

Operating Instructions

JETI Spectroradiometer

specbos 2501



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1. Introduction

specbos 2501 is an easy-to-use spectroradiometer for various light measuring applications. Its robustness and miniaturized shape make it suitable for laboratory as well as industrial use. It can measure Luminance/ Radiance as well as Illuminance/ Irradiance. Furthermore, colorimetric data (CCT, chromaticity, RGB, color purity, dominant wavelength, CRI, CQS and other color quality scales) are calculated from the spectral data. Therefore, it is suited for the test of light sources, of LCD screens, for the measurement of projectors and of room illuminance.

specbos 2501 covers the wavelength range of **380 nm to 780 nm**.

specbos 2501-NIR covers the wavelength range of **380 nm to 1100 nm**.

specbos 2501-UV covers the wavelength range of **200 nm to 1100 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 the optional cosine corrector. Other accessories are available.

The software switches to the appropriate measuring mode determined by the attached accessory.

Measurement of Radiant flux can be done if devices have an additional integrating sphere (diameter selectable from 50mm to 500mm) as accessory.

Acquisition and analysis of data is done by the PC software JETI LiVal. The connection to the PC works via USB interface (virtual COM port) or via Bluetooth. It is also possible to communicate directly with the instrument via DLLs. Detailed helping information for this application is included on USB flash drive. Furthermore, the instrument can be driven by SCPI compatible firmware commands. The command list is also available on the USB flash drive.

specbos 2501 is optionally available with:

- LAN Add-On, Network Interface
- Focus Add-On, for measurement of small spots of 0.5 mm, 1 mm, and 3 mm with Add-On Optics
- HiRes Add-On, with increased optical bandwidth of 2 nm

PC Requirements:

- Processor (x86/x64) with 1 GHz or faster with 2 or more cores, min. 4 GB RAM
- Graphic resolution: min. 1024 * 768, 32-bit colour depth recommended
- Windows 10/11

Scope of Delivery:

- Device with protection cap
- Operating instructions
- Tripod
- Transport case
- USB flash drive with PC software *JETI LiVal*, DLLs, operating instructions and firmware command list
- Double locked USB-C to USB-A cable
- USB power supply
- Bluetooth USB adapter (dongle)
- Calibration certificate

Optionally:

- LAN Add-On with double lock USBC 5V Power supply
- Focus Add-On with Add-On Optics
- Trigger Add-On with Trigger connector
- Additional caps with filters or diffusers with attenuating filters to shift the measuring range 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. To avoid any contingent danger, this device has to be used only within the specified ranges.

- The target pointer is a Class 1 laser product¹, which must 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.
- Don't spill liquids of any kind on the device.
- Don't 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, please contact JETI.
- Batteries are to be disposed of properly in accordance with statutory provisions. Never open or puncture them, nor throw them into fire.
- We recommend using proper charging devices to avoid any health risks and damage to the device.

¹ Classification according to IEC 60825-1

3. Driver installation

No manual USB driver installation is necessary. The specbos 2501 works with the standard USB CDC driver, which is already integrated in Windows 10 and 11.

This driver is installed automatically when the device is connected to the PC for the first time.

3.1. How to open the device manager on Windows 10/ 11

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:

- Find the **Start** icon in the middle or left end of the taskbar and click on it with the right mouse button.
- In the window that appears, click on the **Device Manager** entry.

4. Installation and operation of hardware

4.1. Installation of USB device

Unpack the spectroradiometer specbos 2501 carefully and check the delivered parts.

All specbos 2501 devices are powered via USB interface.

Additionally, the battery will be charged during this time.

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 and current of at least 500 mA.
 Otherwise – what can be the case e.g. if using passive USB-hubs – the measuring values can be unreliable or the device will be disconnected.



specbos 2501

The instrument is switched on automatically when the USB connection to the PC is established and ready for operation, e.g. by *JETI LiVal*.

Reset: Please take a little rod, e.g. of a paper clip and press the reset button through the hole in the device housing.

Status LEDs:

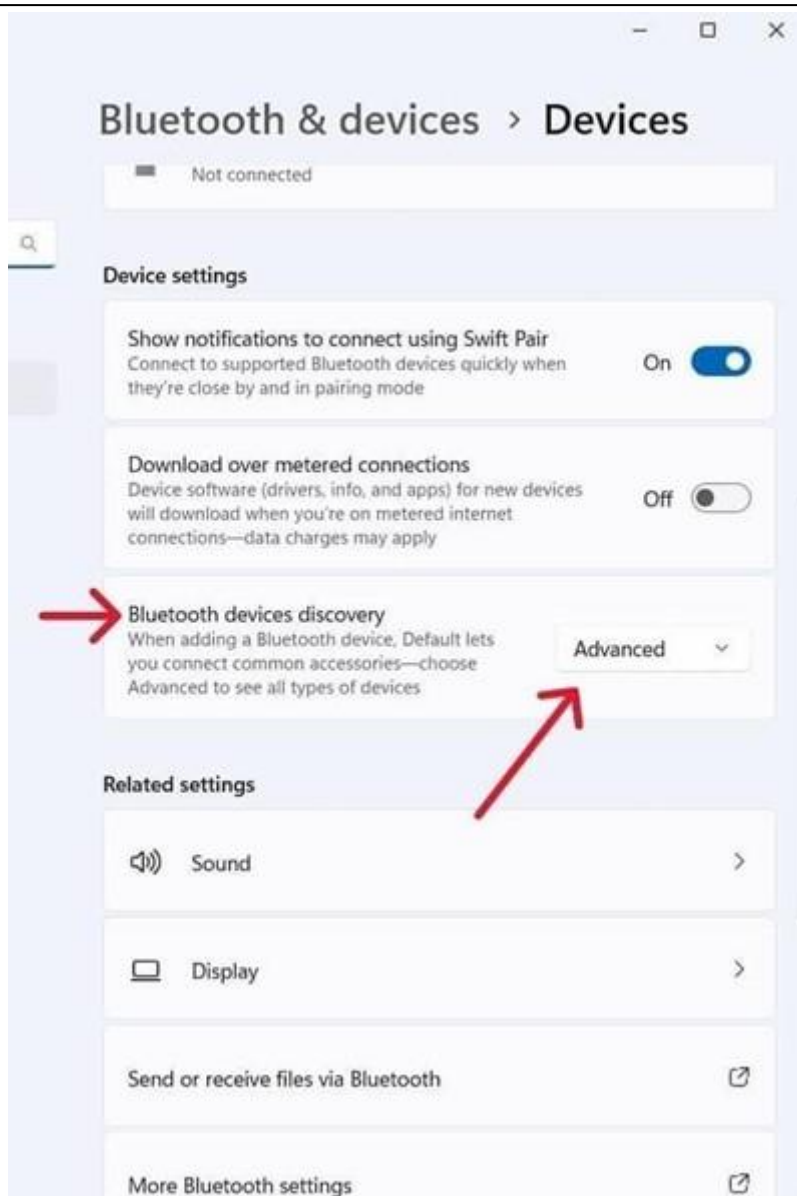
<i>while Battery powered</i>		<i>while connected to a power source</i>
Battery ok ($\geq 25\%$), no Bluetooth connection	Green	Battery fully loaded, no Bluetooth connection
Battery ok ($\geq 25\%$), Bluetooth connected	Blue	Battery fully loaded, Bluetooth connected
---	Yellow	Battery is loading, no Bluetooth connection
---	Turquoise	Battery is loading, Bluetooth connected
Battery low ($< 25\%$), no Bluetooth connection	Orange	---
Battery low ($< 25\%$), Bluetooth connected	Lila	---
Battery empty, device is shutting down	Red	Battery isn't loading
---	Red blinking	Insufficient power supply
Device is powering up or in Bootloader	White	Device is powering up or in Bootloader

4.2. Installation of Bluetooth device

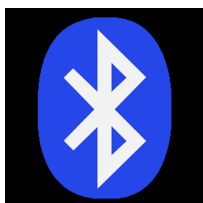
specbos 2501 can be used via Bluetooth or USB, alternatively.

The Bluetooth interface is often integrated into modern computers. If your computer is not equipped with it, you will need to use the Bluetooth dongle (included in the delivery). The software guides you through the installation.

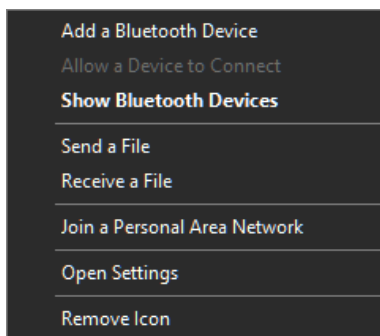
Note: In Windows 11 you must change the setting for Bluetooth devices discovery to “Advanced”



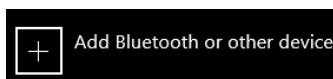
- Click on the Bluetooth symbol to start the installation process.



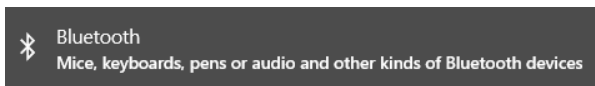
- Click **Add a Bluetooth Device**



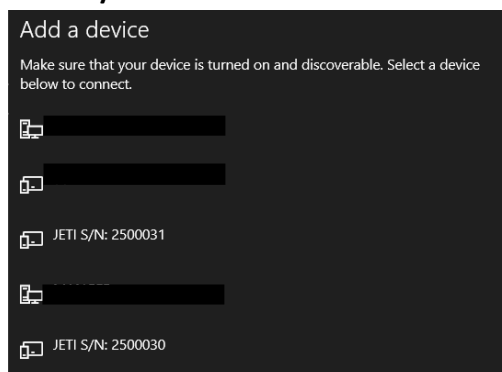
- a window opens, click on



- a window opens, click on



- Select your device, looks like **"JETI S/N: 250xxxx"** and wait for it to connect



- If a PIN number is requested, enter 0000
- The next window finalizes the installation. Click **Close**
- If you have problems with the Bluetooth connection, there is a collection of possible causes and solutions on our website: www.jeti.com

4.3. Battery handling

specbos 2501 is powered by battery if the wireless interface is used.

Note: The battery powered **specbos 2501** will be switched off automatically if the defined operating time of 5 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.

Note: Connect the device with your PC or the power supply 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.

4.4. Network settings for specbos 2501 with LAN Add-On

The **specbos** device and the controlling PC must use the same network address space, to communicate with the **specbos 2501** with **LAN Add-On** via a network connection.

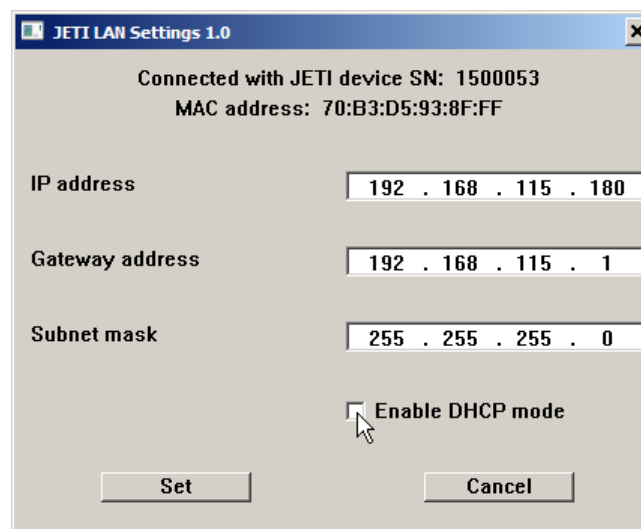
Note: The specbos 2501 with LAN Add-On needs the power supply if it isn't used with PoE

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 must be changed through a tool called 'JETI_LAN_settings.exe' (available on the installation USB flash drive).

Note: You must have administrator privileges!

- Connect **specbos 2501** with **LAN Add-On** to the power supply and to the LAN (1:1 as well as crossed cables can be used).
- Start 'JETI_LAN_settings.exe' from directory **Tools** > **JETI_LAN_Settings** to change LAN configurations.
- A window will appear where you can configure the network setting of the specbos device.



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

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

4.5. Trigger function

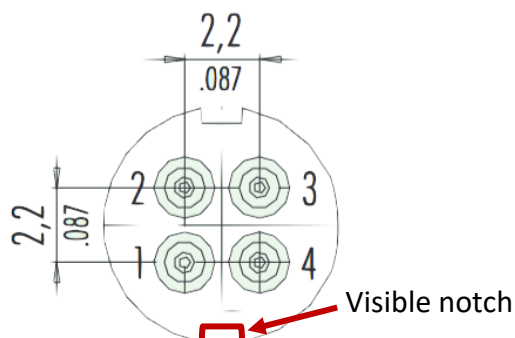
If you ordered the Trigger Add-On, your specbos 2501 will have a Trigger port and a suitable male connector will be included in the device's delivery package.

4.5.1. 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:

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

- | | |
|---|---------------------------------------------|
| 1 | Trigger-OUT 3.3 V TTL signal |
| 2 | Ground |
| 3 | Power supply 7...28V (only for LAN Devices) |
| 4 | Trigger-IN (3...5V tolerant) |



4.5.2. External Control of the Measurement

A measurement can be initiated externally by a shortcut between the pins 1 and 3. 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.

5. Technical data

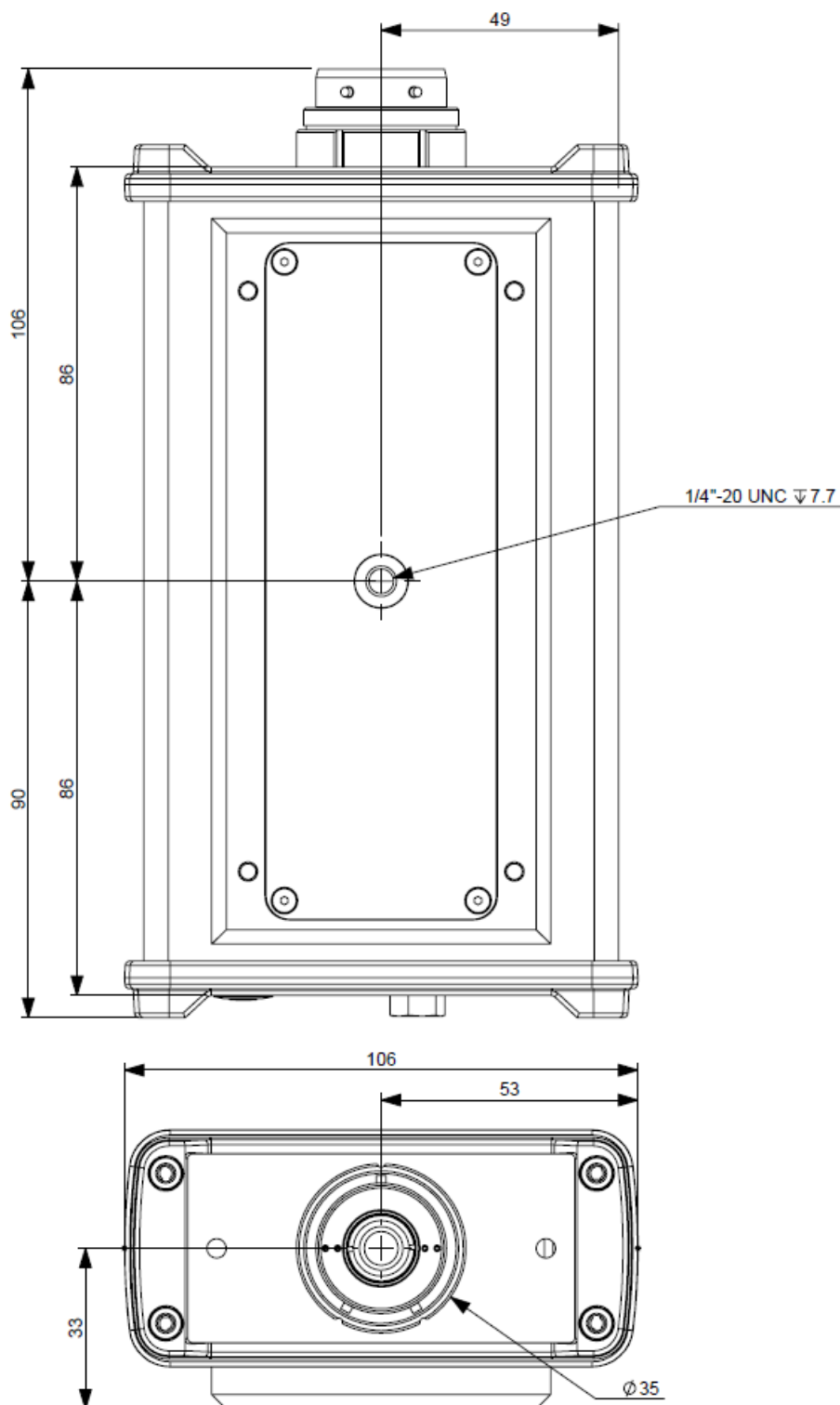
5.1. Basic characteristics

Interfaces	2501: USB-C 2.0 / Bluetooth 2501-LAN: USB-C 2.0 / LAN
Software	JETI LiVal
Power supply	2501: USB Hub powered/ Battery/ 5 32 V 2501-LAN: additionally LAN (PoE)
Weight	≈1000 g
Dimensions	186 mm x 105 mm x 50 mm
Wavelength range	380 ... 780 nm UV version: 200 ... 1100 nm NIR version: 380 ... 1100 nm
Optical resolution (FWHM)	4 nm (HiRes: 2 nm)
Wavelength resolution	1 nm
Digital electronic resolution	16 bit ADC
Viewing angle Radiance mode	1.8 °
Measuring distance/ diameter (measured from front end of the device)	20 cm – Ø 7 mm; 100 cm – Ø 33 mm
Measuring time on grayscale pattern of a display	~ 0.4 s @ 100 cd/m ² ~ 4 s @ 5 cd/m ²
Measuring values with optional diffusor	Spectral Radiance, Luminance, total Radiance, x,y, u',v', CCT, CRI, color purity, RGB, PAR, TLCl, circadian metrics and others Spectral Irradiance/ total Irradiance/ Illuminance
Measuring range luminance (Illum. A/ typical warm white LED spectrum)	0.2 ... 150 000 cd/m ² 0.2 ... 100 000 cd/m ² (<i>higher values with optional filter</i>)
Luminance accuracy	± 3.5 % (Illuminant A @ 100 cd/m ² , k=2)
Luminance reproducibility	± 1 %
Chromaticity accuracy	± 0.002 x, y (Illuminant A, k=2)
Color reproducibility	± 0.0005 x, y (Illuminant A)
Measuring range illuminance	1 ... 800 000 lx
Illuminance accuracy	± 2.4 % (Illuminant A @ 2000 lx, k=2)
CCT reproducibility	± 20 K (Illuminant A)
Max. wavelength error	± 0.3 nm (HgAr line source)
Polarization error f _a	< 1 %
Dispersive element	Imaging grating (flat field)
Light receiving element	Back thinned CMOS/ CCD array 2048 pixels
Operating conditions	Temperature 10 ... 40 °C Humidity < 85 % relative humidity at 35 °C
Accessories (included)	PC software JETI LiVal for Windows 10/ 11, operating instructions and software development kit on USB flash drive, USB cable, battery charger, tripod, carrying case, protection cap, calibration certificate
Accessories (optional)	Integrating sphere, filters, side view and fiber extended diffusors, add-on optics
Calibration	NIST traceable, recommended recalibration interval: 1 year

5.2. Device dimensions

The following drawing shows the position of the thread on the bottom side of the device, the position of the measuring port on the front and the general dimensions of the instrument.

5.2.1. specbos 2501



6. Declarations

6.1. CE – Declaration of conformity

We:

JETI Technische Instrumente GmbH
Göschwitzer Straße 48
D-07745 Jena

declare that the product series

Spectroradiometer specbos 2501

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


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Jena, November 20, 2023

6.2. Declaration of UKCA conformity

We:

JETI Technische Instrumente GmbH
Göschwitzer Straße 48
D-07745 Jena

declare that the product series

Spectroradiometer

specbos 2501

placed on the market by the Company and its subsidiaries are compliant with Electromagnetic 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 ^{UK}CA sign confirms the conformity of the product with the standards and directives mentioned above.


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Jena, November 20, 2023

6.3. Certificate of warranty

Certificate of warranty for

Model: Spectroradiometer
Type: specbos 2501

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 feels 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 customer's 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.

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For the JETI operating environment, the following terms apply:

JETI warrants that for a period of ninety (90) days from the date of acquisition the software, if operated as directed, will substantially achieve the functionality described in the documentation. JETI does not warrant however that your use of the software will be uninterrupted or that the operation of the software will be error-free or secure. JETI also warrants that the media containing the software, if provided by JETI, is free from defects in material and workmanship and will so remain for ninety (90) days from the date you acquire the software.

To the maximum extend permitted by applicable law JETI and its suppliers disclaim all other warranties either express or implied including but not limited to implied warranties of merchantability and fitness for a particular purpose with regard to the software, the accompanying written materials and any accompanying hardware.

If the media is subjected to accident abuse or improper use during the warranty period; or if you violate the terms of this License Agreement, this warranty is immediately terminated. This warranty is void if the software is used on or in conjunction with hardware or software other than the unmodified version of hardware and software with which the software was designed to be used as described in the documentation.

This limited warranty gives you specific legal rights.

Your remedies:

JETI's sole liability for a breach of this warranty is to be in JETI's sole discretion:

- to replace your defective media; or
- to advise you how to achieve substantially the same functionality with the software as described in the documentation through a procedure different from that set forth in the documentation; or
- if the above remedies are impracticable, to refund the license fee, if any, you paid for the software. Repaired, corrected or replaced software and documentation covered by this limited warranty for the period remaining under the warranty that covered the original software or if longer for thirty (30) days after the date JETI either shipped to you the repaired or replaced software or advised you as to how to operate the software so as to achieve the functionality described in the documentation, whichever is applicable. Only if you inform JETI of the problem with the software during the applicable warranty period and provide evidence of the date you acquired the software will JETI be obligated to honor this warranty.

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7. Service

Please contact in case of any question or technical problem:

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Internet: www.jeti.com

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July 22, 2024