SiC UV Sensor Solutions




- **Robust SiC and GaP photodiodes in hermetic TO-style packages**
- **Integrated detector/preamplifer solutions - TOCONs**
- **Hardened UV probes for high reliability and extreme environments**
- **Accessories, calibration services, UV-Index measuring**
- **UV lamp monitoring**

sglux
The UV Experts

BostonElectronics

www.boselec.com | shop.boselec.com | uv@boselec.com | (617)566-3821

UV Solutions from Boston Electronics and sglux

Thank you for your interest in our **UV detection solutions**. In this catalog, you will find dedicated sections describing the full breadth of **sglux'** product offerings. In this catalog you will find discussions on the applications, tutorials on the technology and UV measurements, and information on sensor selection. The enclosed information should allow you to appropriately select the sensor you need for your specific application.

Sections:

- SiC UV Photodiodes
- UV TOCONS
- UV Probes
- Displays
- UV Calibration
- UV Spectrometer
- UV-Index Measurement

If you wish to look at a specific data sheet, please go to our website. You can also conveniently purchase from our web store. Also, do not hesitate to contact our applications staff so that they can answer any questions you have, and provide a quotation.

If you also have a need for **UV Light Emitting Diodes (UV LEDs)** please see our web store. We carry high performance, affordable solutions from **Violumas**.

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SiC UV Photodiodes

Application Guide

SIC UV PHOTODIODES

Content

GENERAL INFORMATION

about the sglux SiC UV photodiodes

About the material SiC

Applications that require UV photodiodes differ widely in required detector properties as well as in spectral and absolute sensitivity. In the field of flame detection very low radiation intensity must be reliably detected. The monitoring of UV purification lamps needs UV photodiodes that will operate in high UV brightness without degradation for many years. Monitoring of very powerful UV radiation emitted by UV curing lamps or LED arrays requires UV photodiodes that endure extreme UV radiation intensity. Monitoring the sun's UV, in particular the erythemal part of the sunlight requires photodiodes with perfect visible blindness and carefully tailored spectral response in the UV region.
Customers that apply Silicon Carbide UV photodiodes to these applications make the best choice within all these application variables. They profit from the very low dark current, near perfect visible blindness, bullet proof radiation hardness and low temperature coefficient of the signal, 0.1%/K. Operating temperature range is up to 170°C.

Our own SiC wafer production since 2009

Since 2009 sglux has produced its own SiC photodiodes, multielement linear SiC spectrometer arrays and SiC-quadrant chips. The sglux R&D team has almost 20 years of experience in producing UV sensitive semiconductor chips. This skill powered the SiC R&D work focusing on extreme radiation hardness. The German PTB in 2011 measured that the radiation hardness of the sglux SiC UV chips has improved by factor of two compared to 1st generation SiC, sensing chips produced by Cree, Inc. until 2007. Furthermore the visible blindness of the sglux chips was improved by five orders of magnitude compared with Cree SiC chips and now totals more than ten orders of magnitude of visible blindness. Please also refer to our list of publications (p. 17) of this catalog.

Photodiode amplification

In order to benefit from the superior properties of SiC UV photodiodes, carefully designed and produced amplifiers made of superior components are needed. Page 15 informs users about how to assemble and adjust such amplifiers. We support developers with a broad selection of ready-to-use amplifier modules. The sglux TOCON series are hybrid photodetectors in a TO5 housing that include such an amplifier stage and output a voltage of 0 to 5V. Please find more information about the TOCONs and the amplifiers at the sglux web-page.

SiC UV Photodiodes

Application Guide

OVERVIEW AT THE PORTFOLIO

that ranges from 0.06 mm² until 36.00 mm² active area photodiodes with different housings, simple optics filtered for UVA, UVB, UVC or UV-Index spectral response

Nomenclature

The UV photodiodes follow the below nomenclature. All part numbers start with SG01 indicating a sglux SiC UV photodiode. The following table shows the selection opportunities:

SG01

Chip area	Spectral response	Housing	Special
S, M, D, L, F, XL –	**nothing, A, B, C or E**	**18, 18ISO90, 18S, 5, 18ISO90S, 5ISO90**	**nothing, Lens, MEGA, GIGA, DIFFUSOR**
S 0.06 mm²	**nothing = broad band UV** λ_{max} = 280 nm $\lambda_{S10\%}$ = 221 nm ... 358 nm	**18** 2-pin TO18 housing, h = 5.2 mm, 1 pin isolated, 1 pin grounded	**Lens** with concentrating lens, TO5 only
M 0.20 mm²	**A = UVA** λ_{max} = 331 nm $\lambda_{S10\%}$ = 309 nm ... 367 nm	**18ISO90** 3-pin TO18 housing, h = 5.2 mm, 2 pins isolated, 1 pin grounded	**MEGA** with altenuator up to 0.5 W/cm^2
D 0.50 mm²	**B = UVB** s_{max} = 280 nm $\lambda_{S10\%}$ = 231 nm ... 309 nm	**18S** 2-pin TO18 housing, h = 3.7 mm, 1 pin isolated, 1 pin grounded	**GIGA** with altenuator up to 7 W/cm^2
L 1.00 mm²	**C = UVC** s_{max} = 275 nm $\lambda_{S10\%}$ = 225 nm ... 287 nm	**5** 2-pin TO5 housing, h = 4.3 mm for broadband; h = 6.7 mm for filtered UVA, UVB, UVC, UVI	**DIFFUSOR** with anorganic diffusor for cosine correction
F 1.82 mm²	**E = UV-Index** spectral response according to ISO 17166	**18ISO90S** 3-pin TO18 housing, h = 3.7 mm, 2 pins isolated, 1 pin grounded	
XL 7.60 mm²		**5ISO90** 3-pin TO5 housing, h = 4.2 mm, 2 pins isolated, 1 pin grounded	

Further information

- call us +49 30 53015211 or send us an email: welcome@sglux.com
- study the background information shown at the following pages of this catalog

SiC UV Photodiodes

Application Guide

TUTORIAL

to answer beginners and users questions about best use of SiC UV photodiodes

SiC UV Photodiodes

Application Guide

1.0 Selection of the chip active area (photocurrent limits)

The chip active area determines how many photons can be collected by a photodetector. Semiconductor detectors, such as SiC UV photodiodes, convert photons into an electrical current, the *PHOTOCURRENT I*. This photocurrent rises linearly with the irradiation power and the chip active area. sglux produces seven different area sizes:

A_1 = 0.06 mm² (S-type)
A_2 = 0.20 mm² (M-type)
A_3 = 0.50 mm² (D-type)
A_4 = 1.00 mm² (L-type)
A_5 = 1.82 mm² (F-type)
A_5 = 7.60 mm² (XL-type)
A_6 = 36 mm² (XXL-type)

As the detector price rises with increasing active area, the area selection basically is a compromise between costs and current.

If you know the minimum and maximum irradiance you like to measure with the UV photodiode the following simplified formula (1) shows a rough estimation of the photocurrent *I* given a particular chip active area A_{Chip}.

$$I = A_{CHIP} * E_{\lambda} * 1.000 \qquad (1)$$

where *I* is the photocurrent in nA, A_{CHIP} *IS THE CHIP ACTIVE AREA IN MM²* (enter values of 0.06 or 0.2 or 0.5 or 1 or 1.82, 7.6 or 36) and E_{λ} is the spectral irradiance of the UV light source you like to measure in mWcm⁻². You may find more information about photocurrent calculation in chapter 1.3 (Calculation of the relation between UV radiation and photocurrent), p. 7.

If you do not know the irradiance coming from your UV light source chapter 1. section 1.3 gives some examples of common UV sources.

The minimum current (photodiode output at lowest irradiance to be measured) should not fall below 500pA. The maximum current must not exceed 400mA if the component's diode properties are to be maintained. Please refer to a detailed discussion on suitable minimum and maximum currents in the following chapters 1. section 1.1 (Problems with current too low) and 1. section 1.2 (Problems with current too high). These chapters assume a certain basic knowledge in photodiode amplifier circuits. If you are not familiar with circuits please see Appendix A (Photodiode Amplification Notes) at p. 15.

1.1 Problems with current too low

If the current is too low, one ore more of the following problems (P_1 – P_4) may affect the measurement:

P_1 ⇢ The measurement signal comes too close to the UV photodiode dark current

P_2 ⇢ High resistance feedback resistors (R_F) must be used which causes temperature drift and non linearity problems

P_3 ⇢ Speed problems

P_4 ⇢ Risk of electromagnetic interferences

Using SiC, P_1 can be neglected due to the extremely low dark current of the sglux 4H SiC UV photodiodes of only some fA. P_2 (temperature drift and non linearity) becomes essential from values R_F > 10 GΩ. Therefore, the photocurrent I should be strong enough to allow R_F values of ≤ 10 GΩ. The relation between I and R_F is given by Ohm's law:

$$I = U_{SUPPLY} / R_F \qquad (2)$$

where U_{SUPPLY} is the supply voltage of the used transimpedance amplifier. A typical value is 5.00 V. Formula (2) calculates:

$$I_{MIN} = 5.00\text{V}/10\ \text{G}\Omega = 500\text{pA} \qquad (3)$$

If a higher speed measurement is needed P_3 (speed problems) could become an issue. As the SiC UV photodiode's detection speed is extremely high (in nanoseconds only) the amplifier speed (rise time) determines the circuit's speed. The amplifier rise time is calculated with the following formula:

$$\tau = R_F * C_F \qquad (4)$$

where C_F is the feedback capacitor value which should not be lower than 0.1 nF. A lower C_F risks hitting the circuit's resonance. Using a C_F = 0.1 nF and a R_F = 10 GΩ the rise time is calculated as follows:

$$\tau = 10\ \text{G}\Omega * 0.1\ \text{nF} = 1\ \text{second} \qquad (5)$$

Formula (5) shows that using a R_F = 10 GΩ the circuit becomes very slow. If a higher speed is needed the photocurrent I must be increased to allow a decrease in the R_F value. This can be done by increasing the UV radiation or, if that is not feasible, by increasing the chip active area.

The last problem (P_4) that can be caused with too low photocurrent (= due to too small an active area) is complications from electromagnetic interferences. This is a general issue. Decreasing photocurrents call for increasing shielding efforts which then increases the system price of the product. If the radiation (and thus the current) is low one should consider using a sglux TOCON amplified hybrid UV sensor.

Conclusion of needed minimum photocurrent I_{min}

To achieve a stable temperature and linear photodiode-amplifier system the lowest measurement current I_{MIN} should be higher than 500pA. If a high speed measuring circuit is needed I_{MIN} is calculated by the following formula:

$$I_{MIN} = U_{SUPPLY} * C_F * \tau^{-1} \qquad (6)$$

With U_{SUPPLY} = 5.00V (typical value), C_F = 0.1nF (recommended value) and R_F = 10 GΩ (lowest recommended value) the formula reduces to:

$$I_{MIN} = 500 * \tau^{-1} \qquad (7)$$

where I_{MIN} results in nanoamperes (nA) and τ must be in milliseconds.

In general, given these reasons, a decreasing photocurrent needs a more advanced amplifier design and better shielding. If you are not familiar with low current circuit development you should consider selecting a higher current (and thus larger active area) photodiode even if the price of a photodiode is higher. This strategy will provide conservative results and the initial increased financial cost will save you money in the long run.

1.2 Problems with current too high

In the previous pages we discussed the calculation of a minimum recommended photodiode current. It also should be mentioned that aside from the photocurrent being too low too high of a current may cause problems as well due to saturation effects. The saturation current I_{sat} of a photodiode is the current limit from which the output of a photodiode turns to arbitrary values. It is determined by the photodiode's open circuit voltage V_{OC} and its serial resistance R_S following the formula below:

$$I_{SAT} = V_{OC} / R_S \qquad (8)$$

A typical value (SiC photodiode) for V_{OC} is 2.0V and for R_S = 5Ω. The calculation is a follows:

$$I_{sat} = 2.0\text{ V} / 5\ \Omega = 400\text{mA}.$$

The needed minimum current (500 pA) is higher than the saturation curret by nine orders of magnitude. Reaching the saturation limit of a SiC photodiode is therefore very unlikely.

1.3 Calculation of the relation between UV radiation and photocurrent

The photocurrent I is calculated by the following formula:

$$I = \int_{200\,nm}^{400\,nm} A_{CHIP} * S_{CHIP}(\lambda) * E_{SOURCE}(\lambda) d\lambda \qquad (9)$$

where I is the photocurrent in A, A_{CHIP} *IS THE CHIP ACTIVE AREA IN* M^{2}. S_{chip} is the chip's spectral sensitivity in AW^{-1} and E_{λ} is the spectral irradiance of the UV light source in Wm^{-2}. Due to extreme visible and IR blindness (13 orders of magnitude) the integral value from 400nm to ∞ can be neglected even if $E_{source}(\lambda)$ is very strong. To get a rough estimate of the photocurrent generated by a certain irradiance a simplification of (9) leads to (10). That simplification assumes that the chip's spectral sensitivity S and the UV source's irradiance E is a constant value and does not depend on wavelength. The calculation is:

$$I = A_{CHIP} * S_{CHIP} * E_{\lambda} * 10.000 \qquad (10)$$

where I is the photocurrent in nA, A_{CHIP} *IS THE CHIP ACTIVE AREA IN* MM^{2}. S_{chip} is the chip's spectral sensitivity in AW^{-1} and E_{λ} is the spectral irradiance of the UV light source in $mWcm^{-2}$.

A typical value of S_{CHIP} *IS 0.1 A/W*. For further refinement please refer to the spectral response graph of the UV photodiode you are interested in (see Datasheet) or have a look at chapter 2.0 (Selection of the spectral response, p. 9) of this guide.

If you know the spectral irradiance range, (minimal and maximal values), of the UV light source and you would like to measure you can easily estimate the photocurrent I by using formula (10) and hence select a chip active area (S-, M-, D-, L-, F-, XL- or XXL-type) that guarantees that your minimum radiation generates a photocurrent of more than 500 pA. The following table lists some common UV applications / light sources with their spectral irradiances at peak. Please note that some simplifications apply; thus the table gives a rough estimation of photocurrents for the different UV source types and different chip active areas.

SiC UV Photodiodes

Application Guide

	TYP. PEAK E_λ	S-TYPE I	M-TYPE I	D-TYPE I	L-TYPE I	F-TYPE I	XL-TYPE I
lacquer hardening Fe doped HG medium pressure lamp or LED	10 W/cm²	**600 µA**	2 mA	5 mA	10 mA	18 mA	40 mA
UV sterilisation low or medium pressure HG lamp	10 mW/cm²	**600 nA**	2 µA	5 µA	10 µA	18 µA	40 µA
Other sources various sources	10 µW/cm² – 1 mW/cm²	0.6 – **40 nA**	**2 – 200 nA**	**5 – 500 nA**	**10 – 1000 nA**	**18 – 1800 nA**	**40 – 4000 nA**
UV-Index sun	10 µW/cm²	600 pA	**2 nA**	**5 nA**	**10 nA**	**18 nA**	**40 nA**
Burner flame detection gas or oil flame	10 nW/cm²	600 fA	2 pA **100 pA with "LENS" feature or use a TOCON**	5 pA **250 pA with "LENS" feature or use a TOCON**	10 pA **500 pA with "LENS" feature or use a TOCON**	18 pA **900 pA with "LENS" feature or use a TOCON**	40 pA

Comments:

- **Lacquer hardening**

S-chip is best. M, D, L, F, XL chips would work but are not needed.

- **UV sterilisation**

S-chip is best. M, D, L, F, XL chips would work but are not needed.

- **Other sources**

All chips are suited. Speed is the main consideration when selecting a chip being mindful of linearity and temperature dependence values. Please contact us for further refinement.

• **UV-Index**

S-Chips are too small for this application. All other chips can be applied. The reliability increases with increasing chip active area. Due to very low current the use of a TOCON (amplified hybrid sensor) should be considered.

• **Burner flame detection**

All chips are too small for this type of detection. A burner flame can be detected with the photodiode „SG01M-5Lens" or "SG01D-5Lens" or "SG01L-5Lens" or "SG01F-5Lens". This sensor works with a concentrating lens. Alternatively the photodiode "SG01F-5ISO90" (1.82 mm² active area) can be applied. However, this photodiode needs an external concentrator lens. Please refer to chapter 4.0. (Special features), for more information. Another approach is to use a sglux TOCON_ABC1 sensor with its included amplifier. The TOCON_ABC1 converts 0-18 nW/cm² radiation into a 0-5 V output voltage.

SiC UV Photodiodes

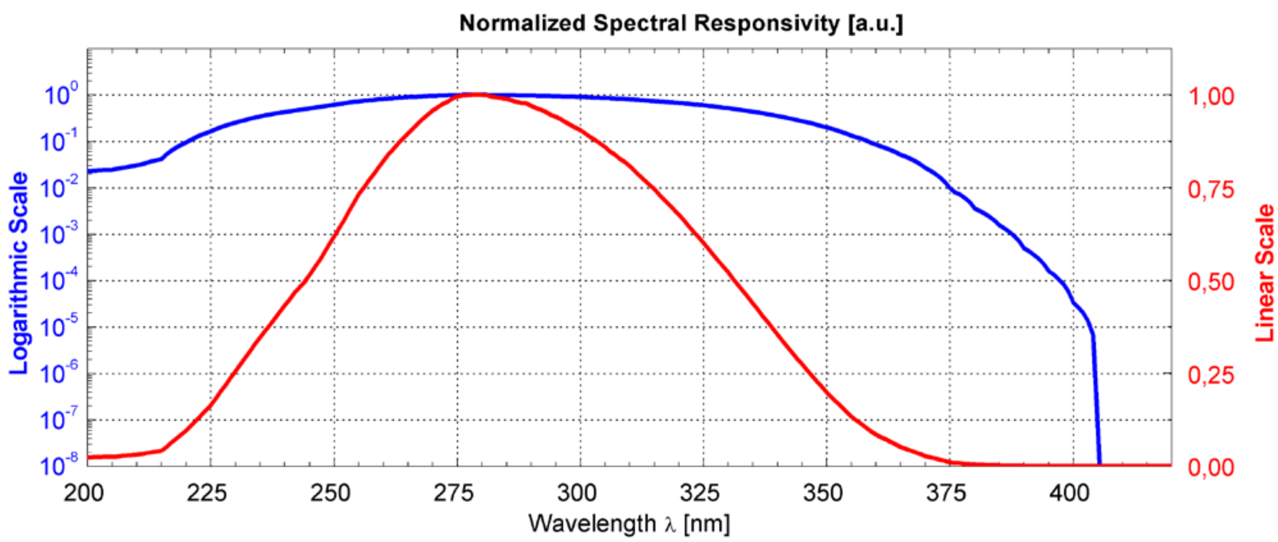
Application Guide

2.0 Selection of the spectral response

This chapter assists in the selection of a spectral response profile best suited for the measurement. All sglux 4H SiC UV photodiodes provide an extreme visible/IR blindness of more than ten orders of magnitude. That means that the UV photodiodes reliably only measure the UV part of a radiation spectrum (and not the visible and/or infrared part), even if visible light or infrared radiation is strongly present. This is a unique feature of the semiconductor material SiC. Currently no other material provides that extreme visible blindness.

2.1 Unfiltered SiC

The following graph shows the spectral curve of an unfiltered 4H SiC UV photodiode.



The curve's maximum is at approximately 280 nm. The response falls down to 10% of maximum at 221 nm, (UVC edge) and 358 nm, (UVA edge). Unfiltered SiC is the standard application and can be used for any UV measurements where the whole UV band needs to be measured or a quasi monochromatic UV source (such as low pressure lamps) is controlled.

SiC UV Photodiodes

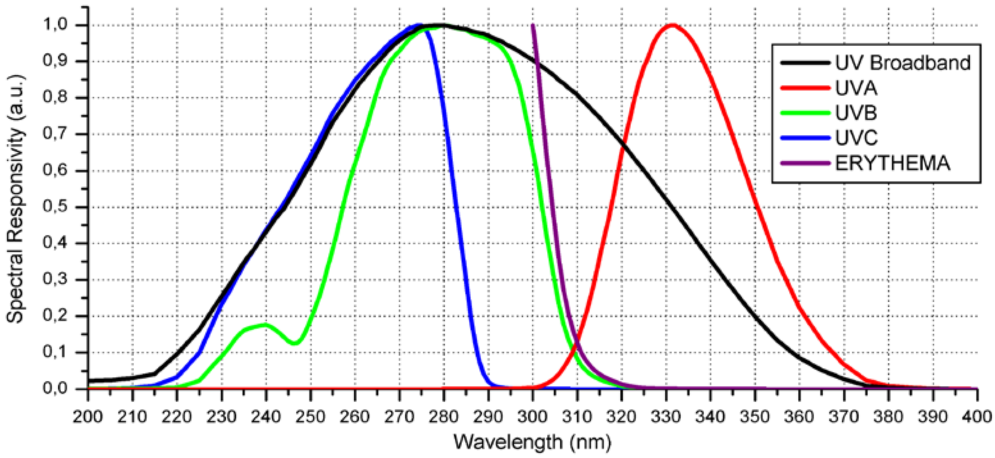
Application Guide

2.2 Filtered SiC

Some applications require measurement of one particular part of the UV radiation spectrum, and it is essential that other UV radiation parts do not contribute to the photodiode's current. This requirement usually arises from standards as DVGW W294/2006 or CIE087 (UV-Index) etc. Other applications for filtered photodiodes are UVA-UVB-UVC selective sensor probes. sglux produces four different filtered SiC UV photodiode types.

- UVA (max = 331 nm)
- UVB (max = 280 nm)
- UVC (max = 275 nm)
- UV-Index (following CIE087 curve)

The following graph shows the four different spectra.



The graph assigns the filtered photodiode's spectral response to an individual wavelength. The following table extracts the most important specifications.

	WAVELENGTH of max.	SENSITIVITY at max.	WAVELENGTH 10% left side	WAVELENGTH 10% right side	VISIBLE BLINDNESS
no filter (broadband UV)	280 nm	0.130 A/W	221 nm	358 nm	$>10^{10}$
UVA	331 nm	0.037 A/W	309 nm	367 nm	$>10^{10}$
UVB	280 nm	0.125 A/W	231 nm	309 nm	$>10^{10}$
UVC	275 nm	0.120 A/W	225 nm	287 nm	$>10^{10}$
ERYTHEMA	280 nm	0.125 A/W	–	310 nm	$>10^{10}$

Other spectral specifications are available on request.

3.0 Packaging features

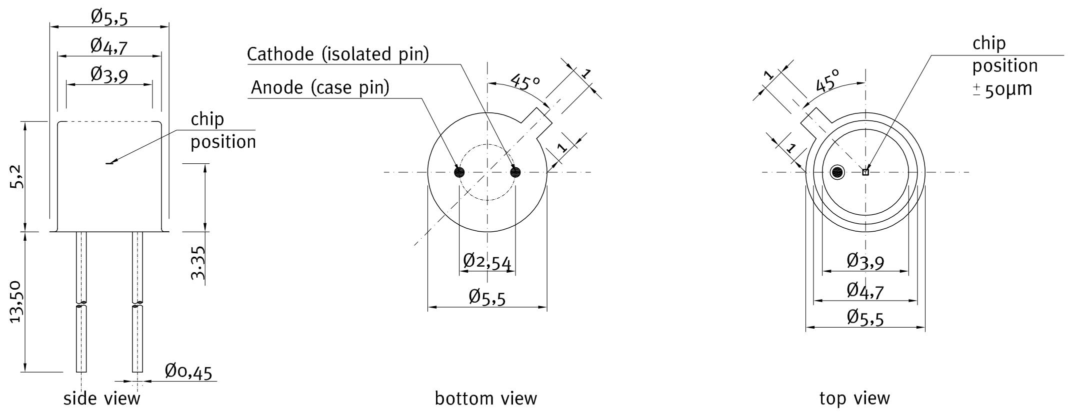
All sglux SiC UV photodiodes use a hermetically sealed melted window metal package. Each photodiode is gross and fine leak tested before sales. Two different sizes, (TO18 and TO5), with corresponding different heights and pin terminals are offered.

The reason for the different packaging types are technical in nature, (field of view, electrically floating housing, etc.) or just to allow the replacement of a previously applied photodiode by keeping the geometric parameters (footprint).

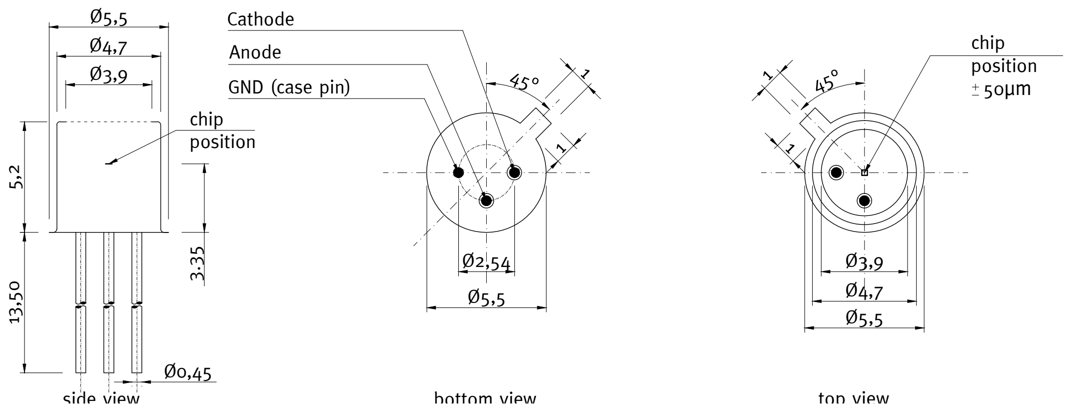
3.1 Overview

SAMPLE PICTURE	SELECTION CODE	DESCRIPTION
	18	TO18 Ni plated housing, 5.5 mm diameter, 5.2 mm height two gold plated pins (Anode grounded and Cathode isolated).
	18ISO90	TO18 Ni plated housing, 5.5 mm diameter, 5.2 mm height three gold plated pins (Anode and Cathode isolated, additional third pin for optional grounding of the body).
	18S	TO18 Ni plated short housing, 5.5 mm diameter, 3.7 mm height two gold plated pins (Anode grounded and Cathode isolated). Not available with filters.
	5	TO5 Ni plated housing, 9.2 mm diameter, 4.3 mm height (unfiltered photodiodes), 6.7 mm height (filtered photodiodes), two gold plated pins (Anode grounded and Cathode isolated).
	5ISO90	TO5 Ni plated housing, 9.2 mm diameter, 4.2 mm height (unfiltered photodiodes), 6.7 mm height (filtered photodiodes), three gold plated pins (Anode and Cathode isolated, additional third pin for optional grounding of the body).

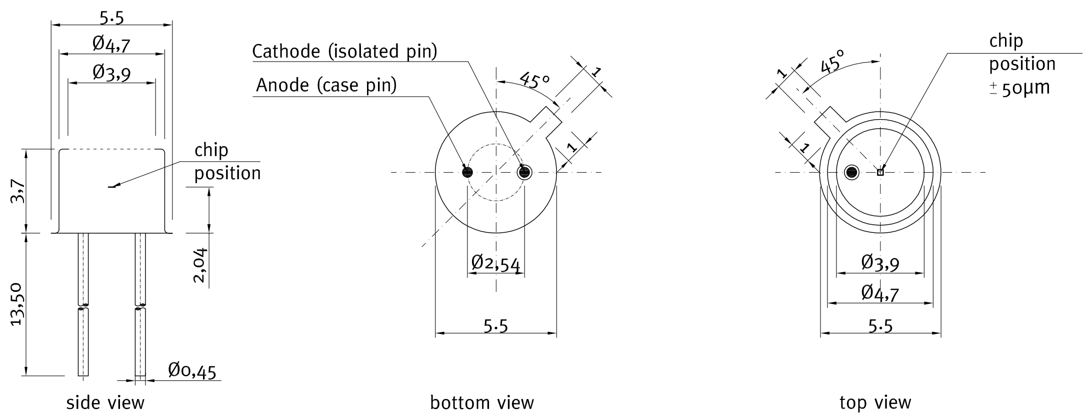
3.2 Drawings



Selection code "18" ····› TO18 Ni plated housing, 5.5 mm diameter, 5.2 mm height two gold plated pins (Anode grounded and Cathode isolated).



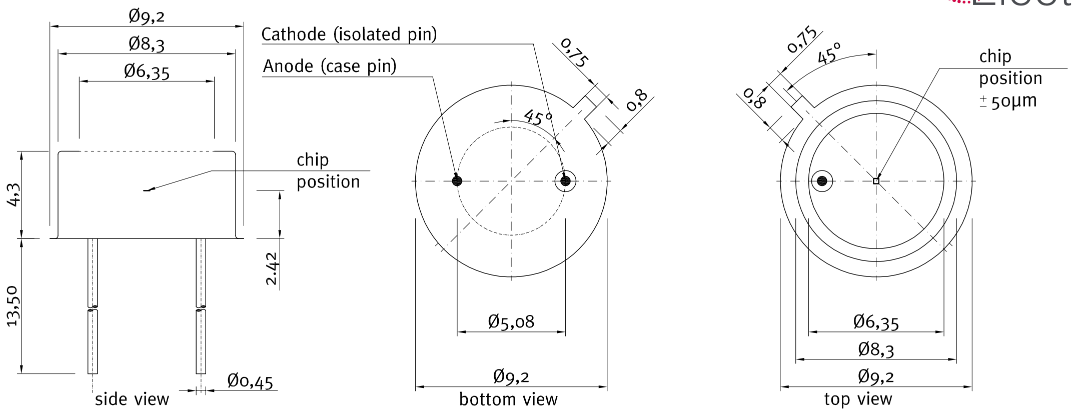
Selection code "18ISO90" ····› TO18 Ni plated housing, 5.5 mm diameter, 5.2 mm height three gold plated pins (Anode and Cathode isolated, additional third pin for optional grounding of the body).



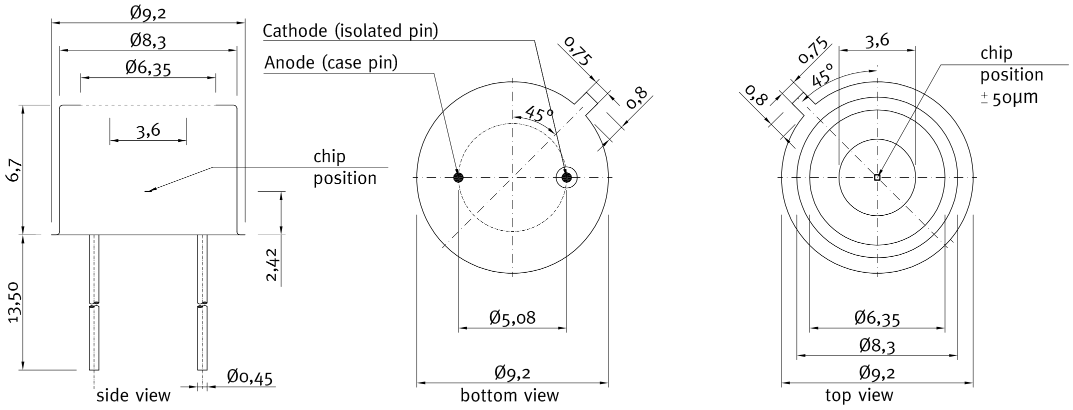
Selection code "18S" ····› TO18 Ni plated short housing, 5.5 mm diameter, 3.7 mm height two gold plated pins (Anode grounded and Cathode isolated). Not available with filters.

SiC UV Photodiodes

Application Guide



Selection Code "5" (photodiodes without filters) ⇢ TO5 Ni plated housing, 9.2 mm diameter, 4.3 mm height, two gold plated pins (Anode grounded and Cathode isolated).



Selection Code "5" (photodiodes with filters) ⇢ TO5 Ni plated housing, 9.2 mm diameter, 6.7 mm height, two gold plated pins (Anode grounded and Cathode isolated).

SiC UV Photodiodes

Application Guide

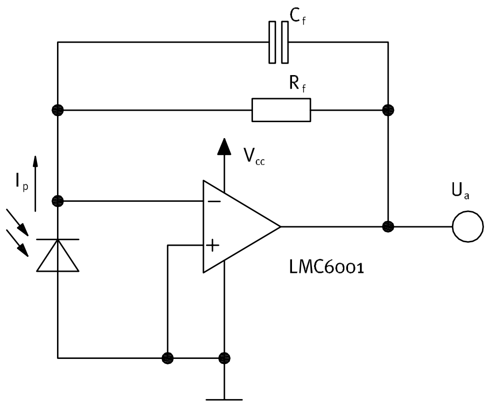
4.0 Special features

Besides the three main selection criteria chip active area, spectral response and packaging details some special features can be added to the photodiode's properties. These special features are useful if the UV radiation is extremely high or low or if a cosine FOV is needed. The below table shows the selectable special features.

SELECTION CODE	DESCRIPTION
Lens	 Concentrating lens creating a virtual active area of 55 * real active area. This approximately multiplies the current by factor 55 while using the same chip active area. A disadvantage is a strongly reduced field of view compared with the flat window type.
MEGA	special attenuated photodiode for very strong UV radiation up to 0.5 W/cm²
GIGA	special attenuated photodiode for extreme UV radiation up to 7 W/cm²
DIFFUSOR	with anorganic diffusor for cosine correction

Appendix A – Photodiode amplification notes

For a correct reading of the photodiode the current (and not the voltage) must be analyzed. This requires a short circuiting of the photodiode. Usual approaches are using a Picoamperemeter e.g. produced by Keithley or a *TRANSIMPEDANCE AMPLIFIER* circuit as shown below.



Calculations and Limits:

$U_a = I_p \times R_f = 0 \ldots \sim V_{cc}$

$U_{a,max}$ depends on load and amplifier type

$R_f = 10k\Omega \ldots \sim 10G\Omega$, $C_f \geq 3pF$

Recommendation: $R_f \times C_f \geq 10^{-3}s$

$I_{p,max} = U_{a,max} \div R_f$

Bandwidth $= DC \ldots \frac{1}{2\pi \times R_f \times C_f}$

Example:

$I_p = 20nA$, $R_f = 100M\Omega$, $C_f = 100\ pF$

$U_a = 20 \times 10^{-9}A \times 100 \times 10^{6}\Omega = 2V$

The adjacent design gives an example of a simple amplifier circuit. At the left side the photodiode is shown. The upper connection is the cathode (isolated pin of the photodiode) and the lower connection is the anode (usually grounded pin of the photodiode).

We recommend using a Texas Instruments LMC6001 transimpedance amplifier.

SiC UV Photodiodes

Application Guide

Upgrade to a TOCON or a PROBE

TOCONs = UV sensors with integrated amplifier

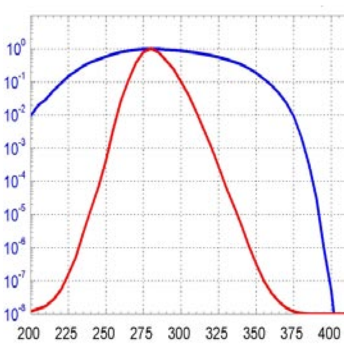
- SiC based UV hybrid detector with amplifier (0-5V output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
- Measures intensities from 1,8 pW/cm² up to 18 W/cm²
- UV broadband, UVA, UVB, UVC, Erythema measurements, blue and blue+VIS
- Different upgrades such as a M12x1 housing available

Miniature housing with M12x1 thread for the TOCON series

- Miniature housing with M12x1 thread for the TOCON series
- Optional feature for all TOCON detectors
- Robust stainless steel M12x1 thread body
- Integrated sensor connector (Binder 4-Pin plug) with 2m connector cable
- Easy to mount and connect

UV probes

- Different housings e.g. with cosine response, water pressure proof or sapphire windows
- Different electronic outputs configurable (voltage, current, USB, CAN, LAN)
- Good EMC safety



Calibration service

- Different NIST and PTB traceable calibrations and measurements for all sglux sensors
- Calibration of sensors for irradiation measurements
- Calibration of UV sensors on discrete wavelengths
- Determination of a specific spectral sensor responsivity

LIST OF PUBLICATIONS

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„Spectral irradiance measurement and actinic radiometer calibration for UV water disinfection“
Metrologia, Issue 51 (2014), *p. 282-288*.

P. Sperfeld[1], B. Barton[1], S. Pape[1], A. Towara[1], J. Eggers[2], G. Hopfenmueller[3]
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[3]sglux GmbH, Berlin, Germany
„Spectral Irradiance Measurement and Actinic Radiometer Calibration for UV Water Disinfection Proceedings of NEWRAD 2014, edited by S. Park, P. Kaerhae and E. Ikonen. (Aalto University, Espoo, Finland 2014) *p. 128.*

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[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany,
[2]sglux GmbH, Berlin, Germany
„Developing and setting up a calibration facility for UV sensors at high irradiance rates EMEA Regional Conference, Karlsruhe, Germany (2013)

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„Traceable spectral irradiance measurements at UV water disinfection facilities EMEA Regional Conference, Karlsruhe, Germany (2013)

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[1]sglux GmbH, Berlin, Germany, [2]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB),
4.1 Photometry and Applied Radiometry, Braunschweig, Germany
„PTB traceable calibrated reference UV radiometer for measurements at high irradiance medium pressure mercury discharge lamps EMEA Regional Conference, Karlsruhe, Germany (2013)

D. Prasai[1], W. John[1], L. Weixelbaum[1], O. Krueger[1] G. Wagner[2], P. Sperfeld[3], S. Nowy[3], D. Friedrich[3], S. Winter[3] and T. Weiss[4]
[1]Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik, Berlin, Germany,
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4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [4]sglux GmbH, Berlin, Germany
„Highly reliable silicon carbide photodiodes for visible-blind ultraviolet detector applications J.Mater.Res., firstview (2012)

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„Characterization of new optical diffusers used in high irradiance UV radiometers Proceedings of NEWRAD 2011, edited by S. Park and E. Ikonen. (Aalto University, Espoo, Finland, 2011) p. 278.1.

Ultraviolet (UV) TOCONS

- SiC based UV sensors with 0 to 5 V voltage output
- measures intensities from $1.8 pW/cm^2$ up to $18 W/cm^2$
- Broadband UV sensitivity or filtered for UVA, UVB, UVC or UV-Index spectral response
- GaP-chip based series for blue light hazard measurement

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TOCON

Selection Guide

TOCONS

Content of this Catalog

GENERAL INFORMATION ABOUT THE SGLUX TOCONS

What is a TOCON?

A TOCON is a UV photodetector that contains a SiC or a GaP detector chip and an amplifier circuit that outputs a voltage of 0 to 5 V. This output voltage is linear in proportion to the UV radiation intensity reaching the SiC chip. Compared with a bare UV photodiode the TOCON's big advantage is the amplifier's position inside the TO5 metal housing and its close proximity to the detector. This construction protects the usually very low current levels generated by the detector chip from electromagnetic interference and also from moisture and pollution induced disturbances. A point to be considered of the TOCON is the lower dynamic range (approx. 3 orders of magnitude) compared with a SiC UV photodiode (10 orders of magnitude). To overdome this disadvantage we offer each TOCON type in many different amplification levels to avoid saturation and too low voltage output levels for nearly all applications. Please consult the selection guide on page 2 for assistance selecting the best suited TOCON.

About the material SiC

Most of the TOCONs are based on Silicon Carbide (SiC). Applications that require UV photodiodes differ widely in both required detector properties as well as spectral and absolute sensitivity. In the field of flame detection very low radiation intensity must be reliably detected. The monitoring of UV purification lamps needs UV photodiodes without degradation for many years under high UV flux. Monitoring very powerful UV radiation emitted by UV curing lamps or LED arrays require UV photodiodes that endure extreme UV radiation. Monitoring the sun's UV, in particular the erythemal intensity of the sunlight requires photodiodes with a near-perfect visible blindness and carefully tailored spectral response in the UV region. Customers that apply Silicon Carbide UV photodiodes do the best selection within all fields of applicaton. They profit from very low dark current, near perfect visible blindness and "bullet proof" radiation hardness.

Our own SiC wafer production since 2009

Since 2009 sglux produces SiC photodiodes, SiC spectrometer arrays and SiC 4-quadrant chips. The sglux R&D team has almost 20 years of experience in producing UV sensitive semiconductor chips. This skill powered the SiC R&D work focusing on extreme radiation hardness. The German PTB in 2011 measured that the radiation hardness of the sglux SiC UV chips has improved by factor of two compared to UV sensing chips produced by Cree, Inc. until 2007. Furthermore the visible blindness of the sglux chips could be improved by five orders of magnitude compared with Cree SiC chips now totaling to more than ten orders of magnitude of visible blindness. Please also refer to our list of publications (p. 10) of this catalog.

TOCON

Selection Guide

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SELECTION GUIDE

Nomenclature

TOCON	ABC, A, B, C, E, blue or GaP	1 … 10
	Spectral response	**Irradiance limits (V_{supply}=5V, $\lambda=\lambda_{peak}$)**
	ABC = broadband λ_{max} = 290 nm $\lambda_{s10\%}$ = 227 nm … 360 nm	1 = 1.8 pW/cm² … 1.8 nW/ cm²
		2 = 18 pW/cm² … 180 nW/ cm²
	A = UVA λ_{max} = 331 nm $\lambda_{s10\%}$ = 309 nm … 367 nm	3 = 180 pW/cm² … 1.8 µW/ cm²
		4 = 1.8 nW/cm² … 18 µW/ cm²
	B = UVB λ_{max} = 280 nm $\lambda_{s10\%}$ = 243 nm … 303 nm	5 = 18 nW/cm² … 180 µW/ cm²
	C = UVC λ_{max} = 275 nm $\lambda_{s10\%}$ = 225 nm … 287 nm	6 = 180 nW/cm² … 1.8 mW/ cm²
		7 = 1.8 µW/cm² … 18 mW/ cm²
	Blue = blue light λ_{max} = 445 nm $\lambda_{s10\%}$ = 390 nm … 515 nm	8 = 18 µW/cm² … 180 mW/ cm²
	GaP = UV + VIS λ_{max} = 445 nm $\lambda_{s10\%}$ = 240 nm … 560 nm	9 = 180 µW/cm² … 1.8 W/ cm²
		10 = 1.8 mW/cm² … 18 W/ cm²
	E = UV-Index spectral response according to ISO 17166	2 = UVI 0 … 30

Some examples for different applications:

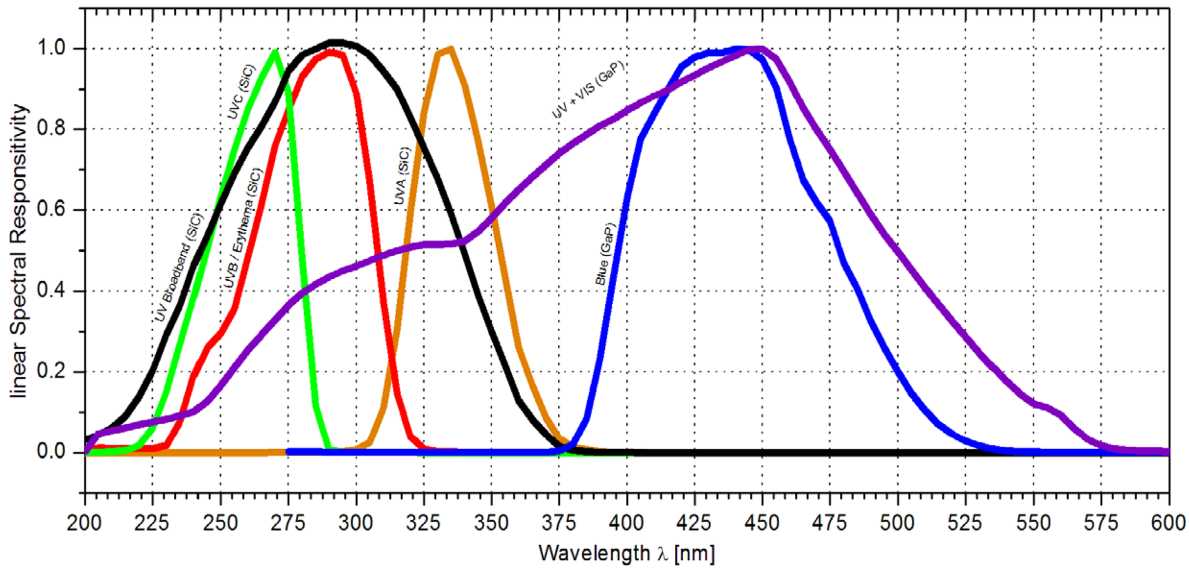
TOCON_ABC1	for flame detection
TOCON_C7	for water purification control
TOCON_E2	for UV-Index measurements

TOCON

Selection Guide

Selection of spectral response

The TOCONs are available with six different spectral responses, Broadband UV “**ABC”**, UVA **“A”** , UVB **“B”**, 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 our model overview (page 6) and the datasheet.

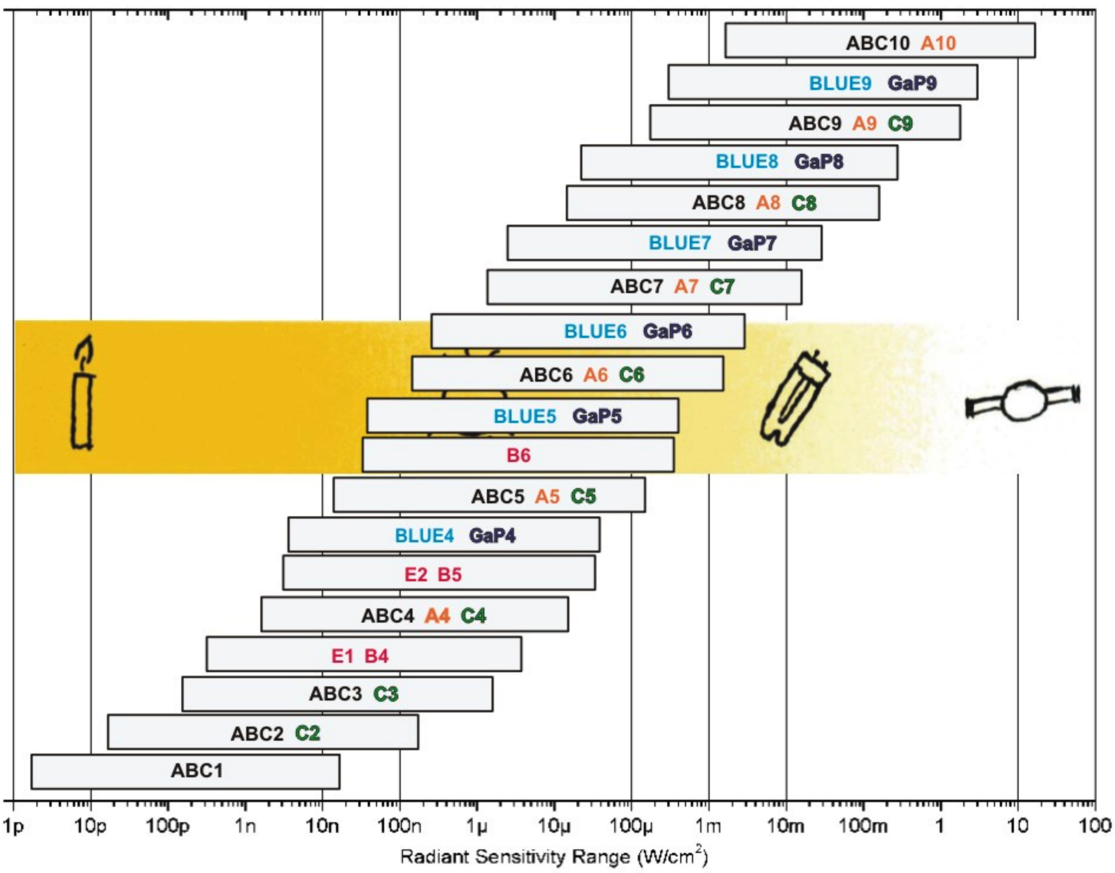


TOCON

Selection Guide

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). If not possible, we recommend to procure two samples with different sensitivities and have an experiment. The related min. radiation is lower by approx. factor 5000 – if the TOCON is powered with 5 V. It is possible to power the TOCON with lower voltages down to 2.5 V. However, this will reduce the dynamic range by factor 5 V/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 (e.g curing source). For detailed specification please refer to our model overview (page 6) and the datasheet.

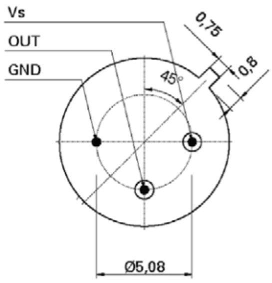


TOCON

Selection Guide

HOW TO USE A TOCON?

The 0 to 5 V output voltage can be directly connected to a voltmeter or a controller. The TOCON is to be supplied with a voltage of V_{supply} = 2.5 - 5 V_{DC} between pin V_s and pin *GND*. The voltage output signal is measured between pin *OUT* und pin *GND*.



PRODUCT DETAILS OF ALL TOCONs

General specifications

	SYMBOL	VALUE	UNIT
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Solding Temperature (3s)	T_{sold}	300	°C

General Characteristics			
Supply voltage	V_{supply}	-2.5 ... +5.0	V
Saturation voltage	V_{sat}	V_{supply} -5%	V
Dark offset voltage	V_{offset}	50	µV
Temperature coefficient	Tc	<-0.3	%/K
Current consumption	I	150	µA
Bandwith (-3 dB)	Q	15	Hz
Risetime (10–90%)	t_{rise}	0.058 – 0.182	s
(other risetimes on request)			

Spectral Characteristics (T = 25°C, V_{supply} = +5V)			
Typical respons. at peak wavelength	S_{max}	see next pages	nm
Wavelength of max. spectral responsivity	l_{max}	see next pages	nm
Responsivity range (S = 0.1 * S_{max})	–	see next pages	nm
SiC Visible blindness (S_{max} / $S_{>405nm}$)	VB	>10^{10} (SiC)	–

TOCON

Selection Guide

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TOCON model overview

Model	Approx. min. irradiance (mW/cm²)	Approx. max. irradiance (V_{supply} = 5V) (mW/cm²)	Applications
Broadband UV (SiC) Peak wavelength = 290 nm / sensivity range ($S = 0.1{*}S_{max}$) = 227 nm–360 nm			
TOCON ABC 1	1.80 E–09	1.80 E–05	Very low UV radiation detection, flame detection
TOCON ABC 2	1.80 E–08	1.80 E–04	Low UV radiation detection, occupational safety
TOCON ABC 3	1.80 E–07	1.80 E–03	UV radiation detection, occupational safety
TOCON ABC 4	1.80 E–06	1.80 E–02	UV irradiation measurement
TOCON ABC 5	1.80 E–05	1.80 E–01	UV irradiation measurement
TOCON ABC 6	1.80 E–04	1.80 E+00	Optimized for total sun UV measurements (not Erythema curve)
TOCON ABC 7	1.80 E–03	1.80 E+01	UV irradiation measurement, industrial standard UV radiation
TOCON ABC 8	1.80 E–02	1.80 E+02	Curing lamp control
TOCON ABC 9	1.80 E–01	1.80 E+03	Curing lamp control
TOCON ABC 10	1.80 E+00	1.80 E+04	UV hardening control and other very high radiation sources
UVA selective (SiC) Peak wavelength = 331 nm / sensivity range ($S = 0.1{*}S_{max}$) = 309 nm–367 nm			
TOCON A 4	1.80 E–06	1.80 E–02	UVA radiation detection
TOCON A 5	1.80 E–05	1.80 E–01	UVA irradiation measurement
TOCON A 6	1.80 E–04	1.80 E+00	UVA irradiation measurement
TOCON A 7	1.80 E–03	1.80 E+01	UVA irradiation measurement
TOCON A 8	1.80 E–02	1.80 E+02	Measurement of high UVA irradiation, curing lamp control
TOCON A 9	1.80 E–01	1.80 E+03	Measurement of very high UVA irradiation, curing lamp control
UVB + UVC selective (SiC) Peak wavelength = 280 nm / sensivity range ($S = 0.1{*}S_{max}$) = 243 nm–303 nm for UVB + UVC measurements and for Erythema Curve, complies with ISO 17166 and DIN5050			
TOCON B 4	7.50 E–07	7.50 E–03	UVB irradiation measurement
TOCON B 5	7.50 E–06	7.50 E–02	UVB irradiation measurement
TOCON B 6	7.50 E–05	7.50 E–01	UVB irradiation measurement
1 UVI input produces electrical output			
TOCON E 1	UVI 0.01	UVI 3	UV-Index measurements, if an attenuating diffusor is used
TOCON E 2	UVI 0.1	UVI 30	UV-Index measurements
TOCON_E_OEM	UVI 0.03	UVI 10	UV-Index measurements, designed to work with customers cosine correction dome

TOCON

Selection Guide

TOCON model overview

Model	Approx. min. irradiance (mW/cm²)	Approx. max. irradiance (V_{supply} = 5V) (mW/cm²)	Applications
UVC selective (SiC) Peak wavelength = 275 nm / sensivity range ($S = 0.1*S_{max}$) = 225 nm–287 nm; complies with DVGW W294(3) and ÖNorm			
TOCON C 1	1.80 E–08	1.80 E–04	UVA + UVB blind, for fire detection
TOCON C 2	1.80 E–08	1.80 E–04	Low UVC radiation detection, occupational safety
TOCON C 3	1.80 E–07	1.80 E–03	UVC radiation detection, occupational safety
TOCON C 4	1.80 E–06	1.80 E–02	UVC irradiation measurement
TOCON C 5	1.80 E–05	1.80 E–01	Purification lamp control
TOCON C 6	1.80 E–04	1.80 E + 00	Purification lamp control
TOCON C 7	1.80 E–03	1.80 E + 01	Purification lamp control
TOCON C 8	1.80 E–02	1.80 E + 02	Curing lamp control
TOCON C 9	1.80 E–01	1.80 E + 03	Curing lamp control
Blue Light (GaP) Peak wavelength = 445 nm / sensivity range ($S = 0.1*S_{max}$) = 390 nm–515 nm; complies with 2006/25/EC			
TOCON BLUE 4	9.00 E–07	9.00 E–03	Measurement of very low blue light irradiation, occupational safety
TOCON BLUE 5	9.00 E–06	9.00 E–02	Measurement of low blue light irradiation, occupational safety
TOCON BLUE 6	9.00 E–05	9.00 E–01	Measurement of blue light irradiation, occupational safety
TOCON BLUE 7	9.00 E–04	9.00 E + 00	Measurement of blue light irradiation, occupational safety
TOCON BLUE 8	9.00 E–03	9.00 E + 01	Measurement of high blue light irradiation, occupational safety
TOCON BLUE 9	9.00 E–02	9.00 E + 02	Measurement of very high blue light irradiation, occupational safety
UV + VIS (GaP) Peak wavelength = 445 nm / sensivity range ($S = 0.1*S_{max}$) = 240 nm–560 nm			
TOCON GaP 4	9.00 E–07	9.00 E–03	Measurement of very low UV & VIS light irradiation, occupational safety
TOCON GaP 5	9.00 E–06	9.00 E–02	Measurement of low UV & VIS light irradiation, occupational safety
TOCON GaP 6	9.00 E–05	9.00 E–01	Measurement of blue UV & VIS light irradiation, occupational safety
TOCON GaP 7	9.00 E–04	9.00 E + 00	Measurement of blue UV & VIS light irradiation, occupational safety
TOCON GaP 8	9.00 E–03	9.00 E + 01	Measurement of high UV & VIS light irradiation, occupational safety
TOCON GaP 9	9.00 E–02	9.00 E + 02	Measurement of very high UV & VIS light irradiation, occupational safety

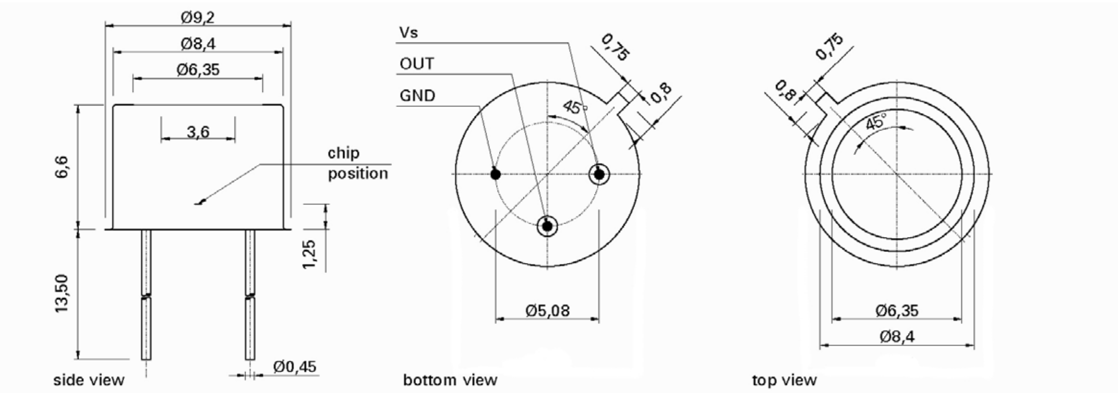
Accessories

TOCON housing	miniature stainless steel housing (M12x1) with TOCON installed and removable 4-pin connector with 2 m cable, easy to mount and connect, robust thread body, suitable for all TOCONs
TOCON PTFE housing	miniature PTFE housing (M12x1) with TOCON installed and removable 4-pin connector with 2 m cable, easy to mount and connect, dirt repellent
TOCON Water housing	miniature water pressure proof (10 bar) housing with G1/4“ thread with TOCON installed and removable 5-pin connector with 2 m cable, easy to mount and connect, dirt repellent
TOCON Starter Kit	Kit for initial testing setup, includes a TOCON socket, two banana plugs to connect with a voltmeter and a 9 V block battery

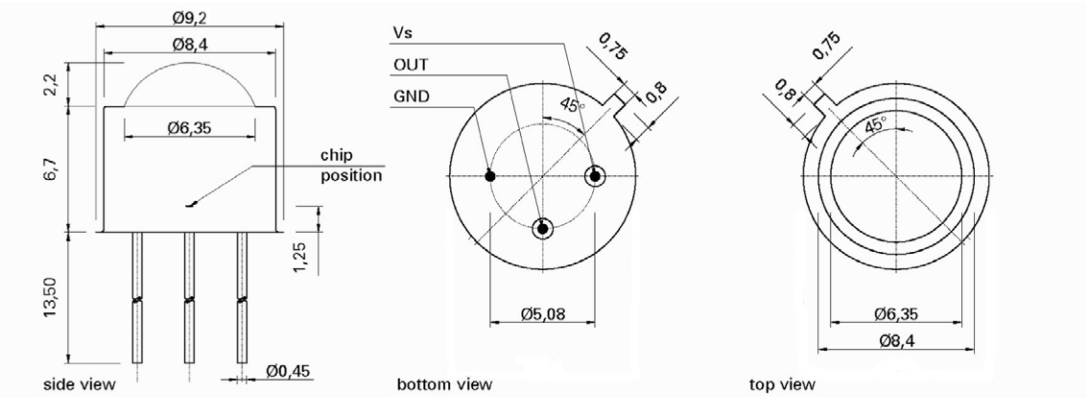
TOCON

Selection Guide

Drawings



TOCON in TO5 housing with filter, diffusor and / or attenuator



TOCON in TO5 housing with lens cap

Application note for TOCONs

The TOCONs need a supply voltage of V_{supply} = 2.5 to 5 VDC and can be directly connected to a controller or voltmeter. Please note that the theoretic maximum signal output is always a little less (approx. 5%) than the supply voltage. To learn more about perfect use of the TOCONs please refer to the TOCON FAQ list published at www.sglux.com. CAUTION! Wrong wiring leads to destruction of the device. For easy setup of the device please ask for a TOCON starter kit that contains a ready to use wired socket, a connector to a 9V battery, 2 banana plugs for V_{out}.

TOCON

Selection Guide

Accessories

TOCON steel housing

- Small housing for the TOCON series
- Supply voltage 7 to 24 V
- Robust stainless steel M12x1 thread body
- Integrated sensor connector (Binder 4-Pin plug) with 2 m connector cable
- Easy to mount and connect

TOCON PTFE housing

- Small housing for the TOCON series
- Supply voltage 7 to 24 V
- Material teflon (PTFE) M12x1 thread body, dirt-repellent, water proof at wetside (IP68), wide cosine field of view
- Integrated sensor connector (Binder 4-Pin plug) with 2 m connector cable
- Easy to mount and connect, cleanable

TOCON water PTFE

- Miniature housing for the TOCON series
- Supply voltage 7 to 24 V
- G1/4” thread, material Teflon (PTFE)
- 10 bar water pressure proof
- Integrated sensor connector (Binder 5-Pin plug) with 2 m connector cable
- Easy to mount and connect

Plastic probes for TOCON series

- UV probes in small plastic housings with a TOCON inside
- Customized housings available
- Easy to mount and to connect
- Integrated sensor connector (Binder 4-Pin plug)
- Connector cable available

TOCON Starter kit

- Optional feature for all TOCON detectors
- kit for easy initial testing setup
- output voltage 0 to 5 V
- 9 V block battey included, easy connection via banana plug ground

LIST OF PUBLICATIONS

P. Sperfeld[1], B. Barton[1], S. Pape[1], A. Towara[1], J. Eggers[2], G. Hopfenmueller[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), Germany, [2]DVGW-Technologiezentrum Wasser, Karlsruhe, Germany, [3]sglux GmbH, Berlin, Germany
„Spectral irradiance measurement and actinic radiometer calibration for UV water disinfection“
Metrologia, Issue 51 (2014), *p. 282-288*.

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[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [2]sglux GmbH, Berlin, Germany
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„Highly reliable silicon carbide photodiodes for visible-blind ultraviolet detector applications”
J. Mater. Res., first view (2012)

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AQUA
UV TOUCH

SiC Ultraviolet (UV) Probes

- Various optics and housings tailored for individual conditions of use
- 0 to 5 V voltage, 4 to 20 mA current loop or digital interface (CAN or USB) output options
- SiC photodiode chip based Broadband UV sensitivity or filtered for UVA, UVB, UVC or UV-Index spectral sensitivity

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SiC UV Sensor Probes

Catalog

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UV SENSOR PROBES

Content

GENERAL INFORMATION

about the sglux UV sensor probes

All sglux UV sensor probes contain a UV photodiode and an electronic circuitry to generate the desired signal output. That can be a voltage, a current or a digital information stream. The applications of UV sensor probes are quite varied and include use and survival at high temperatures, in rain, under water as well as in normal environments. Therefore the required optics, environmental endurance, spectral responsivity and electronic output interface must be tailored for individual conditions of use.

About the material SiC

Most of the UV probes base on Silicon Carbide (SiC) detector chips. A GaP-chip based series is available for blue light hazard measurement. Applications that require UV photodiodes differ widely in required detector properties as well as in spectral and absolute sensitivity. In the field of flame detection a very low radiation intensity must be reliably detected. The monitoring of UV purification lamps needs UV photodiodes that will operate in high UV brightness without degradation for many years. Monitoring of very powerful UV radiation emitted by UV curing lamps or LED arrays requires UV photodiodes that endure extreme UV radiation intensity. Monitoring the sun's UV, in particular the erythemal part of the sunlight requires photodiodes with perfect visible blindness and carefully tailored spectral response in the UV region. Customers that apply Silicon Carbide UV photodiodes to these applications make the best choice within all these application variables. They profit from the very low dark current, near perfect visible blindness, bullet proof radiation hardness (resistance to aging under high UV dose) and low temperature coefficient of the signal, ~ 0,1%/K.

Our own SiC wafer production since 2009

Since 2009 sglux has produced its own SiC photodiodes, multielement linear SiC spectrometer arrays and SiC-quadrant chips. The sglux R&D team has almost 20 years of experience in producing UV sensitive semiconductor chips. This skill powered the SiC R&D work focusing on extreme radiation hardness. The German PTB in 2011 measured that the radiation hardness of the sglux SiC UV chips has improved by factor of two compared to 1st generation SiC, sensing chips produced by Cree, Inc. until 2007. Furthermore the visible blindness of the sglux chips was improved by five orders of magnitude compared with Cree SiC chips and now totals more than ten orders of magnitude of visible blindness. Please also refer to our list of publications (p. 11) of this catalog.

SiC UV Sensor Probes

Catalog

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OVERVIEW OF THE FIXED AND VARIABLE PROPERTIES

Fixed Specifications **Parameter**	**Value**
Dimensions	please refer to drawing of the housings (next pages)
Temperature Coefficient (30 to 65°C)	0.05 to 0.075%/K
Operating Temperature	-20 to +80°C (+170°C)
Storage Temperature	-40 to +80°C (+170°C)
Humidity	< 80%, non condensing, submersible on request

Configurable Specifications **Parameter**	**Value**
Spectral Sensitivity	Broadband UV, UVA, UVB, UVC, UV-Index, Bluelight and UV+VIS
Signal Output	0 to 5 V or 4 to 20 mA or CAN bus signal (125kbit/s) or USB
Current Consumption	for 0 to 5 V = < 30 mA / for 4 to 20 mA = signal out / digital = < 17 mA
Connections	cable = 2 m cable with tinned leads on free end plug = 5 pin male connector with 2 m cable with tinned leads on free end CAN = 2 m cable with 8 pin male connector (to converter or else) USB = with 1.5 m cable with USB-A plug
Measuring Range	between 1 nW/cm² to 1 µW/cm² and 20 mW/cm² to 20 W/cm² for analog or 100 µW/cm² to 20 W/cm² for digital sensors (see p. 10)

The measuring range of **analog sglux UV sensors** is 3 orders of magnitude corresponding to 5 mV to 5 V or 4.02 mA to 20 mA output. The highest sensitivity range is 1 nW/cm² to 1 µW/cm². The lowest sensitivity range is 20 mW/cm² to 20 W/cm². The **digital sglux UV sensors** contain an integrated microprocessor that converts the UV radiation into 125kbit/s digital CAN bus data. A large dynamic range of 5 orders of magnitude allows to measure low radiation and strong radiation without changing the probe. Customers may specify any range between the mentioned limits.

SiC UV Sensor Probes

Catalog

AVAILABLE PROBE HOUSINGS

UV-Surface ⇢ Top looking surface-mount UV sensor

For UV radiation reference measurements of radiation exposed to a surface (diameter 38 mm).

UV-Air ⇢ Threaded body UV sensor

With M22x1.5 thread for many mounting possibilities i.e. inside UV radiation chambers.

UV-Cosine ⇢ Waterproof cosine corrected UV sensor for outdoor use

Stain repellent for outdoor or in-water measurements. Particularly suited for UV-Index measurements. (M20x1.5)

UV-Water-G3/4 ⇢ 10 bar water pressure proof UV sensor with G3/4" thread

Used in pressurized water systems. Suited for low and medium pressure lamps.

UV-Water-PTFE ⇢ 10 bar water pressure proof UV sensor with G1/4" thread

Used in pressurized water systems. Suited for low pressure lamps.

UV-DVGW ⇢ UV sensor for DVGW (40°) certified water purifiers

Complies with standard DVGW294-3(2006), suited for certified water purifiers.

UV-DVGW-160 ⇢ UV sensor for DVGW (160°) and ÖNORM certified water purifiers

Complies with standard DVGW294-3(2006) and ÖNORM 5873-2, suited for certified water purifiers with 160° FOV.

UV-Cure ⇢ Sensor for strong UV irradiation, working temperature up to 170° (338°F)

To control curing processes or other high temperature operations where strong UV light is present. (M22x1.5)

TOCON-Probe ⇢ Miniature UV sensor

Miniature UV sensor in M12x1 housing. Available with 0 to 5 V voltage output.

ACCESSORIES FOR ANALOG SENSOR PROBES

Sensor Monitor 5.0 measuring and control module

RADIKON ⇢ converter box and measurement controller

ACCESSORIES FOR DIGITAL SENSOR PROBES

UVTOUCH ⇢ digital multi-channel UV radiometer

DIGIBOX ⇢ CAN-to-USB converter

Control Pad ⇢ windows 8 based 10.1" tablet computer display unit

WINDOWS

WIN294 ⇢ measurement window acc. to DVGW 294-3 and ÖNORM M5873

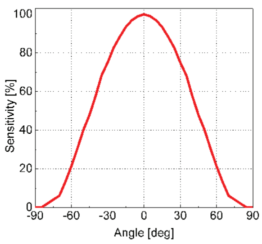
SiC UV Sensor Probes

Catalog

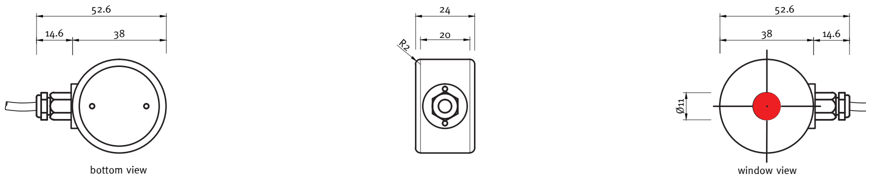
SELECTION GUIDE

UV sensor "UV-SURFACE"

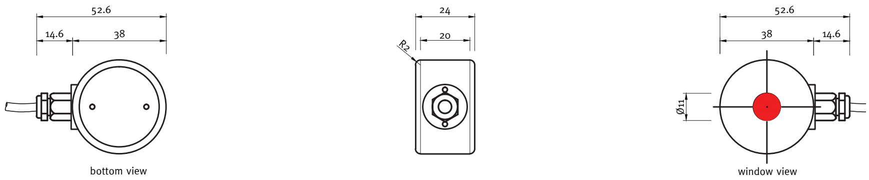
This UV sensor sensor is used for UV radiation reference measurements on surfaces exposed to UV light. It is available with a NIST or PTB traceable calibration. Cosine correction is available on request.



ANALOG CABLE

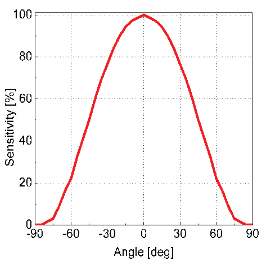


DIGITAL

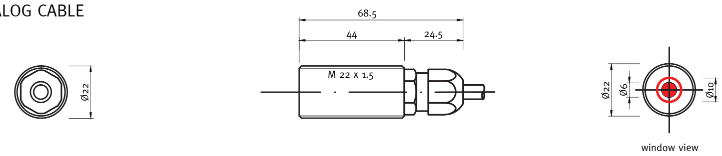


UV sensor "UV-AIR"

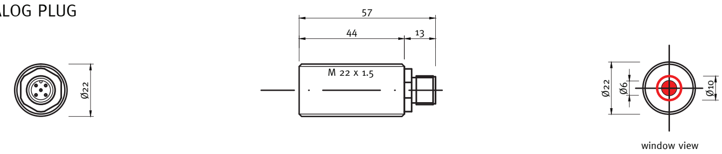
This UV sensor is a sensor with a male threaded body (M22x1.5). It is available with a NIST or PTB traceable calibration.

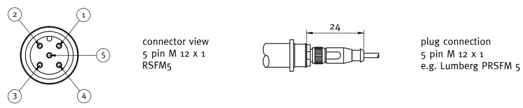


ANALOG CABLE

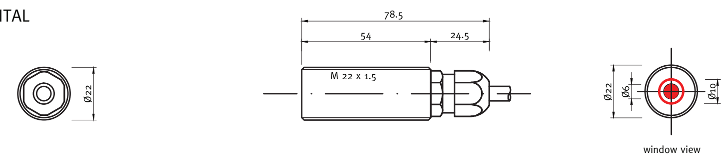


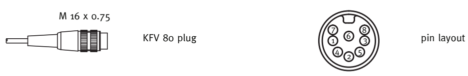
ANALOG PLUG





DIGITAL



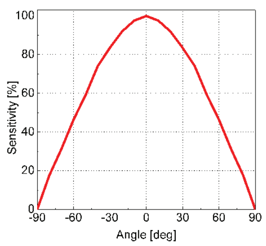


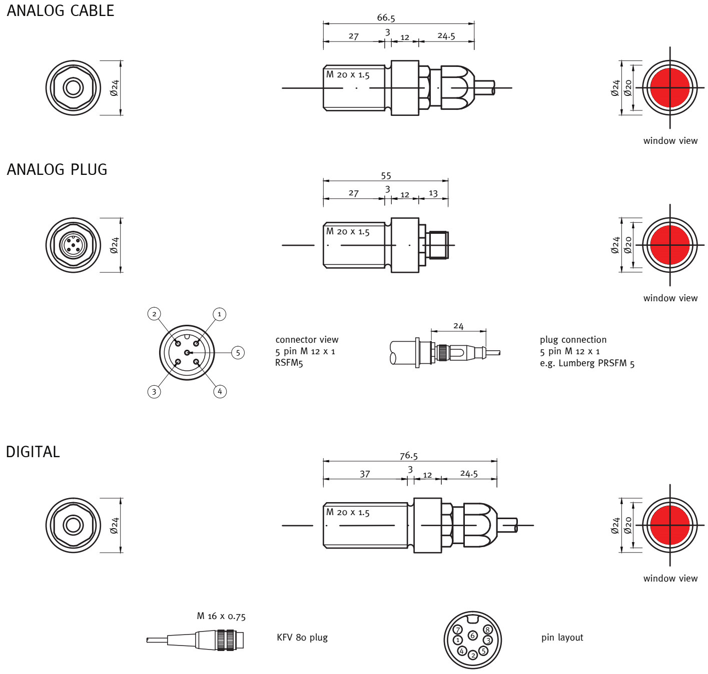
SiC UV Sensor Probes

Catalog

UV sensor “UV-COSINE”

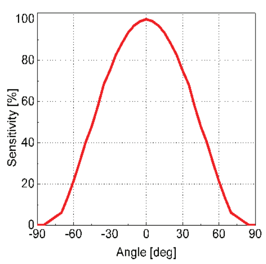
This UV sensor is a cosine corrected waterproof sensor with a male threaded body (M20x1.5). The PTFE housing is stain repellent. This UV sensor is suited for outdoor or in-water UV measurements. It is particularly suited for UV-Index measurements. The UV sensor is available with a NIST or PTB traceable calibration.

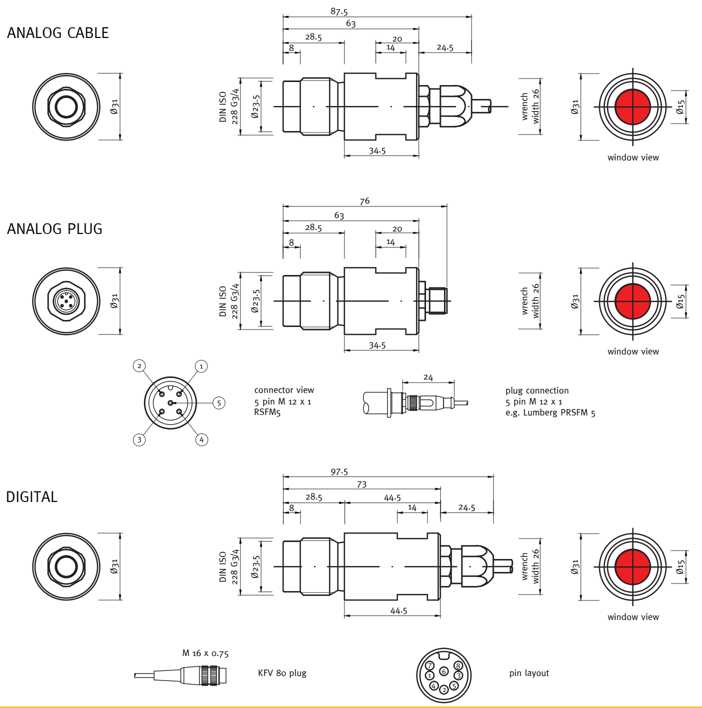




UV sensor “UV-WATER-G3/4”

This UV sensor is a waterproof (10 bar or 145 psi) sensor with a male threaded body (G3/4") to be used in pressurized water systems. It is suited for low and medium pressure lamps. The UV sensor is available with a NIST or PTB traceable calibration.





SiC UV Sensor Probes

Catalog

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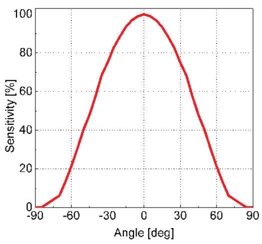
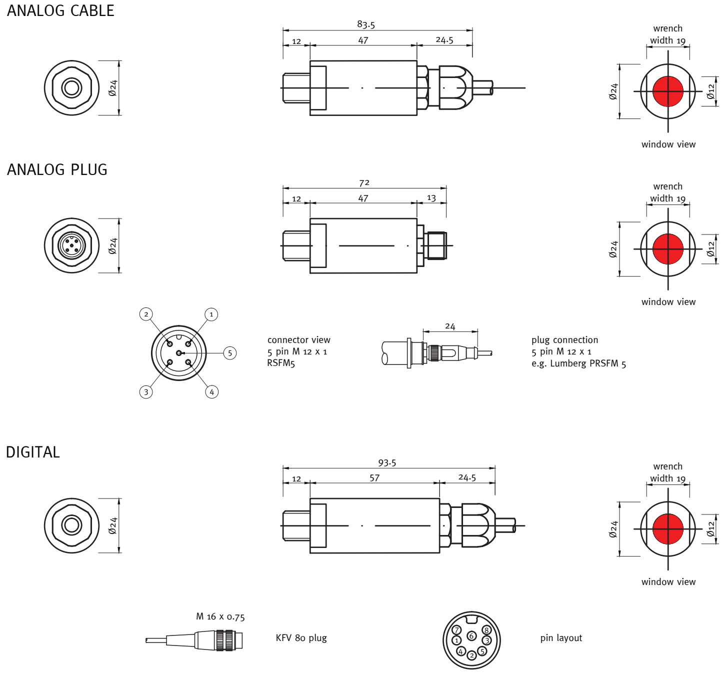
UV sensor “UV-WATER-PTFE”

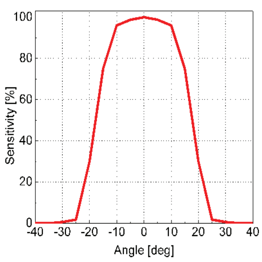
This UV sensor is a waterproof (10 bar or 145 psi) sensor with a G1/4" thread to be used in pressurized water systems. The sensor housing is made of Teflon (PTFE). The sensor is suited for low pressure lamps. The UV sensor is available with a NIST or PTB traceable calibration.

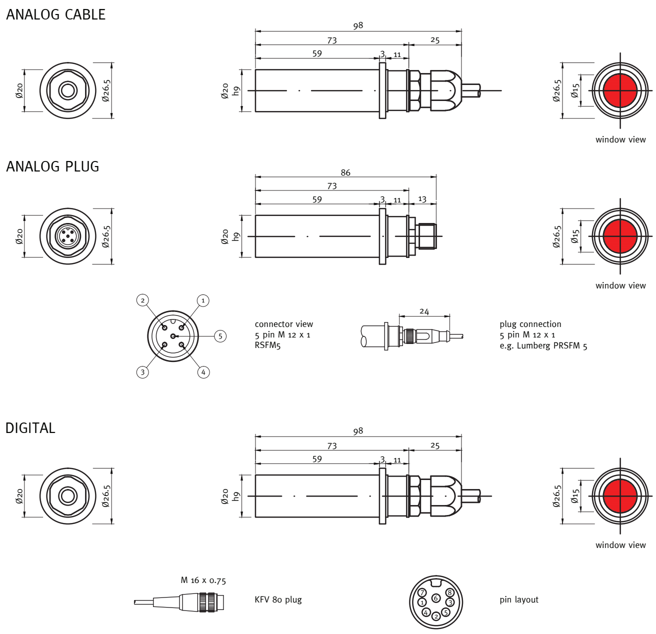




UV sensor “UV-DVGW”

This UV sensor is a special sensor for DVGW certified water purifiers with 40° field of view. It complies with the standard DVGW W294-3(2006). It is always delivered calibrated according to DVGW requirements. A water-proof measurement window ("WIN294") is available.



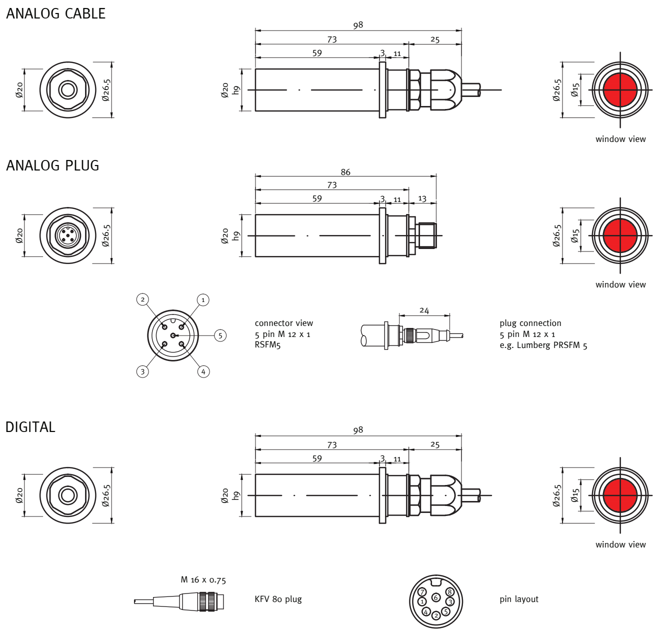


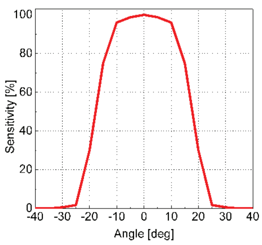
SiC UV Sensor Probes

Catalog

UV sensor "UV-DVGW-160"

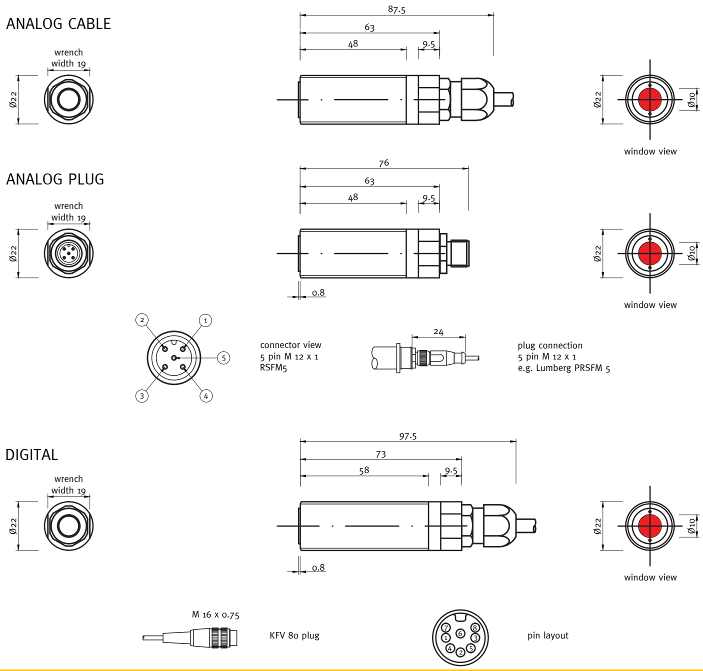
This UV sensor is a special sensor for DVGW and ÖNORM certified water purifiers with 160° field of view. Suitable for low pressure and medium pressure lamps. It complies with the standard DVGW W294-3(2006) and ÖNORM 5873-2. The UV sensor is always delivered calibrated according to DVGW and ÖNORM requirements. A water-proof measurement window ("WIN294") is available.

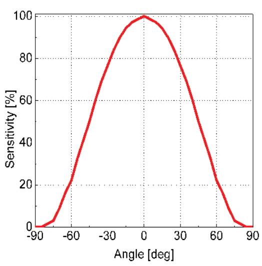




UV sensor "UV-CURE"

This UV sensor is an axial looking sensor with a male threaded body (M22x1.5) for measurement of high UV radiation to control i.e. curing or drying processes where strong UV light is present. It works with a diffuser made of radiation hard and temperature resistant microporous quartz glass. The UV sensor is available with a NIST or PTB traceable calibration.



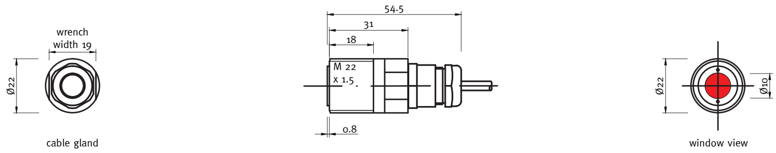


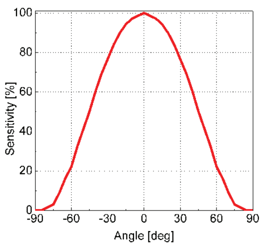
SiC UV Sensor Probes

Catalog

UV sensor “UV-CURE-HT”

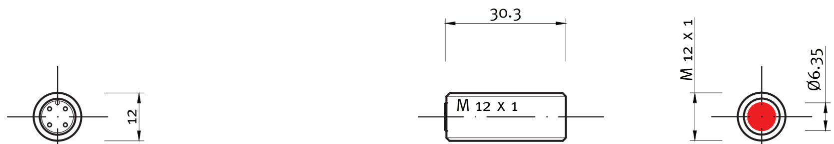
This UV sensor is an axial looking sensor with a male threaded body (M22x1.5) for measurement of high UV radiation at high temperature (up to 170°C / 338°F) e.g. for curing and drying processes. It works with a diffuser made of radiation hard and temperature resistant microporous quartz glass and is configured with a heat resistant cable. The signal output is photocurrent (nA to µA). The UV-Cure-HT needs an external amplifier (such as the sglux RADIKON).





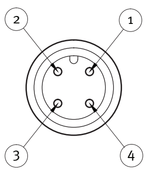
UV sensor “TOCON-Probe”

This UV sensor is a miniature UV sensor with a male threaded body (M12x1) configured with an amplified UV photodetector. The signal output is a voltage of 0 to 5 V. The UV sensor is available with a NIST or PTB traceable calibration.

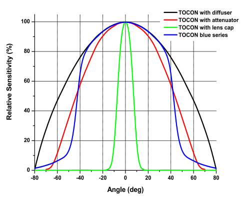


connector view
4 pin M 12 x 1
RSFM5

window view



plug connection
4 pin M 12 x 1
e.g. Lumberg PRSFM 5
$V_- = 2$, $V_+ = 4$, $V_{out} = 3$



SiC UV Sensor Probes

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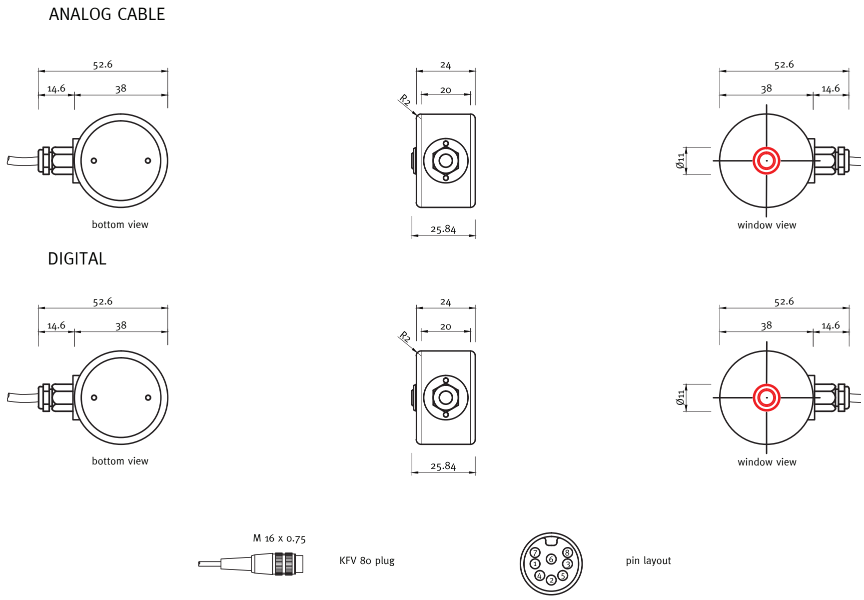
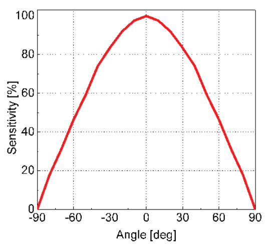
UV sensor "UV-SURFACE-UVI"

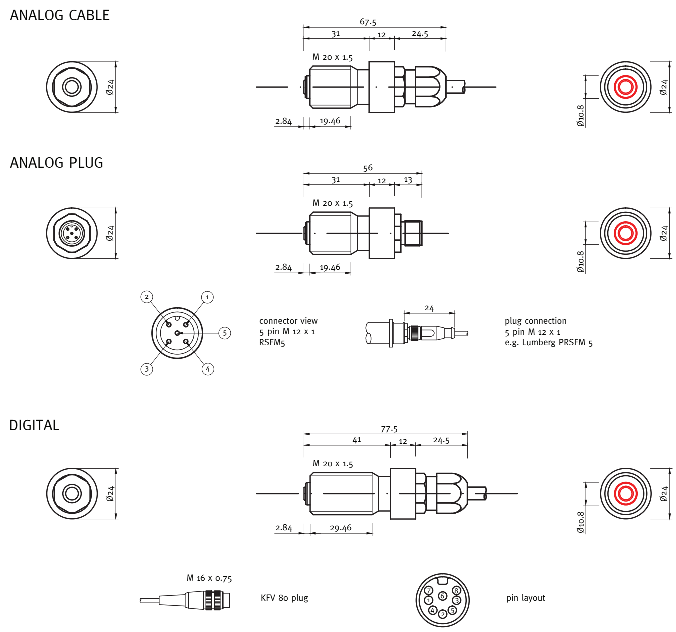
This UV sensor is designed for very high accuracy UV-Index measurements. The measurement mean error of this sensor is 1.3% only. The spectral response curve and the field of view (cosine type) are in near perfect accordance with the requirements defined in the ISO 17166 standard. The UV sensor is available with a PTB traceable calibration.

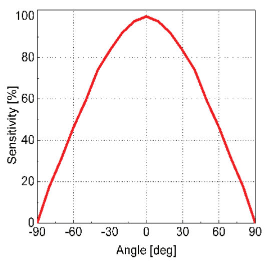




UV sensor "UV-COSINE-UVI"

This UV sensor is designed for very high accuracy UV-Index measurements. The measurement mean error of this sensor is 1.3% only. The spectral response curve and the field of view (cosine type) are in near perfect accordance with the requirements defined in the ISO 17166 standard. The housing is made of PTFE. It is waterproof and stain repellent with a male threaded body (M20x1.5). The UV sensor is available with a PTB traceable calibration.





SiC UV Sensor Probes

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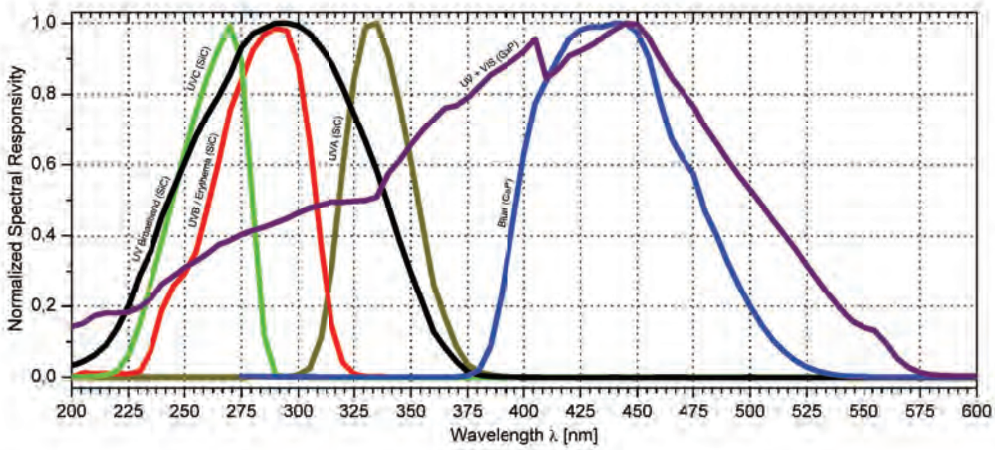
Sensor Requirements Questionaire Sheet

STEP 1 ⇢ Configuration of Normalized Spectral Responsivity



Please select

- ☐ Broadband UV (SiC)
- ☐ UVC (SiC)
- ☐ UVB/Erythema (SiC)
- ☐ UVA (SiC)
- ☐ Blue (GaP)
- ☐ UV + VIS (GaP)

STEP 2 ⇢ Signal Output Type Selection

Please tick your selection. The pin configuration is shown in drawings.

Output Type	**Description**	**Connection = "cable"**	**Connection = "male plug"**
☐ 0 to 5 V	0 to 5 V voltage output proportional to radiation input. Supply voltage is 7 to 24VDC, current consumption is < 30 mA.	☐ V_- = brown, V_+ = white, V_{out} = green, shield = black	☐ V_- = 1, V_+ = 4, V_{out} = 3
☐ 4 to 20 mA	4 to 20 mA current loop for PLC controllers. The current is proportional to the radiation, supply voltage is 24VDC.	☐ V_- = brown, V_+ = white, shield = black	☐ V_- = 1, V_+ = 4
☐ CAN bus signal	VSCP protocol according to the following specifications: http://download.sglux.de/probes-digital/vscp-protocol/	Pins 1 & 7 = CAN low Pins 3 & 8 = CAN high Pins 2 & 4 & 5 = GND	
☐ USB	The signal is transmitted via standard USB-A plug to a computer. Software and 1.5 m cable are included.		

STEP 3 ⇢ Measurement Range Selection

Please mark your approx. max. UV intensity to be measured. The dynamic range for analog UV sensors is 3 orders of magnitude and for digital UV sensors it is 5 orders of magnitude.

max. UV intensity	1µW/cm²	10µW/cm²	100µW/cm²	1 mW/cm²	10mW/cm²	100mW/cm²	1 W/cm²	10 W/cm²	20 W/cm²

SiC UV Sensor Probes

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LIST OF PUBLICATIONS

P. Sperfeld[1], B. Barton[1], S. Pape[1], A. Towara[1], J. Eggers[2], G. Hopfenmueller[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), Germany, [2]DVGW-Technologiezentrum Wasser, Karlsruhe, Germany,
[3]sglux GmbH, Berlin, Germany
„Spectral irradiance measurement and actinic radiometer calibration for UV water disinfection“
Metrologia, Issue 51 (2014), *p. 282-288*.

P. Sperfeld[1], B. Barton[1], S. Pape[1], A. Towara[1], J. Eggers[2], G. Hopfenmueller[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig and Berlin (PTB), Germany, [2]DVGW-Technologiezentrum Wasser, Karlsruhe, Germany,
[3]sglux GmbH, Berlin, Germany
„Spectral Irradiance Measurement and Actinic Radiometer Calibration for UV Water Disinfection Proceedings of NEWRAD 2014, edited by S. Park, P. Kaerhae and E. Ikonen. (Aalto University, Espoo, Finland 2014) *p. 128.*

B. Barton[1], P. Sperfeld[1], A. Towara[1], G. Hopfenmueller[2]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany,
[2]sglux GmbH, Berlin, Germany
„Developing and setting up a calibration facility for UV sensors at high irradiance rates EMEA Regional Conference, Karlsruhe, Germany (2013)

P. Sperfeld[1], B. Barton[1], S. Pape[1], G. Hopfenmueller[2]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany,
[2]sglux GmbH, Berlin, Germany
„Traceable spectral irradiance measurements at UV water disinfection facilities EMEA Regional Conference, Karlsruhe, Germany (2013)

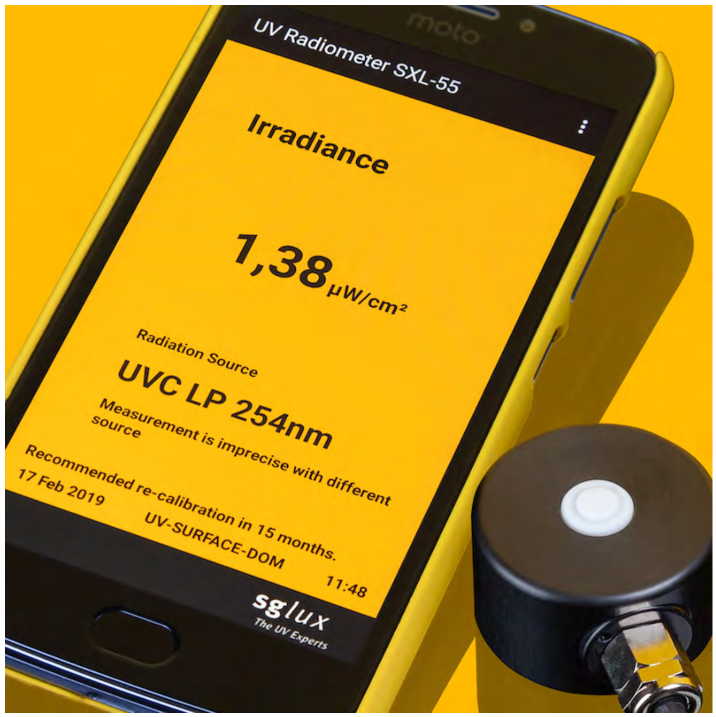
G. Hopfenmueller[1], T.Weiss[1], B. Barton[2], P. Sperfeld[2], S. Nowy[2], S. Pape[2], D. Friedrich[2], S. Winter[2], A. Towara[2], A. Hoepe[2], S. Teichert[2]
[1]sglux GmbH, Berlin, Germany, [2]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB),
4.1 Photometry and Applied Radiometry, Braunschweig, Germany
„PTB traceable calibrated reference UV radiometer for measurements at high irradiance medium pressure mercury discharge lamps EMEA Regional Conference, Karlsruhe, Germany (2013)

D. Prasai[1], W. John[1], L. Weixelbaum[1], O. Krueger[1] G. Wagner[2], P. Sperfeld[3], S. Nowy[3], D. Friedrich[3], S. Winter[3] and T. Weiss[4]
[1]Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik, Berlin, Germany,
[2]Leibniz-Institut fuer Kristallzuechtung, Berlin, Germany, [3]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB),
4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [4]sglux GmbH, Berlin, Germany
„Highly reliable silicon carbide photodiodes for visible-blind ultraviolet detector applications J. Mater. Res., first view (2012)

S. Nowy[1], B. Barton[1], S. Pape[1], P. Sperfeld[1], D. Friedrich[1], S. Winter[1], G. Hopfenmueller[2], and T. Weiss[2]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany,
[2]sglux GmbH, Berlin, Germany
„Characterization of SiC photodiodes for high irradiance UV radiometers Proceedings of NEWRAD 2011, edited by S. Park and E. Ikonen. (Aalto University, Espoo, Finland, 2011) *p. 203.*

B. Barton[1], P. Sperfeld[1], S. Nowy[1], A. Towara[1], A. Hoepe[1], S. Teichert[1], G. Hopfenmueller[2], M. Baer[3], and T. Kreuzberger[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB),
4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [2]sglux GmbH, Berlin, Germany, [3]SGIL Silicaglas GmbH, Langewiesen, Germany
„Characterization of new optical diffusers used in high irradiance UV radiometers Proceedings of NEWRAD 2011, edited by S. Park and E. Ikonen. (Aalto University, Espoo, Finland, 2011) p. 278.1.

UV Radiometers



- Radiometric measurements of UV radiation
- Easy-to-use Android applications - mobile phone based
- Exposure limits for UVC radiation
- Calibrated UV sensor probes
- Certified calibration laboratory at sglux

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www.boselec.com | shop.boselec.com | boselec@boselec.com | +1.617.566.3821

Ultraviolet (UV) Radiometers

Catalog

INTRODUCTION

A UV radiometer is needed for quantification and documentation of the impact of UV radiation on biological or chemical processes, as well as the UV effect on the health of human beings, animals, plants or material properties (i.e. occupational and environmental impacts).

The features of a UV radiometer of choice will depend on the individual customer's requirements or a standard/ guideline. The following UV radiometers are available for different purposes, viz. for validation of DVGW/ÖNORM duty sensors (DVGW W 294-3:2006 / ÖNORM M 5873); for UV hazard assessment in workplaces (2006/25/EC); and for the measurement of the UV Index (ISO 17166). The last category refers to UV radiometers that are configured and calibrated according to the customer's requirements and UV datalogger for long-term UV dosimetry.

We produce radiometers with "classical" appearance consisting of a handheld device and a UV sensor. Alternatively, our digital UV sensor can be connected to a Smartphone (Android) using an Android radiometer / dosimeter app.

The core components of a UV radiometer or datalogger are the UV sensor and the sensor's calibration. sglux is strictly committed to uncompromising quality, reliability and accuracy of the UV sensor and its calibration. Our quality management is DIN/ISO 9001 certified. Our well-equipped calibration laboratory works in close cooperation with governmental metrology authorities. Please find collaborative publications here (LINK). The calibration is PTB (Physikalisch-Technische Bundesanstalt, German National Metrology Institute) traceable, and works according to guideline DAkkS-DKD-MB-3 and the technical report CIE 220:2016.

REFERENCE RADIOMETERS FOR UV PURIFIER SENSOR VALIDATION

Reference radiometers are used to validate the calibration of UV duty sensors used in UV water purifiers.

UV purifiers use UV light to inactivate bacteria. These purifiers use UV duty sensors to control the UV light emission of the source (e.g. a low pressure UVC tube) and, eventually, to detect a fouling effect of UV transparent glass components of the purifier.

If a UV purifier is designed and operated according to the guidelines DVGW W 294-3:2006 or ÖNORM M 5873, the UV duty sensor needs (according to chapter 8.2 of the guidelines DVGW W 294-3:2006) a recalibration after 10,000 hours of operation or after two years of use. This recalibration is usually organized by the purifier's manufacturer.

The owners of purifiers need to regularly validate the duty sensor using a reference radiometer (designed according to guideline DVGW W 294-3:2006). This is done by replacing the duty sensor with the reference radiometer sensor, and comparison of the values. If these values deviate by more than 5 % the duty sensor needs to be recalibrated or replaced.

The sglux reference radiometers listed below are used for this purpose. We calibrate the reference radiometers using the world's first traceable calibration standard for high irradiation levels, in particular for UV water purification duty sensor calibration. sglux developed this standard in the years 2010 to 2012, in collaboration with the German PTB.

Please refer to our website (www.sglux.com) for datasheet download and price information of the products listed below.

Ultraviolet (UV) Radiometers
Catalog

UVRRM ÖNORM

Reference Radiometer for validation of ÖNORM/DVGW-160° duty sensors according to ÖNORM M 5873. The unit is powered by a 9 V battery that allows several years of use if infrequently used. The radiometer price includes a PTB traceable calibration.

UVRRM DVGW

Reference Radiometer for validation of DVGW-40° duty sensors according to DVGW W 294-3:2006. The unit is powered by a 9 V battery that allows several years of use if infrequently used. The radiometer price includes a PTB traceable calibration.

UVRRM DVGW 40° + ÖNORM 160°

Reference Radiometer with two sensors for validation of DVGW-40° and ÖNORM-160° duty sensors according to DVGW W 294-3:2006 and ÖNORM M 5873. The unit is powered by a 9 V battery that allows several years of use if infrequently used. The radiometer price includes a PTB traceable calibration.

AQUATOUCH

Reference Radiometer with two sensors for validation of DVGW-40° and ÖNORM-160° duty sensors according to DVGW W 294-3:2006 and ÖNORM M 5873. The AQUATOUCH device is designed for developers and for all-day use under harsh conditions. It offers a broad range of functions such as a datalogger, data export and graphic display with trend information. The radiometer price includes a PTB traceable calibration.

Ultraviolet (UV) Radiometers

Catalog

UV RADIOMETERS FOR UV HAZARD ASSESSMENT IN WORKPLACES

The radiometers are used for hazard assessment of artificial UV radiation in workplaces.

If a workplace in the European Union is suspected to be exposed to artificial UV radiation, a UV hazard assessment according to guideline 2006/25/EC needs to be done. This method ensures that the maximum dose of 30 J/m²/day (as defined by this guideline) will not be exceeded. Basically, the guideline stipulates that artificial UV radiation needs to be avoided as much as possible.

Harmful UV radiation needs to be suspected in companies that use or maintain UV polymerisation machines for lacquer or print hardening, or companies where UV radiation is used to disinfect air or liquids (e.g. hospitals, canteen kitchens or laundries).

The mandatory hazard assessment needs a suitable radiometer such as the sglux Safester UVC. These radiometers need a spectral responsivity according to Table 1.2 of the guideline 2006/25/EC and a calibration on the UV source used. The Safester UVC complies with class 1 (highest precision requirements) of DIN/ISO 5051-11 for actinic radiometers.

For a correct understanding of the measurement value obtained by such a radiometer, it is adequate to divide the exposure limit of 30 J/m²/day by the actual value and subsequently calculate the maximum exposure time. However, this procedure is quite impractical and prone to errors.

The special feature of the sglux Safester UVC is not just to display the measurement value, but also to calculate the maximum exposure time and to display this information using graphic symbols which are easy to understand. Based on this information, it is possible to generate actions to eliminate the harmful radiation. If this is not possible, e.g. during machine maintenance, suitable guidelines for skin and eye protection need to be developed, communicated and implemented.

Please refer to our website (www.sglux.com) for datasheet download and pricing information of the products listed below.

SAFESTER UVC

Radiometers for hazard assessment of artificial UV radiation emitted by low pressure UVC sources in workplaces, according to European Union guideline 2006/25/EC, visualization of the maximum exposure time per day, with acoustical and optical warning features.
The radiometers comply with class 1 (highest precision requirements) of DIN 5031-11 for actinic radiometers. The price includes the following:

- a UV sensor with PTB traceable calibration
- a calibration certificate and,
- a Smartphone.

The Safester UVC is also available without the Smartphone as a software download.

MEASUREMENT OF THE SOLAR UV INDEX ACCORDING TO ISO 17166

The radiometers are used to measure the UV Index according to the ISO 17166 standard.

The UV Index quantifies the risk of sunburn at a given exposure to solar radiation. The ISO 17166 standard defines the scientific background and the requirements for UV Index radiometers. The sglux UV Index radiometers are renowned worldwide for their high precision (= lowest measurement uncertainty) and are used by governmental institutions that use the obtained value to carry out their duty of informing the respective populations about the UV Index.

The Safester UVI radiometer is used by persons that need to pay special attention to solar UV radiation, in particular persons suffering from lupus erythematosus or xeroderma pigmentosum, or persons with increased risk of developing skin cancer. Another group of users are persons that by medical prescription and therapeutic purposes need to be exposed to UV radiation, such as psoriasis patients. Another important application of the Safester UVI is the documentation of the UV Index while investigating the impact of solar UV on plants or animals.

A UV Index radiometer should not be used for lifestyle reasons, e.g. to monitor solar UV exposure during sunbathing or outdoor activities. Even though sglux radiometers are extremely precise measuring instruments, the measured value can never replace the common sense together with daily local UVI forecast that should remind us to enjoy exposure to solar UV only in moderation.

Please refer to our website (www.sglux.com) for datasheet download and price information of the products listed below.

UV INDEX REFERENCE RADIOMETER (SMARTPHONE BASED)

Digital Smartphone (Android) based UV Index radiometer with graphic display for hazard assessment of natural UV radiation in workplaces according to the ISO 17166 standard (UV Index). The price includes a UV sensor with PTB traceable calibration, a calibration certificate and a Smartphone. The radiometer is also available without a Smartphone and a software download.

UV INDEX REFERENCE RADIOMETER (CLASSICAL DESIGN)

Digital UV Index radiometer with graphic display for hazard assessment of natural UV radiation in workplaces according to the ISO 17166 standard (UV Index). This device is designed for developers and for all-day use under harsh conditions. It offers a broad range of functions such as a datalogger, data export and graphic display with trend information. The price includes a UV sensor with PTB traceable calibration, and a calibration certificate.

OTHER UV RADIOMETERS AND UV DATALOGGERS

The radiometers are used to measure UV radiation of various processes conforming to various standards.

Industrial, medical or scientific processes use UV radiation to influence or modify the properties of materials or tissues. Usually this UV radiation needs to be quantified to guarantee the process reproducibility. Every process is distinct, with regard to the type of UV radiation and its intensity. A standard UV radiometer cannot be used; an individual calibration and a customized configuration are required instead. Furthermore, some applications require that the sensor device have a specific geometry, e.g. a side-looking sensor. sglux provides a customization service which are applicable to the radiometers listed below.

Please refer to our website (www.sglux.com) for datasheet download and price information of the products listed below.

UVTOUCH

Digital 2-channel UV radiometer with graphic display, touch screen, dosimeter and datalogging function. Data transmission (CAN) complies with GLP and LIMS standards. The UVTOUCH device is designed for developers and for all-day use under harsh conditions. The price includes one sglux UV sensor (free selection from the sglux line) and a customized PTB traceable calibration.

UV RADIOMETER SXL 55

Digital Smartphone (Android) based UV radiometer with graphic display and dosimeter function. Data transmission (CAN) complies with GLP and LIMS standards. The price includes one sglux UV sensor (free selection from the sglux line) and a customized PTB traceable calibration.

UVMICROLOG

Rugged UV datalogger for long-term monitoring of moving goods, persons or animals. It includes one customized UV sensor (broadband UV, UVA, UVB, UVC, erythema or v(lambda)) with PTB traceable calibration. Additional sensors for temperature, pressure, relative humidity, and illuminance (VIS) are available. The UVMicrolog stores up to 2,000,000 data records and is also available in an IP67 waterproof version.

UVMINILOG

Rugged UV datalogger for long-term monitoring of moving goods, persons or animals. It includes one or two customized UV sensors (broadband UV, UVA, UVB, UVC, erythema or v(lambda)) with PTB traceable calibration. Additional sensors for temperature, pressure, relative humidity, and illuminance (VIS) are available. The UVMinilog stores up to 2,000,000 data records. The battery lifetime is up to 18 months of permanent logging without re-charging of the battery.

Ultraviolet (UV) Radiometers

Catalog

LIST OF PUBLICATIONS

P. Sperfeld[1], B. Barton[1], S. Pape[1], A. Towara[1], J. Eggers[2], G. Hopfenmueller[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), Germany, [2]DVGW-Technologiezentrum Wasser, Karlsruhe, Germany, [3]sglux GmbH, Berlin, Germany

„Spectral irradiance measurement and actinic radiometer calibration for UV water disinfection"

Metrologia, Issue 51 (2014), *p. 282-288*.

P. Sperfeld[1], B. Barton[1], S. Pape[1], A. Towara[1], J. Eggers[2], G. Hopfenmueller[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig and Berlin (PTB), Germany, [2]DVGW-Technologiezentrum Wasser, Karlsruhe, Germany, [3]sglux GmbH, Berlin, Germany

„Spectral Irradiance Measurement and Actinic Radiometer Calibration for UV Water Disinfection"

Proceedings of NEWRAD 2014, edited by S. Park, P. Kaerhae and E. Ikonen. (Aalto University, Espoo, Finland 2014) *p. 128.*

B. Barton[1], P. Sperfeld[1], A. Towara[1], G. Hopfenmueller[2]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [2]sglux GmbH, Berlin, Germany

„Developing and setting up a calibration facility for UV sensors at high irradiance rates"

EMEA Regional Conference, Karlsruhe, Germany (2013)

P. Sperfeld[1], B. Barton[1], S. Pape[1], G. Hopfenmueller[2]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [2]sglux GmbH, Berlin, Germany

„Traceable spectral irradiance measurements at UV water disinfection facilities"

EMEA Regional Conference, Karlsruhe, Germany (2013)

G. Hopfenmueller[1], T.Weiss[1], B. Barton[2], P. Sperfeld[2], S. Nowy[2], S. Pape[2], D. Friedrich[2], S. Winter[2], A. Towara[2], A. Hoepe[2], S. Teichert[2]
[1]sglux GmbH, Berlin, Germany, [2]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany

„PTB traceable calibrated reference UV radiometer for measurements at high irradiance medium pressure mercury discharge lamps"

EMEA Regional Conference, Karlsruhe, Germany (2013)

D. Prasai[1], W. John[1], L. Weixelbaum[1], O. Krueger[1] G. Wagner[2], P. Sperfeld[3], S. Nowy[3], D. Friedrich[3], S. Winter[3] and T. Weiss[4]
[1]Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik, Berlin, Germany, [2]Leibniz-Institut fuer Kristallzuechtung, Berlin, Germany, [3]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [4]sglux GmbH, Berlin, Germany

„Highly reliable silicon carbide photodiodes for visible-blind ultraviolet detector applications"

J. Mater. Res., first view (2012)

S. Nowy[1], B. Barton[1], S. Pape[1], P. Sperfeld[1], D. Friedrich[1], S. Winter[1], G. Hopfenmueller[2], and T. Weiss[2]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [2]sglux GmbH, Berlin, Germany

„Characterization of SiC photodiodes for high irradiance UV radiometers"

Proceedings of NEWRAD2011, edited by S. Park and E. Ikonen. (Aalto University, Espoo, Finland, 2011) *p. 203.*

B. Barton[1], P. Sperfeld[1], S. Nowy[1], A. Towara[1], A. Hoepe[1], S. Teichert[1], G. Hopfenmueller[2], M. Baer[3], and T. Kreuzberger[3]
[1]Physikalisch-Technische Bundesanstalt Braunschweig und Berlin (PTB), 4.1 Photometry and Applied Radiometry, Braunschweig, Germany, [2]sglux GmbH, Berlin, Germany, [3]SGIL Silicaglas GmbH, Langewiesen, Germany

„Characterization of new optical diffusers used in high irradiance UV radiometers"

Proceedings of NEWRAD2011, edited by S. Park and E. Ikonen. (Aalto University, Espoo, Finland, 2011) p. 278.1.

UV Radiometer SXL 55

Measuring device for determining the UV irradiance

GENERAL FEATURES

Properties of the UV Radiometers SXL 55

The UV Radiometer SXL55 is an instrument for diverse applications in UV detection. It consists of a calibrated SiC UV sensor probe and an Android smartphone which serves as a display unit.

Besides the UV-Surface housing various sglux sensors are available upon request. Those types of sensors are listed in our product catalog UV Sensor Probes in the Android USB output category. This flexible configuration allows to choose the type of housing and also to select the desired measurement range and spectral responsivity.

Moreover, the SXL55 is able to distinguish up to 5 different calibrations (stored in the sensor probe) and recognize them autonomously using the preinstalled sglux Radiometer-app.

GETTING STARTED

Connect the sensor to the smartphone's USB terminal and start the sglux radiometer app.

Select the desired radiation source in the menu (upper right side). If the source to be measured is not stored in the sensor, the use of another sensor or a further sensor calibration by sglux is recommended to avoid false values.

The radiometer app offers two different display screens. The standard view displays the irradiance as well as the source data. The advanced view offers the opportunity to display further information and to select other measurement options (e.g. dose measurement, sensor temperature).

UV Radiometer SXL 55

Measuring device for determining the UV irradiance

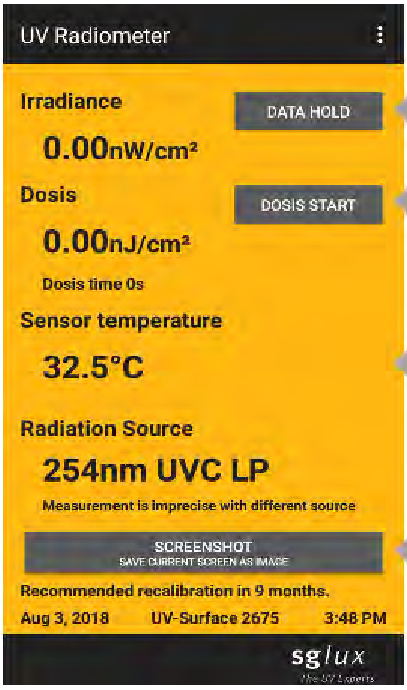
STANDARD VIEW

Drop-down menu
The radiation source (calibration) can be selected here. The advanced view is also selectable.

Here, the radiation source to which the sensor has been calibrated is displayed. The source to be measured must be identical. If necessary, the source selection can be changed, or another sensor can be used.

The recommended re-calibration time of the sensor is displayed here.

ADVANCED VIEW



This button freezes the display (e.g. to read the information easily or to take a screenshot).

Here the dose measurement can be started (integration of the irradiance over the time).

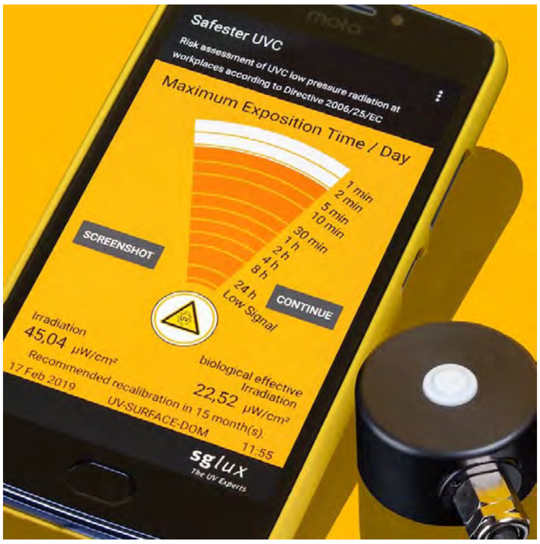
Internal sensor temperature (in general slightly above ambient temperature).

The screenshot function stores the actual display as a photo on the smartphone.

Safester UVC

Instrument to detect harmful UVC radiation according to Directive 2006/25/EC

GENERAL FEATURES

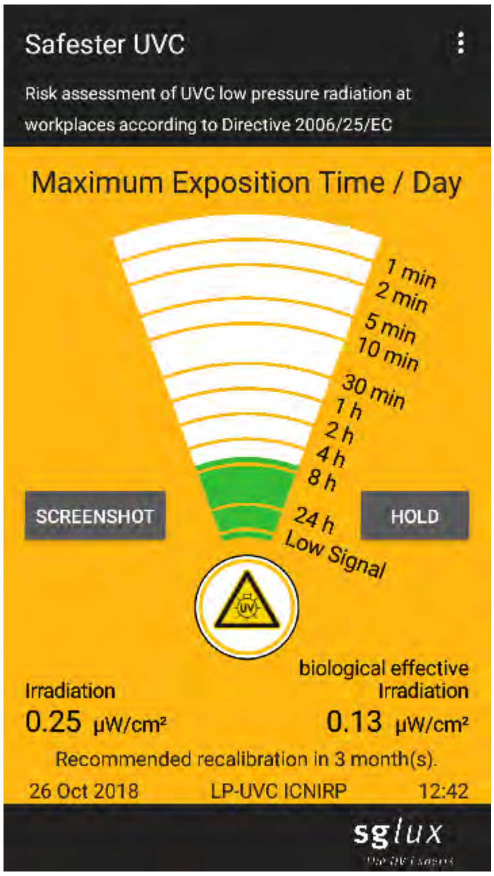


Properties of the Safester UVC

The Safester UVC is an instrument to detect harmful UVC radiation in workplaces according to the "Directive 2006/25/EC of the European Parliament and of the Council of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from UVC radiation." According to DIN 5031-11, the Safester UVC fulfills the highest requirements of quality class 1 for actinic radiometer and can therefore be used for precision measurements. The instrument measures and displays the maximum time a person can be exposed to a given UVC irradiation anticipating that this irradiation will not change over time. It consists of a calibrated UV sensor with calibration certificate, an Android Smartphone, a battery charger and a carry case. The instrument must not be used to detect other UV radiation sources than UVC low pressure tubes.

GETTING STARTED

Protect eyes and skin and switch on the UVC low pressure source. Please note that the Safester sensor also reacts to strong sunlight. Accordingly we recommend to avoid sunlight e.g. by closing a curtain, or doing the measurement when no sunlight is present (clouds, morning or evening time).



USING THE SAFESTER UVC

Connect the sensor to the Smartphone's USB terminal and power on the Smartphone. The app will start automatically. Point the sensor to a place where UVC radiation is suspected, move it and turn it, observe the display and enter the shortest exposition time displayed into your Risk Assessment Protocol.

In addition to the max. exposition time, the currently measured biologically effective irradiation according to TROS IOS / ICNIRP is displayed.

Safester UVC

Instrument to detect harmful UVC radiation according to Directive 2006/25/EC

SCIENTIFIC BACKGROUND

Occurrence of harmful UV radiation

Harmful UV radiation is generated by UV light sources used in industrial processes such as curing or welding machines or end user devices such as UV sterilizers for air and water or ozone generators. In case of improper shielding some of these devices emit a radiation such strong that just a few seconds will irreversibly damage the human eye. During normal use these devices usually protect the operator from this radiation. However, defective or unsuited devices and devices in maintenance mode emit harmful UV radiation.

Functional Principle of the Safester UVC

The Directive 2006/25/EC defines a maximum daily dose of harmful artificial UV radiation with H_{eff} = 30 J/m². H_{eff} is defined by the following formula:

$$H_{eff} = \int_{0}^{t} \int_{\lambda = 180\ nm}^{\lambda = 400\ nm} E_{\lambda}(\lambda, t) \cdot S(\lambda) \cdot d\lambda \cdot dt$$

where:

t	time of exposure
λ	wavelength of UV irradiation between 180 nm an 400 nm
E_{λ}	spectral irradiance of the source
S_{λ}	spectral weighting taking into account the wavelength dependence of the health effects of UV radiation on eye and skin, (according to Table 1.2 of the Directive)

The Safester UVC works with a Silicon Carbide (SiC) UV photodiode combined with a filter to suppress the influence of the sun's UV radiation. The spectral responsivity of this photodiode is close to the wavelength dependence of the health effects of UV radiation, but it is not identical. Thus, the Safester UVC must not be used to measure other sources than low pressure UVC lamps.

The calibration of the sensor is done using a traceable UVC reference source. Please find further information in the Calibration Certificate that comes with the instrument.

Directive 2006/25/EC - artificial optical radiation

This Directive aims to improve the health and safety of workers by laying down limit values for exposures of workers to artificial optical radiation to eyes and skin. Exposure to natural optical radiation (sunlight) and its possible health consequences are not covered by the Directive. The Directive gives legal definitions on optical radiation, on wavelength ranges (visible, ultraviolet, infrared), on kinds of artificial optical radiation (laser radiation and non-coherent radiation), on exposure limit values whose compliance ensures the physical health of workers who are exposed to artificial optical radiation at work, and on parameters for measurement such as irradiation, radiance and radiant exposure. The employer is obliged to assess and to measure (and/or to calculate) the levels of exposure to artificial optical radiation to which workers are likely to be exposed.

Safester UVC

Instrument to detect harmful UVC radiation according to Directive 2006/25/EC

Further Information

The following links guide to a "Non-binding guide to good practice for implementing Directive 2006/25/EC" issued by the European Commission. We recommend to study this document carefully before using the Safester UVC.

ec.europa.eu/social/BlobServlet?docId=6790&langId=en (English language)
ec.europa.eu/social/BlobServlet?docId=6790&langId=fr (French language)
ec.europa.eu/social/BlobServlet?docId=6790&langId=es (Spanish language)

Safester UVI

Mobile instrument for measuring the UV-Index according to ISO 17166

GENERAL

Ultraviolet (UV) sunlight is ionizing radiation. Absorbed by human or animal tissue, it frees electrons and causes chemical reactions. UV radiation plays an essential role in the formation of vitamin D and is helpful in many cases, such in mood improvement and the treatment of psoriasis.

However, not all chemical reactions that UV radiation induces are beneficial. UV radiation absorbed by DNA can lead to genetic mutation. Skin reddening, termed sunburn or erythema, is linked to skin cancers. In addition, UV radiation increases the risk of developing eye damage such as photokeratitis and cataracts. Nowadays, stratospheric ozone-layer depletion increases UV-levels at the earth surface.

The UV-Index [1], defined by the ISO 17166 standard, quantifies the risk of erythema at a given solar UV-exposure spectrum. The arbitrary definition of one UV-Index equals to an erythema weighted irradiance of 25 mW/m². Accordingly, the UV-Index value two corresponds to 50 mW/m².

The typical UV-Index ranges from 0 to 11. The higher the index value, the greater the potential for harmful damage and the less time it takes for harm to occur. As most of the UV-related health risks could be avoided by reducing exposure to UV radiation, detailed information about the actual UV-Index is essential for being able to take appropriate measures.

FEATURES

With **Safester UVI** sglux developed a compact portable measurement system, which is able to precisely detect the UV-Index according to ISO 17166 [2]. The system consists of a sensor unit and a standard edition Smartphone used for visualisation of the measured values and displaying of protective measures, as recommended by the World Health Organization (WHO).

The entrance optic of the sensor unit is equipped with an optimal cosine-corrected diffusor, which allows detection of sun radiation from the upper hemisphere. The core of the sensor consists of a silicon-carbide (SiC) based diode, which is an intrinsic visible blind photodetector. In other words the sensor is insensitive for visible and infrared light, which makes over 90 % of the solar radiation, and it only detects UV radiation. This eliminates the need for efficiency-limiting optical filters to remove out-of-band visible or infrared photons. In order to achieve an optimal adaption of the erythema action spectrum, a specially designed interference filter is applied [3]. In this way, a UV-Index determination with a low measurement uncertainty of ± 6 % for values between 3 and 8 can be achieved, while for values higher than 8 **Safester UVI** offers an even lower uncertainty of just ± 3 %. Please note that WHO recommends UV-protective actions for UV-Index values over 3.

Furthermore, a standard Android Smartphone is used for displaying the measured values and the appropriate protection measures, which should be implemented. The sensor unit is connected to the Smartphone via micro-USB cable. The whole system, consisting of sensor unit and Smartphone, weighs around 260 g, which makes it ideal for portable and in real time UV-Index detection.

Anyway, **Safester UVI** is not the only device made by sglux, which is equipped with the above-described SiC-based photodiode. Other sglux sensors such as **UV-Cosine_UVI** and UV-Index sensor **TOCON_UVI** are also equipped with this SiC-based photodiode. Furthermore, the outstanding quality of sglux-sensors has been published in a number of scientific papers [4,5,...].

Please note that **Safester UVI** is designed only for detection of solar UV radiation measurements [1]. sglux offers a broad range of measuring equipment for UV-Index determination including artificial UV radiation light sources. Please do not hesitate to contact us if you are interested in any other kind of UV-measurement equipment.

MEASUREMENT IMPLEMENTATION

In order to measure the UV-Index according to the ISO 17166, **Safester UVI** sensor should be placed at a shadow-free position. Please take care that the sensor is not shaded due to nearby buildings, plants or reflections of mirroring surfaces, which would interfere with the **Safester UVI** measurements. The measurement should be performed at an elevated location with a free 360° view of the horizon. During measurement the sensor should be placed horizontally.

In case of every day applications, when you want to find out what kind of protective measures are needed for avoiding erythema, the **Safester UVI** sensor should be placed at the same location as the user. Shadows and reflections are permitted, but during this kind of measurement the sensor should be placed horizontally. Thus, UV-Index values comparable to ISO 17166 can be measured. Afterwards, the sensor can be placed at the same orientation as the irradiated person to determine the actual UV-Index values, which might be higher than the ones of the horizontal measurement. In order to implement the necessary protection, measurements at different body parts can be taken under consideration.

SAFESTER UVI UTILISATION

Connect the sensor to the USB-port of your Smartphone and turn the Smartphone on. The measurement app starts automatically. Place the sensor in the measuring position to determine the current UV-Index. The display shows the UV-Index and coloured background display. The colours correspond to the WHO nomenclature. In addition, the erythema-weighted irradiance value given in mW/m² is indicated in the lower right corner of the display. By pressing the hold button, the continuously measured UV-Index can be interrupted and the last read value is displayed. The screenshot function saves the current displayed values as images to the Smartphone.

Safester UVI

Mobile instrument for measuring the UV-Index according to ISO 17166

sglux
The UV Experts
Boston Electronics

UNDERSTANDING OF THE UV-INDEX VALUES

Typical UV-Index values are in the range between 0 and 11. **Safester UVI** presents the UV-Index values in large figures and coloured background display. The colours correspond to the nomenclature of WHO.

The following table includes WHO's concrete recommendations of action for UV-Index values between 3 and 11 [1]. :

UV-Index 1-2	low UV-Index	No protection required
UV-Index 3-5	moderate UV-Index	Put on a shirt, put on a hat, cover-up with sun cream
UV-Index 6-7	high UV-Index	Put on a shirt, put on a hat, wear sunglasses, cover-up with sun cream; seek shade during midday hours
UV-Index 8-10	very high UV-Index	UV resistant shirt, hat, sunglasses and sunscreen are a must; avoid being outside during midday hours
UV-Index 11	extreme UV-Index	UV resistant shirt, hat, sunglasses and sunscreen are a must; avoid being outside

TECHNICAL DATA

Brief description	broadband radiometer handheld device for UV-Index determination
Main features	portable, compact measurement system consisting of UV-Index sensor with SiC-based photodiode, filter in accordance with the UV erythema action spectrum and Smartphone for data collection and monitoring
Measuring ranges	wavelength: 290 nm ... 390 nm UV-Index: 0.... 25+ erythema relevant UV radiation intensity: 0 ...625 mW/m²
Input optics	diffusor with a diameter of 11 mm, cosine corrected field of view
Photodiode	SiC erythema photodiode
Calibration	PTB-traceable factory calibration
Measurement uncertainty	<= UVI 2 ± 12 %, >UVI 2: ± 6 %, >UVI 8: ± 3%
Interface	USB 2.0
Temperature range	-5°C ... + 45 °C
Power supply	via Smartphone USB
Weight	260 g

SOURCES

1. WHO: Global solar UV index - A Practical Guide, https://www.who.int/uv/publications/en/UVIGuide.pdf

2. ISO 17166:1999(en), https://www.iso.org/obp/ui/#iso:std:iso:17166:ed-1:v2:en

3. McKinlay AF, Diffey BL, A reference action spectrum for ultraviolet induced erythema in human skin.CIE J 1987; 6: 17-22.

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Device with the EUVB Ratio of Natural Light, Sensors 2019, 19(4), 754; doi:10.3390/s19040754

STAND-ALONE UV INDEX TRANSMITTER

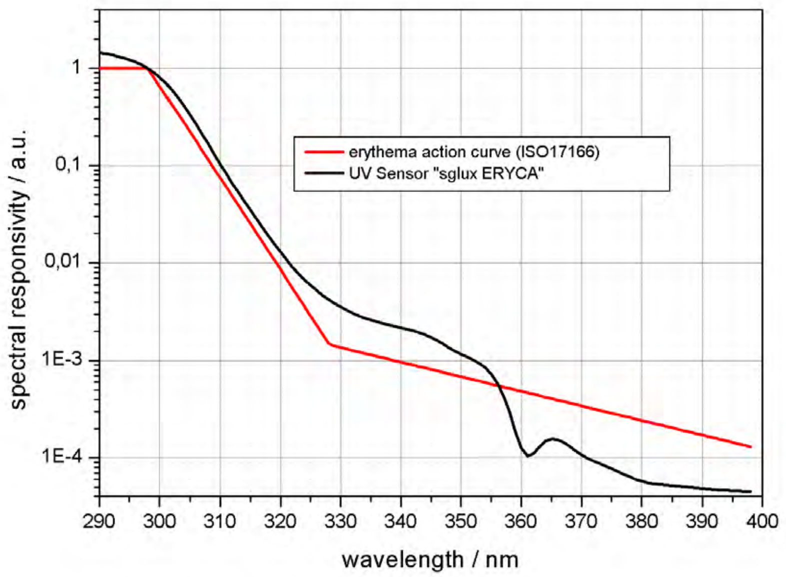
- measurement of the UV Index
- the UV sensor (sglux ERYCA) is featured by a spectral responsivity close to the erythema action curve as defined by ISO17166:2019
- calculation of the UV Index according the WHO requirements [1]
- data transmission via cellular radio to a server using the MQTT protocol
- solar powered with integrated battery
- various approaches to display the UV Index measured by the unit

PRODUCT DESCRIPTION

The solar cell powered stand-alone UV Index transmitter measures the UV Index according to the standard ISO17166:2019 and the WHO requirements [1]. The UV Index quantifies the risk of sunburn at a given solar UV exposure spectrum. The unit transmits the current UV Index via cellular radio using the MQTT protocol to a server where the obtained values are stored. By default this server is hosted by sglux. Alternatively the user's server can be used. The unit does not require any wiring to the building where it is placed. It can also be used where lightning protection requirements exclude wires on the roof of a building. The unit bases on the UV sensor "sglux ERYCA" that is featured by a spectral responsivity very close to the erythema action curve (picture 1). Set-up and use of the UV Index transmitter does not require specific metrological or computer knowledge.

SPECIFICATIONS

sensor	SiC based UVI sensor "sglux ERYCA" with interference filter according to ISO17166 and WHO requirements, spectral responsivity close to the erythema action curve as defined by ISO17166
measurement uncertainty	+-10%
measurement range	0.00 ..... 1.00 W/m² biological effective UV irradiance
field of view	cosine weighted
calibration	at sun, PTB traceable
resolution	2 mW/m²
temperature range	-30°C ... 70°C
power supply	10 W solar cell with battery, 5 days operation time at full clouding of the solar cell
transmitted values	biological effective UV irradiance in W/m², battery voltage, charging current, battery status, internal temperature. Additional values (e.g. external temperature, humidity) can be measured and transmitted.
wireless connection	via cellular radio. A SIM card with a suitable data plan is required.
weight	5 kg without sinker stone, mast mounting is possible
height	80 cm

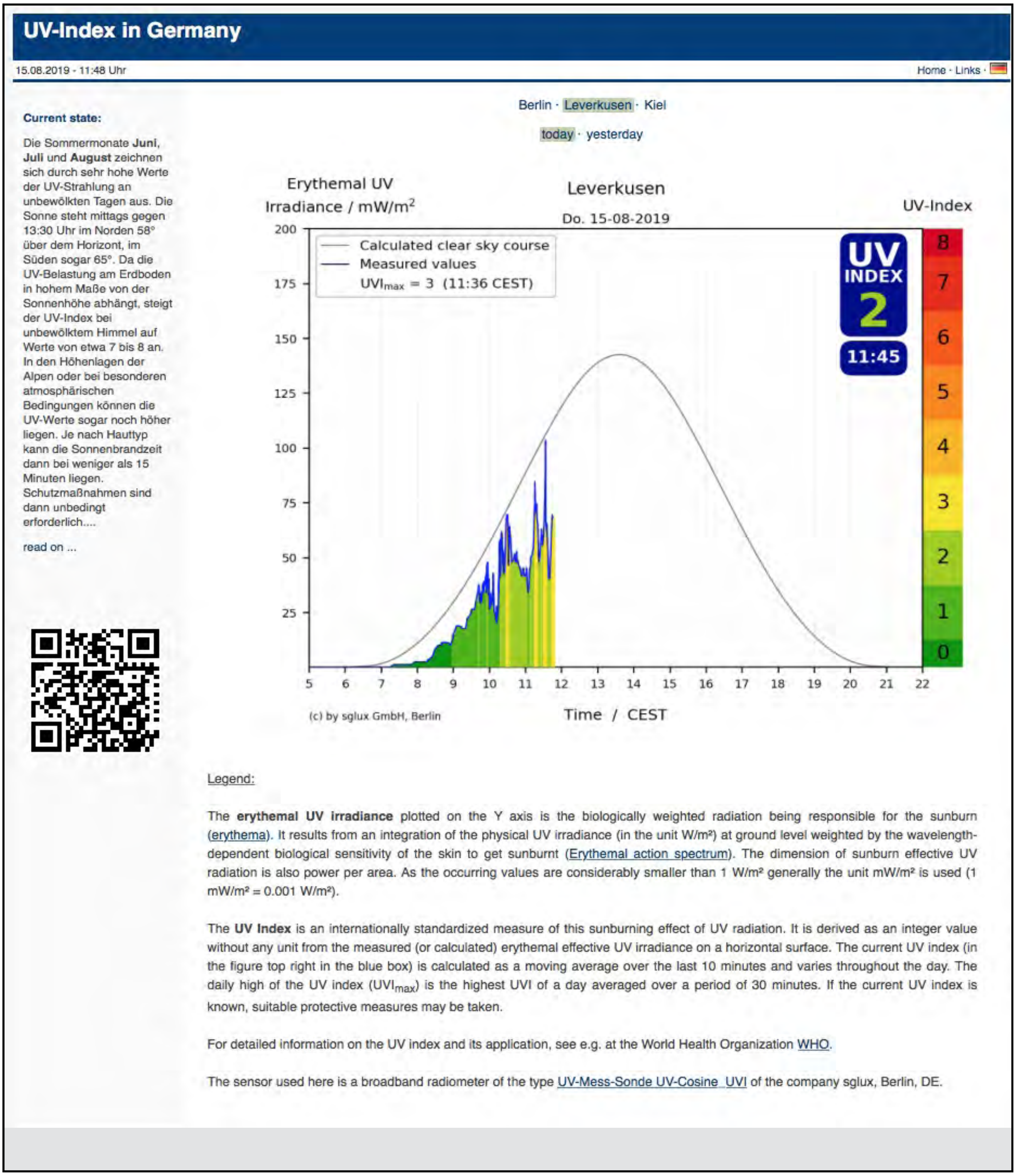


picture 1 spectral responsivity of the sglux ERYCA sensor compared with the erythema action curve according to ISO17166:2019

APPROACHES FOR DISPLAYING OF THE OBTAINED UV INDEX VALUE

The reasons to purchase and operate a UV Index measuring unit are quite various. As various are the approaches to display the obtained UV Index values. A scientific approach is to get the values from the server and to analyze and publish them according to the specific research interest or according to a public authority task. This approach requires good meteorological and database administration skill. As a free of charge plug & play solution for not (yet) skilled persons we offer a web based desktop display as shown on picture 2. It shows the current and the previous day's UV Index. The text shown on picture 2 can be deleted or modified according to the customer's requirements.

Other possible approaches to display could be a smartphone optimized web site or a smartphone app. Also possible is a display optimized to a wall mounted monitor. If used on construction areas, public pools etc. a mechanical display using a clock hand can be a suitable solution because at presence of bright sunlight electronic displays are hard to read. sglux is happy to produce such special software and hardware for customized application.

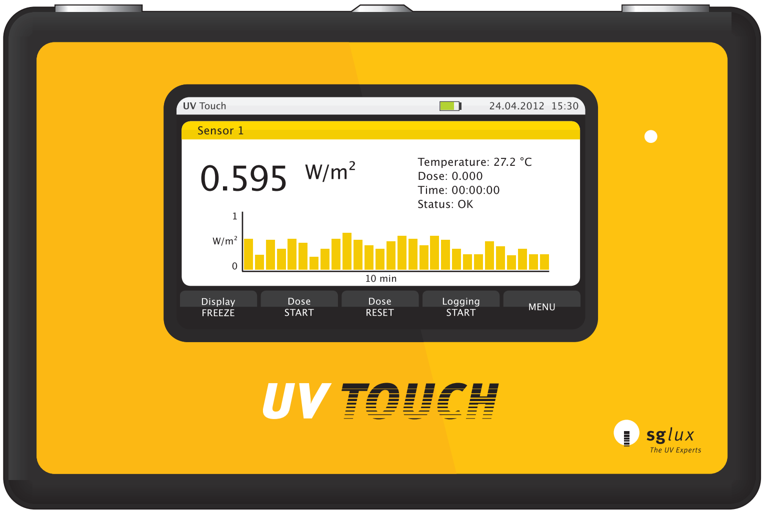


picture 2 Example of the web based desktop diplay, colors and UV Index calculation according to the WHO requirements

[1]: *WHO (2002): Global Solar UV Index - a practical guide.*

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

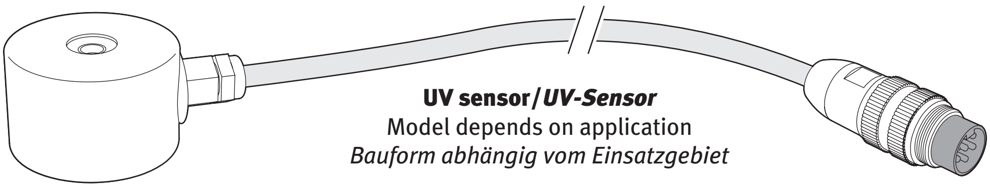
SiC Photodetector
guarantees radiation hardness

CAN bus signal processing
offers a large dynamic range

Intuitive touch screen control
makes working a pleasure

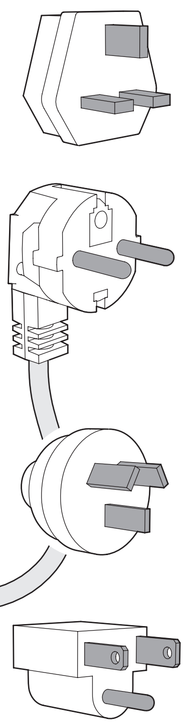
Halten Sie die Welt der UV-Strahlung in Ihrer Hand. Strahlungsharte SiC-Detektoren garantieren zuverlässige Werte im Mess-Alltag. Hochmoderne CAN-basierte Übertragungstechnologie sichert einen großen Dynamikbereich. Eine intuitive Touch-Screen-Bedienung macht die Arbeit mit dem ***UVTOUCH*** *zum Vergnügen.*

I. Components – *Komponenten*

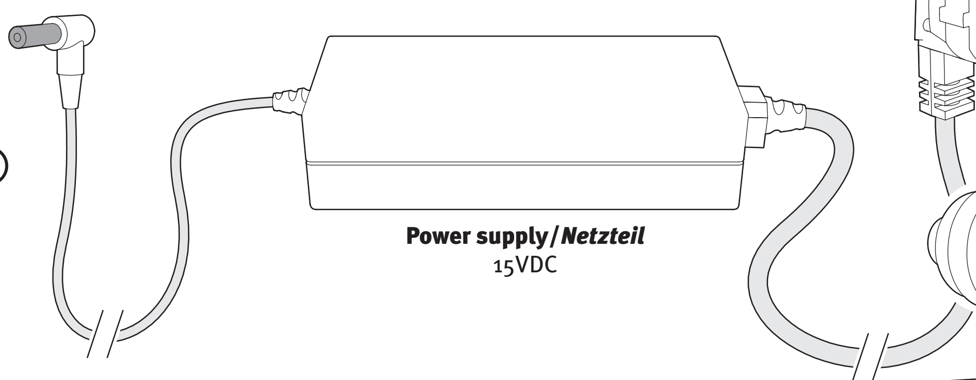


UV sensor / *UV-Sensor*
Model depends on application
Bauform abhängig vom Einsatzgebiet

(Sensor not included. Please order a customized digital probe and calibration separately.)
(Sensor nicht enthalten. Bitte bestellen Sie den passenden Sensor separat.)

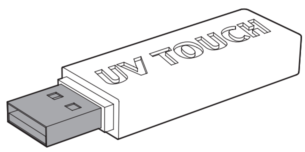


POWER

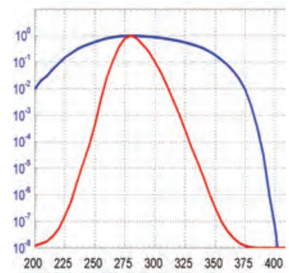


Power supply / *Netzteil*
15VDC

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



Ultraviolet (UV) Calibration



- **Calibration service according to guidance DAkkS-DKD-MB-3 and DIN/ISO 17025**
- **Traceability to NIST or PTB**
- **Determination of the spectral responsivity of UV sensors**
- **Determination of the UV transmission**
- **Determination of the temperature dependency of UV sensors**

sglux
The UV Experts

BostonElectronics

www.boselec.com | shop.boselec.com | uv@boselec.com | (617)566-3821

UV Calibration

Catalog

WHAT IS CALIBRATION?

Calibration is the reliable and reproducible determination and documentation of a measurement value deviation in comparison to a standard. If the used standard is traceable and the deviation and the measurement uncertainty is determined, the procedure is a traceable calibration. The traceable standard is conducted to the definition of the SI units by an uninterrupted calibration chain.

HOW DOES A CALIBRATION LABORATORY WORK?

A calibration laboratory ensures the performance of examinations and calibrations on good practice under controlled conditions. Therefore the allocation of qualified personnel, appropriate measurement instrumentation and necessary infrastructure is required. Doing UV calibration, different interplays of sources, reference sources, spectrometers, radiometers and reference radiometers are to be analyzed.

OUR SERVICES

The UV calibration work at sglux determines the spectral responsivity of UV irradiance sensors, integral irradiance sensitivity of UV irradiance sensors, spectral emission spectrum of UV sources and transmission. We have done this service since 2010 according to guidance DAkkS-DKD-MB-3, and our calibration laboratory is ISO 9001 certified. Following our goal of continuous improvement, we have since 2010 cooperated with the German PTB (Department of Photometry and Applied Radiometry) in several R&D projects continuing until 2017. For 2018 we seek the ability of being accredited according to DIN 17025. Our mission is to deliver detailed property information along the UV measurement components we produce.

CALIBRATION PROCESS

Calibrations are performed after determination of the customer's requirements, the field of application and the specific environmental conditions while using the UV measurement components.Our calibration laboratory uses different traceable transfer standards for the determination of the spectral responsivity and the integral irradiance sensitivity of sensors at different UV sources. The typical delivery time for a calibration is two weeks after clarification of technical details and, if necessary, the consignment of detectors or emitters.

CALIBRATION 1

Determination of the absolute spectral responsivity of sglux sensors incl. calibration certificate according to guidance DAkkS-DKD-MB-3 and DIN/ISO 17025.

CALIBRATION 2

Irradiance calibration of an sglux UV sensor for measurements at a specific UV source incl. calibration certificate according to DAkkS-DKD-MB-3 and DIN/ISO 17025.

UV-Index Measurement

- **Photodiodes for measurement of the UV Index, various optics and detector chip areas**
- **UV sensors (TOCONs) with 0 to 5 V voltage output for measurement of the UV Index, various optics**
- **UV sensor probes for measurement of the UV Index, cosine field of view**

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The UV Experts

BostonElectronics

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UV-Index Measurements

Catalog

DEFINITION OF THE UV-INDEX

The UV Index is defined by ISO 17166 and quantifies the risk of sunburn (Erythema Solare) at a given solar UV exposure spectrum. Please check the video at the right column of this page for further information.

APPROACHES TO MEASURE THE UV INDEX

Precise measurement of the UV Index is usually based on data generated by spectrometers. These spectrometers measure the ultraviolet spectrum of the sun. Subsequently the UV Index is calculated by multiplication and integration of this spectrum with the human skin's erythema action curve. A handy alternative to spectrometer based UV Index measurement is using radiometers such as photodiode based integrating sensors. This method requires precision matching of the photodiode's spectral responsivity with the erythema action curve of the human skin and a cosine field of view. This precision is needed because the spectrum of the source (the sun) varies strongly depending on time of day, place, date, clouds, shadow and the local ozone layer thickness. A radiometer sold as an "UV Index Sensor" that does not precisely match the erythema action curve is not a valid UV Index Sensor, it is just a UV Sensor. As a result of many years of R&D the sglux ERYCA UV Index sensors nearly perfectly match the erythemal action curve. The mean error is 1.3% only.

SGLUX ERYCA RADIOMETER BASED GLOBAL METEOROLOGICAL NETWORK

Since 2014 Berlin's first UV Index measuring station works on the roof of sglux's building. This station bases on a UV Index sensor probe ("UV-Cosine_UV-Index") and a LAN transmitter module ("SKYLINK UV-transmitter"). Since October 2015 a duplicate station works in the Southern hemisphere, in Florianopolis, a city in the South of Brasil. On our website the values of these two stations are displayed.

OUR PRODUCTS

Our components and systems for measurement of the UV Index are listed on page 2. It starts with a selection of UV-Index photodiodes (external amplifier needed). Easiest to use components are the UV-Index TOCONs (photodiodes with internal amplifier for 0 to 5V voltage output). The sglux UV-Cosine_UV-Index probe is a waterproof sensor ready-to-mount outdoors with cosine field of view. To display and control the sensor's signal sglux offers the UVTOUCH and UV Control Pad displays as well as datalogger units. Our "SYKLINK UV transmitter" unit converts the sensor's signal into a web graph and transmits this graph to one or more multiple webpages. All items will be delivered calibrated on request.
Contact sglux and discover YOUR opportunities to precisely detect and report the sun's UV-Index.

UV-Index Measurements

Catalog

PHOTODIODES AND SENSORS (MEASUREMENT MEAN ERROR ‹ 1.3%)

SiC UV photodiodes

UV-Index photodiodes, different active chip areas and housings, with erythema filter

SiC TOCONs

UV-Index hybrid sensor in a TO5 housing with 0 - 5 V signal output, with erythema filter

TOCON_PTFE24V_UVI

UV-Index hybrid sensor (TOCON) in PTFE housing (male thread M12x1), EMC safe, with erythema filter

TOCON_UVI

UV-Index hybrid sensor (TOCON) in PTFE housing (with G1/4" thread), EMC safe, with erythema filter

UV-Surface_UVI

top looking surface-mount UV sensor probe with cosine FOV, EMC safe, with erythema filter

UV-Cosine_UVI

waterproof UV-Index sensor probe with cosine FOV, EMC safe, for outdoor use, with erythema filter

UV-INDEX DISPLAYS AND NETWORK COMPUTERS

UV-Index reference radiometer

Reference radiometer for UV-Index measurements, incl. calibrated (PTB traceable) UVI sensor probe

Skylink UV transmitter

network computer with UV-Index sensor

UV Solutions from Boston Electronics and sglux

Thank you for your interest in our **UV detection solutions**. In this catalog, you will find dedicated sections describing the full breadth of **sglux'** product offerings. In this catalog you will find discussions on the applications, tutorials on the technology and UV measurements, and information on sensor selection. The enclosed information should allow you to appropriately select the sensor you need for your specific application.

Sections:

- SiC UV Photodiodes
- UV TOCONS
- UV Probes
- Displays
- UV Calibration
- UV Spectrometer
- UV-Index Measurement

If you wish to look at a specific data sheet, please go to our website. Also, do not hesitate to contact our applications staff so that they can answer any questions you have, and provide a quotation.

If you also have a need for **UV Light Emitting Diodes (UV LEDs)** please see our web site. We carry high performance, affordable solutions from **Violumas**.