



**LP PYRA 02 - LP PYRA 03 - LP PYRA 12
PYRANOMETERS**

Delta Ohm manufactures First Class **LP PYRA 02** and **LP PYRA 12** and Second Class **LP PYRA 03** pyranometers which fully comply with ISO 9060 standards, and meet the requirements defined by the World Meteorological Organization (WMO). These are strong and reliable instruments, especially designed to be used under all weather conditions. They are suitable for installation on the field.

Recommended use: atmospheric research, weather stations, climatology, energy saving research, productive efficiency test of photovoltaic plants, etc...
Pyranometers LP PYRA 02 and LP PYRA 03 are well suited for the measurement of incoming global solar radiation (0.3µm...3µm spectral range). LP PYRA 12 shadow



LP PYRA 02

ring is designed to shield the instrument sensor from direct radiation; by that, an exact measurement of the diffuse sky radiation is possible.

- LP PYRA 0x with direct, unamplified output, no external power supply required
 - LP PYRA 0x AC with 4..20 mA current output- 2-wire connection, requires external power supply
 - LP PYRA 0x AV with 0..1Vdc, 0..5Vdc or 0..10 Vdc voltage output, requires external power supply
 - LP PYRA 0x S with serial RS485 and MODBUS-RTU protocol, requires external power supply
 - LP PYRA 0x S12 with SDI-12 output, requires external power supply
- The pyranometers with unamplified output have a typical sensitivity of:

$$10 \frac{\text{mV}}{\text{kW} \cdot \text{m}^2}$$

Every pyranometer is calibrated separately and is supplied standard with a WRR (World Radiometric Reference) Report of Calibration.

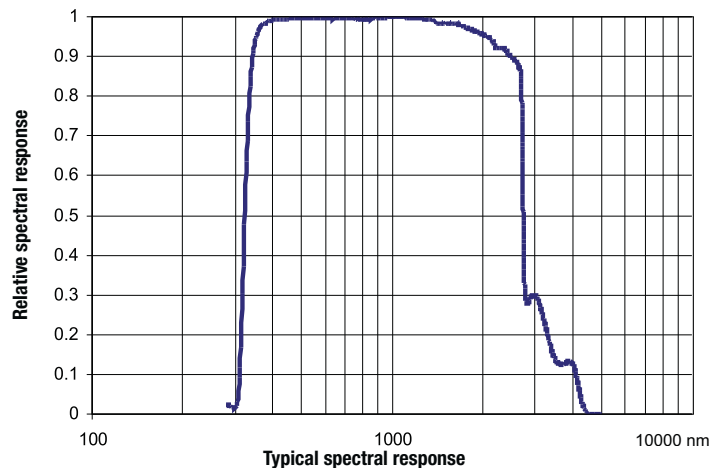
Technical Specification	LP PYRA 02 / LP PYRA 12	LP PYRA 03
Typical sensitivity	10 µV/(W/m ²)	
Impedance	33 Ω ÷ 45 Ω	
Measuring range	0 ÷ 2000 W/m ²	
Viewing field	2π sr	
Spectral field	305 nm ÷ 2800 nm	
Operating temperature	-40 °C ÷ 80 °C	
Weight	0.90 Kg	0.45 Kg
ISO 9060 Specifications		
Response time 95%	< 28 sec	< 30sec
Zero Off-set		
a) Response to thermal radiation (200Wm ⁻²)	15 W/m ²	25 W/m ²
b) Response to temperature change 5K/h	<± 4W/m ²	<± 6W/m ²
3a) Non stability over 1 year	<± 1.51%	<± 2.51%
3b) Non linearity	<± 11%	<± 21%
3c) Cosine response	<±18W/m ²	<±22W/m ²
3d) Spectral selectivity	<±51%	<±71%
3e) Response with regard to temperature	< 4 %	< 8 %
3f) Tilt response	<± 21%	<± 41%
Shadow ring for LP PYRA 12		
Weight	5.90 Kg	
Diameter	570 mm	
Height	54 mm	
Basis diameter	300 mm	

ORDERING CODE

LP PYRA 02: First class pyranometer according to ISO 9060. Complete with: shade disk LP SP1, desiccant sachet with silica-gel crystals, 2 cartridges, spirit level, **M12** 4-pole connector and Report of Calibration. Typical sensitivity 10µV/(W/m²). **Connection cable has to be ordered separately.**

LP PYRA 02 AC: First class pyranometer according to ISO 9060. Complete with shade disk LP SP 1, desiccant sachet with silica-gel crystals, 2 cartridges, spirit level, **M12** 4-pole connector and Report of Calibration. **Connection cable has to be ordered separately. Current output 4...20mA.** 4mA = 0W/m², 20mA = 2000W/m². Power supply: 10...30Vdc.

LP PYRA 02 AV: First class pyranometer according to ISO 9060. Complete with shade disk LP SP 1, desiccant sachet with silica-gel crystals, 2 cartridges, spirit level, **M12** 4-pole connector and Report of Calibration. **Voltage output 0...1Vdc, 0...5Vdc, 0...10Vdc.** 0V = W/m², 1/5/10Vdc = 2000W/m². Power supply: 10...30Vdc (15...30Vdc for models with output 0...10Vdc).



LP PYRA 02 S: First class pyranometer according to ISO 9060. Complete with shade disk LP SP 1, desiccant sachet with silica-gel crystals, 2 cartridges, spirit level, **M12** 8-pole connector and Report of Calibration. **Connection cable CPM12-8D...** with M12 connector with 2, 5 or 10m length have to be ordered separately. **Serial output RS485 MODBUS-RTU.** Power supply: 5...30Vdc.

LP PYRA 02 S12: First Class pyranometer according to ISO 9060. Supplied with: shade disk, cartridge with silica-gel crystals, 2 spare sachets, levelling device, connector and Calibration Report. **SDI-12 output.** Power supply 7...30Vdc. On request 2, 5 or 10 m **CPM12 8D...** cables with 8-pole M12 connector.

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

LP SP1: Shade disk for LP PYRA 02

LP RING 02: Base with levelling device and adjustable holder for mounting the LP PYRA 02 pyranometers in an inclined position. Not suitable for LP PYRA02AV, LP PYRA02AC.

LP SG: Drying cartridge with silicagel crystals, complete with O-ring.

LP G: Pack of 5 cartridges of silicagel.

LP PYRA 03: Second class pyranometer according to ISO 9060. Complete with spirit level, **M12** 4-pole connector and Report of Calibration. Typical sensitivity 10µV/(W/m²). **Connection cable has to be ordered separately.**

LP PYRA 03 AC: Second class pyranometer according to ISO 9060. Complete with spirit level, **M12** 4-pole connector and Report of Calibration. Typical sensitivity 10µV/(W/m²). **Connection cable has to be ordered separately. Current output 4...20mA.** 4mA = 0W/m², 20mA = 2000W/m². Power supply: 10...30Vdc.

LP PYRA 03 AV: Second class pyranometer according to ISO 9060. Complete with spirit level, **4-pole connector and Report of Calibration.** Typical sensitivity 10µV/(W/m²). **Connection cable has to be ordered separately. Voltage output 0...1Vdc, 0...5Vdc, 0...10Vdc.** 0V = W/m², 1/5/10Vdc = 2000W/m². Power supply: 10...30Vdc (15...30Vdc for models with output 0...10Vdc).

LP PYRA 03 S: Second class pyranometer according to ISO 9060. Complete with spirit level, **8-pole connector and Report of Calibration.** Typical sensitivity 10µV/(W/m²). **Connection cable CPM12-8D...** with M12 connector with 2, 5 or 10m length have to be ordered separately. **Serial output RS485 MODBUS-RTU.** Power supply: 5...30Vdc.

LP PYRA 03 S12: Second Class pyranometer according to ISO 9060. Supplied with levelling device and Calibration Report. **SDI-12 output.** Power supply 7...30Vdc. On request 2, 5 or 10 m **CPM12 8D...** cables with 8-pole M12 female connector and shade disk.

LP RING 04: Adjustable holder for mounting the LP PYRA 02 and LP PYRA 03 series pyranometers in an inclined position on Ø 40 mm mast with internal thread.

LP S2: Mounting kit: spirit level and stud for mounting LP PYRA 03 on a support which is also part of the kit. Fasteners, shade disk LP SP2 are included.

LP SP2: Shade disk.

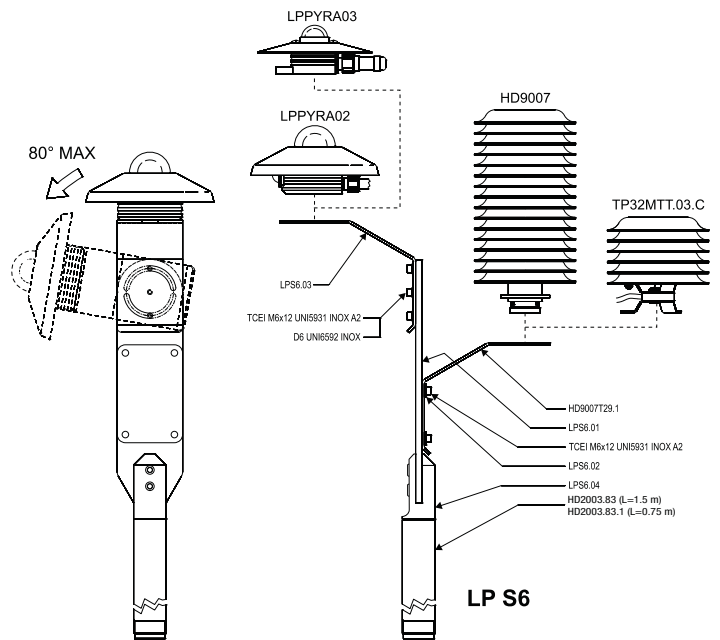
LP S3: Attachment bracket for pyranometers LP PYRA 03, LP PYRA03AC...AV. Suitable for mast with diameter of 40÷50mm.

LP S6: Kit for the installation of LP PYRA 02 and LP PYRA 03 pyranometers. The kit includes: 750 mm mast (HD2003.83.1), base fitting (LP S6.04), graduated support plate (LP S6.01), bracket for pyranometers (LP S6.03). On request, HD9007T29.1 bracket for HD9007 or HD32MTT.03.C.

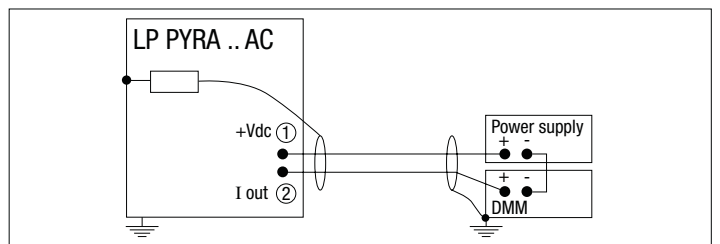
HD 9007.T29.1: White powder-coated anticorrosive aluminium mounting bracket. Supplied with screws for fixing to the LPS6.01 support. For the air temperature probe TP32MTT.03.C or the protection from solar radiations HD9007.

HD 9007.T29K: White powder-coated anticorrosive aluminium mounting bracket. Supplied with accessories for fixing to a Ø 25...44 mm mast. For the air temperature probe TP32MTT.03.C.

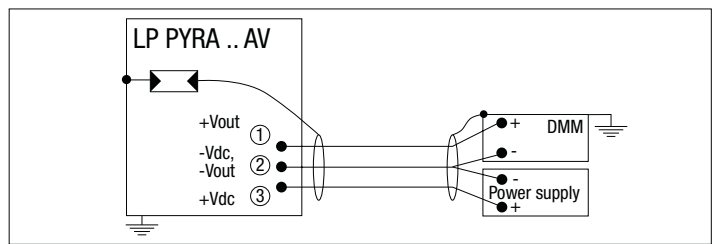
LP PYRA 12: First Class Pyranometer (LP PYRA 02) according to ISO 9060. Complete with shade disk, shadow ring for diffuse radiation, drying cartridge for silicagel crystals, 2 silicagel cartridges and Report of Calibration. M12 4-pole connector. Typical sensitivity 10µV/(W/m²). **Connecting cable has to be ordered separately.**



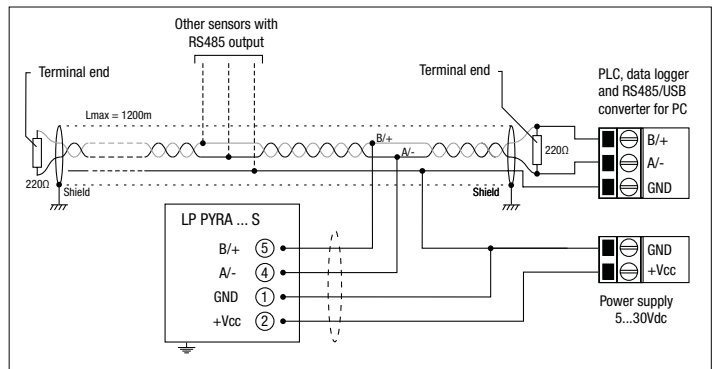
Wiring diagram LP PYRA .. AC



Wiring diagram LP PYRA .. AV

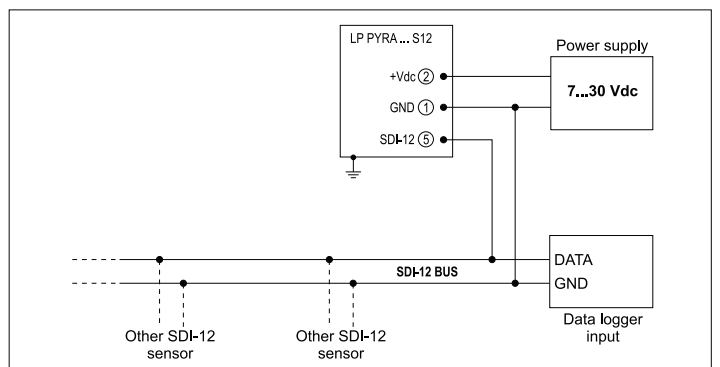
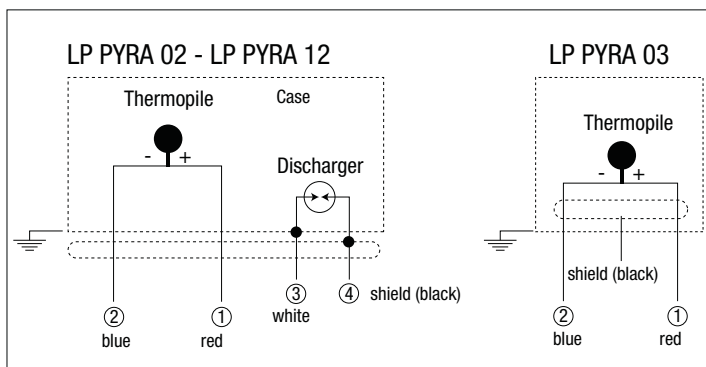


Wiring diagram LP PYRA ... S



Wiring diagram LP PYRA ... S12

Wiring diagram LP PYRA



LP PYRA 12 AC: First Class Pyranometer (LP PYRA 02) according to ISO 9060. Complete with shade disk, shadow ring for diffuse radiation, drying cartridge for silicagel crystals, 2 silicagel cartridges and Report of Calibration. M12 4-pole connector. Typical sensitivity $10\mu\text{V}/(\text{W}/\text{m}^2)$. **Connection cable has to be ordered separately. Current output 4...20mA.** $4\text{mA} = 0\text{W}/\text{m}^2$, $20\text{mA} = 2000\text{W}/\text{m}^2$. Power supply: $10...30\text{Vdc}$.

LP PYRA 12 AV: First Class Pyranometer (LP PYRA 02) according to ISO 9060. Complete with shade disk, shadow ring for diffuse radiation, drying cartridge for silicagel crystals, 2 silicagel cartridges and Report of Calibration. M12 4-pole connector. Typical sensitivity $10\mu\text{V}/(\text{W}/\text{m}^2)$. **Connection cable has to be ordered separately. Voltage output 0...1Vdc, 0...5Vdc, 0...10Vdc.** $0\text{V} = \text{W}/\text{m}^2$, $1/5/10\text{Vdc} = 2000\text{W}/\text{m}^2$. Power supply: $10...30\text{Vdc}$ ($15...30\text{Vdc}$ for models with output $0...10\text{Vdc}$).

LP PYRA 12 S : First Class Pyranometer (LP PYRA 02) according to ISO 9060. Complete with shade disk, shadow ring for diffuse radiation, drying cartridge for silicagel crystals, 2 silicagel cartridges and Report of Calibration. Typical sensitivity $10\mu\text{V}/(\text{W}/\text{m}^2)$. **Connection cable CPM12-8D...** with M12 connector with 2, 5 or 10m length have to be ordered separately. **Serial output RS485 MODBUS-RTU.** Power supply: $5...30\text{Vdc}$.

LP PYRA 12 S12: First Class pyranometer according to ISO 9060 with shadow ring for measuring the diffuse radiation only. Supplied with: shade disk, cartridge with silica-gel crystals, 2 spare sachets, levelling device and Calibration Report. **SDI-12 output.** Power supply $7...30\text{Vdc}$. On request 2, 5 or 10 m **CPM12 8D...** cables with 8-pole M12 connector.

LP RING 12: Ring base for measuring the diffuse radiation, for LP PYRA 12.

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

Connection cables for LP PYRA 02... - 03... - 12...

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

CPM12-8D.2: Cable with 8-pole M12 connector on one end, open wires on the other side. Length 2 m. **Only for LP PYRA...S and LP PYRA...S12.**

CPM12-8D.5: Cable with 8-pole M12 connector on one end, open wires on the other side. Length 5 m. **Only for LP PYRA...S and LP PYRA...S12.**



LP RING 02



LP PYRA 02 + HD 9008TRR

CPM12-8D.10: Cable with 8-pole M12 connector on one end, open wires on the other side. Length 10 m. **Only for LP PYRA...S and LP PYRA...S12.**

CP 24: PC connecting cable for the RS485 MODBUS-RTU parameters configuration of the LP PYRA...S pyranometers. With built-in RS485/USB converter. 8-pole M12 connector on instrument side and A-type USB connector on PC side. Supplied with a CD-ROM including the USB drivers and a software for the Modbus connection to PC.

HD978TR3: Configurable signal converter amplifier with $4\div 20\text{mA}$ ($20\div 4\text{mA}$) output. Input measuring range $-10...+60\text{mV}$. Default setting $0\div 20\text{mV}$. Minimum measuring range 2mV .

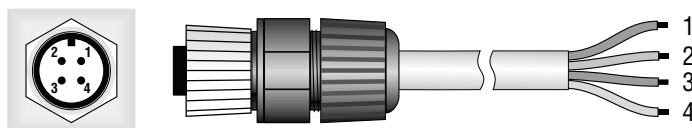
HD978TR4: Configurable signal converter amplifier with $0\div 10$ ($10\div 0\text{Vdc}$) output. Input measuring range $-10...+60\text{mV}$. Default setting $0\div 20\text{mV}$. Minimum measuring range 2mV .

HD978TR5: Wall configurable, signal converter amplifier with $4\div 20\text{mA}$ ($20\div 4\text{mA}$) output. Input measuring range $-10...+60\text{mV}$. Default settings $0\div 20\text{mV}$. Minimum measuring range 2mV .

HD978TR6: Wall configurable, signal converter amplifier with $0\div 10$ ($10\div 0\text{Vdc}$) output. Input measuring range $-10...+60\text{mV}$. Default settings $0\div 20\text{mV}$. Minimum measuring range 2mV .

HD 778 TCAL: Voltage generator in the range $-60\text{mVdc}...+60\text{mVdc}$, controlled by PC through the RS232C serial port, **DELTA LOG-7** software for setting of HD 978TR3, HD 978TR4, HD978TR5, HD978TR6 converters.

WIRING DIAGRAM LP PYRA 02 - LP PYRA 03 - LP PYRA 12



Fixed 4-pole plug M12

Flying 4-pole M12 connector

LP PYRA 02 - LP PYRA 03 - LP PYRA 12

Connector	Function	Color
1	Positive signal (+)	Red
2	Negative signal (-)	Blue
3	Not connected (LP PYRA 03) Container (LP PYRA 02 - LP PYRA 12)	White
4	Shield (\perp)	Black

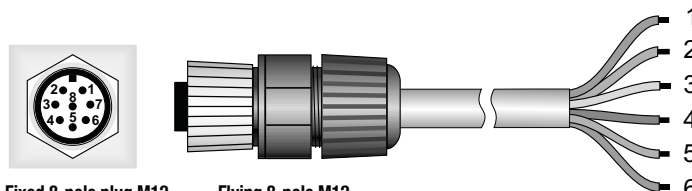
LP PYRA 02 AC - LP PYRA 03 AC - LP PYRA 12 AC

Connector	Function	Color
1	Positive signal (+)	Red
2	Negative signal (-), -Vdc	Blue
3	Not connected (LP PYRA 03) Container (LP PYRA 02 - LP PYRA 12)	White
4	Shield (\perp)	Black

LP PYRA 02 AV - LP PYRA 03 AV - LP PYRA 12 AV

Connector	Function	Color
1	(+) Vout	Red
2	(-) Vout e (-) Vcc	Blue
3	(+) Vcc	White
4	Shield (\perp)	Black

WIRING DIAGRAM LP PYRA 02 S - LP PYRA 03 S - LP PYRA 12 S



Fixed 8-pole plug M12

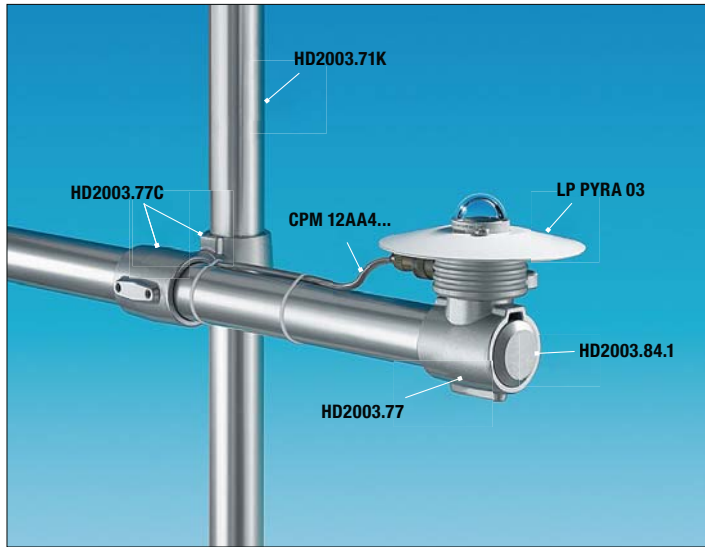
Flying 8-pole M12

LP PYRA 02 S - LP PYRA 03 S - LP PYRA 12 S

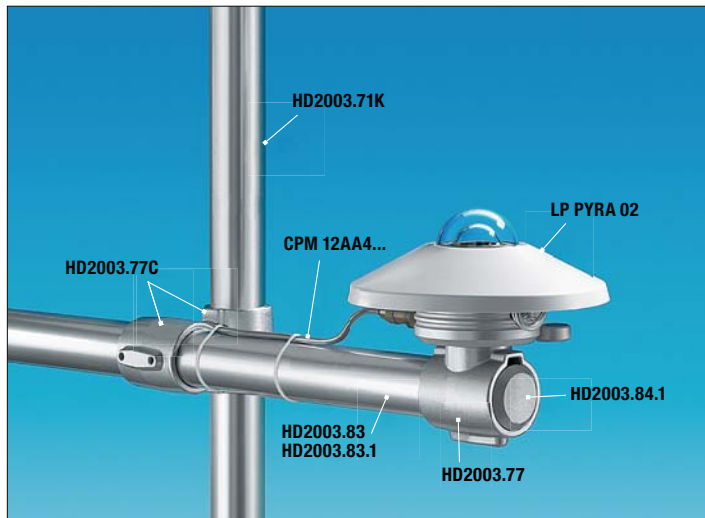
Connector	Function	Color
1	Power supply negative (GND)	Blue
2	Power supply positive (+Vdc)	Red
3	Not connected	
4	RS485 A/-	Brown
5	RS485 B/+	White
6	Case	Shield (Black)
7	Not connected	
8	Not connected	

LP PYRA 02 S - LP PYRA 03 S - LP PYRA 12 S

Connector	Function	Color
1	Power supply negative (GND) SDI-12 output negative	Blue
2	Power supply positive (+Vdc)	Red
3	Not connected	
4	Not connected	
5	SDI-12 output positive	White
6	Case	Shield (Black)
7	Not connected	
8	Not connected	



LP PYRA 03 + HD2003.77 + HD2003.77C



LP PYRA 02 + HD2003.77C + HD2003.77



HD978TR3, HD978TR4, HD978TR5, HD978TR6

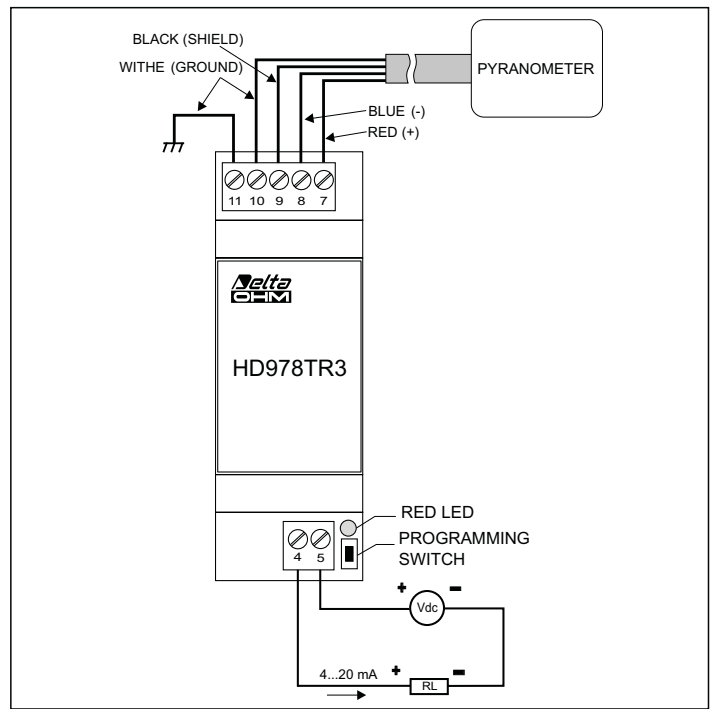


Fig.5 Connection diagram of the HD978TR3 to a pyranometer.

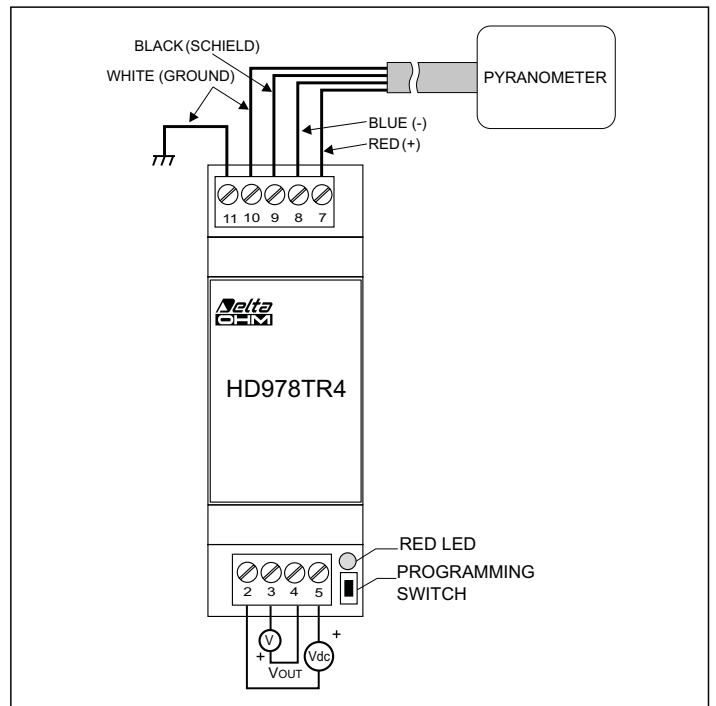
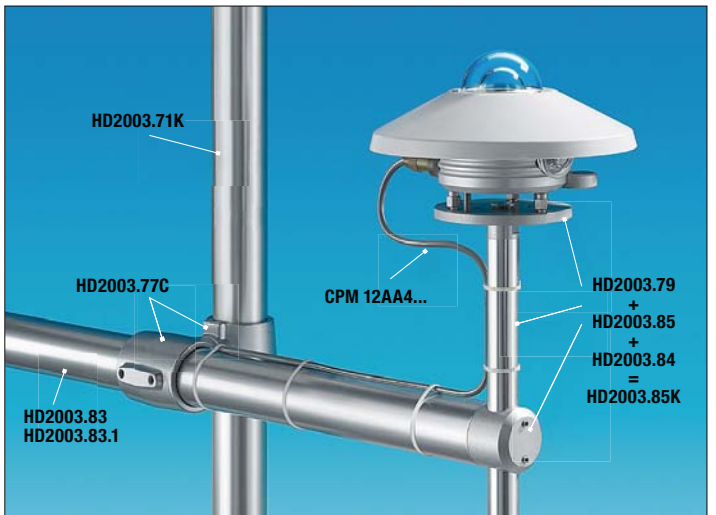


Fig.6 Connection diagram of the HD978TR4 to pyranometer.



LP PYRA 02 + HD2003.85K + HD2003.77C

Environmental analysis