

## LP PHOT 02

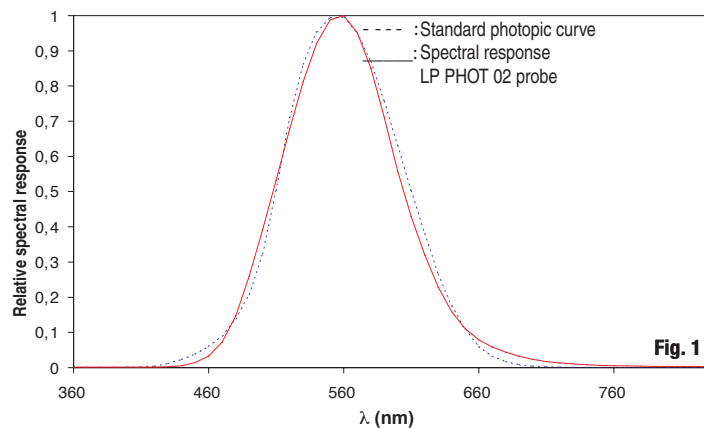


### LP PHOT 02 - LP PHOT 02AC - LP PHOT 02AV PHOTOMETRIC PROBES

The LP PHOT 02, LP PHOT 02AC, and LP PHOT 02AV probes measure illuminance (lux), defined as the ratio between the luminous flux (lumen) through a surface and the surface area ( $m^2$ ). The spectral response curve of a photometric probe is equal to the human eye, known as standard photopic curve  $V(\lambda)$ . The difference in spectral response between LP PHOT 02 and the standard photopic curve  $V(\lambda)$  is calculated by means of the error  $f'$ . **LP PHOT 02 is designed and constructed for outdoor installation for long periods.** The photometric measurement for external use is used for the measurement of daylight in climatological and meteorological applications.

#### Working principle

LP PHOT 02 probe is based on a solid state sensor, whose spectral response corrected by filters to fit the response of the human eye. The typical spectral response curve is shown in fig.1.



LP PHOT 02 is provided with a 50 mm diameter transparent glass dome, in order to protect the sensor against atmospheric damage.

The cosine corrected response has been obtained through both the PTFE diffuser and case particular shapes. Deviation between the theoretical response and the real one, is shown in fig.2.

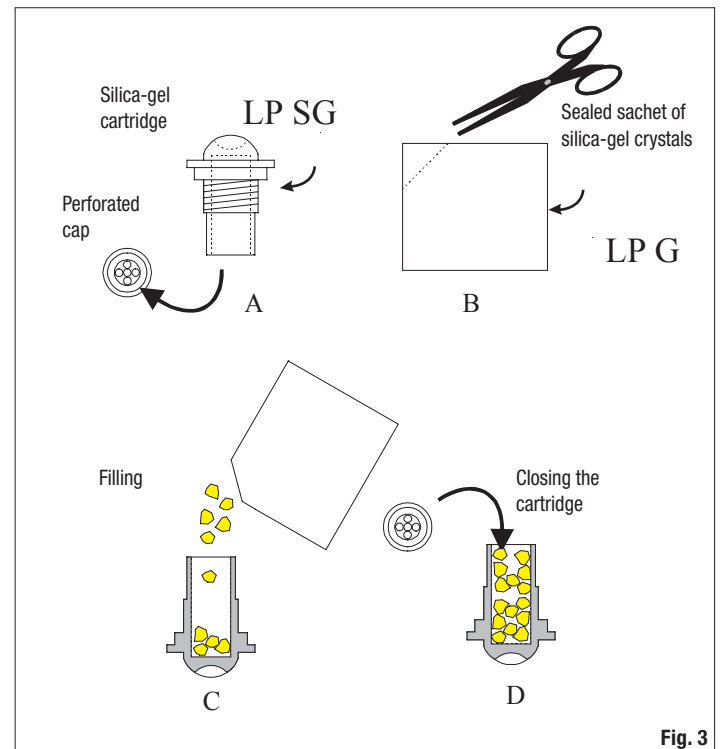
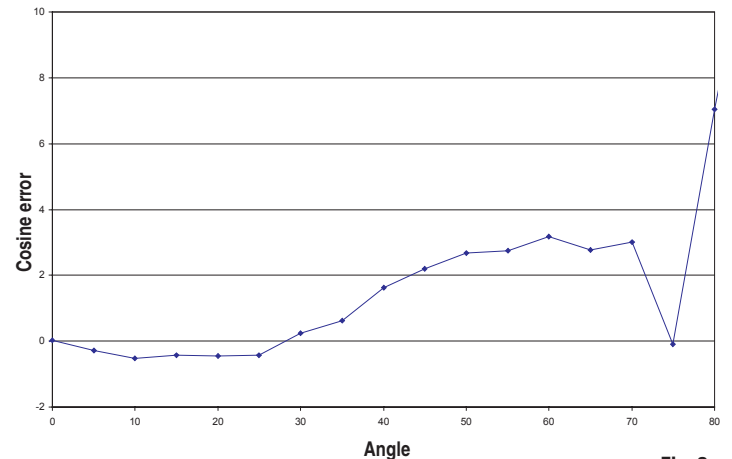
The LP PHOT 02 excellent cosine response allows for use even when the sun elevation is low.

#### Installing and mounting the LP PHOT 02 probe for global radiation measurements:

Before installation, the silica-gel cartridge must be refilled. Silica-gel crystals absorb humidity in the dome chamber and in case of particular climatic conditions, prevent internal condensation forming on the dome inner wall, with a consequent alteration in measurements. Do not wet or touch the instrument with your hands while refilling the silica-gel cartridge. Carry out the following instructions in a (possibly) dry environment:

- 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 silica-gel sachet (supplied with the luxmeter)
- 5- Fill the cartridge with silica-gel crystals
- 6- Close the cartridge with its own cap, and check that the sealing O-Ring is in the right position.
- 7- Screw the cartridge to the luxmeter using a coin
- 8- Make sure the cartridge is tightly screwed (otherwise silica-gel crystal will last for a shorter time)
- 9- Position the shade and tighten it with the screws
- 10- The luxmeter is ready for use

Fig.3 shows the operations needed to refill the cartridge with silica-gel crystals



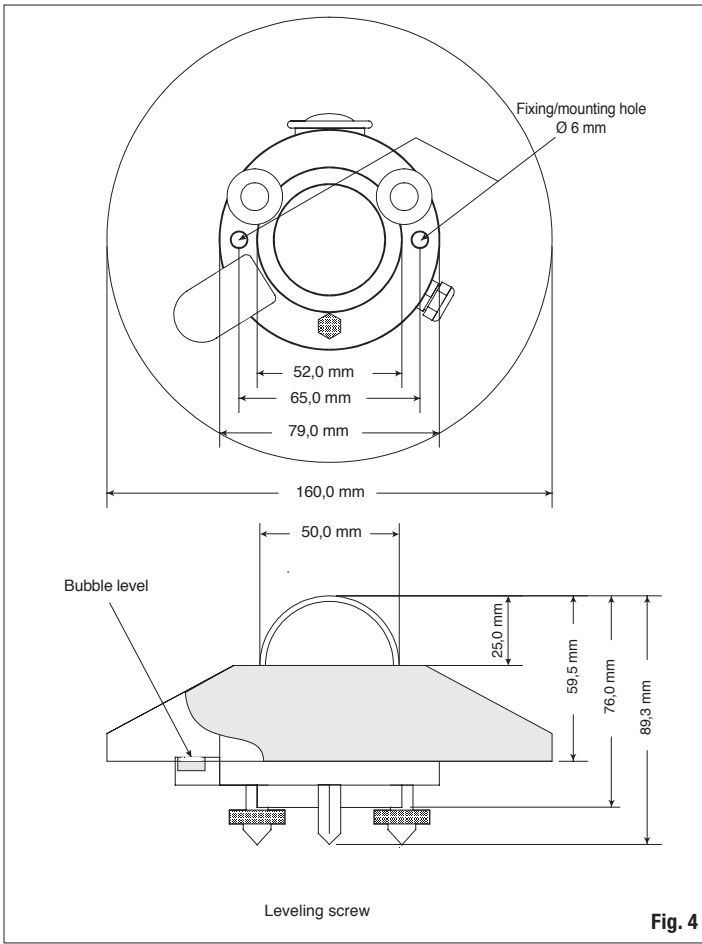
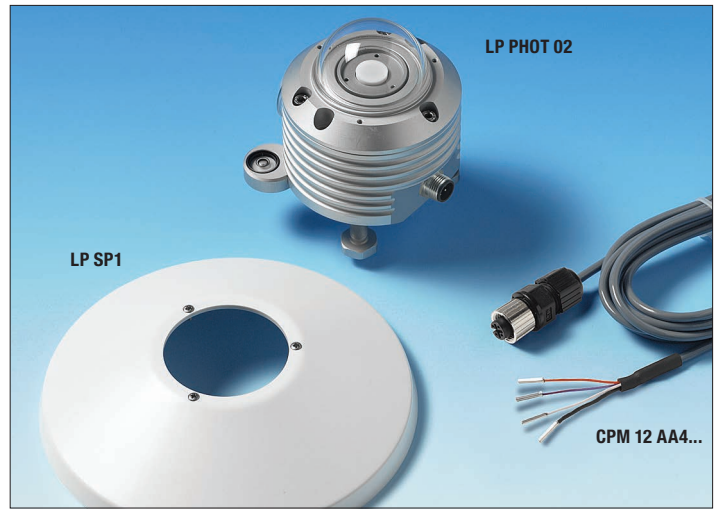


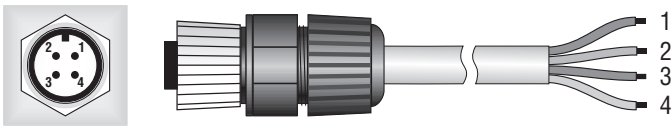
Fig. 4



- For a correct horizontal placing, LP PHOT 02 is provided with a bubble level; inclination adjustment of the luxmeter is made by means of two leveling screws. Use the two 6mm-diameter screw holes with an interaxial distance of 65 mm, to mount the instrument on a plane. To access the holes, remove the shade disk and reposition it after mounting (see fig. 4).
- LP S1 mounting kit is supplied upon demand as an accessory, and allows for an easy mounting of the instrument on a mast. The mast maximum diameter shall not exceed 50 mm. The operator will check that the mast height does not exceed the luxmeter plane, in order to avoid measurement errors due to any reflection or shadow of the mast itself. To fix the luxmeter to the mounting bracket, remove the shade disk by loosening the three screws, then fix the luxmeter to the bracket and mount the white shade disk again.
- The luxmeter should be thermally isolated from the mounting bracket, and the electrical contact with the ground must be properly made.

**LP PHOT 02 Electrical Connections and requirements for electronic readout devices**

**WIRING DIAGRAM LP PHOT 02**



Fixed 4-pole plug M12

Flying 4-pole M12 connector

**LP PHOT 02**

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

**LP PHOT 02 AC**

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

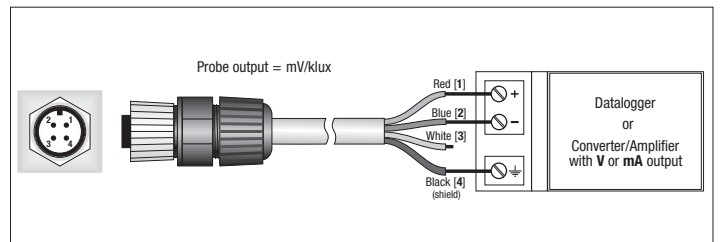
**LP PHOT 02 AV**

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

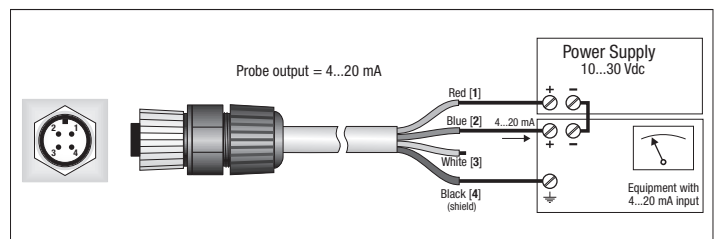
- To allow cleaning the outer dome regularly and carrying out the instrument maintenance, LP PHOT 02 should be mounted in easily reachable places. At the same time, you should check that no building, tree, or any other obstacle exceeds the horizontal plane where the luxmeter is mounted. In case this is not possible, you should find a place where obstacles do not exceed 5 degrees elevation over the path followed by the sun from rising until sunset.
- The luxmeter should be located far from any obstacle which might reflect sunlight (or any shadow) onto the instrument.

**WIRING DIAGRAM CONNECTION**

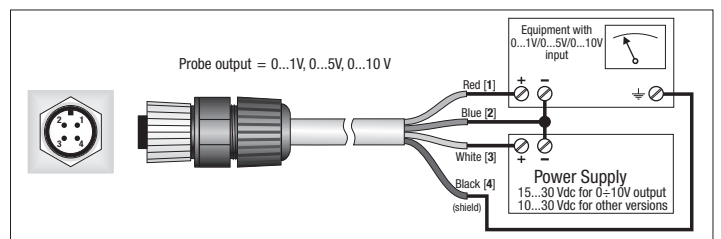
**LP PHOT 02**



**LP PHOT 02 AC**



**LP PHOT 02 AV**



- LP PHOT 02 luxmeter is passive and it does not require any power supply.
- LP PHOT 02 is supplied with a flying 4-pole M12 connector
- UV-proof cables are available already assembled, with standard length 2m, 5m or 10m.
- Amplified probes are available, with current output signal 4...20mA or voltage output 0...1Vdc, 0...5Vdc or 0...10Vdc.
- The **optional** cable is UV-proof, cable colors and connector poles are matched as follows:
  - Black → shield braid
  - Red → (+) signal generated by the detector
  - Blue → (-) negative signal generated by the detector (in contact with the housing)
 See wiring scheme.
- LP PHOT 02 is to be connected to a millivoltmeter or data acquisition unit which input load resistance must be > 100kΩ.

#### Maintenance:

In order to grant the best precision and accuracy in measurements, the outer dome must be always kept clean; the cleaner you keep the dome, the better the accuracy in measurements will be. Washing can be made with water and standard lens paper; in case this wouldn't work, use pure ETHIL alcohol. After using alcohol, the dome must be washed with water only. Sudden rise and fall in temperature throughout day and night, might cause condensation to appear on the luxmeter dome; in this case the performed reading is highly overestimated. To reduce condensation, the luxmeter is provided with a cartridge containing desiccant material, such as Silica-gel. Silica-gel efficiency decreases in time while absorbing humidity. Active silica-gel crystals are **yellow** colored, while they turn into **white** when they gradually loose power. To replace them, see instructions at paragraph installing and mounting the LP PHOT 02. Silica-gel generally lasts from 2 to 6 months; depending on which climatic conditions you have and where the luxmeter works.

#### Calibration and measurements:

The Luxmeter sensitivity, indicated as **S** (or calibration factor), allows determining illuminance by measuring a signal in Volts at the probe ends. **S** factor is measured in **V/klux**.

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

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

where;

- $E_e$ : indicates Illuminance expressed in klux,
- DDP: indicates the difference of potential expressed in mV and measured by the multimeter,
- S: indicates the calibration factor expressed in mV/klux and shown on the luxmeter label (calibration factor is also mentioned in the calibration report).

Each probe is individually calibrated at the factory and is distinguished by its calibrator factor. Calibration is carried out by using a standard **illuminant A**, as indicated in CIE publication N°69 "Methods of characterizing illuminance meters and luminance meters: Performance, characteristics and specifications, 1987". Calibration is carried out by comparison with a reference luxmeter, assigned to Delta OHM Metrological Laboratory. To get the best performances from LP PHOT 02, it is recommended to check calibration annually.

#### Technical specifications:

Typical sensitivity:	0,5...2,0 mV/klux
Response time:	<0.5 sec (95%)
Impedance:	0.5...1 kΩ
Measuring range:	0...150 klux
Viewing angle:	2π sr
Spectral range:	Standard photopic curve
Operating temperature:	-40°C...80°C
Error f <sub>1</sub>	<9 %
Cosine response/directional error:	< 8 % (between 0° and 80°)

Long term instability (1 year):	<  ±3  %
Non-linearity:	<1 %
Temperature response	< 0.1%/°C
Weight:	0.90 Kg
Dimensions:	fig. 4

#### ORDERING CODES

**LP PHOT 02:** Photometric probe for outdoor **Illuminance** measurements (0...150klux), CIE photopic filter, diffuser for cosine correction, complete with LP SP1 protection and silica gel cartridge, bubble level, 4-pole M12 plug and Calibration Report. **Cable has to be ordered separately.**

**LP PHOT 02AC:** Photometric probe for outdoor **Illuminance** measurements (0...150klux), CIE photopic filter, diffuser for cosine correction. **4...20mA output**, integrated transmitter amplifier. **Power supply 10...30Vdc**. Complete with LP SP1 protection and silica gel cartridge, bubble level, 4-pole M12 plug and Calibration Report. **2m, 5m or 10m cables with connectors available on request.**

**LP PHOT 02AV:** Photometric probe for outdoor **Illuminance** measurements (0...150klux), CIE photopic filter, diffuser for cosine correction. **0...1Vdc, 0...5Vdc, 0...10Vdc output**, integrated transmitter amplifier. **Power supply 10...30Vdc (15...30Vdc for 0...10Vdc output)**. Complete with LP SP1 protection and silica gel cartridge, bubble level, 4-pole M12 plug and Calibration Report. **2m, 5m or 10m cables with connectors available on request.**

**LP S1:** Mounting kit for LP PHOT 02: bracket for attachment to a mast, including fasteners and levelling 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 RING 02:** Base with levelling device and adjustable holder for mounting the LP PHOT 02 in an inclined position.

**LP S6:** Kit for the installation of LP PHOT 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).

**CPM12 AA4.2:** 4-pole cable. Length 2m. 4-pole M12 connector on one end, open wires on the other side.

**CPM12 AA4.5:** 4-pole cable. Length 5m. 4-pole M12 connector on one end, open wires on the other side.

**CPM12 AA4.10:** 4-pole cable. Length 10m. 4-pole M12 connector on one end, open wires on the other side

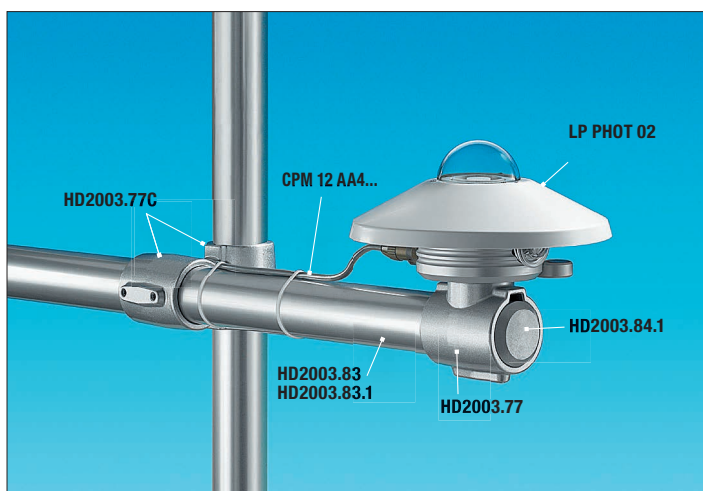
**HD978TR3:** **Configurable** signal converter amplifier with 4...20mA (20...4mA) output. Input range -10...+60mVdc. **Standard configuration 0...20mVdc**. Minimum measuring range 2mVdc. 2- DIN modules for 35mm rail. **Configurable with HD778 TCAL**

**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.**

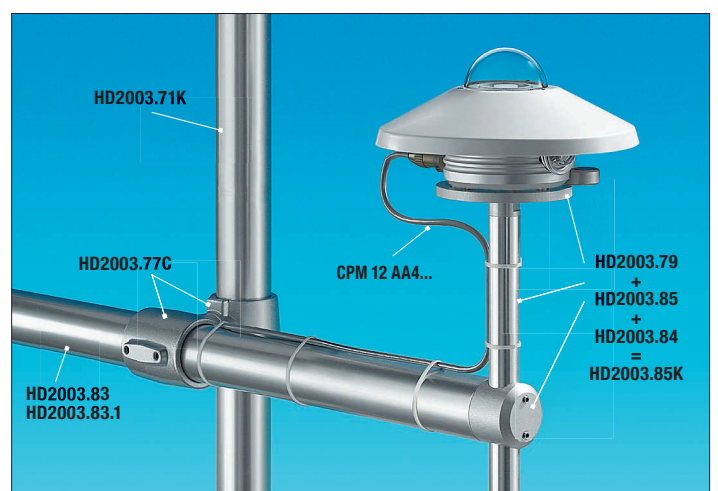
**HD978TR4:** **Configurable** signal converter amplifier with 0...10Vdc (10...0Vdc) output. Input range -10...+60mVdc. **Standard configuration 0...20mVdc**. Minimum measuring range 2mVdc. 2- DIN modules for 35mm rail.. **Configurable with HD778 TCAL**

**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.



LP PHOT 02



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