Monochromator with imaging grating and aspherical, quartz-coated optics Internal holmium oxide filter
Detector	Two silicon photo diodes Peltier-controlled for SPECORD 210 and 250 PLUS
Sample position	Additional measuring location for opaque samples Large selection of accessories for optimized positioning of solid, liquid and gaseous samples
Light source	Combination of halogen and deuterium lamp Lamp replacement adjustable between 300 and 450 nm

10.1.2 SPECORD 50 PLUS

Optics	Double-beam spectrophotometer with split beam technology
Wavelength range	190 to 1100 nm
Photometric display range	-9 to 9 A
Photometric measuring range	-3 to 3 A
Spectral bandwidth	1.4 nm
Spectral resolution capability for toluol/hexane at 20 – 25 °C	1.6 to 1.8
Wavelength accuracy (deuterium line at 486 nm)	± 0.2 nm
Wavelength accuracy (deuterium line at 656.1 nm)	± 0.1 nm
Wavelength accuracy (holmium oxide filter at 360.9 nm)*	± 0.5 nm
Wavelength reproducibility (holmium oxide filter at 360.9 nm)*	≤ 0.02 nm
Transmission zero point (200 – 1000 nm)	± 0.05 %T
VIS photometric accuracy (Hellma neutral glass filter F4 at 546 nm)*	± 0.003 A
UV photometric accuracy (potassium dichromate)*	± 0.010 A
Photometric accuracy (potassium dichromate at 430 nm)*	± 0.010 A
Photometric reproducibility (Hellma neutral glass filter F4 at 546 nm)*	≤ 0.0005 A
Scattered light at 198 nm (KCl)**	≤ 0.3 %T
Scattered light at 220 nm (NaI)	≤ 0.03 %T
Scattered light at 240 nm (NaI)	≤ 0.03 %T

Scattered light at 340 nm (NaNO ₂)	≤ 0.02 %T
Baseline noise at 500 nm (RMS)	≤ 0.0001 A
Baseline deviation (200 – 1000 nm)	± 0.0005 A
Long-term stability at 500 nm	± 0.0005 A/h
Uncorrected 100 % transmission line (min./max.; 200 – 1000 nm)	300 to 900 %T
Logging speed	Up to 12000 nm/min
Minimum integration time	0.001 s
Minimum data interval	0.02 nm

* Taking into account the tolerances of the standard solutions used

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10.1.3 SPECORD 200 PLUS

Optics	Double-beam spectrophotometer with fixed slit
Wavelength range	190 to 1100 nm
Photometric display range	-9 to 9 A
Photometric measuring range	-3 to 3 A
Spectral bandwidth	1.4 nm
Spectral resolution capability for toluol/hexane at 20 – 25 °C	1.6 to 1.8
Wavelength accuracy (deuterium line at 486 nm)	± 0.2 nm
Wavelength accuracy (deuterium line at 656.1 nm)	± 0.1 nm
Wavelength accuracy (holmium oxide filter at 360.9 nm)*	± 0.5 nm
Wavelength reproducibility (holmium oxide filter at 360.9 nm)*	≤ 0.02 nm
Transmission zero point (200 – 1000 nm)	± 0.05 %T
VIS photometric accuracy (Hellma neutral glass filter F4 at 546 nm)*	± 0.003 A
UV photometric accuracy (potassium dichromate)*	± 0.010 A
Photometric accuracy (potassium dichromate at 430 nm)*	± 0.010 A
Photometric reproducibility (Hellma neutral glass filter F4 at 546 nm)*	≤ 0.0005 A
Scattered light at 198 nm (KCl)**	≤ 0.3 %T
Scattered light at 220 nm (NaI)	≤ 0.03 %T
Scattered light at 240 nm (NaI)	≤ 0.03 %T
Scattered light at 340 nm (NaNO ₂)	≤ 0.02 %T
Baseline noise at 500 nm (RMS)	≤ 0.0001 A
Baseline deviation (200 – 1000 nm)	± 0.0005 A
Long-term stability at 500 nm	± 0.0005 A/h
Uncorrected 100 % transmission line (min./max.; 200 – 1000 nm)	60 to 160 %T

Logging speed	Up to 12000 nm/min
Minimum integration time	0.001 s
Minimum data interval	0.02 nm

* Taking into account the tolerances of the standard solutions used

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10.1.4 SPECORD 210 PLUS

Optics	Double-beam spectrophotometer with variable slit widths
Wavelength range	185 to 1200 nm
Photometric display range	-9 to 9 A
Photometric measuring range	-3 to 3 A
Spectral bandwidth	0.2 / 0.5 / 1 / 2 / 4 nm
Spectral resolution capability for toluol/hexane at 20 – 25 °C	2.3 to 2.5
Wavelength accuracy (deuterium line at 486 nm)	± 0.2 nm
Wavelength accuracy (deuterium line at 656.1 nm)	± 0.1 nm
Wavelength accuracy (holmium oxide filter at 360.9 nm)*	± 0.5 nm
Wavelength reproducibility (holmium oxide filter at 360.9 nm)*	≤ 0.02 nm
Transmission zero point (185 – 190 nm, 4 nm slit width)	± 1 %T
Transmission zero point (190 – 1150 nm, 2 nm slit width)	± 0.05 %T
Transmission zero point (1150 – 1200 nm, 2 nm slit width)	± 0.2 %T
VIS photometric accuracy (Hellma neutral glass filter F4 at 546 nm)*	± 0.003 A
UV photometric accuracy (potassium dichromate)*	± 0.010 A
Photometric accuracy (potassium dichromate at 430 nm)*	± 0.010 A
Photometric reproducibility (Hellma neutral glass filter F4 at 546 nm)*	≤ 0.0005 A
Scattered light at 198 nm (KCl)**	≤ 0.3 %T
Scattered light at 220 nm (NaI)	≤ 0.03 %T
Scattered light at 240 nm (NaI)	≤ 0.03 %T
Scattered light at 340 nm (NaNO ₂)	≤ 0.01 %T
Baseline noise at 500 nm (RMS)	≤ 0.0001 A
Baseline deviation (200 – 1000 nm, 2 nm slit width)	± 0.0005 A
Long-term stability at 500 nm	± 0.0005 A/h
Uncorrected 100 % transmission line (min./max.; 200 – 1000 nm)	60 to 160 %T
Logging speed	Up to 12000 nm/min
Minimum integration time	0.001 s

Minimum data interval	0.02 nm
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* Taking into account the tolerances of the standard solutions used

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10.1.5 SPECORD 250 PLUS

Optics	Double-beam spectrophotometer with variable slit widths and double monochromator
Wavelength range	190 to 1100 nm
Photometric display range	-9 to 9 A
Photometric measuring range	-3 to 3 A
Spectral bandwidth	0.2 / 0.5 / 1 / 2 / 4 nm
Spectral resolution capability for toluol/hexane at 20 – 25 °C	2.3 to 2.5
Wavelength accuracy (deuterium line at 486 nm)	± 0.2 nm
Wavelength accuracy (deuterium line at 656.1 nm)	± 0.1 nm
Wavelength accuracy (holmium oxide filter at 360.9 nm)*	± 0.5 nm
Wavelength reproducibility (holmium oxide filter at 360.9 nm)*	≤ 0.02 nm
Transmission zero point (200 – 1000 nm, 2 nm slit width)	± 0.05 %T
VIS photometric accuracy (Hellma neutral glass filter F4 at 546 nm)*	± 0.003 A
UV photometric accuracy (potassium dichromate)*	± 0.010 A
Photometric accuracy (potassium dichromate at 430 nm)*	± 0.010 A
Photometric reproducibility (Hellma neutral glass filter F4 at 546 nm)*	≤ 0.0005 A
Scattered light at 198 nm (KCl)**	≤ 0.03 %T
Scattered light at 220 nm (NaI)	≤ 0.005 %T
Scattered light at 240 nm (NaI)	≤ 0.005 %T
Scattered light at 340 nm (NaNO ₂)	≤ 0.005 %T
Baseline noise at 500 nm (RMS)	≤ 0.0001 A
Baseline deviation (200 – 1000 nm, 2 nm slit width)	± 0.0005 A
Long-term stability at 500 nm	± 0.0005 A/h
Uncorrected 100 % transmission line (min./max.; 200 – 1000 nm)	60 to 160 %T
Logging speed	Up to 12000 nm/min
Minimum integration time	0.001 s
Minimum data interval	0.02 nm

* Taking into account the tolerances of the standard solutions used

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10.2 General technical data of the SPECORD PLUS

Mass	SPECORD 50 PLUS: 21.0 kg SPECORD 200 PLUS: 21.9 kg SPECORD 210 PLUS: 22.2 kg SPECORD 250 PLUS: 22.8 kg
Floor space (width x depth)	approx 900 x 690 mm with PC
Dimensions (width x height x depth)	590 x 290 x 690 mm
Sample chamber dimensions (width x height x depth)	364 x 200 x 185 mm
Mains voltage	85 – 264 V/AC
Frequency	50 – 60 Hz
Power consumption	200 VA
Mains fuses	2 x T 3.15 AH / 250 V, type 19181 by Wickmann
Data connections	2 x RS-232 for accessories 1 x USB port for connecting an external PC 1 x RS-232 for connecting an external PC
Ambient conditions	Temperature during operation Humidity during operation Air pressure Temperature and humidity during storage
	15 to 35 °C 90% at 30 °C 0.7 to 1.06 bar 15 – 55 °C at 10 – 30 % humidity, use desiccant

Energy consumption

Energy consumption in different operating modes (SPECORD 210 PLUS)

Operating state	Power in [VA]	Power in [W]	Energy consumption per year in [kW] 3 h / 5-day week	Energy consumption per year in [kW] 8 h / 5-day week
Standby without lamps	31.3	16.6	12.9	34.5
Standby, VIS lamp only	69.1	40.4	31.5	84.0
Standby, VIS lamp only	92.5	54	42.1	112.3
Standby, VIS and UV lamp	128	77.8	60.7	161.8
Both lamps on, scan only in UV	131.5	82.7	64.5	172.0
Both lamps on, scan only in UV	130.2	79.6	62.1	165.6

The power values for the SPECORD 50 PLUS are lower by approx. 10 VA / 7 W in all operating states.

The power values for the SPECORD 200 PLUS are lower by approx. 10 VA / 7 W in all operating states.

The power values for the SPECORD 250 PLUS are higher by approx. 16 VA / 9 W in standby operating states.

The power values for the SPECORD 250 PLUS are higher by approx. 19.5 VA / 14 W in the scan operating states.

10.3 Standards and directives

Protection class and protection type	The device is protection class I. The housing is protection type IP 20.
Device safety	<p>The device complies with the following safety standards</p> <ul style="list-style-type: none"> ■ DIN EN 61010-1 (VDE 0411-1; IEC 61010-1) ■ DIN EN 61010-2-081 (VDE 0411-2-081, IEC 61010-2-081)
EMC compatibility	<p>The SPECORD PLUS has been checked for interference emission and resistance.</p> <p>The device meets the requirements for interference emission in accordance with</p> <ul style="list-style-type: none"> ■ EN 55011 class B ■ EN 61000-3-2 ■ EN 61000-3-3 ■ EN 61326-1 <p>It meets the requirements for interference immunity in accordance with</p> <ul style="list-style-type: none"> ■ DIN EN 61326-1 <p>Requirements for the use in industrial environments are met with limitations; there is no interference for electromagnetic fields in the frequency range of 500 – 1000 MHz up to 6 V/m</p>
Environmental and ambient influences	<p>This device has been tested in environmental simulations under operation and transport conditions and is in accordance with the requirements in:</p> <ul style="list-style-type: none"> ■ ISO 9022-2 ■ ISO 9022-3
EU directives	<p>The device meets the requirements of the directive 2011/65/EU.</p> <p>The device is designed and tested in accordance with standards meeting the requirements of EU directives 2014/35/EU and 2014/30/EU. The device leaves the factory in a sound condition with regard to technical safety. To maintain this condition and to ensure safe operation, the user must strictly observe the safety and operating instructions contained in this operating manual. For accessories delivered with the device and system components from other manufacturers, the information provided in their respective operating manuals has priority.</p>
Guidelines for China	<p>The device contains substances subject to regulation (according to the directive GB/T 26572-2011). Analytik Jena guarantees that, if the device is used as intended, these substances will not leak within the next 25 years and therefore will not pose a threat to the environment or health within this time period.</p>

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