User Manual



Solar Hybrid Inverter

SP100-12000-48/SP200-12000-48

Version: V1.1

Version updated. No further notice will be given



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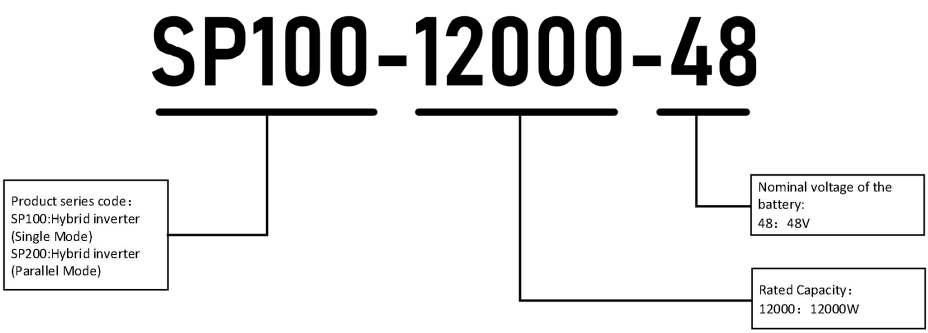
1.Information on this Manual

1.1 Validity

This manual is valid for the following devices:

- SP100-12000-48
- SP200-12000-48

1.1.1 Demonstration of the type



1.2 Scope

This manual provides an introduction to the product architecture, installation instructions, operation guidance, and troubleshooting procedures. Before installing and operating the product, please read this user manual carefully.

1.3 Target Group

This manual is applicable to qualified technicians and professional end-users. Operators must possess the following skills:

- Understand the working principle and operation mode of the inverter
- Possess professional skills to handle electrical hazards and risks during the installation and use of electrical equipment, and to avoid and deal with them
- Have professional skills for the installation and commissioning of electrical equipment
- Be familiar with applicable safety standards
- Understand and follow the contents of this manual and comply with all safety regulations

1.4 Security Identifier

In order to ensure the personal safety of users when using this product, the inverter label and the user manual provide relevant identification information and use appropriate symbols to alert users. Users should carefully read the symbols and information used in this manual.

	CAUTION Danger: Do not perform equipment maintenance or repair while the power is on. Otherwise, there is a risk of electric shock! Danger: Non-professionals are strictly prohibited from installing, wiring, maintaining, inspecting or replacing components of the equipment!
	Danger: Failure to follow the relevant requirements may result in serious personal injury or even death. Danger: Before conducting the wiring operation at the inverter terminals, all power sources connected to the inverter must be disconnected;
	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.

The meanings of the symbols in the user manual

 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

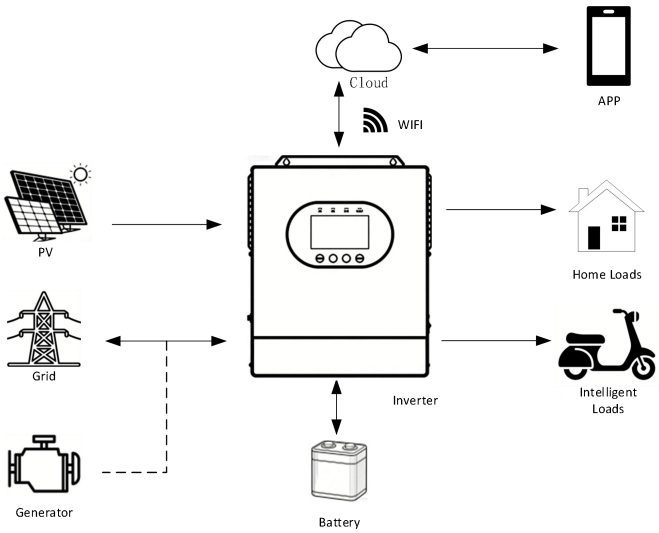


WARNING!

This chapter contains important safety and operating instructions. Read and keep this manual for future reference.

1. Before using the equipment, please carefully read the warning marks on the inverter and battery, as well as all the warning signs in this manual. If the equipment is damaged due to improper installation not following the installation instructions in this manual, the company and the supplier have the right to not provide quality assurance.
2. All operations and connections should be carried out by professional technicians.
3. All electrical installations must comply with local electrical safety standards.
4. If installing photovoltaic components during the day, the installation personnel should cover the photovoltaic components with opaque materials. Otherwise, the component's terminal voltage will be too high, causing danger.
5. **Note:** To reduce risks, only rechargeable deep-cycle lead-acid batteries or lithium batteries can be used. Other types of batteries may burst and cause personal injury and damage.
6. Please clearly identify whether it is a lithium battery or a lead-acid battery. If the incorrect battery mode is set, the system will not work properly.
7. **Do not charge frozen batteries.**
8. When using metal tools around the battery, be extremely careful. Any dropped tools may cause the battery or other electrical components to generate sparks or short circuits, and this could lead to an explosion.
9. To ensure the inverter can operate properly, select the appropriate cable size according to the required specifications.
10. **When you want to disconnect the AC or DC terminals, please follow the installation procedures strictly. For detailed information, please refer to the installation section of this manual.**
11. **Grounding instructions: The inverter should be permanently grounded. When installing the inverter, be sure to comply with local laws and regulations.**
12. **Do not cause a short circuit between the AC output or DC input. Do not connect the AC power when the DC input is short-circuited.**
13. **Before starting, ensure that the inverter has been fully assembled.**
14. Do not disassemble this machine. When needing maintenance or repair, send the equipment to a qualified service center. Incorrect reassembly may lead to the risk of electric shock or fire.
15. To reduce the risk of electric shock, disconnect all connections before any maintenance or cleaning. Simply turning off the equipment will not reduce the risk of electric shock.
16. When using the MAIN OUT and EPS OUT terminals of the inverter,ensure that the inverter is the sole power supply source to prevent equipment damage
17. When the inverter is operating, even if the battery is not connected, there will still be voltage at the battery port. Do not touch the battery port.

2. Introduction



Solar Energy Storage System

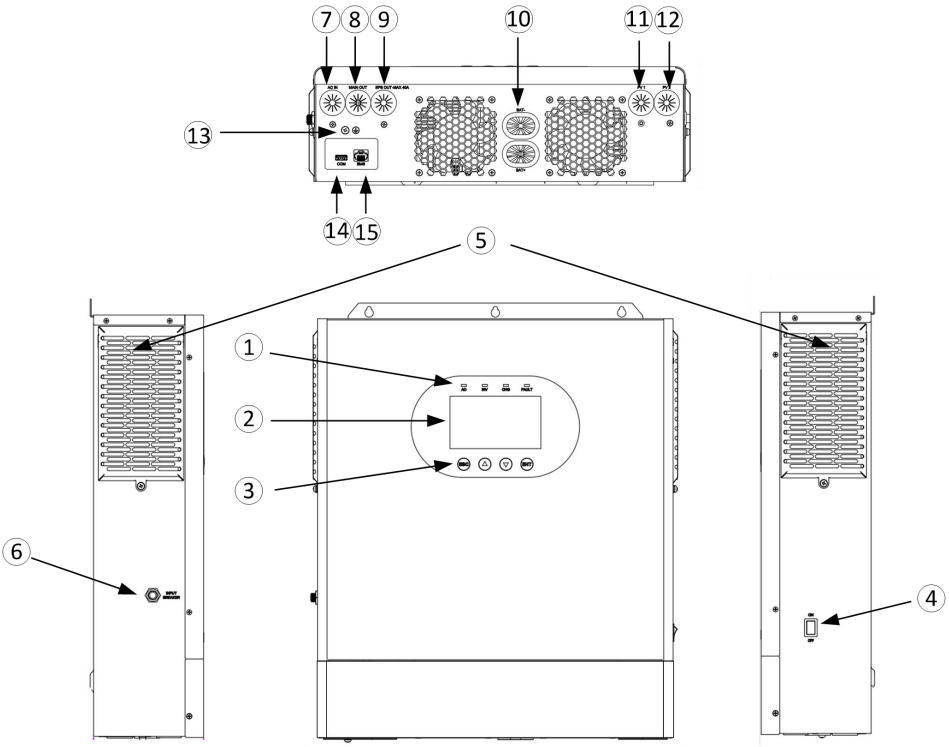
The SP100/SP200 series is a multi-functional hybrid inverter that integrates an MPPT solar charging controller, a mains power charging and energy storage module, a pure sine wave AC module, and an UPS function module. Under the conditions of the local laws and regulations, it supports grid connection operation. It is equipped with a Wi-Fi Data Logger interface. The Wi-Fi Data Logger is installed on the inverter and can remotely monitor the operation status of the inverter. The inverter can be used in conjunction with batteries or operate independently. It has complete software and hardware protection functions to ensure a safer and more stable system. It is very suitable for off-grid backup power sources and household self-use scenarios.

2.1 Product Feature

- Support setting the priority of mains power and photovoltaic output;
- Rated power: 12kW / 12kVA, Power factor: 1 ;
- MPPT range: 60VDC - 450VDC, maximum open-circuit voltage: 500V, the maximum input power of the photovoltaic system is 15000W;
- Support operation without battery;
- Has CAN&RS485 communication port for BMS communication;
- Support lithium battery activation function;
- Has external COM interface, used for Wi-Fi wireless monitoring and remote OTA upgrade;
- SP200-12000-48 can support up to 6 units in parallel use (only when connected to batteries), and supports three-phase system output in groups;
- Has intelligent load output function;
- Supports feed-in function, but must comply with local laws and regulations;
- Has complete short-circuit protection, over-voltage and under-voltage protection, overload protection, over-temperature protection and photovoltaic reverse injection protection, etc.

2.2 Panel and Port Definitions

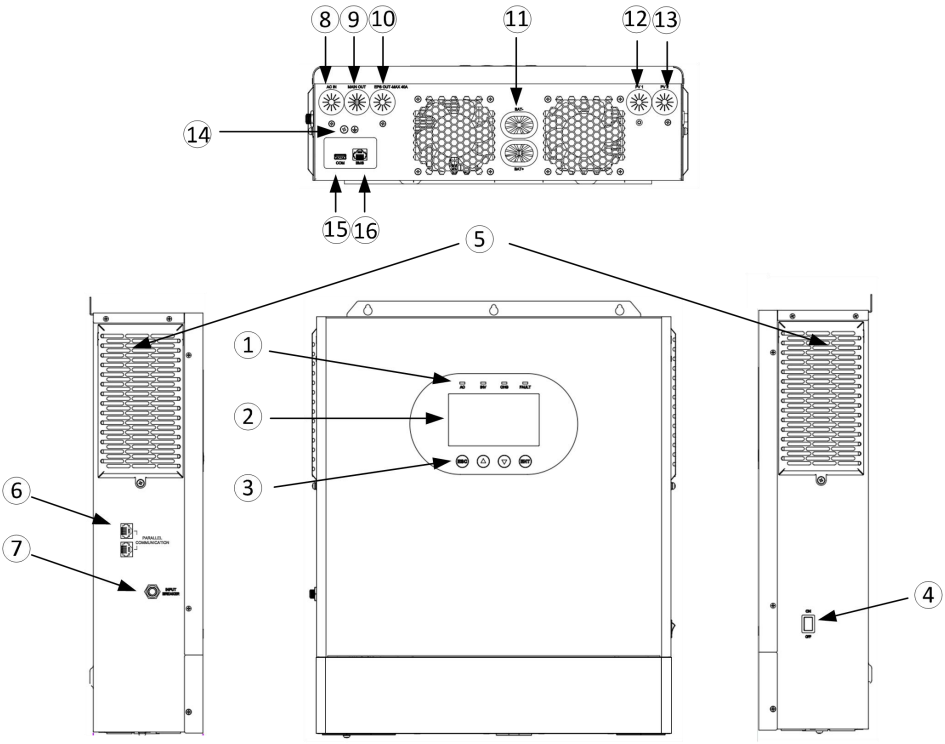
2.2.1 SP100-12000-48 Panel and Port Definitions



Number	Description	Number	Description
1	Status indicator	2	LCD display screen
3	Function buttons	4	Inverter switch
5	Removable air intake cover	6	Circuit breaker
7	AC input port	8	Main output port
9	EPS output port	10	Battery input port
11	PV1 input port	12	PV2 input port
13	GND port	14	COM port(Wi-Fi Logger communication)
15	BMS communication port(CAN&485)		

PV1 and PV2 adopt a common negative electrode design, Main output and EPS output are designed with a common ground line.

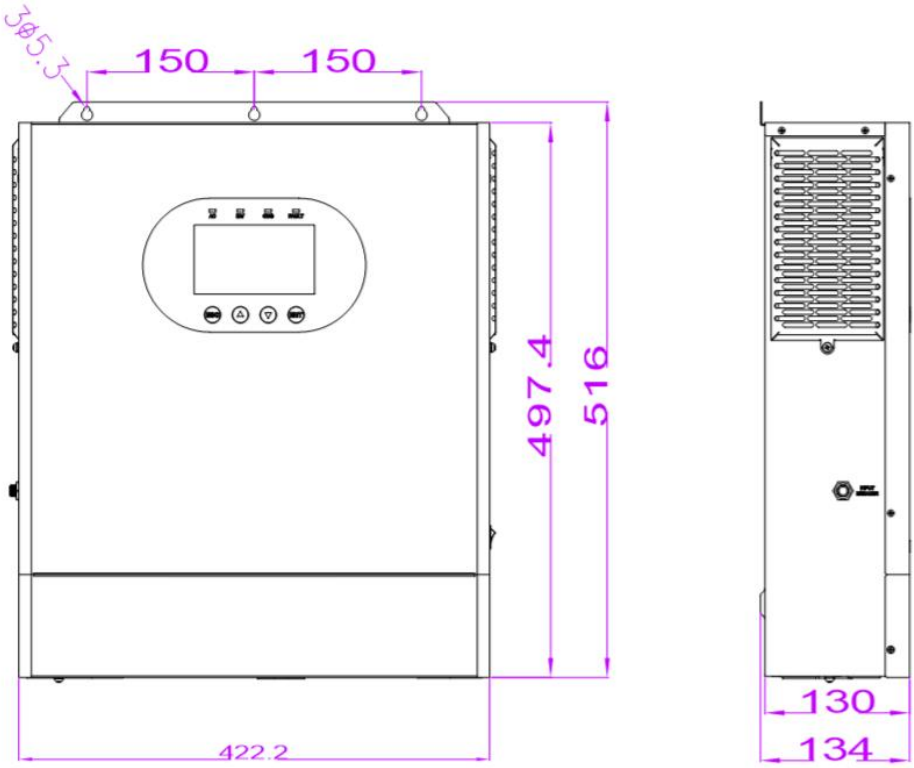
2.2.2 SP200-12000-48 Panel and Port Definitions



Number	Description	Number	Description
1	Status indicator	2	LCD display screen
3	Function buttons	4	Inverter switch
5	Removable air intake cover	6	Parallel port
7	Circuit breaker	8	AC input port
9	Main output port	10	EPS output port
11	Battery input port	12	PV1 input port
13	PV2 input port	14	GND port
15	COM port(Wi-Fi Logger communication)	16	BMS communication port(CAN&485)

PV1 and PV2 adopt a common negative electrode design, Main output and EPS output are designed with a common ground line.

2.2.3 Dimension

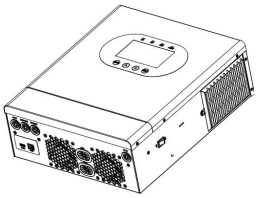
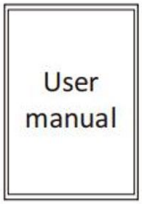
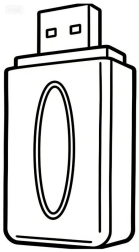
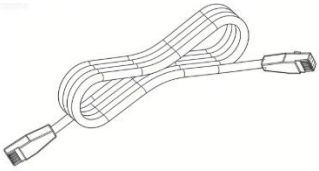


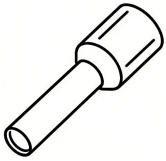
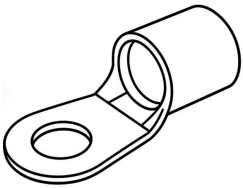
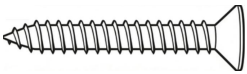
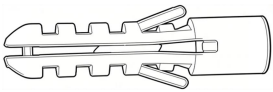
Unit : mm

3. Installation Instructions

3.1 List of attachments

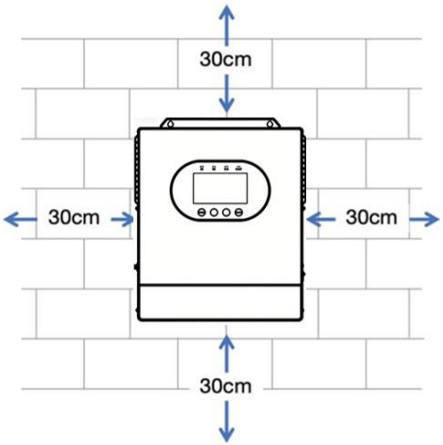
The product has undergone strict testing before leaving the factory. Before installation, please check if the outer packaging is intact. Open the inverter package and confirm that there are no damaged items inside. Check if the following items are included. If the product is damaged, please contact the local dealer.

serial number	picture	name	amount
1		Inverter	1
2		User manual	1
3		Wi-Fi Data Logger	1
4		Parallel communication cable （For SP200）	1

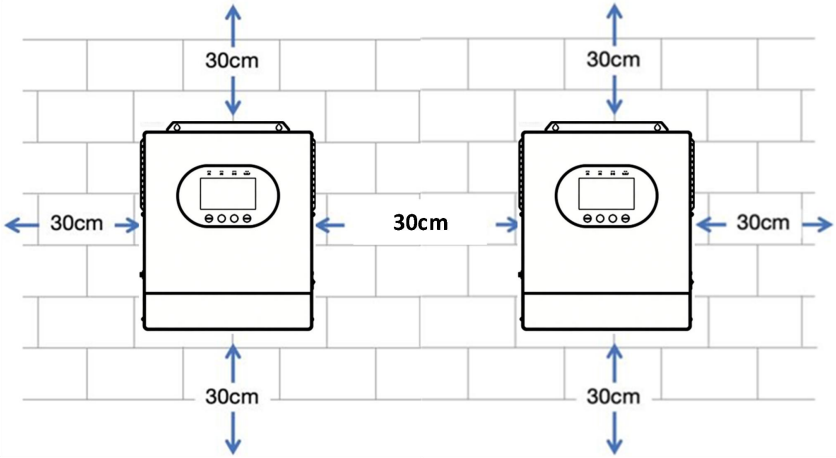
5		Tubular terminal(AC IN、MAIN OUT、EPS OUT、PV IN terminal)	11
6		R-type terminal(GND)	1
7		O-type terminal(BAT terminal)	2
8		APP manual	1
9		Screws	3
10		Rubber plug	3

3.2 Installation and fixation

When installing a single inverter, at least 30cm of space should be reserved in each direction.



When installing multiple inverters, a minimum space of 30cm should be left between each inverter.



Consider the following points before selecting where to install:

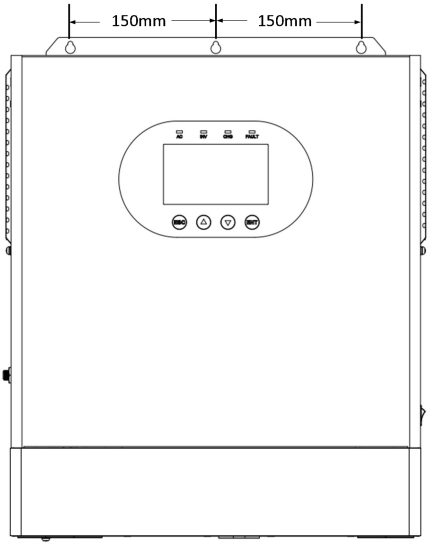
- Do not mount the inverter on flammable construction materials.
- Install the inverter at a height where it is easily visible, so that the LCD screen can be easily read.
- The ambient temperature should be between − 10°C and 60°C.
- The recommended installation position is to be adhered to the wall vertically.
- It is essential to follow the reserved cooling space as indicated in the above chart to ensure effective cooling performance, and also to leave sufficient space for the arrangement of connection cables.

WARNING!

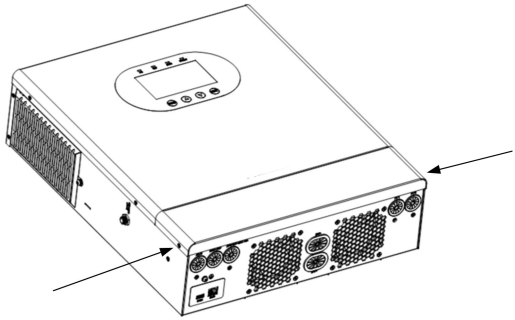
- **The inverter is only applicable for installation on a sturdy and non-flammable surface.**
- **If the energy storage system is installed in a salt-affected area, it may be corroded and cause a fire. Therefore, the energy storage system should be installed in a location away from the salt-affected area.**

Follow the installation steps:

1. It is recommended to use a φ8 drill bit to make holes at the appropriate installation position on the wall surface. Then, insert expansion screws (M6) into the holes.



2. Pick up the inverter vertically and align the screws' holes at the top of the inverter with the expansion screw tube already installed on the wall. Fix the inverter on the mounting surface by screws.
3. Before connecting all wiring, please take off bottom cover by removing two screws as shown below:



3.2.1 Recommended cables and circuit breakers

WARNING!

For the security and smooth operation of the system, using the appropriate cables is of great importance. Please use the cables of the recommended specifications as follows.

Recommended cable and circuit breaker specifications for a single inverter

Model	Connector port	Gauge	Cable (mm²)	circuit breaker specifications
SP100-12000-48 SP200-12000-48	AC input	1*6 AWG	13.3	70A/230VAC
	Main output			70A/230VAC
	EPS output	1*8 AWG	8.37	40A/230VAC
	PV1 port			32A/500VDC
	PV2 port			32A/500VDC
	Battery input	2*2 AWG	2*33.62	350A/60VDC

3.3 AC Input / Output Connection

WARNING!

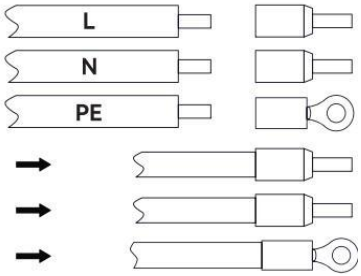
- Electric shock hazard. Before preparing to connect the wires, make sure to disconnect the AC circuit breaker and the inverter switch of the inverter.
- Do not reverse the connections of the AC input and output terminals. The input and output neutral (N) conductors must not be shorted together; shorting them may cause damage to the inverter.
- Make sure the polarity of the AC cables is connected correctly. If the L wire and N wire are connected in reverse, the inverter parallel operation may cause a power grid short circuit.
- Do not connect loads with a current exceeding 40 A to the ESP output port; otherwise, errors may be triggered.
- All installation work of the lines must be completed by relevant professional technicians.
- Before connecting the cables to the equipment, make sure the AC power supply has been disconnected.
- All operations carried out during the electrical connection process, as well as the specifications of the cables and components used, must comply with local laws and regulations. The cable colors mentioned below are for reference only.
- To ensure safe and efficient system operation, be sure to use appropriate cables when connecting to the AC output terminals 1 and 2. To reduce the risk of injury, use the cable specifications recommended above.
- Appliances such as air conditioner are required at least 2~3minutes to restart beca use it's re quired 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

Please follow below steps to implement AC connection:

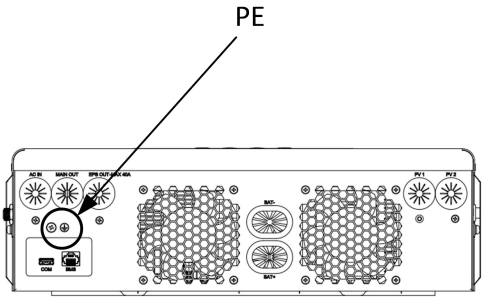
1. Before connecting to the AC input power supply, please install an independent AC circuit breaker between the inverter and the AC input power supply. This will ensure that the inverter power can be safely disconnected during maintenance, and it will also prevent overloading of the AC input current.
2. Remove insulation sleeve 12mm from the head of cables, shorten the conductor part to 10mm . Insert the cable into the tubular terminal. Then use terminal crimping tool make the terminal and cable connected tightly.
3. First, connect the PE protective wire, then sequentially secure the main output wire, the intelligent load wire, and the AC output wire.
4. And mark the corresponding polarity positions on the terminals.

You can refer to the following content identifiers:

PE protective grounding → (yellow-green) L wire → (brown) N wire → neutral line (blue)

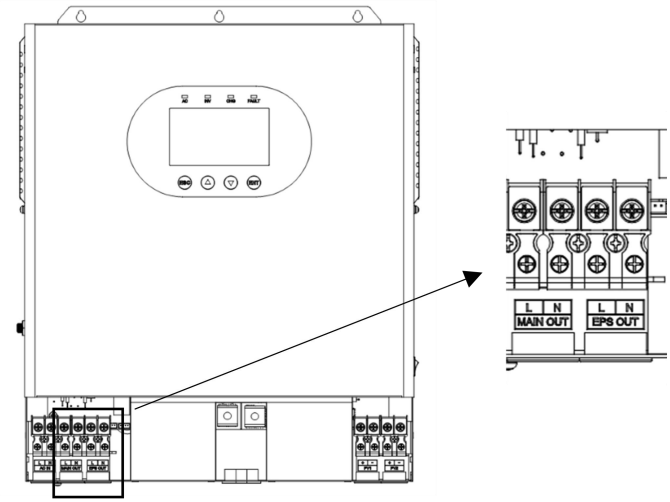


①The connection position of the PE protective wire is shown in the following diagram. Ensure that the metal casing of the inverter is grounded (grounding in the power grid system)

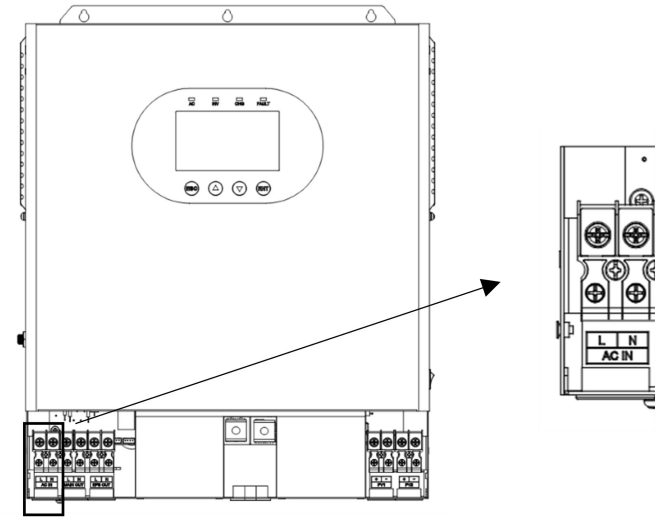


② Insert the main output wire according to the polarity indicated on the terminal block, and make sure the screw is tightly pressing the wire.

③ Insert the intelligent output wire according to the polarity indicated on the terminal block, and ensure the screw is tightly pressing the wire.



④ Insert the grid input wire according to the polarity indicated on the terminal block, and make sure that the screw is tightly pressed against the wire.



CAUTION!

- **When performing the above operations, please ensure that they are carried out in a non-powered environment.**
- **After inserting the wires according to the polarity marked on the terminals, be sure to check if the wires are securely locked.**
- **After completing all the wiring, please recheck whether the corresponding wires are connected correctly to avoid causing the inverter to fail to work properly or damaging equipment.**

3.4 PV Connection

WARNING!

- **Do not ground the positive or negative pole of the photovoltaic (PV) modules, as this may cause severe damage to the inverter.**
- **Sunlight exposure may generate a lethal high voltage in the PV string. Therefore, the safety measures listed in the PV string and relevant documents must be strictly adhered to.**
- **Ensure that the terminals of the PV modules are connected to the corresponding ports on the inverter, as reversing the polarity will damage the inverter.**
- **All wiring must be performed by a qualified personnel.**
- **Do not close any DC switches or AC/DC circuit breakers until the electrical connections are completed.**

PV Module Selection:

When connecting the photovoltaic modules, please install a DC circuit breaker separately between the inverter and the photovoltaic modules. When selecting the photovoltaic modules, please make sure to consider the following parameters:

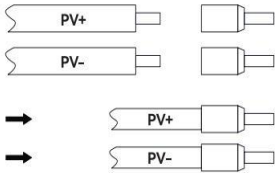
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than start-up voltage.

Max. PV Array Open Circuit Voltage	500VDC
Start-up Voltage	80VDC
PV Array MPPT Voltage Range	60VDC~450VDC

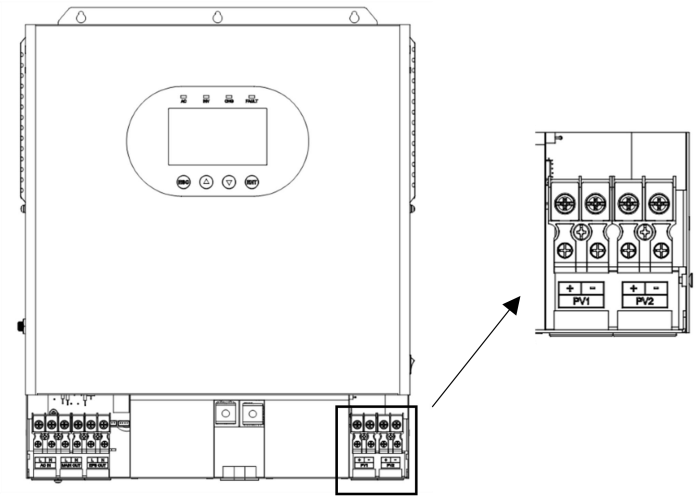
Photovoltaic cable connection:

Please connect the photovoltaic modules according to the following steps:

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. The inverter has two photovoltaic input ports, as shown in the following figure: PV1 and PV2. Insert the processed cables correctly into the corresponding ports according to the polarity indicated on the terminals and tighten the terminal screws.



5. Make sure the cables are securely connected.
6. PV1 and PV2 can be connected to different photovoltaic modules. If PV1 and PV2 are connected to the same photovoltaic module, then the setting item 62 of the inverter needs to be modified to enable the PV parallel mode.

3.5 Battery Connection

WARNING!

- **To ensure safe operation and compliance with regulations, it is recommended to install an independent DC overcurrent protector or circuit breaker between the battery and the inverter.**
- **For the safety and efficient operation of the system, it is very important to use appropriate cables for battery connection. To reduce the risk of injury, please follow the recommendations in Section 3.2.1 and use the appropriate cable and terminal size specifications. The cable colors mentioned below are for reference only.**
- **Do not place any items at the flat position of the inverter terminals or between the ring terminals. Otherwise, a short circuit may occur, leading to overheating and fire.**
- **Ensure that the positive (+) power line of the battery is connected to the battery terminal port (BAT+) of the inverter, and the negative (-) power line of the battery is connected to the battery terminal port (BAT-) of the inverter.**
- **All operations during the electrical connection process, as well as the specifications of the cables and components used, must comply with local laws and regulations. The cable colors mentioned below are for reference only.**
- **Before attempting to connect AC power to the equipment, ensure that the AC power supply has been disconnected.**
- **All wiring must be completed by professional personnel.**
- **Electric shock hazard: Due to the high voltage of the series-connected batteries, care must be taken during installation.**
- **For lead-acid batteries, the recommended charging current is 0.3C (C ≤ battery capacity)**

3.5.1 Lead-acid Battery Connection

1. Selection of battery modules: Choose the appropriate batteries based on the actual situation.

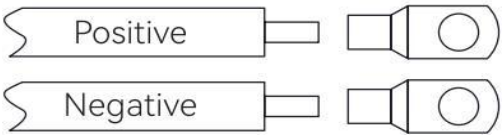
The charging and discharging current of the batteries should be greater than that of the inverter itself and leave a certain margin. The battery capacity should be configured according to the actual electricity demand.

Please configure lead-acid batteries with an appropriate capacity and a nominal voltage of 48V. Then, according to the battery user manual, set the battery type of the inverter normally. For lead-acid batteries, generally set it as "AGM" or "FLD".

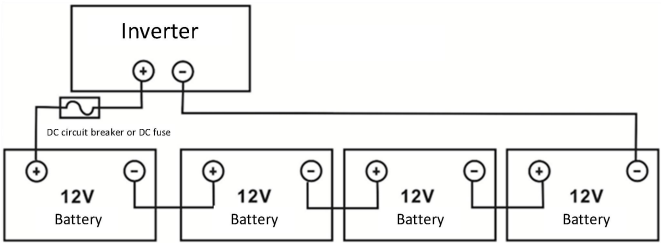
2. Connection of battery cables

Please connect the battery cables according to the following steps:

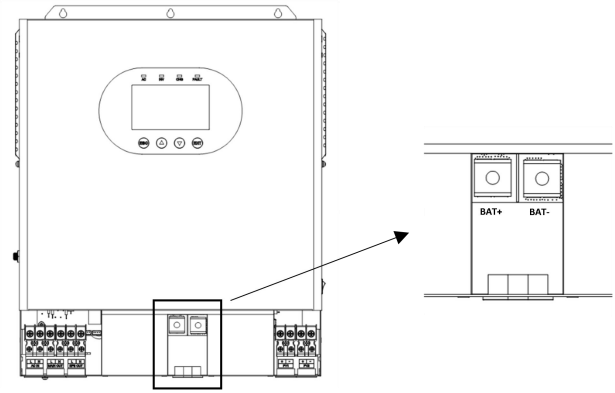
1) Unscrew the pre-fixed screws on battery poles. Prepare 2 DT terminals (It should fit for AWG2 cables).
2) Remove insulation sleeve 12mm from the head of cables, shorten the conductor part to 10mm . Insert the cable into the DT terminal. Then use terminal crimping tool make the terminal and cable connected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



3) Remove the pre-fixed screws on the battery connector.

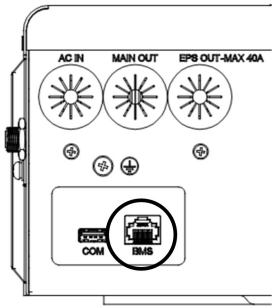


4) Pass the battery cable through the battery installation hole on the bottom shell and connect it to the corresponding interface. Ensure that the polarity of the battery and the inverter terminals are compatible, and tighten the nuts.



3.5.2 Lithium Battery Connection

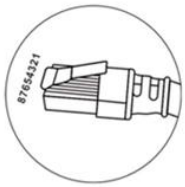
If choosing lithium battery for inverter, Please check the compatibility of the protocol first. There are two connectors on the lithium battery, RJ45 port of BMS and power cable.



Please follow below steps to implement lithium battery connection:

1. Please complete the power line connection as per Section 3.5.1.
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(RS485 or CAN).
4. Make sure that the lithium battery BMS port is tightly connected to the inverter. The pinout of the inverter's BMS port is as follows:


BMS port



Communication cable

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

CAUTION!

- **To ensure normal communication of the lithium battery BMS, please change the battery type to "LIb" or "FEL" in the 17th setting item, and then select the CAN or RS485 protocol that matches the inverter in the 44th setting item. For specific matching of the BMS protocol, please refer to Chapter 4.4;**
- **In the parallel system, the BMS communication should ensure that at least one inverter is connected to the battery BMS for communication.**

3.6 Electric Meter Connection

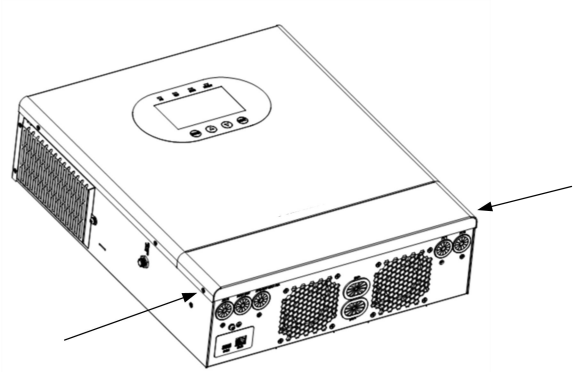
The inverter can be connected to an external electricity meter installed on the grid side. By obtaining accurate grid power data, the grid connection function can be precisely realized.

The interface of the inverter used for connecting to the electricity meter is RS485A and RS485B in the BMS interface; when RS485A/B is used to connect the electricity meter, CAN H/L can also be connected to BMS. Terminal definitions are detailed in Section 3.5.

The electricity meter model required by the manufacturer should be selected to ensure that the communication protocol of the electricity meter is compatible with the inverter.

3.7 Final Assembly

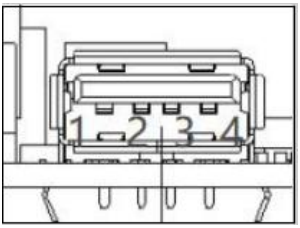
Carefully check if all the connections are correct. Arrange the plastic pieces of the air duct properly to avoid affecting the user experience. Please screw the 5 screws back onto the terminal cover plate as shown in the picture below.



3.8 Wi-Fi Data Logger Connection

The COM port can be connected with our independently developed Wi-Fi Data Logger for use. After connecting to the inverter and successfully configuring the network, the inverter can be remotely monitored and set up through our APP.

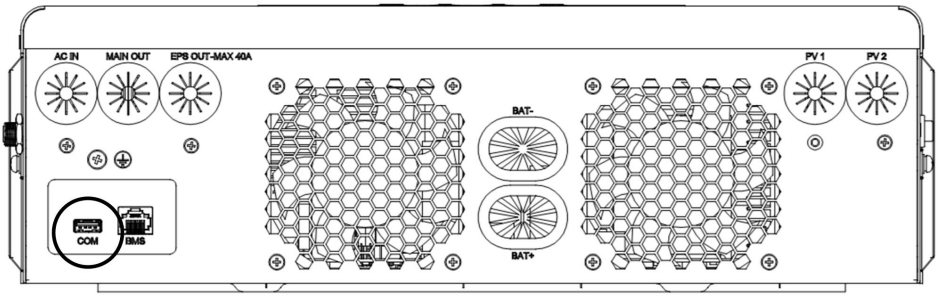
1.The port definition is shown in the following figure:



PIN number	COM port
1	+5V
2	RS232-TX
3	RS232-RX
4	GND

CAUTION!

The +5V output on the port has limited capacity and can only be used with our Wi-Fi data logger. Reversing the pin or overloading may cause damage to the device. If the device is damaged for any other purposes such as external power supply, our company will not be responsible.



2.APP download

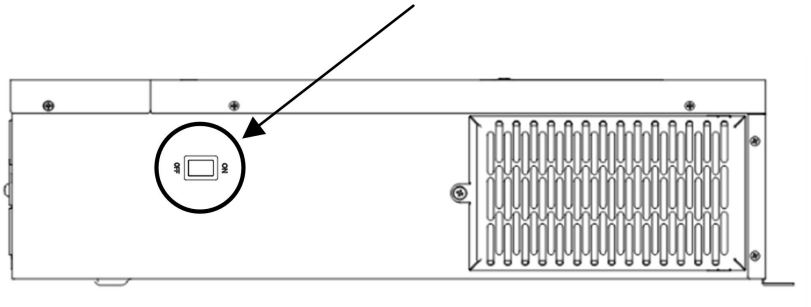
Scan and download the APP, view the user manual of the user interface or the manual of the Wi-Fi data logger, complete the account registration and device addition, and you can conveniently manage the energy storage system.



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.



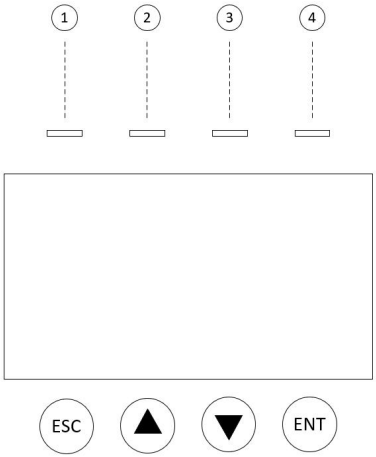
Note:

1. Turn on the inverter switch, and the inverter will start to invert and supply power to the load.

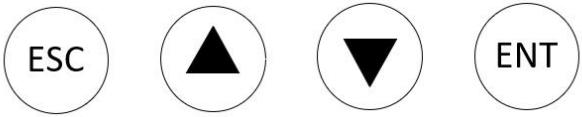
2. Under normal circumstances, if you want to put the inverter into standby mode to modify certain parameters, please turn off the inverter switch.

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
①AC	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.
②Inverter	Invert indicator (Yellow)	Solid On	Output is powered by battery or PV in battery mode.
		Off	Other states.
③Charging	Charging indicator (Yellow)	Solid On	The battery is in float charging.
		Flashing	The battery is in constant voltage charging.
		Off	Other states.
④Fault	Fault indicator (Red)	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.
		Off	The inverter is working properly.

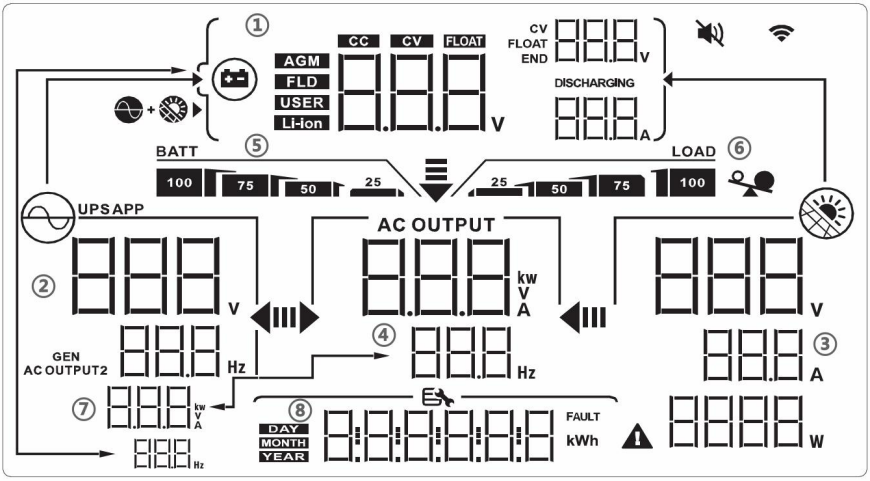


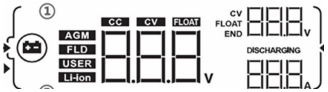
ESC UP DOWN ENTER

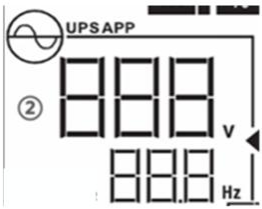
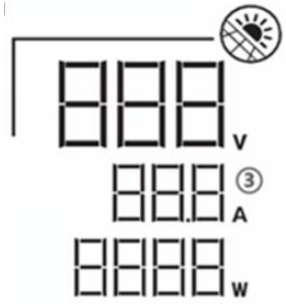
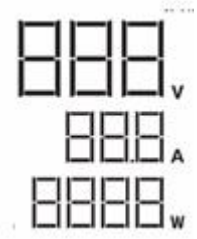
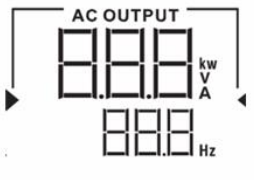
Function Buttons

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



Display area	Icon	Description
①Battery Information 		Battery icon
		Battery type
		Three charging period. The CC icon is illuminated during the constant current charging stage, the CV icon is illuminated during the constant voltage charging stage, and the FLOAT icon is illuminated during the float charging stage.
		Indicate battery voltage
		During the constant voltage charging stage, the CV voltage is displayed and the CV icon is illuminated. During the float

		charging stage, the float voltage is displayed and the FLOAT icon is illuminated. During the discharge state, the end discharge voltage is displayed and the END icon is illuminated.
		Battery charging/discharging current
②AC Input Information 		AC input icon
	UPS APP	UPS or APP input mode When set to GEN input, it displays as APP
		AC input voltage and frequency
③PV Input Information 		PV input icon
		Indicate PV power, PV voltage, PV current, etc.
④Output Information		Indicate output voltage(V), apparent power (VA or kVA), output active power (W or kW) alternately, switching every five seconds Indicate output frequency

⑤Battery Capacity		Indicate battery capacity
⑥Load Capacity		Indicate load capacity
		Over load icon
⑦EPS OUT information		Second AC output icon
		Indicate AC output 2 voltage(V)
⑧Parameter Query, Function Setting or Fault/Alarm Information		Indicate system information; Function setting; Indicate Fault/Alarm
Other Information		Mute
		If PV + Grid, the left and right icon light at same time; if only PV, the right icon is only light
		If PV first, the left and right icon light at same time.

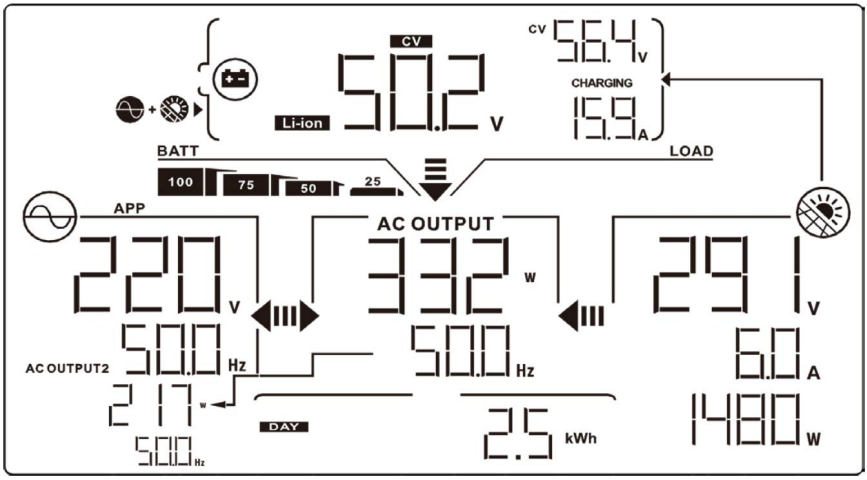
For Lead-acid battery, detailed description of battery icon as following:

In battery mode, battery icon will present Battery Capacity		
Load Percentage	Battery Voltage	Display
Load >50%	< 44.584V	

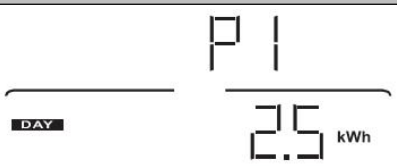
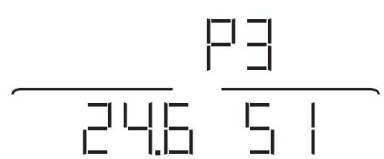
	44.584 ~ 46.74V	
	46.74 ~ 48.896V	
	> 48.896V	
50%> Load > 20%	< 47.18V	
	47.18 ~ 49.336V	
	49.336 ~ 51.492V	
	> 51.492V	
Load < 20%	< 48.48V	
	48.48 ~ 50.636V	
	50.636 ~ 52.792V	
	> 52.792V	

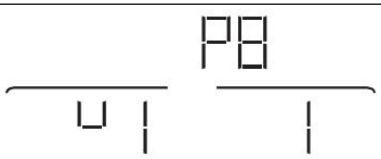
4.3 Display information

The LCD display information will be switched in turns by pressing '▲'or '▼' key. If there is no operation for a long time, the daily PV power generation will be displayed at the bottom of the screen. For example the following screen displays 2.5kWh.



The selectable information is switched as below.

LCD display	Information
	Display the daily power generation from solar.
	Display total power generation from solar.
	Display lithium battery temperature and SOC. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery rated capacity and remaining capacity. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery maximum charging voltage and minimum discharging voltage. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery maximum charging current and maximum discharging current. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery alarm and fault information. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.

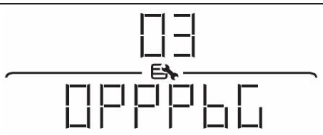
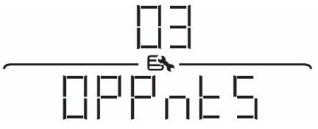
	Display inverter firmware version.

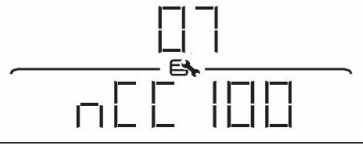
4.4 LCD Setting

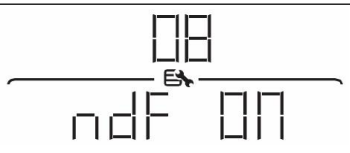
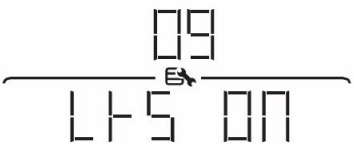
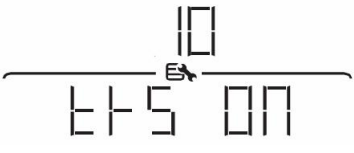
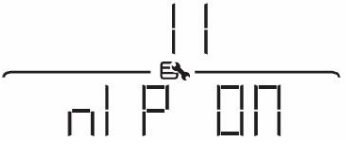
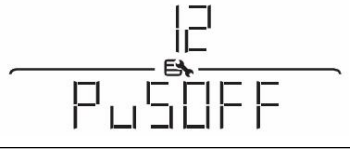
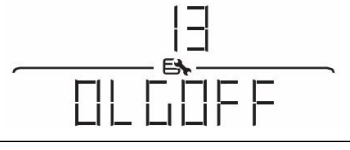
After pressing and holding ENT button for 2 seconds, the unit will enter setting mode. Press '▲'or '▼' button to select setting programs. Then press 'ENT' button to confirm the selection or ESC button to exit.

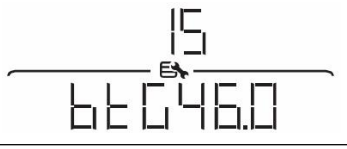
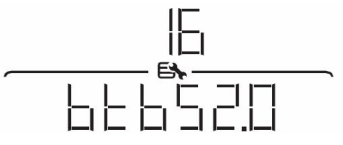
Notes:
Standby mode: Inverter is not allowed to power the load. (Turn output switch to 'OFF' or inverter is abnormal)
Battery mode: Inverter is allowed to power the load with PV / PV+Battery / Battery, and operates without the grid.
Grid mode: Inverter is allowed to power the load with PV / PV+Grid / Grid, and operates with the grid.

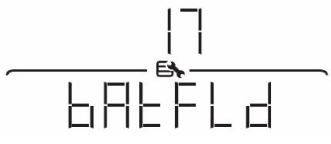
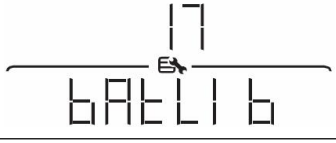
Program	Description	Setting Option	
01	Output voltage		
		230V (default) Adjustable/settable value: 208V, 220V, 230V, 240V	
02	Output frequency		
		50Hz(default) Adjustable/settable frequency: 50Hz, 60Hz It can be set in standby mode or grid mode, and take effect immediately.	
03	Output source priority	GPB: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 absent and solar is sufficient, solar will power the loads. If grid is absent and solar is not sufficient, solar and battery will power the loads. If grid is absent, solar and battery are not sufficient to power loads at the same time,	

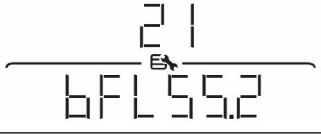
		inverter will go to standby and charge battery.	
		PGB:Solar first	
		Solar energy provides power to the loads as first priority. If solar energy is sufficient, battery will be charged with solar energy. If solar energy is not sufficient to power all connected loads, Grid will supply power to the loads at the same time. If grid is absent and solar is not sufficient, solar and battery will power the loads. If grid is absent, solar and battery are not sufficient to power loads at the same time, inverter will go to standby and charge battery.	
		PBG priority	
		Solar energy provides power to the loads as first priority. If solar energy is sufficient, solar will charge the battery. If solar energy is not sufficient, battery will also supply power. If solar and battery energy are not sufficient, grid will supply power to the loads and solar charges the battery. If battery is charged to be sufficient, solar and battery will power the loads instead of grid. If grid is absent, solar and battery are not sufficient to power loads at the same time, inverter will go to standby and charge battery.	
		MKS	
		Generator provides power to loads as first priority. When generator, PV, battery all exist, the work mode is as PBG. When generator exists with PV or battery, the work mode is as GPB.	
04	Input mode	APP: Appliance (default)	
		Applied to household appliances. Typical switching time is 10ms.	
		UPS	

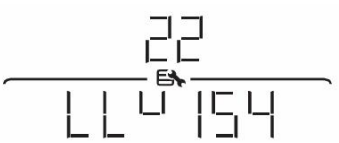
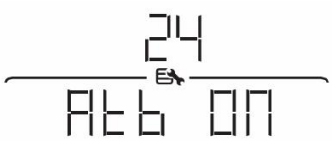
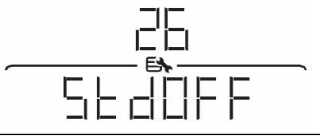
		Applied to computer and other devices. Typical switching time is 10ms.	
		GEN	
		Applied to connect generator from AC IN port. Typically switching time is 20ms.	
05	Charger source priority	PNG: PV and Grid (default)	
		PV and Grid are charged at the same time.	
		OPV: Only PV	
		Only PV charge.	
		PVF: PV first	
		If both gird and PV are available, PV charge. If only PV is available, PV charge. If only grid is available, grid charge.	
06	Grid charging current		
		Set charging current for grid chargers. The default setting is 60A. Available options: 2/10/20/30/40/50/60/70/80/90/100/110/120/130/140/150/160A	
07	Maximum charging current		
		Set total charging current for solar and grid chargers. The default setting is 100A. Available options: 10/20/30/40/50/60/70/80/90/100/110/120/130/140/150/160A If the BMS is connected, the total charging current will follow the data from BMS.	

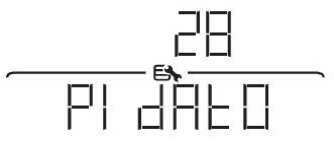
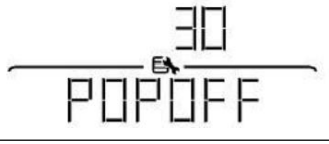
08	Menu Default		
		ON: If the current page is not on the first page and no operation with 1 minute, the system will return to display the first page. OFF: If the current page is not on the first page and no operation with 1 minute, the system will stay on the current page.	
09	Auto restart when overload	ON(default)	
10	Auto restart when over temperature	ON(default)	
11	Main input cut warning		
		Enable/Disable Grid or PV loss alarm. The default setting is ON. If the grid input detected lost, the buzzer will sound for 5 seconds. when set to OFF, after the grid input is lost, the buzzer will not sound.	
12	Energy-saving mode		
		The default setting is OFF and this function doesn't work in parallel mode. When set to ON, in battery mode, if the load<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>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 (PV priority) or MKS (generator priority) mode, if there is an overload, the system will immediately transfer to	

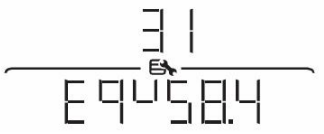
		bypass mode (grid power outputs to the load, also known as bypass mode).
14	Silent mode setting	
		Enable/disable buzzer sound. The default setting is OFF. When set to ON, in any situation such as alarms or faults, the buzzer will not sound. This setting can be applied to all modes. Button sound is not affected.
15	Battery return to grid voltage point	
		When the battery is set to the AGM (Lead Acid Battery Type) or FLD (Flooded Battery Type) mode. The default setting is 46V, and it can be adjusted within a range of [44, 52V].
		When the battery is set to LIB (Ternary lithium battery). The default setting is 47.6V. It can be adjusted within a range of [40, 50V]. When the battery is set to FEL (Lithium iron battery), the default setting is 49.6V. It can be adjusted within a range of [40, 50V].
		When the battery is set to the CUS (Customer Setting Type) mode, the default setting is 47.6V, and it can be adjusted within a range of [40, 50V].
16	Switching back to battery mode voltage points	
		After the battery is shut down due to low voltage, it needs to reach a specific voltage level before it can be restarted in battery mode. This value can be set to either "FUL" or the battery voltage.
		When the battery is set to AGM (Absorbent Glass Mat) or FLD (flooded) mode, The default setting is 52V. It can be adjusted within a range of [48, 58V].
		When the battery is set to LIB (Ternary lithium battery). The default setting is 54.4V. It can be adjusted within a range of [46, 58V]. When the battery is set to FEL (Lithium iron battery), the default setting is 53.2V. It can be adjusted within a range of [46, 58V].
		When the battery is set to CUS (Customer Set Type) mode, The default setting is 54.4V, The voltage range is [46, 58V].

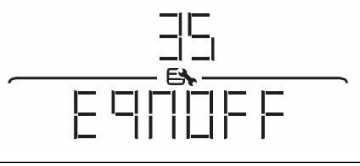
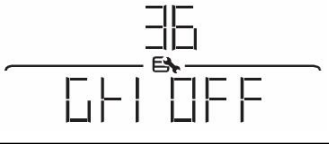
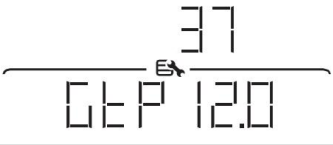
		When it is set to FUL, battery output again after been fully charged.	
17	Battery type	AGM(default)	
		Flooded	
		Lithium (Ternary Lithium Battery)	
		FEL (Lithium iron)	
		User-Defined	
18	Battery low voltage point		
		Battery low voltage alarm setting. If BMS is connected and the minimum discharge voltage uploaded by BMS is lower than the current set low voltage point, the low voltage point will be changed to the data from BMS. When the battery type is set to LIB, the default setting is 47.6V. The adjustable range for the voltage is [41.2, 50V]. When the battery type is set to FEL, the default setting is 48V. The adjustable range for the voltage is [41.2, 50V]. When the battery type is set to CUS, the default setting is 47.6V. The adjustable range for the voltage is [42, 54V]. It is not possible to set the battery definition mode to AGM or FLD mode. The default setting is 44V.	

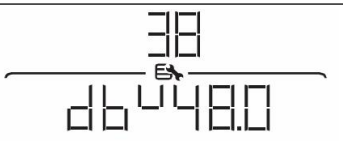
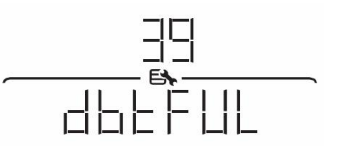
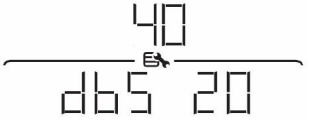
19	Battery shutdown voltage point	
		The battery low voltage shutdown point setting function cannot be adjusted when the battery is defined as AGM or FLD mode. The default setting is 42V. If BMS is connected, the battery low voltage shutdown point will be changed to the data from BMS.
		If BMS is not connected, according to the following settings: When the battery type is set to LIB, the default setting is 46V, and the adjustable range is [40, 48V]. Initial settings for CUS are the same as for LIB. When the battery type is set to FEL, the default setting is 42V,and the adjustable range is [40, 48V].
20	Constant voltage mode voltage point setting	
		When the battery is defined in AGM or FLD mode, the voltage set point cannot be configured. The default setting for AGM mode is 56.4V, for FLD mode is 58V. When the battery type is LIB or CUS, It can be set within the range of [48, 60V] for the constant voltage charging set point. The default setting is 56.4V. When the battery type is set to FEL, the default setting is 55.2V, and it can be adjusted within the range of [48, 60V]. It is important to ensure that the constant voltage set point voltage is higher than the float charge set point voltage. Notes: The inverter operates according to the set voltage point without BMS connected. After connecting to BMS, these voltage points follow the changes in data uploaded by BMS.
21	Floating charge mode voltage point setting	
		For AGM or FLD type, the voltage set point cannot be configured. The default setting is 54V. For CUS type, the default setting is 55.2V with a range of [48, 60V]. For LIB type, the default setting is 55.2V with a range of [50, 58V]. For FEL type, the default setting is 54.4V with a range of [50, 58V]. It is important to note that the constant voltage point voltage should always be set higher than the floating charge point voltage. Notes: The inverter operates according to the set voltage point without BMS connected. After connecting to BMS, these voltage points follow the changes in data uploaded by

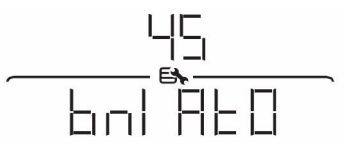
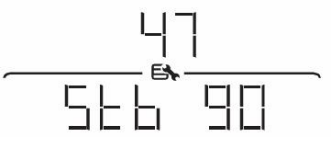
		BMS.
22	Grid low voltage point setting	
		If input mode is APP/GEN, Grid low voltage point can be set within a range of 90V to 154V. The default setting is 154V. If input mode is UPS, Grid low voltage point can be set within a range of 170V to 200V. The default setting is 185V.
23	Grid high voltage point setting	
		If input mode is APP/GEN, Grid high voltage point can be set within a range of 264V to 280V. The default setting is 264V. If input mode is UPS, Grid high voltage point is 264V and can't be changed.
24	Automatic turn off backlight	
		The default setting is ON. If ON, the backlight will turn off after 1 minutes of no button operation.
25	Inverter soft start setting	
		The default setting is OFF. If ON, the inverter output gradually increases from 0 to the target voltage value. If OFF, the inverter output directly increases from 0 to the target voltage value. This function doesn't work in parallel mode.
26	Reset factory setting	
		Restore all settings to factory default values. Before the setting, this interface is displayed as OFF. When set to ON, the system will restore to default settings. After the setting is completed, this interface will display OFF again. This setting will take effect immediately both in normal power supply mode and in

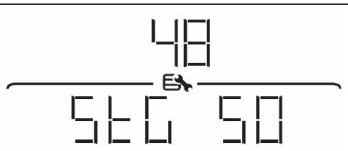
		standby mode.
27	Parallel mode setting(SP200-12000-48)	
		Set the parallel operation mode. It can be set in mains mode and standby mode (Stand By: no output but screen is on), but cannot be set in battery mode. Other models cannot be set. The default setting is SIG (single mode), which can be set to PAR (parallel mode) single-phase parallel operation mode, 3P1 (R phase mode), 3P2 (S phase mode), 3P3 (T phase mode). For details, please refer to section 5. The SP100 model does not display this page. This setting won't be changed after "Reset factory".
28	Parallel identity code(SP200-12000-48)	
		The default setting is ATO (auto mode), which can be set to 1-6. When using the parallel function, except for ATO mode, the same identical ID cannot be set for two inverters. The SP100 model does not display this page. This setting won't be changed after "Reset factory".
29	Battery Disconnection Alarm	
		Enable/Disable battery disconnection alarm. OFF(default). When set to OFF, there will be no battery disconnection alarm when the battery is disconnected.
30	Inverter parallel operation without battery operation state	
		The default setting is "OFF". This setting can only be adjusted through the screen and cannot be set via the app. Place. When set to "OFF", if only the photovoltaic system is connected but no battery is connected, the inverter cannot operate in parallel. If connected to the grid, the inverter can perform parallel operation. When set to "ON", the inverter can operate in parallel when only the photovoltaic system is connected and there is no battery.

31	Equalization Voltage Point Setting	 The default setting is 58.4V, with a configurable range of [48, 60V].
32	Equalization Charging Time Setting	 The function can be set as 'OFF' or active. During the equalization stage, the controller will charge the battery as much as possible until the battery voltage rises to the battery equalization voltage. Then, it will adopt constant voltage regulation to maintain the battery voltage. The battery will remain in the equalization stage until the set battery equalization time is reached. The setting range is [5, 900] with 5 minutes for every step. The default setting is OFF and won't start equalization.
33	Equalization Delay Time Setting	 The function can be set as 'OFF' or active. During the equalization stage, if the battery equalization time expires and the battery voltage has not risen to the battery equalization voltage point, the charging controller will extend the battery equalization time until the battery voltage reaches the battery equalization voltage. When the battery equalization delay setting is completed and the battery voltage is still below the battery equalization voltage, the charging controller will stop equalization and return to the floating stage. The default setting is 120 minutes, with a configurable range of OFF or [5, 900] with 5 minutes for every step. When set to OFF, no equalization delay is performed.
34	Equalization Interval Time Setting	

		When the battery connection is detected during the float phase with the equalization mode turned on, the controller will start to enter the equalization phase when the set equalization interval (cell equalization period)is reached. The default setting is 30 days, the settable range is[1,90], and the increment of each setting is 1 day.
35	Enable Equalization Immediately	
		The default setting is OFF, and the function is not turned on. If it is set to ON, in the float charging stage when the equalization mode is turned on and the battery connection is detected. The equalization charging is activated immediately, and the controller will start to enter the equalization stage.
36	Grid-tie inverter function	
		The default setting is OFF, with the range being OFF / INT. When set to INT, the inverter supplies power to the grid through internal sampling. If this value is INT, the inverter can incorporate excess electrical energy into the grid based on different output source priorities. In PGB mode, when the battery is fully charged and the grid connection is normal, the photovoltaic system will supply as much power as possible to the grid, and the remaining energy of the photovoltaic system will be used to charge the battery. In PGB mode, when the battery is low on power, the photovoltaic system will charge the battery as much as possible, and the remaining energy of the photovoltaic system will be fed back to the grid. In GPB or PBG mode, as long as the grid is connected, the photovoltaic system will try to charge the battery as much as possible, and the remaining energy of the photovoltaic system will be fed back to the grid. In MKS mode, the inverter will not feed power to the grid. If this value is INT, when the photovoltaic system is available, the grid is prohibited from charging the battery, but when the photovoltaic system is unavailable, the grid is allowed to charge the battery.
37	Max Grid Tie Power	
		Setting the output power value to grid. The default setting is12.0kW. The setting range is [0, 12.0]kW. Every setting step is 0.5kW.

		When the setting item GTI is 'MET', the feed data uploaded by the electricity meter will be used as the reference.
38	Battery dual output low voltage shutdown point	
		When enabled, the secondary output of the inverter is enabled by default. In battery mode, when the battery voltage drops below the set point, the secondary output is turned off when the battery voltage rises above the set value +2V per battery cell, the secondary output is turned on The default setting is 48V, with a configurable range of [44, 60]V.
39	EPS output duration	
		When enabled, the secondary output of the inverter is enabled by default. In battery mode, when the battery discharge time reaches the set point, the secondary output is turned off. Default setting is OFF, the function is not enabled. The configurable range is [5,900] in minutes. When set to FUL, the secondary output has unlimited output time.
40	EPS output battery mode cut-off SOC	
		When enabled, the secondary output of the inverter is enabled by default. In battery mode, when the battery SOC is lower than the set value, the secondary output is turned off. After the battery voltage is 5% higher than set value, the secondary output will turn on. The default setting is 20. The setting range is [5, 90] and OFF.
44	BMS Communication Function	
		The default setting is OFF, and the function is not enabled. When set to a specific BMS protocol, the inverter communicates with the lithium battery BMS through the centralized control board and obtains battery information. If the communication is abnormal after the function is enabled, alarm 56 is generated, and the inverter does not determine the running logic based on the BMS information. PYL: PYLON protocol (485 and CAN) GRO: GROWATT protocol (485 and CAN) VOL: VOLTRONIC protocol (485)

		IRF: China Tower protocol (485) PAC: PACE RTU protocol (485)
45	BMS ID	 Setting BMS ID number to communication with. The setting value is AtO or numerical value [0, 15]. Among them, A-F represents 10-15respectively. The default value is auto (AtO). When set to auto (AtO), system will automatically poll the BMS ID from small to large. When system poll for the first ID with a correct response, it locks the ID and only asks the BMS with that ID.
46	Low SOC Shutdown	 Set the inverter to shut down when the State of Charge (SOC) of the battery is low. The default setting is 20, with a configurable range of [5, 50]. When the lithium battery SOC reaches the set value in battery mode, the inverter shuts down and generates alarm 68. The alarm 68 is cleared when the SOC returns to the set value + 5%. In standby mode, the inverter can switch to battery mode only when the SOC reaches the set value + 10%. If it does not reach this threshold, alarm 69 is generated. Once the function is enabled, alarm 69 is triggered when the lithium battery SOC reaches the set value + 5%,and it is cleared when it returns to the set value + 10%. It can be set to OFF, in which case the inverter no longer performs shutdown, startup, or alarm operations based on the SOC condition. Once the function is enabled, if a communication abnormality occurs, the inverter no longer operates based on the SOC information and clears the related alarms.
47	High SOC to Battery	 Set the SOC value for the inverter to switch to battery mode. The default setting is 90, with a configurable range of [10, 100]. In PBG priority mode, when the lithium battery SOC reaches the set value in normal grid mode, the inverter switches to battery mode. Once enabled, the inverter will only switch to battery mode when the SOC is above the set point and the battery voltage is higher than the voltage point to switch back to battery mode. It can be set to OFF, in which case the inverter no longer switches between grid mode and battery mode based on the SOC condition and the setting Low SOC to Grid will take effect as 'OFF' Once the function is enabled, if a communication abnormality occurs, the inverter no longer operates based on the SOC information and clears the related alarms.

48	Low SOC to Grid	
		Set the SOC value for the inverter to switch to grid mode. The default setting is 50, with a configurable range of [10, 90].In PBG priority mode, when the lithium battery SOC reaches the set value in battery mode, the inverter switches to grid mode. Onceenabled, the inverter will switch to grid mode when the SOC is below the set point or the battery voltage is lower than the voltage point to switch back to grid mode. It can be set to OFF, in which case the inverter no longer switches between battery mode and grid mode based on the SOC condition. the setting High SOC to Battery will take effect as 'OFF'. Once the function is enabled, if a communication abnormality occurs, the inverter no longer operates based on the SOC information and clears the related alarms. When this setting is higher than the STB point, STB and STG will no longer take effect after the next activation.
61	Battery Max. Discharge Current	
		The default setting is 220A. The setting range is [10, 220A], with each step adjustment being 5A. When a numerical value is set, this value represents the limiting current. If the discharge current exceeds the limit for more than 3 seconds, an alarm 60 will be triggered. If the continuous overcurrent time reaches 5 seconds, a fault 14 will be triggered and the inverter will enter the fault mode. When set to "OFF", if the discharge current exceeds 230A within 3 seconds, an alarm 60 will be triggered. If the continuous overcurrent time reaches 5 seconds, a fault 14 will be triggered and the inverter will enter the fault mode. When the BMS is connected and the communication is successful, the maximum discharge current will be updated to the maximum discharge current uploaded by the BMS.
62	PV Parallel Mode	
		The default setting is OFF. When the value is 'OFF', PV1/2 are connected to different PV string. When the value is 'ON', PV1/2 are connected to same PV string.

5. Parallel Installation Guide (Only for SP200 model)

The inverter can be used in parallel with two different operation modes.

1. Parallel operation in single phase with up to 6 units.
2. Maximum 6 units work together to support 3-phase operation, and up to 4 units can be configured for one phase of the three-phase system. In a 3-phase system, it is required that at least 1 inverter is working properly for each phase.

Please refer to the installation instructions in Sections 3.2-3.5. Ensure there is sufficient space between each pair of inverters. Connect the cables and AC/DC circuit breakers. Select the appropriate circuit breaker model and size based on the number of
inverters.



WARNING!

- **The redundant system can operate without batteries or an electrical grid, but the AC output power will decrease.**
- **Ensure that the input/output cables of the parallel inverters of the same phase have the same materials, cross-sectional areas and lengths.**
- **If the parallel system includes batteries, all inverters must be connected to the same battery bank.**
- **It is recommended to connect all the battery interfaces of the inverters to the same cable, and then connect the batteries to this cable.**
- **Do not connect the same string of photovoltaic modules to multiple inverters, as this may cause damage to the inverters. Ensure that each inverter is connected to the photovoltaic modules separately.**

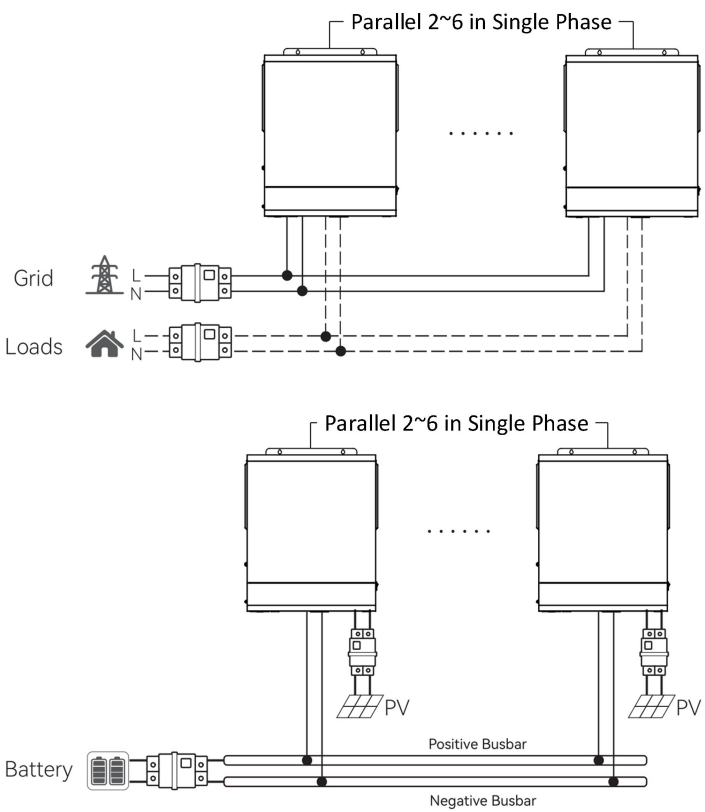


CAUTION!

- **To avoid system overload, it is best to ensure that the entire system is operating normally first, and then close the circuit breaker on the load side.**
- **There is a switching time in the power supply system. For critical equipment with high power supply requirements, power interruption may occur.**
- **When the parallel operation function is enabled, the energy-saving mode and the inverter soft-start function will not be available.**
- **In the parallel system, the leakage current specification of the AC input circuit breaker should be selected as 300 mA.**
- **If the EPS OUT terminal of the inverter is used during parallel operation, they will be connected independently of MAIN OUT, but with the same wiring method, providing power to different loads respectively.**

5.1 Parallel Cable Connection in Single Phase

2~6 inverters in parallel system connection:



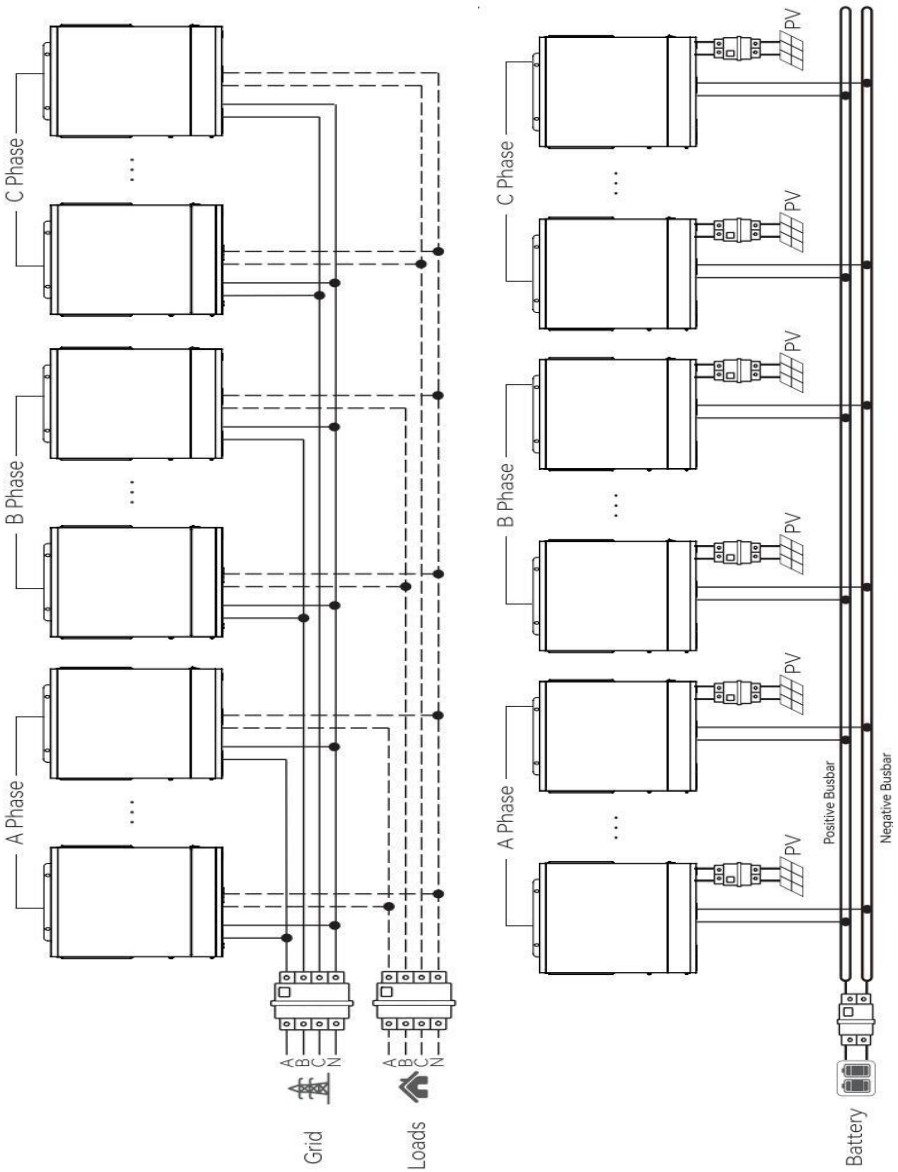
5.2 Parallel Cable Connection in Three Phase

In parallel system, at least 1 inverter that is working properly must be maintained for each phase.

Example 1: phase A-2 inverters, phase B-2 inverters, phase C-2 inverters.

Example 2: phase A-1 inverters, phase B-1 inverters, phase C-4 inverters.

3~6 inverters in parallel system connection:



5.3 Communication Cable for Parallel

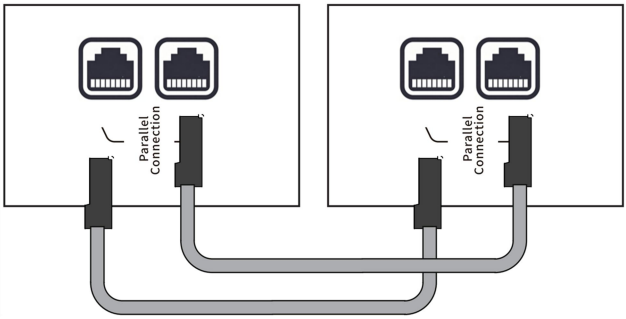
When connecting the communication network cables for parallel operation, there is no need to consider the phase of the inverter. The parallel communication ports of the inverter do not distinguish between input and output. However, please make sure that the communication cables are connected in a circular manner.

WARNING!

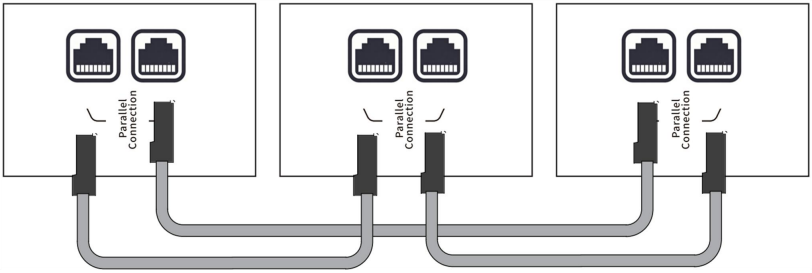
The parallel co mmunication cable needs to b e arranged separately from the power line to avoid interference with communication. It is recommended to have a spacing of at least 5cm.

When there are multiple inverters in the parallel system, it is recommended to connect an inverter communication cable between every two inverters. This way, the standard cables provided in the box can be used to complete the connection of the entire system, eliminating the need for long cables to connect the starting inverter and the tail inverter.

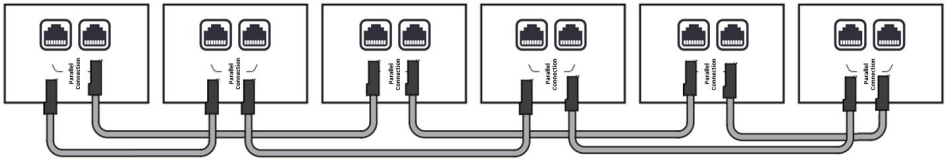
Communication connection for 2 inverters in parallel system:



Communication connection for 3 inverters in parallel system:



Communication connection for 6 inverters in parallel system:

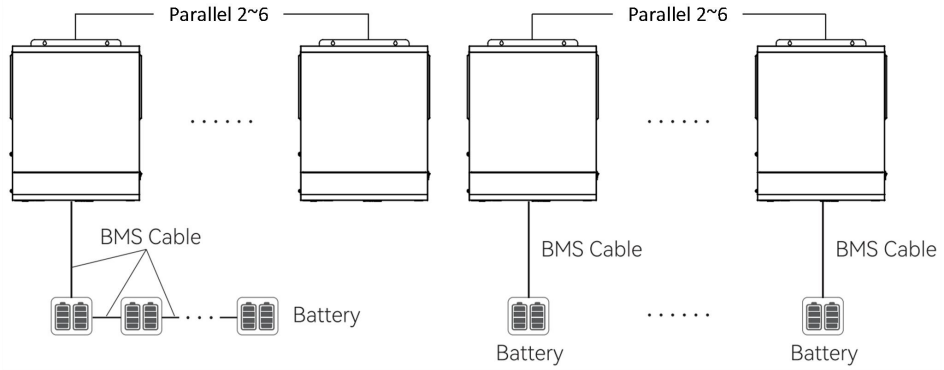


5.4 BMS Cable for Parallel

There are two ways to connect BMS and inverters:

1. All battery BMS are interconnected and then connected to only one inverter.
2. If the number of inverters is the same as the number of batteries, each BMS can be separately connected to one inverter.

Attention: All battery power cables must be connected in parallel. If the number of inverters does not match the number of batteries, connection (1) must be used.



5.5 System Setting for Parallel

To perform the system setting, please refer to section 4.3 Program 27 and 28 first.

CAUTION!

If there is a machine set to SIG in the parallel system, it will report a fault 24. If there are machines set to 3P1, 3P2, and 3P3 in the parallel system, all machines must be set to one of these threemodes, and at least one machine must be set for each mode.Otherwise, all machines set to these three modes will report a fault 24.

5.5.1 Single phase setting

Step 1: Before proceeding, check if the wiring is correct. Make sure all circuit breakers (photovoltaic, AC input, AC output, battery circuit breaker) are disconnected. Each inverter's neutral and live wires should be connected separately. Ensure that each inverter's photovoltaic input is connected to an independent photovoltaic module.

Step 2: Switch the inverter switch to off and make sure all inverters are turned off. Close the battery circuit breaker to supply power to the inverters.

Step 3: Open the inverter switch of each inverter and set item 27 on the LCD screen of each inverter to "PAR" and set item 28 to "ATO". Then turn off all units.

Step 4: Open the inverter switch of all inverters.

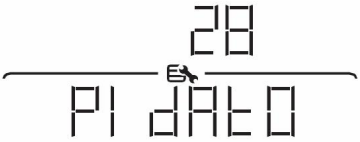
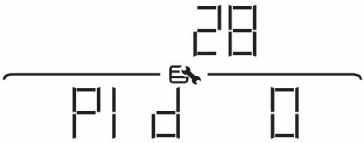
Step 5: After the inverter output is normal, close all AC circuit breakers on the AC input line. All inverters must be connected to the mains power simultaneously; otherwise, a fault will be reported.

Step 6: If there is no fault alarm, the parallel system installation is complete.

Step 7: Finally, close all AC circuit breakers on the load line to supply power to the load.

Note:

1. When setting the LCD program, the ON/OFF switch must be OFF. Otherwise, it cannot be set up.
2. The primary and slave devices are generated by competition within the system.
3. After parallel setting, when the parameters of one inverter (unrelated to parallel operation) are changed, other inverters will automatically synchronize the parameters.
4. It is suggested that the default setting for item 28 be ATO.

	The default setting for the inverter is SIG: single machine mode.
	The default setting for the inverter is PAR: single-phase parallel mode
	PID: Parallel identity code. The default setting is ATO (auto mode), system will automatically assign a parallel ID.
	Parallel identity code can be set to 0-8, the same identical ID cannot be set for two inverters.

5.5.2 Three phase setting

Step 1: Before proceeding, check if the wiring is correct. Ensure that all circuit breakers (photovoltaic, AC input, AC output, battery circuit breaker) are disconnected. Connect the zero of each inverter together, and connect the live wires of the same phase together. Make sure that each inverter's photovoltaic input is connected to an independent photovoltaic module.

Step 2: Switch the inverter switch to off, and ensure that all inverters have been turned off. Close the battery circuit breaker to supply power to the inverters.

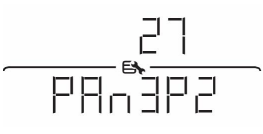
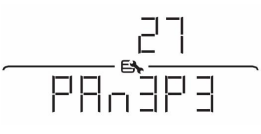
Step 3: Open the inverter switch of each inverter, and set the 27th item on the LCD screen of each inverter to "3P1", "3P2", "3P3", set the 28th item to "ATO", then turn off all units.

Step 4: Open the inverter switch of all inverters.

Step 5: After the inverter output is normal, close all AC circuit breakers on the AC input line, and set item 4 to UPS mode. If the screen shows that the grid cannot be connected to the system, then adjust the AC phase sequence of the system input. After the grid is properly connected, you can set the APP or UPS mode according to actual needs.

Step 6: If there is no fault alarm, the three-phase parallel system installation is completed.

Step 7: Finally, close all AC circuit breakers on the load line to supply power to the load.

First-phase LCD is shown	Second-phase LCD is shown	Third-phase LCD is shown
		

5.6 Precautions for Settings When Using in Parallel

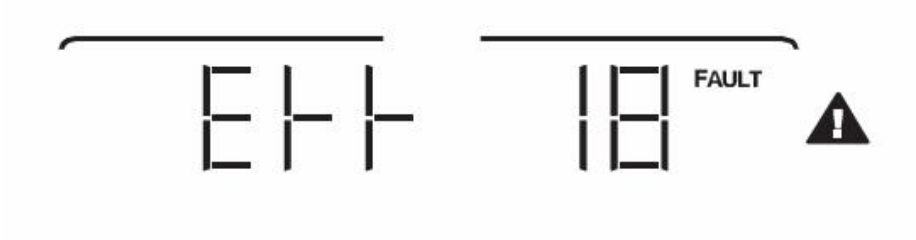
1. Program 28 (PID): Settings can only be made in standby mode and take effect immediately. If settings are needed, the power switches of all inverters should be turned off.

2. Program 01 (OPU): If the inverters are in parallel mode, Program 01 can only be set to standby mode and the settings will take effect immediately. If settings are required, the power switches of all inverters should be turned off.

3. Program 02 (OPF): If the inverters are in parallel mode, Program 02 can only be set to standby mode and the settings will take effect immediately. If settings are needed, the power switches of all inverters should be turned off.

4. Program 27 (MOD): If the inverters are in parallel mode, Program 27 can only be set to standby mode and the settings will take effect immediately. If settings are required, the power switches of all inverters should be turned off.

6. Fault Reference Code



Fault display:

Function description: If alarm occurs, Fault indicator flashes and buzzer sounds every one second for 1 minute, then stop. If fault occurs, the fault indicator is always on, the buzzer sounds 10 seconds then stops. System will try restart automatically. If the machine does not work after six times' restart, the machine and LCD display will always in the fault status. You need to completely power off (off the screen) or wait for 30 minutes to restart the machine. The fault LCD display is shown in the figure above. In fault mode fault icon is bright, in alarm state alarm icon is flashing, and contact the manufacturer to troubleshoot the abnormal situation according to the fault information. The parallel fault is applicable to the SP200 series.

Fault: The inverter has entered the fault mode. The LED fault indicator light remains constantly on, and the LCD displays the fault code.

Fault code sheet

Fault code	Meaning	Relevant action	Trigger conditions	Resume conditions
1	Bus boost fail	Turn fault mode	Grid soft start process starts but bus voltage does not reach set value	Restore after reaching the set voltage for 15 seconds
2	Bus Over Voltage	Turn fault mode	Bus voltage is higher than set value	Restore after reaching the set voltage for 15 seconds
3	Bus Below Voltage	Turn fault mode	Bus voltage is lower than set value	Restore after 15 seconds
4	Battery Over Current	Turn fault mode	Battery current is higher than set value	Cannot restore
5	System Over Temperature	Turn fault mode	Temperature is higher than set value or fan is not connected	Restore after temperature lower than set value and fan connected for 15 minutes
6	Battery Over Voltage	Turn fault mode	Battery voltage is higher than set value	Restore after reaching the set voltage for 15 seconds
7	Bus Soft Start Fault	Turn fault mode	Battery soft start process starts but the bus voltage has	Restore after reaching the set voltage for 15 seconds

			not reached set value	
8	Bus Short Circuit	Turn fault mode	Bus voltage is lower than set value	Cannot restore
9	Invert Soft Start Fault	Turn fault mode	Inverter soft start process starts but the inverter voltage has not reached set value	Restore after reaching the set voltage for 15 seconds
11	Invert Under Voltage	Turn fault mode	The inverter voltage is lower than the set value in battery mode	Restore after reaching the set voltage for 15 seconds
12	Invert Short Circuit	Turn fault mode	Inverter voltage is less than the set value and current is higher than the set value	Restore after reaching the set value for 15 seconds
13	Inverter negative power	Turn fault mode	The inverter power is negative and exceeds the set value for a period of time	Restore after reaching the set value for 15 seconds
14	Over Load	Turn fault mode	The load current is higher than the set value	Restore after reaching the set value for 15 seconds
15	Model identification fault	Turn fault mode	The system has detected a hardware mismatch.	Cannot restore
17	Programming	Turn fault mode	Inverter updating or OTA	Restore after updating
18	Panel Reverse	Turn fault mode	PV reverse connection	Restore after connecting correctly for 15 seconds
19	Parallel Same ID	Turn fault mode	Same parallel ID in system	Restore when there is no identical ID.
20	Parallel Communication Fault	Turn fault mode	When communication abnormalities occur, the number of parallel devices decrease to 1	Restore after re-establishing parallel mode or adjusting to single machine mode
21	Parallel Battery Differ	Turn fault mode	In parallel mode, the battery voltage difference between different machines is too large	Restore after the battery voltage of each inverter under parallel operation is consistent
22	Parallel Grid Voltage Differ	Turn fault mode	In parallel mode, the input voltage difference between different machines is too large	Restore after the grid voltage of each inverter under parallel operation is consistent
23	Parallel Grid Frequency Differ	Turn fault mode	In parallel mode, the input frequency difference between different machines is too large	Restore after the grid frequency of each inverter under parallel operation is consistent

24	Parallel Configuration Differ	Turn fault mode	In three-phase parallel mode, different machine parallel mode settings may have phase loss, or both three-phase and single-phase parallel modes may exist, or there may be single machine mode.	Restore after set to single machine operation and disconnect parallel communication, or parallel operation condition recover.
25	Parallel Sync Loss	Turn fault mode	In parallel mode, the output voltage detection loses synchronization.	Cannot restore in parallel mode or restore after change to single mode.
26	BMS Fault	Turn fault mode	Error code in BMS message.	Restore after BMS fault resolved
27	MCU Fault	Turn fault mode	MCU anomaly	Cannot restore
28	Host heartbeat loss	Turn fault mode	Unable to receive heartbeat signal from the host inverter	Restart after the heartbeat signal returns to normal
29	Inverter load abnormal	Turn fault mode	Abnormal inverter Toad leads to abnormal voltage	Restore after voltage returning normal for 15 seconds
30	Photovoltaic overvoltage	Turn fault mode	Photovoltaic voltage exceeds the maximum supported voltage	Recovery after voltage returns to below the maximum supported voltage
31	Phase synchronization fault	Turn fault mode	Excessive phase difference between the client inverter and the host inverter after phase synchronization	Recovery after phase synchronization
32	Failures of the parallel version	Turn fault mode	Software versions in the parallel system do not match	Recover by replacing with inverters of the same software version

Notes:

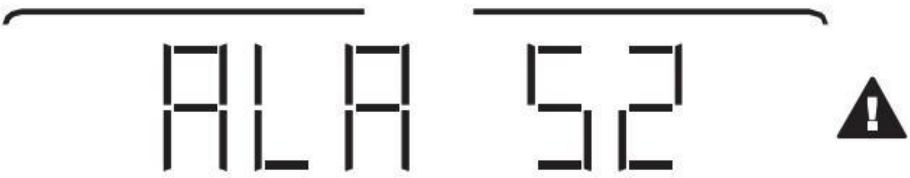
Standby mode: No output but screen is on.

Battery mode: Battery is powering the load.

Grid mode: Only grid is powering the load.

7. Alarm Reference Code

Alarm: the inverter does not enter the fault mode, LED red light flashing, LCD displays the Alarm code.



Alarm code sheet

Alarm code	Meaning	Relevant action	Trigger conditions	Resume conditions
50	Battery Open	Alarm	Battery disconnected for no more than 10 minutes	Restore after battery connected and charging for 2 minutes
51	Battery Under Voltage	Alarm, battery low voltage shutdown or cannot power on	Battery voltage is lower than BAU set value	Restore after the battery voltage exceeding the BAU set value by 2V
52	Battery Below Voltage	Alarm	Battery voltage is lower than BAL set value	Restore after the battery voltage exceeding the BAL set value by 2V
53	Battery Charge Short Circuit	Alarm, battery does not charge	Battery voltage is less than 24V and the charging current exists.	Restore after the short circuit is eliminated.
56	BMS Loss	Alarm	Communication failure after BMS communication function is enabled	Restore after communication function disabled or communication success
58	Fan Lock	Alarm, fan operation in full speed	No fan speed signal detected	Restore after fan speed signal detected
59	EEPROM Error	Alarm	EEPROM read/write exception	Can not restore
60	Over Load	Alarm	The mains current/battery discharge current/ load power is higher than the rated value.	Restore after the mains current/battery discharge current/load power is less than the rated value.

62	PV Energy Weak	Alarm, Turn off the PV output to the load, but keep the PV charging the battery	In only PV mode, PV power is less than load demand.	Restore after 10 minutes
64	Parallel Configuration Differ	Alarm, turn to standby mode	In standby mode, there is an incompatible mode setting while parallel operation	Restore after setting the parallel operation mode correctly
67	Parallel grid phase error	Alarm, Unable to connect to the grid	When in non-grid-connected mode, if there is a persistent abnormality in grid phase locking, or the grid voltage error exceeds 20V, or the grid frequency difference exceeds 0.5Hz	Restore after all triggering conditions are eliminated
68	Battery Under SOC	Alarm, turn to standby mode	BMS reports SOC lower than BSU set value	Restore after meeting one of the following three conditions: 1. Disable low SOC shutdown function 2. Disable BMS communication function 3. SOC is higher than the set value by 5%
69	Battery Below SOC	Alarm, if it is in standby mode, it will remain in standby mode.	Lithium battery SOC is lower than set value+5% (grid mode or battery mode), lower than set value+10% (standby mode)	Restore after meeting one of the following three conditions: 1. Disable low SOC shutdown function 2. Disable BMS communication function 3. SOC is higher than the set value by 10%
70	Parallel battery under-voltage	Alarm, Switch to standby mode	In a parallel battery system, some units shut down due to low battery voltage or low SOC (State of Charge)	Recover after all triggering conditions are removed
72	Battery Can Not Startup	Alarm	During standby, battery voltage is lower than the allowed startup voltage	Restore after the battery voltage is higher than the allowed startup voltage

77	Unstable Grid Power	Alarm	Lost of grid power three times within 5 minutes	Restore after 5 mins
78	Meter Loss	Alarm	When the grid power is connected and the grid connected inverter function is set to Meter, the meter communication is disconnected	Restore after grid is disconnected, or detection device is not set to Meter, or meter communication restore

Notes: Standby mode: No output but screen is on.

Battery mode: Battery is powering the load.

Grid mode: Only grid is powering the load.

8. Battery Equalization

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

Note:*Don't activate this mode when using lithium batteries.

How to Apply Equalization Function

You can enable battery equalization function in monitoring LCD setting Program 32 by setting time, or you can choose immediate equalization on Program 35. Then, you may apply this function in device by either one of following methods:

1.Set equalization voltage point on Program 31.

2.Set equalization charging time on Program 32.

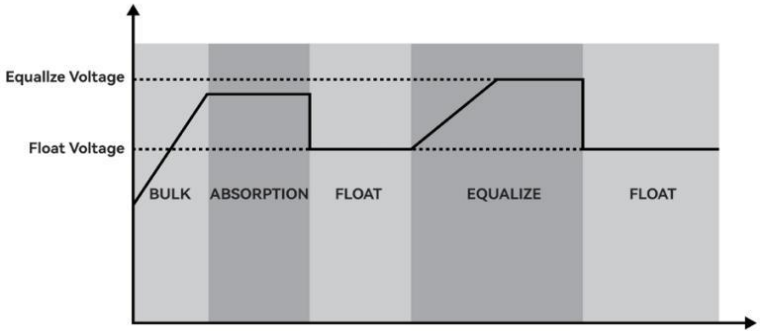
3.Set equalization delay time on Program 33.

4.Set equalization interval time on Program 34.

5.Set immediate equalization mode activation on Program 35.

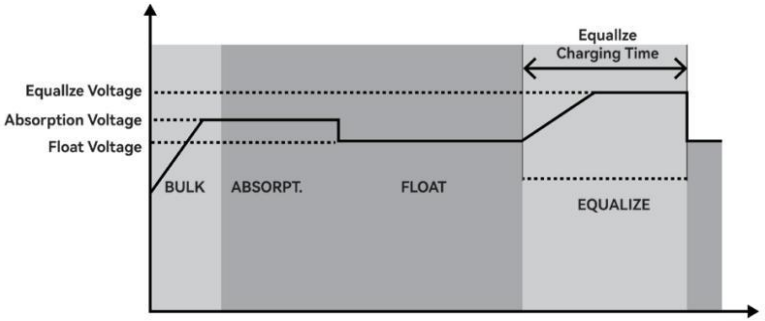
When to Equalize

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.

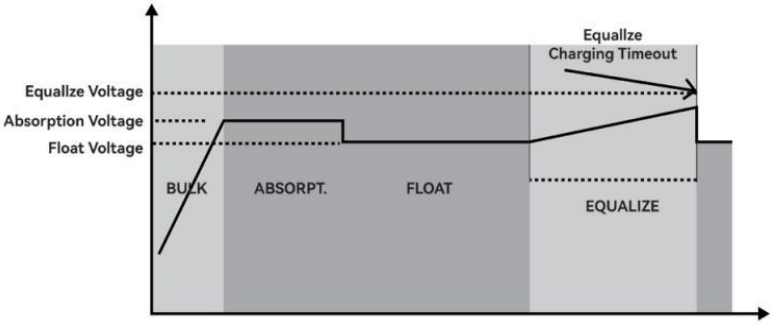


Equalize charging time and timeout

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalization time is arrived.



However, in Equalize stage, when battery equalization time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalization time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalization timeout setting is over, the charge controller will stop equalization and return to float stage.



9. Specifications

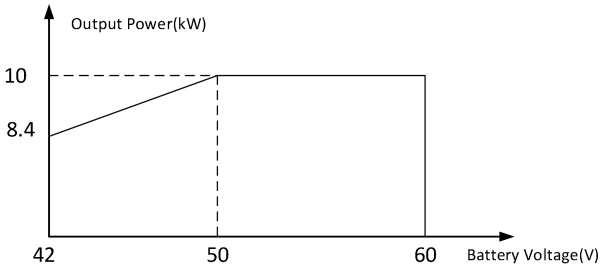
Model	SP100-12000-48	SP200-12000-48
AC Input		
Rated Input Voltage (VAC)	208 / 220 / 230 / 240	
Voltage Range (VAC)	90~280(APP/GEN mode); 170~280 (UPS mode)	
Low loss voltage(VAC)	154 (default, 90 - 154 can be set, APP/GEM mode), 185 (default, 170 - 200 can be set, UPS mode)	
Low loss recover voltage(VAC)	Low loss voltage + 9V	
High loss voltage(VAC)	264 (default, 264 - 280 can be set, APP/GEM mode), 264 (default, UPS mode)	
High loss recover voltage(VAC)	High loss voltage - 9V	
Frequency (Hz)	50 / 60 (Auto Adaptive)	
Frequency Range(Hz)	40-70	
Rated Input Current (A)	52.2	
Max. Input Current (A)	70(by pass + charging current)	
AC Output		
Rated Capacity (kW)	12(In the parallel operation mode, the rated output power will be reduced to 95%.)	
Surge Power (kVA)	24	
Voltage (VAC)	220 / 230 / 240	
Power Factor (PF)	1	
Rated Output Current (A)	52.2	
Frequency	50/60Hz±0.1%	
Switch Time (ms)	10(UPS/APP mode),20(GEM mode)	
Wave Form	Pure Sine Wave	
Overload Capacity (Battery Mode)	1min 102%~110% load; 10s > 110% load	
Max. Efficiency (Battery Mode)	94% 48VDC	
THDU	＜5% @ Rated Voltage	
Parallel Quantity	NA	6
Charger (PV / AC)		
Solar Charger Type	MPPT	
Max PV Input Curren	27A+27A	

Max PV Input Power	15000W	
MPPT Range Operating Voltage (VDC)	60-450	
Start-up Voltage(VDC)	80	
Max PV Open Circuit Voltage (VDC)	500	
Max PV Charge Current (A)	160	
Max AC Charge Current (A)	160	
Max. Charge Current (PV + AC) (A)	160	
Battery		
Rated Voltage (VDC)	48	
Voltage Range(VDC)	40-60	
Constant Voltage(VDC)	56.4	
Floating Charge Voltage (VDC)	54	
Overcharge Protection (VDC)	61	
Battery Type	Lithium and Lead-acid	
Interface		
HMI	LCD	
Interface	RS232/RS485/CAN	RS232/RS485/CAN /Parallel Interface
Monitoring	Wi-Fi (external)	
General Data		
Certification	CE	
Ingress Protection	IP21	
Operating Temperature	-10 °C - 60 °C	
Relative Humidity	5% ~ 95% (Non-condensing)	
Storage Temperature	-15 °C - 60 °C	
type of cooling	Air cooling	
Net Weight (kg)	14.3	14.6
Dimensions (H*W*D)	516*422*134mm	
Max. Operating Altitude	4000m (Derating above 2000m, For every 100 meters increase in altitude, the power drops by 1%)	

Maximum load output power

Only battery	10000W @50V
PV + BAT	12000W
By pass	70A

Battery Voltage Derating Curve



10. Trouble Shooting

The inverter underwent a series of rigorous tests before leaving the factory, ensuring its reliable operation. If your inverter experiences the aforementioned faults or other fault indications, and the problem persists even after a restart, please contact your local dealer or service center, or directly report the issue to our company through the APP for handling. Please prepare the following information:

1. Inverter serial number

2. Description of the problem (including the fault code displayed on the LCD and the status of the indicator lights (Screenshots from the APP and fault information), or specific fault videos and pictures) as detailed as possible

3. Basic system component information (such as the battery, photovoltaic panel, load usage and specifications)

4. Your contact information

In order to help you better understand the fault information of the inverter, we have listed the common fault codes, descriptions and solutions when the inverter is not working properly.

Problem	Fault Event	Trigger conditions	What to do
LCD screen display fault code 2	Bus voltage high	1. Check whether the total rated voltage of PV string exceeds the Max. PV open circuit voltage of inverter.	If it exceeds, reduce the PV module number.
		2. In case of parallel operation, check whether the output voltage settings of the two inverters are consistent.	If inconsistent, reset.
LCD screen display fault code 3	Bus voltage low	1. Disconnect the load from inverter and restart again to observe if it recovers.	If it recovers, it indicates that there are too many impact loads and part of them should be removed from inverter.
LCD screen display fault code 5	Over temperature	1. After the temperature is low, start the inverter output and check whether the fan rotates.	If the fan is not rotating, there may be a fault with the fan or its wiring.
		2. Check if the dust filter is too dirty.	If there is excessive dust accumulation, it needs to be cleaned.
		3. Check if there is a clearance space of more than 30cm around the machine.	If there is insufficient space, please refer to the user manual for reinstalling.
		4. Check if the ambient temperature is too high (above 45°C).	For example, avoid direct sunlight.
		5. Check if the air duct paper is loose.	Install the plastic nail provided by the manufacturer at the loose position

LCD screen display fault code 26	BMS fault	1. Check the BMS fault information through the battery background controller.	Handle battery problems according to fault information.
LCD screen display fault code 56	BMS loss	1. Check whether the communication cable is plugged into the correct port of the lithium battery.	The lithium battery may have multiple communication interfaces, which need to be plugged into the correct position.
		2. Check whether the battery dial switch setting is consistent with the protocol used.	The battery supports a variety of BMS protocols, and different protocols can be selected through the dial switch on the battery.
		3. Confirm whether the definition of battery port pin of BMS communication cable is consistent with that of inverter.	If not, replace the correct cable.
		4. Confirm whether the BMS protocol matches the inverter.	If it is not within the matching range of inverter, the Protocol shall be replaced.
		5. Replace the battery or inverter for test.	If it is normal after replacement, the communication hardware fails.
LCD screen display fault code 58	Fan abnormal alarm	1. Confirm if the fan rotation is abnormal and if there is any foreign object causing obstruction.	Remove any foreign objects.
		2. Check if the fan is not connected or if the wiring is loose.	Ensure proper connection of the fan.
		3. Replace the fan to check if the fan is damaged.	Confirm damage and replace the fan.
LCD screen display fault code 62	PV Energy Weak	1. Check if PV power is normal.	If abnormal, repair PV.
		2. Check if PV power is lower than load demand.	Remove part of the load.

Note: To restart the inverter, all power sources must be disconnected. After the LCD screen goes dark, start it using the battery only.

11 Maintenance and Repair

11.1 System maintenance

To ensure the long-term stable operation of the energy storage system, it is recommended to conduct regular inspections at least twice a year according to the following items (during the cleaning and maintenance of the inverter, the power supply must be disconnected to ensure personal safety):

1. Ensure that the airflow around the inverter is not blocked and clean the dirt or debris on the radiator.

2. Check if all exposed wires have been damaged in insulation due to sun exposure, friction with other objects, dry rot, insect or rodent damage, etc. If necessary, repair or replace the wires.

3. Verify that the indications and displays are consistent with the equipment operation. Pay attention to any faults or error displays and take corrective measures when necessary.

4. Inspect all connection terminals, check for corrosion, insulation damage, high temperature or signs of burning or discoloration, and tighten the terminal screws.

5. Check for dirt, nesting insects and corrosion. Clean as required.

6. If the lightning arrester on the photovoltaic panel has failed, replace the failed arrester in time to prevent damage to the inverter or other user equipment from lightning strikes.

7. When using the equipment in areas with poor air quality, the dust filter may be blocked by particles. Please regularly disassemble and clean the dust filter to avoid affecting the airflow speed inside the inverter, triggering device over-temperature protection, and affecting the power supply usage and the lifespan of the inverter.

The disassembly steps of the dust-proof net are as follows:

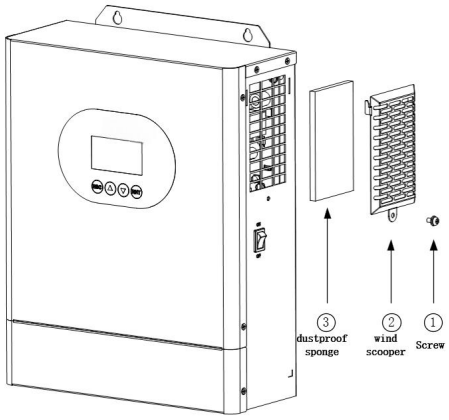
1) Remove the screws at the bottom of the air intake cover;

2) Remove the air intake cover;

3) Take out the dust filter inside the air intake cover and clean it;

4) Put the cleaned dust filter back into the air intake cover and secure it to the corresponding position of the inverter;

5) Tighten the screws at the bottom of the air intake cover.



11.2 Responsibility

The following situations will result in damages for which our company will not be held responsible:

1. Damages caused by improper use or use in an inappropriate place.

2. Damage when the open-circuit voltage of the photovoltaic module exceeds the maximum allowable voltage.

3. Damage caused by the working environment temperature exceeding the limit working temperature range.

4. Damage caused by disassemble the inverter without permission.

5. Damage caused by force majeure： damage occurring during the transportation or loading/unloading of the inverter.