

Energy metering for SolarEdge commercial three-phase inverters - Application Note

This document describes the connection and configuration for energy meters connected to a SolarEdge device. This specific set-up may also be used for export limitation applications.

Revision history

- Version 1.5, December 2023: Updated supported CPU firmware version
- Version 1.4, December 2023: Added the Schneider iEM3255 meter.
- Version 1.3, November 2023: Added the Janitza UMG604 meter.
- Version 1.2, January 2019: Added section on export limitation response
- Version 1.1, June 2018: Updated connectivity procedure

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Overview

The Schneider iEM3255 meter can be connected directly to a SolarEdge Inverter. The Janitza UMG104 and UMG604 meters can be connected directly to a SolarEdge Inverter or to a Control and Communication Gateway (CCG). The SolarEdge Inverter reads the energy data from the meter and forwards the data to the monitoring platform. In addition, export limitation can be configured.

Supported meters

All the meters used in this application are three phase meters intended for commercial use.

The following meters are supported:

- Janitza UMG104
- Janitza UMG604
- Schneider iEM3255



IMPORTANT NOTES

- The Schneider meter can only be used in Wye (Y) grid connections.
- The Schneider meter cannot be used for export limitation control. It can only be used for monitoring export/import.

For detailed information, refer to:

Meter Type	URL
Janitza UMG104	https://www.janitza.com/files/download/manuals/current/UMG104/UL/janitza-bhb-umg104ul-en.pdf
Janitza UMG604	https://www.janitza.com/us/umg-604-pro.html
Schneider iEM3255	https://www.se.com/us/en/product/A9MEM3255/iem3255-energy-meter-ct-modbus-1-digital-i-1-digital-o-multitariff-mid/

SolarEdge device firmware version

The required inverter CPU firmware version is shown in the table below.

Meter Type	CPU Firmware Version
Janitza UMG104/UMG604	4.12 or later
Schneider iEM3255	4.19 or later

To check the CPU version:

In **SetApp**, in the **Commissioning** screen, select **Information**. The CPU version number displays in one of the fields in the Information screen.

Meter connections

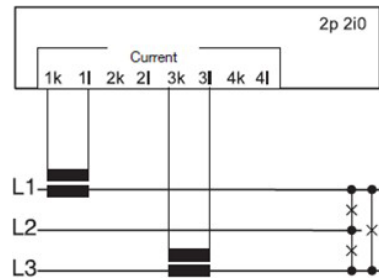
AC power connection

For detailed information on how to connect each meter's AC side, refer to the installation guide provided for that meter.

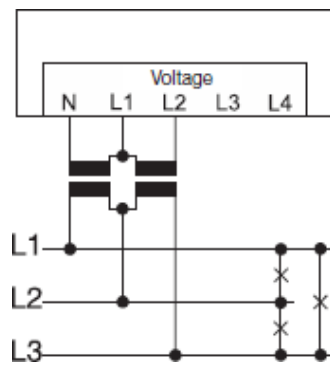
Connect current transformers (CT) to the meter CT inputs. If the meter is connected to a higher voltage than the meter's supported voltage range, voltage transformers (VT) must be connected to the meter phase inputs.

The following figures illustrate typical CT and VT connections.

Janitza UMG104/UMG604

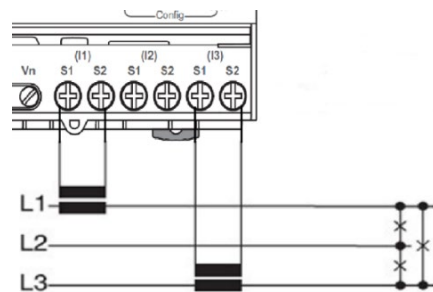


Current Transformer Connection

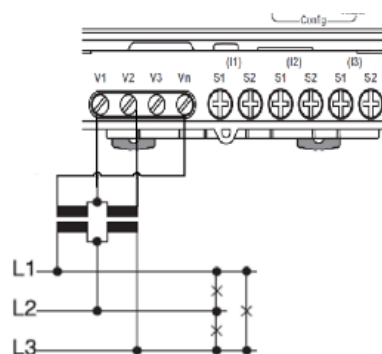


Voltage Transformer Connection

Schneider iEM3255



Current Transformer Connection



Voltage Transformer Connection

**NOTE**

When connecting current transformers to a Schneider meter, ensure that all S2 terminals are grounded. Failure to do so may result in incorrect readings. Refer to the installation guide for more detailed information about connecting the meter.

RS485 communication connection

RS485 wiring specifications:

Item	Definition
Cable type	3-wire shielded twisted pair or Cat5/5E STP
Wire cross-section area	0.2- 1 mm ² / 24-18 AWG.
Maximum nodes	32
Maximum distance between first and last devices	1 km /3300 ft

**NOTE**

When using a cable longer than 10m (33ft) in areas where there is a risk of induced voltage surges by lightning, we recommend using external surge protection devices. For details refer to

https://www.solaredge.com/sites/default/files/lightning_surge_protection.pdf.

**NOTE**

If grounded metal conduits are used for routing the communication wires, a lightning protection device is not required. In this case connect the grounding wire to the first inverter in the RS485 chain making sure the grounding wire is not in contact with any other wires. For inverters with a Connection Unit, connect the grounding wire to the grounding busbar in the Connection Unit.

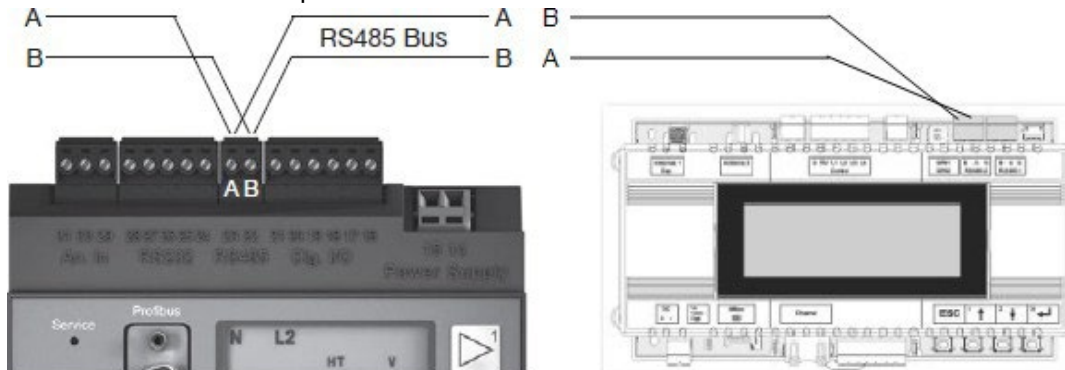
**NOTE**

An RS485 surge protection plugin is integrated into the RS485-1 terminal block in the inverter.

To connect a communication cable to the meter:

Janitza UMG104/UMG604

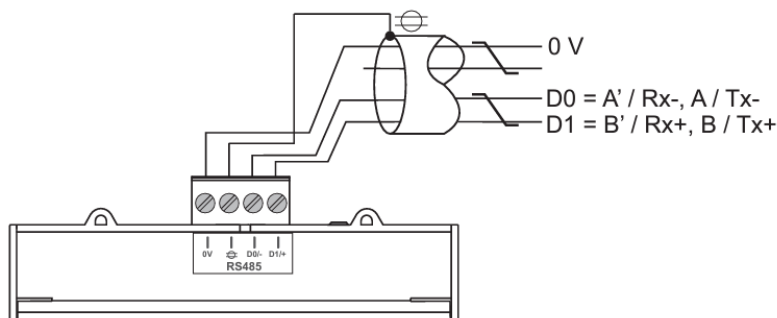
1. Loosen the screws of pins 485A and 485B on the meter, as shown below:



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.

Schneider iEM3255

1. Loosen the screws of pins 0V, D0/- and D1/+ on the meter, as shown below:



2. Insert the wire ends into the correct pins.
3. Tighten the terminal screws.
4. Connect the wire on D0/- on the meter to wire B on the SolarEdge device.
5. Connect the wire on D1/+ on the meter to wire A on the SolarEdge device.



NOTE

Perform a "cross" RS485 cable connection. Connect wire A on the meter to wire B on the SolarEdge device. Connect wire B on the meter to wire A on the SolarEdge device.



NOTE

When multiple meters are used, and only one meter is connected to the RS485 bus, commission each meter separately. Refer to [Device Configuration](#)



Connecting a Meter to a Three-phase Inverter

NOTE

An additional RS485 port (RS485-E) is available from SolarEdge, allowing configuration of multiple RS485 buses for communications in large sites; Refer to http://www.solaredge.com/files/pdfs/RS485_expansion_kit_installation_guide.pdf



To connect a meter to a three-phase inverter:

1. Set the inverter ON/OFF/P switch to "0" (OFF).
2. If applicable, turn the DC Safety Unit OFF
3. Turn the AC switch of the main circuit board OFF.
4. Open the inverter cover.
5. Remove the seal from one of the openings in communication gland #2 at the bottom of the inverter.
6. Insert the cable through the opening.
7. Pull out the RS485 terminal block connector located on the communication board.
8. Loosen the screws of pins A and B of the RS485 port.



NOTE

Use the RS485-1 port or RS485-E if an RS485 Expansion Kit is connected.

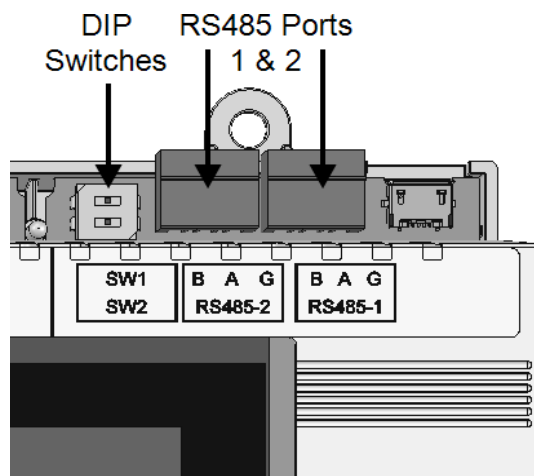


9. Connect the wire from RS485A on the meter to pin B.
10. Connect the wire from RS485B on the meter to pin A.
11. Tighten the terminal block screws.
12. Push the RS485 terminal block firmly all the way into the communication board.
13. Terminate the inverter by turning ON a termination DIP-switch inside the inverter. The switch is located on the communication board and is marked SW1 or SW2.

Connecting a Janitza Meter to a Control and Communication Gateway (CCG):

To connect a meter to a CCG:

1. On the CCG, pull out the 3-pin RS485-2 terminal block connector.



Gateway RS485 connections and DIP switches

2. Loosen the screws of terminals A, B and G.
3. Connect the wire from RS485A on the meter to pin B.
4. Connect the wire from RS485B on the meter to pin A.
5. Tighten the terminal block screws.
6. Push the RS485 terminal block firmly into its port.
7. Terminate the gateway by switching the SW2 termination DIP-switch ON, as shown above.

Connecting the meter to the power supply

In general, the rated input power supply for the meter is specified on the meter's rating plate. Clearly label the device's disconnect circuit mechanism and install it within easy reach of the operator.

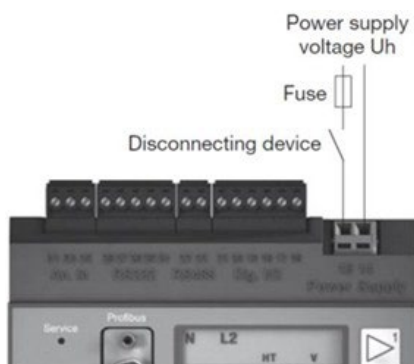


NOTE

Before applying the power supply voltage, ensure that the voltage and frequency match the information provided on the meter's rating plate.

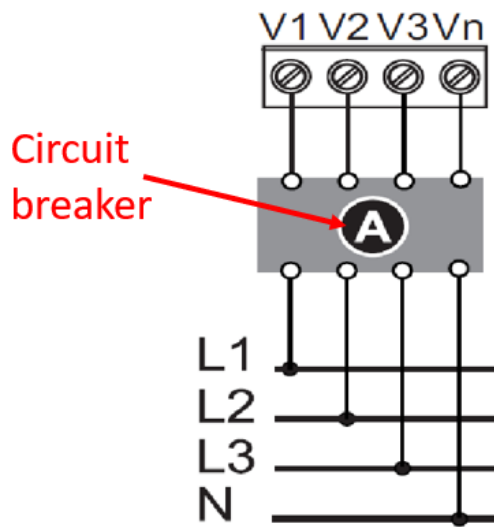
Janitza UMG104/UMG604

The cables for the power supply voltage must be fused with a UL-listed fuse (6A type C), as shown.



Schneider iEM3255

Fuses / circuit breakers must be rated for the installation voltage and sized for the available fault current. A Fuse for neutral is required if the source neutral is not grounded.



Configure the devices

This section describes the basic configuration of SolarEdge devices (inverter/CCG) when using a meter. In addition, export limitation may be required. Refer to http://www.solaredge.com/sites/default/files/feed-in_limitation_application_note.pdf.

Establish connectivity

Janitza UMG104/UMG604

When first establishing connectivity between the SolarEdge device and the Janitza meter, synchronize the Modbus address between the devices.



Configure the Janitza meter using the arrow keys adjacent to the screen. For detailed information, refer to the manual provided with the product.

To establish connectivity between the SolarEdge Device and the Meter:

1. Set the Janitza meter to Program mode by simultaneously pressing keys 1 and 2 for about one second.

The PRG symbol for programming mode appears and the content of address 000 is displayed.

2. To display the meter's Modbus address, access the memory address **200**. Set the address to the **Meter ID** number.
3. Exit program mode by simultaneously pressing both keys for about 1 second.

The setting is saved and the meter returns to display mode.

4. Access the SolarEdge device (the CCG) and enter its setup mode.
5. To enter Setup mode, press the **Enter key (3)** for at least five seconds. The following message displays:

```
Please enter
Password
*****
```

6. Using the buttons (Up-1, Down-2 and Enter-3), enter the default password: **12312312**.
7. Select **Communication > RS485-X Conf**. The **RS485-X** screen displays.

```
Device Type <SE>
Protocol <M>

Device ID <1>
Slave Detect <#>
Cluster SLV Detect
Long Slave Detect <#>
Slave List <#>
Multi-Iny Set
```

8. Select **Device Type > Multi Devices**.
9. Select **Meter 1**. The meter configuration screen displays.

```
Device Type <MTR>
Protocol <WN>

Device ID <2>
CT Rating <0>

Secondary CT <5>
VT Rating <11000>

Secondary VT <110>
Meter Func <None>
Meter Commission
Topology <Wye>
```

10. Select **Device ID** and set the ID to the same Modbus address configured earlier.
11. Select **Meter Commission**. The following displays.

```
Set Serial Conf
Set Meter ID
```



NOTE

Make sure that the Device ID is always synchronized with the Modbus address set in the Janitza meter. If the values differ, communication between the devices is lost. To modify the address, use the **Set Meter ID** function in the SolarEdge device. This function modifies the address setting simultaneously in the Janitza meter and the SolarEdge device, thus preserving the connection.

12. Select **Set Serial Conf** to configure the meter's serial interface baud rate to 9600. Wait for

Applied to display.



NOTE

To check the setting, set the meter to Program mode and make sure that the value at address 202 is set to '0' (9600 baud). If the value is not '0', insert the correct value manually.

To modify the Modbus address of a connected Janitza meter:

1. Perform steps 1 to 9 of the procedure To establish connectivity between the SolarEdge Device and the Meter:
2. Select Meter Commission.
3. Select Set Meter ID.

The message **Make sure single device is connected. Continue?** displays.

Make sure that only one Modbus device is connected to the SolarEdge device and respond **YES**.

4. Enter the existing Meter ID, and press **<Enter>**.
5. Enter the new Meter ID, and press **<Enter>**.

Wait until the meter ID and the value in the SolarEdge device are modified. The message **Applied** displays.



NOTE

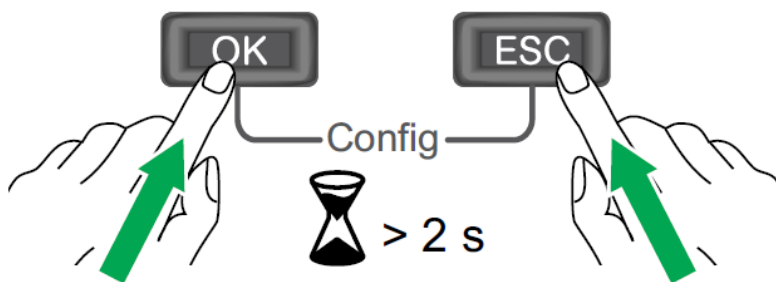
In the case that the Janitza meter is connected directly to the Inverter and not via the CCG, configuring the connectivity between the meter and the Inverter can be done via the SetApp application in a similar way to the Schneider meter process described below.

Schneider iEM3255

Setting up the Meter

To enter configuration mode:

1. Press and hold **OK** and **ESC** at the same time for about two seconds.



2. Enter the meter password **0010**.
3. Using the **▼** button, scroll to **Communication**. Press **OK**.
4. Scroll to **Slave Address**. Press **OK**.
5. Set the **Slave Address** to the **Meter ID** number. Press **OK**.
6. Scroll to **Baud Rate**. Press **OK**.
7. Set the **Baud Rate** to **9600**. Press **OK**.
8. Scroll to **Parity**. Press **OK**.
9. Set the **Parity** to **None**. Press **OK**.
10. Scroll to **Com. Protection**. Press **OK**.

11. Set **Com. Protection** to **Disable**. Press **OK**.



IMPORTANT NOTE

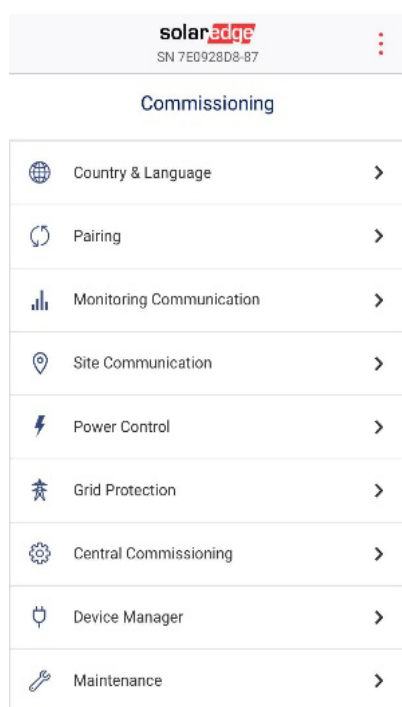
Com. Protection MUST be set to **Disable** to allow communication between the Inverter and the meter.

12. Set any other parameters such as Wiring type (3PH3W or 3PH4W); Wiring VT; Wiring CT etc as above.

To establish connectivity between the Inverter and the Meter:

Preliminary procedure

1. Power ON the inverter.
2. Wait for the inverter to initialize and perform updates (if any).
3. Using a smartphone or a tablet, enter the **SetApp** application.
4. Scan the QR code on the side of the inverter The **Commissioning** screen displays.



To Set Up the connection between the Inverter and the Schneider meter

1. Select Site Communication. The **Site Communication** screen displays.

The screenshot shows the 'Site Communication' screen. At the top, there is a header bar with the SolarEdge logo, a back arrow, and a menu icon. Below the header, the title 'Site Communication' is centered. The main content area is a table with the following rows:

Ethernet	DHCP	>
Wi-Fi	Not Connected	>
RS485-1	SolarEdge Follower	>
RS485-2	SolarEdge Follower	>
GPIO	None	>
Modbus TCP port	Disabled	>

2. Select RS485-1 or RS485-2, depending on which RS485 port you have wired. The appropriate RS485-x screen displays.

The screenshot shows the 'RS485-1' screen. At the top, there is a header bar with the SolarEdge logo, a back arrow, and a menu icon. Below the header, the title 'RS485-1' is centered. The main content area is a table with the following rows:

Protocol	SolarEdge Follower	>
Device ID	1	>

3. Select **Protocol**. The RS485-x Protocol screen displays.

The screenshot shows the 'RS485-1 Protocol' screen. At the top, there is a header bar with the SolarEdge logo, a back arrow, and a menu icon. Below the header, the title 'RS485-1 Protocol' is centered. The main content area is a table with the following rows:

<input checked="" type="checkbox"/> SolarEdge	Follower	>
Modbus (Multi-Device)		
SunSpec (Non-SE Logger)		
None		

4. Select **Modbus (Multi-Device)**.
5. Return to the previous screen by pressing the arrow.

Return to previous screen

solar^{edge}
SN 7E0928D8-87

RS485-1 Protocol

SolarEdge	>
✓ Modbus (Multi-Device)	
SunSpec (Non-SE Logger)	
None	

6. The RS485-x Add Modbus Device screen displays.

← solar^{edge}
SN 7E0928D8-87

RS485-1 Add Modbus Device

Meter




7. Select **Meter**. The RS485-x screen displays.

← solar^{edge}
SN 7E0928D8-87

RS485-1

Protocol	Modbus (Multi-Device)	>
Meter 1	None	>
Add Modbus Device		>

8. Select **Meter 1**. The RS485-x Meter 1 screen displays.

SN 7E0928D8-87

RS485-1 Meter 1

Meter Function	None	>
Meter Protocol	SolarEdge	>
Device ID	4	>
CT Rating	529	>
Grid Topology	WYE	>

9. Select **Device ID**. Choose the **Device ID** number you want to use. This must be the same as the **Slave Address** set on the meter. In the example below, it is set to 2.


  

SN 7E0928D8-87

RS485-1 Meter 1




Device ID

2

10. Go back .

11. Select **Meter Protocol**.


12. Choose the appropriate meter. In this example it is **Schneider**.

SN 7E0928D8-87

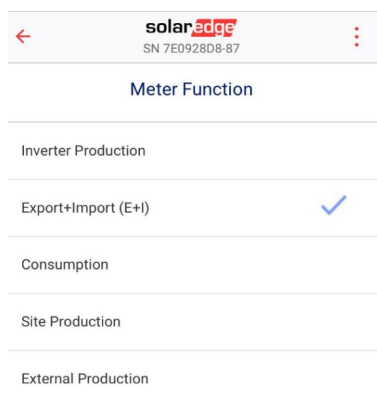
Meter Protocol


SolarEdge	<input type="radio"/>
WattNode	<input type="radio"/>
Pro1-Pro380 Modbus	<input type="radio"/>
Janitza	<input type="radio"/>
Schneider	<input checked="" type="radio"/>

13. Go back .

14. Select **Meter Function**.

15. Choose the appropriate function depending on your application. In this example it is **Export + Import (E + I)**.



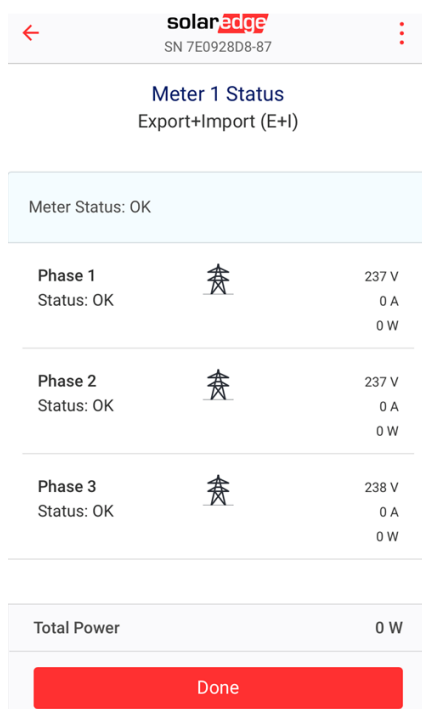
16. Go back .

17. You can now set parameters such as CT Rating, CT Rating Secondary, VT Rating, and VT Rating Secondary

The connectivity between the Inverter and the Schneider meter is set up. You can check that the system is set up and working correctly.

To check the system functionality:

1. Go back to the **RS485-x** screen.
2. Select **View Status**. The **Meter Status** screen displays. Here you can see the three phases, and the voltage, current and power for each phase. You can also see the Total Power.



Export Limitation Response Time

The system Export Limitation response time depends on the meter location, the communication method between the inverters, and the inverter CPU version.

Meter	Single Inverter Response Time	Multiple Inverters Response Time ¹	
		Smart Energy Manager is RS-485	Bus of Buses (Cluster)
Janitza UGM104/UGM604	Less than 3 seconds	Less than 3 seconds	Less than 3 seconds

¹ Assumes that all inverters produce power at the same level.

Appendix A: Troubleshooting

This section describes how to troubleshoot installation and performance errors.

Janitza UMG104/UMG604

Communication Status Screen Troubleshooting

The Communication status screen displays the following:

Dev	Prot	##
RS485-1	<MTR>	<JN> <1>
RS485-2	<-->	<--> <-->

If Device Type or Protocol are Configured Incorrectly

Select **Communication** > **RS485-x Conf** > **Device Type** > **Revenue Meter**.

Select **Communication** > **RS485-x Conf** > **Protocol** > **Janitza**.

Check that the Device ID under **Communication** > **RS485-X Conf** > **Device ID** is set to 2.

18. To set a metering function, select **Revenue Meter** > **Meter Func** and choose between **Export + Import** / **Export** / **Import** / **Consumption** / **Site Production** / **Inv. Production**.

If the Number of devices is not displayed

If <--> is displayed under the ## column in the Communication status screen, the meter is not communicating with the inverter.

Check the following:

1. Ensure that the meter configuration in the inverter is set as described in the previous section.
2. Check that the meter's settings are configured as specified in the meter's User Manual.
3. Check that the wiring between the meter and the RS485 terminal block on the communication board is correct and well connected.
4. Using a Voltmeter, measure the voltage on the meter's 10-pin terminal block. The L1 – L2 line to line voltage should be 400Vac \pm 20%.
5. Ensure that the inverter RS485 termination resistor (DIP switch) on the communication board is in the up position (ON).

Meter Status Screen Troubleshooting

If <OK> is not displayed in the Status line of the status screen shown below, the meter is not communicating with the inverter.

Export Meter	
Status:	<OK / Error#>
Power [W]:	x x x x x . x
Energy [Wh]:	x x x x x . x

Check the following:

1. There are no loose connections at the inverter communication board and at the meter.
2. The wiring between the black 4-pin terminal block on the meter and the RS485 terminal block on the communication board is correct.

If Comm. Error Message Displays in the Meter Status Screen

1. Verify proper connection of the RS485 cables and connectors.
2. Ensure that the **Meter ID** is correct. It must match the **Modbus Address** set up on the meter.
3. Check the AC connection of the meter.

If the message **Error code 3X6E** or **Error 185 Meter Comm. Error** is displayed, contact SolarEdge support.

Energy [Wh] value is not advancing

If the Energy [Wh] value displays a steady value even though the site is exporting or importing power, check the following:

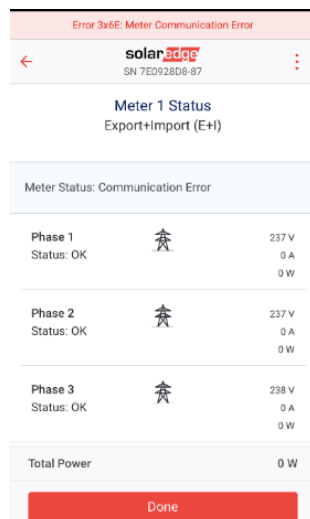
1. There are no loose connections at the inverter connectors or at the meter, especially the AC wiring on the meter 10-pin connector.
2. The current transformers are connected correctly to the meter.

Schneider iEM3255

There are three main potential issues that can lead to a communication error. These are shown in the following table with their appropriate corrective actions.

Error	Corrective Action
Communication Errors	Ensure that the Modbus ID is correct. It must match the Slave Address set up on the meter.
	Ensure that the Com. Protection parameter is set to Disable on the meter.
	Check the physical RS485 wiring to ensure that it is correct and that all connectors are firmly in place.

When there is an RS485 communication error, you will see an error message as shown in the screen below:



Appendix B: External lightning protection connection

Protection devices are most often installed from each data line to the local earth ground. They must be selected to begin conducting current at a voltage as close to the system's normal communication level as possible, but not lower. For RS485 communication lines, the selected voltage rating is typically 6-8 V.

Transient suppressors must be installed as close as possible to the port that is being protected. 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 must 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 8/20μs and **I_{max}**: 20kA 8/20μs is recommended.

For further information, see the *Overvoltage Surge Protection Technical Note*:

https://www.solaredge.com/sites/default/files/lightning_surge_protection.pdf

