Member of GHM GROUP

English

Operating manual

Sunshine duration sensor

LPSD18

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1 INTRODUCTION

The Sunshine Duration sensor LPSD18 measures status and sunshine duration. The WMO (World Meteorological Organization) defines the sunshine duration as the time during which the direct solar radiation exceeds the level of 120 W/m^2.

The LPSD18 performs the measure of radiation with an array of photodiodes arranged in a particular geometry which allows to obtain an accurate measurement in any weather conditions. This solution avoids the use of mechanical moving parts and ensures high reliability over time.

The instrument, besides indicating the presence of sun as required by the WMO, measures also direct radiation (SRD), therefore it can be used as a low cost alternative to a pyrheliometer, which use is bound to a solar tracker.

The instrument is available in three versions, which differ in the type of output:

LPSD18.1 RS485 MODBUS-RTU output and volt-free contact output
(contact closed = SRD ≥ 120 W/m^2, contact open = SRD < 120 W/m^2)

LPSD18.2 RS485 MODBUS-RTU output, analog voltage output 0…1 Vdc, which corresponds to 0…2000 W/m^2 of direct radiation, and digital output voltage (digital voltage output: 1V = SRD ≥ 120 W/m^2, 0V = SRD < 120 W/m^2)

LPSD18.3 SDI-12 output and volt-free contact output
(contact closed = SRD ≥ 120 W/m^2, contact open = SRD < 120 W/m^2)

The LPSD18 is equipped with a heating element separately powered and galvanically isolated, which prevents the formation of condensation on the glass surface onto which the sensitive elements are placed. For harsh climates, the above-mentioned versions are available with a second heating element (option R, LPSD18.x**R**), which prevents the formation of ice and prevents snow from settling.

The instrument does not need any positioning adjustment during the year and it can be installed on a mast or on a proper fixing base (optional).

The application fields are multiple: from the agronomy (agricultural science) to the study the growth of crops, to photovoltaic systems for verifying their performance, to building automations for automatic opening/closing of blinds, shutters and, in general, to all those areas where it is necessary to monitor the presence of sunlight.

2 OPERATING PRINCIPLE

The Sunshine Duration LPSD18 is based on the use of 16 sensors arranged in such a way that, in the presence of sun, at least one of the photo-detectors is exposed to sun light directly from the sun (besides the diffusion component).

Those sensors which are not directly illuminated by the sun are used for the measurement of the diffused light that is subtracted from the measurement of the sensor which sees the sun directly to get direct radiation.

The cylindrical glass protects the sensors and the internal circuits of the instrument from the weather and at the same time provides an excellent transparency to sunlight.

In order to avoid the formation of condensation inside the instrument, in addition to the heating element, the LPSD18 is supplied with a cartridge that must be loaded with desiccant material in colloidal silica (Silica-gel).

3 INSTALLATION

Before installing the sunshine duration sensor, refill the cartridge containing silica-gel crystals.

Do not touch the silica-gel crystals with your hands while refilling the cartridge. Carry out the following instructions in an environment as drier as possible:

1. Unscrew the silica gel cartridge using a coin.
2. Remove the cartridge perforated cap.
3. Open the sachet containing silica gel (supplied with the sunshine duration sensor).
4. Fill the cartridge with the silica gel crystals.
5. Close the cartridge with its own cap, paying attention that the sealing O-ring be properly positioned.
6. Screw the cartridge to the sunshine duration sensor body using a coin.
7. Check that the cartridge is screwed tightly (if not, silica gel life will be reduced).

The figure below shows the operations necessary to fill the cartridge with the silica gel crystals.

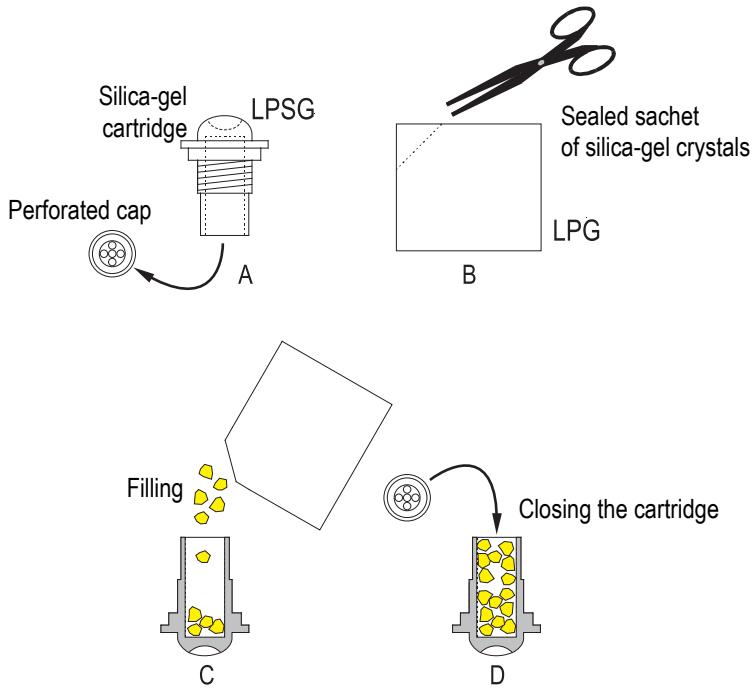


Fig. 3.1: filling the silica-gel cartridge

The sunshine duration sensor should be installed in a place easy to be reached for the periodical cleaning of the glass and the maintenance. At the same time, it should be avoided that buildings, trees or obstructions of any kind exceed the horizontal plane on which the sunshine duration is placed. It is acceptable to choose a location where obstacles in the path of the sun from sunrise to sunset is less than 5° from the horizontal plane of the sunshine duration sensor. It should be also checked that there are no reflective elements that may alter the measure.

The LPSD18 does not need any positioning adjustment during the year.

Various installation methods are possible, with adjustable supports so to fit the sensor to the position of the sun to the latitude of the place of installation:

- Installation on a flat base by using the **LPSD18.19K** support with adjustable inclination (without graduated scale). The support has to be requested when ordering the sensor because it must be assembled at the factory.

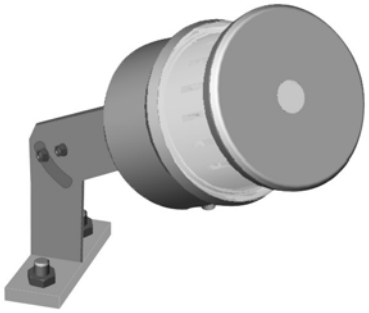


Fig. 3.2: LPSD18.19K support

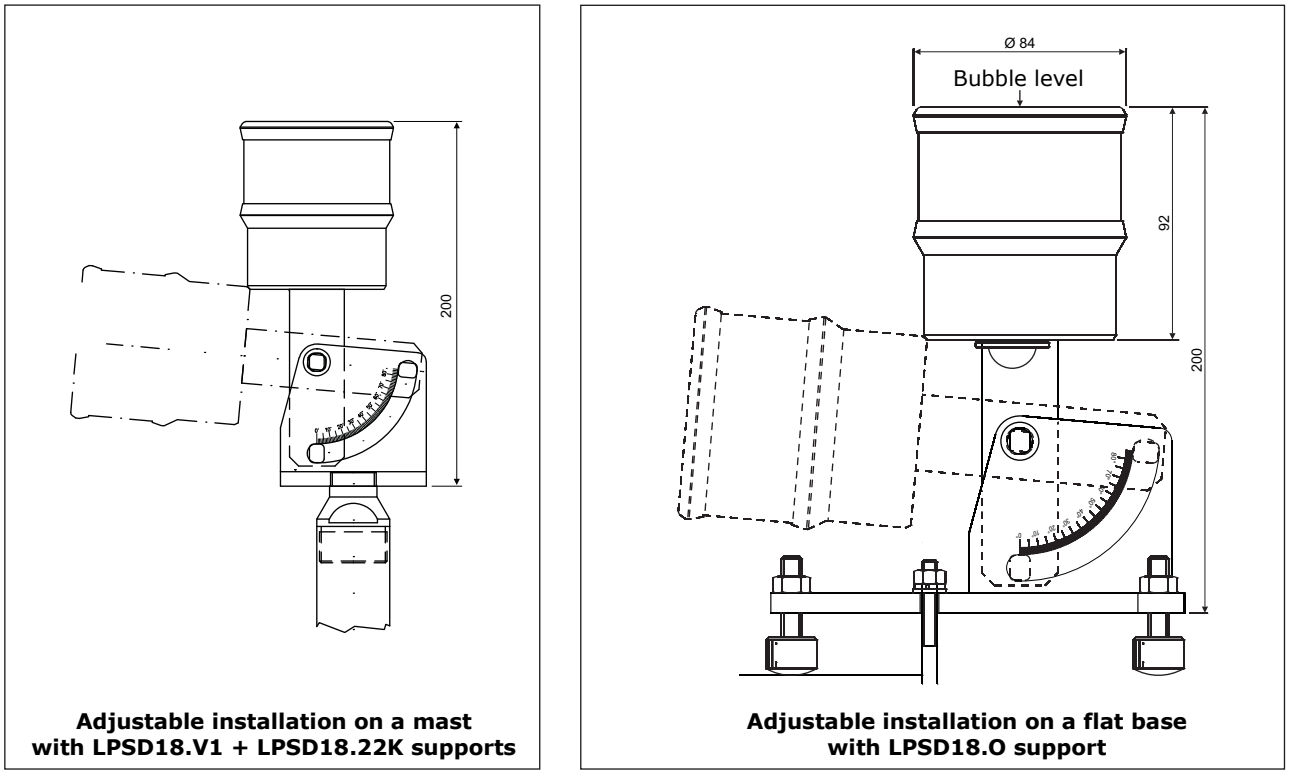
- Installation on the base **LPSD18.O**. The base allows the inclination of the sensor up to 80° (with graduated scale) respect to the vertical. Two adjustable feet and one fixed foot allow the sensor horizontal levelling.

Fig. 3.3: LPSD18.O support

- Installation on a vertical Ø 40 mm mast by using the **LPSD18.V1** support. The support allows the inclination of the sensor up to 80° (with graduated scale) respect to the vertical.

Fig. 3.4: LPSD18.V1 support

In the installation on a vertical Ø 40 mm mast, the **LPSD18.22K** optional accessory allows the rotation of the sensor on the horizontal plane.



Adjustable installation on a mast with LPSD18.V1 + LPSD18.22K supports

Adjustable installation on a flat base with LPSD18.O support

Fig. 3.5: supports

Before orienting the Sunshine Duration Sensor to its final position, place it vertically and adjust the base (for installation on a plane) or support (for installation on a ø 40 mm mast) feet so that the level on the upper side of the instrument is perfectly levelled (Fig. 3.6).

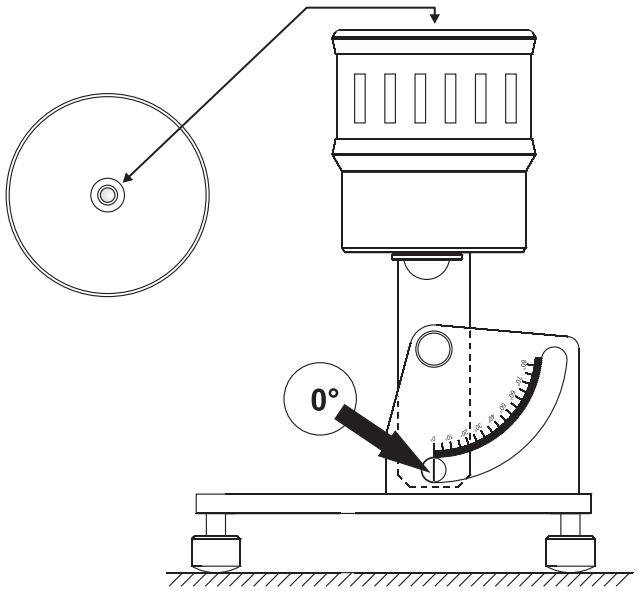


Fig. 3.6: levelling of the Sunshine Duration Sensor

Orient the Sunshine Duration Sensor so that the index of the graduated scale of the support matches the value (90° - Latitude) and the top (where the spirit level is

placed) is directed towards the NORTH pole, if used in the northern hemisphere, or towards south, if used in the southern hemisphere (Fig. 3.7).

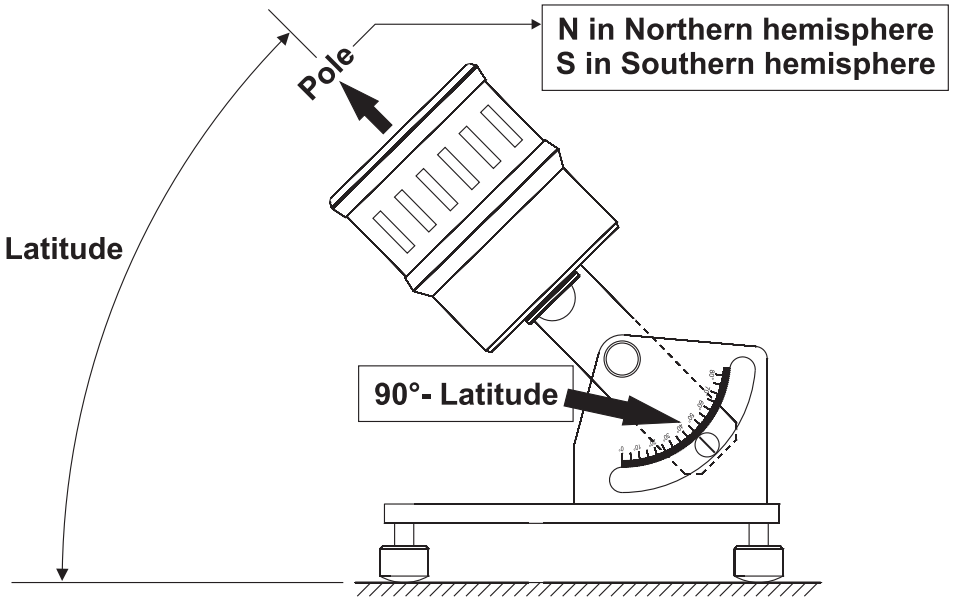


Fig. 3.7: orientation of the Sunshine Duration Sensor

The angle that instrument axis should make with respect to the ground is equal to the latitude of the installation site, this way the axis of the instrument will be parallel to the earth axis North-South (Fig. 3.8).

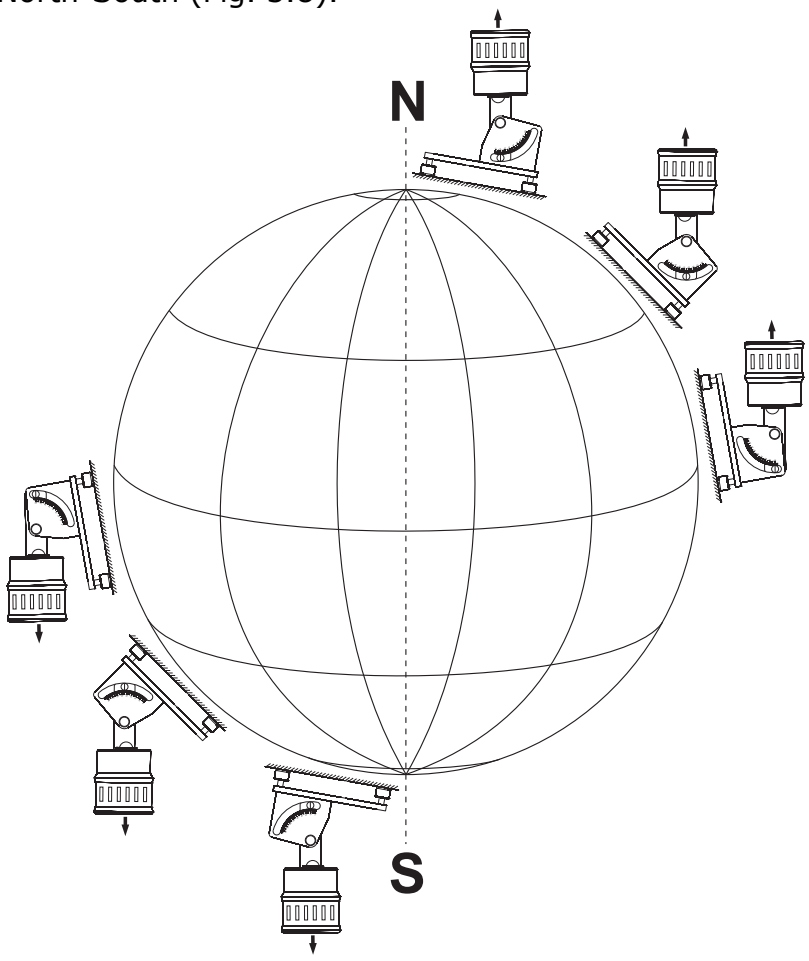


Fig. 3.8: Sunshine Duration Sensor parallel to the Earth axis

3.1 ELECTRICAL CONNECTIONS

The Sunshine Duration Sensor has an 8-pole connector and uses the **CP18... optional** cables with 8-pole connector on one side and open wires on the other side.

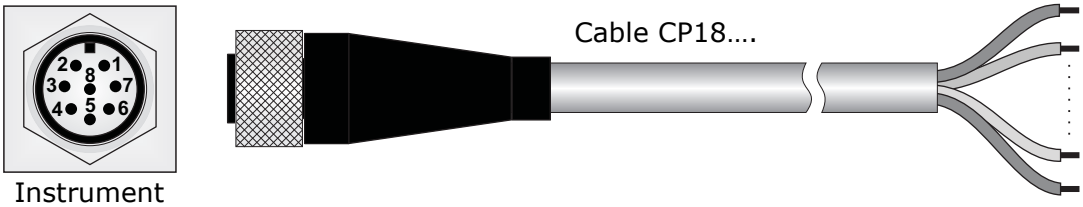


Fig. 3.9: connections

Connector pin N°	Function	CP18... cable wire N°/colour
LPSD18.1[R]		
1	Power supply negative	12/Black + 7/Violet + 6/Pink (**)
2	Power supply positive	1/Red + 2/Blue + 4/Grey-Pink (**)
3	Heating (*)	3/Yellow
4	RS485 A/-	9/White
5	RS485 B/+	5/Red-Blue
6	Volt-free contact output	8/Grey
7	Heating (*)	10/Brown
8	Volt-free contact output	11/Green
LPSD18.2[R]		
1	Power supply negative 0-1 V analog output negative 0-1 V digital output negative	12/Black + 7/Violet + 6/Pink (**)
2	Power supply positive	1/Red + 2/Blue + 4/Grey-Pink (**)
3	Heating (*)	3/Yellow
4	RS485 A/-	9/White
5	RS485 B/+	5/Red-Blue
6	0-1 V digital output positive	8/Grey
7	Heating (*)	10/Brown
8	0-1 V analog output positive	11/Green
LPSD18.3[R]		
1	Power supply negative	12/Black + 7/Violet + 6/Pink (**)
2	Power supply positive	1/Red + 2/Blue + 4/Grey-Pink (**)
3	Heating (*)	3/Yellow
4	NC	9/White
5	SDI-12	5/Red-Blue
6	Volt-free contact output	8/Grey
7	Heating (*)	10/Brown
8	Volt-free contact output	11/Green

(*) The connection of the heating is not polarized; the two wires can be reversed.

(**) Wires shorted on the connector pin.

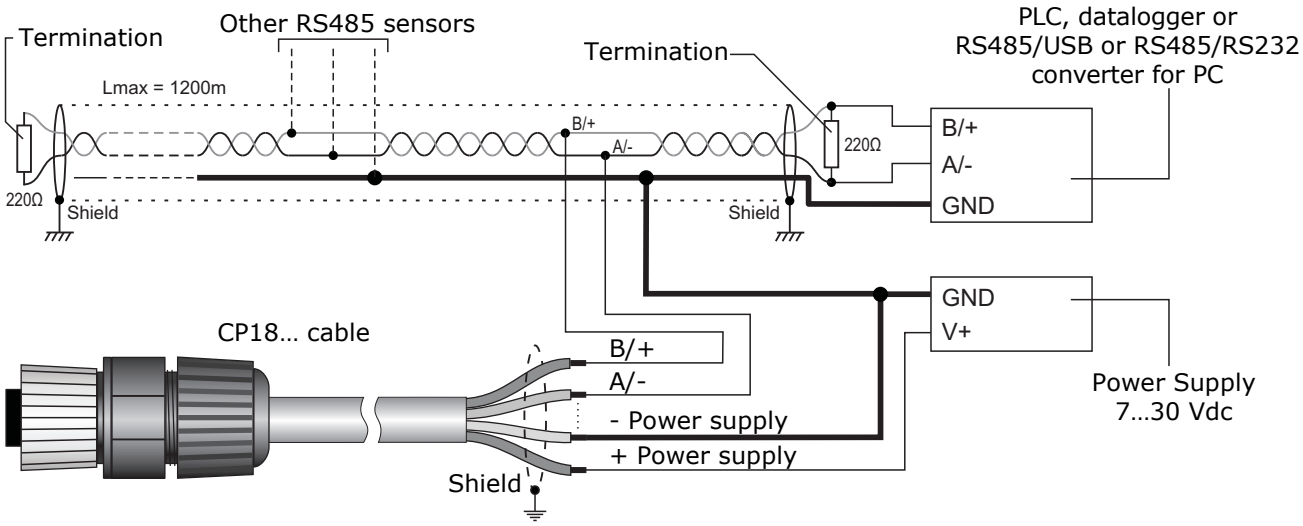


Fig. 3.10: RS485 connection

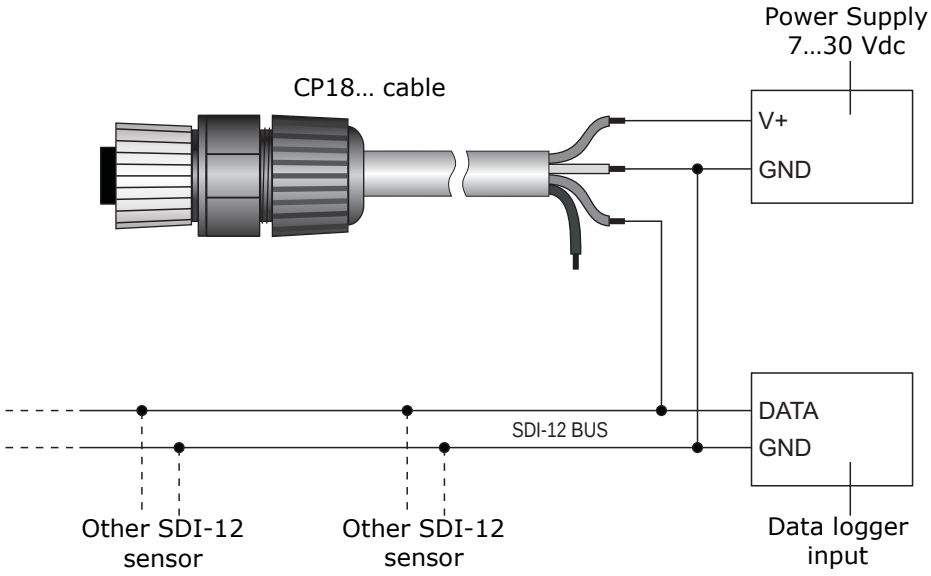


Fig. 3.11: SDI-12 connection

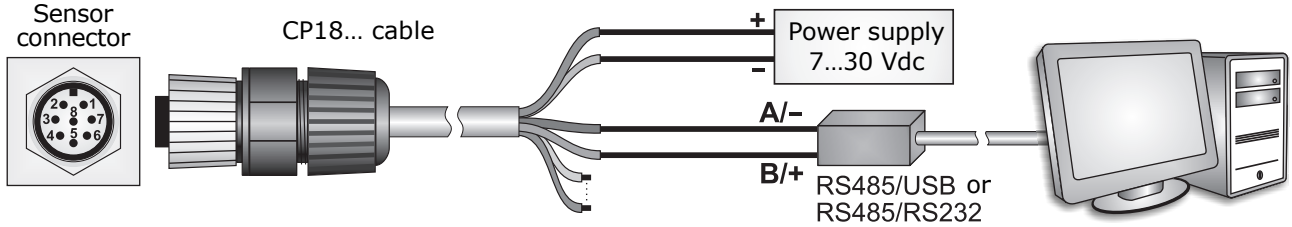
4 RS485 MODBUS-RTU OUTPUT

LP SD18.1[R] and **LP SD18.2[R]** are equipped with a RS485 MODBUS-RTU output.

Before connecting the sensor to the RS485 network, an address must be assigned and the communication parameters must be set, if different from the factory preset.

4.1 SETTING THE COMMUNICATION PARAMETERS

Connect the sensor to the PC by using the supplied 8-pole M12 free connector or the optional **CP18...** cable and a RS485/USB or RS485/RS232 converter. If a RS485/USB converter is used, it is necessary to install the related USB drivers in the PC.



NOTES ON THE INSTALLATION OF UNSIGNED USB DRIVER: before installing unsigned USB driver into operating systems starting from Windows 7, it is necessary to restart the PC by disabling the driver signing request. If the operating system is 64-bit, even after installation the request of driver signing have to be disabled each time the PC is restarted.

Procedure:

1. Start with the sensor not powered.
2. In the PC, start a serial communication program. Set the Baud Rate to 57600 and set the communication parameters as follows (the sensor is connected to a COM type port):

   Data Bits: 8
   Parity: None
   Stop Bits: 2

   In the program, set the COM port number to which the sensor will be connected.
3. Switch the sensor on.
4. Wait until the sensor transmits the **&** character, then send (within 5 seconds from the sensor power on) the **@** command and press **Enter**.

   Note: if the sensor does not receive the **@** command within 5 seconds from power on, the RS485 MODBUS mode is automatically activated. In such a case, it is necessary to switch off and on again the sensor.
5. Send the command **CAL USER ON**.

   Note: the command CAL USER ON is disabled after 5 minutes of inactivity.
6. Send the serial commands given in the following table to set the RS485 MODBUS parameters:

Command	Response	Description
CMAnnn	&|	Set RS485 address to nnn Ranging from 1 to 247 Preset on 1
CMBn	&|	Set RS485 Baud Rate n=0 ⇒ 9600 n=1 ⇒ 19200 Preset on 1 ⇒ 19200
CMPn	&|	Set RS485 transmission mode n=0 ⇒ 8-N-1 (8 data bits, no parity, 1 stop bit) n=1 ⇒ 8-N-2 (8 data bits, no parity, 2 stop bits) n=2 ⇒ 8-E-1 (8 data bits, even parity, 1 stop bit) n=3 ⇒ 8-E-2 (8 data bits, even parity, 2 stop bits) n=4 ⇒ 8-O-1 (8 data bits, odd parity, 1 stop bit) n=5 ⇒ 8-O-2 (8 data bits, odd parity, 2 stop bits) Preset on 2 ⇒ 8-E-1
CMWn	&|	Set receiving mode after RS485 transmission n=0 ⇒ Violate protocol and go in Rx mode right after Tx n=1 ⇒ Respect protocol and wait 3.5 characters after Tx Preset on 1 ⇒ Respect the protocol

7. You can check the parameters setting by sending the following serial commands:

Command	Response	Description
RMA	*Address*	Read RS485 address
RMB	*Baud Rate* (0,1)	Read RS485 Baud Rate 0 ⇒ 9600 1 ⇒ 19200
RMP	*Tx Mode* (0,1,2,3,4,5)	Read RS485 transmission mode 0 ⇒ 8-N-1 1 ⇒ 8-N-2 2 ⇒ 8-E-1 3 ⇒ 8-E-2 4 ⇒ 8-O-1 5 ⇒ 8-O-2
RMW	*Rx Mode* (0,1)	Read receiving mode after RS485 transmission 0 ⇒ Violate protocol and go in Rx mode right after Tx 1 ⇒ Respect protocol and wait 3.5 characters after Tx

Note: it is not required to send the CAL USER ON command to read the settings.

4.2 READING THE MEASURES WITH THE MODBUS-RTU PROTOCOL

In MODBUS mode, you can read the values measured by the sensor (and some status parameters) through the function code 04h (Read Input Registers). The following table lists the quantities (and parameters) available with the appropriate register address:

MODBUS Input Registers

Number	Address	Quantity	Format
1	0	Internal temperature °C [x10]	16-bit integer
2	1	Internal temperature °F [x10]	16-bit integer
3	2	Direct radiation (SRD, "Direct Sunshine") in W/m^2	16-bit integer
4	3	Status register Bit0=1 ⇒ error in the measure of radiation Bit1=1 ⇒ error in the measure of temperature Bit2=1 ⇒ data memory error Bit3=1 ⇒ program memory error	16-bit integer
5	4	Number of seconds in the last minute with radiation higher than 120 W/m^2 (number between 0 and 60)	16-bit integer
6	5	Number of tens of seconds in the last 10 minutes with radiation ≥ 120 W/m^2 (number between 0 and 60: for each interval of 10 s, in the last 10 minutes, is counted a 1 if SRD ≥ 120 W/m^2 for at least 5 s) For a higher resolution use the register number 5.	16-bit integer
7	6	Status of the sun presence/absence contact 0 = SRD < 120 W/m^2 (open contact) 1 = SRD ≥ 120 W/m^2 (closed contact)	16-bit integer
8	7	Status of heating: 0 = off, 1 = on	16-bit integer
9	8	Temperature in °C [x10] below which the heating turns on	16-bit integer
10	9	Circular counter from 0 to 32767 of the measuring cycles. It is increased after each measurement.	16-bit integer

Note: Register address = Register number - 1, as defined in the Modbus standard.

OPERATING MODE: the sensor enters RS485 MODBUS-RTU mode after 5 seconds from power on. In the first 5 seconds from power on the sensor does not reply to requests from the MODBUS master unit. After 5 seconds, it is possible to send MODBUS requests to the sensor.

4.3 CHANGE OF THE HEATING ACTIVATION TEMPERATURE

The temperature below which the heating turns on can be changed by using 06h function code (Write Single Register) to write the value in the Holding Register number 3 (address 2). The value must be set in tenths of degrees between -450 (-45.0 °C) and 700 (+70.0 °C).

The write 06h function changes only the value in the RAM memory, the change is therefore cancelled in case of power supply failure in the instrument. To make the change permanent, write the hexadecimal value FF00 in the Coil Register number 3 (address 2) by using the 05h function code (Write Single Coil).

To check if the permanent storage has been completed successfully, verify that the Holding Register number 2 (address 1) contains the value 0, by using the 03h function code (Read Holding Registers).

MODBUS Coils

Number	Address	Datum
3	2	Permanent storage of the heating activation temperature.

MODBUS Holding Registers

Number	Address	Datum	Format
1	0	Indicator of the correct interpretation of the last Modbus command sent. If 0, the command has been executed correctly. If 1, command execution errors occurred.	16-bit integer
2	1	Indicator of the correct permanent storage of heating activation temperature. If 0, the temperature has been stored correctly. If 1, storage errors occurred.	16-bit integer
3	2	Temperature in °C [x10] below which the heating turns on	16-bit integer

CHECK OF THE CORRECT INTERPRETATION OF THE MODBUS COMMANDS: in order to check if the last MODBUS command sent to the instrument has been interpreted correctly, verify that the Holding Register number 1 (address 0) contains the value 0, by using the 03h function code (Read Holding Registers).

5 SDI-12 OUTPUT

LPSD18.3 is equipped with an SDI-12 communication interface compliant with the version 1.3 of the protocol.

The protocol communication parameters are: Baud rate = 1200. Data bits = 7, Parity = Even, Stop bits = 1.

The communication with the instrument is performed by sending a command in the following form:

<Address><Command>!

with <Address> = address of the instrument the command is sent to
<Command> = type of operation requested to the instrument

The instrument reply is as follows:

<Address><Data><CR><LF>

with <Address> = address of the instrument which replies
<Data> = information sent by the instrument
<CR> = ASCII character *Carriage Return*
<LF> = ASCII character *Line Feed*

The sensors come with a factory address preset to 0. The address can be modified by using the proper SDI-12 command reported in the following table.

The following table reports the SDI-12 commands available. For consistency with SDI-12 standard documentation, the instrument address is indicated in the table with the letter **a**.

SDI-12 Commands

Command	Instrument reply	Description
a!	a<CR><LF>	Verifies the presence of the instrument.
aI!	allccccccccmmmmmmvvvssssssss<CR><LF> with: a = address of the instrument (1 character) ll = SDI-12 compliant version (2 characters) cccccccc = manufacturer (8 characters) mmmmmm = instrument model (6 characters) vvv = firmware version (3 characters) ssssssss = serial number (8 characters) ⇒ Example of response: 013DeltaOhmLPSD1810013201518 with: 0 = instrument address 13 = SDI-12 version 1.3 compliant DeltaOhm = manufacturer's name LPSD18 = instrument model 100 = firmware version A.0.0 13201518 = serial number	Requests for information from the instrument.

Command	Instrument reply	Description
aAb! Where: b = new address	b<CR><LF> Note: if the b character is not an acceptable address, the instrument responds with a instead of b.	Modification of the instrument address.
?!	a<CR><LF>	Request of the address of the instrument. If more than one sensor is connected to the bus, a conflict occurs.
TYPE M (START MEASUREMENT) AND TYPE C (START CONCURRENT MEASUREMENT) COMMANDS		
Insolation status		
aM! **aC!**	atttn<CR><LF> with: ttt = number of seconds necessary for the instrument to make the measure available (3 characters) n = number of detected variables (1 character for aM!, 2 characters for aC!) Note: ttt = 000 means datum immediately available.	Request of detection of the insolation status (presence or absence of sun).
aD0!	a+x<CR><LF> with: x = 0 if SRD < 120 W/m^2, x = 1 if SRD ≥ 120 W/m^2 ⇒ Example of response: 0+0 The instrument with address 0 measures SRD < 120 W/m^2	Reads the status of insolation (presence or absence of sun).
Direct Solar Radiation		
aM1! **aC1!**	atttn<CR><LF> with: ttt = number of seconds necessary for the instrument to make the measure available (3 characters) n = number of detected variables (1 character for aM1!, 2 characters for aC1!) Note: ttt = 000 means datum immediately available.	Request for performing the measurement of direct solar radiation (SRD) in W/m^2.
aD0!	a+rrrr<CR><LF> with: rrrr = SRD with resolution 1 W/m^2 ⇒ Example of response: 0+0135 The instrument with address 0 measures SRD = 135 W/m^2	Reads the measurement of direct solar radiation (SRD) in W/m^2.

Command	Instrument reply	Description
State and duration of sunshine		
aM2! **aC2!**	atttn<CR><LF> with: ttt = number of seconds necessary for the instrument to make the measure available (3 characters) n = number of detected variables (1 character for aM2!, 2 characters for aC2!) Note: ttt = 000 means datum immediately available.	Request for detecting status and lasting of insolation.
aD0!	a+x+mm+dd+nnnnn<CR><LF> with: x = 0 if SRD < 120 W/m^2, x = 1 if SRD ≥ 120 W/m^2 mm = number of seconds in the last minute with x=1 dd = number of tens of seconds in the last 10 minutes with x=1 (dd=0…60: for each interval of 10 s, a 1 is added if x=1 for at least 5 s) nnnnn = circular counter of the measuring cycles number. ⇒ Example of response: 0+1+25+12+00048 The instrument with address 0 measures x=1, in the last minute there have been 25 s with x=1, in the last 10 min there have been from 60 to 120 s with x=1, 48 measuring cycles have elapsed since the counter reset.	Reads status and lasting of isolation.
Internal temperature and heating status		
aM3! **aC3!**	atttn<CR><LF> with: ttt = number of seconds necessary for the instrument to make the measure available (3 characters) n = number of detected variables (1 character for aM3!, 2 characters for aC3!) Note: ttt = 000 means datum immediately available.	Request of detecting the internal temperature and the heating status.
aD0!	a+nn.d+n<CR><LF> with: nn.d = internal temperature in °C n = 0 when heating OFF, n = 1 when heating ON ⇒ Example of response: 0+15.3+0 the instrument with address 0 measures 15.3 °C of internal heating and the heater is switched off.	Reads the internal temperature and the heating status.
TYPE R (CONTINUOUS MEASUREMENTS) COMMANDS		
aR0!	a+x<CR><LF> with: x = 0 if SRD < 120 W/m^2, x = 1 if SRD ≥ 120 W/m^2	Reads the status of insolation (presence of absence of sun).
aR1!	a+rrrr<CR><LF> with: rrrr = SRD with resolution 1 W/m^2	Reads the measure of the direct solar radiation (SRD) in W/m^2

Command	Instrument reply	Description
aR2!	a+x+mm+dd+nnnnn<CR><LF> with: x = 0 if SRD < 120 W/m^2, x = 1 if SRD ≥ 120 W/m^2 mm = number of seconds in the last minute with x=1 dd = number of tens of seconds in the last 10 minutes with x=1 (dd=0…60: for each interval of 10 s, a 1 is added if x=1 for at least 5 s) nnnnn = circular counter of the measuring cycles number	Reads status and lasting of insolation.
aR3!	a+nn.d+n<CR><LF> with: nn.d = internal temperature in °C n = 0 when heating OFF, n = 1 when heating ON	Reads internal temperature and status of heating

In addition to the above-mentioned commands, the sensor also implements the corresponding commands with CRC, that require to add a 3-character CRC code at the end of the reply before <CR><LF>. The format of these commands is obtained from the previous by adding the letter C: aMC!, aMC1!, aMC2!, aMC3!, aCC!, aCC1!, aCC2!, aCC3!.

For more information about the SDI-12 protocol, visit the website "www.sdi-12.org".

6 MAINTENANCE

In order to grant measurements high accuracy, it is important to keep the protective glass clean.

You can wash it using water and microfiber cloths for lens. If necessary, use pure ETHYL alcohol. After using alcohol, clean again the protective glass with water only and dry it thoroughly.

In order to minimize the condensation, the sensor is provided with a heating element and a cartridge containing dessicant material (silica-gel). The efficiency of the silica-gel crystals decreases over time while absorbing humidity. Silica-gel crystals are efficient when their color is **yellow**, while they turn **white/translucent** as soon as they lose their efficiency. Read instructions on chapter 3 about how to replace the silica-gel crystals. Silica-gel typical lifetime goes from 2 to 6 months depending on the environment where the sensors works.

7 TECHNICAL SPECIFICATIONS

Sensitive elements	16 Silicon photodiodes
Spectral range	360…1100 nm
Direct radiation SRD measuring range	0…2000 W/m^2
Accuracy of the measurement of direct radiation	Better than 90% on the monthly total
Accuracy of the measurement of the sunshine duration sensor	Better than 90% on the monthly total
Response time	<1 ms
Threshold value	120 W/m^2
Sunshine duration resolution	1 s
Power supply **Consumption**	7…30 Vdc 5mA @ 12V
Heating system **Anti-condensation device consumption** **Antifreeze device consumption**	12…15 Vdc 1 W @ 12 V 5 W @ 12 V ON for internal Temp. < 6 °C, OFF for internal Temp. > 10 °C
Internal temperature **Measuring range** **Accuracy**	 -40…+80 °C ± 0.5 °C
Operating temperature	-40…+80 °C
Weight	0.9 kg
Protection degree	IP66
Outputs **LPSD18.1** **LPSD18.2** **LPSD18.3**	 • RS485 MODBUS-RTU • Galvanically isolated contact closed = SRD ≥ 120 W/m^2 open = SRD < 120 W/m^2 • RS485 MODBUS-RTU • Analog output 0…1 V (0…2000 W/m^2) • Digital output 0…1 V 1 V = SRD ≥ 120 W/m^2 0 V = SRD < 120 W/m^2 • SDI-12 • Galvanically isolated contact closed = SRD ≥ 120 W/m^2 open = SRD < 120 W/m^2

8 SAFETY INSTRUCTIONS

General safety instructions

The instrument has been manufactured and tested in accordance with the safety standard EN61010-1:2010 "Safety requirements for electrical equipment for measurement, control and laboratory use" and has left the factory in perfect safety technical conditions.

The instrument proper operation and operating safety can be ensured only if all standard safety measures as well as the specific measures described in this manual are followed.

The instrument proper operation and operating safety can be ensured only in the climatic conditions specified in this manual.

Do not use the instruments in places where there are:

- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

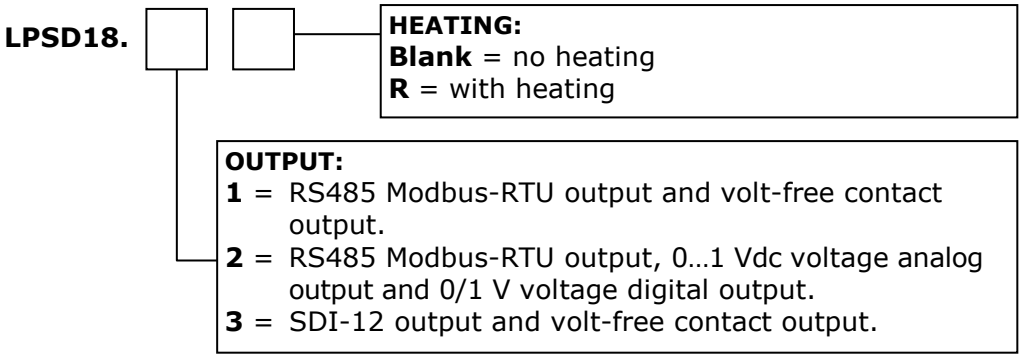
User obligations

The instrument operator shall follow the directives and regulations below that refer to the treatment of dangerous materials:

- EEC directives on workplace safety.
- National law regulations on workplace safety.
- Accident prevention regulations.

9 ORDER CODES

LPSD18... Sensor for measuring sunshine duration, referred to the 120 W/m^2 threshold of direct radiation, according to WMO indications. This sensor has no moving parts. Various outputs available depending on the model. Power supply 7…30 Vdc. It can be fixed on a mast or installed on a horizontal surface by using optional accessories. Built-in spirit level for levelling. The sensor does not require any adjustment of its position during the year. Equipped with anti-condensation system. 8-pin M12 connector. Optional heating for installation in harsh climates, for the removal of ice and snow. **CP18... cable has to be ordered separately**.



ACCESSORIES

LPSD18.O Base for installation of the sunshine duration sensor on a horizontal plane. Two adjustable feet and one fixed foot. Allows the inclination of the sensor up to 80° (with graduated scale) from the vertical, to suit the position of the sun to the latitude of the place of installation.

LPSD18.V1 Support for installation of the sunshine duration sensor on a mast Ø 40 mm. Allows the inclination of the sensor up to 80° (with graduated scale) from the vertical, to suit the position of the sun to the latitude of the place of installation.

LPSD18.19K Basic support for installation of the sunshine duration sensor on a plane. Allows the inclination of the sensor (without graduated scale) from the vertical, to suit the position of the sun to the latitude of the place of installation. **To be requested when ordering the sensor (it must be assembled at the factory).**

LPSD18.22K Accessory for installation of the sunshine duration sensor on a Ø 40 mm mast. It allows the rotation of the sensor on a horizontal plane.

HD2003.83 ∅ 40 mm mast, 150 cm length. M37x2 mm thread.

HD2003.83.1 ∅ 40 mm mast, 75 cm length. M37x2 mm thread.

LPSG Cartridge for containing crystals of silica gel with O-ring.

LPG Pack of 5 cartridges of the silica-gel.

CP18.5 12- pole cable. 5 m long. 8-pin M12 connector on one side, free wires on the other side.

CP18.10 12- pole cable. 10 m long. 8-pin M12 connector on one side, free wires on the other side.

DELTA OHM metrology laboratories LAT N° 124 are ISO/IEC 17025 accredited by ACCREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity. They can supply calibration certificates for the accredited quantities.

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DICHIARAZIONE DI CONFORMITÀ UE
EU DECLARATION OF CONFORMITY

Delta Ohm S.r.L. a socio unico – Via Marconi 5 – 35030 Caselle di Selvazzano – Padova – ITALY

Documento Nr. / Mese.Anno:
Document-No. / Month.Year : **5108 / 07.2019**

Si dichiara con la presente, in qualità di produttore e sotto la propria responsabilità esclusiva, che i seguenti prodotti sono conformi ai requisiti di protezione definiti nelle direttive del Consiglio Europeo:
We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:

Codice prodotto:
Product identifier : **LPSD18.1 – LPSD18.2 – LPSD18.3**

Descrizione prodotto:
Product description : **Eliofanometro**
Sunshine duration sensor

I prodotti sono conformi alle seguenti Direttive Europee:
The products conform to following European Directives:

Direttive / *Directives*	
2014/30/EU	Direttiva EMC / *EMC Directive*
2014/35/EU	Direttiva bassa tensione / *Low Voltage Directive*
2011/65/EU - 2015/863/EU	RoHS / *RoHS*

Norme armonizzate applicate o riferimento a specifiche tecniche:
Applied harmonized standards or mentioned technical specifications:

Norme armonizzate / *Harmonized standards*	
EN 61010-1:2010	Requisiti di sicurezza elettrica / *Electrical safety requirements*
EN 61326-1:2013	Requisiti EMC / *EMC requirements*
EN 50581:2012	RoHS / *RoHS*

Il produttore è responsabile per la dichiarazione rilasciata da:
The manufacturer is responsible for the declaration released by:

Johannes Overhues

Amministratore delegato
Chief Executive Officer

Caselle di Selvazzano, 19/07/2019

Questa dichiarazione certifica l'accordo con la legislazione armonizzata menzionata, non costituisce tuttavia garanzia delle caratteristiche.
This declaration certifies the agreement with the harmonization legislation mentioned, contained however no warranty of characteristics.

GUARANTEE

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TERMS OF GUARANTEE

All DELTA OHM instruments are subject to accurate testing, and are guaranteed for 24 months from the date of purchase. DELTA OHM will repair or replace free of charge the parts that, within the warranty period, shall be deemed non efficient according to its own judgement. Complete replacement is excluded and no damage claims are accepted. The DELTA OHM guarantee only covers instrument repair. The guarantee is void in case of incidental breakage during transport, negligence, misuse, connection to a different voltage than that required for the appliance by the operator. Finally, a product repaired or tampered by unauthorized third parties is excluded from the guarantee. The instrument shall be returned FREE OF SHIPMENT CHARGES to your dealer. The jurisdiction of Padua applies in any dispute.

The electrical and electronic equipment marked with this symbol cannot be disposed of in public landfills. According to the Directive 2011/65/EU, the european users of electrical and electronic equipment can return it to the dealer or manufacturer upon purchase of a new one. The illegal disposal of electrical and electronic equipment is punished with an administrative fine.

This guarantee must be sent together with the instrument to our service centre.

IMPORTANT: Guarantee is valid only if coupon has been correctly filled in all details.

Instrument Code: LPSD18...

Serial Number _____

RENEWALS

Date _____	Date _____
Inspector _____	Inspector _____
Date _____	Date _____
Inspector _____	Inspector _____
Date _____	Date _____
Inspector _____	Inspector _____

CE

RoHS 2011/65/EU

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The quality level of our instruments is the result of the constant development of the product. This may produce some differences between the information written in this manual and the instrument you have purchased. We cannot completely exclude the possibility of errors in the manual, for which we apologize.

The data, images and descriptions included in this manual cannot be legally asserted. We reserve the right to make changes and corrections with no prior notice.

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