



Sunmeter Pro configuration

Best Practice Installation Manual

Issue 02

Date 06-03-2023

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About This Document

Purpose

This document introduces the best installation practices for the configuration set up of Soluzione Solare sensors by briefly mentioning the recommended and not recommended practices during the field installation. This document also gives clear instructions related to troubleshooting of MODBUS 485 configurations.



Intended Audience

This document is intended for consumers of Soluzione Solare sensors and qualified electricians.

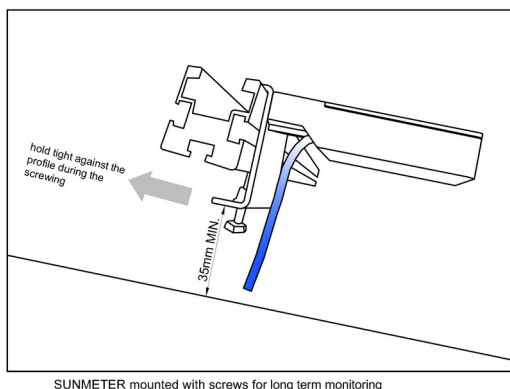
1. Recommended to do during the installation

1.1 Mechanical

- (1) In order to get the right fit of male and female side of the connector pin, turn the male side of the connector less than 360° for finding the right position.

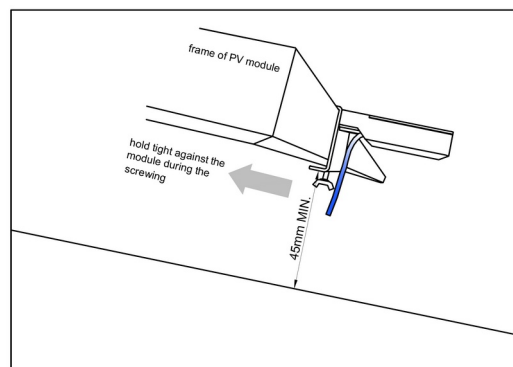


- (2) After finding the right position, tighten the connection between the male and female connectors only by rotating the steel ring and make sure you do not rotate the connector.
- (3) Always clamp the Sunmeter Pro sensor on parallel side of the PV module in order to avoid casting shadow on the PV module behind it.
- (4) SM PRO is provided with a bracket to apply it to structures or directly to a PV module as shown in Fig. 1 and 2:



SUNMETER mounted with screws for long term monitoring

Fig. 1



SUNMETER mounted with butterfly-screws for short time monitoring

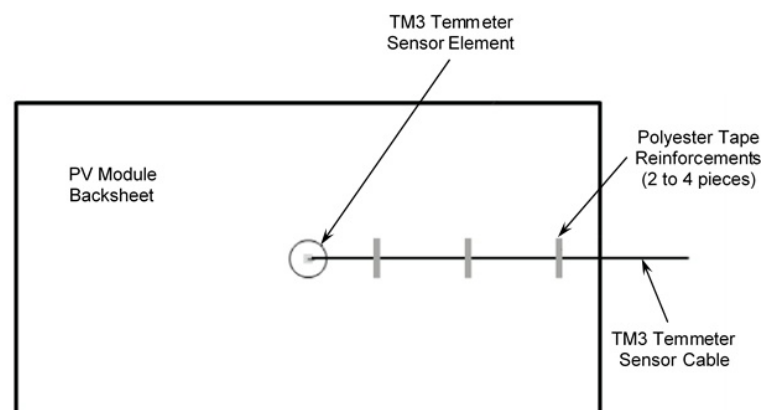
Fig. 2

We suggest to mount SM PRO on the bottom side of a PV module because, if applied on the top side, it may be chosen by a bird as a springboard! The same considerations apply when fastening to a structure's profile. Stainless screws are provided for permanent mounting of SM PRO on your PV plant.

- (5) Make sure the sensor is placed on the same plane and angle as of the PV module array for optimal measurements.

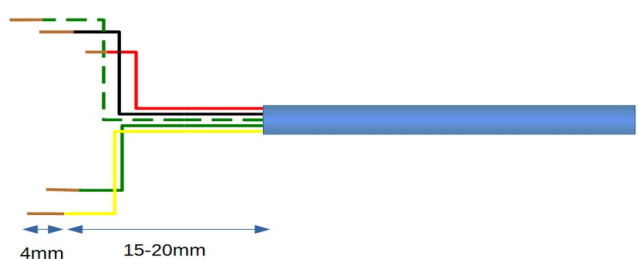
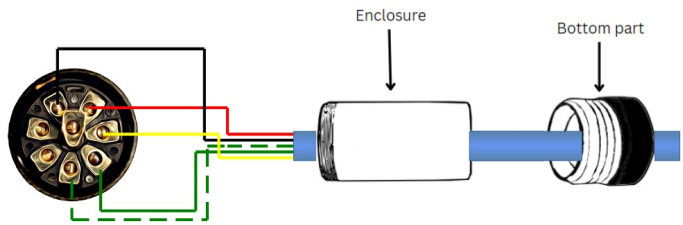
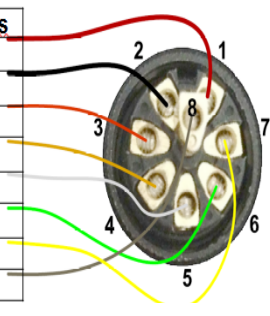


- (6) In the case of crystalline Si PV modules, stick the TM3 Temmeter sensor at the center of the center-most cell of the PV module, avoiding boundaries between cells.
- (7) In the case of thin-film PV modules, stick the TM3 Temmeter sensor within the boundary of a cell near the center of the PV module, avoiding scribe lines between adjacent cells whenever possible.
- (8) Clean the back surface of the PV module of oil and dust by using lint-free wipes dampened with a 70% solution of isopropyl alcohol in distilled water. Allow all cleaned surfaces to dry completely before sticking the TM3 Temmeter sensor.
- (9) Manipulate the TM3 Temmeter sensor adhesive in such a way to remove air bubbles and obtain a uniform adhesive thickness.
- (10) It is highly recommended to secure the TM3 Temmeter sensor cable to the PV module's back surface using polyester tape at 2 to 4 places to reduce strain on the sensor element, as illustrated in the image below. Usually, the pieces of polyester tape do not need to be larger than 2cm wide by 5cm long.

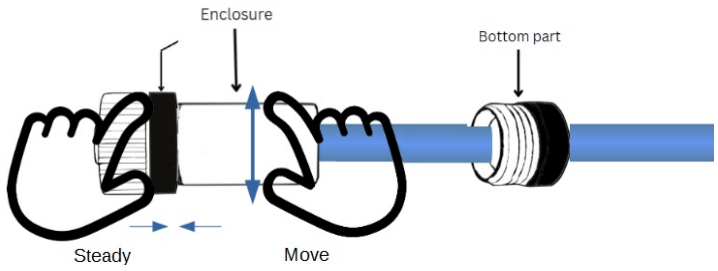
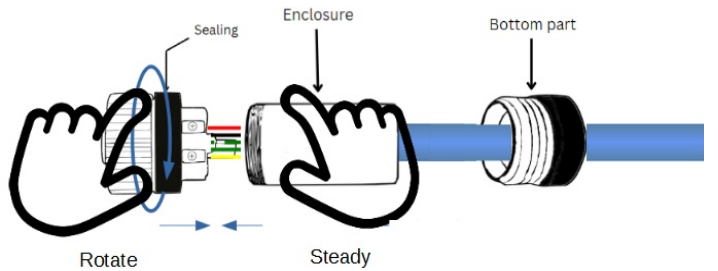
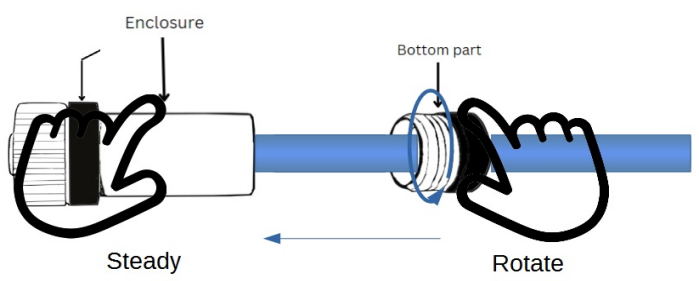


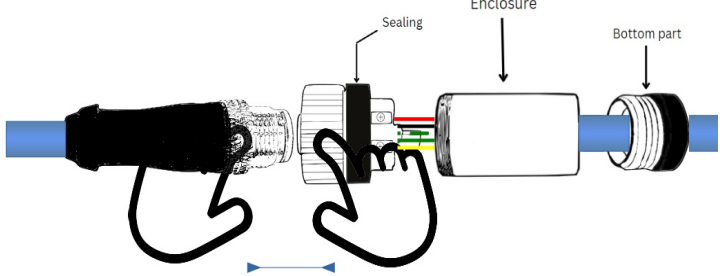
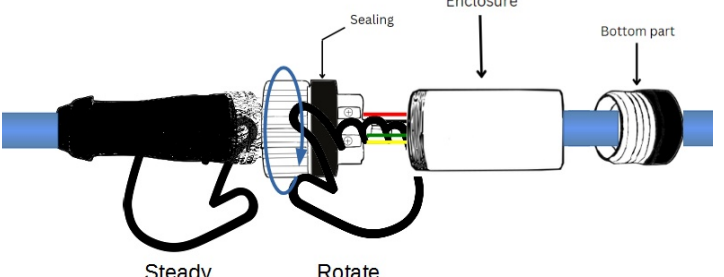
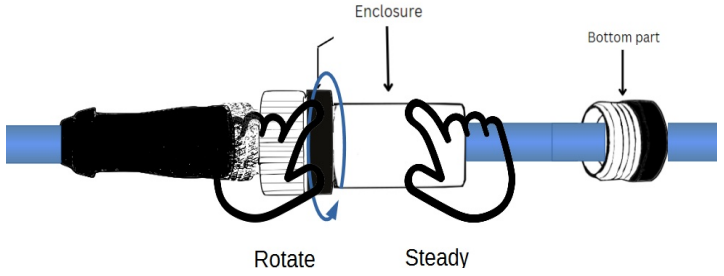
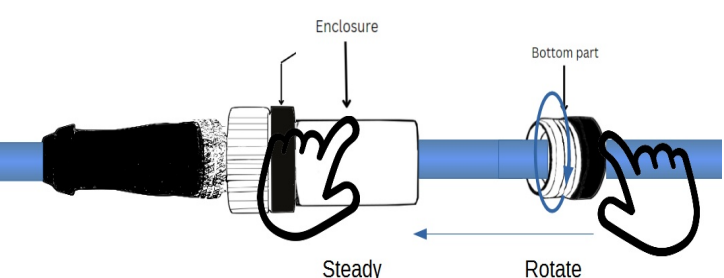
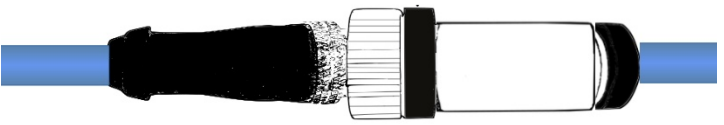
- (11) Verify that the cable of the TM3 Temmeter sensor is well connected to the Sunmeter Pro and tightened.

(11) Sunmeter devices are provided with a connector M12 8 PINS Male. It has to be connected with matched M12 female connector and cable. The below sub-steps clearly explains how to make proper connections.

Steps	Instruction	Visual representation																																				
Step 1	Cable: Use RS485 cable or an Ethernet cable for outdoor applications. The recommended diameter of the cable is 6mm to 8mm .																																					
Step 2A	In the female part of the connector partially unscrew the pins, insert the wire and then tighten the screws. Wire connections with female connectors should be made according to the table mentioned in the step 2B.																																					
Step 2	Please follow the table mentioned in this step to make proper wire connections in step 2A.	Female connector back view with connection scheme <table><tr><th>#</th><th>Name</th><th>Description</th><th>Cable colors</th></tr><tr><td>1</td><td>SUPPLY +VIN</td><td>power supply input, 9-30 Vdc, typ. 90mA @ 12 Vdc (note 1)</td><td>Red</td></tr><tr><td>2</td><td>GND</td><td>power supply ground reference and for output signals</td><td>Black</td></tr><tr><td>3</td><td>PT100.1</td><td>2-wire RTD connection 1</td><td></td></tr><tr><td>4</td><td>Analog Output</td><td>configurable as 0-5 Vdc, 0-10 Vdc, 0-20 mA, 4-20 mA (note 3)</td><td></td></tr><tr><td>5</td><td>RS485-/A</td><td>communication bus inverting bus signal (note 2)</td><td>White/Green</td></tr><tr><td>6</td><td>RS485+/B</td><td>communication bus non inverting signal (note 2)</td><td>Green</td></tr><tr><td>7</td><td>Digital Input</td><td>PNP-like digital input (to be shorted to GND Signal to activate) (note 4)</td><td>Yellow</td></tr><tr><td>8</td><td>PT100.2</td><td>2-wire RTD connection 2</td><td></td></tr></table> 	#	Name	Description	Cable colors	1	SUPPLY +VIN	power supply input, 9-30 Vdc, typ. 90mA @ 12 Vdc (note 1)	Red	2	GND	power supply ground reference and for output signals	Black	3	PT100.1	2-wire RTD connection 1		4	Analog Output	configurable as 0-5 Vdc, 0-10 Vdc, 0-20 mA, 4-20 mA (note 3)		5	RS485-/A	communication bus inverting bus signal (note 2)	White/Green	6	RS485+/B	communication bus non inverting signal (note 2)	Green	7	Digital Input	PNP-like digital input (to be shorted to GND Signal to activate) (note 4)	Yellow	8	PT100.2	2-wire RTD connection 2	
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Step 3	If the connector is used in wet or humid environment, It is recommended to spray an insulating laquer liquid on the back side of the female connector and make sure it is not applied on the front part of the connector.																																					

Now we illustrate how the user should set up and properly seal the female connector using two alternative methods. Users are free to choose the method which is more convenient for them.

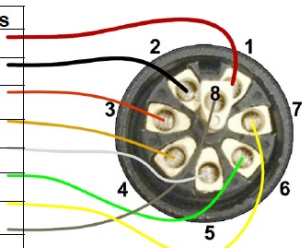
Steps	Instruction	Visual representation
Step 4A	Method 1 – After making the wire connections, in order to tight the connections please follow the step shown below.	
Step 4A-(1)	Hold the sealing in the top part steady without any movement and attach the enclosure with the top part. You can make sure by checking the enclosure that will move slightly inside when the threads in the enclosure and the top part are matched properly.	
Step 4A-(2)	Hold the enclosure steady without any movement and rotate the sealing in the counter clockwise direction till it is tight.	
Step 4A-(3)	Following that, Attach the bottom part with the enclosure, keep the enclosure steady without any movement and rotate the enclosure in the clockwise direction till it is tight.	
Step 4A-(4)	After all the above steps have been performed, you can have a properly connected cable like shown in this image.	

Steps	Instruction	Visual representation
Step 4B	Method 2 – After making the wire connections, in order to tight the connections please follow the step shown below.	
Step 4B - (1)	Connect the male connector and female connector by correctly matching the keyhole in the female connector with the key in the male connector.	
Step 4B - (2)	After connecting the male connector and female connector by correctly, Hold the male part of the connector steady and rotate the top part of the female connector.	
Step 4B - (3)	After connecting, Hold the enclosure without any movement and rotate the sealing in the counter clockwise direction till it is tight.	
Step 4B - (4)	Once the enclosure and sealing are tightened, attach the bottom part with the enclosure. Hold the enclosure steady without any movement and rotate the bottom part in the counter clockwise direction till it is tight	
Step 4B- (5)	After all the above steps have been performed, you can have a properly connected cable like shown in this image.	

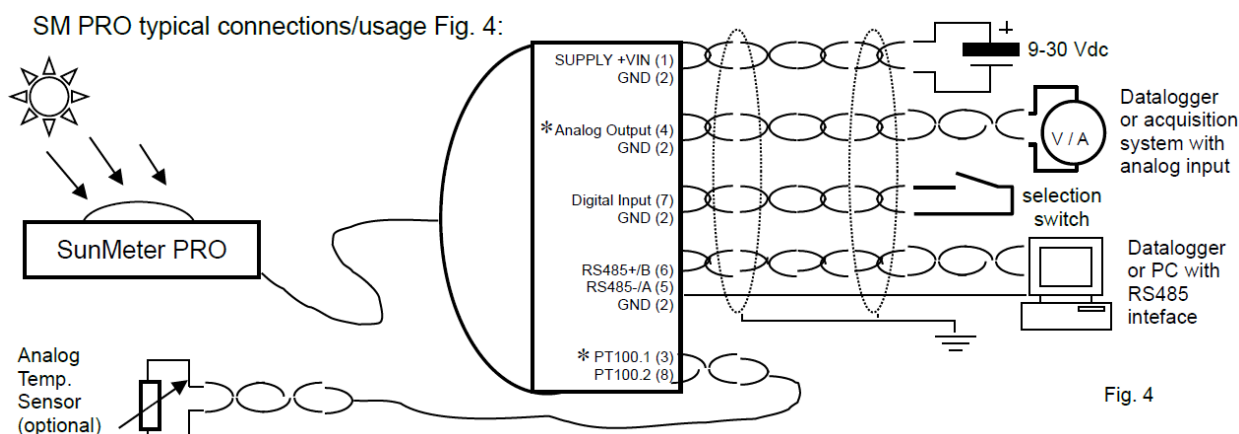
1.2 Electrical

- (1) For proper cable connections, please refer to the instruction manual that comes along with the Sunmeter Pro device. The manual can also be downloaded by clicking on the following link: (https://www.soluçõesolare.com/documenti/Manual_SunMeter_PRO.pdf)

#	Name	Description	Cable colors
1	SUPPLY +VIN	power supply input, 9-30 Vdc, typ. 90mA @ 12 Vdc (note 1)	Red
2	GND	power supply ground reference and for output signals	Black
3			
4			
5	RS485-/A	communication bus inverting bus signal (note 2)	White/Green
6	RS485+/B	communication bus non inverting signal (note 2)	Green
7			
8			



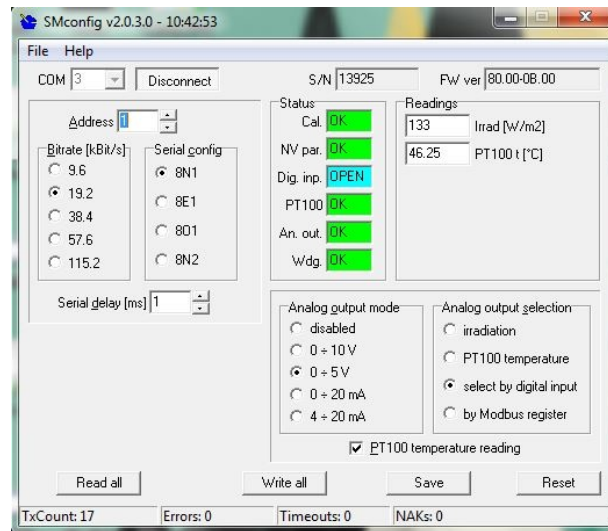
- (2) Power supply should be connected with the exact pins as the manual indicates and the suitable voltage to be supplied is 9-30 Vdc.



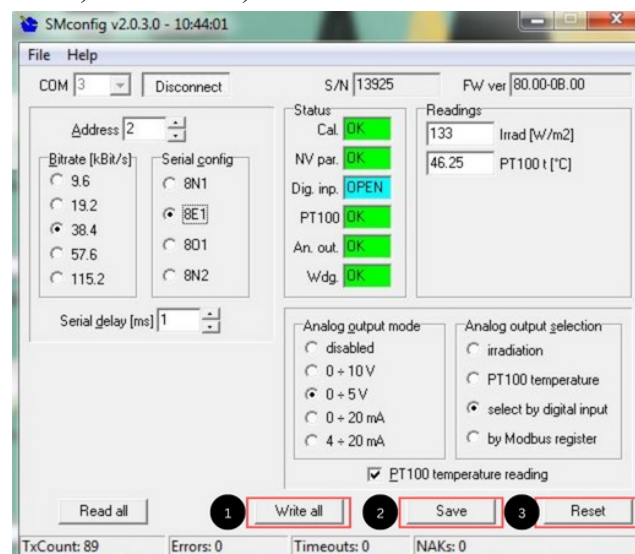
- (3) For the connections, we suggest you to use twisted cables which are shielded.
- (4) Always connect the shield to the ground.
- (5) If there is no signal received from the RS485 port, try to swap the wires A and B and check again if the signal is received.
- (6) If you are using a TM3 Temmeter sensor, please connect it before powering on the Sunmeter Pro for proper working.

1.3 Firmware

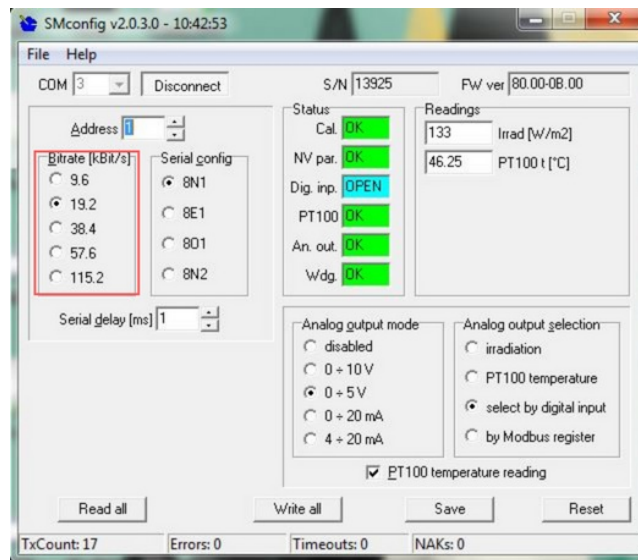
- (1) For the first time after unboxing the Sunmeter Pro, connect it using the default factory settings: Address = 1, Baud rate = 19200 and Serial configuration = 8N1



- (2) After turning on the Sunmeter Pro, please wait for 5 seconds before connecting it to the SMconfig software in order to achieve a proper configuration.
- (3) The SMconfig software is available for free. The SMconfig software can be downloaded by clicking on the following link: <https://www.soluçõesolare.com/documenti/smconfig.zip>
- (4) If you need to change the default factory setting values, use the SMconfig software by first connecting the device with the default setting values mentioned in point 1 and then change them to the required values.
- (5) After changing the values, click the buttons shown in the image below in the following sequence: i) Write all ii) Save and iii) Reset



- (6) Please ensure you leave a time gap of 2 seconds in between clicking each button.
- (7) We recommend you to place a label on the Sunmeter Pro with the new settings in order to remember the modified new settings.
- (8) Bit rate should be set low in case of long wire connections and environment with more electrical noises.



2. Not recommended to do during the installation

- (2.1) It is not recommended to connect the Sunmeter Pro at the bottom side of the PV module, since there will be casting of shadows on the sensor which could modify the readings and also sensor could get affected in case of rain water flow. Always clamp the sensor on the parallel side of the PV module in order to avoid casting of shadow on the PV module behind it. Alternately in rare cases, Sunmeter Pro sensor can be clamped on top of the PV module when there is an optimal distance between the two rows of the PV modules.



- (2.2) Do not supply voltage which is very low or very high from the recommended values mentioned in the user manual.

<i>Supply</i>	<i>Ext. Current loop</i>	<i>9 ÷ 30 Vdc protected against reverse polarity, short circ.</i>
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- (2.3) Do not place the sensor in such a way that there is a high level of stress acting on the sensor element and connectors.



- (2.4) Do not bend the connectors. It is not recommended to place it on sharp edges.

(2.5) It is not recommended to use dusty Sunmeter Pro irradiance sensor which could show a deviated readings. Always clean the Sunmeter Pro irradiance sensor for optimal readings.

(2.6) Do not apply high level of stress at the edges of the TM3 Temmeter sensor.



(2.7) Do not bend the cable near the TM3 Temmeter sensor.



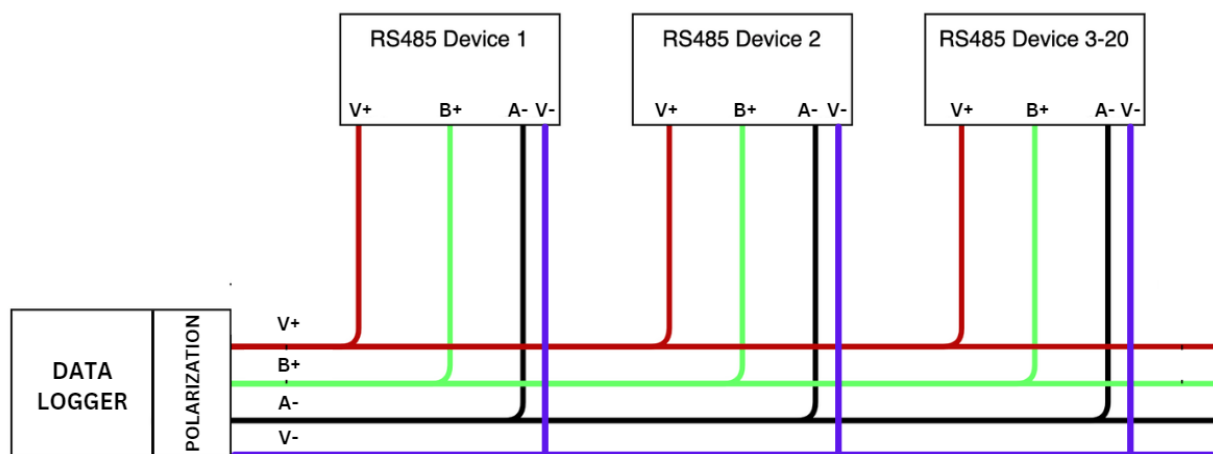
(2.8) Do not run the output cable of the Sunmeter Pro along side voltage cables to avoid noise interference. It is recommended to maintain a distance of at least 30cm between these cables if they running parallel to each other.

3.MODBUS troubleshooting

Important Note !!

In General, Dataloggers and Soluzione Solare sensor devices comes with lines which are polarized by default. **Only incase** if you face any problem with the MODBUS communication please refer to the steps given below.

(3.1) For troubleshooting and information about MODBUS protocol kindly visit <https://modbus.org/> even for recommendations on polarization. Kindly check the general schema of the MODBUS RS485 protocol given below.



(3.2) In case if you have a bad communication and in order to have a right polarization, follow this formula for calculating the voltages between B+ and A- for finding out if the connections satisfy the condition

$$V_{B+} - V_{A-} \geq 0.2 \text{ V}$$

Polarization network

If the above condition is not satisfied, please refer to the polarization network to be inserted on the bus

$$\text{B+ potential value: } V_{B^+} = \frac{(R_2 + R_3)V^+}{(R_1 + R_2 + R_3)}$$

$$\text{A- potential value: } V_{A^+} = \frac{(R_3)V^+}{(R_1 + R_2 + R_3)}$$

Where R_1 , R_2 and R_3 are the three resistors.(refer to the example images)

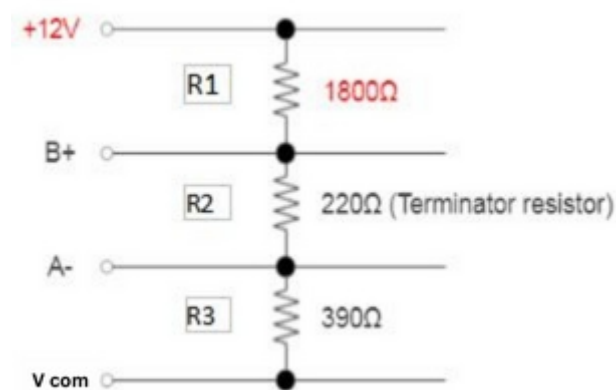
V^+ is the supply voltage

If the Datalogger does not have this RS485 polarization net, the user has to do the proxy from input/output.

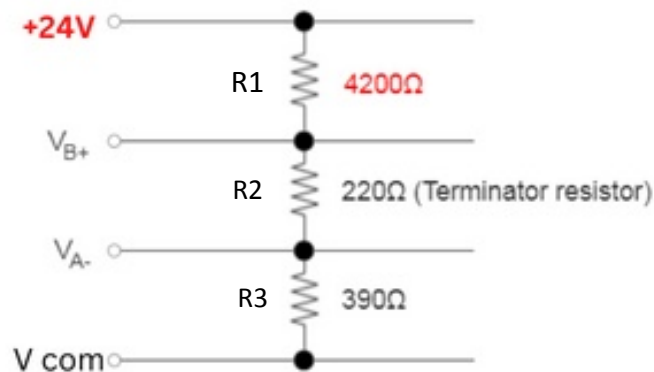
If the lines are longer user could implement the polarization and if the line is more longer it is suggested to provide with a local power supply which should be polarized.

Examples of local power supply for less than 5 devices connected is given below.

Example for 12V



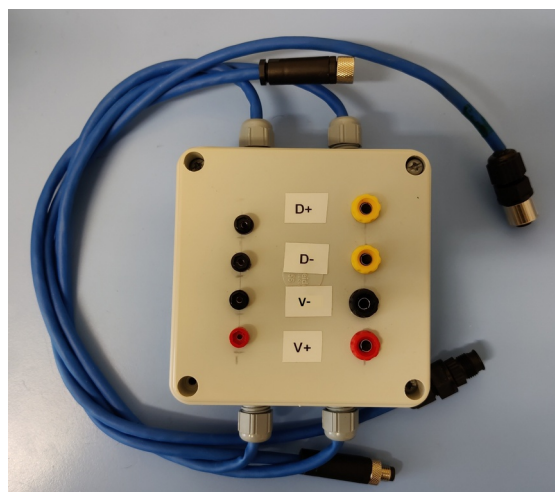
Example for 24V



Note

Terminator resistor is required for **high speed and longer lines**, except in the use of dataloggers like Huawei, Sungrow, Goodwe.. etc which **does not** require the terminator resistor even in those above mentioned conditions.

(3.3) If you have troubles with MODBUS connection which can happen if you have more than a couple of devices from different manufacturers connected in the same RS485 line, it is suggested to test the values along the RS485 cable. If you find it difficult to test the values along the line, MODBUS test box can be used. Please check the output voltage levels and impedance of each terminal using the MODBUS test box.



Contact and Customer support

ITSensor S.r.l.

Email: assistenza@itsensor.it



In case of technical support,

In the email please include the below mentioned information:

- Mention the Device model
- Mention the Device serial number
- Mention the information about the fault or problem
- Attach some pictures which represents the fault or problem