SiC UV Sensor Probes

Catalog

sglux
The UV Experts

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.

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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.

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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

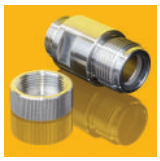
ACCESSORIES FOR DIGITAL SENSOR PROBES

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

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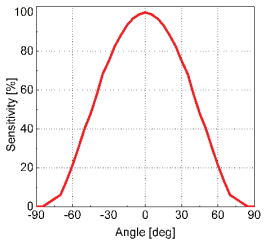
SELECTION GUIDE

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.



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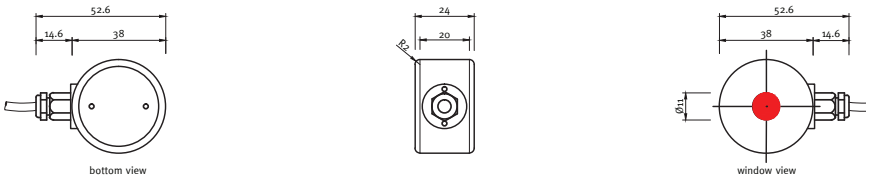

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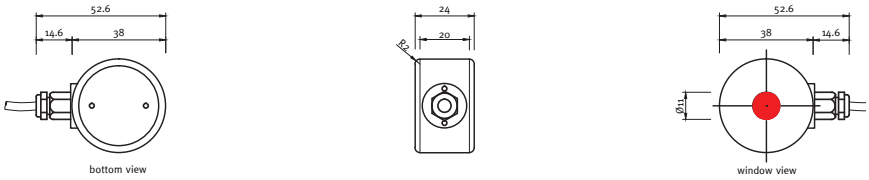
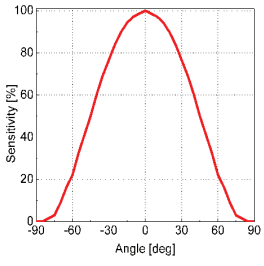


UV sensor “UV-AIR”

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



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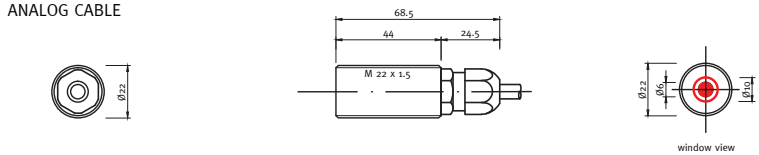

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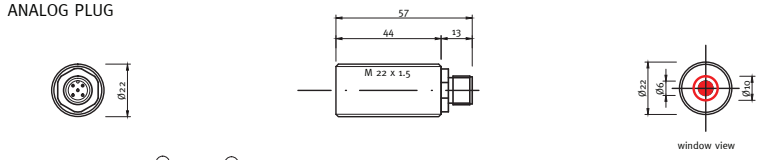

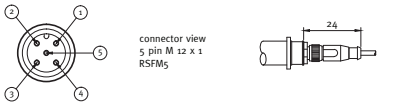

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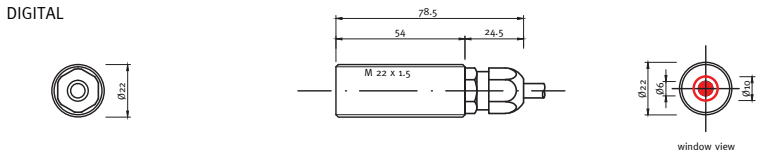

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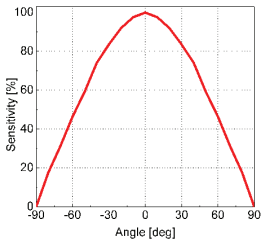
UV sensor “UV-COSINE”

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.



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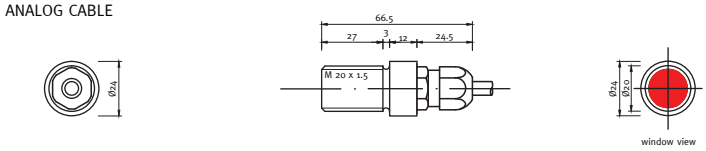

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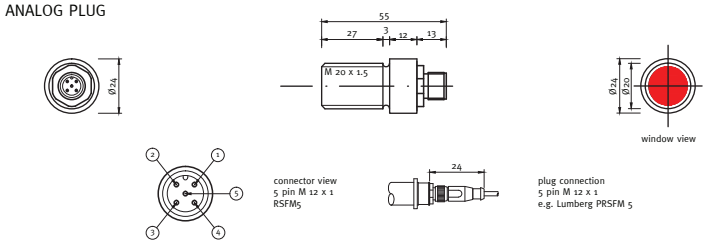

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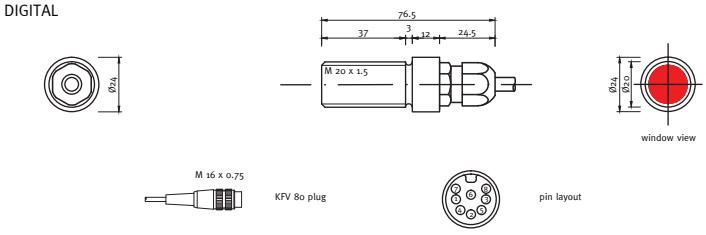
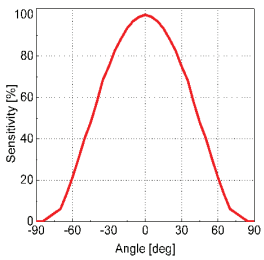


UV sensor “UV-WATER-G3/4”

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.



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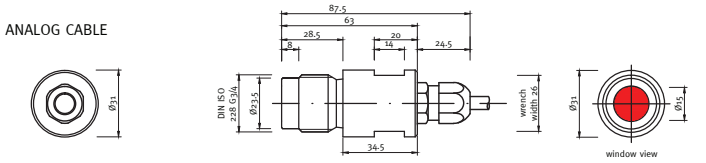

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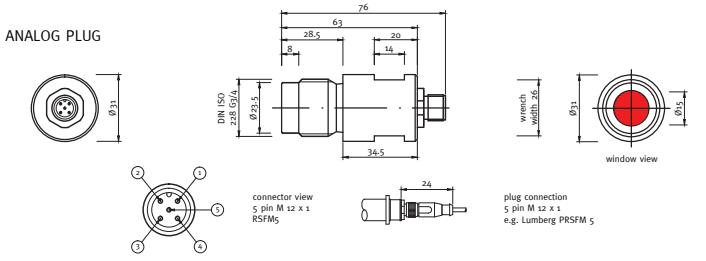

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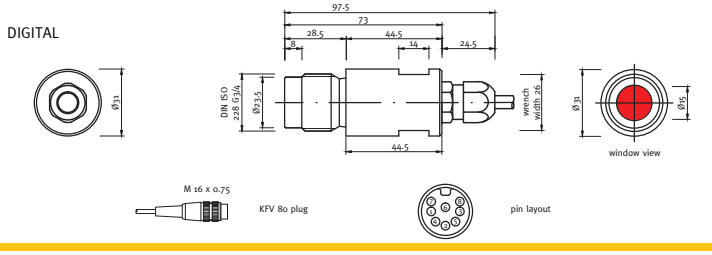
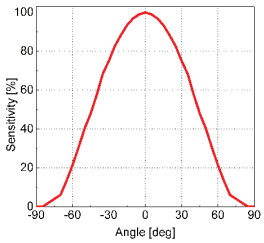


UV sensor “UV-WATER-PTFE”

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.



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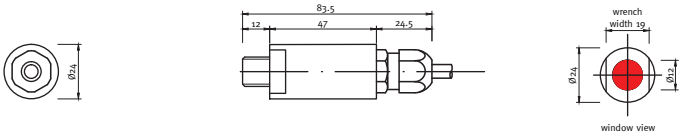

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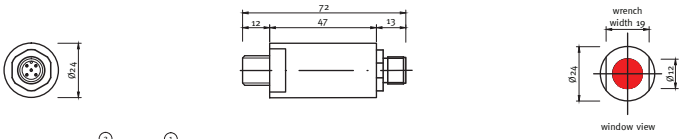

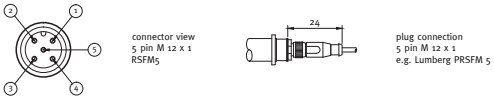

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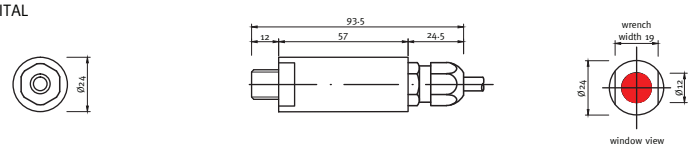
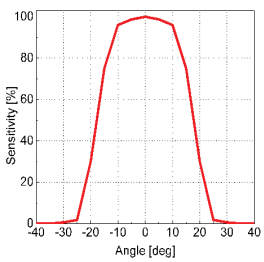


UV sensor “UV-DVGW”

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.



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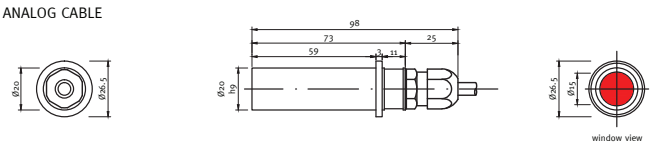

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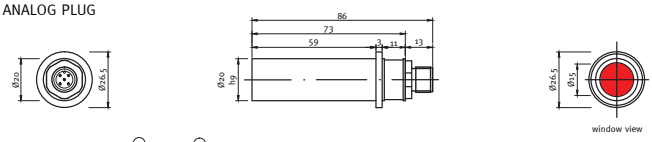

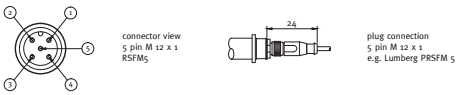

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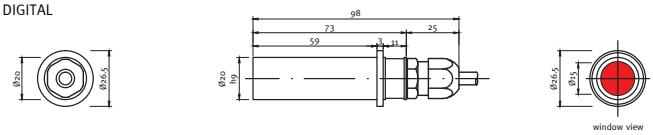
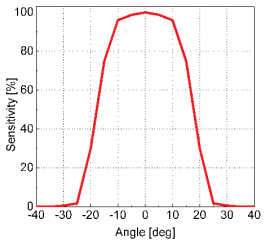


UV sensor “UV-DVGW-160”

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.



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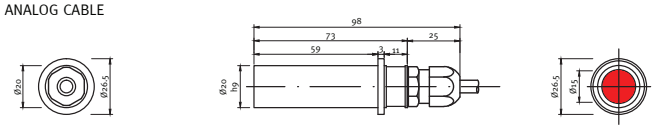

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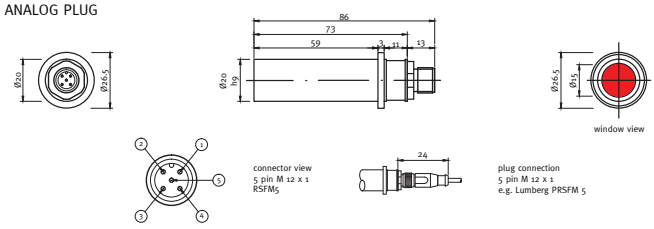

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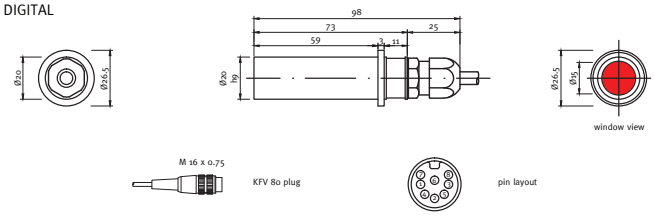
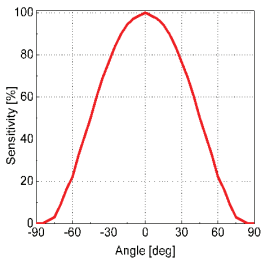


UV sensor “UV-CURE”

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.



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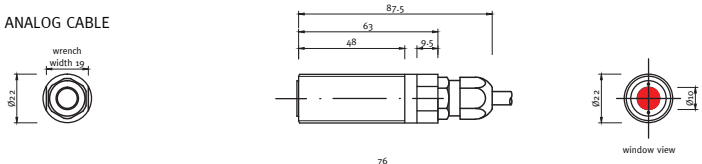

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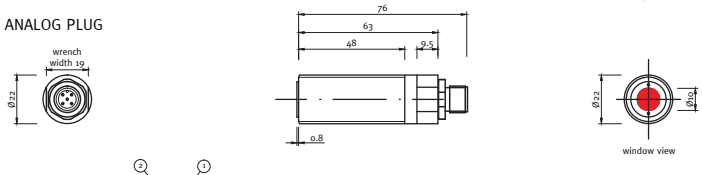

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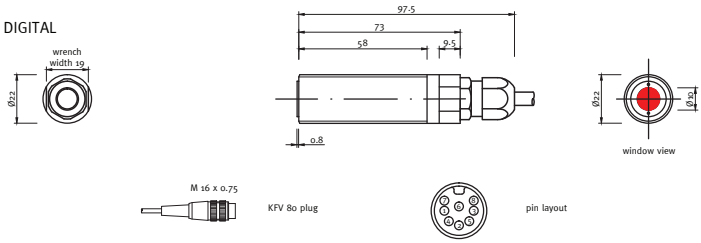

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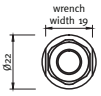
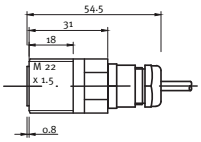
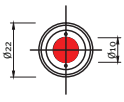
UV sensor “UV-CURE-HT”

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).

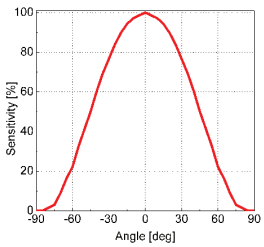


cable gland



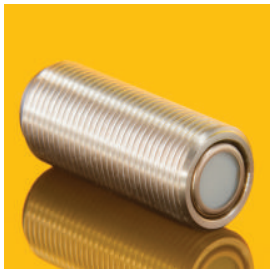


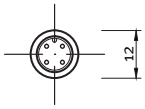
window view



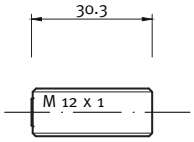
UV sensor “TOCON-Probe”

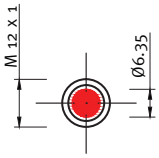
This UV sensor is a miniature UV sensor with a male threaded body (M12x1) configured with an amplified UV photodetector. The signal output is a voltage of 0 to 5 V. The UV sensor is available with a NIST or PTB traceable calibration.



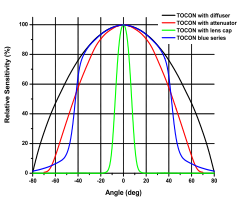


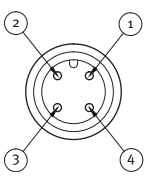
connector view
4 pin M 12 x 1
RSFM5





window view





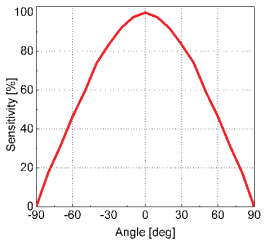
plug connection
4 pin M 12 x 1
e.g. Lumberg PRSFM 5
$V_- = 2$, $V_+ = 4$, $V_{out} = 3$

SiC UV Sensor Probes

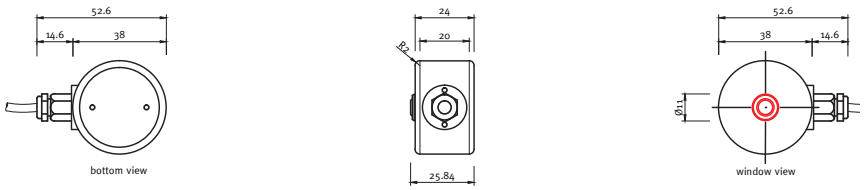
Catalog

UV sensor “UV-SURFACE-UVI”

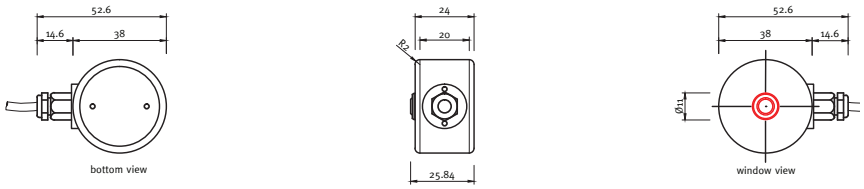
This UV sensor is designed for very high accuracy UV-Index measurements. The measurement mean error of this sensor is 1.3% only. The spectral response curve and the field of view (cosine type) are in near perfect accordance with the requirements defined in the ISO 17166 standard. The UV sensor is available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



ANALOG CABLE

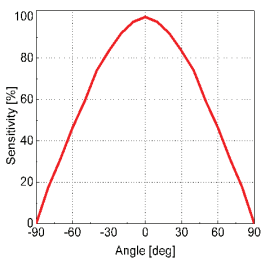


DIGITAL

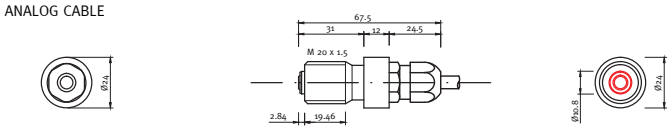


UV sensor “UV-COSINE-UVI”

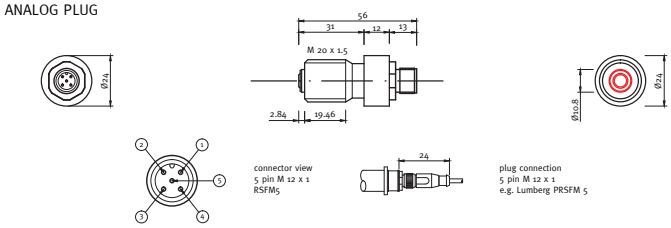
This UV sensor is designed for very high accuracy UV-Index measurements. The measurement mean error of this sensor is 1.3% only. The spectral response curve and the field of view (cosine type) are in near perfect accordance with the requirements defined in the ISO 17166 standard. The housing is made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



ANALOG CABLE



ANALOG PLUG



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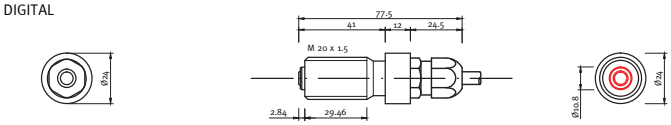


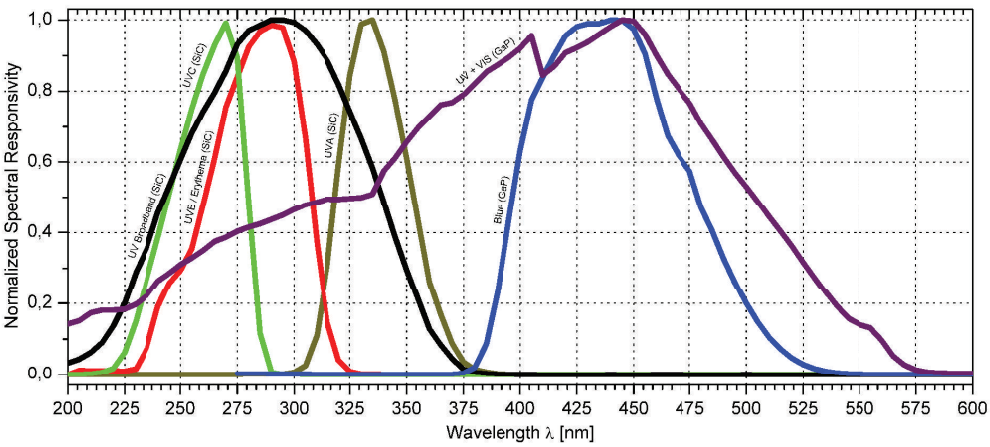
SiC UV Sensor Probes

Catalog

sglux
The UV Experts

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

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.