

SUN2000L-(2KTL-5KTL)

User Manual

Issue 06

Date 2020-03-19

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About This Document

Purpose

This document describes the SUN2000L-(2KTL-5KTL) in terms of its installation, electrical connections, commissioning, maintenance, and troubleshooting. SUN2000L-(2KTL-5KTL) is abbreviated as SUN2000L. Before installing and operating the SUN2000L, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

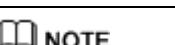
Intended Audience

This document is intended for:

- Installers
- Users

Symbol Conventions

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

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

Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

Issue 06 (2020-03-19)

Updated [6.3 Commissioning](#).

Issue 05 (2019-06-06)

- Delete the CHINT-DDSU666 Smart Power Sensor in [5.1 Preparing Cables](#).
- The FusionHome app is updated to the FusionSolar app.
- Updated the Nameplate.
- The 2067 alarm possible cause is updated.

Issue 04 (2018-12-26)

Added the following description in [5.1 Preparing Cables](#): the CHINT-DDSU666 Smart Power Sensor supports two communication protocols: Modbus and DLT645. Purchase a CHINT-DDSU666 Smart Power Sensor using the Modbus protocol. The CHINT-DDSU666 Smart Power Sensor that uses the DLT645 communication protocol is unavailable.

Issue 03 (2018-03-28)

Upgraded the FusionHome app to 2.1.11.217.

Issue 02 (2017-12-12)

Upgraded the FusionHome app to 2.1.11.201.

Issue 01 (2017-09-27)

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

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1 Safety Information

1.1 General Safety

Statement

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "CAUTION", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Huawei will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting equipment malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

Huawei will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document
- Installation or use in environments which are not specified in relevant international or national standards
- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Equipment damage due to force majeure, such as earthquakes, fire, and storms
- Damage caused during transportation by the customer
- Storage conditions that do not meet the requirements specified in this document

General Requirements

 DANGER

Do not work with power on during installation.

- 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, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not scrawl, damage, or block any warning label on the equipment.
- Tighten the screws using tools when installing the equipment.
- Understand the components and functioning of a grid-tied PV power system and relevant local standards.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.
- Do not open the host panel of the equipment.

Personal Safety

- If there is a probability of personal injury or equipment damage during operations on the equipment, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.
- Use tools correctly to avoid hurting people or damaging the equipment.
- Do not touch the energized equipment, as the enclosure is hot.

1.2 Personnel Requirements

- Personnel who plan to install or maintain Huawei equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- 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 operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

NOTE

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance
- Trained personnel: personnel who are technically trained, 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
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

1.3 Electrical Safety

Grounding

- 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.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is securely grounded.

General Requirements

DANGER

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

- Ensure that all electrical connections comply with local electrical standards.
- Obtain approval from the local electric utility company before using the equipment in grid-tied mode.
- Ensure that the cables you prepared meet local regulations.
- Use dedicated insulated tools when performing high-voltage operations.

AC and DC Power

DANGER

Do not connect or disconnect power cables with power on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.

- Before making electrical connections, switch off the disconnector on the upstream device to cut off the power supply if people may contact energized components.

- Before connecting a power cable, check that the label on the power cable is correct.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

Cabling

- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.

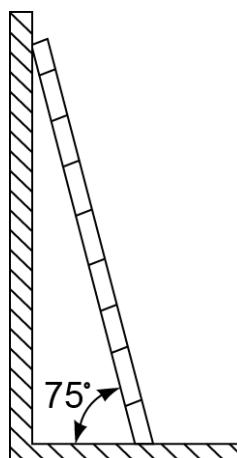
1.4 Installation Environment Requirements

- Ensure that the equipment is installed in a well ventilated environment.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

1.5 Mechanical Safety

Using Ladders

- Use wooden or fiberglass ladders when you need to perform live working at heights.
- When a step ladder is used, ensure that the pull ropes are secured and the ladder is held firm.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the wider end of the ladder is at the bottom, or protective measures have been taken at the bottom to prevent the ladder from sliding.
- Ensure that the ladder is securely positioned. The recommended angle for a ladder against the floor is 75 degrees, as shown in the following figure. An angle rule can be used to measure the angle.



PI02SC0008

- When climbing a ladder, take the following precautions to reduce risks and ensure safety:
 - Keep your body steady.
 - Do not climb higher than the fourth rung of the ladder from the top.
 - Ensure that your body's center of gravity does not shift outside the legs of the ladder.

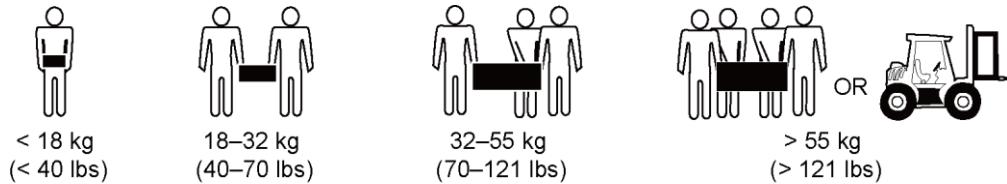
Drilling Holes

When drilling holes into a wall or floor, observe the following safety precautions:

- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.



NH01H00144

- When moving the equipment by hand, wear protective gloves to prevent injuries.

1.6 Commissioning

When the equipment is powered on for the first time, ensure that professional personnel set parameters correctly. Incorrect settings may result in inconsistency with local certification and affect the normal operation of the equipment.

1.7 Maintenance and Replacement

 DANGER

High voltage generated by the equipment during operation may cause an electric shock, which could result in death, serious injury, or serious property damage. Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents.

- Maintain the equipment with sufficient knowledge of this document and using proper tools and testing equipment.
- Before maintaining the equipment, power it off and follow the instructions on the delayed discharge label to ensure that the equipment is powered off.
- Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
- If the equipment is faulty, contact your dealer.
- The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.

2 Product Overview

2.1 Product Introduction

Function

The SUN2000L is a single-phase grid-tied PV string inverter that converts the DC power generated by PV strings into AC power and feeds the electricity into the power grid.

Models

This document involves the following product models:

- SUN2000L-2KTL
- SUN2000L-3KTL
- SUN2000L-3.68KTL
- SUN2000L-4KTL
- SUN2000L-4.6KTL
- SUN2000L-5KTL

Figure 2-1 Designation explanation of the SUN2000L-5KTL

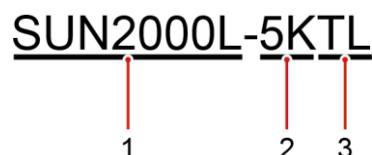


Table 2-1 Designation explanation of the SUN2000L-5KTL

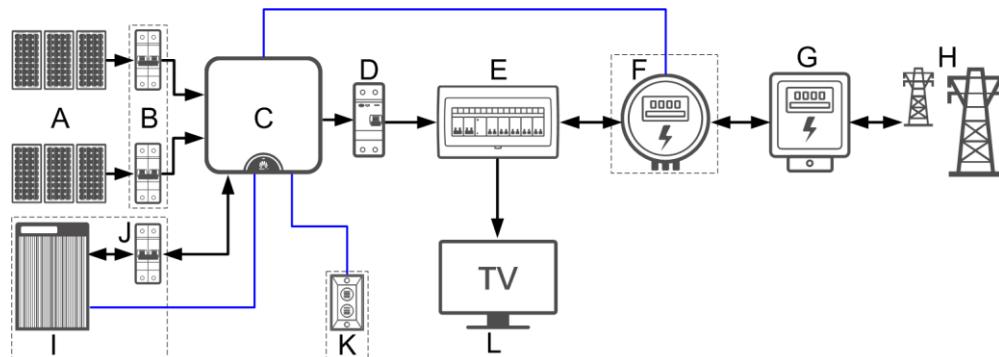
No.	Meaning	Description
1	Series name	SUN2000L: single-phase grid-tied PV string inverter

No.	Meaning	Description
2	Power level	<ul style="list-style-type: none"> • 2K: The power level is 2K. • 3K: The power level is 3K. • 3.68K: The power level is 3.68K. • 4K: The power level is 4K. • 4.6K: The power level is 4.6K. • 5K: The power level is 5K.
3	Topology	TL: transformerless

Networking Application

The SUN2000L applies to a residential rooftop grid-tied system. Typically, a grid-tied system consists of the PV string, grid-tied inverter, AC switch, and power distribution unit.

Figure 2-2 Network diagram (dashed boxes indicate optional components)



NOTE

— indicates a power cable, —→ indicates the power flow direction, and

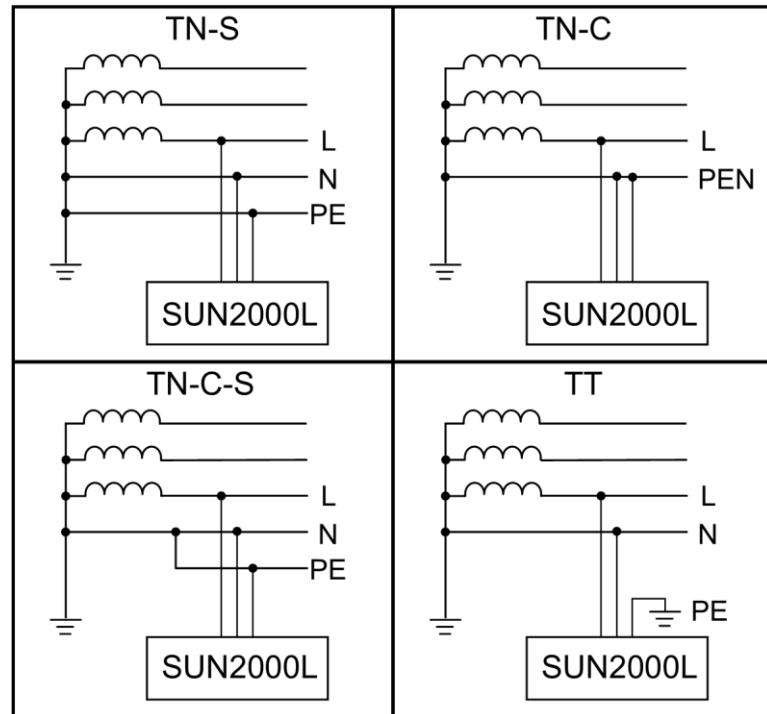
— blue line indicates a signal cable.

- | | | |
|--------------------|-----------------------------|------------------------|
| (A) PV string | (B) DC switch | (C) SUN2000L |
| (D) AC switch | (E) Power distribution unit | (F) Smart Power Sensor |
| (G) Power meter | (H) Power grid | (I) Battery |
| (J) Battery switch | (K) Alarm beacon | (L) Residential load |

Supported Power Grid

The power grids supported by the SUN2000L include TN-S, TN-C, TN-C-S, and TT. In a TT power grid, the N-PE voltage should be lower than 30 V.

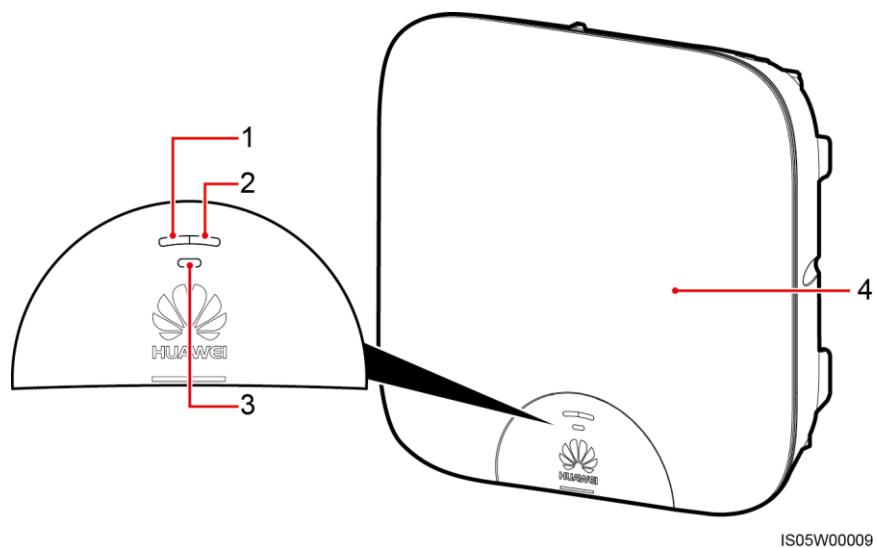
Figure 2-3 Power grid types



2.2 Appearance

Front View

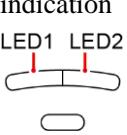
Figure 2-4 Front view



IS05W00009

(1) LED 1 (2) LED 2 (3) LED 3 (4) Front panel

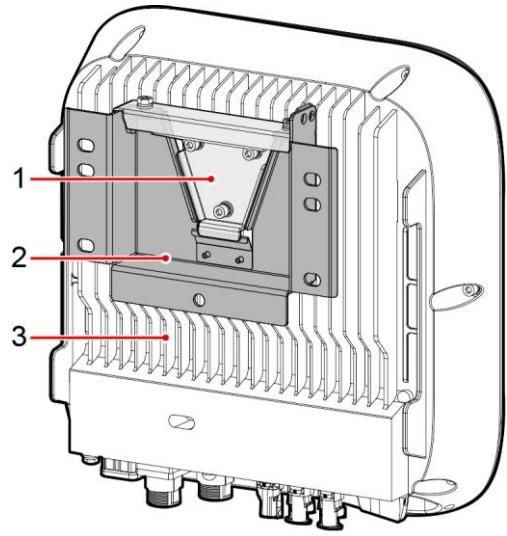
Table 2-2 LED description

Type	Status		Meaning
 Running indication LED1 LED2	LED 1	LED 2	N/A
	Steady green	Steady green	The SUN2000L is exporting power to the power grid.
	Blinking green at long intervals (on for 1s and then off for 1s)	Off	The DC is on and the AC is off.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is off and the AC is on.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is on, the AC is on, and the SUN2000L is not exporting power to the power grid.
	Off	Off	Both the DC and AC are off, or the SUN2000L is in Low Power Consumption mode. Low Power Consumption mode means that the monitoring system of the SUN2000L is hibernating.
Communicat	LED 3	Steady red	The SUN2000L is faulty.
Communicat			N/A

Type	Status	Meaning
ion indication  LED3	Blinking green at short intervals (on for 0.2s and then off for 0.2s)	Communicating (Communicating means that the communication with the upper-level management unit is in progress. However, if a mobile phone accesses the SUN2000L, the LED indicates the "mobile phone access status: blinking green at long intervals" first.)
	Blinking green at long intervals (on for 1s and then off for 1s)	The mobile phone is connected to the SUN2000L.
	Off	No communication

Rear View

Figure 2-5 Rear view



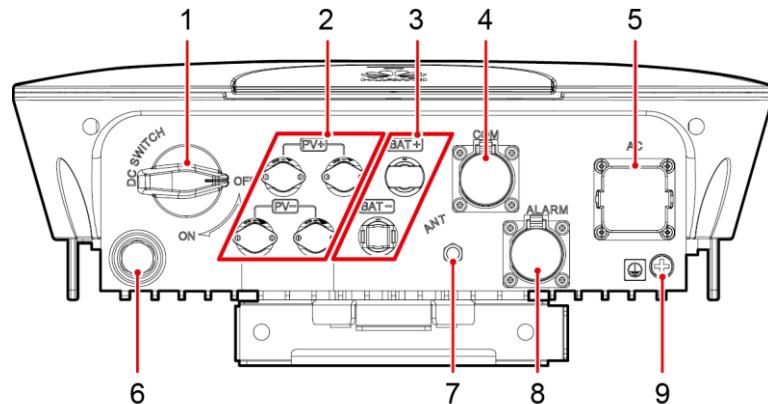
(1) Mounting plate

(2) Mounting bracket

(3) Heat sink

Bottom View

Figure 2-6 Bottom view

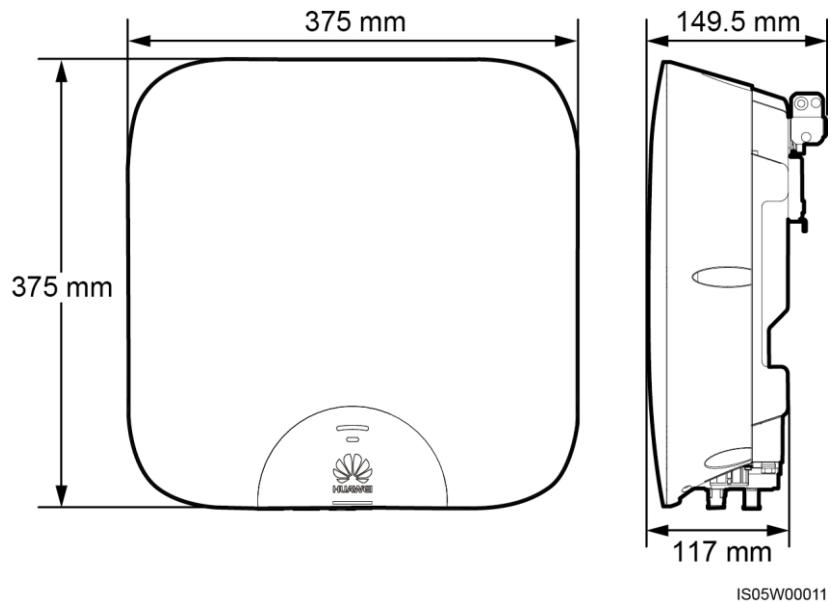


IS05W00010

No.	Component	Silk Screen
1	DC switch	DC SWITCH
2	DC input terminal	PV+/PV-
3	Battery terminal	BAT+/BAT-
4	COM port	COM
5	AC output port	AC
6	Ventilation valve	N/A
7	Antenna port	ANT
8	Alarm port	ALARM
9	Ground point	N/A

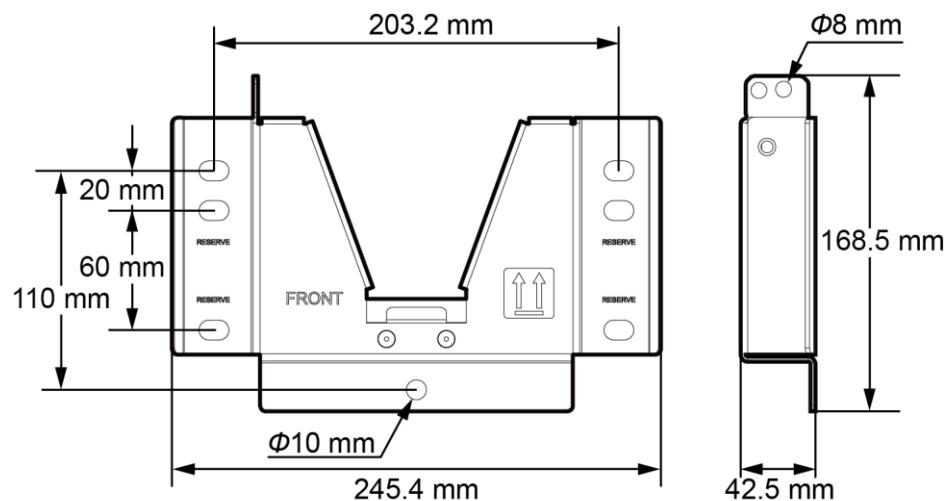
Dimensions

Figure 2-7 Enclosure dimensions



IS05W00011

Figure 2-8 Mounting bracket dimensions



IS05W00020

2.3 Label Descriptions

Labels

Table 2-3 Label description

Symbol	Name	Meaning
	Burn warning	Do not touch a running SUN2000L because the shell is hot when the SUN2000L is running.
	Delay discharge	<ul style="list-style-type: none"> High voltage exists after the SUN2000L is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000L. Residual voltage exists after the SUN2000L is powered off. It takes 5 minutes for the SUN2000L to discharge to the safe voltage.
	Refer to documentation	Reminds operators to refer to the documents supplied with the SUN2000L.
	Grounding	Indicates the position for connecting the protective earthing (PE) cable.
	Operation warning	Do not remove the connector or antenna when the SUN2000L is running.

Symbol	Name	Meaning
	Indicator status description label	Describes the indicator status.
 SN: xxxxxxxxxxxxxxxxxxxx	SUN2000L serial number (SN) label	Indicates the SUN2000L SN.
 MAC: xxxxxxxxxxxx	SUN2000L MAC address label	Indicates the MAC address.
	QR code for SUN2000L WLAN connection	Scan the QR code to connect to Huawei SUN2000L WLAN network (Android) or obtain the WLAN password (iOS).

NOTE

The labels are for reference only.

Nameplate

Figure 2-9 Nameplate



(1) Trademark and product model

(2) Important technical specifications

(3) Compliance symbols

(4) Company name and country of manufacture

NOTE

The nameplate figure is for reference only.

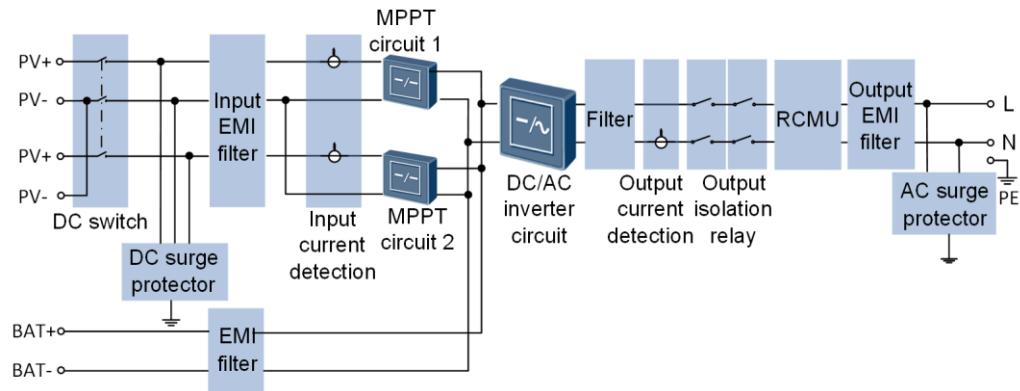
2.4 Working Principles

Conceptual Diagram

The SUN2000L receives two inputs from the two PV strings. Two MPPT circuits are configured inside the SUN2000L. Each circuit tracks the maximum power point of one PV string respectively. 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 SUN2000L has a reserved battery port to connect to batteries, which are used to store the surplus power produced by PV strings and not required by residential loads. The power stored in batteries can be exported to the power grid based on the load condition to meet peak and valley power consumption requirements and maximize the benefits.

Figure 2-10 Conceptual diagram



Working Modes

Figure 2-11 Working modes

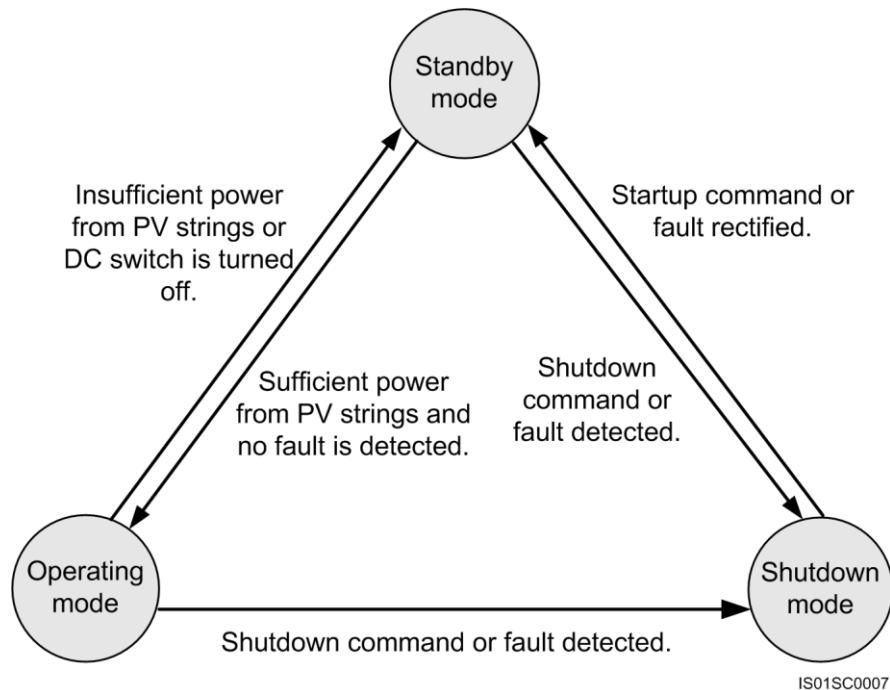


Table 2-4 Working mode description

Working Mode	Description
Standby	<p>The SUN2000L enters Standby mode when the external environment does not meet the requirements for starting the SUN2000L. In Standby mode:</p> <ul style="list-style-type: none">• The SUN2000L continuously checks its status and enters Operating mode once the operating requirements are met.• The SUN2000L enters Shutdown mode after detecting a shutdown command or a fault after startup.
Operating	<p>In Operating mode:</p> <ul style="list-style-type: none">• The SUN2000L converts DC power from PV strings into AC power and feeds the energy to the power grid.• The SUN2000L tracks the maximum power point to maximize the PV string output.• The SUN2000L enters Shutdown mode after detecting a fault or a shutdown command, and enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid and producing power.
Shutdown	<ul style="list-style-type: none">• In Standby or Operating mode, the SUN2000L enters Shutdown mode after detecting a fault or shutdown command.• In Shutdown mode, the SUN2000L enters Standby mode after detecting a startup command or that the fault is rectified.

3 Storage

The following requirements should be met when the SUN2000L needs to be stored prior to installation:

- Do not unpack the SUN2000L.
- Keep the storage temperature at -40°C to $+70^{\circ}\text{C}$ and the humidity at 5%–95% RH.
- The SUN2000L should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of 10 SUN2000Ls can be stacked. To avoid personal injury or device damage, stack SUN2000Ls with caution to prevent them from falling over.
- Regular inspection is required during the storage. Replace the packing materials when necessary.
- After long-term storage, the SUN2000L needs to be inspected and tested by qualified persons before it is put into use.

4 System Installation

4.1 Checking Before Installation

Outer Packing Materials

Before unpacking the SUN2000L, check the outer packing materials for damage, such as holes and cracks, and check the SUN2000L model. If any damage is found or the SUN2000L model is not what you requested, do not unpack the product and contact your supplier as soon as possible.

NOTICE

You are advised to remove the packing materials no more than 24 hours before installing the SUN2000L.

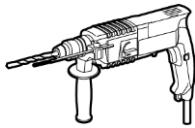
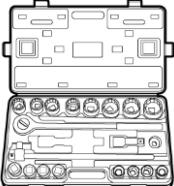
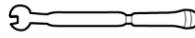
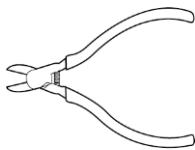
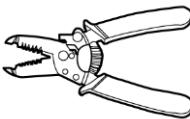
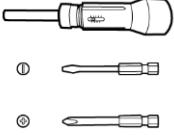
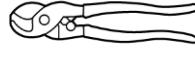
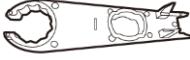
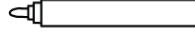
Package Contents

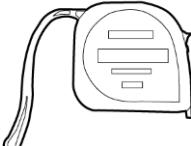
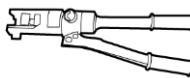
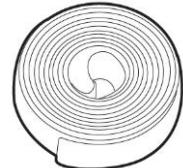
After unpacking the SUN2000L, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

NOTE

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

4.2 Tools and Instruments

Category	Tools and Instruments		
Installation	 Hammer drill (with a $\Phi 10$ mm drill bit)	 Torque socket wrench (open end: 13 mm, applicable for M8 bolts; torque range: 0–15 N m)	 Torque wrench (open end: 13 mm; torque range: 0–1.5 N m)
	 Diagonal pliers	 Wire stripper	 Torque screwdriver (head: M4 or M6; torque range: 0–5 N m)
	 Rubber mallet	 Utility knife	 Cable cutter
	 Crimping tool (model: UTXTC0005/H4TC0003; manufacturer: Amphenol)	 Open-end wrench (model: H4TW0001; manufacturer: Amphenol)	 Cable tie
	 Vacuum cleaner	 Multimeter (DC voltage measurement range ≥ 600 V DC)	 Marker

Category	Tools and Instruments		
	 Measuring tape	 Bubble or digital level	 Hydraulic pliers
	 Heat shrink tubing	 Heat gun	N/A
PPE	 Safety gloves	 Safety goggles	 Anti-dust respirator
	 Safety shoes	N/A	N/A

4.3 Determining the Installation Position

Basic Requirements

- The SUN2000L is protected to IP65 and can be installed indoors or outdoors.
- Do not install the SUN2000L in a place where a person can easily touch it because its enclosure and heat sinks are extremely hot during operation.
- Do not install the SUN2000L in areas with flammable or explosive materials.
- Do not install the SUN2000L at a place within children's reach.
- Do not install the SUN2000L outdoors in salt areas because it will be corroded there and may cause fire. A salt area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary depending on weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).

Installation Environment Requirements

- The SUN2000L must be installed in a well-ventilated environment to ensure good heat dissipation.
- When installed under direct sunlight, the power of the SUN2000L may be derated due to additional temperature rise.
- Install the SUN2000L in a sheltered place or install an awning over the SUN2000L.

Mounting Structure Requirements

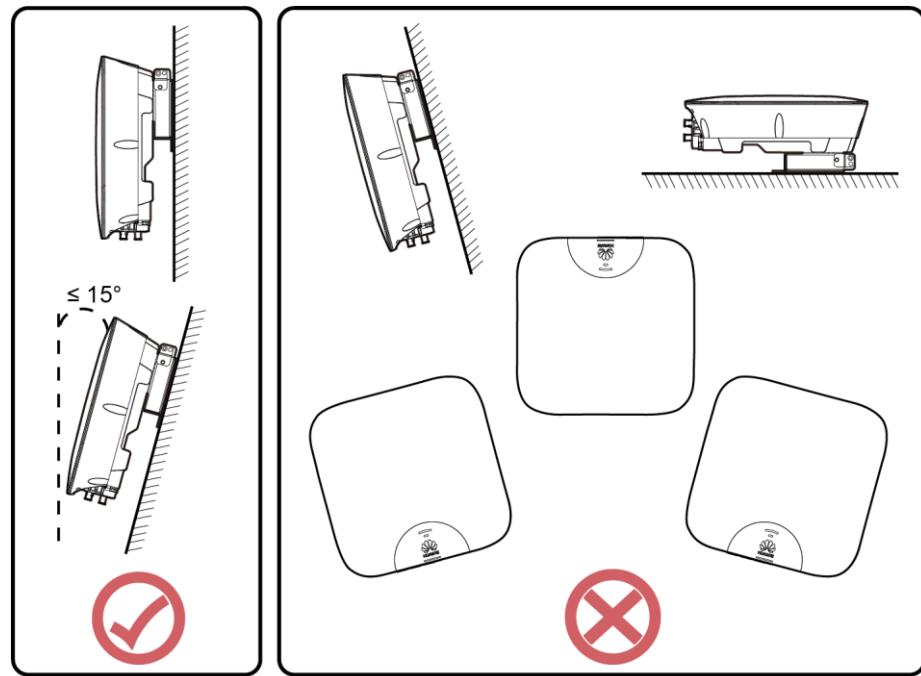
- The mounting structure where the SUN2000L is installed must be fireproof.
- Do not install the SUN2000L on flammable building materials.
- Ensure that the installation surface is solid enough to bear the weight load.
- In residential areas, do not install the SUN2000L on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the SUN2000L is noticeable.

Installation Angle Requirements

The SUN2000L can be wall-mounted or pole-mounted. The installation angle requirements are as follows:

- Install the SUN2000L vertically or at a maximum back tilted angle of 15 degrees to facilitate heat dissipation.
- Do not install the SUN2000L at forward tilted, excessively back tilted, side tilted, horizontal, or upside down positions.

Figure 4-1 Installation angle

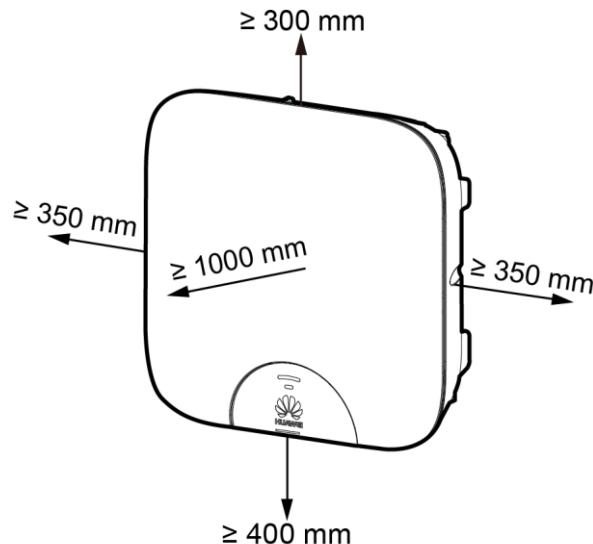


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Installation Clearance Requirements

Reserve enough clearance around the SUN2000L to ensure sufficient space for installation and heat dissipation.

Figure 4-2 Installation clearance requirements

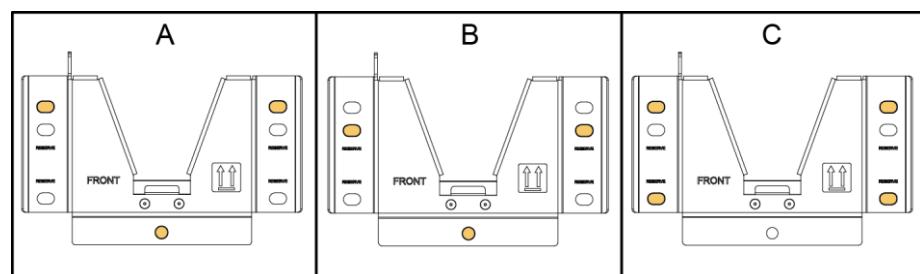


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4.4 Installing the Mounting Bracket

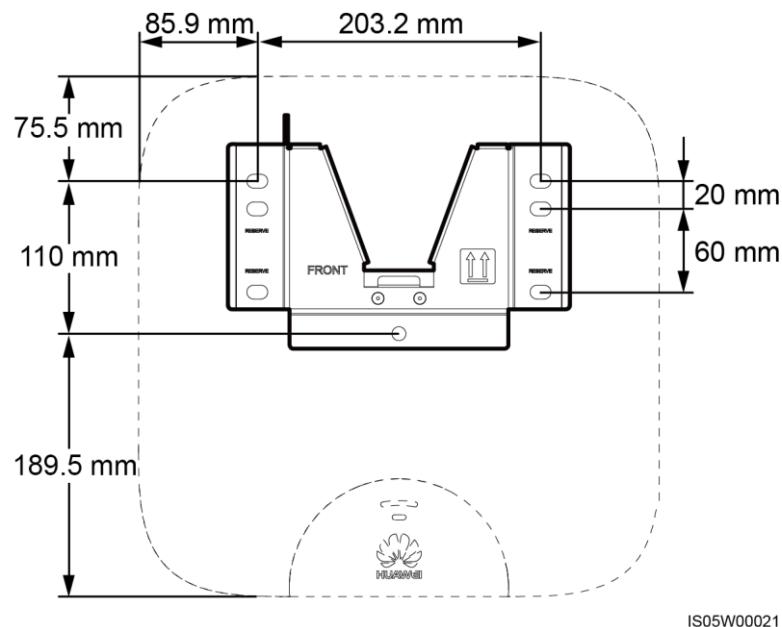
Fixing holes can be used in three combinations. Select a hole combination based on site requirements. Combination A is preferred.

Figure 4-3 Hole combinations



IS05W00027

Figure 4-4 Hole distances



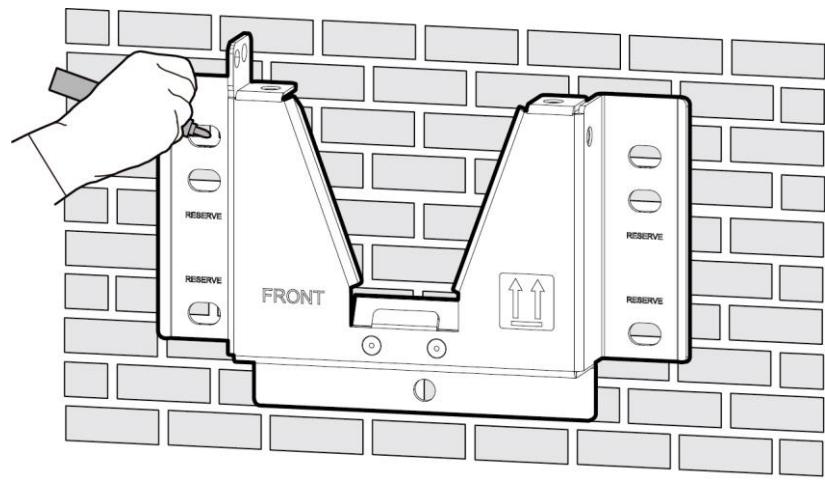
IS05W00021

4.4.1 Wall-Mounted Installation

Procedure

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the positions of mounting holes using a bubble or digital level, and mark the positions with a marker.

Figure 4-5 Determining hole positions



IS05H00017

- Step 2** Install expansion bolts.

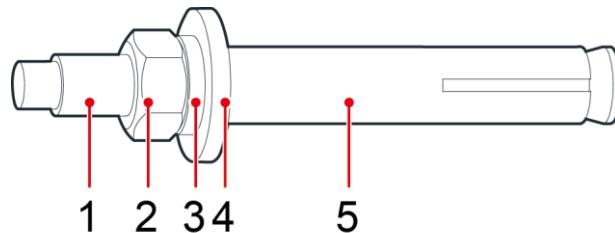
DANGER

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

NOTE

If the length or number of M8x80 expansion bolts supplied with the SUN2000L is not enough, prepare M8 stainless steel expansion anchor bolts.

Figure 4-6 Expansion bolt composition



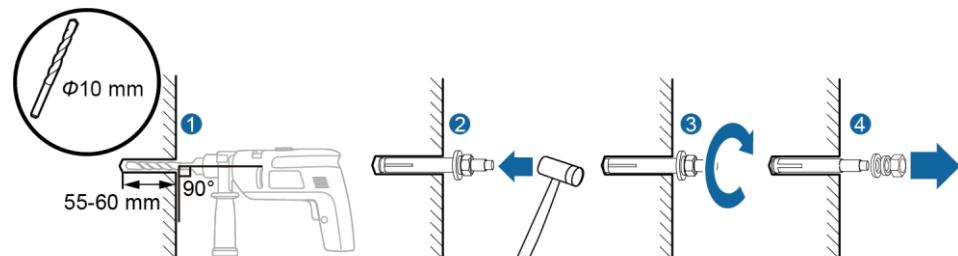
IS05W00018

- | | | |
|-----------------|----------------------|-------------------|
| (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 an anti-dust respirator when drilling holes.
- Clean up any dust in and around the holes using a vacuum cleaner and measure the distance between holes. If the holes are inaccurately positioned, drill a new set of the holes.
- Level the head of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the concrete wall.

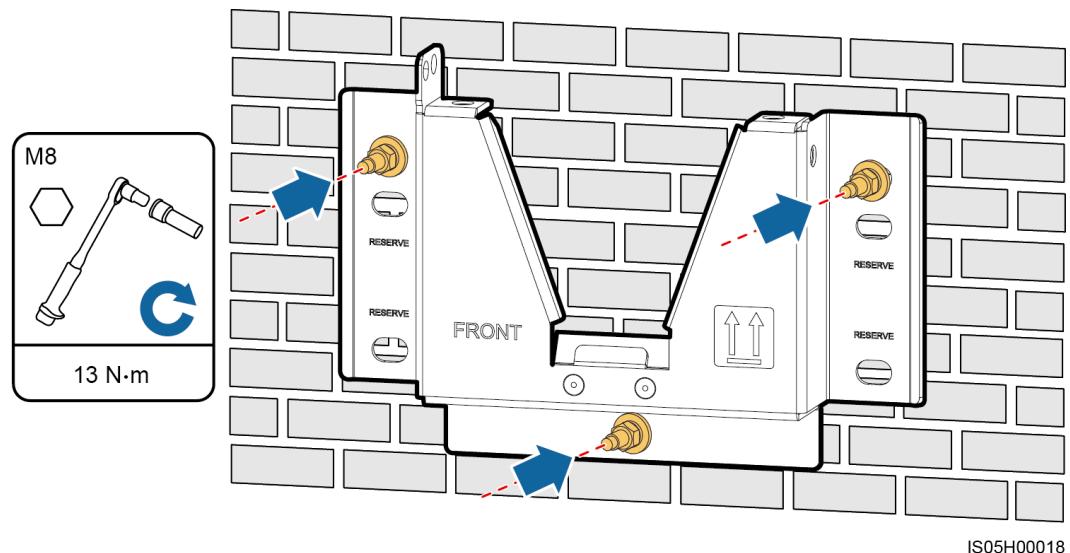
Figure 4-7 Installing an expansion bolt



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Step 3 Secure the mounting bracket.

Figure 4-8 Securing a mounting bracket



IS05H00018

----End

4.4.2 Support-mounted Installation

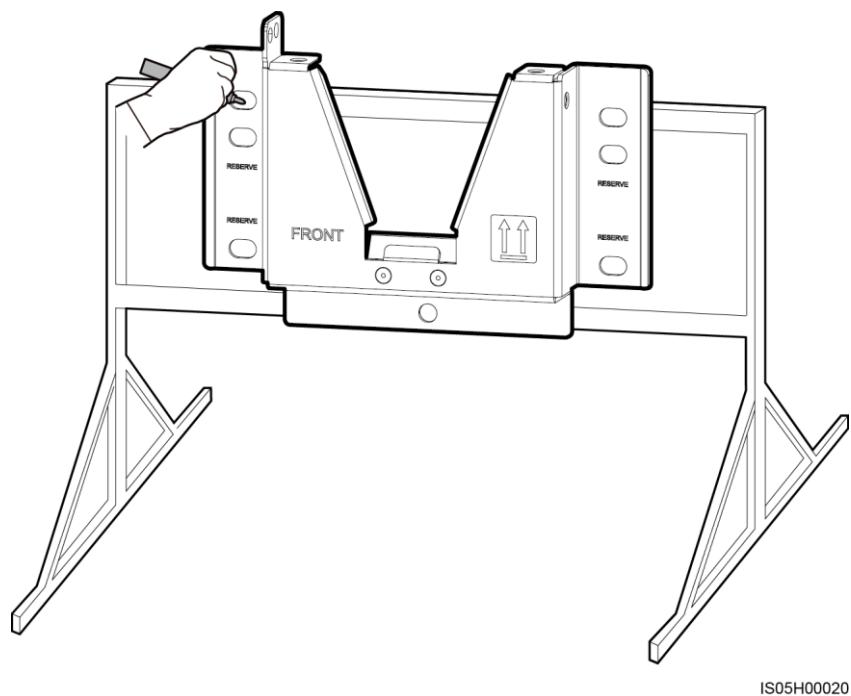
Prerequisites

Prepare M8 stainless bolt assemblies (including flat washers, spring washers, and M8 bolts) with appropriate lengths as well as matched flat washers and nuts based on the support specifications.

Procedure

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the positions of mounting holes using a bubble or digital level, and mark the positions with a marker.

Figure 4-9 Determining hole positions

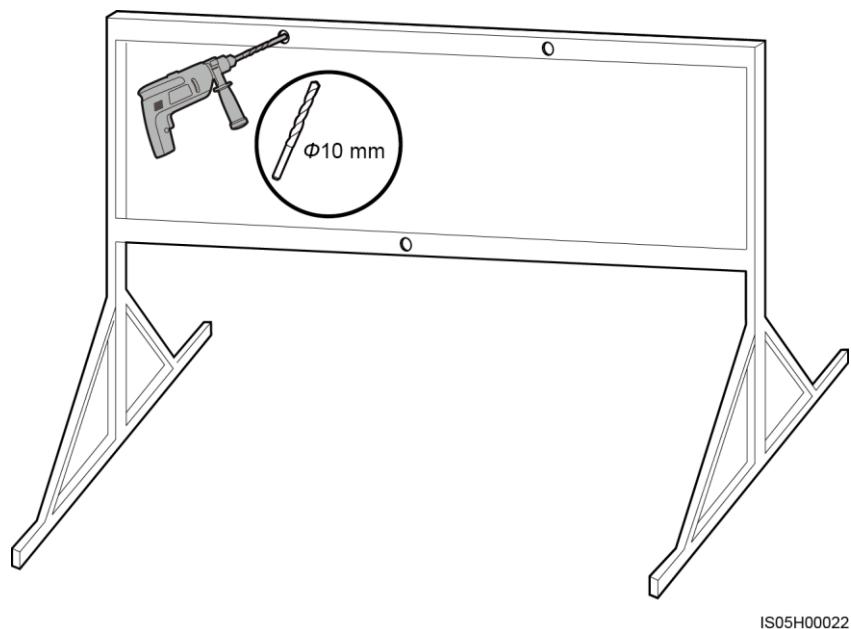


Step 2 Drill holes using a hammer drill.

NOTE

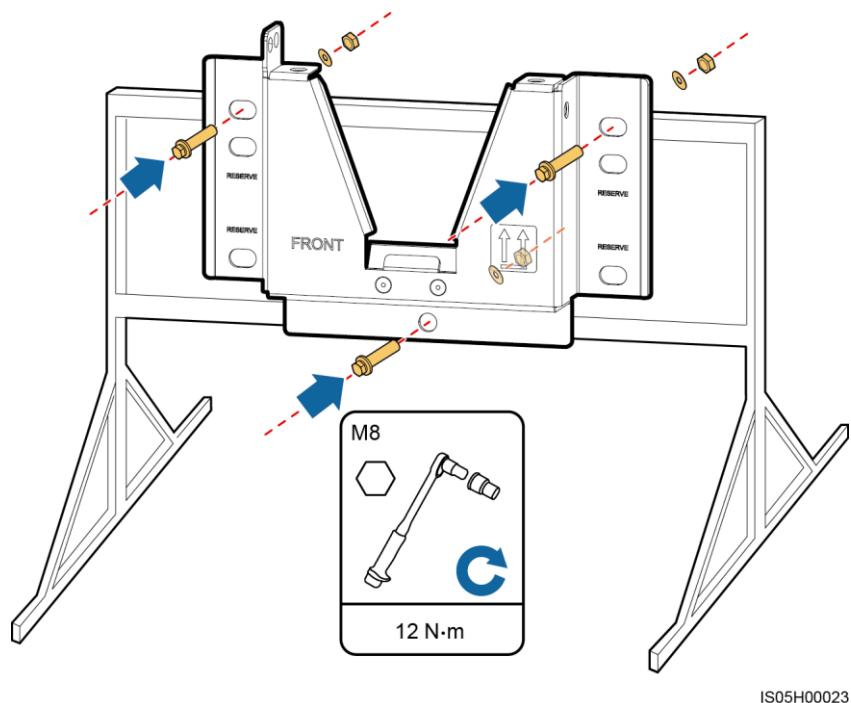
You are advised to apply anti-rust paint on the hole positions for protection.

Figure 4-10 Drilling holes



Step 3 Secure the mounting bracket.

Figure 4-11 Securing a mounting bracket



IS05H00023

----End

4.5 Installing the SUN2000L

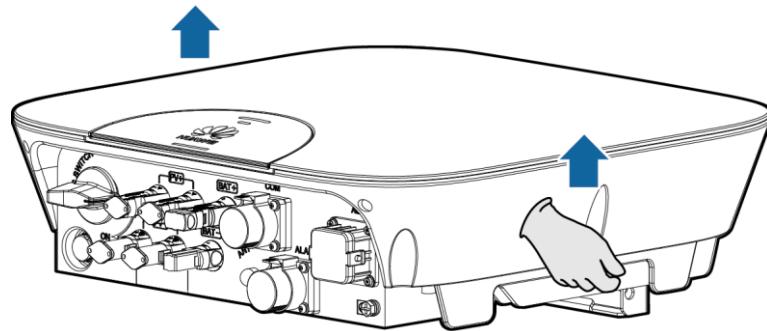
Procedure

- Step 1** Hold the handles on both sides of the SUN2000L, lift the SUN2000L from the packing case, and move it to the installation position.

⚠ CAUTION

- To prevent device damage and personal injury, keep balance when moving the SUN2000L.
- Do not use the wiring terminals and ports at the bottom to support any weight of the SUN2000L.
- When you need to temporally place the SUN2000L on the ground, use foam, paper or other protection materials to prevent damage to its cover.

Figure 4-12 Moving a SUN2000L



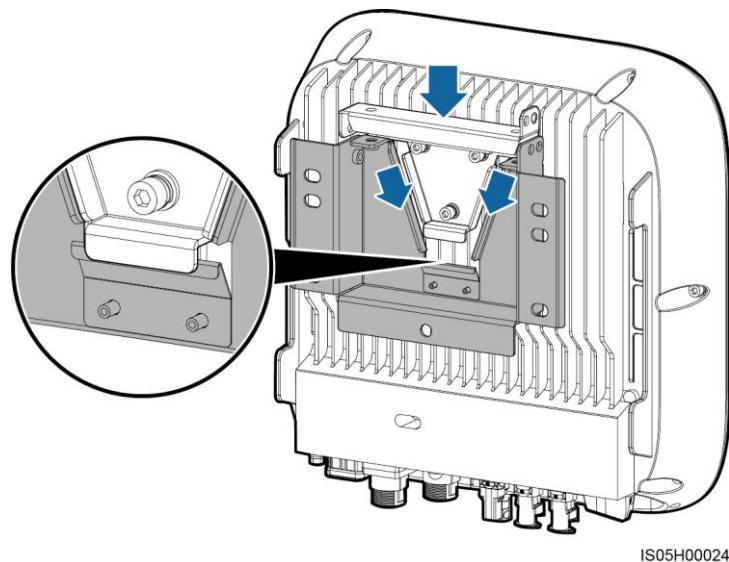
IS05H00019

Step 2 Install the SUN2000L on the mounting bracket and align the SUN2000L enclosure with the mounting bracket.

NOTICE

If the bottom of the mounting plate does not snap into place, push the SUN2000L from the front until the bottom of the mounting plate snaps into the mounting bracket.

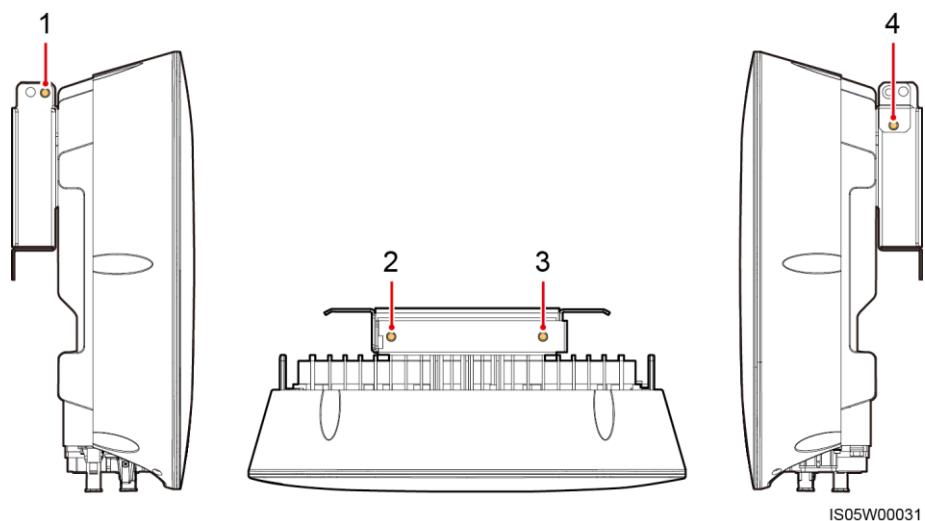
Figure 4-13 Mounting a SUN2000L



Step 3 Tighten screw assemblies.

Fixing holes can be used in three combinations. Select a hole combination based on site requirements. Combination A is preferred.

Figure 4-14 Fixing holes



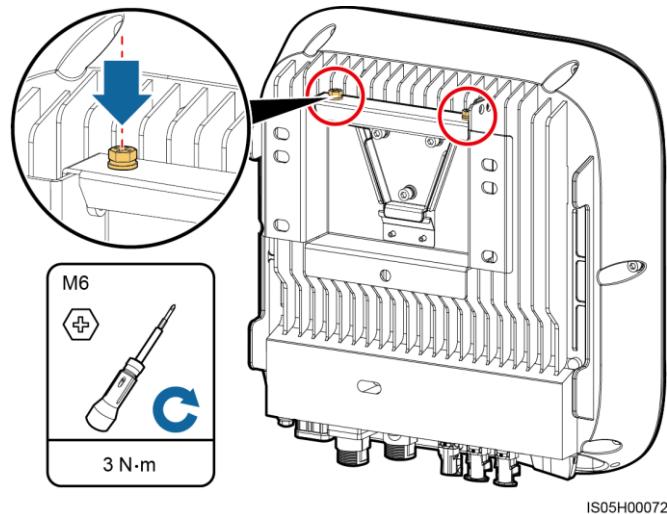
Combination A: holes 2 and 3

Combination C: holes 1 and 4

Combination B: holes 1 and 3

Combination D: holes 2 and 4

Figure 4-15 Tightening screw assemblies



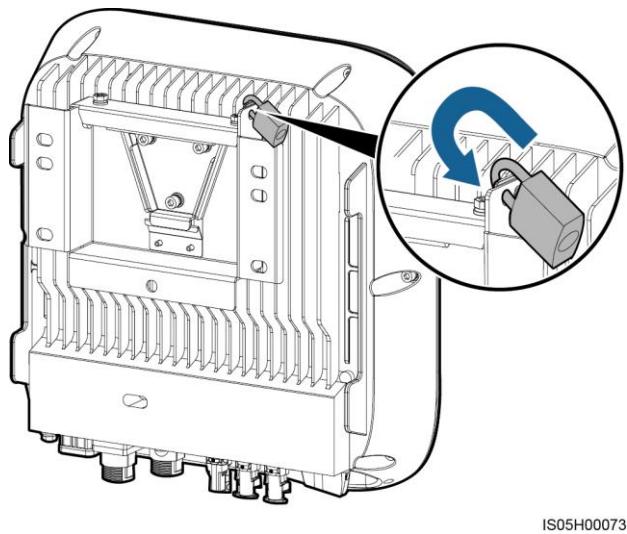
Step 4 (Optional) Install an anti-theft lock.

The function of an anti-theft lock is to secure the SUN2000L to the mounting bracket and protect it from being stolen.

NOTICE

- Use an anti-theft lock suitable for the lock hole diameter ($\Phi 8$ mm). The anti-theft lock is supplied by the customer.
- Keep the key to the anti-theft lock safe.

Figure 4-16 Installing an anti-theft lock



IS05H00073

----End

4.6 Installing the WLAN Antenna

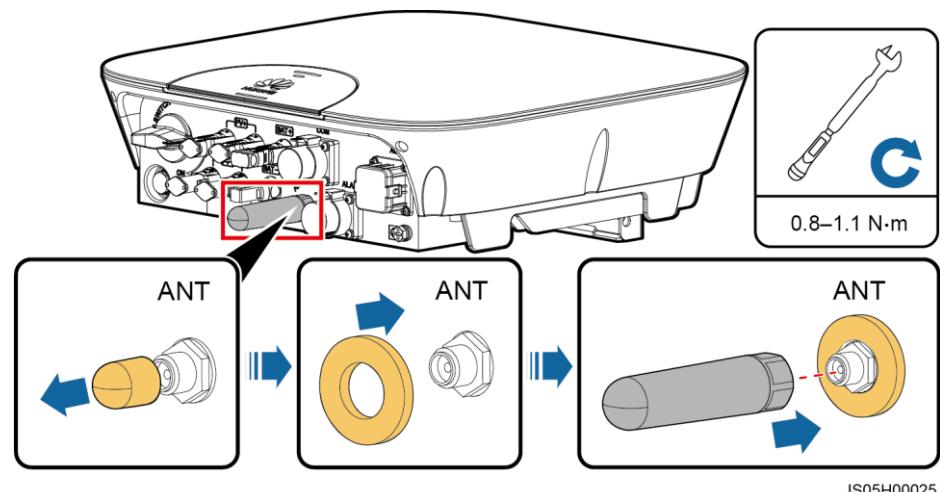
Procedure

- Step 1** Remove the watertight cap from the ANT port.
- Step 2** Remove the release paper of the double-sided tape and attach the washer to the enclosure.
- Step 3** Install the WLAN antenna.

NOTICE

Ensure that the WLAN antenna is installed securely.

Figure 4-17 Installing a WLAN antenna

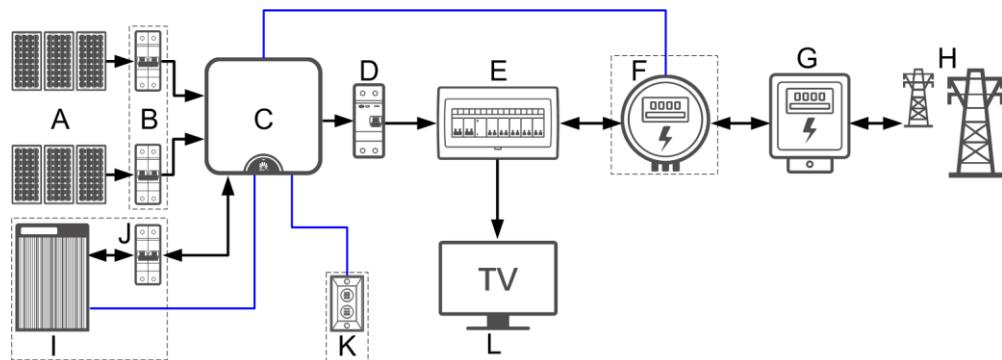


----End

5 Electrical Connections

5.1 Preparing Cables

Figure 5-1 Network diagram (dashed boxes indicate optional components)



NOTE

— indicates a power cable, → indicates the power flow direction, and
— indicates a signal cable.

- | | | |
|--------------------|-----------------------------|------------------------|
| (A) PV string | (B) DC switch | (C) SUN2000L |
| (D) AC switch | (E) Power distribution unit | (F) Smart Power Sensor |
| (G) Power meter | (H) Power grid | (I) Battery |
| (J) Battery switch | (K) Alarm beacon | (L) Residential load |

Figure 5-2 SUN2000L cable connections (dashed boxes indicate optional components)

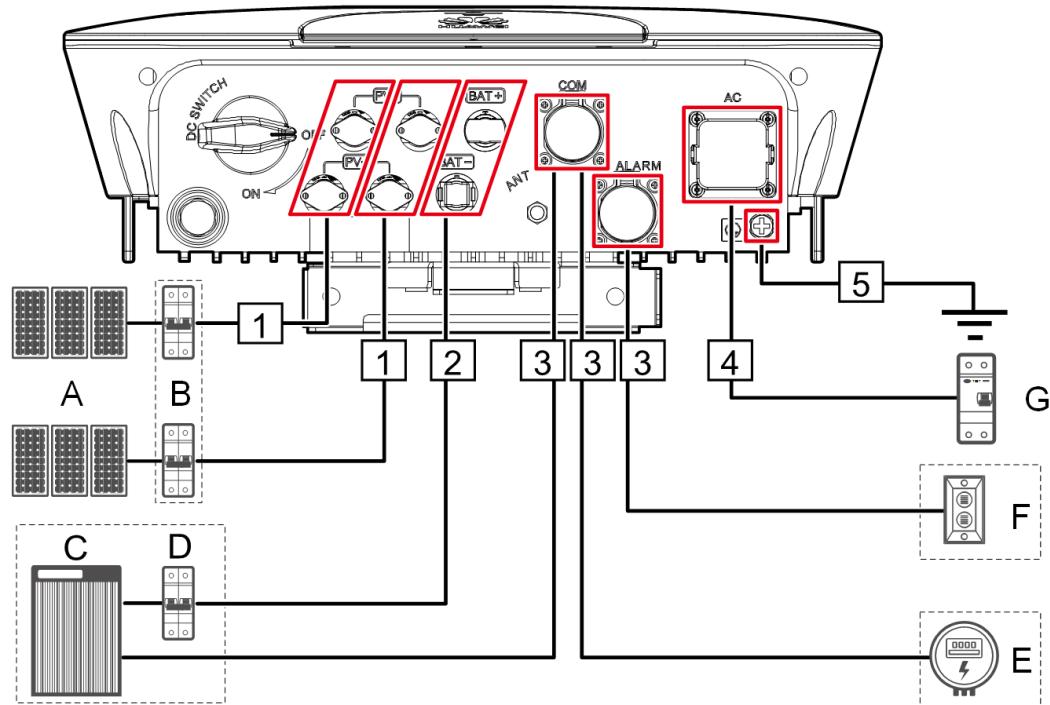


Table 5-1 Component description

No.	Component	Description	Source
A	PV string	<ul style="list-style-type: none"> A PV string is composed of the PV modules connected in series and works with an optimizer. The SUN2000L supports the input from two PV strings. 	Purchased by the customer
B	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	Purchased by the customer
C	Battery	The batteries that can connect to the SUN2000L are LG-RESU (LG RESU7H and RESU10H).	Purchased by the customer
D	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	Purchased by the customer

No.	Component	Description	Source
E	Smart Power Sensor ^a	The Smart Power Sensors that can connect to the SUN2000L are DDSU666-H and DTSU666-H.	Can be purchased from Huawei
		The Smart Power Sensors that can connect to the SUN2000L are CCS-WNC-3Y-400-MB, Gavazzi-EM112DINAV01X S1X08, Gavazzi-EM340DINAV23X S1X08 and Gavazzi-EM111DINAV81X S1X08.	Purchased by the customer
F	Alarm beacon	The rated voltage is 12 V and the power is less than or equal to 3 W.	Purchased by the customer
G	AC switch	Recommended: a single-phase AC circuit breaker with a rated voltage greater than or equal to 250 V AC and a rated current of <ul style="list-style-type: none"> • 16 A (SUN2000L-2KTL) • 25 A (SUN2000L-3KTL and SUN2000L-3.68KTL) • 32 A (SUN2000L-4KTL, SUN2000L-4.6KTL, and SUN2000L-5KTL) 	Purchased by the customer
Note a: Only the DDSU666-H Smart Sower Sensor (provided by Huawei) can be used in Spain.			

NOTICE

- The SUN2000L is embedded with a residual current monitoring unit (RCMU). Only a single-phase circuit breaker or a similar AC load breaking device is required to function as the external AC switch (shown by G in [Figure 5-2](#)) to ensure that the SUN2000L can be safely disconnected from the power grid.
- 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 SUN2000Ls 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 SUN2000Ls multiplied by 100 mA.
- A knife switch cannot be used as an AC switch.

Table 5-2 Cable description

No.	Cable	Type	Conductor Cross-sectional Area Range	Outer Diameter	Source
1	DC input power cable	Standard PV cable in the industry (recommended model: PV1-F)	4–6 mm ²	4.5–7.8 mm	Purchased by the customer
2	Battery cable	Standard PV cable in the industry (recommended model: PV1-F)	4–6 mm ²	4.5–7.8 mm	Purchased by the customer
3	Signal cable	Four-core outdoor shielded twisted pair cable	0.25–1 mm ²	4–11 mm	Purchased by the customer
4	AC output power cable	<ul style="list-style-type: none">Not using the PE equipotential point at the AC output port: two-core (L and N) outdoor copper cableUsing the PE equipotential point at the AC output port: three-core (L, N, and PE) outdoor copper cable	4–6 mm ²	10–21 mm	Purchased by the customer
5	PE cable	Single-core outdoor copper cable with an M6 OT terminal	4–10 mm ²	N/A	Purchased by the customer

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.
- When installing cables, ensure that the AC output power cable and PE cable are close to each other.
- When installing cables, ensure that the AC output power cable and DC input power cables are close to each other.
- When installing DC input power cables, ensure that the PV+ and PV– cables are close to each other.

5.2 Installing the PE Cable

Context

⚠ DANGER

Do not connect the neutral wire to the enclosure as a PE cable. Otherwise, electric shocks could occur.

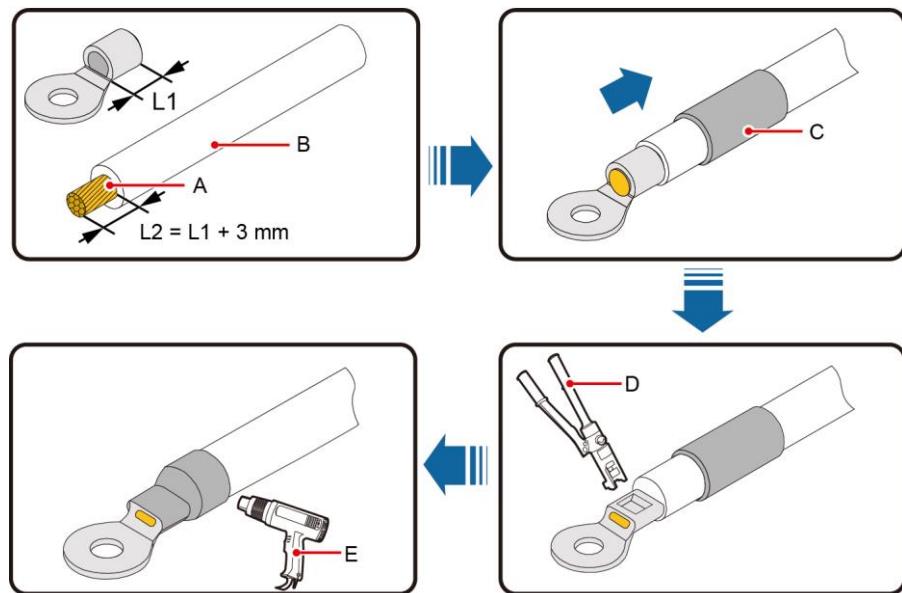
Procedure

Step 1 Crimp the OT terminal.

NOTICE

- Pay attention not to damage 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 PVC insulation tape. The following figure uses heat shrink tubing as an example.
 - When using the heat gun, protect devices from being scorched.

Figure 5-3 Crimping an OT terminal



(A) Core wire

(B) Insulation layer

(C) Heat shrink tubing

(D) Hydraulic pliers

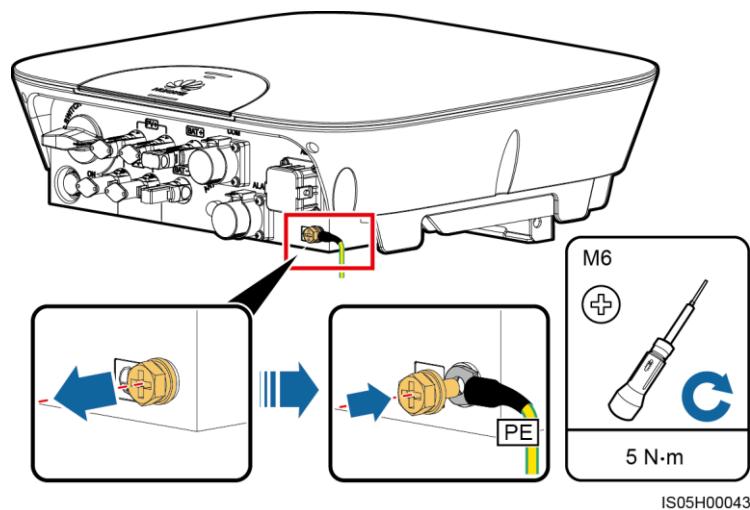
(E) Heat gun

Step 2 Connect the PE cable.

NOTICE

Ensure that the PE cable is connected securely.

Figure 5-4 Connecting a PE cable



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.
- To enhance the corrosion resistance of a ground terminal, apply silica gel or paint around the terminal after connecting the PE cable.

----End

5.3 Installing the AC Output Power Cable

Prerequisites

An AC switch must be installed on the AC side of the SUN2000L to ensure that the SUN2000L can be safely disconnected from the power grid.

WARNING

Do not connect any load between the SUN2000L and the AC switch.

Context

The SUN2000L can detect the grounding. This function is used to detect whether the SUN2000L is properly grounded before starting it, or to detect whether the PE cable is disconnected when the SUN2000L is working. This function is available only under limited conditions. To ensure the safe operation of the SUN2000L, properly ground the SUN2000L in strict accordance with the connection requirements for PE cables. For certain types of power grids, if an isolation transformer connects to the output side of the SUN2000L, you need to set **Grounding inspection** to **Disable** after checking that the SUN2000L is properly grounded. Then the SUN2000L can start normally. If you are not sure whether the SUN2000L connects to such a power grid, confirm it with your supplier or Huawei technical support.

 NOTE

- According to IEC62109, to ensure the safe operation of the SUN2000L in the case of PE cable damage or disconnection, connect the SUN2000L PE cable according to the requirements described in [5.2 Installing the PE Cable](#) and ensure that the SUN2000L PE cable meets at least one of the following requirements before disabling the grounding detection function.

The SUN2000L PE cable is a copper cable with a cross-sectional area of at least 10 mm².

Use two cables that have the same diameter as the AC output power cable to ground the PE terminal on the AC connector and the ground screw on the enclosure respectively (see [5.2 Installing the PE Cable](#) and [5.3 Installing the AC Output Power Cable](#) for details).

- Certain countries require an additional PE cable for the SUN2000L. In this case, use two cables that have the same diameter as the AC output power cable to ground the PE terminal on the AC connector and the ground screw on the enclosure respectively (see [5.2 Installing the PE Cable](#) and [5.3 Installing the AC Output Power Cable](#) for details).

Procedure

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

 NOTICE

- Ensure that the cable jacket is inside the connector.
- Ensure that the exposed core wire is totally inserted into the cable hole.
- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000L malfunction and damage to its AC connectors.
- Ensure that the cable is not twisted.

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

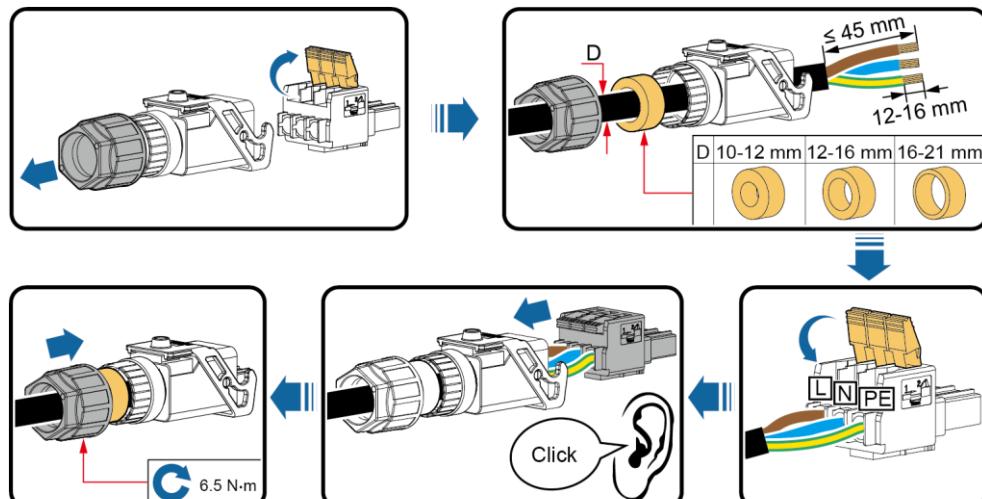
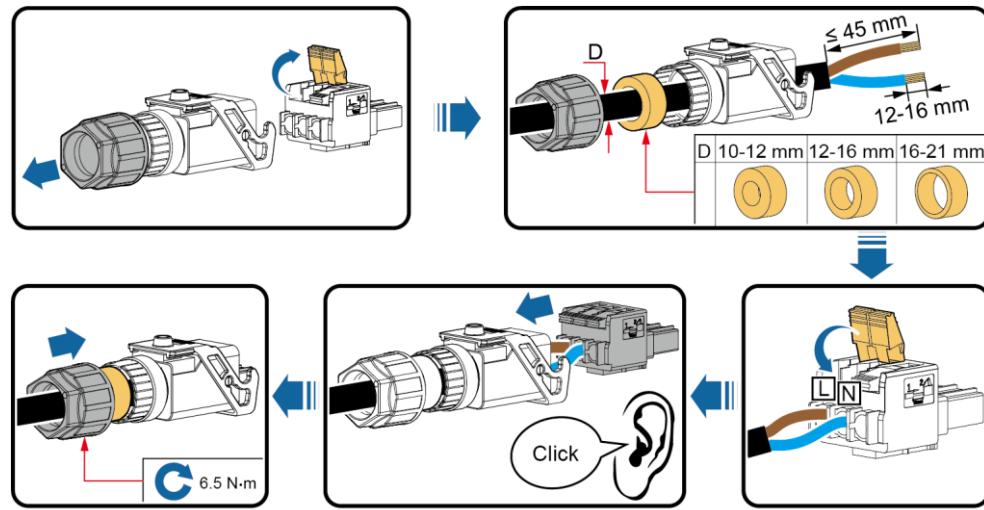


Figure 5-6 Assembling an AC connector (two-core wire)

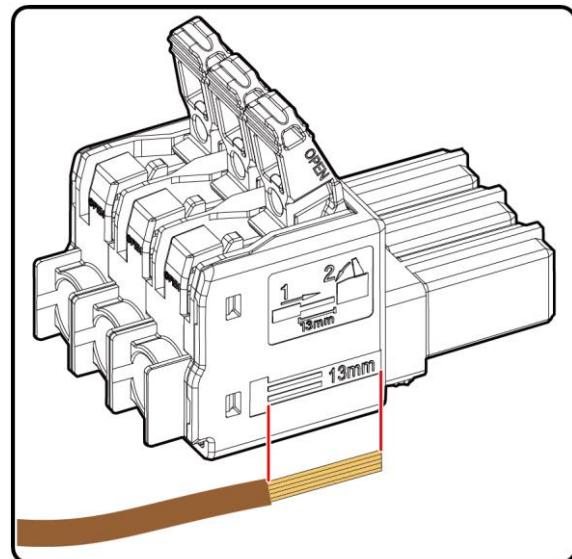


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NOTE

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

Figure 5-7 Stripped length



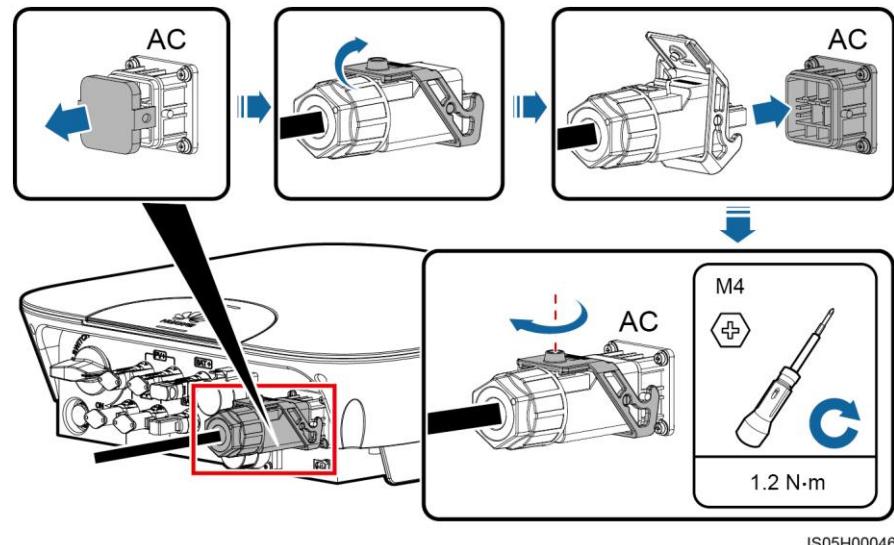
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Step 2 Connect the AC connector to the AC output port.

NOTICE

Ensure that the AC connector is connected securely.

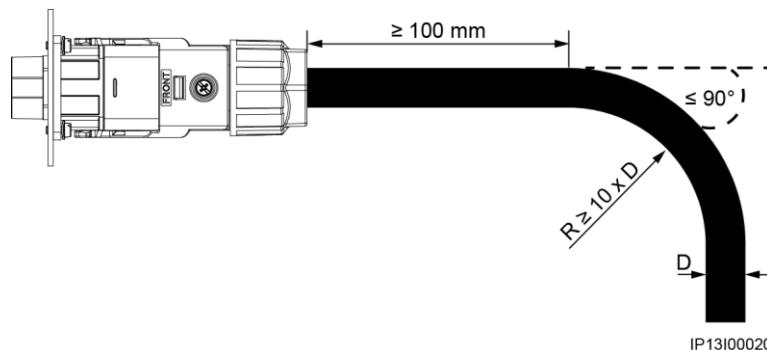
Figure 5-8 Securing an AC connector



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

Figure 5-9 Cable route



----End

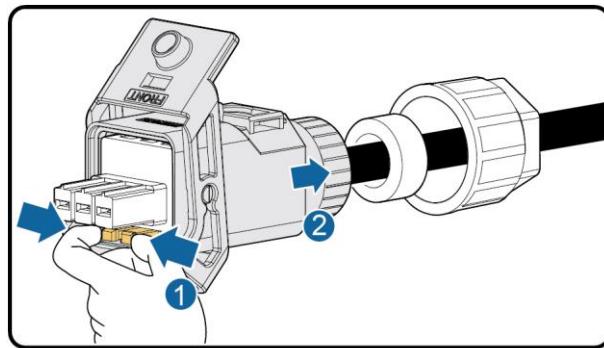
Follow-up Procedure

⚠️ WARNING

Before removing the AC connector, ensure that the DC switch at the bottom of the SUN2000L and all the switches connecting to the SUN2000L are OFF.

To remove the AC connector from the SUN2000L, perform the operations in reverse order.

Figure 5-10 Removing a plug insert



IS05H00031

5.4 Installing the DC Input Power Cable

Prerequisites

DANGER

- Before connecting the DC input power cable, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the DC switch on the SUN2000L is OFF. Failing to do so may result in electric shocks.
- When the SUN2000L is operating, it is not allowed to work on DC circuit, 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 the DC input terminals, do not remove the watertight cap from the DC input terminals. Otherwise, the SUN2000L will not comply with its Ingress Protection Rating.

WARNING

Ensure that the following conditions are met. Otherwise, the SUN2000L will be damaged, or even become a fire hazard.

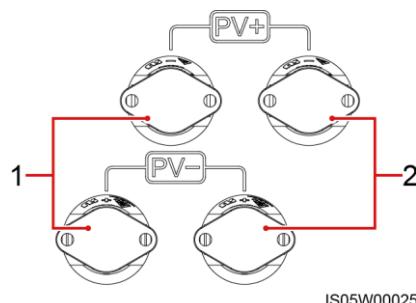
- The open-circuit voltage of each PV string is always lower than or equal to 600 V DC.
- The positive and negative terminals of a PV string connect to corresponding positive and negative DC input terminals of the SUN2000L.
- If polarity of the DC input power cable is reversed and the DC switch is ON, do not turn off the DC switch immediately or unplug positive and negative connectors. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch and remove the positive and negative connectors. Correct the string polarity before reconnecting the string to the SUN2000L.

NOTICE

- The PV terminal of the inverter supports only the PV string input and cannot be connected to other power supplies. Since the output of the PV string connected to the SUN2000L cannot be grounded, ensure that the PV module output is well insulated to ground.
- During the installation of PV strings and SUN2000L, the positive or negative terminals of PV strings may be grounded if power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000L. This damage is not covered under any warranty.

Context

Figure 5-11 DC input terminals



(1) The first set of DC input terminals

(2) The second set of DC input terminals

Procedure

Step 1 Assemble the black positive and negative connectors.

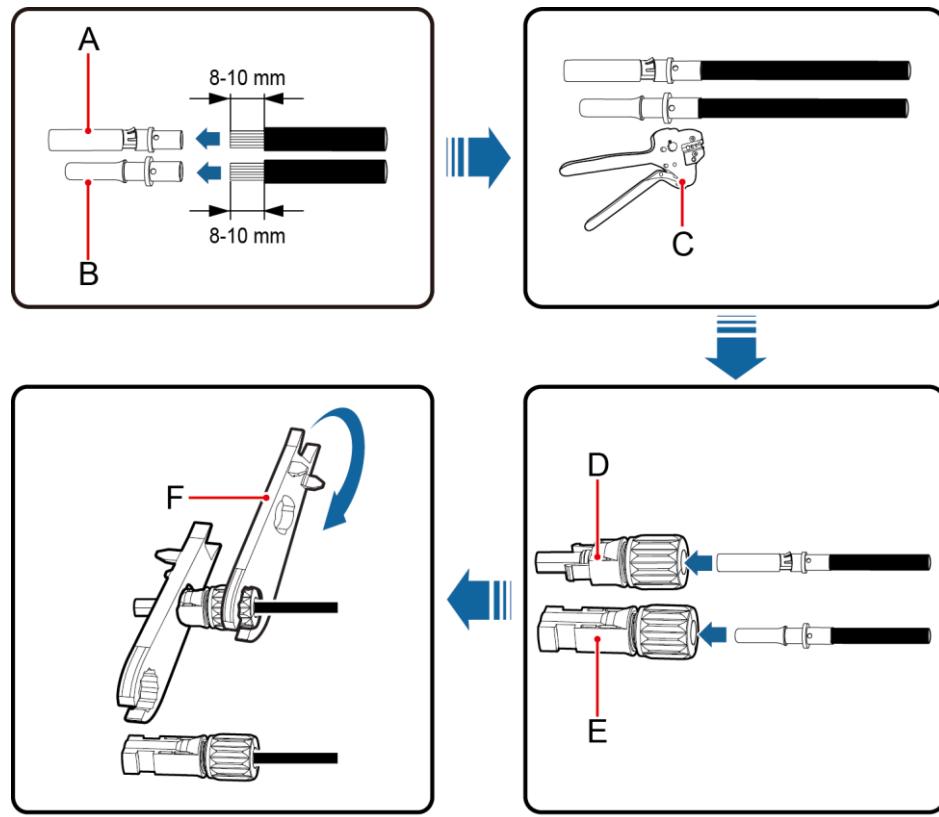
⚠ CAUTION

Use the positive and negative metal contacts and DC connectors supplied with the SUN2000L. Using incompatible positive and negative metal contacts and DC connectors may result in serious consequences. The caused device damage is not covered under any warranty.

NOTICE

- Cables with high rigidity, such as armored cables, are not recommended as DC input power cables, because poor contact may be caused by the bending of the cables.
- The metal contacts supplied with the DC connectors are either cold forming contacts or stamping forming contacts. Crimp the metal cold forming contacts using crimping tool UTXTC0005 (Amphenol, recommended) or H4TC0001 (Amphenol). Crimp the metal stamping forming contacts using crimping tool H4TC0003 (Amphenol, recommended) or H4TC0002 (Amphenol).
- DC terminal model (cold forming metal terminal): straight male HH4CMD5TM and straight female HH4CFC5DM; DC terminal model (stamp forming metal terminal): straight male HH4CMD4TMS and straight female HH4CFD4TMS.
- Before assembling DC input connectors, label the cable polarities correctly to ensure correct cable connections.
- After crimping the positive and negative metal contacts, pull the DC input power cables back to check that they are connected securely.
- Insert the crimped metal contacts of the positive and negative power cables into the corresponding positive and negative connectors. Then pull back the DC input power cables to check that they are connected securely.

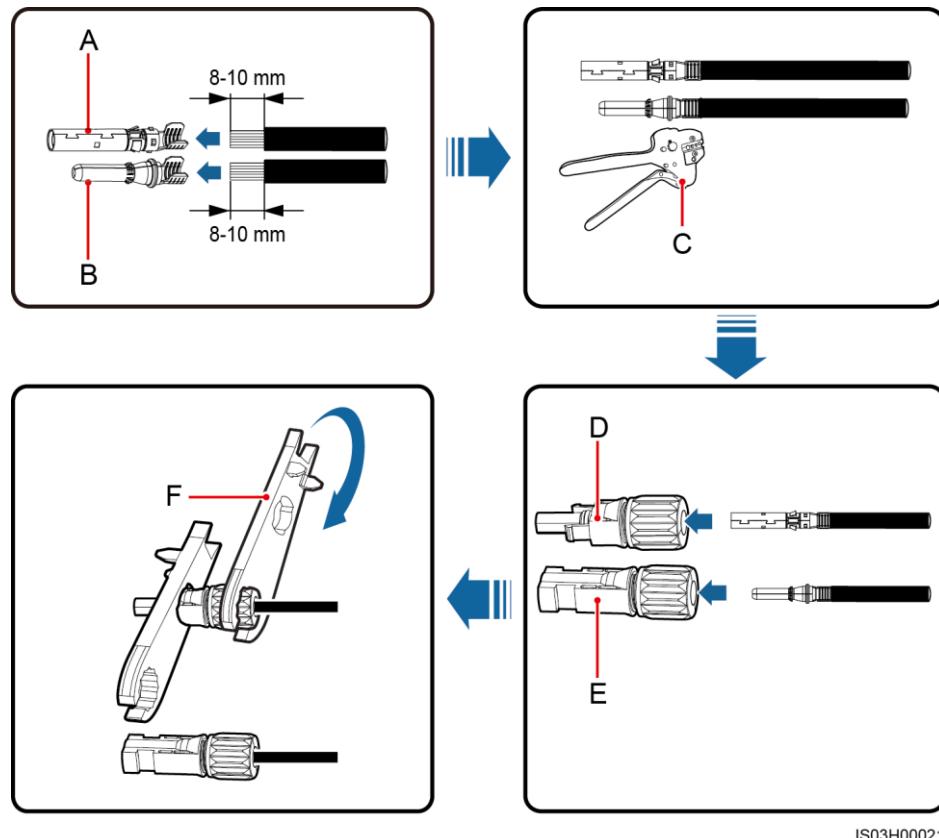
Figure 5-12 Assembling DC connectors (using metal cold forming contacts)



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- | | | |
|----------------------------|----------------------------|------------------------------|
| (A) Positive metal contact | (B) Negative metal contact | (C) UTXTC0005 crimping tool |
| (D) Positive connector | (E) Negative connector | (F) H4TW0001 open-end wrench |

Figure 5-13 Assembling DC connectors (using metal stamping forming contacts)



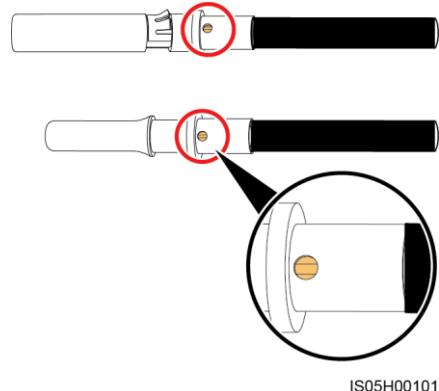
IS03H00021

- | | | |
|----------------------------|----------------------------|------------------------------|
| (A) Positive metal contact | (B) Negative metal contact | (C) H4TC0003 crimping tool |
| (D) Positive connector | (E) Negative connector | (F) H4TW0001 open-end wrench |

NOTICE

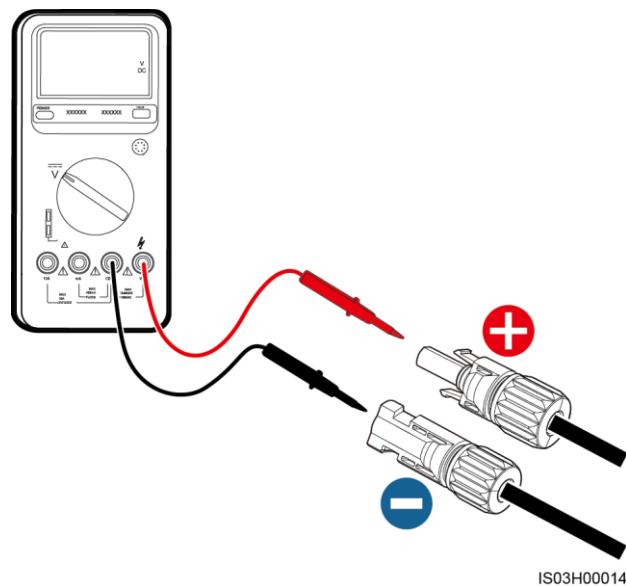
Ensure that the core wires can be seen through the hole on the terminal both before and after the positive and negative metal terminals are crimped.

Figure 5-14 Observing core wires through the hole on the terminal



Step 2 Ensure that the DC input voltage of each PV string is within the specified range of the SUN2000L using a multimeter and check that the polarities of DC input power cables are correct.

Figure 5-15 Measuring the DC input voltage



⚠️ WARNING

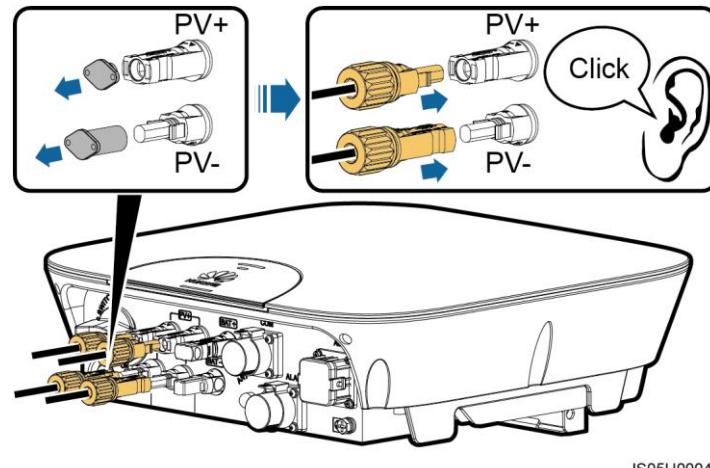
Before performing [Step 3](#), ensure that the DC switch is OFF.

Step 3 Insert the positive and negative connectors into corresponding DC input terminals on the SUN2000L.

NOTICE

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

Figure 5-16 Connecting DC input power cables



NOTICE

If polarity of the DC input power cable is reversed and the DC switch is ON, do not turn off the DC switch immediately or unplug positive and negative connectors. The device may be damaged if you do not follow the instruction. This damage is not covered under any warranty. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch and remove the positive and negative connectors. Correct the string polarity before reconnecting the string to the SUN2000L.

----End

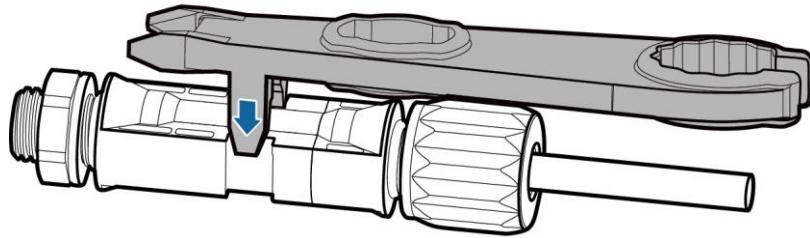
Follow-up Procedure

⚠️ WARNING

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

To remove the positive and negative connectors from the SUN2000L, insert an open-end wrench into the notch and press the wrench with an appropriate force.

Figure 5-17 Removing a DC connector



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5.5 Installing Battery Cables

Prerequisites

DANGER

- Battery short circuits may cause personal injury. The high transient current generated by a short circuit will release a surge of power and may even cause fire.
- Do not connect or disconnect battery cables when the SUN2000L is running. Failing to do so may cause electric shocks.
- Before connecting battery cables, ensure that the DC switch on the SUN2000L and all the switches connecting to the SUN2000L are OFF, and the SUN2000L has no residual electricity. Otherwise, the high voltage of the SUN2000L and battery may result in electric shocks.
- If no battery connects to the SUN2000L, do not remove the watertight cap from the battery terminal. Otherwise, the SUN2000L will not comply with its Ingress Protection Rating. If a battery connects to the SUN2000L, 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 SUN2000L and the battery to ensure that the SUN2000L can be safely disconnected from the battery.

WARNING

Do not connect any load between the SUN2000L and the battery.

Ensure that the following conditions are met. Otherwise, the SUN2000L will be damaged, or even become a fire hazard.

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 SUN2000L respectively.

NOTICE

- During the installation of the SUN2000L 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 SUN2000L. This damage is not covered under any warranty or service agreement.
- The cables between the battery and the SUN2000L should be less than or equal to 10 meters, and within 5 meters is recommended.

Procedure

Step 1 Assemble the blue positive and negative connectors by following the instructions in [5.4 Installing the DC Input Power Cable](#).

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 SUN2000L battery terminal.

NOTICE

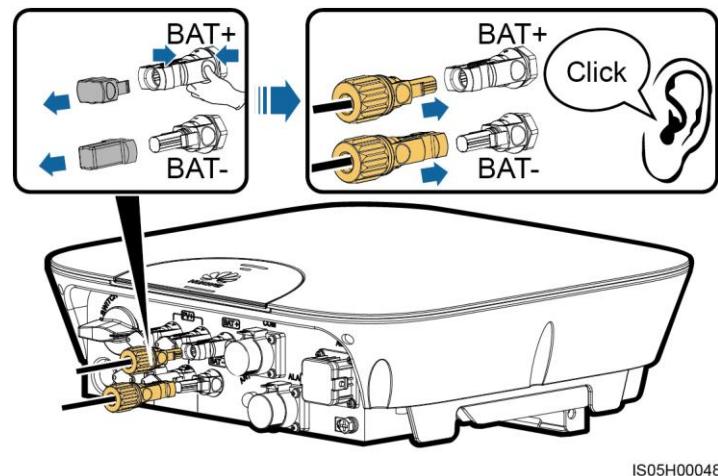
Cables with high rigidity, such as armored cables, are not recommended, because poor contact may be caused by the bending of the cables.

Step 2 Insert the positive and negative connectors into corresponding battery terminals on the SUN2000L.

NOTICE

After the positive and negative connectors snap into place, pull the battery cables back to check that they are secured.

Figure 5-18 Installing battery cables



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----End

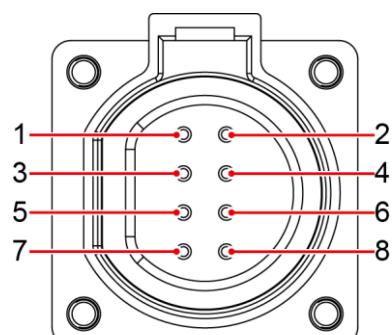
5.6 Installing the Signal Cable

Context

NOTICE

When laying out signal cables, separate them from power cables to avoid strong signal interference sources.

Figure 5-19 Signal Cable Ports

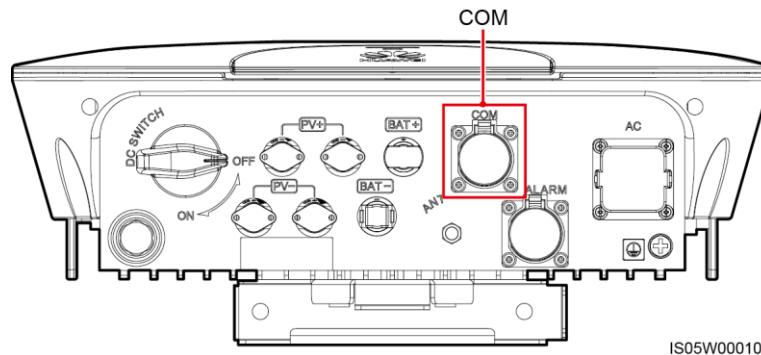


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NOTE

Signal cable ports are classified into COM ports and ALARM ports.

Figure 5-20 COM Ports

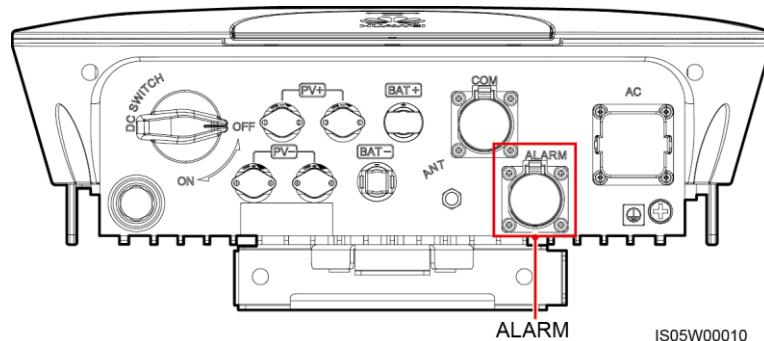


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The COM port provides two RS485 communications ports and one enable signal port to connect to Smart Power Sensors, batteries, and so on.

Table 5-3 COM port definitions

No.	Label	Definition	Description
1	485B1	RS485B, RS485 differential signal-	Reserved, can connect to the RS485 signal port on the Smart Power Sensor.
2	485A1	RS485A, RS485 differential signal+	
3	485B2	RS485B, RS485 differential signal-	Reserved, can connect to the RS485 signal port and enable signal port on a battery.
4	485A2	RS485A, RS485 differential signal+	
5	EN-	Enable signal-	
6	EN+	Enable signal+	
7	N/A	N/A	N/A
8	PE	Shielding ground	Connects to the shield layer of the cable.

Figure 5-21 ALARM Ports

The ALARM port provides an alarm signal port to connect to an alarm beacon, which reminds the user to handle the **Low Insulation Resistance**, **Abnormal Residual Current**, or **Faulty Residual Current Sensor** alarm. The ALARM port reserves an RS485/12 V signal port.

NOTICE

- The alarm beacon should be installed within 2 meters away from the SUN2000L.
- The shield layer of the device signal cable connected to the ALARM port and the COM port is also advised to be grounded.
- The **Faulty Residual Current Sensor** alarm is the Abnormal Device alarm with a cause ID of 5.

Table 5-4 ALARM port definitions

No.	Label	Definition	Description
1	ALARM-	Alarm signal-	Reserved, can connect to the power port on an alarm beacon
2	ALARM+	Alarm signal+	
3	485B3	RS485B, RS485 differential signal-	Reserved RS485/12 V signal port, output power of the 12 V power supply ≤ 3 W
4	485A3	RS485A, RS485 differential signal+	
5	12 V-	Negative of the 12 V power supply	
6	12 V+	Positive of the 12 V power supply	
7	N/A	N/A	N/A
8	PE	Shielding ground	Connects to the shield layer of the cable.

Procedure

Step 1 Connect signal cables to appropriate signal connectors.

NOTICE

- The protection layer of the cable is in the connector. Surplus core wires are cut off from the protection layer.
- Ensure that the exposed core wire is totally inserted into the cable hole.
- Ensure that the signal cables are connected securely.
- Ensure that the cable is not twisted.
- If a connector needs to connect to only one signal cable, block the unused cable hole on the seal using a waterproofing bolt and tighten the sealing nut.
- If a connector needs to connect to two signal cables, ensure that the cables have the same outer diameter.

Figure 5-22 Assembling a signal connector (COM port)

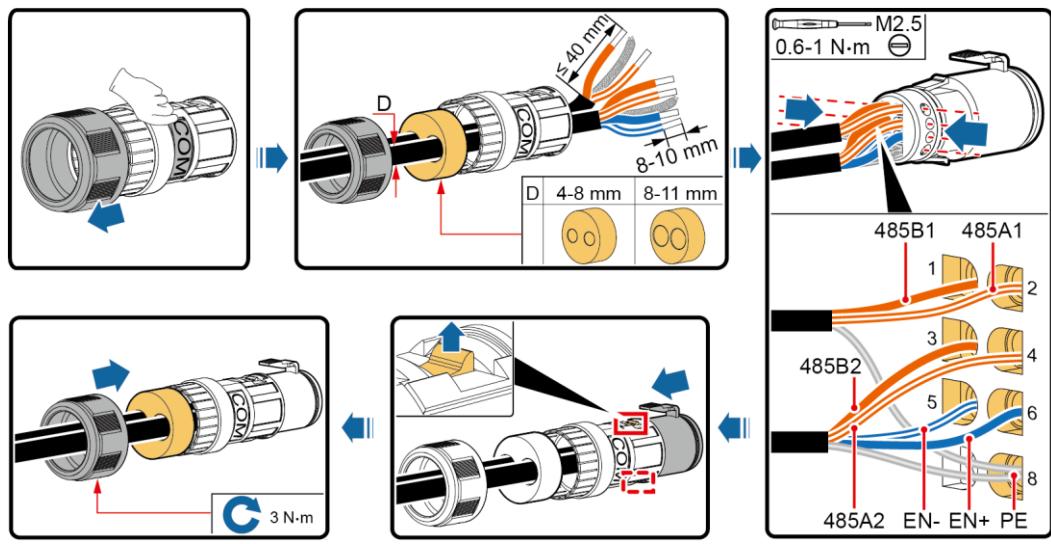
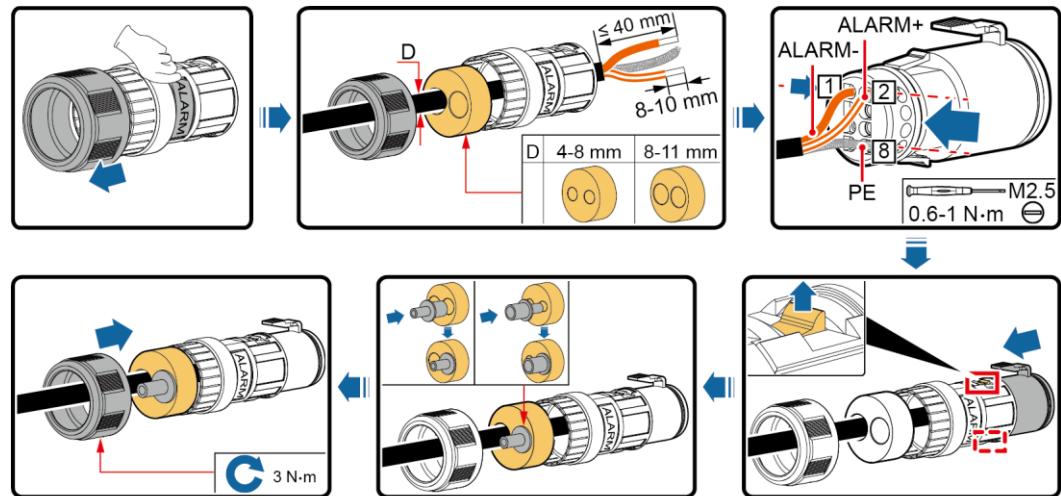


Figure 5-23 Assembling a signal connector (ALARM port)



Step 2 Connect the signal connector to the corresponding port.

NOTICE

- Do not confuse the connector to the COM port with that of ALARM port.
- Ensure that the signal connector is connected securely.

Figure 5-24 Securing a connector (COM port)

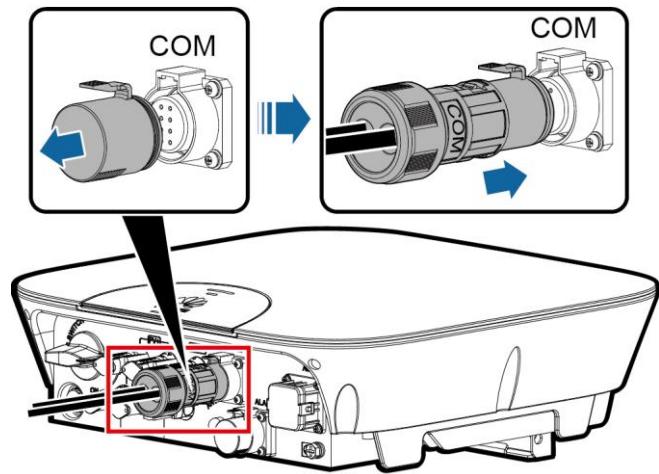
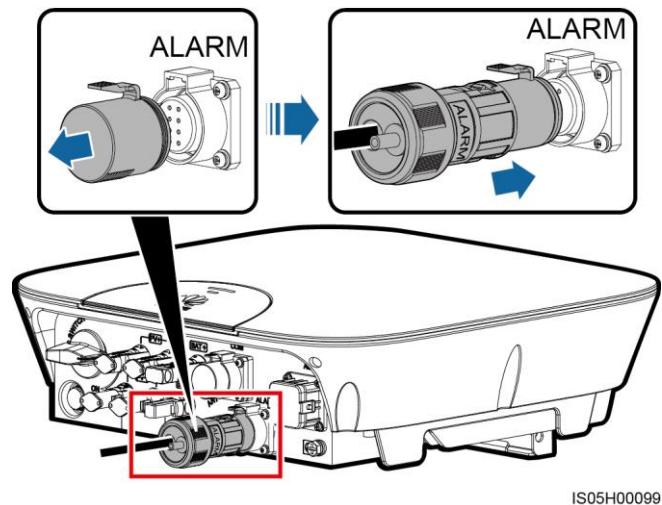


Figure 5-25 Securing a connector (ALARM port)



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----End

6 System Commissioning

6.1 Checking Before Power-On

Table 6-1 Installation checklist

No.	Check Item	Acceptance Criteria
1	SUN2000L installation	The SUN2000L is installed correctly, securely, and reliably.
2	WLAN antenna installation	The WLAN antenna is installed correctly, securely, and reliably.
3	Cable layout	Cables are routed properly as required by the customer.
4	Cable tie	Cable ties are secured evenly and no burr exists.
5	Grounding	The ground cable is connected correctly, securely, and reliably.
6	Switch status	The DC switch and all the switches connecting to the SUN2000L are OFF.
7	Cable connections	The AC output power cable, DC input power cable, battery cable, and signal cable are connected correctly, securely, and reliably.
8	Unused terminals and ports	Unused terminals and ports are blocked by watertight caps.
9	Installation environment	The installation space is proper, and the installation environment is clean and tidy, without foreign matter.

6.2 Powering On the System

Prerequisites

Before turning on the AC switch between the SUN2000L and the power grid, check that the AC voltage on the power grid side of the AC switch is within the specified range.

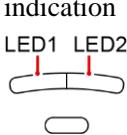
NOTICE

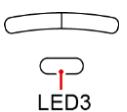
- If the DC is on and the AC is off, the SUN2000L reports a **Grid Loss** alarm. The SUN2000L starts normally only after the fault is rectified.
- If the AC is on and the battery is off, the SUN2000L reports a **Battery Abnormal** alarm.
- If the inverters are connected to batteries, turn on the DC switch within 1 minute after turning on the AC switch. Otherwise, the inverters, connected to the power grid, will shut down and start again.

Procedure

- Step 1** If a battery connects to the battery port, turn on the battery Auxiliary Power ON/OFF switch, and then turn on the battery Circuit Breaker switch.
- Step 2** Turn on the AC switch between the SUN2000L and the power grid.
- Step 3** Turn on the DC switch between the PV string and the SUN2000L if there is any.
- Step 4** Turn on the DC switch at the bottom of the SUN2000L.
- Step 5** (Optional) Measure the temperatures at DC terminals and battery terminals using a point-test thermometer.
Under normal operation conditions of the SUN2000L, the temperature rise at DC terminals should remain below 30 °C at all time.
- Step 6** Observe the LEDs to check the SUN2000L operating status.

Table 6-2 LED description

Type	Status		Meaning
	LED 1	LED 2	N/A
	Steady green	Steady green	The SUN2000L is exporting power to the power grid.
	Blinking green at long intervals (on for 1s and then off for 1s)	Off	The DC is on and the AC is off.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is off and the AC is on.

Type	Status	Meaning
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s) The DC is on, the AC is on, and the SUN2000L is not exporting power to the power grid.
	Off	Both the DC and AC are off, or the SUN2000L is in Low Power Consumption mode. Low Power Consumption mode means that the monitoring system of the SUN2000L is hibernating.
	Steady red	Steady red The SUN2000L is faulty.
Communication indication 	LED 3	N/A
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)	Communicating (Communicating means that the communication with the upper-level management unit is in progress. However, if a mobile phone accesses the SUN2000L, the LED indicates the "mobile phone access status: blinking green at long intervals" first.)
	Blinking green at long intervals (on for 1s and then off for 1s)	The mobile phone is connected to the SUN2000L.
	Off	No communication

----End

6.3 Commissioning

For details, please refer to the [FusionSolar App and SUN2000 App User Manual](#), you can download it by scanning the QR code below.



6.4 Powering Off the System

Context

WARNING

- After the SUN2000L is powered off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, put on protective gloves and operate the SUN2000L 5 minutes after the power-off.
- If the SUN2000L is connected to the battery, ensure that a shutdown command is sent from the app. Power off the system after the SUN2000L has shut down. If no shutdown command is sent from the app, the SUN2000L will shut down after the power grid is powered off. Then, the SUN2000L will wait for 1 minute and restart (not grid-tied) to charge the battery, which poses the risk of turning off the DC switch with power.

Procedure

- Step 1** Send a shutdown command from the app.
- Step 2** Turn off the AC switch between the SUN2000L and the power grid.
- Step 3** Turn off the DC switch at the bottom of the SUN2000L.
- Step 4** Turn off the DC switch between the PV string and the SUN2000L if there is any.
- Step 5** If a battery connects to the battery port, turn off the battery switch.

----End

7 System Maintenance

7.1 Routine Maintenance

To ensure that the SUN2000L can operate properly in the long term, you are advised to perform routine maintenance on it as described in this chapter.

⚠ CAUTION

Before cleaning the system, connecting cables, and maintaining the grounding reliability, power off the system (see [6.4 Powering Off the System](#) for details).

Table 7-1 Maintenance checklist

Check Item	Acceptance Criteria	Maintenance Interval
System cleanliness	The heat sinks are free from obstacles or dust.	Once every 6 to 12 months
System running status	<ul style="list-style-type: none">The SUN2000L is not damaged or deformed.The SUN2000L operates with no abnormal sound.All SUN2000L parameters are correctly set. Perform this check when the SUN2000L is running.	Once every 6 months
Electrical connections	<ul style="list-style-type: none">Cables are securely connected.Cables are intact, and in particular, the cable jackets touching the metallic surface are not scratched.Unused DC input terminals, battery terminals, COM ports, ALARM ports, and ANT ports are locked by watertight caps.	Perform the first maintenance 6 months after the initial commissioning. From then on, perform the maintenance once every 6 to 12 months.

Check Item	Acceptance Criteria	Maintenance Interval
Grounding reliability	Ground cables are securely connected.	Perform the first maintenance 6 months after the initial commissioning. From then on, perform the maintenance once every 6 to 12 months.

7.2 Troubleshooting

Alarm severities are defined as follows:

- Major: The SUN2000L enters Shutdown mode and disconnects from the power grid to stop generating power after a fault occurs.
- Minor: Some components are faulty but the SUN2000L can still connect to the power grid and generate power.
- Warning: The SUN2000L output power decreases due to external factors.

Table 7-2 Common alarms and troubleshooting measures

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2001	High String Input Voltage	Major	The PV array is incorrectly configured. Excessive PV modules are connected in series to the PV string, and therefore the open-circuit voltage exceeds the maximum inverter input voltage.	<p>Reduce the number of PV modules connected in series to the PV string until the PV string open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array is correctly configured, the inverter alarm disappears.</p> <p>The following is the mapping between PV strings and alarm cause IDs:</p> <ul style="list-style-type: none"> • Cause ID 1: string 1 • Cause ID 2: string 2

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2011	String Reversed	Major	The PV string is reversely connected.	<p>Check whether the PV string is reversely connected to the SUN2000L. If so, wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the DC switch and correct the PV string polarity.</p> <p>The following is the mapping between PV strings and alarm cause IDs:</p> <ul style="list-style-type: none">• Cause ID 1: string 1• Cause ID 2: string 2
2032	Grid Failure	Major	Cause ID = 1 <ul style="list-style-type: none">• The power grid experiences an outage.• The AC circuit is disconnected or AC switch is off.	<ol style="list-style-type: none">1. Check the AC voltage.2. Check that the AC power cable is connected and that the AC switch is ON.
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 LVRT.	<ol style="list-style-type: none">1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000L automatically recovers after detecting that the power grid becomes normal.2. If the alarm occurs frequently, check whether the grid voltage is within the acceptable range. If not, contact the local power operator. If so, modify the power grid undervoltage protection thresholds 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.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2034	Grid Overvoltage	Major	Cause ID = 1 The grid voltage exceeds the higher threshold or the high voltage duration has lasted for more than the value specified by HVRT.	1. Check whether the grid connection voltage exceeds the upper threshold. If so, contact the local power operator. 2. If you have confirmed that the grid connection voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage protection thresholds. 3. Check whether the peak grid voltage exceeds the upper threshold.
2035	Unbalanced Grid Voltage	Major	The difference between grid phase voltages exceeds the upper threshold.	1. Check that the grid voltage is within the normal range. 2. Check the connection of the AC output power cable. 3. If the cable connection is proper but the alarm occurs frequently and affects the power production of the PV plant, contact the local power operator.
2036	Grid Overfrequency	Major	Cause ID = 1 Power grid exception: The actual grid frequency is higher than the local power grid standard.	1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000L automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If not, contact the local power operator. If so, modify the grid overfrequency protection threshold with the consent of the local power operator.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2037	Grid Underfrequency	Major	Cause ID = 1 Power grid exception: The actual grid frequency is lower than the local power grid standard.	1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000L automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If not, contact the local power operator. If so, modify the grid underfrequency protection threshold with the consent of the local power operator.
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 accidentally, the power grid may be abnormal temporarily. The SUN2000L automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If not, contact the local power operator.
2039	Output Overcurrent	Major	Cause ID = 1 The grid voltage drops dramatically or the power grid is short-circuited. As a result, the inverter transient output current exceeds the upper threshold and therefore the inverter protection is triggered.	1. The SUN2000L monitors its external working conditions in real time. The SUN2000L automatically recovers after the fault is rectified. 2. If the alarm occurs frequently and affects the power production of the PV plant, check whether the output is short-circuited. If the fault persists, contact your supplier or Huawei technical support.
2040	Output DC Component Overhigh	Major	Cause ID = 1 The DC component of the SUN2000L output current exceeds the specified upper threshold.	1. The SUN2000L monitors its external working conditions in real time. The SUN2000L automatically recovers after the fault is rectified. 2. If the alarm occurs frequently, contact your supplier or Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2051	Abnormal Residual Current	Major	Cause ID = 1 The insulation impedance of the input side to PE decreases when the SUN2000L is operating.	1. If the alarm occurs accidentally, the external power cable may be abnormal temporarily. The SUN2000L automatically recovers after the fault is rectified. 2. If the alarm occurs frequently or persists, check whether the impedance between the PV string and ground is below the lower threshold.
2061	Abnormal Grounding	Major	Cause ID = 1 <ul style="list-style-type: none">• The PE cable for the SUN2000L is not connected.• The voltage between the SUN2000L neutral wire and ground exceeds the upper threshold.	1. Check that the PE cable for the SUN2000L is connected properly. 2. Check that the voltage between the SUN2000L neutral wire and ground is within the normal range. If an isolation transformer is connected, set Grounding inspection to Disable . 3. If the connections of the PE cable and neutral wire of the inverter are restored, this alarm is automatically cleared 1 hour after the alarm is generated or after the inverter is powered off and restarted.
2062	Low Insulation Resistance	Major	Cause ID = 1 <ul style="list-style-type: none">• The PV string is short-circuited to PE.• The PV string is installed in a moist environment for a long time.	1. Check the impedance between the PV array output and PE, and eliminate short circuits and poor insulation points. 2. Check that the SUN2000L PE cable is correctly connected. 3. If you confirm that the impedance is less than the default value in a cloudy or rainy environment, reset Insulation resistance protection .

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2063	Overtemperature	Major	Cause ID = 1 <ul style="list-style-type: none"> • The SUN2000L is installed in a place with poor ventilation. • The ambient temperature exceeds the upper threshold. • The SUN2000L is not working properly. 	<ul style="list-style-type: none"> • Check the ventilation and ambient temperature at the SUN2000L installation position. • If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. • If both the ventilation and ambient temperature meet requirements, contact your supplier or Huawei technical support.
2064	Device Fault	Major	Cause ID = 1–12 An unrecoverable fault occurs on a circuit inside the SUN2000L.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the fault persists, contact your supplier or Huawei technical support.
2065	Upgrade Failed	Major	Cause ID = 1–4 The upgrade does not end normally.	<ol style="list-style-type: none"> 1. Perform an upgrade again. 2. If the upgrade fails several times, contact your supplier or Huawei technical support. 3. Check that the DC power supply is connected.
61440	Monitoring Unit Faulty	Minor	Cause ID = 1 The communication module is faulty.	Contact your supplier or Huawei technical support to rectify the fault.
2067	Faulty Power Collector	Major	Cause ID = 1 The Smart Power Sensor communication is interrupted.	<ol style="list-style-type: none"> 1. Check that the preset Smart Power Sensor model is the same as the actual model. 2. Check that the preset communications parameters for the Smart Power Sensor are the same as the actual configurations. 3. Check that the Smart Power Sensor is powered on and the RS485 communications cable is correctly connected.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2068	Battery Abnormal	Minor	<p>Cause ID = 1</p> <ul style="list-style-type: none"> • The battery is faulty. • The battery communication is interrupted. • The battery switch trips when the SUN2000L is running. 	<ol style="list-style-type: none"> 1. If the battery fault indicator is steady on or blinking, contact the battery supplier. 2. Check that the battery enable/power/communications cable is correctly installed, and that the communications parameters are the same as the SUN2000L RS485 configurations. 3. Check that Auxiliary Power switch on the battery is 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 alarm persists, contact your supplier or Huawei technical support.
2075	Peripheral Port Short Circuit	Warning	<p>Cause ID = 1</p> <p>The SUN2000L Alarm port is short-circuited when supplying 12 V power to peripheral.</p>	<ol style="list-style-type: none"> 1. Turn off the AC and DC switches on the SUN2000L and disconnect the peripheral from the Alarm port. Then power on the SUN2000L again and clear the alarm manually. If the alarm persists, contact your supplier or Huawei technical support to rectify the fault. If the alarm is cleared, it indicates that the port on the SUN2000L is normal. Then check that the pins in the power port on the peripheral are not short-circuited. 2. Replace the peripheral, and then start a self-check to check that the port functions properly.

NOTE

Contact your supplier or Huawei technical support if all failure analysis procedures listed above are completed and the fault still exists.

8 Handling the SUN2000L

8.1 Removing the SUN2000L

Procedure

- Step 1** Power off the system by following the instructions in [6.4 Powering Off the System](#).
- Step 2** Disconnect all cables from the SUN2000L, including signal cables, DC input power cables, battery cables, AC output power cables, and PE cables.
- Step 3** Remove the WLAN antenna from the SUN2000L.
- Step 4** Remove the SUN2000L from the mounting bracket.
- Step 5** Remove the mounting bracket.

----End

8.2 Packing the SUN2000L

- If the original packaging is available, put the SUN2000L inside it and then seal it using adhesive tape.
- If the original packaging is not available, put the SUN2000L inside a suitable cardboard box and seal it properly.

8.3 Disposing of the SUN2000L

If the SUN2000L service life expires, dispose of it according to the local disposal rules for electrical equipment and electronic component waste.

9 Technical Specifications

Efficiency

Item	SUN2000 L-2KTL	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Maximum efficiency	98.4%	98.5%	98.5%	98.6%	98.6%	98.6%
European weighted efficiency	97%	97.6%	97.8%	97.9%	98%	98%

Input

Item	SUN2000 L-2KTL	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Maximum input voltage ^a	<ul style="list-style-type: none">• 600 V (No battery connects to the SUN2000L.)• 495 V (An LG-RESU battery connects to the SUN2000L.)					
Maximum input current (per MPPT)	11 A					
Maximum short-circuit current (per MPPT)	15 A					

Item	SUN2000 L-2KTL	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Maximum inverter backfeed current to the PV array	0 A					
Operating voltage range	<ul style="list-style-type: none"> • 90–500 V (No battery connects to the SUN2000L.) • 90–495 V (An LG-RESU battery connects to the SUN2000L.) 					
Start voltage range	<ul style="list-style-type: none"> • 120–600 V (No battery connects to the SUN2000L.) • 120–495 V (An LG-RESU battery connects to the SUN2000L.) 					
MPPT voltage range	<ul style="list-style-type: none"> • 90–500 V (No battery connects to the SUN2000L.) • 90–425 V (An LG-RESU battery connects to the SUN2000L.) 					
Rated input voltage	380 V					
Number of inputs	2					
Number of MPP trackers	2					
Note a: Maximum input voltage includes the voltage of PV and battery inputs.						

Output

Item	SUN2000 L-2KTL	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Rated output power ^a	2000 W	3000 W	3680 W	4000 W	4600 W	5000 W
Maximum apparent power ^b	2200 VA	3300 VA	3680 VA	4400 VA	5000 VA	5500 VA
Rated output voltage	220 V/230 V/240 V					

Item	SUN2000 L-2KTL	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Adapted grid frequency	50 Hz/60 Hz					
Maximum output current ^c	10 A	15 A	16 A	20 A	23 A	25 A
Power factor	0.8 leading... 0.8 lagging					
Maximum total harmonic distortion (rated power)	$\leq 3\%$					
<ul style="list-style-type: none"> Note a: The maximum output power of the SUN2000L-5KTL is 4990 W if the Australian AS4777 grid code is selected. Note b: The maximum apparent power of the SUN2000L-4.6KTL is 4600 VA if the Germany VDE-AR-N 4105 grid code is selected. The maximum apparent power of the SUN2000L-4.6KTL and SUN2000L-5KTL is 4990 VA if the Australian AS4777 grid code is selected. Note c: The maximum output current of the SUN2000L-4.6KTL and SUN2000L-5KTL is 21.7 A if the Australian AS4777 grid code is selected. 						

Protection

Item	SUN2000L-2KTL	SUN2000L-3KTL	SUN2000L-3.68KTL	SUN2000L-4KTL	SUN2000L-4.6KTL	SUN2000L-5KTL
Anti-islanding protection	Supported					
Input reverse polarity protection	Supported					
Output short-circuit protection	Supported					
RCMU	Supported					
AC surge protection	Supported					

Item	SUN200 0L-2KT L	SUN2000 L-3KTL	SUN200 0L-3.68KT TL	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
DC surge protection	Supported					
Output overvoltage protection	Supported					
Insulation resistance detection	Supported					

Communication

Item	SUN2000 L-2KTL	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Display	LED					
WLAN	Supported					
RS485	Supported					

Common parameters

Item	SUN2000L-2KT L	SUN2000 L-3KTL	SUN2000 L-3.68KT L	SUN2000 L-4KTL	SUN2000 L-4.6KTL	SUN2000 L-5KTL
Topology	Transformerless					
Ingress Protection Rating	IP65					
Cooling mode	Natural cooling					
Dimensions (W x H x D)	375 mm x 375 mm x 117 mm (excluding the mounting plate)/375 mm x 375 mm x 149.5 mm (including the mounting plate)/440 mm x 440mm x 231mm (including the package)					
Weight	Net weight: 11.6 kg (including the mounting plate) Including the package: 13.8kg					
Operating temperature	−30 °C to +60 °C (derated above +45 °C)					
Humidity	0%–100% RH					

Item	SUN2000L-2KTL	SUN2000L-3KTL	SUN2000L-3.68KTL	SUN2000L-4KTL	SUN2000L-4.6KTL	SUN2000L-5KTL
Operating altitude	0–4000 m (derated above 2000 m)					

A Grid Codes

NOTE

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

Grid codes (SUN2000L-2KTL/SUN2000L-3KTL)

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V	50 Hz
2	NB/T 32004	China Golden Sun low-voltage power grid	220 V	50 Hz
3	UTE C 15-712-1(A)	France mainland power grid	230 V	50 Hz
4	UTE C 15-712-1(B)	France island power grid (50 Hz)	230 V	50 Hz
5	UTE C 15-712-1(C)	France island power grid (60 Hz)	230 V	60 Hz
6	G83-England	England 230 V power grid ($I < 16 A$)	230 V	50 Hz
7	G83-Scotland	Scotland 240 V power grid ($I < 16 A$)	240 V	50 Hz
8	CEI0-21	Italy power grid	230 V	50 Hz
9	EN50438-NL	Netherlands power grid	230 V	50 Hz
10	AS4777	Australia power grid	230 V	50 Hz

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
11	IEC61727	IEC61727 low-voltage power grid (50 Hz)	230 V	50 Hz
12	EN50438-TR	Turkey low-voltage power grid	230 V	50 Hz
13	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)	230 V	60 Hz
14	CLC/TS50549_IE	Ireland power grid	230 V	50 Hz

Grid codes (SUN2000L-3.68KTL)

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V	50 Hz
2	UTE C 15-712-1(A)	France mainland power grid	230 V	50 Hz
3	UTE C 15-712-1(B)	France island power grid (50 Hz)	230 V	50 Hz
4	UTE C 15-712-1(C)	France island power grid (60 Hz)	230 V	60 Hz
5	G83-England	England 230 V power grid ($I < 16 A$)	230 V	50 Hz
6	G83-Scotland	Scotland 240 V power grid ($I < 16 A$)	240 V	50 Hz
7	CEI0-21	Italy power grid	230 V	50 Hz
8	EN50438-NL	Netherlands power grid	230 V	50 Hz
9	AS4777	Australia power grid	230 V	50 Hz
10	IEC61727	IEC61727 low-voltage power grid (50 Hz)	230 V	50 Hz

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
11	EN50438-TR	Turkey low-voltage power grid	230 V	50 Hz
12	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)	230 V	60 Hz
13	CLC/TS50549_IE	Ireland power grid	230 V	50 Hz

Grid codes (SUN2000L-4KTL)

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V	50 Hz
2	NB/T 32004	China Golden Sun low-voltage power grid	220 V	50 Hz
3	UTE C 15-712-1(A)	France mainland power grid	230 V	50 Hz
4	UTE C 15-712-1(B)	France island power grid (50 Hz)	230 V	50 Hz
5	UTE C 15-712-1(C)	France island power grid (60 Hz)	230 V	60 Hz
6	G59-England	England 230 V power grid ($I > 16 A$)	230 V	50 Hz
7	G59-Scotland	Scotland 240 V power grid ($I > 16 A$)	240 V	50 Hz
8	CEI0-21	Italy power grid	230 V	50 Hz
9	EN50438-NL	Netherlands power grid	230 V	50 Hz
10	AS4777	Australia power grid	230 V	50 Hz
11	IEC61727	IEC61727 low-voltage power grid (50 Hz)	230 V	50 Hz

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
12	EN50438-TR	Turkey low-voltage power grid	230 V	50 Hz
13	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)	230 V	60 Hz
14	CLC/TS50549_IE	Ireland power grid	230 V	50 Hz

Grid codes (SUN2000L-4.6KTL)

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V	50 Hz
2	UTE C 15-712-1(A)	France mainland power grid	230 V	50 Hz
3	UTE C 15-712-1(B)	France island power grid (50 Hz)	230 V	50 Hz
4	UTE C 15-712-1(C)	France island power grid (60 Hz)	230 V	60 Hz
5	G59-England	England 230 V power grid ($I > 16 A$)	230 V	50 Hz
6	G59-Scotland	Scotland 240 V power grid ($I > 16 A$)	240 V	50 Hz
7	CEI0-21	Italy power grid	230 V	50 Hz
8	EN50438-NL	Netherlands power grid	230 V	50 Hz
9	AS4777	Australia power grid	230 V	50 Hz
10	IEC61727	IEC61727 low-voltage power grid (50 Hz)	230 V	50 Hz
11	EN50438-TR	Turkey low-voltage power grid	230 V	50 Hz

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
12	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)	230 V	60 Hz
13	CLC/TS50549_IE	Ireland power grid	230 V	50 Hz

Grid codes (SUN2000L-5KTL)

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
1	UTE C 15-712-1(A)	France mainland power grid	230 V	50 Hz
2	NB/T 32004	China Golden Sun low-voltage power grid	220 V	50 Hz
3	UTE C 15-712-1(A)	France mainland power grid	230 V	50 Hz
4	UTE C 15-712-1(B)	France island power grid (50 Hz)	230 V	50 Hz
5	UTE C 15-712-1(C)	France island power grid (60 Hz)	230 V	60 Hz
6	G59-England	England 230 V power grid ($I > 16 A$)	230 V	50 Hz
7	G59-Scotland	Scotland 240 V power grid ($I > 16 A$)	240 V	50 Hz
8	CEI0-21	Italy power grid	230 V	50 Hz
9	EN50438-NL	Netherlands power grid	230 V	50 Hz
10	AS4777	Australia power grid	230 V	50 Hz
11	IEC61727	IEC61727 low-voltage power grid (50 Hz)	230 V	50 Hz
12	EN50438-TR	Turkey low-voltage power grid	230 V	50 Hz
13	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)	230 V	60 Hz

No.	National/Regional Grid Code	Description	Grid Voltage	Grid Frequency
14	CLC/TS50549_IE	Ireland power grid	230 V	50 Hz

B Acronyms and Abbreviations

A

AC alternating current

D

DC direct current

I

ID identifier

L

LED light emitting diode

LVRT low voltage ride-through

M

MAC Media Access Control

MPPT maximum power point tracking

P

PC personal computer

PE protective earthing

PV photovoltaic

R

RCD	residual current device
RCMU	residual current monitoring unit
RH	relative humidity
S	
SN	serial number
T	
THDi	total distortion of the input current waveform
W	
WEEE	waste electrical and electronic equipment
WLAN	wireless local area network