

Application Note - Connecting an Electricity Meter to SolarEdge Devices (Europe and APAC)

This document describes how to connect an electricity meter to a SolarEdge device (inverters, Safety & Monitoring Interfaces (SMIs) or Control & Communication Gateways), and how to configure the connection.

Single or three phase electricity meters can be connected to the RS485 port of SolarEdge devices. The SolarEdge device reads the energy value from the energy meter and sends it to the SolarEdge monitoring portal.

To read the energy produced by multiple inverters, connect the meter at the common AC connection point.

Supported Electricity Meters

SolarEdge supports the following electricity meters:

Inepro[®] Metering PRO Series

This meter type can be used¹ for monitoring of energy consumption only; it cannot be used for Smart Energy Management.

Only the total energy value is read from these meters.

Models:

- **PRO75D MODBUS** – MID approved single phase electricity meter. For detailed information refer to <http://dutchmeters.com/files/Datasheets/PRO-meters/PRO75 - MID - Modbus M-bus.pdf>
- **PRO1250D MODBUS** – MID approved three phase electricity meter. For detailed information refer to <http://dutchmeters.com/files/Datasheets/PRO-meters/PRO1250 - MID - Modbus M-bus.pdf>

WattNode[®] Revenue Modbus[®]

This meter is a bidirectional meter (measures both forward and backward power) that can be used for monitoring of power and energy production, consumption, feed-in or purchasing. It can be used for Smart Energy Management (SEM).

Model: **SE-WNC-3Y-400-MB-K**

For detailed information, refer to http://www.solaredge.com/files/pdfs/products/se_electricity_meter.pdf and to http://www.ccontrols.com/w/WattNode_Modbus - Downloads.

SolarEdge Device Firmware Version

To use the electricity meter connection, the inverter communication board firmware (CPU) must be:

- With Inepro meters: 2.0348 or higher
- With WattNode meters:
 - Version 2.0700 or higher, if the CPU version is 2.0xxx
 - Version 3.0700 or higher, if the CPU version is 3.0xxx

► To check the inverter CPU version:

- 1 Verify that the inverter has been activated using the activation card supplied with the inverter.
- 2 Press the LCD light button short presses until the screen below is reached.

```

ID : # # # # # # # #
DSP 1 / 2 : x . x x x x / x . x x x x
CPU : 0 0 0 2 . 0 7 0 0
Country : X X X X X
  
```

- 3 SolarEdge devices with earlier firmware versions can be upgraded locally. Contact the SolarEdge support team to obtain the upgrade files and instructions. Refer to *Support and Contact Information* on page 10.

¹ This electricity meter is not supplied by SolarEdge and should be purchased separately.

Electricity Meter Connection

Power Connection

► **To connect the electricity meter to the AC power:**

For detailed information on how to connect the meter’s AC side, refer to the meter installation manual.



NOTE

When the meter is located at the grid connection point or the load consumption point, make sure that the CTs (Current Transformers) are installed with its arrow pointing towards the grid. If the meters are intended for inverter production reading only, the CTs should be installed with the arrow pointing towards the inverter.

Communication Connection

RS485 wiring specifications

- Recommended cable type: 2-wire shielded twisted pair
- Wire cross-section area: 0.2- 1 mm²/ 24-18 AWG (a CAT5 cable may be used)



NOTE

If using a cable longer than 10 m/33 ft in areas where there is a risk of induced voltage surges by lightning, it is recommend to use external surge protection devices. For details refer to *Appendix A – External Lightning Protection Connection*. If grounded metal conduit are used for routing the communication wires, there is no need for a lightning protection device.



NOTE

When an electricity meter is connected to your inverter, it uses the RS485 port and therefore an RS485 master-slave communication bus between inverters cannot be created.

► **To connect a communication cable to the electricity meter – Inepro:**

- 1 Loosen the screws of pins **485A** and **485B** shown below: pins 8 and 7 in the single phase Pro75 meter, or pins 11 and 10 in the three phase Pro1250 meter.

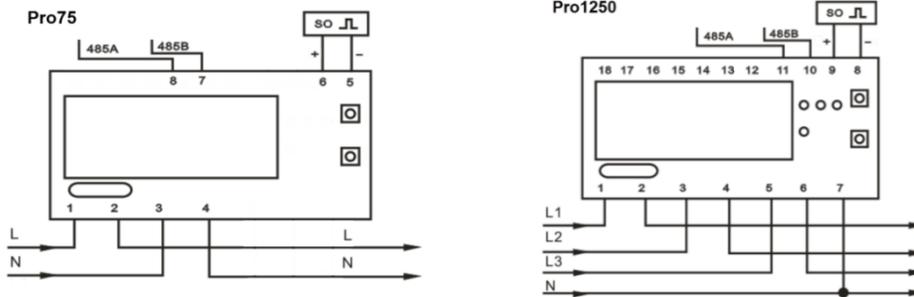


Figure 1: Pro75/Pro1250 pin connection

- 2 Insert the wire ends into the 485A and 485B pins.
- 3 Tighten the terminal screws.
- 4 Connect the other end of the cable to the SolarEdge device as detailed below.

► To connect a communication cable to the electricity meter – WattNode:

For outdoor distances longer than 35 ft/10m, always use a shielded twisted-pair cable to prevent interference. When using a shielded cable, connect the shield to earth ground at one end.

- 1 Loosen the screws of pins RS485 A-, RS485 B+ and RS485 C, shown below.

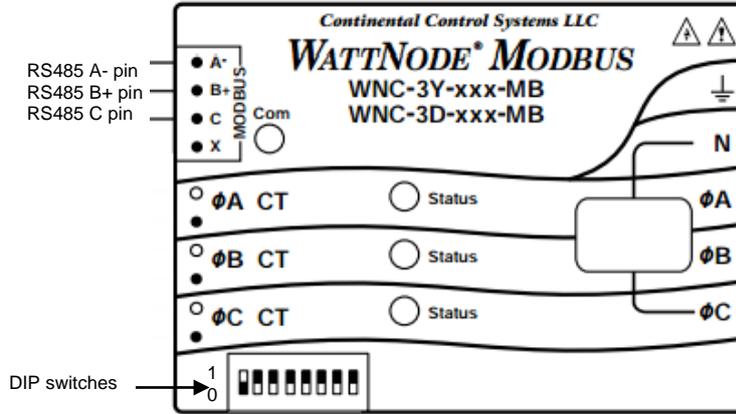


Figure 2: WattNode Modbus communication terminal block connection

- 2 Connect the twisted pair to the A- and B+ terminals, and connect the shield to the C (common) terminal. The X terminal is usually not used.
- 3 Tighten the terminal screws.
- 4 Check that the WattNode Modbus address is set to 1 and the Baud Rate is set to 9600bps: DIP switch 1 (left switch) is set to 1 and all other DIP switches are set to 0 – as shown above.
- 5 Connect the other end of the cable to the SolarEdge device as detailed below.

Connection to a SolarEdge Device

► To connect an electricity meter to an inverter or an SMI:



NOTE: When connecting an electricity meter to an inverter's RS485 port, an RS485 master-slave inverter configuration is not possible.

- 1 Shut down the SolarEdge device by turning OFF the device ON/OFF switch.
- 2 Turn OFF the AC/DC Safety Switch (if applicable) and the AC switch of the main circuit board.
- 3 Open the inverter/SMI cover.
- 4 Remove the seal from one of the openings in communication gland #2 at the bottom of the inverter/SMI and insert the wire through the opening.
- 5 Pull out the 9-pin RS485/RS232 terminal block connector located on the device's communication board, as shown below:

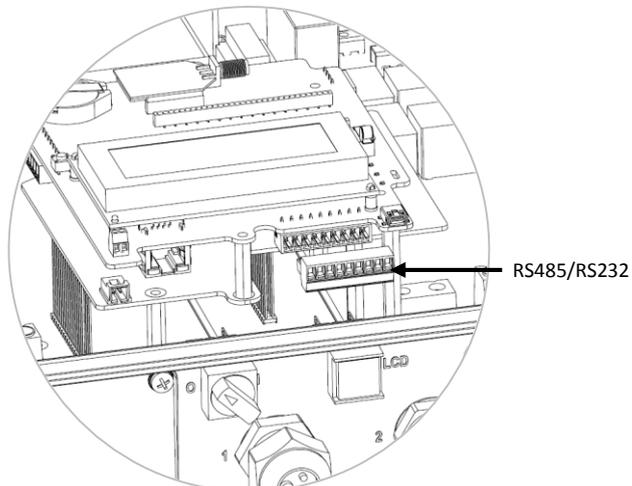


Figure 3: The RS485/RS232 terminal block

6 Loosen the screws of pins **A** and **B** of the RS485 port, as shown in Figure 4 below:

- Inverter: use the RS485-1 port
- SMI: use the RS485-2 port

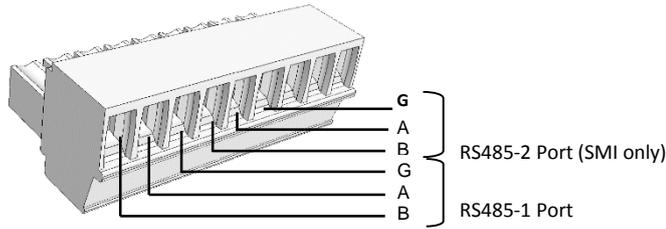


Figure 4: RS485/RS232 terminal block

7 Insert the wire ends from the meter into the pins shown above:

- For Inepro meter:
 - Connect the wire from **RS485 A** in the meter to pin **A**.
 - Connect the wire from **RS485 B** in the meter to pin **B**.
- For WattNode meter:
 - Connect the wire from **RS485 B+** in the meter to pin **A**.
 - Connect the wire from **RS485 A-** in the meter to pin **B**.
 - Connect the wire from **RS485 C** in the meter to pin **G**.

8 Tighten the terminal block screws.

9 Push the RS485 terminal block firmly all the way into the communication board.

10 Terminate the inverter/SMI by switching a termination DIP-switch inside the inverter to ON. The switch is located on the communication board and is marked **SW7**.

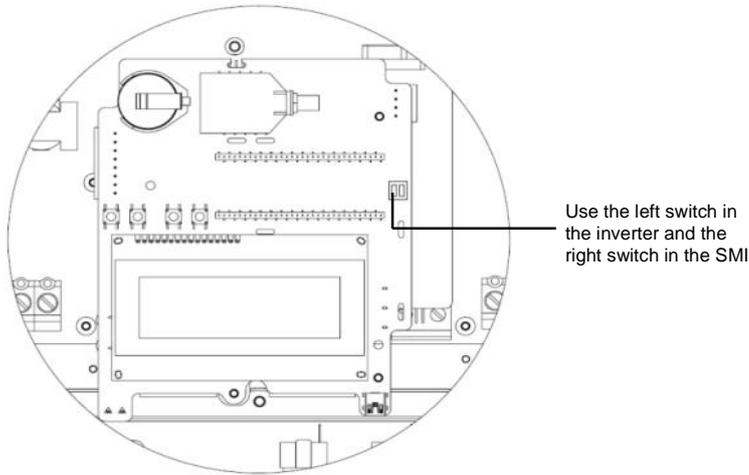


Figure 5: RS485 termination switch

► **To connect an electricity meter to a Control and Communication Gateway:**

1 Pull out the 3-pin RS485-2 terminal block connector.

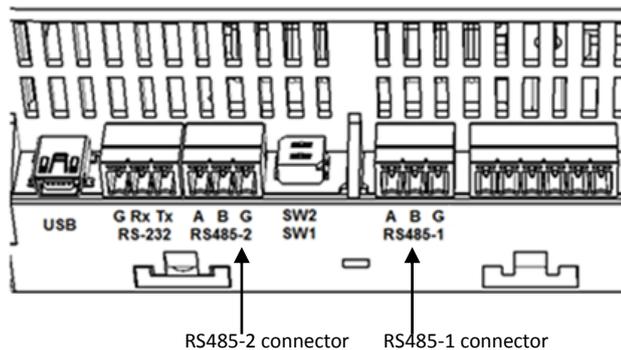


Figure 6 Gateway RS485 connections

- 2 Loosen the screws of terminals **A**, **B** and **G**.
- 3 Insert the wire ends from the meter into the **A** and **B** pins shown above:
 - For Inepro meter:
 - Connect the wire from **RS485 A** in the meter to pin **A**.
 - Connect the wire from **RS485 B** in the meter to pin **B**.
 - For WattNode meter:
 - Connect the wire from **RS485 B+** in the meter to pin **A**.
 - Connect the wire from **RS485 A-** in the meter to pin **B**.
 - Connect the wire from **RS485 C** in the meter to pin **G**.
- 4 Tighten the terminal block screws.
- 5 Push the RS485 terminal block firmly all the way into its port.
- 6 Terminate the gateway by switching the SW2 termination DIP-switch to ON.

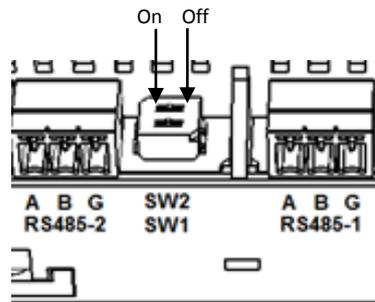


Figure 7: Gateway termination switches

SolarEdge Device Configuration

Use the four user buttons to control the LCD panel menus:

- **Esc**: Goes to the beginning of the currently entered parameter or to the previous menu.
- **Up** (1) and **Down** (2): Moves the cursor (>) to the relevant menu option.
- **Enter** (3): Used to select an option

These buttons can also be used to type in a number.

- 1 Verify that the device ON/OFF switch is OFF.
- 2 Turn ON the AC switch of the main circuit board.



WARNING!

ELECTRICAL SHOCK HAZARD. Do not touch uninsulated wires when the device cover is removed.

- 3 Press the **Enter** (3) button for at least five seconds. The following message is displayed:

```

Please enter
Password
*****
  
```

- 4 Use the three right most buttons (Up-1, Down-2 and Enter-3) to type in the following default password: **12312312**.
- 5 Scroll to the **Communication** menu and select **RS485-X Conf**.
- 6 Set the following (X represents the actual RS485 port to which the electricity meter is connected: 1 or 2):

```

Device type <MTR>
Device Protocol <WN>
CT Rating <XXXXA>
Meter Func. <none>
Device ID <1>
  
```

- Select Device Type → *Revenue Meter*
- Select Protocol → [*DMM-Modbus* or *WattNode*]
- If you selected the WattNode meter, set the CT (Current Transformer) rating to the value that appears on the meter CT: **CT Rating <xxxxA>**

- Select **Meter Func.** → [Select **Feed-in + Purchased** or **Consumption** according to meter location]



NOTE

Calculated meter readings, such as self-consumption, are calculated using the data measured by the meter and the inverters. Calculated meters are only sent when Energy Manager is enabled (for details refer to http://www.solaredge.com/files/pdfs/products/feed-in_limitation_application_note.pdf). If calculated meter information is required, but feed-in limitation is not, the Energy Manager should be enabled without any site limit setting (default).

- In the RS485 Conf menu, verify that the **Device ID** is set to 1 and exit Setup mode.
- 7** If your device is connected to the SolarEdge server, you can show the meter's readings in the monitoring portal. Verify that that the meter type is set to Production in the Admin page > Logical Layout > Meter details:

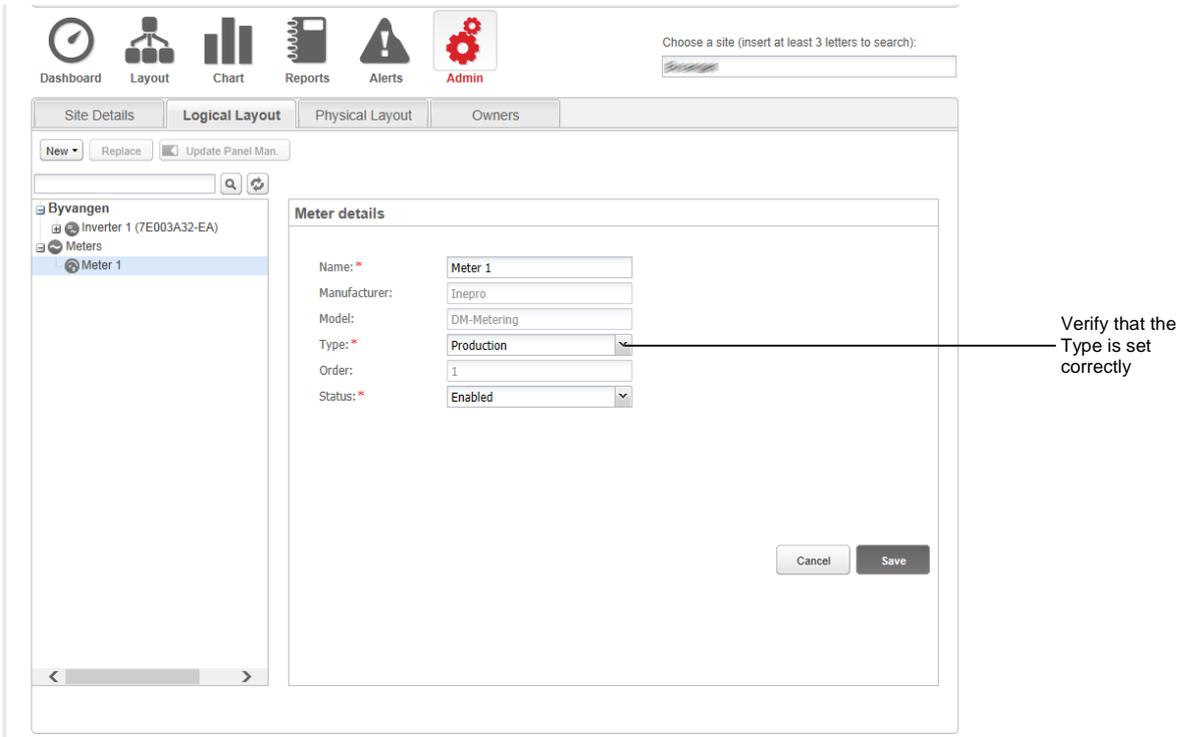


Figure 8: Setting the Meter details in the monitoring portal

Verifying the Connection

- 1** Press the **Enter** button or the LCD external button until the Communication Ports status screen is displayed as shown below. This screen shows the number of external devices that communicate on each port, the device type, and the protocol to which each port was configured.
- 2** Verify that the setting of the relevant RS485 port is correct and that the port is communicating with the external electricity meter.

For example, if the electricity meter is connected to the RS485-1 port, a message similar to the following should appear in the Communication status screen on the LCD panel:

```

      D e v   P r o t   # #
R S 4 8 5 - 1 < M T R > < D M > < 1 >
R S 4 8 5 - 2 < - - - > < - - > < - - >
Z i g B e e   < - - - > < - - > < - - >
    
```

Dev : the type of device configured to a specific port. **MTR** indicates an electricity meter.

Prot: the communication protocol:

- **DM** - DMM Modbus meter
- **WN** – WattNode meter

= 1: Indicates that the connection to the electricity meter is successful.

- 3** Check the Energy status screen, showing the Total (Wh) energy reading:

```

R e v e n u e   G r a d e   M e t e r
S t a t u s :   < O K >
< E r r o r   M e s s a g e >
T o t a l [ W h ] : x x x x x x x
    
```

Status: Displays OK if the meter is communicating with the communication board and the meter readings are valid, that is, the meter energy count is aligned with the internal energy count of the inverter.

<Error message>: If an internal meter error occurs, it will be displayed here.

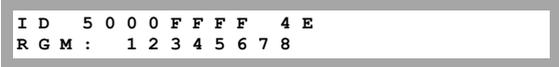
Total (Wh): The energy production as read by the electricity meter. If the SolarEdge device is connected to the SolarEdge server this value will also be displayed in the monitoring portal.

Displaying the Meter Serial Number

1 Enter Setup mode and select the Information screen:



2 Select **Hardware IDs**. The following is displayed showing the ID of the inverter and any meter connected to it:



Troubleshooting

≠ 1 in the Communication Status Screen

If ## ≠ 1 in the Communication status screen shown above:

- For WattNode meters - Check the physical RS485 Modbus address and baud rate DIP switch setting.
- Check the cable connection between the inverter and the meter.
- Check that the RS485 termination resistor on the SolarEdge is turned ON.
- Check that the Device ID under **Communication** → **RS485-X Conf** → **Device ID** is set to 1.

Status LEDs in WattNode Meter

The three status LEDs on the front of the meter can help indicate correct measurements and operation.

■ **Normal operation indications:**

- At normal startup - when power is first applied, all LEDs light up sequentially for 1 sec.
- The following table describes LED indications during normal operation:

LED color	Function	Indication
Red	Flashing ON/Off	Negative power to the phase. Appears only when the meter is connected in the grid connection point (CT directed towards the grid). Indicates feed-in power measurement.
Yellow	Flashing	Communication OK
Green	Flashing ON/OFF	Positive power to the phase. - When the meter is connected at the grid connection point it indicates purchased power measurement (CT directed towards the grid). - When the meter is connected at the load connection point it indicates consumption power measurement (CT directed towards the grid). - When the meter is used for production it indicates power measurement (CT directed toward the inverter).
	ON for >3 sec	No current flow (zero current)

■ **Abnormal operation indications:**

- If all LEDs are off – the meter is not operating.
- The following table describes additional LED indications that require troubleshooting and repair.

LED color	Function	Indication	Troubleshooting
Red	ON for >3 sec.	Internal error	Contact SolarEdge Support.
	Flashing ON/OFF	Negative power for the phase	If the meter is connected at the load connection point or if the meter is used for production metering, check for reversed CTs, swapped CT wires, or CTs not matched with line voltage phases.
	Flashing with green LED	Voltage is too high for this model	Disconnect power immediately! Check the line voltages and the meter ratings.
	Flashing with yellow LED	The line voltage is too low for the meter to operate correctly and the meter reboots repeatedly.	Verify that the voltage on the Vac screw terminals is more than 20% of the nominal operating voltages printed in the white rectangle on the front label.
Yellow	ON for >3sec.	Power line frequency is below 45 Hz or above 70 Hz.	Check for the presence of high noise, for example, the meter is too close to an unfiltered variable frequency drive.
	Flashing with red LED	Voltage is too high for this model	Disconnect power immediately! Check the line voltages and the meter ratings.

Appendix A – External Lightning Protection Connection

Protection devices are most often installed from each data line to the local earth ground, and should be selected to begin conducting current at a voltage as close to the system's normal communication level as possible, but never lower. For RS485 communication lines, the selected voltage rating is typically 6-8 V. Transient suppressors should be installed as close as possible to the port that is being protected, and the user must provide an extremely low impedance connection to the local earth ground of the SolarEdge device. This ground connection is crucial for proper suppression device operation. The ground connection should be made using a heavy gauge wire and kept as short as possible. If the cable between the SolarEdge device and the protection device must be longer than 1m/3.3 ft., a copper strap or a braided cable intended for grounding purposes must be used for the protection device to be effective. In addition to the high frequency nature of transients, extremely high current may flow.

A protective device with surge discharge ratings of **In**: 10kA 8/20 μ s and **I_{max}**: 20kA 8/20 μ s is recommended.

Various lightning protection devices are available for RS485 communication lines.

The diagram below shows a connection example. For more examples and recommendations, refer to the Communication section in the *Lightning and Surge Protection Application Note* at http://www.solaredge.com/files/pdfs/lightning_surge_protection.pdf.

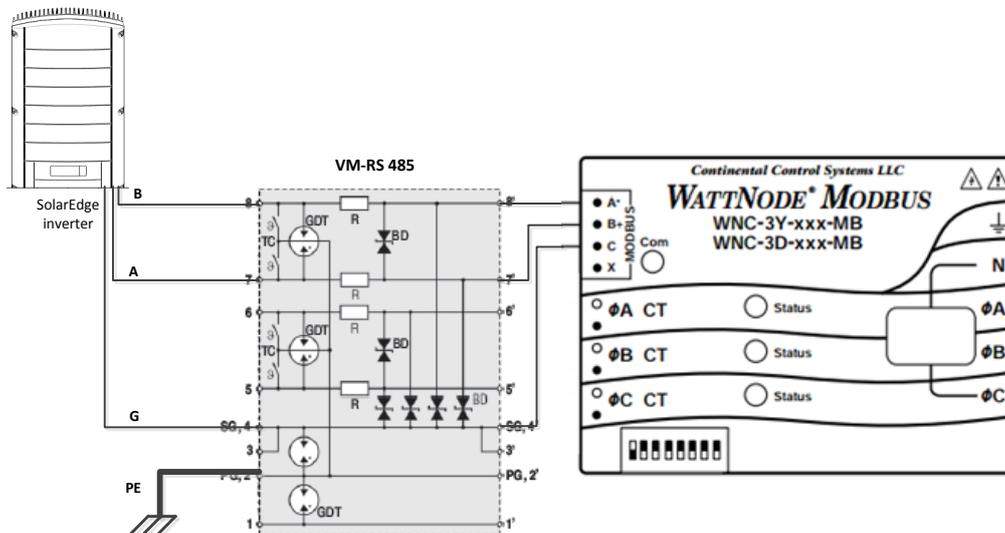
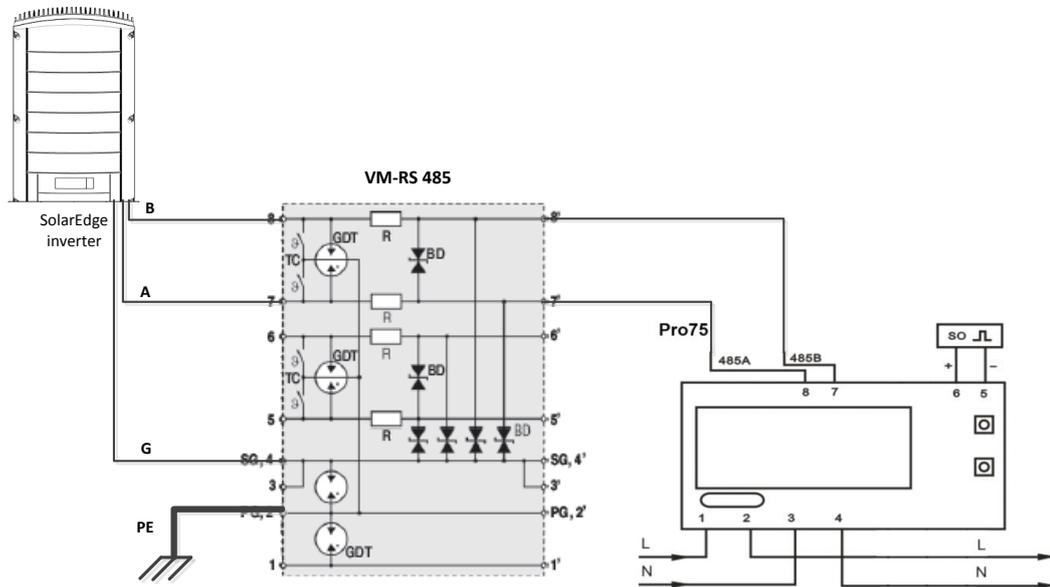


Figure 9: Protection connection

Support and Contact Information

If you have technical queries concerning our products, please contact us:

Australia	1800 465 567	support@solaredge.net.au
APAC (Asia Pacific)		support-asia@solaredge.com
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