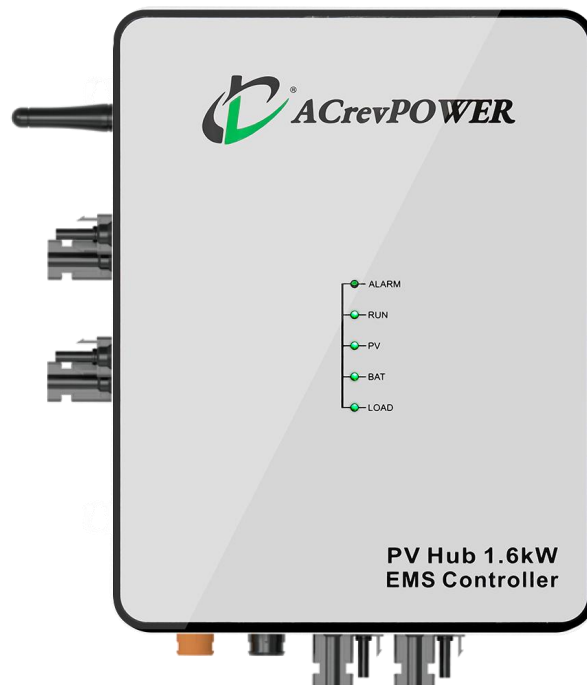


# EMS Controller User's Manual

V 1.0



EMS Controller

Model

SPD-EMS1.6kW

## Foreword

Before using this product, read this document carefully to understand and use it correctly.

Keep this document in a safe place for future reference.

Improper operation may cause injury or damage.

By using this product, you agree to the terms and conditions in this document.

The Company is not liable for damages due to improper use.

The Company has the final interpretation of this document and related documents.

Check the official website for updates to this document.

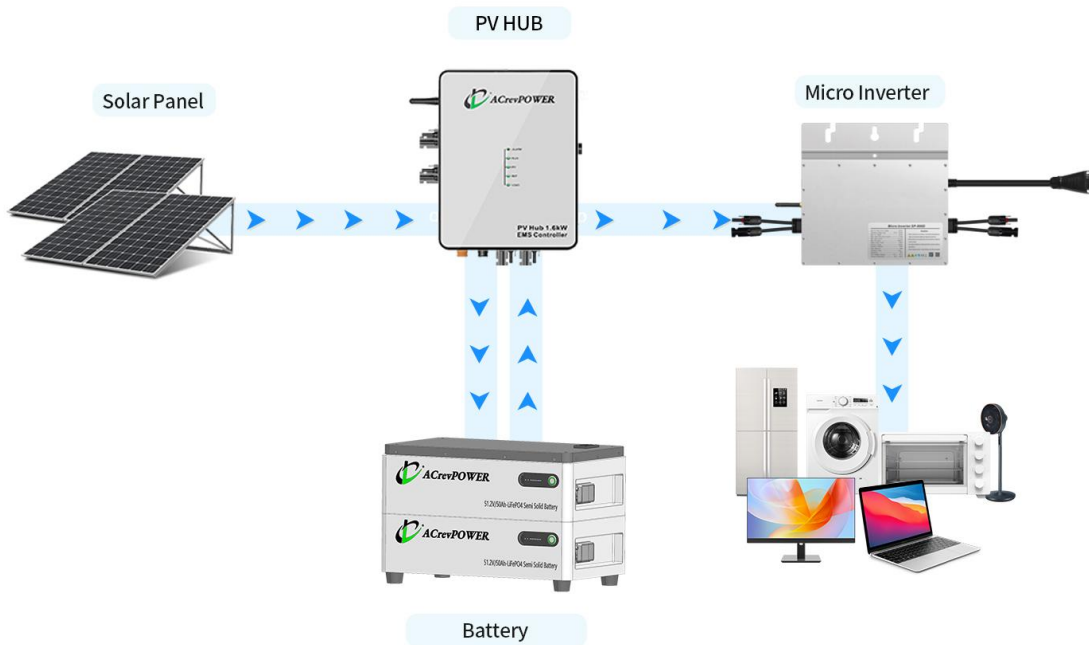
## Catalogue

1. Introduction .....	2
1.1. About PV Hub .....	2
1.2. About the manual .....	2
2. Important information .....	2
3. SPD-EMS 1.6kW Controller .....	3
3.1. Product Overview .....	3
3.2. Main Features .....	4
3.3. Technical Structure .....	4
3.4. Connection Diagram .....	5
3.5. Connection Ports .....	5
4. Installation Preparation .....	6
4.1. Physical Damage Inspection .....	6
4.2. Packing List .....	6
4.3. Tools Required for Installation .....	6
4.4. Devices and Components for Entire System .....	7
5. Start Installation .....	7
6. Install APP and Monitor Your System .....	14
7. Technical Data Sheet .....	14

# 1. Introduction

## 1.1. About PV Hub

We normally call the energy storage controller as PV Hub, which is used in balcony photovoltaic energy storage system, to manage the energy flow among PV, battery and micro inverter, for energy storage system building, the following devices are needed, PV panel, PV Hub, Battery pack and micro inverter, the PV Hub is playing the key role.











## 1.2. About the manual

This manual contains important instructions for the PV Hub, user shall read it carefully before installation and operation. For safety reasons, only qualified personnel who has received the appropriate training shall install this energy storage system under the guidance of this manual.

# 2. Important information

The following symbols appear on the product label and are described here:

Symbols	Explanation
	Danger: Refer to the safety instructions
	Danger: Risk of electrical shock

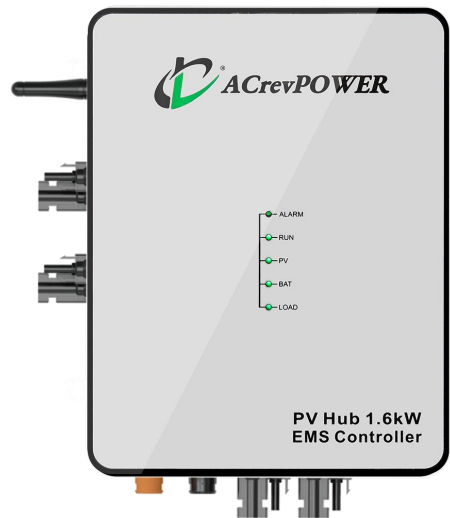
	Warning: Hot surface
	The Micro Inverter is covered by the EU WEEE directive.
	The CE mark confirms the compliance of the Micro Inverter with the European Low Voltage and EMC Directives
	The RoHS mark confirms the compliance of the Micro Inverter with European directive on “the restriction of the use of certain Hazardous substances in Electrical and Electronic devices”.
	The Micro Inverter complies with the FCC requirements.
	Grounding Protection: prior to operation you must make sure that grounding protection is properly connected.
	Please read the user’s manual firstly before installation, operation and maintenance.
	This indicates information that is very important for optimal system operation. Follow instructions closely.

### 3. SPD-EMS 1.6kW Controller

#### 3.1. Product Overview

The SPD-EMS Controller is equipped with the remarkable capability to simulate the voltage-current curve of solar panels. With both manual and automated modes, it exerts precise control over the microinverter's power output to the power grid, guided by real-time energy consumption data. Notably, it provides an elegant solution to the persistent challenge of efficiently storing surplus solar energy within batteries. Furthermore, the device seamlessly interfaces with smart meters via WiFi connectivity, facilitating meticulous recording of power import and export interactions with the public grid. This transparent data acquisition empowers users to maintain a vigilant eye on the operational state and performance metrics while also facilitating the effortless transmission of PV curves to the device. All of these dynamic functionalities are efficiently managed through the user-friendly APP.

The SPD-EMS controller exemplifies the pinnacle of innovation in the realm of microinverter storage systems, ushering in a new era of efficiency, control, and seamless integration.



### 3.2. Main Features

- a. Module-level MPPT trackers, safe and easy to monitor each individual panel's performance.
- b. Independence MPPT trackers, peak conversion efficiency >98%, maximize each solar panel's output.
- c. Simulate the solar panel's output voltage-current curve, which can match most brands microinverter.
- d. Control other brand microinverter's output power to grid, storage more solar energy in the battery.
- e. Manually or automatically control the microinverter's output, and meet different users' requirements.
- f. Integrated the BMS, communicates with the battery in real-time, more safe and efficient for managing your battery.
- g. Overcharge, over-discharge and overload protection, keep your battery in a safe situation.
- h. Flexibly remote monitor your solar harvest via APP in rural places.

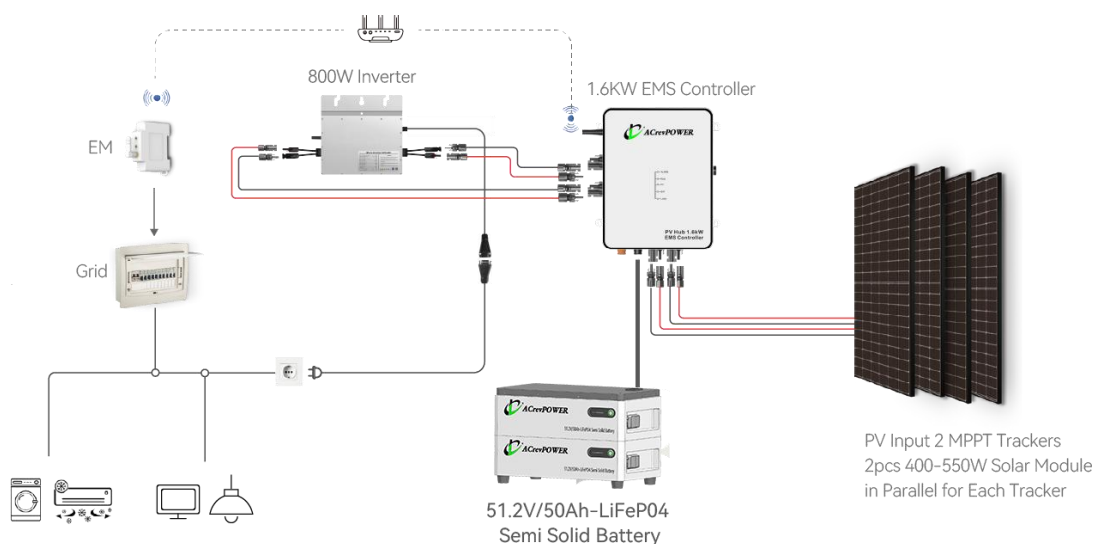
### 3.3. Technical Structure

- a. Rear side of the controller chassis is designed with metal fins for heat dissipation and unit protection.

- b. Temperature control mechanism ensures safe operation in high ambient temperatures.
- c. Micro controller facilitates seamless interface communication and transmission of values/messages via mobile APP or cloud platform.
- d. Dedicated micro controller for effective monitoring of AC grid integrated with APP.
- e. Controller designed for exclusive grid-parallel operation with automatic anti-islanding function.
- f. Integrated DC arc-fault circuit interrupter detects and responds to potential arc faults in the DC circuit.
- g. Emphasis on delivering a professional-grade solution prioritizing performance, safety, and reliability

### 3.4. Connection Diagram

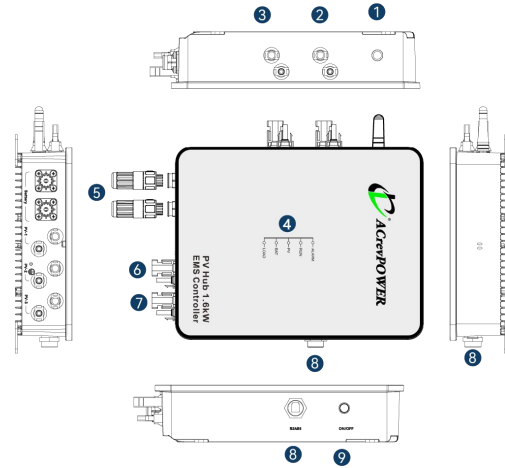
The EMS controller, compatible with microinverters from various brands, operates as a hybrid power generation system. It receives DC power from PV panels, directing it to the microinverter, then the battery for storage, and the grid for feeding in. Upon meeting loading requirements, surplus power can be exported to the main grid (on-grid). The device can be paired with a smart meter via WiFi to record both the export and import of power with the public grid.



### 3.5. Connection Ports

- ① Wifi
- ② DC Output to Microinverter 1

- ③ DC Output to Microinverter 2
- ④ LED Indicator
- ⑤ 48V Battery Connector
- ⑥ PV Input 1
- ⑦ PV Input 2
- ⑧ RS485
- ⑨ On/Off Switch



## 4. Installation Preparation

### Note

This controller must be paired with a microinverter (supporting most brands) to establish a hybrid solar storage system. Consequently, it is essential to install one or more microinverters in conjunction with this controller.

### 4.1. Physical Damage Inspection

Upon receiving the controller, it is crucial to meticulously inspect it for any signs of physical damage that may have occurred during transportation. Examine the components thoroughly for visible cracks or other damages. If any such damage is detected, it is imperative to contact your authorized dealer immediately for further assistance and guidance. We prioritize the safety and integrity of our products, and prompt action in the case of any physical damage will ensure a smooth and reliable installation process.

### 4.2. Packing List

Upon opening the package and retrieving the product, please check the accessories first. The packing list is shown below as in pictures- option.



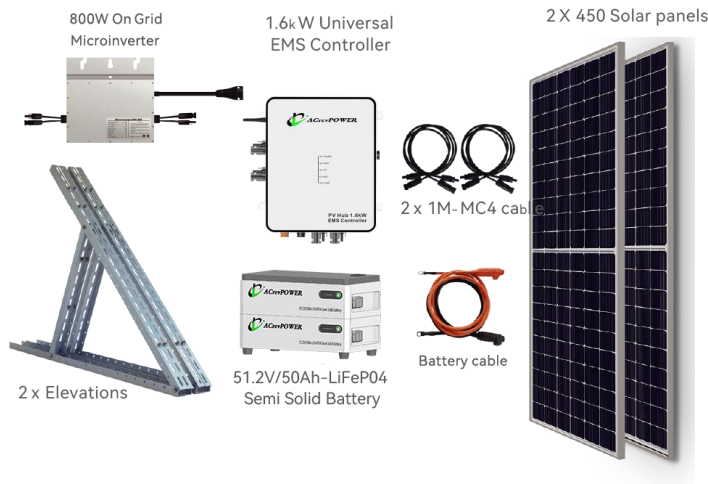
### 4.3. Tools Required for Installation



- ① Crimping pliers, ② Wire strippers, ③ Screwdriver, ④ Nut drivers, ⑤ Manual Wrench,
- ⑥ Power drill/driver etc.

#### 4.4.Devices and Components for Entire System

- ① Controller, ② Microinverters, ③ PV Panels (not provided), ④ Battery (optional),
- Mounting Brackets (not provided), ⑥ CT Meter (optional), ⑦ Y type MC4 cable, ⑧
- Battery Cable (not provided)



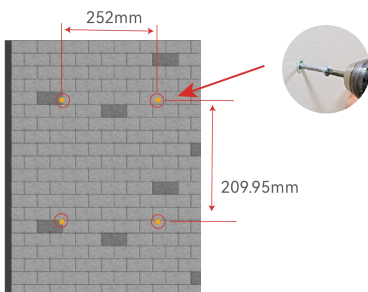
**Note** 

Battery cable is provided with battery together when battery is purchased.

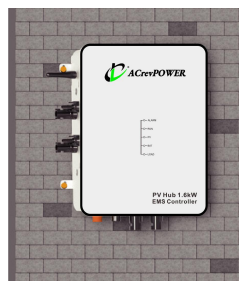
## 5. Start Installation

### Step 1 : Mounting the Controller on the Wall

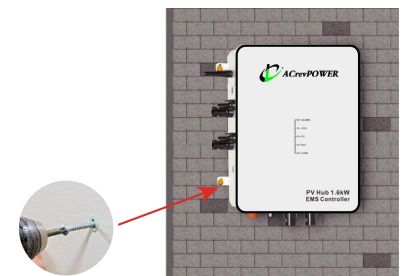
First slide out the four mounting feet from the back of the controller.



1. Align the controller with its mounting holes and insert two screws into the upper side of the controller. Ensure that the screw heads are smaller than the larger side holes of the controller.



2. Slightly lower the controller, allowing it to rest on the smaller side of the mounting hole. Once the controller is in position, securely tighten the screws.



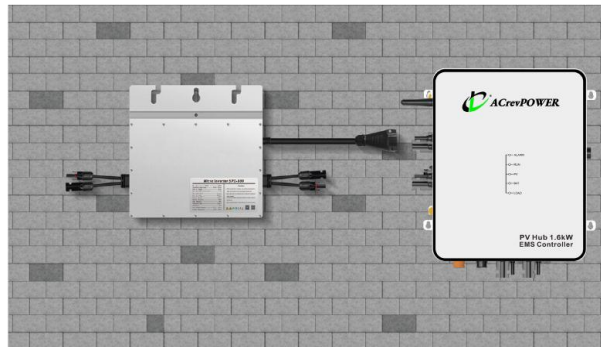
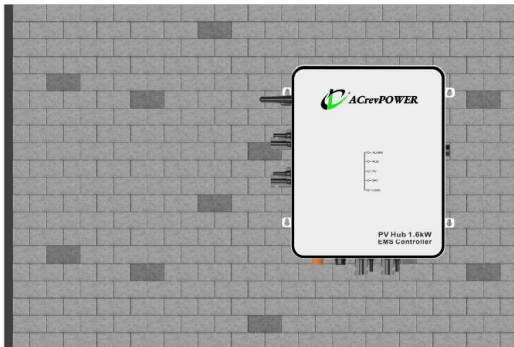
3. Finally, use M4 screws to complete the attachment by screwing them into the lower side of the controller. Ensure a firm and secure connection.

## Step 2 : Mounting the Microinverter on the Wall

### Note

Align the microinverter with the controller on the wall and accurately mark the positions of the mounting feet holes.

Insert screws into the mounting feet holes and gently tighten them, being careful not to over-tighten.



## Step 3 : Microinverters and Controller Connection

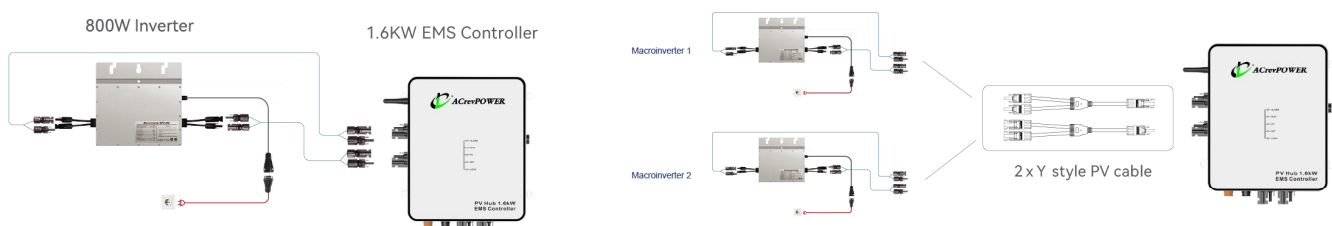
### Note

For a 1.6kW controller, connect the maximum of two microinverters with 800W power output each.

For DC connections, users need suitable connectors compatible with the microinverters and the Controller. Common connectors used in solar installations include MC4 connectors or Amphenol connectors.

If you plan to install one microinverter with 2 independent MPPT inputs, it is recommended to use Inverter-1 to connect MPPT1 input, and Inverter-2 to connect MPPT 2.

If connect with >2pcs microinverter, please buy following Y type PV cable, we suggest you need change it into the solid core pin MC4 connector.



## Step 4 : Controller and Battery Connection

### Warning

For safe operation and regulation compliance, it is strongly recommended to install a separate DC over-current protector or disconnect device between the battery and controller, especially when the current is more than 100 amps.

All wiring must be conducted by qualified personnel. Using appropriate cable for battery connection is crucial for system safety and efficient operation.

Recommended cable

Model	Cable size	Battery voltage
SPD-EMS 1.6kW-pro+	2x8AWG	48V/51.2V

### Battery cable preparation:

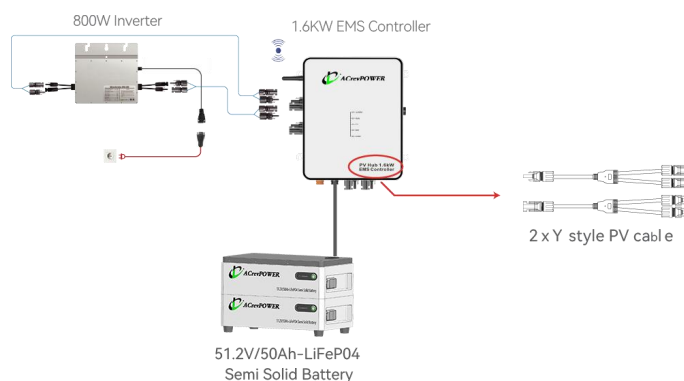
Separate the three components of the DC cable connector provided with accessories, following the provided picture. Strip off about half an inch of insulation from both ends of the cable using cable strippers. Carefully insert the stripped cable ends into the appropriate crimp terminals of the connector. Use a crimping tool to securely crimp the terminals onto the cable strands



### Polarity and correct connections:

Ensure that you connect the positive (+) terminal of the battery to the positive (+) terminal of the controller, and likewise for the negative (-) terminals. Reversing the polarity can lead to equipment damage and safety risks.

## Step 5: PV Connection



## Attention

The 1.6 kW system features two independent MPPT input ports for panels, supporting 800W to 900W each port (equivalent to two 400W to 450W solar panels in parallel).

The MPPT working voltage range is 25-50V, requiring the connection of two solar panels in parallel to connect two PV panels to one MPPT input. You need to purchase a Y-style PV cable with one end having two ports for the panels and the other end with one port for the controller. You can find this cable at your local electrical supply shop.

### PV Cable Preparation:

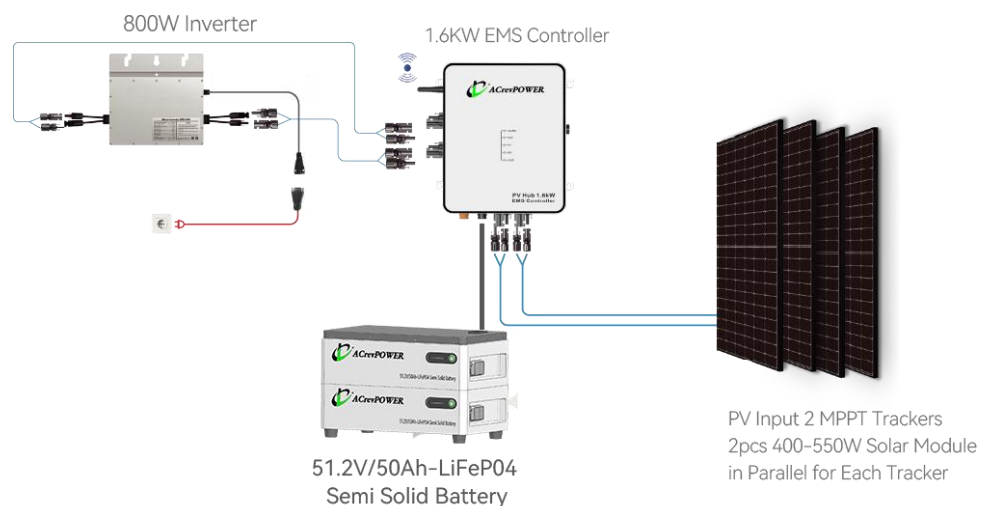
#### a. Connector Installation:

Common connector types used in solar PV systems include MC4 connectors, which typically support a maximum PV current of 30A. If you are using the Y-type 1in2 solar cable, it is recommended to replace it with a solid core pin MC4 connector.



#### b. Solar Panel Connection:

Connect the male and female leads of the solar panels to the corresponding input terminals on the solar controller. Ensure that the male and female connections are securely fastened to prevent any accidental disconnections.



## Step 6: Smart Meter and Grid Connection (optional)

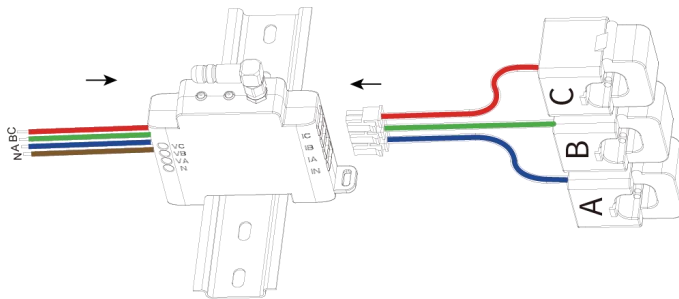
EMS controller is compatible with several kinds of digital power meter (smart meter), please contact local vendor for details.

### Attention

installs in your home's electrical panel using CT sensor clamps that go around your mains and the other circuits you wish to monitor. DIY instructions included, but a professional electrician is recommended.

#### a. Connect the meter's conductors

Base on following pictures, ensuring three power supply cables and conductors are correctly attached to the respective phases port. Typically three-phase meters have A, B, C phases corresponding to the three-phase power supply.

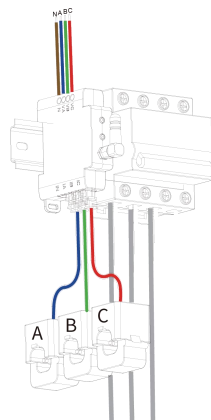


### Note


This EM is used for three-phase power with three hot line and one neutral line. If you want to measure the circuit with 1hot line, you just need clamp-on one conductors con for this line and connect this hot line and neutral line.

#### b. Install the smart EM into your electric panel.

**Step A:** Base on following picture choose a suitable installation location. Put the EM on a rail and lock the bottom fixed buckle.

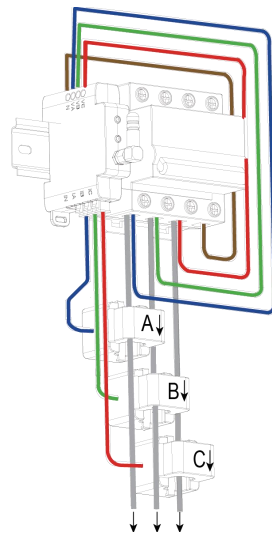


**Step B:** Clamp on each conductor to the correct meter side main service cable, ensure the conductor-A trap the phase-A cable, conductor-B trap the phase-B cable. And same time should ensure the direction of the arrow on the conductor is aligned with the direction of the main service current.

Attention 

The direction of the external EM is from phase1 to phase3 end, and the corresponding AC power line direction is from the grid side to the meter side.

**Step C:** Fix the three-phase power supply cable corresponding to the three-phase meters output A, B, C phases.



Attention 

An incorrect inlet or direction from the external EM to the meter cable can cause damage to the device or incorrect acquisition of data.

**Step D:** Once all connections and wiring are in place, it is time to check the entire system. Verify all components and devices, and then activate the system by turn on the breaker.

Attention 

- ① Please make sure the AC input is Pure Sine Wave. (Municipal electric power is pure sine wave). Please don't use the meter to measure AC power converted from a DC-AC inverter UNLESS you can make sure the output from your DC-AC inverter is Pure Sine Wave.
- ② Applied load should not exceed the rated power.

③ Wiring order cannot be wrong.

**Step E:** Scan follow QR code and download Mic Power set up the net parameter.



**Attention** 

Before setting the parameters, make sure that: The EMS controller already be powered on and activate the EM system by turn on the breaker.

**Step 7: System Unit Check and LED Display, Complete the installation**

**Note** 

Once all connections, wiring, and plugs are in place, it is time to check the entire system. Verify all components and devices, and then activate the system by pressing the power button. The LED display should illuminate, indicating proper functionality.

Indicator	Status	Description	Countermeasure
Alarm	Off	/	Normal
	Fast flashing	High temperature	Automatically cools down; resumes normal operation after a period. However, will stop working if it reaches a certain high temperature.
	Constant On	System Fault	When the alarm red light is on, check for fast flashing lights below. Take corrective actions based on the specific item with fast-flashing lights.
RUN	Once per second Flashing	Normal Operation	/
	Fast Flashing	Upgrade Status	Rare occurrence, only appears during upgrade status
PV	Constant On	Normal Operation	/
	Fast Flashing	Short Circuit	PV input voltage too high or too low, requires repair.
	Off	No Connection	Ensure PV is correctly connected

Bat	Constant On	Normal Operation	/
	Fast Flashing	Overvoltage/ Undervoltage	Test the battery
	Off	No Connection	Ensure BAT is correctly connected, or no power at night
Load	Constant On	Output Open	/
	Once per second Flashing	Normal Operation	/
	Fast Flashing	Short Circuit	Check controller for reverse polarity
	Off	No Output	/

## 6. Install APP and Monitor Your System

The APP facilitates easy control and management of these work for a comprehensive understanding of the Mic Power APP's capabilities, we invite you to explore our Mic Power APP user manual.

a. If you are an Apple user, please download from the App Store or scan the QR code below to download.

b. If you are an Android user, please download it from Goggle Play



Mic Power APP  
Scan the QR code for quick installation

### Attention

Before setting the parameters, make sure that:

- ① The DC side of the inverter is powered on, but no output on the AC side.
- ② Communication is functioning properly between APP and microinverter or controller.
- ③ To keep your account secure, it is recommended to change your password regularly.

## 7. Technical Data Sheet

Item	Parameter
<b>MPPT Solar Charger</b>	
Number of MPPT Trackers	2
PV Operating Voltage	20-60V
MPPT Operating Voltage Range	25-50V
Max. PV Open Circuit Voltage	60Vdc
Max. PV Array Power	2 x 1 Tracker 800W
Standard Charging Current	20A (1600W)
Self Consumption	5W
MPPT Tracking Efficiency	99%



Conversion Efficiency	95%
Protection	PV Reverse, Battery Reverse, Battery Over-Charge, Battery Over-Discharge, Controller Over-Heating
<b>DC Output</b>	
DC Output Power	Controlled by APP
DC Output Port	2(Independent)
DC Output Voltage Range	20~50V
DC Output Max. Current	2*25A
DC Output Max. Power	1600W
<b>Battery</b>	
Battery Type	Sealed , AGM, Gel, Flooded, Lithium , Lithium carbonate
Battery Voltage	Standard 48V(51.2V)
Battery Voltage Range	40V-60V
Battery Charging Overvoltage Protection Value	57.6V(Default)
Battery Discharge Voltage Protection Value	44V(Default)
<b>Communication</b>	
Communication Port	RS485 with battery
WiFi	For APP Remote Monitoring
<b>Energy Management</b>	
Output Power to Microinverter	1600W
Qty of Microinverter	2pcs 800W Microinverter
Limited the Output Power to Microinverter	Set up by APP or Automatically Controlled By the EM
Customized the Output Power at Different Time	Set up By APP
Controller Working Mode	Load priority
<b>Mechanical</b>	
Net Weight	5KG
Dimensions	300*235*70mm
Cooling	Natural Convection-No Fans
Enclosure	IP65
<b>Environment</b>	
Operating Ambient Temperature Range	-40 °C to +85 °C(-40 °F to +185° F )
Storage Temperature	-25 °C to +65 °C(-13°F to +149 ° F )
Humidity	100% Non-Condensing
Warranty	10 Years(Except for vulnerable structural parts (such as terminal blocks, panels, external wiring materials, etc.)
<b>Certification</b>	
Safety	CE and UL