KIPP & ZONEN
SINCE 1830



Broadband UV Radiometers

FOR THE ACCURATE MEASUREMENT OF SOLAR ULTRAVIOLET RADIATION

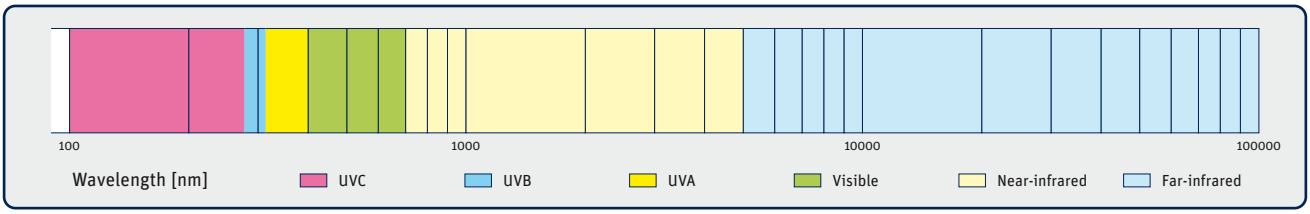
Spectral responses optimised for UVA, UVB and UVE/UVI
Temperature stabilised detection system
Cost effective dual-band models
'Total UV' radiometer

Introduction

The Ultraviolet (UV) part of the solar spectrum has several beneficial effects for human biology, but too much can be very harmful. The UV region covers the wavelength ranges 100-280 nm (UVC), 280-315 nm (UVB) and 315-400 nm (UVA). Almost all UVC, and approximately 90 % of UVB from the sun is absorbed by the Earth's atmosphere.

UV radiation helps to produce Vitamin D, but it can also burn the skin and cause cancers, melanoma and cataracts. UV radiation measured with a similar response to the human skin is termed Erythemally active UV irradiance (UVE) and is to calculate the Global Solar UV Index (UVI) for public health information.

For many applications it is only necessary to monitor the 'total UV' irradiance, which represents the combined UVA and UVB components. UVA radiation at the Earth's surface is normally 15-20 times greater than UVB.



Applications

'Total UV' is most commonly monitored in meteorology and climatology stations as an extension to the solar radiation monitoring by pyranometers. It is also used for checking the UV output of light sources and solar simulators for renewable energy research.

UVA and UVB measurements are used to monitor and investigate the effects of solar UV radiation on plants and animals. In materials testing important issues are the ageing effects of outdoor UV exposure that cause degradation, such as brittleness and discolouration. Measurements are also carried out under controlled conditions in environmental test chambers using artificial UV light sources.

UVE is monitored for human biology and medical applications, where it is important that the measurement is similar to the Erythemal response of the human skin. The data is often used to calculate the UV Index for public health information in weather reports. UVE is also measured in the development of cosmetics, sun blocks and creams, and protective materials for the skin.



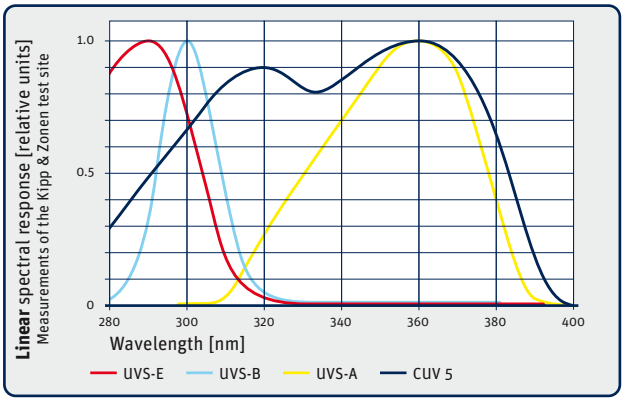
Choice of UV Radiometer

Type	For the measurement of
CUV 5	'Total UV' irradiance
UVS-A-T	UVA irradiance
UVS-B-T	UVB irradiance
UVS-E-T	Erythemally active UV irradiance
UVS-AB-T	UVA + UVB irradiance
UVS-AE-T	UVA + Erythemally active UV irradiance

Kipp & Zonen offers the UVS range of broadband radiometers for the accurate measurement of solar ultraviolet radiation through the atmosphere. UVA, UVB and UVE spectral responses match various measurement needs and dual-band models are available. Our unique UVIATOR software for UVS further improves the accuracy of the measurements by correcting for the amount of Ozone in the atmosphere and the solar elevation.

For the measurement of total UV irradiance the CUV 5 is the best choice.

For the ultimate UV measurements we have the Kipp & Zonen Brewer Mk III Spectrophotometer.



UVS Radiometers

UVS instruments are fully weather protected and suitable for use in all environments. Adjustable feet and a bubble level are used to ensure that the radiometer is horizontal. A precision quartz dome and specially shaped diffuser provide class-leading directional response.

The detection system includes optical filters and a phosphor that determine the spectral response. The phosphor is very sensitive to low levels of ultraviolet radiation and is stimulated by the UV to emit green light, which is detected by a photo-diode. The system is temperature stabilised at +25 °C to prevent changes in spectral response and sensitivity with variations in the ambient conditions.

The signal output is amplified for easy interfacing to data acquisition systems and the internal stabilisation temperature can be monitored. Power and signal connections are via a waterproof plug with 10 m of high quality UV resistant cable (25 m optional) and the instrument is kept dry internally by an easily removable desiccant cartridge.

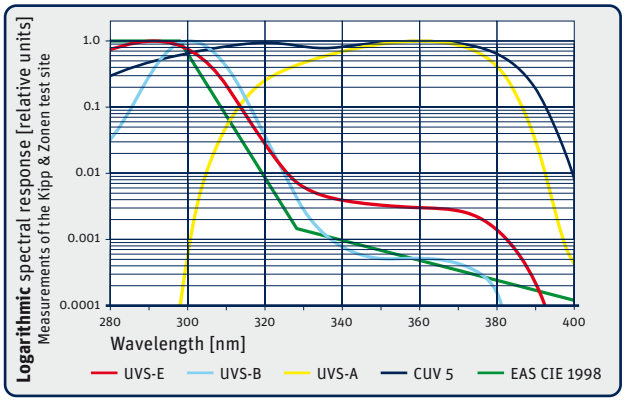
UVS-A-T Radiometer has a broad spectral response optimised for precise measurements of atmospheric UVA irradiance. The output of 0-3 V represents 0-90 W/m² of radiation.

UVS-B-T Radiometer has a broad spectral response optimised for precise measurements of atmospheric UVB irradiance. The output of 0-3 V represents 0-6 W/m² of radiation.

UVS-E-T Radiometer has a spectral response function that is close to the Erythemal (sunburn) action spectrum of the human skin (ISO: 17166:1999 / CIE S 007/E-1998). It can be seen from the response graphs that UVE includes some UVA radiation and a response into the UVC band. For this reason a UVB radiometer should not be used to measure UVE and to calculate the Global Solar UV Index.

The output of 0-3 V represents 0-0.6 W/m² of radiation. The Global Solar UV Index can be calculated by multiplying the radiation value by 40 m²/W. For example, 0.25 W/m² of UVE represents a UV Index of 10. This is the value used for public health information.

UVS-AB-T & UVS-AE-T Dual-Band Radiometers are cost-effective by combining two independent measurements in a single instrument. The performance of each band is the same as for the single-band radiometers.



Calibration and UVIATOR

People are very sensitive to small changes in the amount of UVB/UVE radiation. This depends upon altitude, the height of the sun in the sky, the amount of Ozone in the atmosphere and cloud cover. UVS radiometers are calibrated for a typical air-mass (solar zenith angle) and Ozone column concentrations. This is by comparison to reference UVS radiometers calibrated outdoors under natural sunlight with a Kipp & Zonen Brewer Mk III spectrophotometer.

All UVS instruments are supplied with calibration data files that include the spectral response function of the individual instrument and allow the data to be corrected for different solar zenith angles and Ozone column concentrations. Applying these corrections improves the accuracy by a factor of two or more. This can be done manually or it can be automated using UVIATOR.

UVIATOR is a Windows™ software programme that can import the calibration files for UVS radiometers. When the measurement data is imported, UVIATOR works out the solar zenith angle from the date, time and location information and applies appropriate corrections. It will go online to find the relevant Ozone Monitoring Instrument (OMI) satellite data and will apply the Ozone corrections. A file that contains the corrected UV measurements is generated.

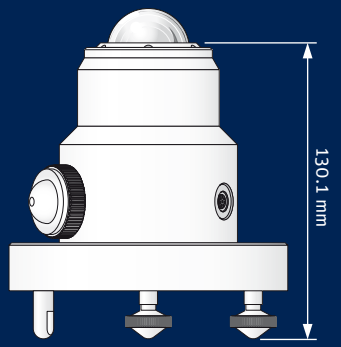


CUV 5 Broadband UV Radiometer

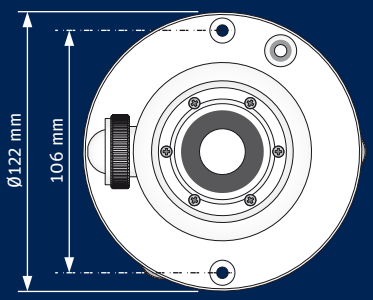
CUV 5 shares features with the CMP range of pyranometers and can be used with the same accessories.

It is suitable for use in all environments. Adjustable feet and a bubble level are used to ensure that the radiometer is horizontal and a snap-on sun shield provides protection. The instrument is kept dry internally by an easily removable desiccant cartridge.

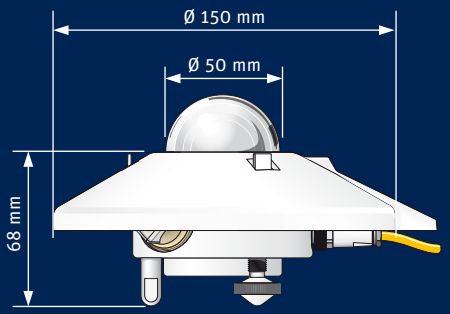
CUV 5 has a glass dome with extended UV transmission and a specially shaped diffuser to provide excellent directional response. The waterproof connector has gold-plated contacts and is fitted with 10 m of high quality signal cable as standard. The detection system includes optical filters and a photo-diode and CUV 5 does not require power to operate.



UVS series



CUV 5



Specifications	UVS-A-T	UVS-B-T	UVS-E-T	CUV 5
Spectral response (see graphs)	315 to 400 nm	280 to 315 nm	ISO 17166:1999 CIE S 007/E-1998	280 to 400 nm
Typical calibration factor	30 W/m²/V	2 W/m²/V	0.2 W/m²/V	N/A
Typical sensitivity	N/A	N/A	N/A	300 to 500 µV/W/m²
Output range	0 to 90 W/m²	0 to 6 W/m²	0 to 0.6 W/m²	0 to 200 W/m²
Zero offset (in darkness)	< 10 mV			N/A
Response time (95%)	< 1.5 s			< 1 s
Non-stability (change/year)	< 5 %			< 5 %
Non-linearity (over full range)	< 1 %			< 1 %
Directional error	< 2.5 % (at 70 ° zenith angle)			< 5 % (at 80 ° zenith angle)
Temperature dependence of sensitivity	Temperature stabilized internally at +25 °C, ±2 °C			-0.1 %/°C
Impedance (nominal)	500 Ω			10 KΩ
Operating temperature	-40 to +50 °C			-40 to +80 °C
Expected daily uncertainty	< 5 %			< 5 %
Internal temperature output	2.5 V at +25 °C			N/A
Power supply	7 to 18 VDC / 8 W			N/A
Calibration data supplied	Nominal sensitivity, spectral response, solar zenith angle corrections, Ozone column corrections			Sensitivity
UVIATOR software	Included, corrects for solar zenith angle and Ozone column concentration			N/A

Specifications for dual-band UVS-AB-T and UVS-AE-T are for each band the same as for the single-band UVS-A-T, -B-T and -E-T models

UVS has a standard cable length of 10 m, optional cable length 25 m

CUV 5 has a standard cable length of 10 m, optional cable lengths 25 m and 50 m

N/A means that the specification is not applicable

Note: The performance specifications quoted are worst-case and/or maximum values

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Go to www.kippzonen.com for your local distributor

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Kipp & Zonen B.V. reserve the right to alter specifications of the equipment described in this documentation without prior notice