

# User Manual

## PV Intelligent Combiner Box

PVS-16MH/PVS-18MH/PVS-20MH/PVS-24MH





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# 1 About This Manual

## 1.1 Validity

This manual is valid for the following PV intelligent combiner boxes:

- PVS-16MH
- PVS-18MH
- PVS-20MH
- PVS-24MH

Unless otherwise specified, any of the above products is hereinafter referred to as "PVS".



The above models are the same as PVS-24MH in electrical structure, installation method, and usage. But the number of PV inputs connected to each model varies.

## 1.2 Target Group

This manual is for technical personnel who are responsible for the transport, installation, and operations of this product. Readers shall meet at least the following requirements:

- Know electronic, electrical wiring and mechanical expertise, and be familiar with electrical and mechanical schematics.
- Be familiar with the composition and working principles of grid-connected PV power generation system and the front- and rear-level equipment of the PVS.
- Have received professional training related to the installation and commissioning of electrical equipment.
- Be familiar with the relevant standards and specifications of the country/region where the project is located.
- Be familiar with the content of this manual.

Only personnel meeting the above requirements may perform installation, operation and maintenance, overhaul, and other operations on the PVS. Unauthorized personnel must not perform any operations on the PVS to avoid accidents.

## 1.3 How to Use This Manual

Read this manual carefully before transporting and installing the product. Please keep this manual and other materials of components together, and ensure that relevant personnel can easily access and use them.

All contents, pictures, marks, and symbols in the manual are owned by SUNGROW. No part of this document may be reprinted by the non-internal staff of SUNGROW without written authorization.

In order to continuously improve customer satisfaction, products, and product manuals of SUNGROW are always in the process of improvement and upgrade. If your manual is not in accord with the product, it may due to the product version upgrade, and the actual product shall prevail. For any questions, please contact Sungrow Customer Service.

## 1.4 Symbol Explanations

This manual contains important instructions, which are highlighted with relevant symbols, to ensure personal and property safety during usage, or to help optimize the product performance in an efficient way.

Symbols that may be used in this manual are listed below. Please read them carefully to make better use of this manual.

### DANGER

**indicates a hazardous situation which, if not avoided, will result in death or serious injury.**

### WARNING

**indicates a hazardous situation which, if not avoided, can result in death or serious injury.**

### CAUTION

**indicates a slightly hazardous situation which, if not avoided, may result in minor or moderate injury.**

### NOTICE

**indicates potential risks that, if not avoided, can lead to device malfunctions or financial losses.**



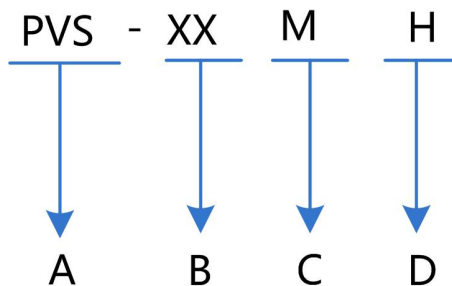
Indicates additional information in this manual. This information emphasizes or supplements the content and may provide tips to better use the product, helping you solve problems or save time.

Always note hazard warnings on the device enclosure.

| Marks                                                                             | Explanation                                                                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|  | High voltage inside! Risk of electric shock by touching it!                                     |
|  | Protective ground terminal which needs to be firmly grounded to ensure the safety of operators. |

## 1.5 Model Description

Description of the PVS model is as follows:



Each letter means:

- A: Code of the PVS
- B: Max. number of PV strings in parallel
- C: With monitoring function
- D: High voltage, up to 1,500Vdc

## 1.6 Related Documents

With the inverter SCU, the functions of the PVS can be configured. Scan the QR code below to access the SCU user manual.

SCU1100 User Manual



<https://en.sungrowpower.com/contactUS>

## 2 Safety Instructions

Please read this chapter carefully when installing and using the PVS. SUNGROW reserves the right not to assume responsibility and quality assurance for any personal injury or device damage due to failure to observe these safety precautions.

### DANGER

**There is a high voltage in the PV string. Accidental contact may cause fatal electric shock or severe burns. When wiring the PVS, observe the following safety precautions:**

- Before wiring, please disconnect the end of PV strings.
- Before wiring, do not use an ordinary multimeter to measure the DC voltage. A multimeter with a withstand voltage of at least 1500V is recommended. Otherwise, serious damage may follow.
- Please follow all safety instructions of the PV module manufacturer.

### DANGER

**Damaged equipment or system failure may cause electric shock or fire!**

- Before operation, visually check the equipment for damage or other dangerous conditions.
- Check whether other external devices or circuit connections are in a safe state.

**Make sure the device is in a safe state before operating.**

### DANGER

**Touching the internal terminals of the equipment may result in electric shock or fire!**

- Do not touch the terminals or conductors connected to the inverter or string.
- Pay attention to all instructions or safety documents regarding the connection of PVS.

### DANGER

**High voltage inside! Risk of electric shock!**

- Note and observe the warnings on the product.
- Respect all safety precautions listed in this manual and other pertinent documents.

**⚠ DANGER**

The grounding cable must be well connected to ground, otherwise:

- It may cause fatal electric shock to the operator in case of failure!
- The equipment may be damaged when struck by lightning!

**⚠ WARNING**

Incorrect cable connection can cause damage to PV modules, the PVS, and inverters. When wiring, observe the following precautions:

- Wire according to the wiring drawing.
- Measure the open circuit voltage of strings before wiring to ensure that the DC input voltage range meets the requirements of the PVS.
- Distinguish the positive and negative polarity of strings before wiring, and ensure that there is no ground fault.

**⚠ WARNING**

- Only professional electricians or qualified personnel can operate and wire the product.
- Operations and wiring must be done in accordance with relevant national and local standards.
- Warning signs must be legible and should be replaced immediately if damaged.

**⚠ WARNING**

Make sure that the fastening screws on terminals of the PVS are fastened in place. If the copper core of the cable cannot be fully contacted with the wiring terminal and pressed tightly, the terminal will be heated and burned after a prolonged period. Use stranded copper core flame-retardant cables with the wire diameter not less than the recommended value in the appendix.

Fasten the screw cap of the waterproof terminal in place, otherwise, it may cause water leakage and damage to the PVS.

**⚠ WARNING**

Disconnect loads before checking and replacing fuses! Install or take out fuses when there is no load connected to avoid arc damage to the equipment and personal injury.

**NOTICE**

**Be sure to lock the door after operation.**

**Do not open the door cover of the PVS frequently to avoid affecting its waterproof performance.**

**⚠ CAUTION**

**Touching the PCB or other static sensitive components may cause damage to components.**

- **Do not touch other parts inside the cabinet except the terminals during installation.**
- **Observe the regulations to protect against electrostatic and wear an anti-static wrist strap.**



## 3 Product Description

### 3.1 Product Introduction

#### 3.1.1 Overview

For large-scale grid-connected PV power generation systems, it is generally necessary to add a DC combiner device between PV modules and inverters to minimize cable connections, facilitate maintenance, and improve reliability.

The PVS independently developed and produced by SUNGROW is an outdoor combiner box. It is designed for meeting these requirements and provides a Turnkey solution for PV systems together with SUNGROW's PV inverters.

#### 3.1.2 Main Features

##### **Safe and Reliable**

- 1500V photovoltaic fuse for safer system
- Special secondary lightning arrester for photovoltaic system
- Integrated communication lightning protection function to enhance communication reliability
- IP65 protection level, meeting the requirements for outdoor installation and use

##### **Flexible Plan**

- Support PV cable specific connector terminal design for easy wiring
- Output supports copper or aluminum core cables, easy to select
- Optional DC PLC communication, cost networking
- Optional 16, 18, 20, 24 inputs, flexible design
- Support SCU for one click networking of DC PLC in combiner box
- Support SCU to automatically search and allocate addresses to combiner boxes through RS485
- Support iSolarCloud App, batch set addresses for combiner boxes through SCU

##### **Convenient Operation and Maintenance**

- Module design, easy and fast maintenance
- Built in monitoring module, real-time monitoring of output switch status
- Monitoring of string current and bus voltage to promptly detect string abnormalities

### 3.1.3 Application Scenarios

The PVS in line with outdoor standards developed and produced by SUNGROW is mainly used in large and medium-sized PV plants. It adopts a modular design to achieve fast installation and to ensure a long-term, reliable, and safe grid-connected operation of the PV plant.

A PV power generation system with the PVS is shown in below.

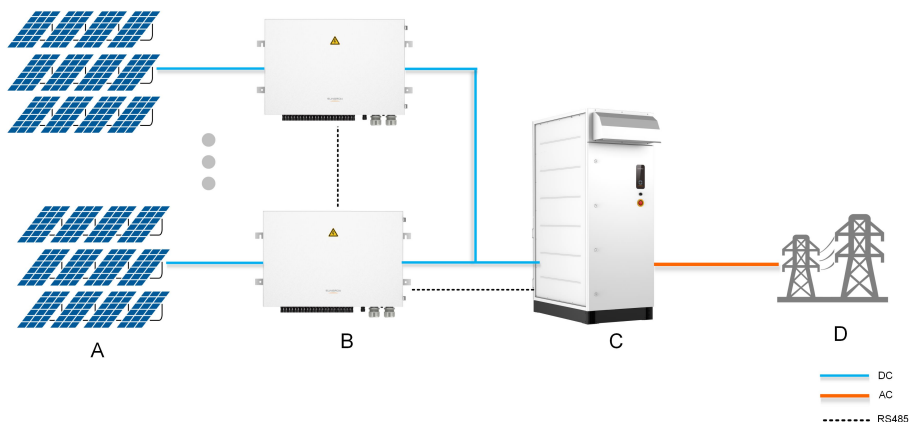


figure 3-1 Composition of grid-connected PV generation system

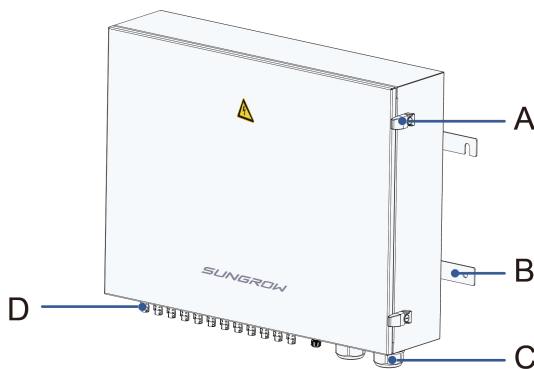
table 3-1 Device description

| No. | Device            |
|-----|-------------------|
| A   | PV array          |
| B   | PVS               |
| C   | Inverter          |
| D   | Public power grid |

## 3.2 External Structure

### 3.2.1 Appearance

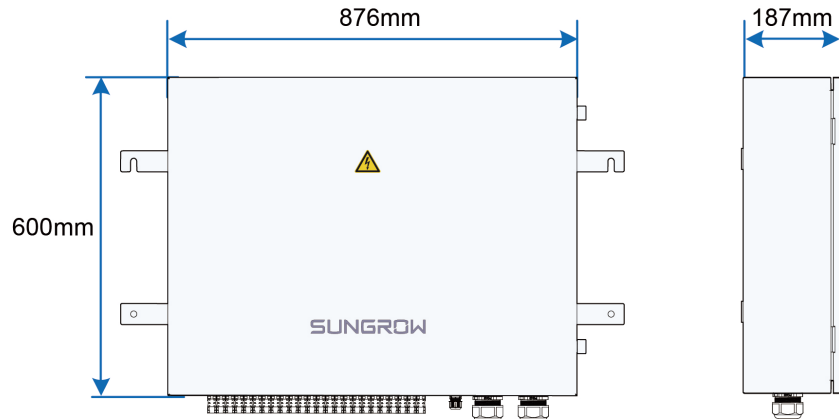
Taking PVS-24MH as an example, the appearance of the PVS is shown in the figure below.



| No. | Name                           |
|-----|--------------------------------|
| A   | Door lock                      |
| B   | Mounting hanger                |
| C   | Waterproof terminal            |
| D   | Special connector for PV cable |

### 3.2.2 External Dimensions

The external dimensions of the combiner box are shown in the following figure.



### 3.3 Internal Structure

Taking PVS-24MH-CN as an example, the internal structure of the PVS is shown in the figures below.

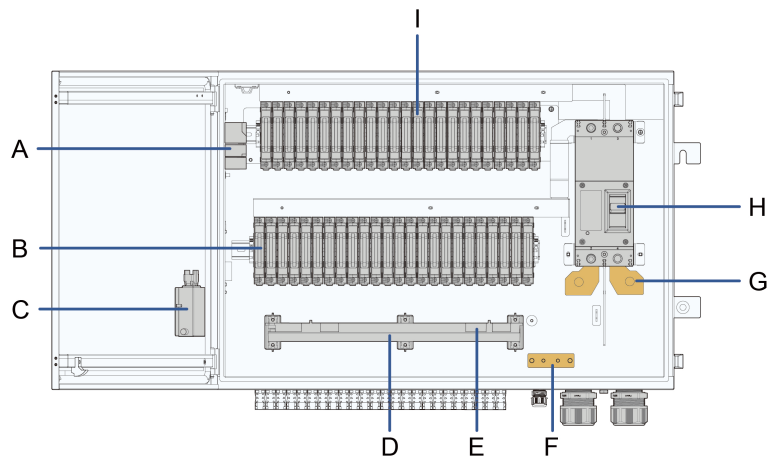


figure 3-2 Negative fuse version

\* Figures are for reference only. The product received may differ.

| No. | Description                                                  |
|-----|--------------------------------------------------------------|
| A   | SPD                                                          |
| B   | Positive DC fuse holder and fuse                             |
| C   | Extended handle for operating load switches/circuit breakers |
| D   | Monitoring panel                                             |
| E   | RS485 communication terminal                                 |
| F   | Grounding point, for equipotential connection                |
| G   | DC output wiring terminal                                    |
| H   | Load switch/ Circuit breaker                                 |
| I   | Negative DC fuse holder and fuse                             |

### Monitoring Panel

The monitoring panel monitors the current of each string and uploads the current data to the host computer through RS485 or DC PLC communication. Users can judge whether modules are faulty by comparing the actual current value with the set value.

| No.   | Indicator light status | Description                                                                         |
|-------|------------------------|-------------------------------------------------------------------------------------|
| Green | Blinking               | Normal operation                                                                    |
|       | Blinking               | Device malfunction                                                                  |
| Red   | Steady on              | Device malfunction or communication abnormality, with priority given to malfunction |



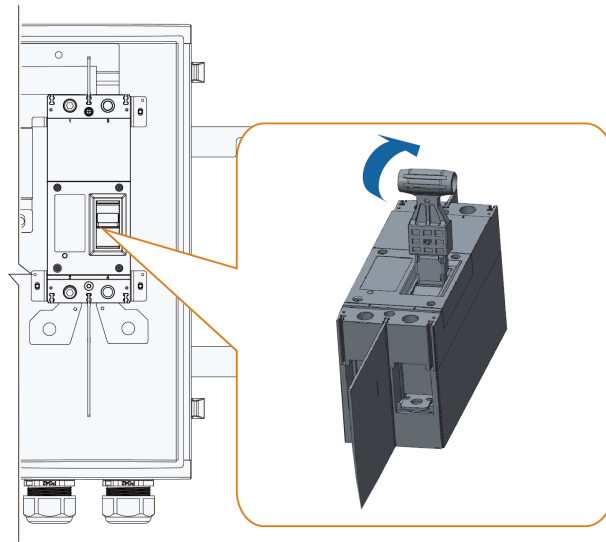
When both the device malfunction and communication abnormality occur, the indicator light turns red and blinking, prioritize handling device malfunction.

### SPD (Surge Protection Device)

The PVS is equipped with built-in SPD to prevent transient over-voltage caused by lightning. The SPD failure signal can be sent to the PC through the RS485 or DC PLC.

### Extended Handle

The PVS is equipped with an extended handle inside, inserted into the load switch/circuit breaker, and pulled upwards to close the load switch/circuit breaker.



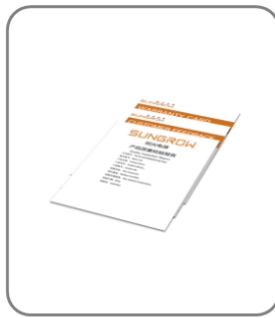
**figure 3-3** Close the load switch/circuit breaker

## 4 Delivery and Storage

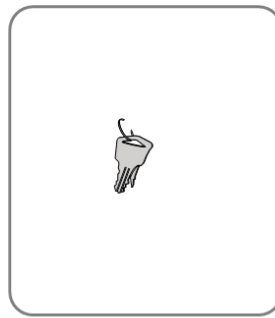
### 4.1 Scope of Delivery



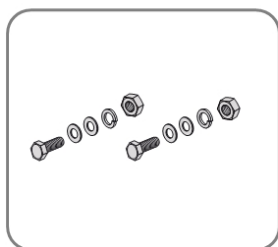
A



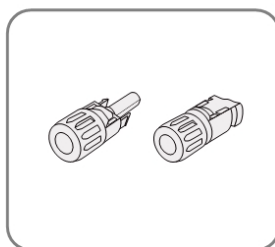
B



C



D



E

| No. | Name                           | Description                                                                        | Quantity                 |
|-----|--------------------------------|------------------------------------------------------------------------------------|--------------------------|
| A   | PVS                            | -                                                                                  | 1                        |
| B   | Related documents              | Including certificate, warranty card, factory inspection report, user manual, etc. | 1                        |
| C   | Key                            | To open the cabinet door of the PVS                                                | 1                        |
| D   | Bolt assembly                  | M5                                                                                 | 1                        |
|     |                                | M8                                                                                 | 1                        |
|     |                                | M16                                                                                | 2                        |
| E   | Special connector for PV cable | To connect the PV input                                                            | 16 pairs <sup>a)</sup> / |
|     |                                |                                                                                    | 18 pairs <sup>b)</sup> / |
|     |                                |                                                                                    | 20 pairs <sup>c)</sup> / |
|     |                                |                                                                                    | 24 pairs <sup>d)</sup>   |

Note :

Parameters noted with a) apply to PVS-16MH;  
Parameters noted with b) apply to PVS-18MH;  
Parameters noted with c) apply to PVS-20MH;  
Parameters noted with d) apply to PVS-24MH.



Installation tools, cables, and crimping terminals are not included in the delivery scope and need to be provided by the user themselves.

## 4.2 Checking for Transport Damages

The PVS has been strictly inspected and firmly packed before delivery. Despite robust packaging, the PVS may be damaged during transport.

For this reason, please conduct a thorough inspection after receiving the PVS. Verify at least the following items:

- Check the scope of delivery for completeness according to the packing list.
- Confirm that the model of the PVS and internal equipment received is consistent with your order.
- Check the internal and external components to see if any damage has occurred during transportation.

Contact the forwarding company or SUNGROW in case of any damage or incompleteness.

### WARNING

**Only intact and undamaged PVS can be installed and started for commissioning. Ensure the following items before installation:**

- **The PVS is in good condition, without any damage.**
- **All internal and external equipment is in good condition, without any damage.**

## 4.3 Storage

If the PVS is not put into use immediately, store it under specific environmental conditions:

- Store the PVS with outer package in a ventilated, dry, and tidy indoor environment with desiccant retained.
- The storage carrier should be solid enough to bear the weight of the PVS and its outer package.
- The number of stacking layers of PVSs cannot exceed the "stacking layer limit" marked on the outer box.
- The packing box cannot be tilted or turned upside down.
- Ensure that the storage environment is well ventilated and free of moisture and water.

- The storage environment should be at the temperature of  $-40\text{ }^{\circ}\text{C} \sim +70\text{ }^{\circ}\text{C}$  and the relative humidity of  $0 \sim 95\%$ , and free of condensation.
- Pay attention to possible hazards in the surrounding environment, such as sudden temperature changes or collisions, to prevent any damage to the PVS.
- If the PVS has been stored for more than half a year, comprehensive inspection and testing by professionals are required before it can be put into operation
- Conduct regular inspection, generally not less than once a week. Check that the packaging is not damaged in any way and prevent any damage that may be caused by pests and animals. Replace the packaging immediately if it is damaged.

**NOTICE**

**Storage without packaging is strictly prohibited!**

**Storage outdoors or in direct sunlight is strictly prohibited!**

**Tilting the PVS or placing it upside down is strictly prohibited!**

**NOTICE**

**After long-term storage, a thorough inspection should be carried out to determine whether the PVS is intact before installation. If necessary, request professionals for testing before installation.**



## 5 Transport and Installation

### 5.1 Transport

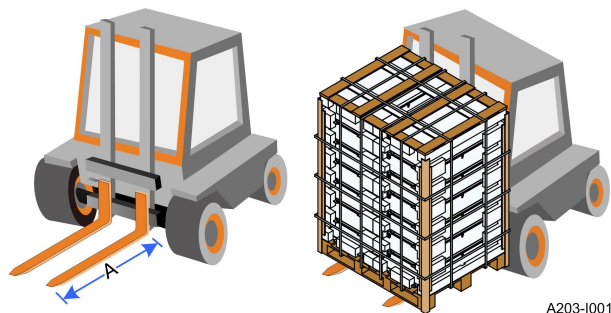
The combiner box will be transported to the power station site, and the on-site management personnel of the power station will negotiate and arrange for delivery and unloading. Transfer of combiner box after delivery. Move to the final position and select the corresponding transportation method according to the factory packaging.

Multiple fully packaged combiner boxes can be moved using forklifts, pallet trucks, or cranes. When moving, pay attention to the weight of the combiner box and ensure that the transport equipment has sufficient load-bearing capacity. Rationally arrange the support or lifting points. Single packaged combiner boxes can be directly moved to the site. When moving, pay attention to avoiding wear on the outer surface of the combiner box.

#### 5.1.1 Transporting with Forklift

Transporting the PVS with a forklift is standard practice. During transportation, perform a test lift with the forklift first, and ensure that the center of gravity of the packaging box is positioned between the two forks. The length of the forks (A in the figure below) should be at least 1.2 m.

Lift, lower, and move the PVS slowly and steadily throughout the entire process. Ensure the PVS is placed only on solid, stable ground.



#### 5.1.2 Transporting with Pallet Truck

Pallet trucks can be used for transportation if the path is smooth and stable. During transportation, perform a test lift with the pallet truck first, and ensure that the center of gravity of the packaging box is positioned between the two forks. The length of the forks should be at least 1.2 m.

Lift, lower, and move the PVS slowly and steadily throughout the entire process. Ensure the PVS is placed only on solid, stable ground.

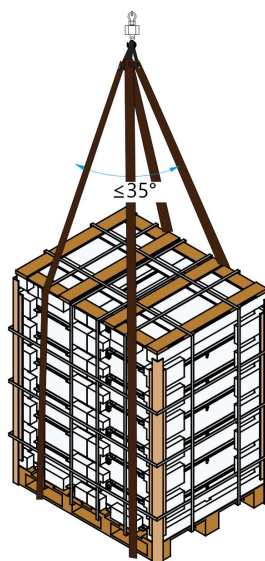
Strictly adhere to the relevant safe operating procedures throughout the entire transportation process.

### 5.1.3 Transporting with a Crane

Cranes can be used to lift and move the PVS. Before lifting, attach two flexible synthetic slings to the designated lifting points at the bottom of the outer packaging box. Ensure that the lifting hook is aligned with the box's center of gravity along the same vertical line. The device must not be tilted during lifting or transportation.

Lift, lower, and move the PVS slowly and steadily throughout the entire process. Ensure the PVS is placed only on solid, stable ground.

Strictly adhere to the crane's safe operating procedures when lifting the PVS. Stop lifting immediately in severe weather conditions, such as heavy rain, thick fog, and strong winds.



## 5.2 Installation Environment Selection

The PVS can be installed outdoors or indoors. The following requirements should be met:

- Dimensions and weight of the PVS shall be fully considered. Try to install the PVS near PV modules for better work performance and less cable usage.
- The ambient temperature of the installation site should be between  $-40^\circ\text{C} \sim +60^\circ\text{C}$ , and the relative humidity should be between 0~95%. It should be installed in a dry, well-ventilated, and dust-proof place.
- For large-scale utility plant projects, the PVS should be vertically installed in a dark place on mounting brackets of PV modules. Reserve sufficient space around the PVS for better heat dissipation and easier daily maintenance.

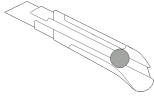
**NOTICE**

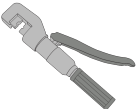
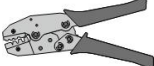
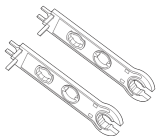
**Moisture during the installation process will cause damage to the PVS. Do not install the PVS in rainy days or when the air humidity is high.**

**After installation, the waterproof terminal must be tightened to prevent water vapor from entering. After wiring, the unused terminals must be blocked.**

### 5.3 Preparation Before Installation

#### Tools

| General Tools                                                                                                                   |                                                                                                                  |                                                                                                        |                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Marker pen<br>                                 | Tape<br>                        | Level ruler<br>       | Tool knife<br>        |
| Multimeter<br>Range: $\geq 1500\text{Vdc}$<br> | Anti-static wrist strap<br>     | Protective gloves<br> | —                                                                                                        |
| Dust mask<br>                                | Sound insulation earplugs<br> | Goggles<br>         | Insulated shoes<br> |
| Vacuum cleaner<br>                           | Heat-shrink tube<br>          | Heat gun<br>        | —                                                                                                        |
| Installation Tools                                                                                                              |                                                                                                                  |                                                                                                        |                                                                                                          |

| General Tools                                                                                               |                                                                                                               |                                                                                                                                |                                                                                                      |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| $\phi 11$ impact drill<br> | M10 electric screwdriver<br> | M10 screwdriver<br>                           | Wire stripper<br> |
| Hydraulic clamp<br>        | Crimping tool<br>            | Wrench for special connector for PV cable<br> | Wire cutter<br>   |

## 5.4 Installing PVS

### Overview

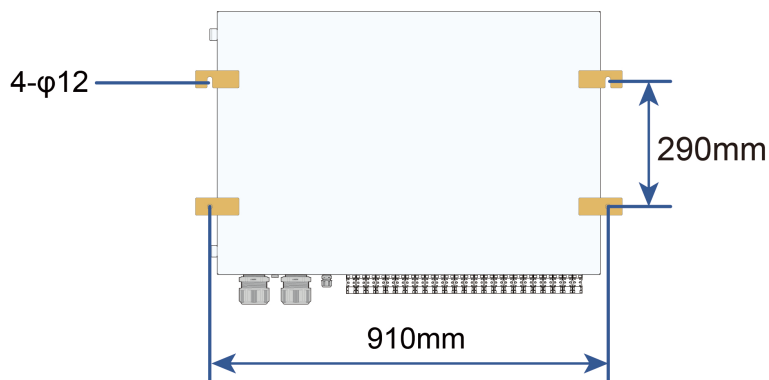
The PVS is fixed to the installation plane by hangers. Therefore, ensure that hangers are installed to the back of the PVS before fixing the PVS to the installation plane.

### NOTICE

The installation area of the combiner box should be far away from areas washed away by rainwater, and it is recommended to install it on the back of the battery panel.

### Installation Distance

The distance between the hangers on the back of the combiner box is shown below.



On site, drill holes for the installation beam based on the distance of the hangers.

### 5.4.1 Vertical Installation

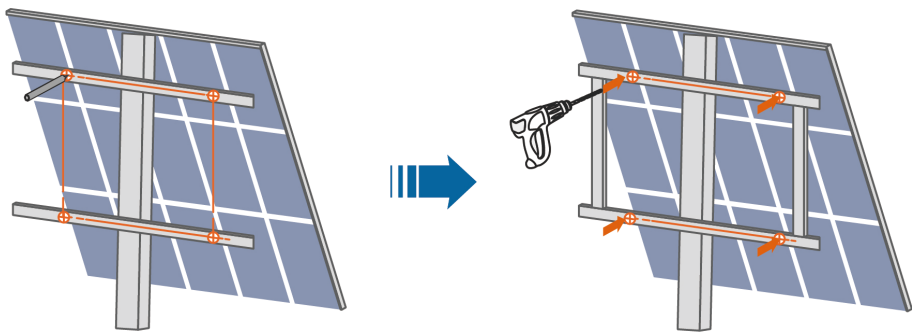
Install the PVS on the bracket or the back of the PV module at a suitable height to facilitate future maintenance.



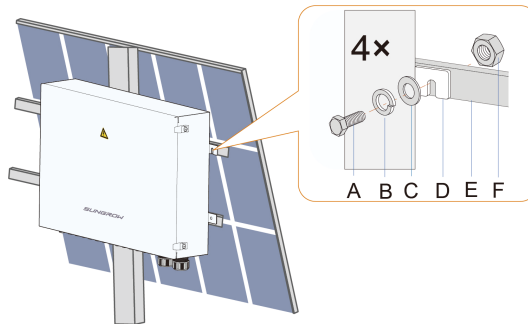
Add washers to compensate for any misalignment between the surfaces of the two beams on the PV module bracket. Ensure the beams remain aligned in the same plane as closely as possible to prevent the deformation of the PVS.

#### 5.4.1.1 Single-post Mounting Structure

**Step 1** Mark positions on the back of the PV module according to the distance between the hangers, and drill holes according to the marks.



**Step 2** Anchor the PVS to the bracket in the sequence shown in the figure below, where the recommended torque is:  $51 \pm 0.7$  N.m.

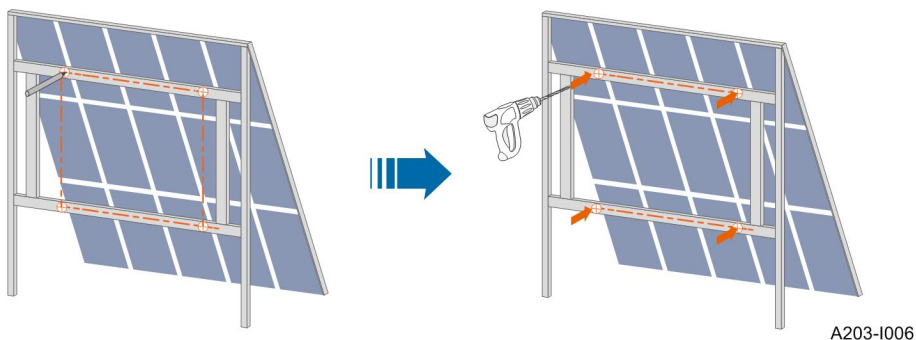


-- End

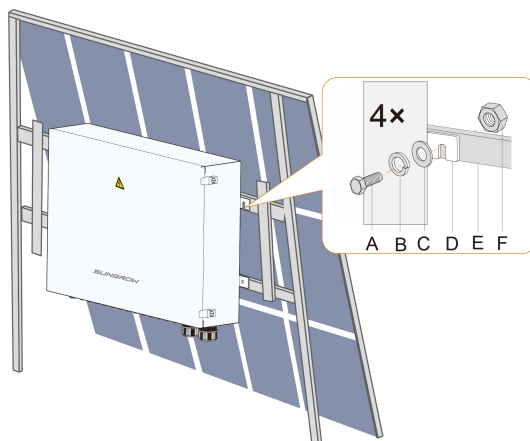
| No. | Name              | Description                  |
|-----|-------------------|------------------------------|
| A   | M10 bolt          | Beyond the scope of delivery |
| B   | Spring washer     | Beyond the scope of delivery |
| C   | Flat washer       | Beyond the scope of delivery |
| D   | PVS hangers       | —                            |
| E   | PV module bracket | Beyond the scope of delivery |
| F   | Nut               | Beyond the scope of delivery |

### 5.4.1.2 Dual-post Mounting Structure

**Step 1** Mark positions on the back of the PV module according to the distance between the hangers, and drill holes according to the marks.



**Step 2** Anchor the PVS to the bracket in the sequence shown in the figure below, where the recommended torque is:  $51 \pm 0.7$  N.m.

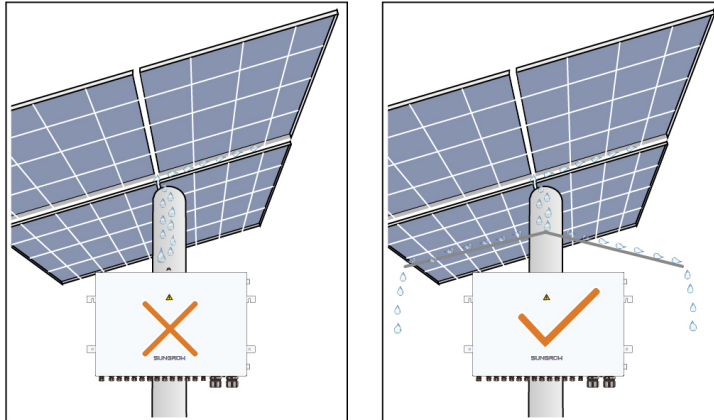


-- End

| No. | Name              | Description                  |
|-----|-------------------|------------------------------|
| A   | M10 bolt          | Beyond the scope of delivery |
| B   | Spring washer     | Beyond the scope of delivery |
| C   | Flat washer       | Beyond the scope of delivery |
| D   | PVS hangers       | —                            |
| E   | PV module bracket | Beyond the scope of delivery |
| F   | Nut               | Beyond the scope of delivery |

### 5.4.1.3 Subsequent Processing (Optional)

If the PVS is installed at the rainwater confluence, a protective cover should be installed on the top of the PVS to avoid rainwater scouring and damage to the PVS.



## 5.4.2 Horizontal Installation



The combiner box supports installation in a floating power station environment on the water surface. When applied in this scenario, it is recommended to use a horizontal installation method.

### 5.4.2.1 Installation Requirements

Take into account the below requirements when designing a mounting structure for the PVS:

- Consider the climatic conditions at the site. Take protective measures against rain and snow if necessary.
- Tighten the waterproof connectors at the torques specified in this manual. Ensure the connectors are secure and well-sealed.
- Keep the cables lying naturally straight. Avoid applying stress to the cables.

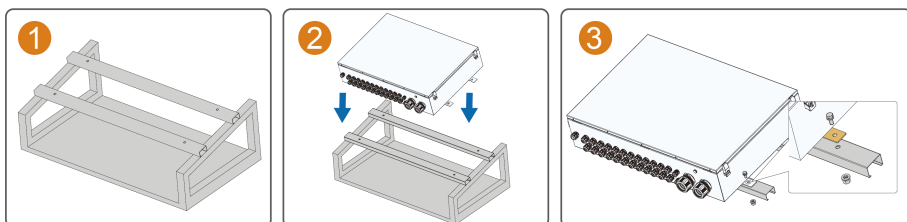
### 5.4.2.2 Procedure

**Step 1** Drill holes in the mounting brackets in advance according to the above distances.

**Step 2** Move the PVS onto the brackets and align the positioning holes at the bottom of the PVS with the holes on the brackets.

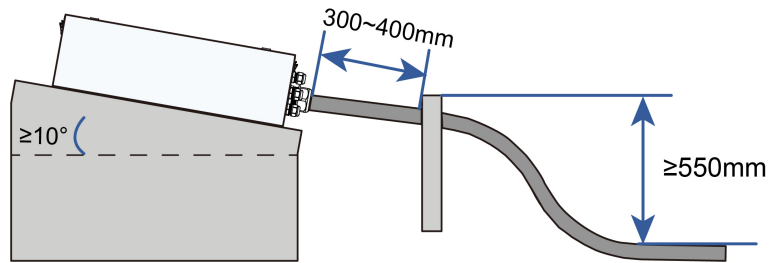
**Step 3** Use M10 bolt assemblies to secure the PVS to brackets with a tightening torque of 16N.m. (The specific bolt length can be adjusted according to the actual situation on site.)

-- End



### 5.4.2.3 Cable Securing and Protection

- The installation angle should meet the specified requirements.
- The waterproof connectors should be  $\geq 550\text{mm}$  off the ground.
- Secure the cables with cable ties at a distance of 300–400mm from the waterproof connectors. This prevents the connectors from loosening due to stress caused by cable hanging down or swaying, hence avoiding impairing the ingress protection for the PVS.





## 6 Electrical Connection

### 6.1 Safety Instructions

#### **⚠ DANGER**

**Electrical Hazard! All operations must only be performed by qualified personnel.**

#### **⚠ WARNING**

**Do not connect the positive and negative cables in reverse. Otherwise, the device may be damaged.**

#### **⚠ WARNING**

**Do not work on the device while it is connected to a load.  
Fuse installation and removal must only be carried out when no load is connected.**

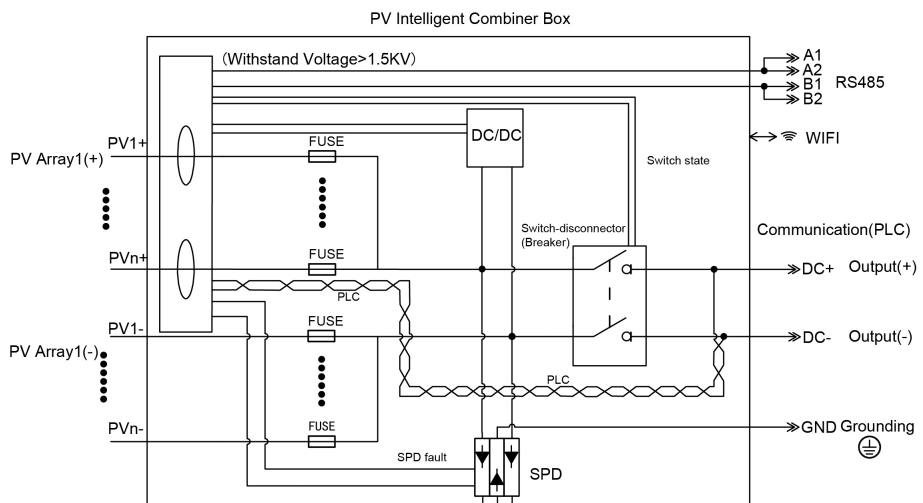
#### **⚠ WARNING**

**Disconnect the SPD before performing insulation withstand voltage testing.**

#### **NOTICE**

**Verify that the input voltage is within normal range before powering on.**

### 6.2 Wiring diagram



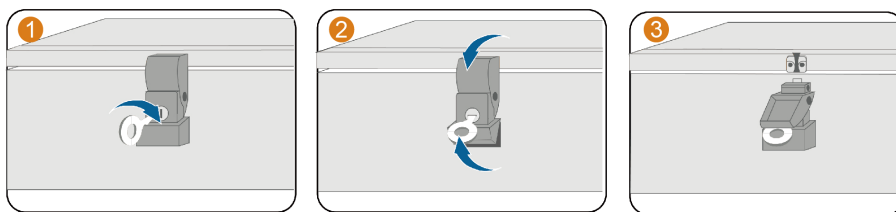
## 6.3 Preparation before Electrical Connections

### 6.3.1 Opening Cabinet Door

#### NOTICE

To prevent moisture from entering the cabinet, do not open the cabinet door in rainy or snowy days. If it is unavoidable, please take protective measures.

Use the dedicated key in the delivery to open the combiner box.

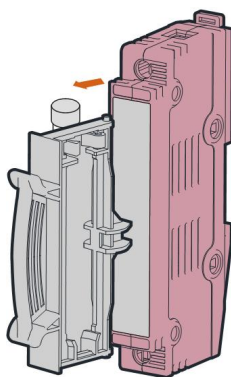


### 6.3.2 Power-off Preparation

**Step 1** Check whether the load switch / circuit breaker of the PVS is in the "OFF" position.

**Step 2** Disconnect the fuse. The fuse has been installed in the fuse holder before delivery. Before electrical connection, pull out the fuse holder to disconnect the fuse.

-- End



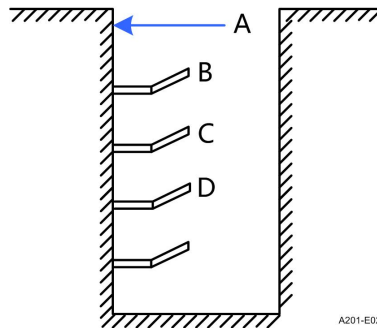
### 6.3.3 Cable Requirements

| Model               | PVS-16MH / 18MH / 20MH /24MH                                                                                                 |
|---------------------|------------------------------------------------------------------------------------------------------------------------------|
| Input cable         | Specifications: special connector for PV cable                                                                               |
|                     | Stripped length: 10 mm                                                                                                       |
|                     | Tightening torque: 2.5~3N.m                                                                                                  |
| Output cable        | Specifications: 120~400 mm <sup>2</sup> (copper wire) flame-retardant cable                                                  |
|                     | Stripped length: 35 mm                                                                                                       |
|                     | Screw: M16<br>Tightening torque: 119~140N.m                                                                                  |
| Communication cable | Specifications: 2 x 0.75 mm <sup>2</sup> ~ 2 x 1.5 mm <sup>2</sup> (outer diameter 5 mm ~ 10 mm) shielded twisted pair cable |
|                     | Stripped length: 7 mm                                                                                                        |
| Grounding cable     | Specifications: stranded flame-retardant copper wire with outer diameter of 10 mm ~ 14 mm                                    |
|                     | Stripping length: 15 mm or 25 mm                                                                                             |
|                     | Screw: M5 or M8<br>Tightening torque: 4.4±0.4N.m or 20.5±2.5N.m                                                              |

### 6.3.4 Cable Layout

Lay cables between the PVS and external devices in cable trenches for easy installation and maintenance. Cable trenches should be designed and constructed in accordance to related regulations, and the quantity and dimensions of devices.

Lay the positive output cable, negative output cable, and communication cable of the PVS in different layers of support arms within the cable trench, as shown in the figure below. This arrangement helps prevent short circuits if the cable insulation is damaged. Users can determine the number of support arms based on their actual needs.

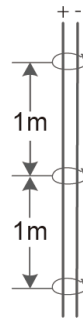


Note: Figures here are for reference only, and users can make adjustment as needed.

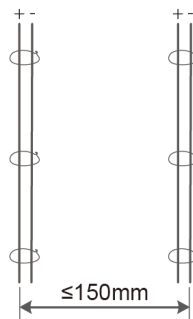
| No. | Name                                    |
|-----|-----------------------------------------|
| A   | Cable trench                            |
| B   | Supporting arm of positive output cable |
| C   | Supporting arm of negative output cable |
| D   | Supporting arm of communication cable   |

The PVS adopts PLC communication. Ensure the output cables meet the following requirements during wiring:

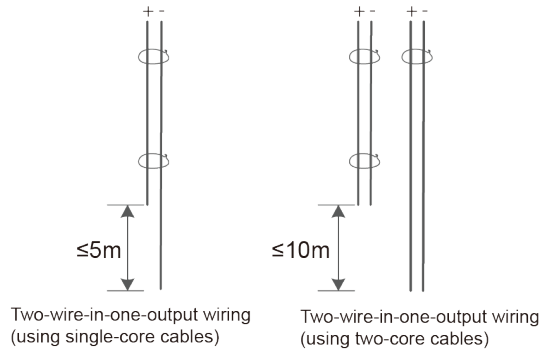
- The cable length should not exceed 1000 m.
- In terms of one-wire-in-one-output wiring (one in output+ and one in output-) using single-core cables, secure the positive and negative cables together with a cable tie every 1 m.
- In terms of two-wire-in-one-output wiring (two in output+ and two in output-) using single-core cables, for each set of cables respectively, secure the positive and negative cables together with a cable tie every 1 m.



- For two-wire-in-one-output wiring, the maximum allowable space between the two sets of cables is 150 mm.



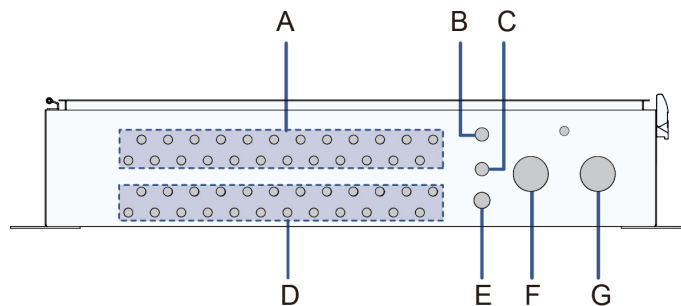
- For two-wire-in-one-output wiring using single-core cables, the length difference between the two sets of cables should not exceed 5 m.
- For two-wire-in-one-output wiring using two-core cables, the length difference between the two sets of cables should not exceed 10 m.



If the length difference between the two sets of cables exceeds the limit, the communication may be compromised due to signal waveform distortion from signal reflection.

### 6.3.5 Waterproof Connector and Cable Specification

The bottom of the combiner box is equipped with waterproof terminals for input, output, communication, grounding, etc.



| No. | Description                                  | Model                          | Cable outer diameter<br>( mm ) |
|-----|----------------------------------------------|--------------------------------|--------------------------------|
| A   | Waterproof terminal for positive input       | Special connector for PV cable | 4.7~6.4                        |
| B   | Waterproof terminal for communication input  | PG-11                          | 5~10                           |
| C   | Waterproof terminal for communication output |                                |                                |
| D   | Waterproof terminal for negative input       | Special connector for PV cable | 4.7~6.4                        |
| E   | Waterproof terminal for grounding            | PG-16                          | 10~14                          |
| F   | Waterproof terminal for positive output      | M50                            | 20-38                          |

| No. | Description                                | Model | Cable outer diameter<br>( mm ) |
|-----|--------------------------------------------|-------|--------------------------------|
| G   | Waterproof terminal for<br>negative output |       |                                |

**NOTICE**

If no waterproof connectors are used, use a plug cap to seal the gap.

## 6.4 Input Connections

### 6.4.1 Safety Precautions

#### **DANGER**

There is a high voltage in the PV string. Accidental contact may cause fatal electric shock or severe burns. When wiring the PVS, observe the following safety precautions:

- Before wiring, please disconnect the end of the PV string.
- Before wiring, do not use an ordinary multimeter to measure the DC voltage. A multimeter with a withstand voltage of at least 1500V is recommended. Otherwise, serious damage may follow.
- Please follow all safety instructions of the PV module manufacturer.

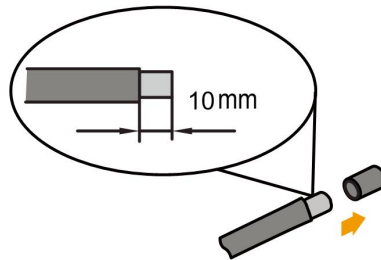
#### **WARNING**

Incorrect cable connection can cause damage to PV modules, the PVS, and inverters. When wiring, observe the following precautions:

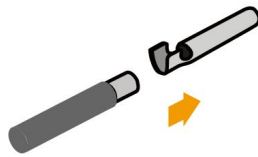
- Wire according to the wiring drawing.
- Measure the voltage of positive and negative polarities of each string by a multimeter with a withstand voltage of at least 1500V and ensure there is no reverse connection before wiring;
- Distinguish the positive and negative polarity of strings before wiring, and ensure that there is no ground fault.
- Star-shape wiring is not supported on site.

### 6.4.2 Special Connector for PV Cable

**Step 1** Strip off the insulation layer of 10mm from the positive and negative DC cables.

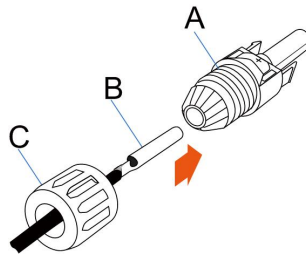


**Step 2** Crimp the metal contacts onto the stripped wires using a crimping tool.



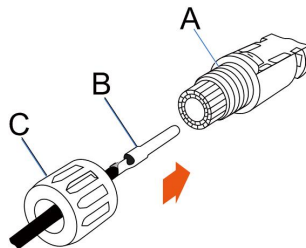
**Step 3** Connect the cables as shown below. Pull the cable gently to make sure it is secured.

—Connect the positive input cable as shown below.



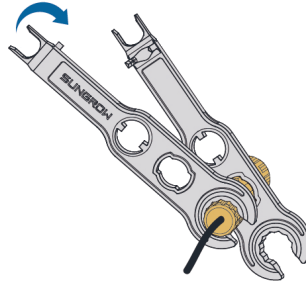
| A                        | B                    | C             |
|--------------------------|----------------------|---------------|
| Positive input connector | Positive Input cable | Sealing cover |

—Connect the negative input cable as shown below.

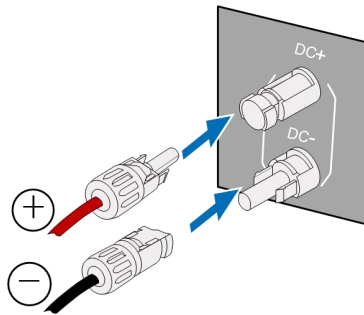


| A                        | B                    | C             |
|--------------------------|----------------------|---------------|
| Negative input connector | Negative Input cable | Sealing cover |

**Step 4** Gently pull the cable backward to ensure firm connection. Tighten the cable gland and the insulator (torque 2.5 N.m to 3 N.m).



**Step 5** Connect the PV connectors to corresponding terminals until there is an audible click.



**Step 6** Connect other PV terminals according to the above steps.

**Step 7** Seal the unused PV terminals with the special connector for PV cable compatible waterproof caps.

-- End

**⚠ WARNING**

After wiring, it is strictly prohibited to seal the gap between cables and the special connector for PV cable with fireproof mud.

## 6.5 Output Connections

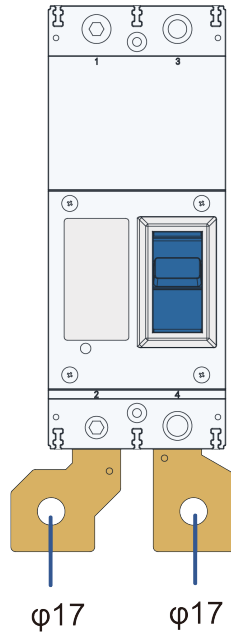
### Preparation Before Wiring

Unscrew the waterproof connectors at the DC output port of the PVS.

Open the protective cover of the output terminals.

### Overview of Wiring Area





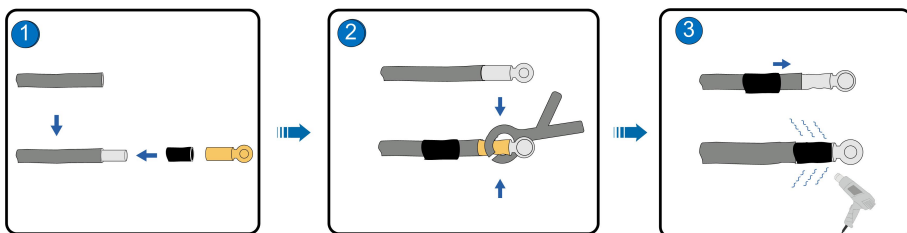
Note: The figure is for reference only and the actual product shall prevail.

**Step 1** Lead the “DC+” cable through the “OUTPUT DC (+)” waterproof connector. Enough cable bending space should be ensured.

**Step 2** Strip the protective layer and insulation layer of the cable to expose the copper core of  $L \approx 25\text{mm}$ , crimp the cable to the appropriate DT terminal, and tighten them with a heat shrinkable tubing.

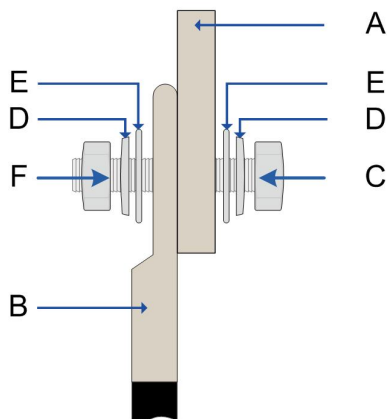


It is recommended to use heat shrinkable tubing with a voltage not lower than 10kV.



**Step 3** Fix the crimped DT terminal to the output terminal.

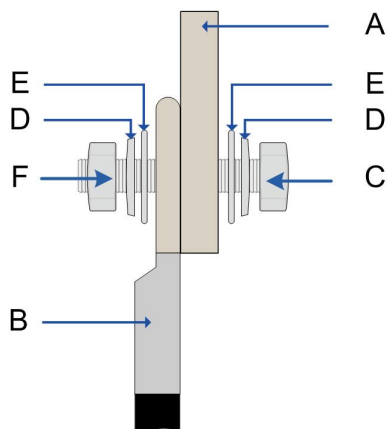
When copper wire is used, fix the DT terminal to the output terminal in an order shown in the figure below, and the tightening torque is 119~140N.m.



**figure 6-1** Schematic of copper wire connection

| A          | B               | C        | D             | E           | F   |
|------------|-----------------|----------|---------------|-------------|-----|
| Copper bar | Copper terminal | M16 bolt | Spring washer | Flat washer | Nut |

When aluminum wire is used, fix the DT terminal to the output terminal in an order



**figure 6-2** Schematic of aluminum wire connection

| A          | B                                   | C        | D             | E           | F   |
|------------|-------------------------------------|----------|---------------|-------------|-----|
| Copper bar | Copper-aluminum transition terminal | M16 bolt | Spring washer | Flat washer | Nut |

**Step 4** Tighten the nut of the waterproof connector clockwise.

**⚠ WARNING**

Use the PV connectors included in the delivery, or purchase the recommended PV connectors as listed below. Equipment damage caused by the use of incompatible connectors will not be covered by the warranty.

- If the cross-sectional area of the DC cable is 4/6 mm<sup>2</sup>, the PV connectors included in the scope of delivery can be used. The recommended PV connectors are: PV-JK03M2-M/2B / PV-JK03M2-F/2B (Jinko), PV-KST4-Evo 2A/6I / PV-KBT4-Evo 2A/6I (Stäubli).
- If the cross-sectional area of the DC cable is 10 mm<sup>2</sup>, purchase PV connectors separately or contact SUNGROW to place an order. The recommended PV connectors are: PV-KST4-EVO 2/10II-UR / PV-KBT4-EVO 2/10II-UR (Stäubli).

**⚠ WARNING**

Make sure that fastening screws on terminals are fastened in place. If the copper core has not been fully and tightly contacted with the wiring terminal, long-time work may burn the terminal.

Use stranded copper core flame-retardant cables with the wire diameter not less than the recommended value in the appendix.

Fasten screw caps of waterproof connectors in place, otherwise, it may cause water leakage and damage to the PVS.

-- End

## 6.6 Ground Connection

### Brief Introduction

**⚠ WARNING**

The grounding cable must be well connected to ground, otherwise:

- It may cause fatal electric shock to the operator in case of failure!
- The equipment may be damaged when struck by lightning!

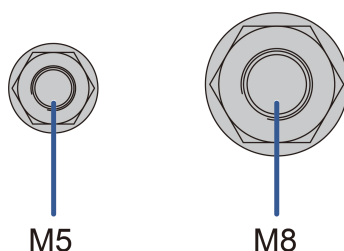
**NOTICE**

**Relevant standards and regulations must be observed.**

- **Grounding cables must be connected firmly with both the device and ground terminals.**
- **The ground resistance shall be measured after the ground connection is finished, and its resistance value shall be no more than 1Ω.**

**Grounding Hole**

There are grounding holes reserved for M5 and M8 riveting screws in the PVS, as shown in the figure below.



On site, select the appropriate grounding holes according to actual conditions.

table 6-1 Wiring requirements

| Riveting Screw Specifications    | M5                | M8                |
|----------------------------------|-------------------|-------------------|
| Recommended cable specifications | 16mm <sup>2</sup> | 95mm <sup>2</sup> |
| Stripping length L               | 15 mm             | 25 mm             |
| Tightening torque                | 4.4±0.4N.m        | 20.5±2.5N.m       |

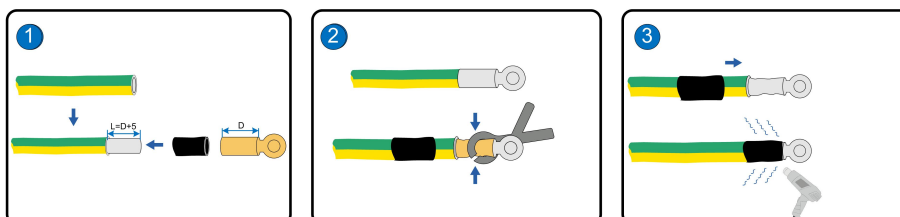
**Connection Method**

**Step 1** Loosen the nut of grounding waterproof terminal.

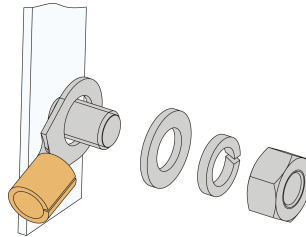
**Step 2** Lead the yellow green cable through waterproof terminal, leaving a proper margin in cable length.

**Step 3** Use wire strippers to strip the protective layer and insulation layer of the cable to expose the copper core of the wire. For the specific stripping length, refer to "table 6-1 Wiring requirements"

**Step 4** Crimp the OT terminal.



**Step 5** Fix it to the ground copper bar in the sequence of screw, spring washer, flat washer, OT terminal, and grounding hole. Refer to "table 6-1 Wiring requirements" for the tightening torque.



**Step 6** Tighten the nut of the waterproof terminal clockwise.

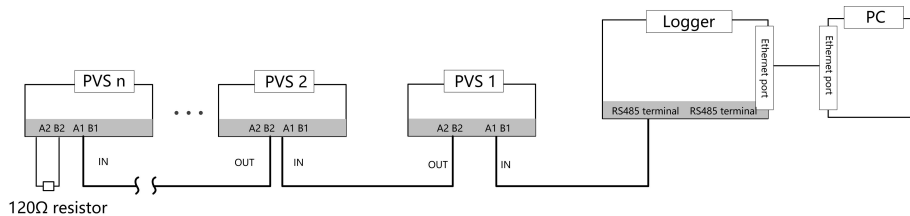
-- End

## 6.7 Communication Connection

### 6.7.1 Communication Solution

#### RS485 Communication

The PVS adopts series RS485 communication, as shown in the following figure.



- A1 and B1 of PVS 1 are connected to A1 and B1 of the logger;
- A2 and B2 of PVS 1 are connected to A1 and B1 of PVS 2;
- A2 and B2 of PVS 2 are connected to A1 and B1 of PVS 3;

And so forth, A2 and B2 of the PVS n-1 are connected to A1 and B1 of PVS n.

#### NOTICE

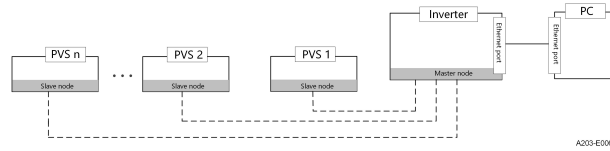
The 120Ω resistor shown in the figure above is not a required item.

If on-site communication is poor, it is recommended to connect a resistor to the last device on the RS485 bus to improve the communication quality. For example, connect a resistor between the RS485-A and RS485-B of PVS n in the above picture.

If the communication quality is not improved, check whether the cable routing meets requirements. For details, please refer to "6.3.3 Cable Requirements"

#### DC PLC communication (optional)

The PVS adopts series DC PLC communication, as shown in the following figure.



- The client node of the first PVS communicates with the host node of the inverter;
- The client node of the second PVS communicates with the host node of the inverter.

And so on, all PVS client nodes communicate with the host nodes of the inverter.

#### NOTICE

**The monitoring panel only works when the PV string voltage reaches the rated working voltage of the switching power supply of the PVS.**

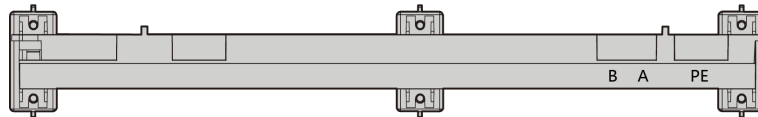
#### NOTICE

**After installation or maintenance, ensure the door is locked and the key cover is fully closed to avoid water penetration.**

**Sufficient bending space for each cable should be reserved, and cables must not be tightened and stressed.**

### 6.7.2 RS485 Communication Wiring

The RS485 communication terminals inside the PVS are shown below.



The specification of RS485 communication cable should be 2 x (0.75 to 1.5) mm<sup>2</sup>.

**Step 1** Loosen the “MONITOR INPUT” and “MONITOR OUTPUT” waterproof connectors on the PVS.

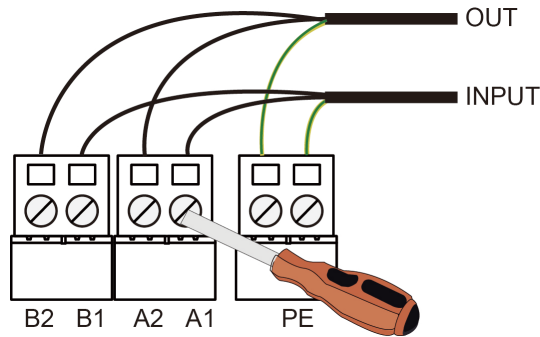
**Step 2** Pass the communication cable through the waterproof connector into the PVS.

**Step 3** Strip the protective layer of the cable and the insulation layers of the wires to expose approximately 8 mm of copper cores.

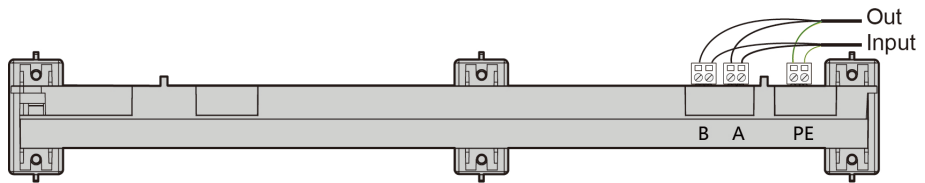
**Step 4** Connect the copper core to the adapter terminal block and tighten the terminal with a screwdriver. The rules are:

- Connect RS485-A to A1;
- Connect RS485-B to B1;
- Connect cable shield to PE.

**Step 5** Connect the wires of the output cable to A2, B2, and PE terminals in the same way.



**Step 6** Insert the adapter terminal into the terminal block of the monitoring board to complete the wiring of the RS485 communication.



#### NOTICE

Use a shielded twisted pair as the communication cable, to avoid unstable communication or communication failure.

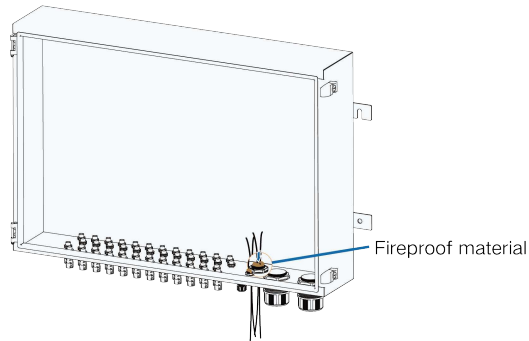
Keep communication cables away from high-voltage cables. Do not run communication cables in parallel with power cables or tie them together, as this may cause communication interruptions and damage the product. If this is not possible, route the communication cables through galvanized conduit for shielding.

-- End

## 6.8 Subsequent Processing

### Sealing Operation

After all wiring is completed, for the unsealed PG waterproof connector, use fireproof material to seal off the gaps around the PG waterproof connector from the inside of the PVS.

**NOTICE**

**During the sealing process, avoid direct contact between DT terminals and fireproof material, which may cause serious accidents.**

**NOTICE**

**Blocking the waterproof vent valve may cause condensation in the PVS and even damage the equipment inside the PVS.**



After installation or maintenance is completed, lock the door cover and tighten the waterproof cover of the lock core to prevent water leakage.

Each cable should have an appropriate margin and should not be subjected to tension or stress.

**Inspection**

After electrical connections are completed, inspect the wiring thoroughly and carefully.

**WARNING**

- Check that the cables are all connected properly.
- Check that the protective cover is installed, the waterproof connectors are tightened, and the doors are locked.
- Gaps between the waterproof connector and the cable are sealed off using fireproof material.



## 7 Commissioning

Follow the steps below to check whether the PVS operates normally after installation:

**Step 1** Measure the input voltage between positive and negative polarities of each input to make sure they are basically same and there is no reverse connection.

**Step 2** Fasten the fuse holder, the PVS has been powered on.

**Step 3** Log in to iSolarCloud to access the PVS. Check that the input parameters of the PVS are normal.

**Step 4** Measure the output voltage between positive and negative polarities of each output to make sure they are basically same and there is no reverse connection.

**Step 5** Close the load switch / circuit breaker.

**Step 6** Lock the door.

**Step 7** Pull out the key.

**Step 8** Complete commissioning.

-- End

## 8 iSolarCloud App

### 8.1 About iSolarCloud

The iSolarCloud App can communicate with the PVS over WLAN. This enables local PVS maintenance and allows users to view the PVS information, check its alarms, and set its parameters on the App.



User interfaces presented in this manual come from V15.4.1 iSolarCloud App intended for iOS devices, which may be different from those actually shown on your screen.

### 8.2 Installing App

#### Method 1

Download and install the App through the following application stores:

- MyApp (Android, mainland China users)
- Google Play (Android, users other than mainland China ones)
- App Store (iOS)

#### Method 2

Scan the following QR code to download and install the App according to the prompt information.



The App icon appears on the home screen after installation.



## 8.3 Login

### 8.3.1 Requirements

Before logging in to the App, please make sure:

- The PVS is powered on.
- Your mobile phone is within 5 meters of the PVS, with no obstructions in between.
- WLAN is enabled on your phone.



Only one phone can connect to the PVS over WLAN at a time.

### 8.3.2 Login Steps

#### Preparation Before Login

Select the server and language based on the on-site conditions.

- 1 Open the iSolarCloud App and choose “**More**→**Select your server**”. The following servers are available: Chinese Server, European Server, International Server, Australian Server, and Custom. Choose one based on actual needs.
- 2 Click **Language** and select a language based on actual needs.



## Steps

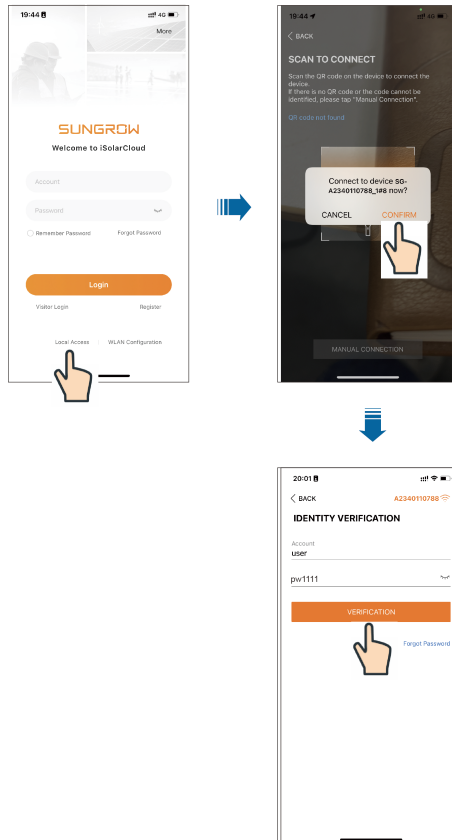
**Step 1** Tap **Local Access** at the bottom of the login screen.

**Step 2** Turn on WLAN on your phone. You can connect to the PVS in the following two ways.

- 1 Scan the QR code on the PVS enclosure for WLAN connection.



No password is required by default. If a password is needed, it will be the S/N on the PVS nameplate.



**figure 8-1** Scan QR Code

- 2 Click **Manual Connection** at the bottom and choose **Others**. A list of device types will show up on the screen. Choose **PVS** from the list for connection.

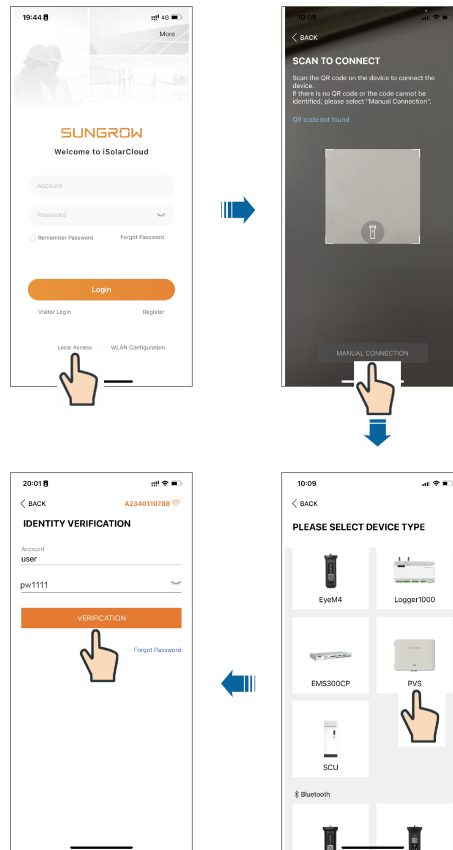
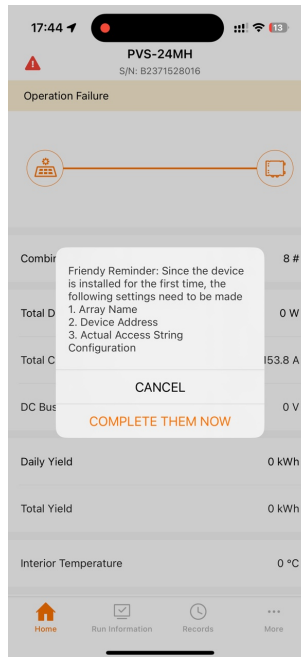


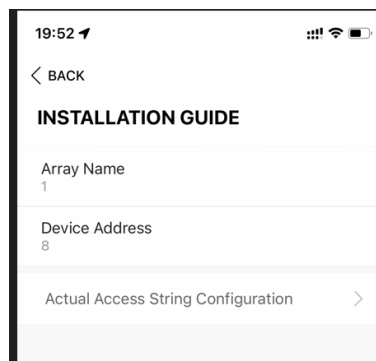
figure 8-2 Manual Connection

### -- End

The first time the connection is established, a pop-up window will show up, prompting you to complete the settings for Array Name, Device Address, and Actual Access String Configuration.



Tap **Go to set** to go to "Installation Guide" and complete the settings based on the on-site conditions. This prompt will not appear for subsequent connections.



The "Device Address" ranges from 1 to 231, and the "Actual Access String Configuration" ranges from CH1 to CH24.

## 8.4 Function Overview

The iSolarCloud App allows users to view and set relevant parameters. Functional modules of the App are shown as follows.

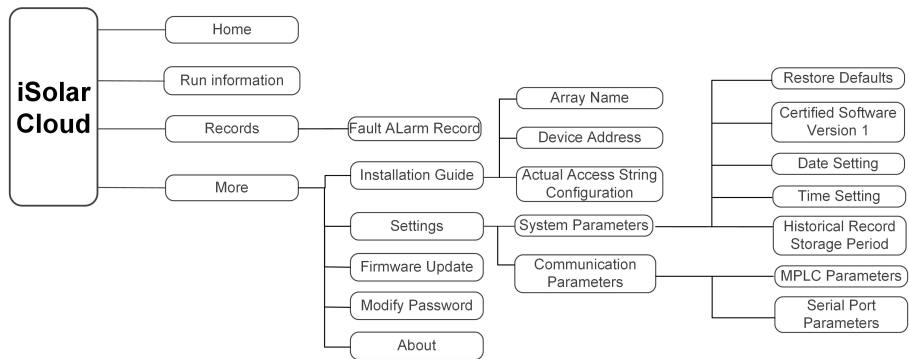


figure 8-3 Function Tree of the iSolarCloud App

## 8.5 Home

Once logged in, you will go to the home screen, as shown below.

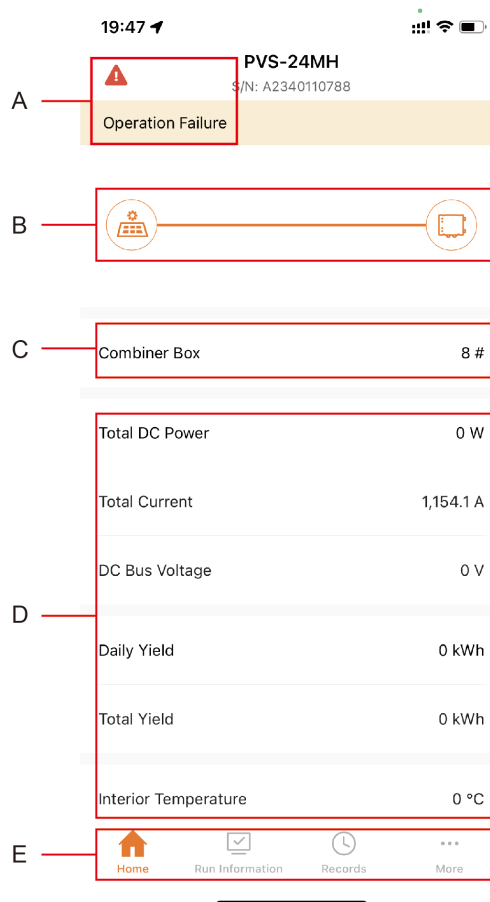




table 8-1 Introduction to Home Screen

| No. | Definition            | Description                                                                                                                                                             |
|-----|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A   | Real-time fault alarm | Indicates whether there is a fault in the PVS.                                                                                                                          |
| B   | Power flow            | Arrows between the icons indicate that there is energy flowing between the devices. The direction in which the arrow points indicates the direction of the energy flow. |
| C   | Device address        | Range: 1 to 231.                                                                                                                                                        |
| D   | Data display          | Shows the total DC power, total current, DC bus voltage, daily yield, total yield, and internal temperature, etc.                                                       |
| E   | Navigation bar        | Provides shortcuts to Home, Run Information, Records, and More.                                                                                                         |

In the case of anything abnormal with the PVS, the icon  will appear in the upper left corner of the screen. You may tap the icon to view the fault details.

## 8.6 Run Information

Click **Run Information** in the navigation bar. You can swipe upward on the "Run Information" screen to view the current and power data of all branches.

19:47   

**Run Information**

**DC Information**

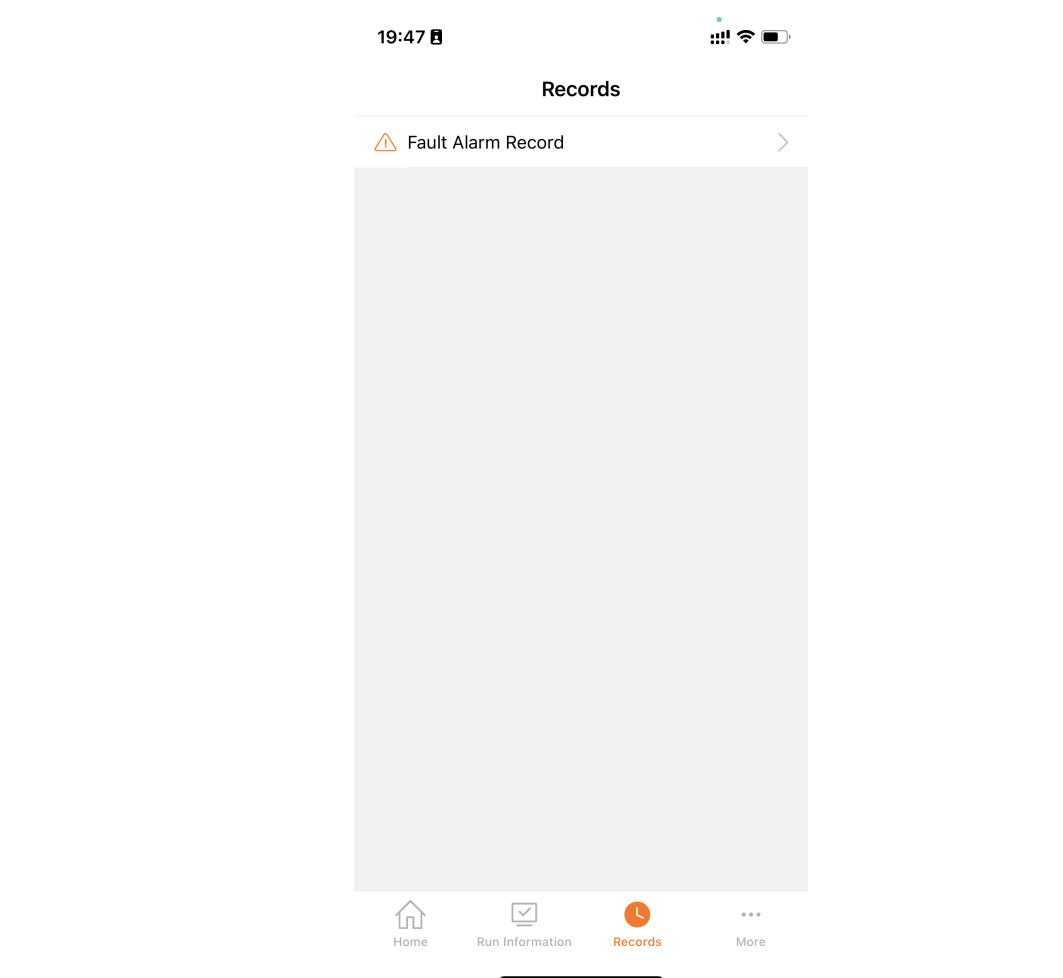
|      | Current(A) | Power(W) |
|------|------------|----------|
| PV1  | 49.95      | 0        |
| PV2  | 49.73      | 0        |
| PV3  | 49.53      | 0        |
| PV4  | 49.95      | 0        |
| PV5  | 49.95      | 0        |
| PV6  | 49.73      | 0        |
| PV7  | 49.55      | 0        |
| PV8  | 49.95      | 0        |
| PV9  | 49.47      | 0        |
| PV10 | 44.42      | 0        |
| PV11 | 46.08      | 0        |
| PV12 | 49.95      | 0        |



 Home  Run Information  Records  More

## 8.7 Records

Tap **Records** in the navigation bar to go to the "Records" screen, as shown below.



**figure 8-4** Records

Tap **Fault Alarm Record** to view the fault alarm history.



You can tap  and specify the start time and end time to view the record within a specific period.

The PVS can record the recent 8000 entries at most.

## 8.8 More

Click **More** in the navigation bar to go to the More screen, as shown below.

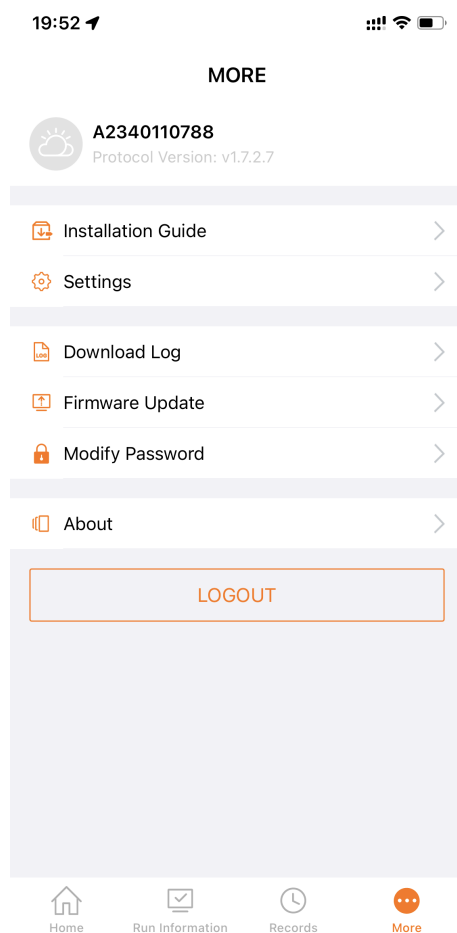
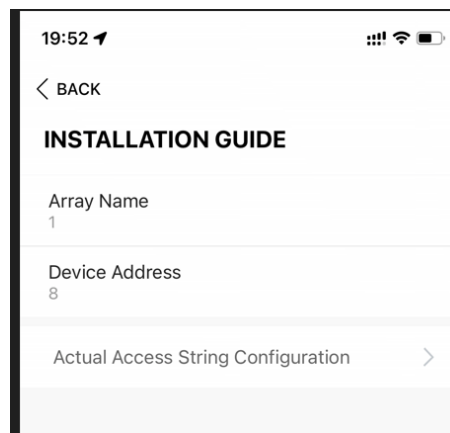


figure 8-5 More

### 8.8.1 Installation Guide

Click **Installation Guide**. Then, set the Array Name and Device Address, and complete the Actual Access String Configuration, as shown below.



**figure 8-6** Installation Guide

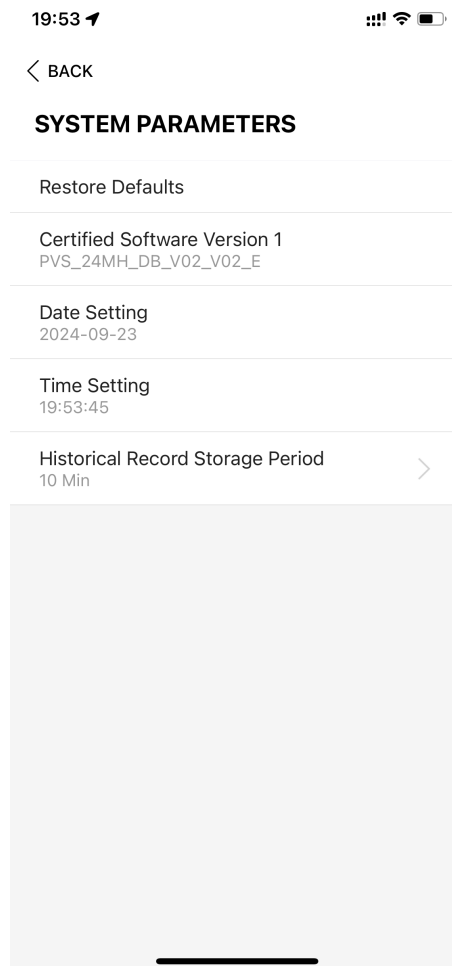


The "Device Address" ranges from 1 to 231, and the "Actual Access String Configuration" ranges from CH1 to CH24.

### 8.8.2 Parameter Settings

#### System Parameters

Choose "**Settings**→**System Parameters**". You'll then see the screen below.



**figure 8-7** System Parameters

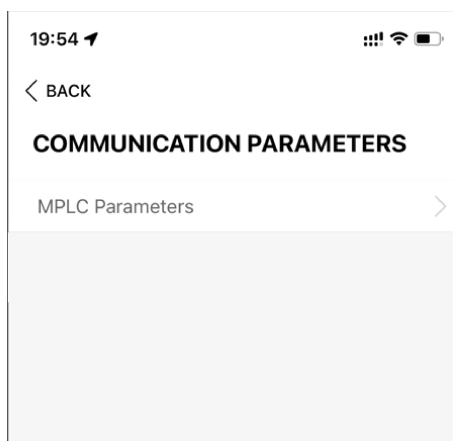
Click **Restore Defaults** to restore the PVS settings to their defaults.

Click **Date Setting** to set the date on the PVS.

Click **Time Setting** to set the time on the PVS.

#### **Communication Parameters**

Choose "**Settings**→ **Communication Parameters**". You'll then see the screen below.



**figure 8-8** Communication Parameters

Click “**MPLC Parameters**” to set the MPLC parameters for the PVS.

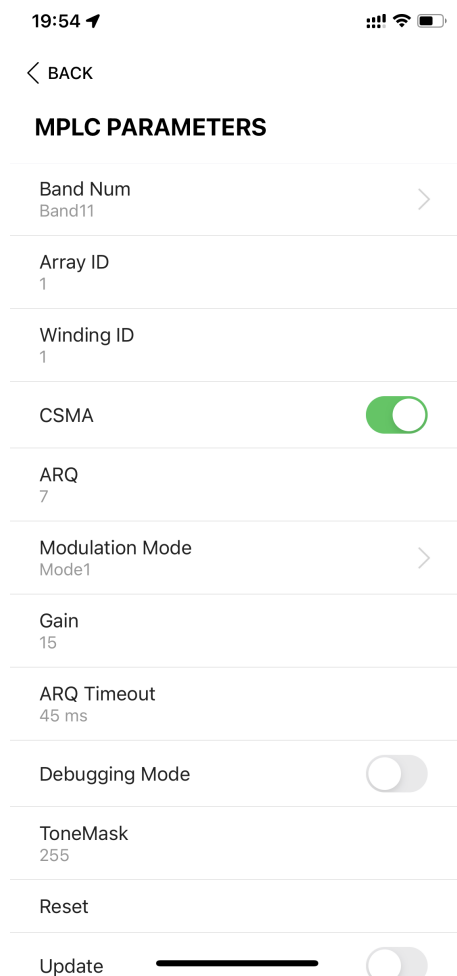


figure 8-9 MPLC Parameters

### 8.8.3 Firmware Update

Download the firmware package to your mobile device.



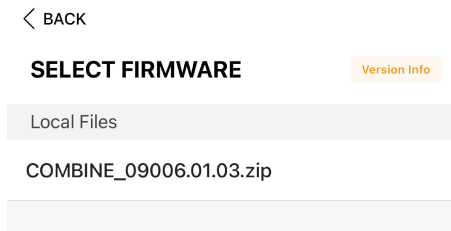
Please contact SUNGROW for the firmware package.

**Step 1** Log in to the iSolarCloud App.

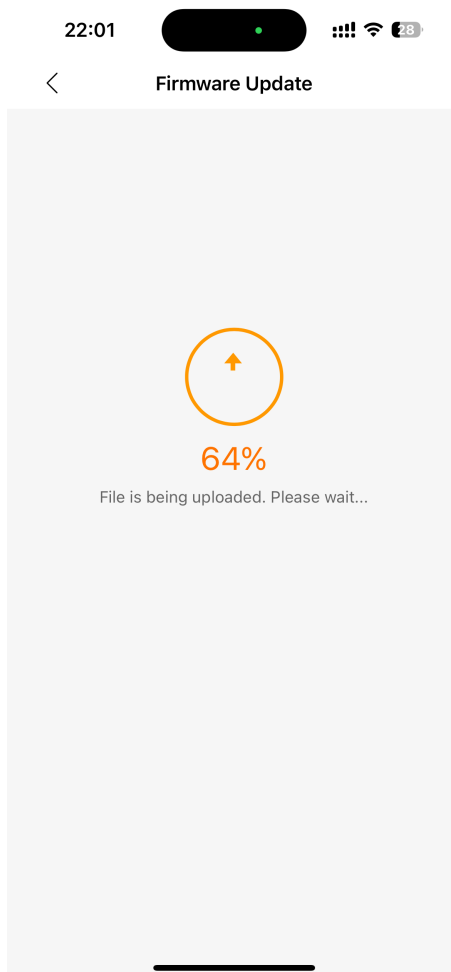
**Step 2** Choose **More** at the bottom of the screen, and then tap **Firmware Update**.



**Step 3** Select the update package. A confirmation dialog will pop up. Tap **Update Immediately** to start.



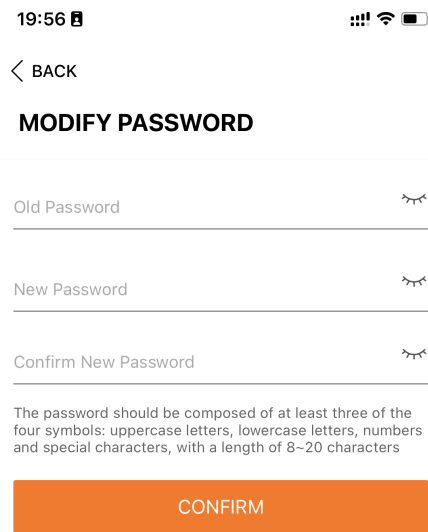
**Step 4** Wait for the update to complete. Once finished, a success message will show up on the screen. Tap **Complete** to finalize.



-- End

#### 8.8.4 Modify Password

Click **Modify Password**. You'll then see the screen below.



19:56

< BACK

### MODIFY PASSWORD

Old Password

New Password

Confirm New Password

The password should be composed of at least three of the four symbols: uppercase letters, lowercase letters, numbers and special characters, with a length of 8~20 characters

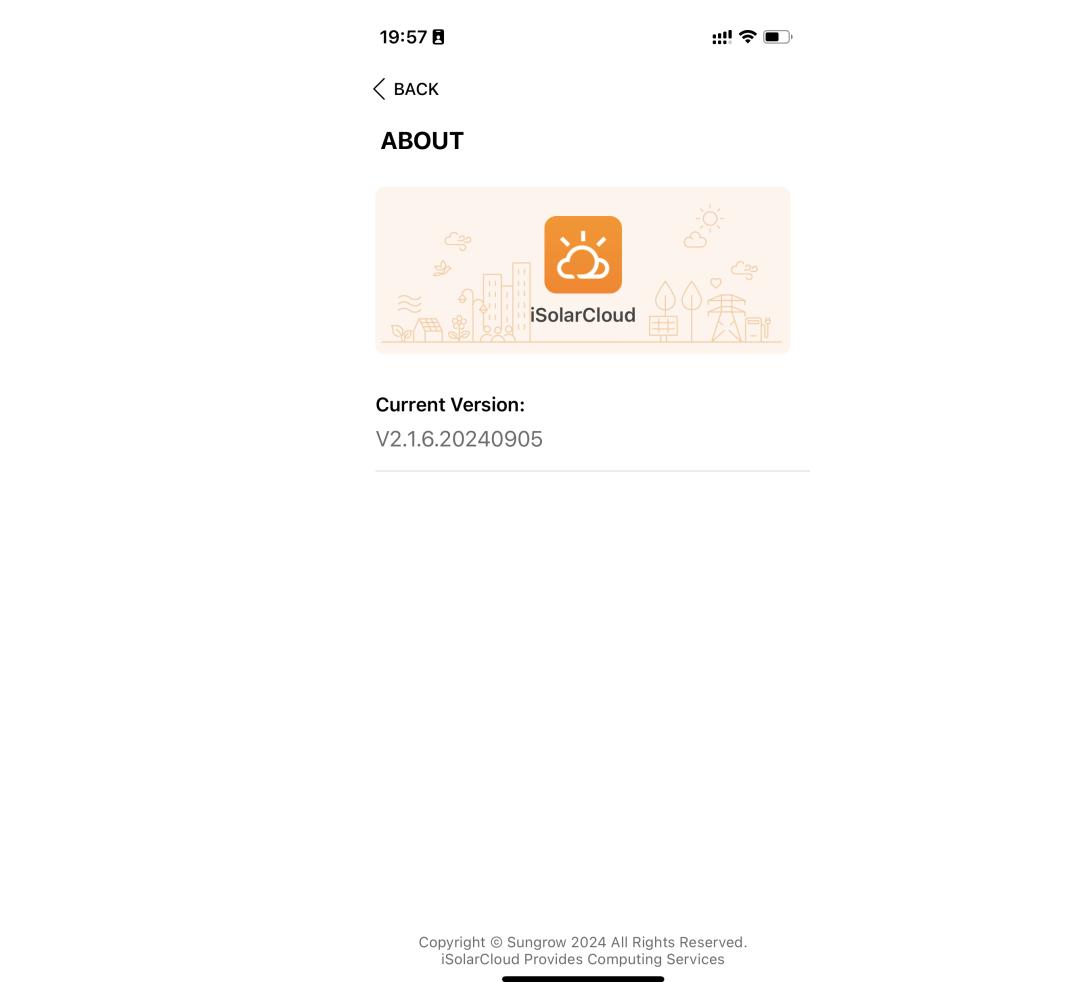
CONFIRM

**figure 8-10** Modify Password

The password should be 8–20 character long and contain letters or numbers.

#### 8.8.5 About

Click **About**. You'll then see the screen below.



**figure 8-11** About

You can check the current version of the iSolarCloud App here.

## 9 Routine Maintenance

### 9.1 Brief Introduction

Due to the influence of ambient temperature, humidity, dust and vibration, the internal components of the PVS will age and wear, which may lead to potential failures of the PVS. Therefore, it is necessary to implement daily and regular maintenance on the PVS to ensure its normal operation and service life.

#### WARNING

**Only qualified electricians can perform the maintenance work described in this chapter.**

#### NOTICE

**Do not leave screws, washers, or other metal parts in the PVS during maintenance. Otherwise, damage may be caused to the device!**

Shut down the PVS before maintaining hardware to ensure the parts that may be touched are voltage free.

### 9.2 Maintenance Work

| Inspection content       | Inspection method                                                                                                         | Maintenance cycle                                        |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Electrical connection    | Check the fuse holder, PG gland terminal and other joints for looseness and dislodgement.<br>Check the cables for damage. | 3 months/time                                            |
| Sealing strip inspection | Regularly check the sealing strip for bubbles, cracks, broken skin and lack of glue, pits, etc.                           | 1-2 months/time in the first period, usually 1 year/time |



The recommended routine maintenance periods in the table are only for reference. The actual maintenance period shall be determined reasonably in consideration of the specific installation environment of the product.

Power plant scale, location, site environment, and other factors also affect the maintenance period of the product. It is necessary to shorten the maintenance period and increase the maintenance frequency in the event of a heavy sandstorm or dust in the operating environment.

### 9.3 Fuse Replacement

#### WARNING

**Once the fuse is blown, it cannot be restored and should be replaced by a qualified operator in time.**

**Replace the fuse with a new one of the same model and the same grade.**

Follow the procedure below to replace the fault fuse.

**Step 1** Disconnect load switch/circuit breaker.

**Step 2** Use a clamp meter to measure the current of each channel to ensure that the current is 0.

**Step 3** Open the fuse box and remove the fuse.

**Step 4** Install a fuse of the same size.

**Step 5** Close the fuse box.

**Step 6** Connect the load switch/circuit breaker.

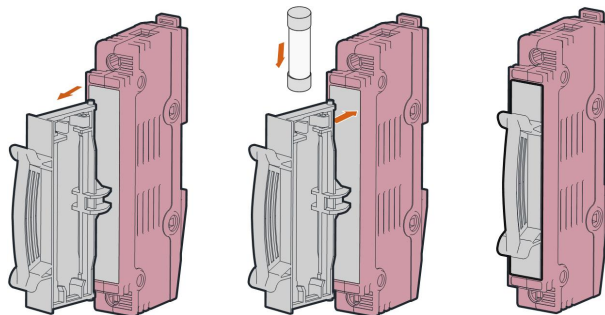


figure 9-1 Fuse replacement steps

-- End

#### WARNING

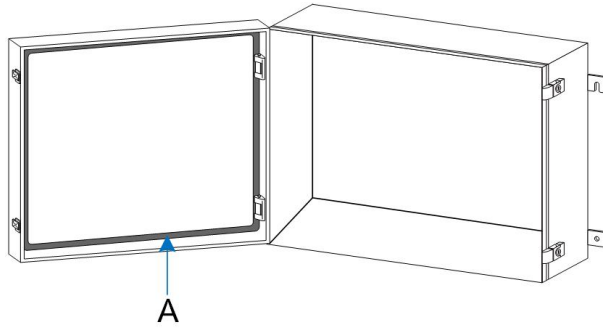
**Push the fuse holder back into place and fasten it after the fuse is replaced.**

**⚠ WARNING**

**Disconnect the load switch before checking and replacing the fuse. Please notice that high voltage still exists in all terminals of the load switch. Make sure the current of each input is zero by a clamp meter and only then can the fuse be replaced.**

## 9.4 Sealing Strip Replacement

The internal sealing strip wraps around the door, shown as “A” in the figure below. It is recommended to check the sealing strip regularly. If there is any damage caused due to non-human factors, please contact SUNGROW immediately to replace the door and the sealing strip.



# 10 Troubleshooting

## 10.1 Before Troubleshooting

Please notice the following items before troubleshooting:

- Disconnect the load switch before operation.
- Do not touch bare metal parts such as copper bar under the protective plate.
- Pull out the fuse holder to disconnect the input for maintenance of the combiner busbar.

### WARNING

**High voltage may still exist in terminals of the load switch when it is disconnected!**  
**The fuse holder may still be live when the fuse is removed. Please do not touch it.**

## 10.2 Troubleshooting

table 10-1 Fault List

| Fault Name                   | Fault Cause                                                                                      | Troubleshooting Method                                                                                                                              |
|------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Ambient temperature too high | The temperature inside the device is too high.<br>The ambient operating temperature is too high. | Generally, the device will resume operation after the internal temperature or module temperature returns to normal. If the fault occurs repeatedly: |
|                              |                                                                                                  | 1 Check whether the ambient temperature is too high.                                                                                                |
|                              |                                                                                                  | 2 Check whether the location of the device is well-ventilated.                                                                                      |
|                              |                                                                                                  | 3 Check whether the device is exposed to direct sunlight; if so, provide shading for it.                                                            |
| System fault                 | The internal module of the system is abnormal.<br>The system wiring or terminals are abnormal.   | 1 Check whether the internal wiring of the system is broken or whether the terminals are loose.                                                     |
|                              |                                                                                                  | 2 If there is no broken wiring or loose connection but the fault still cannot be resolved, please contact SUNGROW Customer Service.                 |
| PV abnormal alarm            | There is short-circuit, open-circuit, or low current issue in the string.                        | Check whether the device voltage and current are within normal range, and determine the cause:                                                      |
|                              |                                                                                                  | 1 Check whether the corresponding module is sheltered. If so, remove the shelter and ensure the module is clean.                                    |
|                              |                                                                                                  | 2 Check whether the PV module cables are loose. If so, reconnect the cables and ensure the connection is secure.                                    |
|                              |                                                                                                  | 3 Check whether the fuse is damaged. If so, replace the fuse.                                                                                       |
|                              |                                                                                                  | 4 If the alarm does not arise for the aforementioned reason and still cannot be removed, please contact SUNGROW Customer Service.                   |



| Fault Name                  | Fault Cause                                       | Troubleshooting Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PV reverse connection alarm | The PV string is connected with reverse polarity. | <ol style="list-style-type: none"> <li>1 Check whether the negative and positive cables of the corresponding PV string is connected in reverse. If so, after the PV string current drops below 0.5A, turn off the DC switch, pull out all fuses, and correct the wiring to ensure correct polarity.</li> <li>2 If the alarm does not arise for the aforementioned reason and still cannot be removed, please contact SUNGROW Customer Service.</li> </ol>                                                                      |
| AFCI fault                  | AFCI fault on the DC side.                        | <ol style="list-style-type: none"> <li>1 Check the output cables for damage, inspect the terminals for loose connections or poor contact, and look for burn marks on the components. If any issues are found, replace the cables or components and tighten the terminals accordingly.</li> <li>2 After completing the DC side inspections in Step 1, reconnect DC power and turn on the DC switch. The device will resume operation.</li> <li>3 If the AFCI fault repeats, please contact SUNGROW Customer Service.</li> </ol> |

# 11 Appendix

## 11.1 Technical Data

### PVS-16MH-CN/PVS-18MH-CN

| Type designation               | PVS-16MH-CN                                 | PVS-18MH-CN |
|--------------------------------|---------------------------------------------|-------------|
| Max. PV string voltage         | 1500 V                                      |             |
| Max. PV string parallel inputs | 16                                          | 18          |
| Fuse rating                    | 25 A / 30 A / 35 A                          |             |
| Max. string input current      | 21 A                                        |             |
| Max. output current            | 336 A                                       | 378 A       |
| General data                   |                                             |             |
| Enclosure material             | Metal                                       |             |
| Input cable                    | 4–6 mm²                                     |             |
| Output cable                   | 120–400 mm²                                 |             |
| Dimensions (W * H * D)         | 876 mm × 600 mm × 187 mm                    |             |
| Weight                         | 35 kg                                       |             |
| Protection class               | IP65                                        |             |
| Environment temperature        | -35 °C to +60 °C                            |             |
| Environment humidity           | 0% – 95% (non-condensing)                   |             |
| Max. operating altitude        | 4000 m (requires customization if > 3000 m) |             |
| Accessories                    |                                             |             |
| PV specific SPD                | Yes                                         |             |
| SPD failure monitoring         | Yes                                         |             |
| PV module power supply         | Yes                                         |             |
| RS485 communication            | Yes                                         |             |
| Switch status monitoring       | Yes                                         |             |
| Parallel arc fault protection  | Yes (only used with SUNGROW 1+X inverters)  |             |
| Smart string diagnosis         | Yes (only used with SUNGROW 1+X inverters)  |             |

| Type designation               | PVS-16MH-CN                                     | PVS-18MH-CN |
|--------------------------------|-------------------------------------------------|-------------|
| Special connector for PV cable | JK03M2                                          |             |
| Local WiFi                     | Yes                                             |             |
| DC PLC communication           | Optional (only used with SUNGROW 1+X inverters) |             |

**PVS-20MH-CN/PVS-24MH-CN**

| Type designation               | PVS-20MH-CN        | PVS-24MH-CN |
|--------------------------------|--------------------|-------------|
| Max. PV string voltage         | 1500 V             |             |
| Max. PV string parallel inputs | 20                 | 24          |
| Fuse rating                    | 25 A / 30 A / 35 A |             |
| Max. string input current      | 18 A               | 16 A        |
| Max. output current            | 360 A              | 384 A       |

| General data            |                                             |       |
|-------------------------|---------------------------------------------|-------|
| Enclosure material      | Metal                                       |       |
| Input cable             | 4–6 mm <sup>2</sup>                         |       |
| Output cable            | 120–400 mm <sup>2</sup>                     |       |
| Dimensions (W * H * D)  | 876 mm × 600 mm × 187 mm                    |       |
| Weight                  | 35.5 kg                                     | 37 kg |
| Protection class        | IP65                                        |       |
| Environment temperature | -35 °C to +60 °C                            |       |
| Environment humidity    | 0% – 95% (non-condensing)                   |       |
| Max. operating altitude | 4000 m (requires customization if > 3000 m) |       |

| Accessories                   |                                            |  |
|-------------------------------|--------------------------------------------|--|
| PV specific SPD               | Yes                                        |  |
| SPD failure monitoring        | Yes                                        |  |
| PV module power supply        | Yes                                        |  |
| RS485 communication           | Yes                                        |  |
| Switch status monitoring      | Yes                                        |  |
| Parallel arc fault protection | Yes (only used with SUNGROW 1+X inverters) |  |
| Smart string diagnosis        | Yes (only used with SUNGROW 1+X inverters) |  |

| Type designation               | PVS-20MH-CN                                     | PVS-24MH-CN |
|--------------------------------|-------------------------------------------------|-------------|
| Special connector for PV cable |                                                 | JK03M2      |
| Local WiFi                     |                                                 | Yes         |
| DC PLC communication           | Optional (only used with SUNGROW 1+X inverters) |             |

## 11.2 Quality Assurance

When product faults occur during the warranty period, SUNGROW will provide free service or replace the product with a new one.

### Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, SUNGROW has the right to refuse to honor the quality guarantee.

### Conditions

- After replacement, unqualified products shall be processed by SUNGROW.
- The customer shall give SUNGROW a reasonable period to repair the faulty device.

### Exclusion of Liability

In the following circumstances, SUNGROW has the right to refuse to honor the quality guarantee:

- The free warranty period for the whole machine/components has expired.
- The device is damaged during transport.
- The device is incorrectly installed, refitted, or used.
- The device operates in harsh conditions beyond those described in this manual.
- The fault or damage is caused by installation, repairs, modification, or disassembly performed by a service provider or personnel not from SUNGROW.
- The fault or damage is caused by the use of non-standard or non-SUNGROW components or software.
- The installation and use range are beyond stipulations of relevant international standards.
- The damage is caused by unexpected natural factors.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of SUNGROW.



Product data such as product dimensions are subject to change without prior notice. The latest documentation from SUNGROW should take precedence in case of any deviation.

## 11.3 Contact Information

In case of questions about this product, please contact us.

We need the following information to provide you the best assistance:

- Model of the device
- Serial number of the device
- Fault code/name
- Brief description of the problem

For detailed contact information, please visit: <https://en.SUNGROWpower.com/contactUS>

