LAC SOLar

Hybrid Inverters

User Manual, Version 426

Features:

- Split-Phase in 3kW-12kW
- Integrated charge controller
- UPS and AC charger function
- Short-circuit protection against overload
- Under-voltage and over-temperature protection
- Over voltage, battery reverse connection (optional)
- High-low voltage protection
- AC Charging current 0-35A
- Configurable to battery or utility priority

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Contents

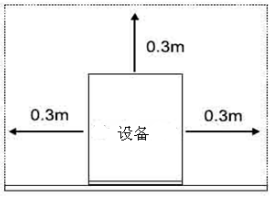
Installation Notice

Important Safety Instructions

Please save these instructions.

This manual contains important safety, installation and operating instructions for the inverter, please read the user manual carefully before using this product.

1) Check that the package is in satisfactory condition before opening. After opening packaging, please check that the inverter is in good physical condition.
2) If you find damage or missing parts, please do not turn on the machine and contact your dealer/place of purchase.
3) Please keep the packing box and materials in case an authorized return is needed.
4) This product is very heavy, please handle it carefully.
5) The inverter installation must be more than 30cm away from the wall, well ventilated, free of water, flammable gases and corrosives. As shown in the figure below:



6) The inverter should not be placed in a corner, on its side, or upside down. Keep away from heat sources. Avoid direct sunlight, and ensure that the front panel, rear panel and fan inlets are well ventilated.
7) The surrounding environment temperature should be between 0° C and 40° C.
8) If the machine is disassembled and used in a low temperature environment, water may condense. The inverter can only work if the inverter and components are dry inside and outside. Failure to keep the inverter dry (inside and out) puts you at risk for electrical shock.
9) Please install the inverter near the main input socket or switch. It is easy to unplug the main input or cut off the power supply in the event of an emergency situation.
10) The external battery should not be exposed. It should be installed in a battery cabinet.
11) The DC input between inverter should be short as possible.
12) Do not stack anything on top of the inverter.
13) When the load is connected to the inverter, the load must be turned off before wiring, the inverter should be connected to a socket with over current protection, and the machine should be safely grounded.
14) The power outlet should be safely grounded.

15) If you need to make the inverter have no output, you must turn off all switches first, then turn off the main power supply. Whether the inverter has input or not, turning off the inverter alone does not ensure that the internal parts do not have power.
16) It is not recommended to replace the battery individually. When replacing, you should follow the battery supplier's operating instructions.
17) Before replacing the battery, you must cut off all power connected to the machine: main switch, battery switch, etc.
18) Take off your body any and all metal objects such as rings and watches.
19) Use tools with coated handles. Do not put tools or other metal objects on the battery, directly in your hand.
20) It is normal for a small spark to occur when connecting the battery cable, this will not harm you or the inverter.

Inverter Safety

1) This inverter is suitable for battery banks ONLY.
2) Always make sure inverter is in OFF position and disconnect all AC and DC connections when working on any circuit associated with the inverter. NEVER connect the AC output of the unit directly to an electrical breaker panel/load center which is also fed from the utility power/generator. When connecting battery terminals, ensure the polarity of the battery connections is correct. Incorrect polarity may cause permanent damage to the unit. Be careful when touching bare terminals of capacitors as they may retain high lethal voltages even after power is removed.

Battery Safety

1) Do NOT let the positive (+) and negative (-) terminals of the battery touch each other.
2) Use sealed lead-acid, flooded, gel, AGM, or lithium batteries which must be deep cycle.
3) Explosive battery gases may be present while charging. Be certain there is enough ventilation to release the gases.
4) Be careful when working with large lead acid batteries. Wear eye protection and have fresh water available in case there is contact with the battery acid.
5) Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high of an equalizing charge or too long of one may cause damage. Please carefully review the specific requirements of the battery used with the system.

Installation Safety

1) The unit should be installed in a well-ventilated, cool and dry environment. Make sure the fans of the unit and the ventilation holes are not blocked.
2) Do not expose the unit to rain, moisture, snow, or liquids of any type.

Product Key Features

1) Suitable for unstable/often off main power, and important equipment that requires backup power.
2) This product adopts high-precision DSP control chip, precise detection circuit, advanced control technology.
3) Utilizes intelligent temperature-regulating fan, efficient heat dissipation, extending system life.
4) Operates with pure sine wave output with multiple working mode options.
5) Includes multiple electronic protections: short circuit protection, overvoltage and under voltage protection, overload protection, overheat/short circuit automatic restart (automatic restart three times).
6) Has wide frequency and wide voltage input that can be used for diesel/gasoline generator input.
7) 3-Stage battery charger with configurable charging current.
8) 8 pre-Set battery voltages including lithium; User-defined option.

Introduction to Working Mode

Work mode	Description
1) Main priority	When the main power is available, the main power supplies power to the load, and when the main power is off, the battery will supply power to the load and charging to battery.
2) Energy saving mode	When the inverter is in battery priority mode and the output load is less than 1%-10% of the power (set by the P7, 10% default), the AC output will be turn off, the inverter restarts every 1 minute and checks whether the load is greater than the set power. When the connected load is greater than the minimum setting, the inverter restarts output. This function reduces the battery loss and extends the battery backup time.
3) Battery priority mode	The battery supplies power to the load. When the battery voltage is lower than the set battery voltage (voltage set by PA item), it uses main power to supply power to the load. When the battery voltage is restored, the battery will supply power to the load again (when battery power is low or PV power is off the inverter uses main power charging for battery or not set by PC).
4) Main priority unattended mode	Inverter automatically turns on when connected to main power or battery voltage is normal (excluding the first time the inverter is used). When the battery discharge voltage is lower than battery voltage as set by F4 (F4: sets the battery

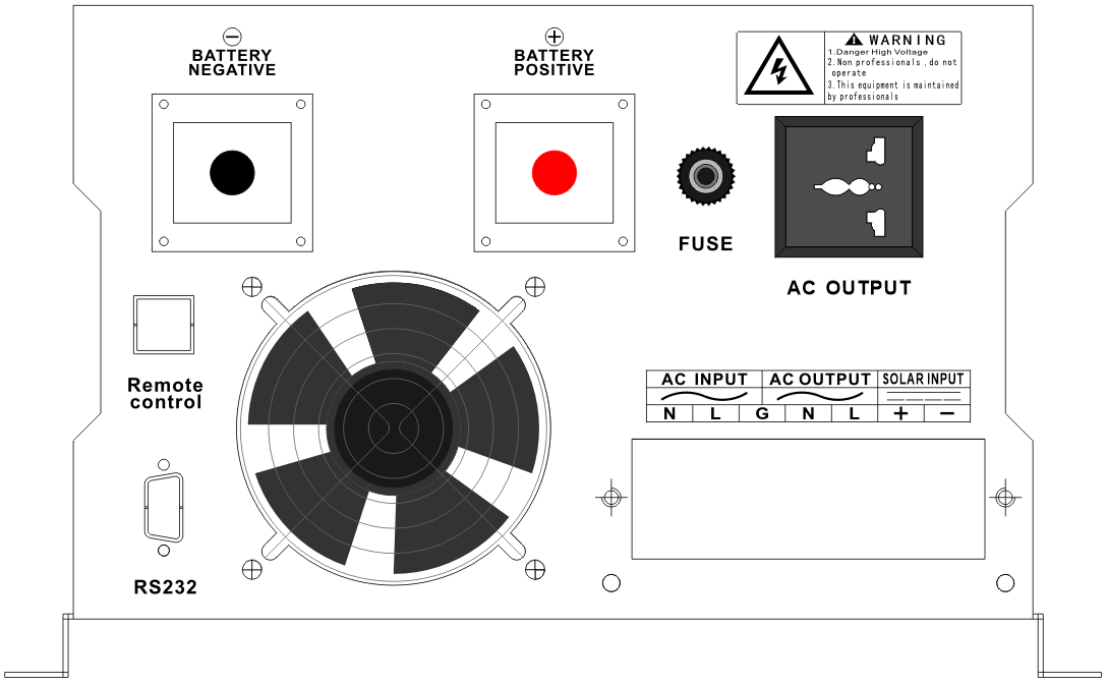
	to low voltage power), the power will be turned off.
5) Battery priority unattended mode	When the battery voltage is normal the inverter automatically turns on and battery supplies power to the load. When the battery is low voltage, main power supplies power to the load. When the battery is discharged and initiates battery low voltage shutdown (PL setting), the inverter enters standby and waits for the main power or solar charging to battery. When the battery voltage is restored (PN setting) the inverter automatically turns on, but when the battery discharge voltage is lower than battery voltage (set by F4), power will be turned off.

Outward Appearance

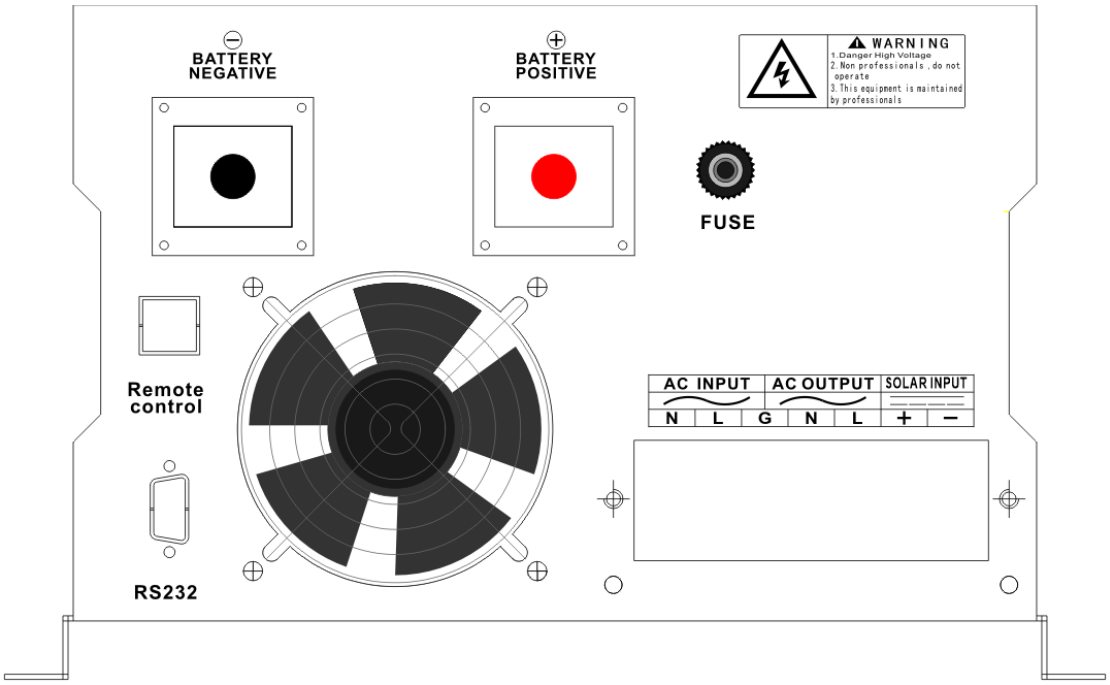
Front Panel

Back Panel

1-3KW



4-6KW



DC Wiring

WARNING DC wiring not following the minimum DC requirements will cause irreversible damage to the unit.

CAUTION Be careful of the positive and negative poles. Reversing the poles might cause permanent damage to the inverter and it will blow the internal fuse.

NOTE Damage to the inverters due to reverse polarity is NOT covered by warranty.

NOTE The input terminals of the inverters have large capacitors connected to them. Once a positive and negative wire are connected to the terminals, it will complete the circuit, and commence drawing a heavy current momentarily. As a result, there may be a sparking that occurs even if the inverter is in the off position. To minimize sparking, it is recommended that the user have the appropriate size wire feeding into the inverters and/or install an external fuse leading into the inverter.

WARNING To prevent accidental shock, ensure all sources of DC power (i.e., batteries, solar, etc.) and AC power (utility power or AC generator) are de-energized (i.e., breakers opened, fuses removed) before proceeding.

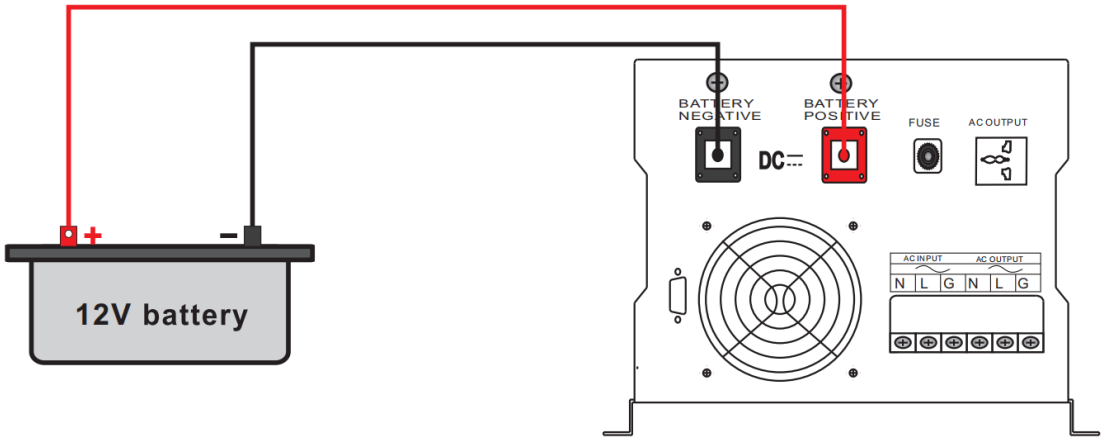
1. Unscrew the screw terminals along the edge of the side plate.
2. Gently remove DC side plate to expose DC terminals.
3. Connect the positive and negative DC cables to their respective terminals and run them through the side panel.

WARNING The terminals must be clean to reduce the resistance in the cable connection. A buildup of dirt or oxidation may eventually lead to the cable terminal overheating during periods of high current draw.

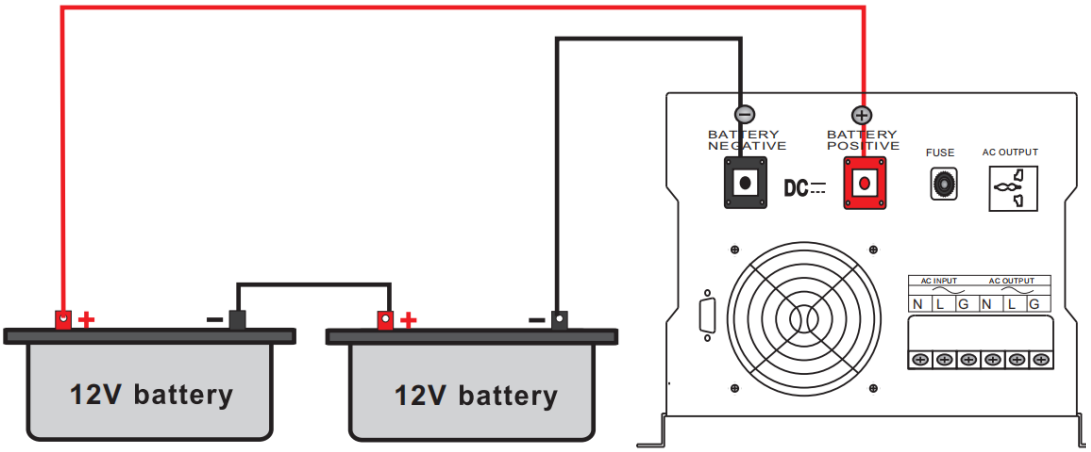
When installing DC cables, the following is recommended:

1. Battery positive and negative cables should be as close to the battery as possible to minimize voltage loss and other possible effects.
2. Tie, tape, or twist cables together to reduce self-inductance.
3. Install all overcurrent devices on the positive cable.

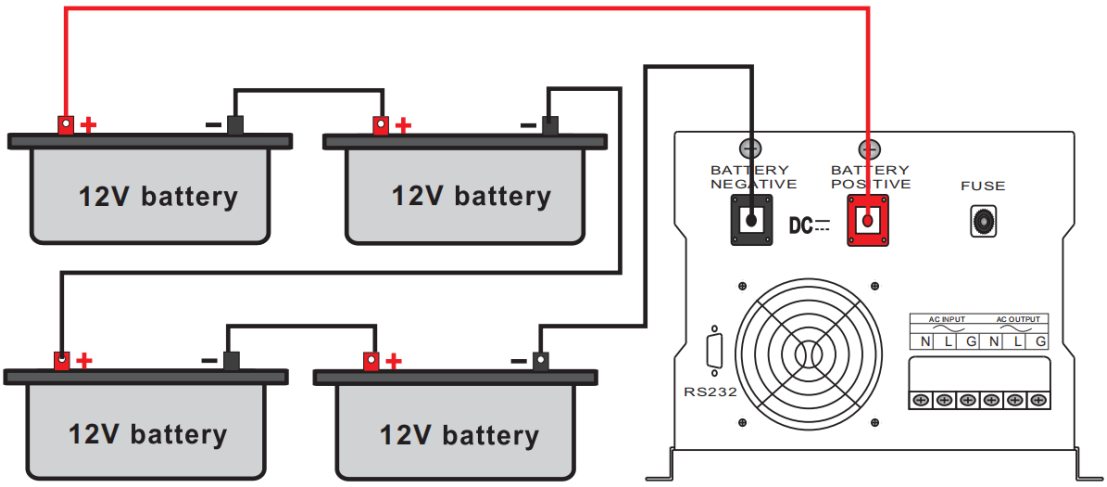
12V Connection Diagram



24V Connection Diagram



48V Connection Diagram



AC Wiring

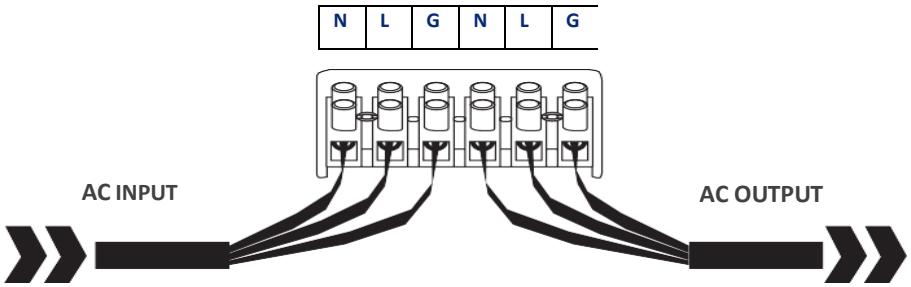
CAUTION Avoid switching on the inverter with the load (electronic devices) already switched on. This may trigger an overload since some electronic devices have an initial high power surge to start.

CAUTION When switching off the inverter, turn off the electronic devices first. Although the inverter is off, the capacitors will still have a charge, so the DC and AC terminals must be disconnected if altering the circuitry.

CAUTION To prevent accidental shock, ensure all sources of DC power (i.e., batteries, solar, etc.) and AC power (utility power or AC generator) are de-energized (i.e., breakers opened, fuses removed) before proceeding.

1. Remove the AC Terminal block.
2. Make note of the AC Input terminals from left to right (Neutral, Live, Ground) and the AC output terminals from left to right (Neutral, Live, Ground).

* If you want to connect the inverter to a diesel generator or a gasoline generator, please follow these steps:

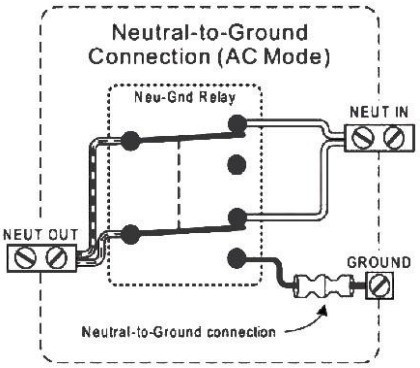


1. Turn on the generator, after it works stably, connect generator output to the inverter input (confirm the inverter is no-load), then turn on the inverter as normal. After the inverter starts working, connect the load.
2. Recommended generator capacity is 2-3 times larger than the inverter.

WARNING The AC input must **NEVER** be connected to the AC output as irreversible overload or damage may result.

WARNING AC Output should **NEVER** be connected to public power or a generator.

This cannot be disabled.



Automatic Transfer Relay

The inverter chargers are equipped with a 30A transfer relay switch that switches between Inverter and Standby mode depending on availability of AC input power. If AC is present, the transfer relay bypasses up to 30A of the incoming AC power through the inverter to power the AC loads on the inverter's output. In the event AC power gets disconnected, the inverter will power the loads through the battery bank.

WARNING The inverter's internal AC transfer relay contacts are rated for 30 amps (each leg), the pass-through current for relay contact must be no greater than 30 amps or damage to this relay may occur.

Dry Contacts for Auto Generator Start

- To use this to function, an auto start controller must be installed on the generator. There are three contacts; left to right: Normally Closed (NC) Common (COM), Normally Open (NO).
- When main power is off the inverter uses battery power to supply the load, dry contact auto start.
- Do not store units with auto gen start feature enabled. Generators exhaust dangerous fumes when running.

Auto Restart Temperature Fault

The operating temperature range for the inverter series is 0C°-40C° / 32F° - 104F°. If internal power components begin to exceed their safe operating temperature levels, the inverter shuts down to protect itself from damage. You will need to manually restart when the inverter cools down.

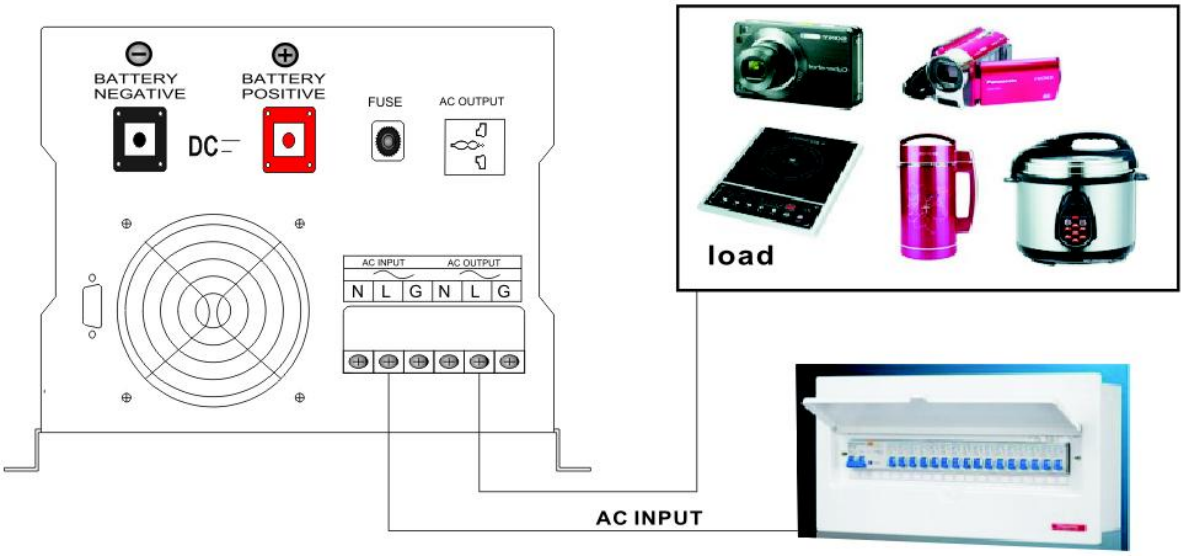
Fan Operation

By default, when first powering the unit the fans and alarm will run for approximately 1 minute as part of the start-up routine. Other fan ON/OFF operation parameters are listed below:

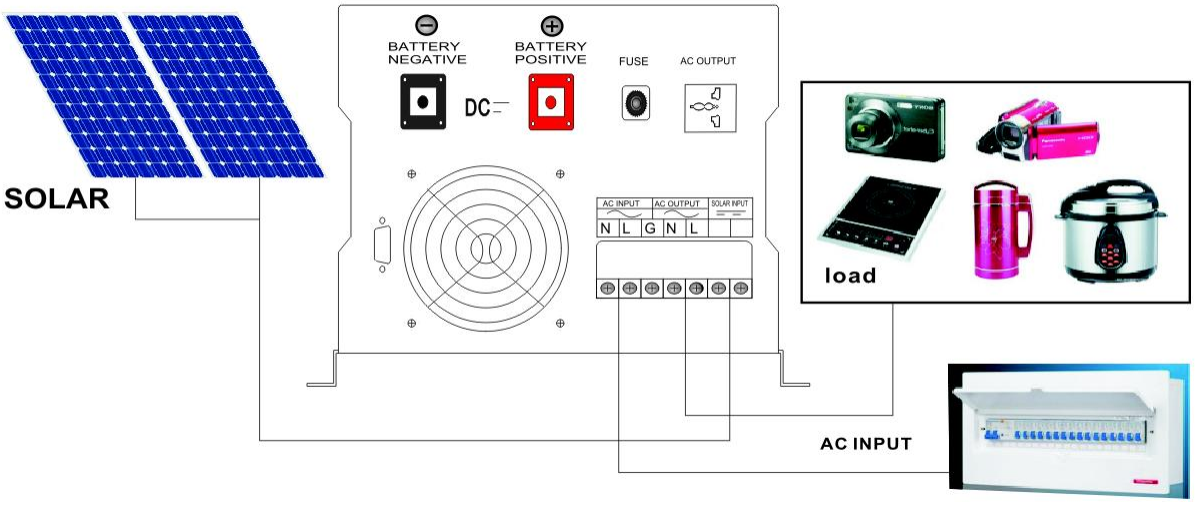
Condition	Turn on Condition	Turn off Condition
Inverter Charger Uptime	Uptime ≤ 1 minute	Uptime > 1 minute
Inverter Mode Load Percentage	Load ≥ 35%	Load < 35%
DC Input Current	Current ≥ 10A	Current < 6A
Inverter Heat Sink Temperature	Temperature ≥50℃	Temperature < 45℃

Connection Diagrams

Inverter Connection Diagram

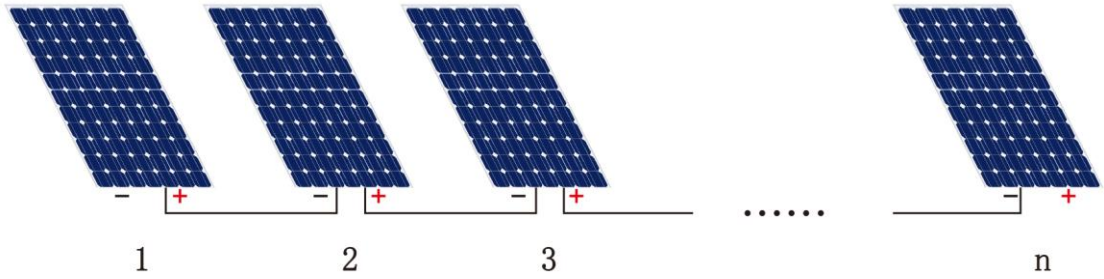


Hybrid Inverter with Solar Controller Connection Diagram



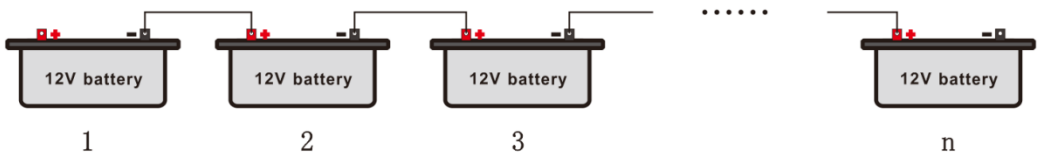
Solar Panel and Battery Connection Diagram

Solar Panels in Series



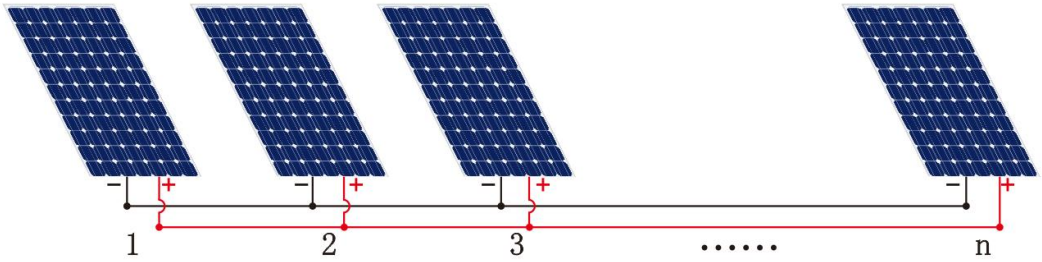
Solar panel voltage = 1 + 2 + 3 + ... n, the voltages of each solar panel are added together.

Batteries in Series



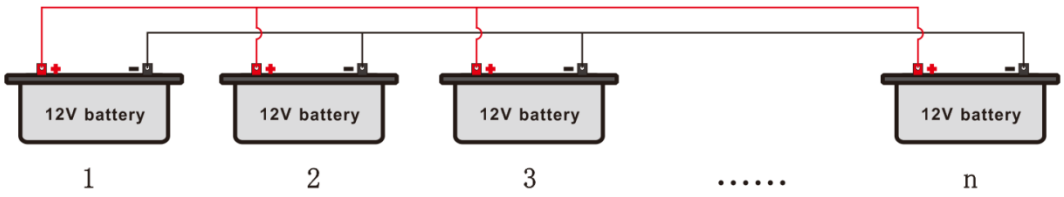
Battery voltage = 1 + 2 + 3 + ... n, the voltages of each battery are added together.

Solar Panels in Parallel



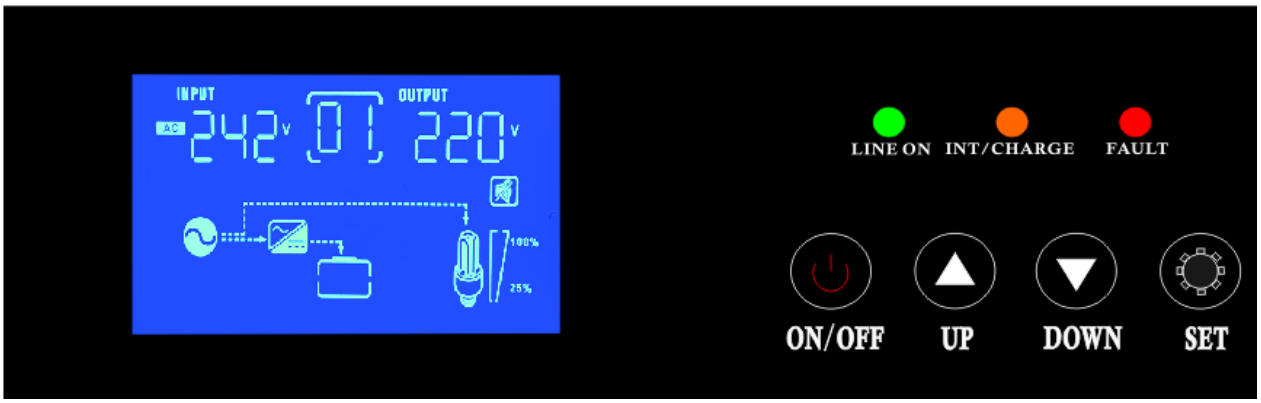
Solar panel voltage = 1 = 2 = 3 = ... n, the voltage of 1PCS solar panel (the voltage of each panel must be the same to be connected in parallel).

Batteries in Parallel



Battery voltage = 1 = 2 = 3 = ... n, the voltage of 1PCS battery (the voltage of each battery must be the same to be connected in parallel).

LED Indicator and LCD Introduction



LED Indicator

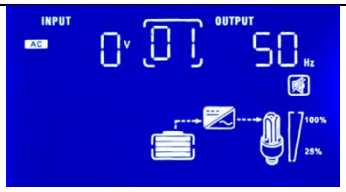
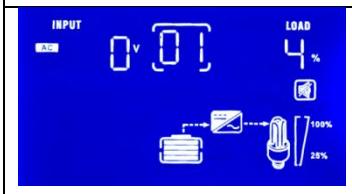
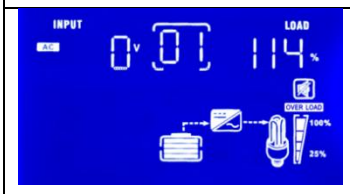
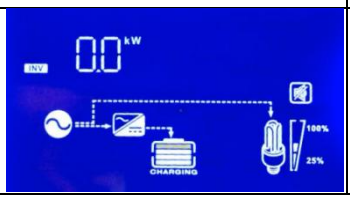
Green Light	In the main working mode, the LED light is on when the main is working, the green light off when the inverter is inverting.
Yellow Light	1. Solid Battery is fully charged or inverter mode In the 03 battery priority mode, the PC menu determines the light is on or off during charging. 2. Flashing Battery is charging main charging indicator. (It will turn off when charging is completed).
Red Light	1. Flashing When the overload is more than 105%, lighting when the overload is more than 110%, lights flashing when the battery is low. 2. Solid When the inverter fails.

ON/OFF	Hold 3-5 seconds to turn on the inverter and buzzer will sound. Hold 3 seconds to turn off the inverter.
UP DOWN	Press UP or DOWN to check LCD display parameters.
SET	1. Press3-5 seconds to enter the inverter setting page parameter. 2. Press to confirm setting in parameter setting.

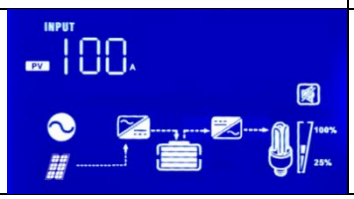
LCD Information

Load Information				
OVER LOAD	Indicates overload.			
100% 25%	Indicates the load level by 0%-25%, 26%-50%, 51%-75%, 76%-100%			
	0%-25%	26%-50%	51%-75%	76%-100%
				
Mode Operation Information				
	Indicates unit is connected to shore power			
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.			

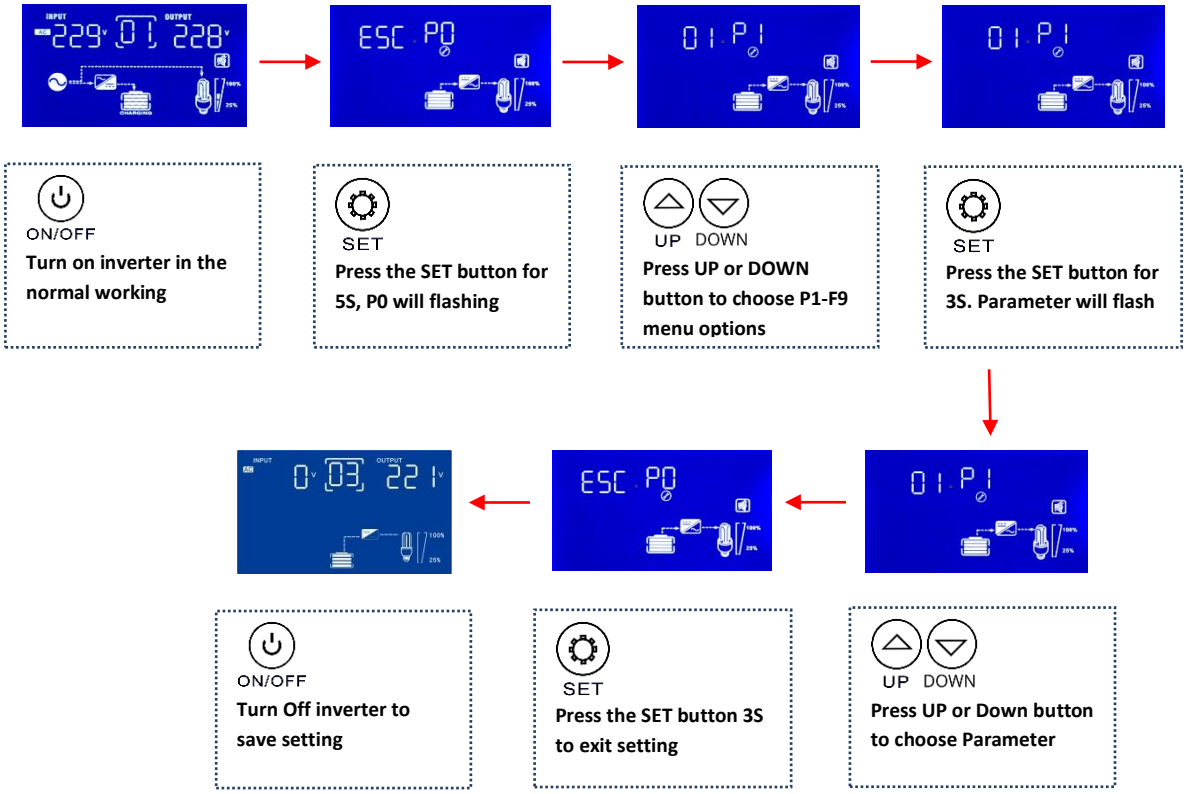
Battery Information	
Battery voltage	Battery capacity percentage
14.00V	100%
13.30V	100%
13.00V	90%
12.60V	80%
12.40V	70%
12.20V	60%
12.00V	50%
11.80V	40%
11.60V	30%
11.40V	20%
11.20V	10%
10.00V	0%

	No Inverter mode: No main input, only connect to battery		Main mode (battery capacity icon flashing when AC charging)
	03: Battery priority mode, main status (main icon will flash)		50Hz/60Hz：Frequency display (automatic)
	LOAD***%: Load % display		LOAD ***W: Load power display
	Overload display (Overload icon will flash)		BATT***%: Battery % display
	BATT **V: Battery voltage display		INV0.0KW: Inverter total output power display

Hybrid Solar Input Information

	Solar input with main		Solar input without main
	PV ***V：Solar input voltage display		PV ***A Solar input current display

Parameter Setting



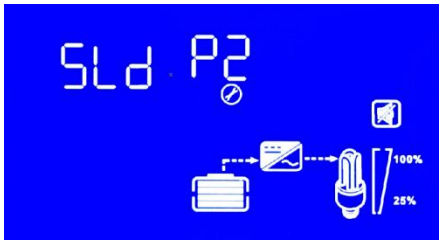
1. When the inverter is in the normal working mode press the **SET** button for 5S to enter the setting menu. Enter the setting menu, LCD shows the working mode icon is flashing.
2. Press the **UP** button or the **DOWN** button to operate the menu options. The working mode icon will change depending on the operation.
3. When you have chosen your desired menu option, press the setting button **SET** 3S to enter the setting parameters (at this time the working mode icon is not flashing, in the left parameter

item is flashing).

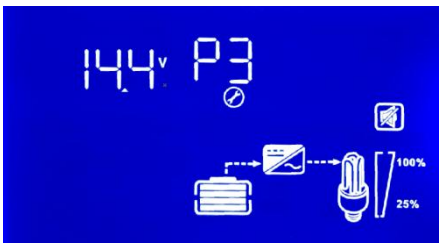
4. Press the **UP** or **DOWN** button to select the setting parameter, press the STE button 3S to exit the setting (at this time the working mode icon flashes, and the parameter icon does not flash.)
5. To exit the mode **(ESC)**, press the **SET** button 3S to enter the set parameters and then press the **SET** button 3S to exit the setting menu and save the settings.
6. Press the **ON/OFF** button to save new parameters.

P0: Set work mode menu:
Press the SET button 3S to enter the setting menu, the menu selection icon is flashing. If need to save and exit, press the SET button 3S to save and exit.

P1: work mode setting:
01: Main priority mode
02: Energy saving mode
03: Battery priority mode
04: Main priority Unattended mode
05: Battery priority Unattended mode

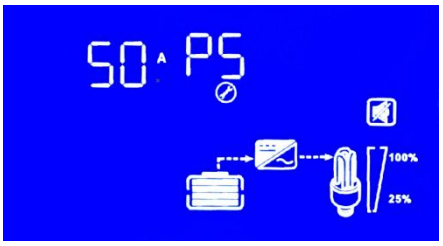


P2: Battery type and charging voltage setting:
SLD: lead-acid battery (default), GEL: gel battery, LI: lithium battery, USE: user mode. Select USE user mode to adjust battery voltage in P3 and P4 menus. If you do not select the USE user mode, the P3 and P4 menus will not appear.

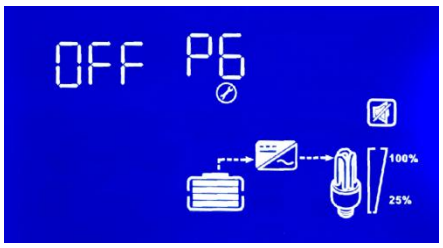


P3: Battery voltage uniform charge setting:
12.5V ～ 15.5V (single) can be set

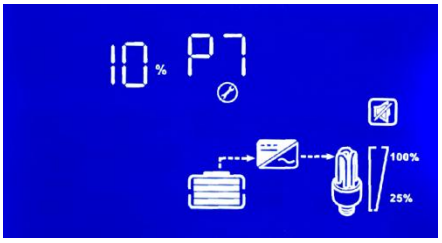
P4: Battery voltage floating charge setting:
12.5 ～ 13.9 (single) can be set



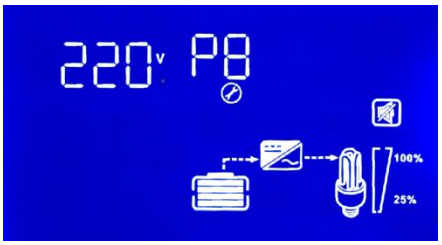
P5: Maximum main charging current setting:
(Default 300W:10A, 500W-1500W:15A,
2000W:20A, 3000W-12000W:50A) 5A, 10A,
20A, 30A, 40A, 50A



P6: Buzzer sound setting:
ON: Turn on the buzzer, OFF: Turn off the buzzer
(overvoltage, under voltage, overload, over
temperature, except faults)



P7: Energy saving mode AC output setting:
(10% default), in (USE) user mode, can be adjusted up
and down 1.0-10% / 1%

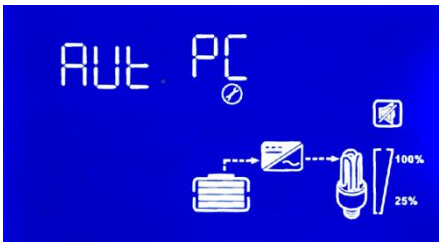


P8: Inverter output voltage setting:
220V default, (208V, 210V, 220V, 230V, 240V)

P9: AC Output frequency setting:
50Hz default (50Hz, 60Hz)

PA: battery priority mode battery under voltage to main voltage setting:
10.5V default, (single section: 10.5V, 10.6V, 10.7V, 10.8V, 10.9V, 11.0V, 11.1V, 11.2V, 11.3V, 11.5V)

PB: battery priority mode, when battery voltage is restored inverter from utility power conversion inverter voltage:
13.2V default, (single battery: 13.2V, 13.3V, 13.4V, 13.5V, 13.7V, 13.9V, 14.1V, 14.4V)

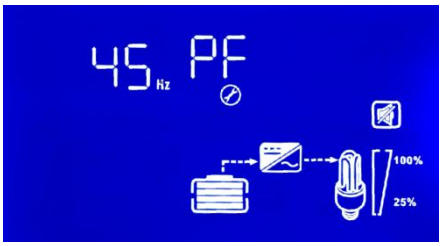


PC: battery priority mode, main is charged or not:
AUT default, ON (battery priority with AC charging), OFF (battery priority without AC charging), Automatic detection solar priority or utility power priority, select solar charging, the main will charge when the solar charging current is small. The specific charging method is as follows:

The relationship between solar charging and main charging:	
Solar charging current	Main charging current (* maximum set charging current)
40A	0%
30A	20%
20A	40%
10A	60%
5A	80%
0	100%

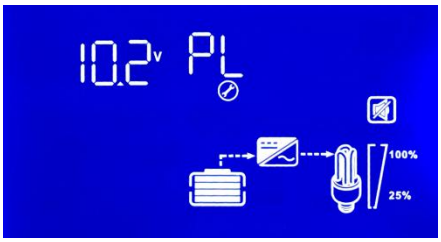
Pd: AC input lowest voltage setting:
Default 160VAC, (140V, 150V, 160V, 170V, 180V)

PE: AC input highest voltage setting:
Default 135VAC (110VAC) 275VVAC (220VVAC)
Range: 110VC :130VAC-145VAC
220VAC: 260V-,290VVAC)



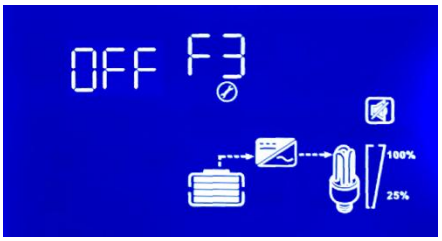
PF: AC input minimum frequency setting:
Default 45Hz, (40Hz, 41Hz, 42Hz, 43Hz,
44Hz, 45Hz

PH: AC input maximum frequency setting:
Default 63Hz, (63Hz, 64Hz, 65Hz)



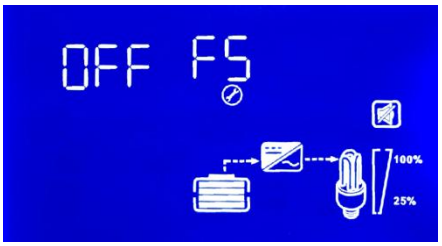
PL: Battery low voltage shutdown setting:
(must be: Pn>PL>F4)
10.2V default,9.5V ～ 12.0V (single) can be set

Pn: unattended mode, battery under voltage restores the startup voltage setting: (must be: Pn>PL>F4)
12.4V default,11.0V ～ 13.0V (single) can be set

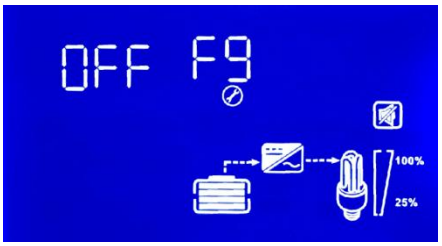


F3: Generator mode setting:
Default OFF (ON \ OFF)

F4: Unattended mode battery voltage low power off power point setting: (must be: Pn>PL>F4)
Default single section 10.0V (9.0V-12.0V can be set)



F5: Fan failure detection settings:
Default single block OFF (ON, OFF)



F9: Negative temperature detection setting:
The default OFF, (ON, OFF) When the temperature is below -15 ℃ and using the machine, please turn on this setting (ON)

Fault Code and Repair

This icon 

will flash when there is a fault.

Cause	Buzzer or indicator	Fault cause	Solution
E01		Battery low voltage	Check if the battery is broken or not
E02	1 long 2 short B-BB shout, red light is off	Battery overvoltage	Check if the battery is broken or not
E03	Buzzer urgent shouting, the red light lighting	Battery low voltage	Check if the battery is broken or not
E04	Intermittent ringing, red light is off	Transformer secondary line reverse connection	Restart or contact the supplier
E05	Keeps shouting, red light keeps lighting	Inverter startup failure	Check if output has short circuit, overload or not
E06	Keeps shouting, red light keeps lighting	Output for short circuit	Check if output has short circuit, overload or not
E07	Keeps shouting, red light keeps lighting	Output voltage is too low or overloaded	Check output voltage and load
E08	Keeps shouting, red light keeps lighting	Temperature is too high	Check if the fan is working
E09	Output low voltage		
E10	----------	----------	----------
E11	Keeps shouting, red light keeps lighting	Low temperature or temperature control failure	Check that the temperature control lines are not open circuit, dropped
E12	----------	----------	----------
E13	----------	----------	----------
E14	Keeps shouting, red light off	Fan open circuit	Check that the fan is not open circuit, dropped
E15		Input relay short circuit	Tap the input relay to check it broken or not
ES0	Displayed when press the controller display page	Controller works well	Controller works well

ES3	Displayed when press the controller display page	Controller over current	Internal fault
ES4	Displayed when press the controller display page	Controller temperature high	Internal fault
ES5	Displayed when press the controller display page	Solar input overvoltage	Check solar input voltage and correct number of solar panels
ES6	Displayed when press the controller display page	Solar input low voltage	Check solar input voltage and that solar panels don't have damage

Buzzer Alert

Buzzer sounds:

1) Inverter: A beep sounds every 10 seconds. 10S --- 10S ---
2) When the battery voltage is low, one sound per second. --1S--1S--
3) When the battery is high voltage: three sound every four seconds, one long and two short. 4S ------
4) Overload:
   > 110% long sound. ----
   > 105% sound every two seconds. 2S --- 2S ---
5) Temperature control failure: 2 sound every 4 seconds 4S-- --4S---
6) The temperature is too high: sound every two seconds. 2 --- 2 ---
7) Fan abnormality: long sound ---

Datasheet

Model		H1KW	H1.5 KW	H2KW	H3KW	H4KW	H5KW	H6KW	H8KW	H10 KW	H12 KW
Input	Rated Capacity	1KW	1.5KW	2KW	3KW	4KW	5KW	6KW	8KW	10KW	12KW
	Peak Power	3KW	4.5KW	6KW	9KW	12KW	15KW	18KW	24KW	30KW	36KW
	Commercial Power Range (VAC)	110V AC:83V-137V / 120V AC: 90V-150V 220V AC: 165V-275V/240V AC: 173V-287V							220V AC: 165V-275V 240V AC: 173V-287V		
	Main Input Frequency Range	45-65HZ									
Solar	MPPT/PWM Solar Controller	30A/50A/60A/80A							80A/100A/120A		
	Solar Input	360W/720W/1440W/1920W/2400W/2880W/3840W							3840W/4800W/7680W/ 9600W		
	PV Input Voltage Range	14V-130V DC (12V SYSTEM)/38V-130V DC (24V SYSTEM)/ 72V-180V DC (48V SYSTEM)/144V-280V DC (96V SYSTEM)									
Battery	Type	AGM, Gel or Lithium									
	DC Voltage	12V/24VDC			24V/48V DC				48V/96V DC		
	DC Input Voltage Range	12V DC: 10.5-15.0V DC; 24V DC: 21-30V DC; 48V DC: 42.0-60.0V DC; 96V DC: 84-120V DC									
Charger	AC Charging	5-35A (Custom set 40A 50A Options)									
	Capable of Starting Electric Motor	0.5HP	1HP		1.5HP	2HP			3HP		
	AVR Voltage Range	110/120/220/230/240±10% (Autosensing)									
	Battery Over Voltage Protection	12V DC: 16.7V DC / 24V DC: 33.4V / 48V DC: 66.8V									
	Battery Over Voltage Alarm	12V DC: 15V DC / 24V DC: 30V / 48V DC: 60V									

Output	Battery Under Voltage Protection	12V DC: 10.5V DC / 24V DC: 21V / 48V DC: 42V									
	Battery Low Voltage Protection	12V DC: 10V DC / 24V DC: 20V / 48V DC: 40V									
	Transfer Time	Typical: 5ms (including detection time)									
	Temperature Protection	≥85°C alarm, ≥90°C machine shut off									
	Overload	IPS automatically shuts down if overload exceeds 120% of normal value for 10 seconds, IPS automatically resumes work if overload comes to rated load									
	Waveform	Pure Sine Wave									
	Frequency	Commercial power supply: shared frequency with the commercial inversion state: 60/50±0.5									
	Output Frequency Range (Electric supply mode)	Tracking automatically									
Temper-ature	Operating Temperature	0-70°C									
	Thermal Method	Cooling fan is intelligent control ≤42°C fan rotates slowly to ≥ 45°C fan rotates fast									
Physical Size	Dimensions (mm)	510*325*215				645*325*215			765*320*250		
	Weight (kg)	16	19	20	27	35	37	41	57	60	62