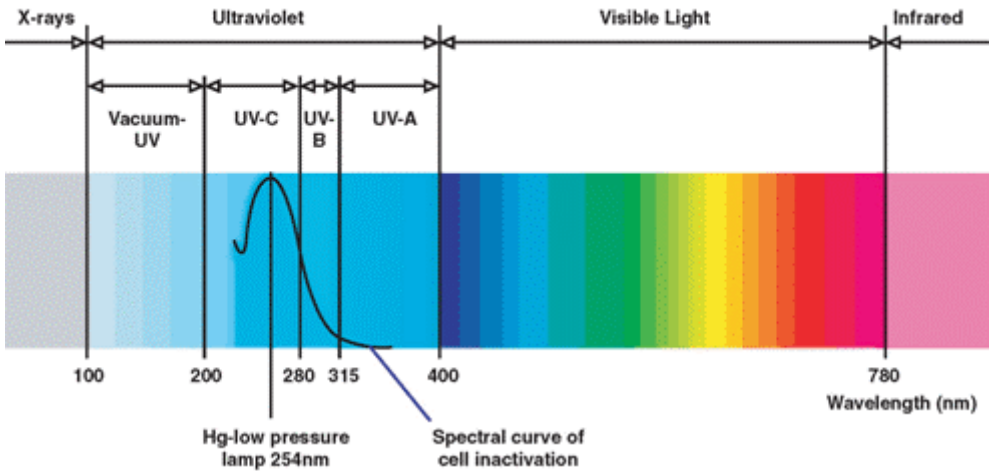
Ultraviolet Tools & Solutions



SiC & GaP

+

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Characterization of SiC photodiodes for high irradiance UV radiometers

S. Nowy [1], *B. Barton* [1], *S. Pape* [1], *P. Sperfeld* [1], *D. Friedrich* [1], *S. Winter* [1], *G. Hopfenmüller* [2], *T. Weiss* [2]

Abstract

For monitoring high UV irradiance, silicon carbide (SiC) based photodiodes are used. In this paper we describe the characterization of novel SiC UV photodiodes in terms of their spectral and integral responsivity. Special attention is paid to the aging behavior of the photodiodes due to high UV irradiance. Artificial aging of the samples is performed by illumination with a high power medium pressure mercury discharge lamp.

Preliminary studies

- comparison of different photodiodes:
  SiC from Cree and sglux
  AlGaN from Genicom
- long term irradiation with a low pressure UVC lamp (Philips PL L 36W 4P, approx. 4.2mW/cm^2 at peak wavelength)

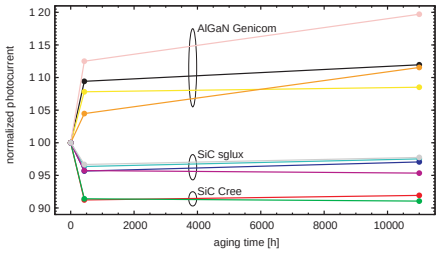


Figure 1: Normalized photocurrent for different types of UV photodiodes during long term irradiation with a low pressure UVC lamp.

- SiC photodiodes loose responsivity in the beginning of the irradiation (Cree: 9%, sglux: 4%), then no further degradation
- AlGaN photodiodes show an increased responsitivity (up to 20%) and a broad scatter

SiC photodiodes used in this study

- 8 novel SiC photodiodes
- manufacturer sglux SolGel Technologies GmbH
- improved visible blindness compared to SiC photodiodes from Cree
- area of the SiC chip: 1mm^2

Measurement setups

1. Artifical aging of the photodiodes

- irradiation with a high power medium pressure Hg discharge lamp
  uv technik meyer UVH2022 17, spectrum see fig. 2
- operated at about 1.8kW constant electric power
- irradiance level in the beginning approx. 17mW/cm^2
- SiC reference detector for irradiance monitoring
- diodes 01, 03 06, 08 are irradiated
- diodes 02 and 07 are not exposed to UV radiation, and used as reference

2. Characterization of the photodidoes

- irradiation with a low pressure Hg discharge lamp Wedeco NLR 1825, spectrum see fig. 2
- UV irradiance approx. 1.04mW/cm^2
- SiC reference detector for irradiance monitoring
- diodes 01 08 are characterized

3. Spectral responsivity of the photodiodes

- obtained at PTB's differential spectral responsivity (DSR) facility
- usually used for calibration of solar cells, modified for measurements in the UV range
- diodes 01 04 are investigated

Spectral emission from the UV lamps

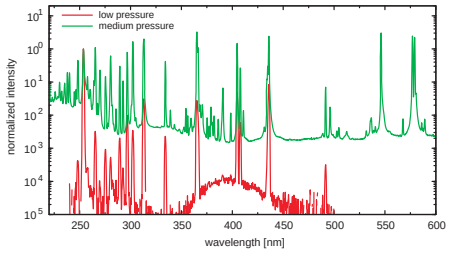


Figure 2: Spectral emission from the low (red line) and medium (green line) pressure lamps. Normalized to 253.75nm.

Photodiode behavior during artificial aging

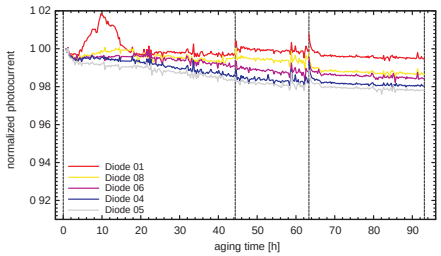


Figure 3: Normalized photocurrent for 5 photodiodes during aging with the medium pressure lamp.

- total aging time approx. 93h
- aging interrupted for characterization with the low pressure Hg lamp (dashed lines)
- decrease in responsivity up to 2.2%

Photodiode characterization

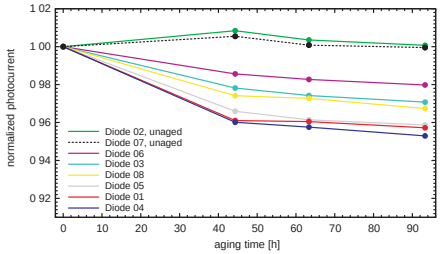


Figure 4: Normalized photocurrent, characterization with the low pressure lamp.

Unaged photodiodes 02 and 07:
- no decrease in photocurrent

Aged photodiodes 01, 03 06, and 08:
- decrease in responsivity up to 4.7%
- much larger decrease in responsivity as compared to fig. 3
- aging of the photodiodes mainly in the beginning

Spectral responsivity

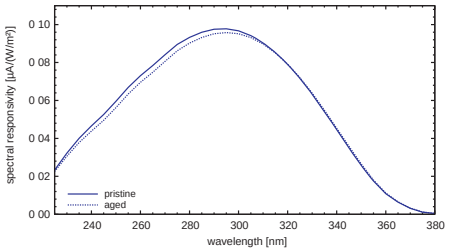


Figure 5: Spectral responsivity of diode 04 in pristine state (solid line) and after 93h of aging (dashed line).

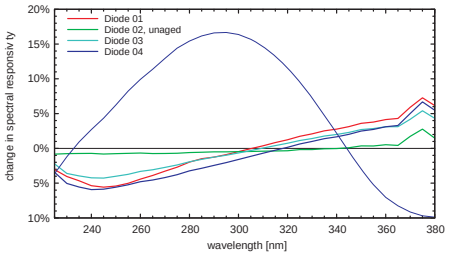


Figure 6: Change in spectral responsivity after aging of diodes 01 04. Additionally, the spectral responsivity of diode 04 in pristine state is shown as thin line.

Unaged photodiode 02:
- no change in spectral responsivity

Aged photodiodes 01, 03, and 04:
- change in spectral responsivity is observed
- change is wavelength dependent
- below approx. 310nm: loss in responsivity
- above approx. 310nm: gain in responsivity

Change in integral responsivity

Due to wavelength dependent responsivity:
- integral responsivity depends on the lamp used
- calculation uses spectral responsivity (fig. 6) and spectra of the low and medium pressure lamps (fig. 2)

	low pressure	medium pressure
Diode 01	4,7%	1.4%
Diode 02	0.7%	0.5%
Diode 03	3.5%	1.2%
Diode 04	5.0%	2.3%

Calculated values perfectly agree with measurement data from both types of lamps (fig. 3 and fig. 4).

Conclusions

Very recent measurements after additional 120h of irradiation: photodiodes are not aging significantly any further
after burn in: SiC photodiodes are very stable

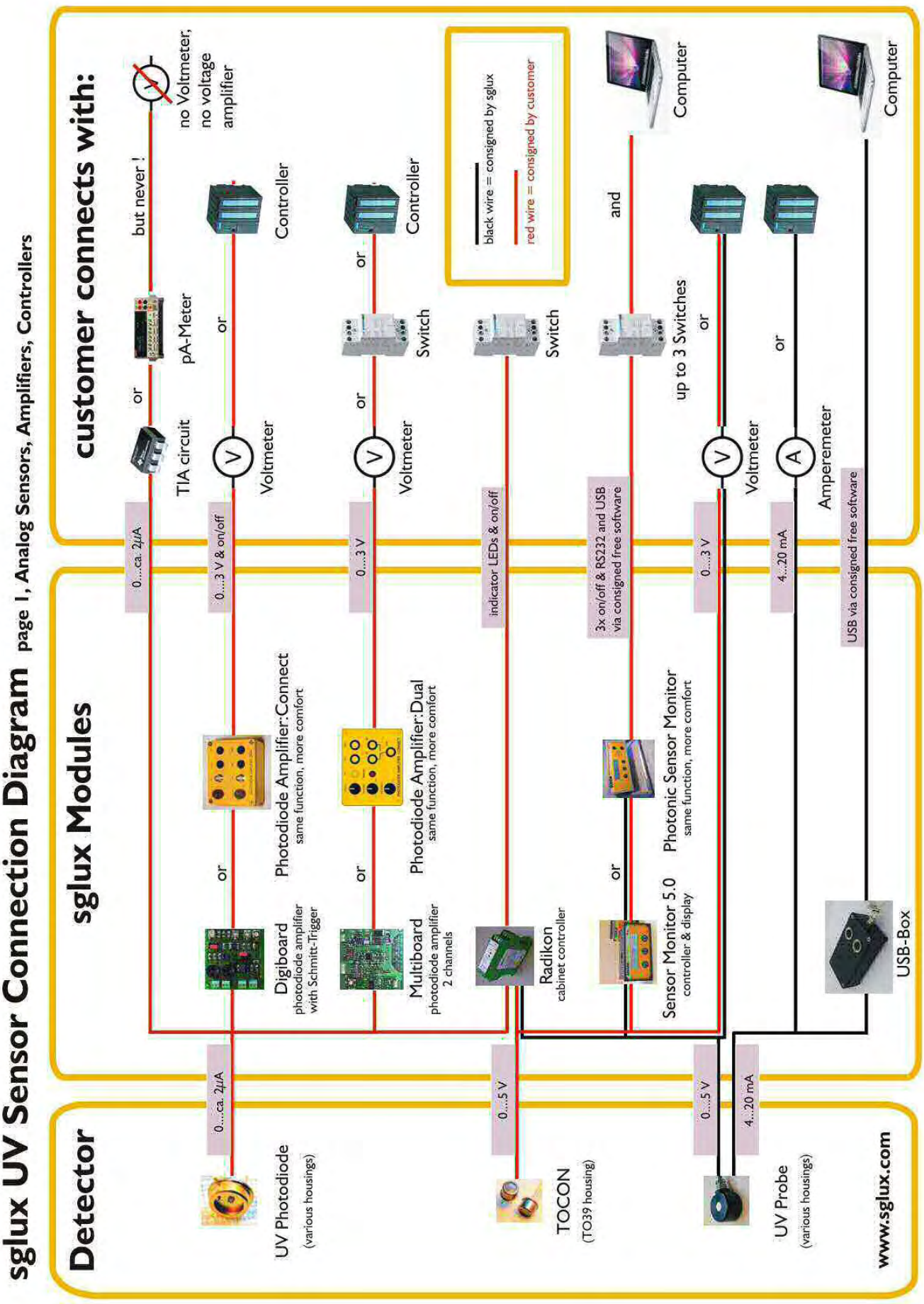
Outlook

- degradation studies of the photodiodes will be continued
- additional photodiodes will be investigated

Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

[1] **4.1 Photometry and Applied Radiometry • e-mail: stefan.nowy@ptb.de**

[2] **sglux SolGel Technologies GmbH, Berlin, Germany**


sglux UV Sensor Connection Diagram
page 1, Analog Sensors, Amplifiers, Controllers
Detector
sglux Modules
customer connects with:
UV Photodiode
(various housings)
0...ca. 2µA
TOCON
(TO39 housing)
0...5 V
UV Probe
(various housings)
4...20 mA
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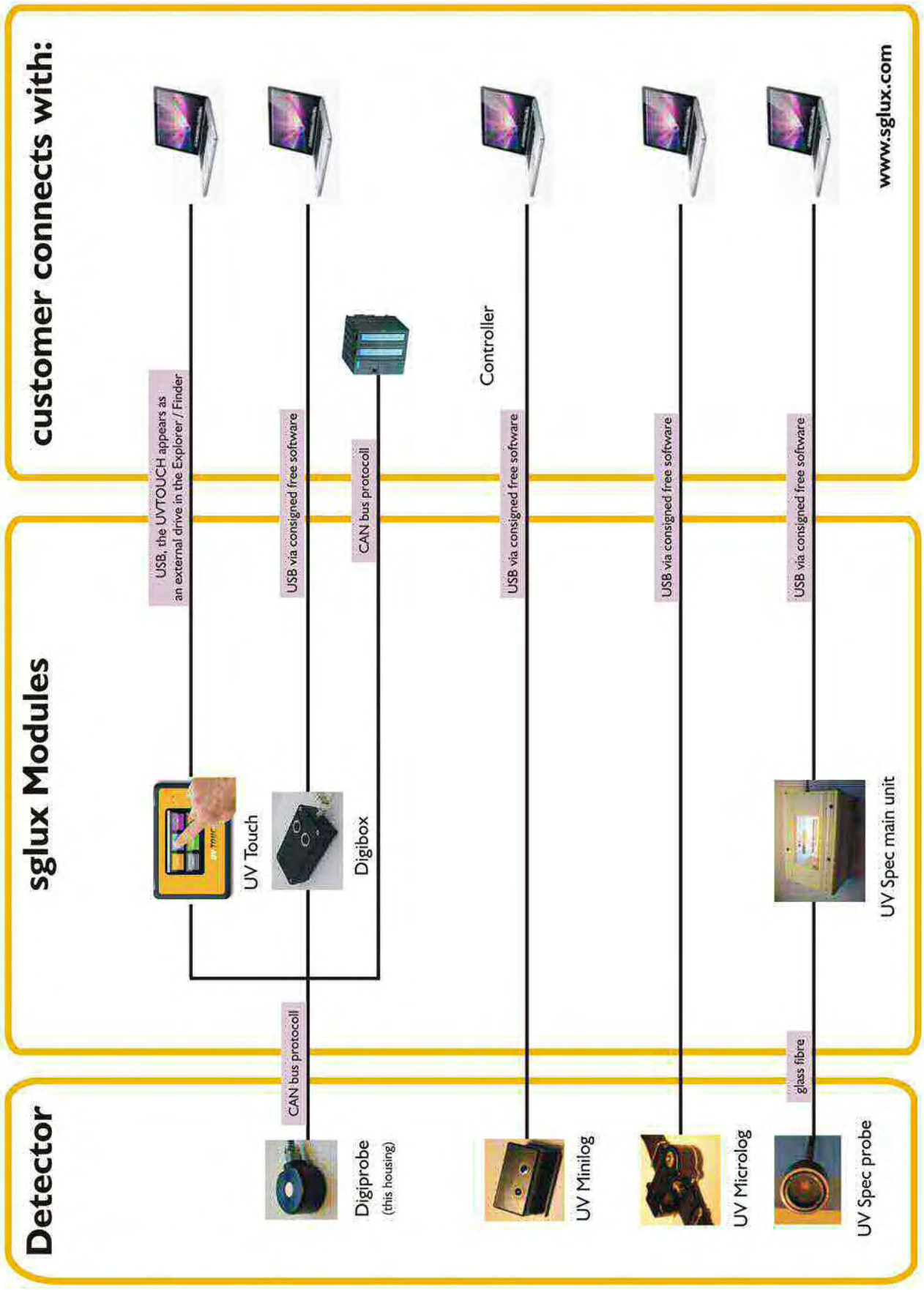
same function, more comfort
Controller
Voltmeter
0...3 V & on/off
Multiboard
photodiode amplifier 2 channels
Photodiode Amplifier:Dual
same function, more comfort
0...3 V
Switch
indicator LEDs & on/off
Radikon
cabinet controller
Sensor Monitor 5.0
controller & display
3x on/off & RS232 and USB via consigned free software
and
Computer
Photonic Sensor Monitor
same function, more comfort
up to 3 Switches
Amperemeter
4...20 mA
USB-Box
USB via consigned free software
black wire = consigned by sglux
red wire = consigned by customer

sglux UV Sensor Connection Diagram

page 2, Digital Sensors, Meters, Dataloggers



TOCON selection guide
pre-amplified UV Photodetectors, 0 … 5V output

What is a TOCON?

A TOCON is a pre-amplified UV photodetector with 0…5V output. The TOCON devices are using modern hybrid technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The output voltage can be directly connected to a controller or a voltage multimeter. No external amplifier is needed. Most of the TOCONs are powered by a Silicon Carbide (SiC) detector chip (ABC, A, E, C). The BLUE and GAP series works with a GaP chip. The TOCONs are available as:

…3 pin photodiodes in a TO39 housing

… or as easy to mount and connect stainless steel M12x1 thread housings, l = 32 mm, integrated plug

TOCON NOMENCLATURE

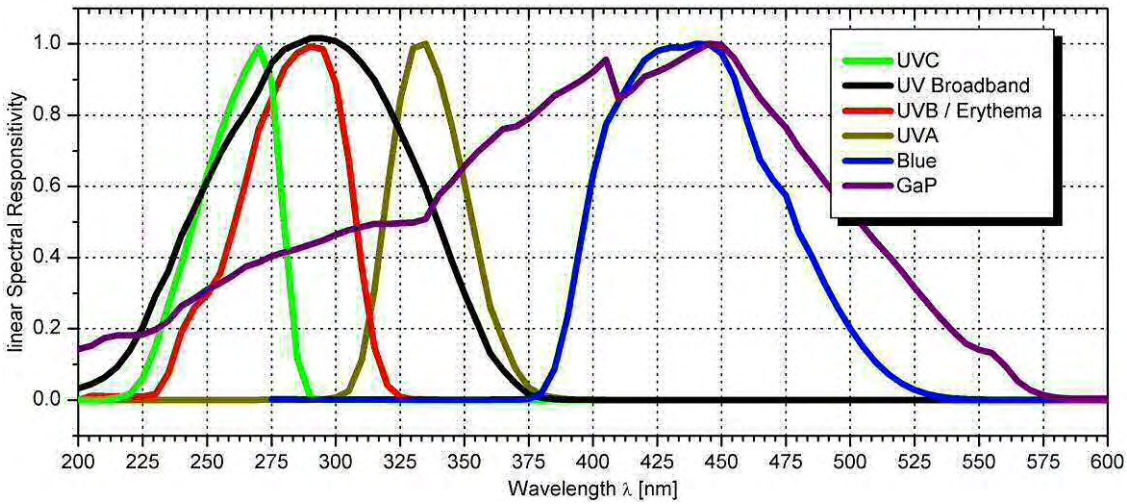
TOCON _	{*spectral*}	{*dynamic range*}
can be:	ABC	1 …. 10
	A	3 …. 9
	E	1 …. 3
	C	2 …. 9
	BLUE	1 …. 6
	GAP	1 …. 6

("1" is very sensitive and "10" is very unsensitive)

How to find „my" TOCON?

Step 1 → Selection of Spectral Response

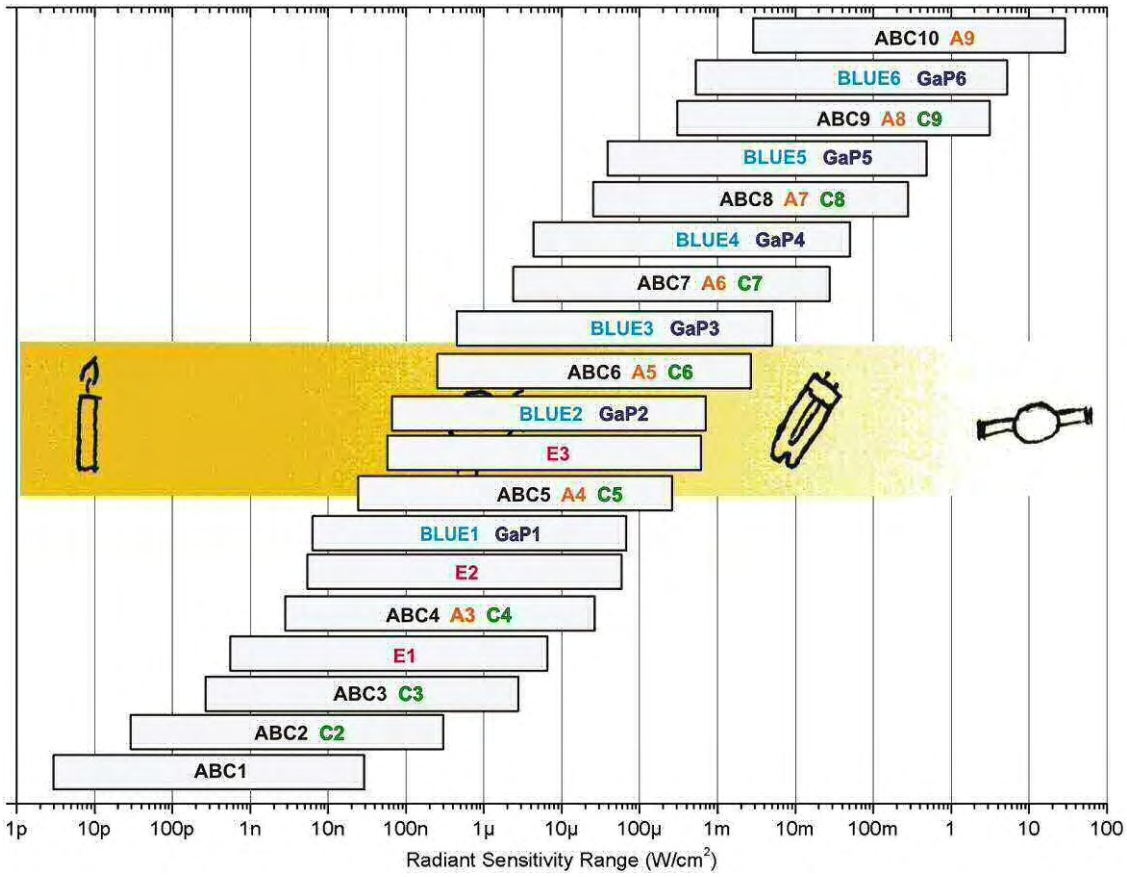
The TOCONs are available with six different spectral responses, UV broadband "**ABC**", UVA **"A"** , UVC **"C"** and Erythema Curve **"E"** (also useful for other selective UVB/UVC measurements) and blue light **"BLUE"** and **"GaP"** for near UV (UVA+blue VIS). The below table shows the spectral response of the different TOCONs. For detailed specification please refer to Appendix B (page 4) and the datasheet.



Manufacturer: **sg***lux* GmbH, Max-Planck-Str. 3, D-12489 Berlin, Tel. +49 30 5301 5211, Fax +49 30 5301 5209
mail: welcome@sglux.de - web: www.sglux.de - WEEE No. DE 76297302

Step 2 → selection of Sensitivity Range

The selection of the sensitivity range must be thorough. If the TOCON is too sensitive it will saturate below the upper limit of the radiation range to be measured. Conversely, a TOCON that is too insensitive gives no or a too low voltage output. Thus, for dynamic range selection, please estimate, it is best to calculate what is the max. radiation your TOCON must measure without getting saturated (the sensor will not be damaged if saturated). The related min. radiation is lower by approx. factor 5000 – if the TOCON is powered with 5V. It is possible to power the TOCON with lower voltages down to 2,5V. However, this will reduce the dynamic range by factor $5V/V_{supply}$. The graph below shows the sglux TOCONs offered spread out over a radiant intensity range of 13 orders of magnitude. The dynamic range is determined by the numeric suffix from "1" = very sensitive for very low UV radiation (e.g. a flame) to "10" = very unsensitive for very strong radiation. For detailed specification please refer to Appendix B (page 4) and the datasheet.



If a higher dynamic range than 15000 is needed, the sglux DIGITAL sensors (digital sensor with 5 orders dynamic range) could be interesting.

How to use a TOCON?

The 0...5V output voltage can be directly connected to a voltmeter or a controller. Alternatively a controller of the sglux *SENSOR MONITOR 5.0* series can be used. These modules include free programmable versatile Radiometer and Dosimeter modules with 3 programmable relay outputs. A data connection and computer software are available. The *SENSOR MONITOR* is perfectly suited for developers.

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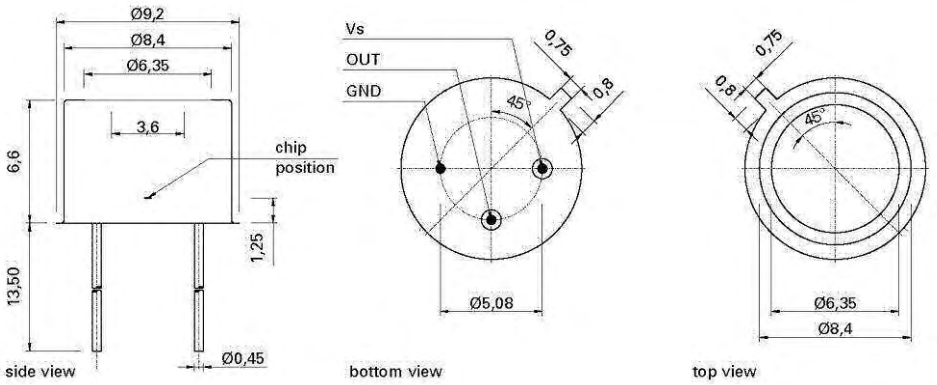
Appendix A_1 – General Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*-25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*-40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics *(T=25°C, V_{supply}=+5 V)*			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*0,05*	*mV*
Temperature coefficient	*Tc*	*<+0,3*	*%/K*
Current consumption	*I*	*0,8*	*mA*
Bandwidth (-3 dB)	*Θ*	*15*	*Hz*
Risetime (63%) *(other risetimes on demand)*	t_{rise}	*10*	*ms*
Spectral Characteristics *(T=25°C, V_{supply}=+5 V)*			
Sensitivity at peak	S_{max}	*see appendix B*	*nm*
Wavelength of max. spectral sens.	λ_{max}	*see appendix B*	*nm*
Sensitivity range (S=0,1*S_{max})	-	*see appendix B*	*nm*
SiC Visible blindness (S_{max} / $S_{>405nm}$)	*VB*	*$>10^{10}$ (SiC)*	-

Appendix A_2 - Drawing



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Appendix B – Product Details of all TOCONs

Model	Optical input at peak, mW/cm², for 2 V output	Approx. minimum irradiance (mW/cm²)	Approx. maximum irradiance (V_{supply} = 5 V) (mW/cm²)	Applications
UV broadband (SiC)	**Peak wavelength = 280nm Sensitivity range (S=0,1*Smax) = 210nm - 380nm**			
TOCON_ABC1	**7,00E-06**	**1,80E-09**	**1,80E-05**	very low UV radiation detection, flame detection
TOCON_ABC2	7,00E-05	1,80E-08	1,80E-04	low UV radiation detection, occupational safety
TOCON_ABC3	7,00E-04	1,80E-07	1,80E-03	UV radiation detection, occupational safety
TOCON_ABC4	**7,00E-03**	**1,80E-06**	**1,80E-02**	UV irradiation measurement
TOCON_ABC5	7,00E-02	1,80E-05	1,80E-01	UV irradiation measurement
TOCON_ABC6	**7,00E-01**	**1,80E-04**	**1,80E+00**	optimized for total sun UV measurements (not Erythema curve)
TOCON_ABC7	**7,00E+00**	**1,80E-03**	**1,80E+01**	UV irradiation measurement, industrial standard UV radiation
TOCON_ABC8	7,00E+01	1,80E-02	1,80E+02	curing lamp control
TOCON_ABC9	**7,00E+02**	**1,80E-01**	**1,80E+03**	curing lamp control
TOCON_ABC10	**7,00E+03**	**1,80E+00**	**1,80E+04**	UV hardening control and other very high radiation sources

UVA selective (SiC)	Peak wavelength = 335nm Sensitivity range (S=0,1*Smax) = 310nm - 395 nm			
TOCON_A3	7,00E-03	1,80E-06	1,80E-02	UVA radiation detection
TOCON_A4	7,00E-02	1,80E-05	1,80E-01	UVA irradiation measurement
TOCON_A5	7,00E-01	1,80E-04	1,80E+00	UVA irradiation measurement
TOCON_A6	7,00E+00	1,80E-03	1,80E+01	UVA irradiation measurement
TOCON_A7	7,00E+01	1,80E-02	1,80E+02	Measurement of high UVA irradiation, curing lamp control
TOCON_A8	7,00E+02	1,80E-01	1,80E+03	Measurement of very high UVA irradiation, curing lamp control
TOCON_A9	**7,00E+03**	**1,80E+00**	**1,80E+04**	Measurement of very high UVA irradiation, curing lamp control

UVB selective (SiC)	Peak wavelength = 280nm Sensitivity range (S=0,1*Smax) = 230nm - 315nm, for Erythema Curve and other UVB measurements, complies with CIE087 and DIN5050			
1 UVI input produces electrical output of:				
TOCON_E1	1,7 V per UVI	0,01 UVI	3 UVI	UV-Index measurements, if an attenuating diffusor is used
TOCON_E2	**170 mV per UVI**	0,1 UVI	30 UVI	UV-Index measurements
TOCON_E3	1,00E-01	5,00E-03	7,50E-01	UVB/UVC radiation measurements

UVC selective (SiC)	Peak wavelength = 270nm Sensitivity range (S=0,1*Smax) = 230nm - 285nm, complies with DVGW W294(3) and ÖNorm			
TOCON_C2	7,00E-05	1,80E-08	1,80E-04	low UVC radiation detection, occupational safety
TOCON_C3	7,00E-04	1,80E-07	1,80E-03	UVC radiation detection, occupational safety
TOCON_C4	7,00E-03	1,80E-06	1,80E-02	UVC irradiation measurement
TOCON_C5	7,00E-02	1,80E-05	1,80E-01	Purification lamp control
TOCON_C6	**7,00E-01**	**1,80E-04**	**1,80E+00**	Purification lamp control
TOCON_C7	**7,00E+00**	**1,80E-03**	**1,80E+01**	Purification lamp control
TOCON_C8	7,00E+01	1,80E-02	1,80E+02	curing lamp control
TOCON_C9	7,00E+02	1,80E-01	1,80E+03	curing lamp control

Blue Light (GaP)	Peak wavelength = 445nm Sensitivity range (S=0,1*Smax) = 390nm - 515nm, complies with 2006/25/EG			
TOCON_BLUE1	1,70E-02	4,20E-06	4,30E-02	measurement of very low blue light irradiation, occupational safety
TOCON_BLUE2	**1,70E-01**	**4,20E-05**	**4,30E-01**	measurement of low blue light irradiation, occupational safety
TOCON_BLUE3	1,70E+00	4,20E-04	4,30E+00	measurement of blue light irradiation, occupational safety
TOCON_BLUE4	1,70E+01	4,20E-03	4,30E+01	measurement of blue light irradiation, occupational safety
TOCON_BLUE5	1,70E+02	4,20E-02	4,30E+02	measurement of high blue light irradiation, occupational safety
TOCON_BLUE6	1,70E+03	4,20E-01	4,30E+03	measurement of very high blue light irradiation, occupational safety

UV + VIS (GaP)	Peak wavelength = 445nm Sensitivity range (S=0,1*Smax) = 190nm - 570nm			
TOCON_GaP1	1,70E-02	4,20E-06	4,30E-02	measurement of very low UV & VIS light irradiation, occupational safety
TOCON_GaP2	1,70E-01	4,20E-05	4,30E-01	measurement of low UV & VIS light irradiation, occupational safety
TOCON_GaP3	1,70E+00	4,20E-04	4,30E+00	measurement of blue UV & VIS light irradiation, occupational safety
TOCON_GaP4	1,70E+01	4,20E-03	4,30E+01	measurement of blue UV & VIS light irradiation, occupational safety
TOCON_GaP5	1,70E+02	4,20E-02	4,30E+02	measurement of high UV & VIS light irradiation, occupational safety
TOCON_GaP6	1,70E+03	4,20E-01	4,30E+03	measurement of very high UV & VIS light irradiation, occupational safety

Accessories	
TOCON_housing	miniature stainless steel housing (M12x1) with TOCON installed and removable 5-pin connector with 2m cable, easy to mount and connect, robust
TOCON_Starter_Kit	Kit for initial testing setup, includes a TOCON socket, two banana plugs to connect with a voltmeter and a 9V block battery

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TOCON_ABC1 (TOCON_nano)
Broadband pre-amplified SiC UV Photodetector

General Features

Properties of the TOCON_ABC1

- Broadband pre-amplified SiC UV detector in TO5 housing with concentrator lens cap
- 7 nW/cm^2 peak radiation results a voltage of approx. 2 V
- RoHS compliant
- Applications: very low UV radiation detection, flame detection

The TOCON pre-amplified UV photodetectors

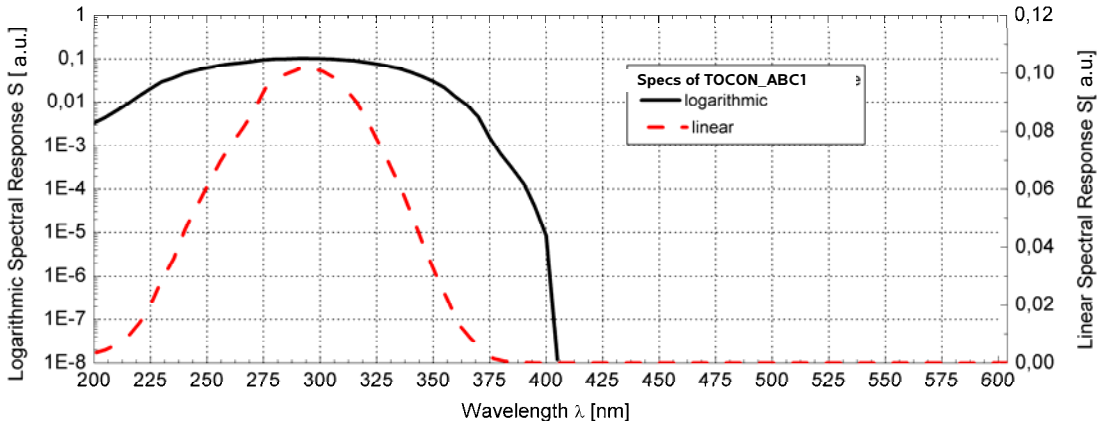
The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

Specifications

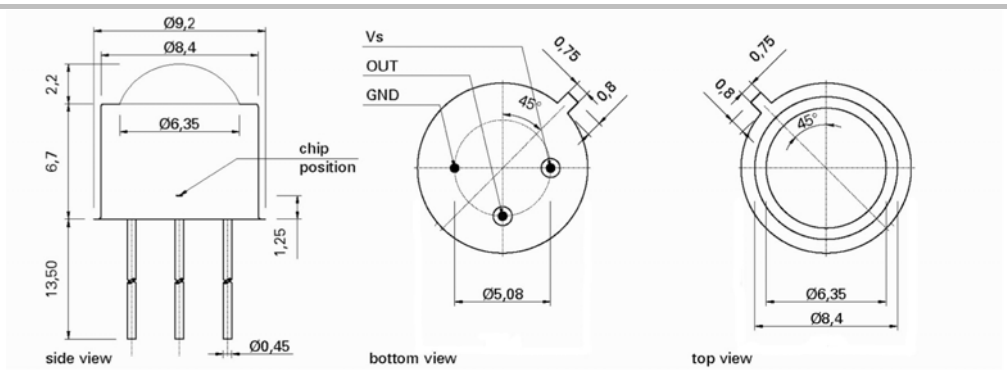
Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*-25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*-40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics *(T=25°C, V_{supply}=+5 V)*			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*50*	*µV*
Temperature coefficient	*Tc*	*<+0,3*	*%/K*
Current consumption	*I*	*0,8*	*mA*
Bandwidth (-3 dB)	*Θ*	*15*	*Hz*
Risetime (63%) *(other risetimes on demand)*	t_{rise}	*10*	*ms*
Spectral Characteristics *(T=25°C, V_{supply}=+5 V)*			
Sensitivity at peak	S_{max}	*280*	*mV/nW/cm^2*
Wavelength of max. spectral sens.	λ_{max}	*300*	*nm*
Sensitivity range (S=0,1*S_{max})	–	*210 … 380*	*nm*
Visible blindness (S_{max} / $S_{>405nm}$)	*VB*	*>10^{10}*	–

TOCON_ABC1 (TOCON_nano)
Broadband pre-amplified SiC UV Photodetector

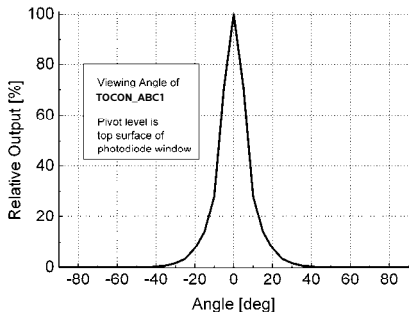
Spectral Response



Drawing



Field of View



TOCON Product Portfolio

Selection of TOCONs with UV broadband sensitivity:

Option	Approx. min irradiance	Approx. max irradiance (V_{supply} = 5 V)
TOCON_ABC1	**1,8 pW/cm²**	**18 nW/cm²** *this device*
TOCON_ABC2	18 pW/cm²	180 nW/cm²
TOCON_ABC3	180 pW/cm²	1,8 µW/cm²
TOCON_ABC4	1,8 nW/cm²	18 µW/cm²
TOCON_ABC5	18 nW/cm²	180 µW/cm²
TOCON_ABC6	180 nW/cm²	1,8 mW/cm²
TOCON_ABC7	1,8 µW/cm²	18 mW/cm²
TOCON_ABC8	18 µW/cm²	180 mW/cm²
TOCON_ABC9	180 µW/cm²	1,8 W/cm²
TOCON_ABC10	1,8 mW/cm²	18 W/cm²

TOCONS are also available with other spectral sensitivity (UVA, UVB, UV-Index, UVC).

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA

TOCON_A6
UVA pre-amplified SiC UV Photodetector

General Features

Properties of the TOCON_A6

- Pre-amplified SiC UVA detector in TO5 housing with diffuser
- 7 mW/cm^2 peak radiation results a voltage of approx. 2 V
- RoHS compliant
- Applications: UVA irradiation measurement

The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

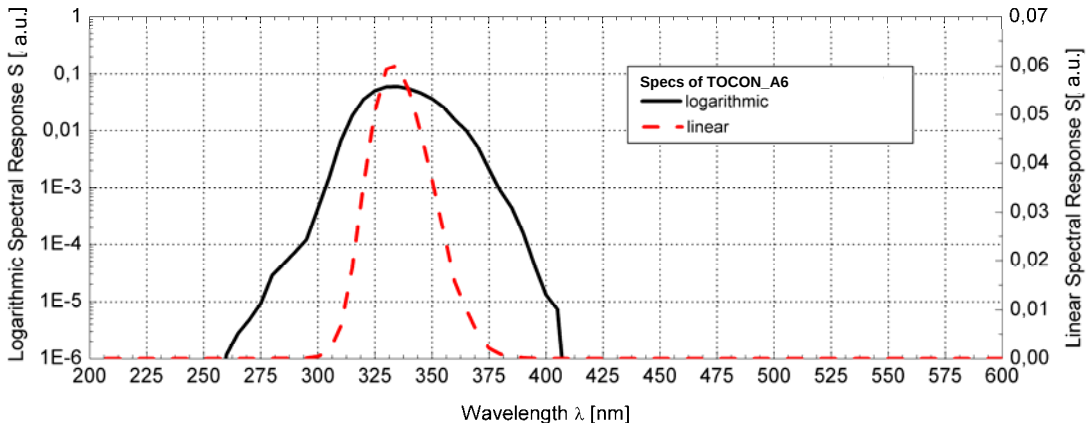
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*–25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*-40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics *(T=25°C, V_{supply}=+5 V)*			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*0,05*	*mV*
Temperature coefficient	*Tc*	*<+0,3*	*%/K*
Current consumption	*I*	*0,8*	*mA*
Bandwidth (-3 dB)	*Θ*	*15*	*Hz*
Risetime (63%) *(other risetimes on demand)*	t_{rise}	*10*	*ms*
Spectral Characteristics *(T=25°C, V_{supply}=+5 V)*			
Sensitivity at peak	S_{max}	*280*	*mV/mW/cm^2*
Wavelength of max. spectral sens.	λ_{max}	*335*	*nm*
Sensitivity range (S=0,1*S_{max})	–	*310…395*	*nm*
Visible blindness (S_{max} / $S_{>405nm}$)	*VB*	*>10^{10}*	–

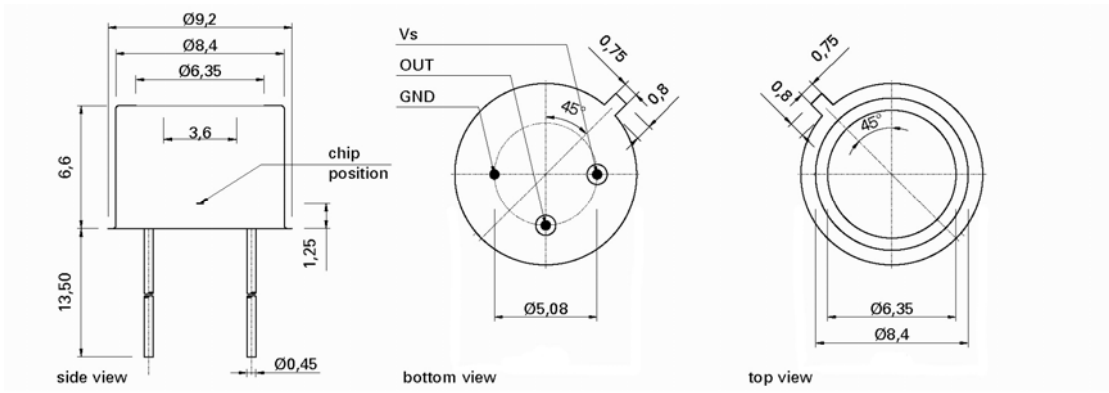
Spectral Response

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

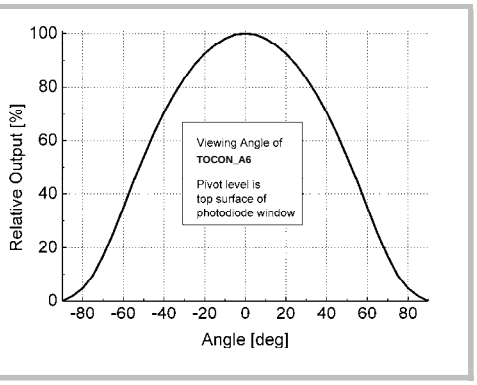
TOCON_A6
UVA pre-amplified SiC UV Photodetector



Drawing



Field of View



TOCON Product Portfolio

Selection of TOCONs with UVA sensitivity:

Option	Approx. min irradiance	Approx. max irradiance (V_{supply} = 5 V)
TOCON_A3	1,8 nW/cm²	18 µW/cm²
TOCON_A4	18 nW/cm²	180 µW/cm²
TOCON_A5	180 nW/cm²	1,8 mW/cm²
TOCON_A6	**1,8 µW/cm²**	**18 mW/cm²** *this device*
TOCON_A7	18 µW/cm²	180 mW/cm²
TOCON_A8	180 µW/cm²	1,8 W/cm²
TOCON_A9	1,8 mW/cm²	18 W/cm²

TOCONS are also available with other spectral sensitivity (UVB, UV-Index, UVC, UV broadband).

Manufacturer: sglux GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA

TOCON_ABC10 (TOCON_giga)
Broadband pre-amplified SiC UV Photodetector

General Features

Properties of the TOCON_ABC10

- Broadband pre-amplified SiC UV detector in TO5 housing with attenuator
- 7 W/cm^2 peak radiation results a voltage of approx. 2 V
- RoHS compliant
- Applications: UV hardening control and other very high radiation sources

The TOCON pre-amplified UV photodetectors

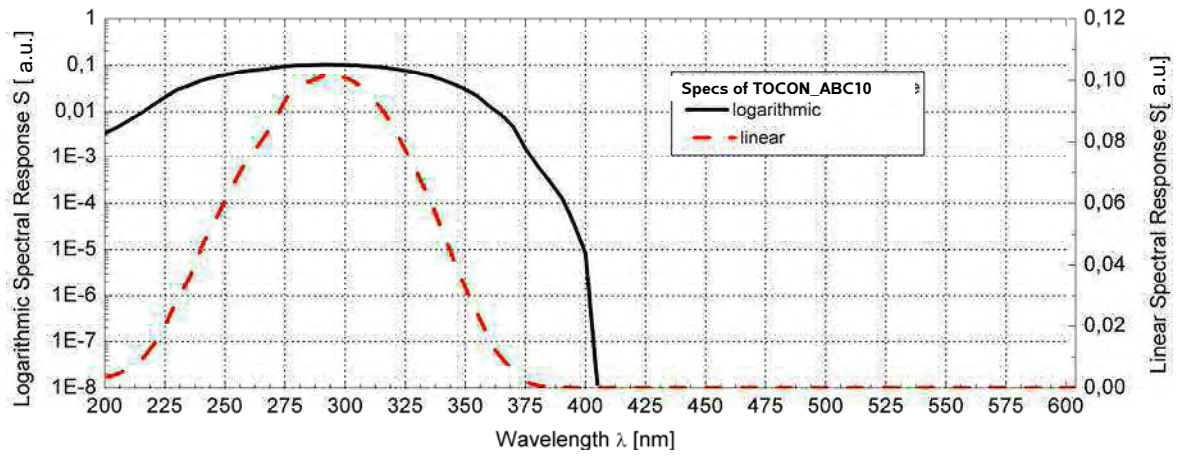
The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*–25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*–40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics *(T=25°C, V_{supply}=+5 V)*			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*50*	*µV*
Temperature coefficient	*Tc*	*<+0,3*	*%/K*
Current consumption	*I*	*0,8*	*mA*
Bandwidth (-3 dB)	*Θ*	*15*	*Hz*
Risetime (63%) *(other risetimes on demand)*	t_{rise}	*10*	*ms*
Spectral Characteristics *(T=25°C, V_{supply}=+5 V)*			
Sensitivity at peak	S_{max}	*0,28*	*mV/mW/cm^2*
Wavelength of max. spectral sens.	λ_{max}	*300*	*nm*
Sensitivity range (S=0,1*S_{max})	–	*210 … 380*	*nm*
Visible blindness (S_{max} / $S_{>405nm}$)	*VB*	*>10^{10}*	–

TOCON_ABC10 (TOCON_giga)
Broadband pre-amplified SiC UV Photodetector

Spectral Response



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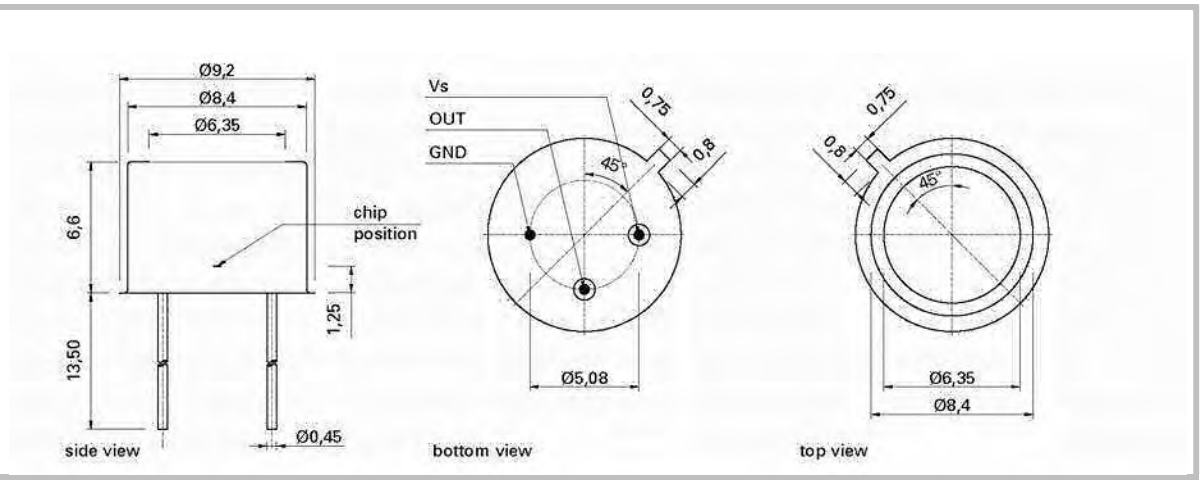
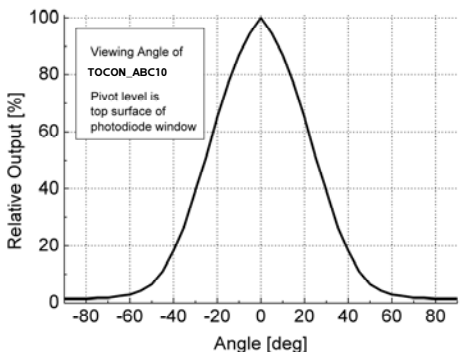


Field of View



TOCON Product Portfolio

Selection of TOCONs with UV broadband sensitivity:

Option	Approx. min irradiance	Approx. max irradiance (V_{supply} = 5 V)
TOCON_ABC1	1,8 pW/cm²	18 nW/cm²
TOCON_ABC2	18 pW/cm²	180 nW/cm²
TOCON_ABC3	180 pW/cm²	1,8 µW/cm²
TOCON_ABC4	1,8 nW/cm²	18 µW/cm²
TOCON_ABC5	18 nW/cm²	180 µW/cm²
TOCON_ABC6	180 nW/cm²	1,8 mW/cm²
TOCON_ABC7	1,8 µW/cm²	18 mW/cm²
TOCON_ABC8	18 µW/cm²	180 mW/cm²
TOCON_ABC9	180 µW/cm²	1,8 W/cm²
TOCON_ABC10	**1,8 mW/cm²**	**18 W/cm²** *this device*

TOCONS are also available with other spectral sensitivity (UVA, UVB, UV-Index, UVC).

TOCON_E2 (TOCON_ERYCA)
Pre-amplified SiC UV-Index Photodetector

General Features

Properties of the TOCON_E2

- Pre-amplified SiC UV detector for UV-Index measurements
- DIN5050/ CIE087 UVI measurement with very small error <± 3%
- 1 UVI result a voltage of approx. 170 mV
- RoHS compliant

The TOCON_ERYCA pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

Information about the UV-Index (UVI)

The UV index is an international standard measurement of how strong the ultraviolet (UV) radiation from the sun is at a particular place on a particular day. It is a scale primarily used in daily forecasts aimed at the general public. The UV-Index is calculated by integrating the sun's UV spectrum multiplied with the Erythema action curve (fig. 1, black curve and fig. 2, formula 1). That integral is divided by 25 mW/m^2 to generate a convenient index value, which becomes essentially a scale of 0 to 10. The Erythema action curve is a wavelength resolved measure of the sunburn danger. It is maximised at 297nm (UVB) and then strongly decreases towards UVA radiation. Literature: A. F. McKinlay and B. L. Diffey, "A reference action spectrum for ultraviolet induced erythema in human skin" CIE Journal, 6-1, 17-22 (1987)

About the sglux TOCON_ERYCA sensors

The ERYCA is designed for accurate measurement of the UV-Index. ERYCA's error is <3% only which is sufficiently small for scientific and high performance commercial applications.

How ERYCA's <3% error is calculated?

A good erythema sensor's response needs to follow the Erythema Action curve (fig 1) as close as possible. Additionally the visible blindness needs to be extremely high as the visible part of sun's radiation exceeds the erythema causing radiation by five orders of magnitude. ERYCA works with a 4H SiC detector chip providing a visible blindness of more than ten orders of magnitude. That means that absolutely no visible light interferes the sensors output value. Sensors with a visible blindness of less than six orders of magnitude are unsuited for UVI measurement even if they match with the CIE curve. ERYCA's curve (fig. 1, red curve) has a near perfect match from 295nm to 320nm. From 320nm a leakage of approx. 0,1% is seen. To find out how that leakage negatively influences the UVI measurement a closer look at different sun spectra (varying tilt angle and ozone layer thickness) is needed. Fig. 4 shows different sun UV spectra issued by the Swiss governmental institute of meteorology. In total nine different sun spectra calculating an UVI from 1,12 to 10,92 were used. For error calculation the different sun spectra were integrated with the Erythema action curve and subsequently the integral of the same spectra with ERYCA's response curve (fig. 2, formula 1 and 2) were calculated. Finally the error was calculated by using formula 3 (fig. 2). As shown by the blue curve (fig. 3) the error of all UVI is less than 3%.

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

Fig. 1 Spectral Response

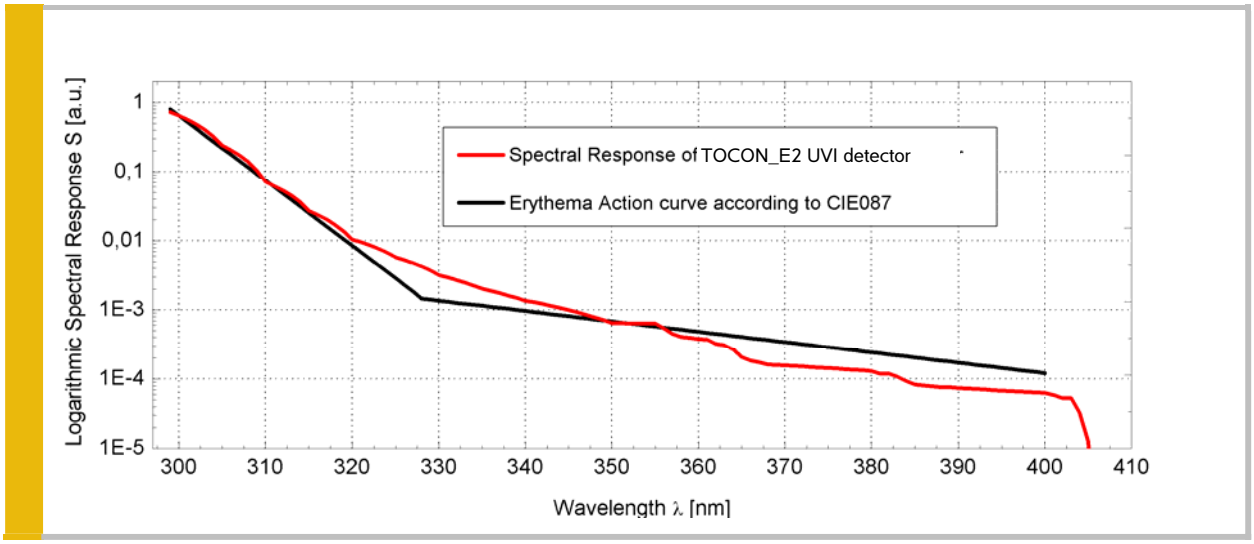


Fig. 2 Calculation Formulae

$$UVI_{ideal} = \int_{\lambda=297\,nm}^{\lambda=400\,nm} \frac{S(\lambda)\cdot CIE(\lambda)}{25mW/m^2} d\lambda \quad (1)$$

$$UVI_{real} = \int_{\lambda=297\,nm}^{\lambda=400\,nm} \frac{S(\lambda)\cdot ERYCA(\lambda)}{25mW/m^2} d\lambda \quad (2)$$

$$E = \frac{(UVI_{ideal} - UVI_{real})\cdot 100}{UVI_{ideal}} \quad (3)$$

Legend

S(λ)=	sun UV spectrum
CIE(λ)=	CIE087 standard curve
ERYCA(λ)=	ERYCA response curve
E=	error in %

Fig. 3 Error Graph

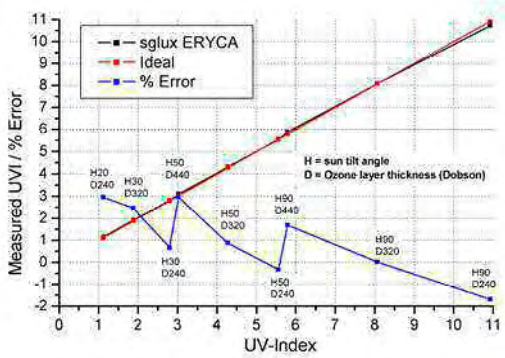
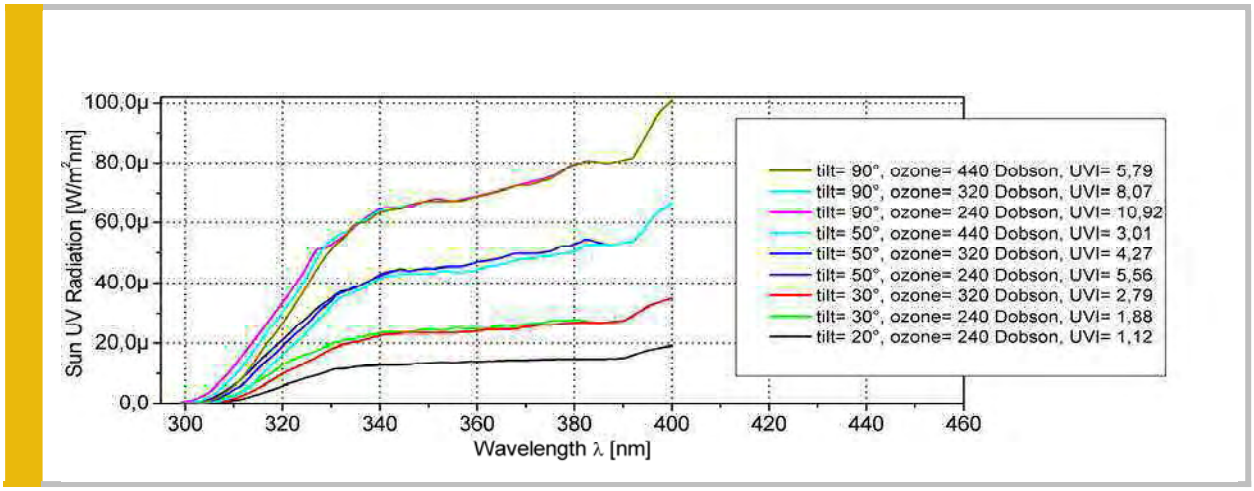


Fig. 4 Sun Spectra Issued by the Swiss Meteo Institute



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(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

Fig. 5 Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*–25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*–40 … +100*	*°C*
Soldering Temperature (3s)	T_{sold}	*300*	*°C*
General Characteristics (*T*=25°C)			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*0,05*	*mV*
Temperature coefficient	*Tc*	*<+0,3*	*%/K*
Current	*I*	*0,8*	*mA*
Bandwidth (-3 dB)	*Θ*	*15*	*Hz*
Risetime (63%) *(other risetimes on demand)*	t_{rise}	*10*	*ms*
Spectral Characteristics (*T*=25°C)			
Approx. sensitivity *(unit is not calibrated)*	S_{max}	*170*	*mV/UVI*
Visible blindness (S_{max} / $S_{>405nm}$)	*VB*	$>10^{10}$	–

Fig. 6 Drawing

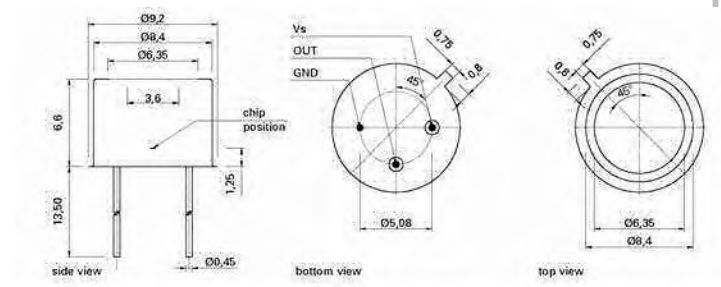


Fig. 7 Field of View

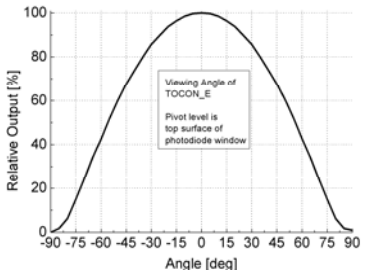


Fig. 8 TOCON Product Portfolio

Selection of TOCONs with UV Index sensitivity:

Option	Approx. max irradiance (V_{out} = 5 V)
TOCON_E1	3 UVI needs sunlight attenuator
TOCON_E2	**30 UVI** *this device*
TOCON_E3	0,75 mW/cm^2

TOCONS are also available with other spectral sensitivity (UVA, UVB, UVC, UV broadband).

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

TOCON_C6
UVC pre-amplified SiC UV Photodetector

General Features

Properties of the TOCON_C6

- Pre-amplified SiC UVC detector in TO5 housing with diffuser
- 700 µW/cm^2 radiation at 254nm results a voltage of approx. 2 V
- RoHS compliant
- Applications: purification lamp control

The TOCON pre-amplified UV photodetectors

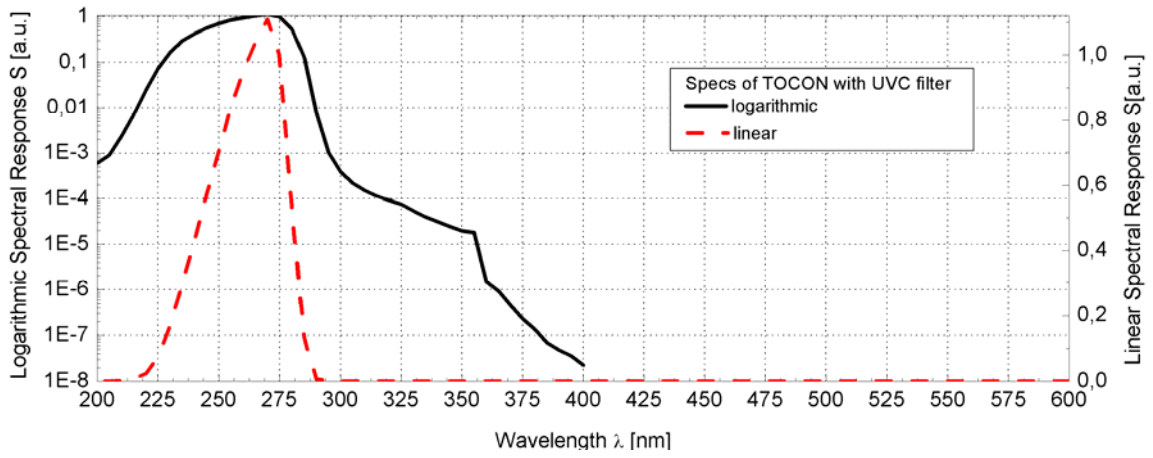
The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*–25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*–40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics *(T=25°C, V_{supply}=+5 V)*			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	*V_{supply}*	*V*
Dark offset voltage	V_{offset}	*0,05*	*mV*
Temperature coefficient	*Tc*	*<+0,3*	*%/K*
Current consumption	*I*	*0,8*	*mA*
Bandwidth (-3 dB)	*Θ*	*15*	*Hz*
Risetime (63%) *(other risetimes on demand)*	t_{rise}	*10*	*ms*
Spectral Characteristics *(T=25°C, V_{supply}=+5 V)*			
Sensitivity at 254nm	S_{max}	*2,8*	*mV/µW/cm^2*
Wavelength of max. spectral sens.	λ_{max}	*270*	*nm*
Sensitivity range (S=0,1*S_{max})	–	*230 … 285*	*nm*
Visible blindness (S_{max} / $S_{>405nm}$)	*VB*	*>10^{10}*	–

TOCON_C6
UVC pre-amplified SiC UV Photodetector

Spectral Response



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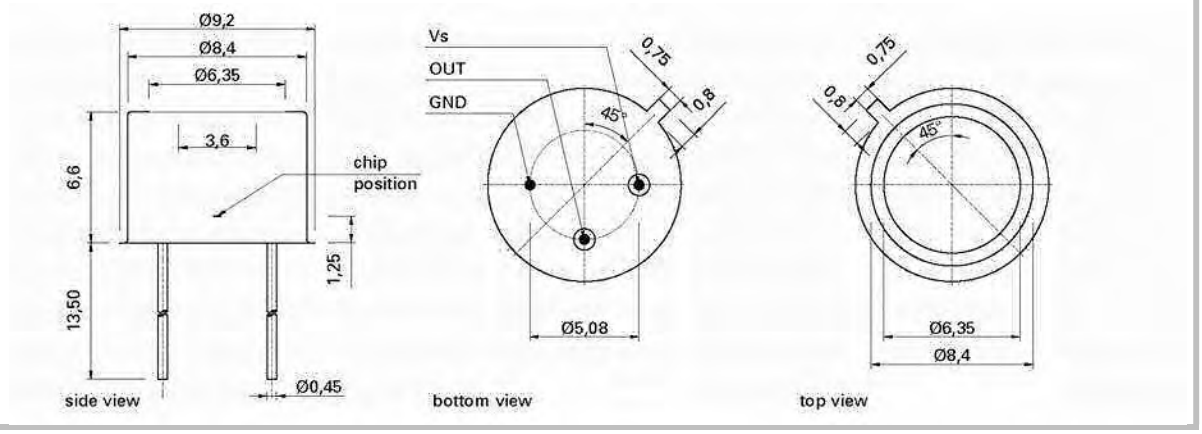
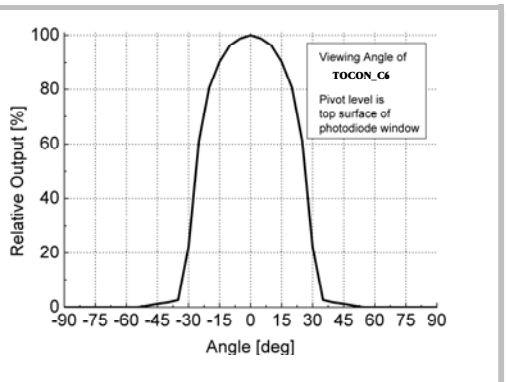


Field of View



TOCON Product Portfolio

Selection of TOCONs with UVC sensitivity:

Option	Approx. min irradiance	Approx. max irradiance (V_{supply} = 5 V)
TOCON_C2	18 pW/cm²	180 nW/cm²
TOCON_C3	180 pW/cm²	1,8 µW/cm²
TOCON_C4	1,8 nW/cm²	18 µW/cm²
TOCON_C5	18 nW/cm²	180 µW/cm²
TOCON_C6	**180 nW/cm²**	**1,8 mW/cm²** *this device*
TOCON_C7	1,8 µW/cm²	18 mW/cm²
TOCON_C8	18 µW/cm²	180 mW/cm²
TOCON_C9	180 µW/cm²	1,8 W/cm²

TOCONS are also available with other spectral sensitivity (UVA, UVB, UV-Index, UV broadband).

TOCON_blue2
pre-amplified GaP blue light detector

General Features

Properties of the TOCON_blue2

- GaP detector for blue light radiation
- detection of incoherent blue light acc. to guideline 2006/25/EG
- 170 µW/cm^2 peak radiation results a voltage of approx. 2 V
- RoHS compliant
- Applications: measurement of low blue light irradiation, occupational safety

The TOCON pre-amplified photodetectors

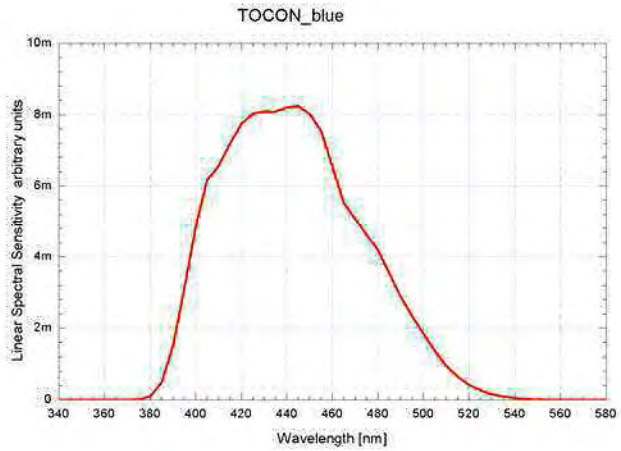
The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

Specifications

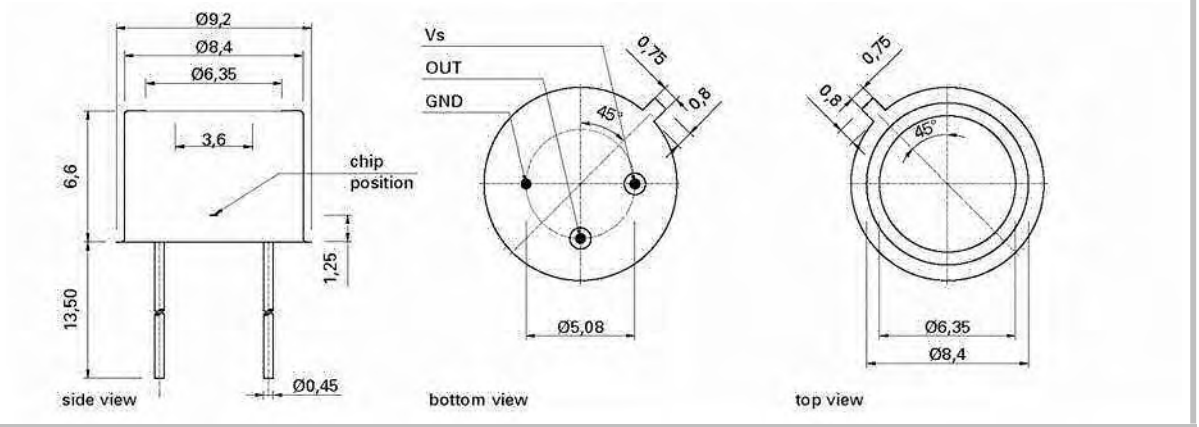
Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*-25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*-40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics (*T*=25°C, V_{supply}=+5 *V*)			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*0,05*	*mV*
Temperature coefficient	*Tc*	*<7*	*%/K*
Current	*I*	*0,8*	*mA*
Spectral Characteristics (*T*=25°C, V_{supply}=+5 *V*)			
Sensitivity at peak	S_{max}	*12*	*mV/µW/cm^2*
Wavelength of max. spectral sens.	λ_{max}	*445*	*nm*
Sensitivity range (S=0,1*S_{max})	–	*390 … 515*	*nm*

Spectral Response

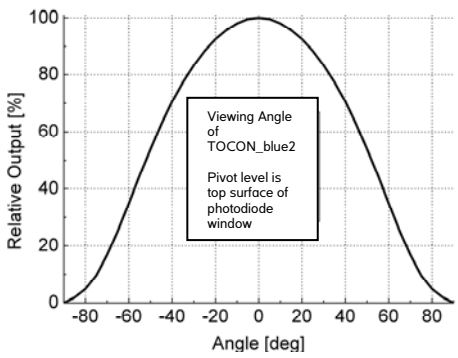
TOCON_blue2
pre-amplified GaP blue light detector



Drawing



Field of View



TOCON Product Portfolio

Selection of TOCONs for blue light radiation:

Option	Approx. min irradiance	Approx. max irradiance (V_{supply} = 5 V)
TOCON_blue1	4,2 nW/cm²	43 µW/cm²
TOCON_blue2	**42 nW/cm²**	**430 µW/cm²** *this device*
TOCON_blue3	420 nW/cm²	4,3 mW/cm²
TOCON_blue4	4,2 µW/cm²	43 mW/cm²
TOCON_blue5	42 µW/cm²	430 mW/cm²
TOCON_blue6	420 µW/cm²	4,3 W/cm²

TOCONS are also available with other spectral sensitivity (UV broadband, UVA, UVB, UV-Index, UVC).

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

TOCON_GaP2
pre-amplified GaP detector

General Features

Properties of the TOCON_GaP2

- GaP detector for irradiation measurements
- 170 µW/cm^2 peak radiation results a voltage of approx. 2 V
- RoHS compliant
- Applications: measurement of low UV...VIS (570nm) irradiation, occupational safety

The TOCON pre-amplified photodetectors

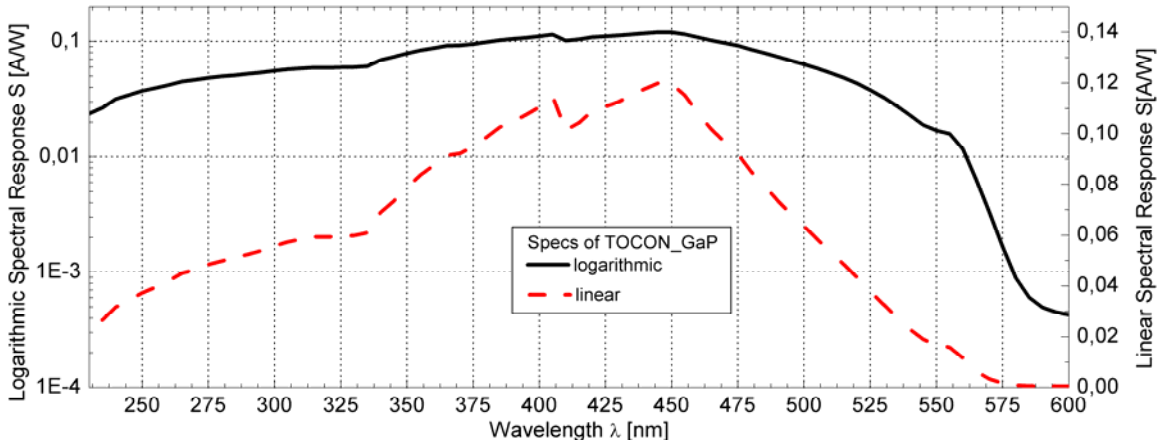
The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No external amplifier is needed.

Specifications

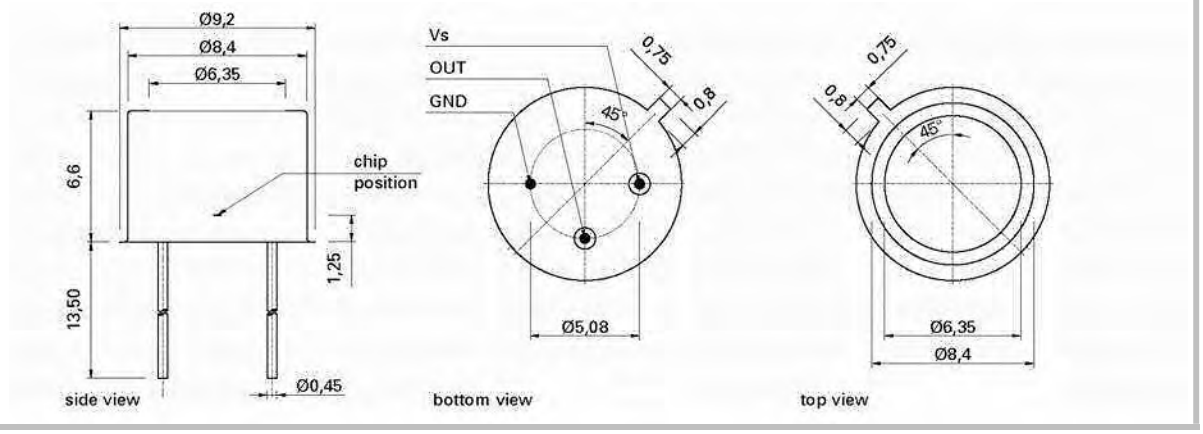
Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	*–25 … +85*	*°C*
Storage Temperature Range	T_{stor}	*–40 … +100*	*°C*
Soldering Temperature (5s)	T_{sold}	*300*	*°C*
General Characteristics (*T*=25°C, V_{supply}=+5 *V*)			
Supply voltage	V_{supply}	*2,5 … 5,0*	*V*
Saturation voltage	V_{sat}	V_{supply}	*V*
Dark offset voltage	V_{offset}	*0,05*	*mV*
Temperature coefficient	*Tc*	*<7*	*%/K*
Current	*I*	*0,8*	*mA*
Spectral Characteristics (*T*=25°C, V_{supply}=+5 *V*)			
Sensitivity at peak	S_{max}	*12*	*mV/µW/cm^2*
Wavelength of max. spectral sens.	λ_{max}	*445*	*nm*
Sensitivity range (S=0,1*S_{max})	–	*190 … 570*	*nm*

TOCON_GaP2
pre-amplified GaP detector

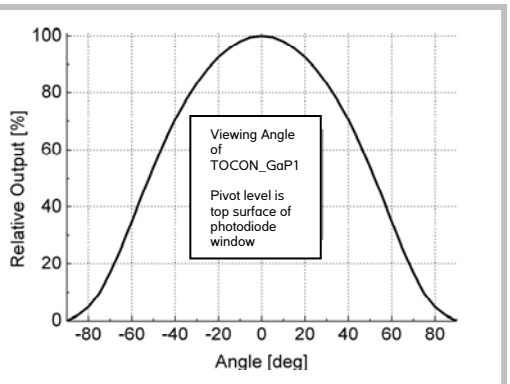
Spectral Response



Drawing



Field of View



TOCON Product Portfolio

Selection of TOCONs for UV-VIS radiation:

Option	Approx. min irradiance	Approx. max irradiance ($V_{supply0}$ = 5 V)
TOCON_GaP1	4,2 nW/cm²	43 µW/cm²
TOCON_GaP2	42 nW/cm²	430 µW/cm² *this device*
TOCON_GaP3	420 nW/cm²	4,3 mW/cm²
TOCON_GaP4	4,2 µW/cm²	43 mW/cm²
TOCON_GaP5	42 µW/cm²	430 W/cm²
TOCON_GaP6	420 µW/cm²	4,3 W/cm²

TOCONS are also available with other spectral sensitivity (UV broadband, UVA, UVB, UV-Index, UVC, blue light, VIS).

TOCON_housing *optional TOCON feature*

Miniature Housing with M12x1 Thread and Plug Connector

General Features

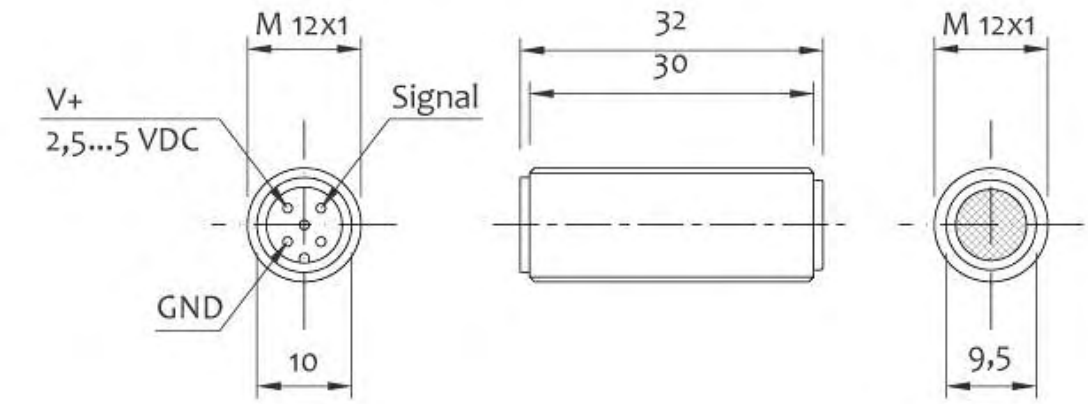
Properties of the TOCON_housing

- Optional feature for all TOCON detectors
- Robust stainless steel M12x1 thread body
- Integrated sensor connector (Binder 5-Pin plug)
- Comes with 2 m connector cable
- Easy to mount and connect

Features of the integrated TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No amplifier is needed.

Drawing and Connection



cable configuration :
black : +V
brown : ground
blue : signal

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

TOCON_PTFE_housing *optional TOCON feature*

Miniature Housing with M12x1 Thread and Plug Connector

General Features

Properties of the TOCON_housing

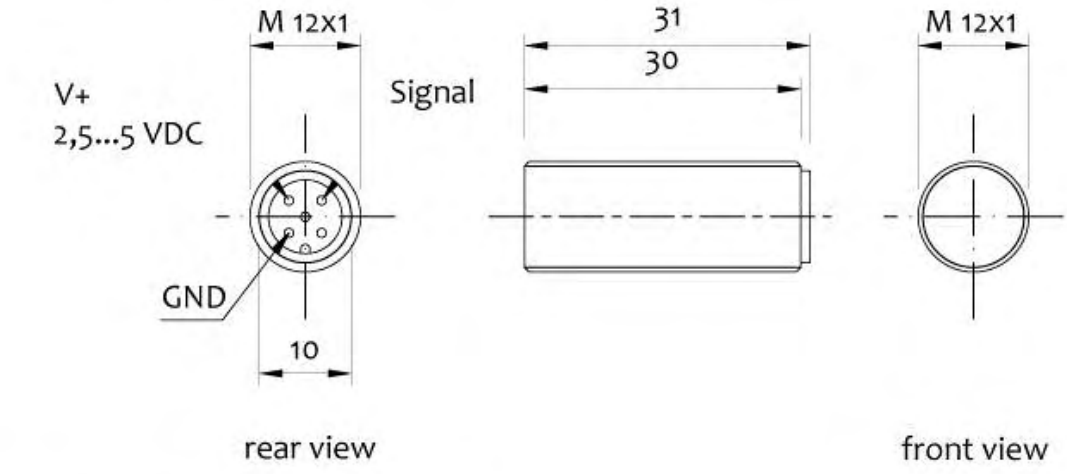
- Optional feature for all TOCON detectors
- Easy to mount and connect, cleanable
- Dirt-repellent, water-proof at wetside (IP68)
- Teflon (PTFE) M12x1 thread body
- Wide field of view
- Integrated sensor connector (Binder 5-Pin plug)
- Comes with 2 m connector cable

The PTFE housing reduces the signal output by 95 %.

Features of the integrated TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter. No amplifier is needed.

Drawing and Connection



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Introduction

The applications of UV sensors are quite varied and therefore the required sensitivity, environmental endurance, spectral response, field of view and electronic output interface must be tailored for individual conditions of use.

This publication presents a variety of different standard UV sensors considering these varying requirements and covering a broad range of industrial UV sensor applications.

All of the probes are amplified and shielded against electromagnetic interference. The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and $>10^{10}$ visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode.

Please find an individual four step configuration procedure at page 5 which allows the prospective user to select among different probe mechanical designs (STEP1), to select the correct spectral response (STEP 2), to select the different output types (STEP 3) and to select a sensitivity range (STEP 4).

Usually the sensors are directly connected to the customer's data bus (via voltage, current, CAN or USB output). Alternatively, developers and scientists use the sglux controllers and display modules.

The sglux calibration laboratory offers NIST and PTB traceable calibration services.

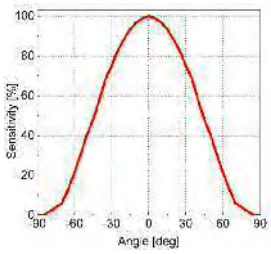
UV Sensor "UV-Surface"

Standard surface-mount 180° FOV UV Sensor

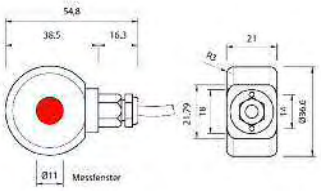
The sensor **UV-Surface** is a cosine corrected sensor to be used for industrial or scientific UV radiation measurements of radiation arriving at a surface, horizontal or vertical or any orientation. On request it is also available in a submersible version. Available calibrated (NIST or PTB traceable) on request.

Picture

Field of View



Drawing



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(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

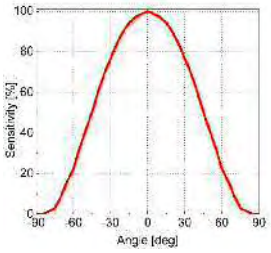
UV Sensor "UV-Air"

Axis oriented in-chamber UV Sensor

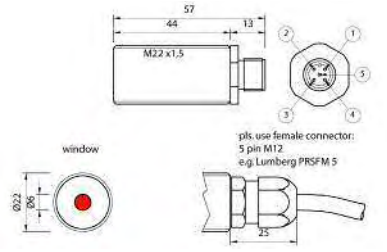
The sensor **UV-Air** is a cosine corrected axial looking UV sensor with a male thread (M22x1,5) with many mounting possibilities inside UV radiation chambers. Available calibrated (NIST or PTB traceable) on request.

Picture

Field of View



Drawing



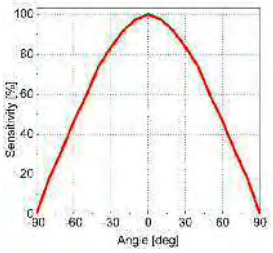
UV Sensor "UV-Cosine"

Waterproof UV Sensor for outdoor use

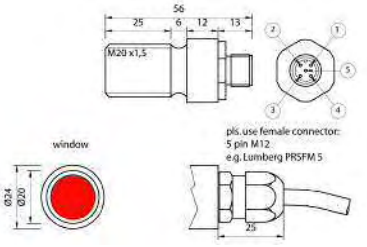
The sensor **UV-Cosine** is an outdoor cosine corrected waterproof sensor (IP68 at window side, IP65 at plug side, or, on request IP68 for submerge applications). The PTFE housing is stain repellent. Available calibrated (NIST or PTB traceable) on request.

Picture

Field of View



Drawing



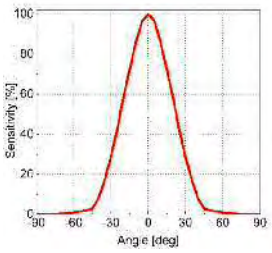
UV Sensor "UV-Water-G3/4"

10 bar water pressure proof UV Sensor

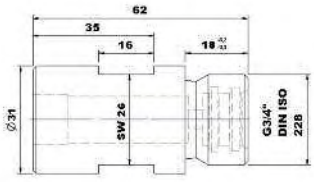
The sensor **UV-Water-G3/4** is a waterproof (10 bar or 150 psi) UV sensor to be included into pressurized water systems (G3/4" thread). This UV sensor is suited for use in food and beverages machinery. Available calibrated (NIST or PTB traceable) on request. Only available with plug connection.

Picture

Field of View



Drawing



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(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

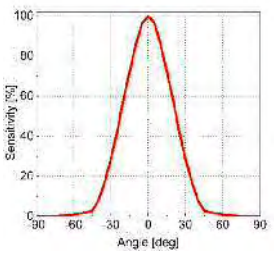
UV Sensor "UV-Water"

10 bar waterprooof UV Sensor

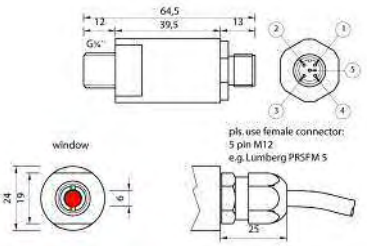
The sensor **UV-Water** is a waterproof (10 bar or 150ps) UV sensor to be included into pressurized water systems (G1/4" thread). It can only be used with low-pressure lamps up to 40W. This UV sensor is suited for use in food and beverages machinery. On request it is also available in a submersible version. Available calibrated (NIST or PTB tracelable) on request.

Picture

Field of View



Drawing



UV Sensors "UV-DVGW" and "UV-DVGW-160"

UV Sensors for DVGW and OENORM certified water purifiers

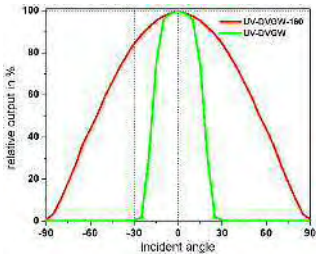
The sensors **UV-DVGW** and **UV-DVGW-160** are special types suitable for use with DVGW and OENORM certified water purifiers. They comply with the standards DVGW W294-3(2006) and OENORM 5873-2. Always delivered calibrated according to DVGW or OENORM requirements.

Pictures

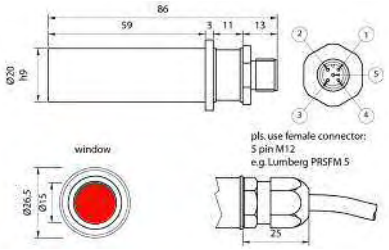
UV-DVGW
40° sensor according to DVGW W294-3

UV-DVGW-160
160° sensor according to DVGW W294-3 and ÖNORM 5873-2

Field of View



Drawing



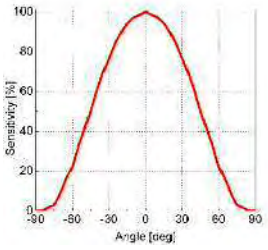
UV Sensor "UV-Cure"

Sensor for high UV-Irradiation with integrated temperature sensor

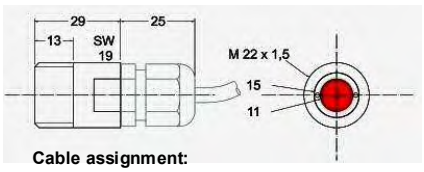
The sensor **UV-Cure** is an axial looking UV sensor for measurement of high UV radiation at high temperatures (up to 170°C/338°F) in curing and drying processes. It has an integrated temperature sensor and a diffuser of radiation hard and temperature resistant microporous silica glass. A male thread (M22x1,5) allows many mounting possibilities inside UV radiation chambers. Available calibrated (NIST or PTB traceable) on request. Only available with photocurrent output.

Picture

Field of View



Drawing



Cable assignment:
***UV sensor*: white anode, brown cathode**
***temperature sensor*: black, blue**

Manufacturer: sglux GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

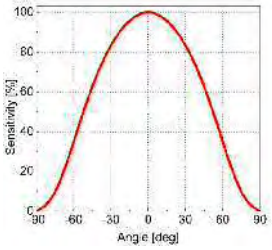
UV Sensor "TOCON-probe"

Pre-amplified UV Photodetector with housing

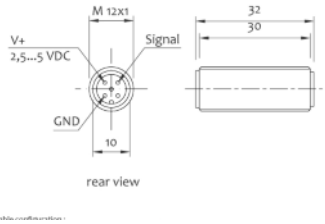
The sensor **TOCON-probe** is a pre-amplified UV Photodiode inside a robust stainless steel M12x1 thread body. It is configured with an integrated sensor connector (Binder 5-Pin plug) and comes with 2m connector cable. The sensor is easy to mount and connect (only with voltage output available, V_{in} max. = 5V).

Picture

Field of View



Drawing



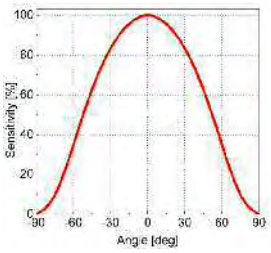
UV Sensor "UV-Minilog"

UV Datalogger with PC Software

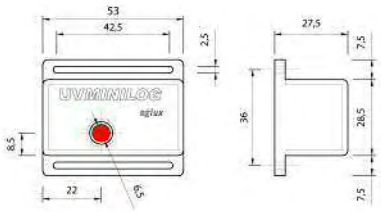
The sensor **UV-Minilog** is a battery powered UV datalogger with a large internal data storage (2 million readings). It can log data for up to 18 months without recharging. It is IP67 waterproof and comes with free PC software. The UV-Minilog can be equipped with all UV sensors to be selected at STEP 2 and STEP 4 of page 6 configuration guide. Available calibrated (NIST or PTB traceable) on request.

Picture

Field of View



Drawing



Specifications, valid for all UV Sensors

Fixed Specifications

Parameter	Value
Dimensions	Pls. refer to the drawing above.
Temp. Coefficient	0.035%/K analogue sensors <0.1%/K digital sensors
Operating Temp.	-20…+80°C (170°C)
Storage Temp.	-40…+80°C
Humidity	<80%, non-condensing for Air versions; 100% immersed for submersible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-broadband, UVA, UVB, UVC, UV-Index, blue light, GaP (blue+visible)
Signal Output	0…5V, 4…20mA, USB, 125kbits CAN bus
Connections	2m cable or 5pin male plug; 8Pin plug with 2m cable (digital sensors)

Please find the configuration guide at page 5 of this catalogue.

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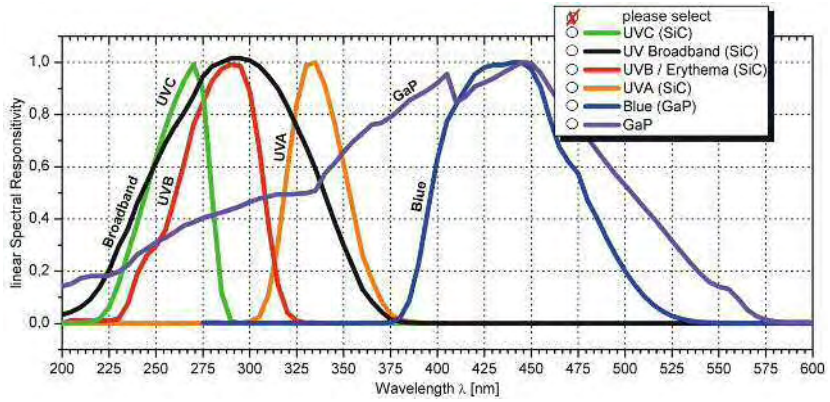
STEP 1 → Selection of probe mechanical design

Please tick your selection. Please find detailed description of the mechanical design above.

	Type	Description
○	UV-Surface	Standard surface-mount 180° FOV UV Sensor
○	UV-Air	Standard axias oriented in-chamber UV Sensor
○	UV-Cosine	Waterproof UV Sensor for outdoor use
○	UV-Water-G3/4	10 bar water pressure proof UV Sensor with G3/4" thread
○	UV-Water	10 bar water pressure proof UV Sensor with G1/4" thread for low-pressure lamps up to 40W
○	UV-DVGW/-160	UV Sensor for DVGW and OENORM certified water purifiers
○	UV-MINILOG	UV Datalogger with PC software
○	TOCON-probe	Pre-amplified UV photodetector in a M12x1 housing (*only with voltage output available*)
○	UV-Cure	Sensor for high UV-Irradiation with integrated temperature sensor (*only with photocurrent output*)

STEP 2 → Configuration of the Spectral Sensitivity



Please select one spectral sensitivity curve.

STEP 3 → Signal Output

Please tick your selection. The pin configuration for analog sensors is shown in the drawings on previous pages.

	Type	Description		Connection = "cable"		Connection = "male plug"
○	0…5V	0…5V V_{out} proportional to radiation input; V_{in} = 7…24VDC (TOCON_probe V_{in} max. = 5V), current consumption is <30mA	○	V_0=brown, V_+=white, Out=green, Shield=black	○	V_0=Pin1=brown V_+=Pin2=black Out=Pin3=blue
○	4…20mA	4…20mA current loop for PLC controllers; the current is proportional to the radiation, supply voltage is 24VDC	○	V_0=brown, V_+= white	○	V_0=Pin1=brown V_+=Pin2=black
○	USB	The signal is transmitted via USB to a computer. Software is included.	----------→		○	Standard USB-A plug, 1,5m cable
○	CAN bus	The signal is transmitted via CAN bus (VSCP protolcol), additional USB converter for computer use incl. software available (DIGIBOX)	----------→		○	Pin a=CAN low Pin b=CAN high Pin c=GND Pin d=Vsupply

STEP 4 → Sensitivity

We configure your UV sensor for intensities across 10 orders of magnitude from 1nW/cm² to 10W/cm². For good dynamic behaviour the min and max. intensity at the probe position needs to be known as precisely as possible. Please fill that value, if known, into the box below. If only a rough estimate is possible, please estimate it in the range selection fields. We will contact you for further refinement of the range.

max. radiation in mW/cm² or, if not precisely known, range estimation

○ ☐ ○ max. up to 10µW/cm² ○ max. up to 100mW/cm² ○ max. up to 10W/cm²

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UV SENSOR "UV-Air"

Standard axis oriented in-chamber UV Sensor

UV Sensor "UV-Air"

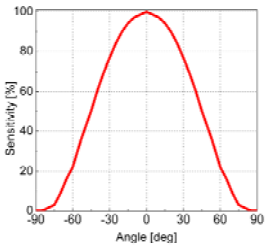
Standard axis oriented in-chamber UV Sensor

The sensor **UV-Air** is a cosine corrected axial looking UV sensor with a male thread (M22x1,5) with many mounting possibilities inside UV radiation chambers. Available calibrated (NIST or PTB traceable) on request.

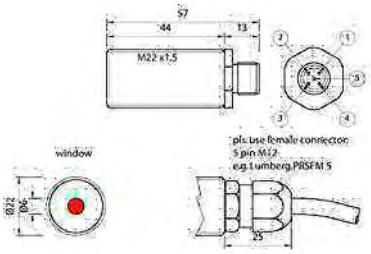
The probe is amplified and shielded against electromagnetic interference. The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and >10^{10} visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode. Please find at page 2 an individual configuration procedure which allows the prospective user to select the correct spectral response (STEP 1), different output types (STEP 2) and to select a sensitivity range (STEP 3).

Picture

Field of View



Drawing



Specifications

Fixed Specifications

Parameter	Value
Dimensions	pls. refer to the drawing
Weight	80 g
Temp. Coefficient	0,035%/K
Operating Temp.	-20…+80°C
Storage Temp.	-40…+80°C
Humidity	<80%, non condensing, on request: 100% submersible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-Broadband, UVA, UVB, UVC, UV-Index
Signal Output	0…5V, 4…20mA, USB, impulse count
Connections	2m cable or 2m cable with 5 pin male connector type Lumberg PRSFM5

Please find the configuration guide at page 2 of this datasheet

Monitor Accessories

Please consider our UV monitor and UV controller offer.

Calibration

We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

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UV Sensor "UV-Cosine"

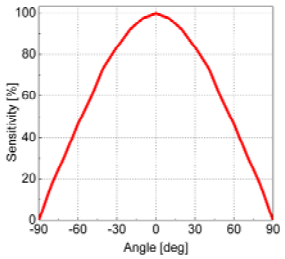
Waterproof UV Sensor for outdoor use

The sensor UV-Cosine is an outdoor cosine corrected waterproof sensor (IP68 at window side, IP65 at plug side, or, on request IP68 for submerge applications). The PTFE housing is stain repellent. Available calibrated (NIST or PTB traceable) on request.

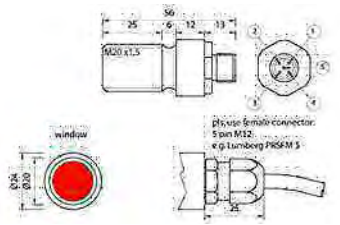
The probe is amplified and shielded against electromagnetic interference. The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and >10^{10} visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode. Please find at page 2 an individual configuration procedure which allows the prospective user to select the correct spectral response (STEP 1), different output types (STEP 2) and to select a sensitivity range (STEP 3).

Picture

Field of View



Drawing



Specifications

Fixed Specifications

Parameter	Value
Dimensions	pls. refer to the drawing
Weight	27 g
Temp. Coefficient	0,035%/K
Operating Temp.	-20…+80°C
Humidity	<80%, non condensing, on request: 100% submersible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-Broadband, UVA, UVB, UVC, UV-Index
Signal Output	0…5V, 4…20mA, USB, impulse count
Connections	2m cable or 2m cable with 5 pin male connector type Lumberg PRSFM5

Please find the configuration guide at page 2 of this datasheet

Monitor Accessories

Please consider our UV monitor and UV controller offer.

Calibration

We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

UV SENSOR "UV-Water"

10 bar water pressure proof

UV Sensor "UV-Water"

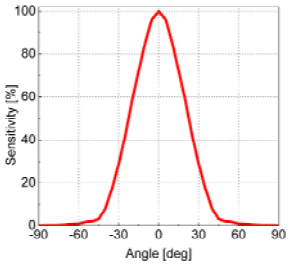
10 bar water pressure proof

The sensor **UV-Water** is a water proof (10 bar or 150 psi) UV sensor to be included into pressurized water systems (G1/4" thread). This UV sensor is suited for use in food and beverages machinery. On request it is available in a submersible version. Available calibrated (NIST or PTB traceable) on request.

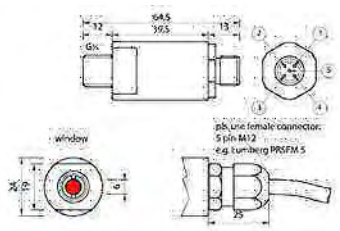
The probe is amplified and shielded against electromagnetic interference. The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and $>10^{10}$ visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode. Please find at page 2 an individual configuration procedure which allows the prospective user to select the correct spectral response (STEP 1), different output types (STEP 2) and to select a sensitivity range (STEP 3).

Picture

Field of View



Drawing



Thread contact material PTFE and stainless steel 14305 only. Do not use with medium pressure lamps.

Specifications

Fixed Specifications

Parameter	Value
Dimensions	pls. refer to the drawing
Weight	108 g
Temp. Coefficient	0,035%/K
Operating Temp.	-20…+80°C
Humidity	<80%, non condensing, on request: 100% submersible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-Broadband, UVA, UVB, UVC, UV-Index
Signal Output	0…5V, 4…20mA, USB, impulse count
Connections	2m cable or 2m cable with 5 pin male connector type Lumberg PRSFM5

Please find the configuration guide at page 2 of this datasheet.

Monitor Accessories

Please consider our UV monitor and UV controller offer.

Calibration

We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

UV Sensor "UV-DVGW"

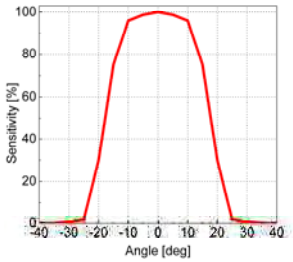
UV Sensor for DVGW certified water purifiers

The sensor UV-DVGW is a special type suitable for use with DVGW certified water purifiers. It complies with the standard DVGW W294-3(2006). Always delivered calibrated according to DVGW requirements.

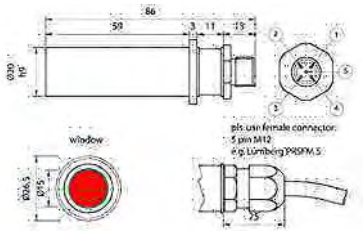
The probe is amplified and shielded against electromagnetic interference. The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and >10^{10} visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode. Please find at page 2 an individual configuration procedure which allows the prospective user to select the correct spectral response (STEP 1), different output types (STEP 2) and to select a sensitivity range (STEP 3).

Picture

Field of View



Drawing



Specifications

Fixed Specifications

Parameter	Value
Dimensions	pls. refer to the drawing
Weight	120 g
Temp. Coefficient	0,035%/K
Operating Temp.	-20…+80°C
Humidity	<80%, non condensing, on request: 100% submersible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm^2 … 10W/cm^2
Spectral Sensitivity	UVC
Signal Output	0…5V, 4…20mA, USB
Connections	2m cable or 2m cable with 5 pin male connector type Lumberg PRSFM5

Please find the configuration guide at page 2 of this datasheet.

Monitor Accessories

Please consider our UV monitor and UV controller offer.

Calibration

We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

STEP 1 → Configuration of the Spectral Sensitivity

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UV SENSOR "UV-Surface"

Standard surface-mount 180° FOV UV Sensor

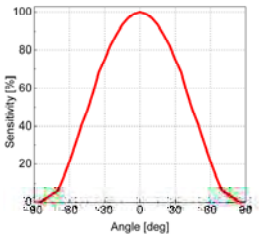
UV Sensor "UV-Surface" — Standard surface-mount 180° FOV UV Sensor

The sensor UV-Surface is a cosine corrected sensor to be used for industrial or scientific UV radiation measurements of radiation arriving at a surface, horizontal or vertical or any other orientation. On request it is also available in a submersible version. Available calibrated (NIST or PTB traceable) on request.

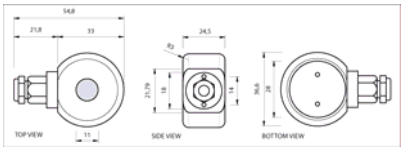
The probe is amplified and shielded against electromagnetic interference. The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and >10^{10} visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode. Please find at page 2 an individual configuration procedure which allows the prospective user to select the correct spectral response (STEP 1), different output types (STEP 2) and to select a sensitivity range (STEP 3).

Picture

Field of View



Drawing



Specifications

Fixed Specifications

Parameter	Value
Dimensions	pls. refer to the drawing
Weight	56 g
Temp. Coefficient	0,035%/K
Operating Temp.	-20…+80°C
Humidity	<80%, non condensing, on request: 100% submersible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-Broadband, UVA, UVB, UVC, UV-Index
Signal Output	0…5V, 4…20mA, USB, impulse count
Connections	2m cable or 2m cable with 5 pin male connector type Lumberg PRSFM5

Please find the configuration guide at page 2 of this datasheet.

Monitor Accessories

Please consider our UV monitor and UV controller offer.

Calibration

We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

UV SENSOR "UV-Cure"

For monitoring of high UV radiation in curing and drying processes, 170°C permanent operating temperature

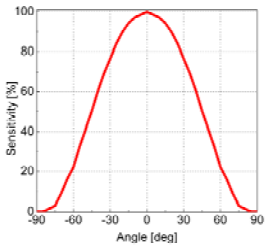
"UV-Cure" – Sensor for high UV-Irradiation with integrated temperature sensor

The sensor **UV-Cure** is an axial looking UV sensor for measurement of high UV radiation at high temperatures (up to 170°C) in curing and drying processes. It has an integrated temperature sensor and a diffuser made of radiation hard and temperature resistant microporous fused silica glass. A male thread (M22x1,5) allows many mounting possibilities inside UV radiation chambers. Available calibrated (NIST or PTB traceable) on request.

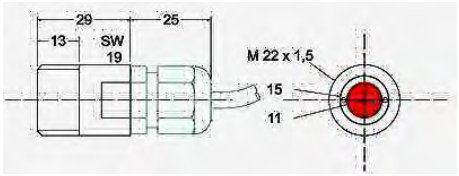
The visible blind sensors are based on a Silicon Carbide (SiC) UV photodiode, which guarantees highest radiation hardness, long term stability and $>10^{10}$ visible blindness (ratio of UV to VIS-IR sensitivity). Blue and GaP type sensors are based on a Galliumphosphide (GaP) UV photodiode.

Picture

Field of View



Drawing



Cable assignment:
***UV sensor*: white anode, brown cathode**
***temperature sensor*: black, blue**

Specifications

Fixed specifications

Parameter	Value
Dimensions	Pls. refer to the drawing
Weight	140 g
Temp. Coefficient	<0,1%/K
Operating Temp.	-55…+170°C
Storage Temp.	-55…+170°C
Signal output	Photocurrent
Signal temp. sensor	Electrical resistance PT100 Type K, class B
Connection	2m cable

Configurable Specifications

Parameter	Value
Absolute Sensitivity	10mW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-Broadband, UVA, UVB, UVC, blue, VIS

Please find the configuration guide at page 2 of this datasheet.

Signal output

The UV-Cure's signal output is photodiode current (some nA).

Due to high temperatures in drying and curing processes, the signal amplification needs to be performed with an external amplifier. For this purpose our RADIKON with 0...10V output voltage and switching relays is well suited.

Our Sensor Monitor series can be used as displaying unit with integrated amplifier.

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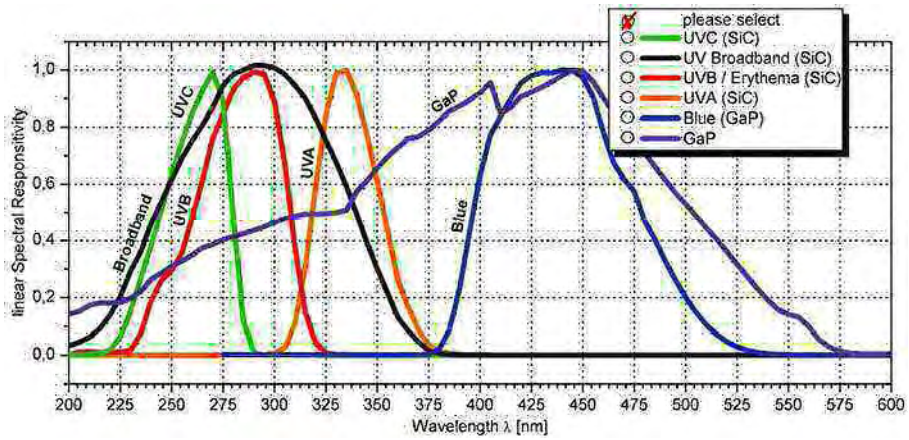
UV SENSOR "UV-Cure"

For monitoring of high UV radiation in curing and drying processes,
170°C permanent operating temperature

STEP 1 → Configuration of the Spectral Sensitivity



Please select one spectral curve.

STEP 2 → Sensitivity

We configure your UV sensor to the irradiance you need to measure. For good dynamic behaviour the min. and max. intensity at the probe position needs to be known as precisely as possible. Please fill that value, if known, into the box below. If only a rough estimate is possible, please estimate it in the range selection fields. We will contact you for further refinement of the range.

☒ max. radiation in mW/cm^2 or, if not precisely known, range estimation

○ ☐ ○ $10mW/cm^2$…$100mW/cm^2$ ○ $100mW/cm^2$…$1W/cm^2$ ○ $1W/cm^2$ … $10W/cm^2$

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sglux Photodiode Amplifiers

selection guide

Function of the amplifiers

The photodiode amplifiers convert small currents, e.g. generated by a photodiode into different output signals such as voltage (0…5V), current (4…20mA), frequency (kHz range) or on/off signal (0 and 5V). Thus, these amplifiers link the small current generated by a photovoltaic element (photodiode) to usual signal conversion electronics like a voltmeter or a controller.

All amplifiers are based on transimpedance amplifier chips (TIA) that short-circuit the source (photodiode) and convert the short circuit current into the desired signal output information.

Amplifier overview

Response time of all amplifiers is 0.1s approx. Please contact us for faster amplifiers.

Type	Signal out	Range(s)	Setting facilities	U_{supply}	special features
Multiboard	0 – 4V	0 –400pA 0 – 400nA 0 – 4nA 0 – 40µA 0 – 400µA 0 – 4mV	• 5 ranges configurable with jumpers • continuously adjustable amplification 4µA – 400µA • offset control	24V	versatile, multi–configurable amplification of currents from pA range up to µA range. Well suited for experimental setup and small series.
Digiboard	0 – 2.9V	0 – 40 µA	• continuously adjustable amplification 400nA – 40µA	5 – 18V	adjustable Schmitt–Trigger with LED, frequency output (alternatively to voltage out)
Ampcon hi	4–20mA	0 – 18nA	• offset control • amplification ±35%	24V	other ranges can be realized by changing two components (solder iron needed). Please refer to the datasheet for instructions.
Ampcon med		0 – 2.5µA			
Ampcon lo		0 – 250µA			
Voltcon hi	0 – 5V	0 – 40nA	• amplification ±5%	5–24V	
Voltcon med		0 – 5µA			
Volcon lo		0 – 500µA			

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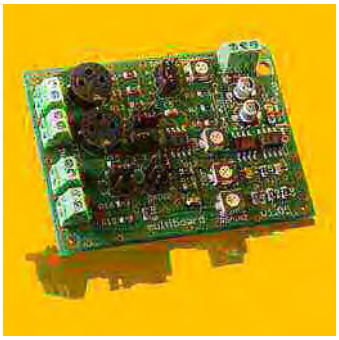
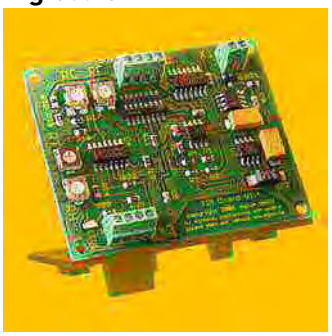
Pictures and dimensions

Multiboard



W = 60mm, D = 45mm
H = 12mm

Digiboard



W = 60mm, D = 50mm
H = 12mm

Ampcon

W = 26mm, D = 13mm
H = 8mm

Voltcon

W = 26mm, D = 13mm
H = 8mm

Laboratory modules with traceable calibration

All of the photodiode amplifier modules are also available as boxed and shielded laboratory modules with traceable calibration. The calibration is performed with equipment directly or indirectly traceable to calibration laboratory reference standards. The reference standards are traceable to the SP Technical Research Institute of Sweden, National Physical Laboratory (NPL), Physikalisch–Technische Bundesanstalt (PTB), UKAS Accredited Laboratory 0029 or to the DANAK Accredited Laboratory 333.

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Introduction

In most applications of visible blind uv-detectors such as the **sg***lux* SG01-series only very small photocurrents are generated. These currents ranging from a microampere down to some picoampere cannot be measured by commonly available multimeters – an amplifier is needed.

We provide a small multifunctional analog amplifier board for developers to simplify and support application development.

Note: The board is shipped without any photodiodes.

Basics

Photocurrents can be converted to voltages by transimpedance amplifiers (TIA) or switched integrating amplifiers (SIA). Our board utilizes the first type because it does not require digital timing signals. The complete schematic of our board is shown in Appendix B.

For basic knowledge about this device please refer for instance to application notes for device OPA128 from TI at http://www.ti.com/. The SIA type is preferably for applications using micro controllers and DSPs – for further information please refer to datasheets and application notes as for instance from http://www.ti.com/ for device IVC102.

Specifications

The supplied board consists of two independent amplifier channels with adjustable gain. By using jumpers one can select the amplifier type (voltage or transimpedance amplifier) and configuration (two independent amplifiers or single two-stage amplifier) as well as the gain.

The board provides current gain in the range 10^5 V/A…10^7 V/A and voltage gain from 2…1000 V/V in single-stage configuration. Additionally to the fixed gain factors are potentiometers for custom gain factors in the range 10^4 V/A…10^6 V/A. By two stages one may reach gains of 10^{10} V/A respectively 10^5 V/V if offsets are carefully adjusted. The maximum usable output voltage range is ±4 V and must be considered while calculating gain factors.

The circuit is ideally operated with a dual power supply of ±9 V…±24 V. For lower performance measurements a single supply of 24 V…36 V may be used. In both cases stabilisation is not required. **Note**: ***Applying operating voltage with the wrong polarity will destroy the board.***

The photodiodes plug directly into sockets or may be externally connected via screw terminals. The output voltages are available on screw terminals.

The boards dimensions are 45 mm x 60 mm and the height is about 12 mm without photodiodes.

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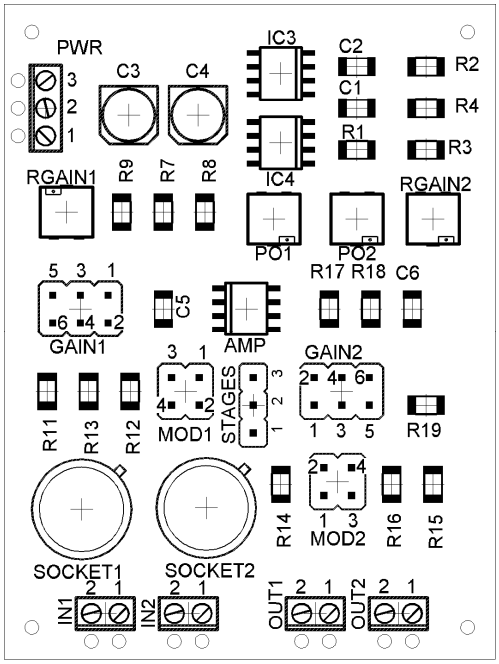
Starting

The index "x" in names relates to the channel number, for positions and pin numbers please refer to the picture on the right.



- Choose operation modes and configuration by setting jumpers MODx and STAGES; refer to Appendix A, tables 2 and 3.
- Set required gains with jumpers GAINx and/or potentiometers RGAINx; again refer to Appendix A, table 4.
- Connect arbitrary voltmeter(s) to screw terminals OUTx. Right pin (#1) is the output, left pin (#2) equals to GND.
- Connect the power supply to screw terminal PWR. For dual power supply use top terminal (#3) for negative, middle (#2) for GND and bottom terminal (#1) for positive voltage. A single supply must be connected with positive pole to bottom pin (#1) and supply GND to top pin (#3), middle pin is left open.
  Note: In case of single supply there is a floating virtual ground on the middle terminal to which the inputs and outputs relate and which **must not** be connected to power supply GND.
- Adjust offsets for all channels. To do this shorten inputs for voltage amplifiers and leave inputs open (or insert photodiodes and darken them to compensate dark currents as well) for transimpedance stages. Now adjust the output voltages to 1mV or less by potentiometers POx.
- Connect photodiode(s) to either terminal INx or SOCKETx. The right pins (#1) of screw terminals INx are the inputs, the left pins (#2) equal to GND. If using the sockets the upper pinhole is the input and must be plugged with one photodiode pin in any case. Other pinholes are grounded and may be used as required. Polarity of the photodiodes within sockets depends only on desired output voltage polarity.

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Examples

Problem:

- Compare photocurrents of two different photodiodes of types TW30SX and TW30DZ to show effect of higher visible blindness. This task requires two identical channels. The predicted photocurrents under sun radiation are 2.2 µA / 1.6 µA. The output voltage shall be 1…2 V giving a suitable gain of 1 V/µA = 10^6 V/A.

Solution:

- ✓ set jumper STAGES to position 1–2 (two channel mode), set MOD1 and MOD2 to position 1–2 (transimpedance amplifier)
- ✓ set GAIN1 and GAIN2 to position 2–4 (transimpedance gain 10^6 V/A)
- ✓ connect and turn on power supply
- ✓ insert photodiodes, darken them, compensate offsets (and dark currents) by adjusting PO1 and PO2
- ✓ illuminate photodiodes with visible and ultraviolet light, compare voltages on terminals OUT1 and OUT2

Problem:

- Convert a photocurrent of 1nA to a voltage of 2.0 Volts. This requires a total gain of 2V/nA = $2 \cdot 10^9$ V/A, which can be provided by two amplifier stages. The first stage converts the current to a voltage of 10mV with a gain 10^7 V/A, which is then boosted to 0.2 V by the second voltage amplifier stage with a gain of 20 V/V. This voltage can be displayed easily by a standard digital panel voltmeter.
- Hint: You can replace the gain jumpers of stage 1 by a multi stage switch to obtain fast and easy range adjustment. The second contact layer of this switch may be used for decimal point shifting on the panel voltmeter.

Solution:

- ✓ set jumper STAGES to position 2–3 (two channel mode)
- ✓ set MOD1 to position 1–2 (transimpedance amplifier) and GAIN1 to position 1–3 giving 10^7 V/A in the first stage
- ✓ open MOD2 (voltage amplifier, pre-gain 2) and set GAIN2 to position 1–3 (giving overall voltage amplification of 200 in stage two)
- ✓ connect and turn on power supply
- ✓ insert photodiode into SOCKET1 and darken it; first compensate offset of first stage by adjusting PO1 until voltage on OUT1 is below 1 mV; then compensate offset of second stage by adjusting PO2 until voltage on OUT2 is below 1 mV
- ✓ illuminate photodiode and measure voltage on terminal OUT1

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Appendix A

Table 1: pin, terminal and other assignments

	Pin 1	Pin 2	Pin 3
PWR	+8 V … +24 V	GND	-8 V … -24 V
IN1	input terminal channel 1	GND	
SOCKET1	input socket channel 1	GND	GND
OUT1	output terminal channel 1	GND	
PO1	offset compensation channel 1		
IN2	input terminal channel 2	GND	
SOCKET2	input socket channel 2	GND	GND
OUT2	output terminal channel 2	GND	
PO2	offset compensation channel 2		

Table 2: channel configuration

STAGES	Function
1-2	two independent amplifier channels
2-3	single two-stage amplifier; note: channel two must be configured as voltage amplifier by setting MOD2 in any position but 1-2

Table 3: amplifier mode

MODx	Function
1-2	transimpedance amplifier
1-3	voltage amplifier pre-gain 10
3-4	voltage amplifier pre-gain 5
Open	voltage amplifier pre-gain 2

Table 4: gain factor setting

GAINx	transimpedance gain [V/A]	voltage gain (multiply by voltage pre-gain to get total voltage gain) [V/V]
1-3	10^7	100
2-4	10^6	10
3-5	10^5	1
4-6	adjustable by potentiometer RGAINx in range 10^4 … 10^6	0.1…10

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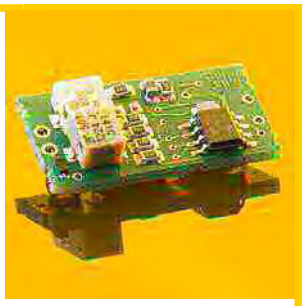
AMPCON_HI

High sensitivity transmitter of photocurrent to 4-20mA current loop

The AMPCON converts a photocurrent into an output current between 4 and 20mA. The module is designed for integration into 4-20mA databusses.

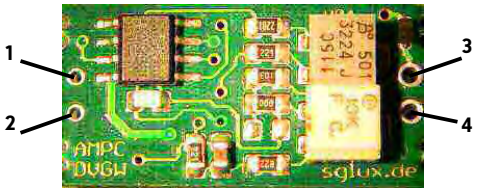
The present module works with a high gain factor and converts a photocurrent of 18nA (adjustable +/-35%) to an output of 20mA. This means, a current higher than 18nA will cause saturation.

Other modules with medium gain (AMPCON_MED, up to 2,5µA) and low gain (AMPCON_LO, up to 250µA) are available. Alternatively, please refer to the below instruction for changing the gain.



Input solder points	Photodiode Anode = positive terminal of the photodiode Photodiode Cathode = negative terminal of the photodiode
Power supply = output terminal solder points	A voltage of 24V is to be applied between V+ and GND. The resulting current between 4 and 20mA is the signal, which is proportional to the photocurrent.
Dimensions	W x L x H = 13 x 26 x 8mm
Operating temperature	-20...80°C
Storage temperature	-40...80°C
The signal offset and the amplification factor are adjustable with potentiometers. (see description)	
RoHS-compliant to 2002/95/EG.	

Connection:



Input solder points
1 Photodiode anode
2 Photodiode cathode

Power supply solder points
3 V+ power supply
4 GND power supply

Offset and gain fine adjustment:

gain adjustment
turn left to raise the gain
turn right to lower the gain

offset adjustment
turn right to raise the offset
turn left to lower the offset

How to change the gain:

R_F and C_F might have another appearance than in the picture.
To change the gain (measurement range) in a larger scale, please change the feedback resistor R_F (the present value is 120 MΩ).
To calculate R_{Fnew} for the new resistor, please use this formula:

R_{Fnew}*(in MΩ)*=2160/I_{max}*(in nA)*

I_{max} is the max. measurable photocurrent. It is adjustable +/- 35% with the potentiometer.
The capacitor C_F (the default value is 820pF) is influencing the time constant τ of the measurement system. The present time constant is approx. 10ms. It is calculated with the formula:

τ*(in ms)* = C_F*(in nF)** R_F *(in MΩ)*

maximum ratings

5kΩ < R_{Fnew}<3GΩ and **τ > 1ms**

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

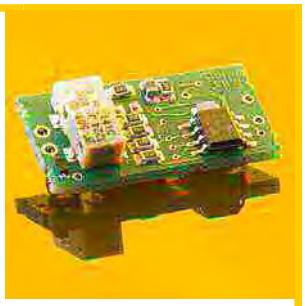
AMPCON_MED

Medium sensitivity transmitter of photocurrent to 4-20mA current loop

The AMPCON converts a photocurrent into an output current between 4 and 20mA. The module is designed for integration into 4-20mA databusses.

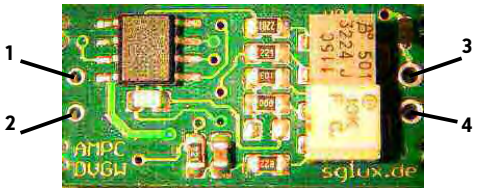
The present module works with a medium gain factor and converts a photocurrent of 2,5µA (adjustable +/-35%) to an output of 20mA. This means, a current higher than 2,5µA will cause saturation.

Other modules with low gain (AMPCON_LO, up to 250µA) and high gain (AMPCON_HI, up to 18nA) are available. Alternatively, please refer to the below instruction for changing the gain.



Input solder points	Photodiode Anode = positive terminal of the photodiode Photodiode Cathode = negative terminal of the photodiode
Power supply = output terminal solder points	A voltage of 24V is to be applied between V+ and GND. The resulting current between 4 and 20mA is the signal, which is proportional to the photocurrent.
Dimensions	W x L x H = 13 x 26 x 8mm
Operating temperature	-20...80°C
Storage temperature	-40...80°C
The signal offset and the amplification factor are adjustable with potentiometers. (see description)	
RoHS-compliant to 2002/95/EG.	

Connection:



Input solder points
1 Photodiode anode
2 Photodiode cathode

Power supply solder points
3 V+ power supply
4 GND power supply

Offset and gain fine adjustment:

gain adjustment
turn left to raise the gain
turn right to lower the gain

offset adjustment
turn right to raise the offset
turn left to lower the offset

How to change the gain:

R_F and C_F might have another appearance than in the picture.
To change the gain (measurement range) in a larger scale, please change the feedback resistor R_F(the present value is 1 MΩ).
To calculate R_{Fnew} for the new resistor, please use this formula:

R_{Fnew}*(in MΩ)*=2160/I_{max}*(in nA)*

I_{max} is the max. measurable photocurrent. It is adjustable +/- 35% with the gain potentiometer.
The capacitor C_F (the default value is 100nF) is influencing the time constant τ of the measurement system. The present time constant is 10ms. It is calculated with the formula:

τ *in ms* = C_F*(in nF)** R_F*(in MΩ)*

maximum ratings

5kΩ < R_{Fnew}<3GΩ and **τ > 1ms**

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(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

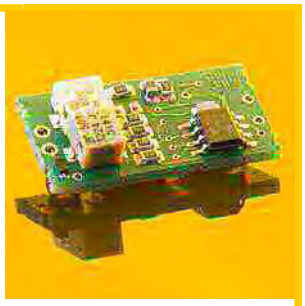
AMPCON_LO

Low sensitivity transmitter of photocurrent to 4-20mA current loop

The AMPCON converts a photocurrent into an output current between 4 and 20mA. The module is designed for integration into 4-20mA databusses.

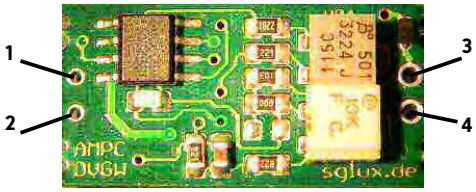
The present module works with a low gain factor and converts a photocurrent of 250µA (adjustable +/-35%) to an output of 20mA. This means, a current higher than 250µA will cause saturation.

Other modules with medium gain (AMPCON_MED, up to 2,5µA) and high gain (AMPCON_HI, up to 18nA) are available. Alternatively, please refer to the below instruction for changing the gain.



Input solder points	Photodiode Anode = positive terminal of the photodiode Photodiode Cathode = negative terminal of the photodiode
Power supply = output terminal solder points	A voltage of 24V is to be applied between V+ and GND. The resulting current between 4 and 20mA is the signal, which is proportional to the photocurrent.
Dimensions	W x L x H = 13 x 26 x 8mm
Operating temperature	-20...80°C
Storage temperature	-40...80°C
The signal offset and the amplification factor are adjustable with potentiometers. (see description)	
RoHS-compliant to 2002/95/EG.	

Connection:



Input solder points
1 Photodiode anode
2 Photodiode cathode

Power supply solder points
3 V+ power supply
4 GND power supply

Offset and gain fine adjustment:

gain adjustment
turn left to raise the gain
turn right to lower the gain

offset adjustment
turn right to raise the offset
turn left to lower the offset

How to change the gain:

R_F and C_F might have another appearance than in the picture.
To change the gain (measurement range) in a larger scale, please change the feedback resistor R_F. (the present value is 10 kΩ)
To calculate R_{Fnew} for the new resistor, please use this formula:

R_{Fnew}*(in kΩ)*=2160/I_{max}*(in µA)*

I_{max} is the max. measurable photocurrent. It is adjustable +/- 35% with the potentiometer.
The capacitor C_F (the default value is 1µF) is influencing the time constant τ of the measurement system. The present time constant is 10ms. It is calculated with the formula:

τ *(in ms)* = C_F*(in µF)** R_F*(in kΩ)*

maximum ratings

5kΩ < R_{Fnew}<3GΩ and **τ > 1ms**

Rev 1.1

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

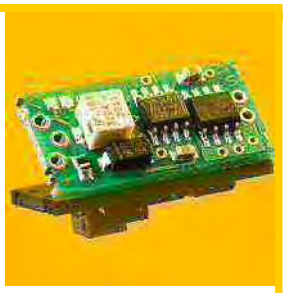
VOLTCON_HI

High sensitivity transmitter of photocurrent to a 0-5V signal

The Voltcon converts a photocurrent into an output voltage between 0 and 5V.

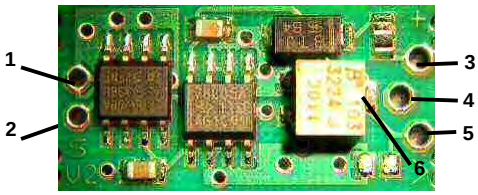
The present module works with a high gain factor and converts a photocurrent of 40nA to an output of 5V. This means, a current higher than 40nA will cause saturation.

Other modules with low gain (VOLTCON_LO, up to 500µA) and medium gain (AMPCON_MED, up to 5µA) are available. Alternatively, please refer to the below instruction for changing the gain.



Input solder points	Photodiode Anode = positive terminal of the photodiode Photodiode Cathode = negative terminal of the photodiode
Power supply and output terminal solder points	A voltage of 5...24V is to be applied between V+ and GND. The resulting output voltage between 0 and 5V is measured between the signal output and GND. The voltage is proportional to the applied photocurrent.
Dimensions	W x L x H = 13 x 26 x 8mm
Operating temperature	-20…80°C
Storage temperature	-40…80°C
The amplification factor (gain) is adjustable with a potentiometer (see description).	
RoHS-compliant to 2002/95/EG.	

Connection:



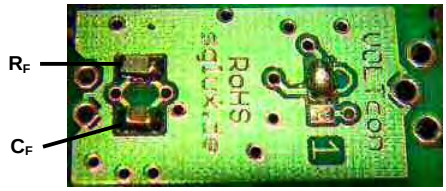
Input solder points
1 Photodiode anode
2 Photodiode cathode

Power supply solder points
3 V+ power supply
4 GND power supply
5 Signal output

Gain fine adjustment:

The gain fine adjustment is done via the potentiometer (6)
- turn left to raise the gain
- turn right to lower the gain

How to change the gain:



R_F and C_F might have another appearance than in the picture.
To change the gain (measurement range) in a larger scale, please change the feedback resistor R_F (the present value is 120 MΩ).
To calculate R_{Fnew} for the new resistor, please use this formula:

R_{Fnew}*(in MΩ)*=5/I_{max}*(in µA)*

I_{max} is the max. measurable photocurrent. It is adjustable with the gain potentiometer.
The capacitor C_F (the default value is 820pF) is influencing the time constant τ of the measurement system. The present time constant is approx. 10ms. It is calculated with the formula:

τ *(in ms)* = C_F*(in nF)** R_F *(in MΩ)*

maximum ratings

10kΩ < R_{Fnew}<3GΩ and **τ > 1ms**

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VOLTCON_MED

Medium sensitivity transmitter of photocurrent to a 0-5V signal

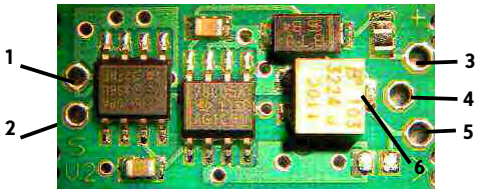
The Voltcon converts a photocurrent into an output voltage between 0 and 5V.

The present module works with a medium gain factor and converts a photocurrent of 5µA to an output of 5V. This means, a current higher than 5µA will cause saturation.

Other modules with low gain (VOLTCON_LO, up to 500µA) and high gain (VOLTCON_HI, up to 40nA) are available. Alternatively, please refer to the below instruction for changing the gain.

Input solder points	Photodiode Anode = positive terminal of the photodiode Photodiode Cathode = negative terminal of the photodiode
Power supply and output terminal solder points	A voltage of 5...24V is to be applied between V+ and GND. The resulting output voltage between 0 and 5V is measured between the signal output and GND. The voltage is proportional to the applied photocurrent.
Dimensions	W x L x H = 13 x 26 x 8mm
Operating temperature	-20…80°C
Storage temperature	-40…80°C
The amplification factor (gain) is adjustable with a potentiometer (see description).	
RoHS-compliant to 2002/95/EG.	

Connection:



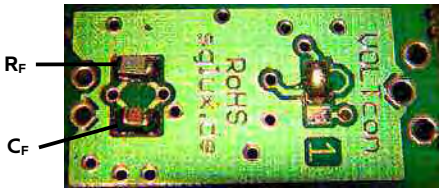
Input solder points
1 Photodiode anode
2 Photodiode cathode

Power supply solder points
3 V+ power supply
4 GND power supply
5 Signal output

Gain fine adjustment:

The gain fine adjustment is done via the potentiometer (6)
- turn left to raise the gain
- turn right to lower the gain

How to change the gain:



R_F and C_F might have another appearance than in the picture.
To change the gain (measurement range) in a larger scale, please change the feedback resistor R_F (the present value is 1 MΩ).
To calculate R_{Fnew} for the new resistor, please use this formula:

R_{Fnew}*(in MΩ)*=5/I_{max}*(in µA)*

I_{max} is the max. measurable photocurrent. It is adjustable with the gain potentiometer.
The capacitor C_F (the default value is 100nF) is influencing the time constant τ of the measurement system. The present time constant is 10ms. It is calculated with the formula:

τ*(in ms)*=C_F*(in nF)** R_F*(in MΩ)*

maximum ratings
10kΩ < R_{Fnew}<3GΩ and **τ > 1ms**

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VOLTCON_LO

Low sensitivity transmitter of photocurrent to a 0-5V signal

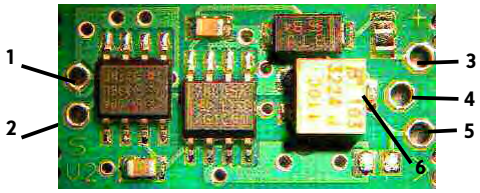
The Voltcon converts a photocurrent into an output voltage between 0 and 5V.

The present module works with a low gain factor and converts a photocurrent of 500µA to an output of 5V. This means, a current higher than 500µA will cause saturation.

Other modules with medium gain (VOLTCON_MED, up to 5µA) and high gain (VOLTCON_HI, up to 40nA) are available. Alternatively, please refer to the below instruction for changing the gain.

Input solder points	Photodiode Anode = positive terminal of the photodiode Photodiode Cathode = negative terminal of the photodiode
Power supply and output terminal solder points	A voltage of 7...24V is to be applied between V+ and GND. The resulting output voltage between 0 and 5V is measured between the signal output and GND. The voltage is proportional to the applied photocurrent.
Dimensions	W x L x H = 13 x 26 x 8mm
The amplification factor (gain) is adjustable with a potentiometer (see description).	
RoHS-compliant to 2002/95/EG.	

Connection:



Input solder points

1 Photodiode anode

2 Photodiode cathode

Power supply solder points

3 V+ power supply

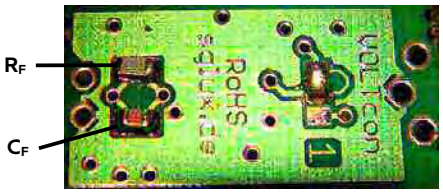
4 GND power supply

5 Signal output

Gain fine adjustment:

The gain fine adjustment is done via the potentiometer (6)
- turn left to raise the gain
- turn right to lower the gain

How to change the gain:



R_F and C_F might have another appearance than in the picture.
To change the gain (measurement range) in a larger scale, please change the feedback resistor R_F (the present value is 10 kΩ).
To calculate R_{Fnew} for the new resistor, please use this formula:

R_{Fnew}*(in MΩ)*=5/I_{max}*(in µA)*

I_{max} is the max. measurable photocurrent. It is adjustable +/- 35% with the gain potentiometer.
The capacitor C_F (the default value is 1µF) is influencing the time constant τ of the measurement system. The present time constant is 10ms. It is calculated with the formula:

τ *(in ms)* = C_F*(in µF)** R_F*(in kΩ)*

maximum ratings

10kΩ < R_{Fnew}<3MΩ and **τ > 1ms**

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PHOTODIODE AMPLIFIER : REFERENCE STANDARD
with traceable calibration

Example Picture

This module is an upgrade for all sglux amplifier boards. It consists of a shielded housing and comes with a traceable calibration and related certificate.

The Module is to be used as a reference Standard for the sglux photodiode amplifier boards or own photodiode amplifier circuit development.

Feature Overview

Measurement properties	Please refer to the related sglux amplifier board.
Input / Output	Input via BNC plugs, output via banana plugs
Housing	Powder-coated aluminium housing with good EMC conditions, rubber feet
Delivered with	Power supply, BNC cable, case

Traceable Calibration

The calibration is performed with equipment directly or indirectly traceable to calibration laboratory reference standards. The reference standards are traceable to the National Institute of Standards and Technology (NIST), SP Technical Research Institute of Sweden, National Physical Laboratory (NPL), Physikalisch-Technische Bundesanstalt (PTB), UKAS Accredited Laboratory 0029 or to the DANAK Accredited Laboratory 333.

Specifications

Parameter	Value	Unit
Degree of protection	IP54	–
Operating temperature	-40….+80	*°C*
Storage temperature	-40… +85	*°C*
Power supply	18…24	V_{DC}
Power consumption (24V)	10	*mA*
Weight	0,54	*kg*

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PHOTODIODE AMPLIFIER : DUAL

Two Channel Photocurrent Amplifier

PHOTODIODE AMPLIFIER:DUAL

The Photodiode Amplifier:Dual is a two channel photocurrent amplifier.

The instrument is used for amplification of low currents like they are generated by a photodiode. The output signal is a voltage between –5V and 5V. Both channels have 5 gain settings for amplification and measurement of photocurrents between 10pA and 400µA.

The amplifier combines approved metrology with a simple and comfortable manageability and robustness. The input signal is integrated via a BNC plug, the output voltage and the relay signal is read out via banana plugs.
The amplifier is primarily used in measurement laboratories and in experimental setups.
All sglux photodiodes are available with BNC output and can be used with the amplifier.
The device comes with a 24VDC external power supply, a case and a BNC cable.

Feature Overview

Measurement properties	Two measurement channels, gain factors 10^4, 10^5, 10^6, 10^7 und 10^8V/A (other gain values on request); photocurrent input via BNC plugs
Output	Output signal –5V...5V via banana plugs
Housing	Powder-coated aluminium housing with good EMC conditions; rubber feet
Accessories	Power supply, BNC cable, case
Optional accessories	Photodiodes from the sglux offer, integrated into a housing with BNC output

Specifications	Wert	Einheit
Degree of protection	IP54	–
Operation temperature	-40….+80	°C
Storage temperature	-40… +85	°C
Power supply	18…24	V_{DC}
Power consumption (24V)	10	mA
Weight	0,54	kg

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

PHOTODIODE AMPLIFIER : CONNECT

Photocurrent Amplifier with Relay Output

PHOTODIODE AMPLIFIER:CONNECT

The Photodiode Amplifier:Connect is a photocurrent amplifier with integrated relay output.

The instrument is used for amplification of very low currents like they are generated by a photodiode. These currents are converted into a voltage between –5V and 5V. The amplifier has a potential free relay output with configurable threshold for switching of alarms, lamps or shutters. Three gains are chosable for conversion and measurement of photocurrents between 100pA and 40µA.

The threshold and hysteresis settings can be done stepless via two control dials. The relay activation is additionally shown by a LED on the panel. The input signal is integrated via a BNC plug, the output voltage and the relay signal is read out via banana plugs.

The amplifier is primarily used in measurement laboratories and in experimental setups. All sglux photodiodes are available with BNC output and can be used with the amplifier. The device comes with a power supply, a case and a BNC cable.

Feature Overview

Measurement properties	One measurement signal; gain factors 10^5, 10^6 and 10^7V/A; photocurrent input via BNC plugr
Outputs	Voltage –5V...5V and potential free relay output, both via banana plugs
Housing	Powder-coated aluminium housing with good EMC conditions; rubber feet
Accessories	Power supply, BNC cable, case
Optional Accessories	Photodiodes from the sglux offer, integrated into a housing with BNC output

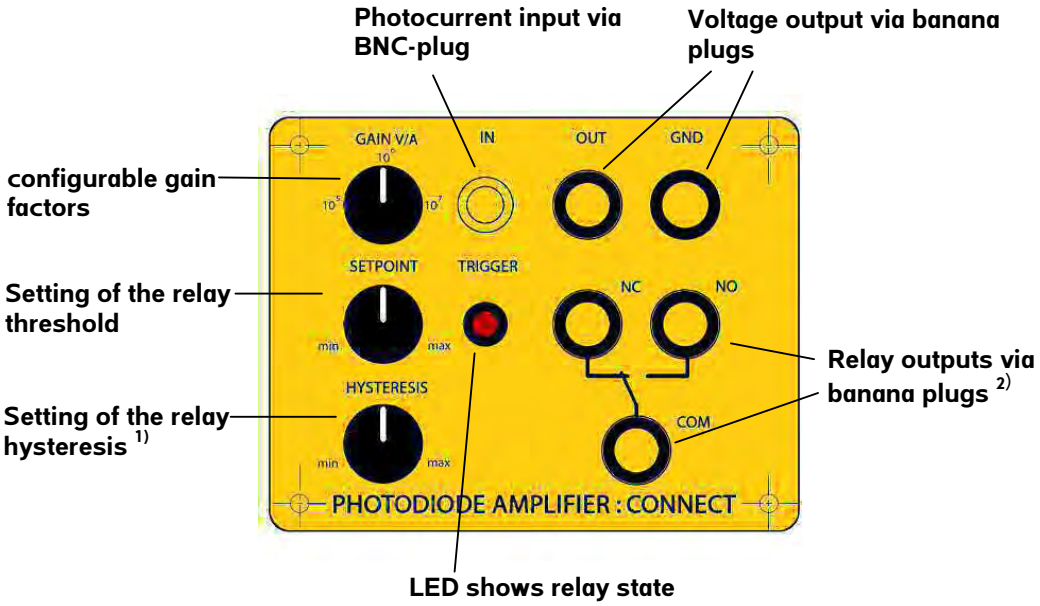
Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

PHOTODIODE AMPLIFIER : CONNECT

Photocurrent Amplifier with Relay Output

Specifications	Wert	Einheit
Degree of protection	IP54	–
Operating temperature	-40….+80	°C
Storage temperature	-40… +85	°C
Power supply	5…18	V_{DC}
Power consumption (24V)	10	mA
Weight	0,54	kg

Operation



1) The activation of the threshold hysteresis is necessary, if the measurement value is fluctuating around the threshold value and small variations should not activate the relay.

2) This is a potential free relay output. If connections NC (normally closed) and COM are used, the switching circuit is closed and will be opened by the relay activation. If connections NO (normally open) and COM are used, the switching circuit is open and will be closed by the relay activation.

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PHOTONIC SENSOR MONITOR

Laboratory Tabletop for Photonic Process Control

Photonic Sensor Monitor

The two channel **Photonic Sensor Monitor** is used in photonic laboratories. It reads sensor signals generated by photodiodes as well as signals from amplified probes (0...2.5V). The unit displays the calibrated intensity values and calculates radiation doses. The included PC software SensorView 1.2 allows data logging and computer based scientific data analysis. Accessories are two sensor cables and a power supply (110...220V). NIST or PTB calibrated sensor inputs are available on request.

The unit is also available as a compact OEM module for industrial use.

Features Overview

Inputs	two channel input, all common photonic sensors and photodiodes, NIST or PTB traceable input calibration on request
Software	SensorView 1.2 for data logging and scientific data evaluation
Outputs	three programmable free floating relay terminals to control minimum and maximum intensity values and dose values; complex logic operations programmable (see page 4)

Specifications	Value	Unit
Numbers of input channels	2	–
Data interface	USB/RS232	–
Numbers of free floating relay	3	–
Dimensions (HxWxD)	234x95X197	*mm*
Degree of protection	IP40	–
Operating temperature	0....+70	*°C*
Storage temperature	-25... +85	*°C*
Power supply	12... 24	V_{DC}
Power consumption (24V)	0,4	*W*
Weight	1,22	*kg*

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

The Inputs and Outputs of the Photonic Sensor Monitors

Sensor Inputs

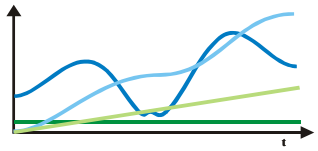
The sensor input terminals can be connected to photodiodes or pre-amplified sensors

Value and status information display

The full-programmable two row display shows e.g.

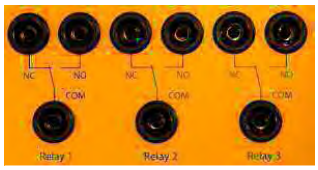
- Radiation, dose and status of the the relay
- error messages like overrange

Data evaluation



The software SensorView 1.2 allows a comfortable data evaluation. Alternatively a USB/RS232 data export to other scientific evaluation softwares such as Origin or Excel is possible.

Relay Outputs



The three free floating relay allow simple and complex process controll. Examples:

- activation if a programmable threshold is exceeded or undershot
- activation if a programmable dose is reached
- logic combination of the two sensor inputs such as controll of multi-step irradiation processes, e.g. swith off lamp #1 if dose #1 is reached and switch on lamp #2 and start of a conveyor belt

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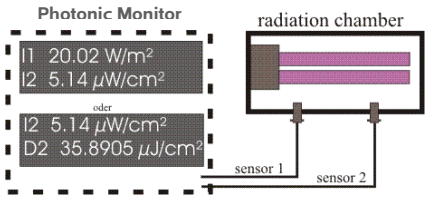
Basic Functions

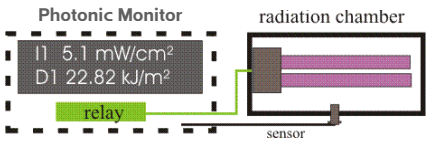
Radiation Measurement

Parallel measurements of two lamp outputs or radiation parts of one lamp can realized (e.g. UVA and UVB). In the first display example the intensity I1 at sensor 1 and the intensity I2 at sensor 2 is displayed. The second picture shows intensity and dose (time integration of the intensity).
If the data port is activated the complete relevant information (intensities, doses, error messages and state of relays and dose measurements) is transferred to a PC.



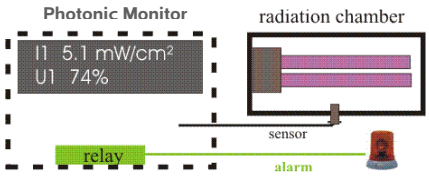
Measurement and Lamp Control

At excessing or falling below a configurable intensity threshold or reaching an irradiation dose the lamp can be switched off or changed over to another lamp.



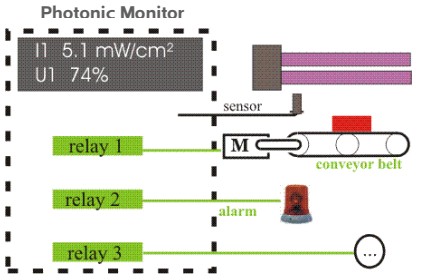
Measurement and Alarm

In the example an alarm is given if the percentaged lamp power falls below a configurable threshold. Further two relays can be used for other functions (switching of pumps, shutters etc.).



Transport Control of irradiated Goods

Measurement of the dose at irradiated goods and activation of the belt transport. The hold times of the relays are variable therefore the transport distance can be adjusted with the hold time. In the example a second relay is giving an alarm if the intensity falls below the threshold. The third relay can be used for information from a second sensor or for a logic combination with one of the other relays (e.g. transport if dose threshold is exceeded and intensity is higher than a minimum value at the same time).



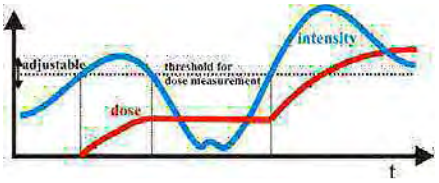
Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

Advanced Use in Process Automation

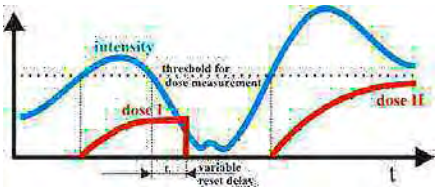
Automated Dose Measurement

The measurement of irradiation doses can be done manually or subjected to automation conditions.

In the first example the dose measurement is started at exceeding a critical intensity. If the intensity falls below the threshold the integration is interrupted and the dose stays constant. While exceeding the threshold again, the integration is continued.



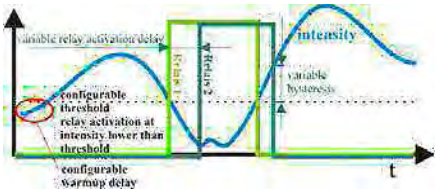
In the second example the dose measurement is finished with falling under the intensity threshold. The reset delay keeps the value on the display. At exceeding of the threshold a new dose is generated. The generation of single doses is used if the dose stop condition is activating a pump or a transport of a good (see below). For each irradiated good or segment a dose is calculated.



Relay Configuration

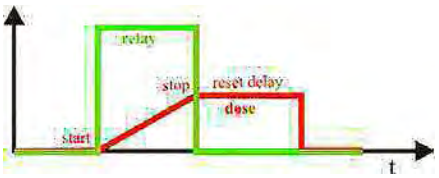
Three relays can be configured for controlling different functions activated by various configurable process conditions. In the simplest use the relays activate at falling under or exceeding a critical threshold of a selectable measure.

A warmup delay can be implemented to avoid false reports at the start-up process. Additionally it may be reasonable to ignore a short malfunction and only to consider a longer malfunction by using a relay activation delay. Hysteresis parameters can be set for values that are alternating around the threshold.



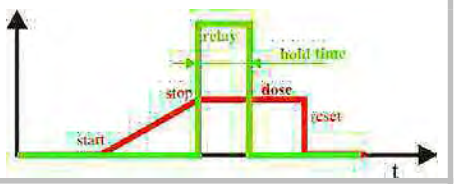
Dose Measurement Indication

Each relay can be associated with dose functions. Running dose measurements can be indicated by an activated relay. There is no difference if the dose measurement is operated manually or under automated conditions.



Dose Limit Indication

At the dose limit indication the relay is activated if the dose measurement is finished. With the hold time the time of the relay activation is set.



Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline NA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

UV*MICROLOG*

Miniature UV Datalogger for Science and Production Monitoring

The Device

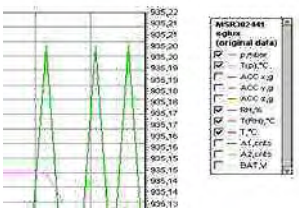
The **UV*MICROLOG*** is designed for logging of ultraviolet radiation. Sophisticated microcontroller technology and low noise SiC based UV detectors allow up to 3 months of permanent measurement and logging without battery charging. **Applications** are dose monitoring of UV sensible goods such as artworks or compound materials. Other fields are dose monitoring of UV hardening systems or sun UV (e.g. Erythema or UVA + UVB) monitoring of persons, animals or plants. The unit can be mounted with a belt or screws.

The UV Sensors

As a broad variety of industrial and scientific fields of UV logging exists the UV*MICROLOG* is available with different detectors (one or two) measuring e.g. UVA, UVB or UVC only, UV-broadband, UV-Erythema or UV-ICNIRP

Different available sensors allow to adjust the UV-sensibility of the UVMICROLOG from the nW/cm2 area for very low UV intensities (e.g. in museums) until some W/cm2 radiation which occurs e.g. in the UV curing industry. A NIST traceable calibration is included in the price.

Optional Sensors



The UV*MICROLOG* can be equipped with four further sensors:

- Temperature
- Relative Humidity
- Pressure
- Accelleration (3-Axis)

Specifications

Measure	***Working Range***	***Accuracy***
Temperature	-10°C to +58°C	±0,1°C (5°C to 45°C) ±0,2°C (-10°C to +58°C)
Relative Humidity	0-100% rel. Hum.(-20°C to +65°C)	±2% rel. hum. (10-85% rel. hum., 0 to 40°C) ±4% rel. hum. (85-95% rel. hum., 0 °C to 40°C)
Pressure	0-2500 mbar abs.	±2,5 mbar (750-1100 mbar absolute)
Acceleration	±10 G / ±2 G sel.	±0,15 g (25 °C)

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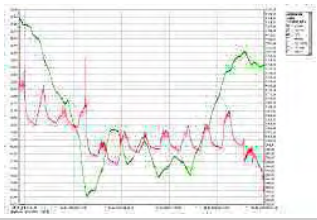
The Software



With the **free software** *Setup* the user customizes the properties of the UVMICROLOG. With the software Reader the USB data transfer is started. The Viewer is used for graphical displaying. The data can be exported as a csv file for analyzing in standard softwares like Excel or Origin. The software Online is displaying online measurements.

Logging Features

- Record limits can be set for all used sensors.
- Measurements can be started via a connected computer (date and time for the start can be chosen)
- For each of the possible sensors a measurement rate between 1s and 12h can be chosen.
- Prediction feature calculates memory and battery capacity for the chosen measurement rates.
- For monitoring of sensitive transport goods a shock measurement can be activated (if accelleration sensor is equipped). Therefore a threshold can be chosen. Every acceleration above this threshold is recorded. The mixing gravitational acceleration is not taken into account.

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Specifications of the UV*MICROLOG*

Parameter	Value	Unit
Sensors and Output		
Number of UV detectors	1	–
Specifiaction of the UV Sensor	different SiC based detectors available please contact us with your specification	–
Storage rates		
min. storage rate UV Intensity	2	*/day*
max. storage rate UV Intensity	50	*/second*
min. storage rate Temperature	2	*/day*
max. storage rate Temperature	1	*/second*
min. storage rate rel. humidity	2	*/day*
max. storage rate rel. humidity	1	*/second*
min. storage rate pressure	2	*/day*
max. storage rate pressure	10	*/second*
min. storage rate accelleration	2	*/day*
max. storage rate accelleration	50	*/second*
Interface	USB	
Standard Parameters of the housing (varies with needed features)		
Dimensions (BxHXD)	59x22(33)x24	*mm³*
Weight	40	*g*
Additional technical data		
Operating temperature	-15….+65	*°C*
Storage temperature	-20… +70	*°C*
Capacity lithium-polymer battery	170	*mAh*
Data storage	>2.000.000	*parameters*

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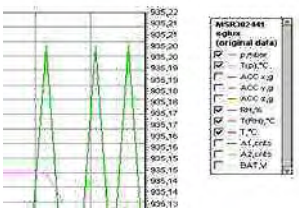

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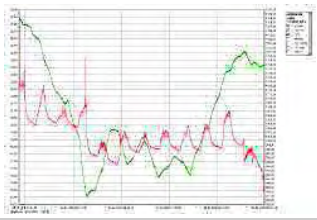
The Software



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Specifications of the UV*MICROLOG*

Parameter	Value	Unit
Sensors and Output		
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Specifiaction of the UV Sensor	different SiC based detectors available please contact us with your specification	–
Storage rates		
min. storage rate UV Intensity	2	*/day*
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min. storage rate Temperature	2	*/day*
max. storage rate Temperature	1	*/second*
min. storage rate rel. humidity	2	*/day*
max. storage rate rel. humidity	1	*/second*
min. storage rate pressure	2	*/day*
max. storage rate pressure	10	*/second*
min. storage rate accelleration	2	*/day*
max. storage rate accelleration	50	*/second*
Interface	USB	
Standard Parameters of the housing (varies with needed features)		
Dimensions (BxHXD)	59x22(33)x24	*mm³*
Weight	40	*g*
Additional technical data		
Operating temperature	-15….+65	*°C*
Storage temperature	-20… +70	*°C*
Capacity lithium-polymer battery	170	*mAh*
Data storage	>2.000.000	*parameters*

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UVC PHOTON DETECTOR

Handheld unit for very low UVC radiation detection

General Features

The **UVC Photon Detector** is designed to measure very low UVC radiation intensities. It is a useful instrument where harmful UVC radiation needs to be detected or other applications where a UV photodiode is not sensible enough. Once installed in the laboratory the unit alarms if invisible UVC radiation is present.

The **UVC Photon Detector** is based on a UVC sensitive gas discharge tube. An included speaker outputs clicks with a frequency proportional to the present UVC radiation (it works similar to a Geiger-Muller-counter)

Specifications

Parameter	Value
Radiant Sensitivity at peak (210nm)	1 click /s / 100 fWcm ^{2}
Dimensions	150mm * 82 mm * 32 mm
Weight	230 g
Power Supply	9V Battery (lifetime is 50 hours of permanent use)
Operating Temp.	20…+80°C
Humidity	<80%, non condensing

User Instructions

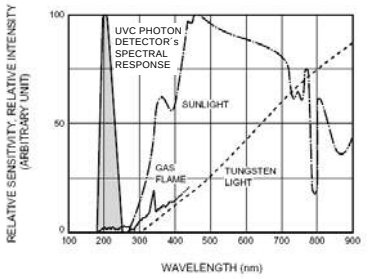
To **get started** switch on the handheld, loosen the locking screw and push out the sensing tube. Never touch the glass of the tube.

Then do a **selftest** by lighting a pocket lighter at a distance of 5m. If you hear the unit clicking it is ready to protect you against harmful radiation.

We recommend to do the **selftest** regularly.

Do not touch the tube and consider that it is fragile.

Spectral Sensitiviy



Manufacturer: sglux GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800) 3475445 or (617) 5663821; fax (617) 7310935; uv@boselec.com ; www.boselec.com

UV TOUCH High Precision Touch Control UV Radiometer, Dosimeter & Datalogger

Hold the world of UV radiation in your hand. Radiation hard SiC detectors guarantee reliable values for years.
Modern CAN based signal conversion offers a large dynamic range.
The intuitive full touch screen control makes working a pure pleasure.

UV TOUCH

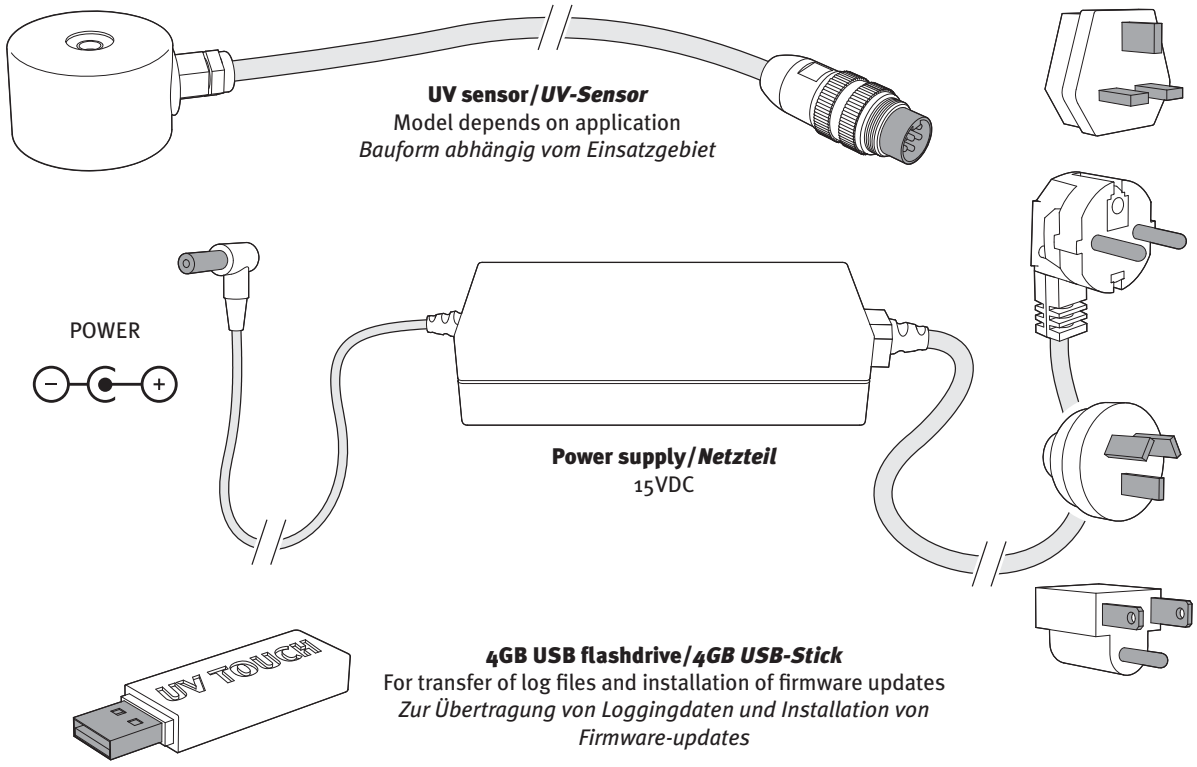
SiC Photodetector
guarantees radiation hardness

CAN bus signal processing
offers a large dynamic range

Intuitive touch screen control
makes working a pleasure

*Halten Sie die Welt der UV-Strahlung in Ihrer Hand. Strahlungsharte SiC-Detektoren garantieren zuverlässige Werte im Mess-Alltag. Hochmoderne CAN-basierte Übertragungstechnologie sichert einen großen Dynamikbereich. Eine intuitive Touch-Screen-Bedienung macht die Arbeit mit dem **UVTOUCH** zum Vergnügen.*

I. Components included in delivery – *Lieferumfang*

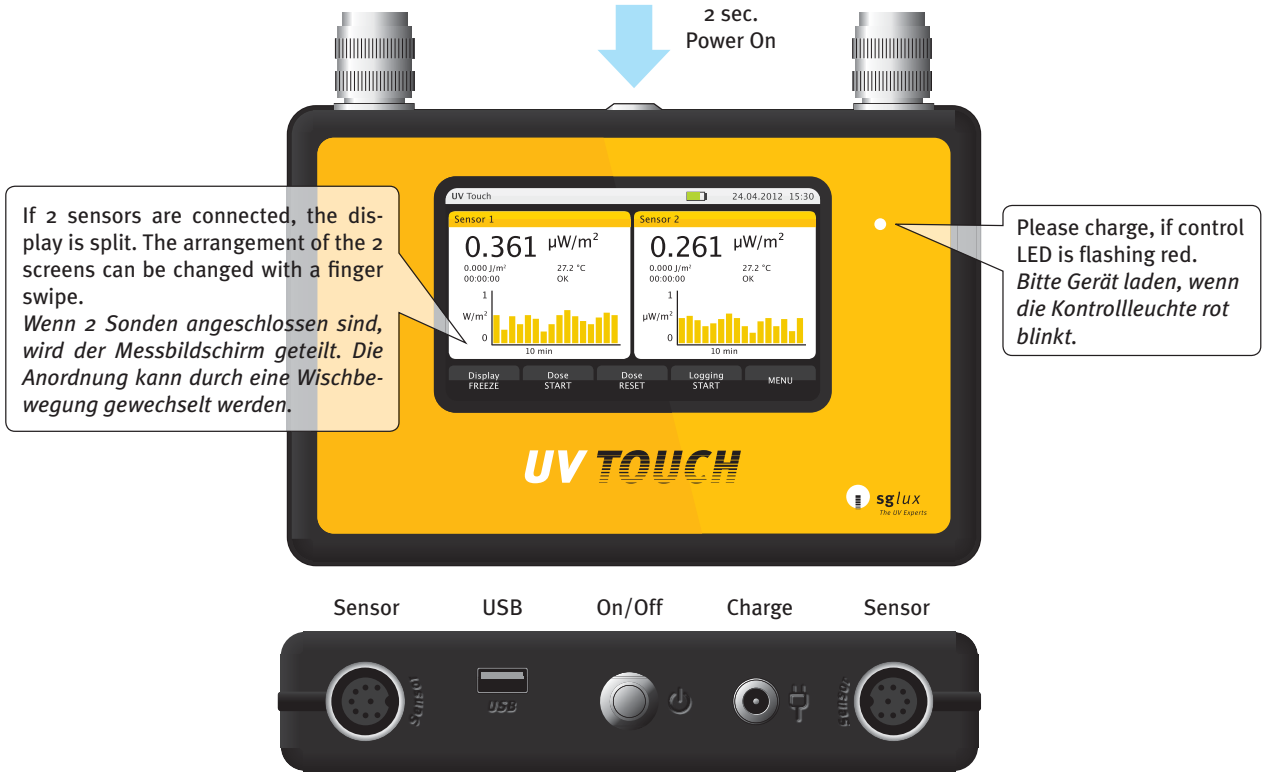


UV sensor/*UV-Sensor*
Model depends on application
Bauform abhängig vom Einsatzgebiet

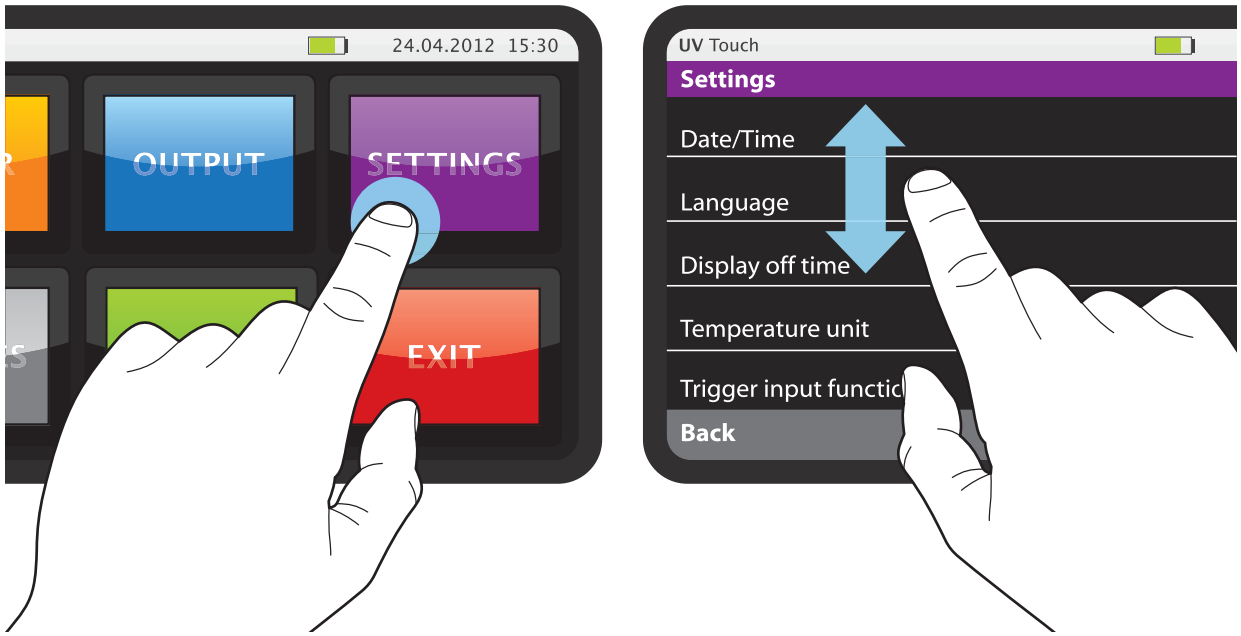
Power supply/*Netzteil*
15VDC

4GB USB flashdrive/*4GB USB-Stick*
For transfer of log files and installation of firmware updates
Zur Übertragung von Loggingdaten und Installation von Firmware-updates

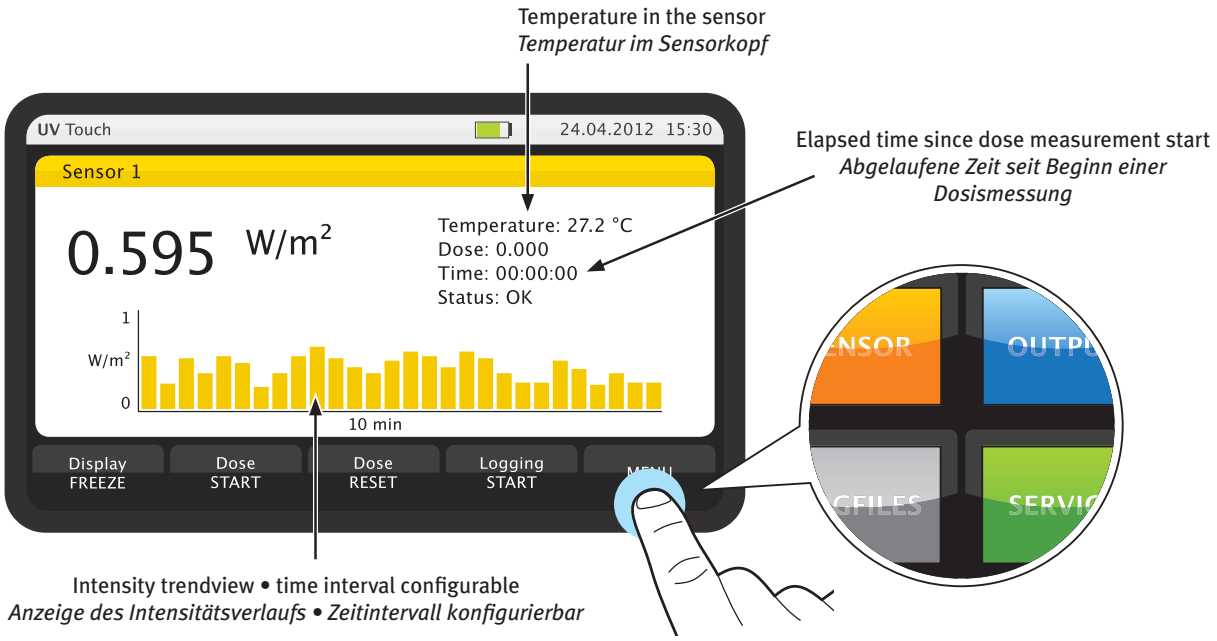
II. Getting started – *Inbetriebnahme*



III. Handling – *Handhabung*



Main screen and menus – *Hauptbildschirm und Menus*



Setting of irradiation and area units, determination of sensor names

Einstellung von Einheiten der Bestrahlungsstärke und Bezugsfläche, Vergabe von Sensornamen

Configuration of switch outputs: Setting of thresholds, optional hysteresis and related measured output

Konfiguration der Schaltausgänge; Einstellung, auf welche Messgröße sich das Schaltsignal bezieht; Einstellung des Schwellwertes und einer möglichen Hysterese

Basic settings: date, time, language, temperature unit, logging interval, external control, configuration of the trend view length

Basiseinstellungen des Handgerätes: Datum, Uhrzeit, Sprache, Temperatureinheit, Logging-Intervall, externe Ansteuerung, Konfiguration der Verlaufsanzeige-Länge

Manufacturer information, upload of firmware updates

Hersteller-Informationen, Aufspielen von Firmwareupdates

Editing of logfiles, logfile transfer to USB flash drive

Editieren von Logging-Daten und Übertragung auf USB-Stick

Exit to main screen

Zurück zum Hauptbildschirm

Technical data, service information – *Technische Daten, Kontaktinformationen*

Dimensions (W x H x D)/*Größe (B x H x T)*	175 x 117 x 37 mm
Weight/*Gewicht*	900 g
Operation temperature/*Betriebstemperatur*	0–50°C
Storage temperature/*Lagertemperatur*	-20–50°C
Supply voltage/*Betriebsspannung*	15 V
Power supply input voltage (multiplug consigned) *Betriebsspannung des Netzteils*	100–240VAC
Power consumption (standard conditions, battery fully charged) *Leistungsaufnahme im Normalbetrieb (Akku voll geladen)*	5 W
Power consumption while charging *Leistungsaufnahme während des Ladevorgangs*	28 W
Pressure/*Luftdruck*	300–1080 hPa
Rel. Humidity (non-condensing)/*Rel. Feuchte (nicht-kondensierend)*	< 70%
Battery lifetime (min.)/*Akkubetriebsdauer (min.)*	10 h
Calibration values/*Kalibrierwerte*	Stored in sensor/*Gespeichert im Messkopf*
Dynamic range/*Dynamikbereich*	> 5 Decades/> *5 Dekaden*
Power supply/*Stromversorgung*	Internal battery, power supply unit/ *Interner Akku, Netzteil*
Data storage/*Messwertspeicher*	> 11.000.000 Measurements/*Messungen*
Measurement range/*Messbereich*	s. Sensor
Display/*Display*	4,3“ TFT
Housing material/*Gehäusematerial*	Aluminium
Protection level/*Schutzklasse*	IP 62

Attention! While operating the UVTOUCH the following must be observed:
Do not expose the UVTOUCH to direct sunlight, intense heat radiation, or high electro-magnetic radiation. Please connect the UVTOUCH USB-port to a USB flashdrive only. Do not connect the USB port to a computer. Use the UVTOUCH with the provided power supply only.
While charging the ambient temperature must not exceed 40°C (104°F).

Achtung! *Bei der Benutzung des UVTOUCH Handheld ist folgendes zu beachten:*
Gerät keiner direkten Sonneneinstrahlung, keiner intensiven Wärmebestrahlung und keiner starken ektromagnetischen Strahlung aussetzen. USB-Anschluss am UVTOUCH ausschließlich mit einem USB-Stick verbinden. Nicht an einen Computer anschließen. Gerät nur mit dem mitgelieferten Netzteil betreiben. Beim Ladevorgang darf die Umgebungstemperatur höchstens 40°C betragen.

Accessories/*Zubehör:* **IO-Box**

Logic input for external UVTOUCH control/*Logik-Eingang zur externen Steuerung des UVTOUCH*
Relais output for switching external devices/*Relais-Ausgänge zur Schaltung externer Geräte*

CE RoHS IP 62

Manufacturer: sglux GmbH; Agent: Boston Electronics Corp.

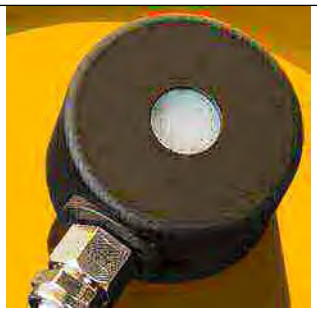
sglux *The UV Experts*

boselec@boselec.com
www.boselec.com
Tel **+1 (0) 617 566 3821**
Fax **+1 (0) 731 566 0935**
Boston Electronics Corporation
91 Boylston St, Brookline MA 02445

Digital UV SENSOR "UV-Surface-D" (DIGIPROBE)

Standard surface-mount 180° FOV digital UV Sensor

UV Sensor "UV-Surface-D" Standard surface-mount 180° FOV UV Sensor



UV–Surface–D

What is a Digital Sensor?

The sglux digital sensors convert the photocurrent generated by a Silicon Carbide (SiC) UV-photodiode into a numeric information. The digital sensors use the CAN bus protocol which is known from automotive applications. The benefit of a digital sensor compared with an analog sensor is a large dynamic range of 5 orders of magnitude (3 orders of magnitude if an analog sensor is used). Another benefit is an almost unlimited cable length and a perfect protection against electromagnetic influences.

Shall I use an analog or a digital sensor?

Today, most industrial optical sensor applications base on analog signal conversion technology where a voltage or current output is connected to the customer's analog input controller. These easy to apply analog sensors cover a broad range of aplications. The main benefit of a digital probe is its large dynamic range which allows to measure low radiation and strong radiation without changing the probe. An example is UV transmission measurement in waste water where the transmission changes within a large range depending on the water's pollution. A scientific lab should always use a digital probe instead of an analog probe due to higher versatility.

How to use the sglux digital sensors?

The digital sensors are connected to the sglux UVTOUCH radiometer or to customer's CAN bus controller. Alternatively, the sglux DIGIBOX (CAN-to-USB converter) is availabe where up to eight digital sensors can be connected. This box can be directly wired to the computer's USB port.

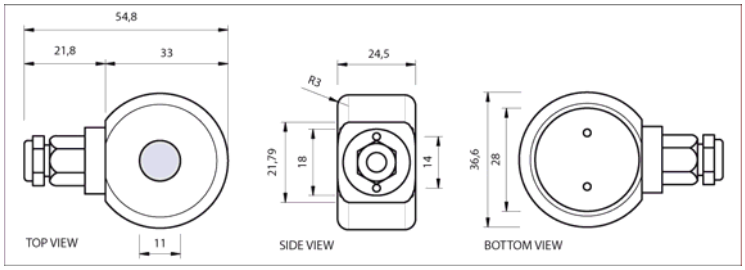
Description of the UV Sensor "UV-Surface-D"

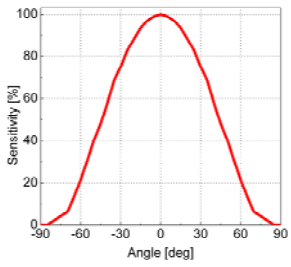
The digital sensor **UV-Surface-D** is a cosine corrected sensor to be used for industrial or scientific UV radiation measurements of radiation arriving at a surface, horizontal or vertical or any other orientation.

Configuration Facilities

Page 3 of this datasheet guides through an individual configuration procedure which allows to select the spectral response (STEP 1) and the sensitivity range (STEP 2) for your order.

Drawing	Field of View





Manufacturer: sglux GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA
(800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

Digital UV SENSOR "UV-Surface-D" (DIGIPROBE)

Standard surface-mount 180° FOV digital UV Sensor

Specifications

Fixed Specifications

Parameter	Value
Dimensions	please refer to the drawing
Signal Output	CAN bus signal, 125kbit/s Pin 1 GND, Pin 2 CAN low, Pin 4 V+, Pin 5 CAN high
VSCP protocol according to the following specifications: http://sourceforge.net/projects/m2m/files/VSCP%20Specification/	
Connection	2m cable with 8-Pin male connector (to converter or else) and 5 pin female connector (to the sensor)
Temp. Coefficient	<0,1%/K
Operating Temp.	-20…+80°C
Humidity	<80%, non condensing (water submersible on request)

Configurable Specifications

Parameter	Value
Absolute Sensitivity	100nW/cm^2 … 1mW/cm^2 or 5µW/cm^2 … 50mW/cm^2 or 1mW/cm^2 … 10W/cm^2
Spectral Sensitivity	UV-Broadband, UVA, UVB, UVC, UV-Index, UV+Blue, Blue

Please find the configuration guide at page 3 of this datasheet.

Accessories

UVTOUCH Radiometer

- 100% touch-screen controlled
- Dosimetry and datalogging
- Digital signal transmission from sensor (CAN bus)
- Compliant with GLP and LIMS standard
- Intuitive handling

CAN-to-USB converter box "DIGIBOX"

The DIGIBOX connects up to eight digital sglux UV sensors and evaluates their signal on a PC.
The freeware „DigiLog" has a logging function and shows actual values and trends. The software can also be used for sensor calibration.

The bundle DIGITAL SENSOR & DIGIBOX is a plug&play solution for high performance laboratory UV measurements.

Configuration Guide

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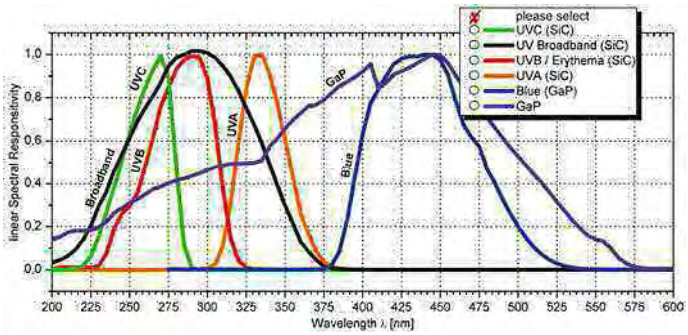
Digital UV SENSOR "UV-Surface-D" (DIGIPROBE)

Standard surface-mount 180° FOV digital UV Sensor

STEP 1 → Configuration of the Spectral Sensitivity



Please select one spectral sensitivity curve.

STEP 2 → Sensitivity

We configure the digital UV sensor for intensities across 10 orders of magnitude from 100nW/cm² to 10W/cm². Please select from our standard ranges listed below. Other ranges are available on request.

☒ **sglux standard ranges**

○ 100nW/cm² … 1mW/cm² ○ 5µW/cm² … 50mW/cm² ○ 1mW/cm² … 10W/cm²

Probe mechanical design overview

Besides the ticked mechanical design of this datasheet other mechanical designs are available.

	Type	Description
☒	**UV-Surface-D**	**Digital Standard surface-mount 180° FOV UV Sensor (this datasheet)**
○	UV-Air-D	Digital Axis oriented in-chamber UV Sensor
○	UV-Cosine-D	Digital Waterproof UV Sensor for outdoor use
○	UV-Water-D	Digital 10 bar water pressure proof UV Sensor
○	UV-DVGW-D	Digital UV Sensor for DVGW certified water purifiers

Calibration

We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

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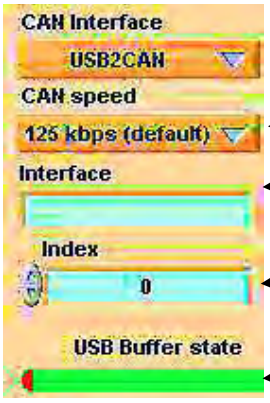
Digital UV SENSOR "DIGIPROBE"

High resolution UV measurement in a wide dynamic range

Software Functions in Detail



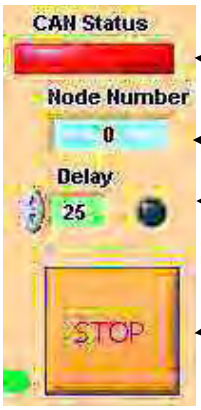
Choice of interface

Transfer rate

Name of the active interface. If connected to multiple Digibox interfaces, a selection is shown at the program start.

Index, if started at "0", this index equals to the number of passed measurements; can be increased for catenation of measurement dates.

Before the data transfer is done, a date pack (configurable under "Delay") is buffered. This bar shows the relative buffer status.



State of the Digibox green=connected; red=disconnected

Number of the used node (measurement channel)

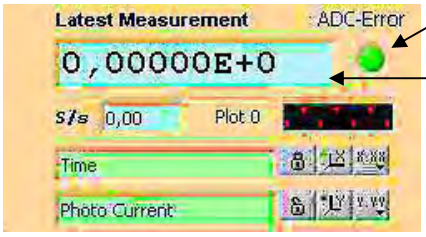
Amount of buffered data (see above.)

Button to start or end the measurement

File, in which the logging dates are written. Please type in the desired file before starting the measurement. It can be written into an already existing file.

The file cache shows the frequency in which the file is opened and written on.

The number of data before writing into the file can be set here.

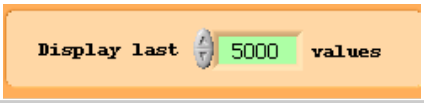


Error display at data transfer

Display of the actual measurement value

Settings of the format of time and measurement value, setting of axis labels and display frequency

The same settings are possible for the temperature measurement

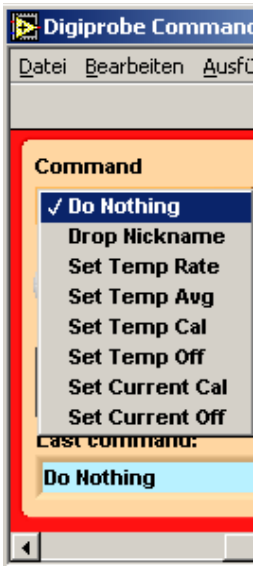


Amount of displayed values

Digital UV SENSOR "DIGIPROBE"

High resolution UV measurement in a wide dynamic range

Software – Command Window



In the command window all basic settings like changing of calibration values are done.

Caution: ***values are changed permanently. Preset calibration values will get lost!***

procedure:

1. Chose command
2. Chose node (measurement channel), which should receive the command.
3. Setting of new value (if applicable: note preset value)
4. click "execute"

At the Command drop-down menu the following choices can be done:

No action
New node name[1)]
Measurement rate temperature [2)]
Averaging, currently without function
Calibration temperature sensor
Offset calibration of temperature sensor
Calibration irradiation sensor [3)]
Offset calibration of irradiation sensor

[1)] The default node name can be changed here. This may be necessary if conflicts occur caused by multiple remitted names.

[2)] This measurement rate is chosen in relation to the measurement rate of the irradiation, which is measured constantly with 13,75Hz. Irradiation and temperature are measured after another.
That means:
1 measurement with 13,75Hz
2 measurement after each 2nd irradiation measurement
…

[3)] Calibration of irradiation:

1- set calibration value to 1, set offset to 0,
2- dark measurement, determine offset
3- balance offset
4- determine calibration value
5- set calibration value

DIGIBOX & Software DigiLog

CAN-to-USB converter box and evaluation software

The DIGIBOX is a CAN to USB converter box converting the CAN output signal of the digital sglux UV sensors into an USB signal. Up to eight sensors can be connected to the box.

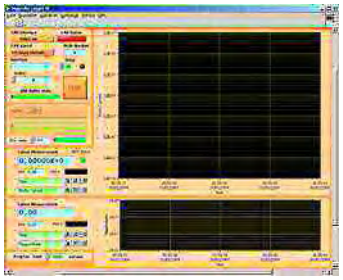
The free software „DigiLog" shows actual values and trends. A logging function is available. The software can also be used for sensor calibration.

Feature Overview of the DIGIBOX

Measurement	Conversion of CAN signal from sglux digital UV sensors into an USB signal
Output	USB-signal
Power Supply	via USB termial

Specifications of the DIGIBOX	Value	Unit
Weight	300	*g*
Dimensions	115 x 65 x 35	cm^3
Sensor inputs in standard configuration	2	-
USB cable length	2	*m*

Feature Overview of the Software DigiLog



The LabView® based free software "DigiLog" is tool for displaying and logging of irradiation and temperature data generated by the sglux digital sensors. The measurements and the data appearance can be customized. The output data is logged in a file.

The irradiation is displayed in the upper graphic window and the sensor temperature is shown below. In the left command column, the user can change various settings for the presentation and the logging. DigiLog runs with all MS Windows systems since Windows NT 4.0

Manufacturer: **sg***lux* GmbH; Agent: Boston Electronics, 91 Boylston St, Brookline MA 02445 USA (800)347-5445 or (617)566-3821; fax (617)731-0935; uv@boselec.com ; www.boselec.com

UV Probes from distributors

Boston Electronics Corporation
91 Boylston St
Brookline MA 02445 USA
uv@boselec.com
www.boselec.com

Prices for UV Sensor Probes (analog)

Model Number and Name Code	product information	Quantity	
		1 to 9	10 to 39
SEN1=UV-Surface	Standard surface-mount 180° FOV UV Sensor	$388	$333
SEN2=UV-Cosine	Waterproof UV Sensor for outdoor use	$324	$273
SEN3=UV-Air	Standard axis oriented in-chamber UV Sensor	$278	$238
SEN4=UV-Water	UV Sensor 10 bar water pressure proof	$415	$362
SEN5=UV-DVGW	UV Sensor for DVGW certified water purifiers	$406	$342
SEN6=UV-Cure	Sensor for hard UV radiation	$388	$333
Add Spectral Response Code to Model Number/Name Code			
SP1=UV Broadband	configure the sensor with a UV broadband SiC detector	$0	$0
SP2=UVA	configure the sensor with an UVA-only SiC detector	$47	$42
SP3=UVB/UV-Index	configure the sensor with an UVB-only/UV-Index SiC detector	$47	$42
SP4=UVC	configure the sensor with an UVC-only SiC detector	$47	$42
SP5=VIS	configure the sensor with a VIS detector	$116	inquire
Add Electrical Output type to Codes above			
SO1= 0...5V	configure the sensor with a 0...5 V signal output	$0	$0
SO2 = 4...20 mA	configure the sensor with a 4...20 mA signal output	$0	$0
SO3 = USB	configure the sensor with an USB signal output	$151	$142
SO4 = binary output for pulsed radiation	configure the sensor with a binary output	$187	$87
Add Sensitivity Code to Codes above			
IR1= 1nW/cm^2... 10µW/cm^2	configure the sensor for low intensities from 1nW/cm^2... 10µW/cm^2	$151	$138
IR2 = 10µW/cm^2... 100mW/cm^2	configure the sensor for medium intensities from 10µW/cm^2... 100mW/cm^2	$0	$0
IR3 = 100mW/cm^2... 10W/cm^2	configure the sensor for strong intensities from 100mW/cm^2... 10W/cm^2	$51	$49
Add Cable or connector code to Codes above			
CO1 = Cable	configure the sensor with a 2m shielded cable	$0	$0
CO2 = Plug	configure the sensor with a male 5pin plug with 2m cable	$55	$47
CO3 = Submersible	configure the sensor to be submersible	$96	$83

Prices for UV Sensor Probes (digital)

SEN8 = DIGIPROBE	digital UV sensor	$736	inquire
SEN10 = DIGIBOX	CAN to USB converter	$286	inquire
SEN12 = UV_Cosine_D	digital UV sensor in a PTFE housing	$736	inquire
SEN13 = UV_Air_D	digital axis oriented in-chamber UV Sensor	$736	inquire
SEN14 = UV_Water_D	digital UV sensor 10 bar water pressure proof	$736	inquire
SEN15 = UV_DVGW_D	digital UV sensor for DVGW certified water purifiers	$736	inquire
SEN7 = Measurement window	for certified UV sensors acc to DVGW 294-3	$175	inquire
ACC10 = Temp sensor	PT100 sensor for all probes	$187	inquire

Prices are in US Currency and subject to change without notice. Prices do NOT include shipping cost.
We accept Credit Cards
Payment terms are NET 30 days to customers whose credit we approve

Example: UV-Surface with UVC response, 4-20 mA output, expected 10 mW/cm input, and cable:
SEN1+SP4+SO2+IR2+CO1, $388 + $47 + $0 + $0 + $0 = $435