



**SUN2000-(50KTL, 60KTL, 65KTL)-M0**

# **User Manual**

**Issue**      **06**

**Date**        **2020-07-07**

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# About This Document

## Purpose




This document describes the SUN2000-50KTL-M0, SUN2000-60KTL-M0 and SUN2000-65KTL-M0 (SUN2000 for short) in terms of its installation, electrical connections, commissioning, maintenance, and troubleshooting. Before installing and operating the SUN2000, ensure that you are familiar with the features, functions, and safety precautions provided in this document.



## Intended Audience

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

## Symbol Conventions

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

Symbol	Remarks
 <b>DANGER</b>	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Symbol	Remarks
 <b>NOTICE</b>	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.
 <b>NOTE</b>	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

## Change History

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

### Issue 06 (2020-07-07)

Updated [4.3.1 Environment Requirements](#).

### Issue 05 (2019-12-18)

Updated [3 Storage](#).

Added [6.4 Power-Off for Troubleshooting](#).

### Issue 04 (2019-06-30)

Updated [2.2 Appearance](#).

Updated [5 Electrical Connections](#).

Updated [6.2 Powering On the SUN2000](#).

Updated [10 Technical Specifications](#).

### Issue 03 (2019-04-16)

Updated [5.1 Precautions](#).

Updated Grid Codes.

### Issue 02 (2018-07-30)

Updated [5.4 Installing the AC Output Power Cable](#).

Updated [7.2.1.3 Setting Feature Parameters](#).



Updated [8.2 Troubleshooting](#).

## **Issue 01 (2018-04-20)**

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

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# 1 Safety Information

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## 1.1 General Safety

### Statement

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

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

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

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

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

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

## General Requirements

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 **DANGER**

Do not work with power on during installation.

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

## Personal Safety

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

## 1.2 Personnel Requirements

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

- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

 **NOTE**

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance
- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

## 1.3 Electrical Safety

### Grounding

- For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is securely grounded.

### General Requirements

---

 **DANGER**

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

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

### AC and DC Power

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 **DANGER**

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

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- Before making electrical connections, switch off the disconnecter on the upstream device to cut off the power supply if people may contact energized components.
- Before connecting a power cable, check that the label on the power cable is correct.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

## Cabling

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

## 1.4 Installation Environment Requirements

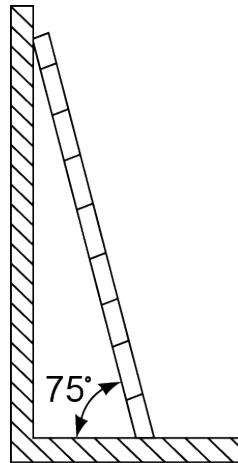
- Ensure that the equipment is installed in a well ventilated environment.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not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

## 1.5 Mechanical Safety

### Using Ladders

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





PI02SC0008

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

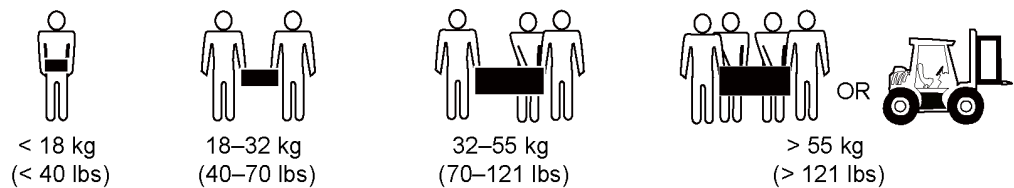
## Drilling Holes

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

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

## Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.



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

## 1.6 Commissioning

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

## 1.7 Maintenance and Replacement

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 **DANGER**

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

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

# 2 Overview

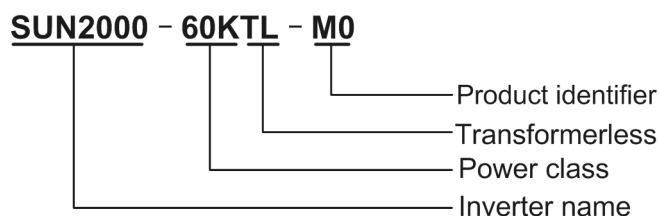
## 2.1 Introduction

### 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 to the power grid.

### Models

**Figure 2-1** Designation explanation of the SUN2000-60KTL-M0

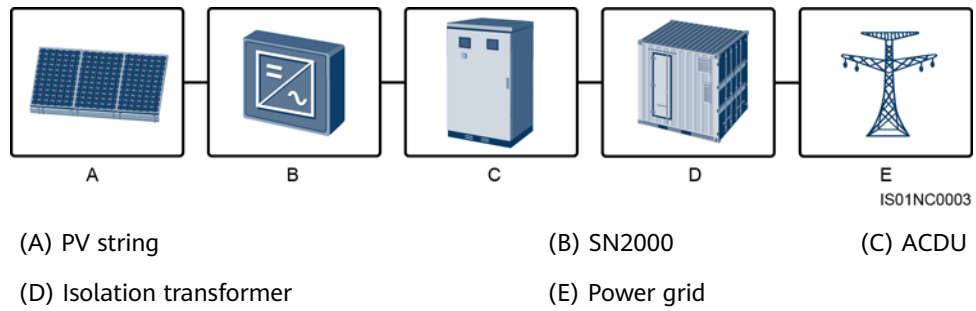


Model	Rated Output Power	Rated Output Voltage
SUN2000-50KTL-M0	50 kW	380 V/400 V/415 V
SUN2000-60KTL-M0	60 kW	380 V/400 V/480 V
SUN2000-65KTL-M0	65 kW	480 V

### Networking Application

The SUN2000 applies to grid-tied PV systems for commercial rooftops and large PV plants. Typically, a grid-tied PV system consists of the PV string, SUN2000, alternating current distribution unit (ACDU), and isolation transformer.

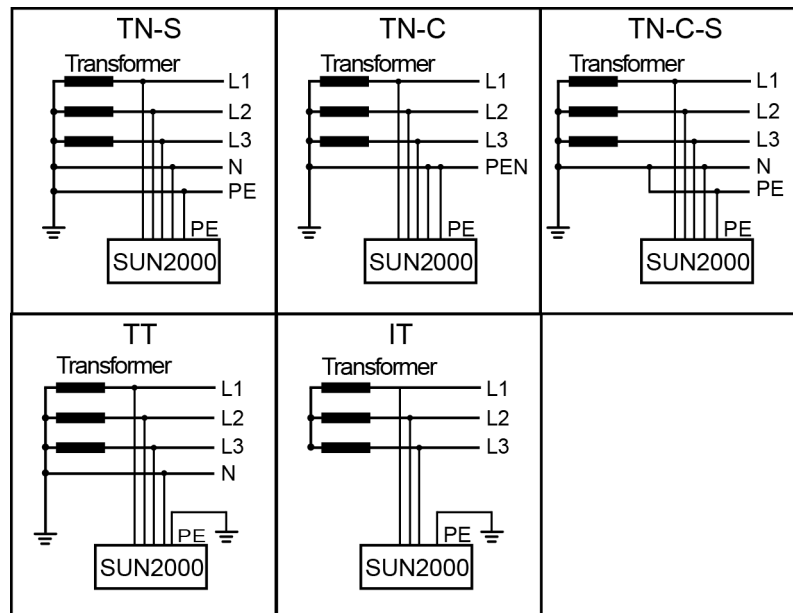
**Figure 2-2 Network diagram**



## Supported Power Grid

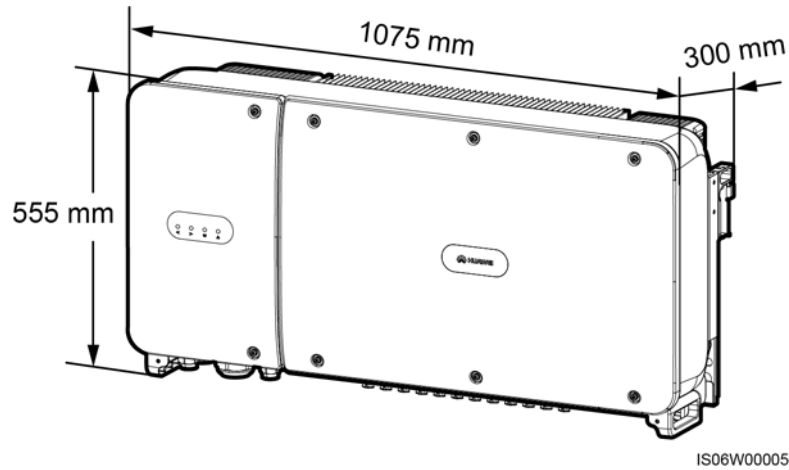
The SUN2000-50KTL-M0 and SUN2000-60KTL-M0 support the following power grid modes: TN-S, TN-C, TN-C-S, TT, and IT. The SUN2000-65KTL-M0 supports only IT grid mode.

**Figure 2-3 Power grid modes**

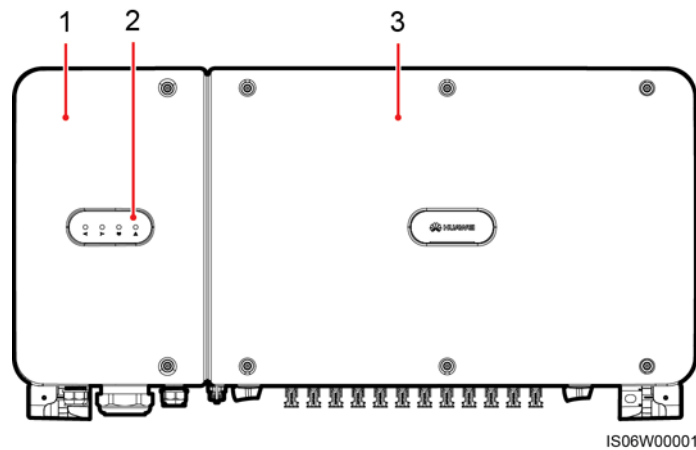


## 2.2 Appearance


### Dimensions






### Front View



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

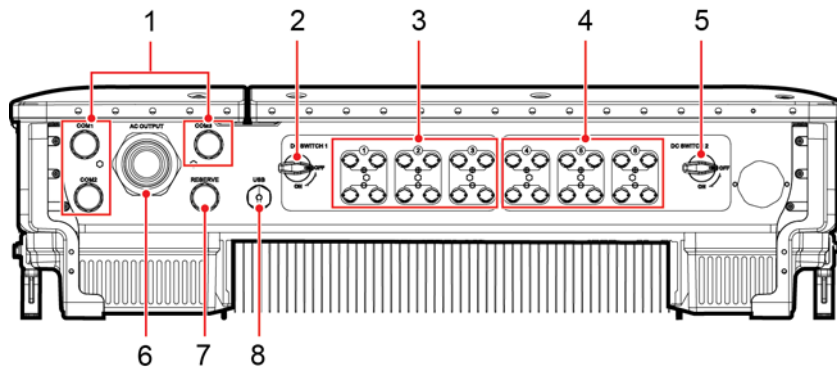
LED	Status	Meaning
PV connection LED 	Steady green	At least one PV string is properly connected, and the DC input voltage of the corresponding MPPT circuit is higher than or equal to 200 V.

LED	Status	Meaning	
	Off	The SUN2000 disconnects from all PV strings, or the DC input voltage of each MPPT circuit is less than 200 V.	
Grid-tied LED 	Steady green	The SUN2000 is exporting power to the power grid.	
	Off	The SUN2000 is not exporting power to the power grid.	
Communication LED 	Blinking green (on for 0.2s and then off for 0.2s)	The SUN2000 receives communications data normally.	
	Off	The SUN2000 receives no communications data for 10s.	
Alarm/Maintenance LED 	Alarm status	Blinking red at long intervals (on for 1s and then off for 4s)	The SUN2000 is generating a warning alarm.
		Blinking red at short intervals (on for 0.5s and then off for 0.5s)	The SUN2000 is generating a minor alarm.
		Steady red	The SUN2000 is generating a major alarm.
	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 for 0.125s and then off for 0.125s)	Local maintenance fails.
		Steady green	Local maintenance is successful.

 **NOTE**

- Local maintenance refers to operations performed after a USB flash drive, Bluetooth module, WLAN module or USB data cable is inserted into the USB port of the SUN2000. For example, local maintenance includes configuration import and export using a USB flash drive, and maintenance operations on the SUN2000 app installed on a device connected to the SUN2000 by a Bluetooth module, WLAN module or USB data cable.
- If an alarm occurs during local maintenance, the Alarm/Maintenance LED shows the local maintenance status first. After the USB flash drive, Bluetooth module, WLAN module or USB data cable is removed, the LED shows the alarm status.

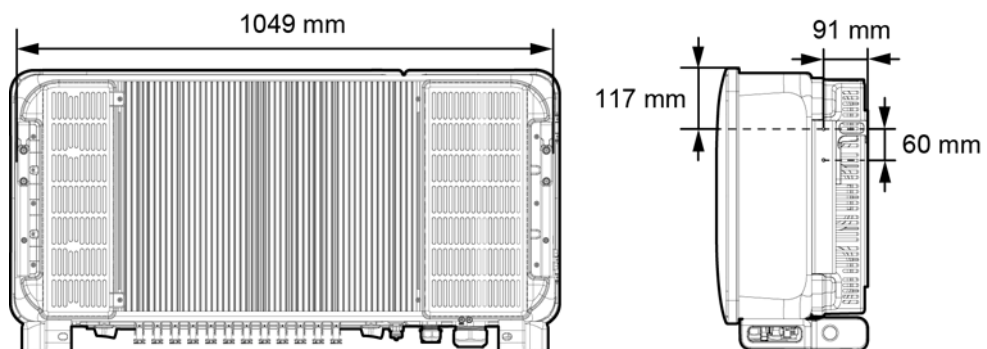
### Bottom View



IS08W00004

No.	Component	Silk Screen	Description
1	Cable gland	COM1, COM2, and COM3	Inner diameter: 14-18 mm
2	DC switch 1	DC SWITCH 1	N/A
3	DC input terminals	+/-	Controlled by DC SWITCH 1
4	DC input terminals	+/-	Controlled by DC SWITCH 2
5	DC switch 2	DC SWITCH 2	N/A
6	Cable gland	AC OUTPUT	Inner diameter: 24-57 mm
7	Cable gland	RESERVE	Inner diameter: 14-18 mm
8	USB port	USB	N/A

### Holes Reserved at the Side of the Enclosure









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#### NOTE




There are two M6 tapped holes reserved on both sides of the enclosures, which are used for installing an awning.

## 2.3 Label Description

### 2.3.1 Enclosure Labels

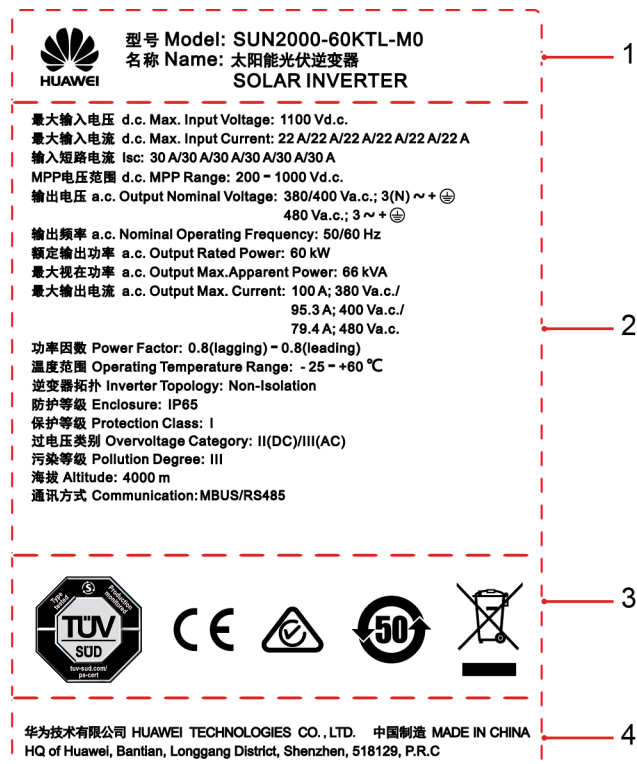
Label	Name	Meaning
	Running warning	Potential hazards exist after the SUN2000 is powered on. Take protective measures when operating the SUN2000.
	Burn warning	Do not touch a running SUN2000 because it generates high temperatures on the shell.
	Delay discharge	<ul style="list-style-type: none"> <li>High voltage exists after the SUN2000 is powered on. Only certified electricians are allowed to perform operations on the SUN2000.</li> <li>Residual voltage exists after the SUN2000 is powered off. It takes 15 minutes for the SUN2000 to discharge to the safe voltage.</li> </ul>
	Refer to documentation	Reminds operators to refer to the documents provided with the SUN2000.
	Grounding	Indicates the position for connecting the PE cable.
 <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>Do not disconnect under load! 禁止带负荷断开连接!</p> </div>	Operation warning	Do not remove the DC input connector when the SUN2000 is running.



Label	Name	Meaning
	<p>DC terminal operation warning</p>	<p>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:</p> <ol style="list-style-type: none"> <li>1. Send a shutdown command.</li> <li>2. Turn off the downstream AC switch.</li> <li>3. Turn off the two DC switches at the bottom.</li> </ol>
	<p>SUN2000 serial number (SN) label</p>	<p>Indicates the SUN2000 SN.</p>
	<p>Weight label</p>	<p>The SUN2000 needs to be carried by four people or using a pallet truck.</p>

### 2.3.2 Product Nameplate

Figure 2-4 Nameplate of the SUN2000-60KTL-M0



- (1) Trademark, product name, and model number
- (2) Important technical specifications
- (3) Compliance symbols
- (4) Company name and place of production

**NOTE**

The nameplate figure is for reference only.

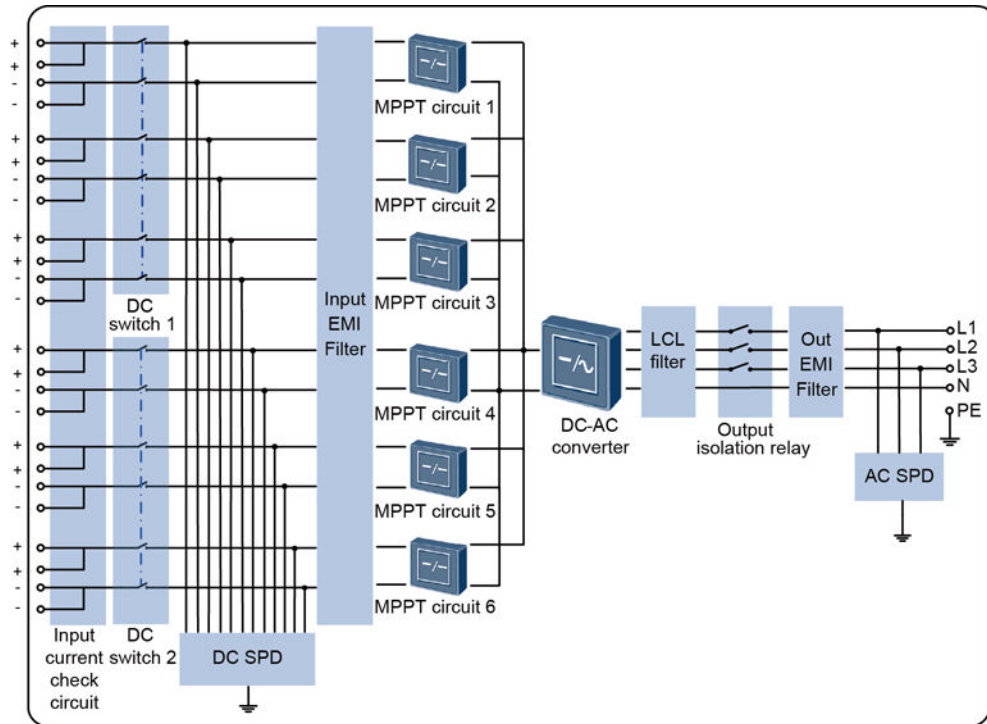
## 2.4 Working Principles

### 2.4.1 Conceptual Diagram

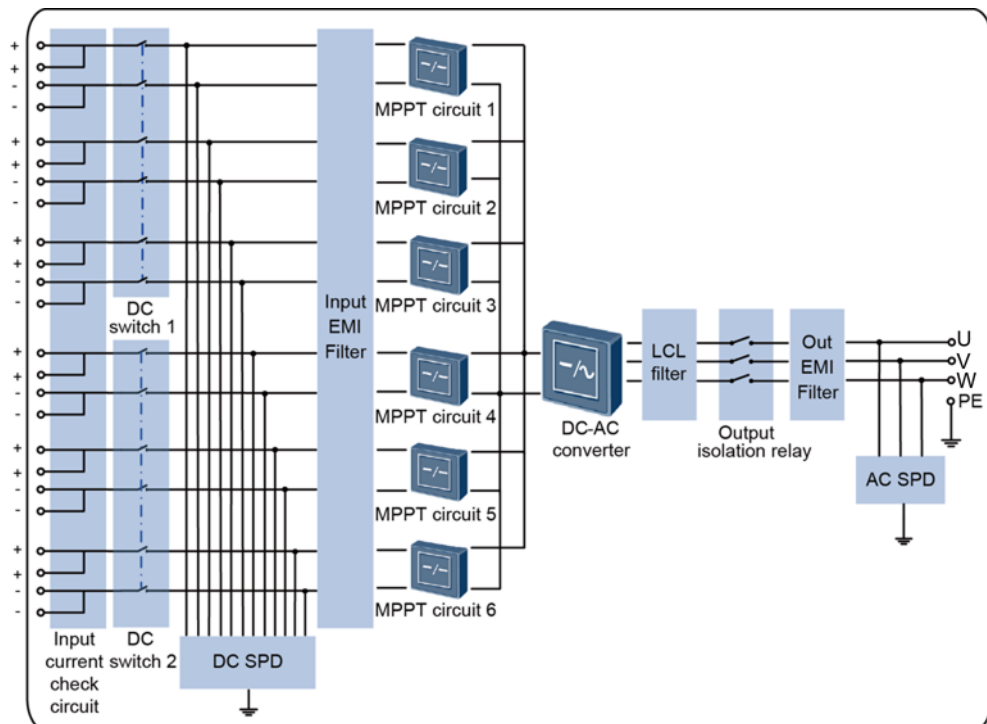
The SUN2000 receives inputs from 12 PV strings. Then the inputs are grouped into six MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

Figure 2-5 shows the conceptual diagram for the SUN2000-50KTL/60KTL-M0.  
Figure 2-6 shows the conceptual diagram for the SUN2000-65KTL-M0.

**Figure 2-5** Conceptual diagram for the SUN2000-50KTL/60KTL-M0



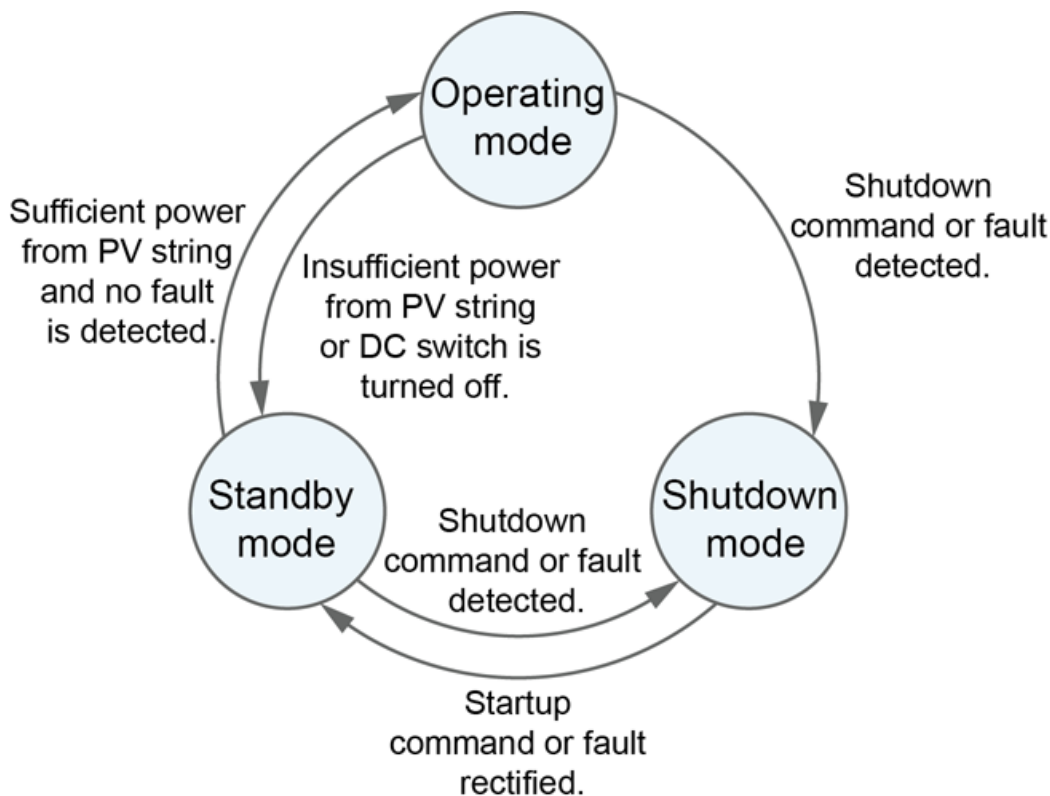
**Figure 2-6** Conceptual diagram for the SUN2000-65KTL-M0



## 2.4.2 Working Modes

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

Figure 2-7 Working modes



IS07S00001

Table 2-1 Working mode description

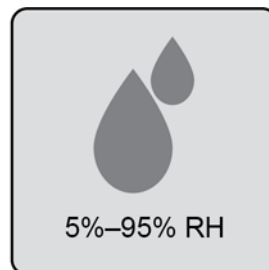
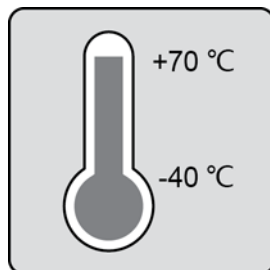
Working Mode	Description
Standby	<p>The SUN2000 enters Standby mode when the external environment does not meet the operating requirements. In Standby mode:</p> <ul style="list-style-type: none"> <li>• The SUN2000 continuously performs status check and enters the Operating mode once the operating requirements are met.</li> <li>• The SUN2000 enters Shutdown mode after detecting a shutdown command or a fault after startup.</li> </ul>
Operating	<p>In Operating mode:</p> <ul style="list-style-type: none"> <li>• The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid.</li> <li>• The SUN2000 tracks the maximum power point to maximize the PV string output.</li> <li>• If the SUN2000 detects a fault or a shutdown command, it enters the Shutdown mode.</li> <li>• The SUN2000 enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid for generating power.</li> </ul>

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

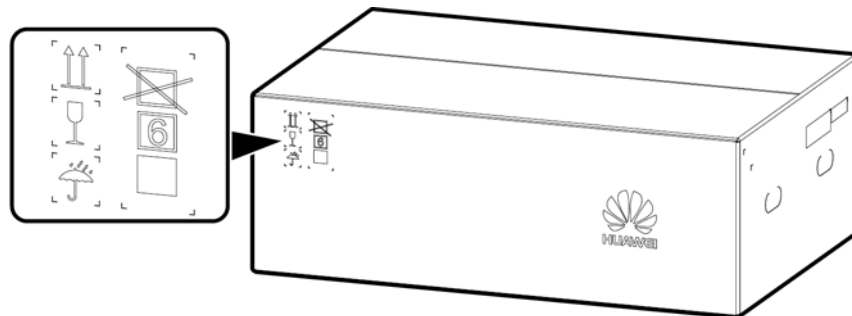
# 3 Storage

The following requirements should be met when the SUN2000 needs to be stored prior to installation:

- Do not remove the packing materials, and check the packing materials regularly (recommended: every three months). If any rodent bites are found, replace the packing materials immediately. If the solar inverter is unpacked but not put into use immediately, put it inside the original package with the desiccant bag, and seal it using tape.
- The ambient temperature and humidity should be suitable for the storage. The air must not contain corrosive or flammable gases.



- The solar inverter should be stored in a clean and dry place and be protected from dust and water vapor corrosion. The solar inverter must be protected against rain and water.
- Do not tilt the package or place it upside down.
- To avoid personal injury or device damage, stack inverters with caution to prevent them from falling over.



IS06W00019

- If the solar inverter has been stored for more than two years, it must be checked and tested by professionals before being put into use.

# 4 Installation

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## 4.1 Checking Before Installation

### Outer Packing Materials

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

 **NOTE**

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

### Package Contents

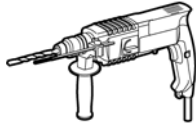
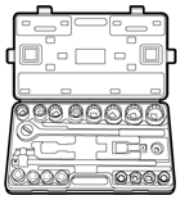
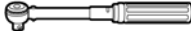
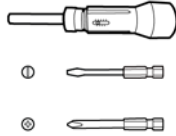
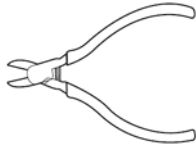
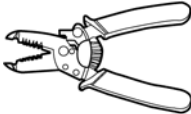





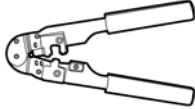




After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

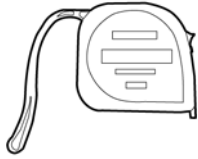

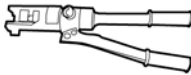







 **NOTE**

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

## 4.2 Tools



Type	Tool			
Installation tools				
	Hammer drill Drill bit: $\Phi 14$ mm and $\Phi 16$ mm	Socket wrench	Torque wrench	Torque screwdriver (Phillips head: M4; flat head: M4)
				
	Diagonal pliers	Wire stripper	Flat-head screwdriver Head: 0.6 mm x 3.5 mm	Rubber mallet
				
Utility knife	Cable cutter	Crimping tool Model: UTXTC0005 or H4TC0003; manufacturer: Amphenol	RJ45 crimping tool	
				
Removal wrench Model: H4TW0001; manufacturer: Amphenol	Vacuum cleaner	Multimeter DC voltage measurement range $\geq 1100$ V DC	Marker	

Type	Tool			
	 Measuring tape	 Digital or bubble level	 Hydraulic pliers	 Heat shrink tubing
	 Heat gun	 Cable tie	N/A	N/A
PPE	 Safety gloves	 Safety goggles	 Anti-dust respirator	 Safety shoes

 NOTE

UTXTC0005 is used to crimp metal cold forming contacts, while H4TC0003 is used to crimp metal stamping forming contacts.

## 4.3 Determining the Installation Position

### 4.3.1 Environment Requirements

#### Basic Requirements

- Do not install the inverter in working or living areas.
- If the device is installed in public places (such as parking lots, stations, and factories) other than working and living areas, install a protective net outside the device, set up a safety warning sign to isolate the device, and prevent unauthorized personnel from approaching the inverter. This is to avoid personal injury or property loss caused by accidental contact or other reasons during device operation.
- Do not install the inverter in areas with flammable materials.
- Do not install the inverter in areas with explosive materials.

- Do not install the inverter in areas with corrosive materials.
- Do not install the inverter where its enclosure and heat sinks are easily accessible, because the voltage is high and these parts are hot during operation.
- Install the solar inverter in a well-ventilated environment for heat dissipation
- If the inverter is installed in an airtight environment, a heat dissipation device or ventilation device must be installed to ensure that the indoor ambient temperature is not higher than the external ambient temperature during operation.
- You are advised to install the inverter in a sheltered place or install an awning over it.
- The solar inverter will be corroded in salt areas. Before installing the solar inverter outdoors in salt areas, consult Huawei. A salt area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).

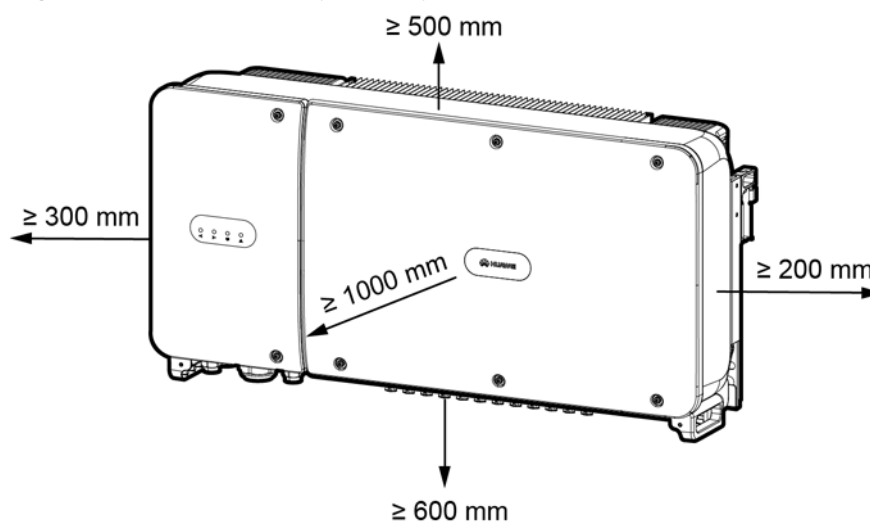
## Mounting Structure Requirements

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

## 4.3.2 Space Requirements

- Reserve enough clearance around the SUN2000 and determine an appropriate installation tilt to ensure sufficient space for installation and heat dissipation.

Figure 4-1 Installation space requirements

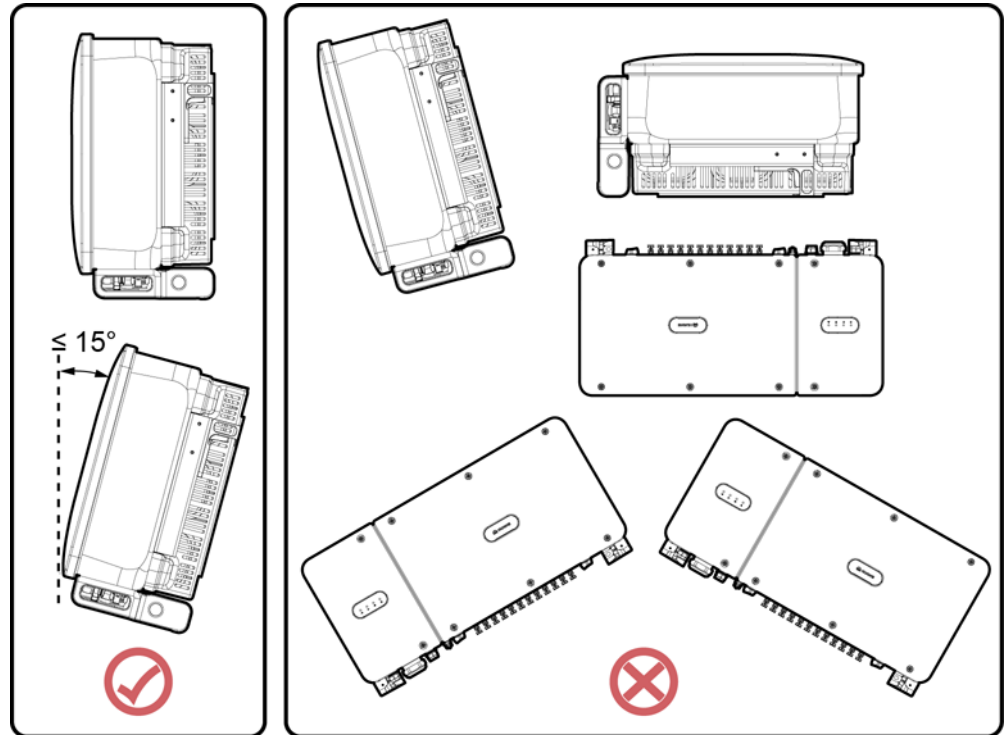


IS06W00004

 **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 in the range of 600 mm to 730 mm. If you have any questions about the clearances, consult the local technical support engineers.

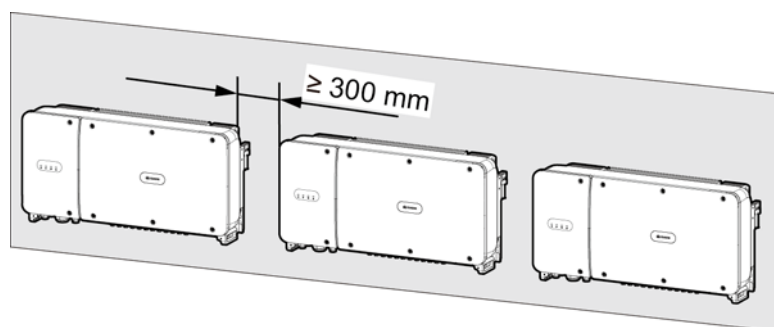
**Figure 4-2** Installation tilts



IS06W00007

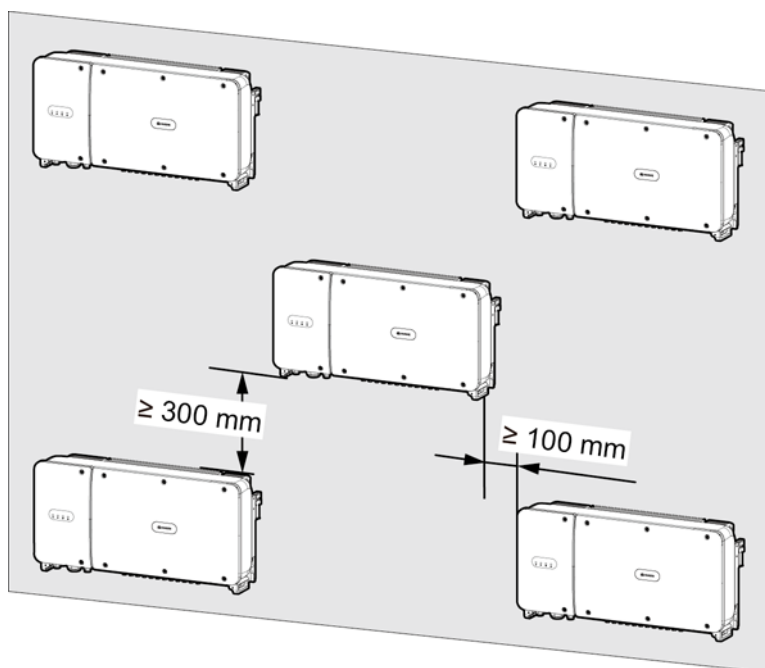
- When installing multiple SUN2000s, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended.

**Figure 4-3** Horizontal installation mode (recommended)



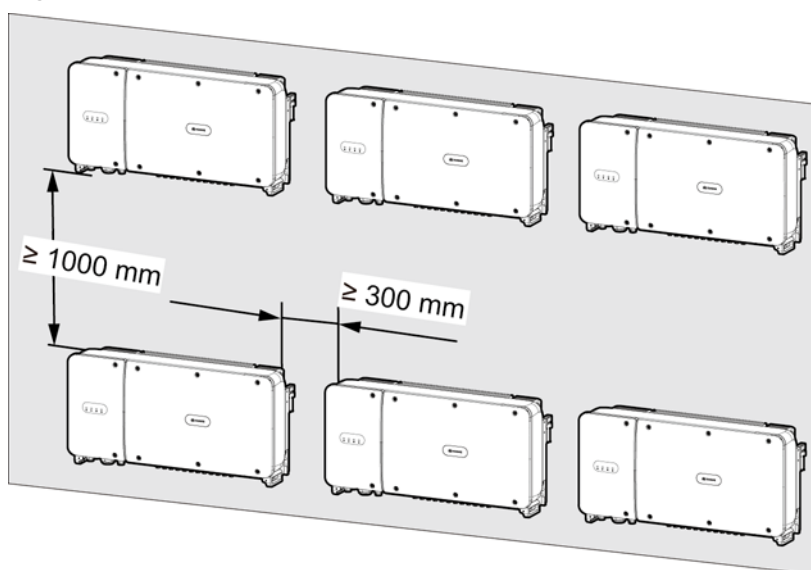
IS06H00009

**Figure 4-4** Triangle installation mode (recommended)



IS06H00010

**Figure 4-5** Stacked installation mode (not recommended)



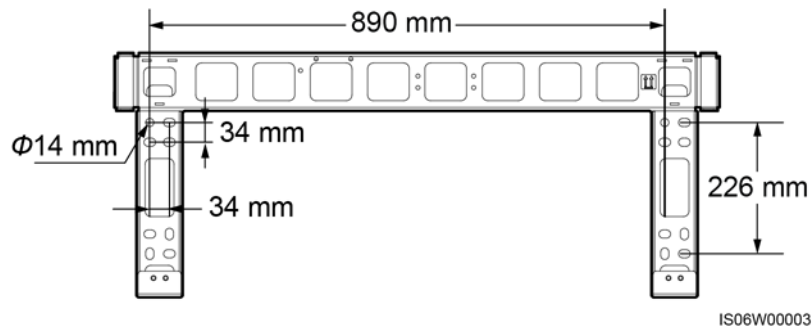
IS06H00011

## 4.4 Installing the Mounting Bracket

### Installation Precautions

**Figure 4-6** shows the SUN2000 mounting bracket dimensions.

**Figure 4-6** Mounting bracket dimensions

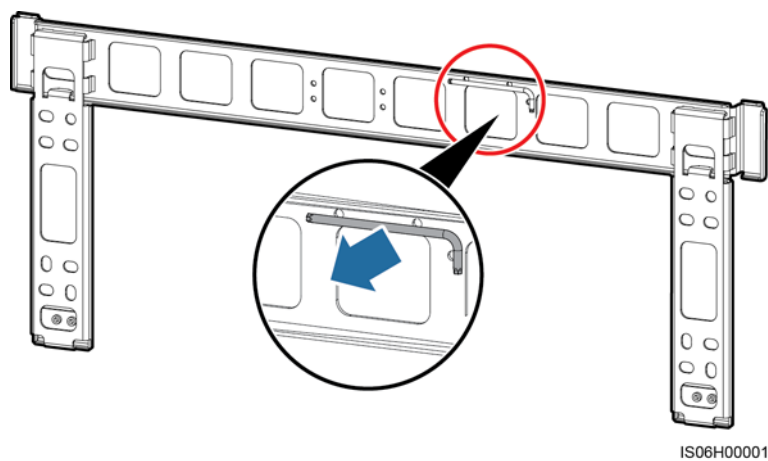


**NOTE**

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 it for later use.

**Figure 4-7** Removing a security torx wrench

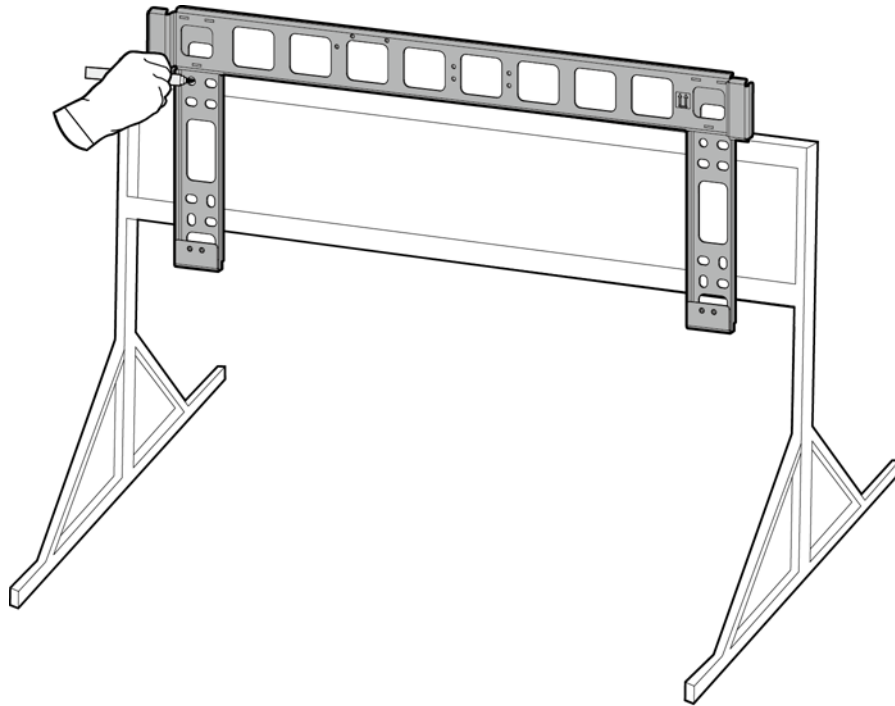


## 4.4.1 Support-mounted Installation

### 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 4-8** Determining hole positions



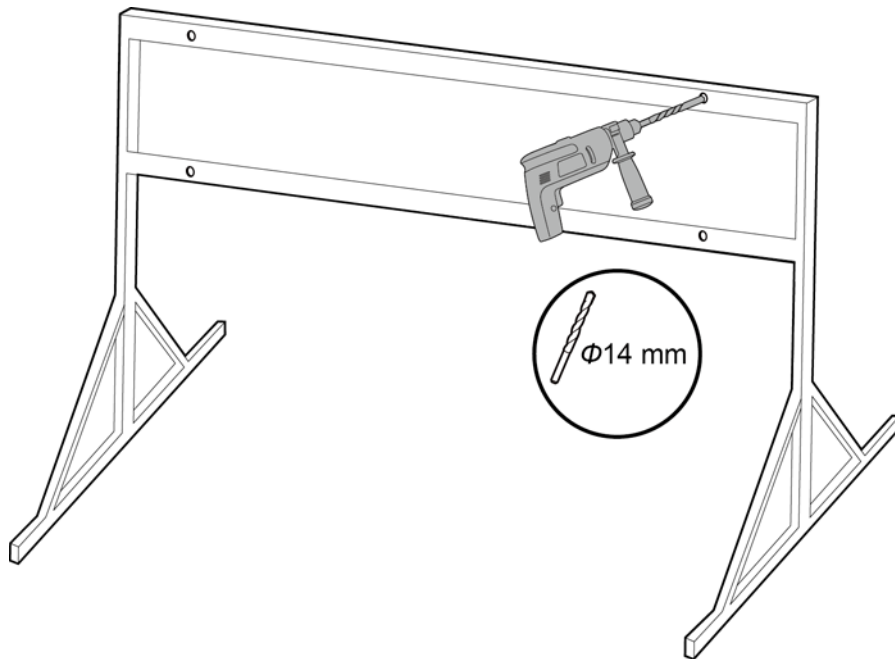
IS06H00004

**Step 2** Drill holes using a hammer drill.

 **NOTE**

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

**Figure 4-9** Drilling a hole



IS06H00005

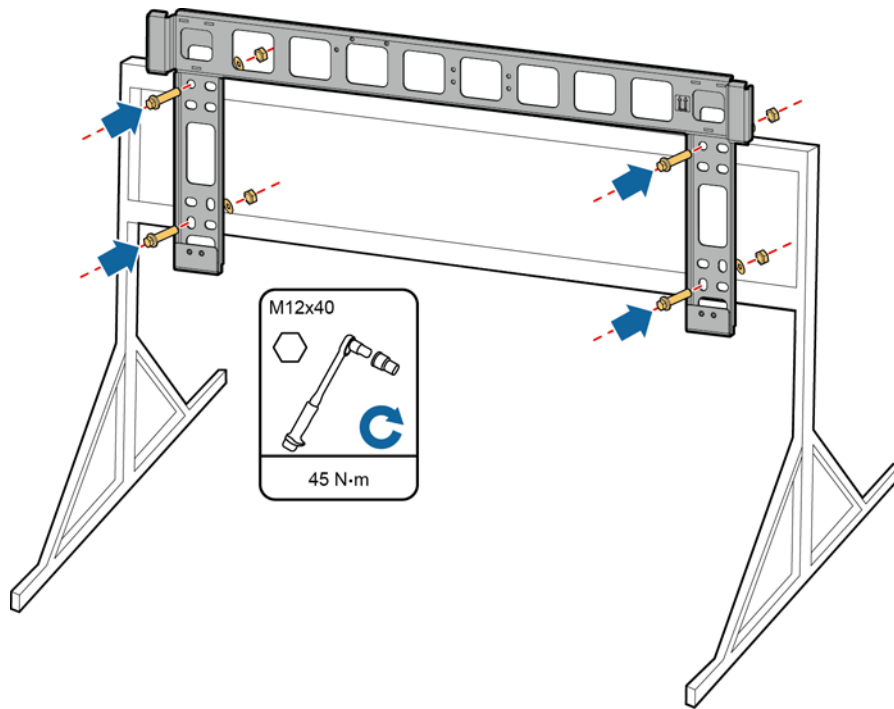
**Step 3** Align the mounting bracket holes with the drilled holes, insert bolt assemblies (flat washers, spring washers, and M12x40 bolts) into the holes through the

mounting bracket, and secure them using the supplied stainless steel nuts and flat washers.

 **NOTE**

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

**Figure 4-10** Securing a mounting bracket



----End

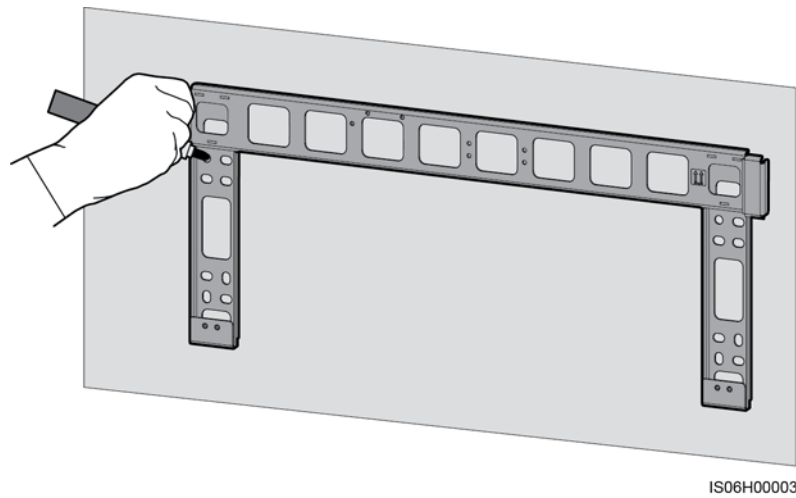
## 4.4.2 Wall-mounted Installation

### 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 4-11** Determining hole positions

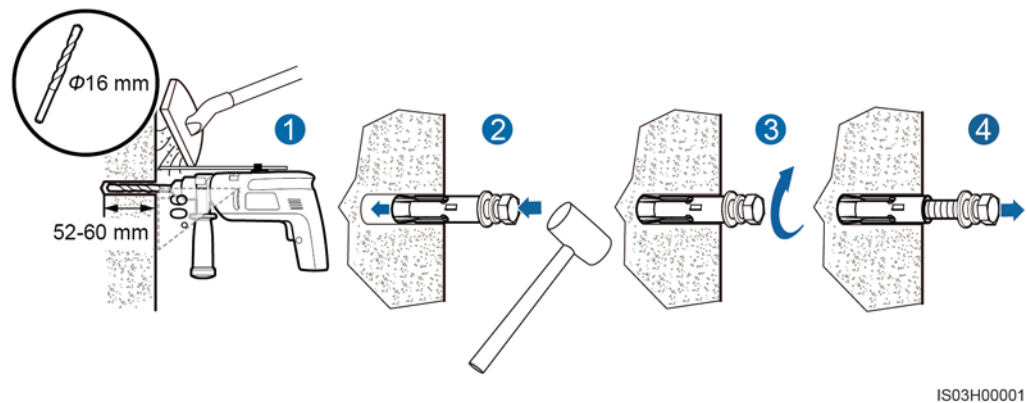


**Step 2** Drill holes using a hammer drill and install expansion bolts.

**NOTE**

You need to prepare expansion bolts. M12x60 stainless steel expansion bolts are recommended.

**Figure 4-12** Drilling a hole and installing an expansion bolt



**WARNING**

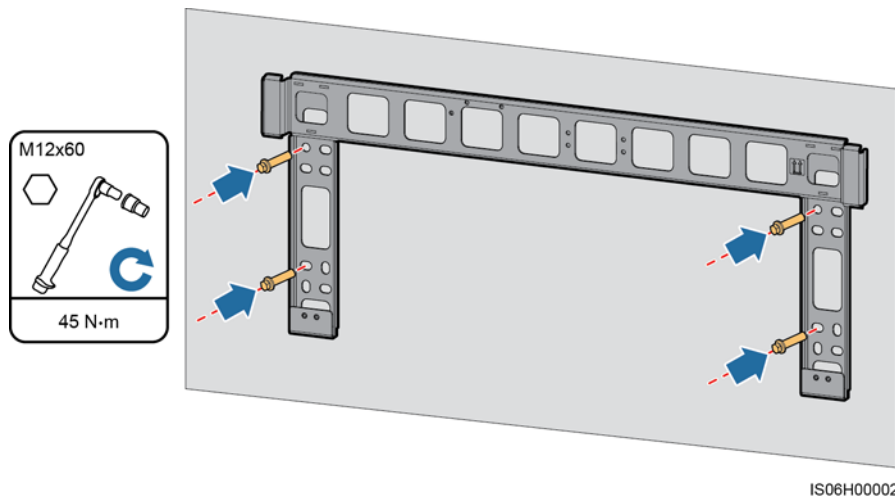
Avoid drilling holes in the utility pipes and/or cables attached to back of the wall.

**NOTICE**

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Clean up any dust in and around the holes using a vacuum cleaner and measure the distance between holes. If the holes are inaccurately positioned, drill a new set of 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 bracket holes with the drilled holes, insert expansion bolts into the holes through the mounting bracket, and then tighten the expansion bolts.

**Figure 4-13** Securing a mounting bracket



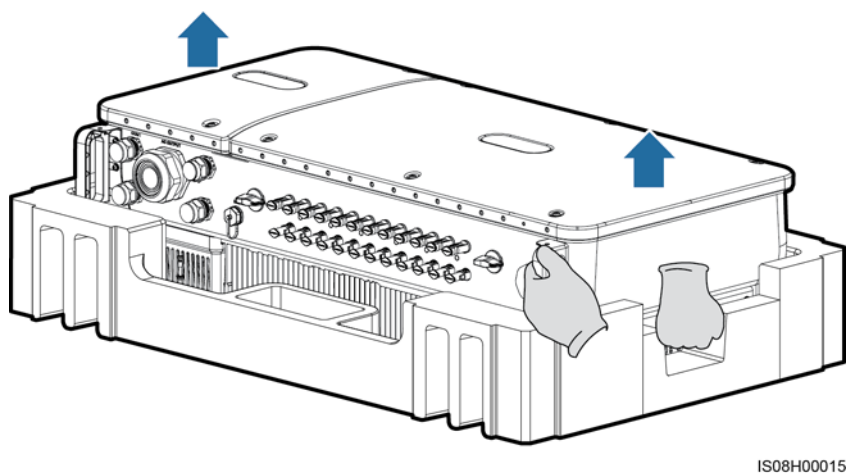
----End

## 4.5 Installing the SUN2000

### Installation Precautions

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

**Figure 4-14** Taking out a SUN2000



**CAUTION**

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

---

**NOTICE**

- Move the SUN2000 with the help of other three persons or using an appropriate transportation tool.
  - Do not use the ports and wiring terminals at the bottom to support any weight of the SUN2000.
  - When you need to temporarily place the SUN2000 on the ground, use foam, paper, or other protection material to prevent damage to its enclosure.
- 

## 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** Lift the SUN2000 and turn it upright.

---

**CAUTION**

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

---

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

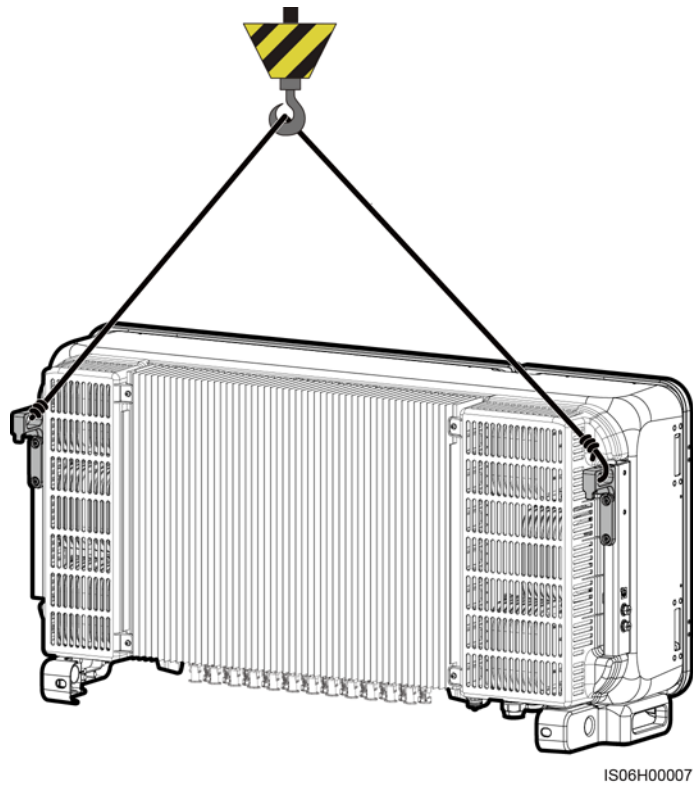
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**CAUTION**

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

---

**Figure 4-15** Lifting a SUN2000

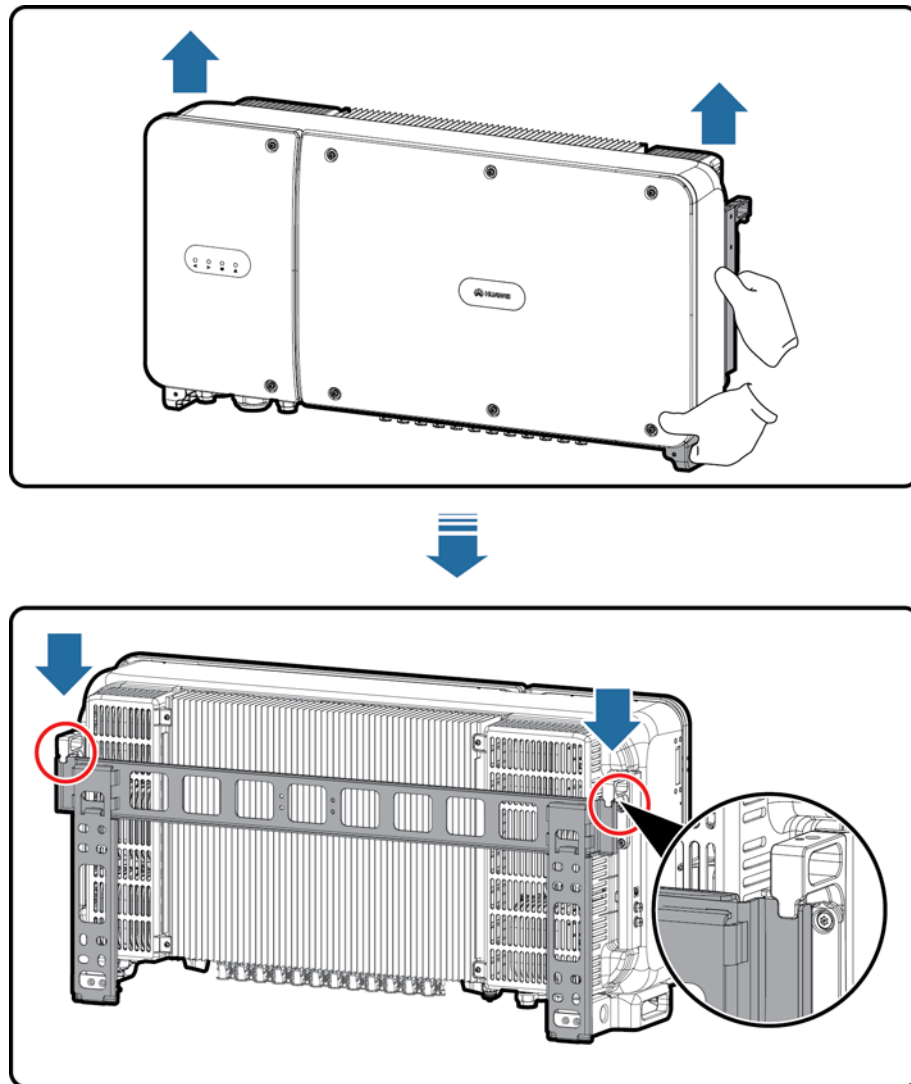


**NOTE**

The figure is for reference only.

**Step 5** Install the SUN2000 on the mounting bracket.

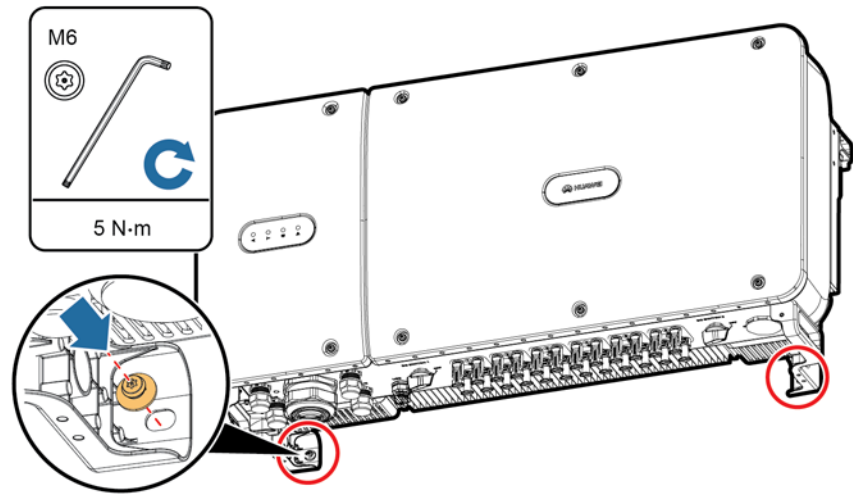
**Figure 4-16** Mounting the SUN2000 onto a mounting bracket



IS06H00008

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

**Figure 4-17** Tightening antitheft screws



IS08H00016

----End

# 5 Electrical Connections

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## 5.1 Precautions

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 **DANGER**

When exposed to sunlight, the PV arrays supplies DC voltage to the SUN2000. 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.

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 **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.
  - To prevent poor cable connection due to overstress, it is recommended that the cables be bent and reserved, and then connected to the appropriate ports.
- 

 **NOTE**

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

## 5.2 Crimping the OT Terminal

### Requirements for the OT Terminal

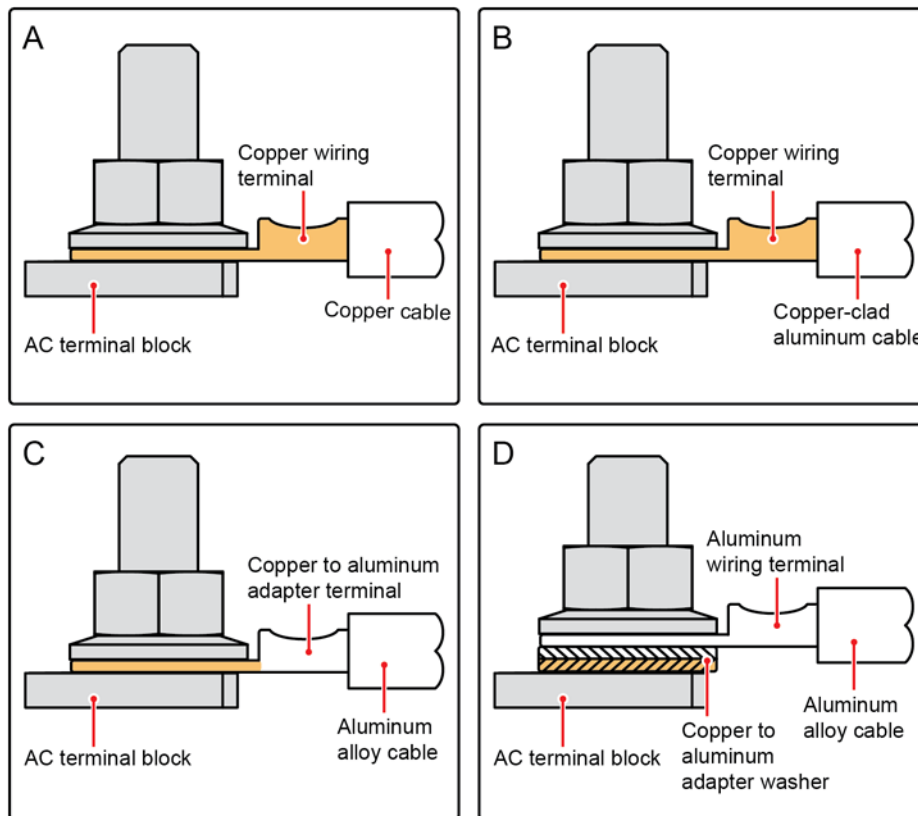
- If a copper cable is used, use a copper wiring terminal.

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

**NOTICE**

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

**Figure 5-1** Requirements for the OT terminal



IS03H00062

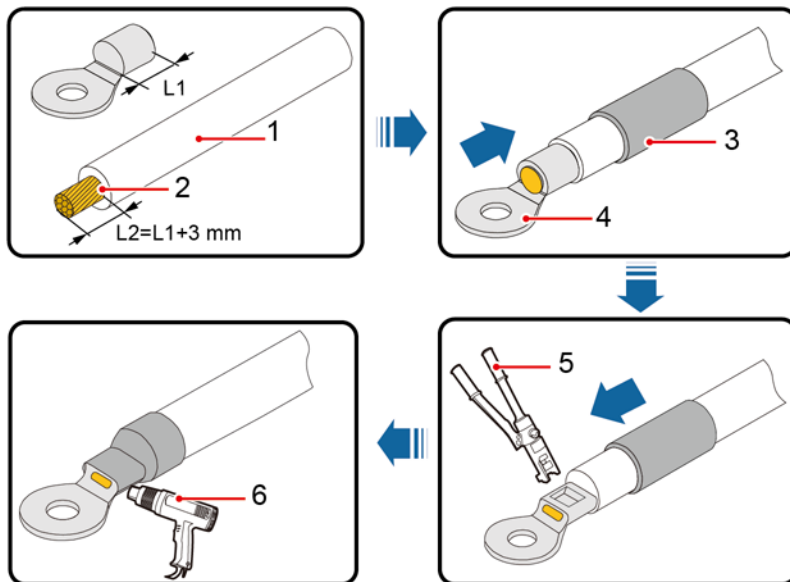


## Crimping the OT terminal

### NOTICE

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

Figure 5-2 Crimping the OT Terminal



IS06Z00001

(1) Cable

(2) Core wire

(3) Heat shrink tubing

(4) OT terminal

(5) Hydraulic pliers

(6) Heat gun

## 5.3 Opening the Maintenance Compartment Door

### Precautions

---

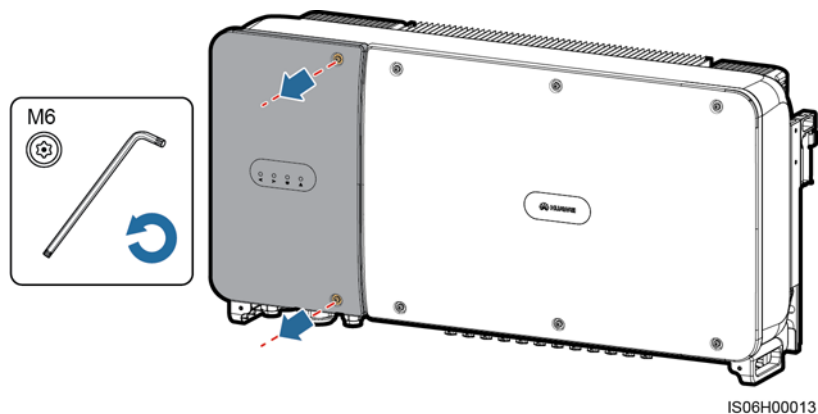
**CAUTION**

- Never open the host panel cover of the SUN2000.
  - Before opening the maintenance compartment door, ensure that neither of the AC and DC connections to the SUN2000 is connected.
  - Do not open the maintenance compartment door in rainy or snowy days. If unavoidable, take protective measures to prevent rain or snow from entering the maintenance compartment.
  - Do not leave extra hardware in the maintenance compartment.
- 

### Procedure

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

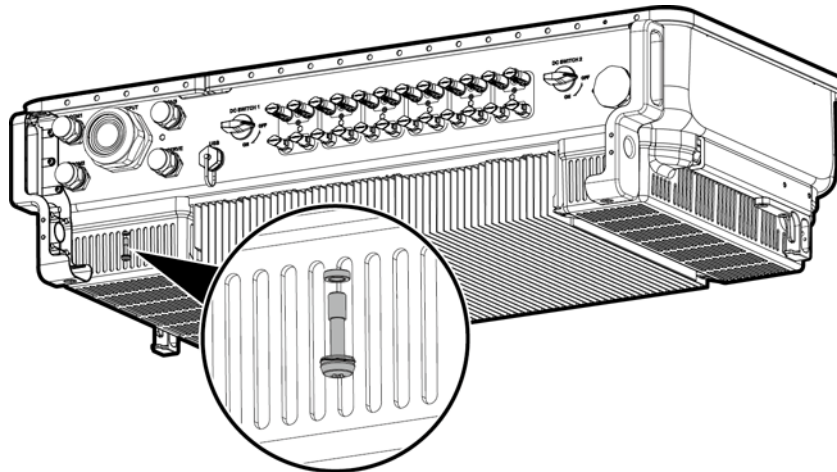
**Figure 5-3** Loosening screws



**NOTE**

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

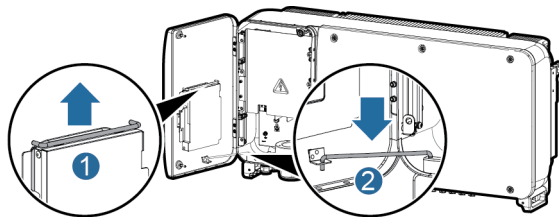
**Figure 5-4** Position for spare screws



IS08W00011

**Step 2** Open the maintenance compartment door and keep it open with the support bar.

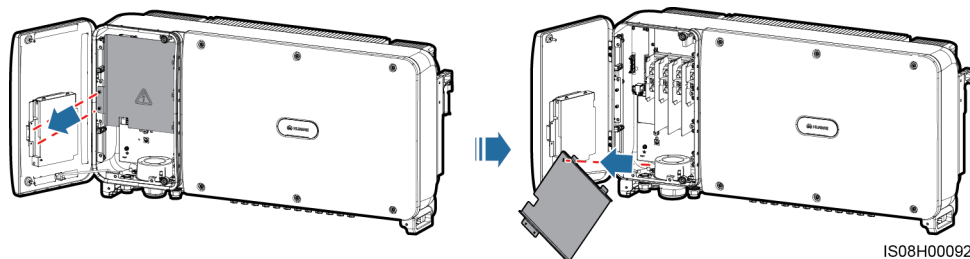
**Figure 5-5** Keeping the door open with a support bar



IS08H00064

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

**Figure 5-6** Removing a cover



IS08H00092

----End

## 5.4 Installing the AC Output Power Cable

### Precautions

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

Model	Recommended Overcurrent Protection Device Specifications
SUN2000-50KTL-M0	125 A
SUN2000-60KTL-M0	125 A
SUN2000-65KTL-M0	125 A

 **WARNING**

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

The SUN2000 is integrated with a comprehensive residual current monitoring unit (RCMU) 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 SUN2000-50KTL-M0, the residual current value to trigger the switch should be greater than 550 mA.
- If an AC switch that can detect residual current is installed outside the SUN2000-60KTL-M0, the residual current value to trigger the switch should be greater than 660 mA.
- If an AC switch that can detect residual current is installed outside the SUN2000-65KTL-M0, the residual current value to trigger the switch should be greater than 720 mA.

## Wiring Precautions

**NOTICE**

Ensure that the SUN2000 PE cable is securely connected. Otherwise the repair of the built-in PID would be affected.

- 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.
- There are two ground points on the enclosure and you only need either of them.
- It is recommended that the ground cable be connected to a nearby ground point. For a system with multiple SUN2000s connected in parallel, connect the ground points of all SUN2000s to ensure equipotential connections to ground cables.

## Cable Specifications

- For the SUN2000-50KTL/60KTL-M0:

- If you connect a ground cable to the ground point on the enclosure in a scenario with no neutral wire, you are advised to use a three-core (L1, L2, and L3) outdoor cable.
- If you connect a ground cable to the ground point in the maintenance compartment in a scenario with no neutral wire, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable.
- If you connect a ground cable to the ground point on the enclosure in a scenario with a neutral wire, you are advised to use a four-core (L1, L2, L3, and N) outdoor cable.
- If you connect a ground cable to the ground point in the maintenance compartment in a scenario with a neutral wire, you are advised to use a five-core (L1, L2, L3, N, and PE) outdoor cable.
- For the SUN2000-65KTL-M0:
  - If you connect a ground cable to the ground point on the enclosure, you are advised to use a three-core (L1, L2, and L3) outdoor cable.
  - If you connect a ground cable to the ground point in the maintenance compartment, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable.
- You need to prepare OT-M10 terminals that match the cables.

**Table 5-1 AC Power Cable Specifications**

Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area (mm <sup>2</sup> )	Range	25-120	25-120
	Recomm ended value	35	70

**Table 5-2 Ground cable specifications**

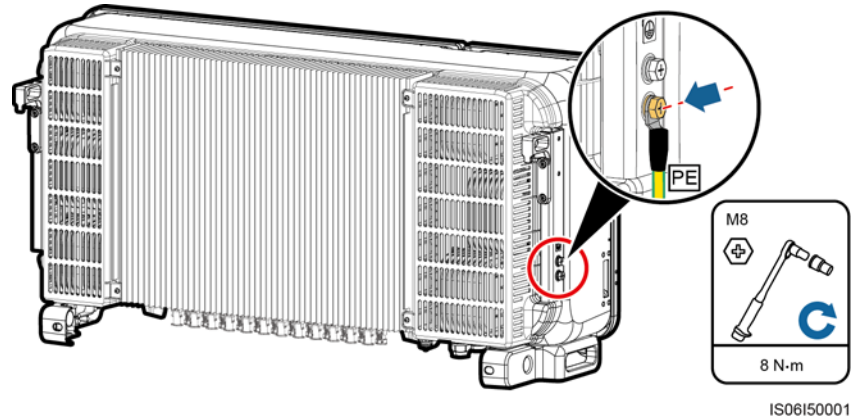
Cross-Sectional Area S (mm <sup>2</sup> ) of the AC Power Cable Conductor	Cross-Sectional Area S <sub>p</sub> (mm <sup>2</sup> ) of the PE Cable Conductor
16 < S ≤ 35	S <sub>p</sub> ≥ 16
35 < S	S <sub>p</sub> ≥ S/2
The values in this table are valid only if the PE cable and AC power cable use the same conductor material. If this is not so, the cross-sectional area of the PE cable conductor is to be determined in a manner which produces a conductance equivalent to that which results from the application of this table.	

## Installing the PE Cable

**Step 1** Crimp an OT terminal.

**Step 2** Secure the PE cable using the ground screw.

**Figure 5-7** Connecting a PE cable



**Step 3** (Optional) To enhance the corrosion resistance of a ground terminal, apply silica gel or paint around the terminal.

----End

## Installing the AC Output Power Cable

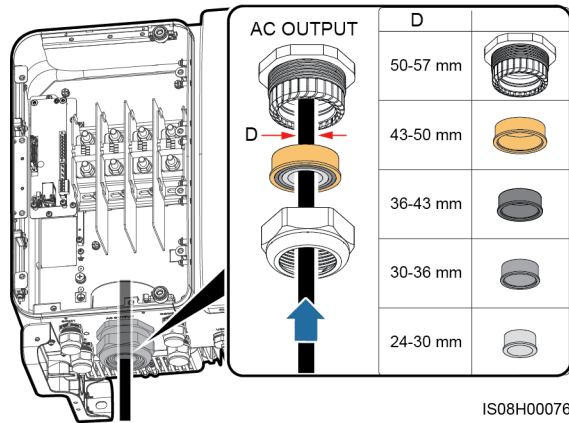
**Step 1** Remove the locking cap from the AC OUTPUT cable gland and then remove the plug.

**Step 2** Route the cable through the cable gland.

### NOTICE

1. Select appropriate rubber fittings based on the outer diameter of the AC power cable to ensure proper sealing.
2. To avoid damaging the rubber fitting, do not route a cable with a crimped OT terminal directly through the rubber fitting.
3. Adjusting a cable when the thread-lock sealing nut is tightened will shift the rubber fitting, which will affect the Ingress Protection Rating of the device.

**Figure 5-8** Routing a cable

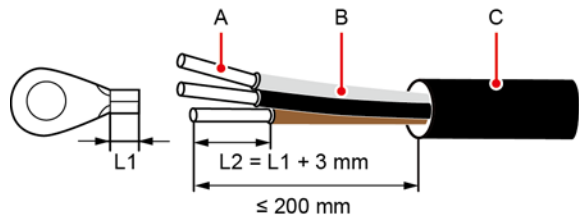


**Step 3** Remove an appropriate length of the jacket and insulation layer from the AC output power cable using a wire stripper.

**NOTICE**

Ensure that the jacket is in the maintenance compartment.

**Figure 5-9** Three-core cable (excluding the ground cable and neutral wire)



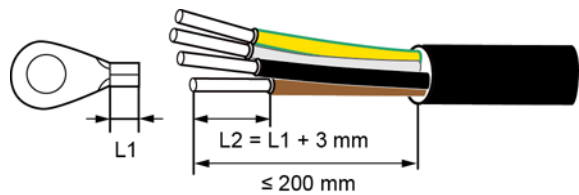
IS08H00049

(A) Core wire

(B) Insulation layer

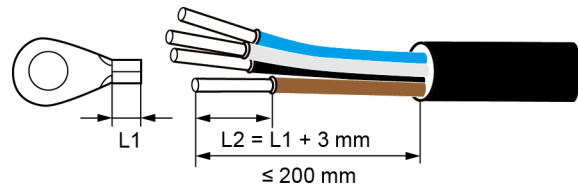
(C) Jacket

**Figure 5-10** Four-core cable (including the ground cable but excluding the neutral wire)

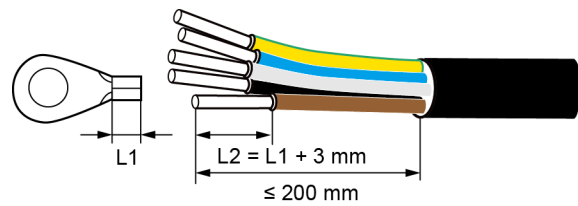


IS08H00050

**Figure 5-11** Four-core cable (excluding the ground cable but including the neutral wire)



**Figure 5-12** Five-core cable (including the ground cable and neutral wire)



**Step 4** Crimp an OT terminal.

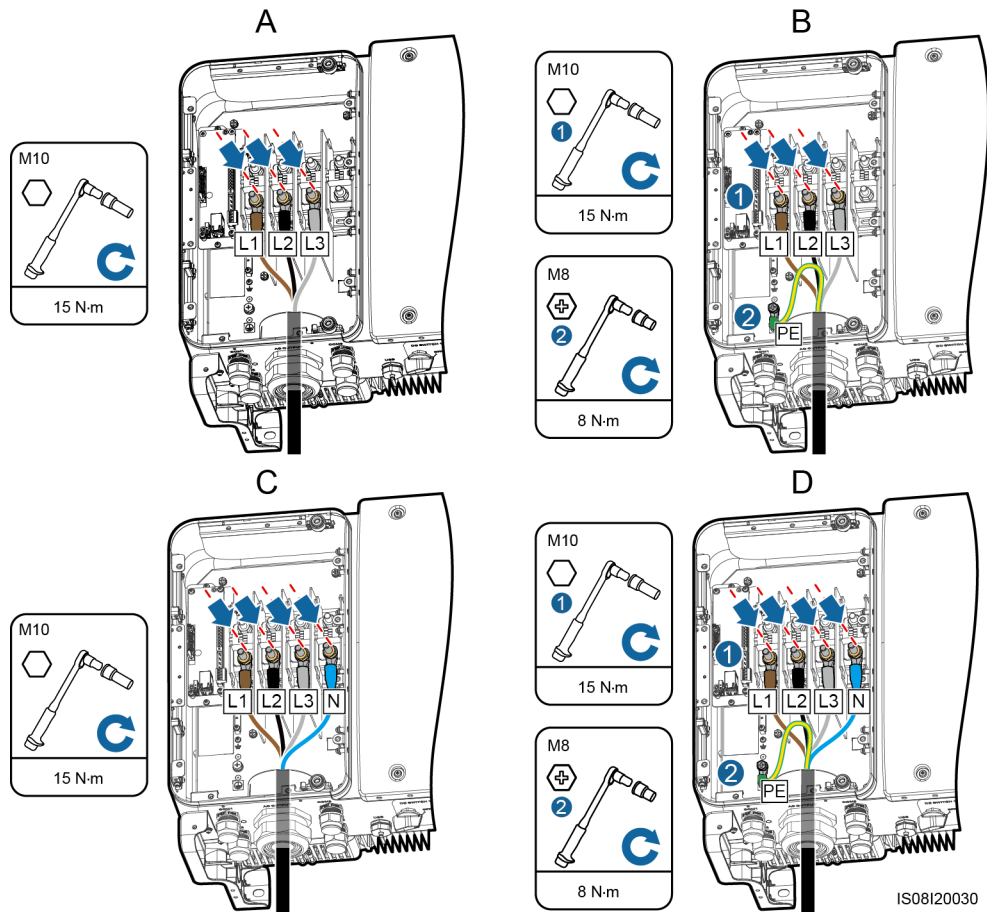
**Step 5** Land the AC output power cable in the terminal block, and tighten the nuts with a torque wrench that has an extension rod.

#### NOTICE

- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its terminal block, even starting thermal events. Any SUN2000 damaged due to weak termination will result in revocation of product warranty.
- When connecting a PE cable, secure the screws using a socket wrench with an extension wrench longer than 200 mm.
- Sufficient slack should be provided in the PE cable to ensure that the last cable bearing the force is the PE cable when the AC output power cable bears pulling force due to force majeure.



**Figure 5-13** Connecting the AC output power cable for the SUN2000-50KTL/60KTL-M0



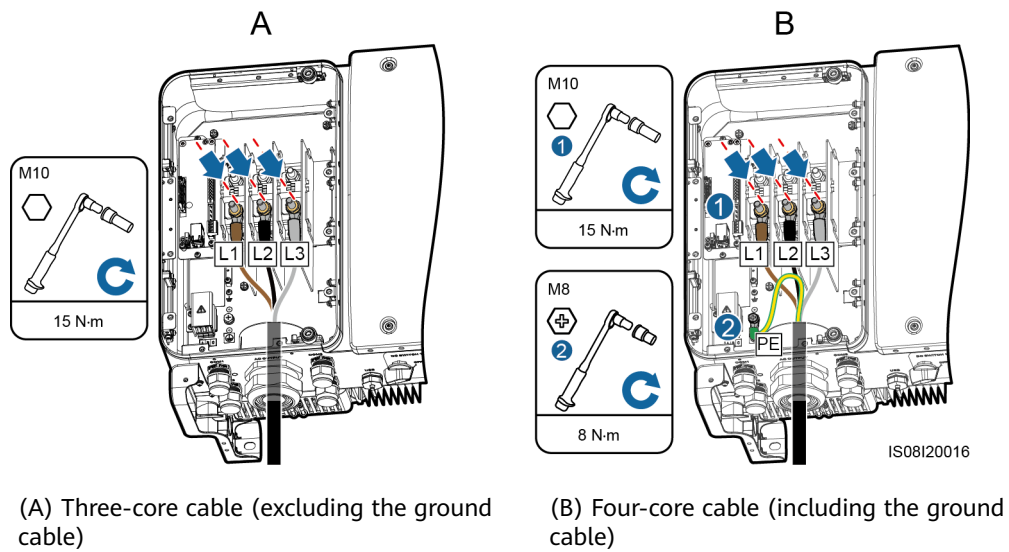
(A) Three-core cable (excluding the ground cable and neutral wire)

(B) Four-core cable (including the ground cable but excluding the neutral wire)

(C) Four-core cable (including the neutral wire but excluding the ground cable)

(D) Five-core cable (including the ground cable and neutral wire)

**Figure 5-14** Connecting the AC output power cable for the SUN2000-65KTL-M0



**NOTE**

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

**Step 6** Tighten the cable gland.

**Step 7** Clear debris from the maintenance compartment.

**CAUTION**

Ensure that there are no cable residues, scraps, or conductive dusts in the maintenance compartment.

----End

## 5.5 Connecting DC input power cables

### Precautions

**DANGER**

- Before connecting the DC input power cable, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the two DC switches on the SUN2000 are OFF. Failing to do so may result in electric shocks.
- When the SUN2000 is grid-tied, it is not allowed to work on DC circuit, such as connecting or disconnecting a PV string or a PV module in a PV string. Failing to do so may cause electric shocks or arcing (which may further cause fire).

**WARNING**

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

- The open-circuit voltage of each PV string is always lower than or equal to 1100 V DC.
- The positive and negative terminals of a PV string are connected to corresponding positive and negative DC input terminals of the SUN2000.

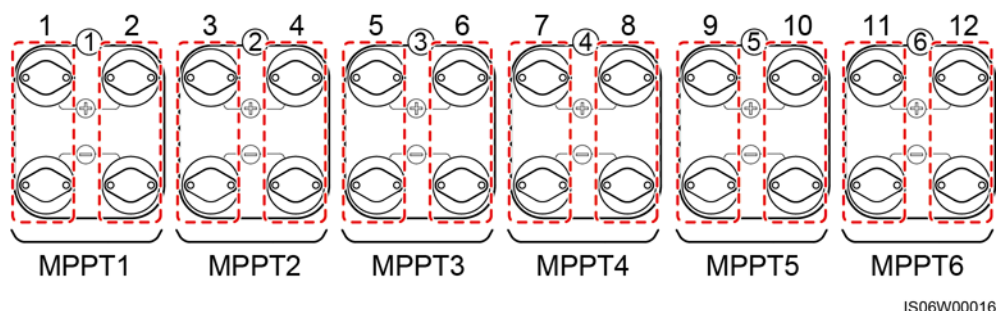
**NOTICE**

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

### Terminal Description

The SUN2000 provides 12 DC input terminals, among which terminals 1 to 6 are controlled by DC switch 1 and terminals 7 to 12 are controlled by DC switch 2.

**Figure 5-15** DC terminals



IS06W00016

Select DC input terminals according to the following rules:

1. Evenly distribute DC input power cables on the DC input terminals controlled by the two DC switches.
2. Maximize the number of connected MPPT circuits.

## Cable Specifications

Cable Type	Conductor Cross-Sectional Area (mm <sup>2</sup> )		Cable Outer Diameter (mm)
	Range	Recommended value	
PV cable that meets the 1100 V standard	4.0–6.0 (12–10 AWG)	4.0 (12 AWG)	4.5–7.8

### NOTICE

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

## Procedure

**Step 1** Prepare positive and negative connectors.

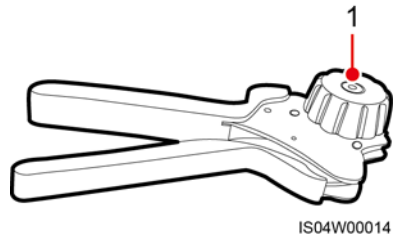
### CAUTION

Use the Amphenol Helios H4 PV connectors provided with the SUN2000. If the terminals are lost or damaged, purchase the PV connectors of the same model. The device damaged caused by incompatible PV connectors is not covered under any warranty or service agreement.

### NOTICE

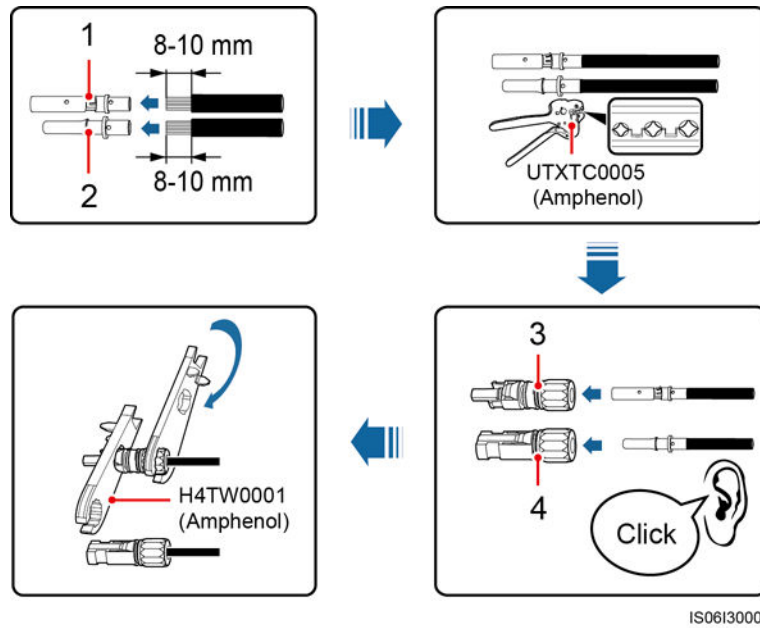
- The metal contacts supplied with the DC connectors are either cold forming contacts or stamping forming contacts. Choose the crimping tools that fit the metal contact types. Do not mix up the tools.
- Crimp the metal cold forming contacts using crimping tool UTXTC0005 (Amphenol, recommended) or H4TC0001 (Amphenol).
- Crimp the metal stamping forming contacts using crimping tool H4TC0003 (Amphenol, recommended), H4TC0002 (Amphenol), 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 5-16** Crimping tool



(1) Locator

**Figure 5-17** Preparing positive and negative connectors (using metal cold forming contacts)



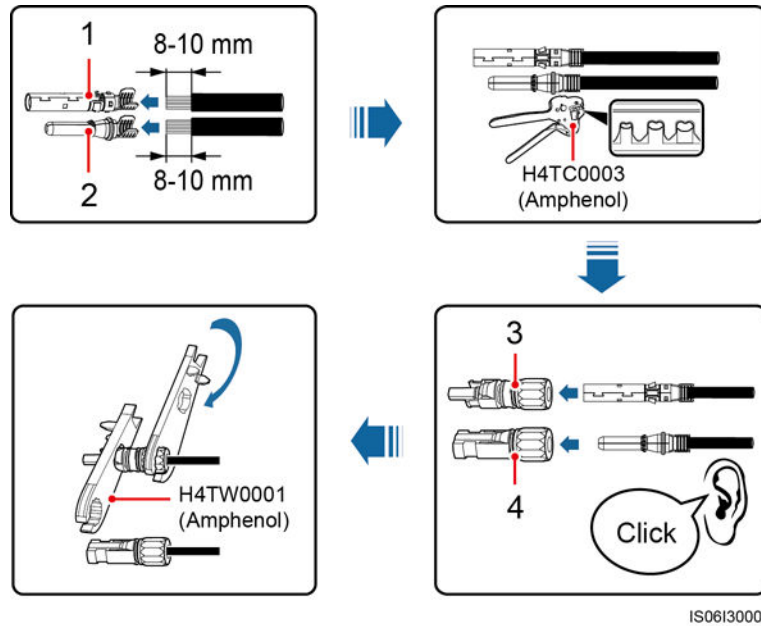
(1) Positive metal contact (cold forming)

(2) Negative metal contact (cold forming)

(3) Positive connector

(4) Negative connector

**Figure 5-18** 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

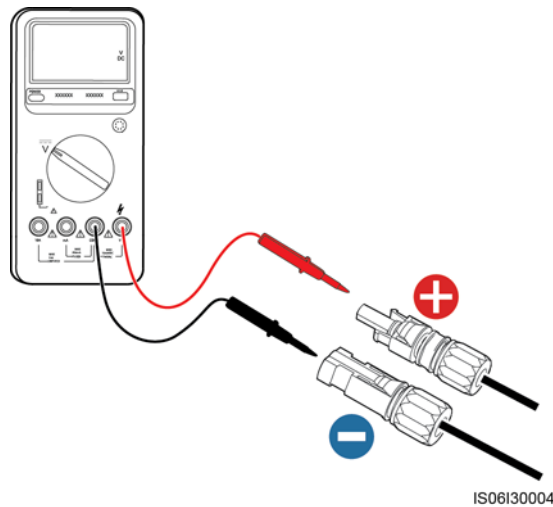
After the positive and negative metal terminals snap into place, pull the DC input power cables back to ensure that they are connected securely.

- Step 2** 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 1100 V.

**Figure 5-19** Measuring voltage



---

**NOTICE**

- If the voltage is a negative value, the PV string is of reversed polarity. Correct before connecting this string to the SUN2000.
- If the voltage is greater than 1100 V, too many PV modules are configured to the same string. Remove some PV modules.

---

**Step 3** Pull out the blue dustproof plugs from the ends of the DC input connectors.

---

**WARNING**

Before performing **Step 4**, ensure that the two DC switches are OFF.

---

**Step 4** Insert the positive and negative connectors into the corresponding positive and negative DC input terminals of the SUN2000 until they snap into place.

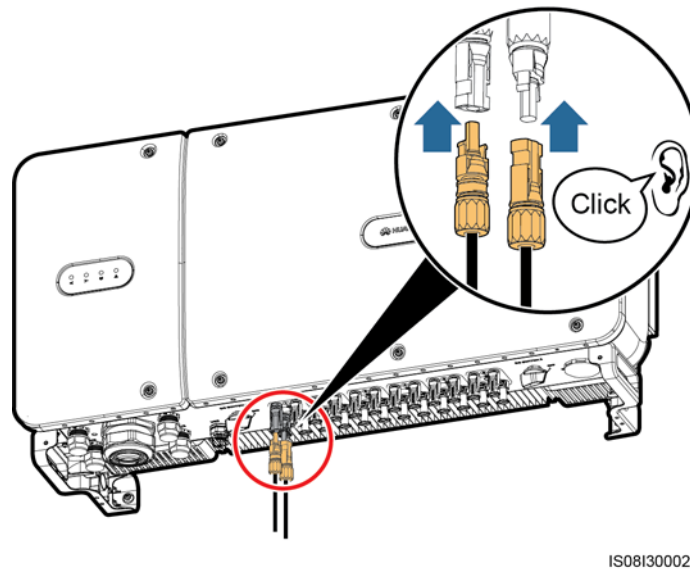
---

**NOTICE**

After the positive and negative connectors snap into place, pull test to the DC input power cable is recommended.

---

**Figure 5-20** Connecting DC input power cables



#### NOTICE

If polarity of the DC input power cable is reversed and the DC switch is ON, do not turn off the DC switch immediately or unplug positive and negative connectors. The device may be damaged if you do not follow the instruction. The caused equipment damage is beyond the warranty scope. Wait until the solar irradiance declines and the PV string current reduces to below 0.5 A, and then turn off the two DC switches and remove the positive and negative connectors. Correct the string polarity before reconnecting the string to the SUN2000.

----End

## 5.6 Installing the Communications Cable

### 5.6.1 Communication Mode Description

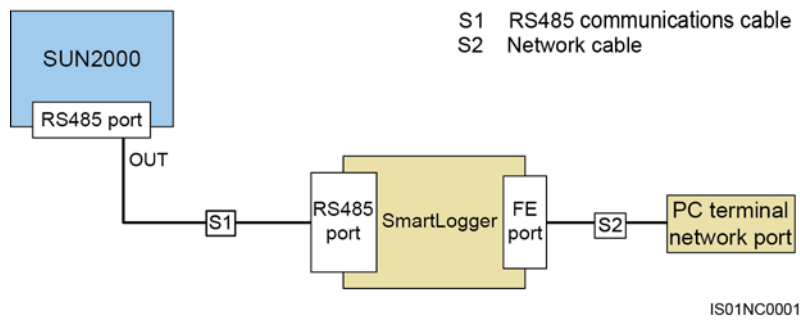
#### RS485 Communication

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 5-21** shows the communication mode for a single SUN2000.

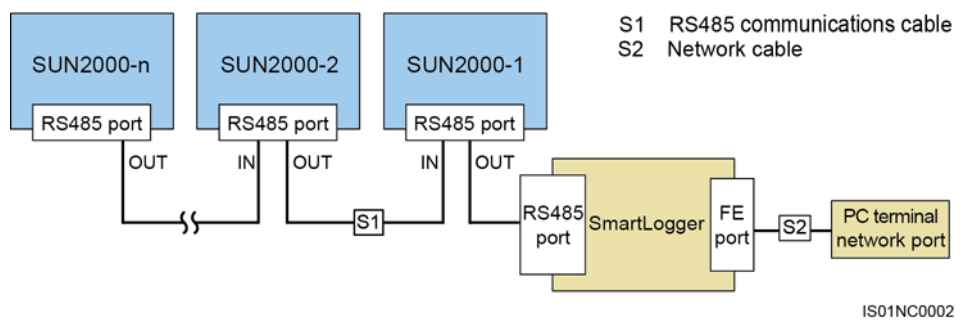


**Figure 5-21** Communication mode for a single SUN2000



- **Figure 5-22** shows the communication mode for multiple SUN2000s. If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

**Figure 5-22** 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 SmartLogger1000, a maximum of three daisy chains can be configured.
- 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.

## MBUS (PLC) Communication

The MBUS (PLC) communication board loads communication signals onto power cables for transmission.

**NOTE**

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

## Selecting a Communication Mode

The RS485 and MBUS (PLC) communication modes are mutually exclusive.

- If the MBUS (PLC) communication mode is selected, do not connect the RS485 communications cable. In addition, you need to set **MBUS Communication** to **Enable** on the SUN2000 app.

---

**NOTICE**

The MBUS (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 MBUS CCO module to the AC power cable. In addition, you are advised to set **MBUS Communication** to **Disable** on the SUN2000 app.

## 5.6.2 Installing the RS485 Communications Cable

### Selecting an Installation Mode

An RS485 communications cable can be connected in two ways:

- Terminal block connection

Recommended: Communications cable with a conductor cross-sectional area of 1 mm<sup>2</sup> and a cable outer diameter of 14–18 mm.

- RJ45 network port connection

Recommended: CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm and internal resistance no greater than 1.5 ohms/10 m, with a shielded RJ45 connector.

**NOTE**

Select only one installation mode in practice. Terminal block connection is recommended.

---

**NOTICE**

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

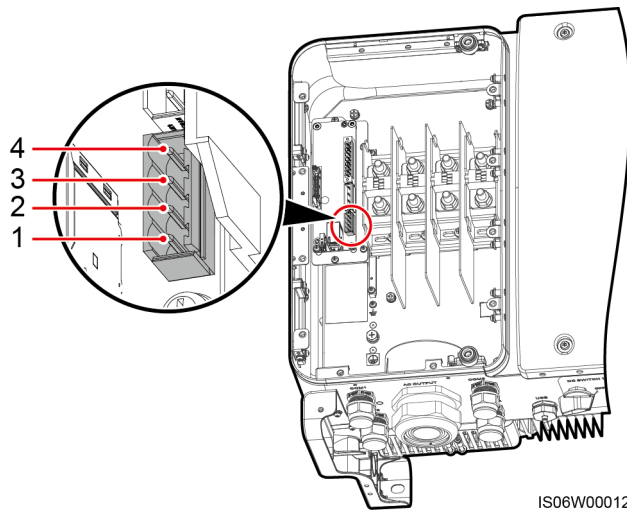
---

### 5.6.2.1 Terminal Block Connection

#### Terminal Block Port Definitions

[Figure 5-23](#) shows an RS485 terminal block.

**Figure 5-23** Terminal block



IS06W00012

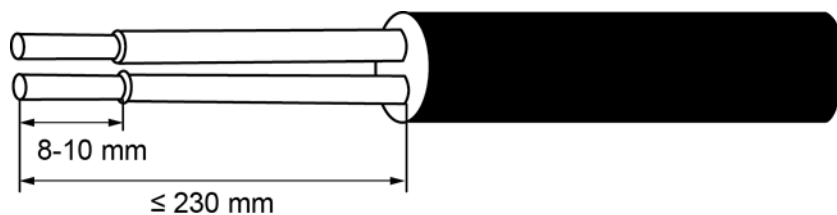
**Table 5-3** Port definitions of the RS485 terminal block

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

## Connecting Cables to the Terminal Block

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

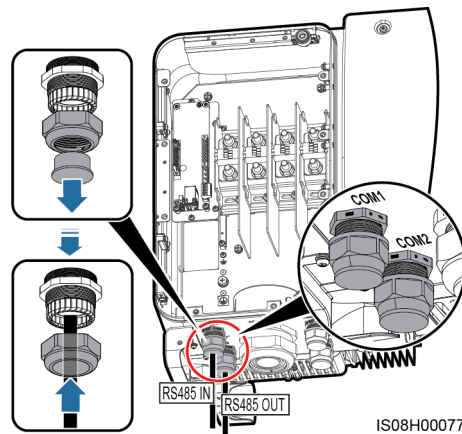
**Figure 5-24** Stripping an RS485 communications cable



IS06H00037

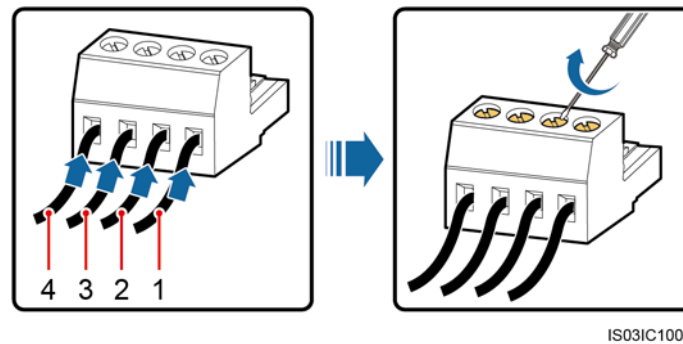
**Step 2** Route the communications cable through the cable gland.

Figure 5-25 Routing a cable



**Step 3** Remove the cable terminal base from the terminal block, and connect the communications cable to the terminal base.

Figure 5-26 Connecting cables to a terminal base



(1) RS485A IN

(2) RS485A OUT

(3) RS485B IN

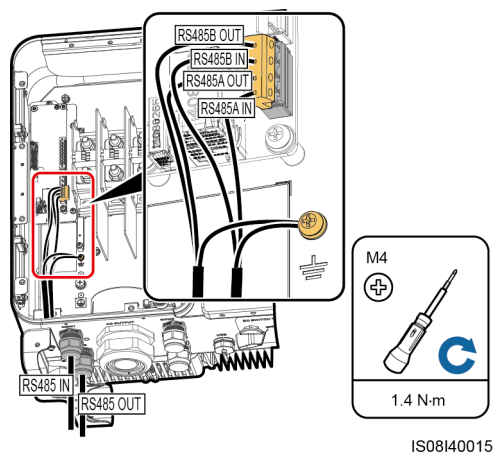
(4) RS485B OUT

**Step 4** Land the cables in 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 5-27** Connecting communications cables

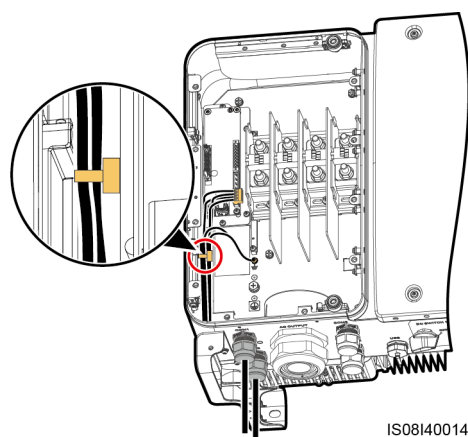


**Step 5** Bundle communications cables after connecting them.

**NOTE**

Tie the communication cables with the cables on internal side of the maintenance compartment.

**Figure 5-28** Bundling communications cables



**Step 6** Tighten the thread-lock sealing nut and seal the cable gland.

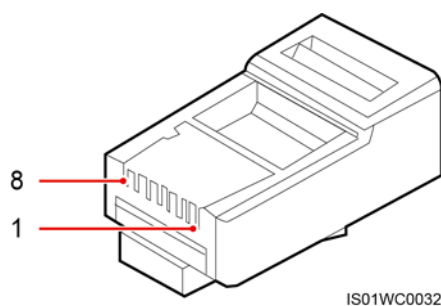
----End

### 5.6.2.2 Connecting Cables to the RJ45 Network Port

#### RJ45 Connector Pin Definitions

**Figure 5-29** shows an RJ45 connector.

**Figure 5-29** RJ45 connector



**Table 5-4** lists the RJ45 connector pin definitions.

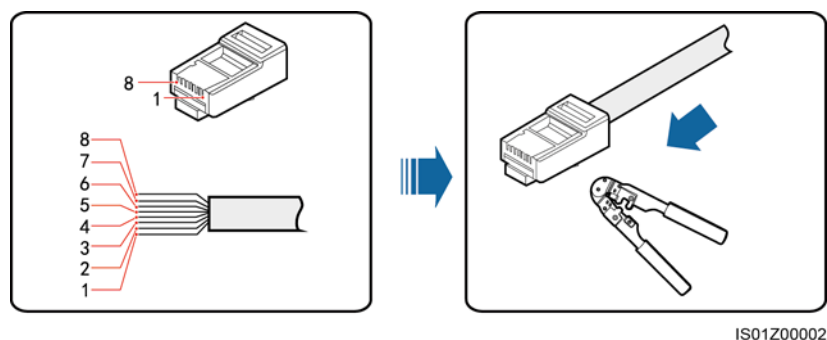
**Table 5-4** RJ45 connector pin definitions

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

## Connecting Cables to the RJ45 Network Port

**Step 1** Prepare an RJ45 connector.

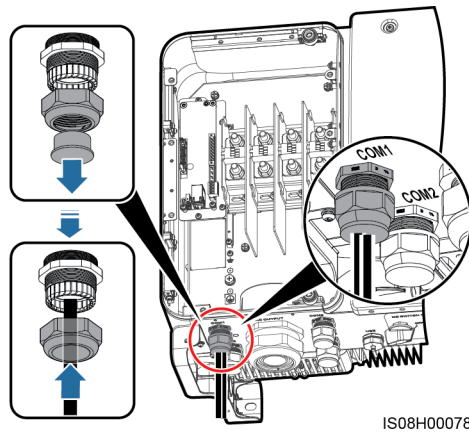
**Figure 5-30** Preparing an RJ45 connector



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

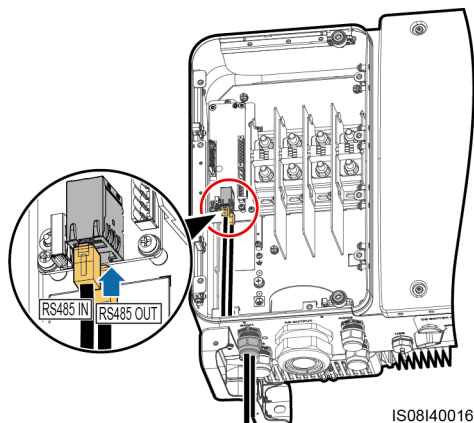
**Step 2** Route the communications cable through the cable gland.

**Figure 5-31** Routing a cable



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

**Figure 5-32** Connecting communications cables

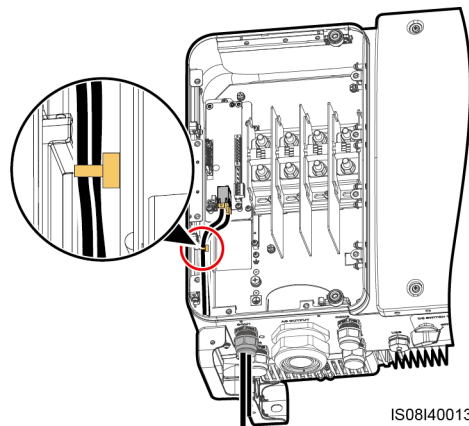


**Step 4** Bundle communications cables after connecting them.

**NOTE**

Tie the communication cables with the cables on internal side of the maintenance compartment.

**Figure 5-33** Bundling communications cables



**Step 5** Tighten the thread-lock sealing nut and seal the cable gland.

----End

### 5.6.3 (Optional) Installing the Solar Tracker Power Cable

The solar tracker power cable can be installed on the SUN2000-65KTL-M0 only.

#### Precautions

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##### NOTICE

- A switch-disconnector-fuse or fuse-switch-disconnector with a voltage of no less than 500 V, current of 16 A, and protection type of gM needs to be installed between the SUN2000 and the tracker controller for protection.
  - The cable between the wiring terminal on the power cable and the switch-disconnector-fuse or fuse-switch-disconnector should be less than or equal to 2.5 meters.
- 

#### Cable Specifications

Recommended: dual-layer three-core outdoor copper cable with a conductor cross-sectional area of 10 mm<sup>2</sup>.

---

##### WARNING

Do not place flammable materials around the cable.

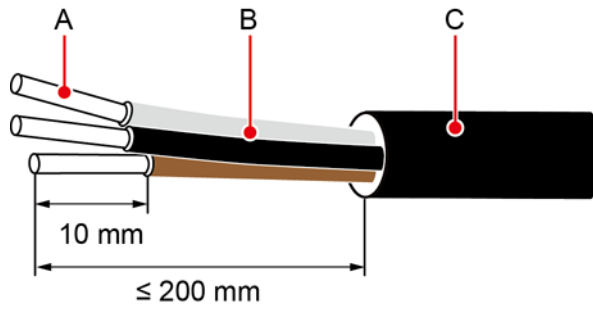
---

#### Procedure

- Step 1** Remove an appropriate length of the jacket and insulation layer from the tracking power cable using a wire stripper. (Ensure that the jacket is in the maintenance compartment.)



**Figure 5-34** Stripping a cable



IS06H00056

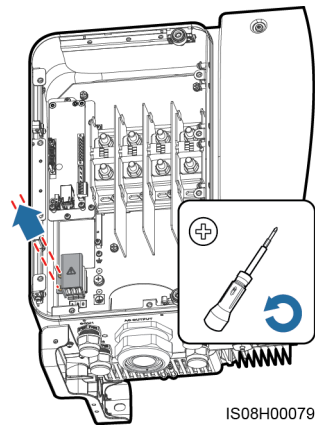
(A) Core wire

(B) Insulation layer

(C) Jacket

**Step 2** Remove the shielding cover from wiring terminals.

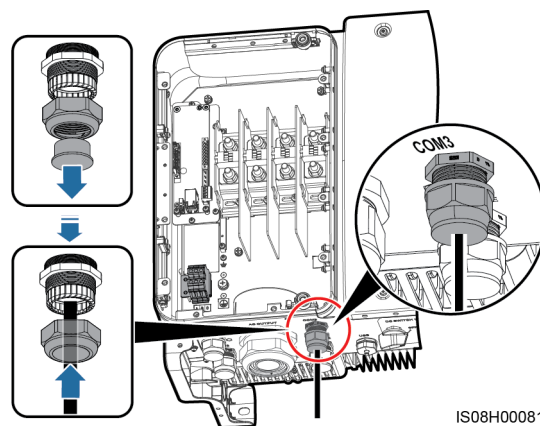
**Figure 5-35** Removing a shielding cover



IS08H00079

**Step 3** Route the cable through the cable gland.

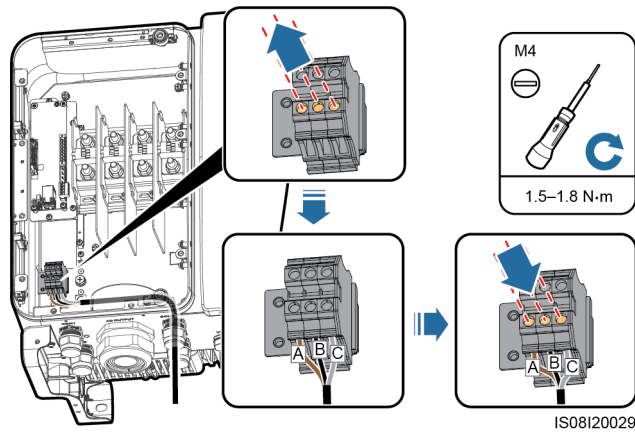
**Figure 5-36** Routing a cable



IS08H00081

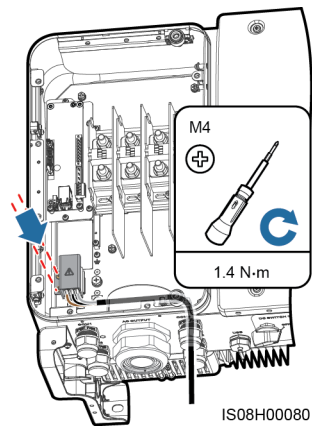
**Step 4** Connect the solar tracker power cable.

**Figure 5-37** Connecting a solar tracker power cable



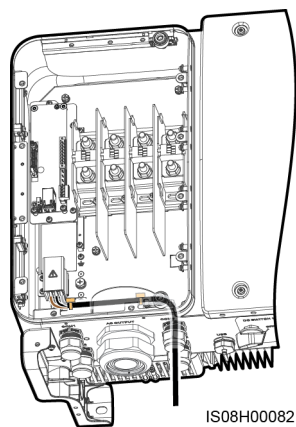
**Step 5** Install the shielding cover on wiring terminals.

**Figure 5-38** Installing a shielding cover



**Step 6** Bind the solar tracker power cable.

**Figure 5-39** Binding a solar tracker power cable



**Step 7** Tighten the thread-lock sealing nut and seal the cable gland.

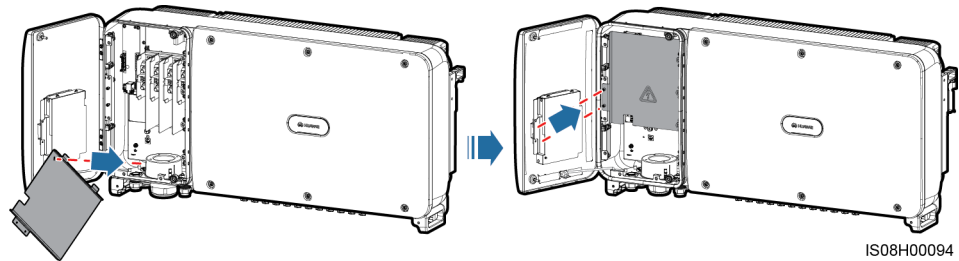
----End

## 5.7 Closing the Maintenance Compartment Door

### Procedure

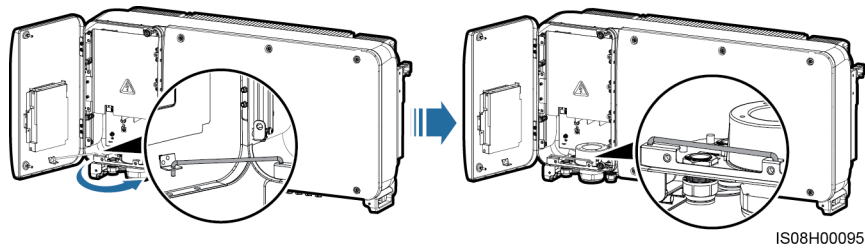
**Step 1** Install the AC terminal cover.

**Figure 5-40** Installing a cover



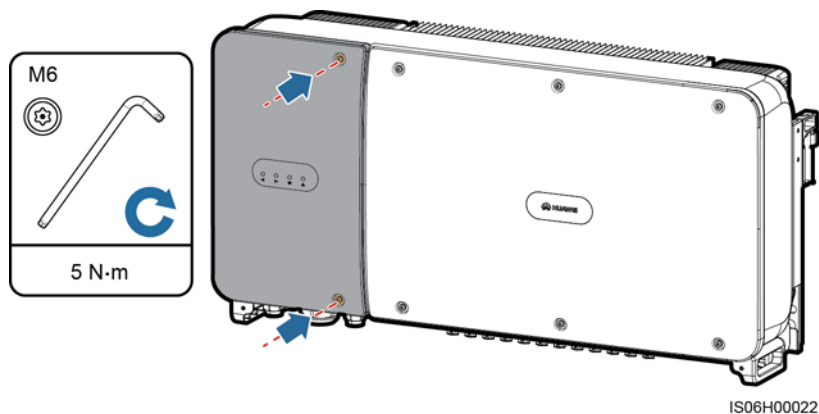
**Step 2** Retrieve the support bar.

**Figure 5-41** Retrieving a support bar



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

**Figure 5-42** Tightening screws



----End

# 6 Commissioning

---

## 6.1 Checking Before Power-On

1. Check that the SUN2000 is installed correctly and securely.
2. Check that the DC switch and downstream AC output switch are OFF.
3. Check that all ground cables are connected correctly and securely.
4. Check that all AC output power cables are connected correctly and securely, without open circuits or short circuits.
5. Check that all DC input power cables are connected correctly and securely, without open circuits or short circuits.
6. Check that the communications cable is connected correctly and securely.
7. Check that all used cable glands at the bottom of the enclosure are sealed, and that the thread-lock sealing nut is tightened.
8. Check that the AC terminal cover is reinstalled.
9. Check that the maintenance compartment interior is clean and tidy, without foreign matter.
10. Check that the maintenance compartment door is closed and the door screws are tightened.
11. Check that unused DC input terminals are sealed.
12. Check that unused USB port is plugged with watertight cap.
13. Check that unused cable glands are plugged and the thread-lock sealing nuts are tightened.

## 6.2 Powering On the SUN2000

### Precautions

#### 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.
- If the solar inverter has not been running for more than half a year after being mounted, it must be checked and tested by professionals before being put into operation.

### Procedure

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

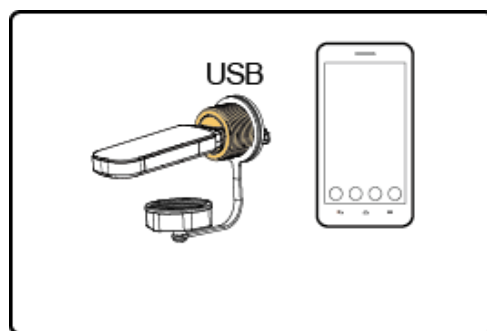
#### NOTICE

If you perform **Step 2** before **Step 1**, the SUN2000 reports a fault about abnormal shutdown. You can start the SUN2000 only after the fault is automatically rectified.

**Step 2** Turn on the DC switch at the bottom of the SUN2000.

**Step 3** Connect a mobile phone that runs the SUN2000 app to the inverter using a Bluetooth module, a WLAN module, or a USB data cable.

**Figure 6-1** Connection mode

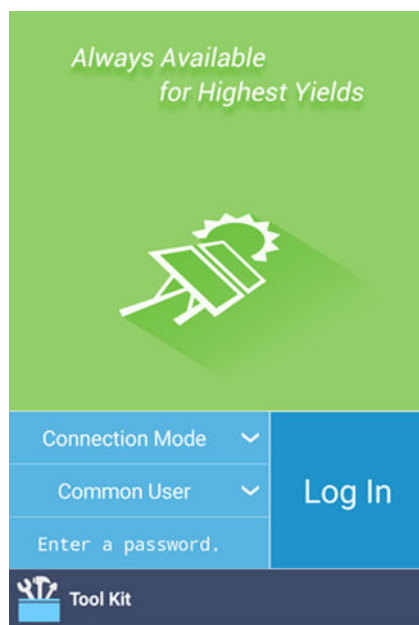


IL01H00003

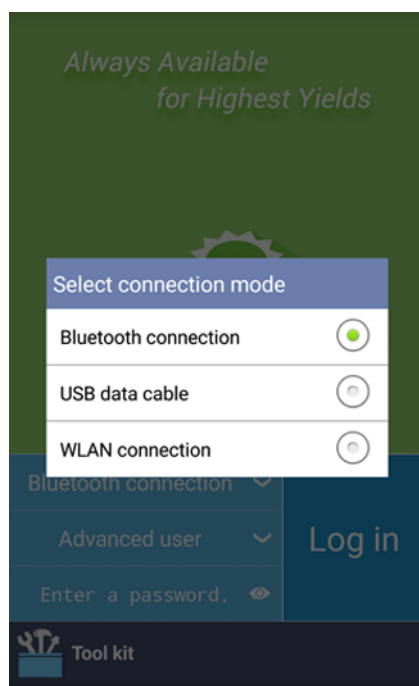
#### NOTE

- Purchase a Bluetooth module or a WLAN module bundled with the inverter. A Bluetooth module or a WLAN module purchased from any other source may not support communication between the inverter and the SUN2000 app.
- Use the USB data cable delivered with the mobile phone. The port type is USB 2.0.
- The screen snapshots in this document correspond to app 3.2.00.001 (Android).

**Figure 6-2** Login screen

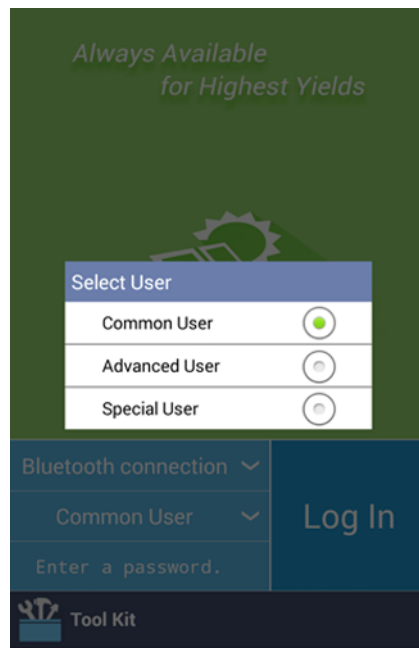


**Figure 6-3** Selecting a connection mode



**Step 4** Tap the user name area on the SUN2000 app to switch between **Common User**, **Advanced User**, and **Special User**.

**Figure 6-4** Switching the user



**NOTE**

- The login password is the same as that for the SUN2000 connected to the app and is used only for the SUN2000 to connect to the app.
- When the WLAN connection is used, the initial name of the WLAN hotspot is **Adapter-WLAN module SN**, and the initial password is **Changeme**.
- The initial passwords for **Common User**, **Advanced User**, and **Special User** are all **00000a**.
- Use the initial password upon first power-on and change it immediately after login. To ensure account security, change the password periodically and keep the new password in mind. Not changing the initial password may cause password disclosure. A password left unchanged for a long period of time may be stolen or cracked. If a password is lost, devices cannot be accessed. In these cases, the user is liable for any loss caused to the PV plant.
- During login, if five consecutive invalid password attempts are made (the interval between two consecutive attempts is less than 2 minutes), the account will be locked for 10 minutes. The password should consist of 6 characters.

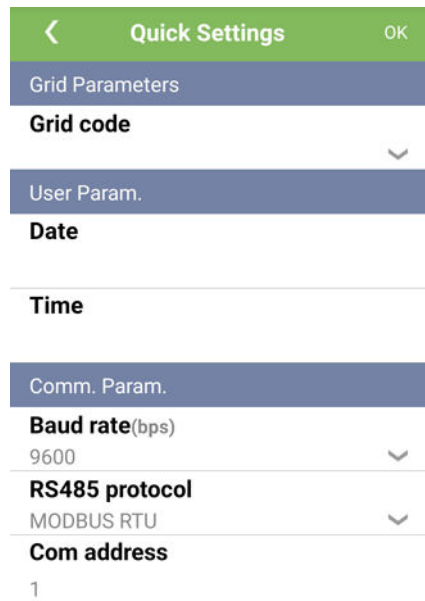
**Step 5** Enter the password and tap **Log In**.

**Step 6** After successful login, the quick settings screen or main menu screen is displayed.

**NOTE**

- If you log in to the SUN2000 app after the device connects to the app for the first time or factory defaults are restored, the quick settings screen will be 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. If the AC switch between the inverter and the power grid is turned on but all DC switches on the inverter are not in the ON position, **Grid code** is not displayed on the quick settings screen.
- You are advised to log in to the **Quick Settings** screen as **Advanced User** for parameter settings.
- Set the correct grid code based on the application region and scenario of the SUN2000.

**Figure 6-5** Quick Settings screen (advanced user)

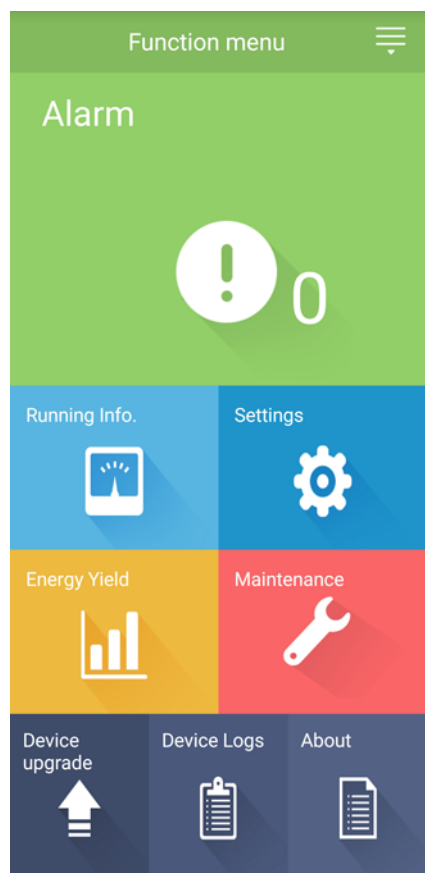


 **NOTE**

- Set the 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**, **Protocol**, and **Address** based on site requirements. **Baud rate** can be set to **4800**, **9600**, or **19200**. **Protocol** can be set to **MODBUS RTU**, and **Address** can be set to any value in the range of 1 to 247.
- When multiple SUN2000s communicate with the SmartLogger over RS485, the RS485 addresses for all the SUN2000s on each RS485 route must be within the address range set on the SmartLogger and cannot be duplicate. Otherwise, the communication will fail. In addition, the baud rates of all the SUN2000s on each RS485 route must be consistent with the SmartLogger baud rate.



**Figure 6-6** Function menu screen



----End

## 6.3 Powering Off the System

### Precautions

---

**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 fifteen minutes after power-off.
- 

### Procedure

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

For details, see the *SUN2000 App User Manual*, *SmartLogger User Manual*, or *iManager NetEco 1000S User Manual*.

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

**Step 3** Turn off both DC switches.

----End

## 6.4 Power-Off for Troubleshooting

### Context

To prevent personal injury and equipment damage, perform the following procedure to power off the solar inverter for troubleshooting or replacement.

---

**CAUTION**

- When a solar inverter is faulty, try to avoid standing in front of the solar inverter.
  - Do not operate the DC switch on the solar inverter before you finish **Step 3** to **Step 5**.
  - If the AC switch between the solar inverter and the power grid has automatically disconnected, do not turn on the switch before the fault is rectified.
  - Before power-off for troubleshooting, do not touch the energized components of the solar inverter. Otherwise, electric shocks or arcing may occur.
- 

### Procedure

**Step 1** Wear proper personal protective equipment (PPE).

**Step 2** If the solar inverter is not shut down due to a fault, send a shutdown command on the app, SmartLogger, or management system. If the solar inverter has shut down due to a fault, go to the next step.

**Step 3** Turn off the AC switch between the solar inverter and the power grid.

**Step 4** Measure the DC current of each PV input string using a clamp meter that is set to the DC position.

- If the current is less than or equal to 0.5 A, go to the next step.
- If the current is higher than 0.5 A, wait until the solar irradiance decreases and the PV string current decreases below 0.5 A at night, and then go to the next step.

**Step 5** Open the maintenance compartment door, install a support bar, and use a multimeter to measure the voltage between the AC terminal block and the ground. Ensure that the AC side of the solar inverter is disconnected.

**Step 6** Turn off all DC input switches of the solar inverter.

**Step 7** Wait for 15 minutes and troubleshoot or repair the inverter.

---

 **WARNING**

- Do not open the host panel for maintenance if the solar inverter is emitting odor or smoke, or has obvious exceptions.
- If the solar inverter does not emit odor or smoke and is intact, repair or restart it based on the alarm handling suggestions. Do not stand in front of the solar inverter during the restart.

---

----End

# 7 Man-Machine Interactions

## 7.1 Operations with a USB Flash Drive

USB flash drives of SanDisk, Netac, or Kingston are supported. Other USB flash drives may not be identified because they are not tested for compatibility.

 NOTE

Delete the script file immediately after use to reduce information disclosure risks.

### 7.1.1 Exporting Configurations

#### Procedure

1. Click **Local maintenance script** on the app to generate a boot script file, see the *FusionSolar APP and SUN2000 APP User Manual*.
2. Import the boot script file to a PC.  
(Optional) The boot script file can be opened as a .txt file.

Figure 7-1 Boot script file



```
1 user engineer
2 psw 7e7bc842b22a991d864faecabe20424f79b3e1977286decaa5ae8753d57eae7f
3 validity duration :xxxx-12-31 23:59:59
4 export param
```


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

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

Ensure that the ciphertext in the boot script matches the login password for logging into the SUN2000 app or entering the Device Commissioning screen on the FusionSolar app. Otherwise, the user account will be locked for 10 minutes after the USB flash drive is inserted for five consecutive times.

**Table 7-1** LED indicator description

LED Indicator	Status	Meaning
	Green off	There is no operation with a USB flash drive.
	Blinking green slowly	There is an operation with a USB flash drive.
	Blinking green fast	An operation with a USB flash drive has failed.
	Steady green	An operation with a USB flash drive is successful.

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.

## 7.1.2 Importing Configurations

### Prerequisites

A complete configuration file has been exported.

### Procedure

1. Click **Local maintenance script** on the app to generate a boot script file, see the *FusionSolar APP and SUN2000 APP User Manual*.
2. Import the boot script file to a PC.
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.

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**

Ensure that the ciphertext in the boot script matches the login password for logging into the SUN2000 app or entering the Device Commissioning screen on the FusionSolar app. Otherwise, the user account will be locked for 10 minutes after the USB flash drive is inserted for five consecutive times.

---

**Table 7-2** LED indicator description

LED Indicator	Status	Meaning
	Green off	There is no operation with a USB flash drive.
	Blinking green slowly	There is an operation with a USB flash drive.
	Blinking green fast	An operation with a USB flash drive has failed.
	Steady green	An operation with a USB flash drive is successful.

### 7.1.3 Exporting Data


#### Procedure

1. Click **Local maintenance script** on the app to generate a boot script file, see the *FusionSolar APP and SUN2000 APP User Manual*.
2. Import the boot script file to the root directory of a USB flash drive.
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

Ensure that the ciphertext in the boot script matches the login password for logging into the SUN2000 app or entering the Device Commissioning screen on the FusionSolar app. Otherwise, the user account will be locked for 10 minutes after the USB flash drive is inserted for five consecutive times.

**Table 7-3** LED indicator description

LED Indicator	Status	Meaning
	Green off	There is no operation with a USB flash drive.
	Blinking green slowly	There is an operation with a USB flash drive.
	Blinking green fast	An operation with a USB flash drive has failed.
	Steady green	An operation with a USB flash drive is successful.

## 7.1.4 Upgrading

### Procedure

1. Download the required software upgrade package from the technical support website.
2. Decompress the upgrade package.

 **NOTE**

If the login password for logging into the SUN2000 app or entering the **Device Commissioning** screen on the FusionSolar app is the initial password, you do not need to perform steps 3 to 5. If not, perform steps 3 to 7.


3. Click **Local maintenance script** on the app to generate a boot script file, see the *FusionSolar APP and SUN2000 APP User Manual*.
4. Import the boot script file to a PC.
5. Replace the boot script file (sun\_lmt\_mgr\_cmd.emap) in the upgrade package with the one generated by the app.
6. Copy the extracted files to the root directory of the USB flash drive.
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**

Ensure that the ciphertext in the boot script matches the login password for logging into the SUN2000 app or entering the Device Commissioning screen on the FusionSolar app. Otherwise, the user account will be locked for 10 minutes after the USB flash drive is inserted for five consecutive times.



**Table 7-4** LED indicator description

LED Indicator	Status	Meaning
	Green off	There is no operation with a USB flash drive.
	Blinking green slowly	There is an operation with a USB flash drive.
	Blinking green fast	An operation with a USB flash drive has failed.
	Steady green	An operation with a USB flash drive is successful.

- The system automatically restarts when the upgrade is completed. All LED indicators are off during the restart. After the restart, the indicator is blinking green slowly for 1 minute and then it becomes steady green, which indicates that the upgrade is successful.

## 7.2 Operations with the SUN2000 App

### NOTICE

- When you use the SUN2000 app to set parameters for the SUN2000, setting items on certain parameter setting screens are not displayed if the AC switch between the SUN2000 and the power grid is turned on but both of **DC SWITCH** on the SUN2000 are not in the **ON** position. Switch both of **DC SWITCH** to the **ON** position and then reset relevant parameters again.
- If you change the grid code, some parameters may be restored to factory defaults. After the grid code is changed, check whether the previously set parameters are affected.
- Delivering a reset, shutdown, or upgrade command to the solar inverters may cause power grid connection failure, which affects the energy yield.
- Only professionals are allowed to set the grid parameters, protection parameters, feature parameters, and power adjustment parameters of the solar inverters. If the grid parameters, protection parameters, and feature parameters are incorrectly set, the solar inverters may not connect to the power grid. If the power adjustment parameters are incorrectly set, the solar inverters may not connect to the power grid as required. In these cases, the energy yield will be affected.

 NOTE

- The app screenshots in this chapter are for the SUN2000-60KTL-M0.
- Configurable parameters vary depending on the grid code. The actual display prevails.
- The parameter names, value ranges, and default values are subject to change. The actual display prevails.

## 7.2.1 Operations Related to the Advanced User

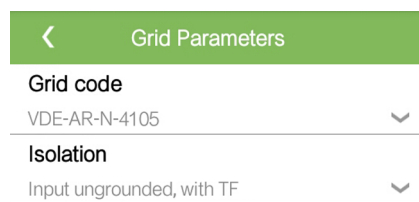
If you log in to the app as **Advanced User**, you can set grid parameters, protection parameters, and feature parameters for the SUN2000.

### 7.2.1.1 Setting Grid Parameters

#### Procedure

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

**Figure 7-2** Grid parameters (advanced user)



----End

#### Parameter List

No.	Parameter	Description
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.
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.

### 7.2.1.2 Setting Protect Parameters

#### Procedure

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

**Figure 7-3** Protect parameters (advanced user)



----End

## Parameter List

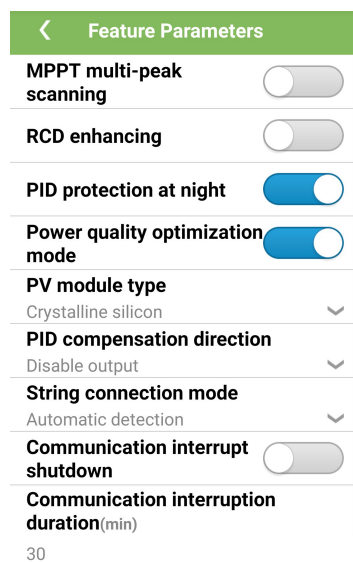
Parameter	Description
Insulation resistance protection threshold (MΩ)	To ensure device safety, the SUN2000 detects the insulation resistance between the input side and the ground when it starts a self-check. If the detected value is less than the preset value, the SUN2000 does not export power to the power grid.

### 7.2.1.3 Setting Feature Parameters

#### Procedure

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

**Figure 7-4** Feature parameters (advanced user)



----End

## Parameter List

Parameter	Description	Remarks
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.	The scanning interval is set by <b>MPPT multi-peak scanning interval</b> .
MPPT multi-peak scan interval (min)	Specifies the MPPT multi-peak scanning interval.	This parameter is displayed only when <b>MPPT multi-peak scanning</b> is set to <b>Enable</b> .
RCD enhancing	RCD refers to the residual current of the SUN2000 to the ground. To ensure device security and personal safety, RCD should comply with the standard. If an AC switch with a residual current detection function is installed outside the SUN2000, this function should be enabled to reduce the residual current generated during SUN2000 running, thereby preventing the AC switch from misoperations.	N/A
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.	This parameter is configurable only when <b>Isolation</b> is set to <b>Input ungrounded, with a transformer</b> .
PID protection at night	<ul style="list-style-type: none"> <li>When <b>PID protection at night</b> is set to <b>Enable</b>, the SUN2000 will shut down automatically if it detects abnormality in PID voltage compensation during the reactive power compensation at night.</li> <li>When <b>PID protection at night</b> is set to <b>Disable</b>, the SUN2000 will operate in grid-tied mode if it detects abnormality in PID voltage compensation during the reactive power compensation at night.</li> </ul>	N/A
Power quality optimization mode	If <b>Power quality optimization mode</b> is set to <b>Enable</b> , the inverter output current harmonics will be optimized.	N/A

Parameter	Description	Remarks
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.	<ul style="list-style-type: none"> <li>● If <b>PV module type</b> is set to <b>Crystalline silicon</b> or <b>Film</b>, the SUN2000 automatically detects the power of PV modules when they are shaded and shuts down if the power is too low.</li> <li>● When the concentration PV modules are used: <ul style="list-style-type: none"> <li>– If <b>PV module type</b> is set to <b>CPV 1</b>, the inverter can quickly restart in 60 minutes when the input power of PV modules drops drastically due to shading.</li> <li>– If <b>PV module type</b> is set to <b>CPV 2</b>, the inverter can quickly restart in 10 minutes when the input power of PV modules drops drastically due to shading.</li> </ul> </li> </ul>
Built-in PID compensation direction	The PID effect may result in the power attenuation of PV modules, which is mainly caused by the DC voltage between PV modules and the ground. Enabling this setting lowers the DC voltage between PV modules and the ground by reducing the impedance on the input side to the ground.	This parameter is displayed only if <b>PV module type</b> is set to <b>Crystalline silicon</b> .
PID running mode	Specifies the operation mode of the SUN2000 built-in PID.	This parameter is displayed only for the models that support <b>Built-in PID repair</b> .
PID nighttime off-grid repair	Specifies whether to enable the PID nighttime off-grid repair.	This parameter is displayed only if <b>PID running mode</b> is set to <b>Repair</b> .
PID daytime off-grid repair	Specifies whether to enable the PID daytime off-grid repair.	This parameter is displayed only if <b>PID running mode</b> is set to <b>Repair</b> .

Parameter	Description	Remarks
String connection mode	<p>Specifies the connection mode of PV strings.</p> <ul style="list-style-type: none"> <li>When the PV strings connect to the inverter separately (fully separate connection), there is no need to set this parameter. The inverter can automatically detect the connection mode of the PV strings.</li> <li>When the PV strings connect to one another in parallel outside the inverter and then connect to the inverter independently (fully parallel connection), set this parameter to <b>All PV strings connected</b>.</li> </ul>	N/A
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.	If <b>Communication interrupt shutdown</b> is set to <b>Enable</b> and the SUN2000 communication has been interrupted for a specified time (set by <b>Communication interruption duration</b> ), the SUN2000 will automatically shut down.
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.	This parameter is displayed when <b>Automatic OFF due to communication interrupted</b> is set to <b>Enable</b> .
Communication interruption duration (min)	Specifies the duration for determining communication interruption, and is used for automatic shutdown for protection in case of communication interruption.	N/A
Soft start/boot time (s)	Specifies the duration for the power to gradually increase when the SUN2000 starts.	N/A
Hibernate at night	The SUN2000 monitors PV strings at night. If <b>Hibernate at night</b> is set to <b>Enable</b> , the monitoring function of the SUN2000 will hibernate at night, reducing power consumption.	N/A

Parameter	Description	Remarks
MBUS communication	For SUN2000 models that support both RS485 and MBUS communication, when RS485 communication is used, you are advised to set <b>MBUS communication</b> to <b>Disable</b> to reduce power consumption.	N/A
Upgrade delay	<b>Upgrade delay</b> 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.	After the SUN2000 upgrade starts, if <b>Upgrade delay</b> is set to <b>Enable</b> , the upgrade package is loaded first. After the PV power supply recovers and the activation conditions are met, the SUN2000 automatically activates the upgrade.
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.	If PV strings are easily shaded, you are advised to set <b>String monitor</b> to <b>Disable</b> to prevent false alarms.
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.	This parameter is displayed when <b>String monitor</b> is set to <b>Enable</b> .
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.	
Tracker controller	Selects a controller vendor.	N/A
Duration for determining short-time grid disconnection (ms)	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.	N/A

## 7.2.2 Operations Related to the Special User

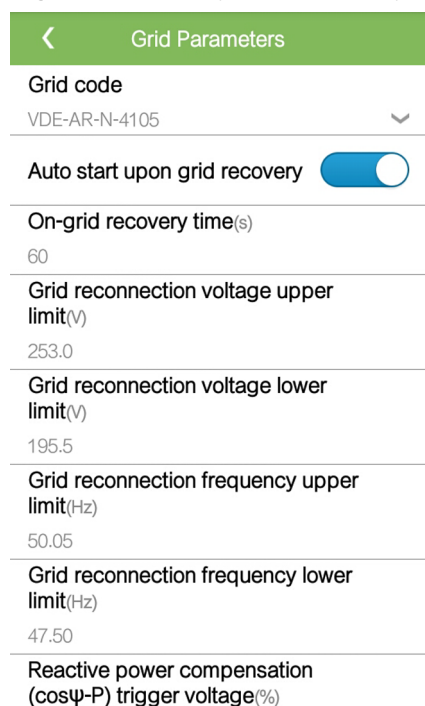
If you log in to the app as **Special User**, you can set grid parameters, protection parameters, feature parameters, and power adjustment parameters for the SUN2000.

### 7.2.2.1 Setting Grid Parameters

#### Procedure

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

**Figure 7-5** Grid parameters (special user)



----End

#### Parameter List

No.	Parameter	Description	Remarks
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
2	Output mode	Indicates whether the SUN2000 output has a neutral wire.	Supported by the SUN2000-50KTL-M0 and SUN2000-60KTL-M0 only.



No.	Parameter	Description	Remarks
3	PQ mode	If this parameter is set to <b>PQ mode 1</b> , the maximum active power equals the maximum apparent power. If it is set to <b>PQ mode 2</b> , the maximum active power equals the rated active power.	
4	Auto start upon grid recovery	Specifies whether to allow the SUN2000 to automatically start after the power grid recovers.	N/A
5	Grid connection duration after power grid recovery	Specifies the waiting time for SUN2000 restart after the power grid recovers.	N/A
6	Grid reconnection voltage upper limit	The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage exceeds the value of <b>Grid reconnection voltage upper limit</b> after the SUN2000 shuts down due to a fault.	N/A
7	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 <b>Grid reconnection voltage lower limit</b> after the SUN2000 shuts down due to a fault.	N/A
8	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 <b>Grid reconnection frequency upper limit</b> after the SUN2000 shuts down due to a fault.	N/A
9	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 <b>Grid reconnection frequency lower limit</b> after the SUN2000 shuts down due to a fault.	N/A
10	Reactive power compensation (cos $\phi$ -P) trigger voltage	Specifies the voltage threshold for triggering reactive power compensation based on the cos $\phi$ -P curve.	N/A

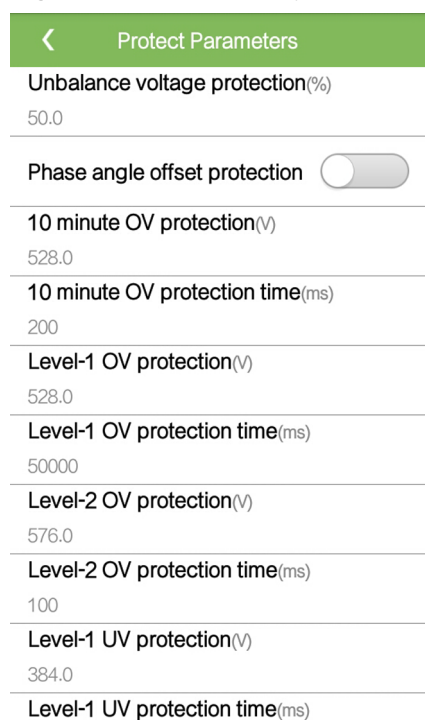
No.	Parameter	Description	Remarks
11	Reactive power compensation (cosφ-P) exit voltage	Specifies the voltage threshold for exiting reactive power compensation based on the cosφ-P curve.	N/A

## 7.2.2.2 Setting Protection Parameters

### Procedure

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

**Figure 7-6** Protection parameters (special user)



----End

### Parameter List

**NOTE**

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

No.	Parameter	Description
1	Unbalance voltage protection	Specifies the SUN2000 protection threshold in the case of unbalanced power grid voltage.

No.	Parameter	Description
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.
3	10 minute OV protection	Specifies the 10-minute overvoltage protection threshold.
4	10 minute OV protection time	Specifies the 10-minute overvoltage protection duration.
5	Level-1 OV protection	Specifies the level-1 overvoltage protection threshold.
6	Level-1 OV protection time	Specifies the level-1 overvoltage protection duration.
7	Level-2 OV protection	Specifies the level-2 overvoltage protection threshold.
8	Level-2 OV protection time	Specifies the level-2 overvoltage protection duration.
9	Level-1 UV protection	Specifies the level-1 undervoltage protection threshold.
10	Level-1 UV protection time	Specifies the level-1 undervoltage protection duration.
11	Level-2 UV protection	Specifies the level-2 undervoltage protection threshold.
12	Level-2 UV protection time	Specifies the level-2 undervoltage protection duration.
13	Level-1 OF protection	Specifies the level-1 overfrequency protection threshold.
14	Level-1 OF protection time	Specifies the level-1 overfrequency protection duration.
15	Level-2 OF protection	Specifies the level-2 overfrequency protection threshold.
16	Level-2 OF protection time	Specifies the level-2 overfrequency protection duration.
17	Level-1 UF protection	Specifies the level-1 underfrequency protection threshold.
18	Level-1 UF protection time	Specifies the level-1 underfrequency protection duration.
19	Level-2 UF protection	Specifies the level-2 underfrequency protection threshold.

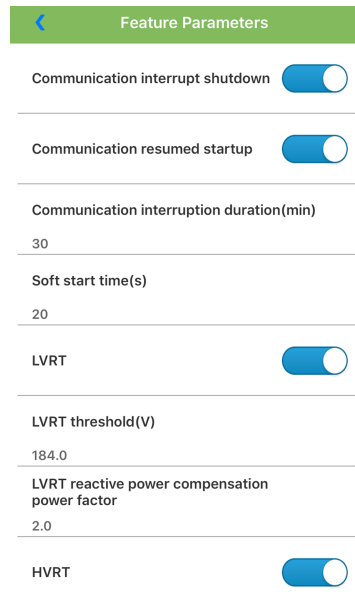
No.	Parameter	Description
20	Level-2 UF protection time	Specifies the level-2 underfrequency protection duration.

### 7.2.2.3 Setting Feature Parameters

#### Procedure

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

**Figure 7-7** Feature parameters (special user)



----End

#### Parameter List

Parameter	Description	Remarks
Automatic OFF due to communication interrupted	The standards of certain countries and regions require that the inverter must shut down after the communication is interrupted for a certain time.	If <b>Automatic OFF due to communication interrupted</b> is set to <b>Enable</b> and the inverter communication is interrupted for a specified time (set by <b>Communication interruption duration</b> ), the inverter will automatically shut down.

Parameter	Description	Remarks
Automatic ON due to communication resumed	If this parameter is set to <b>Enable</b> , the inverter automatically starts after communication recovers. If this parameter is set to <b>Disable</b> , the inverter needs to be started manually after communication recovers.	This parameter is displayed when <b>Automatic OFF due to communication interrupted</b> is set to <b>Enable</b> .
Communication interruption duration (min)	Specifies the duration for determining communication interruption. Used for automatic shutdown for protection in case of communication interruption.	N/A
Soft start/boot time (s)	Specifies the duration for the power to gradually increase when the inverter starts.	N/A
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
LVRT threshold (V)	Specifies the threshold for triggering LVRT. The threshold settings should meet the local grid standard.	Vn represents the rated voltage.
LVRT undervoltage protection shield	Specifies whether to shield the undervoltage protection function during LVRT.	N/A
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.	For example, if you set <b>LVRT reactive power compensation power factor</b> to <b>2</b> , the reactive current generated by the SUN2000 is 20% of the rated current when the AC voltage drops by 10% during LVRT.
HVRT	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
Threshold for triggering HVRT (V)	Specifies the threshold for triggering HVRT. The threshold settings should meet the local grid standard.	This parameter is displayed when <b>HVRT</b> is set to <b>Enable</b> .

Parameter	Description	Remarks
HVRT compensation power factor of reactive power in positive sequence	During HVRT, the inverter needs to generate reactive power to support the power grid. This parameter is used to set the reactive power generated by the inverter.	N/A
VRT exit hysteresis threshold	Specifies the LVRT/HVRT recovery threshold.	<ul style="list-style-type: none"> <li>• This parameter is displayed when <b>LVRT</b> or <b>HVRT</b> is set to <b>Enable</b>.</li> <li>• LVRT recovery threshold = Threshold for triggering LVRT + VRT exit hysteresis threshold</li> <li>• HVRT recovery threshold = Threshold for triggering HVRT + VRT exit hysteresis threshold</li> </ul>
Grid voltage protection shield during VRT	Specifies whether to shield the undervoltage protection function during LVRT or HVRT.	This parameter is displayed when <b>LVRT</b> or <b>HVRT</b> is set to <b>Enable</b> .
Active islanding	Specifies whether to enable the active islanding protection function.	N/A
Soft start time after grid failure (s)	Specifies the time for the power to gradually increase when the SUN2000 restarts after the power grid recovers.	N/A

#### 7.2.2.4 Setting Power Adjustment Parameters

##### Procedure

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

**Figure 7-8** Power adjustment parameters (special user)

<
Power Adjustment

---

Remote power schedule

---

Schedule instruction valid duration(s)  
0

---

Maximum active power(kW)  
66.000

---

Shutdown at 0% power limit

---

Active power change gradient(%/s)  
125.000

---

Fixed active power derating(kW)  
66.0

---

Active power percentage derating(%)  
100.0

---

Power factor((-1.000,-0.800) U  
[0.800,1.000])  
1.000

---

Reactive power compensation (Q/S)  
0.000

----End

## Parameter List

**Table 7-5** Parameter description

No.	Parameter	Description	Remarks
1	Remote power schedule	If this parameter is set to <b>Enable</b> , the SUN2000 responds to the remote power scheduling instruction. If this parameter is set to <b>Disable</b> , the SUN2000 does not respond to the remote power scheduling instruction.	N/A
2	Schedule instruction valid duration	Specifies the duration within which the scheduling instruction is valid.	If the value is less than 60 seconds, the scheduling instruction is valid permanently.
3	Maximum active power	Specifies the output upper threshold for the maximum active power to adapt to various market requirements.	<b>Pmax_limit</b> is the upper limit of the maximum active power.

No.	Parameter	Description	Remarks
4	Shutdown at 0% power limit	If this parameter is set to <b>Enable</b> , the SUN2000 shuts down after receiving the 0% power limit command. If this parameter is set to <b>Disable</b> , the SUN2000 does not shut down after receiving the 0% power limit command.	N/A
5	Active power change gradient	Adjusts the change speed of the SUN2000 active power.	Adjust the active power based on the percentage of the rated apparent power.
6	Fixed active power derated	Adjusts the active power output of the SUN2000 to a fixed value.	<b>Pmax_limit</b> is the upper limit of the maximum active power.
7	Active power percentage derating	Adjusts the active power output of the SUN2000 to a percentage.	If this parameter is set to <b>100</b> , the SUN2000 delivers power output based on the maximum output power.
8	Power factor	Adjusts the SUN2000 power factor.	N/A
9	Reactive power compensation (Q/S)	Adjusts the SUN2000 output reactive power.	N/A
10	Reactive power compensation at night (Q/S)	If <b>Reactive power output at night</b> is set to <b>Enable</b> , no PV input exists, and no remote scheduling instruction is delivered, the SUN2000 responds to this command.	N/A
11	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.	Fn represents the rated frequency.
12	Quit frequency of over frequency derating	Specifies the frequency threshold for exiting overfrequency derating.	
13	Recovery gradient of over frequency derating	Specifies the power recovery gradient for overfrequency derating.	N/A



No.	Parameter	Description	Remarks
14	Overfrequency derating	If this parameter is enabled, the active power of the inverter will be derated according to a certain slope when the grid frequency exceeds the value that triggers overfrequency derating.	N/A
15	Cutoff frequency of overfrequency derating	Specifies the frequency threshold for cutting off overfrequency derating.	N/A
16	Cutoff power of overfrequency derating	Specifies the power threshold for cutting off overfrequency derating.	N/A

# 8 Maintenance

## 8.1 Routine Maintenance

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

 **CAUTION**

- Before cleaning the system and maintaining the cable connections and grounding reliability, power off the system and ensure that the two DC switches on the SUN2000 are OFF.
- If you need to open the maintenance compartment door on 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 on rainy or snowy days.

**Table 8-1** Maintenance checklist

Item	Check Method	Maintenance Frequency
System cleanliness	Periodically check that the heat sinks are free from obstacles or dust.	Once every six to twelve months
System running status	<ul style="list-style-type: none"><li>• Check that the SUN2000 is not damaged or deformed.</li><li>• Check that the running sound of the SUN2000 is normal.</li><li>• When the SUN2000 is running, check that all SUN2000 parameters are correctly set.</li></ul>	Once every six months

Item	Check Method	Maintenance Frequency
Electrical connections	<ul style="list-style-type: none"> <li>• Check that cables are securely connected.</li> <li>• If clamps are used for AC cable connections, check that they are secured with a torque of 35 N·m.</li> <li>• Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.</li> <li>• Check that the unused COM, USB, and RESERVE ports are covered by watertight caps.</li> </ul>	The first inspection is six months after the initial commissioning. From then on, the interval can be six or twelve months.
Grounding reliability	Check that ground cables are securely connected.	The first inspection is six months after the initial commissioning. From then on, the interval can be six or twelve months.

## 8.2 Troubleshooting

Alarm severities are defined as follows:

- Major: The inverter is faulty. As a result, the output power decreases or the grid-tied power generation is stopped.
- Minor: Some components are faulty without affecting the grid-tied power generation.
- Warning: The inverter works properly. The output power decreases or some authorization functions fail due to external factors.

**Table 8-2** Common alarms and troubleshooting measures

Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2001	High String Input Voltage	Major	<p>The PV array is incorrectly configured. Excessive PV modules are connected in series to the PV string, and hence the PV string open-circuit voltage exceeds the maximum operating voltage of the SUN2000.</p> <ul style="list-style-type: none"> <li>• Cause ID 1 corresponds to PV strings 1 and 2.</li> <li>• Cause ID 2 corresponds to PV strings 3 and 4.</li> <li>• Cause ID 3 corresponds to PV strings 5 and 6.</li> <li>• Cause ID 4 corresponds to PV strings 7 and 8.</li> <li>• Cause ID 5 corresponds to PV strings 9 and 10.</li> <li>• Cause ID 6 corresponds to PV strings 11 and 12.</li> </ul>	<p>Reduce the number of PV modules connected in series to the PV string until the PV string open-circuit voltage is less than or equal to the maximum operating voltage of the SUN2000. After the PV array configuration is corrected, the alarm stops.</p>
2011	String Reverse Connection	Major	<p>The PV string is reversely connected.</p> <p>Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.</p>	<p>Check whether the PV string is reversely connected to the SUN2000. If yes, wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the two DC switches and correct the PV string connection.</p>
2012	String Current Backfeed	Warning	<ol style="list-style-type: none"> <li>1. Only a few PV modules are connected in series to the PV string, and hence the end voltage is lower than that of other PV strings.</li> <li>2. The PV string is shaded.</li> </ol> <p>Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.</p>	<ol style="list-style-type: none"> <li>1. Check whether the number of PV modules connected in series to this PV string is less than the number of PV modules connected in series to the other PV strings. If yes, connect more PV modules in series to this PV string.</li> <li>2. Check the open-circuit voltage of the PV string.</li> <li>3. Check that the PV string is not shaded.</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2013	Abnormal String Power	Warning	<p>1. The PV string has been shaded for a long time.</p> <p>2. The PV string deteriorates abnormally.</p> <p>Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.</p>	<p>1. Check whether the current of the abnormal PV string is lower than the current of other PV strings. If yes, check that the abnormal PV string is not shaded and the actual number of PV strings is the same as the configured number.</p> <p>2. If the abnormal PV string is clean and not shaded, check whether the PV string is damaged.</p>
2031	Phase Wire Short-Circuited to PE	Major	<p>Cause ID = 1</p> <p>The impedance of the output phase wire to PE is low or the output phase wire is short-circuited to PE.</p>	<p>Check the impedance of the output phase wire to PE, locate the position with lower impedance, and rectify the fault.</p>
2032	Grid Loss	Major	<p>Cause ID = 1</p> <p>1. The power grid experiences an outage.</p> <p>2. The AC circuit is disconnected or AC switch is off.</p>	<p>1. The alarm disappears automatically after the power grid recovers.</p> <p>2. Check that the AC power cable is connected and that the AC switch is ON.</p>
2033	Grid Undervoltage	Major	<p>Cause ID = 1</p> <p>The grid voltage is below the lower threshold or the low voltage duration has lasted for more than the value specified by LVRT.</p>	<p>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</p> <p>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, modify the power grid undervoltage protection threshold with the consent of the local power operator.</p> <p>3. If the fault persists for a long time, check the AC circuit breaker and AC output power cable.</p>

Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2034	Grid Overvoltage	Major	<p>Cause ID = 1</p> <p>The grid voltage exceeds the higher threshold or the high voltage duration has lasted for more than the value specified by HVRT.</p>	<ol style="list-style-type: none"> <li>1. Check whether the grid connection voltage exceeds the upper threshold. If yes, contact the local power operator.</li> <li>2. If you have confirmed that the grid connection voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage protection threshold.</li> <li>3. Check that the peak grid voltage does not exceed the upper threshold.</li> </ol>
2035	Grid Voltage Imbalance	Major	<p>Cause ID = 1</p> <p>The difference between grid phase voltages exceeds the upper threshold.</p>	<ol style="list-style-type: none"> <li>1. Check that the grid voltage is within the normal range.</li> <li>2. Check the connection of the AC output power cable. If the cable connection is proper but the alarm occurs frequently and affects the power production of the PV plant, contact the local power operator.</li> </ol>
2036	Grid Overfrequency	Major	<p>Cause ID = 1</p> <p>Power grid exception: The actual grid frequency is higher than the requirement of the local power grid standard.</p>	<ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator. If yes, modify the power grid overfrequency protection threshold with the consent of the local power operator.</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2037	Grid Underfrequency	Major	<p>Cause ID = 1</p> <p>Power grid exception: The actual power grid frequency is lower than the standard requirement for the local power grid.</p>	<ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator. If yes, modify the power grid underfrequency protection threshold with the consent of the local power operator.</li> </ol>
2038	Unstable Grid Frequency	Major	<p>Cause ID = 1</p> <p>Power grid exception: The actual grid frequency change rate does not comply with the local power grid standard.</p>	<ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator.</li> </ol>
2039	Output Overcurrent	Major	<p>Cause ID = 1</p> <p>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.</p>	<ol style="list-style-type: none"> <li>1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers.</li> <li>2. If the alarm occurs frequently and affects the power production of the PV plant, check whether the output is short-circuited. If the fault persists, contact Huawei technical support.</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2040	Output DC Component Overhigh	Major	Cause ID = 1 The DC component of the SUN2000 output current exceeds the specified upper threshold.	<ol style="list-style-type: none"> <li>1. If the exception is caused by an external fault, the SUN2000 automatically recovers after the fault is rectified.</li> <li>2. If the alarm occurs frequently and affects the power production of the PV plant, contact Huawei technical support.</li> </ol>
2051	Abnormal Residual Current	Major	Cause ID = 1 The insulation impedance of the input side to PE decreases when the SUN2000 is operating.	<ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the external power cable may be abnormal temporarily. The SUN2000 automatically recovers after the fault is rectified.</li> <li>2. If the alarm occurs frequently or persists, check that the impedance between the PV string and ground is not below the lower threshold.</li> </ol>
2061	Abnormal Grounding	Major	Cause ID = 1 <ol style="list-style-type: none"> <li>1. The PE cable for the SUN2000 is not connected.</li> <li>2. The SUN2000 output side does not connect to an isolation transformer when the PV string output is grounded.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check that the PE cable for the SUN2000 is connected properly.</li> <li>2. If the PV string output is grounded, check that the SUN2000 output side connects to an isolation transformer.</li> </ol>
2062	Low Insulation Resistance	Major	Cause ID = 1 <ol style="list-style-type: none"> <li>1. The PV string is short-circuited to PE.</li> <li>2. The PV string has been in a moist environment for a long time and the power cable is not well insulated to ground.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the impedance between the PV string and the PE cable. If a short circuit occurs, rectify the fault.</li> <li>2. Check that the PE cable for the SUN2000 is correctly connected.</li> <li>3. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, reset <b>Insulation resistance protection</b>.</li> </ol>



Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2063	Cabinet Overtemperature	Major	Cause ID = 1 1. The SUN2000 is installed in a place with poor ventilation. 2. The ambient temperature exceeds the upper threshold. 3. The SUN2000 is not working properly.	1. Check the ventilation and ambient temperature at the SUN2000 installation position. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 2. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.
2064	Device Fault	Major	Cause ID = 1-15 An unrecoverable fault occurs on a circuit inside the SUN2000.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the fault persists, contact Huawei technical support. <b>NOTICE</b> Cause ID = 1: Perform the preceding operations when the PV string current is less than 1 A.
2065	Upgrade Failed	Minor	Cause ID = 1-5 The upgrade ends abnormally.	1. Perform an upgrade again. 2. If the upgrade fails several times, contact your dealer.
2066	License Expired	Warning	Cause ID = 1 1. The privilege certificate has entered the grace period. 2. The privilege feature will be invalid soon.	1. Apply for a new certificate. 2. Load the new certificate.
61440	Faulty Monitoring Unit	Minor	Cause ID = 1 1. The flash memory is insufficient. 2. The flash memory has bad sectors.	Turn off the AC output switch and DC input switch, and then turn them on after 15 minutes. If the fault persists, replace the monitoring board or contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2085	Built-in PID Operation Abnormal	Minor	Cause ID = 1/2 1. The output resistance of PV arrays to ground is low. 2. The system insulation resistance is low.	<ul style="list-style-type: none"> <li>• Cause ID = 1                             <ol style="list-style-type: none"> <li>1. Turn off the AC output switch and then the DC input switch. After 15 minutes, turn on the AC output switch and then the DC input switch.</li> <li>2. If the fault persists, contact your supplier/Huawei technical support.</li> </ol> </li> <li>• Cause ID = 2                             <ol style="list-style-type: none"> <li>1. Check the output resistance of PV arrays to ground. If there is a short circuit or lack of insulation, rectify it.</li> <li>2. If the fault persists, contact your supplier/Huawei technical support.</li> </ol> </li> </ul>

 **NOTE**

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

# 9 Handling the Inverter

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## 9.1 Removing the SUN2000

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**NOTICE**

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

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Perform the following operations to remove the SUN2000:

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

## 9.2 Packing the SUN2000

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

## 9.3 Disposing of the SUN2000

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

# 10 Technical Specifications

## Efficiency

Item	SUN2000-50 KTL-M0	SUN2000-60KTL-M0		SUN2000-65 KTL-M0
Maximum efficiency	98.70%	98.70% (380 V/400 V)	98.90% (480 V)	98.90%
European efficiency	98.50%	98.50% (380 V/400 V)	98.70% (480 V)	98.70%

## Input

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Maximum input power	56,200 W	67,400 W	73,500 W
Maximum input voltage <sup>a</sup>	1100 V		
Operating voltage range <sup>b</sup>	200–1000 V		
Maximum input current (per MPPT)	22 A		
Maximum short-circuit current (per MPPT)	30 A		

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Maximum SUN2000 backfeed current to the PV array	0 A		
Minimum startup voltage	200 V		
Full power MPPT voltage range	520–800 V	520–800 V (380 V/400 V), 600–850 V (480 V)	600–850 V
Rated input voltage	600 V (380 V/400 V), 620 V (415 V)	600 V (380 V/400 V), 720 V (480 V)	720 V
Number of inputs	12		
Number of MPP trackers	6		
<p>Note a: The maximum input voltage is the upper threshold of the DC voltage. If the input voltage exceeds the threshold, the solar inverter may be damaged.</p> <p>Note b: If the input voltage is beyond the operating voltage range, the solar inverter cannot work properly.</p>			

## Output

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Rated active power	50 kW	60 kW	65 kW
Maximum apparent power	55 kVA	66 kVA	72 kVA
Maximum active power ( $\cos\phi = 1$ )	55 kW (Can be set to 50 kW)	66 kW (Can be set to 60 kW)	72 kW
Rated output voltage <sup>a</sup>	220V/380V, 230V/400V, 240V/415V, 3W+(N) <sup>b</sup> +PE	220V/380V, 230V/400V, 277V/480V, 3W+(N) <sup>b</sup> +PE	277 V/480 V, 3W+PE

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Rated output current	76 A (380 V), 72.2 A (400 V), 69.6 A (415 V)	91.2 A (380 V) 86.7 A (400 V), 72.2 A (480 V)	78.2 A
Adapted grid frequency	50 Hz/60 Hz		
Maximum output current	83.6 A (380 V), 79.4 A (400 V), 76.6 A (415 V)	100 A (380 V), 95.3 A (400 V), 79.4 A (480 V)	86.7 A
Power factor	0.8 leading ... 0.8 lagging		
Maximum total harmonic distortion (rated power)	< 3%		
<p>Note a: The rated output voltage is determined by <b>Grid code</b>, which can be set on the SUN2000 app, SmartLogger, or NetEco.</p> <p>Note b: Choose whether to connect the neutral wire to the SUN2000-50KTL-M0 and SUN2000-60KTL-M0 based on the application scenario. When it is used in the scenarios without neutral wires, set <b>Output mode</b> to <b>Three-phase, three-wire</b>. When it is used in the scenarios with neutral wires, set <b>Output mode</b> to <b>Three-phase, four-wire</b>.</p>			

## Protection

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Input DC switch	Supported		
Anti-islanding protection	Supported		
Output overcurrent protection	Supported		
Input reverse polarity protection	Supported		

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
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		
Overvoltage category	PV II/AC III		
Built-in PID repair <sup>c</sup>	Optional	Optional	Not supported
<p>Note c: When the SUN2000 is disconnected from the grid and stops working, the built-in PID can achieve the PV- positive offset of the PV module. (PV- positive offset refers to raising the voltage between PV- and the ground to above 0 V through voltage compensation.) When designing a power plant, confirm with the PV module manufacturer that the anti-PID voltage compensation direction of the PV module is the same as the direction of the PV- positive offset. Otherwise, PV modules may be damaged.</p>			

 **CAUTION**

For the SUN2000 that supports built-in PID repair, when **Built-in PID running mode** is set to **Repair**, there is repair voltage between PV modules and the ground at night. If you need to maintain PV modules at night, power off the SUN2000 to avoid electric shocks.

## Display and Communication

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Display	LED, Bluetooth module+app, USB data cable+app, WLAN module +app		

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Communication networking mode	MBUS/RS485		

## Common Parameters

Item	SUN2000-50KTL-M0	SUN2000-60KTL-M0	SUN2000-65KTL-M0
Dimensions (W x H x D)	1075 mm x 555 mm x 300 mm		
Net weight	74 kg±1 kg		72 kg±1 kg
Operating temperature	-25°C to +60°C		
Cooling mode	Natural convection		
Highest operating altitude	4000 m		
Humidity	0%–100% RH		
Input terminal	Amphenol Helios H4		
Output terminal	Cable gland+OT terminal		
Ingress Protection Rating	IP65		
Topology	Transformerless		



# A Grid Codes

 **NOTE**

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

**Table A-1** Grid codes (for the SUN2000-50KTL-M0)

No.	Grid Code	Description
1	AS4777	Australia low-voltage power grid
2	IEC61727	IEC61727 low-voltage power grid (50 Hz)
3	Custom(50Hz)	Reserved
4	Custom(60Hz)	Reserved
5	TAI-PEA	Thailand low-voltage power grid (PEA)
6	TAI-MEA	Thailand low-voltage power grid (MEA)
7	Custom-MV480(50Hz)	Reserved
8	Custom-MV480(60Hz)	Reserved
9	IEC61727-MV480	IEC61727 medium-voltage power grid (50 Hz)
10	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)
11	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)
12	Philippines	Philippines low-voltage power grid
13	Philippines-MV480	Philippines medium-voltage power grid

No.	Grid Code	Description
14	AS4777-MV480	Australia medium-voltage power grid
15	NRS-097-2-1	South Africa low-voltage power grid
16	NRS-097-2-1-MV480	South Africa medium-voltage power grid
17	KOREA	South Korea low-voltage power grid
18	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)
19	IEC61727-60Hz-MV480	IEC61727 medium-voltage power grid (60 Hz)
20	KOREA-MV480	South Korea medium-voltage power grid
21	Egypt ETEC	Egypt low-voltage power grid
22	Egypt ETEC-MV480	Egypt medium-voltage power grid
23	Jordan-Transmission	Jordan low-voltage power grid
24	Jordan-Transmission-MV480	Jordan medium-voltage power grid
25	NAMIBIA	Namibia power grid
26	ABNT NBR 16149	Brazil low-voltage power grid
27	SA_RPPs	South Africa low-voltage power grid
28	SA_RPPs-MV480	South Africa medium-voltage power grid
29	ZAMBIA	Zambia low-voltage power grid
30	Chile	Chile low-voltage power grid
31	Mexico-MV480	Mexico medium-voltage power grid
32	Malaysian	Malaysia low-voltage power grid
33	KENYA_ETHIOPIA	Kenya low-voltage and Ethiopia low-voltage power grid
34	NIGERIA	Nigeria low-voltage power grid
35	NIGERIA-MV480	Nigeria medium-voltage power grid
36	DUBAI	Dubai low-voltage power grid

No.	Grid Code	Description
37	DUBAI-MV480	Dubai medium-voltage power grid
38	Cameroon	Cameroon low-voltage power grid
39	Cameroon-MV480	Cameroon medium-voltage power grid
40	Jordan-Distribution	Jordan power distribution network low-voltage power grid
41	LEBANON	Lebanon low-voltage power grid
42	Jordan-Transmission-HV	Jordan high-voltage power grid
43	TUNISIA	Tunisia power grid
44	SAUDI	Saudi Arabia power grid
45	Israel	Israel power grid
46	Chile-PMGD	Chile PMGD project power grid
47	VDE-AR-N4120_HV	VDE4120 standard power grid
48	VDE-AR-N4120_HV480	VDE4120 standard power grid (480 V)
49	Vietnam	Vietnam power grid

**Table A-2** Grid codes (for the SUN2000-60KTL-M0)

No.	Grid Code	Description
1	AS4777	Australia low-voltage power grid
2	IEC61727	IEC61727 low-voltage power grid (50 Hz)
3	Custom(50Hz)	Reserved
4	Custom(60Hz)	Reserved
5	TAI-PEA	Thailand low-voltage power grid (PEA)
6	TAI-MEA	Thailand low-voltage power grid (MEA)
7	Custom-MV480(50Hz)	Reserved
8	Custom-MV480(60Hz)	Reserved
9	IEC61727-MV480	IEC61727 medium-voltage power grid (50 Hz)

No.	Grid Code	Description
10	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)
11	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)
12	Philippines	Philippines low-voltage power grid
13	Philippines-MV480	Philippines medium-voltage power grid
14	AS4777-MV480	Australia medium-voltage power grid
15	NRS-097-2-1	South Africa low-voltage power grid
16	NRS-097-2-1-MV480	South Africa medium-voltage power grid
17	KOREA	South Korea low-voltage power grid
18	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)
19	IEC61727-60Hz-MV480	IEC61727 medium-voltage power grid (60 Hz)
20	KOREA-MV480	South Korea medium-voltage power grid
21	Egypt ETEC	Egypt low-voltage power grid
22	Egypt ETEC-MV480	Egypt medium-voltage power grid
23	Jordan-Transmission	Jordan low-voltage power grid
24	Jordan-Transmission-MV480	Jordan medium-voltage power grid
25	NAMIBIA	Namibia power grid
26	ABNT NBR 16149	Brazil low-voltage power grid
27	SA_RPPs	South Africa low-voltage power grid
28	SA_RPPs-MV480	South Africa medium-voltage power grid
29	ZAMBIA	Zambia low-voltage power grid
30	ZAMBIA-MV480	Zambia medium-voltage power grid
31	Chile	Chile low-voltage power grid

No.	Grid Code	Description
32	Chile-MV480	Chile medium-voltage power grid
33	Mexico-MV480	Mexico medium-voltage power grid
34	Malaysian	Malaysia low-voltage power grid
35	Malaysian-MV480	Malaysia medium-voltage power grid
36	KENYA_ETHIOPIA	Kenya low-voltage and Ethiopia low-voltage power grid
37	KENYA_ETHIOPIA_MV480	Kenya medium-voltage and Ethiopia medium-voltage power grid
38	NIGERIA	Nigeria low-voltage power grid
39	NIGERIA-MV480	Nigeria medium-voltage power grid
40	DUBAI	Dubai low-voltage power grid
41	DUBAI-MV480	Dubai medium-voltage power grid
42	Cameroon	Cameroon low-voltage power grid
43	Cameroon-MV480	Cameroon medium-voltage power grid
44	Jordan-Distribution	Jordan power distribution network low-voltage power grid
45	Jordan-Distribution-MV480	Jordan power distribution network medium-voltage power grid
46	NAMIBIA_MV480	Namibia power grid
47	LEBANON	Lebanon low-voltage power grid
48	LEBANON-MV480	Lebanon medium-voltage power grid
49	ARGENTINA-MV500	Argentina medium-voltage power grid
50	Jordan-Transmission-HV	Jordan high-voltage power grid
51	Jordan-Transmission-HV480	Jordan high-voltage power grid
52	TUNISIA	Tunisia power grid
53	TUNISIA-MV480	Tunisia medium-voltage power grid
54	AUSTRALIA-NER	Australia NER standard power grid
55	AUSTRALIA-NER-MV480	Australia NER standard power grid

No.	Grid Code	Description
56	SAUDI	Saudi Arabia power grid
57	SAUDI-MV480	Saudi Arabia power grid
58	Ghana-MV480	Ghana medium-voltage power grid
59	Israel	Israel power grid
60	Israel-MV480	Israel power grid
61	Chile-PMGD	Chile PMGD project power grid
62	Chile-PMGD-MV480	Chile PMGD project power grid
63	VDE-AR-N4120_HV	VDE4120 standard power grid
64	VDE-AR-N4120_HV480	VDE4120 standard power grid (480 V)
65	Vietnam	Vietnam power grid
66	Vietnam-MV480	Vietnam power grid
67	VDE-AR-N-4105	Germany low-voltage power grid
68	UTE C 15-712-1(A)	France mainland low-voltage power grid
69	UTE C 15-712-1(B)	France islands
70	UTE C 15-712-1(C)	France islands
71	VDE 0126-1-1-BU	Bulgaria power grid
72	VDE 0126-1-1-GR(A)	Greece mainland power grid
73	VDE 0126-1-1-GR(B)	Greece Island Grid
74	BDEW-MV	Germany medium-voltage power grid
75	G59-England	England 230 V power grid (I > 16 A)
76	G59-Scotland	Scotland 240 V power grid (I > 16 A)
77	G83-England	England 230 V power grid (I < 16 A)
78	G83-Scotland	Scotland 240 V power grid (I < 16 A)
79	CEI0-21	Italy low-voltage power grid
80	EN50438-CZ	Czech Republic low-voltage power grid

No.	Grid Code	Description
81	RD1699/661	Spain low-voltage power grid
82	RD1699/661-MV480	Spain medium-voltage power grid
83	EN50438-NL	Netherlands power grid
84	C10/11	Belgium low-voltage power grid
85	CEI0-16	Italy low-voltage power grid
86	BDEW-MV480	Germany medium-voltage power grid
87	G59-England-MV480	England 480 V medium-voltage power grid (I > 16 A)
88	UTE C 15-712-1-MV480	France Island medium-voltage power grid
89	EN50438-DK-MV480	Denmark medium-voltage power grid
90	EN50438-TR-MV480	Turkey medium-voltage power grid
91	EN50438-TR	Turkey low-voltage power grid
92	C11/C10-MV480	Belgium medium-voltage power grid
93	ANRE	Romania low-voltage power grid
94	ANRE-MV480	Romania medium-voltage power grid
95	PO12.3-MV480	Spain medium-voltage power grid
96	EN50438_IE-MV480	Ireland medium-voltage power grid
97	EN50438_IE	Ireland low-voltage power grid
98	CEI0-16-MV480	Italy medium-voltage power grid
99	PO12.3	Spain low-voltage power grid
100	CEI0-21-MV480	Italy medium-voltage power grid
101	CLC/TS50549_IE	Ireland low-voltage power grid
102	CLC/TS50549_IE-MV480	Ireland medium-voltage power grid
103	Northern Ireland	Northern Ireland low-voltage power grid
104	Northern Ireland-MV480	Northern Ireland medium-voltage power grid

**Table A-3** Grid codes (for the SUN2000-65KTL-M0)

No.	Grid Code	Description
1	Custom-MV480(50Hz)	Reserved
2	Custom-MV480(60Hz)	Reserved
3	IEC61727-MV480	IEC61727 medium-voltage power grid (50 Hz)
4	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)
5	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)
6	Philippines-MV480	Philippines medium-voltage power grid
7	AS4777-MV480	Australia medium-voltage power grid
8	NRS-097-2-1-MV480	South Africa medium-voltage power grid
9	IEC61727-60Hz-MV480	IEC61727 medium-voltage power grid (60 Hz)
10	KOREA-MV480	South Korea medium-voltage power grid
11	Egypt ETEC-MV480	Egypt medium-voltage power grid
12	Jordan-Transmission-MV480	Jordan medium-voltage power grid
13	SA_RPPs-MV480	South Africa medium-voltage power grid
14	ZAMBIA-MV480	Zambia medium-voltage power grid
15	Chile-MV480	Chile medium-voltage power grid
16	Mexico-MV480	Mexico medium-voltage power grid
17	Malaysian-MV480	Malaysia medium-voltage power grid
18	KENYA_ETHIOPIA_MV480	Kenya medium-voltage and Ethiopia medium-voltage power grid
19	NIGERIA-MV480	Nigeria medium-voltage power grid
20	DUBAI-MV480	Dubai medium-voltage power grid



No.	Grid Code	Description
21	Cameroon-MV480	Cameroon medium-voltage power grid
22	Jordan-Distribution-MV480	Jordan power distribution network medium-voltage power grid
23	NAMIBIA_MV480	Namibia power grid
24	LEBANON-MV480	Lebanon medium-voltage power grid
25	ARGENTINA-MV500	Argentina medium-voltage power grid
26	Jordan-Transmission-HV480	Jordan high-voltage power grid
27	TUNISIA-MV480	Tunisia medium-voltage power grid
28	AUSTRALIA-NER-MV480	Australia NER standard power grid
29	SAUDI-MV480	Saudi Arabia power grid
30	Ghana-MV480	Ghana medium-voltage power grid
31	Israel-MV480	Israel power grid
32	Chile-PMGD-MV480	Chile PMGD project power grid
33	VDE-AR-N4120_HV480	VDE4120 standard power grid (480 V)
34	Vietnam-MV480	Vietnam power grid

# B Domain Name List of Management Systems

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 **NOTE**

The list is subject to change.

**Table B-1** Domain names of management systems

Domain Name	Data Type	Scenario
intl.fusionsolar.huawei.com	Public IP address	FusionSolar hosting cloud <b>NOTE</b> The domain name is compatible with cn.fusionsolar.huawei.com (Chinese mainland).

# C Product User Lists

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User Name	Initial Password
Common User	00000a
Advanced User	00000a
Special User	00000a

# D Acronyms and Abbreviations

<b>C</b>	
<b>CCO</b>	central controller
<b>H</b>	
<b>HVRT</b>	high voltage ride-through
<b>L</b>	
<b>LED</b>	light emitting diode
<b>LVRT</b>	low voltage ride-through
<b>M</b>	
<b>MPP</b>	maximum power point
<b>MPPT</b>	maximum power point tracking
<b>P</b>	
<b>PID</b>	potential induced degradation
<b>PV</b>	photovoltaic
<b>R</b>	
<b>RCD</b>	residual current device
<b>W</b>	
<b>WEEE</b>	waste electrical and electronic equipment