Hybrid Solar Inverter

J4000HC

User Manual

V1.0

Table Of Contents

1.Information on this Manual

1.1 Validity

This manual is valid for the following devices:

- 4000VA inverter

1.2 Scope

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations.

1.3 Target Group

This document is intended for qualified persons and end users. Tasks that do not require any particular qualification can also be performed by end users. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of the applicable standards and directives
- Knowledge of the compliance with this document and all safety information

1.4 Label Description

In order to ensure the user's personal safety when using this product, the inverter and manual provides relevant identification information and uses appropriate symbols to alert the user, who should carefully read the following list of symbols used in this manual.

Labels on Inverter

	CAUTION Do not disconnect under load!
	Danger: High Voltage! Danger: Electrical Hazard!
	Start maintaining the INVERTER at least 5 minutes after the INVERTER disconnected from all external power supplies.
	Read instructions carefully before performing any operation on the INVERTER.
	Grounding: The system must be firmly grounded for operator safety.

Labels in the documentation

⚠ WARNING!	A high level of potential danger, which, if not avoided, could result in death or serious injury to personnel.
⚠ CAUTION!	A moderate or low level of potential danger, which, if not avoided, could result in moderate or minor injuries to personnel. In some bad situation, it could result in death or serious injury to personnel.

1.5 Safety Instructions

WARNING!

This chapter contains important safety and operating instructions.

Read and keep this manual for future reference.

01. Please be clear which kind of battery system you want, lithium battery system or lead-acid battery system, if you choose the wrong system, energy storage system can't work normally.
02. Before using the unit, read all instructions and cautionary marking on the unit, the batteries and all appropriate sections of this manual. The company has the right not to quality assurance, if not according to the instructions of this manual for installation and cause equipment damage.
03. All the operation and connection please professional electrical or mechanical engineer.
04. All the electrical installation must comply with the local electrical safety standards.
05. When install PV modules in the daytime, installer should cover the PV modules by opaque materials, otherwise it will be dangerous as high terminal voltage of modules in the sunshine.
06. CAUTION – To reduce risk of injury, charge only deep-cycle lead-acid type rechargeable batteries and lithium batteries. Other types of batteries may burst, causing personal injury and damage.
07. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
08. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning.Turning off the unit will not reduce this risk.
09. NEVER charge a frozen battery.
10. For optimum operation of this inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter.

11.Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.

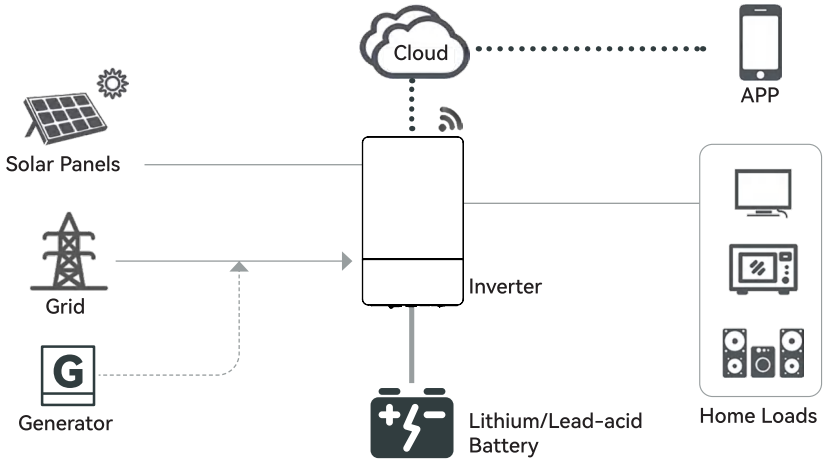
12.Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.

13.GROUNDING INSTRUCTIONS -This inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.

14.NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.

15.Make sure the inverter is completely assembled, before the operation.

2.Introduction



Hybrid Solar Energy Storage System

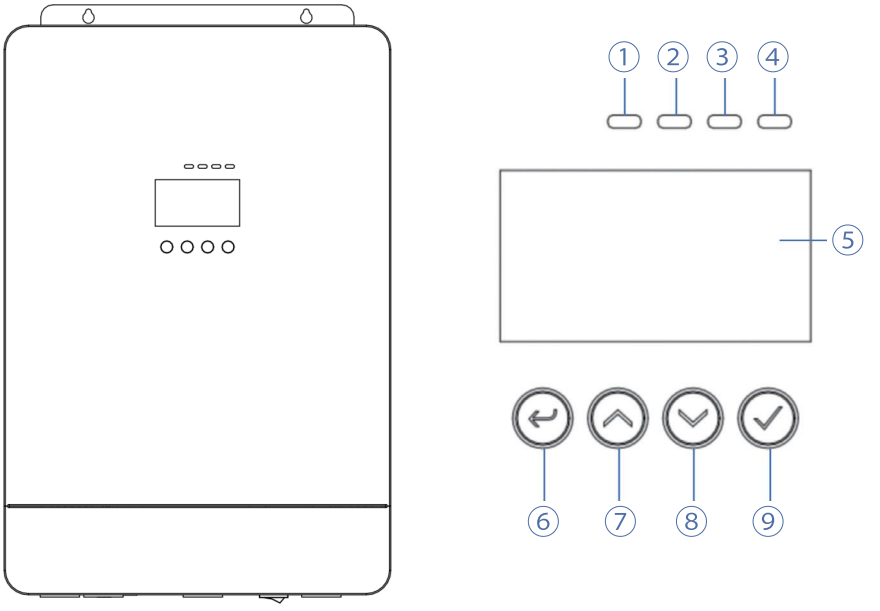
This is a multifunctional solar inverter, integrated with a MPPT solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is perfect for off grid backup power and self-consumption applications. This inverter can work with or without batteries.

The whole system also need other devices to achieve complete running such as PV modules, generator, or utility grid. Please consult with your system integrator for other possible system architectures depending on your requirements. The WiFi / GPRS module is a plug-and-play monitoring device to be installed on the inverter. With this device, users can monitor the status of the PV system from the mobile phone or from the website anytime anywhere.

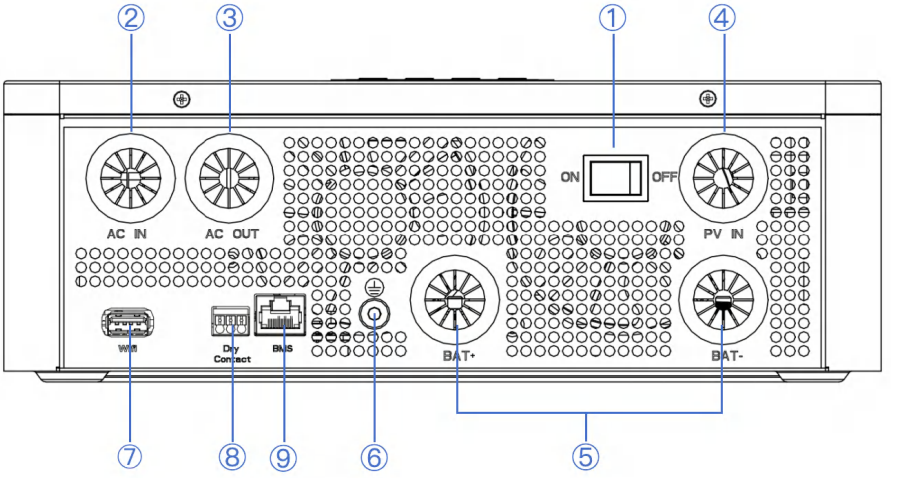
2.1 Features

- Rated power 4000VA
- MPPT ranges 40V~450V, 500Voc
- High frequency inverter with small size and light weight
- Pure sine wave AC output
- Solar and utility grid can power loads at the same time
- With CAN/RS485 for BMS communication
- With the ability to work without battery
- WIFI/ GPRS remote monitoring (optional)

2.2 Product Overview



① AC Indicator
② Invert Indicator
③ Charging Indicator
④ Fault Indicator
⑤ LCD Display
⑥ ESC Button
⑦ Up Button
⑧ Down Button
⑨ Enter Button



① Power On/Off Switch
② AC Input
③ AC Output
④ PV Input
⑤ Battery Input
⑥ Grounding
⑦ WiFi/GPRS Communication Port
⑧ Dry Contact
⑨ BMS Communication Port (Support CAN/RS485 Protocol)

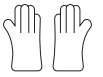
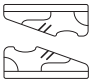
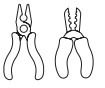
3. Installation

3.1 Unpacking and Inspection

3.1.1 Open-box Inspection

Products have been strictly tested before leaving the factory. Please sign for them after inspection. If the product is damaged, please contact the local distributor. Please open the box to check whether the outer packaging is intact or damaged, whether the internal equipment is damaged.

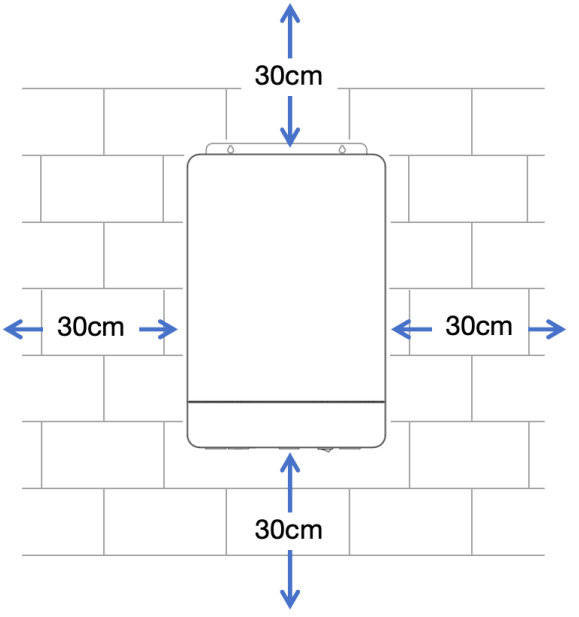
3.1.2 Installation Tools

Installation Tools	Multi-meter 	Protective gloves 	Insulated anti-smashing shoes 
	Safety glasses 	ESD wrist strap 	Hammer drill 
	Electric screwdriver 	Cross screwdriver 	Rubber mallet 
	Spirit level 	Wire cutter / stripper 	Terminal crimping tool 

3.1.3 Packing List

No.	Item	Quantity	Description	Remarks
1	Inverter	1		
2	User manual	1	English	
3	Tubular Terminal	8	E2510	For AC output,,AC input,PE,PV
4	OT Terminal	1		For PE
5	Cross Head Screw	2	M4 8mm	For PE

3.2 Mounting Unit



Consider the following points before selecting where to install:

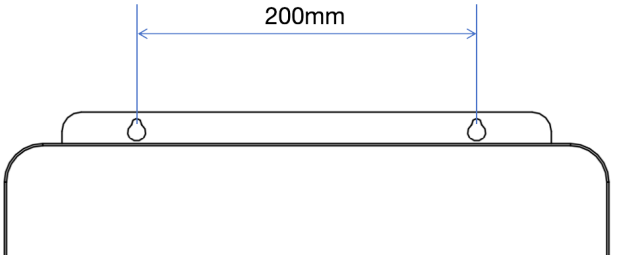
- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between -15°C and 60°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the diagram above to guarantee sufficient heat dissipation and to have enough space for removing wires.

WARNING!

Inverter is suitable for mounting on concrete or other non-combustible surface only.

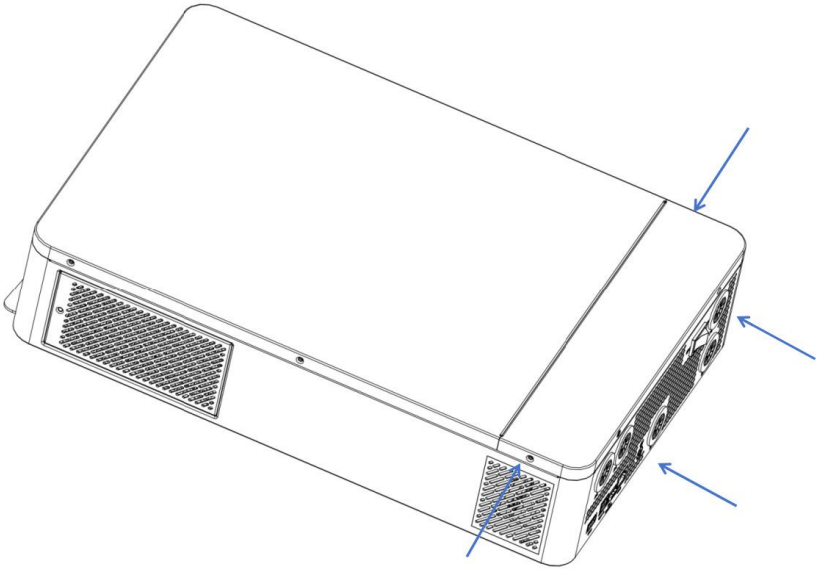
Follow the installation steps:

1. Use ϕ8 drilling bit drill holes on the mounting surface. The distance between 2 holes is 200mm. Then insert the expansion screw(M6). M6 expansion screw is suggested.



2. Pick up the inverter vertically and align the screw at the top of the inverter with the screw already installed on the wall. Hang the inverter on the mounting surface by the screws.

Before connecting all wiring, please take off bottom cover by removing four screws as shown below:



3.3 External Protective Grounding Connection

DANGER

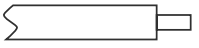
Ensure a reliable connection of the grounding wire to prevent electrical shock hazards.

WARNING

- The external grounding protection point provides a reliable grounding. Do not use
- inappropriate grounding conductors as it may result in product damage or personal injury.
- If unsure about the grounding connection, please consult a professional for proper guidance.

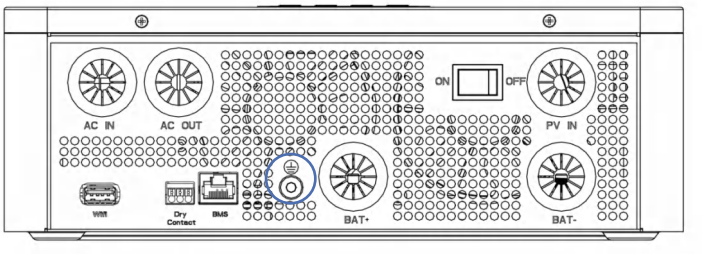
The external grounding cable is to be prepared by customer. The grounding cable must be yellow-green color. OT terminals with insulating jacket is in the packing.

1. Remove insulation sleeve a proper length from the head of cables.



2.Use OT terminal crimping tool make cable and terminal crimped tightly.

3.Connect the ground cable with M4 screw.



3.4 AC Input / Output Connection

CAUTION!

Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 25A for 4KVA inverter.

CAUTION!

There are two terminal blocks with "AC IN", ""AC OUT"markings.
Please do NOT mis-connect input and output connectors.

CAUTION!

Be sure to connect AC cables with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation

WARNING!

All wiring must be performed by a qualified personnel.

WARNING!

It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggestion for AC input wires

Model	Gauge	Cable (mm^2)
4KVA Inverter	14 AWG	2.075

WARNING!

It's very important for system safety and efficient operation to use appropriate cable for AC dual output connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggestion for AC output wires

Model	Gauge	Cable (mm^2)
4KVA Inverter	14 AWG	2.075

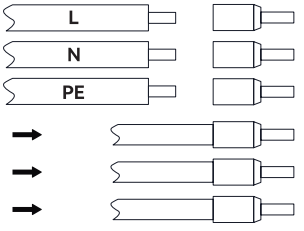
WARNING!

Make sure AC power is disconnected before attempting to connect AC power to the unit.

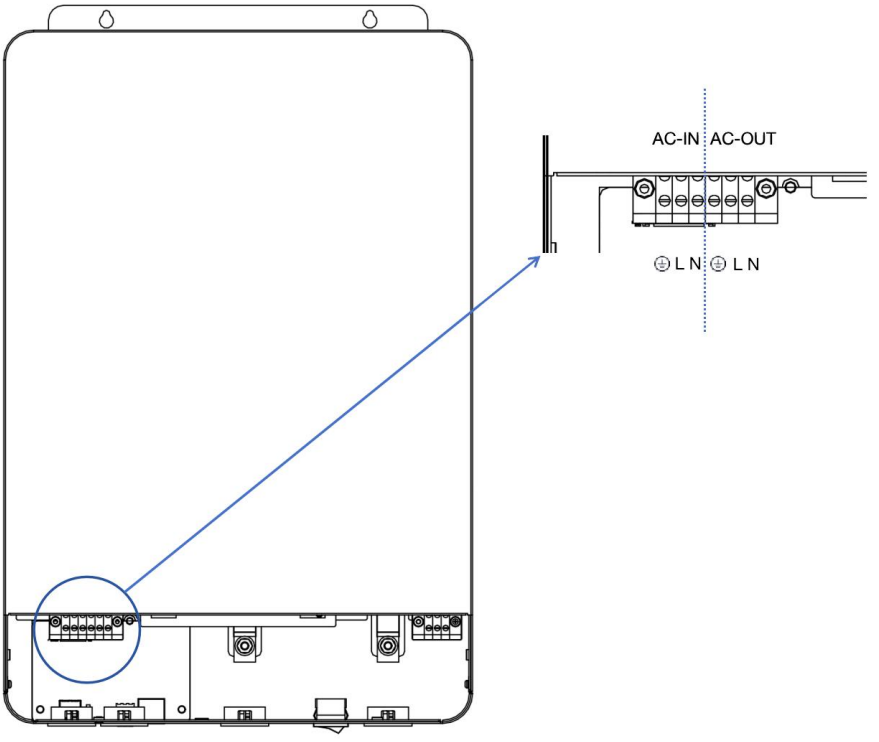
All operations during the electrical connection process, as well as the specifications of cables and components used, must comply with local laws and regulations. The cable color mentioned below is for typical reference.

Please follow below steps to implement AC input / output connection:

1. Before making AC connection, be sure to open AC circuit breaker first.
2. Remove insulation sleeve 12mm from the head of cables, shorten the conductor part to 10 mm. Insert the cable into the tubular terminal. Then use terminal crimping tool make the terminal and cable connected tightly.



3. Insert AC input/output cables according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective cable first.
   PE→ Protecting Earth (yellow-green)
   L → LINE (brown or black)
   N → Neutral (blue)



4. Make sure the cables are securely connected.

CAUTION!

Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check with manufacturer of air conditioner that if it's equipped with time-delay function before installation. Otherwise, this off grid solar inverter will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air condition.

3.5 PV Connection

CAUTION!
Before connecting to PV modules, please install a separate DC circuit breaker between inverter and PV modules.
The recommended spec of DC breaker is 25A with a maximum operating voltage greater than 500VDC for 4KVA inverter.

WARNING!
Do not ground the positive or negative terminals of the PV modules, as this can severely damage the inverter.

WARNING!
Exposure to sunlight can generate lethal high voltages in photovoltaic strings, so strictly adhere to the safety precautions listed in the photovoltaic string and related documents.

WARNING!
Make sure to connect the PV terminals to the corresponding ports on the inverter, as reversing the polarity can damage the inverter.

WARNING!
All wiring must be performed by a qualified personnel.

WARNING!
It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below. The cable color mentioned below is for typical reference.

Model	Gauge	Cable (mm^2)
4KVA Inverter	14 AWG	2.075

PV Module Selection:

When selecting proper PV modules, please be sure to consider below parameters:

1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

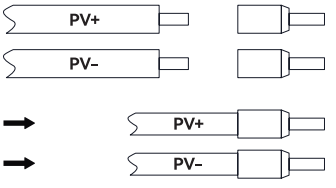
2. Open circuit Voltage (Voc) of PV modules should be higher than start-up voltage.

INVERTER MODEL	4KVA Inverter
Max. PV Array Open Circuit Voltage	500Vdc
Start-up Voltage	60Vdc
PV Array MPPT Voltage Range	40Vdc~450Vdc

WARNING!
Please do not connect any DC switches or AC/DC circuit breakers before completing the electrical connections.

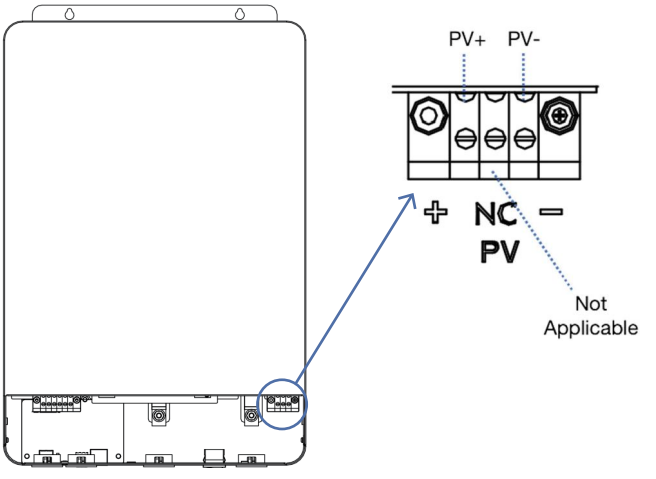
Please follow below steps to implement PV module connection:

1. Before making PV connection, be sure to open DC circuit breaker first.
2. Remove insulation sleeve 12mm from the head of cables, shorten the conductor part to 10 mm. Insert the cable into the tubular terminal. Then use terminal crimping tool make the terminal and cable connected tightly



3. Use multi-meter check to ensure the polarities are correct.
4. Insert PV cables according to polarities indicated on terminal block and tighten the terminal screws.

+ → PV+ (red)
- → PV- (black)



5. Make sure the cables are securely connected.

3.6 Battery Connection

3.6.1 Lead-acid Battery Connection

User can choose proper capacity lead acid battery with a nominal voltage at 24V. Also, you need to choose battery type as 'AGM or FLD(flooded)'

CAUTION!
For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. The recommended size of protector or disconnect is 175A.

WARNING!
All wiring must be performed by a qualified person.

WARNING!
It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below. The cable color mentioned below is for typical reference.

WARNING!
Make sure AC power is disconnected before attempting to connect AC power to the unit.
All operations during the electrical connection process, as well as the specifications of cables and components used, must comply with local laws and regulations.The cable color mentioned below is for typical reference.

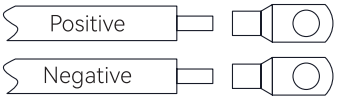
Recommended battery cable and terminal size:

Model	Gauge	Cable (mm^2)
4KVA Inverter	2 AWG	25

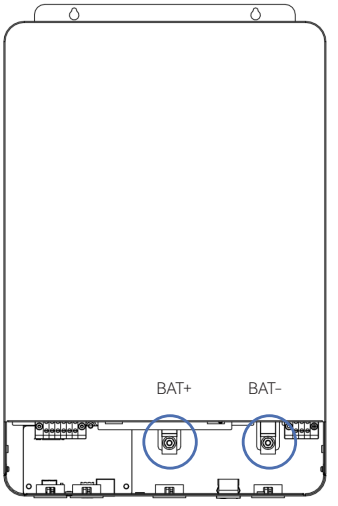
Note: For lead acid battery, the recommended charge current is 0.3C (C>battery capacity)

Please follow below steps to implement battery connection:

1. Unscrew the pre-fixed screws on battery poles. Prepare 2 DT terminals(It should fit for AWG2 cables).
2. Remove insulation sleeve 12mm from the head of cables, shorten the conductor part to 10 mm. Insert the cable into the DT terminal. Then use terminal crimping tool make the terminal and cable connected tightly.



3. Pass the battery cable through the battery installation hole on bottom shell, and tighten the terminal screws. Make sure polarity at both the battery and the inverter/charge is correctly connected and DT terminals are tightly screwed to the battery terminals.



4. Connect all battery packs as units requires. It's suggested to connect at least 200Ah capacity battery.

WARNING! Shock Hazard
Installation must be performed with care due to high battery voltage in series.

CAUTION!
Do not place anything between the flat part of the inverter terminal and the DT terminal. Otherwise, overheating may occur.

CAUTION!
Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.

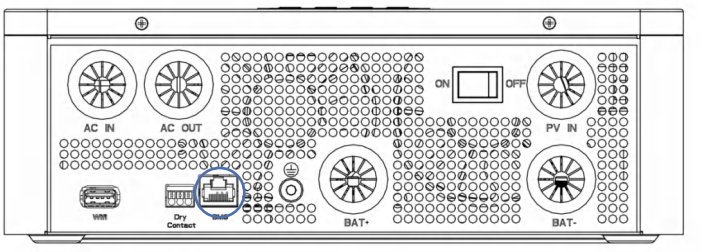
CAUTION!
Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

3.6.2 Lithium Battery Connection

If choosing lithium battery for inverter, Please check the compatibility of the protocol first. There're two connectors on the lithium battery, RJ45 port of BMS and power cable.

Please follow below steps to implement lithium battery connection:

1. Follow section 3.5.1 to implement the power cable connection.
2. Connect RJ45 terminal of battery communication cable to BMS communication port of inverter. The communication protocol should be RS485 or CAN.



3. Insert the other end of RJ45 (battery communication cable) to battery communication port of lithium battery.

Note: If choosing lithium battery, make sure to connect the BMS communication cable between the battery and the inverter. You need to choose battery type as “lithium battery” during inverter setting.

Lithium battery communication and setting:

In order to communicate with battery BMS, you should set the battery type to “LIb” in Section 4.2.2 Program 17.

Make sure the lithium battery BMS port connects to the inverter is Pin to Pin, the inverter BMS port pin assignment shown as below:

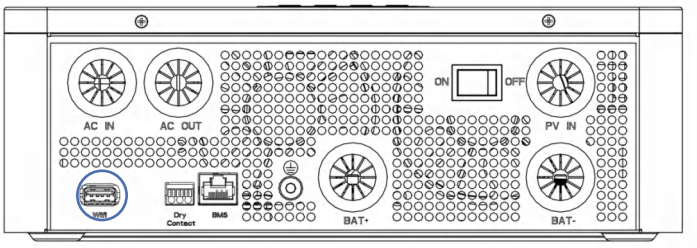
Pin number	BMS port
1	RS485B
2	RS485A
3	-
4	CANH
5	CANL
6	-
7	-
8	-

3.7 Final Assembly

After connecting all wiring, please put bottom cover back by screwing four screws mentioned in Section 3.2.

3.8 Smart Communication Stick Connection(Optional)

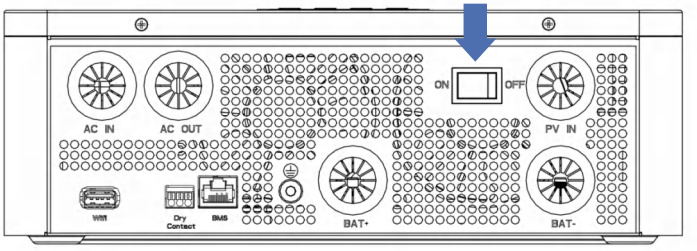
The smart communication stick is used to connect to the cloud platform. Please insert the stick into COM port directly.



4. Operation

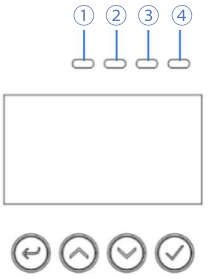
4.1 Power ON/OFF

Once the unit has been properly installed and the batteries are connected well, simply press ON/OFF switch (located on the button of the case) to turn on the unit.

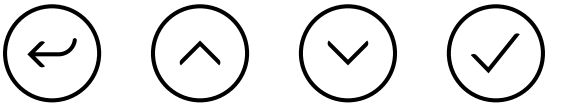


4.2 Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes four indicators, four function keys and a LCD display, indicating the operating status and input/output power information.



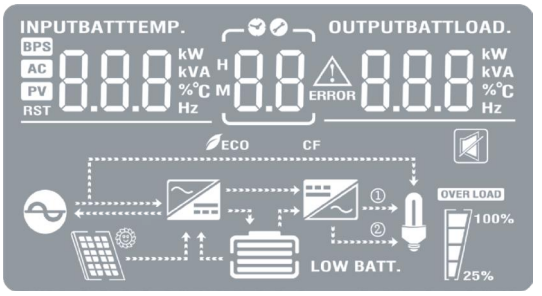
LED Indicator			Messages
① AC	Status indicator (Green)	Solid On	The mains power is normal and enters the mains power operation.
		Flashing	The mains power is normal, but it has not entered mains power operation.
		Off	The mains power is abnormal.
② Inverter	Invert indicator (Yellow)	Solid On	Output is powered by battery or PV in battery mode.
		Off	Other states.
③ Charging	Charging indicator (Yellow)	Solid On	The battery is in float charging.
		Flashing	The battery is in constant voltage charging.
		Off	Other states.
④ Fault	Fault indicator (Red)	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.
		Off	The inverter is working properly.



Function Buttons

Button	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

4.2.1 LCD Display Icons



Icon	Description
AC Input Information	
	AC input icon.
	Indicate AC input power, AC input voltage, AC input frequency, AC input current.
PV Input Information	
	PV input icon.
	Indicate PV power, PV voltage, PV current, etc.
Output Information	
	Inverter icon.
	Indicate output voltage, output current, output frequency, inverter temperature.
Load Information	
	Load icon.
	Indicate power of load, power percentage of load.
OVER LOAD	Indicate overload happened.
Battery Information	
	Indicate battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
	Indicate battery voltage, battery percentage, battery current.
Other Information	
	Indicate alarm code or fault code.
ERROR	Indicate a fault is happening.
	Indicate the alarm is disabled.
ECO	Indicate power saving mode.

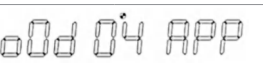
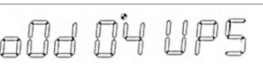
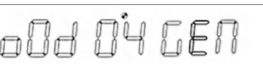
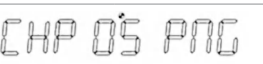
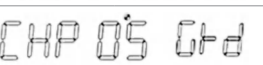
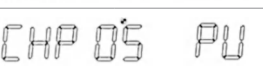
For Lead-acid battery, detailed description of battery icon as following:

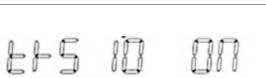
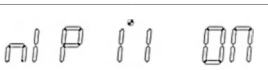
In battery mode, battery icon will present Battery Capacity		
Load Percentage	Battery Cells Voltage	Display
Load >50%	< 11.146V	
	11.146V ~ 11.685V	
	11.685V ~ 12.224V	
	> 12.224V	
50%> Load > 20%	< 11.795V	
	11.795V ~ 12.334V	
	12.334V ~ 12.873V	
	> 12.873V	
Load < 20%	< 12.12V	
	12.12V ~ 12.659V	
	12.659V ~ 13.198V	
	> 13.198V	

4.2.2 LCD Setting

After pressing and holding ENTER button for 2 seconds, the unit will enter setting mode. Press “UP” or “DOWN” button to select setting programs. Then press “ENTER” button to confirm the selection or ESC button to exit.

Program	Description	Setting Option	
01	Output voltage		
		230V (default) Adjustable/settable value: 208V, 220V, 230V, 240V	
02	Output frequency		
		50Hz(default) Adjustable/settable frequency: 50Hz, 60Hz	
03	Output source priority	Solar first	
		Solar energy provides power to the loads as first priority. If solar energy is sufficient, battery will be charged with solar energy. If solar energy is not sufficient to power all connected loads, Grid will supply power to the loads at the same time. The extra power will charge the battery. If solar energy and grid are not sufficient, battery will supply power to the loads at same time. If solar, grid and battery power is not sufficient to power loads, inverter will go to standby and charge battery.	
		Grid first (default)	
		Grid provides power to the loads as first priority. Solar power will charge the battery. If solar is not sufficient to charge battery, grid will charge the battery at the same time. If grid is not sufficient to power all connected loads, solar energy will supply power to the loads at the same time. If solar energy and grid are not sufficient, battery will supply power to the loads at same time. If solar, grid and battery power is not sufficient to power loads, inverter will go to standby and charge battery.	

03	Output source priority	PBG priority	
		Solar energy provides power to the loads as first priority. If solar energy is sufficient, battery will be charged with solar energy. If solar energy is not sufficient to power all connected loads, battery will supply power to the loads at the same time. If solar energy and battery are not sufficient, grid will supply power to the loads at same time. If solar, grid and battery power is not sufficient to power loads, inverter will go to standby and charge battery.	
04	Output mode	APP: Appliance (default)	
		Applied to household appliances	
		UPS	
		Applied to computer and other devices. Typical switching time is 10ms.	
		GEN	
		Applied to connect generator by using grid input port	
05	Charger source priority	PNG: PV and Grid (default)	
		OPV: Only PV	
		GRD: Grid first	
		PV: PV first	
		There are four options for charging priority. The default is PNG (PV and Grid). PV and Grid are charged at the same time;. The second is OPV (Only PV). Only PV charge. The third is GRD (Grid). Grid charging takes priority. The fourth is PV. PV gives priority to charging.	
06	Grid charging current		
		40A(default) Setting range is [2, 100A]	

07	Maximum charging current		
		Set total charging current for solar and grid chargers. The default is 60A. Available options: 2/10/20/30/40/50/60/70/80/90/100A	
08	Menu Default		
		During setting: Set to ON. If the current page is not on the first page and no operation with 1 minute, the system will return to display the first page. Set to OFF. If the current page is not on the first page and no operation with 1 minute, the system will stay on the current page.	
09	Auto restart when overload occurs	The default is ON.	
10	Auto restart when over temperature occurs	The default is ON.	
11	Main input cut warning		
		Enable/Disable Mains or PV loss alarm. The default setting is ON. If the main input detected lost, the buzzer will sound for 3 seconds. when set to OFF, after the main input is lost, the buzzer will not sound.	
12	Energy-saving mode		
		The default setting is OFF. When set to ON, in battery mode, if the load is lower than 25W, the system will stop output for a period then resume. If the load is still lower than 25W, the system will do the loop stop then resume. If the load is higher than 35W, the system will resume continuous normal output.	
13	Overload transfer to bypass		
		The default setting is OFF. When set to ON, in the case of PBG priority output, if there is an overload, the system will immediately transfer to bypass mode (utility power output, also known as bypass mode).	