User Manual of MPPT Solar Charge Controller

Suitable for Lead-acid batteries or Li-ion batteries

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

Please keep this handbook in case of need

(Revision data: 202205)

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.

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 **Specification** for the battery detailed system identification voltage.

2)The controller has 7 or 9 kinds of conventional battery charging parameters (**Table 2**) . To charge other types of batteries, please select "USE" , then set up. To charge lithium battery , please select "Lit", then set up .(on the controller, Remote meter, APP or PC software).

Battery type	Constant voltage = C*N (V)	Floating voltage = F*N (V)	Equalize voltage =E*N (V)	Over protect =OP*N (V)	Over recovery =OR*N (V)	Low protect =LP*N (V)	Low recovery =LR*N (V)
Flooded(FLD)	14.6 * N	13.8 * N	14.8*N	15.0*N	14.6*N	11.1*N	12.6*N
Sealed(SEL)	14.4 * N	13.8 * N	14.6*N	15.0*N	14.4*N	11.1*N	12.6*N
Gel(GEL)	14.2 * N	13.8 * N	----	15.0*N	14.2*N	11.1*N	12.6*N
User (USE)	1. **C** = Cell's constant charging parameter.(9≤F<C≤15) 2. **F** = Cell's floating charging parameter.(9≤F<C≤15) 3. **N** = Series quantity of battery.[e.g. N=2, battery system is 24V] 4. **Example**: If battery system is 48V, then N=4; If the cell's voltage C=14.6V, then Constant voltage= 14.6*4=58.4V.						

Battery type (Li)	Charge voltage	Nominal voltage	Over protect	Over recovery	Low protect	Low recovery	In series
12V LiFePO4(LF1)	14.4V	12.8V	14.6V	14.4V	10.8V	12.4V	4 cells
24V LiFePO4(LF2)	28.8V	25.6V	29.2V	28.8V	21.6V	24.8V	8 cells
48V LiFePO4(LF4)	54.0V	48.0V	55.2V	54.0V	40.5V	46.5V	15 cells
12V Ternary (LC1)	12.6V	11.1V	12.9V	12.6V	9.6V	10.5V	3 cells
24V Ternary (LC2)	25.2V	22.2V	25.8V	25.2V	19.2V	21.0V	6 cells
48V Ternary (LC4)	54.6V	48.1V	55.8V	54.6V	41.6V	45.5V	13 cells
Li-ion(Lit)	Set the charging and protection parameters according to the specifications of the selected lithium batteries. **Operation instruction:** 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:3.2V — 6 cells in series Reference Settings: S06 : 22.2V Nominal Voltage; S05 : 25.2V Charge Voltage; S07 : 19.2V Low-volt protection						

Table 2

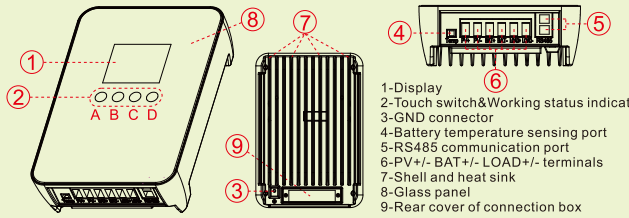
Working status instruction

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 on

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

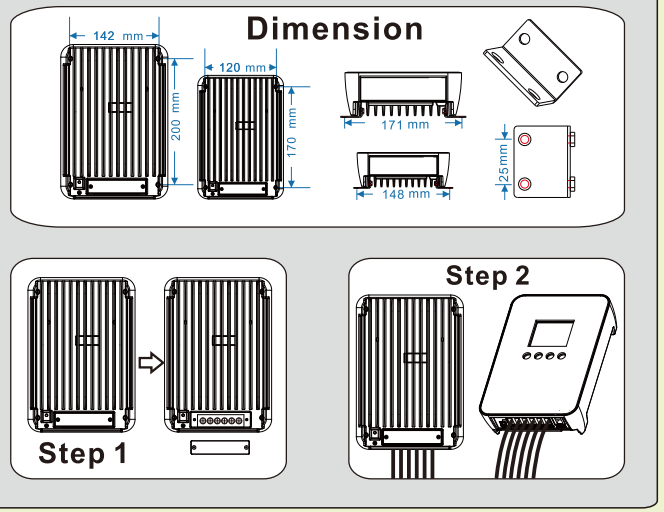
Figure 1

2. Product List

	Description	Quantity
Product	MPPT controller	1 unit
Installation accessories package	Suspension hanger	2 pcs
	Temperature sensing cable	1 pcs
	M4 screws (for mounting backboard)	4 pcs
	M4 screw (for controller)	4 pcs
	Plastic expansion particles	4 pcs
Accessory pack	User manual	1 pcs
	Operational instructions	1 pcs
Optional	RS485-USB cable	1 pcs
	External WIFI communication module	1 unit
	Bluetooth communication module	1 unit
	MH-M80 module(Remote meter)	1 unit

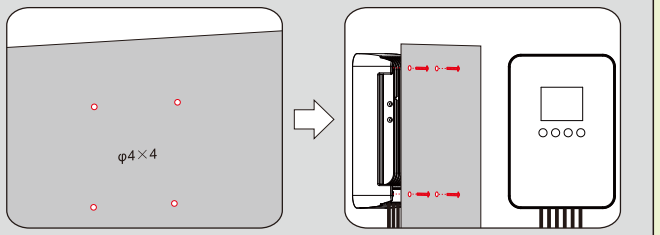
Table 4 (If there are any parts missing, please contact dealer.)

3. Installation Instructions



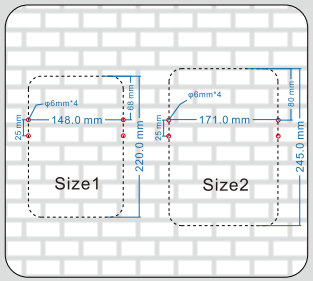
Step 3

Application Ⅰ: Install on cabinet or boards

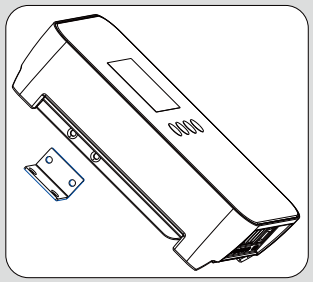


Drill four φ4mm holes accord to the size of Dimension, and then fix the controller with M4 screws from the back.

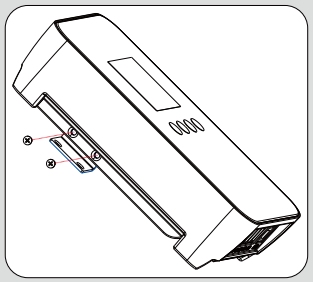
Application Ⅱ: Mounting installation



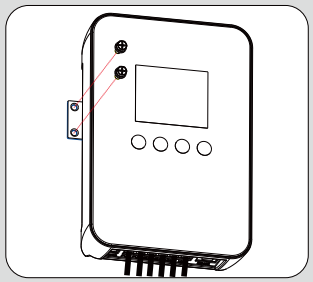
1.Measure and mark the distance on the wall, drill Φ6mm holes and insert plastic expansion particles and tighten.



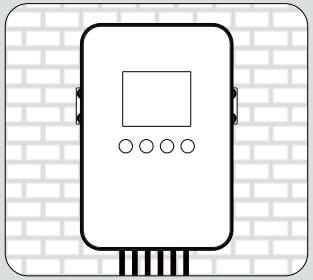
2.Align the installation accessories with the mounting holes on the controller.



3. Fasten the installation accessories to the controller with M4 screws.



4.Tighten and fix thecontroller to the wall 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 quantity(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
Voc * N = PV_{input} < DC150V												
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	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

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.

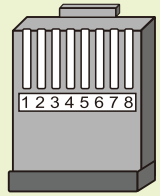
To restart DC LOAD, user should set Load Type to "ON" or "USE" manually through controller/APP/PC /MH-M80.

6. Communication port instruction

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**).

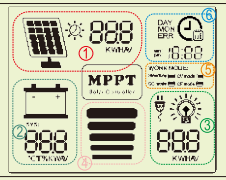
The controller has dual RS485 communication ports. It can be used for communication and parallel connection.

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.

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.

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 Operation fault codes description

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

Table 1

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

Button	Accessible information	Fuction
PV	PV voltage / PV current / PV power / PV total energy	In non setting mode: Long press for 6s to reset the parameters
BAT up	Bat voltage / Bat current / Bat power / Bat temp / Bat type / Device address	In setting mode: Go up/increase
DC down	Load voltage / Load current / Load power / Load total energy / Load working mode	In setting mode: Go down/decrease
S	• Long press 3s to enter or exit setup mode • Press the button: -> Select settable parameters S01~S14. -> Save parameters before exit	S01 Bat-Type->USER/SEL/FLD/GEL/LIT/LF1/LF2/LF4/LC1/LC2/LC4 S02 Device address S03 Load mode->ON/OFF/USER S04 Bat-temp->℃/℉ S05 (LIT)Charge-Volt->9~30V or 9~60V (USE)CV Charge->9~15V S06 (LIT)Nominal-Volt->8~29V or 8~58V (USE)CF Charge->9~15V S07 (LIT or USE)Low-volt protection voltage S08 (LIT or USE)Low-volt recovery voltage S09 (LIT or USE)Over-volt protection voltage S10 (LIT or USE)Over-volt recovery voltage S11~S12 - Realtime set S13~S14 - Date set **Tip:** LF1(12V LiFePO4) ; LF2(24V LiFePO4) ;LF4(48V LiFePO4) ; LC1(12V Ternary lithium) ; LC2(24V Ternary lithium) ; LC4(48V Ternary lithium) .

Table 7

8. FAQ

Fault	Possible Reasons	Solution
Controller cannot start up, screen can not be on.	Battery positive and negative reversely connected.	Check the wiring, reconnect in right order.
Controller not charging, PV voltage undetectable.	PV Input positive and negative reversely connected.	Check the wiring, reconnect in right order.
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. External electrical port

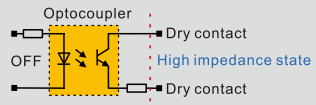
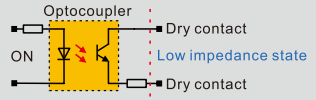
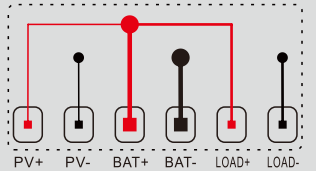
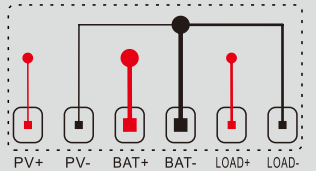
The dry contact signal follows the state of LOAD.When load is on, the optocoupler receives the "OFF" signal.Dry contact turn to high impedance state	
The dry contact signal follows the state of LOAD.When load is off, the optocoupler receives the "ON" signal.Dry contact turn to low impedance state	
Common positive electrical schematic	
Common negative electrical schematic	

Table 9

10. Parameters and specifications

Common negative MPPT controller			EN2420	EN2430	EN2440	EN2450	EN2460	EP2420	EP2430	EP2440	EP2450	EP2460	EP4820	EP4830
Product Category	MPPT efficiency		≥99.5%											
	Standby consumpion		1W~2W											
	Heat-dissipating method		Natural-Cooling											
	Battery system voltage Range(Lead acid)		12V system: 9VDC~15VDC 24V system: 18VDC~30VDC 36V system: 32VDC~40VDC 48V system: 42VDC~60VDC											
	Li-ion battery system		8VDC~30VDC										8VDC~60VDC	
Input Parameters	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						
	PV rated power	12V system	260W	390W	520W	650W	780W	260W	390W	520W	650W	780W	260W	390W
		24V system	520W	780W	1040W	1300W	1560W	520W	780W	1040W	1300W	1560W	520W	780W
		36V system	——	——	——	——	——	——	——	——	——	——	780W	1170W
		48V system	——	——	——	——	——	——	——	——	——	——	1040W	1560W
		Li-ion	252W~504W	378W~756W	504W~1008W	630W~1260W	756W~1512W	252W~504W	378W~756W	504W~1008W	630W~1260W	756W~1512W	252W~1008W	378W~1512W
Charge Parameters	Activation for lithium battery		Standard											
	Battery types (Default Gel battery)		Sealed(SEL), Gel(GEL), Flooded(FLD), User-defined(USE), Li-ion(Lit), LiFePO4_12V/24V/48V(LF1/LF2/LF4), Ternary_12V/24V/48V(LC1/LC2/LC4)											
	Charge rated current		20A	30A	40A	50A	60A	20A	30A	40A	50A	60A	20A	30A
	Charge method		Lead acid: CC(Constant Current), CV(Constant Voltage), CF(Floating Charge) Li-ion: CC(Constant Current), CV(Constant Voltage)											
	Output voltage stability accuracy		≤±0.2V											
LOAD Parameters	Load voltage		Same as battery voltage											
	Load rated current		20A		30A			20A		30A			20A	
	Load control mode		On/Off mode , PV voltage control mode, Dual-time control mode, PV + Time control mode											
	Low voltage protection		Settable											
Display & Communication	Display		High-definition LCD segment code backlight display											
	Communication		Dual RJ45 port / RS485 protocol / Centralized monitoring / Support Modbus communication protocol / PC (via RS485-USB Cable) & APP (via Wi-Fi module or Bluetooth module) / MH-M80 remote meter											
	Dry contact access voltage		5V ~ 12V											
Other Parameters	Protections		Input & output over-volt / low-voltage protection, reverse polarity protection, over-heating protection, battery shedding protection etc.											
	Operating ambient temperature		-20℃~+50℃											
	IP(Ingress protection)		IP43											
	Max. Wiring size (mm2/AWG)		28mm^2											
	Recommended breaker		≥40A	≥63A	≥63A	≥100A	≥100A	≥40A	≥63A	≥63A	≥100A	≥100A	≥40A	≥63A
	Net weight (KG)/Gross weight (KG)		1.7/2.0		2.4/2.8			1.7/2.0		2.4/2.8				
	Product size (mm)/Packing size (mm)		220×148×58.8/289×212×105		245×170×68.5/334×255×123			220×148×58.8/289×212×105		245×170×68.5/334×255×123				