



## LP UVA 02 - LP UVA 02AC - LP UVA 02AV RADIOMETRIC PROBES

The radiometric LP UVA 02, LP UVA 02AC, and LP UVB02AV probes measure the global irradiance in the UVA on a flat surface (Watt/ m<sup>2</sup>). The irradiance is the sum of direct solar irradiance and of diffuse irradiance from the sky.

The radiometer can also be used for monitoring UVA irradiance indoor.

### Working Principle

LP UVA 02 radiometer is based on a solid state sensor, the spectral match with the desired curve is obtained using special filter. The relative spectral response is reported on figure 3. In order to protect the diffuser from the dust, LP UVA 02 is equipped with a 50mm glass dome. The cosine law response is obtained with a particular shaped PTFE diffuser. In figure 4 the cosine error versus angle of incident is reported.

The excellent cosine law response of LP UVA 02 allow to use the radiometer at any sun's zenith angle. (The diffused component of the UVA increases as the sun moves away from the zenith, so the error on direct component due to imperfect response according to the cosine becomes negligible on the measurement of global irradiance).

### Installation and Mounting of the Radiometer for the Measurement of Global Radiation:

Before installation, refill the cartridge containing silica-gel crystals. Silica gel absorbs humidity in the dome chamber and prevents (in particular climatic conditions) internal condensation forming 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 dry 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- Replace 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.

Figure N.1 shows the operations necessary to fill the cartridge with the silica gel crystals.

- The LP UVA 02 radiometer has to be mounted in a readily accessible location to clean the dome regularly and to carry out maintenance. At the same time, check that no building, construction, tree or obstruction exceeds the horizontal plane where the radiometer lays. If this is not possible, select a site where obstructions do not exceed 5 degrees of elevation, in the path followed by the sun, between earliest sunrise and latest sunset.
- The radiometer has to be located far from any kind of obstruction, which might reflect sunlight (or sun shadow) onto the radiometer itself.
- The LP UVA 02 radiometer is provided with a spirit level for carrying out an accurate horizontal leveling. The adjustment is made by means of two leveling screws that allow to adjust the radiometer inclination. Use the two 6mm-diameter holes and a 65mm interaxial distance to mount the instrument on a plane. Remove the shade disk to access the holes and reposition it after mounting (see fig. 2).
- The LP S1 mounting kit, supplied on demand as an accessory, allows an easy mounting of the radiometer on a mast. The mast maximum diameter shall not exceed 50 mm. The operator shall take care that the mast height does not exceed the radiometer plane to avoid measurement errors caused by any reflection or shadow of the mast itself. To fix the radiometer to the mounting bracket, remove the shade disk loosening the three screws, fix the radiometer, and mount the white shade disk again.
- It is suggested to thermally isolate the radiometer from its mounting brackets, and to check that the electrical contact with the ground be done properly

### Electrical Connection and Requirements for Electronic Readout Devices:

- LP UVA 02 radiometer does not require any power supply.
- LP UVA 02 is supplied with a 4-pole M12 connector
- UV-proof cables are **available on request**. Cable colors are as follows:
  - Black →shield braid
  - Red →(+) signal generated by the detector
  - Blue →(-) negative signal generated by the detector
- LP UVA 02 is to be connected either to a millivoltmeter or data acquisition unit which input load resistance must be > 5MΩ. Typically, the radiometer output signal does not exceed 5...10mV. In order to better exploit the radiometer features, the readout instrument should have a 1μV resolution.

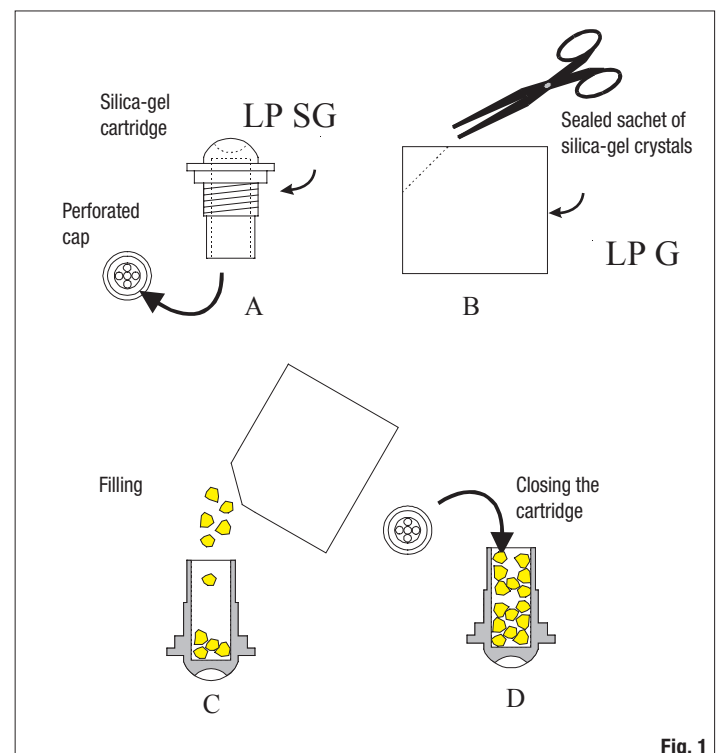
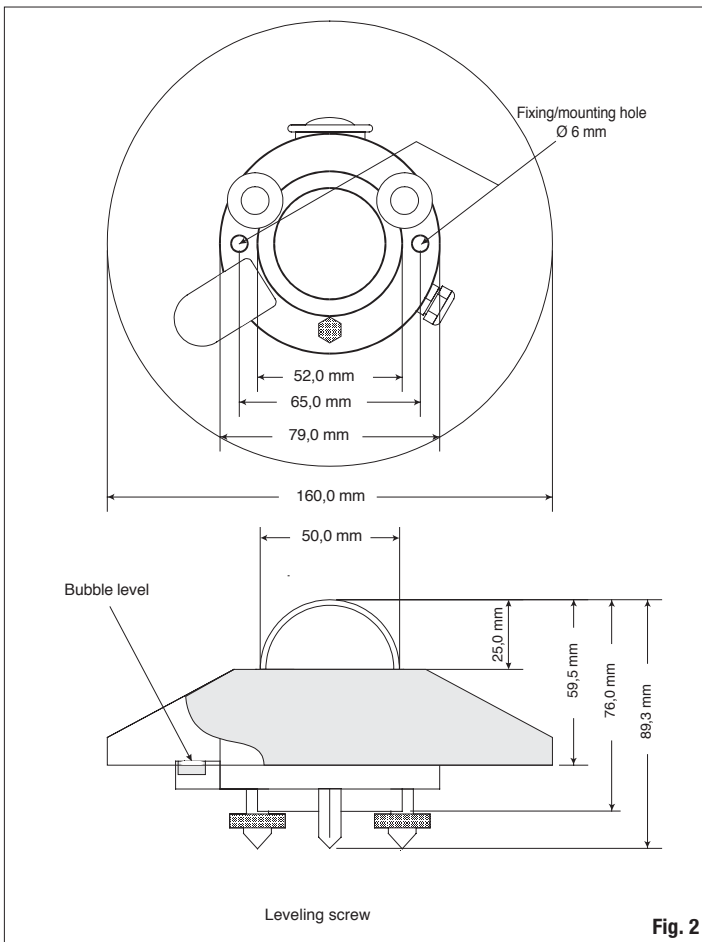
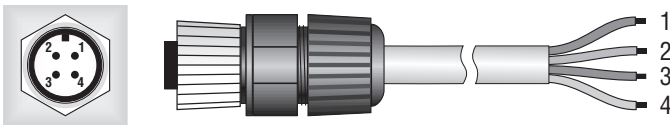


Fig. 1



#### WIRING DIAGRAM LP UVA 02



Fixed 4-pole plug M12

Flying 4-pole M12 connector

#### LP UVA 02

Connector	Function	Color
1	V out (+)	Red
2	V out (-)	Blue
3	Not connected	White
4	Shield (⊥)	Black

#### LP UVA 02 AC

Connector	Function	Color
1	Positive (+), +Vdc	Red
2	Negative (-), -Vdc	Blue
3	Not connected	White
4	Shield (⊥)	Black

#### LP UVA 02 AV

Connector	Function	Color
1	(+) Vout	Red
2	(-) Vout e (-) Vdc	Blue
3	(+) Vdc	White
4	Shield (⊥)	Black

#### Maintenance:

It is important to keep the outer glass dome clean to grant measurement best accuracy. Consequently, the more the dome will be kept clean, the more measurements will be accurate. Washing can be made using water and standard papers for lens, or, in some cases, using pure ethyl alcohol. After using alcohol, clean again the dome with water only.

Because of the high rise/fall in temperature between day and night, some condensation might appear on the radiometer dome. To minimize the condensation growth, the radiometer is provided with a cartridge containing desiccant material: Silica gel. The efficiency of the Silica gel crystals decreases in the course of time while absorbing humidity. Silica gel crystals are



active when their color is **yellow**, while they turn **white** as soon as they loose their power. Read instructions on how to replace them. Silica gel typical lifetime goes from 2 to 6 months depending on the environment where the radiometer works.

#### Calibration and Measurements:

The radiometer sensitivity **S** (or calibration factor) allows to determine the irradiance by measuring a signal in Volts at the ends of the resistance which short-circuits the terminals of the photodiode ends. The **S** factor is measured in  $\mu\text{V}/(\text{W}/\text{m}^2)$ .

- Once the difference of potential (DDP) has been measured at the ends of the sensor, the  $E_e$  irradiance is obtained applying the following formula:

$$E_e = \text{DDP}/S$$

Where:

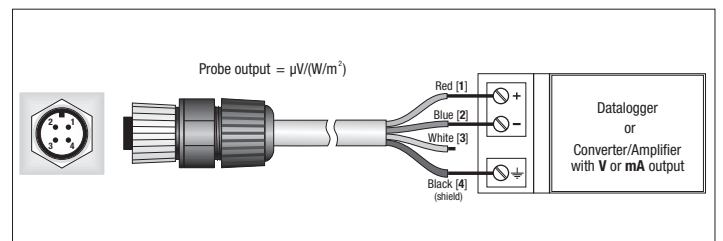
$E_e$ : is the Irradiance expressed in  $\text{W}/\text{m}^2$ ,

DDP: is the difference of potential expressed in  $\mu\text{V}$  and measured by the multimeter,

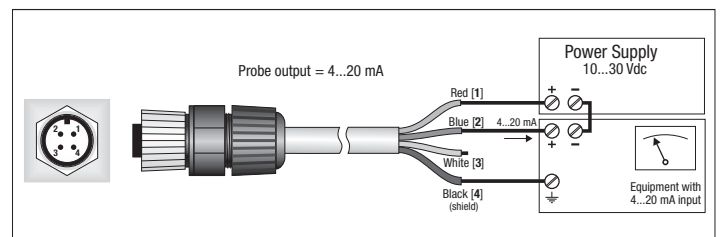
S: is the calibration factor in  $\mu\text{V}/(\text{W}/\text{m}^2)$  (shown on the radiometer label (and mentioned in the calibration report).

#### CONNECTION DIAGRAMS

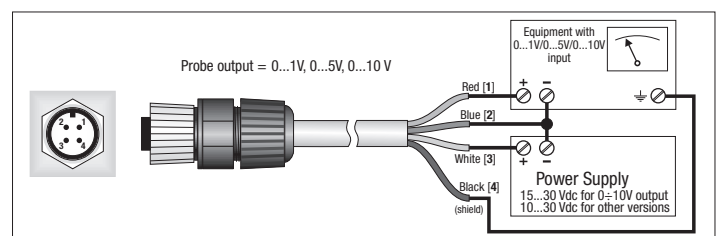
##### LP UVA 02



##### LP UVA 02 AC



##### LP UVA 02 AV



Each radiometer is individually calibrated at the factory and is distinguished by its calibrator factor.

The calibration is carried out following procedure N° DHLF-E-59. This procedure is used in the ACCREDIA LAT calibration center N° 124 for the calibration of UVA radiometers.

The calibration was performed by reference to Delta Ohm srl primary standard with monochromatic light at 365 nm. To get best performances from your LP UVA 02 it is strongly recommended that the calibration be checked annually.

**Note: currently no international calibration standards for this type of radiometer exist; therefore, the calibration coefficient only makes sense if the procedure followed to obtain it has been specified. Therefore the user has to consider that the same radiometer calibrated with different procedures can have different sensitivity factors, as explained in the article "Source of Error in UV Radiation Measurements", T. C. Larason, C. L. Cromer issued in the "Journal of Research of the National Institute of Standards and Technology" Vol. 106, Num. 4, 2001. (The article is available free of charge on the NIST web site at the following address: <http://www.nist.gov/jers>)**

#### Technical Specifications:

Typical sensitivity:	70...200 $\mu$ V/(W/m <sup>2</sup> )
Response time	<0.5 sec (95%)
Impedance:	3 k $\Omega$
Measuring range:	0...200 W/m <sup>2</sup>
Viewing angle:	2 $\pi$ sr
Spectral range:	327 nm...384 nm (1/2) 312 nm...393 nm (1/10) 305 nm...400 nm (1/100)
Operating temperature	-40 °C...80 °C
Cosine response:	< 8 % (between 0° and 80°)
Long-term non-stability: (1 year)	<   $\pm$ 3  %
Non-linearity:	< 1 %
Temperature response:	< 0.1%/°C
Dimensions:	figure 2
Weight:	0.90 Kg

#### ORDERING CODES

**LP UVA 02:** Radiometric probe for the outdoor measurement of UVA irradiance (315...400nm), complete with LP SP1 protection, silica gel cartridge, 2 spare sachets with silica gel crystals, bubble level, M12 4-pole connector and Calibration Report. **2m, 5m or 10m cables with connectors available on request.**

**LP UVA 02AC:** Amplified radiometric probe for the outdoor measurement of UVA irradiance (315...400nm), **4...20mA output (0...200W/m<sup>2</sup>)**, integrated transmitter amplifier, **power supply 10...30Vdc**. Complete with M12 4-pole connector and Calibration Report. **2m, 5m or 10m cables with connectors available on request.**

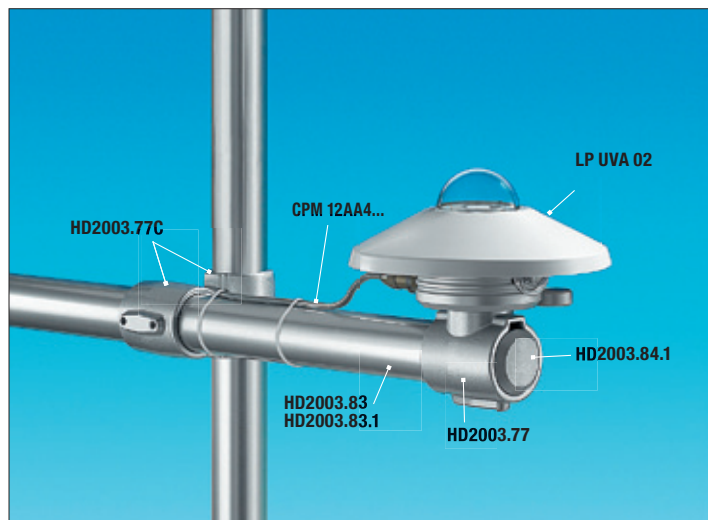
**LP UVA 02AV:** Amplified radiometric probe for the outdoor measurement of UVA irradiance (315...400nm), **0...1Vdc, 0...5Vdc, 0...10Vdc output (0...200W/m<sup>2</sup>)**, integrated transmitter amplifier, **power supply 10...30Vdc. (15...30Vdc for 0...10Vdc output)**. Complete with M12 4-pole connector and Calibration Report. **2m, 5m or 10m cables with connectors available on request.**

**LP S1:** Mounting kit for LP UVA 02: bracket for attachment to a mast, including fasteners and leveling screws.

**LP SP1:** UV resistant plastic shade disk (BASF LURAN S777K).

**LP SG:** Desiccant sachet with silica gel crystals, complete with inner O-ring and cap.

**LP G:** Packet with 5 silica gel spare cartridge.



LP UVA 02

**CPM12 AA4.2:** 4-pole cable. Length 2m. 4-pole M12 connector on one end, open wires on the other side. For LP UVA 02, LP UVA 02AC, LP UVA 02AV.

**CPM12 AA4.5:** 4-pole cable. Length 5m. 4-pole M12 connector on one end, open wires on the other side. For LP UVA 02, LP UVA 02AC, LP UVA 02AV.

**CPM12 AA4.10:** 4-pole cable. Length 10m. 4-pole M12 connector on one end, open wires on the other side. For LP UVA 02, LP UVA 02AC, LP UVA 02AV.

**LP RING 02:** Base with levelling device and adjustable holder for mounting the LP UVA 02 in an inclined position.

**LP S6:** Kit for the installation of LP UVA 02. The kit includes: 1 m mast (LP S6.05), base fitting (LP S6.04), graduated support plate (LP S6.01), bracket for HD9007 or HD32MTT.03.C (HD 9007T29.1), bracket for pyranometers (LP S6.03).

**HD978TR3:** Configurable signal converter amplifier with 4...20mA (20...4mA) output. Input range -10...+60mVdc. **Standard configuration 0...20mVdc.** Minimum measuring range 2mVdc. 2- DIN modules for 35mm rail. **Configurable with HD778 TCAL**

**HD978TR5:** Configurable signal converter amplifier with 4...20mA (20...4mA) output. Input range -10...+60mVdc. **Standard configuration 0...20mVdc.** Minimum measuring range 2mVdc. **Configurable with HD778 TCAL. Container for Wall mount installation.**

**HD978TR4:** Configurable signal converter amplifier with 0...10Vdc (10...0Vdc) output. Input range -10...+60mVdc. **Standard configuration 0...20mVdc.** Minimum measuring range 2mVdc. 2- DIN modules for 35mm rail. **Configurable with HD778 TCAL**

**HD978TR6:** Configurable signal converter amplifier with 0...10Vdc (10...0Vdc) output. Input range -10...+60mVdc. **Standard configuration 0...20mVdc.** Minimum measuring range 2mVdc. **Configurable with HD778 TCAL. Container for Wall mount installation.**

**HD778TCAL:** Voltage generator in the range -60mVdc...+60mVdc, **controlled by PC through the RS232C serial port, DELTALOG-7:** software for setting K, J, T, N thermocouple transmitters and HD978TR3, HD978TR4, HD978TR5, HD978TR6 converters.

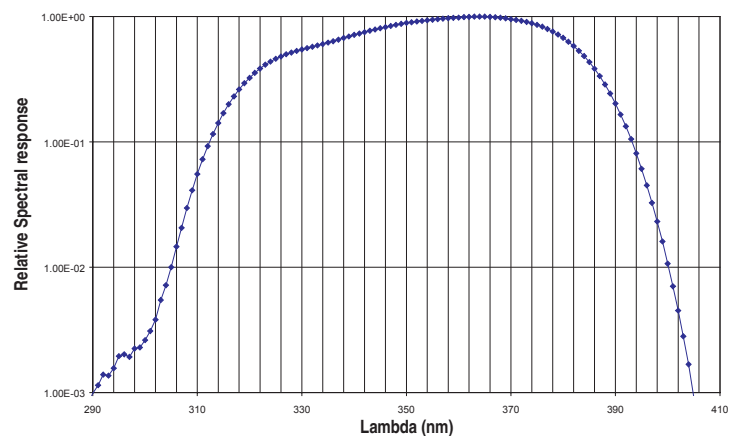


Fig. 3

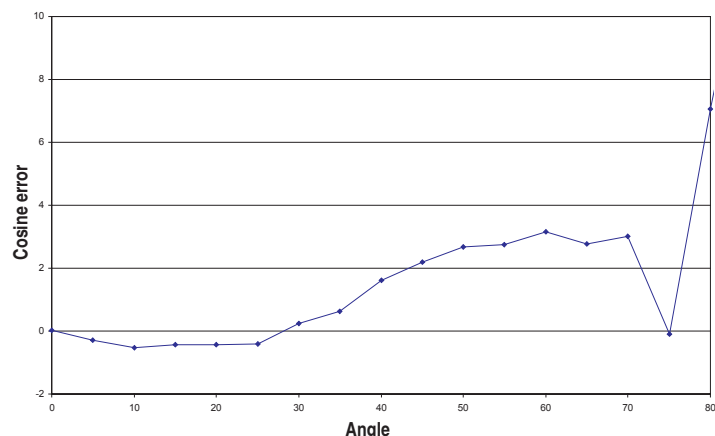


Fig. 4