

Product Type

POW-Boost 10A



# POWMr

SOLAR CHARGE CONTROLLER

User Manual

# Important Safety Instructions

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## **WARNING: CAREFULLY READ AND FOLLOW ALL SAFETY INSTRUCTIONS**

- Carefully read the manual before the controller is installed and operated; retain the manual in a safe place for future reference.
- The controller must not be installed or operated by any of the following persons, unless they are under strict instruction and supervision:
  - a. Anyone who lacks the appropriate knowledge, experience or competence, required for safe installation and/or usage.
  - b. Anyone with compromised/reduced physical, sensory or mental capabilities, which may effect safe installation and/or usage (including children).
- **Controller installation and operation**
  - a. There are no serviceable parts for this controller. Do NOT disassemble or attempt to repair the controller.
  - b. Install the controller in a location with good natural airflow/ventilation and sufficient unobstructed space around it.
  - c. Install the controller on a non-flammable substrate and ensure there are no heat-sensitive items in the immediate vicinity; it is normal for the controller to become hot during operation.
  - d. Install the controller in a location where it is protected from environmental conditions such as direct sunlight, water, high moisture and dust, and also located well away from any flammable liquids or gasses. Controller is for indoor use only.
  - e. Do not install or place/operate the controller on top of the battery, directly above the battery, or in a sealed compartment with the battery; batteries can emit explosive gasses.
  - f. Do not cover or place any other items on top of the controller.
- **Battery installation and charging**
  - a. Install and charge the battery in a location with good natural airflow/ventilation.
  - b. Ensure that there are no ignition sources near the battery; batteries can emit explosive gasses.
  - c. Battery acid is corrosive; if battery acid comes into contact with skin immediately rinse with water.
  - d. Do not charge non-rechargeable batteries. And Do Not charge Li-ion batteries if the battery temperature is below 0°C. Never charge a frozen battery.
  - e. Ensure that the unit is properly set up for the type of battery intended to be charged.

- **Battery DC connections**

- a. Ensure that the DC system is fully shut down/isolated prior to disconnection of any existing cabling and/or new connections are made to the battery/DC system.
- b. Use flexible multi stranded copper cable with sufficient cross sectional area, inline with an appropriate fuse or circuit breaker.
- c. NEVER connect the solar panel array to the controller without a battery. Battery must be connected first.

- **Controller setup**

- a. Refer to the battery manufacturers instructions and specifications to ensure the battery is suitable for use with this controller and confirm the recommended charge settings.
- b. The integrated charge modes combined with adaptive charge logic are well suited for most common battery types; such as flooded lead-acid, Gel and LiFePO4.

# Table of Contents

|  |           |
|--|-----------|
| <b>Important Safety Instructions</b> .....               | <b>1</b>  |
| <b>1 General Information</b> .....                       | <b>4</b>  |
| 1.1 Function .....                                       | 5         |
| 1.2 Product Overview .....                               | 7         |
| 1.3 Product Dimension .....                              | 8         |
| <b>2 Installation</b> .....                              | <b>10</b> |
| 2.1 Unpacking and Inspection .....                       | 10        |
| 2.2 Preparing for Installation .....                     | 10        |
| 2.3 Installation Steps .....                             | 11        |
| <b>3 Connection</b> .....                                | <b>12</b> |
| 3.1 Things You Need .....                                | 12        |
| 3.2 Wiring Precautions .....                             | 12        |
| 3.3 Connection Steps .....                               | 13        |
| <b>4 Operation</b> .....                                 | <b>14</b> |
| 4.1 Operation Interface Introduction .....               | 14        |
| 4.2 Viewing and Configuration Guide for Parameters ..... | 15        |
| <b>5 Protection and Troubleshooting</b> .....            | <b>18</b> |
| 5.1 Protection .....                                     | 18        |
| 5.2 Troubleshooting.....                                 | 18        |
| 5.3 Maintenance.....                                     | 19        |
| <b>6 Technical Specification</b> .....                   | <b>20</b> |

# General Information

The core of the PowMr Boost-Type Solar Charge Controller lies in its adoption of cutting-edge boost converter circuitry. This sophisticated circuit intelligently elevates the voltage output from solar panels and matches the optimal charging voltage for batteries. By precisely adjusting the voltage, the controller maximizes energy transfer efficiency, capturing every available watt of solar power.

The PowMr controller incorporates advanced Maximum Power Point Tracking (MPPT) technology to ensure that solar panels operate at their highest power output. Through continuous monitoring and adjustment of the operating voltage point of the photovoltaic input, MPPT optimizes energy capture under varying environmental conditions. This results in superior charging efficiency and increased power generation, maximizing the utilization of solar energy for battery charging.

While focusing on high-efficiency operation, PowMr also prioritizes safety and protection. The Boost-Type Solar Charge Controller integrates multiple protection mechanisms, including overcharge, short circuit, and reverse current protection. These measures safeguard your equipment and batteries from damage, providing reliable and secure charging performance.

The design of an LCD display allows for comprehensive monitoring of the controller's charging status and real-time data. The display supports configuration of specific operational programs via user-friendly operation buttons, catering to specific application requirements. Real-time data on photovoltaic input voltage, battery charge status, charging current, voltage, and more are easily accessible. This enables users to monitor system performance from various angles and make informed decisions to optimize energy management.

## 1.1 Function

### ● **Boost Voltage Charging Controller**

Designed for scenarios where the photovoltaic input voltage is lower than the battery voltage, this controller effectively boosts the voltage to match the battery's charging requirements. It overcomes limitations caused by insufficient voltage from a single photovoltaic panel, ensuring reliable battery charging.

### ● **Integrated charge presets**

Integrated charge presets combined with adaptive charge logic are well suited for most common battery types, such as LiFePO<sub>4</sub>, Gel and flooded lead-acid.

### ● **Flexible Application**

Compatible with 24V/36V/48V/60V/72V system voltage.

### ● **Multi-stage charge algorithm**

The multi-stage charge algorithm is specifically engineered to optimize each recharge cycle and charge maintenance over extended periods.

### ● **Adaptive boost charge**

Adaptive boost charge monitors the battery's response during initial charging and intelligently determines the appropriate boost charge duration for each individual charge cycle. This ensures that the battery is fully recharged regardless of the discharge level or capacity and avoids excessive time at the elevated boost charging voltage (that can accelerate battery aging).

### ● **Durable and safe**

- i. Protection against overheating: When the equipment temperature exceeds 85 °C, the control automatically stops charging. Resume charging when the equipment temperature is 75 °C.
- ii. Protection against output short circuit.
- iii. Protection against reverse polarity connection: No damage to the controller will result, when polarity is reversed. And the controller will not work.
- iv. Limit the maximum charging current. Protect battery performance and prolong battery life.

### ● **Silent operation**

Almost silent operation since there is no cooling fan or moving parts, cooling is via natural convection.

### ● **Lithium battery activation**

Compatible with Li-ion (LiFePO<sub>4</sub>) batteries; when the battery type parameter is set to Lithium battery the charge cycle settings are altered to suit. Moreover, when the connected lithium battery is in a

protected state, the controller will activate the lithium battery using the energy from the solar panel with a current that does not exceed the lithium battery's protection voltage and current range.

**Warning:** Do not charge Li-ion batteries if the battery temperature is below 0°C.

## 1.2 Product Overview



1. LCD display
2. Function Keys
3. PV Input port
4. Battery port
5. Install holes
6. Heat sink



### 1.3 Product Dimension



#### ***NOTICE***

- Dimensional measurement tolerance is  $\pm 0.5\text{mm}$ .

# Installation

## 2.1 Unpacking and Inspection

Before unpacking the controller, check whether the package is damaged. After unpacking, check whether the contents of the package are damaged or missing. You should have received the following items inside of package:

- Controller
- User manual

## 2.2 Preparing for Installation

The Controller range is designed to be wall mounted using the flanges which protrude from either side of the heatsink backplane.

### Select the Mount Location:

Before mounting, the following aspects should be considered to identify/provide a suitable and safe location:

- Install the controller in a location with good natural airflow/ventilation.
- Ensure there is sufficient unobstructed space around the controller. The minimum spacing between the top, bottom, and sides of the controller is 150mm.

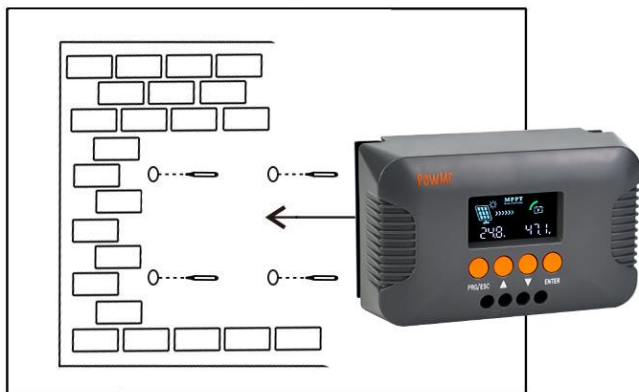


- Install the controller on a non-flammable substrate and ensure there are no heat-sensitive items in the immediate vicinity; it is normal for the controller to become hot during operation.

- d. Install the controller in a location where it is protected from environmental conditions such as water, high moisture and dust, and also located well away from any flammable liquids or gasses.
- e. DO NOT install or place/operate the controller on top of the battery, directly above the battery, or in a sealed compartment with the battery; batteries can emit explosive gasses.
- f. DO NOT cover or place any other items on top of the controller.
- g. Install the unit by screwing four screws. It's recommended to use **M5** screws.

## 2.3 Installation Steps

- Step 1. Strictly adhere to the requirements and recommendations outlined in section 2.2 to select the installation location.
- Step 2. Inspect the surroundings and spatial environment of the installation location.
- Step 3. Mark the installation holes.
- Step 4. Drill the holes.
- Step 5. Secure the controller using four M5 screws.



# Connection

## 3.1 Things You Need

Make sure you have all the parts you need to install and connect the Pstar Controller:

| Item   | Quantity |
|--|----------|
| Controller (included)  | 1        |
| DC-cable to connect the positive DC connection (+) of the Pstar Controller to the positive polarity of DC input or DC output | 2        |
| DC-cable to connect the negative DC connection (-) of the Pstar Controller to the negative polarity of DC input or DC output | 2        |
| DC breaker   | 2        |
| PV array   | 1        |
| Battery pack   | 1        |

## 3.2 Wiring Precautions

1. All wiring must be carried out by qualified professionals with appropriate qualifications.
2. Prioritize connecting the battery before connecting the photovoltaic array.
3. Do not install the controller and lead-acid batteries in an enclosed environment as the batteries release explosive gases, which may pose a risk of explosion due to gas accumulation.
4. The controller can handle photovoltaic input voltage within the specified range. Exceeding the maximum input voltage can damage the equipment, so please inspect the system before making connections.
5. When considering wiring and circuit breaker configuration, refer to the relevant specifications to determine the maximum current of the connected circuit. Choose the appropriate cable and circuit breaker accordingly. Thicker cables enhance boost performance, while thinner cables may reduce it. It is recommended to select cables that are both thick and short to minimize resistance and avoid voltage drop.
6. Install separate DC circuit breakers for each circuit during the wiring process to facilitate safe disconnection of the controller during maintenance or repair and provide adequate protection against circuit overcurrent. The specifications of the circuit breakers should be configured based on the maximum current of each circuit.
7. The ports of the controller are labeled with polarity markings for the photovoltaic input and battery charging ports. Strictly follow the markings when connecting the cables to the

photovoltaic and battery ends, ensuring that the positive (+) terminal is connected to the positive (+) terminal and the negative (-) terminal is connected to the negative (-) terminal.

- 8. Keep each circuit breaker in the open position during the wiring process.
- 9. Tighten the port screws to avoid loose connections that can cause overheating at the ports, posing a risk of circuit damage and potentially leading to a fire.
- 10. Before closing the circuit breakers, check if the cable terminals are securely connected and ensure there are no reverse connections or errors.

### 3.3 Connection Steps

#### Step 1. Battery Wiring

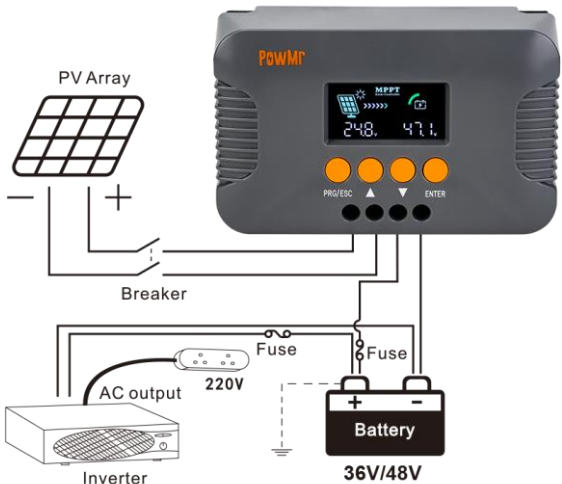
Prioritize connecting the battery module before connecting the photovoltaic array. Install a separate DC circuit breaker for the battery charging circuit.

#### Step 2. Photovoltaic Wiring

After confirming that the configured photovoltaic array voltage falls within the acceptable range of the controller, connect the photovoltaic array. Install a separate DC circuit breaker on the photovoltaic input line.

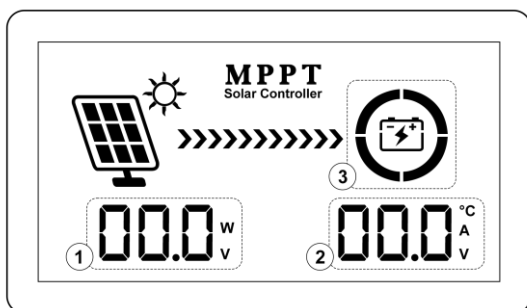
#### Step 3. Controller Startup

Once the battery and photovoltaic array are connected, check for any reverse connections or loose connections in the cables. After confirming everything is correct, sequentially close the circuit breakers for the battery charging circuit and photovoltaic input circuit to start the controller.



# Operation

## 4.1 Operation Interface Introduction



PRG/ESC



ENTER

| Icon                | Description  |
|---------------------|--|
| <b>LCD display</b>  |  |
| ①                   | <ol style="list-style-type: none"> <li>1. On the main screen, display the photovoltaic input data and operating mode.</li> <li>2. In the settings interface, display the setting options.</li> <li>3. In the event of a fault state, display "ERR".</li> </ol>   |
| ②                   | <ol style="list-style-type: none"> <li>1. On the main screen, display the battery charging parameters and device temperature.</li> <li>2. In the settings interface, display the setting codes.</li> <li>3. In the event of a fault state, display the fault codes, refer to section 5.2 "Troubleshooting" for details.</li> </ol> |
| ③                   | Indicate the battery charge status.  |
| <b>Function key</b> |  |
| PRG/ESC             | Used to enter or exit the setup program.   |
| ▲                   | Navigate to the next screen or setting item/increase the setting value.  |
| ▼                   | Go back to the previous screen or setting item/decrease the setting value.   |
| ENTER               | In the setup interface, enter a setting item or confirm the setting value.   |

## 4.2 Viewing and Configuration Guide for Parameters

After successfully starting the device, please refer to the following guide to view and configure the controller parameters based on your specific requirements.

### 4.2.1 Browsing Interface Data

On the main interface, use the "▲" and "▼" keys to toggle between different screen information.

| Page | Left Side Parameters on the Interface | Right Side Parameters on the Interface: |
|------|---------------------------------------|---|
| 1    | Photovoltaic Input Voltage            | Current Battery Voltage                 |
| 2    | Photovoltaic Input Power              | Charging Current                        |
| 3    | Operating Mode                        | Device Temperature                      |

#### ➤ Operation Mode

| Mode Code | Description                    |
|-----------|--------------------------------|
| 3.0       | Standby state                  |
| 4.0       | MPPT State                     |
| 7.0       | Content Voltage charging state |
| 8.0       | Flooded charging state         |

### 4.2.2 Configuration Setup Program

To access the setup program interface, press the "PRG/ESC" key. Use the "▲" and "▼" keys to navigate through the setting options. Press "ENTER" to enter a specific setting option. Adjust the parameter values using the "▲" and "▼" keys, and press "ENTER" to confirm the settings.

| Item | Program                          | Description   |
|------|----------------------------------|---|
| D01  | Open Circuit Voltage of PV Input | The maximum voltage value of the photovoltaic input sets the limit for the solar panel's input voltage that the controller will allow. This configuration is based on the maximum open-circuit voltage of the solar panels. |
| D02  | Bulk Charging Voltage            | Specific to charging lithium batteries. This parameter sets the maximum charging voltage for lithium batteries.   |
| D03  | Float Charging Voltage           | Specific to charging lead-acid batteries. After the battery is fully charged, it will be maintained at a weak current to keep the battery voltage at the float charging voltage value.                                      |

|     |                                 |   |
|-----|---------------------------------|---|
| D04 | Return-to-MPPT Charging Voltage | When the battery voltage drops to this value, the controller will enter a new charging cycle to charge the battery.                                 |
| D05 | Maximum Charging Current        | The maximum charging current of the controller. Set according to the charging parameters of the connected battery.                                  |
| D06 | Battery Voltage Calibration     | Used to calibrate the battery voltage measured by the controller when it does not match the voltage measured by other devices such as a multimeter. |

#### 4.2.3 Charging Parameter Configuration Reference

Please refer to the table below for the appropriate charging parameters based on the battery type you have connected.

##### For lead-acid battery:

|                            |                                  | System Voltage |       |       |     |       |
|----------------------------|----------------------------------|----------------|-------|-------|-----|-------|
|                            |                                  | 24V            | 36V   | 48V   | 60V | 72V   |
| Voltage control parameters |                                  |                |       |       |     |       |
| Sealed                     | Boost charging voltage           | 28.8V          | 43.2V | 57.6V | 72V | 86.4V |
|                            | Float charging voltage           | 27.6V          | 41.4V | 55.2V | 69V | 82.8V |
|                            | Boost reconnect charging voltage | 26.4V          | 39.6V | 52.8V | 66V | 79.2V |
| GEL                        | Boost charging voltage           | 28.4V          | 42.6V | 56.8V | 71V | 85.2V |
|                            | Float charging voltage           | 27.6V          | 41.4V | 55.2V | 69V | 82.8V |
|                            | Boost reconnect charging voltage | 26.4V          | 39.6V | 52.8V | 66V | 79.2V |
| FLD                        | Boost charging voltage           | 29.2V          | 43.8V | 58.4V | 73V | 87.6V |
|                            | Float charging voltage           | 27.6V          | 41.4V | 55.2V | 69V | 82.8V |
|                            | Boost reconnect charging voltage | 26.4V          | 39.6V | 52.8V | 66V | 79.2V |



**Lithium iron phosphate battery:**

| <b>Voltage control parameters</b> | <b>Boost charging voltage</b> | <b>Float charging voltage</b> | <b>Boost reconnect charging voltage</b> |
|-----------------------------------|-------------------------------|-------------------------------|---|
| <b>7S</b>                         | 25.2V                         | 24.5V                         | 22.4V                                   |
| <b>8S</b>                         | 28.8V                         | 28V                           | 25.6V                                   |
| <b>11S</b>                        | 39.6V                         | 38.5V                         | 35.2V                                   |
| <b>12S</b>                        | 43.2V                         | 42V                           | 38.4V                                   |
| <b>15S</b>                        | 54V                           | 52.5V                         | 48V                                     |
| <b>16S</b>                        | 57.6V                         | 56V                           | 51.2V                                   |
| <b>18S</b>                        | 64.8V                         | 63V                           | 57.6V                                   |
| <b>19S</b>                        | 68.4V                         | 66.5V                         | 60.8V                                   |
| <b>22S</b>                        | 79.2V                         | 77V                           | 70.4V                                   |
| <b>23S</b>                        | 82.8V                         | 80.5V                         | 73.6V                                   |

**For Ternary lithium battery:**

| <b>Voltage control parameters</b> | <b>Boost charging voltage</b> | <b>Float charging voltage</b> | <b>Boost reconnect charging voltage</b> |
|-----------------------------------|-------------------------------|-------------------------------|---|
| <b>6S</b>                         | 25.2V                         | 24.6V                         | 22.8V                                   |
| <b>7S</b>                         | 29.4V                         | 28.7V                         | 26.6V                                   |
| <b>9S</b>                         | 37.8V                         | 36.9V                         | 34.2V                                   |
| <b>10S</b>                        | 42V                           | 41V                           | 38V                                     |
| <b>12S</b>                        | 50.4V                         | 49.2V                         | 45.6V                                   |
| <b>13S</b>                        | 54.6V                         | 53.3V                         | 49.4V                                   |
| <b>16S</b>                        | 67.2V                         | 65.6V                         | 60.8V                                   |
| <b>17S</b>                        | 71.4V                         | 69.7V                         | 64.6V                                   |
| <b>19S</b>                        | 79.8V                         | 77.9V                         | 72.2V                                   |
| <b>20S</b>                        | 84V                           | 82V                           | 76V                                     |

# Protection and Troubleshooting

## 5.1 Protection

| No. | Protection                     | Description   |
|-----|--------------------------------|---|
| 1   | Reverse Polarity               | Fully protected against reverse polarity; no damage to the controller will result. Correct the miswire to resume normal operation |
| 2   | Maximum Charging Current limit | Ensure safe charging current to prevent battery damage. Protect battery performance and prolong battery life.                     |
| 3   | Short Circuit Protection       | The controller shuts down output for one minute.  |
| 4   | Controller Overheating         | When the temperature exceeds 85 °C , the control automatically stops charging. Resume charging when the temperature is 75°C.      |

## 5.2 Troubleshooting

In case of a failure, the Controller display shows an error signal to help you find its source.

| Fault Code | Possible Cause             | What to do   |
|------------|----------------------------|--|
| 60         | Temperature Too High       | Once the device temperature cools down below the recovery temperature, normal charging and discharging will resume.  |
| 63         | High Battery Voltage       | Reconfigure parameters or verify if the battery voltage exceeds the rated voltage, and also, consider shutting off the photovoltaic array circuit breaker. |
| 71         | High PV Voltage            | Reconfigure parameters or lower the voltage by adjusting the series and parallel connections.  |
| 73         | Excessive Charging Current | Reduce the number of photovoltaic arrays connected to the controller.  |

### 5.3 Maintenance

The following inspections and maintenance tasks are recommended at least two times per year for best performance.

- Make sure controller firmly installed in a clean and dry ambient.
- Make sure no block on air-flow around the controller. Clear up any dirt and fragments on heat sink.
- Check all the naked wires to make sure insulation is not damaged for serious solarization, frictional wear, dryness, insects or rats etc. Repair or replace some wires if necessary.
- Tighten all the terminals. Inspect for loose, broken, or burnt wire connections.
- Confirm that all the system components are ground connected tightly and correctly.
- Confirm that all the terminals have no corrosion, insulation damaged, high temperature or burnt/discolored sign, and tighten terminal screws.
- Check for dirt, nesting insects and corrosion. If so, clear up in time.

***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.

# Technical Specification

|                              |                      |           |        |
|------------------------------|----------------------|-----------|--------|
| <b>Model</b>                 | <b>POW-Boost 10A</b> |           |        |
| <b>PV Input</b>              |                      |           |        |
| PV Input Voltage             | 15~25V               | 25~48V    | 48~60V |
| PV Input Power               | ≤150W                | ≤250W     | ≤400W  |
| System Voltage               | 24/36/48/60/72V      | 48/60/72V | 60/72V |
| <b>Charging Mode</b>         |                      |           |        |
| Charging technology          | MPPT                 |           |        |
| Charge Algorithm             | 3-Stage              |           |        |
| Self-consumption             | <2W                  |           |        |
| Nominal System Voltage       | 24V/36V/48V/60V/72V  |           |        |
| Battery Voltage Range        | 20~88V               |           |        |
| <b>Environment</b>           |                      |           |        |
| Operating Temperature Range  | -35°C ~ +65°C        |           |        |
| Humidity Range               | ≤95%                 |           |        |
| <b>General Specification</b> |                      |           |        |
| Protection Class             | IP32                 |           |        |
| Dimension                    | 140*85*50mm          |           |        |
| Net weight                   | 305g                 |           |        |



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