

SUN2000-(55KTL, 60KTL) Series

User Manual

Issue 05

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About This Document

Purpose

This document describes the SUN2000-55KTL-HV-D1, SUN2000-55KTL-IN-HV-D1, SUN2000-55KTL-HV-D1-001, SUN2000-60KTL-HV-D1, and SUN2000-60KTL-HV-D1-001 (SUN2000L for short) in terms of their installation, electrical connections, commissioning, maintenance, and troubleshooting. Understand the safety information and get familiar with the SUN2000 functions and features before installing and operating the SUN2000.

Intended Audience

This document is intended for photovoltaic (PV) power plant personnel and qualified electrical technicians.

Symbol Conventions

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

| Symbol | Description |
|--|---|
|  DANGER | Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death. |
|  WARNING | Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death. |
|  CAUTION | Indicates a potentially hazardous situation which, if not avoided, may 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. |

| Symbol | Description |
|---|--|
|  NOTE | Calls attention to important information, best practices and tips. 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 05 (2018-03-15)

Added description about the metal stamping forming contact.

Issue 04 (2018-01-15)

Added [A Grid Codes](#).

Issue 03 (2017-10-30)

Updated [3 Inverter Storage](#).

Updated [5.2 Crimping the OT Terminal](#).

Issue 02 (2017-07-30)

Updated [5.3 Connecting a ground cable](#).

Updated [10 Technical Specifications](#).

Issue 01 (2017-06-15)

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

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1 Safety Precautions



NOTICE

Before performing operations, read through this manual and follow all the precautions to prevent accidents. The safety precautions provided in this document do not cover all the safety precautions. Huawei shall not be liable for any consequence caused by the violation of the safety operation regulations and design, production, and usage standards.

Disclaimer

Huawei shall not be liable for any consequence caused by any of the following events.

- Transportation
- The storage conditions do not meet the requirements specified in this document.
- Violate the operation instructions and safety precautions in this document for installation, cable connecting, and maintenance.
- Operation in extreme environments which are not covered in this document
- Unauthorized modifications to the product or software code
- Installation or use in environments which are not specified in related international standards

Personnel Requirements

Only certified electricians are allowed to install and operate the SUN2000.

- Operation personnel should receive professional training.
- Operation personnel should read through this document and follow all the precautions.
- Operation personnel should be familiar with the safety specifications about the electrical system.
- Operation personnel should understand the composition and working principles of the grid-tied PV power system and local regulations.

Protect Labels

- Do not tamper with any warning labels on the inverter enclosure because these labels contain important information about safe operation.
- Do not tamper with the nameplate on the inverter enclosure because it contains important product information.

Installation

- Ensure that the inverter is not connected to a power supply and is not powered on before starting installation.
- Ensure that there are no objects within 200 mm, 300 mm, 500 mm, 600 mm, and 1000 mm of the left, right, top, bottom, and front of the inverter, respectively. This is to allow sufficient space for installation and heat dissipation. For ease of installation, ensure that the inverter bottom is at most 730 mm above the floor. If you have any questions about the distance, consult the local technical support engineers.
- Ensure that the inverter is installed in a well ventilated environment.
- Ensure that the inverter heat sinks are free from blockage.
- Open the maintenance compartment door of the chassis before connecting cables. Do not perform any operation on other components inside the chassis except connecting the PE cable, AC power cables and communications cables.

Cable Connections



DANGER

Before connecting cables, ensure that the inverter is secured in position and not damaged in any way. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.
- Obtain approval from the local utility company before using the inverter to generate electricity in grid-tied mode.
- Ensure that the cables used in a grid-tied PV system are properly connected and insulated, meet all specification requirements.

Operation



DANGER

High voltages may cause electric shocks result in serious injury, death or serious property damage from inverter in operation. Strictly comply with the safety precautions in this document and associated documents when operating the inverter.

- Do not touch an energized inverter because the heat sink may be over 60°C.
- Follow local laws and regulations when operating the equipment.

Maintenance and Replacement



DANGER

High voltages may cause electric shocks result in serious injury, death or serious property damage from inverter in operation. Prior to maintenance, power off the inverter and strictly comply with the safety precautions in this document and associated documents to operate the inverter.

- Maintain the inverter with sufficient knowledge of this document and proper tools and testing equipment.
- Before performing maintenance tasks, power off the inverter and wait at least 5 minutes.
- Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
- Rectify any faults that may compromise the inverter security performance before powering on the inverter again.
- Observe ESD precautions during the maintenance.
- For personal safety, wear insulation gloves and safety shoes.

2 Overview

2.1 Introduction

Function

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

Models

Figure 2-1 Model number description (SUN2000-55KTL-IN-HV-D1)

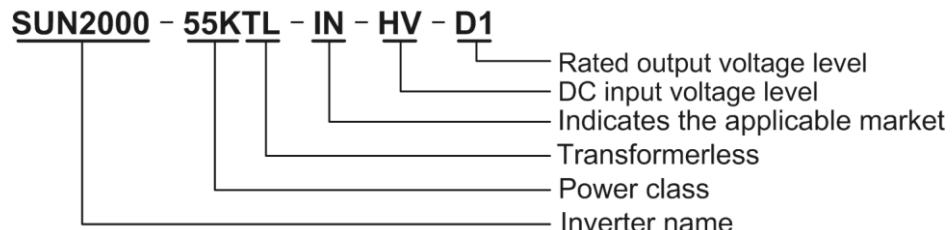
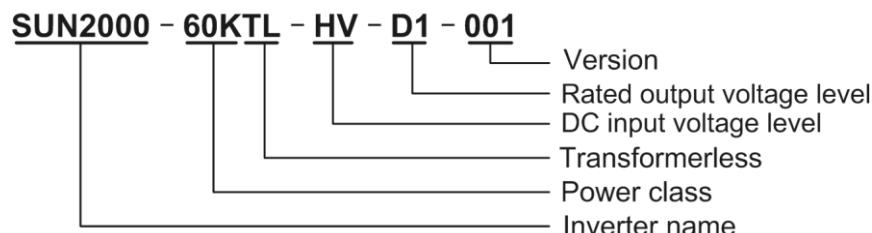


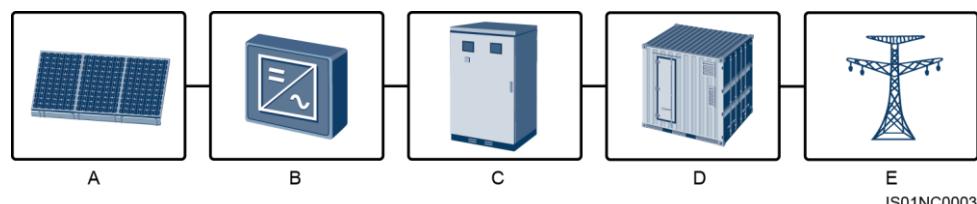
Figure 2-2 Model number description (SUN2000-60KTL-HV-D1-001)



Network Application

The SUN2000 applies to grid-tied PV systems for commercial rooftops and large plants. Typically, a grid-tied PV system consists of PV strings, grid-tied inverters, AC power distribution units, and step-up transformers.

Figure 2-3 Network application

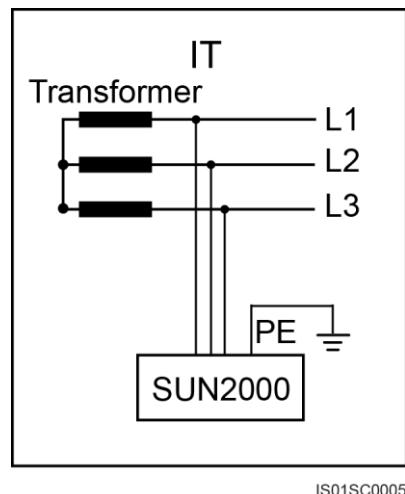


- (A) PV string
 - (B) SUN2000
 - (C) ACDU
 - (D) Step-up transformer
 - (E) Power grid

Supported Power Grids

The SUN2000 only supports the IT power grid mode, as shown in Figure 2-4.

Figure 2-4 Power grid modes



NOTE

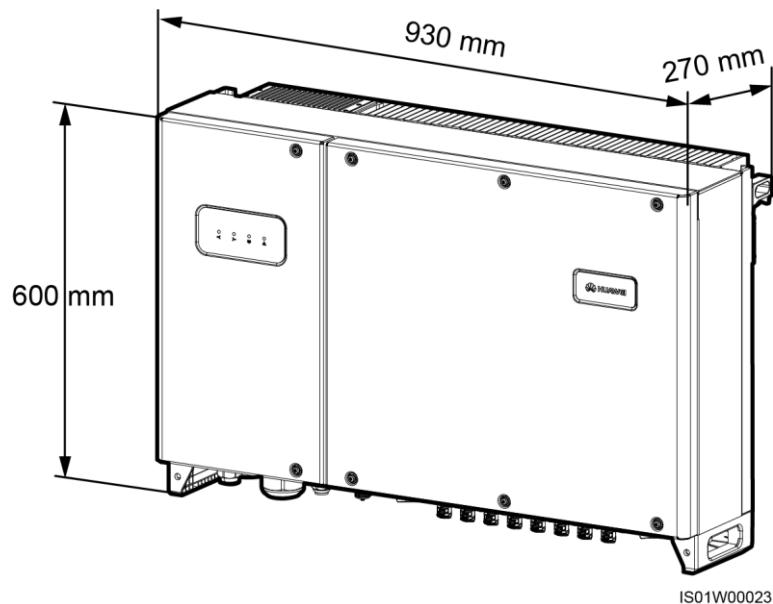
Instead of connecting to the neutral wire, the SUN2000 applies to the TN system with the neutral wire on the transformer connected to ground.

2.2 Appearance

SUN2000 Dimensions

Figure 2-5 shows the SUN2000 dimensions.

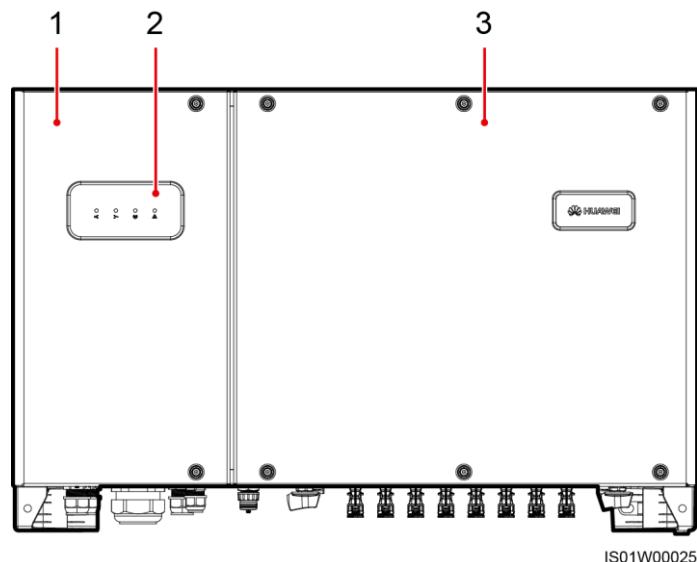
Figure 2-5 SUN2000 dimensions



Front view

Figure 2-6 shows the SUN2000 front view.

Figure 2-6 Front view



(1) Maintenance compartment door

(2) LED indicator

(3) Host panel

Table 2-1 describes the LED indicators.

Table 2-1 LED indicator description (from left to right)

| Indicator | Status | | Meaning |
|--|---|---|---|
|  PV connection indicator | DC input detection status | Blinking green | The DC input is normal. |
| | | Blinking red | DC input detection is in progress. |
| | | Steady red | The DC input is abnormal. |
| | PV string connection status | Steady green | At least one PV string is properly connected, and the DC input voltage of the corresponding maximum power point tracking (MPPT) circuit is higher than or equal to 600 V. |
| | | Green off | The SUN2000 disconnects from all PV strings, or the DC input voltage of each MPPT circuit is less than 600 V. |
| |  Grid-tied indicator | Steady green | The SUN2000 connects to the power grid. |
| | | Green off | The SUN2000 does not connect to the power grid. |
|  Communications indicator | Blinking green | | The SUN2000 receives data over RS485/PLC communication. |
| | Green off | | The SUN2000 has not received data over RS485/PLC communication for 10 seconds. |
|  Alarm/Maintenance indicator | Alarm status | Blinking red at long intervals (on for 1s and then off for 4s) | A warning alarm is generated. |
| | | Blinking red at short intervals (on for 0.5s and then off for 0.5s) | A minor alarm is generated. |
| | | Steady red | A critical alarm is generated. |
| | Local maintenance status | Blinking green at long intervals (on for 1s and then off for 1s) | Local maintenance is in progress. |

| Indicator | Status | Meaning |
|-----------|---|-----------------------------|
| | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | Local maintenance fails. |
| | Steady green | Local maintenance succeeds. |

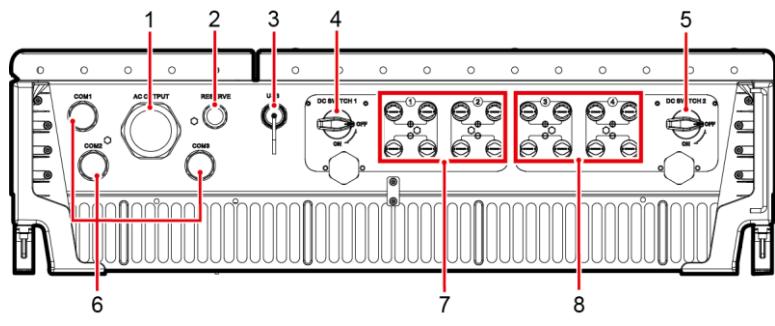
 **NOTE**

- If both DC switches are OFF, the PV connection indicator indicates the DC input detection status. If one or two DC switches are ON, the PV connection indicator indicates the PV string connection status.
- Local maintenance refers to operations performed after a universal serial bus (USB) flash drive, Bluetooth module, or USB data cable is inserted into the USB port of the SUN2000. For example, local maintenance includes data import and export using a USB flash drive and connecting to the SUN2000 APP over a Bluetooth module or USB data cable.
- If alarming and local maintenance happen concurrently, the alarm/maintenance indicator shows the local maintenance state first. After the USB flash drive, Bluetooth module, or USB data cable is removed, the indicator shows the alarm state.

Bottom View

Figure 2-7 shows the SUN2000 bottom view.

Figure 2-7 Bottom view



IS01W00024

| No. | Component | Silk Screen |
|-----|---|-------------|
| 1 | Waterproof cable connector (inner diameter: 37–44 mm) | AC OUTPUT |
| 2 | Waterproof cable connector (inner diameter: 10–15 mm) | RESERVE |
| 3 | USB port | USB |
| 4 | DC switch 1 | DC SWITCH 1 |
| 5 | DC switch 2 | DC SWITCH 2 |

| No. | Component | Silk Screen |
|-----|---|------------------|
| 6 | Waterproof cable connector (inner diameter: 14–18 mm) | COM1, COM2, COM3 |
| 7 | DC input terminal (controlled by DC SWITCH 1) | +/- |
| 8 | DC input terminal (controlled by DC SWITCH 2) | +/- |



Waterproof cable connector is abbreviated as waterproof connector in the following text.

2.3 Label Description

Symbols

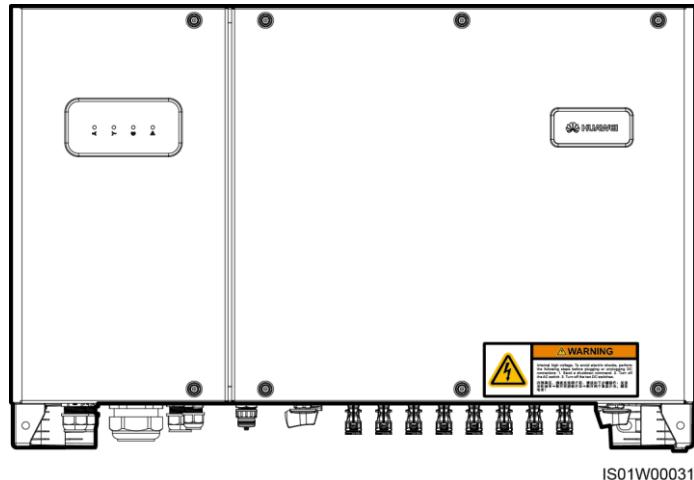
Table 2-2 describes the labels on the SUN2000 chassis and their meanings.

Table 2-2 Label description

| Symbol | Name | Meaning |
|--------|-----------------|--|
| | Running warning | Potential hazards exist after the SUN2000 is powered on. Take protective measures when operating the SUN2000. |
| | Burn warning | Do not touch a running SUN2000 because it generates high temperatures on the shell. |
| | Delay discharge | <ul style="list-style-type: none"> High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage. |

| Symbol | Name | Meaning |
|--|--|--|
| | Refer to documentation | Remind operators to refer to the documents shipped with the SUN2000. |
| | Grounding | Indicates the position for connecting the protection ground cable. |
| Do not disconnect under load! 禁止带负荷断开连接! | Operation warning | Do not remove the DC input connector when the SUN2000 is running. |
| WARNING Internal high voltage. To avoid electric shocks, perform the following steps before plugging or unplugging DC connectors: 1. Send a shutdown command. 2. Turn off the AC switch. Turn off the two DC switches. 内部高压。插拔直流电源前,请按以下步骤操作:发送关机指令→断开交流侧开关→断开两个直流开关,避免触电! | DC terminal operation warning ^a | High voltage exists after the SUN2000 is powered on. To avoid electric shocks, perform the following system power-off operations before plugging or unplugging DC input connectors of the SUN2000: 1. Send a shutdown command. 2. Turn off the downstream AC switch. 3. Turn off the two DC switches at the bottom. |
| | SUN2000 serial number label | Indicates the SUN2000 serial number. |
| > 55 kg (121 lbs) | Weight label | The SUN2000 needs to be carried by more than one person or using a pallet truck. |
| Note a: Fittings delivered with the SUN2000 contain the label of DC terminal operation warning. You are advised to attach the label at the bottom of the SUN2000 front side, as shown in Figure 2-8 . You can also select an appropriate place for attaching the label based on site requirements. | | |

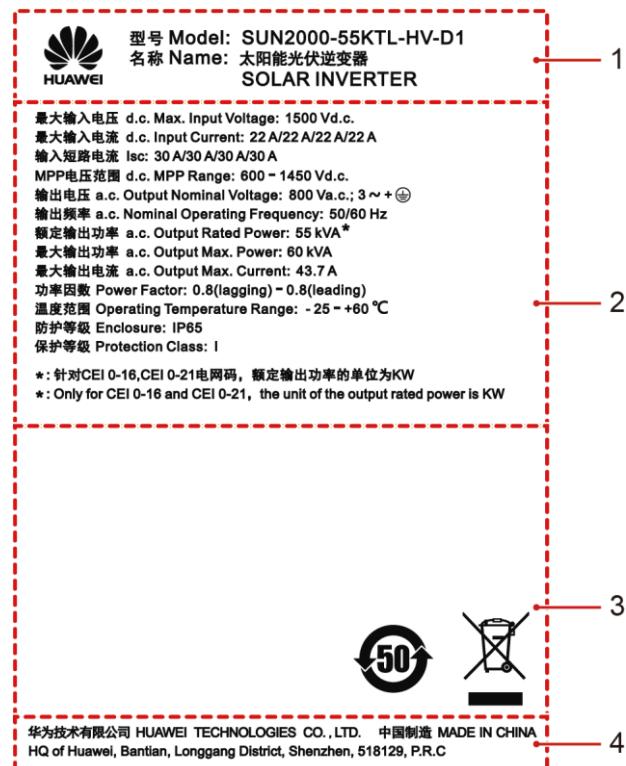
Figure 2-8 Place for attaching



Nameplate

The SUN2000 is labeled with a nameplate on the side that contains the model information, technical specifications, and compliance symbols, as shown in Figure 2-9 (which uses SUN2000-55KTL-HV-D1 as an example).

Figure 2-9 Nameplate



- (1) Trademark and product model
- (2) Important technical specifications
- (3) Compliance symbols
- (4) Company name and country of manufacture

Table 2-3 describes the compliance symbols.

 **NOTE**

The certification marks on the nameplate will be subject to the actual product.

Table 2-3 Compliance symbols

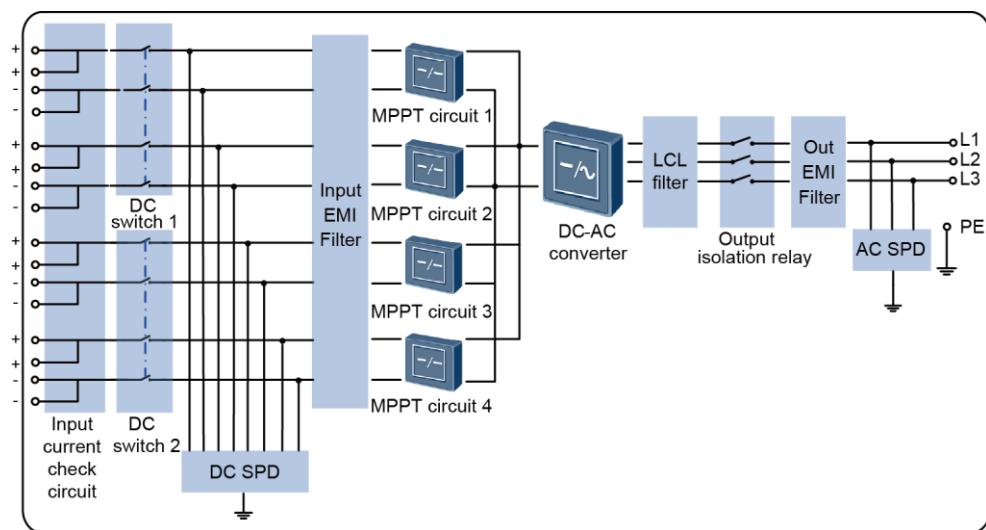
| Symbol | Name | Meaning |
|---|---|---|
|  | Environmentally friendly use period (EFUP) label | The SUN2000 does not pollute the environment during the specified period. |
|  | EU waste electrical and electronic equipment (WEEE) label | Do not dispose of the SUN2000 as household garbage. |

2.4 Working Principle

Conceptual Diagram

The SUN2000 receives inputs from eight PV strings. Then the inputs are grouped into four MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides. [Figure 2-10](#) shows the SUN2000 conceptual diagram.

Figure 2-10 SUN2000 conceptual diagram

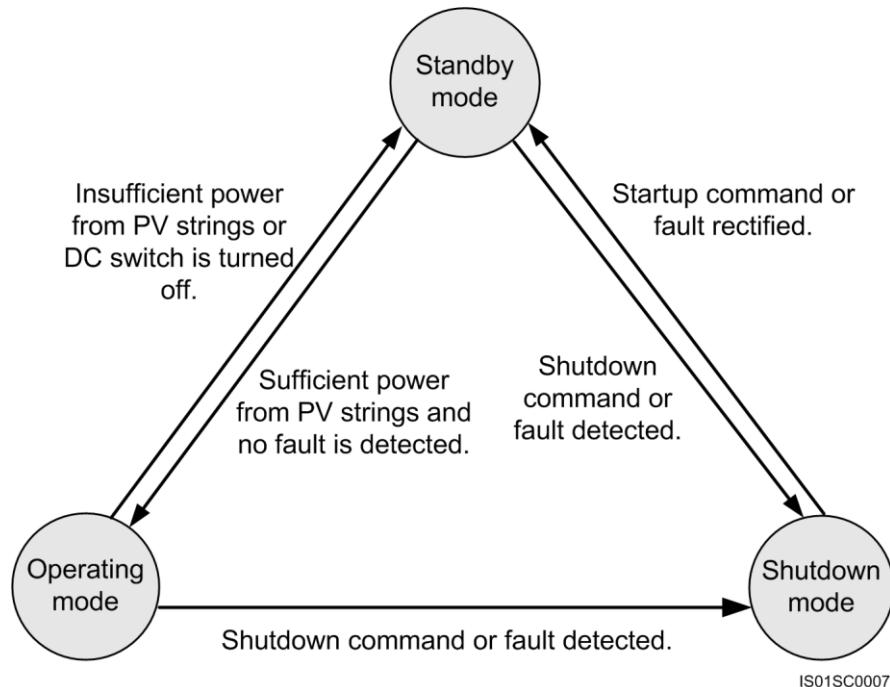


IS03PC0010

Working Modes

The SUN2000 can work in standby, operating, or shutdown mode. [Figure 2-11](#) shows the relationship between the three working modes.

Figure 2-11 SUN2000 working modes



[Table 2-4](#) describes the three working modes shown in [Figure 2-11](#).

Table 2-4 Working mode description

| Working Mode | Description |
|--------------|--|
| Standby | <p>The SUN2000 enters the standby mode when the external environment does not meet the requirements for starting the SUN2000. In standby mode:</p> <ul style="list-style-type: none"> • The SUN2000 continuously performs self-check and enters the operating mode once the operating requirements are met. • If the SUN2000 enters the 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 SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid. • The SUN2000 tracks the maximum power point to maximize the PV string output. • The SUN2000 enters the shutdown mode after detecting a fault or a shutdown command, and enters the standby mode after detecting that the PV string output power does not meet the requirements for grid-tied electricity generation. |

| Working Mode | Description |
|--------------|---|
| Shutdown | <ul style="list-style-type: none">• In standby or operating mode, the SUN2000 enters the shutdown mode after detecting a fault or shutdown command.• In shutdown mode, the SUN2000 enters the standby mode after detecting a startup command or that a fault is rectified. |

3 Inverter Storage

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

- Put the SUN2000 in the original package. Keep the desiccant and seal it using the adhesive tape.
- Keep the storage temperature at -40°C to $+70^{\circ}\text{C}$ and the humidity at 5%–95% RH.
- The inverter should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of five inverters can be stacked.
- Periodic inspections are required during the storage. If any rodent bites are found, replace the packing materials immediately.
- If the inverter has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

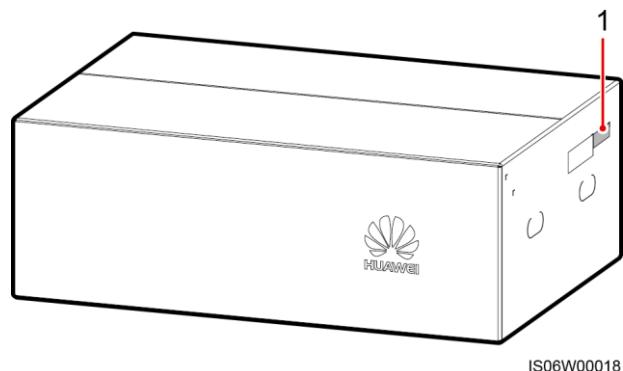
4 Installation

4.1 Checking Before Installation

Outer Packing Materials

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

Figure 4-1 Position of the inverter model label



(1) Position of the model label



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

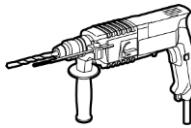
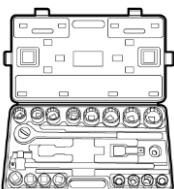
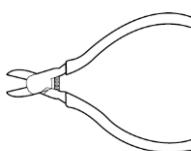
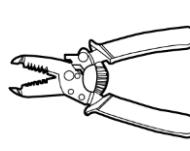
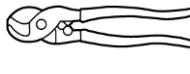
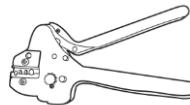
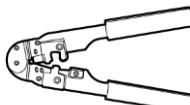
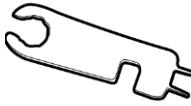
Package Contents

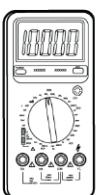
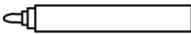
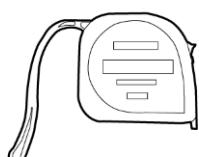
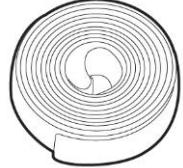
After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.



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

4.2 Materials

| Category | Materials | | |
|-------------------|---|---|---|
| Installation tool |  |  |  |
| | Hammer drill Drill bit: Φ14 mm and Φ16 mm | Socket wrench | Torque wrench |
| |  |  |  |
| | Diagonal pliers | Wire stripper | Flat-head screwdriver Head: 0.6 mm x 3.5 mm |
| |  |  |  |
| | Rubber mallet | Utility knife | Cable cutter |
| |  |  |  |
| | Crimping tool (used to crimp metal cold forming contacts) Model: UTXTC0001 or H4TC0001; manufacturer: Amphenol | Crimping tool (used to crimp metal stamping forming contacts) Model: UTXTC0002; manufacturer: Amphenol | RJ45 crimping tool |
| |  |  |  |
| | Removal wrench Model: UTXTWA001; manufacturer: Amphenol | Removal wrench Model: H4TW0005; manufacturer: Amphenol | Vacuum cleaner |

| Category | Materials | | |
|-------------------------------------|--|---|---|
| |  Multimeter DC voltage measurement range ≥ 1500 V DC |  Marker |  Measuring tape |
| |  Bubble or digital level |  Hydraulic pliers |  Heat shrink tubing |
| |  Heat gun |  Cable tie | |
| Personal protective equipment (PPE) |  Safety gloves |  Safety goggles |  Anti-dust respirator |
| |  Safety shoes | N/A | N/A |



Choose one from UTXTWA001 and H4TW0005.

4.3 Determining the Installation Position

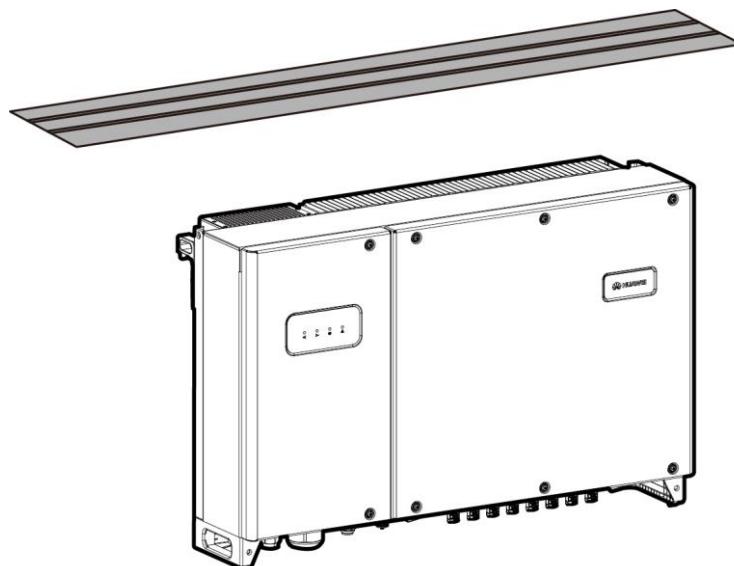
Basic Requirements

- The SUN2000 is protected to IP65 and can be installed indoors or outdoors.
- Do not install the SUN2000 in a place where personnel are easy to come into contact with its chassis and heat sinks, because these parts are extremely hot during operation.
- Do not install the SUN2000 in areas with flammable or explosive materials.

Environment Requirements

- The SUN2000 must be installed in a well-ventilated environment to ensure good heat dissipation.
- Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

Figure 4-2 Awning



IS01H00052

Carrier Requirements

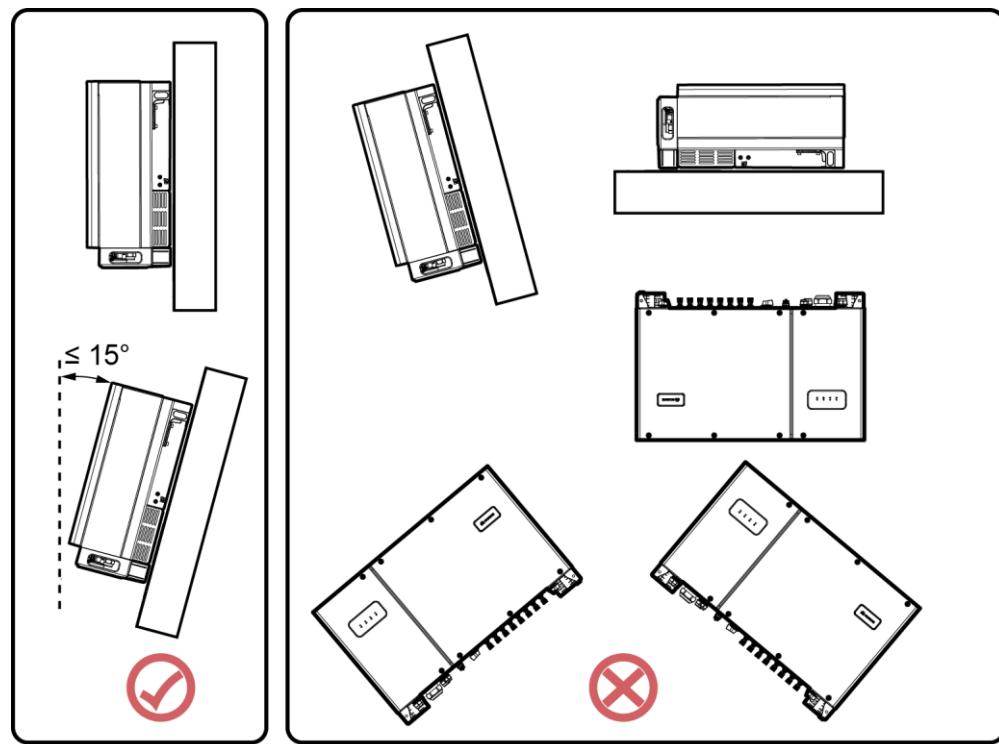
- The mounting structure where the SUN2000 is installed must be fire-resistant.
- Do not install the SUN2000 on flammable building materials.
- The SUN2000 weighs more than 60 kg. Ensure that the installation surface is solid enough to bear the weight load.
- In residential areas, do not install the SUN2000 on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the SUN2000 is noticeable.

Installation Angle Requirements

- Install the SUN2000 vertically or at a maximum back tilted angle of 15 degrees to facilitate heat dissipation.

- Do not install the SUN2000 at forward tilted, excessive back tilted, side tilted, horizontal, or upside down positions.

Figure 4-3 Installation angle

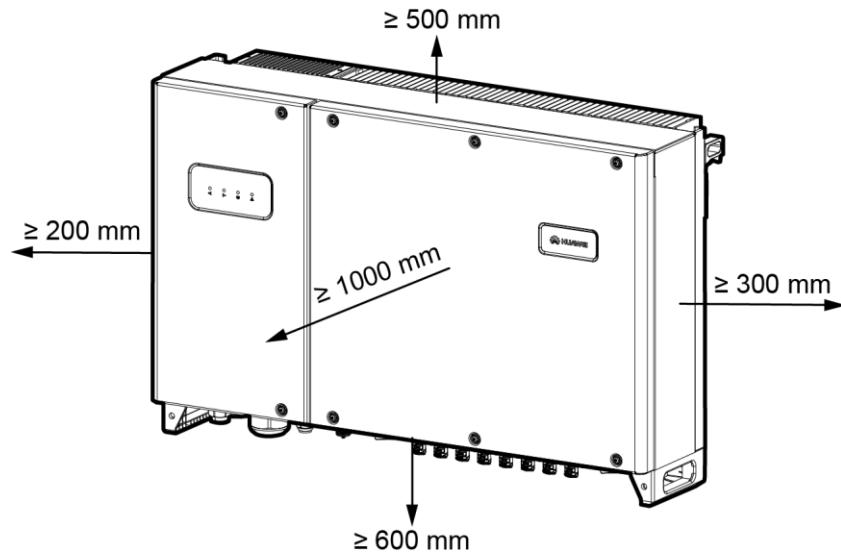


IS03W00047

Installation Space Requirements

- The SUN2000 dimensions (W x H x D) are 930 mm x 600 mm x 270 mm. Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation.

Figure 4-4 Installation space requirements



IS01W00026

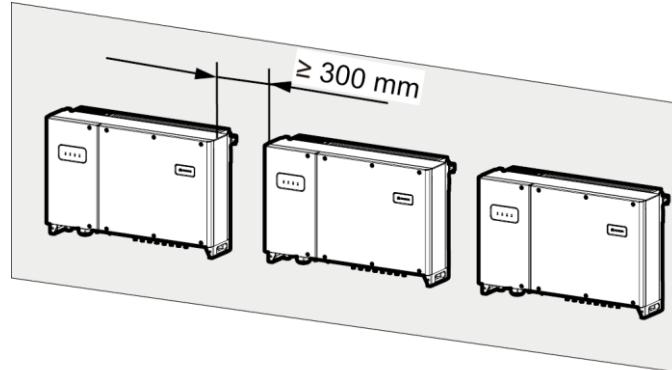


NOTE

For ease of installing the SUN2000 on the mounting bracket, connecting cables to the bottom of the SUN2000, and maintaining the SUN2000 in future, it is recommended that the bottom clearance be between 600 mm and 730 mm. If you have any questions about the distance, consult the local technical support engineers.

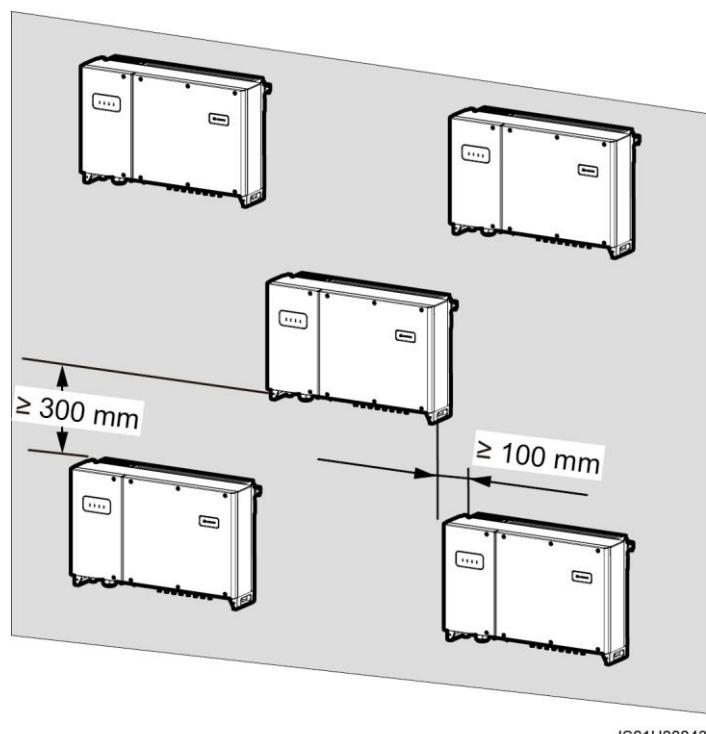
- When installing multiple SUN2000s, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended.

Figure 4-5 Horizontal installation mode (recommended)



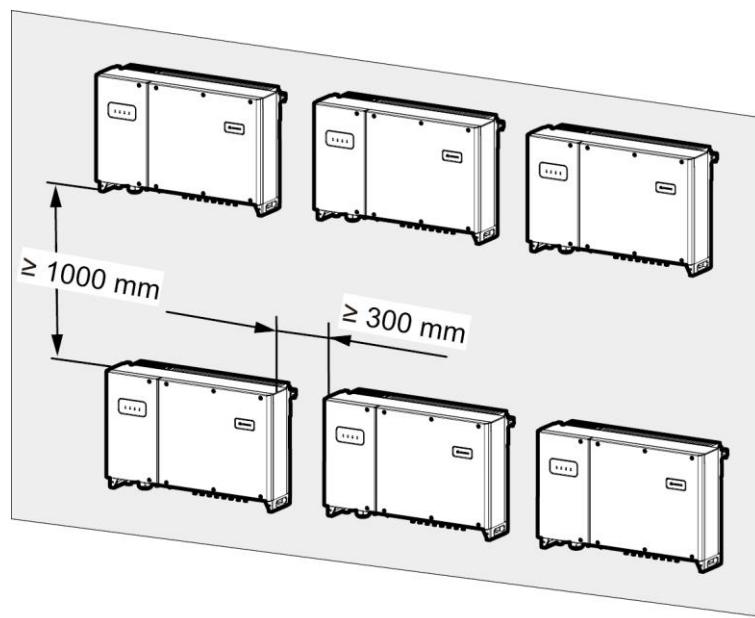
IS01H00050

Figure 4-6 Triangle installation mode (recommended)



IS01H00043

Figure 4-7 Stacked installation mode (not recommended)



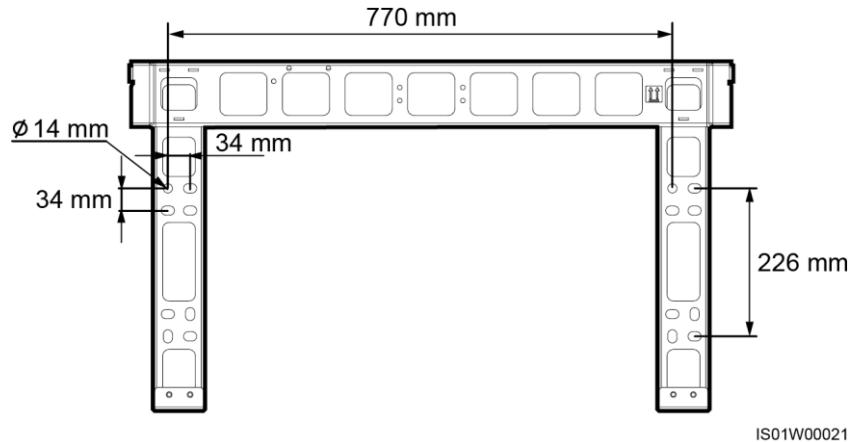
IS01H00047

4.4 Installing the Mounting Bracket

Context

Figure 4-8 shows the SUN2000 mounting bracket dimensions.

Figure 4-8 Mounting bracket dimensions

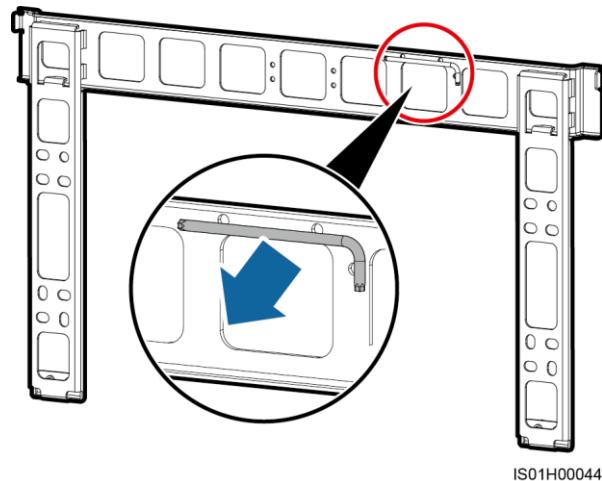


NOTE

The SUN2000 mounting bracket has four groups of tapped holes, each group containing four tapped holes. Mark any hole in each group based on site requirements and mark four holes in total. Two round holes are preferred.

Before installing the mounting bracket, remove the security torx wrench from the mounting bracket and save for later use.

Figure 4-9 Removing a security torx wrench





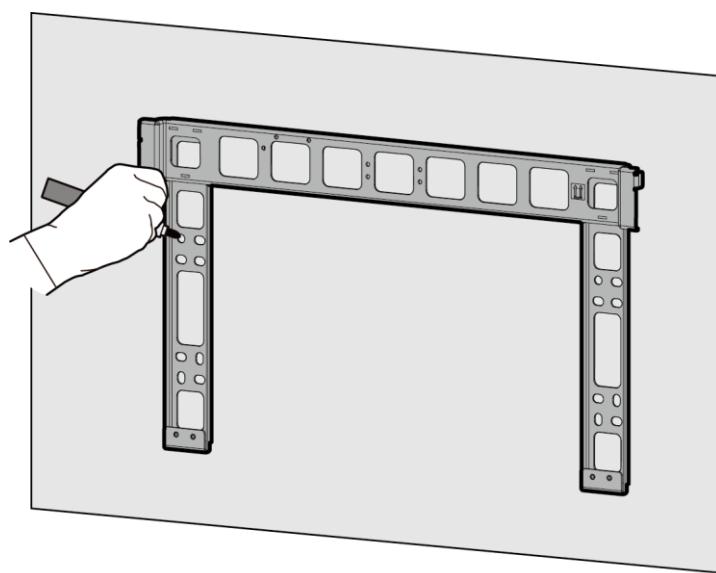
NOTICE

The bolts supplied with the SUN2000-60KTL-HV-D1 are M12x40 bolt assemblies. The bolts supplied with other models of SUN2000s are M12x60 expansion bolts and M12x40 bolt assemblies.

Wall-mounted Installation

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.

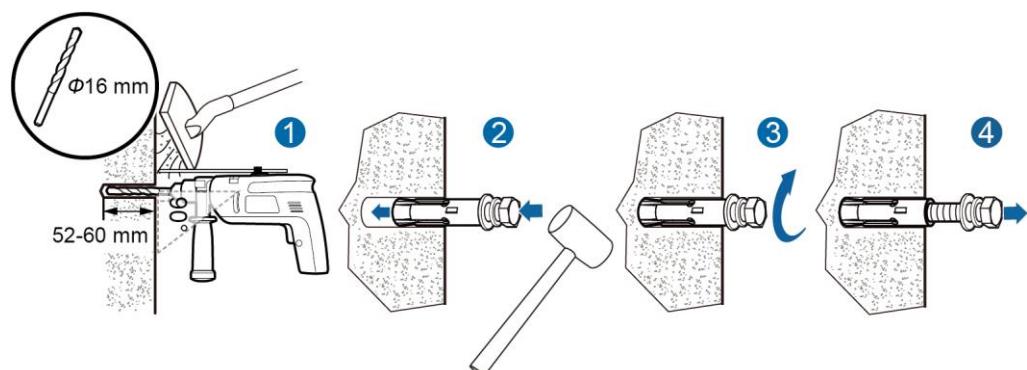
Figure 4-10 Determining hole positions



IS01H00045

Step 2 Drill holes using a hammer drill and install expansion bolts.

Figure 4-11 Drilling a hole and installing an expansion bolt



IS03H00001



WARNING

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

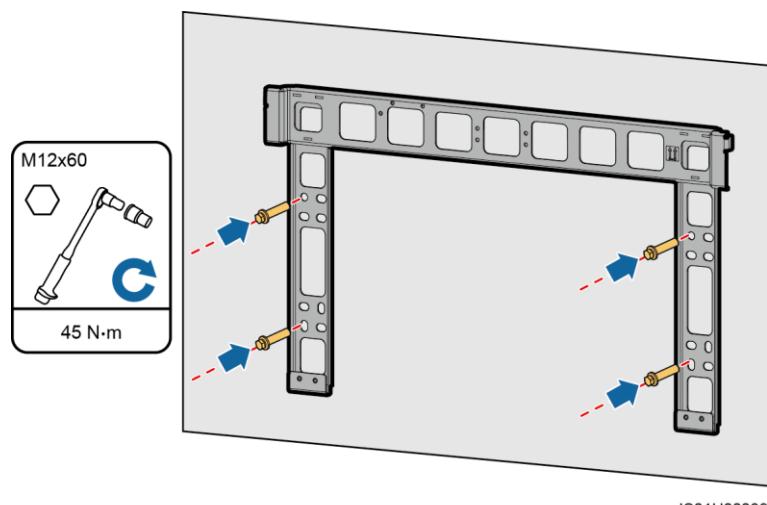


NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust mask 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 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.

Step 3 Align the mounting plate holes with the drilled holes, insert expansion bolts into the holes through the mounting plate, and then tighten the expansion bolts.

Figure 4-12 Securing a mounting bracket

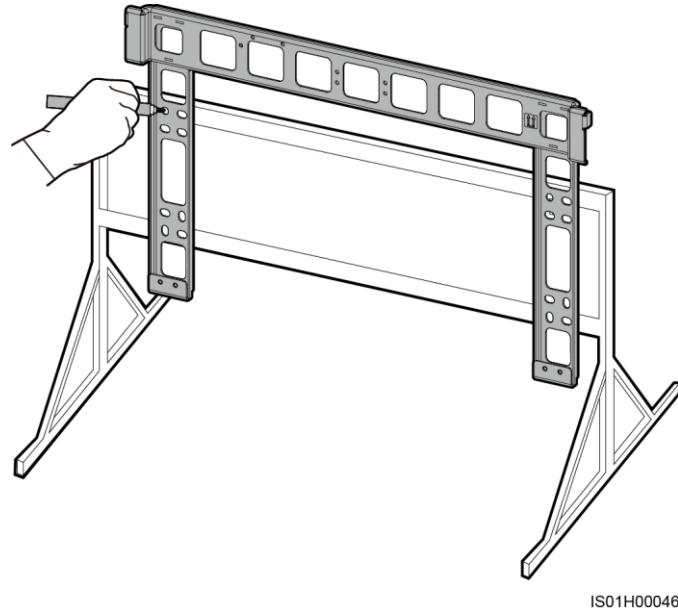


----End

Support-mounted Installation

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 4-13 Determining hole positions

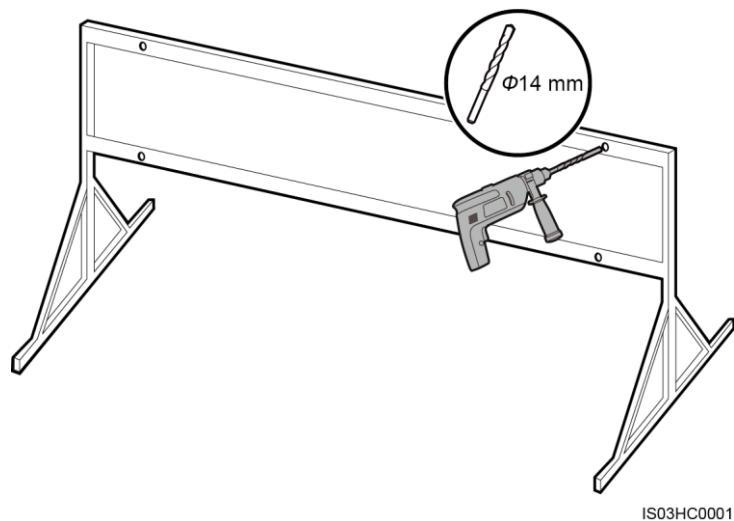


Step 2 Drill holes using a hammer drill.

NOTE

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

Figure 4-14 Drilling holes

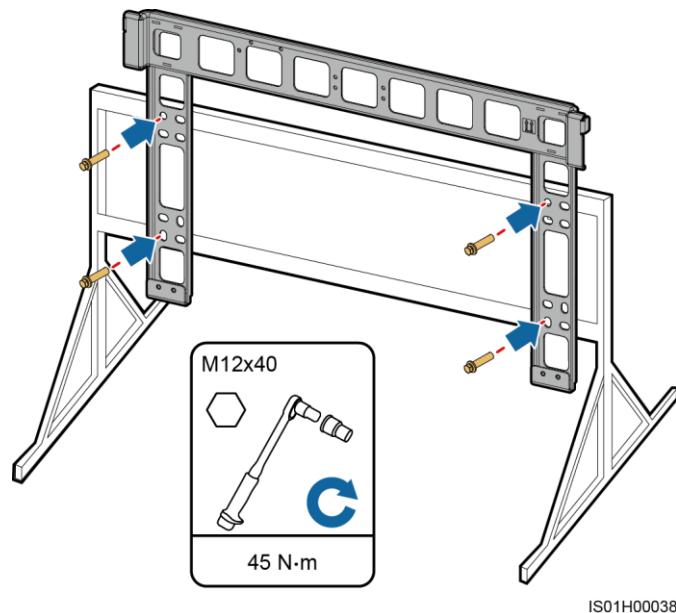


Step 3 Align the mounting plate holes with the drilled holes, insert bolt assemblies (flat washers, spring washers, and M12x40 bolts) into the holes through the mounting plate, and secure them using the shipped stainless steel nuts and flat washers.

NOTE

The SUN2000 is delivered with M12x40 bolt assemblies. If the bolt length does not meet the installation requirements, prepare M12 bolt assemblies by yourself and use them together with the delivered M12 nuts.

Figure 4-15 Securing a mounting bracket



----End

4.5 Installing the SUN2000

Prerequisites

Before installing the SUN2000, take it out from the packing case and move it to the installation position.



CAUTION

To prevent device damage and personal injury, keep balance when moving the SUN2000 because it is heavy.



NOTICE

- Move the SUN2000 by four people with an appropriate transportation tool.
- Do not use the wiring terminals at the bottom to support any weight of the SUN2000.
- When need to temporally place the SUN2000 on the ground, use foam, paper or other protection material to prevent damage to its cover.

Procedure

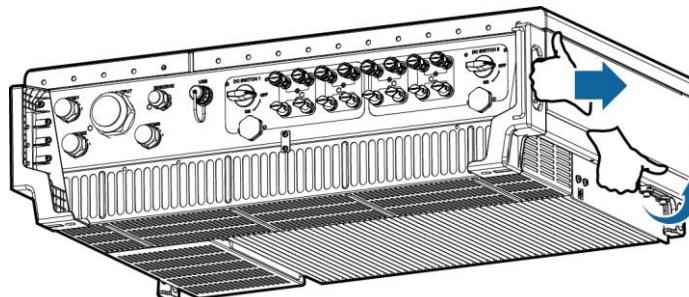
- Step 1** If you can mount the SUN2000 onto the mounting bracket directly, go to [Step 3](#) and then [Step 5](#).
- Step 2** If you cannot mount the SUN2000 onto the mounting bracket directly, go to [Step 3](#) and then [Step 6](#).
- Step 3** Ensure that minimum of two people lift one SUN2000 and turn it upright. Move the SUN2000 with handles at the top and bottom.



CAUTION

To prevent device damage and personal injury, keep balance when lifting the SUN2000 because it is heavy.

Figure 4-16 Lifting a SUN2000



IS01H00049

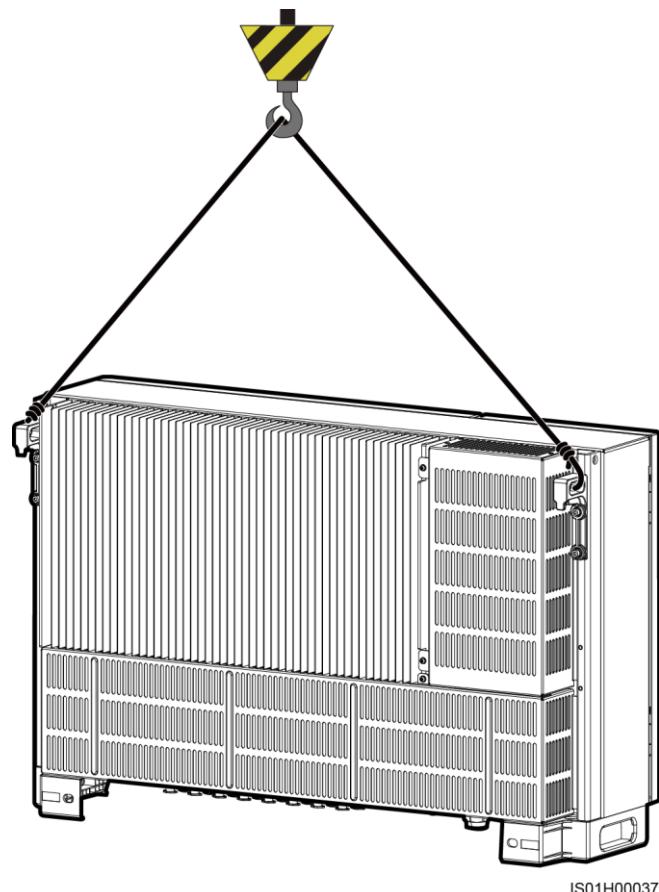
- Step 4** Run a lifting sling through the lifting eyes of the SUN2000.



CAUTION

When lifting the SUN2000, keep balance to prevent the SUN2000 impacting with a wall or other objects.

Figure 4-17 Lifting a SUN2000

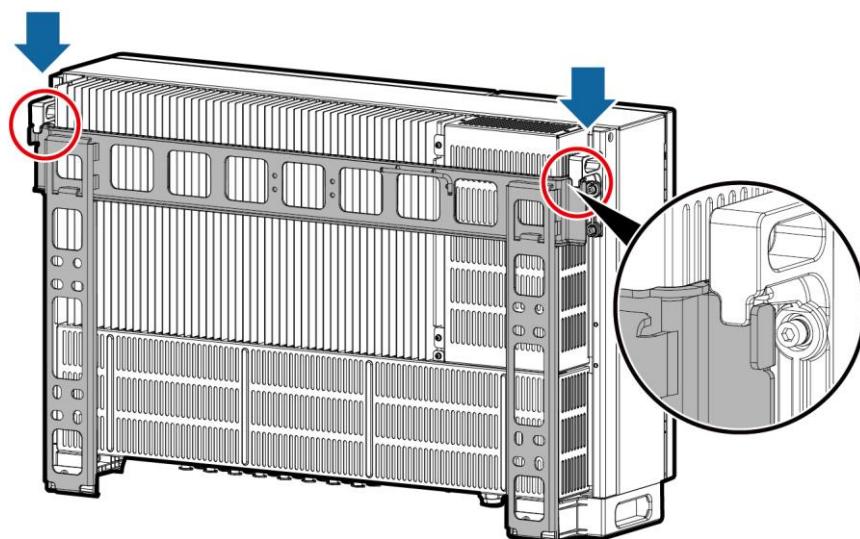


NOTE

The figure is for reference only.

- Step 5** Install the SUN2000 on the mounting bracket and align the SUN2000 chassis with the mounting bracket.

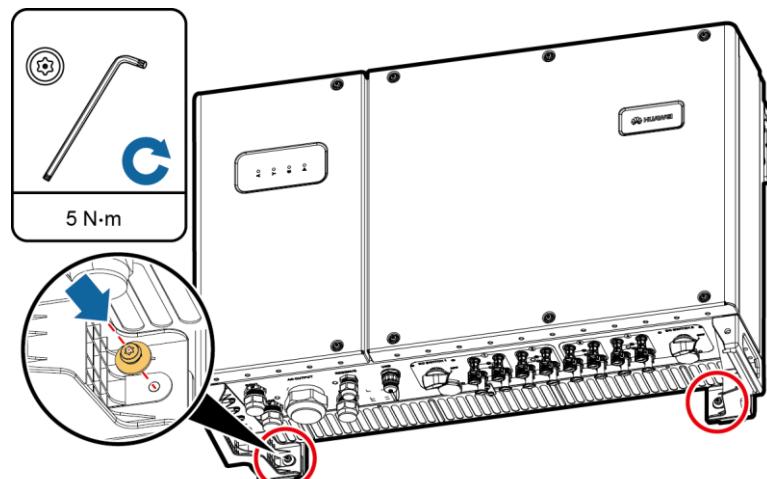
Figure 4-18 Mounting the SUN2000 onto a mounting bracket



IS01H00040

Step 6 Tighten the two antitheft screws using a security torx wrench.

Figure 4-19 Tightening antitheft screws



IS01H00032

----End

5 Electrical Connections

5.1 Precautions



DANGER

Before connecting cables, ensure that the two DC switches on the SUN2000 are OFF. Otherwise, the high voltage of the SUN2000 may result in electric shocks.



WARNING

- The equipment damage caused by incorrect cable connections is beyond the warranty scope.
- Only certified electrician can perform electrical terminations.
- Wear proper PPE at all time when terminating cables.



NOTE

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

5.2 Crimping the OT Terminal

Requirements for the OT Terminal

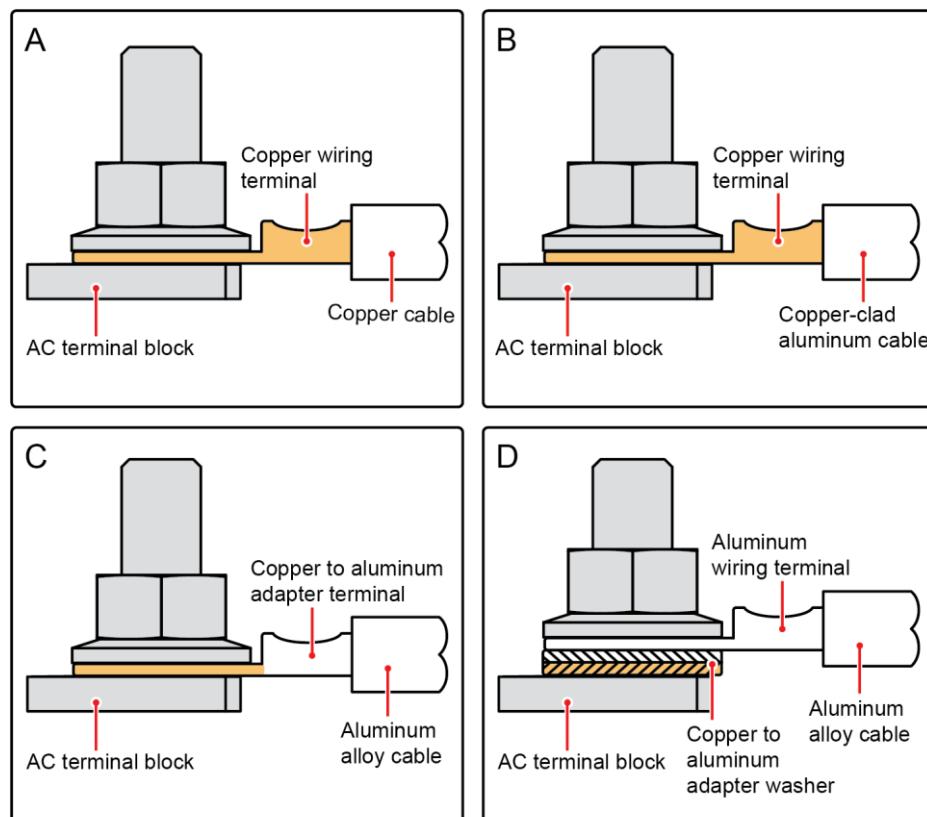
- If a copper cable is used, use a copper wiring terminal.
- If a copper-clad aluminum cable is used, use a copper wiring terminal.
- If an aluminum alloy cable is used, use a copper to aluminum adapter terminal or an aluminum wiring terminal with a copper to aluminum adapter washer.



NOTICE

- Directly connecting an aluminum wiring terminal to the AC terminal block will cause electro-chemical corrosion and weaken the cable connection reliability.
- The copper to aluminum adapter terminal or an aluminum wiring terminal with a copper to aluminum adapter washer must comply with IEC61238-1.
- Do not mix up the aluminum and copper sides of the copper to aluminum adapter washer. Ensure that the aluminum side of the washer contacts the aluminum wiring terminal, and the copper side contacts the AC terminal block.

Figure 5-1 Requirements for the OT terminal



IS03H00062

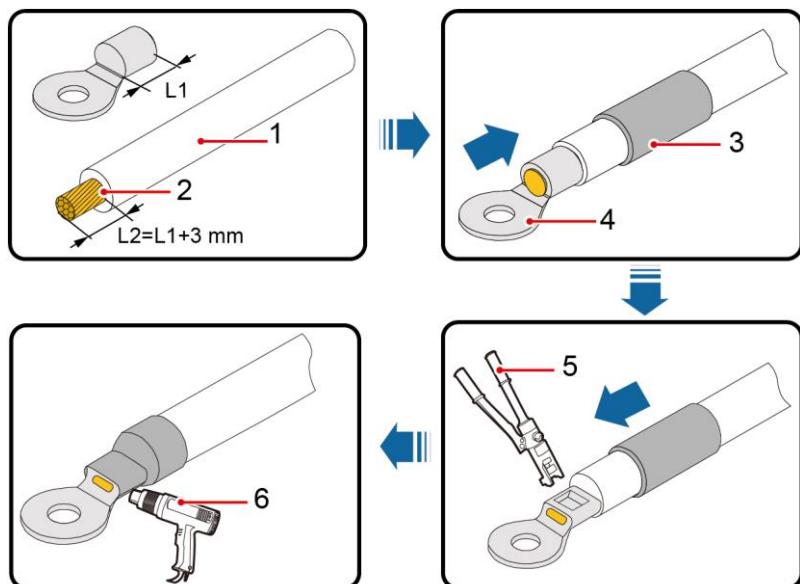
Crimping the OT terminal



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 5-2 Crimping the OT Terminal



IS06Z00001

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

5.3 Connecting a ground cable

Prerequisites

The ground cable and OT terminal are available.

- Ground cable: You are advised to use an outdoor copper cable with a conductor cross-sectional area greater than or equal to 16 mm^2 , and the conductor cross-sectional area should be greater than or equal to half of the conductor cross-sectional area of the AC power cable.
- OT terminal: M6 and matching the wire gauge of chosen

Context

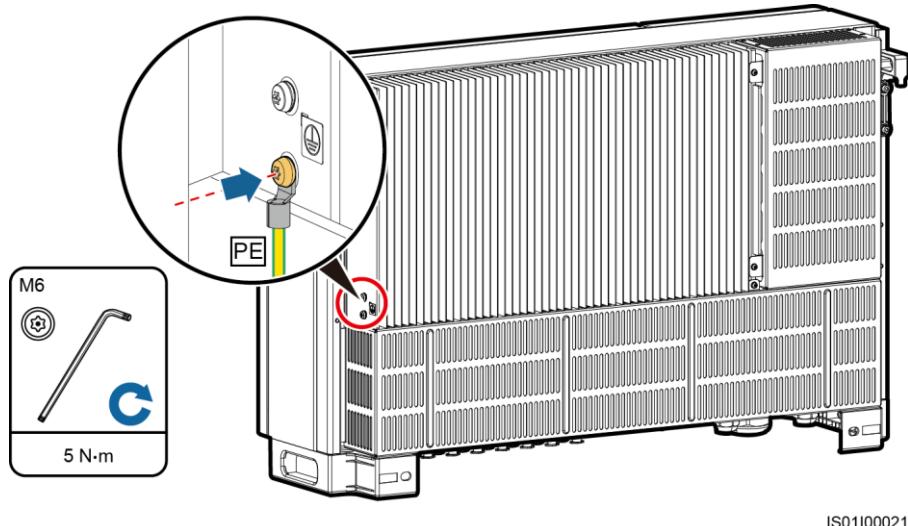
- The ground point on the enclosure is preferred to connect to the PE cable for the SUN2000.
- The ground point in the maintenance compartment is mainly used for connecting to the ground cable included in the multi-core AC power cable. For details, see section [5.5 Connecting AC Output Power Cables](#).
- There are two ground points on the chassis shell and you only need to use either of them.
- It is recommended that the ground cable be connected to a nearby ground point. For a system with multiple SUN2000s connected in parallel, connect the ground points of all SUN2000s to ensure equipotential connections to ground cables.

Procedure

Step 1 Crimp the OT terminal.

Step 2 Secure the ground cable using the ground screw.

Figure 5-3 Connecting a ground cable



IS01I00021

----End

Follow-up Procedure

Recommendation: To enhance the corrosion resistance of a ground terminal, silica gel or paint might be needed.

5.4 Opening the Maintenance Compartment Door

Prerequisites



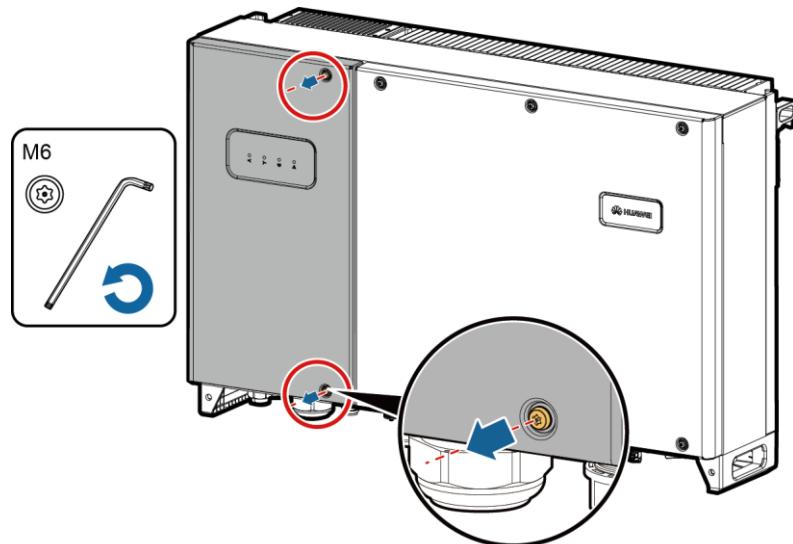
CAUTION

- Never open the Host panel cover of the SUN2000.
- Before opening the maintenance compartment door, disconnect the AC and DC power supplies. For processes of disconnecting the power supplies, see [6.4 Powering Off the SUN2000](#). After powering off the SUN2000, wait at least 5 minutes and then perform operations on the SUN2000.
- If you need to open the maintenance compartment door on rainy or snowy days, take protective measures to prevent rain or snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door in rainy or snowy days.
- Do not leave extra hardware in the maintenance compartment.

Procedure

Step 1 Partially loosen the two screws on the maintenance compartment door.

Figure 5-4 Loosening screws



IS01H00042



NOTE

If the screws on the chassis door are lost, obtain spare screws from the fitting bag bound to the inductor cover at the bottom of the chassis.

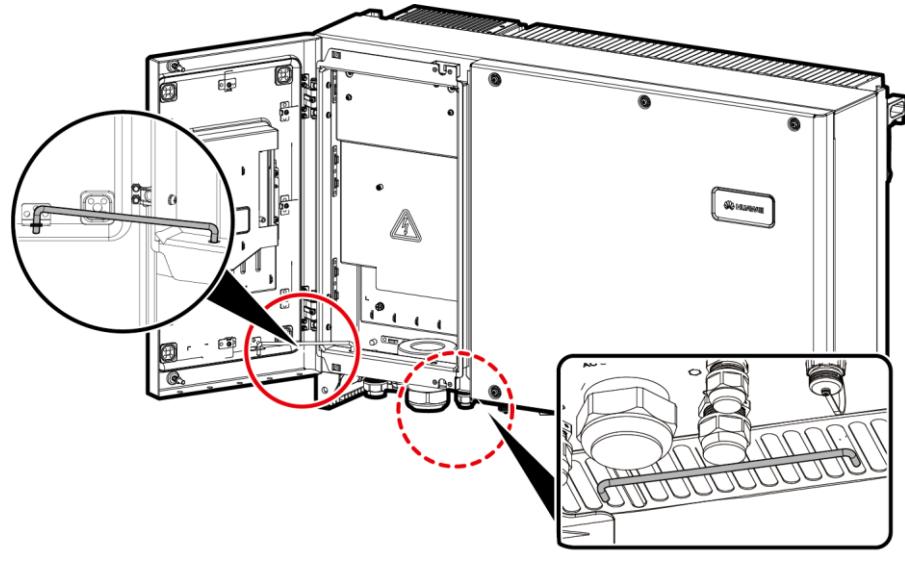
Step 2 Open the maintenance compartment and use the support bar to stabilize the door.



NOTE

The support bar is bound to the inductor cover at the chassis base.

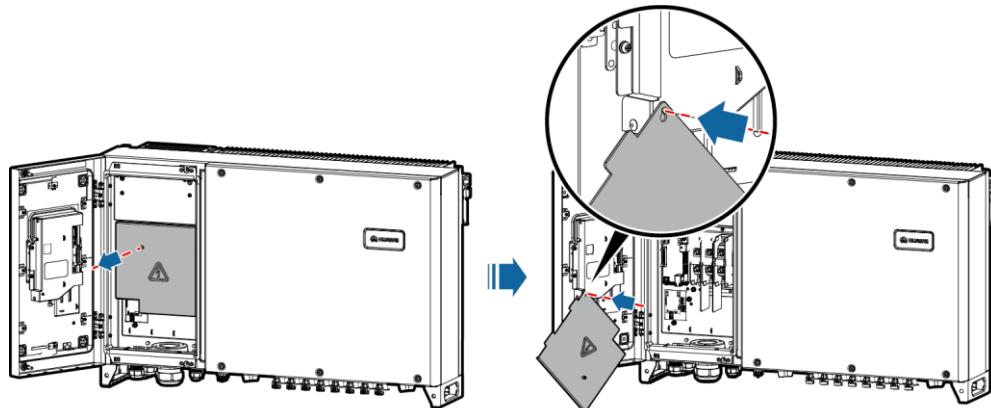
Figure 5-5 Stabilizing a door using a support bar



IS01H00033

Step 3 Remove the cover and hang it on the hook of the chassis door.

Figure 5-6 Removing a cover



IS04H00014

----End

5.5 Connecting AC Output Power Cables

Prerequisites

A three-phase AC switch needs to be configured outside the AC side of the SUN2000. To ensure that the SUN2000 can safely disconnect from the power grid under abnormal conditions, select an appropriate overcurrent protection device according to local power distribution regulations.



WARNING

Do not connect loads between the SUN2000 and the AC switch.

The SUN2000 is integrated with a comprehensive residual current detection unit to distinguish fault current from residual current. Upon detecting that the residual current exceeds the threshold, the SUN2000 immediately disconnects from the power grid.



NOTE

- If an AC switch that can detect residual current is installed outside the SUN2000-55KTL-HV-D1 the residual current value to trigger the switch should be greater than 600 mA.
- If an AC switch that can detect residual current is installed outside the SUN2000-60KTL-HV-D1, SUN2000-60KTL-HV-D1-001, SUN2000-55KTL-IN-HV-D1, or SUN2000-55KTL-HV-D1-001, the residual current value to trigger the switch should be greater than 660 mA.

Context

- If you connect a ground cable to the ground point on the chassis shell, you are advised to use a three-core (L1, L2, and L3) outdoor cable.
- If you connect a ground cable to the ground point in the maintenance compartment, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable.
- You need to prepare M8 OT terminals by yourself.

Table 5-1 Cable specifications

| Cable Specifications | | Copper-Core Cable | Copper-Clad Aluminum Cable or Aluminum Alloy Cable |
|---|--------------------|-------------------|--|
| Conductor cross-sectional area (mm ²) | Range | 16–70 | 25–70 |
| | Recommended to use | 25 | 35 |
| Cable outer diameter (mm) | Range | 37–44 | |
| | Recommended to use | 40 | |



NOTE

If you connect a ground cable to the ground point in the maintenance compartment, prepare an M6 OT terminal by yourself.

Procedure

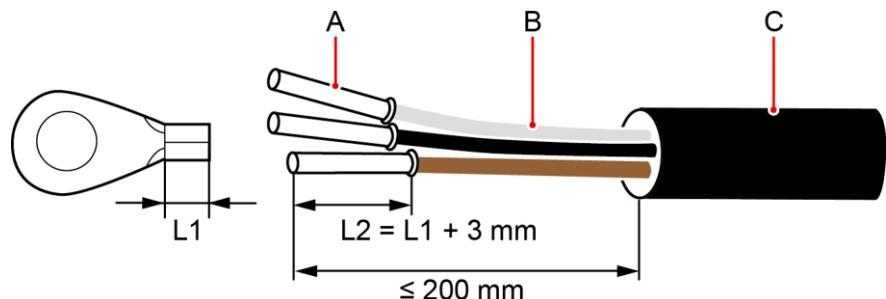
- Step 1** Remove an appropriate length of the jacket and insulation layer from the AC output power cable using a wire stripper.



NOTICE

Ensure that the jacket is in the maintenance compartment.

Figure 5-7 Three-core cable



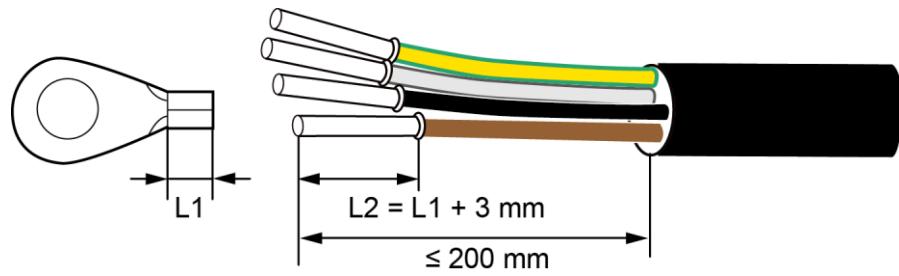
IS03Z00003

(A) Core wire

(B) Insulation layer

(C) Jacket

Figure 5-8 Four-core cable



IS03Z10003

Step 2 Crimp the OT terminal.

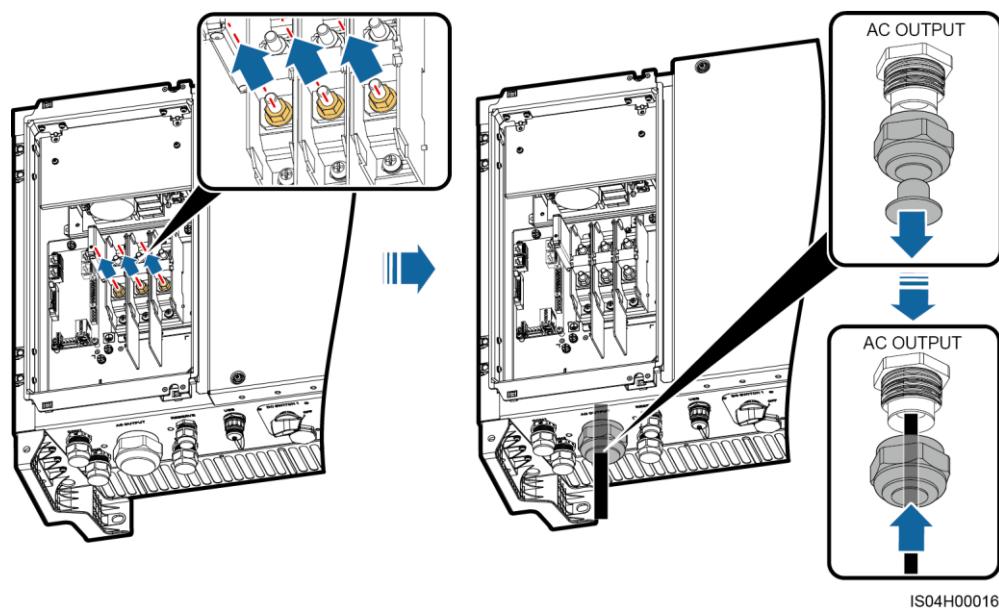
Step 3 Route the cable through the waterproof connector.



NOTE

For ease of connecting the AC output power cable, you are advised to remove the nut assembly from the AC terminal and save it for later use, and then route the cable through the waterproof connector.

Figure 5-9 Routing cables



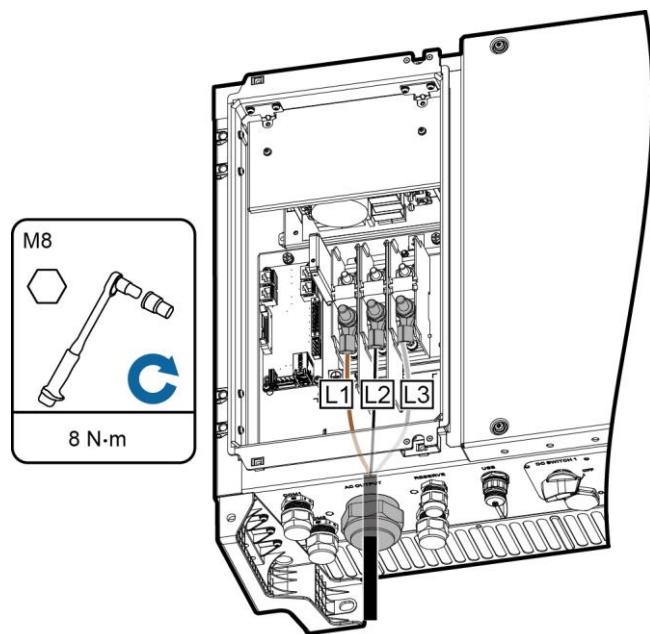
Step 4 Land the AC output power cable in the terminal block, and tighten the nuts with a torque wrench to achieve a proper torque value.



NOTICE

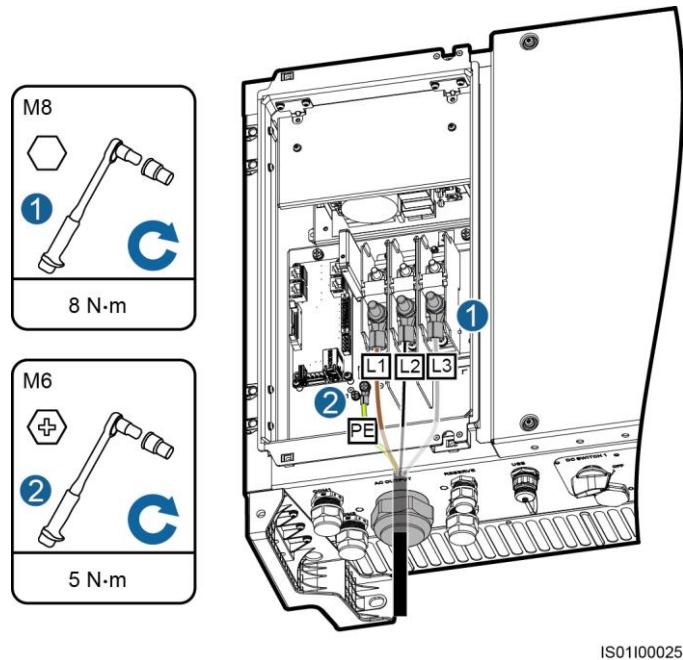
- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its terminal block, even starting thermal events.
- If the AC output power cables are subject to a pulling force because the inverter is not installed stably, ensure that the last cable that bears the stress is the PE cable.

Figure 5-10 Connecting an AC output power cable (three-core cable)



IS01I00024

Figure 5-11 Connecting an AC output power cable (four-core cable)



IS0100025

NOTE

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

Step 5 Tighten the sealing nut and seal the cable gland.

----End

5.6 Connecting DC input power cables

Prerequisites



DANGER

- Before connecting DC input power cables, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the two DC switches on the SUN2000 are OFF. Failing to do so may result in electric shocks.
- When the SUN2000 is grid-tied, 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 or arcing (which may further cause fire).



WARNING

Ensure that the following conditions are met. Otherwise, the SUN2000 will be damaged, or even become a fire hazard.

- The open-circuit voltage of each PV string is always lower than or equal to 1500 V DC.
- The positive and negative terminals of a PV module connect to corresponding positive and negative DC input terminals of the SUN2000.



NOTICE

- Ensure that the PV module output is well insulated to ground.
- The PV strings connecting to the same MPPT circuit should contain the same number of identical PV modules.
- During the installation of PV strings and SUN2000, the positive or negative terminals of PV strings may be short-circuited to ground if power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused equipment damage is beyond the warranty scope.

Context

- DC terminal selection

[Figure 5-12](#) shows the DC terminals at the bottom of the SUN2000. [Table 5-2](#) shows the requirements for selecting DC terminals.



NOTE

The SUN2000 provides two DC switches, named as, DC SWITCH 1 and DC SWITCH 2. DC SWITCH 1 controls the first to fourth sets of DC input terminals, whereas DC SWITCH 2 controls the fifth to eighth sets of DC input terminals.

Figure 5-12 DC terminals

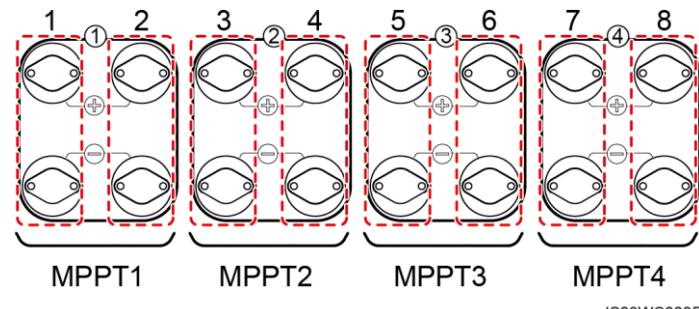


Table 5-2 Requirements for selecting DC terminals

| Number of Inputs | SUN2000 |
|------------------|--------------------|
| 1 | Connects to set 1. |

| Number of Inputs | SUN2000 |
|------------------|--|
| 2 | Connects to sets 1 and 5. |
| 3 | Connects to sets 1, 3, and 5. |
| 4 | Connects to sets 1, 3, 5, and 7. |
| 5 | Connects to sets 1, 2, 3, 5, and 7. |
| 6 | Connects to sets 1, 2, 3, 5, 6, and 7. |
| 7 | Connects to sets 1, 2, 3, 4, 5, 6, and 7. |
| 8 | Connects to sets 1, 2, 3, 4, 5, 6, 7, and 8. |

- DC input power cable specifications

[Table 5-3](#) lists the recommended DC input power cable specifications.

Table 5-3 Recommended DC input power cable specifications

| Cable Type | Conductor Cross-Sectional Area (mm ²) | | Cable Outer Diameter (mm) | Cable Outer Diameter (mm) |
|---|---|-------------------|---------------------------|---------------------------|
| | Range | Recommended Value | | |
| PV cable that meets the 1500 V standard | 4.0–6.0 (or 12–10 AWG) | 4.0 (or 12 AWG) | 4.5–7.8 | 4.5–7.8 |



NOTICE

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

Procedure

Step 1 Prepare the positive and negative connectors.



CAUTION

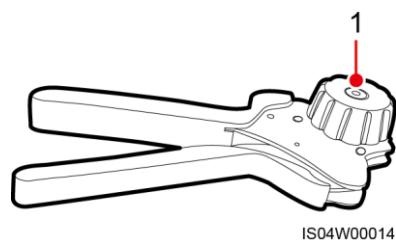
Use the Amphenol UTX PV connectors provided with the SUN2000. If the terminals are lost or damaged, purchase the PV connectors of the same model. The device damaged caused by incompatible PV connectors is not covered under any warranty or service agreement.



NOTICE

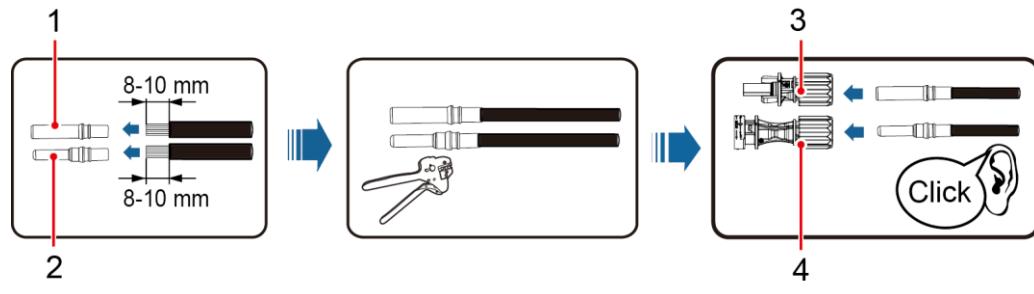
- The metal contacts supplied with the Amphenol Helios H4 PV connectors are either the cold forming contacts or stamping forming contacts. Choose the crimping tools that fit the metal contact types. Do not mix up the tools.
- Crimp the metal cold forming contacts using crimping tool UTXTC0001 (recommended) or H4TC0001. When choosing H4TC0001, do not use the locator.
- Crimp the metal stamping forming contacts using crimping tool UTXTC0002.

Figure 5-13 Locator



(1) Locator

Figure 5-14 Preparing positive and negative connectors (using metal cold forming contacts)



IS01I20005

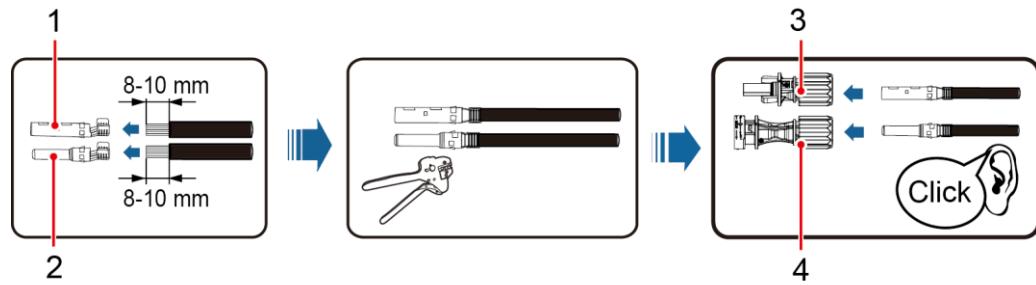
(1) Positive metal contact (cold forming)

(2) Negative metal contact (cold forming)

(3) Positive connector

(4) Negative connector

Figure 5-15 Preparing positive and negative connectors (using metal stamping forming contacts)



IS01I20004

(1) Positive metal contact (stamping forming)

(3) Positive connector

(2) Negative metal contact (stamping forming)

(4) Negative connector

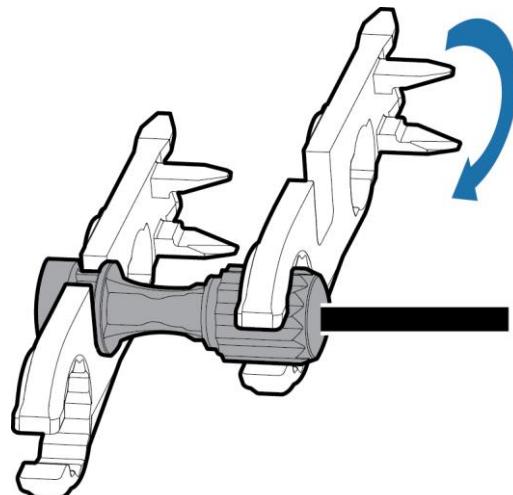


NOTICE

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

Step 2 Tighten the locking nuts on the positive and negative connectors.

Figure 5-16 Locking a nut



IS01I00047

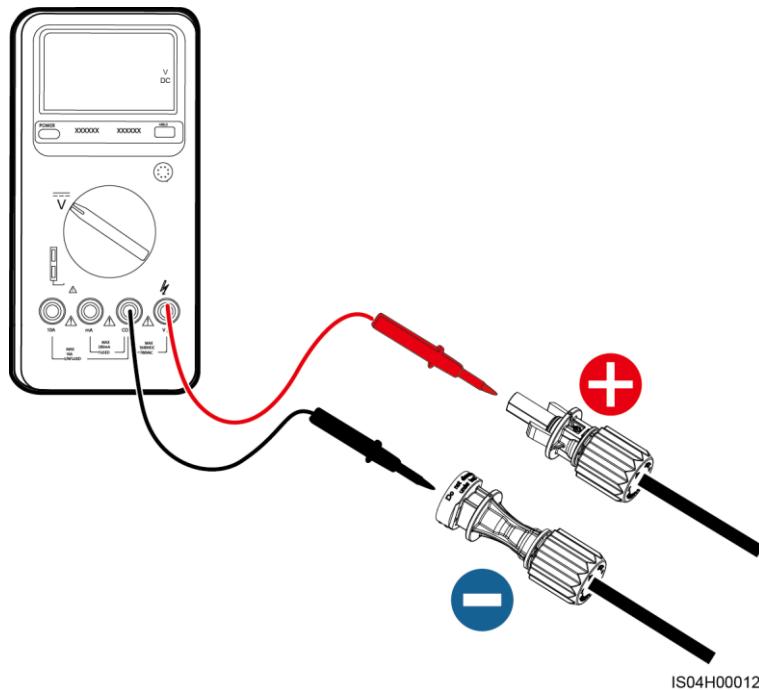
Step 3 Use a multimeter to measure the DC voltage between the positive and negative of the PV string and confirm the string polarity.



NOTICE

The DC voltage measurement range of the multimeter must be at least 1500 V.

Figure 5-17 Measuring voltage



NOTICE

- If the voltage is a negative value, the DC input polarity is incorrect. Correct the polarity.
- If the voltage is greater than 1500 V, too many PV modules configured to the same string. Remove some PV modules.

Step 4 Pull out the blue dustproof plugs from the ends of the DC input connectors.



WARNING

Before performing [Step 5](#), ensure that the two DC switches are OFF.

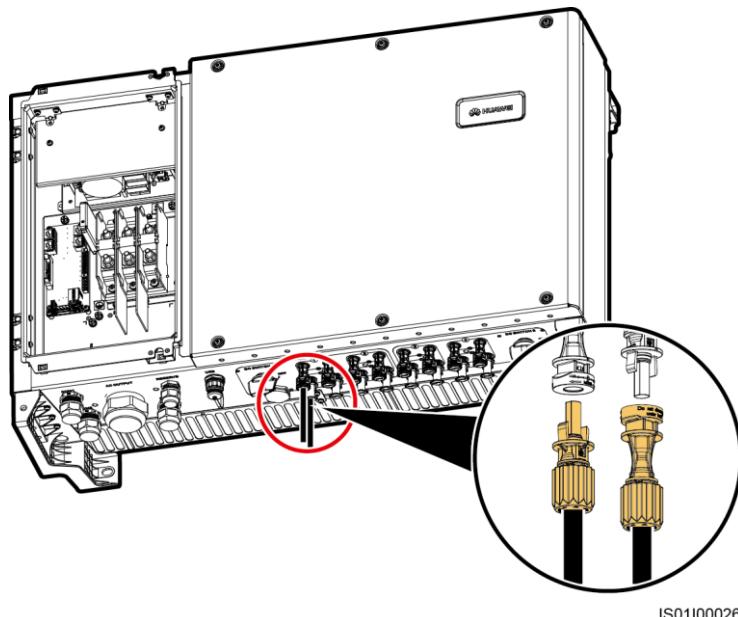
Step 5 Insert the positive and negative connectors into the corresponding positive and negative DC input terminals of the SUN2000 until they snap into place.



NOTICE

1. After the positive and negative connectors snap into place, pull test to the DC input cables is recommended.
2. Only after at least one PV string correctly connects to the MPPT1 circuit, can the SUN2000 enable the DC input detection function. Therefore, you are required to connect DC input power cables to the MPPT1 circuit first.

Figure 5-18 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. The caused equipment damage is beyond the warranty scope. Wait until the solar irradiance declines and the PV string current reduces to below 0.5 A, and then turn off the two DC switches and remove the positive and negative connectors. Correct the string polarity before reconnecting the string to the SUN2000.

---End

5.7 Connecting the Communications Cable

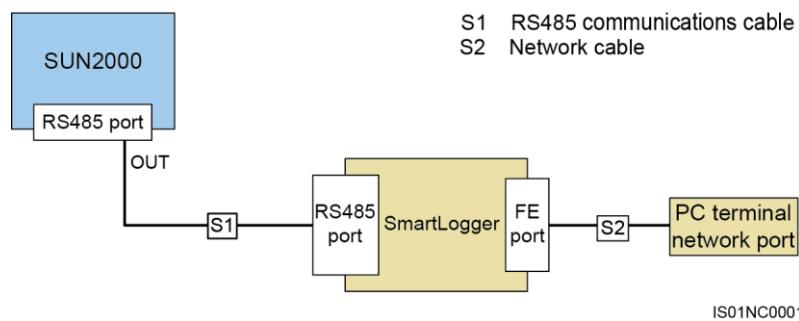
5.7.1 Communication Mode Description

RS485 Communication

The SUN2000 can connect to the SmartLogger over RS485 or to a PC through the SmartLogger to implement communication. You can use the SUN2000 app, SmartLogger, embedded WebUI, or the network management software (such as the NetEco) on the PC to query information about the SUN2000, such as energy yield, alarms, and running status.

- [Figure 5-19](#) shows the communication mode for a single SUN2000.

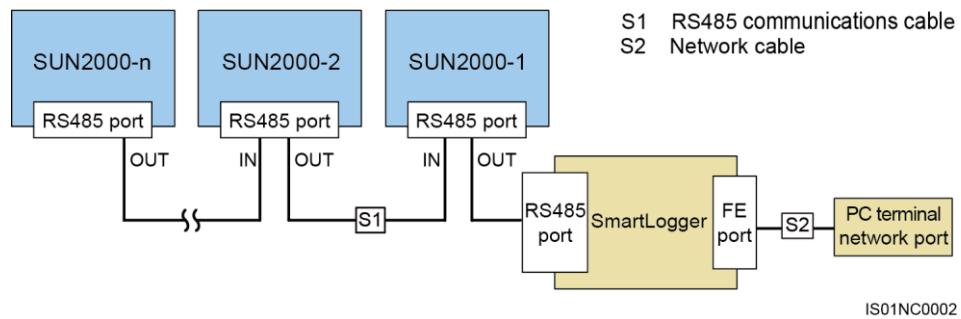
Figure 5-19 Communication mode for a single SUN2000



- [Figure 5-20](#) shows the communication mode for multiple SUN2000s.

If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

Figure 5-20 Communication mode for multiple SUN2000s



NOTE

- The RS485 communication distance between the SUN2000 at the end of the daisy chain and the SmartLogger cannot exceed 1000 meters.
- If multiple SUN2000s need to communicate with one another and are connected to a PC over the SmartLogger2000, a maximum of six daisy chains can be configured.
- To ensure the system response speed, it is recommended that the number of devices on each daisy chain be less than 30.

PLC Communication

The PLC communication board loads communication signals onto power cables for transmission. For details about how to install the PLC, see the *PLC CCO01A User Manual* or *SmartLogger2000 User Manual*.



The built-in PLC module in the SUN2000 does not need to be connected with cables.

Selecting a Communication Mode

The RS485 and PLC communication modes are mutually exclusive.

- If the PLC communication mode is selected, do not connect the RS485 communications cable. In addition, you need to set **PLC Communication** to **Enable** on the SUN2000 app.
- If the RS485 communication mode is selected, do not connect the PLC CCO module to the AC power cable or connect the AC power cable for the SmartLogger2000. In addition, you are advised to set **PLC Communication** to **Disable** on the SUN2000 app.



PLC Communication is set to **Enable** by default.

5.7.2 Connecting the RS485 Communications Cable

Description

An RS485 communications cable can be connected in two ways:

- Terminal block connection

You are advised to use a DJYP2VP2-22 2x2x1 PC cable or a communications cable with a conductor cross-sectional area of 1 mm² and cable outer diameter of 14–18 mm.

- RJ45 network port connection

You are advised to use a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm and internal resistance not greater than 1.5 ohms/10 m, with a shielded RJ45 connector.



Select either connection mode during installation. Terminal block connection is preferred.



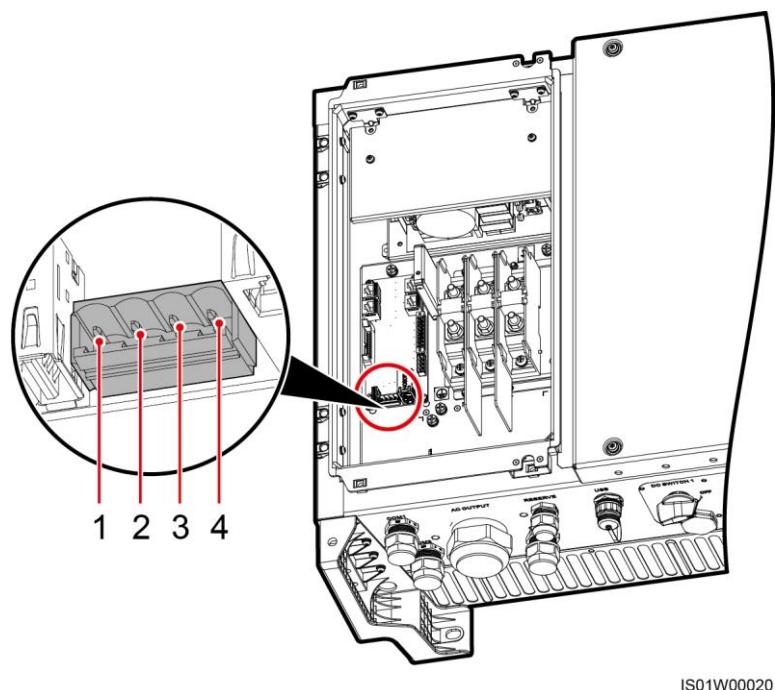
NOTICE

When laying out communications cables, separate them from power cables and avoid large signal interference sources to protect communication from being affected.

Terminal Block Pin Definitions

Figure 5-21 shows an RS485 terminal block.

Figure 5-21 Terminal block



IS01W00020

[Table 5-4](#) describes pin definitions of the RS485 terminal block.

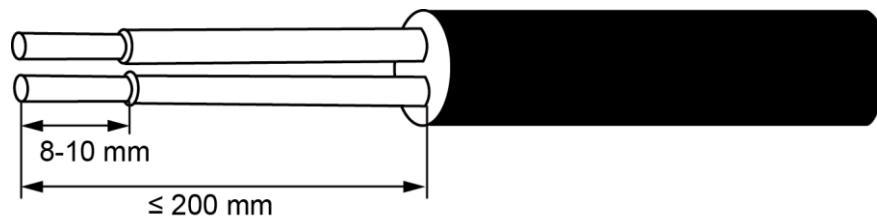
Table 5-4 Pin definitions of the RS485 terminal block

| No. | Port Definition | Description |
|-----|-----------------|------------------------------|
| 1 | RS485A IN | RS485A, differential signal+ |
| 2 | RS485A OUT | RS485A, differential signal+ |
| 3 | RS485B IN | RS485B, differential signal- |
| 4 | RS485B OUT | RS485B, differential signal- |

Connecting Cables to the Terminal Block

Step 1 Remove an appropriate length of the jacket and core wire insulation layer from the communications cable using a wire stripper.

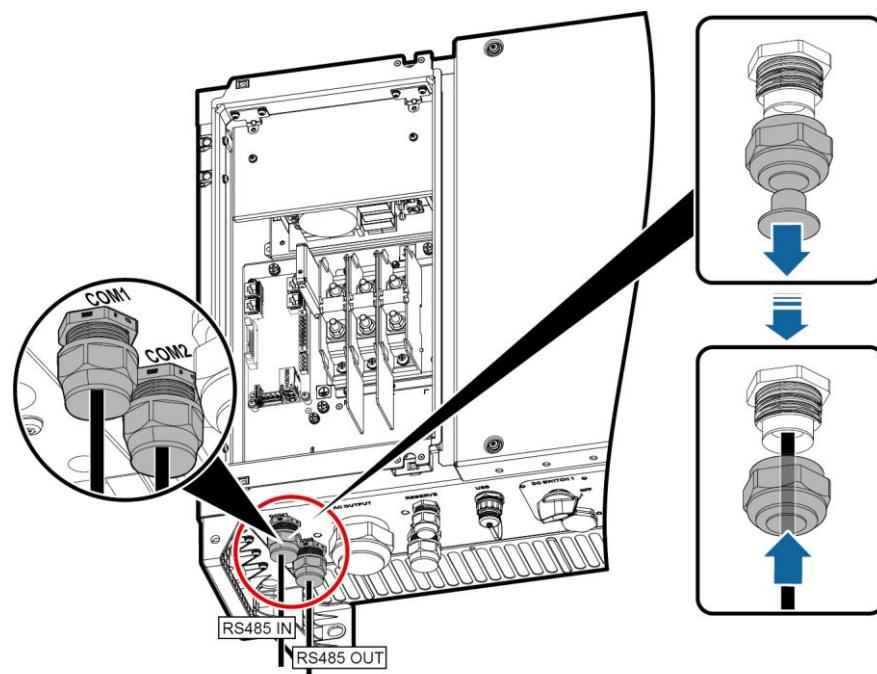
Figure 5-22 Stripping an RS485 communications cable



IS01Z00007

Step 2 Route the communications cable through the waterproof connector.

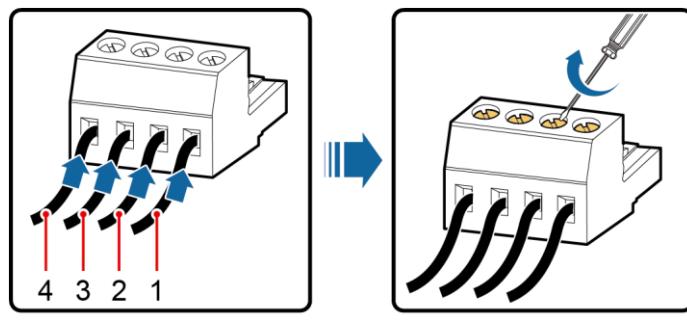
Figure 5-23 Routing cables



IS04H00018

Step 3 Remove the cable terminal base from the terminal block. Connect the communications cable to the terminal base.

Figure 5-24 Connecting cables to a terminal base



(1) RS485A IN

(2) RS485A OUT

(3) RS485B IN

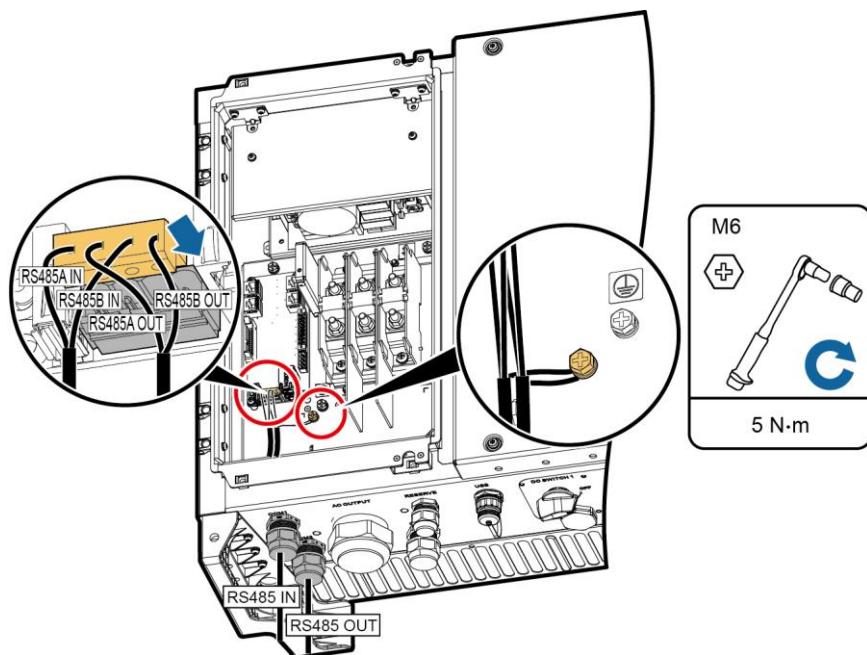
(4) RS485B OUT

Step 4 Install the terminal base on the terminal block, and connect the shield layer to the ground point.

NOTE

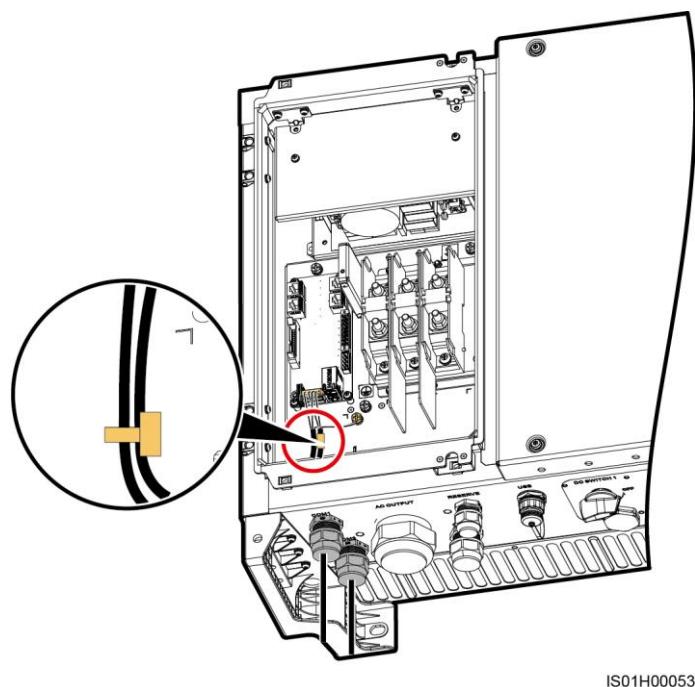
When connecting the shielded cable, crimp the OT terminal if required.

Figure 5-25 Connecting communications cables



Step 5 Bind communications cables after connecting them.

Figure 5-26 Binding communications cables



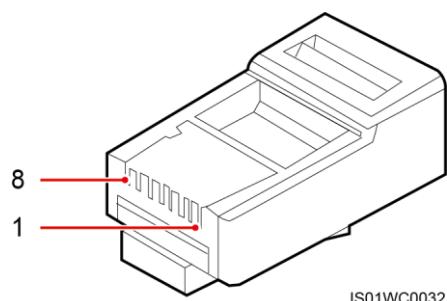
Step 6 Tighten the sealing nut and seal the cable gland.

----End

RJ45 Connector Pin Definitions

[Figure 5-27](#) shows an RJ45 connector.

Figure 5-27 RJ45 connector



[Table 5-5](#) lists the RJ45 connector pin definitions.

Table 5-5 RJ45 connector pin definitions

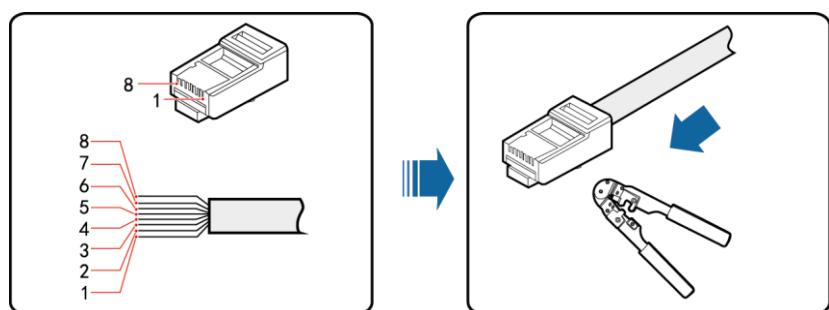
| Pin | Color | Function |
|-----|------------------|------------------------------|
| 1 | White-and-orange | RS485A, differential signal+ |

| Pin | Color | Function |
|-----|-----------------|------------------------------|
| 2 | Orange | RS485B, differential signal- |
| 3 | White-and-green | N/A |
| 4 | Blue | RS485A, differential signal+ |
| 5 | White-and-blue | RS485B, differential signal- |
| 6 | Green | N/A |
| 7 | White-and-brown | N/A |
| 8 | Brown | N/A |

Connecting a Cable to the RJ45 Network Port

Step 1 Prepare an RJ45 connector.

Figure 5-28 Preparing an RJ45 connector

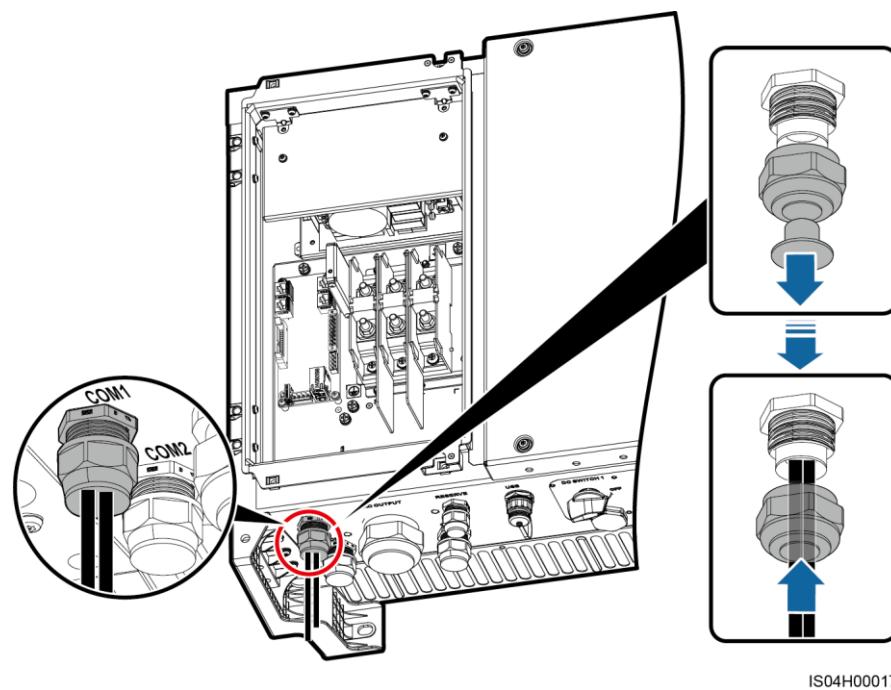


IS01Z00002

- | | | | |
|----------------------|------------|---------------------|-----------|
| (1) White-and-orange | (2) Orange | (3) White-and-green | (4) Blue |
| (5) White-and-blue | (6) Green | (7) White-and-brown | (8) Brown |

Step 2 Route the communications cable through the waterproof connector.

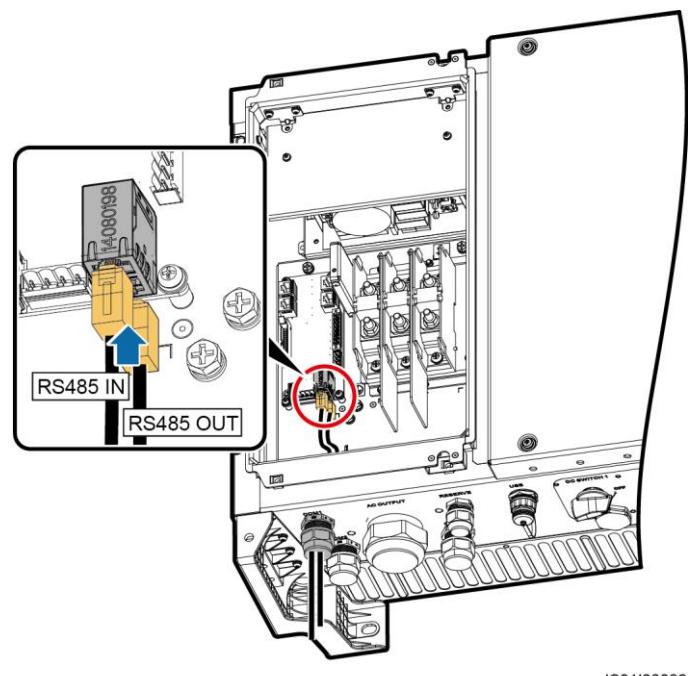
Figure 5-29 Routing cables



IS04H00017

Step 3 Insert the RJ45 connector into the RJ45 network port in the SUN2000 maintenance compartment.

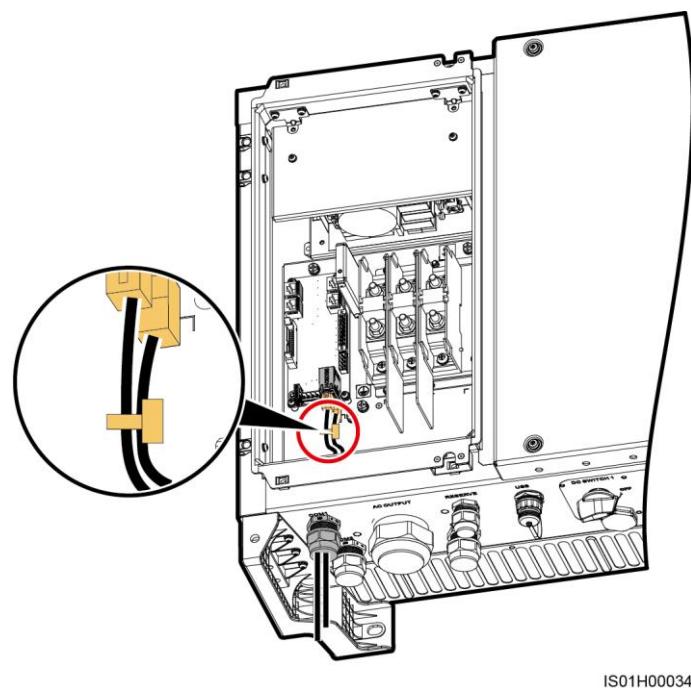
Figure 5-30 Connecting communications cables



IS01I00022

Step 4 Bind communications cables after connecting them.

Figure 5-31 Binding communications cables



Step 5 Tighten the sealing nut and seal the cable gland.

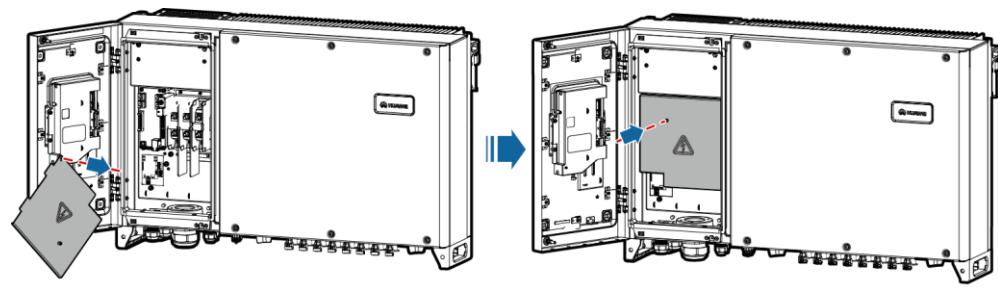
----End

5.8 Closing the Maintenance Compartment Door

Procedure

Step 1 Install the AC terminal cover.

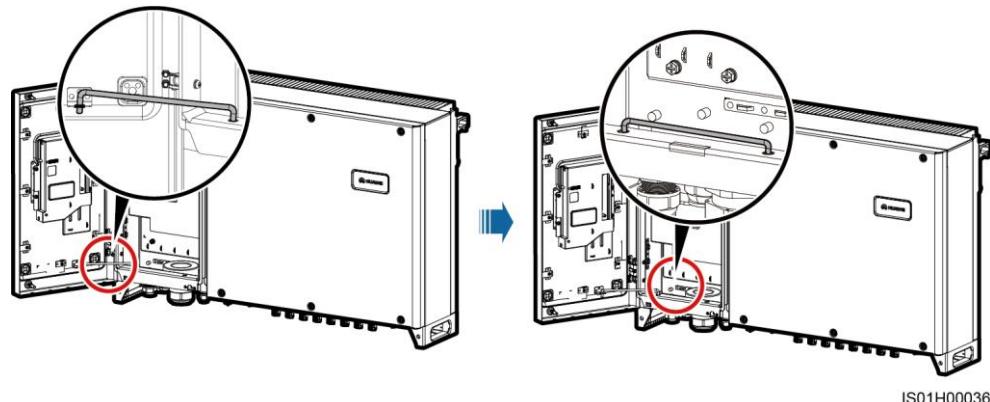
Figure 5-32 Installing a cover



IS04H00015

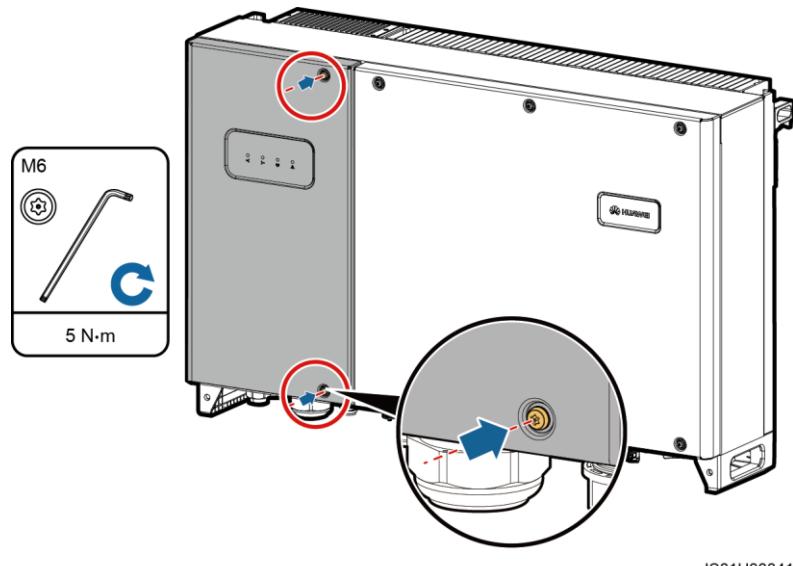
Step 2 Retrieve the support bar.

Figure 5-33 Retrieve the support bar



Step 3 Close the maintenance compartment door and tighten the two screws on the door.

Figure 5-34 Tightening screws on the maintenance compartment door



----End

6 System Commissioning

6.1 Checking Before Power-On

1. The SUN2000 is installed correctly and securely.
2. Check that the DC switch and downstream AC output switch are OFF.
3. All ground cables are connected securely.
4. All AC output power cables are connected correctly and securely, without open circuits or short circuits.
5. All DC input power cables are connected correctly and securely, without open circuits or short circuits.
6. The communications cable is connected correctly and securely.
7. Check that all used waterproof connectors at the bottom of the enclosure are sealed, and that the thread-lock sealing nut is tightened.
8. The AC terminal cover is reinstalled.
9. The maintenance compartment door is closed and the door screws are tightened.
10. Unused DC input terminals are sealed.
11. Unused USB ports are plugged with waterproof plugs.
12. Unused waterproof connectors are plugged and the locking caps are tightened.

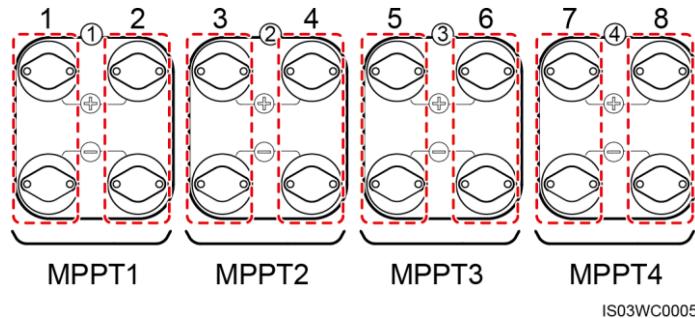
6.2 DC Input Detection

Function Description

When SUN2000 detects an abnormal DC input voltage from any PV string after DC cables are connected to the SUN2000, the SUN2000 generates an alarm through the LED indicator and buzzer. Attention from site personnel is required to check and clear the fault, to avoid damage to the SUN2000.

The SUN2000 provides four MPPT circuits with eight DC input terminals, as shown in [Figure 6-1](#). After one PV string correctly connects to the MPPT1 circuit, the SUN2000 can start the DC input detection function. DC input detection can be performed automatically or manually.

Figure 6-1 DC terminals



NOTICE

- Only after at least one PV string correctly connects to the MPPT1 circuit, the SUN2000 enables the DC input detection function. Therefore, you are required to connect DC input power cables to the MPPT1 circuit first.
- The DC input detection function allows only independent access from each PV string to the inverter. That means, the PV strings cannot be connected in parallel and then to the inverter.

[Table 6-1](#) describes the status of the LED indicators and buzzers.

Table 6-1 LED indicator and buzzer status description

| PV Connection Indicator Status | Buzzer Status | Meaning |
|--------------------------------|---------------|------------------------------------|
| Blinking red | No sound | DC input detection is in progress. |
| Blinking green | No sound | The DC input is normal. |
| Steady red | Buzzing | The DC input is abnormal. |

Automatic Detection

Following are the rules for starting automatic detection:

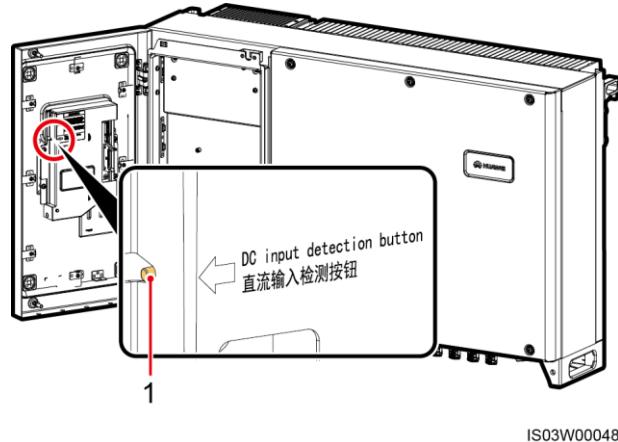
- Initial automatic detection is triggered 2 minutes after at least one PV string correctly connects to the MPPT1 circuit.
- Within three days after initial automatic detection is triggered, the SUN2000 performs automatic detection once every 10 minutes. From the fourth day, the SUN2000 performs automatic detection only when the PV string voltage equals the lowest operating voltage of the SUN2000.
- The DC input detection only functions when the two DC switches on the SUN2000 are OFF.

Manual Detection

Perform manual detection by pressing the DC voltage detection button once or using the SUN2000 app as showing below:

- Once the DC input detection is triggered, the detection process cannot be aborted or restarted until detection cycle completes.

Figure 6-2 DC input detection button



(1) DC input detection button

- The audible alarm can be manually turned off by pressing DC input detection button twice.
- The DC input detection only functions when the two DC switches on the SUN2000 are OFF.

6.3 Powering On the SUN2000

Prerequisites



NOTICE

- Before turning on the AC switch between the SUN2000 and the power grid, use a multimeter to check that the AC voltage is within the specified range.
- Before turning the DC switches of the SUN2000 to ON, ensure that the DC input is already checked and is normal.

Procedure

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



NOTICE

If you perform **Step 2** before **Step 1**, the SUN2000 reports a fault about abnormal shutdown. The SUN2000 can start normally after the fault is automatically rectified. The default fault rectification time is 1 minute. You can modify the time over the NMS software installed on the PC that connects to the SUN2000.

Step 2 Turn the DC switch at the bottom of the SUN2000 to ON.

Step 3 (Optional) Measure the temperatures at the joints between DC terminals and connectors using a point-test thermometer.

To ensure that the DC terminals are in good contact, check the temperatures at the joints between DC terminals and connectors after the SUN2000 has been running for a period of time. Ensure that the temperature rise does not exceed 40°C.

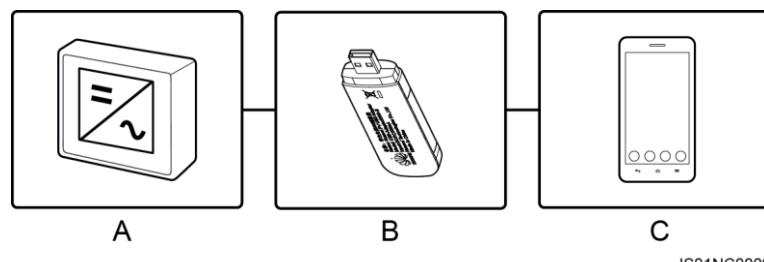
Step 4 Connect the SUN2000 to the mobile phone that runs SUN2000 app (**APP** for short) through a Bluetooth module or USB data cable.



NOTICE

- Mobile phone operating system: Android 4.0 or later, iOS 7.0 or later. When the iOS is used, the app supports only Bluetooth connection.
- The screen snapshots in this document correspond to app V200R001C20SPC010.

Figure 6-3 Bluetooth module connection



IS01NC0009

(A) SUN2000

(B) Bluetooth module

(C) Mobile phone

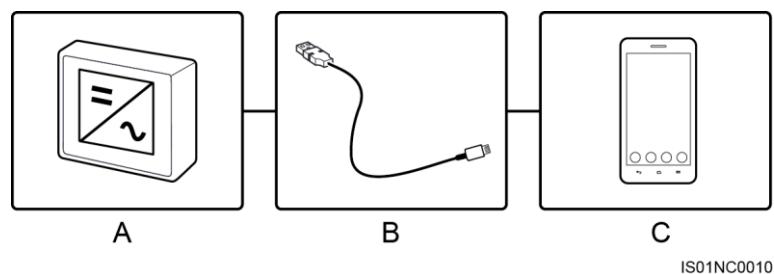


NOTE

Purchase the Bluetooth module bundled with the SUN2000. A Bluetooth module purchased from any other source may not support communication between the SUN2000 and the app.

- The Android system supports the Bluetooth module USB-Adapter2000-B and BF4030.
- The iOS system supports the Bluetooth module USB-Adapter2000-B.

Figure 6-4 Data cable connection



(A) SUN2000

(B) USB data cable

(C) Mobile phone



NOTE
Use the USB data cable delivered with the mobile phone. The port type is USB 2.0.

Figure 6-5 Login screen

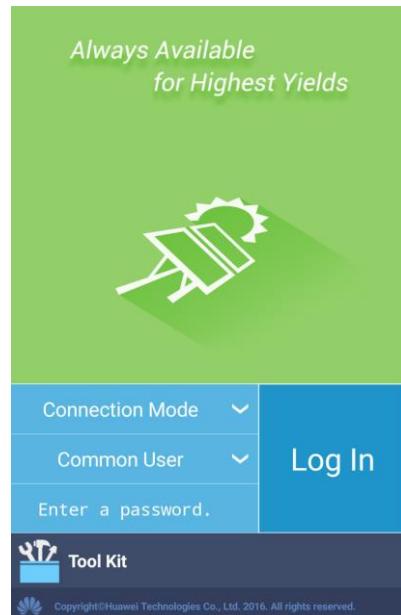


Figure 6-6 Selecting a connection mode

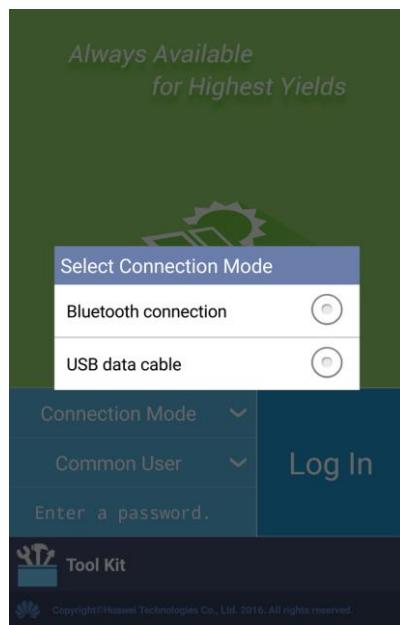
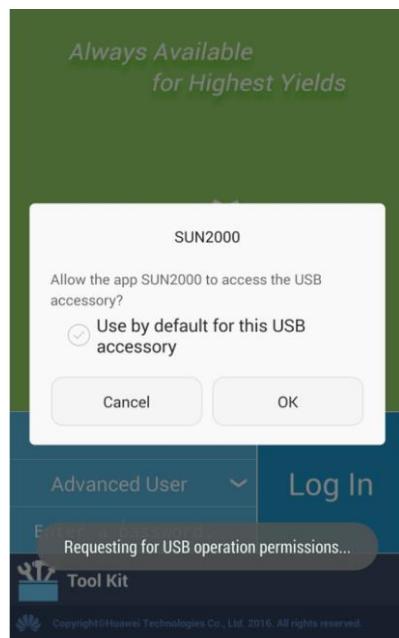


Figure 6-7 Bluetooth connection



Figure 6-8 Data cable connection

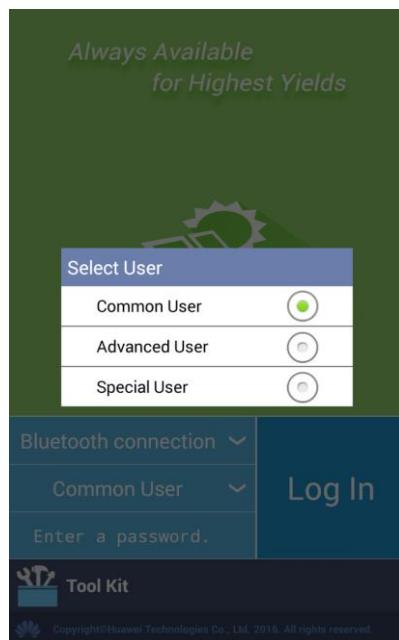


NOTE

After you select **Use by default for this USB accessory**, the message will not appear if you reconnect the app without disconnecting the USB data cable.

- Step 5** Tap the user name area to switch between **Common User**, **Advanced User**, and **Special User**.

Figure 6-9 Switching between users



 **NOTE**

- The login password is the same as that for the SUN2000 connected to the app and is used only when the SUN2000 connects to the app.
- The initial passwords for **Common User**, **Advanced User**, and **Special User** are all **00000a**. Use the initial password upon first login. To ensure account security, change the password immediately after login.
- During the login, if five consecutive invalid password entries are made (the interval between two consecutive entries is less than 2 minutes), the account will be locked for 10 minutes. The password should consist of six digits.

Step 6 Enter the password and tap **Log In**.

Step 7 After the successful login, the **Quick Settings** screen or **Function Menu** screen is displayed.

 **NOTE**

- If you log in to the app after the SUN2000 connects to the app for the first time or factory defaults are restored, the **Quick Settings** screen is displayed, on which you can set basic parameters. After the settings take effect, you can enter the main menu screen and modify the parameters on the **Settings** screen. Set the correct grid code based on the application region and scenario of the SUN2000.
- You are advised to log in to the **Quick Settings** screen as an advanced user for parameter settings.

Figure 6-10 Quick Settings (advanced user)

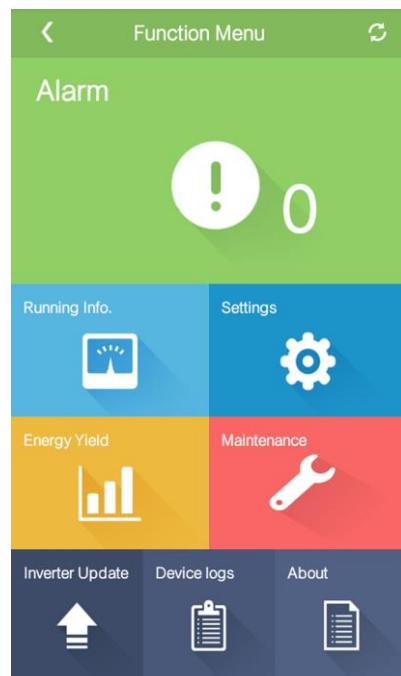


 **NOTE**

- Set the power grid code that applies to the country or region where the PV plant is located and the SUN2000 model.
- Set user parameters based on the current date and time.
- Set **Baud rate**, **RS485 protocol**, and **Address** based on site requirements. **Baud rate** can be set to **4800**, **9600**, or **19200**. **RS485 protocol** can be set to **MODBUS RTU**, and **Address** can be set to any value in the range of 1 to 247.

- When multiple SUN2000s communicate with the SmartLogger over RS485, the RS485 addresses for all the SUN2000s on each RS485 route must be within the address range set on the SmartLogger and cannot be duplicate. Otherwise, the communication will fail. In addition, the baud rates of all the SUN2000s on each RS485 route must be consistent with the SmartLogger baud rate.

Figure 6-11 Function Menu



----End

6.4 Powering Off the SUN2000

Context



WARNING

- If two SUN2000s share the same AC switch on the AC side, power off the two SUN2000s.
- After the SUN2000 powers off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, put on personal protective equipment (PPE) and begin servicing the SUN2000 five minutes after the power-off.

Procedure

Step 1 Run a shutdown command on the SUN2000 APP, SmartLogger, or NMS.

For details, see the *SUN2000 APP User Manual* or *SmartLogger2000 User Manual* or *iManager NetEco 1000S User Manual*.

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

Step 3 Set the two DC switches to OFF.

----End

7 Man-Machine Interactions

7.1 Operations with a USB Flash Drive

USB flash drives of SanDisk, Netac, and Kingston are recommended. Other brands may be incompatible.

7.1.1 Exporting Configurations

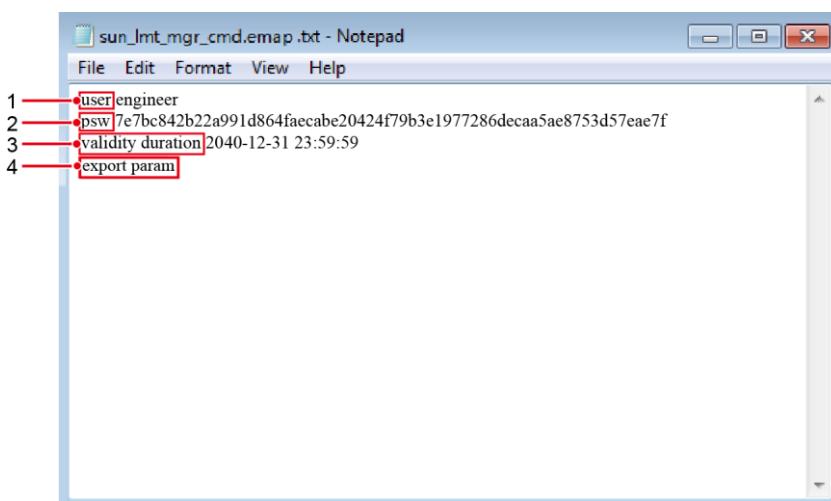
Procedure

Step 1 On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.

Step 2 Import the boot script file to a PC.

(Optional) The boot script file can be opened as a .txt file, as shown in [Figure 7-1](#).

Figure 7-1 Boot script file



| No. | Meaning | Remarks |
|-----|------------------------|---|
| 1 | User name | <ul style="list-style-type: none"> Advanced user: engineer Special user: admin |
| 2 | Ciphertext | The ciphertext varies depending on the login password of the SUN2000 APP. |
| 3 | Script validity period | - |
| 4 | Command | <p>Different command settings can produce different commands.</p> <ul style="list-style-type: none"> Configuration export command: export param. Configuration import command: import param. Data export command: export log. Upgrade command: upgrade. |

Step 3 Import the boot script file to the root directory of a USB flash drive.

Step 4 Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-1 LED indicator description

| LED Indicator | Status | Meaning |
|---------------|---|--|
| | Green off | There is no operation with a USB flash drive. |
| | Blinking green at long intervals (on for 1s and then off for 1s) | There is an operation with a USB flash drive. |
| | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed. |
| | Steady green | An operation with a USB flash drive is successful. |

Step 5 Insert the USB flash drive into a computer and check the exported data.



NOTE

When the configuration export is complete, the boot script file and exported file are in the root directory of the USB flash drive.

----End

7.1.2 Importing Configurations

Prerequisites

A complete configuration file has been exported.

Procedure

- Step 1** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 2** Import the boot script file to a PC.
- Step 3** Replace the exported boot script file in the root directory of the USB flash drive with the imported one.



NOTICE

Replace the boot script file only and keep the exported files.

- Step 4** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-2 LED indicator description

| LED Indicator | Status | Meaning |
|---------------|---|---|
| | Green off | There is no operation with a USB flash drive. |
| | Blinking green at long intervals (on for 1s and then off for 1s) | There is an operation with a USB flash drive. |
| | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed. |

| LED Indicator | Status | Meaning |
|---------------|--------------|--|
| | Steady green | An operation with a USB flash drive is successful. |

----End

7.1.3 Exporting Data

Procedure

- Step 1** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 2** Import the boot script file to the root directory of a USB flash drive.
- Step 3** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-3 LED indicator description

| LED Indicator | Status | Meaning |
|---------------|---|--|
| | Green off | There is no operation with a USB flash drive. |
| | Blinking green at long intervals (on for 1s and then off for 1s) | There is an operation with a USB flash drive. |
| | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed. |
| | Steady green | An operation with a USB flash drive is successful. |

- Step 4** Insert the USB flash drive into a PC and check the exported data.



NOTE

After the data is exported, the boot script file and exported file are in the root directory of the USB flash drive.

----End

7.1.4 Upgrading

Procedure

- Step 1** Log in to <http://support.huawei.com/carrier/> and browse or search for **SUN2000HA** on the **Product Support** tab page. Download the required upgrade package (for example, SUN2000HAV100R001C00SPCXXX) from the **Software** tab page.
- Step 2** Decompress the upgrade package.

After obtaining the upgrade package **SUN2000HAV100R001C00SPCXXX_package.zip**, decompress the package and copy the extracted files to the root directory of the USB flash drive. Ensure that the extracted files include:

- config.txt
- sun_lmt_mgr_cmd.emap (This is a boot script file.)
- SUN2000.bin
- SUN2000_CPLD.bin
- SUN2000_FLT_Release.bin
- SUN2000_Master_Release.bin
- SUN2000_Slave_Release.bin
- vercfg.xml



NOTICE

- When the login password of the SUN2000 APP is the initial password (**00000a**), there is no need to perform **Step 3–Step 5**.
 - When the login password of the SUN2000 APP is not the initial password, perform **Step 3–Step 7**.
-

- Step 3** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 4** Import the boot script file to a computer.
- Step 5** Replace the boot script file in the upgrade package with the one generated by the SUN2000 APP.
- Step 6** Copy the extracted files to the root directory of the USB flash drive.
- Step 7** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-4 LED indicator description

| LED Indicator | Status | Meaning |
|---------------|---|--|
| | Green off | There is no operation with a USB flash drive. |
| | Blinking green at long intervals (on for 1s and then off for 1s) | There is an operation with a USB flash drive. |
| | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed. |
| | Steady green | An operation with a USB flash drive is successful. |

Step 8 (Optional) The system automatically restarts when the upgrade is completed. All LED indicators turn off during the restart. After the restart, the green indicator is blinking at long intervals (on for 1s and then off for 1s) for 1 minute until it becomes steady on, which indicates that the upgrade is successful.



NOTE

The SUN2000 can also be upgraded through the **Inverter Upgrade** in the SUN2000 APP. For details, see the *SUN2000 APP User Manual*.

----End

7.2 Operations with the SUN2000 App

Description



NOTICE

- The app screenshots in this chapter are for the SUN2000-60KTL-HV-D1-001. The SUN2000 app version is V200R001C20SPC010.
- Configurable parameters vary with the device model and grid code. The actual screen prevails. The parameter list provided in this section includes all configurable parameters.
- The parameter names, value ranges, and default values are subject to change. The actual display prevails.

7.2.1 Operations Related to the Advanced User

Description

If you log in to the app as **Advanced User**, you can set the grid parameters, protection parameters, and feature parameters for the SUN2000.

7.2.1.1 Setting Grid Parameters

Procedure

Step 1 Tap **Function Menu > Settings > Grid Parameters** to access the parameters setting screen.

Figure 7-2 Grid parameters (advanced user)



----End

Parameter List

| No. | Parameter | Description | Default Value | Value Range |
|-----|-----------|--|--|--|
| 1 | Grid code | Set this parameter based on the grid code of the country or region where the SUN2000 is used and the SUN2000 application scenario. | The default value varies with the model. The displayed value prevails. | N/A |
| 2 | Isolation | Specifies the working mode of the SUN2000 according to the grounding status at the DC side and the connection status to the grid. | The default value varies with the grid code. The displayed value prevails. | <ul style="list-style-type: none">• Input grounded, with TF• Input ungrounded, without TF• Input ungrounded, with TF |

7.2.1.2 Setting Protection Parameters

Procedure

Step 1 Choose **Function Menu > Settings > Protection Parameters** to access the parameters setting screen.

Figure 7-3 Protection parameter (advanced user)



----End

Parameter List

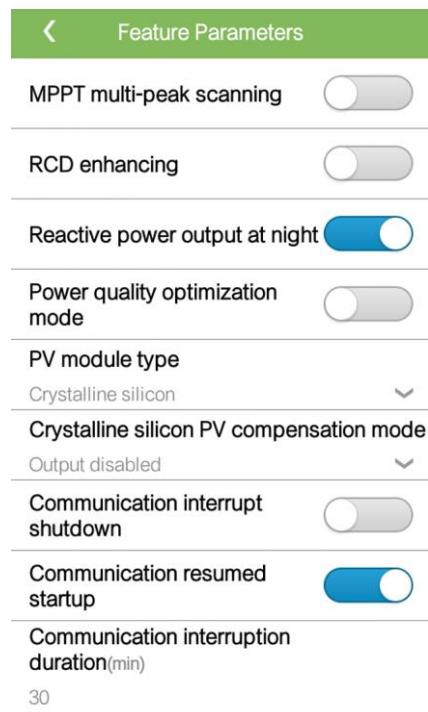
| No. | Parameter | Description | Unit | Default Value | Value Range |
|-----|----------------------------------|---|------|---------------|--------------|
| 1 | Insulation resistance protection | To ensure device safety, the SUN2000 detects the insulation resistance between the input side and the ground when it starts a self-check. If the detected value is less than the preset value, the SUN2000 does not export power to the power grid. | MΩ | 0.05 | [0.033, 1.5] |

7.2.1.3 Setting Feature Parameters

Procedure

Step 1 Choose **Function Menu > Settings > Feature Parameters** to access the settings screen.

Figure 7-4 Feature Parameters (advanced user)



----End

Parameter List

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|-----------------------------------|--|------|---------------|---|---|
| 1 | MPPT multi-peak scanning | When the SUN2000 is used in scenarios where PV strings are obviously shaded, enable this function. Then the SUN2000 will perform MPPT scanning at regular intervals to locate the maximum power. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | The scanning interval is set by MPPT multi-peak scanning interval . |
| 2 | MPPT multi-peak scanning interval | Specifies the MPPT multi-peak scanning interval. | min | 15 | [5, 30] | This parameter is displayed only when MPPT multi-peak scanning is set to Enable . |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|---------------------------------|---|------|---------------|---|---|
| 3 | RCD enhancing | RCD refers to the residual current of the SUN2000 to the ground. To ensure device security and personal safety, RCD should comply with the standard. If an AC switch with a residual current detection function is installed outside the SUN2000, this function should be enabled to reduce the residual current generated during SUN2000 running, thereby preventing the AC switch from misoperations. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 4 | Reactive power output at night | In some specific application scenarios, a power grid company requires that the SUN2000 can perform reactive power compensation at night to ensure that the power factor of the local power grid meets requirements. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | This parameter is configurable only when Isolation is set to Input ungrounded, with a transformer . |
| 5 | Power quality optimization mode | If Power quality optimization mode is set to Enable , the inverter output current harmonics will be optimized. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | N/A |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|----------------|--|------|---------------------|---|--|
| 6 | PV module type | This parameter is used to set different types of PV modules and the shutdown time of the concentration PV modules. If the concentration PV modules are shaded, the power drops drastically to 0 and the SUN2000 shuts down. The energy yield would be affected since it takes too long for the power to resume and SUN2000 to restart. The parameter does not need to be set for crystalline silicon and filmy PV modules. | N/A | Crystalline silicon | <ul style="list-style-type: none"> • Crystalline silicon • Film • CPV 1 • CPV 2 | <ul style="list-style-type: none"> • If PV module type is set to Crystalline silicon or Film, the SUN2000 automatically detects the power of PV modules when they are shaded and shuts down if the power is too low. • If PV module type is set to CPV 1, the SUN2000 can operate for 60 minutes if the power of PV modules drops drastically due to shading. It can also quickly output power when the power resumes. • If PV module type is set to CPV 2, the SUN2000 can operate for 10 minutes if the power of PV modules drops drastically due to shading. It can also quickly output power when the power resumes. |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|--|--|------|-----------------|---|--|
| 7 | Crystalline silicon PV compensation mode | This parameter reduces the DC voltage of PV modules to the PE by reducing the impedance of the SUN2000 input side to the PE, thereby effectively reducing PID effect of PV modules. | N/A | Output disabled | <ul style="list-style-type: none"> • Output disabled • P-type output • N-type output | This parameter is displayed if PV module type is set to Crystalline silicon . Set this parameter to P-type output for P-type PV modules and N-type output for N-type PV modules. |
| 8 | Communication interrupt shutdown | The standards of certain countries and regions require that the SUN2000 must shut down after the communication is interrupted for a certain time. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | If Communication interrupt shutdown is set to Enable and the SUN2000 communication has been interrupted for a specified time (set by Communication interruption duration), the SUN2000 will automatically shut down. |
| 9 | Communication interruption duration | Specifies the duration for determining communication interruption, and is used for automatic shutdown for protection in case of communication interruption. | min | 30 | [1, 120] | N/A |
| 10 | Communication resumed startup | If this parameter is enabled, the SUN2000 automatically starts after communication recovers. If this parameter is disabled, the SUN2000 needs to be started manually after communication recovers. | N/A | Enable | <ul style="list-style-type: none"> • Disable • Enable | N/A |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|-------------------------------|--|------|--|---|---------|
| 11 | Soft start time | Specifies the duration for the power to gradually increase when the SUN2000 starts. | s | The default value varies depending on the grid code. The displayed value prevails. | [20, 1800] | N/A |
| 12 | Current error during scanning | When the IV curves of PV strings are being scanned, the current change of PV strings operating properly should be monitored to avoid inaccurate scanning caused by sunlight change. If the current exceeds the specified value, it is determined that the sunlight changes, and the IV curves should be scanned again. | A | 0.20 | [0.00, 2.00] | N/A |
| 13 | Hibernate at night | The SUN2000 monitors PV strings at night. If Hibernate at night is set to Enable , the monitoring function of the SUN2000 will hibernate at night, reducing power consumption. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 14 | PLC communication | For SUN2000 models that support both RS485 and PLC communication, when RS485 communication is used, you are advised to set PLC communication to Disable to reduce power consumption. | N/A | Enable | <ul style="list-style-type: none"> • Disable • Enable | N/A |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|-----------------------------------|--|------|---------------|---|---|
| 15 | Upgrade delay | Upgrade delay is mainly used in the upgrade scenarios where the PV power supply is disconnected at night due to no sunlight or unstable at dawn or dusk due to poor sunlight. | N/A | Enable | <ul style="list-style-type: none"> • Disable • Enable | After the SUN2000 upgrade starts, if Upgrade delay is set to Enable , the upgrade package is loaded first. After the PV power supply recovers and the activation conditions are met, the SUN2000 automatically activates the upgrade. |
| 16 | String monitor | The SUN2000 monitors PV strings in real time. If any PV string is abnormal (such as the PV string is shaded or the energy yield decreases), the SUN2000 generates an alarm to remind maintenance personnel to maintain the PV string in a timely manner. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | If PV strings are easily shaded, you are advised to set String monitor to Disable to prevent false alarms. |
| 17 | String detection low power delay | Specifies the delay time for generating abnormal string alarms when the SUN2000 detects that a PV string is working with low power. This parameter is mainly used in the scenario where PV strings are shaded for a long time in the morning and evening, and is used to prevent false alarms. | min | 180 | [2, 720] | This parameter is displayed when String monitor is set to Enable . |
| 18 | String detection high power delay | Specifies the delay time for generating abnormal string alarms when the SUN2000 detects that a PV string is working with high power. | min | 30 | [2, 720] | |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|--|--|------|---------------|---|--|
| 19 | String detection power segment division percentage | Specifies the thresholds for determining whether a PV string is working with high power or low power. This parameter is used to distinguish the working status of PV strings. | % | 50 | [1, 100] | |
| 20 | String detection reference asymmetric coefficient | Specifies the threshold for determining PV string exception. The false alarms caused by fixed shadow shading can be controlled by changing this parameter. | N/A | 20 | [5, 100] | |
| 21 | String detection starting power percentage | Specifies the threshold for starting PV string exception detection. The false alarms caused by fixed shadow shading can be controlled by changing this parameter. | % | 20 | [1, 100] | This parameter is displayed when String monitor is set to Enable . |
| 22 | Shutdown at 0% power limit | If this parameter is set to Enable , the SUN2000 shuts down after receiving the 0% power limit command. If this parameter is set to Disable , the SUN2000 does not shut down after receiving the 0% power limit command. | N/A | Disable | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 23 | Maximum apparent power | Specifies the output upper threshold for the maximum apparent power to adapt to the capacity requirements for standard and customized transformers. | kW | Smax_limit | [Maximum active power, Smax_limit] | If the maximum active power equals Smax_limit, this parameter is not displayed. |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|--|--|------|---------------|---|---------|
| 24 | Maximum active power | Specifies the output upper threshold for the maximum active power to adapt to various market requirements. | kW | Pmax_limit | [0.1, Pmax_limit] | N/A |
| 25 | Tracking system controller | Selects a controller vendor. | N/A | N/A | N/A | N/A |
| 26 | Duration for determining short-time grid disconnection | The standards of certain countries and regions require that the SUN2000 should not disconnect from the power grid if the power grid experiences a short-time failure. The SUN2000 output power should be recovered immediately after the fault is rectified. | ms | 3000 | [500, 20000] | N/A |
| 27 | Adjust total energy yield | Specifies the initial energy yield of the SUN2000. This parameter is used in SUN2000 replacement scenarios. Set the initial energy yield of the new SUN2000 to the total energy yield of the old SUN2000 to ensure continuous statistics of cumulative energy yield. | kWh | N/A | [0.00, 42949600.00] | N/A |
| 28 | DC input detection | If DC input detection is set to Disable , the SUN2000 does not perform automatic DC input detection or manual DC output detection. | N/A | Enable | <ul style="list-style-type: none"> • Disable • Enable | N/A |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|--|---|------|--|---|---------|
| 29 | Commanded shutdown hold after power recovery | The standards of certain countries and regions require that the SUN2000 remains in the commanded shutdown state after being powered off by a command and experiencing a power failure and recovery. | N/A | The default value varies depending on the grid code. The displayed value prevails. | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 30 | Buzzer | If this parameter is set to Enable , the buzzer buzzes when a DC input cable connection error is detected. If this parameter is set to Disable , the buzzer does not buzz when a DC input cable connection error is detected. | N/A | Enable | <ul style="list-style-type: none"> • Disable • Enable | N/A |

7.2.2 Operations Related to the Special User

Description

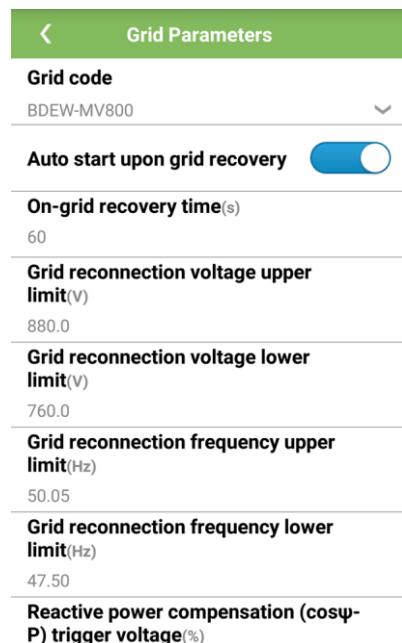
If you log in to the app as **Special User**, you can set the grid parameters, protection parameters, feature parameters, and grid adjustment parameters for the SUN2000.

7.2.2.1 Setting Grid Parameters

Procedure

Step 1 Choose **Function Menu > Settings > Grid Parameters** to access the parameters setting screen.

Figure 7-5 Grid Parameters (special user)



----End

Parameter List

| No. | Parameter | Description | Unit | Default Value | Value Range |
|-----|--|--|------|--|---|
| 1 | Grid code | Set this parameter based on the grid code of the country or region where the SUN2000 is used and the SUN2000 application scenario. | N/A | The default value varies depending on the model. The displayed value prevails. | N/A |
| 2 | Auto start upon grid recovery | Specifies whether to allow the SUN2000 to automatically start after the power grid recovers. | N/A | The default value varies depending on the grid code. The displayed value prevails. | <ul style="list-style-type: none"> • Disable • Enable |
| 3 | Grid connection duration after power grid recovery | Specifies the waiting time for SUN2000 restart after the power grid recovers. | s | | [0, 900] |

| No. | Parameter | Description | Unit | Default Value | Value Range |
|-----|--|---|------|--|--------------------|
| 4 | Grid reconnection voltage upper limit | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage exceeds the value of Grid reconnection voltage upper limit after the SUN2000 shuts down due to a fault. | V | The default value varies depending on the grid code. The displayed value prevails. | [100% Vn, 136% Vn] |
| 5 | Grid reconnection voltage lower limit | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage is below the value of Grid reconnection voltage lower limit after the SUN2000 shuts down due to a fault. | V | | [45% Vn, 95% Vn] |
| 6 | Grid reconnection frequency upper limit | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid frequency exceeds the value of Grid reconnection frequency upper limit after the SUN2000 shuts down due to a fault. | Hz | The default value varies depending on the grid code. The displayed value prevails. | [100% Fn, 112% Fn] |
| 7 | Grid reconnection frequency lower limit | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid frequency is below the value of Grid reconnection frequency lower limit after the SUN2000 shuts down due to a fault. | Hz | | [85% Fn, 100% Fn] |
| 8 | Reactive power compensation ($\cos\phi$ -P) trigger voltage | Specifies the voltage threshold for triggering reactive power compensation based on the $\cos\phi$ -P curve. | % | The default value varies depending on the grid code. The displayed value prevails. | [100, 110] |

| No. | Parameter | Description | Unit | Default Value | Value Range |
|-----|---|---|------|---------------|-------------|
| 9 | Reactive power compensation ($\cos\phi$ -P) exit voltage | Specifies the voltage threshold for exiting reactive power compensation based on the $\cos\phi$ -P curve. | % | | [90, 100] |



NOTE

V_n represents the rated voltage and F_n represents the rated frequency.

7.2.2.2 Setting Protection Parameters

Procedure

Step 1 Choose **Function Menu > Settings > Protection Parameters** to access the parameters setting screen.

Figure 7-6 Protection Parameters (special user)



----End

Parameter List



NOTE

- The default values in the following table vary depending on the grid code. The displayed values prevail.
- V_n represents the rated voltage and F_n represents the rated frequency.

| No. | Parameter | Description | Unit | Value Range |
|-----|-------------------------------|--|------|---|
| 1 | Unbalance voltage protection | Specifies the SUN2000 protection threshold in the case of unbalanced power grid voltage. | % | [0.0, 50.0] |
| 2 | Phase angle offset protection | The standards of certain countries and regions require that the SUN2000 needs to be protected when the three-phase angle offset of the power grid exceeds a certain value. | N/A | <ul style="list-style-type: none"> • Disable • Enable |
| 3 | 10 minute OV protection | Specifies the 10-minute overvoltage protection threshold. | V | [1 x Vn, 1.36 x Vn] |
| 4 | 10 minute OV protection time | Specifies the 10-minute overvoltage protection duration. | ms | [50, 7200000] |
| 5 | Level-1 OV protection | Specifies the level-1 overvoltage protection threshold. | V | [1 x Vn, 1.36 x Vn] |
| 6 | Level-1 OV protection time | Specifies the level-1 overvoltage protection duration. | ms | [50, 7200000] |
| 7 | Level-2 OV protection | Specifies the level-2 overvoltage protection threshold. | V | [1 x Vn, 1.36 x Vn] |
| 8 | Level-2 OV protection time | Specifies the level-2 overvoltage protection duration. | ms | [50, 7200000] |
| 9 | Level-1 UV protection | Specifies the level-1 undervoltage protection threshold. | V | [0.15 x Vn, 1 x Vn] |
| 10 | Level-1 UV protection time | Specifies the level-1 undervoltage protection duration. | ms | [50, 7200000] |
| 11 | Level-2 UV protection | Specifies the level-2 undervoltage protection threshold. | V | [0.15 x Vn, 1 x Vn] |
| 12 | Level-2 UV protection time | Specifies the level-2 undervoltage protection duration. | ms | [50, 7200000] |
| 13 | Level-1 OF protection | Specifies the level-1 overfrequency protection threshold. | Hz | [1 x Fn, 1.15 x Fn] |
| 14 | Level-1 OF protection time | Specifies the level-1 overfrequency protection duration. | ms | [50, 7200000] |
| 15 | Level-2 OF protection | Specifies the level-2 overfrequency protection threshold. | Hz | [1 x Fn, 1.15 x Fn] |
| 16 | Level-2 OF protection time | Specifies the level-2 overfrequency protection duration. | ms | [50, 7200000] |
| 17 | Level-1 UF protection | Specifies the level-1 underfrequency protection threshold. | Hz | [0.85 x Fn, 1 x Fn] |
| 18 | Level-1 UF protection time | Specifies the level-1 underfrequency protection duration. | ms | [50, 7200000] |

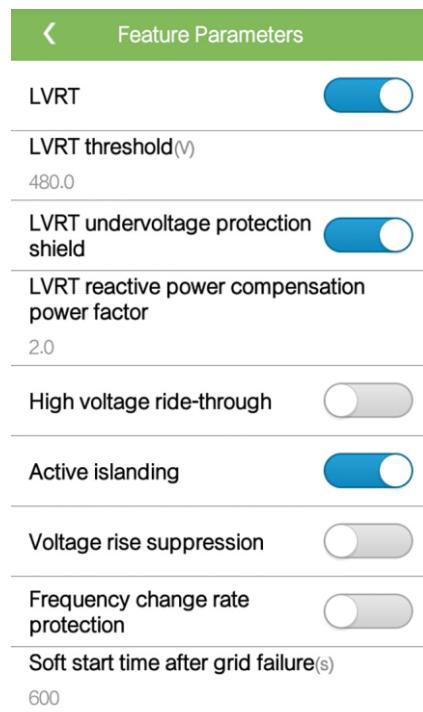
| No. | Parameter | Description | Unit | Value Range |
|-----|----------------------------|--|------|---------------------|
| 19 | Level-2 UF protection | Specifies the level-2 underfrequency protection threshold. | Hz | [0.85 x Fn, 1 x Fn] |
| 20 | Level-2 UF protection time | Specifies the level-2 underfrequency protection duration. | ms | [50, 7200000] |
| 21 | Level-3 OV protection | Specifies the level-3 overvoltage protection threshold. | V | [1 x Vn, 1.36 x Vn] |
| 22 | Level-3 OV protection time | Specifies the level-3 overvoltage protection duration. | ms | [50, 7200000] |
| 23 | Level-4 OV protection | Specifies the level-4 overvoltage protection threshold. | V | [1 x Vn, 1.36 x Vn] |
| 24 | Level-4 OV protection time | Specifies the level-4 overvoltage protection duration. | ms | [50, 7200000] |
| 25 | Level-3 UV protection | Specifies the level-3 undervoltage protection threshold. | V | [0.15 x Vn, 1 x Vn] |
| 26 | Level-3 UV protection time | Specifies the level-3 undervoltage protection duration. | ms | [50, 7200000] |
| 27 | Level-4 UV protection | Specifies the level-4 undervoltage protection threshold. | V | [0.15 x Vn, 1 x Vn] |
| 28 | Level-4 UV protection time | Specifies the level-4 undervoltage protection duration. | ms | [50, 7200000] |

7.2.2.3 Setting Feature Parameters

Procedure

Step 1 Choose **Function Menu > Settings > Feature Parameters** to access the parameters setting screen.

Figure 7-7 Feature Parameters (special user)



----End

Parameter List

NOTE

The default values in the following table vary depending on the grid code. The displayed values prevail.

| No. | Parameter | Description | Unit | Value Range | Remarks |
|-----|-------------------------------------|---|------|---|---------|
| 1 | LVRT | When the power grid voltage is abnormally low for a short time, the SUN2000 cannot disconnect from the power grid immediately and has to work for some time. This is called LVRT. | N/A | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 2 | LVRT threshold | Specifies the threshold for triggering LVRT. | V | [50% Vn, 92% Vn] | N/A |
| 3 | LVRT undervoltage protection shield | Specifies whether to shield the undervoltage protection function during LVRT. | N/A | <ul style="list-style-type: none"> • Disable • Enable | N/A |

| No. | Parameter | Description | Unit | Value Range | Remarks |
|-----|--|---|------|---|---|
| 4 | LVRT reactive power compensation power factor | During LVRT, the SUN2000 needs to generate reactive power to support the power grid. This parameter is used to set the reactive power generated by the SUN2000. | N/A | [0, 3] | For example, if you set LVRT reactive power compensation power factor to 2, the reactive power generated by the SUN2000 is 20% of the rated power when the AC voltage drops by 10% during LVRT. |
| 5 | High voltage ride-through | When the power grid voltage is abnormally high for a short time, the SUN2000 cannot disconnect from the power grid immediately and has to work for some time. This is called high voltage ride-through (HVRT). | N/A | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 6 | Active islanding | Specifies whether to enable the active islanding protection function. | N/A | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 7 | Voltage rise suppression | The standards of certain countries and regions require that the SUN2000 should prevent the grid voltage from rising by delivering reactive power and decreasing active power when the output voltage exceeds a certain value. | N/A | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 8 | Voltage rise suppression reactive adjustment point | The standards of certain countries and regions require that the SUN2000 must generate a certain amount of reactive power when the output voltage exceeds a certain value. | % | [100, 115] | <ul style="list-style-type: none"> • This parameter is displayed when Voltage rise suppression is set to Enable. • The value of Voltage rise suppression active derating point must be greater than that of Voltage rise suppression reactive adjustment point. |
| 9 | Voltage rise suppression active derating point | The standards of certain countries and regions require that the active power of the SUN2000 be derated according to a certain gradient when the output voltage exceeds a certain value. | % | [100, 115] | |

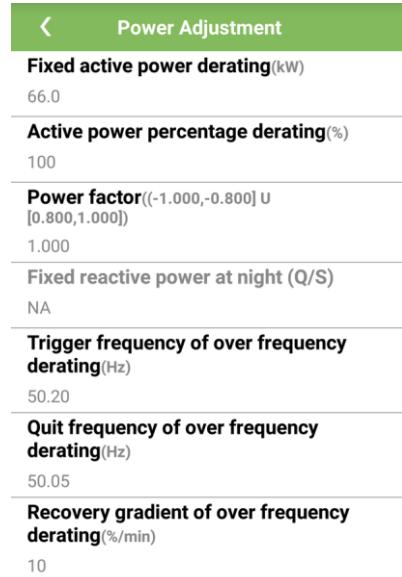
| No. | Parameter | Description | Unit | Value Range | Remarks |
|-----|--|---|------|---|--|
| 10 | Frequency change rate protection | The SUN2000 triggers protection when the power grid frequency changes too fast. | N/A | <ul style="list-style-type: none"> • Disable • Enable | N/A |
| 11 | Frequency change rate protection point | Specifies the frequency change rate protection threshold. | Hz/s | [0.1, 2.5] | This parameter is displayed if Frequency change rate protection is set to Enable . |
| 12 | Frequency change rate protection time | Specifies the frequency change rate protection duration. | s | [0.2, 20.0] | |
| 13 | Soft start time after grid failure | Specifies the time for the power to gradually increase when the SUN2000 restarts after the power grid recovers. | s | [20, 800] | N/A |

7.2.2.4 Setting Power Adjustment Parameters

Procedure

Step 1 Choose **Function Menu > Settings > Power Adjustment** to access the parameters setting screen.

Figure 7-8 Power Adjustment (special user)



----End

Parameter List

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|--|--|------|--|--|---|
| 1 | Fixed active power derating | Adjusts the active power output of the SUN2000 to a fixed value. | kW | Pmax_limit | [0, Pmax_limit] | N/A |
| 2 | Active power percentage derating | Adjusts the active power output of the SUN2000 to a percentage. | % | 100 | [0, 100] | If this parameter is set to 100 , the SUN2000 delivers power output based on the maximum output power. |
| 3 | Power factor | Adjusts the SUN2000 power factor. | N/A | 1.000 | (-1.000, -0.800]U[0.800, 1.000] | N/A |
| 4 | Trigger frequency of over frequency derating | The standards of certain countries and regions require that the output active power of the SUN2000 be derated when the grid frequency exceeds a certain value. | Hz | The default value varies depending on the grid code. The displayed value prevails. | <ul style="list-style-type: none"> When the output frequency is 50 Hz, the value range is 45.00–55.00 Hz. When the output frequency is 60 Hz, the value range is 55.00–65.00 Hz. | N/A |
| 5 | Quit frequency of over frequency derating | Specifies the frequency threshold for exiting overfrequency derating. | Hz | | <ul style="list-style-type: none"> When the output frequency is 50 Hz, the value range is 45.00–55.00 Hz. When the output frequency is 60 Hz, the value range is 55.00–65.00 Hz. | N/A |

| No. | Parameter | Description | Unit | Default Value | Value Range | Remarks |
|-----|--|---|-------|---------------|-------------|---------|
| 6 | Recovery gradient of over frequency derating | Specifies the power recovery gradient for overfrequency derating. | %/min | | [5, 20] | N/A |

8 System Maintenance

8.1 Routine Maintenance

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



CAUTION

- Before cleaning the system, and maintaining the cable connections and grounding reliability, power off the system (see [6.4 Powering Off the SUN2000](#)) and ensure that the two DC switches on the inverter are OFF.
- If you need to open the maintenance compartment door in rainy or snowy days, take protective measures to prevent rain and snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door in rainy or snowy days.

Table 8-1 Maintenance list

| Item | Check Method | Maintenance Interval |
|-----------------------|---|---------------------------|
| System cleanliness | Check periodically that the heat sinks are free from obstacles or dust. | Once six months to a year |
| System running status | <ul style="list-style-type: none">• Check that the inverter is not damaged or deformed.• Check that the running sound of the inverter is normal.• When the inverter is running, check that all inverter parameters are correctly set. | Once six months |

| Item | Check Method | Maintenance Interval |
|-----------------------|--|--|
| Cable connections | <ul style="list-style-type: none">• Check that cables are securely connected.• Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.• Check that the idle COM, USB, and AC OUTPUT ports are locked by waterproof caps. | The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year. |
| Grounding reliability | Check that ground cables are securely connected. | The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year. |

8.2 Troubleshooting

Alarm severities are defined as follows:

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

Table 8-2 Common alarms and troubleshooting measures

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|-----------------------|----------------|--|--|
| 103 | High DC Input Voltage | Major | <ul style="list-style-type: none"> • Cause ID = 1 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 1 and 2, and therefore the PV string open-circuit voltage exceeds the inverter maximum operating voltage. • Cause ID = 2 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 3 and 4, and therefore the PV string open-circuit voltage exceeds the inverter maximum operating voltage. • Cause ID = 3 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 5 and 6, and therefore the PV string open-circuit voltage exceeds the inverter maximum operating voltage. • Cause ID = 4 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 7 and 8, and therefore the PV string open-circuit voltage exceeds the inverter maximum operating voltage. | <ul style="list-style-type: none"> • Cause ID = 1 Reduce the number of PV modules connected in series to PV strings 1 and 2 until the open-circuit voltage is less than or equal to the maximum inverter operating voltage. After the PV array configuration is corrected, the inverter alarm disappears. • Cause ID = 2 Reduce the number of PV modules connected in series to PV strings 3 and 4 until the open-circuit voltage is less than or equal to the maximum inverter operating voltage. After the PV array configuration is corrected, the inverter alarm disappears. • Cause ID = 3 Reduce the number of PV modules connected in series to PV strings 5 and 6 until the open-circuit voltage is less than or equal to the maximum inverter operating voltage. After the PV array configuration is corrected, the inverter alarm disappears. • Cause ID = 4 Reduce the number of PV modules connected in series to PV strings 7 and 8 until the open-circuit voltage is less than or equal to the maximum inverter operating voltage. After the PV array configuration is corrected, the inverter alarm disappears. |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|---------------------|--|--|--|
| 106-113 | Abnormal String 1-8 | Warning | <p>Cause ID = 1</p> <ul style="list-style-type: none"> • The PV string is shielded from sunlight for a long time. • The PV string deteriorates or is damaged. | <ol style="list-style-type: none"> 1. Check whether the PV string current is obviously lower than the currents of other PV strings. 2. If yes, check whether the PV string is shielded from sunlight. 3. If the PV string is clean and not shielded from sunlight, check whether any PV module is faulty. |
| 120-127 | String 1-8 Reversed | Cause ID = 1: Major Cause ID = 2: Warning | <ul style="list-style-type: none"> • Cause ID = 1 The PV string is reversely connected. • Cause ID = 2 Only a few PV modules are connected in series to the PV string, and therefore the end voltage is lower than that of other PV strings. | <ul style="list-style-type: none"> • Cause ID = 1 Check whether the PV string is reversely connected to the inverter. If yes, turn off the two DC switches after the PV string voltage drops within the safe voltage range (lower than 60 V DC), and then correct the PV string connection. • Cause ID = 2 Check whether the number of PV modules connected in series to the inverter is small. If yes, increase the number. |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|---------------------|----------------|--|---|
| 200 | Abnormal DC Circuit | Major | <p>Abnormal external conditions trigger the protection for the DC circuit inside the inverter. The possible causes are as follows:</p> <ul style="list-style-type: none"> • Cause ID = 3 The inverter input is disconnected accidentally, or the PV string output power changes sharply because the PV string is shielded from sunlight. • Cause ID = 10 The three phases of the power grid are seriously unbalanced, which triggers the protection for the internal control circuit of the inverter. • Cause ID = 11 The power grid voltage changes sharply and the inverter input power fails to discharge in a short time, which increases the internal voltage and triggers overvoltage protection. • Cause ID = 12/15 An unrecoverable fault occurs on a circuit inside the inverter. | <p>Cause ID = 3/10/11</p> <ol style="list-style-type: none"> 1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 2. If the alarm persists, contact Huawei technical support. <p>Cause ID = 12/15</p> <p>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</p> |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|-------------------------|----------------|---|---|
| 202 | Abnormal Invert Circuit | Major | <p>Abnormal external conditions trigger the protection for the inverter circuit inside the inverter. The possible causes are as follows:</p> <ul style="list-style-type: none"> • Cause ID = 13 The power grid voltage drops dramatically or the power grid is short-circuited, which damages the internal voltage detection circuit in the inverter. • Cause ID = 14 The power 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. • Cause ID = 16 The DC current in the power grid exceeds the upper threshold. • Cause ID = 20 The inverter output is short-circuited. As a result, the output current surges to a value above the upper limit, and the inverter protection is triggered. | <p>Cause ID = 13/14/16</p> <ol style="list-style-type: none"> 1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 2. If the alarm persists, contact Huawei technical support. <p>Cause ID = 20</p> <ol style="list-style-type: none"> 1. Check the inverter output cable for short-circuits. 2. If the alarm persists, contact Huawei technical support. |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|-----------------------|-----------------------|----------------|---|---|
| 301 | Abnormal Grid Voltage | Major | <p>The power grid voltage is beyond the acceptable range. The possible causes are as follows:</p> <ul style="list-style-type: none"> • Cause ID = 4 The power grid voltage is below the specified lower threshold. • Cause ID = 16 The power grid voltage exceeds the specified upper threshold. • Cause ID = 19 The power grid voltage has exceeded the specified upper threshold for 10 minutes. • Cause ID = 26 The power grid voltage exceeds the specified upper threshold. • Cause ID = 28 The three phases of the power grid differ greatly in voltage. • Cause ID = 29 <ol style="list-style-type: none"> 1. The power grid experiences an outage. 2. The AC circuit is disconnected or AC switch is off. • Cause ID = 31 The impedance of the output phase wire A to the PE cable is low or short-circuited. • Cause ID = 32 The impedance of the output phase wire B to the PE cable is low or short-circuited. • Cause ID = 33 The impedance of the output phase wire C to the PE cable is low or short-circuited. | <p>Cause ID = 4</p> <ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 APP, SmartLogger, or the NetEco to modify the power grid overvoltage and 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. <p>Cause ID = 16/19/26</p> <ol style="list-style-type: none"> 1. Check whether the grid-tied voltage exceeds the upper threshold. If yes, contact the local power operator. 2. If you have confirmed that the grid-tied voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage and undervoltage protection thresholds. 3. Check whether the peak power grid voltage exceeds the upper threshold. <p>Cause ID = 28</p> <ol style="list-style-type: none"> 1. If the exception is caused by an external fault, the inverter automatically recovers after the fault is rectified. 2. If the alarm persists and affects the energy yield of the power station, contact the local power operator. <p>Cause ID = 29</p> <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. |
| Issue 05 (2018-03-15) | | | Huawei Proprietary and Confidential Copyright © Huawei Technologies Co., Ltd. | 101 Cause ID = 31 Check the impedance of output phase wire A to the PE cable, locate the position with lower impedance, and resolve the issue. |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|---------------------------|----------------|---|--|
| 305 | Abnormal Grid Frequency | Major | <ul style="list-style-type: none"> • Cause ID = 2 The actual power grid frequency is higher than the standard requirement for the local power grid. • Cause ID = 4 The actual power grid frequency is lower than the standard requirement for the local power grid. • Cause ID = 5 The actual change rate of the power grid frequency does not meet the standard requirement for the local power grid. | <p>Cause ID = 2/4</p> <ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 app, SmartLogger, or NMS to modify the power grid overfrequency and underfrequency protection thresholds with the consent of the local power operator. <p>Cause ID = 5</p> <ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator. |
| 313 | Low Insulation Resistance | Major | <p>Cause ID = 1</p> <ul style="list-style-type: none"> • A short circuit occurs between the PV string and the PGND cable. • The PV string is installed in a moist environment for a long time. | <ol style="list-style-type: none"> 1. Check the impedance between the PV string and the PGND cable. If a short circuit occurs, rectify the fault. 2. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, log in to the SUN2000 app, SmartLogger, or NMS and set Insulation resistance protection. |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|----------------------------|----------------|---|---|
| 318 | Abnormal Residual Current | Major | Cause ID = 1 The insulation resistance against the PGND cable at the input side decreases when the inverter is running, which causes an excessively high residual current. | 1. If the alarm occurs accidentally, the external circuit may be abnormal temporarily. The inverter automatically recovers after fault is rectified. 2. If the alarm occurs repeatedly or persists, check whether the impedance between the PV string and the ground is excessively low. |
| 321 | Cabinet Overtemperature | Major | Cause ID = 1 <ul style="list-style-type: none">• The inverter is installed in a place with poor ventilation.• The ambient temperature exceeds the upper threshold.• The internal fan works abnormally. | 1. Check the ventilation and ambient temperature of the inverter installation position. 2. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 3. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support. |
| 322 | Abnormal SPI Communication | Major | Cause ID = 1 An unrecoverable fault occurs on a circuit inside the inverter. | Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support. |
| 326 | Abnormal Grounding | Major | Cause ID = 1 <ul style="list-style-type: none">• The PGND cable does not connect to the inverter.• The SUN2000 output side does not connect to an isolation transformer when the PV string output is grounded. | 1. Check that the PGND cable properly connects to the inverter. 2. If the PV string output is grounded, check that the SUN2000 output side connects to an isolation transformer. |
| 400 | System Fault | Major | Cause ID = 1/3/21/23/27 An unrecoverable fault occurs on a circuit inside the inverter. | Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support. |

| Alarm ID | Alarm Name | Alarm Severity | Possible Cause | Suggestion |
|----------|-------------------------------|----------------|---|---|
| 410 | Abnormal Auxiliary Power | Major | <p>Cause ID = 4</p> <p>The sampling control board has an abnormal voltage, which may be caused by the following:</p> <ul style="list-style-type: none"> • The internal power chip of the sampling control board is faulty. • The detection circuit becomes faulty. | <ol style="list-style-type: none"> 1. When the alarm is generated, the inverter shuts down automatically. When the fault is rectified, the inverter starts automatically. 2. If the alarm persists, contact Huawei technical support. |
| 413 | Abnormal PV String Connection | Major | <p>Cause ID = 1</p> <p>The PV string does not properly connect to the MPPT1 circuit.</p> <p>Cause ID = 2</p> <p>The PV string does not properly connect to the MPPT2 circuit.</p> <p>Cause ID = 3</p> <p>The PV string does not properly connect to the MPPT3 circuit.</p> <p>Cause ID = 4</p> <p>The PV string does not properly connect to the MPPT4 circuit.</p> | Check the PV string for reverse connection and cross connection. |
| 504 | Software Version Unmatch | Minor | <p>Cause ID = 1/2/3</p> <p>During inverter software upgrade, the version of the software loaded is incorrect.</p> | Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again. |
| 505 | Upgrade Failed | Major | <p>Cause ID = 1</p> <p>The upgrade does not end normally.</p> | Perform the upgrade again. |
| 61440 | Flash Fault | Minor | <p>Cause ID = 1</p> <ul style="list-style-type: none"> • The flash memory is insufficient. • The flash memory has bad sectors. | <ol style="list-style-type: none"> 1. Replace the monitoring board. 2. If the monitoring board is built into the monitoring device, replace the monitoring device. |



If you cannot rectify faults with the measures listed in the preceding table, contact Huawei technical support.

9

Handling the Inverter

9.1 Removing the SUN2000



NOTICE

Before removing the SUN2000, disconnect both AC and DC connections. For processes of disconnecting, see [6.4 Powering Off the SUN2000](#). After powering off the SUN2000, wait at least 5 minutes before performing operations on it.

Perform the following operations to remove the SUN2000:

1. Disconnect all cables from the SUN2000, including RS485 communications cables, DC input power cables, AC output power cables, and PGND cables.
2. Remove the SUN2000 from the mounting bracket.
3. Remove the mounting bracket.

9.2 Packing the SUN2000

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

9.3 Disposing of the SUN2000

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

10 Technical Specifications

Efficiency

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|---------------------|-------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Maximum efficiency | 99.00% | 99.00% | | | |
| Chinese efficiency | 98.50% | N/A | | | |
| European efficiency | N/A | 98.80% | | | |

Input

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|---|-------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Maximum input voltage | 1500 V | | | | |
| Maximum input current (per MPPT) | 22 A | | | | |
| Maximum short-circuit current (per MPPT) | 30 A | | | | |
| Maximum inverter backfeed current to the PV array | 0A | | | | |

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|-----------------------------------|-------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Minimum operating/startup voltage | 600 V/650 V | | | | |
| Highest operating voltage | 1500 V | | | | |
| MPPT voltage range | 600–1450 V | | | | |
| Full power MPPT voltage range | 880–1275 V | | | | |
| Rated input voltage | 1080 V | | | | |
| Number of inputs | 8 | | | | |
| Number of MPP trackers | 4 | | | | |

Output

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|---|-------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Rated active power | 60,000 W | 55,000 W | 55,000 W | 55,000 W | 60,000 W |
| Maximum apparent power | 66,000 VA | 60,000 VA | 66,000 VA | 66,000 VA | 66,000 VA |
| Maximum active power ($\cos\phi = 1$) | 66,000 W | 60,000 W | 66,000 W | 66,000 W | 66,000 W |
| Rated output line voltage | 800 V AC, 3W+PE | | | | |
| Rated output current | 43.3 A | 39.7 A | 39.7 A | 39.7 A | 43.3 A |
| Adapted grid frequency | 50 Hz/60 Hz | | | | |
| Maximum output current | 48 A | 43.7 A | 48 A | 48 A | 48 A |

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|---|-----------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Power factor | 0.8 leading ... 0.8 lagging | | | | |
| Maximum total harmonic distortion (rated power) | < 3% | | | | |

Protection

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|---|-------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Input DC switch | Supported | | | | |
| Islanding protection | Supported | | | | |
| Output overcurrent protection | Supported | | | | |
| Input reverse polarity protection | Supported | | | | |
| PV string fault detection | Supported | | | | |
| DC surge protection | Type II | | | | |
| AC surge protection | Type II | | | | |
| Insulation resistance detection | Supported | | | | |
| Residual current monitoring unit (RCMU) | Supported | | | | |

Display and Communication

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 |
|---------|---|-------------------------|----------------------------|---------------------------------|---------------------------------|
| Display | LED, Bluetooth module+app, USB data cable+app | | | | |
| RS485 | Supported | | | | |
| PLC | Supported | | | | |

Common Parameters

| Item | SUN2000-60K TL-HV-D1 | SUN2000-55K TL-HV-D1 | SUN2000-55K TL-IN-HV-D1 | SUN2000-55K TL-HV-D1-00 1 | SUN2000-60K TL-HV-D1-00 1 | | | | |
|----------------------------|--|-------------------------|----------------------------|---------------------------------|---------------------------------|--|--|--|--|
| Dimensions (W x H x D) | 930 mm x 600 mm x 270 mm | | | | | | | | |
| Weight | About 63 kg | About 62 kg | | | | | | | |
| Operating temperature | -25°C to +60°C | | | | | | | | |
| Cooling mode | Natural convection | | | | | | | | |
| Maximum operating altitude | 4000 m | | | | | | | | |
| Humidity | 0%–100% RH | | | | | | | | |
| Input terminal | Amphenol UTX | | | | | | | | |
| Output terminal | Waterproof cable connector+OT terminal | | | | | | | | |
| Ingress Protection Rating | IP65 | | | | | | | | |
| Topology | Transformerless | | | | | | | | |

A Grid Codes



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

[Table A-1](#) lists the grid codes that the SUN2000-60KTL-HV-D1 supports.

Table A-1 Grid codes (for the SUN2000-60KTL-HV-D1)

| No. | Grid Code | Description |
|-----|----------------------|----------------------------------|
| 1 | CHINA_MV800 | China medium-voltage power grid |
| 2 | G59-England-MV800 | G59 medium-voltage power grid |
| 3 | ABNT NBR 16149-MV800 | Brazil medium-voltage power grid |
| 4 | UTE C 15-712-1-MV800 | France power grid |

[Table A-2](#) lists the grid codes that the SUN2000-55KTL-HV-D1 supports.

Table A-2 Grid codes (for the SUN2000-55KTL-HV-D1)

| No. | Grid Code | Description |
|-----|----------------------|-------------------------------------|
| 1 | G59-England-MV800 | G59 medium-voltage power grid |
| 2 | AS4777-MV800 | Australia medium-voltage power grid |
| 3 | IEC61727-MV800 | IEC61727 medium-voltage power grid |
| 4 | BDEW-MV800 | Germany medium-voltage power grid |
| 5 | ABNT NBR 16149-MV800 | Brazil medium-voltage power grid |
| 6 | UTE C 15-712-1-MV800 | France power grid |
| 7 | EN50438-TR-MV800 | Turkey power grid |
| 8 | NRS-097-2-1-MV800 | South Africa power grid |
| 9 | DUBAI-MV800 | Dubai power grid |

| No. | Grid Code | Description |
|-----|------------------------|-----------------------------------|
| 10 | Northern Ireland-MV800 | Northern Ireland power grid |
| 11 | CEI0-21-MV800 | Italy power grid |
| 12 | IEC 61727-MV800-60Hz | General |
| 13 | Pakistan-MV800 | Pakistan power grid |
| 14 | Israel-MV800 | Israel power grid |
| 15 | CEI0-16-MV800 | Italy medium-voltage power grid |
| 16 | AUSTRALIA-NER-MV800 | Australia NER standard power grid |
| 17 | VDE-AR-N4120_HV800 | VDE4120 standard power grid |

[Table A-3](#) lists the grid codes that the SUN2000-55KTL-IN-HV-D1 supports.

Table A-3 Grid codes (for the SUN2000-55KTL-IN-HV-D1)

| No. | Grid Code | Description |
|-----|----------------------|-------------------------------------|
| 1 | G59-England-MV800 | G59 medium-voltage power grid |
| 2 | AS4777-MV800 | Australia medium-voltage power grid |
| 3 | INDIA-MV800 | India medium-voltage power grid |
| 4 | IEC61727-MV800 | IEC61727 medium-voltage power grid |
| 5 | BDEW-MV800 | Germany medium-voltage power grid |
| 6 | ABNT NBR 16149-MV800 | Brazil medium-voltage power grid |
| 7 | UTE C 15-712-1-MV800 | France power grid |
| 8 | EN50438-TR-MV800 | Turkey power grid |
| 9 | NRS-097-2-1-MV800 | South Africa power grid |
| 10 | DUBAI-MV800 | Dubai power grid |
| 11 | CEI0-21-MV800 | Italy power grid |
| 12 | IEC 61727-MV800-60Hz | General |
| 13 | CEI0-16-MV800 | Italy medium-voltage power grid |
| 14 | VDE-AR-N4120_HV800 | VDE4120 standard power grid |

[Table A-4](#) lists the grid codes that the SUN2000-55KTL-HV-D1-001 supports.

Table A-4 Grid codes (for the SUN2000-55KTL-HV-D1-001)

| No. | Grid Code | Description |
|-----|---------------------------|--|
| 1 | G59-England-MV800 | G59 medium-voltage power grid |
| 2 | AS4777-MV800 | Australia medium-voltage power grid |
| 3 | IEC61727-MV800 | IEC61727 medium-voltage power grid |
| 4 | BDEW-MV800 | Germany medium-voltage power grid |
| 5 | ABNT NBR 16149-MV800 | Brazil medium-voltage power grid |
| 6 | UTE C 15-712-1-MV800 | France power grid |
| 7 | EN50438-TR-MV800 | Turkey power grid |
| 8 | NRS-097-2-1-MV800 | South Africa power grid |
| 9 | SA_RPPs-MV800 | South Africa power grid |
| 10 | Jordan-Transmission-MV800 | Jordan power grid |
| 11 | Jordan-Distribution-MV800 | Jordan power grid |
| 12 | Egypt ETEC-MV800 | Egypt power grid |
| 13 | DUBAI-MV800 | Dubai power grid |
| 14 | SAUDI-MV800 | Saudi Arabia power grid |
| 15 | CEI0-21-MV800 | Italy power grid |
| 16 | IEC 61727-MV800-60Hz | General |
| 17 | Israel-MV800 | Israel power grid |
| 18 | CEI0-16-MV800 | Italy medium-voltage power grid |
| 19 | ZAMBIA-MV800 | Zambia medium-voltage power grid |
| 20 | KENYA_ETHIOPIA_MV800 | Kenya medium-voltage power grid and Ethiopia medium-voltage power grid |
| 21 | NAMIBIA_MV800 | Namibia power grid |
| 22 | Cameroon-MV800 | Cameroon medium-voltage power grid |
| 23 | NIGERIA-MV800 | Nigeria medium-voltage power grid |
| 24 | ABUDHABI-MV800 | Abu Dhabi medium-voltage power grid |
| 25 | LEBANON-MV800 | Lebanon medium-voltage power grid |
| 26 | Jordan-Transmission-HV800 | Jordan high-voltage power grid |
| 27 | TUNISIA-MV800 | Tunisia medium-voltage power grid |
| 28 | VDE-AR-N4120_HV800 | VDE4120 standard power grid |

| No. | Grid Code | Description |
|-----|-----------------|---------------------------------|
| 29 | IEEE 1547-MV800 | General |
| 30 | Nicaragua-MV800 | Nicaragua power grid |
| 31 | Ghana-MV800 | Ghana medium-voltage power grid |

Table A-5 lists the grid codes that the SUN2000-60KTL-HV-D1-001 supports.

Table A-5 Grid codes (for the SUN2000-60KTL-HV-D1-001)

| No. | Grid Code | Description |
|-----|------------------------|-------------------------------------|
| 1 | G59-England-MV800 | G59 medium-voltage power grid |
| 2 | AS4777-MV800 | Australia medium-voltage power grid |
| 3 | IEC61727-MV800 | IEC61727 medium-voltage power grid |
| 4 | BDEW-MV800 | Germany medium-voltage power grid |
| 5 | ABNT NBR 16149-MV800 | Brazil medium-voltage power grid |
| 6 | UTE C 15-712-1-MV800 | France power grid |
| 7 | Chile-MV800 | Chile power grid |
| 8 | Mexico-MV800 | Mexico power grid |
| 9 | EN50438-TR-MV800 | Turkey power grid |
| 10 | TAI-PEA-MV800 | Thailand power grid |
| 11 | Philippines-MV800 | Philippines power grid |
| 12 | Malaysian-MV800 | Malaysia power grid |
| 13 | NRS-097-2-1-MV800 | South Africa power grid |
| 14 | DUBAI-MV800 | Dubai power grid |
| 15 | EN50438_IE-MV800 | Ireland power grid |
| 16 | CLC/TS50549-MV800 | Ireland power grid |
| 17 | Northern Ireland-MV800 | Northern Ireland power grid |
| 18 | CEI0-21-MV800 | Italy power grid |
| 19 | IEC 61727-MV800-60Hz | General |
| 20 | BRASIL-ANEEL-MV800 | Brazil power grid |
| 21 | CEI0-16-MV800 | Italy medium-voltage power grid |
| 22 | ARGENTINA-MV800 | Argentina medium-voltage power grid |
| 23 | JAMAICA-MV800 | Jamaica medium-voltage power grid |

| No. | Grid Code | Description |
|-----|--------------------|--|
| 24 | VDE-AR-N4120_HV800 | VDE4120 standard power grid |
| 25 | RD1699/661-MV800 | Spain medium-voltage power grid |
| 26 | PO12.3-MV800 | Spain medium-voltage power grid |
| 27 | Vietnam-MV800 | Vietnam medium-voltage power grid |
| 28 | Chile-PMGD-MV800 | Chile PMGD medium-voltage power grid |
| 29 | TAIPOWER-MV800 | Taiwan power medium-voltage power grid |

B Acronyms and Abbreviations

C

CCO central controller

L

LED light emitting diode

M

MPP maximum power point

MPPT maximum power point tracking

P

PID potential induced degradation

PLC power line communication

PV photovoltaic

R

RCD residual current device

W

WEEE waste electrical and electronic equipment