PrimeVOLT

USER MANUAL

Single Phase ESS Inverter

PV 3K6HB-60
PV 3K68HB-60
PV 4K6HB-60
PV 4K6HB-120
PV 5KHB-120
PV 5KHB-60
PV 6KHB-120
PV 6KHB-60

HISTORY

VERSION	ISSUED	COMMENTS
V1.0	17-Oct.-23	First release.
V1.1	12-Apr.-24	Update 4.2, 4.3 and 4.6.1.
V1.2	17-Jun.-24	Changed the silk screen from “Temp./ Ext. Signal” to “Temp./ Ext. Sig”.
V1.3	18-Jul.-24	Add the data of the short circuit curret.

Preface

About This Manual

This manual describes the installation, connection, the use of APP, commissioning and maintenance etc. of ESS inverter. Please first read the manual and related documents carefully before using the product and store it in a place where installation, operation and maintenance personnel can access it at any time. The illustration in this user manual is for reference only. This user manual is subject to change without prior notice. (Specific please in kind prevail.)

Target Group

ESS inverters must be installed by professional electrical engineers who have obtained relevant qualifications.

Scope

This manual is applicable to the following inverters:

- PV 3K6HB-60
- PV 3K68HB-60
- PV 4K6HB-60
- PV 4K6HB-120
- PV 5KHB-120
- PV 5KHB-60
- PV 6KHB-120
- PV 6KHB-60

Conventions

The following safety instructions and general information are used within this user manual.

DANGER	Indicates an imminently hazardous situation which, if not correctly followed, will result in serious injury or death.
WARNING	Indicates a potentially hazardous situation which, if not correctly followed, will result in serious injury or death.
CAUTION	Indicates a potentially hazardous situation which, if not correctly followed, could result in moderate or minor injury.
NOTICE	Indicates a potentially hazardous situation which, if not correctly followed, could result in equipment failure to run, or property damage.
NOTE	Call attention to important information, best practices and tips: supplement additional safety instructions for your better use of the ESS inverter to reduce the waste of you resource.

CONTENTS

1 Safety

Before using the inverter, please read all instructions and cautionary markings on the unit and in this manual. Put this manual to a place where you can take it easily.

Our ESS inverter strictly conforms to related safety rules in design and test. Please follow the local laws and regulations during installation, operation and maintenance. Incorrect operation 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 Symbol used

Safety Symbol	Description
	Danger of high voltage! Only qualified personnel may perform work on the inverter.
	Residual voltage exists after the inverter is powered off. It takes 5 minutes for system to discharge to a safe voltage.
	Danger of hot surface
 Do not disconnect under load!	Do not disconnect under load, otherwise there will be a danger of fire.
	Environmental Protection Use Period
	Refer to the operating instructions
	Don’t dispose of the inverter with the household waste.
	Grounding terminal

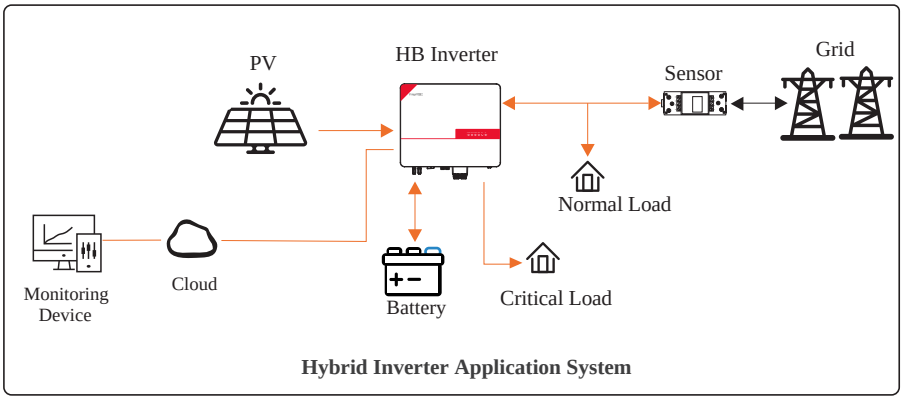
1.2 Safety Precaution

- The ESS inverters are certified in Australia, India, and South Africa. Installation, maintenance and connection of inverters must be performed by qualified personnel, in compliance with the local electrical standards, wiring rules and requirements of local power authorities and/or companies. (for example: AS 4777 and AS/NZS 3000 IN Austalia.)
- The temperature of some parts of the inverter may exceed 60℃ during operation. Do not touch the inverter during operation to avoid being burnt.
- Ensure children are kept away from inverters.
- Don't open the front cover of the 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 methods must be adopted to prevent such damage to the inverter; otherwise the inverter 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 inverter; otherwise the 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 inverter before maintaining. Completely isolate the inverter should: turn off the PV switch and disconnect the PV terminal, battery terminal, and AC terminal.
- After the inverter is powered off, the remaining electricity and heat may still cause electric shock and body burns. Do not touch parts of inverter for 10 minutes after disconnection from the power sources.
- Prohibit inserting or pulling the AC and DC terminals when the inverter is running.
- In Australia, the inverter internal switching does not maintain the neutral neutral continuity. And neutral integrity must be addressed by external connection arrangements.
- Don't connect ESS inverter in the following ways:
  The BACKUP Port should not be connected to the grid;
  A single PV panel string should not be connected to two or more inverters.

2 Product Introduction

2.1 Overview

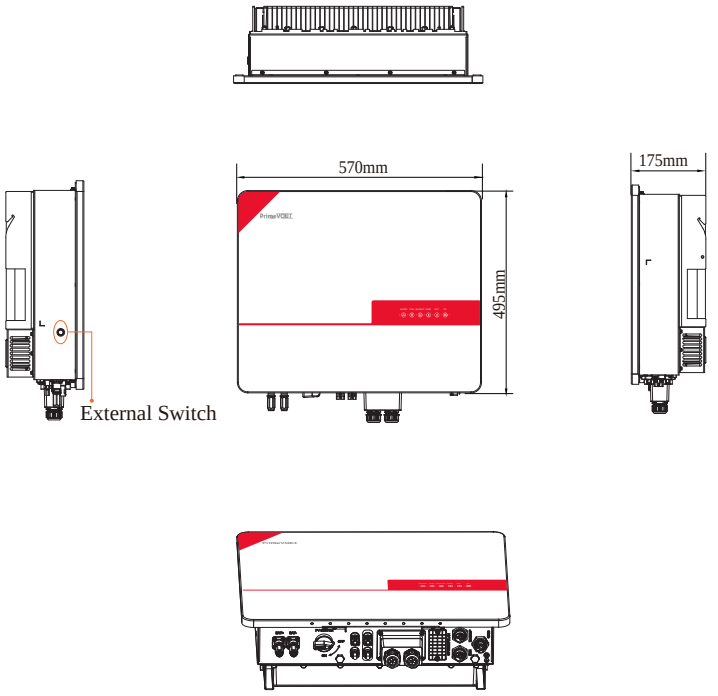
The ESS inverters are high-quality inverter which can convert solar energy to AC energy and store energy into battery. Typically, an ESS inverter system consists of PV array, ESS inverter, battery, loads and electricity sensor. The energy generated by inverter can be preferentially supplied to its self-consumption, stored in the battery for future use or fed into public grid.



Hybrid Inverter Application System

Inverters have been tested as per AS/NZS 4777.2:2020 for parallel connection combinations.

2.2 Product Appearance

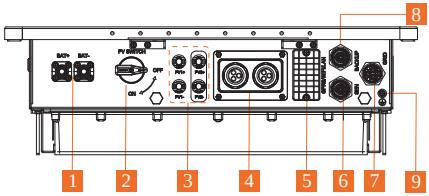


The External View of the Inverter

LED Details

Length(mm)	Height(mm)	Width(mm)
570	495	175

LED Indicators	ALARM	COM	BACKUP	GRID	BAT	PV

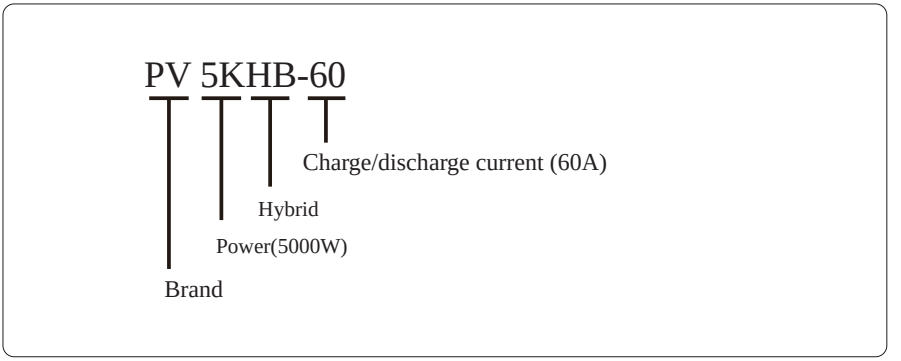


The Bottom View of the Inverter

1. Battery Input Terminals
2. PV Switch
3. PV Input Terminals
4. USB, PARAL, RS485, DRM, CT/METER, BMS, NTC/RMO/DRY
5. GPRS/WIFI/LAN
6. GEN Output Terminal
7. GRID Output Terminal
8. BACKUP Output Terminal
9. Grounding Terminal

2.3 Model Definition

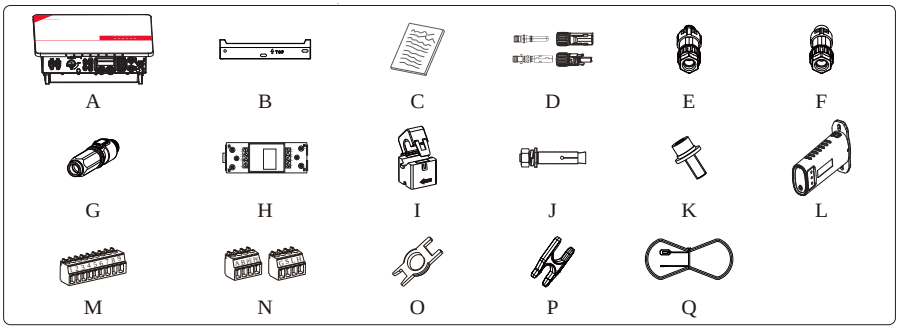
The letters in the product model have the specific informations.
(Take PV 5KHB-60 as an example.)



3 Installation

3.1 Packing List

After unpacking, please check the following packing list carefully for any damage or missing parts. If any damage or missing parts occurs, contact the supplier for help.



Number	Quantity	Description
A	1	Inverter
B	1	Mounting bracket
C	1	File package
D	2/2	PV terminal connector group (PV+/PV-)
E	2	BACKUP/GEN connector
F	1	GRID connector
G	2	Battery connector
H	1	Meter (Optional)
I	1	CT
J	3	M12 Expansion bolt
K	1	M6 Security screw
L	1	WIFI module (Optional)
M	1	9-Pin terminal
N	2	4-Pin terminal
O	1	Removal tool for PV connector
P	1	Removal tool for GRID/BACKUP/GEN connector
Q	1	Battery temperature sensor (Optional)

Inverters have been tested as per AS/NZS 4777.2:2020 for parallel connection combinations.

3.2 Selecting the Mounting Location

3.2.1 Installation Environment Requirements

a. With an IP65 protection rating, the inverter can be mounted indoors or outdoors.

b. The mounting location must be inaccessible to unrelated personnel since the enclosure and heat sinks are extremely hot during operation.

c. Do not install the inverter in areas containing highly flammable materials or gases.

d. To ensure optimum operation and long service life, the ambient temperature must be below 50℃.

e. The inverter must be mounted in a well-ventilated environment to ensure good heat dissipation.

f. To ensure long service life, the inverter must not be exposed to direct solar irradiation, rain, or snow. It is recommended that the inverter be mounted in a sheltered place.

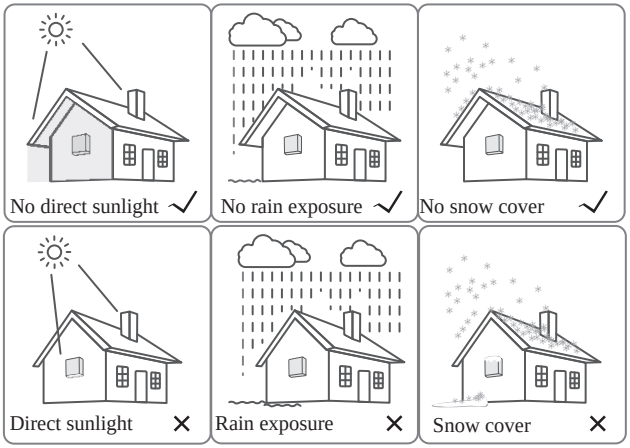
g. The carrier where the inverter is mounted must be fire-proof. Do not mount the inverter on flammable building materials.

h. Do not install the inverter in a rest area since it will cause noise during operation.

i. The installation height should be reasonable, and please make sure it is easy to operate and view the display.

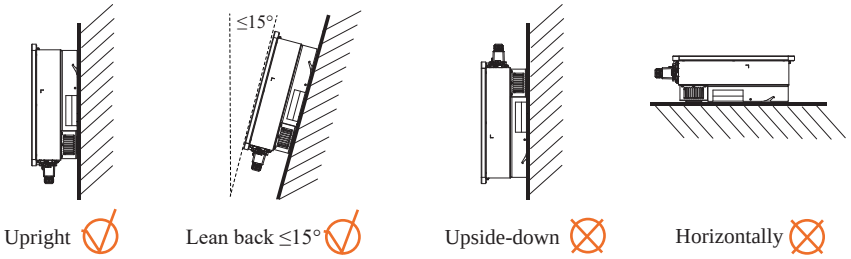
j. Product label and warning symbols shall be clear to read after installation.

k. Please avoid direct sunlight, rain exposure, snow cover.



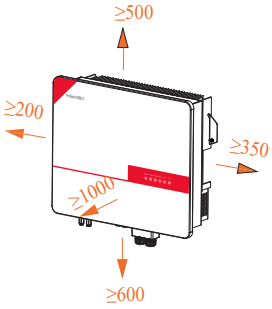
3.2.2 Mounting Requirements

Mount the inverter vertically or tilted backward by max 15°. The device can not be installed with a wrong mode and the connection area must point downward.



3.2.3 Installation Space Requirements

To ensure the inverter normally and easy to operate, there are requirements on available spaces of the inverter, e.g. to keep enough clearance. Refer to the following figures.



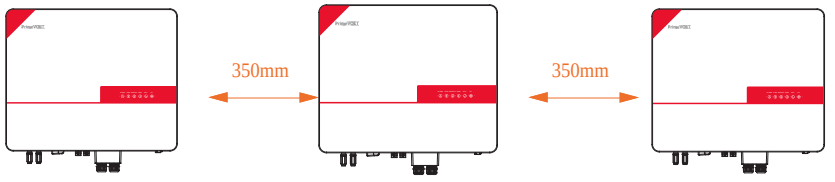
Above: 500mm

Below: 600mm

Front: 1000mm

Left side: 200mm

Right side: 350mm



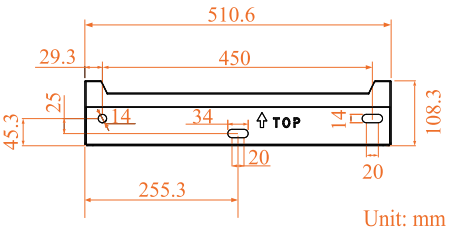
Installation along the same line for multiple inverter

3.3 Mounting

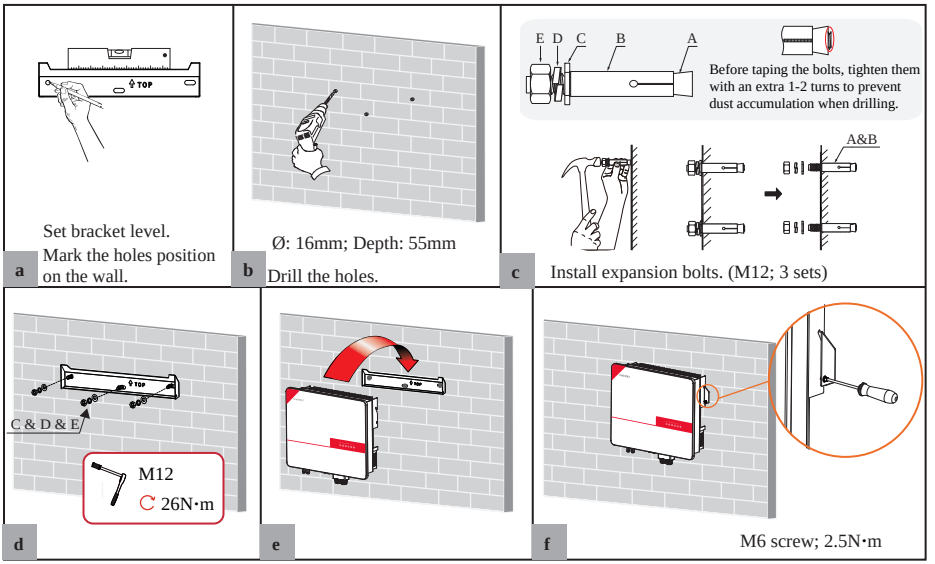
Before mounting the inverter, you have to prepare expansion screws and a security screw.

Step 1. Install the mounting bracket

1. Use a level ruler to mark the position of the 3 holes on the wall. Refer to Figure a. And drill 3 holes, 16mm in diameter and 55mm in deep. Refer to Figure b.
2. Knock the expansion screw kit into the hole together with a hammer. Refer to Figure c.
   Note: Do not remove the nut unit in this step.
3. After tightening 2-3 buckles, the expansion bolts are tight and not loose, and then unscrew the bolts, spring washer, gasket. Refer to Figure c.
4. Install and fix the mounting bracket on the wall. Refer to Figure d.



Step 2. Install the inverter on the mounting bracket. Then lock the inverter using the security screw. Refer to Figure e, Figure f.



DANGER	Before drilling the hole on the wall, ensure no damage on the electric wire and/or water pipe inside the wall.
CAUTION	To prevent potential damages and injuries from inverter falling down, please hang the inverter on the bracket, do not loosen grip unless confirm the inverter is well mounted.

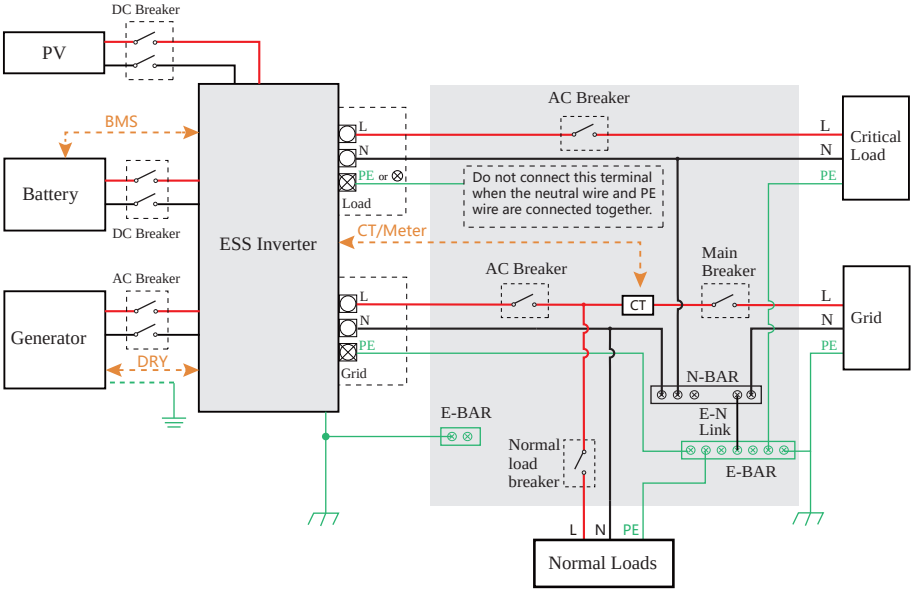
4 Electrical Connection

This chapter shows the details connection of ESS inverter. The following illustration only uses the hybrid inverters as an example.

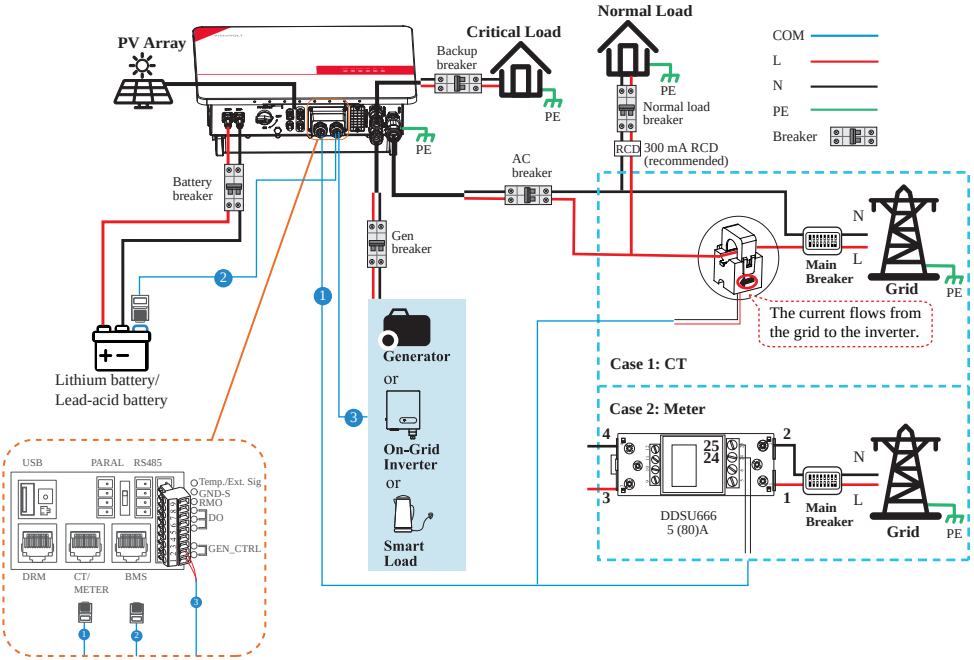
Stand-alone application

- For Au/NZ/SA

  For Australia, New Zealand and South Africa, the neutral cable of GRID side and BACK UP side must be connected together. Otherwise BACK UP function will not work.



- For other countries
  For other countries, the following diagram is an example for grid systems without special requirement on wiring connection.



① CT/Meter communication connection
② BMS communication connection
③ GEN DRY communication connection

Note

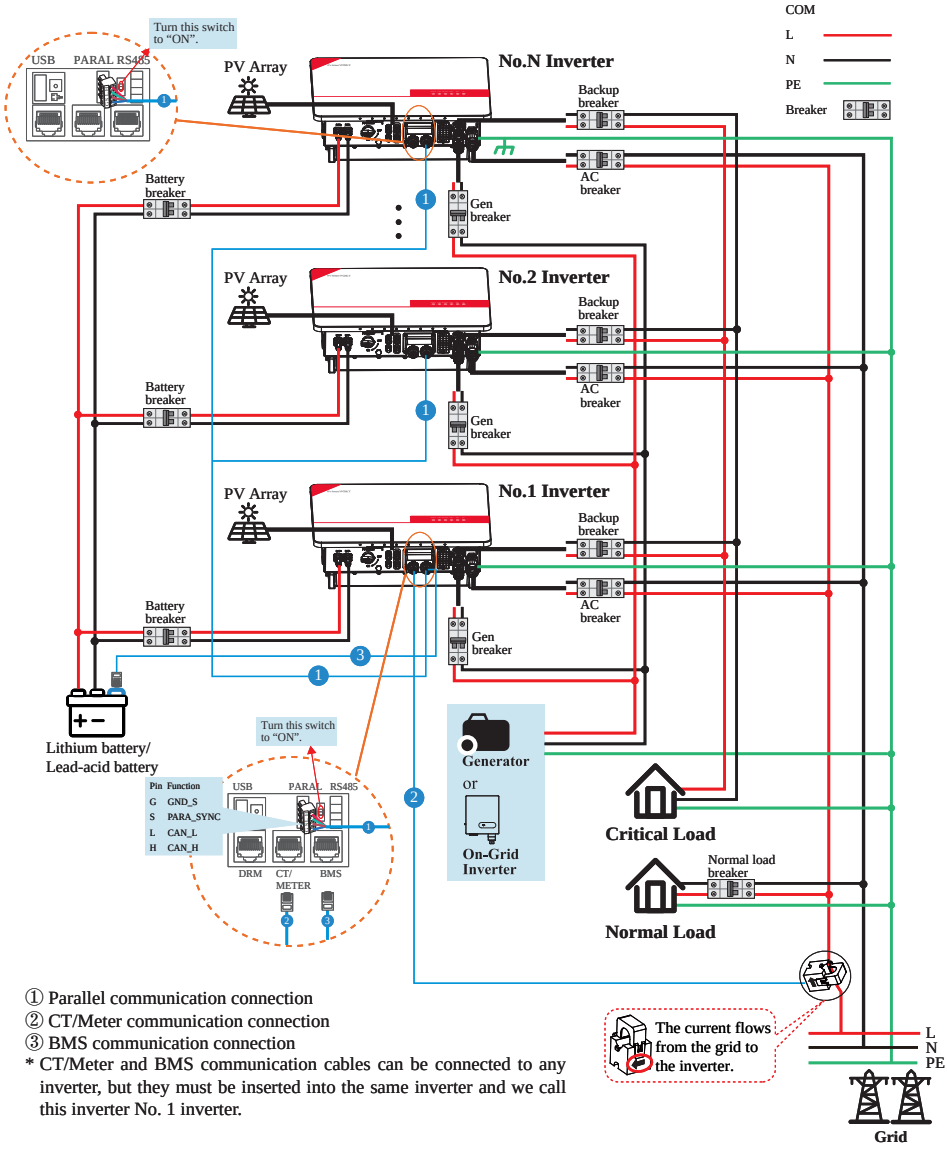
1. BMS connection is only for lithium battery.
2. Meter is optional.
3. About breakers:

DC breaker on BATTERY side: 150A
AC breakers on Critical load side and Smart load side ≥50A
AC breaker on Inverter load side ≥50A

DANGER	Ensure that inverter and all cables to be installed are completely powered off during whole installation and connection. Otherwise, fatal injury could be caused by the high voltage.

Parallel application

For N≤5



① Parallel communication connection
② CT/Meter communication connection
③ BMS communication connection
* CT/Meter and BMS communication cables can be connected to any inverter, but they must be inserted into the same inverter and we call this inverter No. 1 inverter.

Note:

1. BMS communication connection is only for lithium battery.
2. It is necessary to turn the matched resistance switch of No. 1 inverter and No. N inverter to “ON” in parallel connection mode.
3. With parallel connection mode, it is necessary to connect APP to one of the inverters and then go to Console > Hybrid Setting> Other >Parallel mode to enable parallel mode on APP.
4. Under parallel connection mode, the smart load should only be connected independently.
5. About breakers:

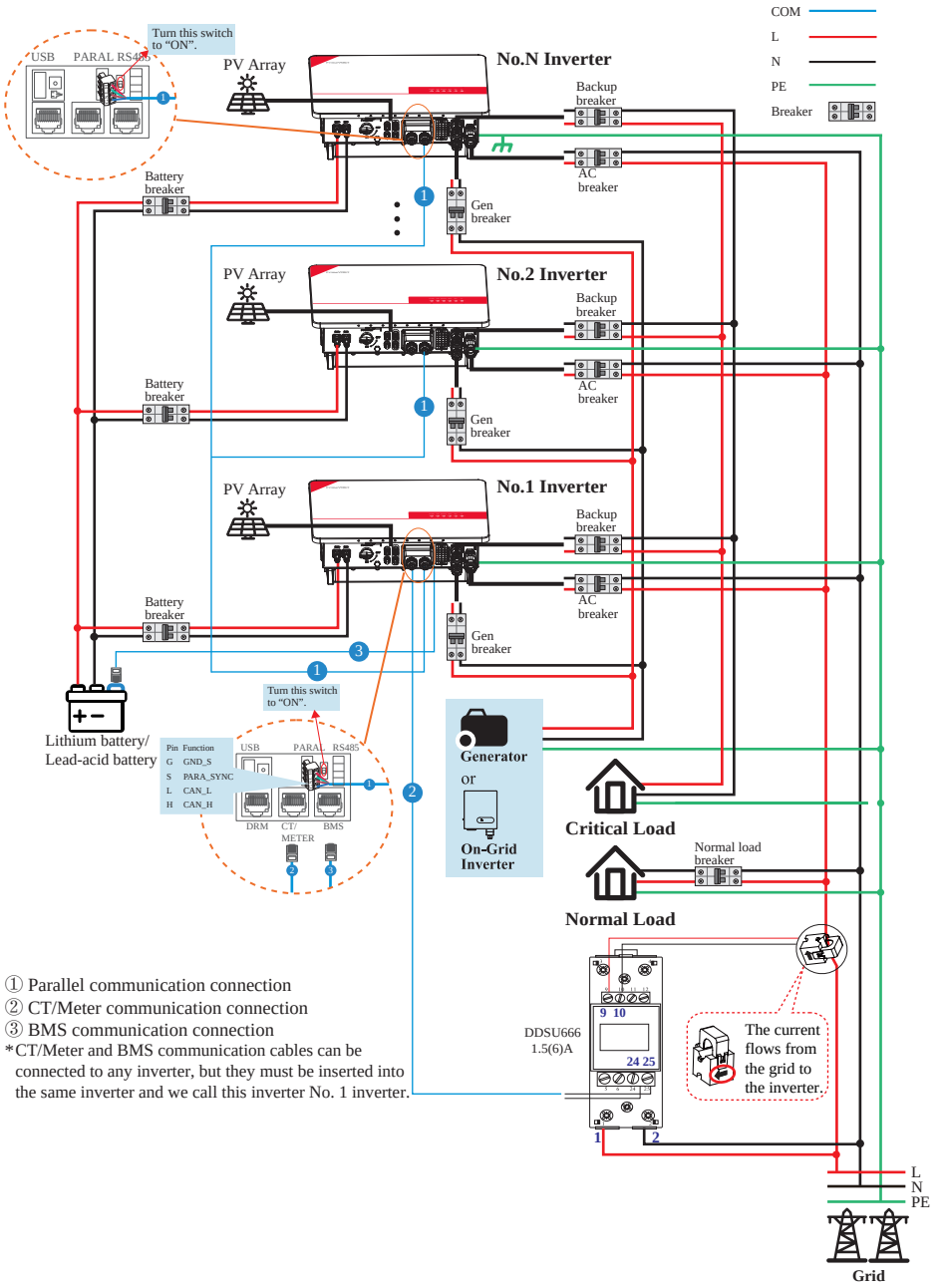
DC breaker on BATTERY side: 150A

AC breakers on Critical load side and Smart load side ≥50A

AC breaker on Inverter load side ≥50A

DANGER	Ensure that inverter and all cables to be installed are completely powered off during whole installation and connection. Otherwise, fatal injury could be caused by the high voltage.

For N>5



① Parallel communication connection
② CT/Meter communication connection
③ BMS communication connection
*CT/Meter and BMS communication cables can be connected to any inverter, but they must be inserted into the same inverter and we call this inverter No. 1 inverter.

Note:

1. BMS communication connection is only for lithium battery.
2. It is necessary to additionally purchase suitable CT and meter according to the specific requirements in parallel connection for N ＞ 5.
3. It is necessary to turn the matched resistance switch of No. 1 inverter and No. N inverter to “ON” in parallel connection mode.
4. With parallel connection mode, it is necessary to connect APP to one of the inverters and then go to Console > Hybrid Setting> Other >Parallel mode to enable parallel mode on APP.
Please refer to section 7.2.3.
5. Under parallel connection mode, the smart load should only be connected independently.
6. About breakers:

DC breaker on BATTERY side: 150A

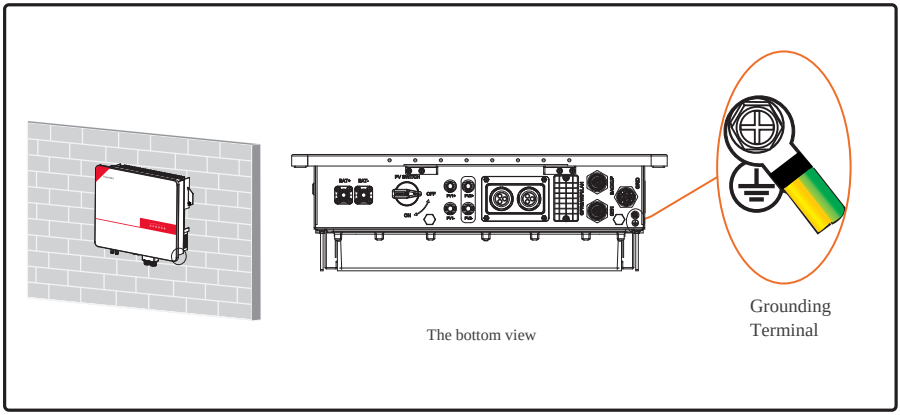
AC breakers on Critical load side and Smart load side ≥50A

AC breaker on Inverter load side ≥50A

DANGER	Ensure that inverter and all cables to be installed are completely powered off during whole installation and connection. Otherwise, fatal injury can occur due to the high voltage.

4.1 Grounding

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. The cross sectional area of green-yellow wire is greater than or equal to 10 mm².



WARNING	The inverter must be grounded; otherwise, there may be electric shock risk.

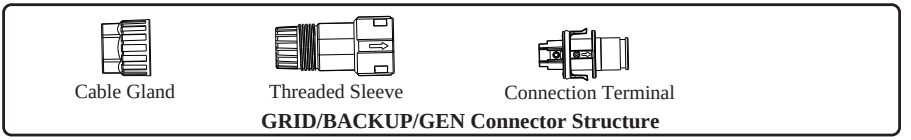
CAUTION	If the positive pole or negative pole of the PV array is required to be grounded, then the inverter output (to AC grid) must be isolated by transformer in accordance with IEC62109-1, -2 standards.

4.2 GRID/BACKUP/GEN Connection

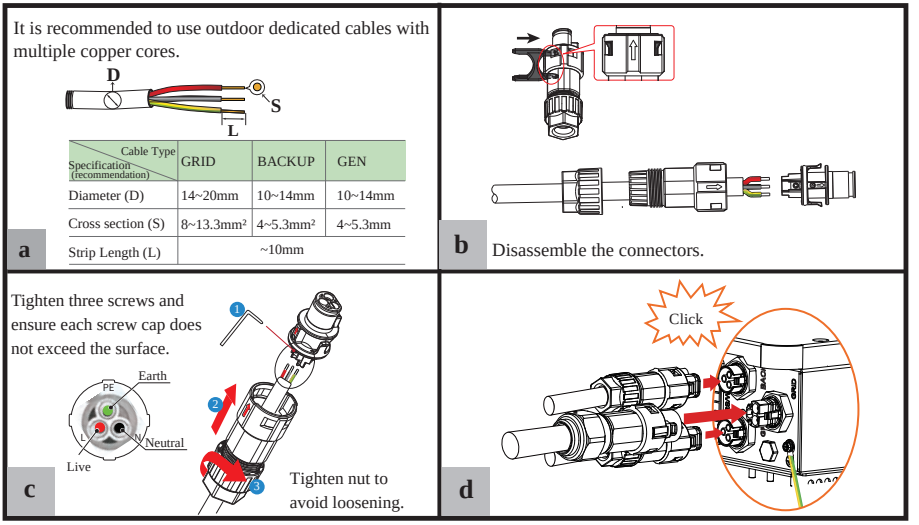
Before connecting the GRID/BACKUP/GEN terminal, ensure that both the AC terminal and the DC terminal are powered OFF and the PV switch is OFF. Otherwise there is a risk of high voltage shock.

GRID/BACKUP/GEN connection please refer to below.

Step 1: Assemble the AC connector and then insert AC connector into GRID/BACKUP/GEN port.



GRID/BACKUP/GEN Connector Structure



Specification (recommendation) \ Cable Type	GRID	BACKUP	GEN
Diameter (D)	14~20mm	10~14mm	10~14mm
Cross section (S)	8~13.3mm²	4~5.3mm²	4~5.3mm
Strip Length (L)	~10mm		

Step 2: Connect the AC breaker.

An AC breaker（≥50A）should be installed between inverter and the grid/critical load/GEN devices (generator, on-grid inverter or smart load).

a. 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 the status.

b. Connect the PE conductor to grounding electrode, and connect the N and L conductors to AC breaker.

c. Connect the AC breakers to the grid/critical load/GEN devices (generator, on-grid inverter or smart load).

Note:

For Australia, New Zealand and South Africa, the neutral cable of GRID side and BACK UP side must be connected together, but do not connect PE terminal of BACKUP side when the neutral wire and PE wire are connected together.

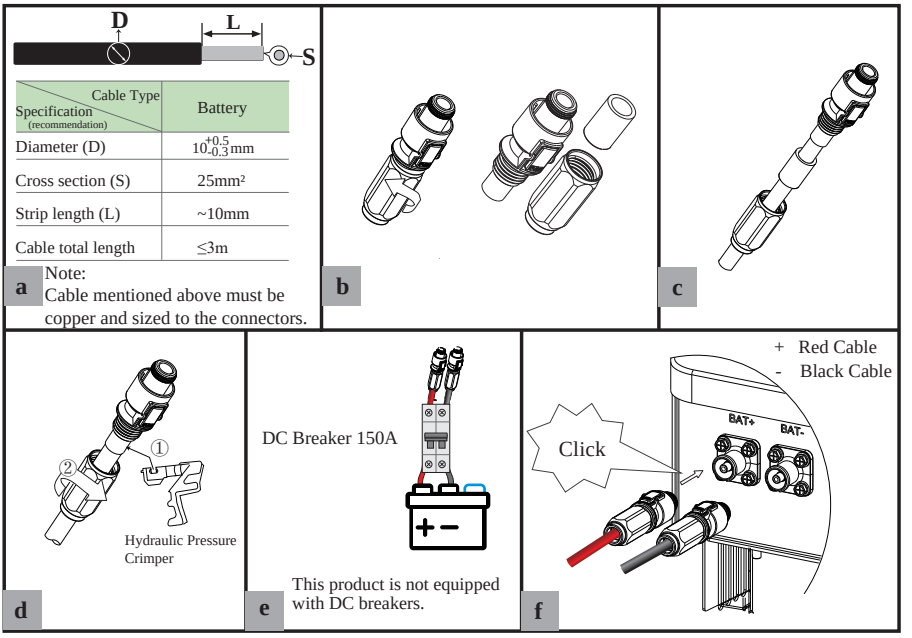
NOTICE	• Multiple inverters are not allowed to share a circuit breaker. • Load is not allowed to connect between the inverter and the AC breaker.

4.3 Battery Connection

ESS inverter now only supports the lithium/lead-acid battery. The recommended lithium battery brands are as follows: PYLON LPF, Aoboet LPF, Dyness LPF, UZENERGY L051100-A.

This part in this manual only describe the battery connection on inverter side. If you need more detailed connection information about the battery side, please refer to the manual of the battery you used.

Before connecting to battery, please install a separate DC breaker (150A; not equipped) between inverter and battery. This ensures the inverter can be securely disconnected during maintenance.

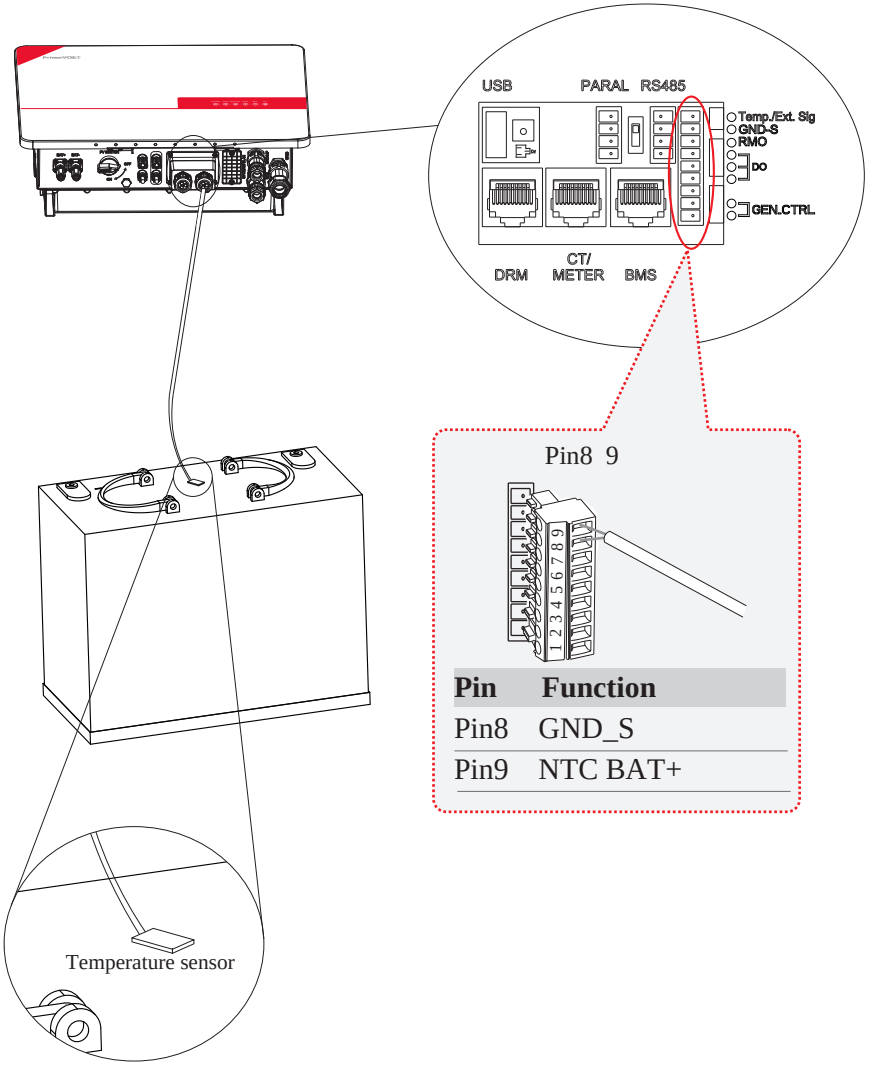


⚠ **WARNING**	• Reverse polarity will damage the inverter! • Be careful of electric shock and chemical hazards! • To reduce risk of injury, please use the suitable recommended cable size.

Battery Communication Connection

If the battery type is lithium battery which need communication between the inverter and battery management system (BMS), the connection must be installed. Please refer to section 4.6.1 for details.

NTC connection for lead-acid battery

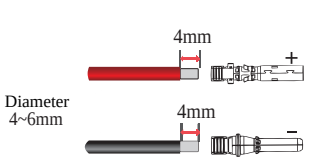


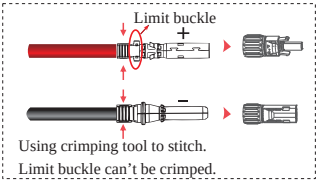
Pin	Function
Pin8	GND_S
Pin9	NTC BAT+

4.4 PV Connection

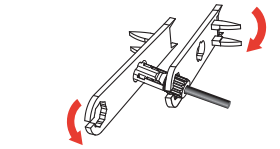
PV connection please refer to below.

1.Photovoltaic arrays exposed to sunlight will generate dangerous voltages!
2.Before connecting the PV terminal, ensure that both the AC terminal and the DC terminal are powered OFF and the PV switch is OFF. Otherwise there is a risk of high voltage shock.

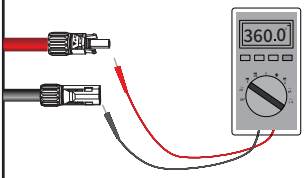




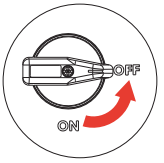
1 Note: PV cable should be delicated PV cable (suggest using 4~6mm² PV1-F cable).



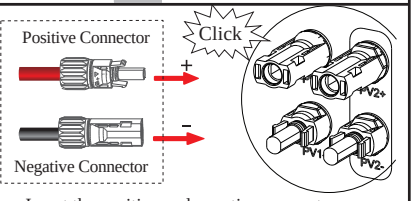
2 Tighten the waterproof nuts on each connector with a wrench to avoid loosening.



3 Test string voltage and confirm string polarity.



4 Ensure that the PV switch is OFF.



5 Insert the positive and negative connectors into the PV+/PV- ports until a "click" sound is heard.

NOTICE

- Before connection the PV panels, make sure the plug connector have the correct polarity. Incorrect polarity could permanently damage the inverter.
- PV array shouldn't be connected to the grounding conductor.
- The minimum insulation resistance to ground of the PV panels must exceed 18.33kΩ, there is a risk of shock hazard if the requirement of minimum resistance is not met.

WARNING

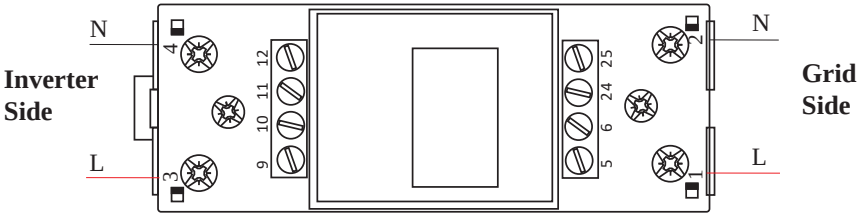
Please check polarity of PV connectors!
If polarity reversed, do not try to disconnect any PV connector until the irradiance declines and the DC currents fall below 0.5 A! Only then disconnect the PV plugs and correct the polarity before reconnecting.

4.5 Meter/CT Connection

You can monitor usage with a meter or a CT. ESS inverter is equipped with the CT HY33C8 by default, and the meter CHINT-DDSU666 5(80)A is optional.

4.5.1 Meter Connection

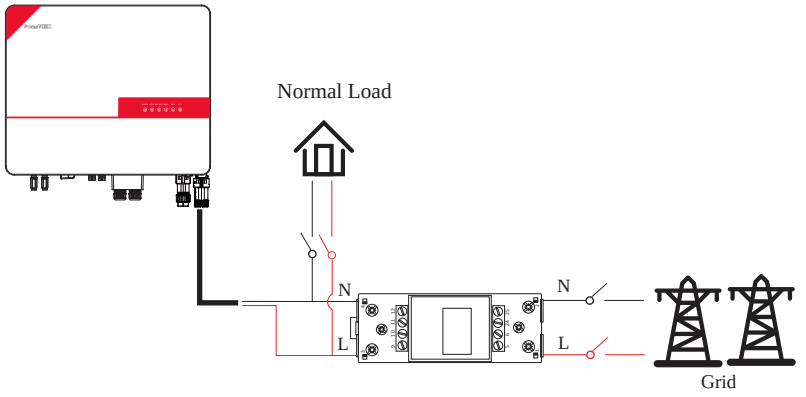
This section is applicable to non-parallel connection mode only.



DDSU666 5(80)A

Before connecting to Grid, please install a separate AC breaker (not equipped) between meter and Grid. This ensures the inverter can be security disconnected during maintenance.

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

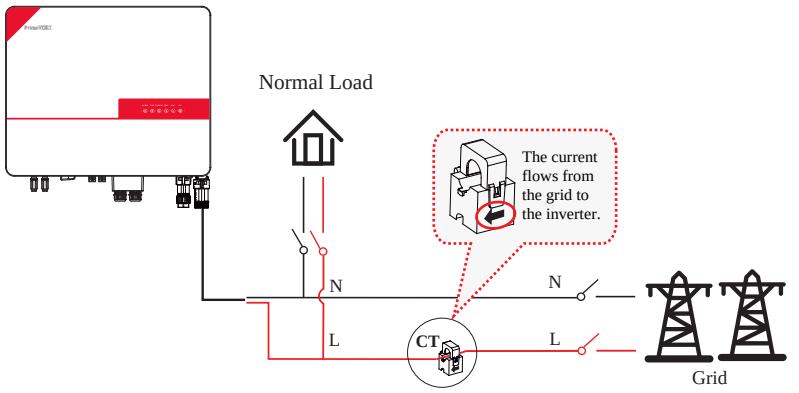


Please refer to the meter instruction manual for details.

4.5.2 CT Connection

Before connecting to Grid, please install a separate AC breaker (not equipped) between CT and Grid. This will ensure the inverter can be safely disconnected during maintenance.

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

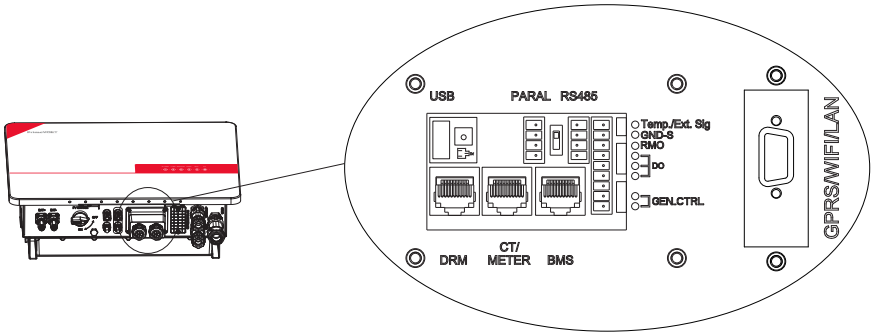


Please attention to the Current interchanger (CT) connection. The arrow on the CT indicates the current flow from grid to inverter. And lead the live line through the detection hole of CT.

NOTE	The current direction from grid to inverter is defined as positive and current direction from inverter to grid is defined as negative.

4.6 Communication Connection

There are communication interfaces in the communication port on the bottom of the inverter as show below:

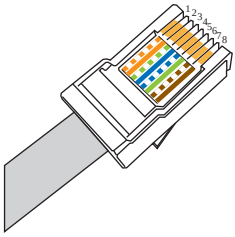


Interface		Descriptions
USB		For fast firmware upgrade.
PARAL		4-Pin interface for parallel communication
		A matched resistance switch for parallel communication
RS485		4-Pin interface for RS485 communication
DRM		Demand response mode for Australia application
CT/METER		For Meter communication or Grid current sense.
BMS		Lithium battery communication interface
9-Pin	GEN	Generator control
	DO	Dry contact control (reserved)
	RMO	Remote off control
	Temp./Ext. Sig	Temperature sensor terminal of lead-acid battery/External signal
GPRS/WIFI/LAN		For GPRS/WIFI/LAN communication.

4.6.1 BMS Connection (Only for Lithium Battery)

NOTE	This manual ONLY illustrates the pinout sequence of BMS at INVERTER SIDE. For details about the pinout sequence at battery side, see the user manual of the battery you use, and the following pinout diagram of battery side is only for illustration.

Standard RJ45 Pinout



RJ45 Pin Configuration	
Pin	**Color**
1	White-Orange
2	Orange
3	White-Green
4	Blue
5	White-Blue
6	Green
7	White-Brown
8	Brown

Always face the flat side of the terminal, and count the pin slots from left to right, which, correspond to 1 to 8. Read the pin definitions of both the battery and inverter carefully.

Pin definition of terminal

INVERTER:

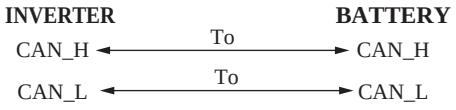
Inverter	
Pin	**Definition**
1	RS485_A
2	RS485_B
3	GND_S
4	CAN_H
5	CAN_L
6	GND_S
7	CAN_L
8	CAN_H

BATTERY:

An example of the battery's pin configuration is as following.

Battery（example）	
Pin	**Definition**
1	NC
2	NC
3	GND_S
4	CAN_H
5	CAN_L
6	GND_S
7	NC
8	NC

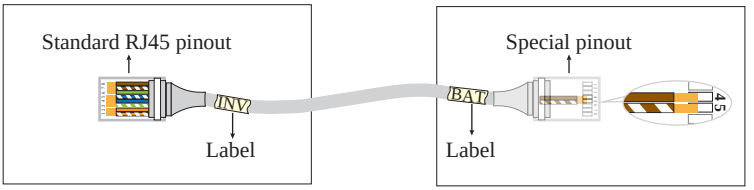
CAN BUS connection principle:



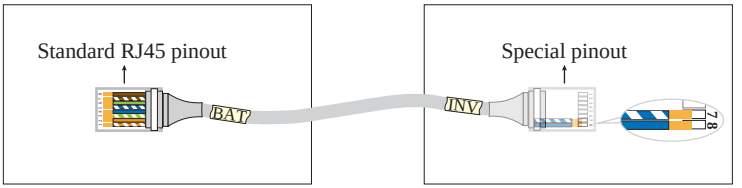
BMS communication cable prepare.

① Prepare RJ45 terminals and strip approperate length of COM cables.
② According to pin definitions and cable order, assemble the RJ45 terminals and crimp communication wires.There are two methods to assemble the RJ45 terminals.
③ Then label the RJ45 terminals (BAT or INV) to avoid confusion.
④ After finishing wire-making, use a multimeter or other specific tool to check if your cable is good, bad, or wired incorrectly.

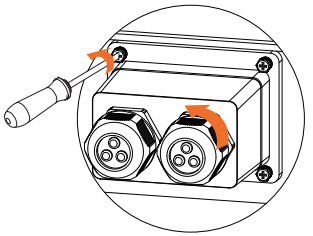
Method 1: Use the INVERTER RJ45 pinout as the standard pinout to crimp wires, then the battery side will be a non-standard one (special pinout). Cut off the other no-used wires (1/2/3/6/7/8) for the battery RJ45 terminal.



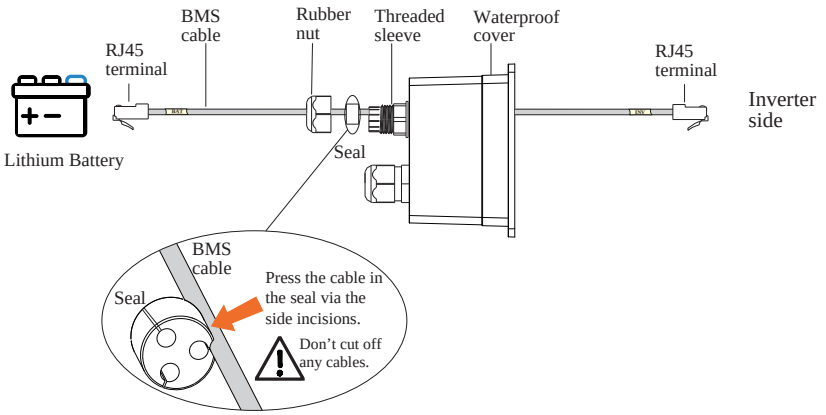
Method 2: Use the BATTERY RJ45 pinout as the standard pinout to crimp wires, then the inverter side will be a non-standard one (special pinout). Cut off the other no-used wires (1/2/3/4/5/6) for the inverter RJ45 terminal.



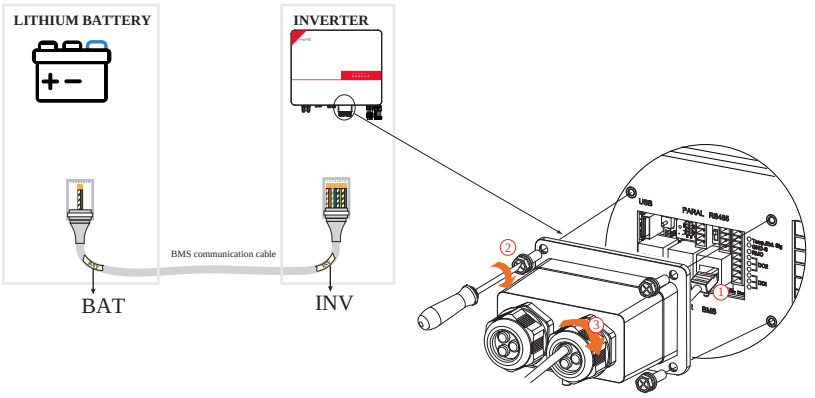
BMS communication cable connection.



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



b Lead the BMS cable through the rubber nut, seal and waterproof cover in turn.



① Insert RJ45 terminal into corresponding port.
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.

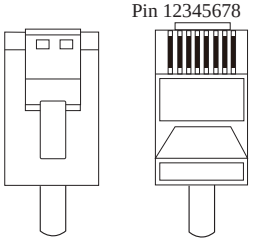
c

4.6.2 DRMs Connection

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

Note: With DRMs connection, it is necessary to connect APP to inverter and then go to Console > Other Setting page to enable DRM function on APP. Please refer to section 7.2.3.

RJ45 Terminal Configuration of DRMs

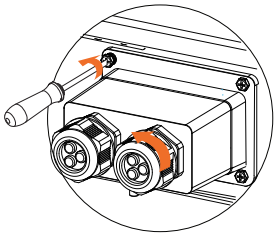


PIN	1	2	3	4
Function Description	DRM1/5	DRM2/6	DRM3/7	DRM4/8

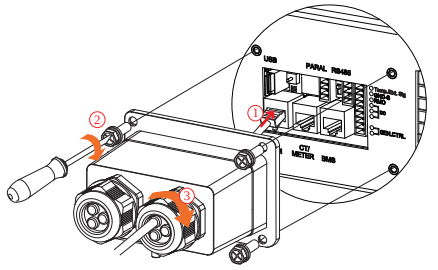
PIN	5	6	7	8
Function Description	REF	DRM 0/COM	NC	NC

Refer to the following steps:

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

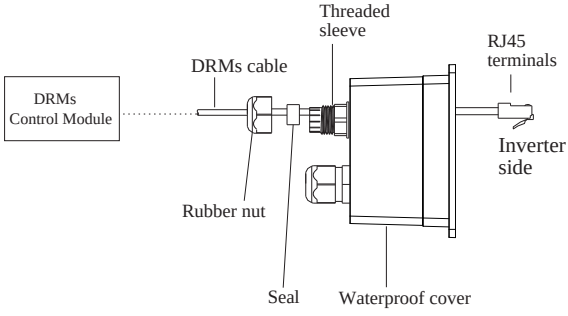


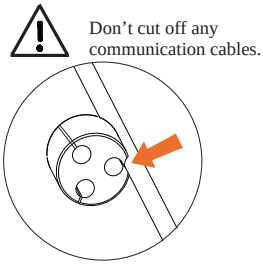
c



① Insert RJ45 terminal into corresponding port.
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 Assembly 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.

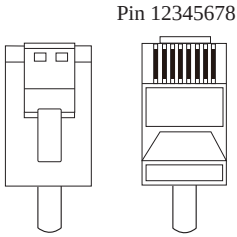




Press the DRMs cable in the seal via the side incisions.

4.6.3 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+	Test-	NC

CT / Meter Connection Requirement

Inverter.Qty	Distance	CT	Meter	CT+Meter
1	≤ 3m	√	√	√
	3 - 10m	√	√	
	> 10m		√	
2 - 5	≤ 3m	√		√
	3 - 10m	√		
	> 10m			
> 5	≤ 3m			√
	3 - 10m			
	> 10m			

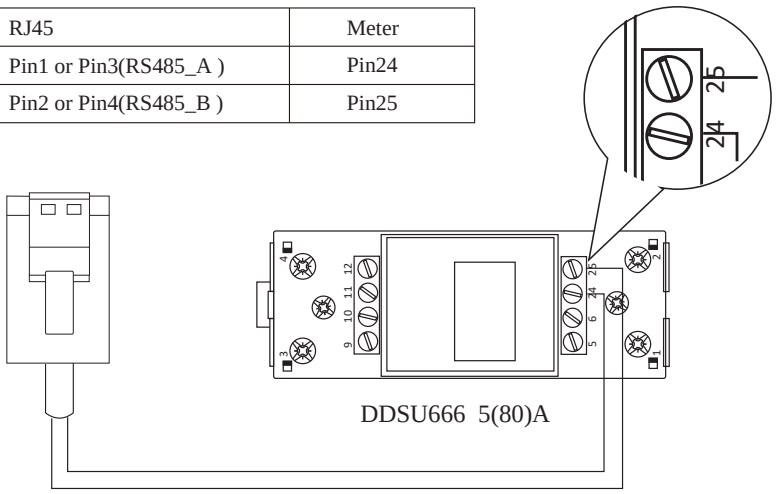
NOTE

- CT: 3m cable length (default); 10m cable length (optional). Do not extend the CT cable.
- Meter (optional): wire length up to 100m.
- For **CT+Meter** connection, it is necessary to additionally purchase suitable CT and meter from customer service according to the specific requirements.

4.6.3.1 Meter Connection

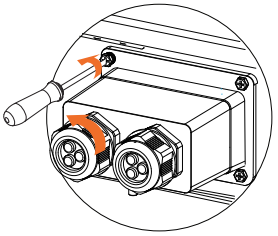
Meter cable connection overview

RJ45	Meter
Pin1 or Pin3(RS485_A)	Pin24
Pin2 or Pin4(RS485_B)	Pin25



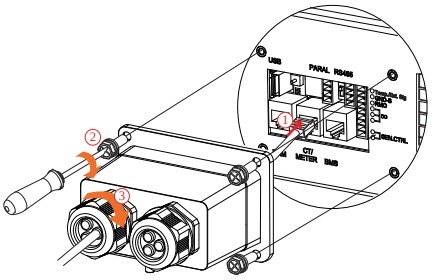
Connect meter. Refer to the following steps:

a



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

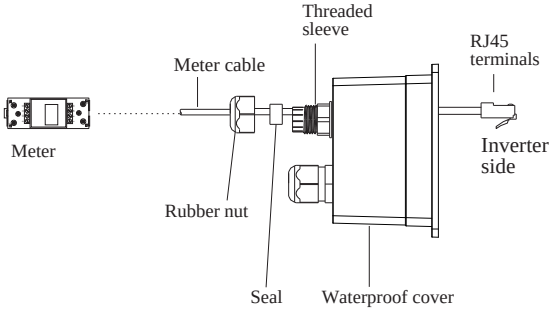
c



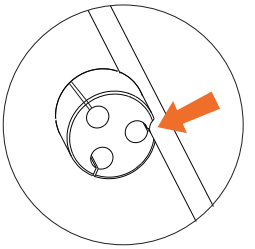
① Insert RJ45 terminal into corresponding port.
② Screw the waterproof cover back to inverter firmly with 4 x M4 screws(1.2N·m).
③ Install the seal into the threaded sleeve, fasten the rubber nut.

b

Assembly 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.

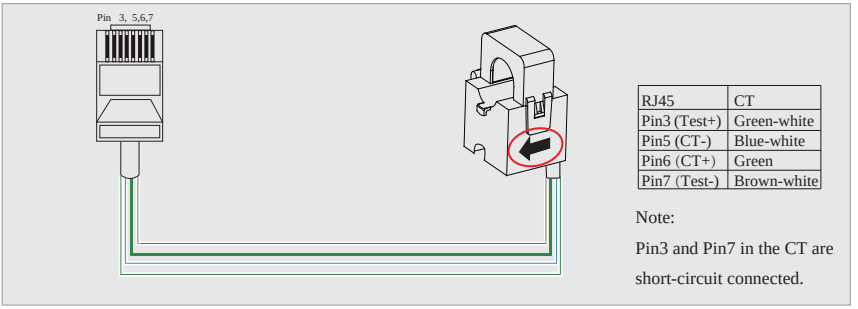


Press the meter cable in the seal via the side incisions.

4.6.3.2 CT Connection

This section is applicable to non-parallel connection mode and parallel connection but the number of machine no more than 5 only.

CT cable connection overview

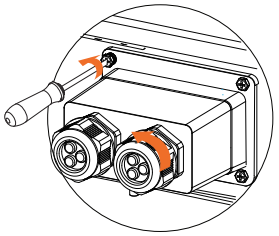


RJ45	CT
Pin3 (Test+)	Green-white
Pin5 (CT-)	Blue-white
Pin6 (CT+)	Green
Pin7 (Test-)	Brown-white

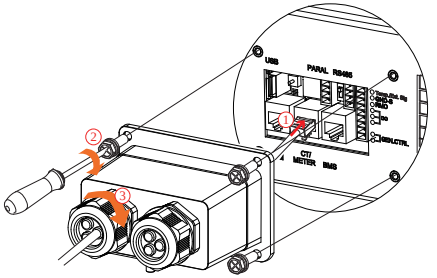
Note:

Pin3 and Pin7 in the CT are short-circuit connected.

Connect CT. Refer to the following steps:



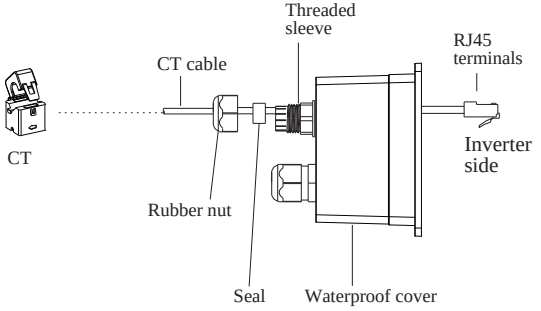
a Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.



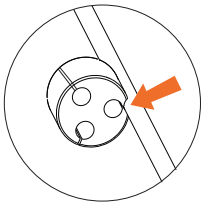
c

① Insert RJ45 terminal into corresponding port.
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 Assembly 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.



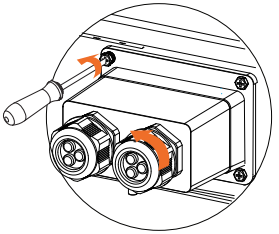
Press the CT cable in the seal via the side incisions.

4.6.4 RS485 Connection

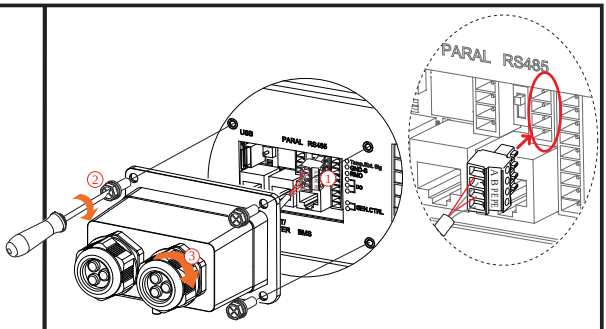
4-Pin Terminal Configuration of RS485 Communication

PIN	A	B	PE	PE
Function Description	RS485_A	RS485_B	PE	PE

Connect RS485. Refer to the following steps:

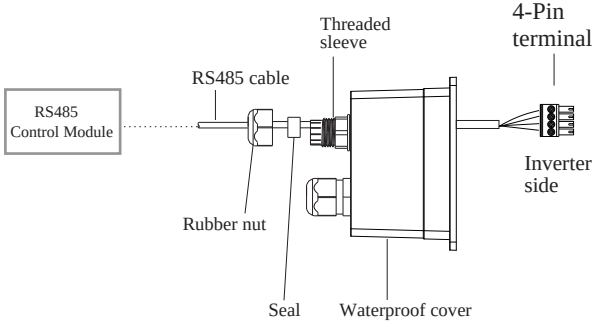


a Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.

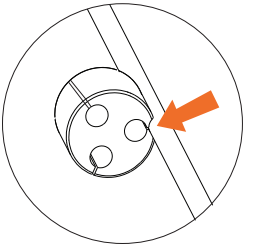


c
① Insert 4-Pins terminal into corresponding port.
② Screw the waterproof cover back to inverter firmly with 4 x M4 screws(1.2N·m).
③ Install the seal into the threaded sleeve, fasten the rubber nut.

b Assembly the 4-Pin terminal according to above function description of each Pin definition.
Lead the RS485 cable through the rubber nut, seal and waterproof cover in turn.



Don't cut off any communication cables.



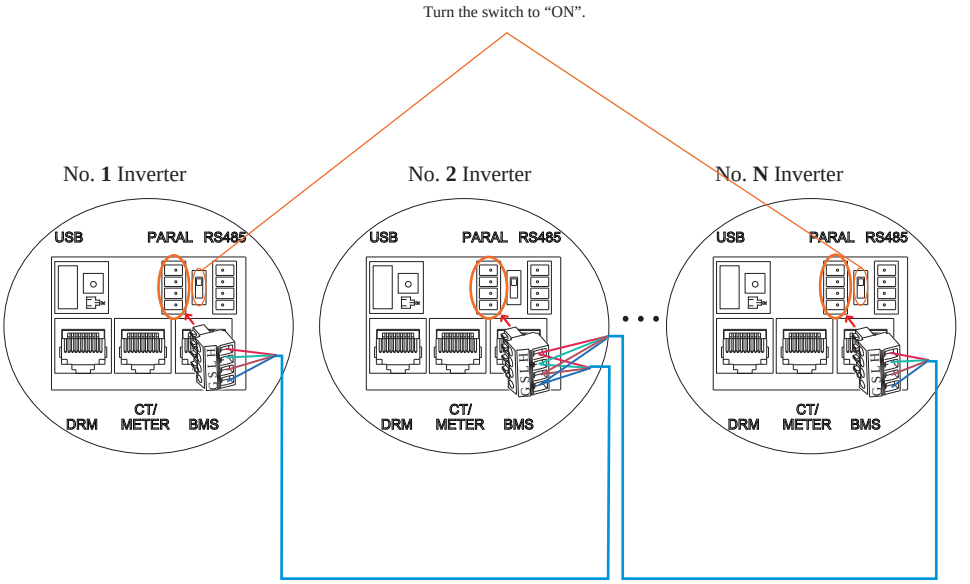
Press the RS485 cable in the seal via the side incisions.

4.6.5 Parallel Communication Connection

4-Pin Terminal Configuration of parallel Communication

PIN	G	S	L	H
Function Description	GND_S	PARA_SYNC	CAN_L	CAN_H

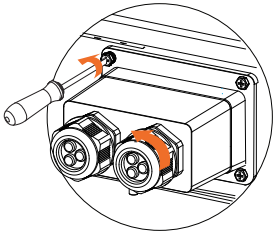
Parallel communication cable connection overview



It is necessary to turn the matched resistance switch of No. **1** inverter and No. **N** inverter to "ON" in parallel connection mode.

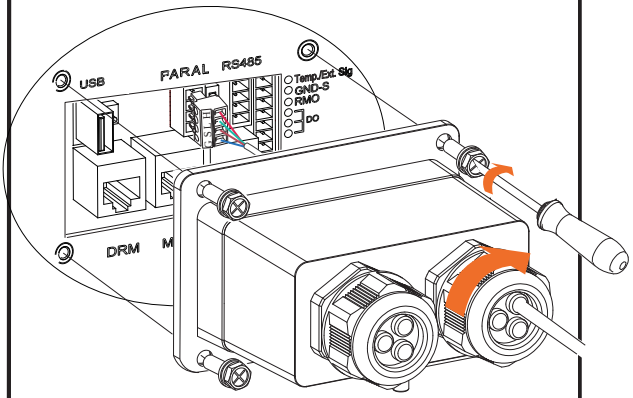
No. 1 Inverter	No. **2** Inverter	……	No. **N** Inverter
PinH(CAN_H)	PinH(CAN_H)		PinH(CAN_H)
PinL(CAN_L)	PinL(CAN_L)		PinL(CAN_L)
PinS(PARA_SYNC)	PinS(PARA_SYNC)		PinS(PARA_SYNC)
PinG(GND_S)	PinG(GND_S)		PinG(GND_S)

Refer to the following steps:



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

a

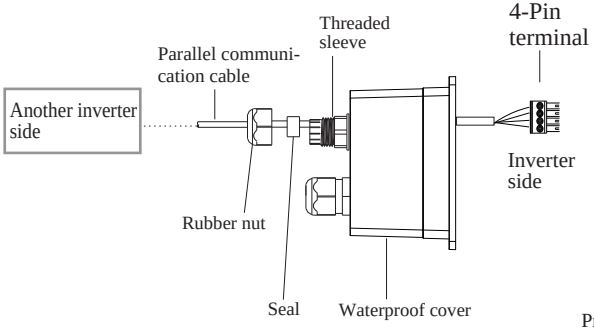


① Insert 4-Pins terminal into corresponding port.
② Screw the waterproof cover back to inverter firmly with 4 x M4 screws(1.2N·m).
③ Install the seal into the threaded sleeve, fasten the rubber nut.

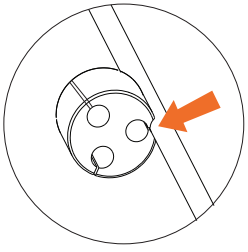
c

b

Assembly the 4-Pin terminal according to above function description of each Pin definition.
Lead the RS485 cable through the rubber nut, seal and waterproof cover in turn.



Don't cut off any communication cables.

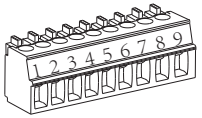


Press the Parallel communication cable in the seal via the side incisions.

4.6.6 Temp. sensor/RMO/DO Control Connection(s)

9-Pin Terminal Configuration of Auxiliary Communication

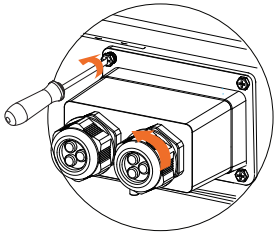
Pin123456789



PIN	Function Description
1	NO1 (Generator Control)
2	N1 (Generator Control)
3	NC1 (Normal Close)
4	NO2 (Normal Open)
5	N2 (Common Pole)
6	NC2 (Normal Close)
7	Remote OFF
8	GND_S
9	Temp. : NTC BAT+ (NOT Italy regulation)
	Ext. Sig: External signal (Italy regualtion)

Refer to the following steps:

a

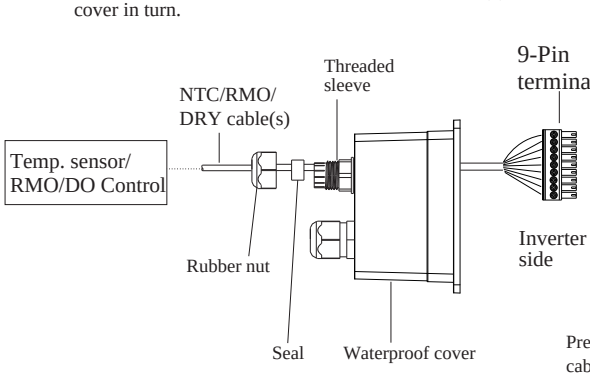


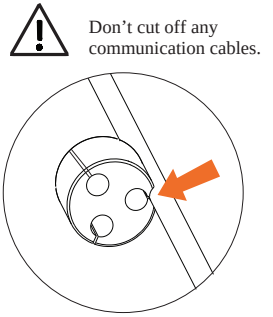
Unscrew the waterproof cover and loosen the rubber nut on waterproof cover.

b

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

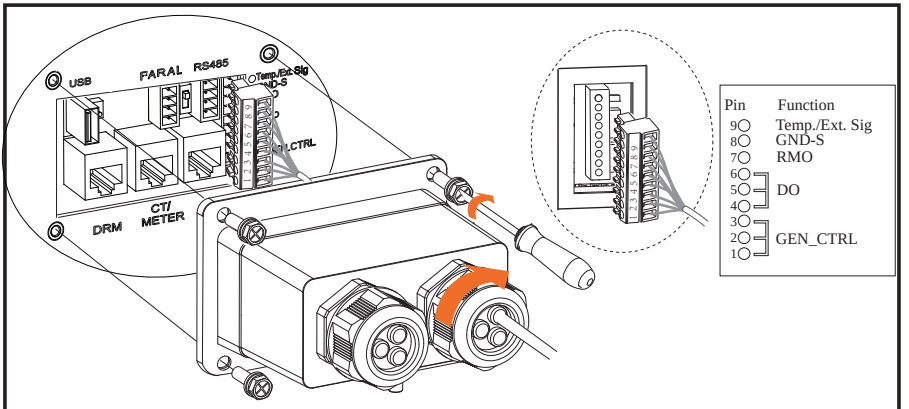
Lead the Temp. sensor/RMO/DO Control cable(s) through the rubber nut, seal and waterproof cover in turn.





Don't cut off any communication cables.

Press the Temp. sensor/RMO/DO Control cable(s) in the seal via the side incisions.

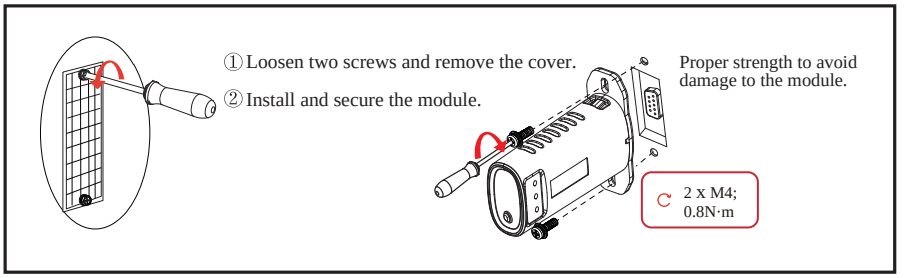


c

Insert its 9-Pin terminal into the corresponding Temp. sensor/RMO/DO Control 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.

4.6.7 WIFI Module Connection (Optional)

For details, please refer to the corresponding Module Installation Guide in the packing.
The figure shown here is only for illustration.



5 System Operation

5.1 Inverter Working Mode

The inverter supports several different working modes.

5.1.1 Self Used Mode

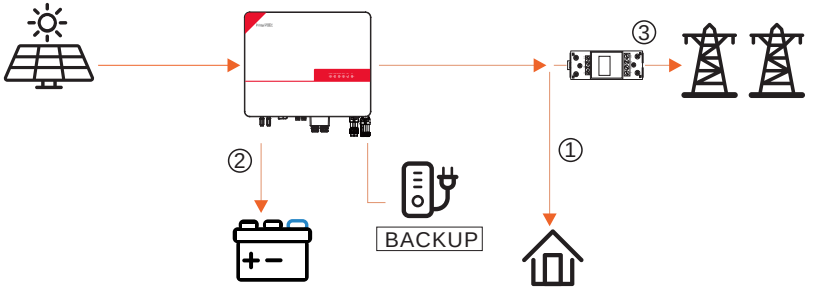
Go to the "Hybrid work mode" menu, and select the "Self used mode".

Under Self Used mode, the priority of PV energy consumption will be Load > Battery > Grid, that means the energy produced by PV gives priority to powering local loads, the excess energy is used to charge 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.

a) Wealthy PV Energy

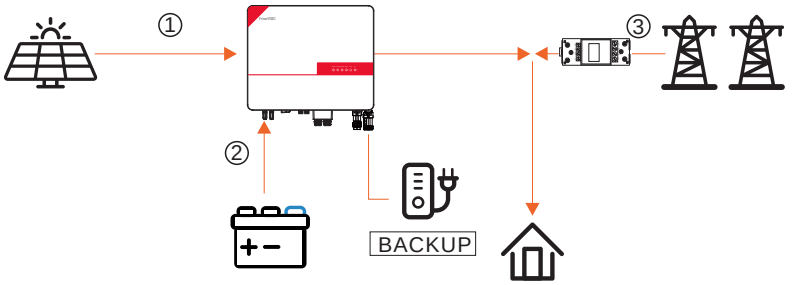
When PV energy is wealthy, the PV energy will be first consumed by loads, the excess energy will be used to charge the battery and then the remaining energy will be fed into the grid.



① ② ③ is the sequence of PV energy transmission.

b) Limited PV Energy

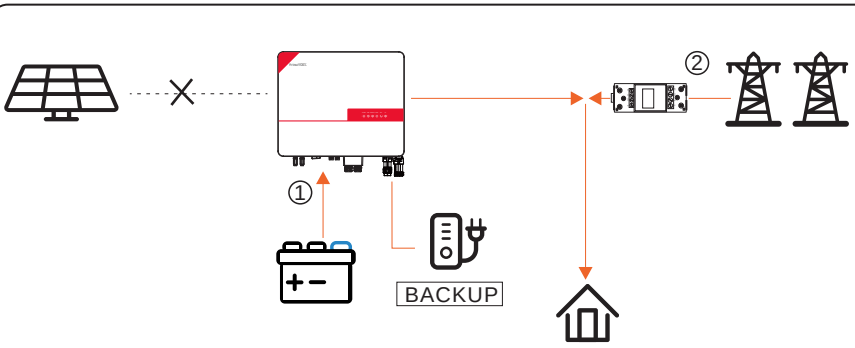
When the PV energy is not enough to cover all consumption, the PV energy will be entirely used by loads, and the insufficient part will be supplied by battery. Then still insufficient parts will be supplied by grid.



① ② ③ is the sequence of load consumption.

c) 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, the loads will consume grid energy.



① ② is the sequence of load consumption.

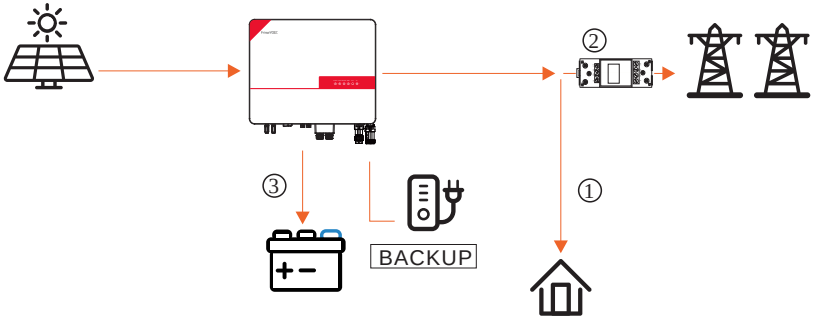
5.1.2 Feed-in Priority Mode

Go to the "Hybrid work mode" menu, and select the "Feed-in priority mode".

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

a) Wealthy PV Energy

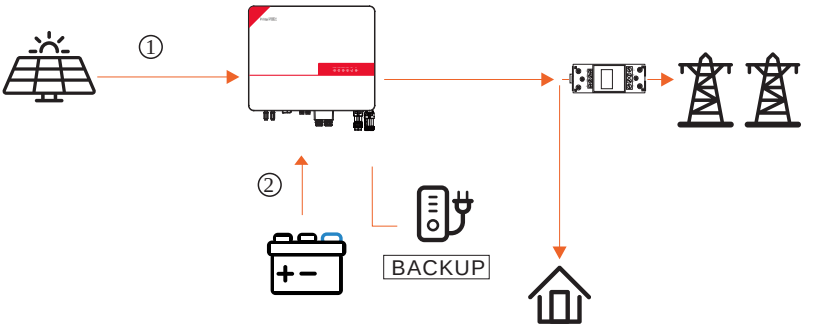
When PV energy is wealthy, the PV energy will be first consumed by loads. If there is excess PV power, the power will be fed into grid. If there is still PV energy left after load consuming and grid feeding, then the remaining PV power will be used to charge the battery.



① ② ③ is the sequence of PV energy transmission.

b) Limited PV Energy

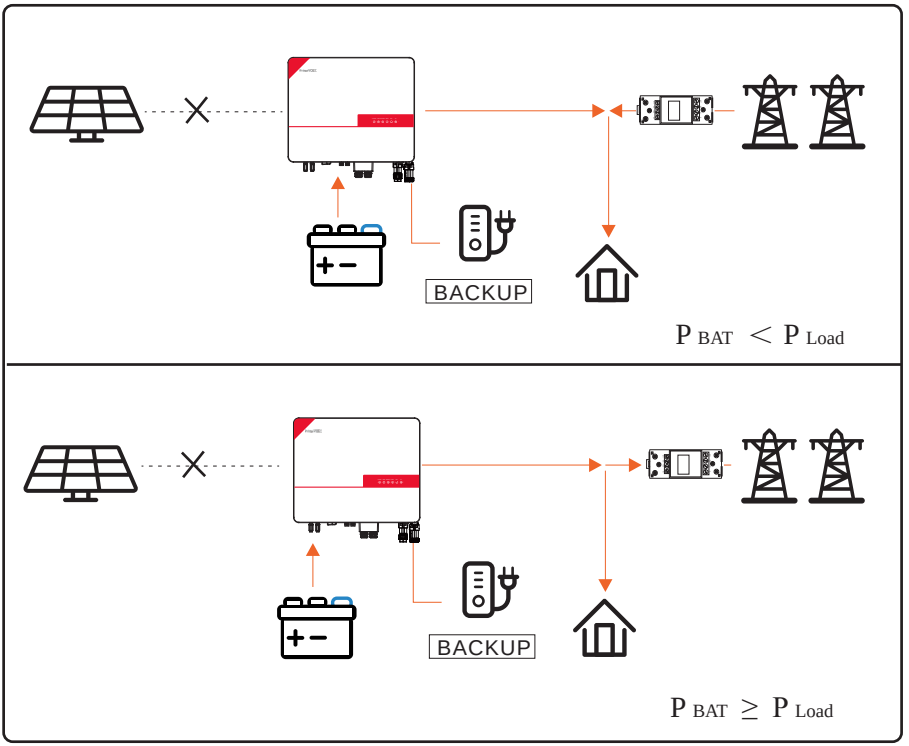
When PV energy is limited and can not meet the feed-in grid power, the battery will discharge to meet it.



① ② is the sequence of grid fed-in energy.

c) 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, the loads will consume the grid energy.



5.1.3 Back-up Mode

Go to the "Hybrid work mode" menu, and select the "Back-up Mode".

Under this mode, the priority of PV energy consumption will be Battery > Load > Grid.

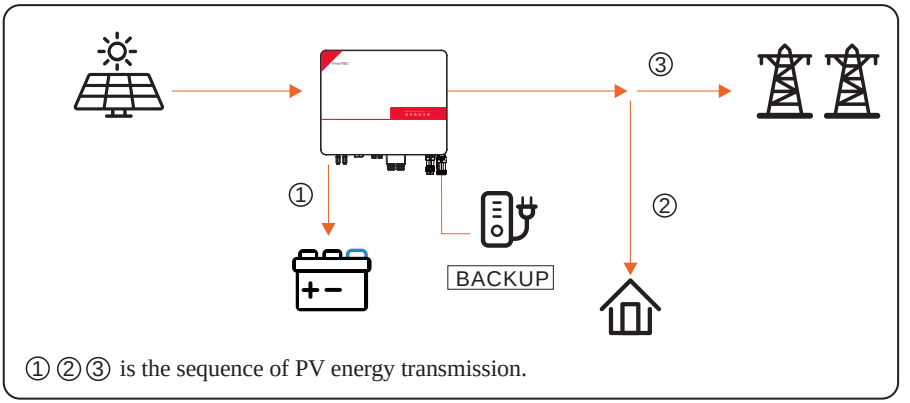
This mode aims at charging the battery quickly, and at the same time, you can choose whether to allow AC to charge the battery.

Forbid AC charging

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

a) Wealthy PV power

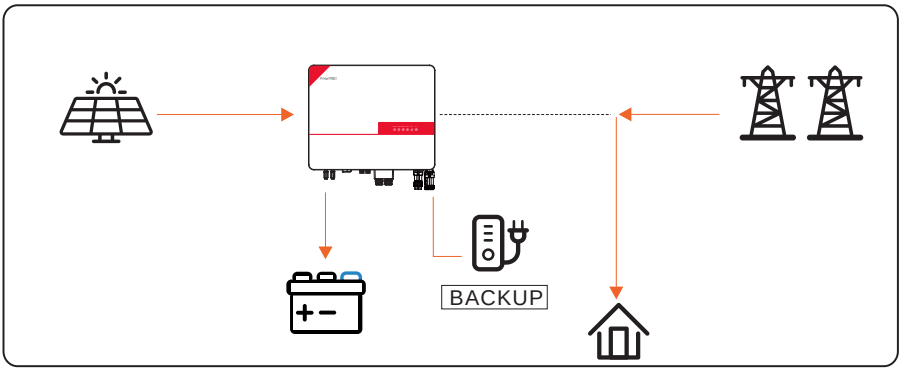
When PV energy is wealthy, PV charges the battery first, then meets the load, and the rest is fed into the grid.



① ② ③ is the sequence of PV energy transmission.

b) Limited PV power

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

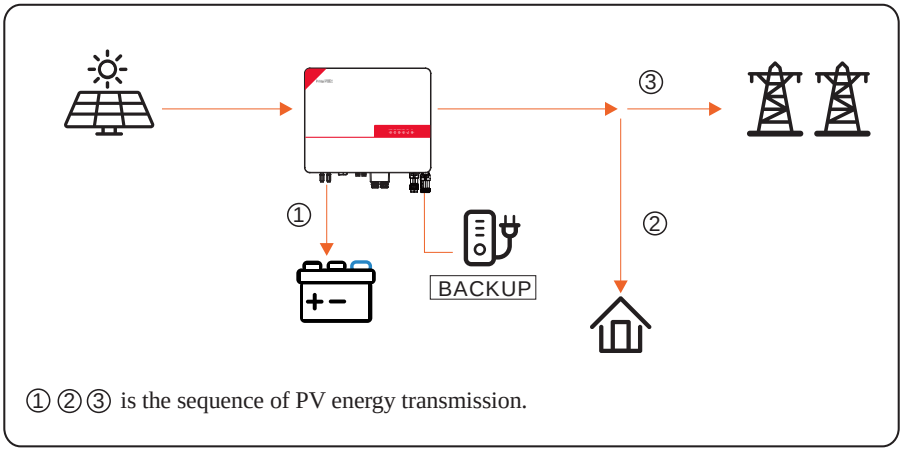


Allow AC charging

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

a) Wealthy PV power

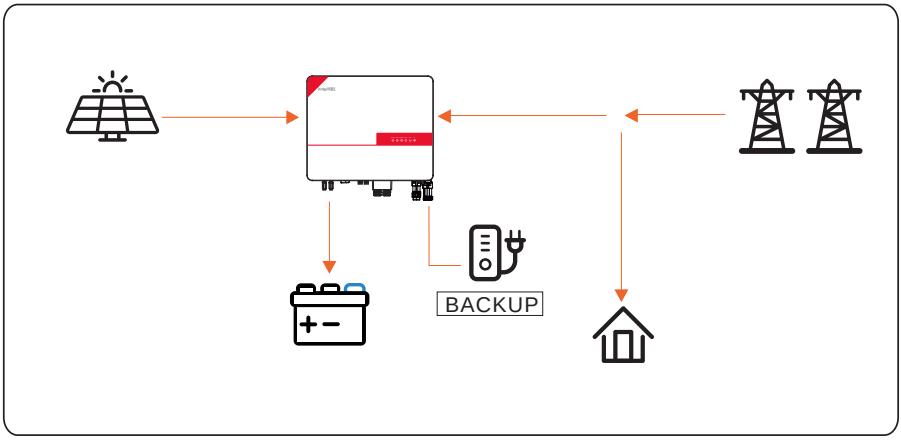
When PV energy is wealthy, PV charges the battery first, then meets the loads, and the rest is fed into the grid.



① ② ③ is the sequence of PV energy transmission.

b) 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.



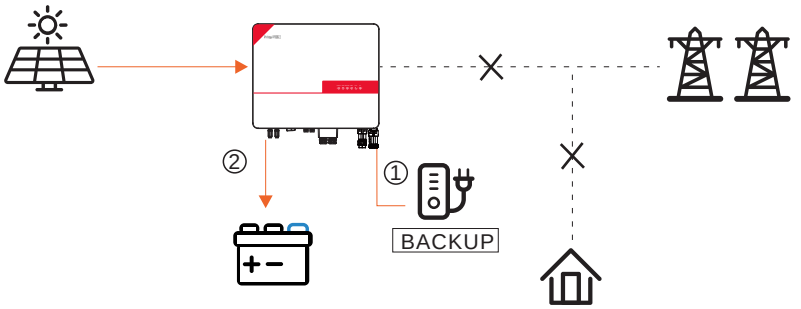
5.1.4 Off Grid Mode

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.

a) Wealthy PV power

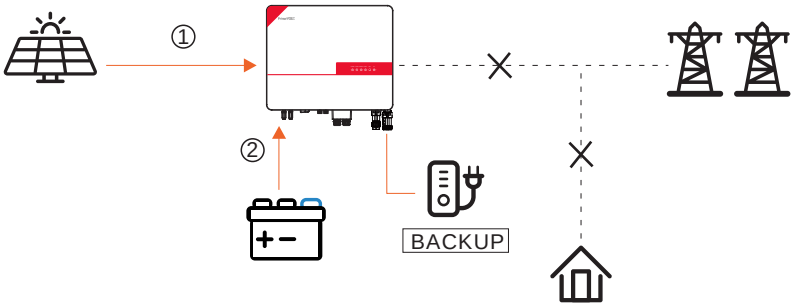
When PV energy is wealthy, the PV power will be first consumed by critical load, then charge the battery.



①② is the sequence of PV energy transmission.

b) Limited PV power

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



①② is the sequence of BACKUP load consumption.

NOTICE	• Under this mode, please complete the output voltage and frequency settings. • It is better to choose the battery capacity larger than 100Ah to ensure BACKUP function work normally. • If BACKUP output loads are inductive or capacitive loads, to make sure the stability and reliability of system, it is recommended to configure the power of these loads to be within 50% BACKUP output power range.

5.2 Startup/Shutdown Procedure

5.2.1 Startup Procedure

Check that the installation is secure and strong enough, and that the system is well grounded. 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:

1) Power on PV.
2) Power on the Battery.
3) Power on the AC.
4) Power on the BACKUP.
5) Connect the cell phone App via Bluetooth. Please refer to Section 7.2 for details.
6) Click the Power ON in the App for the first time. Please refer to Section 7.2 for details.

5.2.2 Shutdown Procedure

According to actual situation, if there is a must to shut-down the running system, please follow below procedure:

1) Connect the cell phone App via Bluetooth. Please refer to Section 7.2 for details.
2) Click the Power OFF on the App. Please refer to Section 7.2 for details.
3) Power off the BACKUP.
4) Power off the AC.
5) Power off the Battery.
6) Power off the PV.
7) If you need to disconnect the inverter cables, please wait at least 10 minutes before touching these parts of inverter.

6 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.

6.1 Inspection

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

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

6.2 Commissioning Procedure

After inspection and making sure status is right, then start the commissioning of the system.

1) Power on the system by referring to the Startup section 5.2.1.
2) Setting the parameters on the App according to user's requirement.
3) Finish commissioning.

7 User Interface

7.1 LED

This section describes the LED panel. LED indicator includes ALARM, COM, BACKUP, GRID, BAT, PV indicators.

The table below explains the status and description of all indicators.

LED Indicator	Status	Description
PV	On	PV input is normal.
	Blink	PV input is abnormal.
	Off	PV is unavailable.
BAT	On	Battery is charging.
	Blink	Battery is discharging (light on 2s and off 2s). Battery is abnormal (light on 1s and off 1s).
	Off	Battery is unavailable.
GRID	On	GRID is available and normal.
	Blink	GRID is available but abnormal.
	Off	GRID is unavailable.
COM	Blink	Data are communicating.
	Off	No data transmission.
BACKUP	On	BACKUP power is available.
	Blink	BACKUP output is abnormal.
	Off	BACKUP power is unavailable.
ALARM	On	Fault has occurred and inverter shuts down.
	Blink	Alarm has occurred but inverter doesn't shut down.
	Off	No fault.

Details	Code	PV LED	Grid LED	BAT LED	BACKUP LED	COM LED	ALARM LED
PV normal		●	◎	◎	◎	◎	○
No PV		○	◎	◎	◎	◎	○
PV over voltage	B0	★	◎	◎	◎	◎	○
PV under voltage	B4						
PV irradiation weak	B5						
PV string reverse	B7						
PV string abnormal	B3						
On grid Bypass output		◎	●	◎	◎	◎	○
Grid absent	A2	◎	○	◎	◎	◎	○
Grid over voltage	A0	◎	★	◎	◎	◎	○
Grid under voltage	A1						
Grid over frequency	A3						
Grid under frequency	A4						
Grid abnormal	A6						
Grid over mean voltage	A7						
Neutral live wire reversed	A8						
Battery in charge		◎	◎	●	◎	◎	○
Battery unavailable		◎	◎	○	◎	◎	○
Battery absent	D1						
Battery in discharge		◎	◎	★★	◎	◎	○
Battery under voltage	D3	◎	◎	★	◎	◎	○
Battery over voltage	D2						
Battery discharge over current	D4						
Battery over temperature	D5						
Battery under temperature	D6						
Communication loss (Inverter - BMS)	D8						
BACKUP output active		◎	◎	◎	●	◎	◎
BACKUP output inactive		◎	◎	◎	○	◎	◎
BACKUP short circuit	DB	◎	◎	◎	★	◎	○
BACKUP over load	DC						
BACKUP output voltage abnormal	D7						
BACKUP over dc-bias voltage	CP						

Details	Code	PV LED	Grid LED	BAT LED	BACKUP LED	COM LED	ALARM LED
RS485/DB9/BLE/USB		◎	◎	◎	◎	★	◎
Inverter over temperature	C5	◎	◎	◎	◎	◎	★
Fan abnormal	C8						
Inverter in power limit state	CL						
Data logger lost	CH						
Meter lost	CJ						
Remote off	CN						
PV insulation abnorma (Earth Fault)	B1	◎	◎	◎	◎	◎	●
Leakage current abnormal (Earth Fault)	B2						
Internal power supply abnormal	C0						
Inverter over dc-bias current	C2						
Inverter relay abnormal	C3						
GFCI abnormal	C6						
System type error	C7						
Unbalance Dc-link voltage	C9						
Dc-link over voltage	CA						
Internal communication error	CB						
Internal communication loss(E-M)	D9						
Internal communication loss(M-D)	DA						
Software incompatibility	CC						
Internal storage error	CD						
Data inconsistency	CE						
Inverter abnormal	CF						
Boost abnormal	CG						
Dc-dc abnormal	CU						

Remark: ● Light on ○ Light off ◎ Keep original status
★ Blink 1s and off 1s ★★ Blink 2s and off 2s

7.2 App Setting Guide

7.2.1 Download App for Local Setting

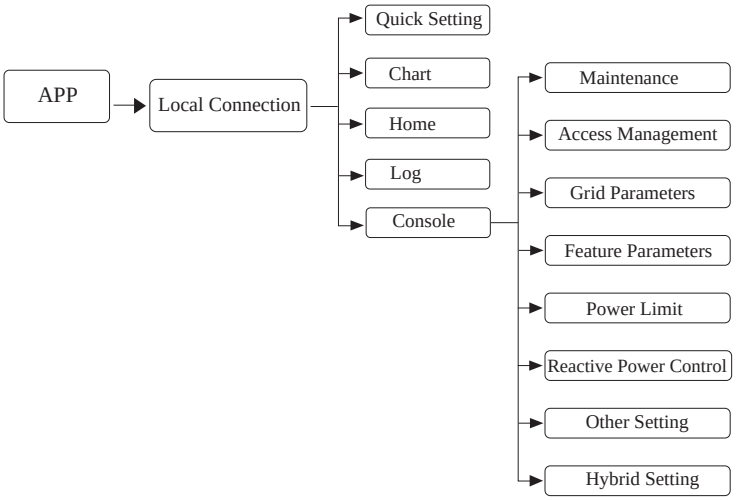
- Scan the QR code on the inverter to download the App *SolarHope*.
- Download the APP from the App Store or Google Play.

NOTE

1. The App *SolarHope* is only for local settings.
Detailed information about remote monitoring, please refer to corresponding WIFI User Manual.
2. The App should access some permissions such as the device's location. You need to grant all access rights in all pop-up windows when installing the App or setting your phone.

7.2.2 App Architecture

Local connection: APP read data from inverter through Bluetooth connection with Modbus protocol to display and configure inverter parameter.



7.2.3 Local Setting

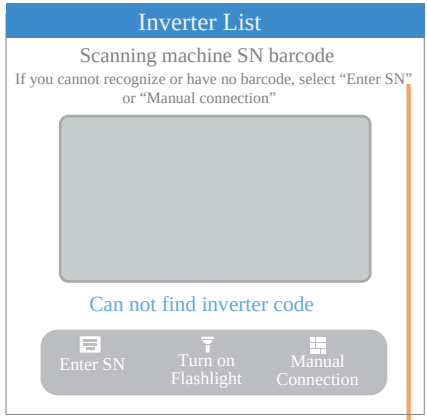
- **Access Permission**

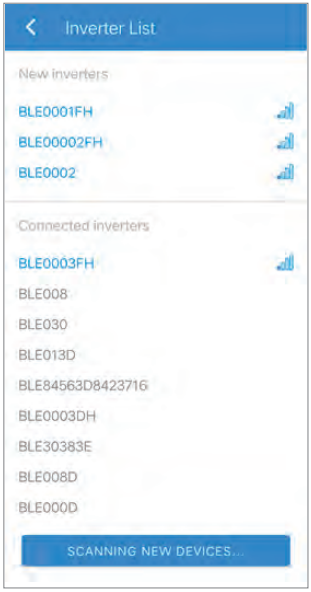
  Before using the local setting, the APP should access some permissions. (You can allow them when you install the APP or grant permissions in your own phone setting.) When the APP asks for permission, please click Allow.

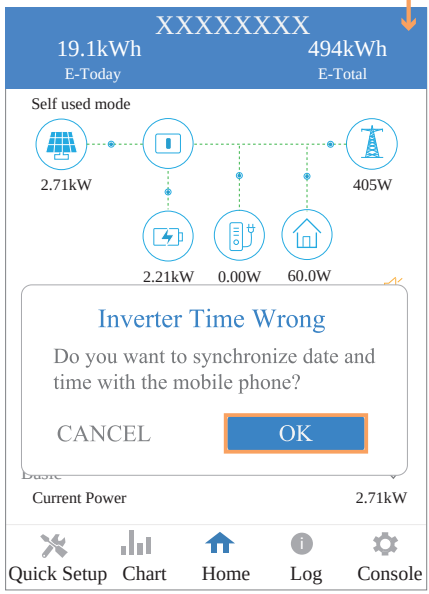
- **Connect Inverter**

  Firstly, open the Bluetooth on your own phone, then open the APP.

  Click Bluetooth Connection to enter scanning interface. This page will list the inverters which you can connect or you have connected. (As shown below) click the inverter's name to connect it.







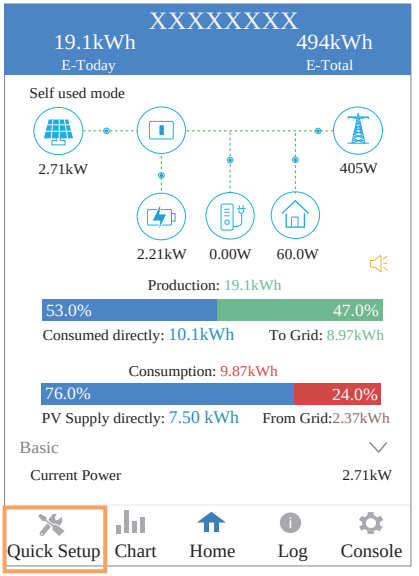
- **Quick Setting**

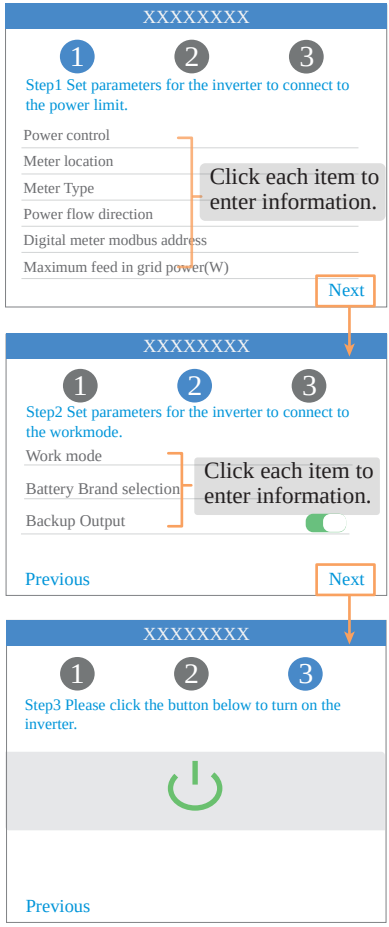
  ➢ Go to Quick Setup page.

  Step 1 Set parameters for the inverter to connect to the power limit. Click each item to enter the information, then click Next.

  Step 2 Set parameters for the invetre to connect to the workmode. Click each item to enter the information, then click Next. You can click Previous to go back to the previous page.

  Step 3 Click the button below to turn on the inveter. You can click Previous to go back to the previous page.

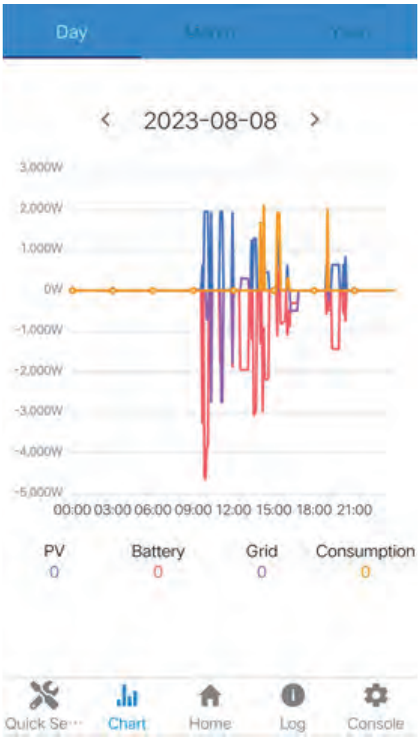


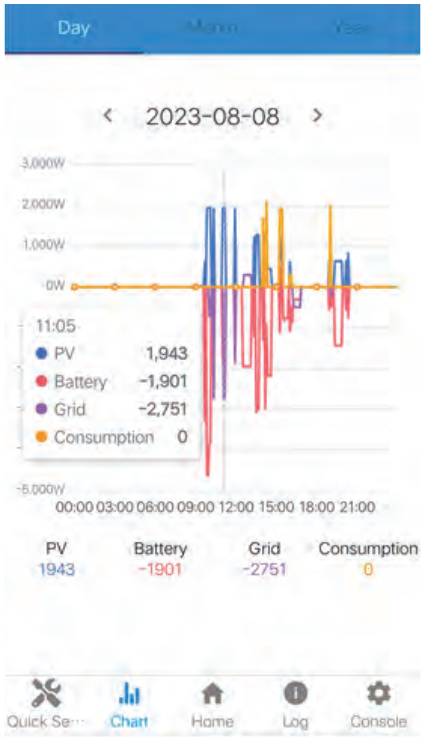


- **APP Power Chart**

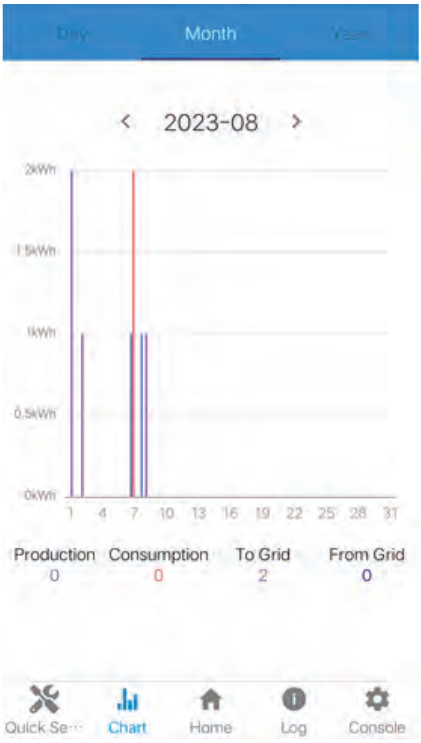
  The power chart is showed by Day, Month and Year in our APP. Data curves in the following figures are only for illustration.

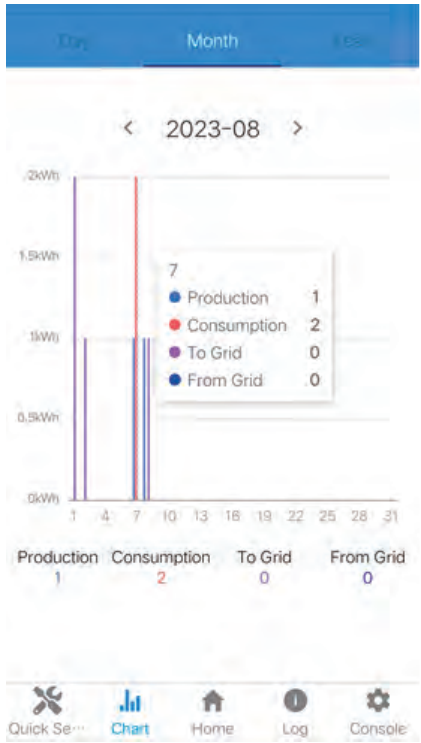
  ➢ Day Chart



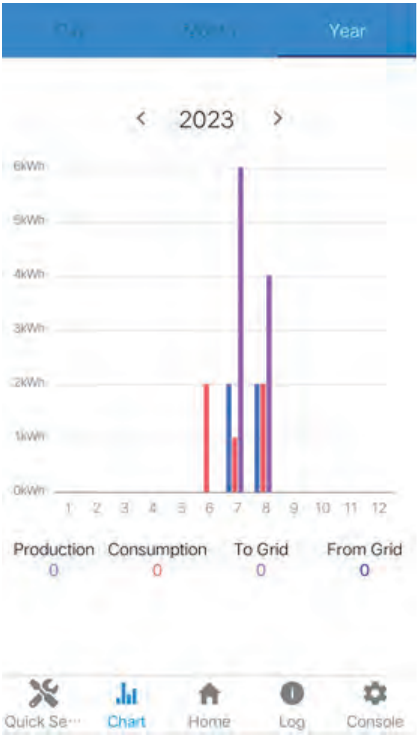


➢ Month Chart


Month
2023-08
2kWh
1.5kWh
1kWh
0.5kWh
0kWh
1 4 7 10 13 16 19 22 25 28 31
Production Consumption To Grid From Grid
0 0 2 0
Quick Se··· Chart Home Log Console

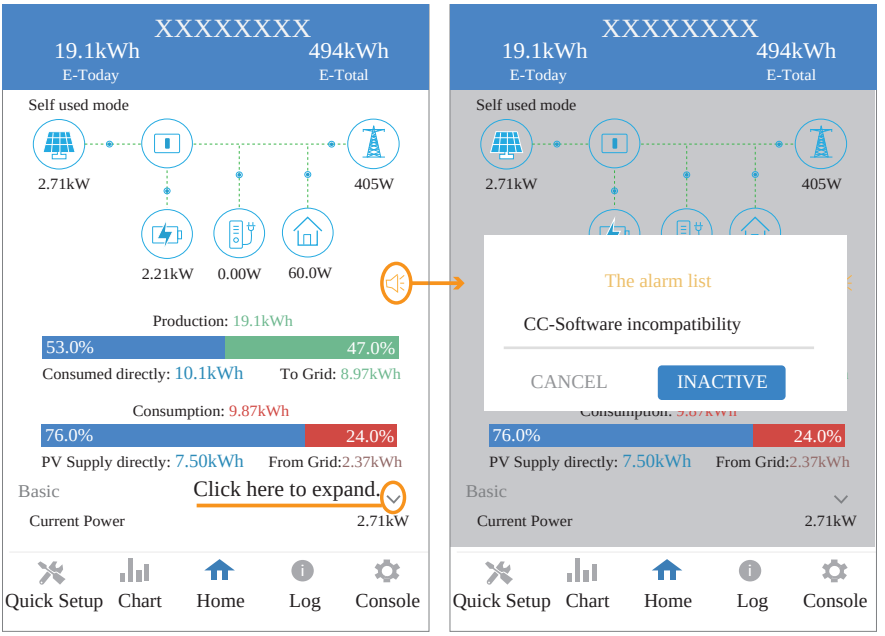

Month
2023-08
2kWh
1.5kWh
1kWh
0.5kWh
0kWh
7
Production 1
Consumption 2
To Grid 0
From Grid 0
1 4 7 10 13 16 19 22 25 28 31
Production Consumption To Grid From Grid
1 2 0 0
Quick Se··· Chart Home Log Console

➢ Year Chart


Year
2023
6kWh
5kWh
4kWh
3kWh
2kWh
1kWh
0kWh
1 2 3 4 5 6 7 8 9 10 11 12
Production
0
Consumption
0
To Grid
0
From Grid
0
Quick Se···
Chart
Home
Log
Console

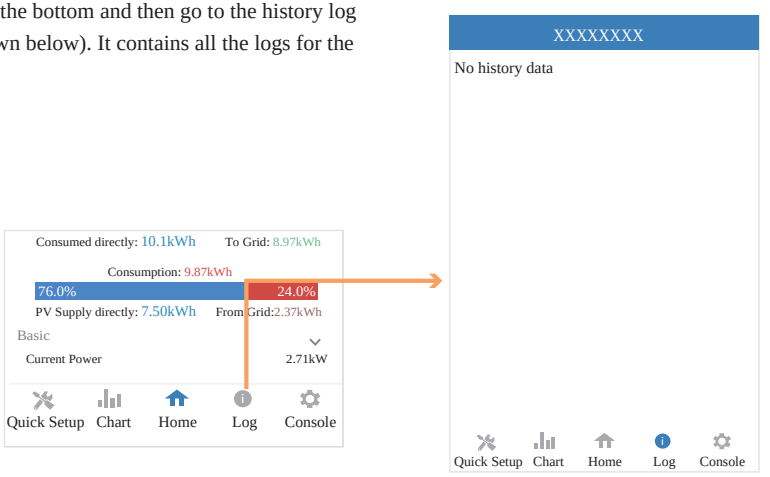
- **Local Setting Homepage**

  This page shows the basic information of inverter. Click to check the warning message.



- **History Log**

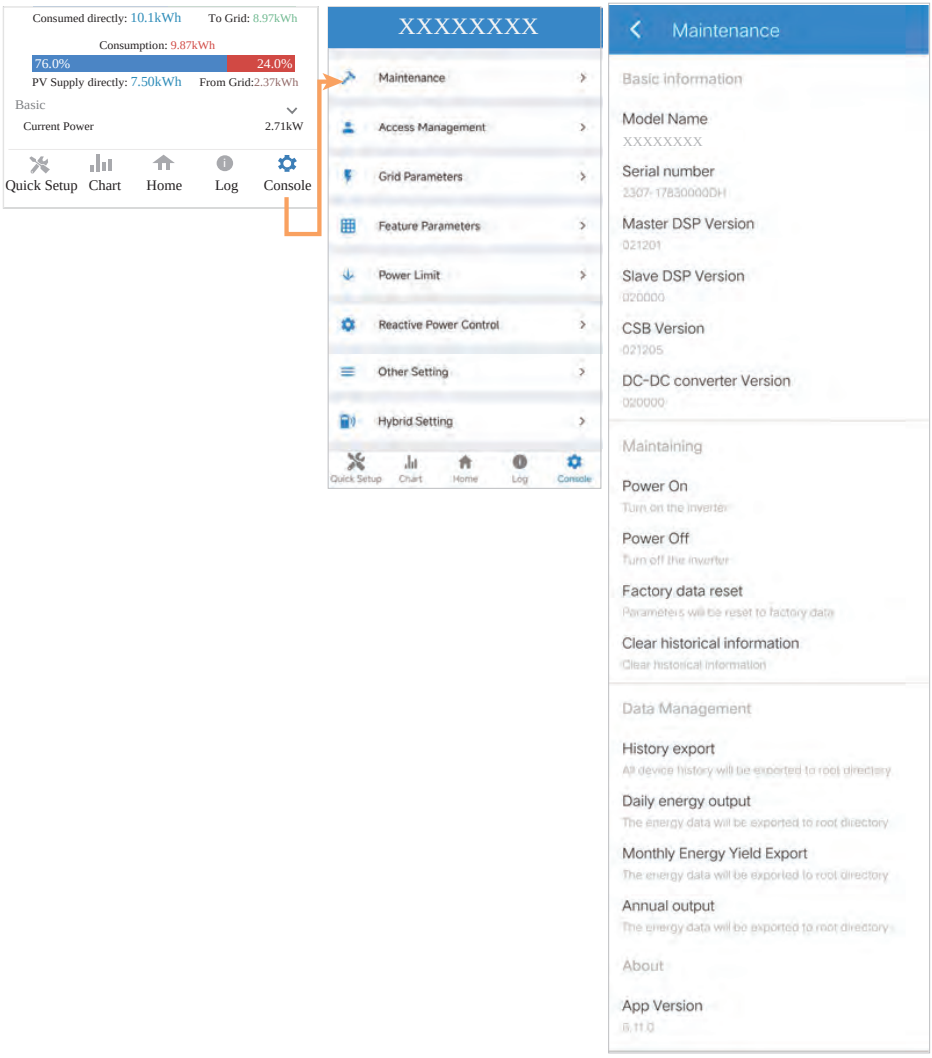
  Click Log at the bottom and then go to the history log page (as shown below). It contains all the logs for the inverter.



- **Console**
  - **Maintenance**

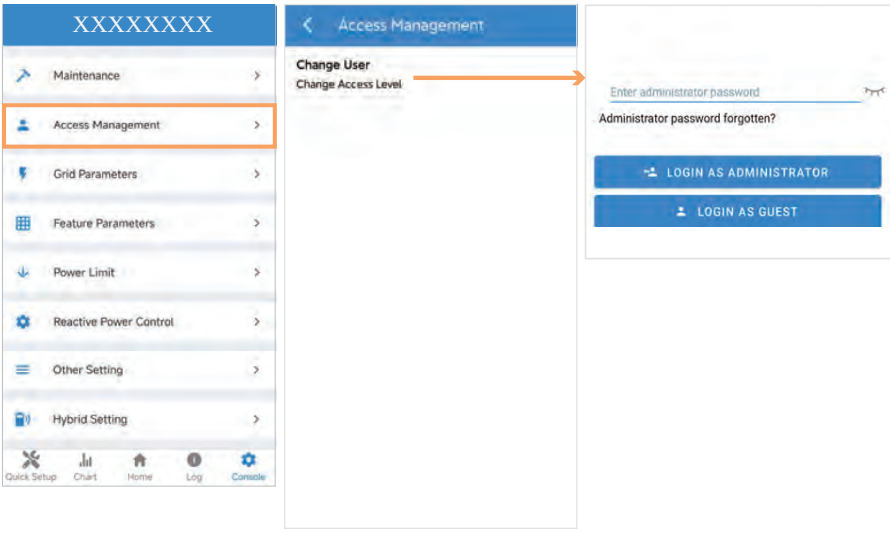
    Go to Console page. And click Maintenance

    In this page, you can view the basic information like some version information, do some maintaining operations like turn off/on the inverter and manage data.



➢ **Access Management**

Go to Console > Access Management page. In this page, you can switch the login permission.



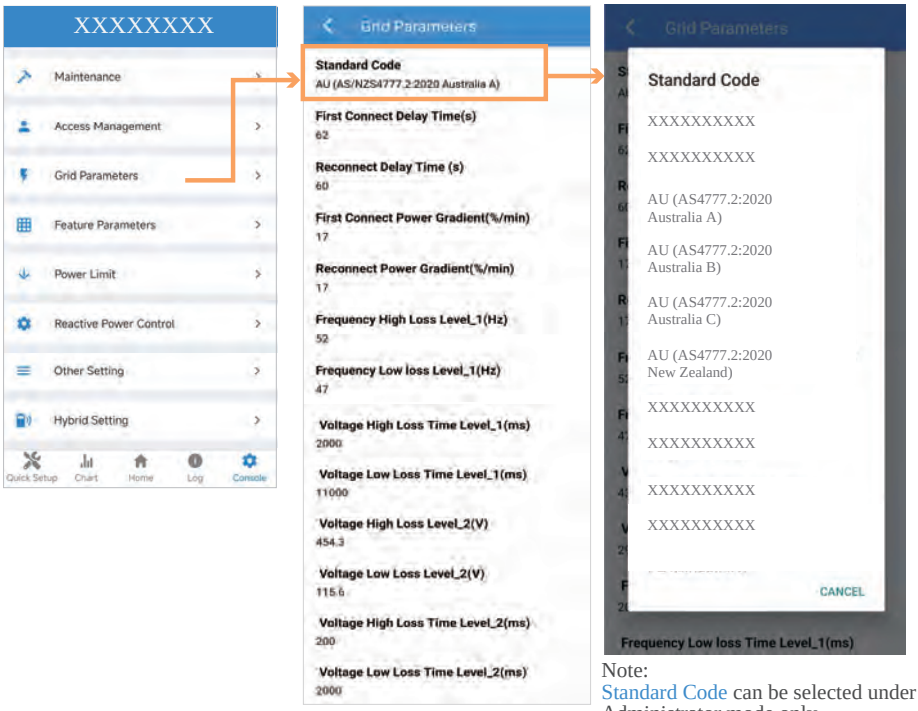
Note:

Clike LOGIN AS ADMINISTRATOR to enter the administrator mode, and set Standard Code. (Please contact the customer service center to get the administrator password.)

Clike LOGIN AS GUEST to enter the guest mode, and view or check Standard Code only.

➢ **Grid Parameters (**country code configuration, only for **Administrator Status)**

Go to Console > Grid Parameters page. Follow the steps below to configure the country code for Australia under Administrator status.

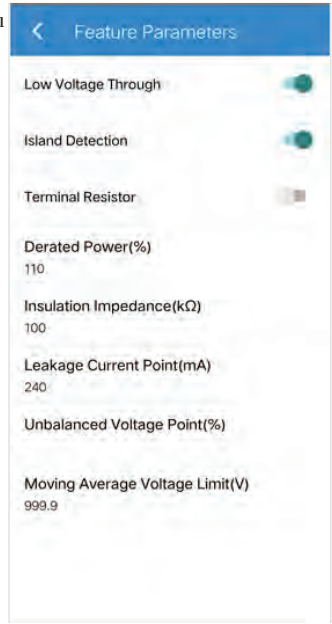


Note:
Standard Code can be selected under Administrator mode only.

Note:
For Australian Market: Region settings must be selected during commissioning. To comply with AS/NZS 4777.2:2020, please console your local electricity grid operator for which region to select.

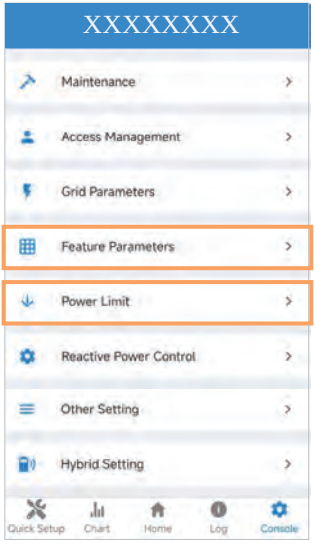
➢ **Feature Parameters**

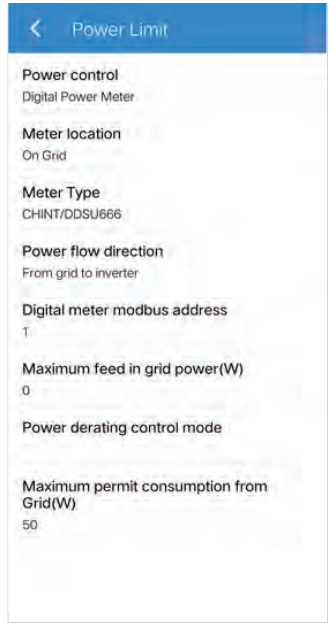
Go to Console > Feature Parameters page. In this page, you can set or change the feature parameters, as shown in the figure.



➢ **Power Limit**

Go to Console > Power Limit page. In this page, you can set or change the parameters of power limit, as shown in the figure.



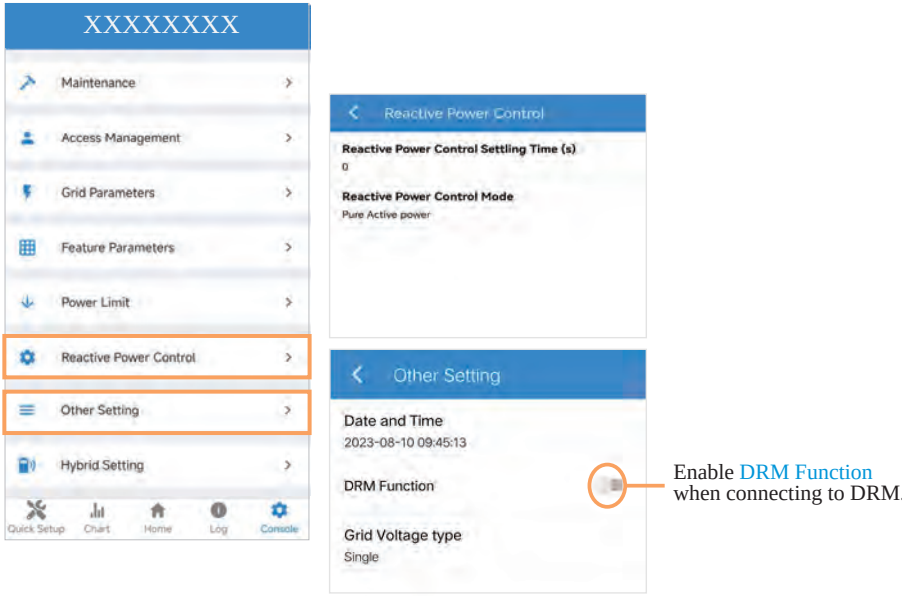


➢ **Reactive Power Control**

Go to Console > Reactive Power Control page. In this page, you can set or change the Reactive Power Control parameters.

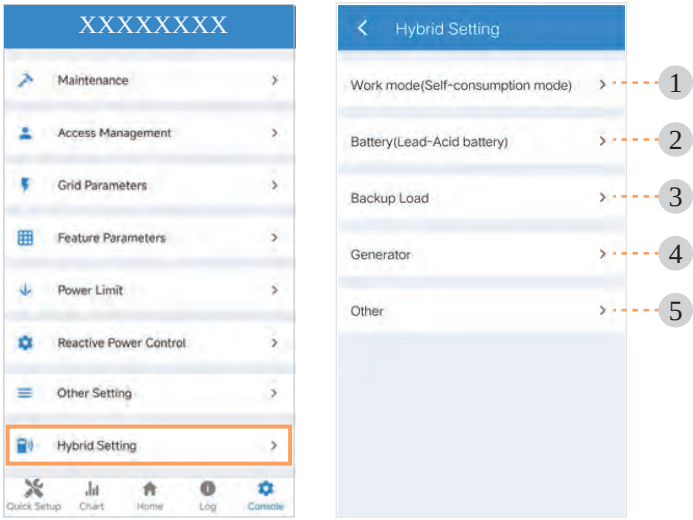
➢ **Other Setting**

Go to Console > Other Setting page. In this page, you can set other setting parameters.



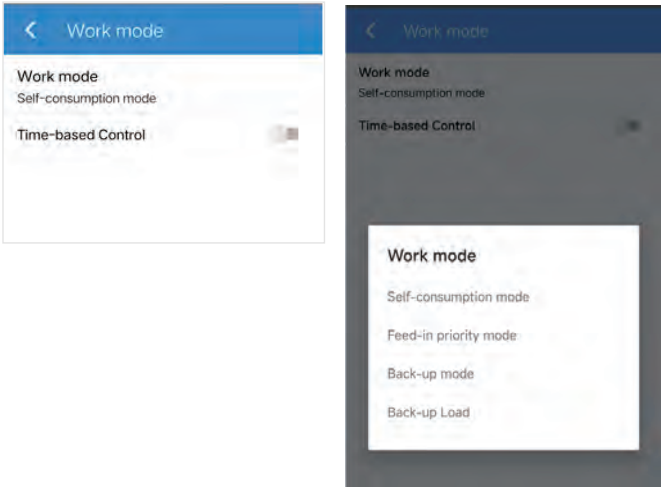
➢ Hybrid Setting

Go to Console > Hybrid Setting page. In this page, you can set contents about work mode, battery, backup Load, generator and other. The setting interfaces are listed one by one.



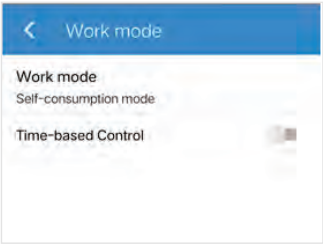
1 Work mode

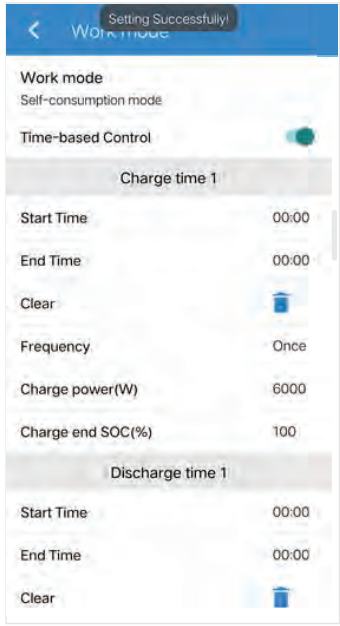
In Work mode page, there are four work modes are available.



In Work mode page, you can also find “Time-based Control” function. This function is designed to control the time setting of charging and discharging the inverter. You can set the following parameters based on your requirements:

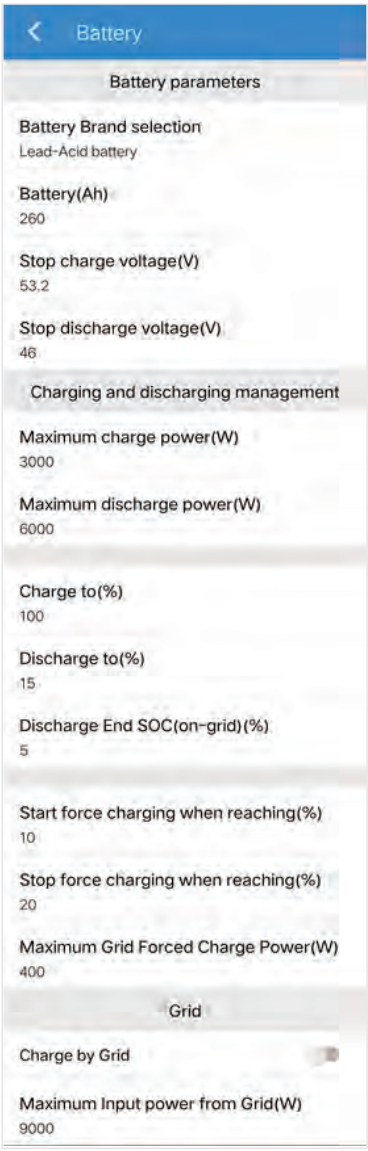
- Charge and discharge frequency: one time or daily
- Charging start time: 0 to 24 hours
- Charging end time: 0 to 24 hours
- Discharge start time: 0 to 24 hours
- Discharge end time: 0 to 24 hours





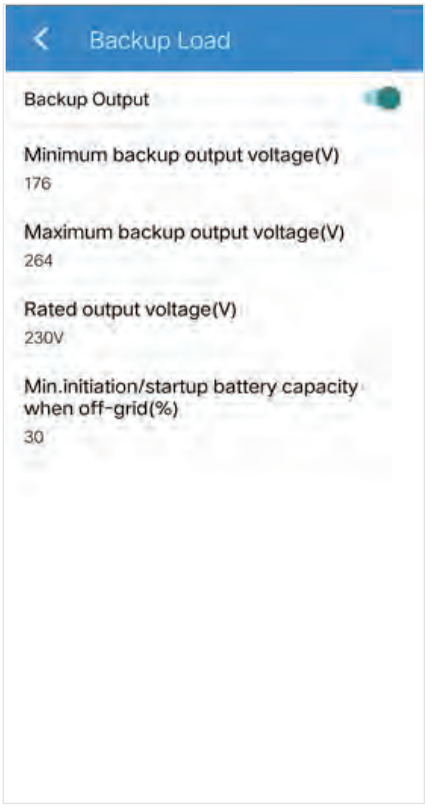
2 Battery

In Battery page, information including battery parameters, charging and discharging management and grid will be listed. Enter corresponding information if necessary.



3 Backup Load

In Backup Load page, if enabling Backup Output, you can set parameters including the range of backup output voltage and Min. initiation/startup battery capacity when off-grid.



4 Generator

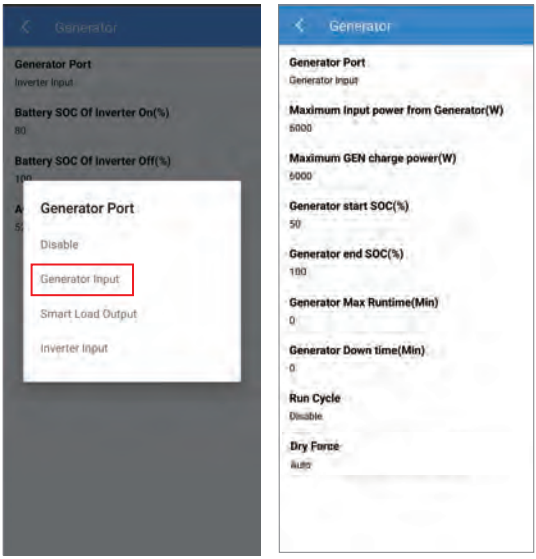
Generator Input Mode Introduction

- **Generator Input Mode:** Under this mode, the GEN port works as an input port from the generator while under off-grid condition. The generator input can charge the battery or take the backup load. The generator has two start-stop ways, one is controlled by dry contact of inverter, the other is controlled by manual. For the former, the start and stop of the generator is completely controlled by the inverter. For the latter, the generator is started and stopped by manual control.

  Note:

  The generator capacity should be 1.3 times larger than the capacity of the hybrid inverter.

- Go to Hybrid Setting > Generator > Generator Port page and choose Generator Input as below.



Note:

You need to shut down the inverter to set the Generator Input Mode.

- All parameters have been set by default.

Maximum Input power from Generator (W)
Forbid the generator power larger than the setting value (W).

Maximum GEN charger power (W)
Maximum battery charge power from generator .

Generator start SOC (%)
Battery SOC below which the generator starts to charge the battery. Meanwhile, the generator running time should not exceed the maximum runtime setting value (Min).

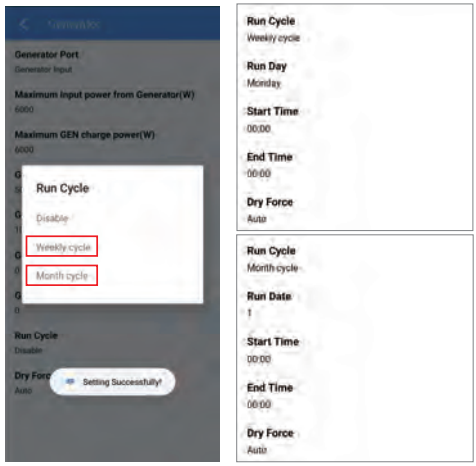
Generator Max Runtime (Min)
When the generator running time reaches to the setting value, the inverter will disconnect the input from generator. But the generator will keep working for a while defined by “Generator down time(Min)”.

Generator end SOC (%)
Battery SOC above which the generator stops charging the battery.

Generator Down time (Min)
When the inverter disconnect the input from generator, the generator will keep working for a while by the down time setting value (Min).

- For generator that switch on and off by dry contact, it will stop working automatically when the generator working time reaches to the down time setting value (Min).
- For generator that are manually switched on and off, it will stop working by manual regardless of the down time setting value (Min).

Run Cycle
Generator Cycle run mode. You can set as Weekly or Month cycle.



Dry force
When the Grid power is abnormal, the generator is forced to be turned on.

Generator start Bat. Volt(V)
Battery voltage below which the generator starts to charge the battery.
Meanwhile, the generator running time should not exceed the maximum runtime setting value (Min).

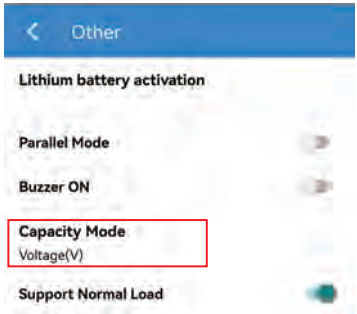
Generator end Bat. Volt(V)
Battery voltage above which the generator stops charging the battery.

Note:

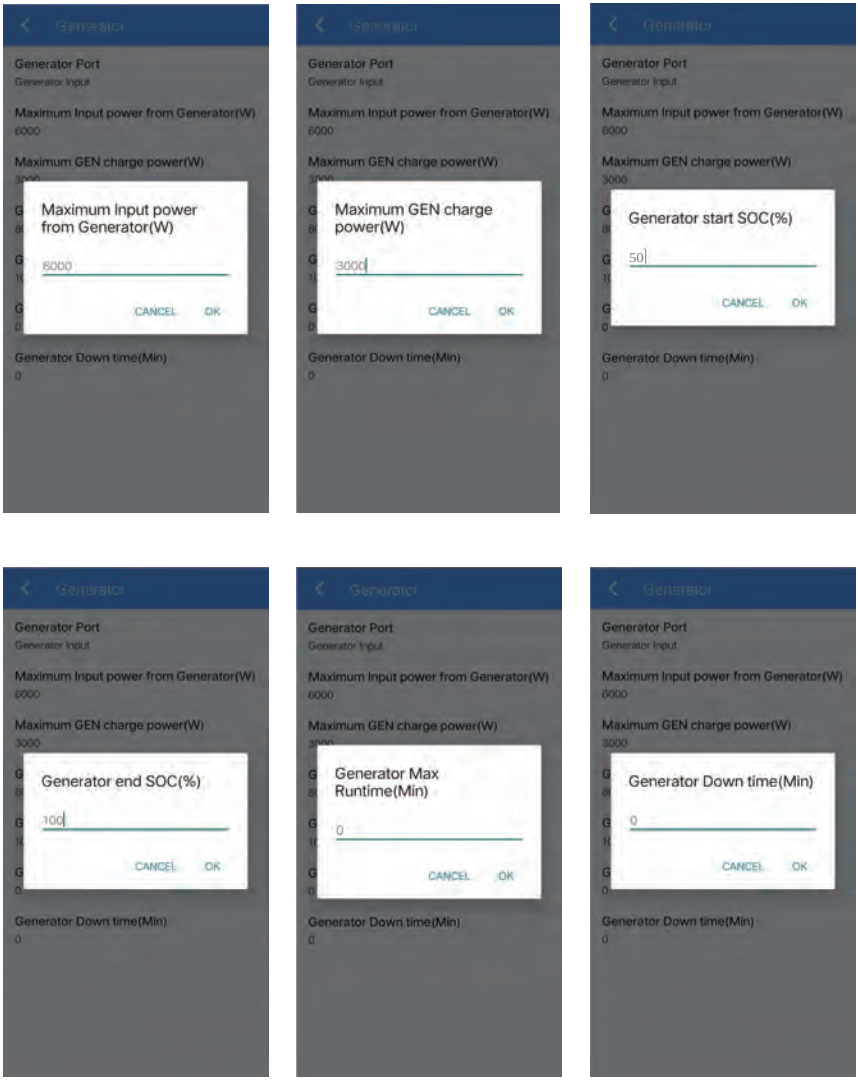
1.The total generator running time is equal to “Generator Max Runtime (Min)” plus “Generator down time (Min)”.

Note:

Go to Hybrid setting > Other > Capacity Mode, when you set Capacity Mode to voltage (V), as shown in below figure, parameter settings about **Generator start SOC (%)** will be changed to **Generator start Bat. Volt(V)**. Also, parameter settings about **Generator end SOC (%)** will be changed to **Generator start Bat. Volt(V)**.



The default values of Generator Input are as below:



Note:

The default value of **Generator start Bat. Volt(V)** is 48V;

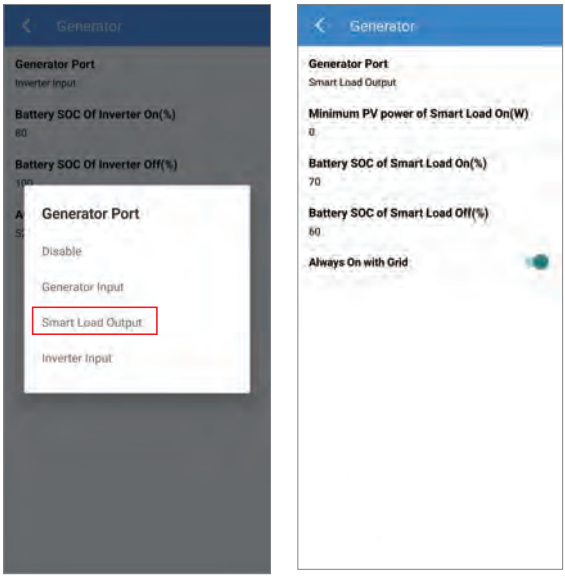
The default value of **Generator end Bat. Volt(V)** is 65V.

- If the values are set as described above, Capacity Mode was set to SOC (%), the situations are as follows:
  - Under Off-Grid mode, the Generator Input will be ON or OFF depends on the battery SOC and Generator Max Runtime.
    When the Battery SOC ≤ 50% and the Runtime is less than Generator Max Runtime (Min), the GEN Port function will be enabled and the Generator Input will be ON.
    When the Battery SOC ≥ 100% or the Runtime is over Generator Max Runtime (Min), the GEN port function will be disabled and the Generator Input will be OFF.
  - Under On-Grid mode, the GEN Port function will be disabled and the Generator Input will be OFF.

  Note:
  1. If Generator and Grid are normal, preferably powered by Grid power.
  2. Generator Max Runtime (Min) = 0, means generator can run all the time.
  3. When the Capacity Mode was set to voltage, the Generator Input Mode still follows the above logic.

➢ Smart Load Output Mode Introduction

- **Smart Load Output Mode:** Under this mode, the GEN Port works as an output port for the Smart Load connected to the GEN terminal.
- Go to Hybrid Setting > Generator > Generator Port page and choose Smart Load Output as below.



- All parameters have been set by default.

Minimum PV power of Smart Load On(W) & Battery SOC of Smart Load On (%)
If the PV input power is higher than the setting value(Power), and the battery SOC exceeds the setting value simultaneously, the Smart Load will switch on.

Battery SOC of Smart Load Off (%)

If the battery SOC is lower than the setting value, the Smart Load will switch off.

Always On with Grid
When click “Always On with Grid” the Smart Load will switch on when the grid is present.

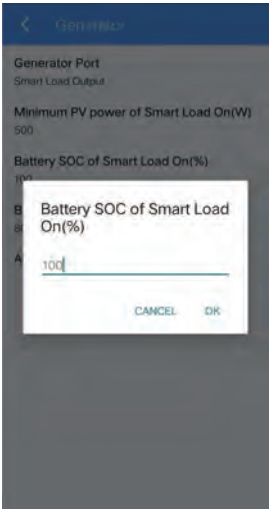
Battery voltage of Smart Load On (V)
If the battery voltage is higher than the setting value, and the PV input power exceeds the setting value(Power) simultaneously, the Smart Load will switch on.

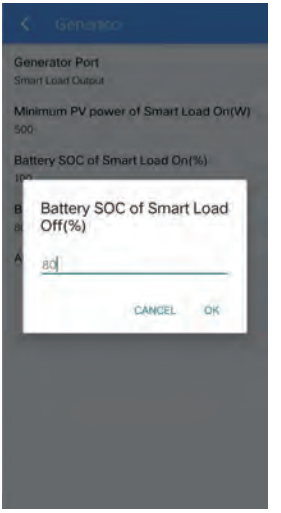
Battery voltage of Smart Load Off (V)
If the battery voltage is lower than the setting value, the Smart Load will switch off.

Note:

Go to Hybrid setting > other > Capacity Mode, when you set Capacity Mode to voltage (V), as shown in below figure, parameter settings about **Battery SOC of Smart Load On (%)** will be changed to **Battery voltage of Smart Load On** (V). Also, parameter settings about **Battery SOC of Smart Load Off (%)** will be changed to **Battery voltage of Smart Load Off** (V).

The default values of Smart Load Output are as below:





Note:

The default value of **Battery Voltage of Smart Load On(V)** is 60V;

The default value of **Battery Voltage of Smart Load Off(V)** is 40V.

- If the values are set as described above, Capacity Mode was selected to SOC (%), the situations are as follows:
  - When Always On with Grid is ON, if the grid is present, the Smart Load will be ON all the time. It is not affected by the change of above parameters. If the grid is not present, the Smart Load output will be ON or OFF depends on the PV power and the battery SOC.

    If the PV power ≥500W and the battery SOC ≥100% , the Smart Load output will be ON. In the state of Smart Load ON, if the battery SOC ＜80%, the Smart Load will be OFF.
    If the PV power <500W or the battery SOC <80%, the Smart Load output will be OFF.
  - When Always On with Grid is OFF.

    If the PV power ≥ 500W and the Battery SOC ≥ 100%, the GEN Port function will be enabled and the Smart Load will be ON. In the state of Smart Load ON, if the battery SOC ＜80%, the Smart Load will be OFF.
    If the PV power ＜ 500W or the Battery SOC ＜ 80%, the GEN Port function will be disabled and the Smart Load will be OFF.

    Note:

    When the Capacity Mode was set to voltage, the Smart Load Output Mode still follows the above logic.

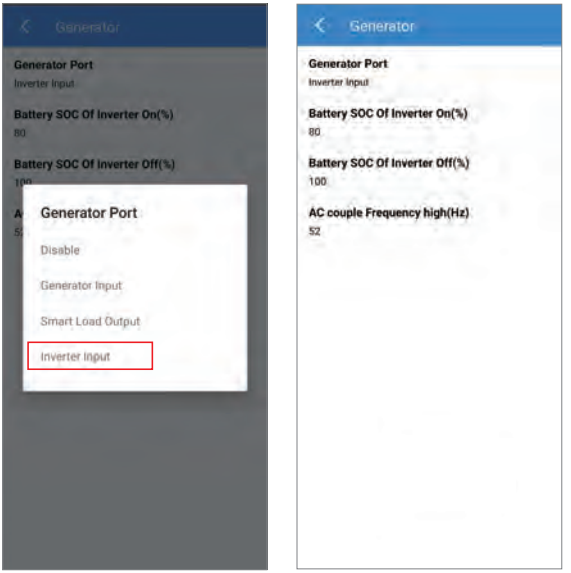
➢ Inverter Input Mode Introduction

- **Inverter Input Mode:** Under this mode, the GEN Port works as an input port from other grid-tied inverter whose rated power should be less than the hybrid inverter. The grid-tied inverter should also support derating output power according to the output frequency.

  Note:

  The capacity of grid-tied inverter should be less than that of hybrid inverter

- Go to Hybrid Setting > Generator > Generator Port page and choose Inverter Input.



- All parameters have been set by default.

Battery SOC Of Inverter On (%)
If battery SOC lower than the default value, the inverter powers on and starts charging the battery.

Battery SOC Of Inverter Off (%)
If battery SOC higher than the default value, the inverter powers off and stops charging the battery.

AC couple Frequency high (Hz)
This parameter is used to limit the output power of grid-tied inverter when the hybrid inverter works under off-grid mode. As the battery SOC reaches gradually to the setting value (Off), during the process, the grid-tied inverter output power will decrease linear. When the battery SOC equal to the setting value (Off), the system frequency will become the setting value (AC Couple Frequency high) and the grid-tied inverter will stop working.

Battery Voltage Of Inverter On (V)
If battery voltage lower than the setting value, the inverter powers on and starts charging the battery.

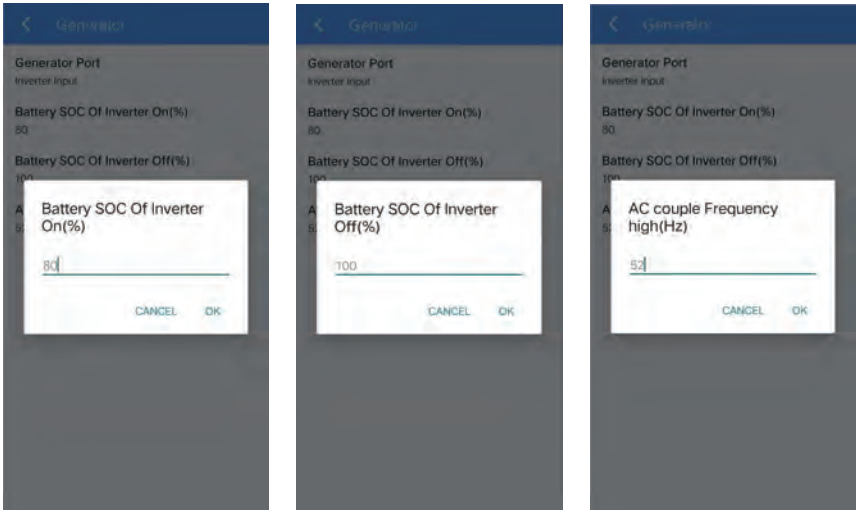
Battery Voltage Of Inverter Off (V)

If battery voltage higher than the setting value, the inverter powers off and stops charging the battery.

Note:

Go to Hybrid setting > Other > Capacity Mode, when you set Capacity Mode to voltage (V), as shown in below figure, parameter settings about **Battery SOC Of Inverter On (%)** will be changed to **Battery voltage Of Inverter On (V)**. Also, parameter settings about **Battery SOC Of Inverter Off (%)** will be changed to **Battery voltage Of Inverter Off (V)**.

The default values of Inverter Input are as below:



Note:

The default value of **Battery Voltage of Inverter On(V)** is 40V;

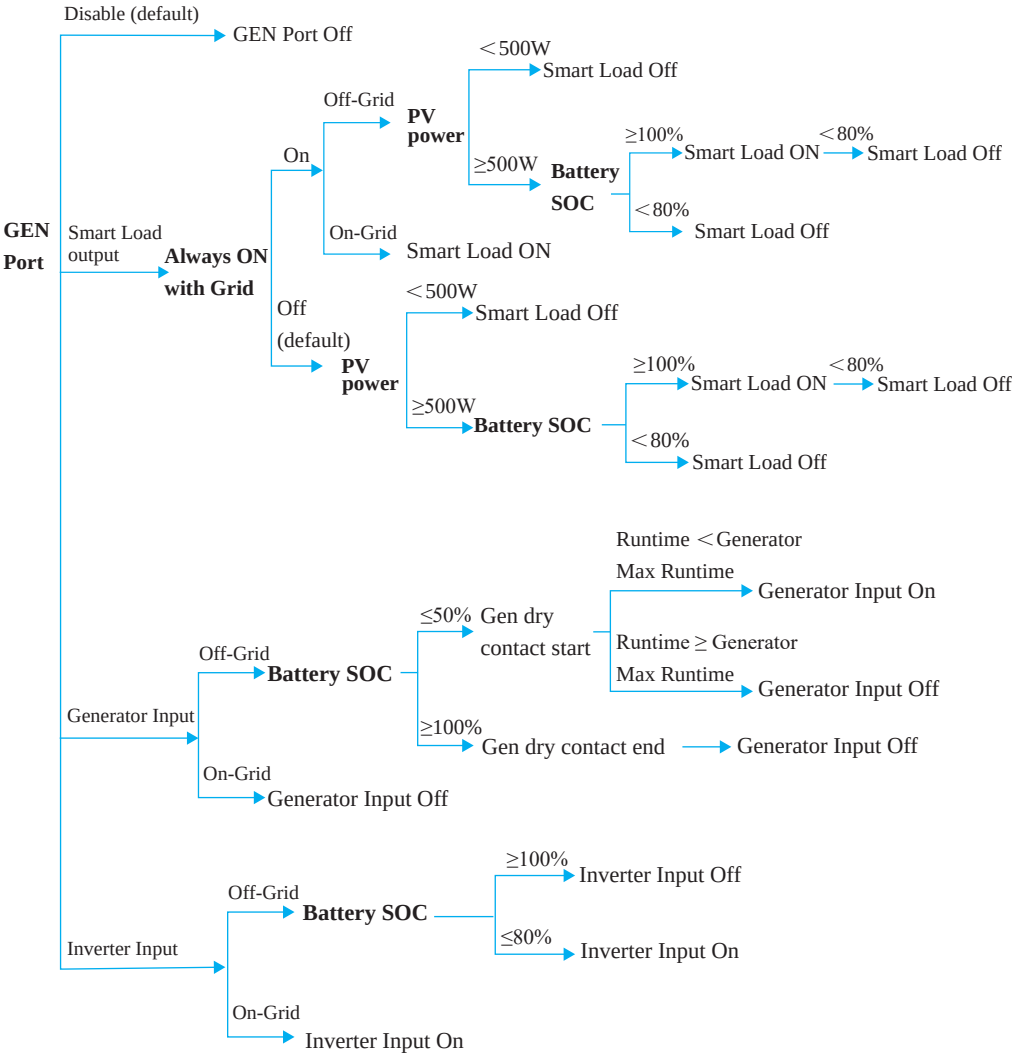
The default value of **Battery Voltage of Inverter Off(V)** is 60V.

- If the values are set as described above, Capacity Mode was set to SOC (%), the situations are as follows:
  - Under off-grid mode, the Inverter Input will be ON or OFF depends on the battery SOC.
    When the Battery SOC ≤ 80%, the GEN port function will be enabled and Inverter Input will be ON.
    When the battery charge power lower than the grid-tied inverter output power, the hybrid inverter will increase the output frequency to maximum 52Hz. Then the grid-tied inverter will work in limited power mode.
  - When the Battery SOC ≥ 100%, the GEN port function will be disabled and Inverter Input will be OFF.
    Under on-grid mode, the grid-tied inverter works as normal regardless of battery capacity.

  Note:

  When the Capacity Mode was set to voltage, the Inverter Input Mode still follows the above logic.

Logic Diagram of Enable/Disable GEN Port Function



Note:

When the Capacity Mode was set to voltage, the Gen Port still follows the above logic.

- Other

In Other page, options including Parallel Mode, Buzzer ON, Support Normal Load are listed. Enable them when necessary.

Enable Parallel Mode when applying parallel connection mode.

Enable Buzzer On to open the Buzzer function.

SOC(%) or voltage(V) can be set.

8 Maintenance

⚠ CAUTION	Before maintaining and commissioning inverter and its peripheral distribution unit, switch off all the charged terminals of the inverter and wait at least 10 minutes after the inverter is powered off.

8.1 Routine Maintenance

Items	Check Content	Maintain Content	Maintenance Interval
Inverter output status	Statistically maintain the status of electrical yield, and remotely monitor its abnormal status.	N/A	Weekly
Inverter cleaning	Check periodically that the heat sink is free from dust and blockage.	Clean periodically the heat sink.	Yearly
Inverter running status	Check that the inverter is not damaged or deformed. Check for normal sound emitted during inverter operation. Check and ensure that all inverter communications is running well.	If there is any abnormal phenomenon, replace the relevant parts.	Monthly
Inverter electrical connections	Check that all AC, DC and communication cables are securely connected; Check that PGND cables are securely connected; Check that all cables are intact and free from aging.	If there is any abnormal phenomenon, replace the cable or re-connect it.	Semiannually

8.2 Inverter Troubleshooting

When the inverter has an exception, its basic common warning and exception handling methods are shown below.

Code	Alarm Information	Suggestions
A0	Grid over voltage	1. If the alarm occurs occasionally, possibly the power grid voltage is abnormal for a short time, and no action is required. 2. If the alarm occurs repeatedly, contact the local power station. After receiving approval of the local power bureau, revise the electrical protection parameters settings on the inverter through the App. 3. If the alarm persists for along time, check whether the AC circuit breaker /AC terminals is disconnected or not, or if the grid has a power outage.
A1	Grid under voltage	
A3	Grid over frequency	
A4	Grid under frequency	
A2	Grid absent	Wait till power is restored.
B0	PV over voltage	Check whether the maximum voltage of a single string of input PV mod is greater than the allowable voltage. If the maximum voltage is higher than the standard voltage, modify the number of pv module connection strings.
B1	PV insulation abnormal (Earth Fault)	1. Check the insulation resistance against the ground for the PV strings. If a short circuit has occurred, rectify the fault. 2. If the insulation resistance against the ground is less than the default value in a rainy environment, set insulation resistance protection on the App.
B2	Leakage current abnormal (Earth Fault)	1. If the alarm occurs occasionally, the inverter can be automatically recovered to the normal operating status after the fault is rectified. 2. If the alarm occurs repeatedly, contact your dealer for technical support.
B4	PV under voltage	1. If the alarm occurs occasionally, possibly the external circuits are abnormal accidentally. The inverter automatically recovers to the norma operating status after the fault is rectified. 2. If the alarm occurs repeatedly or last a long time, check whether the insulation resistance against the ground of PV strings is too low.
C0	Internal power supply abnormal	1. If the alarm occurs occasionally, the inverter can be automatically restored, no action required. 2. If the alarm occurs repeatedly, pls. contact the customer service cente

C2	Inverter over dc-bias current	1. If the alarm occurs occasionally, possibly the power grid voltage is abnormal for a short time, and no action is required. 2. If the alarm occurs repeatedly, and the inverter fails to generate power, contact the customer service center.
C3	Inverter relay abnormal	1. If the alarm occurs occasionally, possibly the power grid voltage is abnormal for a short time, and no action is required. 2. If the alarm occurs repeatedly, pls. refer to the suggestions or measures of Grid over voltage. and the inverter fails to generate power, contact the customer service center. If there is no abnormality on the grid side, the machine fault can be determined. (If you open the cover and find traces of damage to the relay, it can be concluded that the machine is faulty.) And pls. contact the customer service center.
CN	Remote off	1. Local manual shutdown is performed in APP. 2. The monitor executed the remote shutdown instruction. 3. Remove the communication module and confirm whether the alarm disappears. If it does, replace the communication module. Otherwise, please contact the customer service center.
C5	Inverter over temperature	1. If the alarm occurs occasionally, the inverter can be automatically restored, no action required. 2. If the alarm occurs repeatedly, pls. check the installation site for direct sunlight, good ventilation, and high ambient temperature (Such as installed on the parapet). If the ambient temperature is lower than 45 ° C and the heat dissipation is good, contact the customer service center.
C6	GFCI abnormal	1. If the alarm occurs occasionally, it could have been an occasional exception to the external wiring, the inverter can be automatically recovered, no action required. 2. If it occurs repeatedly or cannot be recovered for a long time, pls. contact customer service to report repair.
B7	PV string reverse	Check and modify the positive and negative polarity of the input of the circuit string.
C8	Fan abnormal	1. If the alarm occurs occasionally, pls. restart the inverter. 2. If it occurs repeatedly or cannot be recovered for a long time, check whether the external fan is blocked by foreign objects. Otherwise, contact customer service.
C9	Unbalance Dc-link voltage	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CA	Dc-link over voltage	

CB	Internal communication error	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CC	Software incompatibility	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CD	Internal storage error	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CE	Data inconsistency	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CF	Inverter abnormal	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CG	Boost abnormal	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
CJ	Meter lost	1. Check the meter parameter Settings 2. Local APP checks that the communication address of the inverter is consistent with that of the electricity meter 3. The communication line is connected incorrectly or in bad contact 4. electricity meter failure. 5. Exclude the above, if the alarm continues to occur, please contact the customer service center.
P1	Parallel ID warning	It is Parallel ID Alarm. Pls. check the parallel communication cable, and check whether any inverter joins or exits online. All inverters are powere off completely, check the line, and then power on the inverters again to ensure that the alarm is cleared.
P2	Parallel SYN signal warning	Parallel synchronization signal is abnormal. Check whether the parallel communication cable is properly connected.
P3	Parallel BAT abnormal	The parallel battery is abnormal. Whether the battery of the inverter is reported low voltage or the battery is not connected.
P4	Parallel GRID abnormal	The parallel grid is abnormal. Whether the grid of the inverter is abnormal.

D2	Battery over voltage	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. Check that the battery overvoltage protection value is improperly set. 3. The battery is abnormal. 4. If exclude the above, the alarm continues to occur, please contact the customer service center.
D3	Battery under voltage	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. Check the communication line connection between BMS and inverter (lithium battery). 3. The battery is empty or the battery voltage is lower than the SOC cut-off voltage. 4. The battery undervoltage protection value is improperly set. 5. The battery is abnormal. 6. If exclude the above, the alarm continues to occur, please contact the customer service center.
D4	Battery discharger over current	1. Check whether the battery parameters are correctly set. 2. Battery undervoltage. 3. Check whether a separate battery is loaded and the discharge current exceeds the battery specifications. 4. The battery is abnormal. 5. If exclude the above, the alarm continues to occur, please contact the customer service center.
D5	Battery over temperature	1. If the alarm occurs repeatedly, please check whether the installation site is in direct sunlight and whether the ambient temperature is too high (such as in a closed room). 2. If the battery is abnormal, replace it with a new one. 3. If exclude the above, the alarm continues to occur, please contact the customer service center.
D6	Battery under temperature	
D7	BACKUP output voltage abnormal	1. Check whether the BACKUP voltage and frequency Settings are within the specified range. 2. Check whether the BACKUP port is overloaded. 3. When not connected to the power grid, check whether BACKUP output is normal. 4. If exclude the above, the alarm continues to occur, please contact the customer service center.
D8	Communication error (Inverter-BMS)	1. Check whether the battery is disconnected. 2. Check whether the battery is well connected with the inverter. 3. Confirm that the battery is compatible with the inverter. It is recommended to use CAN communication. 4. Check whether the communication cable or port between the battery and the inverter is faulty. 5. If exclude the above, the alarm continues to occur, please contact the customer service center.

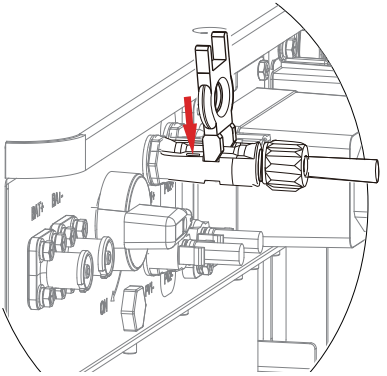
D9	Internal communication loss(E-M)	1. Check whether the communication cables between BACKUP, electricitymeter and inverter are well connected and whether the wiring is correct 2. Check whether the communication distance is within the specification range. 3. Disconnect the external communication and restart the electricity meter and inverter. 4. If exclude the above, the alarm continues to occur, please contact the customer service center.
DA	Internal communication loss(M-D)	
CU	Dcdc abnormal	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, please check: 1) Check whether the MC4 terminal on the PV side is securely connecte 2) Check whether the voltage at the PV side is open circuit, ground to ground, etc. If exclude the above, the alarm continues to occur, please contact the customer service center.
CP	BACKUP over dc-bias voltage	1. If the alarm occurs occasionally, the inverter can be automatically recovered and no action is required. 2. If the alarm occurs repeatedly, the inverter cannot work properly. Pls. contact the customer service center.
DB	BACKUP short circuit	1. Check whether the live line and null line of BACKUP output are short-circuited. 2. If it is confirmed that the output is not short-circuited or an alarm, please contact customer service to report for repair. (After the troubleshooting of alarm problems, BACKUP switch needs to be manually turned on during normal use.)
DC	EPS over load	1.Disconnect the BACKUP load and check whether the alarm is cleared 2. If the load is disconnected and the alarm is generated, please contact the customer service. (After the alarm is cleared, the BACKUP switch needs to be manually turned on for normal use.)

8.3 Removing the Inverter

WARNING	Before removing DC input connector, double check DC input switch is turned to OFF to avoid inverter damage and personal injury.

Perform the following procedures to remove the inverter:

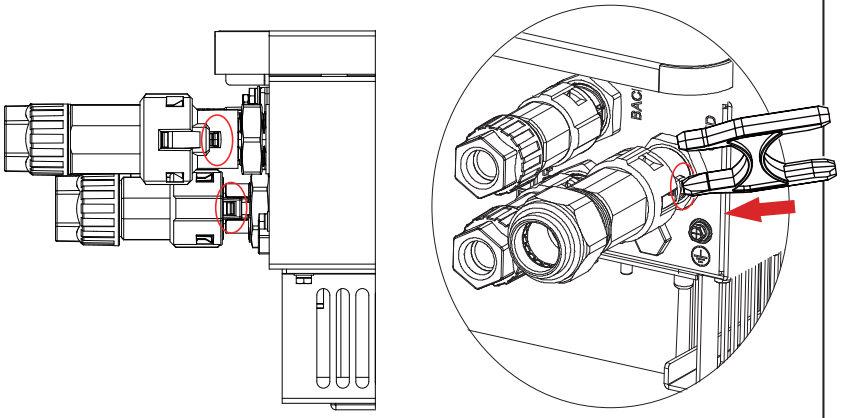
Step 1. Disconnect all cables from the inverter, including communications cables, DC input power cables, AC output power cables, and PGND cable, as shown below.



PV Connectors Removing Detail

NOTE

To remove the PV/Grid/BACKUP connectors, insert the removal tool into the bayonet according to the position indicated in the drawing, press inward, and then take out the connector outward.



Grid/BACKUP Connectors Removing Detail

Step 2. Remove the inverter from the mounting bracket.

Step 3. Remove the mounting bracket.

9 Technical Specifications

Model	3K6HB-60	3K68HB-60	4K6HB-60	4K6HB-120
Efficiency				
Max.efficiency (PV to AC)	97.3%			
Max.efficiency (AC to BAT)	94.0%			
Input (PV)				
Max. PV power (W)	9000			
Max. PV voltage (V)	550			
Max. input current (A)	15/15			
Max. short current (A)	20/20			
Startup voltage (V)	90			
MPPT voltage range @full load (V)	280~480		200~480	
No. of MPPT trackers	2			
String per MPPT tracker	1			
Max. Short Circuit Current (PV port)(A)	20/20			
Input (BAT)				
Compatible battery type	Lithium/Lead-acid			
Norminal battery voltage (V)	48			
Battery voltage range (V)	40~60			
Lithium battery charge curve	Self-adaption to BMS			
Max. charge/discharge current (A)	60/60			120/120
Max. charge/discharge power (W)	3000/3000			6000/6000
Max. Short Circuit Current (BAT port)(A)	65			125
Output (Grid)				
Nominal AC output power (W)	3600	3680	4600	
Max.AC output apparent power (VA)	3960	3680	4600	
Max.AC output power (PF=1) (W)	3960	3680	4600	
Max.AC output current (A)	18		22	
Rated AC voltage (V)	220/230/240			
AC voltage range (V)	150~300(adjustable)			
Rated AC frequency (Hz)	50/60			
AC frequency range (Hz)	45~55/55~65(adjustable)			
Grid connection	Single phase			
Power factor	>0.99@rated power(adjustable 0.8LG~0.8LD)			
THDI	<3%			
Max. Short Circuit Current (AC port)(A)	82.5			

Model	3K6HB-60	3K68HB-60	4K6HB-60	4K6HB-120
Output (Back up)				
Nominal output voltage (V)	230			
Nominal output frequency (Hz)	50/60			
Transfer time (ms)	10(type)/20(max.)			
THDV	<3%@100%R load			
Nominal output power (W)	3000			4600
Nominal output current (A)	13			20
Protection				
Protection category	Class I			
AC overcurrent protection	Support			
AC short circuit protection	Support			
Leakage current protection	Support			
AC overvoltage category	III			
PV overvoltage category	II			
Surge Arrester	DC Type III; AC Type III			
PV switch	Support			
Anti-islanding protection	Support (Frequency shift)			
DC reverse detection	Support			
Insulation detection	Support			
General				
Topology	Transformerless			
Max. operation altitude (m)	4000			
Ingress protection degree	IP65			
Environmental Category	Outdoor			
Operating temperature range (°C)	-25~60			
Noise emission (dB)	<30			<35
Weight (kg)	16		25	25
Relative humidity (%)	0~100			
Cooling concept	Natural			
Mounting	Wall bracket			
Dimensions (W*H*D)	(570*495*175)mm			
PV connection way	MC4/H4			
Battery connection way	Dedicated DC connector			
AC connection way (Grid & back up)	Dedicated AC connector			
Display & Communication				
Display	LED+APP			
Communication interface	BMS (CAN/RS485)/LAN/WIFI/GPRS/DRMs/Meter (RS485)/USB			
Certification				
Grid	IEC61727; VDE-AR-N4105; IEC62116; CEI0-21; EN50549-1			
Safety	IEC62109-1&2; IEC62477-1; IEC62040-1			
EMC	IEC61000-6-1/2/3/4			
Warranty				
Period (Years)	5/10 (optional)			

Model	5KHB-60	5KHB-120	6KHB-60	6KHB-120
Efficiency				
Max.efficiency (PV to AC)	97.3%			
Max.efficiency (AC to BAT)	94.0%			
Input (PV)				
Max. PV power (W)	9000			
Max. PV voltage (V)	550			
Max. input current (A)	15/15			
Max. short current (A)	20/20			
Startup voltage (V)	90			
MPPT voltage range @full load (V)	200~480		230~480	
No. of MPPT trackers	2			
String per MPPT tracker	1			
Max. Short Circuit Current (PV port)(A)	20/20			
Input (BAT)				
Compatible battery type	Lithium/Lead-acid			
Norminal battery voltage (V)	48			
Battery voltage range (V)	40~60			
Lithium battery charge curve	Self-adaption to BMS			
Max. charge/discharge current (A)	60/60	120/120	60/60	120/120
Max. charge/discharge power (W)	3000/3000	6000/6000	3000/3000	6000/6000
Max. Short Circuit Current (BAT port)(A)	65	125	65	125
Output (Grid)				
Nominal AC output power (W)	5000		6000	
Max.AC output apparent power (VA)	5500		6000	
Max.AC output power (PF=1) (W)	5500		6000	
Max.AC output current (A)	25		27.2	
Rated AC voltage (V)	220/230/240			
AC voltage range (V)	150~300(adjustable)			
Rated AC frequency (Hz)	50/60			
AC frequency range (Hz)	45~55/55~65(adjustable)			
Grid connection	Single phase			
Power factor	>0.99@rated power(adjustable 0.8LG~0.8LD)			
THDI	<3%			
Max. Short Circuit Current (AC port)(A)	82.5			
Output (Back up)				
Nominal output voltage (V)	230			

Model	5KHB-60	5KHB-120	6KHB-60	6KHB-120
Nominal output frequency (Hz)	50/60			
Transfer time (ms)	10(type)/20(max.)			
THDV	<3%@100%R load			
Nominal output power (W)	3000	5000	3000	6000
Nominal output current (A)	13	21.7	13	26
Protection				
Protection category	Class I			
AC overcurrent protection	Support			
AC short circuit protection	Support			
Leakage current protection	Support			
AC overvoltage category	III			
PV overvoltage category	II			
Surge Arrester	DC Type III; AC Type III			
PV switch	Support			
Anti-islanding protection	Support (Frequency shift)			
DC reverse detection	Support			
Insulation detection	Support			
General				
Topology	Transformerless			
Max. operation altitude (m)	4000			
Ingress protection degree	IP65			
Environmental Category	Outdoor			
Operating temperature range (°C)	-25~60			
Noise emission (dB)	<30	<35	<30	<35
Weight (kg)	25	25	25	25
Relative humidity (%)	0~100			
Cooling concept	Natural			
Mounting	Wall bracket			
Dimensions (W*H*D)	(570*495*175)mm			
PV connection way	MC4/H4			
Battery connection way	Dedicated DC connector			
AC connection way (Grid & back up)	Dedicated AC connector			
Display & Communication				
Display	LED+APP			
Communication interface	BMS (CAN/RS485)/LAN/WIFI/GPRS/DRMs/Meter (RS485)/USB			
Certification				
Grid	IEC61727; VDE-AR-N4105; IEC62116; CEI0-21; EN50549-1			
Safety	IEC62109-1&2; IEC62477-1; IEC62040-1			
EMC	IEC61000-6-1/2/3/4			
Warranty				
Period (Years)	5/10 (optional)			

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