SUN2000-(2KTL-6KTL)-L1

User Manual

Issue	17
Date	2023-11-03



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About This Document

Purpose

This document describes the SUN2000-(2KTL-6KTL)-L1 (SUN2000 for short) in terms of its installation, electrical connection, commissioning, maintenance, and troubleshooting. Before installing and operating the SUN2000, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

Intended Audience

This document is Applicable to:

- 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.
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.

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Symbol	Description
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

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

Issue 17 (2023-11-03)

Updated **5.6 Connecting an AC Output Power Cable**.

Issue 16 (2023-09-30)

Updated **7.2.1.4 Capacity Control**.

Issue 15 (2023-09-06)

Updated **A Grid Code**.

Issue 14 (2023-08-23)

Updated **D Rapid Shutdown**.

Issue 13 (2023-07-30)

Updated **2.3 Label Description**.

Updated **10.1 SUN2000 Technical Specifications**.

Issue 12 (2023-06-01)

Updated **2.1 Overview**.

Issue 11 (2023-04-10)

Updated **A Grid Code**.

Issue 10 (2023-02-13)

- Updated **5.2 Preparing Cables**.
- Updated **5.9 (Optional) Connecting Signal Cables**.
- 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**.

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- Updated **7.2 Parameters Settings**.

Issue 09 (2022-08-25)

- Updated **5.2 Preparing Cables**.
- Updated **5.6 Connecting an AC Output Power Cable**.
- Added **7.2.1.4 Capacity Control**.
- Updated **10.1 SUN2000 Technical Specifications**.
- Updated **A Grid Code**.
- Added **F AI Energy Management Assistant (EMMA)**.
- Added **Contact Information**.

Issue 08 (2022-06-01)

Updated **10.1 SUN2000 Technical Specifications**.

Issue 07 (2022-03-04)

- Updated **5.9 (Optional) Connecting Signal Cables**.
- Updated **C Resetting Password**.
- Updated **D Rapid Shutdown**.

Issue 06 (2022-01-13)

- Updated **5.8 (Optional) Connecting Battery Cables**.
- Updated **5.9 (Optional) Connecting Signal Cables**.
- Updated **7.1.3 Creating a PV Plant and a User**.
- Updated **7.2.1 Energy Control**.
- Updated **10.1 SUN2000 Technical Specifications**.

Issue 05 (2021-08-10)

- Updated **5.7 Connecting DC Input Power Cables**.
- Updated **5.8 (Optional) Connecting Battery Cables**.
- Updated **5.9 (Optional) Connecting Signal Cables**.
- Updated **7.1 App Commissioning**.
- Updated **7.2.1.3 Battery Control**.
- Updated **B Device Commissioning**.
- Updated **D Rapid Shutdown**.

Issue 04 (2021-04-01)

- Updated **5.2 Preparing Cables**.
- Updated **6.2 System Power-On**.
- Updated **8.3 Troubleshooting**.

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Issue 03 (2020-09-15)

- Updated **5.3 Connecting PE Cables**.
- Updated **8.3 Troubleshooting**.

Issue 02 (2020-06-09)

- Updated **4.2 Preparing Tools and Instruments**.
- Updated **5.2 Preparing Cables**.
- Updated **5.7 Connecting DC Input Power Cables**.
- Updated **5.9 (Optional) Connecting Signal Cables**.
- Updated **7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers**.
- Updated **C Resetting Password**.

Issue 01 (2020-04-17)

This issue is the first official release.

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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.

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- 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

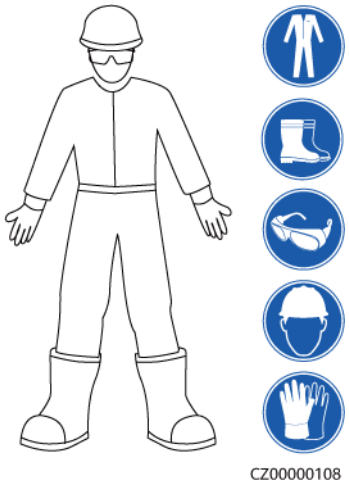
During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

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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

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  - 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 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.

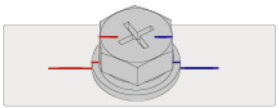
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CAUTION

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 before operating 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.

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- 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.

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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

- Ensure that the equipment is stored in a clean, dry, and well ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.
- 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.

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- 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 (recommended area: 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

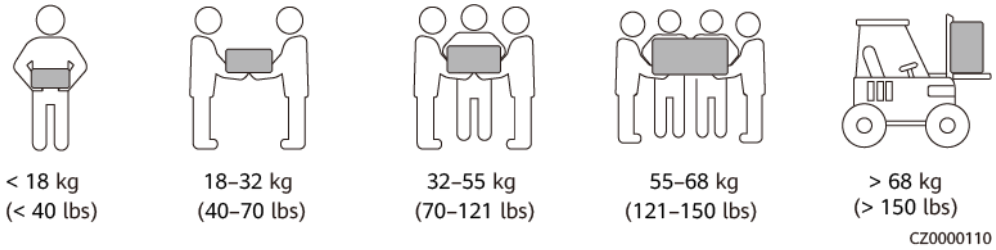
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches must not be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.

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- Do not install other devices on the top of the equipment without evaluation by the Company.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea, roads in good conditions, or airplanes for transportation. Do not transport the equipment by railway. Avoid tilt or jolt during transportation.

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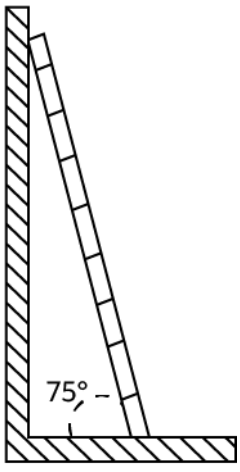
Using Ladders

- 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.



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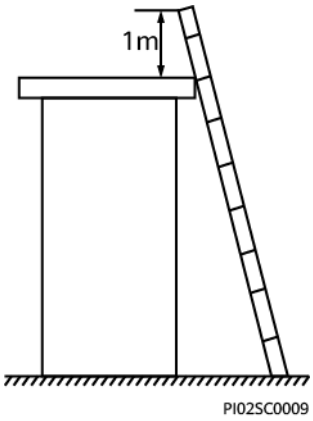
- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.
- If a single ladder is used, the recommended angle for the ladder against the floor is 75 degrees,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



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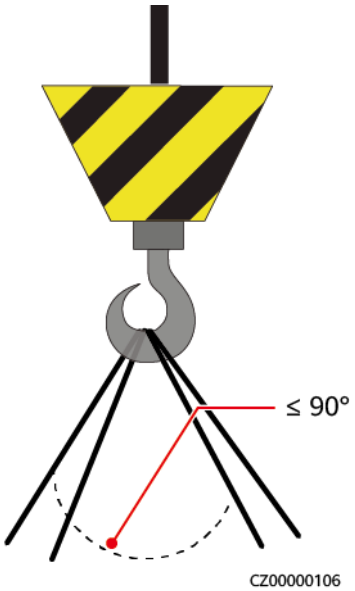
- If a single ladder is used, ensure that the wider end of the ladder is at the bottom, and take protective measures to prevent the ladder from sliding.
- If a single ladder is used, do not climb higher than the fourth rung of the ladder from the top.
- If you use a single ladder to climb up to a platform,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



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.

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- 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.

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2 Product Introduction

2.1 Overview

Function

The SUN2000-(2KTL-6KTL)-L1 is a single-phase grid-tied string inverter that converts the DC power generated by PV strings into AC power and feeds the electricity into the power grid.

Model

This document involves the following product models:

- SUN2000-2KTL-L1
- SUN2000-3KTL-L1
- SUN2000-3.68KTL-L1
- SUN2000-4KTL-L1
- SUN2000-4.6KTL-L1
- SUN2000-5KTL-L1
- SUN2000-6KTL-L1

Figure 2-1 Model identifier (using SUN2000-5KTL-L1 as an example)

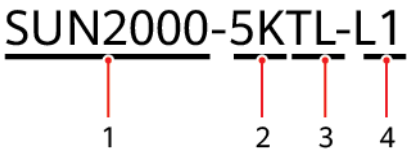


Table 2-1 Identifier description

No.	Meaning	Value
1	Product family name	SUN2000: grid-tied solar inverter

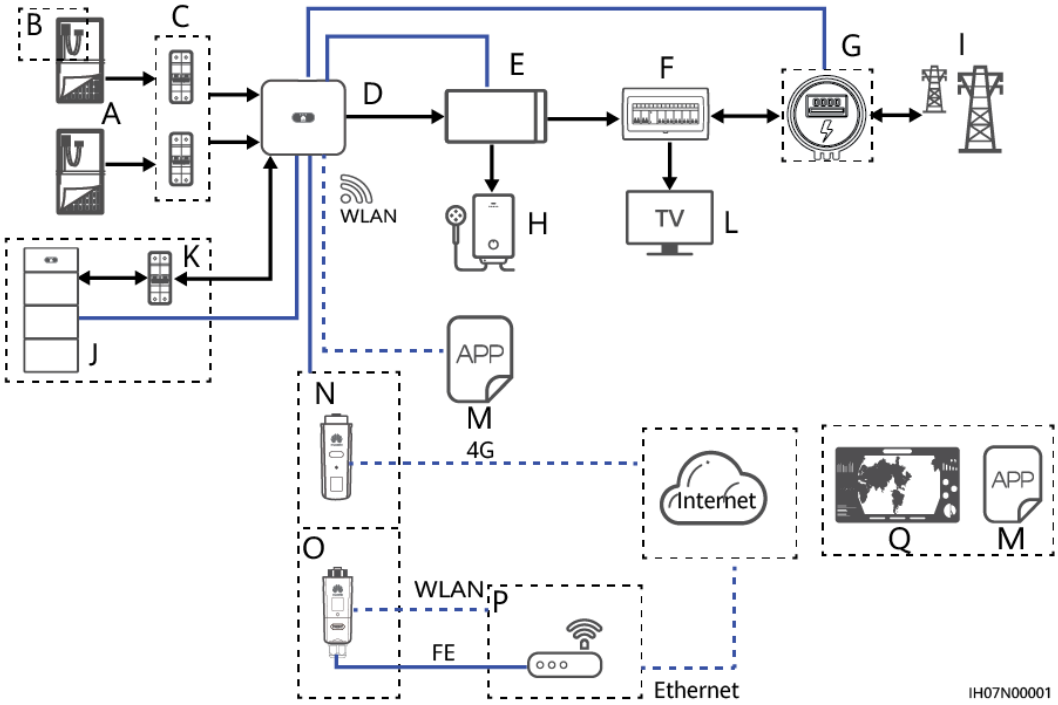
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No.	Meaning	Value
2	Power level	• 2K: The power level is 2 kW. • 3K: The power level is 3 kW. • 3.68K: The power level is 3.68 kW. • 4K: The power level is 4 kW. • 4.6K: The power level is 4.6 kW. • 5K: The power level is 5 kW. • 6K: The power level is 6 kW.
3	Topology	TL: transformerless
4	Design code	L1: residential

Networking Application

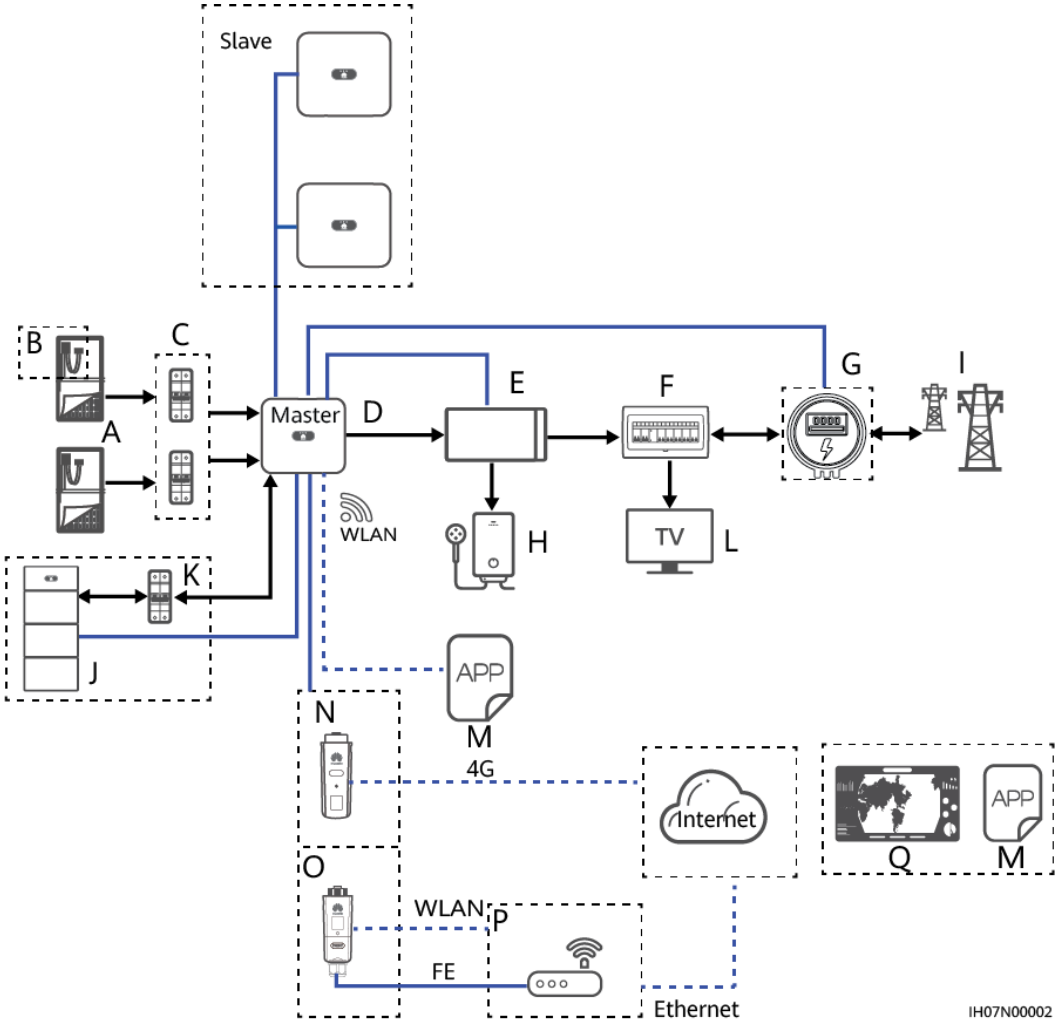
The SUN2000 applies to residential rooftop grid-tied systems. The system consists of PV strings, grid-tied solar inverters, AC switches, and power distribution units (PDUs).

Figure 2-2 Single SUN2000 scenario (dashed boxes indicate optional configuration)



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Figure 2-3 SUN2000 cascading scenario (dashed boxes indicate optional configuration)



NOTE

- → indicates the power flow direction, —— indicates the signal line, and ····· indicates the wireless communication.
- In the SUN2000 cascading scenario, the master and slave solar inverters are both SUN2000-(2KTL-6KTL)-L1, and a maximum of three SUN2000s can be cascaded.
- In the SUN2000 cascading scenario, only one smart power sensor (G in the figure) can be connected to the master inverter.
- In the SUN2000 cascading scenario, the SUN2000s connected to the power grid must meet the local power grid requirements.

(A) PV string	(B) Smart PV optimizer	(C) DC switch
(D) SUN2000	(E) Backup	(F) Residential PDU
(G) Smart Power Sensor	(H) Important Load	(I) Power grid
(J) Battery	(K) Battery switch	(L) Household load

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(M) FusionSolar App	(N) 4G Smart Dongle	(O) WLAN-FE Smart Dongle
(P) Router	(Q) FusionSolar Smart PV Management System	

NOTE

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

- ***SUN2000-450W-P Smart PV Optimizer Quick Guide***
- ***LUNA2000-(5-30)-S0 User Manual***
- ***Backup Box-(B0, B1) Quick Guide***

CAUTION

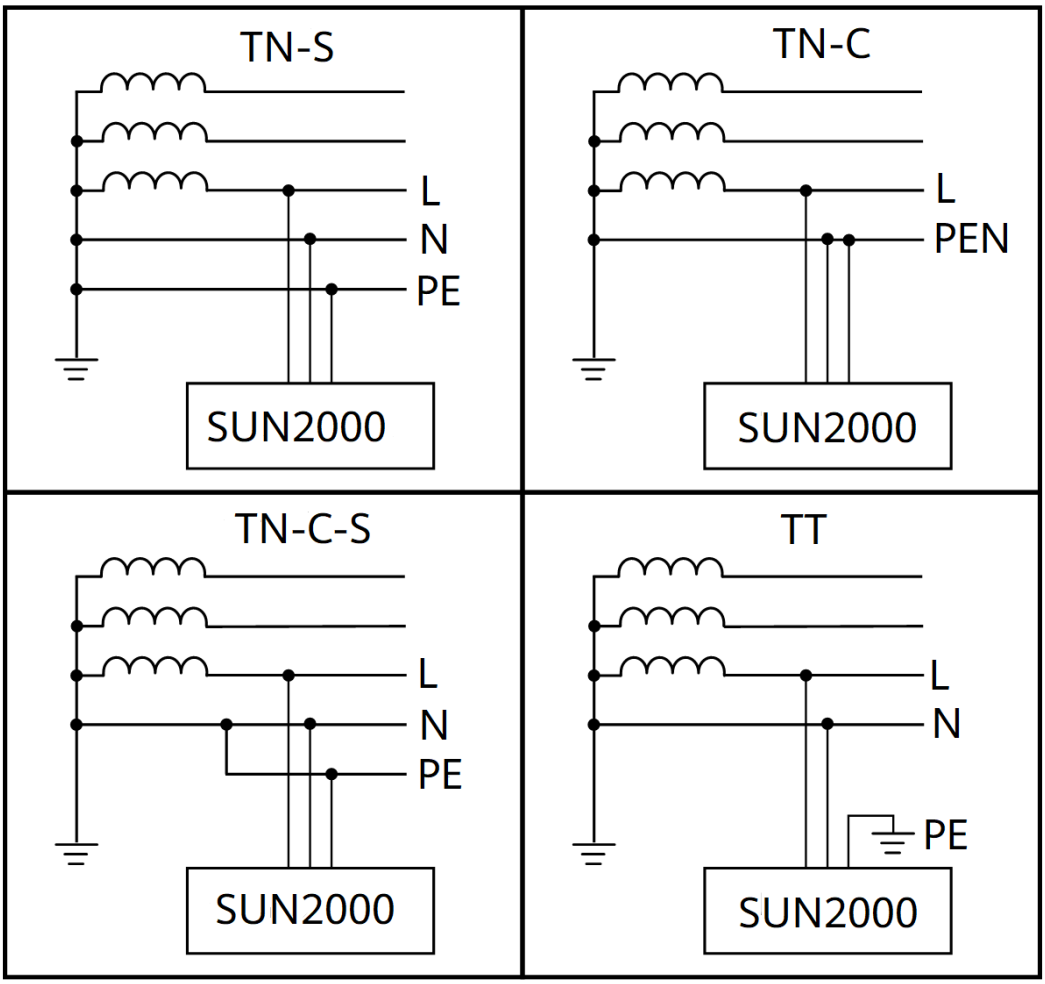
- The off-grid load output port of the Backup Box cannot be directly connected to the power grid. Otherwise, the Backup Box will be shut down due to overload.
- Off-grid electric motor loads are not supported. The startup power of an electric motor is several times of its rated power, which may exceed the load capacity of the inverter, resulting in startup failure.

Supported Power Grid Types

The SUN2000 supports the following power grid types: TN-S, TN-C, TN-C-S, and TT. In the TT power grid, the N-to-PE voltage must be less than 30 V.

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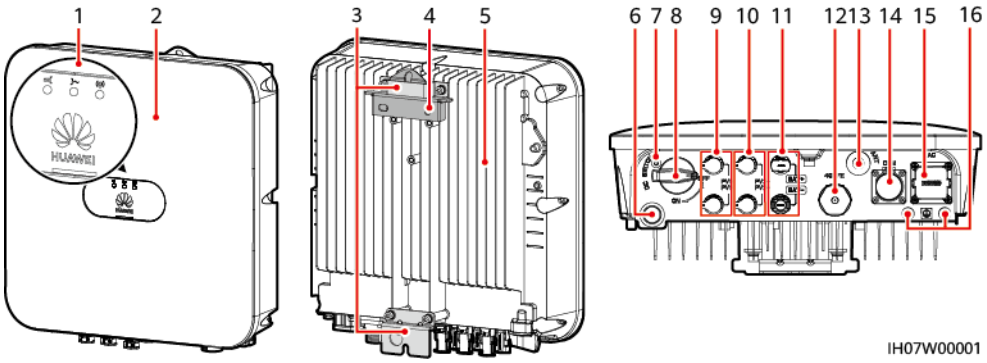
Figure 2-4 Power grid types



2.2 Component Description

Appearance

Figure 2-5 Appearance



(1) LED indicators (2) Front panel

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(3) Hanging kit
(4) Mounting bracket
(5) Heat sink
(6) Ventilation valve
(7) DC switch locking screw hole[a]
(8) DC switch[b] (DC SWITCH)
(9) DC input terminals (PV1+/PV1–)
(10) DC input terminals (PV2+/PV2–)
(11) Battery terminals (BAT+/BAT–)
(12) Smart Dongle port (4G/FE)
(13) Antenna port (ANT)
(14) Communications port (COM)
(15) AC output port (AC)
(16) Ground point

NOTE

- Note a: The DC switch locking screw is used to lock the DC switch to prevent accidental startup. It is delivered with the SUN2000.
- Note b: DC input terminals PV1 and PV2 are controlled by the DC switch.

2.3 Label Description

Enclosure Labels

Table 2-2 Enclosure label description

Icon	Name	Meaning
	Burn warning	Do not touch a running SUN2000 because the enclosure is hot when the SUN2000 is running.
	Delayed discharge	• High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. • Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.

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Icon	Name	Meaning
	Refer to documentation	Reminds operators to refer to the documents delivered the SUN2000.
	Grounding	Indicates the position for connecting the protective earthing (PE) cable.
	Operation warning	Do not remove the connector or antenna when the SUN2000 is running.
	Grounding warning	Ground the SUN2000 before powering it on.
	Serial number (SN)	Indicates the SUN2000 SN.
	Media access control (MAC) address	Indicates the MAC address.
	QR code for logging in to the SUN2000 WLAN	Scan the QR code to connect to the Huawei SUN2000 WLAN (Android) or obtain the WLAN login password (iOS).

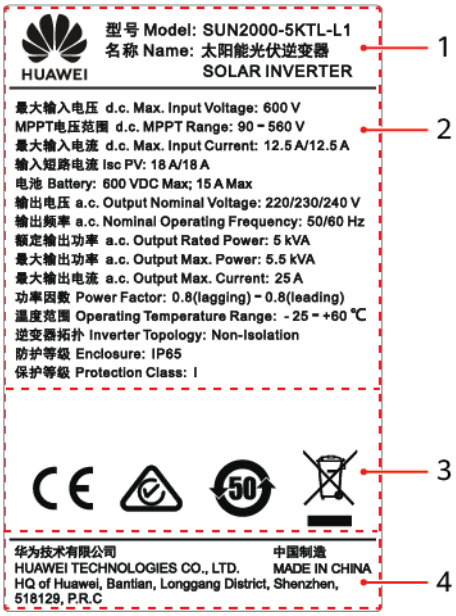
NOTE

The labels are for reference only.

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Nameplate

Figure 2-6 Nameplate (using SUN2000-5KTL-L1 as an example)



(1) Trademark and model

(2) Key technical specifications

(3) Compliance symbols

(4) Company name and country of origin

NOTE

The nameplate figure is for reference only.

2.4 Working Principles

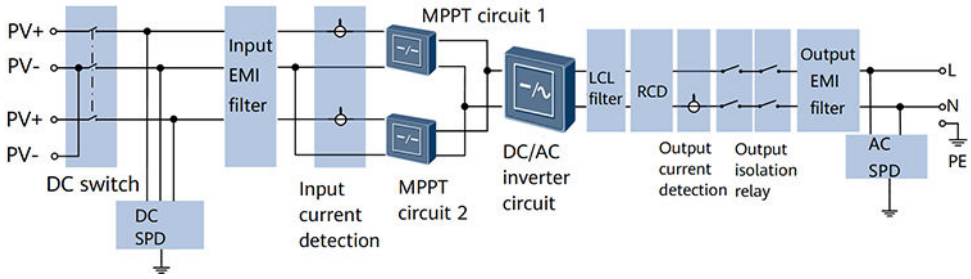
Schematic Diagram

The SUN2000 receives inputs from up to two PV strings. Then the inputs are grouped into two MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into single-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

The SUN2000 uses a reserved battery port for energy storage expansion. Battery performs charging and discharging operations according to the battery working mode.

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Figure 2-7 Schematic diagram



Working Mode

Figure 2-8 Working modes

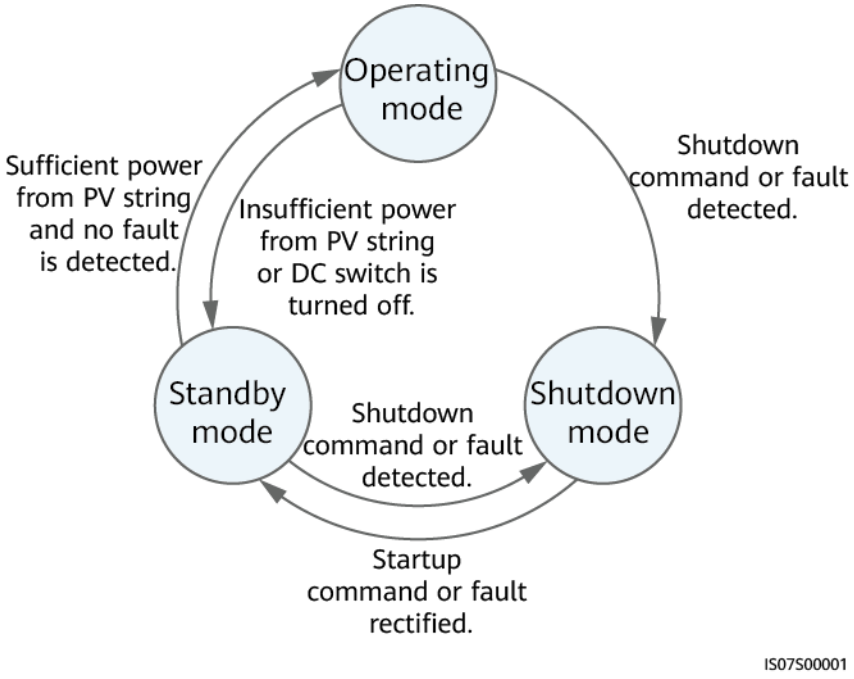


Table 2-3 Working mode description

Working mode	Description
Standby mode	The SUN2000 enters Standby mode when the external environment does not meet the requirements for starting the SUN2000. In Standby mode: • The SUN2000 continuously detects its operation status. Once the operating conditions are met, the SUN2000 enters Operating mode. • If the SUN2000 detects a shutdown command or a fault after startup, it enters Shutdown mode.

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Working mode	Description
Operating mode	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 power. ● If the SUN2000 detects a shutdown command or a fault, it enters Shutdown mode. ● If the SUN2000 detects that the output power of PV strings does not meet the requirements for grid-tied power generation, it enters Standby mode.
Shutdown mode	● In Standby or Operating mode, if the SUN2000 detects a shutdown command or a fault, it enters Shutdown mode. ● In Shutdown mode, if the SUN2000 detects that the fault is rectified or the startup command is executed, the SUN2000 enters Standby mode.

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3 SUN2000 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.
- The product should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of eight SUN2000s can be stacked. To avoid personal injury or device damage, stack SUN2000s with caution to prevent them from falling over.
- During the storage period, check the SUN2000 periodically. (It is recommended that the check is performed every three months.) Replace the packing materials that are damaged by insects or rodents in a timely manner.
- If the SUN2000 has been stored for more than two years, it must be checked and tested by professionals before being put into use.

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4 System 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.

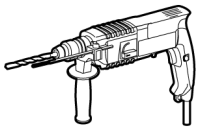
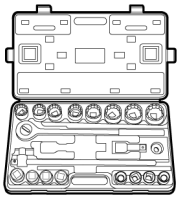
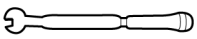
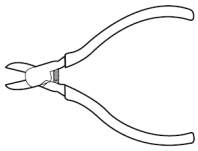
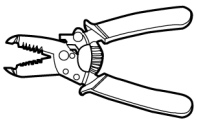
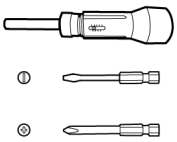
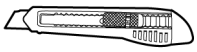
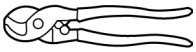
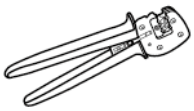
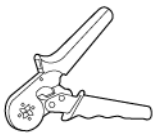
After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

NOTE

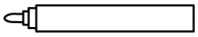
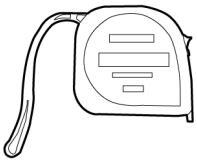
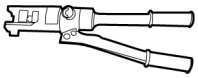
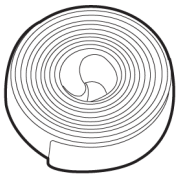
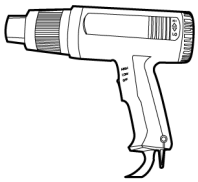
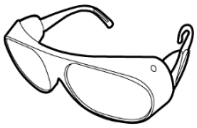
For details about the number of contents, see the *Packing List* in the packing case.

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4.2 Preparing Tools and Instruments

Type	Tools and Instruments		
Installation	 Hammer drill (with a drill bit of 8 mm)	 Torque socket wrench	 Torque wrench
	 Diagonal pliers	 Wire strippers	 Torque screwdriver
	 Rubber mallet	 Utility knife	 Cable cutter
	 Crimping tool (model: PV-CZM-22100/19100)	 Cord end terminal crimper	 Disassembly and Assembly Tool (model: PV-MS-HZ open-end wrench)
	 Cable tie	 Vacuum cleaner	 Multimeter (DC voltage measurement range ≥ 600 V DC)

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Type	Tools and Instruments		
	 Marker	 Steel measuring tape	 Level
	 Hydraulic pliers	 Heat-shrink tubing	 Heat gun
Personal protective equipment (PPE)	 Insulated gloves	 Protective gloves	 Dust mask
	 Safety boots	 Safety goggles	-

4.3 Determining the Installation Position

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 sink, because these parts are extremely hot during operation.
- Do not install the SUN2000 near flammable or explosive materials.
- Do not install the SUN2000 at a place within children's reach.
- The SUN2000 will be corroded in salt areas, and the salt corrosion may cause fire. Do not install the SUN2000 outdoors in salt areas. A salt area refers to the region within 500 meters from the coast or prone to sea breeze. The

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regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).

Installation Environment Requirements

- The SUN2000 must be installed in a well-ventilated environment to ensure good heat dissipation.
- When the SUN2000 is installed under direct sunlight, the power may be derated due to the temperature rise.
- You are advised to install the SUN2000 in a sheltered place or install an awning over it.

Mounting Structure Requirements

- The mounting structure where the SUN2000 is installed must be fire resistant.
- Do not install the SUN2000 on flammable building materials.
- Ensure that the installation surface is solid enough to bear the weight of the SUN2000.
- In residential areas, do not install the SUN2000 on plaster board walls or walls made of similar materials with a weak sound insulation performance because the noise generated by the SUN2000 may interfere with residents.

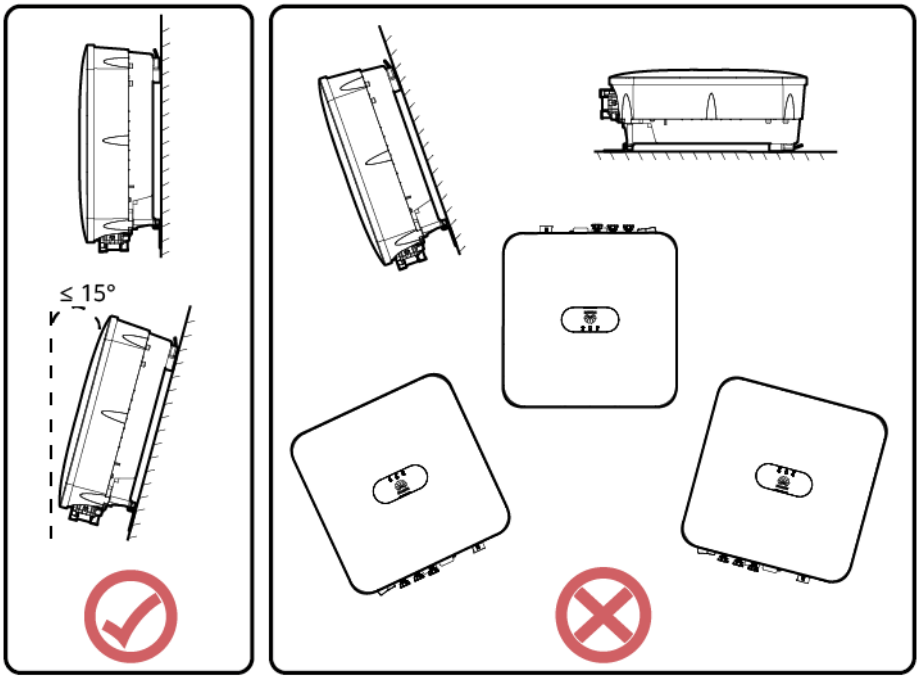
Installation Angle Requirements

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.

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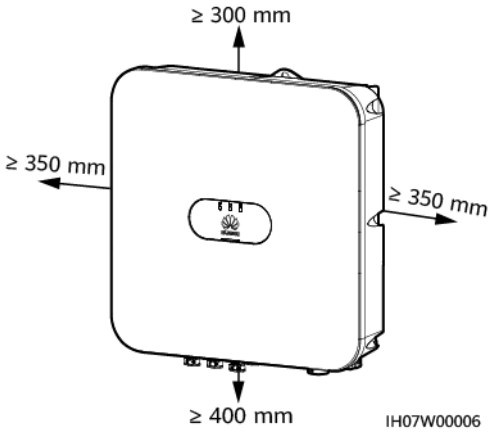
Figure 4-1 Installation angle



Installation Space Requirements

- Reserve enough clearance 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.

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Figure 4-3 Horizontal installation mode (recommended)

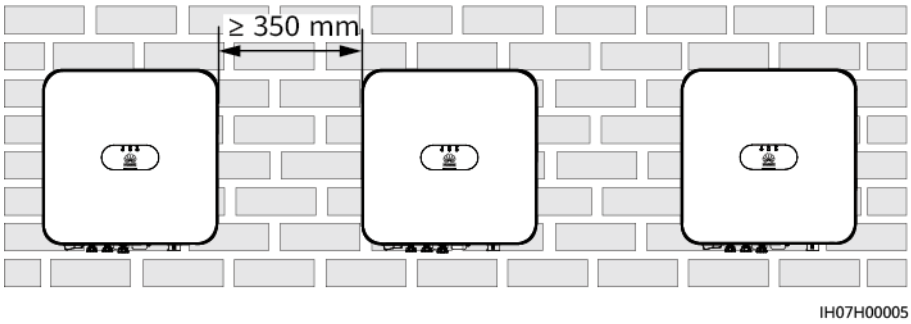


Figure 4-4 Triangle installation mode (recommended)

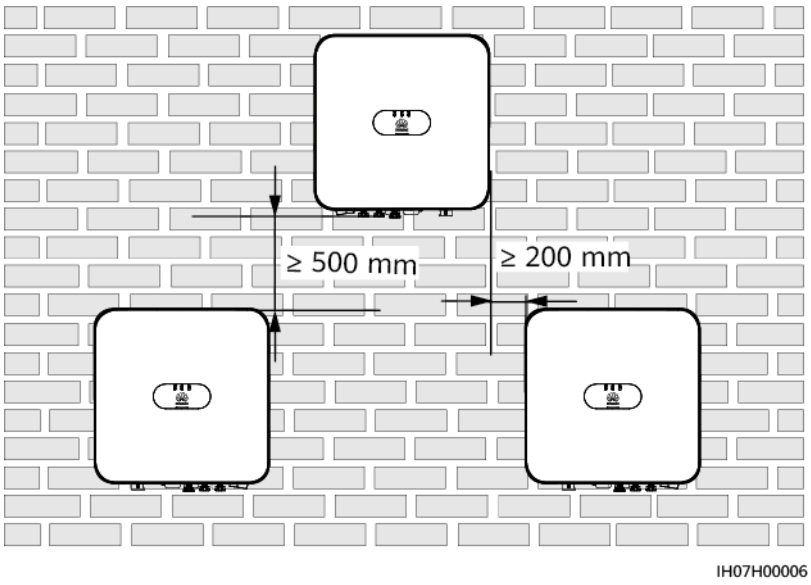
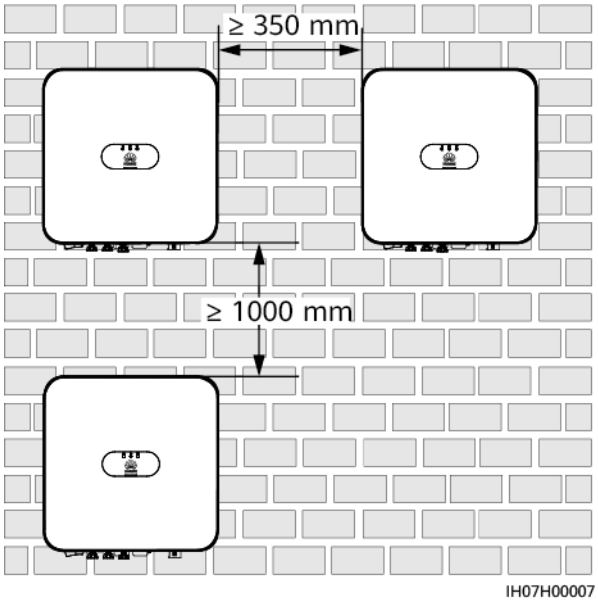


Figure 4-5 Stacked installation mode (not recommended)



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NOTE

The installation figures are for reference only and are irrelevant to the SUN2000 cascading scenario.

4.4 Moving a SUN2000

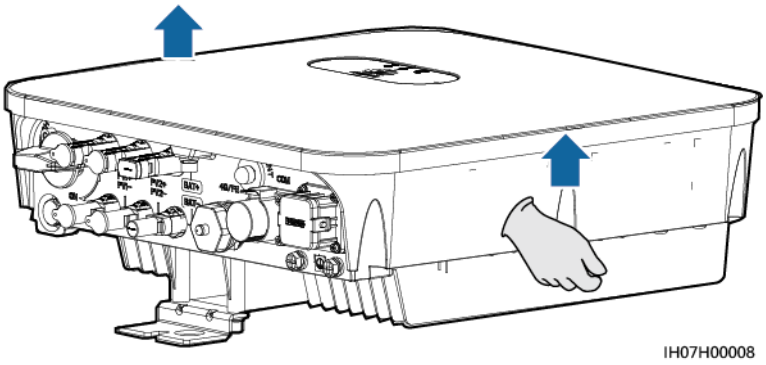
Procedure

Step 1 Hold the handles on both sides of the SUN2000, lift the SUN2000 from the packing case, and transport it to the installation position.

CAUTION

- Move the SUN2000 with care to prevent device damage and personal injury.
- 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 protection material to prevent damage to its enclosure.

Figure 4-6 Moving a SUN2000



----End

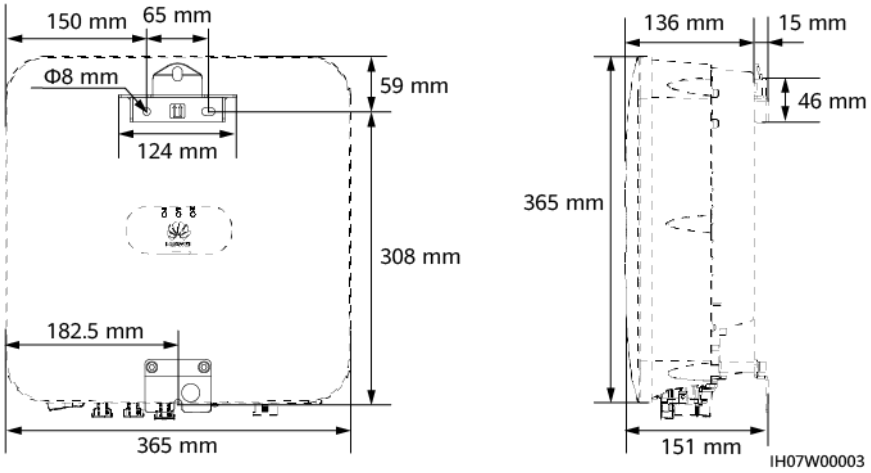
4.5 Installing a SUN2000

Installation Precautions

Figure 4-7 shows the dimensions of mounting holes for the SUN2000.

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Figure 4-7 Mounting bracket dimensions



4.5.1 Wall-Mounted Installation

Procedure

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

Step 2 Secure the mounting bracket.

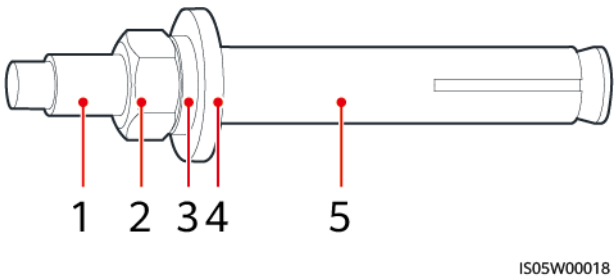
DANGER

When drilling holes, avoid the water pipes and power cables buried in the wall.

NOTE

- M6x60 expansion bolts are delivered with the SUN2000. 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



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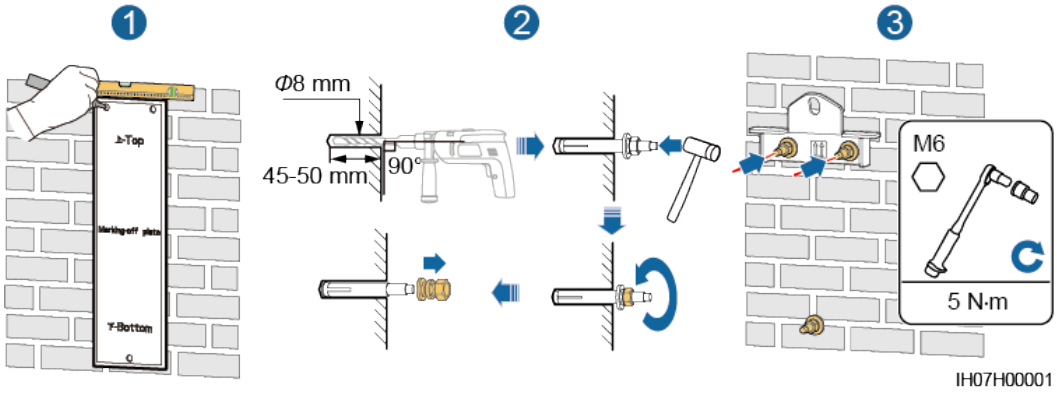
(1) Bolt (2) Nut (3) Spring washer

(4) Flat washer (5) Expansion sleeve

NOTICE

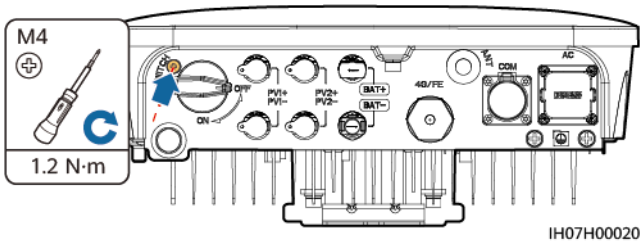
- To prevent dust inhalation or contact with eyes, wear safety goggles and a dust mask when drilling holes.
- Wipe away any dust in or around the holes and measure the hole distances. If the holes are inaccurately positioned, drill holes again.
- Level the head of the expansion sleeve with the concrete wall after removing the nut, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the wall.
- Loosen the nut, spring washer, and flat washer of the expansion bolt at the bottom.

Figure 4-9 Installing expansion bolts



Step 3 (Optional) Install the locking screw for the DC switch.

Figure 4-10 Installing a locking screw for the DC switch

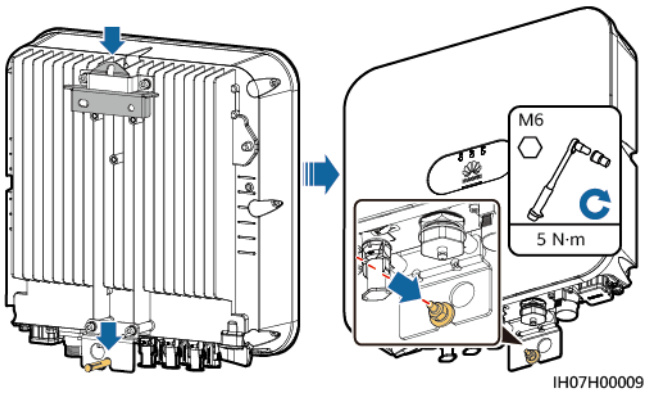


Step 4 Install the SUN2000 on the mounting bracket.

Step 5 Tighten the nuts.

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Figure 4-11 Tightening nuts

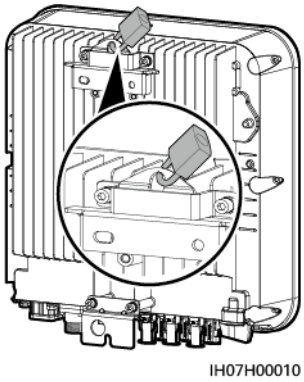


Step 6 (Optional) Install an anti-theft lock.

NOTICE

- Prepare an anti-theft lock suitable for the lock hole diameter (Φ10 mm).
- An outdoor waterproof lock is recommended.
- Keep the key to the anti-theft lock.

Figure 4-12 Installing an anti-theft lock



----End

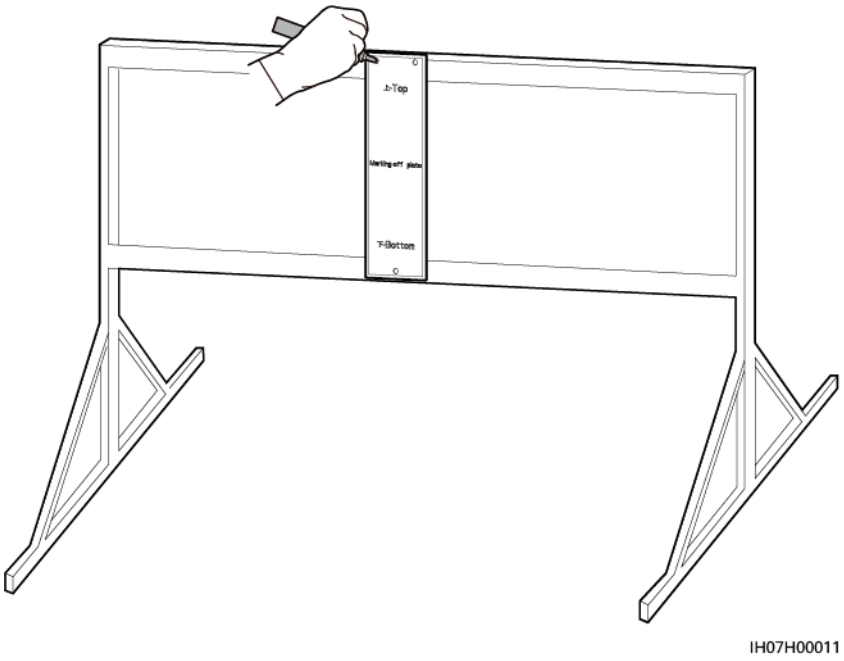
4.5.2 Support-Mounted Installation

Procedure

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

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Figure 4-13 Determining hole positions

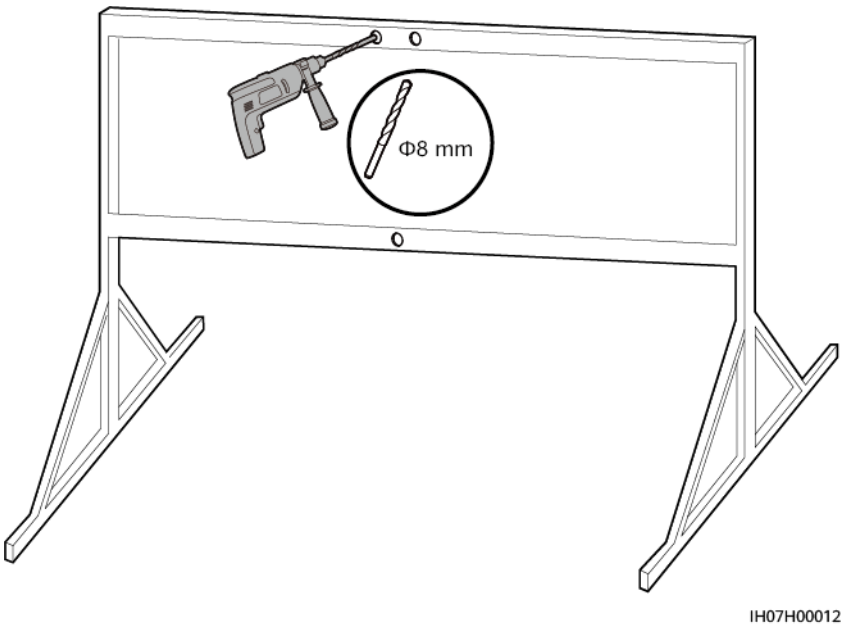


Step 2 Drill holes using a hammer drill.

NOTE

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

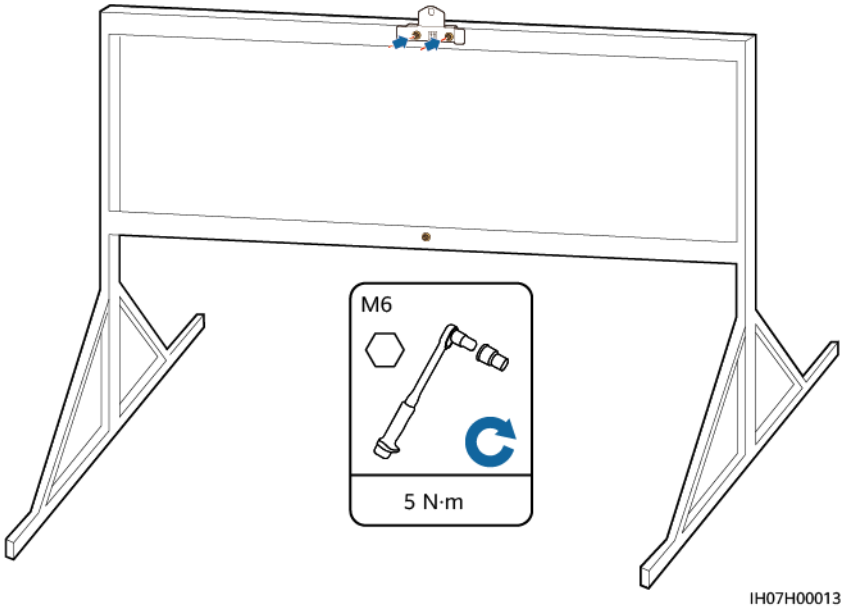
Figure 4-14 Drilling holes



Step 3 Secure the mounting bracket.

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Figure 4-15 Secure the mounting bracket

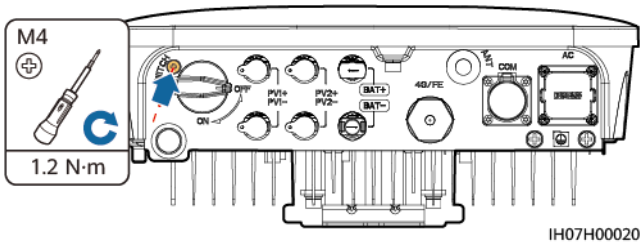


NOTE

Prepare bolt assemblies based on the hole diameter of the mounting bracket.

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

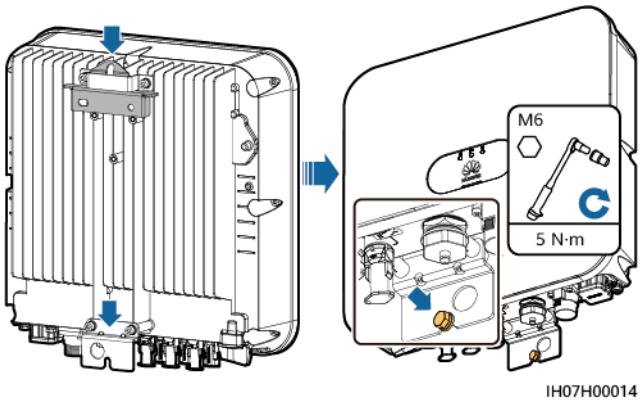
Figure 4-16 Installing a locking screw for the DC switch



Step 5 Install the SUN2000 on the mounting bracket.

Step 6 Tighten the bolt assemblies.

Figure 4-17 Tightening bolt assemblies



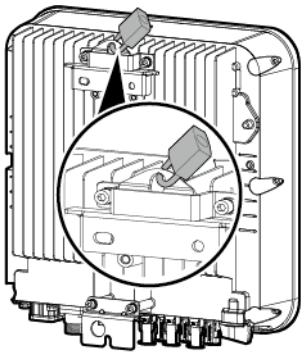
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Step 7 (Optional) Install an anti-theft lock.

NOTICE

- Prepare an anti-theft lock suitable for the lock hole diameter (Φ10 mm).
- An outdoor waterproof lock is recommended.
- Keep the key to the anti-theft lock.

Figure 4-18 Installing an anti-theft lock



----End

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5 Electrical Connection

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.

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CAUTION

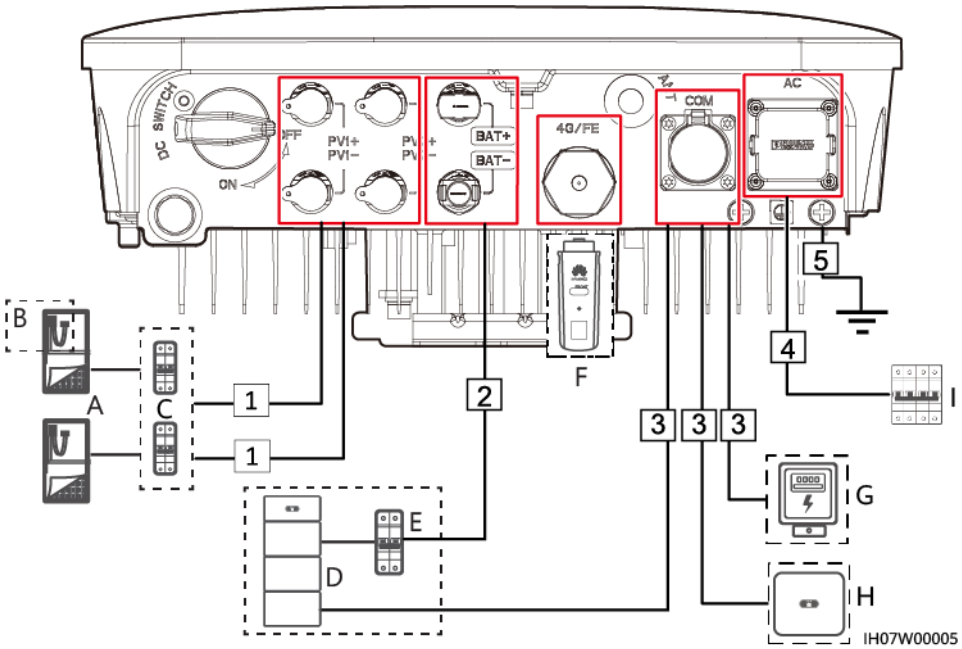
- Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.
- When routing PV cables, it is recommended that the positive and negative PV string cables be routed in different pipes to prevent cable damage and short circuits caused by improper operations during construction.

NOTE

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

5.2 Preparing Cables

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



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Table 5-1 Component description

No.	Component	Description	Source
A	PV string	• A PV string is composed of the PV modules connected in series and works with an optimizer. • The SUN2000 supports the input from two PV strings.	Prepared by the customer
B	Smart PV optimizer	The SUN2000-450W-P smart PV optimizer is supported.	Purchased from Huawei
C	DC switch	Recommended: a DC circuit breaker with a rated voltage greater than or equal to 600 V DC and a rated current of 20 A	Prepared by the customer
D	Battery	The SUN2000 can connect to LUNA2000 batteries.	Purchased from Huawei
		The SUN2000 can connect to LG-RESU batteries (LG RESU7H and RESU10H).	Prepared by the customer
E	Battery switch	Recommended: a DC circuit breaker with a rated voltage greater than or equal to 600 V DC and a rated current of 20 A	Prepared by the customer
F	Smart Dongle[a]	Supported models: • WLAN-FE Smart Dongle: SDongleA-05 • 4G Smart Dongle: SDongleA-03	Purchased from Huawei
G	Smart Power Sensor [b]	The SUN2000 can connect to the DTSU666-HW[c], YDS60-80[d], YDS70-C16[e], DDSU666-H, and DTSU666-H smart power sensors.	Purchased from Huawei

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No.	Component	Description	Source
H	SUN2000	Select a proper model as required.	Purchased from Huawei
I	AC switch	To ensure that the inverter can be safely disconnected from the power grid when an exception occurs, connect an AC switch to the AC side of the inverter. Select an appropriate AC switch in accordance with local industry standards and regulations. Huawei recommends the following switch specifications: Recommended: a single-phase AC circuit breaker with a rated voltage greater than or equal to 250 V AC and a rated current of: ● 16 A (SUN2000-2KTL-L1) ● 25 A (SUN2000-3KTL-L1 and SUN2000-3.68KTL-L1) ● 32 A (SUN2000-4KTL-L1, SUN2000-4.6KTL-L1, SUN2000-5KTL-L1, and SUN2000-6KTL-L1)	Prepared by the customer

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No.	Component	Description	Source
• Note a: For details about how to use the 4G Smart Dongle SDongleA-03, see the ***SDongleA-03 Quick Guide (4G)***. For details about how to use the WLAN-FE Smart Dongle SDongleA-05, see the ***SDongleA-05 Quick Guide (WLAN-FE)***. You can obtain these documents at **https://support.huawei.com/enterprise** by searching for models. • Note b: The Spanish version can use only the DDSU666-H smart power sensor provided by Huawei. 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***, ***DDSU666-H Smart Power Sensor User Manual***, *and* ***YDS70-C16 Smart Power Sensor Quick Guide***. • Note c: SUN2000L V200R001C00SPC121 and later versions can connect to DTSU666-HW power meters. • Note d: SUN2000L V200R001C00SPC124 and later versions can connect to YDS60-80 power meters. • Note e: SUN2000L V200R001C00SPC127 and later versions can connect to YDS70-C16 power meters.			

Table 5-2 Cable description

No.	Cable	Type	Recommended Specifications	Source
1	DC input power cable	Common outdoor PV cable in the industry	• Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 5.5–9 mm	Prepared by the customer
2	(Optional) Battery cable	Common outdoor PV cable in the industry	• Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 5.5–9 mm	Prepared by the customer

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No.	Cable	Type	Recommended Specifications	Source
3	(Optional) Signal cable	Outdoor shielded twisted pair cable	• Conductor cross-sectional area: – Combined crimping of cables on the port: 0.20–0.35 mm^2 – Crimping the cables on the port without combining them: 0.20–1 mm^2 • Cable outer diameter: – 4-hole rubber plug: 4–8 mm – 2-hole rubber plug: 8–11 mm	Prepared by the customer
4	AC output power cable[a]	• Not using the PE equipotential point at the AC output port: two-core (L and N) outdoor copper cable • Using the PE equipotential point at the AC output port: three-core (L, N, and PE) outdoor copper cable	• Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 10–21 mm	Prepared by the customer
5	PE cable	Single-core outdoor copper cable and M6 OT terminal	4–10 mm^2	Prepared by the customer
Note a: The minimum cross-sectional area of the cable should be selected based on the rated value of the AC fuse.				

NOTE

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

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5.3 Connecting PE Cables

Precautions

DANGER

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

NOTE

- The PE point at the AC output port is used only as a PE equipotential point, and cannot substitute for the PE point on the enclosure.
- It is recommended that silica gel or paint be used around the ground terminal after the PE cable is connected.

Additional Information

The SUN2000 provides the grounding detection function. This function is used to check whether the SUN2000 is properly grounded before the SUN2000 starts, or check whether the ground cable is disconnected when the SUN2000 is running. This function is only available under limited conditions. To ensure the safe operation of the SUN2000, properly ground the SUN2000 according to the connection requirements of the ground cable. For some power grid types, if the output side of the SUN2000 is connected to an isolation transformer, ensure that the SUN2000 is properly grounded and set **Grounding inspection** to **Disable** to enable the SUN2000 to run properly. If you are not sure whether the SUN2000 is connected to such a type of power grid, contact your dealer or Huawei technical support for confirmation.

- According to IEC 62109, to ensure the safe operation of the SUN2000 in the case of ground cable damage or disconnection, properly connect the ground cable of the SUN2000 and ensure that it meets at least one of the following requirements before the grounding detection function becomes invalid:
  - 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 mm^2 as the PE cable on the chassis.
  - Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screws on the chassis.
- In some countries and regions, the SUN2000 must have additional ground cables. Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screws on the chassis.

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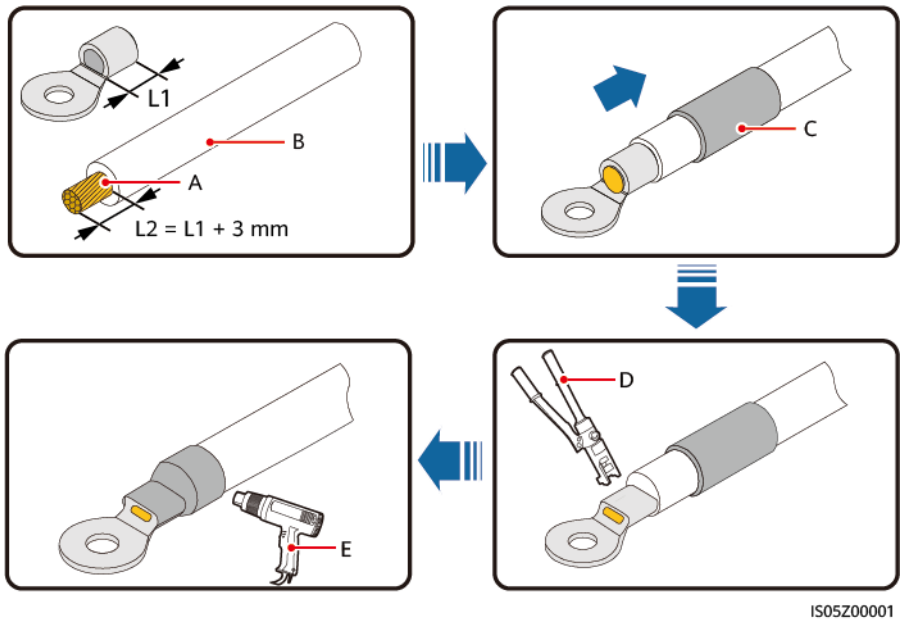
Procedure

Step 1 Crimp an OT terminal.

NOTICE

- Avoid scratching the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrink tubing or insulation tape. The heat shrink tubing is used as an example.
- When using a heat gun, protect the equipment from being scorched.

Figure 5-2 Crimping an OT terminal



(A) Core wire (B) Insulation layer (C) Heat shrink tubing

(D) Hydraulic pliers (E) Heat gun

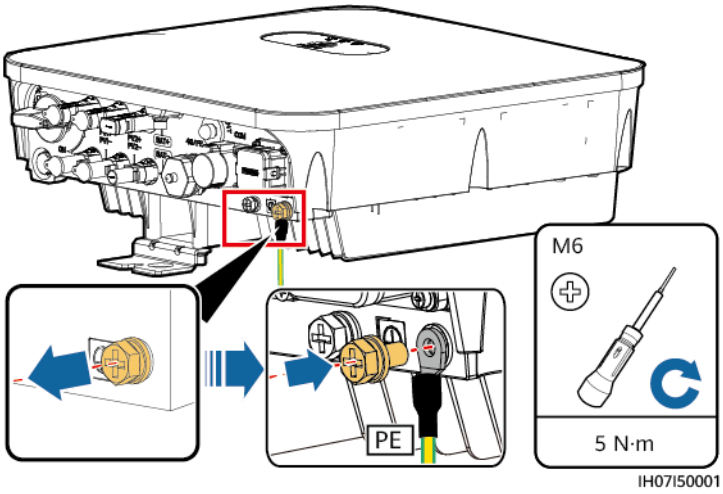
Step 2 Connect the PE cable.

NOTICE

- Ensure that the PE cable is connected securely.
- You are advised to use the right ground point and reserve the other ground point for future use.

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Figure 5-3 Connecting a PE cable



----End

5.4 (Optional) Installing a Smart Dongle

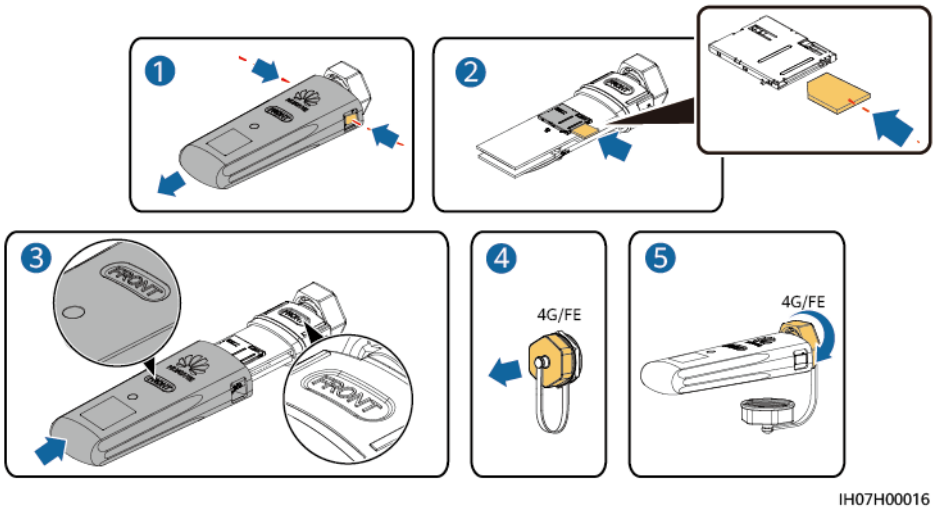
Procedure

NOTE

- You are advised to install the Smart Dongle before installing the WLAN antenna.
- 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.

- 4G Smart Dongle (4G Communication)

Figure 5-4 Installing a 4G Smart Dongle

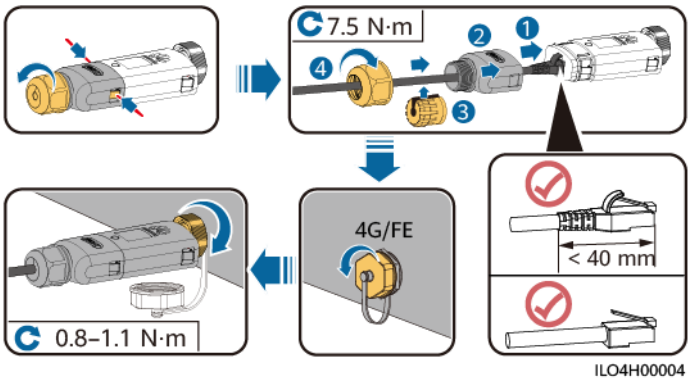


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- WLAN-FE Smart Dongle (FE Communication)

  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 5-5 Installing a WLAN-FE Smart Dongle (FE communication)



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 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.

5.5 Installing a WLAN Antenna

Procedure

Step 1 Remove the watertight cap from the ANT port.

Step 2 Install the washer to the ANT port on the chassis.

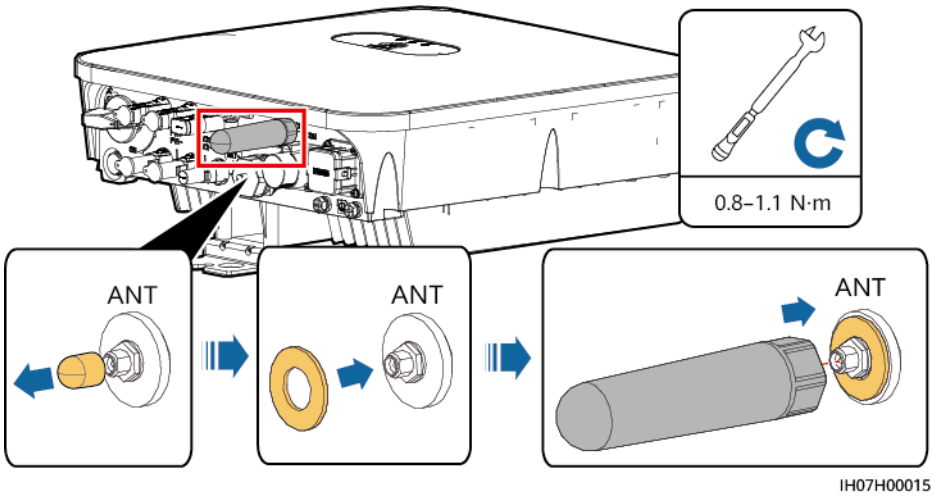
Step 3 Install the WLAN antenna.

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NOTICE

Ensure that the WLAN antenna is installed securely.

Figure 5-6 Installing a WLAN antenna



----End

5.6 Connecting an AC Output Power Cable

Precautions

An AC switch must be installed on the AC side of the SUN2000 to ensure that the SUN2000 can be safely disconnected from the power grid.

⚠ WARNING

- Do not connect loads between the inverter and the 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 Huawei's recommendations, the switch may fail to turn off in a timely manner in case of exceptions, causing serious faults.

⚠ CAUTION

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

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NOTICE

- If the external AC switch can perform earth leakage protection, the rated leakage action current should be greater than or equal to 100 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 100 mA.
- A knife switch cannot be used as an AC switch.

Procedure

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

NOTICE

- 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.
- Keep the AC output power cable and the PE cable close to each other.
- Keep the AC output power cable and the DC input power cable close to each other.
- Ensure that the cable jacket is inside the connector.
- Ensure that the exposed core is totally inserted into the cable hole.
- Ensure that AC output cable is secured. Failing to do so may cause SUN2000 malfunction or damage to its AC connector.
- 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. Otherwise, the device may fail to run properly or be damaged during operation.

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Figure 5-7 Assembling an AC connector (three-core wire)

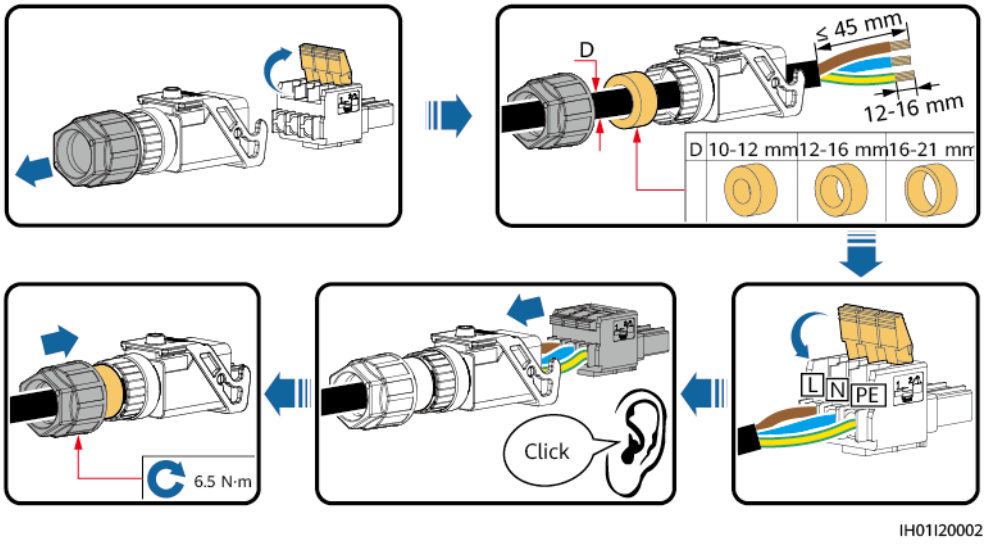
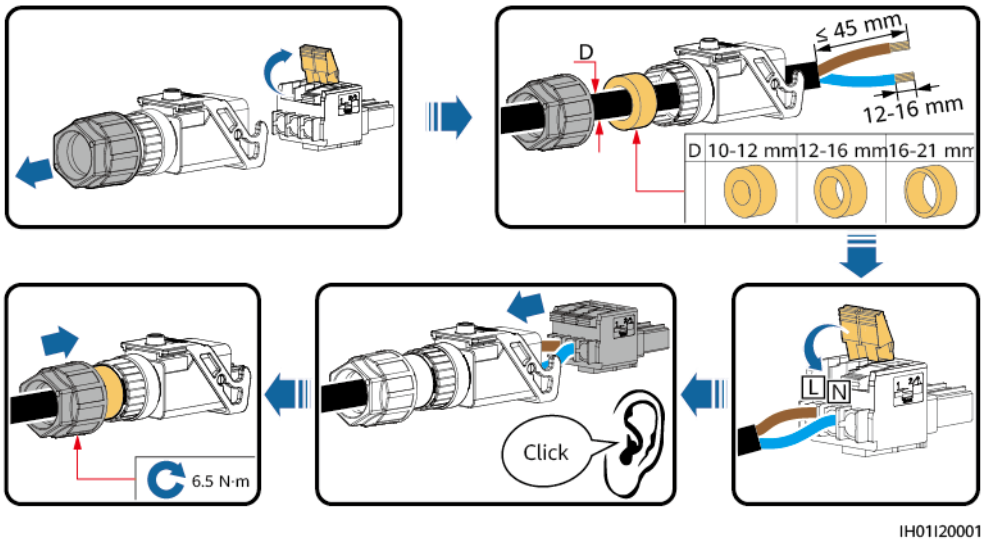


Figure 5-8 Assembling an AC connector (two-core wire)

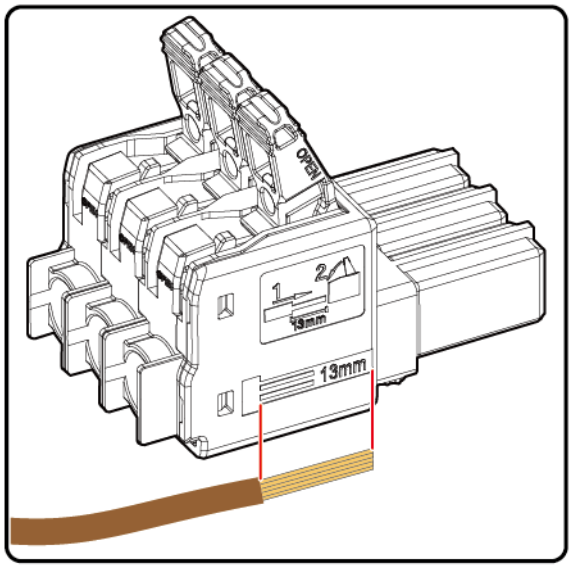


NOTE

- The cable colors shown in the figures are for reference only. Select an appropriate cable according to the local standards.
- For the core installation method and the length for cable stripping, see the instructions on the side of the plug insert.

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Figure 5-9 Length for cable stripping

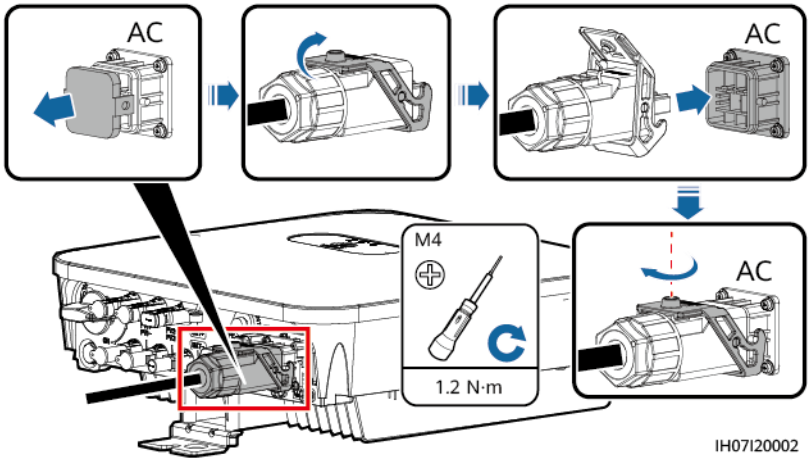


Step 2 Connect the AC connector to the AC output port.

NOTICE

Ensure that the AC connector is connected securely.

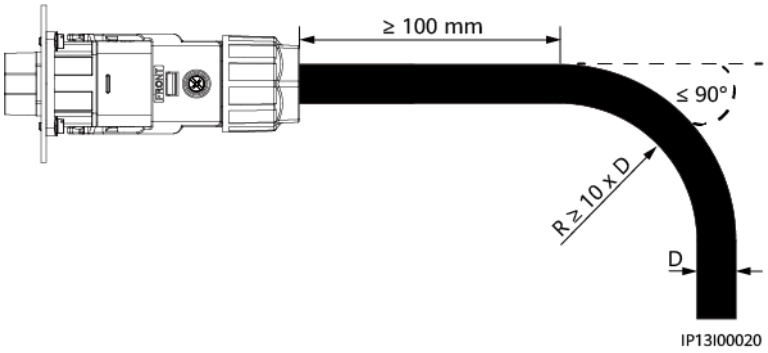
Figure 5-10 Securing an AC connector



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

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Figure 5-11 Cabling requirements



----End

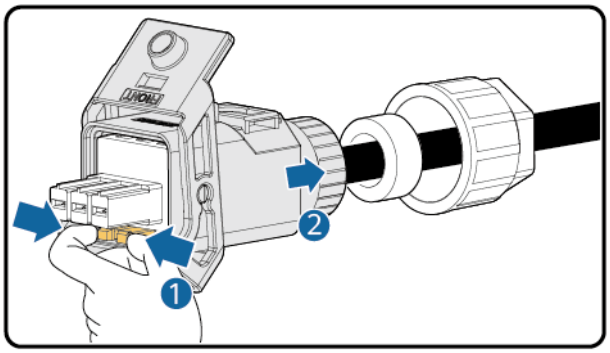
Follow-up Procedure

WARNING

Before removing the AC connector, ensure that the DC switch at the bottom of the SUN2000 and all the switches connected to the SUN2000 are OFF.

To remove the AC connector from the SUN2000, perform the operations in reverse order.

Figure 5-12 Removing a plug insert



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5.7 Connecting DC Input Power Cables

Precautions

DANGER

- Before connecting the DC input power cables, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the DC switch on the SUN2000 is OFF. Failing to do so may result in electric shocks.
- When the SUN2000 is running, it is not allowed to work on the DC input power cables, 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 connects to a DC input terminal of the SUN2000, do not remove the watertight cap from the DC input terminals. 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.

- The DC input voltage of the SUN2000 shall not exceed maximum input voltage under any circumstance.
- The polarities of electric connections are correct on the DC input side. The positive and negative terminals of a PV string connect to corresponding positive and negative DC input terminals of the SUN2000.
- If the DC input power cables are reversely connected, do not operate the DC switch as well as positive and negative connectors immediately. Wait until the night when solar irradiance declines and the PV string current drops to below 0.5 A. Then set the DC switch to the OFF position, remove the positive and negative connectors, and correct the polarities of the DC input power cables.

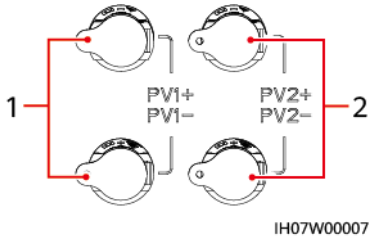
NOTICE

- Since the output of the PV string connected to the SUN2000 cannot be grounded, ensure that the PV module output is well insulated to ground.
- During the installation of PV strings and the SUN2000, the positive or negative terminals of PV strings may be short-circuited to ground if the power cable is not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused device damage is not covered under any warranty or service agreement.

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Terminal Description

Figure 5-13 DC input terminals



(1) Terminals of DC input 1 (2) Terminals of DC input 2

Procedure

Step 1 Assemble a DC connector.

CAUTION

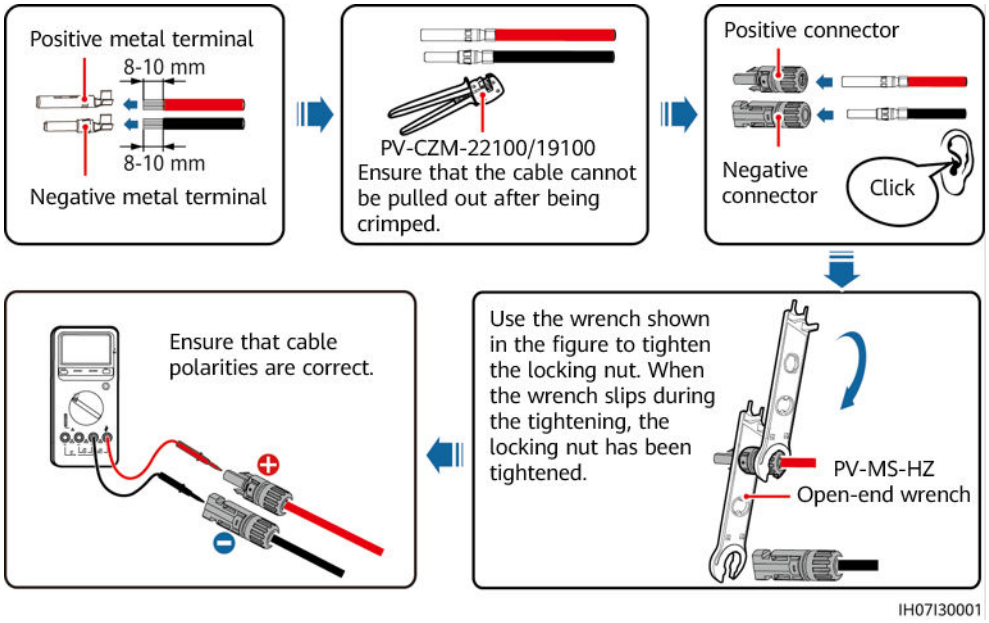
Use the Staubli MC4 positive and negative metal terminals and DC connectors delivered with the SUN2000. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused device damage is not covered under any warranty or service agreement.

NOTICE

- Keep the DC input PV+ cable and PV– cable close to each other.
- Cables with high rigidity, such as armored cables, are not recommended as DC input power cables, because poor contact may be caused by the bending of the cables.
- Before assembling DC connectors, label the cable polarities correctly to ensure correct cable connections.
- After crimping the positive and negative metal terminals, pull the DC input power cables back to ensure that they are connected securely.
- Insert the crimped metal terminals of the positive and negative power cables into the appropriate positive and negative connectors. Then pull back the DC input power cables to ensure that they are connected securely.

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Figure 5-14 Assembling a DC connector



NOTE

- If the PV string is not configured with an optimizer, use a multimeter to measure the voltage at the DC position. The multimeter must have a DC voltage range of at least 600 V. If the voltage is a negative value, the DC input polarity is incorrect and needs correction. If the voltage is greater than 600 V, too many PV modules are configured to 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.

WARNING

Before performing **Step 2**, ensure that the DC switch is set to OFF.

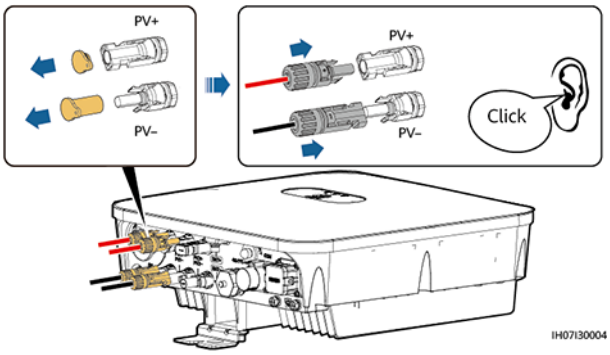
Step 2 Insert the positive and negative connectors into corresponding DC input terminals on the SUN2000.

NOTICE

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

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Figure 5-15 Connecting DC input power cables



NOTICE

If the DC input power cable is reversely connected and the DC switch is set to ON, do not immediately turn off the DC switch or reconnect the positive and negative connectors. Otherwise, the device may be damaged. The caused device damage is not covered under any warranty or service agreement. Wait until the night when solar irradiance declines and the PV string current drops to below 0.5 A. Then set the DC switch to the OFF position, remove the positive and negative connectors, and correct the polarities of the DC input power cables.

----End

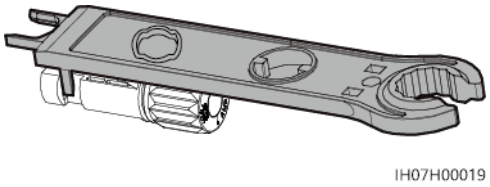
Follow-up Procedure

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 a disassembly tool into the notch and press the tool with an appropriate force.

Figure 5-16 Removing a DC connector



5.8 (Optional) Connecting Battery Cables

Prerequisites

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DANGER

- Battery short circuits may cause personal injury. The high transient current generated by a short circuit may release a surge of power and cause fire.
- Do not connect or disconnect the battery cable when the SUN2000 is running. Failing to do so may cause electric shocks.
- Before connecting the battery cables, ensure that the DC switch on the SUN2000 and all the switches connecting to the SUN2000 are OFF, and the SUN2000 has no residual electricity. Otherwise, the high voltage of the SUN2000 and battery may result in electric shocks.
- If no battery connects to the SUN2000, do not remove the watertight cap from the battery terminal. Otherwise, the IP rating of the SUN2000 will be affected. If a battery connects to the SUN2000, set aside the watertight cap. Reinstall the watertight cap immediately after removing the connector. The high voltage of the battery terminal may result in electric shocks.

A battery switch can be configured between the SUN2000 and the battery to ensure that the SUN2000 can be safely disconnected from the battery.

WARNING

- Do not connect loads between the SUN2000 and the battery.
- The battery cables should be connected correctly. That is, the positive and negative terminals of the battery connect to the positive and negative battery terminals on the SUN2000 respectively. Otherwise, the SUN2000 may be damaged, or even a fire could happen.

NOTICE

- During the installation of the SUN2000 and battery, the positive or negative terminal of the battery will be short-circuited to ground if power cables are not installed or routed as required. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused device damage is not covered under any warranty or service agreement.
- The cabling distance between the battery and the SUN2000 should be less than or equal to 10 meters, and within 5 meters is recommended.

Procedure

Step 1 Assemble the positive and negative connectors by referring to **5.7 Connecting DC Input Power Cables**.

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DANGER

- The battery voltage will result in serious injury. Use dedicated insulation tools to connect cables.
- Ensure that cables are correctly connected between the battery terminal and the battery switch, and between the battery switch and the SUN2000 battery terminal.

NOTICE

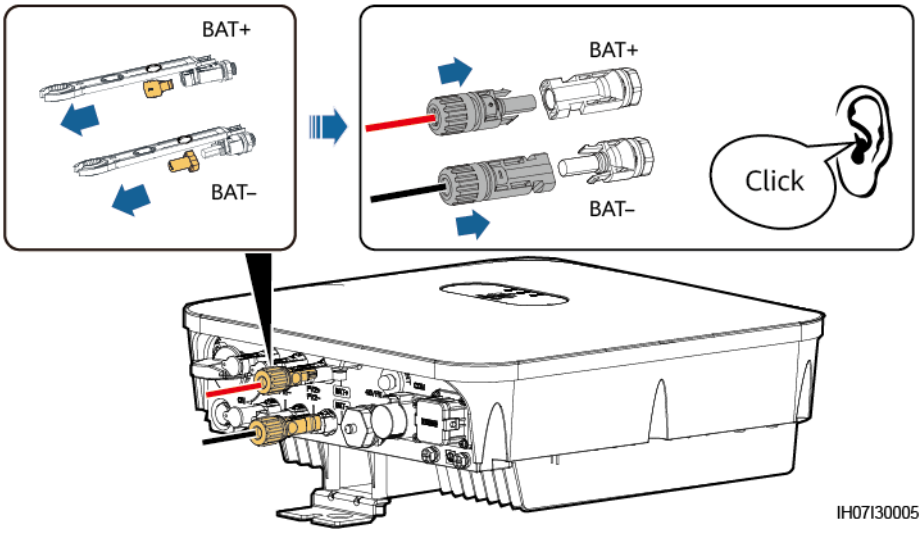
Cables with high rigidity, such as armored cables, are not recommended as battery cables, because poor contact may be caused by the bending of the cables.

Step 2 Insert the positive and negative connectors into corresponding battery terminals on the SUN2000.

NOTICE

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

Figure 5-17 Connecting battery cables



----End

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5.9 (Optional) Connecting Signal Cables

Context

NOTICE

When laying out signal cables, separate them from power cables and keep them away from strong interference sources to prevent communication interruption.

Figure 5-18 Signal cable ports

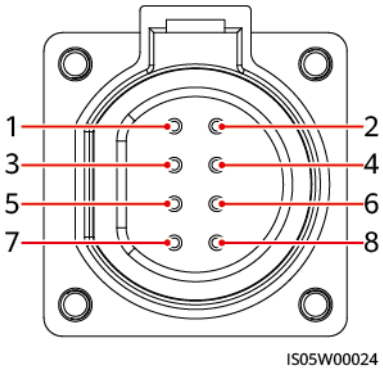


Table 5-3 COM port definition

No.	Label	Definition	Single SUN2000 Scenario	SUN2000 Cascading Scenario
1	485B1	RS485B, RS485 differential signal–	-	Used to connect to the inverter.
2	485A1	RS485A, RS485 differential signal+		
3	485B2	RS485B, RS485 differential signal–	Used to connect to the RS485 signal ports on the batteries or power meters. When batteries and power meters coexist, they share the 485B2 and 485A2 ports.	Used to connect to the RS485 signal ports on the batteries or power meters. When batteries and power meters coexist, they share the 485B2 and 485A2 ports.
4	485A2	RS485A, RS485 differential signal+		
5	GND	GND of the enable signal/12V/DI1/DI2	Used to connect to the GND of the enable signal/12V/DI1/DI2 of a battery.	

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No.	Label	Definition	Single SUN2000 Scenario	SUN2000 Cascading Scenario
6	EN+	Enable signal +/12V+	Used to connect to the enable signal of a battery and the positive terminal of 12V.	
7	DI1	Digital input signal 1+	Used to connect to the positive terminal of DI1. It can connect to the DRM0 scheduling signal or serve as a port for rapid shutdown signals.	
8	DI2	Digital input signal 2+	Used to connect to the positive terminal of DI2. It receives feedback signals of the on/off-grid controller	

NOTE

For details about how to connect signal cables, see **SUN2000L-(2KTL-5KTL) and SUN2000-(2KTL-6KTL)-L1 Battery and Smart Power Sensor Quick Guide**. You can also scan the QR code to obtain the document.

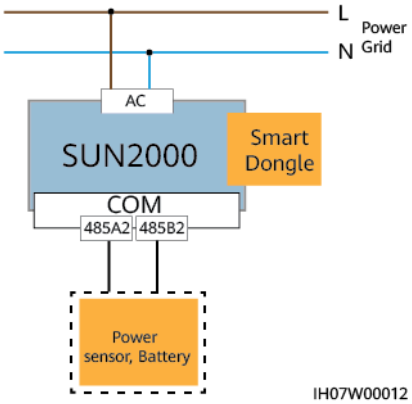
Communication Networking Mode

NOTE

The power meter and Smart Dongle must be connected to the same SUN2000.

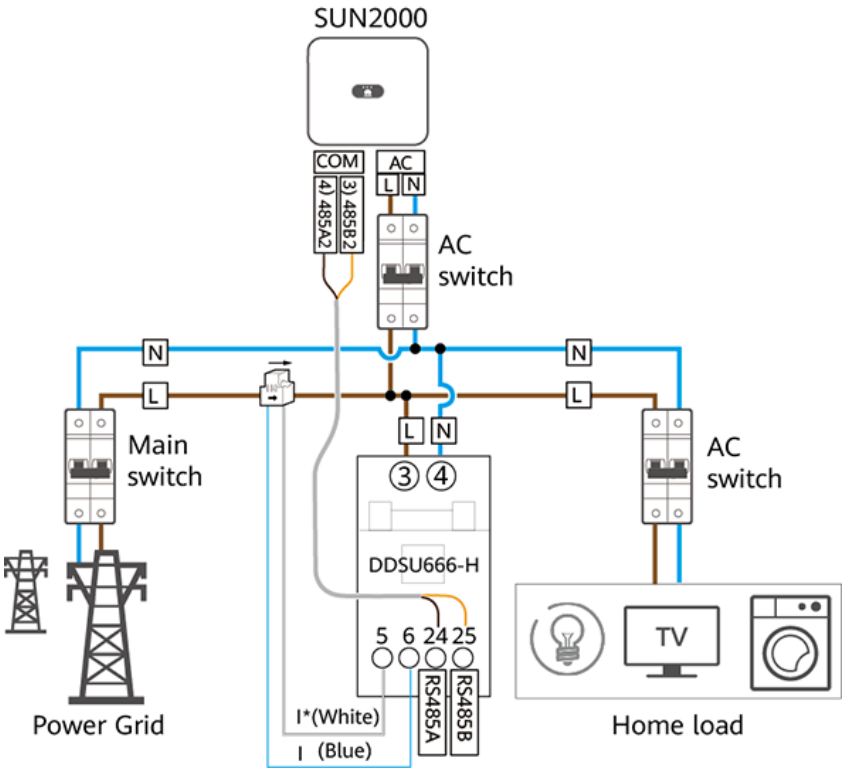
- Single SUN2000 scenarios

Figure 5-19 Single SUN2000



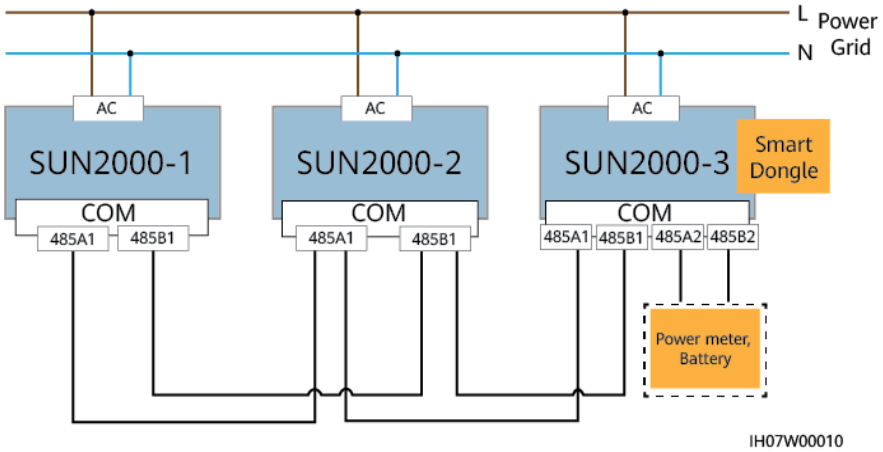
Copyright © Huawei Technologies Co., Ltd.

Figure 5-20 Connecting cables to the power meter (single SUN2000)



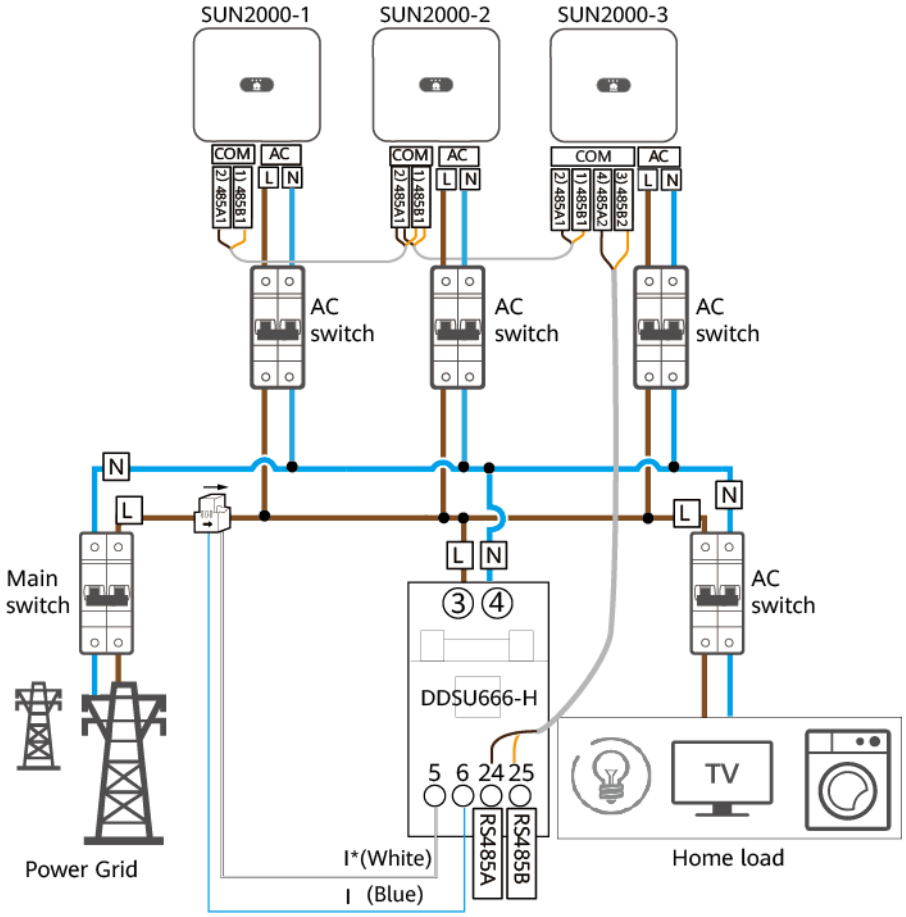
- SUN2000 cascading scenarios
  - In-phase grid connection

Figure 5-21 In-phase grid connection



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Figure 5-22 Connecting cables to the power meter (in-phase grid connection)



NOTE

- Retain the default baud rates for the DDSU666-H and YDS70-C16 power meters. If they are changed, the power meters may go offline, generate alarms, or affect the inverter output power.
- The preceding networking uses DDSU666-H as an example. Cable connections for other meter models may vary.
- In cascading scenarios, the inverters are required to connect to the management system through a Smart Dongle.
- In the preceding networking, the inverters are cascaded and support the grid-tied point control function to achieve zero export.
- If the inverters require the grid-tied point control function, they need to be connected to a power meter.
- A single-phase power meter is recommended for the networking with only single-phase inverters.
- If the SUN2000-(2KTL-6KTL)-L1 inverters are cascaded with three-phase inverters, the SUN2000-(2KTL-6KTL)-L1 must be connected to the grid in phase.
- Only one LG battery is supported, and the LG battery must be connected to the inverter where the Smart Dongle is installed.
- LG batteries cannot be connected in cascading scenarios.

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Procedure

Step 1 Connect signal cables to corresponding signal connectors.

NOTICE

- Ensure that the protection layer of the cable is in the connector. The surplus core should be cut off from the protection layer.
- Ensure that the exposed core is totally inserted into the cable hole.
- Ensure that the signal cables are connected securely.
- Ensure that the cables are not twisted.
- If multiple signal cables need to be connected to a single connector, ensure that the outer diameters of the signal cables are the same.

Figure 5-23 Crimping two signal cables

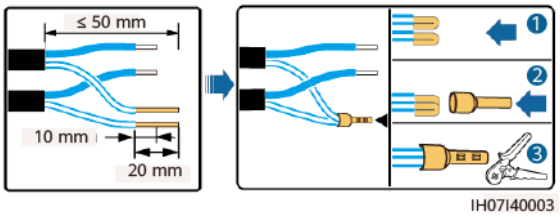
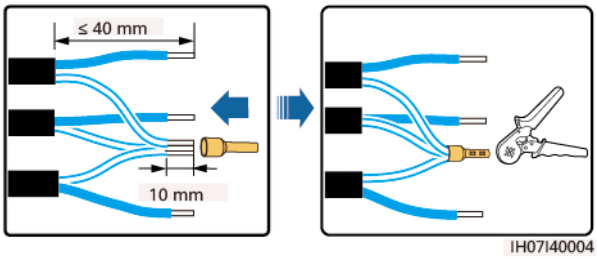


Figure 5-24 Crimping three signal cables



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Figure 5-25 Assembling a signal connector (single SUN2000)

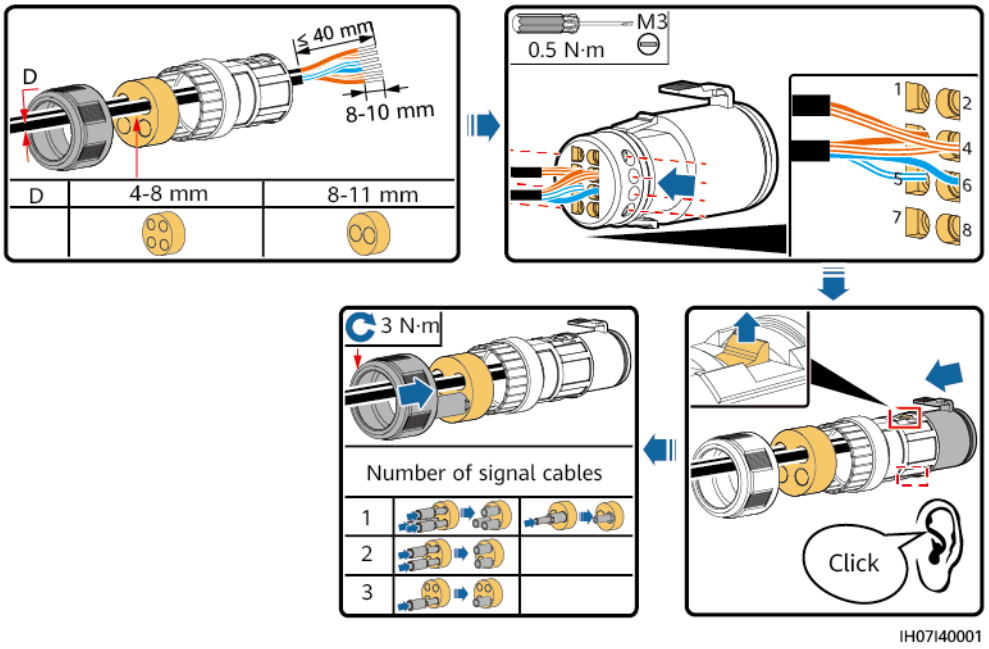
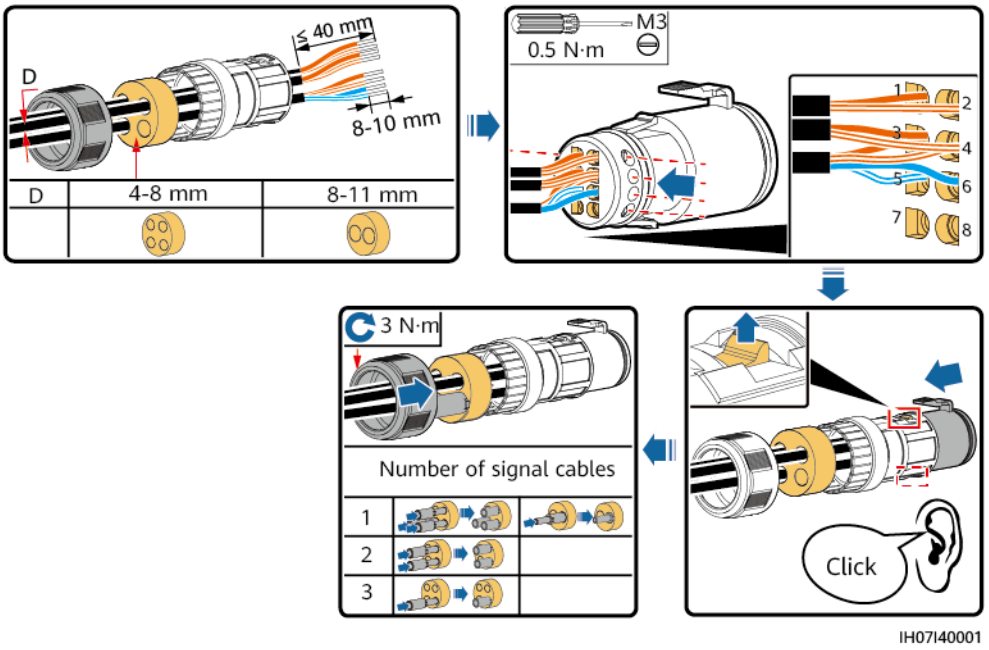


Figure 5-26 Assembling a signal connector (SUN2000 cascading)



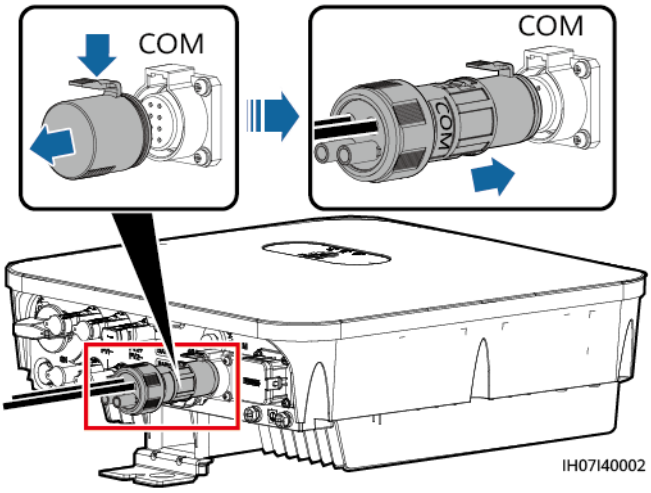
Step 2 Connect the signal connector to the corresponding port.

NOTICE

Ensure that the signal connector is connected securely.

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Figure 5-27 Securing a signal connector



----End

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6 System Commissioning

DANGER

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

6.1 Verification Before Power-On

Table 6-1 Check items and acceptance criteria

No.	Check Item	Acceptance Criteria
1	SUN2000	The SUN2000 is installed correctly and securely.
2	WLAN antenna	The WLAN antenna is installed correctly and securely.
3	Cables routing	Cables are routed properly as required by the customer.
4	Cable tie	Cable ties are evenly distributed and no burr exists.
5	Grounding	The PE cable is connected correctly, securely, and reliably.
6	Switch	The DC switch and all the switches connecting to the SUN2000 are OFF.
7	Cable connection	The AC output power cable, DC input power cable, battery cable, and signal cable are connected correctly, securely, and reliably.
8	Unused terminal and port	Unused terminals and ports are locked by watertight caps.

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No.	Check Item	Acceptance Criteria
9	Installation environment	The installation space is proper, and the installation environment is clean and tidy.

6.2 System Power-On

Prerequisites

Before turning on the AC switch between the SUN2000 and the power grid, use a multimeter to check that the AC voltage is within the allowed range.

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

- If the DC power supply is connected but the AC power supply is disconnected, the SUN2000 will report a **Grid Loss** alarm. The SUN2000 can start properly only after the power grid recovers.
- If the AC power supply is connected but the battery is not connected, the SUN2000 reports a **Battery Abnormal** alarm.
- If the SUN2000 is connected to LG batteries, turn on the DC switch within 1 minute after the AC switch is turned on. Otherwise, the SUN2000, connected to the power grid, will shut down and start again.

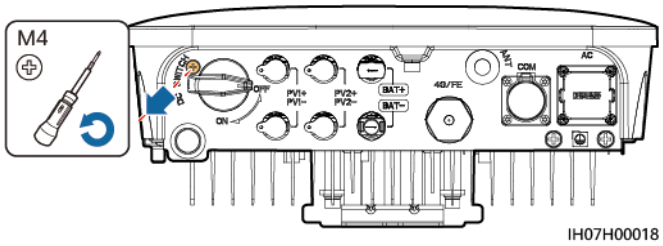
Procedure

Step 1 If the battery port of the SUN2000 is connected to a battery, turn on the auxiliary power switch of the battery and then the battery switch.

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

Step 3 (Optional) Remove the locking screw from the DC switch.

Figure 6-1 Removing the locking screw from a DC switch



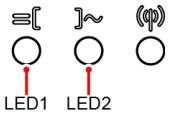
Copyright © Huawei Technologies Co., Ltd.

Step 4 Turn on the DC switch between the PV string and the SUN2000 if there is any.

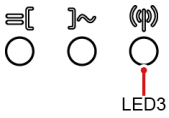
Step 5 Turn on the DC switch at the bottom of the SUN2000.

Step 6 Observe the LEDs to check the SUN2000 operating status.

Table 6-2 LED indicators 1

Category	Status		Description
Running indicator 	**LED1**	**LED2**	–
	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)	Both the DC and AC are 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.
	Steady orange	Steady orange	The SUN2000 is operating in the off-grid mode.
	Blinking orange slowly	Off	The DC is on, and the SUN2000 has no output in the off-grid mode.
	Blinking orange slowly	Blinking orange slowly	The SUN2000 is operating in the overload in backup mode.
	Off	Off	Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	–	There is a DC environmental alarm, such as an alarm indicating that High String Input Voltage, String Reverse Connection, or Low Insulation Resistance.

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Category	Status		Description
	–	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 indicator 	**LED3**		–
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)		Communication is in progress.
	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.

NOTE

If the off-grid load is overloaded, indicators LED1 and LED2 on the inverter blink orange slowly. Reduce the off-grid load power and manually clear the alarm or until the inverter is recovered. The inverter attempts to restart at an interval of 5 minutes. If the inverter fails to restart for three times, the interval changes to 2 hours. If the inverter is standby in off-grid mode, check the inverter alarms and rectify the fault.

Table 6-3 LED indicators 2

Category	Status			Description
Device replacement indication	**LED1**	**LED2**	**LED3**	–
	Steady red	Steady red	Steady red	The SUN2000 hardware is faulty. The SUN2000 needs to be replaced.

----End

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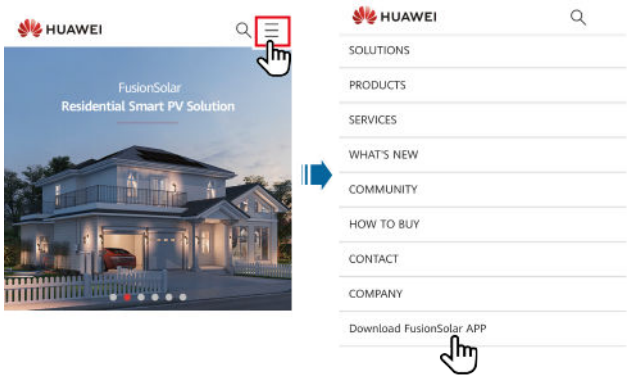
7 Man-Machine Interaction

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

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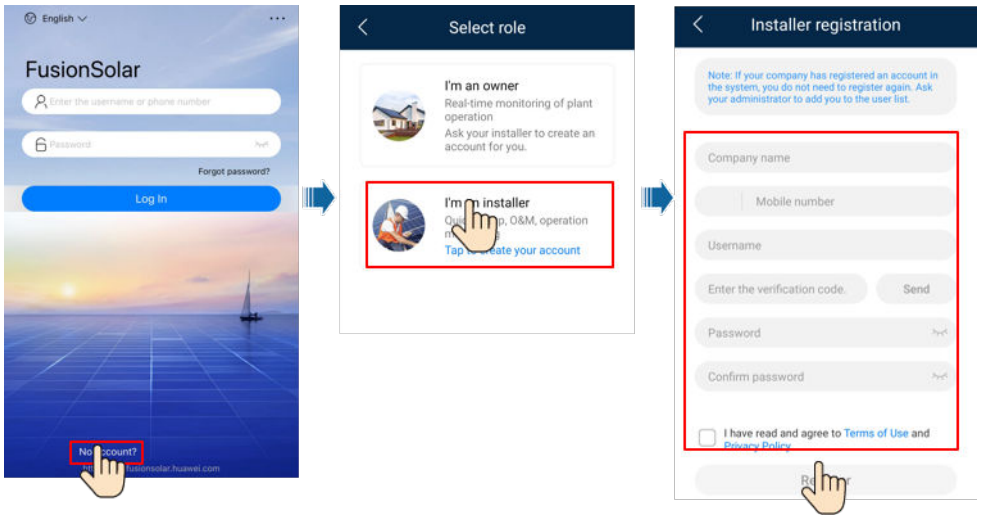
7.1.2 (Optional) Registering an Installer Account

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.

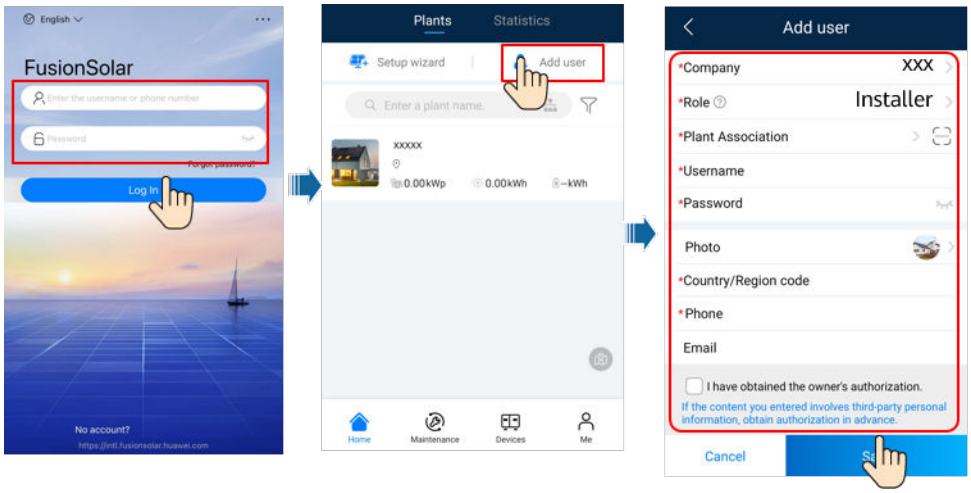
Figure 7-3 Creating the first installer account



NOTICE

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

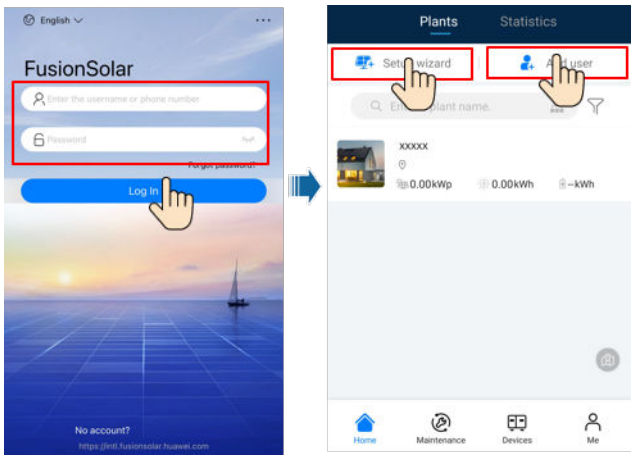
Figure 7-4 Creating multiple installer accounts for the same company



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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

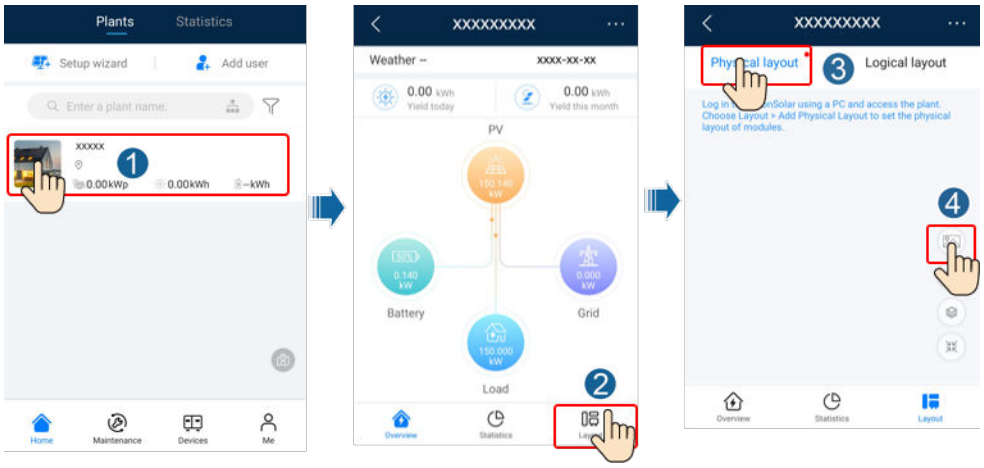
- If smart PV optimizers are configured for PV strings, ensure that the smart PV optimizers have been successfully connected to the SUN2000 before performing the operations in this section.
- Check that the SN labels of smart PV optimizers are correctly attached to the physical layout template.
- Take 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.

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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.

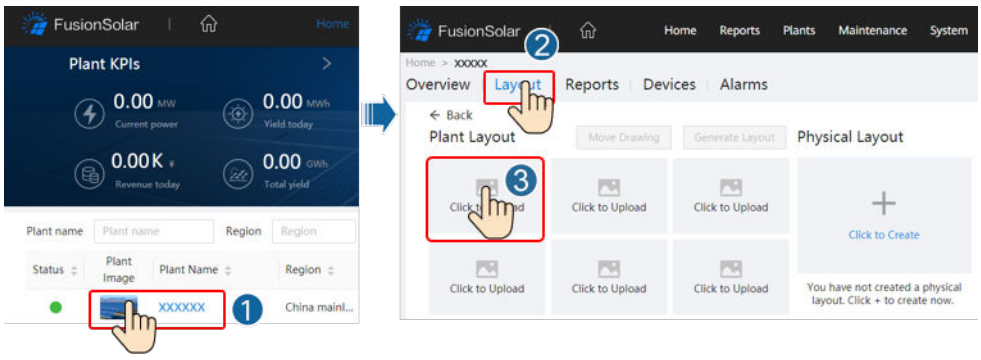
Figure 7-6 Uploading the physical layout template photo (App)



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.

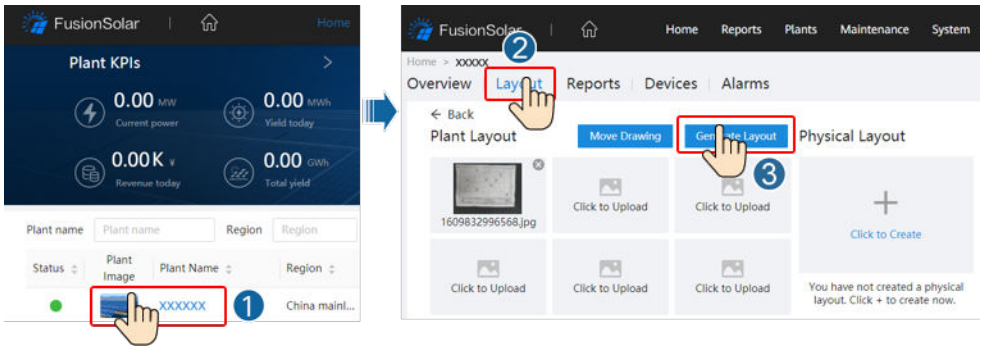
Figure 7-7 Uploading the physical layout template photo (WebUI)



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.

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Figure 7-8 Physical layout design of PV modules



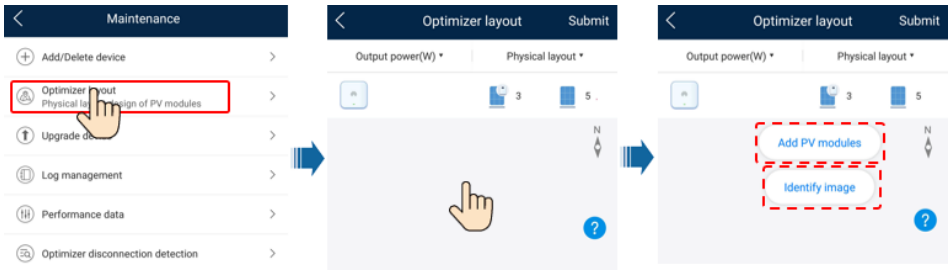
----End

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

7.2 Parameters Settings

Go to the **Device Commissioning** screen and set SUN2000 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.

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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 7-10 Grid-tied point control

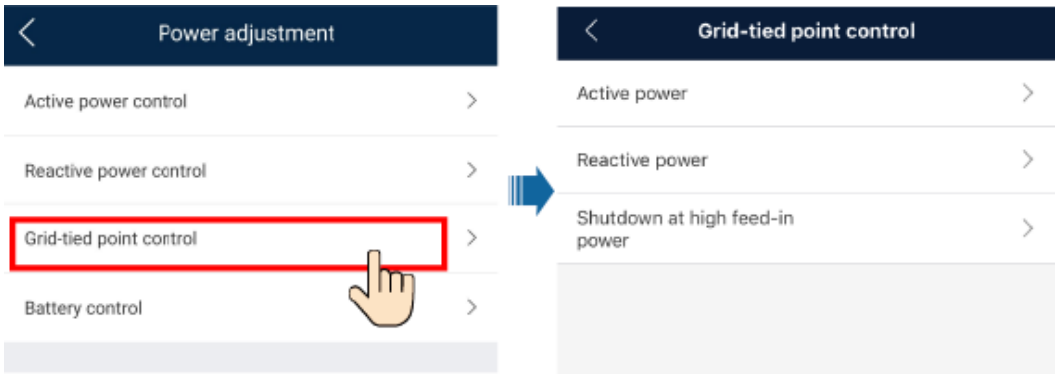


Table 7-1 Grid-tied point control

Parameter Name			Description
Active power	Unlimited	-	If this parameter is set to **Unlimited**, the output power of the SUN2000 is not limited and the SUN2000 can connect to the power grid at the rated power.
	Grid connection with zero power	Closed-loop controller	• If multiple SUN2000s are cascaded, set this parameter to **SDongle/SmartLogger**. • If there is only one SUN2000, set this parameter to **Inverter**.

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Parameter Name			Description
		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.
		Power control hysteresis	Specifies the dead zone for adjusting the SUN2000 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 SUN2000 active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the SUN2000 is disconnected, the Smart Dongle delivers the derating value of the SUN2000 active power by percentage.
		Communication disconnection fail-safe	In the SUN2000 anti-backfeeding scenario, if this parameter is set to **Enable**, the SUN2000 will derate according to the active power derating percentage when the communication between the SUN2000 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 SUN2000 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 SUN2000s are cascaded, set this parameter to **SDongle/SmartLogger**. • If there is only one SUN2000, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.

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Parameter Name			Description
		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.
		Power control hysteresis	Specifies the dead zone for adjusting the SUN2000 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 SUN2000 active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the SUN2000 is disconnected, the Smart Dongle delivers the derating value of the SUN2000 active power by percentage.
		Communication disconnection fail-safe	In the SUN2000 anti-backfeeding scenario, if this parameter is set to **Enable**, the SUN2000 will derate according to the active power derating percentage when the communication between the SUN2000 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 SUN2000 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 SUN2000s are cascaded, set this parameter to **SDongle/SmartLogger**. • If there is only one SUN2000, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.

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Parameter Name			Description
		PV plant capacity	Specifies the total maximum active power in the SUN2000 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.
		Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.
		Power control hysteresis	Specifies the dead zone for adjusting the SUN2000 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 SUN2000 active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the SUN2000 is disconnected, the Smart Dongle delivers the derating value of the SUN2000 active power by percentage.
		Communication disconnection fail-safe	In the SUN2000 anti-backfeeding scenario, if this parameter is set to **Enable**, the SUN2000 will derate according to the active power derating percentage when the communication between the SUN2000 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 SUN2000 and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.

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Parameter Name		Description
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.
	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.

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Figure 7-11 Apparent power control

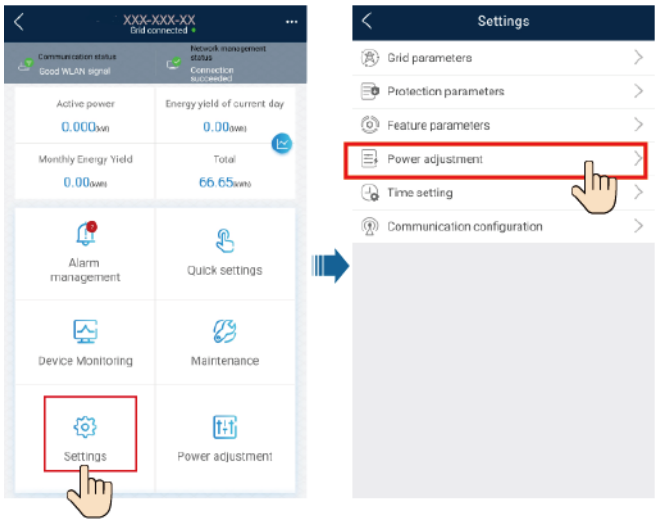


Table 7-2 Apparent power

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.

7.2.1.3 Battery Control

Prerequisites

The screenshots in this chapter are taken in the SUN2000 3.2.00.011 App. The App is being updated. The actual screens may vary.

Function

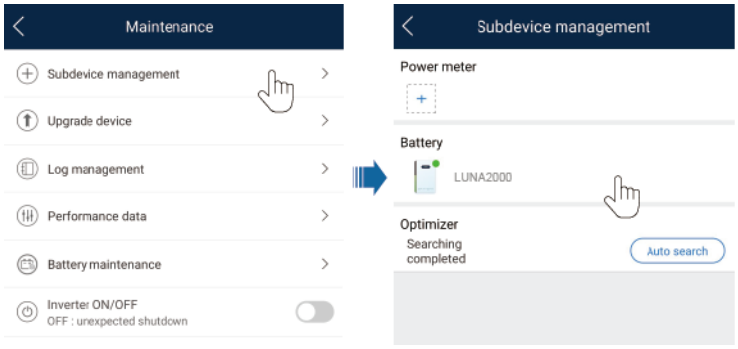
When the inverter connects to a battery, add the battery and set battery parameters.

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Adding a Battery

To add a battery, choose **Maintenance** > **Subdevice management** on the home screen.

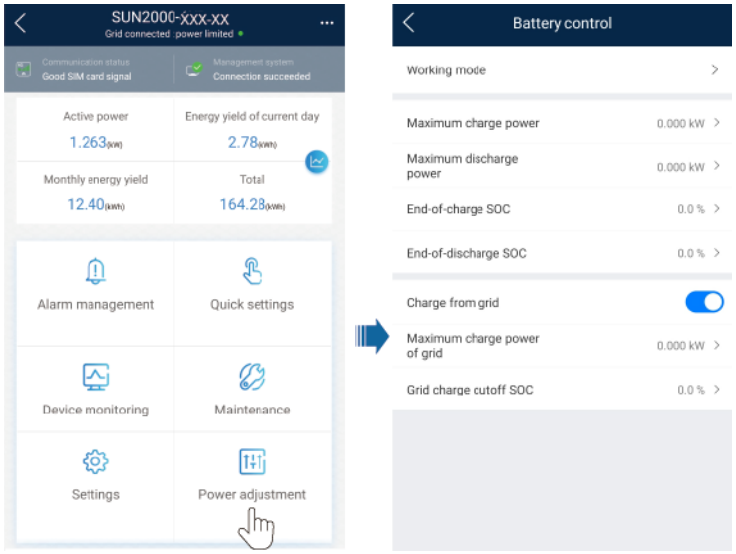
Figure 7-12 Adding a battery



Parameters Settings

On the home screen, choose **Power adjustment** > **Battery control**, and set the battery parameters and working mode.

Figure 7-13 Battery control parameter setting



Parameter	Description	Value Range
Working mode	For details, see the description on the App screen.	• Maximum self-consumption • Time-of-use • Fully fed to grid

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Parameter	Description	Value Range
Maximum charge power (kW)	Retain this parameter to the maximum charge power. Additional configuration is not required.	• Charge: [0, Maximum charge power]
Maximum discharge power (kW)	Retain this parameter to the maximum discharge power. Additional configuration is not required.	• Discharge: [0, Maximum discharge power]
End-of-charge SOC (%)	Set the charge cutoff capacity.	90%–100%
End-of-discharge SOC (%)	Set the discharge cutoff capacity.	0%–20% (When no PV module is configured or the PV modules have no voltage for 24 hours, the minimum value is 15%.)
Charge from grid	If **Charge from grid** function is disabled by default, comply with the grid charge requirements stipulated in local laws and regulations when this function is enabled.	• Disable • Enable
Grid charge cutoff SOC	Set the grid charge cutoff SOC.	[20%, 100%]

7.2.1.4 Capacity Control

Prerequisites

The screenshots in this section are captured from the SUN2000 app 6.23.00.125. The actual screens may vary with app updates.

Description

If the inverter connects to an ESS and the ESS working mode is set to **Maximum self-consumption** or **TOU**, you can set capacity control parameters.

Table 7-3 Application Scenario

Applicable Model	Application Scenario
SUN2000-(2KTL-6KTL)-L1	Single inverter + LUNA2000 directly connected to the management system

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Applicable Model	Application Scenario
	Single inverter + Smart Dongle (WLAN-FE) + LUNA2000 connected to the management system

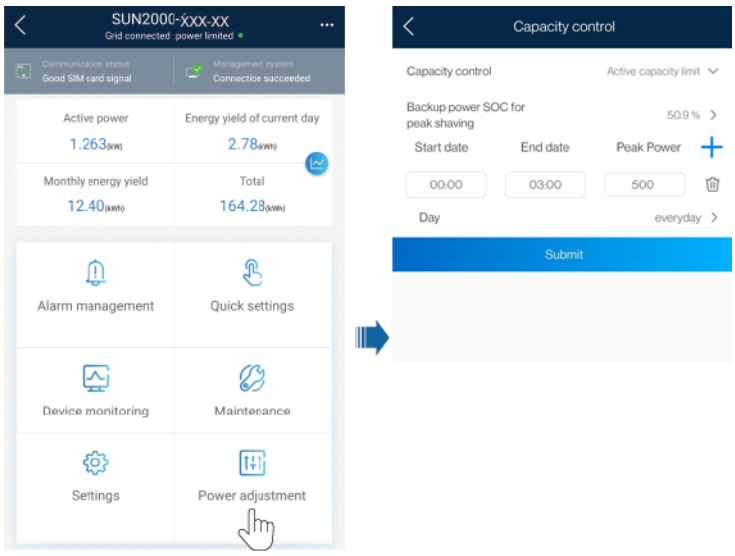
Parameter Settings

On the home screen, choose **Power adjustment** > **Capacity control** and set capacity control parameters.

NOTE

- The capacity control function is unavailable when the energy storage working mode is set to **Fully fed to grid**.
- When capacity control has been enabled, you must first disable capacity control and then set the energy storage working mode to **Fully fed to grid**.

Figure 7-14 Setting capacity control parameters



Parameter	Description	Range
Capacity control	1. Before enabling **Capacity control**, set **Charge from grid** to **Enable**. 2. Before disabling **Charge from grid**, set **Capacity control** to **Disable**.	• Disable • Active capacity limit

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Parameter	Description	Range
Backup power SOC for peak shaving (%)	The value of this parameter affects the peak shaving capability. A larger value indicates stronger peak shaving capability.	[0.0, 100.0] Backup power SOC for peak shaving > Backup power SOC (when BackUp is enabled) > End-of-discharge SOC
Start date	• Set the peak power range based on the start time and end time. The peak power is configured based on electricity prices in different time segments. You are advised to set the peak power to a low value when the electricity price is high. • A maximum of 14 time segments are allowed.	-
End dete		
Peak power (kW)		[0.000, 1000.000]

Description

In SmartLogger networking, if the ESS working mode is **Maximum self-consumption** or **TOU**, you can set **Peak shaving** parameters on the SmartLogger WebUI or FusionSolar app by scanning the QR code on the SmartLogger.

Table 7-4 Application scenarios

Applicable Model	Application Scenario
SUN2000-(2KTL-6KTL)-L1	SmartLogger + single/cascaded system + LUNA2000 connected to the management system

Parameter Settings

- On the SmartLogger WebUI, choose **Settings > Battery control**, and set **Peak shaving**.
- Connect the app to the SmartLogger by scanning the QR code, choose **Power adjustment > Peak shaving**, and set related parameters.

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NOTE

- In SmartLogger V300R023C00SPC170 and later versions, **Peak shaving** is displayed only when the export+import meter is connected in the ESS scenario.
- The peak shaving function is unavailable when the ESS working mode is set to **Fully fed to grid**.
- When peak shaving has been enabled, you must first disable it and then set the ESS working mode to **Fully fed to grid**.
- For details about the peak shaving function, see the ***Introduction to Peak Shaving***.

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 SUN2000s 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 SUN2000 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 SUN2000 has the AFCI alarm automatic clearance mechanism. If an alarm is triggered for less than five times within 24 hours, the SUN2000 automatically clears the alarm. If the alarm is triggered for five times or more within 24 hours, the SUN2000 locks for protection. You need to manually clear the alarm on the SUN2000 so that it can work properly.

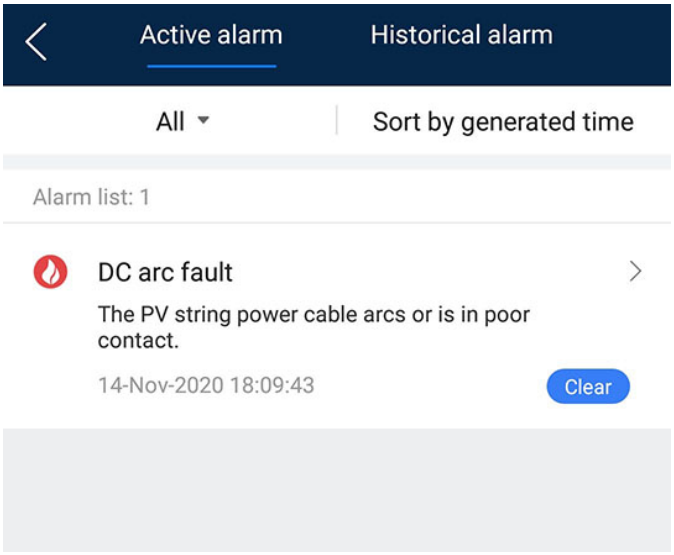
You can manually clear the alarm as follows:

- **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 SUN2000 that generates the AFCI alarm, tap **Alarm management**, and tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.

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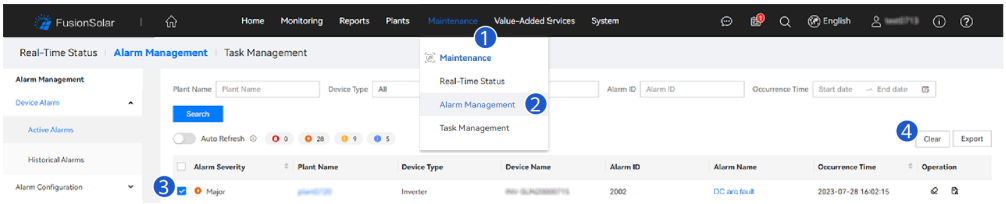
Figure 7-15 Alarm management



- **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 7-16 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 SUN2000. During the self-check, the SUN2000 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 SUN2000 detects maximum voltage over 10 min (59.S1), maximum overvoltage (59.S2), minimum undervoltage (27.S1), minimum

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undervoltage (27.S2), maximum overfrequency (81.S1), maximum overfrequency (81.S2), and minimum underfrequency (81.S1), and minimum underfrequency (81.S2).

Figure 7-17 IPS test

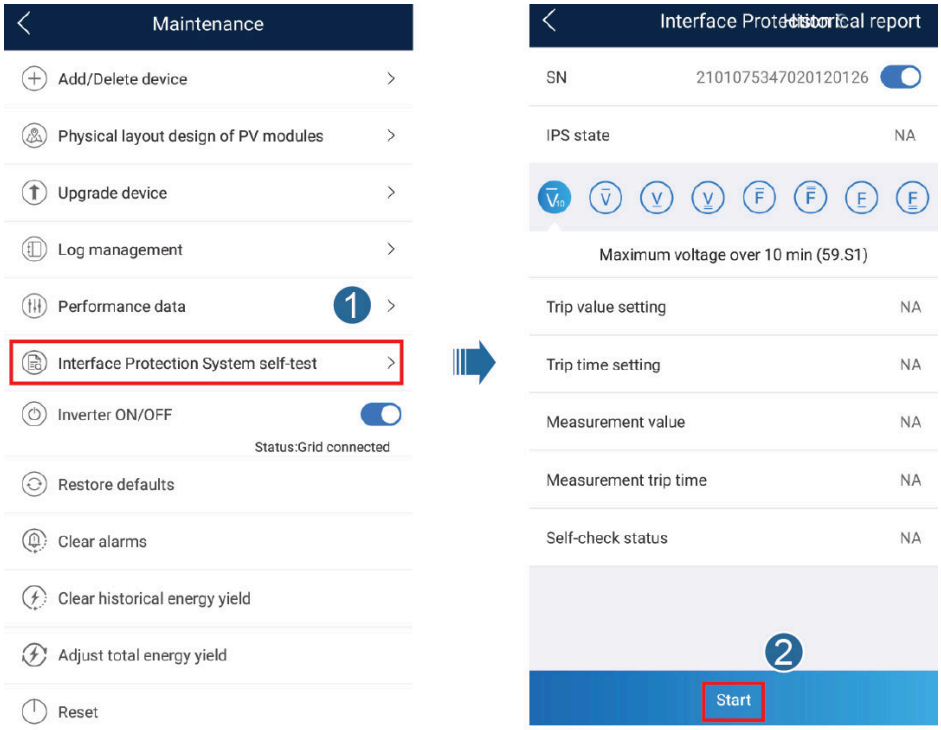


Table 7-5 IPS test type

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.
Maximum overfrequency (81.S1)	The default overfrequency protection threshold is 50.2 Hz, and the default protection time threshold is 0.1s.

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IPS Test Type	Description
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

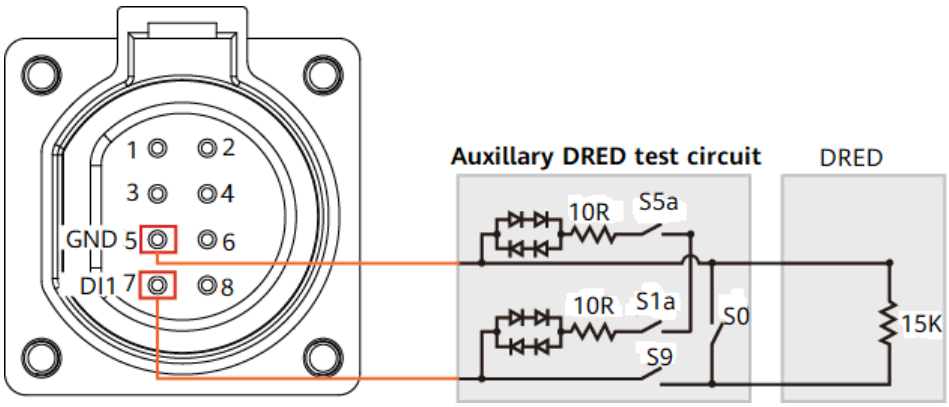
7.2.4 DRM (Australia AS4777)

Function

According to Australia AS 4777.2-2015, solar inverters need to support the function of demand response mode (DRM), and DRM0 is a mandatory requirement.

This function is disabled by default.

Figure 7-18 Wiring diagram for the DRM function



NOTE

The demand response enabling device (DRED) is a power grid dispatch device.

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Table 7-6 DRM requirements

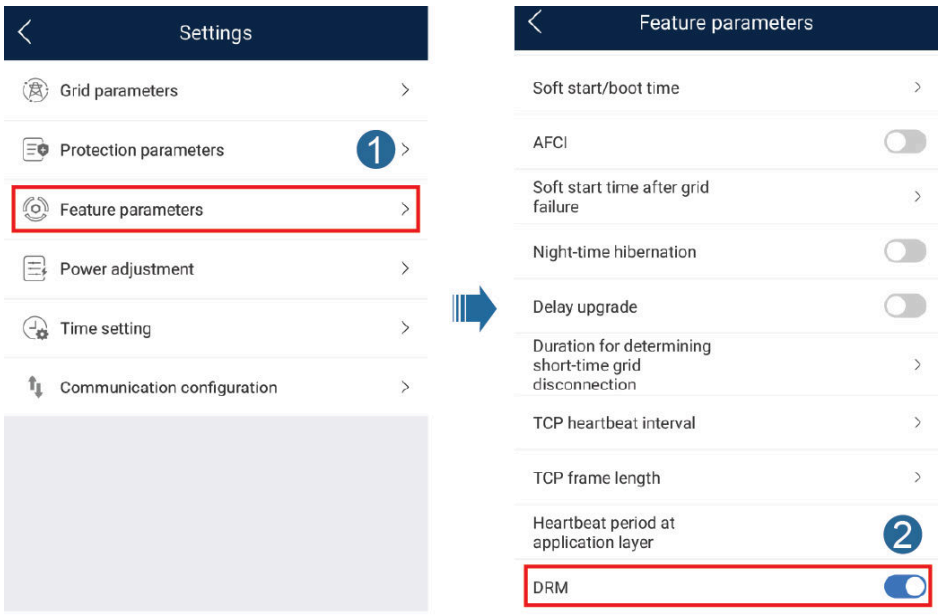
Mode	Port on the SUN2000	Requirements
DRM0	DI1 and GND of the COM port	• When switches S0 and S9 are switched on, the solar inverter should be turned off. • When switch S0 is switched off, and switch S9 is switched on, the solar inverter should be grid-tied.

Procedure

Step 1 On the home page, choose **Settings** > **Feature parameters**.

Step 2 Set **DRM** to .

Figure 7-19 DRM



----End

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8 System Maintenance

DANGER

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

WARNING

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

8.1 System Power-Off

Precautions

WARNING

After the SUN2000 powers off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, put on insulated gloves and begin operating the SUN2000 five minutes after the power-off.

Procedure

Step 1 Send a shutdown command on the App.

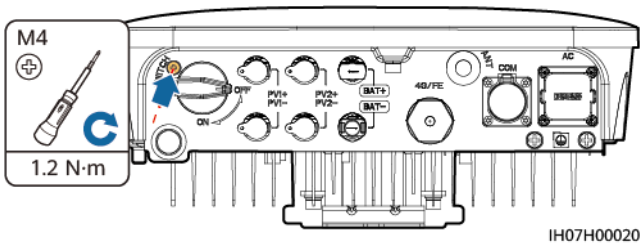
Step 2 Turn off the AC switch between the SUN2000 and the power grid.

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

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

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Figure 8-1 Installing a locking screw for the DC switch



Step 5 Turn off the DC switch between the SUN2000 and PV strings.

Step 6 (Optional) Turn off the battery switch between the SUN2000 and batteries.

----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 SUN2000, connecting cables, and maintaining the grounding reliability, power off the SUN2000 (see **8.1 System Power-Off** for details).

Table 8-1 Maintenance checklist

Check Item	Check Method	Maintenance Interval
System cleanliness	Check periodically that the heat sinks are free from obstacles and dust.	Once every 6 to 12 months
System running status	• Check that the SUN2000 is not damaged or deformed. • Check that the SUN2000 operates with no abnormal sound. • Check that all SUN2000 parameters are correctly set during operation.	Once every six months
Electrical connection	• Check that cables are secured. • Check that cables are intact, and that in particular, the parts touching the metallic surface are not scratched. • Check that unused DC input terminals, battery terminals, COM ports, ANT ports, and Smart Dongle waterproof covers are locked.	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.

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Check Item	Check Method	Maintenance Interval
Grounding reliability	Check that ground cables are securely connected.	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.

8.3 Troubleshooting

Alarm severities are defined as follows:

- Major: The SUN2000 enters the shutdown mode or functions abnormally after a fault occurs.
- Minor: Some components are faulty but the SUN2000 can still connect to the power grid and generate power.
- Warning: The SUN2000 functions normally, but its output power decreases due to external factors.

Table 8-2 Common alarms and troubleshooting measures

Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2001	High String Input Voltage	Major	The PV array is not properly configured. Excessive PV modules are connected in series to the PV string, and therefore the open-circuit voltage exceeds the maximum SUN2000 operating voltage. Cause ID = 1, 2 • 1: The PV1 input voltage is high. • 2: The PV2 input voltage is high.	Check the serial connection configuration of the PV string and ensure that the PV string open-circuit voltage is not greater than the maximum operating voltage of the SUN2000. After the PV array configuration is corrected, the alarm disappears.
2002	DC Arc Fault	Major	The PV string power cables arc or are in poor contact. Cause ID = 1, 2 • 1: PV1 DC arc fault • 2: PV2 DC arc fault	Check whether the string cables arc or are in poor contact.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2003	DC arc fault	Major	The PV string power cables arc or are in poor contact. ● Cause ID 1 = PV1 ● Cause ID 2 = PV2 ● Cause ID 3 = PV3	Check whether the PV string cables arc or are in poor contact.
2011	String Reversed	Major	The PV string is reversely connected. Cause ID = 1, 2 ● 1: PV1 is reversely connected. ● 2: PV2 is reversely connected.	Check whether the PV string is reversely connected to the SUN2000. If yes, wait until the PV string current decreases below 0.5 A, set DC switch to OFF, and adjust the PV string polarity.
2021	AFCI Check Failure	Major	The AFCI check fails. Cause ID = 1, 2 ● 1: The AFCI check circuit is abnormal. ● 2: The AFCI circuit is faulty.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the fault persists, contact your dealer or Huawei technical support.
2032	Grid Failure	Major	Cause ID = 1 ● The power grid experiences an outage. ● The AC circuit is disconnected or the AC circuit breaker is OFF.	1. Check the AC voltage. 2. Check whether the AC circuit is disconnected or the AC circuit breaker is OFF.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2033	Grid Undervoltage	Major	Cause ID = 1 The grid voltage is below the lower threshold or the low voltage duration has lasted for more than the value specified by low voltage ride-through (LVRT).	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the allowed range. If no, contact the local power operator. If yes, modify the grid undervoltage protection threshold through the mobile App, SmartLogger, or network management system (NMS) with the consent of the local power operator. 3. If the fault persists for a long time, check the connection between the AC switch and the output power cable.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2034	Grid Overvoltage	Major	Cause ID = 1 The grid voltage exceeds the higher threshold or the high voltage has lasted for more than the value specified by high voltage ride-through (HVRT).	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the allowed range. If no, contact the local power operator. If yes, modify the grid overvoltage protection threshold through the mobile App, SmartLogger, or NMS with the consent of the local power operator. 3. Check whether the peak voltage of the power grid is too high. If the fault persists and cannot be rectified for a long time, contact the power operator.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2036	Grid Overfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is higher than the standard requirement for the local power grid.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the allowed range. If no, contact the local power operator. If yes, modify the grid overfrequency protection threshold through the mobile App, SmartLogger, or NMS with the consent of the local power operator.
2037	Grid Underfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is lower than the standard requirement for the local power grid.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the allowed range. If no, contact the local power operator. If yes, modify the grid underfrequency protection threshold through the mobile App, SmartLogger, or NMS with the consent of the local power operator.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2038	Unstable Grid Frequency	Major	Cause ID = 1 Power grid exception: The actual grid frequency change rate does not comply with the local power grid standard.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the allowed range. If no, contact the local power operator.
2039	Output Overcurrent	Major	Cause ID = 1 The power grid voltage drops dramatically or the power grid is short-circuited. As a result, the SUN2000 transient output current exceeds the upper threshold and therefore the SUN2000 protection is triggered.	1. The SUN2000 detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers. 2. If the alarm occurs frequently and affects the energy yield of the power plant, check whether the output is short-circuited. If the fault persists, contact your dealer or Huawei technical support.
2040	Output DC Component Overhigh	Major	Cause ID = 1 The DC component of the SUN2000 output current exceeds the specified upper threshold.	1. The SUN2000 detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers. 2. If the alarm occurs frequently, contact your dealer or Huawei technical support.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2051	Abnormal Residual Current	Major	Cause ID = 1 The insulation impedance of the input side to PE decreases when the SUN2000 is operating.	1. If the alarm occurs occasionally, the external circuit may be abnormal temporarily. The SUN2000 automatically recovers after the fault is rectified. 2. If the alarm occurs frequently or persists, check whether the impedance between the PV string and the ground is too low.
2062	Low Insulation Resistance	Major	Cause ID = 1 • A short circuit occurs between the PV array and the ground. • The ambient air of the PV array is damp and the insulation between the PV array and the ground is poor.	1. Check the output impedance of the PV array to ground. If there is a short circuit or lack of insulation, rectify it. 2. Check that the PE cable of the SUN2000 is correctly connected. 3. If the impedance is lower than the specified protection threshold in rainy and cloudy days, set **Insulation resistance protection** using the mobile App, SmartLogger, or NMS. Current insulation resistance: x MΩ, possible short circuit position: x%. The short circuit position is valid for a single PV string. If there are multiple PV strings, check the PV strings one by one. For details, see **E Locating Insulation Resistance Faults**.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2063	Overtemperature	Minor	Cause ID = 1 • The SUN2000 is installed in a place with poor ventilation. • The ambient temperature is higher than the upper threshold. • The SUN2000 is not working properly.	• Check the ventilation and ambient temperature of the SUN2000 installation position. • If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. • If the ventilation and ambient temperature both meet requirements, contact your dealer or Huawei technical support.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2064	Device Fault	Major	An unrecoverable fault has occurred on a circuit inside the SUN2000. Cause ID = 1–12 ● 1: The Boost input is short-circuited. ● 2: The Boost input experiences overcurrent. ● 3: The control circuit is faulty. ● 4: The inverter circuit is abnormal. ● 5: The residual current sensor is faulty. ● 6: The temperature detection fails. ● 7: EEPROM read/write fails. ● 8: The auxiliary power supply is abnormal. ● 9: The grid-tied relay is abnormal. ● 10: The DC bus experiences overvoltage. ● 11: The DC bus experiences undervoltage. ● 12: The DC bus experiences voltage imbalance.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the fault persists, contact your dealer or Huawei technical support.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2065	Upgrade Failed or Version Mismatch	Minor	The upgrade does not complete normally. Cause ID = 1–4, 7 ● 1. The software and hardware of the main controller do not match. ● 2: The main and auxiliary controller software versions do not match. ● 3: The monitoring and power controller software versions do not match. ● 4: The upgrade fails. ● 7: The optimizer upgrade fails.	1. Perform an upgrade again. 2. If the upgrade fails for multiple times, contact your dealer or Huawei technical support.
61440	Monitoring Unit Faulty	Minor	Cause ID = 1 ● The flash memory is insufficient. ● The flash memory has bad sectors.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the fault persists, replace the monitoring board or contact your dealer Huawei technical support.
2067	Faulty Power Collector	Major	Cause ID = 1 The smart power sensor is disconnected.	1. Check that the configured power meter model is the same as the actual model. 2. Check that the communications parameters for the smart power sensors are the same as the SUN2000 RS485 configurations. 3. Check whether the smart power sensor is powered on and whether the RS485 communications cable is connected.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2068	Battery Abnormal	Minor	The battery is faulty, disconnected, or the battery circuit breaker is OFF when the battery is running. Cause ID = 1–4 • 1: The battery communication is abnormal. • 2: The battery port experiences overcurrent. • 3. The battery enabling cable is not properly connected. • 4: The battery port voltage is abnormal.	1. If the battery fault indicator is steady on or blinking, contact the battery supplier. 2. Check that the battery enabling/power/communications cable is correctly installed, and that the communications parameters are the same as the SUN2000 RS485 configurations. 3. Check that the auxiliary power switch on the battery is set to ON. 4. Send a shutdown command on the App. Turn off the AC output switch, DC input switch, and battery switch. Then turn on the battery switch, AC output switch, and DC input switch in sequence after 5 minutes. 5. If the fault persists, contact your dealer or Huawei technical support.
2070	Active Islanding	Major	Cause ID = 1 When the power grid experiences an AC power outage, the SUN2000 detects islanding proactively.	Check that the grid connection voltage of the SUN2000 is normal.
2077	Off-grid output overload	Major	Cause ID = 1/2 The output is overloaded or short-circuited.	1. Check whether the device output is short-circuited. 2. Check whether the device load configuration exceeds the rated value.

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
2080	Abnormal PV Module Configuration	Major	PV module configuration does not meet requirements, or the PV module output is reversely connected or short-circuited. Cause ID = 2, 3, 6, 7, 8, 9 • 2: The PV string power or the number of optimizers connected in series in a PV string exceeds the upper threshold. • 3: The number of optimizers connected in series in a PV string is less than the lower threshold, the PV string output is reversely connected, or the output of some optimizers in the PV string is reversely connected. • 6: Under the same MPPT, the number of optimizers connected in series in PV strings connected in parallel is different, or the output of some optimizers in PV strings is reversely connected. • 7: The optimizer installation position is changed, or PV strings are combined or exchanged. • 8: The sunlight is weak or changes abnormally. • 9: In partial configuration scenarios, the PV string voltage exceeds the inverter input voltage specifications.	Check whether the total number of PV modules, number of PV modules in a string, and number of PV strings meet requirements and whether the PV module output is reversely connected. • ID2: Check whether the PV string power or the number of PV modules connected in series in the PV string exceeds the upper threshold. • ID3: 1. Check whether the number of optimizers connected in series in the PV string is below the lower threshold. 2. Check whether the PV string output is reversely connected. 3. Check whether the PV string output is disconnected. 4. Check whether the optimizer output extension cable is correct (positive connector at one end and negative connector at the other). • ID6: 1. Check whether the number of optimizers connected in series in the PV strings connected in parallel under the same MPPT is the same. 2. Check whether the optimizer output extension cable is correct (positive connector at one end and negative connector at the other).

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Alarm ID	Alarm Name	Alarm Severity	Possible Causes	Troubleshooting
				• ID7: When the sunlight is normal, perform the optimizer search function again. • ID8: When the sunlight is normal, perform the optimizer search function again. • ID9: Calculate the PV string voltage based on the number of PV modules in the PV string and check whether the PV string voltage exceeds the upper threshold of the inverter input voltage.
2081	Optimizer Fault	Warning	Cause ID = 1 An optimizer is faulty.	Go to the optimizer information screen to view the fault details.
2082	Grid-tied/Off-grid Controller Abnormal	Major	Cause ID = 1 The inverter fails to communicate with the Smart Backup Box. Cause ID = 2 An unrecoverable fault occurs on a circuit inside the Smart Backup Box.	1. Send a shutdown command on the App. Turn off the AC output switch, DC input switch, and battery switch. 2. Check whether the power cable and RS485 cable between the Smart Backup Box and the inverter are normal. 3. After 5 minutes, turn on the battery switch, AC output side, AC output switch, and DC input switch. 4. If the alarm persists, contact your dealer or Huawei technical support.

NOTE

Contact your dealer if all failure analysis procedures listed above are completed and the fault still exists.

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9 SUN2000 Disposal

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, battery cables, AC output power cables, and PE cables.

Step 3 Remove the WLAN antenna or 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 a SUN2000

- If the original packaging is available, put the SUN2000 inside it and then seal it using adhesive tape.
- If the original packaging is unavailable, put the SUN2000 inside a suitable hard carton and seal it properly.

9.3 Disposing a SUN2000

If the SUN2000 service life expires, dispose the SUN2000 according to the local disposal rules for electrical equipment and electronic component waste.

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10 Technical Parameters

10.1 SUN2000 Technical Specifications

Efficiency

Technical Specification	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Maximum efficiency	98.2%	98.3%	98.4%	98.4%	98.4%	98.4%	98.4%
European weighted efficiency	96.7%	97.3%	97.3%	97.5%	97.7%	97.8%	97.8%

Input

Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Maximum input voltage[a]	600 V						
Maximum input current (per MPPT)	12.5 A						
Maximum short-circuit current (per MPPT)	18 A						
Operating voltage range	80–600 V						

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Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Startup voltage	100 V						
MPPT voltage range	90–560 V						
Rated input voltage	360 V						
Power supply	2						
Number of MPPTs	2						
Battery normal voltage	450 Vdc						
Battery voltage range	350-600 Vdc						
Battery maximum current	15 A						
Battery type	Li-ion						
Note a: The maximum input voltage includes the PV input voltage and battery input voltage.							

Output (On grid)

Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Rated output power	2000 W	3000 W	3680 W	4000 W	4600 W	5000 W[a]	6000 W
Maximum apparent power	2200 VA	3300 VA	3680 VA	4400 VA	5000 VA[b]	5500 VA[c]	6000 VA
Rated output voltage	220 V /230 V /240 V	220 V /230 V /240 V	230 V /240 V	220 V /230 V /240 V	220 V /230 V /240 V	220 V /230 V /240 V	220 V /230 V /240 V
Rated power grid frequency	50 Hz/60 Hz						
Maximum output current	10 A	15 A	16 A	20 A	23 A	25 A	27.3 A
Rated output current	9.1 A /8.7 A /8.3 A	13.6 A /13.0 A /12.5 A	16.0 A /15.3 A	18.2 A /17.4 A /16.7 A	20.9 A /20.0 A /19.2 A	22.7 A /21.7 A /20.8 A	27.3 A /26.1 A /25.0 A

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Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Rated apparent power	2 kVA	3 kVA	3.68 kVA	4 kVA	4.6 kVA	5 kVA	6 kVA
Inrush current	10 A	15 A	16 A	20 A	23 A	25 A	27.3 A
Max output fault current	30.12 A	45.18 A	55.42 A	60.24 A	69.28 A	75.3 A	90.37 A
Max output overcurrent protection	12 A	18 A	19.2 A	24 A	27.6 A	30 A	32.76 A
Power factor	0.8 leading and 0.8 lagging						
Maximum total harmonic distortion (rated power)	≤ 3%						
Note a: The rated output power is 5000 W for the AS4777 grid code. Note b: The maximum apparent power is 4600 VA for the VDE-AR-N 4105 grid code, and 5000 VA for the AS4777 grid code. Note c: The maximum apparent power is 5000 VA for the AS4777 grid code.							

Output (Off grid)

Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Maximum apparent power	2000 VA	3000 VA	3680 VA	4000 VA	4600 VA	5000 VA	5000 VA
Peak apparent power	110%, 10 s						

Protection

Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Anti-islanding protection	Supported						
DC reverse polarity protection	Supported						

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Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Insulation resistance detection	Supported						
Residual current monitoring unit (RCMU)	Supported						
AC short-circuit protection	Supported						
AC overcurrent protection	Supported						
Overtemperature protection	Supported						
DC surge protection	Supported						
AC surge protection	Supported						
AC overvoltage protection	Supported						
Arc fault protection	Supported						
AFCI	Supported						
Active anti-islanding method	AFD						
Protection class	I						
Overvoltage category	II(DC)/III(AC)						
PV and AC port	DVCC						
Communication port	DVCA						

Communications

Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Display	LED indicators; WLAN+App						
WLAN	Supported						
RS485	Supported						

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Technical Specifications	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Maximum RS485 communication distance	1000 m						
Communications expansion module	WLAN-FE (optional)/4G (optional)						

Common Parameters

Technical Specification	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Topology	Non-Isolation						
IP rating	IP65						
Cooling mode	Natural cooling						
Dimensions (H x W x D)	365 mm x 365 mm x 156 mm (including the mounting bracket)						
Weight	12 kg						
Operating temperature	–25°C to +60°C (derated when the temperature is higher than +45°C)						–25°C to +60°C (derated when the temperature is higher than +40°C)
Humidity	0–100% RH						
Operating altitude	0–4000 m (derated above 2000 m)						

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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-CN: • Supports LTE-FDD: B1/B3/B8. • Supports LTE-TDD: B38/B39/B40/B41. • Supports DC-HSPA+/HSPA+/HSPA/UMTS: B1/B5/B8/B9. • Supports TD-SCDMA: B34/B39. • Supports GSM/GPRS/EDGE: 900 MHz/1800 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.
Protocol standard	WLAN 802.11b/g/n	SDongleA-05: WLAN 802.11b/g/n	SDongleA-03-CN: • Supports LTE-FDD (with receive diversity): B1/B3/B5/B8. • Supports LTE-TDD (with receive diversity): B34/B38/B39/B40/B41. • Supports WCDMA: B1/B5/B8. • Supports GSM: 900 MHz/1800 MHz. • Supports digital audio. 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.

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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. • 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

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

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

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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
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

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A Grid Code

NOTE

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

Table A-1 Grid Code

National/ Regional Grid Code	Description	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
VDE-AR-N-4105	Germany LV power grid	Supported	Supported	Supported	Supported	Supported	-	-
UTE C 15-712-1(A)	France mainland power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
UTE C 15-712-1(B)	France island power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
UTE C 15-712-1(C)	France island power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
CEI0-21	Italy power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
RD1699/661	Spain LV power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported

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National/ Regional Grid Code	Description	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
C10/11	Belgium power grid	Supported	Supported	Supported	Supported	Supported	Supported	-
IEC61727	IEC 61727 LV (50 Hz)	Supported	Supported	Supported	Supported	Supported	Supported	Supported
IEC61727-60Hz	IEC 61727 LV (60 Hz)	Supported	Supported	Supported	Supported	Supported	Supported	Supported
TAI-PEA	Thailand grid-tied standard power grid	-	Supported	-	-	-	Supported	-
TAI-MEA	Thailand grid-tied standard power grid	-	Supported	-	-	-	Supported	-
EN50549-LV	Ireland power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
EN50549-SE	Sweden LV	Supported	Supported	Supported	Supported	Supported	Supported	Supported
ABNT NBR 16149	Brazil power grid	Supported	Supported	-	Supported	-	Supported	Supported
Fuel-Engine-Grid	Diesel generator hybrid power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
Fuel-Engine-Grid-60Hz	Diesel generator hybrid power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported

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National/ Regional Grid Code	Description	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
Austria	Austrian power grid	Supported	Supported	Supported	-	-	-	-
G98	UK G98 power grid	Supported	Supported	Supported	-	-	-	-
G99-TYPEA-LV	UK G99_TypeA_LV power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
NRS-097-2-1	South Africa Power Grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
SWITZERLAND-NA/EEA:2020-LV230	Switzerland	Supported	Supported	Supported	Supported	Supported	Supported	Supported
SINGAPORE	Singapore LV power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
HONGKONG	Hong Kong LV power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
DUBAI	DUBAI LV power grid	Supported	Supported	Supported	Supported	-	Supported	Supported
Island-Grid	Off-grid grid code	Supported	Supported	Supported	Supported	Supported	Supported	Supported
DENMARK-EN50549-DK1-LV230	Denmark power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported

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National/ Regional Grid Code	Description	SUN2000-2KTL-L1	SUN2000-3KTL-L1	SUN2000-3.68KTL-L1	SUN2000-4KTL-L1	SUN2000-4.6KTL-L1	SUN2000-5KTL-L1	SUN2000-6KTL-L1
DENMARK-EN50549-DK2-LV230	Denmark power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
AUSTRALIA-AS4777_A-LV230	Australia power grid	Supported	Supported	-	Supported	Supported	Supported	Supported
AUSTRALIA-AS4777_B-LV230	Australia power grid	Supported	Supported	-	Supported	Supported	Supported	Supported
AUSTRALIA-AS4777_C-LV230	Australia power grid	Supported	Supported	-	Supported	Supported	Supported	Supported
AUSTRALIA-AS4777_NZ-LV230	Australia power grid	Supported	Supported	-	Supported	Supported	Supported	Supported
OMAN	Oman low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
ANRE	Romania low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
FINLAND-EN50549-LV230	Finland power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported
Philippines	Philippines low-voltage power grid	Supported	Supported	Supported	Supported	Supported	Supported	Supported

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B Device Commissioning

Step 1 Access **Device Commissioning** screen.

Figure B-1 Method 1: before login (not connected to the Internet)

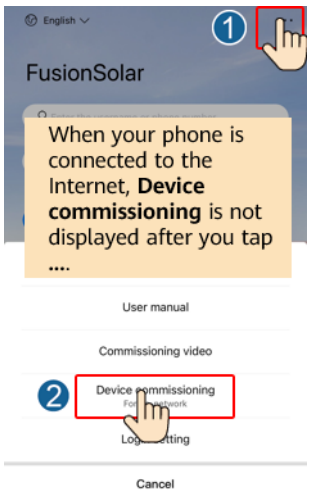
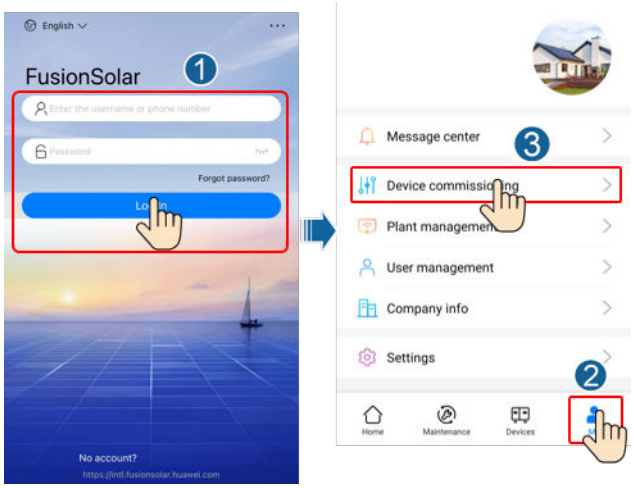


Figure B-2 Method 2: after login (connected to the Internet)



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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 SUN2000, the visible distance between the SUN2000 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 the SUN2000. The distances are for reference only and may vary with mobile phones and shielding conditions.
- When connecting the SUN2000 to the WLAN over a router, ensure that the mobile phone and SUN2000 are in the WLAN coverage of the router and the SUN2000 is connected to the router.
- The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz) and the WLAN signal reaches the SUN2000.
- 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 SUN2000 for the first time, you need to manually set the login password because the SUN2000 does not have an initial login password.

----End

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C Resetting Password

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

Step 2 Complete the following operations within 4 minutes:

Turn off the AC switch and set **DC SWITCH** to **OFF** at the bottom of the inverter. If the inverter is connected to a battery, turn off the battery switch. Wait until all LED indicators on the inverter panel turn off.

Turn on the AC switch and set **DC SWITCH** to **ON**. Wait about 90s and check that indicator is blinking green slowly.

Turn off the AC switch and set **DC SWITCH** to **OFF**. Wait until all LED indicators on the inverter panel turn off.

Turn on the AC switch and set **DC SWITCH** to **ON**. Wait until all LED indicators on the inverter panel blink and then turn off after 30s.

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

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

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Figure C-1 Setting the password

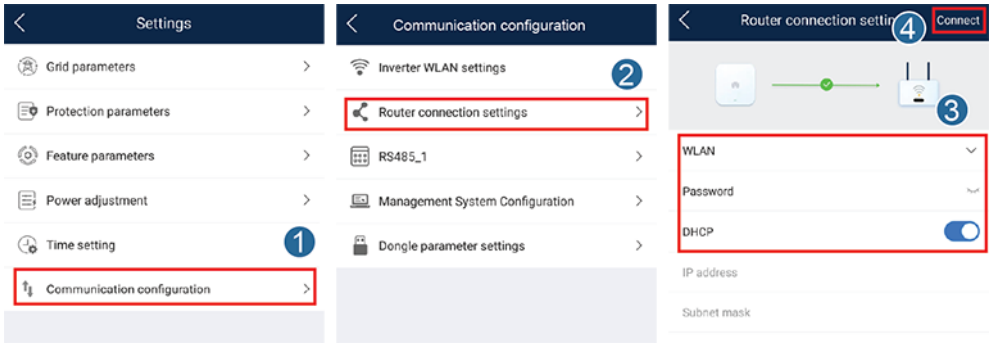


Step 4 Set router and management system parameters to implement remote management.

- Setting router parameters

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

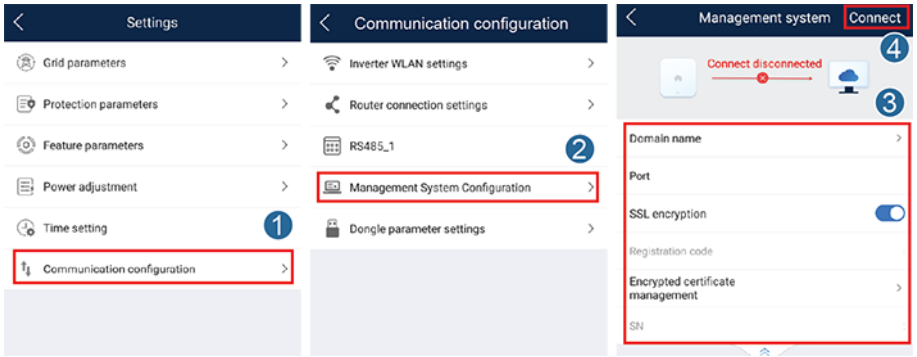
  Figure C-2 Setting router parameters



- 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

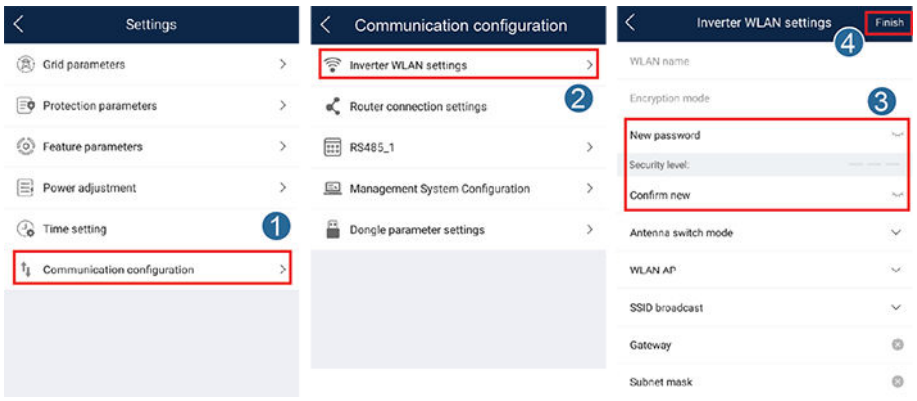


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- (Optional) Resetting the WLAN password

  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

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D Rapid Shutdown

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

Perform the following step to trigger rapid shutdown:

- Method 1: Use the rapid shutdown function. Set **Dry contact function** to **DI Rapid Shutdown**. Connect the access switch to pins 7 and 5 of the inverter communications terminal. The switch is turned off by default. When the switch is turned on, rapid shutdown is triggered.
- Method 2: Turn off the AC switch between the solar inverter and the power grid. (If the inverter supports the off-grid function and **Off-grid mode** is enabled by choosing **Settings > Feature parameters** on the home screen, turning off the AC switch will not trigger a rapid shutdown.)
- Method 3: Turn off the DC switch at the bottom of the SUN2000. (If an extra DC switch is connected to the input side of the SUN2000, turning off this DC switch will not trigger rapid shutdown.)
- Method 4: If **AFCI** is enabled, the inverter automatically detects arc faults, triggering a rapid shutdown.

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E Locating Insulation Resistance Faults

If the ground resistance of a PV string connected to a solar inverter is too low, the solar inverter generates a **Low Insulation Resistance** alarm.

The possible causes are as follows:

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

To locate the fault, connect each PV string to a solar inverter, power on and check the solar inverter, and locate the fault based on the alarm information reported by the FusionSolar App. If a system is not configured with any optimizer, skip the corresponding operations. Perform the following steps to locate an insulation resistance fault.

NOTICE

If two or more ground insulation faults occur in a single PV string, the following method cannot locate the fault. You need to check the PV modules one by one.

Step 1 The AC power supply is connected, and set the DC switch at the bottom of the solar inverter to OFF. If the solar inverter connects to batteries, wait for 1 minute, and turn off the battery switch and then the auxiliary power switch of the battery.

Step 2 Connect each PV string to the solar inverter and set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a startup command.

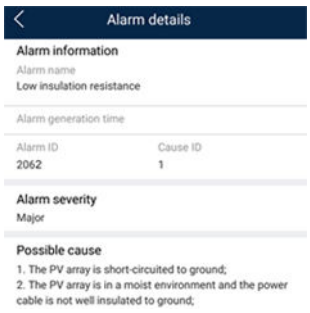
Step 3 Log in to the FusionSolar App and choose **My** > **Device Commissioning**. On the **Device Commissioning** screen, connect and log in to the solar inverter, and access the **Alarm management** screen. Check whether the **Low Insulation Resistance** alarm is reported.

- If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command. Set the DC switch to OFF and go to **Step 2** to connect another PV string to the solar inverter for a check.

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- If a **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, check the percentage for possible short-circuit positions on the **Alarm details** page and go to **Step 4**.

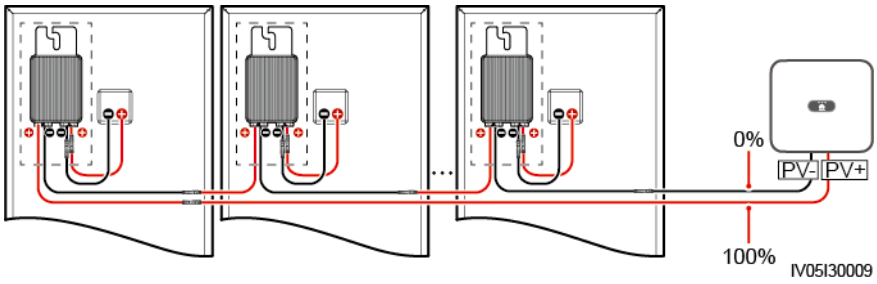
Figure E-1 Alarm details



NOTE

- The positive and negative terminals of a PV string are connected to the PV+ and PV– terminals of the solar inverter. The PV– terminal represents a possibility of 0% for the short-circuit position and the PV+ terminal represents a possibility of 100% for the short-circuit position. Other percentages indicate that the fault occurs on a PV module or cable in the PV string.
- Possible fault position = Total number of PV modules in a PV string x Percentage of possible short-circuit positions. For example, if a PV string consists of 14 PV modules and the percentage of the possible short-circuit position is 34%, the possible fault position is 4.76 (14 x 34%), indicating that the fault is located near PV module 4, including the previous and the next PV modules and the cables of PV module 4. The solar inverter has a detection precision of ±1 PV module.

Figure E-2 Definition of the percentage of the short-circuit position



Step 4 Set the DC switch to OFF and check whether the connector or DC cable between the possible faulty PV modules and the corresponding optimizers, or those between the adjacent PV modules and the corresponding optimizers are damaged.

- If yes, replace the damaged connector or DC cable, set the DC switch to ON, and view the alarm information.
  - If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, the inspection on the PV string is complete. Choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command. Set the DC switch to OFF. Go to **Step 2** to check other PV strings. Then go to **Step 8**.
  - If the **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, go to **Step 5**.

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- If not, go to **Step 5**.

Step 5 Set the DC switch to OFF, disconnect the possible faulty PV modules and corresponding optimizers from the PV string, and connect a DC extension cable with an MC4 connector to the adjacent PV modules or optimizers. Set the DC switch to ON and view the alarm information.

- If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, the fault occurs on the disconnected PV module and optimizer. Choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command. Go to **Step 7**.
- If the **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, the fault does not occur on the disconnected PV module or optimizer. Go to **Step 6**.

Step 6 Set the DC switch to OFF, reconnect the removed PV module and optimizer, and repeat **Step 5** to check the adjacent PV modules and optimizers.

Step 7 Determine the position of the ground insulation fault.

1. Disconnect the possible faulty PV module from the optimizer.
2. Set the DC switch to OFF.
3. Connect the possible faulty optimizer to the PV string.
4. Set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a startup command. Check whether the **Low Insulation Resistance** alarm is reported.
   - If the **Low Insulation Resistance** alarm is not reported one minute after the solar inverter is powered on, the PV module is faulty. Choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command.
   - If the **Low Insulation Resistance** alarm is still reported one minute after the solar inverter is powered on, the optimizer is faulty.
5. Set the DC switch to OFF. Replace the faulty component to rectify the insulation resistance fault. Go to **Step 2** to check other PV strings. Then go to **Step 8**.

Step 8 If the solar inverter connects to batteries, turn on the auxiliary power switch of the battery and then the battery switch. Set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Device Commissioning** > **Maintenance** > **Inverter ON/OFF** on the App and send a startup command.

----End

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F AI Energy Management Assistant (EMMA)

The AI Energy Management Assistant (EMMA) provides intelligent energy scheduling and management functions. Based on big data analysis, it accurately predicts the power generation and consumption curves of households, and intelligently stores, purchases, and sells electricity to achieve optimal system performance, improve the utilization rate of green power, and maximize financial benefits.

- Method 1: FusionSolar Smart PV Management System WebUI

  When the system determines that the plant meets the conditions for enabling the EMMA function, the **EMMA** dialog box is displayed. You can enable the EMMA function as prompted. If you select **Not Now**, you can click

 next to **EMMA** and enable the EMMA function as prompted.
- Method 2: FusionSolar app

  On the **Overview** screen, if the system determines that the plant meets the conditions for enabling the EMMA function,  is displayed in the energy flow diagram. You can tap this icon to enable the EMMA function. Alternatively, tap ... in the upper right corner and then tap **EMMA**.

NOTE

- Only owners have the permission to enable the EMMA function. After the EMMA function is enabled, owners and installers can view the relevant revenue and energy forecast and analysis.
- For details, see the user manuals of the FusionSolar Smart PV Management System and FusionSolar app.

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G Contact Information

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

Table G-1 Customer service contact information

Region	Country/ Region	Email	Tel
Europe	France	eu_inverter_support@huawei.com	0080033888888
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	Spain		
	Italy		
	United Kingdom		
	Netherlands		
	Others	For details, visit solar.huawei.com.	
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	Türkiye	eu_inverter_support@huawei.com	-
	Malaysia	apsupport@huawei.com	0080021686868 /1800220036
	Thailand		(+66) 26542662 (charged at local call rates)
			1800290055 (free in Thailand)
	China	solarservice@huawei.com	400-822-9999
	Others	apsupport@huawei.com	0060-3-21686868

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South Korea	South Korea	koreainverter@huawei.com	-
North America	United States	eu_inverter_support@huawei.com	1-877-948-2934
	Canada	eu_inverter_support@huawei.com	1-855-482-9343
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	Argentina		0-8009993456
	Brazil		0-8005953456
	Chile		800201866 (only available on fixed-line)
	Others		0052-442-4288288
Middle East and Africa	Egypt	eu_inverter_support@huawei.com	08002229000 /0020235353900
	United Arab Emirates		08002229000
	South Africa		0800222900
	Saudi Arabia		8001161177
	Pakistan		0092512800019
	Morocco		0800009900
	Others		0020235353900

NOTE

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H Acronyms and Abbreviations

A	
AC	alternating current
D	
DC	direct current
DCI	direct current identification
F	
FRT	fault ride through
H	
HVRT	high voltage ride-through
I	
ID	identifier
L	
LED	light emitting diode
LVRT	low voltage ride-through
M	
MAC	Media Access Control
MPPT	maximum power point tracking
P	
PE	protective earthing

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PV	photovoltaic
R	
RCMU	residual current monitoring unit
RH	relative humidity
S	
SN	serial number

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