

USER MANUAL

HYBRID SOLAR INVERTER

4.5KW / 6.5KW / 9KW / 12KW



TABLE OF CONTENTS

1.ABOUT THIS MANUAL	02
1.1 Purpose	02
1.2 Target Group	02
2.SAFETY REGULATIONS	02
3.INTRODUCTION	03
3.1 Features	03
3.2 Basic System Architecture	04
3.3 Product Overview	04
4.INSTALLATION	05
4.1 Unpacking And Inspection	05
4.2 Installation	05
4.3 Preparation Before Installation	06
4.4 Battery Connection	06
4.5 External Protective Grounding Connection	08
4.6 Wi-Fi communication	08
4.7 Communication And Setting Of Lithium Battery	08
4.8 AC Input/Output Connection	14
4.9 PV Connection	16
4.10 Final Assembly	17
4.11 CT Connection(option)	17
4.12 Parallel function	18
5.OPERATION	24
5.1 Power On/Off	24
5.2 Operation And Display Panel	24
5.3 RGB Light(optional)	25
5.4 LCD Display Icons	25
5.5 LCD Setting	28
5.6 LCD Display Information	38
5.7 Operation Mode Description	41
5.8 Fault Code	47
5.9 Warning Code	49
6.BATTERY EQUALIZATION	49
7.CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT	51
7.1 Overview	51
7.2 Clearance and Maintenance	51
8.SPECIFICATIONS	53
9.TROUBLE SHOOTING	56

1. ABOUT THIS MANUAL

1.1 Purpose

This manual introduces the assembly, installation, operation and troubleshooting of inverter. Please read this manual carefully before installation and operation.

1.2 Target Group

This manual is designed for professionals and end users. Operations that do not require any specific skills can also be handled by the end users themselves. Professionals must have the following skills:

- Understand how the inverter works and operates
- After training, someone knows that how to deal with crises and risks in the installation and use of electrical equipment and devices
- After training, someone knows that how to install and commission electrical equipment and fixtures
- Understand the applicable standards and directives
- Understand and abide by this manual and all safety knowledge

2. SAFETY REGULATIONS



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

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. 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.
3. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
4. **CAUTION-** Only qualified personnel can install this device with battery.
5. **NEVER** charge a frozen battery.
6. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
7. 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.
8. Please strictly follow installation procedure when you want to disconnect AC or DC terminals.
9. Please refer to INSTALLATION section of this manual for the details.
10. **GROUNDING INSTRUCTIONS** -This inverter/charger should be connected to a permanent grounded wiring system.
11. Be sure to comply with local requirements and regulation to install this inverter. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
12. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.

3.INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/solar charger priority, and acceptable input voltage based on different applications.

The whole system also needs other equipment to achieve complete operation, such as photovoltaic modules, generator or utility grid. According to your requirements, please consult your system integrator to obtain other possible system components. WiFi module is a plug-and-play monitoring device installed on the inverter. With this device, users can monitor the running status of solar system anytime and anywhere through mobile phones or websites.

3.1 Features

- Pure sine wave output inverter
- According to the requirements of load (household appliances/personal computers), the input voltage range of utility grid can be selected
- According to the battery requirements, the charging current can be set through LCD
- Solar energy and utility grid can power loads at the same time
- This unit have two AC inputs, one compatible with the mains power supply, and the other compatible with the generator
- This unit have two AC outputs, one connected to the main load and the other to the Non-critical load
- Automatic restart function when mains power is restored
- Overload/ Over temperature/ short circuit protection
- The intelligent charging design of battery makes the battery more fully utilized
- Cold start function
- RS485 is used to communicate with BMS and adjust the charging current of inverter according to battery demand
- It can work with or without batteries
- Intelligent fan speed adjustment, which adjusts the fan speed according to temperature, load and charging current
- Built-in MPPT, operating voltage range 120V~480V, open circuit voltage 500Voc
- RGB lamp, which displays different colors according to inverter status(optional)
- WiFi Bluetooth module monitoring(optional)
- Equip with clock, you can set the AC charge time/ utility source to take Load time, Meanwhile also count the solar power generation
- Local upgrade function: firmware can be upgraded through RS232 port
- Online upgrade function: Firmware can be upgraded through the mobile phone APP
- Grid-connected
- parallel operation(optional)

3.2 Basic System Architecture

The following illustration shows basic application for this inverter/charger. It also includes following devices to have a complete running system:

- Generator or mains electricity
- Solar module(optional)

Consult with your system integrator for other possible system architectures depending on your requirements. This inverter can power all kinds of appliances in home or office environment, including motor type appliances such as tube light, fan, refrigerator and a air conditioner.

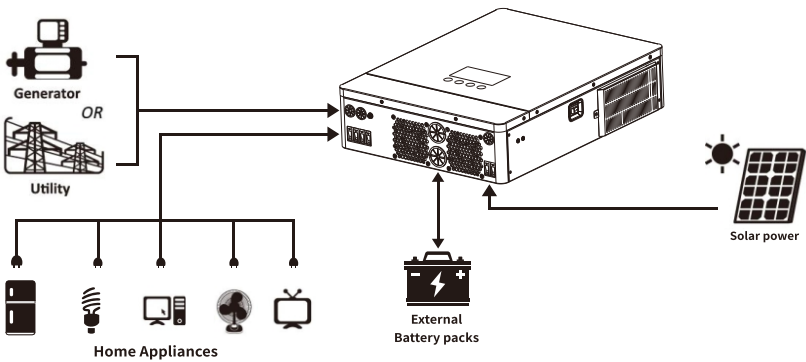
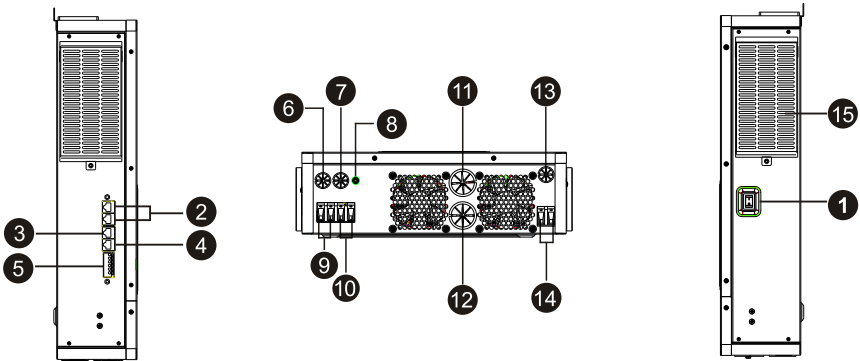


Figure 1 Hybrid Power System

3.3 Product Overview



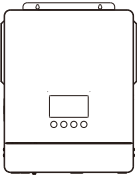
- | | | |
|-----------------------------------|-------------------------|---------------------|
| 1. Power on/off | 6. AC input | 11. Battery + input |
| 2. Parallel port | 7. Generator input | 12. Battery - input |
| 3. WIFI communication/RS-232 port | 8. Ground wire terminal | 13. PV1 input |
| 4. BMS communication/RS-485 port | 9. Main AC output | 14. PV2 input |
| 5. 120R-Dry-CT | 10. Second AC output | 15. Anti dust kit |

*120R:Parallel operation,Dry:Dry connection point,CT:CT Terminal.
*The ES version does not support the 2/13-point function,In the ES version, PV2 Input is equivalent to PV1 Input.

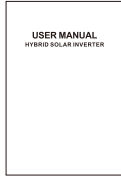
4.INSTALLATION

4.1 Unpacking And Inspection

Unpack the inverter and make sure there are no damaged objects in the package.
You should have received the following items inside of package(Resistors and parallel connection line accessories are unavailable for the ES version):



Inverter unit * 1



User manual * 1

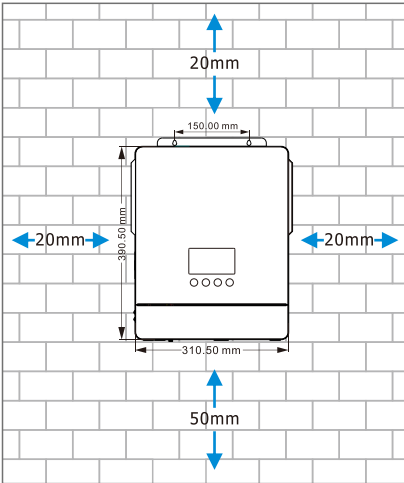


Resistor(120R) * 1

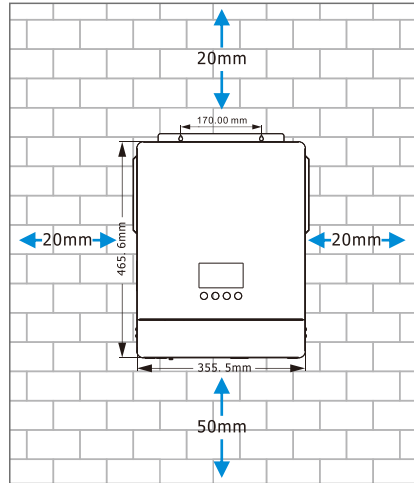


Parallel connection line * 1

4.2 Installation



4.5KW/6.5KW



9KW/12KW

Consider the following points before selecting where to install:

1. Do not mount the inverter on flammable construction materials.
2. Mount on a solid surface
3. Install this inverter at eye level in order to allow the LCD display to be read at all times.
4. For proper air circulation to dissipate heat, allow a clearance of approx 20 cm on both sides and above the equipment, 50 cm below the unit.
5. The ambient temperature should be between -20°C and 65°C to ensure optimal operation.
6. The recommended installation position is to be adhered to the wall vertically.
7. Make sure that other objects and surfaces are left with enough space from the machine to ensure adequate heat dissipation and that there is enough room to remove the wires.



Suitable for installation on concrete or other non-combustible materials Surface.

Follow the installation steps:

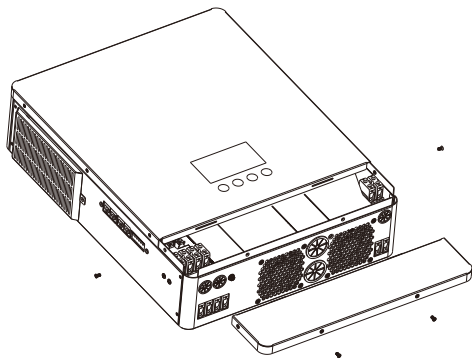
1. Measure the distance between the two holes. Drive expansion nails into the wall. Machine fixing screws: M4 or M5 screws are recommended.



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.

4.3 Preparation Before Installation

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



4.4 Battery Connection

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. Please refer to typical amperage in below table as required fuse or breaker size.

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

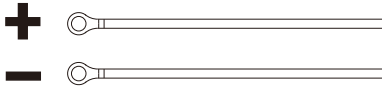
WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable as below.

Recommended battery cable specifications:

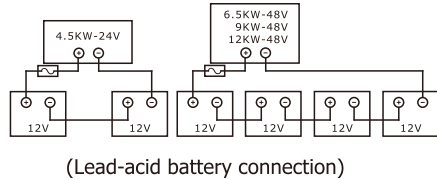
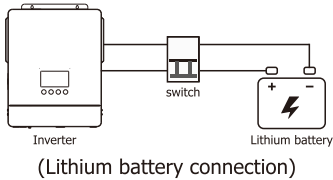
Model	Wire specification		Torque value
4.5KW-24V	3 AWG*2	25mm ² *2	10 Nm
6.5KW-48V	4 AWG*2	20mm ² *2	10 Nm
9KW-48V	2 AWG*2	30mm ² *2	10 Nm
12KW-48V	2 AWG*2	35mm ² *2	10 Nm

Please follow below steps to implement battery connection:

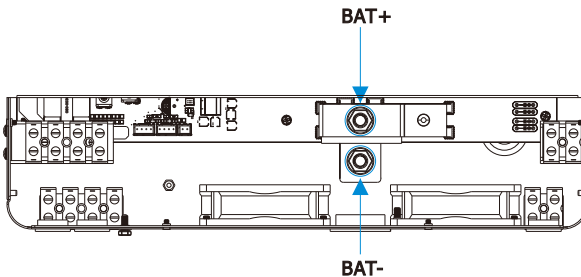
1. Remove insulation sleeve 18 mm for positive and negative conductors.
2. Suggest to put bootlace ferrules on the end of positive and negative wires with a proper crimping tool.



3. Connect all battery packs in the following table.



4. Insert the battery wires flatly into battery connectors of inverter and make sure the bolts are tightened with torque of 10 Nm in clockwise direction. Make sure polarity at both the battery and the inverter/charge is correctly connected and conductors are tightly screwed into the battery terminals. Recommended tool: Nut sleeve



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 ring terminal, otherwise, It may cause short circuit or overheating.



CAUTION!! Do not apply antioxidant to the terminal before it is tightly connected.

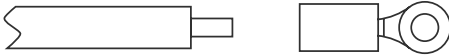


CAUTION!! Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative(-).

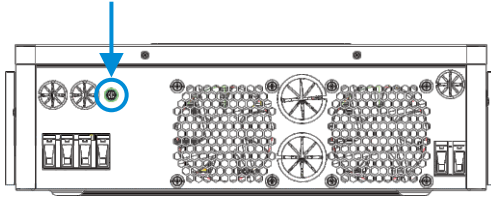
4.5 External Protective Grounding Connection

The external grounding cable is to be prepared by customer. The grounding cable must be yellow-green color.

- 1. Remove insulation sleeve a proper length from the head of cables.
- 2. Use OT terminal crimping tool make cable and terminal crimped tightly.



- 3. Connect the ground cable with M4 screw.



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 or proper guidance.

4.6 Wi-Fi communication(optional)

Please scan the QR code on the right or on the machine Download APP and install from APP store, and refer Installation Guideline to set up network and registering. The inverter status would be shown by mobile phone APP or webpage of computer.

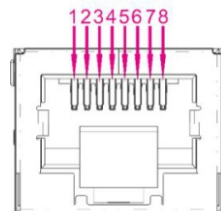
APP download



4.7 Communication And Setting Of Lithium Battery

- 1. Connect the RJ45 communication cable between inverter and battery. Please confirm that the lithium battery BMS port's PIN is correspond with the inverter BMS communication port. The inverter BMS port's PIN definition as below:

Pin number	Port definitions
1	BMS485B
2	BMS485A
3	NG
4	BMSCAN-H(Optional)
5	BMSCAN-L(Optional)
6	NG
7	BMS485A
8	BMS485B



2. In order to communicate with the lithium battery BMS, you should press the "ENTER" button for a long time, and set the battery type as "LIB-485" in program 05. Then select the matching battery protocol in Program 10.

05	Battery type	AGM (default) 05 AGM
		Flooded 05 FLd
		User Defined 05 USE
		Lithium battery mode 05 LIB
		Lithium battery communication mode LIB 05 485
10	Lithium battery protocol	PYLON 10 PYL
		PACE 10 PAC

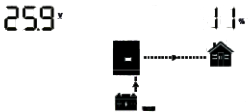
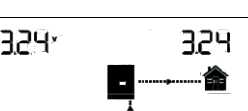
CAUTION: When the battery type is set to "LIB-485", the setting items 12, 13 and 29 are displayed in percentage.

CAUTION: When the battery type is set to "LIB-485", the user cannot modify the maximum charging current.

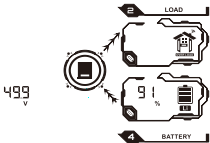
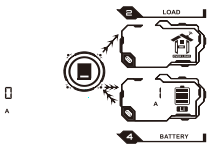
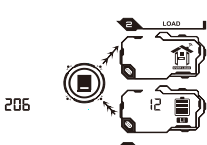
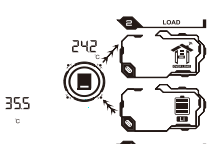
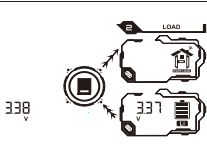
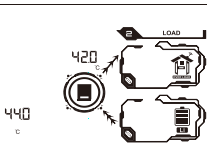
12	When the SBU mode is selected in program 01, the battery SOC point at which Battery discharge is not allowed.	12 50% The default value is 50%, and 10% ~ 50% can be set.
13	When the SBU mode is selected in program 01, the SOC point at which Battery Discharge Recovery.	13 95% The default value is 95%, and 30% ~ 100% can be set.
29	If "LIB-485" is selected in item 05. you can set the battery low SOC shutdown point.	29 20% The default value is 20%, and 5% ~ 50% can be set.

3. In "LIB-485" mode, press and hold the "ESC" button to view the information of the lithium battery, and the inverter display screen will enter the following screen (the initial interface shows the total battery voltage and remaining battery capacity). Press the "DOWN" button to display the following data in turn.

4.5KW-24V(ES)/6.5KW-48V(ES)

Selectable information		LCD display
The data is displayed in the upper left corner of the LCD	The data is displayed in the upper right corner of the LCD	LCD display interface
Total battery voltage = 25.9V	Remaining battery capacity = 11%	
Battery charging current = 0A	Battery discharge current = 1A	
Rated battery capacity = 100AH	Battery charge cycles = 12	
Minimum MOS temperature of battery = 29.4°C	Maximum MOS temperature of battery = 44.5°C	
The maximum voltage of a single battery cell = 3.24V	Minimum voltage of a single battery cell = 3.24V	
Maximum temperature of battery cell = 32.8°C	Minimum temperature of battery cell = 31.5°C	

6.5KW-48V/9KW-48V/12KW-48V

Selectable information		LCD display
The data is shown on the left side of the LCD	The data is shown on the right side of the LCD	LCD display interface
Total battery voltage = 49.9V	Remaining battery capacity =91%	
Battery charging current = 0A	Battery discharge current =1A	
Rated battery capacity =206AH	Battery charge cycles =12	
Minimum BMS MOS temperature of battery =35.5℃	Maximum BMS MOS temperature of battery =24.2℃	
The maximum voltage of a single battery cell =3.38V	Minimum voltage of a single battery cell =3.37V	
Maximum temperature of battery cell = 44.0℃	Minimum temperature of battery cell = 42.0℃	

Battery Alarm Code

Alarm code	Alarm event	Icon flashing
21	Battery Cell Over Voltage	 ①
22	Battery Cell Under Voltage	 ①
23	Battery Pack Over Voltage	 ①
24	Battery Pack Under Voltage	 ①
25	Charging Over Current	 ①
26	Discharging Over Current	 ①
27	Charging Cell Over Temperature	 ①
28	Discharging Cell Over Temperature	 ①
29	Charging Cell Under Temperature	 ①
30	Discharging Cell Under Temperature	 ①
31	Ambient Over Temperature	 ①
32	Ambient Under Temperature	 ①
33	MOS Over Temperature	 ①
34	Battery capacity is too low	 ①
44	Battery Cell Voltage Imbalance	 ①
45	Battery Cell Temperature Imbalance	 ①
46	Internal Communication Alarm	 ①

Battery Fault Code

Fault code	Fault event	The icon is long and bright
21	Battery Cell Over Voltage	
22	Battery Cell Under Voltage	
23	Battery Pack Over Voltage	
24	Battery Pack Under Voltage	
25	Charging Over Current	
26	Discharging Over Current	
27	Charging Cell Over Temperature	
28	Discharging Cell Over Temperature	
29	Charging Cell Under Temperature	
30	Discharging Cell Under Temperature	
31	Ambient Over Temperature	
32	Ambient Under Temperature	
33	MOS Over Temperature	
35	Battery Short Circuit	
36	Charge Overvoltage	
37	System Failure	
39	Charging MOS Fault	
40	Discharge MOS Fault	
41	Temperature Sensor Fault	
42	Battery Cell Fault	
43	Sampling Communication Failure	
61	Communication Failure	

4.8 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.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT misconnect input and output connectors.

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

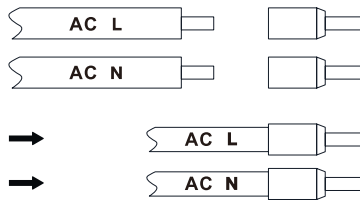
WARNING! ! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suitable cable specifications for AC wires

Model	Wire Gauge	Torque Value
4.5KW-24V/6.5KW-48V	10 AWG	5 Nm
9KW-48V/12KW-48V	8 AWG	5 Nm

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

1. Before making AC input/output connection, be sure to open DC protector or disconnecter first.
2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.

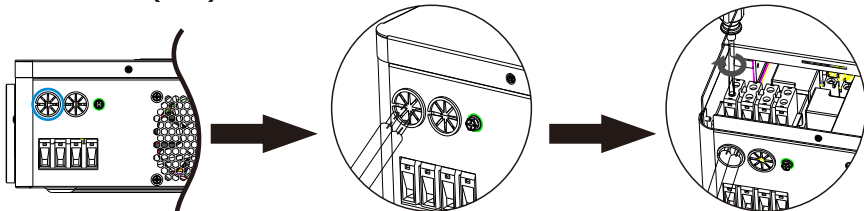


3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor(⊕)first.

⊕ → Ground(yellow-green)

L → Line(brown or black)

N → Neutral(blue)

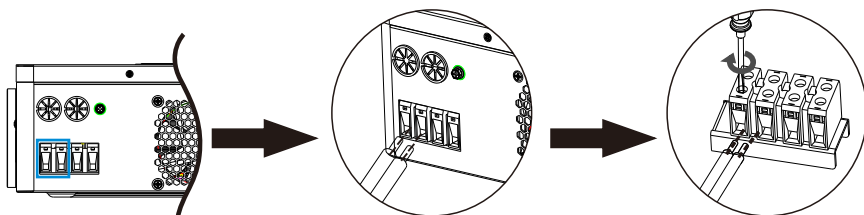


WARNING: Be sure that ac power source is disconnected before attempting to hardwire it to the unit.

4. Then, insert the output conductor according to the polarity identification at the terminal, and tighten the screw.

L → Line (brown or black)

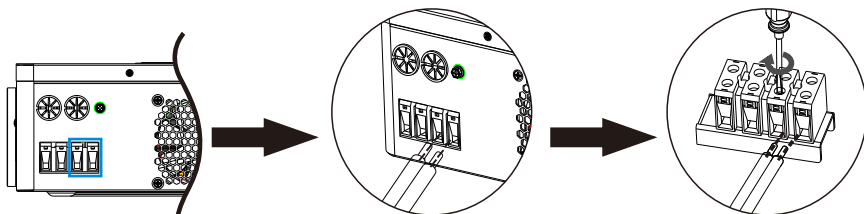
N → Neutral (blue)



5. Then, insert the output conductor according to the polarity mark at the terminal, and tighten the screw. (Note: this road is connected to emergency standby load)

L → Line (brown or black)

N → Neutral (blue)



6. Make sure the wires are firmly connected.



CAUTION: Please ensure that all AC cables are connected correctly according to the corresponding polarity.



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 manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

4.9 PV Connection

CAUTION: Before connecting the PV module, please install separately a DC circuit breaker between the inverter and PV module.

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.

Model	Wire Gauge	Torque Value
4.5KW-24V/9KW-48V	12 AWG	5 Nm
6.5KW-48V/12KW-48V	12 AWG	5 Nm

1.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 min battery voltage.

Model	4.5KW-24V	6.5KW-48V	9KW-48V	12KW-48V
Recommended MPPT voltage	360Vdc			
MPPT operating voltage range	120Vdc~480Vdc			

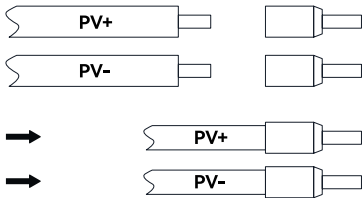
Take 250Wp PV module as an example.After considering above two parameters, the recommended module configurations are listed as below table:

Solar panel parameters -250Wp -Vmp: 30.1Vdc -Imp: 8.3A -Voc: 37.7Vdc -Isc: 8.4A -Cells: 60	Solar Input	Q'ty of panels	Total Input
	Range (Min in serial: 6 pcs, max in serial: 11 pcs)		
	6 pcs in serial	6	1500W
	8 pcs in serial	8	2000W
	11 pcs in serial	11	2750W
	8 pieces in serial and 2 sets in parallel	16	4000W
	11 pieces in serial and 2 sets in parallel	22	5500W
	8 pieces in serial and 3 sets in parallel	24	6000W

2. PV Module wire Connection

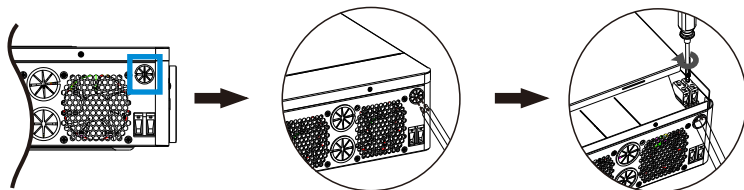
Please follow below steps to implement PV module connection:

- 1) Remove insulation sleeve 10 mm for positive and negative conductors.

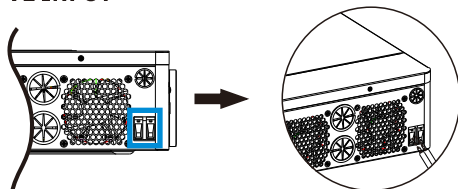


- 2) Check correct polarity of connection cable from PV modules and PV input connectors.
Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector.
Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.
- 3) Make sure the wires are securely connected.

PV1 INPUT



PV2 INPUT

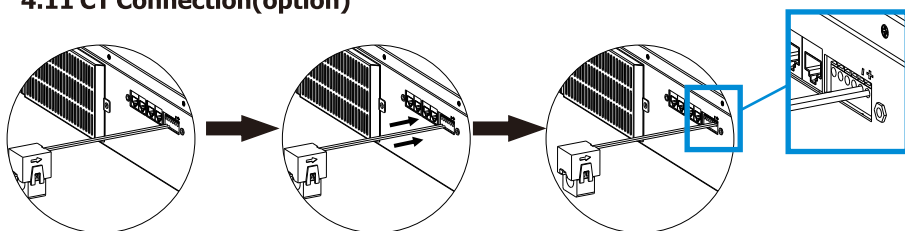


In the ES version, PV2 Input is equivalent to PV1 Input.

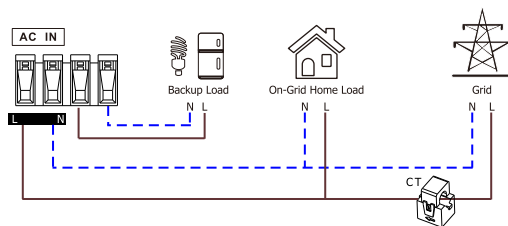
4.10 Final Assembly

After connecting all the wires, put the bottom cover back and screw the screws.

4.11 CT Connection(option)



Please use a CT sensor with a scale of 1:2000. The correct wiring method is as shown in the figure below.



WARNING: If the CT falls accidentally, please turn off all power supply, reconnect them properly and then turn on the power. Do not operate with power on.

4.12 Parallel function(optional)

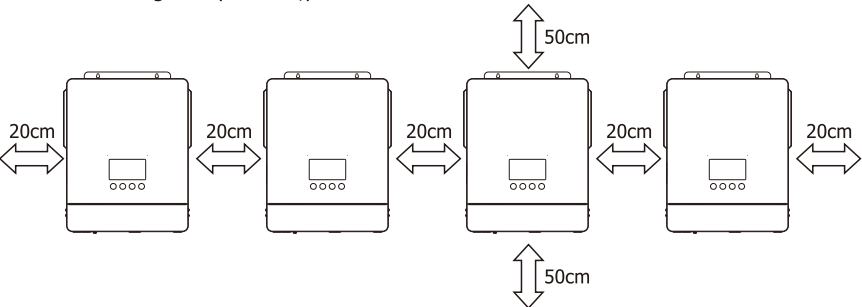
1. Introduction

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

- 1) Parallel operation in single phase is with up to 6 units.6.5KW The supported maximum output power is 39KW/39KVA.9KW The supported maximum output power is 54KW/54KVA.12KW The supported maximum output power is 72KW/72KVA.
- 2)Maximum 3*N units work together to support three-phase equipment.N units support on phase maximum.6.5KW The supported maximum output power is 6.5KW*N.9KW The supported maximum output power is 9KW*N.12KW The supported maximum output power is 12KW*N.
- 3)In parallel operation mode, the open-circuit voltage of the PV module is less than 420V.
In parallel operation mode, the battery voltage is not lower than 48V.

2.Mounting the Unit

When installing multiple units,please follow below chart.



NOTE:For proper air circulation to dissipate heat,allowa deariance of approx.20cm to the side and approx.50cm above and below the unit.Be sure to install each unit in the same level.

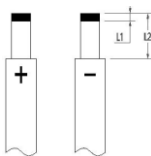
3.Wiring Comnection

WARNING:It's REQUIRED to connect battery for parallel operation.The cable size of each inverter is shown as below:

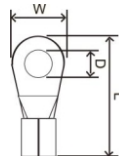
Recommended battery cable and terminal size for each inverter:

Model	Maximum Amperage	Battery Capacity	Wire Size	Cable	Terminal size			Torque Value
					L	W	D	
4.5KW-24V	160A	400AH	3 AWG *2	25mm ² *2	37mm	22mm	8.4mm	10 Nm
6.5KW-48V	140A	400AH	4 AWG *2	20mm ² *2	37mm	22mm	8.4mm	10 Nm
9KW-48V	190A	600AH	2 AWG *2	30mm ² *2	37mm	22mm	8.4mm	10 Nm
12KW-48V	230A	600AH	2 AWG *2	35mm ² *2	37mm	22mm	8.4mm	10 Nm

Stripping Length:



Terminal size:



WARNING:Be sure that length of all battery cables in the same.Otherwise,there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

Model	Wire Size	Cable	Torque Value
4.5KW-24V/6.5KW-48V	10 AWG	6mm ²	2 Nm
9KW-48V/12KW-48V	8 AWG	10mm ²	2 Nm

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel.

Regarding AC input and output, please also follow the same principle.

CAUTION!! Please install the breaker at the battery and AC input side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of battery or AC input.

Recommended breaker specification of battery for each inverter:

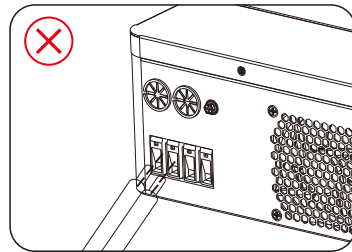
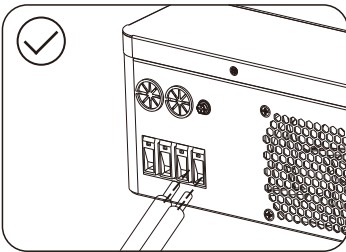
Model	1 unit*	Model	1 unit*
4.5KW-24V/6.5KW-48V	240A/70VDC	9KW-48V/12KW-48V	300A/70VDC

*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of 1 unit. "X" indicates the number of inverters connected in parallel.

Recommended breaker specification of AC input with single phase:

Model	1 unit*	Model	1 unit*
4.5KW-24V/6.5KW-48V	60A/230VDC	9KW-48V/12KW-48V	100A/230VDC

*If you want to use only one breaker at the output side for the whole system, the rating of the breaker should be X times current of 1 unit, "X" indicates the number of inverters connected in parallel.

Parallel operation mode line connection:

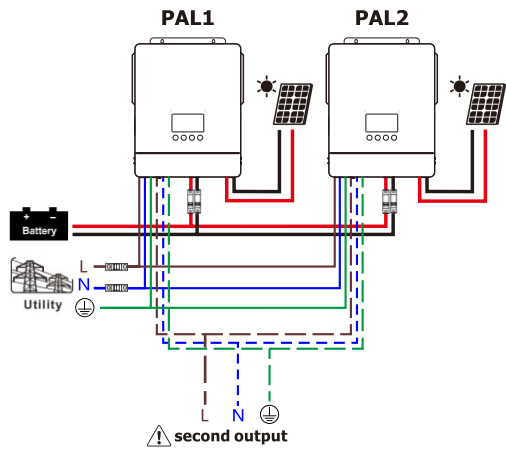
WARNING: When operating in single-phase parallel mode, the main output cannot be connected to the load. Can only connect the second output.



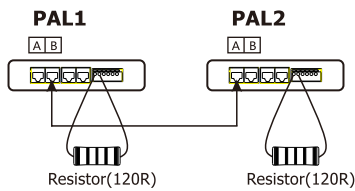
WARNING: Be sure that all inverter will share the same battery bank. Otherwise, the inverter will transfer to fault mode.

Two inverters in parallel:

Power Connection

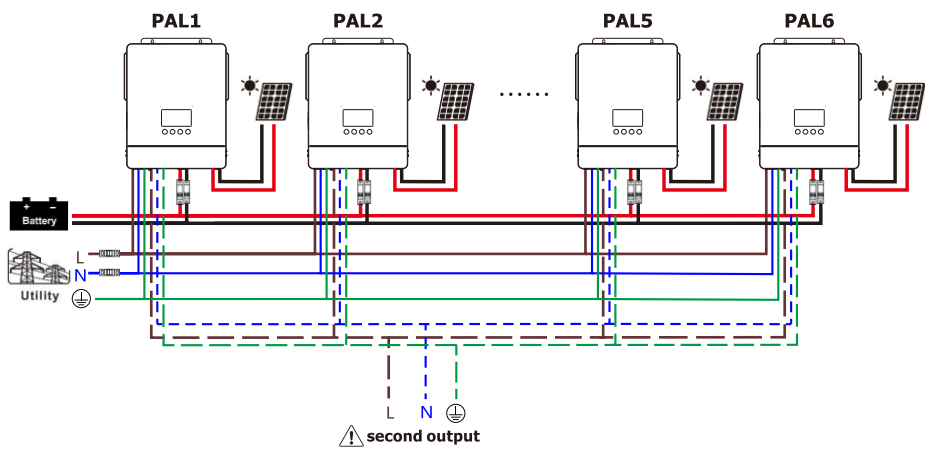


Communication Connection

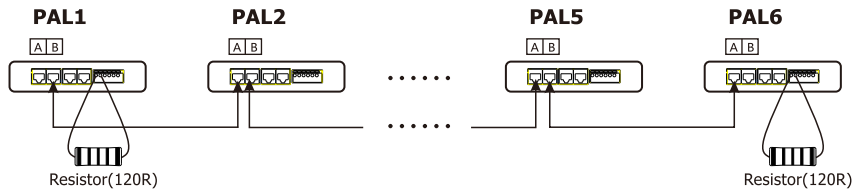


More than Three inverters in parallel:

Power Connection



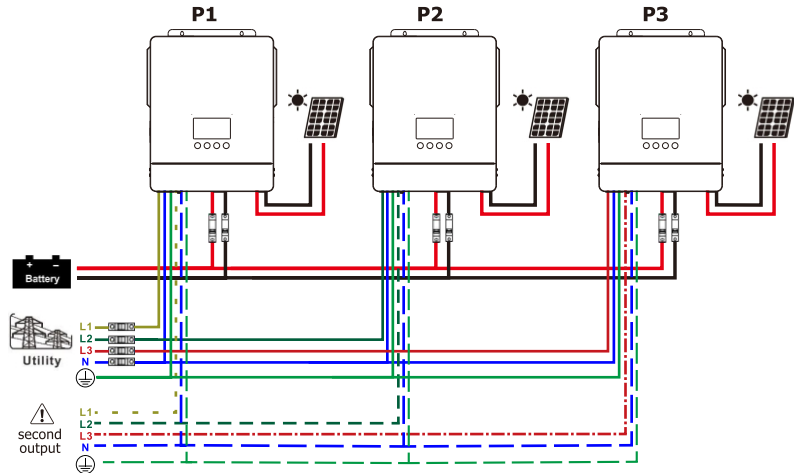
Communication Connection



Support 3-phase equipment

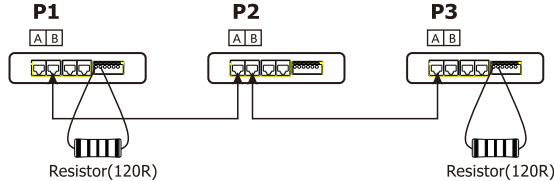
One inverter in each phase:

Power Connection



CAUTION!! Can only use Only Y-connection motors are allowed. Delta-connection motors are prohibited.

Communication Connection



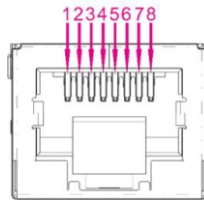
4.Parallel operation LCD setting

*The Nth unit in a certain phase of three-phase electricity,*Indicate 1-N.

Describe	Icon flashing
When the setting program is at item 54,Set to PAL1, The machine is a single-phase Master:	[H5]
When the setting program is at item 54,Set to PAL2-6, The machine is a single-phase Slave:	[L5]
When the setting program is at item 54,Set to 3P11, three phase L1 phase:	[P 11]
When the setting program is at item 54,Set to 3P21, three phase L2 phase:	[P 21]
When the setting program is at item 54,Set to 3P31, three phase L3 phase:	[P 31]

5.Parallel communication interface wiring sequence

interface A	interface B
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8



6.Commissioning

Parallel in single phase/three phase

Step 1: Check the following requirements before commissioning:

- 1.Turn on each unit and set "PALx" or "3Pxx" in LCD setting program 54 of each unit.
- 2.After the settings are completed, turn off the machine.

Step 2:

- 1.Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected.
- 2.Turn on the master unit first, then turn on the slave unit.

NOTE: Master units is set "PAL1"or"3P11".slave units is set"PAL2"or"PAL3"or"PAL4"or"PAL5" or"PAL6"or"3P21"or"3P31".

Step 3: If there is no more fault alarm, the parallel system is completely installed.

Step 4: Please switch on all breakers of Line wires in load side. This system will start to provide power othe load.Commissioning Parallel in single phase/three phase.

When operating in single-phase parallel mode, the battery voltage shall be greater than or equal to 48V, and the PV voltage shall be less than or equal to 420V.

485 communication can only connect to the host.

NOTE:In the parallel operation mode, the slave machine must be turned off first before the master machine is turned off.

Power on the parallel system

Before powering on, please ensure that the wiring is correct before proceeding with the following operations:

- Step 1: After turn on each battery switch and powering on, set the parallel operation parameters for each inverter ("PALx" or "3Pxx" as indicator in the LCD setting program 54 of each unit.)
- Step 2: Disconnect all the battery switches and wait for the inverter indicator light to go out.
- Step 3: Turn on the master unit battery switch and confirm that the master unit is working normally without being connected to the power grid.
- Step 4: Turn on the battery switch of slave unit 1, confirm that both units are operating independently and normally, then disconnect the battery switch of slave unit 1 (make sure that when there are multiple units in parallel, the power line connection at the off-grid load end is consistent with the grid connection sequence).
- Step 5: For other slave units, repeat step 4 and ensure that all slave units can be properly connected and operate in parallel with the master unit for power output.
- Step 6: Turn on the power switches of all slave batteries, and confirm that all devices are operating in parallel properly.
- Step 7: Turn on the photovoltaic DC switches of all the equipment.
- Step 8: Turn on the grid circuit breaker. If each inverter has its own grid circuit breaker, first Turn on the grid circuit breaker of each inverter, and then turn on the total grid circuit breaker.

Power off the parallel system

- Step 1: Turn off all the loads connected to the off-grid port.
- Step 2: Disconnect the load circuit breaker.
- Step 3: Disconnect the circuit breaker of the power grid.
- Step 4: Disconnect the photovoltaic DC switches of all machines one by one.
- Step 5: Disconnect the battery switches of all the machines one by one.

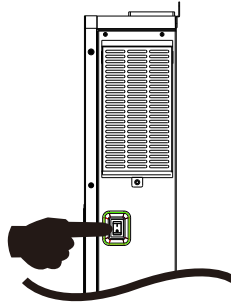
NOTE: It is recommended to strictly follow the power-off procedures for the redundant system to ensure a smooth power-off process. Otherwise, it may cause system abnormalities.

5. OPERATION

5.1 Power On/Off

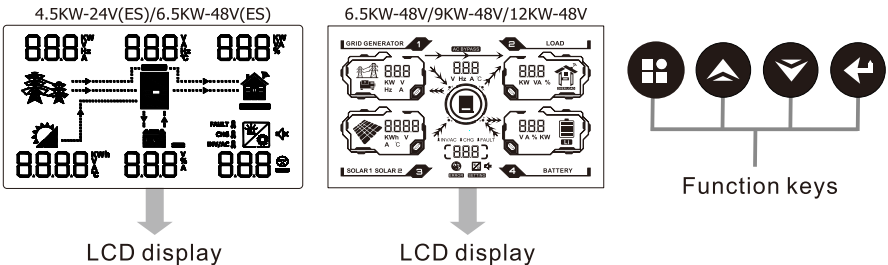
After installing the machine correctly and connecting the battery correctly, just press the On/Off switch to turn on the machine.

Side view of unit



5.2 Operation And Display Panel

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



LED Indicator

LED Indicator		Messages	
INV/AC	Green	Solid On	Output is powered by utility in Line mode.
		Flashing	Output is powered by battery or PV in battery mode.
CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
FAULT	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function Keys

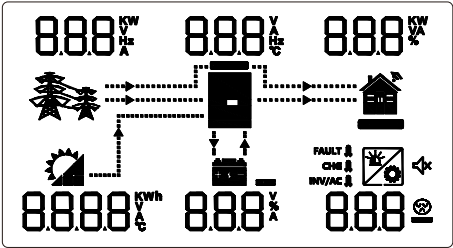
Function Key	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

5.3 RGB Light(optional)

Inverter state: green light
Utility state: blue light
Failure state: red light

5.4 LCD Display Icons

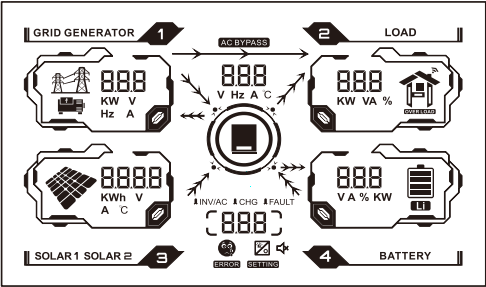
4.5KW-24V(ES)/6.5KW-48V(ES)



Icon	Function description
Input Source Information	
	Indicates the AC input.
	Indicates the PV input
	Indicate input voltage, input frequency, PV voltage, charger current (if PV in charging for 3.6KW models), charger power, battery voltage.
Configuration Program and Fault Information	
	Indicates the setting programs.
Indicates the warning and fault codes.	
	Warning: flashing with warning code.
	Fault: lighting with fault code
Output Information	
	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.
Battery Information	

Load Information	
OVER LOAD	
	Indicates overload.
Mode Operation Information	
	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
AC BYPASS	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
Mute Operation	
	Indicates unit alarm is disabled.

6.5KW-48V/9KW-48V/12KW-48V



Icon	Function description
Input Source Information	
	Indicates the AC input.
	Indicates the Generator input.
	Indicates the PV input.
	Indicate input voltage, input frequency, PV voltage, charger current (if PV in charging for 12KVA models), charger power, battery voltage.

Configuration Program and Fault Information	
	Indicates the setting programs.
	Indicates the warning and fault codes. Warning:  flashing with warning code. Fault:  lighting with fault code.
Output Information	
	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.
Battery Information	
	battery capacity%.
Load Information	
	Indicates overload.
	
Mode Operation Information	
	Indicates unit connects to the mains.
	Indicates unit connects to the Generator.
	Indicates unit connects to the PV panel.
	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
Mute Operation	
	Indicates unit alarm is disabled.

5.5 LCD Setting

After pressing and holding "ENTER" button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or "ESC" button to exit.

Setting Programs:

Option	Describe	Optional Item	
00	Exit setting mode	Escape 00 <u>ESC</u>	factory data reset
01	Output source priority: To configure load power source priority	SUB priority (default) 01 <u>SUB</u>	Solar energy gives priority to supplying power to the load. If solar energy can't effectively provide all connected loads, Utility will provide power to the loads at the same time.
		SBU priority 01 <u>SBU</u>	Solar energy gives priority to supplying power to the load. If solar energy cannot effectively provide all connected loads, the battery will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12.
02	Maximum charging current: To configure total charging current for solar and utility chargers.	10A 02 <u>10</u> ^A	20A 02 <u>20</u> ^A
		30A 02 <u>30</u> ^A	40A 02 <u>40</u> ^A
		50A 02 <u>50</u> ^A	60A 02 <u>60</u> ^A
		70A 02 <u>70</u> ^A	80A (default) 02 <u>80</u> ^A
		90A 02 <u>90</u> ^A	100A 02 <u>100</u> ^A
		110A 02 <u>110</u> ^A	120A 02 <u>120</u> ^A
		130A 02 <u>130</u> ^A	140A 02 <u>140</u> ^A
		150A 02 <u>150</u> ^A	160A 02 <u>160</u> ^A

		170A 02 <u>170^A</u>	180A 02 <u>180^A</u>
		190A 02 <u>190^A</u>	200A 02 <u>200^A</u>
		210A 02 <u>210^A</u>	220A 02 <u>220^A</u>
		230A 02 <u>230^A</u>	
03	Ac input voltage range	Appliances (default) 03 <u>APL</u>	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS 03 <u>UPS</u>	If selected, acceptable AC input voltage range will be within 170-280VAC.
04	Power saving mode enable/disable	Saving mode disable(default) 04 <u>SdS</u>	If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected.
		Saving mode enable 04 <u>SEn</u>	If enabled, the output of inverter will be off when connected load is pretty low or not detected.
05	Battery type	AGM (default) 05 <u>AGm</u>	Flooded 05 <u>FLd</u>
		User-Defined 05 <u>USE</u>	LIB 05 <u>LIB</u>
		LIB-485 LIB 05 <u>485</u>	If USE or LIB is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
06	Auto restart when overload occurs	Restart disable(default) 06 <u>Lfd</u>	Restart enable 06 <u>LfE</u>
07	Auto restart when over temperature occurs	Restart disable(default) 07 <u>tfD</u>	Restart enable 07 <u>tfE</u>
08	Output voltage	220V 08 <u>220^v</u>	230V (default) 08 <u>230^v</u>
		240V 08 <u>240^v</u>	

09	Output frequency	50Hz (default) 09 <u>50</u>	60Hz 09 <u>60</u>
10	Lithium battery protocol	PYLON (default) 10 PYL	PACE 10 PAC
11	Maximum Utility charging current	10A 11 <u>10^A</u>	20A 11 <u>20^A</u>
		30A (default) 11 <u>30^A</u>	40A 11 <u>40^A</u>
		50A 11 <u>50^A</u>	60A 11 <u>60^A</u>
		70A 11 <u>70^A</u>	80A 11 <u>80^A</u>
		90A 11 <u>90^A</u>	100A 11 <u>100^A</u>
		110A 11 <u>110^A</u>	120A 11 <u>120^A</u>
		130A 11 <u>130^A</u>	140A 11 <u>140^A</u>
		150A 11 <u>150^A</u>	160A 11 <u>160^A</u>
		170A 11 <u>170^A</u>	180A 11 <u>180^A</u>
		190A 11 <u>190^A</u>	200A 11 <u>200^A</u>
		210A 11 <u>210^A</u>	220A 11 <u>220^A</u>
		230A 11 <u>230^A</u>	

12	Setting the voltage point at which Battery discharge is not allowed. when selecting "SBU priority" Lithium battery 48V (default)	Available options in 24V models:	
		22V 12 <u>22.0</u> ^v	22.5V 12 <u>22.5</u> ^v
		23V (default) 12 <u>23.0</u> ^v	23.5V 12 <u>23.5</u> ^v
		24V 12 <u>24.0</u> ^v	24.5V 12 <u>24.5</u> ^v
		25V 12 <u>25.0</u> ^v	25.5V 12 <u>25.5</u> ^v
		Available options in 48V models:	
		44V 12 <u>44</u> ^v	45V 12 <u>45</u> ^v
		46V (default) 12 <u>46</u> ^v	47V 12 <u>47</u> ^v
		48V 12 <u>48</u> ^v	49V 12 <u>49</u> ^v
		50V 12 <u>50</u> ^v	51V 12 <u>51</u> ^v
13	Setting the voltage point at which Battery discharge is allowed. when selecting "SBU priority" in program 01	Available options in 24V models:	
		Battery full charged 13 <u>FUL</u>	24V 13 <u>24.0</u> ^v
		24.5V 13 <u>24.5</u> ^v	25V 13 <u>25.0</u> ^v
		25.5V 13 <u>25.5</u> ^v	26V 13 <u>26.0</u> ^v
		26.5V 13 <u>26.5</u> ^v	27V (default) 13 <u>27.0</u> ^v
		27.5V 13 <u>27.5</u> ^v	28V 13 <u>28.0</u> ^v
		28.5V 13 <u>28.5</u> ^v	29V 13 <u>29.0</u> ^v

		Available options in 48V models:	
		Battery full charge 13 <u>FUL</u>	48V 13 <u>480^v</u>
		49V 13 <u>490^v</u>	50V 13 <u>500^v</u>
		51V 13 <u>510^v</u>	52V 13 <u>520^v</u>
		53V 13 <u>530^v</u>	54V (default) 13 <u>540^v</u>
		55V 13 <u>550^v</u>	56V 13 <u>560^v</u>
		57V 13 <u>570^v</u>	58V 13 <u>580^v</u>
16	Charger source priority: To configure charger source priority	If this inverter/charger is working in Line,Standby or Fault mode, charger source can be programmed as below:	
		Solar first 16 <u>CS0</u>	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		Solar and Utility(default) 16 <u>SNU</u>	Solar energy and utility will charge battery at the same time.
		Only Solar 16 <u>OSO</u>	Solar energy will be the only charger source no matter utility is available or not.
		If this inverter/charger is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
18	Alarm control	Alarm on (default) 18 <u>6ON</u>	Alarm off 18 <u>6OF</u>
19	Auto return to default display screen	Return to default display screen(default) 19 <u>ESP</u>	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 19 <u>LEP</u>	If selected, the display screen will stay at latest screen user finally switches.

20	Backlight control	Backlight on(default) 20 <u>LON</u>	Backlight off 20 <u>LOF</u>
22	Beeps while primary source is interrupted	Alarm on (default) 22 <u>RON</u>	Alarm off 22 <u>ROF</u>
25	Record fault code	Record enable(default) 25 <u>FEN</u>	Record disable 25 <u>FdS</u>
26	Bulk charging voltage (C.V voltage)	Default setting of 24V model: 28.2V <u>CU</u> 26 <u>28.2^v</u>	
		Default setting of 48V model: 56.4V <u>CU</u> 26 <u>56.4^v</u>	
		If USE or LIB is selected in program 5, this program can be set up. Set voltage range, 24V model: from 24V to 29.2V; 48V Model: from 48.0V to 58.4V, and each press increases by 0.1V.	
27	Floating charging voltage	Default setting of 24V model: 27.0V <u>FLU</u> 27 <u>27.0^v</u>	
		Default setting of 48V model: 54.0V <u>FLU</u> 27 <u>54.0^v</u>	
		If USE or LIB is selected in program 5, this program can be set up. Set voltage range, 24V model: from 24V to 29.2V; 48V Model: from 48.0V to 58.4V, and each press increases by 0.1V.	
29	Low DC cut-off voltage	Default setting of 24V model: 21.0V <u>COU</u> 29 <u>21.0^v</u>	
		Default setting of 48V model: 42.0V <u>COU</u> 29 <u>42.0^v</u>	
		If USE or LIB is selected in program 5, this program can be set up. set voltage range, 24V model: from 20V to 24V; 48V models range from 40V to 48V, Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.	

33	Battery equalization	Battery equalization 33 <u>EE</u> <u>N</u>	Battery equalization disable(default) 33 <u>Ed</u> <u>S</u>
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
34	Battery equalization voltage	Default setting of 24V model: 29.2V <u>Ev</u> 34 <u>29.2</u> ^v	
		Default setting of 48V model: 58.4V <u>Ev</u> 34 <u>58.4</u> ^v	
		The setting range of 24V model is from 25.0V to 29.5V, and 48V model is from 50V to 59.0V . Increase by 0.1V per press.	
35	Battery equalized time	60min (default) 35 <u>60</u>	Setting range is from 5 min to 900min.Increment of each click is 5min.
36	Battery equalized timeout	120min (default) 36 <u>120</u>	Setting range is from 5min to 900 min.Increment of each click is 5min.
37	Equalization interval	30 days (default) 37 <u>30d</u>	Setting range is from 0 to 90 days.Increment of each click is 1 day
39	Equalization activated immediately	Enable 39 <u>AE</u> <u>N</u>	Disable(default) 39 <u>Ad</u> <u>S</u>
		If equalization function is enabled in program 33, this program can be set up.If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD mainpage will shows "Eq".If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 37setting. At this time, will not be shown in LCD main page.	
40	Setting time: year	Year <u>2025</u> 40	Range:2025~2099
41	Setting time: month	Month <u>01</u> 41 7	Range:01~12
42	Setting time: day	Day <u>01</u> 42 25	Range:01~31
43	Setting time: hour	Hour <u>00</u> 43 9	Range:00~23

44	Setting time: minutes	minute n 17 44 46	Range:01~59
45	Setting time: seconds	second SEC 45 55	Range:01~59
46	AC Charge time setting	0000 (default) Allow the mains to charge all day. CHG 21 n 0000 46	There are four numbers used to describe the AC charge time setting. The two numbers in left is start time. Setting Range:00~23 And the other two numbers in right is time of end. Setting Range:00~23 (For example, 2320 means that the mains charge time are 23:00 to the next day 20:59)
47	AC input to power Load time setting	0000 (default) Allow the mains to be loaded all day. OUP 21 n 0000 47	There four numbers used to describe the utility to take load time setting. The two numbers in left is start time. Setting Range:00~23 And the other two numbers in right is time of end. Setting Range:00~23 (For example, 2320 means that the utility to take load time are 23:00 to the next day 20:59)
48	RGB lighting	RGB lights off 48 L0F	RGB lights on (default) 48 L0N
49	Dual output	Disable (default) 49 L2F	Enable 49 L2N If you select Enable in the program, the inverter will turn off the second output when the battery is low The inverter will not restore the second output until the battery voltage returns to the 13 set point
50	Grid-Connected	Disable (default) 50 0Fd	Enable 50 0tE If enabled is selected in the program, The machine allows grid connection.

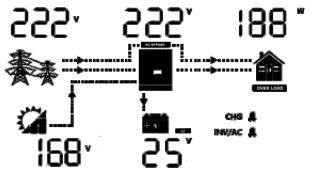
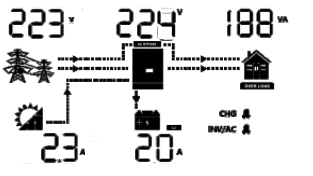
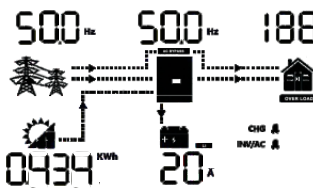
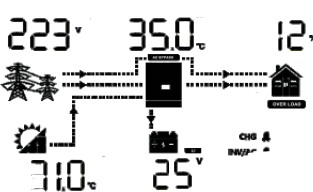
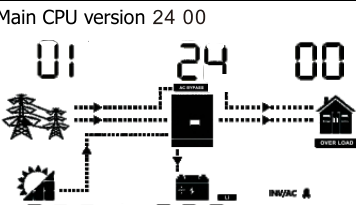
51	Grid-tie Power Setting	0.5KW 51 0.5 ^{KW}	1.0KW 51 1.0 ^{KW}
		1.5KW 51 1.5 ^{KW}	2.0KW 51 2.0 ^{KW}
		2.5KW 51 2.5 ^{KW}	3.0KW 51 3.0 ^{KW}
		3.5KW 51 3.5 ^{KW}	4.0KW 51 4.0 ^{KW}
		4.5KW 51 4.5 ^{KW}	5.0KW 51 5.0 ^{KW}
		5.5KW 51 5.5 ^{KW}	6.0KW 51 6.0 ^{KW}
		6.5KW 51 6.5 ^{KW}	7.0KW 51 7.0 ^{KW}
		7.5KW 51 7.5 ^{KW}	8.0KW 51 8.0 ^{KW}
		8.5KW 51 8.5 ^{KW}	9.0KW 51 9.0 ^{KW}
		9.5KW 51 9.5 ^{KW}	10.0KW 51 10.0 ^{KW}
		10.5KW 51 10.5 ^{KW}	11.0KW 51 11.0 ^{KW}
		11.5KW 51 11.5 ^{KW}	12.0KW 51 12.0 ^{KW}
52	Battery grid connection	Disable (default) 52 0FD	Enable 52 0FE In SBU mode, if program 50 is set to Enable and Item 52 is also set to Enable, the battery will be allowed to connect to the grid.

53	CT	Disable (default) 53 0Fd	Enable 53 0FE
54	Parallel operation Function In parallel operation mode, the open-circuit voltage of the PV module is less than 420V. In parallel operation mode, the battery voltage is not lower than 48V. (6.5KW-48V/ 9KW-48V/12KW-48)	SIG	single phase Offline(default)
		PAL1	single phase Master
		PAL2	single phase Slave 1
		PAL3	single phase Slave 2
		PAL4	single phase Slave 3
		PAL5	single phase Slave 4
		PAL6	single phase Slave 5
		3P11	three phase L1 phase
		3P21	three phase L2 phase
		3P31	three phase L3 phase

5.6 LCD Display Information

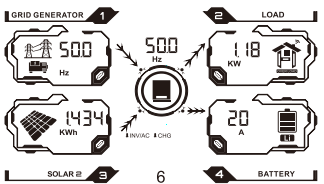
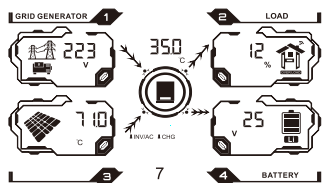
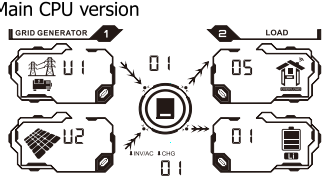
By pressing the "UP" or "DOWN" key, the information on the LCD screen will be switched in turn. Optional information is switched in the following order: voltage, frequency, current, power, firmware version and time.

4.5KW-24V(ES)/6.5KW-48V(ES)

Selectable information	LCD display
Charged state, and the power is less than 1kw	
Input voltage=222V , PV voltage=168V, Battery voltage=25V, Output voltage=222V, Load in Watt=188W, Chg(Flashing), Inv/ac(bright)	
Input voltage=223V , PV current=2.3A, Battery current=20A, Output voltage=224V, Load in VA=188VA, Chg(Flashing), Inv/ac(bright)	
Input frequency=50.0Hz , PV power=0.434KWh, Battery current=20A, Output frequency=50.0Hz, Load in watt=188W, Chg(Flashing), Inv/ac(bright)	
Input voltage=223V , Pv ntc temperture=71.0°C, Battery voltage= 25V, Inv ntc temperture=35.0°C, Load percentage=12% , Chg(Flashing), Inv/ac(bright)	
Main CPU version checking	Main CPU version 24 00 

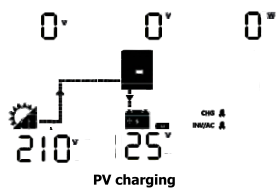
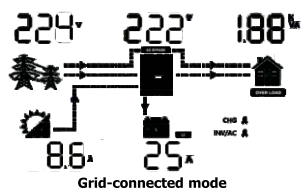
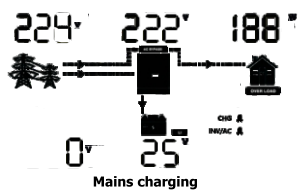
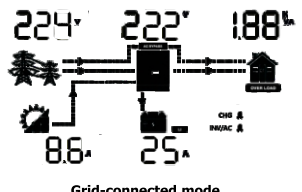
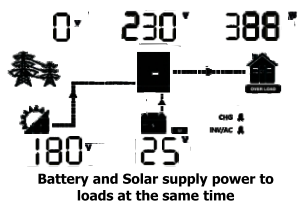
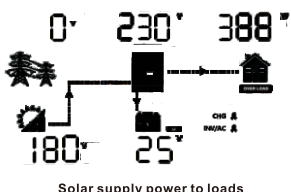
6.5KW-48V/9KW-48V/12KW-48V

Selectable information	LCD display
Input Power=1.85KW , PV Total Power=6.46KW , Battery Power=1.79KW , Output Voltage=232V , Load power=6.32KW , Chg(Flashing),INV/AC(bright)	The LCD display shows the following readings: GRID GENERATOR 1 (185 KW), SOLAR 1 (6.46 KW), GRID GENERATOR 2 (232 V), SOLAR 2 (0 KW), GRID GENERATOR 3 (632 KW), SOLAR 3 (1.79 KW), GRID GENERATOR 4 (232 V), SOLAR 4 (0 KW), GRID GENERATOR 5 (188 W), SOLAR 5 (5.12 V), GRID GENERATOR 6 (20 A), SOLAR 6 (20 A), GRID GENERATOR 7 (188 W), SOLAR 7 (5.12 V), GRID GENERATOR 8 (20 A), SOLAR 8 (20 A), GRID GENERATOR 9 (188 W), SOLAR 9 (5.12 V), GRID GENERATOR 10 (20 A), SOLAR 10 (20 A), GRID GENERATOR 11 (188 W), SOLAR 11 (5.12 V), GRID GENERATOR 12 (20 A), SOLAR 12 (20 A).
Input voltage=222V , PV1 voltage=168V , Battery voltage=51.2V , Output voltage=222V , Load in Watt=188W , Chg(Flashing),INV/AC(bright)	The LCD display shows the following readings: GRID GENERATOR 1 (222 V), SOLAR 1 (168 V), GRID GENERATOR 2 (222 V), SOLAR 2 (1 V), GRID GENERATOR 3 (188 W), SOLAR 3 (5.12 V), GRID GENERATOR 4 (20 A), SOLAR 4 (20 A), GRID GENERATOR 5 (188 W), SOLAR 5 (5.12 V), GRID GENERATOR 6 (20 A), SOLAR 6 (20 A), GRID GENERATOR 7 (188 W), SOLAR 7 (5.12 V), GRID GENERATOR 8 (20 A), SOLAR 8 (20 A), GRID GENERATOR 9 (188 W), SOLAR 9 (5.12 V), GRID GENERATOR 10 (20 A), SOLAR 10 (20 A), GRID GENERATOR 11 (188 W), SOLAR 11 (5.12 V), GRID GENERATOR 12 (20 A), SOLAR 12 (20 A).
Input voltage=223V , PV1 current=2.3A , Battery current=20A , Output voltage=224V , Load in VA=188VA , Chg(Flashing),INV/AC(bright)	The LCD display shows the following readings: GRID GENERATOR 1 (223 V), SOLAR 1 (2.3 A), GRID GENERATOR 2 (224 V), SOLAR 2 (2 A), GRID GENERATOR 3 (188 VA), SOLAR 3 (5.12 V), GRID GENERATOR 4 (20 A), SOLAR 4 (20 A), GRID GENERATOR 5 (188 VA), SOLAR 5 (5.12 V), GRID GENERATOR 6 (20 A), SOLAR 6 (20 A), GRID GENERATOR 7 (188 VA), SOLAR 7 (5.12 V), GRID GENERATOR 8 (20 A), SOLAR 8 (20 A), GRID GENERATOR 9 (188 VA), SOLAR 9 (5.12 V), GRID GENERATOR 10 (20 A), SOLAR 10 (20 A), GRID GENERATOR 11 (188 VA), SOLAR 11 (5.12 V), GRID GENERATOR 12 (20 A), SOLAR 12 (20 A).
Input frequency=50.0Hz , PV1 power=0.434KW , Battery current=20A , Output frequency=50.0Hz , Load in watt=188W , Chg(Flashing),INV/AC(bright)	The LCD display shows the following readings: GRID GENERATOR 1 (500 Hz), SOLAR 1 (0.434 KW), GRID GENERATOR 2 (500 Hz), SOLAR 2 (3 Hz), GRID GENERATOR 3 (188 W), SOLAR 3 (5.12 V), GRID GENERATOR 4 (20 A), SOLAR 4 (20 A), GRID GENERATOR 5 (188 W), SOLAR 5 (5.12 V), GRID GENERATOR 6 (20 A), SOLAR 6 (20 A), GRID GENERATOR 7 (188 W), SOLAR 7 (5.12 V), GRID GENERATOR 8 (20 A), SOLAR 8 (20 A), GRID GENERATOR 9 (188 W), SOLAR 9 (5.12 V), GRID GENERATOR 10 (20 A), SOLAR 10 (20 A), GRID GENERATOR 11 (188 W), SOLAR 11 (5.12 V), GRID GENERATOR 12 (20 A), SOLAR 12 (20 A).
Input voltage=222V , PV2 voltage=168V , Battery voltage=51.2V , Output voltage=222V , Load in Watt=1.18KW , Chg(Flashing),INV/AC(bright)	The LCD display shows the following readings: GRID GENERATOR 1 (222 V), SOLAR 1 (168 V), GRID GENERATOR 2 (222 V), SOLAR 2 (4 V), GRID GENERATOR 3 (188 KW), SOLAR 3 (5.12 V), GRID GENERATOR 4 (20 A), SOLAR 4 (20 A), GRID GENERATOR 5 (188 KW), SOLAR 5 (5.12 V), GRID GENERATOR 6 (20 A), SOLAR 6 (20 A), GRID GENERATOR 7 (188 KW), SOLAR 7 (5.12 V), GRID GENERATOR 8 (20 A), SOLAR 8 (20 A), GRID GENERATOR 9 (188 KW), SOLAR 9 (5.12 V), GRID GENERATOR 10 (20 A), SOLAR 10 (20 A), GRID GENERATOR 11 (188 KW), SOLAR 11 (5.12 V), GRID GENERATOR 12 (20 A), SOLAR 12 (20 A).
Input voltage=224V , PV2 current=8.6A , Battery current=12.5A , Output voltage=222V , Load in VA=1.88KVA , Chg(Flashing),INV/AC(bright)	The LCD display shows the following readings: GRID GENERATOR 1 (224 V), SOLAR 1 (8.6 A), GRID GENERATOR 2 (222 V), SOLAR 2 (5 A), GRID GENERATOR 3 (188 KW), SOLAR 3 (12.5 A), GRID GENERATOR 4 (20 A), SOLAR 4 (20 A), GRID GENERATOR 5 (188 KW), SOLAR 5 (12.5 A), GRID GENERATOR 6 (20 A), SOLAR 6 (20 A), GRID GENERATOR 7 (188 KW), SOLAR 7 (12.5 A), GRID GENERATOR 8 (20 A), SOLAR 8 (20 A), GRID GENERATOR 9 (188 KW), SOLAR 9 (12.5 A), GRID GENERATOR 10 (20 A), SOLAR 10 (20 A), GRID GENERATOR 11 (188 KW), SOLAR 11 (12.5 A), GRID GENERATOR 12 (20 A), SOLAR 12 (20 A).

Input frequency=50.0Hz , PV2 power=1.434KWh, Battery current=20A, Output frequency=50.0Hz, Load in watt=1.18KW, Chg(Flashing),INV/AC(bright)	 The display shows a central circle with the number 6. Surrounding it are four panels: top-left (GRID GENERATOR 1) shows 500 Hz; top-right (LOAD 2) shows 118 KW; bottom-left (SOLAR 2 3) shows 1434 KWh; bottom-right (BATTERY 4) shows 20 A. Arrows indicate power flow between these components.
Input voltage=223V , PV1ntc temperture=71.0°C, Battery voltage= 25V, Inv ntc temperture=35.0°C, Load percentage=12%, Chg(Flashing),INV/AC(bright)	 The display shows a central circle with the number 7. Surrounding it are four panels: top-left (GRID GENERATOR 1) shows 223 V; top-right (LOAD 2) shows 12 %; bottom-left (SOLAR 1 3) shows 71.0 °C; bottom-right (BATTERY 4) shows 25 V. Arrows indicate power flow between these components.
Main CPU version checking	Main CPU version  The display shows a central circle with the number 01. Surrounding it are four panels: top-left (GRID GENERATOR 1) shows 01; top-right (LOAD 2) shows 05; bottom-left (SOLAR 1 SOLAR 2 3) shows 02; bottom-right (BATTERY 4) shows 01. Arrows indicate power flow between these components.

5.7 Operation Mode Description

4.5KW-24V(ES)/6.5KW-48V(ES)

Operation mode	Selectable information	LCD display
Stand by mode *standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	 PV charging
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	 Grid-connected mode
		 Mains charging
Grid-Tie operation	When working in Grid -Tie mode, the will be flash 3S/times. 	 Grid-connected mode
Battery Mode	The unit will provide output power from battery and power.	 Battery and Solar supply power to loads at the same time
		 Solar supply power to loads

Operation mode	Selectable information	LCD display
Working Mode AC Output Mode: The AC output mode corresponds to parameter setting items 01, 50 and 52, allowing users to set it manually.	SUB (Default): Solar energy supplies power to the load with priority. After enabling grid connection via Parameter 50, excess solar power will be fed back to the grid once the load power demand is satisfied. When solar power is unavailable, the utility grid will serve as a backup to supply power to the load. This mode maximizes the utilization of solar energy while preserving battery power, and is suitable for areas with a relatively stable grid. (Priority: Solar > Utility Grid > Battery)	Solar Available
		PV Unavailable
	SBU: Solar power supplies power to the load first. When solar power is insufficient or unavailable, the battery serves as a backup to supply power to the load. After enabling grid connection via Setting Item 50 and Item 52, excess solar energy will be fed back to the grid once the load power demand is met; when solar power is insufficient, the battery will supplement power and feed excess energy into the grid. When the battery voltage drops below the threshold set in Setting Item 12, the battery will stop feeding energy to the grid, and the system will switch to the utility grid to supply power to the load. This mode maximizes the utilization of DC power and is suitable for areas with a stable power grid. (Priority: Solar > Battery > Utility Grid)	PV Available
		PV Unavailable
		Battery voltage lower than Setting Item 12

Operation mode	Selectable information	LCD display
Working Mode Battery Charging Mode: The battery charging mode corresponds to parameter setting item 16, which allows users to set it manually.	SNU (Default): Both PV and the utility grid charge the battery simultaneously, with PV taking priority and the utility grid acting as a supplement when PV power is insufficient. This is the fastest charging method. It is suitable for areas with insufficient power supply and provides users with sufficient backup energy. (Priority: PV > Utility Grid)	
	CSO: PV charging is prioritized, and utility grid charging is only activated when PV power fails. It makes full use of solar power during the daytime and switches to utility grid charging at night to maintain battery capacity. This mode is suitable for areas with a relatively stable power grid and high electricity prices. (Priority: PV > Utility Grid)	
	OSO: Only PV charging is enabled, and utility grid charging will not be activated. This is the most energy-saving mode. All battery power is supplied solely by photovoltaic energy, and it is generally used in areas with good solar irradiation conditions.	

6.5KW-48V/9KW-48V/12KW-48V

Operation mode	Selectable information	LCD display
Stand by mode Note: *standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	1 GRID GENERATOR 4 BATTERY AC Standby without charging
		1 GRID GENERATOR 3 SOLAR 1 SOLAR 2 4 BATTERY PV charging
Line Mode	When the photovoltaic power is sufficient, this device can be Grid connection, provide output power and charge the battery.	1 GRID GENERATOR 3 SOLAR 1 SOLAR 2 4 BATTERY Grid-connected mode
	The unit will provide output power from the mains. It will also charge the battery at line mode.	1 GRID GENERATOR 3 SOLAR 1 SOLAR 2 4 BATTERY Mains charging

Operation mode	Selectable information	LCD display
Battery Mode	The unit will provide output power from battery and power.	Battery and Solar supply power to loads at the same time
		BP Solar supply power to loads The lithium battery mode is not functioning properly
	*Power saving mode: If enabled, the output of inverter will be off when connected load is pretty low or not detected.	Battery supply power to loads
Working Mode	SUB (Default): Solar energy supplies power to the load with priority. After enabling grid connection via Parameter 50, excess solar power will be fed back to the grid once the load power demand is satisfied. When solar power is unavailable, the utility grid will serve as a backup to supply power to the load. This mode maximizes the utilization of solar energy while preserving battery power, and is suitable for areas with a relatively stable grid. (Priority: Solar > Utility Grid > Battery)	

Operation mode	Selectable information	LCD display
Working Mode	SBU: Solar power supplies power to the load first. When solar power is insufficient or unavailable, the battery serves as a backup to supply power to the load. After enabling grid connection via Setting Item 50 and Item 52, excess solar energy will be fed back to the grid once the load power demand is met; when solar power is insufficient, the battery will supplement power and feed excess energy into the grid. When the battery voltage drops below the threshold set in Setting Item 12, the battery will stop feeding energy to the grid, and the system will switch to the utility grid to supply power to the load. This mode maximizes the utilization of DC power and is suitable for areas with a stable power grid. (Priority: Solar > Battery > Utility Grid)	
CT operation	If Grid-Connected is Disable in program 50, This program will take effect. In program 53, "Disable": If selected, inverter will only provide power to the backup load connected. The inverter will neither provide power to the home load nor sell power to grid. If PV power and battery power is insufficient, it will take grid energy as supplement. In program 53, "Enable": If selected, inverter will not only provide power to the backup load connected but also provide power to the home load connected. The inverter will not sell power to grid. If PV power and battery power is insufficient, it will take grid energy as supplement. In this mode, a CT is needed. The installation method of the CT please refer to chapter 4.11 CT Connection.	

5.8 Fault Code

No parallel operation function

Fault Code	Fault Event	Icon on
01	Fan is locked when the inverter is turned off	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuit	
06	Output voltage is too high	
07	AC overload fault	
08	BUS voltage is too high	
09	BUS soft start failed	
13	PV voltage is too high	
51	Over current and surge	
52	BUS voltage is too low	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
87	AC input relay fault	
57	Current sensor failed	
58	Output voltage is too low	

With parallel operation function

Fault Code	Fault Event	Icon on
70	Three-phase phase sequence abnormal	
71	Parallel version mismatch	
72	Output current mismatch	
73	Output Volt mismatch	
80	CAN communication fail	
81	Parallel synchronous signal loss	
82	Output frequency mismatch	
83	Battery Volt mismatch	
84	Grids input volt mismatch	
86	Incorrect parallel configuration	
56	Battery is disconnected	

5.9 Warning Code

Warning Code	Warning Event	Automatic Alarm	Icon flashing
01	Fan is locked when inverter is on	Beep three times every second	
02	Over-temperature warning	Beep once every second	
03	Battery overvoltage	Beep once every second	
04	Battery low voltage	Beep once every second	
07	Overload	Beep once every 0.5 second	
10	Output power is derating	Beep twice every 3 seconds	
15	PV energy is weak	No Beep	
EQ	Battery equalization	No Beep	
bP	Battery is not connected	No Beep	
63	CT Reverse connection	No Beep	
64	OTA upgrade failed	No Beep	

6.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.

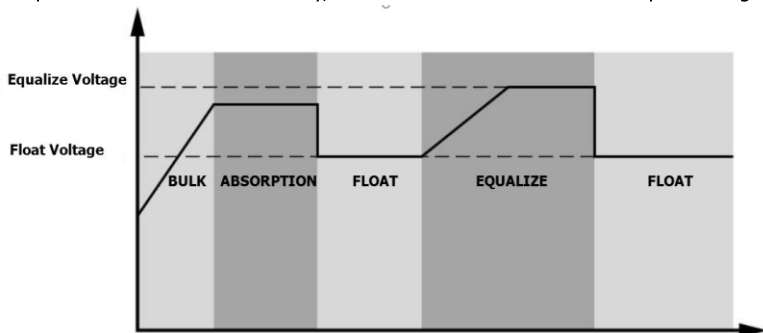
● How to Apply Equalization Function

You must enable battery equalization function in monitoring LCD setting program 33 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 37.
2. Active equalization immediately in program 39.

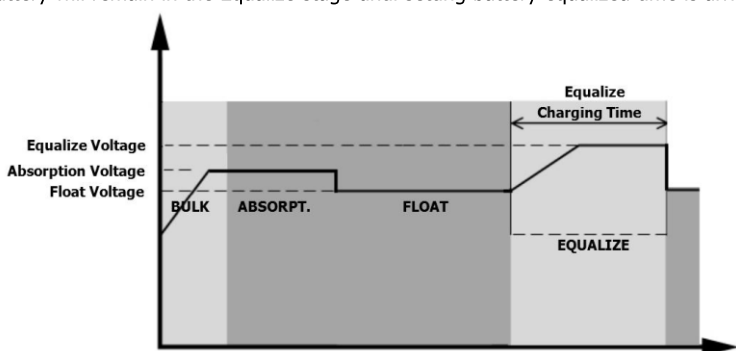
- When to Equalize

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.

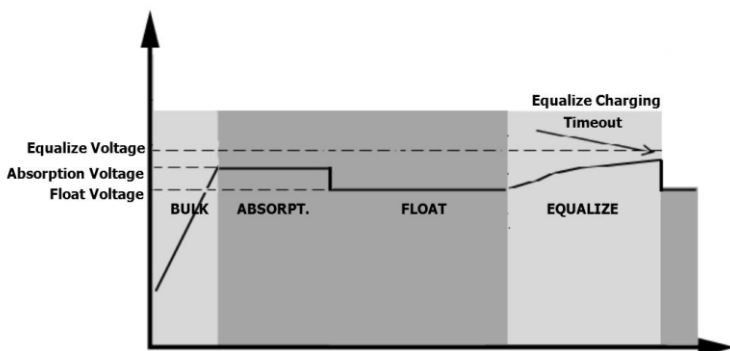


- Equalize charging time and time out

In equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raise 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 time out setting is over, the charge controller will stop equalization and return to float stage.



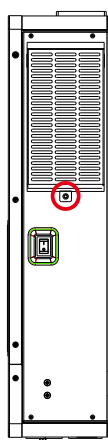
7.CLEARANCE AND MAINTNEANCE FOR ANTI-DUST KIT

7.1 Overview

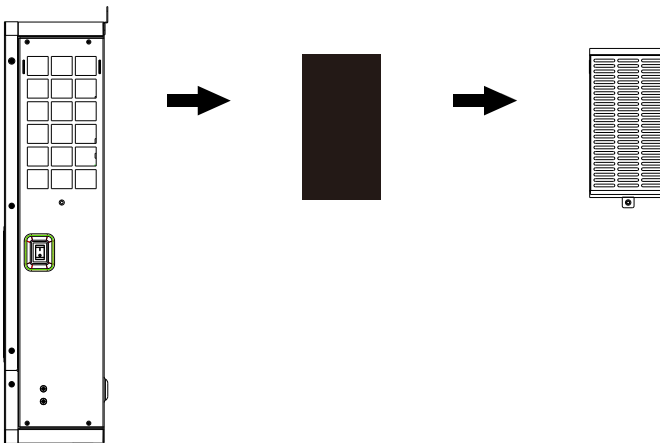
Every inverter is already installed with anti-dust kit from factory. Inverter will automatically detect this kit and activate internal thermal sensor to adjust internal temperature. This kit also keeps dusk from your inverter and increases product reliability in harsh environment.

7.2 Clearance and Maintenance

Step 1: Please loosen the screw in counterclockwise direction on the top of the inverter.



Step 2: Then, dustproof case can be removed and take out air filter foam as shown in below chart.



Step 3: Clean air filter foam and dustproof case. After clearance, re-assemble the dust-kit back to the inverter.

NOTICE: The anti-dust kit should be cleaned from dust every one month.

8.SPECIFICATIONS

Work environment	
Operating temperature range	-20°C to 65°C (45°C derating, 60°C Half load)
Relative humidity	5% ~ 95%
Altitude	0-2000M
Storage environment	
Storage temperature range	-40°C~ 75°C
Relative humidity	5% ~ 95%
Altitude	0-2000M

Photovoltaic PV input					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Maximum power input of PV	6KW	8.5KW	10KW	12KW	14.5KW
Maximum PV input current	24A		18A+18A		
MPPT Quantity	1		1+1		
Maximum PV input voltage	500VDC				
Startup voltage	120VDC				
MPPT range	75-400(VDC)				
Recommended MPPT voltage	360VDC				
Priority supply of PV	Priority charging				
Maximum Conversion Efficiency	97%	97.3%		97.5%	
MPPT Maximum Efficiency	99.5%				

Battery mode (BAT)					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Battery mode no-load loss	<40W			<50W	
Battery mode output power	4.5KW	6.5KW		9KW	12KW
Battery input range	20-30(VDC)	40-60(VDC)			
Rated battery voltage	25.6VDC	51.2VDC			

Battery mode (BAT)					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Overvoltage protection	32VDC	63VDC			
Battery discharge power	160A	140A		190A	230A
Battery charging current	160A	140A		190A	230A
Battery type	Lead-acid batteries, lithium batteries, open-type lead-acid batteries, user-defined				
Lithium battery	One line RS485		One line RS485; one line CAN		
Lithium battery communication	Standard protocol: Peicheng, Pianeng; Supports dedicated charging curve for lithium batteries				
Battery discharge conversion efficiency	95%	95.2%		95.5%	
Battery charging conversion efficiency	95%	95.2%		95.5%	

Communication and Grid Connection & Bypass					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Rated grid-connected power	4.5KW	6.5KW		9KW	12KW
Rated/Maximum Grid-connected Current	19.6A/22.5A	28.5A/32.5A		39.2A/45A	52A/60A
Load loss in the mains power mode	<30W			<40W	
Grid-connected voltage/ frequency range	184~253Vac;47.5-51.5Hz,57-62Hz				
Input voltage range	Single-phase; 90 - 280Vac (wide range); 170 - 280Vac (narrow range selectable)				
Input frequency range	40-65(Hz)				
Mains power startup voltage	120Vac				
Maximum input AC power	5.8kw	8.5kw		12kw	14.5kw
Maximum input AC current	32A	40A		55A	65A
Conversion time	< 20 ms				
Power factor	>0.99(Fully loaded); >0.9(Half-load loaded)				
Direct current component	<Rated current 0.5%				
Current harmonics	Total Harmonic <3%(Fully loaded); <5%(Half-load condition)				
Reactive power	< 30VA				
Grounding method	Protect the power supply case				

Generator AC parameters					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Rated input power	4.5KW	6.5KW		9KW	12KW
Rated input current	19.6A	28.5A		39.2A	52A
Input method	Single-phase				
Input voltage range	170~280Vac				
Input frequency range	40~65(Hz)				

Off-grid communication mode					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW -48V	9KW-48V	12KW-48V
Off-grid rated output power	4.5KW	6.5KW		9KW	12KW
Output voltage	Single-phase;220/230/240±5(Vac)				
Output frequency	50/60±0.1(Hz)				
Dual-output	The second load can be set to have start-up and shutdown modes: 1. The user can define the battery voltage for shutdown and startup. 2. The user can define the time intervals for start-up and shutdown.				
Output current peak coefficient	1:3				
Direct current component	<200mV				
Dynamic adjustment	Five power frequency cycles				
Parallel Equal current	Not supported		Imbalance degree<2%		
Voltage harmonic	<3%				

Communication function					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Parallel operation	Not supported		Supported		
WIFI	No built-in Wi-Fi, but can be connected with an external Wi-Fi module.		Built-in Wi-Fi + Bluetooth module		
Remote control	Not supported		Bluetooth		
Human-machine interface	Customized LCD 2.5-inch		Customized LCD 4.3-inch		
Dry connection point	Start the generator and you can set the battery voltage point for starting.				
Anti-backflow	External CT interface (optional)				

Protection function					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Input overvoltage protection restoration	280Vac				
Input overvoltage protection recovery	270Vac				
Input under-voltage protection	90Vac (wide range); 170Vac (narrow range)				
Input under-voltage protection recovery	100Vac (wide range); 180Vac (narrow range)				
Overload protection	1s@≥150% load; 30s@125%~150% load; 60s@110%~125% load				
Output short-circuit protection	Five power frequency cycles				
Inverter output low voltage protection	160Vac				
Fan failure protection	It has a fan failure protection function. When any fan fails, the power module will not output.				
Island Protection	Yes				
Over-temperature protection	Yes				

Others					
Inverter model	4.5KW-24V (ES)	6.5KW-48V (ES)	6.5KW-48V	9KW-48V	12KW-48V
Dimension(D * W * H)mm	390*310*105			465*355*114	
Net Weight	8.6kg			12.1kg	
Battery-free mode	Compatible with lithium battery activation and battery-free operation				
Protection level	IP20				
Dust cover/net	Standard configuration				
Noise	Under rated power conditions, < 50dB(ambient temperature 45°) During night with light load, < 40dB(ambient temperature 25°)				
Electromagnetic Compatibility	IEC-61000-6-1/2/3/4, EN55011,EN62920				
Safety regulations	IEC/EN-62109-1,IEC/EN-62109-2				

9.TROUBLE SHOOTING

Problem	LCD/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD and buzzer will be active for 3 seconds and then complete off.	Battery voltage is too low	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. 2. Battery polarity is connected reversed.	1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	The power-on icon of LCD flashes, and the status indicator icon flashes.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
Buzzer beeps continuously and the status indicator icon is always on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
	Fault code 02	Internal temperature of inverter component are over heated.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 03	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fan
	Fault code 06/58	Output abnormal	1. Reduce the connected load. 2. Return to repair center
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.
	Fault code 51	Over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 52	Bus voltage is too low.	
	Fault code 55	Output voltage is unbalanced.	
	Fault code 70	Three-phase phase sequence abnormal	Swap three phase L2 phase Master and three phase L3 phase Master