

Three Phase Residential Inverter and Home Battery 400V Integration - Application Note

Revision History

Version 1.0 July 2024

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Overview

This application note explains how to connect the SolarEdge Home Battery 400V to a SolarEdge 3Ph Residential inverter (SExK-AUBTEBEU4).

This is the initial release to the market, and the following applies:

- Only a single SolarEdge Inverter on a site.
- The SolarEdge 3Ph Residential Inverter (SExK-AUBTEBEU4), is only permitted to have a single SolarEdge Home Battery 400V connected via the SolarEdge Home Network.
 - Inverters without a SolarEdge Home Network plug in card have to be opened and installed with the plug-in card.
 - For selection of the correct plug-in card based on Inverter version please refer to Appendix A, at the end of this document
- No Zigbee smart home devices shall be installed as part of the system.
- The inverter FW version must be 4.21.1xx or above.

Connecting battery communication and the DC

When setting up communication between the battery and the inverter, use the SolarEdge Home Network.

Use the following cable types:

- DC - 6mm - 10mm CSA 600V insulated depending on route length.
- Communication - CAT6



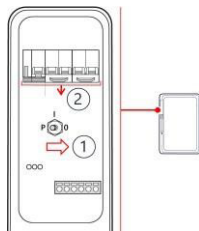
WARNING!

Read carefully all handling and safety instructions in the installation guides that come with the battery and the inverter.

WARNING!
The inverter cover must only be opened after switching the inverter P/1/0 switch located at the bottom of the inverter to OFF. This disables the DC voltage inside the inverter. Wait five minutes before opening the cover.

WARNING!
Ensure that the correct battery polarity is always observed. Turning on the battery with reverse polarity may permanently damage the battery

WARNING!
Before connecting the battery to the inverter, ensure the battery power is off.



SolarEdge Home Battery

1. Toggle off the battery P/1/0 switch.
2. Turn off the battery circuit breaker.

Three Phase Booster (AUB) Inverter

WARNING!
Read all handling and safety instructions in the installation guides that are provided with the SolarEdge Home Network card and the inverter.

To connect communication via SolarEdge Home Network:

1. Remove the inverter cover.
1. Switch off the inverter P/1/0 switch and wait 5 minutes for the internal capacitors to discharge.
2. Switch off the AC circuit breaker on the main distribution panel.
3. Open the Allen screws of the inverter cover and carefully pull the cover horizontally before lowering it.
4. Connect the SolarEdge Home Network plug-into the socket on communication board.
5. Connect the antenna, pass antenna cable through communication gland.
6. Clip antenna (supplied) to heatsink fin.
7. Tie antenna cable to communication board bracket with plastic tie (supplied).
8. Replace the inverter cover and Connection Unit cover (DCD). Tighten screws to 8.4Nm.
9. Restart the inverter and verify the device in SetApp, select **Status > Communication > Home Network OK**.

To connect DC cables:

1. Connect the DC cables to the battery, as explained in the [installation guide](#) that is provided with the battery.

NOTE
Only a single battery can be connected to the Three Phase Booster (AUB) Inverter.

2. Pass the other end of the DC cable through the Battery conduit of the inverter.
3. Connect the wires to the DC terminals.

WARNING!
Make sure to connect the cables at the correct polarity. Connecting the cables at reverse polarity may result in damage to the inverter or battery.

4. Proceed with the battery installation, as explained in the [SolarEdge Solution Connection and Configuration Guide for Australia](#).

Pre-startup battery polarity check:

Before energizing the battery ensure that the polarity of the DC connections is correct, +to+ and -to-.

Use the following cable types:

- Use a voltmeter set to DC

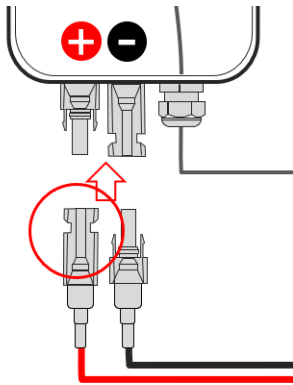


WARNING!

Startup of the battery in reverse polarity may cause permanent failure of the battery and is not covered under warranty

To check the DC polarity between the battery and the PV (Optimizers):

1. Ensure that the AC to the inverter is **OFF**.
2. Ensure that the DC Isolator on the DCD is in the **OFF** position
3. If a DC Combiner is connected ensure the DC Isolator is in the **ON** position.
4. With the MC4 connections at the battery terminal removed, test for the nominal Safe DC string voltage. If a string contains x20 Optimizers then expect a 20Vdc result.
5. Ensure that the + plug (female negative MC4, highlighted in the following image) reads a + voltage value.



Running a battery self-test

You can only run a battery self-test after finishing the battery installation and configuration, refer to the [battery installation guide](#).

The purpose of the battery self-test is to check the battery's charge and discharge functionality.

To run a battery self-test:

1. Make sure the battery's circuit breaker switch is **ON**.
2. Switch the inverter **P/1/0** switch to **ON**.
3. In SetApp, select **Commissioning** > **Maintenance** > **Diagnostics** > **Self-Test Battery Self-Test** > **Run Test**.
4. Wait for all tests to complete and check the results in the summary table.
5. If any of the tests have failed, see the table below for possible solutions:

Test Results	Solution
Charge failed	Check that the power and communication cables between the battery and inverter are properly connected.

Test Results	Solution
Discharge failed	Check that the power and communication cables between the battery and inverter are properly connected.
Communication	Check that the communication cables between the battery and inverter are properly connected.
Inverter switch is off	Switch the inverter P/1/0 switch to ON.

To display the last test results:

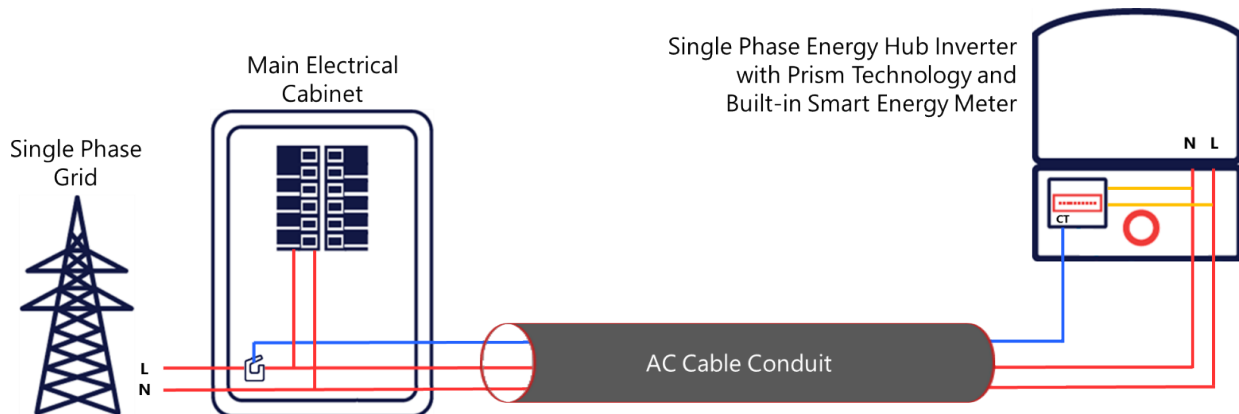
Select **Commissioning > Maintenance > Diagnostics > Self-Test > Battery Self-Test > Show Last Results**.

Current transformer (CT) installation

- If the Backup Interface is not installed, or if the CT within the Backup Interface is not connected, this section describes the installation and extension process.
- As the Home Hub inverter has a built in Modbus meter within the DC Connections module (DCD), in most cases when the CT is installed within the meter board the CT connection needs to be extended. A CAT6 shielded extension cable shall be used to connect the CT twisted pair to the meter. The extension cable is routed via the AC conduit, together with the AC wiring.
- Wire the meter in accordance with the connection diagram in the scenario: Export/Import Energy Metering in a Single-Phase Grid Installation.

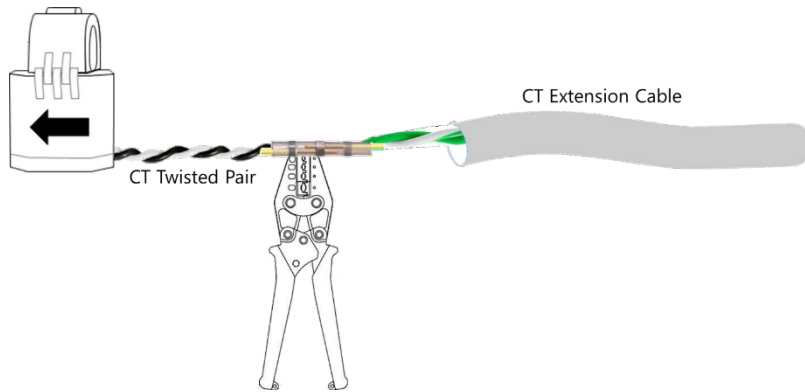
Export/Import Energy Metering in a Single Phase Grid Installation

In the single-phase grid example in the figure below, one CT is installed for export/import metering.



To install the CT:

1. Power **OFF** the inverter and disconnect its main circuit breaker.
2. Attach the CT to the relevant AC wire, in accordance with the connection diagram in the scenario: Export/Import Energy Metering in a Single-Phase Grid Installation.
3. When attaching the CT to the conductor to be measured, the arrow on the CT should point in the direction of the current source.
4. Cut the CT's black-and-white twisted wire pair to the required length (leaving some additional length) and connect the pair to the shielded CT extension cable, splicing them using a crimping tool as described in the following figure:

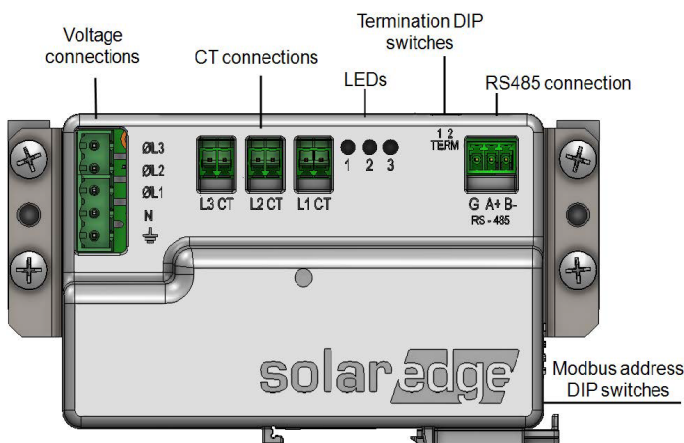


Do not use the method of twisting the wires and taping them together. This type of connection is not reliable, and the wires may eventually disconnect from each other. CT's can be extended up to 100m. Connect the grid AC wiring – L and N – to the designated terminal blocks.

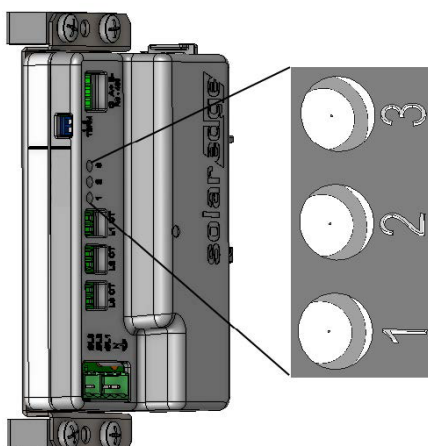
Three Phase Booster (AUB) inverter metering connections

When metering a 3Ph site SolarEdge offers two metering options, one being via the Modbus meter, the second via the Inline meter.

Modbus meter interface

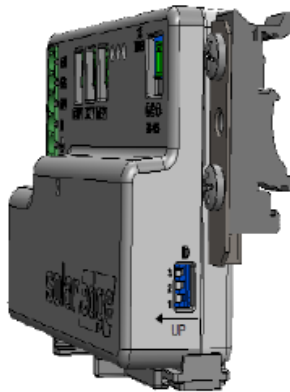


- **Voltage Connections:** - for connection to the grid: Wye: L1, L2, L3, N, Ground.
- **CT Connections** - (L1 CT, L2 CT, L3 CT): for connection to current transformers.
- **RS485** - for connection to the inverter.
- **LEDs** - On the front of the unit to indicate the current status.



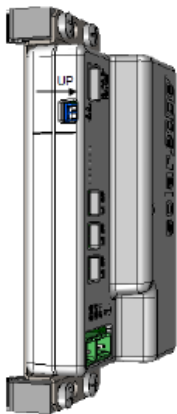
LED #	LED	Function	Indication
1	Green	Operational status	Blinking ON/OFF - normal operation
2	Yellow	RS485 Modbus communication	Blinking ON/OFF - communication OK
3	Yellow	Energy management	Single blink when the meter reads an energy change of ~1 kWh.

- **Modbus address DIP switches-** (ID 1, 2, 3): The Modbus address DIP switches are used to set the Modbus address of the meter. The addressing options are listed in the table below.



Modbus Address	Switch 1	Switch 2	Switch 3
0	Down	Down	Down
1	Up	Down	Down
2 (factory default)	Down	Up	Down
3	Up	Up	Down
4	Down	Down	Up
5	Up	Down	Up
6	Down	Up	Up
7	Up	Up	Up

- **Termination DIP switches-** (TERM 1, 2): used to set RS485 termination. termination options are listed in the table below.

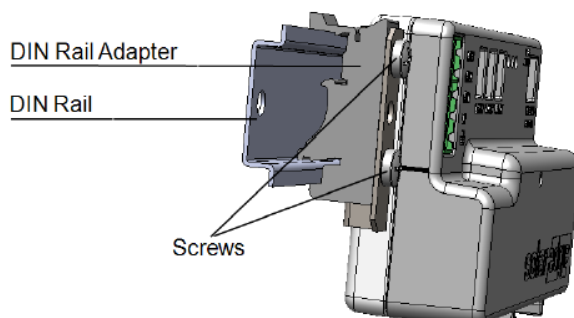


RS485 Termination	TERM 1	TERM 2
	Terminated	Down
Not Terminated (factory default)	Up	Up

Modbus meter installation:

AC wire specifications: 1.3 to 2.0 mm diameter stranded wire, 600 V, type THHN, MTW, or THWN.
 RS485 wiring specifications:

- Cable type: Min. 3-wire shielded twisted pair (a 4-wire cable may be used)
- Wire cross-section area: 0.2- 1 mm² (a CAT6 cable may be used)
- If using a cable longer than 10 meters in areas where there is a risk of induced voltage surges by lightning, it is recommended to use external surge protection devices.
- **Mount on a DIN rail using clips-** The supplied kit includes two DIN-rail adapters and four screws.



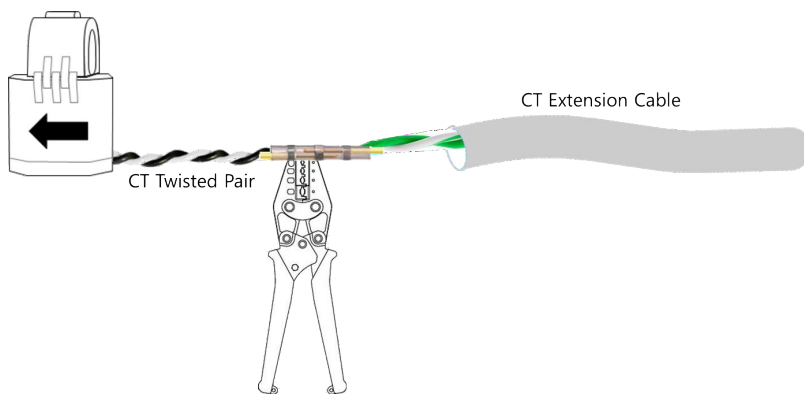
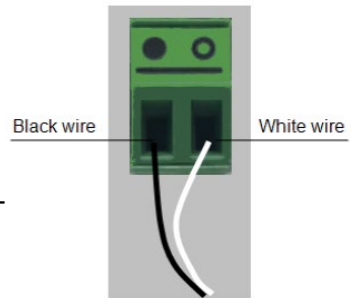
1. Attach the DIN-rail adapters to the DIN rail.
2. Connect the meter to the DIN-rail adapters and fasten them using the supplied screws.

To wire the meter:

1. Verify that power is **OFF** before making connections.
2. Connect the AC side wires (meter input) to the grid connectors on the meter.

To install the CT:

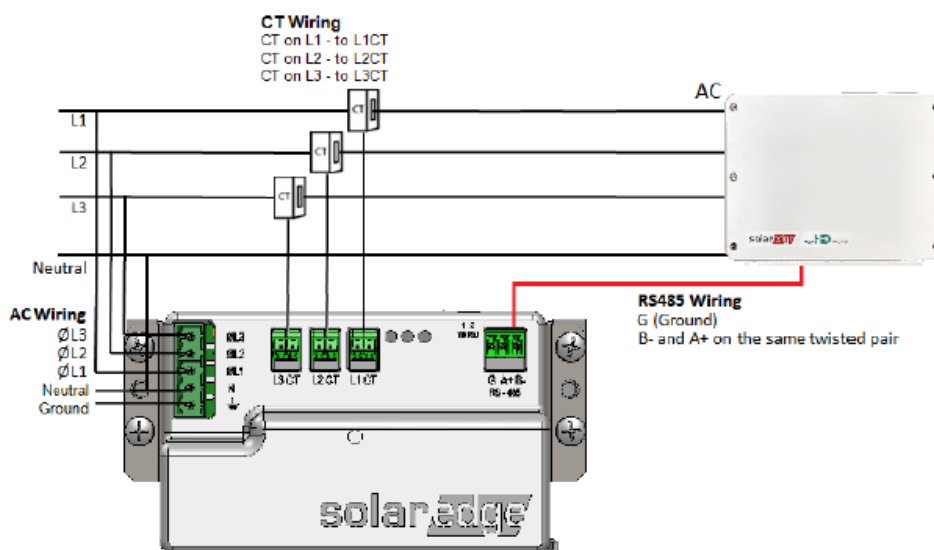
1. Turn off AC power before clamping on current transformers.
2. Attach the CT to the relevant AC wire, in accordance with the connection diagram in the scenario: Export/Import Energy Metering in a Single-Phase Grid Installation.
3. When attaching the CT to the conductor to be measured, the arrow on the CT should point in the direction of the current source.
4. Cut the CT's black-and-white twisted wire pair to the required length (leaving some additional spare length) and connect the pair to the shielded CT extension cable, splicing them using a crimping tool, as shown in the figure below.



Do not use the method of twisting the wires and taping them together. This type of connection is not reliable, and the wires may eventually disconnect from each other.

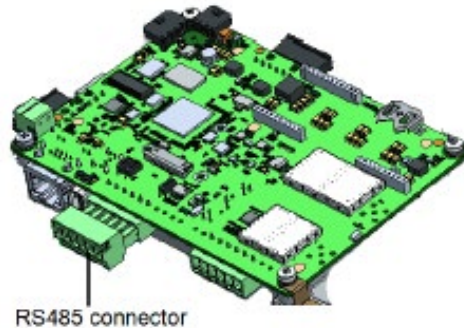
CT's can be extended up to 100m. Connect the grid AC wiring – L and N – to the designated terminal blocks.

Wire the meter in accordance with the three-phase connection diagrams below.



1. Connect the RS485 twisted pair cable to the 3-pin terminal on the meter: a.
2. Connect the wires to the A+ and B- terminals, and connect the shield to the G terminal. 5.
3. Set the meter's DIP switches as follows.

4. Set the termination DIP switches for Termination. Switch 1 and switch 2 should be in the DOWN position.
5. Set the address DIP switches for Modbus Address 2: Set switch 2 to UP, and set switches 1 and 3 to DOWN.
6. Prepare to connect to one of the available RS485 ports of the device, as shown below:
7. Inverter RS485-1 - pull out the RS485 connector located on the communication board.

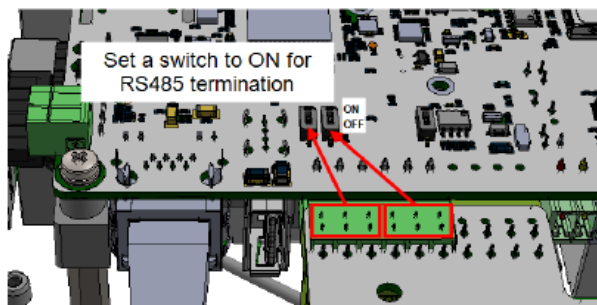


8. Connect the meter's RS485 G, A+, and B- connectors to the G, A, and B connectors in the inverter.

If the SolarEdge device is at the end of the RS485 bus, terminate as follows:

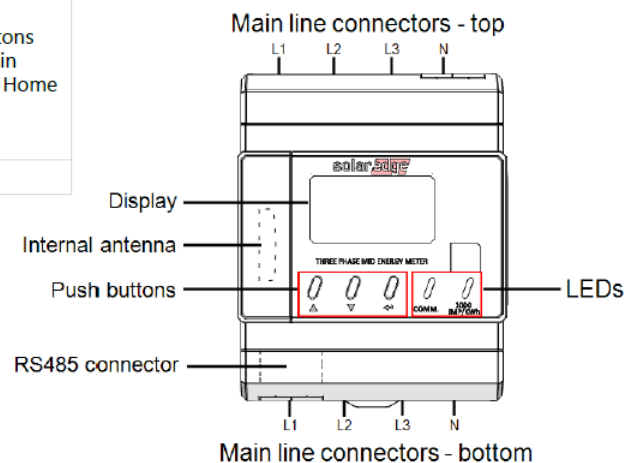
Inverter - Terminate by switching a termination DIP-switch inside the inverter to **ON** (top position).

Inline meter interface



- **Main line connectors::** - inputs/output terminal blocks
- **Internal antenna::** - for wireless connectivity with the inverter
- **RS485** - detachable connector for wired connectivity with the inverter.
- **Three push buttons::** - to operate the inline meter display.

Button	Function	Combination
Left	Up	Push the Left and Middle buttons simultaneously for 5 seconds in order to initiate an SolarEdge Home Network search session.
	Push the left button for 5 seconds in order to reset the meter.	
Middle	Down	
Right	Enter	



- **LEDs** - used to monitor meter status:
 - Orange: meter operation

- Blue: SolarEdge Home Network/RS485 communication status

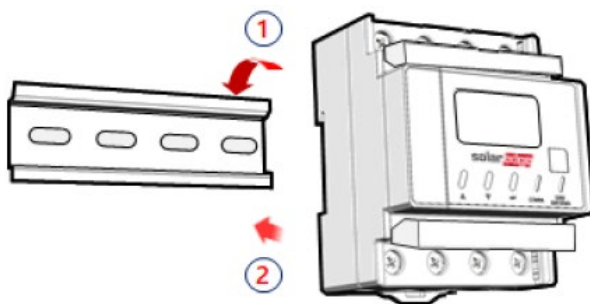
Function	LED	Indication
Energy measurements	Orange	Blinking rate of 1000 pulses per hour indicates 1 kWh of measured energy.
Communication status	Blue	<ul style="list-style-type: none"> ■ Blinking: Meter is searching for a SolarEdge Home Network, or is not connected to RS485 bus. ■ Lit: Meter is in the reboot state, or has successfully paired with the SolarEdge Home Network, or was successfully connected to the RS485 bus. ■ Fast blinking during configuration of the inline meter.

Display - Used for basic configuration and operation of the meter, and for reapplying factory default settings.

Inline meter installation

If an AC wiring extension is required, use the same type of AC wiring that is used in the cabinet.
RS485 wiring specifications:

- Cable type: Min. 3-wire shielded twisted pair (a 4-wire cable may be used)
- Wire cross-section area: 0.2- 1 mm² (a CAT6 cable may be used)
- If using a cable longer than 10 meters in areas where there is a risk of induced voltage surges by lightning, it is recommended to use external surge protection devices.
- **Mount on a DIN rail**- The inline meter is designed for permanent installation in indoor locations. It is intended for installation in switch cabinets or in small-installation distributors on a 35mm mounting rail as per DIN EN 60715.
- Mount the inline meter on the DIN rail as shown in the figure below. Fit the slot on the back of the meter over the DIN rail (see steps 1 and 2), and secure it in place on the DIN rail using the latching mechanism at the bottom of the meter.

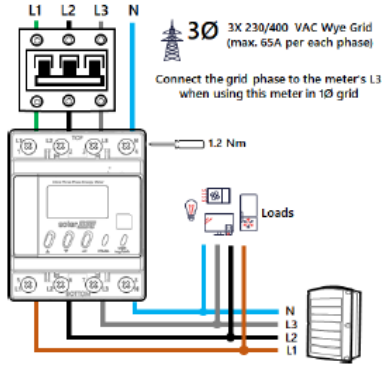


To wire the meter

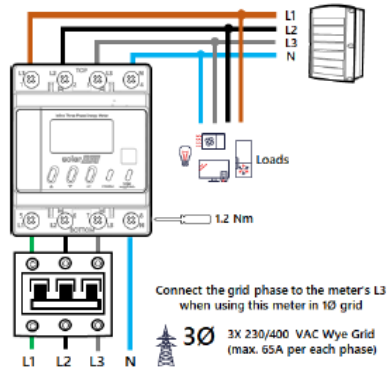
1. Turn off the AC power (main circuit breakers) before connecting the inline meter.
2. Using one of the below wiring schemes, connect the AC wiring to the terminal blocks at the top and the bottom of the inline meter

For Import/Export Metering -

3Ø Meter Wiring - Accuracy class B (1%)

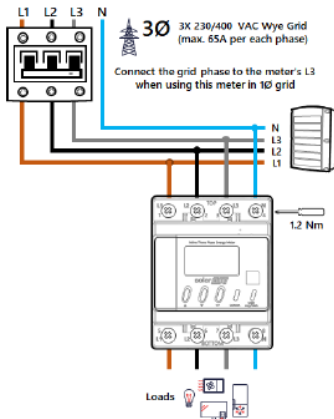


3Ø Meter Wiring - Accuracy class A (2%)

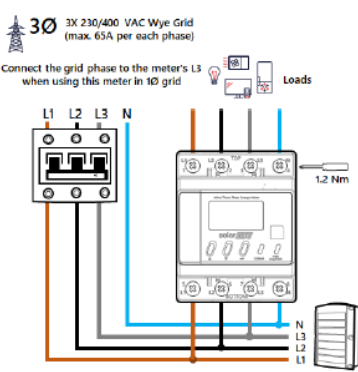


For Consumption Metering -

3Ø Meter Wiring - Accuracy class B (1%)



3Ø Meter Wiring - Accuracy class A (2%)



System startup and shutdown

To start up the system:

1. Turn **ON** the SolarEdge Home Battery MCB.
2. Move the SolarEdge Home Battery toggle to the **ON** position.
3. Switch the DC Isolator on the DC Combiner (If installed) to **ON**.
4. Switch the DC Isolator on the inverter DCD to **ON**.
5. Move the SolarEdge inverter toggle to the **ON** position.
6. Switch the AC to the inverter at the adjacent AC isolator (if installed) and inside the main switch board to **ON**.

To shut down the system:

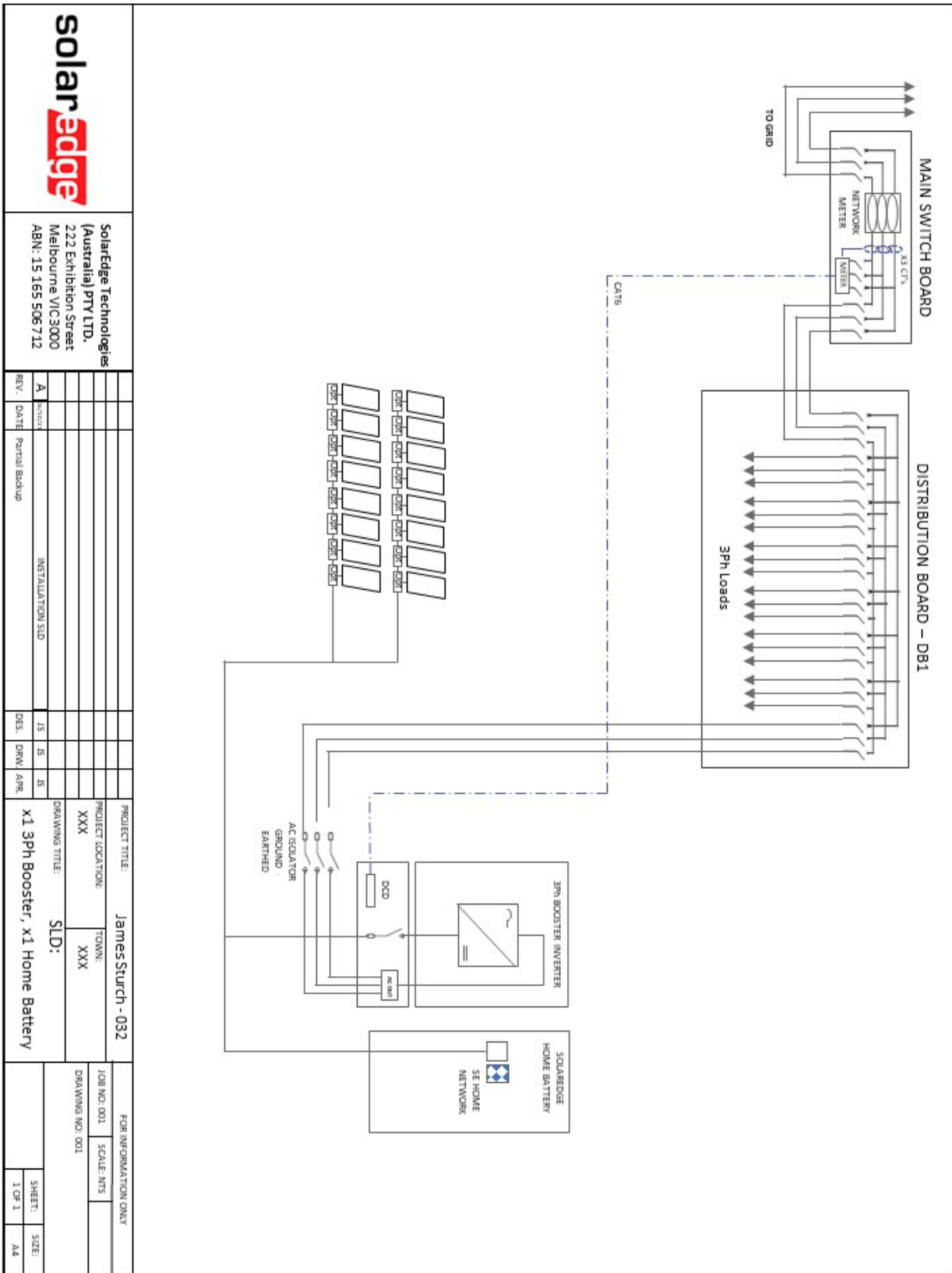
1. Move the SolarEdge inverter toggle to the **OFF** position and wait until the green LED is blinking, indicating that the DC voltage is safe (<50V), or wait five minutes before continuing to the next step.
2. Switch the AC to the inverter at the adjacent AC isolator (if installed) and inside the main switch board to **OFF**.
3. Switch the DC Isolator on the inverter DCD to **OFF**.
4. Switch the DC Isolator on the DC Combiner (If installed) to **OFF**.
5. Move the SolarEdge Home Battery toggle to the **OFF** position.
6. Turn **OFF** the SolarEdge Home Battery MCB.

To shut down the system in case of emergency:

1. Switch to the **OFF** position, the AC to the inverter at the adjacent AC isolator (if installed) and inside the main switch board.
2. Switch to the **OFF** position the DC Isolator on the inverter DCD.
3. Switch to the **OFF** position the DC Isolator on the DC Combiner (If installed).
4. Turn **OFF** the SolarEdge Home Battery MCB.

Common installation configuration

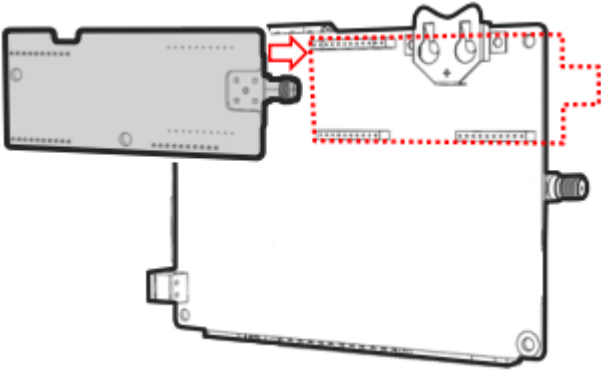
The following image displays a 3Ph Booster Inverter (PV Connected) Home Battery via Home Network, Metering via Modbus Meter.



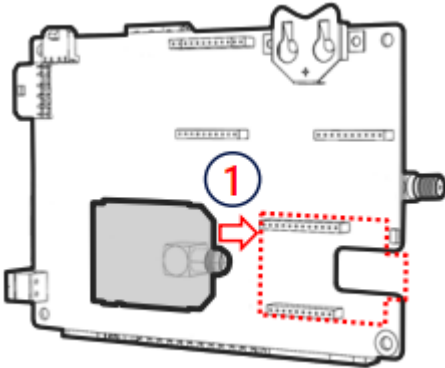
Appendix A

The Network Plug-In Kit shall be selected according to the inverter's communication board. Refer to the following image to identify the correct Home Network Plug-in kit:

ENET-HBCL-01 – For communication boards which are not HW ready for Home Network Plug-in:



ENET-HBNP-01 – For communication boards which are HW ready for Home Network Plug-in:



CAUTION

Do not use ENET-HBCL-01 if you have a dedicated slot for the Home Network Plug-in (see figure above) as it can fit, but may damage the product.