User Manual of MPPT Solar Charge Controller

Suitable for 12V/24V batteries or Li-ion batteries

20A/30A/40A/50A/60A

Please keep this handbook in case of need

(Revision data: 201908)

Important safety instructions (Please keep this handbook for future reference. Please read all instructions and precautions in the manual carefully before installation.)

This manual contains all the safety, installation and operation instructions of this series solar charge controller (hereinafter referred to as "controller"):

- Install the controller in a well ventilated place. The controller's case temperature may be very high during operation. Please don't touch the metal shell directly to prevent burns.
- It is recommended to connect fuse or circuit breakers to the input, load and battery terminals to prevent electric shock hazard during use.
- After installation,check all wiring connections are secure, so as to avoid the danger of heat build-up caused by virtual connection.
- If the controller does not display properly when first use, please cut off the fuse or circuit breaker immediately and check whether the wiring connection is correct or not.
- If the solar system needs to connect the inverter, please connect the inverter directly to the battery, instead of the load terminal of the controller.
- Don't disconnect the battery when the controller is charging. Otherwise, it may damage the DC load.

Operation fault codes description

Code	Description	Code	Description	Code	Description
001	Battery over-voltage	010	Battery over-temperature	100	Trigger over-voltage protection
002	PV over-voltage	020	Internal over-temperature	200	Command mode
004	Overcharging	040	PV under-voltage	400	Battery system unrecognized
008	Over-discharging	080	Battery under-voltage		

Table 1

System Voltage and Battery Types

1)The controller identifies the system voltage according to the battery voltage at start-up. And the controller will re-identify the system voltage when power-off and restart. Please ensure the system voltage displayed in controller is consistent with the actual voltage. Otherwise, need to recheck the battery pack voltage.

Note: Please refer to **Table 9** for the battery detailed system identification voltage.

2)The controller has set 3 kinds of conventional battery charging parameters (**Table 2**) . To charge other types of batteries, please select "USE" , then set up by PC software or APP. The controller can identify 12V/24V ONLY. To charge lithium battery , please select "Lit", then set up on the controller.

Battery type	Constant voltage = C*N (V)	Floating voltage = F*N (V)
Flooded(FLD)	14.6 * N	13.8 * N
Sealed(SEL)	14.4 * N	13.8 * N
Gel(GEL)	14.2 * N	13.8 * N
User (USE)	C * N	F * N

1. **C** = Constant charging parameter.(9≤F<C≤15)
2. **F** = Floating charging parameter.(9≤F<C≤15)
3. **N** = Series number of battery.(1≤N≤2)
   [e.g. N=2,battery system is 24V]
4. **Example**:If battery system is 24V,then N=2;If battery pack's saturation voltage is 28.4V,then C=28.4/N=14.2V.

Li-ion(Lit)

According to the specifications of the selected lithium batteries, charging and protection parameters can be set through the controller.

Example:Step1: Enter the setup mode.
Step2: Set the battery type to "Lit".
Step3: Set the parameters of S05~S10.
Step4: Save the setting parameters and exit.
Note: Please refer to **Table 7**.

Cell Specification
Nominal Voltage:3.7V
Charge Voltage:4.2V
Cut-off Voltage:2.7V

6 cells in series →

Reference Settings
S06 : 22.2V Nominal Voltage
S05 : 25.2V Charge Voltage
S07 : 16.2V Under-volt protection

Table 2

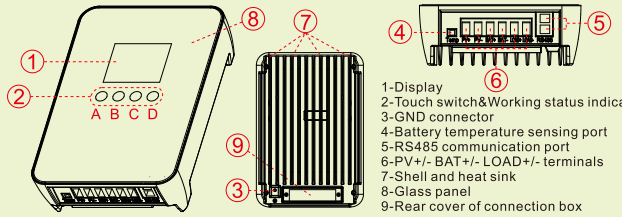
Working status instruction

User can identify the controller current working status according to the flash rule of the light. (When the screen is off.)

Indicator Light	Instruction
The first light is always on(A)	Standby
All lights flashing(ABCD)	Error warning
Three lights turn on sequentially(ABC)	Charging
The fourth light is always on(D)	Load indicators

Table 3 (Tip: A/B/C/D comes from **Figure 1**)

1. Characteristics



1-Display
2-Touch switch&Working status indicator
3-GND connector
4-Battery temperature sensing port
5-RS485 communication port
6-PV+/- BAT+/- LOAD+/- terminals
7-Shell and heat sink
8-Glass panel
9-Rear cover of connection box

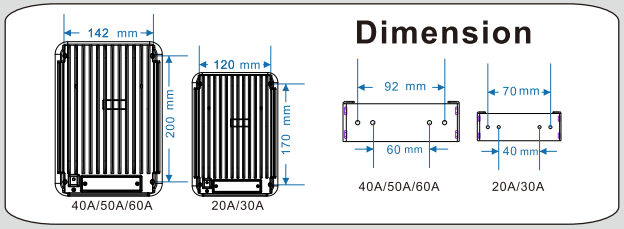
Figure 1

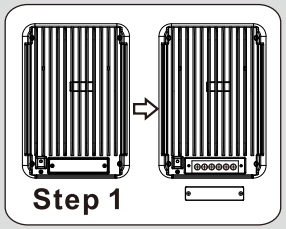
2. Product List

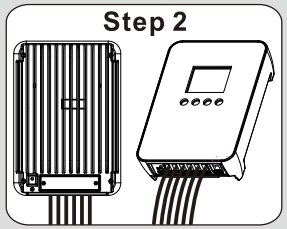
	Description	Quantity
Product	MPPT controller	1 unit
Installation accessories package	Mounting backboard	1 pcs
	Temperature sensing cable	1 pcs
	M4 screws (for mounting backboard)	2 pcs
	M4 screw (for controller)	4 pcs
	Plastic expansion particles	2 pcs
Information pack	User manual	1 pcs
	Operational instructions	1 pcs
Optional	RS485-USB cable	1 pcs
	External WIFI communication module	1 unit

Table 4 (If there are any parts missing, please contact dealer.)

3. Installation Instructions

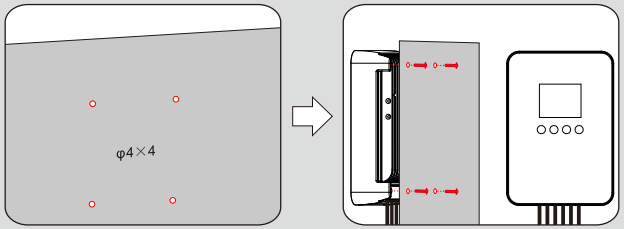






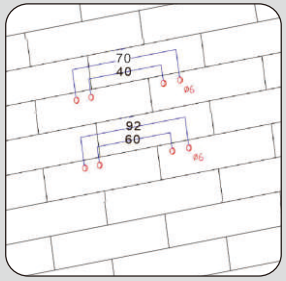
Step 3

Application Ⅰ: Install on cabinet or boards

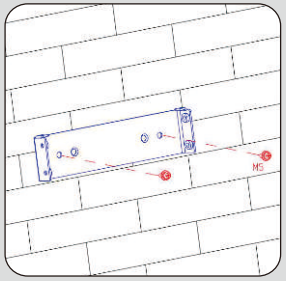


Drill four φ4mm holes accord to the size of Dimension, and then fix the controller with M4 screws from the back.

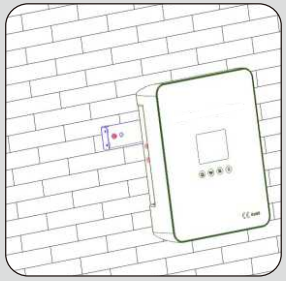
Application Ⅱ: Mounting installation



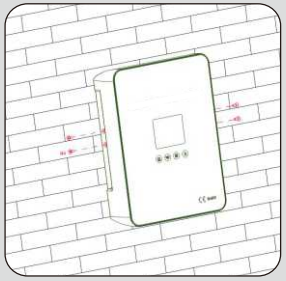
1.Measure and mark the distance on the wall, drill Φ6mm holes and insert plastic expansion particles and tighten.



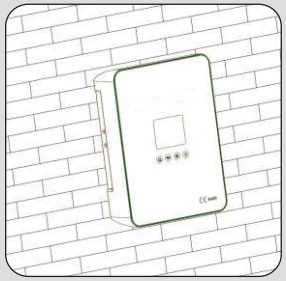
2.Align the holes of mounting backboard to the holes in the wall, fix it with M5 screws.



3. Hang the controller to the mounting backboard accordingly.



4. Tighten and fix the controller to the mounting backboard with M4 screws.



5.Well-installed.

Remark:

1. Above steps of mounting backboard are suitable for general wall installation. If installed on wooden wall, use self-tapping screws to fix it directly.
2. Be cautious to the controller installation position, keep 20cm space up and down for good ventilation and heat dissipation.
3. The ambient temperature of installation position must be within -20℃~+50℃, otherwise, the controller may not work properly.

4. Serial connection(string) of solar panels

The **Table 5** is the number(N) of solar panels in series, for reference only.

Voc * N = PV_{input} < DC100V												
System Voltage	Voc<23V		Voc<31V		Voc<34V		Voc<38V		Voc<46V		Voc<62V	
	Max.	Best	Max.	Best	Max.	Best	Max.	Best	Max.	Best	Max.	Best
12V	4	2	3	1	2	1	2	1	2	1	1	1
24V	4	3	3	2	2	2	2	2	2	2	1	1

Table 5

5. DC Load Output Voltage and Max. Discharge Current

The controller has DC LOAD output function, and its output voltage range is the same as battery pack. For example, if the battery's voltage is 25.2V, the instant DC output voltage is 25.2V, too.

It can supply power to DC LOAD continuously if the DC LOAD's current in within the rated range.

When the DC LOAD's working current is 100%-120% of rated current for 5 mins, DC LOAD will be OFF. As soon as DC LOAD's working current is over 120% of rated current, the DC LOAD will be OFF immediately.

To restart DC LOAD, user should set Load Type to "ON" or "USE" manually through controller/APP/PC.

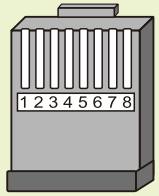
6. Communication port description

The communication port of the controller is compatible with RS485-USB communication cable for real-time monitoring by PC software and Wi-Fi module to have remote cloud monitoring by APP.

The communication port is a standard 8 pin RJ45 interface, and the pins are defined as follows(**Table 6**):

PIN	Function
1	RS485-A
2	RS485-B
3	Dry contact
4	Dry contact
5	GND
6	GND
7	+5V(Non-Isolated)
8	+5V(Non-Isolated)

Table 6



(Figure 2)

(**Note:** The pin definition is applicable to our related products ONLY!)

When the Load output is off due to the triggering protection mechanism, the dry contact output interface will be ON (**low impedance**). Otherwise, it is OFF (**high impedance**).

The controller has dual RS485 communication ports. It can be used for communication and parallel connection.

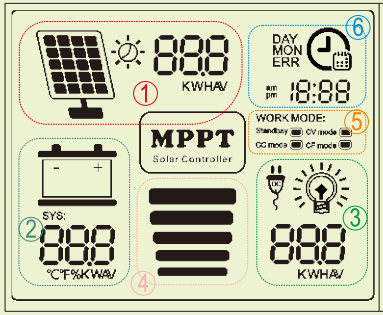
If need to monitor multiple controllers centrally, please set the device address order (1~254) of the controllers accordingly. **For example,** 5 controllers in parallel connection and monitor centrally, set controllers' address order as 1, 2, 3, 4, 5.

If want to monitor the multiple controllers in Master-Slave communication, set the host controller address to 255. **For example,** 5 controllers in parallel connection, just need to set the MASTER(host) controller address order as 255.

Tip: For more information, please refer to the official website document.

7. Operation

7.1 LCD displayarea description



① PV information
② Battery information
③ DC Load information
④ Charging navigator
⑤ Working status
⑥ System information

7.2 Button Operation: (Four buttons: PV, BAT/up, DC/down, S)

Button	Accessible information	In setup mode fuction
PV	PV voltage/PV current/ PV power/PV total energy	
BAT up	Bat voltage/Bat current/Bat power/Bat percentage/ Bat temp/Bat type/Device address	Go up/increase
DC down	Load voltage/Load current/Load power/ Load total energy/Load working mode	Go down/decrease

Button	Operational instructions	Setup items
S	• Long touch 3S to enter or exit setup mode • Touch the button: -> Selection of settable parameters S01~S14. -> Save parameters before exit	S01 Bat-Type->USER/SEL/FLD/GEL/LIT S02 Device address S03 Load mode->ON/OFF/USER S04 Bat-temp->℃/℉ S05 Charge-Volt->9~30V S06 Nominal-Volt->8.5~29V S07 Under-volt protection voltage S08 Under-volt recovery voltage S09 Over-volt protection voltage S10 Over-volt recovery voltage S11~S12 Realtime set S13~S14 Date set } Available for Li-ion

Table 7

8. Common fault and trouble shooting.

Common Problems	Possible Reasons	Solution
Controller cannot start up, screen can not be on.	Battery positive and negative reverse connected.	Check the wiring, reconnect in right order.
Controller not charging, PV voltage undetectable.	PV Input positive and negative reverse connected.	Check the wiring, reconnect in right order.
Switching from Standby and CC modes in circular manner.	Number of solar panels is too less in series and PV voltage is low.	PV Vmpp voltage must be greater than Vbat. Please refer to the proposed series-parallel scheme(**Table 5**)
	It may occur in cloudy weather or in early morning and at dusk.	Normal phenomenon.
	Unreasonable configuration of solar panels.	Based on sufficient power, please refer to the proposed series-parallel scheme(**Table 5**)
Controller is on and PV voltage is normal, but not charging.	The controller can not recognize battery system voltage (The "System" in LCD flashes).	Check whether the battery voltage in LCD is in the range of controller system recognition.
The battery is in a low energy or empty for a long time.	Solar panels quantity are too less to generate enough energy.	Increase solar panels quantity.
	Battery capacity is too small to Store enough energy.	Increase battery capacity.

Table 8

9. Parameters

	Model		EM2420	EM2430	EM2440	EM2450	EM2460
Product Category	MPPT efficiency		≥99.5%				
	Standby consumption		0.5W~1.2W				
	Heat-dissipating method		Natural-Cooling				
	Battery system voltage range	12V system	9VDC~15VDC(Lead acid)				
		24V system	18VDC~30VDC(Lead acid)				
		Li-ion	8VDC~30VDC(Default), ≤30VDC(Optional activation function)				
Input Characteristics	Max. PV input voltage(Voc)		100VDC(Default), DC150V(Optional for SMXXXX)				
	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(Default),150VDC/145VDC(Optional)				
	Rated PV Power	12V system	260W	390W	520W	650W	780W
		24V system	520W	780W	1040W	1300W	1560W
		Li-ion	252W~504W	378W~756W	504W~1008W	630W~1260W	756W~1512W
Charge Characteristics	Activation for lithium battery		Optional				
	Battery types(Default Gel battery)		Sealed(SEL), Gel(GEL), Flooded(FLD), User-defined(USE), Li-ion(Lit)				
	Rated charge current		20A	30A	40A	50A	60A
	Temperature compensation		-3mV/℃/2V (default)				
	Charge method		3-stages: CC(Constant Current), CV(Constant Voltage), CF(Floating Charge)				
	Output voltage stability accuracy		≤±0.2V				
LOAD Characteristics	Load voltage		Same as battery voltage.				
	Rated load current		20A		30A		
	Load control mode		On\Off mode, 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				
Display & Communication	Display		High-definition LCD segment code backlight display				
	Communication		Dual RJ45 port/ RS485 protocol / PC (via RS485-USB Cable) & APP (via Wi-Fi module) / Centralized monitoring (via parallel connection and RS485-USB cable)				
Other Parameters	Protection		Input & output over-volt / low-voltage protection, reverse polarity protection, over-heating protection, battery shedding protection etc.				
	Operating ambient temperature		-20℃~+50℃				
	Storage temperature		-40℃~+75℃				
	IP(Ingress protection)		IP43				
	Noise		≤10dB				
	Altitude		0~3000m				
	Max. Wiring size		28mm²				
	Recommended breaker		≥40A	≥63A	≥63A	≥100A	≥100A
	N.weight (kg) / G.weight (kg)		1.65 / 1.98		2.35 / 2.78		
	Product size / Packing size(mm)		220×148×58.5/289×212×105		245×170×63.5/334×225×123		

Table 9