

Operating Instructions

***JETI* Spectroradiometer**

spectraval 15x1



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Contents

1	Introduction	5
2	Security Recommendations	6
3	Drivers under Windows 7/ 8/ 10	7
3.1	How to Install	7
3.2	How to Uninstall	8
3.3	How to Determine Driver Version	9
3.4	How to Open the Device Manager on Windows 7/ 8/ 10	9
4	Installation of Hardware	10
4.1	Installation of USB Device	10
4.2	Installation of Bluetooth Device spectraval	10
4.3	Installation of LAN Device spectraval 1501	12
5	Operation of Device	14
5.1	spectraval 15x1	14
5.2	Battery charging	15
5.3	Trigger Function	15
5.3.1	Connectors	15
5.3.2	External Control of the Measurement	16

6	Display Operation (only spectraval 1511)	17
6.1	Taking a Measurement	17
6.2	Displaying of Results	18
6.2.1	Numeric Values	18
6.2.1.1	Customizing the Num. Values List	18
6.2.2	Spectrum	19
6.2.2.1	Modifying the spectrum range	19
6.2.3	xy Diagram	19
6.2.3.1	Displaying the RGB-Color Space /-White Point	19
6.2.4	u'v' Diagram	20
6.2.4.1	Displaying the RGB Color Space	20
6.2.5	CRI	20
6.2.6	RGB	21
6.2.6.1	Modifying the RGB Color Space	21
6.3	SD Card	22
6.3.1	File Management	22
6.3.2	Configuring the File Settings	22
6.4	Reference Measurement	24
6.5	Settings	25
6.5.1	Device Settings	25
6.5.1.1	Power Options	25
6.5.1.2	Touchscreen Calibration	25
6.5.2	Measurement Settings	25
6.5.2.1	Average	25
6.5.2.2	Continuous Scan Interval	25
6.5.2.3	Sync Frequency	26
6.5.2.4	Change Calibration	26
6.5.3	View Settings	27
6.5.3.1	Units	27
6.5.3.2	Number Format	27
6.5.3.3	Content Selection	27
7	Technical Data	28
7.1	spectraval 1501	28
7.2	spectraval 1511	29
7.3	Mechanical Dimensions	30
8	Declarations	31
8.1	Certificate of Warranty	31
8.2	CE – Declaration of Conformity	32
8.3	License Agreement	33
9	Service	35

1 Introduction

spectraval 1501 is an easy to use spectroradiometer for various applications. Its miniaturized shape makes them suitable for laboratory as well as industrial use. The units can be used in the field in combination with a laptop.

They measure the spectral Radiance of light sources from 380 nm to 780 nm within an field of view of 1.8°. Additionally photometric, colorimetric (CCT, chromaticity, color purity, dominant wavelength, CRI, CQS, RGB) and application specific data (TLCI, PAR, circadian) are calculated from this spectrum. Therefore they are suited for the test of monitors as LCD, OLED and plasma type, for the measurement of projectors and of video walls as well as for scientific investigations. The indication of the measuring spot on the target is done with a pilot laser circle.

spectraval 15x1 can be used via Bluetooth or alternatively via USB.

Acquisition and analysis of data is done by the PC-software *JETI LiVal*. It is also possible to create customer specific software using the tool kit provided with the instrument: SDK (spectrometric and radiometric DLLs). It is included on the supplied USB flash drive with detailed helping information. Furthermore, the instruments can be driven by their SCPI compatible firmware commands. The command list is also available on the USB flash drive.

PC Requirements:

- Pentium 4/ AMD Athlon XP or higher, min. 512 MB RAM
- Graphic resolution: 1024 × 768, 16 bit color depth recommended
- Windows 7/ 8/ 10

Scope of Delivery:

- Basic device with protection cap
- Operating instructions
- Tripod
- Transport box
- USB flash drive with PC software *JETI LiVal*, DLLs, operating instructions and firmware command list
- USB cable
- Bluetooth dongle
- Rechargeable lithium ion battery GEI103450 (Green Energy)
- USB battery charger

2 Security Recommendations

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

- The target pointer is a class 1 laser product¹, 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 direct the laser to another person!
- Avoid using liquid cleaners.
- Never spill liquids of any kind on the device.
- Never touch the glass window of the device, nor diffusers, glasses or filters contained in additional equipment.
- If any mechanical damages on the device are detected, please contact *JETI*.
- Batteries are to be disposed properly in accordance with statutory provisions. Never open or puncture them, nor throw them into fire.

¹Classification according to IEC 60825-1

3 Drivers under Windows 7/ 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 delivered with your device in an open USB slot on your computer.
- Run install.exe from the USB flash drive. The following window will appear:



- 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.

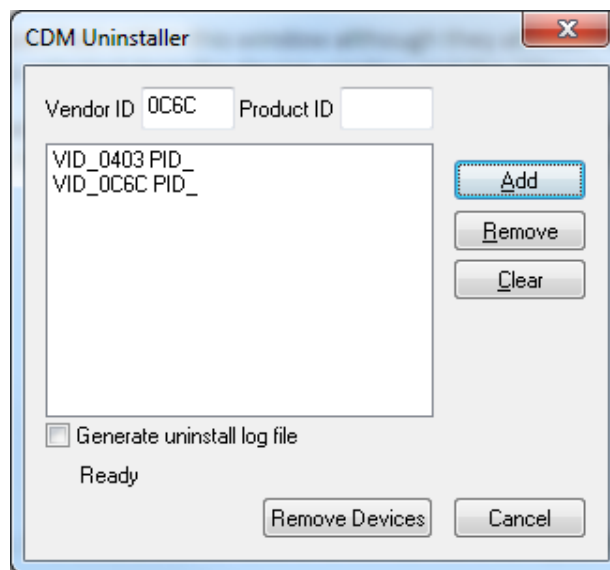
If the driver could not be installed successfully, please uninstall the driver according to instructions from the next chapter, and try again.

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 way.
- **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).
- 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 7/ 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.

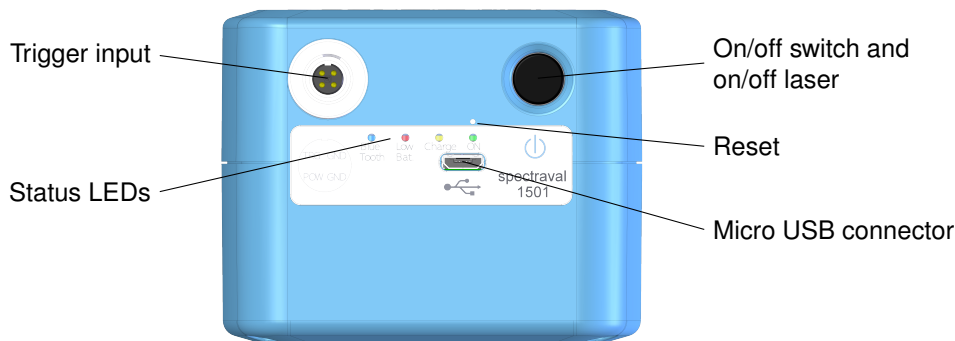
4 Installation of Hardware

4.1 Installation of USB Device

Unpack the spectroradiometer **spectraval 15x1** carefully and check the delivered parts.

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

The **spectraval** devices are powered by USB if operated via USB interface. Additionally the battery will be charged during this time.



Control elements of **spectraval 1501**

Connect the device to a USB interface of a PC or laptop using the enclosed USB cable. Shortly afterwards the device is ready for operation, e.g. by *JETI LiVal*.

4.2 Installation of Bluetooth Device spectraval

spectraval can be used via Bluetooth.

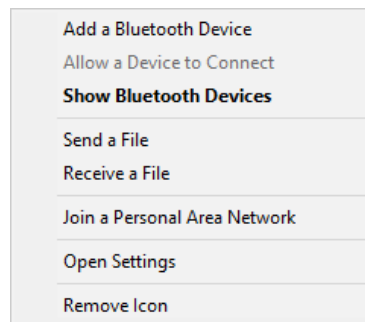
The Bluetooth interface is often integrated into modern computers. If your computer is not equipped with it, you need to use the Bluetooth dongle included in the delivery or any other one. Please connect it to the computer and switch on the **spectraval** device.

The software guides you through the installation.

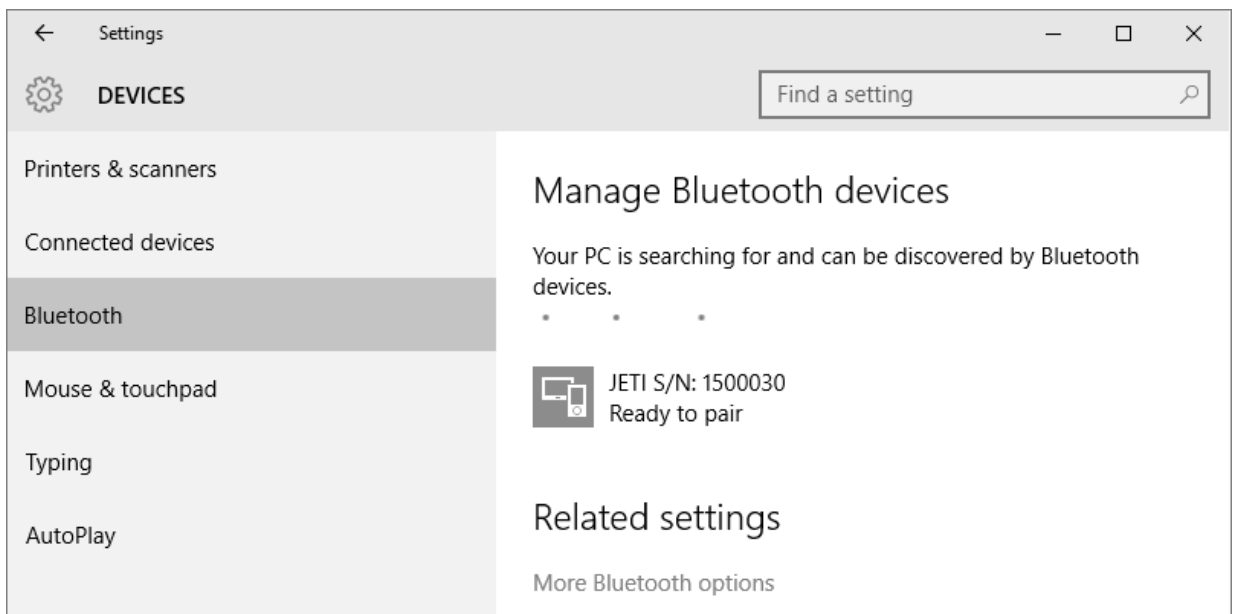
- Click on the Bluetooth symbol.



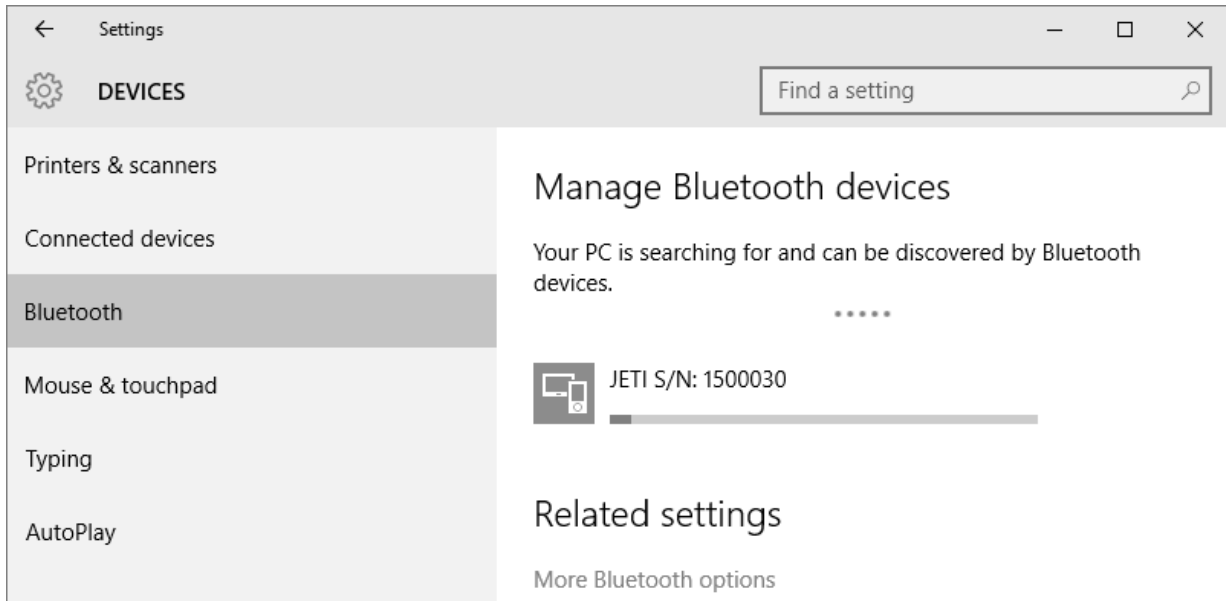
- Click **Add a Bluetooth Device**.



- After a short time the spectraval device will be recognized. Click Ready to pair.



- If the following screen appears, the installation is complete and the device is ready to use:



- Close the window.

4.3 Installation of LAN Device spectraval 1501



The **spectraval** device and the controlling PC have to use the same network address space, to communicate with the **spectraval-LAN** via a network connection.

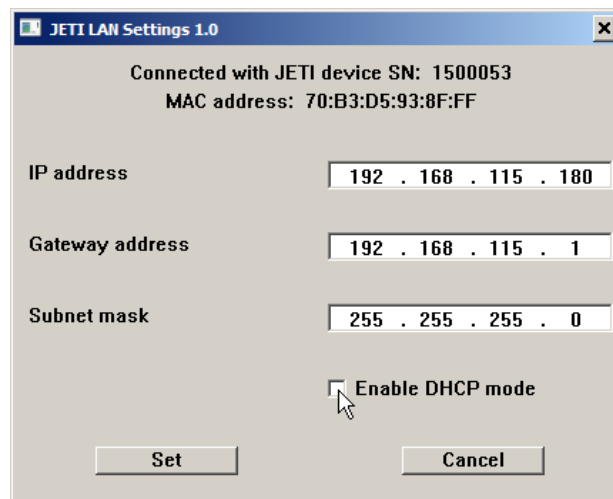
Remark: The **spectraval 1501-LAN** needs a 5 V power supply if it is used via network or USB.

The default network setting of the **spectraval** 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 **spectraval** device has to be changed through a tool called 'JETI_LAN_settings.exe' (available on the installation USB flash drive).

Note: You must have administrator privileges!

- Connect **spectraval 1501-LAN** via USB to computer.
- Start 'JETI_LAN_settings.exe' from 'Tools\JETI_LAN_Settings' to change LAN configurations.
- A window will appear where you can configure the network setting of the **spectraval** device.



- After clicking on **Set** button a message appears that device parameters have been changed successfully.

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

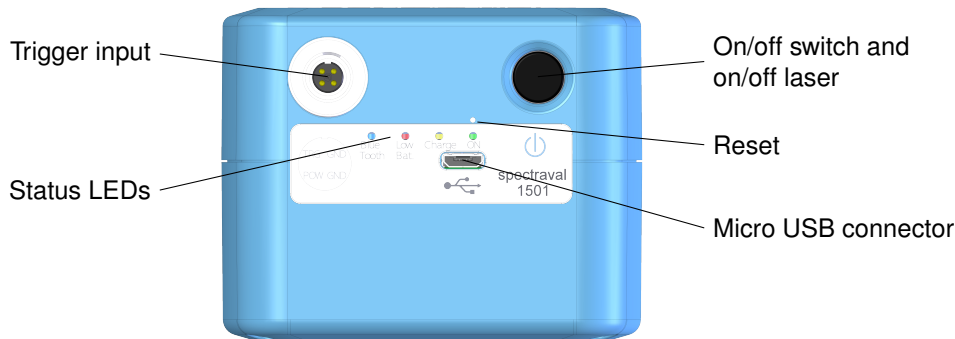
5 Operation of Device

5.1 spectraval 15x1

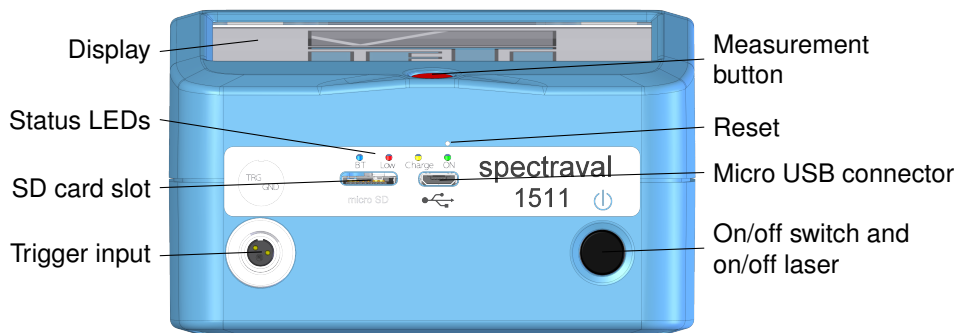
The instrument will be switched on automatically shortly after it was connected to a PC when the USB cable is used. This will be shown by the shining green LED.

Attention: The USB driver must be installed at first without connected instrument (see chapter 3 'Drivers under Windows 7/ 8/ 10', page 7).

If you communicate via Bluetooth, the device has to be switched on using the **On/ off** switch on the rear side.



spectraval 1501



spectraval 1511

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

If **spectraval** is connected to PC via Bluetooth and the connection is interrupted, **spectraval** is switched off immediately.

The battery status is shown by the yellow LED on the rear side of the device.

Status LEDs

Green:	Device is on
Yellow:	On Device is charging Off Device is not charging Flashing Charging error
Red:	Battery low. Device will be switched off shortly after this.
Blue:	Active Bluetooth connection

5.2 Battery charging

The battery can be charged using the USB battery charger or using the USB port of a PC. To use USB port for charging, plug in the USB device cable and make sure that the device is recognized by Windows correctly.

The battery will remain in the instrument, it is not exchangeable by the user.

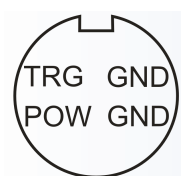


If the device is operated by *JETI LiVal* software, battery status can be seen in the title bar of the window and through menu **Info/ Battery Status**. If battery is low, corresponding warnings will be shown.

5.3 Trigger Function

5.3.1 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:



A suitable male connector is included in the device's delivery package.

5.3.2 External Control of the Measurement

A measurement can be initiated externally by a shortcut between the ground (GND) and trigger (TRG) pins. 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.

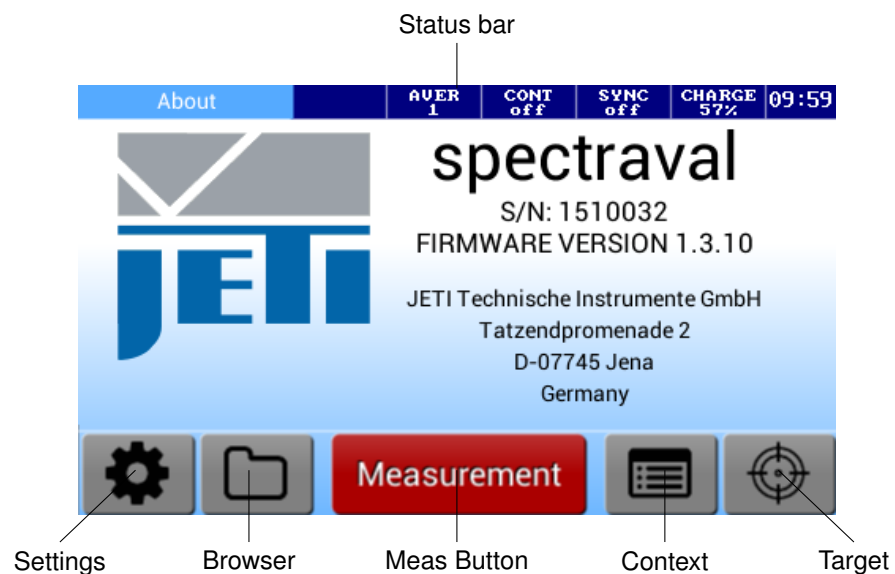
6 Display Operation

(only spectraval 1511)

6.1 Taking a Measurement

This section describes how to get started by taking a quick measurement. Note that some of the references to buttons and lights are describes in the previous sections.

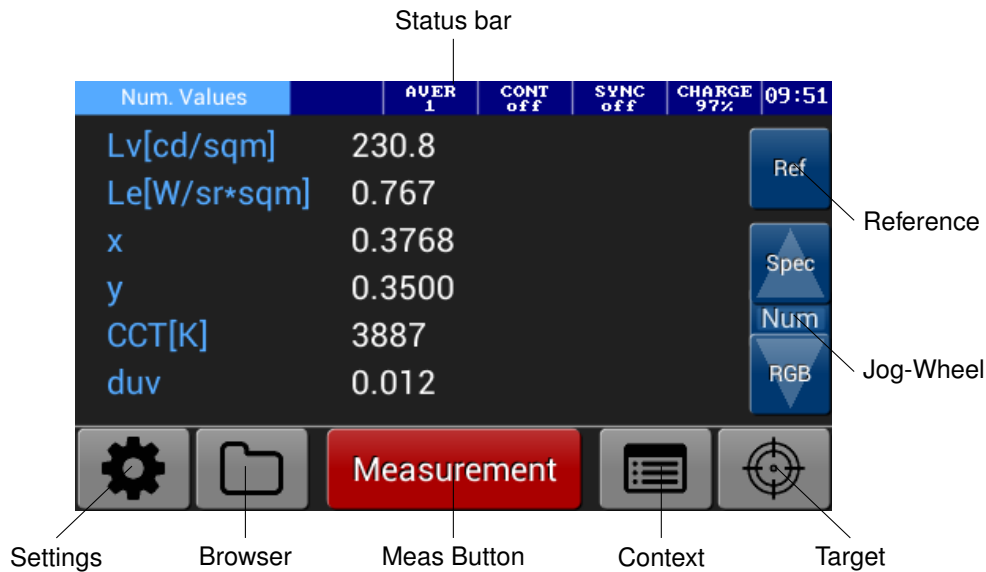
- Turn on the **spectraval 1511** by pressing the **On/Off** switch. The green status LED will illuminate.
- The **spectraval 1511** will initialize and then the following screen will display:



- Optionally, the measuring area can now be marked by clicking the **Target Icon**.
- Aim the laser point by pointing the measuring head on the front of the device in the direction of light. Press the **Measurement button**.
- The results will be instantly displayed on the screen:



6.2 Displaying of Results

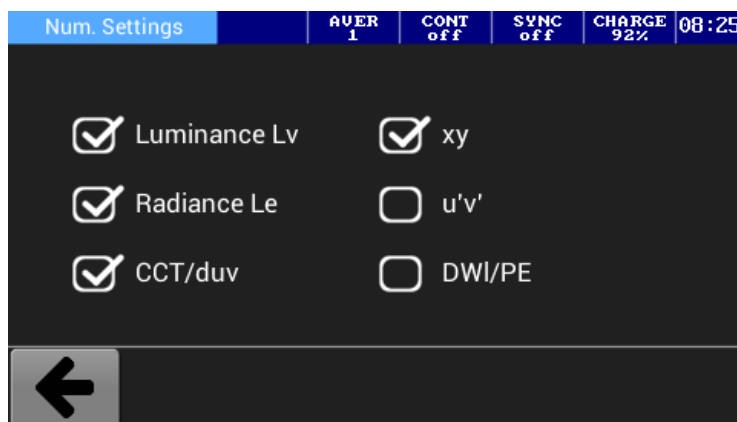


6.2.1 Numeric Values

This screen shows a list of measurements recorded after pressing the **Measurement button** as demonstrated in the previous section.

6.2.1.1 Customizing the Num. Values List

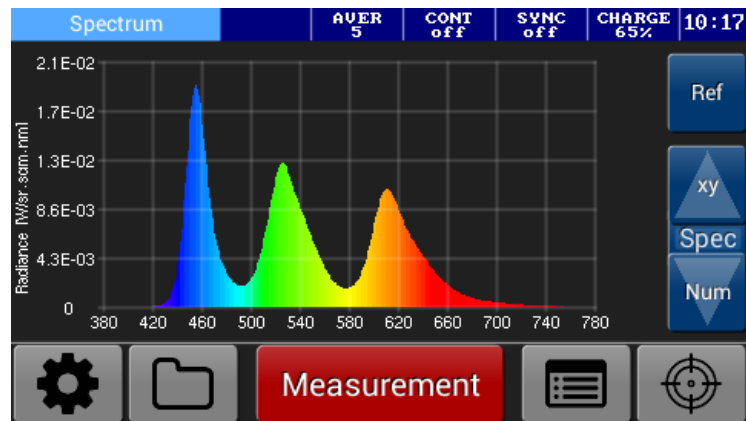
The Numeric Values list can be customized with different units of measure (e.g. Lv,xy,CCT) through the context-based Options, accessed from the Num. Values Screen.



Tap on the checkbox to select/deselect an item from the list and then return to the Num. Value by tapping the Back Icon. Now your new data-set will display.

6.2.2 Spectrum

Light Spectrum of the latest measurement taken.

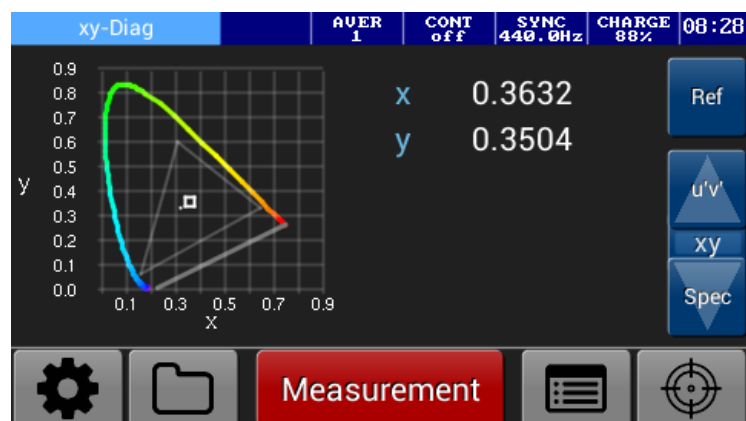


6.2.2.1 Modifying the spectrum range

The start and the end of the displayed spectrum can be adjusted through the context-based Options, accessed from the Spectrum Screen.

6.2.3 xy Diagram

The CIE1931 chromaticity x, y values of the latest measurement taken.

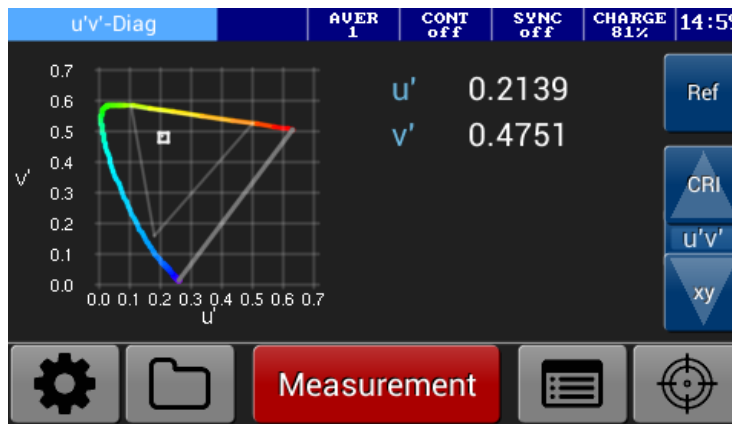


6.2.3.1 Displaying the RGB-Color Space /-White Point

By tapping the checkbox you can display the RGB color triangle and the white point of the chosen RGB color Space, through the context-based Options.

6.2.4 u'v' Diagram

The CIE1976 chromaticity u' , v' values of the latest measurement taken.

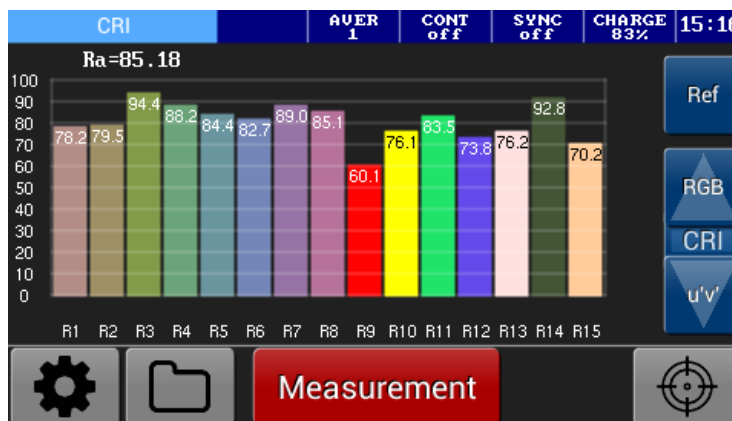


6.2.4.1 Displaying the RGB Color Space

By tapping the checkbox you can display the RGB color triangle and the white point of the chosen RGB color Space, through the context-based Options.

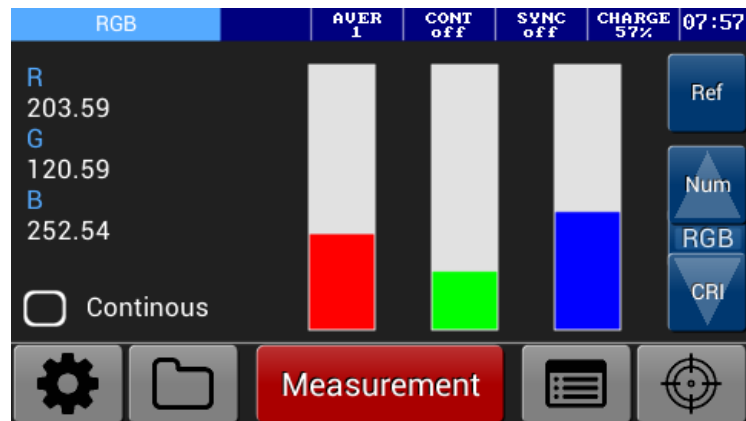
6.2.5 CRI

The CRI R1-R15 values of the latest measurement taken.



6.2.6 RGB

The RGB values of the latest measurement taken.



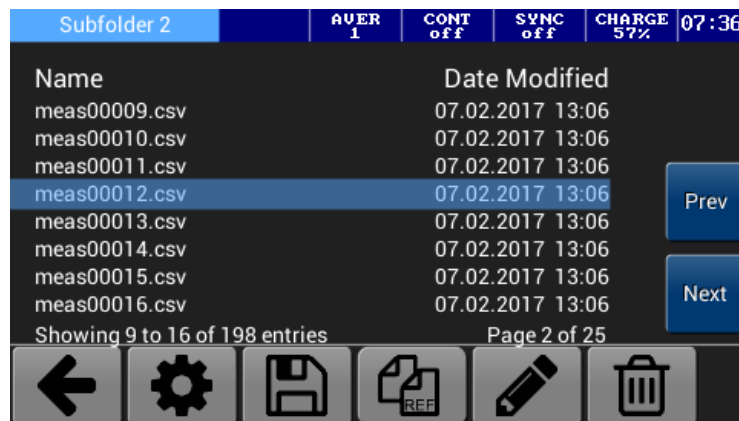
6.2.6.1 Modifying the RGB Color Space

The required RGB color space can be select (e.g. PAL, NTSC, HDTV) through the context-based Options, accessed from the RGB Screen.

6.3 SD Card

6.3.1 File Management

The **spectraval 1511** can write measurement data onto a SD Card (only support 1GB up to 32GB Fat32). Simply insert the card into the card reader slot, tap the **Browser Icon** to access the File Explorer and furthermore tap the **Disk Icon** to write a measurement. Data is written as comma separated files (.csv).

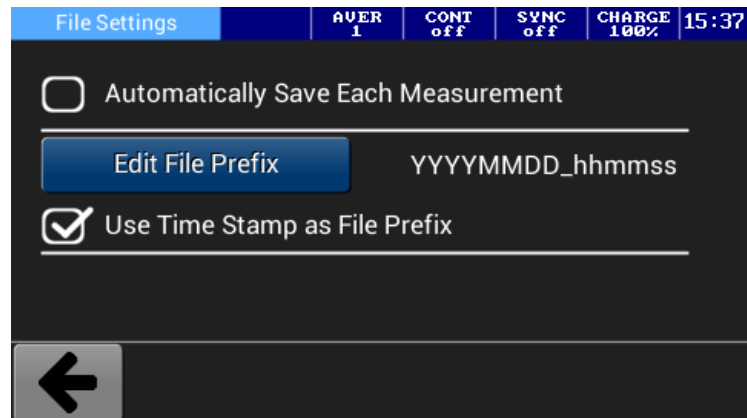


If you select a measurement by tapping onto it, more options are available. By tapping the **Copy Ref Icon**, the selected measurement will be copied to the RefData folder and can be used as a reference. (described in detail in section Reference Measurement). If you tap the **Pencil Icon**, the selected file can be renamed. By tapping the **Recycle Bin Icon** the selected file can be deleted.

6.3.2 Configuring the File Settings

Configure the settings by pressing the **Settings Icon** at the lower left. This is where you can make additional settings related to the written files. By tapping the checkbox you can select/deselect the 'Automatic Save' feature. If this option is selected, measurements are automatically written onto the sd card. Specify a file name prefix by tapping the

Edit File Prefix Button. Otherwise you can use a time stamp (year, month, day, hour, minutes, and seconds) as file prefix by checking the checkbox below.



6.4 Reference Measurement

Note: There are two folders written onto the SD card. SpecData and Ref-Data. RefData contains the Reference Measurement data.

The Reference item allows you to compare two measurement side by side. You can compare two consecutive measurements or compare a measurement against historical data from sd card.

Num. Values	AVER 1	CONT off	SYNC 440.0Hz	CHARGE 86%	08:11
Lv[cd/sqm]	394.4	158.8			Ref
Le[W/sr*sqm]	1.335	0.5014			
x	0.3498	0.3422			Spec
y	0.3397	0.3526			Num
CCT[K]	4766	5114			RGB
duv	0.008	0.002			








Measurement



When you tap the **Ref Button** above the jog-wheel, the reference file menu will display, which is similar to the File Explorer. Like the File Explorer a screen appears showing the files which are located in the RefData folder. Select one of the CSV files and press the **REF Button**. The data will appear in the Reference column.

Reference File	AVER 1	CONT off	SYNC 440.0Hz	CHARGE 86%	08:20
Name	Date Modified				
20161220_082137.csv	20.12.2016 08:21				
RGB.csv	16.01.2017 15:40				

Showing 1 to 2 of 2 entries Page 1 of 1




REF



It is also possible to see the relative difference between the measurement and the reference, by checking the option 'Show Reference as Difference'.

6.5 Settings

For a better understanding of the possible settings some important terms and measurement parameters are explained below. The different adjustment possibilities are divided into **Device Settings**, **Measurement Settings** and **View Settings**.

6.5.1 Device Settings

6.5.1.1 Power Options

The Power Setting Options allows you to set different actions to take when the device is left idle for a certain amount of time. If the device will turn off after a specific time, any unsaved measurement data will be lost!

6.5.1.2 Touchscreen Calibration

Opens a window in which you can recalibrate the touchscreen (realign) should it react imprecisely to touch.

6.5.2 Measurement Settings

6.5.2.1 Average

The Average setting can be used to obtain the spectrum as the mean value from up to 254 successive measurements.

6.5.2.2 Continuous Scan Interval

If you want to measure continuously, you can select the interval in the range of 0 s to 65 535 s. Note that you can begin a measurement session by tapping the **Measurement Button** in the different Mode View and stop the session by pressing the Button again.

6.5.2.3 Sync Frequency

If you want to measure modulated light sources (typical examples are TV monitors and PWM modulated LED's), it is necessary to synchronize your device to the repetition rate, because **spectraval** devices are very sensitive. Otherwise the results, especially of bright sources, will fluctuate significantly. If the repetition rate of the display lies in the order of magnitude of the measuring time of the instrument, the repeatability of the measurement will be poor. To do this, use the Sync **Determine Sync Freq Button** below. The frequency setting can be adjusted manually between 16 Hz and approximately 2000 Hz. If the sync measurement fails, it can have the following reasons:

- The instrument is positioned too far from the light source.
- The influence of the surrounding light or other light sources is too significant.
- The source is not modulated (note that some monitors do not fluctuate in intensity if their brightness control is set to maximum).

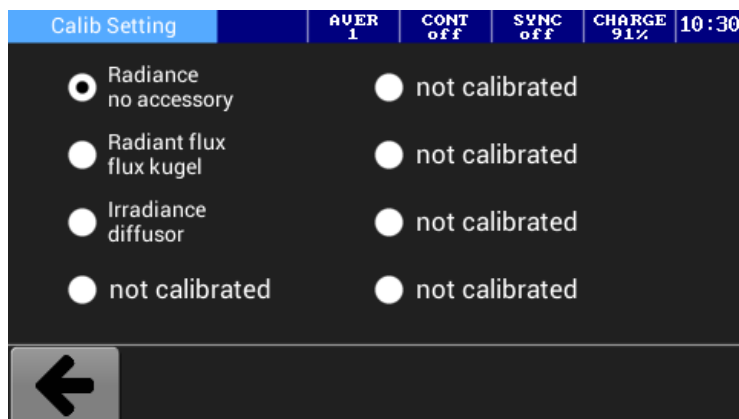
6.5.2.4 Change Calibration

The NFC sensor in the measuring head recognize the accessory attached to the device automatically. The software will use automatically the appropriate calibration file if the attached accessory is compatible with the device. By default, the first position is reserved for the Luminance mode measurement without an accessory.

Remark: If the NFC-sensor is disabled, always make sure that the right calibration file is selected, to obtain correct measuring results.

JETI spectraval 15x1 are delivered in a calibrated status. The calibration data are saved in the device. A separate file exists for each measuring mode and each accessory.

The menu point **Change Calibration** displays the following options:



You can choose between the calibration data that are saved in the device. Each calibration data is described with the measuring mode (Radiance, Irradiance, Radiant flux or Radiant intensity) and a remark.

6.5.3 View Settings

6.5.3.1 Units

It is possible to switch between SI and imperial units. In case of imperial units, Luminance units are footlamberts (*fL*) and Illuminance units are footcandle (*fc*).

6.5.3.2 Number Format

The **Number Format** allows the user to switch between scientific and floating point notation.

6.5.3.3 Content Selection

If you want to make a selection that is different to the default, select/deselect a mode view from the list. Now only the selected modes will be displayed.

7 Technical Data

7.1 spectraval 1501

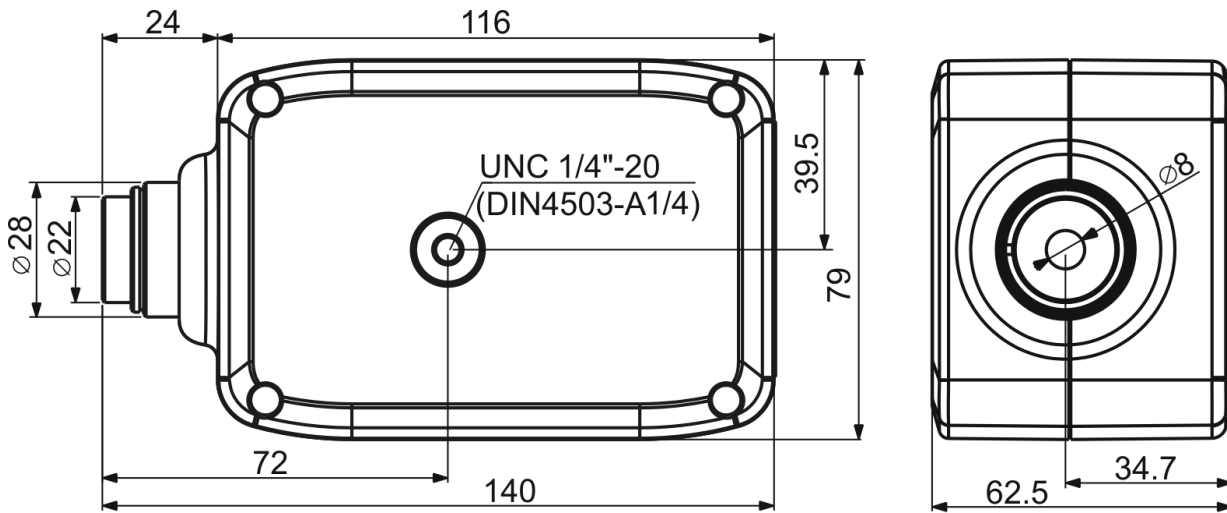
	spectraval 1501
Applications	Calibration of broadcast monitors, color adjustment of digital projectors and video walls, measurement of LED displays
Spectral range	380 nm to 780 nm
Optical resolution (FWHM)	4.5 nm
Wavelength accuracy	±0.5 nm
Calculated wavelength step	1 nm
Digital electronic resolution	16 bit ADC
Measuring values	Spectral Radiance, integral Luminance and Radiance, Chromaticity x, y; u', v'; Correlated color temperature; Dominant wavelength, color purity; Color rendering index CRI; circadian metrics; RGB; CQS; TLCI
Measuring range Luminance	0.1 cd/m ² to 150 000 cd/m ² typical 0.1 cd/m ² to 100 000 cd/m ² (white LED)
Viewing angle	1.8°
Measuring distance/ diameter in luminance mode	20 cm - ∅ 6 mm; 100 cm - ∅ 31 mm
Luminance accuracy	±2% (at 100 cd/m ² for illum. A)
Luminance reproducibility	±2% (at 100 cd/m ² for illum. A)
Color chromaticity accuracy	±0.002 x, y (for illum. A)
Color reproducibility	±0.0005 x, y (for illum. A)
CCT reproducibility	±20 K (for illum. A)
Integration time range	10 μs ... 60 s
Dispersive element	Diffraction grating
Light receiving element	CCD line array with 2048 pixels
Operating conditions	Temperature 10 °C to 40 °C Humidity <85 % relative humidity at 35 °C
Power supply	Hub powered 5 V power supply (LAN-version only)
PC interface	USB 2.0 fullspeed (12 Mbit/s); Bluetooth
Dimensions (basic unit)	140 mm × 80 mm × 70 mm
Weight (basic unit)	400 g
Pilot laser	Laser Class 1, λ= 645 ... 660 nm (classific. accord. to EN60825-1/Oct. 2003)

7.2 spectraval 1511

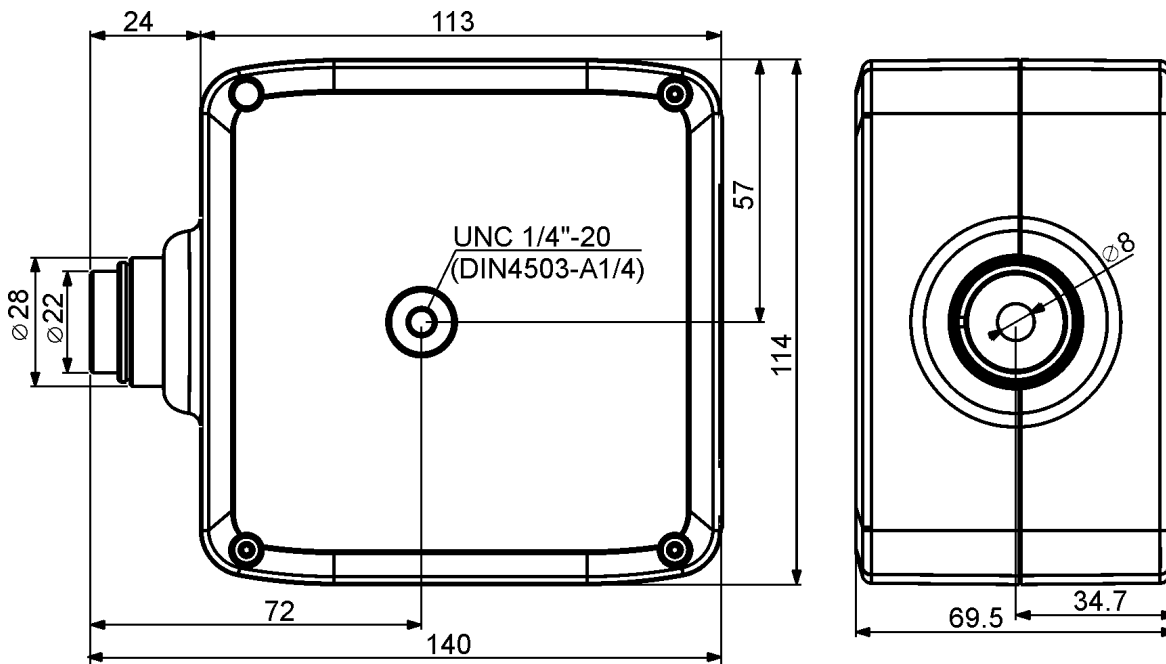
	spectraval 1511
Applications	Calibration of broadcast monitors, color adjustment of digital projectors and video walls, measurement of LED displays
Spectral range	380 nm to 780 nm
Optical resolution (FWHM)	4.5 nm
Wavelength accuracy	±0.5 nm
Calculated wavelength step	1 nm
Digital electronic resolution	16 bit ADC
Measuring values	Spectral Radiance, integral Luminance and Radiance, Chromaticity x, y; u', v'; Correlated color temperature; Dominant wavelength, color purity; Color rendering index CRI; circadian metrics; RGB; CQS; TLCI
Measuring range Luminance	0.1 cd/m ² to 150 000 cd/m ² typical 0.1 cd/m ² to 100 000 cd/m ² (white LED)
Viewing angle	1.8°
Measuring distance/ diameter in luminance mode	20 cm - ∅ 6 mm; 100 cm - ∅ 31 mm
Luminance accuracy	±2 % (at 100 cd/m ² for illum. A)
Luminance reproducibility	±2 % (at 100 cd/m ² for illum. A)
Color chromaticity accuracy	±0.002 x, y (for illum. A)
Color reproducibility	±0.0005 x, y (for illum. A)
CCT reproducibility	±20 K (for illum. A)
Integration time range	10 μs . . . 60 s
Dispersive element	Diffraction grating
Light receiving element	CCD line array with 2048 pixels
Operating conditions	Temperature 10 °C to 40 °C Humidity <85 % relative humidity at 35 °C
Power supply	Battery and USB powered
PC interface	USB 2.0 fullspeed (12 Mbit/s); Bluetooth
Dimensions (basic unit)	140 mm × 115 mm × 70 mm
Weight (basic unit)	500 g
Pilot laser	Laser Class 1, λ= 645 . . . 660 nm (classific. accord. to EN60825-1/Oct. 2003)

7.3 Mechanical Dimensions

The following drawings show the position of the thread downside the device and the general dimensions of the instrument.



spectraval 1501



spectraval 1511

8 Declarations

8.1 Certificate of Warranty

Certificate of warranty for

Model: **Spectroradiometer**

Type: **spectraVal 15x1**

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 labour problems or materials shortages to cause delays). The choice between repair and replacement is to be made 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 is in effect for a period of 24 months, beginning one week after the date of delivery.

8.2 CE – Declaration of Conformity

No: 1605J1029V1.0

We:

JETI Technische Instrumente GmbH Tatzendpromenade 2 07745 Jena GERMANY

declare that the product series

JETI spectroradiometer **spectraval 15x1**

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

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

EU Harmonised standards:

- EN 61326-1 (2013-07)
- EN 55011 (2011-04)
- EN 61000-4-2 (2009-12); EN 61000-4-3 (2011-04)
- EN 61000-4-8 (2010-11)

The **CE** sign confirms the conformity of the product with the standards and directives mentioned above.

JETI
Technische Instrumente GmbH
Tatzendpromenade 2
07745 Jena
Tel.: 03641/225680
Fax: 03641/225681



Jena, August 2016

8.3 License Agreement

License Agreement for JETI Technische Instrumente GmbH Software Products
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9 Service

Please contact in case of any question or technical problem:

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July 25, 2017