Portable Android-based UV Radiometers

- Cell phone based
- Easy-to-Use Android applications
- Calibrated UV sensor probe
- Safester UVC – displays exposure limits for UVC radiation
- SXL 55 – displays radiometric measurements of UV radiation

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The UV Experts

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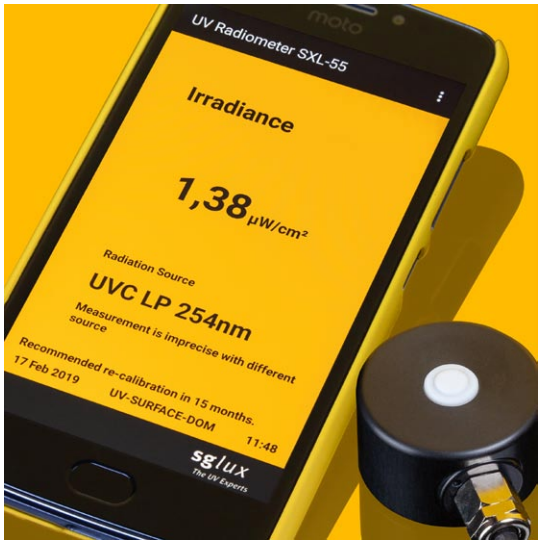
UV Radiometer SXL 55

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.

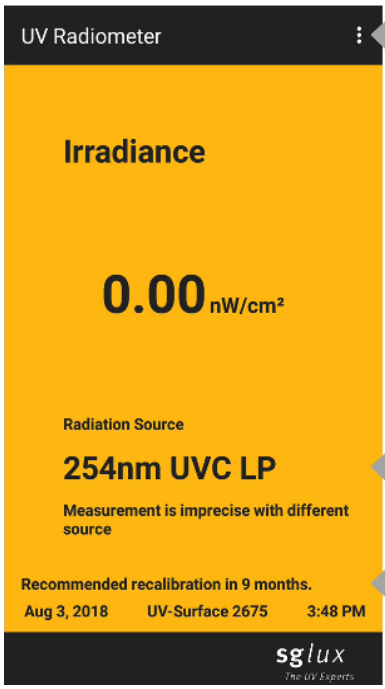
Select the desired radiation source in the menu (upper right side). If the source to be measured is not stored in the sensor, the use of another sensor or a further sensor calibration by sglux is recommended to avoid false values.

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

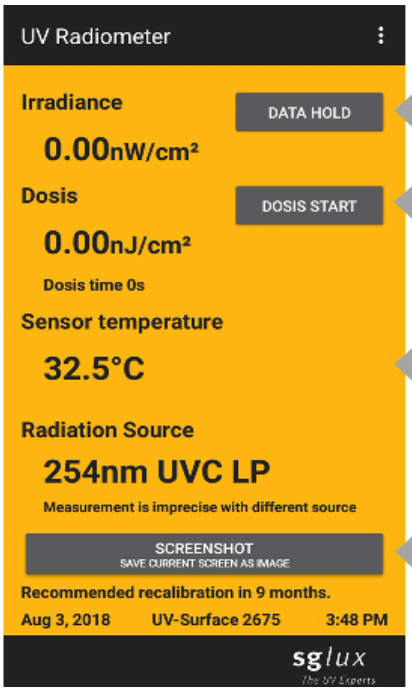


Drop-down menu
The radiation source (calibration) can be selected here. The advanced view is also selectable.

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).

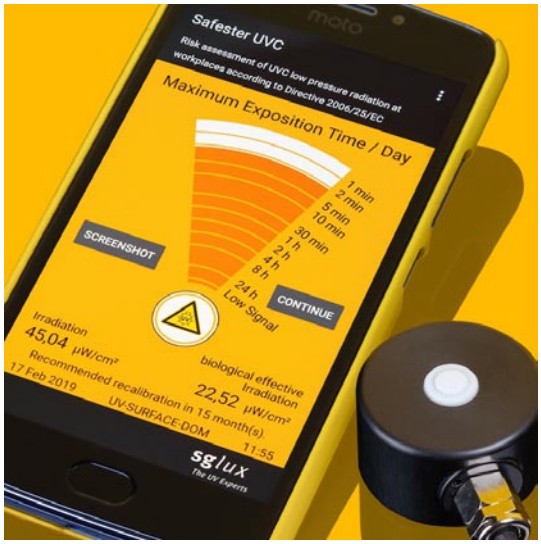
Internal sensor temperature (in general slightly above ambient temperature).

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

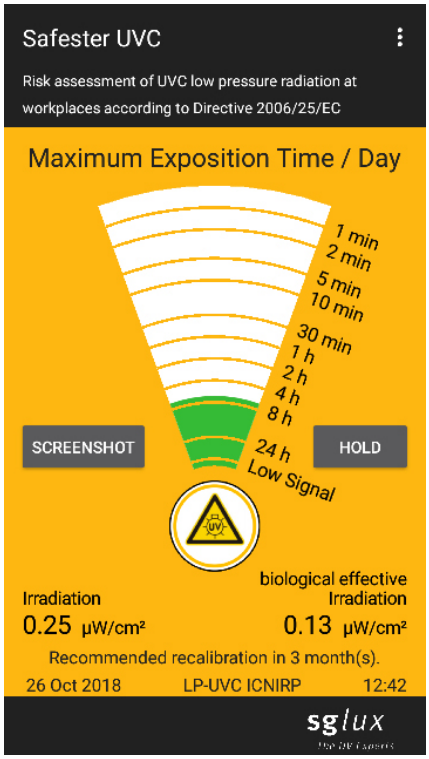


Properties of the Safester UVC

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. A current example of use is to ensure that UV air disinfection equipment used to inactivate COVID virus do not emit harmful UV irradiation intensity that may damage skin and eyes.

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.

Safester UVI

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

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

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

Safester UVI

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

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.

4. A.W. Schmalwieser, J. Gröbner, M. Blumthaler, B. Klotz, H. De Backer, D. Bolsée, R. Werner, D. Tomsic, L. Metelka, P. Eriksen, N. Jepsen, M. Aun, A. Heikkilä, T. Duprat, H. Sandmann, T. Weiss, A. Bais, Z. Toth, A. M. Siani, L. Vaccaro, H. Diémoz, D. Grifoni, G. Zipoli, G. Lorenzetto, B. H. Petkov, A. Giorgio di Sarra, F. Massen, C. Yousif, A.A. Aculinin, P. den Outer, T. Svendby, A. Dahlback, B. Johnsen, J. Biszczuk-Jakubowska, J. Krzyscin, D. Henriques, N. Chubarova, P. Kolarz, Z. Mijatovic, D. Groselj, A. Pribullova, J. Ramon Moreta Gonzales, J. Bilbao, J. M. Vilaplana Guerrero, A. Serrano, S. Andersson, L. Vuilleumier, A. Webb and J. O'Hagan (2017) UV Index monitoring in Europe. Photochem. Photobiol. Sci., 16, 1349-1370, DOI 10.1039/C7PP00178A

5. Dae-Hwan Park, Seung-Taek Oh, and Jae-Hyun Lim: Development of a UV Index Sensor-Based Portable Measurement
Device with the EUVB Ratio of Natural Light, Sensors 2019, 19(4), 754; doi:10.3390/s19040754

UV Radiometer SXL 55-UVC

UV radiometer / dosimeter for measurement of Hg low pressure lamps

GENERAL FEATURES

The UV Radiometer SXL 55-UVC is a radiometer / dosimeter for measurement of the germicidal irradiation and dose of a UVC Hg low pressure source at a definded position. It consists of a PTB traceably calibrated UVC sensor and a smartphone.
By default sensitivity range is 0 ... 200 mW/cm².

Besides chemical treatment, UVC sterilization is applied to disinfect air and tools in hospitals, doctor's offices, pharmacies as well as food and pharmaceutical production facilities and public washrooms. In most cases the needed UVC radiation is generated by Hg low pressure lamps.

However, surfaces in other facilities that are open to the public are not yet object of systematic disinfection. The COVID19 pandemy rised the attention to also disinfect these locations, e.g disinfection of air and surfaces in open office environments, factories, depots, public transportation, washrooms and lockers, surface disinfection of packages, disinfection of tools in workshops and production facilities.

While designing and using of UVC disinfection systems it is important to ensure that the surface to be disinfected will be irradiated with a sufficient germicidal UVC dose. The International Ultaviolet association's website (iuva.org) publishes a good overview at the state of the art and recommended irradiation doses for different purposes.

GETTING STARTED

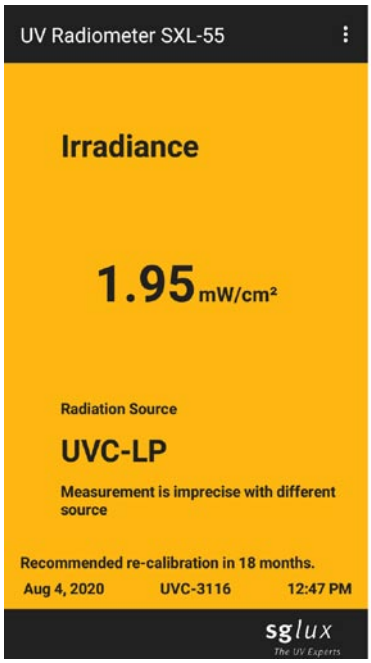
Connect the sensor to the smartphone's USB terminal and start the sglux radiometer app.

The radiometer app offers two different display screens. The standard view displays the irradiance as well as the UV source to be used for measurment (a Hg low pressure lamp). The advanced view offers the opportunity of a dose measurement and displays the sensor's temperature.

UV Radiometer SXL 55-UVC

UV radiometer / dosimeter for measurement of Hg low pressure lamps

STANDARD VIEW

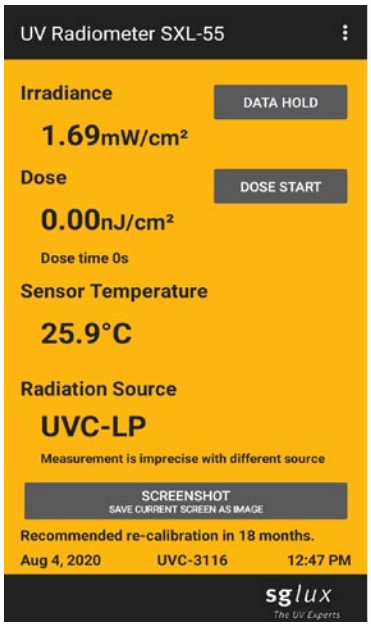


Drop-down menu
Skip to advanced view

Information about radiation source to which the sensor has been calibrated is displayed (a Hg low pressure lamp).

Information about date, time, sensor type and serial number and remaining time until recommended re-calibration.

ADVANCED VIEW



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

Start of the dose measurement (integration of the irradiance over the time). After having started, the measurement can be stopped and then either continued or it can be set back to zero.

Internal sensor temperature

The screenshot function stores the actual display as a jpg-file on the smartphone's homescreen.

UV Sensor "UV-Surface_UVI"

Top looking surface-mount UV sensor for UV-Index measurements

sglux The UV Experts

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GENERAL FEATURES

Properties of this sensor

This UV sensor is designed for very high accuracy UV-Index measurements. The measurement uncertainty of this sensor is 5% 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 sensor contains integrated electronics and is shielded against electromagnetic interference. The sensor can be configured as a voltage of 0 to 5 V, a current of 4 to 20 mA, CAN bus interface or USB. The UV sensor is available with a PTB traceable calibration.

Page 3 of this datasheet allows to enter the signal output requirements of the needed sensor. After selection you may forward this document to factory or agent, or alternatively use the sensor probe online configurator at www.sglux.com. Please contact us for assistance.

SPECIFICATIONS

Fixed Specifications **Parameter**	**Value**
Dimensions	please refer to drawing on page 2
Weight	56 g
Spectral Sensitivity	UV-Index (erythema curve) according to ISO 17166, measurement uncertainty 5 %
Temperature Coefficient (30 to 65°C)	0.05 to 0.075%/K
Operating Temperature	-20 to +80°C
Storage Temperature	-40 to +80°C
IP Protection Class	< 80%, non condensing

Configurable Specifications **Parameter**	**Value** (page 3 shows more detailed information)
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 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	up to UVI 30

UV Sensor "UV-Surface_UVI"

Top looking surface-mount UV sensor for UV-Index measurements

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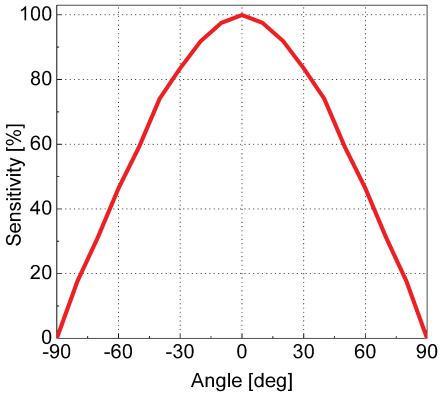
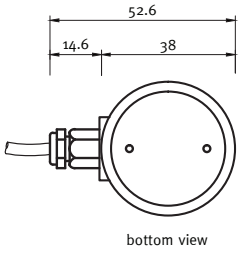
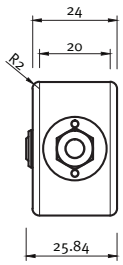
FIELD OF VIEW

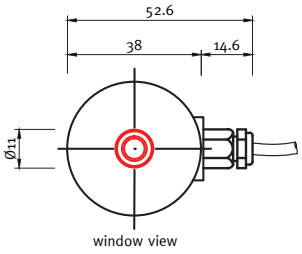


DRAWING

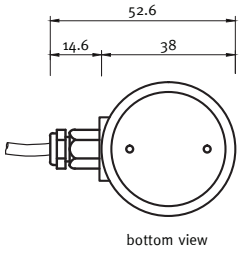
ANALOG CABLE

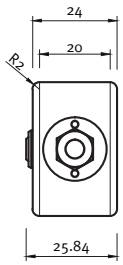


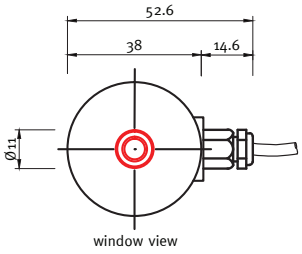


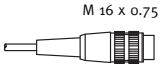


DIGITAL









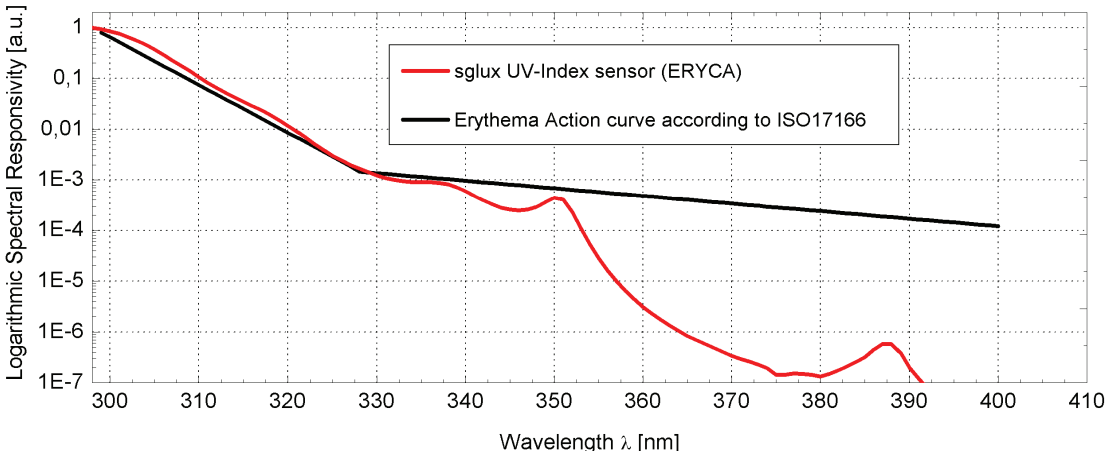
KFV 80 plug

pin layout

UV Sensor "UV-Surface_UVI"

Requirements questionaire sheet

STEP 1 ⇢ Normalized Spectral Responsivity



STEP 2 ⇢ Signal Output Type Selection

Please tick your selection. The pin configuration is shown in drawings on page 2.

Output Type	Description	Connection = "cable"
☐ 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
☐ 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
☐ CAN bus signal	VSCP protocol according to the following specifications: http://download.sglux.de/probes-digital/digiprobe-can/	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. Other cable lengths on request. Programming guide available: http://download.sglux.de/probes-digital/digiprobe-usb/digiprobe_USB_Programming_Guide.pdf	

Products for UV-Index measurements

sglux
The UV Experts
Boston Electronics

PHOTODIODES AND SENSORS (MEASUREMENT UNCERTAINTY < 5%)

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