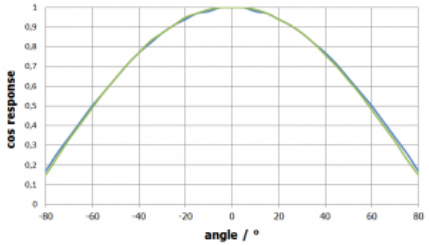
BTS256-PAR

http://www.gigahertz-optik.de/en-us/product/BTS256-PAR

Product tags: VIS , Spectral Data , PAR , Waterproof , General lighting

Description

Measurement and examination of the photosynthetically active radiation, R/FR, DLI, illuminance, luminous color, color rendering index, scotopic to photopic ratio, EVE factor , spectrum of LEDs and other lights



Light meter with a precise cosine field of view function

The BTS256-PAR is a high-quality light meter that is well suited for illuminance and luminous color measurements in all application areas thanks to its compact design, high-quality light sensor and precise cosine field of view function.

BiTec light sensor for precise light measurements

One of the outstanding properties of this mobile light meter is its BiTec light sensor. This combines the characteristic properties of a silicon photodiode with those of a low-noise CMOS diode array. The BiTec sensor guarantees precise photometric and spectral-radiometric measurement values over a large dynamic range through mutual correction of the measurement signals of both sensors.

Silicon photodiode detector, fast and linear

When taking into account the dynamic range, linearity and speed, silicon photodiodes have always been and are still the ultimate light detectors. A photometric corrected silicon photodiode is therefore incorporated in the BiTec light sensor of the BTS256-PAR light meter. Its matching to the photometric V(λ) responsivity is improved by the diode array's spectral measurement data.

User specific weigthing function

It is possible to use up to five user specific weigthing functions within the device for custom calculations. These functions can be transmitted by the S-BTS256 software and are saved in the device.

Diode array detector for spectral measurement data

The CMOS diode array of the BiTec Light sensor provides precise measurement data required for the luminous spectrum. This data is then used for calculation of the color values and scotopic illuminance as well as for optimization of the photometric responsivity.

Optimized Signal to Noise Ratio

The noise signal from diode array detectors has significant effect on the signal to noise ratio (SNR) and hence on the quality of the measurement signal as well. A remote controlled shutter in the BiTec light sensor enables online compensation of the dark signals that are dependent on the temperature and integration time.

Pulse Width Modulated (PWM) LED lamps

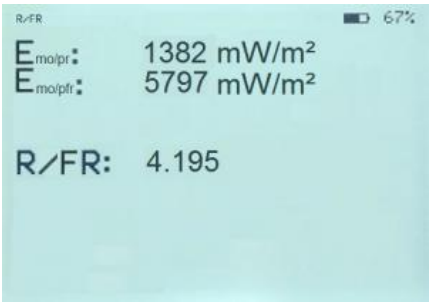
The fast photodiode of the BiTec light sensor enables the BTS256-PAR to automatically synchronize itself to the frequency of lamps operated in PWM mode.

Precise cosine corrected field of view

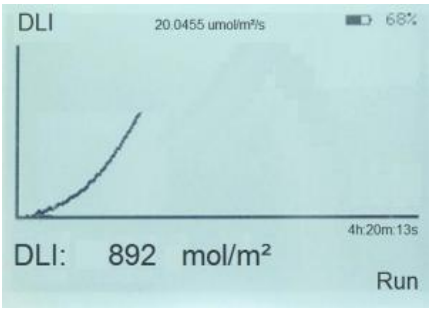
A cosine corrected field of view is absolutely necessary for illuminance measurement devices. For extended illuminance setups, the cosine matching has significant influence on the measurement uncertainty of the light meter. The BTS256-PAR light meter is equipped with a diffuser window with a 20mm diameter whose cosine matching ensures an f2 ≤ 3% uncertainty which corresponds to the DIN 5036 requirements for the quality class B. Both detectors of the BiTec light sensor are centrally aligned behind the diffuser window and therefore have the same view angle.

DIN quality class A and B luxmeter

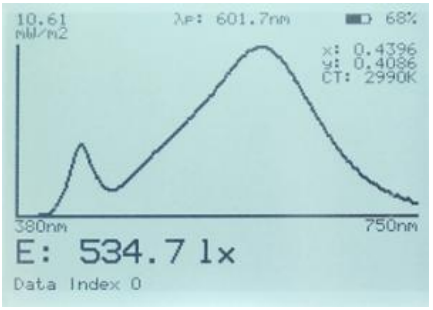
Through the cutting-edge Bi-Technology sensor concept, use of modern electronics, online dark signal adjustment and the possibility to perform temperature compensation, the device



R/FR ratio



DLI measurement



Standard display for the illuminance and spectrum

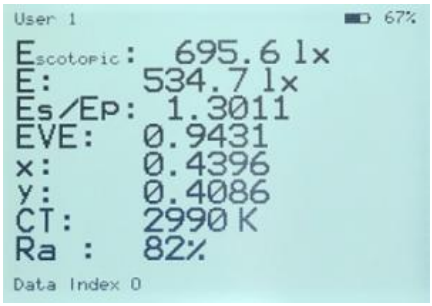
meets the conditions specified for two of the DIN 5036 quality classes.

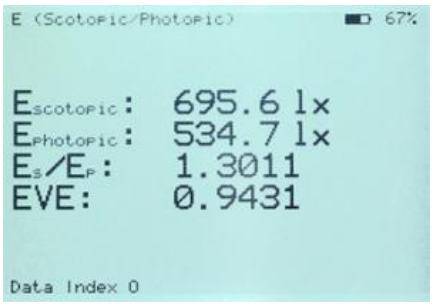
- In terms of the f2 uncertainty i.e. ≤ 3%, the device corresponds to the quality class B (DIN 5032 section 7).
- In applications where limitation of the viewing angle is acceptable, the BTS256-PAR, with its f1', u, f3 and f4 values, corresponds to the quality class A (DIN 5032 section 7).

Diverse photometric and colorimetric measurands

A much broader diversity of measurands as the one offered by conventional light meters is required for verification and testing of LED lamps. The BTS256-PAR offers fourteen measurands and thereby meets all the requirements for a modern light meter:

- Ep photopic illuminance
- Es scotopic illuminance
- DLI (Daily Light Integral)
- R/FR Red to Far-Red relationship
- Qsy' PAR value PAR PPFD in µmol/(m²s)
- Esy1, Esy2, Etp1, Etp2 in W/m²
- UWF User Weigthing Function (5 different user function are possible)
- Es/Ep ratio of night and daylight vision
- EVE "Equivalent Visual Efficiency" factor
- Ee irradiance
- Eλ spectral irradiance
- x, y CIE 1931 color coordinates
- u', v' CIE 1976 color coordinates
- CT color temperature
- Δuv Deviation from the blackbody locus
- λdom dominant wavelength
- λp peak intensity wavelength
- λ0,5 spectral half-width
- Purity color purity
- CRI Ra and R1 to R15 Color Rendering Index

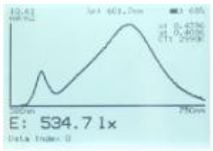




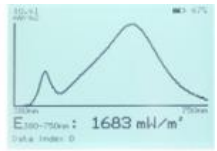
Ratio of the scotopic and photopic illuminance with the EVE factor as per IES TM-24-13

Display modes for standard measurements

The BTS256-PAR Bi-Tec sensor luxmeter has several display modes where the necessary measurands for the common photometric measurements are incorporated. The cursor buttons can be used to switch between the displays.



Spektrale Beleuchtungsstärke lx



Spektrale Bestrahlungsstärke W/m²

Customized display modes

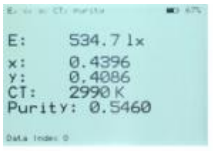
The BTS256-PAR enables users to individually configure and save display modes. The required measurands can hereby be selected.

Info display for measurement parameters

An incorporated Info Display shows all the relevant measurement parameters.

Easy operation and handling

Three control buttons and the diligently structured menu navigation make the device easy and safe to operate the device. For instance, in the standard measurement mode, the user does not have to manually set the measurement parameters since these are automatically and best adjusted to match the measurement conditions. In the expert mode, the user has access to all measurement parameters.



x,y Farbortkoordinaten

u',v' Farbortkoordinaten

Many useful extra functions

- If the user wants to distance himself from the device's field of view, he/she can set a time-delayed measurement.
- The display can automatically be dimmed during the measurement.
- An acoustic signal can be set to mark the end of a measurement.
- A layout created using a PC with the support points for the single measurements can be adopted in the device for measurement of the illuminance distribution. The measurement points can be progressively processed and saved.
- Fast data logger measurement mode where time-clocked readings of the photodiode can be recorded at a maximum measurement rate of up to 100ms.
- A second data logger measurement mode that enables time-clocked recording of all measurands including the spectral measurement data.
- Date and time in real-time can also be set.

Tripod mount

The measurement device has a tripod stand socket on the bottom side.

Protective cap with chain

The protective cap for the diffuser window is attached onto the device.

Use without PC

The BTS256-PAR has all the necessary functions enabling free operation of the device without having to depend on a computer. Furthermore, the rechargeable batteries have a capacity of more than 8 operation hours. The USB power adapter enables recharging of the device without a PC.

Use with PC

The BTS256-PAR additionally has a USB 2.0 interface for use with a PC. This enables both data exchange and battery charging.

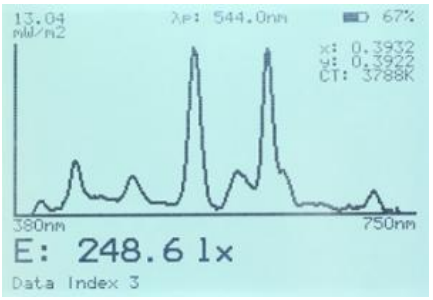
User software

The S-BTS256 software included in the device's price provides all the necessary functions for the measurements, measurement data display and data transfer. The cutting-edge, flexible desktop concept of the software offers the user an individual constellation of the required measurement values. This can be a full screen filled with lux measurement values or a matrix with both numerical and graphical fields. Each desktop constellation can easily be saved for future use.

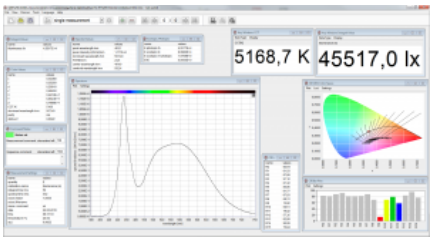
Software Development Kit

Gigahertz-Optik offers programmers the S-SDK-BTS256 Software Development Tool. This can be used with LabView from National Instruments, .NET from Microsoft and C/C++. The SDKs simplify integration of the BTS256-PAR in an internally developed software.

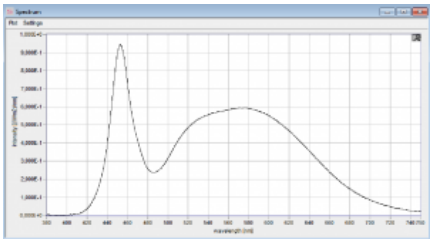
The measurement parameters protocol is saved together with a measurement data file



Standard display with illuminance, x,y color coordinates, color temperature and emission spectrum of an energy saving lamp



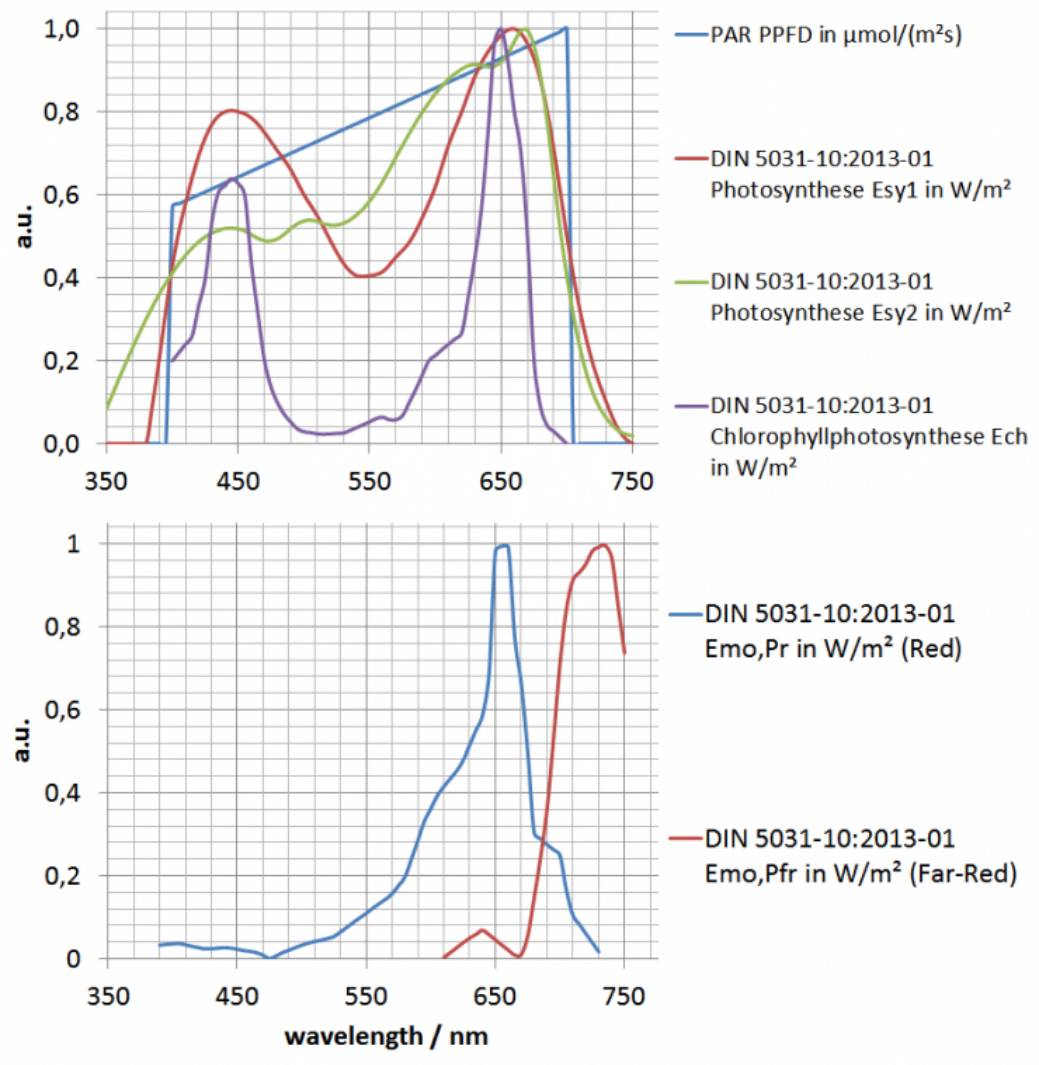
S-BTS256 user software with modular setup desktop



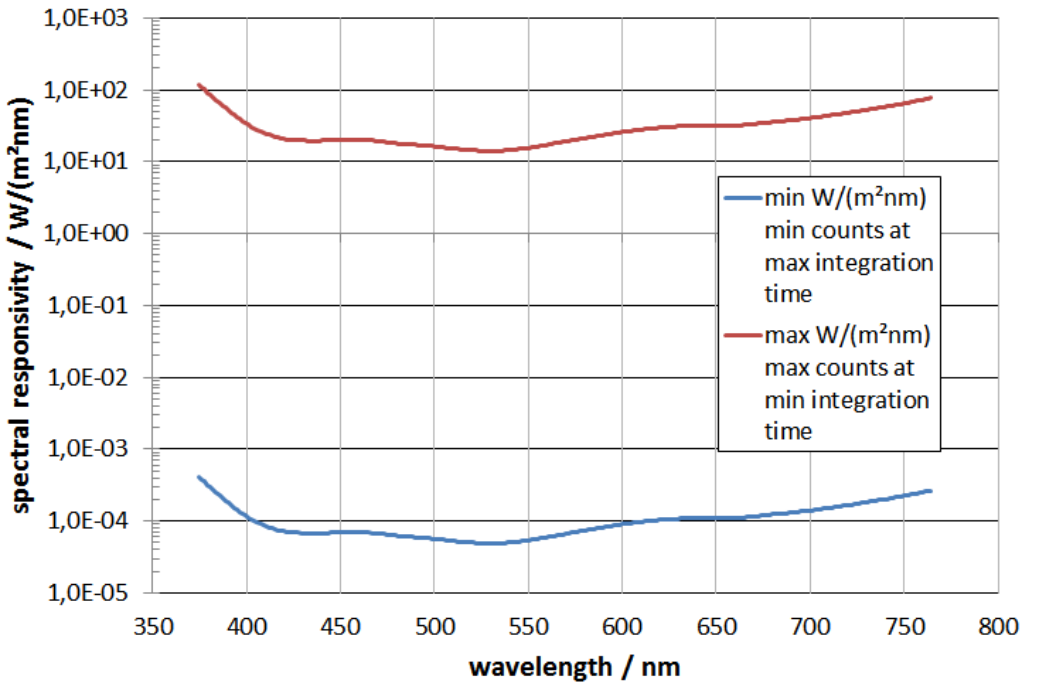
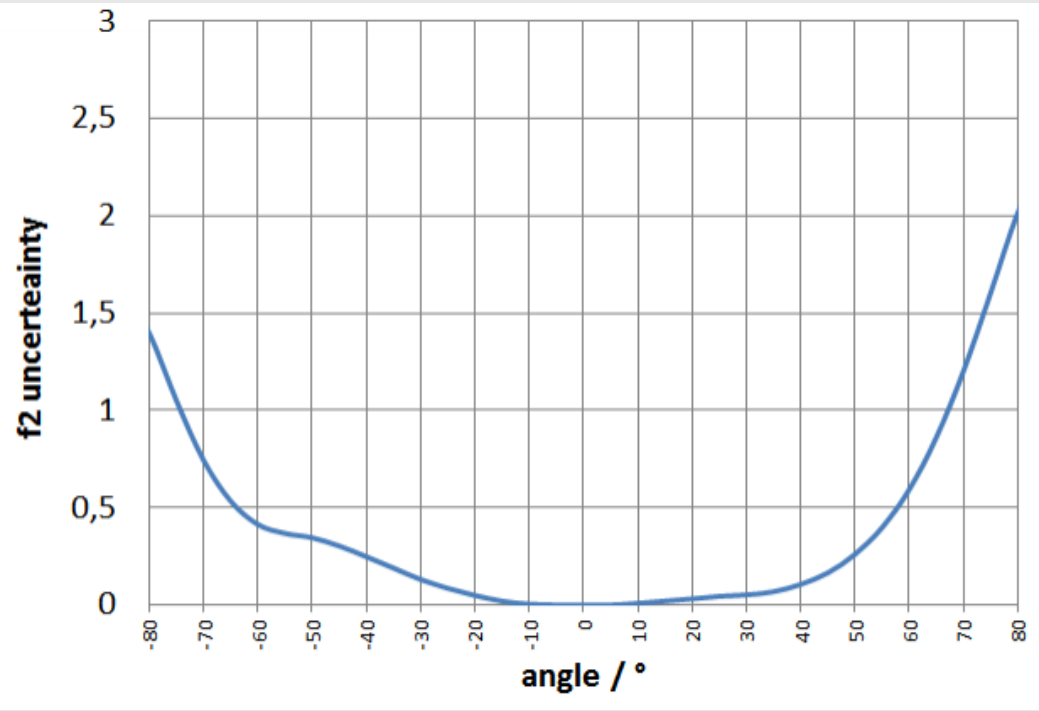
The graphical display module can be zoomed

Specifications

General	
Lightmeter	class B DIN 5032 part 7 or AA according to JIS C 1609-1:2006 class A DIN 5032 part 7 for f1', u, f3 and f4 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, f2 ≤ 3 %
Calibration uncertainty	Illuminance +/-2.2%
Weighting functions	 Additionally five different user specific weighting functions can be saved in the device.
additional Measurands (to BTS256-E)	PAR - µmol/(m²s) DLI - Daily Light Integral (time resolved measured with the help of a data logger) R/FR - Red to Far Red ratio Esy1, Esy2, Etp1, Etp2 weighting functions 5 different user specific weighting functions
Spectral Detector	
Chip	CMOS diode-array
Wavelength Range	(380 - 750) nm
Optical Bandwidth	10 nm
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.

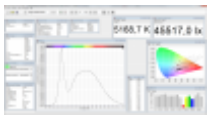
Typ. Measurement Time	199,999 lx ≤ 5ms (white light) 100 lx ≤ 1s (white light)
Color measurement range spectral	(1- 199,999) lx (white light)
PAR measurement range	(0.1 - 20000) µmol/(m²s) (white light)
Scotopic	Scotopic measurement range spectral (1 - 199,999) lx Calibration uncertainty of scotopic Illuminance +/-2.2%
Peak wavelength	+/- 1nm
Dominant wavelength	+/- 1nm
Δx, Δy reproducibility	+/- 0.0001 (Standard illuminant type A) +/- 0.0002 (LED)
Δx, Δy 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)
Calibration uncertainty	Spectral irradiance (380 - 399) nm: +/- 7 % (400 - 750) nm: +/- 4 % Spectral irradiance responsivity (380 - 750) nm
Integral Detector	
Filter	Spectral responsivity with fine CIE photometric matching. Online correction of the photometric matching through spectral measurement data (spectral missmatch factor correction)
f1'	≤6% (uncorrected) ≤3% (f1' a*($s_z(\lambda)$) respectively F*($s_z(\lambda)$) corrected by spectral data, done automatically by BTS technology)
Max. measurable illuminance	≥199,999 lx
Noise equivalent illuminance	≤ 0.01lx
Resolution	12Bit
Measurement Time	(0.1 - 6000) ms
Graphs	

spectral irradiance responsivity	
f2 uncertainty	

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

hard-top casing	333mm x 280mm x 70mm 650g

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		
	BTS256-PAR	measurement device, USB cabel, hard case, manual, S-BTS256 software, calibration certificate.
	BTS256-PAR WiFi	measurement device, USB cable, hard case, manual, S-BTS256 Software, calibration certificate.
Re-calibration		
15300751	K-BTS256-E-I	BTS256-PAR Re-Calibration with calibration certificate.
Accessories		
15298218	S-SDK-BTS256	Software Development Kit; Software and users guide on CD.