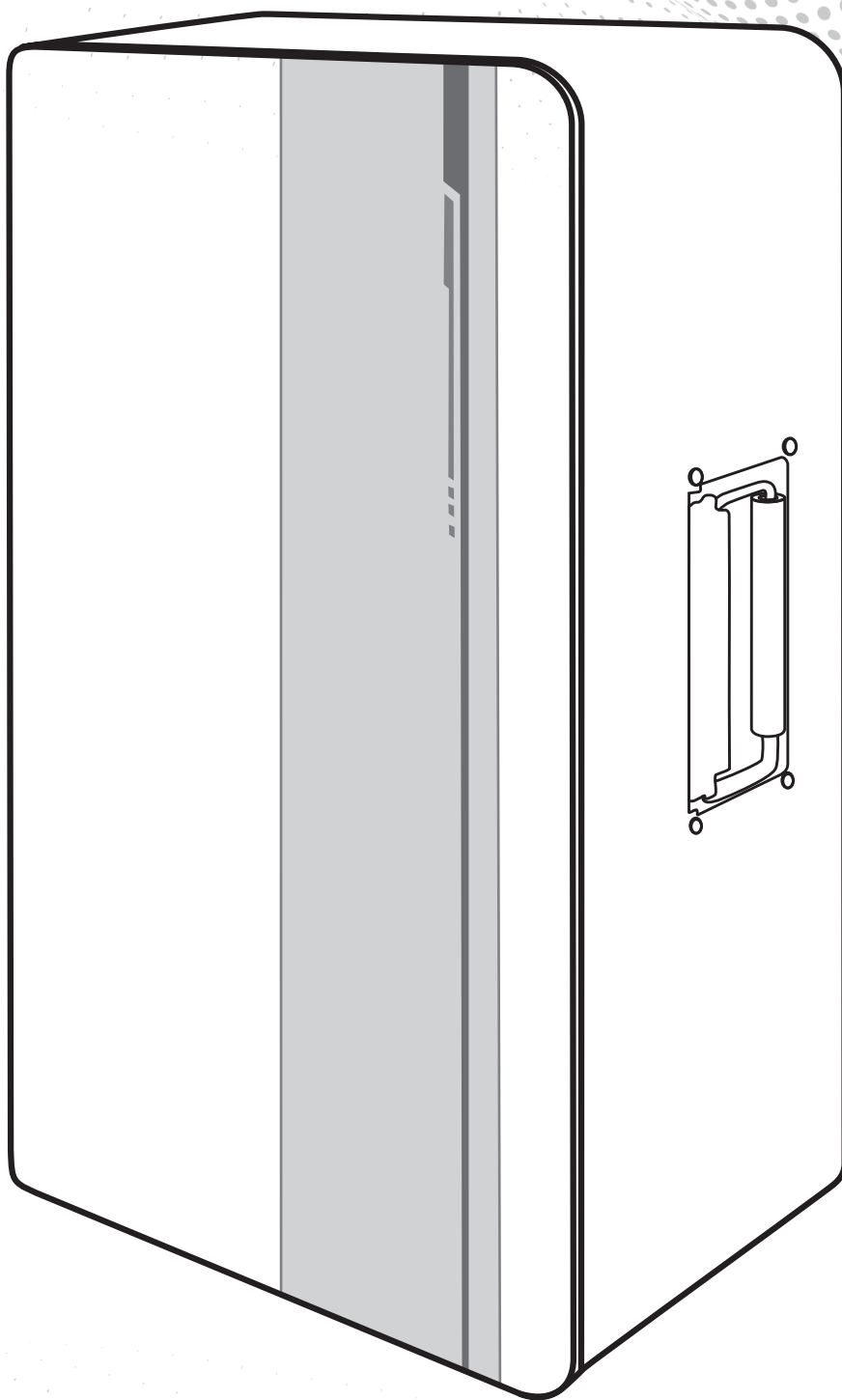


IPANDEE

THE
NEW



Intelligent photovoltaic MPPT controller

- Please read this user manual carefully before use and keep it properly.
- Please refer to the actual product, the picture is for reference only.

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1.0 Important safety instructions

1.1 Express one's thanks

Thank you for buying our products and for your trust and support.

In this product manual, we are committed to providing you with accurate and clear usage guidelines and relevant information to help you better understand and use our products.

1.2 Notice to Operation

Before using this product, please read this manual thoroughly to understand the correct and safe operation methods. By using this product, you agree to and fully read and understand all contents of this manual. Do not use this product before carefully reading the instructions and understanding the performance of this product; We are not responsible for any financial loss or personal injury arising from operations that do not comply with the provisions of this Manual. In order to continuously optimize our products, we reserve the right to adjust the content of the manual. It also retains all relevant intellectual and industrial property rights, including Copyrights, patents, trademarks and designs. This manual will be updated from time to time without prior notice. If you find any conflict between your product and this manual, or have any questions about the product or this manual, please contact us for consultation and modification. We reserve the right of final interpretation of this manual.

1.3 Safety warning note

We take safety very seriously and recommend that anyone who is in close contact with our products, such as installing, operating, maintaining or servicing this product, use caution, follow common sense, and follow the safety information on this manual and machine installation stickers to ensure the safety of people and products and reduce safety risks.

The following information is displayed on the instructions or product labels: A hazard or warning label indicates a potentially hazardous or hazardous situation which, if not avoided, will result in death or serious injury. Extra care and attention should be paid to the safety of you or the product.

	Reminder: indicates suggestions and prompts to the operator.
	Note: Indicates that this operation is destructive.
	Warning: indicates that this operation is dangerous. Make safety preparations before performing this operation.

2.0 Product introduction

2.1 Product overview

This series of products is designed to match the application of high battery voltage systems in the range of 96V to 480V. The unique voltage overcharge protection technology can effectively prevent the risk of system damage caused by battery side disconnection (abnormal heating of circuit breakers or BMS protection of lithium batteries).

This series of products has the function of limiting current charging. When the user's photovoltaic panel power is too large, the controller automatically maintains the charging power, and the charging current does not exceed the rated value.

This series of products support various types of lead-acid battery and lithium battery energy storage system solar charging application requirements, users can connect the built-in Bluetooth module through the mobile phone to complete the setting of working parameters and operation data reading. This series of products supports the external WIFI cloud module of our company, and supports the operation and maintenance of PC monitoring software through serial communication. The purchase of this series of products comes with a monitoring watch head. The user can connect the monitoring watch head with the RJ45 interface of the controller to normal use. The monitoring watch head has practical functions, simple operation logic, easy to use, and can be directly magnetically attracted on the controller chassis when installing.

2.2 Product characteristics

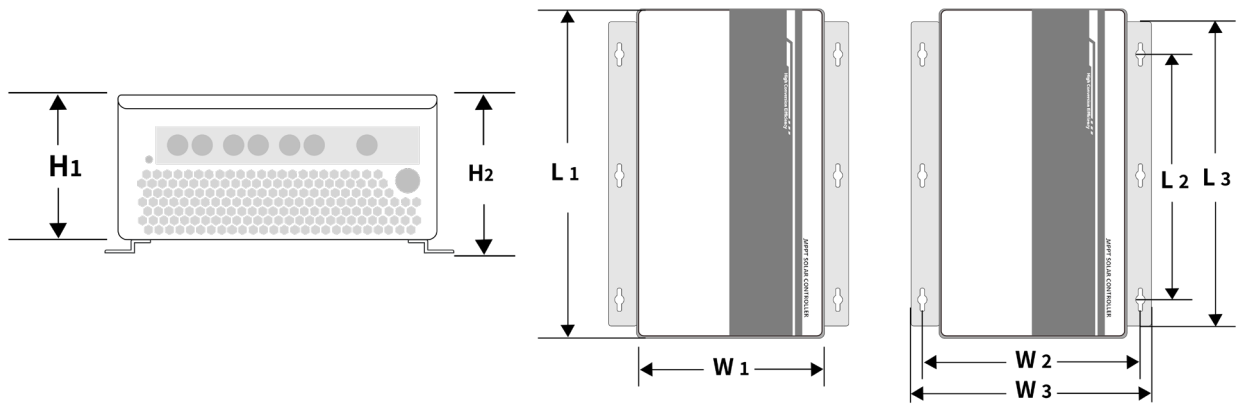
- ◆ MPPT efficiency $\geq 99.5\%$, the average conversion efficiency of the machine 98%
- ◆ Automatic voltage identification of battery system
- ◆ Three-stage charge (constant current, constant voltage, floating charge)
- ◆ Can customize a variety of batteries (including lithium batteries) charging
- ◆ Supports remote monitoring by PC and APP
- ◆ Dual RS485 communication, unified integrated management and secondary development
- ◆ Support multiple parallel communication, unified integrated monitoring
- ◆ A variety of protection functions, over voltage and over current, reverse protection, charging protection and so on

2.3 Product list

1	Controller *1	5	MH-M80 monitor head *1
2	Temperature sensing line *1	6	Accessory Pack *1
3	RS485-USB Communication Cable (optional)	7	Instructions *1
4	Bluetooth antenna *1		

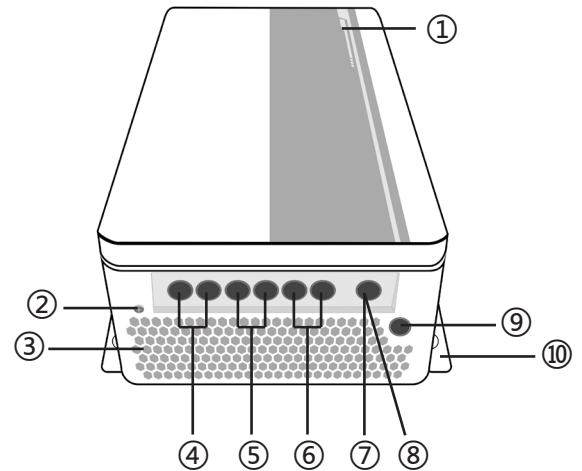
2.4 Product size

	L1	W1	H1	L2	L3	W2	W3	H2
L:96V~216V	535mm	313mm	176mm	400mm	480mm	338mm	359mm	188mm
H:192V~384V	521mm	340mm	214mm	400mm	480mm	365mm	386mm	226mm
H:480V	580mm	343mm	215mm	400mm	480mm	368mm	389mm	227mm



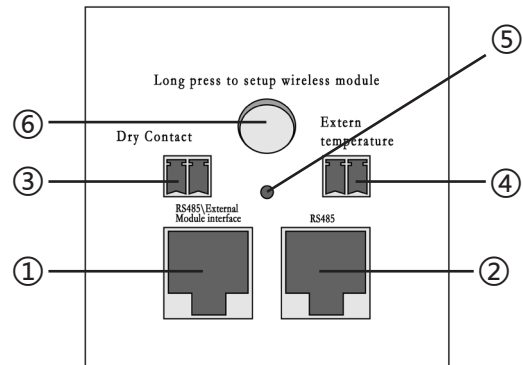
2.5 Structure specification

1	Operating status light	6	Load end
2	Ground connection	7	RJ45 communication cable outlet
3	Controller heat dissipation air inlet hole	8	Temperature sensor wire outlet
4	PV terminal	9	Bluetooth antenna interface
5	Battery end	10	Fixing strip



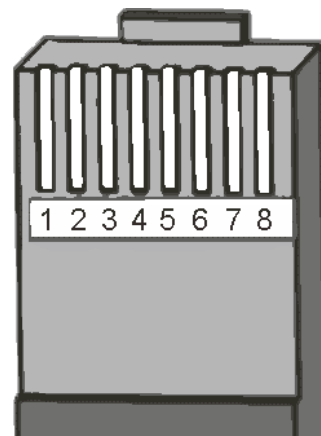
2.6 Controller communication port definition

1	Connector head and communication module interface with 5V power supply
2	RS485 communication interface
3	Reserve dry contact ports
4	External temperature sensor interface
5	Bluetooth module signal light (flashing indicates that data is being transmitted)
6	Reset/restart (long press to reset and restart Bluetooth module)



2.7 RS485 pin definition

S/N	RJ45 port ①	RJ45 port ②
1	RS485-A	RS485-A
2	RS485-B	RS485-B
3	—	—
4	—	—
5	GND	—
6	GND	—
7	+5V	—
8	+5V	—



Reminder: RJ45 port (1) support the upper computer and MH-M80 monitor head, RJ45 port (2) only support the upper computer (external communication), the pin definition is only applicable to our related products!

2.8 Specification parameter

Product item	GS96L60	GS96L80	GS96L100
Static power consumption	4W~5W		
Maximum Power Point Tracking Efficiency	$\geq 99.5\%$		
Cooling method	Forced air cooling		
Lead-acid battery system voltage range	72V~120V		
Lithium-ion battery system	96V		
Maximum input voltage(Voc.Max)*	430VDC		
Minimum MPPT voltage (Vmppt.min)	Vbat + 10V		
Start charging voltage	Vbat + 20V		
Input overvoltage protection/Recovery voltage	430VDC/425VDC		
Rated input power(W)**	6240	8320	10400
Applicable battery type	Common lead-acid batteries (SEL, GEL, FLD) and custom lead-acid batteries, custom lithium iron phosphate, ternary lithium or other lithium-ion batteries		
Rated charging current	60A	80A	100A
Charging method	Lead Acid Battery: CC (Quick Charge)-CV (Constant Voltage Charge)-CF (Float Charge) Li-Ion Battery: CC (Quick Charge)-CV (Constant Voltage Charge)		
Load voltage	Same as battery voltage		
Rated load current	60A	80A	100A
Load control mode	On/Off, Light Control Mode, Dual Time Period Timing Control Mode, Fixed Time Light Control Mode		
Display	Working status indicator or MH-M80 meter		
Communication	Dual RJ45 interface/RS485 bus/host computer software/ built-in Bluetooth/WIFI module mobile phone cloud monitoring (optional)		
Protocol	Standard Modbus protocol & non-standard proprietary protocol		
How to set	PC softwar / APP /Meter		
Protections	Input / output overvoltage and undervoltage protection / input reverse connection protection / battery anti reverse connection protection / overheating protection / overcharge protection		
Operating ambient temperature	-20°C ~+50°C		
Storage temperature	-40°C ~+70°C		
IP(Ingress protection)	IP21		
Recommended breaker for battery	$\geq 80A$	$\geq 100A$	$\geq 125A$
Net weight / Gross weight	17kg / 23.5kg		
Product Size	535*313*188MM		
Package dimensions	636*413*288MM(wooden box)		

*The voltage of the PV array cannot exceed this limit.

**These power limits refer to the maximum power that the MPPT controller can handle. High power arrays can be used without damaging the controller.

Product item	GS120L60	GS120L80	GS120L100
Static power consumption	4W~5W		
Maximum Power Point Tracking Efficiency	$\geq 99.5\%$		
Cooling method	Forced air cooling		
Lead-acid battery system voltage range	90V~150V		
Lithium-ion battery system	120V		
Maximum input voltage(Voc.Max)*	430VDC		
Minimum MPPT voltage (Vmppt.min)	Vbat + 10V		
Start charging voltage	Vbat + 20V		
Input overvoltage protection/Recovery voltage	430VDC/425VDC		
Rated input power(W)**	7800	10400	13000
Applicable battery type	Common lead-acid batteries (SEL, GEL, FLD) and custom lead-acid batteries, custom lithium iron phosphate, ternary lithium or other lithium-ion batteries		
Rated charging current	60A	80A	100A
Charging method	Lead Acid Battery: CC (Quick Charge)-CV (Constant Voltage Charge)-CF (Float Charge) Li-Ion Battery: CC (Quick Charge)-CV (Constant Voltage Charge)		
Load voltage	Same as battery voltage		
Rated load current	60A	80A	100A
Load control mode	On/Off, Light Control Mode, Dual Time Period Timing Control Mode, Fixed Time Light Control Mode		
Display	Working status indicator or MH-M80 meter		
Communication	Dual RJ45 interface/RS485 bus/host computer software/ built-in Bluetooth/WIFI module mobile phone cloud monitoring (optional)		
Protocol	Standard Modbus protocol & non-standard proprietary protocol		
How to set	PC softwar / APP /Meter		
Protections	Input / output overvoltage and undervoltage protection / input reverse connection protection / battery anti reverse connection protection / overheating protection / overcharge protection		
Operating ambient temperature	-20°C ~+50°C		
Storage temperature	-40°C ~+70°C		
IP(Ingress protection)	IP21		
Recommended breaker for battery	$\geq 80A$	$\geq 100A$	$\geq 125A$
Net weight / Gross weight	17kg / 23.5kg		
Product Size	313*540*187MM		
Package dimensions	636*413*288MM (wooden box)		

*The voltage of the PV array cannot exceed this limit.

**These power limits refer to the maximum power that the MPPT controller can handle. High power arrays can be used without damaging the controller.

Product item	GS144L60	GS144L80	GS180L60	GS180L80
Static power consumption	4W~5W			
Maximum Power Point Tracking Efficiency	≥ 99.5%			
Cooling method	Forced air cooling			
Lead-acid battery system voltage range	108V~180V		135V~225V	
Lithium-ion battery system	144V		180V	
Maximum input voltage(Voc. Max)*	430VDC			
Minimum MPPT voltage (Vmppt.min)	Vbat + 10V			
Start charging voltage	Vbat + 20V			
Input overvoltage protection/ Recovery voltage	430VDC/425VDC			
Rated input power(W)**	9360	12480	11700	15600
Applicable battery type	Common lead-acid batteries (SEL, GEL, FLD) and custom lead-acid batteries, custom lithium iron phosphate, ternary lithium or other lithium-ion batteries			
Rated charging current	60A	80A	60A	80A
Charging method	Lead Acid Battery: CC (Quick Charge)-CV (Constant Voltage Charge)-CF (Float Charge) Li-Ion Battery: CC (Quick Charge)-CV (Constant Voltage Charge)			
Load voltage	Same as battery voltage			
Rated load current	60A	80A	60A	80A
Load control mode	On/Off, Light Control Mode, Dual Time Period Timing Control Mode, Fixed Time Light Control Mode			
Display	Working status indicator or MH-M80 meter			
Communication	Dual RJ45 interface/RS485 bus/host computer software/built-in Bluetooth/WIFI module mobile phone cloud monitoring (optional)			
Protocol	Standard Modbus protocol & non-standard proprietary protocol			
How to set	PC softwar / APP /Meter			
Protections	Input / output overvoltage and undervoltage protection / input reverse connection protection / battery anti reverse connection protection / overheating protection / overcharge protection			
Operating ambient temperature	-20℃ ~+50℃			
Storage temperature	-40℃ ~+70℃			
IP(Ingress protection)	IP21			
Recommended breaker for battery	≥ 80A	≥ 100A	≥ 80A	≥ 100A
Net weight / Gross weight	17kg / 23.5kg			
Product Size	535*313*188MM			
Package dimensions	636*413*288MM (wooden box)			

*The voltage of the PV array cannot exceed this limit.

**These power limits refer to the maximum power that the MPPT controller can handle. High power arrays can be used without damaging the controller.

Product item	GS192L50	GS192L60	GS216L50	GS216L60	GS240L50	GS240L60
Standby power consumption	4W~5W					
Maximum Power Point Tracking Efficiency	≥ 99.5%					
Cooling method	Forced air cooling					
Lead-acid battery system voltage range	144V~240V		162V~270V		180V~300V	
Lithium-ion battery system	192V		216V		240V	
Maximum input voltage*	430VDC					
Minimum MPPT voltage	Vbat + 10V					
Start charging voltage	Vbat + 20V					
Input overvoltage protection/ Recovery voltage	430VDC / 425VDC					
Rated input power(W)**	10400	12480	11700	14040	13000	15600
Applicable battery type	Common lead-acid batteries (SEL, GEL, FLD) and custom lead-acid batteries, custom lithium iron phosphate, ternary lithium or other lithium-ion batteries					
Rated charging current	50A	60A	50A	60A	50A	60A
Charging method	Lead Acid Battery: CC (Quick Charge)-CV (Constant Voltage Charge)-CF (Float Charge) Li-Ion Battery: CC (Quick Charge)-CV (Constant Voltage Charge)					
Load voltage	Same as battery voltage					
Rated load current	50A	60A	50A	60A	50A	60A
Load control mode	On/Off, Light Control Mode, Dual Time Period Timing Control Mode, Fixed Time Light Control Mode					
Display	Working status indicator or MH-M80 meter					
Communication	Dual RJ45 interface/RS485 bus/host computer software/built-in Bluetooth/WIFI module mobile phone cloud monitoring (optional)					
Protocol	Standard Modbus protocol & non-standard proprietary protocol					
How to set	PC softwar / APP /Meter					
Protections	Input / output overvoltage and undervoltage protection / input reverse connection protection / battery anti reverse connection protection / overheating protection / overcharge protection					
Operating ambient temperature	-20℃ ~ +50℃					
Storage temperature	-40℃ ~ +70℃					
IP(Ingress protection)	IP21					
Recommended breaker for battery	≥ 80A					
Net weight/Gross weight	17kg / 23.5kg					
Product Size	535*313*188MM					
Package dimensions	636*413*288MM (wooden box)					

*The voltage of the PV array cannot exceed this limit.

**These power limits refer to the maximum power that the MPPT controller can handle. High power arrays can be used without damaging the controller.

Product item	GS192H100	GS216H80	GS216H100	GS240H80	GS240H100
Standby power consumption	4W~5W				
Maximum Power Point Tracking Efficiency	≥ 99.5%				
Cooling method	Forced air cooling				
Lead-acid battery system voltage range	144V~240V	162V~270V		180V~300V	
Lithium-ion battery system	192V	216V		240V	
Maximum input voltage*	660VDC				
Minimum MPPT voltage	Vbat + 10V				
Start charging voltage	Vbat + 20V				
Input overvoltage protection/ Recovery voltage	660VDC/655VDC				
Rated input power(W)**	20800	18720	23400	20800	26000
Applicable battery type	Common lead-acid batteries (SEL, GEL, FLD) and custom lead-acid batteries, custom lithium iron phosphate, ternary lithium or other lithium-ion batteries				
Rated charging current	100A	80A	100A	80A	100A
Charging method	Lead Acid Battery: CC (Quick Charge)-CV (Constant Voltage Charge)-CF (Float Charge) Li-Ion Battery: CC (Quick Charge)-CV (Constant Voltage Charge)				
Load voltage	Same as battery voltage				
Rated load current	Measurable range: 0~100A				
Load control mode	Normally open				
Display	Working status indicator or MH-M80 meter				
Communication	Dual RJ45 interface/RS485 bus/host computer software/built-in Bluetooth/WIFI module mobile phone cloud monitoring (optional)				
Protocol	Standard Modbus protocol & non-standard proprietary protocol				
How to set	PC softwar / APP /Meter				
Protections	Input / output overvoltage and undervoltage protection / input reverse connection protection / battery anti reverse connection protection / overheating protection / overcharge protection				
Operating ambient temperature	-20℃ ~+50℃				
Storage temperature	-40℃ ~+70℃				
IP(Ingress protection)	IP21				
Recommended breaker for battery	≥ 125A	≥ 100A	≥ 125A	≥ 100A	≥ 125A
Net weight/Gross weight	23kg / 31kg				
Product Size	521*340*226MM				
Package dimensions	621*440*326MM (wooden box)				

*The voltage of the PV array cannot exceed this limit.

**These power limits refer to the maximum power that the MPPT controller can handle. High power arrays can be used without damaging the controller.

Product item	GS360H80	GS384H80	GS384H100	GS480H60	GS480H80
Standby power consumption	4W~5W				
Maximum Power Point Tracking Efficiency	99.50%				
Cooling method	Forced air cooling				
Lead-acid battery system voltage range	270V~450V	288V~480V	288V~480V	360V~600V	360V~600V
Lithium-ion battery system	360V	384V		480V	
Maximum input voltage*	850VDC				
Minimum MPPT voltage	Vbat + 10V				
Start charging voltage	Vbat + 20V				
Input overvoltage protection/ Recovery voltage	850VDC/845VDC				
Rated input power(W)**	31200	33280	41600	31200	41600
Applicable battery type	Common lead-acid batteries (SEL, GEL, FLD) and custom lead-acid batteries, custom lithium iron phosphate, ternary lithium or other lithium-ion batteries				
Rated charging current	80A	80A	100A	60A	80A
Charging method	Lead Acid Battery: CC (Quick Charge)-CV (Constant Voltage Charge)-CF (Float Charge) Li-Ion Battery: CC (Quick Charge)-CV (Constant Voltage Charge)				
Load voltage	Same as battery voltage				
Rated load current	Measurable range: 0~100A				
Load control mode	Normally open				
Display	Working status indicator or MH-M80 meter				
Communication	Dual RJ45 interface/RS485 bus/host computer software/built-in Bluetooth/WIFI module mobile phone cloud monitoring (optional)				
Protocol	Standard Modbus protocol & non-standard proprietary protocol				
How to set	PC softwar / APP /Meter				
Protections	Input / output overvoltage and undervoltage protection / input reverse connection protection / battery anti reverse connection protection / overheating protection / overcharge protection				
Operating ambient temperature	-20℃ ~ +50℃				
Storage temperature	-40℃ ~ +70℃				
IP(Ingress protection)	IP21				
Recommended breaker for battery	≥ 100A	≥ 100A	≥ 125A	≥ 80A	≥ 100A
Net weight/Gross weight	23 kg / 30 kg			——	
Product Size	340*522*222MM			580*343*227mm	
Package dimensions	620*450*335MM (wooden box)			680*450*335MM (wooden box)	

*The voltage of the PV array cannot exceed this limit.

**These power limits refer to the maximum power that the MPPT controller can handle. High power arrays can be used without damaging the controller.

3.0 Install

3.1 Precautions before installation

➤ Installation position

- ◆ Install the controller indoors, and ensure that the installation location is dry, ventilated, and convenient for disassembly and maintenance.
- ◆ Do not install on flammable building materials; Do not install on highly flammable materials; Do not install in hazardous areas where there is a risk of explosion.
- ◆ Do not expose the equipment to harsh environments such as damp, flammable and explosive, or large accumulation of dust.
- ◆ Never install the controller in a case with an open/liquid-rich battery.
- ◆ The temperature of the controller may exceed 40 ° C during operation. Please install the controller in a position that is not accessible to non-professionals.
- ◆ Do not install in direct sunlight, direct sunlight causes the body temperature rise, affecting the product's own heat dissipation effect, resulting in product damage.

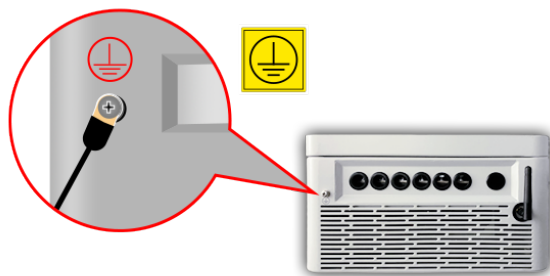
➤ Safety information

- ◆ Wear insulation tools for installation.
- ◆ Disconnect all power to the controller before installing or adjusting it.
- ◆ It is recommended that more than two people cooperate with the operation and installation. If an accident occurs, ask the nearby people to help.
- ◆ The controller must be installed by qualified technicians or personnel trained in safety installation in accordance with the electrical regulations of the country where it is located.

➤ Proper use

- ◆ This controller is only used for solar power generation. Connecting to any other type of power source (such as a wind turbine or generator) may void the warranty.
- ◆ There are no user repairable parts in the controller, do not disassemble or attempt to repair the controller.
- ◆ When maintaining the product, disconnect the internal circuit breaker of the product before performing related operations.
- ◆ If the indicator light is not on for the first time, cut the fuse or circuit breaker immediately and check whether the line is connected correctly.
- ◆ When the controller is in the normal charging state, do not disconnect the battery; otherwise, the DC load may be damaged.
- ◆ When the controller is running and charging, do not let the battery fall off (including manually shutting off the battery circuit breaker or shutting down the battery circuit breaker due to too small specifications or overheating). (It is recommended to use a circuit breaker with a power higher than 1.3 to 1.5 times the rated current.)
- ◆ It is recommended that you connect an insurance or circuit breaker to the input end, load end, and battery end to prevent the risk of electrical spark and electric shock during cable connection, and prevent the difficulty of disconnecting the system circuit when a fault occurs.

- ♦ The operating voltage of the controller is high. When installing the system, ensure that the chassis is properly grounded (grounding screws are installed at the bottom of the chassis) to prevent electric shocks and other abnormal conditions (As shown at right).



3.2 Installation procedure

➤ Step 1: Unpack and check

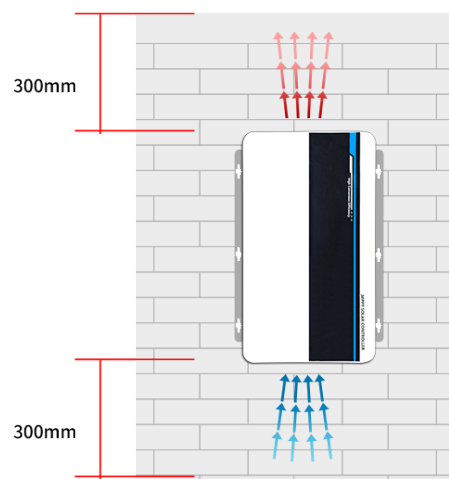
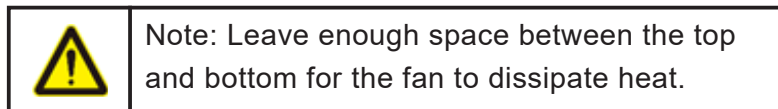
Check the controller for transport damage; Check whether the specifications are consistent with the order.

➤ Step 2: Check the controller parameter limits

Ensure that the solar array open circuit voltage (Voc) under maximum temperature compensation does not exceed the rated voltage value of the controller model. Multiple controllers can be mounted in parallel on the same battery pack for greater charging current. Each controller in parallel must be connected to an independent solar panel.

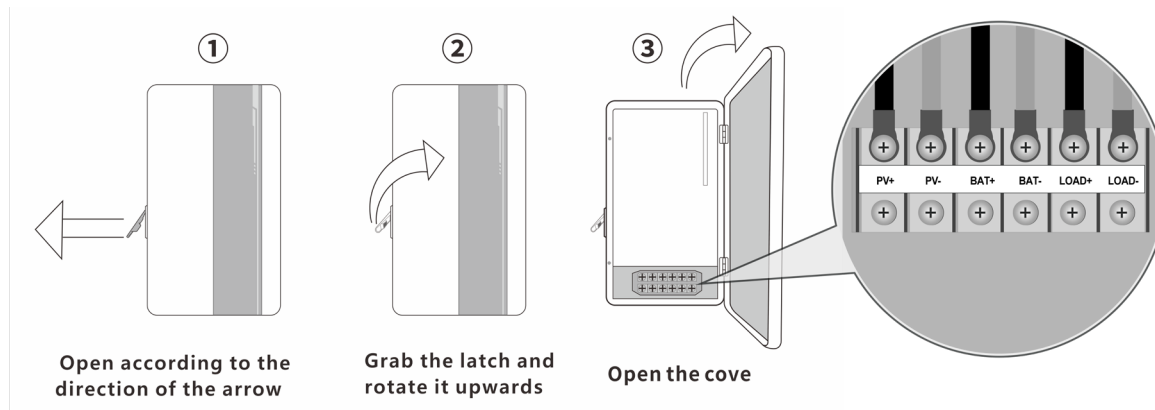
➤ Step 3: Determine the installation space

To ensure space for air circulation, leave at least 30 cm (11.8 in) of space above and below the controller, and do not install it in a closed box. As shown at right



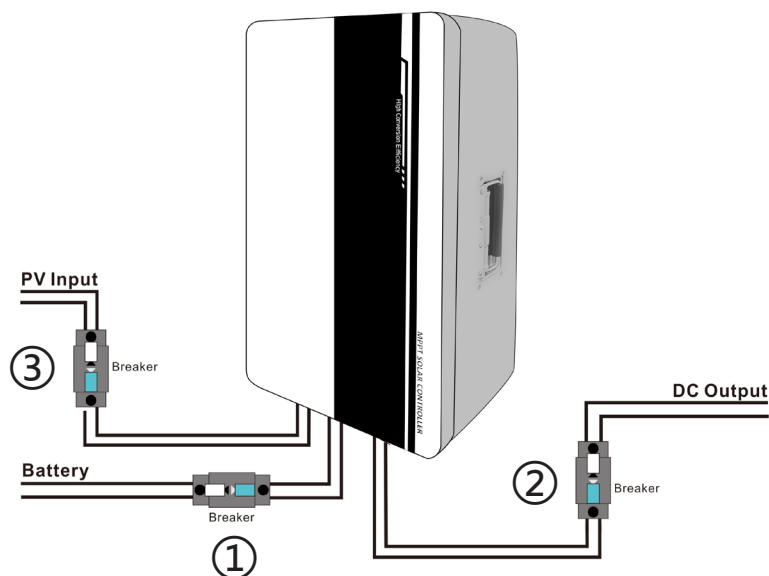
➤ Step 4: Open the patch board

After opening the controller housing according to the sequence below, the bottom is the controller wiring port.



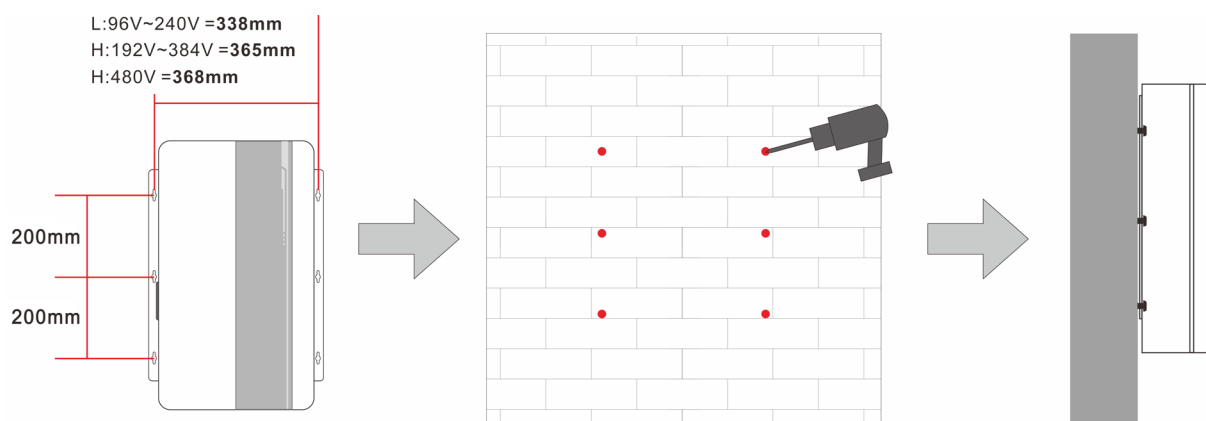
➤ Step 5: Wiring sequence

Connect the cables with circuit breakers to the positive and negative extremes on the controller in sequence. Ensure that the circuit breaker is off before connecting the cables. As shown below



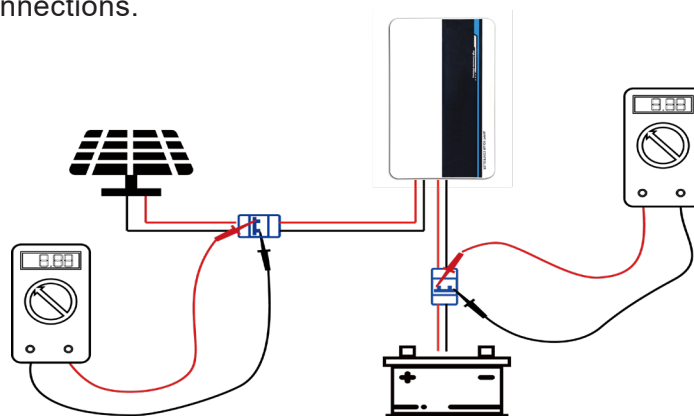
➤ Step 6: Secure the controller

Drill six holes with a diameter of 8mm and a depth of about 6cm into the installation position according to the corresponding model dimensions indicated in the figure below. Fill the six holes with plastic expansion particles and insert them into the plastic expansion particles using self-tapping screws to expose a certain distance. Then, align the ear holes of the controller with the screws and hang them on.



➤ Step 7: Power on step

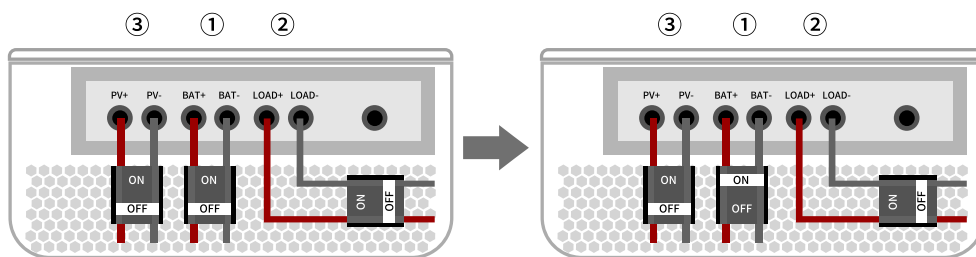
Before powering on the controller, check whether the positive and negative poles of the PV input and BAT battery output are correct. Otherwise, the controller may not work properly or be damaged due to misconnections.



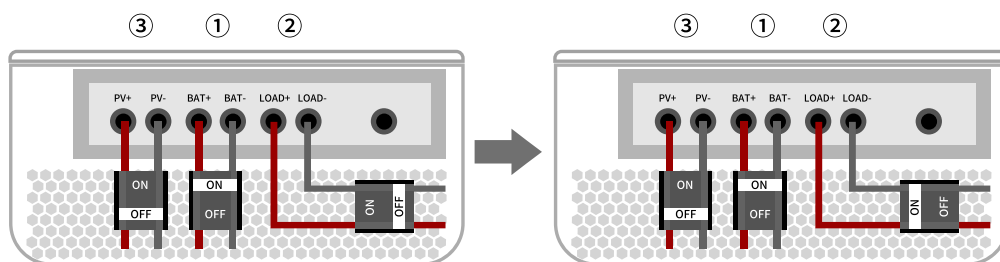
Note: The battery open circuit voltage must be greater than the current system voltage 20V for the controller to operate.

Ensure that all cables are securely connected before powering on the device.

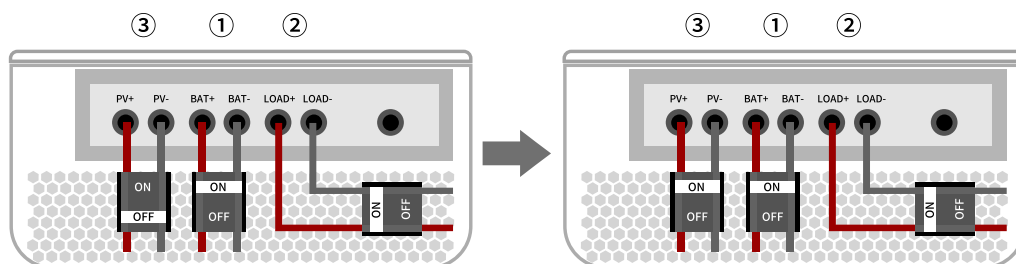
1, first close the circuit breaker connected to the battery ①, ensure that the controller and the battery are connected (the controller LED status light is green), then you can set the output working parameters;



2, if you need DC output control load, then first set the output control mode, and then open the DC output circuit breaker ②;



3, close the solar panel PV input circuit breaker ③, PV input voltage in the controller charging working range, then the controller will enter the charging state;



Reminder: ① After the circuit breaker is closed, if the controller does not run, it may be that the battery has no power; After closing the circuit breaker ③, it will be powered on normally by the input of the solar panel.



Reminder: This controller prevents nighttime reverse current leakage, so serial diodes are not required in the system.



Note: The photovoltaic input should not be incorrectly connected to the output power line of the controller when wiring, otherwise the internal circuit of the controller may be damaged and the warranty will be invalid.



Note: Installation must comply with electrical code requirements. Select the appropriate circuit breaker and fuse specifications according to the application requirements.



Warning: Ensure that the connection is secure and secure with cable clips to prevent the cable from shaking and overheating, which may cause danger.



Warning: Risk of electric shock. Before contact, test the impedance between all terminals and ground.

If the system needs to connect an inverter, connect the inverter directly to the battery, do not connect the inverter to the controller load terminal.



Warning: The negative power terminals of the controller are interconnected (common negative). If necessary, ground according to instructions, local codes and regulations.

3.3 Power Failure

Disconnect the circuit breakers ③ , ② and ① in sequence, and only after the controller is powered off can the controller be maintained.

4.0 Settings and Operations

4.1 Series rules of photovoltaic modules

Since the types of photovoltaic modules on the market are different, it is particularly important that the controller, as the core component in the photovoltaic system, can be suitable for various types of photovoltaic modules and can maximize the conversion of solar energy into electricity. Therefore, according to the open circuit voltage of the MPPT controller (VOC) and maximum power point voltage (VMPP) can be used to calculate the number of photovoltaic modules in series suitable for different types. The following is a table of the quantity of photovoltaic modules in series, for reference only.

PV_{input} <DC430V The total input voltage is prohibited greater than 430V								
System voltage	36cell Voc<23V		48cell Voc<31V		54cell Voc<34V		60cell Voc<38V	
	Maximum	Optimal	Maximum	Optimal	Maximum	Optimal	Maximum	Optimal
96V	18	10~15	13	8~11	12	7~10	11	6~9
192V	18	15~18	13	11~13	12	11~12	11	10~11
216V	18	16~18	13	12~13	12	11~12	11	10~11
240V	18	17~18	13	13	12	12	11	11
System voltage	72cell Voc<46V		96cell Voc<62V		film 80V<Voc<100V			
	Maximum	Optimal	Maximum	Optimal	Maximum		Optimal	
96V	9	5~7	7	4~6	4		2~3	
192V	9	7~9	7	5~6	4		3	
216V	9	8~9	7	6	4		3	
240V	9	9	7	6	4		3~4	

PV_{input} < DC660V The total input voltage is prohibited greater than 660V								
System voltage	36cell Voc<23V		48cell Voc<31V		54cell Voc<34V		60cell Voc<38V	
	Maximum	Optimal	Maximum	Optimal	Maximum	Optimal	Maximum	Optimal
192V	28	17~23	21	12~17	19	11~15	17	10~13
216V	28	18~24	21	13~18	19	12~16	17	11~14
240V	28	19~25	21	14~19	19	13~17	17	12~15
System voltage	72cell Voc<46V		96cell Voc<62V		film 80V<Voc<100V			
	Maximum	Optimal	Maximum	Optimal	Maximum		Optimal	
192V	14	8~11	10	6~8	6		4	
216V	14	9~12	10	7~8	6		4~5	
240V	14	10~12	10	8	6		5	

PV_{input} < DC850V The total input voltage is prohibited greater than 850V								
System voltage	36cell Voc<23V		48cell Voc<31V		54cell Voc<34V		60cell Voc<38V	
	Maximum	Optimal	Maximum	Optimal	Maximum	Optimal	Maximum	Optimal
384V	36	32~36	27	24~27	25	22~25	22	19~22
480V	36	35~36	27	26~27	25	24~25	22	20~22
System voltage	72cell Voc<46V		96cell Voc<62V		film 80V<Voc<100V			
	Maximum	Optimal	Maximum	Optimal	Maximum		Optimal	
384V	18	16~18	13	12~13	8		7~8	
480V	18	17~18	13	13	8		8	

	Note: The above parameter values are calculated under standard test conditions (STC: standard test condition 25°C , air quality AM1.5, 1000W/square meter).
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4.2 PV module input total power

This series of MPPT controllers has a charging current limit function, that is, the controller can limit the charging current within the rated charging current range of the controller, and the controller can obtain a maximum power that is not greater than the rated charging current of the controller, so even if the PV side of the controller If the input power exceeds the rated charging power of the controller, the controller will charge the battery according to the rated charging current of the controller. For example, if the rated power is 60A controller for 96V system, no matter how big the input solar panel is, the charging current will not exceed 60A.

The actual operating power of the PV array meets the following conditions:

- 1) When the actual power of the photovoltaic array is less than or equal to the rated charging power of the controller, the maximum charging power of the controller is the actual power of the photovoltaic array.
- 2) When the actual power of the photovoltaic array > the rated charging power of the controller, the controller works according to the power of the rated charging current. If the power of the photovoltaic array is greater than the rated charging power of the controller, the charging time at the rated charging current will be prolonged, so more energy can be obtained to charge the battery. At the same time, when the sun is strong, the current limiting effect will also cause the solar panel waste;

	Note: Please refer to the specification table for the rated power of different types of products!
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4.3 Battery system voltage and its type

1) The default of lead-acid battery is to automatically identify whether the current battery voltage is normal (Auto), and the user can also directly set the system voltage of the battery. Features of automatic identification: it can detect whether the battery voltage is within the normal range (12V single-cell battery range is between 9~15V), if it cannot be recognized normally, it will not be charged; the characteristics of the specified battery system voltage: regardless of the current battery voltage is how much will work at the specified system voltage.

2) The lithium-ion battery mode will default to a set of working parameters for commonly used lithium iron phosphate batteries. It is recommended that users reset the parameters according to their own lithium battery type and battery pack string number to avoid damage to expensive charging parameters due to wrong charging parameters. Battery.

3) The controller has set 3 kinds of conventional battery parameters in the following table for lead-acid batteries. If you need to charge other special batteries, please select the "User" type and then set it through the APP or host computer software; (voltage parameters are all 12V system parameters at 25°C, 96V system parameters*8, 192V system parameters*16, 216V system*18, 240V system*20)

Battery Type	Constant Voltage	Floating Voltage
Flooded	14.6V	13.8V
Sealed	14.4V	13.8V
Gel	14.2V	13.8V
User (setting)	C(9V~15V)	F(9V~15V)

4.4 DC load output voltage system and maximum current

This series of controllers has the DC LOAD output function, and its output voltage range is the same as the working voltage of the battery pack. If the voltage of the battery pack is 100.8V, then the current DC output voltage is 100.8V.

Users can choose to set different DC load output control modes according to different application requirements.

Remarks: Due to the difference of product models, some models can control the DC load output in different modes, and some models can only be permanently open and monitor the size of the load current and power usage.

4.5 Specifications of cables and circuit breakers/air switches

Wiring and installation must comply with national and local electrical requirements.

PV array wiring specifications:

Since the output current of the photovoltaic array is affected by the type of photovoltaic modules, connection method and illumination, the minimum wire diameter of the photovoltaic array is calculated according to the short-circuit current of the photovoltaic array. Please refer to the short-circuit current value in the PV module specification (the short-circuit current remains unchanged when the PV modules are connected in series; the short-circuit current is the sum of the short-circuit currents of all parallel-connected modules). And for the convenience of switching on and off and safety, it is recommended to install a circuit breaker. Please refer to the following table for wire and circuit breaker specification selection.

Model	Rated charging current	Rated discharge current	Battery wire diameter (mm ² /AWG)	Load wire diameter (mm ² /AWG)	Battery breaker
50A	50A	50A	10/7	10/7	>100A
60A	60A	60A	16/6	16/6	>100A
70A	70A	70A	20/5	20/5	>125A
80A	80A	80A	26/3	26/3	>125A
100A	100A	100A	34/2	34/2	>150A

4.6 Status Indicator

Indicator light	Illustrate
Yellow	The controller works in standby mode
Blue	The controller is in charging state
Green	DC Load is on
Red	A fault or warning is currently detected

4.7 Parameter Settings

Users can use the included MH-M80 monitor head to set parameters. For details, refer to the MH-M80 accessory manual.

4.8 Communication

This series of controllers adopts a screen-free design, which can be viewed and operated through the built-in Bluetooth module. Users can search for "SolarMate" in the AppStore or GooglePlay to download and install the app, or obtain the installation package directly from the website. When the Bluetooth function of the mobile phone is enabled, you can use the App to interact with the controller through Bluetooth.



IOS platform



google platform



Android platform



PC monitoring platform



Note: This APP is only suitable for use with Cloud-Box-M2 (cloud monitoring module) and BT-02 (Bluetooth module) Supporting the use of!

5.0 Common Faults and Troubleshooting

5.1 Common Faults

Unable to charge fault solution:

Check whether the solar panels are in good contact and whether the array is blocked or damaged;
Check whether the input voltage of the controller is normal, and ensure that the controller is connected correctly;
Check the battery status and replace it if necessary.

Show troubleshooting:

Restart the controller and check whether it is normal.

If the display is damaged, contact the manufacturer for replacement or repair;

If the internal circuit of the controller is damaged, contact the manufacturer for replacement or maintenance.

Communication failure resolution:

Check whether the data cable is damaged, and contact the manufacturer for replacement or maintenance;

Ensure that the communication interface is properly connected and not loose or damaged;

Check communication protocol Settings to ensure they match other devices.



Warning: There are no user repairable parts in the controller, do not disassemble or attempt to repair the controller yourself.



Warning: Inputs and outputs are not electrically isolated and may be energized using dangerous solar voltages. Under certain fault conditions, the battery may be overcharged. Before contact, take protective insulation measures.

6.0 Product protection function and system maintenance

6.1 Protection Function Description

➤ **Waterproof and dustproof protection: IP21**

Waterproof grade: 2, dust grade: 1

➤ **Battery reverse protection**

After the positive and negative terminals of the battery are reversed, the system does not work and will not burn out the controller.

➤ **Photovoltaic input short circuit protection**

When the input end of the photovoltaic array is short circuited, the controller disconnects the charging. When the short circuit is cleared, the charging will automatically resume.

➤ **Photovoltaic input reverse protection**

When the photovoltaic array polarity is reversed, the controller will not be damaged, and will continue to work normally after correcting the wiring error.

➤ **Internal overtemperature protection**

When the internal temperature of the controller reaches the specified threshold, the power is automatically reduced.

➤ **Radiator temperature limit**

When the heat sink temperature exceeds the maximum threshold, the controller automatically power off and stops running.

➤ **Battery drop protection**

When the battery is in the overcharge state, the charging circuit will automatically fall off and disconnect, preventing overcharge and extending the battery life.



Note: There is no GFDI (Ground fault detection device) inside the controller.

6.2 System Maintenance

- ◆ In order to maintain the best performance, it is recommended to inspect the project more than twice a year.
- ◆ Ensure that the air flow around the controller is not blocked, and clear dust and blockage from the ventilation holes of the chassis.
- ◆ Check all exposed wires for insulation damage caused by sun exposure, friction with other objects around, dry rot, insects or rodents. Wires need to be repaired or replaced as necessary.
- ◆ Verify that the indicator is consistent with the device operation. Please note any faults or errors displayed and take corrective action if necessary.
- ◆ Check all terminals for signs of corrosion, insulation damage, high temperature, or burning/discoloration, and tighten the terminal screws.
- ◆ Check for dirt, nesting insects and corrosion and clean as required.



Warning: Electric shock danger! When performing the above operations, ensure that all power supplies of the controller are disconnected, and then perform the corresponding check or operation!

