

## X1-4

<http://www.gigahertz-optik.de/en-us/product/X14>

**Product tags: UV**



# Description

## European Commission UV Protection Directive

UV radiation is one of the most prevalent cancer risk factors. Because of this, federal lawmakers are trying to reduce the risk from artificial UV radiation with the UV Protection Directive. For sun tanning beds that emit UV radiation, this is achieved by a limit on the maximum UV output.

## UV Erythema Broadband Radiometer

In order to provide the responsible committees with a mobile instrument to measure UV radiation in accordance with the UV Protection Directive, Gigahertz-Optik GmbH has developed the X1<sub>4</sub> Broadband Radiometer.

## VA and UVB Two-channel UV Erythema detector head

The UV radiometer's UV erythema detector head sets itself apart from others thanks to the fact that it features two UV radiation detectors. Separating the UVA and UVB spectral ranges between two radiation detectors reduces the crosstalk between the long-wavelength UVA and short-wavelength UVB spectral ranges. This design principle offers a greatly reduced measurement uncertainty compared to UV erythema measurement detectors with only one UV radiation detector.

## Actinic UV Erythema Dose-Response Function

The spectral sensitivity of the two UV radiation detectors take into account the UV erythema actinic function. Therefore the sum signal of the two UV radiation detector forms the effective UV erythema irradiance. Additionally, both signals can be displayed separately in order to depict the ratio of UVB to UVA radiation.

## Detection of UVC Radiation

In addition to the verification of the UV erythema irradiance, the UV Protection Directive conform inspection of UV sun tanning beds also requires verification of the UVC irradiance in the spectral range from 200 to 280nm. The UVC radiation must be less than the limit of 0.003 W/m<sup>2</sup>. The UV Erythema measurement head of the X1<sub>4</sub> includes a separate UVC detector for this purpose.

## UV Protection Directive Conformity

The X1<sub>4</sub> Erythema UV meter and the XD-45-ERYC measurement head were developed in accordance with DIN 60335-2-27 and DIN 5050-1 conform to the respective critical values.

## Artificial UV Sources and Sun Spectrum Correction

The measurement uncertainty due to the spectral mismatching of Broadband Radiometers can be effectively reduced if the spectrum of the measured lamp is known. The X1<sub>4</sub> UV Erythema Broadband Radiometer includes a database of common spectrums of artificial UV lamps, technical UV radiators, and the sun spectrum at various zenith angles. The measurement uncertainty of +/- 25% without knowledge of the lamp's spectrum can be reduced to +/- 6.5% when the spectrum is known.

## Cosine-Corrected Field of View

A basic prerequisite for the accurate measurement of UV irradiance of extensive UV emitters is that the UV meter has a cosine-corrected field of view. The UV Protection Directive refers to the DIN 5050-1 that dictates an f2 error of less than 0.06.

## Simple Operation and Handling

Only three buttons and a clearly structured menu make the meter easy to operate. The UV radiation detector head is separate from the device and is connected to the device using a 2m cable. There is a mounting point for a tripod on the measurement head.

## Usage with a Computer

The X1<sub>4</sub> UV meter includes a USB interface to enable operation with a computer. During USB operation the device is supplied with power through the USB interface.

## Threshold values from the UV Protection Directive

Relevant norms and regulations: UV Protection Directive, DIN EN 60335-2-27 (VDE 0700-27):2009-04, DIN 5050-1:2010-01



X14 with BHO case



Display of the UV Erythema effective and UVC irradiance with selected correction factor for solar radiation at 70 ° zenith angle



X14 being used for the measurement of UV radiation due to solar radiation.

Threshold values irradiance  
UV Protection Directive

60335-2-27

5050-1

Threshold values spectral correction

UV Protection Directive

60335-2-27

5050-1

Threshold value cosine correction

UV Protection Directive

60335-2-27

5050-1

Threshold value temperature coefficient

UV Protection Directive

60335-2-27

5050-1

Burn-in period of UV Emitters

UV Protection Directive

60335-2-27

5050-1

Exposure time for 100J/m<sup>2</sup>

UV Protection Directive calculation example

Threshold value measurement distance

UV Protection Directive

60335-2-27

5050-1

250 nm - 400 nm 0.3 W/m<sup>2</sup><sub>eff</sub>

200 nm - 280 nm 0.003 W/m<sup>2</sup>

250 nm - 320 nm 0.15 W/m<sup>2</sup><sub>e</sub>

320 nm - 400 nm 0.15 W/m<sup>2</sup><sub>e</sub>

No threshold value def

Consult 60335-2-27 and 5050-1

No value for spectral correction

$f_1 < 0.2$  for broadband radiometer without specification of reference spectrum

***XD-45-ERYC-4 UV erythema detector head with additional UVC radiation detection function***

Consult 60335-2-27 and 5050-1

No specifications for difference to cosine

$f_2 < 0.06$  for broadband radiometer

Consult 60335-2-27 and 5050-1

Measurement at 20 °C ± 5 °C ambient temperature

0.005 K<sup>-1</sup> (10 °C - 50 °C)

Consult 60335-2-27 and 5050-1

Half of the maximum exposure time

At least 15min and fluctuations less than ± 5 %

At  $E_{\text{eff}}$  0.3 W/m<sup>2</sup> about 5 min und 30 s

100 J/m<sup>2</sup> / 0.3 W/m<sup>2</sup> ≈ 330 s

Consult 60335-2-27 and 5050-1

Min. recommended distance 100±2mm for facial radiation devices

Full body radiation 0mm or in a radius of 30 cm

in front of the measurement point on the support surface



## Specifications

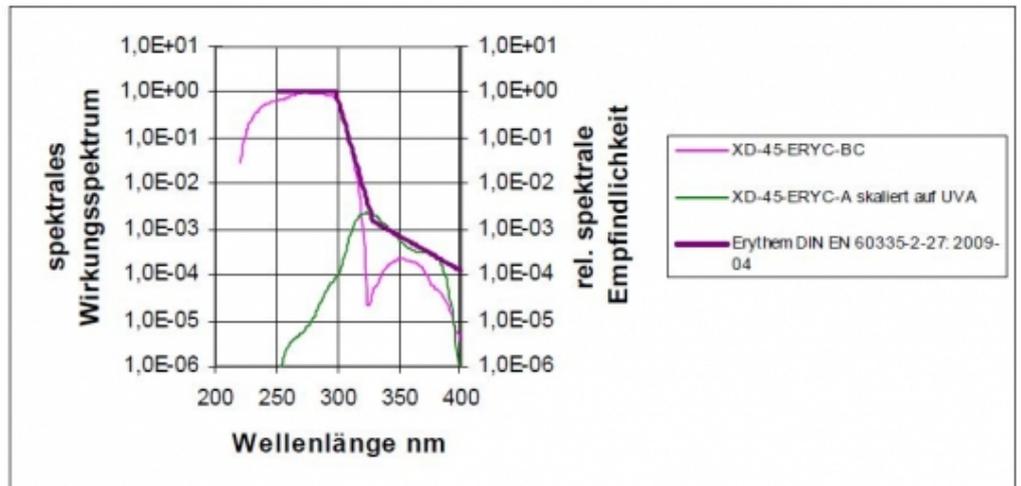
### General

Specifications	Model	XD-45-ERYC-4	UV-A <sub>320-400nm</sub> Sensor	UV-BC <sub>250-320nm</sub> Sensor	UV-C <sub>254nm</sub> Sensor
Spectral function	Erythema UV-ABC	Erythema UV-ABC	Erythema UV-A	Erythema UV-BC	UV-C
Sensitivity	-	-	9E-7 A/(W/m <sup>2</sup> ) <sub>eff</sub>	1.1E-8 A/(W/m <sup>2</sup> ) <sub>eff</sub>	1.4E-9 A/(W/m <sup>2</sup> )
Measurement range min.1)	1E-4 W/m <sup>2</sup> <sub>eff</sub>	1E-4 W/m <sup>2</sup> <sub>eff</sub>	1.1E-6 W/m <sup>2</sup> <sub>eff</sub>	9.E-5 W/m <sup>2</sup> <sub>eff</sub>	7E-4 W/m <sup>2</sup>
Measurement range max.1)2)	100 W/m <sup>2</sup> <sub>eff</sub>	100 W/m <sup>2</sup> <sub>eff</sub>	1.1E2 W/m <sup>2</sup> <sub>eff</sub>	5E3 W/m <sup>2</sup> <sub>eff</sub>	3.5E4 W/m <sup>2</sup>
Noise floor signal 1)	1E-5 W/m <sup>2</sup> <sub>eff</sub>	1E-5 W/m <sup>2</sup> <sub>eff</sub>	1.1E-7 W/m <sup>2</sup> <sub>eff</sub>	9E-6 W/m <sup>2</sup> <sub>eff</sub>	7E-5 W/m <sup>2</sup>
Max. signal amperage	-	-	100 µA	50 µA	50 µA
Sensor area	-	-	8 mm Ø	8 mm Ø	8 mm Ø
Viewing field function	-	-	cosine	cosine	cosine
Operating temp.	(5 - 40) °C	(5 - 40) °C	(5 - 40) °C	(5 - 40) °C	(5 - 40) °C
Cable length	2 m	2 m	-	-	-
Plug type	ITT (-4)	ITT (-4)	-	-	-
Short description	Mobile radiometer for the measurement of the UV Erythema effective irradiance and detection of UV-C radiation in accordance with the UV protection Act for solarium. UVSV, DIN EN 60335-2-27 and DIN 5050-1:2010-01 conformity.				

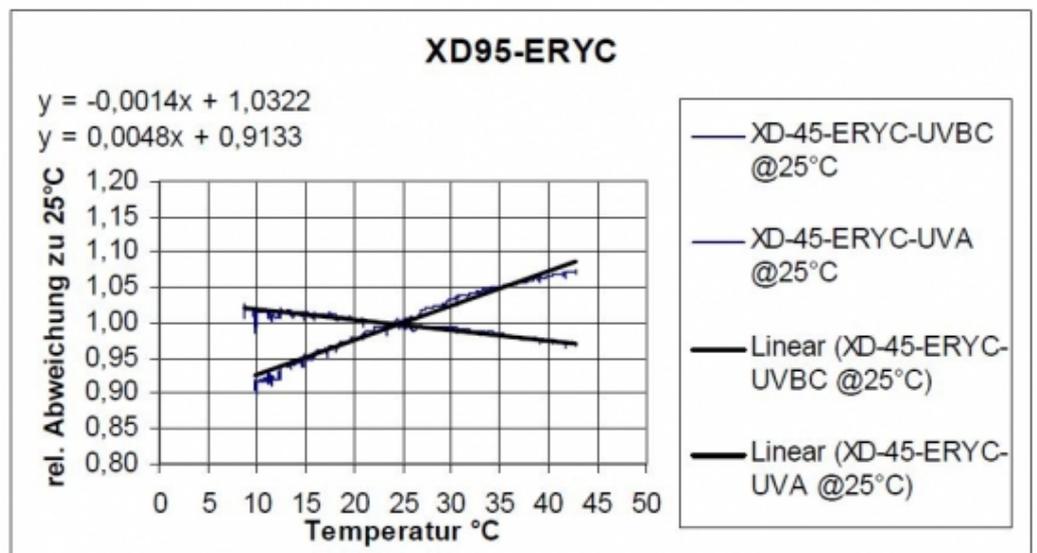
Main features	Compact gauge in ergonomic design for one hand control. Three-channel detector head XD-45-ERYC for the measurement of the effective UV-A and UV-BC Erythema irradiance and detection of UV-C irradiance. Battery powered with two AA cells. USB-Interface.
Measurement range	In accordance with the specifications of the detector head XD-45-ERYC.
typical applications	Mobile gauge for the check of the Erythem risk by use of sunbeds and tanning beds.
Calibration	Meter: Calibration and comparison of the current responsivity in each of the seven gain ranges.  Detector heads: Calibration of the actinic responsivity of each of the detector head channel. Calibration of the relative spectral responsivity of each of the detector head cells.  Calibration certificate with description of the calibration procedure, reference standards used and calibration values.

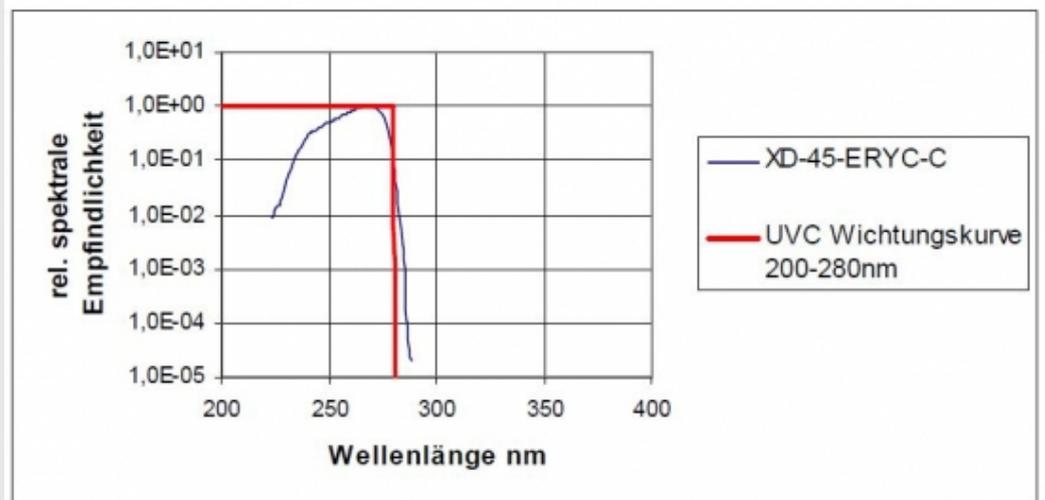
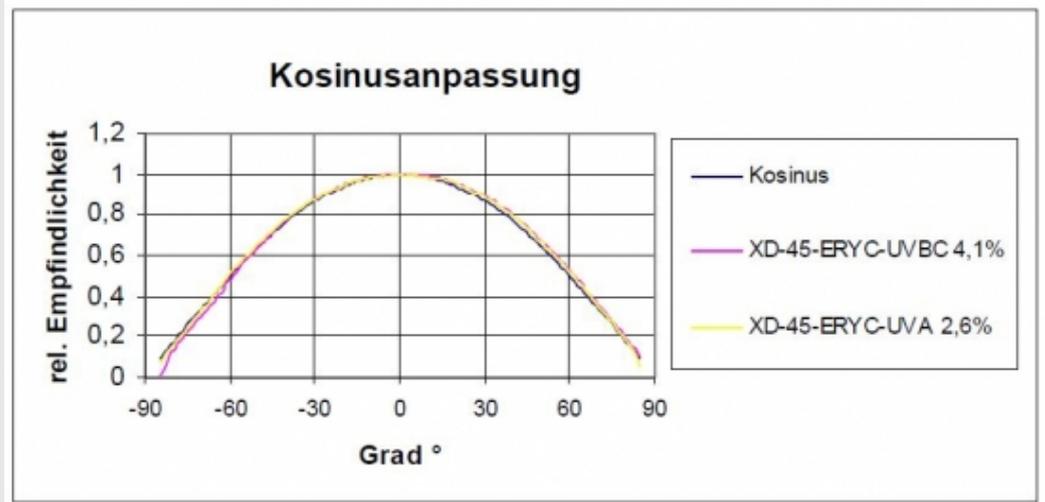
### Graphs

spectral responsivity



temperature range





## Configurable with

Produktname	Product Image	Description	Show product
XD-45-ERYC		Detector for UV hazard measurements of solaria and other tanning lamps in accordance to UVSV.  Features: Multi-cell detector for ERYTHEMA effective irradiance and UV-C evidence, for the usage with X1-4 optometer, calibration certificate.	<a href="http://www.gigahertz-optik.de/en-us/product/XD-45-ERYC">http://www.gigahertz-optik.de/en-us/product/XD-45-ERYC</a>
S-X1		Application software for X1 variants.	<a href="http://www.gigahertz-optik.de/en-us/product/S-X1">http://www.gigahertz-optik.de/en-us/product/S-X1</a>
S-SDK-X20		Software Development Kit for X20 variants (X1 and HCT99).	<a href="http://www.gigahertz-optik.de/en-us/product/S-SDK-X20">http://www.gigahertz-optik.de/en-us/product/S-SDK-X20</a>

## Purchasing information

Article-Nr	Modell	Description
<b>Product</b>		
15298893	X14	X1 <sub>4</sub> Erythema UV Meter with user manual and two AA batteries
15298270	XD-45-ERYC-4	UV Erythema and UVC irradiance detector head for use with X1 <sub>4</sub> Erythema UV Meter. 2m connector cable with ITT (-4) plug. Protection cap. Calibration certificate.
<b>Calibration</b>		
15300671	K-X1-c	Re-calibration for absolute current reading in all gain ranges of the amplifier of the X1 <sub>4</sub>
15300482	K-XD45ERYC-I	Re-calibration of the integral responsivities of the three detectors in the XD-45-ERYC detector head. Calibration certificate
15300571	K-UV-SR	Re-calibration of the relative spectral sensitivities of the two erythema effective sensors in the detector head XD-45-ERYC. 250 to 550nm
15300754	K-UV230-SR	Re-calibration of the relative spectral sensitivity of the UVC sensor in the detector head XD-45-ERYC. 230 to 550nm
<b>Software</b>		
15298167	S-X1	User software for the X1
15298071	S-SDK-X20	For software implementation of the X20 optometer board or X1 device into custom made software. Supply of .dll's and LabView VI's for device communication.
<b>Accessories</b>		
15298236	BHO-15	Hard case for X1 <sub>4</sub> and XD-45-ERY-4