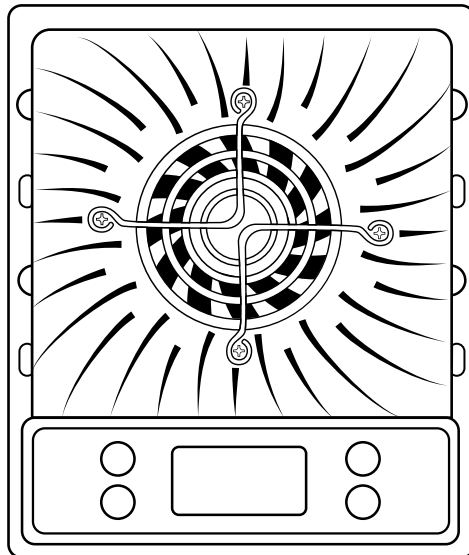




# STEP-DOWN MPPT SOLAR CHARGE CONTROLLER

**MPC-40A**

**User Manual**



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# 1 IMPORTANT SAFETY INSTRUCTIONS


## Please keep this manual well.

This manual contains important safety, installation, and operating instructions for the MPPT solar controller.

Before starting the installation, please read all instructions and precautions in the manual.

 **Warning:** Indicates a potentially hazardous situation that requires special care when performing related operations.

 **Caution:** Represents critical procedures for the safe and correct operation of the controller.

 **Attention:** Indicates a program or function that is important for the safety and correct operation of the controller.

## 1.1 PRECAUTIONS

### Caution

1.1.1 The controller has no components that require maintenance or repair inside. Please do not disassemble or attempt to repair the controller.

1.1.2 Solar controllers may generate heat during operation, so it is recommended to install them in an environment with good ventilation and heat dissipation.

1.1.3 After installation, check all the line connections to ensure they are tight and avoid the danger of heat accumulation caused by virtual connections.

## 1.2 SAFETY INFORMATION

1.2.1 Please read this manual carefully before using and installing this product, so that you can use it better.

1.2.2 When the device is not in use for a long time, the battery and photovoltaic switch should be turned off.

1.2.3 There are high voltages and currents inside the machine, non-professional personnel are not allowed to disassemble the machine.

1.2.4 The input and output terminals should be connected reliably to avoid heating at the connection point.

1.2.5 If you encounter a fault that other users cannot solve, please contact the manufacturer's after-sales maintenance personnel.

## 2 PRODUCT INTRODUCTION

The step-down MPPT solar controller EMD600W is an intelligent photovoltaic controller designed for small photovoltaic off-grid power generation systems. It uses the industry leading MPPT maximum power point tracking technology to achieve maximum energy tracking of solar panels, enabling it to quickly and accurately track the maximum power point of solar cells in any environment, and obtain the maximum energy of solar panels in real-time, significantly improve the energy utilization rate of solar systems.

### 2.1 PRODUCT FEATURE

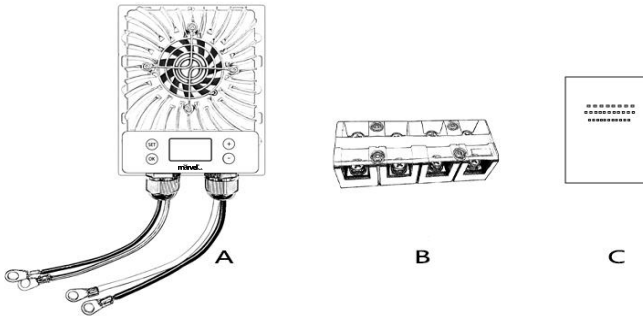
- 2.1.1 Using MPPT (Maximum Power Point Tracking) technology, the efficiency of MPPT tracking reach up to 99%
- 2.1.2 Using high efficiency synchronous rectifier circuit structure
- 2.1.3 MAX output power: 600W
- 2.1.4 Input voltage: 17-55V Output voltage: 10-30V
- 2.1.5 Efficiency  $\geq 97\%$
- 2.1.6 Output voltage adjustable
- 2.1.7 Support for lead-acid & lithium battery etc.
- 2.1.8 Supports lithium battery and lead-acid activation
- 2.1.9 High-definition LCD screen display input voltage, output voltage & output current
- 2.1.10 Intelligent temperature control & use a fan for heat dissipation
- 2.1.11 Under-voltage protection, Over-temperature protection, Short-circuit protection, Output over-current protection, Over voltage protection, Reverse current protection
- 2.1.12 High-quality aluminum radiators & high-temperature reduction treatments ensure reliable & efficient operation in various working environments

### 2.2 APPLICATION AREA

- Solar power generation
- Outdoor energy storage power supply
- RV backup power supply
- Household appliances
- Lighting
- Digital products
- Solar powered toy cars

### 3 PRODUCT OVERVIEW

The following accessories are included after purchasing the device:



A	1 pc	Solar charge controller
B	1 pc	Connector
C	1 pc	User manual

If you find a lack of accessories, please contact the manufacturer or dealer.

- Check whether there is any damage during transportation.  
After receiving the solar controller, do not be in a hurry to sign for it. First, open the seal and check whether the device has obvious falls such as deformation or shell cracks. If there are similar damages, refuse to sign for it, and contact the manufacturer or dealer.
- Check MPPT solar charge controller  
There is a label on the side of the solar controller for this charging controller. If you find that it does not match the product you purchased, please contact the manufacturer or dealer.

## 4 INSTALLATION INSTRUCTIONS



### 4.1 INSTALLATION PRECAUTIONS

- It is recommended that equipment installation be carried out by professional personnel or assisted by local dealers.
- The input and output lines should be distinguished to prevent incorrect connections.
- The battery's positive and negative terminals should be correctly connected, and the battery voltage should match the machine model.
- Do not expose the equipment to harsh environments such as moisture, flammable or explosive substances, or areas with a lot of dust accumulation. Do not cover or obstruct the equipment.
- A space of more than 10 cm should be left around the ventilation openings and equipment to ensure good air circulation for heat dissipation.

### 4.2 INSTALLATION STEPS



#### Attention:

Step 1: Choose an installation location:

- Install on a solid surface.
- Install in a location that can be easily removed.
- The ambient temperature should be between  $-20^{\circ}\text{C}$  and  $60^{\circ}\text{C}$  to ensure optimal working conditions.
- Do not install the charging controller in direct sunlight to avoid power loss caused by overheating.
- Do not install on flammable building materials or highly flammable material attachments, and do not install in areas with potential explosion hazards.
- Do not install the charging controller in direct sunlight to prevent power losses due to overheating.

Step 2: Inspection and Cleaning: Place the controller in the intended installation location and check for adequate ventilation space above and below, as well as enough space for wiring around the controller.

Step 3: Marking: Use a pen to mark the four mounting hole locations on the installation surface.

Step 4: Drilling: Move the controller aside and drill four appropriately sized mounting holes at the marked positions.

Step 5: Securing the Controller: Place the controller back onto the installation surface, aligning it with the four holes drilled in Step 4, and use screws to secure the controller in place.

## 4.3 PRODUCT CONNECTION



### Warning:

1. It is prohibited to connect the positive and negative poles in reverse.
2. Explosion or fire is strictly prohibited! Do not short-circuit the positive and negative poles of the battery or the cables.

### **Step 1: Connect the photovoltaic module**



### Caution:

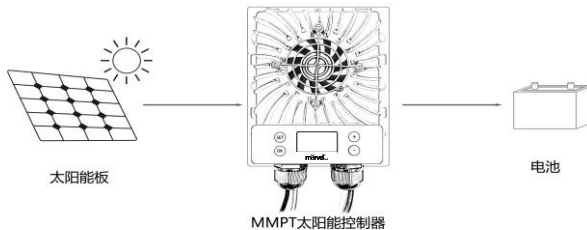
1. If you are unsure about the scientifically reasonable series-parallel connection method for photovoltaic modules, please contact the manufacturer of this controller for consultation.
2. The controller can be used with various types of photovoltaic modules such as monocrystalline silicon, polycrystalline silicon, and thin film.
3. Connect the positive (+) pole of the photovoltaic module to the positive input (red wire) of the controller, and connect the negative (-) pole of the photovoltaic module to the negative input (black wire) of the controller.

### **Step 2: Setting the controller output voltage**

The output voltage of the controller is the charging voltage of the battery. If you are unsure about the charging voltage of the battery, please contact the battery manufacturer or the controller manufacturer.

### **Step 3: Connecting the battery**

Connect the positive (+) pole of the battery to the positive output (yellow wire) of the controller, and connect the negative (-) pole of the battery to the negative output (black wire) of the controller.



## 5 PRODUCT OPERATION

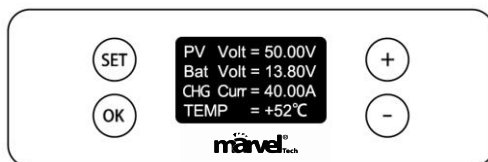


Figure 5-1: Normal Working Display Interface

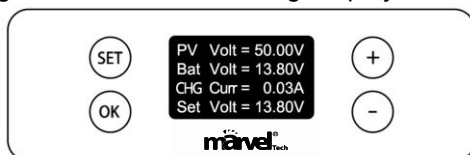


Figure 5-2: Voltage Setting Display Interface

The output voltage of the controller can be adjusted by the user. The voltage setting range is automatically limited based on the input voltage, and any adjustments outside of this range will not be valid. The specific operation method is as follows:

1. In normal working mode, press the [SET] button to enter the [Voltage Setting Display Interface] (shown in Figure 5-2) from the [Normal Working Display Interface] (shown in Figure 5-1).
2. The user can increase or decrease the [set voltage value] by pressing the [+] or [-] buttons as needed. Each click changes the voltage by 0.1V, and holding down the button allows for quick continuous adjustment. The voltage setting range is automatically limited based on the input voltage, and the button will not respond if the adjustment is outside of this range.
3. Once the desired [set voltage value] has been reached, press the [OK] button to confirm it. Only then will the last [set voltage value] be remembered by the controller, and it will display [Setting Successful].
4. After a successful setting, the controller will exit the [Voltage Setting Display Interface] and return to the [Normal Working Display Interface] after 4 seconds.
5. Although the user has entered the [Voltage Setting Display Interface], if they do not press the [OK] button within 4 seconds after the last [+] / [-] button pressing, the controller will automatically exit the [Voltage Setting Display Interface]. In this case, the last [set voltage value] adjustment will not be valid and will not be remembered.



### Warm reminder:

In normal working mode, pressing [SET] will enter the [Voltage Setting Display Interface],

By simultaneously pressing [SET] and [+] together, the [set voltage value] can be quickly adjusted to 24V;

Similarly, pressing [OK] and [-] together, the [set voltage value] can be quickly adjusted to 12V.

## 6 PRODUCT PROTECTION FUNCTION

### 6.1 OVER TEMPERATURE PROTECTION

When the internal ambient temperature of the MPPT controller exceeds 100°C, the MPPT controller will reduce its output power. If the internal ambient temperature continues to rise to 110°C, the MPPT controller will automatically shut down its output and display [Over Temperature] as shown in Figure 6-1. When the internal ambient temperature of the MPPT controller is below 85°C, it will automatically resume operation.

When the internal ambient temperature of the MPPT controller exceeds 65°C or the charging current is greater than 30A, the MPPT controller will automatically turn on the fan. When the internal ambient temperature of the MPPT controller is below 45°C, the fan will automatically turn off.

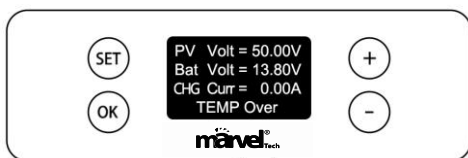


Figure 6-1: Over Temperature Interface

### 6.2 REVERSE CURRENT PROTECTION

Using MOSFET-based reverse current protection technology, it automatically disconnects when the solar panel output voltage is lower than the battery voltage, preventing reverse current flow, protecting battery energy storage, and avoiding waste.

## 6.3 SHORT CIRCUIT/OVER CURRENT PROTECTION

When a short circuit or overcurrent occurs unexpectedly in the output of the MPPT controller, the MPPT controller automatically shuts down the output and displays [Over current] as shown in Figure 6-3. Normal operation resumes after the short circuit is eliminated.

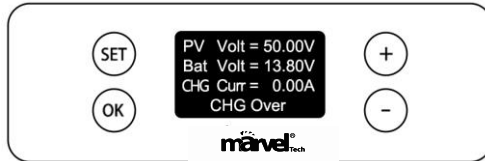


Figure 6-3: Overcurrent Protection Interface

## 6.4 INPUT LOW VOLTAGE PROTECTION

When the MPPT controller is powered on, the input voltage needs to be higher than 17V to start working. During normal operation, the input voltage needs to be at least 1.15 times higher than the output voltage to achieve better charging performance.

## 6.5 OUTPUT OVER VOLTAGE PROTECTION

When the MPPT controller is powered on, if the battery voltage is higher than controller's set output voltage, the controller cannot work properly and will display [output overvoltage] as shown in Figure 6-5. The output voltage of the controller should be adjusted to match the charging voltage of the battery, and then the controller will return to normal operation.

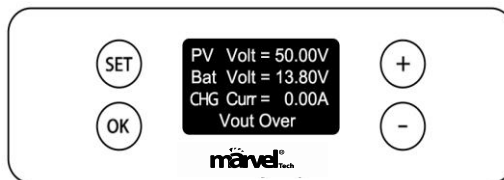


Figure 6-5: Output Over-Voltage Protection interface

## 7 TECHNICAL PARAMETERS

### 7.1 ELECTRIC PARAMETER

PARAMETER NAME	CONDITION	MIN	RATED	MAX	
POWER			600		W
Solar tracking voltage range		17		55	V
MAX output voltage		10	13.8	30	V
MAX output current	600W		600/V <sub>o</sub>	600/V <sub>o</sub> or 43 <sup>[1]</sup>	A
	12V system		40	43	A
	24V system		20	22	A
No-load loss			0.5W-0.8W		
Voltage regulation			1%		
Load regulation			5%		
PWM efficiency			97%		
MPPT efficiency			99.5%		
Cooling method			smart air cooling		
Charging method			CV CC		
Internal temperature protection			110		°C
Operating ambient temperature	Full load	-40		65	°C
Storage temperature		-40		125	°C

Figure 7-1: Electrical Parameter

Note: Items or data that are blank in the table do not exist. [1] The smaller value of the two is used.

Note: This translation may vary slightly depending on the context in which it is used.

## 7.2 EFFICIENCY CURVE

### 7.2.1 12V system conversion efficiency

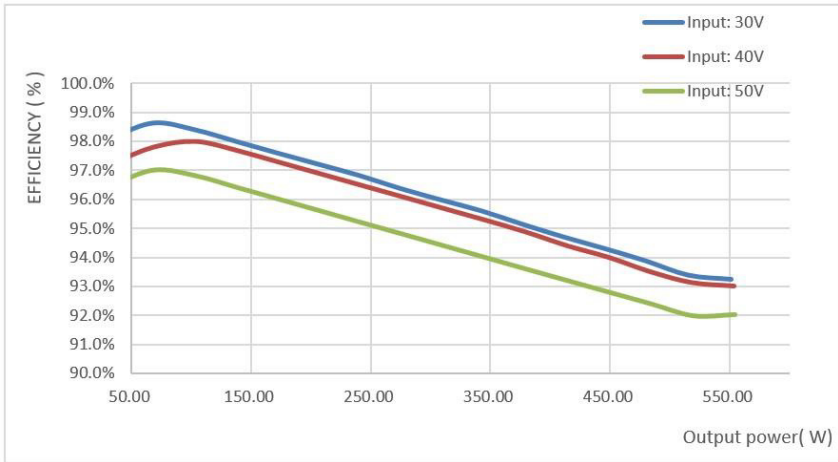


Figure 7.2-1 output 13.8V

### 7.2.2 24V system conversion efficiency

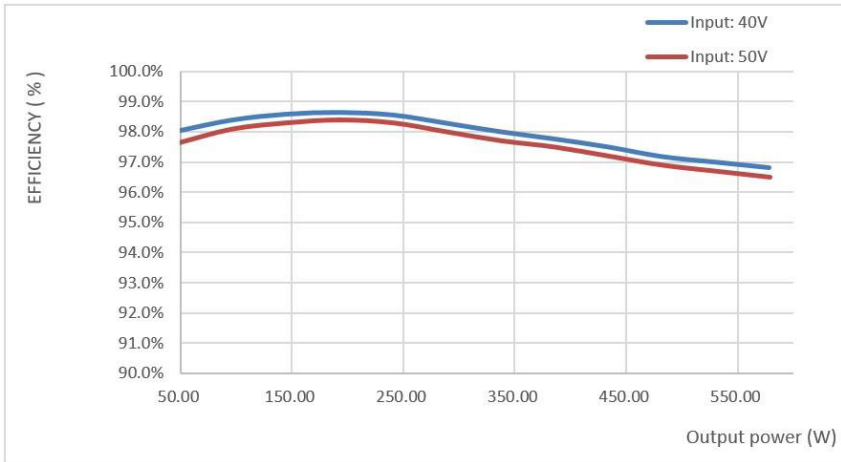


Figure 7.2-2 output 27.6V

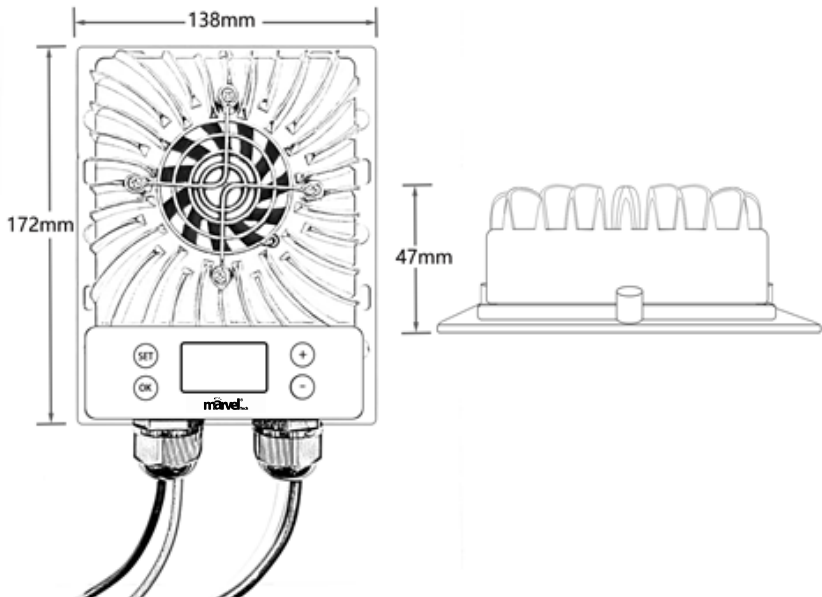
## 7.3 OTHER PARAMETER

- Protection level: IP65
- Noise: <55dB
- Mechanical shock & vibration resistance: Compliant with SAE

J1378

- G.W.: 1300g
- N.W.: 1050g
- Carton size: 295\*176\*70mm

## 7.4 SHAPE PARAMETER



## 8 GENERAL TROUBLESHOOTING

If the following fault phenomena occur, please follow the methods below for inspection and troubleshooting:

Fault phenomenon	Possible cause	Solution
Controller not working after initial installation	<ol style="list-style-type: none"> <li>1. Solar panel operating voltage does not reach the controller's start-up voltage.</li> <li>2. Wires are not connected properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check if the solar panel is exposed to outdoor sunlight.</li> <li>2. Please check the wiring connection.</li> </ol>
The controller does not charge when the solar panel is exposed to direct sunlight	Battery array wiring open circuit.	Please check if the connections of the photovoltaic power supply are correct and reliable.
Low charging current	<ol style="list-style-type: none"> <li>1. The illumination is not strong.</li> <li>2. The battery is approaching saturation and is in a floating state.</li> </ol>	<ol style="list-style-type: none"> <li>1. Observe when the sunlight is strong.</li> <li>2. Normal.</li> </ol>
Display [over temperature]	Controller internal temperature is too high.	Optimize the heat dissipation and working environment of the controller to reduce the temperature.
Display [over current]	<ol style="list-style-type: none"> <li>1. Controller output experiences unexpected short circuit.</li> <li>2. Controller output current is too high.</li> <li>3. Controller output power exceeds the rated power.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for any short circuits in the controller output and remove them.</li> <li>2. Do not exceed the rated power of the controller with the input power.</li> </ol>
Display [over voltage]	The voltage of the battery is higher than the [output voltage] set by the controller.	Adjust the [output voltage] to match the charging voltage of the battery.

## 9 USE ENVIRONMENT

1. In a dry, clean, and ventilated environment.
2. Stay away from direct sunlight, moisture, and acidic environments.
3. Avoid dust when using
4. The distance between the machine and controller should be greater than 0.5 meters.
5. Prohibited for use in flammable and explosive environments, beware of flames and sparks.
6. Operating temperature range:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .
7. Maximum humidity is below 85% ( $-25^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ ).