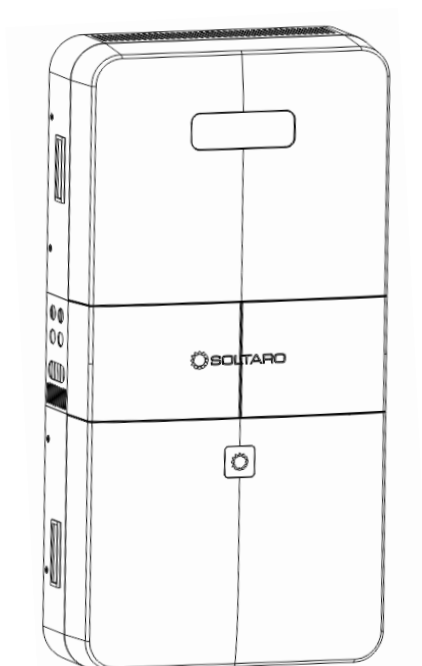




Operating Manual

AIO2-INS Series



Version: AIO2 Pro-INS-EN 3.0-202407

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1 About This Manual

1.1 Products Covered by This Manual

AIO2 Series Low Voltage Solar Hybrid Inverter:

AIO2-INS-3000, AIO2-INS-3680, AIO2-INS-4600, AIO2-INS-5000.

1.2 Target Group

This document is intended for qualified electricians. Any electrical installation and maintenance on this inverter must be performed by qualified electricians in compliance with standards, wiring rules or requirements of local grid authorities or bodies.

1.3 Symbols Used

These important instructions must be followed during installation, operation and maintenance of the inverter.

 DANGER	Indicates a hazard with a high level of risk that will result in death or serious injury.
 WARNING	Indicates a hazard with a medium level of risk that can result in death or serious injury.
 CAUTION	Indicates a hazard with a low level of risk that can result in minor or moderate injury.
NOTICE	Indicates a situation which, if not avoided, can results in property damage.

1.4 Storage of the Manual

The manual should be stored with other documents belonging to the inverter and must be available to people authorized to work on the installation.

Note: This manual will be updated if necessary. Please check www.soltaro.com for more information.

2 Safety

2.1 Intended Use

The **AIO2 Series** are single phase solar hybrid inverters suitable for both on-grid and off-grid operation. With Lithium batteries, PV panels and a smart meter, the hybrid inverter is the central device to make a solar storage system for increased self-consumption.

The AIO2-INS Series must only be connected with the lithium battery from SOLTARO.

To prevent personal injury and property damage and to ensure long-term operation of the product, please read and follow all the instructions and cautions on the inverter and this user manual during installation, operation or maintenance at all times.

2.2 Important Safety Instructions

DANGER

Danger to life from electric shock.

- Before performing any work on the inverter, disconnect all DC and AC power from inverter and wait for at least 5 minutes.
 - Do not touch DC conductors or any non-isolated cable ends.
 - If an error occurs, contact your local distributor or qualified electricians.
 - Make sure the inverter is not touchable by children.
-

WARNING

Risk of burns from hot surfaces.

- The surface of the inverter might exceed 60°C, touching the surface may result in burns.
 - Do not touch hot surfaces before it cools down.
 - Only authorized service personnel are allowed to install the inverter or perform servicing and maintenance.
 - All power, both AC and DC, should be disconnected from inverter before attempting any maintenance or cleaning or working on any circuits connected to inverter.
-

⚠ CAUTION

- The Inverter has a transformerless design on the PV side. Either positive or negative terminals of PV panels should not be grounded.
- The frames of PV panels should be grounded for safety reasons.

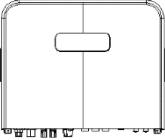
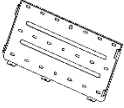
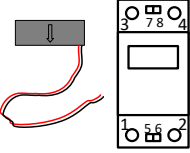
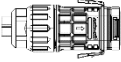
NOTICE

- Do not open inverter cover or change any components without authorization, otherwise the warranty commitment for the inverter will be invalid.
 - Appropriate methods must be adopted to protect inverter from electrostatic discharge, any damage caused by ESD is not warranted by the manufacturer.
-

2.3 Storage and Transportation

- Store the inverter in a dry environment where ambient temperature keeping always between -20 °C and +60 °C. Take care of the inverter during the storage and transportation.
- The package shall not be tilted or inverted during transportation, handling and storage.
- When the inverter or other related components need to be disposed, make sure it is carried out according to local waste handling regulations.
- Please be sure to deliver waste inverters and packing materials to appropriate recycling centers where possible.

3 Scope of Delivery

	 Wall Mounting Bracket	 Battery power cables	 BMS Cable
 EPS Connector	 Grid Connector	 PV Connectors	 RJ45 Connector for DRM port
 CT and Smart Meter	 16pin Multi port connector	 M5 Screws	 Expansion Screws
 Certificate card	 User Manual	 Qendercore Hub (Wi-Fi & LAN Stick)	

4 Product Description

Thank you for choosing the SOLTARO AIO2 ESS which is a single-phase system. Inverters should not be used in multiple phase combinations. Features of the inverter are ahead of the field and should be understood prior to install.

4.1 View of the Inverter

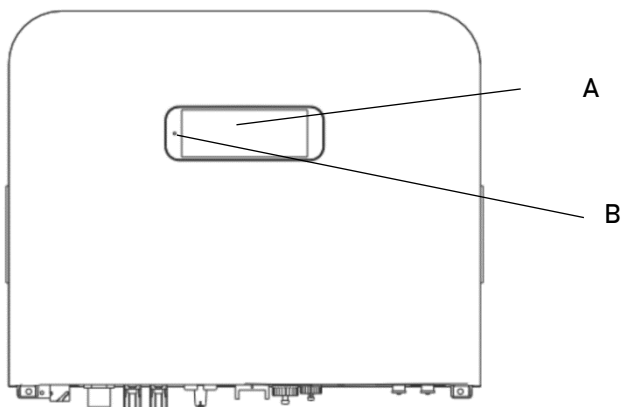


Figure 1. View of the AIO2 Series Hybrid Inverter

Position	Designation
A	Graphical Display
B	LED light. When inverter is running normally, the light is green. When an error occurs, the light turns red.

Icons on the Nameplate

Symbol	Explanation
	CE Mark
	UKCA Mark
	UKNI Mark
	Caution, Risk of Danger
	Caution, Risk of Electric Shock
	Caution, Hot Surface.
	Refer to the Operating Manual
	Danger, Risk of Electric Shock due to Stored Energy. Cut off all power and wait at least 5 minutes before any work is carried out on the inverter.
	RCM Mark for Australia and New Zealand.
	WEEE Mark. This inverter should not be disposed as ordinary waste.

4.2 Topology of the Inverter

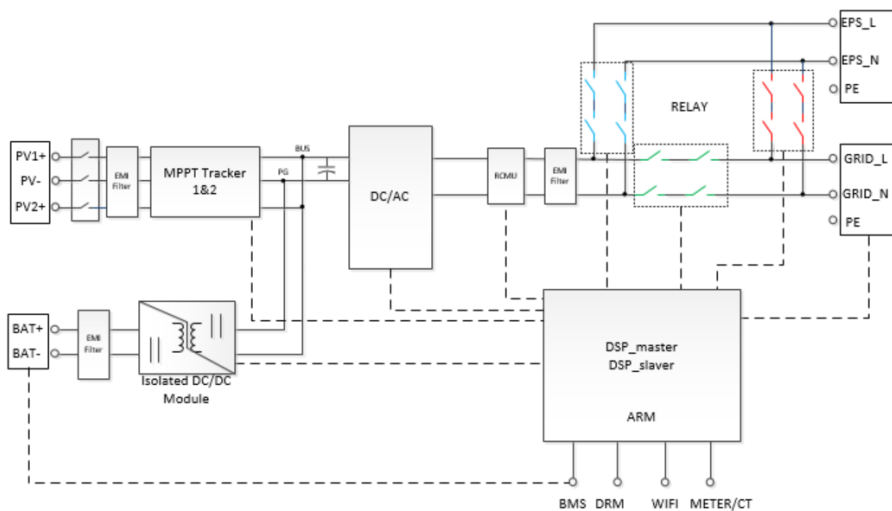
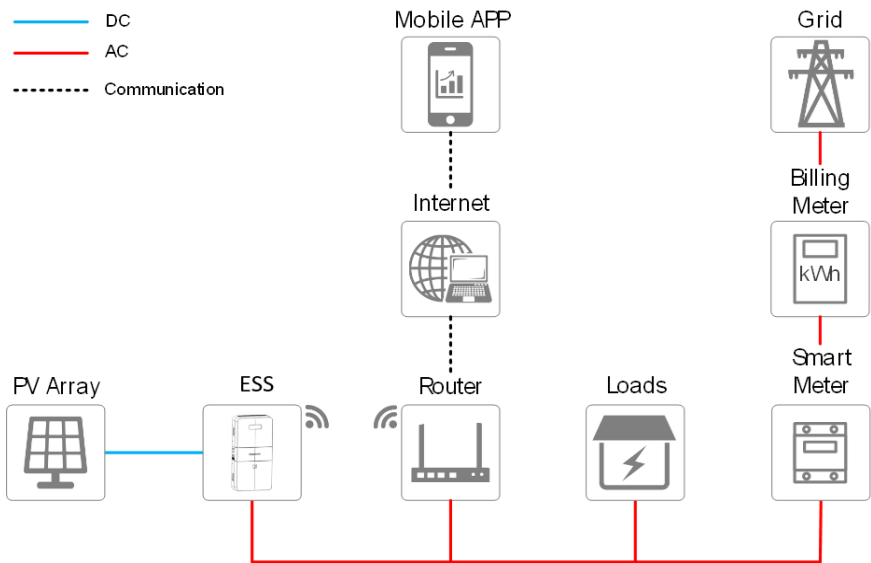


Figure 2. AIO2 Series Hybrid Inverter topology

NOTICE

- After the PCE installation is completed, it is recommended that the N and PE wires are joined at the distribution box;

4.3 System Diagram



4.4 Operating Mode Introduction

4.4.1 On Grid Self-Use Operating Mode

The on grid self-use operating mode is recommended for when the system is installed in an area with a stable grid. The purpose is to increase self-consumption of PV energy. When Inverter is set to work in this mode:

i. During daytime and there is sufficient PV Power,

- The PV energy is used to supply local loads as first priority and then charge the battery, any excess energy will be fed into grid^{*1*2}.
- When battery is fully charged, PV energy is supplied to the local loads and fed into grid^{*1*2}.

ii. During nighttime or there is not sufficient PV Power,

- Battery is discharged to supply local loads, if extra power is required, it will be imported from grid.
- When the battery SOC is below the DischargeEndSOC@Grid value or fully discharged, the inverter will stop working and local loads will be supplied from the grid.
- Thanks to the on-grid operation, the switch from battery power, PV power and grid power is automatic and seamless.

iii. When grid fails,

- When grid fails, the inverter will automatically disconnect from grid and output power to the EPS port.
- When battery is discharged to the DischargeEndSOC@EPS value, the inverter will stop working and wait for the grid to recover or until there is sufficient power from PV panels to charge the battery.
- If grid failure can be a common occurrence in your area, you can adjust the DischargeEndSOC@Grid higher to ensure there is battery power available.

iv. You can also:

- Set a schedule for the inverter to charge the battery using cheap off-peak grid power.
- Specify the daily working periods of self-use for inverter.

*1: The inverter can be set not to feed power into the grid. But a small amount of energy will still inevitably be fed into grid due to unpredictable PV power changes and load fluctuations.

*2: Firmware update may be required to support this function.

NOTICE

- For on-grid self-use operating mode, one can set the discharge end SOC@Grid as low as the battery allows (10% or 20% for example). Please refer to your local battery technician for minimum discharging end SOC.
-

4.4.2 On-Grid Self-Define Mode

On-Grid Self-Defined Mode can also be referred to as Forced Charge/Discharge Mode. When operating in this mode, the charging and discharging time can be set flexibly as required. This mode is ideal for those who want to store the power in the battery when the electricity price is at an off-peak rate and use the power during peak rate time or save the energy for grid outages. The schedules can be set via the monitoring software. This mode is set automatically upon setting any schedules in Qendercore via the Daily Schedule page.

i. When PV, grid and battery are available:

- When set to Forced Charge, PV and grid power will charge battery as the first priority at the same time. Any excess PV energy will supply local loads and then be fed into the grid^{*1*2}.
- When set to Forced Discharge, PV power will supply local loads first, then excess PV power and battery power will be fed into grid^{*1*2}.
- When Forced Charge or Discharge is not set, the inverter will automatically work in Self-Use mode.

ii. When grid and battery are available (PV is disconnected):

- When set to Forced Charge, grid power will charge the battery and supply local loads at the same time.
- When set to Forced Discharge, battery will discharge to local loads first, then the excess power will be fed into grid^{*1*2}.

*1: The inverter can be set not to feed power into the grid. But a small amount of energy will still inevitably be fed into grid due to unpredictable PV power changes and load fluctuations.

*2: Firmware update may be required to support this function.

4.4.3 Back-up Operating Mode^{*3}

For systems installed in areas with a weak grid, the inverter should be working in back-up

operating mode:

i. When grid power is available,

- When the battery is below the DischargeEndSOC@Grid value, it will be charged from PV first, and from grid/generator secondly at the max allowable current (Can be set by (Forced Charge Current Value).
- When the battery is above the DischargeEndSOC@Grid value, it will be charged by excess PV power and will discharge if the PV power is not enough to support the loads.

ii. When grid power is not available,

- When there is enough energy stored in the battery, the EPS port will export power to support EPS loads. If there's excess PV power, it will be used to charge the battery. Otherwise the battery will be discharged to power the load.
- When the battery SOC is below the DischargeEndSOC@EPS value, the inverter will disconnect power to the EPS port. All power from PV will be used to charge the battery until the SOC reaches the EPS restart value (10% above DischargeEndSOC@EPS value).

iii. When working in this mode:

- The max power*³ from the EPS port is limited by inverter type, battery type and battery SOC.
- A larger battery is always recommended for off grid / backup configuration. You should never discharge the battery too deeply to avoid it "Running Flat".
- When there is an overload or short circuit fault, the inverter will stop working and an alarm will sound. It will try to restart several times before shutting down completely. Turn off or unplug load to remove the short circuit fault or overload as soon as possible.

*2: Firmware update may be required to support this mode.

*3: Please be noted that refrigerators, air conditioners, water pumps and etc., demand a large start up currents and may trip EPS overload protection. Be sure not to connect too many of this kind of load to avoid frequent system shutdown and restart.

NOTICE

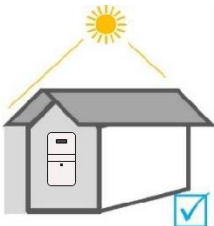
- For off-grid / back-up operating mode, one should set a higher DischargeEndSOC@Grid value (above 50% for example). So that there will be some energy in battery when a grid failure occurs.
-

5 Mounting

5.1 Requirements for Mounting

NOTICE

- Check to make sure the installation site does not fall into any of the following conditions:
If it does, then a risk assessment will be required.



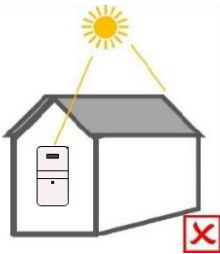
No direct sunlight



No rain exposure



No snow lay up



Direct sunlight

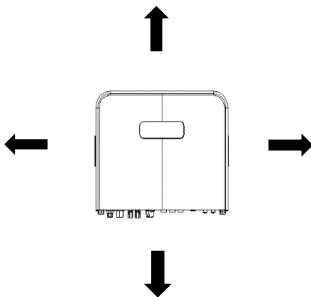


Rain exposure



Snow lay up

Clearance Requirement



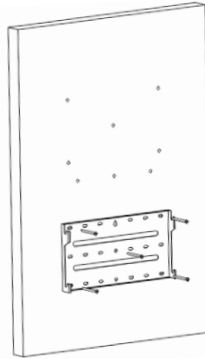
Position	Min. size
Left	300
Right	300
Top	600
Front	600

Additional Notes:

- The inverter must be installed in a ventilated environment to ensure good heat dissipation.
- DO NOT install the inverter in a place where personnel are likely to come into contact with its enclosure and heat sinks because these parts are extremely hot during operation.
- Select an optimal mounting location for safe operation, long service life and expected performance. Make sure the installation avoids the following conditions:
- Unsafe due to assessment of occupational health safety risks.
- The ambient temperature is outside the range of tolerable ambient temperature (-20°C to +60°C, -4°F to +140°F).
- Higher than the altitude of 2,000m above sea level. Above 2000m the inverter output will be de-rated.
- Close to flammable materials or areas where flammable materials are stored.
- Prone to be damaged by seawater.
- Prone to be flooded or high levels of snowfalls.
- Close to corrosive gas or liquid (for example, locations where chemicals are processed or stored).
- Exposed to direct sunlight or in an enclosure exposed to direct sunlight.
- Little or no airflow
- Mounted on a surface without suitable fire/heat rating.
- Mounted on a wall without suitable load bearing capability.
- High humidity.
- Site is considered unsafe because of local regulations.
- Confined space without adequate airflow.
- Area subject to sand or dust storms.
- Exposed to steam, vapor, or water.
- Near antenna and/or data cables.
- Electrical Installation & Maintenance in Australia shall be conducted by a licensed electrician and shall comply with Australia National Wiring Rules.

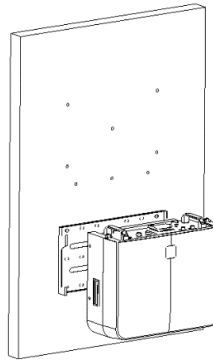
STEP 2:

- Fix the battery-bracket to the wall with 5 expansion bolts (M8-60).



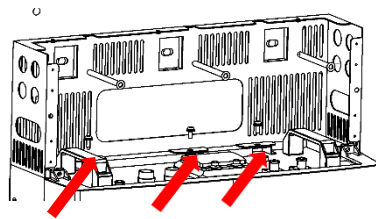
STEP 3:

- Lift and hang the battery to the battery-bracket.
- Note: Make sure that the 4 hooks of the bracket are all engaged, otherwise it will not be strong enough.



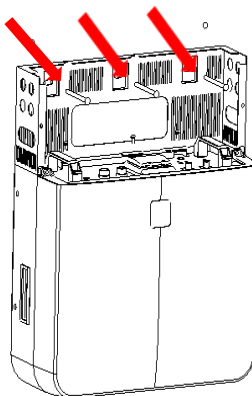
STEP 4:

- Install the outer frame of the wiring area.
- Place the frame of the wiring area on the battery, align the outer frame, and screw the three M5-10 stainless steel Phillips head screws into the three holes marked by the arrows.



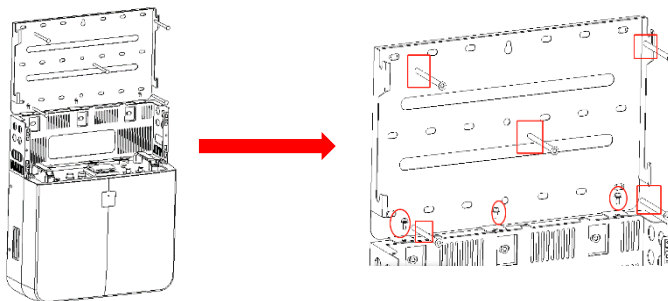
STEP 5:

- Fix the outer frame to the wall with 3 *M8-60 screws.



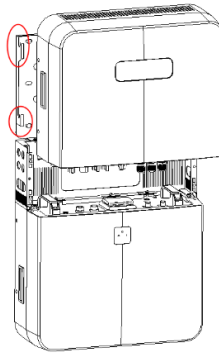
STEP 6:

- Install and secure the inverter-bracket on the wall with 5*M8-60 hex screws.
- Fix the inverter-bracket to the frame of the wiring area with 3 *M5-10 Phillips head screws.



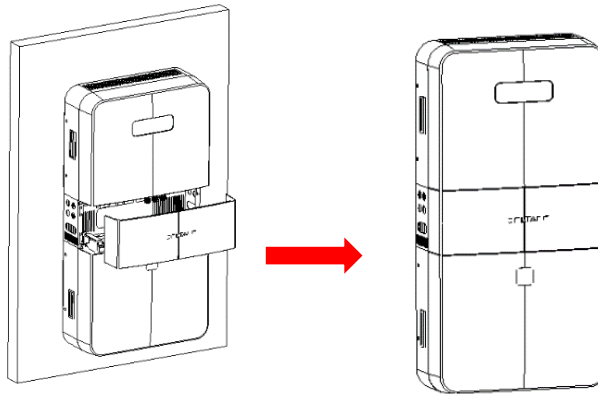
STEP 7:

- Lift and hang the Inverter to the bracket and secure with screw.
- Make sure the 4 mounting ears are perfectly engaged with the bracket.



STEP 8:

- After the battery and inverter are wired, buckle the cover of the wiring area.

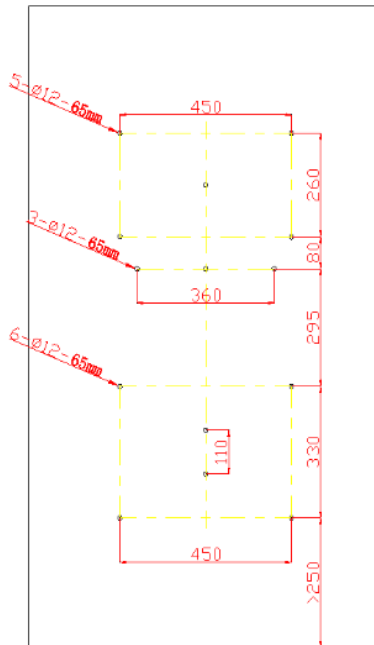
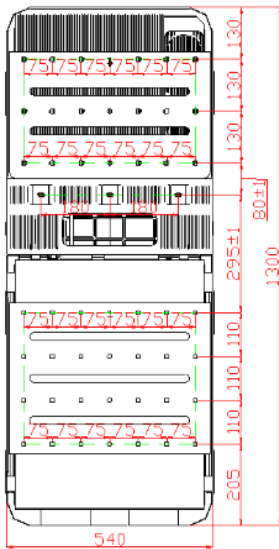


5.3 Mounting the Inverter (with AIO2-BTLV-10KWH battery)

Procedure:

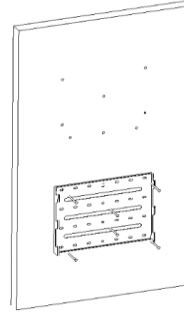
STEP 1:

- Drill holes in the wall ($\varphi=12\text{mm}$, drilling depth $\geq 65\text{mm}$)
- The dimensions of the back of the product are as follows (note: the height of the bottom row of holes $\geq 200\text{mm}$)
- Unscrew the M8-60 expansion screws and put the expansion head into the drilled hole.



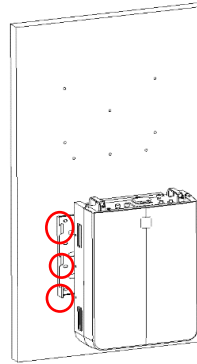
STEP 2:

- Install the bracket with 6*M8-60 inner hexagonal expansion screws, as shown in the picture to the right.



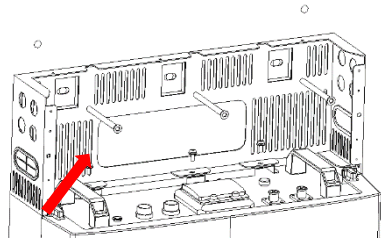
STEP 3:

- Hang the battery on the bracket.
Note: Make sure that the six hooks of the bracket are all engaged, otherwise it will not be strong enough.



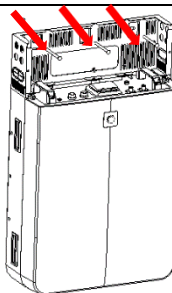
STEP 4:

- Install the outer frame of the wiring area.
- Place the frame of the wiring area on the battery, align the outer frame, and screw the three M5-10 stainless steel Phillips head screws into the three holes marked by the arrows.



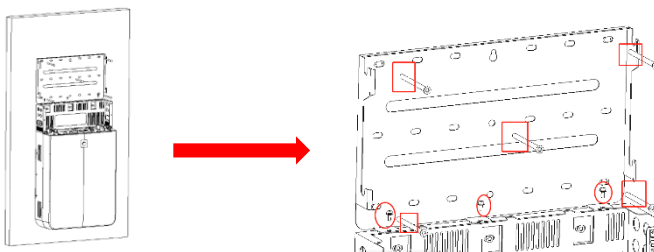
STEP 5:

- Use 3*M8-60 screws to fix the frame on the wall, as shown in the picture to the right.



STEP 6:

- Install and secure the inverter-bracket on the wall with 5*M8-60 hex screws.
- Fix the inverter-bracket to the frame of the wiring area with 3 *M5-10 Phillips head screws.

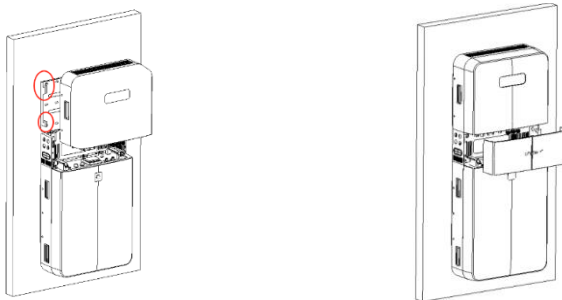


STEP 7:

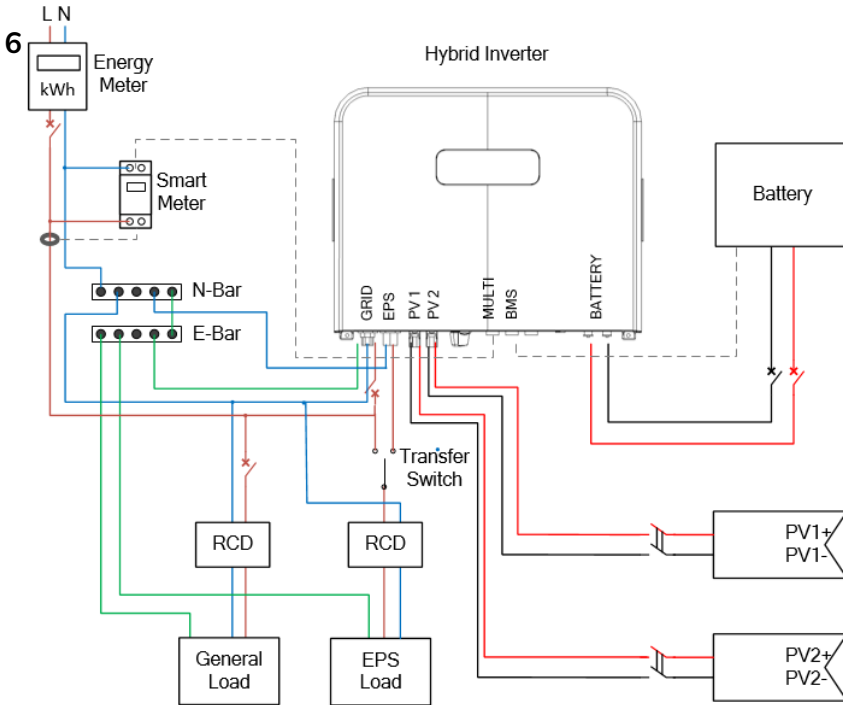
- Lift and hang the Inverter to the bracket and secure with screw.
- Make sure the 4 mounting ears are perfectly engaged with the bracket.

STEP 8 :

- After the battery and inverter are wired, buckle the cover of the wiring area.



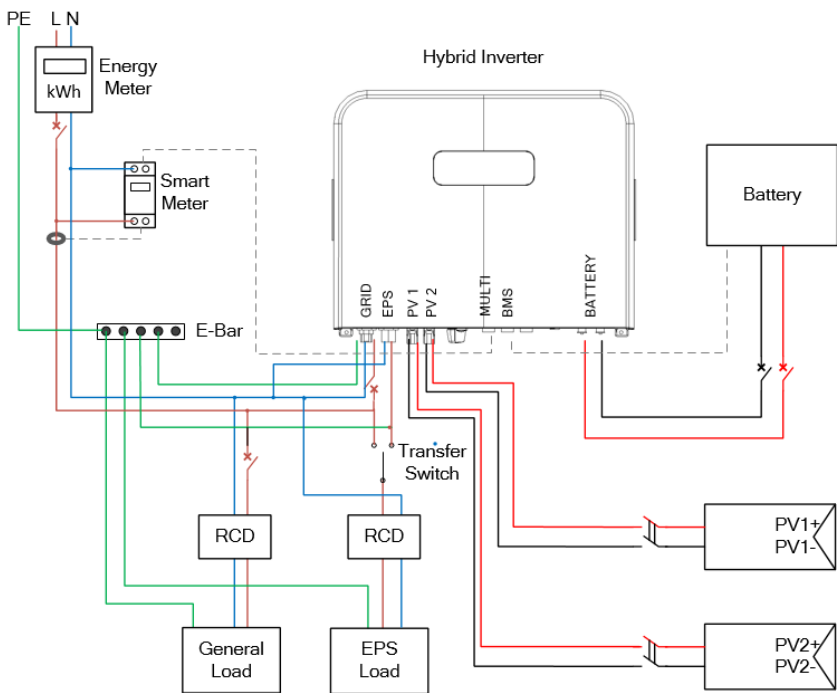
6 Electrical Connection



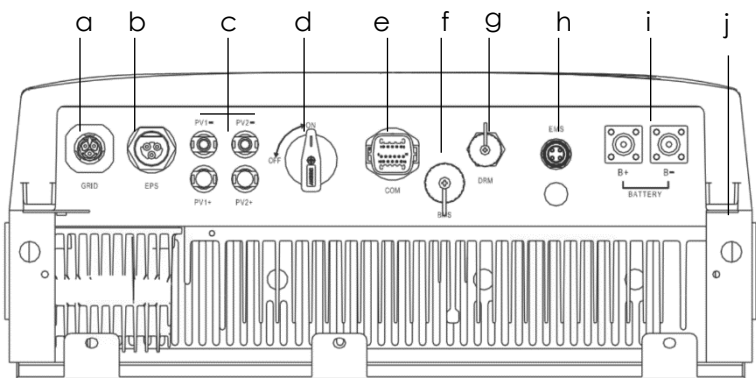
WARNING

- In Australia and New Zealand, electrical installation and maintenance shall be conducted by a licensed electrician and shall comply with Australia/New Zealand National Wiring Rules.
 - Because the inverter does not maintain neutral integrity during grid failure, an external neutral connection must be used in Australia and New Zealand. 30mA Type "A" RCD can be used on EPS loads.
-

6.2 Wiring Diagram for Europe



6.3 Overview of the Connection Area



Position	Description
a	Grid Connector
b	EPS Output
c	PV Inputs
d	DC Switch (optional, mandatory for Australia)
e	MULTI Port (for Meter & Other Communications)
f	BMS Port
g	DRM Port
h	EMS Port (for Wi-Fi Stick or other EMS Controllers)
i	Battery Connectors
j	Additional Grounding Point

6.4 PV Connection

Please only use the PV connectors from the accessory box for connection.

Before connecting, please make sure:

- The voltage, current and power ratings of the panels to be connected are within the allowable range of the inverter. Ensure polarity is correct. Please refer to the Technical Data in chapter 9 for voltage and current limits.
- Since the inverter is transformerless, please do not ground either output of the PV panels. Ground the panel frames.
- The 3.68kW/4.6KW/5kW inverter is designed with 2 MPPT trackers, if the inputs of the PV panels are paralleled, please consult with your local distributor for technical support.
- If the inverter is equipped with a PV switch, please make sure it is in the “off” position. Otherwise please use an external PV switch to switch off the PV connection during wiring and when necessary for maintenance.

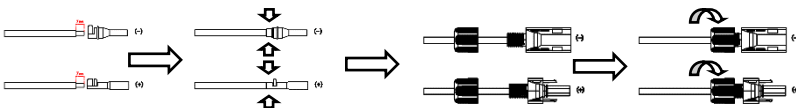
Procedure:



- Use IEC61730 class-A Rating PV modules.
 - When exposed to light, PV panels will generate DC voltage.
 - Turn off the PV switch before connecting any wiring.
-

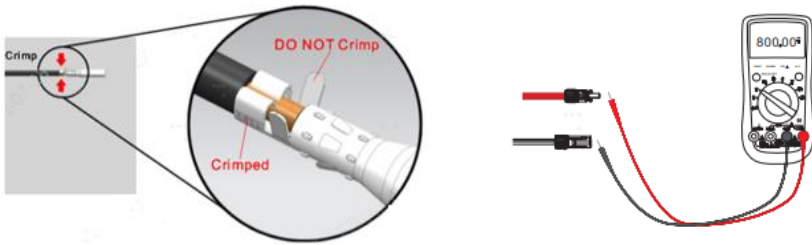
STEP 1:

- Strip the insulation from each PV cable by 6–8 mm.
- Assemble the cable ends with the crimping pliers.
- Lead the cable through the cable gland and connect PV cable to PV connectors.
- Screw the cable gland and the insulator.



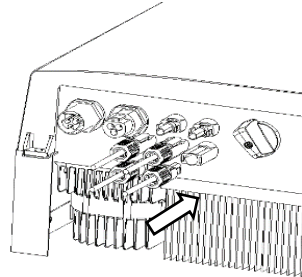
NOTICE

- DO NOT crimp the two metal sheets (below picture).
- These are fixing structure of metal core and its plastic shell. Crimping of the two metal sheets will result in failure of assembly, which may cause contact problems, and even fire in extreme cases.
- Measure the voltage of every String using a Multi-meter.
- Ensure that the polarities of the DC input power cables are correct.



STEP 2:

- Check the positive and negative polarity of the PV strings.
- Connect the PV connectors to the corresponding terminals until a “click” sound is heard.
- Seal the unused PV terminals with the terminal caps.



6.5 Grid Connection

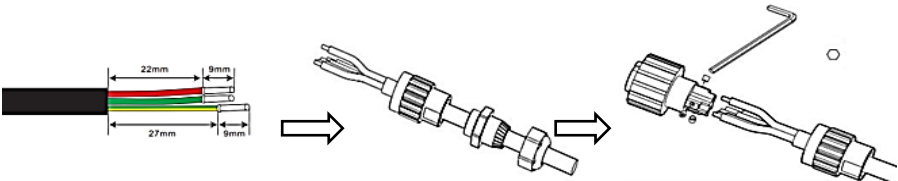
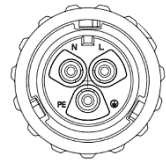
Please use the Grid connector from the accessory box for connection. Before connecting, please make sure:

- The grid voltage and frequency must be in the permissible range.
- An external AC switch ($\geq 32A$) must be used on the Grid connection to cut the inverter off from the Grid when necessary.

Procedure:

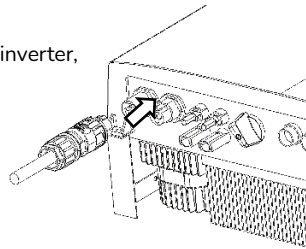
STEP 1:

- Disassemble the Grid connector.
- Select appropriate cables and strip the AC wires about 9mm.
- Pass the cable through the nut and sleeve of socket element.
- Connect the wires to the terminals according to the identification on the terminals and tighten them with allen wrench.



STEP 2:

- Connect the Grid connector to the Grid port on the inverter, and rotate the clamp clockwise.
- Install the included shroud to prevent access to live parts.



WARNING

High leakage current!

- Earth connection essential before connecting supply.
 - The inverter has a ground fault detection function, if an earth fault occurs, the fault code "F2:00000001" will be displayed on the LCD screen. The inverter will also beep repeatedly until the fault is rectified.
-

6.6 EPS Connection

If you want to use the energy storage system to power the house (as a standalone system or during Grid failure), the EPS connector should be used and the EPS function should be enabled during setup. Otherwise you can leave the EPS port disconnected. Where possible, an external switch to bypass the inverter to power backup loads directly from the grid must be installed.

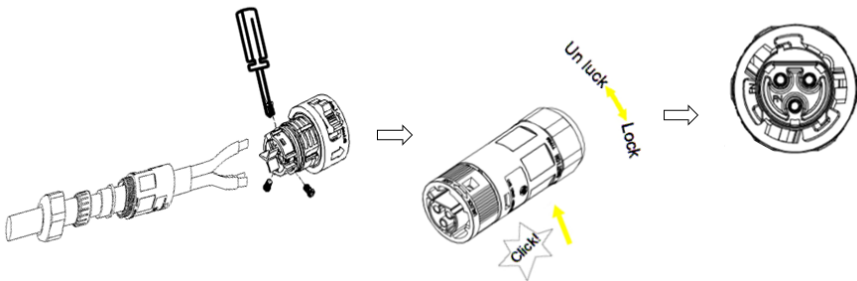
Before connecting, please check the following:

- The grid voltage and frequency must be in the permissible range.
- External AC switches must be used on EPS connection to cut off the inverter from EPS load when necessary.
- External switch must not allow connection of EPS circuit to Grid. A 3-position switch with intermediate OFF position and a minimum current rating of 32A is recommended.

Procedure:

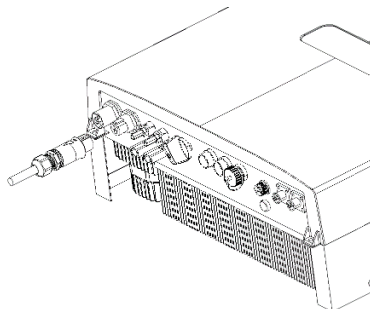
STEP 1:

- Disassemble the EPS connector.
- Select appropriate cables and strip the AC wires about 9mm.
- Pass the cable through the nut and sleeve of socket element.
- Connect the wire to the terminal and fasten the wire using a cross screw driver.
- Insert the EPS connector and hear "click", then tighten the waterproof nut.



STEP 2:

- Connect the EPS plug to the inverter.
- Turn the EPS connector knob to lock until you hear a "click" and the clasp is in place.



NOTICE

- Before mating the plug and socket, please double check both Grid and EPS Backup connectors. Do not connect the grid cables to the EPS Backup port or connect the backup load cables to the Grid Port. Otherwise, it will lead to malfunction or damage.
-

Declaration for backup loads :

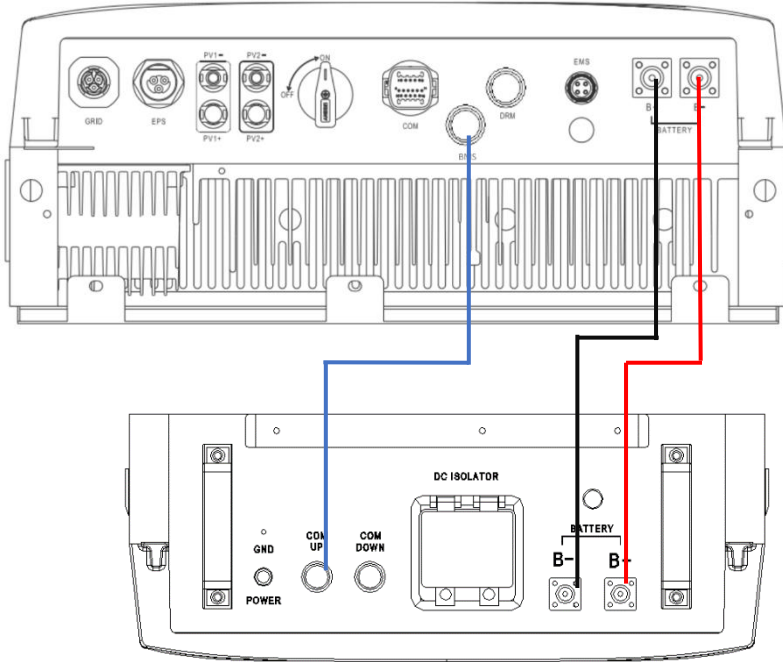
- Soltaro AIO2-INS inverter is able to supply a continuous output (As per Technical Data – Section 9) on EPS side. Inverter will shut down under full loading with high ambient temperature if grid is absent. Extra battery may be required to achieve full inverter surge capacity.
- Accepted loads as below (3.68/5KW Model):
- Inductive Load: Max 1/1.5KVA for single inductive load, max 1.75/2.5KVA for total inductive load power
- Capacitive load: Total capacitive load (like computer, SMPS etc.) power $\leq 2/3.0$ KVA
- (Any load with high inrush current at start-up is not supported on EPS circuit).

NOTICE

- Soltaro AIO2-INS series inverter is intended to be used as a backup supply for residential loads only.
 - Any commercial or industrial usage of the backup supply should be checked with Soltaro support, as there may be extra requirements or limitations.
-

6.7 Battery Connection

6.7.1 Battery connection diagram



DANGER

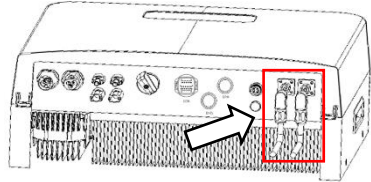
- Be careful against any electric shock or chemical hazard.
 - Only use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, use electrical tape to cover the entire exposed metal surfaces of the available tools except their tips.
 - Connect battery cables with correct polarity. If battery cables are reversely connected, the solar inverter may be damaged.
 - All wiring must be performed by a professional person.
 - Do not disconnect under load! Battery can be placed in a no loads state by shutting down the inverter completely.
-

6.7.2 Battery Power Connection

Procedure:

STEP 1:

- Please use the pre-assembled battery power wire in the accessory box for connection.



STEP 2:

- Connect the battery cables to the inverter. A “click” sound will indicate firm connection.

CAUTION

- A DC breaker with OCP capability must be installed between inverter and battery. The battery may have this switch integrated. If not, an external DC switch of proper ratings should be used.
 - Please note that the waterproof cover of the IP65 battery circuit breaker should be closed and locked after installation.
-

6.7.3 BMS Communication Connection

Please check whether the BMS communication cable in the accessory box is appropriate for the battery. If you are not sure, please confirm with your battery vendor.

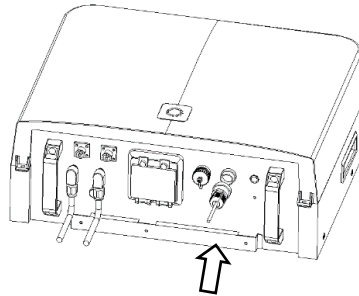
Procedure:

STEP 1:

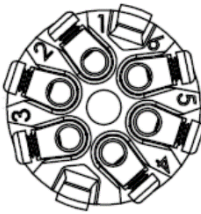
- Insert the BMS cable connector into BMS port on the inverter and screw it tightly.

STEP 2:

- Insert other side of communication cable into CAN port on the battery.
- Make sure the lithium battery BMS port connects to the inverter is Pin to Pin.



BMS Connector Pin Definition:



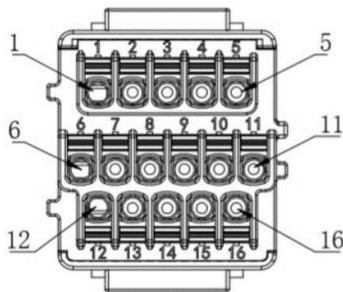
1. BMS_CAN_H
2. BMS_CAN_L
3. NULL
4. NULL
5. NULL
6. NULL

6.8 Smart Meter Connection

The inverter provides 16pin multi terminals to facilitate you to install Smart meter or other communication.

NOTICE

- Follow the pin definition below to connect the Multi port communication cables.
- Do not remove any resistors or short circuit wire unless you are going to use the corresponding PINs.



Signal Definitions

Pin	Definition	Description	Pin	Definition	Description
1	485B	485 contact interfaces for Smart meter	9	SYNC-TXA	Reserved
2	485A		10	N/A	
3	CT+		11	N/A	
4	CT-		12	N/A	Reserved
5	NC	N/A	13	N/A	
6	Parallel CANH	CAN Interface for Parallel Connection	14	NC	
7	Parallel CANL		15	Dry-	Dry Contact Interface for Generator
8	GND-C		16	Dry+	

Procedure:

STEP 1:

- Assemble the Smart Meter communication cable.
- Prepare the Smart Meter communication cable and take out the 16pin Multi connector and terminal pins from the package.
- Remove the cable jacket and strip the wire insulation by 0.5~12 mm.
- Insert the wires into the corresponding terminal pin and crimp them.
- Check all the wires are firmly installed.

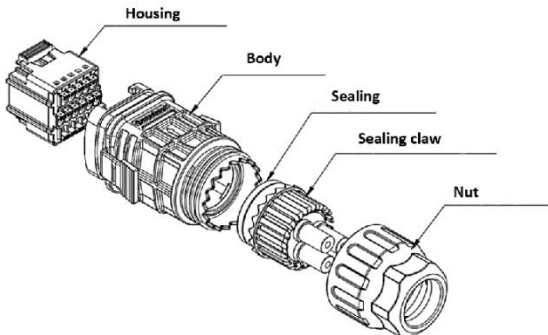
Meter Connector Pin Definition

PIN	1	2
Definition	485B	485A

STEP 2:

- Disassemble the 16pin Multi connector, then take out the Housing and remove one rubber plug from the Sealing. To avoid water and dust, keep the rubber plug to seal the unused holes.

16pin Multi connector show as below:

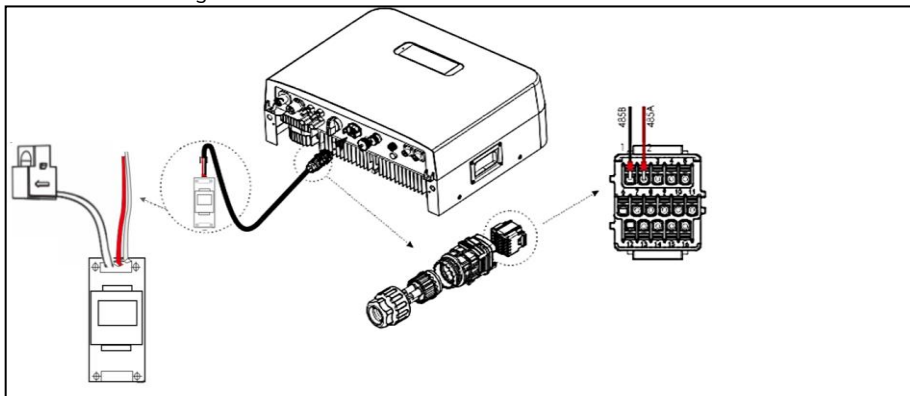


STEP 3:

- Feed the Smart Meter communication cable through the Nut, Sealing claw, Sealing, and the Body in sequence.

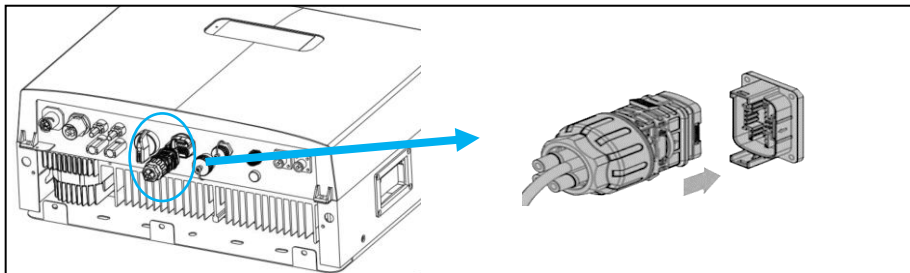
STEP 4:

- Insert the cables of the smart meter communication cable into the corresponding terminals on the Housing.

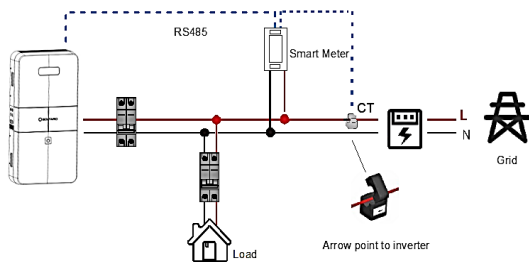


STEP 5:

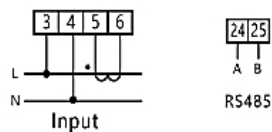
- Assemble the 16pin Multi connector and plug it into the communication terminal on the inverter.



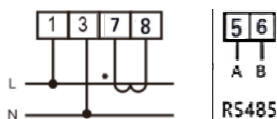
Smart Meter :



CHINT Meter:



LITOT Meter:

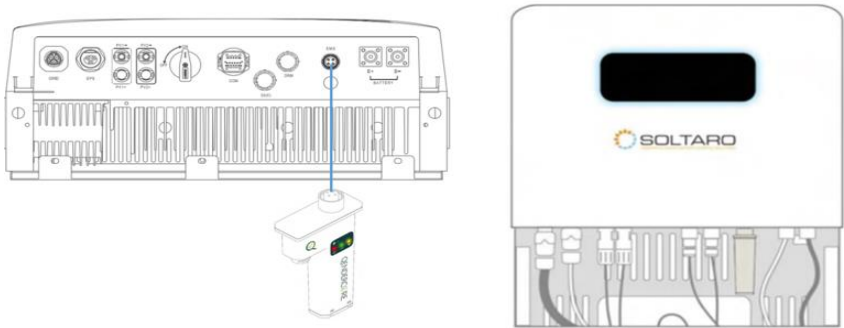


6.9 Qendercore Hub Connection

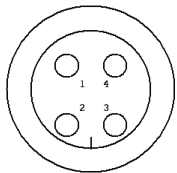
The inverter provides a communication port, which can collect data and transmit data of the inverter to the Cloud server via Qendercore Hub (Wi-Fi & LAN 2in1 function) to monitor the data status. For more details, refer to the Qendercore Hub Manual available on the Soltaro Website.

Procedure:

- Insert the Wi-Fi stick to the EMS port and fasten the nut tight.



“EMS” Connector Pin Definition

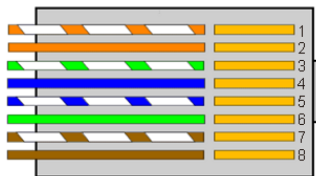


1. +5V
2. GNDD
3. RS485A
4. RS485B

6.10 DRM Connection

DRM is provided to support several demand response modes by certain control signals.

“DRM” Connector Pin Definition

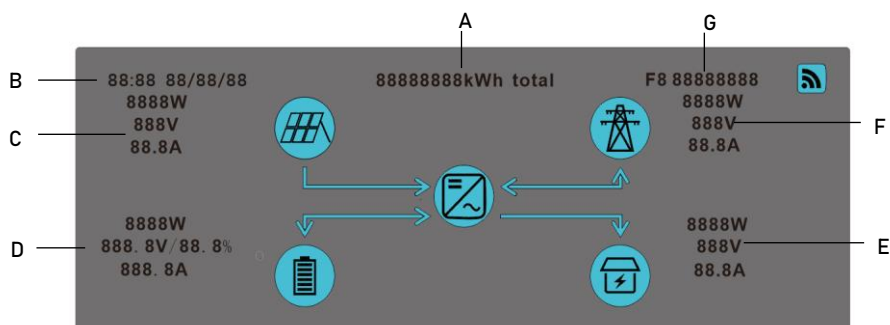


1. DRM1/5
2. DRM2/6
3. DRM3/7
4. DRM4/8
5. 3.3V
6. DRM0
7. 3.3V
8. GND

7 Operating of the Inverter

7.1 Graphical Display

The graphical display shows the detailed information of the inverter.



Position	Designation
A	Total energy the inverter has produced.
B	Time and date
C	PV system real-time parameters, including power, voltage and current. If the connection to PV is disconnected, the icon, arrow and data will not be displayed on the screen.
D	Battery real-time parameters, including power, voltage/SOC and current. If the connection to battery is disconnected, the icon, arrow and data will not be displayed on the screen.
E	Load consumption real-time parameters, including power, voltage and current. If the connection to load is disconnected, the icon, arrow and data will not be displayed on the screen.
F	Grid parameters, power, voltage and current. If the connection to grid is disconnected, the icon, arrow and data will not be displayed on the screen.
G	Error Code. It will be displayed when an error occurs.

7.2 Commissioning

Before commissioning the inverter, make sure:

- The country mark on the box is in accordance with the installation site;
- The inverter is correctly and firmly mounted;
- The Circuit breaker and RCD are correctly connected and are all in “off” position;
- All cables are connected according to chapter 6;
- Unused inputs must be sealed using the corresponding connectors or sealing plugs.

STEP 1: Power on the Grid

- Wait a while, the green LED should be glowing and the graphical display should start displaying. The icon of grid and its parameters should appear on the screen. If not, please power off and check for the connections of grid power line and smart meter.

STEP 2: Power on the Battery

- The battery icon and its parameters should be shown on the screen.

STEP 3: Power on the PV

- If there's sunlight, the PV icon and its parameters should be shown on the screen.
- Wait for a moment and the inverter will start a self-test procedure. When it is done successfully, the inverter will start using PV power to charge the battery or feed in power to the house and grid.

STEP 4: Switch on the loads

- The load parameters should show.

STEP 5: Configure the Wi-Fi stick

- Configure the Wi-Fi stick for remote monitoring. Please follow the instruction manual in the Wi-Fi stick's packing box. Otherwise please contact Soltaro for detailed instructions.

7.3 Decommission

STEP 1: Turn off the load;

STEP 2: Turn off the PV;

STEP 3: Turn off battery;

STEP 4: Turn off the main grid switch;

STEP 5: Wait for at least 5 minutes after the LED and graphical display black out for the internal circuits to discharge energy;

STEP 6: Disconnect all the power cables;

STEP 7: Disconnect all the communication cables, Remove the Wi-Fi stick;

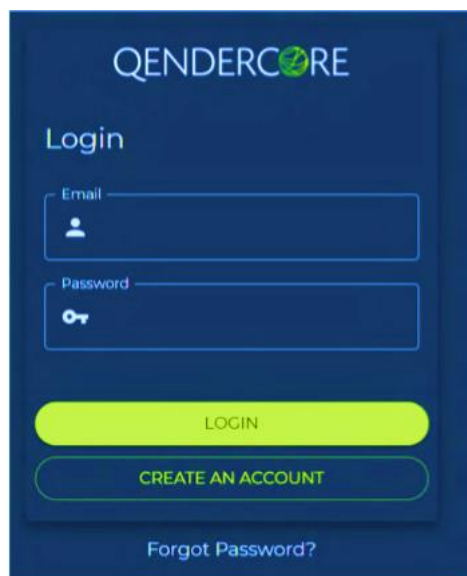
STEP 8: Remove the inverter from the wall, also remove the bracket if necessary;

STEP 9: Pack the inverter inside the original carton, and store it.

7.4 Network Configuration

Network configuration is necessary for online monitoring and after-sales support. All inverter settings are available via connection to the Qendercore Hub included with your Soltaro AIO2. Before attempting monitoring setup, please navigate to the Qendercore web portal at <https://www.qendercore.com/> and register a Qendercore end user account. These account details will need to be entered to setup monitoring for your Soltaro AIO2.

For details about Wi-Fi Configuration and system settings please refer to the Qendercore User Manual found on the Soltaro Website.



The image shows a login and registration interface for Qendercore. It features a dark blue background with the Qendercore logo at the top. Below the logo is the word "Login". There are two input fields: "Email" with a person icon and "Password" with a key icon. Below these fields are two buttons: a red "LOGIN" button and a blue "CREATE AN ACCOUNT" button. At the bottom, there is a link that says "Forgot Password?".

7.4.1 Connect to the Inverter

Procedure:

Please follow the instructions in the included Qendercore Installation Manual to connect to the inverter to access and adjust settings as required. All settings are protected by a password.

7.4.2 Check the Country

Each country code represents corresponding local protective parameters that have been preset before delivery.

Procedure:

STEP 1: Enter the Setting interface

- Enter the Settings interface, click “Basic Settings”;

STEP 2: Set the country

- Check the “Country”, make sure it is your current location;
 - If it is not your current location, please choose the right country, and click “Apply” to save the setting.
-

NOTICE

The inverter complies with AS/NZS 4777.2:2020, people in Australia need to select the corresponding Australia Region A/B/C for grid protection settings and power quality response modes settings. Please contact your local grid operator for which region to select.

7.4.3 Export Power Limit

You can set Grid Feed Power Limitation value (W) to enable Export Power Limit when your local grid operator allows limited external power feed into grid.

NOTICE

- Only effective when smart meter connected in the system.
 - If you use this function and set a Power limit value, then PV production could be limited if consumer load or battery charge power is low.
-

Procedure:

STEP 1: Enter the Setting interface

- Go to Settings interface, click “Basic Settings”.
-

STEP 2: Set Export Power Limitation

- Set Value of the Grid Feed Power/Inverter Power to allowable grid export/inverter output, according to your situation and/or local regulations;
 - Inv. Power Limitation (W): the allowable output power of the hybrid inverter (Default: Inverter nameplate power)
 - Export Power Limitation (W): Default value “65535” means Export Power Limit OFF, no limit on export to grid.
 - Click “Apply”, to save the settings.
-

7.4.4 Check Firmware & Time Synchronization

You can check the Inverter's SN, Firmware version and do Time Synchronization on the same page. It is recommended to perform Time Synchronization first after the inverter is installed and successfully connected to the Soltaro Local APP and then to set or modify the parameters.

Procedure:

STEP 1: Enter the Setting interface

- Go to the Settings interface, click “Inverter Operations”.
-

STEP 2: Check Firmware

- You can check the Serials (SN), Hardware code or firmware on this page.
-

STEP 3: Time Synchronization

- Click “Time & Date Sync.” to calibration and synchronize time. Inverter time and date can be synchronized to Qendercore Servers if internet connection is available. Otherwise, it can be synced to the device connected to the inverter.
-

8 Troubleshooting and Maintenance

8.1 Troubleshooting

This chapter is a guide for troubleshooting problems that may arise in the installation and operation of AIO2 Series inverters.

In the event that more than one error is generated at the same time, the hexadecimal error corresponding to each alarm is added together. That is to say, if error code 0006H is displayed, errors 0002H and 0004H are being produced simultaneously.

Error Code	Description	Solution
F1:00000001	PV1 Over Volt	Check the configuration of connected PV Panels.
F1:00000002	PV1 Over Current	
F1:00000004	PV2 Over Volt	
F1:00000008	PV2 Over Current	
F1:00000010	Low battery	
F1:00000020	PV Energy Weak	Check irradiance levels on the PV strings. Check for short circuit, open circuit etc. in the PV strings.
F1:00000040	PV Hardware Over Current	Check the inductive current of the PV Panels.
F1:00000100	Grid Voltage Abnormal	Check if grid has failed or the grid voltage or country settings are set correct
F1:00000200	Grid Frequency Abnormal	
F1:00000400	BUS Over Volt (AC)	Wait a few minutes for inverter recovery or restart the system. If the fault still exists, contact your dealer for technical support.
F1:00000800	INV Over current	
F1:00001000	DCI Abnormal	
F1:00002000	Leakage Current Abnormal	
F1:00004000	AC Over Current	Check the AC hardware Current
F1:00010000	EPS Voltage Abnormal	Check the EPS load. Make sure

F1:00020000	EPS Over Current	the load power is within the EPS power range.
F1:00040000	EPS Over Load	
F1:00080000	EPS Short Circuit	
F1:00100000	LVDC Temp High	Wait for the Inverter to cool down. Check if the installation location is too hot.
F1:00200000	Heat Sink (LVDC) Temp High	
F1:00400000	Heat Sink (AC) Temp High	
F1:02000000	Charge/Discharge 1 Over Current	Wait a moment for inverter recovery or restart the system. If the fault still exists, contact your dealer for technical support.
F1:04000000	Charge/Discharge 2 Over Current	
F1:08000000	Battery Over Current @HD	
F1:10000000	Resonant Over Current @HD	
F1:20000000	Bus Over Volt 1	
F1:40000000	Bus Over Volt 2	
F1:80000000	Bus Over Volt (DC)	
F2:00000001	Grid Grounding Fault	Check the grounding wire.
F2:00000002	L/N Reversely Connected	Check the L/N wire.
F2:00000004	PV Insulation abnormal	Check the insulation of PV panels.
F2:00000008	RCD Self-test failure	Wait a few minutes for inverter recovery or restart the system. If the fault still exists, contact your dealer for technical support.
F2:00000010	AC Relay Fault	
F2:00000020	EPS Relay Fault	
F2:00000040	Bypass Relay Fault	
F2:00000080	EEPROM Error	
F2:00000100	Grid Volt. Sampling Fault	
F2:00000200	Internal Comm. Fault(MCU1&2)	
F2:00000400	Internal Comm. Fault(MCU1&3)	
F2:00000800	Internal Comm. Fault(MCU2&3)	
F2:00004000	Firmware not compatible with U1 and U2	
F2:00001000	PV1 reverse	Switch off the DC Switch.
F2:00002000	PV2 reverse	Check whether the PV strings are correctly connected and reconnect the cables if need.
F2:00008000	Temperature sampling single fault	
		Contact your dealer for

F2:00010000	Boost circuit failure	technical support.
F2:00020000	Fan failure	
F2:00040000	Driver circuit failure	
F2:00100000	Single fault in grid frequency sampling	
F2:10000000	Parallel ID Conflict	Check the settings and wiring of the parallel system, If the fault still exists, contact your dealer for technical support.
F2:20000000	Parallel communication abnormality	
F2:40000000	Inconsistency in Parallel Parameters	
F2:80000000	Parallel fault	
F3:00000001	PAL Communication Fault	Check the cable in parallel system; Check the APP setting or version of the system. If the fault still exists, contact your dealer for technical support.
F3:00000002	PAL Multi-Master	
F3:00000004	PAL ModelHDFW Incompatibility	
F3:00000008	ATF Temp High	Wait for the Inverter to cool down. Check if the installation location is too hot.
F3:00000010	EPS Overload(L1)	Check the battery parameter settings. Contact with your local distributor.
F3:00000020	EPS Overload(L2)	
F3:00000040	AFCI Fault	Contact your dealer for technical support.
F3:00000080	AFCI self-test Fault	
F3:00000100	AFCI ARMCom Fault	
F3:00000200	Communications error, ATF	Communications failure to ATF. Check it, If the problem remains, please contact your dealer for technical support
F3:00000400	External Communications error, Smart Meter	Communications failure to smart meter. Check whether the communications cable connections of the Smart Meter/CT are correct/not damaged. Install the included

		1kohm resistor across the communications terminals of the smart meter. If the problem remains, please contact your dealer for technical support.
F3:00000800	Internal Comm. ARM and DSP	Wait a moment for inverter recovery or restart the system. If the fault still exists, contact your dealer for technical support.
F3:00002000	EEPROM Fault	
F3:00004000	External Communications error, BMS	Communication between Inverter and BMS is not working. Check BMS cabling is connected correctly and battery powered on. Check BMS setting for inverter.
F3:00008000	FW Upgrade Failure	Check if the firmware version is correct. Restart inverter, If the problem remains, please contact your dealer for technical support.
F4: {n}0000001	BAT Over Volt Protection	If this alarm occurs occasionally, the inverter & BMS can automatically recover to the normal operating status after the alarm is rectified, no action is required.
F4: {n}0000002	Cell Over Volt Protection	
F4: {n}0000004	BAT Under Volt Protection	
F4: {n}0000008	Cell Under Volt Protection	
F4: {n}0000010	BAT Over Current Protection	
F4: {n}0000020	BAT Over Temp Protection	If the alarm occurs repeatedly or lasts a long time, please contact your dealer for technical support.
F4: {n}0000040	BAT Under Temp Protection	
F4: {n}0000080	BAT Short Circuit	
F4: {n}0000100	BAT Over Volt Alarm	
F4: {n}0000200	Cell Over Volt Alarm	

F4: {n}0000400	BAT Under Volt Alarm	
F4: {n}0000800	Cell Under Volt Alarm	
F4: {n}0001000	BAT Over Current Alarm	
F4: {n}0002000	BAT Over Temp Alarm	
F4: {n}0004000	BAT Under Temp Alarm	
F4: {n}0008000	BAT Low SOC Alarm	

8.2 Recommended Maintenance

To ensure that the inverter can operate properly for a long term, you are advised to perform routine maintenance on it as described in this chapter.

CAUTION

- Risk of inverter damage or personal injury due to incorrect service!
- Always keep in mind that the inverter is powered by dual sources: PV strings and utility grid.
- Before cleaning the system, connecting cables, and maintaining the grounding reliability, power off the system (see 7.3 Decommission the System for details)

Maintenance list

Check Item	Method	Period
System clean	Check the temperature and dust of the inverter. Clean the inverter enclosure if necessary.	Once every 6 to 12 months
System running status	Check whether the inverter is damaged or deformed and operates with no abnormal sound.	
Cable entries	Check that all cable entries is sufficiently sealed, the gap is not excessively large, and reseal entries if necessary.	
Electrical connection	Check whether all cables are firmly in place. Check if any cables are damaged, especially the part contacting the metal enclosure.	

9 Technical Data

9.1 Specification of inverter

Inverter Model	AIO2- INS- 3000	AIO2-INS- 3680	AIO2-INS- 4600 AIO2-INS- 5000
AC Output @ Grid			
AC Input Voltage / Frequency	186 ~ 264Vac/ 50 or 60Hz		
Nominal AC Power	3000W	3680W	4600W/5000W
Nominal AC Current	13.0A	16.0A	20A/21.7A
Current (inrush)	35A/10ms	35A/10ms	35A/10ms
Maximum output fault current	80A/3ms	80A/3ms	80A/3ms
Conditional short-circuit current (I _{cc})	80A/3ms	80A/3ms	80A/3ms
Maximum output overcurrent protection	19.5A	24A	30A/33A
Recommended circuit breaker	20A type C/D	25A type C/D	32A type C/D
THD of AC Current	<3%		
AC Output @ Off Grid			
AC Output Voltage / Frequency	220Vac / 50 or 60Hz, Single Phase		
Continuous Output Power (@25C)	3kVA	3.68kVA	4.6kVA/5kVA
AC Output Current	13.0A	16.0A	20A/21.7A
Peak Power	1.1 x P _{nom} , 10 sec; 1.5 x P _{nom} , 100 ms		
Power Factor	0.8 inductive to 0.8 capacitive		

Waveform	Pure Sinusoidal Wave		
THD of AC Voltage	<3% with Resistive Load		
Solar Input			
Max. allowable PV panel power	4500W	5520W	7500W
Max. input power	3300W	4000W	5400W
Open circuit voltage	600V		
MPPT voltage range	125-500 V		
Max. PV current	12A	12/12A	12/12A
Max. Short Circuit Current	15A	15/15A	15/15A
Strings per MPP Tracker	1	1	1
Number of MPP Trackers	1	2	2
Galvanic Isolation for PV Modules	Transformerless		
Battery Input			
Battery Type	Lithium Battery		
Battery Voltage	40~60V		
Galvanic Isolation for Battery	YES		
Max Charge Current	60A	80A	100A
BMS Communication	CAN/RS485		
Protection	Over Voltage, Under Voltage, Over Current, Short Circuit, Over Temperature		
Efficiency			
MPPT Efficiency	99.90%		
Euro Efficiency	96.50%		
Max. Efficiency	97.80%		
Battery Charge Efficiency	95%		

General Data			
PV inverter topology	Non-isolated		
Dimensions	540*430*210 mm (inverter)		
Weight	27kg	29kg	34kg
Mounting Information	Wall mount		
Operating Temperature	-10°C to +60°C(up 45°Cderating)		
Relative Humidity	0 to 100%RH		
Site Altitude	Up to 2000m above sea level without de-rating		
IP Protection Type	IP65		
Protective class	Class I		
Cooling Concept	Free convection		

9.2 Specification of battery

Battery Model	AIO2-BTLV-5KWH		AIO2-BTLV-10KWH
Electrical Data			
Cell Type	LFP		
Total Energy	5 kWh		10kWh
Max. Depth of Discharge	90%		
Nominal Voltage	51.2 V		
Operating Voltage Range	40-58.4 V		
Nominal Capacity	100 Ah		200Ah
Max. Charge Current	50 A		100 A
Max. Discharge Current	100 A		100 A
Max. Parallel Number	3 units		
General Data			
Mounting information	Wall mount / Ground mount		

Communication	CAN / RS485	
Operating Temperature	0~45℃ charge / -10~50℃ discharge	
Dimension	540*430*210 mm	540*680*210 mm
Weight	45 kg	85 kg
IP Protection Type	IP65	

9.3 Certificates and Grid Regulations

●**EMC:**

EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4,
EN61000-4-18, EN61000-4-29

●**Safety:**

IEC/EN62109-1 & -2,
IEC62477-1

●**Grid Regulations:**

G98, G99;
AS/NZS4777.2;
C10/11;
EN50549

10 Contacts:

Head Office & Showroom

8 Mohr Street, Tullamarine, VIC, Australia 3043

Tel: +61 1300 276 582

Email: service@soltaro.com Support Head Office

service.au@soltaro.com Australian Support

UK/Europe Office

Unit 8, High Grounds Industrial Est., Worksop, Notts, S80 3AF, United Kingdom

Tel: +44 (0)1909 807 577

Email: service.uk@soltaro.com

Website

WWW.SOLTARO.COM

Registration URL

<https://soltaro.com/product-registration>