

# BTS2048-IR-WP

<https://www.gigahertz-optik.com/en-us/product/bts2048-ir-wp/>

**Product tags:** NIR



## Description

### BTS2048-IR spectroradiometer with thermoelectrically cooled detector

The BTS2048-IR incorporates thermoelectric cooling of its InGaAs array detector and also a cooled InGaAs Diode for the BTS technology. The device meets all the requirements of a high-end diode array spectroradiometer and is favourably priced despite its cutting-edge design. Thermoelectric cooling of the array detector minimizes the dark noise signal.

#### Innovative detector technology

In order to make use of the advantages of an InGaAs chip that is less noisy compared to an extended InGaAs chip in the possible spectral ranges, a detector chip with both technologies is used. This matches the spectral ranges optimally and thus allows the best electro-optical properties. Other features such as an electronic shutter, OD filter and the proven BTS technology find their place as usual (see technical article [BiTec Sensor](#)).

#### Features on a glance

- Spectral range from 950 nm to 2150 nm
- BTS technology (integrated additional diode)
- Electronic shutter and filter wheel with four positions (open, dark, OD1 and OD2)
- Convincing optical properties
- Compact dimensions
- Fast data transmission due to Ethernet and USB interface
- I/O connector
- Traceable calibration

### User software and developer software

The standard [S-BTS2048](#) user software has a customizable user interface and a large number of display and function modules that can be activated when configuring the BTS2048-IR with the respective accessory components from Gigahertz-Optik GmbH. The [S-SDK-BTS2048](#) developer software is offered for the integration of the BTS2048-IR in custom software.

### Calibration

One essential quality feature of photometric devices is their precise and traceable calibration. The BTS2048-IR is calibrated by Gigahertz-Optik's [ISO/IEC 17025 calibration laboratory](#) that was accredited by DAkkS (D-K-15047-01-00) for the *spectral responsivity* and *spectral irradiance* according to ISO/IEC 17025. The calibration also included the corresponding accessory components. Every device is delivered with its respective calibration certificate.

## Specifications

#### General

Short description	TE cooled spectroradiometer with a wide dynamic range for CW and short-term measurement of the irradiance, spectrum, and peak wavelength. Accessories for other parameters.
Main features	Compact device. BiTec detector with TE cooled detector (512 pixels, 9 nm optical resolution, electronic shutter), and additional InGaAs diode. Optical bandwidth correction (CIE214). Filter wheel with shutter and OD-Filter. Input lens with diffusor window. Cosine field of view.
Measurement range	Spectral: 2E-4 W/(m <sup>2</sup> nm) to 1E4 W/(m <sup>2</sup> nm) @1600 nm. Responsivity from 950 nm to 2150 nm.
Typical applications	Diode array spectroradiometer for R&D applications and for the integration in testing systems.
Calibration	Factory calibration. Traceable to international calibration standards

#### Product

Measured Quantity	Spectral irradiance (W/(m <sup>2</sup> nm)), irradiance (W/m <sup>2</sup> ), spectral radiant intensity (W/(sr nm)), radiant intensity (W/sr), peak wavelength, center wavelength, centroid wavelength, etc.. Option integrating sphere: in addition spectral flux (W/nm). Option goniometer: in addition radiant intensity (W/sr)
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The BTS2048-IR-WP spectroradiometer with thermoelectrically cooled array detector



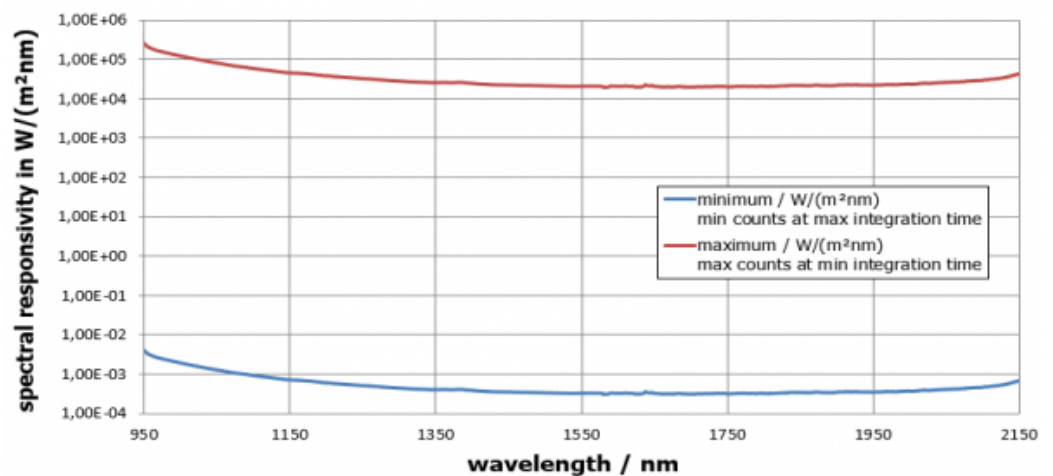
Cosine corrected diffuser with heated air flow for keeping the entrance optic snow free, dry, etc.

Input optics	Diffusor, cosine corrected field of view
Filter wheel	4 positions (open, closed, OD1, OD2). Use for remote dark current measurement and dynamic range extension.
BiTec	Parallel measurement with diode and array is possible, thereby an online correction of the spectral mismatch of the diode through $a^*(s_2(\lambda))$ respectively $F^*(s_2(\lambda))$ .

### Spectral Detector

Calibration uncertainty	Spectral irradiance																
	<table border="0"> <tr> <td><math>\lambda</math></td> <td><math>u(k=2)</math></td> </tr> <tr> <td>(950 - 1039) nm</td> <td>4 %</td> </tr> <tr> <td>(1040 - 1549) nm</td> <td>4,5 %</td> </tr> <tr> <td>(1550 - 1949) nm (sensor part 1*)</td> <td>5 %</td> </tr> <tr> <td>(1550 - 1949) nm (sensor part 2*)</td> <td>6 %</td> </tr> <tr> <td>(1950 - 2049) nm</td> <td>6,8 %</td> </tr> <tr> <td>(2050 - 2150) nm</td> <td>7,5 %</td> </tr> <tr> <td>Spectral irradiance responsivity (950 - 2150) nm</td> <td></td> </tr> </table> <p>* In this area, the transition from sensor part 1 to sensor part 2 takes place. The uncertainty increases.</p>	$\lambda$	$u(k=2)$	(950 - 1039) nm	4 %	(1040 - 1549) nm	4,5 %	(1550 - 1949) nm (sensor part 1*)	5 %	(1550 - 1949) nm (sensor part 2*)	6 %	(1950 - 2049) nm	6,8 %	(2050 - 2150) nm	7,5 %	Spectral irradiance responsivity (950 - 2150) nm	
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Spectral irradiance responsivity (950 - 2150) nm																	
Integration Time	10 $\mu$ s - 20 s *11																
Spectral range	(950 - 2150) nm																
Optical Bandwidth	9 nm																
Pixel resolution	~2.3 nm/Pixel																
Number of pixels	512																
Chip	cooled highly sensitive InGaAs chip with second order filter																
ADC	16bit																
Peak wavelength	$\pm 1$ nm																
Band-pass correction	mathematical online band-pass correction is supported																
Linearity	completely linearized chip >99% *10																
Base line noise	7 cts *1																
SNR	5000 *2																
Dynamic range	8 Magnitudes																

Spectral responsivity



### Integral Detector

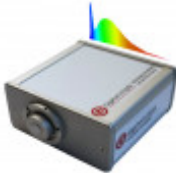
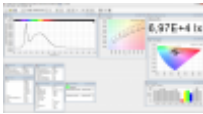



Measurement range	Nine (9) measurement ranges with offset correction
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Measurement range	Optional: (15 bis 6E7) W/m <sup>2</sup> responsivity range: (1050 - 2100) nm
Filter	Optional: Spectral responsivity with radiometric matching. Online correction of the radiometric matching through spectral measurement data (spectral mismatch factor correction).
<b>Miscellaneous</b>	
Microprocessor	32bit for device control, 16bit for detector array control, 8bit for photodiode control
Interface	USB V2.0, Ethernet (LAN UDP protocol), RS232, RS485
Data transfer	Standard for 512 float array values via ethernet 5 ms
Input Interfaces	2x (0 - 25) VDC, 1x optocoupler isolated 5 V / 5 mA
Output Interfaces	2x open collector, max. 25 V, max. 500 mA
Trigger	Trigger input incorporated (different options, rising/falling edge, delayed, etc.)
Software	User software S-BTS2048 Optional software development kit S-SDK-BTS2048 for user software set-ups based on .dll's in C, C++, C# or in LabView.
Power Supply	With power supply: DC Input 5V (±10 %) at 3000 mA
Dimensions	135 mm x 107 mm x 90 mm (Length x Width x Height)
Weight	1000g
Mounting	Tripod and M6 screw threads  Front adapter UMPA-1.0-HL for use with integrating sphere port-frame UMPF-1.0-HL
Temperature range	Storage: (-10 to 50) °C  Operation: (-25 to <45) °C      *9
Temperature range	Temperature stabilization chip: ≤ ± 0.25 °C
Info	<i>* 1 typical value measured without averaging with an integration time of 1ms (standard deviation). With averaging the base line noise reduces.</i>  <i>* 2 typical value measured without averaging with a measuring time of 1ms and full saturation of the detector. With averaging the SNR increases.</i>  <i>*9 The device takes about 25 minutes to stabilize in temperature. If measurements are taken in the warm-up phase or at non-constant temperatures, a new dark measurement is required for each measurement.</i>  <i>*10 The chip is basend on two different materials depending on the spectral range. Upper half (extendend InGaAs) may show a higher uncertainty at longer integration times.</i>  <i>*11 At longer integration times the possible saturation for the extendend InGaAs range may be limited by ambient temperature</i>
Temperature range	Temperature detector: ≤ ± 0.25 °C

## Downloads

Type	Description	File-Type	Download
Dimensions	BTS2048-IR technical drawing	pdf	<a href="https://www.gigahertz-optik.com/assets/Uploads/V127877.pdf">https://www.gigahertz-optik.com/assets/Uploads/V127877.pdf</a>

## Configurable with

Product Name	Product Image	Description	Go to product
BTS2048 Series		Compact spectroradiometers with excellent optical performance and BiTec technology for precise measurements for lab and field use.	<a href="https://www.gigahertz-optik.com/en-us/product/bts2048-series/">https://www.gigahertz-optik.com/en-us/product/bts2048-series/</a>
S-BTS2048		Application software for BTS2048 variants.	<a href="https://www.gigahertz-optik.com/en-us/product/s-bts2048/">https://www.gigahertz-optik.com/en-us/product/s-bts2048/</a>
S-SDK-BTS2048		Software Development Kit for BTS2048 variants.	<a href="https://www.gigahertz-optik.com/en-us/product/s-sdk-bts2048/">https://www.gigahertz-optik.com/en-us/product/s-sdk-bts2048/</a>
SUT-1711		Sun tracker for use with e.g. BTS2048-xx-WP series meter for direct solar irradiance measurement.	<a href="https://www.gigahertz-optik.com/en-us/product/sut-1711/">https://www.gigahertz-optik.com/en-us/product/sut-1711/</a>
BN-LHSI-WP		Calibration Lamp for Spectral Irradiance and Illuminance for Outdoor -WP devices	<a href="https://www.gigahertz-optik.com/en-us/product/bn-lhsi-wp/">https://www.gigahertz-optik.com/en-us/product/bn-lhsi-wp/</a>

## Purchasing information

Article-Nr	Modell	Description
<b>Product</b>		
15309075	BTS2048-IR-WP	Measuring device, users guide, S-BTS2048 software, calibration certificate.
<b>Re-calibration</b>		
15312264	K-BTS2048IR-E-S-V01	Re-calibration of the BTS2048-IR-WP from 950 nm to 2150 nm with calibration certificate.
<b>Software</b>		
15298470	S-SDK-BTS2048	Software development kit, software CD with users guide.
<b>Accessories</b>		
15306934	BTS2048-XX-WP-Z01	Desiccant cartridge for BTS2048-XX-WP housing.
15308476	BTS2048-XX-WP-Z03	5 m power supply cable.
15308477	BTS2048-XX-WP-Z04	10 m power supply cable.

<b>Article-Nr</b>	<b>Modell</b>	<b>Description</b>
15308478	BTS2048-XX-WP-Z05	20 m power supply cable.
15308479	BTS2048-XX-WP-Z06	5 m Ethernet cable.
15308480	BTS2048-XX-WP-Z07	10 m Ethernet cable.
15308481	BTS2048-XX-WP-Z08	20 m Ethernet cable.
15312053	BTS2048-XX-WP-Z12	Building kit for 5 m power supply cable.
15312054	BTS2048-XX-WP-Z13	Building kit for 10 m power supply cable.
15312055	BTS2048-XX-WP-Z14	Building kit for 20 m power supply cable.
15309076	BTS2048-XX-WP-Z09	Front tube for direct irradiance measurements.

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- Calibrations & Re-Calibrations ([ISO/IEC 17025 Calibration Services](#), [factory calibration](#), [Calibration of Third-Party Products](#))
- Repairs & Updates
- OEM & Feasibility Consulting of Customized Solutions

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