Product Model

HHJ60-PRO

PowMr

SOLAR CHARGE CONTROLLER

User Manual

Important Safety Instructions

WARNING: Carefully read and adhere to all safety instructions.

- Before installing and operating the controller, please read the user manual thoroughly and keep it for future reference.
- The installation or operation of the controller should only be performed by individuals who have received proper training and supervision.

a. Anyone lacking the necessary knowledge, experience, or capabilities for the safe installation and operation requirements.

b. Individuals (including children) who may have physical, sensory, or intellectual impairments that could affect the safe installation and operation.

Controller Installation and Operation

a. This controller product does not have user-serviceable components; do not disassemble or attempt to repair the controller yourself.

b. Install the controller in a well-ventilated environment with adequate clearance around it.

c. Install the controller on non-combustible walls and ensure there are no flammable materials nearby; it is normal for the controller to generate heat during operation.

d. Place the controller in an environment that is protected from direct sunlight, rain, humidity, and dust, and keep it away from any flammable liquids or gases. The controller is for indoor use only.

e. Do not install or operate the controller on top of, directly above, or in an enclosed space above batteries, as batteries emit explosive gases.

f. Do not place any objects on top of the controller.

Battery Installation and Charging

a. Install and charge batteries in well-ventilated or exhaust-ventilated environments.

b. Ensure there are no open flames in the vicinity of the batteries, as batteries emit explosive gases.

c. Battery acid is corrosive; if battery acid comes into contact with the skin, rinse immediately with clean water.

d. Do not charge non-rechargeable batteries. Do not charge lithium batteries when the

temperature is below 0℃. Charging frozen batteries is prohibited.

e. Ensure that the equipment is properly configured for the type of battery connected to it.

DC Battery Connections

a. Ensure that the DC system is fully off/powered down by disconnecting all cables and/or new ports from the battery/DC system.

b. Use flexible, multi-strand copper cables with an appropriate cross-sectional area, and connect them to matching fuses or circuit breakers.

c. Connecting the photovoltaic array to the controller is prohibited until the battery is connected first.

Controller Configuration

a. Refer to the battery manufacturer's guide and specifications to ensure the battery is suitable for the controller and confirm the recommended charging settings.

b. Integrated charging modes include adaptive charging logic, which is suitable for most battery types.

Warranty Services

Dear Customer,

Thank you for choosing the HHJ series solar controller.

Please carefully read this manual as it will help you maximize the many advantages the controller offers for your solar system.

This manual provides important recommendations regarding installation and usage. For your own benefit, please read and pay close attention to the safety advice within.

In accordance with the instructions, repair services may be provided to users for any damaged units resulting from incorrect installation, disassembly, or improper use of this product.

Warranty Terms:

- Within 30 days from the date of purchase, a malfunctioning controller will be replaced at no charge, provided that it has been used under normal circumstances and authorized by the company's technical personnel.
- Within 2 years from the date of purchase, a malfunctioning controller will be repaired at no charge.

NOTE

- Unauthorized disassembly voids the warranty.

Declaration

Under the following circumstances, our company reserves the right not to assume any quality warranty responsibilities:

- Damage caused by improper transportation.
- Damage resulting from incorrect storage, installation, or usage.
- Damage caused by non-professionals or untrained personnel installing and operating the equipment.
- Damage resulting from non-compliance with the instructions and safety warnings in this document.
- Damage caused by operation in environments that do not meet the requirements specified in this document.
- Damage due to operation beyond the parameter ranges specified in applicable technical specifications.
- Damage resulting from unauthorized disassembly, product alteration, or software code modification.
- Damage caused by abnormal natural conditions (force majeure), such as lightning, earthquakes, fires, storms, etc.
- Any damage resulting from failure to adhere to local standards and regulations during the installation and operation processes.
- Products outside the warranty period.

Table of contents

1 Product Introduction

Welcome to the HHJ series solar controller. This controller represents advanced innovation in the field of solar technology and is designed to provide exceptional performance and reliability for your solar energy system. The controller is equipped with advanced CNC technology, an LCD display, automated operation, and a Maximum Power Point Tracking (MPPT) battery charging mode. Combined with advanced control technology, it significantly extends the lifespan of your batteries.

The HHJ series solar controller is designed to meet the diverse needs of various solar energy systems, whether in standalone systems or other application scenarios. It automatically controls the charging and discharging processes. By optimizing the controller's battery charging and discharging processes, it not only prolongs the battery's lifespan but also enhances the overall system's performance. The controller features self-diagnostic functions and electronic protection, effectively preventing damage to the controller or batteries during installation errors or system faults, ensuring system reliability and stability.

Our HHJ series solar controllers are suitable for a wide range of solar energy applications. We offer a user-friendly custom open-program configuration interface, making the configuration process of solar energy systems quicker and smoother. It also provides more possibilities for expanding solar energy systems. Whether you are setting up a small-scale residential standalone solar system or expanding your solar energy project, the HHJ series solar controller will be an indispensable partner.

By choosing the HHJ series solar controller, you will gain an efficient, sustainable, and secure energy management solution that provides strong support for future energy needs. We are committed to advancing solar technology and delivering outstanding products and services to you.

1.1 Features

- **Integrated Charging Presets**

Integrated charging modes include adaptive charging logic, suitable for most battery types such as flooded lead-acid batteries, gel-sealed lead-acid batteries, and lithium batteries. Specific charging parameters for each battery type can be found in Section 3.5.

- **Versatile Application**

Compatible with 12V/24V/36V/48V system voltages.

- **Multi-Stage Charging Algorithm**

The multi-stage charging algorithm is designed to optimize each charging cycle. After the batteries are fully charged, it maintains battery capacity by applying preset charging parameters in specific charging stages.

- **Maximum Power Point Tracking (MPPT) Technology**

MPPT technology tracks the maximum power point voltage (Vmp) of the array as it varies with weather conditions, ensuring the collection of maximum power from the array throughout the day.

- **High-Efficiency Charging**

Innovative MPPT technology with a tracking efficiency of up to 99.9% and a peak conversion efficiency of up to 97%, reducing power consumption, minimizing heat generation, and lowering operating temperatures.

- **Supports Up to 12 Units in Parallel**

The parallel operation function allows for easy expansion of the solar panel configuration and energy storage capacity limits, thus increasing the scale of energy storage. For detailed parallel operation guidelines, refer to Section 7.

- **Adaptive Boost Charging**

During the initial charging phase, adaptive boost charging monitors battery response and automatically determines the duration of the boost stage for each independent charging cycle, ensuring that the battery is fully charged at any discharge level or capacity while avoiding overcharging during the boost charging stage (extends battery life).

- **Durable and Secure**

a. Photovoltaic input overcurrent
b. Photovoltaic array short circuit
c. Reversed photovoltaic polarity

d. Overvoltage protection for batteries
e. Overdischarge protection for batteries
f. Over-temperature protection

- **External Temperature Probe Configuration**

Precisely monitor battery temperature. When the battery temperature exceeds 65℃, charging is stopped, and when the battery temperature drops below 55℃, charging is resumed to protect the battery.

- **Forced Air Cooling**

Built-in cooling fan for forced heat dissipation, improving overall device operational efficiency.

- **Lithium Battery Activation**

Compatible with lithium batteries. When the battery type parameter is set to lithium batteries, the charging cycle will be adjusted to accommodate the needs of lithium battery charging. Additionally, when connected lithium batteries are in a protected state, the controller will activate the lithium batteries with the energy from the solar panels, with current not exceeding the lithium battery protection voltage and current range.

Warning: Do not charge lithium batteries when the temperature is below 0℃.

1.2 Product Appearance

1	LCD display	5	Load port
2	Function key	6	Temperature probe port
3	PV input port	7	Parallel communication port
4	Battery port		

2 Installation and Wiring

2.1 Unpacking and Inspection

Before unpacking, inspect the packaging for any signs of damage. After unpacking, check the contents to ensure nothing is damaged or missing. Inside the package, you will find the following items:

- Controller
- User Manual
- Installation screws
- Parallel connector
- External temperature sensor

2.2 Choosing the Installation Location

Before installation, several aspects should be considered to determine or provide a suitable and safe installation location:

	Install the controller in a space with good natural ventilation/exhaust.
	Avoid direct sunlight.
	Ensure there is ample clearance around the controller. The minimum clearance at the top, bottom, and both sides of the controller is 75mm.
	Install the controller on a non-combustible wall and ensure there are no flammable materials nearby; an increase in temperature during controller operation is a normal occurrence.
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	Install the controller on a non-combustible wall and ensure there are no flammable materials nearby; an increase in temperature during controller operation is a normal occurrence.
	When running multiple controllers in parallel, ensure they are installed at the same horizontal height, with a minimum spacing of 75mm between controllers.

2.3 Wiring Precautions

1. Installation and wiring work should be carried out by a certified electrician.
2. Wiring should follow the sequence of Battery > PV Input > Load.
3. To avoid short-circuits and polarity reversal, pay attention to connecting the positive (+) cable to the device's positive (+) terminal and the negative (-) cable to the device's negative (-) terminal.
4. Loose and/or incomplete connections can lead to cable or terminal overheating. Therefore, tighten all cables to minimize transition resistance, using cable sizes appropriate for the specific circuit's current rating.
5. Do not connect the inverter to the load terminal of the controller, as doing so may result in irreversible damage to the equipment. If it is necessary to connect the inverter, please follow the battery connection steps outlined in Section 2.4, as indicated in the wiring diagram.

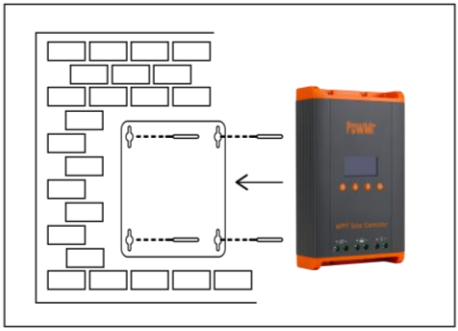
2.4 Installation and Wiring Guidelines

Please refer to the following steps to complete the installation and wiring of the controller. Alternatively, scan the QR code on the right to access the operating guide.

NOTE

- For parallel connection wiring, please refer to Chapter 7.

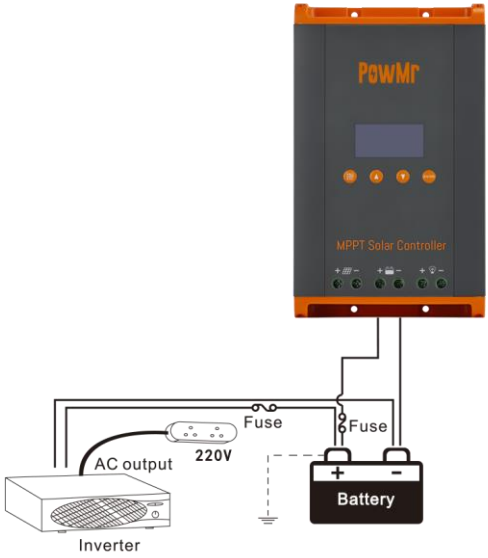
Step 1. Install the controller vertically with its ports facing downward, securing it to the wall through the four mounting holes using screws. For ease of installation, it is recommended to use two upper screws for initial "hanging" of the device, followed by the addition of two lower screws, and then fully tighten all four screws.



Step 2. Battery Wiring: Connect the battery to the controller using cables.

Attention:

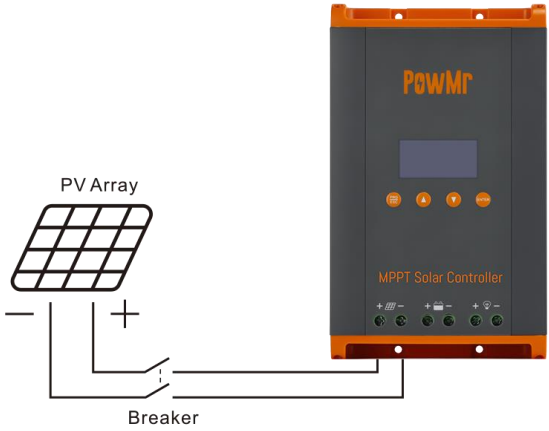
- Do not connect the inverter to the load terminal of the controller; otherwise, it may cause irreversible damage to the equipment. If it is necessary to connect the inverter, please refer to the diagram below.



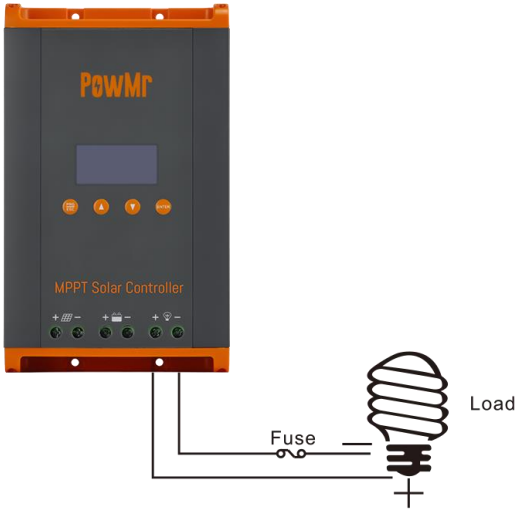
NOTE

- All wiring work must be carried out by professionals.
- For safe operation and proper application, circuit breakers of the appropriate specifications must be installed on the cables connected to the controller, and ensure that the connections are tight.
- Ensure that all circuit breakers are in the off position before completing all wiring.
- Connect the positive cable terminal to the positive terminal port, and the negative cable terminal to the negative terminal port.
- The above notes also apply to the PV ports and DC output ports.

Step 3. PV Wiring: Connect the photovoltaic array to the controller using cables.



Step 4. DC Output Wiring: Connect the load to the controller using cables.



Step 5. Temperature Probe Connection: Connect the temperature probe wire to the controller and securely fix the probe end to the battery using insulation tape.

Step 6. Pre-Startup Check: Refer to the wiring diagram below. If all connections are accurate, and all wiring is securely connected, close the circuit breakers in the order of Battery, PV Input, and Load terminals.

WARNING: Risk of Electric Shock!

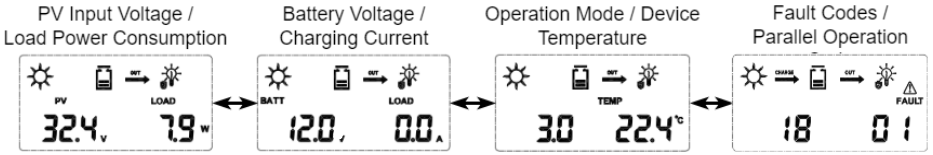
- Before wiring, ensure that all power sources are turned off and follow the relevant inspection and operation procedures.

3 Operation Guide

3.1 Key Introduction

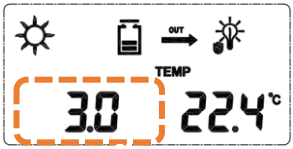
Function key	Description
PRG/ESC	Enter the setup program / Exit the setup program
▲	Enter the next item/Increase value
▼	Return to the previous item/ Decrease value
ENTER	Confirmation button

3.2 Main Page Overview



Page	Description
1	PV Voltage / Output Power
2	Battery Voltage / Charging Current
3	Operating Mode / Temperature
4	Fault Codes/Parallel Operation Code

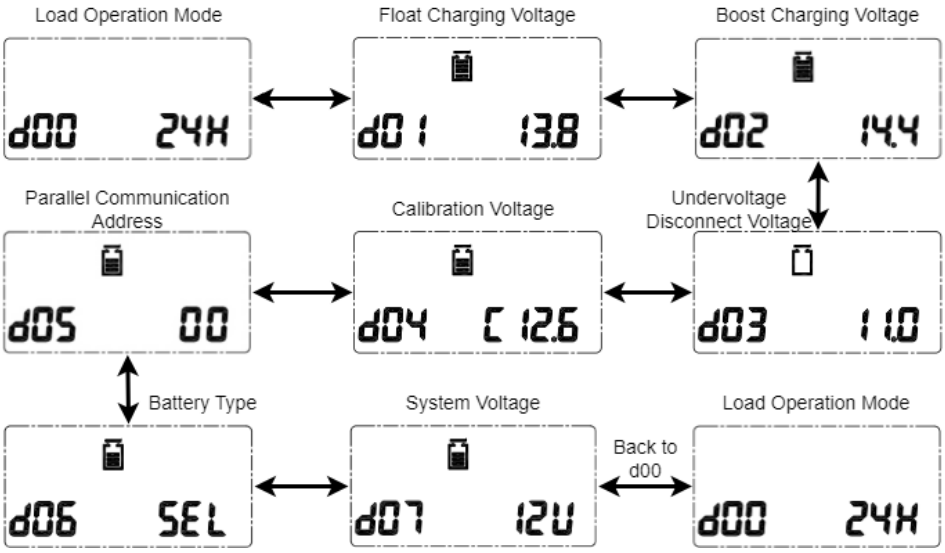
3.3 Operating Modes (Page 3)



Mode Codes	Description
3. 0	Night Mode, No Charging
4. 0	MPPT Mode
7. 0	Boost Charging Mode (Constant Voltage Charging)
8. 0	Float Charging Mode

3.4 Overview of the Settings Page

On the main screen, press the PRG button to access the settings page. Use the ▲ and ▼ buttons to navigate through the settings items, then press the ENT button to enter the settings for the selected item. Within a setting item, use the ▲ or ▼ buttons to adjust the numerical values or toggle options. Finally, press the ENT button to save the settings. After configuring all the settings items, press the ESC button to exit the settings page.



3.5 Setting Guidelines

D00 Load Operation Mode Setting

Configure the mode and duration for enabling the load output.

1. 00H: Light control mode. (Loads start to supply power after dark and stop working after dawn.)
2. 24H (Default): Immediate load activation.
3. 01H~23H: Adjust the duration for load activation.

D01 Float Charge Voltage Setting

After the boost charge phase, the controller will reduce the battery voltage by decreasing the charging current and maintain the battery at the float charge voltage setting value to keep the battery in a fully charged state. Please adjust this setting based on the charging parameters of the connected batteries.

D02 Boost Charge Voltage Setting

During the boost charge phase, the battery will be charged at a constant preset voltage value. Please set this value according to the specific charging parameters of your batteries.

D03 Low Voltage Disconnect Setting

When the battery voltage falls below the value set in D03, the controller will stop discharging the battery to prevent over-discharging.

D04 Voltage Calibration Setting

This setting allows you to calibrate the displayed battery voltage when there is a difference between the controller's detected voltage and the voltage measured with a multimeter. Please note that using excessively long or thin cables can affect the controller's ability to accurately read the battery voltage.

D05 Parallel Communication Code Setting

NOTICE

- This program requires no configuration if you are not operating in parallel mode.

After completing the parallel wiring, you can use the D05 setting program to define the master and slave controllers.

The controller with the lowest communication code value will be the master. In parallel operation, if the master encounters an issue, the system will automatically select the controller with the next code value as the new master.

For example, if the No. 01 master fails, the system will designate No. 02 as the new master.

Assuming six controllers are operating in parallel:

Code / Possible Scenarios	01	02	03	04	05	06
Scenario 1: Normal operation	Master	Slave	Slave	Slave	Slave	Slave
Scenario 2: No. 01 failure	Fault	Master	Slave	Slave	Slave	Slave
Scenario 3: No. 03 failure	Master	Slave	Fault	Slave	Slave	Slave
Scenario 4: No. 01 & 02 failures	Fault	Fault	Master	Slave	Slave	Slave

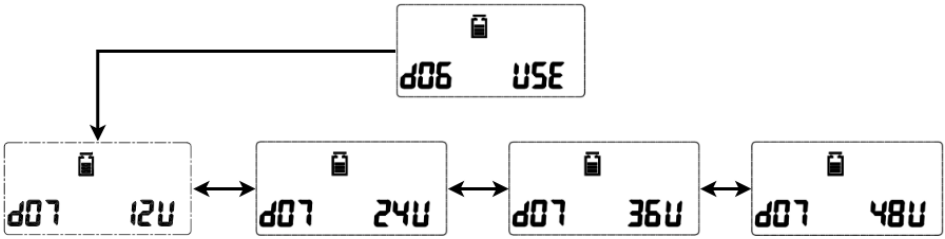
D06 Battery Type Setting

Display	Battery Type
SEL	Lead-acid Battery (Default)
GEL	Gel Sealed Lead-acid Battery
FLd	Flooded Lead-acid Battery
L04	4-Cell Lithium Iron Phosphate Battery
L08	8-Cell Lithium Iron Phosphate Battery
L15	15-Cell Lithium Iron Phosphate Battery
L16	16-Cell Lithium Iron Phosphate Battery
USE	Custom Battery Type

➢ **Battery Charging Voltage Reference**

Battery Type	Float Charging Voltage	Boost Charging Voltage	Undervoltage Protection Voltage
SEL	13.8	14.4	11.0
GEL	13.8	14.2	11.0
FLd	13.8	14.6	11.0
L04	13.8	14.5	11.2
L08	27.6	29.0	22.4
L15	51.8	54.4	42.0
L16	55.2	58.0	44.8
USE	User-defined		

D07 System Voltage Setting



If D06 is set to USE, it will enter D07 to select the system voltage. If D06 is not set to USE, the system will automatically detect the system voltage of the connected battery and will not enter D07 setting program.

The system voltage configuration range is 12V/24V/36V/48V.

4 Protection

4.1 Protection Function

Protection	Description
Photovoltaic Input Overcurrent	The controller limits the battery charging current to the maximum battery current rating. Consequently, an overcurrent from the photovoltaic array input will not allow it to operate at peak power.
Photovoltaic Array Short Circuit	When a short circuit occurs in the photovoltaic array, the controller will stop charging, and operation can be restored by eliminating the short circuit fault.
Photovoltaic Polarity Reversal	If the photovoltaic input wiring polarity is reversed, the controller will not operate, and it will not damage the controller. After proper reconnection, the controller will operate normally.
Battery Overvoltage	When the battery voltage exceeds 15.5/31.0/46.5/62.0V, the controller will stop charging to protect the battery from overcharging damage. Please note that stopping the charging means the charging current is very low.
Battery Over-discharge	When the battery voltage drops to the low-voltage disconnect setpoint, the controller will stop discharging to protect the battery from over-discharge damage.
Over-temperature Protection	When the battery voltage drops to the low-voltage disconnect setpoint, the controller will stop discharging to protect the battery from over-discharge damage.

4.2 Troubleshooting

Fault Code	Description	Resolution
18	Photovoltaic Input Voltage Too Low	Increase the photovoltaic array voltage by changing the series-parallel connection or adding more solar panels.
60	Over-temperature Protection	In case of over-temperature, the fan will start automatically to provide efficient forced cooling.
63	Battery Overvoltage	Charging will automatically stop, and it will resume when the battery voltage returns to normal levels.
65	Battery Undervoltage	Discharging will automatically stop, and it will resume when the battery voltage rises to normal levels.
71	Photovoltaic Input Voltage Too High	Reduce the photovoltaic array voltage by changing the series-parallel connection or reducing the number of solar panels.
73	Overcharging Current	Reduce the photovoltaic input power by decreasing the number of solar panels.

5 Maintenance

We recommend conducting the following checks and maintenance at least twice a year to ensure optimal performance:

1. Ensure the controller is securely mounted in a clean and dry environment.
2. Ensure proper airflow around the controller and clean any dust or debris from the heat sinks.
3. Inspect all exposed wires for insulation damage, such as severe sun exposure, friction wear, dryness, insect or rodent damage. Repair or replace any damaged wires as necessary.
4. Tighten all terminals and check for loose, broken, or burnt cable connections.
5. Confirm that all system components are properly grounded.
6. Ensure all terminals are free from corrosion, insulation damage, high temperatures, or signs of burning/discoloration, and tighten terminal screws.
7. Check for dirt, nesting insects, and corrosion. If present, clean promptly.

WARNING: Risk of electric shock!

- Before performing the above operations, ensure that all power sources are turned off and then follow the relevant check and operation guidelines.

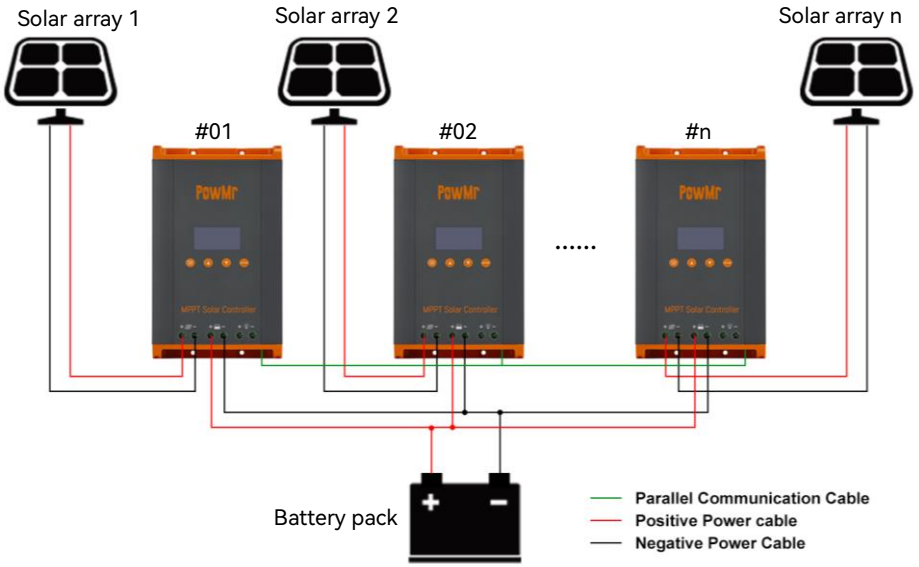
6 Specification Parameters

Models	HHJ60-PRO
Solar Input Parameters	
Max. Solar Array Open-Circuit Voltage	160V
Maximum Input Power: For 12V System For 24V System For 36V System For 48V System	 720W 1440W 2100W 2800W
Input Voltage Range: For 12V System For 24V System For 36V System For 48V System	 20V~80V 37V~105V 50V~160V 72V~160V
Battery Charging Parameters	
Charging Technology	MPPT
Charging Algorithm	3 stages
Battery Voltage Auto-Detection 12V System 24V System 36V System 48V System	 DC9V~DC15V DC18V~DC29V DC30V~DC39V DC40V~DC60V
Overcharge Protection Voltage	60V
Charging Limit Current	61A
Maximum Efficiency	≥98. 1%
Solar Utilization Rate	≥99%
Load Terminal Output	
Rated Output Current	6A

Maximum DC Output Current	8A
Protection	
Temperature Protection	75℃ / 167 ℉
Fan Start Temperature	>45℃ / 104℉
Fan Shutdown Temperature	<40℃ / 95℉
General Specification	
Dimensions	215x130x85mm /8.46x5.12x3.35in
Net Weight	990g / 2.18lb
Electromagnetic Compatibility	EN61000, EN55022, EN55024
Protection Level	IP21
Operating Temperature	-20℃ ~ +55℃ / -4℉ ~ 131℉
Storage Temperature	-40℃ ~ +75℃ / -40℉ ~ 167℉

7 Parallel Operation Guide

Parallel Operation Schematic



Main Modules:

➢ Controller

The controller device is capable of standalone operation for individual units and can also support a maximum of 12 units in parallel operation. When operating in parallel, communication between the parallel controllers is achieved through communication lines. The parallel controllers are installed at the same horizontal height.

➢ Solar Array

Each controller must be connected to a separate solar array. One solar array cannot be simultaneously connected to more than one controller. The input power connected to each controller should not exceed the rated input power of a single controller.

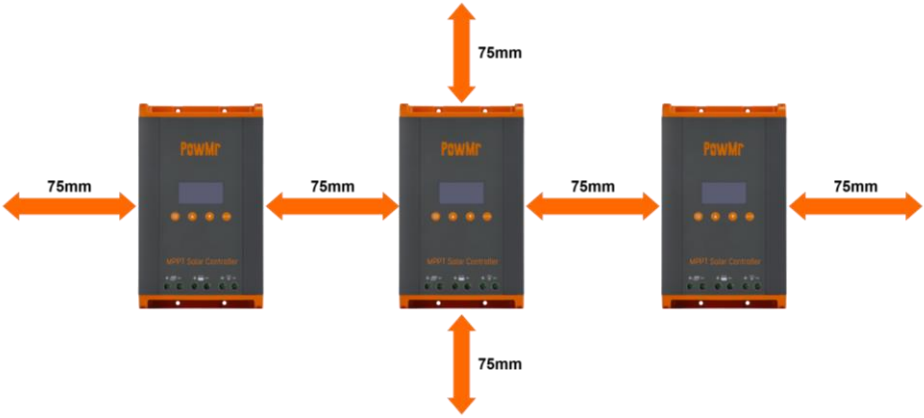
➢ Battery Bank

Parallel controllers are connected to the same battery bank.

Parallel Installation and Wiring

✧ You can view the parallel operation guide by scanning the QR code in the upper right corner.

Step 1. Install parallel devices at the same height level with a minimum distance of approximately 75mm between devices.



Step 2. Connect communication lines.

Step 3. Connect all parallel controllers to the same battery bank in sequence.

Step 4. Then, individually connect each controller to its respective photovoltaic array.

Step 5. Finally, connect each controller to the DC load.

Step 6. Step 6: Set the parallel operation code for each controller, as detailed in Section 3.5 of the Setting Guidelines under the explanation for Setting D05.

PowMr

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