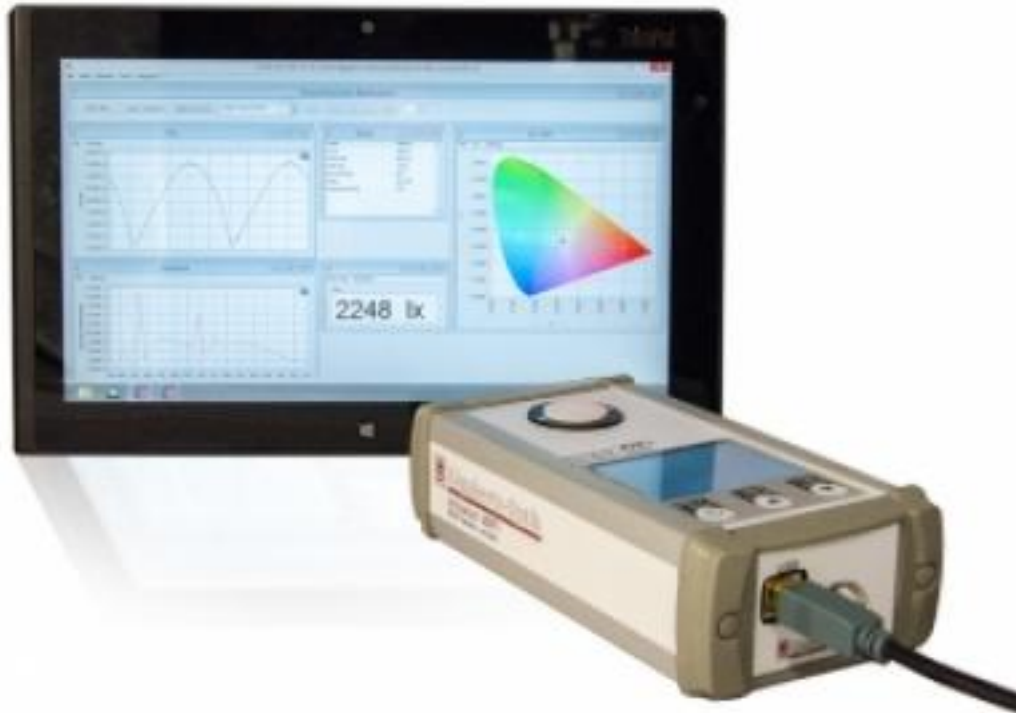


BTS256-EF

<http://www.gigahertz-optik.de/en-us/product/BTS256-EF>

Product tags: VIS , Spectral Data , Color Temperature , CRI , Waterproof , WiFi , Luminous Color , LED , Photometry , General lighting



Description

Traditional lux meters are increasingly being replaced by spectral light meters such as the MSC15. However, the lighting industry also needs high accuracy spectral light meters that can handle more complex measurements. These include measurement of pulse width modulated light and the ability to measure both internal and external illumination, determination of thermal transient behavior of lamps, and so on. The primary criterion that such meters must always meet is the quality of their photometric features. Additional electronic features may improve usability and display quality, but they cannot compensate for substandard measurement results.

Manufacturers of lamps and luminaires for general lighting purposes must consider light flicker when qualifying product safety in terms of EMC immunity requirements. In addition to the influence of mains voltage fluctuations, flicker effects caused by the lamp and the luminaire itself must be taken into account.

With the BTS256-EF, Gigahertz-Optik GmbH, a renowned measuring device manufacturer, offers a universal measuring device for the determination of all relevant light parameters in general lighting. Combined with a programmable AC source, the BTS256-EF becomes a comprehensive flicker test system for lamps and luminaires including voltage fluctuation immunity tests IEC TR 61547-1:2017.

BTS256-EF – Highquality, spectral light and color measurement meter

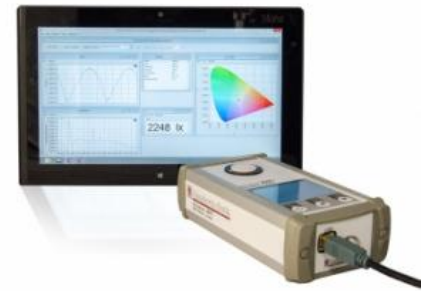
The BTS256-EF is a high-quality measuring device for photometric and colorimetric measurement of general lighting products and conditions. A special feature of the meter is a Bi-Tec sensor. This consists of a fast photodiode and a CMOS array detector. Thus, the meter supports all the requirements of a modern light meter:

- Cosine field of view illuminance measurement for accurate evaluation of extended illumination (class B DIN 5032 part 7 or AA according to JIS C 1609-1:2006)
- Flicker measurement
- Spectral measurement technology, required for LED light, color, color rendering, color effects
- Photodiode for synchronization to pulse width modulated light and flicker measurement
- alpha-opic measurement (CIE: TN-003)
- Compact and robust design for mobile use

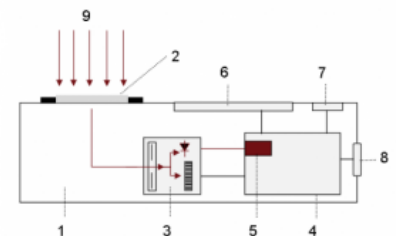
BTS256-EF – Flicker meter

In its function as a light-flicker meter, the BTS256-EF supports all current [flicker measurements](#):

- Percent Flicker (IES: RP-16-10, CIE: TN-006)
- Flicker Index (IES: RP-16-10, CIE: TN-006)

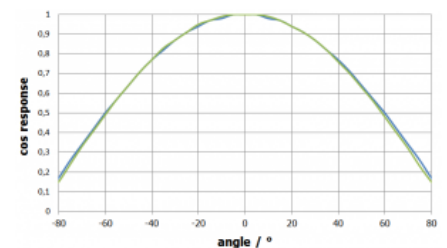


BTS256-EF for complex measurements in lighting technology, including flicker measurement



Principle illustration of the BTS256-EF

- 1) BTS256-EF
- 2) Precision cosine diffuser
- 3) BiTec sensor with Si photodiode, CMOS diode array spectrometer and shutter
- 4) Photometric Si-photodiode with fast amplifier
- 5) Microprocessor
- 6) Display
- 7) Control Buttons
- 8) USB 2.0 interface
- 9) Light incident



BTS256-EF light meter with precise cosine field of view function

- FFT Frequency component analysis
- P_{st} Short term flicker severity (CIE: TN-006)
- Stroboscopic Visibility Measure, SVM (CIE: TN-006)
- M_p ASSIST Flicker perception metric

BTS256-EF – Meter for photosynthetically active radiation (PAR) in plant growth

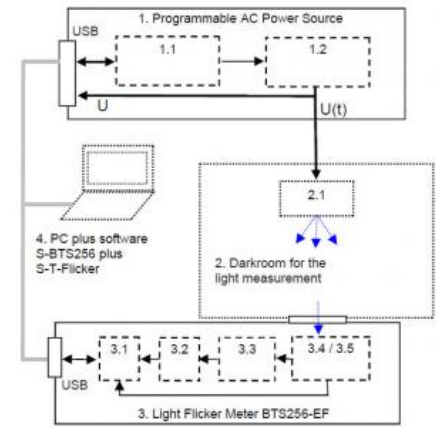
LED grow lights need to be measured in terms of the Photosynthetically Active Radiation (PAR) they produce. This function is supported by the BTS256-EF. The Photosynthetic Photon Flux Density (PPFD) in $\mu\text{mol}/(\text{m}^2\cdot\text{s})$ can be measured which is a measure of the total number of photons within the PAR wavelength range that reach a surface each second per square meter area. Furthermore, the daylight integral (DLI) can be displayed which represents the total amount of photosynthetically active radiation received by a plant in the course of a day.

Calibration of the BTS256-EF

One essential quality feature of photometric devices is their precise and traceable calibration. The BTS256-EF is calibrated by Gigahertz-Optik's 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.

Options for the BTS256-EF light meter

- Software development kit for integration of the device in the user's own software
- In connection with the software tool S-T-Flicker and the programmable AC Source LPS-CH-500 Gigahertz-Optik GmbH offers a functional extension of the BTS256-EF for an test system according to the IEC TR 61547-1:2017 Equipment for general lighting purposes - EMC immunity requirements - Part 1: An objective light flicker and fluctuation immunity test method.



Principle illustration light-flicker test system

- 1.1 Test waveform generator
- 1.2 Amplifier
- 2.1 Lamp/luminaire under test
- 3.1 Data processor light
- 3.2 Light data acquisition
- 3.3 Anti-aliasing filter
- 3.4 Fast photodetector
- 3.5 Spectral radiometer
4. User software with flicker measurement tool

Specifications

General	
Short description	Spectroradiometer for the illuminance (photopic, scotopic, melanopic), PAR, spectrum, light color, color rendering index, and flicker
Main features	Mobile measurement device, BiTec sensor with a V-lambda photodiode and low stray light CMOS spectroradiometer with a 10 nm optical bandwidth and additional optical bandwidth correction (CIE214), remote-controlled offset shutter, precise cosine-corrected field of view, data logger, automatic PWM synchronization, flicker measurement of P_{st} , SVM, Flicker Index, etc.
Range of measurement	1 lx to 199,000 lx, 360 nm to 830 nm, flicker frequency between 0.25 Hz and 5 kHz
Typical applications	Precise spectral light meter for the lighting industry
Calibration	Factory calibration, traceable to international standards
Product	
Lightmeter	class B DIN 5032 part 7 or AA according to JIS C 1609-1:2006 class A DIN 5032 part 7 for f_1' , u , f_3 and f_4 or general precision class according to JIS C 1609-1:2006
Light sensor	Bi-Technology sensor with a photometric broadband detector and a array spectrometer. Integrated aperture for automatic dark signal adjustment.
Input optic	Diffuser window with 20mm diameter, cosine corrected field of view, f_2 Error $\leq 3\%$

Filter	Spectral responsivity with fine CIE photometric matching. Online correction of the photometric matching through spectral measurement data (spectral mismatch factor correction)					
Flicker	Using as a handheld device without software, limited by internal storage:					
	Measurement Time (Sensor)	Measurement Time (Flicker)	Sampling Rate	Upper Cut-Off Frequency	Lower Cut-Off Frequency	Lower Frequency
	50 ms	41.0 ms	20 μ s	5 kHz		60 Hz
	100 ms	81.9 ms	40 μ s	5 kHz		30 Hz
	200 ms	163.8 ms	80 μ s	2.5 kHz		15 Hz
	500 ms	327.7 ms	160 μ s	1.2 kHz		8 Hz
	1000 ms	655.4 ms	320 μ s	0.6 kHz		4 Hz
	3000 ms	2620 ms	1280 μ s	150 Hz		1 Hz
	6000 ms	5240 ms	2560 μ s	75 Hz		0.5 Hz
	12000 ms	10486 ms	5120 μ s	33 Hz		0.25 Hz
	By Software controlled use the above analysis or the following high resolution analysis is possible:					
Measurement Time (Sensor)	Measurement Time (Flicker)	Sampling Rate	Upper Cut-Off Frequency	Lower Cut-Off Frequency	Frequency uncertainty acceptable S/N ratio	
5 ms	5 ms	20 μ s min. 40 μ s	5 kHz	2.5/meas. time	1 % \pm 0.5 Hz	
to	to	for TLA measurement				
180000 ms (3 min)	180000 ms					
Calibration uncertainty	Illuminance +/- 2.2%					
Spectral Detector						
Chip	CMOS diode-array					
Wavelength Range	(360 - 830) nm					
Optical Bandwidth	10 nm, mathematical optical bandwidth correction according to CIE 214 can be automatically applied					
Data Resolution	1 nm					
Integration Time	(5.2 - 30000) ms					
Shutter	Automatic aperture for dark signal measurements with the same integration time as that of light measurements. Aperture delay = 100ms.					
Typ. Measurement Time	199,999 lx \leq 5ms (white light) 100 lx \leq 1s (white light)					
Color measurement range spectral	(1 - 199,999) lx					
Scotopic	Scotopic measurement range spectral (1 - 199,999) lx Calibration uncertainty of scotopic Illuminance +/-2.2%					
Peak wavelength	+/- 1nm					
Dominant wavelength	+/- 1nm					
$\Delta x, \Delta y$ reproducibility	+/- 0.0001 (Standard illuminant type A)					

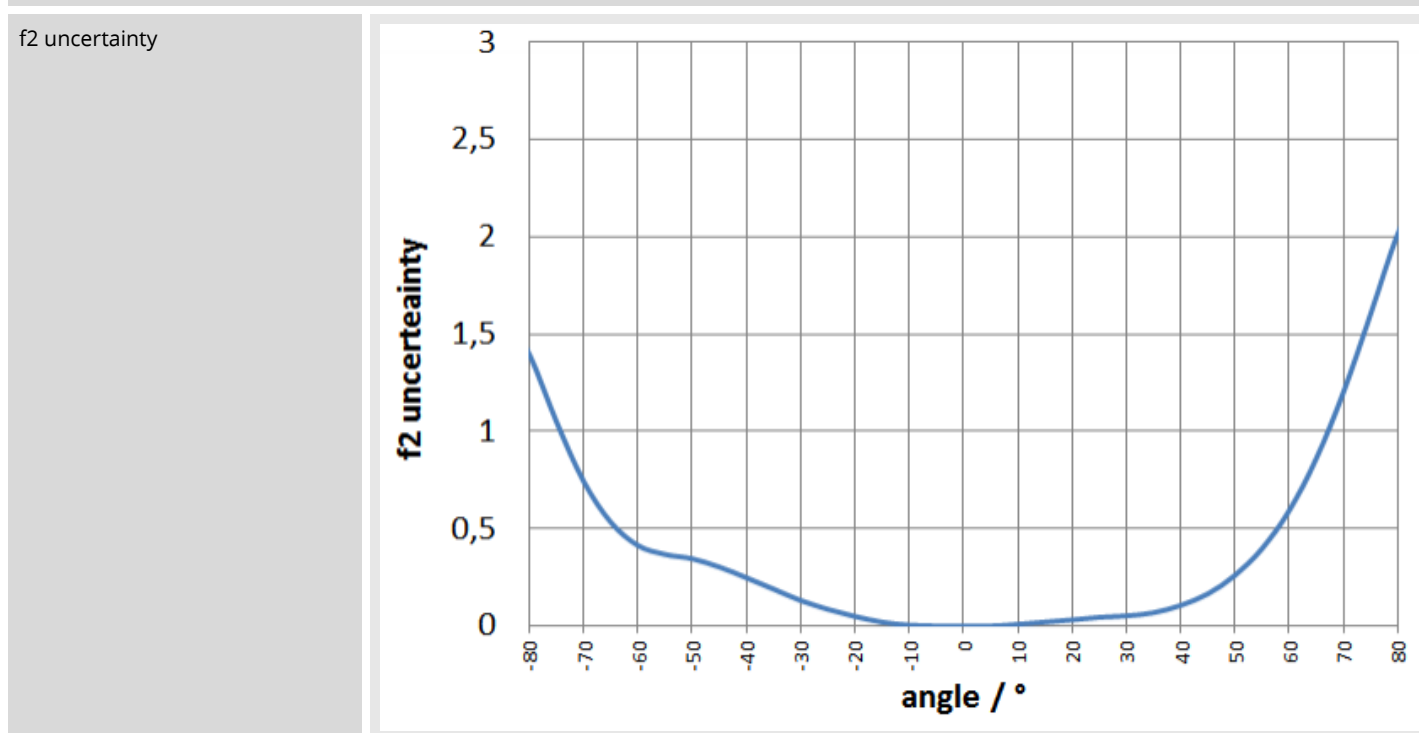
+/- 0.0002 (LED)

$\Delta x, \Delta y$ uncertainty	+/- 0.002 (Standard illuminant type A) +/- 0.005 (typ. LED)
CCT Measurement range	(1700 - 17000) K
ΔCCT	+/- 50K (standard illuminant type A) +/- 4% (depending on the LED spectrum)
CRI (color rendering index)	Ra and R1 to R15
Stray Light	6E-4 (Blue LED) 6E-4 (Green LED) 6E-4 (Red LED) 1E-3 (White LED) (typical value, measured 100 nm to the left of the peak of the LEDs)
Calibration uncertainty	Spectral irradiance (360 - 399) nm +/- 7 % (400 - 799) nm: +/- 4 % (800 - 830) nm: +/- 6 % Spectral irradiance responsivity (360 - 830) nm

Integral Detector

f1'	$\leq 6\%$ (uncorrected) $\leq 3\%$ ($f1' a^*(s_z(\lambda))$) respectively $F^*(s_z(\lambda))$ corrected by spectral data, done automatically by BTS technology)
Max. measurable illuminance	$\geq 199,999$ lx
Noise equivalent illuminance	≤ 0.01 lx
Resolution	12Bit
Measurement Time	(0.1 - 6000) ms
temperatur correction	The measured values of the diode are corrected by means of an internal temperature sensor.


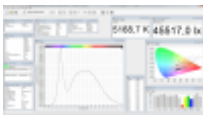
Graphs



Miscellaneous

Microprocessor	16Bit, 25ns instruction cycle time
Charging voltage	5VDC, 450mA per USB
Interface	USB 2.0 (Type B USB) Option WiFi: WiFi 2,4 GHz (external antenna, range > 100m)
Temperature	Operation: -10°C bis +30°C Storage: -10°C bis +50°C
Housing	Splashproof IP54
Transport case	333mm x 280mm x 70mm, 650g
Dimension	159mm x 85mm x 45mm (Length x Width x Height)
Weight	500 g

Configurable with

Produktname	Product Image	Description	Show product
S-SDK-BTS256		Software Development Kit for BTS256 variants.	http://www.gigahertz-optik.de/en-us/product/S-SDK-BTS256
S-BTS256		Application software for BTS256 variants.	http://www.gigahertz-optik.de/en-us/product/S-BTS256

Purchasing information

Article-Nr	Modell	Description
Product		
15308415	BTS256-EF	BTS256-EF meter, user manual (D or E), S-BTS256 user software CD, USB cable for PC operation and battery charging, USB power adapter (EU, USA or GB), BHO-17 hard-top case
15308416	BTS256-EF WiFi	BTS256-EF WiFi meter, user manual (D or E), WiFi antenna, S-BTS256 user software, USB cable for PC operation and battery charging, USB power adapter (EU, USA or GB), BHO-17 hard-top case
Re-calibration		
15300751	K-BTS256-E-I	Recalibration of the BTS256-EF. Including calibration certificate.
Options		
15308526	LPS-CH-500	Programmable power supply with reference source impedance

Article-Nr	Modell	Description
		Commissioning and training on request
Software		
15298218	S-SDK-BTS256	Software Development Kit; Software and users guide on CD
15308525	S-T-Flicker	Flicker software tool, only usable in combination with LPS-CH-500