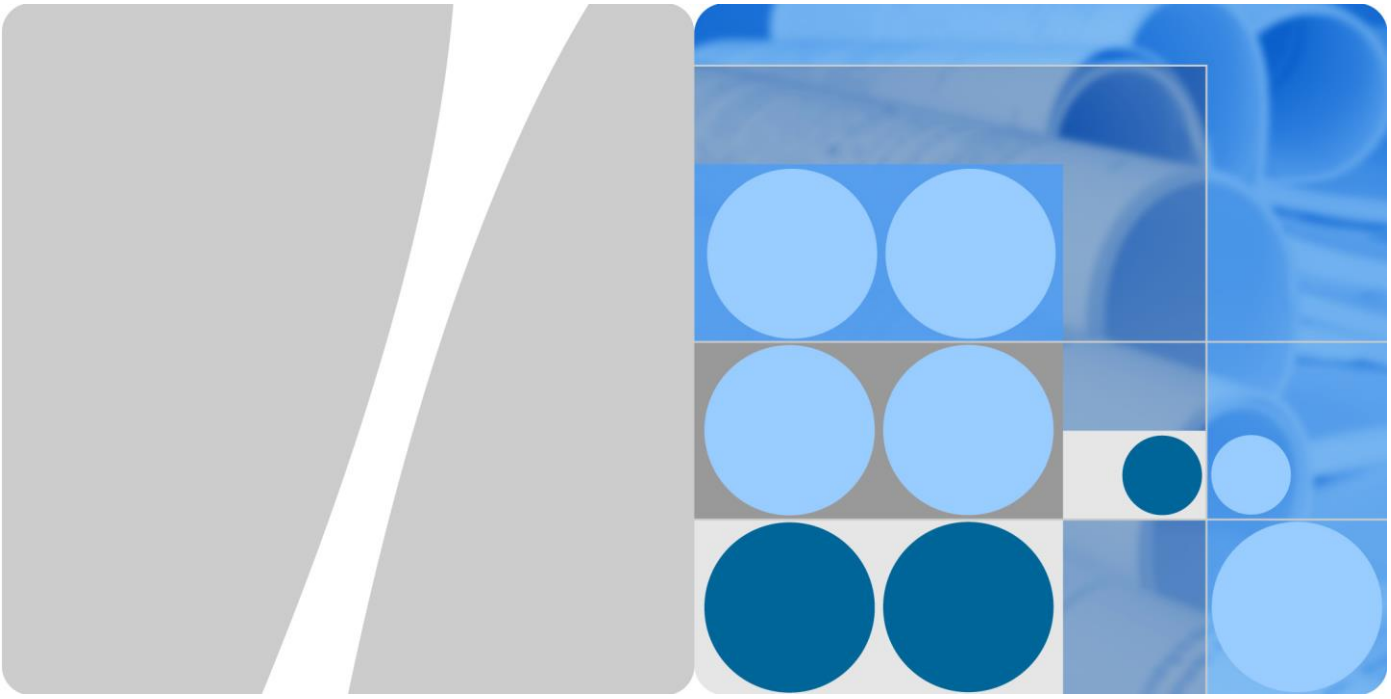

SUN2000-45KTL-US-HV-D0

User Manual

Issue 04

Date 2018-06-01

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About This Document

Purpose

This document describes the SUN2000-45KTL-US-HV-D0 (SUN2000 for short) in terms of its 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.
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 04 (2018-06-01)

Changed **Supported Power Grids** in 2.1 Introduction to **Supported Power Grid Earthing Systems**. Added three power grid earthing systems supported by the SUN2000. Deleted the description that "The SUN2000 only supports the IT power grid mode" and that "The SUN2000 is mainly used for medium-voltage power grids. It delivers three-phase, three-wire output, which is then fed to a medium-voltage power grid through a step-up transformer."

Issue 03 (2018-05-05)

Updated **Supported Power Grids** in 2.1 Introduction. Added the description that "The SUN2000 can be configured in common transformer secondary winding scenarios, such as grounded Y, neutral ungrounded Y, and delta (floating). For any other transformer configuration, contact Huawei technical support."

Added the description about the metal stamping forming contact in 6.5 Connecting DC Input Power Cables.

Issue 02 (2017-10-30)

Updated 3 Storage.

Updated 5.1 Crimping the OT Terminal.

Updated 6.3.1 Connecting a Ground Cable to the PE Point (Bonding).

Updated 11 Technical Specifications.

Issue 01 (2017-03-10)

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

Contents

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 (7.87 in.), 300 mm (11.81 in.), 500 mm (19.69 in.), 600 mm (23.62 in.), and 1000 mm (39.37 in.) 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 (28.74 in.) 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 60ºC (140°F).
- 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 protective shoes.

2 Overview

2.1 Introduction

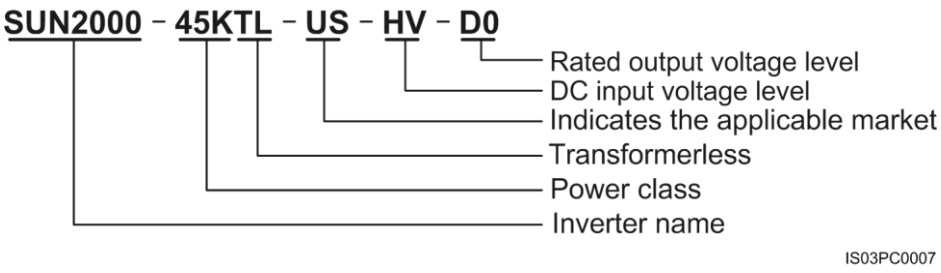
Function

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 describes the model number.

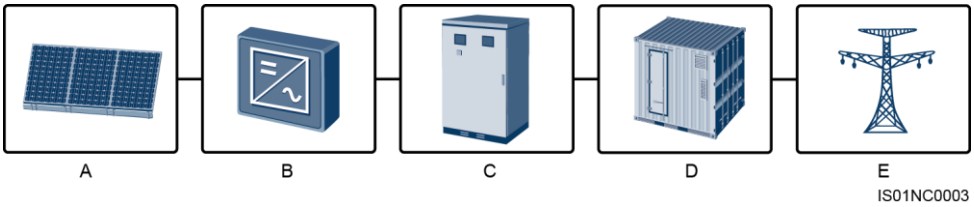
Figure 2-1 Model number description



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 2-2 Network application

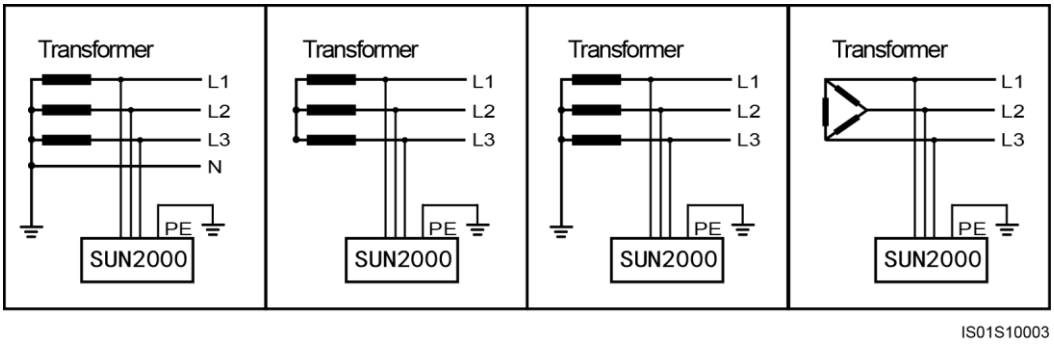


(A) PV string
(B) SUN2000
(C) ACDU
(D) Step-up transformer
(E) Power grid

Supported Power Grid Earthing Systems

The following figure shows the power grid earthing systems supported by the SUN2000.

Figure 2-3 Power Grid Earthing System



NOTE

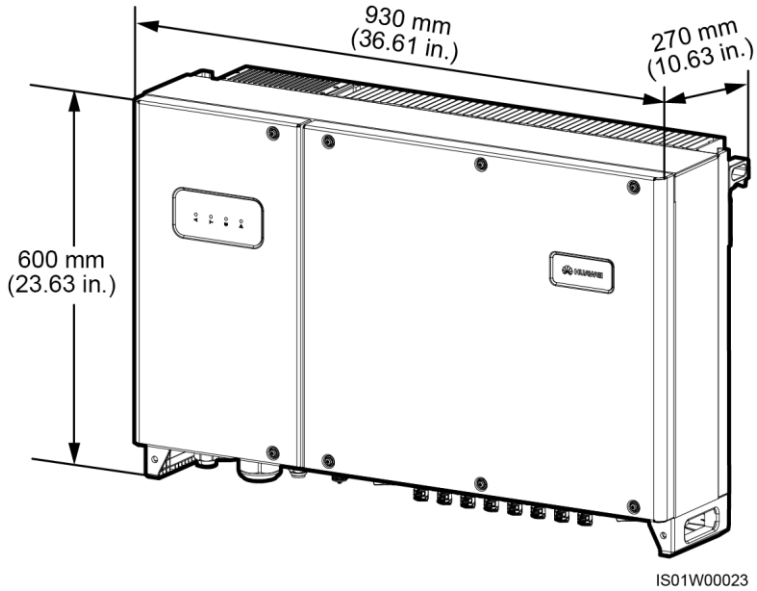
The SUN2000 can be installed in common transformer secondary winding configuration such as neutral grounded Y, neutral ungrounded Y, delta (floating). For any other transformer configuration, please contact Huawei.

2.2 Appearance

SUN2000 Dimensions

Figure 2-4 shows the SUN2000 dimensions.

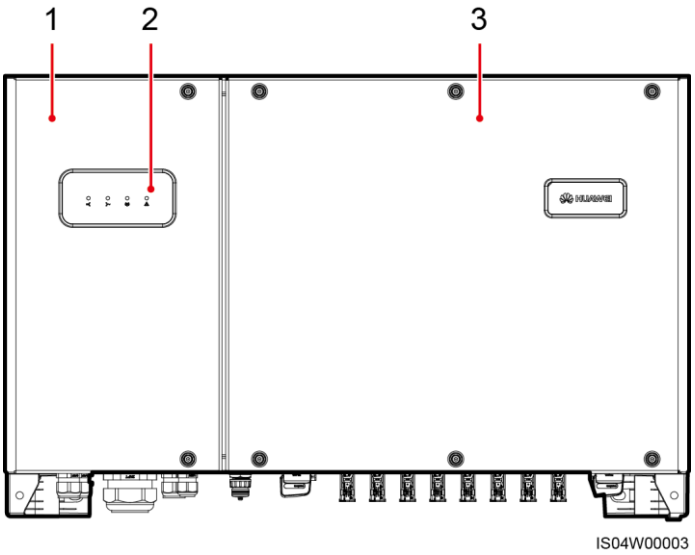
Figure 2-4 SUN2000 dimensions



Front view

Figure 2-5 shows the SUN2000 front view.

Figure 2-5 Front view



(1) Maintenance compartment door (2) LED indicators (3) Host panel cover

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 MPPT circuit is higher than or equal to 600 V.
		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 has connected to the power grid.
	Off		The SUN2000 does not connect to the power grid.
Communication indicator 	Blinking green		The SUN2000 receives data over RS485 or PLC communication.
	Off		The SUN2000 has not received data over RS485 or 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.
		Blinking green at short intervals (on	Local maintenance fails.

Indicator	Status		Meaning
		for 0.125s and then off for 0.125s)	
		Steady green	Local maintenance succeeds.

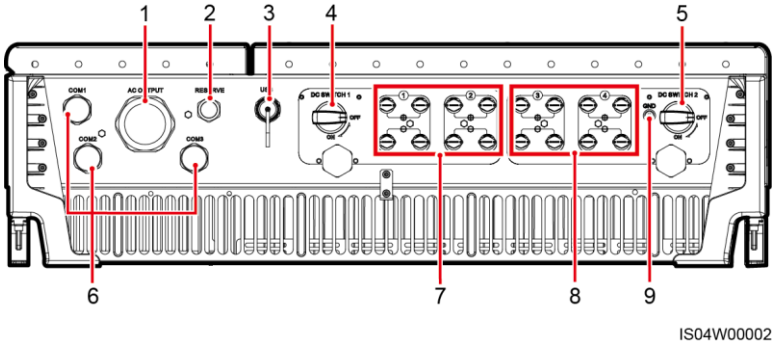
NOTE

- 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 2-6 shows the SUN2000 bottom view.

Figure 2-6 Bottom view



No.	Component Name	Description	Silk Screen
1	Waterproof cable connector	Inner diameter: 37–44 mm (1.46–1.73 in.)	AC OUTPUT
2	Waterproof cable connector	Inner diameter: 10–15 mm (0.39–0.59 in.)	RESERVE
3	USB port	N/A	USB
4	DC switch 1	N/A	DC SWITCH 1
5	DC switch 2	N/A	DC SWITCH 2
6	Waterproof cable connector	Inner diameter: 14–18 mm (0.55–0.71 in.)	COM1, COM2, COM3

No.	Component Name	Description	Silk Screen
7	DC input terminal	Controlled by DC SWITCH 1	+/–
8	DC input terminal	Controlled by DC SWITCH 2	+/–
9	PV side ground point	N/A	GND

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

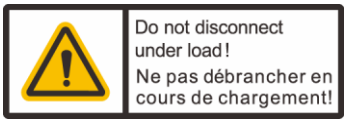
2.3 Label Description

Symbols

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

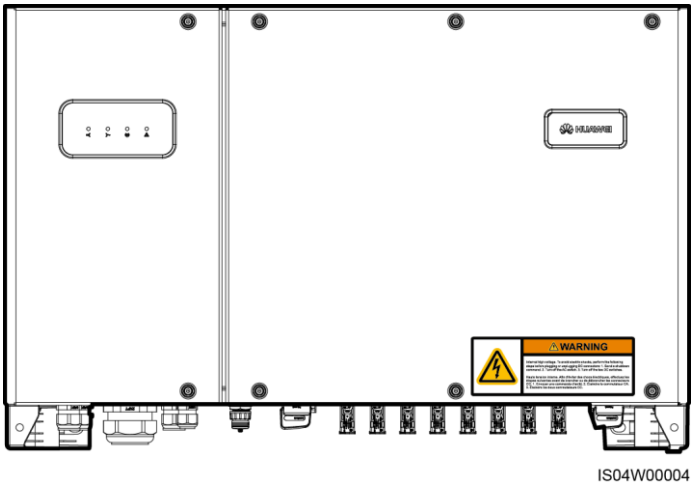
Table 2-2 Label description

Symbol	Name	Meaning
	Electric shock	• Lethal voltages 1500 V DC. Keep out. • No user serviceable parts inside. Only trained service personnel are allowed access. • Both AC and DC voltage sources are terminated inside this equipment. Each circuit must be disconnected before servicing. • When the photovoltaic array is exposed to light, it supplies DC voltage to this equipment. • The DC conductors of this photovoltaic system are ungrounded and may be energized. • The DC conductors of this photovoltaic system are normally ungrounded but will become intermittently grounded without indication when the SUN2000 measures the PV array isolation.
	Burn warning	Do not touch a running SUN2000 because it generates high temperatures on the shell.

Symbol	Name	Meaning
	Delay discharge	• High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. • Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.
	Transformerless inverter	The SUN2000 output does not pass through an isolation transformer.
	Grounding	Indicates the position for connecting the protection ground cable.
	Operation warning	Do not remove the DC input connector when the SUN2000 is running.
	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.

Symbol	Name	Meaning
	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 2-7. You can also select an appropriate place for attaching the label based on site requirements.		

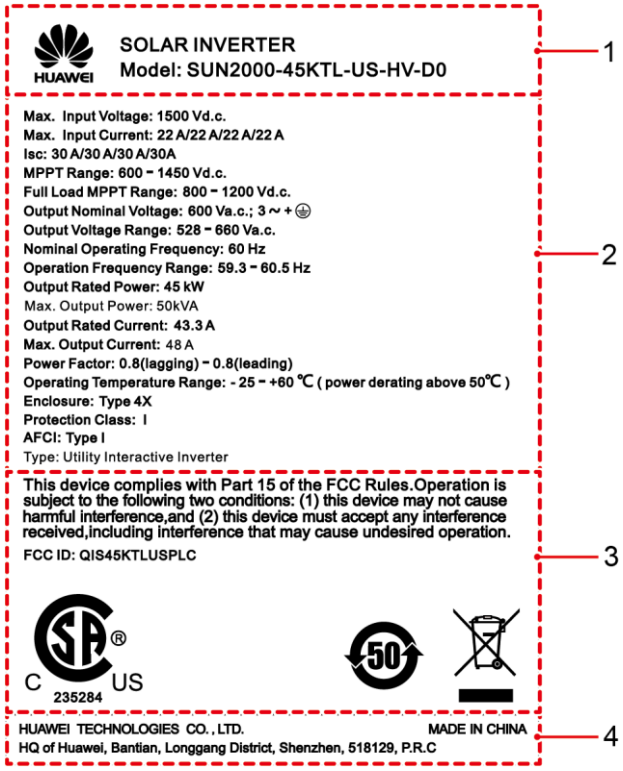
Figure 2-7 Place for attaching



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 2-8.

Figure 2-8 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
This device complies with Part 15 of the FCC Rules.Operation is subject to the following two conditions: (1) this device may not cause harmful interference,and (2) this device must accept any interference received,including interference that may cause undesired operation.	American FCC Part 15B certification	The SUN2000 complies with FCC Part 15B certification standards.
FCC ID: QIS40KTLUSPLC	American FCC Part 15G certification	The SUN2000 complies with FCC Part 15G certification standards.
C US 235284	CSA certification of America and Canada	The SUN2000 complies with CSA certification standards.
50	EFUP label	The SUN2000 does not pollute the environment during the specified

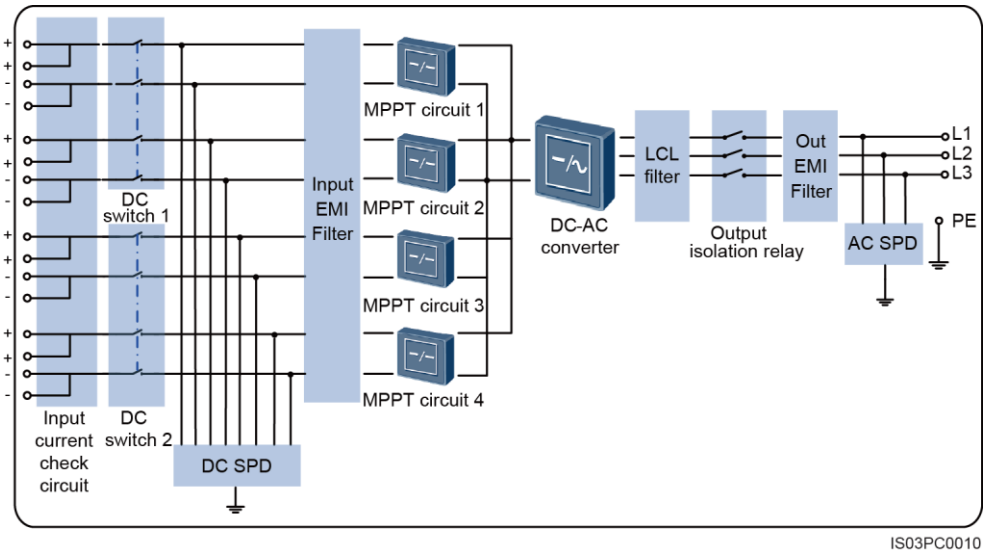
Symbol	Name	Meaning
		period.
	EU waste electrical and electronic equipment (WEEE) label	Do not dispose of the SUN2000 as household garbage.

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 2-9 shows the SUN2000 conceptual diagram.

Figure 2-9 SUN2000 conceptual diagram



Working Modes

The SUN2000 can work in standby, operating, or shutdown mode. Figure 2-10 shows the relationship between the three working modes.

Figure 2-10 SUN2000 working modes

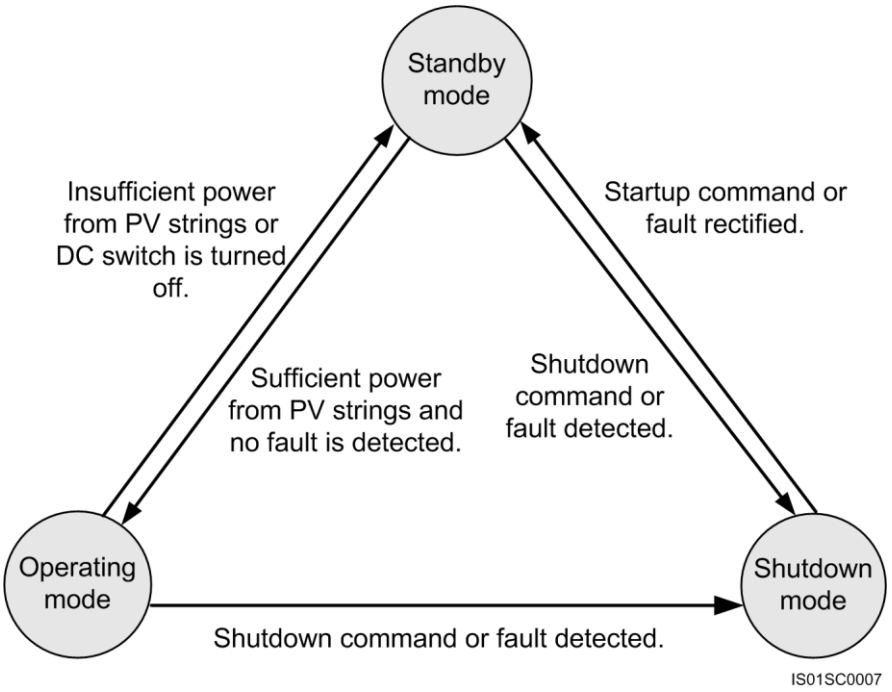


Table 2-4 describes the three working modes shown in Figure 2-10.

Table 2-4 Working mode description

Working Mode	Description
Standby	The SUN2000 enters the standby mode when the external environment does not meet the requirements for starting the SUN2000. In standby mode: • 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	In operating mode: • The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid. • The SUN2000 tracks the maximum power point to maximize the PV string output. • 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.
Shutdown	• 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 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 (–40°F) to +70°C (+158°F) and the humidity at 5%–95% RH.
- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of five SUN2000s can be stacked.
- Periodic inspections are required during the storage. Replace the packing materials as necessary.
- If the SUN2000 has been long-term stored, inspections and tests should be conducted by qualified personnel before put into use.

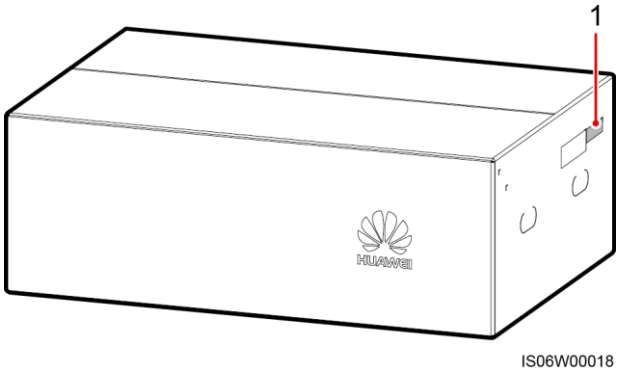
4 Installation

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

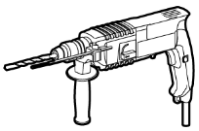
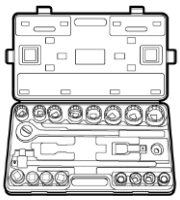
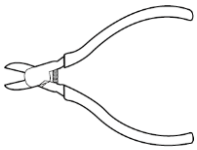
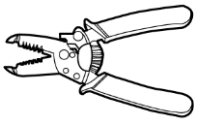
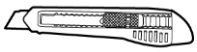
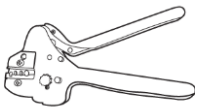
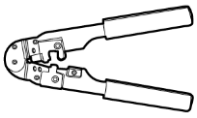
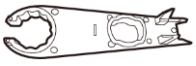
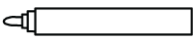
NOTE
You are advised to remove the packing materials within 24 hours before installing the inverter.

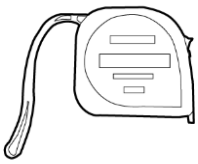
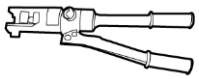
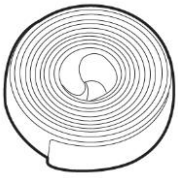
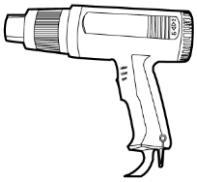
Package Contents

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.

NOTE
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 (0.55 in.) and Φ16 mm (0.63 in.)	 Socket wrench	 Torque wrench
	 Diagonal pliers	 Wire stripper	 Flat-head screwdriver Head: 0.6 mm x 3.5 mm (0.02 in. x 0.14 in.)
	 Rubber mallet	 Utility knife	 Cable cutter
	 Crimping tool Model: H4TC0001 or H4TC0002; manufacturer: Amphenol	 RJ45 crimping tool	 Removal wrench Model: H4TW0001; manufacturer: AMPHENOL
	 Vacuum cleaner	 Multimeter DC voltage measurement range ≥ 1500 V DC	 Marker

Category	Materials		
	 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

NOTE

H4TC0001 is used to crimp metal cold forming contacts, while H4TC0002 is used to crimp metal stamping forming contacts.

4.3 Determining the Installation Position

Basic Requirements

- The SUN2000 is protected to Type 4X 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.

Installation Environment Requirements

- The SUN2000 must be installed in a well-ventilated environment to ensure good heat dissipation.

- When installed under direct sunlight, performance de-rate may be initiated due to additional temperature rise.

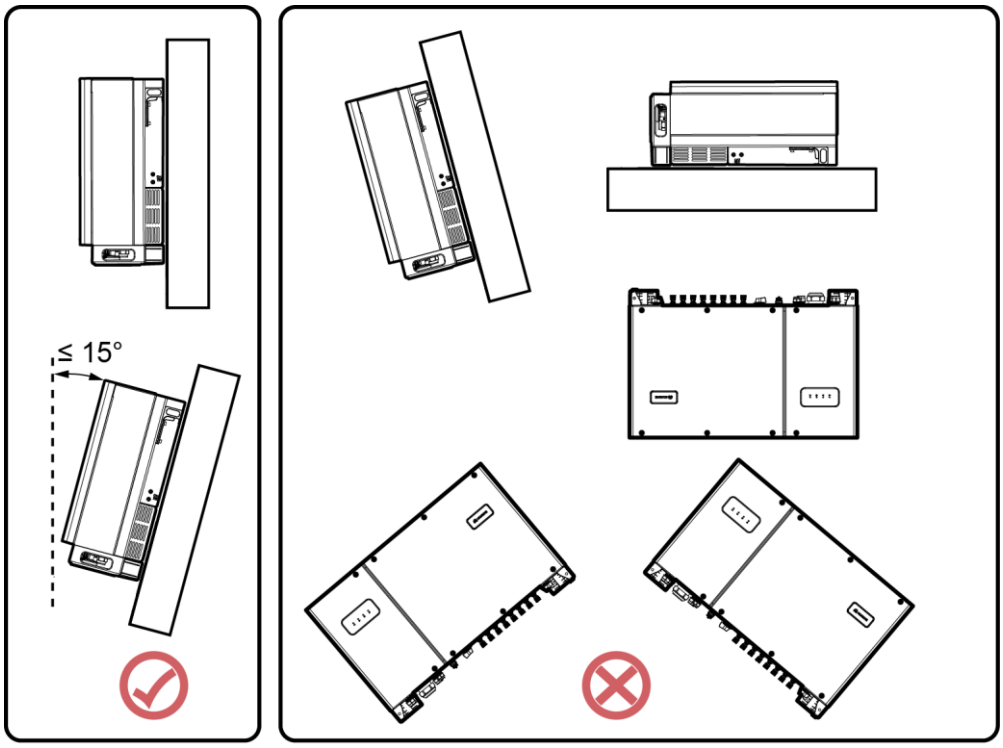
Carrier Requirements

- The mounting structure where the SUN2000 is installed must be fire-resistant.
- Do not install the SUN2000 on flammable building materials.
- The SUN2000 weighs 64 kg (141 lb). 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 4-2 Installation angle



Installation Space Requirements

- The SUN2000 dimensions (W x H x D) are 930 mm (36.61 in.) x 600 mm (23.62 in.) x 270 mm (10.63 in.). Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation.

Figure 4-3 Installation space requirements (non-back-to-back installation)

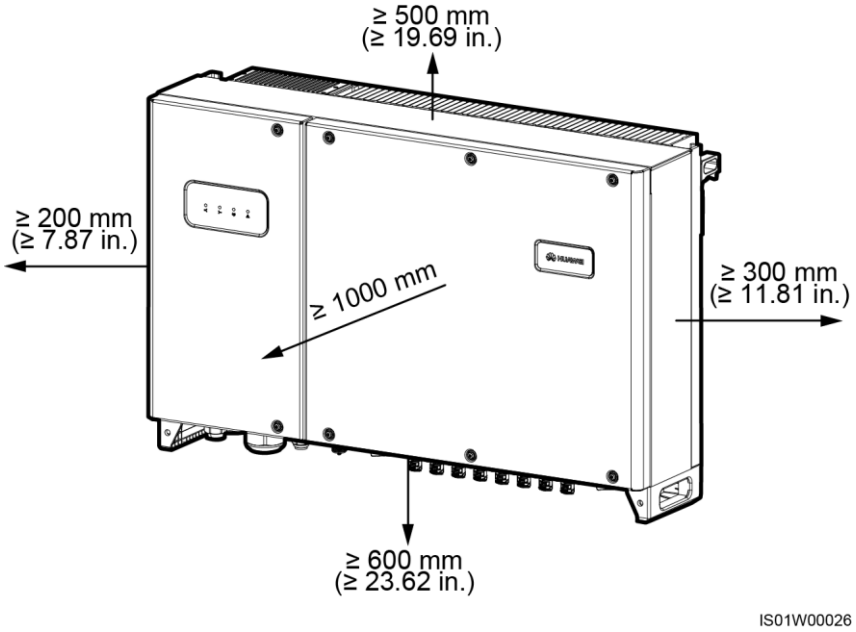
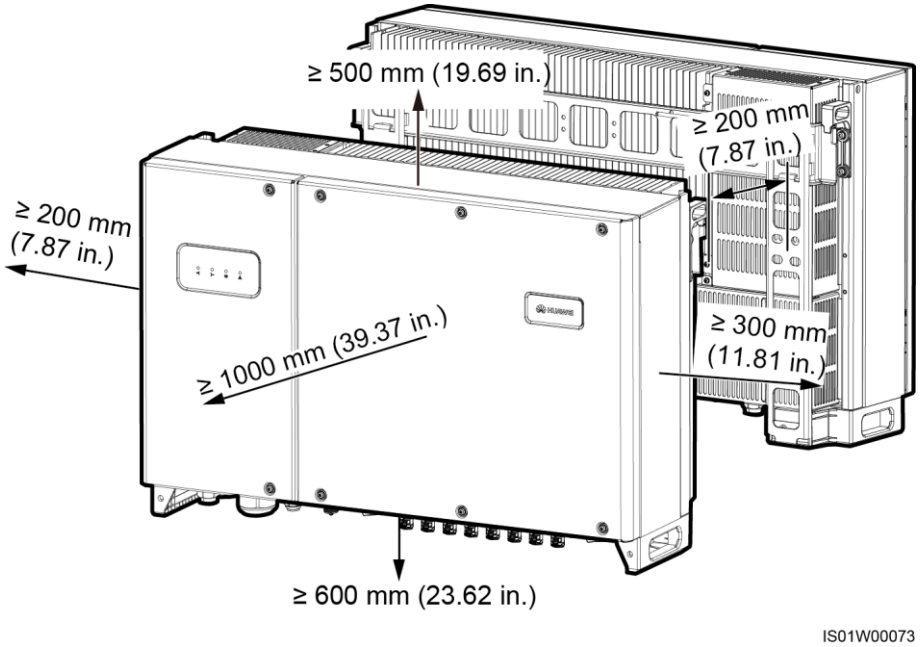


Figure 4-4 Installation space requirements (back-to-back installation)



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 (23.62 in.) and 730 mm (28.74 in.). 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)

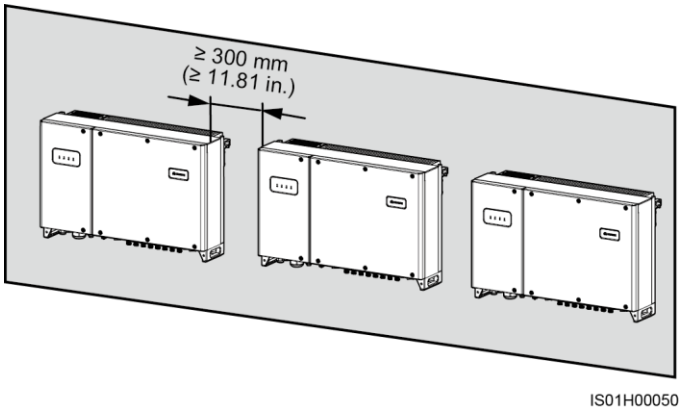


Figure 4-6 Triangle installation mode (recommended)

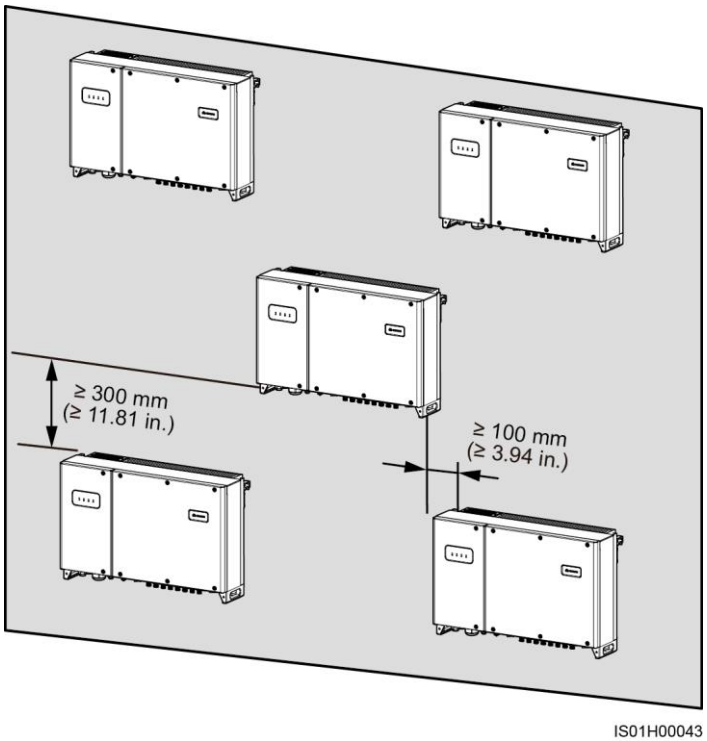
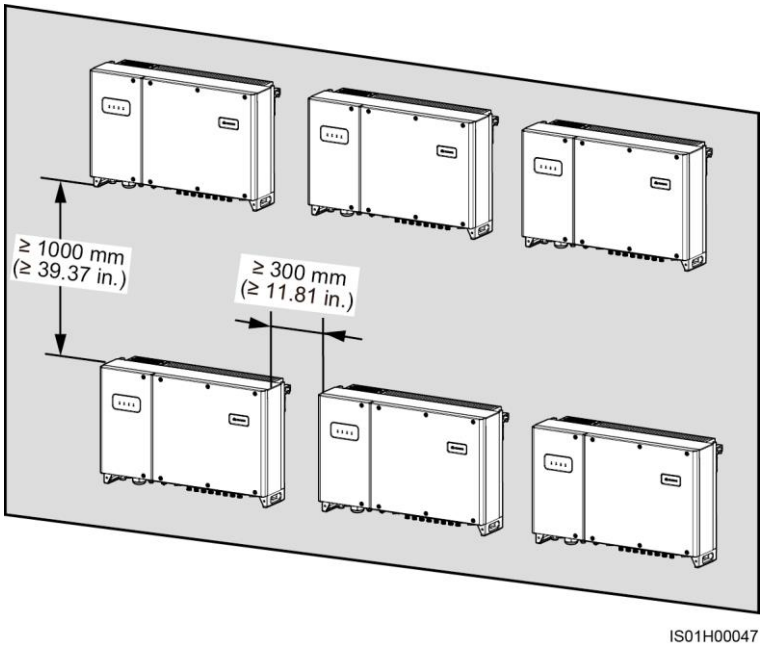


Figure 4-7 Stacked installation mode (not recommended)

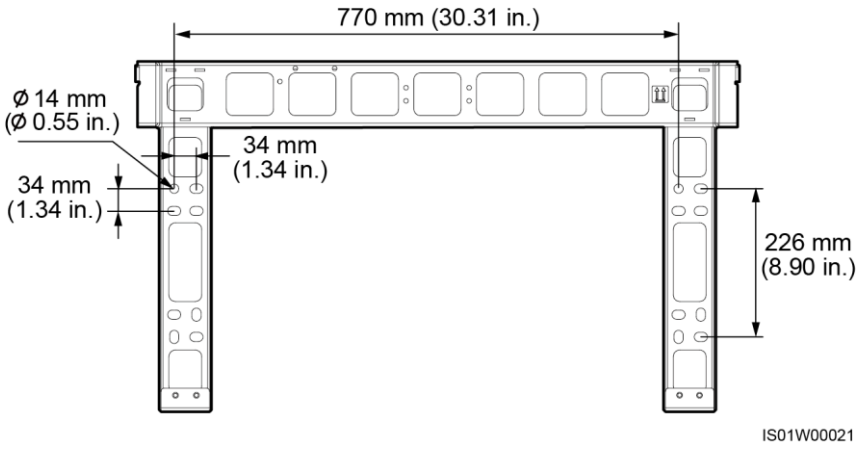


4.4 Installing the Mounting Bracket

Context

Figure 4-8 shows the SUN2000 mounting bracket dimensions.

Figure 4-8 Mounting bracket dimensions

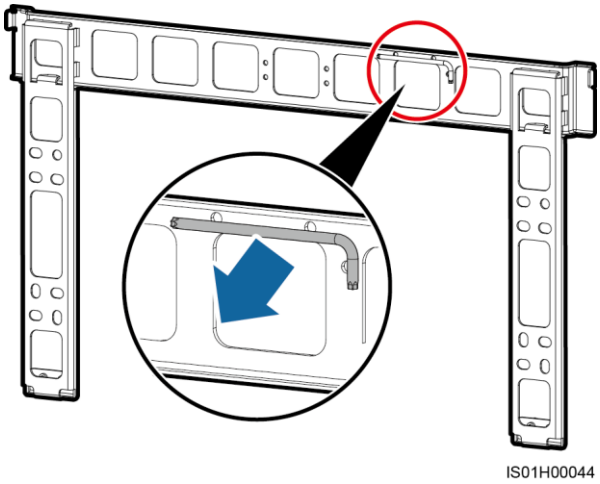


NOTE

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.

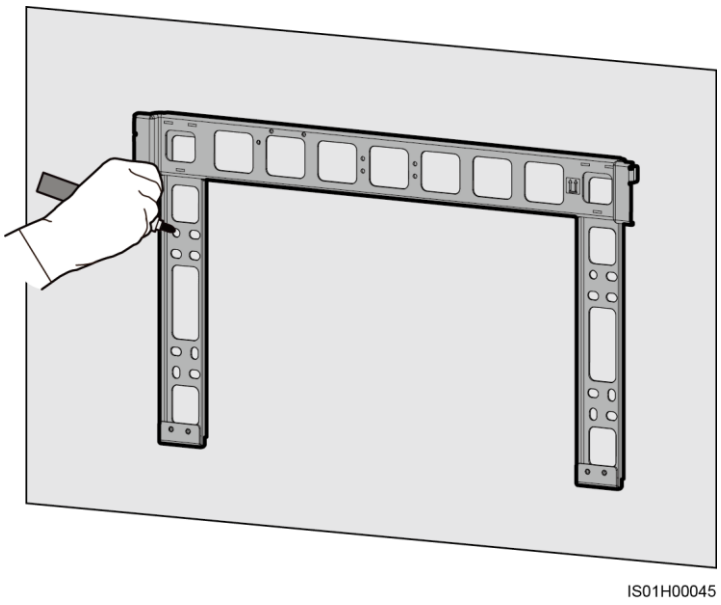
Figure 4-9 Removing a security torx wrench



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.

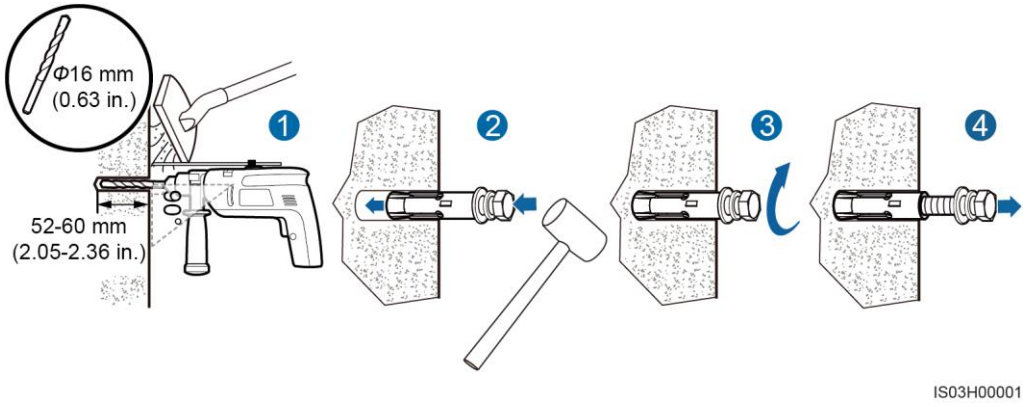
Figure 4-10 Determining hole positions



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

NOTE
M12x60 expansion bolts are delivered with the SUN2000.

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



WARNING

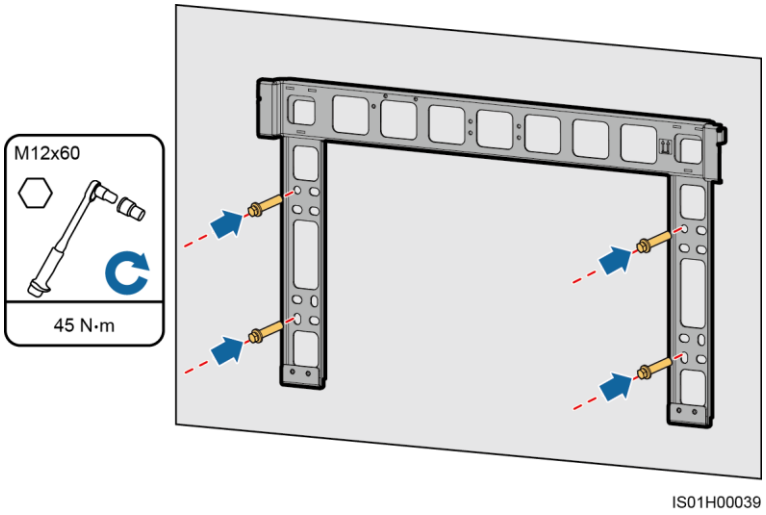
Avoid drilling holes in the utility pipes and/or cables attached to back of the wall.

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

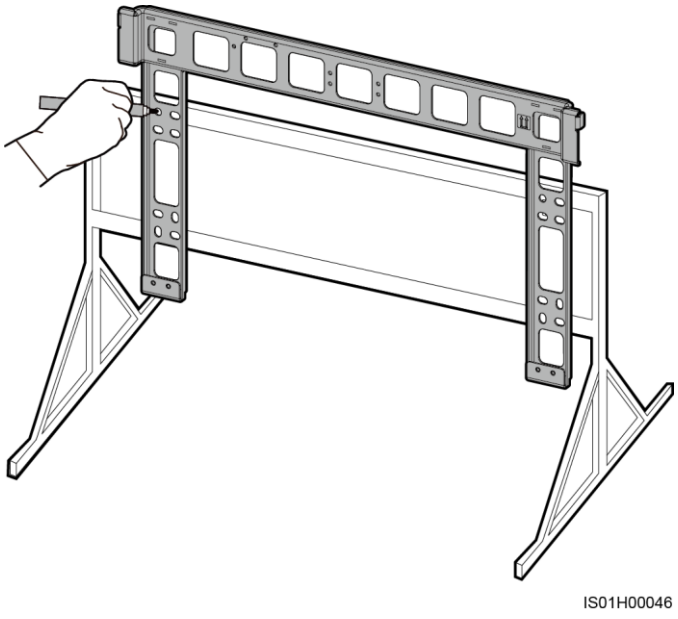


----End

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

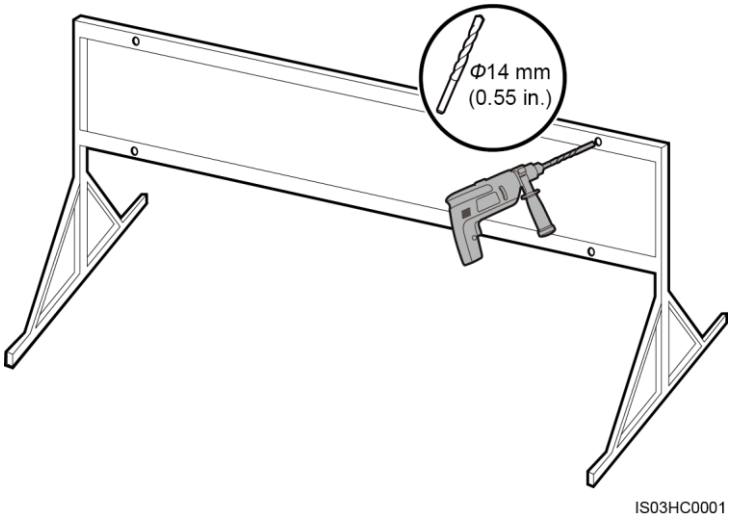


Step 2 Drill holes using a hammer drill.

NOTE

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

Figure 4-14 Drilling holes

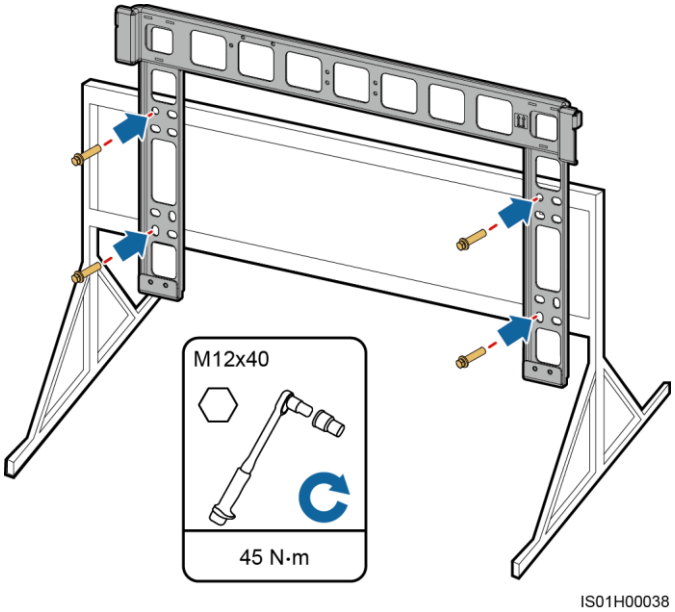


Step 3 Align the mounting plate holes with the drilled holes, insert bolt assemblies (flat washers, spring washers, and M12x40 bolts) into the holes through the mounting plate, and secure them using the shipped stainless steel nuts and flat washers.

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.

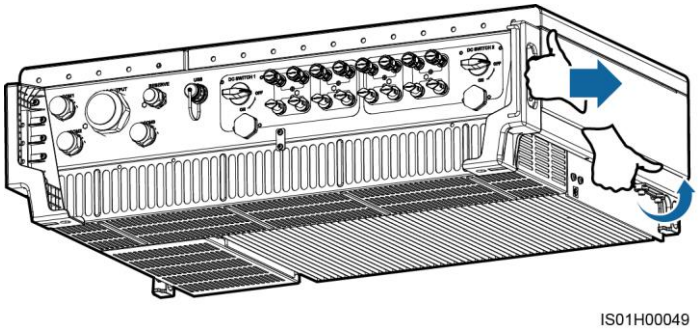
Step 2 If you cannot mount the SUN2000 onto the mounting bracket directly, go to Step 3 and then Step 6.

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

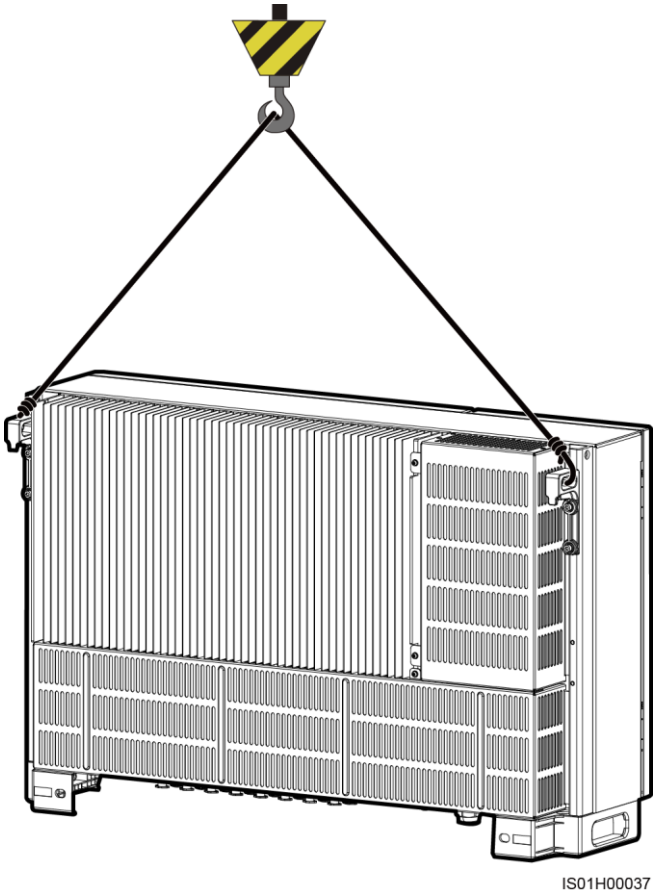


Step 4 Run a lifting sling through the lifting eyes of the SUN2000.

CAUTION

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

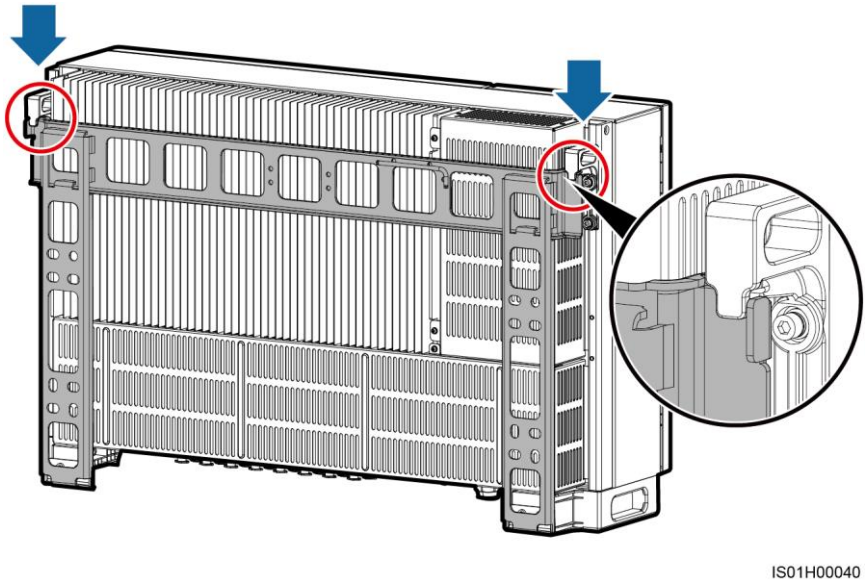
Figure 4-17 Lifting a SUN2000



NOTE
The figure is for reference only.

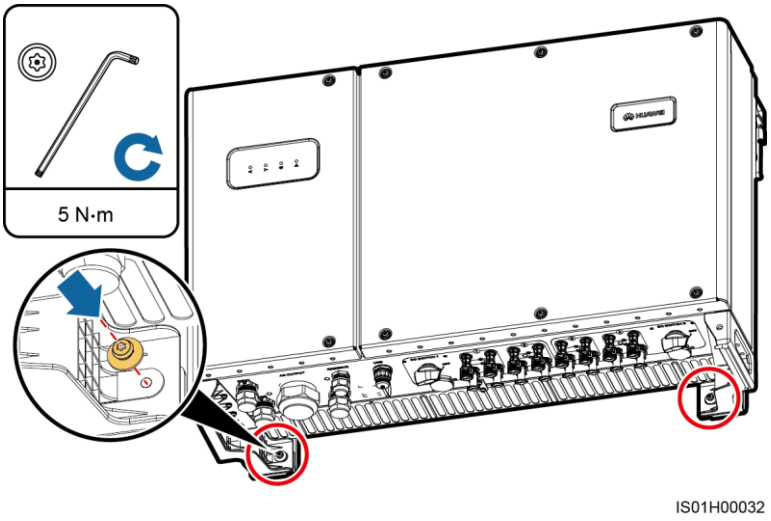
Step 5 Install the SUN2000 on the mounting bracket and align the SUN2000 chassis with the mounting bracket.

Figure 4-18 Mounting the SUN2000 onto a mounting bracket



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

Figure 4-19 Tightening antitheft screws



----End

5 General Operation

5.1 Crimping the OT Terminal

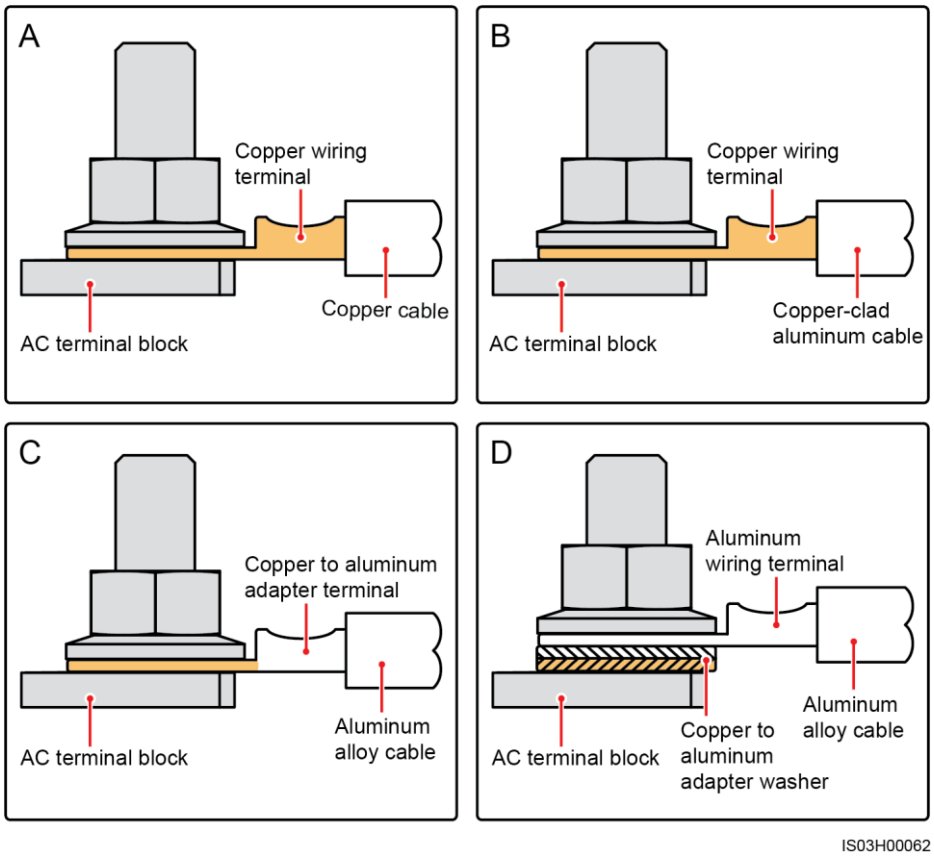
Requirements for the OT Terminal

- 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 UL486-A and UL486-B.
- 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

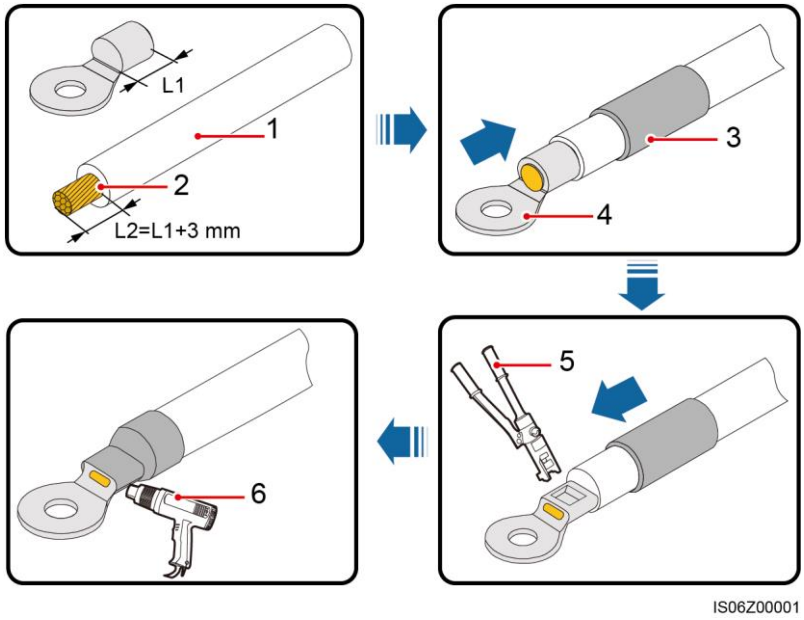


Crimping the OT terminal

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



(1) Cable (2) Core wire (3) Heat shrink tubing

(4) OT terminal (5) Hydraulic pliers (6) Heat gun

5.2 Installing the Tube Fittings

Context

The tube specifications should comply with the waterproof connector specifications. For example, for a 2 in. waterproof connector, prepare a 2 in. tube.

Table 5-1 Waterproof connector specifications

No.	Silk Screen	Specifications
1	AC OUTPUT	2 in.

No.	Silk Screen	Specifications
2	COM1/COM2/COM3	3/4 in.
3	RESERVE	1/2 in.

Figure 5-3 shows the diameters of the cable holes without waterproof connectors.

Figure 5-3 Cable hole diameters

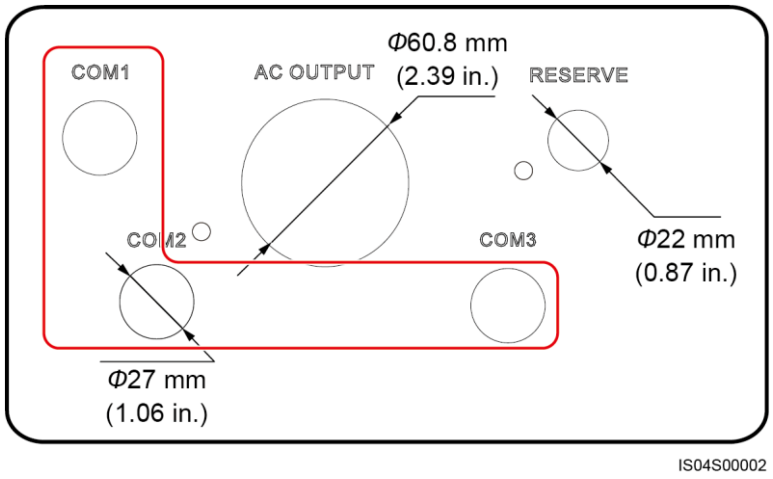
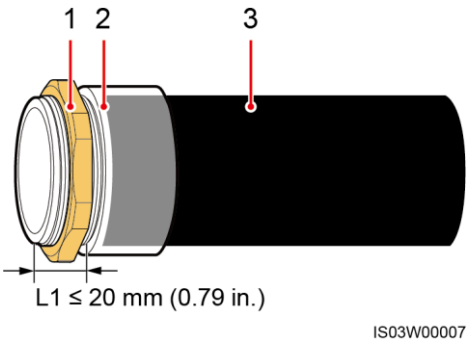


Figure 5-4 shows a tube.

Figure 5-4 Tube



(1) Nut (2) Fitting (3) Conduit

NOTE
The tube appearance is for reference only. The actual tube prevails.

Installing the Tube Fitting (Using AC OUTPUT as an Example)

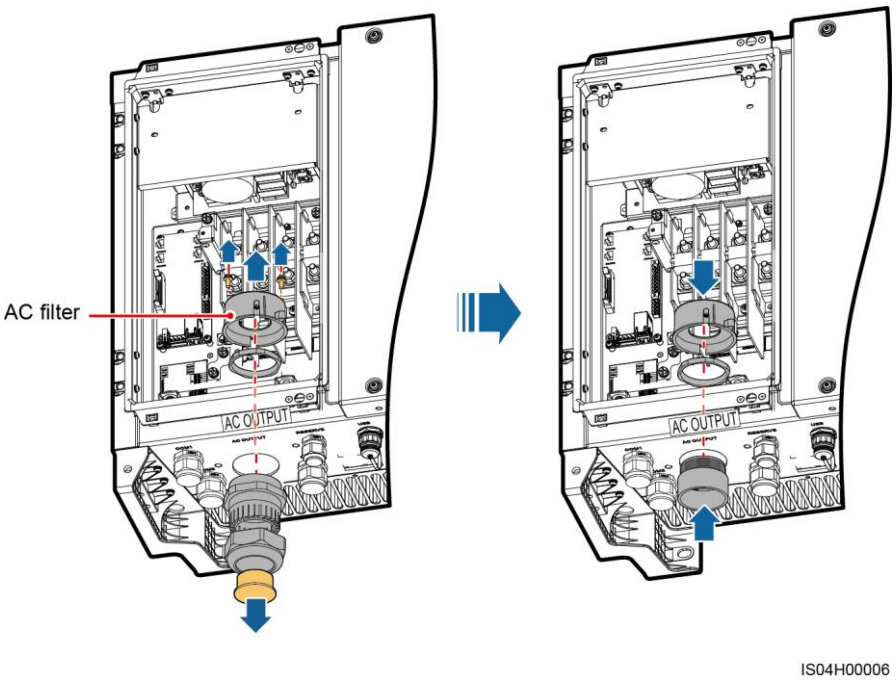
Step 1 Remove the AC filter.

Step 2 Remove the cable gland and cap from the waterproof connector, and then remove the waterproof connector.

Step 3 Secure the tube fitting to the chassis using the nut delivered with the tube.

Step 4 Install the AC filter in the original position.

Figure 5-5 Installing the tube fitting (using AC OUTPUT as an example)



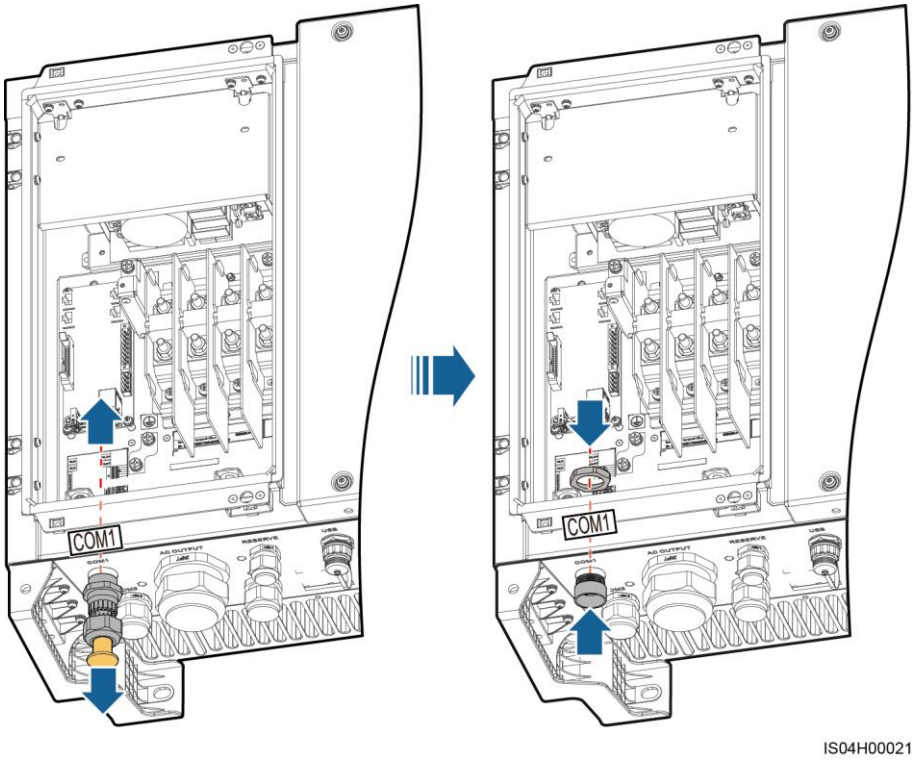
----End

Installing the Tube Fitting (Using COM/RESERVE as an Example)

Step 1 Remove the cable gland and cap from the waterproof connector, and then remove the waterproof connector.

Step 2 Secure the tube fitting to the chassis using the nut delivered with the tube.

Figure 5-6 Installing the tube fitting (using COM/RESERVE as an example)



----End

5.3 Routing Cables Through Waterproof Connectors

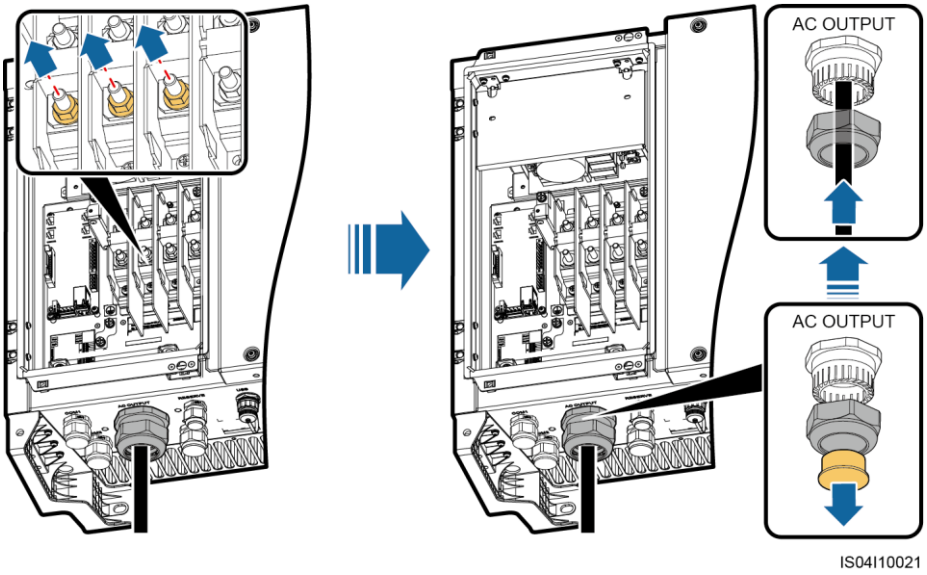
Context

This section describes how to route an AC power cable through the AC OUTPUT waterproof connector.

Procedure

Step 1 Route the cable through the waterproof connector.

Figure 5-7 Routing a cable



NOTE

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

----End

6 Electrical Connections

6.1 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).

6.2 Opening the Maintenance Compartment Door

Prerequisites

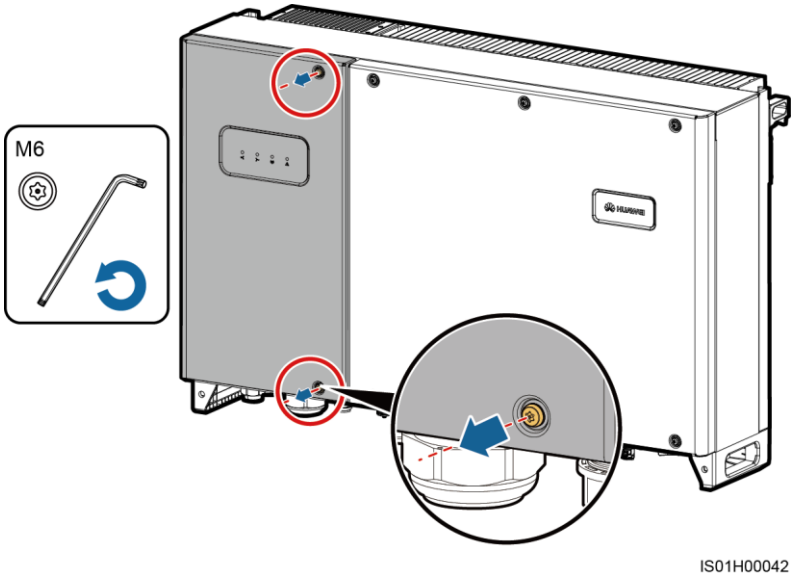
CAUTION

- 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 7.4 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 6-1 Loosening screws

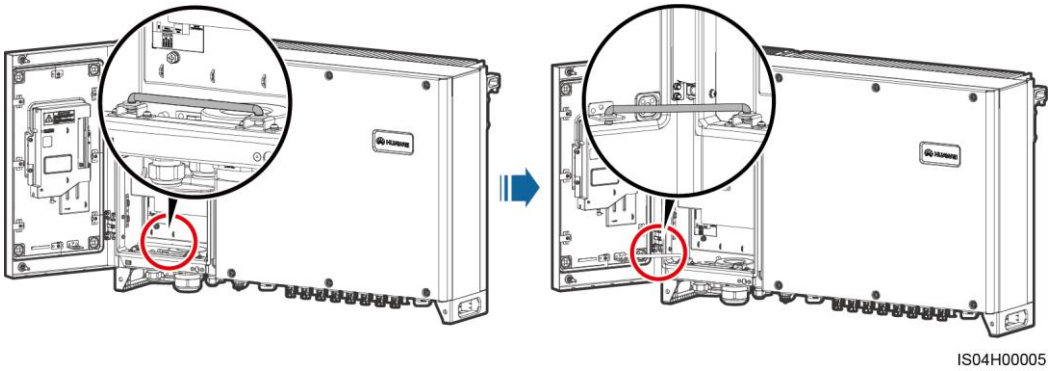


NOTE

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.

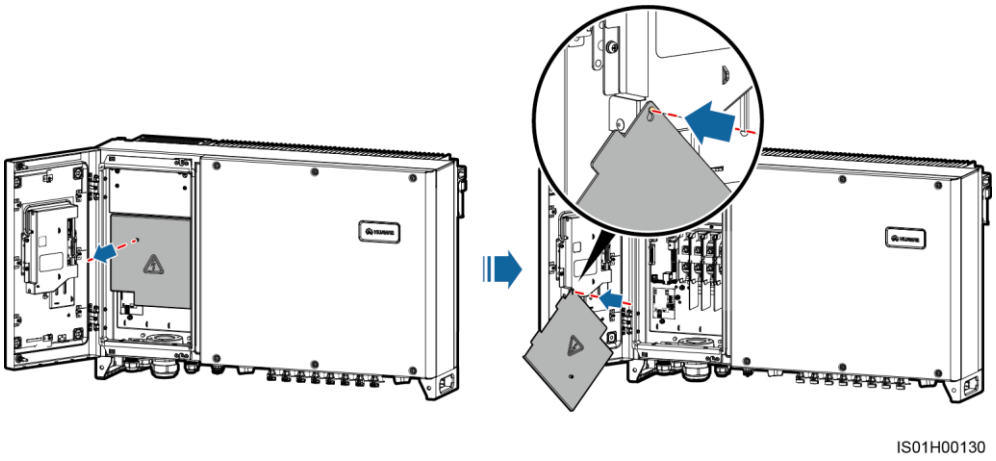
Step 2 Open the maintenance compartment and use the support bar to stabilize the door.

Figure 6-2 Stabilizing a door using a support bar



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

Figure 6-3 Removing a cover



----End

6.3 Connecting the Ground Cable

6.3.1 Connecting a Ground Cable to the PE Point (Bonding)

Prerequisites

The ground cable and OT terminal are available.

- Ground cable: 6 AWG or thicker outdoor rated copper wire
- 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.

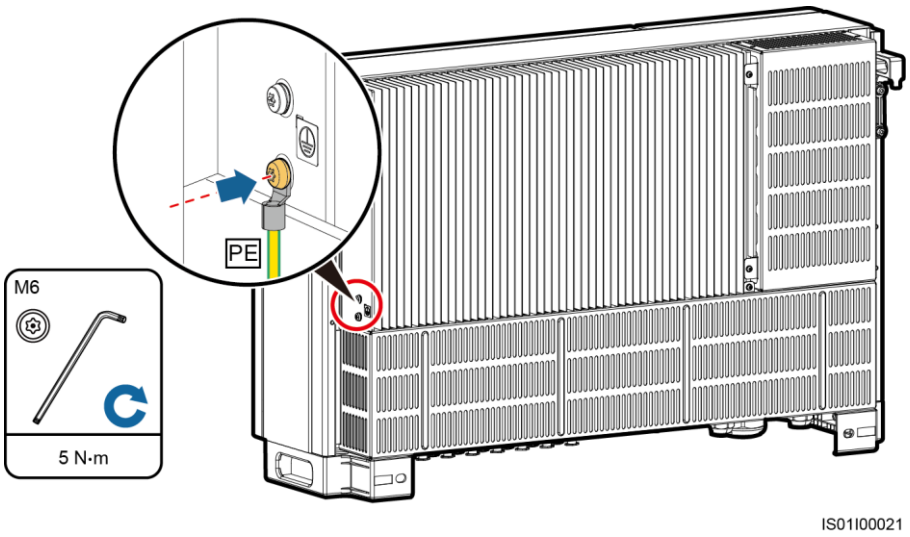
- The ground point in the maintenance compartment is mainly used for connecting to the ground cable included in the multi-core AC power cable. For details, see section 6.4 Connecting AC Output Power Cables.
- There are two PE points on the chassis shell, only one need to be utilized.
- It is recommended that the ground cable be connected to a nearby PE point. For a system with multiple SUN2000s connected in parallel, connect the PE 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 6-4 Connecting a ground cable



----End

Follow-up Procedure

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

6.3.2 Connecting the Ground Cable to the PV Side Ground Point (GND)

Prerequisites

The ground cable and OT terminal are available.

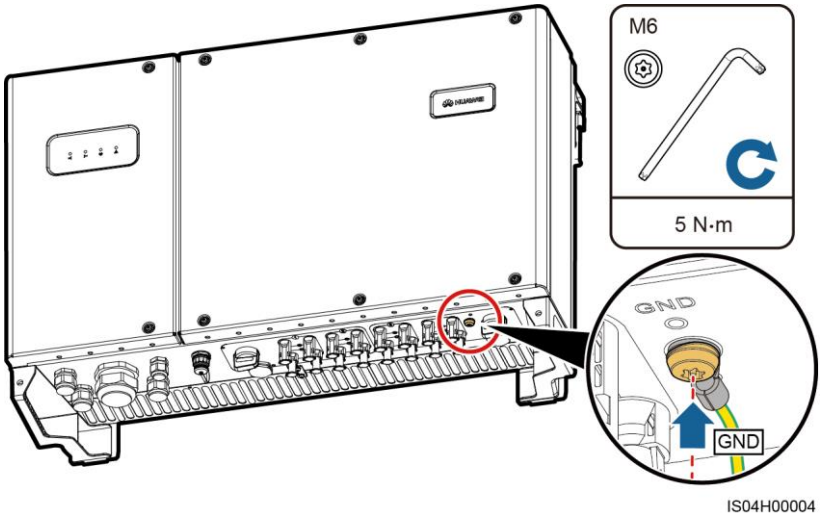
- Ground cable: 6 AWG or thicker outdoor rated copper wire
- OT terminal: M6 and matching the wire gauge of chosen

Procedure

Step 1 Crimp the OT terminal.

Step 2 Secure the ground cable using the ground screw.

Figure 6-5 Connecting a ground cable



----End

Follow-up Procedure

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

6.4 Connecting AC Output Power Cables

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

WARNING

Do not connect loads between the 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, the residual current value that will trigger the switch trip should be greater than 500 mA.

6.4.1 Connection Through a Tube

Prerequisites

- Use cables that can withstand 90°C (194°F) or 105°C (221°F). The cable that can withstand 105°C (221°F) is recommended. To facilitate the installation, use flexible cables.
- If you connect a ground cable to the PE point on the chassis, you are advised to use three (L1, L2, and L3) single-core outdoor copper cables.
- If you connect a ground cable to the PE point in the maintenance compartment, you are advised to use four (L1, L2, L3, and PE) single-core outdoor copper cables.

  Table 6-1 describes the cable specifications.

Table 6-1 Cable specifications

Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area	Range	6–2/0 AWG	4–2/0 AWG
	Recommended to use	4 AWG	2 AWG
Cable outer diameter		6.3–12.1 mm (0.25–0.48 in.)	

- OT terminal: M8 (L1, L2, and L3) and M6 (PE).
- Tube: 2-inch tube

Procedure

Step 1 Install the tube fitting. For details, see 5.2 Installing the Tube Fittings.

Step 2 Route the cable through the tube conduit and then fitting.

Step 3 Crimp the OT terminal.

Step 4 Land the AC output power cable in the terminal block, and tighten the nuts with a torque wrench that has an extension rod.

NOTICE

- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its components, even start thermal events. Any SUN2000 damaged due to weak termination will result in revocation of product warranty.
- 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 6-6 Connecting an AC output power cable (excluding the ground cable)

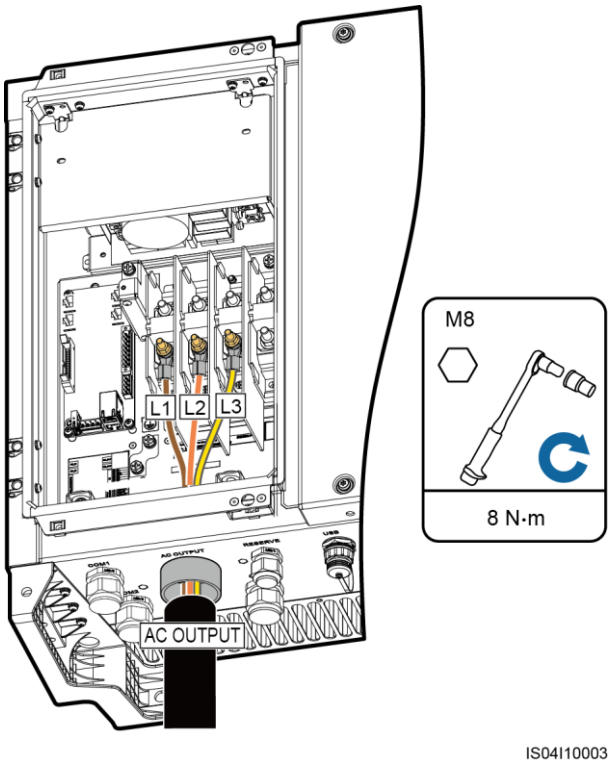
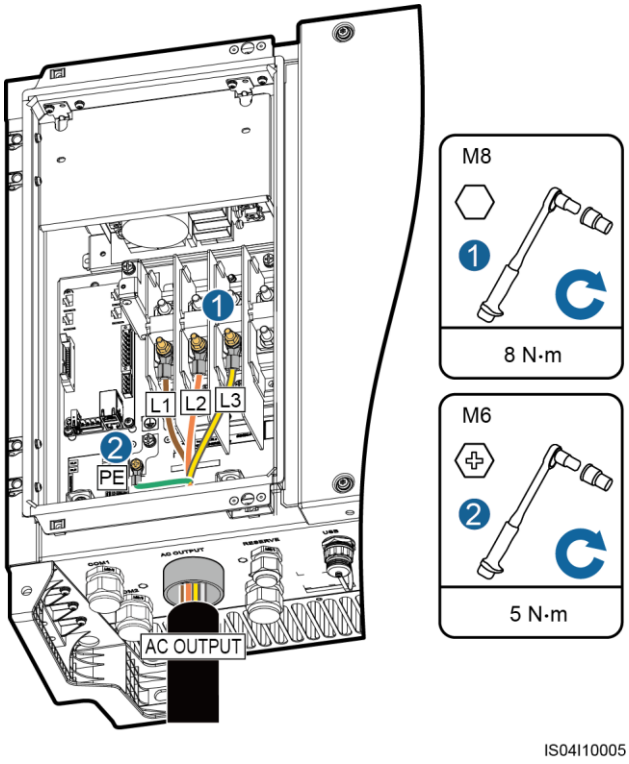


Figure 6-7 Connecting an AC output power cable (including the ground cable)



NOTE

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

Step 5 Secure the fitting to the conduit.

Step 6 Seal the cable hole.

Step 7 Secure the AC filter.

Step 8 Clear debris from the maintenance compartment.

CAUTION

Please do not leave any extra material in the maintenance compartment.

----End

6.4.2 Connection Through a Waterproof Connector

Prerequisites

- Use cables that can withstand 90°C (194°F) or 105°C (221°F). The cable that can withstand 105°C (221°F) is recommended. To facilitate the installation, use flexible cables.

- If you connect a ground cable to the PE point on the chassis, you are advised to use a three-core (L1, L2, and L3) outdoor cable.
- If you connect a ground cable to the PGND point in the maintenance compartment, you are advised to use a four-core (L1, L2, and L3) outdoor cable.

  Table 6-2 describes the cable specifications.

Table 6-2 Cable specifications

Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area	Range	6–2/0 AWG	4–2/0 AWG
	Recommended to use	4 AWG	2 AWG
Cable outer diameter range supported by the AC OUTPUT waterproof connector		37–44 mm (1.46–1.73 in.)	

- OT terminal: M8 (L1, L2, and L3) and M6 (PE).

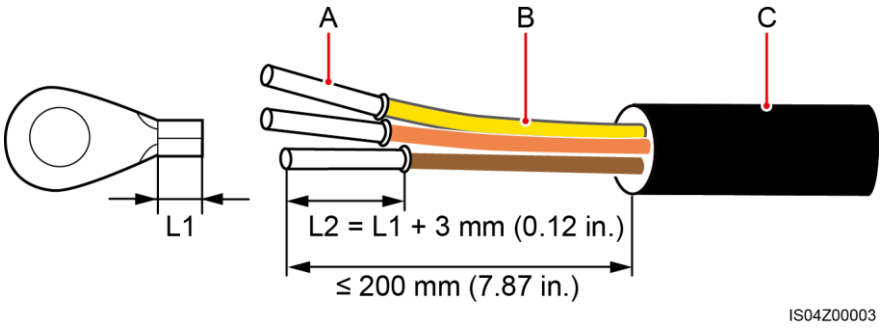
Procedure

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

NOTICE

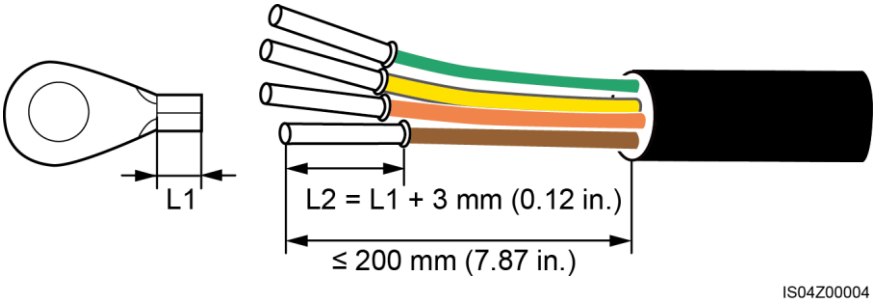
Ensure that the jacket is in the maintenance compartment.

Figure 6-8 Three-core cable (excluding the ground cable)



(A) Core wire (B) Insulation layer (C) Jacket

Figure 6-9 Four-core cable (including the ground cable)



Step 2 Crimp the OT terminal.

Step 3 Route the cable through the waterproof connector.

Step 4 Land the AC output power cable in the terminal block, and tighten the nuts with a torque wrench that has an extension rod.

NOTICE

- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its components, even start thermal events. Any SUN2000 damaged due to weak termination will result in revocation of product warranty.
- 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 6-10 Connecting an AC output power cable (excluding the ground cable)

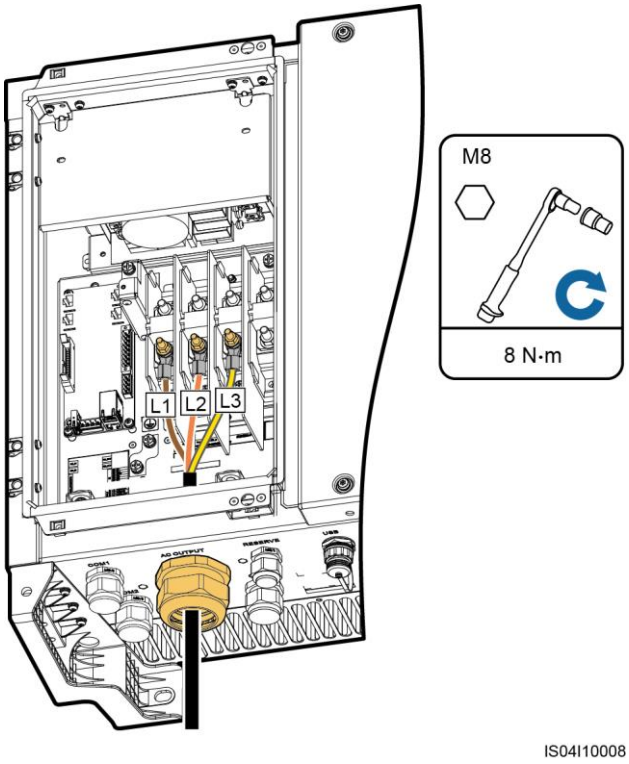
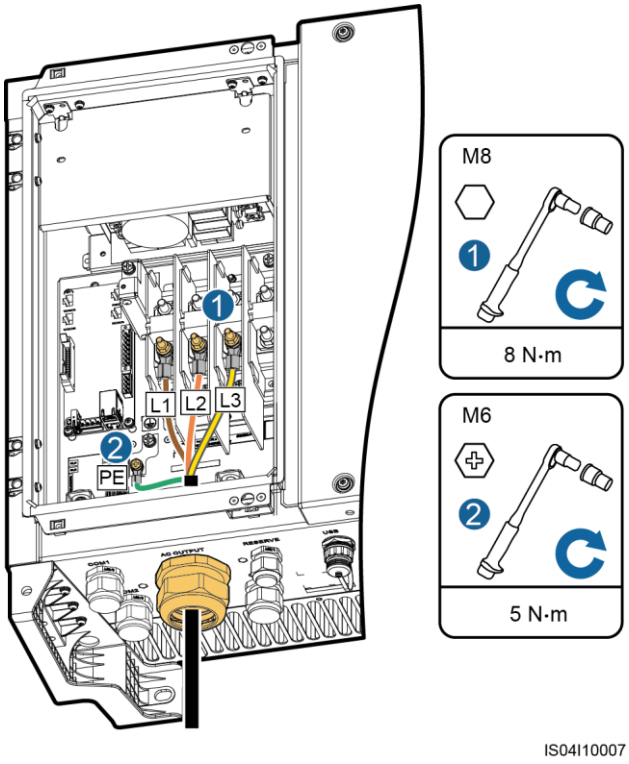


Figure 6-11 Connecting an AC output power cable (including the ground cable)



NOTE

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

Step 5 Tighten the thread-lock sealing nut and seal the waterproof connector.

----End

6.5 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 array 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 string 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 grounded 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 6-12 shows the DC terminals at the bottom of the SUN2000. Table 6-3 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 6-12 DC terminals

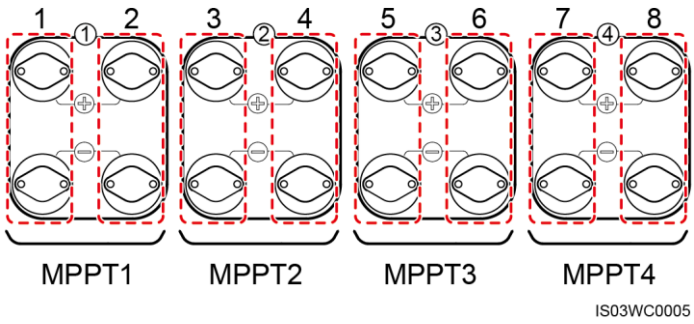


Table 6-3 DC terminal selection requirements

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 6-4 lists the recommended DC input power cable specifications.

Table 6-4 Recommended DC input power cable specifications

Cable Type	Conductor Cross-Sectional Area	Cable Outer Diameter
PV cable that meets the 1500 V standard	4–6 mm^2 (or 12–10 AWG)	4.5–7.8 mm

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 positive and negative connectors.

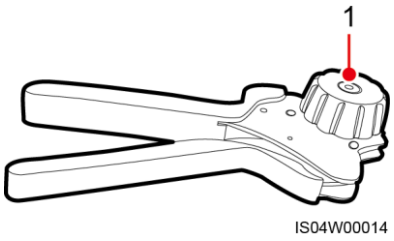
CAUTION

Use the Amphenol HH4 DC input terminals provided with the SUN2000. If the terminals are lost or damaged, purchase the DC input terminals of the same model. Other models of DC input terminals may be incompatible with the SUN2000, which may cause serious consequences. The caused equipment damage is beyond the warranty scope.

NOTICE

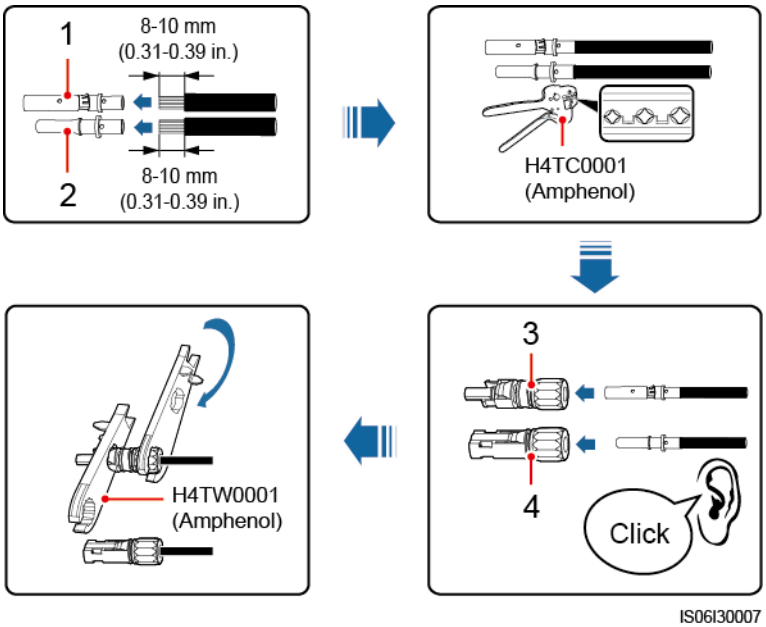
- The metal contacts supplied with the DC connectors are either cold forming contacts or stamping forming contacts. Choose the crimping tools that fit the metal contact types. Do not mix up the tools.
- Crimp the metal cold forming contacts using crimping tool H4TC0001 (Amphenol).
- Crimp the metal stamping forming contacts using crimping tool H4TC0002 (Amphenol, recommended), PV-CZM-22100 (Staubli), or PV-CZM-19100 (Staubli). When choosing PV-CZM-22100 or PV-CZM-19100, do not use the locator. Otherwise metal contacts would be damaged.

Figure 6-13 Crimping tool (H4TC0002)



(1) Locator

Figure 6-14 Preparing positive and negative connectors (using metal cold forming contacts)



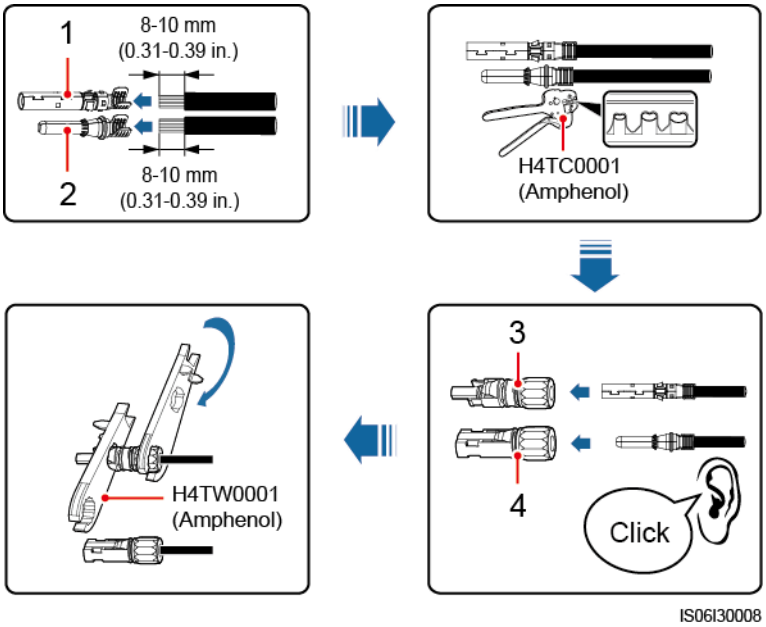
(1) Positive metal contact (cold forming)

(2) Negative metal contact (cold forming)

(3) Positive connector

(4) Negative connector

Figure 6-15 Preparing positive and negative connectors (using metal stamping forming contacts)



(1) Positive metal contact (stamping forming)

(2) Negative metal contact (stamping forming)

(3) Positive connector

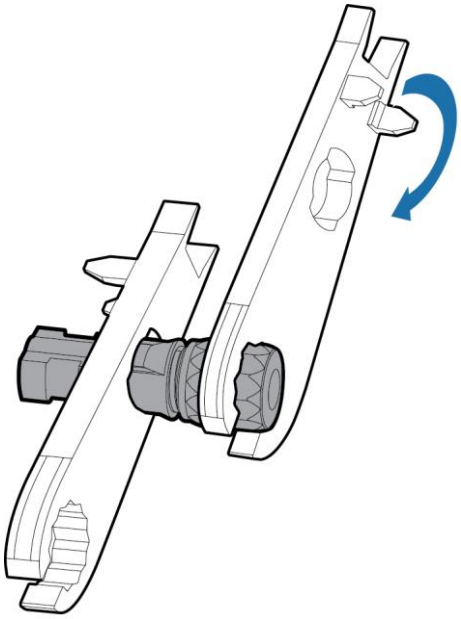
(4) Negative connector

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 6-16 Locking a nut

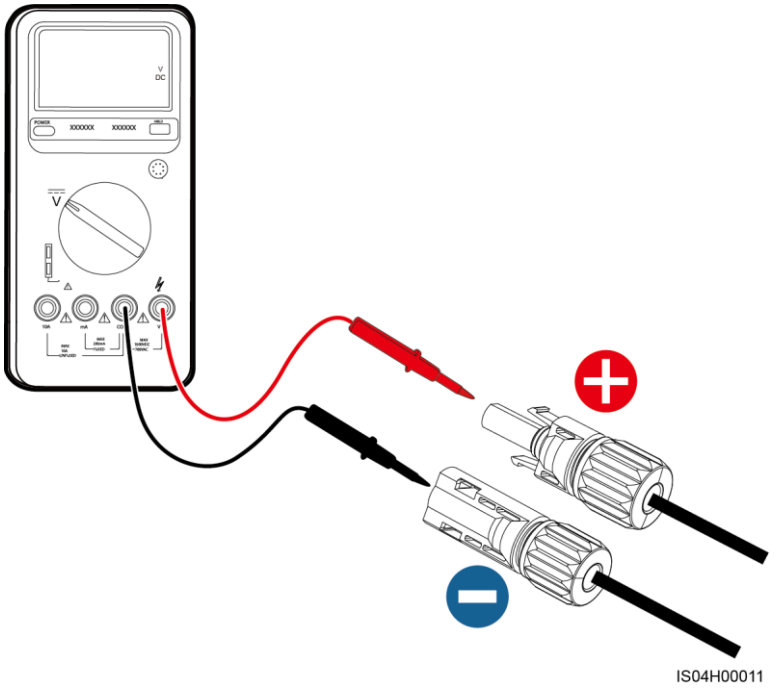


Step 3 Use a multimeter to measure the DC voltage between the positive and negative of the PV string and confirm the string polarity.

NOTICE

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

Figure 6-17 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

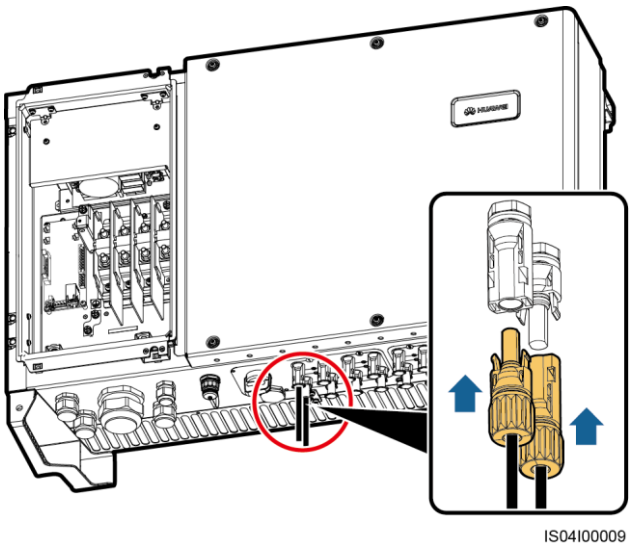
Before performing Step 5, ensure that the two DC switches are OFF.

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, the SUN2000 enables the DC input detection function. Therefore, you are required to connect DC input power cables to the MPPT1 circuit first.

Figure 6-18 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

6.6 Connecting the Communications Cable

6.6.1 Communication Mode Description

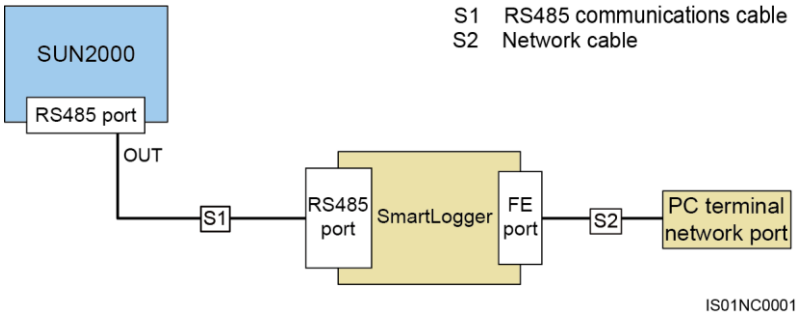
RS485 Communication

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 6-19 shows the communication mode for a single SUN2000.

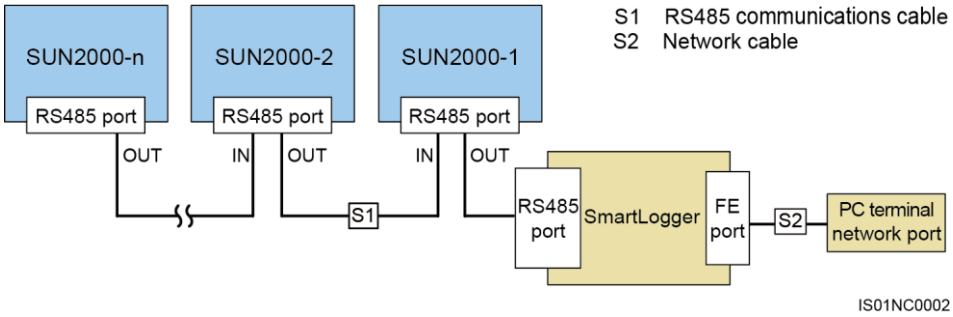
Figure 6-19 Communication mode for a single SUN2000



- Figure 6-20 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 6-20 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*.

NOTE

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**.

NOTICE

The PLC communication mode is only applicable to medium-voltage grid connection scenarios and non-low-voltage public grid connection scenarios (industrial environment).

- If the RS485 communication mode is selected, do not connect the PLC CCO module to the AC power cable. In addition, you are advised to set **PLC communication** to **Disable**.

NOTE

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

6.6.2 Connecting the RS485 Communications Cable (to a Terminal Block)

Description

The RS485 communications cable can connect to either a terminal block or an RJ45 network port. Connecting to a terminal block is recommended.

- You are advised to use a multi-paired, individually foil shielded cable that complies with UL2919, CM/CMG (NEC type), or CMH (CSA type) and has a conductor cross-sectional area of less than or equal to 2.5 mm^2 14 AWG and an outer diameter of 14–18 mm (0.55–0.71 in.).
- RS485 communications cables can also run through a 3/4 in.tube, which is not provided with SUN2000 shipping package.

NOTICE

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

Terminal Block Pin Definitions

Figure 6-21 shows an RS485 terminal block.

Figure 6-21 Terminal block

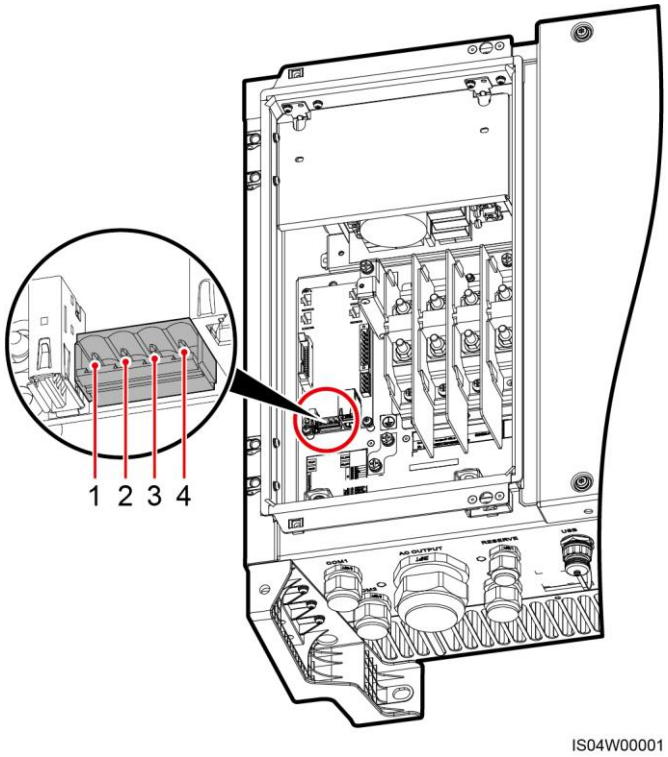


Table 6-5 describes pin definitions of the RS485 terminal block.

Table 6-5 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–

6.6.2.1 Connection Through a Tube

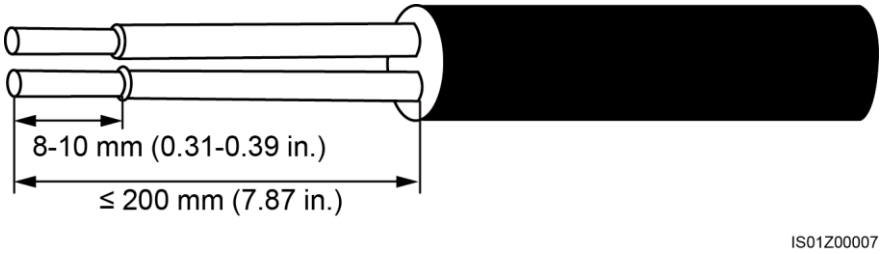
Procedure

Step 1 Install the tube fitting. For details, see 5.2 Installing the Tube Fittings.

Step 2 Route the cable through the tube conduit and then fitting.

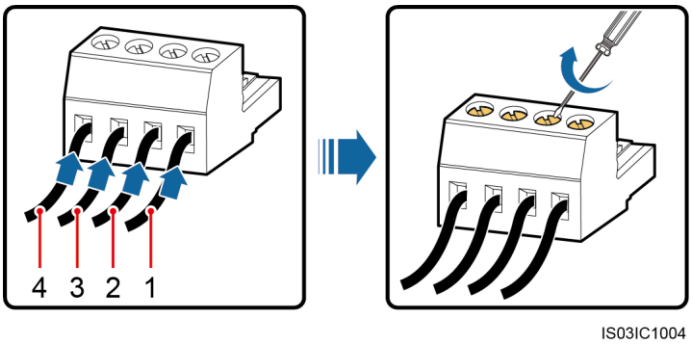
Step 3 Remove an appropriate length of the jacket and core wire insulation layer from the communications cable using a wire stripper.

Figure 6-22 Stripping an RS485 communications cable



Step 4 Remove the cable terminal base from the terminal block. Connect the communications cable to the terminal base.

Figure 6-23 Connecting cables to a terminal base



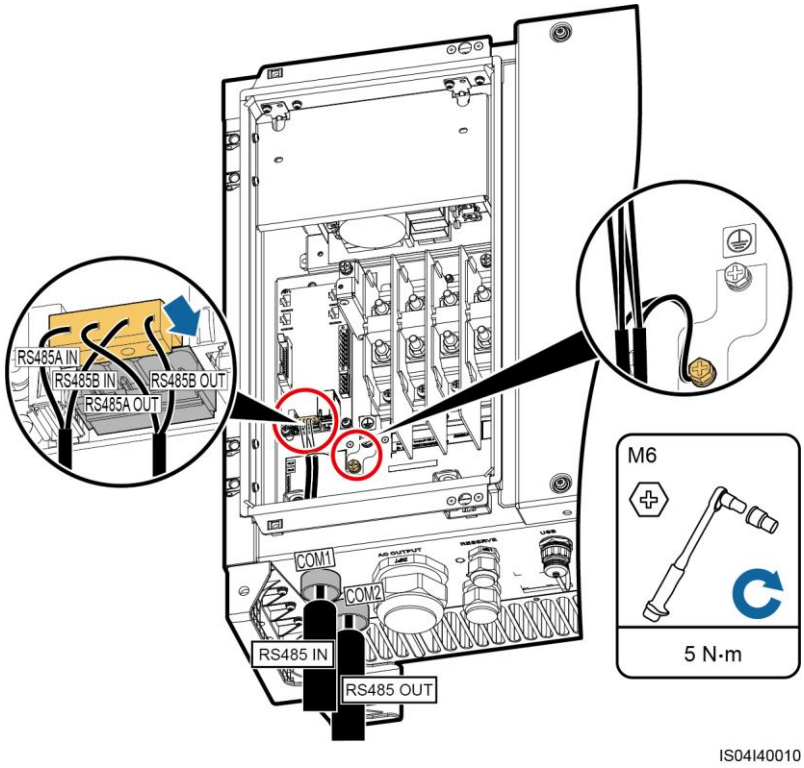
(1) RS485A IN (2) RS485A OUT

(3) RS485B IN (4) RS485B OUT

Step 5 Install the terminal base on the terminal block, and bond the shield layer to the ground point.

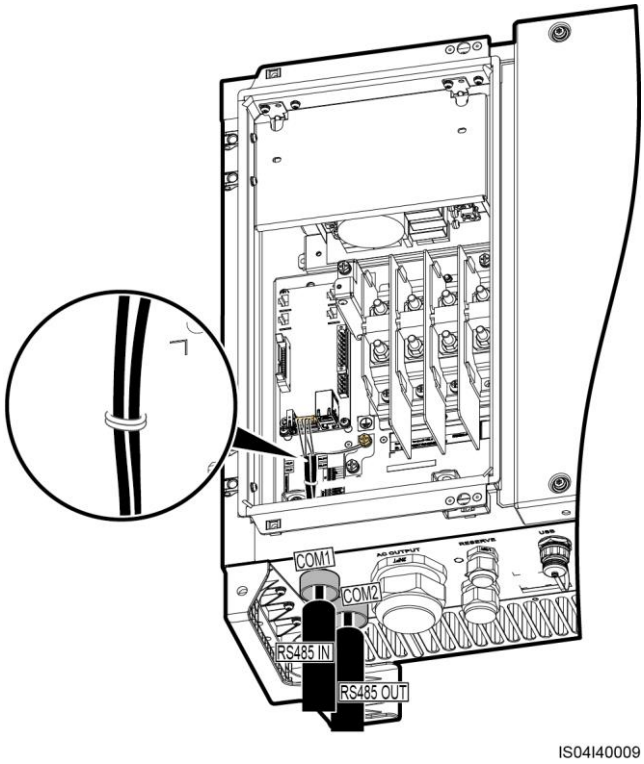
NOTE
When connecting the shielded cable, crimp the OT terminal if required.

Figure 6-24 Connecting communications cables



Step 6 Bundle communications cables after connecting them.

Figure 6-25 Binding communications cables



Step 7 Secure the fitting to the conduit.

Step 8 Clear debris from the maintenance compartment.

CAUTION

Please do not leave any extra material in the maintenance compartment.

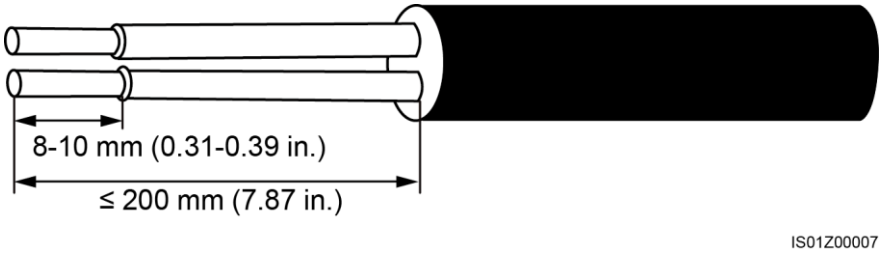
----End

6.6.2.2 Connection Through a Waterproof Connector

Procedure

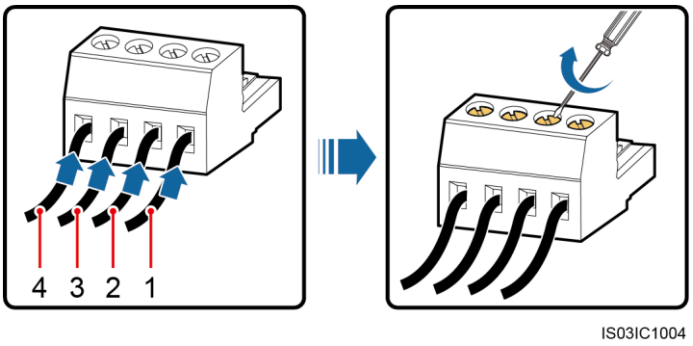
Step 1 Remove an appropriate length of the jacket and core wire insulation layer from the communications cable using a wire stripper.

Figure 6-26 Stripping an RS485 communications cable



Step 2 Remove the cable terminal base from the terminal block. Connect the communications cable to the terminal base.

Figure 6-27 Connecting cables to a terminal base



(1) RS485A IN (2) RS485A OUT

(3) RS485B IN (4) RS485B OUT

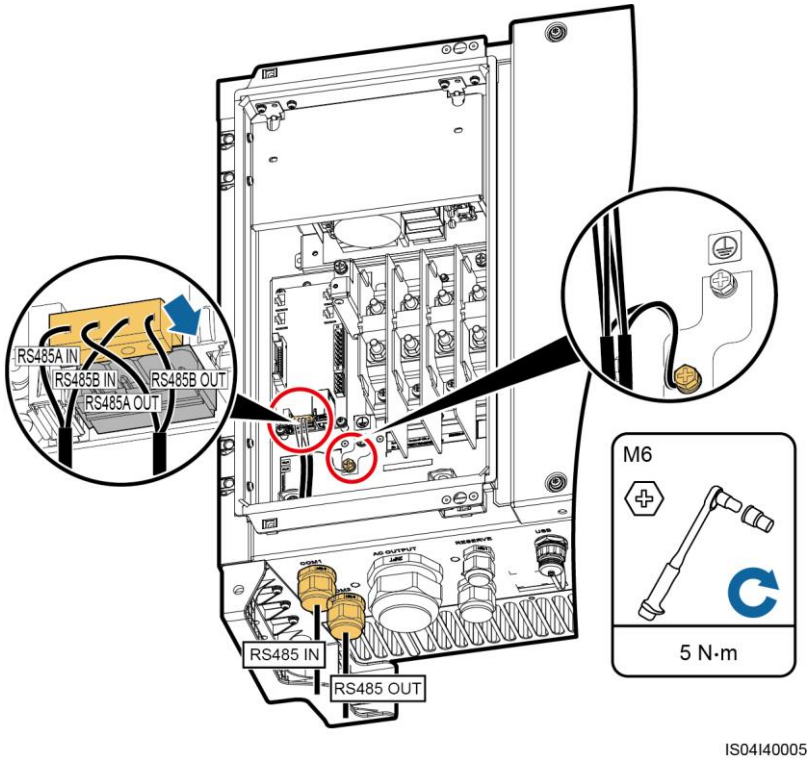
Step 3 Route the cable through the waterproof connector.

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

NOTE

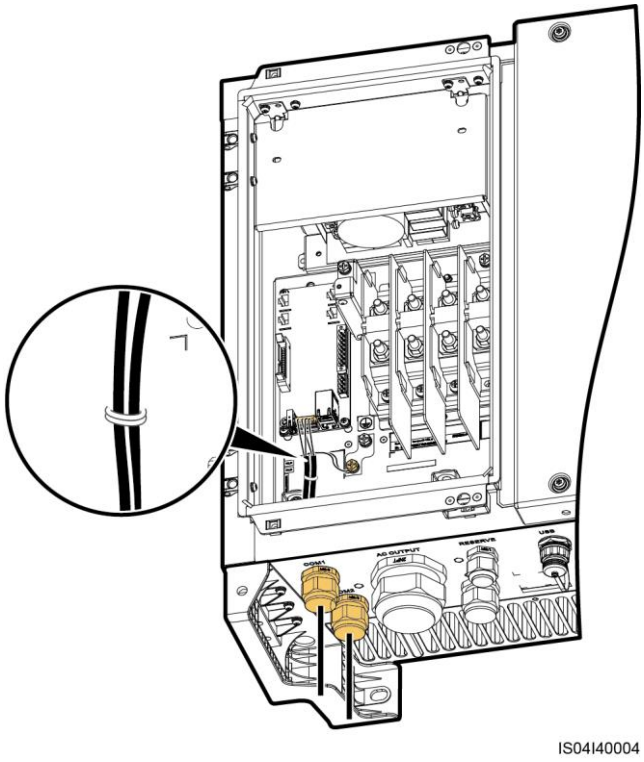
When connecting the shielded cable, crimp the OT terminal if required.

Figure 6-28 Connecting communications cables



Step 5 Bundle communications cables after connecting them.

Figure 6-29 Binding communications cables



Step 6 Tighten the thread-lock sealing nut and seal the waterproof connector.

----End

6.6.3 Connecting RS485 Communications Cables (to an RJ45 Network Port)

Description

The RS485 communications cable can connect to either a terminal block or an RJ45 network port. Connecting to a terminal block is recommended.

- You are advised to use a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm (0.35 in.) and internal resistance not greater than 1.5 ohms/10 m (1.5 ohms/32.81 ft), as well as a shielded RJ45 connector.
- RS485 communications cables can also run through a 3/4 in.tube, which is not provided with SUN2000 shipping package.

NOTICE

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

RJ45 Connector Pin Definitions

Figure 6-30 shows an RJ45 connector.

Figure 6-30 RJ45 connector

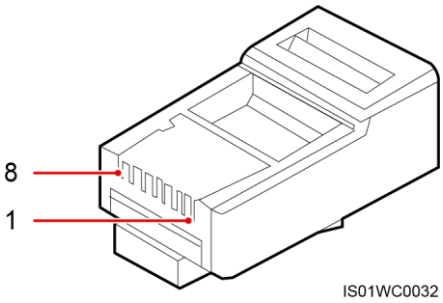


Table 6-6 lists the RJ45 connector pin definitions.

Table 6-6 RJ45 connector pin definitions

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

6.6.3.1 Connection Through a Tube

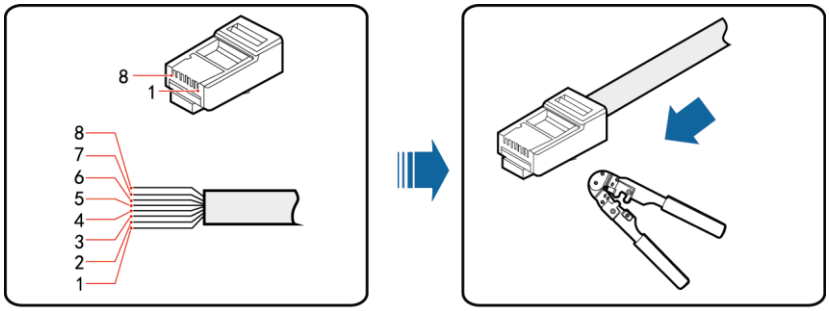
Procedure

Step 1 Install the tube fitting. For details, see 5.2 Installing the Tube Fittings.

Step 2 Route the cable through the tube conduit and then fitting.

Step 3 Crimp an RJ45 connector.

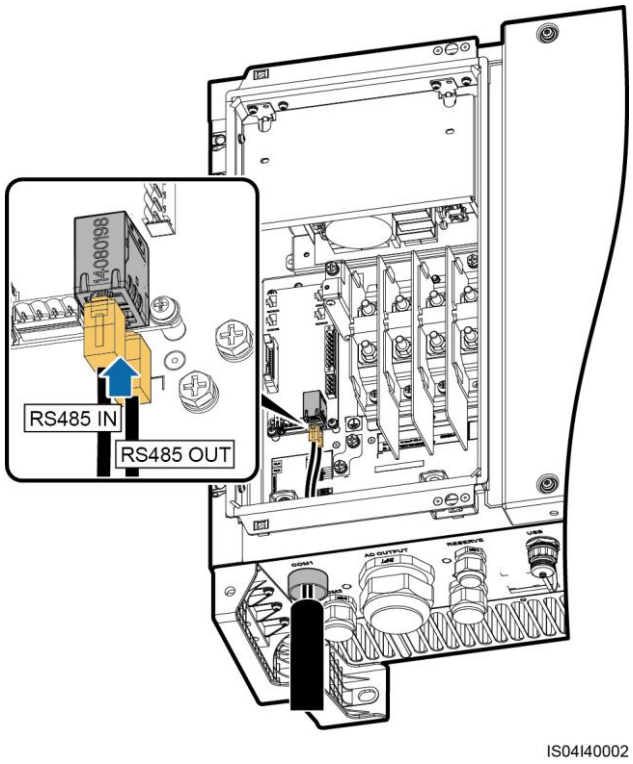
Figure 6-31 Preparing an RJ45 connector



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

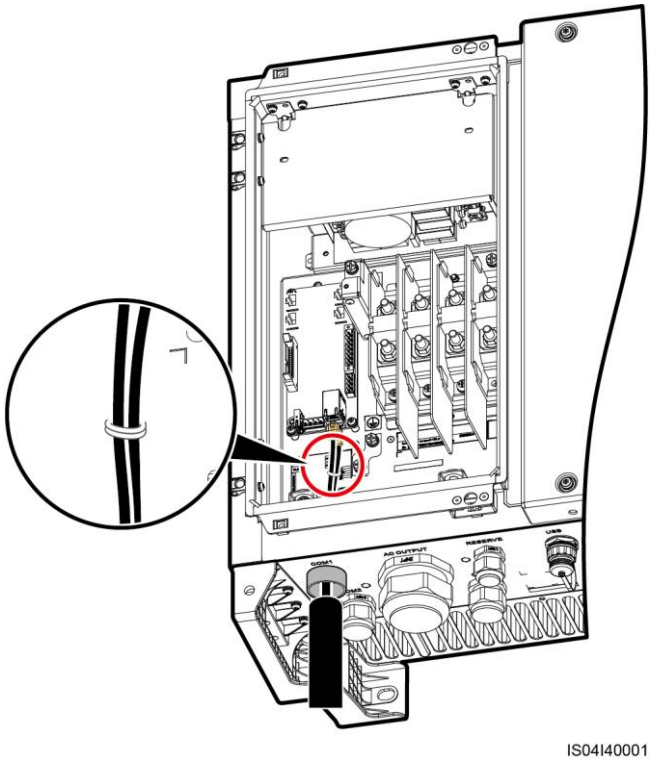
Step 4 Route the communications cable through the waterproof connector.

Figure 6-32 Connecting communications cables



Step 5 Bundle communications cables after connecting them.

Figure 6-33 Binding communications cables



Step 6 Secure the fitting to the conduit.

Step 7 Clear debris from the maintenance compartment.

CAUTION

Please do not leave any extra material in the maintenance compartment.

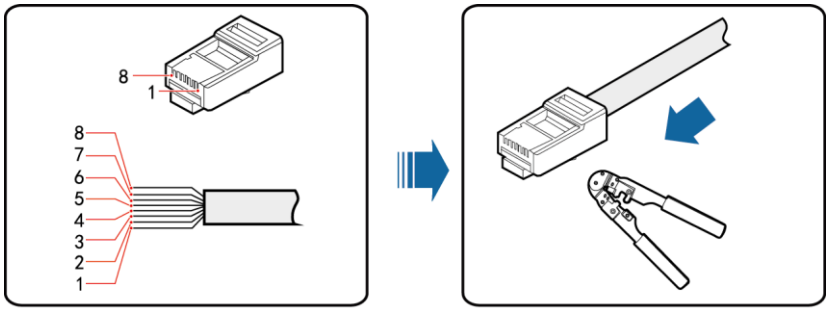
----End

6.6.3.2 Connection Through a Waterproof Connector

Procedure

Step 1 Crimp an RJ45 connector.

Figure 6-34 Preparing an RJ45 connector



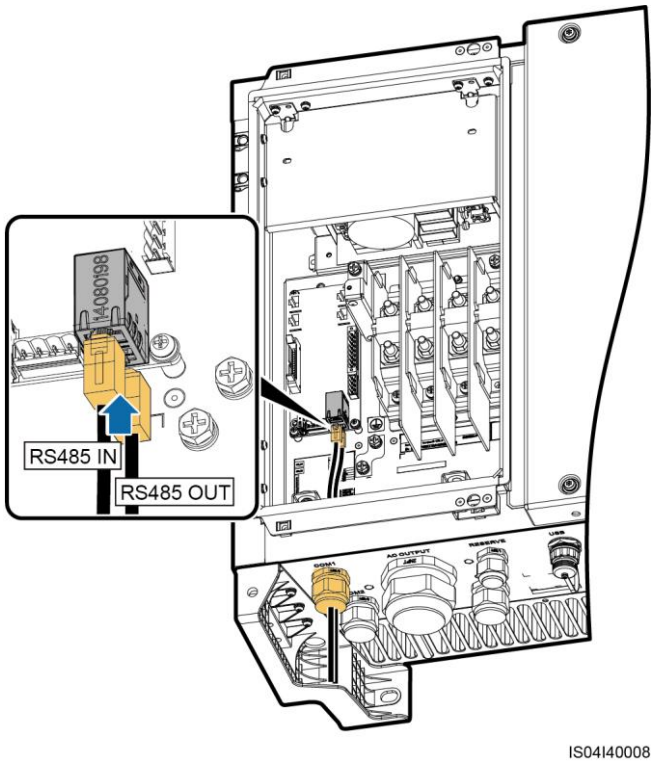
(1) White-and-orange (2) Orange (3) White-and-green (4) Blue

(5) White-and-blue (6) Green (7) White-and-brown (8) Brown

Step 2 Route the cable through the waterproof connector.

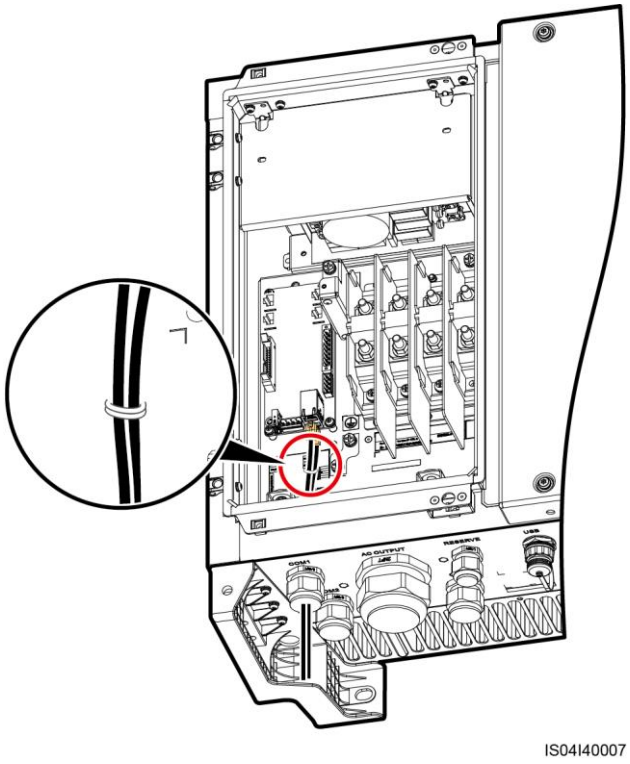
Step 3 Route the communications cable through the waterproof connector.

Figure 6-35 Connecting communications cables



Step 4 Bundle communications cables after connecting them.

Figure 6-36 Binding communications cables



Step 5 Tighten the thread-lock sealing nut and seal the waterproof connector.

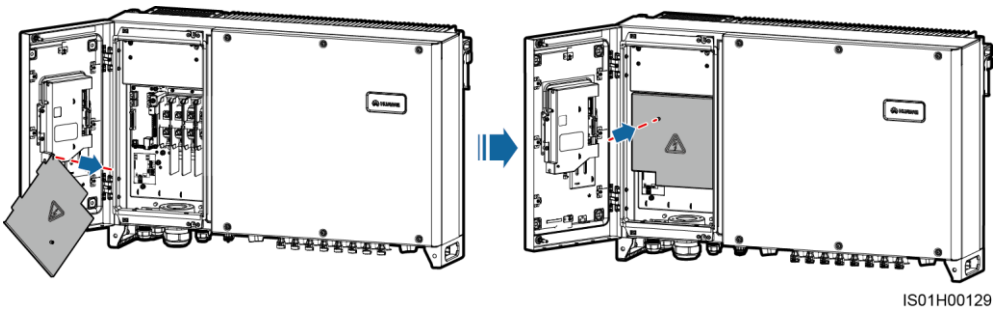
----End

6.7 Closing the Maintenance Compartment Door

Procedure

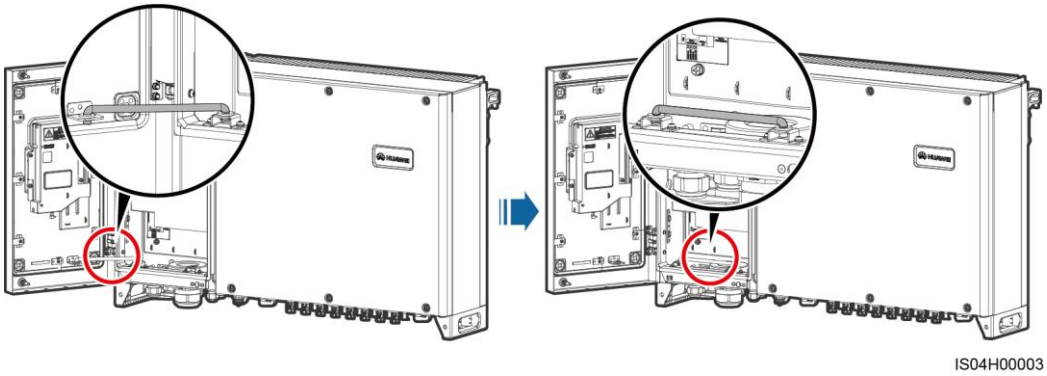
Step 1 Install the AC terminal cover.

Figure 6-37 Installing a cover



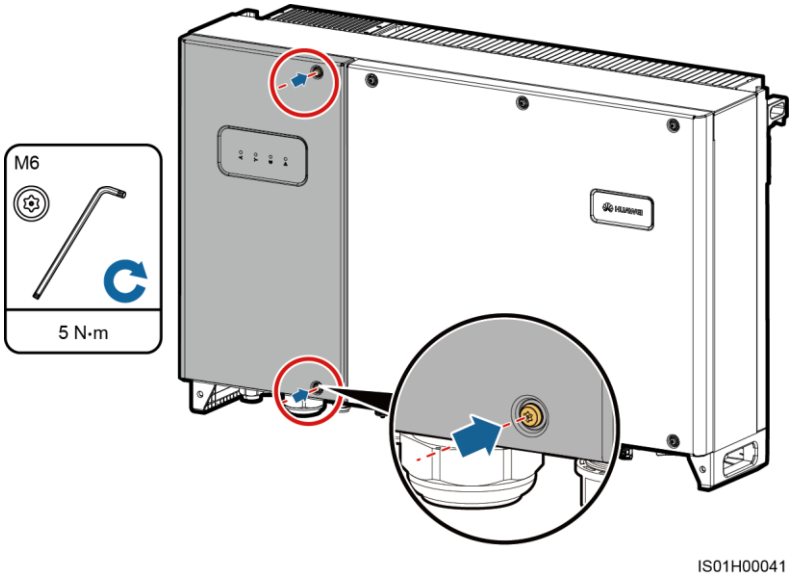
Step 2 Retrieve the support bar.

Figure 6-38 Retrieve the support bar



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

Figure 6-39 Tightening screws on the maintenance compartment door



----End

7 System Commissioning

7.1 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. All tube openings and/or used waterproof connectors at the chassis bottom are sealed.
8. The AC terminal cover is installed.
9. The maintenance compartment interior is clean and free from any extra material.
10. The maintenance compartment door is closed and secured with screws.
11. Unused DC input terminals are sealed.
12. Unused USB ports are plugged with waterproof caps.
13. Unused waterproof connectors are covered and the cable glands are tightened.

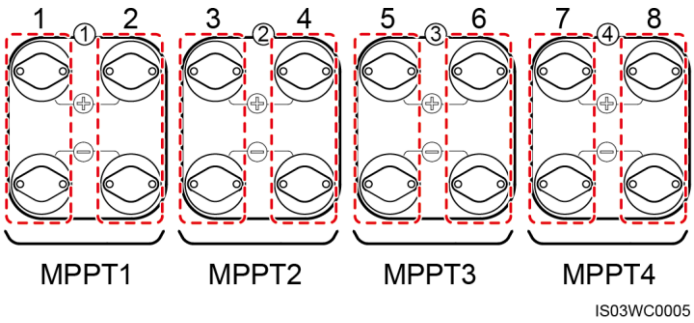
7.2 DC Input Detection

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 7-1. 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 7-1 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 7-1 describes the status of the LED indicators and buzzers.

Table 7-1 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:

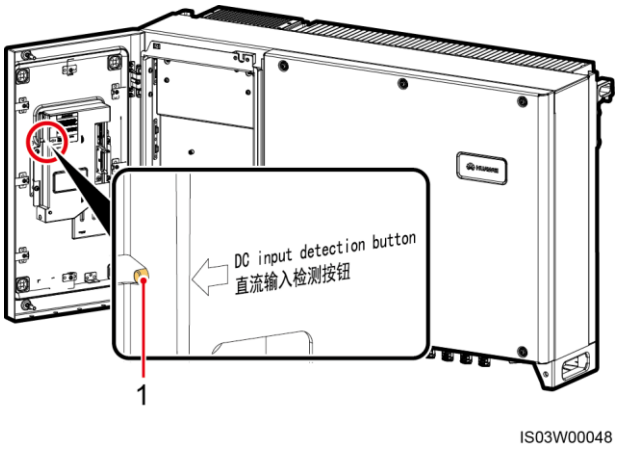
- Initial automatic detection is triggered 2 minutes after at least one PV string correctly connects to the MPPT1 circuit.
- Within three days after initial automatic detection is triggered, the SUN2000 performs automatic detection once every 10 minutes. From the fourth day, the SUN2000 performs automatic 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 7-2 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.

7.3 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. Proper PPE is required.
- Before turning the DC switch on the SUN2000 to ON, ensure that the DC input power cable is connected correctly.

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 cleared. The default time for auto correction 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.

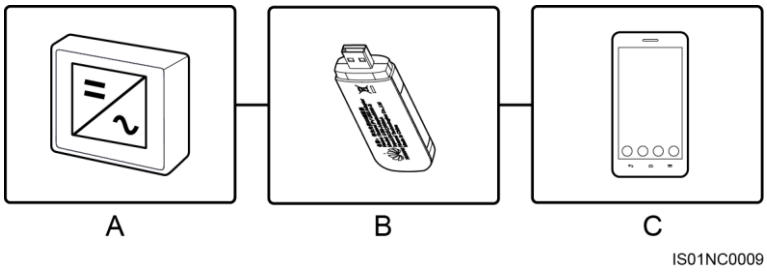
To ensure that the DC terminals are in good contact, check the temperatures at the joints between DC terminals and connectors after the SUN2000 has been running for a period of time. Ensure that the temperature rise does not exceed 40°C (104°F).

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 7-3 Bluetooth module connection



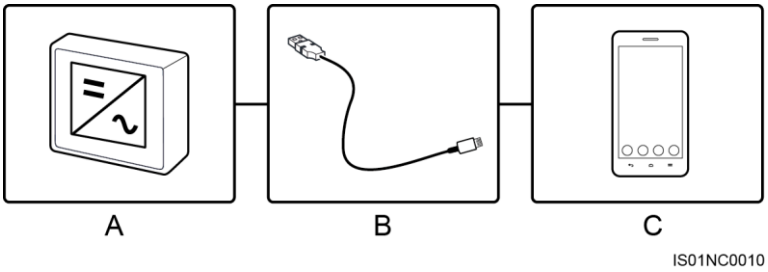
(A) SUN2000 (B) Bluetooth module (C) Mobile phone

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 7-4 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 of the USB data cable connected to the SUN2000 is USB 2.0.
- If the mobile phone provides a USB Type-C port, prepare a USB Type C to USB 2.0 adapter cable.

Figure 7-5 Login screen

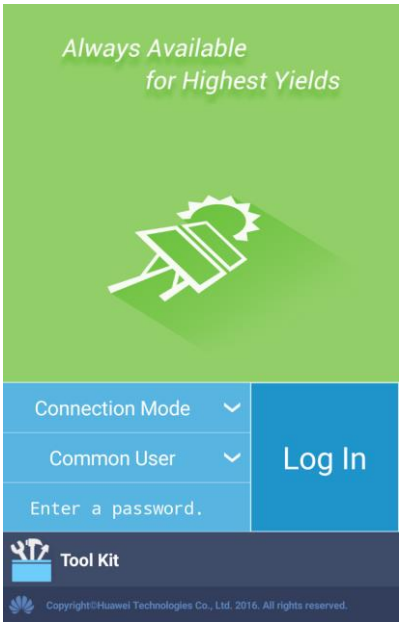


Figure 7-6 Selecting a connection mode

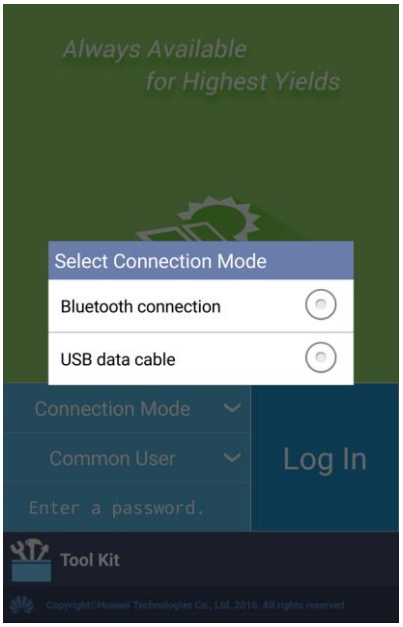


Figure 7-7 Bluetooth connection

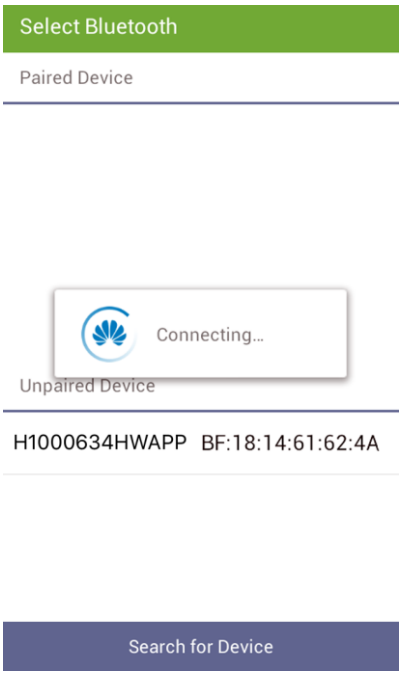
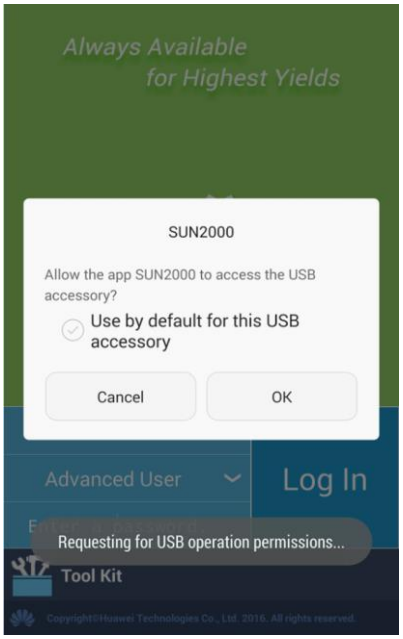


Figure 7-8 Data cable connection

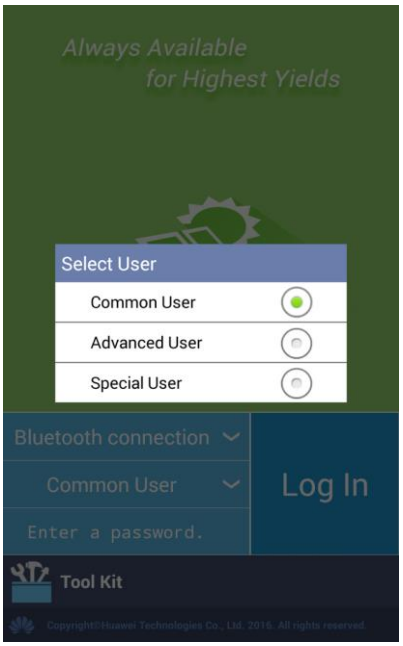


NOTE

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 7-9 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 **Login**.

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

NOTE

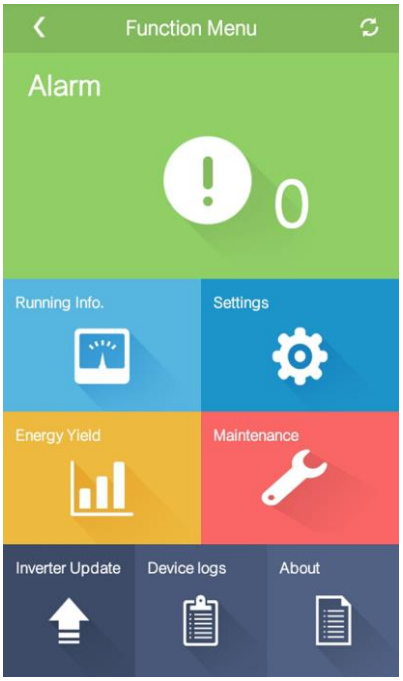
- If you log in to the app after the SUN2000 connects to the app for the first time or factory defaults are restored, the **Quick Settings** screen is displayed, on which you can set basic parameters. After the settings take effect, you can enter the main menu screen and modify the parameters on the **Settings** screen. By default, the SUN2000 can be grid-tied and you do not have to set parameters.
- You are advised to log in to the **Quick Settings** screen as an advanced user for parameter settings.

Figure 7-10 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. The baud rates of all the SUN2000s on each RS485 chain must be consistent with the SmartLogger baud rate.

Figure 7-11 Function menu



----End

7.4 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

8 Man-Machine Interactions

8.1 Operations with a USB Flash Drive

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

8.1.1 Exporting Configurations

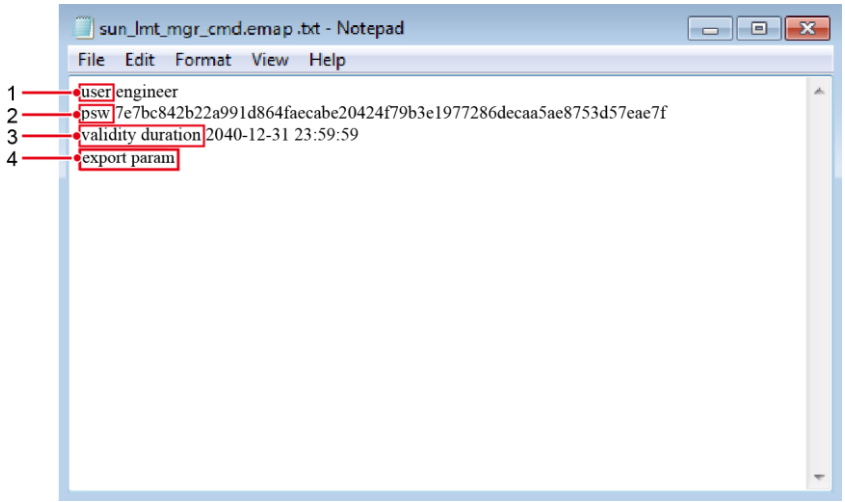
Procedure

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 computer.

(Optional) The boot script file can be opened as a .txt file, as shown in Figure 8-1.

Figure 8-1 Boot script file



No.	Meaning	Remarks
1	User name	• Advanced user: engineer

No.	Meaning	Remarks
		• Special user: admin
2	Ciphertext	The ciphertext varies depending on the login password of the SUN2000 APP.
3	Script validity period	The script validity period varies depending on the script export time.
4	Command	Different command settings can produce different commands. • 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 8-1 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

8.1.2 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 8-2 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.
	Steady green	An operation with a USB flash drive is successful.

----End

8.1.3 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 8-3 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

8.1.4 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, SUN2000HAV100R001C00SPC*XXX*) 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 8-4 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

8.2 Operations with the SUN2000 App

NOTICE

- The app software version corresponding to the user interface (UI) snapshots in this section is SUN2000APP V200R001C20SPC010.
- Configurable parameters vary with the grid code.
- The parameter names, value ranges, and default values are subject to change. The actual display prevails.

8.2.1 Operations Related to the Advanced User

Description

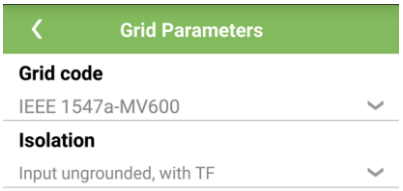
If you log in to the app as **Advanced User**, you can set the grid parameters, protection parameters, and feature parameters for the SUN2000.

8.2.1.1 Setting Grid Parameters

Procedure

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

Figure 8-2 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.	IEEE 1547a-MV600	-
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.	Input ungrounded, with TF	• Input grounded, with TF • Input ungrounded, without TF • Input ungrounded, with TF

8.2.1.2 Setting Protection Parameters

Procedure

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

Figure 8-3 Protection parameter (advanced user)

----End

Parameter List

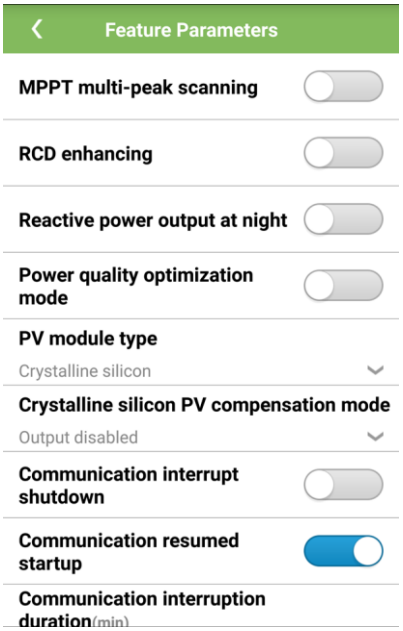
No.	Parameter	Description	Unit	Default Value	Value Range
1	Insulation resistance protection	To ensure device safety, the SUN2000 detects the insulation resistance between the input side and the ground when it starts a self-check. If the detected value is less than the preset value, the SUN2000 does not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

8.2.1.3 Setting Feature Parameters

Procedure

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

Figure 8-4 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	• 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**.
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	N/A	Disable	• Disable • Enable	N/A

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
		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.				
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	• 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	• Disable • Enable	N/A
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	• Crystalline silicon • Film • CPV 1 • CPV 2	• 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. • When the concentration PV modules are used: – If **PV module type** is set to **CPV 1**, the inverter can

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
						quickly restart in 60 minutes when the input power of PV modules drops drastically due to shading. – If **PV module type** is set to **CPV 2**, the inverter can quickly restart in 10 minutes when the input power of PV modules drops drastically due to shading.
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	• 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	• 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	Specifies the duration for determining	min	30	[1, 120]	N/A

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
	interruption duration	communication interruption, and is used for automatic shutdown for protection in case of communication interruption.				
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	• Disable • Enable	N/A
11	Soft start time	Specifies the duration for the power to gradually increase when the SUN2000 starts.	s	20	[20, 1800]	N/A
12	AFCI	The North American standard requires the SUN2000 to provide the DC arc detection function.	N/A	Enable	• Disable • Enable	N/A
13	AFCI detection adaptive mode	Adjusts the sensitivity of arc detection.	N/A	Moderate	• High • Moderate • Low	This parameter is displayed only when **AFCI** is set to **Enable**.
14	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
15	Hibernate at night	The SUN2000 monitors PV strings at	N/A	Disable	• Disable	N/A

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
		night. If **Hibernate at night** is set to **Enable**, the monitoring function of the SUN2000 will hibernate at night, reducing power consumption.			• Enable	
16	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	• Disable • Enable	N/A
17	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	• Disable • Enable	N/A
18	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	• Disable • Enable	If PV strings are easily shaded, you are advised to set **String monitor** to **Disable** to prevent false alarms.
19	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	min	180	[2, 720]	This parameter is displayed when **String monitor** is set to **Enable**.

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
		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.				
20	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]	
21	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]	
22	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]	
23	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]	
24	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	N/A	Disable	• Disable • Enable	N/A

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
		receiving the 0% power limit command.				
25	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.
26	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
27	Tracking system controller	Selects a controller vendor.	N/A	N/A	N/A	N/A
28	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
29	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
30	DC input	If **DC input detection**	N/A	Enable	• Disable	N/A

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
	detection	is set to **Disable**, the SUN2000 does not perform automatic DC input detection or manual DC output detection.			• Enable	
31	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 with the grid code. The displayed value prevails.	• Disable • Enable	N/A
32	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	• Disable • Enable	N/A

8.2.2 Operations Related to the Special User

Description

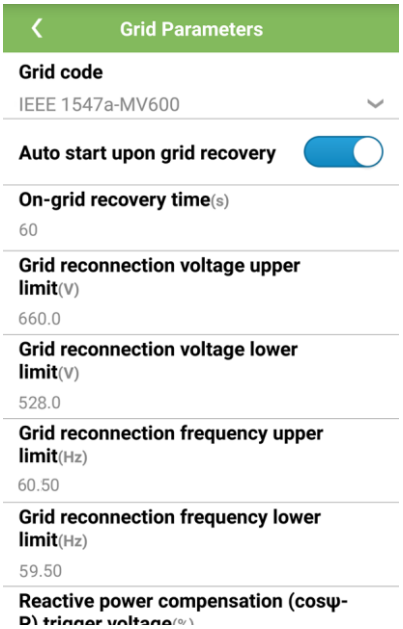
If you log in to the app as **Special User**, you can set the grid parameters, protection parameters, feature parameters, and grid adjustment parameters for the SUN2000.

8.2.2.1 Setting Grid Parameters

Procedure

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

Figure 8-5 Grid Parameters (special user)



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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	IEEE 1547a-MV600	N/A
2	Auto start upon grid recovery	Specifies whether to allow the SUN2000 to automatically start after the power grid recovers.	N/A	Enable	• Disable • Enable
3	Grid connection duration after power grid recovery	Specifies the waiting time for SUN2000 restart after the power grid recovers.	s	The default value is 60 if the 1547a-MV600 grid code is selected. The default value is 300 if another grid code is selected.	[0, 900]
4	Grid reconnection voltage upper limit	The standards of certain countries and regions require that the SUN2000 must not export power to the power	V	The default value varies with the grid code. The displayed value	[100%Vn, 136%Vn]

No.	Parameter	Description	Unit	Default Value	Value Range
		grid again when the grid voltage exceeds the value of **Grid reconnection voltage upper limit** after the SUN2000 shuts down due to a fault.		prevails.	
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 with 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 (cosφ-P) trigger voltage	Specifies the voltage threshold for triggering reactive power compensation based on the cosφ-P curve.	%	105	[100, 110]
9	Reactive power compensation (cosφ-P) exit voltage	Specifies the voltage threshold for exiting reactive power compensation based on the cosφ-P curve.	%	98	[90, 100]

NOTE
Vn represents the rated voltage and Fn represents the rated frequency.

8.2.2.2 Setting Protection Parameters

Procedure

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

Figure 8-6 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.
- Vn represents the rated voltage and Fn 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	• Disable • Enable

No.	Parameter	Description	Unit	Value Range
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, 720000]
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, 720000]
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, 720000]
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, 720000]
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, 720000]
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, 720000]
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, 720000]
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, 720000]
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, 720000]
21	Level-3 OV protection	Specifies the level-3 overvoltage protection threshold.	V	[1 x Vn, 1.36 x Vn]
22	Level-3 OV	Specifies the level-3 overvoltage	ms	[50, 720000]

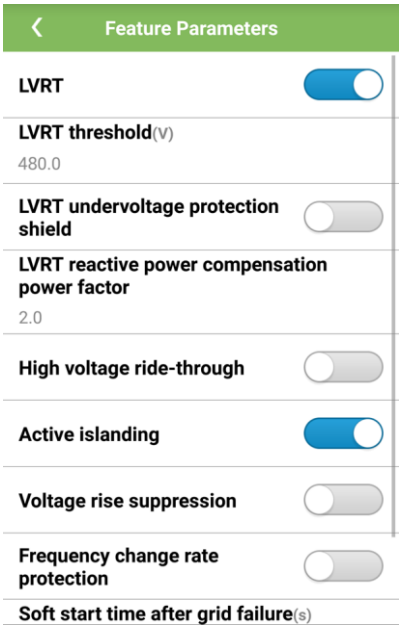
No.	Parameter	Description	Unit	Value Range
	protection time	protection duration.		
23	Level-4 OV protection	Specifies the level-4 overvoltage protection threshold.	V	[1 x Vn, 1.36 x Vn]
24	Level-4 OV protection time	Specifies the level-4 overvoltage protection duration.	ms	[50, 720000]
25	Level-3 UV 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, 720000]
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, 720000]

8.2.2.3 Setting Feature Parameters

Procedure

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

Figure 8-7 Feature Parameters (special user)



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Parameter description

No.	Parameter	Description	Unit	Default Value	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	The default value varies with the grid code. The displayed value prevails.	• Disable • Enable	N/A
2	LVRT threshold	Specifies the threshold for triggering LVRT.	V	80%Vn	[50%Vn, 92%Vn]	Vn represents the rated voltage.
3	LVRT undervoltage protection shield	Specifies whether to shield the undervoltage protection function during LVRT.	N/A	The default value varies with the grid code. The displayed value prevails.	• Disable • Enable	N/A
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	2	[0, 3]	For example, if you set **LVRT reactive power compensation power factor** to **2**, the reactive current generated by the SUN2000 is 20% of the rated current 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	Disable	• Disable • Enable	N/A
6	Active islanding	Specifies whether to enable the active islanding protection function.	N/A	Enable	• Disable • Enable	N/A
7	Voltage rise	The standards of certain countries and	N/A	Disable	• Disable	N/A

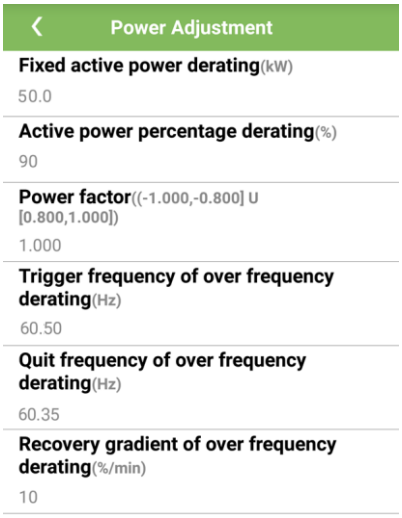
No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
	suppression	regions require that the SUN2000 should prevent the grid voltage from rising by delivering reactive power and decreasing active power when the output voltage exceeds a certain value.			• Enable	
8	Voltage rise suppression reactive 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.	%	110	[100, 115]	• 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.	%	112.5	[100, 115]	
10	Frequency change rate protection	The SUN2000 triggers protection when the power grid frequency changes too fast.	N/A	Disable	• Disable • Enable	N/A
11	Frequency change rate protection point	Specifies the frequency change rate protection threshold.	Hz/s	0.2	[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	0.5	[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	600	[20, 800]	N/A

8.2.2.4 Setting Power Adjustment Parameters

Procedure

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

Figure 8-8 Power Adjustment (special user)



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Parameter List

Table 8-5 Parameter description

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]	Pmax represents the maximum active power.
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

No.	Parameter	Description	Unit	Default Value	Value Range	Remarks
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.	• 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			N/A
6	Recovery gradient of over frequency derating	Specifies the power recovery gradient for overfrequency derating.	%/min	10	[5, 20]	N/A

9 System Maintenance

9.1 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 7.4 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 9-1 Maintenance list

Item	Check Method	Maintenance Interval
System cleanliness	Check the heat sink for foreign matter or the overall health of the SUN2000.	Annual or every time an abnormality is detected
System running status	Check the SUN2000 for damage or deformation.	Annual
Cable connections	• 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 whether the ground terminal and ground cable are securely connected.	Annual

Item	Check Method	Maintenance Interval
Sealing	Check whether all cable glands are properly sealed.	Annual

9.2 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 9-2 Common alarms and troubleshooting measures

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
103	High DC Input Voltage	Major	• 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	• 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

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			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.	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.
106–113	Abnormal String 1–8	Warning	Cause ID = 1 • The PV string is shielded from sunlight for a long time. • The PV string deteriorates or is damaged.	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	• 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.	• 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.
200	Abnormal DC Circuit	Major	Abnormal external conditions trigger the protection for the DC circuit inside the inverter. The possible causes are as follows: • Cause ID = 3 The inverter input is disconnected accidentally, or the PV string output power changes sharply because the PV string is	Cause ID = 3/10/11 1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 2. If the fault persists, contact Huawei technical support. Cause ID = 12/15 Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			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.	switch after 5 minutes. If the fault persists, contact Huawei technical support.
202	Abnormal Invert Circuit	Major	Abnormal external conditions trigger the protection for the inverter circuit inside the inverter. The possible causes are as follows: • 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 = 13/14/16 1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 2. If the fault persists, contact Huawei technical support. Cause ID = 20 1. Check the inverter output cable for short-circuits. 2. If the fault persists, contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			• 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.	
301	Abnormal Grid Voltage	Major	The power grid voltage is beyond the acceptable range. The possible causes are as follows: • 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 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	Cause ID = 4 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. Cause ID = 16/19/26 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. Cause ID = 28 1. If the exception is caused by an external fault, the inverter automatically recovers after the fault is rectified.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			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.	2. If the fault persists and affects the energy yield of the power station, contact the local power operator. Cause ID = 29 1. Check the AC voltage. 2. Check that the AC power cable is connected and that the AC switch is ON. 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. Cause ID = 32 Check the impedance of output phase wire B to the PE cable, locate the position with lower impedance, and resolve the issue. Cause ID = 33 Check the impedance of output phase wire C to the PE cable, locate the position with lower impedance, and resolve the issue.
305	Abnormal Grid Frequency	Major	• 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.	Cause ID = 2/4 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. Cause ID = 5 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
				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	Cause ID = 1 • 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.	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**.
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 • 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 • The neutral wire or PGND cable does not connect to the inverter.	1. Check that the neutral wire or PGND cable properly connects to the inverter. 2. If the PV string is grounded, check whether the inverter output

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			• When you are grounding the PV string, you do not connect an isolation transformer to the inverter output.	needs to connect to an isolation transformer. If yes, connect the transformer to the inverter.
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.
410	Abnormal Auxiliary Power	Major	Cause ID = 4 The sampling control board has an abnormal voltage, which may be caused by the following: • The internal power chip of the sampling control board is faulty. • The detection circuit becomes faulty.	1. When the alarm is generated, the inverter shuts down automatically. When the fault is rectified, the inverter starts automatically. 2. If the fault persists, contact Huawei technical support.
411	AFCI Self-Check Failure	Major	Cause ID = 1/2/3 AFCI check fails.	1. 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. 2. Disable the AFCI function if you are sure not to use it.
412	DC Arc Fault	Major	Cause ID = 1/2/3/4 The PV string cable is in poor contact or with open circuits.	Check whether the PV string cable is in poor contact or with open circuits. If yes, reconnect the cable.
413	Abnormal PV String Connection	Major	Cause ID = 1 The PV string does not properly connect to the MPPT1 circuit. Cause ID = 2 The PV string does not properly connect to the MPPT2 circuit. Cause ID = 3 The PV string does not properly connect to the MPPT3 circuit. Cause ID = 4	Check the PV string for reverse connection and cross connection.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			The PV string does not properly connect to the MPPT4 circuit.	
504	Software Version Unmatch	Minor	Cause ID = 1/2/3 During inverter software upgrade, the version of the software loaded is incorrect.	Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again.
505	Upgrade Failed	Major	Cause ID = 1 The upgrade does not end normally.	Perform the upgrade again.
61440	Flash Fault	Minor	Cause ID = 1 • The flash memory is insufficient. • The flash memory has bad sectors.	1. Replace the monitoring board. 2. If the monitoring board is built into the monitoring device, replace the monitoring device.

NOTE
Please contact Huawei technical support if all failure analysis procedures listed above completed and issue still exist.

10 Handling the Inverter

10.1 Removing the SUN2000

NOTICE

Before removing the SUN2000, disconnect both AC and DC connections. 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.

10.2 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.

10.3 Disposing of the SUN2000

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

11 Technical Specifications

Efficiency

Item	SUN2000-45KTL-US-HV-D0
Maximum efficiency	98.70%
CEC efficiency	98.50%

Input

Item	SUN2000-45KTL-US-HV-D0
Maximum input voltage	1500 V
Maximum input current (per MPPT)	22 A
Maximum short-circuit current (per MPPT)	30 A
Maximum SUN2000 backfeed current to the PV array	0 A
Maximum operating voltage	1500 V
Lowest operating/startup voltage	600 V/650 V
MPPT voltage range	600–1450 V
Full power MPPT voltage range	800–1200 V
Rated input voltage	1000 V
Number of inputs	8
Number of MPP trackers	4

Output

Item	SUN2000-45KTL-US-HV-D0
Rated output power	45,000 W
Maximum apparent power	50,000 VA
Maximum AC output power (cosφ = 1)	50,000 W
Rated output line voltage	600 V AC, 3W+PE
Rated output current	43.3 A
Output frequency	60 Hz
Maximum output current	48 A
Power factor	0.8 leading ... 0.8 lagging
Maximum total harmonic distortion (THD)	< 3%

Protection

Item	SUN2000-45KTL-US-HV-D0
Input DC switch	Supported
Anti-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
AFCI	Supported (UL 1699B, Type I)

Display and Communication

Item	SUN2000-45KTL-US-HV-D0
Display	LED indicator, Bluetooth module+app, USB data cable+app
RS485	Supported
PLC	Supported

Common Parameters

Item	SUN2000-45KTL-US-HV-D0
Dimensions (W x H x D)	930 mm x 600 mm x 270 mm (36.61 in. x 23.63 in. x 10.63 in.)
Weight	About 64 kg (141 lb)
Operating temperature	–25°C to +60°C (–13°F to +140°F)
Cooling mode	Natural convection
Humidity	0%–100% RH
Input terminal	Amphenol Helios H4
Output terminal	Waterproof cable connector+OT terminal
Ingress Protection Rating	Type 4X
Topology	No transformer

A 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

B Contact Information

If you need to consult any technical problem, dial the Huawei technical assistance center (TAC) hotline. Please provide the following information to receive better service.

- Customer Name
- Contact Info
- Project Name and Location
- Project Scale
- Project Grid-connection Time
- Fault Occurrence Time
- Quantity of Faulty Inverters
- Inverter Model
- Inverter SN
- Inverter Firmware Version
- Warranty Info
- Problem Description
- SmartLogger Model
- SmartLogger Firmware Version
- SmartLogger Networking Scenarios (Such as Optical Fiber + RS485/PLC Networking)
- RMA Shipping Address

HUAWEI TECHNOLOGIES USA INC.

5700 Tennyson Pkwy, Plano, TX 75024

TAC Line: 877-948-2934

Emai: na_inverter_support@huawei.com