Delta OHM LPUVI02 UV Index Radiometer User Manual

Member of GHM GROUP

Operating manual
UV Index Radiometer
LPUVI02

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Keep for future reference.

Contents

INTRODUCTION

The LPUVI02 radiometer measures the global effective irradiance on a flat surface according to the requirements of the WMO for the measurement of UV index. The global irradiance is the sum of direct sun irradiance and diffuse irradiance. In the ultraviolet spectral region, unlike what occurs in the portion of visible light, where the direct component is prevalent on the diffuse component, the light is strongly scattered by the atmosphere, and therefore the two components are equivalent; it is therefore of primary importance that the radiometer is able to accurately measure both components.
The radiometer is available in the following versions:

Range 0…16 UV index

- LPUVI02AC: 4…20 mA current output
- LPUVI02AV: 0…10 V voltage output
- LPUVI02AV1: 0…1 V voltage output
- LPUVI02AV5: 0…5 V voltage output

Range 0…20 UV index

- LPUVI02.1AC: 4…20 mA current output
- LPUVI02.1AV: 0…10 V voltage output
- LPUVI02.1AV1: 0…1 V voltage output
- LPUVI02.1AV5: 0…5 V voltage output

The versions LPUVI02.1… have 20 UV index measuring range and are suitable for the measurement of UV in equatorial areas and high mountains, where the UV index can exceeds 11 for a significant time.
The radiometer is manufactured to operate for long periods without maintenance (if powered correctly). This characteristic makes it suitable for use in remote meteorological stations.

UV INDEX EXPOSURE LIMITS
The UV index is a dimensionless value calculated from the total effective irradiance Eeff (expressed in W/m 2) in accordance with WMO requirement: UV_index = Eeff x 40
The following table shows the potential damage that the solar ultraviolet radiation can cause to skin and eyes.

UV index	Exposure	Prescriptions
1, 2	Low	No protection needed
3…5	Moderate	Some protection required
6, 7	High	Full protection required
8…10	Very high	Extra protection required
> 10	Extreme	Stay inside

WORKING PRINCIPLE

LPUVI02 is based on a solid state sensor, whose spectral response has been adapted to the UV weighting curve (CIE, Erythema action curve). Figure 2.1 shows the comparison between the spectral response of LPUVI02 and the UV action curve.

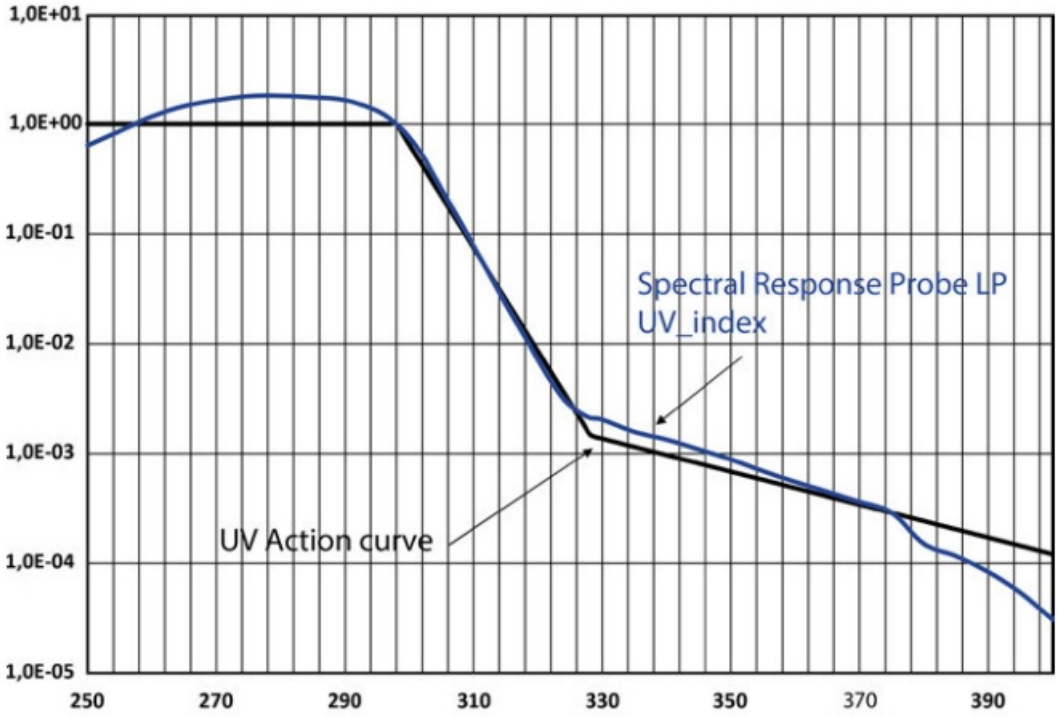


Fig. 2.1

The radiometer is equipped with a quartz dome in order to ensure adequate sensor protection against weather agents.
The response according to the cosine law has been obtained by using a material with excellent ultraviolet diffusion and transmission properties. The deviation between the theoretical and the measured response is shown in figure 2.2.

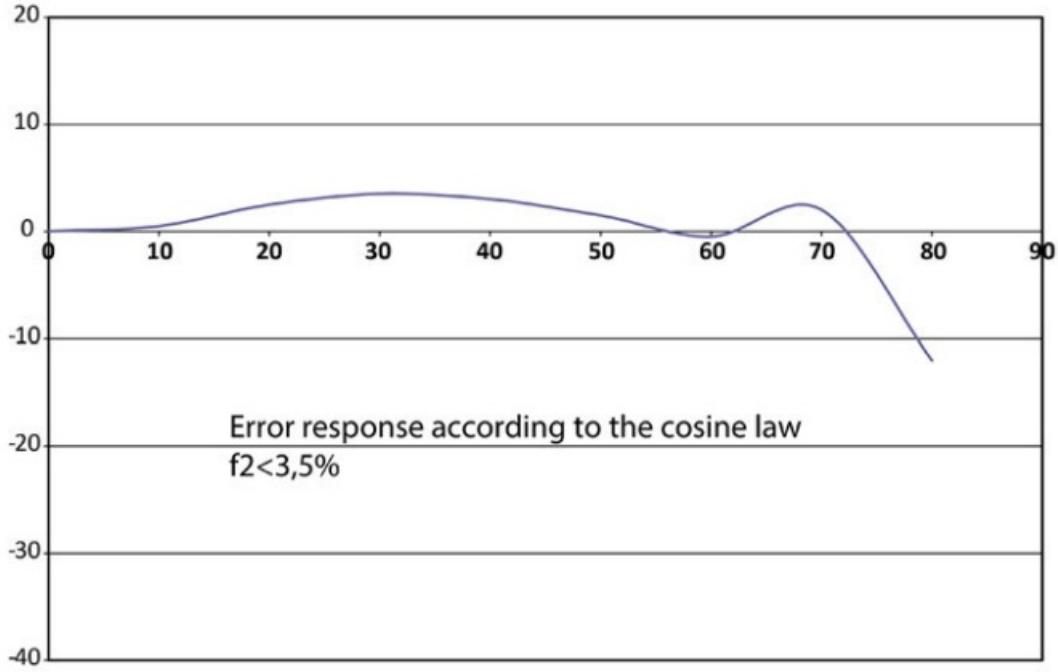


Fig. 2.2

The excellent accordance between the LPUVI02 response and cosine response (error f2<3.5%) allows using the sensor even when the sun elevation is low (the diffuse component of solar ultraviolet light increases as the sun moves away from the zenith, so the error on direct component due to imperfect response according to the cosine law, becomes negligible on the measurement of global radiation).

INSTALLATION

Before installing the radiometer, refill the cartridge containing silica-gel crystals. Silica gel absorbs humidity in the dome chamber and prevents, in particular climatic conditions, condensation on the internal walls of the domes and measurement alteration.
Do not touch the silica gel crystals with your hands while refilling the cartridge. Carry out the following instructions in an environment as drier as possible:

1. Loosen the three screws that fix the white shade disk.
2. Unscrew the silica gel cartridge using a coin.
3. Remove the cartridge perforated cap.
4. Open the sachet containing silica gel (supplied with the radiometer).
5. Fill the cartridge with the silica gel crystals.
6. Close the cartridge with its own cap, paying attention that the sealing O-ring be properly positioned.
7. Screw the cartridge to the radiometer body using a coin.
8. Check that the cartridge is screwed tightly (if not, silica gel life will be reduced).
9. Position the shade disk and screw it with the screws.
10. The radiometer is ready for use.

The figure below shows the operations necessary to fill the cartridge with the silica gel crystals.

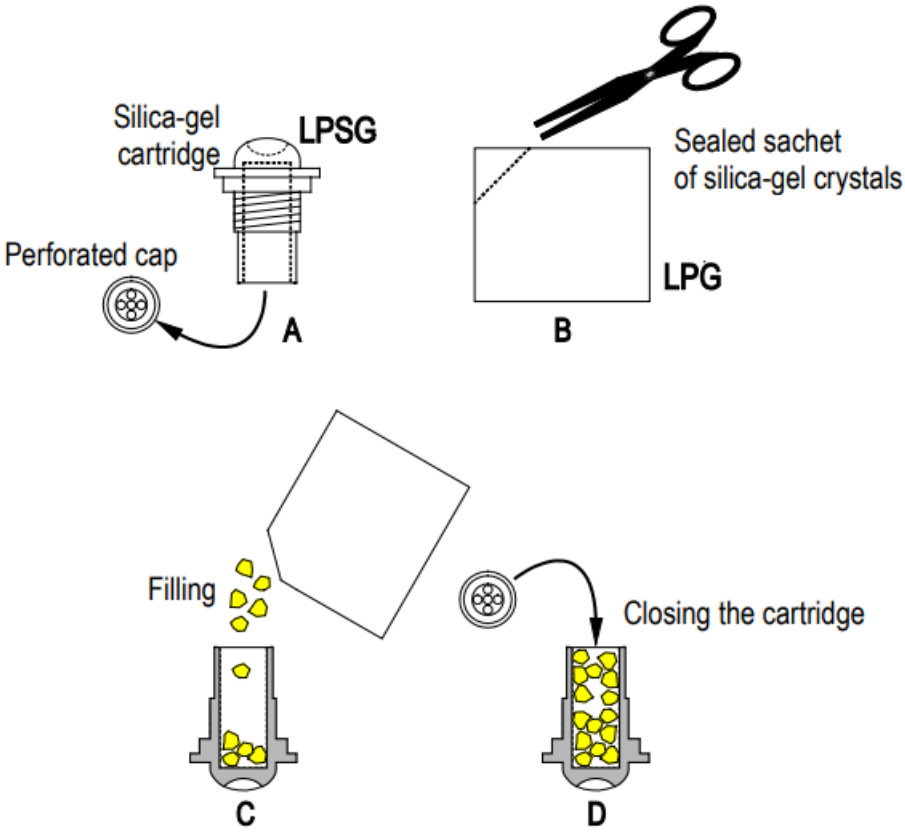


Fig. 3.1: filling the silica-gel cartridge

- The radiometer must be mounted in an easy-to-reach location in order to clean the dome regularly and carry out maintenance. At the same time, make sure that no buildings, constructions, trees or obstructions exceed the horizontal plane where the radiometer lies. If this is not possible, select a site where obstructions in the path of the sun from sunrise to sunset do not exceed 5 degrees of elevation.
- The radiometer must be located far from any kind of obstruction, which might reflect sunlight (or sun shadow) onto the radiometer itself.
- For fixing, use the holes on the radiometer body (remove the shade disk to access the holes and reposition it after mounting) or the suitable accessories (see the figures below). In order to allow an accurate horizontal positioning, the radiometer is equipped with a levelling device: the adjustment is made by means of the two levelling screws that allow adjusting the radiometer inclination. The mast height does not exceed the radiometer plane to avoid measurement errors caused by any reflection or shadow of the mast itself.
- It is preferably to thermally insulate the radiometer from its mounting bracket ensuring, at the same time, a good electrical contact to ground.

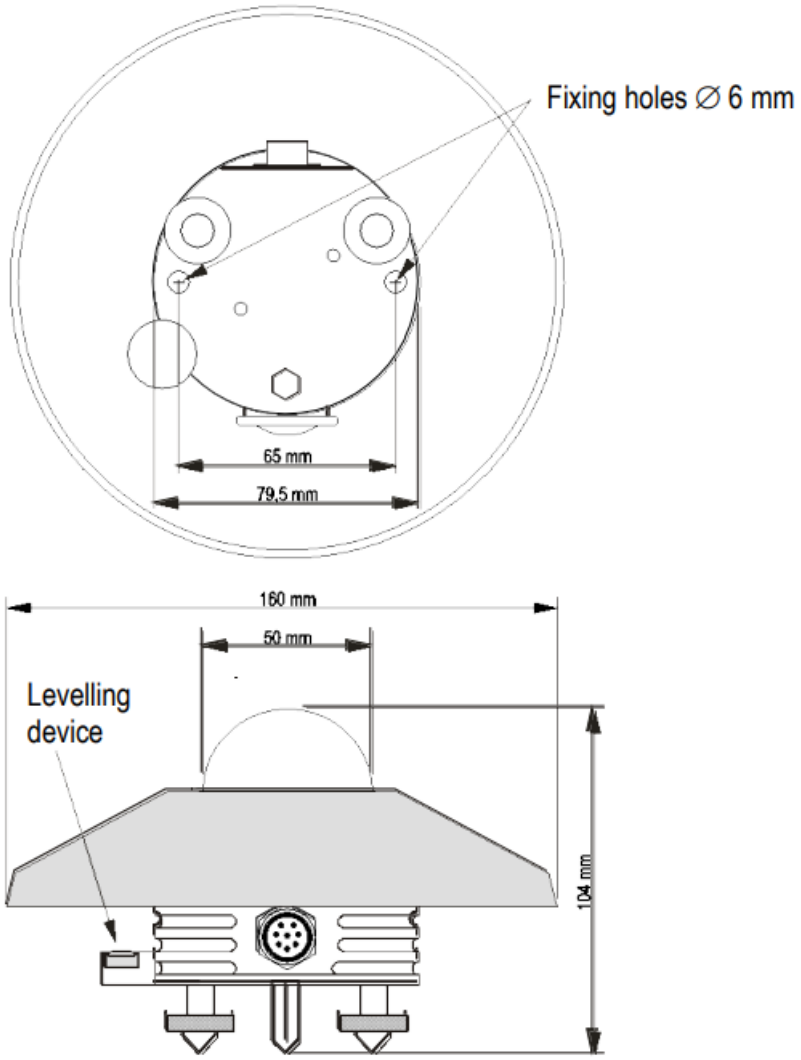


Fig. 3.2: fixing holes and levelling device

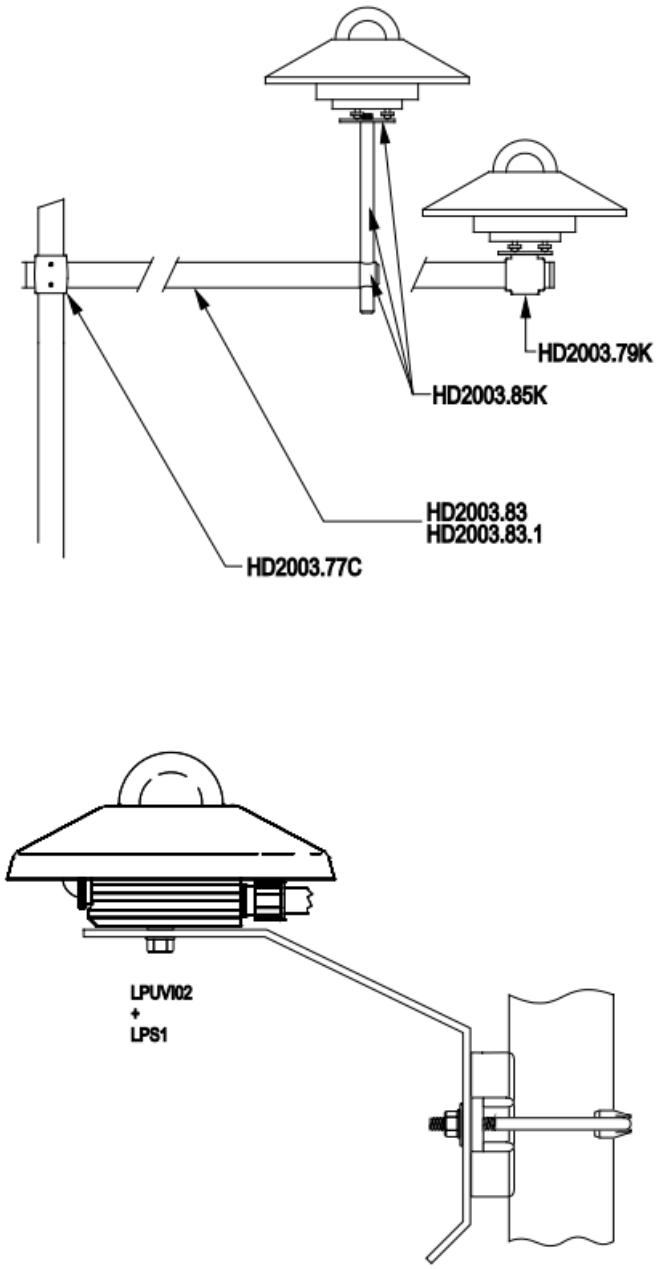


Fig. 3.3: fixing accessories

ELECTRICAL CONNECTIONS

LPUVI02 has a 4-pole connector and uses the CPM12AA4… optional cables.

The metallic housing of the radiometer should preferably be grounded (⏚) locally. In this case, do not connect the wire of the cable corresponding to the housing to prevent ground loops.
Only if it is not possible to ground locally the metallic case of the radiometer, connect the wire of the cable corresponding to the housing to ground. Note: in LPUVI02…AV… the housing is not connected to the connector.

4.1 LPUVI02…AC CONNECTIONS

The radiometer LPUVI02…AC has 4…20 mA output and requires 8…30 Vdc external power supply. It is to be connected to a power supply and an instrument with 4…20 mA input as shown in fig. 4.1. The load resistance of the instrument reading the signal must be ≤ 500 Ω.

Connector	Function	Color
1	Positive (Iin)	Red
2	Negative (Iout)	Blue
3	Housing (C)	White
4	Cable shield (SH)	Black

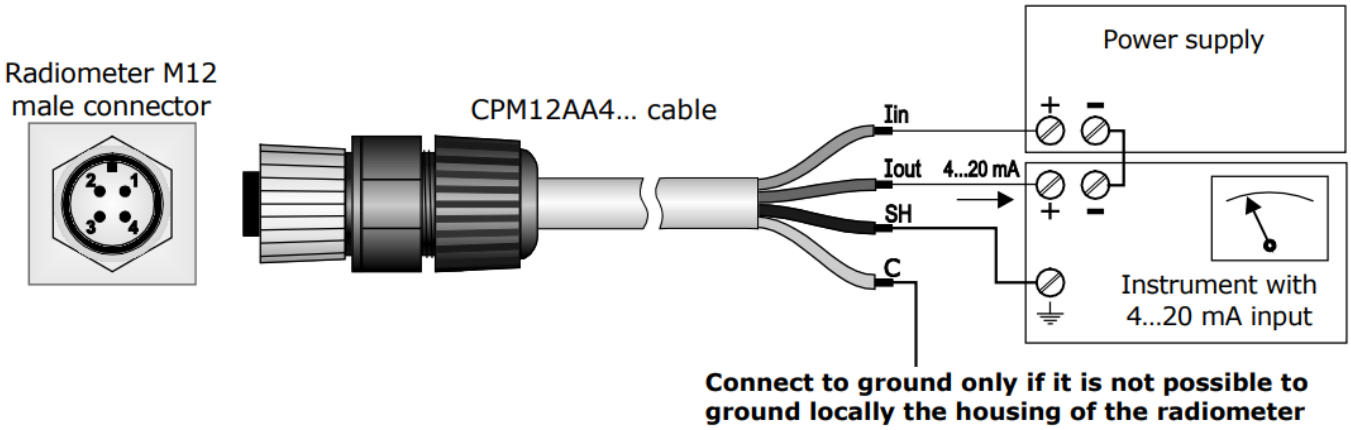


Fig. 4.1: LPUVI02...AC connections

4.2 LPUVI02…AV… CONNECTIONS

The radiometer LPUVI02…AV… has 0…1 V, 0…5 V or 0…10 V output (depending on the ordered output) and requires external power supply: 8…30 Vdc for 0…1 V and 0…5 V outputs, 15…30 Vdc for 0…10 V output. It is to be connected to a power supply and an
instrument with voltage input as shown in fig. 4.2. The load resistance of the instrument reading the signal must be ≥ 100 kΩ.

Connector	Function	Color
1	Output positive (+Vout)	Red
2	Output negative Power supply negative (GND)	Blue
3	Power supply positive (+Vdc)	White
4	Cable shield (SH)	Black

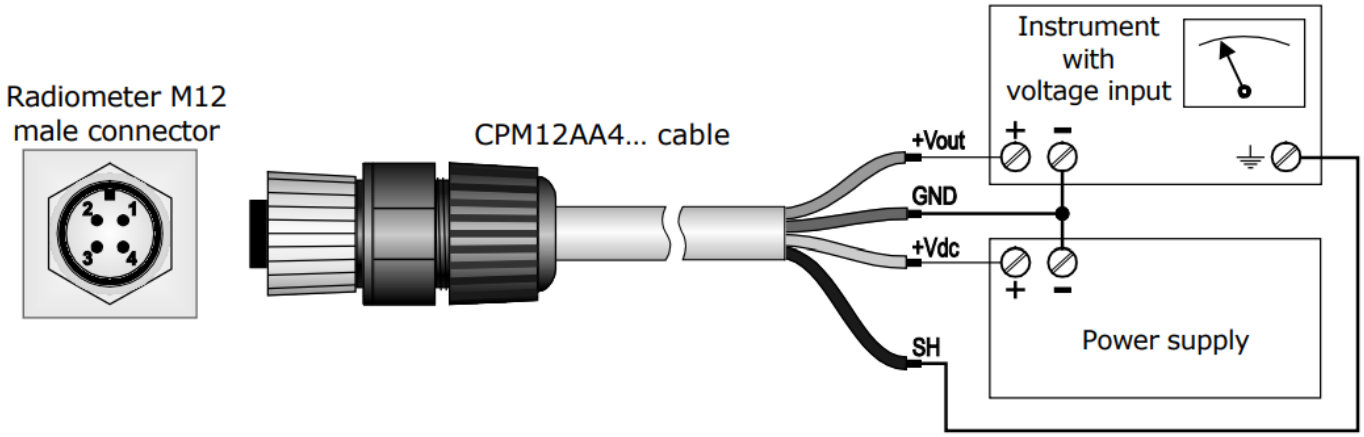


Fig. 4.2: LPUVI02...AV... connections

MEASUREMENT

LPUVI02AC
The 4…20 mA output signal corresponds to 0…16 UV Index range.
The UV Index is obtained by measuring with a multimeter the current Iout absorbed by the sensor, expressed in mA, and applying the following formula:

UV Index = (Iout – 4)

LPUVI02.1AC
The 4…20 mA output signal corresponds to 0…20 UV Index range.
The UV Index is obtained by measuring with a multimeter the current Iout absorbed by the sensor, expressed in mA, and applying the following formula:

UV Index = 1.25 x (Iout – 4)

LPUVI02AV…
The output signal (0…1 V, 0…5 V or 0…10 V depending on the version) corresponds to 0…16 UV Index range.
The UV Index is obtained by measuring with a multimeter the output voltage Vout of the sensor, expressed in V, and applying the following formula:

UV Index = 16 x Vout for the version 0…1 V
UV Index = 3.2 x Vout for the version 0…5 V
UV Index = 1.6 x Vout for the version 0…10 V

LPUVI02.1AV…

The output signal (0…1 V, 0…5 V or 0…10 V depending on the version) corresponds to 0…20 UV Index range.
The UV Index is obtained by measuring with a multimeter the output voltage Vout of the sensor, expressed in V, and applying the following formula:

UV Index = 20 x Vout for the version 0…1 V
UV Index = 4 x Vout for the version 0…5 V
UV Index = 2 x Vout for the version 0…10 V

MAINTENANCE

In order to grant measurements high accuracy, it is important to keep the glass dome clean. Consequently, the

more the dome will be kept clean, the more measurements will be accurate.
You can wash it using water and standard papers for lens. If necessary, use pure ETHYL alcohol. After using alcohol, clean again the dome with water only.
Because of the high temperature changes between day and night, some condensation might appear on the radiometer dome. In this case the performed reading is highly over-estimated. To minimize the condensation, the radiometer is provided with a cartridge containing dessicant material (silica-gel). The efficiency of the silica-gel crystals decreases over time while absorbing humidity. Silica-gel crystals are efficient when their colour is yellow, while they turn white/translucent as soon as they lose their efficiency. Read instructions at chapter 3 about how to replace the silica-gel crystals. Silica-gel typical lifetime goes from 2 to 6 months depending on the environment where the radiometer works. To exploit all the radiometer features, it is highly recommended that the calibration be checked annually.

TECHNICAL SPECIFICATIONS

Measuring range	0…16 UV Index (LPUVIO2AC / AV…) 0…20 UV Index (L PUVIO2.1AC / AV…)
Viewing range	27 sr
Spectral range	According to UV weighting curve
Response time	<0.5 s (95%)
Output	LPUVIO2AC = 4…20 mA LPUVIO2AV… = 0…1, 0…5, 0…10 V (depending on the model)
Power supply	8…30 Vdc (15…30 Vdc only for output 0…10 V)
Operating temperature	-40 °C…+80 °C
Response according to the cosine law	< 8 % (between 0° and 80°)
Long term instability (1 year)	<1±31 %
Non linearity	< ±1 %
Temperature response	< 0.1%/°C
Weight	900 g approx.

SAFETY INSTRUCTIONS

The instrument has been manufactured and tested in accordance with the safety standard EN61010-1:2010 “Safety requirements for electrical equipment for measurement, control and laboratory use” and has left the factory in perfect safety technical conditions. The instrument proper operation and operating safety can be ensured only if all standard safety measures as well as the specific measures described in this manual are followed.

Do not use the instruments in places where there are:

- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

User obligations
The instrument operator shall follow the directives and regulations below that refer to the treatment of dangerous

materials:

- EEC directives on workplace safety.
- National law regulations on workplace safety.
- Accident prevention regulations.

ACCESSORIES ORDERING CODES

The radiometer is supplied with shade disk, sylica-gel cartridge, 2 spare sachets, levelling device, M12 connector and Calibration Report.

Accessories

CPM12AA4…	4-pole cable. 4-pole M12 connector on one end, open wires on the other end. Available length 2 m (CPM12AA4.2), 5 m (CPM12AA4.5) or 10 m (CPM12AA4.10).
LPS1	Only attachment bracket, suitable for mast with diameter 40…50 mm. Installation on horizont al or vertical mast.
LPSP1	Spare shade disk.
LPSG	Cartridge to contain desiccant silica-gel crystals, complete with Oring and cap. Spare part.
LPG	Pack of 5 sachets of silica-gel crystals. Spare part.
LPS6	Kit for the installation of the radiometer. The kit includes: 750 mm mast, base fitting, graduate d support plate, bracket for radi- ometer.
LPRING02	Base with levelling device and adjustable holder for mounting the radiometer in an inclined po sition.

DELTA OHM metrology laboratories LAT N° 124 are ISO/IEC 17025 accredited by ACCREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity.
They can supply calibration certificates for the accredited quantities.

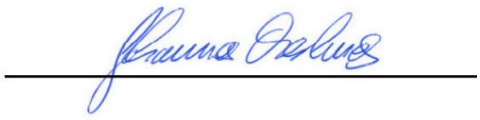
CE

EU DECLARATION OF CONFORMITY
Delta Ohm S.r.L. a socio unico — Via Marconi 5 — 35030 Caselle di Selvazzano — Padova — ITALY
Document-No. / Month.Year : 5189 / 07.2019
We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:
Product identifier :LPUVIO2…
Product description :UV Index radiometer
The products conform to following European Directives:

Harmonized standards	
EN 61010-1:2010	Electrical safety requirements
EN 61326-1:2013	EMC requirements
EN 50581:2012	RoHS

Applied harmonized standards or mentioned technical specifications:

Harmonized standards EN 61010-12010 Electrical safety requirements EN 81328-12013 EMC requirements EN 505812012 RoHS
The manufacturer is responsible for the declaration released by:
Johannes Overhues
Chief Executive Officer
Caselle di Selvazzano, 1 910 7/2 01 9



This declaration certifies the agreement with the harmonization legislation mentioned, contained however no warranty of characteristics.

WARRANTY

Delta OHM is required to respond to the “factory warranty” only in those cases provided by Legislative Decree 6 September 2005 – n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.
Delta OHM repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the “Convention on Contracts for the International Sales of Goods” apply.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased. In case of discrepancies and/or inconsistencies, please write to **sales@deltaohm.com**.
Delta OHM reserves the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION

Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste.
European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.
Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

CE  RoHS

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08/2022
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Documents / Resources

	Delta OHM LPUVI02 UV Index Radiometer [pdf] User Manual LPUVI02 UV Index Radiometer, LPUVI02, UV Index Radiometer, Index Radiometer

References

- Delta OHM - Measuring, monitoring, testing and control instruments