



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

The LP PHOT 02, LP PHOT 02AC, and LP PHOT 03AV probes measure illuminance (lux), defined as the ratio between the luminous flux (lumen) passing through a surface and the surface area ( $m^2$ ).

The spectral response curve of a photometric probe is similar to the human eye curve, 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  $f_e$ .

**LP PHOT 02 is designed for outdoor installation for long period.**

The photometric measurement for external use is used for measurement of daylight in meteorology and climatology.

### Working principle

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

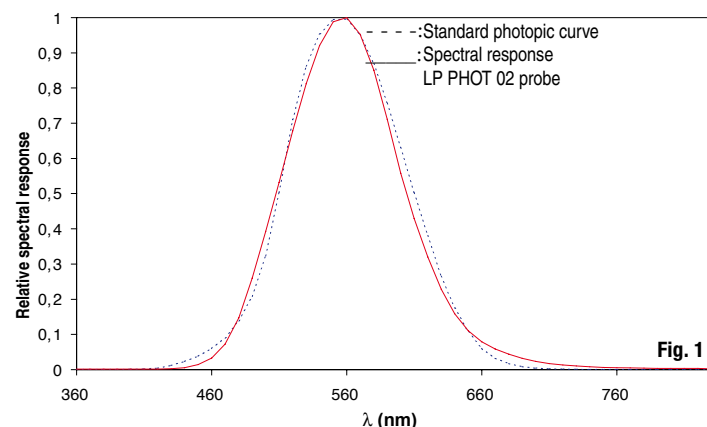


Fig. 1

LP PHOT 02 is equipped 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 installing the probe, 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 probe is ready for use

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

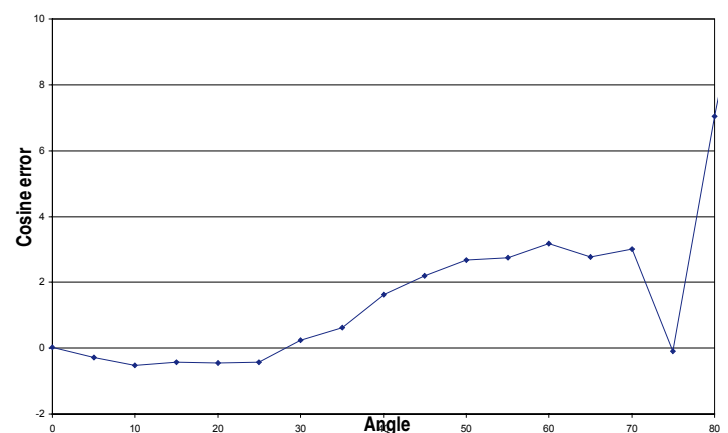


Fig. 2

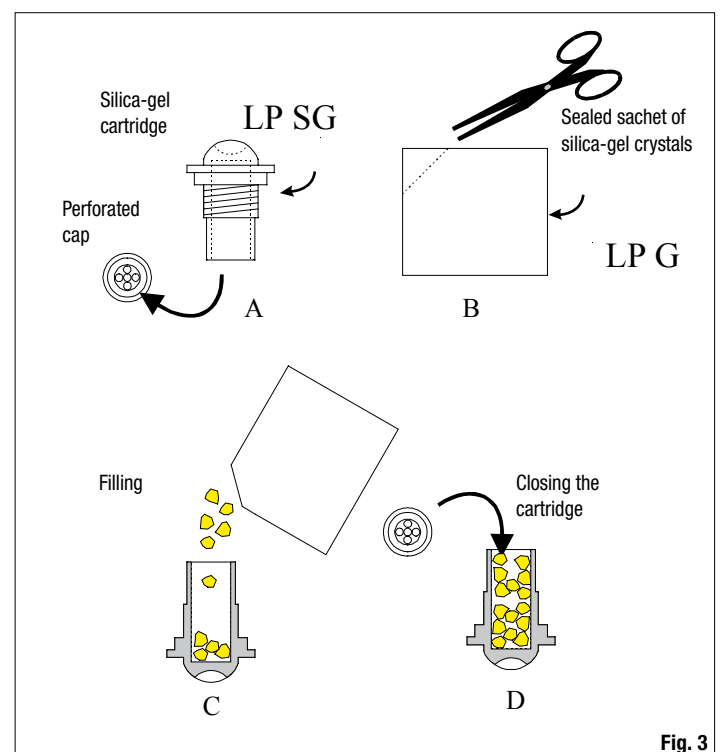


Fig. 3

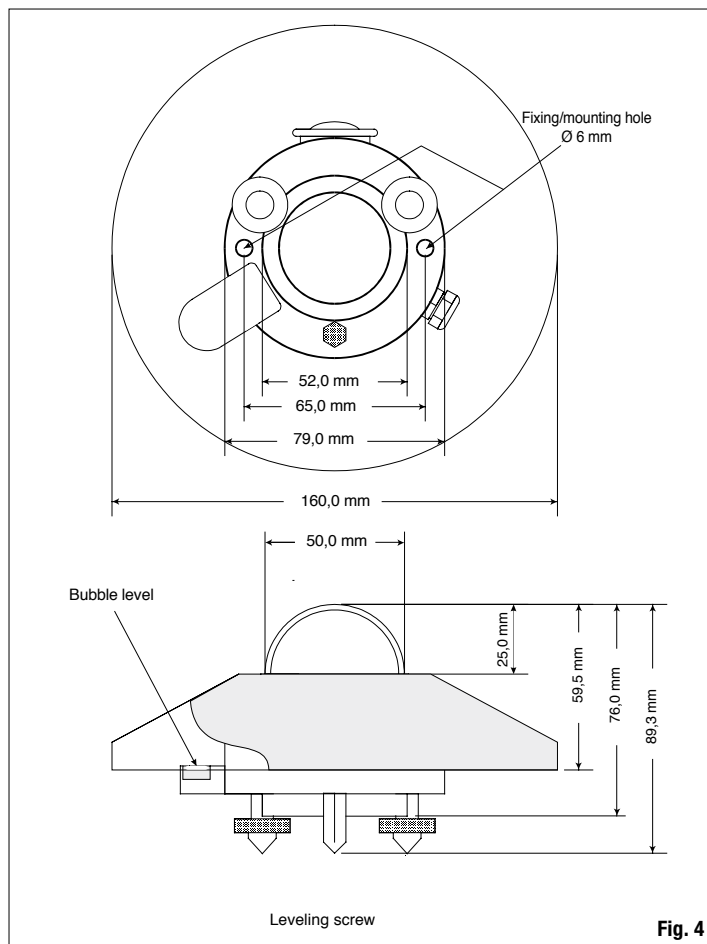
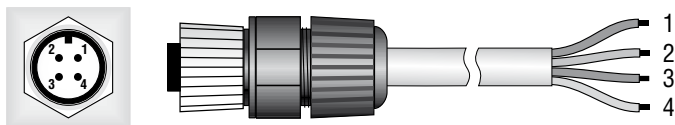


Fig. 4

#### WIRING DIAGRAM LP PHOT 02



Fixed 4-pole plug M12

Flying 4-pole M12 socket

#### P PHOT 02

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

#### LP PHOT 02 AC

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

#### LP PHOT 02 AV

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

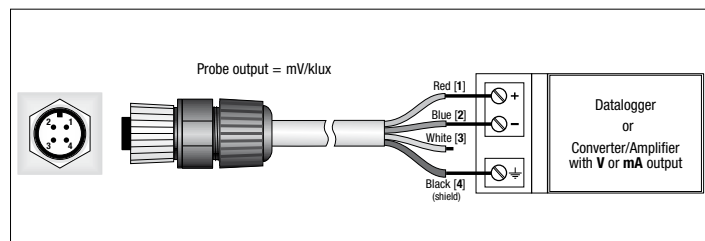
- The LP PHOT 02 is installed in a location easily accessible for periodic cleaning of the outer dome and maintenance. At the same time you should avoid buildings, trees or obstacles of any kind exceeds the horizontal plane on which lies the probe. In case this is not possible it is advisable to choose a location where obstacles on the path of the sun from sunrise to sunset is less than 5°.
- The probe should be placed away from any obstacle that might reflect the sun (or shadow) on the probe itself.
- For accurate horizontal positioning, the probe LP PHOT 02 is equipped with bubble level,



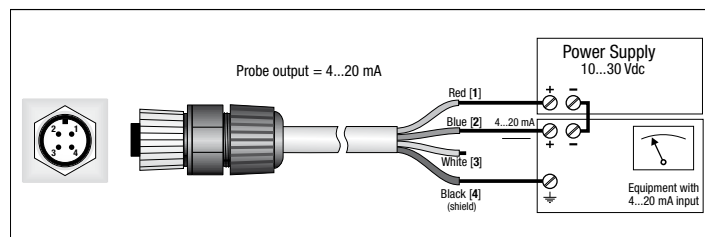
the adjustment is by means of the two screws with adjusting nut for adjusting the tilt. The fixation on a plane can be performed using the two holes of 6mm diameter and spacing of 65 mm. To access holes to remove the screen and reposition it after mounting, see Figure 4.

- The support LP S1, available on request as an accessory, allows easy installation of the probe on a support pole. 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 probe, 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 probe from its support.
- Ensure good electrical contact to earth.

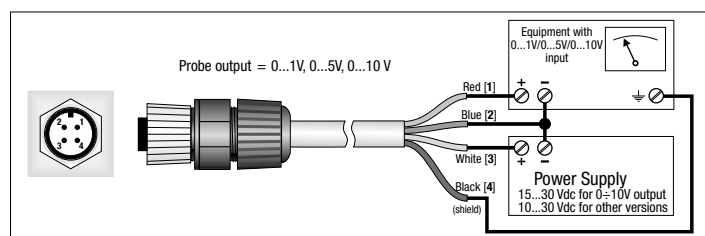
#### LP PHOT 02 CONNECTION DIAGRAMS



#### LP PHOT 02 AC



#### LP PHOT 02 AV



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

- LP PHOT 02 probe 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 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:

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 overestimated. 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 photometric probe 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 photometric probe is individually factory calibrated and is distinguished by its calibration 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, we strongly recommend 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 $f_1$ :	<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

## PURCHASING 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, flying 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, flying 4-pole M12 plug and Calibration Report. **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, flying 4-pole M12 plug and Calibration Report. **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.

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

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

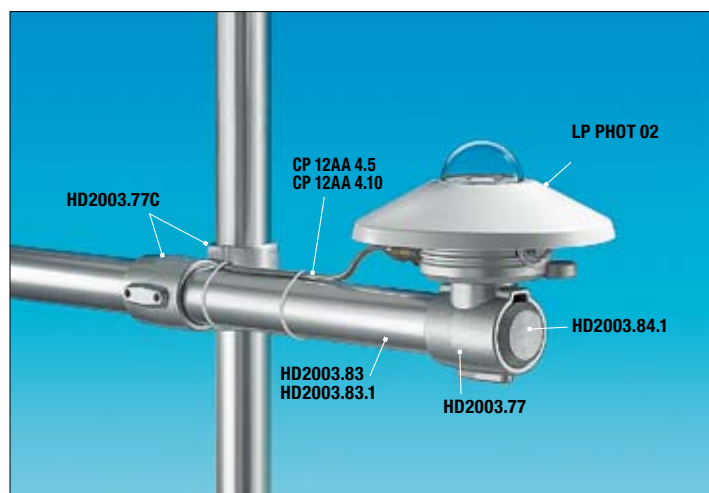
**HD978TR5:** Configurable signal converter amplifier with 4÷20mA (20÷4mA) output.

Input measuring range -10...+60mV. **Default setting 0÷20mV.** Minimum measuring range 2mV. **Configurable with HD 778 TCAL. For wall mounting.**

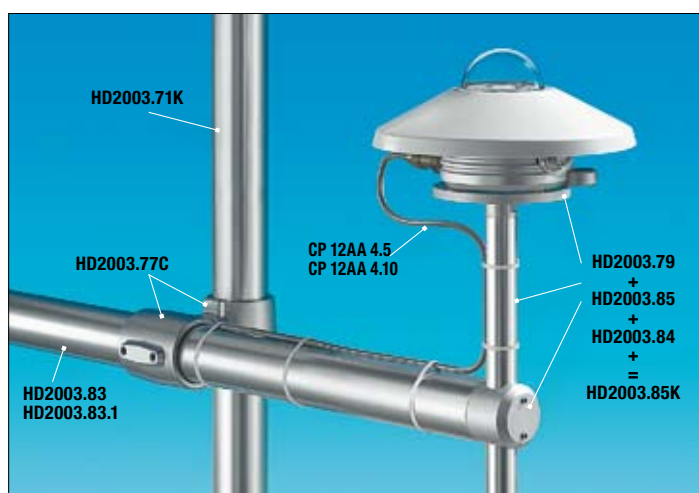
**HD978TR6:** Configurable signal converter amplifier with 0÷10 (10÷0Vdc) output.

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.



LP PHOT 02



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