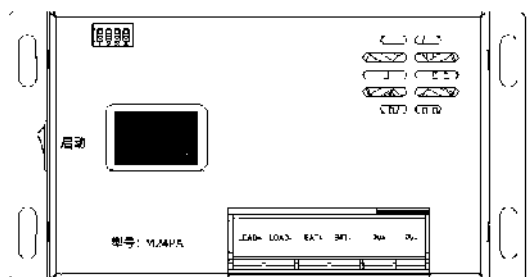
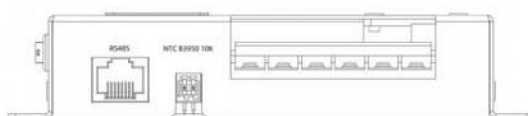


MPPT Solar Charging Controller User Manual

M24PA model

Applicable to 24V platform battery (ternary, iron lithium, lead-acid, customized) pressure reduction model



Manual version: V1.1 If there is any change, you can contact the sales department to obtain the latest electronic information documents without prior notice.

Thank you very much for choosing our products!

Safety instructions

-  1、 Since the applicable voltage of this controller exceeds the human safety voltage, please read the instructions in detail before operation and after the safety operation training is completed.
You can operate this controller.
-  2、 There are no parts inside the controller that need to be maintained or repaired. Users should not disassemble and repair the controller by themselves.
-  3、 Please install the controller indoors to avoid the exposure of components and prevent water from entering the controller.
-  4、 Please install the controller in a well-ventilated place. The temperature of the heat sink will be very high when working.
-  5、 It is recommended to install a suitable fuse or circuit breaker outside the controller.
-  6、 Before installing and adjusting the wiring of the controller, be sure to disconnect the connection of the photovoltaic array and the fuse or circuit breaker near the battery terminal.
-  7、 After installation, check whether all line connections are tight to avoid the danger of heat accumulation due to virtual connection.



Warning: It means that this operation is dangerous. Be sure to make



safety preparations before operation.

Note: It means that this operation is destructive.



Tips: Indicates suggestions and tips for the operator.

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1. Product introduction

1.1 Product Overview

M24P The controller adopts the industry-leading MPPT maximum tracking technology to realize the maximum energy tracking of solar panels, so that it

In the environment, it can quickly and accurately track the maximum power point of solar cells, obtain the maximum energy of solar panels in real time, and significantly improve the

The energy utilization rate of the Yang energy system. It is widely used in solar off-grid photovoltaic systems to manage solar panels, batteries and loads. It is

The core control components of the off-grid photovoltaic system. The controller has perfect software and hardware fault detection and protection functions, which can avoid

Installation errors and system failures cause damage to product parts.

1.2 Product features

- With the maximum power tracking technology of MPPT, the tracking efficiency of MPPT can reach 99.9%.
- Support simultaneous full-power charging and discharge.
- Support a variety of battery types such as sealed, colloidal, open, lithium battery and customization.
- Support lithium battery and lead acid activation.
- Support charging current setting.
- Support full settings.
- Support temperature compensation function.
- Support parallel charging.
- Support multiple load working modes.
- Support start-up capacitive load and inductive load.
- Support saving historical data.
- Support RS485 communication of the standard Modbus protocol, and the baud rate is fixed.
- Support TTL communication of the standard Modbus protocol, and the baud rate is fixed.
- Support Bluetooth and Ethernet communication functions (optional).
- It has perfect charging and discharge protection mechanisms such as overvoltage, overcurrent, overload, overtemperature, short circuit, etc.
- It adopts high-quality aluminum radiator, air cooling and high-temperature reduction treatment to ensure reliable and efficient operation in various working environments.

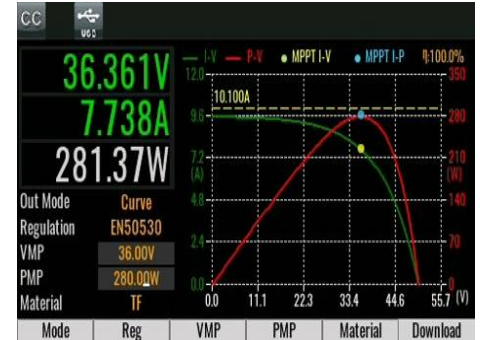
Weak-light tracking >99%



Universal tracking >99.9%

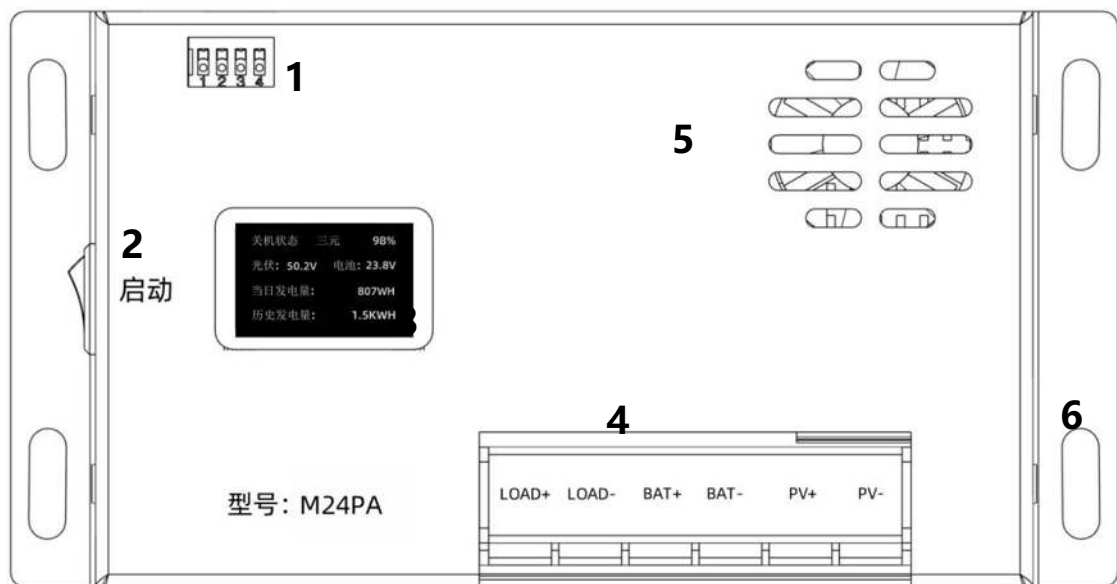


Strong light tracking >99.9%



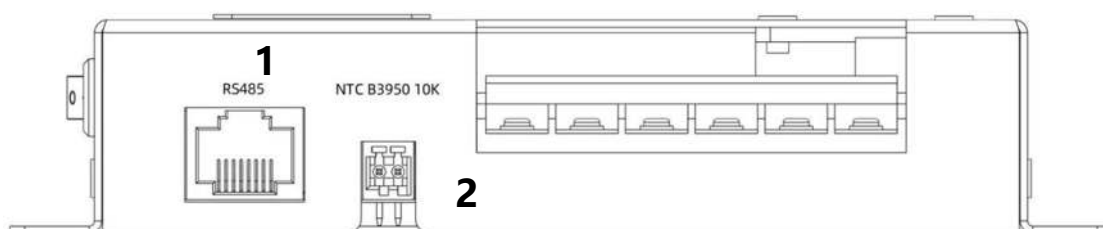
1.3 Appearance and interface description

Introduction of front interface



No.	Function description	Remarks
1	Battery type selection, Chinese and English switch, but the interface changes the dial code switch	For details, please refer to the chapter of dial switch.
2	Start button	Side boat-type switch
3	Display interface	
4	Load interface; battery interface; photovoltaic input interface	Interface KF2EDGR
5	Air outlet of the fan	No blockage
6	Earth screw hole position	

Introduction of side interface



No.	Function description	Remarks
1	RS485 communication interface	See other chapters for the definition of interface pins.
2	Battery temperature monitoring interface, external NTC B3950 10K temperature sensor	No battery temperature monitoring

1.4 Introduction to Maximum Power Tracking Technology

M24PASeries maximum power point tracking (Maximum Power Point Tracking, abbreviated as MPPT) system is a kind of through an advanced charging technology that adjusts the working state of electrical modules so that solar cells can output more electricity. Due to solar electricity The nonlinear feature of the pool array is that there is a maximum power point of an array on its curve, and the traditional controller PWM charging technology cannot maintain hold the battery at this point to charge, so it is impossible to obtain the maximum energy of the battery panel, but the sun with MPPT control technology the controller can always track the maximum power point of the array to obtain the maximum energy to charge the battery. With 12V system .For example, because the peak voltage (V_{pp}) of solar cells is about 18V, while the voltage of the storage battery is about 12V, generally When the charging controller is charging, the voltage of the solar cell is about 12V, and the maximum power is not fully exerted.

The MPPT controller can overcome this problem and adjust the input voltage and current of the battery panel in real time to maximize the input power. The purpose of value. Compared with the traditional PWM controller, the MPPT controller can give full play to the maximum power of solar cells, so it can raise For a larger charging current, MPPT can improve the energy utilization rate by 20% to 30% compared with the PWM controller.

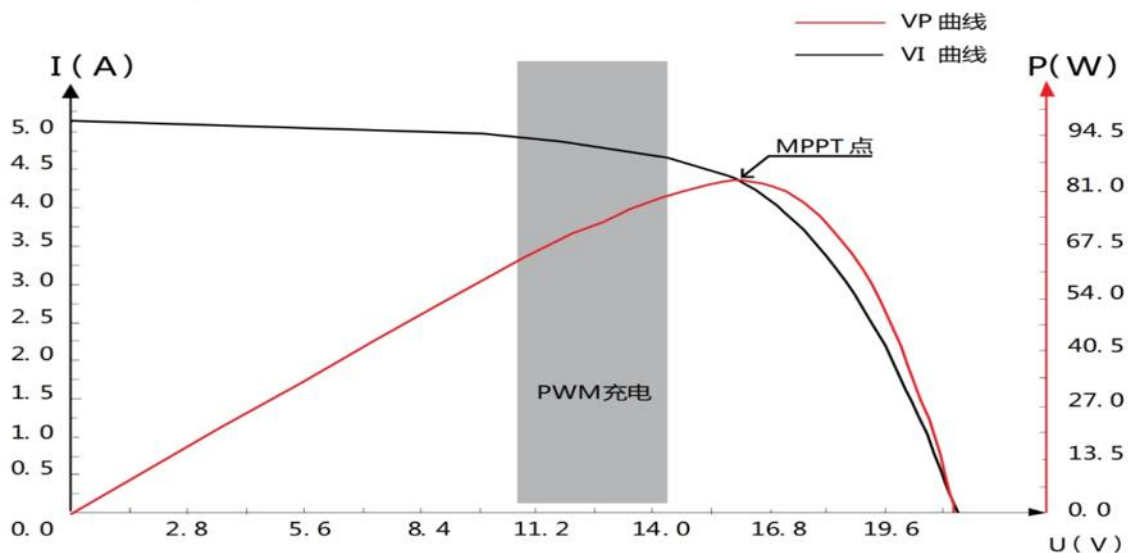


Figure 1-2 Output characteristic curve of battery panel

Due to different ambient temperatures and lighting conditions, the maximum power point often changes. Our company's MPPT controller can be based on different conditions adjust the parameters from time to time so that the system is always near the maximum working point. The whole process is completely

automatic, and there is no need for users to How to adjust.

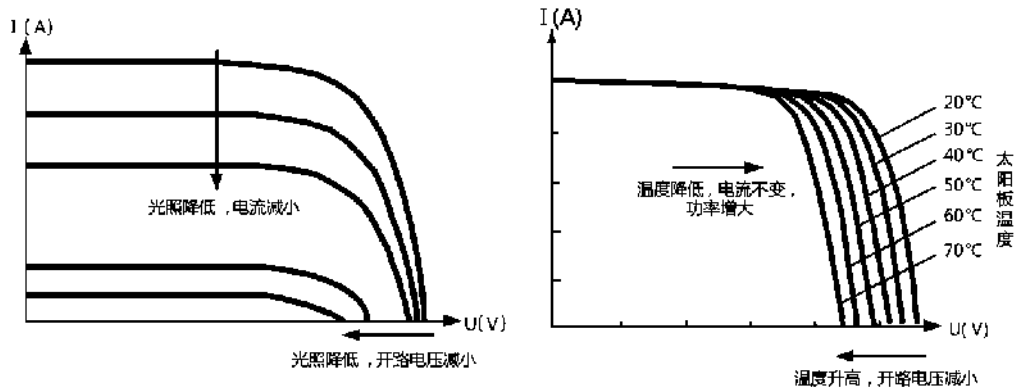


Figure 1-3 The relationship between the output characteristics of the battery board and the light.

Figure 1-4 The relationship between the output characteristics of the battery board and temperature

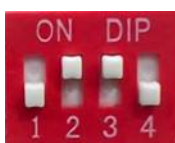
2. Technical parameter

Product model	M24PA
Static power consumption	≤30mA
Battery type	Ternary/iron lithium/lead-acid/colloid/other batteries (users can configure independently according to the upper computer)
Battery voltage	24V platform (ternary, iron lithium, lead acid)
System mode	Reduce voltage
Rated battery charging current	12.5A (exceeds the automatic flow limit)
Maximum PV input current	10A (exceed the automatic flow limit)
Maximum solar panel power	300W (exceed the automatic power limit)
Max: PV open circuit voltage (Voc)	30V to 56V
Recommended PV power point voltage (Vmp)	30V~42V (recommended)
Maximum withstand pressure of the system	60V(±2%) overvoltage will damage the system
MPPT tracking efficiency	>99.9%
MPPT tracking rate	Less than 1ms
Charging conversion efficiency	More than 96 percent
Rated load current	10A
Load working mode	Manual mode, automatic mode (users can configure independently according to the upper computer)
Charging working mode	Activation/Tremle/Constant Flow/Constant Voltage
Battery charging temperature control can be set	√
Temperature protection	√
Activate the battery	√
Load overload/short circuit protection	√
TTL communication	√

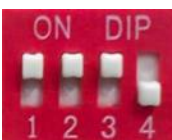
RS485 communication	√
External expansion 12V power supply (<300mA)	√
Display screen	√
Support SOC display	√
Charging power can be set	√
The number of battery models and strings can be configured	√
Support Bluetooth (external expansion optional)	√
Support Ethernet (external expansion optional)	√
Set up automatic saving	√
Baud rate support type	4800/9600/14400/19200/38400/56000/57600/115200 Default 9600 (replacement requires upper computer configuration)
Backlight function	The default backlight is always on (M24PA model is not adjustable)
Protection function	PV overvoltage protection, PV reverse connection protection, PV short circuit protection, night reverse charge protection, input power limit protection, overtemperature protection, Load short-circuit protection, load overload protection, battery overvoltage/over-discharge protection, battery reverse connection protection (Melt fuse)
Temperature range of working environment	-35°C~65°C (no reduction within 45°C under good ventilation)
Protection level	IP32
Cooling method	Natural heat dissipation, air cooling
Measurement	Length, width and height 78x150x29mm
Weight	0.36 kilograms
Lithium iron phosphate battery support	7/8 strings
Support for ternary lithium batteries	6/7 strings
Lead-acid/colloidal battery support	2 strings
Other batteries	Users set their own undervoltage and overvoltage points (16.0V~30.0V)

3. Instructions for the use of dial switch and switch

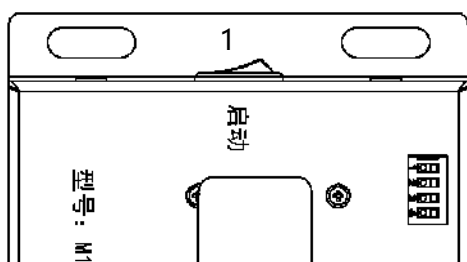
3.1 Instructions for using the dial switch (please be sure to choose the battery type in the past)



The first three digits dial code [1 2 3]"011"Representative: Choose 6 strings of ternary batteries
Overvoltage protection point: 25.2V undervoltage protection point: 17.4V (automatically generated by the system)

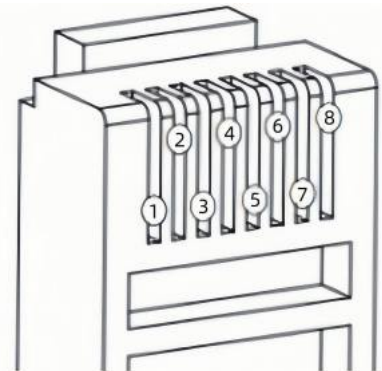
	The first three digits dial code [1 2 3]"101"Representative: Choose 8 strings of iron lithium batteries Overvoltage protection point: 28.8V Overvoltage protection point: 22.4V (automatically generated by the system)
	The first three digits dial code [1 2 3]"110"Representative: Choose 24V lead-acid or 24V colloidal battery Overvoltage protection point: 28.8V undervoltage protection point: 21.0V (automatically generated by the system)
	The first three digits dial code [1 2 3]"001"Representative: Choose 7 strings of ternary batteries Overvoltage protection point: 29.4V undervoltage protection point: 20.3V (automatically generated by the system)
	The first three digits dial code [1 2 3]"100"Representative: Choose 7 strings of iron lithium batteries Overvoltage protection point: 25.2V undervoltage protection point: 19.6V (automatically generated by the system)
	The first three digits dial code [1 2 3]"000"Representative: Custom battery, overvoltage and undervoltage need customers to set it through the upper computer.
	The first three digits dial code [1 2 3]"111"Representative: All alarm information can be viewed (using this function, the system will automatically stop charging)
	The first three digits dial code [1 2 3]"010"Representative: You can view the system temperature information and battery temperature information (using this function, the system will automatically stop charging). If you need to change the protection value, the user needs to configure it on the upper computer.
	The 4th dial code "1": English interface, "0": Chinese interface

3.2 Instructions for the use of the device start switch



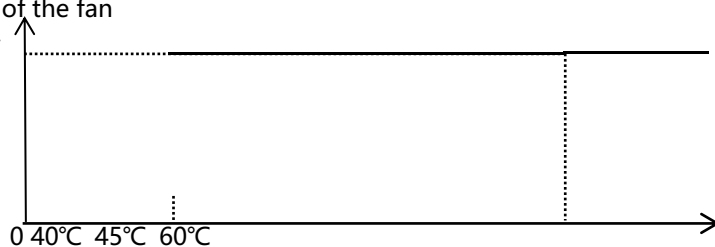
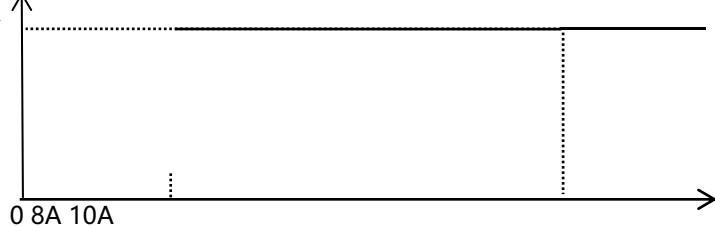
Switch left to off and right to turn on.

4. TTL communication, RS485 communication, external expansion 12V output

	No.	Definition
	1	485-A
	2	485-B
	3	12V
	4	GND
	5	Unused
	6	Unused
	7	TTL-TXD
	8	TTL-RXD

Remarks: 12V provides a maximum current of 300mA, which has a certain probability of damaging the interface.

5. Fan temperature control

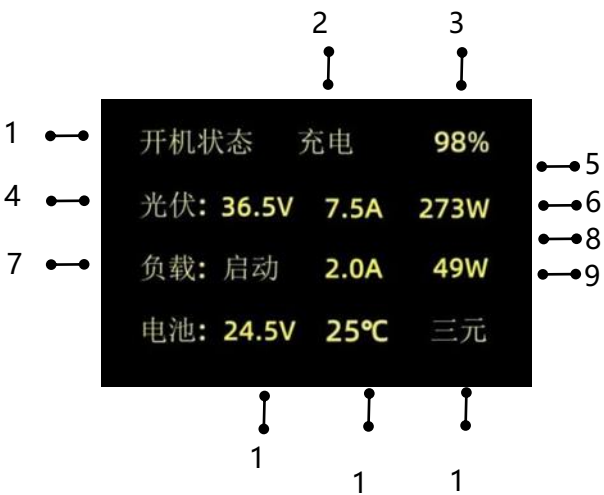
No.	Logic diagram of fan start-up
When PV is charging	The voltage of the fan 
When the PV is not charged, it starts with the discharge load current.	The voltage of the fan 

6. Frequently asked questions and solutions

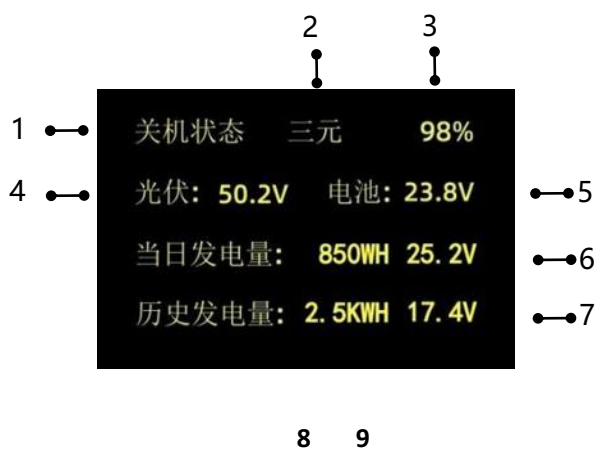
Phenomenon	Solutions
The indicator light and LCD screen are not on.	Check whether the battery and solar panel are connected correctly.
Solar energy has voltage, and the battery end has no voltage output.	Disconnect the battery to check whether there is voltage in the battery. If there is no voltage, start the battery activation in the system settings. (The battery is in the activated state, and the system does not support battery reverse connection protection)
Battery type and string number cannot be modified in MPPT work.	Changing the battery type will change the overvoltage and undervoltage protection points!
The charging power does not reach the rated value.	The system adopts flow limitation and constant temperature control; Check whether the system has reset the charging power; Whether the voltage difference between the voltage of the PV model and the voltage of the battery model is too large.
The load cannot start some loads.	Different external loads can be applied by setting the short-circuit load time on the upper computer.
Other problems or intractable anomalies	Go to the setting interface to restore the factory settings. After setting the factory settings, set the relevant parameters again according to the system configuration. Be careful!
There is no response to the battery connection	1、 Whether the fuse was damaged by the last reverse connection, and the fuse needs to be replaced, or contact the manufacturer for repair.
The fan doesn't turn.	1、 Check whether the fan is blocked by foreign matter, and clean up the air duct foreign matter in time and regularly. 2、 If the fan still doesn't turn, you can contact the after-sales service to replace the fan. 3、 Whether the mute mode is set.

7. Display interface introduction

7.1 Start the system display interface

	1 The power-on status is displayed
	2 The system is in the charging state (charging, discharging, protecting)
	3 Power SOC display
	4 Display the photovoltaic voltage value
	5 Display the size of photovoltaic charging current
	6 Display the size of photovoltaic charging power
	7 Load startup status display
	8 Load output current size display
	9 Load output power size display
	10 Display the size of the battery voltage
	11 Battery temperature display (not connected to NTC, not displayed)
	12 Display the battery selection type (ternary, iron lithium, lead acid, etc.)

7.2 Close the system display interface

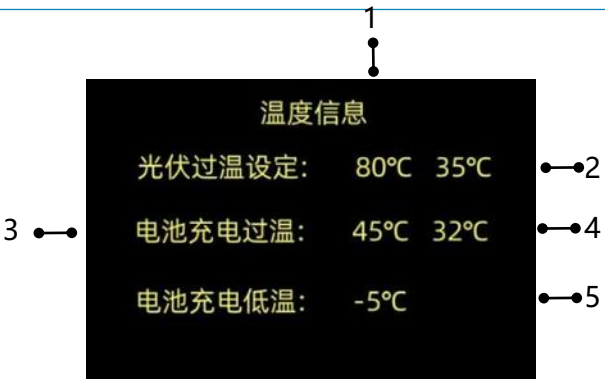
	1 means that the current shutdown status
	2 means that the current battery is selected as the ternary type.
	3 Display battery power SOC
	4 Display the size value of photovoltaic voltage
	5 Display the size value of the battery voltage
	6 Current battery overvoltage protection setting point
	7 Current battery undervoltage protection setting point
	8 Display the power generation of the day
	9 Display the historical power generation

7.3 System alarm interface "Fault": sensor failure (users can take corresponding measures according to the alarm information)

	1 Photovoltaic "overvoltage", "undervoltage" prompt
	2 Photovoltaic "overcurrent", "fault" prompts
	3 Photovoltaic "overheating" and "fault" prompts

	4 Battery "overvoltage" and "low-voltage" prompts
	5 Battery "overheated", "low temperature", "fault" prompts
	6 Load "short circuit", "overcurrent", "fault" prompts

7.4 System temperature interface

	1 Current photovoltaic over-temperature protection point (can be modified by the upper computer)
	2 Current real-time working temperature of photovoltaics
	3 The current battery is set to over-temperature (can be modified by the upper computer)
	4 Current real-time battery temperature
	5 The current battery is set to the low-temperature value of charging (can be modified by the upper computer)

8. Product installation

8.1 Precautions for installation

- Be very careful when installing the battery. For the installation of open lead-acid batteries, you should wear protective glasses. Once you come into contact with the acid liquid of the battery Please rinse with water in time.
- Avoid placing metal objects near the battery to prevent a short circuit in the battery.
- Acid gas may be generated when the battery is charged to ensure good ventilation around the environment.
- The battery may produce flammable gases. Please stay away from sparks.
- When installing outdoors, direct sunlight and rainwater should be avoided.
- Virtual connection points and corroded wires may cause great heat to melt the wire insulation, burn the surrounding materials, and even cause fire, so make sure that the connector is tight, and the wire

It's best to fix it with a tie to avoid the wire shaking when moving the application, causing the connection head to be loose.

- When connecting the system, the output voltage of the component may exceed the safety voltage of the human body. When you need to operate, pay attention to the use of insulation tools, and ensure it proves that the hands are dry.
- The battery terminal on the controller can be connected to the same battery and the same group of batteries. The follow-up instructions in the manual are for the use of a single battery, but it is also applicable to a set of battery systems.
- Please follow the safety advice of the battery manufacturer.
- Ground the controller to the ground end
- During installation, it is forbidden to reverse the battery, which will cause irreversible damage.

8.2 Installation steps

The wiring and installation methods must comply with the national and local electrical standards. The wiring specifications must be selected according to the rated current, generally according to $5A/mm^2$.

Step 1: Select the installation location

Avoid installing the controller in direct sunlight, high temperature and easy-to-water places, and ensure good ventilation around the controller.

Step 2: Fix the hanging screw

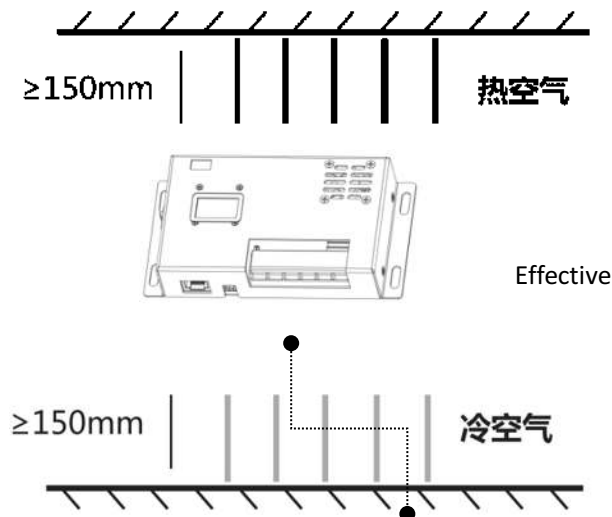
Make a mark on the installation position according to the installation size of the controller, drill 2 mounting holes of appropriate size at 2 marks, and fix the screws on the two mounting holes.

Step 3: Fixed controller

Aim the fixing hole of the controller with the two pre-fixed screws and hang them on, and then fix the following two screws.

Step 4: Fix the ground wire

Lock a wire with the screw on the side of the controller, and the other end of the wire is effectively connected to the earth (metal blocks can be tied for burial), so that leakage, static electricity and lightning current can be introduced into the earth.



9. Protection function

- Equipment over-temperature protection
When the internal temperature of the controller exceeds the set value, the charging power will be automatically reduced or even

turned off when charging, thus further slowing down the internal temperature rise of the controller.

- Battery over-temperature protection

Battery over-temperature protection requires an external battery temperature sampling sensor. When it detects that the battery temperature is too high, it will stop charging. When the battery temperature drops to

When it is 5 degrees lower than the set value, it lasts for 2 seconds and automatically resumes charging.

- Input overpower protection

When the power of the battery panel is greater than the rated power, the controller will limit the charging power within the rated power range to prevent excessive current from damaging the controller. Control

The device enters the current-limiting charging.

- The voltage of the photovoltaic input is too high

If the voltage at the input end of the photovoltaic array is too high, the controller will automatically cut off the photovoltaic input.

- Photovoltaic input reverse connection protection

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

- Anti-back charging protection at night

Prevent the battery from being discharged through solar cells at night. Special note: There is no battery reverse connection protection function

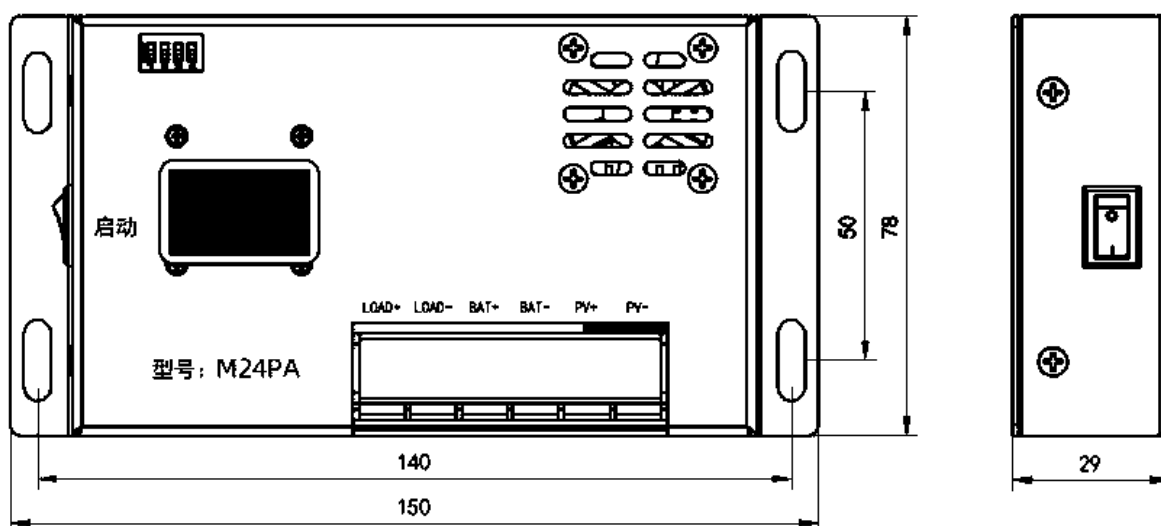
10. System maintenance

In order for the controller to maintain the best working performance for a long time, it is recommended to check the following items regularly.

- When abnormal faults or error prompts are found, corrective measures should be taken in time.
- Check whether the terminal blocks have corrosion, insulation damage, high temperature or signs of combustion/discoloration, shell deformation and other phenomena, and repair or replace them in time.
- Wires that are exposed, damaged and have poor insulation performance should be repaired or replaced in time.
- Check if there is dirt, nesting insects and corrosion, it should be cleaned up in time.

Warning: Electric shock is dangerous! When performing the above operations, be sure to make sure that all the power supply of the controller has been disconnected, and then carry out the corresponding inspection or operation! Non-professionals, please do not operate without permission.

11. Schematic diagram of product size



12. Communication protocol

12.1 Basic configuration of communication

Transmission mode	RTU	Protocol standard/function code	0x02 Read one or more input states	Read by bit
Baud rate	The default is 9600bps	This communication protocol is based on <Standard MODBUS Protocol>. The host requests data from the follower in a cycle, receives request instructions from the follower, and responds to the response data.	0x03 Read and hold register	Read by 16-bit words
Check the position	No verification		0x04 Read a register	Read by 16-bit characters (function code is prohibited)
Data bit	Eight bits		0x05 Write a coil state	Write by bit (function code is prohibited)
Stop position	One bit		0x06 Write a maintenance register	Write in 16-digit characters
Frame interval	Not less than 3.5 byte time		0x10 Write multiple retention registers	Write in 16 characters (function code is prohibited)
Frame length	200 bytes		When the communication module detects an error other than the CRC code error, it must send the information back to the host. The highest position of the function code is 1; 01 illegal function code, 02 illegal data address 03 Illegal data value 04 Service failure	
The maximum value of the response time from the machine	350 bytes of time			
The minimum value of the host polling interval	400 byte time			

12.2 Information address

Register address table, read the corresponding function code 0x03, and set the corresponding function code 0x06. The address in the following table is the same as the address in the actual information frame, and there is no need for offset or other conversions.

Address (Decimal system)	Meaning	Byte	Read/write	Example	Explain
40,000	EquipmentModel	2	R	52421	M24PA model
40001	Software version	2	R	Ten	V1.0
40002	Hardware version	2	R	Ten	V1.0
40003	Maximum power support	2	R	300	300W
40004	Input and output maximum current	2	R	1012	PV:10A, BAT:12A
40005	Photovoltaic step-down radiator temperature	2	R	25	The current system temperature is 25 degrees Celsius.
40006	PV NTC status	2	R	0	Zero to seven
40007	BAT NTC status	2	R	0	Zero to seven
40008	Reserve	2	R	Unused	Reserve
40009	Reserve	2	R	Unused	Reserve
40010	Charging stage	2	R	3	1: Activation, 2: trickle 3: Constant flow 4: Constant pressure
40011	Charging status	2	R	1	0: Not charged, 1: Charging

40012	Full battery status	2	R	1	0: Not fully charged, 1: Fully charged
40013	Current load status	2	R	1	1 is starting, 0 is shutting down
40014	BUCK radiator temperature	2	R	50	50℃
40015	Reserve	2	R	Unused	Reserve
40016	Reserve	2	R	Unused	Reserve
40017	Reserve	2	R	Unused	Reserve
40018	Reserve	2	R	Unused	Reserve
40019	Reserve	2	R	Unused	Reserve
40020	Photovoltaic input voltage	2	R	4550	45.5V (accuracy 0.01V)
40021	Photovoltaic input current	2	R	111	1.11A (accuracy 0.01A)
40022	Photovoltaic input power	2	R	256	256W (accuracy 1W)
40023	Photovoltaic radiator temperature	2	R	20	20℃ (accuracy 1℃)
40024	Photovoltaic fault code	2	R	0	See fault table 1
40025	Battery output voltage	2	R	2412	24.12V (accuracy 0.01V)
40026	Battery output current	2	R	0	None (see load current)
40027	Battery output power	2	R	0	None (see load power)
40028	Battery radiator temperature	2	R	25	25℃ (accuracy 1℃)
40029	Battery fault code	2	R	See the fault table 2	See the fault table 2
40030	Load output current	2	R	18	1.8A
40031	Load output power	2	R	125	125W
40032	Fan start-up status	2	R	0	0: Close 1: Start
40033	Historical system charging WH number is high	2	R	H+L (unit WH)	Historical total power generation WH
40034	Historical system charging WH number is low	2	R		
40035	Current SOC value	2	R	982	98.2%
40036	Reserve	2	R	Unused	Reserve
40037	Today's power generation	2	R	855	855WH
40038	MPPT working mode	2	R	0	See Function Table 2
40039	Remote load switch	2	R/W	0	1: Load on; 0: Load ban
40040	The maximum voltage setting of photovoltaic access	2	R	560	56.0V
40041	The minimum voltage setting for photovoltaic access	2	R	20	20.0 V
40042	The user sets the maximum charging power	2	R/W	200	200W (limit the maximum power of photovoltaics)
40043	Reserve	2	R/W	Unused	Reserve
40044	Photovoltaic stop working temperature setting	2	R/W	70	70 degrees Celsius
40045	Current photovoltaic start-up fan temperature	2	R	40	40℃ fan start
40046	Equipment address	2	R/W	01	Correspondence address: 01H
40047	The maximum voltage setting for battery charging	2	R	2520	25.2V
40048	The minimum voltage setting for battery discharge	2	R	1740	17.4V
40049	Reserve	2	R/W	Unused	Reserve

40050	Current battery discharge high temperature setting	2	R/W	60	>60℃ stop load output
40051	Current battery discharge low temperature setting	2	R/W	-10	<-10℃ stop load output
40052	Current battery charging high temperature setting	2	R/W	45	>45℃ stop charging the battery
40053	Current battery charging low temperature setting	2	R/W	0	<0 Stop charging the battery
40054	Reserve	2	R/W	Unused	Reserve
40055	Set the battery type	2	R	0	0: TERNARY LITHIUM, SEE FUNCTION TABLE I
40056	strings number of battery	2	R	7	7 strings of ternary lithium
40057	Start	2	R/W	1	0: No power generation, 1: Start power generation (default)
40058	Battery activation settings	2	R	0	0: Prohibit activation (default), 1: Activate
40059	Baud rate	2	R/W	0	1:9600 (default) 0~8
40060	Backlight time	2	R/W	60	60S (default) (some models M24PA are not supported)
40061	Lock the screen	2	R/W	0	0: Unlock, 1: Lock (some models M24PA are not supported)
40062	Reserve	2	R/W	Unused	Reserve
40063	the battery overvoltage	2	R/W	2520	25. 2V
40064	low-voltage battery	2	R/W	1740	17. 4V
40065	the load short-circuit time	2	R/W	500	500*20 (us)
40066	Reserve	2	R/W	Unused	Reserve
40067	Reserve	2	R/W	Unused	Reserve
40068	Reserve	2	R/W	Unused	Reserve
40069	Reserve	2	R/W	Unused	Reserve
40070	Reserve	2	R/W	Unused	Reserve

13. Detailed table of attachment

13.1 Function Table

Function Table I (decimal system)		
NMC Battery	Ternary lithium	0
LFP battery	Lithium iron	1
PAB battery	Lead-acid	2
OTH Battery	Other batteries	5
ERR	Wrong configuration	8

Function Table II (decimal)		
MPPT->BAT	Solar panel to battery charging	0

13.2 Fault table

Fault Table I (decimal system)					
OV	Solar panel overvoltage	1	SC.	Short circuit of solar panel	128
Ultraviolet	solar panel Low-Voltage	2			
OT	The system is overheated	4			
TF	Temperature sensor failure	8			
OC	Solar panel overcurrent	16			
OP	The solar panel is over.	32			
SF.	Current sensor failure	64			

Fault Table II (decimal system)					
OV	Battery overvoltage	1	SF.	Battery current sensor failure	128
Ultraviolet	Battery lowvoltage	2	SC.	Battery short circuit	256
OT	battery overheated	4	LOC1	Load first-level overcurrent	512
UT	Low temperature battery	8	LOC2	Load secondary overcurrent	1024
TF	Temperature sensor failure	16	LSC.	Load short circuit	2048
OC	Battery overcurrent	32	LSF.	Load current sensor failure	5096
OP	Battery overload	64	PF	Abnormal battery configuration	10192
DPF.	Charging fault code	20384			

14. Apply the wiring diagram

