SUN2000-(12K-25K)-MB0 Series

User Manual

Issue	16
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About This Document

Purpose

This document describes the following inverter models (also referred to as SUN2000) in terms of the safety precautions, product introduction, installation, electrical connections, power-on and commissioning, maintenance, and technical specifications. Read this document carefully before installing and operating the inverter.

- SUN2000-12K-MB0
- SUN2000-15K-MB0
- SUN2000-17K-MB0
- SUN2000-20K-MB0
- SUN2000-25K-MB0
- SUN2000-15K-MB0-ZH
- SUN2000-17K-MB0-ZH
- SUN2000-20K-MB0-ZH
- SUN2000-25K-MB0-ZH

Intended Audience

This document is intended for:

- Installers
- Users

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Symbol	Description
⚠ WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 16 (2025-07-01)

- Updated **7.2.4 Limit on Power Purchased from Grid**.
- Updated **7.3.4 Limit on Power Purchased from Grid**.
- Added **7.2.5 Setting the Energy Measurement Mode**.
- Added **7.3.5 Setting the Energy Measurement Mode**.
- Added **7.2.6 Resetting the Password for Logging In to the Local Commissioning Screen**.
- Added **7.3.6 Resetting the Password for Logging In to the Local Commissioning Screen**.

Issue 15 (2025-04-22)

- Added **7.2.4 Limit on Power Purchased from Grid**.
- Added **7.3.4 Limit on Power Purchased from Grid**.

Issue 14 (2025-04-10)

Updated **5.2 Preparing Cables**.

Issue 13 (2025-01-10)

- Updated **2.2 Networking Application**.
- Updated **5.2 Preparing Cables**.
- Updated **5.7 Connecting Signal Cables**.

- Added **5.7.6 Connecting RS485 Communications Cables (SmartGuard)**.
- Updated **7.2.1 Deploying a New Plant**.
- Updated **7.3.1 Deploying a New Plant**.
- Updated **9 Technical Specifications**.
- Updated **A Grid Codes**.

Issue 12 (2024-10-23)

- Updated **I Certificate Management and Maintenance**.
- Updated **A Grid Codes**.
- Updated **5.7.8 Connecting the Grid Scheduling Signal Cable**.

Issue 11 (2024-08-09)

- Updated **B Connecting to the Inverter on the App**.
- Updated **C Connecting to the EMMA on the App**.

Issue 10 (2024-07-27)

- Updated **2.3 Appearance**.
- Updated **5.2 Preparing Cables**.
- Updated **8.5 Replacing a Fan**.

Issue 09 (2024-06-21)

- Updated **2.3 Appearance**.
- Updated **4.6 Installing an Inverter (Wall Mounting)**.
- Updated **4.7 Installing an Inverter (Support Mounting)**.
- Updated **5.2 Preparing Cables**.
- Updated **7.1 Powering On the Inverter**.
- Updated **8.2 System Power-Off**.
- Updated **A Grid Codes**.

Issue 08 (2024-06-13)

Updated **5.2 Preparing Cables**.

Issue 07 (2024-03-30)

Updated **8.5 Replacing a Fan**.

Issue 06 (2024-02-05)

Updated **2.2 Networking Application**.

Issue 05 (2024-01-12)

- Updated **2.2 Networking Application**.
- Updated **5.2 Preparing Cables**.

- Updated **5.7.2 Connecting RS485 Communications Cables (Power Meter)**.
- Updated **8.3 Troubleshooting**.
- Updated **A Grid Codes**.

Issue 04 (2023-11-02)

- Updated **5.3 Connecting a PE Cable**.
- Updated **5.4 Connecting an AC Output Power Cable**.
- Updated **5.5 Connecting DC Input Power Cables**.

Issue 03 (2023-08-31)

Updated **2.2 Networking Application**.

Updated **5.2 Preparing Cables**.

Updated **5.7 Connecting Signal Cables**.

Added **5.7.4 Connecting RS485 Communications Cables (EMMA)**.

Added **5.7.5 Connecting RS485 Communications Cables (EMMA and Battery)**.

Updated **7.2.3 AFCI**.

Updated **7.3.1 Deploying a New Plant**.

Updated **8.1 Routine Maintenance**.

Added **C Connecting to the EMMA on the App**.

Added **F Baud Rate Negotiation**.

Added **G Contact Information**.

Added **H Digital Power Customer Service**.

Updated **I Certificate Management and Maintenance**.

Issue 02 (2023-06-30)

Updated **2.2 Networking Application**.

Updated **2.4 Working Modes**.

Updated **7.1 Powering On the Inverter**.

Updated **7.2.2 Setting Common Parameters**.

Updated **7.2.3 AFCI**.

Updated **B Connecting to the Inverter on the App**.

Updated **7.4 Viewing the Plant Creation Status**.

Added **5.6 (Optional) Connecting Battery Cables**.

Added **5.7.3 Connecting RS485 Communications Cables (Power Meter and Battery)**.

Added **7.5 SmartLogger Networking Scenario**.

Issue 01 (2023-04-30)

This issue is used for first office application (FOA).

Contents

1 Safety Information

Statement

Before transporting, storing, installing, operating, using, and/or maintaining the equipment, read this document, strictly follow the instructions provided herein, and follow all the safety instructions on the equipment and in this document. In this document, "equipment" refers to the products, software, components, spare parts, and/or services related to this document; "the Company" refers to the manufacturer (producer), seller, and/or service provider of the equipment; "you" refers to the entity that transports, stores, installs, operates, uses, and/or maintains the equipment.

The **Danger**, **Warning**, **Caution**, and **Notice** statements described in this document do not cover all the safety precautions. You also need to comply with relevant international, national, or regional standards and industry practices. **The Company shall not be liable for any consequences that may arise due to violations of safety requirements or safety standards concerning the design, production, and usage of the equipment.**

The equipment shall be used in an environment that meets the design specifications. Otherwise, the equipment may be faulty, malfunctioning, or damaged, which is not covered under the warranty. The Company shall not be liable for any property loss, personal injury, or even death caused thereby.

Comply with applicable laws, regulations, standards, and specifications during transportation, storage, installation, operation, use, and maintenance.

Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.

The Company shall not be liable for any of the following circumstances or their consequences:

- The equipment is damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- The equipment is operated beyond the conditions specified in this document.

- The equipment is installed or used in environments that do not comply with international, national, or regional standards.
- The equipment is installed or used by unqualified personnel.
- You fail to follow the operation instructions and safety precautions on the product and in the document.
- You remove or modify the product or modify the software code without authorization.
- You or a third party authorized by you cause the equipment damage during transportation.
- The equipment is damaged due to storage conditions that do not meet the requirements specified in the product document.
- You fail to prepare materials and tools that comply with local laws, regulations, and related standards.
- The equipment is damaged due to your or a third party's negligence, intentional breach, gross negligence, or improper operations, or other reasons not related to the Company.

1.1 Personal Safety

DANGER

Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will generate electric arcs or sparks, which may cause a fire or personal injury.

DANGER

Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.

DANGER

Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

DANGER

During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

WARNING

During operations, wear personal protective equipment such as protective clothing, insulated shoes, goggles, safety helmets, and insulated gloves.

Figure 1-1 Personal protective equipment

General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment.
- If there is a likelihood of personal injury or equipment damage during operations, immediately stop, report the case to the supervisor, and take feasible protective measures.
- Do not power on the equipment before it is installed or confirmed by professionals.
- Do not touch the power supply equipment directly or with conductors such as damp objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to ensure that there is no risk of electric shock.
- Do not touch operating equipment because the enclosure is hot.
- Do not touch a running fan with your hands, components, screws, tools, or boards. Otherwise, personal injury or equipment damage may occur.
- In the case of a fire, immediately leave the building or the equipment area and activate the fire alarm or call emergency services. Do not enter the affected building or equipment area under any circumstances.

Personnel Requirements

- Only professionals and trained personnel are allowed to operate the equipment.
  - Professionals: personnel who are familiar with the working principles and structure of the equipment, trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, maintenance

  - Trained personnel: personnel who are trained in technology and safety, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Personnel who plan to install or maintain the equipment must receive adequate training, be able to correctly perform all operations, and understand all necessary safety precautions and local relevant standards.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will perform special tasks such as electrical operations, working at heights, and operations of special equipment must possess the required local qualifications.
- Only authorized professionals are allowed to replace the equipment or components (including software).
- Only personnel who need to work on the equipment are allowed to access the equipment.

1.2 Electrical Safety

DANGER

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

DANGER

Non-standard and improper operations may result in fire or electric shocks.

DANGER

Prevent foreign matter from entering the equipment during operations. Otherwise, equipment short-circuits or damage, load power derating, power failure, or personal injury may occur.

WARNING

For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.

WARNING

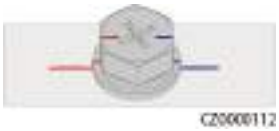
During the installation of PV strings and the inverter, the positive or negative terminals of PV strings may be short-circuited to ground if the power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the inverter. The resulting device damage is not covered under any warranty.

CAUTION

Do not route cables near the air intake or exhaust vents of the equipment.

General Requirements

- Follow the procedures described in the document for installation, operation, and maintenance. Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission.
- Obtain approval from the national or local electric utility company before connecting the equipment to the grid.
- Observe the power plant safety regulations, such as the operation and work ticket mechanisms.
- Install temporary fences or warning ropes and hang "No Entry" signs around the operation area to keep unauthorized personnel away from the area.
- Before installing or removing power cables, turn off the switches of the equipment and its upstream and downstream switches.
- Before performing operations on the equipment, check that all tools meet the requirements and record the tools. After the operations are complete, collect all of the tools to prevent them from being left inside the equipment.
- Before installing power cables, check that cable labels are correct and cable terminals are insulated.
- When installing the equipment, use a torque tool of a proper measurement range to tighten the screws. When using a wrench to tighten the screws, ensure that the wrench does not tilt and the torque error does not exceed 10% of the specified value.
- Ensure that bolts are tightened with a torque tool and marked in red and blue after double-check. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm that the bolts are tightened and then mark them in red. (The marks must cross the edges of the bolts.)



- If the equipment has multiple inputs, disconnect all the inputs and wait until the equipment is completely powered off before performing operations on the equipment.
- Before maintaining a downstream electrical or power distribution device, turn off the output switch on the power supply equipment.

- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.
- Do not open equipment panels.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.
- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated, and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are away from each other without entanglement and overlapping.
- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.
- When routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.

1.3 Environment Requirements

DANGER

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

DANGER

Do not store any flammable or explosive materials in the equipment area.

DANGER

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheat may damage the equipment or cause a fire.

WARNING

Install the equipment in an area far away from liquids. Do not install it under areas prone to condensation, such as under water pipes and air exhaust vents, or areas prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.

WARNING

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Store the equipment according to the storage requirements. Equipment damage caused by unqualified storage conditions is not covered under the warranty.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.
- The operating temperature range provided in the equipment's technical specifications refers to the ambient temperatures in equipment's installation environment.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install the equipment in an area conducive to the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.
- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land prone to water or snow accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel (the area shall be greater than or equal to 3 m x 2.5 m).
- Do not install the equipment outdoors in salt-affected areas because it may be corroded. A salt-affected area refers to the region within 500 m of the coast or prone to sea breeze. Regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- Before installation, operation, and maintenance, clean up any water, ice, snow, or other foreign objects on the top of the equipment.
- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.4 Mechanical Safety

⚠ WARNING

Ensure that all necessary tools are ready and inspected by a professional organization. Do not use tools that have signs of scratches or fail to pass the inspection or whose inspection validity period has expired. Ensure that the tools are secure and not overloaded.

WARNING

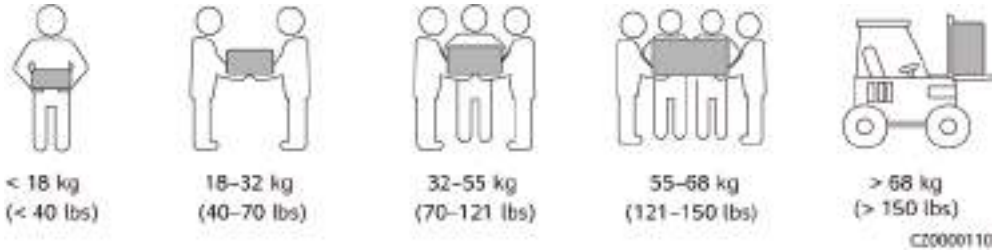
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches must not be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.
- Do not install other devices on the top of the equipment without evaluation by the Company.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



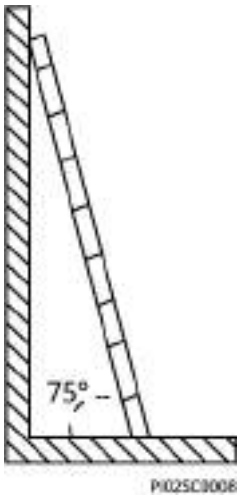
- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.

- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea, roads in good conditions, or airplanes for transportation. Do not transport the equipment by railway. Avoid tilt or jolt during transportation.

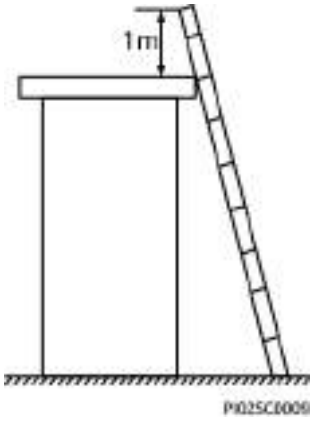
Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Single ladders are not recommended.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the ladder is securely positioned and held firm.

- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.
- If a single ladder is used, the recommended angle for the ladder against the floor is 75 degrees, as shown in the following figure. A square can be used to measure the angle.

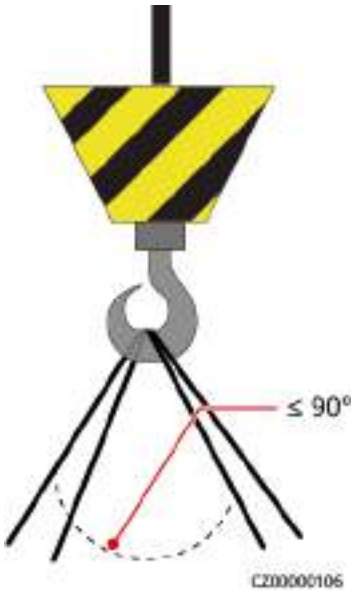


- If a single ladder is used, ensure that the wider end of the ladder is at the bottom, and take protective measures to prevent the ladder from sliding.
- If a single ladder is used, do not climb higher than the fourth rung of the ladder from the top.
- If you use a single ladder to climb up to a platform, ensure that the ladder is at least 1 m higher than the platform.



Hoisting

- Only trained and qualified personnel are allowed to perform hoisting operations.
- Install temporary warning signs or fences to isolate the hoisting area.
- Ensure that the foundation where hoisting is performed on meets the load-bearing requirements.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a fixed object or wall that meets the load-bearing requirements.
- During hoisting, do not stand or walk under the crane or the hoisted objects.
- Do not drag steel ropes and hoisting tools or bump the hoisted objects against hard objects during hoisting.
- Ensure that the angle between two hoisting ropes is no more than 90 degrees, as shown in the following figure.



Drilling Holes

- Obtain consent from the customer and contractor before drilling holes.
- Wear protective equipment such as safety goggles and protective gloves when drilling holes.
- To avoid short circuits or other risks, do not drill holes into buried pipes or cables.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings.

2 Overview

The SUN2000 is a three-phase grid-tied PV string inverter that converts the DC power generated by PV strings into AC power and feeds the power into the power grid.

2.1 Model Number Description

This document involves the following product models:

- SUN2000-12K-MB0
- SUN2000-15K-MB0
- SUN2000-17K-MB0
- SUN2000-20K-MB0
- SUN2000-25K-MB0
- SUN2000-15K-MB0-ZH
- SUN2000-17K-MB0-ZH
- SUN2000-20K-MB0-ZH
- SUN2000-25K-MB0-ZH

Figure 2-1 Model number (using SUN2000-15K-MB0-ZH as an example)

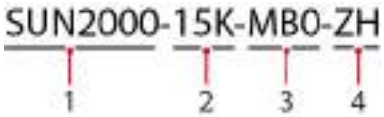


Table 2-1 Model number description

No.	Item	Description
1	Series name	SUN2000: three-phase grid-tied PV string inverter

No.	Item	Description
2	Power	• 12K: The rated power is 12 kW. • 15K: The rated power is 15 kW. • 17K: The rated power is 17 kW. • 20K: The rated power is 20 kW. • 25K: The rated power is 25 kW.
3	Design code	MB0: three-phase product series with the DC input voltage level of 1000 V or 1100 V
4	Region	ZH: China

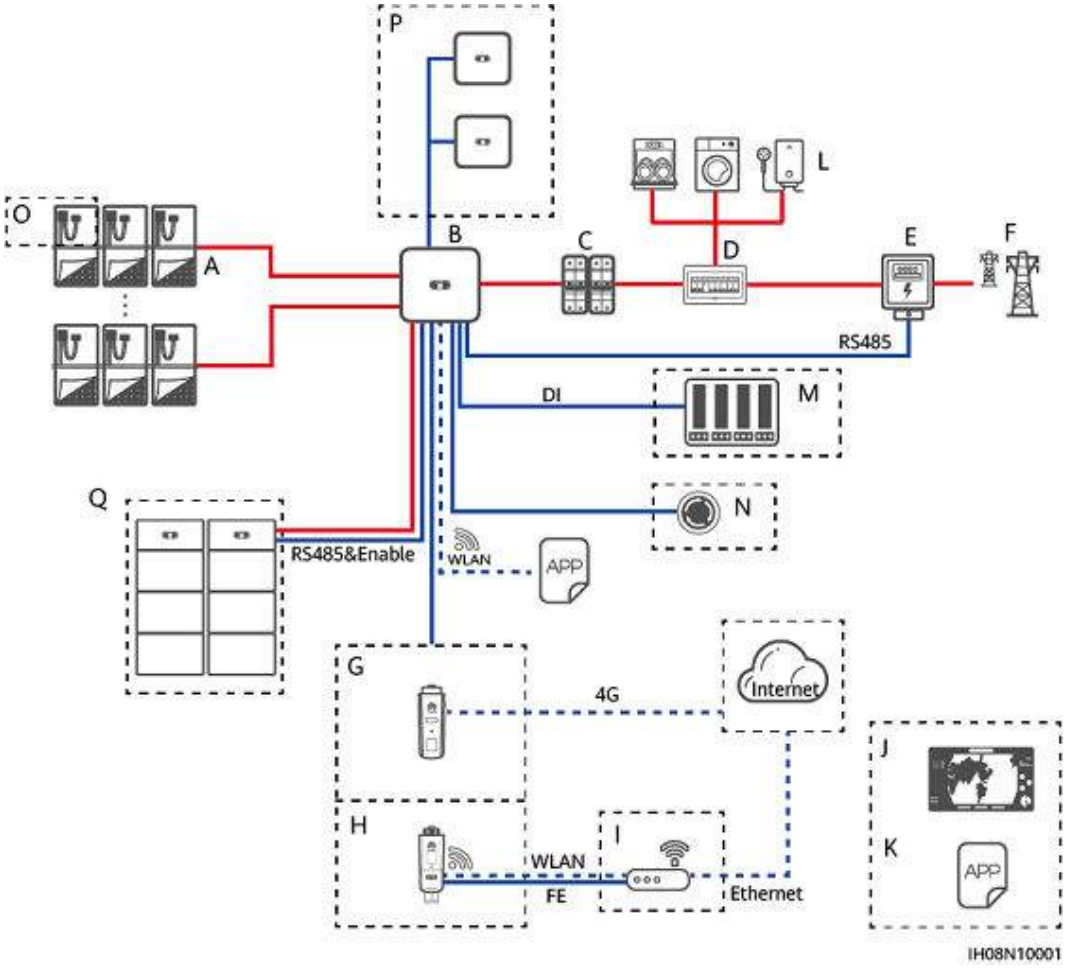
2.2 Networking Application

Typical Networking

The SUN2000 applies to residential rooftop grid-tied systems and small-sized ground grid-tied PV plants. The system consists of PV strings, grid-tied inverters, AC switches, and power distribution units (PDUs).

Smart Dongle networking

Figure 2-2 Smart Dongle networking (the components in dashed boxes are optional)



(A) PV string	(B) SUN2000	(C) AC switch
(D) AC PDU	(E) Power meter	(F) Power grid
(G) 4G Smart Dongle	(H) WLAN-FE Smart Dongle	(I) Router
(J) FusionSolar management system	(K) FusionSolar app	(L) Load
(M) Ripple control device	(N) Rapid shutdown switch	(O) Optimizer
(P) Slave devices	(Q) Battery	

NOTE

M1/M2/M5/MB0 can be cascaded and each M1 can connect to a maximum of two batteries, each MB0 can connect to a maximum of four batteries (each battery terminal can connect to a maximum of two batteries). In the Smart Dongle networking scenario, a maximum of three inverters and six batteries can be connected

NOTICE

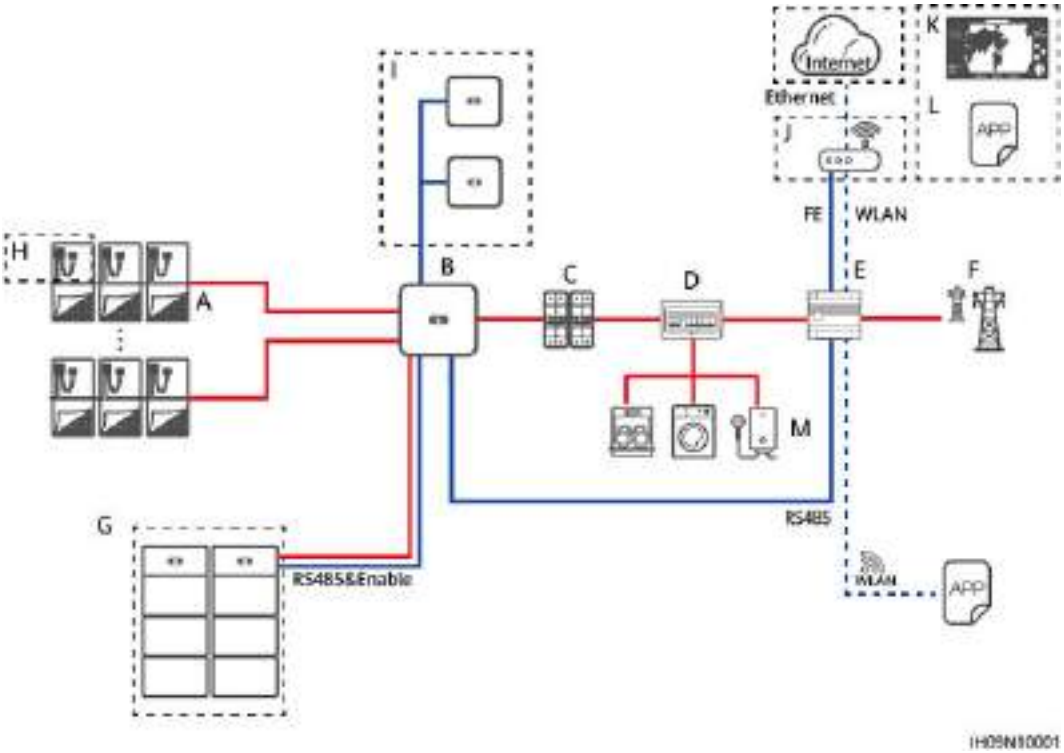
When MB0 functions as the master inverter and needs to connect to both a power meter and battery, if more than two batteries are connected, select one of the following meter models: DTSU666-HW, YDS60-80, YDS60-C24, DTSU71, and DHSU1079-CT. The DTSU666-H is not supported. Ensure that the baud rate for RS485-2 is negotiated to 115200 bit/s. For details about baud rate negotiation, see **Baud Rate Negotiation**.

NOTE

When the inverter is connected to three or more batteries, EMMA networking is recommended.

EMMA networking

Figure 2-3 EMMA networking (the components in dashed boxes are optional)



(A) PV string
(B) SUN2000
(C) AC switch
(D) AC PDU
(E) EMMA
(F) Power grid
(G) Battery
(H) Optimizer
(I) Slave devices
(J) Router
(K) FusionSolar management system
(L) FusionSolar app
(M) Load

NOTE

- M1/M2/M5/MB0 can be cascaded and each M1 can connect to a maximum of two batteries, each MB0 can connect to a maximum of four batteries (each battery terminal can connect to a maximum of two batteries). In the EMMA networking scenario, a maximum of three inverters and twelve batteries can be connected.
- For details about the EMMA networking scenario, see the **Residential Smart PV Solution Quick Guide (Three-Phase PV+ESS Scenario + EMMA Networking)**.

SmartGuard networking

Figure 2-4 Networking with all loads connected to the SmartGuard (the components in dashed boxes are optional)

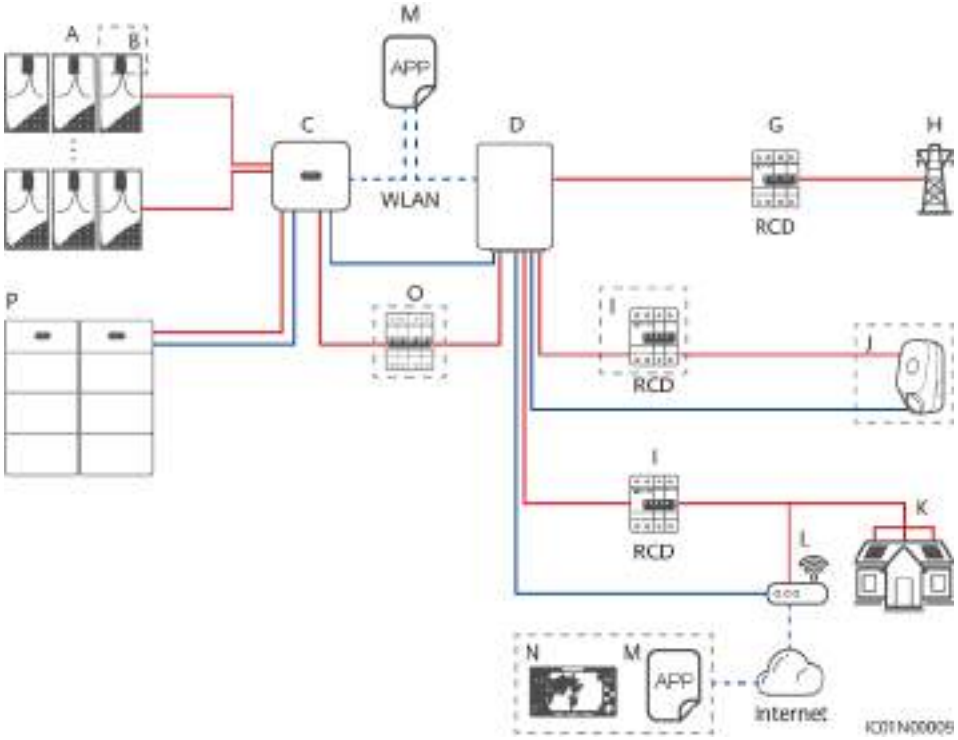
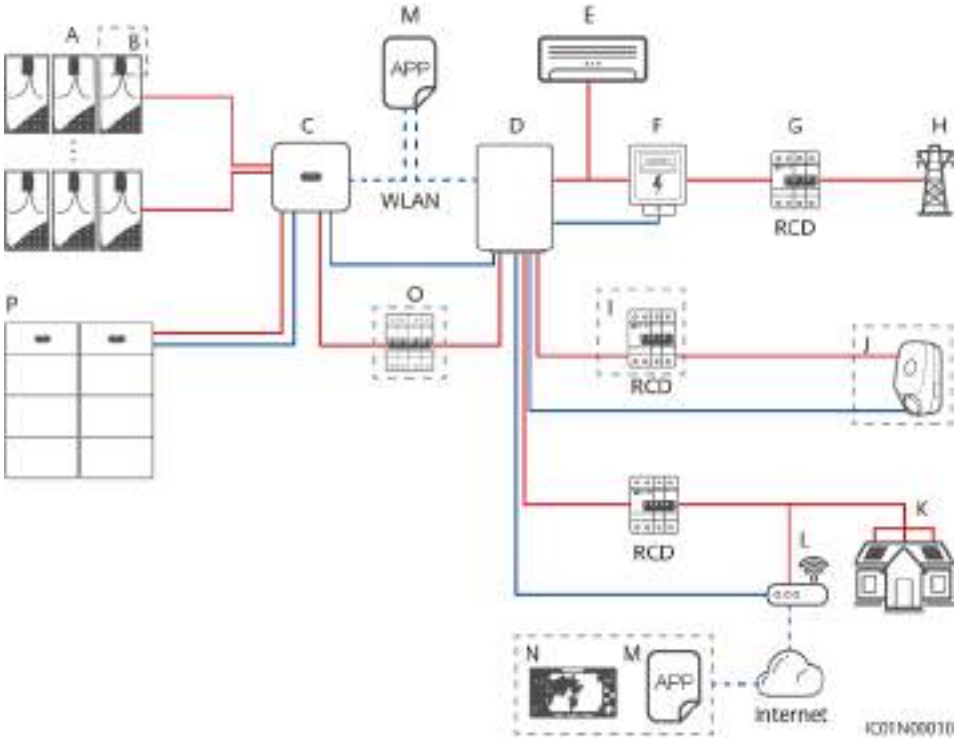


Figure 2-5 Networking with some of loads connected to the SmartGuard (the components in dashed boxes are optional)



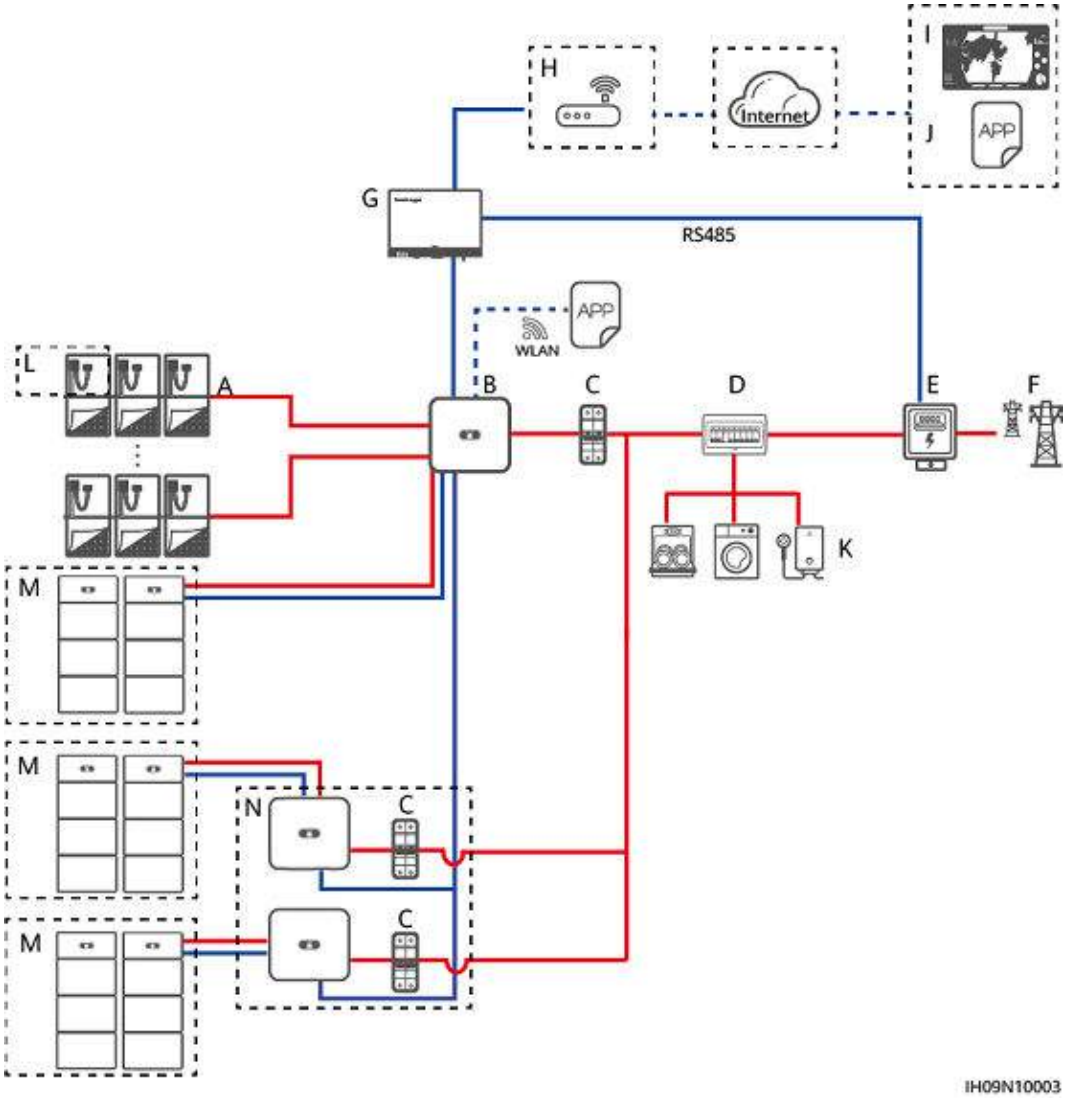
(A) PV string	(B) Smart PV Optimizer	(C) Inverter
(D) SmartGuard	(E) Load not connected to the SmartGuard	(F) Power meter
(G) Main circuit breaker	(H) Power grid	(I) Residual current device (RCD)
(J) Non-backup load	(K) Backup load	(L) Router
(M) FusionSolar app	(N) FusionSolar SmartPVMS	(O) AC switch of the inverter
(P) Battery		

NOTE

- — indicates a power cable, — indicates a signal cable, and - - - indicates wireless communication.
- In SmartGuard networking, SUN2000-(12K, 25K)-MB0 inverters cannot be cascaded.
- For details about SmartGuard networking, see **Residential Smart PV Solution Quick Guide (Three-Phase PV+ESS Scenario + SmartGuard Networking)** or **Residential Smart PV Solution User Manual (EMMA Networking & SmartGuard Networking)**.

SmartLogger networking

Figure 2-6 SmartLogger networking (the components in dashed boxes are optional)



(A) PV string	(B) SUN2000	(C) AC switch
(D) AC PDU	(E) Smart power sensor	(F) Power grid
(G) SmartLogger 3000	(H) Router	(I) FusionSolar management system
(J) FusionSolar app	(K) Load	(L) Optimizer
(M) Battery	(N) SUN2000 (Slave devices)	

NOTE

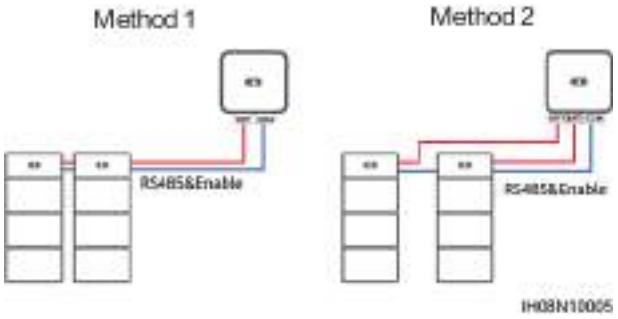
When the SUN2000-(12K-25K)-MB0 series inverters are used in the SmartLogger3000 networking scenario, a maximum of three inverters can be cascaded, and each inverter can connect to a maximum of four batteries (each battery terminal can connect to a maximum of two batteries). In the SmartLogger networking scenario, a maximum of seven batteries can be connected.

In the preceding scenario, the following version mapping requirements must be met:

- SUN2000-(12K-25K)-MB0 series: SUN2000MB V200R023C10SPC200 or later
- LUNA2000-(5-30)-S0: FusionSolarDG V100R002C00SPC127 or later
- SmartLogger3000: SmartLogger V300R023C10SPC311 or later
- FusionSolar SmartPVMS: SmartPVMS Plant V600R024C20CP0005 or later
- FusionSolar app: 6.24.00.350 or later

To connect the inverter to two batteries, refer to the following figure.

Figure 2-7 Connecting the inverter to two batteries

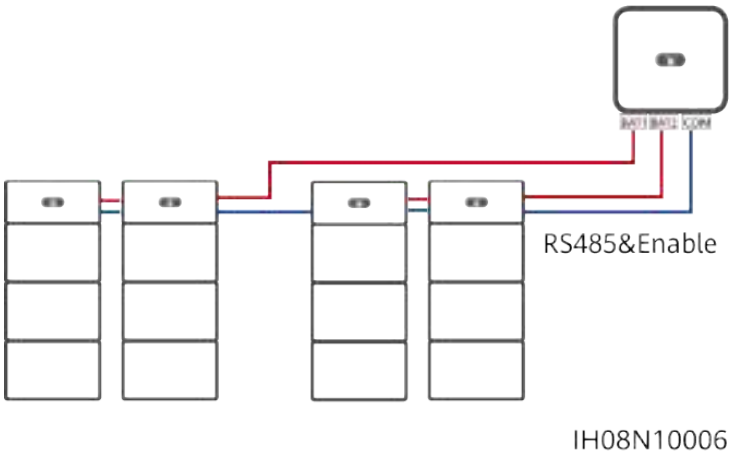


To connect the inverter to four batteries, refer to the following figure.

NOTE

Each battery terminal can connect to a maximum of two batteries.

Figure 2-8 Connecting the inverter to four batteries



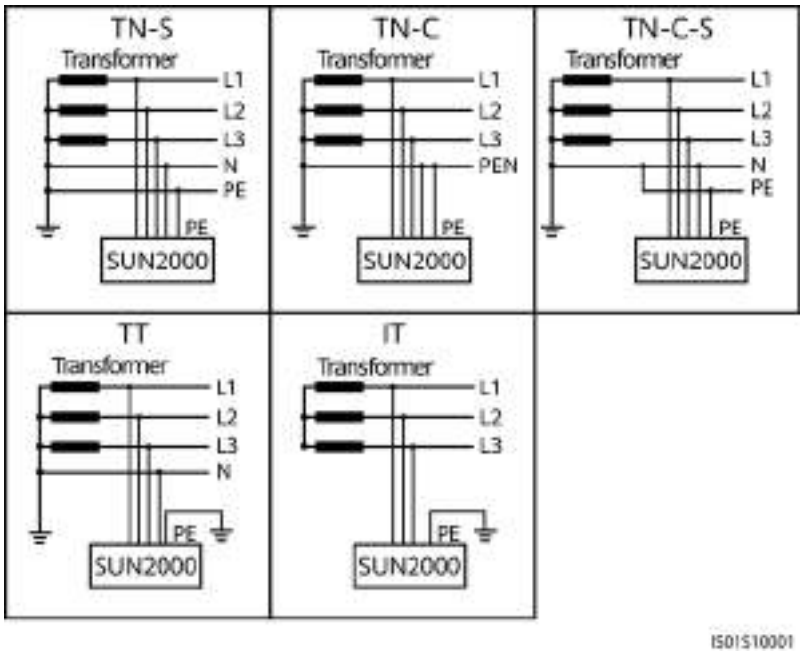
NOTE

- For two PV strings connected in parallel to the same MPPT circuit, the model, quantity, orientation, and tilt angle of PV modules in the PV strings must be the same.
- The voltage of different MPPT circuits must be the same.
- The MPPT voltage must be greater than the lower threshold of the full-load MPPT range specified in the inverter technical data sheet. Otherwise, the inverter will be derated, causing the system yield loss.

Power Grid Types

The inverter supports the TN-S, TN-C, TN-C-S, TT, and IT earthing systems.

Figure 2-9 Supported earthing systems



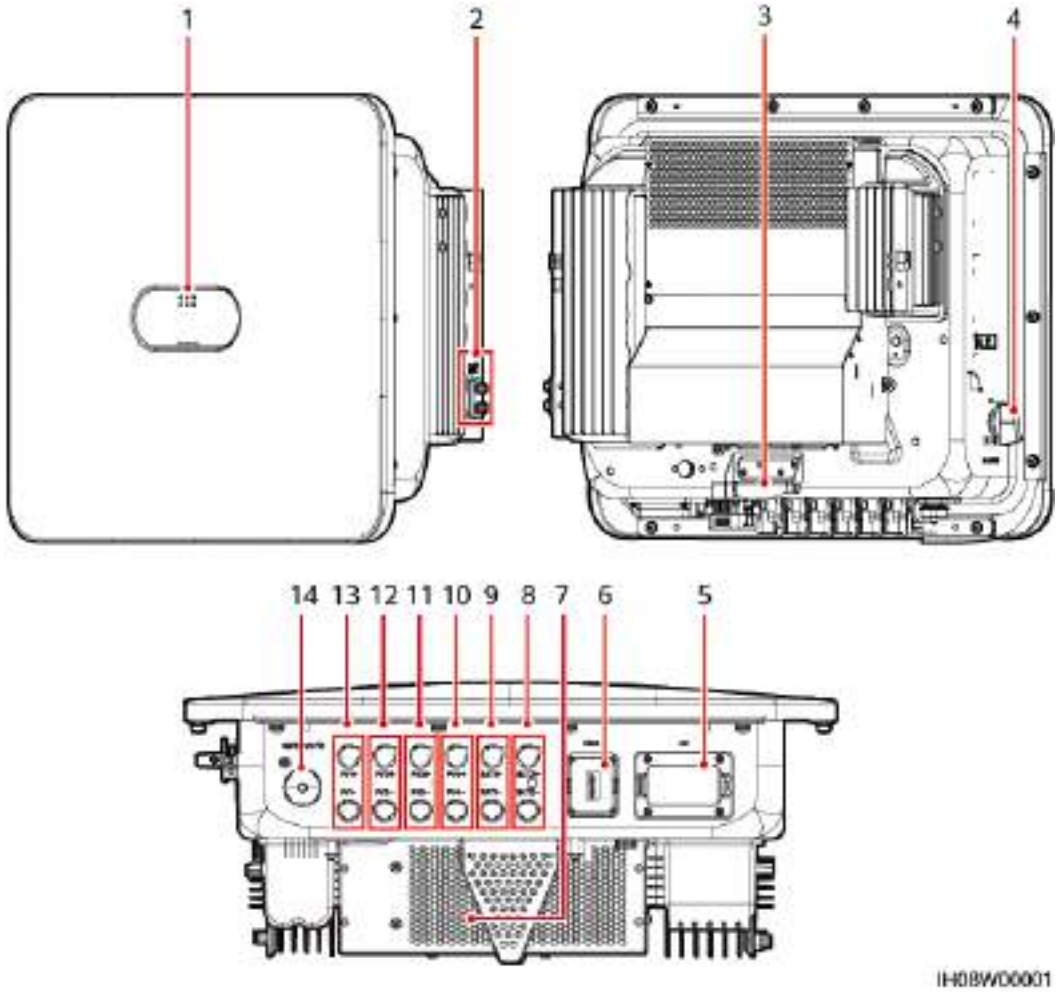
NOTE

- In a TT power grid, the N-PE voltage should be lower than 30 V.
- In an IT power grid, you need to set **isolation settings** to **input not grounded, with a transformer.**

2.3 Appearance

Appearance and Ports

Figure 2-10 Appearance



(1) LED indicators

(2) Ground screws

(3) Mounting bracket

(4) DC switch (DC SWITCH)

(5) AC output port (AC)

(6) Communications port (COM)

(7) Fan

(8) Battery terminals (BAT2+ and BAT2–)

(9) Battery terminals (BAT1+ and BAT1–)

(10) DC input terminals (PV4+ and PV4–)

(11) DC input terminals (PV3+ and PV3–)

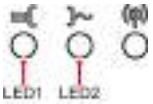
(12) DC input terminals (PV2+ and PV2–)

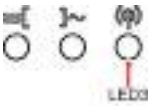
(13) DC input terminals (PV1+ and PV1–)

(14) Smart Dongle port (4G/WLAN-FE)

Indicator Description

Table 2-2 LED indicator description

Category	Status		Description
Running indication 	**LED1**	**LED2**	-
	Steady green	Steady green	The inverter is operating in grid-tied mode.
	Blinking green slowly (on for 1s and off for 1s)	Off	The DC is on and the AC is off.
	Blinking green slowly (on for 1s and off for 1s)	Blinking green slowly (on for 1s and off for 1s)	Both the DC and AC are on, and the inverter is off-grid.
	Off	Blinking green slowly (on for 1s and off for 1s)	The DC is off and the AC is on.
	Off	Off	Both the DC and AC are off.
	Blinking red fast (on for 0.2s and off for 0.2s)	-	There is a DC environmental alarm, such as **High String Input Voltage**, **String Reverse Connection**, or **Low Insulation Resistance**.
	-	Blinking red fast	There is an AC environmental alarm, such as **Grid Undervoltage**, **Grid Overvoltage**, **Grid Overfrequency**, or **Grid Underfrequency**.
	Steady red	Steady red	A fault exists.

Category	Status			Description
Communication indication 	**LED3**			-
	Blinking green fast (on for 0.2s and off for 0.2s)			Communication is in progress. (When a mobile phone is connected to the inverter, the indicator first blinks green slowly, indicating that the phone is connected to the inverter.)
	Blinking green slowly (on for 1s and off for 1s)			The mobile phone is connected to the inverter.
	Off			There is no communication.
Device replacement indication	**LED1**	**LED2**	**LED3**	–
	Steady red	Steady red	Steady red	The inverter hardware is faulty and needs to be replaced.

2.4 Working Modes

The inverter can work in Standby, Operating, or Shutdown mode.

Figure 2-11 Working modes

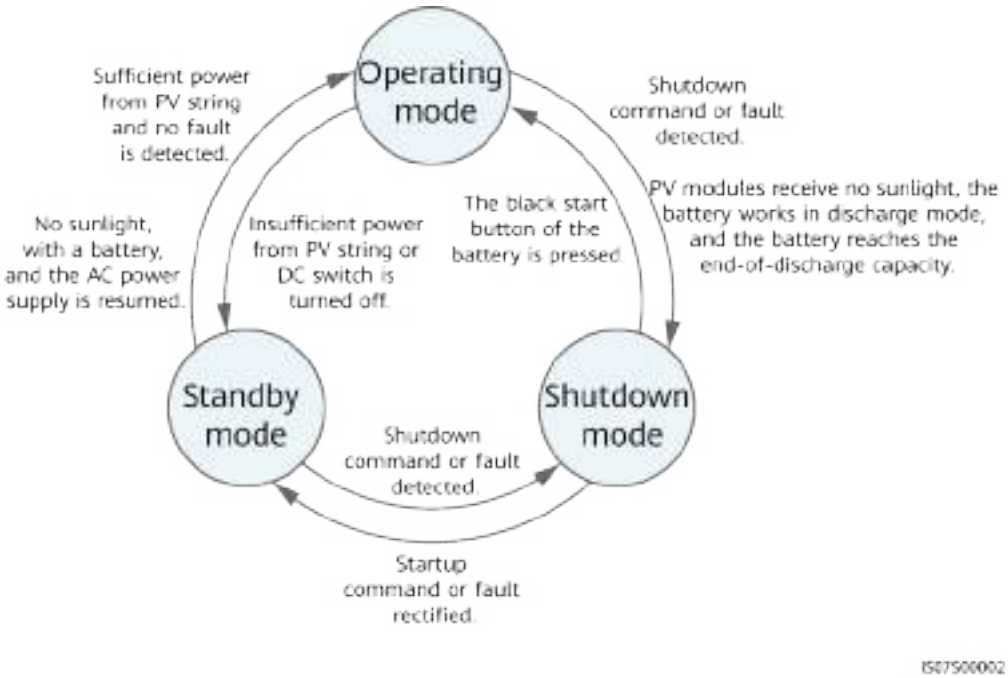


Table 2-3 Working mode description

Working Mode	Description
Standby	The inverter enters Standby mode when the external environment does not meet the operating requirements. In Standby mode: • The inverter continuously performs status check and enters the Operating mode once the operating requirements are met. • The inverter enters Shutdown mode after detecting a shutdown command or a fault after startup.
Operating	In Operating mode: • The inverter converts DC power from PV strings into AC power and feeds the power to the power grid. • The inverter tracks the maximum power point to maximize the PV string output. • If the inverter detects a fault or a shutdown command, it enters the Shutdown mode. • The inverter enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid for generating power. • If the PV modules receive no sunlight, the battery works in discharge mode, and the battery reaches the end-of-discharge capacity, the inverter enters Shutdown mode.
Shutdown	• In Standby or Operating mode, the inverter enters Shutdown mode after detecting a fault or shutdown command. • In Shutdown mode, the inverter enters Standby mode after detecting a startup command or that the fault is rectified. • In Shutdown mode, if the black start button of the battery is pressed, the inverter enters Operating mode.

2.5 Label Description

Enclosure Labels

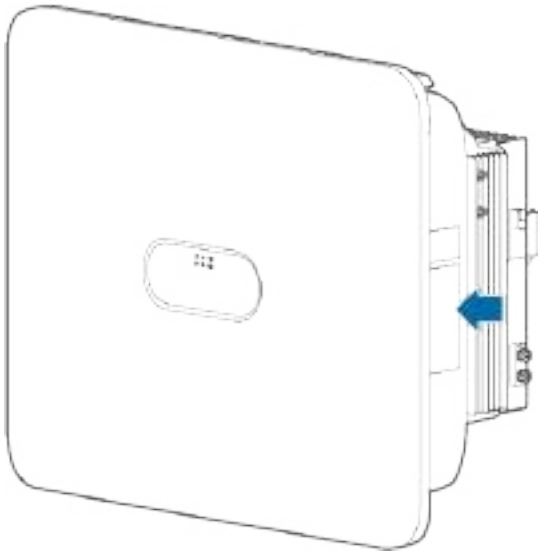
Symbol	Name	Meaning
	Delayed discharge	Residual voltage exists after the inverter is powered off. It takes 5 minutes for the inverter to discharge to the safe voltage.

Symbol	Name	Meaning
	Burn warning	Do not touch the inverter when it is running because its enclosure is hot.
	Electric shock warning	• High voltage exists after the inverter is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the inverter. • High touch current exists after the inverter is powered on. Before powering on the inverter, ensure that the inverter is properly grounded.
	Refer to documentation	Reminds operators to refer to the documents delivered with the inverter.
	Grounding	Indicates the position for connecting the protective earthing (PE) cable.
	Operation warning	Do not remove the DC input connector or AC output connector when the inverter is running.
	Weight	The inverter is heavy and needs to be carried by two persons.
	Serial number (SN)	Indicates the product SN.

Symbol	Name	Meaning
	QR code for inverter WiFi connection	Scan the QR code to connect to the inverter WiFi.

Product Nameplate

The nameplate contains the trademark, product model, important technical specifications, compliance symbols, company name, and place of origin.



NOTE

Scan the QR code on the nameplate to view related product information and documents.

3 Storage Requirements

The following requirements shall be met if inverters are not put into use immediately:

- Do not unpack inverters.
- Keep the storage temperature at –40°C to +70°C and the humidity at 5%–95% RH.
- Store inverters in a clean and dry place and protect them from dust and moisture.
- Inverters can be stacked in a maximum of six layers. To avoid personal injury or device damage, stack inverters with caution to prevent them from falling over.
- During the storage period, check inverters periodically (recommended: once every three months). Replace the packing materials that are damaged by insects or rodents in a timely manner.
- If inverters have been stored for two years or longer, they must be checked and tested by professionals before being put into use.

4 Installation

4.1 Installation Modes

The inverter can be wall-mounted or support-mounted.

Table 4-1 Installation modes

Installation Mode	Screw Specifications	Description
Wall mounting	M6x60 stainless steel expansion bolt	Delivered with the product
Support mounting	M6 stainless steel bolt assembly	Prepared by the customer

4.2 Installation Requirements

4.2.1 Site Selection Requirements

Basic Requirements

- The inverter is protected to IP66 and can be installed indoors or outdoors.
- Do not install the inverter in an easily accessible place because its enclosure and heat sinks generate high temperature during operation.
- Do not install the inverter in noise-sensitive areas.
- Do not install the inverter in areas with flammable or explosive materials.
- Do not install the inverter in a place within children's reach.
- Do not install the inverter outdoors in salt areas because it will be corroded there and may cause fire. A salt area refers to a region within 500 m of the coast or prone to sea breeze. Regions prone to sea breeze vary with weather

conditions (such as typhoons and monsoons) or terrains (such as dams and hills).

- The inverter should be installed in a well-ventilated environment to ensure good heat dissipation.
- You are advised to install the inverter in a sheltered area, or with an awning over it.

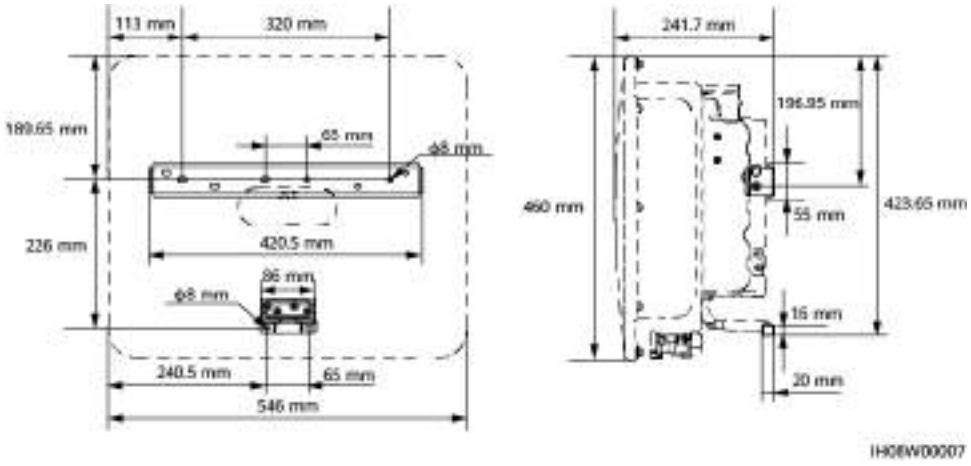
Mounting Structure Requirements

- The mounting structure where the inverter is installed must be fireproof.
- Do not install the inverter on flammable building materials.
- The inverter is heavy. Ensure that the installation surface is solid enough to bear the weight.
- In residential areas, do not install the inverter on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the inverter is noticeable.

4.2.2 Clearance Requirements

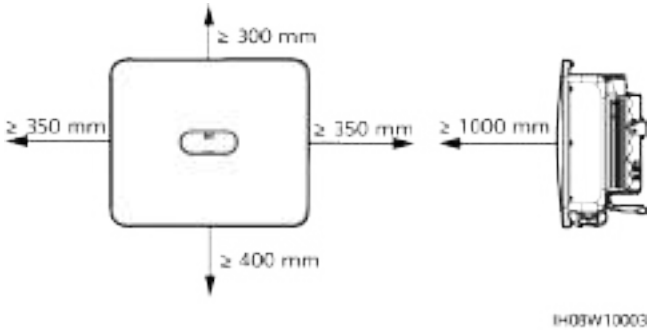
- **Figure 4-1** shows the dimensions of mounting holes for the inverter.

Figure 4-1 Dimensions of the inverter and mounting bracket



- Reserve enough clearances around the inverter to ensure sufficient space for installation and heat dissipation.

Figure 4-2 Clearances



- When installing multiple inverters, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended.

Figure 4-3 Horizontal installation mode (recommended)

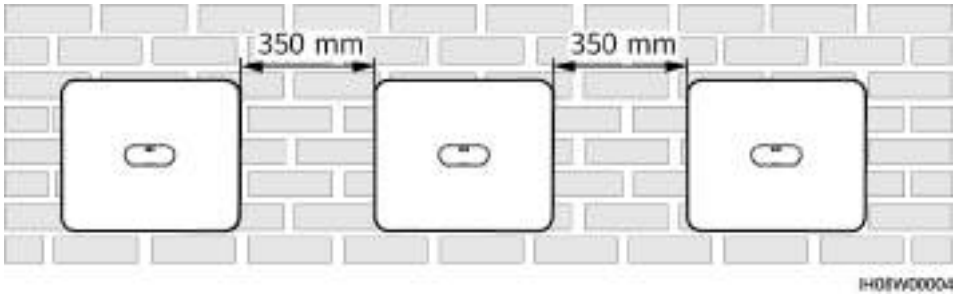
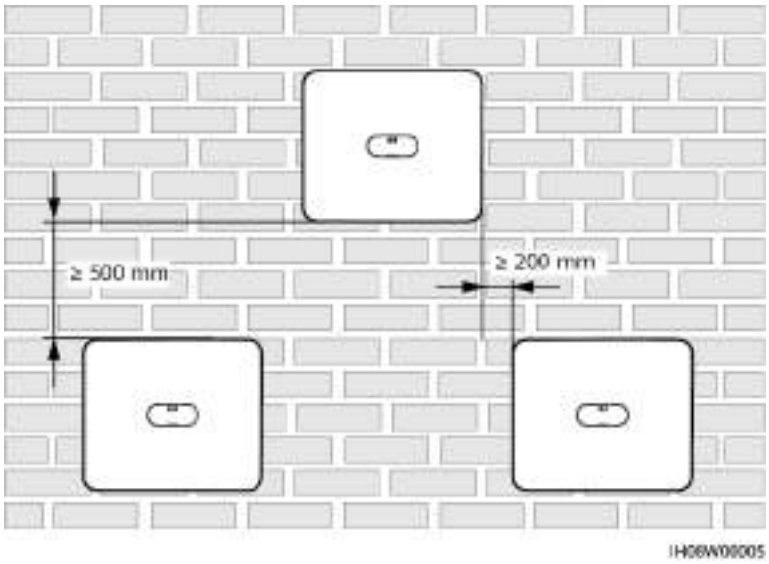


Figure 4-4 Triangle installation mode (recommended)

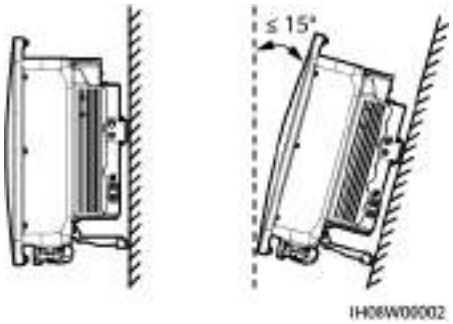


4.2.3 Angle Requirements

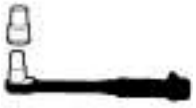
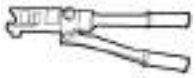
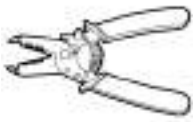
The inverter can be wall-mounted or support-mounted. The installation angle requirements are as follows:

- Install the inverter vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the inverter at forward tilted, excessive backward tilted, side tilted, horizontal, or upside down positions.

Figure 4-5 Installation angle



4.3 Tools

Type	Tool			
Installation tool	 Hammer drill Drill bit: Φ8 mm, Φ6 mm	 Phillips insulated torque screwdriver	 Hex insulated torque screwdriver	 Insulated torque socket wrench
	 Hex key	 Diagonal pliers	 Hydraulic pliers	 Wire stripper
	 Cable tie	 Removal wrench Model: PV-MS-HZ open-end wrench Manufacturer: Staubli	 Rubber mallet	 Utility knife

Type	Tool			
	 Cable cutter	 Crimping tool Model: PV-CZM-22100/19100 Manufacturer: Staubli	 Multimeter DC voltage measurement range ≥ 1100 V DC	 Vacuum cleaner
	 Marker	 Steel measuring tape	 Level	 Cord end terminal crimping tool
	 Heat shrink tubing	 Heat gun	-	-
Personal protective equipment (PPE)	 Insulated gloves	 Protective gloves	 Dust mask	 Insulated shoes
	 Goggles	 Safety helmet	-	-

4.4 Checking Before Installation

Outer Packing Materials

Before unpacking the inverter, check the outer packing materials for damage, such as holes and cracks, and check the inverter model. If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your supplier as soon as possible.

NOTE

You are advised to remove the packing materials within 24 hours before installing the inverter.

Package Contents

NOTICE

- After placing the equipment in the installation position, unpack it with care to prevent scratches. Keep the equipment stable during unpacking.

After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

NOTE

For details about the number of contents, see the *Packing List* in the packing case.

4.5 Moving an Inverter

Procedure

Step 1 Two persons are required to move the inverter with one person on both sides. Lift the inverter from the packing case and move it to the specified installation position.

CAUTION

- Move the inverter with care to prevent device damage and personal injury.
- Do not hold the wiring terminals and ports at the bottom. Do not place the inverter with the wiring terminals and ports touching the ground or other supporting surface.
- When you need to temporally place the inverter on the ground, use protection material such as foam and paper underneath to prevent damage to its enclosure.

----End

4.6 Installing an Inverter (Wall Mounting)

Procedure

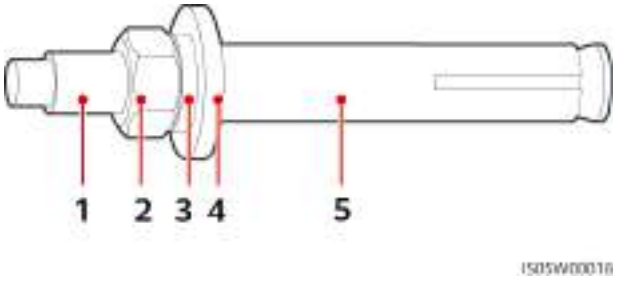
Step 1 Determine the hole positions and mark them using a marker.

Step 2 Secure the mounting bracket.

NOTE

- M6x60 expansion bolts are delivered with the inverter. If the length and amount of the bolts do not meet installation requirements, prepare M6 stainless steel expansion bolts by yourself.
- The expansion bolts delivered with the inverter are used for solid concrete walls. For other types of walls, prepare bolts by yourself and ensure that the wall meets the load bearing requirements of the inverter.

Figure 4-6 M6 expansion bolt structure



(1) Bolt (2) Nut (3) Spring washer

(4) Flat washer (5) Expansion sleeve

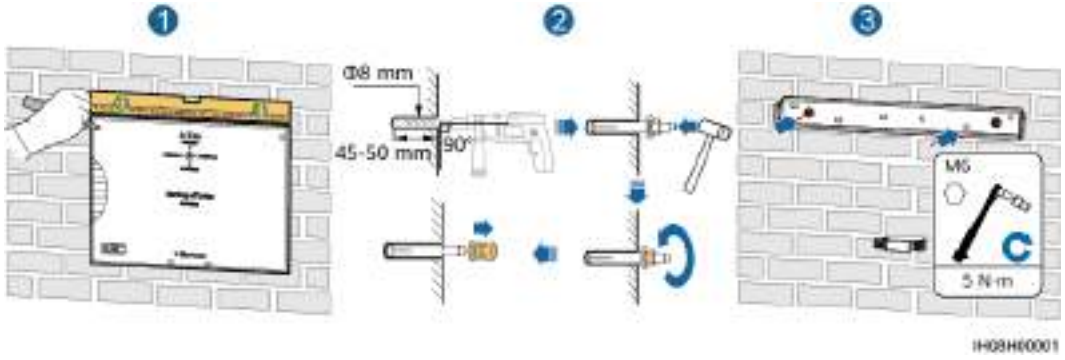
DANGER

Avoid drilling holes in the utility pipes or cables attached to the back of the wall.

NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Clean up any dust in and around the holes using a vacuum cleaner and measure the distance between holes. If large hole tolerance exists, position and drill holes again.
- After removing the bolt, spring washer, and flat washer, level the front of the expansion tube with the concrete wall. Otherwise, the mounting brackets will not stay steady on the concrete wall.
- Partially loosen the nut, flat washer and spring washer of the two expansion bolts below.

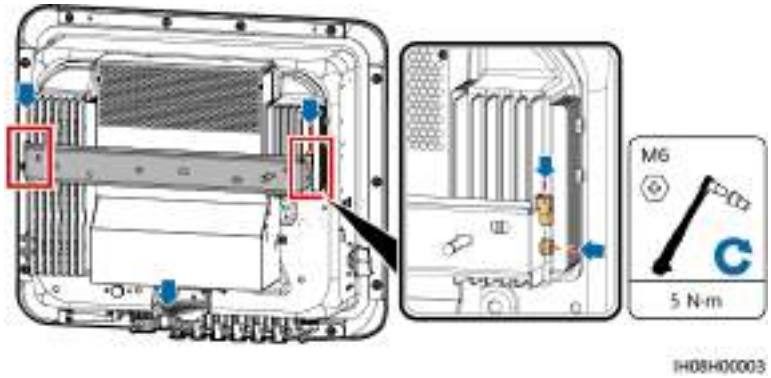
Figure 4-7 Installing the mounting bracket



Step 3 Install the inverter on the mounting bracket.

Step 4 Tighten the nuts.

Figure 4-8 Installing the inverter



----End

4.7 Installing an Inverter (Support Mounting)

Prerequisites

Prepare M6 stainless steel bolt assemblies (including flat washers, spring washers, and M6 bolts) with appropriate lengths as well as matched flat washers and nuts based on the support specifications.

Procedure

Step 1 Determine the positions for drilling holes using the marking-off template, and then mark the positions with a marker.

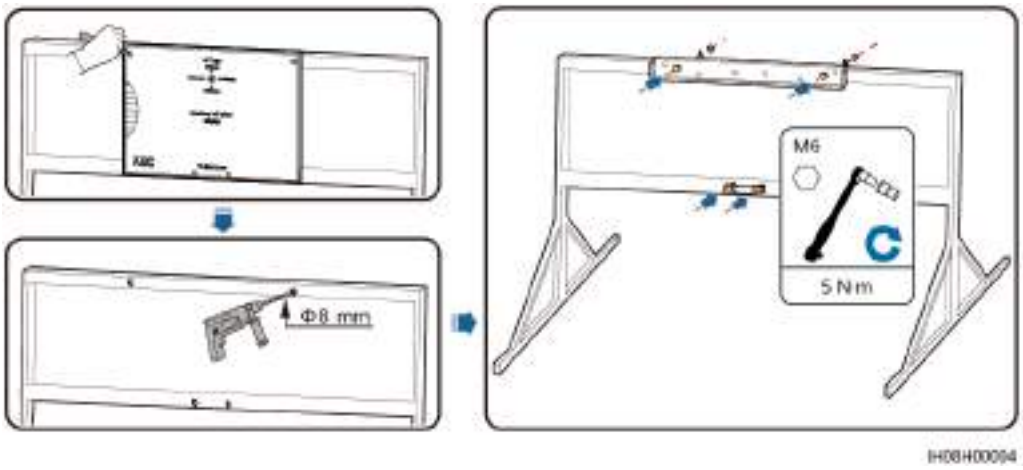
Step 2 Drill holes using a hammer drill.

NOTE

You are advised to apply anti-rust paint on the hole positions for protection.

Step 3 Secure the mounting bracket.

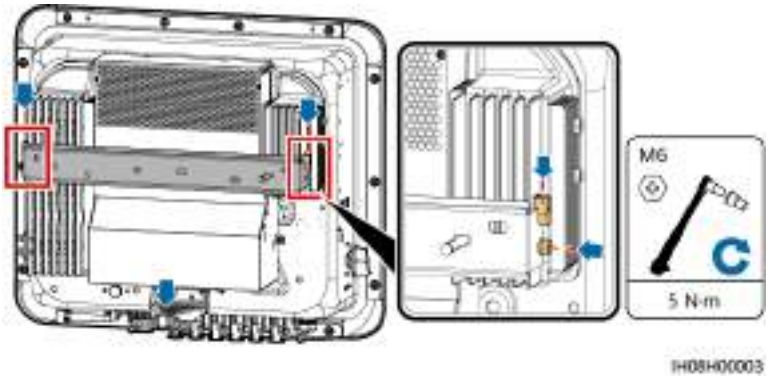
Figure 4-9 Securing the mounting bracket



Step 4 Install the inverter on the mounting bracket.

Step 5 Tighten the bolt assemblies.

Figure 4-10 Installing an Inverter



----End

5 Electrical Connections

5.1 Precautions

DANGER

When exposed to sunlight, the PV arrays supply DC voltage to the inverter. Before connecting cables, ensure that all **DC SWITCH** on the inverter are OFF. Otherwise, the high voltage of the inverter may result in electric shocks.

DANGER

- The site must be equipped with qualified fire fighting facilities, such as fire sand and carbon dioxide fire extinguishers.
- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

WARNING

- The equipment damage caused by incorrect cable connections is beyond the warranty scope.
- Only certified electrician can perform electrical terminations.
- Operation personnel must wear PPE when connecting cables.
- Before connecting cables to ports, leave enough slack to reduce the tension on the cables and prevent poor cable connections.

CAUTION

- Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.

NOTE

The cable colors shown in the electrical connection diagrams provided in this section are for reference only. Select cables in accordance with local cable specifications (green-and-yellow cables are only used for protective earthing).

5.2 Preparing Cables

Figure 5-1 SUN2000 cable connections (the components in dashed boxes are optional)

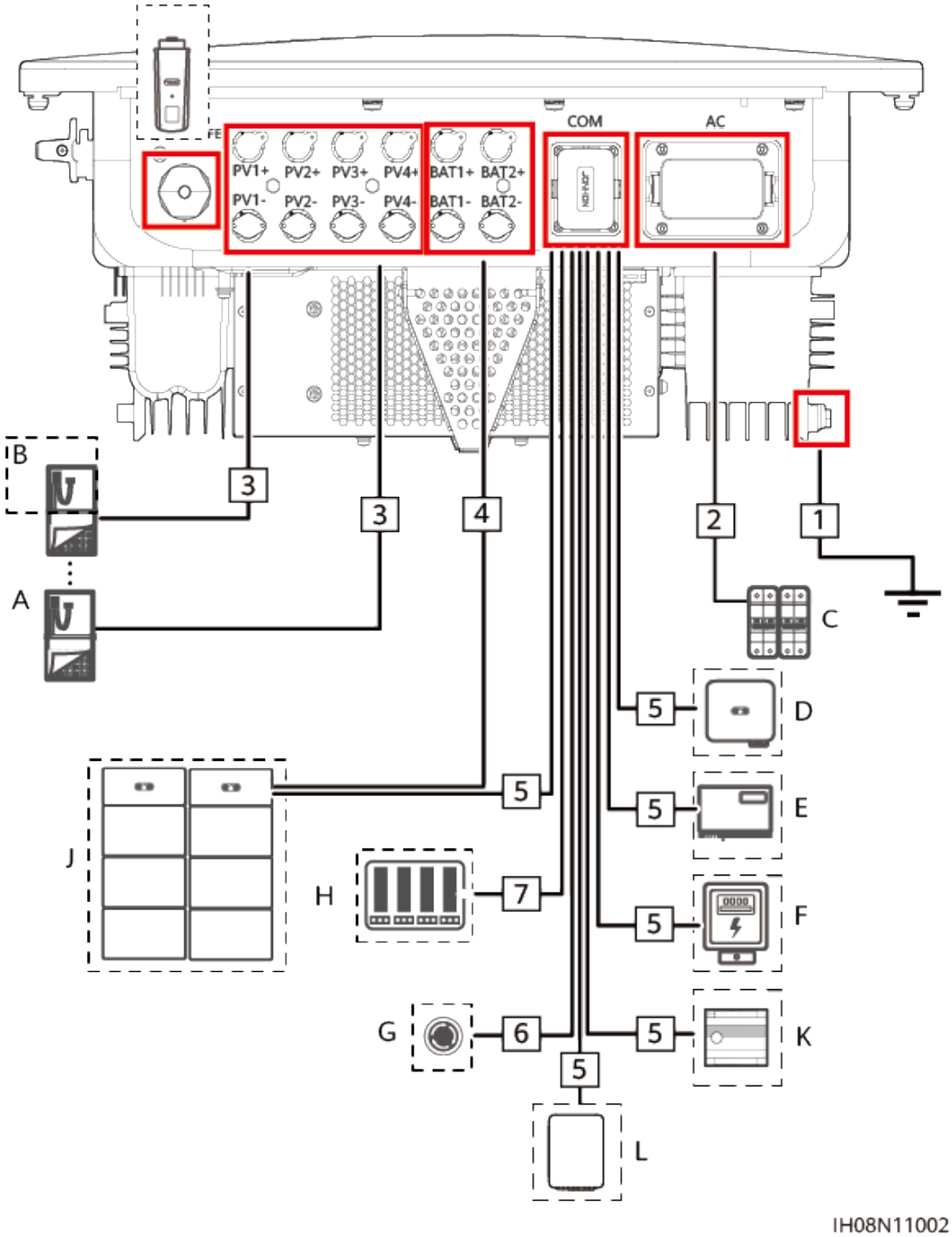


Table 5-1 Component description

No.	Component	Description	Source
A	PV module	• A PV string consists of PV modules connected in series. • The inverter supports 4 PV string inputs.	Prepared by the customer
B	Smart PV Optimizer	Supported models: SUN2000-(600W-P, 450W-P2), MERC-(1300W, 1100W)-P, and MERC-600W-PA0[3]	Purchased from Huawei
C	AC switch	To ensure that the inverter can be safely disconnected from the power grid when an exception occurs, connect an AC switch to the AC side of the inverter. Select an appropriate AC switch in accordance with local industry standards and regulations. Huawei recommends the following switch specifications: It is recommended that you use a three-phase AC circuit breaker with a rated voltage greater than or equal to 415 V AC and a rated current of: • On-grid: 12K–20K: 40 A 25K: 50 A or 63 A • On/Off-grid: 12K–25K: 50 A or 63 A	Prepared by the customer
D	SUN2000	Select a proper model as required.	Purchased from Huawei
E	SmartLogger	Select a proper model as required.	Purchased from Huawei
F	Power meter[1]	The recommended power meter models are DTSU666-H, DTSU666-HW, YDS60-80, YDS60-C24, DTSU71, and DHSU1079-CT[4].	Purchased from Huawei
G	Rapid shutdown switch	Select a proper model as required.	Prepared by the customer
H	Ripple control device	Select the device that meets the power grid scheduling requirements.	Provided by the local power grid company

No.	Component	Description	Source
I	Smart Dongle[2]	Supported models: • WLAN-FE Smart Dongle: SDongleA-05 • 4G Smart Dongle: SDongleB-06[5]	Purchased from Huawei
J	Battery	The inverter can connect to the LUNA2000.	Purchased from Huawei
K	EMMA[6]	Supported models: EMMA-A01 and EMMA-A02	Purchased from Huawei
L	SmartGuard	The three-phase SmartGuard can be used to switch the inverter between on-grid and off-grid states. Supported models: SmartGuard-63A-T0 and SmartGuard-63A-AUT0	Purchased from Huawei

Note [1]: For details about how to operate a power meter, see **DTSU666-HW Smart Power Sensor Quick Guide**, **DTSU666-H 100 A and 250 A Smart Power Sensor User Manual**, **YDS60-80 Smart Power Sensor Quick Guide**, and **YDS60-C24 Smart Power Sensor Quick Guide**.

Note [2]: For details about how to operate a WLAN-FE Smart Dongle SDongleA-05, see **SDongleA-05 Smart Dongle Quick Guide (WLAN-FE)**. For details about how to operate a 4G Smart Dongle SDongleB-06, see **SDongleB-06 Smart Dongle Quick Guide (4G)**. You can obtain these documents at **https://support.huawei.com/enterprise** by searching for models.

Note [3]:

- Any two or three models of the SUN2000-(600W-P, 450W-P2), MERC-(1300W, 1100W)-P, and MERC-600W-PA0 cannot be used together for the same inverter.
- If the MERC-600W-PA0 is selected, the optimizers must be configured for all PV modules.

Note [4]:

- Retain the default baud rates for the DTSU666-H, YDS60-C24, DTSU71, and DHSU1079-CT power meters. If they are changed, the power meters may go offline, generate alarms, or affect the inverter output power.
- SUN2000MB V200R023C10SPC200 and later versions can connect to the DTSU71 and DHSU1079-CT power meters.

Note [5]: If the Smart Dongle B-03-CN is used, only one inverter is supported. If the Smart Dongle B-06-CN (02314ALM-001) is used, a maximum of two inverters can be cascaded.

Note [6]: For details about how to operate the EMMA, see **EMMA-(A01, A02) Quick Guide**.

Table 5-2 Cable description

No.	Name	Type	Conductor Cross-Sectional Area	Outer Diameter
1	PE cable	Single-core outdoor copper cable	12K: ≥ 6 mm^2 15K–25K: ≥ 10 mm^2	-
2	AC output power cable	Five-core outdoor copper cable	On-grid: 12K: 6–16 mm^2 15K–25K: 10–16 mm^2	11–26 mm
			On/Off-grid: 12K–25K: 10–16 mm^2	
3	DC input power cable	Common outdoor PV cable in the industry	4–6 mm^2	5.5–9 mm
4	(Optional) Battery cable			
5	(Optional) RS485 communications cable	Two-core outdoor shielded twisted pair cable	0.2–1 mm^2 (0.5 mm^2 recommended)	4–11 mm
6	(Optional) Signal cable to the rapid shutdown switch			
7	(Optional) Grid scheduling signal cable	Five-core outdoor cable		

NOTE

- The minimum cable diameter must meet local standards.
- The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.

5.3 Connecting a PE Cable

Precautions

DANGER

- Ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.
- Do not connect the neutral wire to the enclosure as a PE cable. Otherwise, electric shocks may occur.

NOTE

- The PE point at the AC output port is used only as a PE equipotential point, and cannot substitute for the PE point on the enclosure.
- It is recommended that silicone grease or paint be applied around the ground terminal after the PE cable is connected.
- When the phase wire is short-circuited to the PE point, you can set the phase-to-PE short-circuit protection switch on the app (choose **Settings > Feature parameters > Phase-to-ground short-circuit protection**). If the switch is disabled, only inverter alarm detection is performed, and the inverter can connect to the power grid and generate power normally. (This feature is applicable to SUN2000-15K-MB0-ZH, SUN2000-17K-MB0-ZH, SUN2000-20K-MB0-ZH, and SUN2000-25K-MB0-ZH.)

Additional Information

The inverter provides the grounding detection function. This function is used to check whether the inverter is properly grounded before the inverter starts, or check whether the ground cable is disconnected when the inverter is running. This function is only available under limited conditions. To ensure the safe operation of the inverter, properly ground the inverter according to the connection requirements of the PE cable. For some power grid types, if the output side of the inverter is connected to an isolation transformer, ensure that the inverter is properly grounded and then set **Phase-to-ground short-circuit protection** to **Disable** so that the inverter can run properly.

- According to IEC 62109, to ensure the safe operation of the inverter in the case of PE cable damage or disconnection, properly connect the PE cable of the inverter and ensure that it meets at least one of the following requirements before the grounding detection function becomes invalid.
  - If the PE terminal of the AC connector is not connected, the PE cable on the enclosure must be a single-core outdoor copper cable with a cross-sectional area of at least 10 mm^2.
  - Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screws on the enclosure.
- In some countries and regions, the inverter must have additional ground cables. In this case, use cables with the same diameter as the AC output

power cable to ground the PE terminal of the AC connector and the ground screws of the enclosure, respectively.

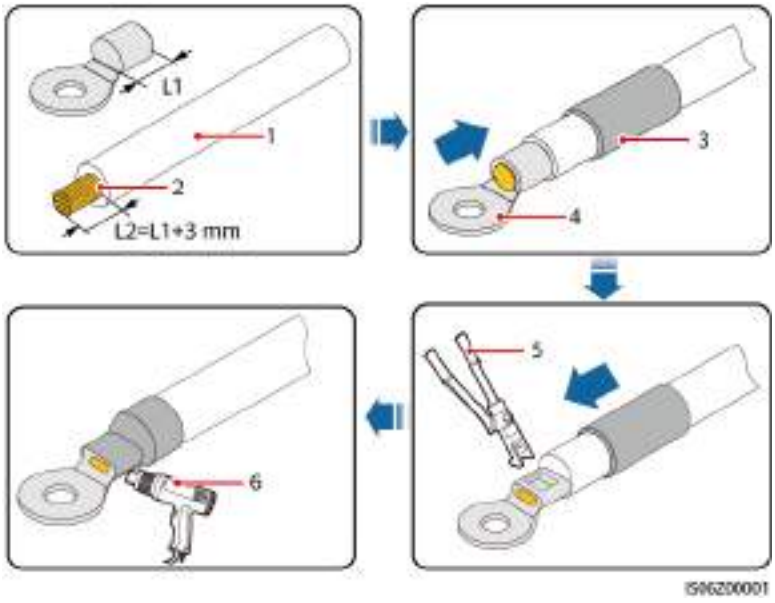
Procedure

Step 1 Crimp an OT terminal.

NOTICE

- Avoid scratching the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wire completely. The core wire must make close contact with the OT terminal.
- Wrap the wire crimping area with heat shrink tubing or insulation tape. The heat shrink tubing is used as an example.
- Use a heat gun carefully to avoid heat damage to the equipment.

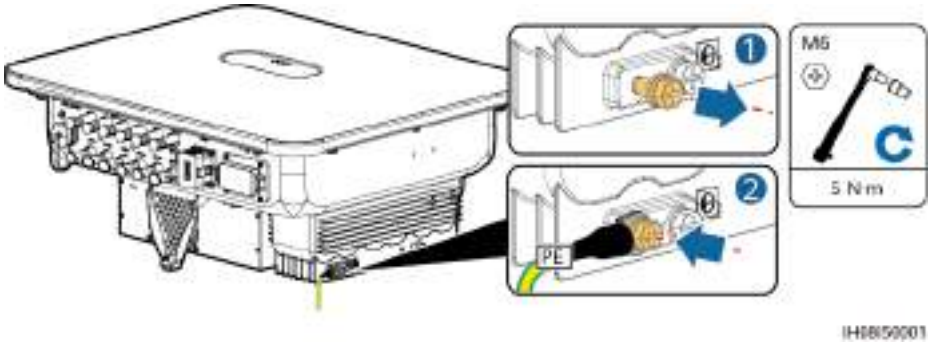
Figure 5-2 Crimping an OT terminal



(1) Cable
(2) Core wire
(3) Heat shrink tubing
(4) OT terminal
(5) Hydraulic pliers
(6) Heat gun

Step 2 Connect the PE cable.

Figure 5-3 Connecting the PE cable



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5.4 Connecting an AC Output Power Cable

Precautions

It is recommended that a three-phase AC switch be installed on the AC side of the inverter. To ensure that the inverter can safely disconnect itself from the power grid when an exception occurs, select a proper overcurrent protection device in compliance with local power distribution regulations.

WARNING

- Do not connect loads between an inverter and an AC switch that directly connects to the inverter. Otherwise, the switch may trip by mistake.
- If an AC switch is used with specifications beyond local standards, regulations, or the Company's recommendations, the switch may fail to turn off in a timely manner in case of exceptions, causing serious faults.

CAUTION

Each inverter shall be equipped with an AC output switch. Multiple inverters shall not connect to the same AC switch.

The inverter is installed with an integrated residual current monitoring unit. When the inverter detects that residual current exceeds the permitted value, it disconnects from the power grid quickly.

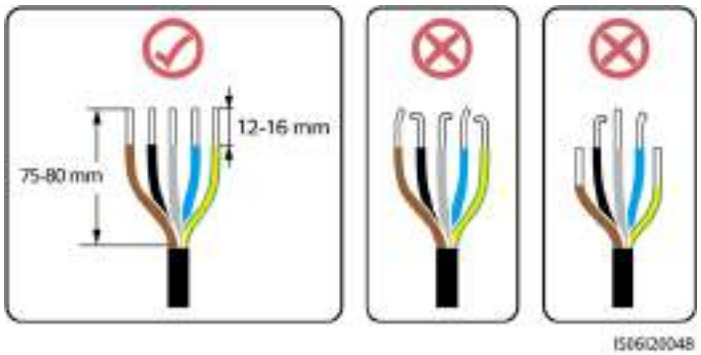
NOTICE

- If the external AC switch provides the leakage protection function, the rated residual operating current must be greater than or equal to 300 mA.
- If multiple inverters are connected to the master leakage protection device through their external AC switches, the rated residual operating current of the device must be greater than or equal to the number of inverters x 300 mA.
- The AC switch cannot be a knife switch.

Procedure

Step 1 Connect the AC output power cable to the AC connector.

Figure 5-4 Wire stripping requirements



NOTICE

- Ensure that the cable jacket is inside the connector.
- Insert the exposed core wires completely into the holes.
- Connect the AC output cable securely. Otherwise, the device may fail to operate properly or the AC connector may be damaged.
- Ensure that the cable is not twisted.

NOTICE

Strip the insulation layers of the AC output power cable by the recommended length (12–16 mm) to ensure that the cable conductors are completely inside the conductor insertion points and no insulation layer is pressed into the conductor insertion points. Tighten the cable conductors to a torque of 1.5 N·m. Otherwise, the device may fail to run properly or be damaged during operation.

Figure 5-5 Three-core cable (L1, L2, and L3)

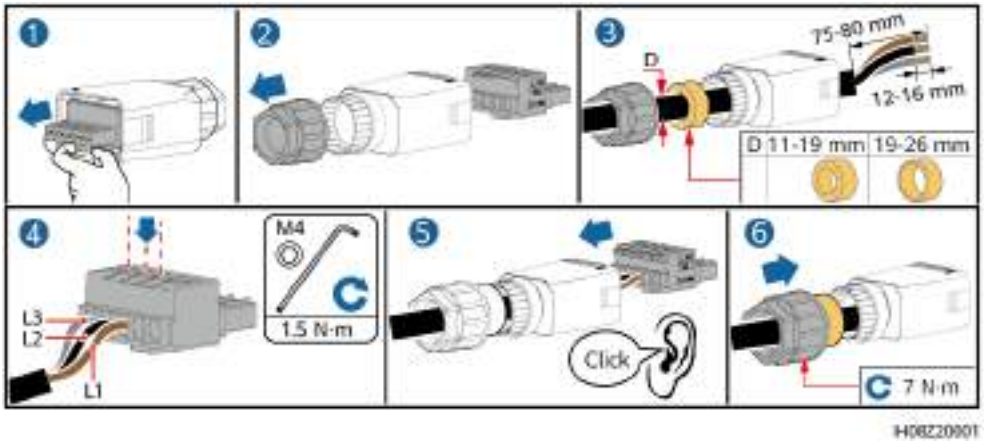


Figure 5-6 Four-core cable (L1, L2, L3, and PE)

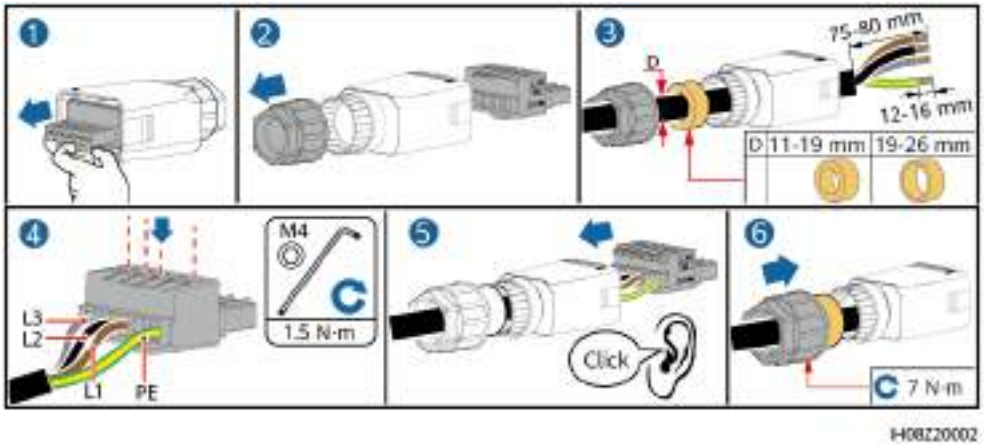


Figure 5-7 Four-core cable (L1, L2, L3, and N)

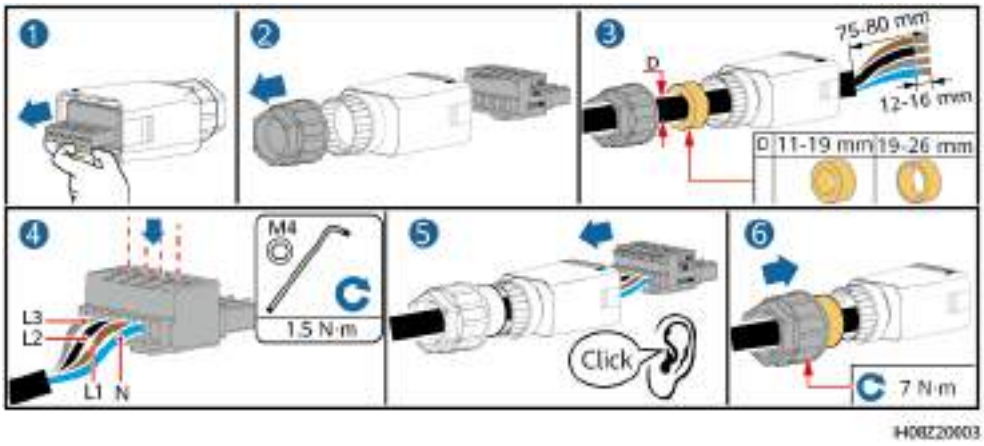
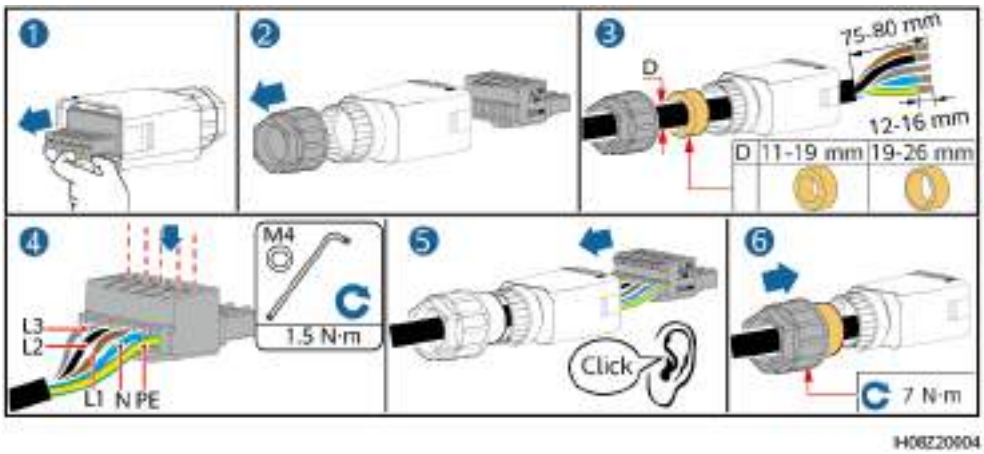


Figure 5-8 Five-core cable (L1, L2, L3, N, and PE)



NOTE

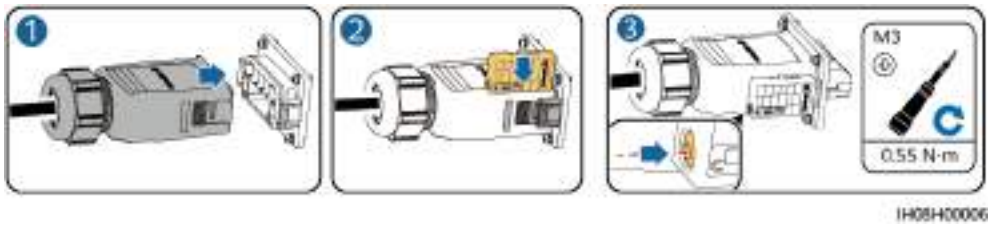
The cable colors shown in the figures are for reference only. Select an appropriate cable according to the local standards.

Step 2 Connect the AC connector to the AC output port.

NOTICE

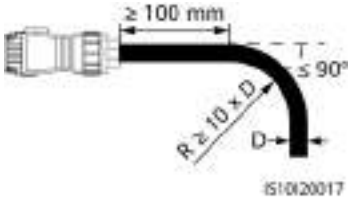
Ensure that the AC connector is connected securely.

Figure 5-9 Securing the AC connector



Step 3 Check the route of the AC output power cable.

Figure 5-10 Cabling requirements



----End

Disconnection

Perform the steps in reverse order to disconnect the cable.

5.5 Connecting DC Input Power Cables

Precautions

DANGER

- Before connecting the DC input power cables, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the DC SWITCH on the inverter is OFF. Otherwise, the high voltage may result in electric shocks.
- When the inverter is operating, do not perform maintenance or operations on the DC input power cables, such as connecting or disconnecting a PV string or a PV module in the PV string. Otherwise, electric shocks may occur.
- If no PV string connects to a DC input terminal of the inverter, do not remove the waterproof cap from the DC input terminal. Otherwise, the protection level of the inverter will decrease.

WARNING

Ensure that the following conditions are met. Otherwise, the inverter may be damaged or even a fire may occur.

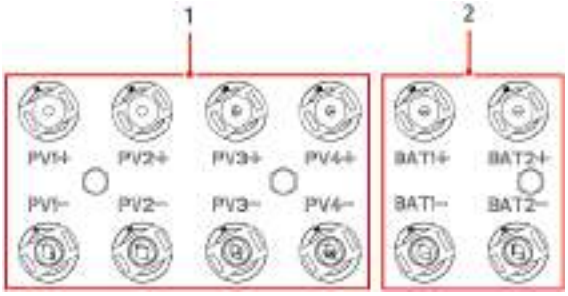
- PV modules connected in series in each PV string are of the same specifications.
- The maximum open-circuit voltage of each PV string must be lower than or equal to 1100 V DC under any circumstances.
- The polarities of electric connections are correct on the DC input side. The positive and negative terminals of a PV string connect to corresponding positive and negative DC input terminals of the inverter.
- If a DC input power cable is reversely connected, do not immediately operate on the DC SWITCH or positive/negative connectors. Wait until the night when solar irradiance declines and the PV string current drops to below 0.5 A. Then set the DC SWITCH to OFF, remove the positive and negative connectors, and correct the polarities of the DC input power cable.

NOTICE

- The output of the PV string connected to the inverter cannot be grounded. Ensure that the PV module output is well insulated to ground.
- The PV strings connected to the same MPPT circuit shall contain the same number and model of PV modules or optimizers.
- During the installation of PV strings and the inverter, the positive or negative terminals of PV strings may be short-circuited to ground if the power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the inverter. The resulting device damage is not covered by the product warranty.

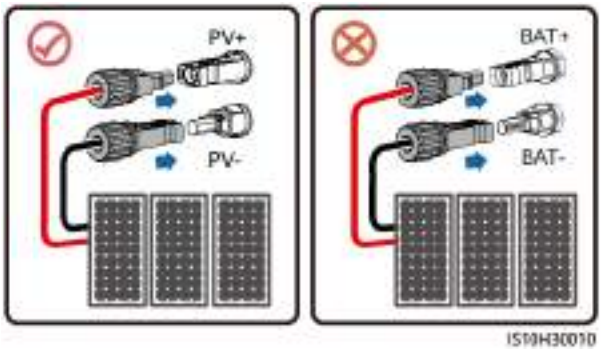
Terminal Description

Figure 5-11 Terminals



(1) DC input terminals (2) Battery terminals

Figure 5-12 Connection



Procedure

WARNING

Before inserting the positive and negative connectors into the positive and negative DC input terminals of the inverter, ensure that the DC SWITCH is set to OFF.

NOTICE

- Cables with high rigidity, such as armored cables, are not recommended as DC input power cables, because poor contact may be caused by the bending of the cables.
- Before assembling DC connectors, label the cable polarities correctly to ensure correct cable connections.
- After crimping the positive and negative metal terminals, pull the DC input power cables back to ensure that they are connected securely.
- Insert the crimped metal terminals of the positive and negative power cables into the appropriate positive and negative connectors. Then pull back the DC input power cables to ensure that they are connected securely.
- If a DC input power cable is reversely connected and the DC SWITCH is set to ON, do not immediately operate on the DC SWITCH or the positive/negative connectors. Otherwise, the device may be damaged. The resulting device damage is not covered by the product warranty. Wait until the night when solar irradiance declines and the PV string current drops to below 0.5 A. Then set the DC SWITCH to OFF, remove the positive and negative connectors, and correct the polarities of the DC input power cable.

NOTE

- The multimeter must have a DC voltage range of at least 1100 V. If the voltage is a negative value, the DC input polarity is incorrect. Rectify the connection. If the voltage is greater than 1100 V, too many PV modules are connected to the same string. Remove some PV modules.
- If PV strings are configured with optimizers, check the cable polarities by referring to the *Smart PV Optimizer Quick Guide*.

Step 1 Connect DC input power cables.

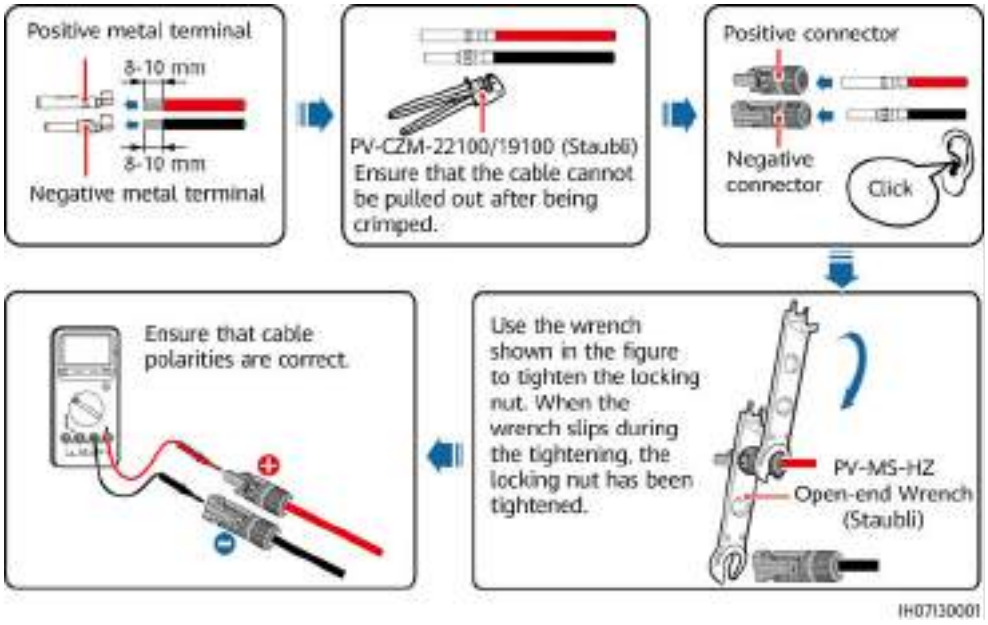
CAUTION

Use the Staubli MC4 positive and negative metal terminals and DC connectors delivered with the inverter. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The resulting device damage is not covered by the product warranty.

NOTICE

During DC input power cabling, leave at least 50 mm of slack. The axial tension on PV connectors must not exceed 80 N. Radial stress or torque must not be generated on PV connectors.

Figure 5-13 Assembling DC connectors



----End

Removing a DC Connector

⚠ WARNING

Before removing the positive and negative connectors, ensure that the DC SWITCH is set to OFF and that the current is less than 0.5 A.

To remove the positive and negative connectors from the inverter, insert an open-end wrench into the notch and press the wrench with an appropriate force.

Figure 5-14 Removing a DC connector

5.6 (Optional) Connecting Battery Cables

Prerequisites

DANGER

- Battery short circuits may cause personal injury. The high transient current generated by a short circuit may release a surge of power and cause fire.
- Do not connect, disconnect, or perform other maintenance operations on battery cables when the inverter is running. Otherwise, electric shocks may occur.
- Before connecting the battery cables, ensure that the **DC SWITCH** on the inverter and all the switches connecting to the inverter are **OFF**, and that the inverter has no residual electricity. Otherwise, the high voltage of the inverter and battery may result in electric shocks.
- If no battery connects to the inverter, do not remove the waterproof covers from the battery terminals. Otherwise, the ingress protection (IP) rating of the inverter will be affected. If a battery connects to the inverter, keep the waterproof covers properly and reinstall them immediately after removing the connectors.

A battery switch can be configured between the inverter and the battery to ensure that the inverter can be safely disconnected from the battery.

WARNING

- Do not connect loads between the inverter and the battery.
- Ensure that the battery cables are connected to the battery terminals of the inverter. If a battery cable is connected incorrectly to the DC input terminal of the inverter, the inverter may be damaged or even a fire may occur.
- The battery cables must be connected correctly. That is, the positive and negative terminals of the battery connect to the positive and negative battery terminals of the inverter, respectively. Otherwise, the inverter may be damaged or even a fire may occur.

WARNING

During the installation of the ESS and the inverter, the positive or negative terminal of the ESS may be short-circuited to ground if the power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the devices. The resulting device damage is not covered under any warranty.

Procedure

Step 1 Assemble the positive and negative connectors by referring to **5.5 Connecting DC Input Power Cables**.

DANGER

- The battery voltage will result in serious injury. Use dedicated insulation tools to connect cables.
- Ensure that cables are connected correctly between the terminals of the battery and the battery switch, and between the battery switch and the battery terminals of the inverter.

NOTICE

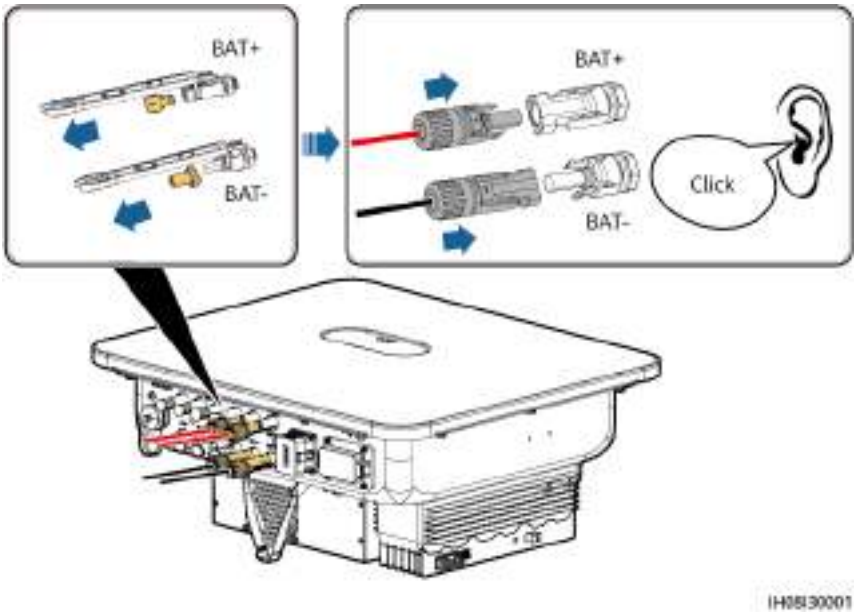
Cables with high rigidity, such as armored cables, are not recommended as battery cables, because poor contact may be caused by the bending of the cables.

Step 2 Insert the positive and negative connectors into corresponding battery terminals of the inverter.

NOTICE

After the positive and negative connectors snap into place, pull the battery cables back to ensure that they are connected securely.

Figure 5-15 Connecting battery cables



----End

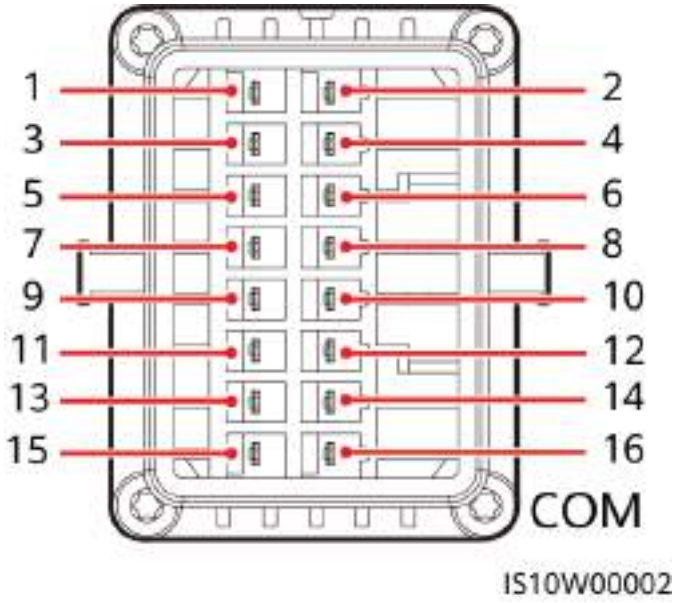
5.7 Connecting Signal Cables

COM Port Pin Definitions

NOTICE

- When laying out a signal cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.
- Ensure that the protection layer of the signal cable is inside the connector, surplus core wires are cut off from the protection layer, the exposed core wires are inserted completely into the holes, and the cable is connected securely.
- Use rubber plugs to fill the cable holes where no cables are routed through the waterproof rubber rings, and tighten the locking caps to the recommended torque.

Figure 5-16 Pin definitions



NOTE

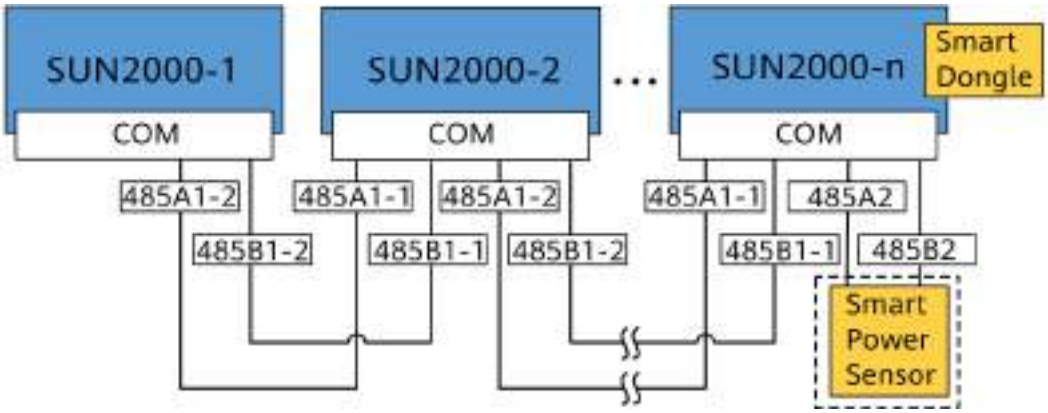
- If the RS485 communications cables of devices, such as the Smart Power Sensor and battery, are connected to the inverter at the same time, RS485A2 (pin 7), RS485B2 (pin 9), and PE (pin 5) are shared.
- When the enabling signal cables of the battery and the rapid shutdown switch signal cables are connected to the inverter at the same time, GND (pin 13) is shared.

Pin	Definition	Function	Description	Pin	Definition	Function	Description
1	485A1-1	RS485A, RS485 differential signal+	Used for cascading inverters or connecting to the RS485 signal port of the SmartLogger, EMMA or SmartGuard.	2	485A1-2	RS485A, RS485 differential signal+	Used for cascading inverters or connecting to the RS485 signal port of the SmartLogger, EMMA or SmartGuard.
3	485B1-1	RS485B, RS485 differential signal–		4	485B1-2	RS485B, RS485 differential signal–	
5	PE	Shield layer grounding	-	6	PE	Shield layer grounding	-
7	485A2	RS485A, RS485 differential signal+	Connecting to RS485 signal ports of devices such as power meters and batteries	8	DIN1	Digital input signal 1+	Used to connect to dry contacts for grid scheduling. Used as the feedback signal port for SmartGuard.
9	485B2	RS485B, RS485 differential signal–		10	DIN2	Digital input signal 2+	Connecting to the power grid scheduling dry contact
11	EN	Enable signal	For the enable signal of the battery	12	DIN3	Digital input signal 3+	
13	GND	GND	-	14	DIN4	Digital input signal 4+	
15	DIN5	Rapid shutdown	For the rapid shutdown DI signal or connecting to the signal cable of an NS protection device	16	GND	GND of DIN1, DIN2, DIN3, or DIN4	Connecting to GND of DIN1, DIN2, DIN3, or DIN4

Communication Networking Mode

- Smart Dongle networking

Figure 5-17 Smart Dongle networking (the component in the dashed box is optional)

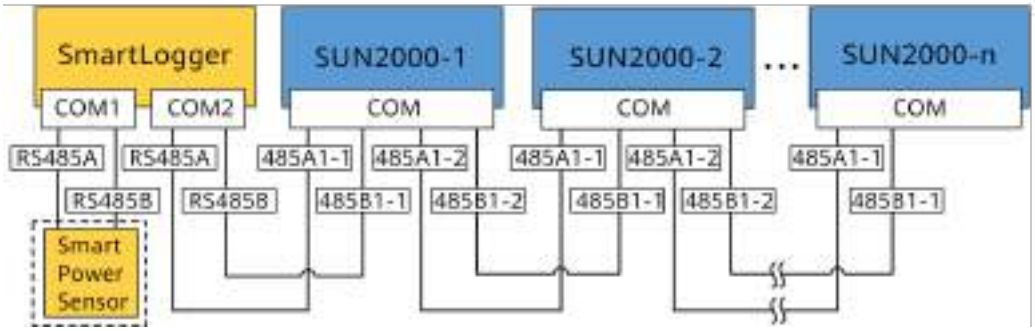


NOTE

- In the Smart Dongle networking scenario, the SmartLogger cannot be connected.
- A power meter is required for export limitation. Select a power meter based on the site requirements.
- The power meter and the Smart Dongle must be connected to the same inverter.

- SmartLogger networking

Figure 5-18 SmartLogger networking (the component in the dashed box is optional)

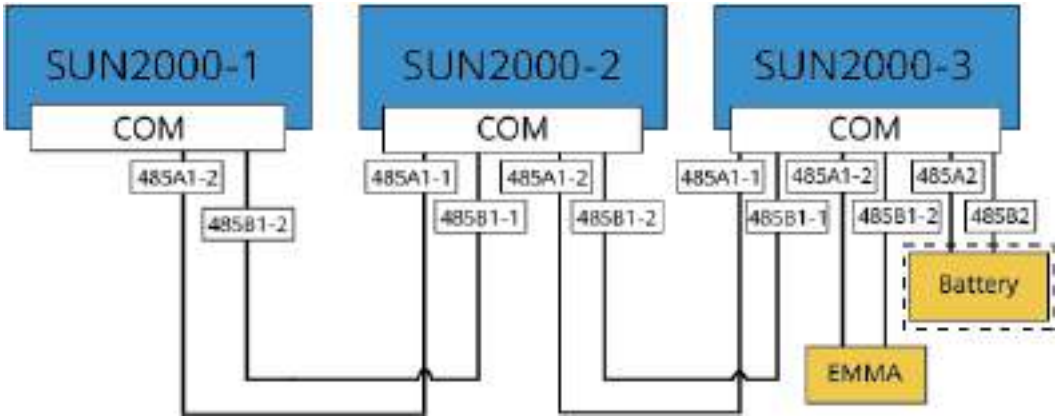


NOTE

- A maximum of 80 devices can connect to a single SmartLogger. You are advised to connect fewer than 30 devices to each RS485 route.
- If the inverter is connected to the SmartLogger, it cannot be connected to the Smart Dongle.
- A power meter is required for export limitation. Select a power meter based on the site requirements.
- To ensure quick responses of the system, you are advised to connect the power meter separately to a COM port.

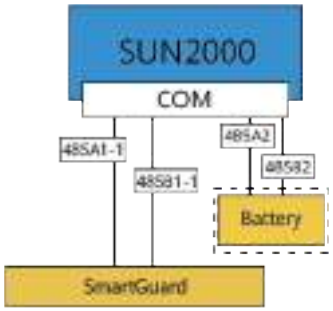
- EMMA networking

Figure 5-19 EMMA networking (the components in dashed boxes are optional)



- SmartGuard networking

Figure 5-20 SmartGuard networking (the components in dashed boxes are optional)

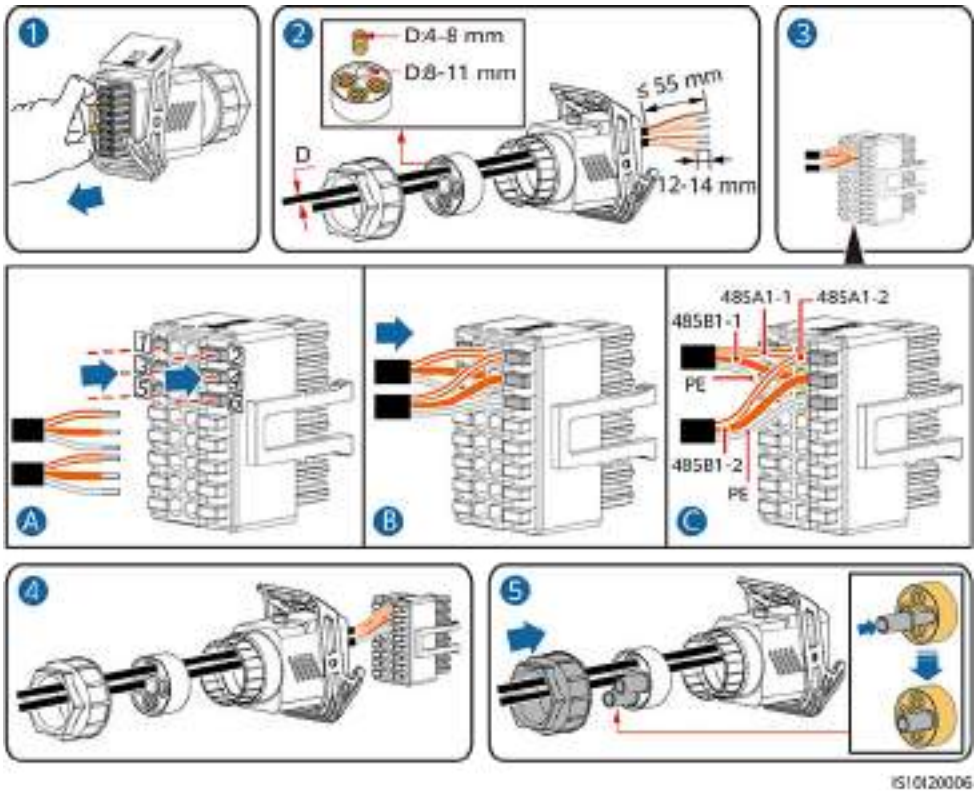


5.7.1 Connecting the RS485 Communications Cable (Inverter Cascading)

Procedure

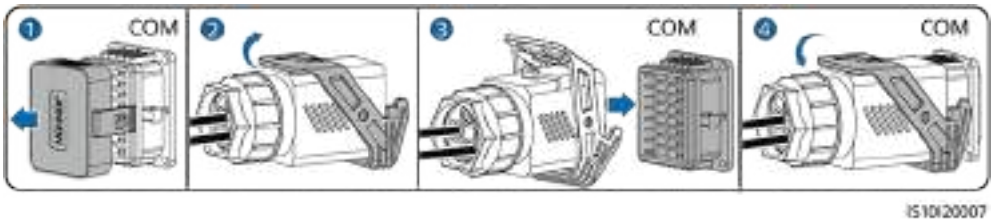
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-21 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-22 Securing the signal cable connector



----End

5.7.2 Connecting RS485 Communications Cables (Power Meter)

Cable Connections

- The following figures show the cable connections between the inverter and DTSU666-H and YDS60-C24 power meters.

  NOTE

  The cable connections between the DTSU71 and DHSU1079-CT power meters and the inverter are the same as those between the DTSU666-H power meter and the inverter.

Figure 5-23 DTSU666-H three-phase, three-wire cable connection (Smart Dongle networking)

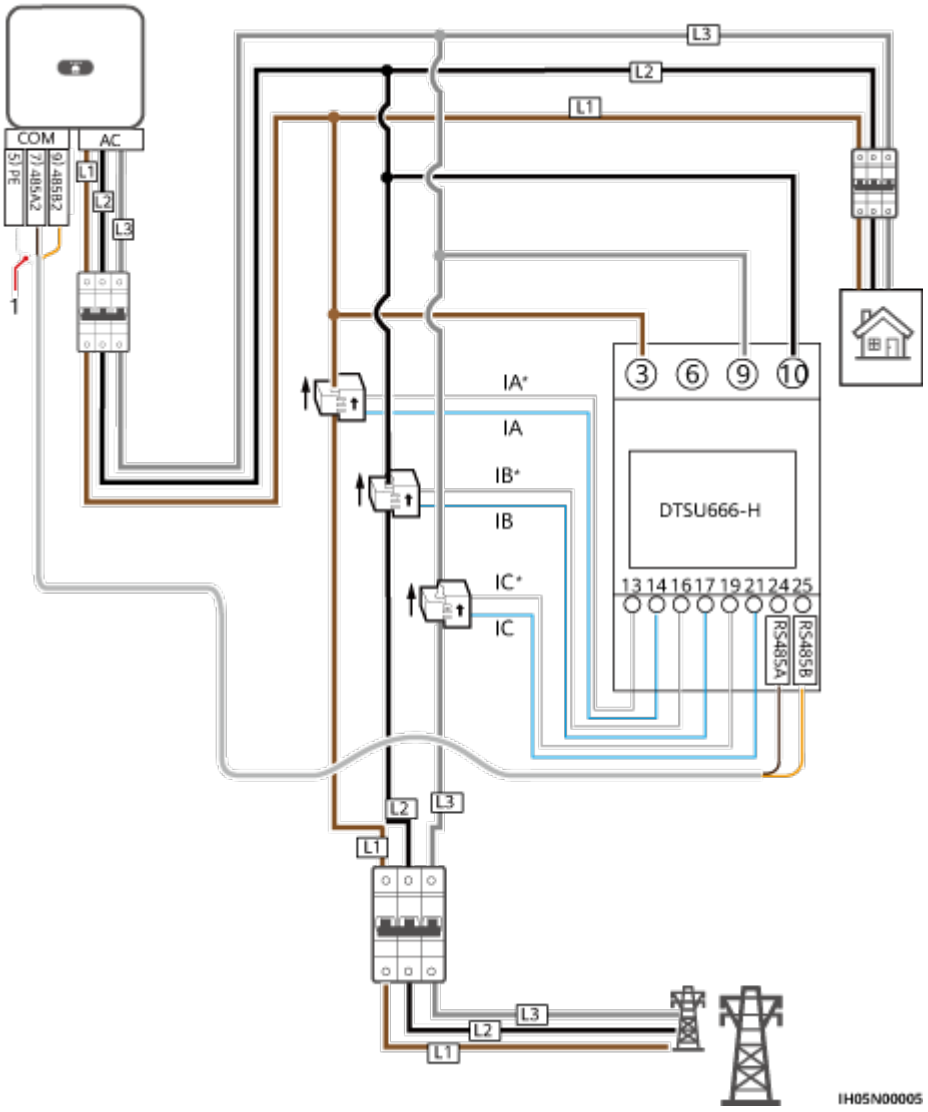


Figure 5-24 YDS60-C24 three-phase, three-wire cable connection (Smart Dongle networking)

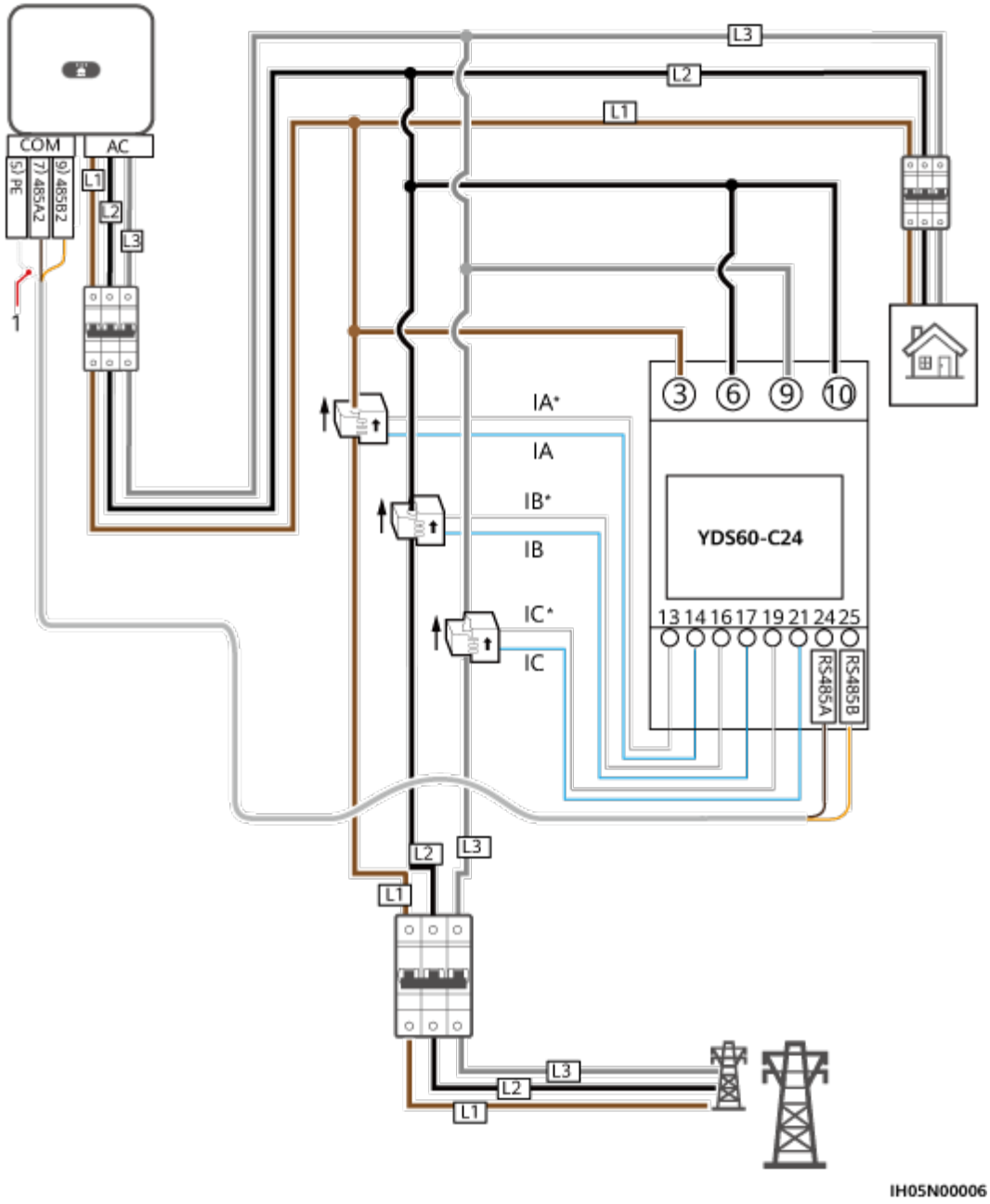
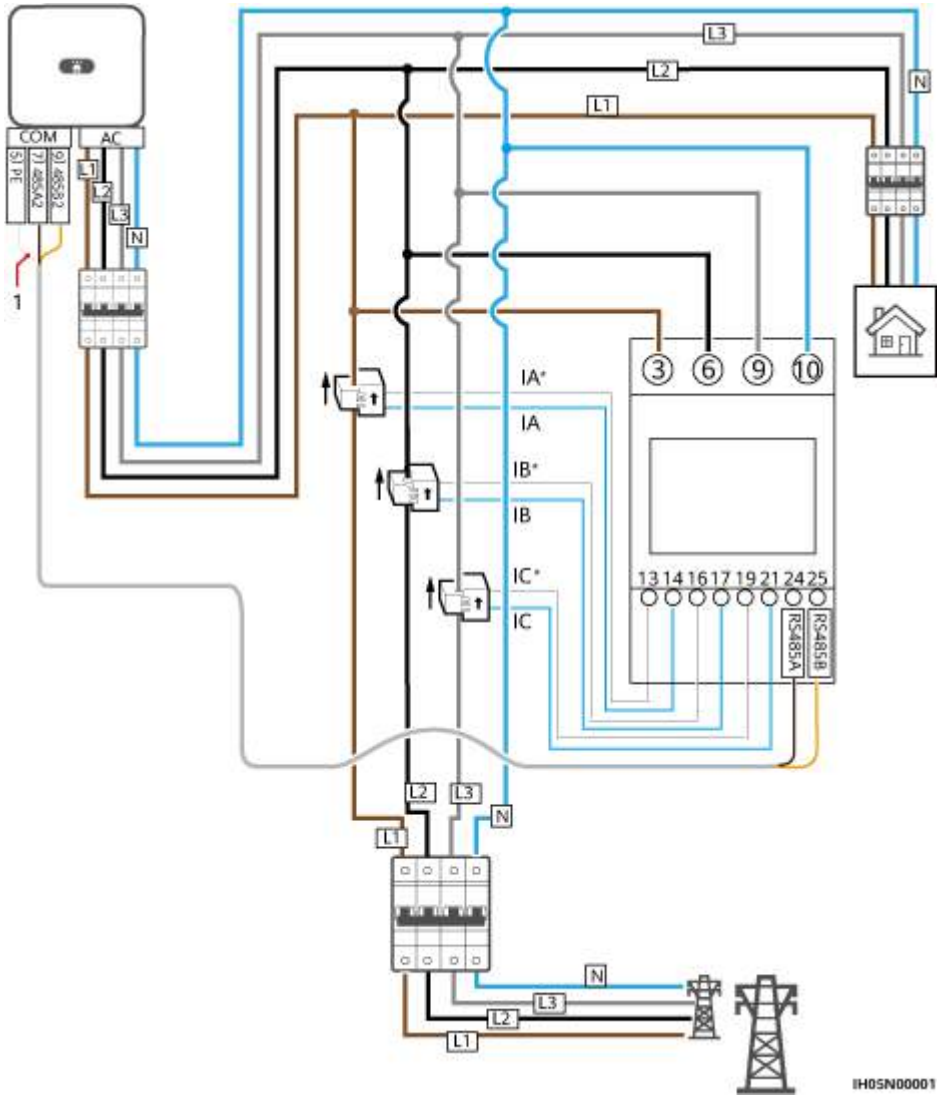


Figure 5-25 Three-phase, four-wire connection (Smart Dongle networking)



- The following figures show the cable connections between the inverter and DTSU666-HW and YDS60-80 power meters.

Figure 5-26 Three-phase, three-wire direct connection (Smart Dongle networking)

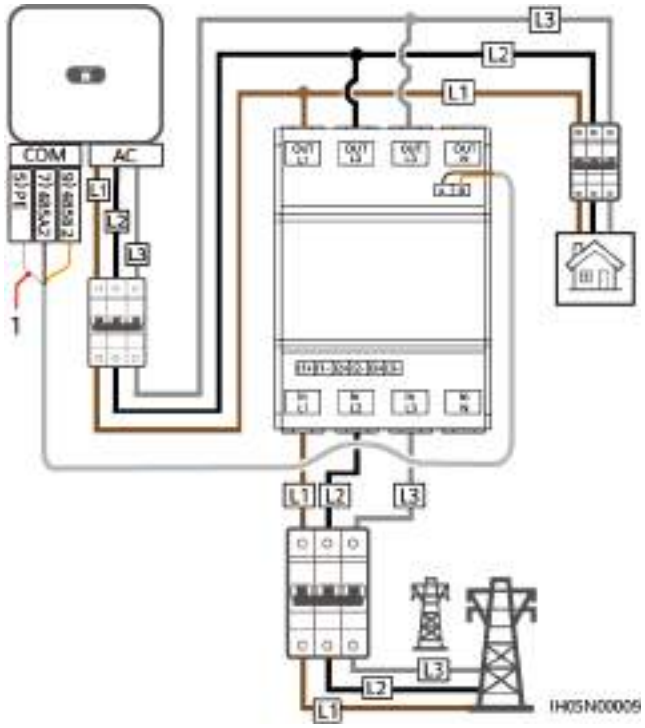


Figure 5-27 Three-phase, four-wire direct connection (Smart Dongle networking)

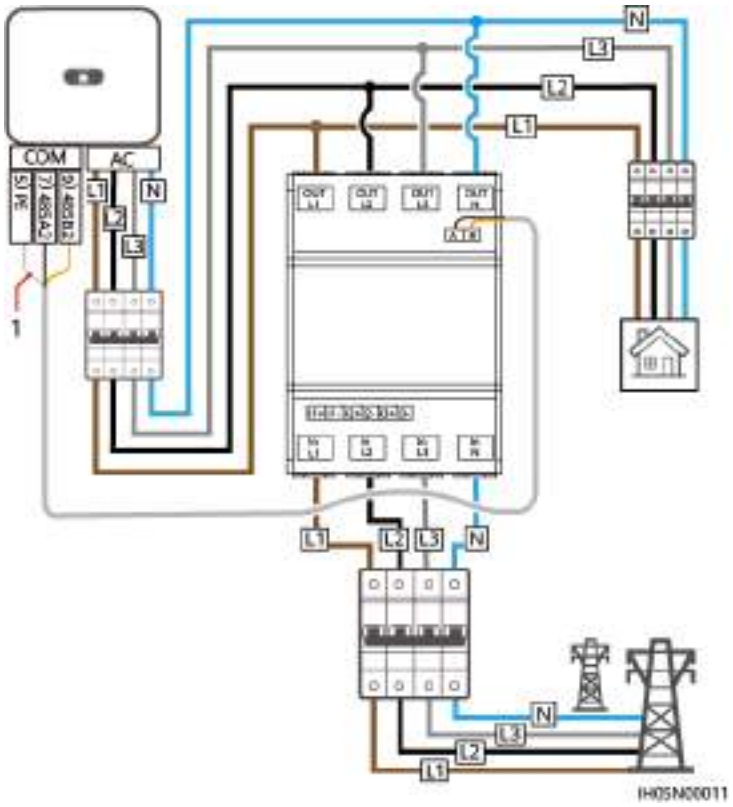


Figure 5-28 Three-phase, three-wire direct connection (SmartLogger networking)

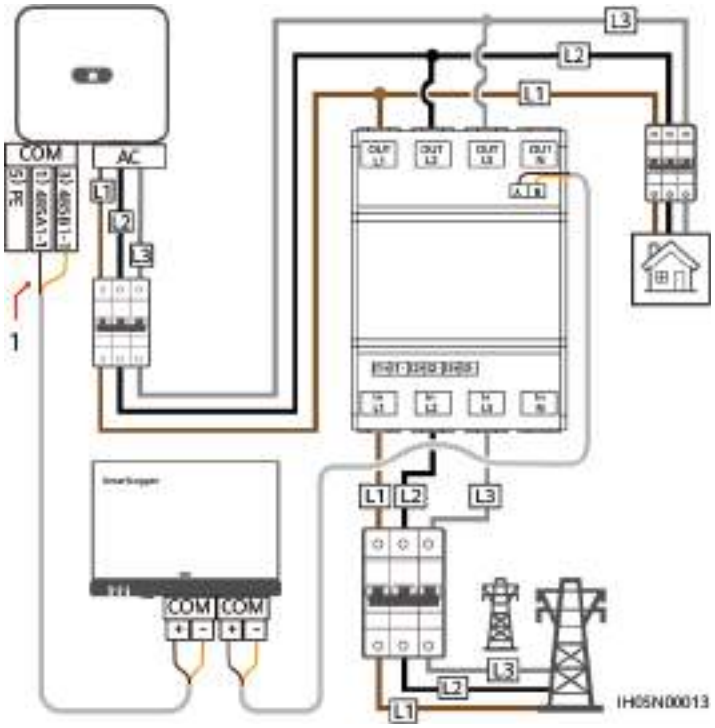
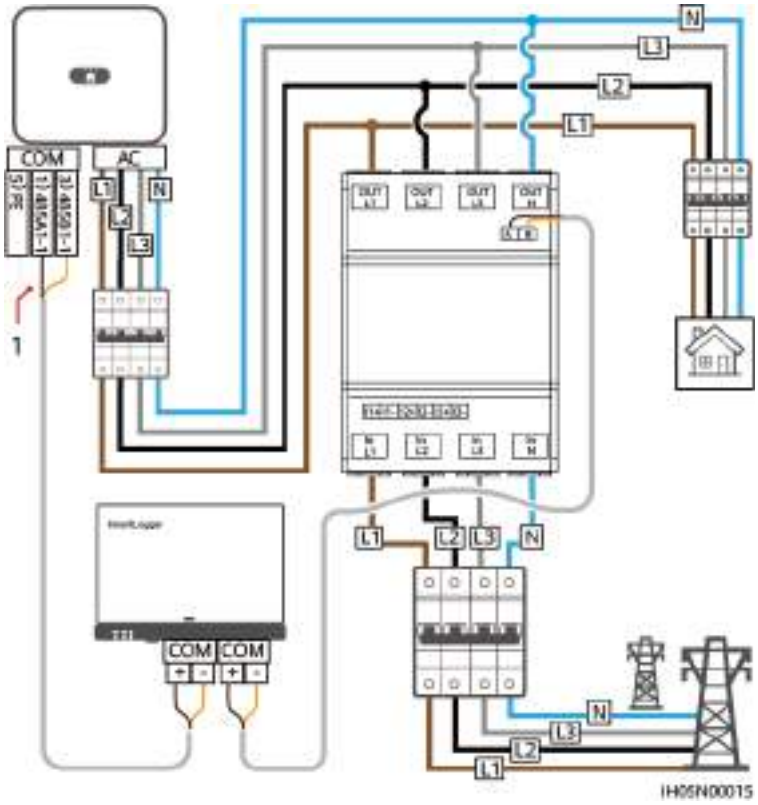


Figure 5-29 Three-phase, four-wire direct connection (SmartLogger networking)



(1) Shield layer of the signal cable

NOTE

- The maximum current of the directly connected DTSU666-HW and YDS60-80 power meters is 80 A.
- For three-phase, three-wire connection, set the cable connection mode. Otherwise, the voltage reading is incorrect.
- Retain the default baud rates for the DTSU666-H, YDS60-C24, DTSU71 and DHSU1079-CT power meters. If they are changed, the power meters may go offline, generate alarms, or affect the inverter output power.

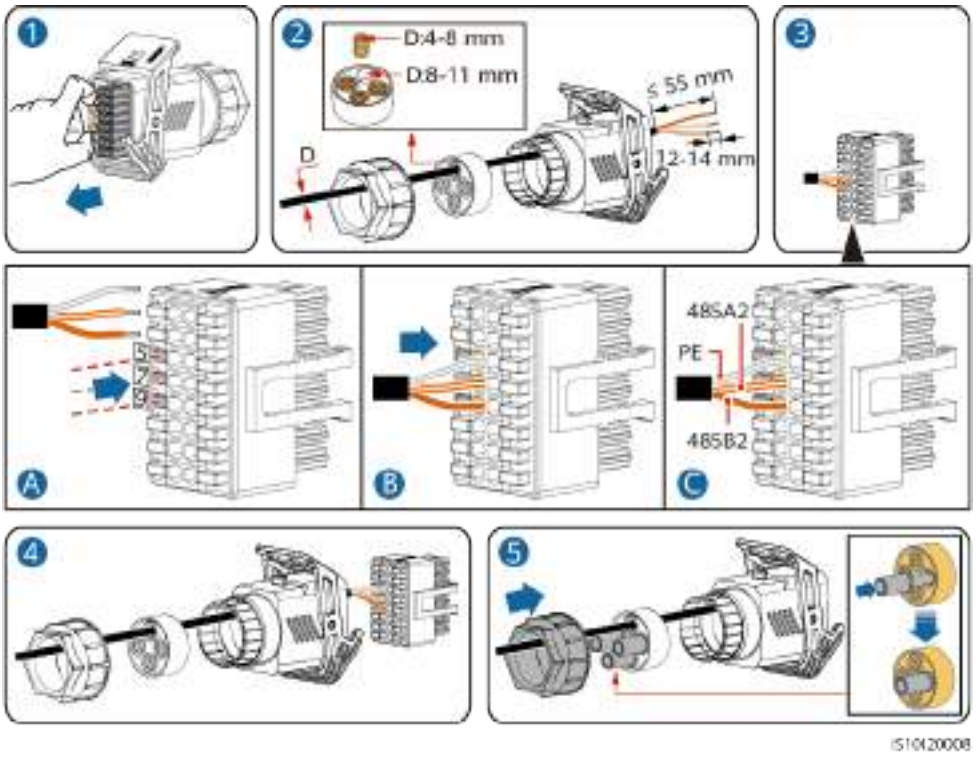
Table 5-3 Setting the cable connection mode

Parameter	Description
nEt	Set the cable connection mode. **0**: n.34 indicates three-phase, four-wire (factory default). **1**: n.33 indicates three-phase, three-wire.

Procedure

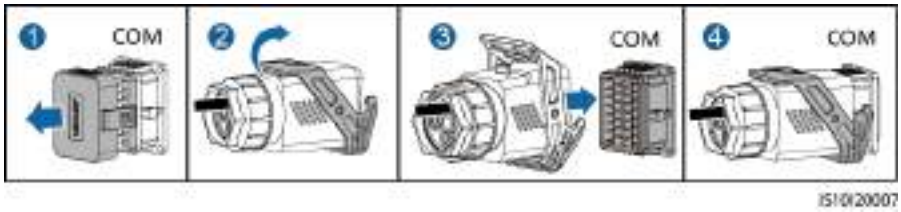
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-30 Installing the cable



Step 2 Connect the signal cable to the COM port.

Figure 5-31 Securing the signal cable connector



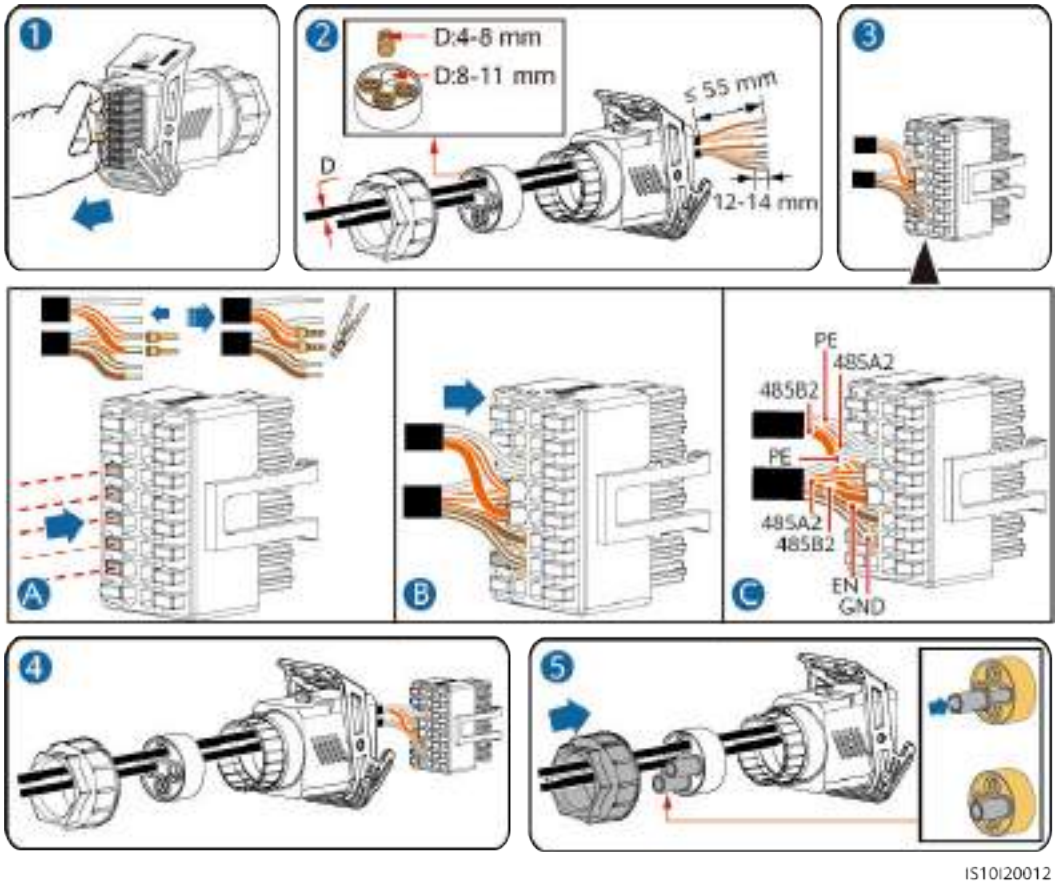
----End

5.7.3 Connecting RS485 Communications Cables (Power Meter and Battery)

Procedure

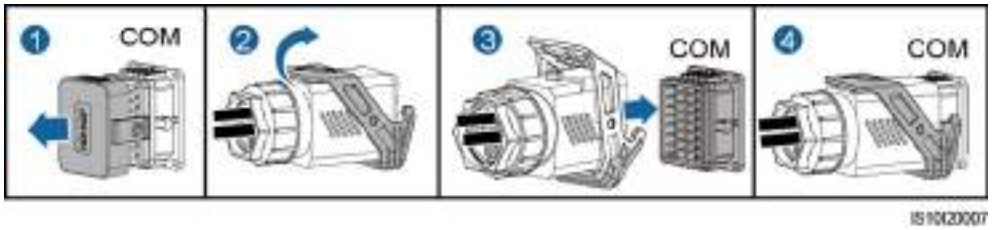
Step 1 Connect signal cables to the signal cable connector.

Figure 5-32 Installing cables



Step 2 Connect the signal cable connector to the COM port.

Figure 5-33 Securing the signal cable connector



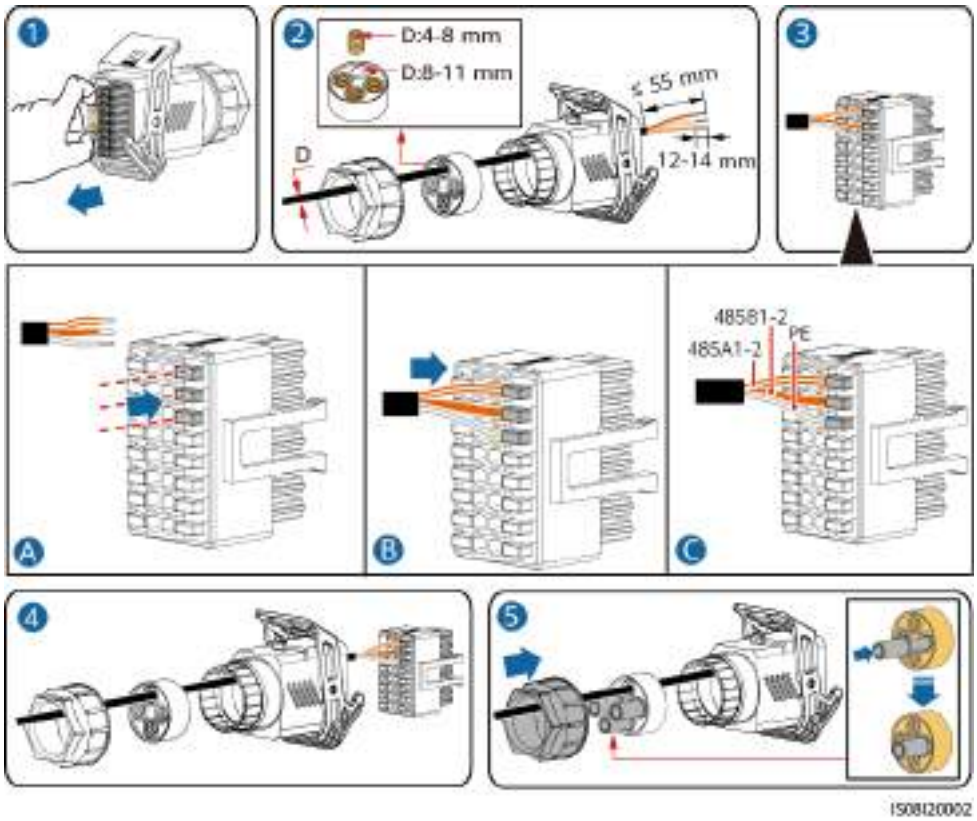
----End

5.7.4 Connecting RS485 Communications Cables (EMMA)

Procedure

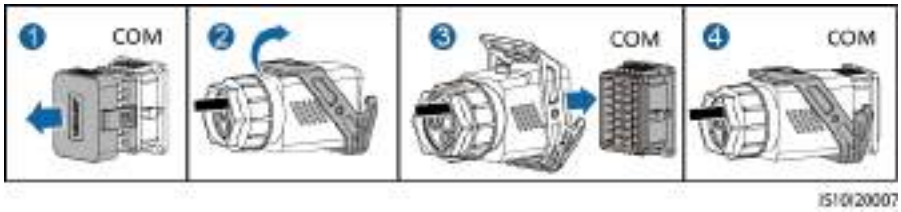
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-34 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-35 Securing the signal cable connector



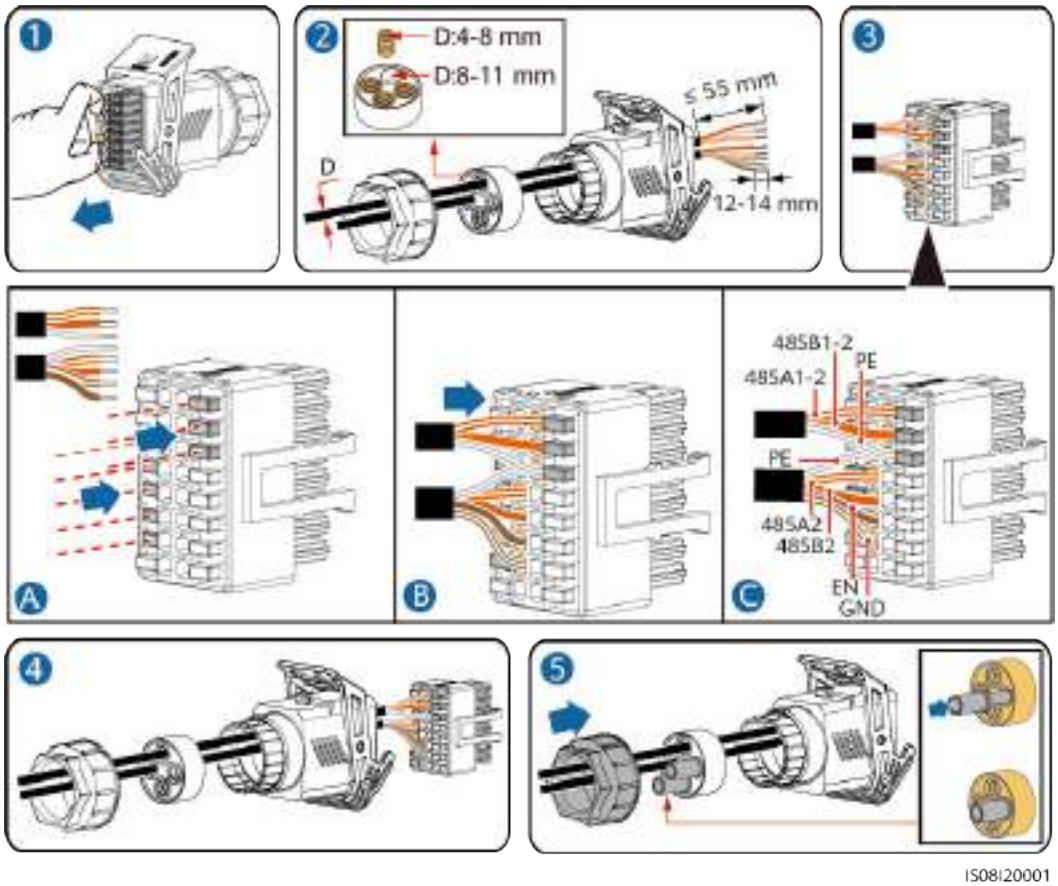
----End

5.7.5 Connecting RS485 Communications Cables (EMMA and Battery)

Procedure

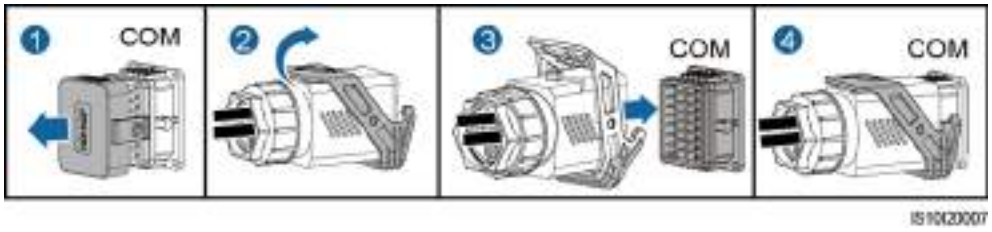
Step 1 Connect signal cables to the signal cable connector.

Figure 5-36 Installing cables



Step 2 Connect the signal cable connector to the COM port.

Figure 5-37 Securing the signal cable connector



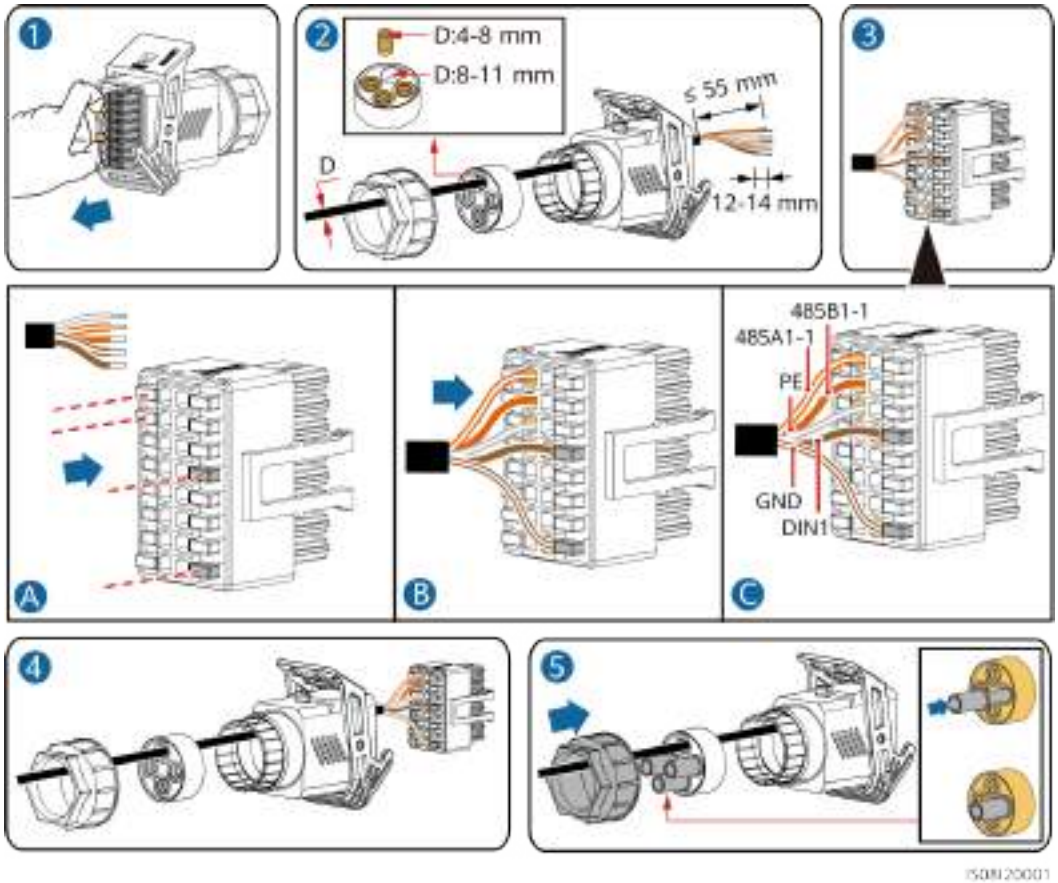
----End

5.7.6 Connecting RS485 Communications Cables (SmartGuard)

Procedure

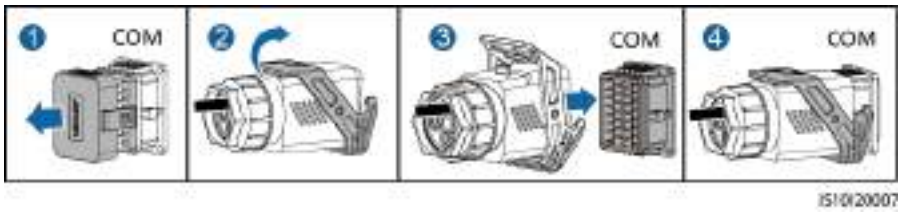
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-38 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-39 Securing the signal cable connector



----End

5.7.7 Connecting the Rapid shutdown signal cable

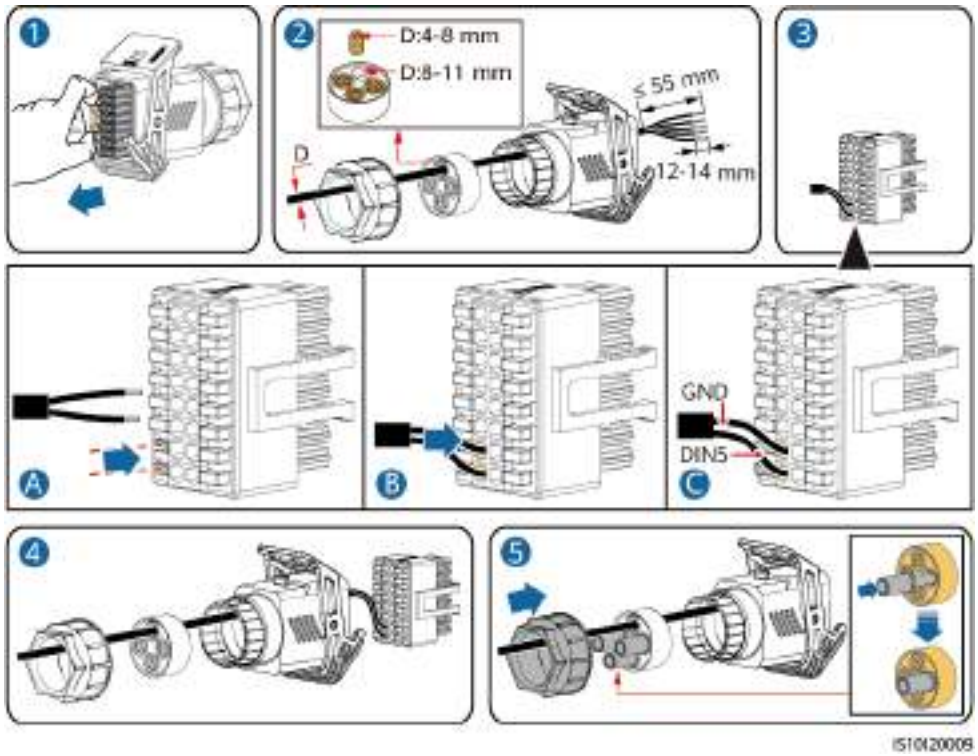
Procedure

Step 1 Connect the signal cable to the signal cable connector.

NOTICE

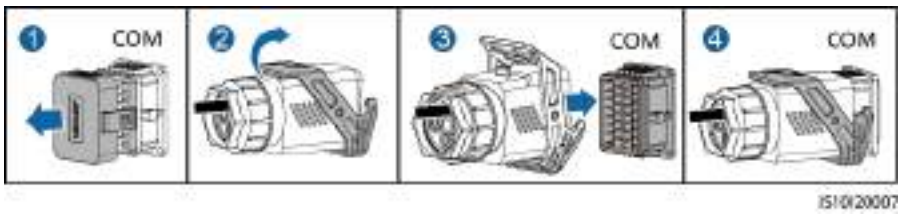
- If optimizers are configured for some PV modules, the rapid shutdown function is not supported.
- To enable the rapid shutdown function, you need to connect the access switch to pins 13 and 15. The switch is closed by default. The rapid shutdown is triggered when the switch changes from closed to open.

Figure 5-40 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-41 Securing the signal cable connector



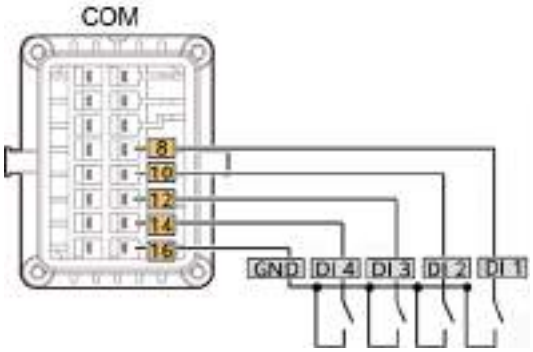
----End

5.7.8 Connecting the Grid Scheduling Signal Cable

Cable Connection

The following figure shows the cable connection between the inverter and the ripple control device.

Figure 5-42 Cable connection



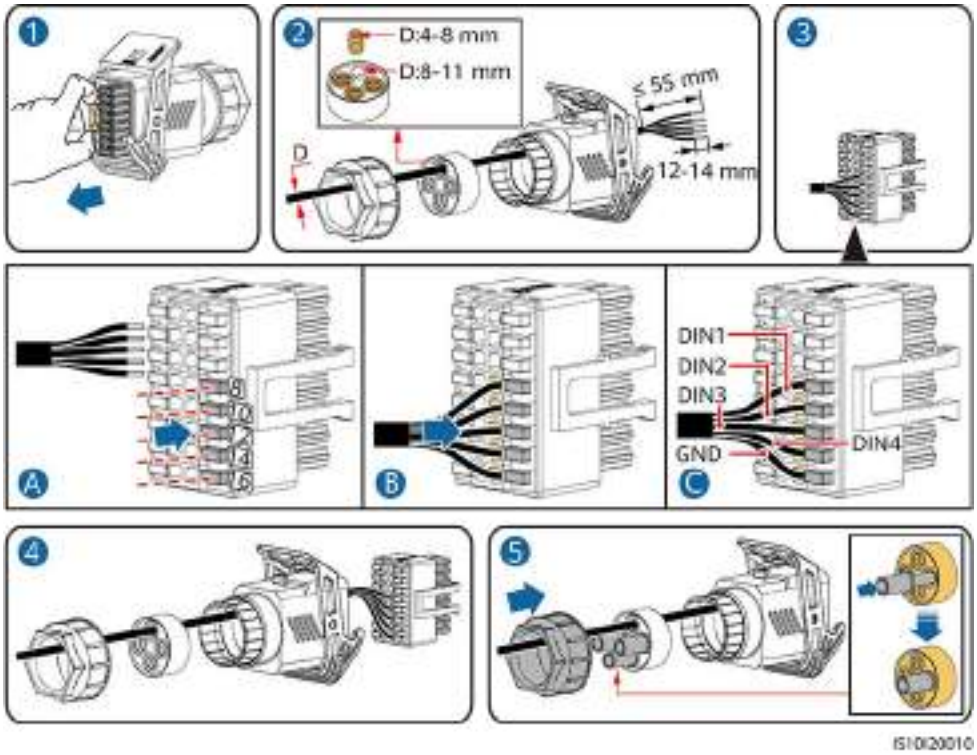
NOTICE

- In SmartLogger or EMMA networking, ensure that **Dry contact scheduling** is disabled for the inverter. Otherwise, the inverter may not accept power scheduling instructions from the SmartLogger or EMMA.
- If **Dry contact scheduling** is enabled for the inverter by mistake, choose **Settings** > **Power adjustment** > **Dry contact scheduling** on the home screen of the app and disable **Dry contact scheduling**.

Procedure

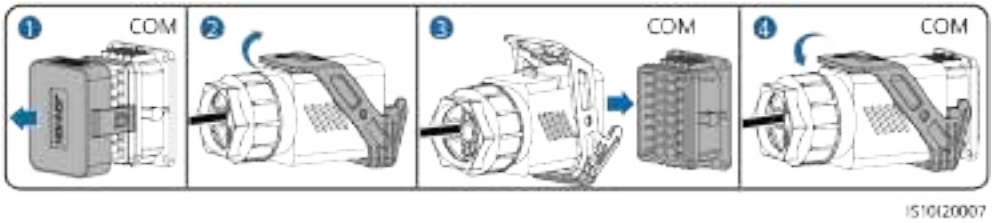
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-43 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-44 Securing the signal cable connector



----End

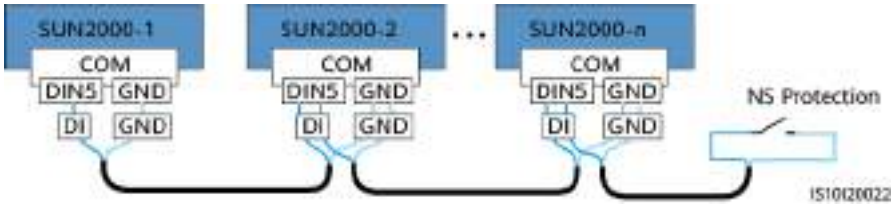
5.7.9 Connecting NS Protection Signal Cables

Connecting NS Protection Signal Cables to Inverters

NOTE

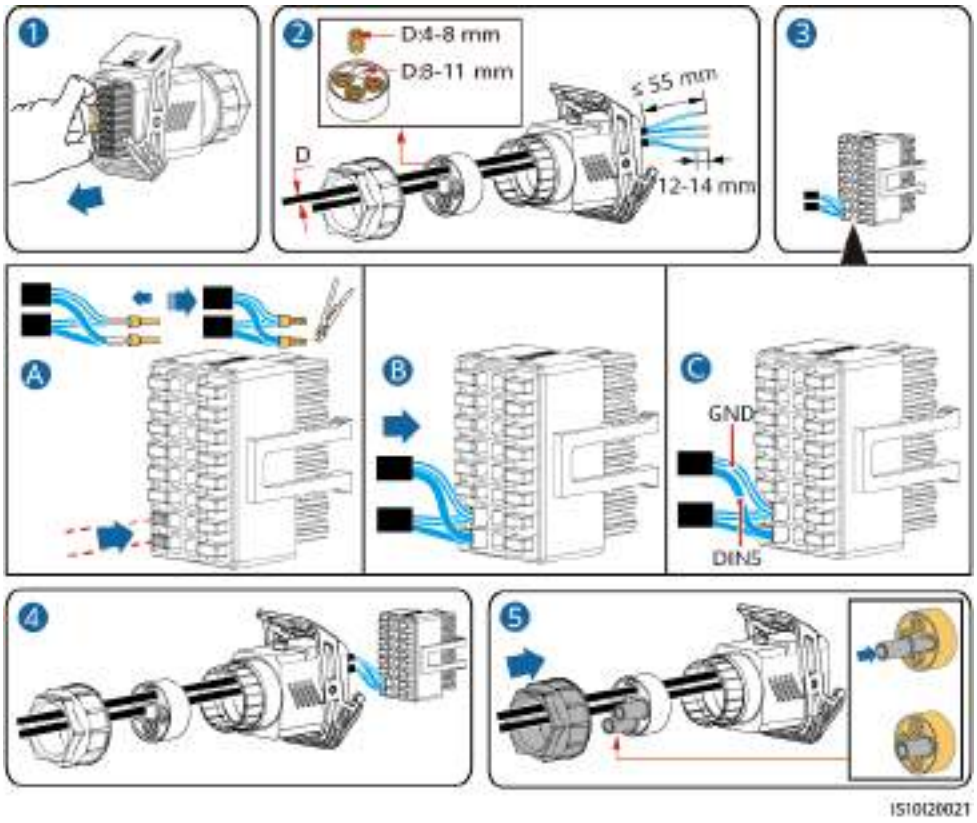
- The NS protection function is applicable to grid code **VDE-AR-N-4105**, **SWITZERLAND-NA/EEA:2020-LV230**, or **FINLAND-EN50549-LV230**.
- The NS protection switch is connected to GND (pin 13) at one end and to DIN5 (pin 15) at the other end. The switch is turned off by default. When the switch is turned on, NS protection is triggered. Rapid shutdown and NS protection use the same pins, which are GND (pin 13) and DIN5 (pin 15). Therefore, you can use only one of the functions.
- The NS protection switch connection is the same for a single inverter and for cascaded inverters.
- Log in to the FusionSolar app as an installer, choose **Me** > **Device commissioning**, and connect to the WLAN hotspot of the inverter. Log in to the local commissioning system as an installer, choose **Settings** > **Feature parameters** > **Dry contact function**, and set **Dry contact function** to **NS protection**.

Figure 5-45 Connecting cascaded inverters to the NS protection switch



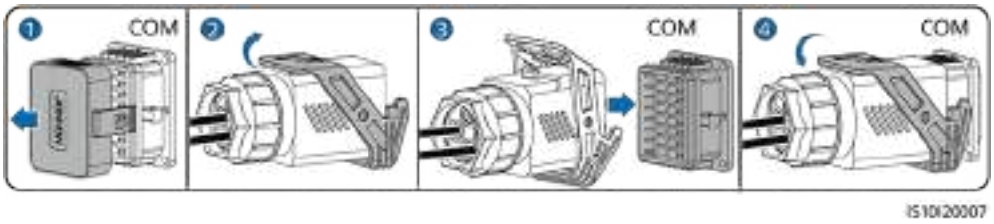
Step 1 Connect signal cables to the signal cable connector (for inverter cascading).

Figure 5-46 Installing cables



Step 2 Connect the signal cable connector to the COM port.

Figure 5-47 Securing the signal cable connector



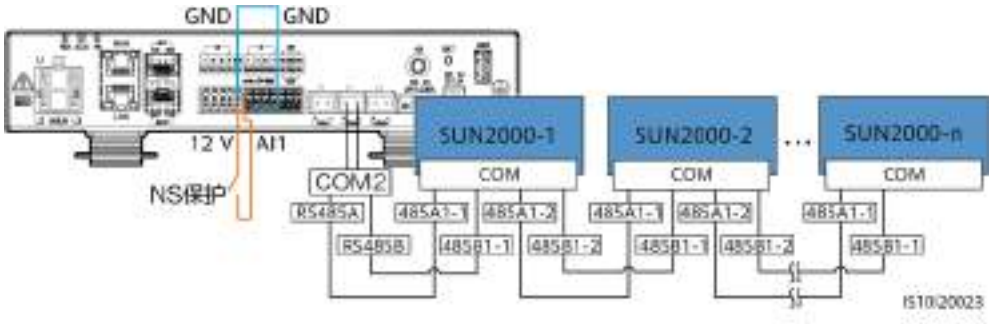
----End

Connecting NS Protection Signal Cables to the SmartLogger

NOTE

- The NS protection function is applicable to areas where standards such as VDE 4105 are used. You need to set the grid code to **VDE-AR-N-4105**, **SWITZERLAND-NA/EEA:2020-LV230**, or **FINLAND-EN50549-LV230**.
- The NS protection device is connected to the AI1 port and 12 V power output port on the SmartLogger. The SmartLogger shuts down the inverter over the voltage change detected at the AI1 port. When the NS protection device is disconnected, the voltage of the AI1 port is 0 V and the inverter shuts down. When the NS protection device is reconnected, the voltage of the AI1 port is 12 V and you need to manually start the inverter.

Figure 5-48 Connecting the SmartLogger to the NS protection switch



5.8 (Optional) Installing the Smart Dongle and Anti-theft Components

NOTE

- If WLAN-FE communication is used, install the WLAN-FE Smart Dongle (SDongleA-05). For details, see **SDongleA-05 Smart Dongle Quick Guide (WLAN-FE)**.
- If 4G communication is used, install the 4G Smart Dongle (SDongleB-06). For details, see **SDongleB-06 Smart Dongle Quick Guide (4G)**.
- If the Smart Dongle is used, you need to install anti-theft components after installing the Smart Dongle.

WLAN-FE Smart Dongle (FE Communication)

You are advised to use a CAT 5E outdoor shielded network cable (outer diameter < 9 mm; internal resistance ≤ 1.5 ohms/10 m) and shielded RJ45 connectors.

Figure 5-49 Installing the WLAN-FE Smart Dongle (FE communication)

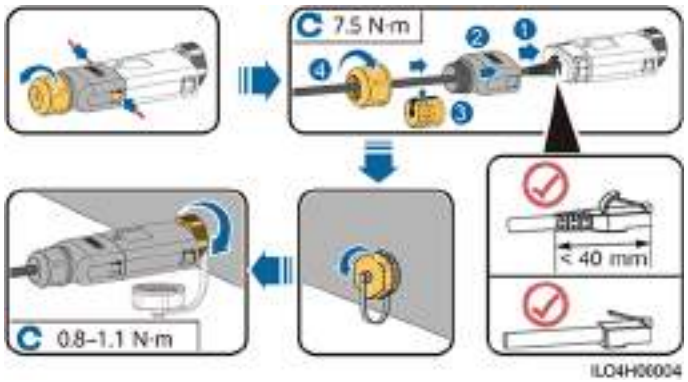


Figure 5-50 Installing anti-theft components for the Smart Dongle

4G Smart Dongle (4G Communication)

NOTE

- If your Smart Dongle is not configured with a SIM card, you need to prepare one (dimensions: 25 mm x 15 mm; capacity: ≥ 64 KB).
- When installing the SIM card, determine its installation direction based on the silk screen and arrow on the card slot.
- Press the SIM card in place to lock it. In this case, the SIM card is correctly installed.
- When removing the SIM card, push it inward to eject it.
- When reinstalling the enclosure of the Smart Dongle, ensure that the snap-fits click into place.

Figure 5-51 Installing the 4G Smart Dongle (SDongleB-06)

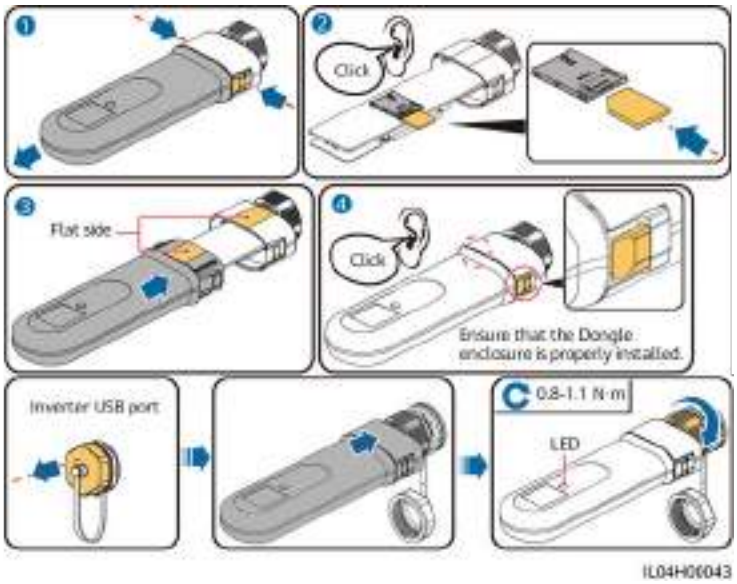


Figure 5-52 Installing anti-theft components for the Smart Dongle

6 Check Before Power-On

Table 6-1 Installation checklist

No.	Check Item	Acceptance Criteria
1	Inverter installation	The inverter is installed correctly, securely, and reliably.
2	Smart Dongle	The Smart Dongle is installed correctly and securely.
3	Cable layout	Cables are routed properly as required by the customer.
4	Cable tie	Cable ties are secured evenly and no burr exists.
5	Grounding	The ground cable is connected correctly, securely, and reliably.
6	Turn off the switches	The **DC SWITCH** and all the switches connected to the inverter are set to **OFF**.
7	Cable connections	The AC output power cable, DC input power cable, and signal cable are connected correctly, securely, and reliably.
8	Unused terminals and ports	Unused terminals and ports are locked by watertight caps.
9	Installation environment	The installation space is proper, and the installation environment is clean and tidy, without foreign matter.

7 Power-On and Commissioning

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

7.1 Powering On the Inverter

Precautions

NOTICE

- Before the equipment is put into operation for the first time, ensure that the parameters are set correctly by professional personnel. Incorrect parameter settings may result in noncompliance with local grid connection requirements and affect the normal operations of the equipment.
- If the DC power supply is connected but the AC power supply is disconnected, the inverter will report a **Grid Failure** alarm. The inverter can start properly only after the power grid recovers.

Procedure

Step 1 If a battery is connected, turn on the battery switch first.

Step 2 At the AC switch between the inverter and the power grid, use a multimeter to measure the grid voltage and ensure that the voltage is within the allowed operating voltage range of the inverter. If the voltage is not in the allowed range, check the circuits.

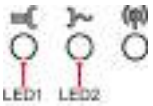
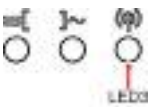
Step 3 Turn on the AC switch between the inverter and the power grid.

Step 4 Turn on the DC switch (if any) between the PV strings and the inverter.

Step 5 Set the DC SWITCH on the inverter to ON.

Step 6 Observe the LED indicators to check the status of the inverter.

Table 7-1 LED indicator description

Category	Status		Description
Running indication 	**LED1**	**LED2**	-
	Steady green	Steady green	The inverter is operating in grid-tied mode.
	Blinking green slowly (on for 1s and off for 1s)	Off	The DC is on and the AC is off.
	Blinking green slowly (on for 1s and off for 1s)	Blinking green slowly (on for 1s and off for 1s)	Both the DC and AC are on, and the inverter is off-grid.
	Off	Blinking green slowly (on for 1s and off for 1s)	The DC is off and the AC is on.
	Off	Off	Both the DC and AC are off.
	Blinking red fast (on for 0.2s and off for 0.2s)	-	There is a DC environmental alarm, such as **High String Input Voltage**, **String Reverse Connection**, or **Low Insulation Resistance**.
	-	Blinking red fast	There is an AC environmental alarm, such as **Grid Undervoltage**, **Grid Overvoltage**, **Grid Overfrequency**, or **Grid Underfrequency**.
	Steady red	Steady red	A fault exists.
Communication indication 	**LED3**		-

Category	Status			Description
	Blinking green fast (on for 0.2s and off for 0.2s)			Communication is in progress. (When a mobile phone is connected to the inverter, the indicator first blinks green slowly, indicating that the phone is connected to the inverter.)
	Blinking green slowly (on for 1s and off for 1s)			The mobile phone is connected to the inverter.
	Off			There is no communication.
Device replacement indication	**LED1**	**LED2**	**LED3**	–
	Steady red	Steady red	Steady red	The inverter hardware is faulty and needs to be replaced.

Step 7 (Optional) Observe the Smart Dongle LED indicator to check the status of the Smart Dongle.

- WLAN-FE Smart Dongle

Figure 7-1 WLAN-FE Smart Dongle

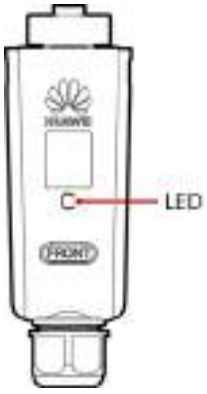


Table 7-2 Indicator description

LED Indicator	Status	Remarks	Description
-	Off	Normal	The Smart Dongle is not secured or not powered on.

LED Indicator	Status	Remarks	Description
Yellow (blinking green and red simultaneously)	Steady on		The Smart Dongle is secured and powered on.
Red	Blinking fast (on for 0.2s and off for 0.2s)		The parameters for connecting to the router are to be set.
Red	Steady on	Abnormal	The Smart Dongle is faulty and needs to be replaced.
Blinking red and green alternately	Blinking slowly (on for 1s and off for 1s)	Abnormal	No communication with the inverter: – Remove and then insert the Smart Dongle. – Check whether the inverter matches the Smart Dongle. – Connect the Smart Dongle to another inverter. Check whether the Smart Dongle is faulty or the USB port of the inverter is faulty.
Green	Blinking slowly (on for 0.5s and off for 0.5s)	Normal	Connecting to the router
Green	Steady on		The management system is successfully connected.
Green	Blinking fast (on for 0.2s and off for 0.2s)		The inverter is communicating with the management system through the Smart Dongle.

- 4G Smart Dongle

Table 7-3 Indicator description

LED Indicator	Status	Remarks	Description
-	Off	Normal	The Smart Dongle is not secured or not powered on.

LED Indicator	Status	Remarks	Description
Yellow (blinking green and red simultaneously)	Steady on	Normal	The Smart Dongle is secured and powered on.
Green	The blinking interval is 2s. The indicator is on for 0.1s and off for 1.9s.	Normal	Dialing (lasts for less than 1 minute)
		Abnormal	If the duration is longer than 1 minute, the 4G parameter settings are incorrect. Re-configure the parameters.
	Blinking slowly (on for 1s and off for 1s)	Normal	The dialup is successful (lasts for less than 30s).
		Abnormal	If the duration is longer than 30s, the management system parameters are incorrectly set. Re-configure the parameters.
	Steady on	Normal	The management system is successfully connected.
	Blinking fast (on for 0.2s and off for 0.2s)		The inverter is communicating with the management system through the Smart Dongle.
Red	Steady on	Abnormal	The Smart Dongle is faulty and needs to be replaced.
	Blinking fast (on for 0.2s and off for 0.2s)		The Smart Dongle has no SIM card or the SIM card is in poor contact. Check whether the SIM card has been installed or is in good contact. If not, install a SIM card or remove and re-insert the SIM card.

LED Indicator	Status	Remarks	Description
	Blinking slowly (on for 1s and off for 1s)		The Smart Dongle fails to be connected to a management system because the SIM card has poor or no reception, or has run out of mobile data. If the Smart Dongle is reliably connected, check the SIM card connectivity through the app. If you have poor or no reception, contact the carrier. Check whether the tariff and mobile data plan of the SIM card are adequate. If not, ensure sufficient balance in the SIM card or purchase a data package.
Blinking red and green alternately	Blinking slowly (on for 1s and off for 1s)		No communication with the inverter: – Remove and then insert the Smart Dongle. – Check whether the inverter matches the Smart Dongle. – Connect the Smart Dongle to another inverter. Check whether the Smart Dongle is faulty or the USB port of the inverter is faulty.

----End

7.2 Commissioning the Inverter (Smart Dongle Networking)

NOTICE

- The grid-connection voltage and frequency of an inverter in China Region are set before delivery according to NB/T 32004 or the latest Chinese standard. If the inverter fails to connect to the power grid because the power grid voltage is close to or higher than the voltage required by Chinese laws and regulations, you can select another voltage level based on the voltage at the grid connection point after obtaining permission from the local power operator.
- If the power grid voltage exceeds the upper threshold, the service life of loads on the grid connection side may be affected, or energy yield loss may occur. In this case, the Company will not be liable for any consequences.

7.2.1 Deploying a New Plant

Figure 7-2 Deploying a new plant

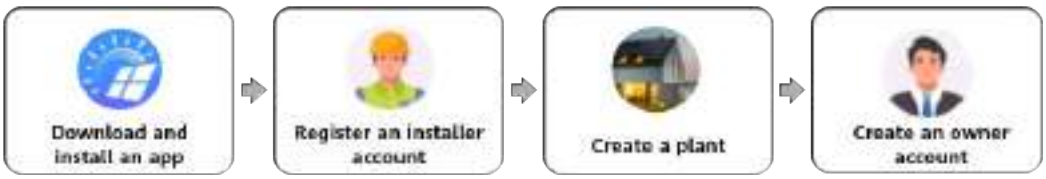


Table 7-4 Plant deployment description

No.	Task	Description
1	Downloading and installing an app	Download and install the FusionSolar app.
2	Registering an installer account	Register an installer account required for deployment and commissioning.
3	Creating a plant	Access the **Setup wizard** screen, scan the QR code to create a plant, commission devices according to the quick setting process, and connect devices to the plant.
4	Creating an owner account	Create an owner account that can be used to remotely monitor and manage devices.

For details, see **FusionSolar App Quick Guide**. Scan the QR code of the inverter to create a plant.

7.2.2 Setting Common Parameters

Set common parameters based on the devices connected to the plant.

Table 7-5 Setting common parameters

Function	Scenario Description	Operation
Grid-tied point control	Many regions impose a limit on the feed-in power of a power generation system. Therefore, a power meter is required to measure the power at the grid connection point to control the output of the inverter in real time, ensuring that the feed-in power meets the power requirement allowed by the power grid.	For details, see section "Parameter Settings" in the **Residential Smart PV Solution User Manual (Smart Dongle Networking & Inverter Direct Connection)**.
Battery parameter setting	If a battery is connected to the system, you need to add the battery and set battery parameters.	
Peak shaving	Applies to areas that have peak demand charges. The peak shaving function allows you to lower the peak power drawn from the grid in maximum self-consumption or TOU mode during peak hours, reducing electricity fees.	
Setting the physical layout of optimizers	If optimizers are configured for PV modules, you can view the physical location of each optimizer after creating a physical layout. If a PV module is faulty, you can quickly locate the faulty PV module from the physical layout to rectify the fault. If a PV module without an optimizer is faulty, you need to check the PV modules one by one to locate the faulty one, which is time-consuming and inefficient.	

For details about how to set more parameters, see **FusionSolar App and SUN2000 App Device Commissioning Guide**.

7.2.3 AFCI

Function Description

If PV modules or cables are incorrectly connected or damaged, electric arcs may be generated, which may cause fire. Huawei inverters provide unique arc fault detection in compliance with UL 1699B-2018 to safeguard users' lives and protect their property.

This function is enabled by default. The inverter automatically detects arc faults. To disable this function, log in to the FusionSolar app, choose **Services** > **Device Commissioning**, connect to the inverter WLAN as prompted, log in to the device, choose **Set** > **Feature parameters** on the home screen, and disable **AFCI**.

NOTE

The AFCI function works only with Huawei optimizers or ordinary PV modules when the inverter is connected to the grid, but does not support third-party optimizers or intelligent PV modules.

Clearing Alarms

The AFCI function involves the **DC arc fault** alarm.

The inverter has the AFCI alarm automatic clearance mechanism. If the alarm is triggered for less than five times within 24 hours, the inverter automatically clears the alarm. If the alarm is triggered for five times or more within 24 hours, the inverter locks for protection. You need to manually clear the alarm on the FusionSolar app or FusionSolar SmartPVMS so that it can work properly. You can manually clear the alarm in either of the following ways:

- **Method 1:** FusionSolar app
  a. **Connect to the inverter that has generated the AFCI alarm using the app** and log in to the local commissioning screen of the device as an installer.
  b. Tap **Alarm**. On the **Current Alarms** screen, tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.

  Figure 7-3 Clearing the alarm

- **Method 2:** FusionSolar SmartPVMS
  a. Log in to the FusionSolar SmartPVMS using an installer account, choose **Maintenance** > **Alarm Management**, select the **DC arc fault** alarm, and click **Clear**.

Figure 7-4 Clearing the alarms

b. Log in the FusionSolar SmartPVMS as a plant owner. Click the plant name on the **Home** page to access the plant page, and clear the alarm as prompted.

7.2.4 Limit on Power Purchased from Grid

Function

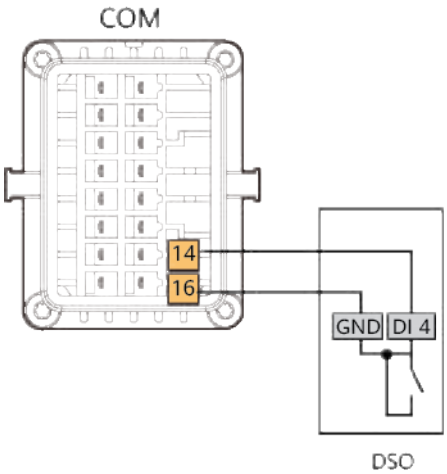
This function is used to control load power purchased from the grid. The power grid company uses the controller to transmit scheduling commands through the DI4 port. When the load power purchased from the grid is too high, it is limited. After the load capacity of the power grid recovers, the limit on the load power is removed.

NOTICE

Before setting this function, ensure that the inverter is correctly connected to the local DSO controller.

The following figure shows the cable connections between the inverter and the local DSO controller.

Figure 7-5 Cable connections



Procedure

1. **Connect to the inverter on the app** and log in to the local commissioning screen of the device as an installer.

2. Choose **Power adjustment** > **Dry contact scheduling settings** and enable **Limit on power purchased from grid**.
3. Tap **Submit**.

NOTE

- If **Dry contact scheduling** has been enabled and the DI4 port has been configured, clear the DI4 port settings before enabling **Limit on power purchased from grid**. After **Limit on power purchased from grid** is enabled, the DI4 port is used to receive scheduling commands from the DSO and cannot be used for **Dry contact scheduling** (in this case, the DI4 port is not displayed on the app).
- **ESS charge power from grid** refers to the maximum charge power of all ESSs in the current network.

7.2.5 Setting the Energy Measurement Mode

Function Description

This function is used to configure different energy measurement modes for different areas. After power meters are installed, you can configure the measurement modes to implement balanced and unbalanced measurement of energy.

NOTE

Only the SUN2000-(5KTL–12KTL)-M1, SUN2000/SUN5000-(12K–25K)-MB0, SUN2000-(5K–12K)-MAP0, and SUN5000-(8K, 12K)-MAP0 series inverters support the energy measurement mode settings.

Procedure

1. **Connect to the inverter on the app** and log in to the local commissioning screen of the device.
2. On the home screen, choose **Maintenance** > **Subdevice management** > **PowerMeter** and set **Energy Measurement Mode**.

Table 7-6 Energy measurement mode

Parameter		Description
Energy Measurement Mode	**Balanced Measurement**	Default setting. The forward energy and reversing energy are respectively calculated by integrating the sum of power from three phases.
	Unbalanced Measurement	The forward energy and reversing energy are respectively calculated by integrating the power of each phase.

7.2.6 Resetting the Password for Logging In to the Local Commissioning Screen

If you forget the password for logging in to the local commissioning screen of the inverter, perform the following steps to reset the password:

Method 1: Connect to the device WLAN, obtain the verification code, and reset the password. For details, see **7.2.6.1 Resetting the Password After Connecting to the Device WLAN**.

Method 2: Log in to the FusionSolar app, obtain the verification code, and connect to the device WLAN to reset the password. For details, see **7.2.6.2 Resetting the Password After Obtaining the Verification Code and Connecting to the Device WLAN**.

NOTICE

- You can reset the login password of only one user at a time.
- This function is supported by only the inverter series of SUN2000-(3K-6K)-LB0, SUN5000-(3K,6K)-LB0, SUN2000-(8K,10K)-LC0, SUN2000-(12K-25K)-MB0, SUN5000-(17K, 25K)-MB0, SUN2000-(5K-12K)-MAP0, and SUN5000-(8K, 12K)-MAP0.

7.2.6.1 Resetting the Password After Connecting to the Device WLAN

1. Log in to the FusionSolar app and choose **Services** > **Device Commissioning**.
2. **Connect to the WLAN of the inverter** and access the **Log in** screen.
3. Select the user whose password needs to be reset and tap **Forgot password?**
4. On the **Forgot Password** screen, tap **Get Code** and switch the network as prompted.
5. Enter the FusionSolar login password to obtain the verification code. After obtaining the verification code, tap **OK** and you will be redirected to the **Forgot Password** screen.
6. Enter the verification code, tap **OK**, and set a new password on the **Log in** screen as prompted.

NOTE

After obtaining the verification code, set a new password within 10 minutes.

More Guidance

If the message in the following figure is displayed, tap **OK** to return to the device connection screen, reconnect to the device WLAN, access the **Forgot Password** screen again, and enter the verification code.

7.2.6.2 Resetting the Password After Obtaining the Verification Code and Connecting to the Device WLAN

1. Log in to the FusionSolar app and select the target plant on the home screen.
2. On the **Device** screen, choose **Inverter** > **: :** > **O&M Authorization** > **Device verification code**.
3. On the **Device verification code** screen, tap **Get Code**, and enter the password for logging in to the FusionSolar to obtain a verification code.
4. Copy the verification code as prompted and tap **Proceed** to **connect to the WLAN of the inverter**.
5. On the **Log in** screen, select the user whose password needs to be reset, tap **Forgot password?**, enter the verification code, and set a new password as prompted.

NOTE

After obtaining the verification code, set a new password within 10 minutes.

7.3 Commissioning the Inverter (EMMA Networking & SmartGuard Networking)

NOTICE

- The grid-connection voltage and frequency of an inverter in China Region are set before delivery according to NB/T 32004 or the latest Chinese standard. If the inverter fails to connect to the power grid because the power grid voltage is close to or higher than the voltage required by Chinese laws and regulations, you can select another voltage level based on the voltage at the grid connection point after obtaining permission from the local power operator.
- If the power grid voltage exceeds the upper threshold, the service life of loads on the grid connection side may be affected, or energy yield loss may occur. In this case, the Company will not be liable for any consequences.

7.3.1 Deploying a New Plant

Figure 7-6 Deploying a new plant

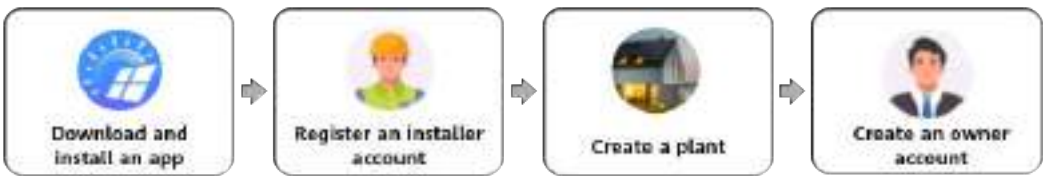


Table 7-7 Plant deployment description

No.	Task	Description
1	Downloading and installing an app	Download and install the FusionSolar app.
2	Registering an installer account	Register an installer account required for deployment and commissioning.
3	Creating a plant	Access the **Setup wizard** screen, scan the QR code to create a plant, commission devices according to the quick setting process, and connect devices to the plant.
4	Creating an owner account	Create an owner account that can be used to remotely monitor and manage devices.

- EMMA networking: For details, see **FusionSolar App Quick Guide (EMMA)**. Scan the QR code of the EMMA to create a plant.
- SmartGuard networking: For details, see **FusionSolar App Quick Guide (EMMA)**. Scan the QR code of the SmartGuard or EMMA to create a plant.

7.3.2 Setting Common Parameters

Set common parameters based on the devices connected to the plant.

Table 7-8 Setting common parameters

Function	Scenario Description	Operation
Grid-tied point control	Many regions impose a limit on the feed-in power of a power generation system. Therefore, a power meter is required to measure the power at the grid connection point to control the output of the inverter in real time, ensuring that the feed-in power meets the power requirement allowed by the power grid.	For details, see section "Parameter Settings" in the **Residential Smart PV Solution User Manual (EMMA Networking & SmartGuard Networking)**.
Battery parameter setting	If a battery is connected to the system, you need to add the battery and set battery parameters.	

Function	Scenario Description	Operation
Peak shaving	Applies to areas that have peak demand charges. The peak shaving function allows you to lower the peak power drawn from the grid in maximum self-consumption or TOU mode during peak hours, reducing electricity fees.	
Setting the physical layout of optimizers	If optimizers are configured for PV modules, you can view the physical location of each optimizer after creating a physical layout. If a PV module is faulty, you can quickly locate the faulty PV module from the physical layout to rectify the fault. If a PV module without an optimizer is faulty, you need to check the PV modules one by one to locate the faulty one, which is time-consuming and inefficient.	

For details about how to set more parameters, see **FusionSolar App and SUN2000 App Device Commissioning Guide**.

7.3.3 AFCI

Function Description

If PV modules or cables are incorrectly connected or damaged, electric arcs may be generated, which may cause fire. Huawei inverters provide unique arc fault detection in compliance with UL 1699B-2018 to safeguard users' lives and protect their property.

This function is enabled by default. The inverter automatically detects arc faults. To disable this function, log in to the FusionSolar app, choose **Services** > **Device Commissioning**, connect to the EMMA WLAN as prompted, log in to the device, choose **Monitor** on the home screen, select the inverter, choose **Set** > **Feature parameters**, and disable **AFCI**.

NOTE

The AFCI function works only with Huawei optimizers or ordinary PV modules when the inverter is connected to the grid, but does not support third-party optimizers or intelligent PV modules.

Clearing Alarms

The AFCI function involves the **DC arc fault** alarm.

The inverter has the AFCI alarm automatic clearance mechanism. If the alarm is triggered for less than five times within 24 hours, the inverter automatically clears the alarm. If the alarm is triggered for five times or more within 24 hours, the inverter locks for protection. You need to manually clear the alarm on the FusionSolar app or FusionSolar SmartPVMS so that it can work properly. You can manually clear the alarm in either of the following ways:

- **Method 1:** FusionSolar app

  Log in to the FusionSolar app, choose **Services** > **Device Commissioning**, connect to the EMMA, tap **Alarm** on the home screen, and tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.

  a. **Connect to the EMMA on the app** and log in to the local commissioning screen of the device as an installer.

  b. Tap **Alarm**. On the **Active alarm** screen, tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.

  Figure 7-7 Clearing the alarm

- **Method 2:** FusionSolar SmartPVMS

  a. Log in to the FusionSolar SmartPVMS using an installer account, choose **Maintenance** > **Alarm Management**, select the **DC arc fault** alarm, and click **Clear**.

  Figure 7-8 Clearing the alarms

  b. Log in the FusionSolar SmartPVMS as a plant owner. Click the plant name on the **Home** page to access the plant page, and clear the alarm as prompted.

7.3.4 Limit on Power Purchased from Grid

Function

This function is used to control load power purchased from the grid. The power grid company uses the controller to transmit scheduling commands through the DI4 port. When the load power purchased from the grid is too high, it is limited.

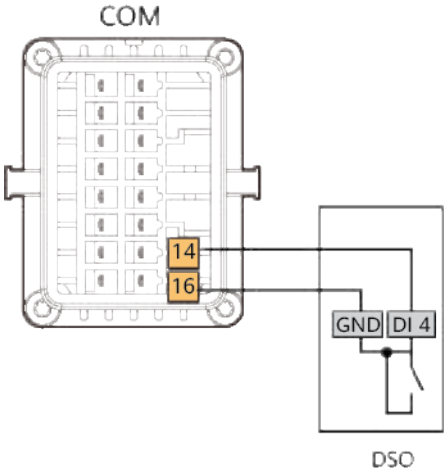
After the load capacity of the power grid recovers, the limit on the load power is removed.

NOTICE

Before setting this function, ensure that the inverter is correctly connected to the local DSO controller.

The following figure shows the cable connections between the inverter and the local DSO controller.

Figure 7-9 Cable connections



Procedure

1. **Connect to the EMMA on the app** and log in to the local commissioning screen of the device as an installer.
2. Choose **Power adjustment** > **Scheduling via DI Port** and enable **Limit on power purchased from grid**.
3. Tap **Submit**.

NOTE

- If **Dry contact scheduling** has been enabled and the DI4 port has been configured, clear the DI4 port settings before enabling **Limit on power purchased from grid**. After **Limit on power purchased from grid** is enabled, the DI4 port is used to receive scheduling commands from the DSO and cannot be used for **Scheduling via DI Port** (in this case, the DI4 port is not displayed on the app).
- **ESS charge power from grid** and **Charge power of charger** refer to the maximum charge power of all ESSs and chargers in the current network, respectively.

7.3.5 Setting the Energy Measurement Mode

Function Description

This function is used to configure different energy measurement modes for different areas. After power meters are installed, you can configure the

measurement modes to implement balanced and unbalanced measurement of energy.

NOTE

Only the SUN2000-(5KTL–12KTL)-M1, SUN2000/SUN5000-(12K–25K)-MB0, SUN2000-(5K–12K)-MAP0, and SUN5000-(8K, 12K)-MAP0 series inverters support the energy measurement mode settings.

Procedure

1. **Connect to the EMMA on the app** and log in to the local commissioning screen of the device.
2. On the home screen, choose **Settings** > **Set Installation Parameters** and set **Energy Measurement Mode**.

Table 7-9 Energy measurement mode

Parameter		Description
Energy Measurement Mode	**Balanced Measurement**	Default setting. The forward energy and reversing energy are respectively calculated by integrating the sum of power from three phases.
	Unbalanced Measurement	The forward energy and reversing energy are respectively calculated by integrating the power of each phase.

7.3.6 Resetting the Password for Logging In to the Local Commissioning Screen

If you forget the password for logging in to the local commissioning screen of the inverter, perform the following steps to reset the password:

Method 1: Connect to the device WLAN, obtain the verification code, and reset the password. For details, see **7.2.6.1 Resetting the Password After Connecting to the Device WLAN**.

Method 2: Log in to the FusionSolar app, obtain the verification code, and connect to the device WLAN to reset the password. For details, see **7.2.6.2 Resetting the Password After Obtaining the Verification Code and Connecting to the Device WLAN**.

NOTICE

- You can reset the login password of only one user at a time.
- This function is supported by only the inverter series of SUN2000-(3K-6K)-LB0, SUN5000-(3K,6K)-LB0, SUN2000-(8K,10K)-LC0, SUN2000-(12K-25K)-MB0, SUN5000-(17K, 25K)-MB0, SUN2000-(5K-12K)-MAP0, and SUN5000-(8K, 12K)-MAP0.

7.3.6.1 Resetting the Password After Connecting to the Device WLAN

1. Log in to the FusionSolar app and choose **Services** > **Device Commissioning**.
2. **Connect to the WLAN of the EMMA** and access the **Log in** screen.
3. Select the user whose password needs to be reset and tap **Forgot password?**
4. On the **Forgot Password** screen, tap **Get Code** and switch the network as prompted.
5. Enter the FusionSolar login password to obtain the verification code. After obtaining the verification code, tap **OK** and you will be redirected to the **Forgot Password** screen.
6. Enter the verification code, tap **OK**, and set a new password on the **Log in** screen as prompted.

   NOTE

   After obtaining the verification code, set a new password within 10 minutes.

More Guidance

If the message in the following figure is displayed, tap **OK** to return to the device connection screen, reconnect to the device WLAN, access the **Forgot Password** screen again, and enter the verification code.

7.3.6.2 Resetting the Password After Obtaining the Verification Code and Connecting to the Device WLAN

1. Log in to the FusionSolar app and select the target plant on the home screen.
2. On the **Device** screen, choose **Inverter** > **: :** > **O&M Authorization** > **Device verification code**.
3. On the **Device verification code** screen, tap **Get Code**, and enter the password for logging in to the FusionSolar to obtain a verification code.
4. Copy the verification code as prompted and tap **Proceed** to **connect to the WLAN of the EMMA**.
5. On the **Log in** screen, select the user whose password needs to be reset, tap **Forgot password?**, enter the verification code, and set a new password as prompted.

   NOTE

   After obtaining the verification code, set a new password within 10 minutes.

7.4 Viewing the Plant Creation Status

The FusionSolar app provides an overview of plants. You can view the plant running status, energy yield and consumption, revenue, and energy flow diagram in real time.

Log in to the app, tap **Home**, and tap **Plants**. This screen displays the real-time running status and basic information of all plants managed by the user by default.

Figure 7-10 Viewing the plant creation status

7.5 SmartLogger Networking Scenario

See the ***PV Plants Connecting to Huawei Hosting Cloud Quick Guide (Inverters + SmartLogger3000 + RS485 Networking)***. You can scan the QR code to obtain it.

Figure 7-11 SmartLogger3000

8 System Maintenance

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

WARNING

- Before performing maintenance, power off the equipment, follow the instructions on the delayed discharge label, and wait for a period of time as specified to ensure that the equipment is not energized.

8.1 Routine Maintenance

To ensure that the inverter can operate properly for a long term, you are advised to perform routine maintenance on it as described in this section.

CAUTION

Power off the system before cleaning the system, connecting cables, and checking grounding reliability.

Table 8-1 Maintenance checklist

Check Item	Check Method	Maintenance Interval
System cleanliness	Check periodically whether the heat sinks are blocked or dirty.	Once every 6 to 12 months

Check Item	Check Method	Maintenance Interval
Cleanness of air intake and exhaust vents	Check periodically whether there is dust or foreign objects at the air intake and exhaust vents.	Power off the inverter and remove dust and foreign objects. If necessary, remove the baffle plates from the air intake and exhaust vents for cleaning. Once every 6 to 12 months (or once every 3 to 6 months based on the actual dust conditions in the environment)
Fan	Check whether the fan generates abnormal noise during operation.	Remove foreign objects from the fan. If the abnormal noise persists, replace the fan. For details, see **8.5 Replacing a Fan**. Once every 6 to 12 months
System running status	• Check whether the inverter is damaged or deformed. • Check whether the inverter generates abnormal sound during operation. • Check whether all inverter parameters are correctly set during operation.	Once every 6 months
Electrical connection	• Check whether cables are disconnected or loose. • Check whether cables are damaged, especially whether the cable sheath that contacts a metal surface is damaged.	6 months after the first commissioning and once every 6 to 12 months after that
Grounding reliability	Check whether the PE cable is securely connected.	6 months after the first commissioning and once every 6 to 12 months after that
Sealing	Check whether all terminals and ports are properly sealed.	Once a year

8.2 System Power-Off

Precautions

WARNING

- After the system is powered off, the inverter is still energized and hot, which may cause electric shocks or burns. Therefore, wait for 5 minutes after power-off and then put on insulated gloves to operate the inverter.
- Power off the system before maintaining optimizers and PV strings. Otherwise, electric shocks may occur when the PV strings are energized.

Procedure

Step 1 Send a shutdown command on the app.

Step 2 Turn off the AC switch between the inverter and the power grid.

Step 3 Set the **DC SWITCH** to **OFF**.

Step 4 Turn off the DC switch between the inverter and PV strings.

Step 5 (Optional) Turn off the battery switch between the inverter and the battery.

----End

8.3 Troubleshooting

For details about alarms, see the **Inverter Alarm Reference**.

8.4 Replacing an Inverter

Step 1 Remove the inverter.

1. Power off the system. For details, see **8.2 System Power-Off**.
2. Disconnect all cables from the inverter, including signal cables, DC input power cables, battery cables, AC output power cables, and PE cables.
3. Remove the inverter from the mounting bracket.
4. Remove the mounting bracket.

Step 2 Pack the inverter.

- If the original packaging is available, put the inverter inside it and then seal it using adhesive tape.
- If the original packaging is unavailable, put the inverter inside a suitable hard cardboard box and seal it properly.

Step 3 Dispose of the inverter.

If the inverter reaches the end of its service life, dispose of it according to local regulations for the disposal of electrical equipment.

Step 4 Install a new inverter.

----End

8.5 Replacing a Fan

CAUTION

- Before replacing a fan, power off the inverter.
- When replacing a fan, use insulated tools and wear PPE.
- Currently, there are two types of fans. Select either one based on the site requirements.

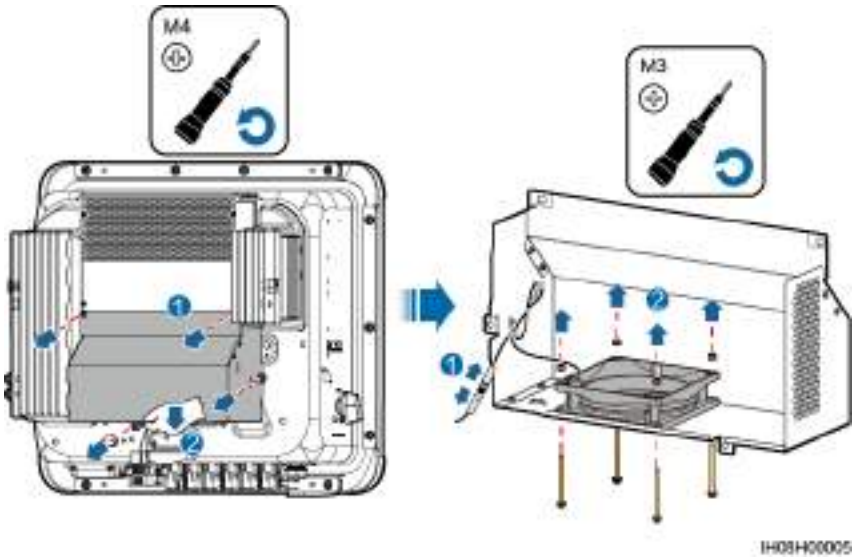
Procedure

Type 1:

Step 1 Remove the inverter from the mounting bracket.

Step 2 Remove the fan cover, disconnect the fan cable, and remove the faulty fan.

Figure 8-1 Removing the faulty fan



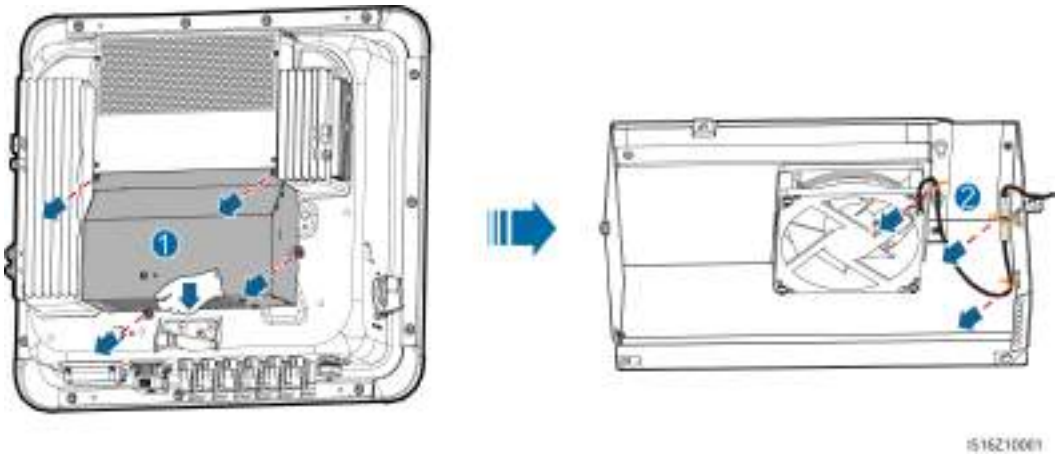
Step 3 Install a new fan, connect and bind the cable, and install the fan cover.

----End

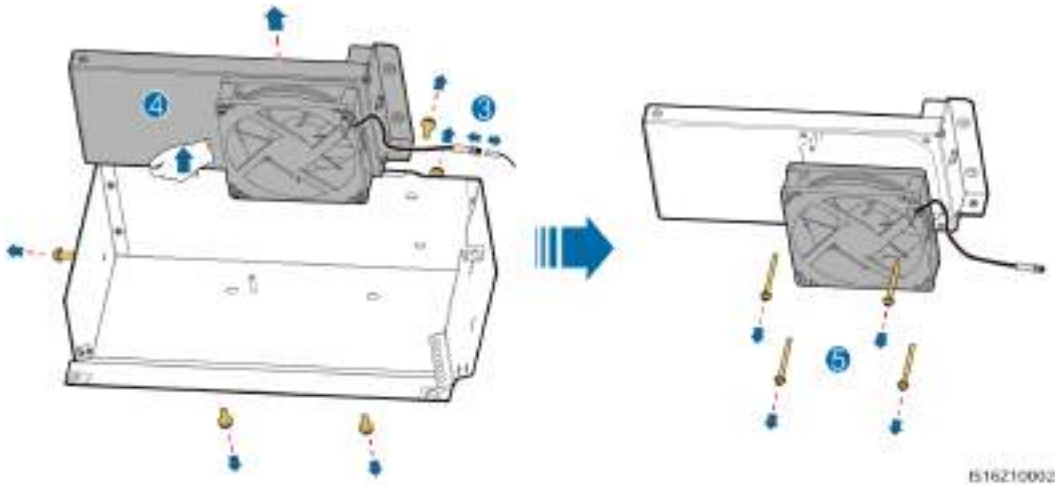
Type 2:

Step 1 Remove the inverter from the mounting bracket.

Step 2 Remove the fan cover and fan cable ties.



Step 3 Disconnect the fan cable, take out the fan bracket, and remove the faulty fan.



Step 4 Install a new fan, install the fan bracket, bind the cable, and install the fan cover.

----End

> ⚠ CAUTION
>
> After the fan is installed, cut off the excess cable ties.

8.6 Locating Insulation Resistance Faults

If the ground resistance of a PV string connected to the inverter is too low, the inverter generates a **Low insulation resistance** alarm. The alarm ID is 2062.

The possible causes are as follows:

- A short circuit has occurred between the PV array and the ground.
- The ambient air of the PV array is damp and the insulation between the PV array and the ground is poor.

After the **Low insulation resistance** alarm is reported by the inverter, insulation resistance fault location is automatically triggered. If the fault location is

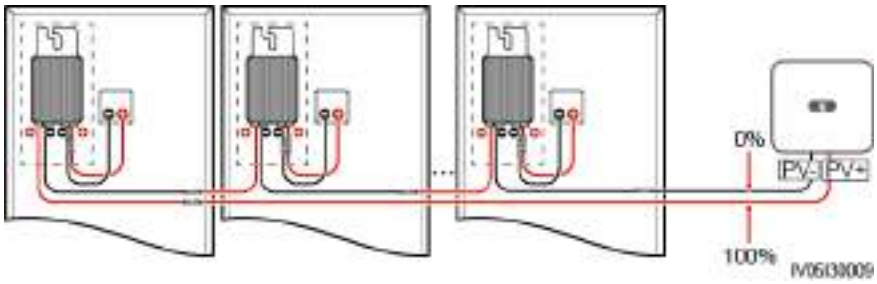
successful, the location information is displayed on the **Alarm details** screen of the **Low insulation resistance** alarm on the FusionSolar app.

Log in to the FusionSolar app, choose **Alarm** > **Active alarm**, select **Low insulation resistance** to enter the **Alarm details** screen.

NOTE

- The positive and negative terminals of a PV string are respectively connected to the PV+ and PV– terminals of the inverter. The PV– terminal represents a possibility of 0% for the short-circuit position and the PV+ terminal represents a possibility of 100% for the short-circuit position. Other percentages indicate that the fault occurs on a PV module or cable in the PV string.
- Possible fault position = Total number of PV modules in a PV string x Percentage of possible short-circuit positions. For example, if a PV string consists of 14 PV modules and the percentage of the possible short-circuit position is 34%, the possible fault position is 4.76 (14 x 34%), indicating that the fault is located near PV module 4, including the previous and the next PV modules and the cables. The inverter has a detection precision of ±1 PV module.
- The possible faulty PV string MPPT1 corresponds to PV1 and PV2, and the possible faulty PV string MPPT2 corresponds to PV3 and PV4. The fault can be located only to the MPPT level. Perform the following steps to connect the PV strings corresponding to the faulty MPPT to the inverter one by one to further locate and rectify the fault.
- When a non-short-circuit fault occurs, the possible short-circuit percentage is not displayed. If the insulation resistance is greater than 0.001 MΩ, the fault is not related to short circuit. Check all PV modules in the faulty PV string one by one to locate and rectify the fault.

Figure 8-2 Percentage of short-circuit positions



Procedure

NOTICE

If the irradiance or the PV string voltage is too high, the insulation resistance fault location may fail. In this case, the fault location status on the **Alarm details** screen is **Conditions not met**. Perform the following steps to connect PV strings to the inverter one by one to locate the fault. If the system is not configured with any optimizer, skip the corresponding optimizer operations.

Step 1 Ensure that the AC connections are normal. Log in to the FusionSolar app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF**.

Step 2 Connect one PV string to the inverter, and set **DC SWITCH** to **ON**. If the inverter status is **Shutdown: Command**, log in to the app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a startup command.

Step 3 Choose **Alarm** on the home screen, enter the **Active alarm** screen, and check whether a **Low insulation resistance** alarm is reported.

- If no **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF**. Go to **Step 2** and check rest of the PV strings one by one.
- If a **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, check the percentage of possible short-circuit positions on the **Alarm details** screen and calculate the location of the possible faulty PV module based on the percentage. Then go to **Step 4**.

Step 4 Log in to the app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF**. Check whether the connectors or DC power cables between the optimizer and PV module, between adjacent PV modules, or between adjacent optimizers on the possible fault position are damaged.

- If yes, replace the damaged connectors or DC power cables, and then set **DC SWITCH** to **ON**. If the inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF**, and send a startup command. View alarm information.
  - If no **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, troubleshoot the insulation resistance fault of the PV string. Log in to the app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF**. Go to **Step 2** and check rest of the PV strings one by one. Then, go to **Step 8**.
  - If the DC side is powered on 1 minute later, the **Low insulation resistance** alarm is still reported. Log in to the app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF** and go to **Step 5**.
- If no, go to **Step 5**.

Step 5 Disconnect the possible faulty PV module and the paired optimizer from the PV string, and use a DC extension cable with an MC4 connector to connect the PV module or optimizer adjacent to the possible faulty PV module. Set **DC SWITCH** to **ON**. If the inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a startup command. View alarm information.

- If no **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, the fault occurred on the disconnected PV module and optimizer. Choose **Maintenance** > **Inverter ON/OFF**, send a shutdown command, and set **DC SWITCH** to **OFF**. Go to **Step 7**.
- If the **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, the fault did not occur on the disconnected PV module and optimizer. Go to **Step 6**.

Step 6 Log in to the app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF**, reconnect the

disconnected PV module and optimizer, and repeat **Step 5** to check the PV modules and optimizers adjacent to the possible fault location.

Step 7 Determine the position of the ground insulation fault:

- Disconnect the possible faulty PV module from the optimizer.
- Connect the possible faulty optimizer to the PV string.
- Set **DC SWITCH** to **ON**. If the inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF**, and send a startup command. View alarm information.
  - If no **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, the fault is on the possible faulty PV module.
  - If the **Low insulation resistance** alarm is reported 1 minute after the DC side is powered on, the fault is on the possible faulty optimizer.
- Log in to the app, choose **Maintenance** > **Inverter ON/OFF** on the home screen, and send a shutdown command. Set **DC SWITCH** to **OFF**, replace the faulty component, and complete troubleshooting the insulation resistance fault. Go to **Step 2** and check rest of the PV strings one by one. Then, go to **Step 8**.

Step 8 Set **DC SWITCH** to **ON**. If the inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF**, and send a startup command.

----End

9 Technical Specifications

9.1 SUN2000-(15K-25K)-MB0-ZH Technical Specifications

Efficiency

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Maximum efficiency	98.5%	98.5%	98.5%	98.5%
Chinese efficiency	97.4%	97.5%	97.6%	98.0%

Input

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Recommended maximum input DC power	22500 W	25500 W	30000 W	37500 W
Maximum input voltage[a]	1100 V			
Maximum input current per MPPT	20 A (one PV string)/30 A (one MPPT)			

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Maximum short-circuit current per MPPT	40 A			
Minimum startup voltage	200 V			
MPPT voltage range	200–1000 V			
Full-load MPPT voltage range	410–800 V	440–800 V	480–800 V	530–800 V
Rated input voltage	600 V			
Maximum number of inputs	4			
Number of MPPTs[b]	2			
Rated battery voltage	600 V DC			
Battery voltage range	600–980 V DC			
Maximum battery current	26.25 A			
Battery type	Li-ion			
Note a: The maximum input voltage is the maximum DC input voltage that the inverter can withstand. If the input voltage exceeds this value, the inverter may be damaged. Note b: The maximum input power of an MPPT circuit is 18.8 kW. If the input power exceeds this value, the inverter may limit the output power of PV modules.				

Output (On Grid)

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Rated output power	15000 W	17000 W	20000 W	25000 W
Maximum apparent power	16500 VA	18700 VA	22000 VA	27500 VA
Maximum active power (cosϕ = 1)	16500 W	18700 W	22000 W	27500 W
Rated output voltage	220 V/380 V, 3W/N+PE 230 V/400 V, 3W/N+PE			
Maximum output voltage at long-term operation	Refer to the local power grid standards.			
Rated output current	22.8 A/380 V 21.7 A/400 V	25.8 A/380 V 24.5 A/400 V	30.4 A/380 V 28.9 A/400 V	38.0 A/380 V 36.1 A/400 V
Maximum output current	25.2 A/380 V 23.9 A/400 V	28.6 A/380 V 27.1 A/400 V	33.6 A/380 V 31.9 A/400 V	42.0 A/380 V 39.9 A/400 V
Output voltage frequency	50 Hz/60 Hz			
Power factor	0.8 leading ... 0.8 lagging			
Output DC component (DCI)	< 0.5% of the rated output			
Maximum total harmonic distortion (AC THDi)	< 3% under rated conditions. Single harmonic meets the VDE 4105 requirements.			

Output (Off Grid)

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Rated apparent power	8300 VA			
Maximum apparent power	9130 VA			

Protection

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Overvoltage category	PV II/AC III			
Input DC switch	Supported			
Anti-islanding protection	Supported			
Output overcurrent protection	Supported			
Input reverse connection protection	Supported			
DC surge protection	TYPE II			
AC surge protection	Yes, compatible with TYPE II protection class according to EN/IEC 61643-11			
Insulation resistance detection	Supported			
Residual current monitoring unit (RCMU)	Supported			

Display and Communication

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Display	LED indicators; WLAN+app			
WLAN-FE Dongle	Supported			
4G Smart Dongle	Standard			
RS485 communication	Supported			
Built-in WLAN	Supported			
DC MBUS	Supported			
AFCI	Supported			
PID recovery	Supported			

General Specifications

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Dimensions (H x W x D)	460 mm x 546 mm x 228 mm			
Net weight	21 kg			
Noise	< 45 dB (typical working condition)	< 45 dB (typical working condition)	< 50 dB (typical working condition)	< 50 dB (typical working condition)
Operating temperature	–25°C to +60°C			
Relative humidity	0–100% RH			
Cooling mode	Smart air cooling			
Maximum operating altitude	4000 m (derated when the altitude is greater than 2000 m)			

Technical Specifications	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
Storage temperature	–40°C to +70°C			
IP rating	IP66			
Topology	Transformerless			

Wireless Communication Parameters

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Frequency	2400–2483.5 MHz	SDongleA-05: 2400–2483.5 MHz	SDongleB-03-CN: • Supports LTE FDD: B1/B3/B5/B8. • Supports LTE TDD: B34/B38/B39/B40/B41. • Supports GSM/GPRS/EDGE: 900 MHz/1800 MHz. SDongleB-06-CN (WiFi): 2400–2483.5 MHz SDongleB-06-CN (4G): • Supports LTE FDD: B1/B3/B5/B8. • Supports LTE TDD: B34/B38/B39/B40/B41. • Supports GSM/GPRS/EDGE: 900 MHz/1800 MHz.

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Protocols and standards	WLAN 802.11b/g/n	SDongleA-05: WLAN 802.11b/g/n	SDongleB-03-CN: • Supports LTE FDD (with receive diversity): B1/B3/B5/B8. • Supports LTE TDD (with receive diversity): B34/B38/B39/B40/B41. • Supports GSM: 900 MHz/1800 MHz. • Supports digital audio. SDongleB-06-CN (WiFi): WLAN 802.11b/g/n SDongleB-06-CN (4G): • Supports LTE FDD (with receive diversity): B1/B3/B5/B8. • Supports LTE TDD (with receive diversity): B34/B38/B39/B40/B41. • Supports GSM: 900 MHz/1800 MHz. • Supports digital audio.

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Bandwidth	≤ 20 MHz	≤ 20 MHz	LTE features: • Supports a maximum of 3GPP R8 non-CA Cat 4 FDD and TDD. • Supports 1.4 MHz/3 MHz/5 MHz/10 MHz/15 MHz/20 MHz RF bandwidth. • Supports MIMO in the downlink. • LTE FDD: maximum downlink rate of 150 Mbit/s and maximum uplink rate of 50 Mbit/s • LTE TDD: maximum downlink rate of 130 Mbit/s and maximum uplink rate of 30 Mbit/s UMTS features: • Supports 3GPP R7 HSDPA+, HSDPA, HSUPA, and WCDMA. • Supports QPSK and 16QAM modulation. • HSDPA+: maximum downlink rate of 21 Mbit/s • HSUPA: maximum uplink rate of 5.76 Mbit/s • WCDMA: maximum downlink rate of 384 kbit/s and maximum uplink rate of 384 kbit/s GSM features: GPRS: • Supports GPRS multislot class 12. • Coding schemes: CS-1, CS-2, CS-3, and CS-4 • Maximum downlink rate: 85.6 kbit/s; maximum uplink rate: 85.6 kbit/s EDGE:

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
			• Supports EDGE multislot class 12. • Supports GMSK and 8-PSK modulation and coding schemes. • Downlink coding format: MCS 1–9 • Uplink coding format: MCS 1–9 • Maximum downlink rate: 236.8 kbit/s; maximum uplink rate: 236.8 kbit/s SDongleB-06-CN (WiFi): 20 MHz/40 MHz (optional)
Maximum transmit power	≤ 20 dBm EIRP	≤ 20 dBm EIRP	• Class 4 (33 dBm±2 dB), EGSM900 frequency band • Class 1 (30 dBm±2 dB), DCS1800 frequency band • Class E2 (27 dBm±3 dB), EGSM900 8-PSK • Class E2 (26 dBm±3 dB), DCS1800 8-PSK • Class 3 (24 dBm+1/–3 dB), WCDMA frequency band • Class 3 (23 dBm±2 dB), LTE FDD frequency band • Class 3 (23 dBm±2 dB), LTE TDD frequency band SDongleB-06-CN (WiFi): ≤ 20 dBm EIRP

9.2 SUN2000-(12K-25K)-MB0 Technical Specifications

Efficiency

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Maximum efficiency	98.4%	98.4%	98.4%	98.4%	98.4%
European efficiency	97.9%	98.0%	98.1%	98.1%	98.2%

Input

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Recommended maximum input DC power	18000 W	22500 W	25500 W	30000 W	37500 W
Maximum input voltage[a]	1100 V				
Maximum input current per MPPT	20 A (one PV string)/30 A (one MPPT)				
Maximum short-circuit current per MPPT	40 A				
Minimum startup voltage	200 V				
MPPT voltage range	200–1000 V				

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Full-load MPPT voltage range	370–800 V	410–800 V	440–800 V	480–800 V	530–800 V
Rated input voltage	600 V				
Maximum number of inputs	4				
Number of MPPTs[b]	2				
Rated battery voltage	600 V DC				
Battery voltage range	600–980 V DC				
Maximum battery current	26.25 A				
Battery type	Li-ion				
Note a: The maximum input voltage is the maximum DC input voltage that the inverter can withstand. If the input voltage exceeds this value, the inverter may be damaged. Note b: The maximum input power of an MPPT circuit is 18.8 kW. If the input power exceeds this value, the inverter may limit the output power of PV modules.					

Output (On Grid)

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Rated output power	12000 W	15000 W	17000 W	20000 W	25000 W

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Maximum apparent power	13200 VA	16500 VA	18700 VA	22000 VA	27500 VA
Maximum active power (cosϕ = 1)	13200 W	16500 W	18700 W	22000 W	27500 W
Rated output voltage	220 V/380 V, 3W/N+PE 230 V/400 V, 3W/N+PE 240 V/415 V, 3W/N+PE				
Maximum output voltage at long-term operation	Refer to the local power grid standards.				
Rated output current	18.2 A/380 V 17.3 A/400 V 16.7 A/415 V	22.8 A/380 V 21.7 A/400 V 20.9 A/415 V	25.8 A/380 V 24.5 A/400 V 23.7 A/415 V	30.4 A/380 V 28.9 A/400 V 27.8 A/415 V	38.0 A/380 V 36.1 A/400 V 34.8 A/415 V
Maximum output current	20.2 A/380 V 19.1 A/400 V 18.5 A/415 V	25.2 A/380 V 23.9 A/400 V 23.1 A/415 V	28.6 A/380 V 27.1 A/400 V 26.1 A/415 V	33.6 A/380 V 31.9 A/400 V 30.8 A/415 V	42.0 A/380 V 39.9 A/400 V 38.5 A/415 V
Output voltage frequency	50 Hz/60 Hz				
Power factor	0.8 leading ... 0.8 lagging				
Output DC component (DCI)	< 0.5% of the rated output				
Maximum total harmonic distortion (AC THDi)	< 3% under rated conditions. Single harmonic meets the VDE 4105 requirements.				

Output (Off Grid)

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Rated apparent power	8300 VA				
Maximum apparent power	9130 VA				

Protection

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Overvoltage category	PV II/AC III				
Input DC switch	Supported				
Anti-islanding protection	Supported				
Output overcurrent protection	Supported				
Input reverse connection protection	Supported				
DC surge protection	TYPE II				
AC surge protection	Yes, compatible with TYPE II protection class according to EN/IEC 61643-11				
Insulation resistance detection	Supported				

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Residual current monitoring unit (RCMU)	Supported				

Display and Communication

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Display	LED indicators; WLAN+app				
WLAN-FE Dongle	Supported				
4G Smart Dongle	Optional				
RS485 communication	Supported				
Built-in WLAN	Supported				
DC MBUS	Supported				
AFCI	Supported				
PID recovery	Supported				

General Specifications

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Dimensions (H x W x D)	460 mm x 546 mm x 228 mm				
Net weight	21 kg				

Technical Specifications	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Noise	< 45 dB (typical working condition)	< 45 dB (typical working condition)	< 45 dB (typical working condition)	< 50 dB (typical working condition)	< 50 dB (typical working condition)
Operating temperature	–25°C to +60°C				
Relative humidity	0–100% RH				
Cooling mode	Smart air cooling				
Maximum operating altitude	4000 m (derated when the altitude is greater than 2000 m)				
Storage temperature	–40°C to +70°C				
IP rating	IP66				
Topology	Transformerless				

Wireless Communication Parameters

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Frequency	2400–2483.5 MHz	SDongleA-05: 2400–2483.5 MHz	SDongleB-06-EU (WiFi): 2400–2483.5 MHz SDongleB-06-EU (4G): • Supports LTE FDD: B1/B3/B5/B8. • Supports LTE TDD: B7/B20/B28/B38/B40/B41. • Supports GSM/GPRS/EDGE: 900 MHz/1800 MHz.

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Protocols and standards	WLAN 802.11b/g/n	SDongleA-05: WLAN 802.11b/g/n	SDongleB-06-EU (WiFi): WLAN 802.11b/g/n SDongleB-06-EU (4G): • Supports LTE FDD (with receive diversity): B1/B3/B5/B8. • Supports LTE TDD (with receive diversity): B7/B20/B28/B38/B40/B41. • Supports GSM: 900 MHz/1800 MHz. • Supports digital audio.

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Bandwidth	20 MHz/40 MHz (optional)	20 MHz/40 MHz (optional)	LTE features: • Supports a maximum of 3GPP R8 non-CA Cat 4 FDD and TDD. • Supports 1.4 MHz/3 MHz/5 MHz/10 MHz/15 MHz/20 MHz RF bandwidth. • Supports MIMO in the downlink. • LTE FDD: maximum downlink rate of 150 Mbit/s and maximum uplink rate of 50 Mbit/s • LTE TDD: maximum downlink rate of 130 Mbit/s and maximum uplink rate of 30 Mbit/s UMTS features: • Supports 3GPP R7 HSDPA+, HSDPA, HSUPA, and WCDMA. • Supports QPSK and 16QAM modulation. • HSDPA+: maximum downlink rate of 21 Mbit/s • HSUPA: maximum uplink rate of 5.76 Mbit/s • WCDMA: maximum downlink rate of 384 kbit/s and maximum uplink rate of 384 kbit/s GSM features: GPRS: • Supports GPRS multislot class 12. • Coding schemes: CS-1, CS-2, CS-3, and CS-4 • Maximum downlink rate: 85.6 kbit/s; maximum uplink rate: 85.6 kbit/s EDGE:

Technical Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
			• Supports EDGE multislot class 12. • Supports GMSK and 8-PSK modulation and coding schemes. • Downlink coding format: MCS 1–9 • Uplink coding format: MCS 1–9 • Maximum downlink rate: 236.8 kbit/s; maximum uplink rate: 236.8 kbit/s SDongleB-06-EU (WiFi): 20 MHz/40 MHz (optional)
Maximum transmit power	≤ 20 dBm EIRP	≤ 20 dBm EIRP	• Class 4 (33 dBm±2 dB), EGSM900 frequency band • Class 1 (30 dBm±2 dB), DCS1800 frequency band • Class E2 (27 dBm±3 dB), EGSM900 8-PSK • Class E2 (26 dBm±3 dB), DCS1800 8-PSK • Class 3 (24 dBm+1/–3 dB), WCDMA frequency band • Class 3 (23 dBm±2 dB), LTE FDD frequency band • Class 3 (23 dBm±2 dB), LTE TDD frequency band SDongleB-06-EU (WiFi): ≤ 20 dBm EIRP

A Grid Codes

NOTE

The grid codes are subject to change. The listed codes are for reference only.

Table A-1 SUN2000-(15K-25K)-MB0-ZH grid codes

No.	Grid Code	Description	SUN2000-15K-MB0-ZH	SUN2000-17K-MB0-ZH	SUN2000-20K-MB0-ZH	SUN2000-25K-MB0-ZH
1	NB/T 32004	China Golden Sun low-voltage power grid	Supported	Supported	Supported	Supported
2	Custom (50 Hz)	Reserved	Supported	Supported	Supported	Supported
3	CHINA-LV220/380	China low-voltage power grid	Supported	Supported	Supported	Supported

Table A-2 SUN2000-(12K-25K)-MB0 grid codes

No.	Grid Code	Description	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
1	VDE-AR-N-4105	Germany low-voltage power grid	Supported	Supported	Supported	Supported	Supported
2	UTE C 15-712-1(A)	France mainland power grid	Supported	Supported	Supported	Supported	Supported
3	UTE C 15-712-1(B)	France island power grid	Supported	Supported	Supported	Supported	Supported

No.	Grid Code	Description	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
4	UTE C 15-712-1(C)	France island power grid	Supported	Supported	Supported	Supported	Supported
5	CEI0-21	Italy power grid	Supported	Supported	Supported	Supported	Supported
6	RD1699/661	Spain low-voltage power grid	Supported	Supported	Supported	Supported	Supported
7	C10/11	Belgium power grid	Supported	Supported	Supported	Supported	Supported
8	IEC61727	IEC 61727 low-voltage grid-connection (50 Hz)	Supported	Supported	Supported	Supported	Supported
9	Custom (50 Hz)	Reserved	Supported	Supported	Supported	Supported	Supported
10	Custom (60 Hz)	Reserved	Supported	Supported	Supported	Supported	Supported
11	CEI0-16	Italy power grid	Supported	Supported	Supported	Supported	Supported
12	TAI-PEA	Thailand grid-connection standard	Supported	Supported	Supported	Supported	Supported
13	TAI-MEA	Thailand grid-connection standard	Supported	Supported	Supported	Supported	Supported
14	Philippines	Philippines low-voltage power grid	Supported	Supported	Supported	Supported	Supported
15	NRS-097-2-1	South Africa power grid standard	Supported	Supported	Supported	Supported	Supported
16	IEC61727-60Hz	IEC 61727 low-voltage grid-connection (60 Hz)	Supported	Supported	Supported	Supported	Supported
17	PO12.3	Spain low-voltage power grid	Supported	Supported	Supported	Supported	Supported

No.	Grid Code	Description	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
18	EN50549-LV	Ireland power grid	Supported	Supported	Supported	Supported	Supported
19	Jordan-Transmission	Jordan low-voltage power grid	Supported	Supported	Supported	Supported	Supported
20	ABNT NBR 16149	Brazil power grid	Supported	Supported	Supported	Supported	Supported
21	DUBAI	Dubai low-voltage power grid	Supported	Supported	Supported	Supported	Supported
22	Jordan-Distribution	Jordan power distribution network low-voltage power grid	Supported	Supported	Supported	Supported	Supported
23	TAIPOWER	Taiwan Power low-voltage power grid	Supported	Supported	Supported	Supported	Supported
24	OMAN	Oman low-voltage power grid	Supported	Supported	Supported	Supported	Supported
25	Pakistan	Pakistan power grid	Supported	Supported	Supported	Supported	Supported
26	Austria	Austria power grid	Supported	Supported	Supported	Supported	Supported
27	G99-TYPEA-LV	UK G99_TypeA_LV power grid	Supported	Supported	Supported	Supported	Supported
28	G99-TYPEB-LV	UK G99_TypeB_LV power grid	Supported	Supported	Supported	Supported	Supported
29	EN50549-MV400	Ireland new standard	Supported	Supported	Supported	Supported	Supported
30	VDE-AR-N4110	Germany medium-voltage power grid (230 V)	Supported	Supported	Supported	Supported	Supported
31	NTS	Spain power grid	Supported	Supported	Supported	Supported	Supported

No.	Grid Code	Description	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
32	SINGAPORE	Singapore low-voltage power grid	Supported	Supported	Supported	Supported	Supported
33	HONGKONG	Hong Kong low-voltage power grid	Supported	Supported	Supported	Supported	Supported
34	EN50549-SE	Sweden low-voltage power grid	Supported	Supported	Supported	Supported	Supported
35	EN50549-PL	Poland power grid	Supported	Supported	Supported	Supported	Supported
36	DENMARK-EN50549-DK1-LV230	Denmark power grid	Supported	Supported	Supported	Supported	Supported
37	DENMARK-EN50549-DK2-LV230	Denmark power grid	Supported	Supported	Supported	Supported	Supported
38	SWITZERLAND-NA/EEA:2020-LV230	Switzerland power grid	Supported	Supported	Supported	Supported	Supported
39	AUSTRALIA-AS4777_A-LV230	Australia power grid	Supported	Supported	Supported	Supported	Supported
40	AUSTRALIA-AS4777_B-LV230	Australia power grid	Supported	Supported	Supported	Supported	Supported
41	AUSTRALIA-AS4777_C-LV230	Australia power grid	Supported	Supported	Supported	Supported	Supported
42	AUSTRALIA-AS4777_NZ-LV230	Australia power grid	Supported	Supported	Supported	Supported	Supported
43	NA_CODE	Default country code	Supported	Supported	Supported	Supported	Supported
44	CZECH-EN50549-LV230	Czech Republic power grid	Supported	Supported	Supported	Supported	Supported
45	Israel	Israel power grid	Supported	Supported	Supported	Supported	Supported
46	ANRE	Romania low-voltage power grid	Supported	Supported	Supported	Supported	Supported

No.	Grid Code	Description	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
47	NC2022	New Caledonia power grid	Supported	Supported	Supported	Supported	Supported
48	FRANCE-EN50549-230	France FD C11-519-11	Supported	Supported	Supported	Supported	Supported

B Connecting to the Inverter on the App

NOTICE

- When directly connecting your phone to a device, ensure that your phone is within the WLAN coverage of the device.
- When connecting the device to the router over WLAN, ensure that the device is within the WLAN coverage of the router and the signal is stable and good.
- The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz) and the WLAN signal reaches the inverter.
- The WPA, WPA2, or WPA/WPA2 encryption mode is recommended for routers. The Enterprise mode is not supported (such as airport WLAN and other public hotspots that require authentication). WEP and WPA TKIP are not recommended because they have serious security vulnerabilities. If the access fails in WEP mode, log in to the router and change the encryption mode of the router to WPA2 or WPA/WPA2.

Step 1 Start device commissioning.

Figure B-1 Method 1: mobile phone connected to the Internet

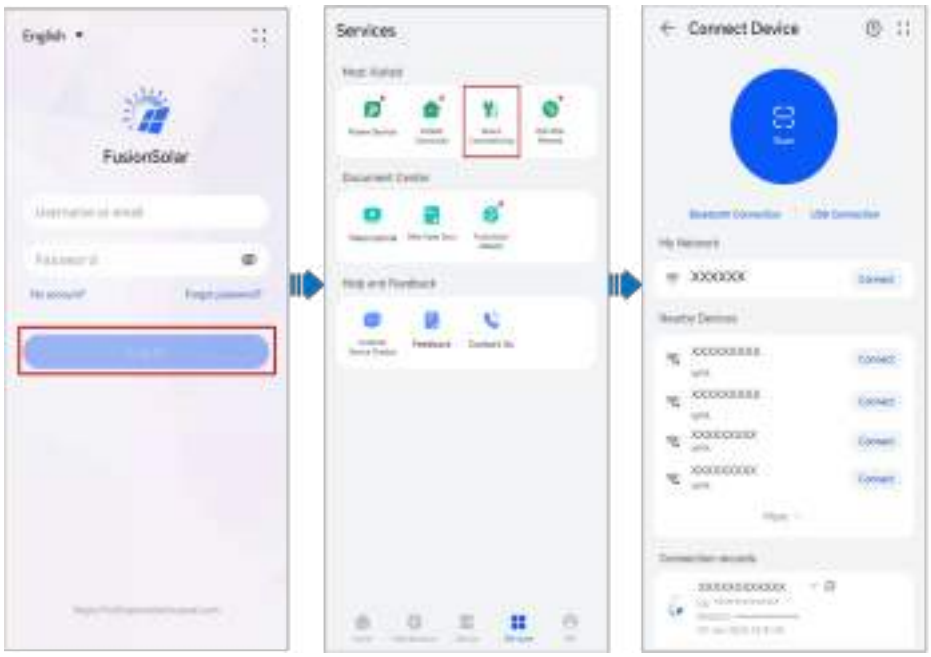
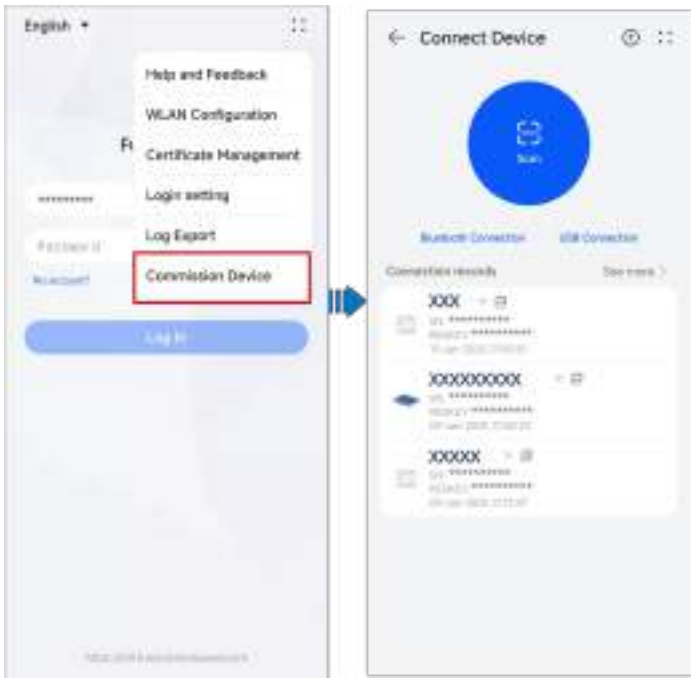


Figure B-2 Method 2: mobile phone not connected to the Internet



NOTE

Method 2 can be used only when no Internet access is available. You are advised to log in to the FusionSolar app to commission devices using method 1.

Step 2 Connect to the inverter WLAN.

Tap **Scan**. On the QR code scanning screen, align the QR code with the scanning box to automatically scan and connect to the WLAN of the inverter.

NOTE

- The WLAN name of a product consists of "Device name-Product SN." (The last six digits of the WLAN name of some products are the same as the last six digits of the product SN.)
- For the first connection, log in with the initial password. You can obtain the initial WLAN password from the device label, that is, the characters following "PSW".
- Ensure account security by changing the password periodically. Your password might be stolen or cracked if it is left unchanged for extended periods. If a password is lost, the device cannot be accessed. In these cases, the Company shall not be liable for any loss.
- If the login screen is not displayed after you scan the QR code, check whether your phone is correctly connected to the device WLAN. If not, manually select and connect to the WLAN.
- If the message **This WLAN network has no Internet access. Connect anyway?** is displayed when you connect to the built-in WLAN, tap **CONNECT**. Otherwise, you cannot log in to the system. The actual UI and messages may vary with mobile phones.

Step 3 Log in to the device commissioning screen as **Installer**.

NOTICE

- After completing the deployment settings, the installer should remind the owner to access the local commissioning screen of the device and set the login password of the owner account as prompted.
- To ensure account security, protect the password by changing it periodically, and keep it secure. Your password might be stolen or cracked if it is left unchanged for extended periods. If a password is lost, devices cannot be accessed. In these cases, the Company shall not be liable for any loss.

----End

C Connecting to the EMMA on the App

NOTICE

- When directly connecting your phone to a device, ensure that your phone is within the WLAN coverage of the device.
- When connecting the device to the router over WLAN, ensure that the device is within the WLAN coverage of the router and the signal is stable and good.
- The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz) and the WLAN signal reaches the inverter.
- The WPA, WPA2, or WPA/WPA2 encryption mode is recommended for routers. The Enterprise mode is not supported (such as airport WLAN and other public hotspots that require authentication). WEP and WPA TKIP are not recommended because they have serious security vulnerabilities. If the access fails in WEP mode, log in to the router and change the encryption mode of the router to WPA2 or WPA/WPA2.

Step 1 Start device commissioning.

Figure C-1 Method 1: mobile phone connected to the Internet

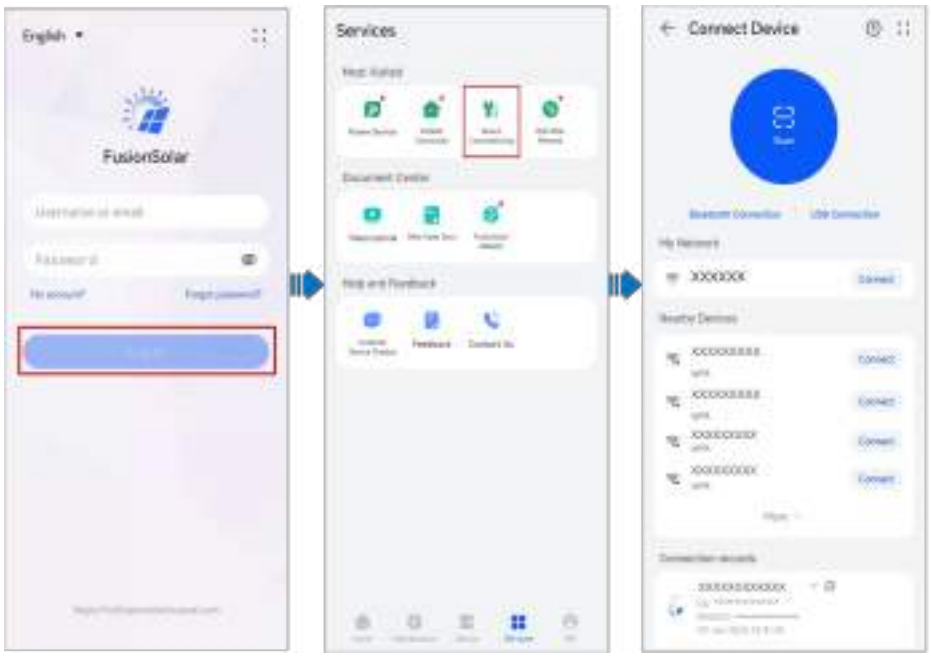
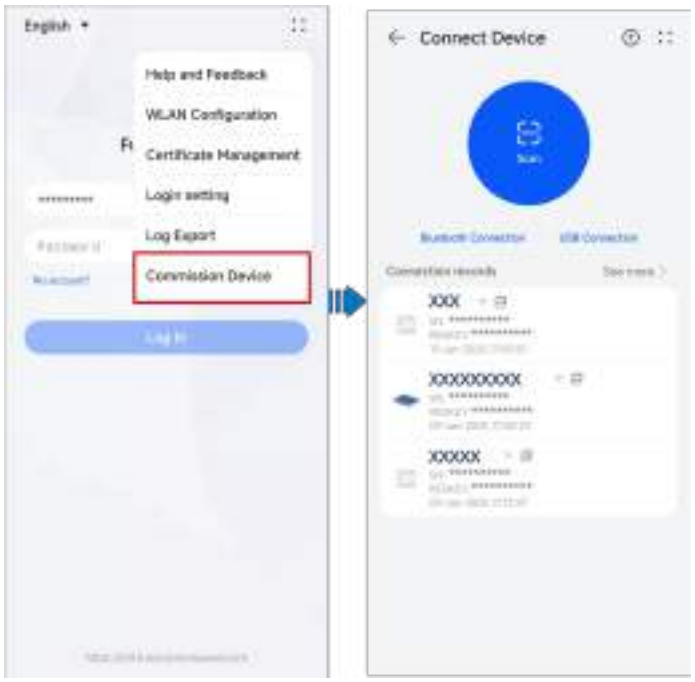


Figure C-2 Method 2: mobile phone not connected to the Internet



NOTE

Method 2 can be used only when no Internet access is available. You are advised to log in to the FusionSolar app to commission devices using method 1.

Step 2 Connect to the WLAN of the EMMA.

Tap **Scan**. On the QR code scanning screen, align the QR code with the scanning box to automatically scan and connect to the WLAN of the EMMA.

NOTE

- EMMA networking: Scan the WLAN QR code of the EMMA.
- SmartGuard networking: Scan the WLAN QR code of the SmartGuard or EMMA.

NOTE

- The WLAN name of a product consists of "Device name-Product SN." (The last six digits of the WLAN name of some products are the same as the last six digits of the product SN.)
- For the first connection, log in with the initial password. You can obtain the initial WLAN password from the device label, that is, the characters following "PSW".
- Ensure account security by changing the password periodically. Your password might be stolen or cracked if it is left unchanged for extended periods. If a password is lost, the device cannot be accessed. In these cases, the Company shall not be liable for any loss.
- If the login screen is not displayed after you scan the QR code, check whether your phone is correctly connected to the device WLAN. If not, manually select and connect to the WLAN.
- If the message **This WLAN network has no Internet access. Connect anyway?** is displayed when you connect to the built-in WLAN, tap **CONNECT**. Otherwise, you cannot log in to the system. The actual UI and messages may vary with mobile phones.

Step 3 Log in to the device commissioning screen as **Installer**.

NOTICE

- After completing the deployment settings, the installer should remind the owner to access the local commissioning screen of the device and set the login password of the owner account as prompted.
- To ensure account security, protect the password by changing it periodically, and keep it secure. Your password might be stolen or cracked if it is left unchanged for extended periods. If a password is lost, devices cannot be accessed. In these cases, the Company shall not be liable for any loss.

----End

D Resetting the Login Password on the Hardware

Step 1 Check that the AC and DC sides of the inverter are both powered on, and indicators and are steady green or blinking slowly for more than 3 minutes.

Step 2 Turn off the AC switch, set the DC SWITCH at the bottom of the inverter to OFF, and wait until all indicators on the inverter panel turn off.

Step 3 Complete the following operations within 4 minutes:

1. Turn on the AC switch and wait for about 90s or until the inverter indicator blinks.
2. Turn off the AC switch and wait about 30s or until all LED indicators on the inverter panel turn off.
3. Turn on the AC switch and wait for about 30s or until all LED indicators on the inverter panel blink and then turn off after about 30s.

Step 4 Wait until the three green LEDs on the inverter panel blink fast and then the three red LEDs blink fast, which indicates that the password is restored.

Step 5 Reset the password within 10 minutes. (If no operation is performed within 10 minutes, all parameters of the inverter remain unchanged.)

1. Wait until the indicator blinks.
2. Connect to the app using the initial WLAN hotspot name (SSID) and initial password (PSW), which can be obtained from the label on the side of the inverter.
3. On the login page, set a new password and log in to the app.

Step 6 Set router and management system parameters to implement remote management.

----End

NOTICE

You are advised to reset the password in the morning or at night when the solar irradiance is low.

E Rapid Shutdown

NOTE

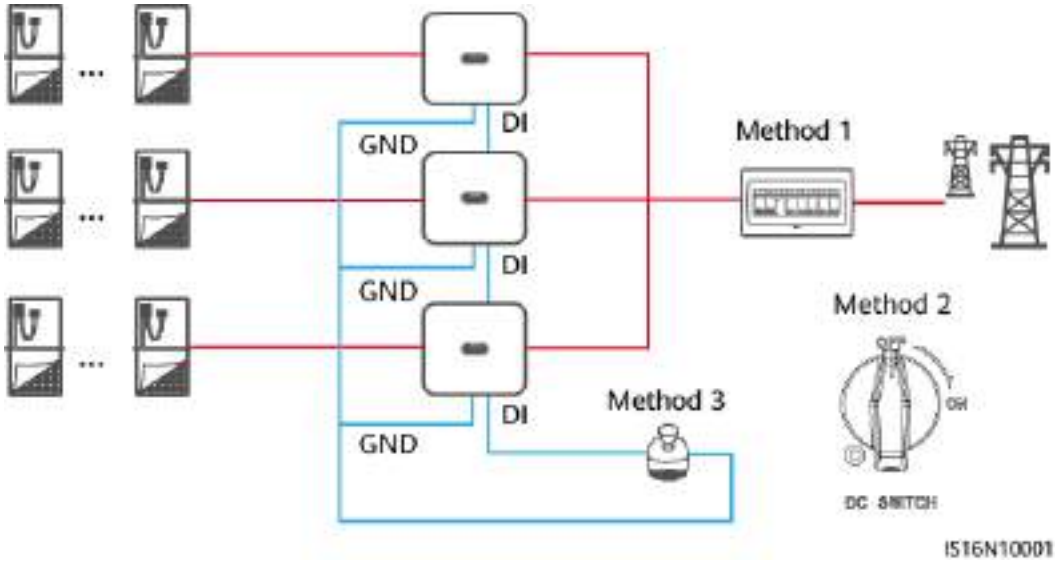
- If method 3 is selected for rapid shutdown, log in to the FusionSolar app as an **installer** user to perform local commissioning, choose **Settings > Feature parameters > Dry contact function**, and set **Dry contact function** to **DI rapid shutdown**.
- The rapid shutdown function is supported only if optimizers are configured for all PV modules.

If optimizers are configured for all PV modules, the PV system can perform a rapid shutdown to decrease the output voltage to below 30 V within 30s.

Perform the following steps to trigger a rapid shutdown:

- Method 1: Turn off the AC switch between the inverter and the power grid (disconnect the voltages of all PV strings connected to the inverter under the AC switch).
- Method 2: Set the **DC SWITCH** of the inverter to **OFF** to trigger a rapid shutdown. The inverter shuts down several minutes later. (Turning off all external switches on the DC side of an inverter can trigger a rapid shutdown, and only the PV strings connected to the inverter is de-energized. Turning off only some external switches cannot trigger a rapid shutdown, and the PV strings may be energized.)
- Method 3: To enable the DI rapid shutdown function, connect a switch to pins DI and GND of the inverter communications terminal. The switch is turned on by default. Turn off the switch to trigger a rapid shutdown. The distance between the switch and the farthest inverter must be less than or equal to 10 m.
- Method 4: If **AFCI** is enabled, the inverter automatically performs arc fault detection and triggers a rapid shutdown when AFCI lock protection is implemented.

Figure E-1 Methods of triggering a rapid shutdown



F Baud Rate Negotiation

Baud rate negotiation increases the communications rate between the inverter and devices such as batteries and power meters, and between the inverter and devices such as the Smart Dongles and the EMMA, solving or relieving communication congestion.

- During device search in a new plant, the system automatically negotiates the baud rate.
- When replacing or adding inverters, batteries, power meters, the Smart Dongle, or the EMMA at an existing plant, you need to manually send local commands on the FusionSolar app to reset the baud rate between devices and negotiate a higher rate.

NOTE

Users can send the baud rate negotiation commands on the FusionSolar app in two networking modes: EMMA networking and Smart Dongle networking.

Table F-1 Manual baud rate negotiation on the app

Networking Mode	Scenario	Operation
EMMA networking	Replacing the EMMA	1. Use the FusionSolar app to locally scan the QR code to connect to the EMMA. 2. Access the **Communication settings** screen, choose **RS485 Settings** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**.

Networking Mode	Scenario	Operation
	Replacing or adding an inverter	1. Use the FusionSolar app to locally scan the QR code to connect to the EMMA. 2. Access the **Communication settings** screen, choose **RS485 Settings > Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**. 3. Use the FusionSolar app to locally scan the QR code to connect to the inverter. 4. Access the **Communication configuration** screen, choose **RS485** > **Baud Rate Negotiation** > **RS485_2** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**.
	Replacing or adding an RS485_2 device (such as a battery or power meter)	1. Use the FusionSolar app to locally scan the QR code to connect to the inverter. 2. Access the **Communication configuration** screen, choose **RS485** > **Baud Rate Negotiation** > **RS485_2** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**.
Smart Dongle networking	Replacing the Smart Dongle	1. Use the FusionSolar app to locally scan the QR code to connect to the inverter. 2. Access the **Communication configuration** screen, choose **RS485** > **Baud Rate Negotiation** > **RS485_1** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**.
	Replacing or adding an inverter	1. Use the FusionSolar app to locally scan the QR code to connect to the inverter. 2. Access the **Communication configuration** screen, choose **RS485** > **Baud Rate Negotiation** > **RS485_1** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**. 3. Access the **Communication configuration** screen, choose **RS485** > **Baud Rate Negotiation** > **RS485_2** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**.

Networking Mode	Scenario	Operation
	Replacing or adding an RS485_2 device (such as a battery or power meter)	1. Use the FusionSolar app to locally scan the QR code to connect to the inverter. 2. Access the **Communication configuration** screen, choose **RS485** > **Baud Rate Negotiation** > **RS485_2** > **Baud Rate Negotiation**, and tap **9600** and **Negotiate a higher rate**.

Troubleshooting

If manual baud rate negotiation fails, refer to the following troubleshooting measures.

Table F-2 Troubleshooting measures

Scenario	Troubleshooting
Negotiation failed	1. Check whether the device cables are connected properly. If no, connect the device cables correctly. 2. Check whether service operations such as upgrade and log export are performed on the management system. If yes, perform baud rate negotiation again after such operations are complete. 3. To replace an RS485_2 device (such as a battery or power meter), choose **Maintenance > Subdevice management** on the home screen, touch and hold the replaced RS485_2 device to delete it. 4. Perform baud rate negotiation again. 5. When replacing or adding an inverter or an RS485_2 device (such as a battery or power meter), if you tap **Negotiate a higher rate** and a message "Negotiation failed. The southbound device does not support the rate." is displayed, it indicates that the device does not support baud rate negotiation. In this case, you only need to tap **9600**. 6. If the fault persists, contact your vendor.

G Contact Information

If you have any questions about this product, please contact us.

https://digitalpower.huawei.com

Path: **About Us** > **Contact Us** > **Service Hotlines**

To ensure faster and better services, we kindly request your assistance in providing the following information:

- Model
- Serial number (SN)
- Software version
- Alarm ID or name
- Brief description of the fault symptom

NOTE

EU Representative Information: Huawei Technologies Hungary Kft.
Add.: HU-1133 Budapest, Váci út 116-118., 1. Building, 6. floor.
Email: hungary.reception@huawei.com

H Digital Power Customer Service

https://digitalpower.huawei.com/robotchat/

I Certificate Management and Maintenance

I.1 Initial Certificate Risk Disclaimer

Huawei's initial certificates are mandatory identity credentials for Huawei devices before delivery. The disclaimer statements for using the certificates are as follows:

1. Initial Huawei-issued certificates are used only in the deployment phase, for establishing initial security channels between devices and the customer's network. Huawei does not promise or guarantee the security of initial certificates.
2. The customer shall bear consequences of all security risks and security incidents involved in using initial Huawei-issued certificates as service certificates.
3. An initial Huawei-issued certificate is valid until October 11, 2041 starting from the manufacturing date.
4. Services using an initial Huawei-issued certificate will be interrupted when the certificate expires.
5. It is recommended that customers deploy a PKI system to issue certificates for devices and software on the live network and manage the lifecycle of the certificates. To ensure security, certificates with short validity periods are recommended.

NOTE

You can view the validity period of an initial certificate on the network management system.

I.2 Application Scenarios of initial Certificates

File Path and Name	Scenario	Replacement
f:/sun_ca.crt	Authenticates the validity of the peer mobile app for communication through Modbus TCP.	For details about how to replace a certificate, contact technical support engineers to obtain the corresponding security maintenance manual. Certificates for communication between the Company's products can be replaced.
f:/sun_tomcat_client.crt		
f:/sun_tomcat_client.key		

J Acronyms and Abbreviations

A	
AFCI	Arc-fault Circuit Interrupter
L	
LED	Light Emitting Diode
M	
MPP	Maximum Power Point
MPPT	Maximum Power Point Tracking
P	
PE	Protective Earthing
PID	Potential Induced Degradation
PV	Photovoltaic
R	
RH	Relative Humidity
S	
SOC	State of Charge

