LPPHOT01S – Transmitter with MODBUS-RTU RS485 output for the probe LPPHOT01

The transmitter LPPHOT01S converts the mV analog signal generated by the illumination probe LPPHOT01 into a digital signal suitable to be transmitted over a serial line RS485 with MODBUS-RTU protocol. All connections are made via screw terminals accessible by removing the top cover of the transmitter. The container is designed for wall mounting.

Technical specifications

Measuring range with the probe LPPHOT01	Low range: 0…10.000 lux (default) High Range: 0…150.000 lux
Resolution	1 lux (low range) / 10 lux (high range)
Output	RS485 (1 Unit Load) with MODBUS-RTU protocol, non isolated
Power supply	5…30 Vdc
Housing dimensions	80 x 84 x 44 mm
Protection degree	IP 66
Working Temperature / %RH	-30…+70 °C / 0…90% RH without condensation
Storage temperature	-40…+80 °C

Setting the RS485 communication parameters of the transmitter

Before connecting the transmitter to the RS485 network, assign an address and set the communication parameters, if different from those preset by the factory.
The parameter setting is done by connecting the transmitter to the PC via optional RS48, with integrated converter RS485/USB. In order to use the cable the USB drivers should be installed on your PC. Alternatively, instead of the cable RS48, it is possible to use a generic RS485/RS232 or RS485/USB converter.
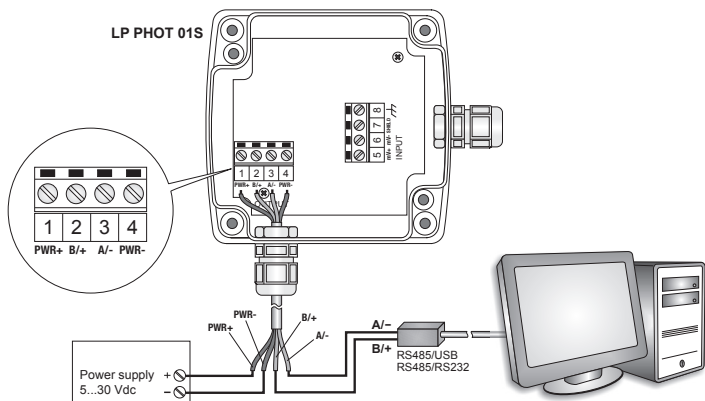
Procedure for setting the parameters

1 - The transmitter should be powered off.

2 - Start a program of serial communication standards, such as Hyperterminal. Set the number of the COM port to which the transmitter should be connected, set the Baud Rate to 57600 and the communication parameters as follows:
    Data bits: 8   Parity: None   Stop bits: 2

3 - Power the transmitter on.

4 - Within 10 seconds from the transmitter power on, send the @ command and press the enter key.

Note: If the transmitter does not receive the @ command within 10 seconds from power on, it automatically switches the RS485 MODBUS on. In this case, it is necessary to remove and restore power to the transmitter.

5 - Send the command **CAL USER ON**.

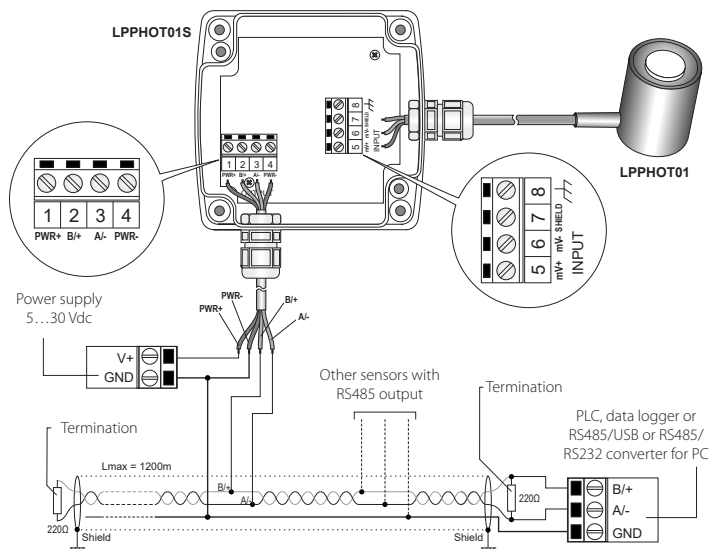*Note:* The command CAL USER ON turns off after 5 minutes of inactivity.

6 - Send the serial commands reported in the following table to set the parameters of RS485 MODBUS:

Command	Response	Description
CMAnnn	&|	Set address RS485 a nnn Ranging from 1 to 247 Preset to 1
CMBn	&|	Set Baud Rate RS485 n=0 ⇒ 9600 n=1 ⇒ 19200 Preset to 1 ⇒ 19200
CMPn	&|	Set transmission mode RS485 n=0 ⇒ 8-N-1 (8 data bit, no parity, 1 stop bit) n=1 ⇒ 8-N-2 (8 data bit, no parity, 2 stop bit) n=2 ⇒ 8-E-1 (8 data bit, even parity, 1 stop bit) n=3 ⇒ 8-E-2 (8 data bit, even parity, 2 stop bit) n=4 ⇒ 8-O-1 (8 data bit, odd parity, 1 stop bit) n=5 ⇒ 8-O-2 (8 data bit, odd parity, 2 stop bit) Preset to 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 - It is possible to check the parameter settings by sending the following commands:

Command	Response	Description
RMA	Address	Read the RS485 address
RMB	Baud Rate	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 wait3.5 characters after Tx

Connection diagram for the operating mode

Terminal	Symbol	Function
1	PWR+	Positive Power Supply
2	B/+	RS485 B/+
3	A/-	RS485 A/-
4	PWR-	Negative Power Supply
5	mV+	Positive input signal in mV
6	mV-	Negative input signal in mV
7	SHIELD	Probe cable shield
8	⏚	Grounding

In order to get the maximum accuracy, it is recommended not to extend the shielded cable that came with the LPPHOT01. It is also recommended not to pass the wiring in the vicinity of power cables (motors, induction ovens, inverters, etc…).

In RS485 connection, the instruments are connected via a shielded twisted pair cable for signals and a third wire for grounding. At the two ends of the network must present the line terminations.

The maximum number of devices connected to the line (Bus) RS485 depends on the load characteristics of the devices to be connected. The RS485 standard requires that the total load does not exceed 32 unit loads (Unit Loads). The load of a transmitter LPPHOT01S is equal to 1 unit load.

If the total load is greater than 32 unit loads, divide the network into segments and then put in a segment and the next a signal repeater. The beginning and end of each segment must be applied for line termination.

Operating mode

The transmitter enters the RS485 MODBUS-RTU mode after 10 seconds after turning on. During the first 10 seconds after turning on, the unit does not respond to any requests from the "master" MODBUS unit. After 10 seconds, it is possible to send requests to the transmitter MODBUS.

Reading the measurements by using the MODBUS-RTU protocol

It is possible to read the measured values by the transmitter by using code function 04h (Read Input Registers). The following table lists the information available with the appropriate register address:

Address	Quantity	Format
2	Illuminance in lux (low range) or lux/10 (high range)	16 Integer
3	Status register bit 0 = 1 ⇒ measure illuminance in error bit 2 = 1 ⇒ error in the configuration data bit 3 = 1 ⇒ error in the program memory	16 Integer
4	Average illuminance in lux (low range) or lux/10 (high range) The average of the last 4 measurements	16 Integer
5	Value of the input signal in µV (low range) or µV/10 (high range)	16 Integer

Setting the sensitivity of the probe and the measurement range

The measuring range preset in the transmitter is 0…10,000 lux (low range), normally suitable for indoor measurements. If it has to be higher, for example in the case of outdoor measurements, it can be set to 0…150,000 lux (high range). The two ranges meet different resolutions: 1 lux for the low range, 10 lux for the high range.

The setting of the value of the probe sensitivity is required in case of replacement of the probe connected to the transmitter with a new probe with different sensitivity.

In order to set the sensitivity of the probe and the measurement range, proceed as follows:

1 - Start when the transmitter is not powered.

2 - Connect the transmitter to your PC **via optional RS48 cable.**

3 - Start a standard serial communication program, such as Hyperterminal. Set the number of the COM port to which the transmitter has to be connected, set the Baud Rate to 57600 and communication parameters as follows:

> Data Bits: 8   Parity: None   Stop bit: 2

4 - Power the transmitter on.

5 - Within 10 seconds from the transmitter power on, send the @ command and press the enter key.

Note: If the transmitter does not receive the @ command within 10 seconds from power on, it automatically switches the RS485 MODBUS on. In this case, it is necessary to remove and restore power to the transmitter.

6 - Send the command CAL START.

Note: The command CAL START turns off after 5 minutes of inactivity.

7 - Send the following serial commands:

| Command	Response	Description
CLSnnn	&|	Set the sensitivity of the probe to the value nnn in µV/klux
02E	&|	Set a low range (0…10.000 lux, resolution 1 lux)
02D	&|	Set a high range (0…150.000 lux, resolution 10 lux)

8 - It is possible to check the setting of the sensitivity of the probe and of the measurement range by sending the following commands:

Command	Response	Description
RLS	& nnn|	Read the set sensitivity in µV/klux
RO	hh|	Read the configuration bite: bit 2 = 0 ⇒ high range (0…150.000 lux, resolution 10 lux) bit 2 = 1 ⇒ low range (0…10.000 lux, resolution 1 lux) The bit 2 is the third bit from the right of the configuration byte

Note: the reading of the settings with the controls and RLS and RO does not require sending the command CAL START.

At the end of the settings, turn off and on the transmitter to activate the operating mode RS485 MODBUS-RTU.

Dimensions
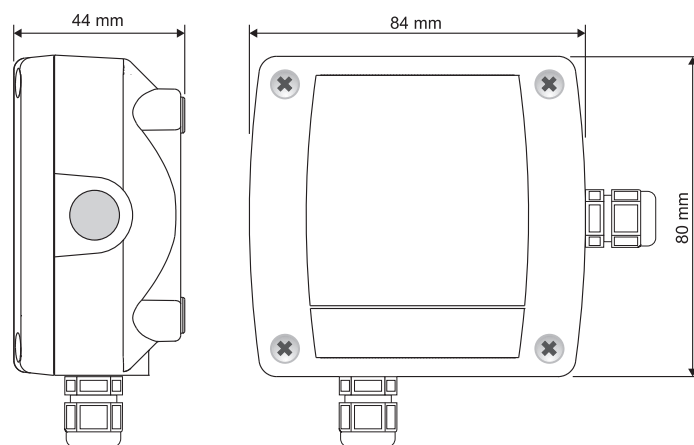
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LPPHOT01S: Transmitter with RS485 MODBUS-RTU for the illumination probe LPPHOT01. Measuring range: 0…10,000 lux with resolution 1 lux or 0…150,000 lux with resolution 10 lux. Connections with screw terminals. Housing for wall mounting. Power supply 5…30 Vdc. Equipped with illumination probe LPPHOT01.

RS48: Connecting cable to PC for the configuration of the MODBUS parameters. Equipped with integrated converter RS485/USB. Free leads from the instrument, USB type A connector on the PC side.