

- © Hand-held Dual-channel Meter for Field Service and Laboratory Use
- © True Broadband UV-A and UV-B Sensitivity
- © Calibration for Narrowband UV-B<sub>311</sub> UV Sources
- © Cosine Corrected Field of View
- © CW Measurement Mode for DC and AC Light
- © Snapshot Hold Function
- © Dose Measurement Mode
- © Easy to Use
- © Economical Price
- © Battery Operation
- © RS232 Interface



### UV-A & UV-B Phototherapy

UV is widely used by dermatologists in the treatment of certain skin diseases like Psoriasis and Vitiligo. Whole body exposure booths and hand and foot units employing light sources which emit broadband UV-A, UV-B, narrowband 311 nm UVB and combinations of UV-A and UV-B are used to irradiate the patient.

In PUVA phototherapy, also called photochemotherapy, UV-A is applied in combination with a photosensitizing agent which is taken in pill form or applied topically to the skin. This medication called psoralen, giving rise to the acronym PUVA, makes the skin more sensitive and responsive to the UV-A (315-400 nm) wavelengths.

Due to the risks of premature skin ageing and skin cancer from prolonged exposures, also with consideration to skin type, PUVA is only recommended for moderate to severe cases of Psoriasis. As a side note, psoralen is also being used as a photosensitizer in UV sterilization of blood.

UV-B broadband treatment is normally administered without a photosensitizing agent. It is considered safer than UV-A for wavelengths between approx. 290 to 315 nm, since it does not penetrate as deeply into the skin and is more energetic allowing shorter overall exposure times. However, it is generally accepted that wavelengths below 290 nm produce more erythema which can actually inhibit the therapeutic effects of the longer wavelengths.

As a result, narrowband UV-B sources emitting at predomi-

nantly 311-312 nm, have been developed. These TL-01 sources emit in the wavelength zone of most effectiveness while producing less erythema than broadband UV-B sources.

A TL-12 UV-B source with a slightly wider emission band between 280-350 nm, peaking at about 305 nm is also in use. For more information contact the National Psoriasis Foundation and the American and European Academies of Dermatology.

Dose, used here as irradiance accumulated over time, is normally measured in phototherapy applications.

Ultraviolet radiation is also used for photobiological studies like SPF testing. Again, the wavelength ranges of interest are typically UV-A, UV-B and UV-B<sub>311</sub>.

Radiometers with a precise spectral match to the spectral ranges of interest with low cross-talk between UV-A and UV-B are required for accurate dosimetry and quantification. A cosine corrected field of view, simple operation for inexperienced users and an attractive price level

are also desirable.

### X9<sub>6</sub> Meter

Beside its precise measurement capability the X9<sub>6</sub> meter's ("Xninesix") most outstanding feature is its easy handling. To measure, the user simply switches on the meter and selects either the CW (W/cm<sup>2</sup>) or Dose (J/cm<sup>2</sup>) mode. The LCD characters are 9 mm high for easy viewing. The X9<sub>6</sub> is a compact handheld battery operated instrument.

### XD-9501-4 Detector Head

The irradiance detector head houses separate UV-A and UV-B detectors whose spectral sensitivity and cosine corrected field of view meet accepted UV-A & UV-B spectral standards.

- The spectral sensitivity characteristic of the UV-A and UV-B detectors was developed by computer simulation using several sample filter and detector combinations. The optimum spectral functions were chosen after calculating the measurement uncertainty of each of these detector/filter/diffusers for a group of sample radiation sources. This method of characterizing the performance of integral measuring UV-meters was developed by the „Thematic Network for Ultraviolet Measurements“ funded by the Standards, Measurements and Testing program of the Commission of the European Communities (see tutorials).

- Cosine correction of the detectors is of equal importance in achieving low measurement uncertainties.

### Traceable Calibration

Instrument calibration is trace-

able to the ISO EN 17025 accredited part of Gigahertz-Optik's Calibration Laboratory for Optical Radiation Quantities.

Calibration of UV-A and UV-B irradiance sensitivity as well as an additional narrowband UV-B calibration at 311 nm for TL-01 type sources is supplied. Individually measured plots of the UV-A and UV-B spectral sensitivities are provided as part of the calibration certificate.

### Custom Labeling:

All meters in the X9 family are ready made for custom design and labeling. Customization may include the meter front panel, function/mode set-up, detector heads, manuals and calibration certificates.

Contact the factory for details and applications assistance.

### Operation

The X9<sub>6</sub> is simple to operate. To measure, connect the detector and switch on the meter.

### Detector Selection

Selection of the UV-A, UV-B or UV-B<sub>311</sub> detector is easily done in the menu mode.

### CW Measurement

CW mode is used to measure continuous DC or AC signals.

### Dose Measurement

Measurement values are accumulated at a logger rate of 1 s and displayed as dose. The measurement is manually started and stopped.

### Stop/Run Function

Current reading can be 'frozen' by pressing 'stop' button.



## X9<sub>6</sub> Specifications & Ordering Information

### Specifications: X9<sub>6</sub> Meter

Signal Input	
Detector Input	Photocurrent to voltage converter amplifier with following voltage to voltage amplifier (x10). 7 decade stepped gain ranges with max. gain signal values from 200.0 $\mu$ A to 200.0 pA . Automatic range switching. 12 bit ADC with up to 14 bits at longer integration times.
Signal Processing	A/D converter with 20 ms time interval. 500 ms integration through averaging of multiple measurements.
Frequency Range	Signal conversion from 0.166 Hz to >300 MHz. .
Detector Connector	9 pin MDSM9 socket . Connected detector identification if meter switched ON (VL-3704-4 and LDM-9901-4 only).

### Range Specifications

Range (A/V)	Max. Input Value	Slew-Rate (10 - 90%)	Error (with offset compensation) 1 year, 23°C $\pm$ 5°C. $\pm$ (% of reading + % of range),	Permitted Detector Capacitance
1x10 <sup>-4</sup>	200.0 $\mu$ A	30 ms	0.2 %* + 0.05 %	2 nF
1x10 <sup>-5</sup>	20,00 $\mu$ A	30 ms	0.2 %* + 0.05 %	2 nF
1x10 <sup>-6</sup>	2,000 $\mu$ A	30 ms	0.2 %* + 0.05 %	2 nF
1x10 <sup>-7</sup>	200,0 A	30 ms	0.2 %* + 0.05 %	10 nF
1x10 <sup>-8</sup>	20,00 nA	30 ms	0.2 %* + 0.05 %	10 nF
1x10 <sup>-9</sup>	2,000 nA	30 ms	0.2 %* + 0.05 %	10 nF
1x10 <sup>-10</sup>	200,0 pA	30 ms	0.2 %* + 0.05 %	10 nF

### Functions

Parameter Settings	Retention of the last settings in continuous memory. 3 function buttons.
Measurement Quantity	Ampere calibrated with DKD calibrated current source. Current signal of UV-A and UV-B detector multiplied with calibration correction factor to display irradiance in mW/cm <sup>2</sup> .

### General

Display	6 character LCD. Character height 9 mm. Indication of appropriate measurement quantities , battery low, peak, stop
Operating Temperature	5 to 40 °C (41 to 104 ° F) (75 % rel. H, non-condensing). Storage Temperature: 0 to 50°C (32 to 122 °F).
Dimensions/Weight	120 x 65 x 22 mm / 150 g (4.7 x 2.6 x 0.9 in / 0.33 lb).
Power	9 V one-piece battery. Operation time about 100 h. Operation from a AC plug-in power supply 230V/50 Hz on option, erases battery operation.

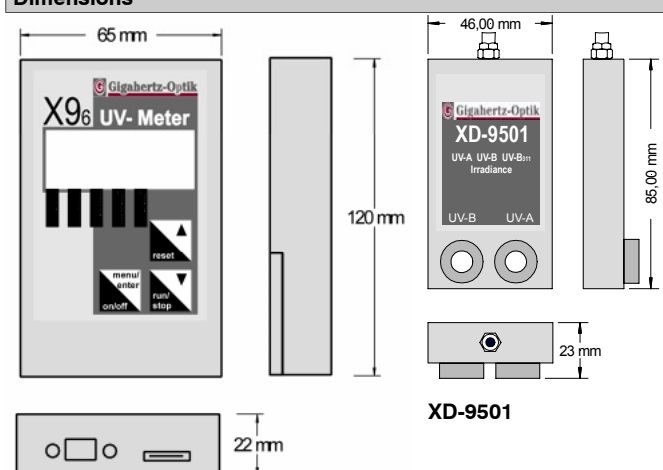
### Interface

RS232	9600 Baud, 8 8D, 1S,N. 8 pin plug Hirose, type 3260-8S1. Power supply operation recommended for remote control.
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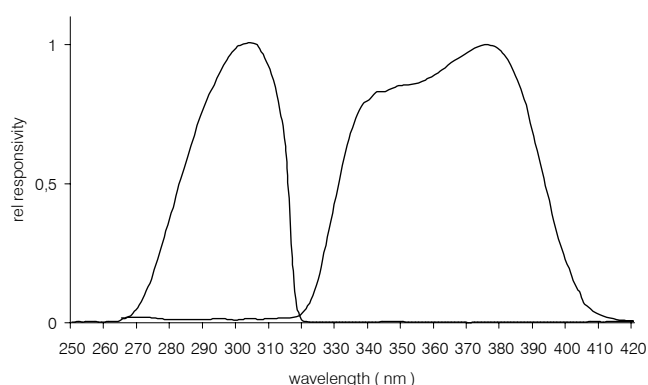
### X9<sub>6</sub> with XD-9501-4

typ. UV-A measurement range	0.0005 to 20.000 mW/cm <sup>2</sup> with max. 0.00001 mW/cm <sup>2</sup> resolution
typ. UV-B measurement range	0.00015 to 60.000 mW/cm <sup>2</sup> with 0.00003 mW/cm <sup>2</sup> resolution
Dose range for UV-A and UV-B	0.00001 J/cm <sup>2</sup> to 100.000 J/cm <sup>2</sup>

### Dimensions



### spectral sensitivity characteristic



### Ordering Information

X9 6	UV-A, UV-B and UV-B311 irradiance and dose meter. Detector calibration data stored in memory . Includes detector head, XD-9501-4 battery , handbook and hard case.
X9Z-01	RS232 interface cable to connect the X9 meter with 9PIN SUB-D PC standard socket
X9Z-02	External AC power unit for the X9 meter including meter modification (cancels battery operation)