SUN2000-(8KTL-20KTL)-M2

User Manual

Issue	15
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About This Document

Purpose

This document describes the SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2, SUN2000-15KTL-M2, SUN2000-17KTL-M2, and SUN2000-20KTL-M2 (SUN2000 for short) in terms of installation, electrical connections, commissioning, maintenance, and troubleshooting. Read this document through, understand the safety information, and get familiar with the functions and features of the SUN2000 before installing and operating it.

☐ NOTE

The SUN2000-8KTL-M2 and SUN2000-10KTL-M2 inverters are applicable only to Australia.

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.
⚠ 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.

Symbol	Description
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 updates made in previous issues.

Issue 15 (2024-10-23)

- Delete Locating Insulation Resistance Faults.
- Updated **5.7.4 Connecting the Grid Scheduling Signal Cable**.

Issue 14 (2024-01-15)

- Updated **5.2 Preparing for Installation**.
- Updated **5.5 Connecting the DC input power cable**.
- Updated **5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)**.
- Updated **10.1 SUN2000 Technical Specifications**.

Issue 13 (2023-11-02)

- Updated **5.3 Connecting the PE cable**.
- Updated **5.4 Connecting the AC Output Power Cable**.

Issue 12 (2023-04-11)

- Updated **5.7.5 Connecting the NS Protection Signal Cable**.
- Updated **A Grid Codes**.

Issue 11 (2023-02-07)

- Updated **2.1 Product Introduction**.
- Updated **5.2 Preparing for Installation**.
- Updated **5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)**.

- Updated **5.7.5 Connecting the NS Protection Signal Cable**.
- Updated **7.1.3 Creating a PV Plant and a User**.
- Updated **7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers**.
- Updated **7.2 Parameters Settings**.

Issue 10 (2022-10-10)

- Updated **5.2 Preparing for Installation**.
- Updated **5.4 Connecting the AC Output Power Cable**.

Issue 09 (2022-06-30)

- Updated **5.2 Preparing for Installation**.
- Updated **5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)**.
- Updated **10.1 SUN2000 Technical Specifications**.
- Updated **A Grid Codes**.

Issue 08 (2022-03-04)

- Updated **5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)**.
- Updated **C Resetting Password**.
- Updated **D Rapid Shutdown**.

Issue 07 (2021-12-20)

- Updated **7.1.3 Creating a PV Plant and a User**.
- Updated **7.2.1 Energy Control**.
- Updated **10.1 SUN2000 Technical Specifications**.

Issue 06 (2021-11-10)

Updated **10.1 SUN2000 Technical Specifications**.

Issue 05 (2021-08-10)

- Updated **5.5 Connecting the DC input power cable**.
- Updated **5.6 (Optional) Installing a Smart Dongle**.
- Updated **5.7.5 Connecting the NS Protection Signal Cable**.
- Updated **7 Man-Machine Interaction**.
- Updated **B Device Commissioning**.

Issue 04 (2021-01-21)

- Updated **10.1 SUN2000 Technical Specifications**.
- Updated **4.3.2 Space Requirements**.
- Updated **5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)**.

Issue 03 (2020-12-10)

- Updated **7.1.1 Downloading the FusionSolar App**.
- Updated **7.1.3 Creating a PV Plant and a User**.
- Updated **7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers**.
- Updated **D Rapid Shutdown**.

Issue 02 (2020-09-15)

- Updated **5.3 Connecting the PE cable**.
- Updated **7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers**.

Issue 01 (2020-07-02)

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
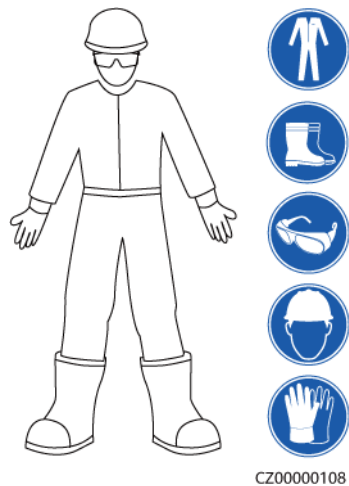
General Requirements

● 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.)

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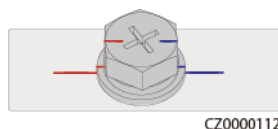
- If the equipment has multiple inputs, disconnect all the inputs and wait until the equipment is completely powered off before performing operations on the equipment.

- 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

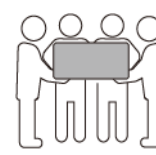- Be cautious to prevent injury when moving heavy objects.

| < 18 kg | 18–32 kg | 32–55 kg | 55–68 kg | > 68 kg |
| (< 40 lbs) | (40–70 lbs) | (70–121 lbs) | (121–150 lbs) | (> 150 lbs) |

CZ0000110

- 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.

CZ00000107

- 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.
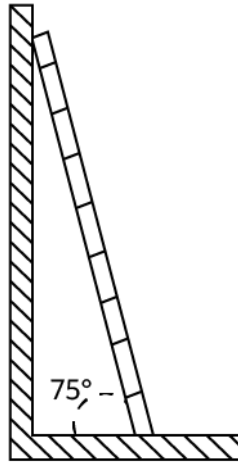
PI02SC0008

- 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.
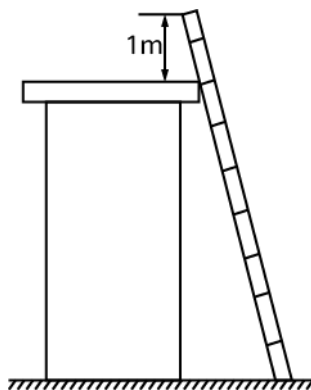

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Hoisting

- 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.

CZ00000106
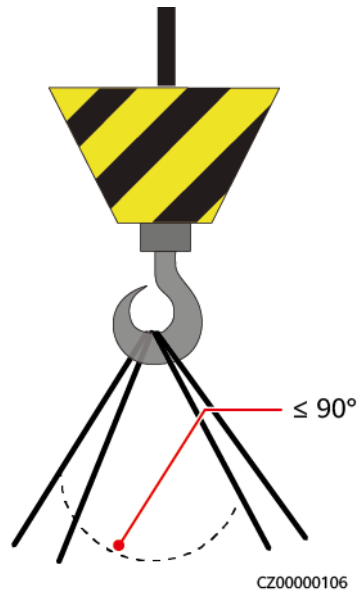
Drilling Holes

- 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

2.1 Product Introduction

Function

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.
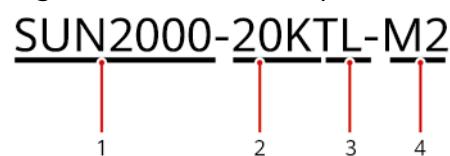
Models

This document involves the following product models:

- SUN2000-8KTL-M2
- SUN2000-10KTL-M2
- SUN2000-12KTL-M2
- SUN2000-15KTL-M2
- SUN2000-17KTL-M2
- SUN2000-20KTL-M2

📖 **NOTE**

> The SUN2000-8KTL-M2 and SUN2000-10KTL-M2 inverters are applicable only to Australia.

**Figure 2-1** Model description (SUN2000-20KTL-M2 is used as an example)

Table 2-1 Model description

| Icon	Meaning	Description
1	Product family	SUN2000: three-phase grid-tied PV string inverter
2	Power level	• 8K: The rated power is 8 kW. • 10K: The rated power is 10 kW. • 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.
3	Topology	TL: transformerless
4	Product code	M2: the product series with the 1080 V DC input voltage

Network Application

The SUN2000 applies to grid-tied PV systems for residential rooftops and small ground plants. Typically, a grid-tied system consists of the PV string, SUN2000, AC switch, and alternating current distribution unit (ACDU).

Figure 2-2 Networking application - Single inverter scenario (optional in dashed boxes)
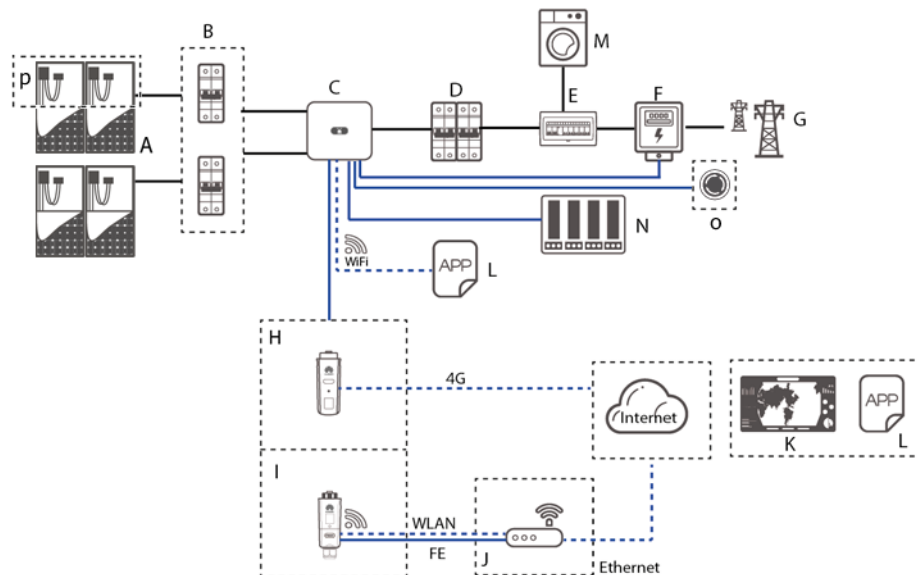
Figure 2-3 Networking application - Inverter cascading scenario (optional in dashed boxes)
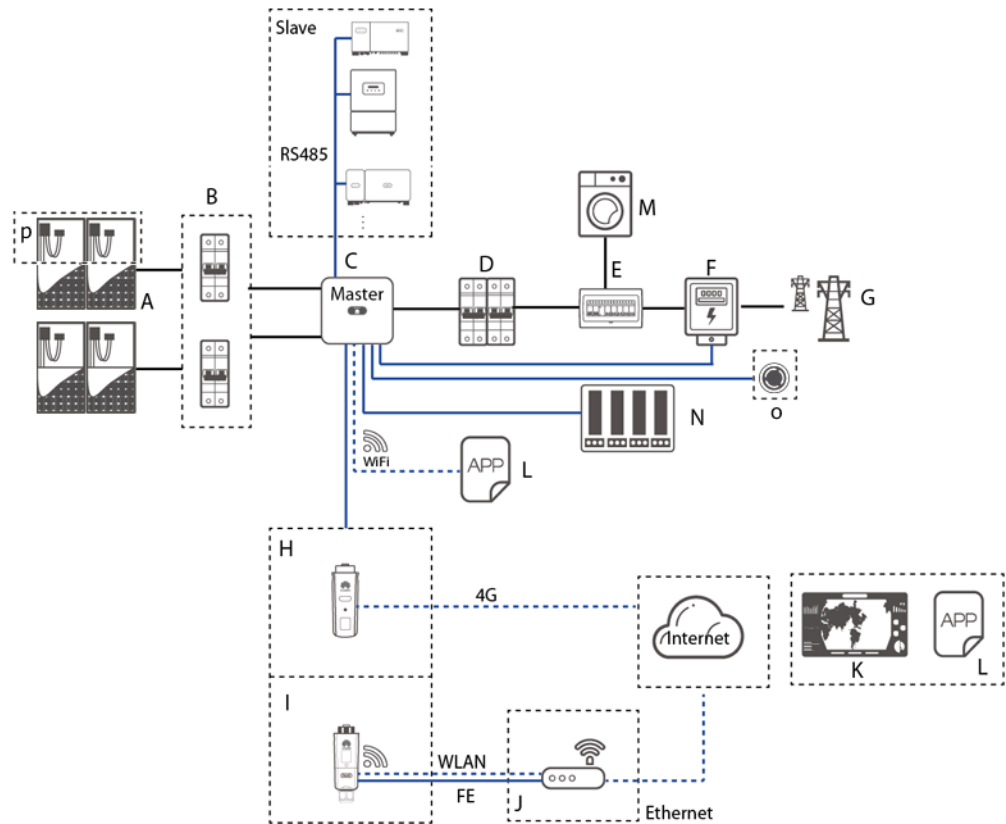
 NOTE

- ── indicates a power cable, ── indicates a signal cable, ····· indicates wireless communication.

- If the inverter is connected to the FusionSolar app over its built-in WiFi network, only local commissioning can be performed.

- In the RS485 cascading communication networking, the master inverter model is SUN2000-(3KTL-20KTL)-M2 and SUN2000-(3KTL-20KTL)-M0, and the slave inverter model can be SUN2000-(3KTL-20KTL)-M2, SUN2000-(3KTL-20KTL)-M0, SUN2000-50KTL/60KTL/65KTL-M0, SUN2000-29.9KTL/36KTL, or SUN2000-33KTL-A.

(A) PV string	(B) DC switch	(C) SUN2000
(D) AC switch	(E) ACDU	(F) Smart Power Sensor
(G) Power grid	(H) 4G Smart Dongle	(I) WLAN-FE Smart Dongle
(J) Router	(K) FusionSolar management system	(L) FusionSolar APP
(M) Load	(N) Ripple Control Device	(O) Rapid shutdown switch
(P) Smart PV optimizer		

 NOTE

For detailed operations on devices in the network, see the following guides:

SUN2000-(600W-P, 450W-P2) Smart PV Optimizer Quick Guide

SUN2000 Smart PV Optimizer User Manual

MERC-(1300W, 1100W)-P Smart PV Optimizer Quick Guide

**MERC Smart PV Optimizer User Manual**

 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.

Earthing Systems

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

Figure 2-4 Supported earthing systems
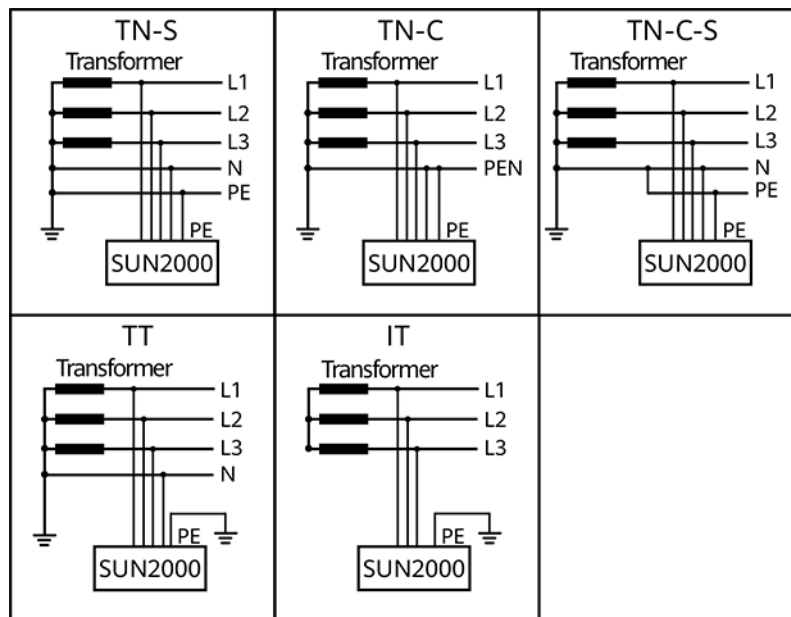
 NOTE

- 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.**

2.2 Appearance
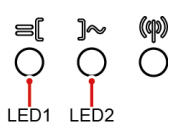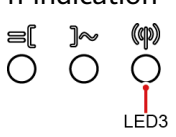
Figure 2-5 Appearance
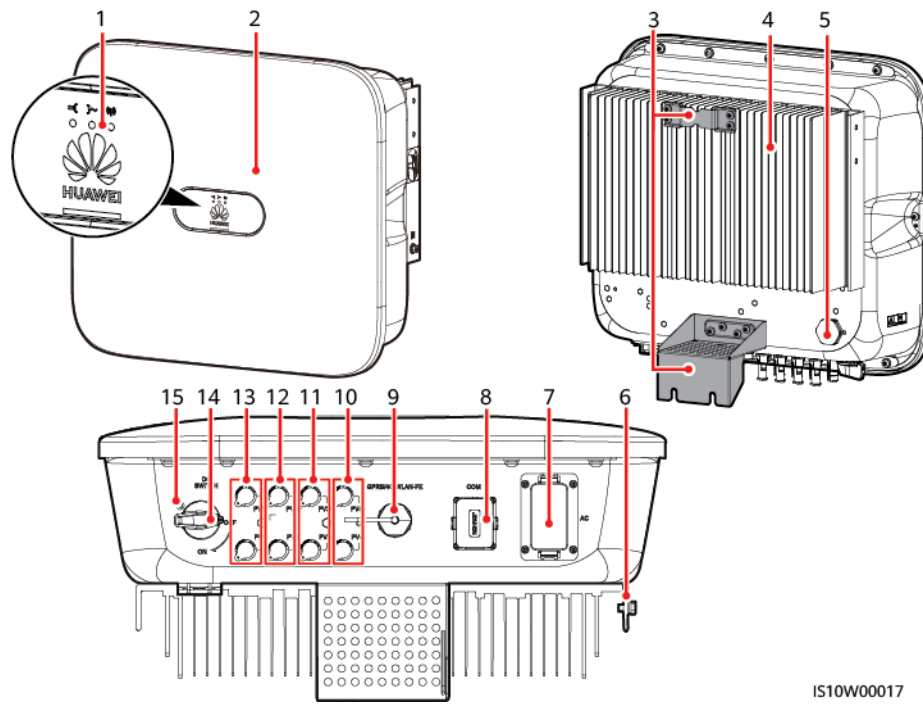
(1) LED indicator

(2) Front panel

(3) Mounting plate

(4) Heat sink

(5) Ventilation valve

(6) Ground screw

(7) AC output port (AC)

(8) Communication port (COM)

(9) Smart Dongle port (GPRS/4G/WLAN-FE)

(10) DC input terminals (PV4+/PV4–)

(11) DC input terminals (PV3+/PV3–)

(12) DC input terminals (PV2+/PV2–)

(13) DC input terminals (PV1+/PV1–)

(14) DC switch (DC SWITCH)

(15) Screw hole for the DC switch (for Australia only)

Table 2-2 LED indicator description

Category	Status		Meaning
Running indication ≡[　]∼　((ρ)) ○　○　○ LED1 LED2	**LED1**	**LED2**	N/A
	Steady green	Steady green	The SUN2000 is operating in grid-tied mode.
	Blinking green at long intervals (on for 1s and then off for 1s)	Off	The DC is on and the AC is off.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is on, the AC is on, and the SUN2000 is not exporting power to the power grid.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is off and the AC is on.
	Off	Off	Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	N/A	There is a DC environmental alarm, such as an alarm indicating that High String Input Voltage, String Reverse Connection, or Low Insulation Resistance.
	N/A	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	There is an AC environmental alarm, such as an alarm indicating Grid Undervoltage, Grid Overvoltage, Grid Overfrequency, or Grid Underfrequency.
	Steady red	Steady red	Fault
Communication indication ≡[　]∼　((ρ)) ○　○　○ LED3	**LED3**		N/A
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)		Communication is in progress. (When a mobile phone is connected to the SUN2000, the indicator first indicates that the phone is connected to the SUN2000: blinks green at long intervals.)
	Blinking green at long intervals (on for 1s and then off for 1s)		The mobile phone is connected to the SUN2000.
	Off		There is no communication.

Category	Status			Meaning
Device replacement indication	**LED1**	**LED2**	**LED3**	N/A
	Steady red	Steady red	Steady red	The SUN2000 hardware is faulty. The SUN2000 needs to be replaced.

2.3 Label Description

2.3.1 Enclosure Labels

Symbol	Name	Meaning
Danger: High Voltage! 高压危险！ Start maintaining the SUN2000 at least 5 minutes after the SUN2000 disconnects from all external power supplies. 逆变器与外部所有电源断开后需要等待至少5分钟，才可以进行维护。 5 mins	Delayed discharge	Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.
Warning: High Temperature! 高温危险！ Never touch the enclosure of an operating SUN2000. 逆变器工作时严禁触摸外壳。	Burn warning	Do not touch an operating SUN2000 because it generates high temperatures on the shell.
Danger: Electrical Hazard! 有电危险！ Only certified professionals are allowed to install and operate the SUN2000. 仅有资质的专业人员才可进行逆变器的安装和操作。 High touch current, earth connection essential before connecting supply. 大接触电流！接通电源前须先接地。	Electric shock warning label	• High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. • High touch current exists after the SUN2000 is powered on. Ensure that the SUN2000 has been grounded before powering on it.
⚠CAUTION Read instructions carefully before performing any operation on the SUN2000. 对逆变器进行任何操作前，请仔细阅读说明书！	Refer to documentation	Reminds operators to refer to the documents shipped with the SUN2000.

Symbol	Name	Meaning
(grounding symbol)	Grounding	Indicates the position for connecting the protective earthing (PE) cable.
Do not disconnect under load! 禁止带负荷断开连接!	Operation warning	Do not remove the DC input connector or the AC output connector when the SUN2000 is running.
(QR code) (1P)PN/ITEM:XXXXXXXX (32P)Model: SUN2000-XKTL-M2 (S)SN:XXXXXXXXXXXX MADE IN CHINA	SUN2000 serial number (SN) label	Indicates the SUN2000 SN.
(barcode) MAC: xxxxxxxxxxxx	SUN2000 MAC address label	Indicates the MAC address.
(QR code)	QR code label for SUN2000 Wi-Fi connection	Scan the QR code to connect to Huawei SUN2000 Wi-Fi network.

2.3.2 Product Nameplate

Figure 2-6 Nameplate (SUN2000-20KTL-M2 as an example)
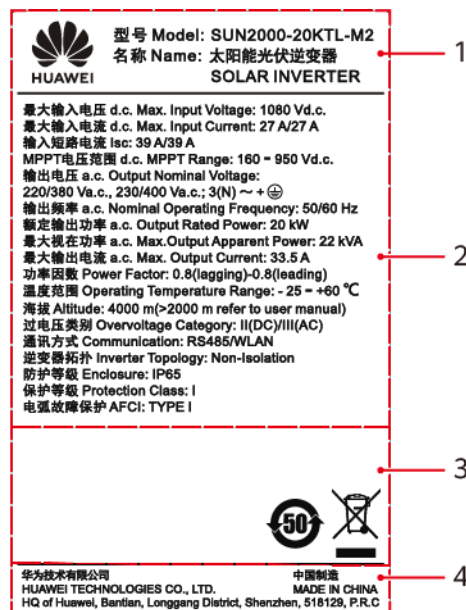
| (1) Trademark and product model | (2) Important technical specifications |
| (3) Compliance symbols | (4) Company name and country of manufacture |

📖 NOTE

The nameplate figure is for reference only.

2.4 Working Principles

2.4.1 Circuit Diagram

Four PV strings connect to the SUN2000, and their maximum power points are tracked by two maximum power point tracking (MPPT) circuits. The SUN2000 converts DC power into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

Figure 2-7 SUN2000 conceptual diagram
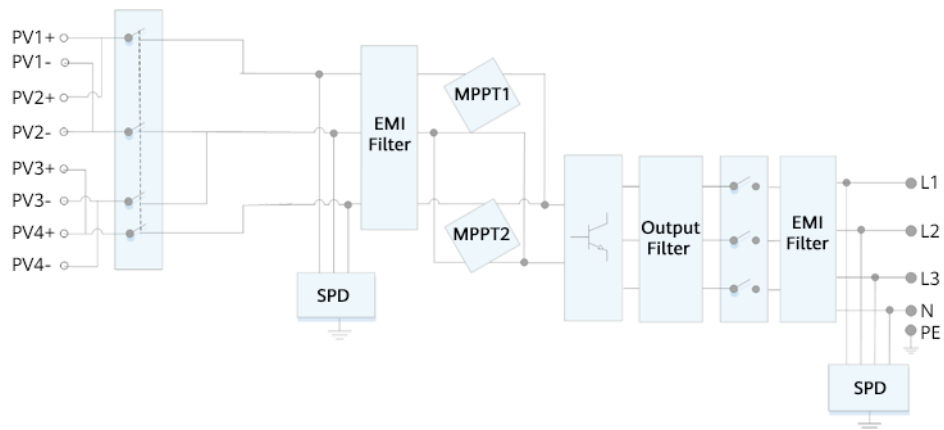
2.4.2 Working Modes

The SUN2000 can work in Standby, Operating, or Shutdown mode.

Figure 2-8 Working modes

Table 2-3 Working mode description

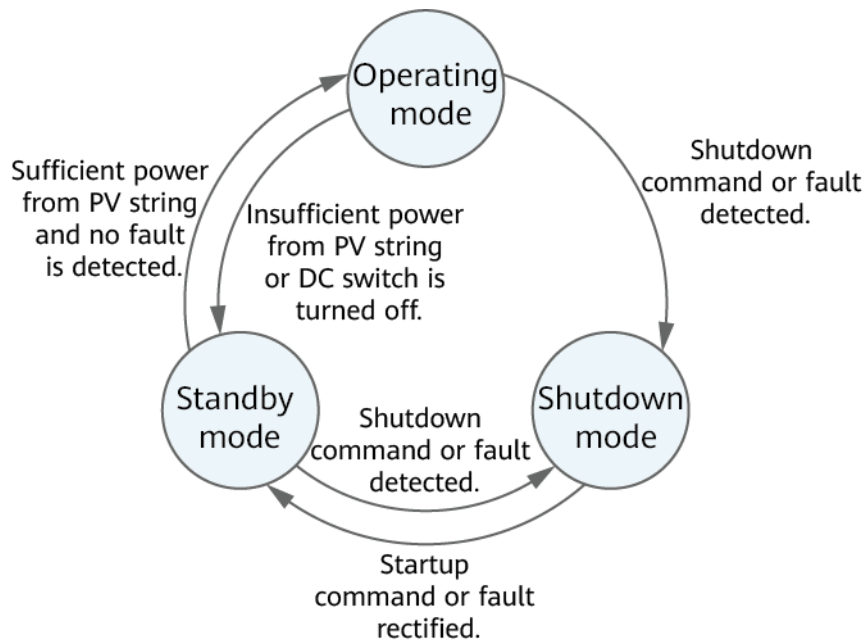| Working Mode	Description
Standby	The SUN2000 enters Standby mode when the external environment does not meet the operating requirements. In Standby mode: ● The SUN2000 continuously performs status check and enters the Operating mode once the operating requirements are met. ● The SUN2000 enters Shutdown mode after detecting a shutdown command or a fault after startup.
Operating	In Operating mode: ● The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid. ● The SUN2000 tracks the maximum power point to maximize the PV string output. ● If the SUN2000 detects a fault or a shutdown command, it enters the Shutdown mode. ● The SUN2000 enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid for generating power.
Shutdown	● In Standby or Operating mode, the SUN2000 enters Shutdown mode after detecting a fault or shutdown command. ● In Shutdown mode, the SUN2000 enters Standby mode after detecting a startup command or that the fault is rectified.

3 Storage

The following requirements should be met if the SUN2000 is not put into use directly:

- Do not unpack the SUN2000.
- Keep the storage temperature at –40°C to +70°C and the humidity at 5%–95% RH (non-condensing).
- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of six SUN2000s can be stacked. To avoid personal injury or device damage, stack SUN2000s with caution to prevent them from falling over.
- Periodic inspections are required during the storage. Replace the packing materials if necessary.
- If the SUN2000 has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

4 Installation

4.1 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.
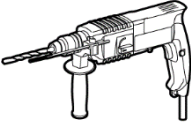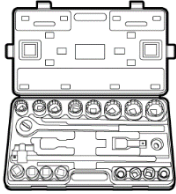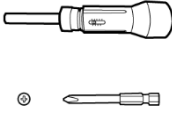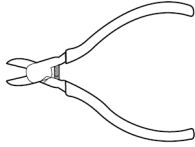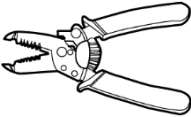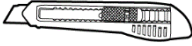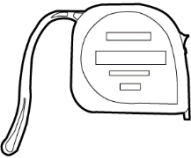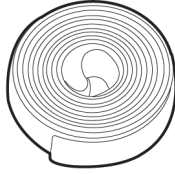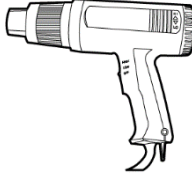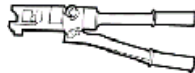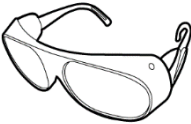
After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

📖 **NOTE**

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

4.2 Tools

Type	Tool			
Installation Tools	Hammer drill Drill bit: Φ8 mm and Φ6 mm	Socket wrench set	Torque screwdriver Phillips head: M3	Diagonal pliers
	Wire stripper	Removal wrench Model: PV-MS-HZ Open-end Wrench; manufacturer: Staubli	Rubber mallet	Utility knife
	Cable cutter	Crimping tool Model: PV-CZM-22100/19100; manufacturer: Staubli	Multimeter DC voltage measurement range ≥ 1100 V DC	Vacuum cleaner
	Marker	Measuring tape	Bubble or digital level	Cord end terminal crimper

Type	Tool			
	Heat shrink tubing	Heat gun	Cable tie	Hydraulic pliers
PPE	Insulated gloves	Protective gloves	Dust mask	Safety shoes
	Safety goggles	-	-	-

4.3 Determining the Installation Position

4.3.1 Environment Requirements

Basic Requirements

- The SUN2000 is protected to IP65 and can be installed indoors or outdoors.
- Do not install the SUN2000 in a place where personnel are easy to come into contact with its enclosure and heat sinks, because these parts are extremely hot during operation.
- Do not install the SUN2000 in areas with flammable or explosive materials.
- Do not install the SUN2000 at a place within children's reach.
- Do not install the SUN2000 outdoors in salt areas because it will be corroded there and may cause fire. A salt area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary depending on weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- The SUN2000 must be installed in a well-ventilated environment to ensure good heat dissipation.
- Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

Mounting Structure Requirements

- The mounting structure where the SUN2000 is installed must be fireproof.
- Do not install the SUN2000 on flammable building materials.
- The SUN2000 is heavy. Ensure that the installation surface is solid enough to bear the weight load.
- In residential areas, do not install the SUN2000 on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the SUN2000 is noticeable.

4.3.2 Space Requirements

Installation Angle Requirements

The SUN2000 can be wall-mounted or pole-mounted. The installation angle requirements are as follows:

- Install the SUN2000 vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the SUN2000 at forward tilted, excessive back tilted, side tilted, horizontal, or upside down positions.

Figure 4-1 Installation tilts
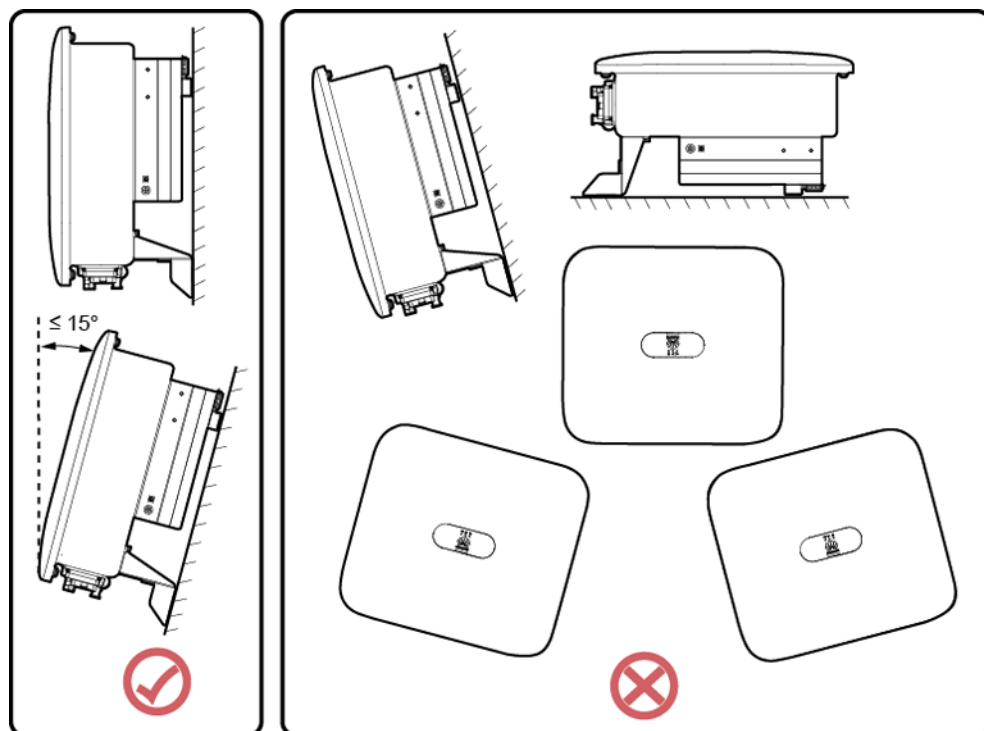
IS10H00040

Installation Space Requirements

- Reserve enough space around the SUN2000 to ensure sufficient space for installation and heat dissipation.

Figure 4-2 Installation space
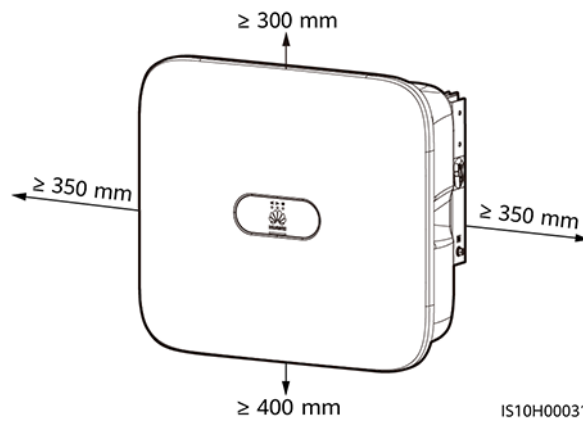
- When installing multiple SUN2000s, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended.

Figure 4-3 Horizontal installation (recommended)
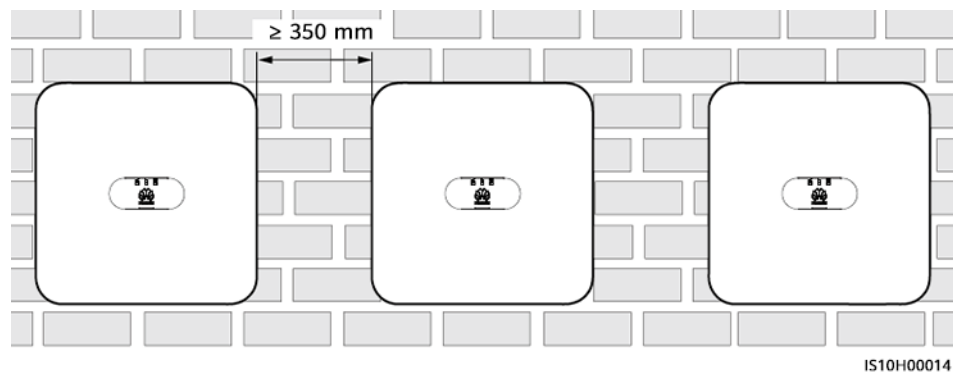
Figure 4-4 Staggered installation (recommended)

≥ 500 mm

≥ 200 mm

IS05W00017
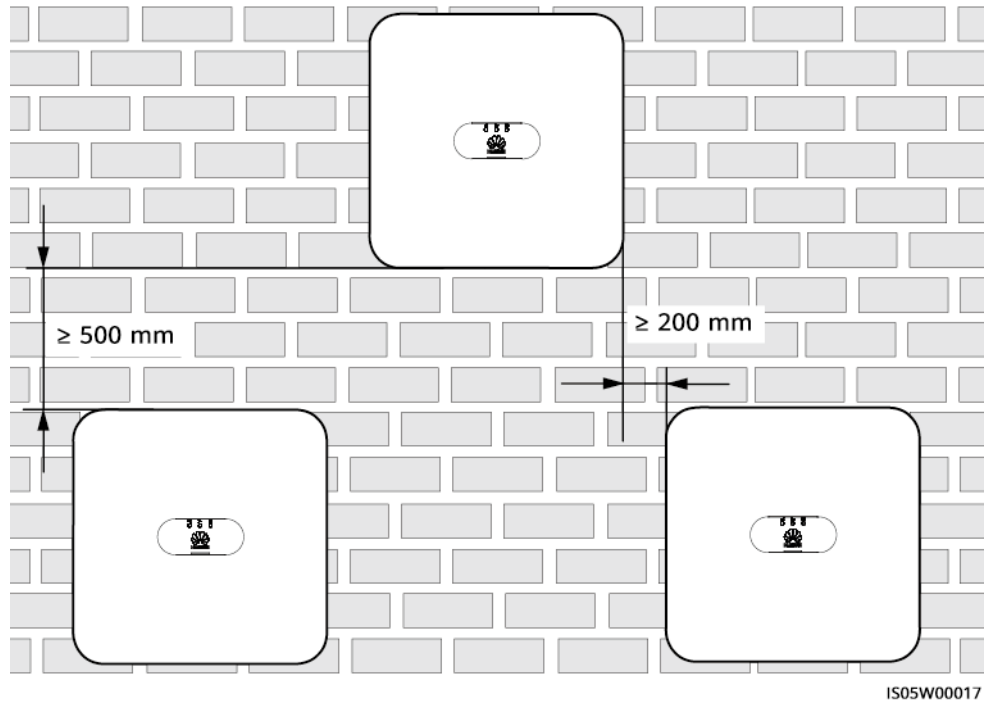
Figure 4-5 Stacked installation (not recommended)

≥ 350 mm

≥ 1000 mm

IS05W00016
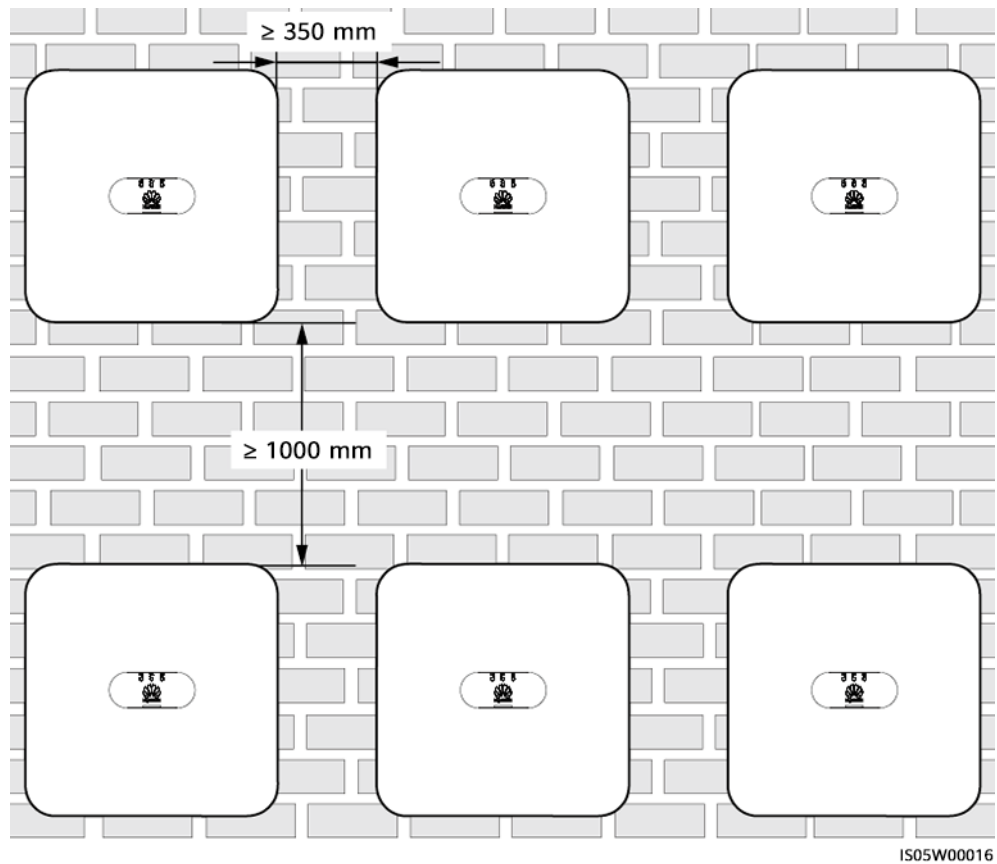
4.4 Moving an Inverter

Procedure

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

⚠️ **CAUTION**

- To prevent personal injury and damage to the device, take care to keep your balance when moving the SUN2000.
- Do not use the wiring terminals and ports at the bottom to support any weight of the SUN2000.
- When you need to temporally place the SUN2000 on the ground, use foam, paper or other protective materials to prevent damage to its enclosure.

Figure 4-6 Moving an inverter
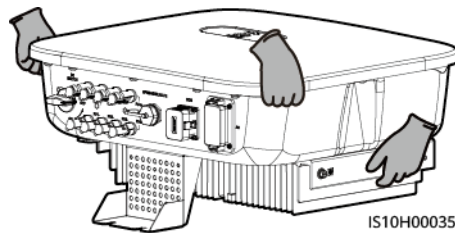
----End

4.5 Installing the Mounting Bracket

Installation Precautions

Figure 4-7 shows the dimensions of installation holes on the SUN2000.

Figure 4-7 Mounting bracket dimensions
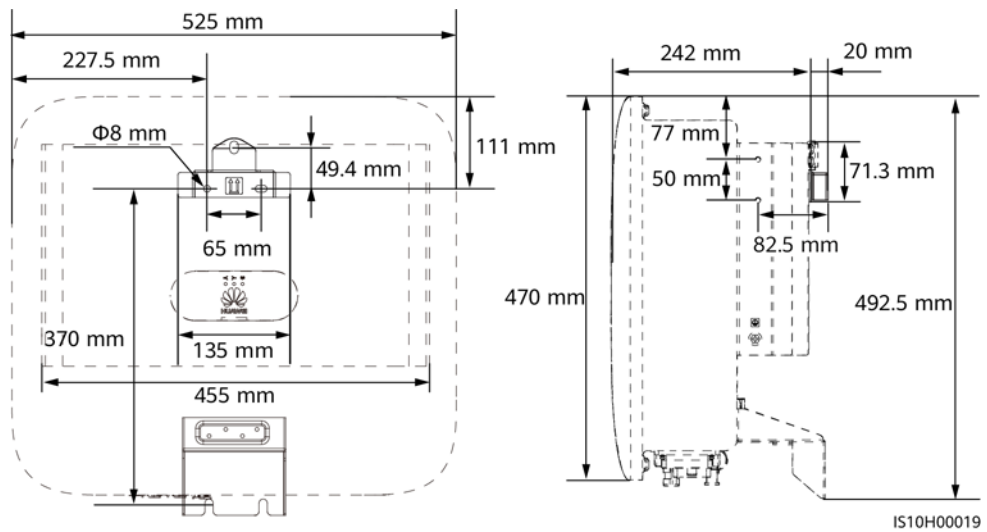
NOTE

Two M6 screw holes are reserved on both left and right sides of the enclosure for installing an awning.

4.5.1 Wall-mounted Installation

Procedure

Step 1 Determine the installation positions for drilling holes, and mark the positions using a marker.

Step 2 Secure the mounting brackets.

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 4-8 Expansion bolt composition
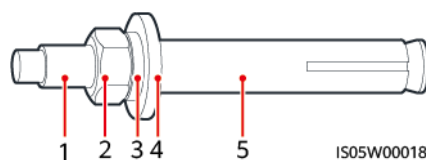
(1) Bolt	(2) Nut	(3) Spring washer
(4) Flat washer	(5) Expansion tube	

⚠ 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 4-9 Installing the Mounting Bracket
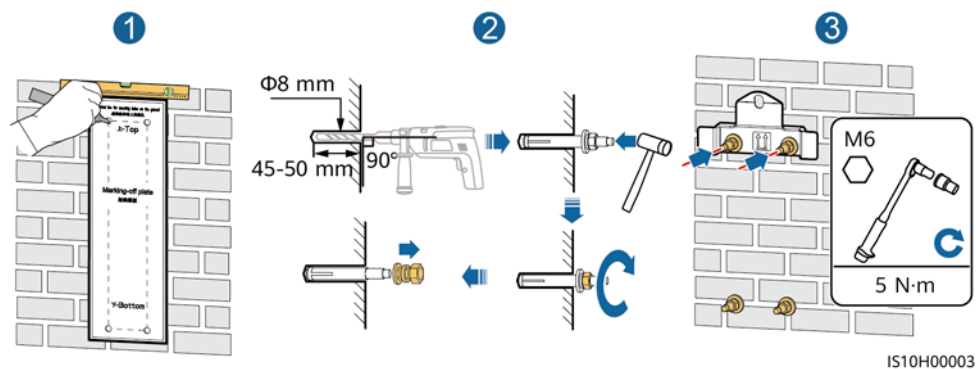
Step 3 (Optional) Install the locking screw for the DC switch.

📖 NOTE

- The screws for DC switches are delivered with solar inverters. According to Australian standards, the screws are used to secure DC switches (DC SWITCH) to prevent them from being turned on by mistake.
- For the model used in Australia, perform this step to meet the local standards.

Figure 4-10 Installing a locking screw for the DC switch
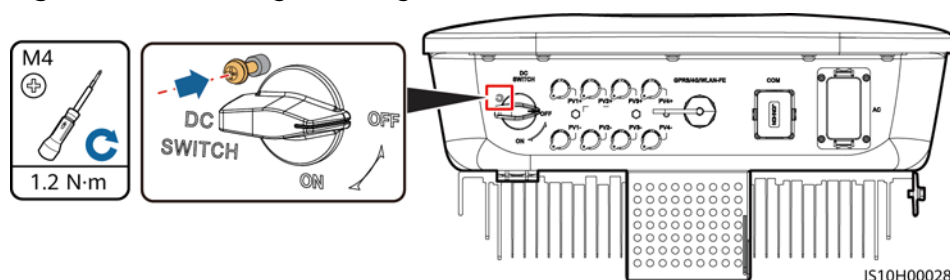
Step 4 Install the SUN2000 onto the mounting bracket.

Step 5 Tighten nuts.

Figure 4-11 Installing the SUN2000
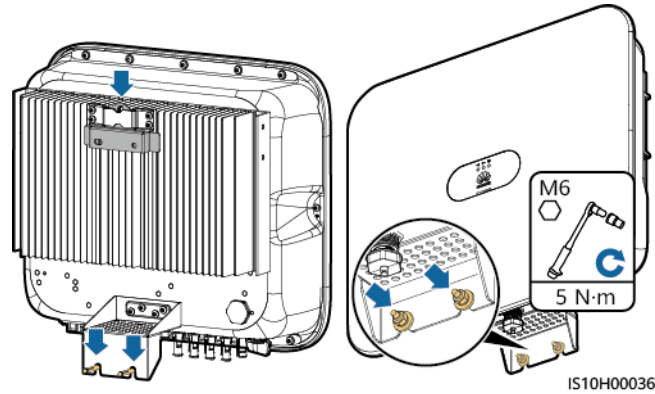
Step 6 (Optional) Install the anti-theft lock.

> **NOTICE**
>
> - Prepare an anti-theft lock suitable for the lock hole diameter (Φ8 mm) by yourself.
> - An outdoor waterproof lock is recommended.
> - Keep the key to the anti-theft lock safe.

Figure 4-12 Installing the anti-theft lock
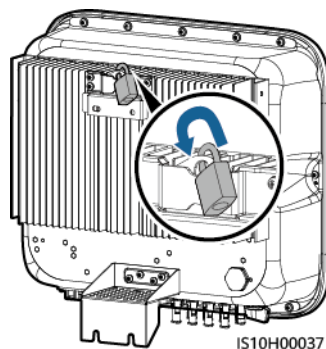
----End

4.5.2 Support-mounted Installation

Prerequisites

Prepare M6 stainless 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 hole positions based on the marking-off template, and then mark the hole positions using a marker.

Figure 4-13 Determining hole positions
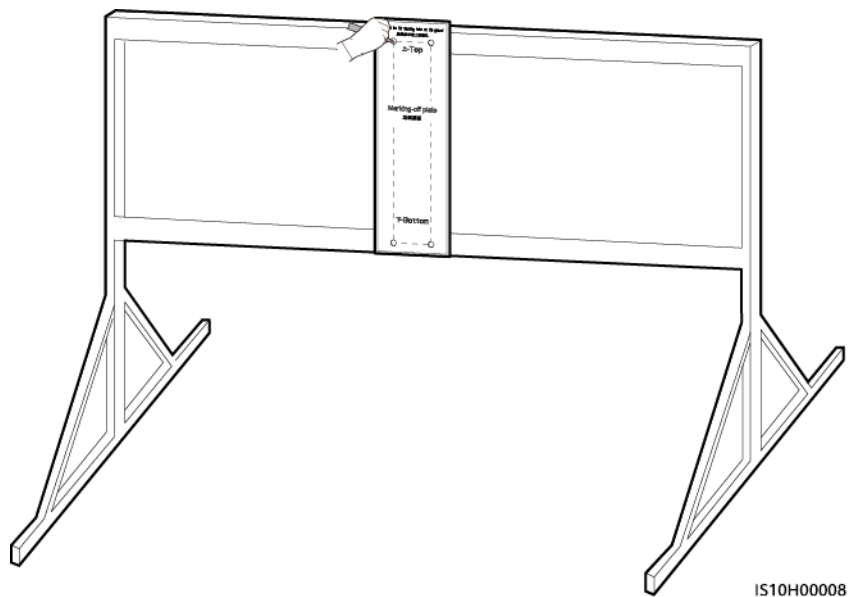
Step 2 Drill holes using a hammer drill.

📖 **NOTE**

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

Figure 4-14 Drilling holes
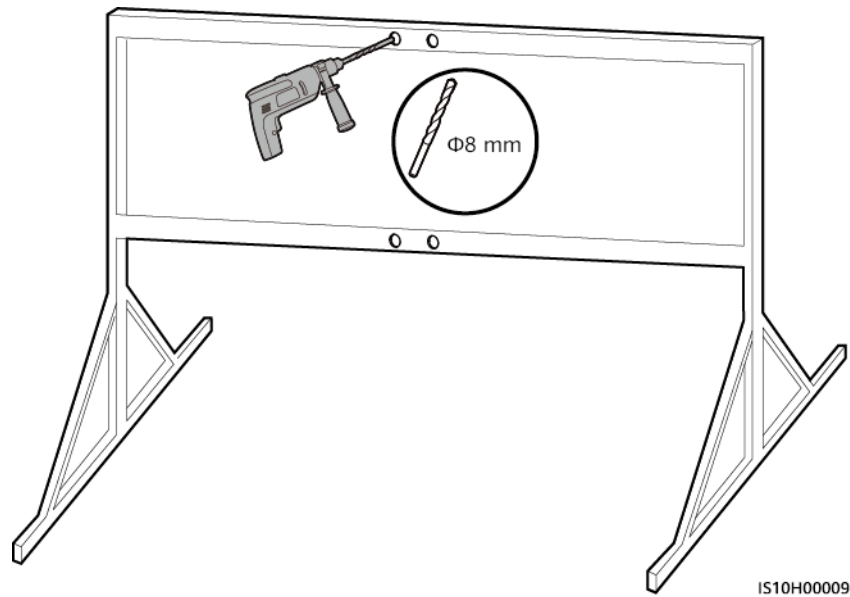
Step 3 Secure the mounting bracket.

Figure 4-15 Securing the mounting bracket
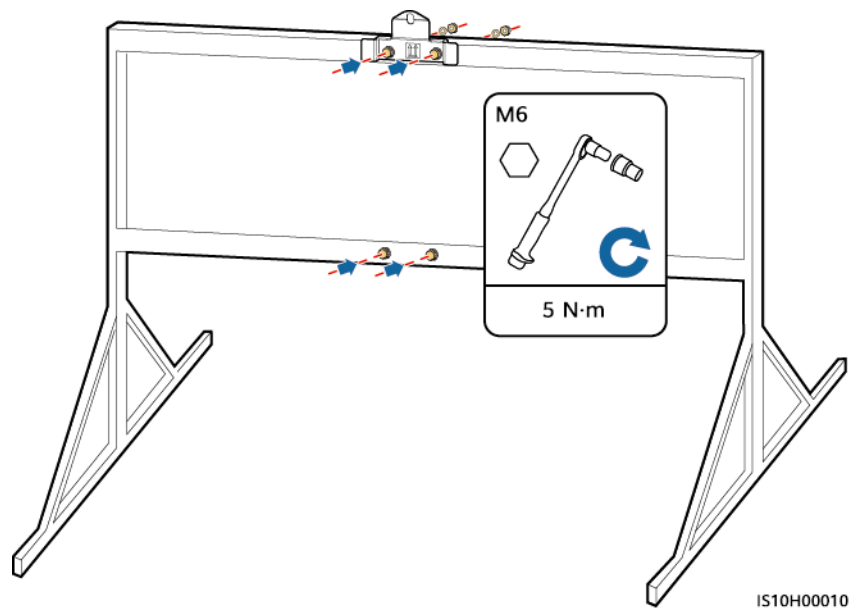
Step 4 Install the SUN2000 onto the mounting bracket.

Step 5 Tighten the bolt assembly.

Figure 4-16 Installing the SUN2000
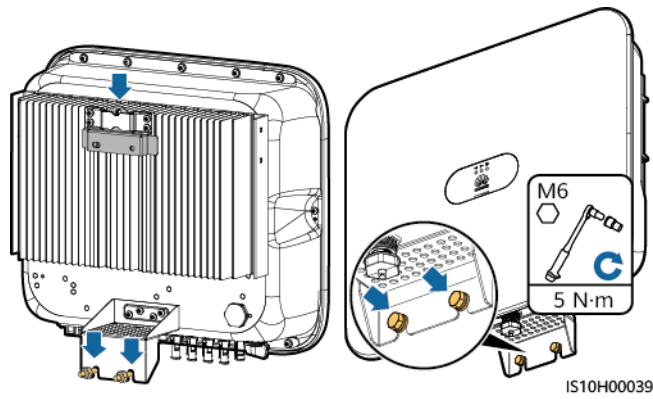
IS10H00039

Step 6 (Optional) Install the anti-theft lock.

> **NOTICE**
>
> - Prepare an anti-theft lock suitable for the lock hole diameter (Φ8 mm) by yourself.
> - An outdoor waterproof lock is recommended.
> - Keep the key to the anti-theft lock safe.

Figure 4-17 Installing the anti-theft lock

IS10H00037
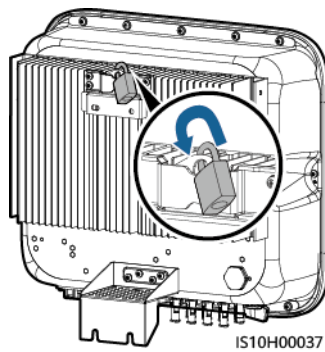
----End

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 for Installation

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

IS10W00012
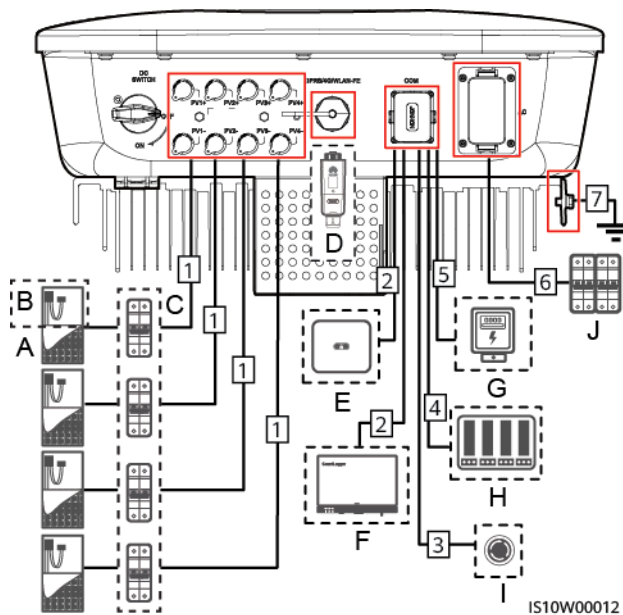
> **NOTICE**
>
> If the Smart Dongle is configured, you are advised to install the Smart Dongle before connecting the signal cable.

Table 5-1 Component description

No.	Component	Description	Source
A	PV module	• A PV string is composed of the PV modules connected in series. • The SUN2000 supports the input from four PV strings.	Prepared by the customer
B	Smart PV optimizer	The SUN2000-(600W-P, 450W-P2) and MERC-(1300W, 1100W)-P are supported.[d]	Purchased from Huawei
C	DC switch	Recommended: a PV circuit breaker with a rated voltage greater than or equal to 1100 V DC and a rated current of 15 A.	Prepared by the customer
D	Smart Dongle[a]	• WLAN-FE Smart Dongle: SDongleA-05. • 4G Smart Dongle: SDongleA-03 and SDongleB-06.	Purchased from Huawei
E	SUN2000	Select a proper model based on requirements.	Purchased from Huawei
F	SmartLogger	Select a proper model based on requirements.	Purchased from Huawei
G	Smart Power Sensor[b]	Recommended meter models: DTSU666-H, DTSU666-HW[e], YDS60-80[f], YDS60-C24[g], DTSU71 and DHSU1079-CT[h]	Purchased from Huawei
H	Ripple Control Device	Select the devices that meet the power grid scheduling requirements.	Provided by local power grid companies
I	Rapid shutdown switch	Select a proper model based on requirements.	Prepared by the customer

No.	Component	Description	Source
J	AC switch[c]	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: Recommended: a three-phase AC circuit breaker with a rated voltage greater than or equal to 415 V AC and a rated current of: ● 25 A (SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2) ● 40 A (SUN2000-15KTL-M2, SUN2000-17KTL-M2, SUN2000-20KTL-M2)	Prepared by the customer

- Note a: WLAN-FE Smart Dongle: For details about the SDongleA-05 operation, see *SDongleA-05 Smart Dongle Quick Guide (WLAN-FE)*; 4G Smart Dongle: For details about the SDongleA-03 operation, see *SDongleA-03 Quick Guide (4G)*. You can obtain the quick guide at **https://support.huawei.com/enterprise** by searching for the Smart Dongle model.

- Note b: For details about meter operations, see ***DTSU666-HW Smart Power Sensor Quick Guide***, ***DTSU666-H 100 A and 250 A Smart Power Sensor User Manual***, and ***YDS60-C24 Smart Power Sensor Quick Guide***.

- Note c: SUN2000-8KTL-M2 and SUN2000-10KTL-M2 inverters are applicable only to Australia.

- Note d: The SUN2000-(600W-P, 450W-P2) cannot be used together with the MERC-(1300W, 1100W)-P.

- Note e: SUN2000MA V100R001C00SPC142 and later versions can connect to DTSU666-HW power meters.

- Note f: SUN2000MA V100R001C00SPC146 and later versions can connect to YDS60-80 power meters.

- Note g: SUN2000MA V100R001C00SPC150 and later versions can connect to YDS60-C24 power meters.

- Note h: SUN2000MA V100R001C00SPC160 and later versions can connect to DTSU71 and DHSU1079-CT power meters.

Table 5-2 Cable description

No.	Name	Type	Recommended Specifications
1	DC input power cable	Standard PV cable in the industry	• Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 5.5–9 mm
2	(Optional) RS485 communications cable (used to cascade inverters or connect to the RS485 signal port on the SmartLogger)	Two-core outdoor shielded twisted pair cable	• Conductor cross-sectional area: 0.2–1 mm^2 • Cable outer diameter: 4–11 mm
3	(Optional) RS485 communications cable (used to connect to the RS485 signal port on a Smart Power Sensor for export limitation)	Two-core outdoor shielded twisted pair cable	• Conductor cross-sectional area: 0.2–1 mm^2 • Cable outer diameter: 4–11 mm
4	(Optional) Rapid shutdown switch signal cable	Two-core outdoor shielded twisted pair cable	• Conductor cross-sectional area: 0.2–1 mm^2 • Cable outer diameter: 4–11 mm
5	(Optional) Grid scheduling signal cable	Five-core outdoor cable	• Conductor cross-sectional area: 0.2–1 mm^2 • Cable outer diameter: 4–11 mm
6	AC output power cable[a]	Outdoor copper cable[b]	SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2: • Conductor cross-sectional area: 6–16 mm^2 • Cable outer diameter: 11–26 mm
			SUN2000-15KTL-M2, SUN2000-17KTL-M2, SUN2000-20KTL-M2: • Conductor cross-sectional area: 10–16 mm^2 • Cable outer diameter: 11–26 mm
7	PE cable	Single-core outdoor copper cable[c]	SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2: Conductor cross-sectional area ≥ 6 mm^2
			SUN2000-15KTL-M2, SUN2000-17KTL-M2, SUN2000-20KTL-M2: Conductor cross-sectional area ≥ 10 mm^2

No.	Name	Type	Recommended Specifications
● Note a: The minimum cable diameter depends on the fuse rating on the AC side.			
● Note b: The SUN2000-8KTL-M2 and SUN2000-10KTL-M2 inverters are applicable only to Australia.			
● Note c: The SUN2000-8KTL-M2 and SUN2000-10KTL-M2 inverters are applicable only to Australia.			

◻ **NOTE**

- The minimum cable diameter should comply with the local cable standard.
- Factors influencing cable selection are as follows: nominal AC current, type of cable, routing method, ambient temperature, and maximum desired line losses.

5.3 Connecting the PE cable

Precautions

⚠ **DANGER**

- Ensure that the PE cable is properly connected. If it is disconnected or loose, 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.
- After the ground cable is installed, it is recommended that the silica gel or paint be applied to the ground terminal for protection.
- 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.

Additional Information

The SUN2000 has the grounding detection function. This function detects whether the SUN2000 is grounded properly before its startup, or whether the ground cable is disconnected when the SUN2000 is running. This function works under limited conditions. To ensure the safe operation of the SUN2000, ground the SUN2000 properly according to the connection requirements of the PGND 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 set **Phase-to-ground short-circuit protection** to **Disable** to enable the inverter to run properly.

- According to IEC62109, to ensure safe application in case of the ground cable is damaged or disconnected, connect the PE cable properly before the grounding detection function is disabled. Ensure that the PE cable meets at least one of the following requirements.
    - If the PE terminal is not connected to the AC connector, use a single-core outdoor copper cable with a conductor cross-sectional area of at least 10 mm2 as the PE cable on the chassis.
    - Use cables that have the same diameter as the AC output cable, and ground the PE terminal on the AC connector and the ground screw on the enclosure respectively.
- In some countries and regions, additional ground cables are required for the SUN2000. In this case, use cables that have the same diameter as the AC output cable, and ground the PE terminal on the AC connector and the ground screw on the enclosure respectively.

Procedure

Step 1 Crimp the OT terminal.

> **NOTICE**
>
> - Pay attention not to damage the core wire when stripping a cable.
> - The cavity formed after crimping the conductor strip of the OT terminal needs to wrap the core wire completely. The core wire needs to contact the OT terminal closely.
> - Wrap the wire crimping area with the heat shrink tubing or the PVC insulation tape. The following figure uses the heat shrink tubing as an example.
> - When using the heat gun, protect devices from being scorched.

Figure 5-2 Crimping an OT terminal
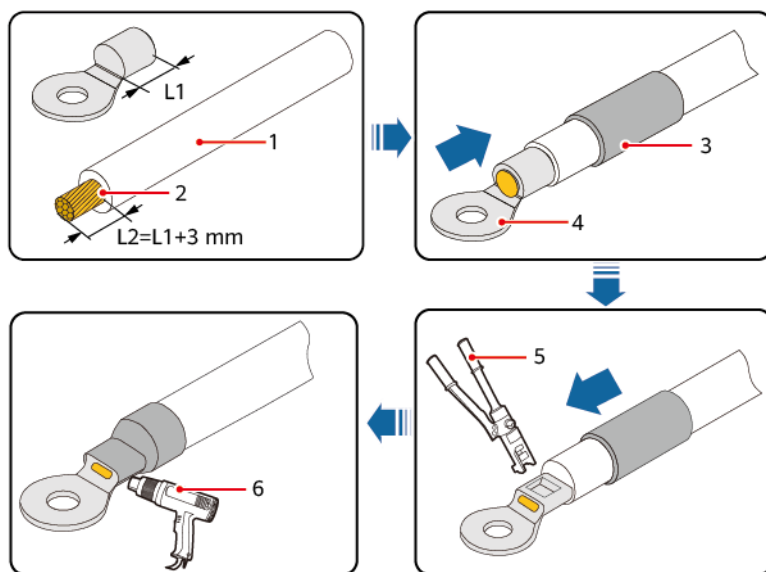
| (1) Cable | (2) Core wire | (3) Heat shrink tubing |
| (4) OT terminal | (5) Crimping tool | (6) Heat gun |

Step 2 Connect the PE cable.

Figure 5-3 Connecting the PE cable
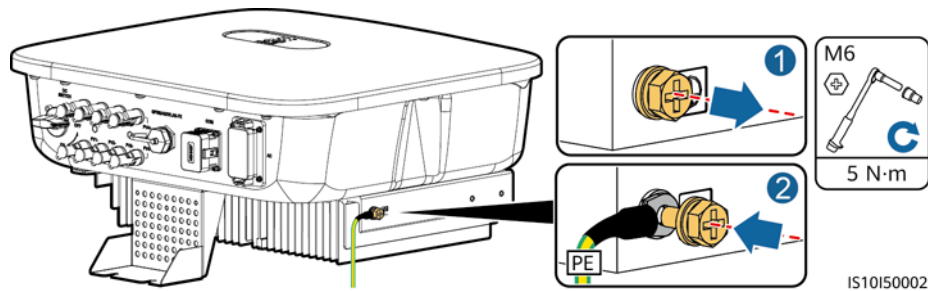
----**End**

5.4 Connecting the AC Output Power Cable

Precautions

A three-phase AC switch needs to be installed on the AC side of the SUN2000. To ensure that the SUN2000 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 SUN2000 is integrated with a comprehensive residual current monitoring unit. Once detecting that the residual current exceeds the threshold, the SUN2000 immediately disconnects itself from the power grid.

NOTICE

- If the external AC switch can perform earth leakage protection, the rated leakage action current should be greater than or equal to 300 mA.
- If multiple SUN2000s connect to the general residual current device (RCD) through their respective external AC switches, the rated leakage action current of the general RCD should be greater than or equal to the number of SUN2000s multiplied by 300 mA.
- A knife switch cannot be used as an AC switch.
- The hex key is delivered with the inverter and bound to the hanging kit at the bottom of the inverter.

Figure 5-4 Hex key
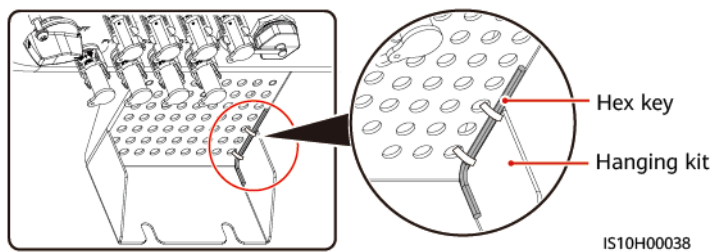
Procedure

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

Figure 5-5 Stripping requirements
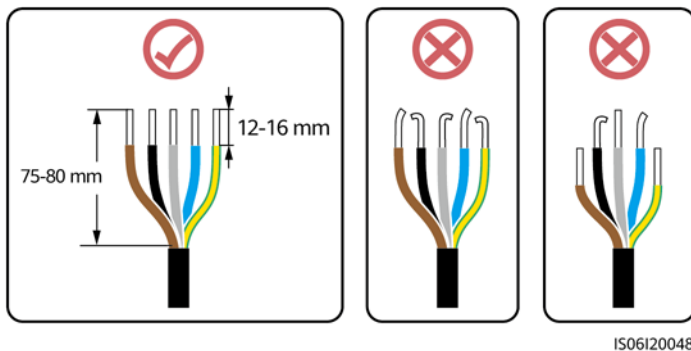
NOTICE

- Ensure that the cable jacket is inside the connector.
- Ensure that the exposed core wire is totally inserted into the cable hole.
- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its AC connectors.
- 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 5-6 Three-core cable (L1, L2, and L3)
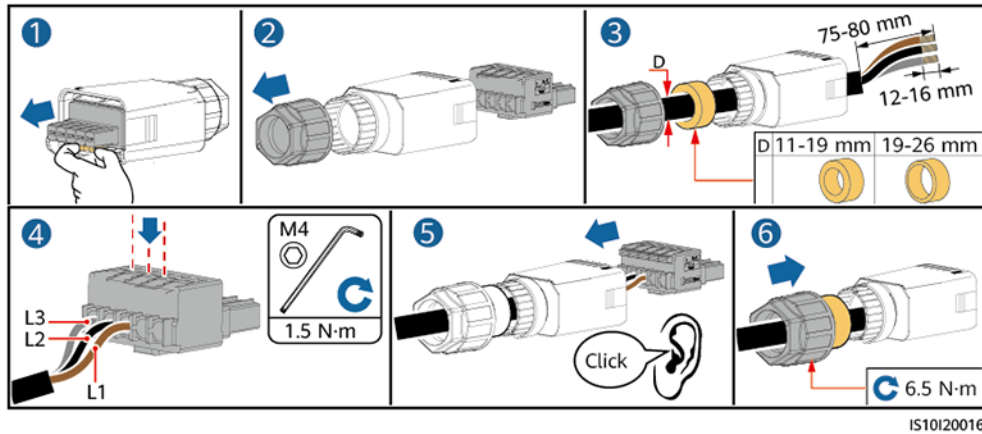
Figure 5-7 Four-core cable (L1, L2, L3, and PE)
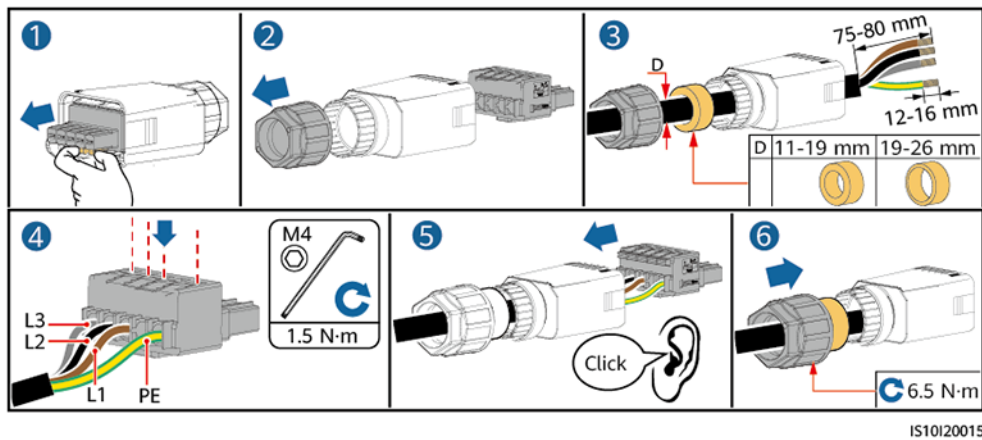
Figure 5-8 Four-core cable (L1, L2, L3, and N)
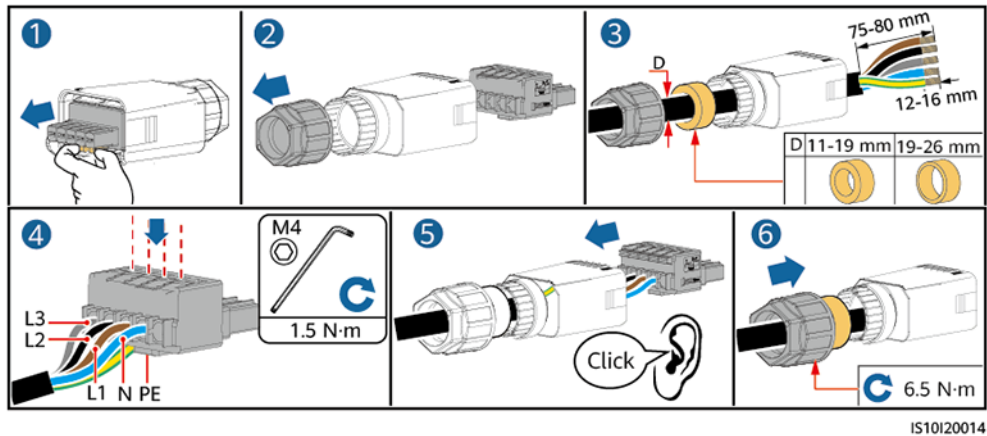
Figure 5-9 Five-core cable (L1, L2, L3, N, and PE)
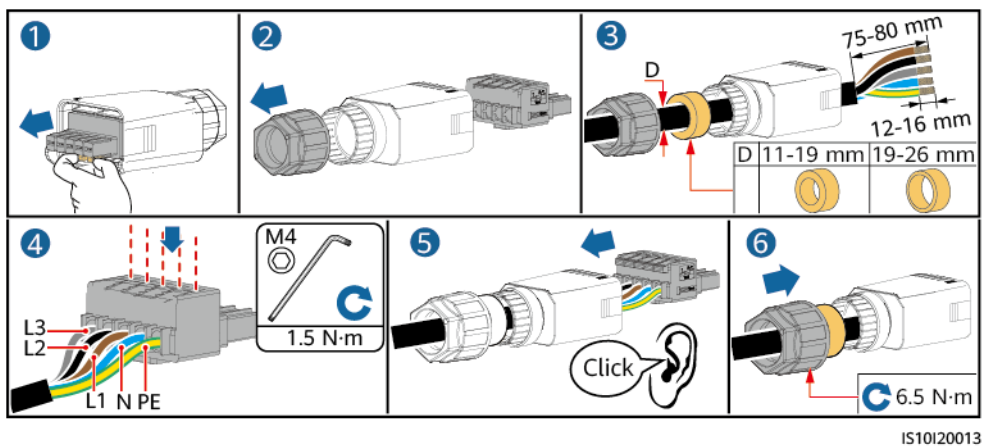
> **NOTE**
>
> The cable colors shown in the figures are for reference only. Select an appropriate cable according to local standards.

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

> **NOTICE**
>
> Ensure that the AC connector is connected securely.

Figure 5-10 Securing the AC connector
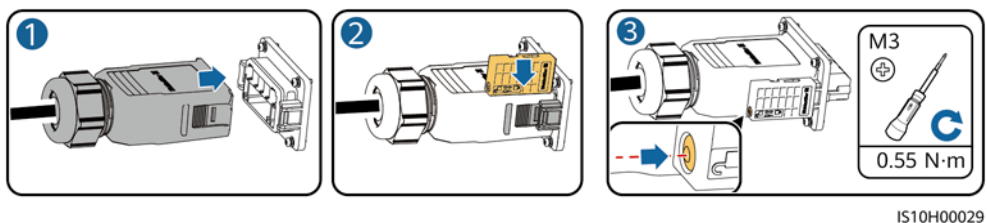
Step 3 Check the route of the AC output power cable.

Figure 5-11 Cable route
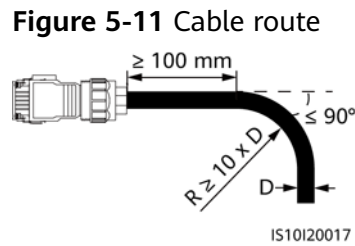
----**End**

Disconnection

Disconnection can be performed in reverse order.

5.5 Connecting the DC input power cable

Precautions

> ⚠️ **DANGER**
>
> ● Before connecting the DC input power cable, ensure that the DC voltage is within the safe range (lower than 60 V DC), and that the **DC SWITCH** is set to the **OFF** position. Failure to do so could generate high voltage, which may cause electric shocks.
>
> ● When the SUN2000 is operating, it is not allowed to operate the DC input power cable, such as connecting or disconnecting a PV string or a PV module in a PV string. Failing to do so may cause electric shocks.
>
> ● If no PV string is connected to a DC input terminal of the SUN2000, do not remove the watertight cap from the terminal. Otherwise, the IP rating of the SUN2000 will be affected.

⚠ WARNING

Ensure that the following conditions are met. Otherwise, the SUN2000 may be damaged, or even a fire could happen.

- PV modules connected in series in each PV string are of the same specifications.
- The open-circuit voltage of each PV string is always lower than or equal to 1080 V DC.
- The maximum short-circuit current of each PV string must be lower than or equal to 15 A.
- The DC input power cable is correctly connected. The positive and negative terminals of a PV module are connected to corresponding positive and negative DC input terminals of the SUN2000.
- If the DC input power cable is reversely connected, do not operate the DC switch and positive and negative connectors. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch. Remove the positive and negative connectors to correct the polarity.

⚠ WARNING

During the installation of PV strings and the SUN2000, the positive or negative terminals of PV strings may be short-circuited to ground if power cables are not properly installed or routed. An AC or DC short circuit may occur and damage the device when the SUN2000 is operating. The caused device damage is not covered under any warranty.

NOTICE

- Because the output of the PV string connected to the SUN2000 cannot be grounded, ensure that the PV module output is insulated to ground.
- The PV strings connecting to the same MPPT route should contain the same number and model of PV modules or Smart PV optimizers.

Terminal Description

Figure 5-12 Terminals
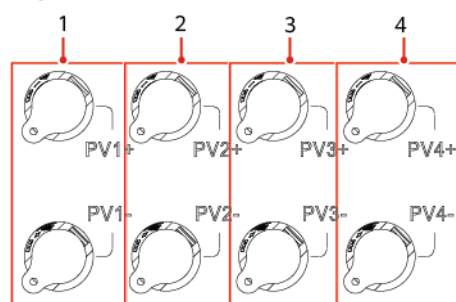
| (1) Terminals of DC input 1 | (2) Terminals of DC input 2 |
| (3) Terminals of DC input 3 | (4) Terminals of DC input 4 |

Procedure

⚠ **WARNING**

Before inserting the positive and negative connectors into the positive and negative DC input terminals of the SUN2000, check that the **DC SWITCH** is **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 contacts, pull the DC input power cables back to ensure that they are connected securely.
- Insert the crimped metal contacts 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 the DC input power cable is reversely connected and the **DC SWITCH** is set to the **ON** position, do not operate the **DC SWITCH** and positive and negative connectors. Otherwise, the device may be damaged. The caused device damage is not covered under any warranty. Wait until the solar irradiance declines and the PV string current drops to below 0.5 A. Then set the two **DC SWITCH** to the **OFF** position, remove the positive and negative connectors, and rectify the connection of the DC input power cable.
- 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.

📖 **NOTE**

- The DC voltage measurement range of the multimeter must be at least 1080 V. If the voltage is a negative value, the DC input polarity is incorrect and needs correction. If the voltage is greater than 1080 V, too many PV modules configured in the same string. Remove some PV modules.
- If the PV string is configured with an optimizer, check the cable polarity by referring to the Smart PV optimizer quick guide.

Step 1 Connect the DC input power cable.

⚠ CAUTION

Use the Staubli MC4 positive and negative metal terminals and DC connectors delivered with the SUN2000. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused device damage is not covered under any warranty or service agreement.

Figure 5-13 Assembling a DC connector
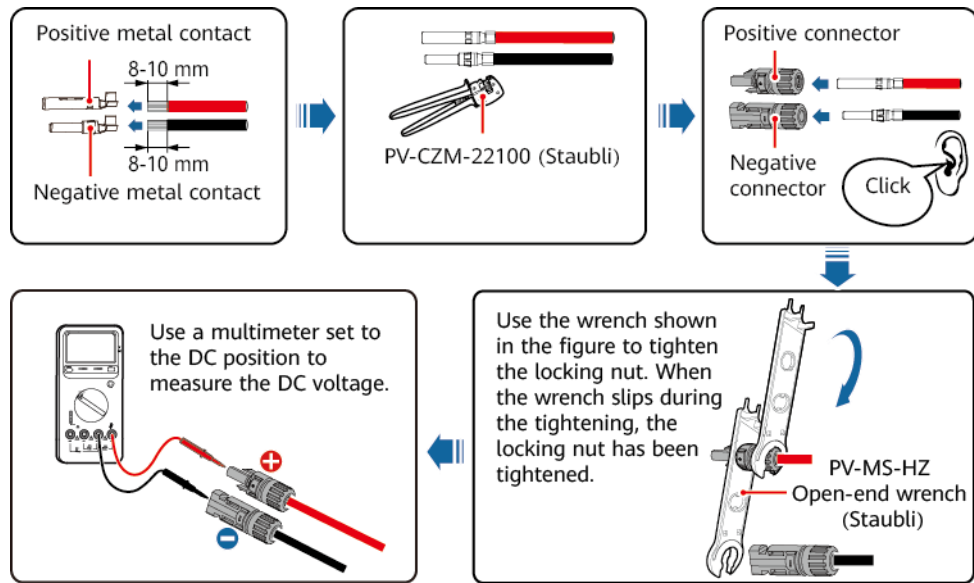
----**End**

Removing a DC connector

⚠ WARNING

Before removing the positive and negative connectors, ensure that the **DC SWITCH** is **OFF**.

To remove the positive and negative connectors from the SUN2000, insert an open-end wrench into the notch and press hard to remove the DC connector.

Figure 5-14 Removing a DC connector
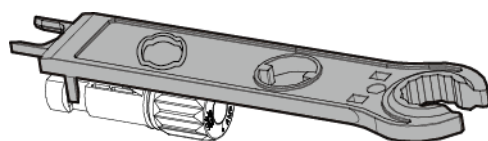
5.6 (Optional) Installing a Smart Dongle

Procedure

 NOTE

- If WLAN-FE communication is used, install a WLAN-FE Smart Dongle (SDongleA-05).
- If 4G communication is used, install a 4G Smart Dongle (SDongleA-03).
- You need to purchase the Smart Dongle by yourself.

- 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 5-15 Installing a WLAN-FE Smart Dongle (FE communication)
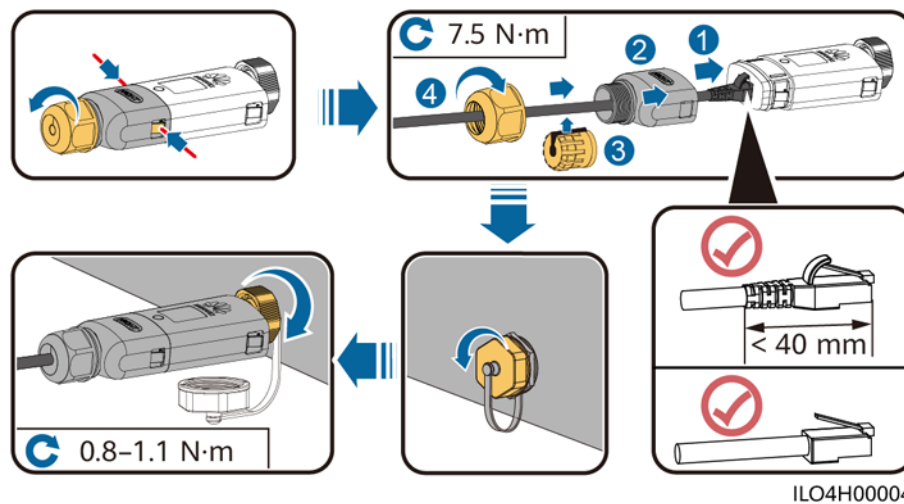
- 4G Smart Dongle (4G communication)

 NOTE

- If you prepared a Smart Dongle without a SIM card, you need to prepare a standard SIM card (size: 25 mm x 15 mm) with the capacity greater than or equal to 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, indicating that the SIM card is correctly installed.
- When removing the SIM card, push it inwards to eject it.
- When reinstalling the cover of the Smart Dongle, ensure that the buckles spring back in place with a click sound.

Figure 5-16 Installing a 4G Smart Dongle
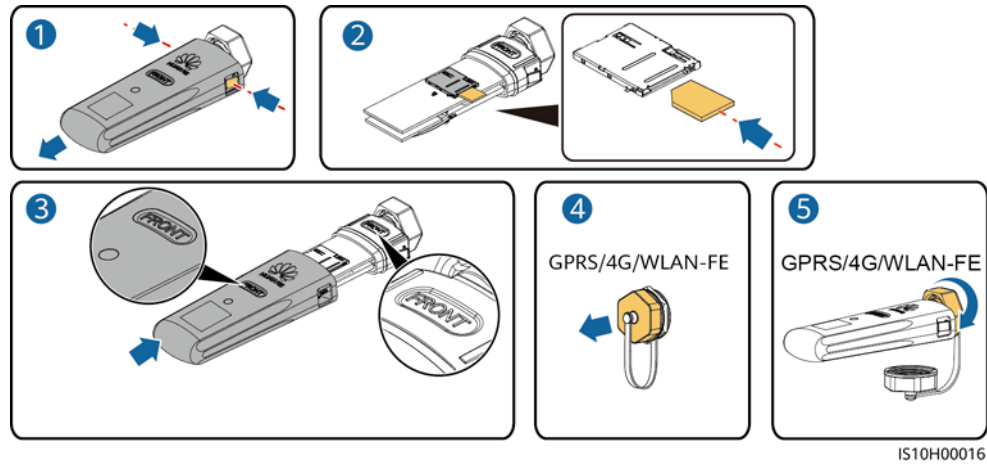
 NOTE

There are two types of Smart Dongle:

- For details about how to use the WLAN-FE Smart Dongle SDongleA-05, see the **SDongleA-05 Smart Dongle Quick Guide (WLAN-FE)**. You can also scan the QR code to obtain the document.

- For details about how to use the 4G Smart Dongle SDongleA-03, see the **SDongleA-03 Quick Guide (4G)**. You can also scan the QR code to obtain the document.

The quick guide is delivered with the Smart Dongle.

5.7 (Optional) Installing the Signal Cable

Communication port signal definitions

> **NOTICE**
>
> - Not all inverter models are delivered with the signal cable connector.
> - When routing the signal cable, ensure that it is separate from the power cable and away from interfering sources to prevent communication from being affected.
> - The protection layer of the cable is in the connector. Cut off surplus core wires from the protection layer. Ensure that the core wires are completely inserted into the cable holes, and that the cable is securely connected.
> - If the Smart Dongle is configured, you are advised to install the Smart Dongle before connecting the signal cable.

Figure 5-17 Signal definitions
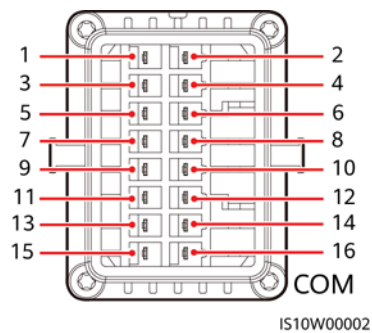
Table 5-3 Signal definitions

Pin	Definition	Function	Description	Pin	Definition	Function	Description
1	485A1-1	RS485 differential signal+	Used to connect to the RS485 signal port on the SUN2000 or SmartLogger1000	2	485A1-2	RS485 differential signal+	Used to connect to the RS485 signal port on the SUN2000 or SmartLogger1000A
3	485B1-1	RS485 differential signal–		4	485B1-2	RS485 differential signal–	
5	PE	Shielding ground	N/A	6	PE	Shielding ground	N/A
7	485A2	RS485 differential signal+	Used to connect to an RS485 signal port on a Smart Power Sensor for export limitation	8	DIN1	Dry contact interface for grid scheduling	N/A
9	485B2	RS485 differential signal–		10	DIN2		
11	N/A	N/A	N/A	12	DIN3		

Pin	Definition	Function	Description	Pin	Definition	Function	Description
13	GND	GND	Used to connect to the rapid shutdown DI signal port or serve as a port for the signal cable of the NS protection.	14	DIN4		
15	DIN5	Rapid shutdown signal+		16	GND		

Communication Networking

- Smart Dongle Networking Scenario

Figure 5-18 Smart Dongle networking
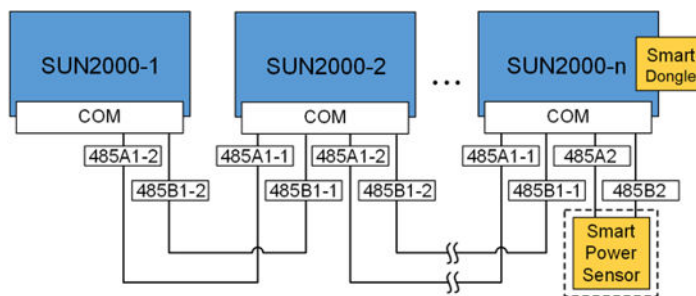
☐ NOTE

- In the Smart Dongle networking scenario, the SmartLogger cannot be connected.
- The Smart Power Sensor is necessary for export limitation. Select the Smart Power Sensor according to the actual project.
- The Smart Power Sensor and Smart Dongle need to be connected to the same inverter.

- SmartLogger Networking Scenario

Figure 5-19 SmartLogger networking
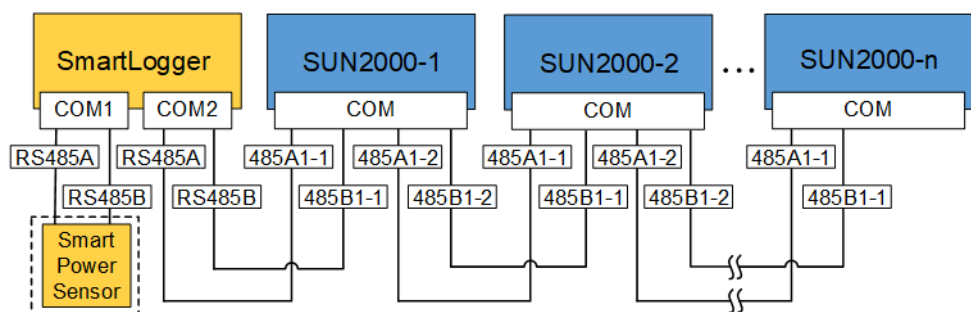
📖 NOTE

- In the SmartLogger networking scenario, the Smart Dongle cannot be connected.
- A maximum of 80 devices can connect to a single SmartLogger, such as inverters, Smart Power sensor, and EMI. You are advised to connect fewer than 30 devices to each RS485 route.
- The Smart Power Sensor is necessary for export limitation. Select the Smart Power Sensor according to the actual project.
- To ensure the system response speed, you can connect the Smart Power Sensor to a separate COM port.

5.7.1 Connecting the RS485 Communications Cable (Inverter Cascading)

Procedure

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

Figure 5-20 Installing the cable
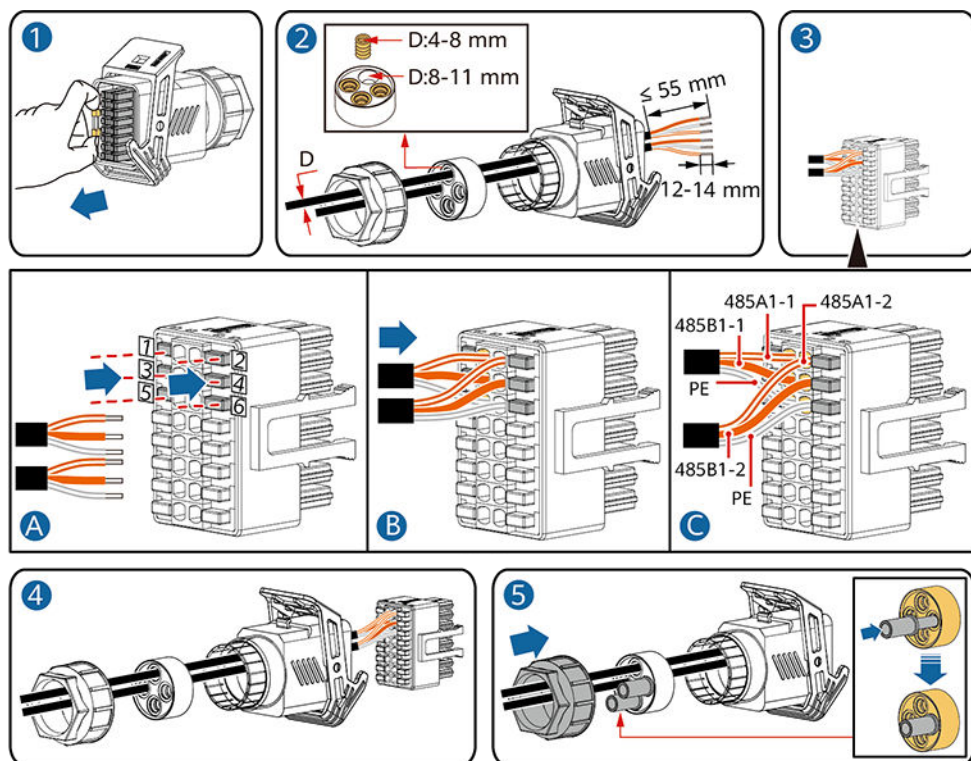
Step 2 Connect the signal cable connector to the COM port.

Figure 5-21 Securing the signal cable connector
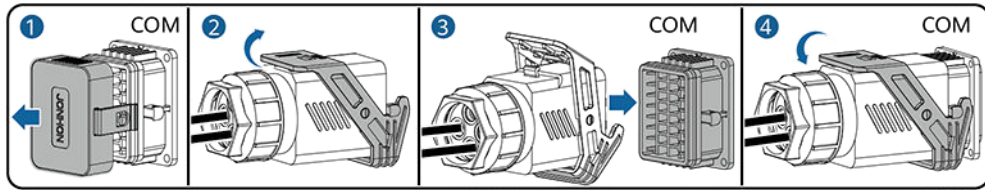
----**End**

5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)

Cable Connection

- The following figures show the cable connections between the inverter and DTSU666-H and YDS60-C24 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 5-22 DTSU666-H three-phase, three-wire cable connection (Smart Dongle networking)
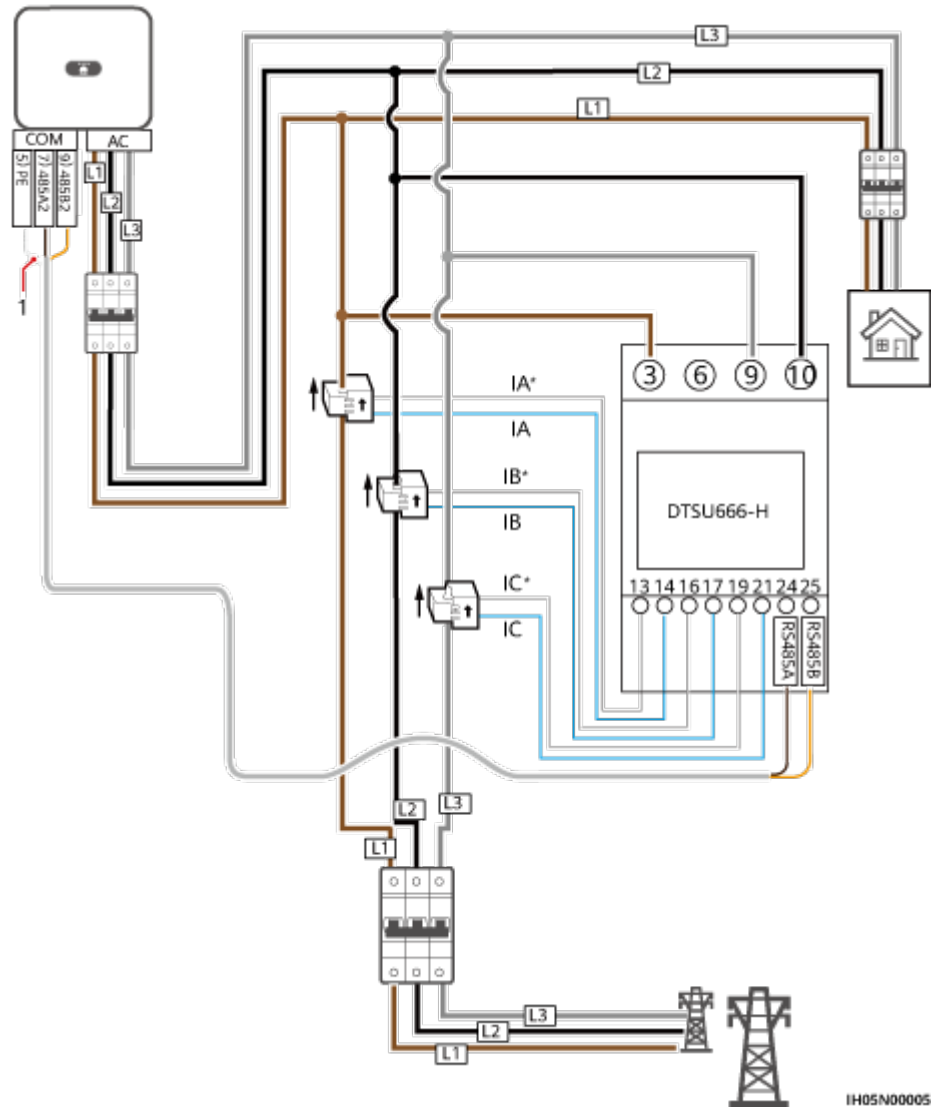
Figure 5-23 YDS60-C24 three-phase, three-wire cable connection (Smart Dongle networking)
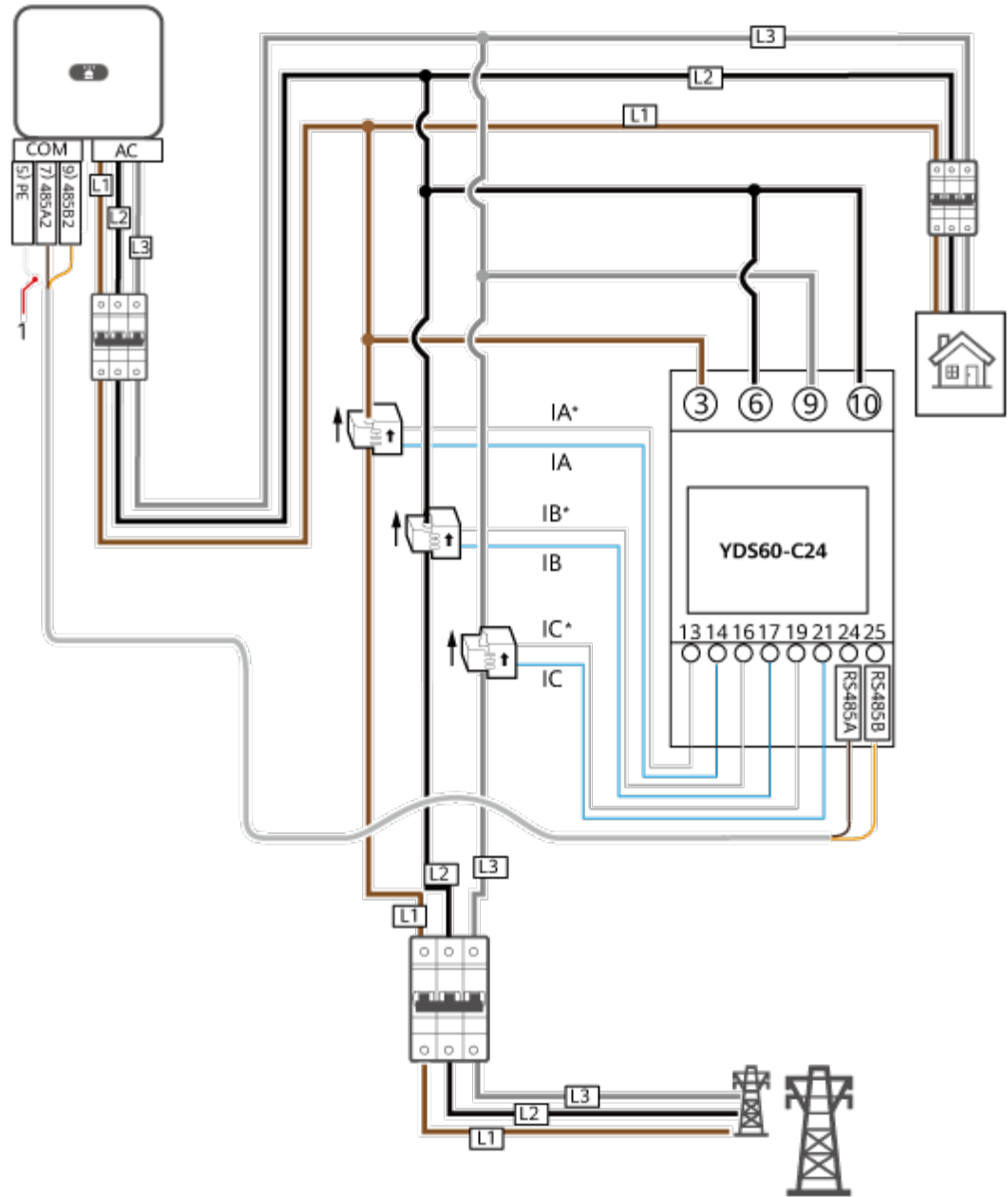
Figure 5-24 Three-phase, four-wire connection (Smart Dongle networking)
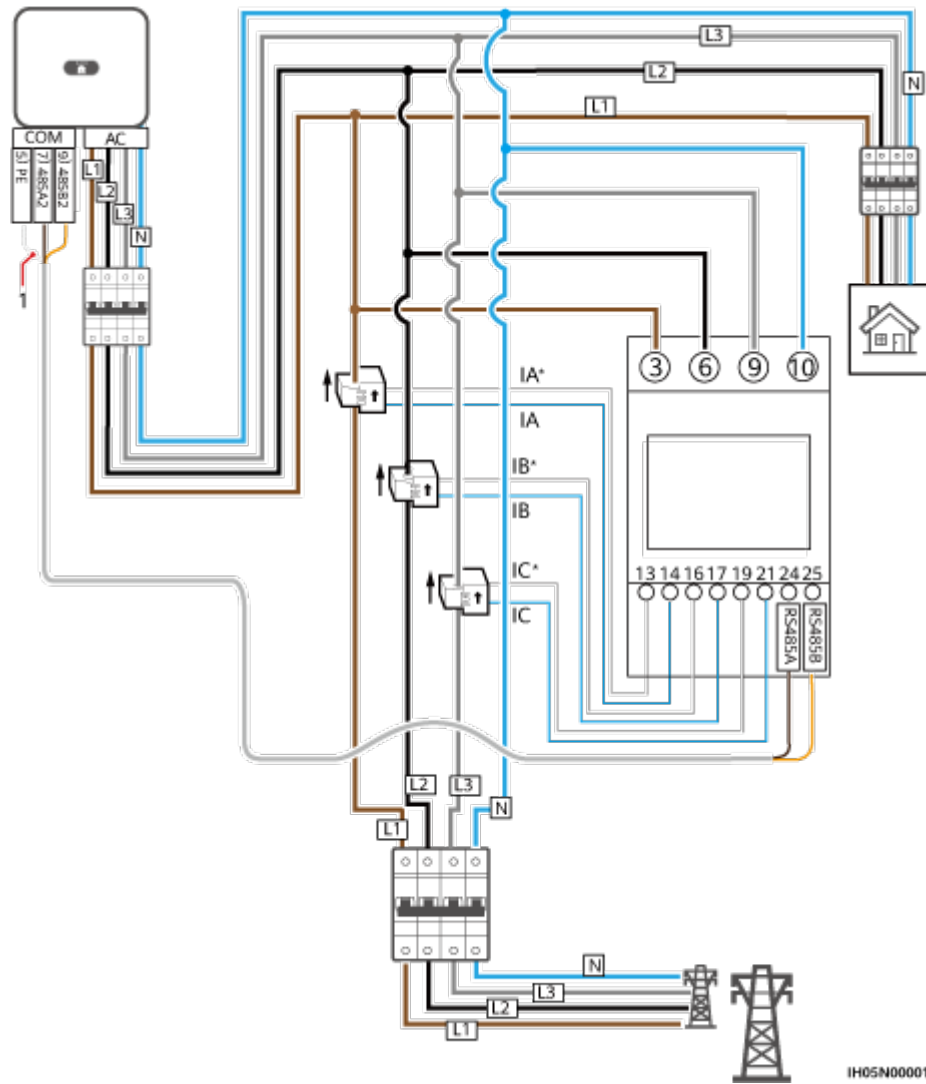
- The following figure shows the cable connections between the inverter and DTSU666-HW and YDS60-80 power meters.

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

IH05N00009
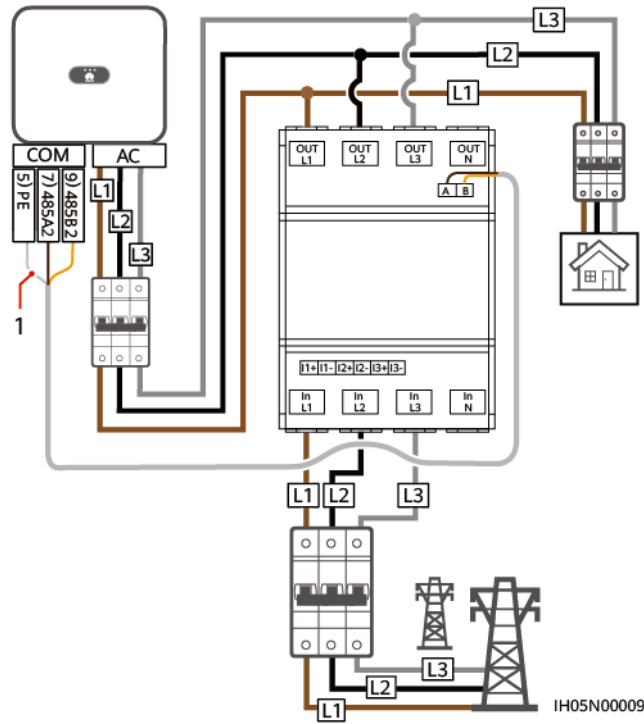
Figure 5-26 Three-phase, four-wire direct connection (Smart Dongle networking)

IH05N00011
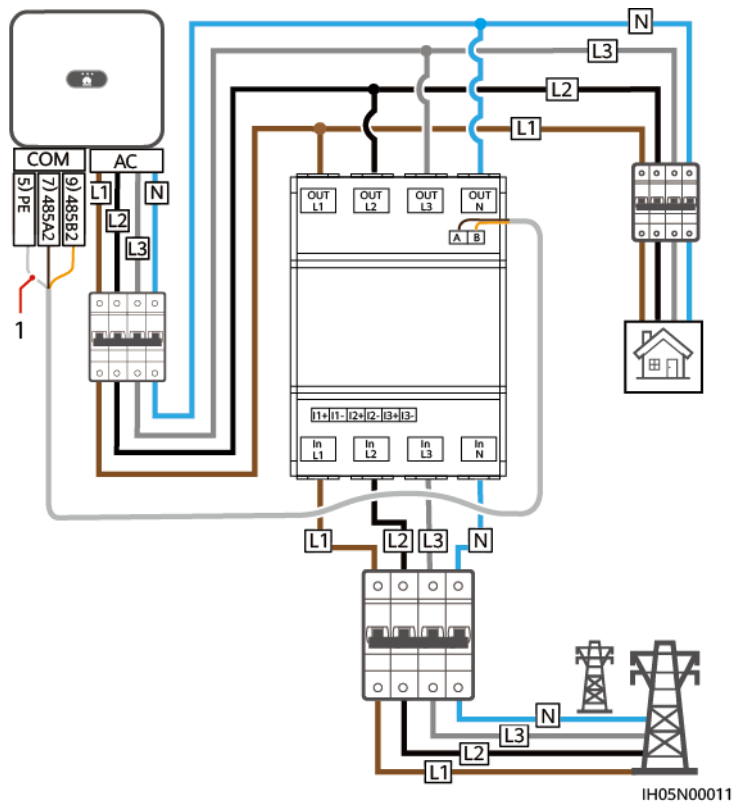
Figure 5-27 Three-phase, three-wire direct connection (SmartLogger networking)
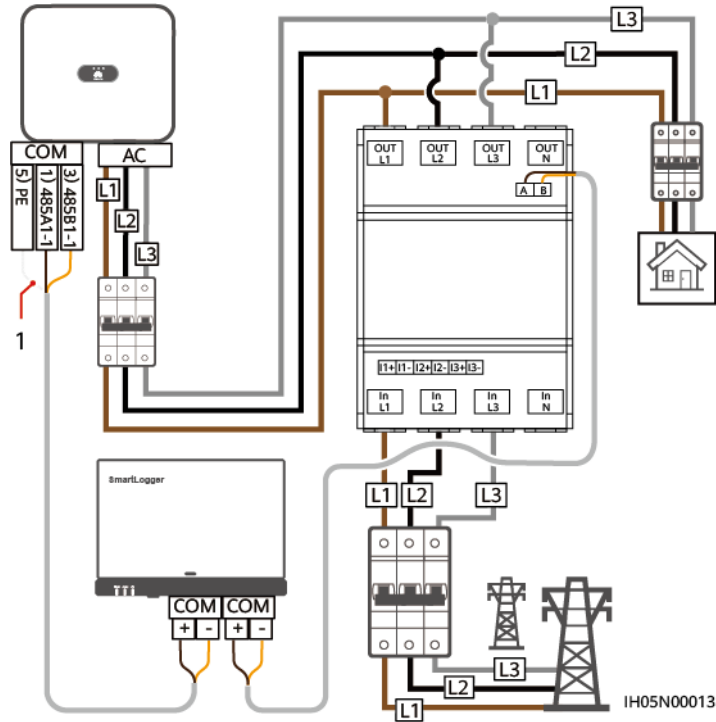
Figure 5-28 Three-phase, four-wire direct connection (SmartLogger networking)
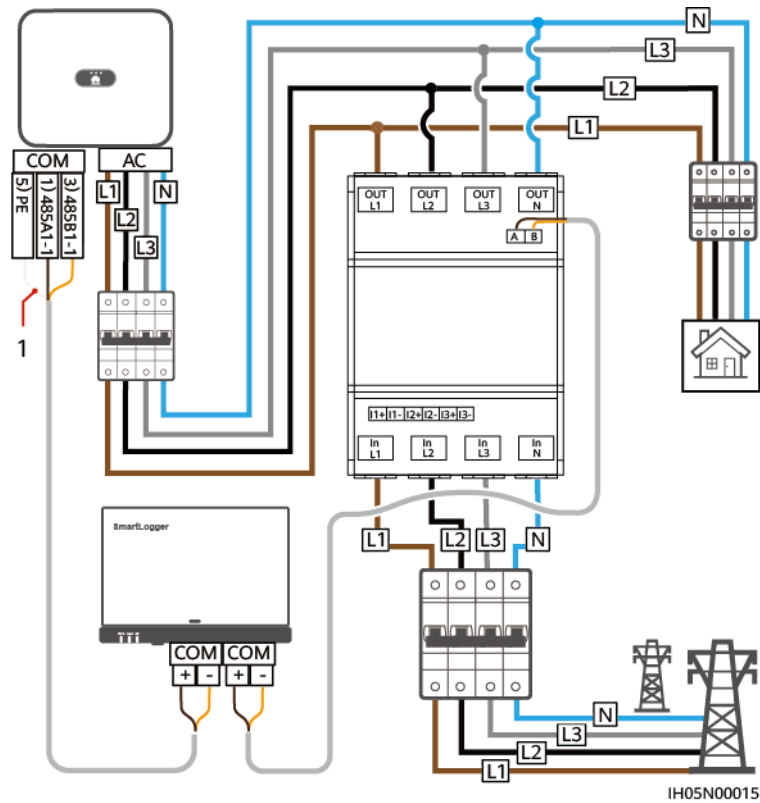
(1) Shielding layer of the signal cable

 NOTE

- The DTSU666-HW and YDS60-80 power meters support a maximum current of 80 A.
- If the SUN2000-(2KTL-6KTL)-L1 are cascaded with three-phase inverters, they must be connected to the grid in the same phase.
- For a three-phase three-wire system, you need to set the cable connection mode. Otherwise, the displayed voltage is incorrect.
- Ensure that the baud rates of the DTSU666-H, YDS60-C24, DTSU71 and DHSU1079-CT meters are set to the default values. If they are changed, meters may go offline, generate alarms, or affect the inverter output power.

Table 5-4 Select the cable connection mode

Parameter	Note
nEt	Select the cable connection mode: 0: n.34 indicates three-phase four-wire. 1: n.33 indicates three-phase three-wire.

Procedure

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

Figure 5-29 Installing the cable
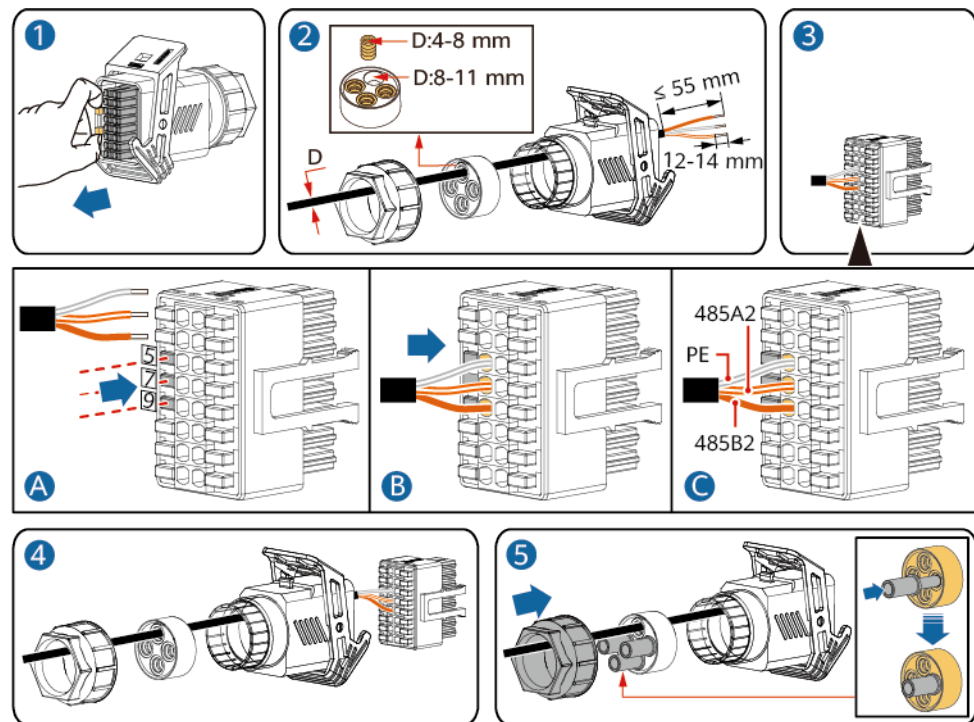
Step 2 Connect the signal cable to the COM port.

Figure 5-30 Securing the signal cable connector
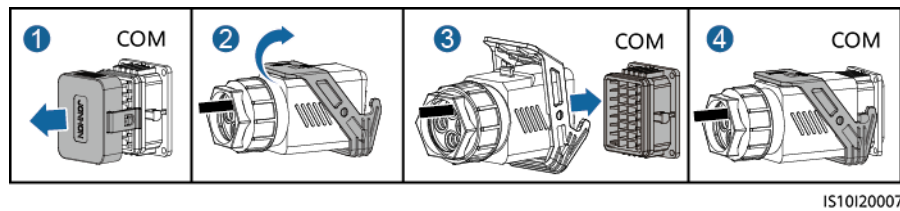
----**End**

5.7.3 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 5-31 Installing the cable
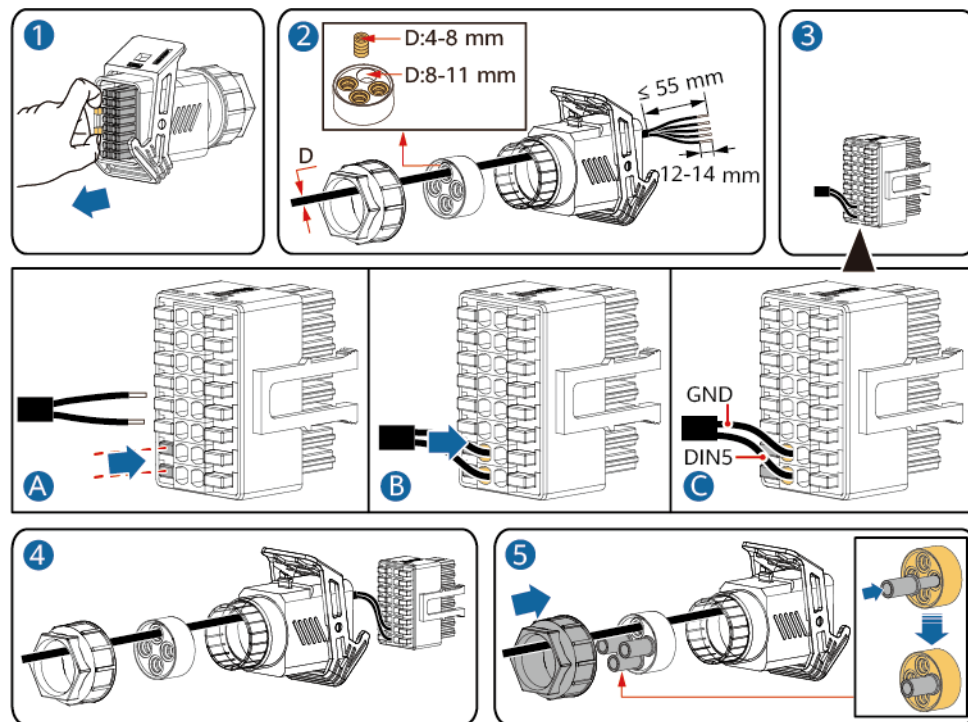
Step 2 Connect the signal cable connector to the COM port.

Figure 5-32 Securing the signal cable connector
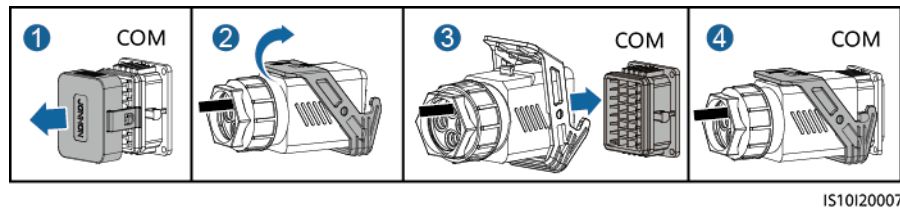
----**End**

5.7.4 Connecting the Grid Scheduling Signal Cable

Cable Connection

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

Figure 5-33 Cable connection
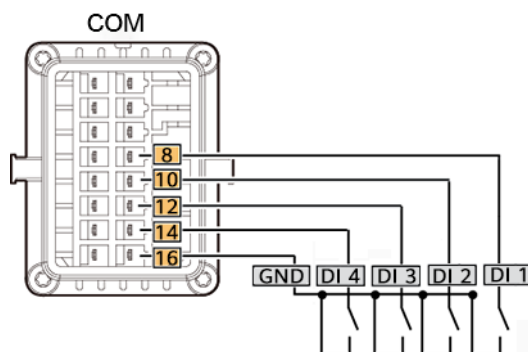
NOTICE

- 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 5-34 Installing the cable
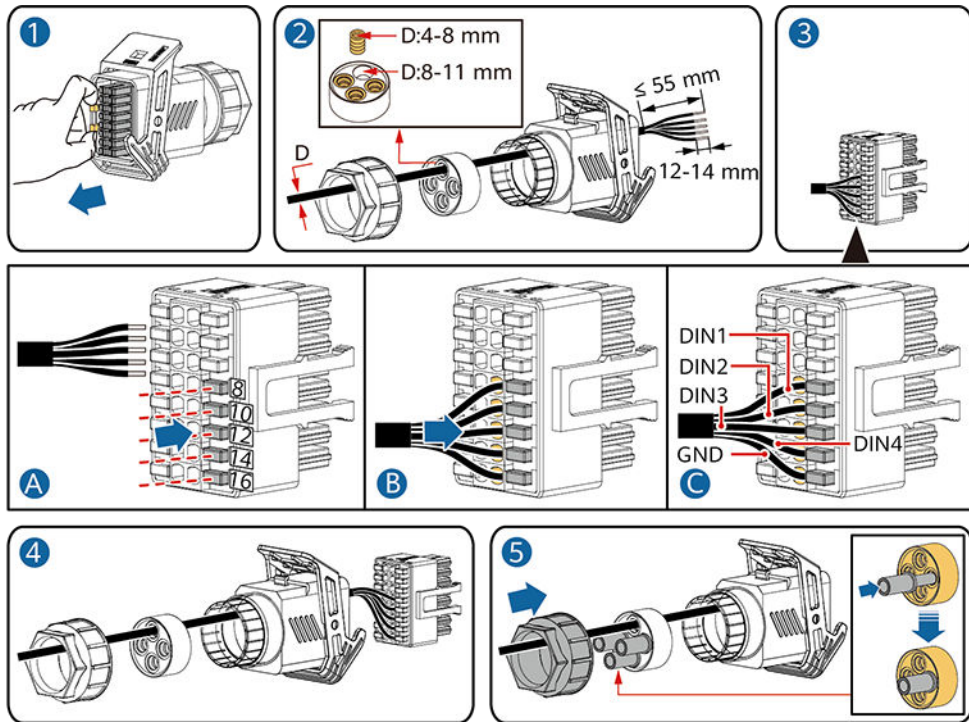
Step 2 Connect the signal cable connector to the COM port.

Figure 5-35 Securing the signal cable connector
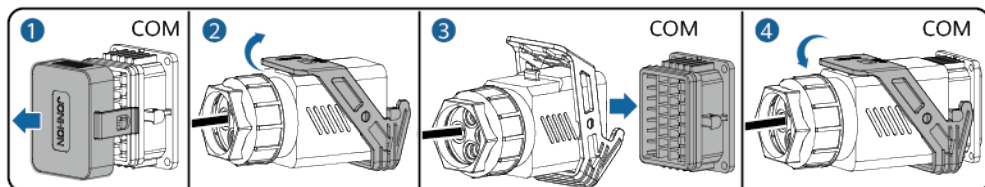
----End

5.7.5 Connecting the NS Protection Signal Cable

Connecting the Inverter to the NS Protection Signal Cable

📖 **NOTE**

- The NS protection function is applicable to grid code **VDE-AR-N-4105**, **SWITZERLAND-NA/EEA:2020-LV230**, or **ANRE**.
- 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 **My** > **Device Commissioning**, and connect to the WLAN hotspot of the SUN2000. Log in to the local commissioning system as an installer user, choose **Settings** > **Feature parameter**s > **Dry contact function**, and set **Dry contact function** to **NS protection**.

Figure 5-36 Connecting cascaded inverters to the NS protection switch
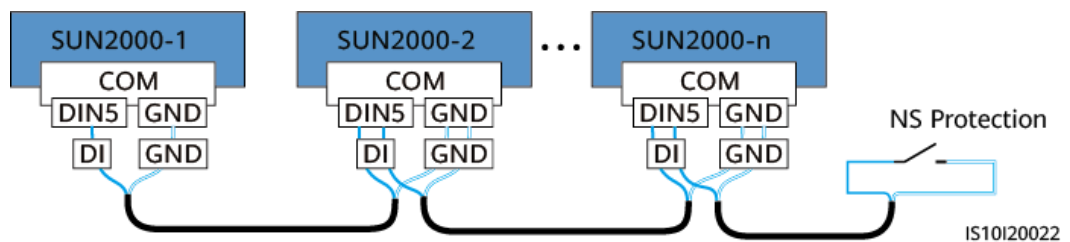
**Step 1** Connect the signal cables of the cascaded inverters to the signal cable connectors.

Figure 5-37 Installing cables
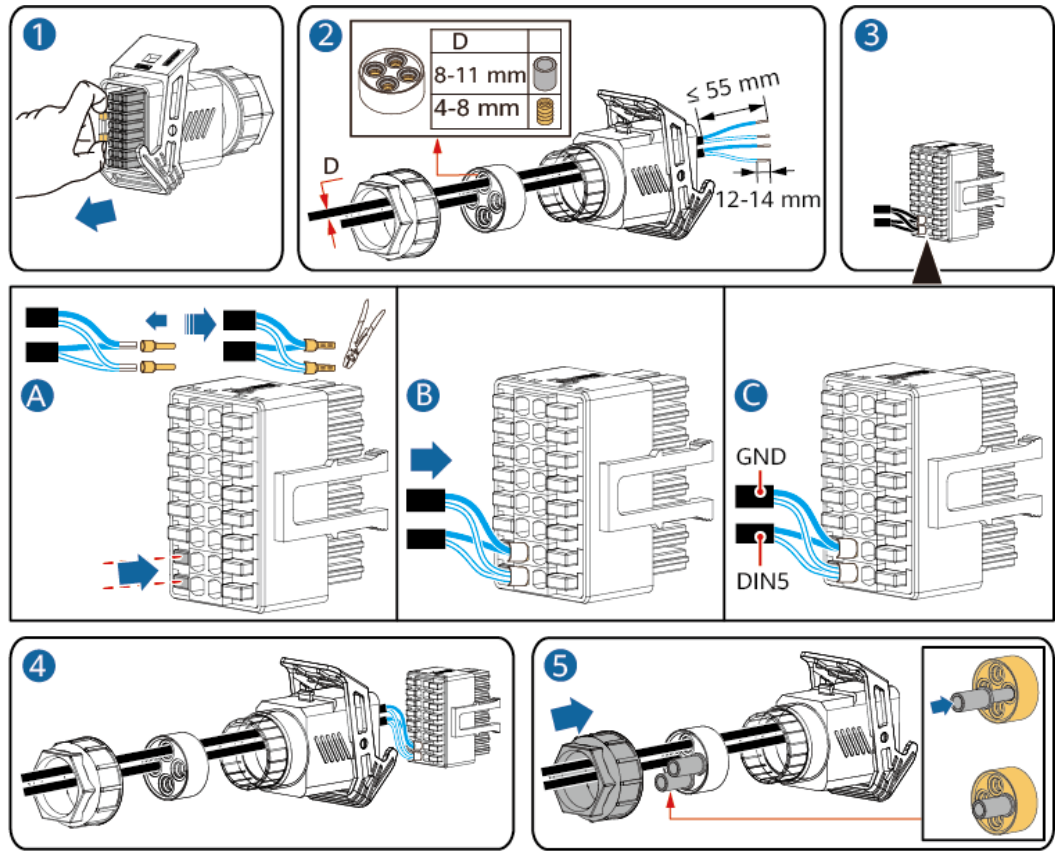
IS10I20021

Step 2 Connect the signal cable connectors to the COM ports.

Figure 5-38 Securing the signal cable connector
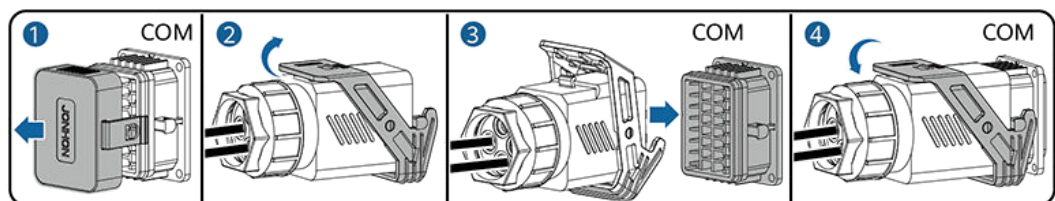
IS10I20007

----End

Setting NS Protection Remote Shutdown

☐ NOTE

- The NS protection function is applicable to grid code **VDE-AR-N-4105**, **SWITZERLAND-NA/EEA:2020-LV230**, or **ANRE**.

- The NS protection device is connected to the AI1 port and 12V power output port. The SmartLogger shuts down the inverter over the voltage change detected at the AI1 port. When the NS protection device is disconnected, the AI1 port voltage is 0 V, and the inverter shuts down. When the NS protection device is connected again, the AI1 port voltage is 12 V, and you need to start the inverter manually.

Figure 5-39 Connecting the SmartLogger to the NS protection switch
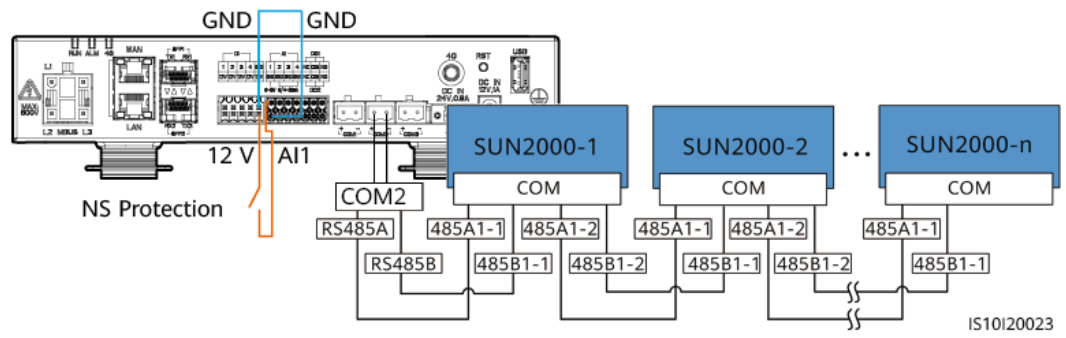
6 Commissioning

⚠️ **DANGER**

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

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.

6.1 Check Before Power-On

6.2 Powering On the System

6.1 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.

No.	Check Item	Acceptance Criteria
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.

6.2 Powering On the System

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.

> **NOTICE**
>
> ● Before turning on the AC switch between the SUN2000 and the power grid, use a multimeter set to the AC position to check that the AC voltage is within the specified range.
> ● If the DC is on and the AC is off, the SUN2000 reports a **Grid Failure** alarm. The SUN2000 starts normally only after the fault is automatically rectified.

Procedure

Step 1 Turn on the AC switch between the SUN2000 and the power grid.

Step 2 (Optional) Remove the locking screw from the DC switch.
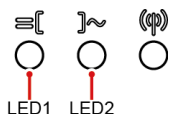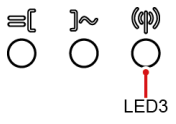
Figure 6-1 Removing the locking screw from a DC switch
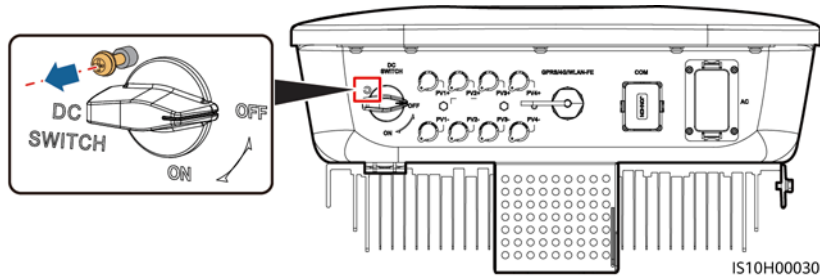
Step 3 If there is a DC switch between the PV string and the inverter, turn on the DC switch.

Step 4 Set the **DC SWITCH** at the bottom of the SUN2000 to the **ON** position.

Step 5 Wait for about 1 minute, and then observe the LED indicators of the inverter to check the running status.

Table 6-2 LED indicator description

Category	Status		Meaning
Running indication	**LED1**	**LED2**	N/A
	Steady green	Steady green	The SUN2000 is operating in grid-tied mode.
	Blinking green at long intervals (on for 1s and then off for 1s)	Off	The DC is on and the AC is off.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is on, the AC is on, and the SUN2000 is not exporting power to the power grid.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is off and the AC is on.
	Off	Off	Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	N/A	There is a DC environmental alarm, such as an alarm indicating that High String Input Voltage, String Reverse Connection, or Low Insulation Resistance.

Category	Status		Meaning
	N/A	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	There is an AC environmental alarm, such as an alarm indicating Grid Undervoltage, Grid Overvoltage, Grid Overfrequency, or Grid Underfrequency.
	Steady red	Steady red	Fault
Communication indication ⬱ ⎘ ⎘ ⬰ ᰍ ᰍ ○ ○ ○ LED3	**LED3**		N/A
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)		Communication is in progress. (When a mobile phone is connected to the SUN2000, the indicator first indicates that the phone is connected to the SUN2000): blinks green at long intervals.)
	Blinking green at long intervals (on for 1s and then off for 1s)		The mobile phone is connected to the SUN2000.
	Off		There is no communication.
Device replacement indication	**LED1**	**LED2**	**LED3**	N/A
	Steady red	Steady red	Steady red	The SUN2000 hardware is faulty. The SUN2000 needs to be replaced.

Step 6 (Optional) Observe the LED to check the operating status of the Smart Dongle.

- WLAN-FE Smart Dongle

Figure 6-2 WLAN-FE Smart Dongle
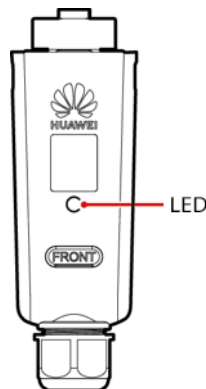
Table 6-3 LED indicator description

Indicators	Status	Remarks	Description
N/A	Off	Normal	The Smart Dongle is not secured or not powered on.

Indicators	Status	Remarks	Description
Yellow (blinking green and red simultaneously)	Steady on		The Smart Dongle is secured and powered on.
Red	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The parameters for connecting to the router are not set.
Red	Steady on	Abnormal	The Smart Dongle is faulty. Replace the Smart Dongle.
Blinking red and green alternatively	Blinking at long intervals (on for 1s and then off for 1s)	Abnormal	No communication with the SUN2000 – Remove and then insert the Smart Dongle. – Check whether the SUN2000 matches the Smart Dongle. – Connect the Smart Dongle to another SUN2000. Check whether the Smart Dongle is faulty or the USB port of the SUN2000 is faulty.
Green	Blinking at long intervals (on for 0.5s on and then off for 0.5s)	Normal	Connecting to the router.
Green	Steady on		Connected to the management system.
Green	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The SUN2000 communicates with the management system through the Smart Dongle.

- 4G Smart Dongle

Table 6-4 LED indicator description

LED Color	Status	Remarks	Description
N/A	Off	Normal	The Dongle is not secured or is not powered on.
Yellow (blinking green and red simultaneously)	Steady on	Normal	The Dongle is secured and powered on.
Green	Blinking in a 2-second cycle (on for 0.1s and then off for 1.9s)	Normal	Dialing (duration < 1 min).
		Abnormal	If the duration is longer than 1 min, the 4G parameter settings are incorrect. Reset the parameters.
	Blinking at long intervals (on for 1s and then off for 1s)	Normal	The dial-up connection is set up successfully (duration < 30s).
		Abnormal	If the duration is longer than 30s, the settings of the management system parameters are incorrect. Reset the parameters.
	Steady on	Normal	Successfully connected to the management system.
	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The inverter is communicating with the management system through the Dongle.
Red	Steady on	Abnormal	The Dongle is faulty. Replace Dongle.

LED Color	Status	Remarks	Description
	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The 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 the SIM card or remove and insert the SIM card.
	Blinking at long intervals (on for 1s and then off for 1s)		The Dongle fails to connect to the management system because it has no signals, weak signal, or no traffic. If the Dongle is reliably connected, check the SIM card signal through the APP. If no signal is received or the signal strength is weak, contact the carrier. Check whether the tariff and traffic of the SIM card are normal. If not, recharge the SIM card or buy traffic.
Blinking red and green alternatively	Blinking at long intervals (on for 1s and then off for 1s)		No communication with the inverter. – Remove and insert the Dongle. – Check whether inverters match the Dongle. – Connect the Dongle to other inverters. Check whether the Dongle or the USB port of the inverter is faulty.

----End

7 Man-Machine Interaction

7.1 App Commissioning

7.1.1 Downloading the FusionSolar App

- Method 1: Access https://solar.huawei.com using the mobile phone browser and download the latest installation package.

Figure 7-1 Download Mode
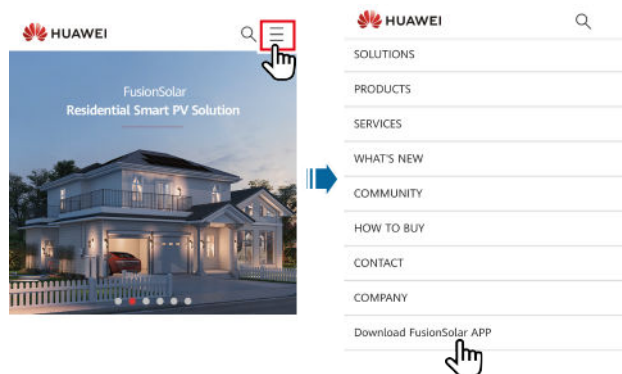
- Method 2: Search for FusionSolar on Huawei AppGallery and download the latest installation package.
- Method 3: Scan the following QR code and download the latest installation package.

Figure 7-2 QR code

FusionSolar

7.1.2 (Optional) Registering an Installer Account

📖 **NOTE**

- If you have an installer account, skip this step.
- You can register an account only using a mobile phone only in China.
- The mobile number or email address used for registration is the user name for logging in to the FusionSolar App.

Create the first installer account and create a domain named after the company name.

Figure 7-3 Creating the first installer account
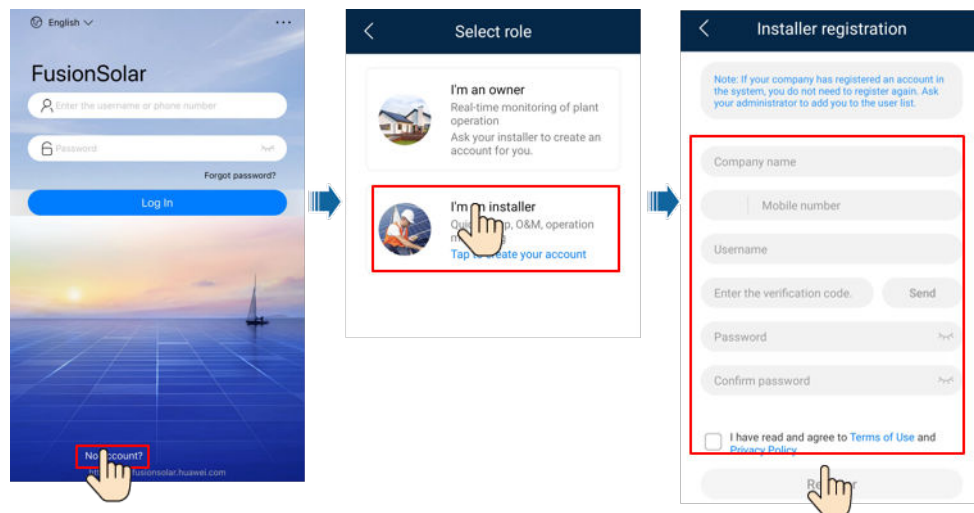
NOTICE

To create multiple installer accounts for a company, log in to the FusionSolar App and tap **Add User** to create an installer account.

Figure 7-4 Creating multiple installer accounts for the same company
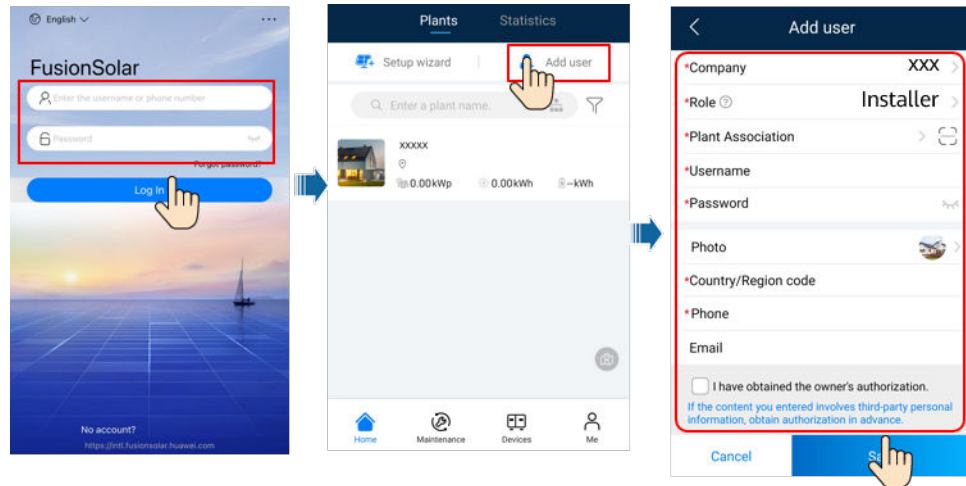
7.1.3 Creating a PV Plant and a User

Figure 7-5 Creating a PV plant and a user
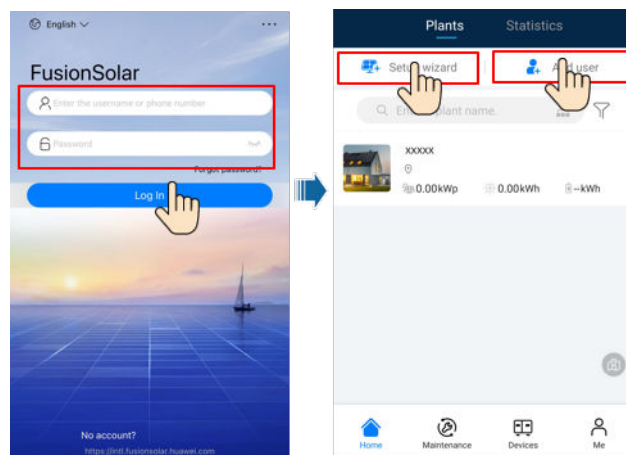
📖 **NOTE**

- In the quick settings, the grid code is set to N/A by default (automatic startup is not supported). Set the grid code based on the area where the PV plant is located.

- For details about how to use the site deployment wizard, see *FusionSolar App Quick Guide*. You can scan the QR code to download the quick guide.

7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers

☐ **NOTE**

- If smart PV optimizers are configured for PV strings, ensure that the smart PV optimizers have been successfully connected to the inverter before performing the operations in this section.
- Check that the SN labels of smart PV optimizers are correctly attached to the physical layout template.
- Take and save a photo of the physical layout template. Keep your phone parallel to the template and take a photo in landscape mode. Ensure that the four positioning points in the corners are in the frame. Ensure that each QR code is attached within the frame.
- For details about the physical layout of smart PV optimizers, see *FusionSolar App Quick Guide*. You can scan the QR code to download the quick guide.

Scenario 1: Setting on the FusionSolar Server Side (Solar Inverter Connected to the Management System)

Step 1 Log in to the FusionSolar App and tap the plant name on the **Home** screen to access the plant screen. Select **Layout**, tap ⬚, and upload the physical layout template photo as prompted.

Figure 7-6 Uploading the physical layout template photo (App)
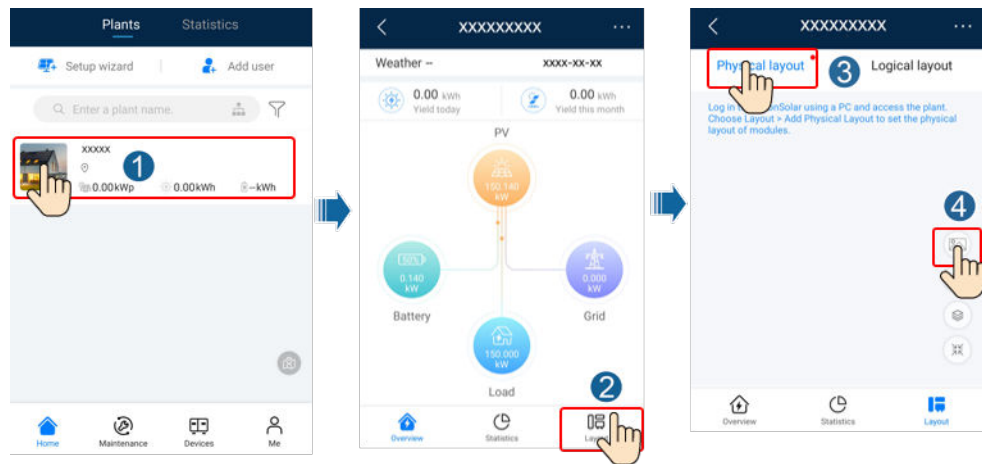
☐ **NOTE**

You can also upload the physical layout template photo on the WebUI as follows: Log in to https://intl.fusionsolar.huawei.com to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Choose **Layout**, click **Click to Upload**, and upload the physical layout template photo.

Figure 7-7 Uploading the physical layout template photo (WebUI)
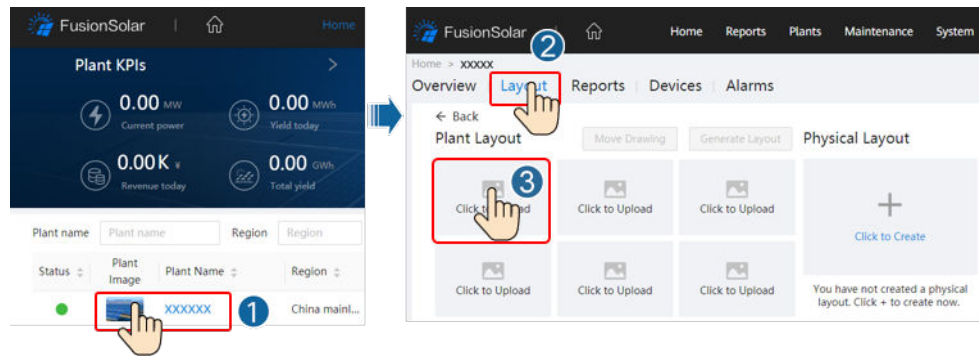
Step 2 Log in to https://intl.fusionsolar.huawei.com to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Select **Layout**. Choose **Generate layout**, and create a physical layout as prompted. You can also manually create a physical location layout.

Figure 7-8 Physical layout design of PV modules
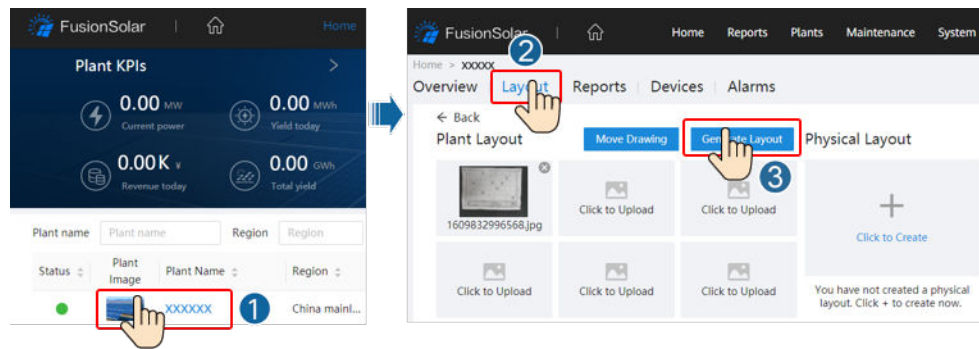
----**End**

Scenario 2: Setting on the Solar Inverter Side (Solar Inverter Not Connected to the Management System)

Step 1 Access the **Device Commissioning** screen on the FusionSolar App to set the physical layout of Smart PV Optimizers.

1. Log in to the FusionSolar App. On the **Device Commissioning** screen, choose **Maintenance** > **Optimizer layout**. The **Optimizer layout** screen is displayed.

2. Tap the blank area. The **Identify image** and **Add PV modules** buttons are displayed. You can use either of the following methods to perform operations as prompted:
   - Method 1: Tap **Identify image** and upload the physical layout template photo to complete the optimizer layout. (The optimizers that fail to be identified need to be manually bound.)
   - Method 2: Tap **Add PV modules** to manually add PV modules and bind the optimizers to the PV modules.

Figure 7-9 Physical layout design of PV modules
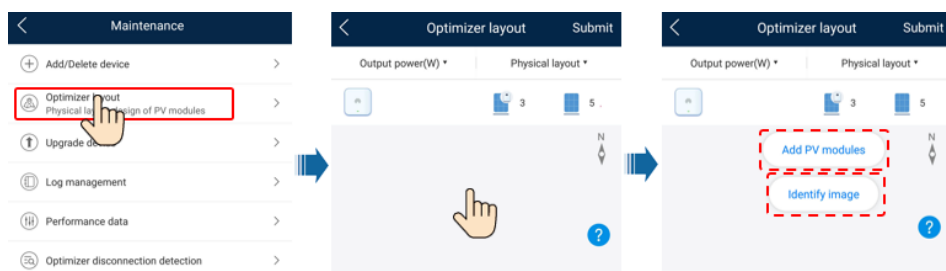
----End

7.1.5 Detecting Optimizer Disconnection

Log in to the FusionSolar app, choose **Device Commissioning** > **Maintenance** > **Optimizer disconnection detection**, tap the detection button to detect the optimizer disconnection, and rectify the fault based on the detection result.

Figure 7-10 Detect optimizer disconnection
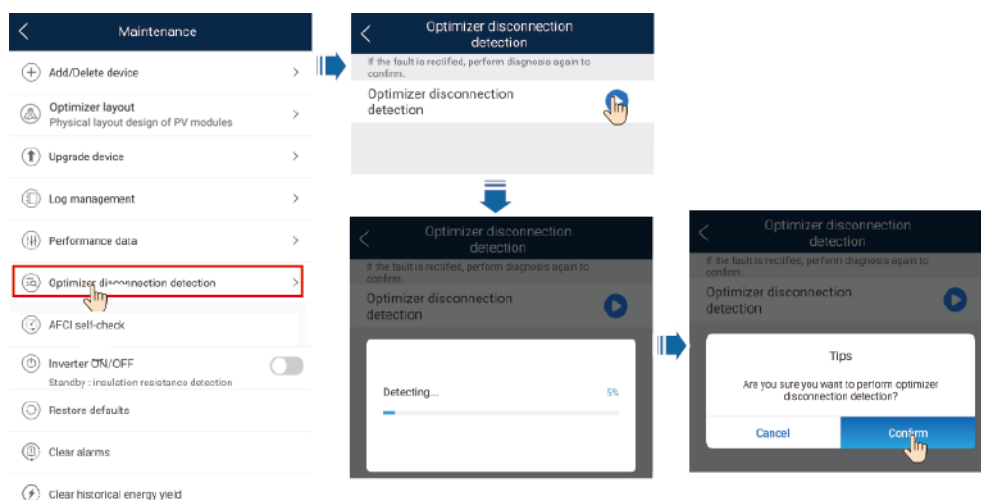
7.2 Parameters Settings

Go to the **Device Commissioning** screen and set inverter parameters. For details about entering the **Device Commissioning** screen, see **B Device Commissioning**.

To set more parameters, tap **Settings**. For details about the parameters, see the *FusionSolar App and SUN2000 App User Manual*. You can also scan the QR code to obtain the document.

7.2.1 Energy Control

7.2.1.1 Grid-tied Point Control

Function

Limits or reduces the output power of the PV power system to ensure that the output power is within the power deviation limit.

Procedure

Step 1 On the home screen, choose **Power adjustment** > **Grid-tied point control**.

Figure 7-11 Grid-tied point control
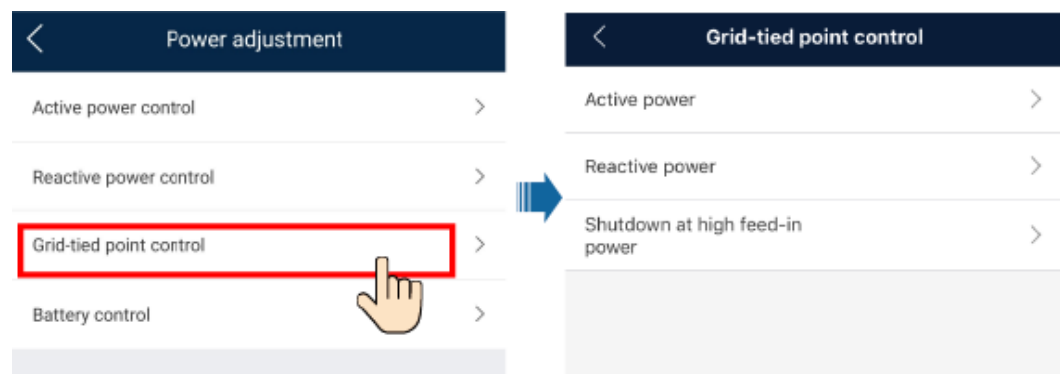
Table 7-1 Grid-tied point control

Parameter Name			Description
Active power	Unlimited	-	If this parameter is set to **Unlimited**, the output power of the inverter is not limited and the inverter can connect to the power grid at the rated power.
	Grid connection with zero power	Closed-loop controller	• If multiple inverters are cascaded, set this parameter to **SDongle/SmartLogger**. • If there is only one inverter, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.
		Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.

Parameter Name			Description
		Power control hysteresis	Specifies the dead zone for adjusting the inverter output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Active power output limit for fail-safe	Specifies the derating value of the inverter active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the inverter is disconnected, the Smart Dongle delivers the derating value of the inverter active power by percentage.
		Communication disconnection fail-safe	In the inverter anti-backfeeding scenario, if this parameter is set to **Enable**, the inverter will derate according to the active power derating percentage when the communication between the inverter and the Smart Dongle is disconnected for a period longer than **Communication disconnection detection time**.
		Communication disconnection detection time	Specifies the time for determining the communication disconnection between the inverter and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.
	Grid connection with limited power (kW)	Closed-loop controller	- If multiple inverters are cascaded, set this parameter to **SDongle/SmartLogger**. - If there is only one inverter, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.
		Maximum grid feed-in power	Specifies the maximum active power transmitted from the grid-tied point to the power grid.
		Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.

Parameter Name			Description
		Power control hysteresis	Specifies the dead zone for adjusting the inverter output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Active power output limit for fail-safe	Specifies the derating value of the inverter active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the inverter is disconnected, the Smart Dongle delivers the derating value of the inverter active power by percentage.
		Communication disconnection fail-safe	In the inverter anti-backfeeding scenario, if this parameter is set to **Enable**, the inverter will derate according to the active power derating percentage when the communication between the inverter and the Smart Dongle is disconnected for a period longer than **Communication disconnection detection time**.
		Communication disconnection detection time	Specifies the time for determining the communication disconnection between the inverter and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.
	Grid connection with limited power (%)	Closed-loop controller	- If multiple inverters are cascaded, set this parameter to **SDongle/ SmartLogger**. - If there is only one inverter, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.
		PV plant capacity	Specifies the total maximum active power in the inverter cascading scenario.
		Maximum grid feed-in power	Specifies the percentage of the maximum active power of the grid-tied point to the PV plant capacity.

Parameter Name			Description
		Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.
		Power control hysteresis	Specifies the dead zone for adjusting the inverter output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Active power output limit for fail-safe	Specifies the derating value of the inverter active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the inverter is disconnected, the Smart Dongle delivers the derating value of the inverter active power by percentage.
		Communication disconnection fail-safe	In the inverter anti-backfeeding scenario, if this parameter is set to **Enable**, the inverter will derate according to the active power derating percentage when the communication between the inverter and the Smart Dongle is disconnected for a period longer than **Communication disconnection detection time**.
		Communication disconnection detection time	Specifies the time for determining the communication disconnection between the inverter and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.
Shutdown at high feed-in power[a]	Shutdown at high feed-in power		• The default value is **Disable**. • If this parameter is set to **Enable**, the inverter shuts down for protection when the grid-connection point power exceeds the threshold and remains in this condition for the specified time threshold.
	Upper feed-in power threshold for inverter shutdown (kW)		• The default value is **0**. This parameter specifies the power threshold of the grid-connection point for triggering inverter shutdown.

Parameter Name	Description
High feed-in power duration threshold for triggering inverter shutdown (s)	The default value is **20**. This parameter specifies the duration threshold of high feed-in power for triggering inverter shutdown. ● When **High feed-in power duration threshold for triggering inverter shutdown** is set to 5, **Shutdown at high feed-in power** takes precedence. ● When **High feed-in power duration threshold for triggering inverter shutdown** is set to **20**, **Grid connection with limited power** takes precedence (when **Active power control** is set to **Grid connection with limited power**).
Note a: This parameter is supported only for the AS4777 grid code.	

----End

7.2.1.2 Apparent Power Control on the Inverter Output Side

On the home screen, tap **Settings > Power adjustment** to set inverter parameters.

Figure 7-12 Apparent power control
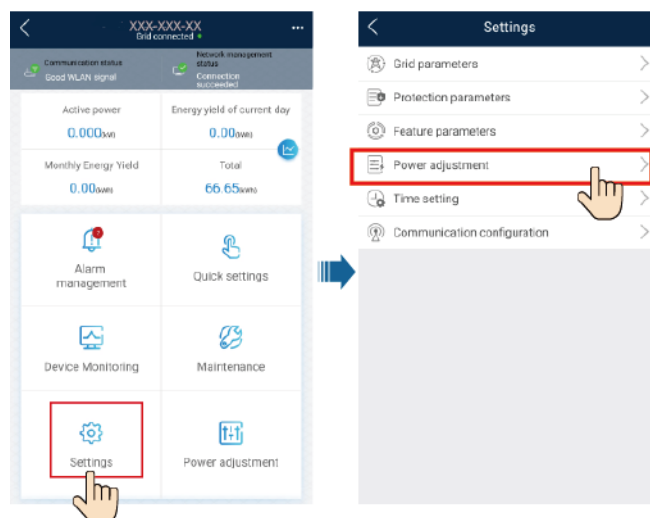
Table 7-2 Apparent power

Parameter	Description	Value Range
Maximum apparent power (kVA)	Specifies the output upper threshold for the maximum apparent power to adapt to the capacity requirements of standard and customized inverters.	[Maximum active power, S_{max}]
Maximum active power (kW)	Specifies the output upper threshold for the maximum active power to adapt to different market requirements.	[0.1, P_{max}]

☐ NOTE

The lower threshold for the maximum apparent power is the maximum active power. To lower the maximum apparent power, lower the maximum active power first.

7.2.2 AFCI

Function

If PV modules or cables are not properly connected or damaged, electric arcs may occur, which may cause fire. Huawei inverters provide unique arc detection in compliance with UL 1699B-2018 to ensure the safety of users' lives and property.

This function is enabled by default. The inverter automatically detects arc faults. To disable this function, log in to the FusionSolar App, enter the **Device Commissioning** screen, choose **Settings** > **Feature parameters**, and disable **AFCI**.

☐ NOTE

The AFCI function works only with Huawei optimizers or ordinary PV modules, 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 an 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 inverter so that it can work properly.

You can manually clear the alarm as follows:

- **Method 1**: FusionSolar App

  Log in to the FusionSolar App and choose **Me** > **Device commissioning**. On the **Device commissioning** screen, connect and log in to the inverter that

generates the AFCI alarm, tap **Alarm management**, and tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.

Figure 7-13 Alarm management
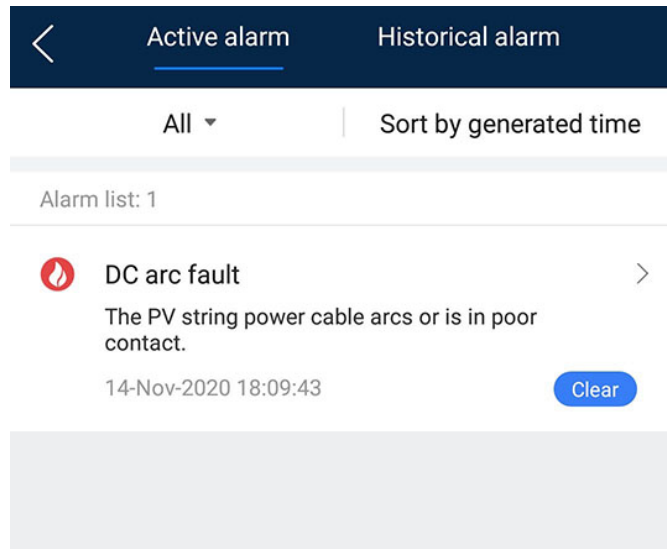
- **Method 2**: FusionSolar Smart PV Management System

    Log in to the FusionSolar Smart PV Management System using a non-owner account, choose **Maintenance** > **Alarm Management**, select the **DC arc fault** alarm, and click **Clear** to clear the alarm.

Figure 7-14 Clearing alarms
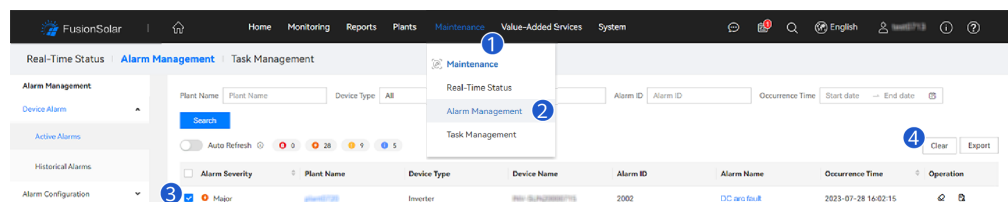
    Switch to the owner account with PV plant management rights. On the home page, click the PV plant name to go to the PV plant page, and click **OK** as prompted to clear the alarm.

7.2.3 IPS Check (for Italy CEI0-21 Grid Code Only)

Function

The Italy CEI0-21 grid code requires an IPS check for the inverter. During the self-check, the inverter checks the protection threshold and protection time of the maximum voltage over 10 min (59.S1), maximum overvoltage (59.S2), minimum undervoltage (27.S1), minimum undervoltage (27.S2), maximum overfrequency (81.S1), maximum overfrequency (81.S2), minimum underfrequency (81.S), and minimum underfrequency (81.S2).

Procedure

Step 1   On the home screen, choose **Maintenance** > **IPS test** to access the IPS test screen.

Step 2   Tap **Start** to start an IPS test. The inverter detects maximum voltage over 10 min (59.S1), maximum overvoltage (59.S2), minimum undervoltage (27.S1), minimum undervoltage (27.S2), maximum overfrequency (81.S1), maximum overfrequency (81.S2), and minimum underfrequency (81.S1), and minimum underfrequency (81.S2).

Figure 7-15 IPS test
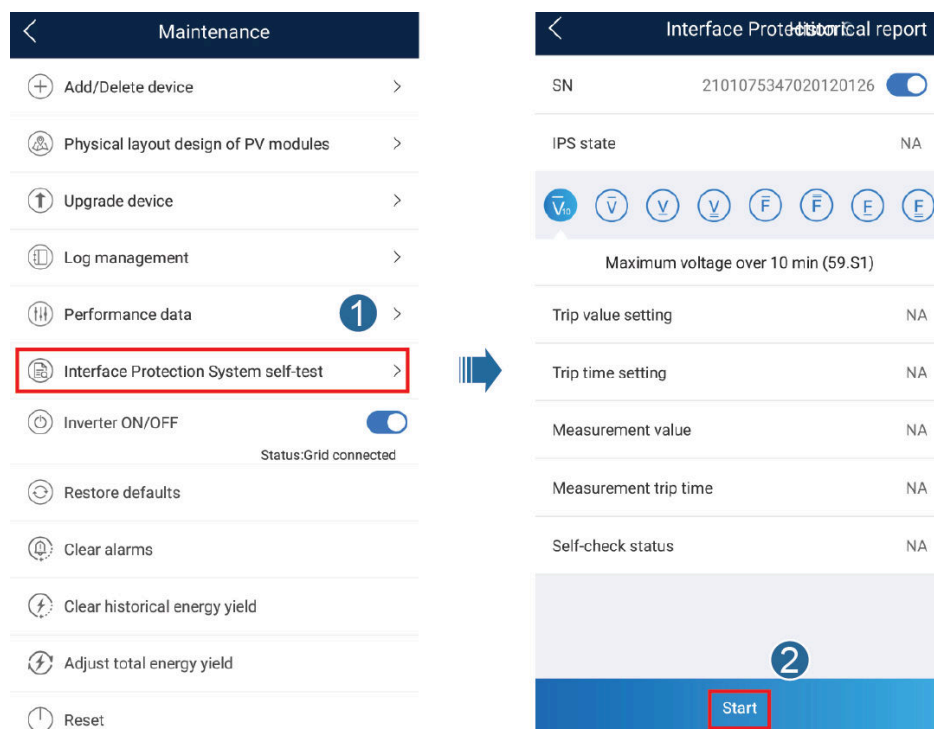
Table 7-3 IPS test type

IPS Test Type	Description
Maximum voltage over 10 min (59.S1)	The default maximum voltage over 10 min protection threshold is 253 V (1.10 Vn), and the default protection time threshold is 3s.
Maximum overvoltage (59.S2)	The default overvoltage protection threshold is 264.5 V (1.15 Vn), and the default protection time threshold is 0.2s.
Minimum undervoltage (27.S1)	The default undervoltage protection threshold is 195.5 V (0.85 Vn), and the default protection time threshold is 1.5s.
Minimum undervoltage (27.S2)	The default undervoltage protection threshold is 34.5 V (0.15 Vn), and the default protection time threshold is 0.2s.

IPS Test Type	Description
Maximum overfrequency (81.S1)	The default overfrequency protection threshold is 50.2 Hz, and the default protection time threshold is 0.1s.
Maximum overfrequency (81.S2)	The default overfrequency protection threshold is 51.5 Hz, and the default protection time threshold is 0.1s.
Minimum underfrequency (81.S1)	The default underfrequency protection threshold is 49.8 Hz, and the default protection time threshold is 0.1s.
Minimum underfrequency (81.S2)	The default underfrequency protection threshold is 47.5 Hz, and the default protection time threshold is 0.1s.

Step 3 After the IPS test is complete, **IPS State** is displayed as **IPS state success**. Tap **Historical report** in the upper right corner of the screen to view the IPS check report.

----End

7.3 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 7-16 SmartLogger3000

8 Maintenance

Prerequisites

⚠️ **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 System Power-Off
8.2 Routine Maintenance
8.3 Alarm Reference

8.1 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.
- Before maintaining the optimizers and PV strings, power off the system by performing the following steps. Otherwise, the PV strings may be energized, resulting in electric shocks.

Procedure

Step 1 Send a shutdown command on the app.

Step 2 Turn off the AC switch between the SUN2000 and the power grid.

Step 3 Turn off the DC switch at the bottom of the SUN2000.

Step 4 (Optional) Install the locking screw for the DC switch.

Figure 8-1 Installing a locking screw for the DC switch
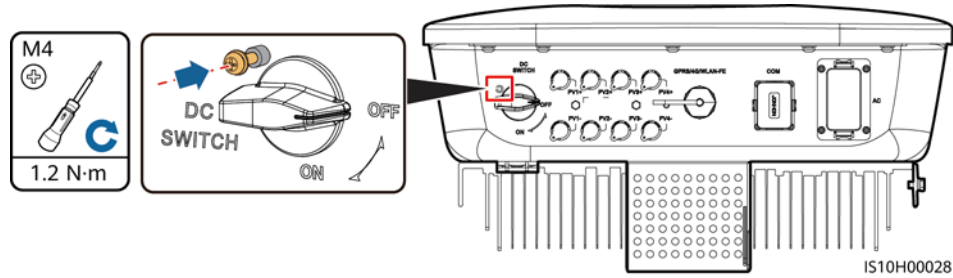
Step 5 Turn off the DC switch between the SUN2000 and PV strings.

----End

8.2 Routine Maintenance

To ensure that the SUN2000 can operate properly for a long term, you are advised to perform routine maintenance on it as described in this chapter.

> ⚠ **CAUTION**
>
> Before cleaning the system, connecting cables, and maintaining the grounding reliability, power off the system.

Table 8-1 Maintenance list

Check Detail	Check Method	Maintenance Interval
System cleanliness	Check the heat sink for foreign matter or the overall health of the SUN2000.	Annual or every time an abnormality is detected
System running status	Check the SUN2000 for damage or deformation.	Annual
Electrical connections	• Cables are securely connected. • Cables are intact, in particular, the parts touching the metallic surface are not scratched.	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.
Grounding reliability	Check whether the ground terminal and ground cable are securely connected.	Annual
Sealing	Check whether all terminals and ports are properly sealed.	Annual

8.3 Alarm Reference

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

9 Handling the Inverter

9.1 Removing a SUN2000

Procedure

Step 1 Power off the SUN2000. For details, see **8.1 System Power-Off**.

Step 2 Disconnect all cables from the SUN2000, including signal cables, DC input power cables, AC output power cables, and PE cables.

Step 3 (Optional) Remove the Smart Dongle from the SUN2000.

Step 4 Remove the SUN2000 from the mounting bracket.

Step 5 Remove the mounting bracket.

----End

9.2 Packing the SUN2000

- If the original packing materials are available, put the SUN2000 inside them and then seal them by using adhesive tape.
- If the original packing materials are not available, put the SUN2000 inside a suitable cardboard box and seal it properly.

9.3 Disposing of the SUN2000

If the SUN2000 service life expires, dispose of it according to the local disposal rules for electrical equipment waste.

10 Technical Data

10.1 SUN2000 Technical Specifications

Efficiency

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Maximum efficiency	98.5%	98.5%	98.5%	98.65%	98.65%	98.65%
European efficiency	98.0%	98.0%	98.0%	98.3%	98.3%	98.3%

Input

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Maximum input voltage[a]	1080 V					
Maximum input current (per MPPT)	22 A/27 A (Subject to the product nameplate)					
Maximum short-circuit current (per MPPT)	30 A/39 A (Subject to the product nameplate)					

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Maximum inverter backfeed current to the PV array	0 A					
Minimum startup voltage	200 V					
Operating voltage range[b]	160–950 V					
Full-load MPPT voltage range	320–850 V	320–850 V	380–850 V	380–850 V	400–850 V	480–850 V
Rated input voltage	600 V					
Number of input routes	4					
Number of MPP trackers	2					
Note a: The maximum input voltage is the upper threshold of the DC voltage. If the input voltage exceeds the threshold, the solar inverter may be damaged.						
Note b: If the input voltage is beyond the operating voltage range, the solar inverter cannot work properly.						

Output

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Rated active power	8000 W	10000 W	12000 W	15000 W	17000 W	20000 W
Maximum apparent power	8800 VA	11000 VA	13200 VA	16500 VA	18700 VA	22000 VA
Maximum active power (cosϕ = 1)	8800 W	11000 W	13200 W	16500 W	18700 W	22000 W
Rated output voltage	220/380 V, 230/400 V, 3W + (N) + PE					
Rated output current	12.8 A (380 V)/ 11.6 A (400 V)	15.9 A (380 V)/ 14.5 A (400 V)	18.2 A (380 V)/ 17.3 A (400 V)	22.8 A (380 V)/ 21.7 A (400 V)	25.8 A (380 V)/ 24.6 A (400 V)	30.4 A (380 V)/ 28.9 A (400 V)

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Maximum output current	13.4 A	17 A	20 A	25.2 A	28.5 A	33.5 A
Rated apparent power	8 kVA	10 kVA	12 kVA	15 kVA	17 kVA	20 kVA
Inrush current	13.4 A	17 A	20 A	25.2 A	28.5 A	33.5 A
Max output fault current	40.16 A	50.2 A	60.2 A	75.3 A	85.34 A	100.4 A
Max output overcurrent protection	48.8 A	48.8 A	48.8 A	48.8 A	48.8 A	48.8 A
Adapted power grid frequency	50/60 Hz					
Power factor	0.8 leading... 0.8 lagging					
Maximum total harmonic distortion (rated power)	< 3%					

Protection and Feature

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Overvoltage category	PV II/AC III					
Input DC switch	Supported					
Islanding protection	Supported					
Output overcurrent protection	Supported					
Input reverse connection protection	Supported					
PV string fault detection	Supported					
DC surge protection	DC common mode: 20 kA					

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
AC surge protection	Common mode: 5 kA; differential mode: 5 kA					
Insulation resistance detection	Supported					
RCD detection	Supported					
PV module safe shutdown, optimizer	Optional					
PID repair	Supported					
AFCI	Supported					
Active anti-islanding method	AFD					
Protection class	I					
PV and AC port	DVCC					
Communication port	DVCA					

Display and Communication

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Display	LED indicators; WLAN + app					
RS485	Supported					
Communications expansion module	(Optional) WLAN/GPRS/4G					
remote ripple control	Supported					

☐ NOTE

When the DC input voltage of the inverter is less than 160 V, the inverter shuts down without communication.

Common Parameters

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Dimensions (W x H x D)	525 mm × 470 mm × 262 mm (including only the rear mounting kit of the SUN2000)					
Net weight	25 kg (including only the rear mounting kit of the SUN2000)					
Noise	29 dB (A) (typical working condition)					
Operating temperature	–25°C to +60°C (derated when the temperature is higher than 45°C)					
Operating humidity	0–100% RH					
Cooling mode	Natural convection					
Maximum operating altitude	4000 m (derated when the altitude is greater than 2000 m)					
Storage temperature	–40°C to +70°C					
Storage humidity	5–95% RH (non-condensing)					
Input terminal	Staubli MC4					
Output terminal	Waterproof quick-connect terminal					
IP rating	IP65					
Topology	Non-Isolation					
Environmental protection requirements	RoHS 6					

Wireless Communication Parameters

Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
Frequency	2400–2483.5 MHz	SDongleA-05: 2400–2483.5 MHz	SDongleA-03-EU: • Supports LTE-FDD: B1/B3/B7/B8/B20. • Supports LTE-TDD: B38/B40. • Supports WCDMA/HSDPA/ HSUPA/HSPA+: B1/B8. • Supports GSM/GPRS/EDGE: 900 MHz/1800 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.
Protocol standard	WLAN 802.11b/g/n	SDongleA-05: WLAN 802.11b/g/n	SDongleA-03-EU: • Supports LTE-FDD (with receive diversity): B1/B3/B7/B8/B20/B28. • Supports LTE-FDD (with receive diversity): B38/B40/B41. • Supports WCDMA: B1/B8. • Supports GSM: 900 MHz/1800 MHz. • Supports digital audio. 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.

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: • Supports EDGE multislot class 12.

Specifications	Inverter Built-in WiFi	WLAN-FE Smart Dongle	4G Smart Dongle
			• 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

10.2 Optimizer Technical Specifications

Efficiency

Technical Specifications	SUN2000-450W-P
Maximum efficiency	99.5%
European weighted efficiency	99.0%

Input

Technical Specifications	SUN2000-450W-P
Rated PV module power	450 W
Maximum PV module power	472.5 W
Maximum input voltage	80 V
MPPT voltage range	8–80 V
Maximum short-circuit current	13 A
Overvoltage level	II

Output

Technical Specifications	SUN2000-450W-P
Rated output power	450 W
Output voltage	4–80 V
Maximum output current	15 A
Output bypass	Yes
Shutdown output voltage/impedance	0 V/1 kΩ (±10%)

Common Parameters

Technical Specifications	SUN2000-450W-P
Dimensions (W x H x D)	71 mm x 138 mm x 25 mm
Net weight	≤ 550 g
DC input and output terminals	Staubli MC4

Technical Specifications	SUN2000-450W-P
Operating temperature	−40°C to +85°C
Storage temperature	−40°C to +70°C
Operating humidity	0–100% RH
Maximum operating altitude	4000 m
IP rating	IP68
Installation mode	● PV module support installation ● PV module frame installation

Long String Design (Full Optimizer Configuration)

Technical Specifications	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
Minimum optimizer number per string	6					
Maximum optimizer number per string	35					
Maximum DC power per string	10,000 W					

A Grid Codes

📖 **NOTE**

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

Table A-1 Grid Codes

National/ Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL- M2	SUN2000-12KTL- M2	SUN2000-15KTL- M2	SUN2000-17KTL- M2	SUN2000-20KTL- M2
VDE-AR-N-4105	Germany low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
UTE C 15-712-1 (A)	France mainland low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
UTE C 15-712-1 (B)	France island power grid (230 V 50 Hz)	Supported	Supported	Supported	Supported	Supported	Supported

National/Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL-M2	SUN2000-12KTL-M2	SUN2000-15KTL-M2	SUN2000-17KTL-M2	SUN2000-20KTL-M2
UTE C 15-712-1 (C)	France island power grid (230 V 60 Hz)	Supported	Supported	Supported	Supported	Supported	Supported
CEI0-21	Italy low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
EN50438-CZ	Czech Republic low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
RD1699/66 1	Spain low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
EN50438-NL	Netherlands low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
C10/11	Belgium low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported

National/ Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL- M2	SUN2000-12KTL- M2	SUN2000-15KTL- M2	SUN2000-17KTL- M2	SUN2000-20KTL- M2
IEC61727	IEC61727 low-voltage power grid (50 Hz)	Supported	Supported	Supported	Supported	Supported	Supported
User-defined (50 Hz)	Reserved	Supported	Supported	Supported	Supported	Supported	Supported
User-defined (60 Hz)	Reserved	Supported	Supported	Supported	Supported	Supported	Supported
CEI0-16	Italy low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
TAI-PEA	Thailand low-voltage power grid (PEA)	Supported	Supported	Supported	Supported	Supported	Supported
TAI-MEA	Thailand low-voltage power grid (MEA)	Supported	Supported	Supported	Supported	Supported	Supported

National/ Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL- M2	SUN2000-12KTL- M2	SUN2000-15KTL- M2	SUN2000-17KTL- M2	SUN2000-20KTL- M2
EN50438- TR	Turkey low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
IEC61727- 60Hz	IEC61727 low-voltage power grid (60 Hz)	Supported	Supported	Supported	Supported	Supported	Supported
EN50438_I E	Ireland low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
PO12.3	Spain low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
EN50549- LV	Ireland power grid	Supported	Supported	Supported	Supported	Supported	Supported
ABNT NBR 16149	Brazil low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
DUBAI	Dubai low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported

National/ Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL- M2	SUN2000-12KTL- M2	SUN2000-15KTL- M2	SUN2000-17KTL- M2	SUN2000-20KTL- M2
TAIPOWER	Taiwan low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
EN50438- SE	Sweden LV	Supported	Supported	Supported	Supported	Supported	Supported
EN50549- SE	Sweden LV	Supported	Supported	Supported	Supported	Supported	Supported
Austria	Austria	Supported	Supported	Supported	Supported	Supported	Supported
G98	United Kingdom G98	Supported	Supported	N/A	N/A	N/A	N/A
G99-TYPEA-LV	United Kingdom G99-TypeA-LV	Supported	Supported	Supported	Supported	Supported	Supported
VDE-AR-N4110	Germany 230 V MV	Supported	Supported	Supported	Supported	Supported	Supported
SINGAPOR E	Singapor e LV power grid	Supported	Supported	Supported	Supported	Supported	Supported
HONGKO NG	Hong Kong LV power grid	Supported	Supported	Supported	Supported	Supported	Supported
EN50549- PL	Poland	Supported	Supported	Supported	Supported	Supported	Supported
EN50549-MV400	Ireland New standard	-	-	Supported	Supported	Supported	Supported

| National/ Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL- M2	SUN2000-12KTL- M2	SUN2000-15KTL- M2	SUN2000-17KTL- M2	SUN2000-20KTL- M2
DENMARK - EN50549- DK1- LV230	Denmark power grid	Supported	Supported	Supported	Supported	Supported	Supported
DENMARK - EN50549- DK2- LV230	Denmark power grid	Supported	Supported	Supported	Supported	Supported	Supported
SWITZERL AND-NA/ EEA:2020- LV230	Switzerla nd	Supported	Supported	Supported	Supported	Supported	Supported
AUSTRALI A-AS4777_ A- LV230	Australia	Supported	Supported	Supported	Supported	Supported	Supported
AUSTRALI A-AS4777_ B- LV230	Australia	Supported	Supported	Supported	Supported	Supported	Supported
AUSTRALI A-AS4777_ C- LV230	Australia	Supported	Supported	Supported	Supported	Supported	Supported
AUSTRALI A-AS4777_ N Z- LV230	Australia	Supported	Supported	Supported	Supported	Supported	Supported
Pakistan	Pakistan	-	-	Supported	Supported	Supported	Supported

| National/ Regional Grid Code	Description	SUN2000-8KTL-M2	SUN2000-10KTL- M2	SUN2000-12KTL- M2	SUN2000-15KTL- M2	SUN2000-17KTL- M2	SUN2000-20KTL- M2
OMAN	Oman low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported
CZECH-EN50549- LV230	Czech power grid	Supported	Supported	Supported	Supported	Supported	Supported
ANRE	Romania low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported

B Device Commissioning

Step 1 Access **Device Commissioning** screen.

Figure B-1 Method 1: before login (not connected to the Internet)
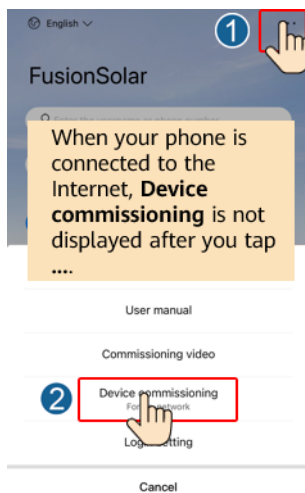
Figure B-2 Method 2: after login (connected to the Internet)
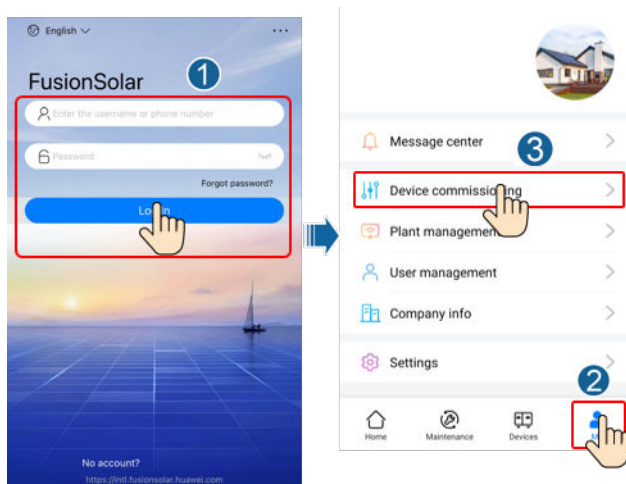
Step 2 Connect to the solar inverter WLAN and log in to the device commissioning screen as the **installer** user.

NOTICE

- If the mobile phone is directly connected to the inverter, the visible distance between theinverter0 and the mobile phone must be less than 3 m when a built-in antenna is used and less than 50 m when an external antenna is used to ensure the communication quality between the App and theinverter0. The distances are for reference only and may vary with mobile phones and shielding conditions.

- When connecting the inverter to the WLAN over a router, ensure that the mobile phone and inverter are in the WLAN coverage of the router and the inverter is connected to the router.

- 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. Enterprise-level encryption is not supported (for example, public hotspots requiring authentication such as airport WLAN). WEP and WPA TKIP are not recommended because these two encryption modes have serious security defects. 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.


📖 **NOTE**

- Obtain the initial password for connecting to the solar inverter WLAN from the label on the side of the solar inverter.

- Set the password at the first login. To ensure account security, change the password periodically and keep the new password in mind. Not changing the initial password may cause password disclosure. A password left unchanged for a long period of time may be stolen or cracked. If a password is lost, devices cannot be accessed. In these cases, the user is liable for any loss caused to the PV plant.

- When you access the **Device Commissioning** screen of the inverter for the first time, you need to manually set the login password because the inverter does not have an initial login password.

----End

C Resetting Password

Step 1 Ensure that the SUN2000 connects to the AC and DC power supplies at the same time. Indicators ⟟ and ⊨ are steady green or blink at long intervals for more than 3 minutes.

Step 2 Perform the following operations within 4 minutes:

1. Turn off the AC switch and set the DC switch at the bottom of the SUN2000 to OFF. Wait until all the LED indicators on the SUN2000 panel turn off.

2. Turn on the AC switch, set the DC switch to ON, and wait for about 90s. Ensure that the indicator ⟟ is blinking green slowly.

3. Turn off the AC switch and set the DC switch to OFF. Wait until all LED indicators on the SUN2000 panel are off.

4. Turn on the AC switch and set the DC switch to ON.

Step 3 Reset the password within 10 minutes. (If no operation is performed within 10 minutes, all inverter parameters remain unchanged.)

1. Wait until the indicator ⟟ blinks green at long intervals.

2. Obtain the initial WLAN hotspot name (SSID) and initial password (PSW) from the label on the side of the SUN2000 and connect to the app.

3. On the login screen, set a new login password and log in to the app.
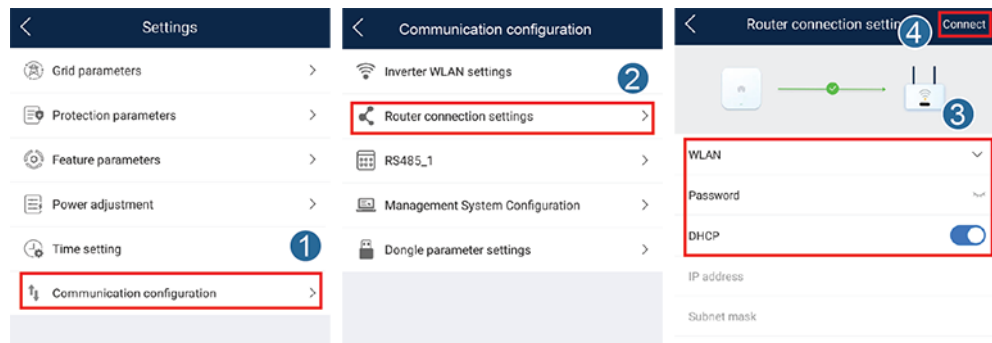
Figure C-1 Setting the password
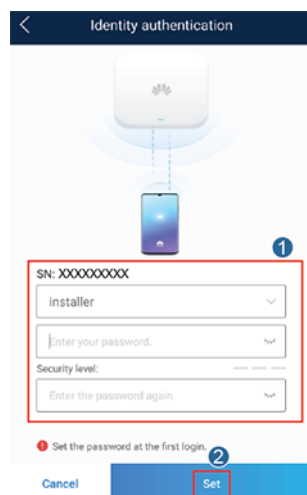
Step 4 Set router and management system parameters to implement remote management.

- Setting router parameters

  Log in to the FusionSolar app, choose **Device Commissioning** > **Settings** > **Communication configuration** > **Router connection settings**, and set router parameters.
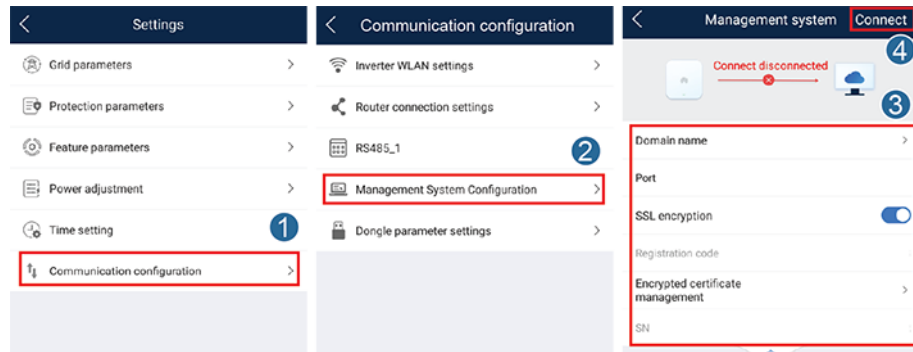
  Figure C-2 Setting router parameters

- Setting management system parameters

  Log in to the FusionSolar app, choose **Device Commissioning** > **Settings** > **Communication configuration** > **Management System Configuration**, and set management system parameters.
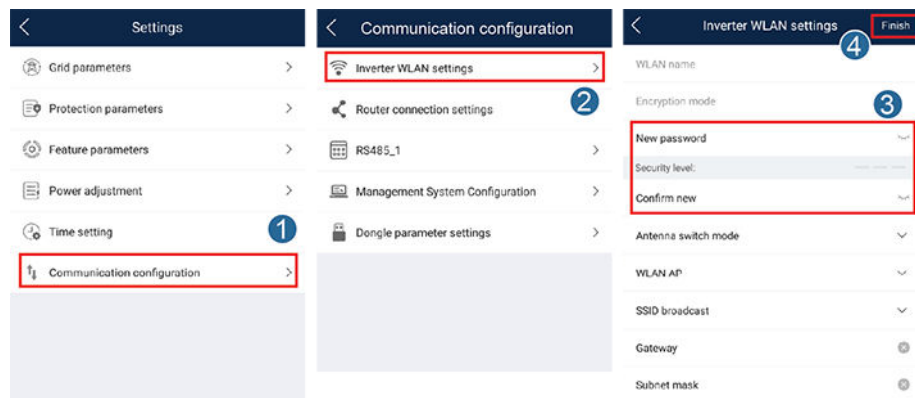
  Figure C-3 Setting management system parameters

- (Optional) Resetting the WLAN password

  Log in to the FusionSolar app, choose **Device Commissioning** > **Settings** > **Communication configuration** > **Inverter WLAN settings**, and reset the WLAN password.

Figure C-4 Resetting the WLAN password

----**End**

D Rapid Shutdown

📖 **NOTE**

● If optimizers are configured for some PV modules, the rapid shutdown function is not supported.

When all PV modules connected to the solar inverter are configured with optimizers, the PV system shuts down quickly and reduces the output voltage of the PV string to below 30 V within 30 seconds.

Perform the following step to trigger rapid shutdown:

● Method 1: 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.

● Method 2: Turn off the AC switch between the inverter and the power grid.

● Method 3: Set the DC switch at the bottom of the SUN2000 to OFF to trigger a rapid shutdown. The SUN2000 shuts down several minutes later. (Turning off all external switches on the DC side of the SUN2000 triggers a rapid shutdown, whereas turning off only some external switches will not trigger a rapid shutdown. PV strings may be energized.)

● Method 4: If **AFCI** is enabled, the inverter automatically detects arc faults, triggering a rapid shutdown.

E Acronyms and Abbreviations

A

ACDU   alternating current distribution unit

AFCI   arc-fault circuit interrupter

L

LED   light emitting diode

M

MPP   maximum power point

MPPT   maximum power point tracking

P

PV   photovoltaic

R

RCD   residual current device

W

WEEE   waste electrical and electronic equipment