Operating Instructions

JETI Spectroradiometer

specbos 12x1
specbos 1211-2

Contents

1   Introduction

specbos devices are easy to use spectroradiometers for various applications. Their miniaturized shape makes them suitable for laboratory as well as industrial use. They can measure Luminance/ Radiance as well as Illuminance/ Irradiance. Furthermore, colorimetric data (CCT, chromaticity, color purity, dominant wavelength, CRI) are calculated from the spectral data. Therefore, they are suited for the test of light sources, of LCD screens, for the measurement of projectors and of room illuminance.

specbos 1201 is a spectroradiometer for the VIS range.

specbos 1211-2 covers the wavelength range of $350\,\text{nm}$ to $1000\,\text{nm}$. The version **specbos 1211-2UV** extends the wavelength range down to $230\,\text{nm}$.

The indication of the measuring spot on the target in case of Luminance/ Radiance measurements will be realized by a pilot laser circle. Irradiance measurements are done with a cosine corrector head-piece. The software switches automatically to the appropriate measuring mode determined by the attached measuring head.

Measurement of Radiant flux can be done with **specbos 1201**/ **1211**, which have an integrating sphere (diameter selectable from $50\,\text{mm}$ to $500\,\text{mm}$) as accessory.

specbos 1401 is suited for the Radiant intensity measurement of LED's according to CIE 127.

Both instruments can measure in Luminance and Illuminance mode.

Acquisition and analysis of data can be done by the PC software *JETI LiVal*. The connection to the PC works via USB interface (virtual COM port). It is also possible to communicate directly with the instrument without the PC program. Detailed helping information for this application is included on USB flash drive. Furthermore, the instruments can be driven by SCPI compatible firmware commands. The command list is also available on the USB flash drive.

specbos 1211-2 is available with other interfaces:

Bluetooth interface	**specbos 1211-2-BT**
Network interface	**specbos 1211-2-LAN**
Serial interface	**specbos 1211-2-RS**

specbos 1201 is optionally available in a special version–**specbos 1201 focus** for measurement of small spots of $0.5\,\text{mm}$, $1\,\text{mm}$ and $3\,\text{mm}$ diameter.

specbos 1211-2 can also be delivered with focusing optics for the same spot sizes.

PC Requirements:

- Processor (x86/x64) with 1 GHz or higher, min. 2 GB RAM

- Graphic resolution: 1024 * 768, $32\,$bit color depth recommended

- Windows 8.1/10

Scope of Delivery:

- Basic device with protection cap

- Cosine corrector head-piece

- Operating instructions

- Tripod

- Transport box

- USB flash drive with PC software *JETI LiVal*, DLLs, operating instructions and firmware command list

- USB cable

- Trigger connector

Additionally:

specbos 1201/ 1211

- Integrating sphere for luminous flux measurement

specbos 1401

- CIE 127 set up for luminous intensity measurement

specbos 1211-2-BT

- Bluetooth antenna and Bluetooth dongle

- Rechargeable lithium polymer battery EasyPack $3.7\,$V (EZPack XL)

- Power supply $9\,$V

specbos 1211-2-LAN

- Power supply $9\,$V

specbos 1211-2-RS

- Serial cable

- Power supply $9\,\text{V}$

specbos 1211-2/1201 focus (also -BT/-RS/-LAN)

- Additional focusing optics (see chapter 5.2.3 'Focusing optics', page 25 for types and mechanical dimensions).

Optional:

- Additional caps with filters or diffusers with attenuating filters to shift the measuring range of **specbos 1201** and **specbos 1211-2** to higher intensities.

2   Security Recommendations

Before any operation, please read the following safety precautions to avoid any possible bodily injury and to prevent the device from damage. In order to avoid any contingent danger, this device has to be used only within the specified ranges.

- The target pointer is a Class 1 laser product[1], which has to be handled carefully. Being directed into human eyes, it can cause loss of eyesight. Do not look into the laser beam or aim the laser at another person!

- Avoid using liquid cleaners.

- Never spill liquids of any kind on the device.

- Never touch the glass window of the device, nor the diffusers, glasses or filters contained in the additional equipment.

- If any mechanical damages on the device are detected, contact *JETI* please.

specbos 1211-2-BT

Batteries are to be disposed of properly in accordance with statutory provisions. Never open or puncture them, nor throw them into fire.

Note:	We recommend to use only original $100\,\%$ mercury-free batteries and proper charging devices to avoid any health risks and damage to the device.

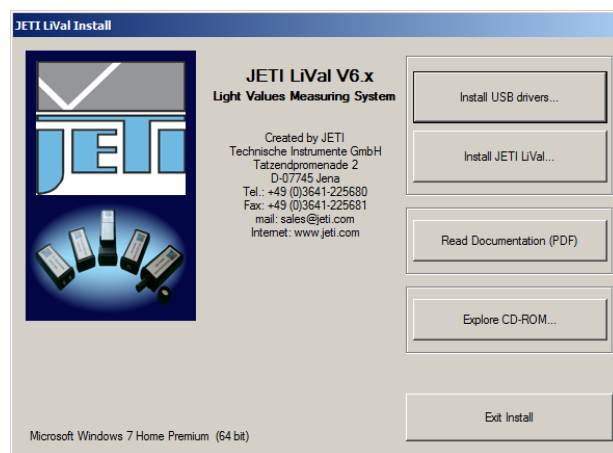[1]Classification according to IEC 60825-1

3 Drivers under Windows 8/ 10

3.1 How to Install

Do **not** connect the device during driver installation!

Note:	You must have administrator privileges to install the device driver.

- Insert the USB flash drive in an open USB slot on your computer.
- Run install.exe from the USB flash drive. Following window appears:

- Click the Install USB drivers... button and follow the instructions to install the drivers.
- If a warning window appears that 'Windows can't verify the publisher of this software', click on Install Anyway .
- After finishing, connect your device to an USB-port. Windows completes the driver installation automatically.

  If the driver could not be installed successfully, please uninstall the driver according to instructions from the next chapter, and try again.

3.2 How to Uninstall

This chapter describes how to uninstall old driver software.

Note:	You must have administrator privileges to uninstall the device driver.

- Run 'CDMUninstallerGUI.exe'. You can find this program on your *JETI* USB flash drive in the directory `Tools ▸ CDMUninstaller`.
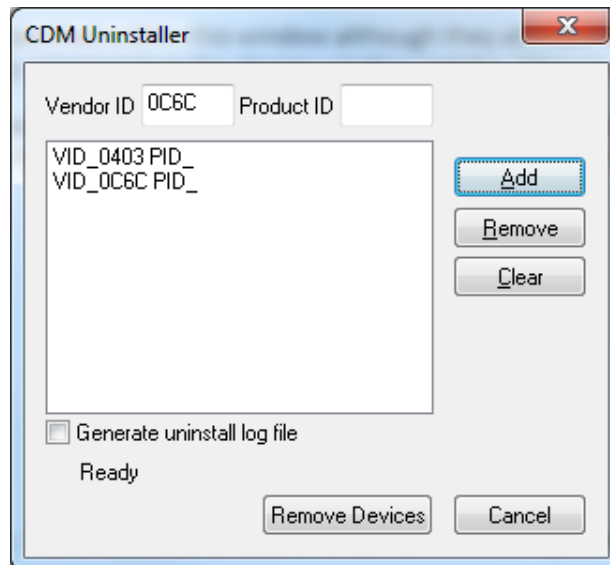
- Enter '0403' in the Vendor ID text box. Leave the Product ID text box blank. Click on Add to add the list entry.

- Repeat the previous step and type '0C6C' in the Vendor ID text box and add it to the list in the same manner.

- Make sure that no *JETI* USB-device is connected to the computer and click Remove Devices.

- Please wait while the drivers are uninstalling. This may take some time.

- The system should now be cleaned from old drivers. Close the program by clicking on Cancel.

3.3   How to Determine Driver Version

Note:	For this procedure, the device, which was already installed, must be connected to the computer.

JETI USB driver consists of two parts, a device driver and a virtual COM-port driver. For the device to function correctly, the versions of the two drivers need to be the same.

To determine the version of the virtual COM-port driver:

- Open the 'device manager' (see next chapter on how to do this).

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- Open the branch 'Ports (COM & LPT)' by clicking on the small plus-sign.

- Right-click the | JETI specbos xxxx Port | (or USB Serial Port) entry and choose ⟩
  ⟩ Properties | from the context menu.

- In the appearing property window open the tab | Driver | by clicking on it.

- On the appearing page you can find the driver version and the driver's date.

To determine the version of the device driver:

- Open the 'device manager' (see next chapter on how to do this).

- Open the branch 'Universal Serial Bus controllers' by clicking the small plus-sign.

- Right-click the | JETI specbos xxxx Device | (or USB Serial Converter) entry and choose
  ⟩ Properties | from the context menu.

- In the appearing property window open the tab | Driver | by clicking on it.

- On the appearing page you can find the driver version and release date.

3.4   How to Open the Device Manager on Windows 8/ 10

The Windows *Device Manager* shows information about the devices installed on your computer.

There are several ways to open the *Device Manager*, depending on the Windows version and the settings of Windows. The easiest of them is:

- Press | ⊞ Win | + | Break | on the keyboard.

- Click | Device Manager | on the left side of the appearing window.

# 4 Installation and Operation of Hardware

4.1 Installation of USB Device

Unpack the spectroradiometer **specbos 12x1** carefully and check the delivered parts.

Attention:	The USB driver must be installed at first without connected instrument.

All specbos devices are powered by USB.

Connect the device to a USB interface of a PC or laptop using the enclosed USB cable.

Attention:	The USB port of the PC must provide voltage of at least $4.8\,$V. Otherwise – what can be the case e.g. if using passive USB-hubs – the measuring values *can* be unreliable.
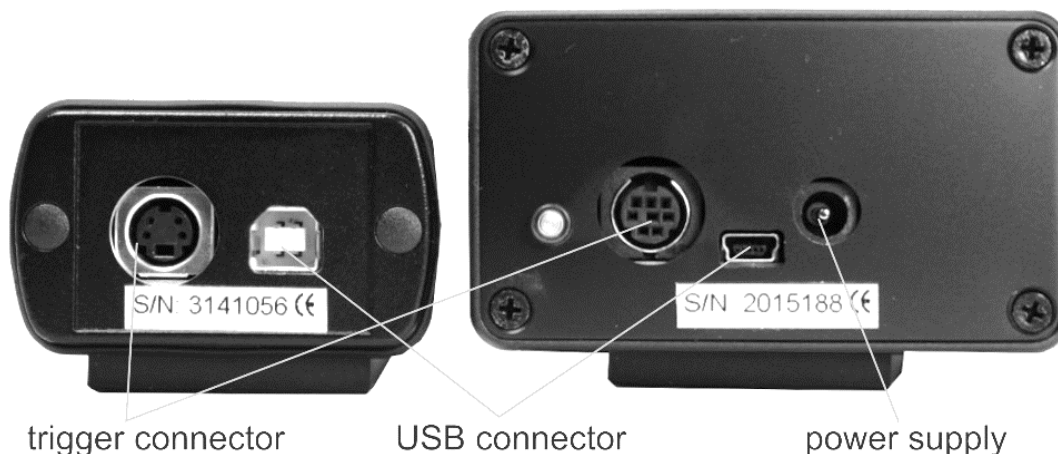
specbos 1201 and **specbos 1211-2**

specbos 1211-2 has a separate power connector, in addition to the USB connector.

4.2 specbos 1201

The instrument is switched on when the USB connection to the PC is established.

Attention:	The USB driver must be installed at first without connected instrument.

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4.3   specbos 1211-2

The instrument is switched on automatically when the USB connection to the PC is established.

Attention:	The USB driver must be installed at first without connected instrument.

Pressing the illuminated switch turns on the target marking if the instrument is in radiance mode. Repeated pressing switches the target marking off.
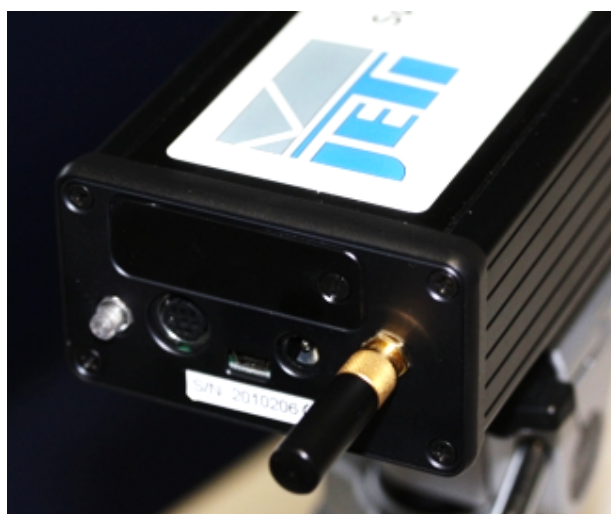
4.4   specbos 1211-2-BT

4.4.1   Installation of Bluetooth Device

specbos 1211-2-BT can be used via Bluetooth or USB, alternatively. The package includes a Bluetooth antenna.
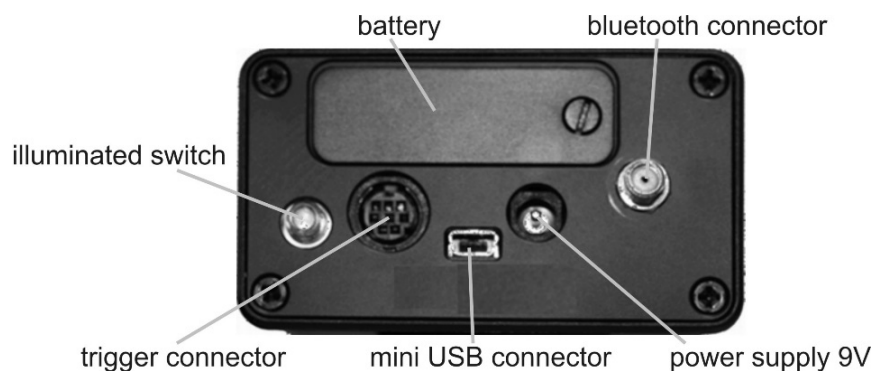
Please connect it to the instrument as shown below.

Press the rear side switch until it turns blue, to switch on the device.
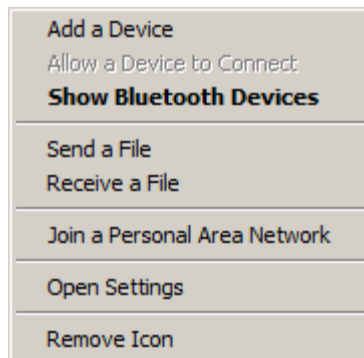
The Bluetooth interface is often integrated into modern computers. If your computer is not equipped with it, you will need to use a Bluetooth dongle (included in the delivery).
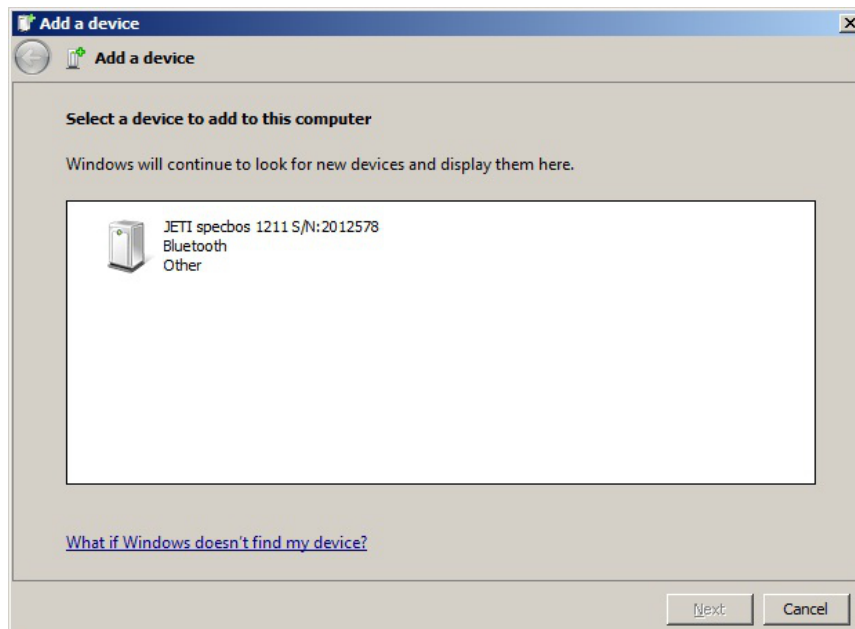
The software guides you through the installation.

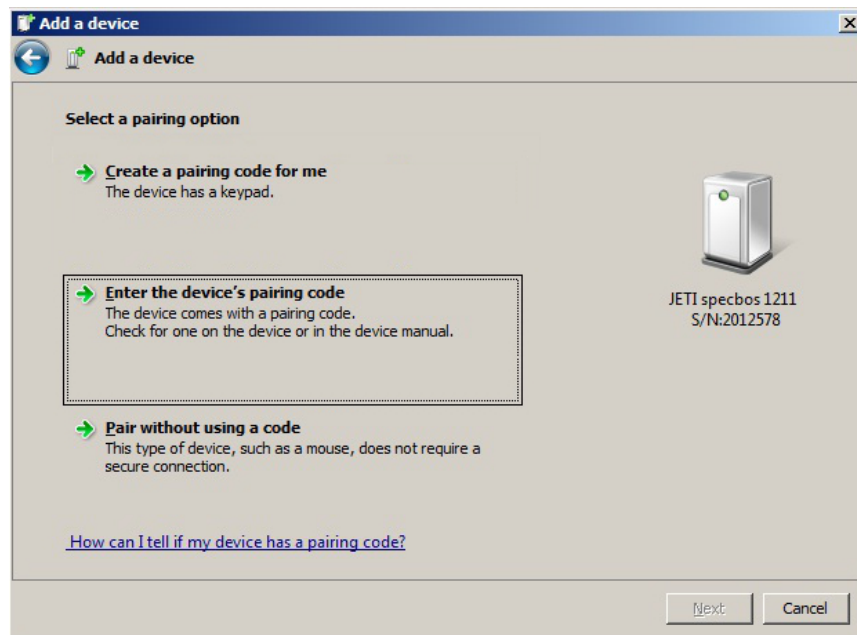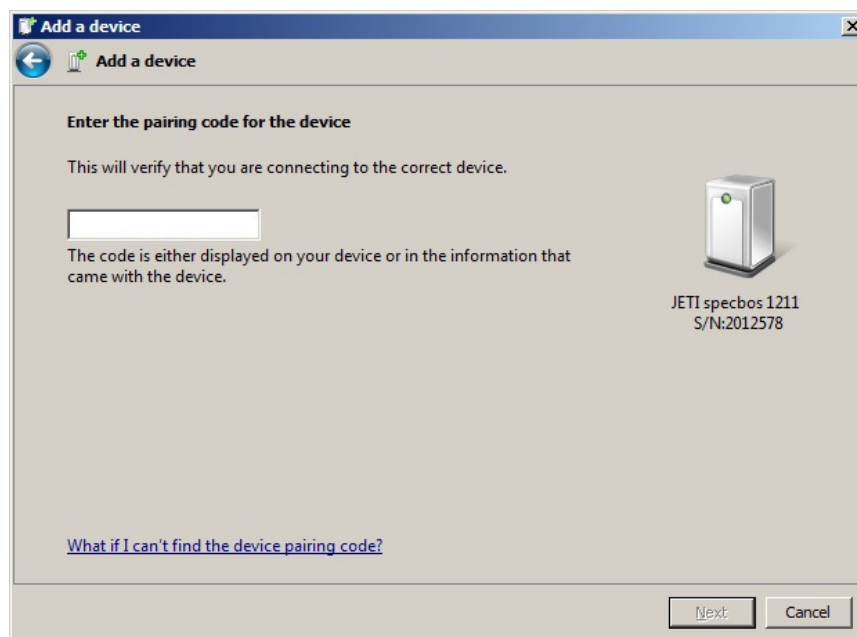- Click on the Bluetooth symbol to start the installation process.

- Click Add a Device .

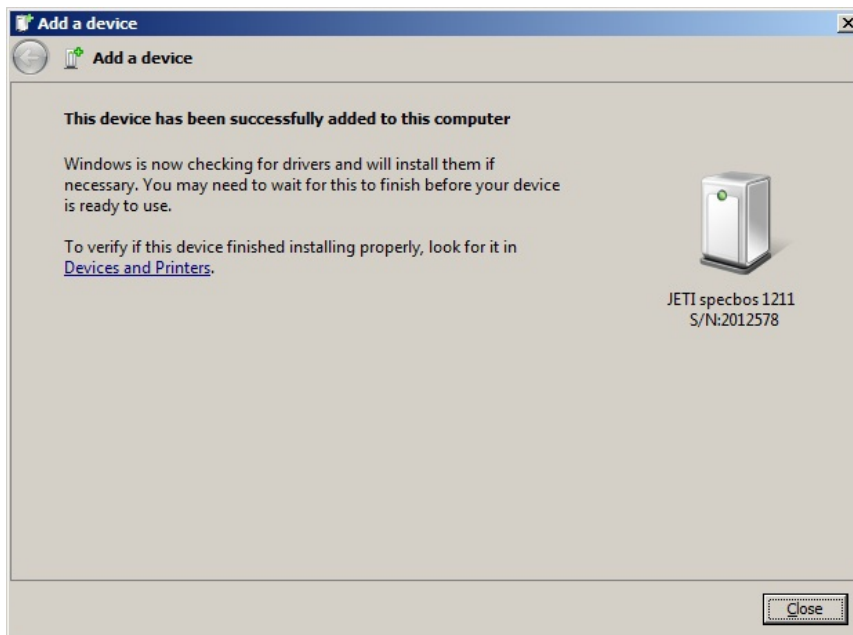- Click Continue , select **JETI specbos 1211** and click **Next**.

- Click Enter the device's pairing code and then Next .

- Insert the device pairing code: 0000 and click Next .

- The next window finalizes the installation. Click Close .

4.4.2 Battery Handling

specbos 1211-2-BT is powered by battery if the wireless interface is used.

Note:	The battery powered **specbos 1211-2-BT** will be switched off automatically if the defined operating time of $15\,\mathrm{min}$ is elapsed without any communication.

The battery will be charged when the device is connected to the PC via USB. Alternatively, it can be charged with the power supply. The switch on the rear side has the following functions:

- Pressing if device is switched off: Turn on the device.

- Short pressing if the device is switched on:

    ○ Turn on/ off the target marking.

- Long pressing if the device is switched on:

    ○ Turn off the device.

    If the device is switched off and connected to power supply or to PC via USB:

    ○ Short flashing - battery is being charged.

○ Illumination off - battery is fully charged.

If the device is switched on:

○ Continuous illumination with short breaks - battery is being charged.

○ Continuous illumination - battery is fully charged.

Remark:	Connect the device with your PC to charge the battery via USB.

If the device is operated by *JETI LiVal* software, battery status can be seen in the title bar of the window and through menu Info 〉 Battery Status . If battery is low, corresponding warnings will be shown.

4.5   Network Settings for specbos 1211-2-LAN
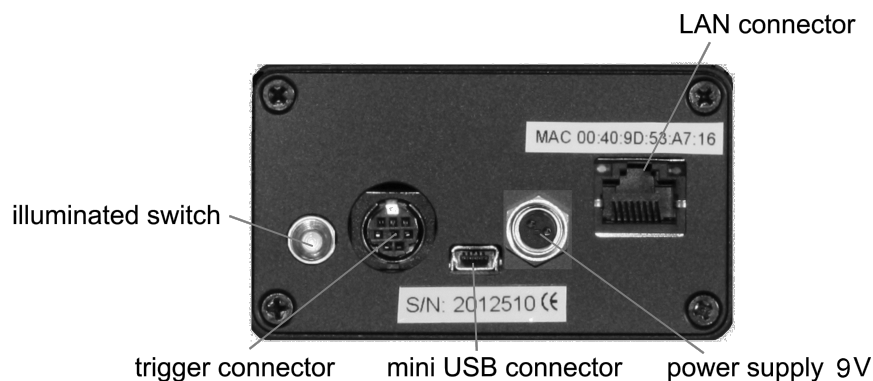
The **specbos** device and the controlling PC have to use the same network address space, to communicate with the **specbos 1211-2-LAN** via a network connection.

Remark:	The **specbos 1211-2-LAN** needs the power supply if it is used via network or USB.

The default network setting of the **specbos** device is set to DHCP (obtain network settings automatically). If a DHCP server is running in your network, the device will obtain an IP address from within the local network address space, and no further steps are required.

If no DHCP server is available (e.g. during a direct connection to a PC) or you want to give the device a fixed IP address for some other reasons, the network setting of the **specbos** device has to be changed through a tool called 'Digi Device Discovery' (available on the installation USB flash drive).

Note:	You must have administrator privileges!

- Connect **specbos 1211-2-LAN** to the power supply and to the LAN (1:1 as well as crossed cables can be used).

- Go to directory `Tools ▸ Device Discovery` on the installation USB flash drive and run 'dgdiscvr.bat'.
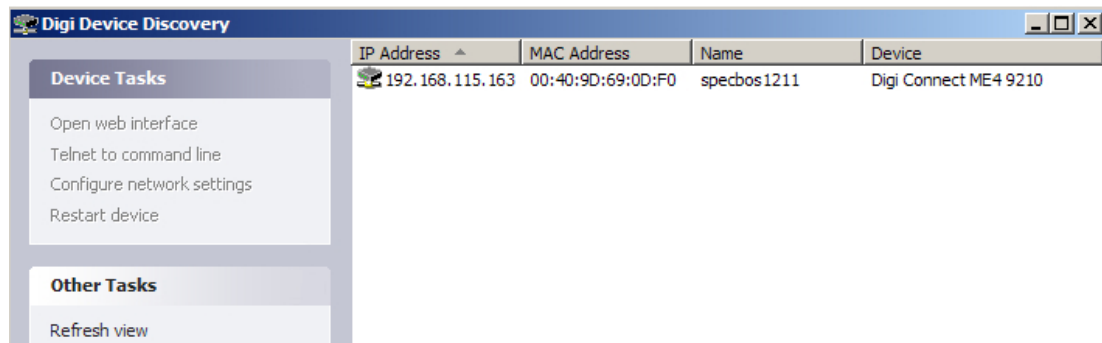
- The tool will search all devices in your LAN and display them on the screen.

- Devices, which are not configured properly to be controlled via your LAN, are marked with a red exclamation mark.

- Right-click on the device to configure and select 'Configure network settings' from the menu.

- A window will appear where you can configure the network setting of the **specbos** device.
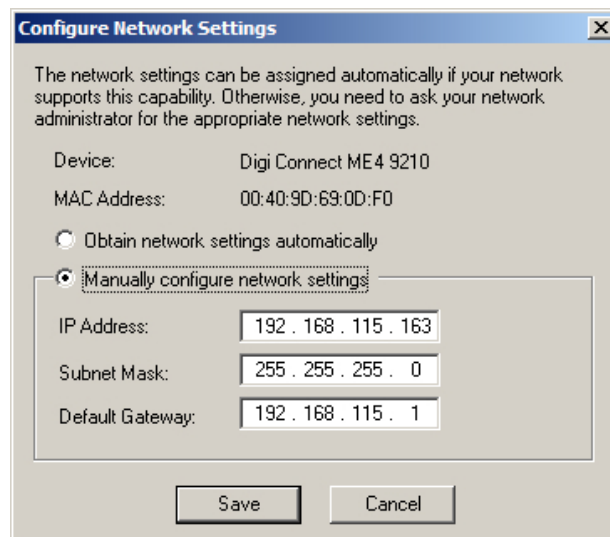

- After clicking on Save a message appears that the device must be restarted.

- If no other red exclamation mark is visible, the device is configured properly to work in your LAN.

Remark:	The IP address of a PC can be found using 'cmd.exe' in the command line and then entering the command 'ipconfig'.

4.6 Installation of RS Device specbos 1211-2-RS

Connect the device to a PC or laptop using the enclosed RS cable and plug the power supply (9 V) into main power.
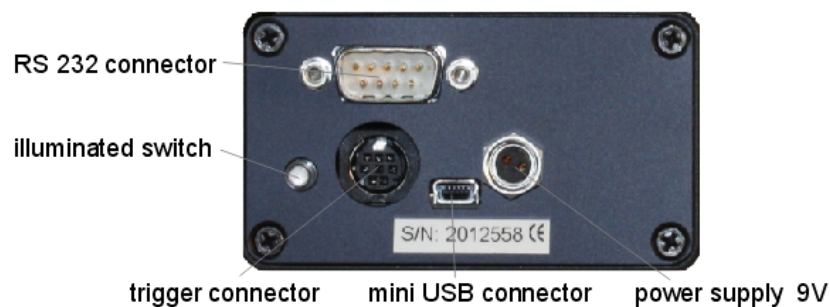
4.7 Trigger Function

4.7.1 Connectors

It is possible to trigger the measurement externally or to initiate a flash of a pulse light source. The trigger female connector at the rear side of the device has the following pin out (specbos 1211-2 Mini DIN 8; specbos 1201 Mini DIN 4)

Pin out (view to female connector of the device):

3	Lamp out 5 V TTL signal (flash lamp trigger)
5	Measuring trigger input
1, 2, 4, 6, 7	not used
8	Ground
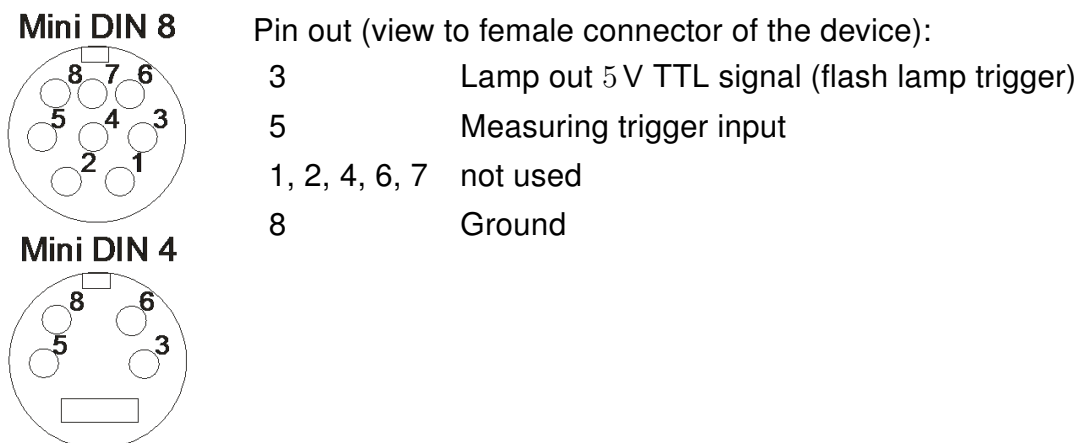
A suitable male connector is included in the device's delivery package.

4.7.2 External Control of the Measurement

A measurement can be initiated externally by a shortcut between the pins 5 and 8. This can be done, e.g., by a foot push-button. Furthermore, it is possible to use a TTL signal to start a measurement. This is done with the falling edge of the signal.

Both triggering versions act similarly as pressing the green Measurement button of the *JETI LiVal* software.

See the firmware description to change the settings.

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5 Technical Data

## 5.1 Basic Characteristics

	specbos 1201	specbos 1211-2
Applications	Measurement of diffuse light sources, screens etc., of room illuminance and of lamps	
Spectral range	380 nm to 780 nm	350 nm to 1000 nm (optional 230 nm to 1000 nm)
Optical resolution (FWHM)	5 nm	4.5 nm
Wavelength accuracy	$\pm$ 0.5 nm	
Calculated wavelength step	1 nm	1 nm
Digital electronic resolution	16 bit A/D (15 bit used, 14 bit displayed)	
Measuring values	Spectral radiance/ spectral irradiance/ (radiant flux with specbos 12x1/ radiant intensity with specbos 1401) integral luminance/ integral radiance/ integral illuminance/ integral irradiance/ (integral luminous/ radiant flux with specbos 1201/ integral luminous/ radiant intensity with specbos 1401) chromaticity x, y; u', v'; CCT (correlated color temperature); dominant wavelength, color purity; circadian metrics; photosynthetically active radiation; CRI; CQS; TLCI; TM-30-18	
Measuring range Luminance	$0.2\,cd/m^2$ to $150\,000\,cd/m^2$ (CIE source A)	$0.2\,cd/m^2$ to $100\,000\,cd/m^2$ (typical warm white LED)
Measuring range Illuminance	1 lx to 1 800 000 lx (CIE source A)	1 lx to 1 500 000 lx (typical warm white LED)
Measuring range Luminous intensity **specbos 1401**	cond. A 0.1 cd to 300 cd cond. B 0.03 cd to 100 cd	
Measuring range Luminous flux **specbos 12x1**	50 mm sphere: 0.03 lm to 250 lm 150 mm sphere: 0.1 lm to 800 lm	300 mm sphere: 0.02 lm to 400 lm 500 mm sphere: 0.04 lm to 900 lm
Viewing angle in luminance mode	1.8°	

| Measuring distance/ diameter in Luminance mode	20 cm - $\varnothing$ 6 mm; 100 cm - $\varnothing$ 30 mm	
Accuracy photometric value	5 % (CIE source A)	
Repeatability of photometric value	2 % (CIE source A)	
Color chromaticity accuracy	$\pm$ 0.002 x, y (CIE source A, k=2)	
Color repeatability	$\pm$ 0.0005 x, y (CIE source A)	
CCT repeatability	$\pm$ 20 K (CIE source A)	
Integration time range	0.005 s to 60 s	
Dispersive element	Diffraction grating	
Light receiving element	512 pixel photodiode array	2048 pixel CCD array
Operating conditions	Temperature 10 °C to 40 °C Humidity $<$ 85 % relative humidity at 35 °C	
Power supply	Hub powered	Hub powered 9 V power supply (necessary for **specbos 1211-2-LAN**)
PC interface	USB 2.0 fullspeed (12 Mbit/s)	USB 2.0 fullspeed (12 Mbit/s) Bluetooth **specbos 1211-2-BT** RS232 **specbos 1211-2-RS** LAN **specbos 1211-2-LAN**
Dimensions (basic unit)	150 mm $\times$ 58 mm $\times$ 34 mm	180 mm $\times$ 82 mm $\times$ 53 mm
Weight (basic unit)	300 g	450 g
Pilot laser	Laser Class 1, $\lambda = 645 \ldots 660$ nm (classific. accord. to DIN EN60825-1-2015-07)	

5.2   Mechanical Dimensions

The following drawings show the positions of the threads on the bottom side of the device and some general dimensions of the instrument.

5.2.1   specbos 1201
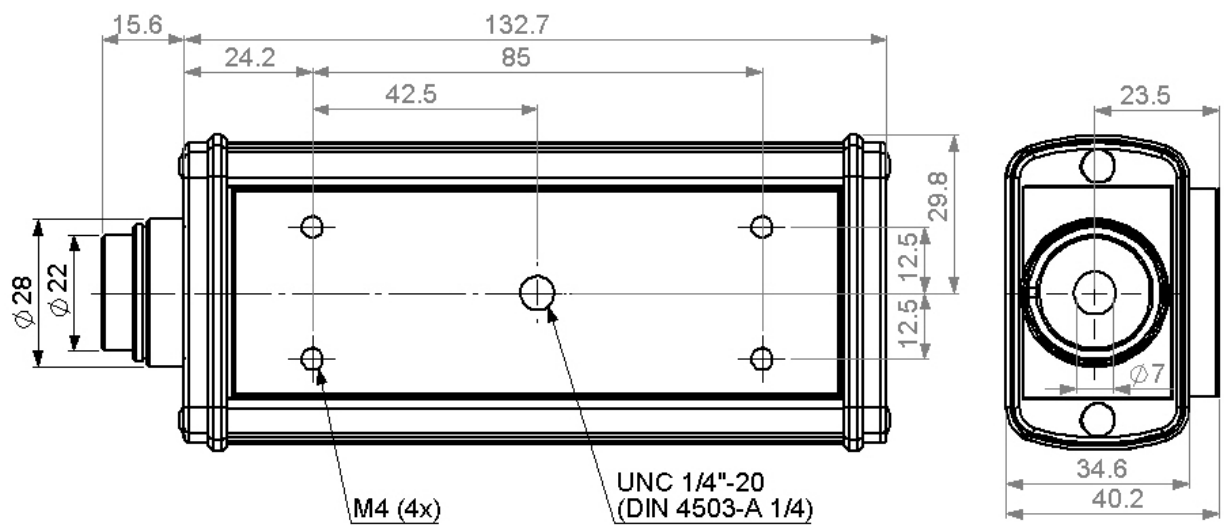
5.2.2   specbos 1211-2
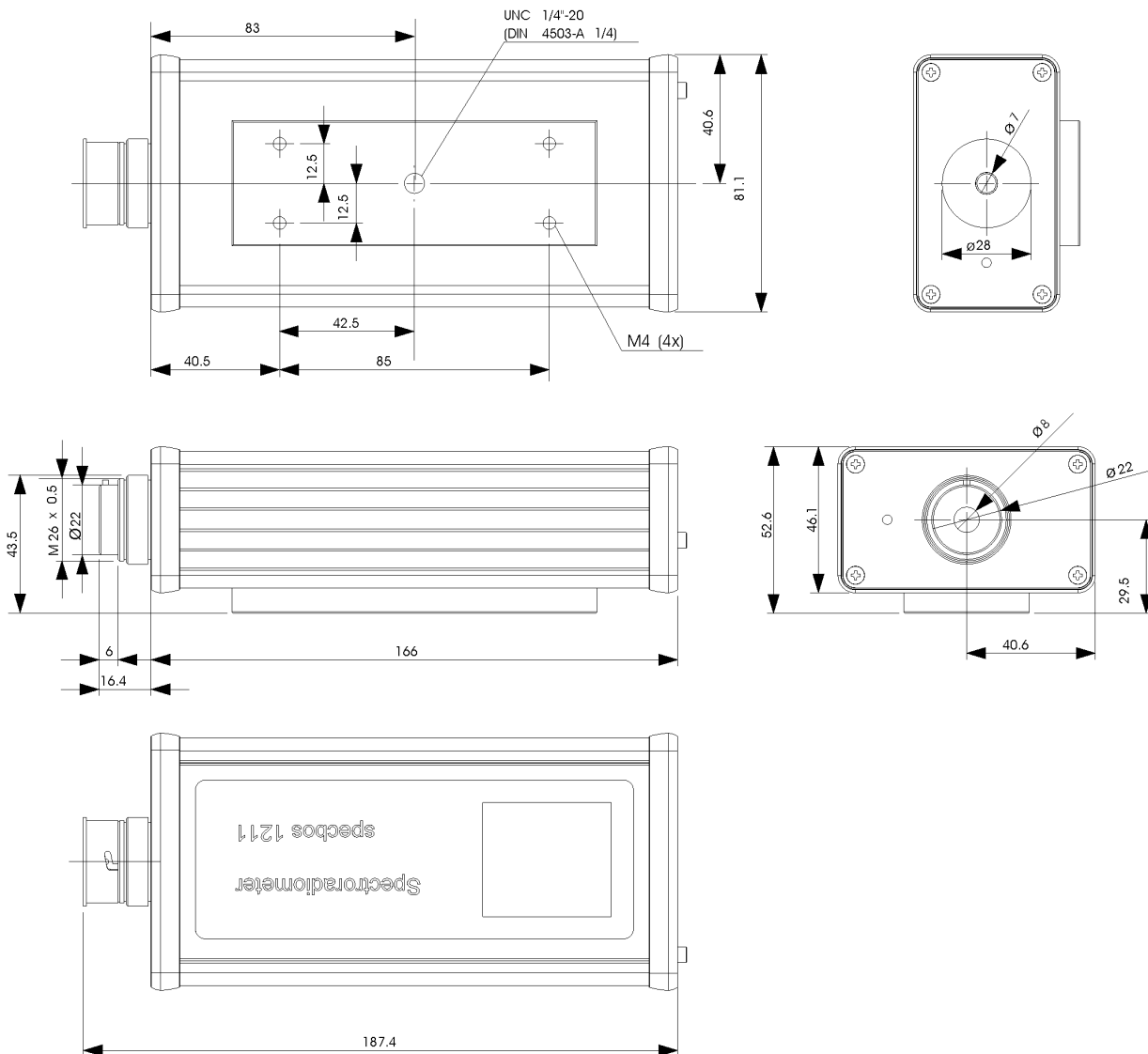
5.2.3 Focusing optics

Name	Measuring diameter	Measuring distance	Field of view	Length
Focusing optics 3	3 mm	70 mm	2.1°	77 mm
Focusing optics 1	1 mm	26 mm	1.9°	26 mm
Focusing optics 0.5	0.5 mm	46 mm	0.6°	77 mm

6 Declarations

6.1 CE – Declaration of Conformity

We:

> JETI Technische Instrumente GmbH
>
> Göschwitzer Straße 48
>
> 07745 Jena
>
> GERMANY

declare that the product series

Spectroradiometer
specbos 1201/ 1211-2

to which this declaration relates is in conformity with the requirements of following documents:

- EU Electromagnetic Compatibility (EMC) Directive 2014/30/EU

- EU Low Voltage Devices (LVD) Directive 2014/35/EU

EU Harmonised standards:

- EN 61326-1 (2018-09)

- EN 55011 (2017-03) class B

- EN 61000-4-2 (2009-12); EN 61000-4-3 (2011-04)

- EN 61000-4-4 (2013-04); EN 61000-4-6 (2014-08)

- EN 61010-1 (2020-03)

- EN 50581 (2013-02)

The $C\!E$ sign confirms the conformity of the product with the standards and directives mentioned above.

JETI
Technische Instrumente GmbH
Göschwitzer Straße 48, D-07745 Jena
Tel.: +49 (0)3641 232 92 00
Fax: +49 (0)3641 232 92 01

Jena, March 2020

6.2   Declaration of UKCA Conformity

We:

> JETI Technische Instrumente GmbH
>
> Göschwitzer Straße 48
>
> 07745 Jena
>
> GERMANY

hereby declares that the product series

JETI spectroradiometer
specbos 1201/ 1211-2

placed on the market by the Company and its subsidiaries are compliant with Electro-magnetic Compatibility Regulations 2016 (S:I: 2016/1091) and following documents.

EU Harmonised standards:

- EN 61326-1 (2018-09)

- EN 55011 (2017-03)

- EN 61000-4-2 (2009-12); EN 61000-4-3 (2011-04)

- EN 61000-4-4 (2013-04); EN 61000-4-6 (2014-08)

- EN 61010-1 (2020-03)

The conformity of the product with the standards and directives mentioned above, is confirmed by the UKCA sign.

JETI
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Fax: +49 (0)3641 232 92 01

Jena, December 2021

6.3   Certificate of Warranty

Certificate of Warranty for

Model: **Spectroradiometer**

Type: **specbos 1201**

specbos 1211

JETI Technische Instrumente GmbH (referred to as JETI) hereby warrants this equipment as follows:

If any part of this unit (except as described below) fails due to poor workmanship or material (determined by JETI) within TWO (2) years from date of delivery, that part will be exchanged at no charge.

This warranty is valid only when the unit is installed and adjusted according to factory specifications and serviced by competent authorized personnel.

JETI does not assume responsibility for any of the following, all of which are excluded from the coverage of this warranty:

- Damage due to ordinary wear and tear, abusive use, or lack of proper maintenance

- Damage due to harsh mechanical shock, e.g. falling to the floor

- Loss or damage due to adverse environmental conditions or acts of God

- Loss of wages or income due to repair, replacement, malfunction or damage

Warranty becomes void if serial number is removed or defaced, or the instrument was opened by the customer.

If a defect appears which the customer feel is covered by this warranty, a written notice describing the defect must be sent to JETI's office at the current address of record.

Upon receipt of customers written report of a defect, if the defective items are covered by this warranty, JETI will repair or replace it at no charge to the customer, within 30 days after receipt of the returned unit (provided there are no labor problems or materials shortages to cause delays). The choice between repair and replacement shall be determined by JETI based on actual conditions or circumstances. JETI reserves the right to substitute new and improved equipment or parts at any time. The obligation to replace defective parts does not require replacement of the complete unit.

NO OTHER WARRANTY EXPRESSED OR IMPLIED IS APPLICABLE TO THIS UNIT.

This warranty shall be in effect for a period of 24 months, beginning one week after the date of delivery.

6.4   License Agreement

License Agreement for JETI Technische Instrumente GmbH Software Products
IMPORTANT – READ CAREFULLY BEFORE USING THE JETI SOFTWARE

JETI hereby grants to you a non-exclusive license to use one copy of the delivered *JETI* software program (the 'software') on a single computer according to the following items:

The software is in 'use' on the computer when it is loaded into temporary memory (i.e. RAM) or installed into permanent memory (e.g. hard disk, CD-ROM, or other storage device) of the computer. However, installation on a network server for the sole purpose of distribution to one or more other computer(s) is not constitute 'use' for which a separate license is required, provided you have separate license for each computer to which the software is distributed.

It is only allowed to use the software in connection with the *JETI* product (instrument, spectrometer or OEM electronics), which was delivered with this software. For additional *JETI* products you need an extra software license.

The software is owned by *JETI* or its suppliers and is protected by German copyright laws and international treaty provisions and all other applicable national laws. Therefore, you must treat the software like any other copyrighted material (e.g. a book or musical recording) except that if the software is not copy protected you may either

- make one copy of the software solely for backup or archival purposes, or
- transfer the software to a single hard disk provided you keep the original solely for backup or archival purposes. You may not copy the user documentation provided with the software and the connected *JETI* product.

You may not:

- permit other individuals to use the software except under the terms listed above;
- modify, translate, reverse engineer, decompile, disassemble (except to the extent that this restriction is expressly prohibited by law) or create derivative works based upon the software or documentation;
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- remove any proprietary notices or labels on the software or documentation.

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- You may not use the software in an attempt to, or in conjunction with, any device, program or service designed to circumvent technological measures employed to control access to, or the rights in, a content file or other work protected by the copyright laws of any jurisdiction.
- If you receive the first copy of the software electronically and a second copy on physical media (e.g., CD, diskette, etc.), the second copy may be used for archival purposes only and may not be transferred to or used by any other person. This license does not grant you any right to any enhancement or update.

The software may include certain external software components ('Add-Ons'), including the Lab Windows user interface and drivers. You may only call to or otherwise use such Add-Ons through the use of the *JETI* applications. Any direct use of Add-Ons through a non-*JETI* proprietary application, including a custom or user-written application is prohibited by this Agreement.

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7 Service

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