Battery system home storage series

User Manual

ProductName: 48V100Ah Lithium Battery

ProductModel: SG48100P

ProductSpecifications: 51.2V 100Ah

CompilationDate: 2022-12-12

Catalogue

1. Document description

This specification covers the performance indexes, technical requirements and safety issue of the 48V100Ah

2. Definition of Terms

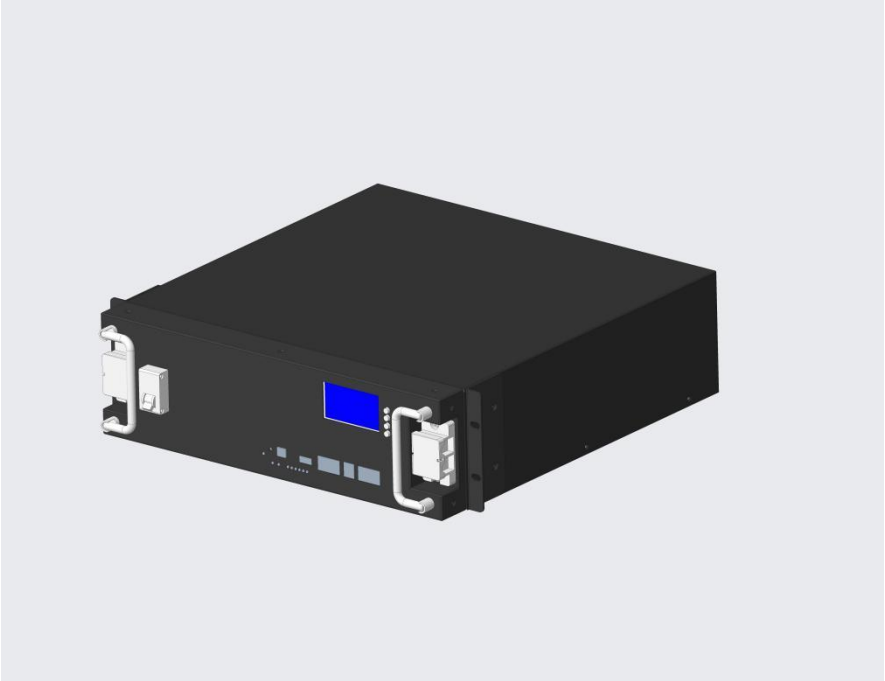
BMS	Battery Management System
DOD	Depth Of Discharge
EOL	End Of Life
OCV	Open Circuit Voltage
SOC	State Of Charge
SOH	State Of Health
EMC	Electro Magnetic Compatibility
Nominal voltage	Appropriate voltage approximation to identify or identify a cell or an electrochemical system.
Capacity	(The amount of power a battery can provide when fully charged under specified conditions. Usually expressed in Ah.)
Energy	The energy that can be provided by a fully charged battery under specified conditions. Usually expressed in Wh or kWh.
Unit	"V" (Volt) (Voltage unit) "A" (Ampere) (Current unit) "Ah" (Ampere-Hour) (unit of charge) "Wh" (Watt-Hour) (electrical energy unit) "Ω" (Ohm) (resistance unit) " °C" (degree Celsius) (temperature unit) "mm" (millimetre) (length unit) "s" (second) (Time unit) "kg" (kilogram) (Weight unit) "Hz" (Hertz) (Frequency unit)

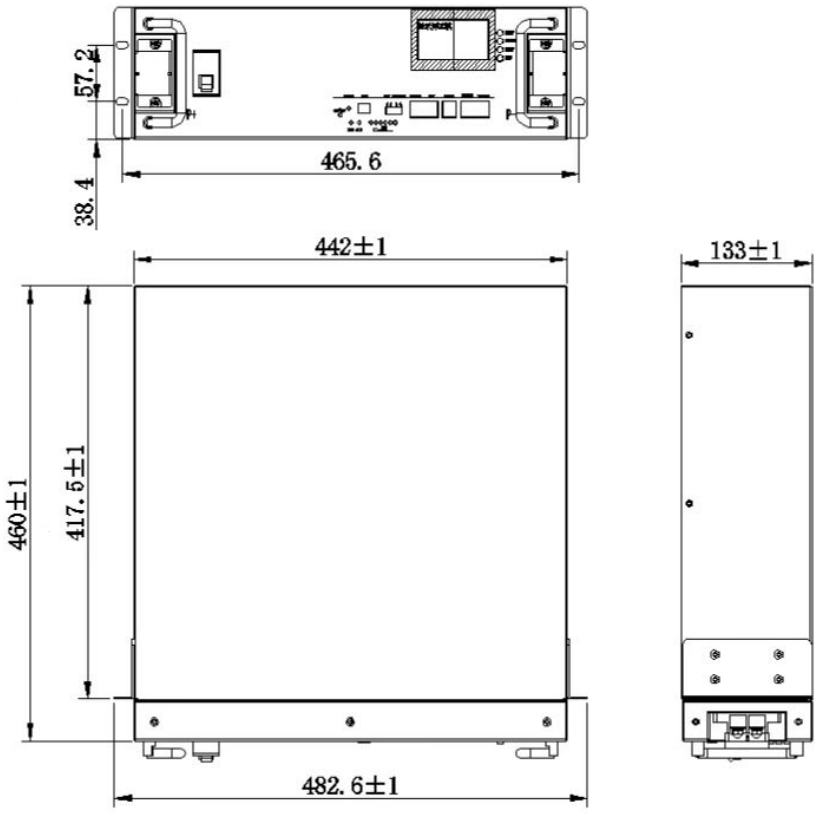
3. Battery system performance parameters

No.	Item	Technical parameter	Note
1	Battery Type	Lithium iron phosphate battery	/
2	Rated capacity	100Ah	@25°C±2，0.5C，100%DOD
3	Nominal voltage	51.2V	
4	Recommended charging voltage	54.5V	
5	Charging Limited Voltage	42V	
6	SOC working range	0~100%	Recommended range of use： 20%~95%
7	Standard discharge current	50A	

8	Maximum continuous discharge current	100A	
9	Standard charging current	50A	
10	Maximum continuous charge current	100A	
11	Maximum cut-off voltage for charging	57.6V	
12	Charge cut-off current	5A	0.05C magnification
13	Disharge cut-off voltage	43.2V	
14	PACK cycle life	≥7000	80%DOD 25℃±2℃, 0.5C charge/0.5C discharge
15	Thermal management method	Natural heat dissipation	
16	IP protection class	IP31 battery box	
17	Flammability rating	plastic parts UL94 V-0	
18	Total system mass	Around 43KG	
19	Battery system shell material	BLACK Q235A	Color can be customized
20	Shipping SOC	SOC45-55%	
21	Dimension（L*W*H mm）	☑442*460*133（3U）±1mm	
22	Design life	15 Year	
23	Parallel function	Supports up to 16 batteries in parallel	
24	Anti-theft function	sensor G-sensor anti-theft function	
25	Display function	English smart display	
26	Charging current limit function	Current limit 20A	Charging current limit can be set according to customer requirements
27	Communication mode	☑RS232	Communication mode can be set according to customer requirements
		☑RS485	
		☑CAN	
28	communication protocol	Support multiple protocols	Communication protocol can be set according to customer requirements
29	Storage ambient temperature	-10~+45℃	Recommended storage temperature：0~+30℃
30	Working temperature	Battery charging:0～45℃ Battery discharging:-20～ +60℃	
31	Relative humidity of working environment	≤95	Best Use Relative Humidity：≤85%

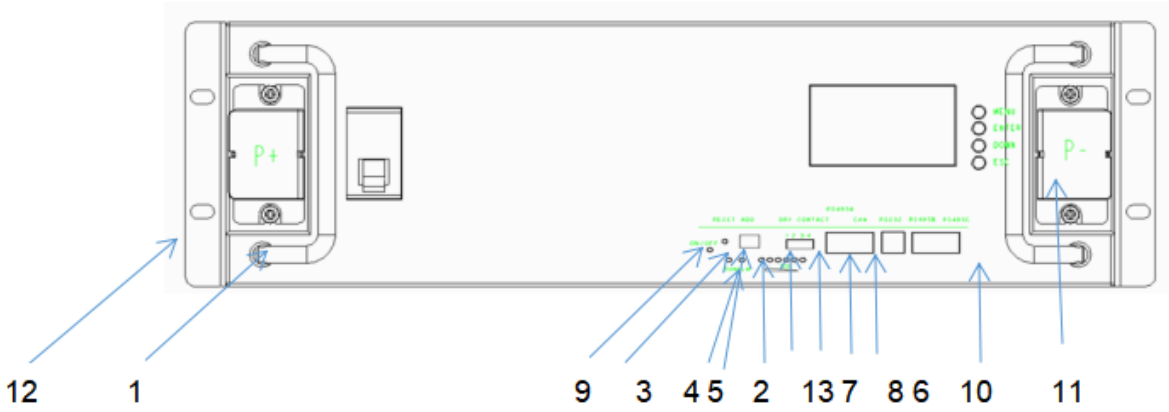
4. Outline and Structural Dimensions of Battery System





5. Definition of battery system interface

5.1. Panel Schematic

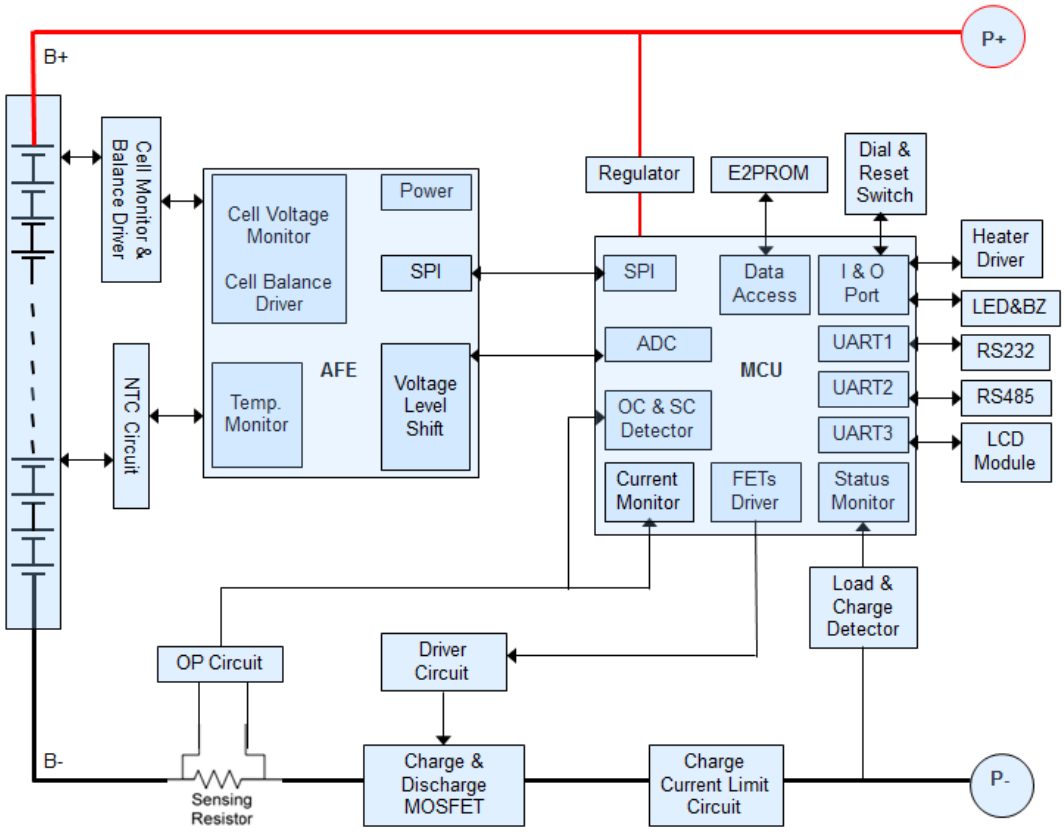


5.2. Module Panel Description

NO	Function definition	Function Description	Note
1	handle	Carrying handle	
2	SOC	Capacity status light	Six green LED lights to show the current charge of the lithium battery pack
3	ALM	Alert	Red LED light, normally off under normal conditions, always on under fault conditions, and a voice prompt
4	RUN	Run	Green light, always on when the product is running
5	ADD	DIP switch	Use 4 bit binary DIP switch (optional) to set address allocation when products are used in parallel,
6	RS232	RS232 communication	Uplink communication port, RS232 communication mode when uploading data, data content includes system parameters, system status and alarm information. The rate of 9600bps is generally used. Note: Wiring definitions are implemented in accordance with BMS product specifications
7	RS485	RS485 communication	RS485 communication method
8	CAN	CAN communic	CANcommunication method
9	RESET	Reset	When the product is in an abnormal state or in a hibernation state, the product can be restarted and woken up through the reset button to ensure the stable operation of the system
10	Main panel	Shell	Sheet metal thickness 1.5mm, galvanized frosted paint, color: black
11	Terminals	Input and output terminals	Battery positive and negative output terminals
12	Hanging ears	Mounting ears	The spacing is implemented according to the national standard
13	dry contact terminal	Load output port	example: definition: Dry contact 1-PIN1 to PIN2: normally open, closed during fault protection Dry contacts 2-PIN3 to PIN4: normally open, SOC<5%, closed for low battery alarm.

6. Functional block diagram

The functional block diagram is shown in the figure below



7. Battery Management System Specifications

7.1. Basic parameter settings

NO.	Indicator item		Factory default parameters	Is it possible to set	Note
1	Cell overcharge protection	Cell overcharge alarm voltage	3600mV	Can be set	
		Cell overcharge protection voltage	3650mV	Can be set	
		Cell overcharge protection delay	4.0S	Can be set	
	Single Overvoltage Protection Released	overcharge protection release voltage Cell	3380mV	Can be set	
		Capacity release	SOC＜96%	Can be set	
		Discharge release	＞1A		
2	Cell overdischarge protection	Cell over-discharge alarm voltage()	2700mV	Can be set	After 30 seconds of over-discharge protection, if it still cannot recover, it will enter low
		Cell over-discharge protection voltage	2500mV	Can be set	
		Monomer over-discharge protection delay	1.0S	Can be set	
	Cell over-discharge	Cell over-discharge protection release voltage	2800mV	Can be set	

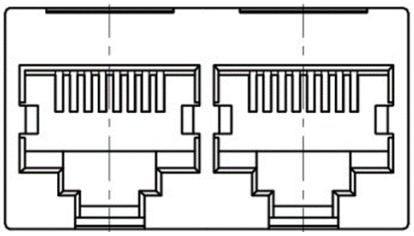
	protection released	(Release when charging)	Plug into the charger to activate		power consumption mode
3	Overall overcharge protection	Overall overcharge warning voltage	57.6V	Can be set	
		Overall overcharge protection voltage	58.4V	Can be set	
		Overall overcharge protection delay	1.0S	Can be set	
	Overall overvoltage protection released	Overall overcharge protection release voltage	54.1V	Can be set	
		Capacity release	SOC＜96%	Can be set	
		Discharge release	> 1A Discharge current > 1A		
4	Overall overdischarge protection	Overall over-discharge warning voltage	43.2V	Can be set	After 30 seconds of over-discharge protection, if it still cannot recover, it will enter low power consumption mode
		Overall over-discharge protection voltage	40V	Can be set	
		Overall over-discharge protection delay	1.0S	Can be set	
	Overall over-discharge protection released	Overall over-discharge protection release voltage	44.8V	Can be set	
		Release when charging	Plug into the charger to activate		
	Charging current limit function	Charging current limit	20A		
5	Charge overcurrent protection	Charge overcurrent 1 alarm current	105A	Can be set	Appearing 10 times in a row will lock the status and will no longer automatically release
		Charge overcurrent 1 protection current	110A	Can be set	
		Charge overcurrent 1 protection delay	1.0S	Can be set	
	Charging overcurrent 1protection released	Automatic release)	1min Automatically cancel after 1min		
		Discharge release	> 1A Discharge current > 1A		
6	Discharge overcurrent 1 protection	Discharge overcurrent 1 alarm current)	105A	Can be set	Appearing 10 times in a row will lock the status and will no longer automatically release
		Discharge overcurrent 1 protection current)	110A	Can be set	
		Discharge overcurrent 1 protection delay	1.0S	Can be set	
	Discharge overcurrent 1 protection released	Automatic release	1min Automatically cancel after 1min		
		Charge release	> 1A Charge current > 1A		
7	Discharge overcurrent 2	Discharge overcurrent 2 protection current	≥120A	Can be set	Appearing 10 times in a row will lock the status and will no longer automatically
		Discharge overcurrent 2 protection delay	100mS	Can be set	
	Discharge	Automatic release	1min		

	overcurrent 2 protection released		Automatically cancel after 1min		release
		charge release	> 1A Charge current > 1A		
8	Short circuit protection	Short circuit protection function	(Have)		
		Short circuit protection current	⩾350A		
		Short circuit protection delay	⩽300US		
		Short circuit protection released	When there is charging, the short circuit protection is released		
			After the load is removed, it will automatically disarm		
9	MOS high temperature protection	MOS over temperature alarm temperature)	90℃	Can be set	
		MOS over temperature protection temperature)	115 ℃	Can be set	
		MOS protection release temperature)	85℃	Can be set	
10	Cell temperature protection	Charging low temperature warning temperature)	0℃	Can be set	
		Charging low temperature protection temperature)	-5℃	Can be set	
		Charging low temperature protection release temperature	0℃	Can be set	
		Charging high temperature alarm temperature	50℃	Can be set	
		Charging high temperature protection temperature)	55℃	Can be set	
		Charging high temperature protection release temperature	50℃	Can be set	
		Discharge low temperature alarm temperature	-15℃	Can be set	
		Discharge low temperature protection temperature	-20℃	Can be set	
		(Discharge low temperature protection release temperature	-15℃	Can be set	
		Discharge high temperature alarm temperature	60℃	Can be set	
		Discharge high temperature protection temperature	65℃	Can be set	
		Discharge high temperature protection release temperature	55℃	Can be set	
11	Ambient temperature alarm	Ambient low temperature alarm temperature	-15℃	Can be set	
		Ambient low temperature protection temperature	-20℃	Can be set	
		Ambient cryogenic protection release temperature	-15℃	Can be set	
		Ambient high temperature alarm temperature	65℃	Can be set	
		Ambient high temperature protection temperature	75℃	Can be set	
		Ambient high temperature protection release	65℃	Can be set	

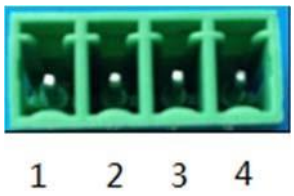
		temperature			
12	Current consumption	Self-consumption current during operation	≤45mA（（with display）		
			≤40mA(without display)		
		Low power mode current	≤200μA		
13	Equalization function	Equalization turn-on voltage	3500mV	Can be set	
		Open differential pressure	30mV	Can be set	
14	Capacity default settings	Low battery warning	SOC＜5%	Can be set	(No alarm when charging)
		Full capacity setting	100AH	Can be set	
15	Sleep function	Sleep voltage	3150mV	Can be set	
		Delay	5min	Can be set	
16	Differential pressure alarm	Overpressure alarm	800mV		
		Overpressure recovery	500mV		
17	Cell failure protection	Monomer differential pressure	＞1V Voltage difference>1V		Charge and discharge are not allowed
18	Full charge judgment	Full charge voltage	56V		
		Cut off current	2A		

7.2. Interface

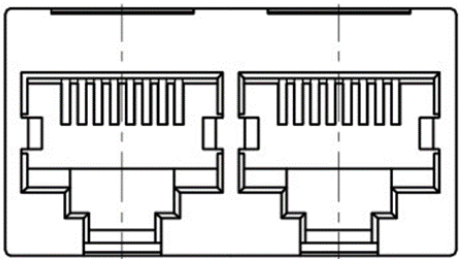
7.2.1. Interface diagram



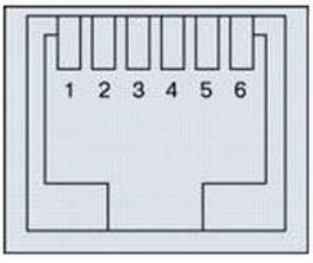
CAN and RS485 interface



dry contact



Parallel communication port



RS232 communication interface

7.2.2. Interface Definition

RS232--Using 6P6C vertical RJ11 socket	
RJ11	Definition description
2	NC
3	TX
4	RX
5	GND

RS485 and CAN interface

RS485--Using 8P8C vertical RJ45 socket		CAN--Using 8P8C vertical RJ45 socket	
RJ45 Pin	Definition description	RJ45 Pin	Definition description
1、8	RS485-B1	9、10、11、14、16	NC
2、7	RS485-A1	12	CANL
3、6	GND	13	CANH
4、5	NC	15	GND

Parallel communication port

RS485--Using 8P8C vertical RJ45 socket		RS485--Using 8P8C vertical RJ45 socket	
RJ45Pin	Definition description	RJ45 Pin	Definition description
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14	GND
4、5	NC	12、13	NC

7.3. Communication description

7.3.1. RS232 communication

The BMS can communicate with the host computer through the RS232 interface, so as to monitor various information of the battery on the host computer side, including battery voltage, current, temperature, status, SOC, SOH and battery production information, etc. The default baud rate is 9600bps.

7.3.2. RS485 communication

With dual RS485 interface, you can view the information of PACK, the default baud rate is 9600bps. To communicate with the monitoring device through RS485, the monitoring device is used as the host to poll data according to the address, and the address setting range is 2~15.

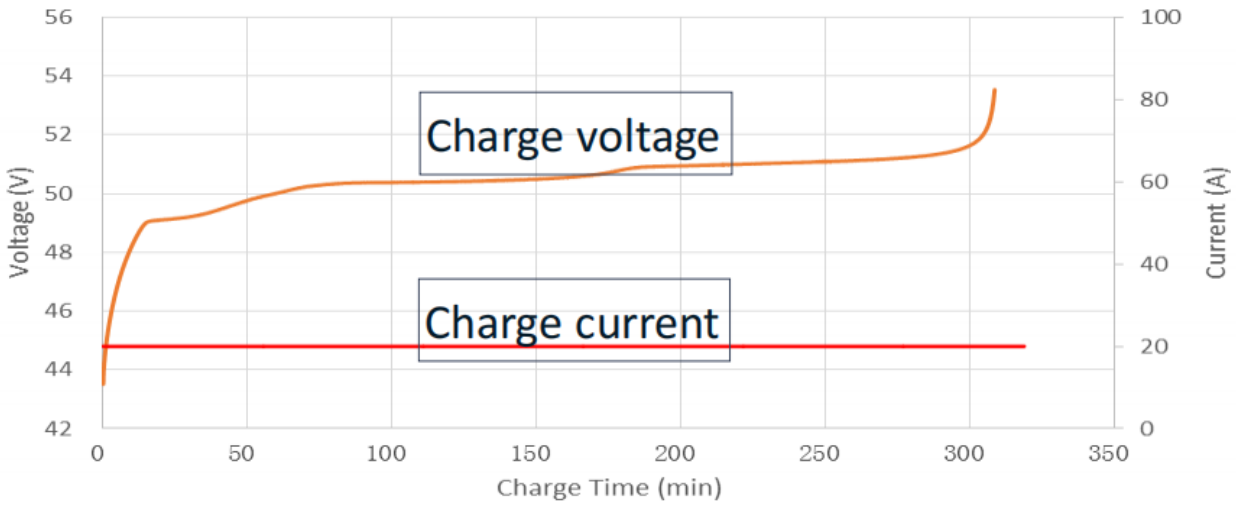
7.3.3. CAN communication

CAN communication, baud rate 500K.

8. Product function and performance description

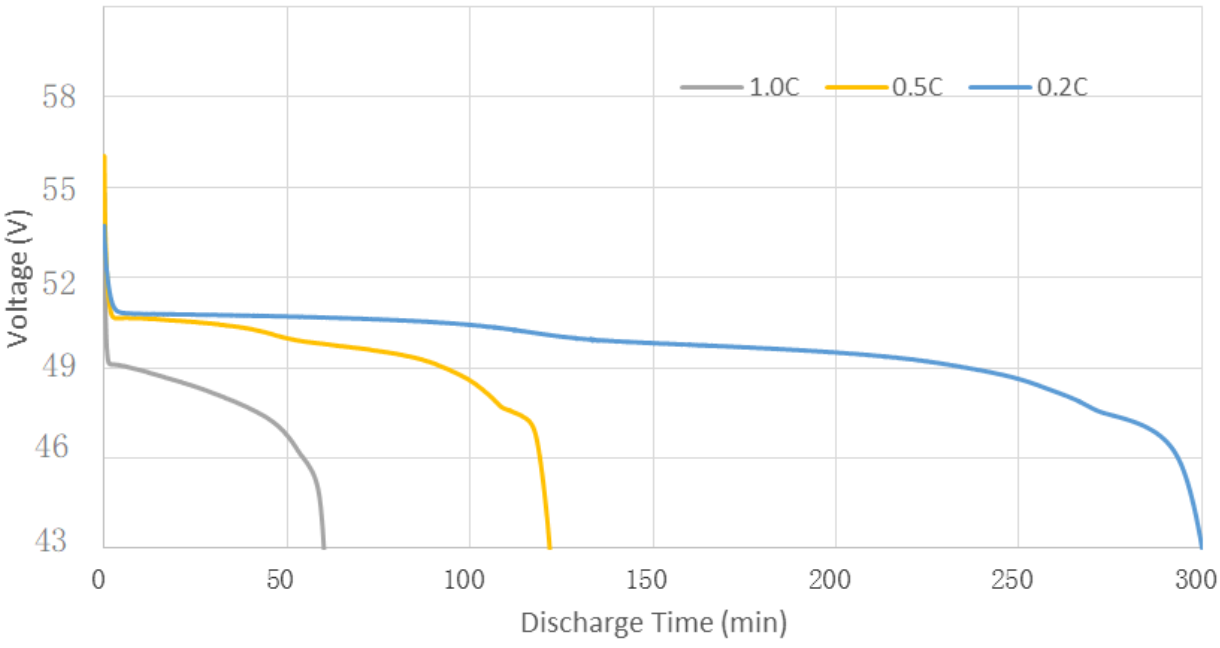
8.1. Charging performance

- Standard charging current （25℃）： example:0.2C（20A）
- Standard charging voltage：54V
- Standard charging mode and charging curve：



8.2. Discharging performance

Discharge curve at different magnification



9. Using & Maintenance Suggestions

9.1. LED indication description

Table 1 LED working status indication

Condition	Normal/Alarm/Protect	RUN	ALM	LED Battery indicator LED						Illustrate
		●	●	●	●	●	●	●	●	
Shutdown	Hibernate	black	black	black	black	black	black	black	black	Annihilate
Standby	Normal	flash1	black	According to the battery indicator						Standby mode
	Alarm	flash1)	flash3							Module low voltage
Charging	Normal	Always bright)	black	According to the battery indicator (battery indication maximum LED flashes 2)						(The highest power LED flashes (flashing 2), the overcharge alarm ALM does not flash)
	Alarm	Always bright	3 flash3							
	Overcharge protection	Always bright	black	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	(If there is no utility power, the indicator light is in standby state)
	Temperature, overcurrent, fail safe	black	Always bright	black	black	black	black	black	black	Stop charging
Discharging	Normal	flash3	black	(According to the battery indicator)						
	Alarm	flash3)	flash3							
	Undervoltage protection	black	black	black	black	black	black	black	black	Stop discharge
	Temperature, overcurrent, short circuit, reverse connection, fail safe	black	Always bright	black	black	black	black	black	black	Stop discharge
Invalid		black	Always bright	black	black	black	black	black	black	Stop charging and discharging

Table 2 Description of capacity indication

Condition		Charging								Discharging			
Capacity indicator		L6●	L5●	L4●	L3●	L2●	L1●	L6●	L5●	L4●	L3●	L2●	L1●
Electricity（%）	0～17%	black	black	black	black	black	flash2	black	black	black	black	black	Always bright
	17～33%	black	black	black	black	flash 2	Always bright	black	black	black	black	Always bright	Always bright
	33～50%	black	black	black	flash 2	Always bright	Always bright	black	black	black	Always bright	Always bright	Always bright

	50～66%	black	black	flash 2	Always bright	Always bright	Always bright	black	black	Always bright	Always bright	Always bright	Always bright
	66-83%	black	flash 2	Always bright	Always bright	Always bright	Always bright	black	Always bright	Always bright	Always bright	Always bright	Always bright
	83-100%	flash 2	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright
Running lights●				Always bright						flash3			

Table 3 LED flashing description

Flashing method	Bright	Black
flash 1	0.25S	3.75S
flash 2	0.5S	0.5S
flash 3	0.5S	1.5S

Note：
The LED indicator alarm can be enabled or disabled through the host computer, and the factory default is enabled.

9.2. Buzzer action description

1) In case of failure, it will beep for 0.25S every 1S;

2) During protection, it will beep for 0.25S every 2S (except for overvoltage protection);

3) When alarming, it will beep every 3S for 0.25S (except overvoltage alarm);

4) The buzzer function can be enabled or disabled by the host computer, and the factory default is disabled.

9.3. Key Description

1)When the BMS is in the dormant state, press the button (3~6S) and release it, the protection board will be activated, and the LED indicators will light up in sequence from "RUN" for 0.5 seconds.

2)When the BMS is activated, press the button (3~6S) and release it, the protection board is put to sleep, and the LED indicators light up sequentially for 0.5 seconds from the lowest battery light.

3)When the BMS is activated, press the button (6~10S) and release it, the protection board will be reset, and all the LED lights will light up at the same time for 1.5 seconds.

After the BMS is reset, it still retains the parameters and functions set by the host computer. If it is necessary to restore the initial parameters, it can be achieved through the "restore default value" of the host computer, but the relevant operation records and stored data remain unchanged (such as power, cycle times, etc.). , protection records, etc.).

9.4. Sleep and wake up

9.4.1. hibernate

When any of the following conditions are met, the system enters a low-power mode:

1. The single or overall over-discharge protection has not been released within 30 seconds.
2. Release the button after pressing the button for 3 seconds.
3. The minimum cell voltage is lower than the sleep voltage, and the duration reaches the sleep delay time (at the same time, no communication, no protection, no balance, and no current are satisfied).
4. The standby time is more than 24 hours (no communication, no charging and discharging, no mains power).
5. Forced shutdown through the host computer software.Before entering the sleep mode, make sure that the input terminal is not connected to an external voltage, otherwise it will not be able to enter the low power consumption mode.

9.4.2. wake

When the system is in low-power mode and meets any of the following conditions, the system will exit the low-power mode and enter the normal operation mode:

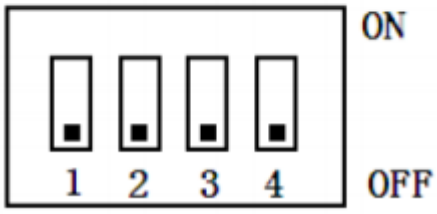
1. Connect the charger, the output voltage of the charger must be greater than 48V.
2. Press the button for 3S and release the button.
3. Connect to the communication line and open the software of the upper computer (it enters the sleep state due to over-discharge protection, this method cannot wake up the protection board).

Remarks:
After the single or overall over-discharge protection, it enters the low-power mode, wakes up regularly every 4 hours, and turns on the charge and discharge MOS. If it can be charged, it will exit the dormant state and enter normal charging; if it cannot be charged after 10 consecutive automatic wake-ups, it will no longer automatically wake up.
When the system is defined as the end of charging, the recovery voltage is not reached after 2 days of standby (standby time setting value), and the charging is forced to resume until the end of charging again.

9.5. DIP switch settings

When the battery packs are used in parallel, different PACK can be distinguished by their hardware addresses, and the hardware address of each PACK in the entire battery stack is unique. The hardware addresses can be set in sequence through the DIP switches on the board. Refer to the following for the definition of the switches. surface.

Address Code						ADD	PACK Definition	Explanation
1	2	3	4	5	6			
OFF	OFF	OFF	OFF	/	/	0	PACK0	Use as SlavePack0
ON	OFF	OFF	OFF			1	PACK1	Use as SlavePack1
OFF	ON	OFF	OFF			2	PACK2	Use as SlavePack2
ON	ON	OFF	OFF			3	PACK3	Use as SlavePack3
OFF	OFF	ON	OFF			4	PACK4	Use as SlavePack4
ON	OFF	ON	OFF			5	PACK5	Use as SlavePack5
OFF	ON	ON	OFF			6	PACK6	Use as SlavePack6
ON	ON	ON	OFF			7	PACK7	Use as SlavePack7
OFF	OFF	OFF	ON			8	PACK8	Use as SlavePack8
ON	OFF	OFF	ON			9	PACK9	Use as SlavePack9
OFF	ON	OFF	ON			10	PACK10	Use as SlavePack10
ON	ON	OFF	ON			11	PACK11	Use as SlavePack11
OFF	OFF	ON	ON			12	PACK12	Use as SlavePack12
ON	OFF	ON	ON			13	PACK13	Use as SlavePack13
OFF	ON	ON	ON			14	PACK14	Use as SlavePack14
ON	ON	ON	ON			15	PACK15	Use as SlavePack15



9.6. The routine maintenance of the battery part can be carried out by referring to the table

Period	Item	Treatment measures
Per month	(Operating environment)	Keep away from heat sources and avoid direct sunlight
	Visual inspection	If the appearance is damaged, leaked or deformed, the faulty battery pack should be disconnected, photographed and replaced.
Each quarter	Clean appearance	Clean the exterior with a cotton cloth. Due to the high voltage of the battery pack, care should be taken when cleaning.
	Connection Status	● Check the bolts at each terminal and retighten them if they are loose. ● If the temperature of the connection line exceeds 40°C (feeling hot), check the cause
Every half year	Voltage detection	● At the end of charging, measure and record the busbar voltage and the positive and negative terminal voltages of the battery pack. The voltages of the two are consistent. Otherwise, check whether the cable at the corresponding connection is faulty. ● In the first year, real-time data collection at the end of discharge was performed at least every six months. ● Beginning in the second year, on-site capacity determination will be conducted every three months. If a certain battery cell is frequently overcharged and over-discharged in the historical alarm information viewed through the RS232 interface, it means that the battery cell has touched the charging protection point and the discharging protection point for a long time. This situation may lead to insufficient backup time, it is recommended to replace it in time

The final state of charge and discharge can be judged by the capacity light, refer to the definition of LED light capacity status light.

10. Packing List

See below for packing list

NO.	Material name	Specification/Module	Number
1	48100Ah lithium iron phosphate battery	48100	1 set/box
2	Positive and negative output lines	25mm2 flame retardant cable, length 0.5m, crimp 25-6 copper noses at both ends, one red and one black.	1 set/1 module
3	RS485 cascade communication line	0.5 meters long, with RJ45 crystal heads at both ends.	1root/2 modules
4	RS485 USB RS232 USB	1.5 meters long, one end is the corresponding crystal head, and the other end is the USB interface.	1 set/8 module
5	Product manual	/	1
6	Certificate	/	1
7	Hanging ear screw	M6*16(stud 16mm)	4
8	Dry contact terminal	Matching according to the number of dry nodes of the BMS	1

11. Storage, maintenance and transportation

11.1. Storage

1. The battery pack is usually stored at a state of charge of 20% to 40% in a clean, dry, ventilated and rain-proof room with an ambient temperature of -5℃ to 35℃ and a relative humidity of not more than 75%, and should be placed flat. Pad height, not less than 100MM from the ground;

2. Batteries cannot be stored with active chemicals or dusting items;

3. The battery cannot be subjected to any mechanical shock or heavy pressure;

4. The battery should avoid direct sunlight, keep away from the fire source, and the distance from the heat source should not be less than 2M;

5. From the date of manufacture, every 3 months of storage should be charged with a current of 0.2~0.5C for 30~60min, and the temperature range is 25℃±5℃.5）.

11.2. Transportation

The battery pack should be packaged and shipped. During transportation, avoid severe vibration, shock or extrusion, and avoid sun and rain. Batteries can be transported by vehicles such as cars, trains, ships, and planes.

12. Maintain

The battery pack should remain at 40% - 60% of state of charge;

When the battery is not in use for a long time, it is recommended to charge it with 0.2c current every three months or so.

During the maintenance process, do not install or remove the battery in the battery pack by yourself, otherwise the battery performance will be reduced;

Any battery in the battery pack shall not be disassembled or replaced without authorization, and dissection of the battery is strictly prohibited.

13. Battery usage precautions

Please read the instruction manual and precautions carefully before use. When used correctly according to the product characteristics, the battery will be a safe, reliable and convenient storage battery.

Warn! Improper use of lithium-ion batteries can result in personal injury or fire!

1. When charging the battery, pay attention to ensure that the polarity is correct, and do not reverse the charging of the battery;
2. Do not expose the battery to adverse environments, such as extreme temperatures, deep cycling, frequent overcharge/overdischarge;
3. If you find that the battery is abnormal, please stop using it immediately and report it to a professional for treatment;
4. Ensure that batteries and battery management systems are kept away from dangerous goods or dangerous materials;
5. It isforbidden to short-circuit the battery;
6. It is forbidden to burn or destroy the battery, which may cause the release or burning of harmful gases;
7. Do not disassemble, squeeze, pierce or burn.
8. Rain is prohibited;
9. It is forbidden to be directly exposed to sunlight;
10. Prohibit exposure to temperatures above 60°C;
11. It is forbidden to discard the battery in the garbage;
12. It is forbidden to use other types of batteries in series or in parallel with lithium-ion batteries;
13. It is forbidden to use new and old batteries (groups) in series or in parallel.

14. Product Liability

Consumers must strictly abide by the requirements of this product specification to use this product. Misuse may lead to serious accidents.The company is not responsible for any accidents caused by the operation and use that are not strictly in accordance with this product specification.The company reserves the right to change the contents of this specification without prior notice; the final interpretation right of this information belongs to the company.

Solar charger inverter

User Manual

Product Type

SPH504880A

Important Safety Instruction

Please keep this manual for future use.

This manual contains all safety, installation and operating instructions for the SPH Series solar charge inverter.

Please read all instructions and precautions in the manual carefully before installation and use.

- Non-safety voltage exists inside the solar charge inverter. To avoid personal injury, users shall not disassemble the solar charge inverter themselves. Contact our professional maintenance personnel if their is a need for repair.
- Do not place the solar charge inverter within the reach of children.
- Do not install the solar charge inverter in harsh environments such as moist, oily, flammable or explosive, or heavily dusty areas.
- The mains input and AC output are high voltage, so please do not touch the wiring terminals.
- The housing of the solar charge inverter is hot when it is working. Do not touch it.
- Do not open the terminal protective cover when the solar charge inverter is working.
- It is recommended to attach proper fuse or circuit breaker to the outside of the solar charge inverter.
- Always disconnect the fuse or circuit breaker near the terminals of PV array, mains and battery before installing and adjusting the wiring of the solar charge inverter.
- After installation, check that all wire connections are tight to avoid heat accumulation due to poor connection, which is dangerous.
- The solar charge inverter is off-grid. It is necessary to confirm that it is the only input device for load, and it is forbidden to use it in parallel with other input AC power to avoid damage.

Table of Contents

1. Basic Information

1.1 Product overview and characteristics

SPH series is a new type of mixed solar charge inverter integrating solar energy storage & municipal power charge storage and AC sine wave output. It adopts DSP control and advanced control algorithm to achieve characteristics of high response speed, high reliability and high industrial standard. There are four charge modes namely only solar power, mains power priority, solar power priority, mains power & solar power; and two optional output modes, namely inverting and mains power to meet different application needs.

The solar charge module adopts the latest optimized MPPT tracking technology, which can quickly track the maximum power point of the photovoltaic array in any environment to obtain the maximum energy of the solar panel in real time with wide voltage range of MPPT.

AC-DC charge module adopts advanced control algorithm to realize full digital double closed-loop control of voltage and current, with high control accuracy and small volume. Battery can be charged and protected stably and reliably with wide AC voltage input range, full input/output protection function.

DC-AC inverter module based on full digital intelligent design adopts advanced SPWM technology, outputs pure sine wave, converts DC into AC. It is suitable for AC loads such as household appliances, electric tools, industrial device, electronic audiovisual, etc. The product adopts the segment LCD display design to display the operation data and state of the system in real time. The comprehensive electronic protection function ensures that safety and stability of the whole system.

Characteristics:

1. Adopt full digital voltage and current double closed-loop control and advanced SPWM technology to output pure sine wave.
2. Two output modes, i.e. mains bypass and inverter output can achieve uninterrupted power supply function.
3. Four optional charge modes: only solar energy, mains priority, solar energy priority and mixed charge.
4. Advanced MPPT technology, with efficiency up to 99.9%.
5. Wide MPPT voltage range.
6. With function of activating lithium battery with solar energy and AC mains power, it supports connection of lead-acid battery and lithium battery
7. LCD screen design and 3 LED indicator lights dynamically display system data and operation states.
8. ON/OFF rocker switch can control AC output.
9. With power saving mode function, it can reduce no-load loss.
10. Intelligent adjustable speed fan is adopted for efficient heat dissipation and extended system life.
11. Possessing multiple protection functions and 360° comprehensive protection.
12. Possessing complete short circuit protection, overvoltage and undervoltage protection, overload protection, back filling protection, etc.
13. It has the function of mixed load: when the battery is not connected, photovoltaic and commercial power can supply power to the load at the same time (if there is no battery, the commercial power must be

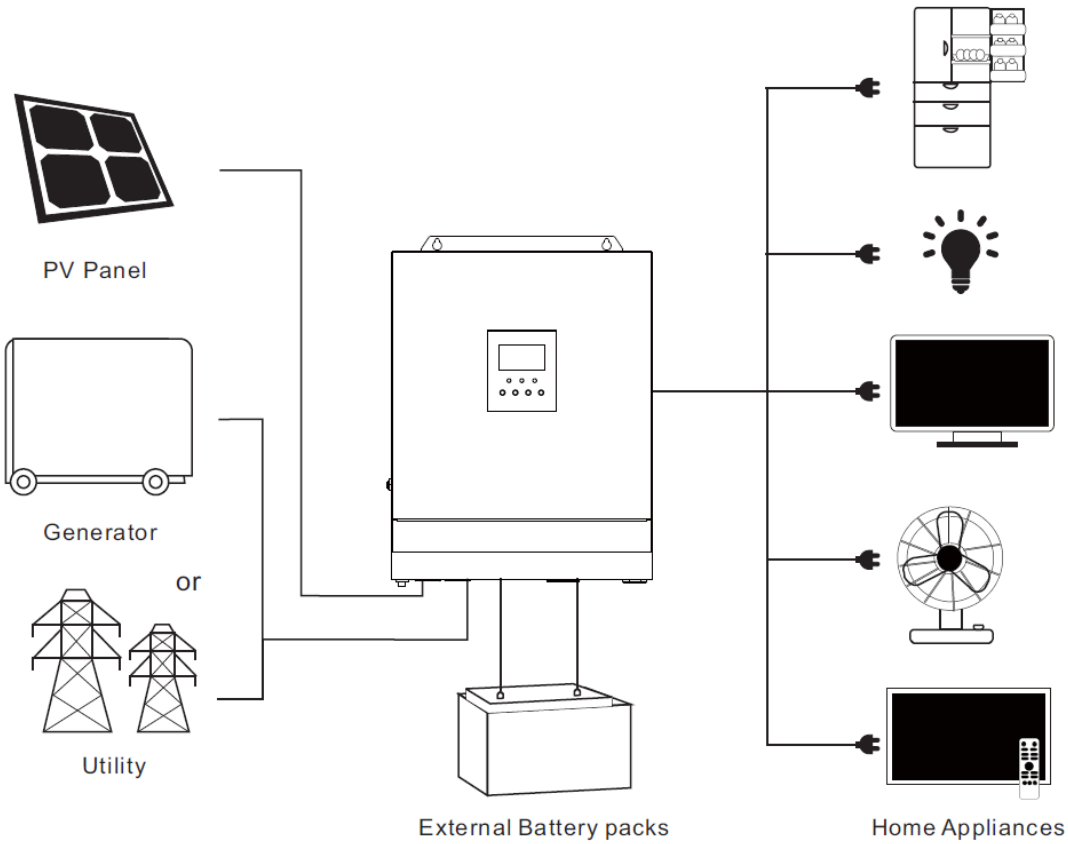
connected). When the battery is full, it can also enter the mixed load mode, which can make full use of the photovoltaic energy.

1.2 Basic system introduction

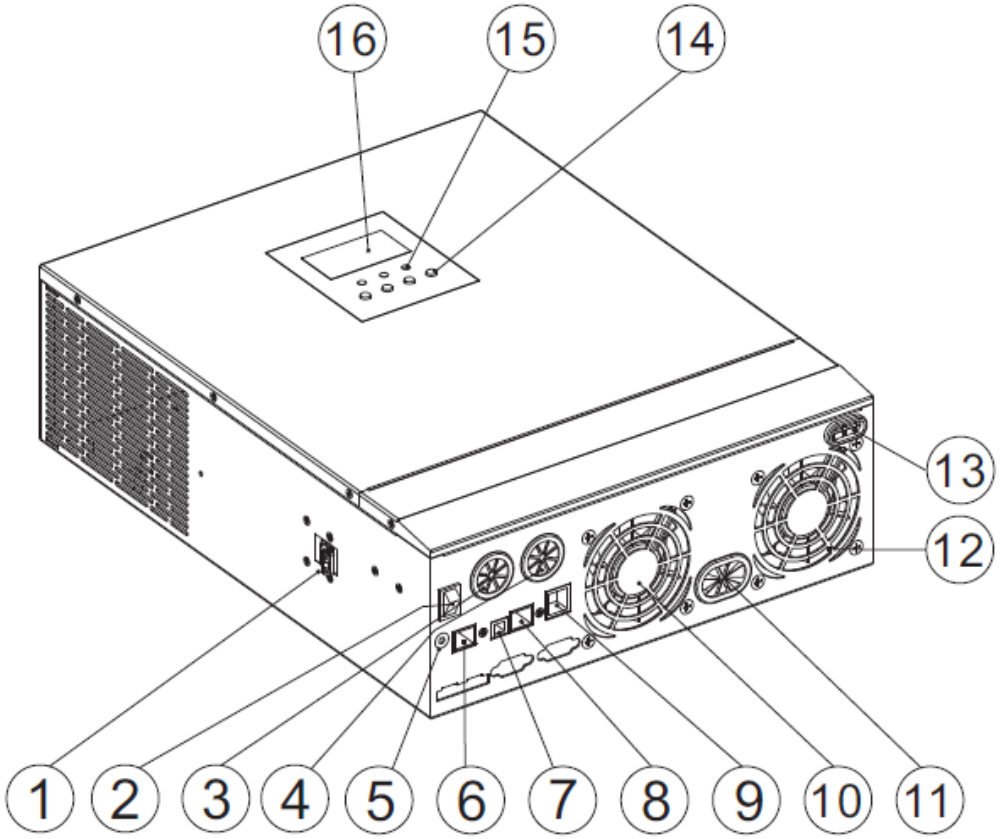
The figure below shows the system application scenario of this product. A complete system includes the following parts:

1. Photovoltaic module: convert the light energy into direct current energy and then charge the battery via the solar charge inverter, or directly invert the light energy into alternating current to supply power to the load.
2. Mains or generator: connected at the AC input, it can supply power to the load and charge the battery at the same time. If no mains power or generator is connected, the system can also operate normally. At this time, the load power is supplied by the battery and photovoltaic modules.
3. Battery: the battery is to ensure the normal power consumption of the system load in case of no sufficient solar energy or mains supply.
4. Household load: it can be connected to various household and office loads, including AC loads such as refrigerators, lamps, televisions, fans, air conditioners, etc.
5. Inverting and control solar charge inverter: the energy conversion device of the whole system.

The specific system wiring mode is determined by the actual application scenario.

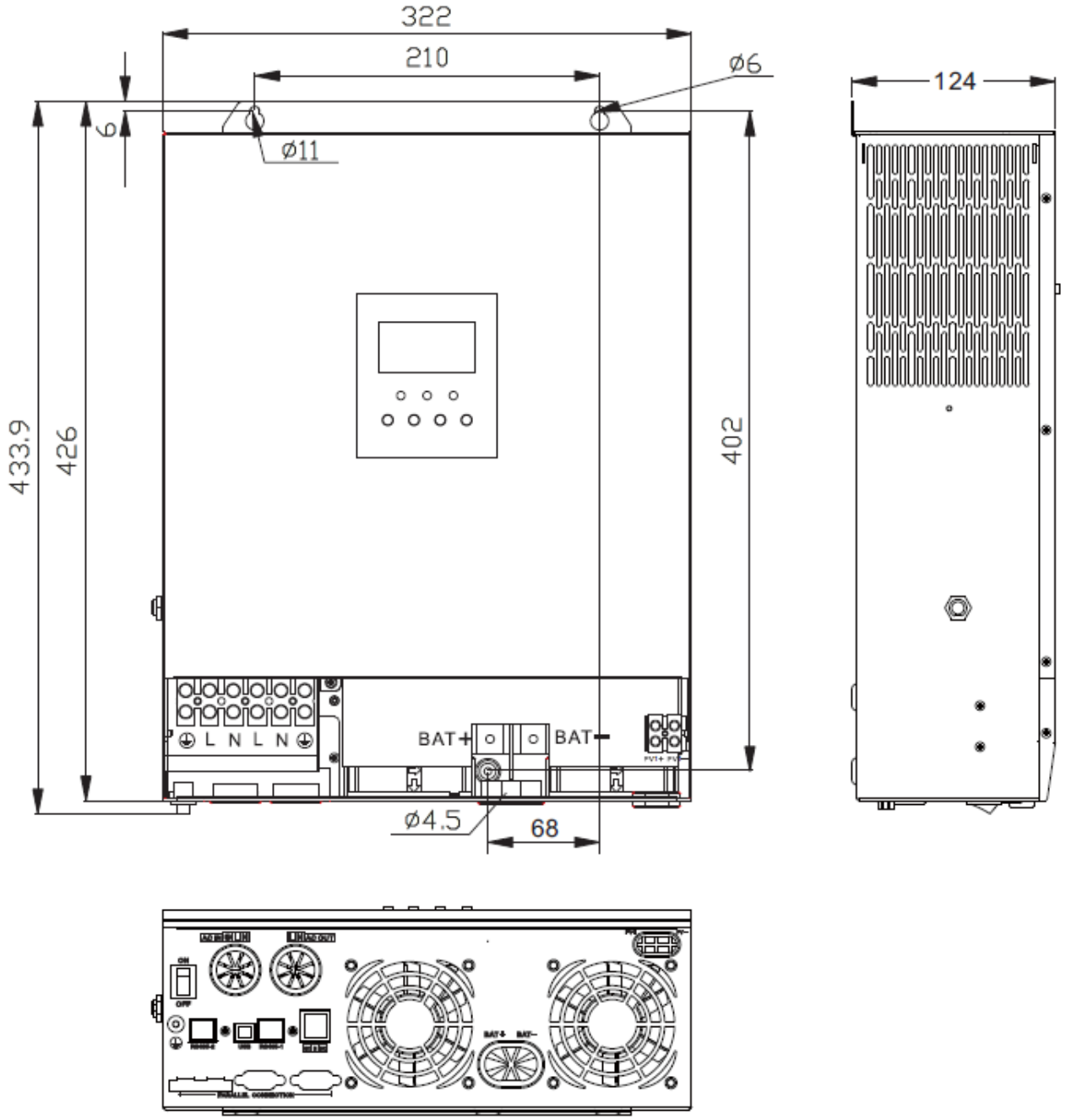


1.3 Product characteristics



①	Overload protector	⑨	Dry contact port
②	ON/OFF rocker switch	⑩	Cooling fan
③	ACi nput port	⑪	Battery port
④	AC output port	⑫	Cooling fan
⑤	Grounding screw hold	⑬	PV port
⑥	RS485-2 communication port	⑭	Touch the key lightly
⑦	USB communication port	⑮	Indicator light
⑧	RS485-1 communication port	⑯	LCD screen

1.4Dimension drawing



2. Installation Instruction

2.1 Installation notice

Before installation, please carefully read the manual and get familiar with the installation step.

- Take care while installing the battery. When installing the lead-acid liquid battery, it is required to wear goggles. Any body part contacting the battery acid must be washed with clear water in time.
- Don ' t place any metal object beside the battery to prevent short circuit of the battery.
- Acid gas may be generated during battery charge. Therefore, it is required to ensure good ventilation around the environment.
- During cabinet installation, sufficient space shall be reserved around the solar charge inverter for heat dissipation; do not install the solar charge inverter and lead-acid liquid battery in the same cabinet to avoid the corrosion of the solar charge inverter by acid gas generated during battery operation.
- Only the battery with type consistent with the solar charge inverter can be charged.
- Loose connection points and corroded wires may cause great heat, thereby melting the insulation layer of wires, burning the surrounding materials, or even causing fire. Therefore, all connectors must be tightened, and the wires must be fixed with ties, so as to avoid the looseness of connectors caused by wire shaking during mobile application.
- Tie conductors are selected based on no greater than 5A/mm^2 current density.
- The machine installed outdoors shall be protected against direct sunlight and rain.
- After the power switch is turned off, there is still high voltage inside the solar charge inverter. Please do not open or touch the internal components, and carry out relevant operation after the capacitor is fully discharged.
- Please do not install the solar charge inverter in a humid, greasy, flammable, explosive or dusty or other severe environments.
- The polarity of the battery input end of this product shall not be reversed, otherwise the device may be damaged easily or there may be some unpredictable dangers.
- AC supply input and AC output are both high voltage, so please do not touch the wires.
- Do not touch the fan in working to prevent injury.
- It is required to confirm that the solar charge inverter is the unique power supply input device for the load device. It is forbidden to use the machine in parallel with other input AC power to avoid damage.

2.2 Wire specification and breaker type

For wiring and installation ways,it is required to observe national and local electrical specification requirements.

Recommended wiring specification and breaker type for photovoltaic array: the output current of the photovoltaic array is affected by the form, connection way and illumination angle of photovoltaic array, therefore the minimum wire diameterof the photovoltaic array is calculated based on the short circuit currentof photovoltaic array. Please refer to the short circuit current value in the specification of photovoltaic array (the short circuit current keeps unchanged for the photovoltaic arrays in series connection; the short circuit current of photovoltaic arrays in parallel connectioni s the sum of short circuit currentof all components connected in parallel); the short circuit current of the array cannot exceed maximumi nput currentof PV.

- **Please refer to the table below for PV input wire diameter and switch:**

Type	Recommended wire diameter	Maximum PV input current	Recommended types of air switchor breaker
SPH504880A	6mm^2/10AWG	18A	2P—25A

Note: the voltage in parallel shall not exceed maximum PV input open-circuit voltage.

- **Please refer to the table below for recommended AC input wire diameter and switch:**

Type	Recommended wire diameter	Maximum bypass input current	Recommended types of air switchor breaker
SPH504880A	10mm^2/7AWG	63A	2P—63A

Note: there is already a corresponding breaker at input connection point of mains supply. Therefore, no breaker may be equipped.

- **Recommended input wire diameter and switch type for battery**

Type	Recommended wire diameter	Rated battery discharge current	Maximum charge current	Recommended types of air switch or breaker
SPH504880A	30mm^2/2AWG	125A	80A	2P—200A

- **Recommended wire specification and breaker type for AC output**

Type	Recommended wire diameter	Rated inverter AC output current	Maximum bypass output current	Recommended types of air switch or breaker
SPH504880A	10mm^2/7AWG	42A	63A	2P—63A

Note: the wire diameter is only for reference. In case of long distance between photovoltaic array and solar charge inverter or between solar charge inverter and battery, use thicker wire to reduce voltage drop and improve system performance.

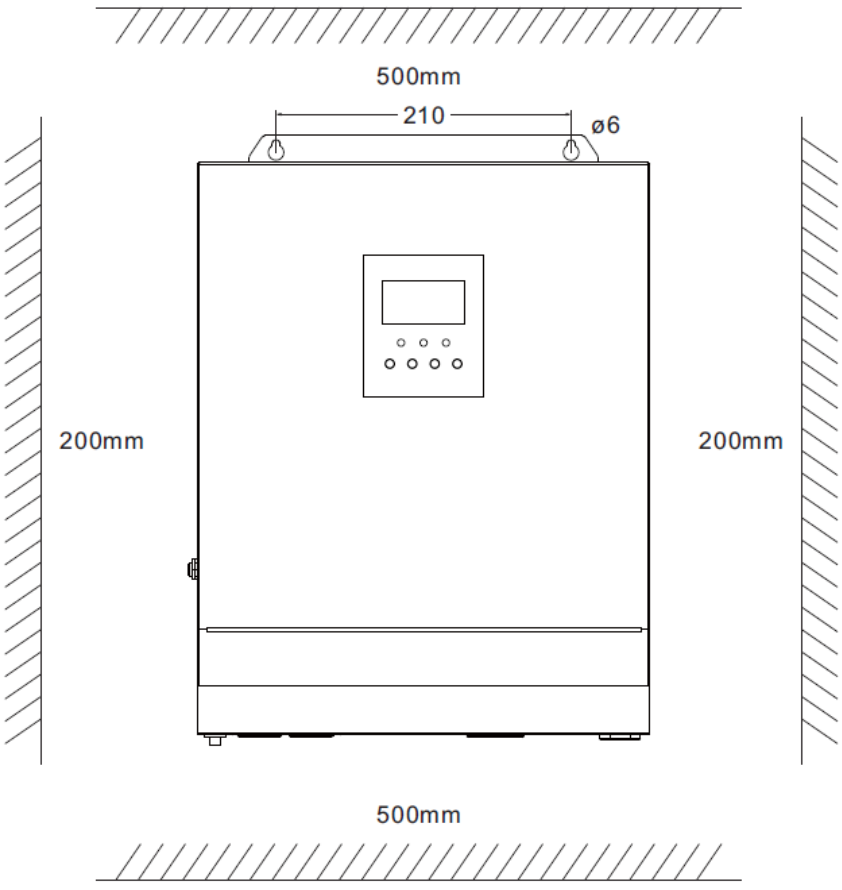
Note: above wire diameter and breaker are only for reference. Please select appropriate wire diameter and breaker based on practical condition.

2.3 Installation and Wiring

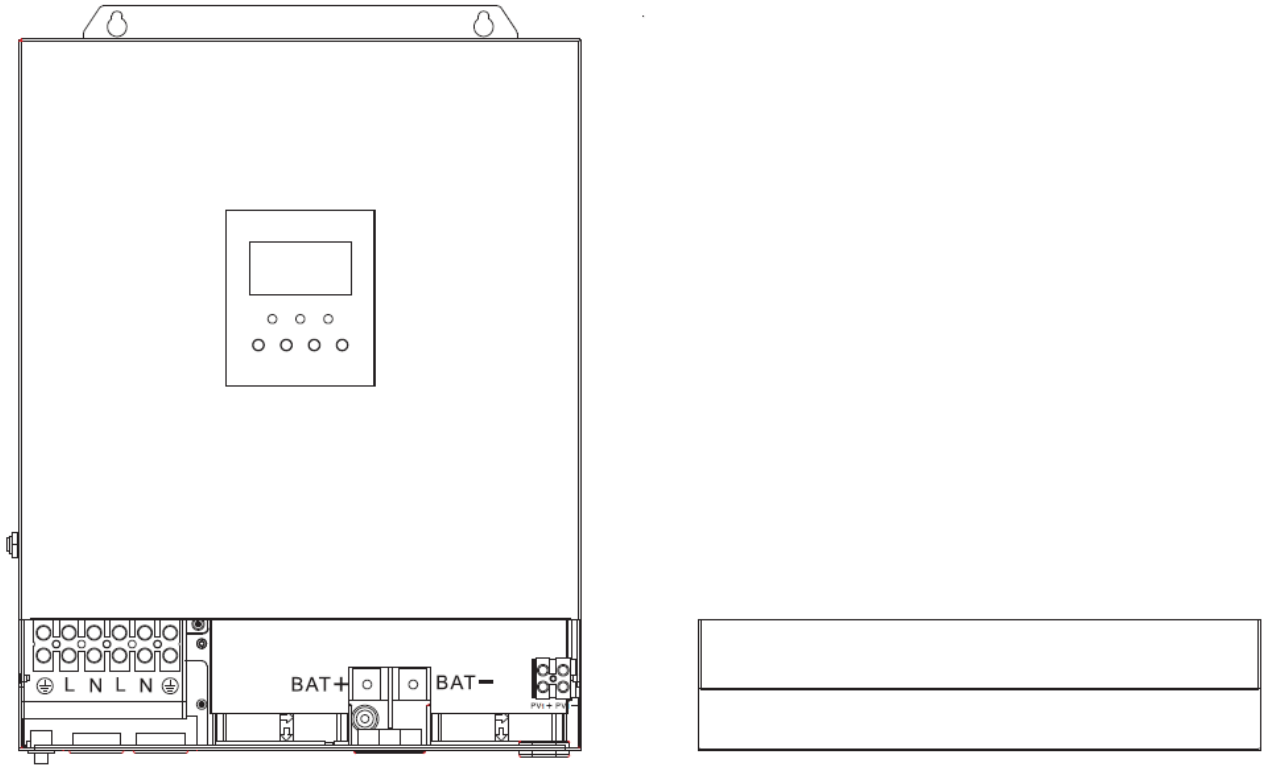
Installation step:

Step 1: confirm the installation position and heat dissipation space, confirm the installation position of solar charge inverter, such as wall surface; to install the solar charge inverter, guarantee there is sufficient air flowing through the cooling fins of solar charge inverter. At least reserve 200mm space at the left and right air outlets of the solar charge inverter to guarantee heat loss through natural convection. Refer to the overall installation schematic above.

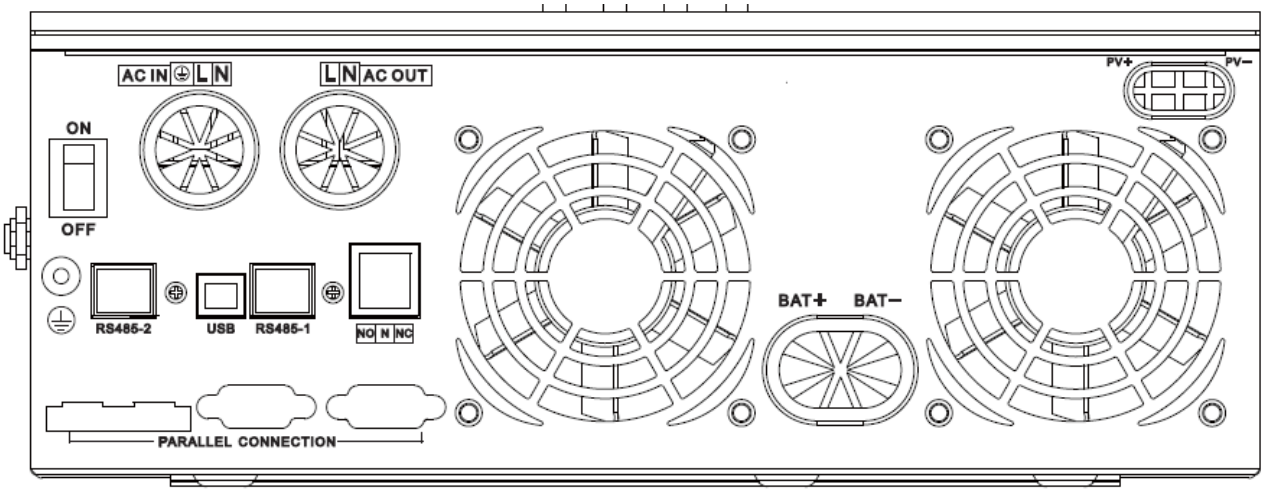
Warning: danger of explosion! Never install the solar charge inverter and lead-acid liquid battery into a same sealed space or in a sealed place with probable accumulation of battery gas.



Step 2: Remove the terminal protection cover



Step 3: wiring

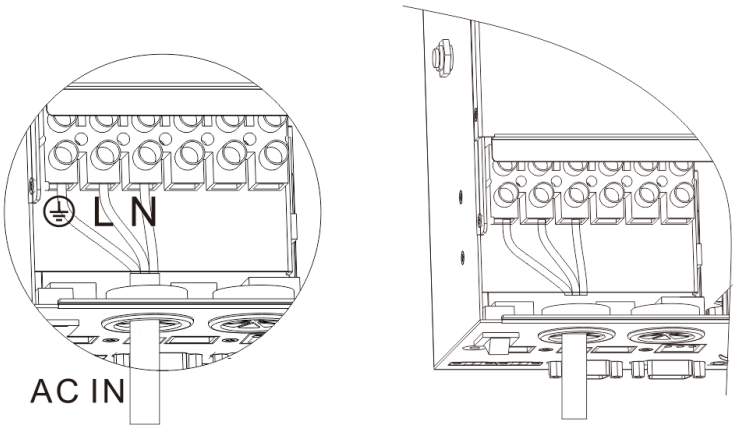


AC input/output wiring method:

① Before AC input/output wiring, disconnect the external breaker at first and then confirm whether the cable used is thick enough. Please refer to chapter “ 2.2 Wiring Specification and Breaker type”;

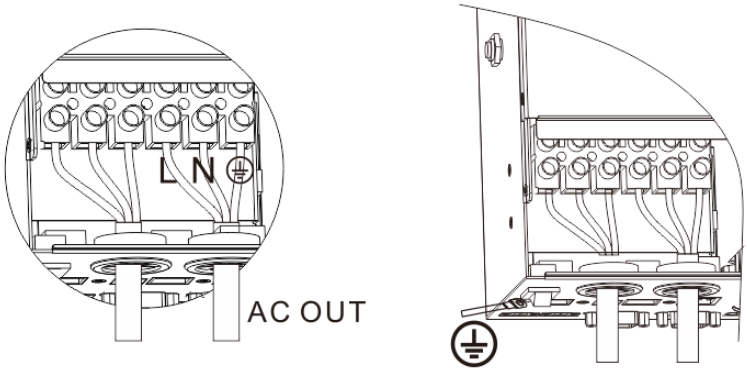
② Correctly connect AC input wire in accordance with cable sequence and terminal position shown in the figure below. Please connect ground lead at first, and then live wire and mull wire;

⏚: **Ground** **L: Live** **N: Neutral**



③ Correctly connect AC output wire in accordance with cable sequence and terminal position shown in the figure below. Please connect the ground wire at first, and then live wire and null wire. The ground wire is connected to the ground screw hold through Oshaped terminal.

⏚: **Ground** **L: Live** **N: Neutral**

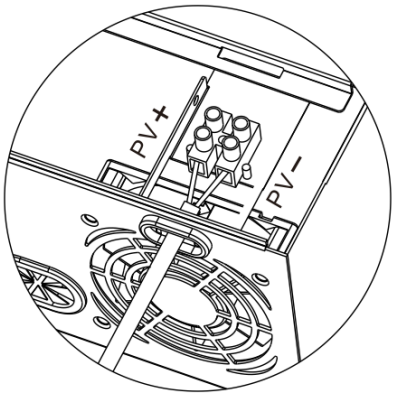


Note: use thick ground cable as far as possible (with cable section not less than 4mm^2), place the ground point to be close to the solar charge inverter as far as possible and choose shorter ground wire to the greatest extent
Wiring method of PV input:

①Before wiring, disconnect external breaker at first, and confirm whether the used cable is thick enough. Please refer to chapter "2.2 Wiring Specification and Breaker Type";

②Correctly connect PV input wire in accordance with cable sequence and terminal position shown in the figure below.

PV+ positive input pole PV1- negative input pole

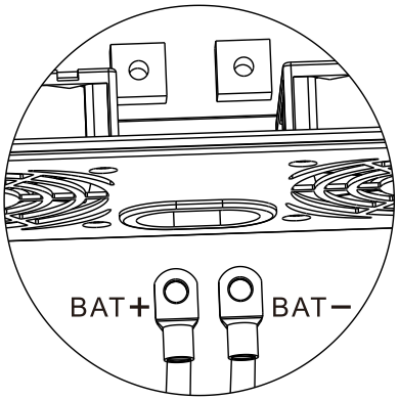


BAT wiring method:

① Before wiring, disconnect external breaker at first, and then confirm whether the used cable is thick enough. Please refer to chapter " 2.2 Wiring Specification and Breaker Type " . BAT wire shall be connected with the machine via O-shaped terminal. It is recommended to use the O-shaped terminal with 5mm inside diameter. The O-shaped terminal must compress BAT wire firmly to prevent excessive heating caused by great contact resistance;

② Correctly connect BAT wire in accordance with cable sequence and terminal position shown in the figure below.

BAT+: positive battery pole BAT-: negative battery pole



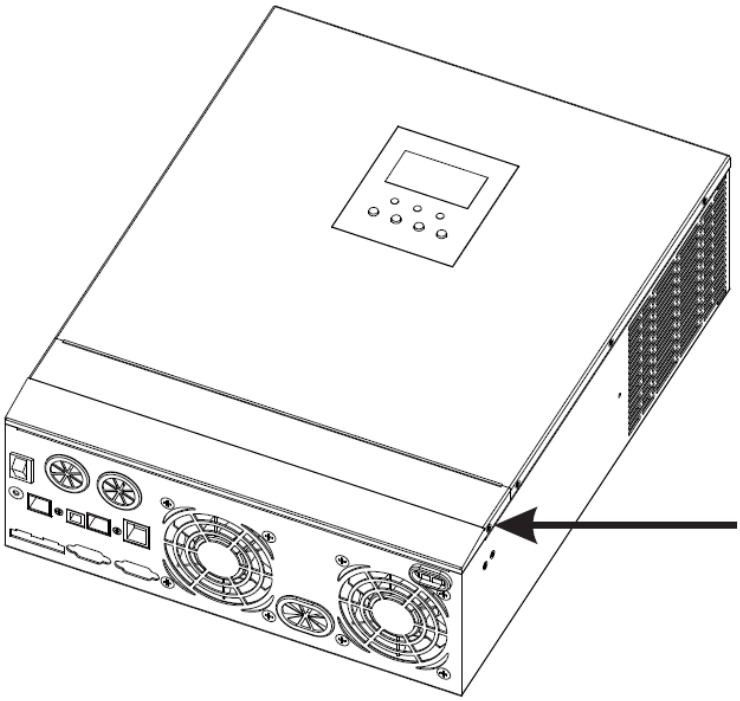
Warning notice:

① Input from mains supply, AC output and photovoltaic array may generate high voltage. Before wiring, make sure to break the breaker or fuse;

② During wiring process, make sure to pay attention to the safety; during the wiring process, please don't close the breaker or fuse. At the same time, guarantee that "+" and "-" poles of different parts are correctly connected with wires; a breaker must be installed at the battery end and selected based on chapter "2.2 Wiring Specification and Breaker Type". Before wiring, make sure to break the breaker to prevent strong electric spark generated during wiring. At the same time, avoid battery short circuit during the wiring process; if the solar charge inverter is in the area with frequent thunder, it is suggested to install an external arrester at PV input terminal.

Step 4: inspect whether the wires are correctly and firmly connected, especially whether the positive and negative input poles of the battery are correct, whether the positive and negative input poles of PV are correct, whether AC input is inaccurately connected to AC output terminal.

Step 5: install protective cap of terminal



Step 6: Start solar charge inverter

At first close the breaker at the battery end, and then press the rocker switch at the lower left side of the machine to " ON " state, " AC/INV " indicator light flashes, indicating normal operation of inverter. Afterwards, close breakers of photovoltaic array and mains supply. In the end, after AC output is normal, turn on AC load one by one to avoid protection action generated by great instant impact owing to simultaneous turnon of loads. The solar charge inverter operates normally in accordance with set mode.

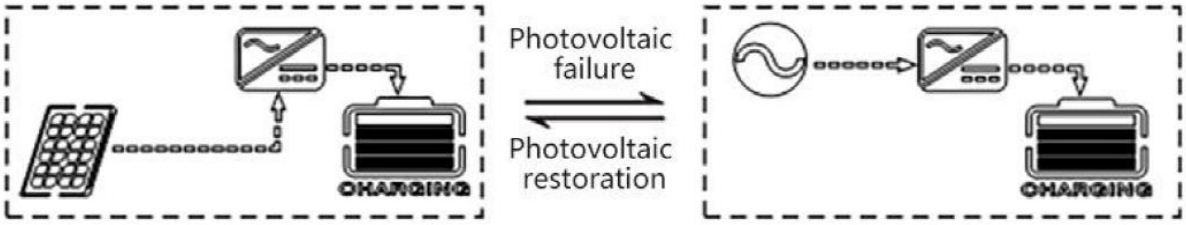
Note: if power is supplied to different AC loads, it is suggested to turn on the loads with great impact current, and then turn on the load with little impact current after the load operates stably.

Note: in case of abnormal operation of solar charge inverter or abnormal display of LCD or indicator light, refer to Chapter 6 for troubleshooting.

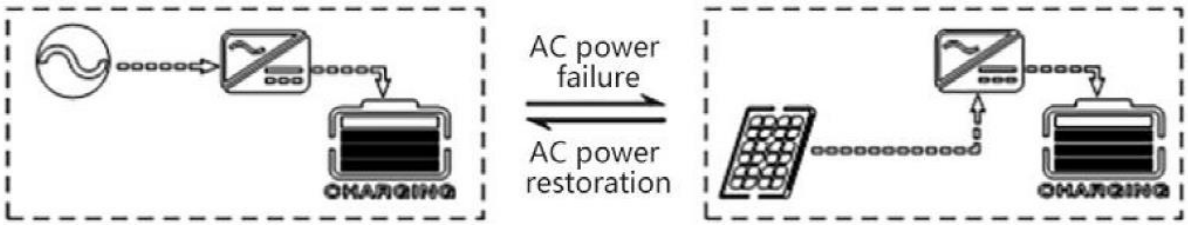
3.Operating Mode

3.1 Charge mode

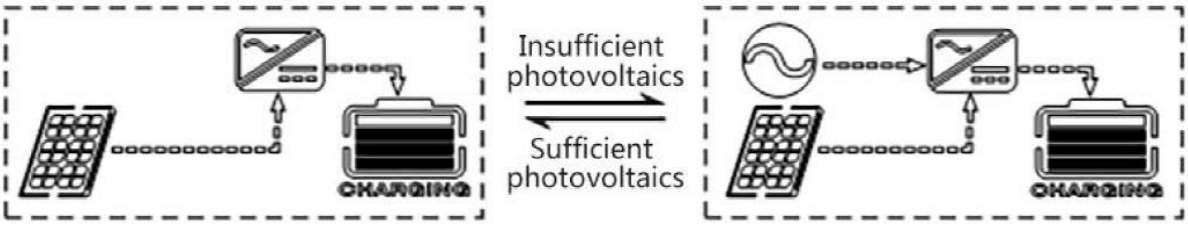
1. Photovoltaic priority: in photovoltaic priority charge mode, mains charge is started only when photovoltaics is out of work. Make full use of solar energy for power generation in the daytime and transfer to the mains supply for charge to maintain electric quantity of the battery. It is suitable for areas with relatively stable power grid and relatively expensive electricity price.



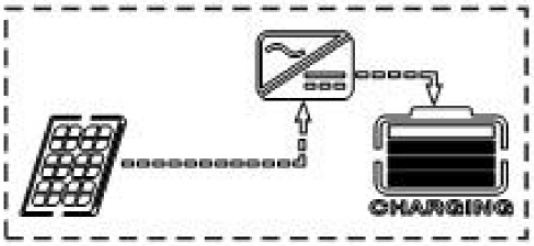
2. Mains supply priority: mains supply is to charge the battery preferentially and the photovoltaic charge can be started only when the mains supply is valid.



3. Mixed charge: with mixed charge through photovoltaics and mains supply, photovoltaic MPPT charge is used preferentially. In case of insufficient photovoltaic energy, the mains supply is used for supplement. In case of sufficient photovoltaic energy, mains supply stops charge. Electricity can be charged fastest with the way, which is suitable for the area with unstable power grid, so as to supply sufficient backup power supply at any time.

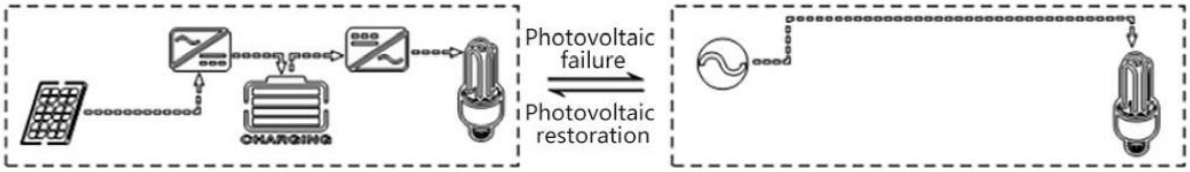


4.Only solar: only photovoltaic charge is used, no mains supply is started. This way can save the energy at most. The electric energies of battery are all from solar energy. This way is suitable for areas with good light condition.

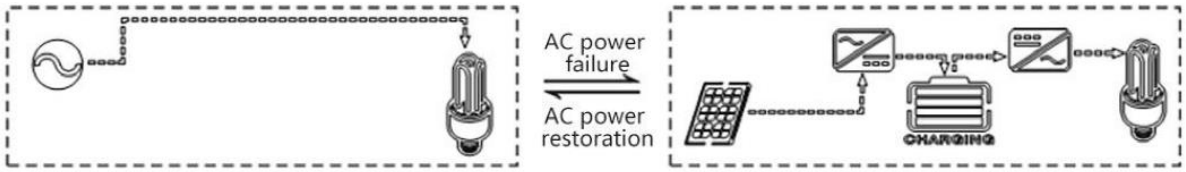


3.2 Output mode

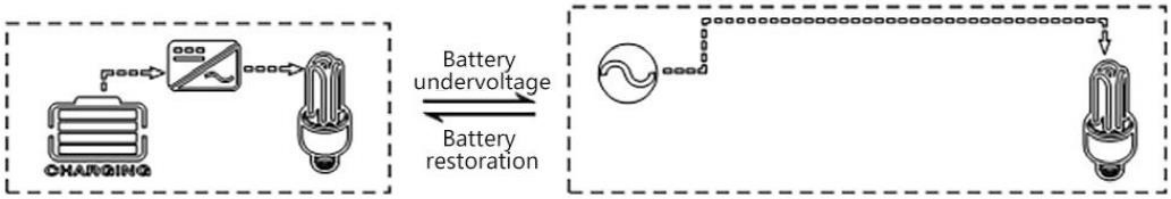
- **Photovoltaic priority mode:** Photovoltaic and battery supply power to the load. With diversified charge mode and optional output mode, when photovoltaic priority mode is selected, the green solar energy can be used as far as possible so as to achieve energy conservation and emission reduction. It switches to mains supply when the photovoltaics is invalid. With the mode, solar energy can be used maximally and electric quantity can be maintained at the same time. Therefore, the mode is suitable for areas with stable power grid.



- **Mains supply priority mode:** it only switches to inverter for power supply when mains supply is invalid, equivalent to a backup UPS. Therefore, the mode is applicable to area with unstable power grid.



- **Inverter priority mode:** it only switches to mains supply in case of undervoltage of battery. With the mode, DC electric energy is used maximally. Therefore, it is applied to the area with stable power grid.



4. Operation Instruction for LCD Screen

4.1 Operation and display panel

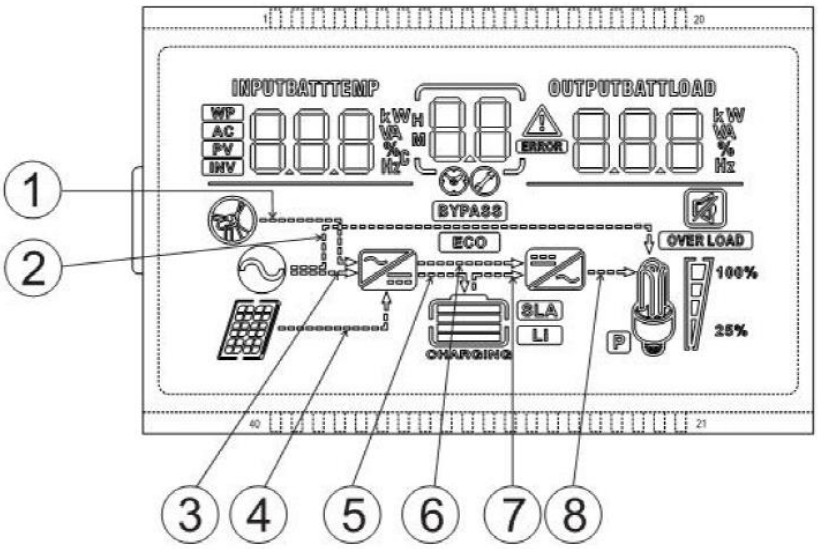
4.2 Introduction to operation keys

Function Key	Description
SET	Enter/exit setting menu
UP	Last option
DOWN	Next option
ENT	Confirm/enter option under setting menu

4.3 Introduction to indicator light

Indicator light	Color	Description
AC/INV	Yellow	Constant on: mains supply output
		Flashing: inverter output
CHARGE	Green	Flashing: battery in charge
		Constant on: charge completed
FAULT	Red	Constant on: fault state

4.4 Introduction to LCD screen



Icon	Function	Icon	Function
	Indicating that AC input end has been connected to power grid		Indicating that inverter circuit is in working.
	Indicates that the AC input mode in APL mode (wide voltage range)	BYPASS	Indicating that the machine is in mains supply bypass work mode
	Indicating that PV input end has been connected to solar battery panel	OVER LOAD	Indicating that AC output is in overload state
	Indicating that machine has been connected to battery, indicating 0%~24% battery remaining capacity indicating 25%~49% battery remaining capacity indicating 50%~74% battery remaining capacity indicating 75%~100% battery remaining capacity		Indicating percentage of AC output load, indicating 0%~24% load percentage, indicating 25%~49% load percentage, indicating 50%~74% load percentage, indicating ≥75% load percentage

	Indicating that present battery type of the machine is lithium battery		Indicating that buzzer is not enabled
	Indicating that current battery type of machine is lead-acid battery		Indicating alarm of machine
	Indicating that the battery is in charge state.		Indicating that the machine is in fault state.
	Indicating that AC/PV charge circuit is in working		Indicating that the machine is in setting mode.
	Indicating that AC output end has AC voltage output		Middle parameter display of screen, 1. In non-setting mode, displaying alarm or fault code; 2. In setting mode, displaying code of parameter item under current setting.
Parameter display at left side of screen: input parameter			
	Indicating AC input		
	Indicating PV input		
	Indicating inverter circuit		
	The icon is not displayed		
	Displaying battery voltage, total charge current of battery, charge power of mains supply, AC input voltage, AC input frequency, PV input voltage, temperature of internal radiator, software version		
Parameter display at right side of screen: output parameter			
	Indicating output voltage, output current, output active power, output apparent power, battery discharge current, software version; under setting mode, displaying the setting parameter under the parameter item code set currently		
Arrow display			
①	The arrow is not displayed	⑤	Indicating charge from charge circuit to battery end
②	Indicating power grid power supply to load	⑥	The arrow is not displayed
③	Indicating power grid power supply to charge circuit	⑦	Indicating power supply from battery end to inverter circuit
④	Indicating PV power supply to charge circuit	⑧	Indicating power supply from inverter circuit to load

Real-time data view method

In LCD main screen, press keys "UP" and "DOWN" to turn page and view different realtime data of the machine.

Page	Left Parameter of Screen	Middle Parameter of Screen	Right Parameter of Screen
1	Battery input voltage	Fault code	Output voltage
2	PV temperature		PV output KW
3	PV input voltage		PV output current
4	Input battery current		Output battery current
5	Input battery KW		Output battery KW
6	AC input frequency		AC output load frequency
7	AC input voltage		AC output load current
8	Input voltage		Output load KVA
9	INV temperature		INV output load KW
10	APP software version		Bootloader software version
11	Model Battery Voltage Rating		Model Output Power Rating
12	Model PV Voltage Rating		Model PV Current Rating

4.5 Setting parameter

Key operation description: to enter setting menu and exit from setting menu, please press key "SET". After entering the setting menu, parameter number【00】shall flash. At this time, press keys " UP " and " DOWN " to select the parameter item code to be set. Afterwards, press key " ENT" to enter parameter editing state. At this moment, the parameter value can flash. The parameter values are adjusted through keys "UP" and "DOWN". In the end, press key "ENT" to complete parameter editing and return to parameter selection state.

No. of Parameter	Name of Parameter	Setting Option	Description
00	Exit	[00] ESC	Exit from setting menu
01	Work priority mode	[01] SOL	At photovoltaic priority mode, when the photovoltaics is invalid or the battery values are lower than the parameter 【04】setting value, it shall switch to AC power.
		[01] UTI **default**	At AC priority mode, it switches to inverter only when the AC power is invalid.
		[01] SBU	At inverter priority mode, it switches to AC power only when battery is undervoltage or lower than the setting value of parameter【04】.
02	Output frequency	[02] 50.0	At bypass self-adaption, it automatically adapts to AC frequency in case of AC power; without AC power, the output frequency can be set via the menu. For 120V machine, it is 60Hz by default.
		[02] 60.0	
03	AC input Voltage range	[03] APL	90~140V AC input range of 120V machine
		[03] UPS **default**	90~140V AC input range of 120V machine
04	Battery to bypass	[04] 44 **default**	When parameter【01】=SOL/SBU, the battery voltage is lower than the set value, the output is switched to mains or generator from battery. The setting range is 44V~52V.
05	Bypass to battery	[05] 57.6V **default**	When parameter【01】=SOL/SBU, battery voltage is higher than the set value, the output is switched to battery from mains or generator at 48V~60V setting range.
06	Charge mode	[06] CSO	For photovoltaics priority charge, the AC charge is started only when photovoltaics is invalid.
		[06] CUB	For AC priority charge, the photovoltaics charge is started only when AC is invalid.
		[06] SNU **default**	In case of mixed charge from photovoltaics and AC power, priority is given to photovoltaic charge. In case of insufficient photovoltaic energy, the AC charge is used for supplement. In case of sufficient photovoltaic charge, stop charge from AC power. Note: photovoltaic charge and AC charge can be performed at the same time only when AC bypass is output under load. When inverter works, only photovoltaic charge can be started.
		[06] OSO	Only photovoltaic charge, no AC charge is started.

No. of Parameter	Name of Parameter	Setting Option	Description
07	Maximum Charge current	[07] 60A **default**	Setting range 0~80A;
08	Battery type	[08] USE	For user-defined, all battery parameters can be set.
		[08] SLd	Sealed lead-acid battery, constant voltage charge voltage 57.6V, float charge voltage 55.2V.
		[08] FLd	For vented lead-acid battery, charge voltage at constant voltage is 58.4V and float charge voltage is 55.2V
		[08] GEL **default**	For gel lead-acid battery, charge voltage at constant voltage is 56.8V and float charge voltage is 55.2V.
		[08] L14/L15/L16	Lithium iron phosphate battery L14/L15/L16 corresponds to lithium iron phosphate battery 14 strings/15 strings/16 strings;16 string/15 string/14 string default constant The voltage charging pressure is 56.8V, 53.2V, 49.6V, which are adjustable.
		[08] N13/N14	Ternary lithium battery; which is adjustable.
09	Boost charge voltage	[09] 57.6V default	The setting range of boost charge voltage is 48V~58.4V with 0.4V step. It is valid in case of a self-defined or a lithium battery.
10	Boost charge maximum time	[10] 120 **default**	Boost maximum charge time setting means setting of maximum charge time of voltage when the voltage reaches parameter 【09】fro 5min~900min at 5-minute step. It is valid in case of a self-defined or a lithium battery.
11	Float voltage	[11] 55.2V **default**	48V~58.4V setting range of float voltage at 0.4V step is valid in case of a self-defined battery.
12	Overdischarge voltage	[12] 42V **default**	So as to overdischarge voltage, when the battery voltage is lower than the judgement point, after delaying for the parameter 【13】setting time, turn off the inverter output. 40V~48V voltage setting range at 0.4V step is valid in case of a self-defined battery and lithium battery.
13	Overdischarge delay time	[13] 5S **default**	So as to overdischarge delay time, when the battery voltage is lower than parameter【12】, the inverter output is turned off after delaying the time set with the parameter. 5S~50S setting range at 5S step is valid in case of a self-defined and lithium battery.

No. of Parameter	Name of Parameter	Setting Option	Description
14	Battery undervoltage alarm point	[14] 44V **default**	So as to battery undervoltage alarm point, when the battery voltage is lower than the judgement point, an undervoltage alarm is given out and no turnoff is output. 40V~52V setting range at 0.4V step is valid in case of a self-defined and lithium battery.
15	Battery discharge limiting voltage	[15] 40V **default**	So as to battery discharge limiting voltage, when the battery voltage is lower than the judgement point, the output is turned off immediately. 40V~52V setting range at 0.4V step is valid in case of a self-defined and lithium battery.
16	Equalizing charge	[16] DIS	No equalizing charge is permitted.
		[16] ENA **default**	When equalizing charge is enabled, only vented lead-acid battery and sealed lead-acid are valid.
17	Equalizing charge voltage	[17] 58.4V **default**	So as to equalizing charge voltage, 48V~58.4V setting range at 0.4V step is valid in case of a vented lead-acid battery and sealed lead-acid battery.
18	Equalizing charge time	[18] 120 **default**	So as to equalizing charge time, 5min~900min setting range at 5min step is valid in case of a vented lead-acid battery and sealed lead-acid battery.
19	Equalizing charge delay	[19] 120 **default**	For equalizing charge delay, 5min~900min setting range at 5min step is valid in case of a vented lead-acid battery and sealed lead-acid battery.
20	Equalizing charge derating time	[20] 30 **default**	For equalizing charge derating time, 0~30days setting range at 1-day step is valid in case of a vented lead-acid battery and sealed lead-acid battery.
21	Equalizing charge enabling	[21] ENA	Start equalizing charge immediately.
		[21] DIS **default**	Stop equalizing charge immediatel.
22	Energysaving mode	[22] DIS **default**	No energy-saving mode
		[22] ENA	After enabling the energy-saving mode, in case of empty or small load, the output is turned off after output delaying of inverter for a certain period of time. After the rocker switch is pressed to "OFF" state and then to "ON" state, the inverter restore the output.
23	Automatic restart after overload	[23] DIS	When the automatic restart after overload is disabled, if the output is turned off upon overload, the machine shall not restore turnon.

		[23] ENA **default**	When the automatic restart after overload is enabled, if the output is turned off upon overload, output is restarted by the mains after 3min delay. The machine shall not restarted after 5 times of restarts.
24	Automatic restart after overtemperature	[24] DIS	When automatic restart after overtemperature is disabled, if the output machine is turned off upon overtemperature, no output is turned on.
		[24] ENA **default**	When automatic restart after overtemperature is enabled, if the output is turned off upon overtemperature, the output can be turned on after the machine cools down.
25	Buzzer alarm	[25] DIS	Disabling alarm
		[25] ENA **default**	Enabling alarm
26	Mode conversion reminding	[26] DIS	No alarm prompt in case of any change in main input source
		[26] ENA **default**	Alarm prompt is enabled if state of main input source is changed.
27	Inverter overload to bypass	[27] DIS	No automatic switching to AC power in case of inverter overload
		[27] ENA **default**	Automatic switching to AC power in case of inverter overload
28	AC maximum Charge current	[28] 40A **default**	AC Out 120Vac Setting range 0~40A
29	Split Phase	[29] DIS **default**	Supply for industrial frequency transformer (disabled)
		[29] ENA	Supply for industrial frequency transformer (enabled)
30	RS485 Address setting	[30] 1 **default**	RS485 communication address setting range 1 ~ 254, (refer to Number [32] is valid when set as SLA)
35	Battery lowvoltage recovery	[35] 52V **default**	Setting range 44V~58.4V
37	Battery fully charged recovery point	[37] 52V **default**	After the battery is fully charged, it needs to be lower than this set voltage before it can be recharged
38	AC output Voltage setting	[38] 120Vac **default**	Settable： (100/105/110Vac)

4.6 Battery type parameters

For Lead-acid Battery :

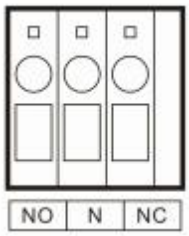
Battery type / Parameters	Sealed lead acid battery (SLD)	Colloidal lead acid battery (GEL)	Vented lead acid battery (FLD)	User-defined (USE)
Overvoltage disconnection voltage	60V	60V	60V	60V
Equalizing charge voltage	58.4V	56.8V	59.2V	40 ~ 60V (Adjustable)
Boost charge voltage	57.6V	56.8V	58.4V	40 ~ 60V (Adjustable)
Floating charge voltage	55.2V	55.2V	55.2V	40 ~ 60V (Adjustable)
Undervoltage alarm voltage	44V	44V	44V	40 ~ 60V (Adjustable)
Low voltage disconnection voltage	42V	42V	42V	40 ~ 60V (Adjustable)
Discharge limit voltage	40V	40V	40V	40 ~ 60V (Adjustable)
Over-discharge delay time	5s	5s	5s	1 ~ 30s (Adjustable)
Equalizing charge duration	120 minutes	-	120 minutes	0 ~ 600 minutes (Adjustable)
Equalizing charge interval	30 days	-	30 days	0 ~ 250 days (Adjustable)
Boost charge duration	120 minutes	120 minutes	120 minutes	10 ~ 600 minutes (Adjustable)

For Lithium Battery :

Battery type / Parameters	Ternary lithium battery (N13)	Ternary lithium battery (N14)	Lithium iron phosphate battery (L16)	Lithium iron phosphate battery (L15)	Lithium iron phosphate battery (L14)	User-defined (USE)
Overvoltage disconnection voltage	60V	60V	60V	60V	60V	60V
Equalizing charge voltage	-	-	-	-	-	40 ~ 60V (Adjustable)
Boost charge voltage	53.2V (Adjustable)	57.6V (Adjustable)	56.8V (Adjustable)	53.2V (Adjustable)	49.2V (Adjustable)	40 ~ 60V (Adjustable)
Floating charge voltage	53.2V (Adjustable)	57.6V (Adjustable)	56.8V (Adjustable)	53.2V (Adjustable)	49.2V (Adjustable)	40 ~ 60V (Adjustable)
Undervoltage alarm voltage	43.6V (Adjustable)	46.8V (Adjustable)	49.6V (Adjustable)	46.4V (Adjustable)	43.2V (Adjustable)	40 ~ 60V (Adjustable)
Low voltage disconnection voltage	38.8V (Adjustable)	42V (Adjustable)	48.8V (Adjustable)	45.6V (Adjustable)	42V (Adjustable)	40 ~ 60V (Adjustable)
Discharge limit voltage	36.4V	39.2V	46.4V	43.6V	40.8V	40 ~ 60V (Adjustable)
Over-discharge delay time	30s (Adjustable)	30s (Adjustable)	30s (Adjustable)	30s (Adjustable)	30s (Adjustable)	1 ~ 30s (Adjustable)
Equalizing charge duration	-	-	-	-	-	0 ~ 600 minutes (Adjustable)
Equalizing charge interval	-	-	-	-	-	0 ~ 250 days (Adjustable)
Boost charge duration	120 minutes (Adjustable)	120 minutes (Adjustable)	120 minutes (Adjustable)	120 minutes (Adjustable)	120 minutes (Adjustable)	10 ~ 600 minutes (Adjustable)

5.Other Function

5.1 Dry node function

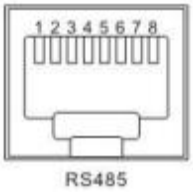


Working principle: this dry node can control the switch of diesel generator to charge the battery.

① Under normal conditions, in this terminal, NC-N point is closed and NO-N point is opened;

② when the battery voltage reaches the low-voltage disconnection voltage point, the coil of the relay is energized and NO-N point is closed and NC-N point opened. At this time, NO-N point can drive resistive loads 125VAC/1A, 230VAC/1A and 30VDC/1A.

5.2 RS485 communication function



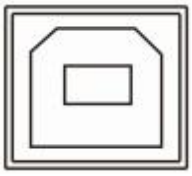
There are two communication ports RS485-1 and RS485-2 and also two functions:

① RS485 communication with lithium battery BMS can be conducted directly through this port RS485-2 (need to be customized);

② RS485-1 is connected to the selected RS485 to WiFi /GPRS communication module independently developed by our company After the selected module is equipped, the reverse control solar charge inverter of our company can be connected through mobile APP, and the operating parameters and status of the reverse control solar charge inverter can be checked through the mobile APP.

③ Such as shown in the figure: pin 1 is 5V power supply; pin 2 is GND, pin 7 is RS485-A and pin 8 is RS485-B.

5.3 USB communication function



This port is a USB communication port, which can be used for USB communication with the selected upper computer software of our company (Need to apply for). To use this port, the corresponding "USB to serial port chip CH340T driver" should be installed in the computer.

6.Protection

6.1 Protection function

No.	Protection Function	Note
1	Current limiting protection	When the charge current of the configured PV array exceeds the rated current of PV, it will be charged at the rated current.
2	Anti-reverse charge protection at night	At night, because the battery voltage is greater than that of the PV module, the battery shall be protected against discharge through the PV module.
3	AC input over- voltage protection	When the AC voltage exceeds 140V (120V model), the AC charge will be stopped and converted to inverter for output.
4	AC input under- voltage protection	When the AC voltage is lower than 90V (120V model), the AC charge will be stopped and converted to inverter for output.
5	Battery overvoltage protection	When the battery voltage reaches the overvoltage breaking voltage point, charge from PV and AC power to the battery shall be automatically stopped to prevent the battery from being damaged due to overcharge.
6	Battery low- voltage protection	When the battery voltage reaches the low-voltage breaking voltage point, the discharge to the battery will automatically stopped to prevent the battery from damage owing to overdischarge.
7	Load output short circuit protection	In case of short-circuit fault at the load output end, the output of AC voltage can be turned off immediately and then restored 1 minute later. After trying for 3 times, the output load end is still in short circuit state, it is required to eliminate the short circuit fault of the load at first, and then turn on the machine again to restore normal output.
8	Radiator overtemperature protection	In case of excessive internal temperature, the solar charge inverter shall stop charge and discharge; after the temperature returns to normal state, the solar charge inverter shall restore charge and discharge.
9	Overload protection	There is output within 3 minutes after overload protection. The output is turned off in case of 5 times of continuous overload until the machine is turned on again. Specific overload grade and duration are shown in the technical parameter able after the manual.
10	AC reverse flowing protection	Prevent AC power inverted from battery inverting against reverse flowing into bypass AC input.
11	Bypass overcurrent protection	Built-in AC input overcurrent protection breaker.

6.2 Meaning of fault code

Fault Code	Fault Name	Affecting output or not	Note
【01】	BatVoltLow	Yes	Battery undervoltage alarm
【02】	BatOverCurrSw	Yes	Average overcurrent software protectionforbattery discharge
【03】	BatOpen	Yes	No connection alarm of battery
【04】	BatLowEod	Yes	Stop discharge alarm for battery undervoltage
【05】	BatOverCurrHw	Yes	Battery overcurrent hardware protection
【06】	BatOverVolt	Yes	Charge overvoltage protection
【07】	BusOverVoltHw	Yes	Bus overvoltage hardware protection
【08】	BusOverVoltSw	Yes	Bus overvoltage software protection
【09】	PV VoltHigh	No	PV overvoltage protection
【10】	PV OCSw	No	PV overcurrent software protection
【11】	PV OCHw	No	PV overcurrent hardware protection
【12】	bLineLoss	No	AC power failure
【13】	OverloadBypass	Yes	Bypass overload protection
【14】	OverloadInverter	Yes	Inverter overload protection
【15】	AcOverCurrHw	Yes	Inverter overcurrent hardware protection
【16】	-	-	-
【17】	InvShort	Yes	Inverter short-circuit protection
【18】	-	-	-
【19】	OverTemperMppt	No	PV radiator overtemperature protection
【20】	OverTemperInv	Yes	Overtemperature protection of inverter radiator
【21】	FanFail	Yes	Fan fault
【22】	EEPROM	Yes	Memory fault
【23】	ModelNumErr	Yes	Inaccurate model setting
【26】	RlyShort	Yes	Inverted AC Output Backfills to Bypass AC Input
【29】	BusVoltLow	Yes	Bus undervoltage protection

6.3 Some fault troubleshooting

Fault	Solving Measures
No display on screen	Check whether the battery air switch or PV air switch is closed; whether the switch is in "on" state; press any key on the screen to exit from the screen sleep mode.
Charge battery overvoltage protection	Measure whether the battery voltage exceeds 60V, and disconnect the photovoltaic array air switch and the AC air switch.
Battery undervoltage protection	After the battery charge restores to be above low-voltage disconnection recovery voltage.
Fan fault	Check if the fan doesn't work or if it's blocked by something else.
Radiator overtemperature protection	When the device cools below the overtemperature recovery temperature, it shall restore to normal charge and discharge control.
Bypass overload protection, inverting overload protection	① Decrease consumer; ② Restart solar charge inverter and the load output is restored.
Inverting short-circuit protection	Carefully check load connection condition, clear short-circuit fault point; After power on again, the load output is restored.
PV overvoltage	Check whether PV input voltage exceeds maximum allowable input voltage with a multimeter.
No connection alarm of battery	Check whether the battery is not disconnected or whether the breaker at the battery side is not closed.

7.System Maintenance

- **In order to maintain the optimum and permanent operation performance, it is suggested to check the following items semiannually.**

1. Confirm that the air flow around the solar charge inverter will not be blocked. In addition, remove any dirt or debris from the radiator.
2. Check whether the insulation of all exposed wires is damaged due to sun exposure, friction with other objects around, dry rot, insect or rat damage, etc. If necessary, it is required to repair or replace the wires.
3. Verify that the indication and display are consistent with the operation of the device. Please pay attention to any fault or error display and take corrective measures if necessary.
4. Check all terminals for corrosion,insulation damage,high temperature or burning/discoloration sign, and tighten the terminal screws.
5. Check for dirt, nesting insects and corrosion phenomenon and clean as required.
6. If the arrester has failed, replace the failed arrester in time to protect the solar charge inverter and other user device against lightning damage.

Warning: Danger of electric shock! To perform above operations, make sure that all the power supplies of the solar charge inverter have been broken and all the capacitor electricity has been discharged. Afterwards, corresponding inspection or operation can be performed!

- **We are not responsible for any following damage:**

① Damage caused by improper use or use in inappropriate place.
② Open-circuit voltage of photovoltaic module exceeds maximum allowable voltage.
③ The damage caused by the operation ambient temperature beyond the limited operation temperature range.
④ Personally take apart and maintain the solar charge inverter.
⑤ Damage caused by force majeure: damage caused by transportation and handling of the solar charge inverter.

8. Technical Parameter

Model	SPH504880A
AC mode	
Rated input voltage	110/120Vac
Input voltage range	(90Vac-140Vac)
Frequency	50Hz/ 60Hz (auto-sensing)
Frequency range	47±0.3Hz ~ 55±0.3Hz (50Hz); 57±0.3Hz ~ 65±0.3Hz (60Hz);
Overload/short- circuit protection	Breaker
Efficiency	>95%
Conversion time (Bypass and inverting)	10ms (Typical value)
AC reverse flowing protection	yes
Maximum bypass overload current	63A
Inverting mode	
Output voltage waveform	Pure sine wave
Rated output power (VA)	5000(4100/ 4300/4500)
Rated output power (W)	5000(4100/ 4300/4500)
Power factor	1
Rated output voltage (Vac)	120Vac (100/105/110Vac Settable)
Output voltage error	±5%
Output frequency range (Hz)	50Hz ± 0.3Hz /60Hz ± 0.3Hz
Efficiency	>90%
Overload protection	(102%<load<110%) ±10%: reporting error and turn off the output after 5 minutes; (110%<load<125%) ±10%: reporting error and turn off the output after 10 seconds ;Load>125% ±10%: reporting error and turn off the output after 5 seconds;
Peak power	10000VA
Loaded motor capacity	4HP
Output short-circuit protection	Breaker
Specification of bypass breaker	63A
Rated battery input voltage	48V (minimum start voltage 44V)
Battery voltage range	40.0Vdc~60Vdc ± 0.6Vdc (undervoltage alarm/turnoff voltage/overvoltage alarm/overvoltage restoration…settable LCD screen)
Power saving mode	Load ≤50W
AC charge	
Battery type	Lead acid or lithium battery

Maximum charge current	40A
Charge current error	± 5Adc
Charge voltage range	40–60Vdc
Short-circuit protection	Breaker and blown fuse
Breaker specification	63A
Overcharge protection	Turn off charge after 1min alarm
Solar charge	
Maximum PV open- circuit voltage	500Vdc
PV operation voltage range	120-500Vdc
MPPT voltage range	120-450Vdc
Battery voltage range	40-60Vdc
Maximum output power	5000W
Charge current range of solar energy (settable)	0-80A
Charge short-circuit protection	Blown fuse
Wiring protection	Inverse wiring protection
Authentication specification	
Specification authentication	CE(IEC 62109-1)/CETL(UL 1741/ CSA C22.2 NO.107.1)
EMC authentication grade	EN61000
Operation temperature range	-15°C to 55°C
Storage temperature range	-25°C ~ 60°C
Humidity range	5% to 95% (three-proof paint protection)
Noise	≤60dB
Thermal dissipation	Forced cooling with adjustable air speed
Communication interface	USB/RS485 (WiFi/GPRS)/dry node control
Dimension (L*W*D)	426mm*322mm*126mm
Weight (kg)	11.6

Mono Power：415W
Dimensions：1722*1134*35mm

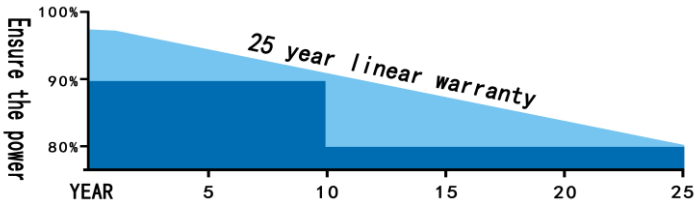
Characteristics

- High efficiency solar cell to keep the modules efficiency reach to 21.25%.
- Positive tolerance to ensure higher output.
- Excellent performance under weak light conditions.
- Modules withstand extremely (temperature, load and impact) TUV certification.
- All modules combination and packing through stepping current to keep effectively reduce mismatch loss.
- 100% EL test to keep higher quality.

Warranty

- *5 year 95% output warranty, 10 year 90% output warranty, 25 year 80% output warranty.*
- *12 years material and workmanship warranty.*

Anodized aluminum frame withstand corrosion and damage, Special osculum can reduce destruction by water freeze.



IP68 junction box long-term weather endurance.

Quality and safety

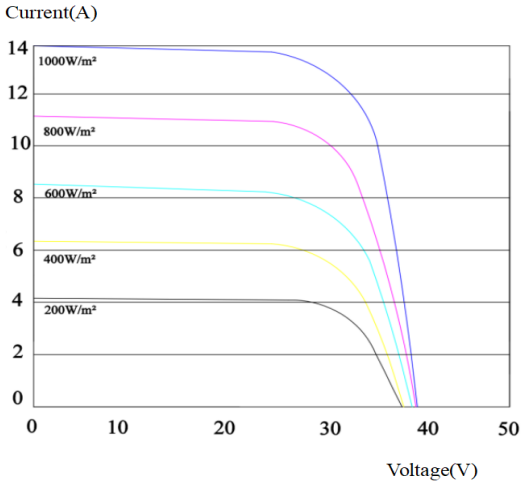
- ISO9001:2015、ISO14001:2015、ISO45001:2018 certified supplier, we provide world first class solar products for clients.
- TUV,IEC,CEC,CE,CB CA 92618 approved.
- *UL61730, CEC Listed.*

Electrical Characteristics

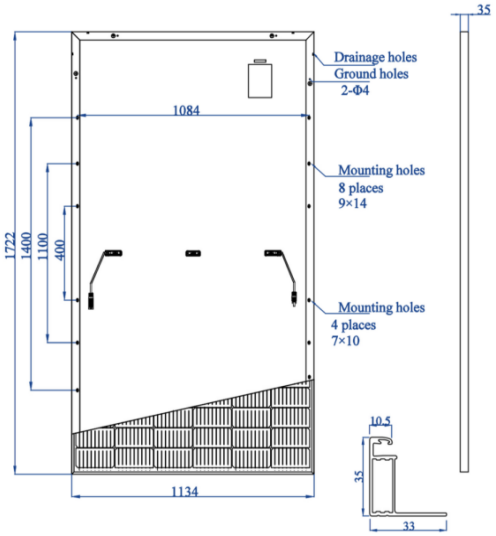
Model No.	SG415WM
Maximum Power (Pmax)	415W
Max-power Voltage (Vmp)	31.11V
Max-power Current (Imp)	13.34A
Open-circuit Voltage (Voc)	38.32V
Short-circuit Current (Isc)	14.09A
Module Efficiency	21.3%
Operating Temperature	-40 ℉ to 185 ℉ -40℃~+85℃
Maximum System Voltage	1500Vdc
Maximum Series Fuse Rating	20A
Power Tolerance	±3%

*STC condition：1000 W/m²,1.5AM and 25℃ cell temperature.

I-V Curve



Dimensions



Temperature Characteristics

NMOT	45℃±2 ℃
Temperature Co-efficient of Pmax	-0.35%/℃
Temperature Co-efficient of Voc	-0.27%/℃
Temperature Co-efficient of Isc	0.048%/℃

Mechanical Characteristics

Mono Power	415W
Cell Type	Mono 182*91mm
Cell Arrangement	108(6*18)
Dimensions	67.80*44.65*1.38inch(1722*1134*35mm)
Weight	48.06lb
Front Cover	3.2mm tempered glass
Frame Material	Anodized aluminium alloy
Junction Box	IP68 rated
Output Cables	4mm²,Length：（+）300mm/（-）300mm

Packing

Packing	40HC
Pieces/Pallet	32
Pieces/container	780