Inverter User Manual

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1.Information on this Manual

1.1 Validity

This manual is valid for the following devices:

– Solar Inverter

1.2 Scope

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

1.3 Target Group

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

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

1.4 Label Description

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

Labels on Inverter

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

Labels in the documentation

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

1.5 Safety Instructions



WARNING!

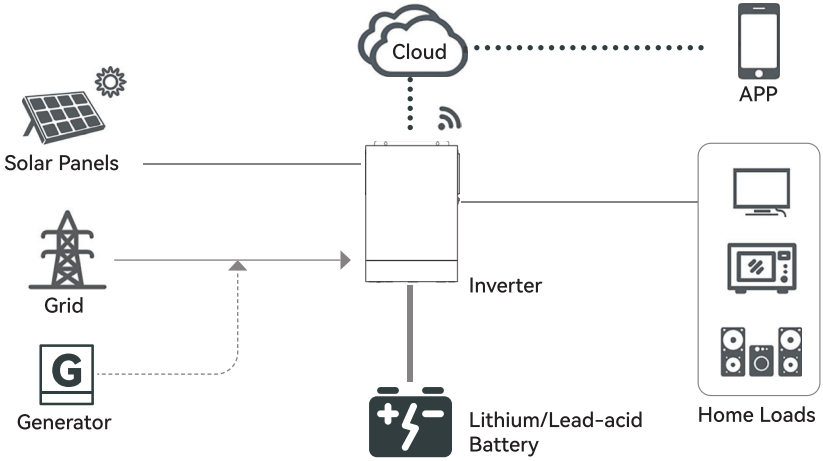
This chapter contains important safety and operating instructions.

Read and keep this manual for future reference.

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

10. For optimum operation of this inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter.
11. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
12. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
13. GROUNDING INSTRUCTIONS -This inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
14. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
15. Make sure the inverter is completely assembled, before the operation.

2. Introduction



Solar Energy Storage System

This is a multifunctional solar inverter, integrated with a MPPT solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is

perfect for off grid backup power and self-consumption applications.
This inverter can work with or without batteries.

The whole system also need other devices to achieve complete running such as PV modules, generator, or utility grid. Please consult with your system integrator for other possible system architectures depending on your requirements.

The WiFi module is a plug-and-play monitoring device to be installed on the inverter or a built-in device. With this device, users can monitor the status of the PV system from the mobile phone or from the website anytime anywhere.

3. Installation

3.1 Unpacking and Inspection

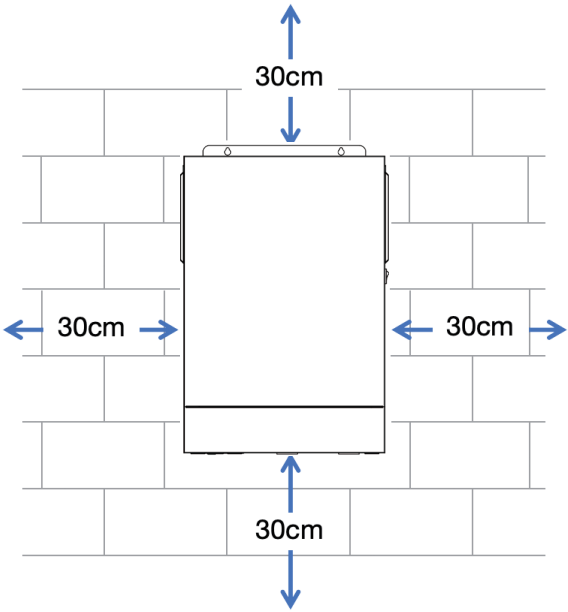
3.1.1 Open-box Inspection

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

3.1.2 Installation Tools

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

3.2 Mounting Unit



Consider the following points before selecting where to install:

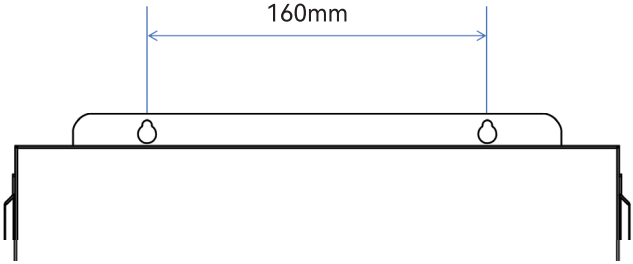
- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between -10°C and 60°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the diagram above to guarantee sufficient heat dissipation and to have enough space for removing wires.

WARNING!

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

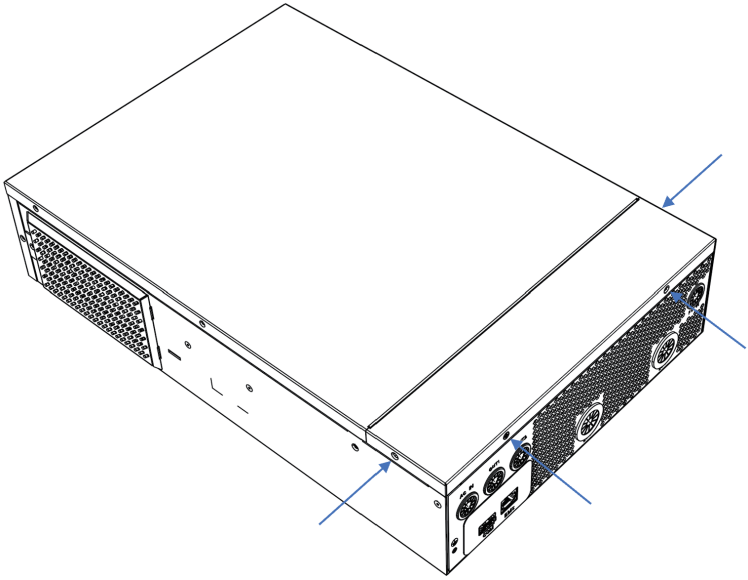
Follow the installation steps:

1. Use ϕ8 drilling bit drill holes on the mounting surface. The distance between 2 holes is 160mm. Then insert the expansion screw(M6). M6 expansion screw is suggested.



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

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



3.3 External Protective Grounding Connection

DANGER

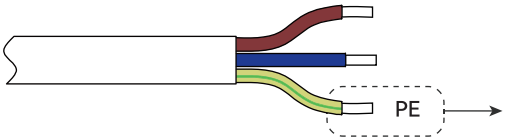
Ensure a reliable connection of the grounding wire to prevent electrical shock hazards.

WARNING

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

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

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

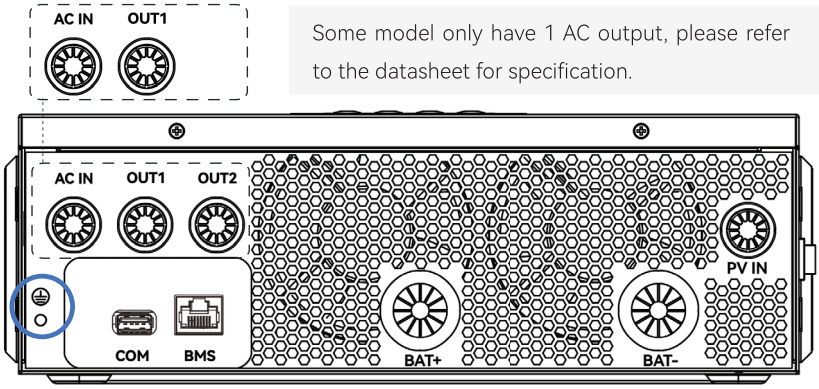


Use PE cable of AC IN cable as grounding cable.

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



3.Connect the ground cable with M4 screw.



Some model only have 1 AC output, please refer to the datasheet for specification.

3.4 AC Input / Output Connection



CAUTION!

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



CAUTION!

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



CAUTION!

Be sure to connect AC cables with correct polarity. If L and N wires are connected reversely, it may cause damage to the inverter.
The N line of input and output must not be connected together, as this may cause damage to the inverter.



WARNING!

All wiring must be performed by a qualified personnel.



WARNING!

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

Suggestion for AC input wires

Gauge	Cable (mm^2)
14 AWG	2.075



WARNING!

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

Suggestion for AC output wires

Gauge	Cable (mm^2)
14 AWG	2.075

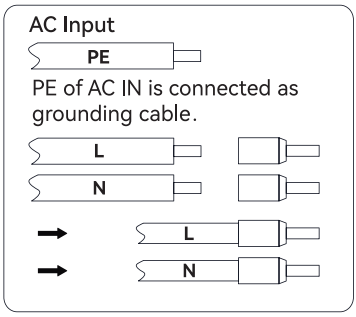
WARNING!

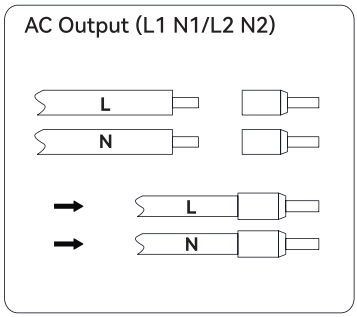
Make sure AC power is disconnected before attempting to connect AC cable to the unit.

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

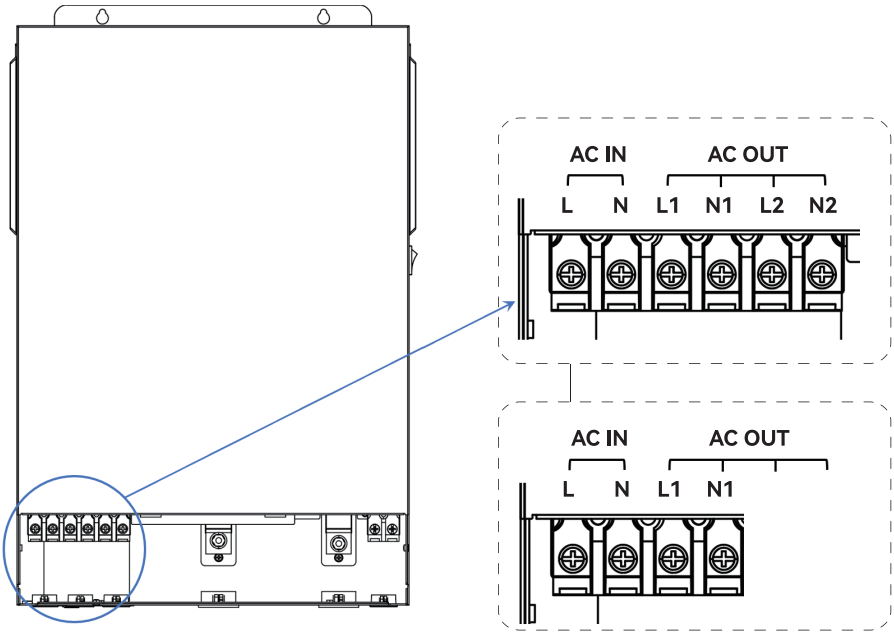
Please follow below steps to implement AC input / output connection:

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





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



Some model only have 1 AC output, please refer to the datasheet for specification.

4. Make sure the cables are securely connected.

CAUTION!

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

3.5 PV Connection



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



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



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



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



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



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

Gauge	Cable (mm^2)
14 AWG	2.075

PV Module Selection:

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

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

inverter.

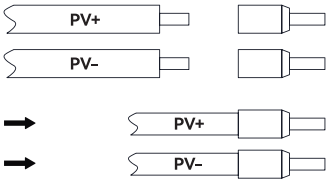
2. Open circuit Voltage (Voc) of PV modules should be higher than start-up voltage.

Max. PV Array Open Circuit Voltage	500Vdc
Start-up Voltage	60Vdc
PV Array MPPT Voltage Range	40Vdc~450Vdc

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

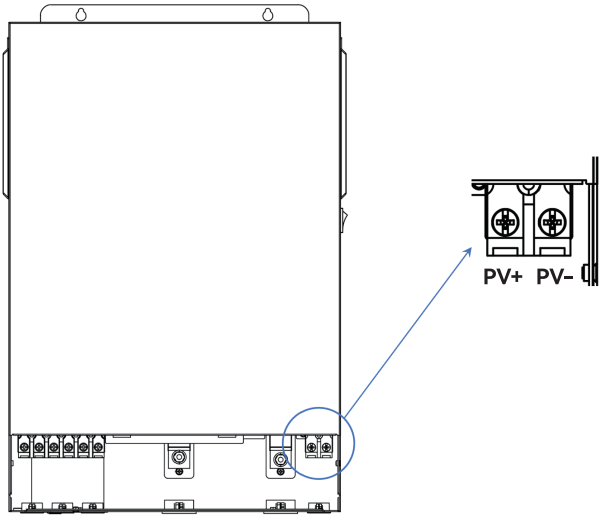
Please follow below steps to implement PV module connection:

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



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

+ → PV+ (red)
- → PV- (black)



5. Make sure the cables are securely connected.

3.6 Battery Connection

3.6.1 Lead-acid Battery Connection

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



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



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



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



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

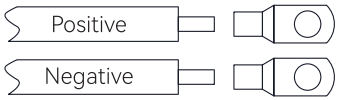
Recommended battery cable and terminal size:

Gauge	Cable (mm^2)
2 AWG	25

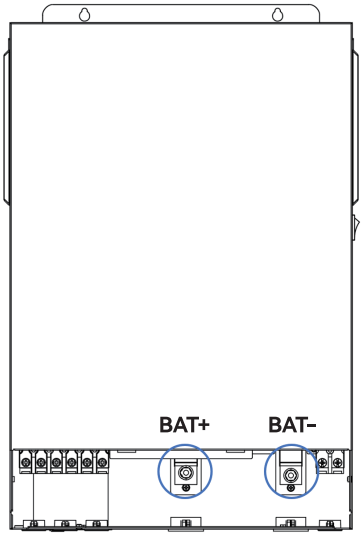
Note: For lead acid battery, the recommended charge current is 0.3C (C≤battery capacity)

Please follow below steps to implement battery connection:

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



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



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

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

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

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

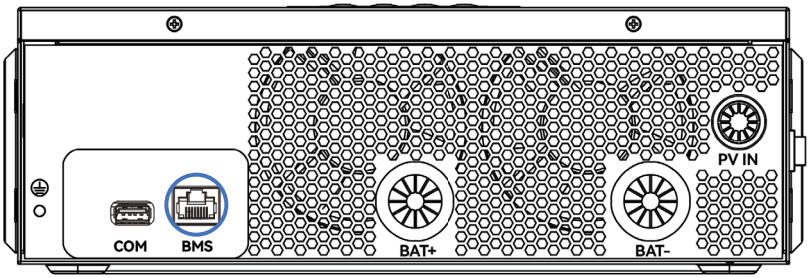
CAUTION!
Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

3.6.2 Lithium Battery Connection

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

Please follow below steps to implement lithium battery connection:

1. Follow section 3.6.1 to implement the power cable connection.
2. Connect RJ45 terminal of battery communication cable to BMS communication port of inverter. The communication protocol should be RS485 or CAN.



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

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

Lithium battery communication and setting:

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

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

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

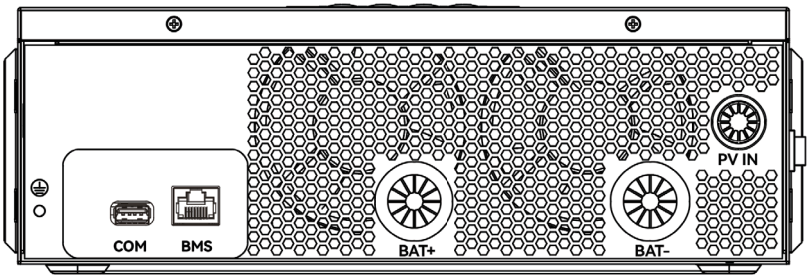
3.7 Final Assembly

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

3.8 Smart Communication Stick Connection(Optional)

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

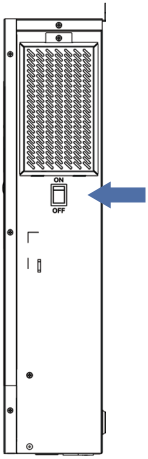
Some models support built-in WIFI monitoring function, please check the solar APP quick configuration guide.



4. Operation

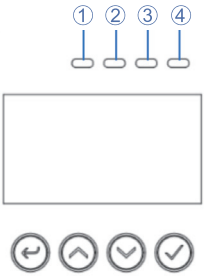
4.1 Power ON/OFF

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

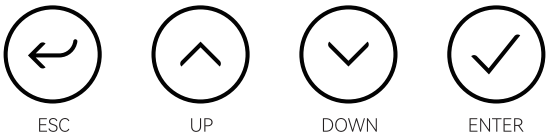


4.2 Operation and Display Panel

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



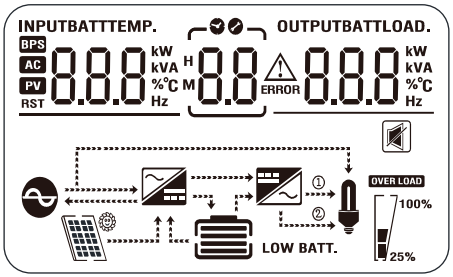
LED Indicator			Messages
① AC	Status indicator (Green)	Solid On	The mains power is normal and enters the mains power operation.
		Flashing	The mains power is normal, but it has not entered mains power operation.
		Off	The mains power is abnormal.
② Inverter	Invert indicator (Yellow)	Solid On	Output is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



Function Buttons

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

4.2.1 LCD Display Icons



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

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%	< 22.292V	
	22.292V ~ 23.37V	
	23.37V ~ 24.448V	
	> 24.448V	
50%> Load > 20%	< 23.59V	
	23.59V ~ 24.668V	
	24.668V ~ 25.746V	
	> 25.746V	
Load < 20%	< 24.24V	
	24.24V ~ 25.318V	
	25.318V ~ 26.395V	
	> 26.395V	

4.2.2 LCD Setting

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

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

03	Output source priority	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.	
04	Output mode	APP: Appliance (default)	
		Applied to household appliances	
		UPS	
		Applied to computer and other devices. Typical switching time is 10ms.	
		GEN	
		Applied to connect generator by using grid input port	
05	Charger source priority	PNG: PV and Grid (default)	
		OPV: Only PV	
		GRD: Grid first	
		PV: PV first	
		There are four options for charging priority. The default is PNG (PV and Grid). PV and Grid are charged at the same time;. The second is OPV (Only PV). Only PV charge. The third is GRD (Grid). Grid charging takes priority. The fourth is PV. PV gives priority to charging.	
06	Grid charging current		
		40A(default) Setting range is [2, 100A]	

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

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 .	
15	Battery return to mains voltage point		
		When the battery is set to the CUS (Customer Setting Type) mode. The adjustable range is [22, 26V].	
		When the battery is set to the AGM (Lead Acid Battery Type) or FLD (Flooded Battery Type) mode. The default setting is 23V, and the adjustable range is [22, 26V].	
		When the battery is set to the LIB (Ternary Lithium Battery Type) mode. The default is 23.8V, and the adjustable range is [20, 25V].	
		When the battery is set to the FEL (Lithium Iron Battery Type) mode. The default is 24.8V, and the adjustable range is [20, 25V].	
16	Switching back to battery mode voltage points		
		After the battery shuts down due to low voltage, it needs to reach a certain voltage level to restart in battery mode. The value can be set to FUL or batery voltage. If set to FUL, the battery will only recharge to full capacity before it can restart in battery mode. Note: BTG (Program 15) and BTB (Program 16) shall be used in combination as the criteria for judging insufficient battery energy in the absence of BMS communication. It is recommended that the BTB setting be at least 2 V higher than the BTG setting, to prevent frequent grid connection and disconnection under PBG mode.	
		When the battery is set to CUS (Customer Set Type) mode, The default setting is 26V. The adjustable range is [24, 29V].	
		When set to AGM (Absorbent Glass Mat) or FLD (Flooded) mode. The default is 26V. The adjustable range is [24, 29V].	
		When the battery is set to LIB (Ternary Lithium Battery Type) mode, The default setting is 27.2V. The adjustable range is [23, 29V].	
		When the battery is set to FEL (Lithium Iron Battery Type) mode, The default setting is 26.6V. The adjustable range is [23, 29V].	
17	Battery type	AGM (default)	
		Flooded	

17	Battery type	Ternary Lithium	
		Lithium Iron	
		User-Defined	
18	Battery low voltage point		
		It is not possible to set the battery definition mode to AGM or FLD mode. The initial default setting is 21.6V. When the battery type is set to CUS, the adjustable range for the battery voltage is [21, 27V].	
		When the battery type is set to LIB, the default setting is 23.8V. The adjustable range is [20.6, 25V]. When the battery type is set to FEL, the default setting is 24V. The adjustable range is [20.6, 25V].	
19	Battery shutdown voltage point		
		It cannot be adjusted when the battery is defined as AGM or FLD mode. The default setting is 21V. When the battery type is set to CUS, the default setting is 21V. The adjustable range for the voltage is [20, 24V].	
		When the battery type is set to LIB , the default setting is 23V, and the adjustable range is [20, 24V]. When the battery type is set to FEL , the default setting is 23.2V, and the adjustable range is [20, 24V].	
20	Constant voltage mode voltage point setting		
		When the battery is defined in AGM or FLD mode, it cannot be configured. The default setting for AGM mode is 28.2V, for FLD mode is 29V. When the battery type is CUS, it can be set within the range of [24, 29V]. It is important to note that the constant voltage set point voltage needs to be higher than the float charge set point voltage.	
		When the battery type is set to LIB, the default is 28.2V, and the adjustable range is [25, 29V]. When the battery type is set to FEL, the default is 27.6V, and the adjustable range is [25, 29V]. It is important to ensure that the constant voltage set point voltage is higher than the float charge set point voltage.	

21	Floating charge 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/FLD mode is 27V. When the battery type is CUS, it can be set within the range of [26.6, 27.8V]. If the battery type is LIB or FEL, the default setting is 27.6V. The setting range is [24, 28V]. It is important to note that the constant voltage point voltage should always be set higher than the floating charge point voltage.
22	Grid low voltage point setting	
		If output mode is APP/GEN, Grid low voltage point can be set within a range of 90V to 154V. The default setting is 154V.
		If output 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 output mode is APP/GEN, Grid high voltage point can be set within a range of 264V to 280V. The default setting is 264V.
		If output mode is UPS, Grid high voltage point is set as 264V.
24	Low power discharge time setting	
		When in battery mode and operating under a low load, unrestricted discharge for an extended period can deplete the battery, affecting its lifespan. When the inverter reaches the set low power discharge time, the low voltage shutdown point will be raised to 22V. The default low power discharge time is 8 (8 hours), adjustable range [1, 8]. In inverter mode,the low power discharge time setting,the default is 8(8 hours),the setting range is [1, 8].
		In battery mode, after the continuous discharge time exceeds 8 hours and the battery shutdown point has not been reached, the battery voltage shutdown point will be modified to 22V, and the system will alarm for 1 minute when the battery continues to discharge to 22V. Then shut down again.When the battery voltage exceeds 26.4V exceeds 30s, the battery discharge time will be reset..

25	Inverter soft start setting	 Default setting is OFF. If it set to 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. Setting Condition: It can be set in single-machine operation 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. The setting can be applied immediately in mains and standby modes, but cannot be set in battery mode.
27	Parallel operation mode	 Not Applicable for this model.
28	Battery Disconnection Alarm	 Enable/Disable battery disconnection alarm. Default setting is OFF.When set to OFF, there will be no battery disconnection, low battery voltage, or battery under voltage alarms when the battery is disconnected.
29	Battery Equalization Mode	 Enable/Disable Battery equalization. Default setting is OFF. If it is set to ON, the controller will start to enter the equalization phase when the set equalization interval (battery equalization period) is reached during the float charging stage, or the equalization is activated immediately.

30	Equalization Voltage Point Setting	
		The default setting is 29.2V, with a configurable range of [25, 31.5V].
31	Equalization Charging Time Setting	
		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 default setting is 60 minutes, with a configurable range of [5, 900], and an increment of 5 minutes for each setting.
32	Equalization Delay Time Setting	
		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 [5, 900], and an increment of 5 minutes for each setting.
33	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.
34	Enable Equalization Immediately	
		The default setting is OFF, the function is not turned on; when 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.

35	Grid-tie inverter function	 Set whether the inverter should feed power to the grid in PV priority grid mode or PBG grid mode. The default setting is OFF, and the function is not enabled. When set to ON, the inverter tracks the maximum power point, and the excess energy is fed into the mains. After the function is turned on, if a communication abnormality occurs, an alarm 56 is generated, and the inverter no longer determines the operation logic according to the BMS information.
36	Battery dual output low voltage shutdown point	 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 plus 1V per additional battery cell, the secondary output is turned on. The default setting of 24V, with a configurable range of [22, 32]V. When the set point is higher than the constant voltage charging (CV) point - 1V per cell, the recovery voltage is set to the constant voltage charging point.
37	Battery dual output duration	 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 [5,890] in minutes. When set to FUL, the secondary output has unlimited output time.
38	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/CAN) GRO: GROWATT protocol (485) VOL: VOLTRONIC protocol (485) IRO: China Tower protocol (485)

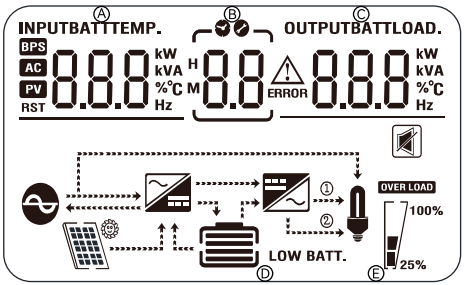
39	Low SOC Shutdown	
		Set the inverter to shut down when the State of Charge (SOC) of the battery is low. Default setting is 20, with a configurable range of [5, 50]. When the lithium battery SOC reaches the set value in battery mode, the inverter shuts down and generates alarm 68. The alarm 68 is cleared 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.
40	High SOC to Battery	
		Set the SOC value for the inverter to switch to battery mode. Default setting is 95, 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 from grid mode to battery mode 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. Note: STB (Program 40) and STG (Program 41) shall be used in combination as the criteria for judging insufficient battery energy when BMS communication is normal. It is recommended that the STB setpoint be more than 5% higher than the STG setpoint to avoid frequent grid connection and disconnection under PBG mode.

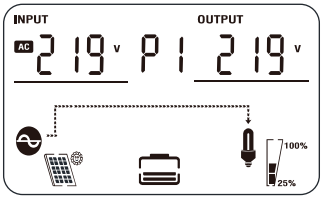
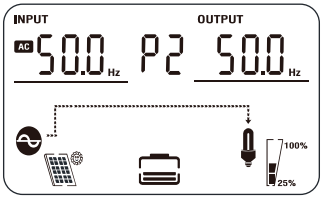
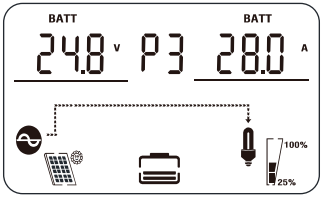
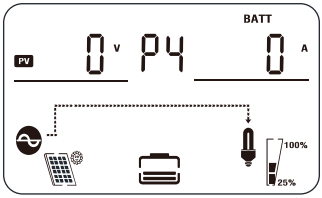
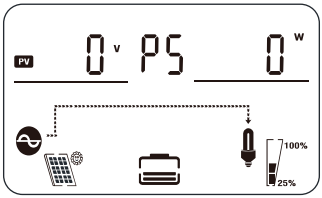
41	Low SOC to Grid	
		Set the SOC value for the inverter to switch to grid mode. The default setting is 50, with a configurable range of [10, 90]. In PBG priority mode, when the lithium battery SOC reaches the set value in battery mode, the inverter switches to grid mode. Once enabled, the inverter will 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 from battery mode to grid mode 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. When this setting is higher than the STB point, STB and STG will no longer take effect after the next activation.
42	Temperature Derating Logic Type	
		The default setting is BCF. During temperature derating, the derating sequence is as follows: first, the feed-through circuit is switched off; second, the battery charging current is reduced (by up to 100 per cent); and finally, the output power is reduced by 30 per cent. When PV < 80 V, the maximum PV output current is reduced to 15 A. When set to NOM, the PV output power, battery charging current and output power are reduced simultaneously during temperature derating.

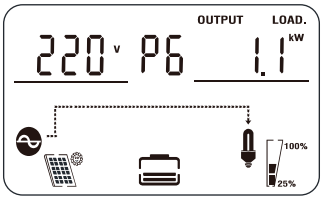
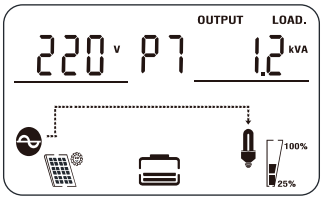
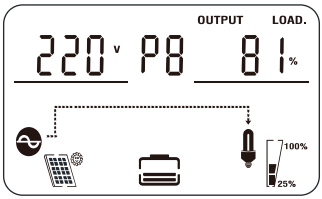
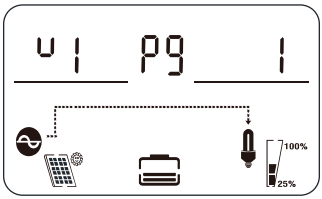
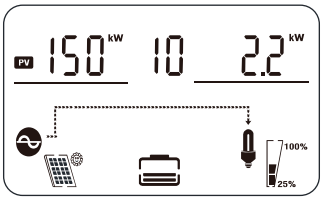
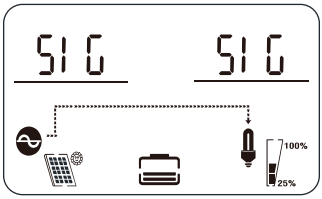
4.3 Display Information

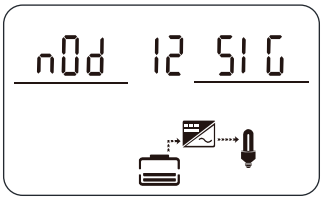
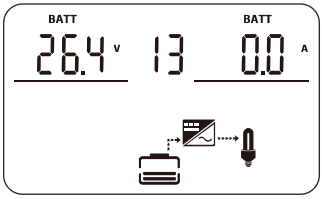
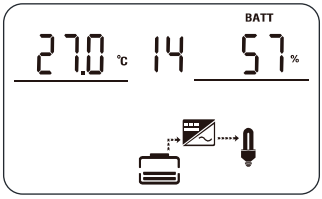
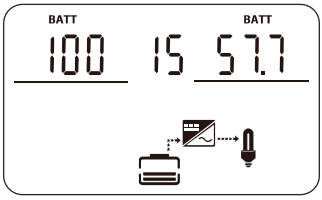
The LCD display information will be switched in turns by pressing “UP” or “DOWN” key.

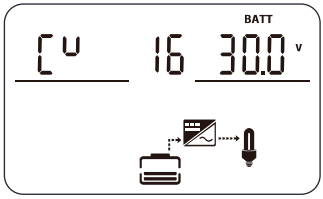
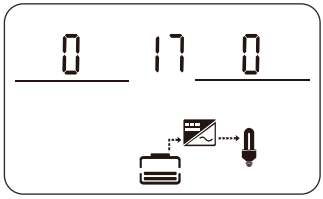
The selectable information is switched as below order: voltage, frequency, current, power, firmware version.



Information	LCD display
Ⓐ AC Input voltage Ⓑ Display page number Ⓒ Output voltage Ⓓ Battery capacity Ⓔ Load percentage	
Ⓐ AC Input frequency Ⓑ Display page number Ⓒ Output frequency Ⓓ Battery capacity Ⓔ Load percentage	
Ⓐ Battery voltage Ⓑ Display page number Ⓒ Battery current Ⓓ Battery capacity Ⓔ Load percentage	
Ⓐ PV voltage Ⓑ Display page number Ⓒ PV charging current Ⓓ Battery capacity Ⓔ Load percentage	
Ⓐ PV voltage Ⓑ Display page number Ⓒ PV power Ⓓ Battery capacity Ⓔ Load percentage	

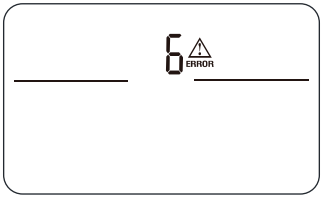
Ⓐ Output voltage Ⓑ Display page number Ⓒ Active power output Ⓓ Battery capacity Ⓔ Load percentage	
Ⓐ Output voltage Ⓑ Display page number Ⓒ Apparent power output Ⓓ Battery capacity Ⓔ Load percentage	
Ⓐ Output voltage Ⓑ Display page number Ⓒ Load percentage Ⓓ Battery capacity Ⓔ Load percentage	
Display software version	
Ⓐ Total power generation Ⓑ Display page number Ⓒ Daily power generation Ⓓ Battery capacity Ⓔ Load percentage	
Parallel operation status	

After enabling BMS, the following pages are available	
Network status of lithium battery. When the upper right display shows SIG constant, the battery pack is operating as a single group; When it shows PAR constant, the battery pack is operating in multiple groups in series and parallel; When it flashes PAR, the battery pack is establishing a state of multiple groups in series and parallel.	
Lithium battery voltage and current information; The upper left displays BMS battery voltage information; The upper right displays BMS battery current information. When BMS communication fails, both the upper left and upper right displays will flash ERR.	
Lithium battery temperature and SOC; The upper left displays BMS temperature information; The upper right displays BMS SOC information. When BMS communication fails, both the upper left and upper right displays will flash ERR.	
Lithium battery capacity; The upper left displays rated capacity; The upper right displays current capacity. When BMS communication fails, both the upper left and upper right displays will flash ERR.	

Lithium battery constant voltage point; The upper left displays the fixed letter CV; The upper right displays the BMS constant voltage charging point. When BMS communication fails, the upper right display will flash ERR.	
Lithium battery fault alarm information; The upper left displays BMS alarm information; The upper right displays BMS fault information. When BMS communication fails, both the upper left and upper right displays will flash ERR.	

5. 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.

Fault: The inverter enters fault mode, with a constant red LED light and LCD displaying a fault code.

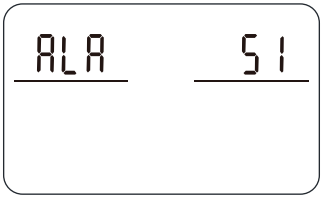
Fault code sheet

Fault code	Meaning	Relevant action	Trigger conditions	Resume conditions
1	Bus soft boost start failed	Turn fault mode	Bus voltage does not reach set value during soft start.	Cannot restore.
2	Bus voltage high	Turn fault mode	The bus voltage is higher than protection point.	Cannot restore.
3	Bus voltage low	Turn fault mode	Bus voltage is below the under voltage protection point.	Cannot restore.
4	Battery over current	Turn fault mode	Battery current exceeds set point instantly, triggering protection.	Cannot restore.
5	Over temperature	Turn fault mode	The PFC temperature exceeds the protection threshold. Fan stuck for more than 5 minutes.	Tried to restart six times, if failed, cannot restore.
6	Battery high voltage	Turn fault mode	Battery voltage is higher than set value.	Restore after voltage is lower set value.
7	Bus soft start fault	Turn fault mode	Soft start process has exceeded but the bus voltage has not reached set value.	Cannot restore.

Fault code	Meaning	Relevant action	Trigger conditions	Resume conditions
8	Bus short circuit	Turn fault mode	Inverter on or PFC on, bus voltage below threshold.	Cannot restore.
9	INV soft start fault	Turn fault mode	INV soft start for a while, it cannot reach the rated output voltage.	Cannot restore.
10	INV over voltage	Turn fault mode	In battery mode, inverter voltage exceeds set value.	Cannot restore.
11	INV under voltage	Turn fault mode	In battery mode, inverter voltage is under set value.	Cannot restore.
12	INV short circuit	Turn fault mode	Inverter voltage drops below the set value, or current is above the set value.	Tried to restart six times, if failed, cannot restore.
13	Negative power protection	Turn fault mode	Inverter power remains below the set value for a certain period of time.	Cannot restore.
14	Overload fault	Turn fault mode	Overload exceeds limit (list in specification).	Tried to restart six times, if failed, cannot restore.
15	Model fault	Turn fault mode	Cannot match any model in model number detection.	Cannot restore.
16	No boot loader	Turn fault mode	No boot loader.	Cannot restore.
17	Flash burning fault	Turn fault mode	Burning the program.	Restore after burning is completed.
26	BMS fault	Turn fault mode	Error code in BMS message.	Turn off BMS communication function or BMS fault recovery.
28	NTC fault	Turn fault mode	NTC open circuit	Cannot restore
29	Inverter over current	Turn fault mode	Instantaneous current of inverter is higher than set value.	Tried to restart six times, if failed, cannot restore.

6. 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 does not charge.	Battery voltage is below set point.	Restore after battery voltage recover.
51	Battery low voltage shutdown	Alarm, battery low voltage shutdown or cannot power on.	Battery voltage is below set point.	Restore after battery voltage recover.
52	Battery low voltage	Alarm	Battery voltage is lower than BAL set value.	Restore after battery voltage recover.
55	Battery over charge	Alarm, battery does not charge.	Battery voltage is higher than the set value.	Can restore.
56	BMS loss	Alarm, lock standby mode.	BMS communication failed (BMS function is open).	Restore after communication recover.
57	Over temperature	Alarm, battery does not charge.	The temperature of PFC or INV is above the set value.	Restore after temperature is under set value.

Alarm code	Meaning	Relevant action	Trigger conditions	Resume conditions
58	Fan error	Alarm, if one fan fails and the other fan is running at full speed.	No fan speed signal detected.	Can restore.
59	EEPROM error	Alarm	Read/Write failure on EEPROM	Cannot restore.
60	Overload	Alarm, battery does not charge.	Load exceeds 102%	Restore after load back to normal.
61	Abnormal generator waveform	Alarm, continuously operating in battery mode.	Generator waveform detection result is abnormal.	Can restore.
62	PV Energy Weak	Alarm, turn off PV output and charging.	When the battery is not connected, the bus voltage is lower than the set value.	Restore after 10mins.
68	SOC Under	Alarm, turn standby mode.	Lithium battery SOC is lower than the set value.	Restore after turning off the low SOC shutdown function, or turning off the BMS communication function, or when the SOC returns to the set value + 5%.

Alarm code	Meaning	Relevant action	Trigger conditions	Resume conditions
69	SOC Low	Alarm, if it is in standby mode, it will remain in standby mode and not power on.	Lithium battery SOC is lower than the set value + 5% (mains mode or battery mode), lower than the set value + 10% (standby mode).	Restore after turning off the low SOC shutdown function, or turning off the BMS communication function, or when the SOC returns to the set value + 10%.
70	Battery terminal source fail	Alarm, turn standby mode	Battery is not connected and the voltage of battery terminal is lower than set value.	Restore after battery is detected or detected that the battery terminal voltage exceeds the set value for one consecutive minute..

7. 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 must enable battery equalization function in monitoring LCD setting Program 29 first. Then, you may apply this function in device by either one of following methods:

  1.Set equalization mode on Program 29.

  2.Set equalization voltage point on Program 30.

  3.Set equalization charging time on Program 31.

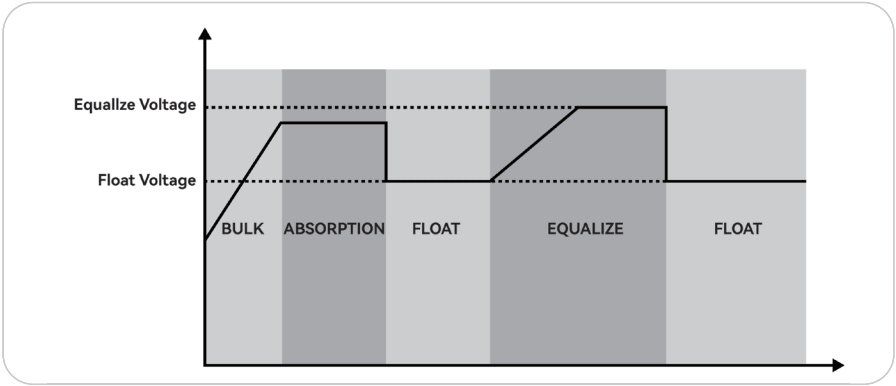
  4.Set equalization delay time on Program 32.

  5.Set equalization interval time on Program 33.

  6.Set immediate equalization mode activation on Program 34.

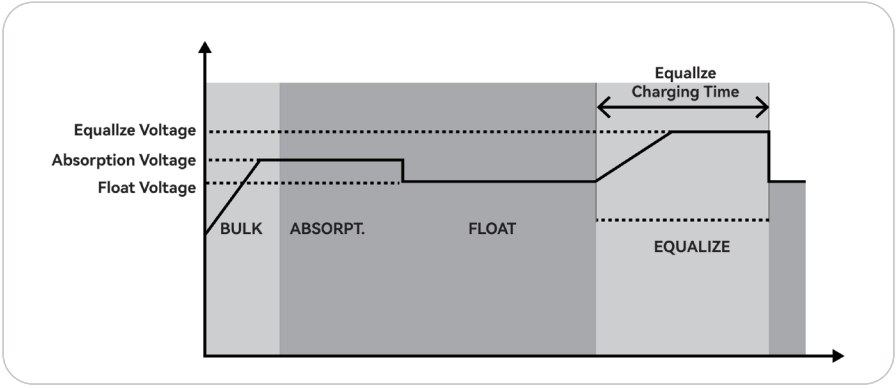
- When to Equalize

  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.

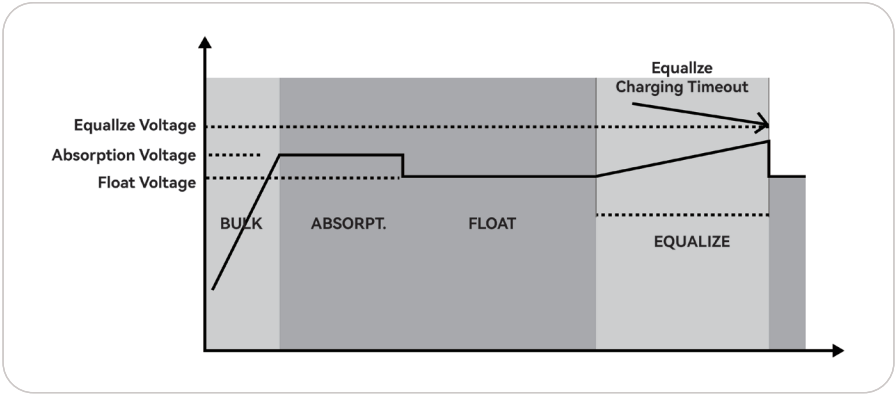


- Equalize charging time and timeout

  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 equalized time is arrived.



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



8. Trouble Shooting

Problem	Fault Event	Inspection Steps	Solution
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.
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.
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.

Problem	Fault Event	Inspection Steps	Solution
Fault code 5	Over temperature	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
Fault code 8	Bus short circuit	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.
Fault code 26	BMS fault	1. Check the BMS fault information through the battery background controller.	Handle battery problems according to fault information.
Alarm 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.

Notes: Updates to the content and version of this manual will not be notified separately.