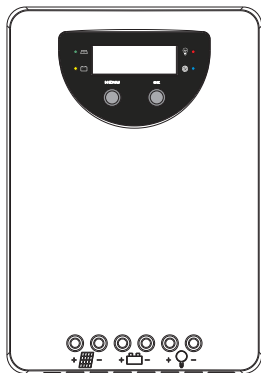


Magicube series

MPPT Solar Charge Controller

12/24V, 20/40/60A

12/24/36/48V, 60A



User Manual

User Manual_Magicube series_V1.3_QG

CE, RoHS, ISO9001:2015

Subject to change without notice!

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Dear Clients,

Thank you for purchasing our Magicube Series Solar Charge Controller. Your support and trust in us are much appreciated. Please take time to read this manual, this will help you make full use of the many advantages this controller can provide your PV-System with. This manual presents important recommendations for installing, operating and monitoring. Read it with special care in your own interest and please pay attention to the safety recommendations herein indicated.

1, Safety instructions and waiver of liability

1.1 Safety Instructions

The following symbols are used throughout this manual to indicate potentially dangerous conditions or mark important safety instructions. Please take care when meeting these symbols.



WARNING: Indicates a potentially dangerous condition. Use extreme caution when performing this task.



CAUTION: Indicates a critical procedure for safe and proper operation of the controller.



CAUTION:

- 1) There are no user serviceable parts inside the controller. Do not disassemble or attempt to repair the controller.
- 2) Keep children away from batteries and the charge controller.

1.2 Liability Exclusion

The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

2, Overview

The new generation Magicube series controller is a product developed in accordance with the latest technical standards, representing the cutting-edge level of industrial technology development.

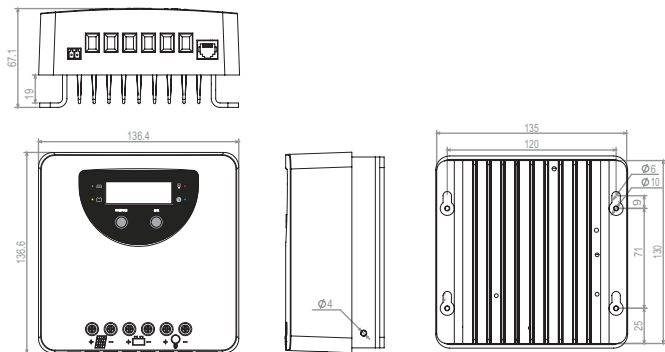
It comes with a number of outstanding features, such as:

- A combination of multiple tracking algorithms enables tracking the maximum power point quickly and accurately.
- Innovative Max Power Point Tracking(MPPT) technology, tracking efficiency >99.9%.
- Full digital technology, high charge conversion efficiency up to 97.5%.
- LCD display design, read operating data and working condition easily.
- Real-time energy statistics function.
- 12/24/36/48V automatic recognition.
- Flexible System battery selection: Liquid, Gel, AGM and Lithium.
- Extends battery life through accurate remote temperature sensor.
- The Controller is protected against over-temperature due to built-in power reduction function.
- Four stages battery charging process: MPPT, boost, equalization, float.
- Dual automatic protection to avoid exceeding the rated charging power and current.
- Multiple load control modes: Always on, Dusk to Dawn, Evening and Manual.
- IoT Wireless communication or Bluetooth communication functions optional.
- Optional APP version for Bluetooth communication.
- With the wireless communication function of the IoT , the controller can be connected remotely through IoT/GPRS.
- Monthly charging data can be calculated and displayed by grouping and graphs.
- Based on RS-485 standard Modbus protocol with RJ11 interface to maximize the communication needs of different occasions.
- Fully automatic electronic protective functions for increased charge controller availability.

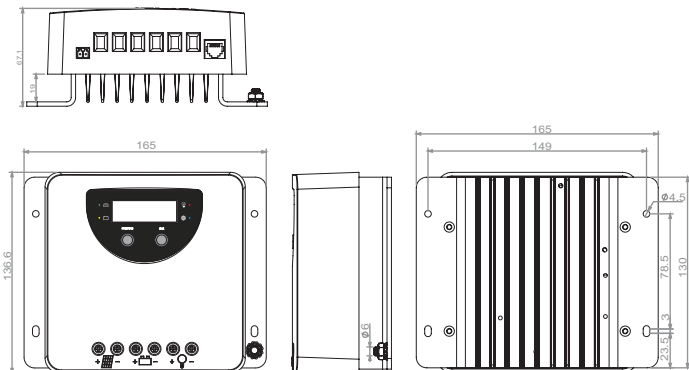
3, Dimensions(Unit:mm)

3.1 The dimensions of MC2010/2006, MC2010-2006-W

①MC2010/2006:

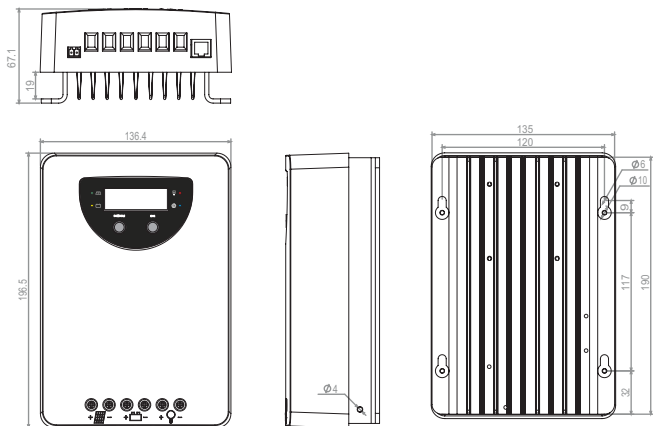


②MC2010/2006-W:

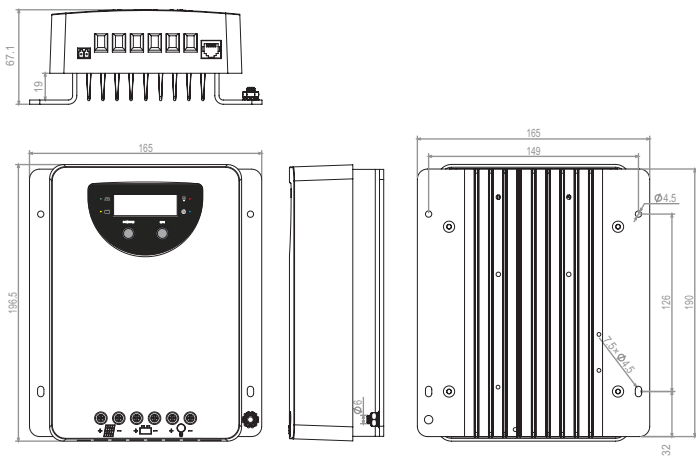


3.2 The dimensions of MC4010/MC4010-W

①MC4010:

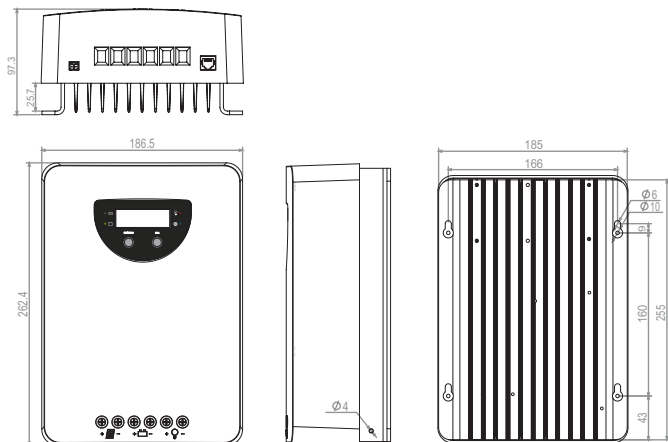


②MC4010-W:

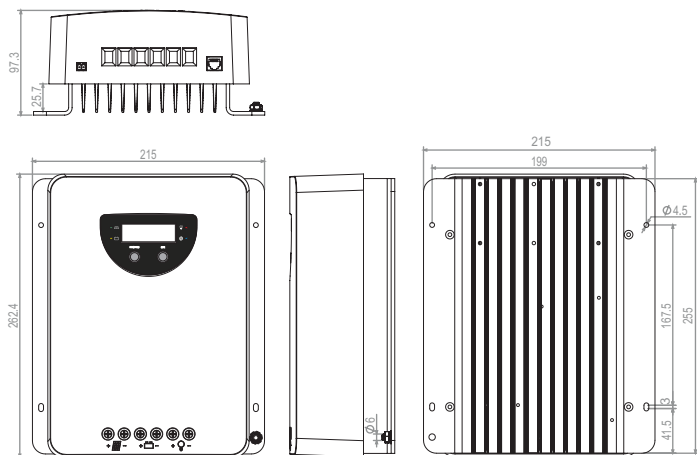


3.3 The dimensions of MC6010/6015, MC6010/6015-W

① MC6010/6015:

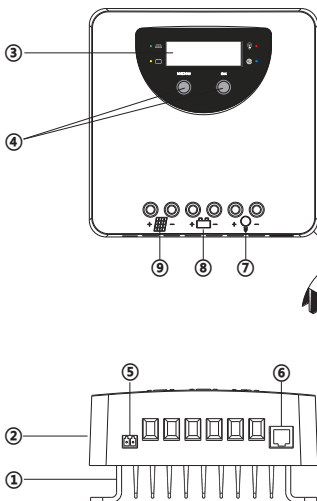


② MC6010/6015-W:



4, Structure & Accessory

4.1 Structure & Characteristics



- ① Heat Sink
—dissipate controller heat
- ② Plastic Case
—Internal protection
- ③ LED & LCD
—Display settings and operating status, system parameters
- ④ Key: MENU、OK
—Set and view the operating parameters
- ⑤ Temperature Sensor Port
—Collect temperature information, for temperature compensation.
- ⑥ RJ11 interface
—Connecting monitoring devices
- ⑦ Load Terminals
—Connected load.
- ⑧ Battery Terminals
—Connect the battery.
- ⑨ Solar module terminals
—Connected solar modules.
- ⑩ Grounding hole
—Grounding(Use M4 triple combination screws).

4.2 Temperature Sensor

The controller is shipped with a temperature sensor of length 80mm. If you need a longer remote temperature sensor, you need to purchase separately.

The remote temperature sensor can measure the temperature at the battery and use this data for very accurate temperature compensation. The standard length of the remote temperature sensor cable is 3m (length can be customized). The temperature sensor is connected via interface ⑤.

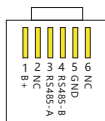


- 1.Connection is independent of polarity.**
- 2.If the external temperature sensor is not connected or damaged, the controller charges at 25 °C by default.**
- 3.If the controller and battery are not located in the same room, then an external temperature sensor for measuring the battery temperature must be installed.**

4.3 RS485

The charger is equipped with a RS485 port with RJ11 sockets, the RJ11 port is defined as follows:

Pin No.	Definition
1	B+
2	NC
3	RS485-A
4	RS485-B
5	GND
6	NC



RJ11 port

 Please contact the sales for the latest version of the communication protocol.



The RS485 port on this charger is not galvanically isolated and can not be grounded. Do not short circuit unused pin (Note NC).

4.4 Option Accessories

4.4.1 Bluetooth Communication

Two options are available:

1. BT inside
2. BT external (Cyber-BT), and connected via RJ11 connector.

Bluetooth communication has the following characteristics :

1. Support Android/iOS mobile phone App
2. Realizes wireless monitoring function of PV charge controller
3. Use high performance, ultra-low power consumption Bluetooth dedicated chip
4. Adopt Bluetooth 4.2 and BLE technology

1. In this manual, the  icon indicates that this function is only available for solar controllers equipped with a Bluetooth communication module.

2. Please refer to the Bluetooth APP instructions for detailed operation of the mobile APP.

4.4.2 Internet of Things module

The IoT wireless communication module has the following features:

1. The controller can be remotely connected via IoT/GPRS without the need for networking—convenient and fast.
2. Multiple operation methods are available, allowing remote monitoring and real-time control of the system via WeChat Mini Program or PC.
3. It supports real-time monitoring of system parameters and device status (solar panel voltage/current, battery voltage/current, load output voltage/current, etc.) and automatic real-time fault alerts.

Please contact our Sales Team for more details about the IoT wireless communication module.

5, Installation



CAUTION: Please read all instructions and precautions in the manual before proceeding with the installation! It is recommended to remove the protective film cover from the LCD screen before operation.

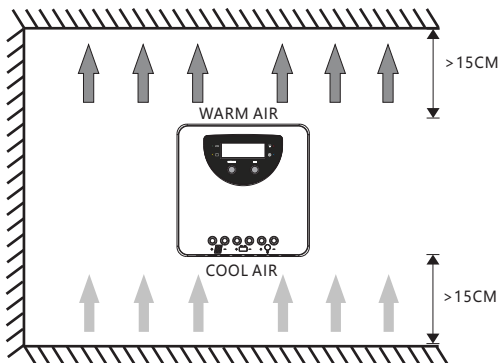
5.1 Installation Notes

- ① The solar controller can only be used in solar photovoltaic systems. During installation and operation, this manual and the technical parameters provided by component manufacturers must be strictly followed. No other energy source other than solar modules may be connected to the controller.
- ② Batteries store a large amount of energy. Do not short-circuit the battery under any circumstances. It is recommended to connect a slow-acting fuse in series with the battery according to the rated current of the controller.
- ③ Batteries can generate flammable gases. Keep batteries away from sparks, open flames, or unprotected fires, and ensure the battery storage area is well ventilated.
- ④ Do not touch or short-circuit wires or terminals, as some terminals or wires may generate voltages up to twice the battery voltage. When performing any operation, keep your hands dry, use insulated tools, and stand on dry ground.
- ⑤ Keep children away from batteries and the controller.

5.2 Mounting Location Requirements

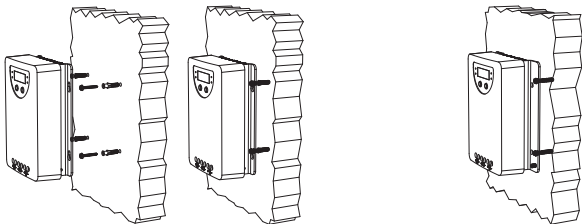
Do not subject the PV charge controller to direct sunlight or any other heat sources. Protect the PV charge controller from any dust, dirt and moisture. Mount it flat to a vertical wall. Must be a non-flammable material. Maintain a minimum clearance of 15 cm below and around the controller to ensure unhindered air circulation. Mount the PV charge controller not too far from the batteries (for accurate voltage sensing least lessening).

Mark the position of the PV charge controller fastening holes on the wall, drill 4 holes and insert dowels, fasten the PV charge controller to the wall with the cable openings facing downwards.



5.3 Fix the controller

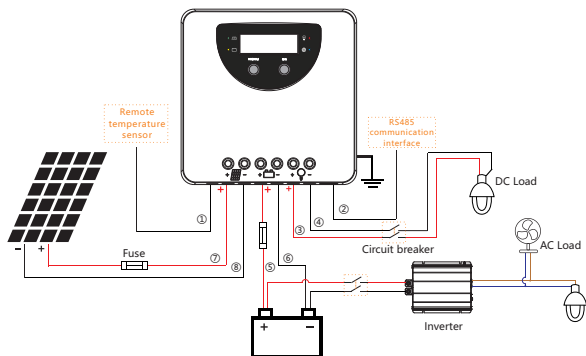
Drill 4 mounting holes in the wall according to "installation position" and fix the four screws(M4) , then aim the controller's fixing holes at the screws and mount the controller on.



The wide-base controller can be directly screwed onto the desired location.

5.4 Connection

We strongly recommend connecting a fuse directly to the battery terminal to protect from any short circuit in the battery circuit. PV-modules generate current whenever light shines on them. The generated current is directly proportional to the light intensity. Even low levels of light, will deliver the PV-Modules no load, full voltage. It is thus utterly advisable to protect PV-modules from any incident light during installation; Never touch uninsulated cables (ends), only use electric insulated tools, and make sure that the wire cross section is adequate for the PV module operating currents. Connections must always be conducted in the sequence as described below.





Warning: High Voltage Hazard! Solar modules may generate very high open-circuit voltage. Disconnect the circuit breaker or remove the fuse before wiring, and exercise extreme caution during the wiring process.



Warning: Risk of Explosion! Short-circuit between the battery terminals or the wires connected to them may cause fire or explosion. Please operate with extreme caution.



CAUTION:

1. When the controller is not connected with the external temperature sensor, the internal temperature of the battery is 25 °C.
2. DC loads can be directly connected to the controller's load terminals, while AC loads must be connected via a DC/AC inverter.
3. If an inverter is used in the system, connect it directly to the battery terminals. Do Not connect it to the controller's load terminals!!!

1st step: Connect accessories

(1) Connect the remote temperature sensor cable

Connect the remote temperature sensor cable to the interface and place the other end close to the battery.

(2) Connect the accessories for RS485 or IoT communication.

2nd step: Connect loads

Connect the load cable with the correct polarity of the right-hand side pair of terminals on the solar charge controller (with the lamp symbol). To avoid the presence of any tension on the cable/wires, please connect these first to the load before connecting them to the charge controller.

3rd step: Connect the battery

Connect the battery cables observing the correct polarity to the center pair of terminals (make sure you identify the battery marking/symbol on the controller casing!) of the PV charge controller. Pay greatest attention to polarity. Never, ever invert the plus+ and minus- poles).

1) Should your system be nominal 12 Vdc, make sure the battery voltage is between the 5 and 15.0 Vdc voltage range;

2) for 24 Vdc nominal voltage, the battery voltage should be within the 20 to 30 Vdc range;

3) for 36 Vdc nominal voltage, the battery voltage should be within the 31 to 42 Vdc range;

4) for 48 Vdc nominal voltage, the battery voltage should be within the 42 to 62 Vdc range.

5) Voltages are identifiable when the controller is set to a lithium battery.

If the polarity is correct, the LCD on the controller will begin to display those.

4th step: Connect the solar module

When connecting the PV-Module make sure to cover it from incident sun light. Double check the PV-Module will not exceed the maximum permissible input current of the Charge Controller (please refer to the section Technical Data). Connect the solar module connection cable to the correct polarity of the left pair of terminals on the solar charge controller (with the solar module symbol).

5th step: Final work

Tighten all cables connected to the controller and remove all the remains around the controller (leaving a void of minimum 15 cm).



When screwing, MC2010/2006/4010 limit torque should not exceed 1.4N.m; MC6010/6015 limit torque should not exceed 2.3N.m; When locking screws, the electric batch (suggest using PH2 screwdriver) or screwdriver must be perpendicular to the surface of the screws to prevent screws from slipping or cracking the plastic body.

5.5 Wiring Specifications

The wiring and installation method of the controller must comply with national and local electrical code requirements. The wire specifications for the solar, battery, and load terminals must be selected according to the rated current. Please refer to the table below:

Model	Rated charging current	Rated discharging current	Solar wire diameter (mm ² /AWG)	Battery wire diameter (mm ² /AWG)	Load wire diameter (mm ² /AWG)
MC2010/2006	20A	20A	5/10	5/10	5/10
MC4010	40A	30A	10/8	10/8	6/9
MC6010/6015	60A	30A	16/5	16/5	6/9

 The wire gauges provided are for reference only. If the distance between the solar panel and the controller or between the controller and the battery is relatively long, using thicker wire can reduce voltage drop and improve system performance.

5.6 Grounding

The casing has a grounding hole, please ground the casing.



CAUTION: For common-negative system, such as motorhome, it is recommended to use a common-negative controller; but if in a common-negative system, some common-positive equipment is used, and the positive pole is grounded, the controller may get damaged.

6, Display and Setting



6.1 Key Operation and Display

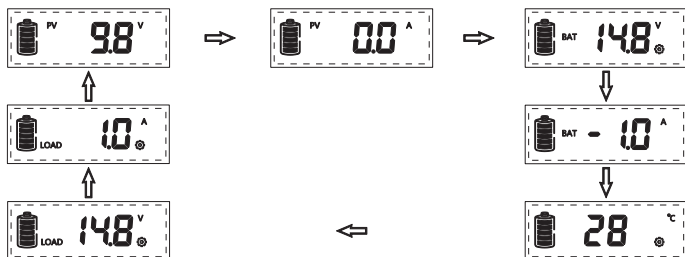
Mode	Operating
Browse interface	Short press OK .
Static display	Press the MENU and OK key at the same time for 1s, the LCD screen will lock the interface. Press the MENU and OK key again for 1s, the LCD interface will unlock and start scrolling.
Setting parameter	When the icon  appears on the display interface, it indicates that the current parameter is adjustable. Press and hold the MENU button for 1 second to enter the setting mode. At this time, the icon  will flash. Press the OK button to increase the parameter value, and press the MENU button to decrease it. After confirming the desired value, press and hold the MENU button for 1 second to exit.
Load On/Off	When the controller is operating in street light mode, press and hold the MENU button for 3 seconds to turn on the load. Press and hold the MENU button again, or wait 30 seconds, and the load will turn off.

6.1.1 Status Description

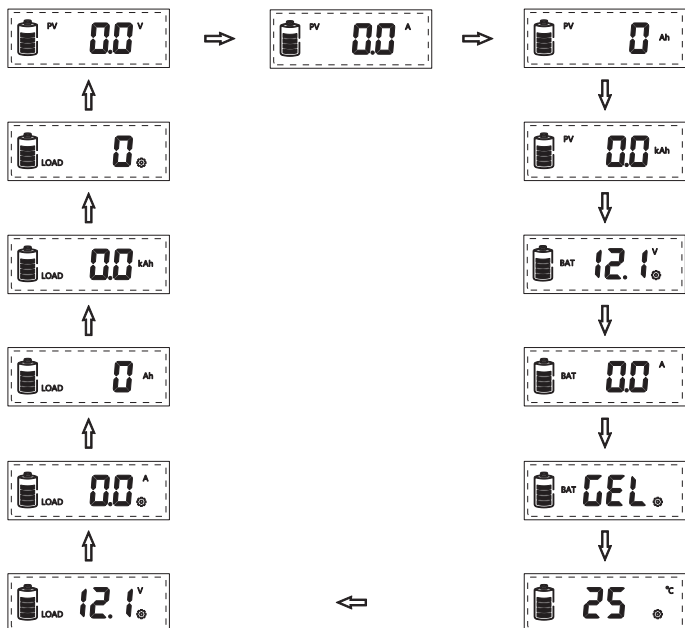
Item	Icon	Status
PV array		PV voltage
		PV current
		PV ampere hours of the day
		The total charge ampere hours of the solar panel
Battery		Battery capacity
		Charging
		Battery voltage(The lithium battery can be set Boost Charging Voltage)
		Battery current
		Battery type(Programmable)
		Temperature(Can clear Bluetooth Device Password)
Load		Load voltage(Set Low Voltage Disconnect Voltage)
		Load current(Set short-circuit protection: On/Off)
		Load ampere hours of the day
		The total discharge ampere hours of the load
		Load mode(Programmable)

PV array charge ampere hours and load ampere hours are off after power failure.

6.1.2 The interface automatically cycles in the displayed sequence



6.1.3 Press OK to browse the interface



6.2 LED indicator

Solar LED



Load LED

Battery LED



Communication LED

LED	Status	Function
Green (PV Panel)	ON	PV voltage > light control threshold voltage, but not charging
	Fast flash(0.1s/0.1s)	MPPT charging
	Flash(0.5s/0.5s)	Equal or Boost Charging
	Slow flash(0.5s/2s)	Float Charging
Yellow (Battery)	ON	Battery is normal
	OFF	Over voltage protection
	Fast flash(0.1s/0.1s)	Low voltage protection
	Slow flash(0.5s/2s)	Battery voltage is low
Red (Load)	ON	Load is on
	OFF	Load is off
	Fast flash(0.1s/0.1s)	Short circuit or over current protection
	Slow flash(0.5s/0.5s)	Over temperature protection
Blue (Communication)	OFF	No communication
	Fast flash(0.1s/0.1s)	Normal communication

6.3 Parameters setting

When the icon  appears on the display interface, it indicates that the current parameter is adjustable. Press and hold the **MENU** button for 1 second to enter the setting mode. At this time, the icon  will flash. Press the **OK** button to increase the parameter value, and press the **MENU** button to decrease it. After confirming the desired value, press and hold the **MENU** button for 1 second to exit. It is recommended to set the "Battery Type" and "Battery Voltage Level" first.

6.3.1 Voltage Default Parameter

Battery type	AGM	GEL	FLD	Range	LI			
					MC2010/ 2006/4010 /6010	Range	MC6015	Range
OVD	15.8V	15.8V	15.8V	/	14.6V	/	30.0V	/
OVR	15.5V	15.5V	15.5V	/	14.4V	/	28.8V	/
Equalization	14.8V	/	14.8V	14.0-15.0V *	/	/	/	/
BCV	14.5V	14.5V	14.5V	14.0-14.8V *	14.4V	10.0-32.0V *	28.8V	10.0-64.0V *
BVR	/	/	/	/	14.0V	9.2-31.8V *	28.0V	9.2-63.8V *
Float	13.7V	13.7V	13.7V	13.0-14.5V *	/	/	/	/
LVD	11.2V	11.2V	11.2V	10.8-11.8V *	10.6V	9.0-30.0V *	21.2V	9.0-60.0V *
LVR	12.0V	12.0V	12.0V	11.4-12.8V *	12.0V	9.6-31.0V *	24.0V	9.6-62.0V *
Remarks	For AGM, GEL, and FLD batteries, the OVD is 31.3/46.8/62.3V for 24/36/48V systems respectively.				/			

※ The above voltage parameters are all for 12V systems. For 24V/36V/48V systems, they are automatically multiplied by 2/3/4 respectively.

※ *indicates that the parameter can be set via the mobile Bluetooth APP, RS485, or IoT mini program.

※ Note: OVD: Over Voltage Disconnect Voltage
 OVR: Over Voltage Reconnect Voltage
 BCV: Boost Charging Voltage
 BVR: Boost Voltage Reconnect Voltage
 LVD: Low Voltage Disconnect Voltage
 LVR: Low Voltage Reconnect Voltage



Note: The minimum voltage difference between the lithium battery boost charging voltage and boost voltage reconnect voltage is 0.2V, and the maximum is 1.5V. Parameter settings outside this range are not supported.



Warning: The accuracy of the lithium-ion battery protection board installed in the system must be no greater than 0.2V. If it exceeds 0.2V, no liability will be assumed in the event of any system abnormality.

6.3.2 Battery Type



When the LCD screen displays the interface shown in the left image, the battery type can be set, and you can choose between Gel, AGM, FLD or Lithium batteries.

Display	Battery type
GEL	GEL(Default)
AGM	AGM
FLD	Flooded
LI	Lithium

6.3.3 Boost Charging Voltage(Lithium)



When the battery type is Lithium, the LCD screen displays as shown in the left image. Press and hold the MENU button for 1 second to set the Lithium battery "Boost Charging Voltage(BCV)".

1. Boost charging voltage setting range:

10.0-64.0V(Default:14.4V/28.8V/43.2V/57.6V);

Note: For model differences, please refer to the voltage default parameter.

※ During setup, for lithium batteries, the following quick operations are available:

- ① Press and hold the MENU and OK buttons simultaneously to switch between default parameters (14.4V/28.8V/43.2V/57.6V);
- ② Press and hold the OK button to speed up value adjustment.

2. When the battery type is GEL/FLD/AGM, the icon ⚡ will not appear on the current interface.

6.3.4 Low Voltage Disconnect Voltage



When the LCD screen displays the interface shown in the left image, press and hold the MENU button for 1 second to set the "Low Voltage Disconnect voltage(LVD)".

1.Low voltage disconnect voltage setting range:
9.0-60.0V(Default:10.6V/21.2V/31.8V/42.4V);

Note: For model differences, please refer to the voltage default parameter.

※ During setup, for lithium batteries, the following quick operations are available:

- ①Press and hold the MENU and OK buttons simultaneously to switch between default parameters (14.4V/28.8V/43.2V/57.6V);
- ②Press and hold the OK button to speed up value adjustment.

2.When the battery type is GEL/FLD/AGM, the setting range for low voltage protection controlled by battery voltage mode is:
10.8-11.8V/21.6-23.6V/32.4-35.4V/43.2-47.2V(Default:11.2V/22.4V/33.6V/44.8V).

Note: The controller's default low voltage reconnect voltage(LVR) is 0.8V/1.6V/2.4V/3.2V higher than the low voltage disconnect voltage(LVD). If you wish to lower the LVR voltage, please first decrease the LVD voltage value.

6.3.5 Load short-circuit protection



When the LCD screen displays the interface shown in the left image, the load short-circuit protection can be set to ON/OFF. Capacitive loads may draw a large inrush current at startup, which could trigger the controller's short-circuit protection and cause the output to shut down. In this case, the user can disable the short-circuit protection. "SoN" means ON, and "SoF" means OFF. The default setting is on. Recommended setting: Keep the default value.

Display	Description
	Short-circuit protection: ON
	Short-circuit protection: OFF

Note: When short-circuit protection is set to off, it does not mean the protection is permanently disabled. Instead, the protection is inactive only within the first 10 seconds of load discharge. After 10 seconds of load discharge, normal protection resumes.

6.3.6 Load mode



When the LCD screen displays the interface shown in the left image, the load working mode can be set.

Display	Load mode
0	Universal controller, 24H output(Default)
!	Dusk to Dawn mode(D2D)
23456789	Fixed lighting duration(2-9 hours)
USE	Manual mode(Default: load on)

1.Always on Mode

When the controller is set to always On mode, no matter the charging or discharging state, the load is always powered on (except in when in protection state).

2. Street Lamp Function

When the load is set to Dusk to Dawn or Evening mode, the Day/Night threshold voltage and the Day/Night delay time can be set by IoT, RS485 or bluetooth APP, and the load can be turned on or off by the test function during the day charging process.

2.1 Day/Night threshold voltage

The controller recognizes day and night based on the solar array open circuit voltage.

This day/night threshold voltage can be modified according to local light conditions and the solar array used. Users can set it via IoT, RS485 or bluetooth APP

Day/Night threshold setting range: 3.0-10.0/6.0-20.0/9.0-30.0/12.0-40.0V(Default: 8V/16V/24V/32V)

2.2 Day/Night delay time

In the evening, when the solar array open circuit voltage reaches the setting day/night detect voltage, you can adjust the day/night delay time to make the load turn on a little bit later. Users can set it via IoT, RS485 or bluetooth APP.

Day/Night delay time setting range: 0-30min(Default: 0min)

2.3 Test Function

When the controller is working in Dusk to Dawn or Evening mode, press the **MENU** key for 3s to turn on the load. Press the **MENU** key again or the load will turn off automatically after 1 minute.

If the controller is operating in always on mode, the test function does not work.

3.User-defined Mode

①If the load mode is selected "USE", then you can switch on and off the load output manually by pressing **MENU** shortly.

②The default switching state of the load in manual mode can be changed by IoT, RS485 or bluetooth APP. At the same time, the output to the load can be turned on or off.



1.If the controller turns off the load due to low voltage protection, overcurrent protection, short-circuit protection or over temperature protection, the load will turn on automatically when the controller recovers from protection state.

2.Please note: Pushing the MENU button can still activate the function of the key, even during of the above four kinds protection states.

6.3.7 Clear Bluetooth device password



When the LCD screen displays the interface shown in the left image, press and hold the MENU button for 1 second. The icon  will flash. Then briefly press the OK button to clear the Bluetooth device password set via the mobile app.

 **Bluetooth** For device passwords, please refer to Bluetooth APP instructions.

7, Protections, Troubleshooting and maintenance

7.1 Protection

■ PV Over Current

If the charging power exceeds the controller's rated power, the controller will charge at the rated power and will not operate at the maximum power point during charging.

■ PV Short Circuit

When the PV is not charging, a short circuit on the solar panel side will not damage the controller.



Warning: Do not short-circuit the PV during charging, otherwise the controller will be damaged.

■ PV overvoltage

If charging the battery, when the solar panel voltage exceeds the PV protection voltage, the controller will stop charging and enter the overvoltage protection state.

■ PV reverse polarity connection

When the solar panel is connected with reverse polarity, the controller will not be damaged. After correcting the wiring error, the controller will resume normal operation.

■ Battery reverse polarity connection

When the battery is connected with reverse polarity, the controller will not be damaged. After correcting the wiring error, the controller will resume normal operation.

■ Battery overvoltage

If another energy source is charging the battery, and the battery voltage (for non-lithium batteries) exceeds 15.8V/31.3V/62.3V (for lithium batteries: overvoltage protection voltage + 0.2V), the controller will stop charging and enter the overvoltage protection state.

■ Low battery voltage

When the battery voltage reaches the set low voltage disconnect (LVD) point, the controller will automatically stop discharging and enter the low voltage protection state to prevent battery damage caused by over-discharge.

■ Load overcurrent protection

If the load discharge current exceeds 1.25 times the controller's rated current, the controller will turn off the load after a delay. When overcurrent protection occurs on the controller's load output terminal, the controller will automatically protect itself and cut off the output. After the first 10 overcurrent protection events, the controller will automatically recover after a delay. After more than 10 events, the controller will not automatically recover. To clear the protection, reduce the power consumption of the connected device, then press a button once, restart the controller, or go through one charge-discharge cycle.

■ Load short-circuit protection

When a short circuit occurs on the controller's load output terminal, the controller will automatically activate protection and cut off the output. 30 seconds after the protection event, the controller will resume discharging.

■ Over-temperature protection

The controller detects its internal temperature via an internal sensor. When the internal temperature exceeds the set value, the charging current decreases linearly with temperature, thereby reducing the controller's temperature rise and preventing high-temperature damage. When the internal temperature exceeds the set over-temperature protection threshold, the controller stops operating and resumes normal operation after the temperature drops.

■ External temperature sensor damaged

When the external temperature sensor is damaged or not connected, the controller will default to 25°C for charging to prevent overcharging and damage to the battery.

7.2 Troubleshooting

Icon	Reason	Description	Troubleshooting
 E1	Short circuit	Load off, fault icon on, LCD shows E1.	①Clear short circuit fault. ②Restart the controller or press the key to restore the load output.
 E2	Over current	Load off, fault icon on, LCD shows E2.	①Reduce electrical equipment; ②Restart the controller or hold down the MENU key for 3s and wait for 10s after the fault is cleared and output is restored (except in USE mode).
 E3	Low voltage	Load off, empty battery bars, fault icon on, battery icon border flashing, LCD shows E3.	Load will be reconnected when battery is recharged.
 E4	Over voltage	Charging off, full battery bars, fault icon on, battery icon flashing, LCD shows E4.	Check if other sources overcharge the battery or battery parameter is set correctly. If not, controller is damaged.
 E5 °C	Over temperature	Charging/discharging off, fault icon on, °C icon flashing, LCD shows E5.	After the temperature decreases, the controller will work normally.
 E7	PV terminal overvoltage	Charging off, fault icon on, LCD shows E7.	Use a multimeter to measure the voltage at the controller's PV terminal and check whether it exceeds the PV voltage point.
 PV BAT LOAD 88.8 VA °C kWh	Battery voltage is abnormal at start-up	The controller does not correctly identify the system voltage.	Charge or discharge the battery so that the battery voltage is within the normal operating range(5.0-15.0V or 20-31V or 31-42 or 40-62V).

7.3 Maintenance

To maintain optimal working performance over the long term, it is recommended to check the following items twice a year:

- Ensure that the airflow around the controller is not blocked, and remove any dirt or debris from the heat sink.
- Check all exposed wires for damage, and repair or replace them if necessary.
- Verify that the LCD display is consistent with the device operation. Any faults or incorrect displays must be cleared by taking corrective actions.
- Check all wiring terminals for corrosion, insulation damage, signs of high temperature, or discoloration due to burning, and tighten the terminal screws.
- Check for any dirt or corrosion, and clean it promptly.



WARNING: Risk of electric shock!

Make sure that all the power is turned off before above operations, and then follow the corresponding inspections and operations.

8, Technical Data

	Item	Standard product	MC2010	MC2006	MC4010
		Suffix description	-W: Wide base plate -BT: Bluetooth communication		
Battery Parameters	Max Charging Current	20A			40A
	System Voltage	12/24V automatic recognition			
	Battery Type	GEL, AGM, FLD, Lithium(Default: GEL)			
	Max volt on Bat. terminal	35V			
	Temp. Compensation	-4.17mV/K per cell (Boost, Equalization), -3.33mV/K per cell (Float)			
Panel Parameters	Max volt on PV terminal ^{**}	90V	60V	100V	
	Max input power	260W/520W			520W/1040W
	Day/Night threshold	3.0~10.0V/6.0~20.0V(Default: 8.0V/16.0V)			
	MPPT tracking range	(Battery Voltage + 2.0V)~Voc*0.9 ^{**2}			
	PV overvoltage point	102V	62V	102V	
Load	Output Current	20A			30A
	Load mode	Universal Controller(Default), Street Light Mode, User Manual Mode			
System Parameters	Max tracking efficiency	>99.9%			
	Max charge conversion	97.5%			
	Dimensions (Standard product/-W)	136.6*136.4*67.1mm/ 136.6*165*67.1mm			196.5*136.4*67.1mm/ 196.5*165*67.1mm
	Net weight (Standard product/-W)	830g/860g			1.3Kg/1.345Kg
	Self consumption	≤22mA			
	Communication	RS485(RJ11 interface)			
	Optional	IoT,Bluetooth(Internal/External)			
	Grounding	Common Negative			
	Ambient temperature	-20~+45°C			
	Ambient humidity	≤95%RH,No condensation			
	Storage temperature	-25~+70°C			
	Protection degree	IP32			

***1.This value represents the maximum voltage of the solar panel at the minimum operating ambient temperature.**

***2.Voc means the open circuit voltage of the solar panel.**

***3.The values before and after the slash represent the values for 12V and 24V systems respectively.**

	Item	Standard product	MC6010	MC6015
		Suffix description	-W: Wide base plate -BT: Bluetooth communication	
Battery Param-eters	Max Charging Current	60A		
	System Voltage	12/24V automatic recognition	12/24/36/48V automatic recognition	
	Battery Type	GEL, AGM, FLD, Lithium(Default: GEL)		
	Max volt on Bat. terminal	35V	65V	
	Temp. Compensation	-4.17mV/K per cell (Boost, Equalization), -3.33mV/K per cell (Float)		
Panel Param-eters	Max volt on PV terminal ^{*1}	100V	150V	
	Max input power	750W/1500W	750W/1500W/2250W/3000W	
	Day/Night threshold	3.0~10.0V/6.0~20.0V(Default: 8.0V/16.0V)		
	MPPT tracking range	(Battery Voltage + 2.0V)~Voc*0.9 ^{*2}		
	PV overvoltage point	102V	153V	
Load	Output Current	30A		
	Load mode	Universal Controller(Default), Street Light Mode, User Manual Mode		
System Param-eters	Max tracking efficiency	>99.9%		
	Max charge conversion	97.5%		
	Dimensions (Standard product/-W)	262.4*186.5*97.3mm/262.4*215*97.3mm		
	Net weight (Standard product/-W)	2.5Kg/2.57Kg	3Kg/3.07Kg	
	Self consumption	≤20mA		
	Communication	RS485(RJ11 interface)		
	Optional	IoT,Bluetooth(Internal/External)		
	Grounding	Common Negative		
	Ambient temperature	-20~+45℃		
	Ambient humidity	≤95%RH,No condensation		
	Storage temperature	-25~+70℃		
	Protection degree	IP32		

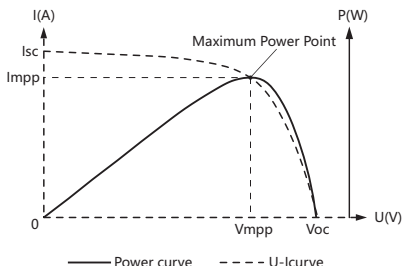
***1. This value represents the maximum voltage of the solar panel at the minimum operating ambient temperature.**

***2. Voc means the open circuit voltage of the solar panel.**

***3. The values before and after the slash represent the values for 12V, 24V, 36V, and 48V systems respectively.**

9, MPPT and Charging Instructions

9.1 MPPT charging introduction



MPPT, the full name of "Maximum Power Point Tracking", is an advanced charging method. The MPPT controller can detect the power generation of the solar panel in real time and track the maximum voltage current value (VI), so that the system can charge the battery at the highest efficiency. Compared with the traditional PWM controller, the MPPT controller can play the maximum power of the panel, so it can provide a larger charging current, generally speaking, MPPT can improve the energy utilization rate of 15% to 20% than the PWM controller.

9.2 MPPT-Four Charging Stage

Battery type: AGM/GEL/LIQ.

As shown in Figure 2-2, the lead-acid battery is charged in the following stages: MPPT charge, constant voltage charge (Equalization charge/Boost charge/Float charge).

The constant voltage charging stage is divided into three stages: Equalization charge, Boost charge and Float charge:

■ MPPT Charge

When the battery voltage does not reach the target constant voltage value, the controller will carry out MPPT charging. When the battery voltage reaches the constant voltage value, the MPPT charging will automatically exit and enter the constant voltage charging (Equalization charge/Boost charge/Float charge).

■ Boost Charge

When the battery has recharged to the Boost voltage setpoint, the controller will charge at a constant voltage, and the charging current will gradually decrease over time. This process will be maintained for 120 minutes before switching to a floating charge.

■ Equalization Charge

Certain types of batteries benefit from periodic equalizing charge, which can stir the electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge increases the battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

※ If the controller detects that the battery voltage is too low, it will automatically start equalization charging for 120 minutes, and then switch to float charging.

※ Equalization charging and boost charging will not be repeated during a single full charge cycle to prevent excessive gas emission or battery overheating.



WARNING: Risk of explosion!

Equalizing flooded battery can produce explosive gases, so well ventilation of battery box is necessary.

■ Float Charge

After boost charging or equalization charging ends, the controller will reduce the charging current to lower the battery voltage and maintain it at the float charging voltage. During the float charging stage, the controller charges the battery with a very weak current to keep the battery in a fully charged state. In the float stage, the load can obtain nearly all of the solar power. If the load draws more power than the solar energy provides, the controller will be unable to keep the battery in the float stage. When the battery voltage drops below the charge recovery voltage, the controller will exit the float stage and re-enter the boost charging stage.

9.3 Lithium battery charging mode

Battery types are available in four and eight series lithium iron phosphate.

As shown in Figure 2-3, the lithium battery charging stage includes: MPPT charging/constant voltage charging.

- **MPPT charging stage:** When the battery voltage has not reached the boost charging voltage, the controller will charge MPPT. When the battery voltage reaches the boost charging voltage, the MPPT charging will automatically exit and enter the constant voltage charging.
- **Constant voltage charging stage:** the lithium battery is in the constant voltage charging stage, when the battery voltage reaches the boost charging voltage, the controller will carry out constant voltage charging, and the charging current will gradually decline over time, this process will remain for 60 minutes, and then stop charging, and re-enter the next charging cycle when the battery voltage reaches the boost voltage reconnect voltage.

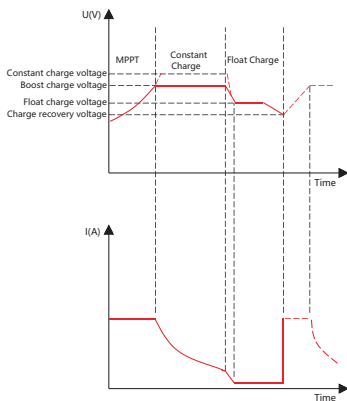


Figure 2-2 Lead-acid battery charging curve

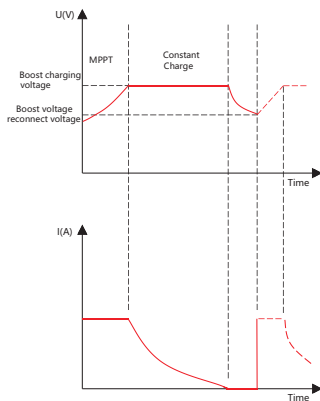


Figure 2-3 Lithium battery charging curve

10,Bluetooth

10.1 Bluetooth Communication

Bluetooth communication has the following characteristics:

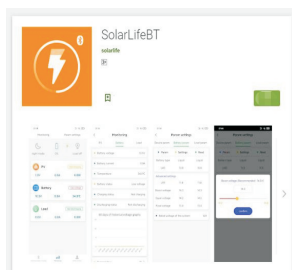
- 1.Support Android and iOS mobile phone APP.
- 2.Realize wireless monitoring function of solar controller.
- 3.Use high performance, ultra-low power consumption Bluetooth dedicated chip.
- 4.Adopt Bluetooth 4.2 and BLE technology.
- 5.Communication distance up to 8m.

BT Refer to Bluetooth APP instructions for detailed operation of mobile APP.

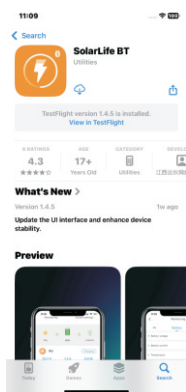
10.2 App installation

Search for "SolarLifeBT" or "SolarLife Pro" in Google Play or the Apple App Store and install the app. For detailed instructions and settings, please read the Bluetooth APP user manual.

Android APP :



iOS APP :



11. Parameter operation example

※ Parameter operation example:

Sample: How to change the battery type to Lithium (LI), adjust the boost charging voltage to 29.0V?

① Change the battery type: Short press the OK button to enter the following setting page. Long press the "MENU" button for 1 second; the icon "⊗" will start flashing. Then short press the "OK" button to select "LI", and long press the "MENU" button for about 1 second to complete the battery type setting.



② Adjusting the battery boost voltage: Short press the "OK" button to enter the following settings page. Long press the "MENU" button for 1 second — the "⊗" icon will start flashing, and the screen will display the boost voltage as 14.4V. Short press the "OK" button to adjust the parameter to 29.0V (or long press the "OK" button to quickly adjust the parameter). Then long press the "MENU" button for about 1 second to complete the setting.



Quick operation: Adjusting the battery boost voltage: Short press the "OK" button to enter the following settings page. Long press the "MENU" button for 1 second — the "⊗" icon will start flashing, and the screen will display the boost voltage as 14.4V. Simultaneously press the "MENU" and "OK" buttons to switch the default parameter to 28.8V. Short press the "OK" button to adjust the parameter to 29.0V; then long press the "MENU" button for about 1 second to complete the setting.

