Spectral measuring instruments for various applications

JETI **Specbos** Instruments

The new **Specbos** family offers compact, spectrometric instruments, designed to measure the color coordinates, spectral characteristics and light levels of transmissive and reflective targets. These small, modular, easy to use spectrographic systems offer accurate solutions within the UV and VIS ranges. The basic spectral diffuser used is a high quality holographic diffraction grating, which exhibits very low stray light and high dynamic range. Many instruments also incorporate built-in light sources and offer several measuring probes. All units are delivered complete with PC-compatible software, power supply, operations manual and transit case.

Specbos instruments are simple to use! No separate light source, spectrometer or electronics modules with interconnecting cables! No struggling with computer interfacing. Simply install the software, connect the instrument to your PC's serial or USB port and plug in power. You are now ready to acquire and analyze spectra!

Choose an appropriate model for your application:

VIS Emission Spectroscopy	Specbos 1000
UV Emission Spectroscopy	Specbos 1000 UV
VIS Spectroradiometry and Luminance	Specbos 1100, 1200
VIS Reflection and Transmission Spectroscopy	Specbos 2000
VIS Reflection Spectroscopy	Specbos 2100
UV-VIS Reflection and Transmission Spectroscopy	Specbos 2200
VIS Transmission Spectroscopy of liquids and solids	Specbos 3000
VIS In-situ Transmission Spectroscopy of liquids	Specbos 3100
VIS Colorimetry (45°/ 0° measuring geometry)	Specbos 4000

General technical data

Wavelength range	380 … 760 nm typically for VIS versions 250 … 500 nm typically for UV versions
Optical resolution	9 nm (6 nm with 50 µm fiber) FWHM
Digital resolution	14-bit A/D converter
Optical input	SMA or ST fiber-optic connectors
Stray light	< 0.1%
PC serial interfaces	RS-232c (9-pin D connector) or USB 1.1

Refer to the appropriate data sheet for a particular instrument for more details.

We also offer and provide multi-channel spectrometers, fiber-optic and micro-optic measuring heads, readout electronics for line arrays and light sources. We additionally offer components and customer specific products. Contact us to find a specific solution for your particular application.

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JETI-001-1001-en

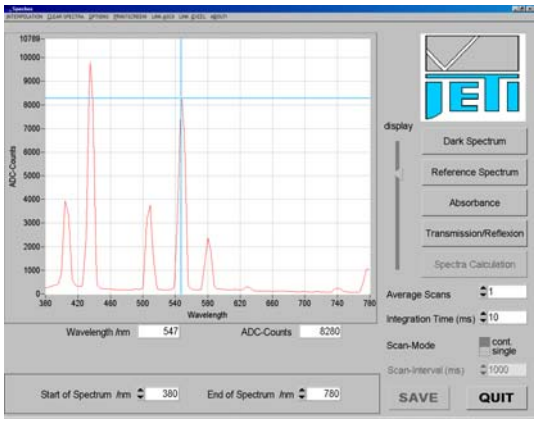
Miniature Spectrometer

Specbos 1000

The **Specbos 1000** is a miniature, fiber-coupled VIS spectrometer, characterized by high sensitivity, low stray light and extremely small dimensions.

Now, the **Specbos 1000** is offered in two versions with different PC interfaces:

The USB version of the **Specbos 1000** is easily connected to the USB port of a PC and spectral measurements started almost immediately – a real plug & play solution! (The USB version is bus powered.)



Emission spectrum of a mercury lamp

The RS-232c version of the **Specbos 1000** is supplied with a PC Serial cable and power supply. The instrument software automatically detects which COM port is being used, avoiding many problems during installation.

The JETI Specbos PC software included is suited for spectral data acquisition and transmission / reflection calculations. Single and continuous measurement modes, as well as averaging, are possible.

Data can also be exported in Excel™ spread sheet format (.xls) and to ASCII data files.

The device can also be delivered in a UV version. Furthermore, input fibers of different lengths and with collimating / focusing optics are available.

Specifications

Applications	Relative emission measurement, e.g. of LED´s, CRT´s, LCD's, lamps, projectors etc.
Spectral range	380 nm ... 760 nm (optional 425 nm ... 850 nm)
Slit	100 µm fiber (optional 50 µm), NA 0.22
Input	SMA (optional ST) fiber-optic connectors
Spectral resolution	9 nm (6 nm with 50 µm fiber) FWHM
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Wavelength accuracy	± 0.5 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7 nm / 684.3 nm)
Wavelength reproducibility	± 0.2 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7nm / 684.3 nm)
Stray light	< 10^{-3} (ASTM E387, GG495, 4 mm, λ = 420 nm / 630 nm)
Sensitivity	typ. $1.3 \cdot 10^{14}$ counts/Ws (550 nm)
Integration time	10 msec ... 5 sec
Spectrometer	Flat field image holographic diffraction grating 128-pixel photodiode detector array
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec)
Dimensions	120 mm x 58 mm x 34 mm
Weight	200 g
Accessories	JETI Specbos PC software for Windows 98/2000/ XP/NT (RS-232c version only) Operations manual Transport case RS-232c version: Switching mode power supply PC Serial cable (9-pin D connector) USB version: USB cable

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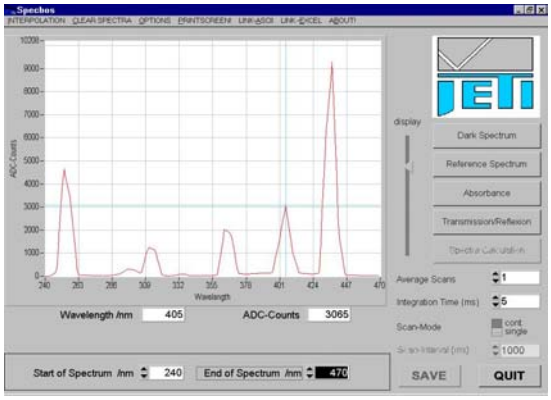
JETI-010-0502-en

Miniature UV Spectrometer

Specbos 1000 UV

The **Specbos 1000 UV** is a miniature, fiber-coupled spectrometer for the wavelength ranges of UVA and UVB, characterized by high sensitivity, low stray light and very small dimensions.

Now, the **Specbos 1000 UV** is offered in two versions with different PC interfaces:
The USB version of the **Specbos 1000 UV** is easily connected to the USB port of a PC and spectral measurement can be started almost immediately – a real plug & play solution! (The USB version is bus powered.)



Emission spectrum of a mercury lamp

The **Specbos 1000 UV**'s RS-232c version is supplied with a PC Serial cable and power supply. The instrument software automatically detects which COM port is being used, avoiding problems during installation.

The JETI Specbos PC software included is suited for spectral data acquisition and transmission / reflection calculations. Single and continuous measurement modes, as well as averaging, are possible.

Data can be exported in Excel™ spread sheet format (.xls) and to ASCII data files.

It is possible to use the Specbos 1000 UV for wavelengths up to 760 nm, if the harmonic orders can be neglected. Furthermore, input fibers of different lengths and with collimating / focusing optics are available.

Specifications

Applications	Relative emission measurement, e.g. of UV lamps, fluorescence signals etc.
Spectral range	250 nm ... 500 nm
Slit	100 µm fiber (optional 50 µm), NA 0.22
Input	SMA (optional ST) fiber-optic connectors
Spectral resolution	9 nm (6 nm with 50 µm fiber) FWHM
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Wavelength accuracy	± 0.5 nm (Hg lamp)
Wavelength reproducibility	± 0.2 nm
Stray light	$< 10^{-3}$ (ASTM E387, GG495, 4 mm, λ = 420 nm / 630 nm)
Sensitivity	typ. $5 \cdot 10^{13}$ counts/Ws (400 nm)
Integration time	5 msec ... 5 sec
Spectrometer	Flat field image holographic diffraction grating 128-pixel photodiode detector array
Power supply	RS-232c version: 115 VAC (230 VAC optional)/ 9 VDC USB version: Hub powered
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec)
Dimensions	120 mm x 58 mm x 34 mm
Weight	200 g
Enclosed accessories	JETI Specbos PC software for Windows 98/2000/ XP/NT (RS-232c version only) Operation manual Transport case RS-232c version: Switching mode power supply PC Serial cable (9-pin D connector) USB version: USB cable

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JETI-011-0502-en

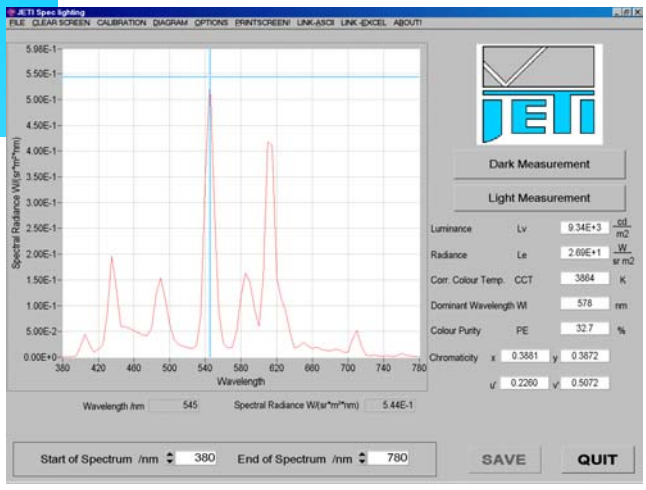
Spectroradiometer

Specbos 1100

The **Specbos 1100** is an easy to use and economical spectroradiometer. Its miniaturized shape makes it suitable for laboratory, as well as industrial applications. The device can be used for the measurement of diffuse light sources, screens etc.

The **Specbos 1100** comes in two versions: The USB version can be easily connected to the USB port of a PC and spectral measurements started almost immediately – a real plug & play solution! The USB version is bus powered.

The RS-232c version is supplied with a PC Serial cable and power supply. The instrument software automatically detects which COM port is being used, avoiding many problems during installation.



Screenshot of a F11 fluorescence lamp

Measurement and analysis of data is performed using the JETI Specbos Lighting software for the PC. It calculates and presents the measured results (chromaticity, color temperature, luminance, radiance spectrum, x,y and u´,v´ diagrams), as well as providing the ability to export data in Excel™ spreadsheet format (.xls) and to ASCII data files.

Convince yourself. This new type of precision spectroradiometer is easy to handle, accurate, reliable and compact.

Specifications

Applications	Measurement of diffuse light sources, screens, etc.
Spectral range	380 nm ... 760 nm
Spectral resolution	9 nm
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Wavelength accuracy	± 0.5 nm
Viewing angle	2°
Measuring distance / diameter	20 cm - ∅ 7 mm; 100 cm - ∅ 35 mm
Measuring values	Total spectral radiance / irradiance Total luminance / illuminance Chromaticity coordinates x,y; u',v' Correlated color temperature Dominant wavelength, purity Color rendering index
Measuring range luminance	2 ... $1 \cdot 10^5$ cd/m^2
Luminance accuracy	± 5%
Luminance reproducibility	± 2%
Color chromaticity accuracy	± 0.002 x, y (@ 2856 K)
Color reproducibility	± 0.0005 x, y
CCT reproducibility	± 20 K (@ 2856 K)
Dispersive element	Holographic diffraction grating
Light receiving element	128-pixel photodiode detector array
Operating conditions	Temperature: 10 ... 40°C Humidity: < 85% relative humidity at 35°C
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec)
Dimensions	150 mm x 58 mm x 34 mm
Weight	300 g
Accessories (included)	Laser head-piece for adjustment purposes Operational instructions JETI Specbos Lighting software for Windows 98/2000/ XP/NT (RS-232c version only) Transport case Calibration certificate RS-232c version: Switching mode power supply PC Serial cable (9-pin D connector) USB version: USB cable
NPL traceable calibration	1 year recommended interval

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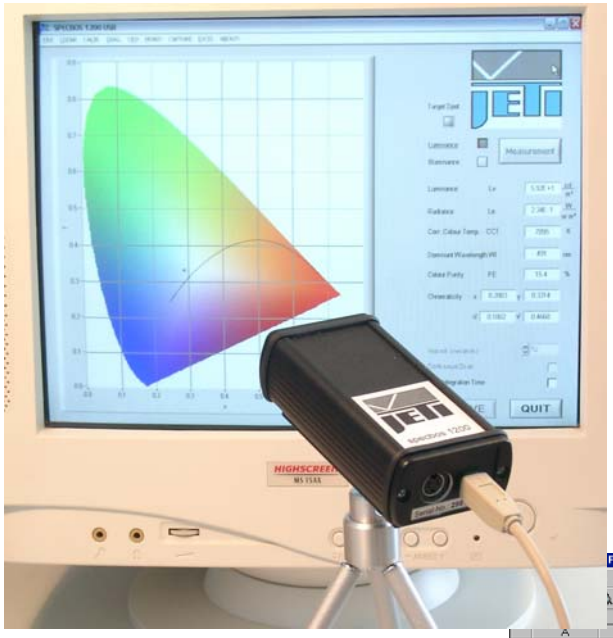
JETI-012-1102-en

VIS Spectroradiometer

Specbos 1200

The **Specbos 1200** is an easy to use and compact Visible light spectroradiometer. The included, user friendly software has a full complement of the radiometric and colormetric functions required for precision research, diagnostic, and quality control applications. Uses include the measurement of diffuse light sources and screens.



Applications:

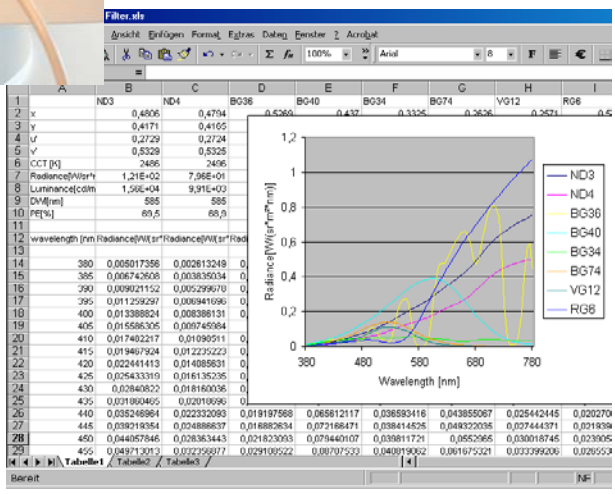
- CRT Monitors, LCD and LED Displays
- Traffic lights, automotive lighting
- Illumination sources
- Lamp burn-in testing …

Advantages:

- USB version is bus powered
- Internal target spot laser
- Exports data in Excel format
- Measurement in time step intervals

Measuring values:

- Luminance, Radiance
- Illuminance, Irradiance
- xy and u´v´ coordinates
- Dominate wavelength
- Color purity
- Correlated color temperature
- Color rendering index



Convince yourself! This new class of precision spectroradiometers is easy to handle, accurate, reliable and compact.

Specifications

Optical parameters		
Spectral range	380 nm ... 760 nm	
Resolution	5 nm	
Calculated resolution	1 nm	
Digital resolution	14-bit A/D converter	
Wavelength accuracy	± 0.5 nm	
Viewing angle	2°	
Dispersive element	Holographic diffraction grating (9 nm FWHM)	
Light receiving element	128-pixel photodiode detector array	
Measuring distance/ diameter	20 cm - ∅ 7 mm; 100 cm - ∅ 35 mm	
Measuring values	Spectral radiance Total luminance / total radiance Total illuminance / total irradiance Chromaticity coordinates x,y; u',v' Correlated color temperature Dominant wavelength, purity Color rendering index	
Measuring ranges and accuracies		
Measuring range luminance	2 ... $1 \cdot 10^5$ cd/m^2	
Measuring range illuminance	20 ...$5 \cdot 10^5$ lx	
Luminance accuracy	± 5%	
Luminance reproducibility	± 2%	
Chromaticity accuracy	± 0.002 x, y (@ 2856°K)	
Color reproducibility	± 0.0005 x, y	
CCT reproducibility	± 20°K (@ 2856°K)	
Technical data		
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1 full speed (12 Mbit/sec)	
Dimensions	150 mm x 58 mm x 34 mm	
Weight	300 g	
Operating conditions	Temperature Humidity	10 ... 40°C < 85% relative humidity at 35°C
Power supply	Switching mode power supply, RS-232c version only	
Accessories (included)	Operational instructions & Calibration certificate JETI Specbos Lighting software for Windows 98/2000/ XP/ NT (Version 5) Transport case RS-232c version: PC Serial cable (9-pin D connector) USB version: USB 1.1 A-B cable	
NPL traceable calibration	One year recommended interval	

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JETI-013-03023en

Spectroradiometer

Specbos 1300

The **Specbos 1300** is an easy to use VIS spectroradiometer for fast radiant flux measurements of small light sources.
The included, easy-to-use PC software has the full complement of radiometric and colorimetric functions requisite for quality control applications and selection of samples.

Applications:

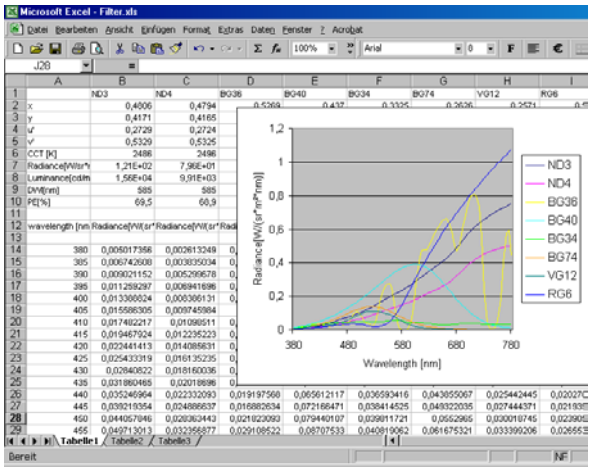
- Radiometric and colorimetric characterization of
  - – LED
  - – Miniature lamps

Advantages:

- USB powered – mobile! – no extra power supply
- Automatic determination of measurement time
- Excel spreadsheets

Measuring values:

- Radiant Flux, Luminous Flux,
- Spectral Radiant Flux
- xy and u´v´ coordinates
- Dominate wavelength
- Color purity
- Correlated Color Temperature
- Color Rendering Index



The standard diameter of the integrating sphere is 50mm. A baffle avoids the inclusion of the first reflex to the measurement. Other sphere sizes and designs are possible.

The input port design can be adapted to user demands. Sample holders can also be fabricated to meet customer specific requirements.

Basic unit can be used also for luminance and illuminance measurement.

Specifications

Optical parameters		
Spectral range	380 nm ... 780 nm	
Optical resolution	9 nm	
Calculated resolution	1 nm	
Digital electronic resolution	14-bit A/D Converter	
Dispersive element	Diffraction grating	
Light receiving element	Photodiode array, 128-pixel	
Measuring values	Spectral Radiant Flux Total Radiant Flux/ Luminous Flux Chromaticity coordinates x,y; u',v' Correlated Color Temperature Dominant wavelength, color purity Color Rendering Index	
Measuring ranges and accuracies		
Measuring range Luminous Flux	1 lm ... 4000 lm (depends from sphere size)	
Luminous Flux accuracy	t. b. d.	
Luminous Flux reproducibility	t. b. d.	
Chromaticity accuracy	± 0.002 x, y (@ 2856 °K)	
Color reproducibility	± 0.0005 x, y	
CCT reproducibility	± 20 °K (@ 2856 °K)	
Wavelength accuracy	± 0.5 nm	
Other technical data		
Sphere diameter	50 mm (other sizes are possible)	
Interface	USB 1.1 fullspeed (12 Mbit/sec)	
Dimensions	220 mm x 90 mm x 140 mm	
Weight	550 g	
Operating conditions	Temperature Humidity	10 ... 40 °C < 85% relative humidity at 35 °C
Power supply	Hub powered	
Accessories (included)	Operation instructions PC program - Specbos Radiometric for Windows 98/2000/XP/NT Calibration certificate USB cable	
NIST traceable calibration	Recommended interval: one year	

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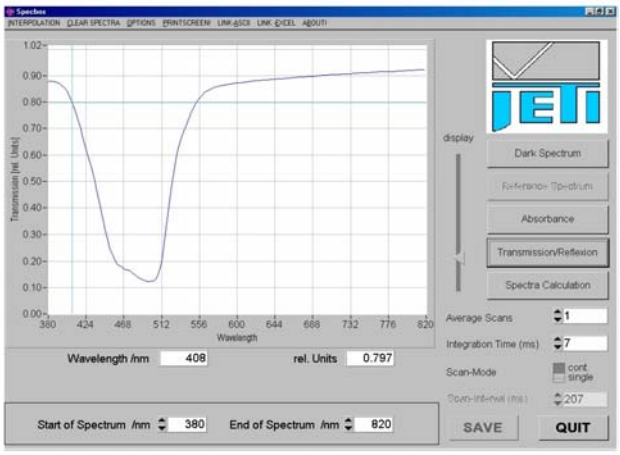
JETI-013-1103en

Miniature Spectrometer with Internal Light Source

Specbos 2000

The **Specbos 2000** is a miniature, fiber-coupled VIS spectrometer with an internal light source, characterized by excellent stray light performance, high light sensitivity and very small dimensions.

The **Specbos 2000** is now offered in two versions: USB and RS-232c. The USB version (under development) can be easily connected to the USB port of a PC and measurements can be started almost immediately – a real plug & play solution! (The USB version is bus powered.)



Transmission spectrum of a Rhodamin G solution

The RS-232c version is supplied with a PC Serial cable and power supply. The instrument software automatically detects which COM port is being used, avoiding many problems during installation.

The JETI Specbos PC software is suited for spectral data acquisition and transmission / reflection calculations. Single and continuous measurement modes, as well as averaging, are possible. Data can also be exported in Excel™ spreadsheet format (.xls) and to ASCII data files.

The **Specbos 2000** can be delivered with various fiberoptic measuring heads, e.g. dip and reflection probes.

Specifications

Applications	Measurement of reflection and transmission spectra, e.g. of solid surfaces, filters and liquids
Spectral range	380 nm ... 760 nm
Slit	100 µm fiber (optional 50 µm), NA 0.22
Input	SMA (optional ST) fiber-optic connectors
Spectral resolution	9 nm (6 nm with 50 µm fiber) FWHM
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Wavelength accuracy	$\pm$ 0.5 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7 nm / 684.3 nm)
Wavelength reproducibility	$\pm$ 0.2 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7nm / 684.3 nm)
Photometric precision	$\pm$ 0.002 AU (ASTM E275, D = 1, λ = 550 nm)
Photometric accuracy	$\pm$ 0.005 AU (ASTM E275, D = 0.46, λ = 550 nm)
Photometric range	0 ... 3 AU (ASTM E275, ND filters, λ = 550 nm)
Stray light	< 10^{-3} (ASTM E387, GG495, 4 mm, λ = 420 nm / 630 nm)
Sensitivity	typ. $1.3 \cdot 10^{14}$ counts/Ws (550 nm)
Integration time	10 msec ... 5 sec
Spectrometer	Flat field image holographic diffraction grating 128-pixel photodiode detector array
Light source	Tungsten lamp + blue LED
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered (under development)
Interfaces	RS-232, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec) (under development)
Dimensions	120 mm x 58 mm x 34 mm
Weight	200 g
Enclosed accessories	JETI Specbos PC software for Windows 98/2000/ XP/NT (RS-232c version only) Operations manual Transport case RS-232c version: Switching mode power supply PC Serial cable (9-pin D connector) USB version: USB cable

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JETI-020-0502-en

Miniature Spectrometer with Reflection Measuring Probe

Specbos 2100

The **Specbos 2100** is a fiber-coupled VIS spectrometer with a reflection measuring head. The main application is the stationary quality control of reflecting products like mirrors. The device is characterized by an excellent stray light performance, high sensitivity and small dimensions.

The **Specbos 2100** is now offered in two versions: RS-232c and USB.

The USB version (under development) can easily be connected to the USB port of a PC and spectral measurements can be started almost immediately – a real plug & play solution! The USB version is bus powered.

The RS-232c version is supplied with a PC cable and power supply. The instrument software automatically detects which COM port is being used, avoiding problems during installation.

The JETI Specbos PC software is suited for spectral data acquisition and reflection / absorbance calculations. Single and continuous measurement modes, as well as averaging are possible. Data can be exported in Excel™ spreadsheet format (.xls) and to ASCII data files.

The device can be delivered with customer-specific reflection measuring heads, e.g. separated illuminating and receiving fiber-optic cables.

Specifications

Applications	Measurement of reflection spectra, e.g. of mirrors
Measuring probe	Fiber-optic bundle (6 outer illuminating and one central receiving fiber)
Spectral range	380 nm ... 760 nm
Input	ST fiber-optic connectors
Spectral resolution	9 nm (optional 6 nm) FWHM
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Wavelength accuracy	± 0.5 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7 nm / 684.3 nm)
Wavelength reproducibility	± 0.2 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7 nm / 684.3 nm)
Photometric reproducibility	± 0.005 AU (λ = 550 nm)
Stray light	< 10^{-3} (ASTM E387, GG495, 4 mm, λ = 420 nm / 630 nm)
Integration time	10 msec ... 5 sec
Spectrometer	Flat field image holographic diffraction grating 128-pixel photodiode detector array
Light source	Tungsten Lamp + blue LED
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered (under development)
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec) (under development)
Dimensions	120 mm x 58 mm x 34 mm
Weight	200 g
Enclosed accessories	JETI Specbos software for Windows 98/2000/ XP/NT (RS-232c version only) Reflection probe with distance holders Operations manual Transport case RS-232c version: Switching mode power supply PC Serial cable (9-pin D connector) USB version: USB cable

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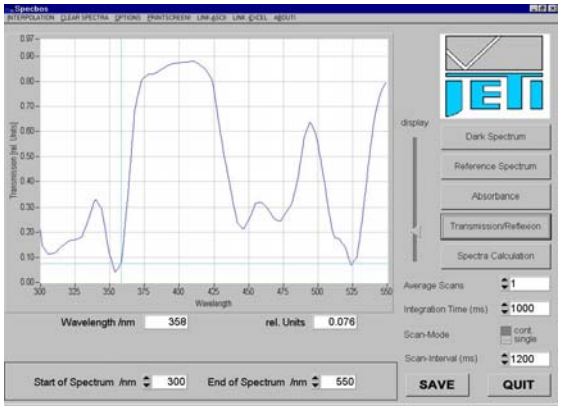
JETI-021-0502-en

UV-VIS Spectrometer with Internal Light Source

Specbos 2200

The **Specbos 2200** is a fiber-coupled UV-VIS spectrometer with a built-in UV-VIS light source (deuterium and tungsten halogen).

It is characterized by excellent stray light performance and high sensitivity. The **Specbos 2200** is now offered in two serial interface versions: USB and RS-232c. The USB version can easily be connected to the USB port of a PC and measurements can be started almost immediately – a real plug & play solution! (The USB version is bus powered.)



Transmission spectrum of BG36 filter

The RS-232c version is supplied with a PC Serial cable and power supply. The instrument software automatically detects which COM port is being used, avoiding many problems during installation.

The JETI Specbos PC software is suited for spectra data acquisition and transmission / reflection calculations. Single and continuous measurement modes, as well as averaging, are possible. Data can easily be exported in Excel™ spreadsheet format (.xls) and to ASCII data files.

The **Specbos 2200** can be delivered with various fiber-optic measuring heads, e.g. dip & reflection probes, as well as a transmission measuring set up.

Specifications

Applications	Measurement of reflection and transmission spectra, e.g. of solid surfaces, filters and liquids
Spectral range	250 nm ... 500 nm
Spectrometer slit	100 µm fiber (optional 50 µm), NA 0.22
Light output/ spectrometer input	SMA fiber-optic connectors
Spectral resolution	9 nm (6 nm with 50 µm fiber) FWHM
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Wavelength accuracy	± 0.5 nm
Wavelength reproducibility	± 0.1 nm
Stray light	< 0.1% (at 400 nm with GG495)
Sensitivity	typ. $1.3 \cdot 10^{14}$ counts/Ws
Integration time	10 msec ... 5 sec
Shutter	Internal motor, driven by software
Spectrometer	Flat field image holographic diffraction grating 128-pixel photodiode detector array
Light source	Tungsten halogen and / or deuterium lamp (selectable by switch)
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec)
Dimensions	170 mm x 175 mm x 55 mm
Weight	1 kg
Enclosed accessories	JETI Specbos PC software for Windows 98/2000/NT/XP Operations manual Transport case RS-232c version: Switching mode power supply PC Serial cable (9-pin D connector) USB version: USB cable

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JETI-022-0102-en

Spectrophotometer

Specbos 3000

The **Specbos 3000** is an easy to use instrument for spectral transmission measurement in the VIS region. It is specially suited for test cells of up to 10mm optical path length and for flat materials like optical filters.
(For larger samples (up to 6” x 6”) the **Specbos Trans** device is available.)

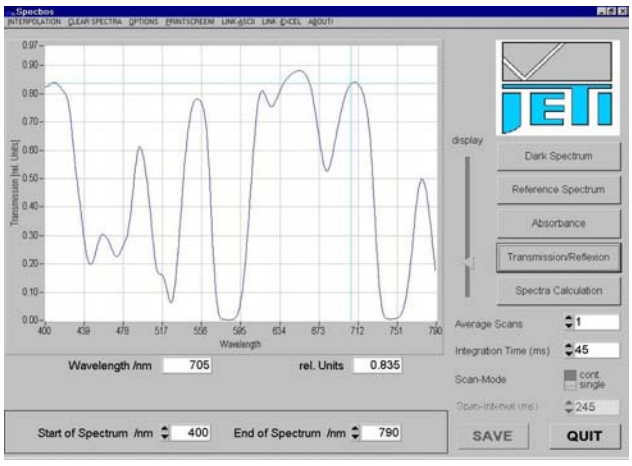
The **Specbos 3000** is offered in two versions: RS-232c and USB.

The USB version (currently under development) can easily be connected to the USB port of a PC and spectral measurements can be started almost immediately – a real plug & play solution! The USB version is bus powered.

The RS-232c version is supplied with a PC Serial cable and power supply.

The instrument software automatically detects which COM port is being used, avoiding many problems during the installation.

The delivery of **Specbos 3000** includes the JETI Specbos data processing software for Windows 98 / 2000 / NT / XP. The software package allows the measurement of spectral data to be displayed in the form of either transmission or absorbance.



Spectral transmission of a filter glass (BG36)

Besides the display and management of spectral data, with hot links to Excel™ spreadsheet files (.xls) and ASCII data files, further mathematical operations, such as calculating the first and second derivatives, are possible. The optional JETI Specbos Color software allows the measurement of color coordinates of samples (e.g. L*a*b*) as well.

Specifications

Samples	Filters (up to 2”), test cells (1 … 10 mm optical path)
Measuring geometry	0/0 (illumination by 0°, observation by 180°)
Centre height	15 mm
Measuring diameter	3 mm
Measuring time	approx. 50 msec
Spectral range	400 ... 780 nm
Spectral resolution	9 nm
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Light source	Tungsten Lamp / Blue LED
Dispersive element	Holographic diffraction grating
Light receiving element	128-pixel photodiode detector array
Operating conditions	Temperature: 10 ... 40° C Humidity: <85% relative humidity at 35° C (non-condensing)
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered (under development)
PC interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec) (under development)
Dimensions	310 mm x 58 mm x 44 mm
Weight	500 g
Enclosed accessories	JETI Specbos PC software for Windows 98/2000/ XP/NT (RS-232c version only) Operations manual Transport case RS-232c version: Switching mode power supply PC Serial cable USB version: USB cable

Photometric measurement (JETI Specbos software)

Measurement curves	Transmission spectrum / Absorbance spectrum
Wavelength accuracy	± 0.5 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7 nm / 684.3 nm)
Wavelength reproducibility	± 0.2 nm (ASTM E275, filter BG 20, 2 mm, λ = 528.7nm / 684.3 nm)
Base line noise	max. 10^{-3} AU at 550 nm (water filled 1 cm test cell)
Base line drift	max. $2 \cdot 10^{-3}$ AU/h
Photometric precision	± 0.002 AU (ASTM E275, D = 1, λ = 550 nm)
Photometric accuracy	± 0.005 AU (ASTM E275, D = 0.46, λ = 550 nm)
Photometric linearity	0 ... 2.6 AU (ASTM E275, ND filters, λ = 550 nm)
Stray light	< 0.1% (ASTM E387, GG495, 4 mm, λ = 420 nm / 630 nm)
Long term stability	± 0.3% per 12 hrs
Temperature dependence	$< 5 \cdot 10^{-4}$ AU/K (D = 0.2, λ = 550 nm)
Option	Kinetics mode (under preparation)

Color measurement (JETI Specbos Color software)

Wavelength pitch	10 nm
Illumination	C (A and D65 selectable)
Observer	2° (10° selectable)
Measuring values	Color systems X,Y,Z; L*a*b* (CIE); Luv; L*C*h* Color differences Jod, Hazen, Gardner (under preparation)
Precision	ΔE < 0.1

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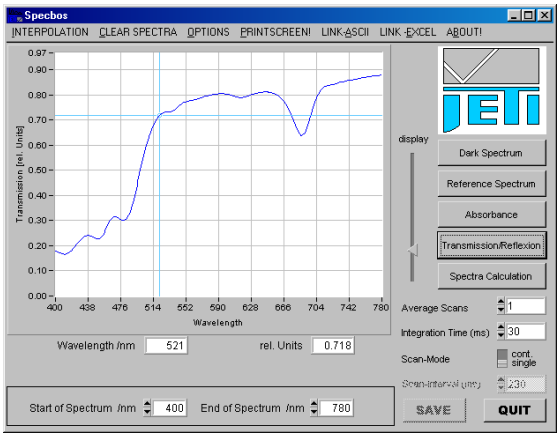
JETI-030-0502-en

Miniature Spectrometer with Dip Probe

Specbos 3100

The **Specbos 3100** is a miniature spectrometer with a fiber-coupled dip probe for in-situ measurement of various liquids in the Visible range. The basic unit contains the Visible light source and is characterized by its very small size and ease of use. The dip probe is available in a variety of different standard and customer-specific versions.

The **Specbos 3100** is offered in two versions: The USB version (under development) can easily be connected to the USB port of a PC and measurements can be started almost immediately – a real plug & play solution! The device is bus powered.



Transmission spectrum of olive oil

The RS-232c version is supplied with a PC Serial cable and a power supply. The instrument software automatically detects which COM port is being used, avoiding many problems during installation.

The JETI Specbos software is included with the system. It is suited for acquisition of spectra, as well as for transmission / absorbance calculations. Single and continuous measurement modes are possible. Data can be exported in Excel™ spreadsheet format (.xls) and to ASCII data files.

Upon request, the parameters of the dip probe can be adapted to meet customer-specific needs (temperature / pressure ranges, diameter, etc.).

Specifications

Application	In-situ spectral measurement of liquids (portable applications, stationary use in combination with Swagelok fitting)
Spectral range	380 nm ... 760 nm
Wavelength accuracy	± 0.5 nm (ASTM E275, λ=485.8 nm / 641.1 nm)
Wavelength reproducibility	± 0.2 nm (ASTM E275, λ=485.8 nm / 641.1 nm)
Spectral resolution	9 nm (optional 6 nm) FWHM
Digital spectral resolution	4.1 nm
Digital resolution	14-bit A/D converter
Extinction range	0 ... 3 AU
Base line noise	max. 10^{-3} AU at 550 nm (aqua dest.)
Photometric precision	± 0.002 AU (ASTM E275, D=1, λ= 550 nm)
Photometric accuracy	± 0.005 AU (ASTM E275, D=0.46, λ= 550 nm)
Temperature dependence	< 10^{-4} AU/ K (D≈0.3, λ=550 nm)
Stray light	< 10^{-3} (ASTM E387, GG495, 4 mm, λ = 420 nm / 630 nm)
Light path	5 mm (optional 1 mm, 2 mm, 10 mm or variable)
Probe diameter	0.5“
Maximum depth of immersion	200 mm
Fiber length	1.5 m
Measuring time	approx. 100 msec
Operation conditions dip probe	Temperature: max.140° C Pressure: max. 3 bar pH: 1 ... 13
Spectrometer	Flat field image holographic diffraction grating 128-pixel photodiode detector array
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered (under development)
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec) (under development)
Dimensions basic unit	120 mm x 58 mm x 34 mm
Weight basic unit	200 g
Enclosed accessories	JETI specbos PC software for Windows 98/2000/ XP/NT (RS-232c version only) Operations manual Transport case RS-232c version: Switching mode power supply PC Serial cable USB version: USB cable

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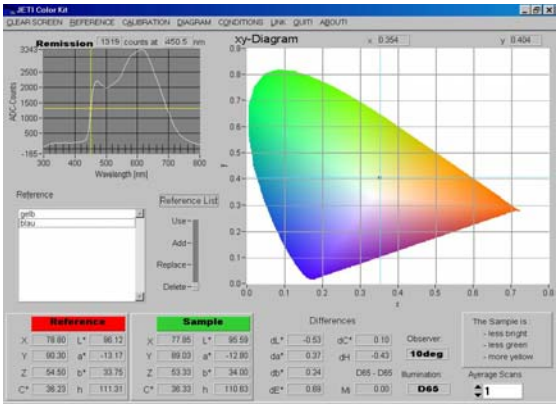
JETI-031-0502-en

Spectral Colorimeter

Specbos 4000

The **Specbos 4000** is a sensor-like color measuring instrument based on a miniature spectrometer. It allows a person to not only distinguish between basic colors, but also to measure tiny color differences and profiles, e.g. of plastics and paintwork.
The device is PC-coupled and makes measurements while in contact with the sample. It employs a directly mounted measuring head with 45°/ 0° geometry.



X,Y measurement of a yellow tile sample

The **Specbos 4000** is offered in two versions: The USB version (now under development) can easily be connected to the USB port of a PC and measurements can be started almost immediately – a real plug & play solution! The USB version is bus powered. The RS-232c version is supplied with a PC Serial cable and power supply. The instrument software automatically detects which COM port is being used, avoiding many problems during installation.

The **Specbos 4000** includes the JETI Specbos Color measuring software for the PC. This software calculates the color values and color differences in dissimilar systems. The management of customer-specific references is also included.

This device can be applied to manual quality control, as well as used for integration in production lines. A version with direct output of color values as L*a*b* or color differences as dE is available for such applications.
Special solutions for non-contact measurements and our involvement in customer-specific applications are possible.

Specifications

Application	Color measurement of solid surfaces
Spectral range	380 nm ... 760 nm
Measuring geometry	Illumination 45° Measurement 0°
Measuring diameter	4 mm
Measuring time	typ. 150 msec
Photometric range	0 ... 130%
Resolution	10 nm
Repeatability	typ. 0.1 dE* to calib. standard
Power supply	RS-232c version: 115 VAC (230 VAC optional) / 9 VDC USB version: Hub powered (under development)
Interfaces	RS-232c, 8N1, 38,400 Baud or USB 1.1, full speed (12 Mbit/sec) (under development)
Dimensions	120 mm x 58 mm x 34 mm
Weight	200 g
Enclosed accessories	JETI Specbos Color software for Windows 98/2000/ XP/NT (RS-232c version only) Operating instructions Transport case Calibration certificate RS-232c version: Switching mode power supply PC Serial cable USB version: USB cable

Software: JETI Specbos Color

- Works under Windows 98/2000/XP/NT (RS-232c version only)
- Averaging scans
- Data exportable in Excel™ spreadsheet format (.xls) and ASCII data files
- Illumination D65, A, C
- Selectable observer (10°, 2°)
- Color systems XYZ, L*a*b*(CIE), Luv, L*C*h*
- Color difference dE* (dl*, da*, db*, dC*, dh*) and metametric calculation
- Management of customer-specific color references

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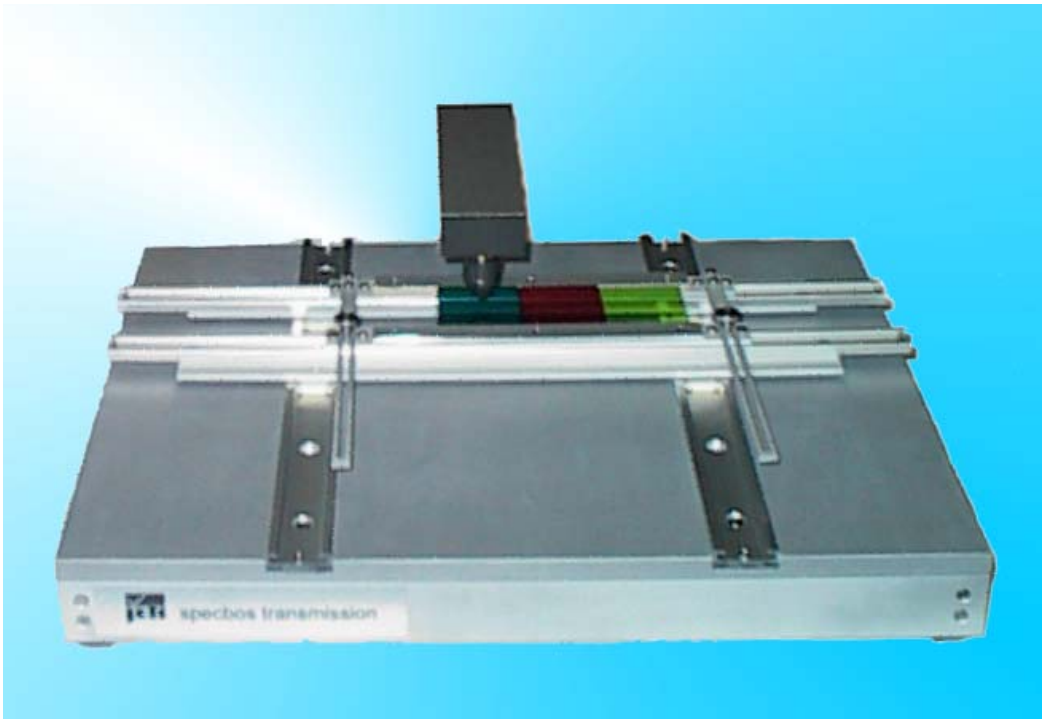
JETI-040-0502-en

Spectrophotometer

Specbos Trans

The **Specbos Trans** is an easy to use instrument for spectral transmission measurement in the VIS region. It is especially suited for flat materials such as optical filters with dimensions up to 6” x 6”.



The **Specbos Trans** is delivered with JETI Specbos data processing software for Windows™ 98/ NT/ 2000, power supply and serial data cable. The software package allows the measurement of transmission and absorbance spectral data over a large sample area.
Besides the display and management of spectra (with hot links to Excel® and ASCII files), further mathematical operations such as first and second derivatives are possible. In addition, the optional JETI Specbos Color software allows the measurement of color coordinates of samples (e.g. L*a*b*).

Specifications

Test objects	Flat samples (1” x 1” … 6” x 6”)
Measuring geometry	0/0 (illumination by 0°, observation by 180°)
Measuring diameter	3 mm
Measuring time	approx. 0.05 sec.
Spectral range	400 nm ... 780 nm
Spectral resolution	9 nm
Digital spectral resolution	4.5 nm
Digital resolution	14-bit A/D converter
Light source	Tungsten lamp / Blue LED
Dispersive element	Holographic diffraction grating
Light receiving element	128-pixel photodiode detector array
Operating conditions	Temperature: 10 ... 40 °C Humidity: <85% relative humidity at 35°C (non-condensing)
Power supply	115 VAC (230 VAC optional) / 9 VDC
PC interface	RS-232c, 8N1, 38,400 Baud
Dimensions	380 mm x 320 mm x 110 mm
Weight	5 kg
Enclosed accessories	Switching mode power supply JETI Specbos PC software for Windows™ 98/2000/NT Operations manual RS-232c Serial PC cable (9-pin D connector)

Photometric measurement (JETI Specbos software)

Measurement curves	Transmission spectrum Absorbance spectrum
Wavelength accuracy	± 0.5 nm (ASTM E275, BG 20 filter, 2 mm, λ = 528.7 nm / 684.3 nm)
Wavelength reproducibility	± 0.2 nm (ASTM E275, BG 20 filter, 2 mm, λ = 528.7nm / 684.3 nm)
Base line noise	maximum 10^{-3} AU at 550 nm
Base line drift	maximum $2 \cdot 10^{-3}$ AU per hour
Photometric precision	± 0.002 AU (ASTM E275, D = 1, λ = 550 nm)
Photometric accuracy	± 0.005 AU (ASTM E275, D = 0.46, λ = 550 nm)
Photometric linearity	0 ... 2.6 AU (ASTM E275, ND filters, λ = 550 nm)
Stray light	< 0.1% (ASTM E387, GG495, 4 mm, λ = 420 nm/ 630 nm)
Long term stability	± 0.3% per 12 hours
Temperature dependence	$< 5 \cdot 10^{-4}$ AU / K (D = 0.2, λ = 550 nm)
Option	Kinetics mode (under preparation)

Color measurement (JETI Specbos Color software)

Wavelength pitch	10 nm
Illumination	C (A and D65 selectable)
Observer	2° (10° selectable)
Measuring values	Color systems X, Y, Z; L*a*b*(CIE), Luv, L*C*h* Color differences Jod, Hazen, Gardner (under preparation)
Precision	$\Delta E < 0.1$

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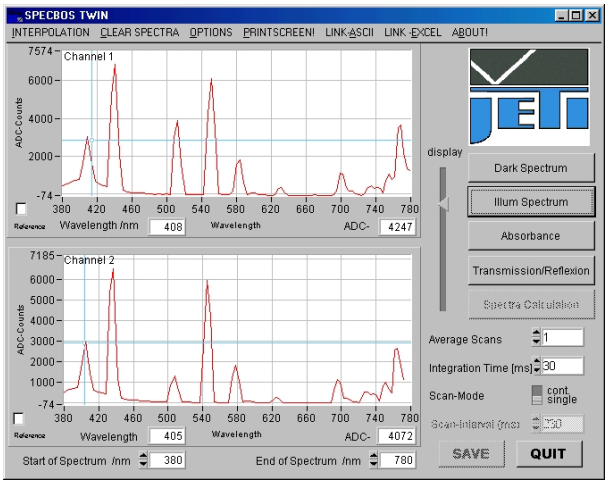
JETI-038-0302-en

2-channel Spectrometer

Specbos Twin

The **Specbos Twin** allows the simultaneous reading of two spectra in the Visible (or UV) wavelength range.
The measurement proceeds without any time delay between the two channels. Furthermore the reproducibility is high because the lack of movable parts.



The Spec Twin software is suited for the read out of the two separate spectrometers, as well as for transmission / reflection calculations. Single and continuous measurement modes are possible.

Data can be exported in Excel™ spreadsheet format (.xls) and to ASCII data files.

The **Specbos Twin** can be delivered with two different VIS (or UV) spectrometers.

The **Specbos Twin** can be connected to a PC via a USB or an RS-232c serial interface.

Specifications

	version 1		**version 2**	
Connector	SMA (optional ST) fiber-optic connector			
Optical input	100 µm (optional 50 µm) optical fiber			
Applications	Simultaneous spectral measurement (quality control, thickness measurement, ...)			
Spectral range	400 nm ... 800 nm		a) 400 ... 800 nm b) 250 ... 500 nm	
Wavelength precision	± 0.5 nm			
Spectral resolution (FHWM)	9 nm (100 µm fiber) 5 nm (50 µm fiber)			
Digital resolution	14-bit A/D converter			
Stray light	typ. 10^{-2} at 420 nm (GG495)		< 10^{-3} at 400 nm (GG495)	
Sensitivity (550 nm)	typ. $1.2 \cdot 10^{14}$ counts/Ws		typ. $6.4 \cdot 10^{14}$ counts/Ws	
S/N ratio	10^3		> 10^4	
Spectrometer grating detector	Flat field imaging spectrograph Embossed Photodiode array 128-pixel 256-pixel		Flat field imaging spectrograph Holographic Photodiode array 128-pixel 256-pixel	
Digital spectral resolution	7.6 nm	3.0 nm	4.0 nm	1.6 nm
Integration time	2 msec ... 64 sec			
Process Control	Digital I/O (4 in, 10 out (TTL))			
Repetition rate	max. 2 per sec			
Operation conditions	Temperature: 10 ... 40°C Humidity: < 85% rel. humidity (@ 35°C)			
Interfaces	USB 1.1, full speed (12 Mbit/sec); RS-232c 8N1, 115 kBaud			
Dimensions	150 mm x 100 mm x 70 mm			
Weight	300 g			
Accessories	Shutter drive output (TTL), Trigger input JETI Spec Twin PC software Operations manual USB cable Switching mode power supply (optional) PC Serial cable (RS-232c)			
Options	115 VAC (230 VAC optional) / 9 VDC			

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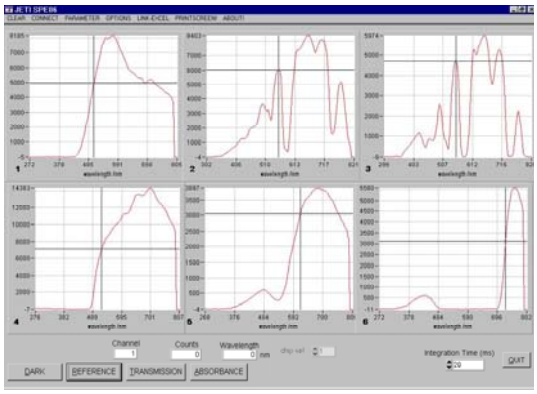
JETI-015-0401-en

Multichannel Spectrometer

SPMC

The **SPMC** multichannel spectrometer allows for the parallel reading of spectral data from eight different input sources in the VIS (or UV) wavelength range. The measurements proceed simultaneously, without a time delay between the several channels. Each channel has an own optical input. Therefore, no moveable parts are required which might reduce the reproducibility of the measurements. The amplification of each channel can be adjusted seperately by software to adapt the instrument to a specific application. Furthermore, the instrument offers a trigger input and a lamp / shutter output.



The **JETI SPE(n)** software is suited for the reading of up to eight spectra, as well as making transmission / reflection calculations. Single and continuous measurement modes are possible. Data can be exported in Excel™ spreadsheet format or to ASCII data files. The optimal integration time can be found by using the automatic setting.

The **SPMC** multichannel instrument can be delivered with two different spectrometers modules — a low cost version, and a higher performance version for more demanding applications.

Specifications

	version 1	**version 2**
Channels (n)	8 (optional 2 ... 7)	
Connector	ST (optional SMA)	
Optical input	100 µm optical fiber (optional 50 µm fiber)	
Applications	Simultaneous spectral measurement (quality control, thickness measurement, multi-angle color measurement ...)	
Spectral range	400 nm ... 800 nm	a) 400 ... 800 nm b) 250 ... 500 nm
Wavelength precision	$\pm$ 1 nm	
Spectral resolution	12 nm	9 nm
Digital spectral resolution	7.6 nm	4.1 nm
Digital resolution	14-bit A/D converter	
Stray light (GG 495, 420 nm)	typ. 10^{-2}	< 10^{-3}
Sensitivity (550 nm)	typ. $1.2 \cdot 10^{14}$ counts/Ws	typ. $6.4 \cdot 10^{14}$ counts/Ws
S/N ratio	10^3	> 10^4
Spectrometer grating detector	 Embossed 128/256 pixel photodiode array	 Holographic 128/256 pixel photodiode array
Integration time	5 msec ... 32 sec	
Repetition rate	max. 2 per sec	
Operation conditions	temperature: 10 ... 40°C humidity: < 85% rel. humidity (@ 35°C)	
Power supply	115 VAC (230 VAC optional) / 9 VDC	
Interface	RS-232c, 8N1, 115,000 Baud (others available on request)	
Dimensions	300 mm x 250 mm x 80 mm	
Weight	approx. 0.8 kg	
Enclosed acessories	Switching mode power supply JETI SPE(n) PC software Operations manual PC Serial cable (9-pin D connector)	
Options	Shutter drive output (TTL) Measuring trigger input (TTL)	

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JETI-060-0602-en