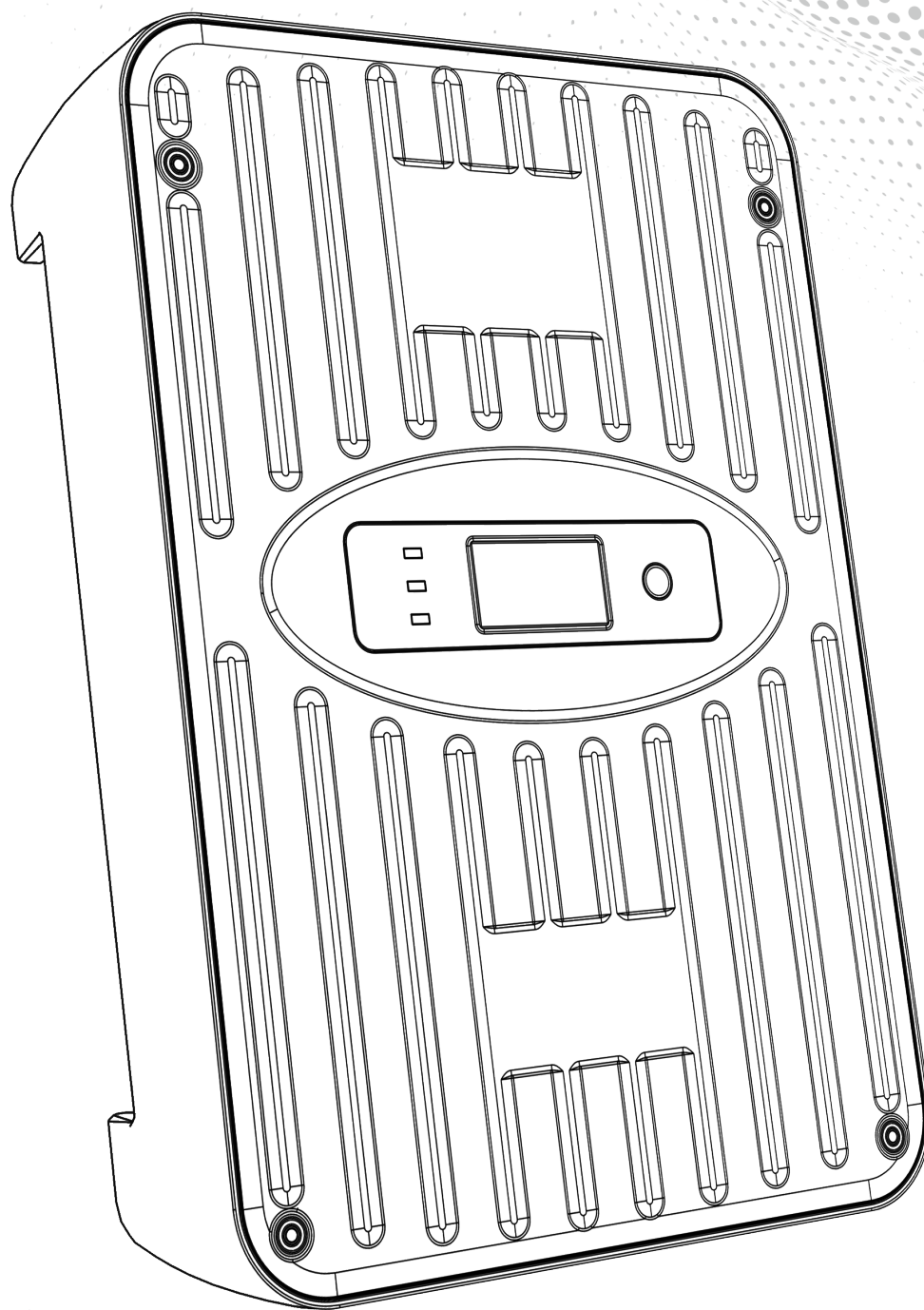


User manual

TEMPERATURE



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 product can detect the power generation of solar panels in real time, and track the maximum voltage current value (VI), so that the system can charge the battery at the maximum power output. It is used in off-grid photovoltaic system to coordinate the work of solar panels, batteries and loads, and is the core control component of off-grid photovoltaic system.

This product can not only be set by pressing buttons, but also by connecting the external Bluetooth /wifi or RJ45 communication interface to the upper computer and other devices to view the operating parameters, controller logs, historical parameters, control parameters, remote control, etc., and can modify the controller parameters according to needs to meet different system requirements.

The controller adopts standard Modbus communication protocol, which is convenient for users to carry out secondary development according to application scenarios. At the same time, the company provides free monitoring software to view and modify the parameters of the system. The controller has a comprehensive electronic fault self-test function and powerful electronic protection function, which can avoid the damage of product components due to installation errors and system failures to the greatest extent.

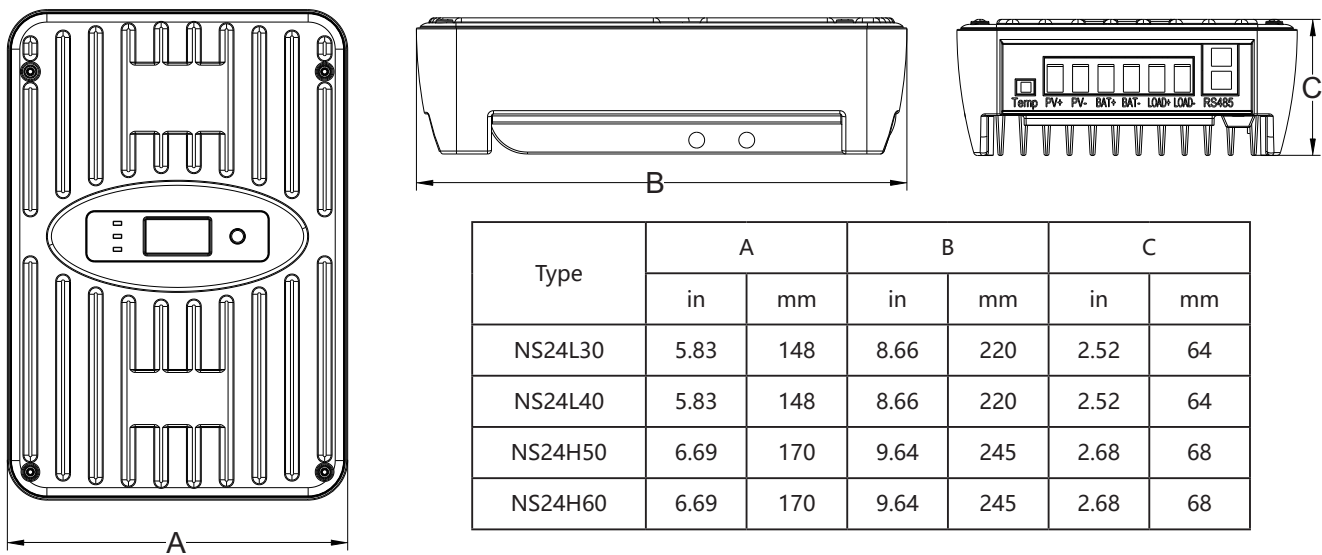
2.2 Product characteristics

- MPPT efficiency 99.5%, conversion efficiency 97%.
- All aluminum alloy design, heat dissipation is more efficient, more stable operation.
- OLED blue display status information.
- Built-in lithium battery activation wake-up function.
- Support common lead-acid battery, lithium iron phosphate, ternary lithium battery charging.
- Support user defined lead-acid battery or lithium battery specifications of charging.
- The protection function is complete to ensure the stable operation of lithium battery or lead-acid battery system.
- Support host computer, wired instrument, wireless module APP remote monitoring.
- Dual RJ45 interface for integrated management and secondary development.

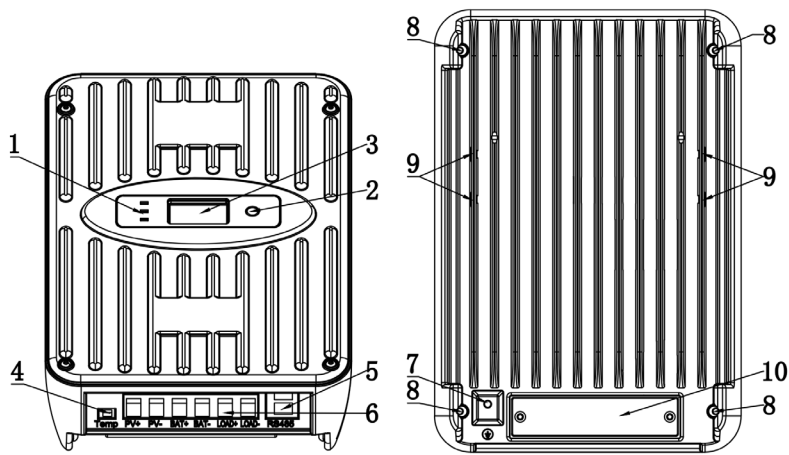
2.3 Product list

1	MPPT controller*1	5	M4x5 screws*4
2	Temperature sensing cable*1	6	M4x8 screws*4
3	Aluminum alloy mounting hanger*2	7	User manual*1
4	Plastic expansion particles*4		

2.4 Product size



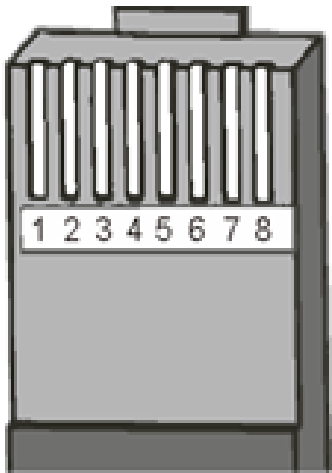
2.5 Structure specification



1	Status light	6	Input and output power line interfaces
2	Operation button	7	Ground cable connection position
3	Digital OLED display	8	Reverse mounting holes
4	Temperature sensing wire interface	9	Install the mounting holes in the forward direction
5	Double RJ45 serial communication port	10	Terminal cover

No. "5" RJ45 Port Definition:

No.	DEFINITION
1	RS485-A
2	RS485-B
3	—
4	—
5	GND (isolate)
6	GND (isolate)
7	+7V
8	+5V



2.6 Specification parameter

Model		NS24L30	NS24L40	NS24H50	NS24H60	NS48H20	NS48H30
MPPT efficiency		99.5%					
Standby power		1.6W~1.8W					
Heat-Dissipating method		All aluminum alloy shell self-heating					
Settable lithium-ion battery system		8VDC~30VDC					
Max.PV input voltage(Voc)*		100VDC		150VDC			
Min.Vmpp Voltage		Battery voltage + 2V					
Start-up charging voltage		Battery voltage + 3V					
Low input voltage protection		Battery voltage + 2V					
Over voltage protection / Recovery		100VDC/95VDC		150VDC/145VDC		150VDC/145VDC	
Reted PV Power	12V system**	420W	560W	700W	840W	280W	420W
	24V system**	840W	1120W	1400W	1680W	560W	840W
	36V system**	——	——	——	——	840W	1260W
	48V system**	——	——	——	——	1120W	1680W
	Li-ion**	432W~864W	576W~1152W	720W~1440W	864W~1728W	292W~1168W	432W~1728W
Activation for lithium battery		Standard					
Battery types		Sealed(SEL),Gel(GEL),Flooded(FLD),User-defined(USER) AGM, LiFePO4 (4 Strings / 7 Strings / 8 strings) ,Ternary lithium battery (3 Strings / 6 strings / 7 strings) , Custom lithium ion battery (Lit)					
		Lithium iron phosphate battery (4 string /7 string /8 string), Ternary lithium battery (3 string /6 string /7 string), Custom Lithium-ion Battery (Lit)				Lithium iron phosphate battery (4 string /7 string /8 string /10 string /15 string /16 string) Ternary lithium battery (3 string /6 string /7 string /10 string /13 string /14 string), Custom Lithium-ion Battery (Lit)	
Rated charge current		30A	40A	50A	60A	20A	30A
Temperature compensation		-3mV/°C /2V					
Charge method		3 stages: CC (Constant current) - CV (Constant voltage) - CF (Floating charge)				CC (Constant current) - CV (Constant voltage)	
Output voltage stability accuracy		≤ ±0.2V					
Load voltage		Same as battery voltage					
Rated load current		20A		30A		20A	
Load control mode		On/Off , PV voltage control mode, Dual-time control mode, PV + Time control mode					
Low voltage protection		10.5V (default), 11V (restored), settable					
Setting method		PC software / APP / Controller /meter					
Display		Blue OLED display					
Communication		Dual RJ45 port / RS485 / support PC software monitoring / support WiFi module for APP cloud monitoring / support centralized parallel monitoring					
Protections		Load short circuit protection / Input & output over-volt / low-voltage protection / reverse polarity protection / over-heating protection / battery shedding protection etc		Input & output over-volt / low-voltage protection / reverse polarity protection / over-heating protection / battery shedding protection etc			
Operating ambient temperature		-20°C ~+50°C					
Storage temperature		-40°C ~+70°C					
IP(Ingress protection)		IP42					
Altitude		0~3000m					
Max. connection size		28mm ²					
Recommended breaker		≥ 63A	≥ 63A	≥ 100A	≥ 100A	≥ 40A	≥ 63A
Net Weight/Gross Weight (kg)		1.5 /1.9		2.25 / 2.6			
Product size /Packing size (mm)		220x148x64/285x190x74		245x170x69/300x220x75			

*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 in a dry, ventilated location that is 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 heat sink of the controller may exceed 40 ° C during operation. Install the controller in a place that is not accessible to children and the elderly.
- Ensure adequate ventilation when installing the controller in the chassis. Installation in a sealed case can result in overheating, reduced power operation and shortened product life.

➤ Safety information

- Wear insulation tools for installation.
- Disconnect all power to the controller before installing or maintaining the MPPT.
- Do not operate or install alone, in case of an accident, ask someone nearby to assist.
- MPPT controllers must be installed by qualified technicians or personnel trained in safety installation in accordance with the electrical regulations of the country in which they are located.

➤ Proper use

- This MPPT 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 MPPT, do not disassemble or attempt to repair the controller.
- In normal use of the circuit, a device capable of disconnecting all power supply electrodes connected to the MPPT must be installed.

3.2 Cable specification

2% Voltage Drop Charts for 75°C Stranded Copper Wire

1-Way Wire Distance (feet), 12 Volt System									
Wire Size(AWG)	60A	55A	50A	45A	40A	35A	30A	25A	20A
2/0*	22.4	24.4	26.9	29.9	33.6	38.4	44.8	53.8	67.2
1/0*	17.7	19.3	21.3	23.6	26.6	30.4	35.5	42.6	53.2
2	11.2	12.2	13.4	14.9	16.8	19.2	22.4	26.9	33.6
4	7.1	7.7	8.5	9.4	10.6	12.1	14.1	17.0	21.2
6	4.4	4.8	5.3	5.9	6.6	7.5	8.8	10.6	13.2
8	2.8	3.1	3.4	3.7	4.2	4.8	5.6	6.7	8.4
10	1.7	1.9	2.1	2.3	2.6	3.0	3.5	4.2	5.2

1-Way Wire Distance (meters), 12 Volt System									
Wire Size (mm2)	60A	55A	50A	45A	40A	35A	30A	25A	20A
70*	6.8	7.4	8.2	9.1	10.2	11.7	13.7	16.4	20.5
50*	5.4	5.9	6.5	7.2	8.1	9.3	10.8	13.0	16.2
35*	3.4	3.7	4.1	4.5	5.1	5.8	6.8	8.2	10.2
25	2.1	2.3	2.6	2.9	3.2	3.7	4.3	5.2	6.4
16	1.3	1.5	1.6	1.8	2.0	2.3	2.7	3.2	4.0
10	0.8	0.9	1.0	1.1	1.3	1.5	1.7	2.0	2.5
6	0.5	0.6	0.6	0.8	0.8	0.9	1.1	1.3	1.6

2% Voltage Drop Charts for 75°C Solid Copper Wire

1-Way Wire Distance (feet), 12 Volt System									
Wire Size(AWG)	60A	55A	50A	45A	40A	35A	30A	25A	20A
2/0*	22.4	24.4	26.9	29.9	33.6	38.4	44.8	53.8	67.2
1/0*	17.7	19.3	21.3	23.6	26.6	30.4	35.5	42.6	53.2
2	11.2	12.2	13.4	14.9	16.8	19.2	22.4	26.9	33.6
4	7.1	7.7	8.5	9.4	10.6	12.1	14.1	17.0	21.2
6	4.4	4.8	5.3	5.9	6.6	7.5	8.8	10.6	13.2
8	2.8	3.1	3.4	3.7	4.2	4.8	5.6	6.7	8.4
10	1.7	1.9	2.1	2.3	2.6	3.0	3.5	4.2	5.2
1-Way Wire Distance (meters), 12 Volt System									
Wire Size (mm2)	60A	55A	50A	45A	40A	35A	30A	25A	20A
70*	8.5	9.2	10.2	11.3	12.7	14.5	16.9	20.3	25.4
50*	6.7	7.3	8.1	9.0	10.1	11.5	13.4	16.1	20.2
35*	4.2	4.6	5.1	5.6	6.3	7.2	8.5	10.1	12.7
25	2.7	2.9	3.2	3.5	4.0	4.6	5.3	6.4	8.0
16	1.7	1.8	2.0	2.2	2.5	2.9	3.3	4.0	5.0
10	1.1	1.1	1.3	1.4	1.6	1.8	2.1	2.5	3.2
6	0.7	0.7	0.8	0.9	1.0	1.1	1.3	1.6	2.0



Note: The specified wire length applies to a pair of wires (one-way distance) from the solar or battery power supply to the controller.

- For a 24-volt system, multiply the length in the table by 2;
- For a 36-volt system, multiply the length in the table by 3;
- For a 48-volt system, multiply the length in the table by 4;



Attention: Wires larger than 4 AWG (25 mm2) must be terminated at the bus box outside the MPPT. Connect the MPPT to the bus box using 4 AWG (25 mm2) or smaller wires.

3.3 Installation procedure

➤ Step 1: Unpack and check

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

➤ Step 2: Check the controller parameter limits

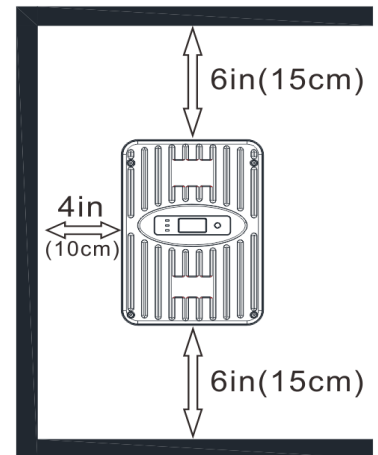
Ensure that the solar array open circuit voltage (Voc) under the maximum temperature compensation state does not exceed the MPPT rated voltage value of the model. Multiple controllers can be mounted in parallel on the same battery pack for greater charging current. Each MPPT in parallel must be connected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

➤ Step 3: Determine the installation space

To ensure room for air circulation, leave at least 15 cm (6in) above and below the controller, and 10 cm (4 in) on the side, and do not install it in a closed box. As shown in the figure.

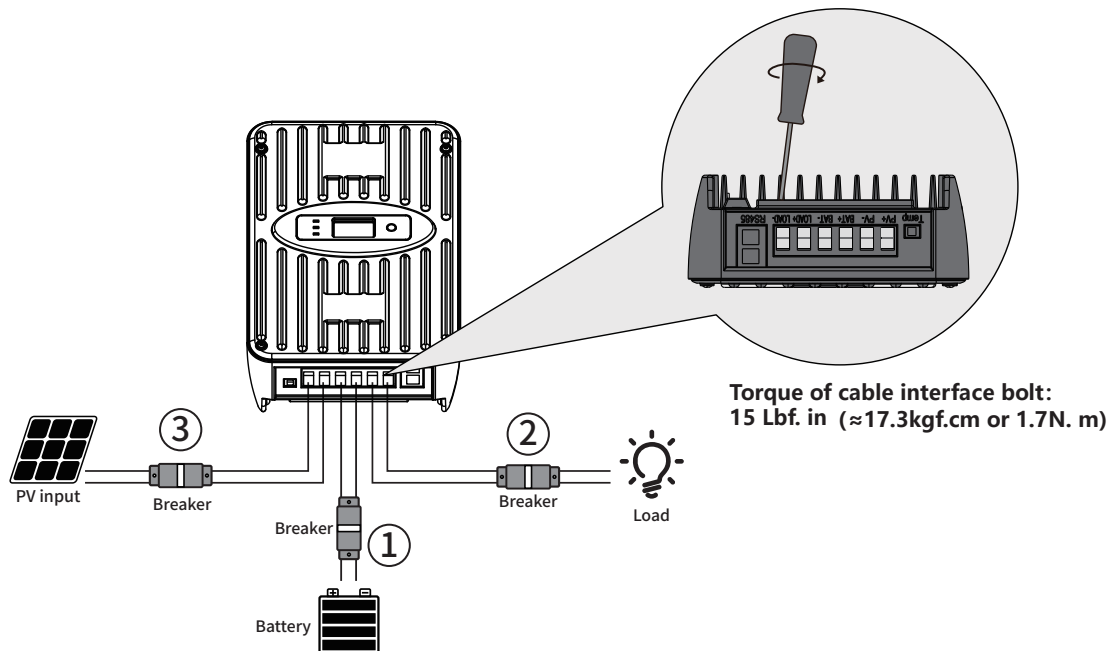


Note: Leave enough space between the top and bottom for the fan to dissipate heat.



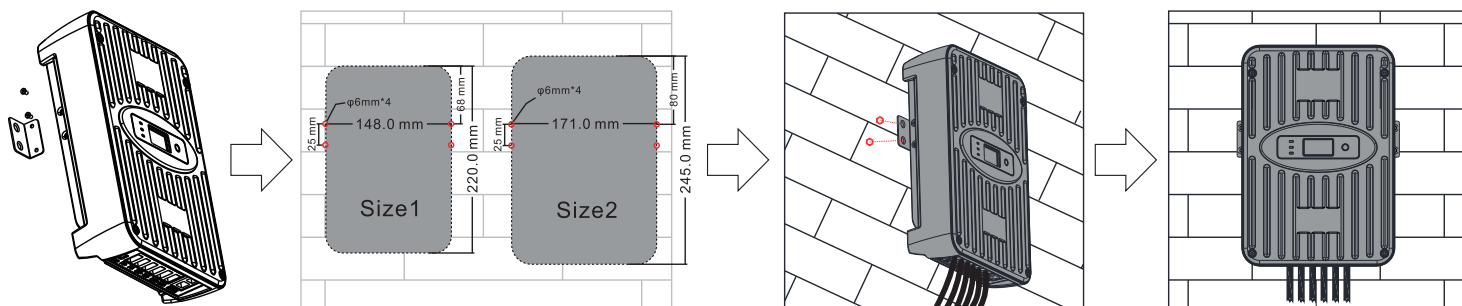
➤ Step 4: Wiring sequence

After connecting the cable installed with the circuit breaker to the wiring terminal, connect the positive and negative poles on the controller according to the serial number. Ensure that the circuit breaker is off before connecting the cable. As shown below:



➤ Step 5: Secure the controller

Measure and mark the distance on the wall, drill four holes with a diameter of 6mm, fill the four holes with plastic expansion particles, fix the controller to the mounting wall using M4 self-tapping screws and tighten the screws.



➤ Step 6: Power on the device

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 is connected to the battery (the controller LCD will display the content), then you can set the battery type (see);
- 2, if you need DC output control load, then first set the output control mode, and then open the DC output circuit breakerv ② ;
- 3, and then connect to open the solar panel PV input circuit breaker ③, if the PV input voltage in the controller charging working range, then the controller will enter the charging state;

 **Reminder:** ① After the No. 1 circuit breaker is connected, the controller fails to turn on, which may be a battery loss; After closing the circuit breaker ③, it will be powered on normally by the input of the solar panel.

 **Reminder:** This MPPT controller prevents reverse current leakage at night, so serial diodes are not required in the system.

 **Note:** Before connecting the battery, measure the open circuit voltage of the battery and must exceed 10 volts to start the controller.

 **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 appropriate specifications for circuit breakers and fuses based on application requirements.

 **Warning:** Ensure that the cable is securely connected and secured with cable clips to prevent the cable from rocking in the mobile application environment and overheating.

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



Warning: Grounding according to local codes and regulations.

3.4 Power off

Please disconnect serial number ③ circuit breaker, then disconnect serial number ② circuit breaker, and finally disconnect serial number ① circuit breaker connection;



Note: If possible, disconnect the battery from the controller after the solar input is disconnected. If the battery is removed during charging, the controller has a low chance of damage.

4.0 Display and operation

4.1 Number of PV modules in series reference table

Voc * N = PV input < 100dc												
System Voltage	Voc<23V		Voc<31V		Voc<34V		Voc<38V		Voc<46V		Voc<62V	
	maximum	optimum	maximum	optimum	maximum	optimum	maximum	optimum	maximum	optimum	maximum	optimum
12V	4	3	3	2	2	1	2	1	2	1	1	1
24V	4	3	3	2	2	1	2	1	2	1	1	1
36V	4	3	3	2	2	1	2	1	2	1	1	1
48V	4	3	3	2	2	1	2	1	2	1	1	1

Voc * N = PV input < 150Vdc												
System Voltage	Voc<23V		Voc<31V		Voc<34V		Voc<38V		Voc<46V		Voc<62V	
	maximum	optimum	maximum	optimum	maximum	optimum	maximum	optimum	maximum	optimum	maximum	optimum
12V	6	2	4	1	4	1	3	1	3	1	2	1
24V	6	3	4	2	4	2	3	2	3	2	2	1
36V	6	4	4	3	4	3	3	3	3	2	2	1
48V	6	5	4	4	4	3	3	3	3	2	2	2



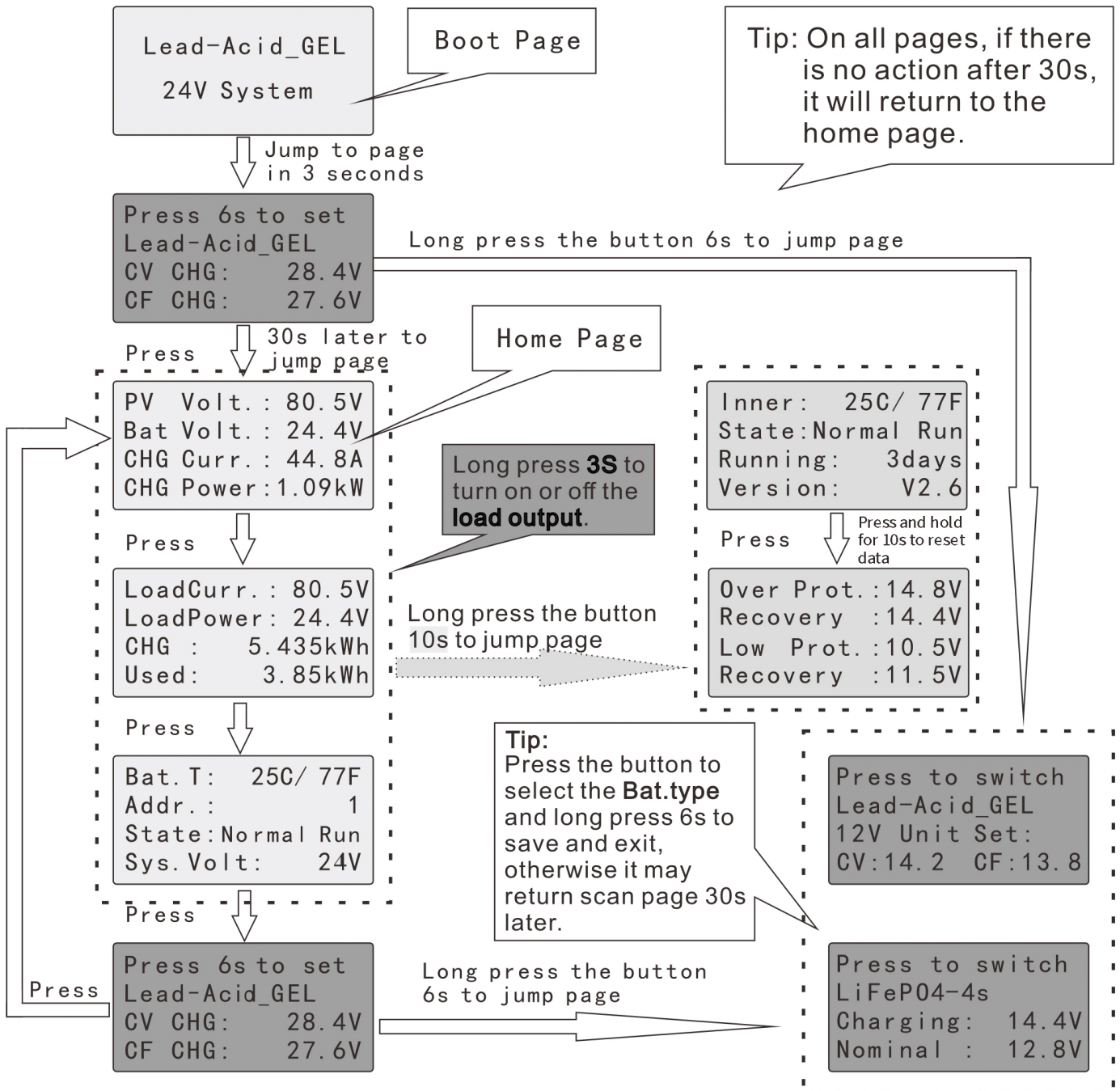
Attention: N in the table represents the number of series, the data is for reference only.

4.2 Status light

Indicator color	Graphical	definition	Indicator status	Controller state
green		Load output	Steady lighting	Load output running status
			Fast flicker	The load output is disconnected
			Not bright	The load output is in off mode
blue		Charging state	Fast flicker	Fast Charge mode (CC mode)
			Slow flash	Constant voltage charging (CV mode)
			Steady lighting	Floating charge state (CF) or standby mode
red		Fault state	Fast flicker	Failure occurs but it can continue to operate
			Steady lighting	A fault occurs and stops running
			Not bright	trouble-free

4.3 Display and operation

This controller has a 1.3-inch OLED display and function buttons. The user can only set the battery type using the preset parameters. See the following figure for specific operation and display logic.



4.4 Set options

Set item	Optional items/parameters	introduce
Battery setup	Lead-Acid_GET (Lead acid colloidal battery) Lead-Acid_AGM (AGM lead-acid battery) Lead-Acid_SEL (Sealed lead-acid battery) Lead-Acid_FLD (Rich liquid lead-acid battery) Lead-Acid_APP (Custom, can be set on the phone or computer) LiFePO4-4s LiFePO4-7s LiFePO4-8s Ternary-3s Ternary-6s Ternary-7s Li_ion APP (Custom battery)	Select the battery type to set the connection;



Note: If you need to customize additional parameters, you can do so by connecting to the APP or other optional attachments.

4.5 Charging status and parameters

4.5.1 The controller charges the lead-acid battery

The MPPT controller has a 4-stage battery charging algorithm for fast, efficient and safe charging of lead-acid batteries.

1 - CC State (Constant Current Charging): Fast Charging Phase - FAST

2 - CV state (constant voltage charging): regulated charging phase - KEEP

3 - CF Status (Float Charging): Prevents the battery from being overcharged for a long time. And make up for the loss of self-discharge. -FULL

4 – Boost charging: activate battery chemistry, desulphurization effect

4.5.2 The controller charges the lithium-ion battery

The MPPT controller will charge according to the specifications of the lithium-ion battery, mainly in two stages. In the first stage, when the battery voltage is lower than the saturation voltage, it will rapidly charge according to the maximum power point that is tracked; in the second stage, when the battery voltage is equal to the saturation voltage, it will charge at a constant voltage, and the charging current will gradually decrease to 0.

4.5.3 Charging parameter settings

The charging parameters of commonly used lead-acid battery. All voltage settings listed are for standard 12 volt batteries. Example: For a 24 volt battery, multiply the voltage setting by 2.

Battery Type	Constant pressure	Float charge	Equalization voltage	Equalization charging time	Undervoltage protection	Brownout Recovery
Gel (GEL)	14.2V	13.8V	14.2V	30 points user-defined	11.1V	12.6V
Sealed (SEL)	14.4V	13.8V	14.6V	30 points user-defined	11.1V	12.6V
Flooded (FLD)	14.6V	13.8V	14.8V	30 points user-defined	11.1V	12.6V
Custom(CUS)	user-defined	user-defined	user-defined	30 points user-defined	user-defined	user-defined

The charging parameters of commonly used lithium-ion batteries.

Battery Type	Standard Voltage	Saturation voltage	Discharge cut-off voltage	cut-off recovery voltage
LiFePO4-12V (4 strings of lithium iron phosphate)	12.8V	14.4V	10.8V	12.4V
LiFePO4-24V (8 strings of lithium iron phosphate)	25.6V	28.8V	21.6V	24.8V
LiFePO4-48V (15 strings of lithium iron phosphate)	48V	54V	40.5V	46.5V
Ternary-12V (3 strings of ternary lithium)	11.1V	12.6V	9.6V	10.5V
Ternary-24V (6 strings of ternary lithium)	22.2V	25.2V	19.2V	21.0V
Ternary-48V (13 strings of ternary lithium)	48.1V	54.6V	41.6V	45.5V
user-defined	user-defined	user-defined	user-defined	user-defined



Note: These Settings are a general guide for user use. MPPT can be set to meet a variety of charging parameters. Consult the battery manufacturer for the best battery charging Settings.

4.6 Load Control

The main purpose of the load control function is to disconnect the system load when the battery is discharged to a low voltage state and reconnect the system load when the battery is charged back to a certain level. System loads can be lamps, DC appliances, or other electronic equipment. The total current of all loads must not exceed the MPPT maximum load rating.



Reminder: Risk of Equipment Damage.

Do not connect any AC inverter to the load terminals of the MPPT. The load control circuit may be damaged. The inverter should be connected to the battery. If any other load may sometimes exceed the maximum voltage or current limit, the device should be connected directly to the battery or battery pack.

➤ Brief description of load control:

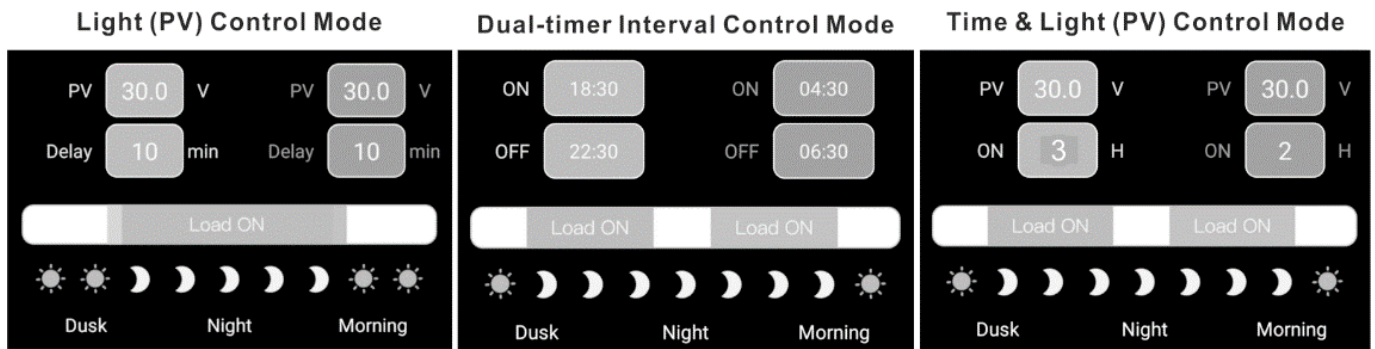
- Do not connect multiple MPPT load outputs in parallel to power supply dc loads that consume more than 30A current, depending on the MPPT model used.
- Be careful when connecting loads with specific polarities to controller load terminals. Reverse polarity connections may damage the load. Be sure to check the load connection carefully before powering on.
- The load output voltage of the controller is the same as that of the battery string. For example, when the battery voltage is 25.2V, the load output voltage is also 25.2V.
- When the load output current is lower than the rated load current, the system provides stable power to the load.
- When the load output current exceeds the preset load current and lasts for 5 minutes in the range of 100% to 120%, the load output is shut down and switches to the normal off mode.
- When the load output current is detected to exceed 120% of the rated load current, the load output will be shut down immediately and switch to the normal off mode.



Attention: When the Load switches to normal off mode, in order to restart the Load, the user need to press the button on the contrlller for 3S to open the load output(if not meet the requirements of starting,the status light of load will flicker,but the light will be steady lightig if open normally) or reset the Load mode through the mobile APP, upper computer, and meter header.

➤ Load Control Mode:

- 1 - Normal on/Normal Off mode: The load output state is on or off.
- 2 - Optical control mode: The load output is turned on or off according to whether there is light (input voltage limit). Refer to the following diagram for the working mechanism.
- 3 - Dual-period timing control mode: The load switch of two different periods is controlled according to two timers. Refer to the following diagram for the working mechanism.
- 4 - Fixed time light control mode: according to whether there is light (input voltage limit), the load output is controlled to turn on or off in hourly units.



Attention: Only the normal ON/normal OFF mode can be set on the controller panel. Other modes need to be set through other optional accessories.

4.7 Communication

4.7.1 Apply

All operations of this series of controllers can be done via Bluetooth /wifi modules. 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/wifi function of the mobile phone is enabled, you can use the App to interact with the controller through Bluetooth/wifi.



IOS download



google download



Android web
download



PC download



Note: Users can also monitor the controller through other optional accessories.

5.0 Common faults and handling

5.1 Common Failures

Unable to charge troubleshooting:

Check that the solar panels are good contacted and that the array is not shaded or damaged;

Check that the controller input voltage is normal and ensure that the controller is wired correctly;

Check the battery status and replace if necessary.

Display troubleshooting:

Try rebooting the controller and observe if it returns to normal;

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

If the internal circuitry of the controller is damaged, contact the manufacturer for replacement or repair.

Communication troubleshooting:

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

Ensure that the communication interface is connected correctly without looseness or damage;

Verify the communication protocol settings to ensure that they match other devices.



Warning: There are no user-serviceable parts inside the controller; do not disassemble or attempt to repair the controller yourself.



Warning: Inputs and outputs are not electrically isolated and may be energized with hazardous solar voltages. Batteries may be overcharged under certain fault conditions. Take protective insulation measures before touching.

5.2 Display status description

Display content	Description	Display content	Description
Normal Run	Normal operation	BAT Over	Battery overvoltage
HS Over	Radiator overheating	PV Over	Input overvoltage
PV Low	Input undervoltage	CHG Over	Charging exceeds current limit
BAT Low	Battery undervoltage	DisC. Over	Discharge exceeds the current limit

6.0 Product protection function and system maintenance

6.1 Protection function description

➤ **Waterproof and dustproof protection: IP42**

Waterproof grade: 4, dust grade: 2

➤ **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.
- Make sure the airflow around the controller is not blocked and remove any dirt or debris from the radiator.
- 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!

