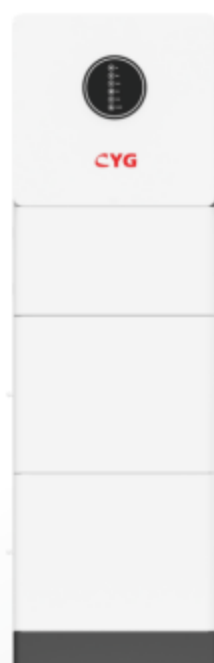


# Powermate A3.68/A4.6/A5/A6 Lite Residential

## ESS User Manual

Ver 1.6



December 2022

The Manual is applicable to Powermate A3.68/A4.6/A5/A6 Hybrid Inverter and is compatible with V1.1 and its compatible version programs.

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This Manual is compiled and published by **CYGET CO.,LTD.**Therefore, we reserve the right to the final interpretation of related products. We are sincerely sorry for that related products subsequently upgraded may be slightly different from those in the instruction manual and the manual may be upgraded without prior notice. Please pay attention to the discrepancy between actual products and corresponding description in this manual.

For more information about the products, please visit the website:<http://www.cyg-et.com>

**Free customer service hotline: +86 400-608-0122**

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# 1 Safety

Before using the Powermate Residential ESS , please read all instructions and cautionary markings on the unit and manual. Put the instructions where you can take them easily.

The ESS inverter of ours strictly conforms to related safety rules in design and test. Local safety regulations shall be followed during installation, operation and maintenance. Incorrect operation work may cause injury or death to the operator or a third party and damage to the inverter and other properties belonging to the operator or a third party.

## 1.1 Symbols Used

Safety Symbol	Description
	Danger of high voltage and electric shock! Only qualified personnel may perform work on the inverter.
	Danger of high voltage. Residual voltage in the inverter need 5 mins to discharge, wait 5 mins before operation.
	Danger of hot surface
	Fire danger
	Environmental Protection Use Period
	Refer to the operating instructions
	Product should not be disposed as household waste.
	Grounding terminal



## 1.2 Safety Precaution

- Installation, maintenance and connection of Powermate Residential ESS must be performed by qualified personnel, in compliance with local electrical standards, wiring rules and requirements of local power authorities and/or companies (for example: AS 4777 and AS/NZS 3000 IN Australia).
- To avoid electric shock, DC input and AC output of the Powermate hybrid inverter must be terminated at least 5 minutes before performing any installation or maintenance.
- The temperature of some parts of the Powermate hybrid inverter may exceed 60°C during operation. Do not touch the inverter during operation to avoid being burnt.
- Ensure children are kept away from Powermate Residential ESS.
- Don't open the front cover of the Powermate hybrid inverter. Apart from performing work at the wiring terminal (as instructed in this manual), touching or changing components without authorization may cause injury to people, damage to inverters and annulment of the warranty.
- Static electricity may damage electronic components. Appropriate method must be adopted to prevent such damage to the Powermate Residential ESS; otherwise the Powermate Residential ESS may be damaged and the warranty annulled.
- Ensure the output voltage of the proposed PV array is lower than the maximum rated input voltage of the Powermate Residential ESS; otherwise the hybrid inverter may be damaged and the warranty annulled.
- When exposed to sunlight, the PV array generates dangerous high DC voltage. Please operate

according to our instructions, or it will result in danger to life.

- PV modules should have an IEC61730 class A rating.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Completely isolate the Powermate Residential ESS before maintaining. Completely isolate the Powermate Residential ESS should: Switch off the PV switch, disconnect the PV terminal, disconnect the battery terminal, and disconnect the AC terminal.
- Prohibit inserting or pulling the AC and DC terminals when the Powermate Residential ESS is running.
- In Australia, the Powermate Residential ESS internal switching does not maintain the neutral integrity, neutral integrity must be addressed by external connection arrangements.
- In Australia, the output of backup side in switch box should be labeled main switch UPS supply, the output of normal load side in switch box should be labeled mains switch inverter supply.
- Don't connect Powermate Residential ESS in the following ways:
  - 1) EPS Port should not be connected to grid;
  - 2) The single PV panel string should not be connected to two or more inverters.

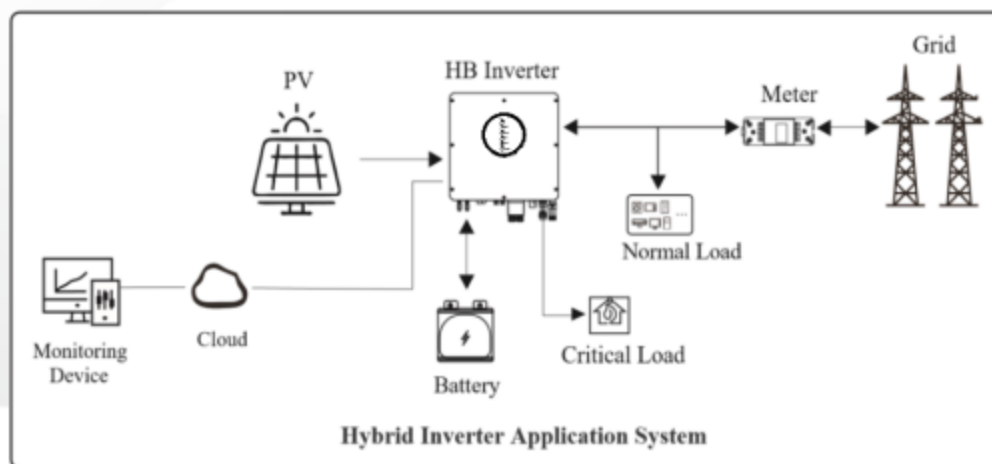
## 2 Introduction

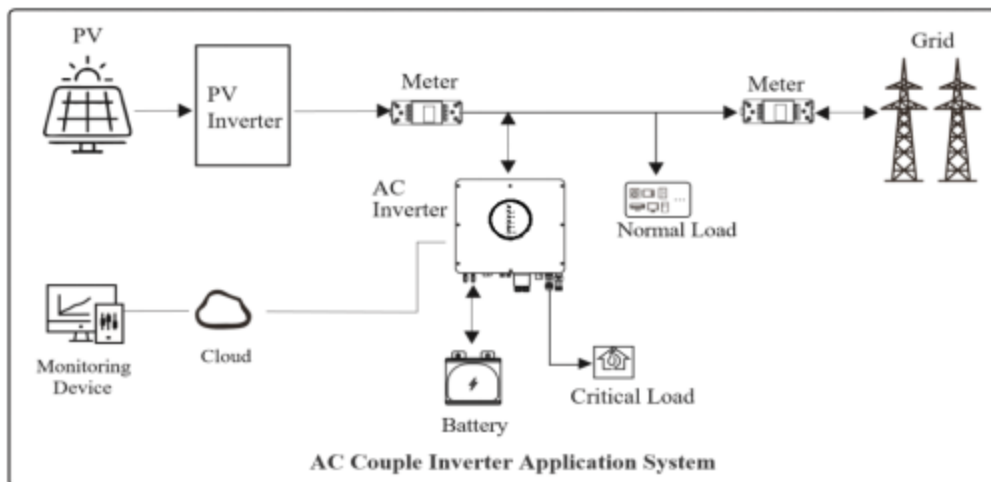
### 2.1 Preface

This manual will provide the users who use the Powermate Series of CYG ET CO., LTD. (SH. 600525) (Short for CYG Energy as below) with the detailed product information and the installation instructions. Please read this manual carefully and put this manual on some place where is convenient to installation, operation, obtain. Any modifications of CYG Energy, we will not notify the user.

### 2.2 System Introduction

The CYG energy storage system consists of Powermate A3.68/A4.6/A5/A6 inverters and Powermate Pack5.2 and system boxes. Powermate A3.68/A4.6/A5/A6 inverters and Powermate Pack5.2 are our standard products and can be sold independently. The system box is designed for energy storage systems and contains a DC battery circuit breaker (125A) that covers all cables, as shown below. It will save space in your room and it will be prettier without the clutter of wires. Our energy storage system can be used in DC coupled system (mainly newly installed), AC coupled system (mainly reformed). As shown in the following scheme:





**CAUTION:** For AC coupled systems, unlike hybrids, two power meters need to be installed.

## 2.3 Powermate P3.68/P4.6/P5/P6 Hybrid Inverter

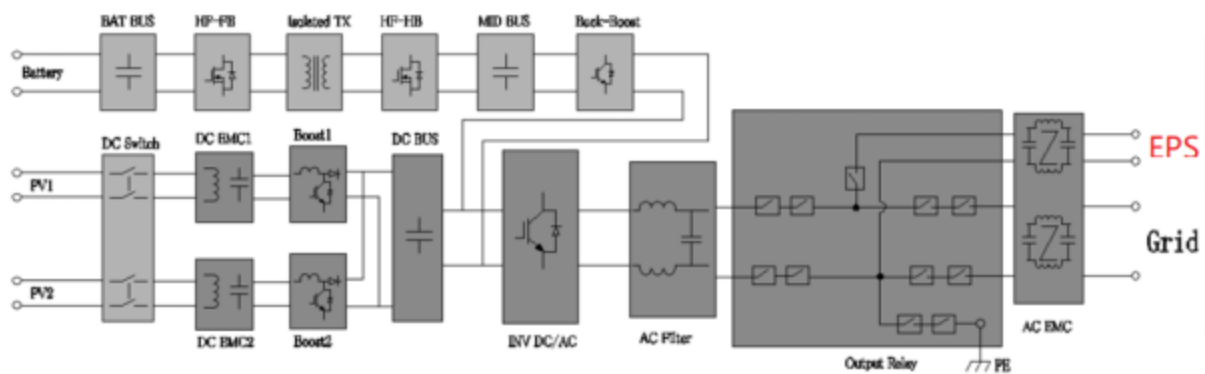
### 2.3.1 Product Overview

The Powermate P3.68/P4.6/P5/P6 hybrid inverters are high-quality inverter which can convert solar energy to AC energy and store energy into battery. The inverter can be used to optimize self-consumption, store in the battery for future use or feed into public grid. Work mode depends on PV energy and user's preference. It can provide power for emergency use during the grid lost by using the energy from battery and inverter (generated from PV).

Powermate P3.68/P4.6/P5/P6 are single phase ESS inverter which utilizes the advanced power electronics conversion components such as MOSFET, IGBT to convert the variable DC power generated from the photovoltaic (PV) arrays as well as batteries to the stable utility AC power, which can be fed into the commercial electrical grid. The battery port is able to be charged by the

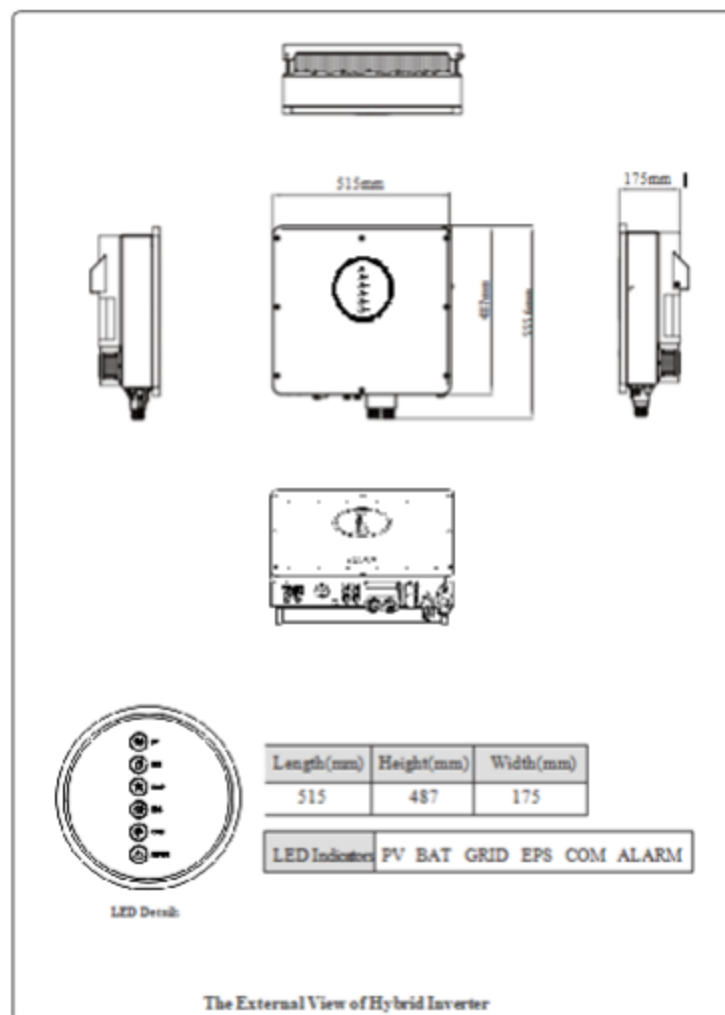
energy from either PV port or AC grid port. Powermate P3.68/P4.6/P5/P6 are also able to work in standalone mode while the grid voltage is not present. They are included communication ports such as RS485, CAN which are connected to the upper computer or network to monitor the status of the inverter by proprietary software. Earthing are provided by dedicated earthing terminals. Grid is protected combination with a two series of relays for each phase conductor as redundant build for ensure the inverter can independent disconnected from grid while a relay was fault.

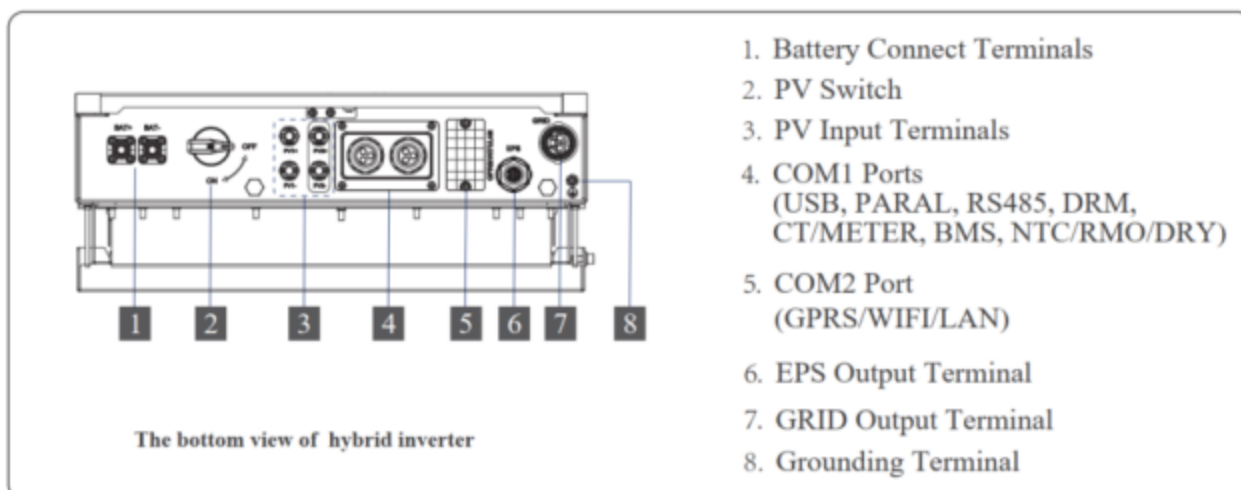
During fault condition, after the DSP receives the abnormal signal from the relevant protective detection circuit, the relays will operate to disconnect the inverter active lines from grid automatically.



System block diagram

2.3.2 Product Appearance





### 2.3.3 Specification

Model	Powermate P3.68/120	Powermate P4.6/120	Powermate P5/120	Powermate P6/120
<b>Efficiency</b>				
Max. efficiency (PV to AC)	96.00%		97.30%	
Max. efficiency (BAT to AC)	93.50%		94.00%	
<b>Input (PV)</b>				
Max PV power	4500W		9000W	
Max PV voltage			550V	
Max input current (input A/input B)			15A/15A	
Max short current (input A/input B)			20A/20A	
Start operating voltage			90V	
MPPT voltage range			70V-520V	
No. of MPPT trackers			2	
String per MPP tracker			1	
<b>Input (BAT)</b>				
Compatible battery type			Lithium-ion/Lead-acid	
Nominal battery voltage			48V	

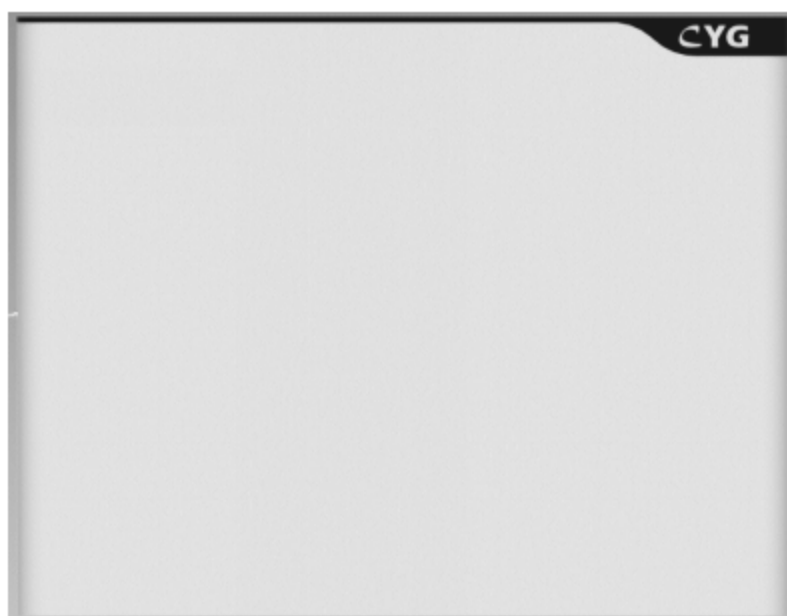
Battery voltage range	40V-60V			
Max. charge/discharge current	60A/60A	120A/120A	120A/120A	120A/120A
Max. charge/discharge power	3000W/3000W	5000W/5000W	5000W/5000W	6000W/6000W
Lithium battery charge curve	Self-adaption to BMS			
<b>Output (Grid)</b>				
Nominal AC output power	3680W	4600W	5000W	6000W
Max. AC output apparent power	3680VA	4600VA	5500VA	6000VA
Max. AC output power (PF=1)	3600W	4600W	5500W	6000W
Max. AC output current	18A	22A	25A	27.2A
Rated AC voltage	220V			
AC voltage range	150V-300V (Adjustable)			
Rated grid frequency	50Hz/60Hz			
AC frequency range	45Hz-55Hz/55Hz-65Hz (Adjustable)			
Grid connection	Single phase			
Power factor	> 0.99 @ rated power (Adjustable 0.8LD-0.8LG)			
THDI	<3% (Rated Power)			
<b>Output (Back up)</b>				
Nominal output voltage	230V			
Nominal output frequency	50Hz/60Hz			
Nominal output power	3000W	4600W	5000W	6000W
Nominal output current	13A	20A	21.7A	26A
Transfer time	10ms(typ) / 20ms(max)			
THDV	<3% @100% R Load			



## 2.4 Powermate Pack5.1 BESS

### 2.4.1 Product Overview

Powermate Pack5.1 is a lithium iron phosphate battery pack (including BMS) designed and manufactured by CYG. It is composed of 16 series of cells. This product is suitable for load equipment with working current less than 100A.

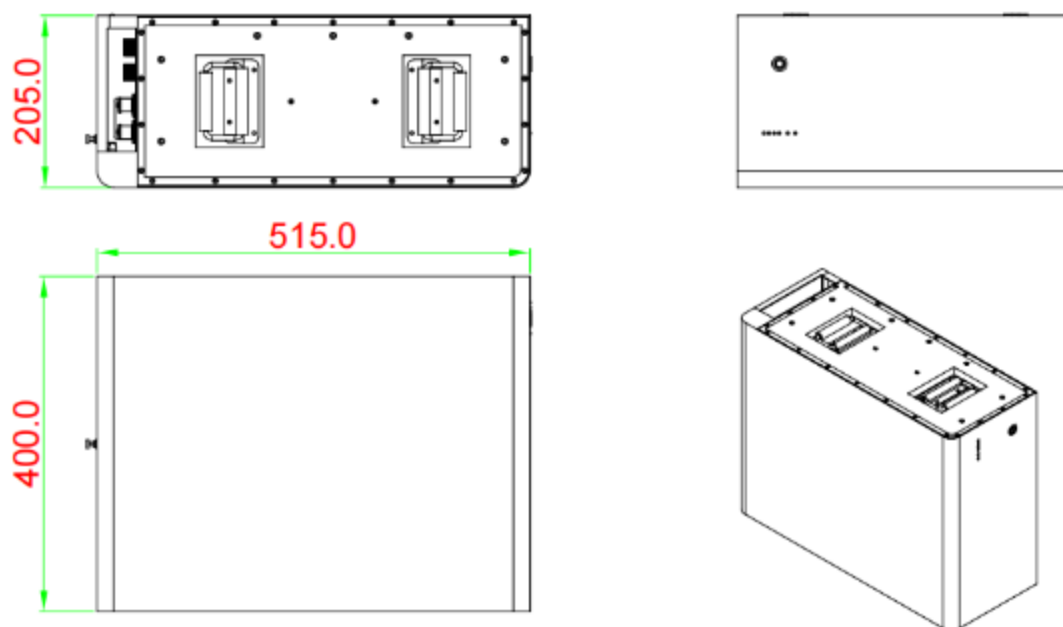


### 2.4.2 Specifications

Powermate Pack5.1 is 51.2 V100Ah battery Pack with

- 100A Max charge/discharge current.
- 20A current limiting function (current greater than 100A current limiting start).
- Communication function (RS232,CAN, dual RS485).
- Storage (500 pieces), 4 energy storage terminals, white case, silk-screen LOGO.

Product Type	Powermate Pack5.1
Cell Technology	Li-ion(LFP)
Capacity(kWh)	5.12
Voltage(Vdc)	51.2
Capacity(AH)	100
Battery Module Cell Series Quantity(pcs)	16
Charge Upper-Voltage(Vdc)	56.2
Charge Current(Amps.Normal)	50
Charge Current(Amps.Max)	100
Discharge lower-Voltage(Vdc)	45.6
Discharge Current(Amps.Normal)	50
Discharge Current(Amps.Max.)	100
Depth of Discharge(%)	90
Dimension(W*D*H,mm)	515*200*400
Communication	RS232/RS485,CAN
Protection Class	IP54
Weight (kg)	46.6
Charging Temperature(°C )	0-55
Discharging Temperature(°C )	-10-55
Storage Temperature(°C )	-20-55
Altitude(M)	<2,000
Product Certificate	IEC 62619、 IEC61000、 UL 1642(cell)
Transfer Certificate	UN38.3



Item	Value
Width (mm)	515 ± 2
Depth (mm)	205 ± 2
Height (mm)	400 ± 2

## 2.4.3 Button and Port

### 2.4.3.1 ON/OFF

For multiple Powermate Pack5.1 in parallel, long press (more than 3 seconds) ON/OFF button of MASTER battery (Which connect with inverter), normal LED will be lighted, battery system will automatically encode and assign ID to each slave battery, then battery system will operate normally.

Press ON/OFF button of Master PACK (which connect with inverter) more than 3s, LED will flash in the front panel and then release the button, the master pack will shut down after all slave packs

shut down (Sleep mode). In the system with inverter, there is a breaker between inverter and battery system, normally the breaker keeps off-state if the system does not work.

## 2.4.4 COM Port

CAN / RS485/RS232 Communication Terminal (RJ45 port).

CAN/RS485 connect to inverter, follow CAN / RS485 protocol.

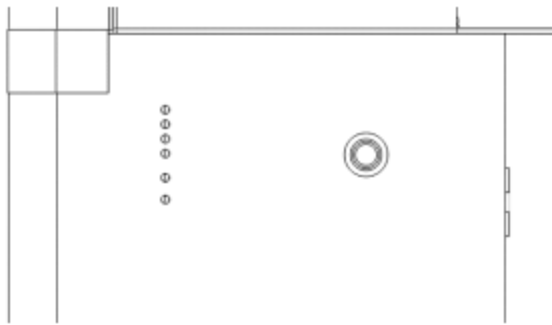
RS232 Communication follow RS232 protocol, for manufacturer or professional engineer to debug or service.

PIN	Definition
Pin 1	RS485-B (to PCS, reserved)
Pin 2	RS485-A (to PCS, reserved)
Pin 3	GND_2
Pin 4	CANH (to PCS)
Pin 5	CANL (toPCS)
Pin 6	RS232_TX
Pin 7	RS232_RX
Pin 8	RS232_GND

## 2.4.5 Link in/Link out

Link in/Link out are used for the communication between battery piles. The battery pack close to the inverter as the master, others are the slave pack.

**2.4.5.1 LED Indicator Definition**

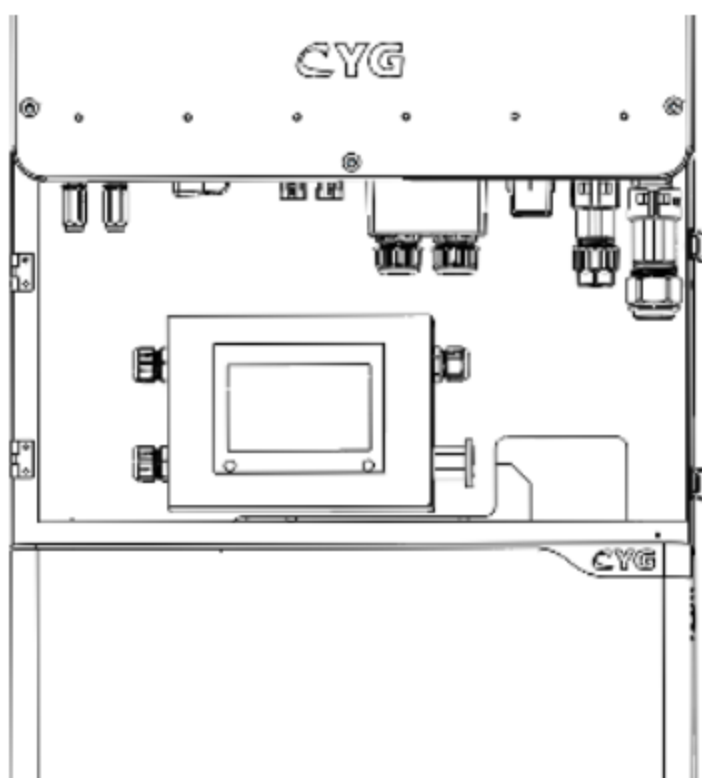


- Flash 1- 0.25 slight//3.75s off
- Flash 2 - 0.5s light /0.5s off
- Flash 3 - 0.5s light /1.5s off
- LED Indicators Instructions

Status	Normal/Alarm/Protection	ON/OFF	Normal	Fault	Power indicator LED						Descriptions	
Shutdown	dormancy	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	Light	Flash 1	OFF	According to the power indicator						Indicates Stand by	
	Alarm	Light	Flash 1	Flash 3							The module of low pressure	
Charging	Normal	Light	Light	OFF	The highest capacity indicator LED flashes(flash 2)						The highest capacity indicator LED flashes(flash 2),The overcharge ALM no flash	
	Alarm	Light	Light	Flash 3								
	Overcharge protection	Light	Light	OFF	Light	Light	Light	Light	Light	Light	Light	Turn to standby status when charger off
	Protection	Light	OFF	Light	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging
Discharge	Normal	Light	Flash 3	OFF	According to the battery level							

	Alarm	Light	Flash 3	Flash 3							
	UVP	Light	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharge
	Protection	Light	OFF	Light	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharge
Fault		OFF	OFF	Light	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging and Discharge

## 2.5 System box information



There is a DC breaker between battery and inverter and can cover all the cables as you can see, It will save your room space and much more beautiful without jumbled wiring.

### 3 System Operation Modes

The system supports several different operation modes.

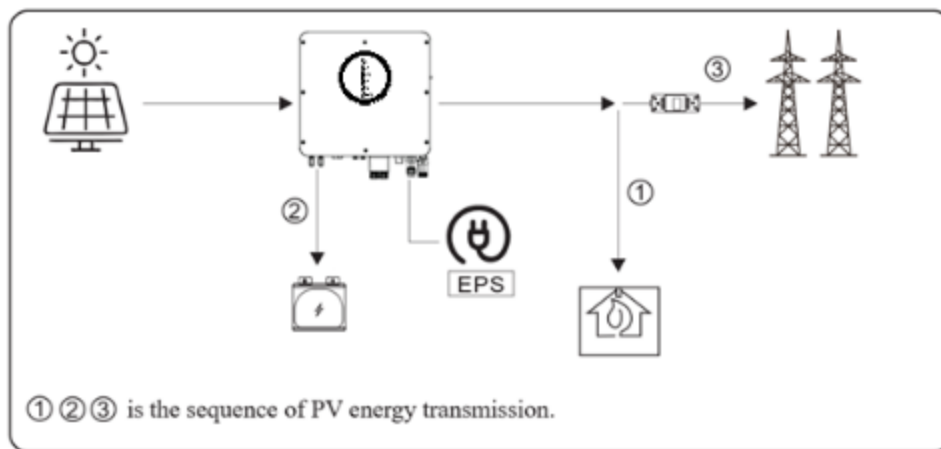
#### 3.1 Self Used Mode

Under Self Used mode, the priority of PV energy will be Load > Battery > Grid, that means the energy produced by PV gives priority to local loads, excess energy is used for charging the battery, and the remaining energy is fed into the grid.

This is the default mode to increase self-consumption rate. There are several situations of Self used working mode based on PV energy.

##### 3.1.1 Wealthy PV Energy

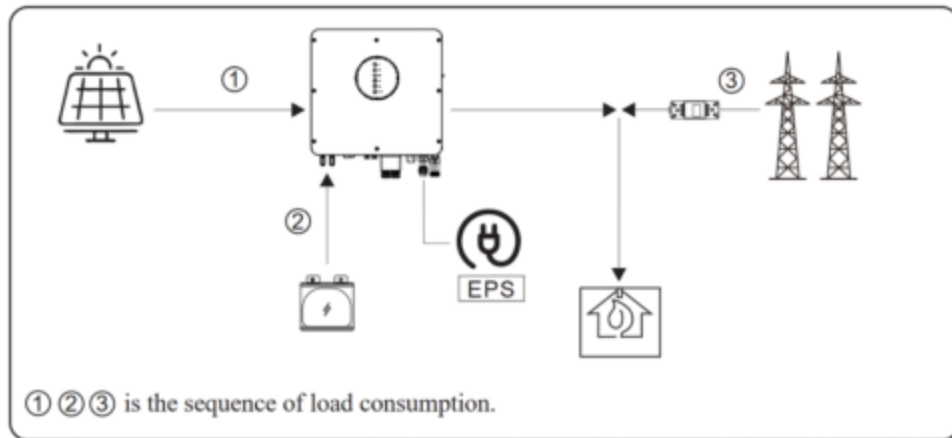
When PV energy is wealthy, the PV energy will first consumed by loads, the excess energy will be used to charge the battery. Then the remaining energy will be fed into the grid.



##### 3.1.2 Limited PV power

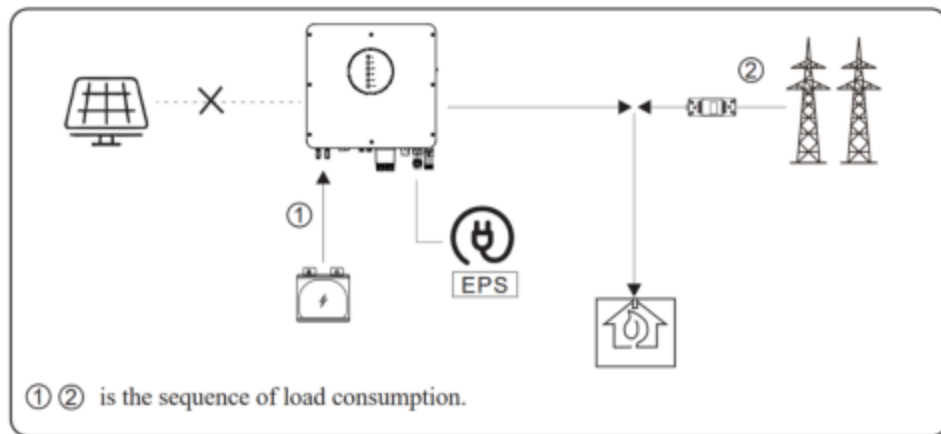
When the PV energy is not enough to cover all the loads, all the PV energy will be used for load, and the insufficient part will be supported by battery. Then still insufficient parts will be supported

by grid.



### 3.1.3 No PV Input

The inverter will first discharge the battery energy for home load consuming when no PV input( such as in the evening or some cloudy or rainy days). If the demand is not met then will consume the grid energy.



### 3.2 Feed-in Priority Mode

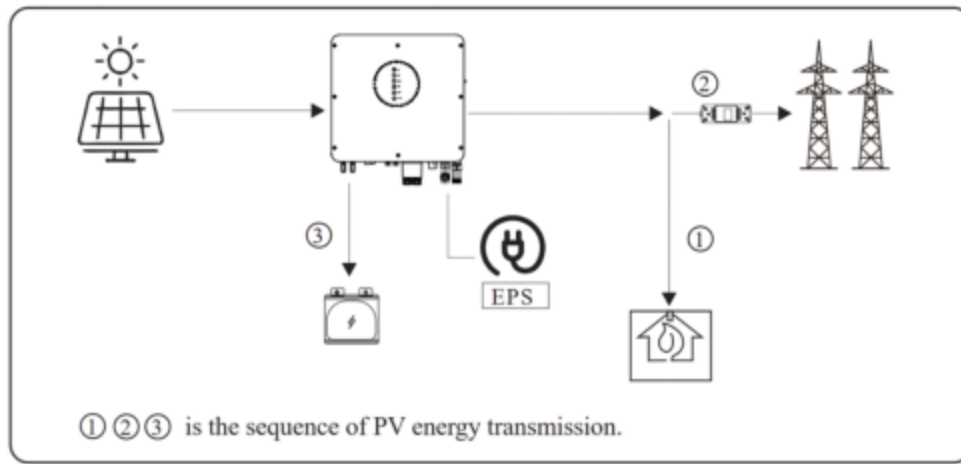
Under this mode, the priority of PV energy will be Load > Grid > Battery, that means the energy produced by PV gives priority to local loads, excess energy is fed into the grid, and the remaining



energy is used for charging the battery.

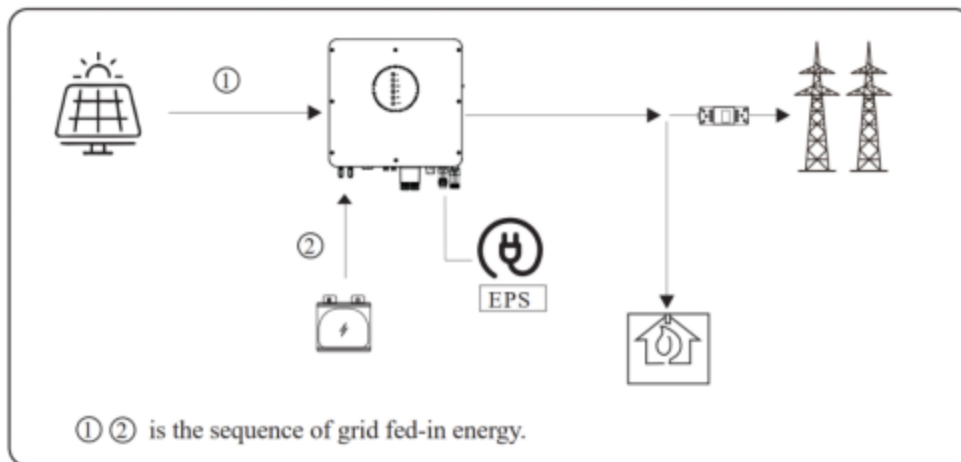
### 3.2.1 Wealthy PV Energy

When PV energy is wealthy, the PV energy will be first consumed by loads, if there is excess PV power, then the excessive power will be fed into grid. If there is still PV energy rested after load consuming and grid feeding, then the rested PV power will be used to charge the battery.



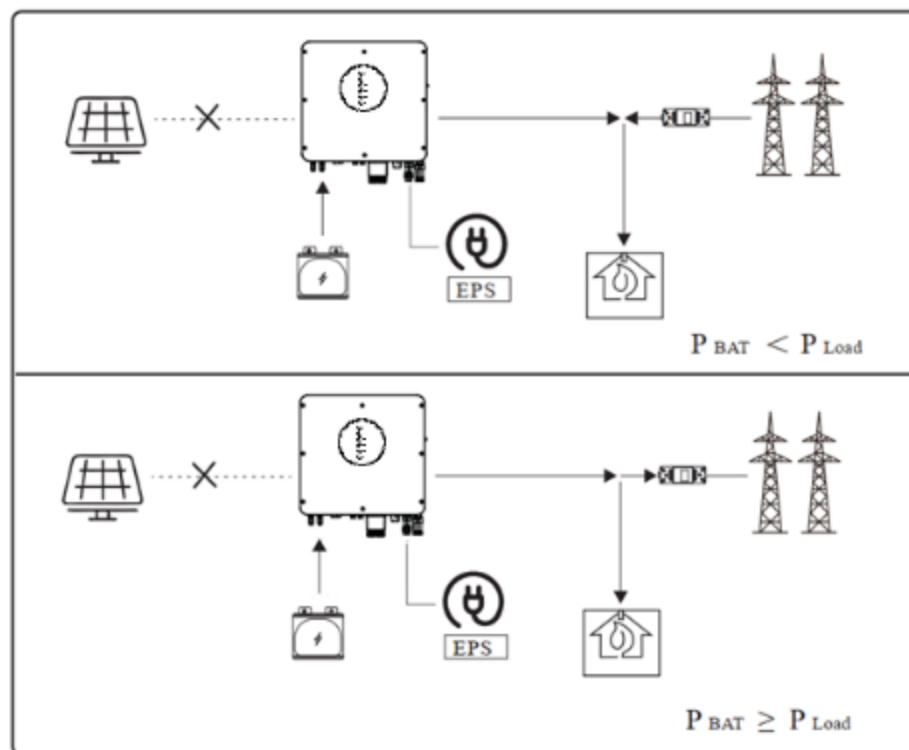
### 3.2.2 Limited PV power

When PV energy is limited and cannot meet the feed-in grid power, the battery will discharge to meet it.



### 3.2.3 No PV Input

The inverter will first discharge the battery energy for home load consuming when no PV input (such as in the evening or some cloudy or rainy days). If the demand is not met then will consume the grid energy.



### 3.3 Time-Based Control Mode

Under this mode, you can control the charging and discharging of the inverter. You can set the following parameters based on your requirements:

- Charge and discharge frequency: one time or daily
- Charging start time: 0 to 24 hours
- Charging end time: 0 to 24 hours
- Discharge start time: 0 to 24 hours
- Discharge end time: 0 to 24 hours

You can also choose whether to allow the grid to charge the battery, which is prohibited by default. If the user enable the "Grid charge function", the "Maximum grid charger power" and "Capacity of grid charger end" can be set. When the battery capacity reaches the set value of "Capacity of grid charger end", the grid will stop charging the battery.

### 3.4 Back-up Mode

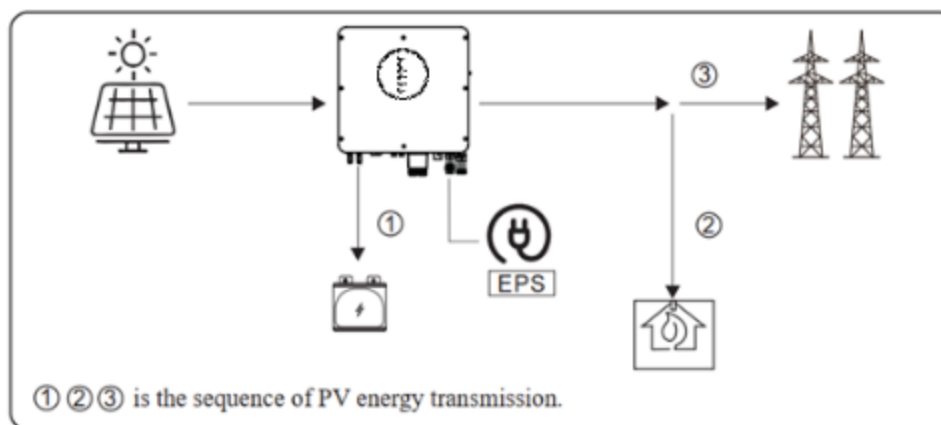
Under this mode, the priority of PV energy will be Battery > Load > Grid. This mode aims at charging the battery quickly, and at the same time, you can choose whether to allow AC to charge the battery.

#### 3.4.1 Forbid AC charging

In this mode, the battery can be charged only with PV power, and the charging power varies with PV power.

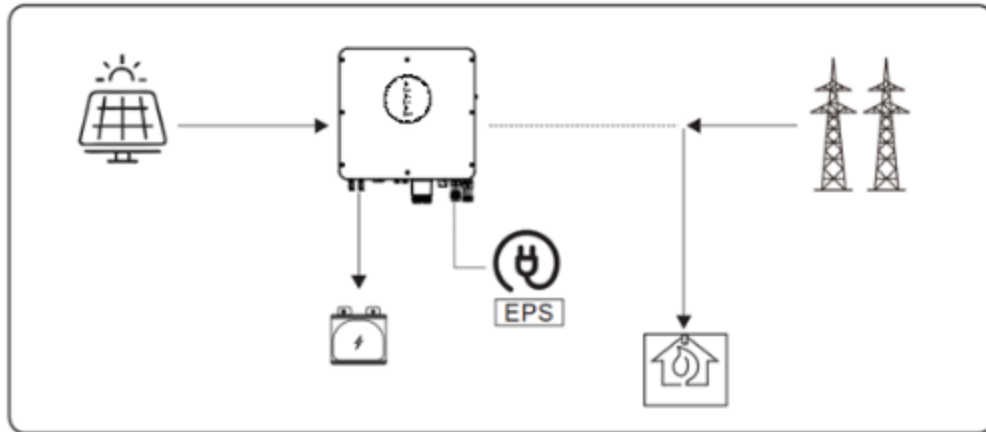
##### 3.4.1.1 Forbid AC charging: Wealthy PV Energy

When PV energy is wealthy, PV charges the battery first, then meets the load, and the rest is fed into the grid.



### 3.4.1.2 Forbid AC charging: Limited PV power

When PV energy is limited, PV gives priority to charging the battery, and the grid directly meet the load demand.

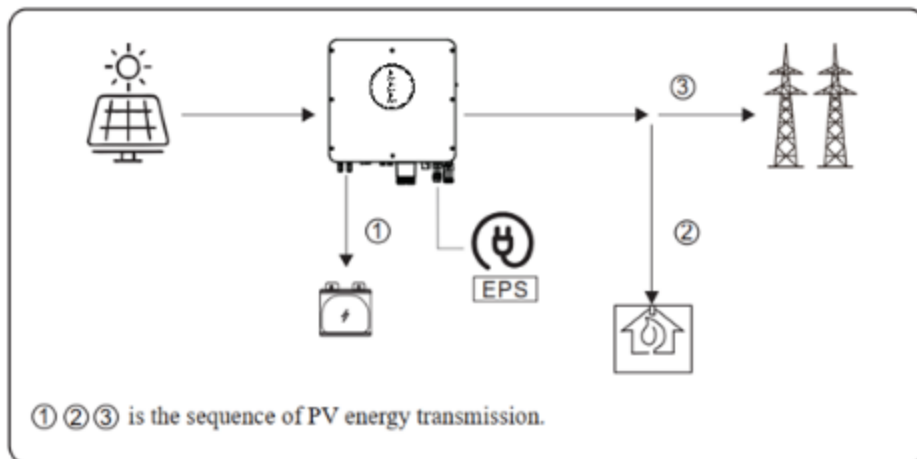


Allow AC charging

In this situation, the battery can be charged both with PV and AC.

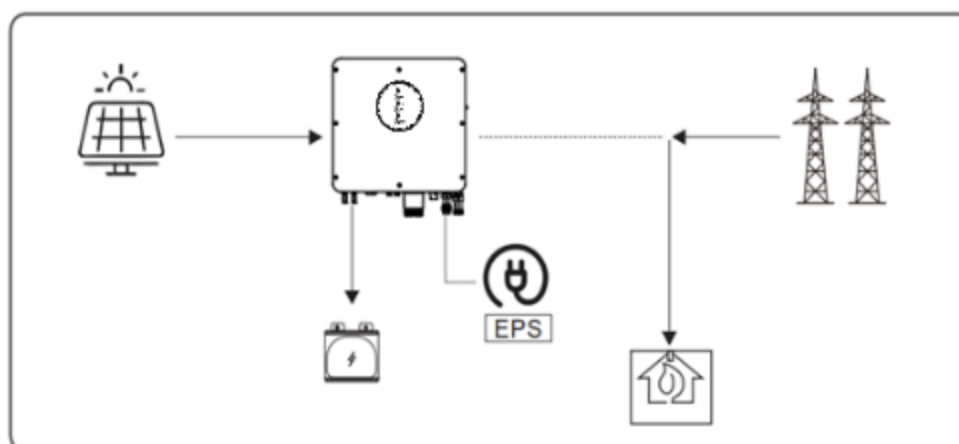
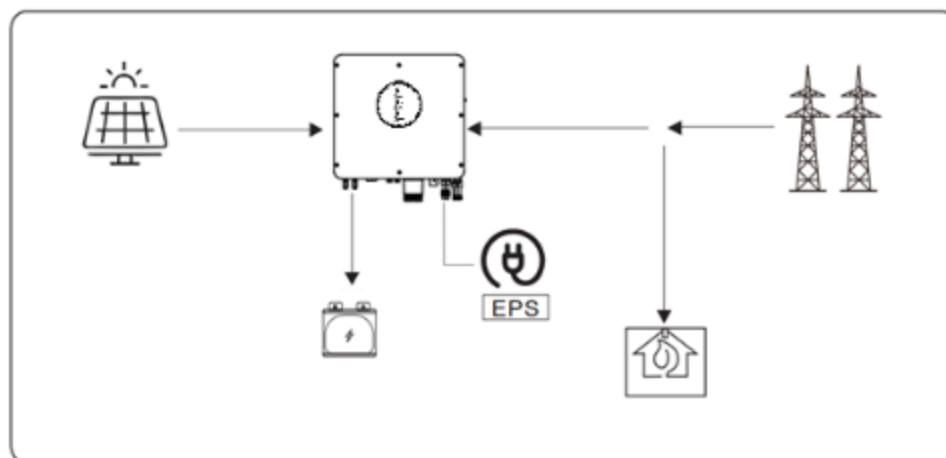
### 3.4.2 Allow AC charging: Wealthy PV Power

When PV energy is wealthy, PV charges the battery first, then meets the load, and the rest is fed into the grid.



### 3.4.3 Allow AC charging; Limited PV Power

When the PV energy is not enough to charge the battery, the grid energy will charge the battery as supplement. Meanwhile, the grid energy is consumed by loads.



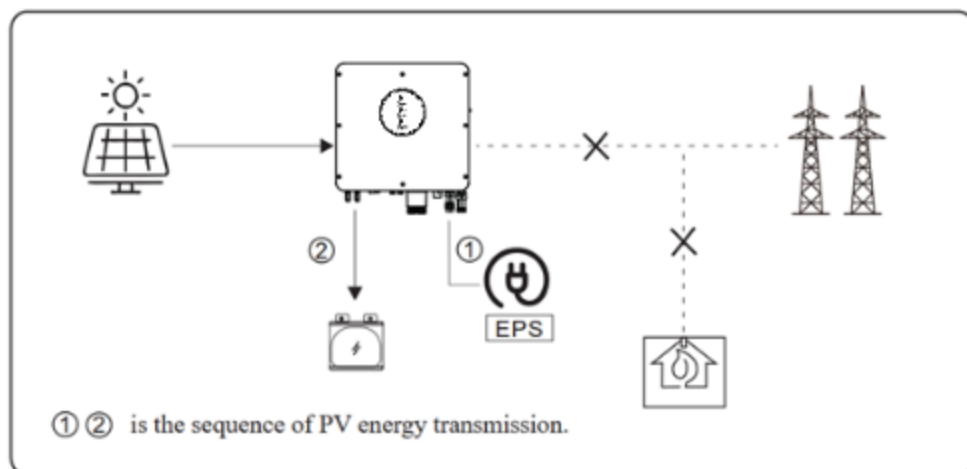
### 3.5 Off Grid Mode

When the power grid is cut off, the system automatically switches to Off Grid mode. Under off-grid mode, only critical loads are supplied to ensure that important loads continue to work without power failure.

Under this mode, the inverter can't work without the battery.

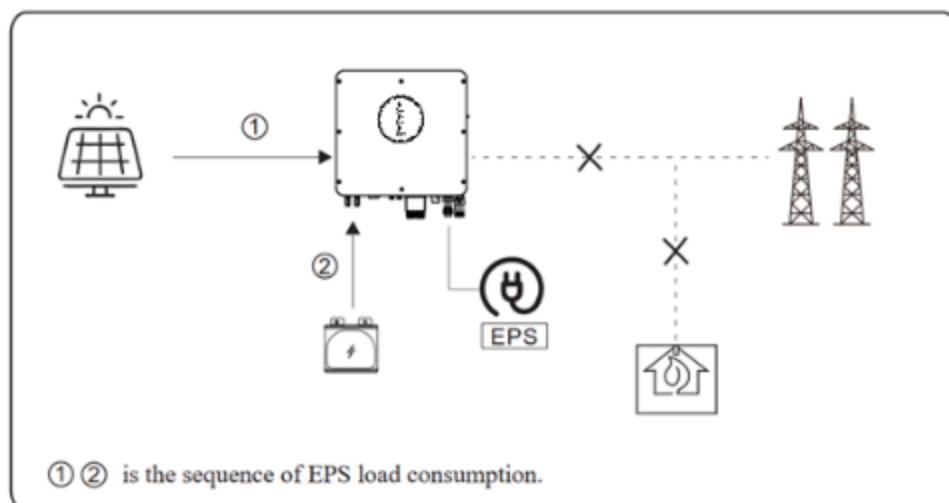
### 3.5.1 Wealthy PV Energy

When PV energy is wealthy, the PV power will be first consumed by critical load, charges battery then smart load.



### 3.5.2 Limited PV power

When PV energy is limited, EPS loads are first powered by PV and then supplemented by battery.



## **3.6 Safety Introduction**

### **3.6.1 Manual Keeping**

This manual is under the copyright of CYG SUNRI CO., LTD. with all rights reserved. Please keep the manual properly and operate in strict accordance with all safety and operating instructions in this manual. Please do not operate the system before reading through the manual.

### **3.6.2 Operator Requirements**

Operators should have professional qualifications or training. Be familiar with the entire storage system, including its components and working principles. Operators should be familiar with the Product Manual. During maintenance, do not operate any device until all devices are shut down and discharged completely.

### **3.6.3 Setting of Warning Sign for Safety**

During instruction, maintenance, and repair, follow the following instructions to prevent misuse or accidents caused by non-professionals:

- Clear signs should be placed at the front and rear switches to prevent accidents caused by wrong switches.
- Warning signs should be set up near the operation area.
- After maintenance or operation, reinstall the system.

### **3.6.4 Measuring Equipment**

Ensure that electrical parameters meet requirements.

Equipment is required for connection or testing of relevant measurement systems.

Make sure to connect and use matching specifications to prevent arcing or electric shocks.

### **3.6.5 Moisture Protection**

Moisture is likely to damage the system. Repair or maintenance activities should be avoided or limited in wet weather.

### **3.6.6 Operation After Power Failure**

Battery systems are part of an energy storage system that can store life-threatening high voltages even when the DC side is turned off. Do not touch the battery socket. Even when disconnected from the DC and/or AC side, the inverter can maintain life-threatening voltages. Therefore, for safety reasons, a properly calibrated voltage tester must be used to test the equipment before the installer can work on it.

## **3.7 Battery Safety Datasheet**

### **3.7.1 Hazard Information**

#### **Classification of hazardous chemicals**

Exemption classification under Australian WHS regulations.

#### **Other hazards**

This product is a lithium iron phosphate battery certified to comply with Section 38.3 of the United Nations Manual of Recommendations, Tests and Standards for the Transport of Dangerous Goods, Part ii. For the cell, the chemical material is stored in a sealed metal case designed to withstand the temperatures and pressures encountered during normal use. Therefore, in the



normal course of use, there is no physical danger of fire, explosion and chemical danger of leakage of dangerous substances. However, the gas release port will be operated if the product is subjected to fire, increases mechanical shock, decomposes, and misuse increases electrical stress. The battery case will be pushed to the limit. Harmful substances may be released. In addition, if the surrounding fire heats strongly, it may produce a pungent or harmful smoke emission.

## **3.8 General Precautions**

### **3.8.1 Danger**

- PV array, high battery voltage, electric shock is dangerous to life. When exposed to sunlight, PV arrays produce dangerous DC voltages, which will be present in the DC conductor and the charged components of the inverter. Contact with a DC conductor or live element can cause a fatal shock. If the DC connector is disconnected under load, arcing may occur, resulting in electric shock and burns.
- Do not touch both ends of the uninsulated cable.
- Do not touch the DC conductors.
- Do not turn on the inverter and battery.
- Do not wipe the system with a damp cloth.
- Only qualified personnel with appropriate skills can install and debug the system.

Before performing any work on the inverter or battery pack, disconnect the inverter from all voltage sources as described in this document.

### 3.8.2 Warning

- Danger of chemical burns from electrolytes or toxic gases. In the standard operation process, the battery pack has no electrolyte leakage, no toxic gas formation. If the battery pack is damaged or faulty, the electrolyte may leak or toxic gas may be generated.
- Do not install the system in an environment where the temperature is lower than  $-1^{\circ}\text{C}$  or higher than  $50^{\circ}\text{C}$ , and the humidity is higher than 90%.
- Do not touch the system with wet hands.
- Do not place heavy objects on the top of the system.
- Do not damage the equipment with sharp objects.
- Do not install or operate the system in a potentially explosive environment or high humidity area.
- Do not install the inverter and battery string in a place with highly flammable substances or gases.
- Do not install or operate the system if there is moisture seeping into the system (for example due to damage to the housing).
- Do not move the device when the battery module is connected. Safety system prevents tipping with restraint straps on your vehicle. The A5/A3 must be shipped by the manufacturer or a person with instructions. These instructions should be recorded and repeated.
- You must carry an ABC certified fire extinguisher with a minimum capacity of 2kg.
- Smoking is strictly prohibited in the vehicle and near the vehicle while loading and unloading.
- When replacing the battery module, if the dangerous goods package needs to be changed,

please ask the supplier to change the dangerous goods package and take delivery of the goods by himself.

- In case of contact with electrolyte, flush the affected area with water immediately and seek medical attention immediately.

### 3.8.3 Caution




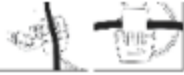





There is a risk of injury to the lifting system. Inverters and batteries are heavy. There is a risk of injury if the inverter or battery is mistakenly lifted or dropped during transportation or when connected to or removed from a wall.



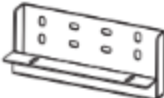



Inverter and battery lift transport must be carried out by more than two people.

## 3.9 Parts List

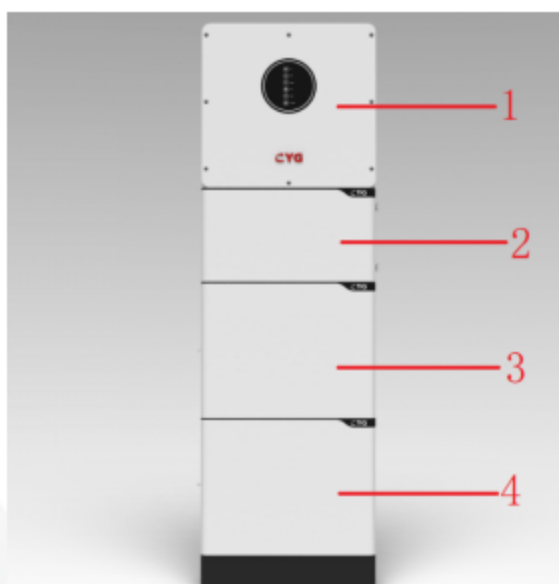
Check the following parts list to ensure it is complete.

Delivers a total system separately on site to client, this consists of:

P5/P3				
				
4xM5*12	2xφ8*60	1xCT Connector	1xCT and com cable	2xAC Collector
				
2xMC4	1xCollector	1x Mounting Panel	1xUser Manual	

PACK10.2 (include two pieces PACK5.1)		
		
8xφ8*60	4xM5*12	2xMounting Panel
		
8xM6 Gasket	2xPower Cable(1 black, 1 red)	1x Battery Communication Cable

### 3.10 System Appearance



Object	Description
1	Hybrid Inverter
2	System box
3	PACK1(Battery 1)
4	PACK2(Battery 2)

### 3.11 Liability Limitation

It does not assume any direct or indirect responsibility for any product damage or property damage caused by the following circumstances.

- Modifying or changing the design or replacing parts without authorization;
- Changing, repairing and erasing serial numbers or seals by non-professional technicians;
- System design and installation does not meet standards and regulations;
- Failure to comply with local safety regulations (VDE is DE, SAA is AU) ;
- Transportation damage (including paint scratches caused by internal friction of packaging during transportation). In such cases, once the container/package has been unloaded and such damage has been determined, a claim should be made directly to the shipping company or insurance company;
- Does not comply with any user manual, installation guide and maintenance procedures;
- Improper use or misuse of equipment; Insufficient ventilation of equipment;
- Product-related maintenance procedures are not up to acceptable standards;
- Force majeure (violent or stormy weather, lightning, overvoltage, fire, etc.);
- Damage caused by any external factors.

## 4 Installation

### 4.1 Installation site and environment

#### 4.1.1 General

This Powermate ESS is outdoor version and can be installed in an outdoor or an indoor location.

When Powermate ESS are installed in a room, it must not be hampered by the structure of the building, the furnishings and equipment of the room.

The Powermate ESS is naturally ventilated. The location should therefore be clean, dry and adequately ventilated. The mounting location must allow free access to the unit for installation and maintenance purposes, and the system panels must not be blocked.

The following location are not allowed for installation:

- Habitable rooms;
- Ceiling cavities or wall cavities;
- On roofs that are not specifically considered suitable;
- Access/ exit areas or under stairs/ access walkways;
- Where the freezing point can be reached, such as garages, carports or other places as well as wet rooms(environmental category 2);
- Locations with humidity and condensation over 85%;
- Places where salty and humid air can penetrate;
- Seismic areas- additional security measures are required;
- Sites higher than 3000 meters above sea level;

- Places with an explosive atmosphere;
- Locations with direct sunlight or a large change in the ambient temperature;
- Places with flammable materials or gases or an explosive atmosphere.

## 4.1.2 Restricted Locations

The Powermate ESS shall not be installed:

- In restricted locations as defined for panels in AS/ NZS 3000;
- Within 600 mm of any heat source, such as hot water unit, gas heater, air conditioning unit or any other appliance;
- Within 600 mm of any exit;
- Within 600 mm of any window or ventilation opening;
- Within 900 mm of access to 240Vac connections;
- (Within 600 mm of side of other device.

A Powermate ESS installed in any corridor, hallway, lobby or the like and leading to an emergency exit shall ensure sufficient clearance for safe egress of at least 1 meter.

The Powermate ESS must also not be installed in potentially explosive atmospheres for gas cylinders that are heavier than air gases and have a vent clampin.

## 4.1.3 Installation Environment

To protect against the spread of fire in living spaces where the Powermate ESS is mounted or on

surfaces of a wall or structure in living spaces with a Powermate ESS on the other side, the wall or structure shall have a suitable non-combustible barrier. If the mounting surface itself is not made of a suitable non-combustible material, a non-combustible barrier can be placed between the Powermate ESS and the surface of a wall or structure.

If the Powermate ESS is mounted at a wall or at a distance of 300mm from the wall or structure separating it from the habitable space, the distances to other structures or objects must be increased. The following distances must then remain free:

- 600 mm beside the Powermate ESS;
- 600 mm above the Powermate ESS;
- 600 mm before the Powermate ESS.

If the distance between the Powermate ESS and the ceiling or any object above the system is less than 600 mm, the ceiling or structural surface above the system must be made of non-combustible material within a radius of 600 mm around the system.

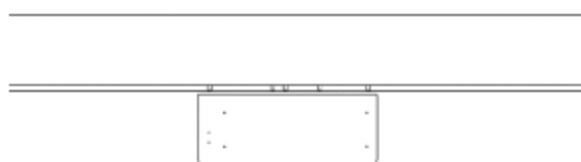
The Powermate ESS must be mounted so that the highest point is not more than 2.2m above the ground or the platform.

## **4.2 Installation steps about Powermate ESS**



### 4.2.1 Step 1

Take out the base from system box and placed the base against the wall, the distance between the base and the wall is 30mm as follows. Use the gradienter to keep the base is not acclinic.



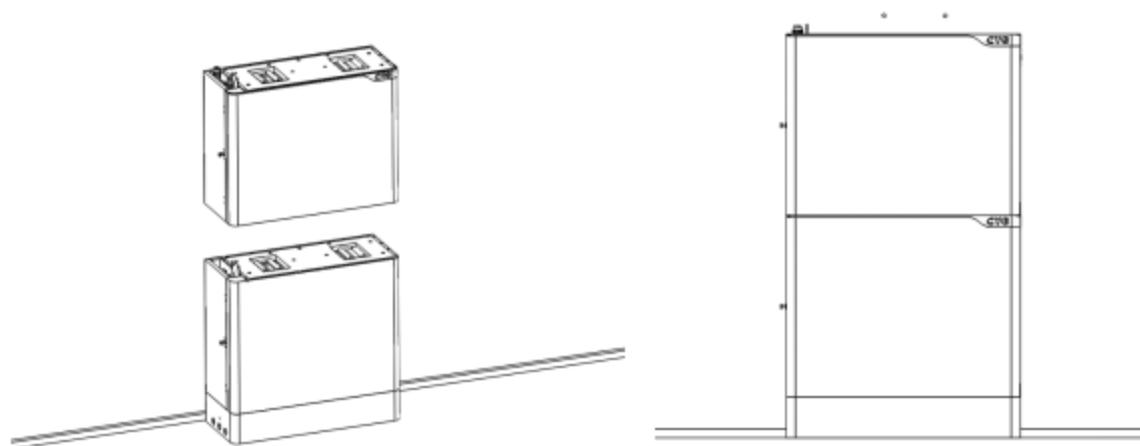
### 4.2.2 Step 2

Installation of the first Battery PACK: Place the first Battery PACK on top of the base. The four positioning holes at the bottom of the first Battery PACK should be aligned with the positioning pins, as shown below:



### 4.2.3 Step 3

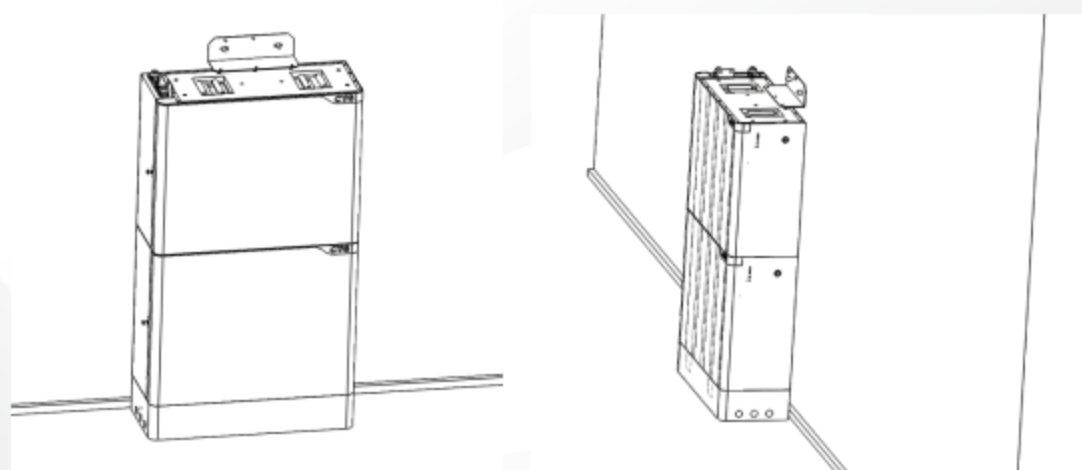
Installation of the second battery PACK: Before installation, you need to install 4 M5 pins on the upper cover of the first PACK as shown in the figure below. The four positioning holes at the bottom of the second Battery PACK should be aligned with the positioning pins:



Schematic diagram of two PACKs installed

#### 4.2.4 Step 4

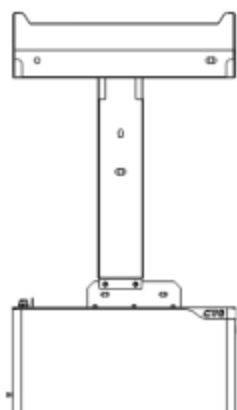
Install the L-shaped bracket and move the PACK to attach the L-shaped bracket to the wall.



#### 4.2.5 Step 5

Drill holes for the inverter wall bracket. First, lock the lower end of the inverter wall bracket with two m5 flange nuts, and then use a marker pen to trace the position of the fixing holes between the

inverter wall bracket and the wall and the position of the L-shaped bracket and the wall. ,As shown below:



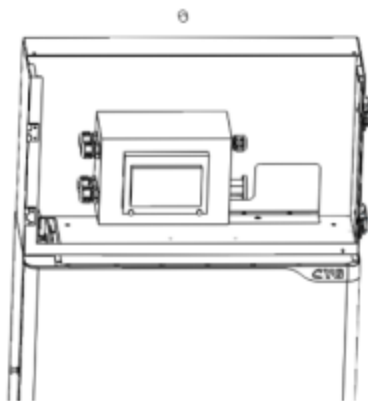
### 4.2.6 Step 6

Drill holes and install the expansion screws of the inverter bracket and the L-shaped bracket.



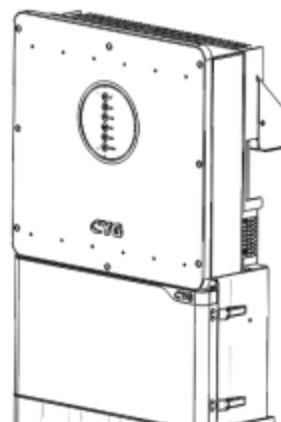
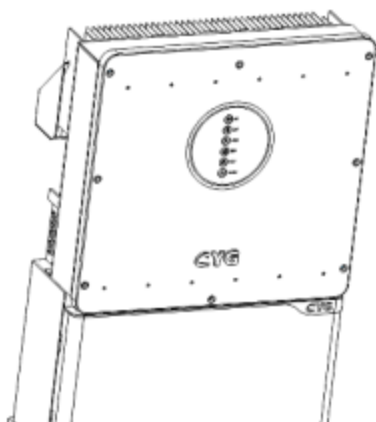
### 4.2.7 Step 7

Install the junction box and lock the junction box to the PACK with 4 pieces of M5X10 cross outer hexagon, as shown in the figure below:



### 4.2.8 Step 8

Install the inverter according to the method shown in the figure below. When the front panel of the inverter is flush with the junction box below, tighten the screws between the inverter and the bracket..

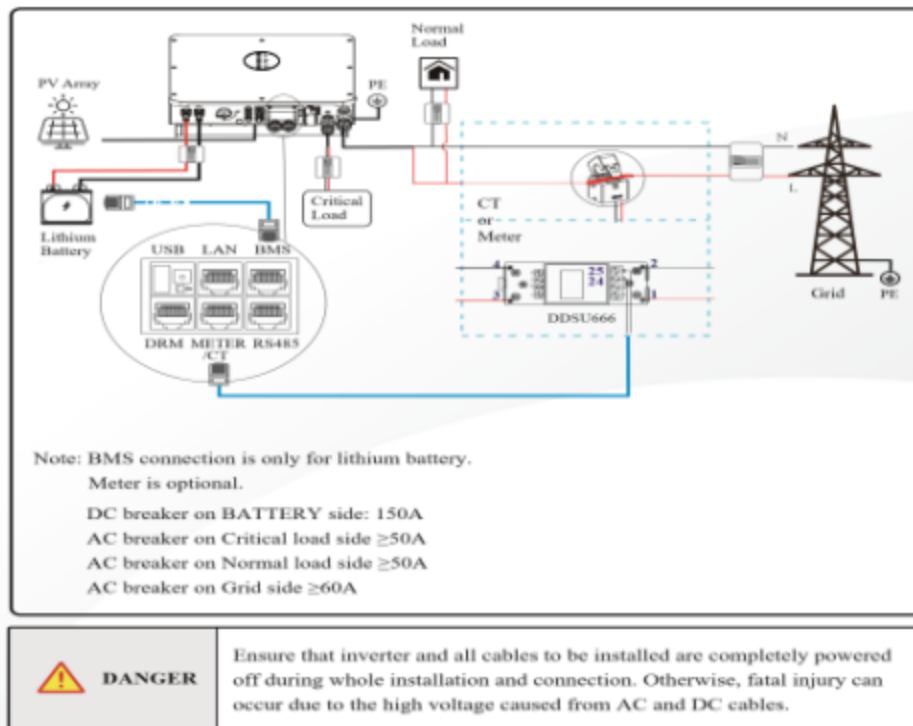


## 5 Electrical Connection

This chapter shows the details connection of Powermate ESS . And PV connection is N/A for Powermate hybrid inverters. The following illustration only uses the Powermate series hybrid inverters as an example.

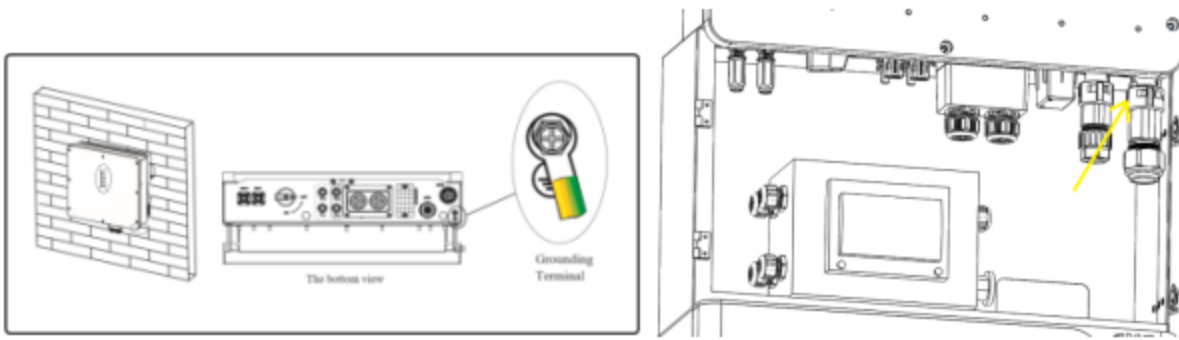
Powermate system connection diagram:

A protective earth (PE) terminal is equipped at the side of the inverter. Please be sure to connect this PE terminal to the PE bar for reliable grounding. AWG 10 or 12 yellow green lines are recommended.

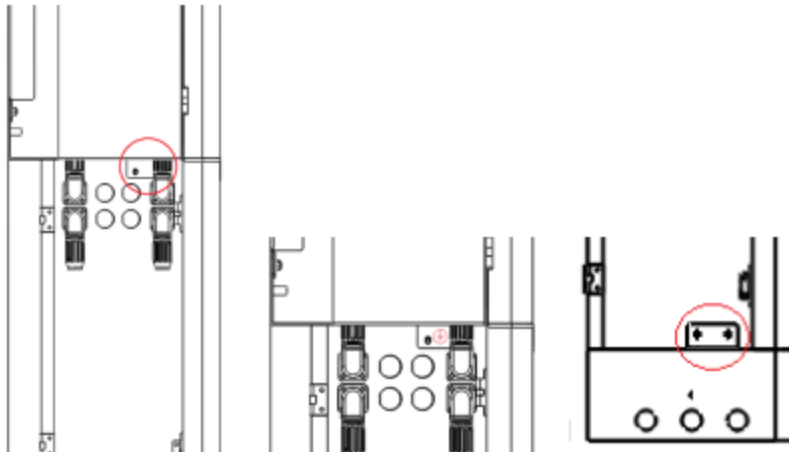


### 5.1 Grounding

- a. Connect to the ground between inverter and system box using M5 hexagon nuts with flange

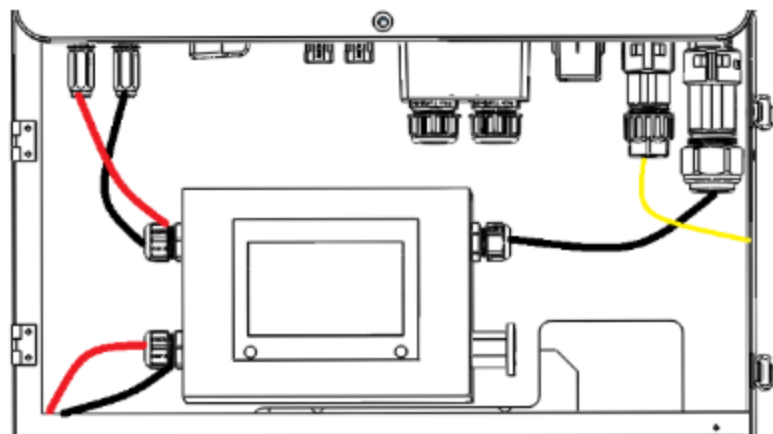


- b. Connect the battery to ground with a small metal plate using screw M4\*8 (from the system packaging box) as follows and there is a 1.5m GND cable fix the base

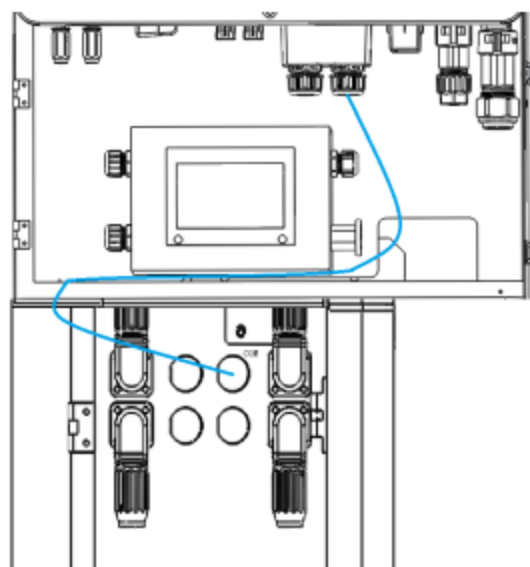
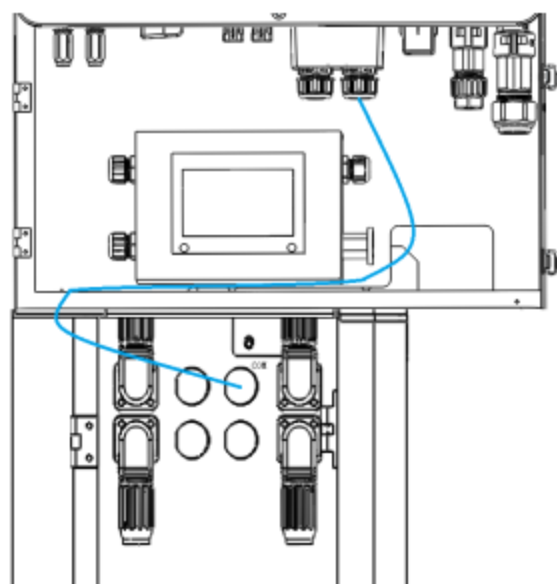


## 5.2 Battery power and communication cable connection

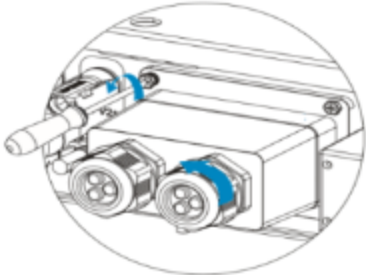
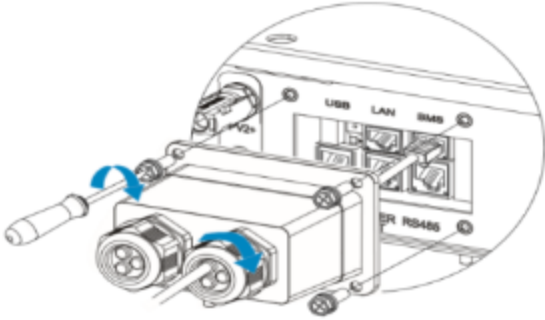
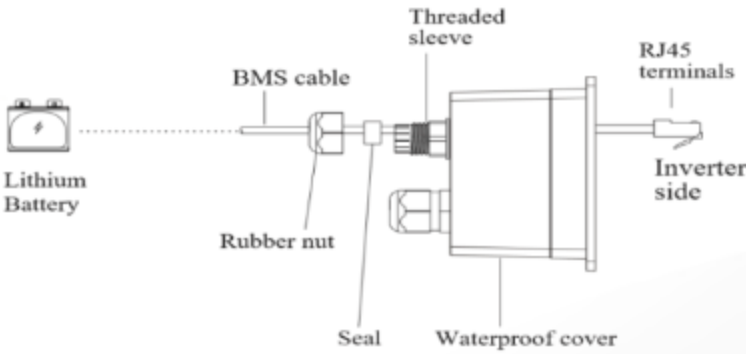
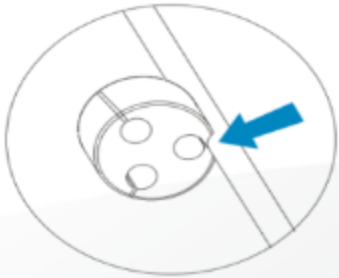
Connect the battery power cable in the down side of the breaker in the system box to the upper battery which is the master battery. Connect the battery power cable in the up side of the breaker in the system box to the inverter battery ports. Connect the battery in parallel using power cable and communication cable as follow:



Connect the BMS cable to the inverter BMS port directly through the system box.



Refer to the following steps:

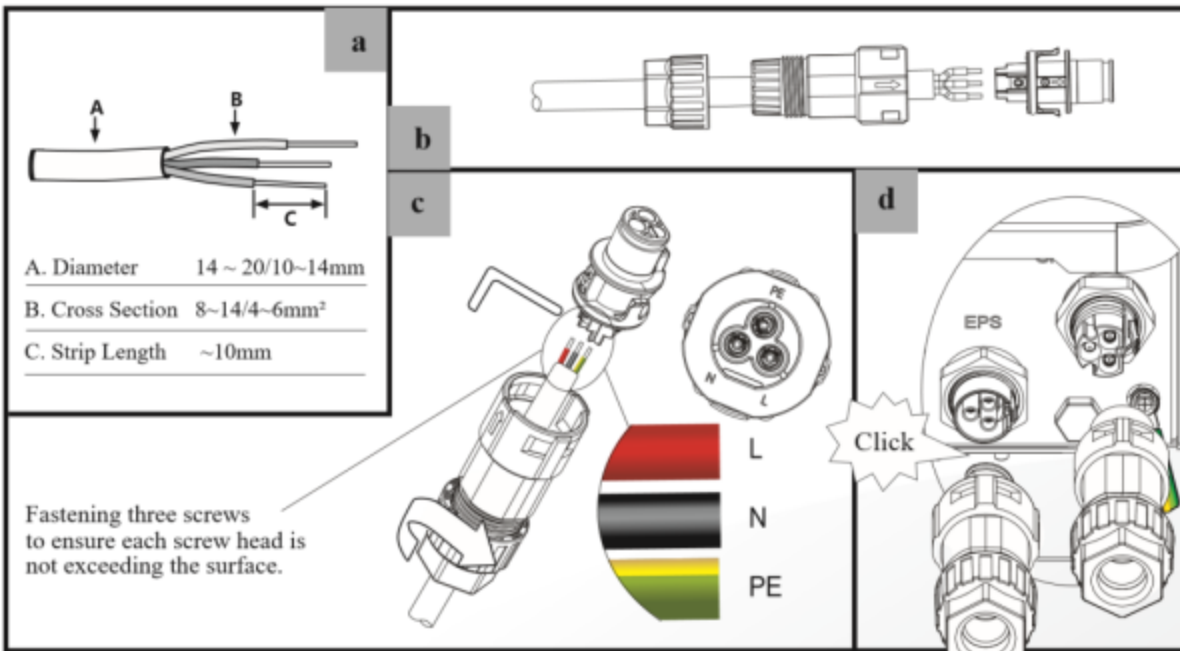
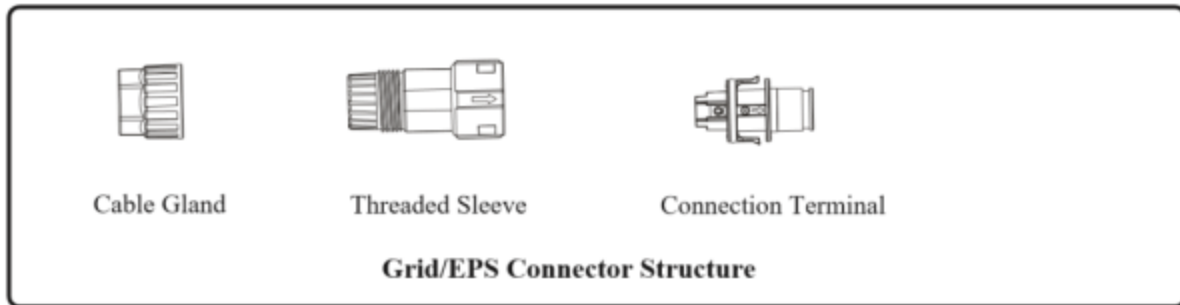
 <p><b>a</b> Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.</p>	 <p><b>c</b> Insert RJ45 terminals into corresponding ports. Install the seal into the threaded sleeve, fasten the rubber nut and screw the waterproof cover back to inverter firmly with 4 x M4 screws; 1.2N.m.</p>
<p><b>b</b> Make the RJ45 terminal according to above function description of each Pin definition. Lead the BMS cable through the rubber nut, seal and waterproof cover in turn.</p>  <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> <p>! Don't cut off any communication cables.</p>  <p>Press the BMS cable in the seal via the side incisions.</p> </div> </div>	

### 5.3 Grid/EPS Connection

Grid/EPS connection please refer to below:



**Step 1: Assemble the AC connector.**



**Step 2: Connect the AC connector.**

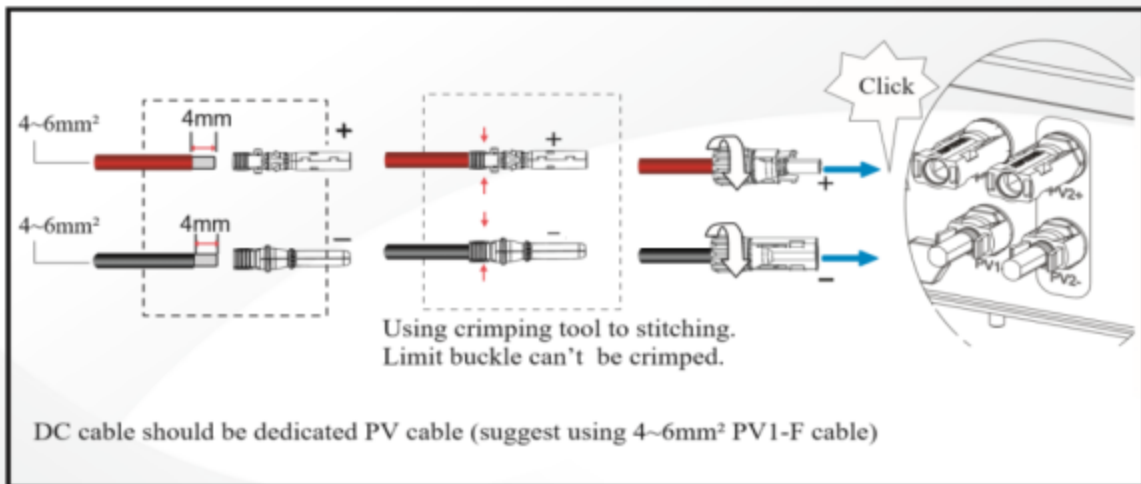
An AC breaker should be installed between inverter and the grid/UPS.

1. Before connecting the AC cable from inverter to AC breaker, you should confirm the AC breaker is working normally. Turn off the AC breaker and keep it open.
2. Connect the PE conductor to grounding electrode, and connect the N and L conductors to AC breaker.

3.Connect the AC breakers to the grid/EPG grid.

<b>NOTICE</b>	<p>Multiple inverters cannot share a circuit breaker. No load is allowed between the inverter and the AC circuit breaker. Make sure the plug connector has the correct polarity before connecting the photovoltaic panel. Incorrect polarity can permanently damage the inverter. Photovoltaic cells should not be connected to ground conductors. The minimum grounding insulation resistance of the photovoltaic panel must exceed 18.33kΩ. If the minimum grounding resistance does not meet the requirements, electric shock may occur.</p>
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To ensure that the inverter can be safely and reliably disconnected from the grid, a AC breaker ( $\geq 50A$ ).



### 5.4 PV Connection (N/A for AC Couple Inverter) PV connection

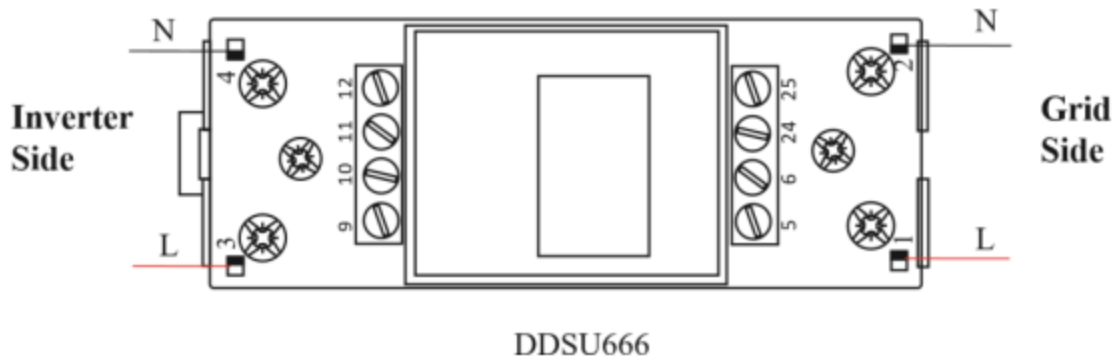
### 5.5 Meter/CT Connection

You can monitor usage with a meter or a CT. The meter and CT can't be installed at the same time.

The meter is optional.

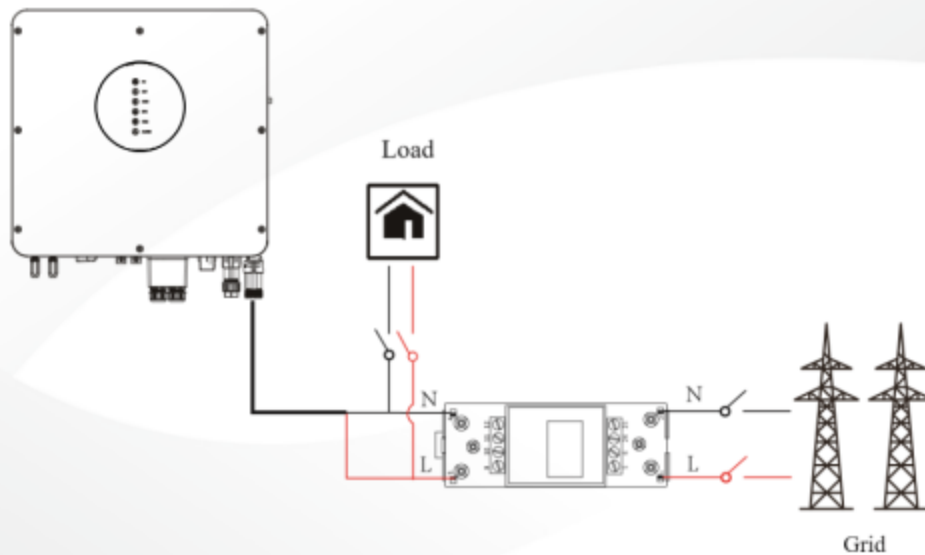
Meter Connection

Powermate Series inverter only supports the meter: CHNT-DDSU666 meter.



Before connecting to Grid, please install a separate AC breaker ( $\geq 60A$ ; not equipped) between meter and Grid. This ensure the inverter can be security disconnected during maintenance.

The connection diagram of power cable of meter is as shown in the figure below:

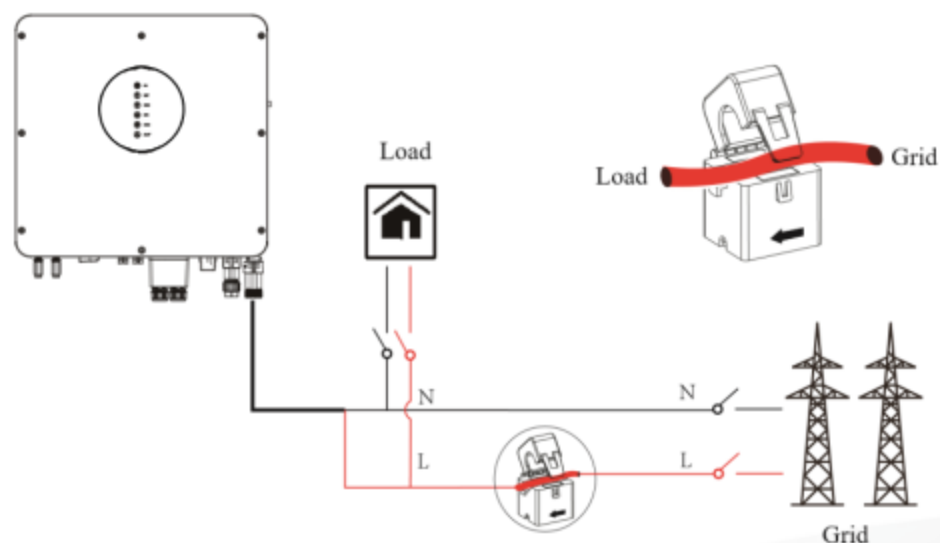


Please refer to the meter instruction manual for details.

### 5.5.1 CT Connection

Before connecting to Grid, please install a separate AC breaker ( $\geq 60A$ ; not equipped) between CT and Grid. This ensure the inverter can be security disconnected during maintenance.

The connection diagram of power cable of CT is as shown in the figure below:



Please attention to the Current interchanger (CT) connection. The arrow on the CT indicates the current flow from grid to inverter. And lead the live line through the detection hole of CT.

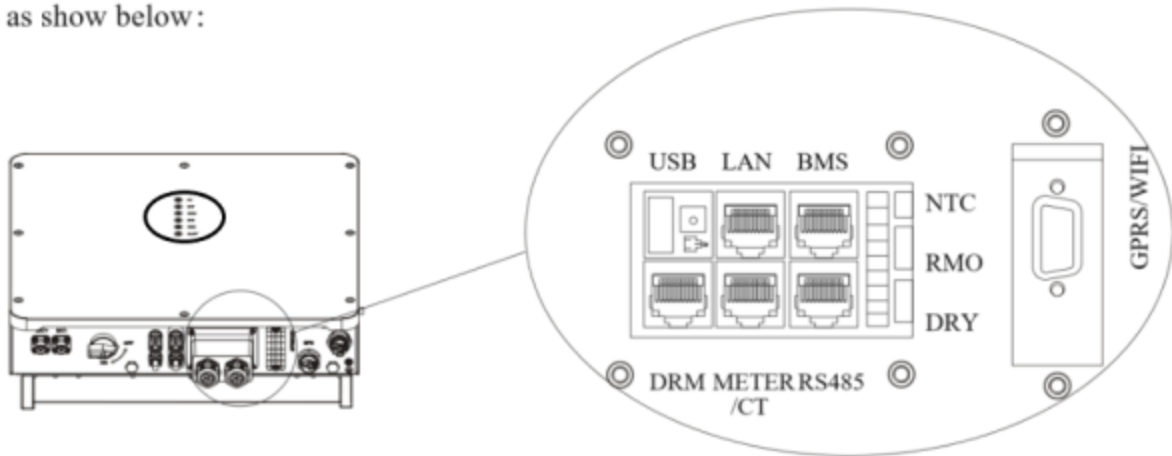
### 5.5.2 Communication Connection

There are communication interfaces in the communication port on the bottom of the inverter.

### 5.5.3 LAN Connection

Use standard Ethernet cable for Ethernet communication.

as show below :

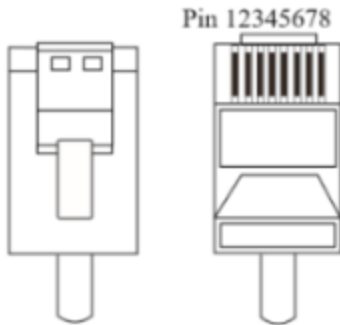


Interface	Descriptions	
USB	For fast firmware upgrade.	
LAN	For ethernet communication.	
BMS	Lithium battery Communication Interface	
DRM	Demand response mode for Australia application	
METER/CT	For Meter communication or Grid current sense.	
RS485	For RS485 communication.	
9-Pins	NTC	Temperature sensor terminal of lead-acid battery
	RMO	Remote off control
	DRY	DI/DO control
GPRS/WIFI	For GPRS/WIFI communication.	

#### DRMs Connection

DRMs is a shortened form for “inverter demand response modes” . It is a compulsory requirements for inverters in Australia.

**RJ45 Terminal Configuration of DRMs**



<b>PIN</b>	1	2	3	4
<b>Function Description</b>	DRM1/5	DRM2/6	DRM3/7	DRM4/8
<b>PIN</b>	5	6	7	8
<b>Function Description</b>	REF	DRM 0/COM	NC	NC

Refer to the following steps:

**a** Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.

**c** Insert RJ45 terminals into corresponding ports. Install the seal into the threaded sleeve, fasten the rubber nut and screw the waterproof cover back to inverter firmly with 4 x M4 screws; 1.2N.m.

**b** Make the RJ45 terminal according to above function description of each Pin definition. Lead the BMS cable through the rubber nut, seal and waterproof cover in turn.

**!** Don't cut off any communication cables.

Press the DRMs cable in the seal via the side incisions.

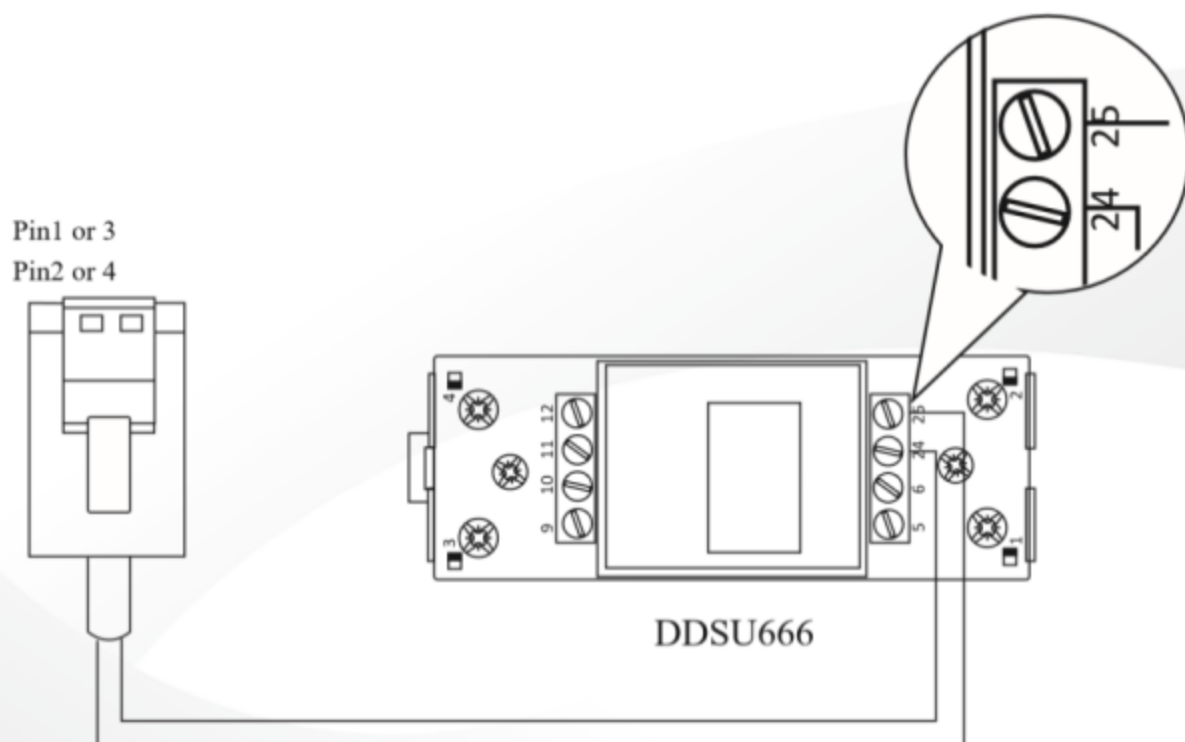
### 5.5.4 Meter/CT Connection

RJ45 Terminal Configuration of Meter/CT Communication

PIN	1	2	3	4	5	6	7	8
Function Description	RS485_A	RS485_B	RS485_A	RS485_B	CT+	CT-	NC	NC

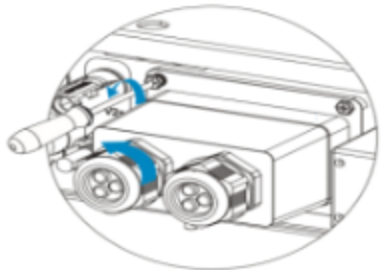
Meter Connection

#### Meter cable connection overview

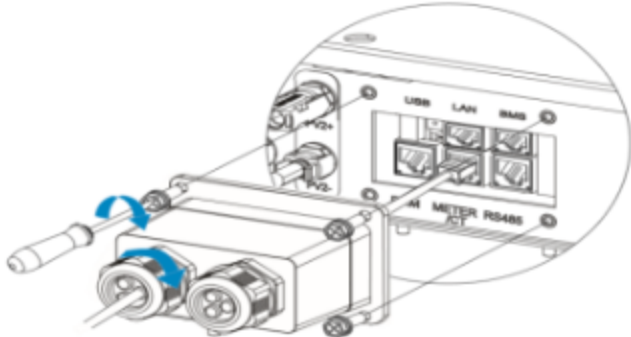


Inverter	Meter
Pin1 or Pin3(RS485_A)	Pin24
Pin2 or Pin4(RS485_B)	Pin25

Connect meter. Refer to the following steps:

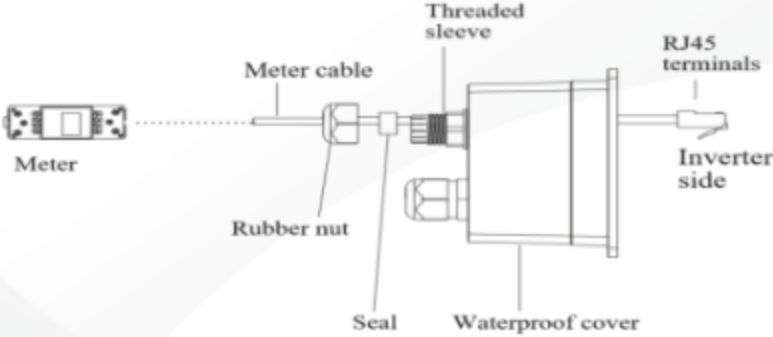



**a** Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.



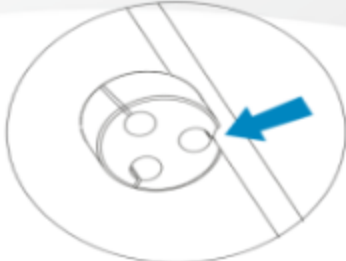
**c** Insert RJ45 terminals into corresponding ports. Install the seal into the threaded sleeve, fasten the rubber nut and screw the waterproof cover back to inverter firmly with 4 x M4 screws; 1.2N.m.

**b** Make the RJ45 terminal according to above function description of each Pin definition. Lead the meter communication cable through the rubber nut, seal and waterproof cover in turn.





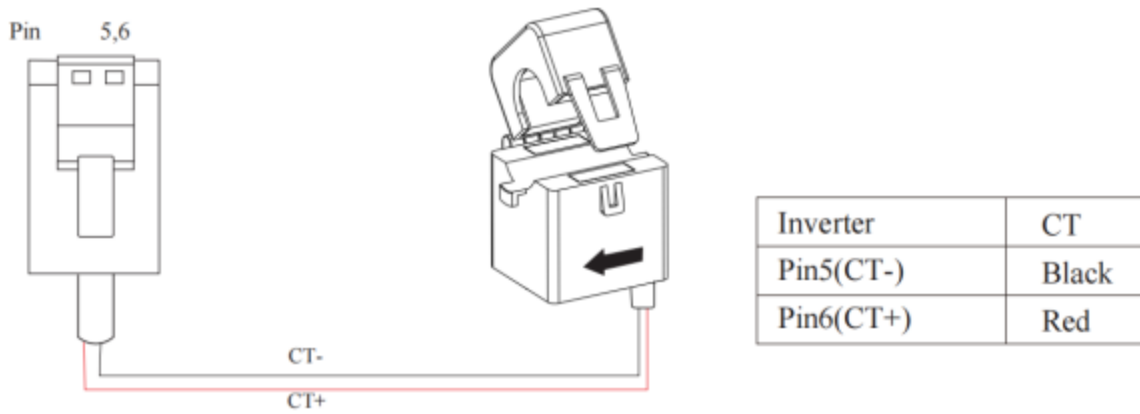
Don't cut off any communication cables.



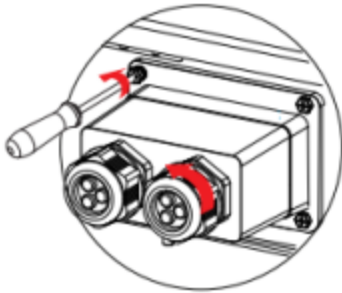
Press the meter cable in the seal via the side incisions.



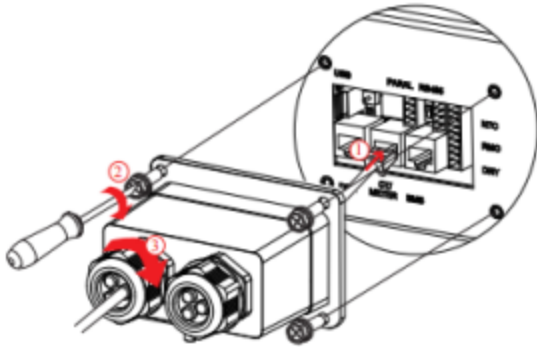
## CT Connection



Connect CT. Refer to the following steps:



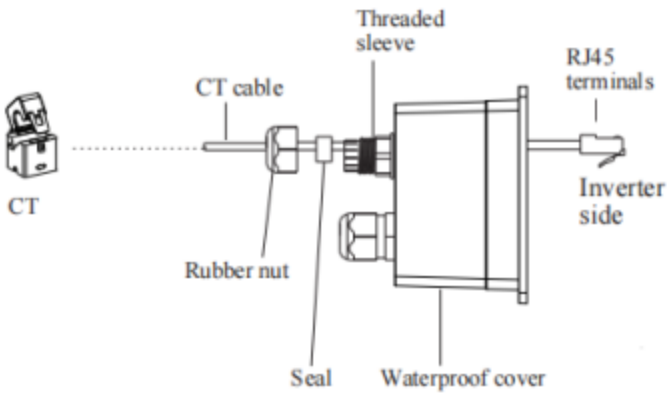
**a** Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.




**c**

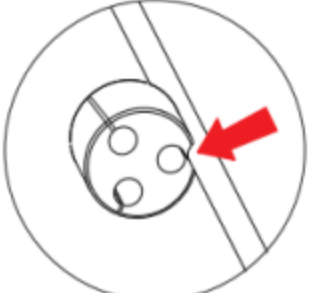
- ① Insert RJ45 terminals into corresponding ports.
- ② Screw the waterproof cover back to inverter firmly with 4 x M4 screws(1.2N.m).
- ③ Install the seal into the threaded sleeve, fasten the rubber nut.

**b** Make the RJ45 terminal according to above function description of each Pin definition. Lead the CT cable through the rubber nut, seal and waterproof cover in turn.





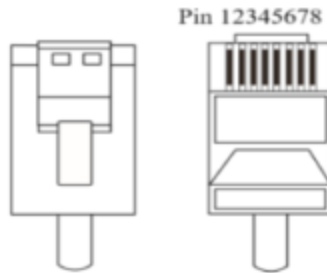
Don't cut off any communication cables.



Press the CT cable in the seal via the side incisions.

RS485 Connection

RJ45 Terminal Configuration of RS485 Communication



<b>PIN</b>	1	2	3	4
<b>Function Description</b>	GND_S	GND_S	GND_S	GND_S
<b>PIN</b>	5	6	7	8
<b>Function Description</b>	RS485_B	RS485_A	RS485_B	RS485_A

**Connect RS485. Refer to the following steps:**

**a** Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.

**c** Insert RJ45 terminals into corresponding ports. Install the seal into the threaded sleeve, fasten the rubber nut and screw the waterproof cover back to inverter firmly with 4 x M4 screws; 1.2N.m.

**b** Make the RJ45 terminal according to above function description of each Pin definition. Lead the RS485 cable through the rubber nut, seal and waterproof cover in turn.

RS485 Control Module

RS485 cable

Rubber nut

Seal

Threaded sleeve

Waterproof cover

RJ45 terminals

Inverter side

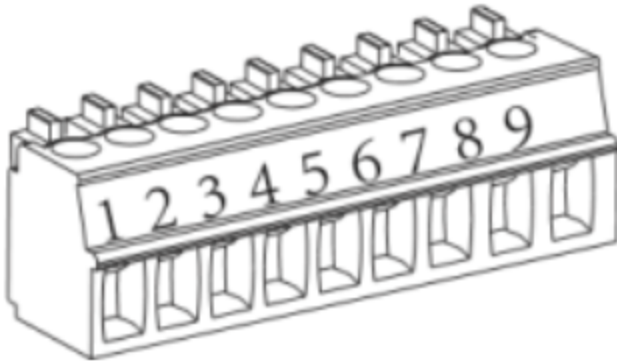
Don't cut off any communication cables.

Press the RS485 cable in the seal via the side incisions.

**5.5.5 NTC/RMO/DRY Connection(s)**

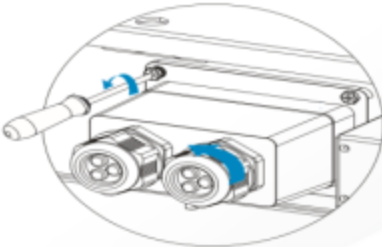
9-Pins Terminal Configuration of Auxiliary Communication

Pin123456789



PIN	Function Description
1	NO1 (Normal Open)
2	N1
3	NC1 (Normal Close)
4	NC2 (Normal Close)
5	N2
6	NC2 (Normal Close)
7	REMO OFF
8	GND S (NTC BAT)
9	NTC BAT+

Refer to the following steps:



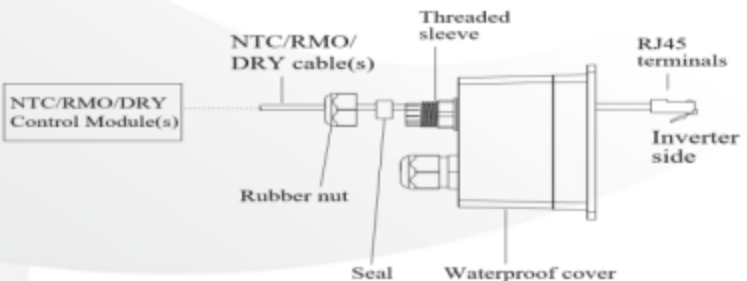
**a**


Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.

**b**

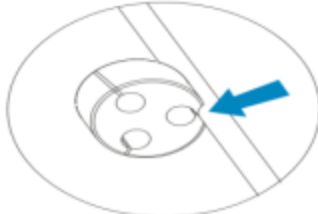
Make the 9-Pins terminal according to above function description of each Pin definition for the auxiliary port you want to use.

Lead the NTC/RMO/DRY cable(s) through the rubber nut, seal and waterproof cover in turn.





Don't cut off any communication cables.



Press the NTC/RMO/DRY cable(s) in the seal via the side incisions.

Pin	Function
9	NTC
8	RMO
7	
6	
5	
4	DRY
3	
2	
1	

Insert its 9-Pins terminal into the corresponding NTC/RMO/DRY port on the ESS inverter. Install the seal into the threaded sleeve, fasten the rubber nut and screw the waterproof cover back to inverter firmly with 4 x M4 screws; 1.2N.m.

C

### 5.5.6 GPRS/WiFi Module Connection (Optional) GPRS/WiFi module

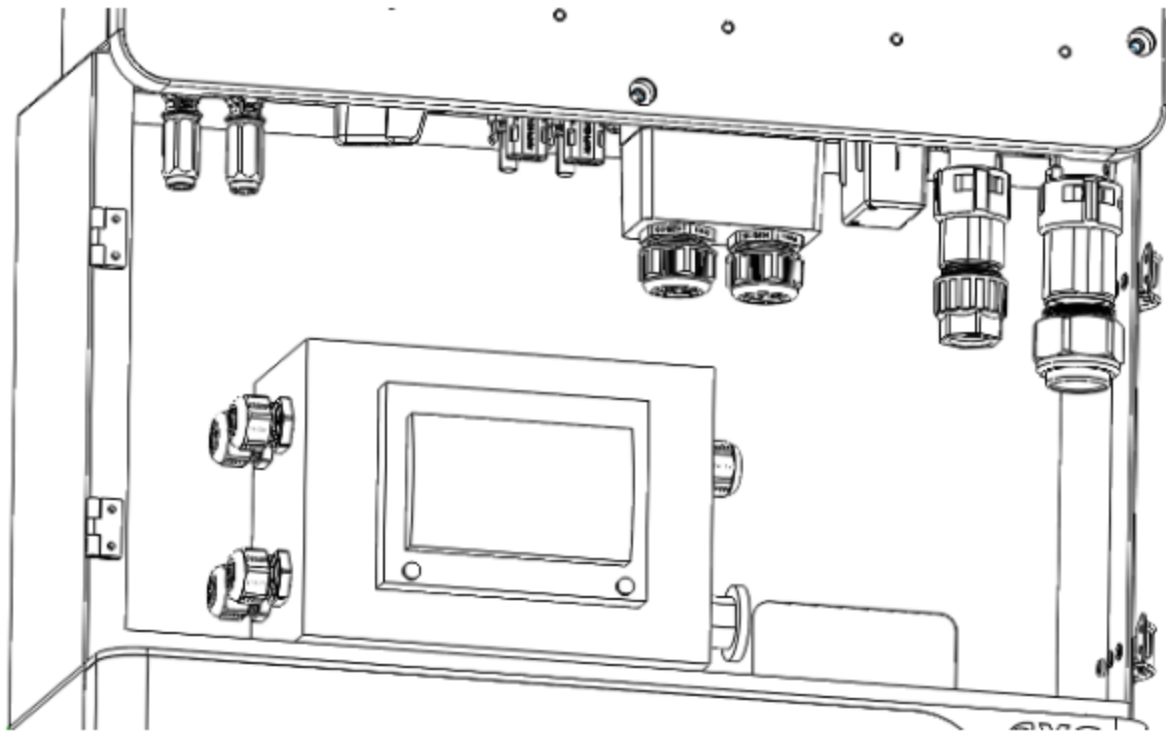
Move the port cover.

Make sure doesn't fall off naturally.

Proper strength to avoid damage to the module.

2 x M4 screws; 0.8N.m

Antenna



## 6 Startup/Shutdown the System

Before operation, you need to Check:

### 6.1 Startup the System

Check and confirm the installation is secure and strong enough and that the system grounding is OK. Then confirm the connections of AC, battery, PV etc. are correct. Confirm the parameters and configurations conform to relevant requirements.

AC Frequency 50/60Hz	PV Voltage 90~530V
Battery Voltage 42~60V	Grid AC Voltage 180~270V

Make sure all the above aspects are right, then follow the procedure to start up the inverter.

### 6.2 Shutdown the System

According to actual situation, if have to shut-down the running system, please follow below procedure:

- Unpower off the battery.
- Unpower off the PV. ( N/A for AC Couple )
- Unpower off the AC.

If need to disconnect the inverter cables, please wait at least 5 minutes before touching these parts of inverter.

### 6.3 Commissioning

It is necessary to make a complete commissioning of the inverter system. This will essentially

protect the system from fire, electric shock or other damages or injuries.

### **6.3.1 Inspection**

Before commissioning, the operator or installer (qualified personnel) must inspect the system carefully and make sure:

- The system is firmly installed correctly following the contents and notifications of this manual, and there are enough spaces for operation, maintenance and ventilation.
- All the terminals and cables are in good status without any damages.
- No items are left on the inverter or within the required clearance section.
- The PV, battery pack is working normally, and grid is normal.

### **6.3.2 Commissioning Procedure**

- After the inspection and make sure status is right, then start the commissioning of the system.
- Power on the system by referring to the Startup section 4.1.
- Setting the parameters on the App according to user' s requirement.
- Finish commissioning.
- Power on the AC.
- Power on the PV. ( N/A for AC Couple ).
- Power on the battery.
- Connect the cell phone App via blue-tooth.
- Click the Power ON on the App for the first time.

## 7 APP Commissioning

### Download the mobile APP

#### What can it do?

- Local monitoring and debugging through short distance wireless communication.
- Remote monitoring the PV inverter from anywhere as long as your smart mobile device connected to the internet.



#### How to download it?

- Method 1: Scan the QR Code in the Quick Installation Manual with smart mobile device.
- Method 2: Search APP name in App Store if using iPhone.
- Method 3: Search APP name in Google play store if using Android.
- Method 4: Access the portal of cloud monitoring service .(<http://www.cloudinverter.net>)



## 8 Cloud Settings

When using the WiFi module, you need a cloud account for inverter's networking monitoring, And bind the inverter to the cloud account. The inverter's operational data will be uploaded to the cloud account after it is grid-tied. You can skip the registration step when you have registered a cloud account before.

### 1. Register a cloud account

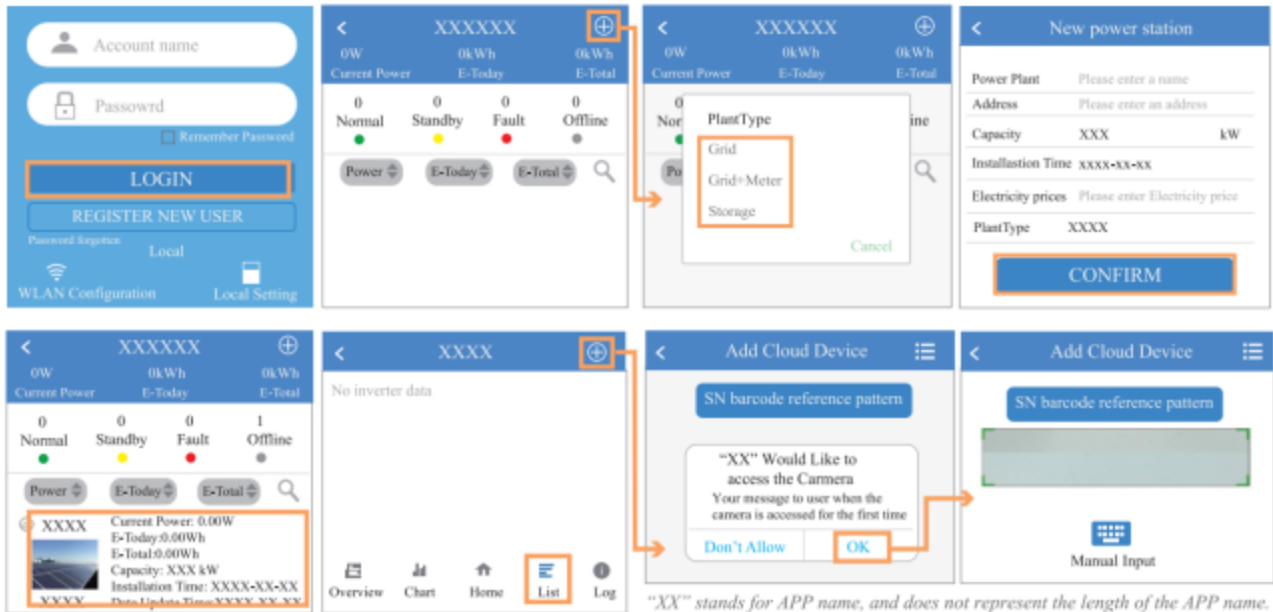
- Click REGISTER NEW USER.
- Click each item to enter the corresponding information then click GET.
- You will receive the registration mail. Enter the verification code from the mail. Then click REGISTER to activate your account and finish the registration process.

The image displays two screenshots of the cloud account registration interface. The left screenshot shows the login and registration options, with 'REGISTER NEW USER' highlighted. The right screenshot shows the registration form with fields for account name, password, email address, and verification code, with 'REGISTER' and 'GET' buttons highlighted.

### 2. Add inverter to cloud account

- Login App with your cloud account. Click “+” and select a PlantType to add the power station.
- Enter power station information then click CONFIRM.

- Select the power station you added, go to List page, and click “+” to scan the serial number barcode at the safety label on the machine to add inverter.



“XX” stands for APP name, and does not represent the length of the APP name.  
 “XXXX” or “XXX” only represents the data information, not the number of digits.

## 9 APP Local Settings

- Download APP.
- Power on the inverter.
- Scan the QR code on the inverter to download the APP.
- Download APP from the App Store or Google Play.

Note: APP should access some permissions such as inverter's location. You need to allow all permission to be granted in all pop-up windows when installing the APP or in your own phone setting.

1. Connect the Inverter.

Open the Bluetooth on your own phone, then open the APP. Then follow the instructions below.



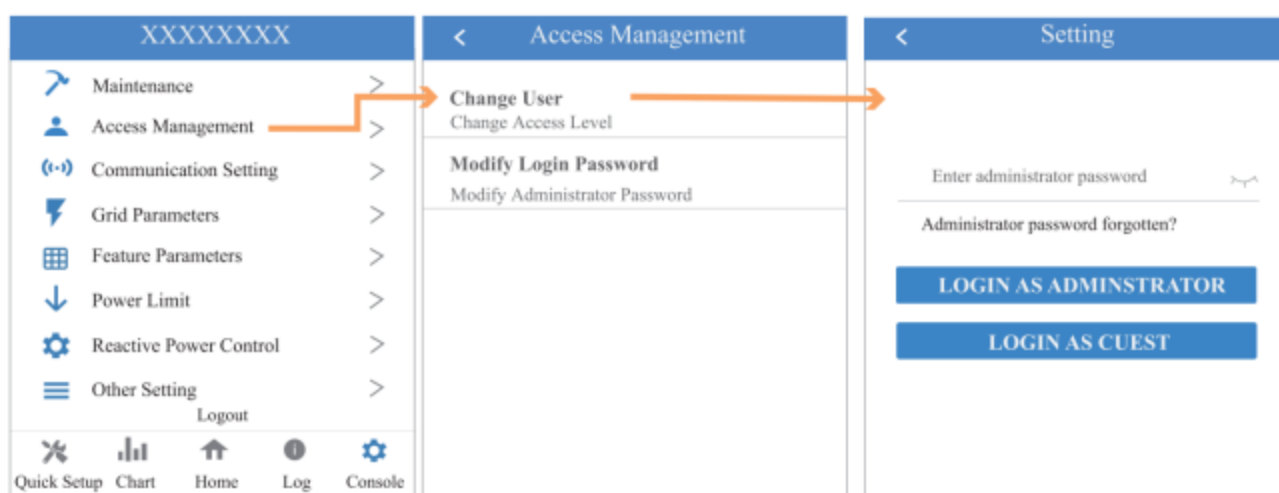
2. Connect to the Internet. (N/A for LAN module).

3. Go to Quick Setup page, and enter the WIFI SSID and password of the current network environment according to the following instructions. And then the inverter is connected to the Internet.



4. Login as administrator

Go to Console > Access Management > Change User page, and enter the administrator password to login as administrator.



5. Then you can do all the local operations you want.