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 broadband UVA irradiance on a plane surface (Watt/ m^2). Measured irradiance is the result of the sum of direct solar irradiance and of diffuse irradiance.
The radiometer can also be used for monitoring UVA irradiance indoor.

Working Principle
LP UVA 02 radiometer is based on a solid state sensor, whose spectral response sensor has been adapted to that desired by using appropriate filters. The relative spectral response is reported on figure 4.
In order to protect the diffuser from the dust, LP UVA 02 is equipped with a 50mm glass dome.
The cosine low response is obtained with a particular shaped PTFE diffuser. In figure 5 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 installing the radiometer, 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 is installed in a location easily accessible for periodic cleaning of the outer dome and maintenance. At the same time you should avoid buildings, trees or obstacles of any kind exceeds the horizontal plane on which lies the radiometer. In case this is not possible, it is advisable to choose a location where obstacles on the path of the sun from sunrise to sunset is less than 5 °.
- The radiometer should be placed away from any obstacle that might reflect the sun (or shadow) on the same radiometer.
- For accurate horizontal positioning, the LP UVA 02 radiometer has a bubble level, the adjustment is by means of two screws with adjusting nut for adjusting the angle of the radiometer. The fixation on a plane can be performed using the two holes of 6mm diameter and spacing of 65 mm. To access holes to remove the screen and reposition it after mounting, see Figure 2.
- The support LP S1, supplied on request as an accessory, allows easy installation of the radiometer on a mast. The maximum diameter of the pole to which the media can be set is 50 mm. The installer must take care that the height of the mast does not exceed the level of the radiometer, not to introduce measurement errors caused by reflections and shadows caused by the pole. To secure the probe to the support bracket remove the screen by removing the three screws, attach the probe and once the installation is complete, refit the white screen.
- It is better to insulate the radiometer from its support, while ensuring that there is a good electrical contact to earth.

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 flying 4-pole M12 connector
- UV-proof PTFE cables are **available on request**, cable colors and connector poles of the screened 2-wire cable are matched as follows:
  Black → shield braid
  Red → (+) signal generated by the detector
  Blue → (-) negative signal generated by the detector (connected to the housing)
- 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 20mV. In order to better exploit the radiometer features, the readout instrument should have a 1μV resolution.

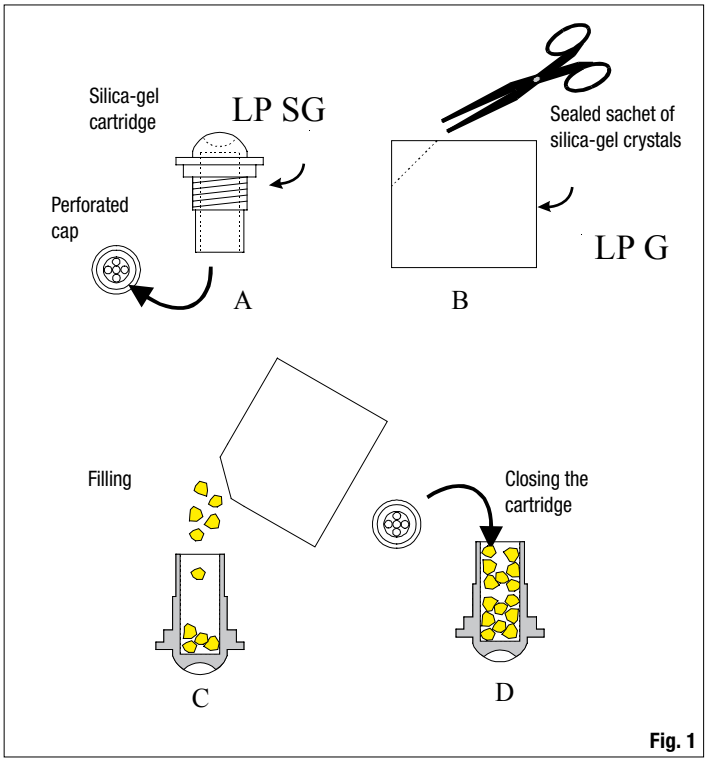


Fig. 1

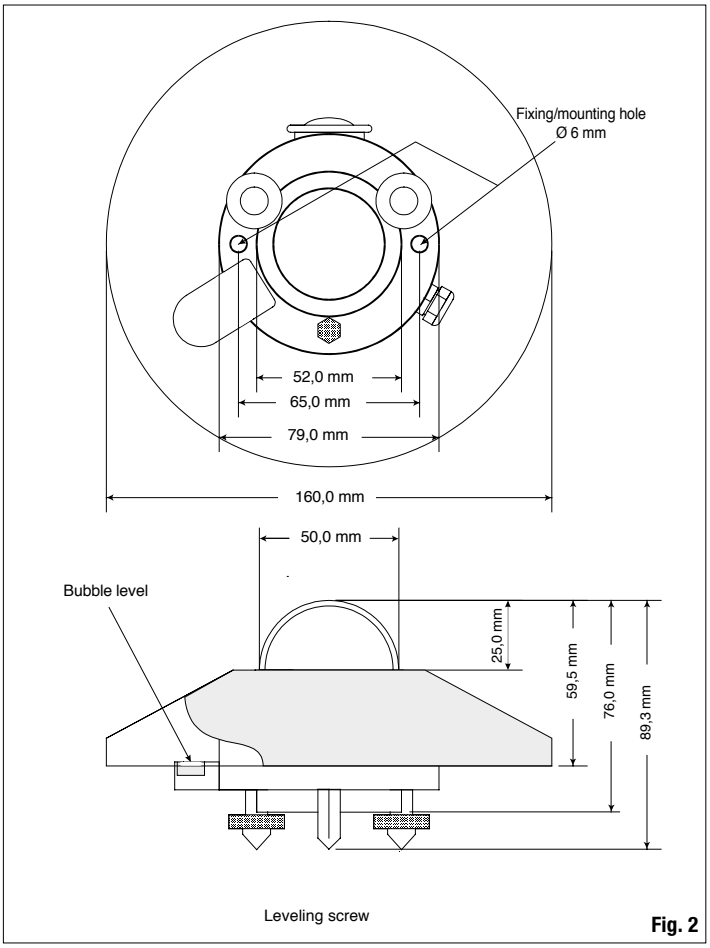
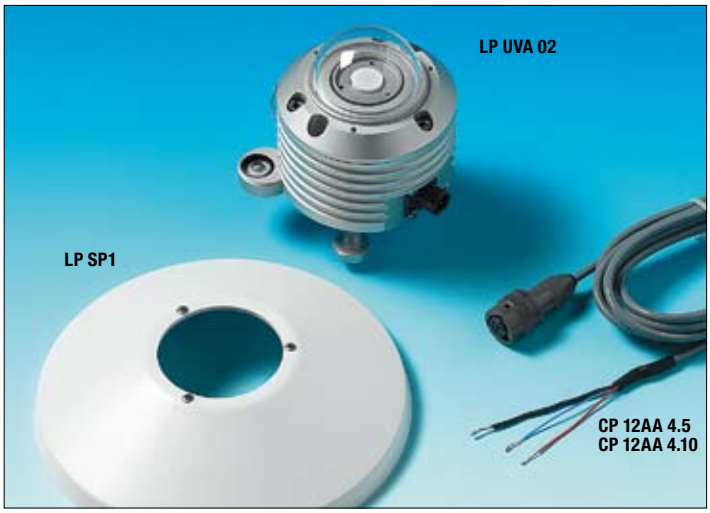


Fig. 2



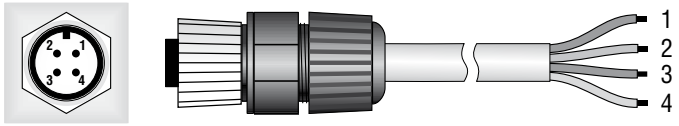
mated. To minimize condensation inside the light meter there is a proper cartridge inside with absorbent material: Silica gel. The efficiency of silica-gel crystals decreases over time with the absorption of moisture. When crystals of silica gel are efficient their color is **yellow**, while gradually losing efficiency the color turns to **white**, see the instructions for replacing.
Typically the duration of silica gel ranges from 4 to 6 months depending on environmental conditions in which it operates the probe.

Calibration and Measurements:
The radiometer **S** sensitivity (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 μV/(Wm^{-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:

$$E_e = DDP/S$$

WIRING DIAGRAM LP PHOT 02



Fixed 4-pole plug M12 **Flying 4-pole M12 socket**

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

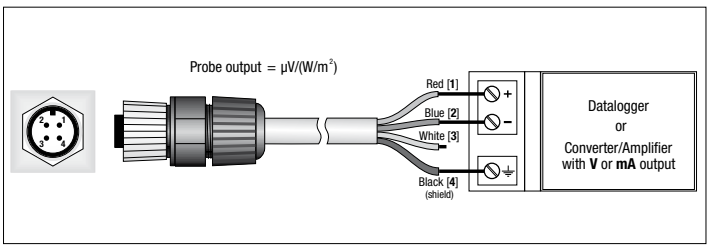
Connector	Function	Color
1	Positivo (+), +Vdc	Red
2	Negativo (-), -Vdc	Blue
3	Not connected	White
4	Shield (⏚)	Black

LP UVA 02 AV

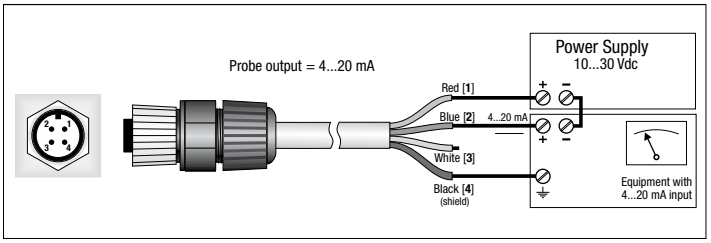
Connector	Function	Color
1	(+) Vout	Red
2	(-) Vout e (-) Vdc	Blue
3	(+) Vdc	White
4	Shield (⏚)	Black

Maintenance:
To ensure a high measurement accuracy is necessary for the outer dome to be always kept clean, so the higher the frequency of cleaning of the dome greater the precision of the measurements. Cleaning can be done with normal maps for the cleaning of lens paper and water, otherwise just use pure ethyl alcohol. After cleaning with alcohol, it is necessary to clean the dome again with just water.
Due to the high temperature changes between day and night it is possible the presence of condense on the dome of the probe, in this case the reading performed is strongly overesti-

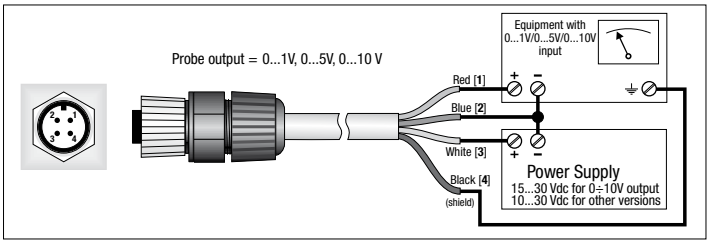
LP UVA 02 CONNECTION DIAGRAMS



LP UVA 02 AC



LP UVA 02 AV



Where:
E_e: is the Irradiance expressed in W/m^2,
DDP: is the difference of potential expressed in µV and measured by the multimeter,
S: is the calibration factor in µV/(W/m^2) shown on the radiometer label (and mentioned in the calibration report) .

Each radiometer is individually calibrated at factory and is distinguished by its calibration factor.
The calibration is carried out following procedure N° DHLF-E-59. This procedure is used in the SIT calibration center N° 124 for the calibration of UVA radiometer.
The calibration was performed by reference to Delta Ohm srl primary standard with monochromatic light at 365 nm obtained separating the emission line of a Xe-Hg lamp with an inferential filter. To get best performances from your LP UVA 02 it is strongly recommended that the calibration be checked annually.
N.B. At the moment no international agreement exists for the calibration of this kind of radiometer, so the calibration coefficient is dependent from the calibration procedure like reported in the following article:
"*Source of Error in UV Radiation Measurements*", T. C. Larason, C. L. Cromer on "*Journal of Research of the National Institute of Standards and Technology*" Vol. 106, Num. 4, 2001. (The article is free on the NIST's WEB site at the following address : http://www.nist.gov/jers)

Technical Specifications:

Typical sensitivity:	150 ÷ 350µV/(W/m^2)
Response time:	<0.5 sec (95%)
Impedance:	5 ÷ 7.5 KΩ
Measuring range:	0-200 W/m^2
Viewing angle:	2π 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)	<|±3| %
Non-linearity:	<1 %
Temperature response:	< 0.1%/°C
Dimensions:	figure 2
Weight:	0.90 Kg

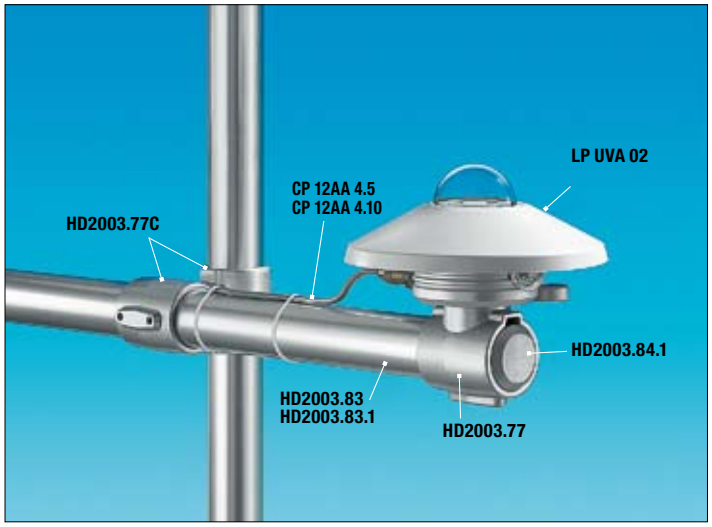
PURCHASING CODES

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, flying M12 4-pole connector and Calibration Report. **Cable has to be ordered separately.**

LP UVA 02AC: Amplified radiometric probe for the outdoor measurement of UVA irradiance (315…400nm), **4÷20mA output (0…150W/m²)**, integrated transmitter amplifier, **power supply 10…30Vdc**. Complete with flying M12 4-pole connector and Calibration Report. **Cable has to be ordered separately.**

LP UVA 02AV: Amplified radiometric probe for the outdoor measurement of UVA irradiance (315…400nm), **0÷1Vdc, 0÷5Vdc, 0÷10Vdc output (0…150W/m²)**, integrated transmitter amplifier, **power supply 10…30Vdc**. **(15..30Vdc for 0…10Vdc output).** Complete with flying M12 4-pole connector and Calibration Report. **Cable has to be ordered separately.**

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



LP UVA 02

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.

CPM12 AA4.5: 4-pole UV resistant cable L=5 m. For the instruments LP UVA 02, LP UVA 02AC, LP UVA 02AV.

CPM12 AA4.10: 4-pole UV resistant cable L=10 m. For the instruments LP UVA 02, LP UVA 02AC, LP UVA 02AV.

Configurable amplifiers and converters

HD978TR3: Configurable signal converter amplifier with 4÷20mA (20÷4mA) output. Input measuring range –10..+60mV. **Default setting 0÷20mV.** Two DIN module (35mm) for rail attachment. Minimum measuring range 2mV. **Configurable with HD 778 TCAL.**

HD978TR4: Configurable signal converter amplifier with 0÷10 (10÷0Vdc) output. Input measuring range –10..+60mV. **Default setting 0÷20mV.** Two DIN module (35mm) for rail attachment. Minimum measuring range 2mV. **Configurable with HD 778 TCAL.**

HD978TR5: Configurable signal converter amplifier with 4÷20mA (20÷4mA) output. Input measuring range –10..+60mV. **Default setting 0÷20mV.** Minimum measuring range 2mV. **Configurable with HD 778 TCAL. For wall mounting.**

HD978TR6: Configurable signal converter amplifier with 0÷10 (10÷0Vdc) output. Input measuring range –10..+60mV. **Default setting 0÷20mV.** Minimum measuring range 2mV. **Configurable with HD 778 TCAL. For wall mounting.**

HD 778 TCAL: Power generator in the range –60mv…+60mV, **regulated by PC through RS232C serial port. DeltaLog-7** software to configure type K, J, T and N thermocouple transmitters and HD978TR3, HD978TR4, HD978TR5 and HD974TR6 converters.

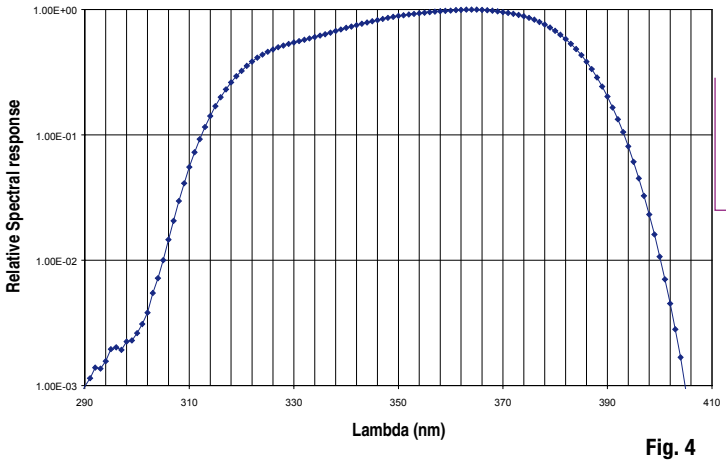


Fig. 4

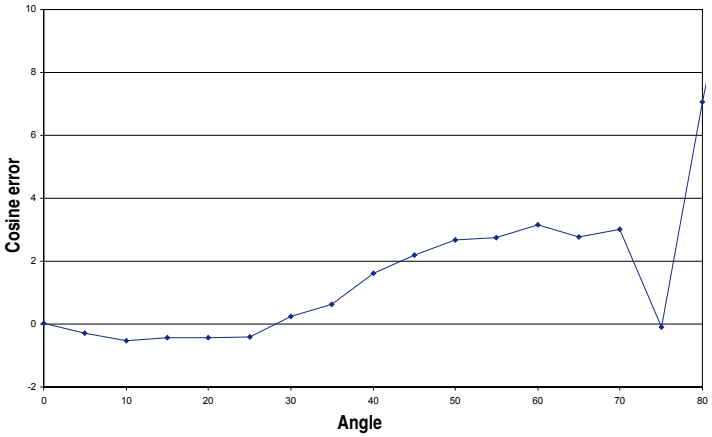


Fig. 5