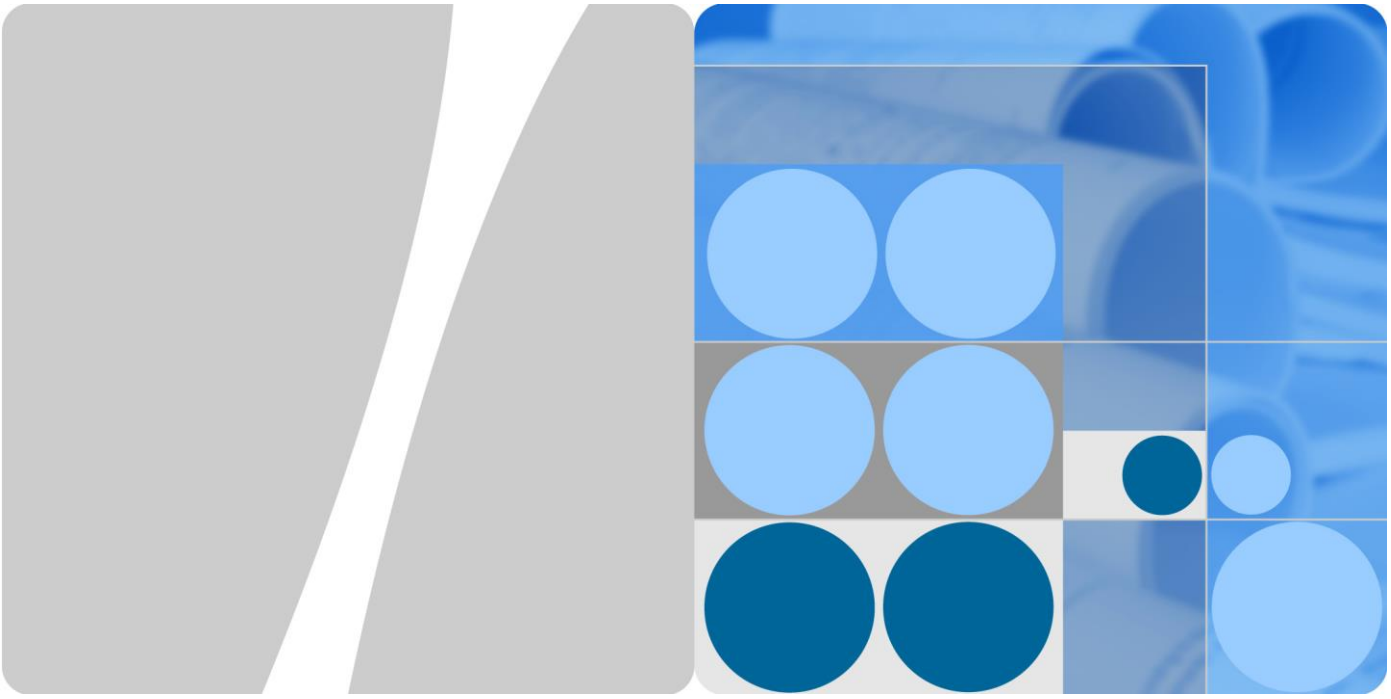

SUN2000-(90KTL, 95KTL, 100KTL, 105KTL) Series

User Manual

Issue 04

Date 2018-10-23

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Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: http://e.huawei.com

About This Document

Purpose

This document describes the SUN2000-90KTL-H0, SUN2000-90KTL-H1, SUN2000-90KTL-H2, SUN2000-95KTL-INH0, SUN2000-95KTL-INH1, SUN2000-100KTL-H0, SUN2000-100KTL-H1, SUN2000-100KTL-H2, and SUN2000-105KTL-H1 (SUN2000 for short) in terms of their 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) power plant personnel and qualified electrical technicians.

Symbol Conventions

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

Symbol	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

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Symbol	Description
NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, or environment deterioration.

Change History

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

Issue 04 (2018-10-23)

Updated 2.2 Product Introduction.

Updated 10 Technical Data.

Issue 03 (2018-07-23)

Added description about the SUN2000-90KTL-H2, SUN2000-95KTL-INH1, SUN2000-100KTL-H2, and SUN2000-105KTL-H1 models.

Issue 02 (2018-06-23)

Updated 10 Technical Data.

Issue 01 (2018-05-17)

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

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Contents

About This Document ii

1 Safety Precautions 1

2 Overview 4

2.1 Models 4
2.2 Product Introduction 7
2.3 Product Appearance 9
2.3.1 Appearance 9
2.3.2 Indicator Status 14
2.3.3 Label Description 15
2.4 Working Principles 16
2.4.1 Circuit Diagram 16
2.4.2 Working Modes 17

3 Storage 19

4 Installation 21

4.1 Checking Before Installation 21
4.2 Tool Preparation 22
4.3 Determining the Installation Position 23
4.4 Installing the Mounting Bracket 28
4.4.1 Support-Mounted Installation 28
4.4.2 Wall-Mounted Installation 29
4.5 Installing the SUN2000 30

5 Electrical Connections 35

5.1 Precautions 35
5.2 Preparing Cables 35
5.2.1 PLC Communication 36
5.2.2 RS485 Communication 39
5.3 Installing the PE Cable 44
5.4 Opening the Maintenance Compartment Door 45
5.5 Installing the AC Output Power Cable (Using the OT/DT Terminal) 46
5.6 Installing the AC Output Power Cable (Using the Terminal Clamp) 50
5.7 Installing the DC Input Power Cable 53

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5.8 Connecting the RS485 Communications Cable 56
5.9 (Optional) Installing the Power Cable of the Tracking System 59
5.10 Closing the Maintenance Compartment Door 60
6 Commissioning 62
6.1 Checking Before Power-On 62
6.2 Powering On the SUN2000 62
7 Man-Machine Interactions 64
7.1 Operations with the SUN2000 App 64
7.1.1 App Introduction 64
7.1.2 Downloading and Installing the App 68
7.1.3 Logging In to the App 68
7.1.4 Operations Related to the Common User 71
7.1.4.1 Setting User Parameters 71
7.1.4.2 Starting and Shutting Down the SUN2000 72
7.1.5 Operations Related to the Advanced User 73
7.1.5.1 Parameter Settings 73
7.1.5.1.1 Setting Grid Parameters 73
7.1.5.1.2 Setting Protection Parameters 73
7.1.5.1.3 Setting Feature Parameters 74
7.1.5.1.4 Setting User Parameters 78
7.1.5.1.5 Setting Communications Parameters 79
7.1.5.1.6 Setting the Support System 81
7.1.5.1.7 Setting a File Save Path 82
7.1.5.2 System Maintenance 82
7.1.5.2.1 Starting and Shutting Down the SUN2000 82
7.1.5.2.2 Restoring Factory Settings 82
7.1.5.2.3 Resetting the SUN2000 83
7.1.5.2.4 Resetting Alarms 83
7.1.5.2.5 Clearing Historical Energy Yield Data 83
7.1.5.2.6 Managing the License 84
7.1.5.2.7 Device inspection 84
7.1.5.3 SUN2000 Upgrade 85
7.1.5.4 Device Logs 86
7.1.6 Operations Related to the Special User 87
7.1.6.1 Parameter Settings 87
7.1.6.1.1 Setting Grid Parameters 87
7.1.6.1.2 Setting Protection Parameters 89
7.1.6.1.3 Setting Feature Parameters 91
7.1.6.1.4 Setting Power Adjustment Parameters 93
7.1.6.1.5 Setting Reactive Power Control 96
7.1.6.1.6 Setting User Parameters 97

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7.1.6.1.7 Setting a File Save Path 97
7.1.6.2 System Maintenance 97
7.1.6.2.1 Starting and Shutting Down the SUN2000 97
7.1.6.2.2 Restoring Factory Settings 98
7.1.6.3 SUN2000 Upgrade 98
7.1.6.4 Device Logs 99
7.1.7 Querying the Status 100
7.1.7.1 Querying Alarm Records 100
7.1.7.2 Querying SUN2000 Running Information 101
7.1.7.3 Querying Energy Yield Data 101
7.1.7.4 Viewing System Version Information 101
7.1.8 Tool Kit 101
7.1.8.1 Scanning SN Bar Codes 101
7.1.8.2 SUN2000 Maintenance Script 101
7.1.8.3 File Manager 101
7.1.8.4 About 101
7.2 Operations with a USB Flash Drive 101
7.2.1 Exporting Configurations 101
7.2.2 Importing Configurations 101
7.2.3 Exporting Data 101
7.2.4 Upgrading 101

8 Maintenance 102

8.1 Powering Off the SUN2000 102
8.2 Routine Maintenance 102
8.3 Troubleshooting 103

9 Handling the Inverter 110

9.1 Removing the SUN2000 110
9.2 Packing the SUN2000 110
9.3 Disposing of the SUN2000 110

10 Technical Data 111

10.1 SUN2000-(90KTL, 95KTL) Series Technical Data 111
10.2 SUN2000-(100KTL, 105KTL) Series Technical Data 114

A Grid Codes 118

B Acronyms and Abbreviations 125

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1 Safety Precautions

General Safety

NOTICE

- Before performing operations, read through this manual and follow all the precautions to prevent accidents. The "DANGER", "WARNING", "CAUTION", and "NOTICE" marks in this document do not represent all the safety instructions. They are only supplements to the safety instructions.
- The personnel responsible for installing, connecting cables for, commissioning, maintaining, and troubleshooting Huawei products should be qualified and trained to master the correct operation methods and the knowledge of safety precautions.

When operating Huawei equipment, in addition to following the general precautions in this document, follow the specific safety instructions given by Huawei. The safety precautions provided in this document do not cover all the safety precautions. Huawei shall not be liable for any consequence caused by the violation of the safety operation regulations and design, production, and usage standards.

Disclaimer

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

- Transportation damage
- Violation of the storage requirements specified in this document
- Incorrect storage, installation, or use
- Installation or use by unqualified personnel
- Failure to obey the operation instructions and safety precautions in this document
- Operation in extreme environments which are not covered in this document
- Operation beyond specified ranges
- Unauthorized modifications to the product or software code or removal of the product
- Device damage due to force majeure (such as lightning, earthquake, fire, and storm)
- The warranty expires and the warranty service is not extended.
- Installation or use in environments which are not specified in related international standards

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Personnel Requirements

Only certified electricians are allowed to install, connect cables for, commission, maintain, troubleshoot, and replace the SUN2000. Operation personnel must meet the following requirements:

- Receive professional training.
- Read through this document and follow all the precautions.
- Be familiar with the safety specifications about the electrical system.
- Understand the components and functioning of a grid-tied PV system, and be familiar with relevant local standards.
- Wear proper personal protective equipment (PPE) during any operation on the SUN2000.

Protect Labels

- Do not scrawl, damage, or block the labels on the SUN2000 enclosure.
- Do not scrawl, damage, or block the nameplate on the side of the SUN2000 enclosure.

Installation

DANGER

Never work under power during installation.

- Ensure that the SUN2000 is not connected to a power supply or powered on before finishing installation.
- Ensure that the SUN2000 is installed in a well-ventilated environment.
- Ensure that the SUN2000 heat sinks are free from blockage.
- Never open the host panel cover of the SUN2000.
- Never remove the terminals and cable glands at the bottom of the SUN2000.

Electrical Connections

DANGER

Before connecting cables to the SUN2000, ensure that the SUN2000 is secured in position and not damaged in any way. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.
- Obtain approval from the local electric utility before using the SUN2000 to generate electricity in grid-tied mode.
- Ensure that the cables used in a grid-tied PV system are properly connected and insulated and meet all specification requirements.

Operation

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DANGER

High voltage may cause an electric shock, which results in serious injury, death or serious property damage from the SUN2000 in operation. Strictly comply with the safety precautions in this document and associated documents to operate the SUN2000.

- Do not touch an energized SUN2000 because the heat sink has a high temperature.
- Follow local laws and regulations when operating the SUN2000.

Maintenance and Replacement

DANGER

High voltage may cause an electric shock, which results in serious injury, death or serious property damage from the SUN2000 in operation. Prior to maintenance, power off the SUN2000 and strictly comply with the safety precautions in this document and associated documents to operate the SUN2000.

- Maintain the SUN2000 with sufficient knowledge of this document, proper tools, and testing equipment.
- Before performing maintenance tasks, power off the SUN2000 and wait at least 15 minutes.
- Temporary warning labels or fences must be placed to prevent unauthorized people entering the site.
- Rectify any faults that may compromise the SUN2000 security performance before powering on the SUN2000 again.
- Observe electrostatic discharge (ESD) precautions during maintenance.

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2 Overview

2.1 Models

Model Number Description

This document involves the following product models:

- SUN2000-90KTL-H0
- SUN2000-90KTL-H1
- SUN2000-90KTL-H2
- SUN2000-95KTL-INH0
- SUN2000-95KTL-INH1
- SUN2000-100KTL-H0
- SUN2000-100KTL-H1
- SUN2000-100KTL-H2
- SUN2000-105KTL-H1

NOTE

The products look alike. The SUN2000-95KTL-INH0 is used as an example.

Figure 2-1 Model number

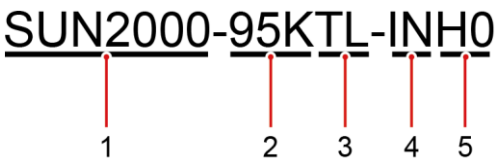

Table 2-1 Model number description

No.	Meaning	Description
1	Product	SUN2000: grid-tied PV inverter

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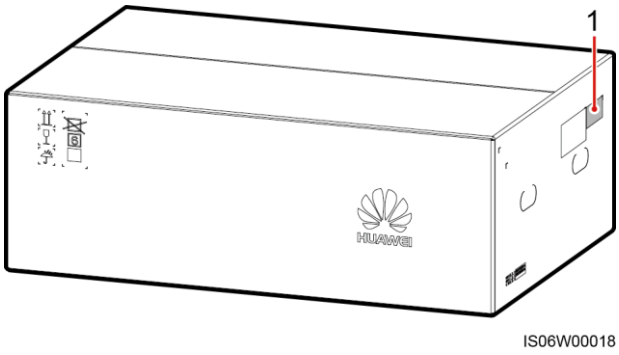
No.	Meaning	Description
2	Power	• 90K: The power level is 90 kW. • 95K: The power level is 95 kW. • 100K: The power level is 100 kW. • 105K: The power level is 105 kW.
3	Topology	TL: transformerless
4	Region	IN: India
5	Design code	H0/H1/H2: product series with the 1500 V DC input voltage

Model Identification

You can query the SUN2000 number by the model label on the external package and the nameplate on the side of the enclosure.

Figure 2-2 Label position on the external package



(1) Position of the model label

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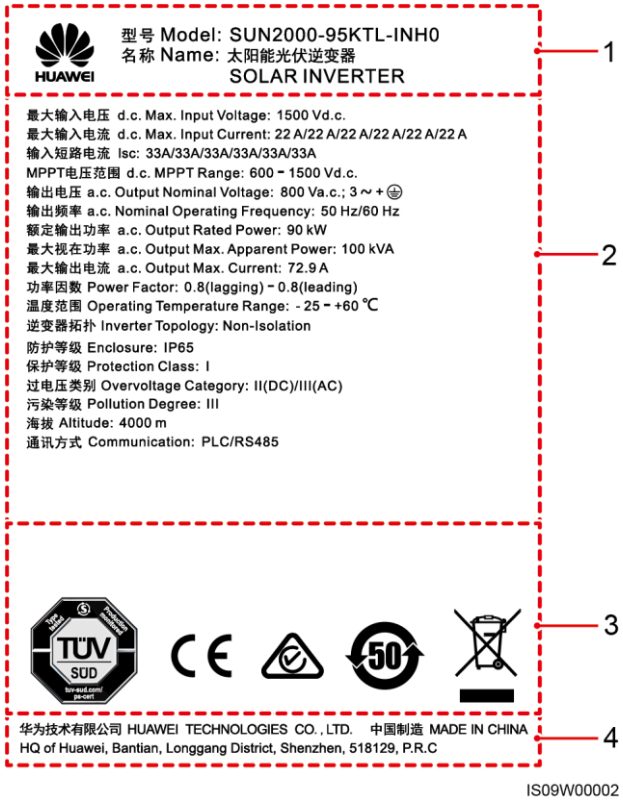
Figure 2-3 Nameplate



(1) Trademark and product model (2) Important technical specifications

(3) Compliance symbols (4) Company name and country of manufacture

NOTE

The nameplate figure is for reference only.

Table 2-2 Compliance symbols

Symbol	Name	Meaning
	German Technical Inspection Association (TÜV SÜD) certification mark	This product complies with TÜV SÜD certification standards.
	Conformité Européenne (CE) certification mark	This product complies with CE certification standards.
	Australia RCM certification mark	This product complies with Australia RCM certification standards.

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

2.2 Product Introduction

Function

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

Features

Intelligent

- Six independent maximum power point tracking (MPPT) circuits and 12 PV string inputs: Supports the flexible configuration of 2+2+2+2+2+2 strings.
- 12 routes of high-precision smart PV string monitoring: Help identify and rectify exceptions timely.
- Power line communication (PLC) networking: Uses the existing power line for communication and does not require an additional communications cable, which reduces the construction and maintenance costs and improves communication reliability and efficiency.
- Smart I-V curve diagnosis: Implements I-V scanning and health diagnosis for PV strings. In this way, potential risks and faults can be detected in time, improving the plant operation & maintenance (O&M) quality.

Safe

- Embedded DC and AC SPDs: all-dimensional surge protection
- Embedded residual current monitoring unit: Immediately disconnects from the power grid upon detecting that the residual current exceeds the threshold.

Reliable

- Natural cooling
- Free fuse design
- Protected to IP65.
- Effective design against ground subsidence: The AC terminal block can be pulled down by up to 50 mm due to the pulling force.

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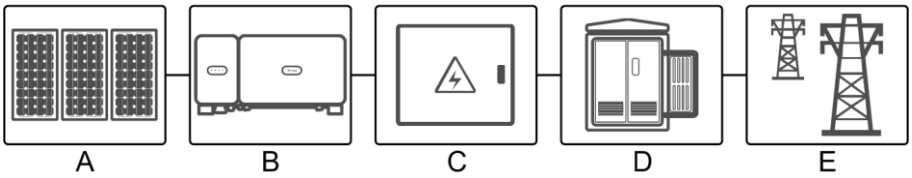
Network Application

The SUN2000 applies to distributed grid-tied commercial PV systems and large-scale grid-tied PV plants. Typically, a grid-tied PV system consists of the PV string, SUN2000, AC combiner box, and step-up transformer.

Figure 2-4 Network application



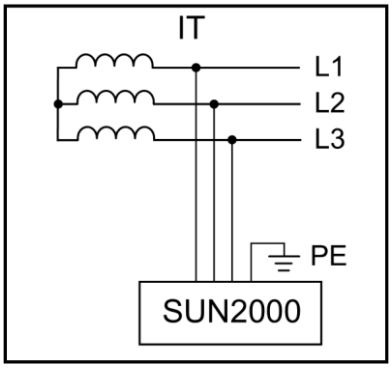
(A) PV string (B) SUN2000 (C) AC combiner box

(D) Step-up transformer (E) Power grid

Supported Power Grid

The SUN2000 supports the IT power grid.

Figure 2-5 Supported power grid



NOTE

The SUN2000 can also apply to the AC power system with the neutral point grounding of the step-up transformer. The SUN2000 itself does not connect to any neutral wire.

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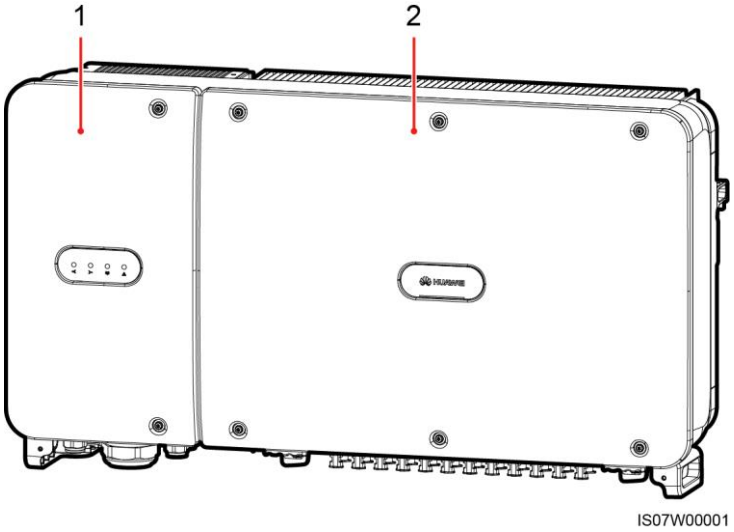
2.3 Product Appearance

2.3.1 Appearance

Front View

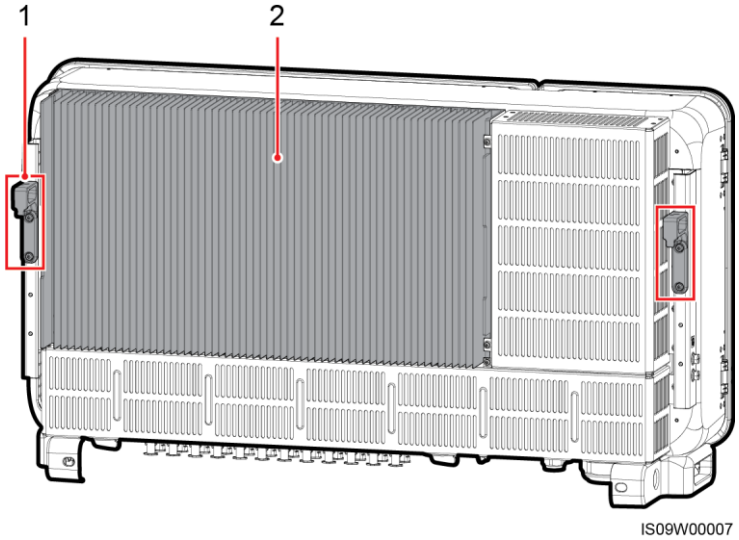
Figure 2-6 Front view



(1) Maintenance compartment door (2) Host panel

Rear View

Figure 2-7 Rear view



(1) Mounting plate (2) Heat sink

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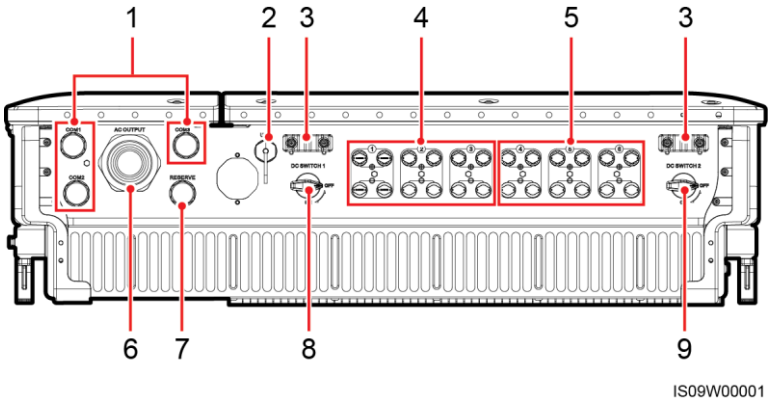
Bottom View

Figure 2-8 Bottom view



No.	Component	Silk Screen	Description
1	Cable glands	COM1, COM2, COM3	Inner diameter: 14–18 mm
2	USB port	USB	Use the USB port only during maintenance (such as power-on setting, upgrade, and data export). Ensure that the USB cover is tightened when maintenance is not performed.
3	Handler	N/A	N/A
4	DC input terminals	+/–	Controlled by DC SWITCH 1
5	DC input terminals	+/–	Controlled by DC SWITCH 2
6	Cable gland	AC OUTPUT	Inner diameter: 24–57 mm
7	Cable gland	RESERVE	Inner diameter: 14–18 mm
8	DC switch 1	DC SWITCH 1	N/A
9	DC switch 2	DC SWITCH 2	N/A

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Dimensions

Figure 2-9 Dimensions

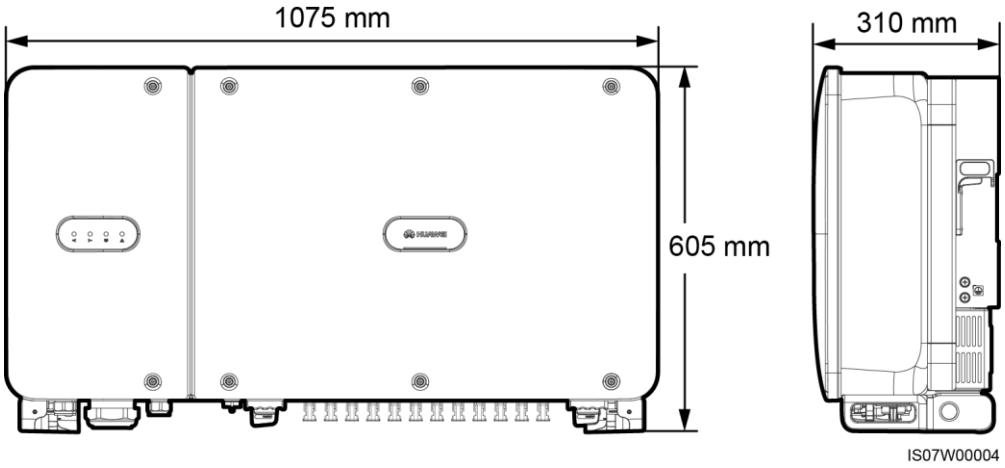


Figure 2-10 Mounting bracket dimensions

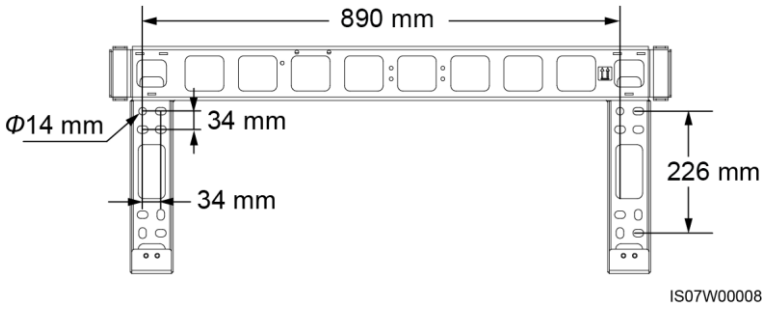
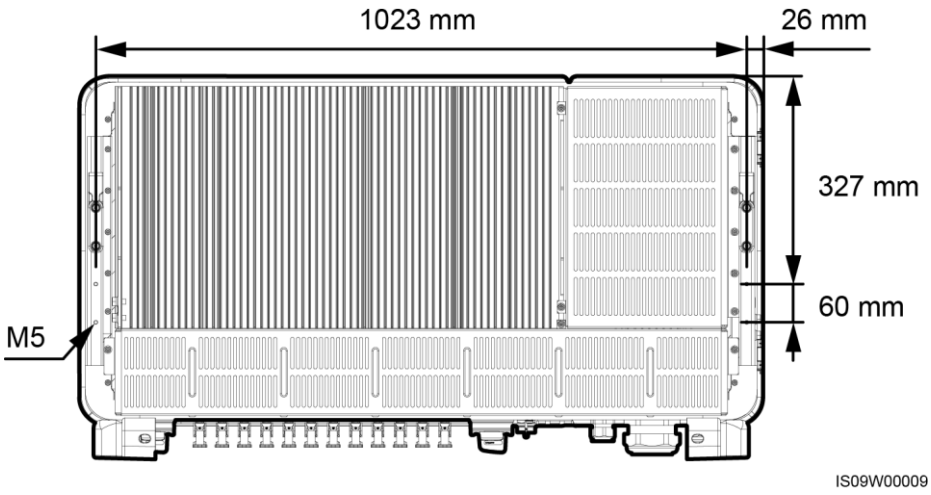


Figure 2-11 Dimensions of reserved holes on the rear



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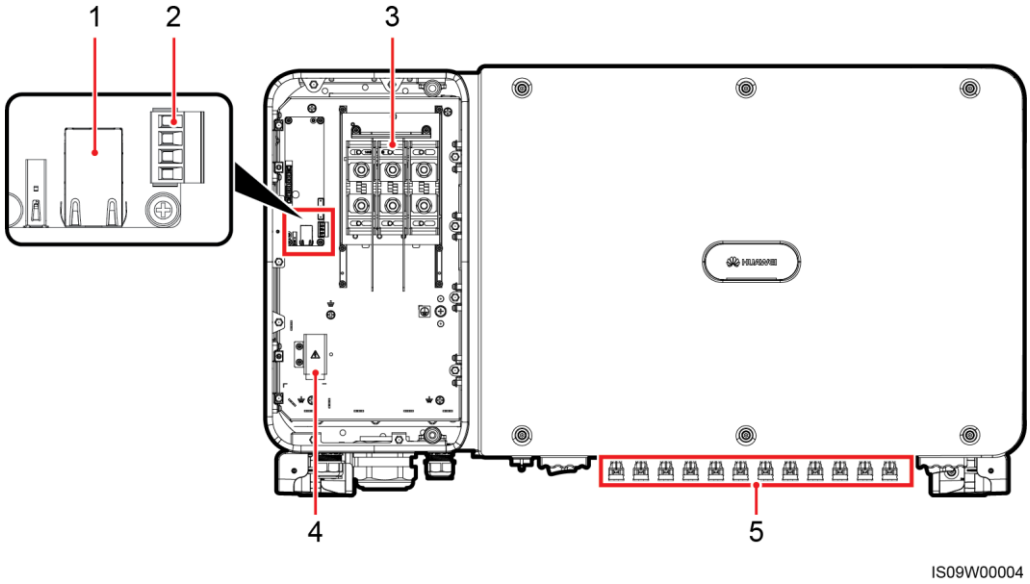
NOTE

Four M5 screw holes are reserved on the rear of the SUN2000 for installing an awning.

Wiring Area

Figure 2-12 Wiring ports (SUN2000-90KTL-H0, SUN2000-90KTL-H1, SUN2000-90KTL-H2, SUN2000-95KTL-INH0, SUN2000-95KTL-INH1, SUN2000-105KTL-H1 and SUN2000-100KTL-H1 with the OT/DT terminal)



(1) RS485 port (RJ45 network port)

(2) RS485 port (terminal block)

(3) AC terminal block (OT/DT terminal)

(4) Power port for the tracking system

(5) DC input terminal

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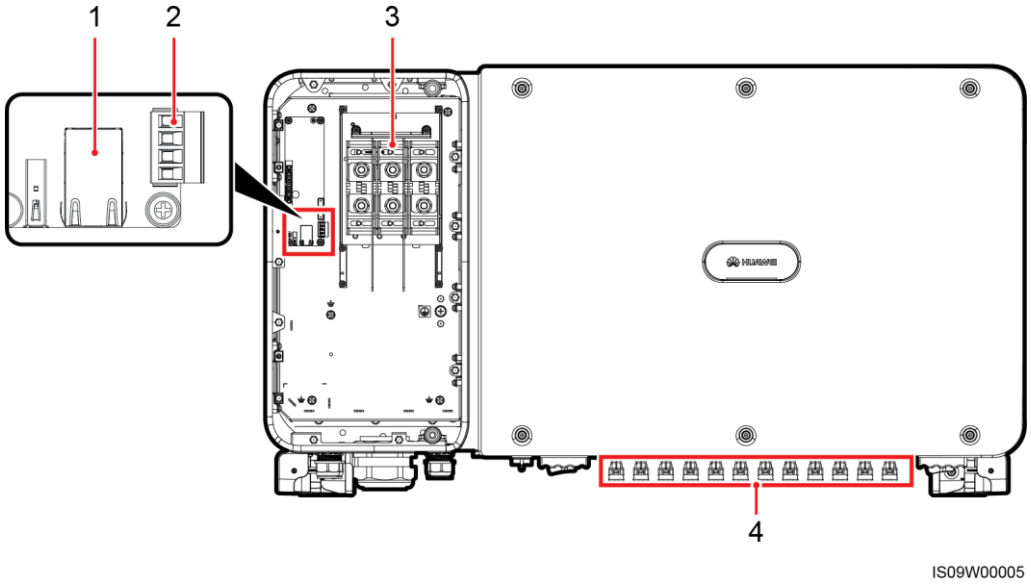
Figure 2-13 Wiring ports (SUN2000-100KTL-H0 and SUN2000-100KTL-H2)



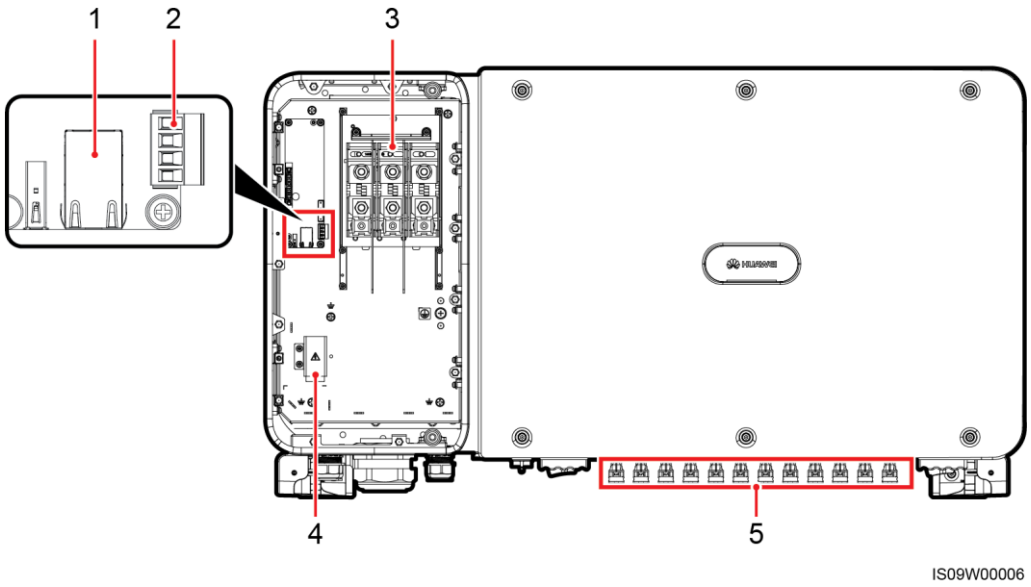
(1) RS485 port (RJ45 network port)

(2) RS485 port (terminal block)

(3) AC terminal block (OT/DT terminal)

(4) DC input terminal

Figure 2-14 Wiring ports (SUN2000-100KTL-H1 with the terminal clamp)



(1) RS485 port (RJ45 network port)

(2) RS485 port (terminal block)

(3) AC terminal block (terminal clamp)

(4) Power port for the tracking system

(5) DC input terminal

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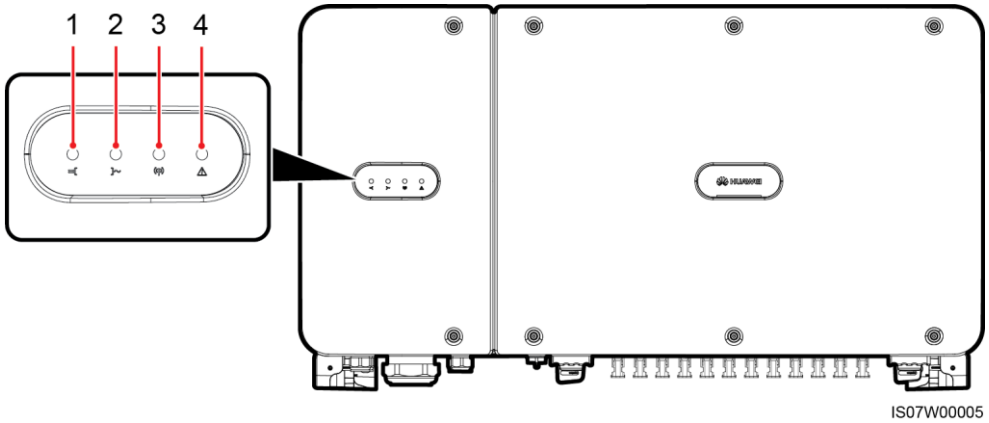
2.3.2 Indicator Status

Figure 2-15 Indicators



No.	Indicator	Status		Meaning
1	PV connection indicator	Steady green		At least one PV string is properly connected, and the DC input voltage of the corresponding MPPT circuit is higher than or equal to 600 V.
		Off		The SUN2000 disconnects from all PV strings, or the DC input voltage of each MPPT circuit is less than 600 V.
2	Grid-tied indicator	Steady green		The SUN2000 is in grid-tied mode.
		Off		The SUN2000 is not in grid-tied mode.
3	Communication indicator	Blinking green		The SUN2000 is receiving data over RS485 or PLC.
		Off		The SUN2000 has not received data over RS485 or PLC for 10 seconds.
4	Alarm/Maintenance indicator	Alarm state	Blinking red at long intervals (on for 1s and then off for 4s)	A warning alarm is generated.
			Blinking red at short intervals (on for 0.5s and then off for 0.5s)	A minor alarm is generated.

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No.	Indicator	Status		Meaning
			Steady red	A major alarm is generated.
		Local maintenance state	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 succeeds.

NOTE

- Local maintenance refers to operations performed after a universal serial bus (USB) flash drive, Bluetooth module, or USB data cable is inserted into the USB port of the SUN2000. For example, local maintenance includes data import and export using a USB flash drive, and connecting to the SUN2000 app over a Bluetooth module or USB data cable.
- If the alarming and the local maintenance happen concurrently, the alarm/maintenance indicator shows the local maintenance state first. After the USB flash drive, Bluetooth module, or USB data cable is removed, the indicator shows the alarm state.

2.3.3 Label Description

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, as the shell becomes hot during operation.
	Delayed discharge	• High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. • Residual voltage exists after the SUN2000 is powered off. It takes 15 minutes for the SUN2000 to discharge to the safe voltage.

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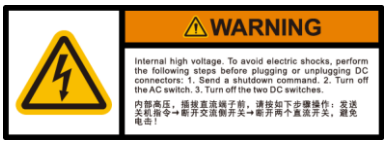
Label	Name	Meaning
	Refer to documentation	Reminds operators to refer to the documents shipped with the SUN2000.
	Grounding	Indicates the position for connecting the protective earthing (PE) cable.
	Operation warning	Do not remove the DC input connector when the SUN2000 is running.
	High voltage warning	High voltage exists after the SUN2000 is powered on. Read this document carefully before operating the SUN2000.
	DC terminal operation warning	High voltage exists after the SUN2000 is powered on. To avoid electric shocks, perform the following system power-off operations before plugging or unplugging DC input connectors of the SUN2000: 1. Send a shutdown command. 2. Turn off the downstream AC switch. 3. Turn off the two DC switches at the bottom.
	SUN2000 SN label	Indicates the SUN2000 serial number.
	Weight label	The SUN2000 needs to be carried by four persons or using a pallet truck.

2.4 Working Principles

2.4.1 Circuit Diagram

The SUN2000 receives inputs from 12 PV strings. The inputs are grouped into 6 MPPT circuits inside the SUN2000 to track the maximum power point of the PV strings. The DC

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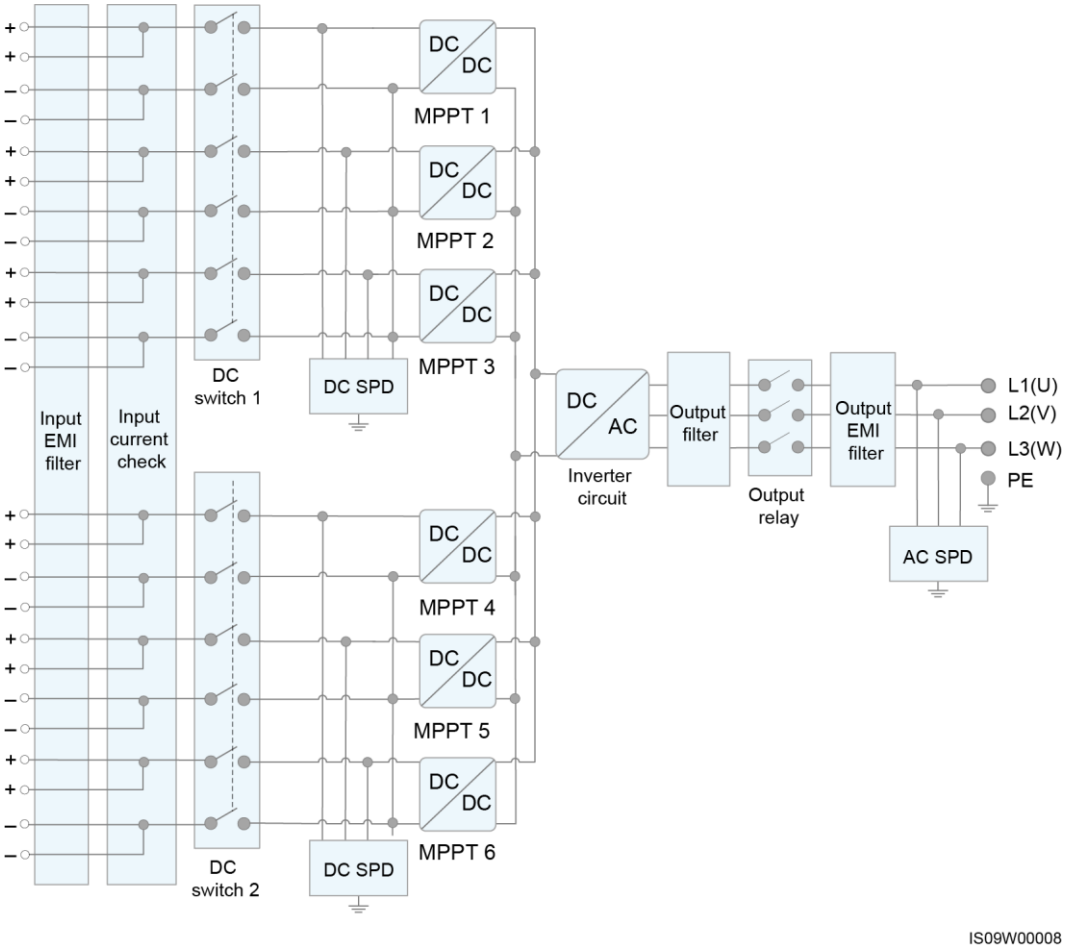
power is then converted into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

Figure 2-16 Conceptual diagram



2.4.2 Working Modes

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

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Figure 2-17 Working modes

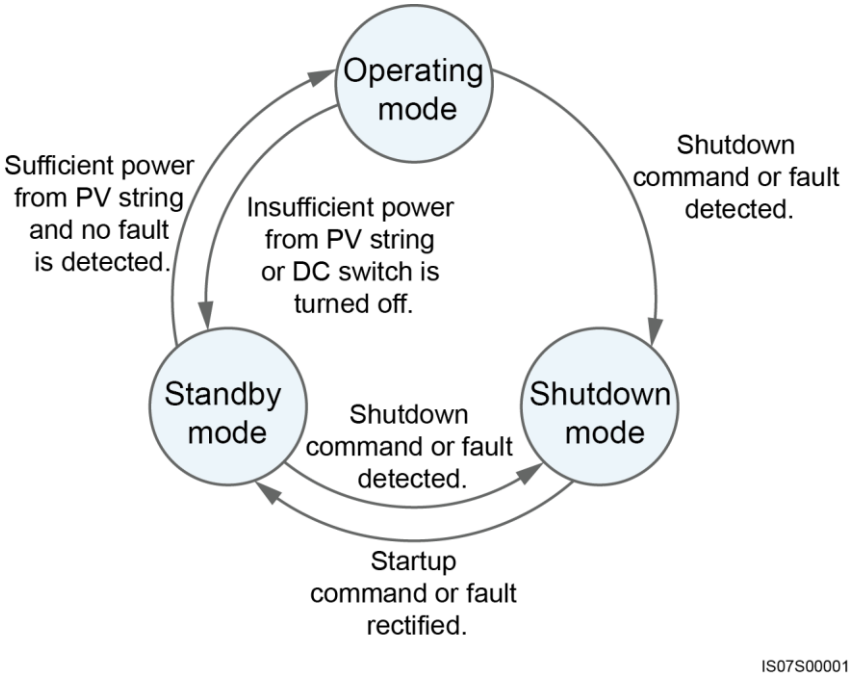

Table 2-3 Working mode description

Working Mode	Description
Standby	The SUN2000 enters Standby mode when the external environment does not meet the operating requirements. In Standby mode: • The SUN2000 continuously performs status check and enters the Operating mode once the operating requirements are met. • The SUN2000 enters Shutdown mode after detecting a shutdown command or a fault after startup.
Operating	In Operating mode: • The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid. • The SUN2000 tracks the maximum power point to maximize the PV string output. • If the SUN2000 detects a fault or a shutdown command, it enters the Shutdown mode. • 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.
Shutdown	• In Standby or Operating mode, the SUN2000 enters Shutdown mode after detecting a fault or shutdown command. • In Shutdown mode, the SUN2000 enters Standby mode after detecting a startup command or that the fault is rectified.

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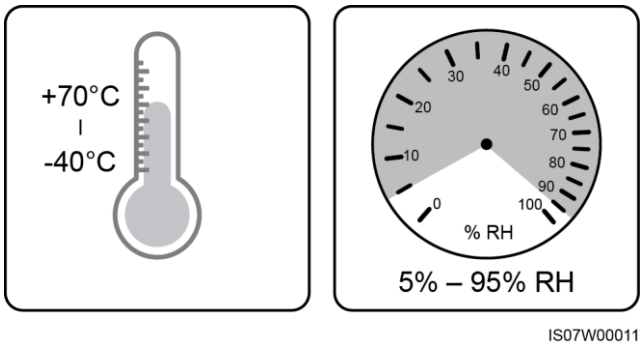
3 Storage

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

- Do not unpack the SUN2000 and check it periodically. Replace the packing materials if necessary. If the SUN2000 is unpacked but not put into use immediately, put it inside the original package with the dessicant bag, and seal it using tape.
- The ambient temperature and humidity are suitable for the storage.

Figure 3-1 Storage temperature and humidity



- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- To avoid personal injury or device damage, stack SUN2000s with caution to prevent them from falling over.

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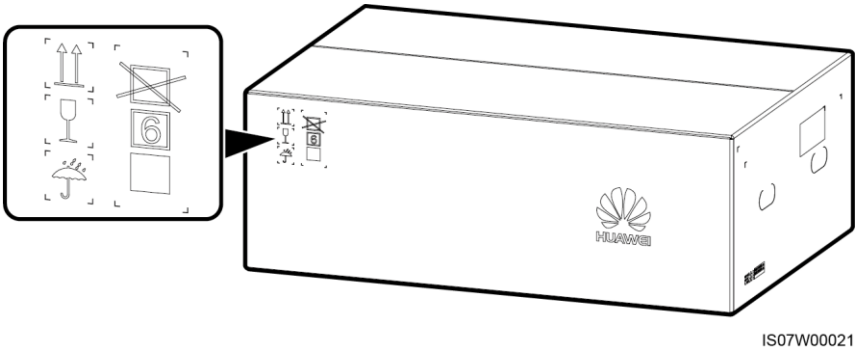
Figure 3-2 Maximum number of pile-up layers allowed



- If the SUN2000 has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

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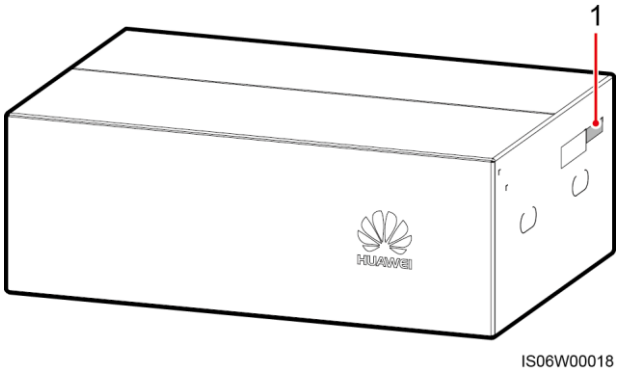
4 Installation

4.1 Checking Before Installation

Outer Packing Materials

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

Figure 4-1 Position of the inverter model label



(1) Position of the model label

NOTE

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

Package Contents

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

NOTE

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

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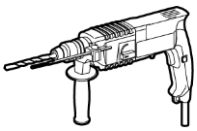
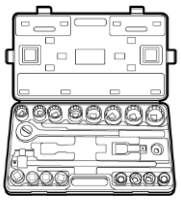
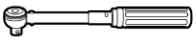
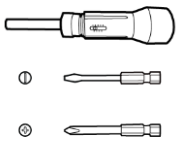
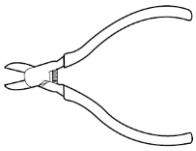
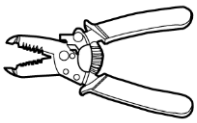
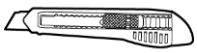
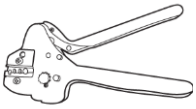
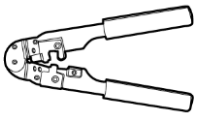
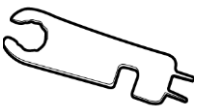
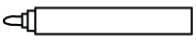
4.2 Tool Preparation

Category	Tool			
Installation	 Hammer drill (with Φ14 mm and Φ16 mm drill bits)	 Socket wrench set	 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: UTXTC0002; manufacturer: Amphenol)	 RJ45 crimping tool
	 Removal wrench (model: UTXTWA001; manufacturer: Amphenol)	Vacuum cleaner	Multimeter (DC voltage measurement range ≥ 1500 V DC)	 Marker

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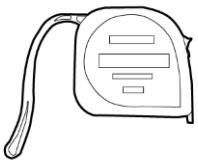
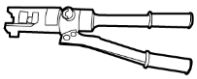
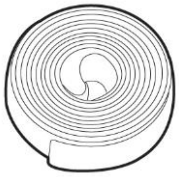
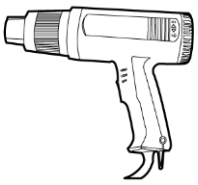
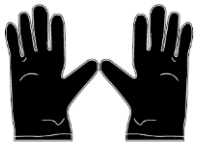
Category	Tool			
	 Measuring tape	Bubble or digital level	 Hydraulic pliers	 Heat shrink tubing
	 Heat gun	Cable tie	N/A	N/A
PPE	 Safety gloves	Safety goggles	Anti-dust respirator	Safety shoes

4.3 Determining the Installation Position

Installation Environment Requirements

- The SUN2000 can be installed indoors or outdoors.
- Do not install the SUN2000 near flammable or explosive materials.
- Do not install the SUN2000 where its enclosure and heat sinks are easily accessible, because the voltage is high and these parts are hot during operation.
- Install the SUN2000 in a well-ventilated environment to dissipate heat.
- When installed under direct sunlight, the power may be derated due to the temperature rise. You are advised to install it in a sheltered place or install an awning over it.

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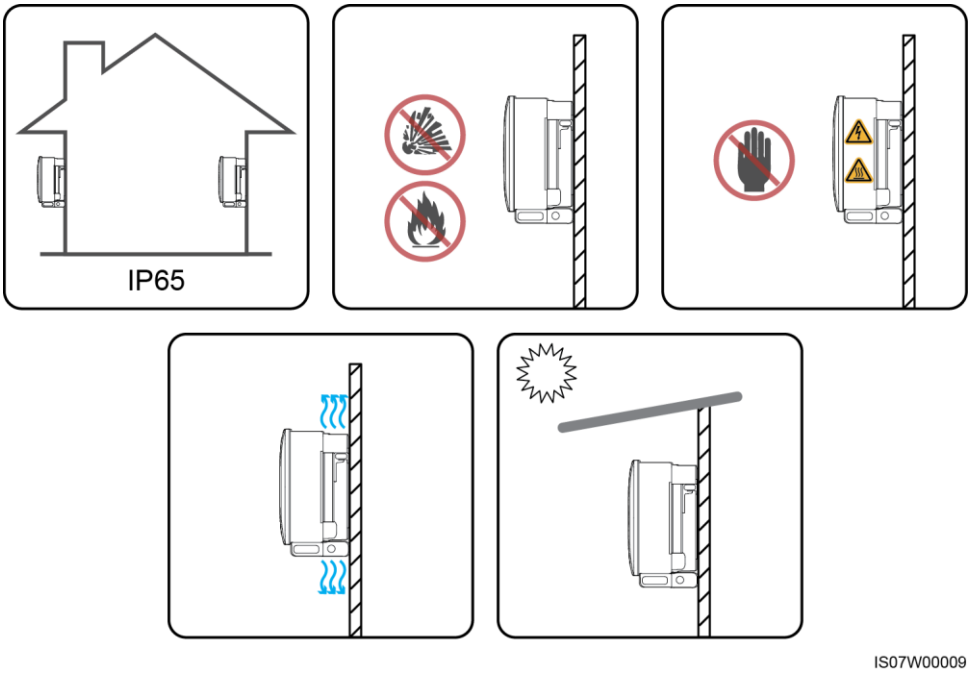
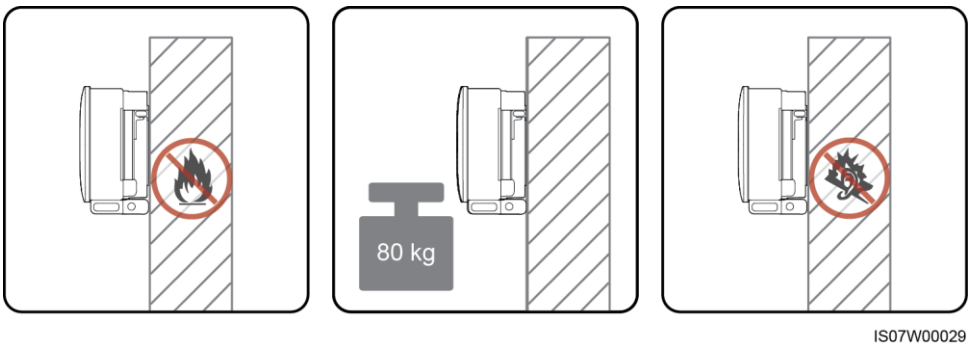
Figure 4-2 Installation environment



Mounting Structure Requirements

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

Figure 4-3 Mounting structure



Installation Angle Requirements

The SUN2000 can be support-mounted or wall-mounted. The installation angle requirements are as follows:

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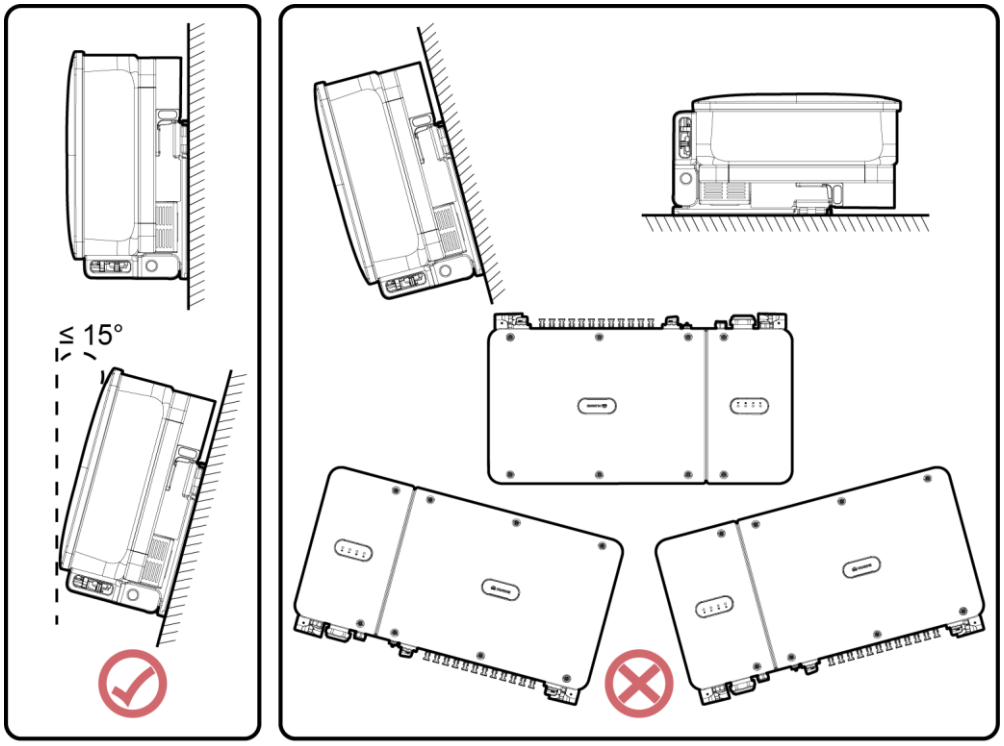
- Install the SUN2000 vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the SUN2000 at forward tilted, excessive back tilted, side tilted, horizontal, or upside down positions.

Figure 4-4 Installation tilts



Installation Space Requirements

Reserve enough space around the SUN2000 for installation and heat dissipation.

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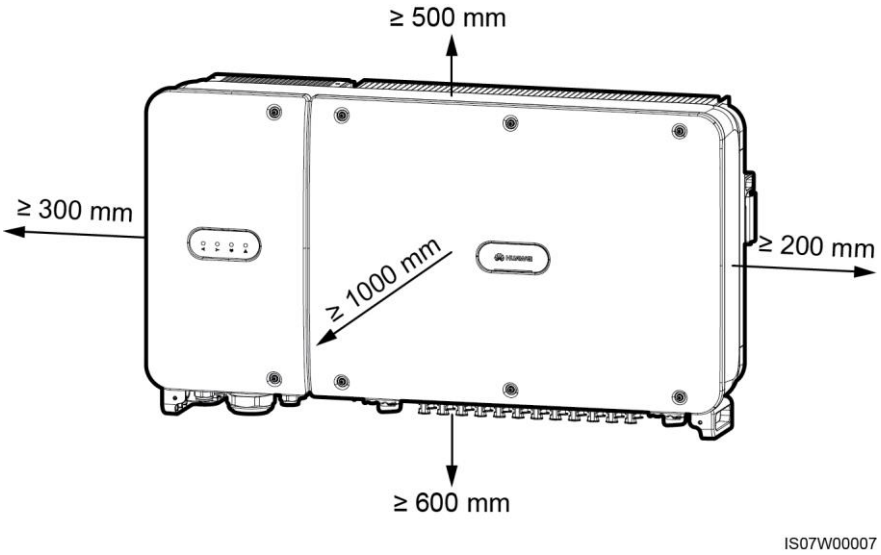
Figure 4-5 Installation space



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 space be from 600 mm to 730 mm. If you have any question about the distance, consult the local technical support engineers.

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

Figure 4-6 Horizontal installation mode (recommended)

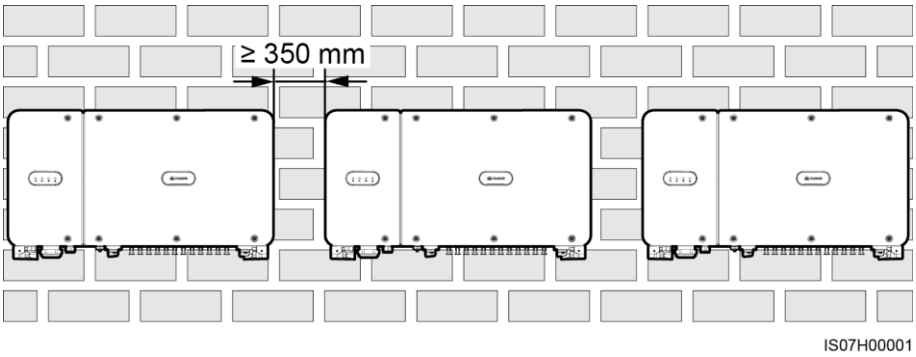


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Figure 4-7 Staggered installation mode (recommended)

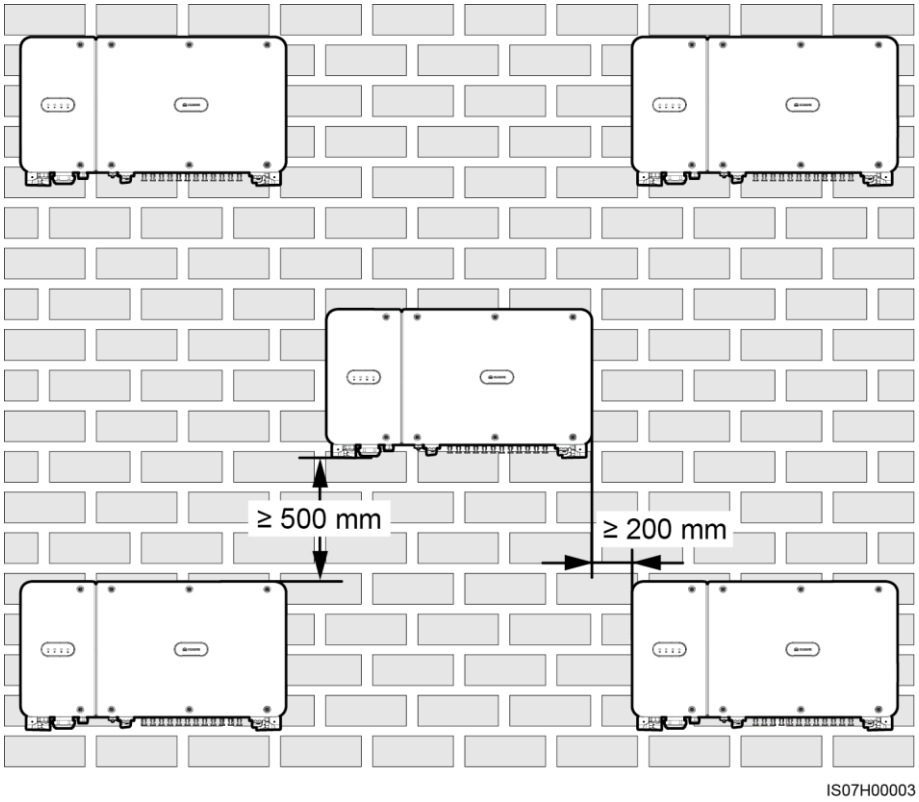
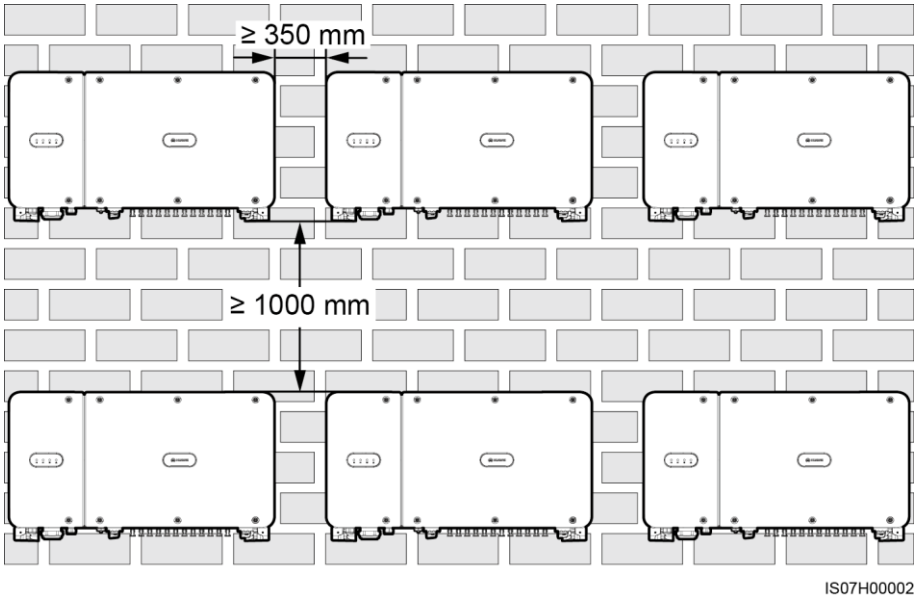


Figure 4-8 Stacked installation mode (not recommended)



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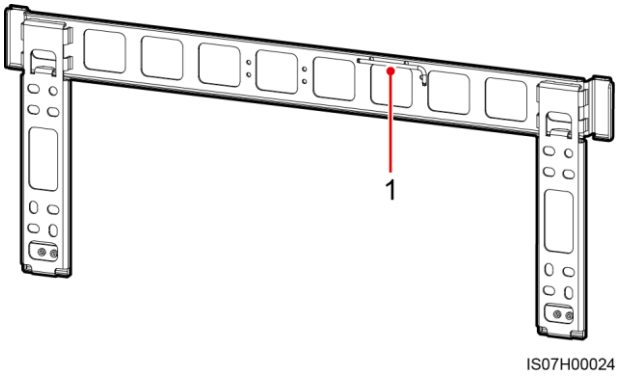
4.4 Installing the Mounting Bracket

Before installing the mounting bracket, remove the security Torx wrench and save it for later use.

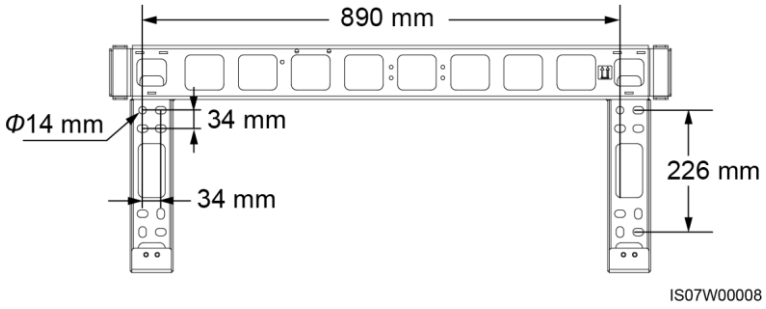
Figure 4-9 Position for binding the security Torx wrench



(1) Position for binding the security Torx wrench

The SUN2000 mounting bracket has four groups of screw holes, each group containing four holes. Mark any one hole in each group based on site requirements and mark four holes in total. The two round holes are recommended.

Figure 4-10 Hole dimensions



4.4.1 Support-Mounted Installation

Prerequisites

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

Procedure

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

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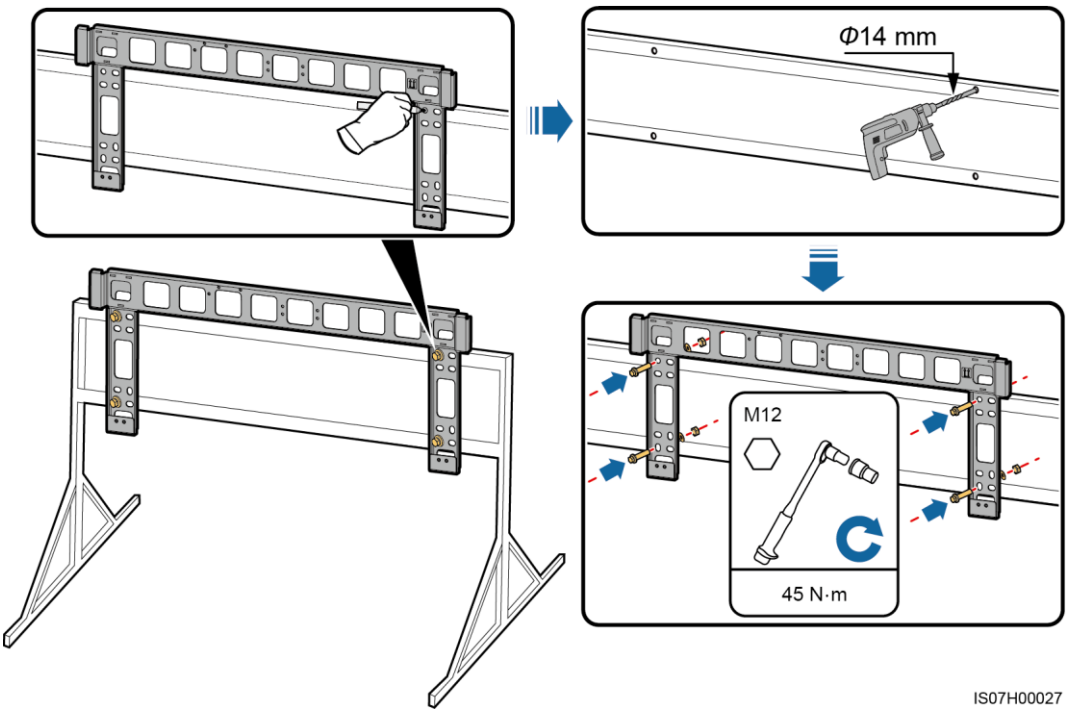
Step 2 Drill holes using a hammer drill. You are advised to apply anti-rust paint on the hole positions for protection.

Step 3 Secure the mounting bracket.

Figure 4-11 Installing the mounting bracket



----End

4.4.2 Wall-Mounted Installation

Prerequisites

You have prepared the expansion bolts. M12x60 stainless expansion bolts are recommended.

Procedure

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

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

WARNING

Avoid drilling holes in the water pipes and power cables buried in the wall.

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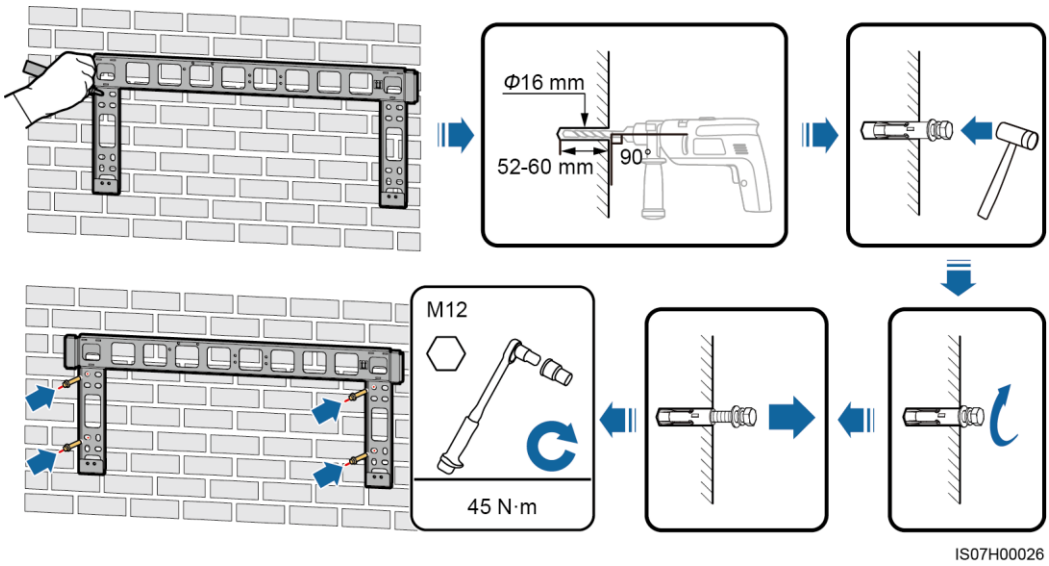
NOTICE

- To prevent dust inhalation or contact with eyes, wear an anti-dust respirator and safety goggles 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 Secure the mounting bracket.

Figure 4-12 Installing the mounting bracket



----End

4.5 Installing the SUN2000

Context

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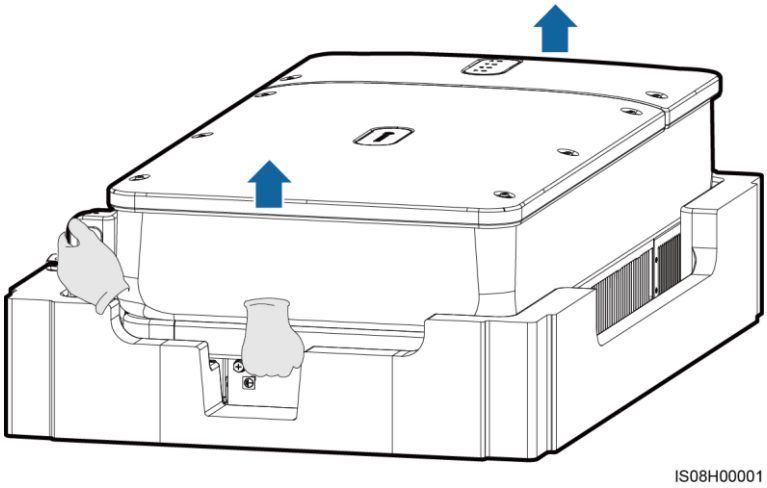
NOTICE

- Handle the SUN2000 with care when moving it to prevent device damage and personal injury.
- It takes multiple persons or a pallet truck to move the SUN2000.
- Do not place the SUN2000 with its wiring terminals at the bottom contacting the floor or any other objects because the terminals are not designed to bear the weight of the SUN2000.
- When you need to temporally place the SUN2000 on the ground, use foam, paper, or other protection material to prevent damage to its cover.

Procedure

Step 1 Lift the SUN2000 from the packing case and move it to the installation position.

Figure 4-13 Taking out the SUN2000



Step 2 Lift the SUN2000 and keep it upright.

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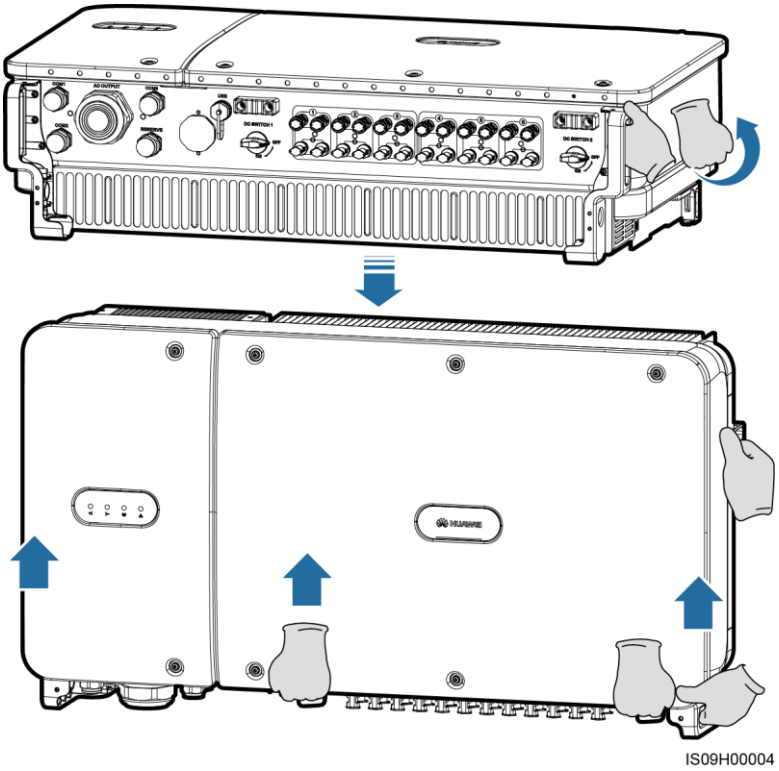
Figure 4-14 Lifting the SUN2000 and keeping it upright



Step 3 If the installation position is too high to install the SUN2000 on the mounting bracket, run a rope that is strong enough to bear the SUN2000 through the two lifting eyes, and hoist the SUN2000.

NOTICE

Hoist the SUN2000 with care to protect it from colliding with the wall or other objects.

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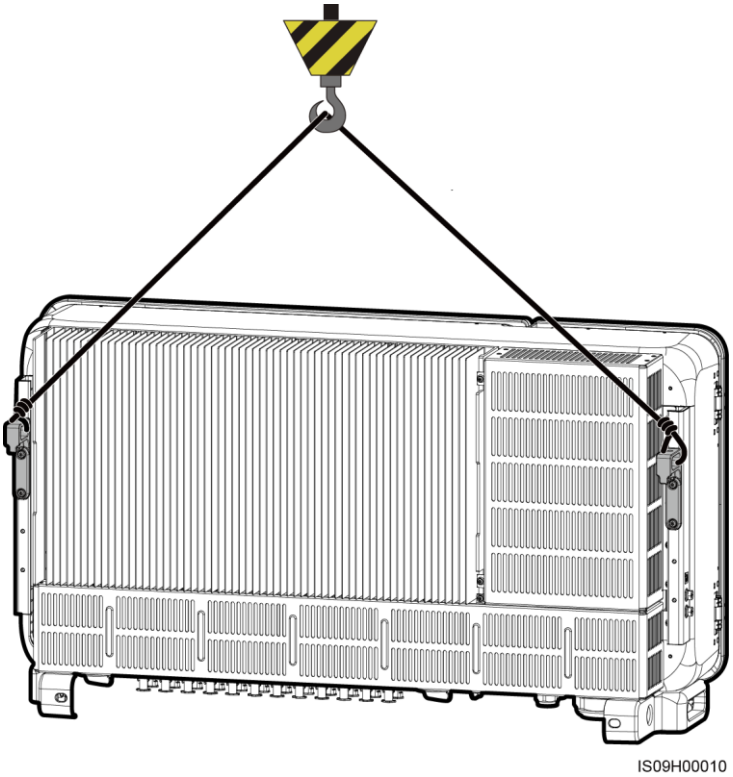
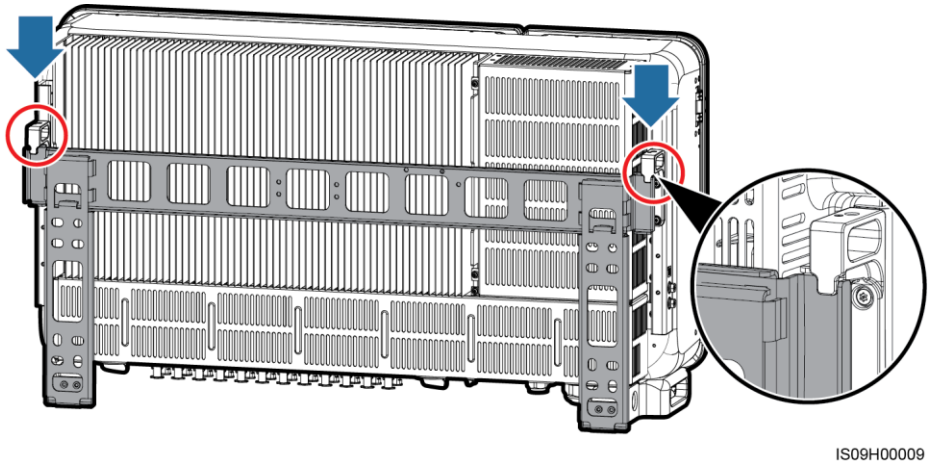
Figure 4-15 Hoisting the SUN2000



Step 4 Install the SUN2000 on the mounting bracket and align the SUN2000 enclosure with the mounting bracket.

Figure 4-16 Mounting the SUN2000



Step 5 Secure the SUN2000.

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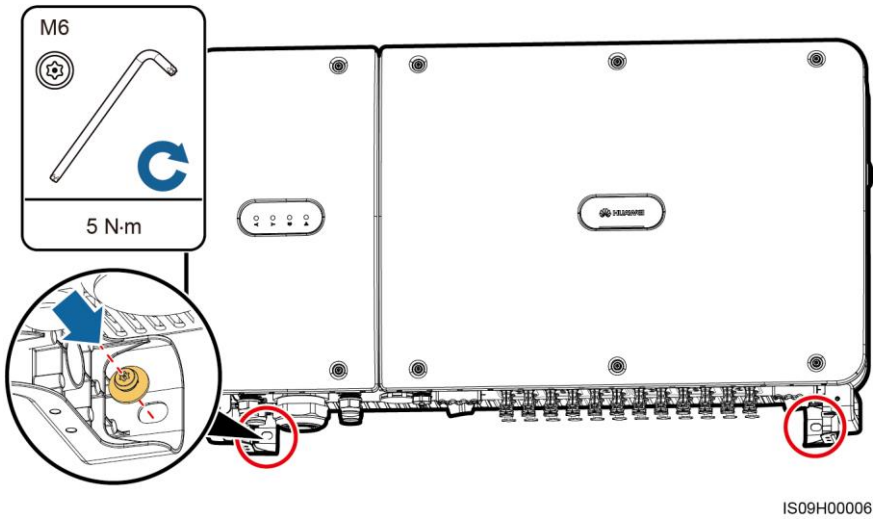
Figure 4-17 Tightening security Torx screws



----End

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5 Electrical Connections

5.1 Precautions

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.

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 contact due to overstress caused by ground subsidence, it is recommended that the cable be bent and reserved and then connected to the appropriate port.

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 Preparing Cables

The SUN2000 supports PLC and RS485 communication modes, but you can choose only one of them.

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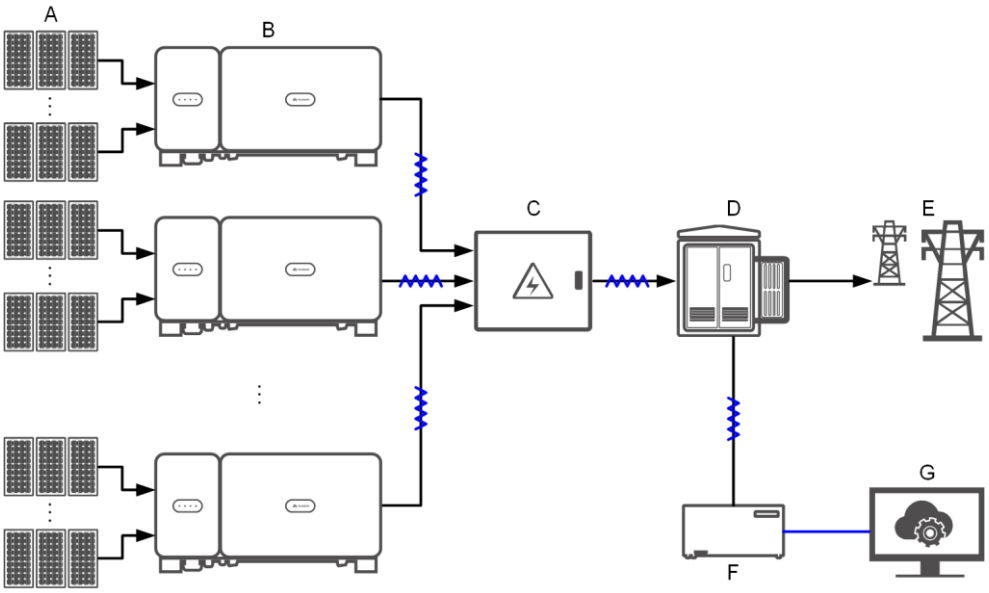
5.2.1 PLC Communication

If PLC is selected, no RS485 communications cable is required to connect to the SUN2000, but the AC power cable needs to connect to a SmartLogger2000 that supports PLC. For detailed operations, see *SmartLogger2000 User Manual*.

NOTICE

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

Figure 5-1 Network Application



NOTE

indicates a power cable; → indicates the power flow direction; indicates a signal cable; indicates the signal flow.

(A) PV string (B) SUN2000 (C) AC combiner box

(D) Step-up transformer (E) Power grid (F) SmartLogger2000

(G) Management system

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Figure 5-2 SUN2000 cable connections (dashed box indicating optional components)

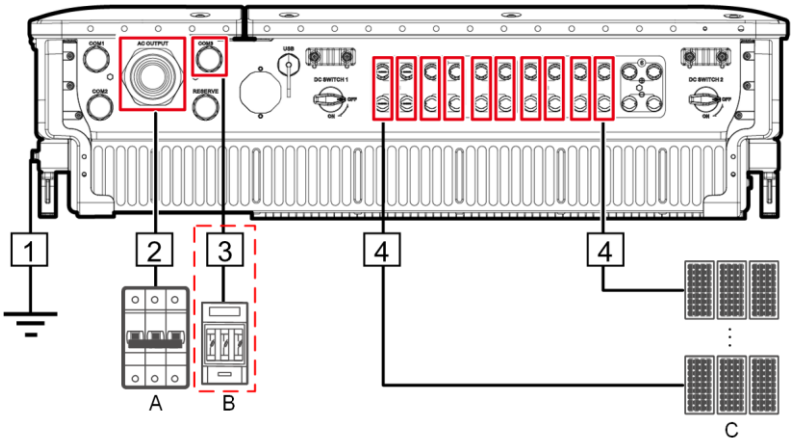

Table 5-1 Component description

No.	Component	Remarks	Source
A	AC switch	• Installed in the AC combiner box • It is recommended that a three-phase AC circuit breaker with a rated voltage greater than or equal to 800 V AC and a rated current of 125 A be configured for the SUN2000-105KTL-H1. • It is recommended that a three-phase AC circuit breaker with a rated voltage greater than or equal to 800 V AC and a rated current of 100 A be configured for other models.	Prepared by the customer
B	Fuse/Circuit breaker	The tracking system should be equipped with an overcurrent protective device/component. The power cable between the device/component and wiring terminal should be no longer than 2.5 m. Therefore, a fuse or circuit breaker is recommended. • Installed between the SUN2000 and tracking control box • Fuse specifications: rated voltage ≥ 800 V; rated current: 6 A; protection: gG • Circuit breaker specifications: rated voltage ≥ 800 V; rated current: 6 A; tripping: C	Prepared by the customer
C	PV string	• A PV string is composed of PV modules connected in series. • The SUN2000 supports the input from 12 PV strings.	Prepared by the customer

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NOTICE

The SUN2000 has an RCMU inside. Its external AC switch should be a three-phase circuit breaker or other AC load circuit breakers to safely disconnect the SUN2000 from the power grid.

Table 5-2 Cable description

No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter	Source
1	PE cable	Single-core outdoor copper cable and M8 OT/DT terminal **NOTICE** Preferred to connect to the PE point on the enclosure. The PE point in the maintenance compartment is used for connecting to the PE cable included in the multi-core AC power cable.	≥ 16 mm². For details, see Table 5-3.	N/A	Prepared by the customer
2	AC output power cable (terminal clamp)	• If you connect a ground cable to the ground point on the chassis shell, you are advised to use a three-core (L1, L2, and L3) outdoor cable. • If you connect a ground cable to the ground point in the maintenance compartment, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable and M8 OT/DT terminals (PE). You do not need to separately prepare a PE cable.	• Copper-core cable – L1, L2, L3: 25–95 mm² – PE: ≥ 16 mm². For details, see Table 5-3. • Aluminum alloy cable or copper-clad aluminum cable: – L1, L2, L3: 35–95mm² – PE: ≥ 16 mm². For details, see Table 5-3.	24–57 mm	Prepared by the customer
	AC output power cable (OT/DT terminal)	• If you connect a ground cable to the ground point on the chassis shell, you are advised to use a three-core (L1, L2, and L3) outdoor cable and M10 OT/DT terminals (L1, L2, and L3). • If you connect a ground cable to the ground point in the maintenance compartment,	• Copper-core cable – L1, L2, L3: 25–95 mm² – PE: ≥ 16 mm². For details, see Table 5-3. • Aluminum alloy cable or	24–57 mm	Prepared by the customer

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No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter	Source
		you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable, M10 OT/DT terminals (L1, L2, and L3), and M8 OT/DT terminals (PE). You do not need to separately prepare a PE cable.	copper-clad aluminum cable: – L1, L2, L3: 35–95mm^2 – PE: ≥ 16 mm^2. For details, see Table 5-3.		
3	Tracking system power cable	Three-core outdoor copper cable with dual-layer protection	6 mm^2	14–18 mm	Prepared by the customer
4	DC input power cable	PV cable that meets the 1500 V standard	4–6 mm^2 (12–10 AWG)	4.5–7.8 mm	Prepared by the customer

Table 5-3 PE cable specifications

Conductor Cross-Sectional Area S of the AC Power Cable (mm^2)	Conductor Cross-Sectional Area S_P of the PE Cable (mm^2)
16 < S ≤ 35	S_P ≥ 16
35 < S	S_P ≥ S/2
The specifications are valid only if the conductors of the PE cable and AC power cable use the same material. If the materials are different, ensure that the conductor cross-sectional area of the PE cable produces a conductance equivalent to that of the cable specified in the table.	

5.2.2 RS485 Communication

If RS485 is selected, connect an RS485 communications cable to the SUN2000, but the AC power cable does not need to connect to a SmartLogger2000 that supports PLC.

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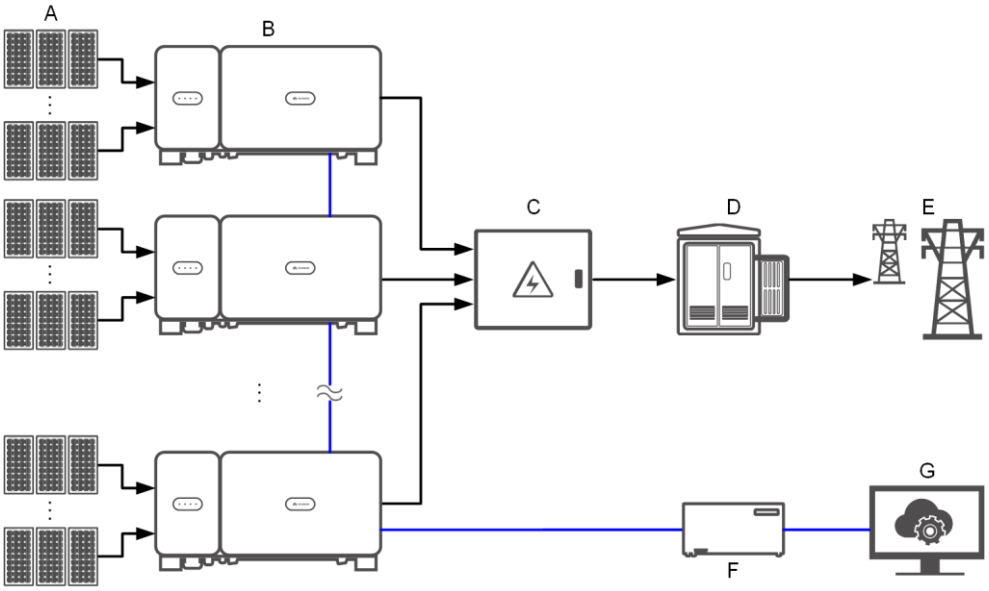
Figure 5-3 Network Application



NOTE

indicates a power cable; → indicates the power flow direction; indicates a signal cable.

(A) PV string (B) SUN2000 (C) AC combiner box

(D) Step-up transformer (E) Power grid (F) SmartLogger2000

(G) Management system

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NOTICE

- To ensure the system response speed, you are advised to connect less than 30 cascading SUN2000s on each COM port of the SmartLogger2000.
- The RS485 communication distance between the SUN2000 at the end and the SmartLogger2000 cannot exceed 1000 m.

Figure 5-4 SUN2000 cable connections (dashed box indicating optional components)

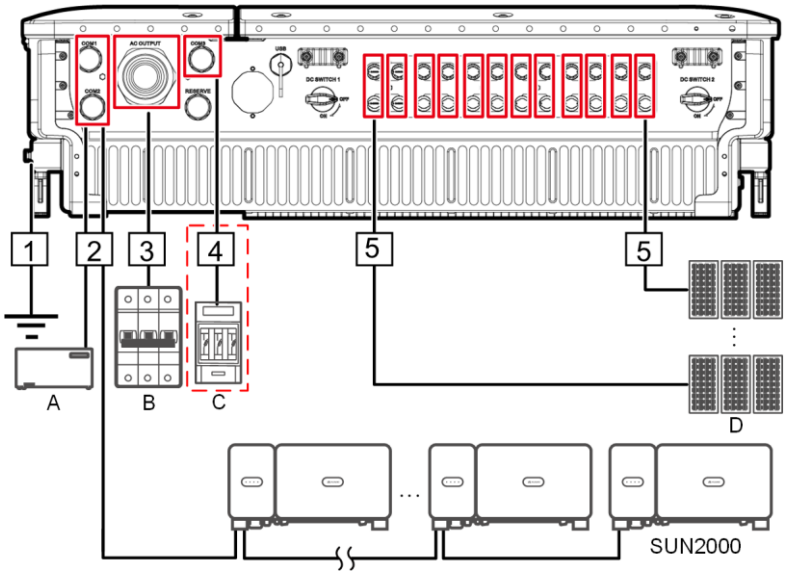

Table 5-4 Component description

No.	Component	Remarks	Source
A	SmartLogger	The SUN2000 can connect to the SmartLogger2000 to implement RS485 communication.	Can be purchased from Huawei
B	AC switch	• Installed in the AC combiner box • It is recommended that a three-phase AC circuit breaker with a rated voltage greater than or equal to 800 V AC and a rated current of 125 A be configured for the SUN2000-105KTL-H1. • It is recommended that a three-phase AC circuit breaker with a rated voltage greater than or equal to 800 V AC and a rated current of 100 A be configured for other models.	Prepared by the customer
C	Fuse/Circuit breaker	The tracking system should be equipped with an overcurrent protective device/component. The power cable between the device/component and wiring terminal	Prepared by the customer

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No.	Component	Remarks	Source
		should be no longer than 2.5 m. Therefore, a fuse or circuit breaker is recommended. • Installed between the SUN2000 and tracking control box • Fuse specifications: rated voltage ≥ 800 V; rated current: 6 A; protection: gG • Circuit breaker specifications: rated voltage ≥ 800 V; rated current: 6 A; tripping: C	
D	PV string	• A PV string is composed of PV modules connected in series. • The SUN2000 supports the input from 12 PV strings.	Prepared by the customer

NOTICE

The SUN2000 has a residual current monitoring unit (RCMU) inside. Its external AC switch should be a three-phase circuit breaker or other AC load circuit breakers to safely disconnect the SUN2000 from the power grid.

Table 5-5 Cable description

No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter	Source
1	PE cable	Single-core outdoor copper cable and M8 OT/DT terminal **NOTICE** Preferred to connect to the PE point on the enclosure. The PE point in the maintenance compartment is used for connecting to the PE cable included in the multi-core AC power cable.	≥ 16 mm^2. For details, see Table 5-6.	N/A	Prepared by the customer
2	RS485 communications cable (connected to a terminal block; recommended)	Recommended: a multi-paired, individually foil shielded cable that complies with local standards and M6 OT terminals	0.25–2 mm^2	14–18 mm	Prepared by the customer
	RS485 communications cable (connected	Recommended: a CAT 5E outdoor shielded network cable with the internal	-	7–9 mm	Prepared by the customer

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No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter	Source
	to a network port)	resistance ≤ 1.5 ohms/10 m (1.5 ohms/393.70 in.), as well as a shielded RJ45 connector			
3	AC output power cable (terminal clamp)	• If you connect a ground cable to the ground point on the chassis shell, you are advised to use a three-core (L1, L2, and L3) outdoor cable. • If you connect a ground cable to the ground point in the maintenance compartment, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable and M8 OT/DT terminals (PE). You do not need to separately prepare a PE cable.	• Copper-core cable: – L1, L2, L3: 25–95 mm^2 – PE: ≥ 16 mm^2. For details, see Table 5-6. • Aluminum alloy cable or copper-clad aluminum cable: – L1, L2, L3: 35–95mm^2 – PE: ≥ 16 mm^2. For details, see Table 5-6.	24–57 mm	Prepared by the customer
	AC output power cable (OT/DT terminal)	• If you connect a ground cable to the ground point on the chassis shell, you are advised to use a three-core (L1, L2, and L3) outdoor cable and M10 OT/DT terminals (L1, L2, and L3). • 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, M10 OT/DT terminals (L1, L2, and L3), and M8 OT/DT terminals (PE). You do not need to separately prepare a PE cable.	• Copper-core cable: – L1, L2, L3: 25–95 mm^2 – PE: ≥ 16 mm^2. For details, see Table 5-6. • Aluminum alloy cable or copper-clad aluminum cable: – L1, L2, L3: 35–95mm^2 – PE: ≥ 16 mm^2. For details, see Table 5-6.	24–57 mm	Prepared by the customer
4	Tracking system power cable	Three-core outdoor copper cable with dual-layer protection	6 mm^2	14–18 mm	Prepared by the customer

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No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter	Source
5	DC input power cable	PV cable that meets the 1500 V standard	4–6 mm^2 (12–10 AWG)	4.5–7.8 mm	Prepared by the customer

Table 5-6 PE cable specifications

Conductor Cross-Sectional Area S of the AC Power Cable (mm^2)	Conductor Cross-Sectional Area S_P of the PE Cable (mm^2)
$16 < S \leq 35$	$S_P \geq 16$
$35 < S$	$S_P \geq S/2$
The specifications are valid only if the conductors of the PE cable and AC power cable use the same material. If the materials are different, ensure that the conductor cross-sectional area of the PE cable produces a conductance equivalent to that of the cable specified in the table.	

5.3 Installing the PE Cable

Context

NOTICE

- Proper grounding is helpful for resisting the impact of surge voltage and improving the electromagnetic interference (EMI) performance. Before connecting the AC power cable, DC power cable, and communications cable, connect the PE cable to the PE point.
- It is recommended that the PE cable of the SUN2000 be connected to a nearby PE point. Connect the PE points of all SUN2000s in the same array to ensure equipotential connections to PE cables.

Procedure

Step 1 Connect the PE cable to the PE point.

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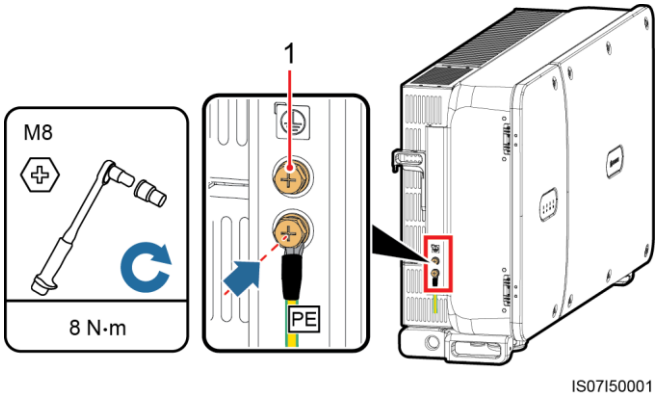
Figure 5-5 Connecting the PE cable to the PE point (on the enclosure shell)



(1) Reserved PE point

----End

Follow-up Procedure

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

5.4 Opening the Maintenance Compartment Door

Precautions

CAUTION

- Do not open the host panel cover of the SUN2000.
- Before opening the maintenance compartment door, ensure that no electrical connections are made for the SUN2000 on the AC or DC side.
- If you need to open the maintenance compartment door in rainy or snowy days, take protective measures to prevent rain or snow entering the maintenance compartment. If unavoidable, do not open the maintenance compartment door.
- Do not leave unused screws in the maintenance compartment.

Procedure

Step 1 Open the maintenance compartment door and install the support bar.

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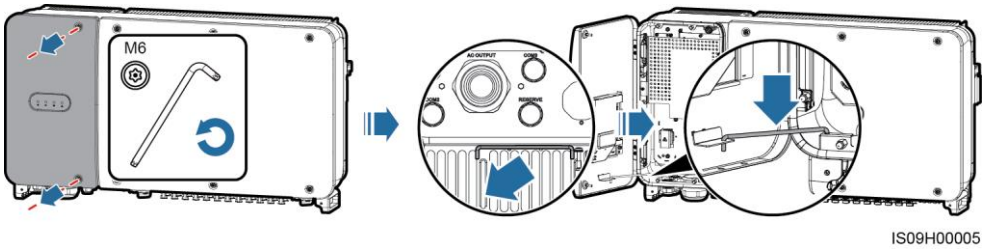
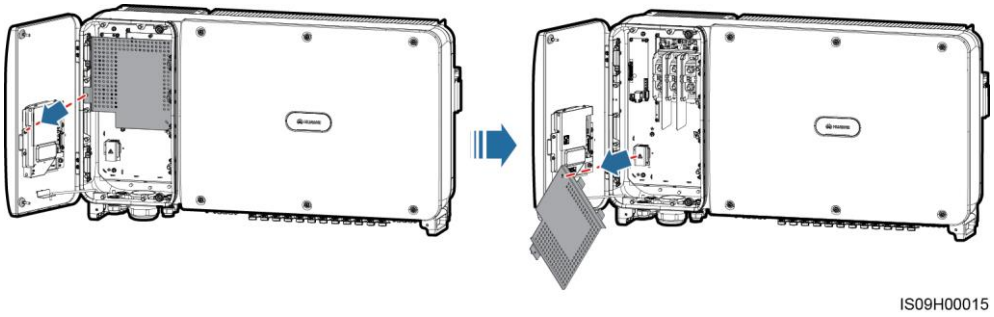
Figure 5-6 Opening the maintenance compartment door



Step 2 Remove the cover and hang it on the hook of the door.

Figure 5-7 Removing the cover



----End

5.5 Installing the AC Output Power Cable (Using the OT/DT Terminal)

Prerequisites

- A three-phase AC switch should be installed on the AC side of the SUN2000. To ensure that the SUN2000 can safely disconnect itself from the power grid when an exception occurs, select a proper overcurrent protection device in compliance with local power distribution regulations.
- Connect the AC output power cable according to the requirements specified by local power grid operators.

WARNING

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

Requirements for the OT/DT terminal

- If a copper cable is used, use copper wiring terminals.
- If a copper-clad aluminum cable is used, use copper wiring terminals.

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- If an aluminum alloy cable is used, use copper-aluminum transition wiring terminals, or aluminum wiring terminals along with copper-aluminum transition spacers.

NOTICE

- Do not connect aluminum wiring terminals to the AC terminal block. Otherwise the electrochemical corrosion will occur and affect the reliability of cable connections.
- Comply with the IEC61238-1 requirements when using copper-aluminum transition wiring terminals, or aluminum wiring terminals along with copper-aluminum transition spacers.
- If copper-aluminum transition spacers are used, pay attention to the front and rear sides. Ensure that the aluminum sides of spacers are in contact with aluminum wiring terminals, and copper sides of spacers are in contact with the AC terminal block.

Figure 5-8 Requirements for the OT/DT terminal

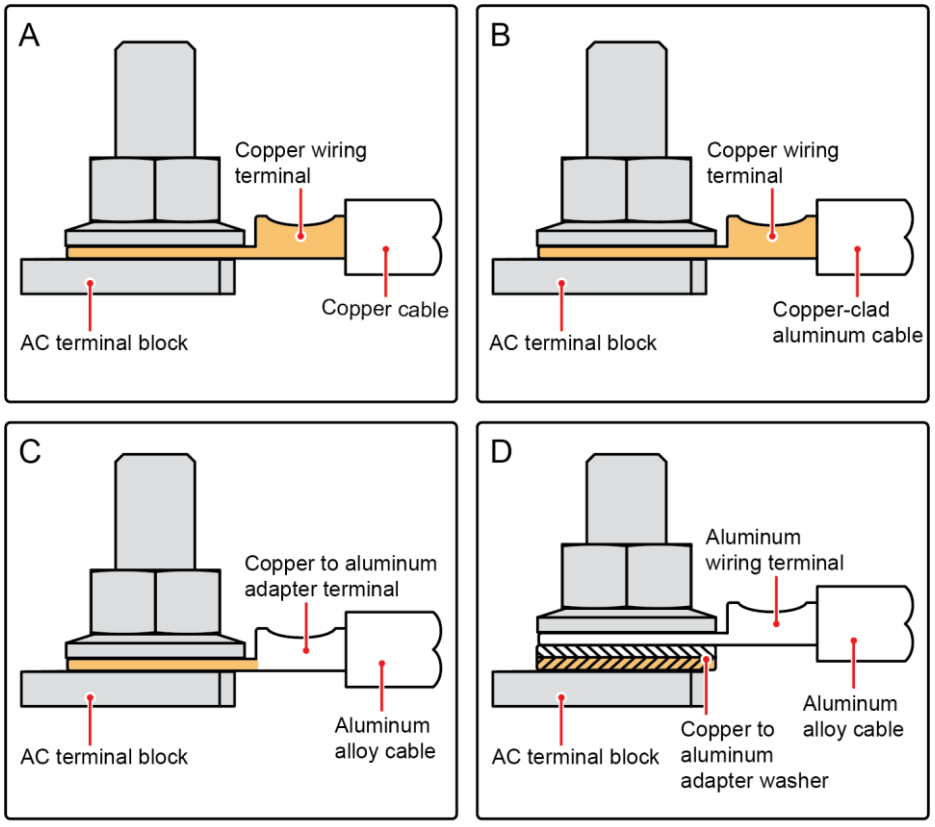

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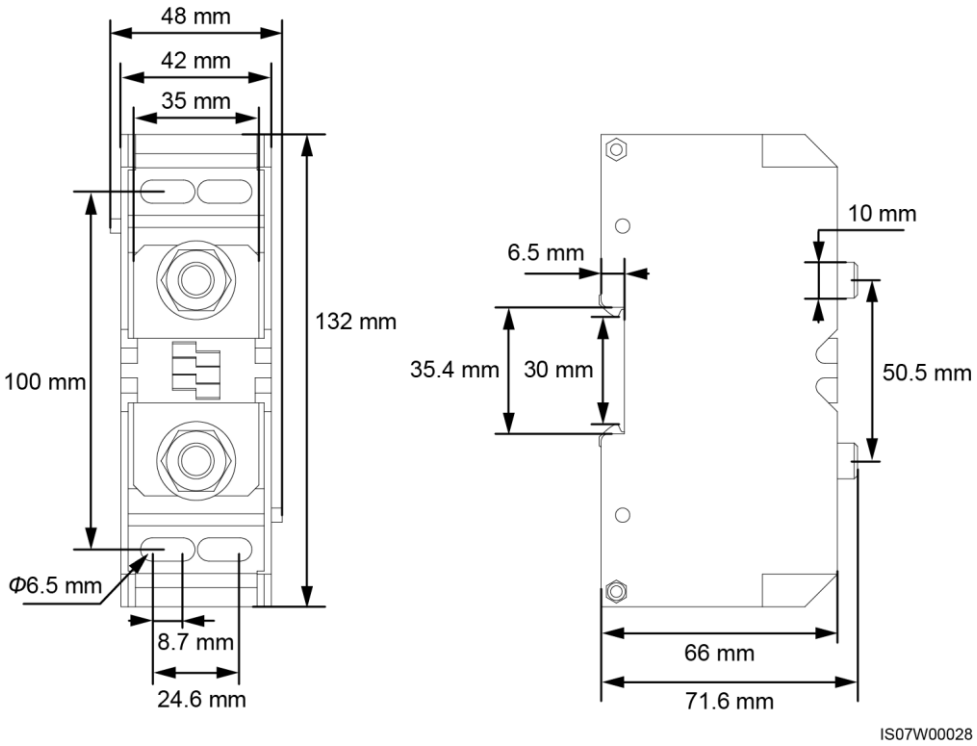
Figure 5-9 AC terminal block dimensions



NOTE

This document introduces how to install the four-core AC output power cable, which can be a reference for installing the three-core cable. The three-core cable does not need a PE cable installed in the maintenance compartment.

Procedure

Step 1 Remove the sealing nut and rubber liner from the cable gland.

Step 2 Select an appropriate rubber liner based on the cable outer diameter.

Step 3 Make the cable and crimp the OT/DT terminal.

Step 4 Route the cable through the cable gland.

Step 5 Secure the AC output power cable and PE cable.

Step 6 Tighten the cable gland.

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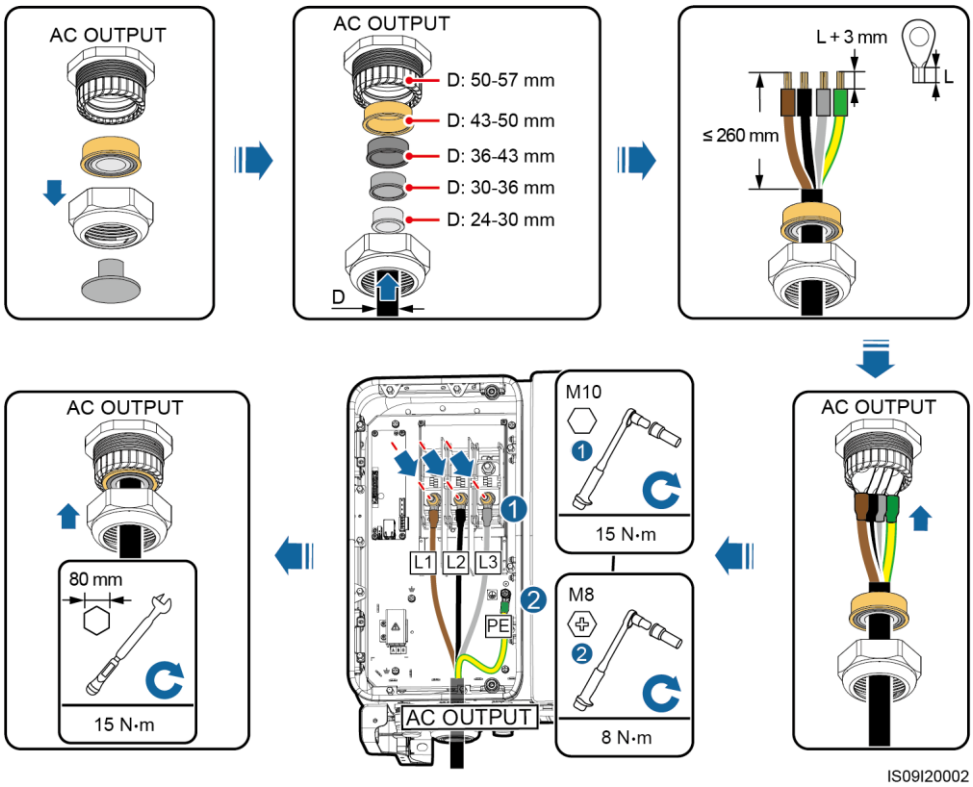
NOTICE

- 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.
- If the cable outer diameter does not match the rubber liner, the IP rating of the device may be affected.
- Do not route the cable with a crimped OT/DT terminal directly through the rubber liner in case it damages the liner.
- Ensure that the cable jacket is in the maintenance compartment.
- Ensure that AC terminations are secured. Failure to do so may cause the SUN2000 to malfunction or damage to its terminal block by issues such as overheating.
- Do not adjust the cable when the sealing nut is tightened. Otherwise, the rubber liner may shift, which affects the IP rating of the device.

Figure 5-10 Installing the AC output power cable



NOTE

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

----End

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Follow-up Procedure

Check that the cable is connected correctly and securely. Then seal the cable gland. Clear the foreign matter from the maintenance compartment.

5.6 Installing the AC Output Power Cable (Using the Terminal Clamp)

Prerequisites

- A three-phase AC switch should be installed on the AC side of the SUN2000. To ensure that the SUN2000 can safely disconnect itself from the power grid when an exception occurs, select a proper overcurrent protection device in compliance with local power distribution regulations.
- Connect the AC output power cable according to the requirements specified by local power grid operators.

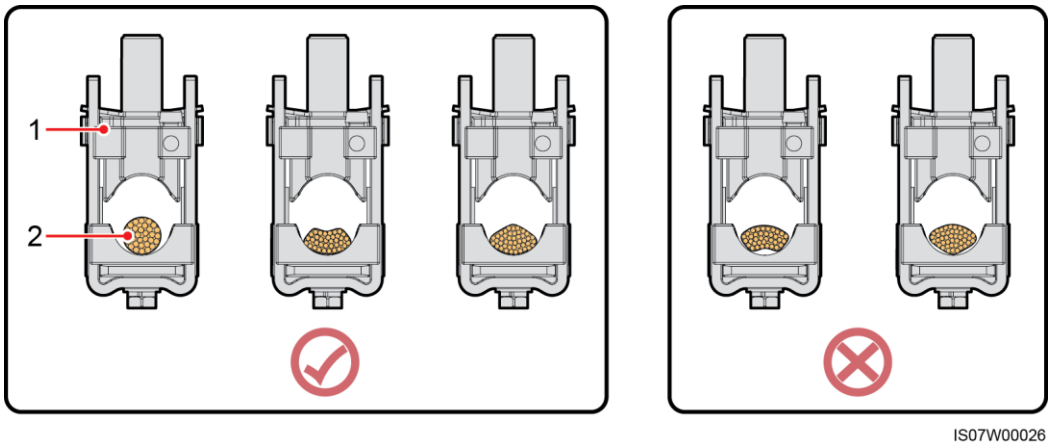
WARNING

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

Context

The terminal clamp supports copper core cables, aluminum alloy cables, and copper-clad aluminum cables. Select cables based on site requirements. When connecting cables, ensure that the AC output power cable and terminal clamp are in good contact.

Figure 5-11 Installation requirements for the AC output power cable



(1) Terminal clamp (2) AC output power cable

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NOTE

This document introduces how to install the four-core AC output power cable, which can be a reference for installing the three-core cable. The three-core cable does not need a PE cable installed in the maintenance compartment.

Procedure

Step 1 Remove the sealing nut and rubber liner from the cable gland.

Step 2 Select an appropriate rubber liner based on the cable outer diameter.

Step 3 Make the cable and crimp the OT/DT terminals for the PE cable.

Step 4 Route the cable through the cable gland.

Step 5 Secure the AC output power cable and PE cable.

Step 6 Tighten the cable gland.

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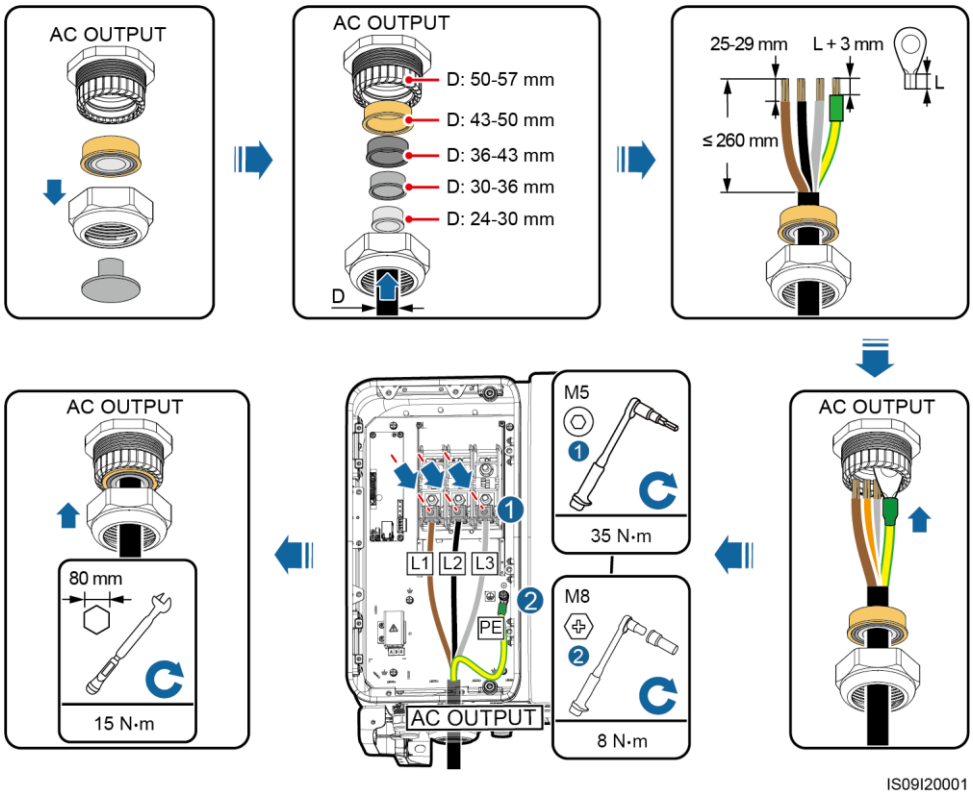
NOTICE

- 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.
- If the cable outer diameter does not match the rubber liner, the IP rating of the device may be affected.
- Do not route the cable with a crimped OT/DT terminal directly through the rubber liner in case it damages the liner.
- Ensure that the cable jacket is in the maintenance compartment.
- Ensure that AC terminations are secured. Failure to do so may cause the SUN2000 to malfunction or damage to its terminal block by issues such as overheating.
- Do not adjust the cable when the sealing nut is tightened. Otherwise, the rubber liner may shift, which affects the IP rating of the device.

Figure 5-12 Installing the AC output power cable



NOTE

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

----End

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Follow-up Procedure

Check that the cable is connected correctly and securely. Then seal the cable gland. Clear the foreign matter from the maintenance compartment.

5.7 Installing the DC Input Power Cable

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 set to OFF. Failure to do so may result in electric shocks.
- When the SUN2000 operates in grid-tied mode, do not to perform maintenance or operations on the DC circuit, such as connecting or disconnecting a PV string or a PV module in the PV string. Failure to do so may cause electric shocks or arcing, which may also cause fire.

WARNING

Ensure that the following conditions are met. Otherwise, the SUN2000 may be damaged, or even a fire could happen.

- The open-circuit voltage of each PV string must always be lower than or equal to 1500 V DC.
- The polarities of electric connections are correct on the DC input side. The positive and negative terminals of a PV module connect to corresponding positive and negative DC input terminals of the SUN2000.

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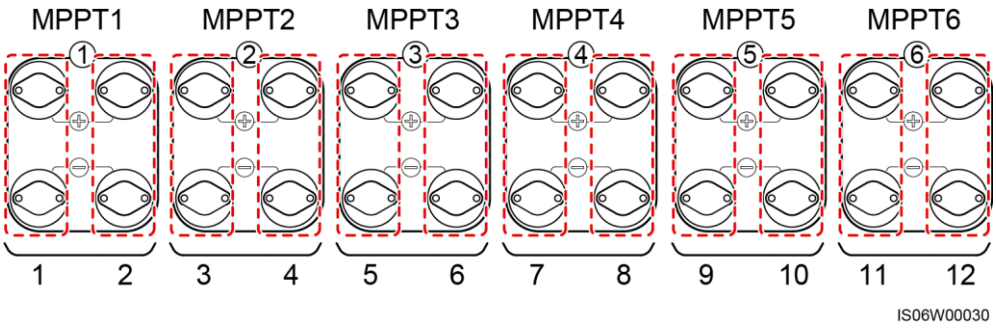
NOTICE

- 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.
- The SUN2000 does not support full parallel connection for PV strings (full parallel connection: PV strings connect to one another in parallel outside the SUN2000 and then connect to the SUN2000 independently).
- During the installation of PV strings and the SUN2000, the positive or negative terminals of PV strings may be short-circuited to ground if the power cable is not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused device damage is not covered under any warranty.

Terminal Description

The SUN2000 provides 12 DC input terminals, which are controlled by its two DC switches. DC SWITCH 1 controls DC input terminals 1–6 (MPPT1–3) and DC SWITCH 2 controls DC input terminals 7–12 (MPPT4–6).

Figure 5-13 DC terminals



When DC inputs are not fully configured, the input terminals should meet the following requirements:

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

For example, if the number of input routes is 1–11, the recommended DC input terminals are as follows:

Number of PV Strings	Terminal Selection	Number of PV Strings	Terminal Selection
1	Connects to any even-number route.	2	Connects to routes 2 and 10.
3	Connects to routes 2, 6, and 10.	4	Connects to routes 2, 6, 10, and 12.

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Number of PV Strings	Terminal Selection	Number of PV Strings	Terminal Selection
5	Connects to routes 2, 4, 6, 10, and 12.	6	Connects to routes 2, 4, 6, 8, 10, and 12.
7	Connects to routes 2, 4, 6, 8, 9, 10, and 12.	8	Connects to routes 1, 2, 4, 6, 8, 9, 10, and 12.
9	Connects to routes 1, 2, 4, 6, 7, 8, 9, 10, and 12.	10	Connects to routes 1, 2, 4, 6, 7, 8, 9, 10, 11, and 12.
11	Connects to routes 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, and 12.	N/A	N/A

Requirements on Cable Specifications

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

CAUTION

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

Procedure

Step 1 Remove the insulation layer of the DC input power cable by an appropriate length using a wire stripper.

Step 2 Crimp positive and negative metal contacts.

Step 3 Insert the contacts into the corresponding positive and negative connectors.

Step 4 Tighten the lock nuts on the positive and negative connectors.

Step 5 Use a multimeter to measure the voltage between the positive and negative terminals of the PV string (measurement range no less than 1500 V).

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

Step 6 Insert the positive and negative connectors into the corresponding DC positive and negative input terminals of the SUN2000.

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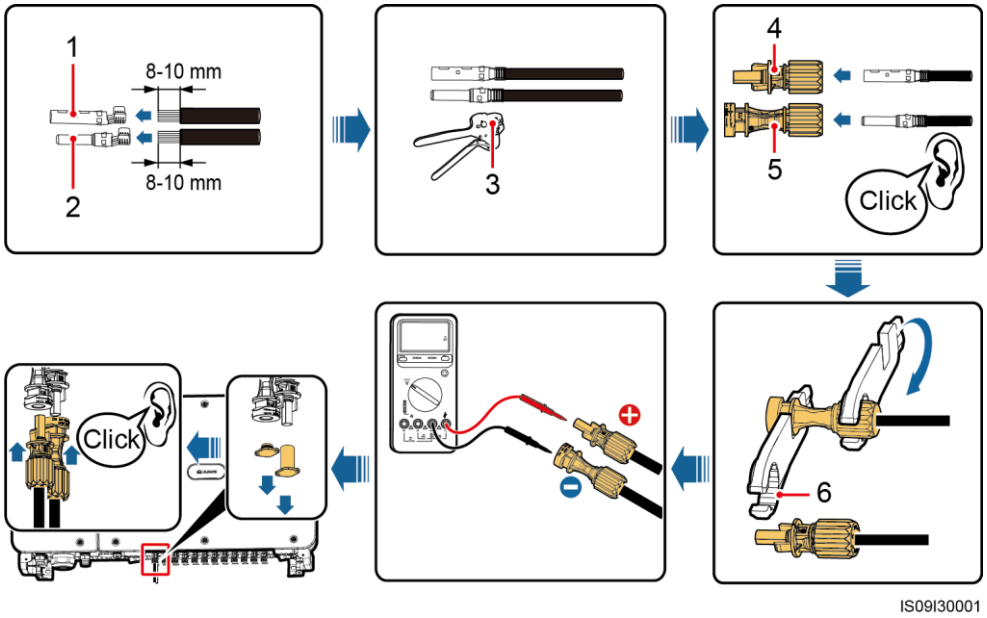
Figure 5-14 Installing the DC input power cable



(1) Positive metal contact (female)

(2) Negative metal contact (male)

(3) UTXTC0002 (Amphenol)

(4) Positive connector

(5) Negative connector

(6) UTXTWA001 (Amphenol)

NOTICE

If the DC input power cable is reversely connected and DC switches are set to **ON**, do not turn off the DC switches 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

5.8 Connecting the RS485 Communications Cable

- When routing the communications cable, separate it from power cables to prevent communication from being affected. Connect the shield layer to the PE point.
- Connect the RS485 communications cable to either a terminal block (recommended) or an RJ45 network port.

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Connecting to a Terminal Block (Recommended)

Figure 5-15 Connecting the RS485 communications cable (to a terminal block)

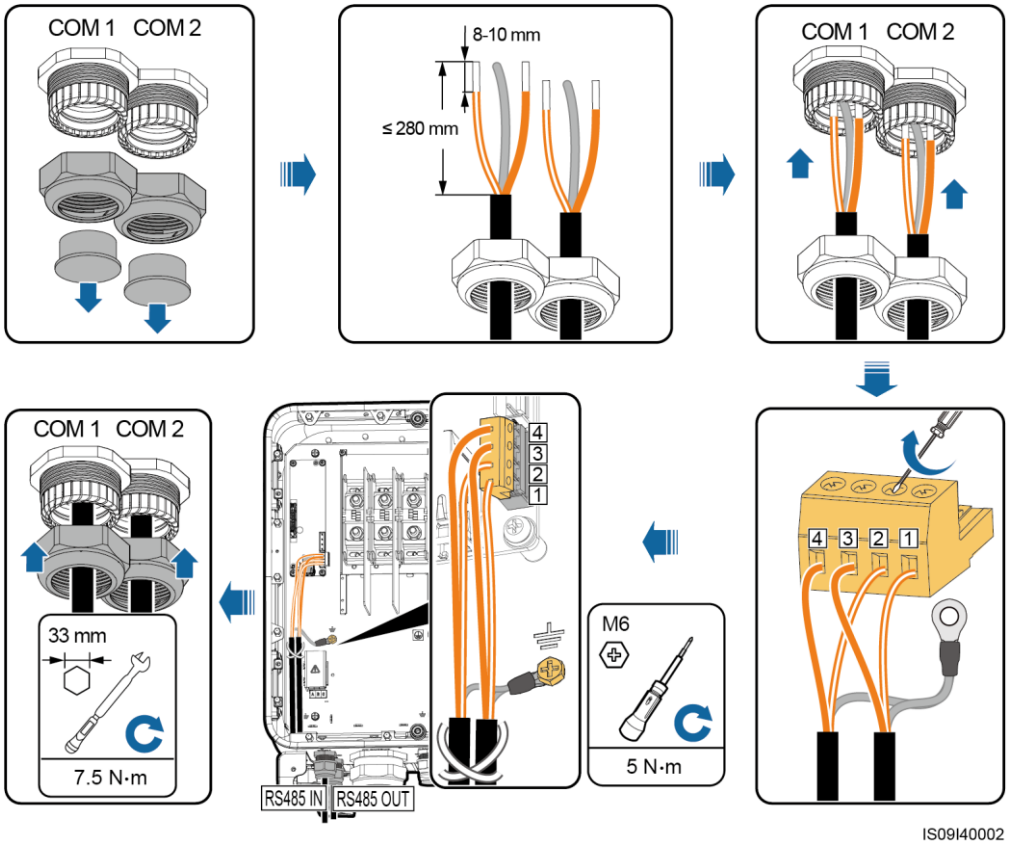

Table 5-7 Terminal block description

No.	Definition	Description
1	RS485A IN	RS485A, RS485 differential signal+
2	RS485A OUT	RS485A, RS485 differential signal+
3	RS485B IN	RS485B, RS485 differential signal–
4	RS485B OUT	RS485B, RS485 differential signal–

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Connecting to an RJ45 Network Port

Figure 5-16 Connecting the RS485 communications cable (to an RJ45 network port)

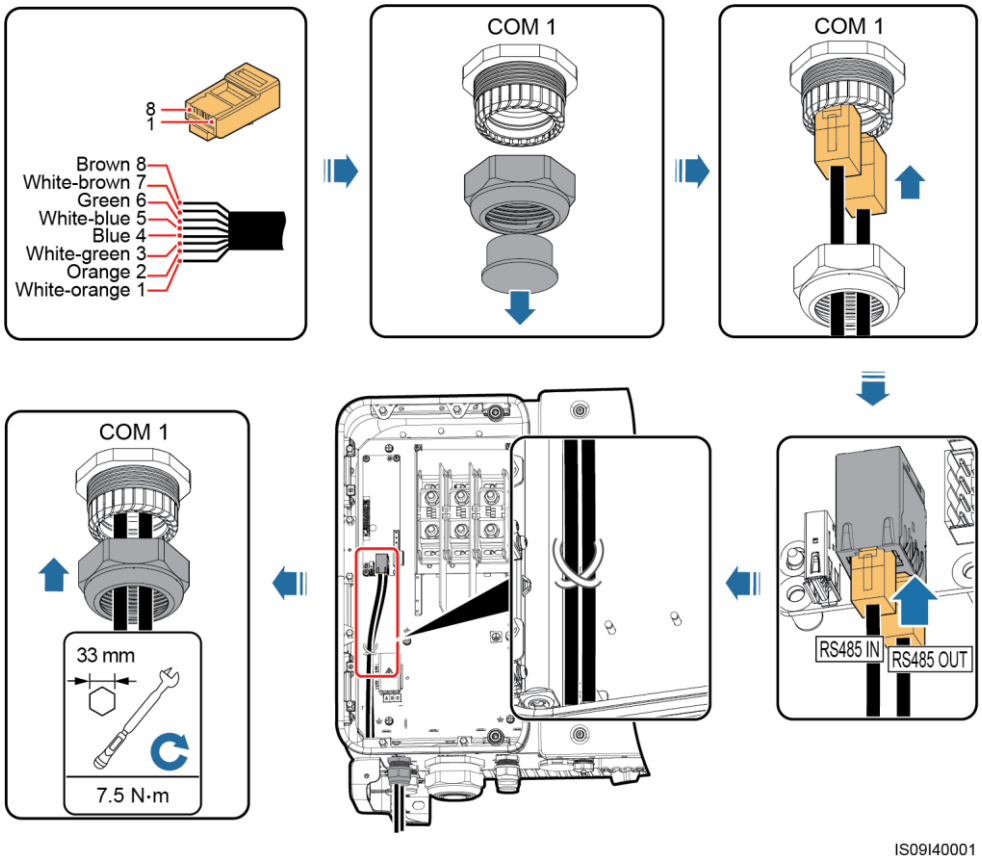

Table 5-8 RJ45 network port description

No.	Description	No.	Description
1, 4	RS485A, RS485 differential signal+	2, 5	RS485B, RS485 differential signal–

Follow-up Operations

Check that the cable is connected correctly and securely. Then seal the cable gland. Clear the foreign matter from the maintenance compartment.

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5.9 (Optional) Installing the Power Cable of the Tracking System

Context

The tracking system should be equipped with an overcurrent protective device/component. The power cable between the device/component and wiring terminal should be no longer than 2.5 m.

WARNING

- The tracking system is powered by the three-phase AC power grid with a rated voltage of 800 V.
- Keep inflammable materials away from the power cable.
- The power cable must be protected with a conduit to prevent short circuits caused by insulation layer damage.

Procedure

Step 1 Remove the sealing nut from the cable gland.

Step 2 Prepare a cable.

Step 3 Route the cable through the cable gland.

Step 4 Connect the power cable of the tracking system.

Step 5 Bind the power cable of the tracking system.

Step 6 Tighten the cable gland.

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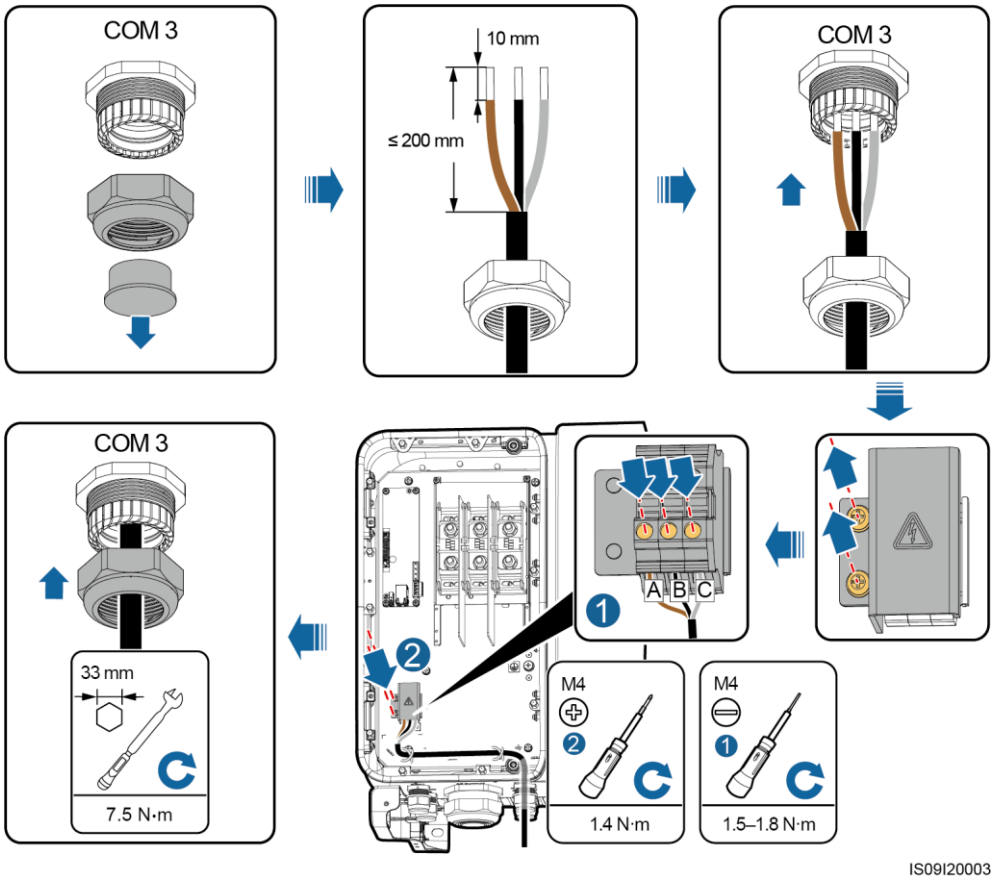
Figure 5-17 Installing the power cable of the tracking system



----End

Follow-up Procedure

Check that the cable is connected correctly and securely. Then seal the cable gland. Clear the foreign matter from the maintenance compartment.

5.10 Closing the Maintenance Compartment Door

Procedure

Step 1 Install the AC terminal cover and then install the support bar.

Step 2 Close the maintenance compartment door and tighten the two screws on the door.

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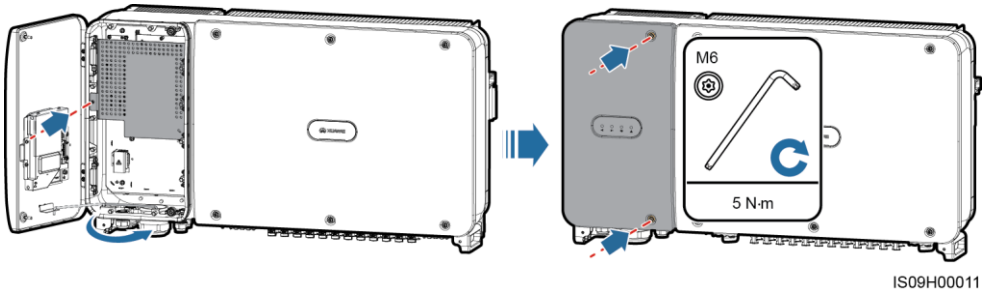
Figure 5-18 Closing the maintenance compartment door



NOTE

If the screws on the door are lost, use the spare screws in the fitting bag at the bottom of the enclosure.

----End

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6 Commissioning

6.1 Checking Before Power-On

No.	Acceptance Criteria
1	The SUN2000 is installed correctly and securely.
2	DC switches and the downstream AC switch are OFF.
3	All cables are connected correctly and securely.
4	Used cable glands are sealed and locking caps are tightened.
5	Unused terminals and ports are locked by watertight caps.
6	The installation space is proper, and the installation environment is clean and tidy, without foreign matter.
7	The AC terminal cover is reinstalled.
8	The maintenance compartment door is closed and the door screws 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 set to the AC position to check that the AC voltage is within the specified range.

Procedure

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

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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 switches at the bottom of the SUN2000.

Step 3 Perform quick settings on the SUN2000 app. For details, see 7 Man-Machine Interactions.

----End

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7 Man-Machine Interactions

7.1 Operations with the SUN2000 App

7.1.1 App Introduction

Functions

The SUN2000 app (app for short) is a mobile phone app that communicates with the SUN2000 over Bluetooth or USB data cable to allow for querying alarms, configuring parameters, and performing routine maintenance.

Connection Mode

After the DC or AC side of the SUN2000 is powered on, you can connect the app to it through Bluetooth or a USB data cable.

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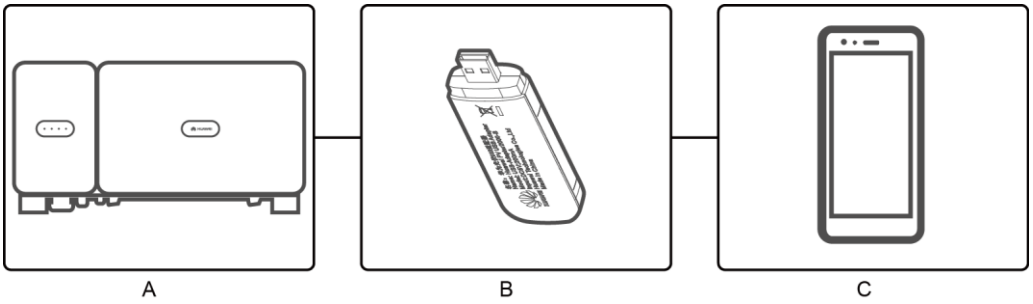
NOTICE

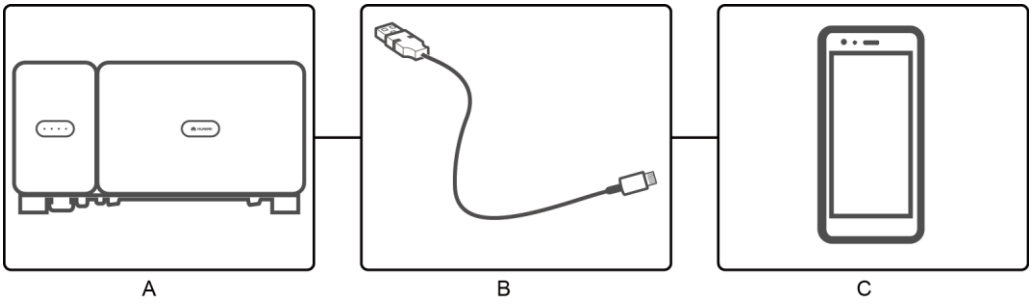
- The SUN2000 connects to the app over a Bluetooth module with the model of **USB-Adapter2000-B**.
- The port type of the USB data cable connecting to the SUN2000 is USB 2.0. Use the USB data cable delivered with the mobile phone.
- Mobile phone operating system: Android 4.0 or later, iOS 8.0 or later.
- Recommended phone brands: Huawei, Samsung, and iPhone

Figure 7-1 Connection over a Bluetooth module (Android and iOS)



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

Figure 7-2 Connection over a USB data cable (Android)



(A) SUN2000 (B) USB data cable (C) Mobile phone

Disclaimer

The UI snapshots provided in this section correspond to the SUN2000APP 2.2.00.020 version. The figure is for reference only.

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NOTICE

- The configurable parameters of the SUN2000 vary with the device model and grid code.
- The parameter names, value ranges, and default values are subject to change.
- The document describes the operation method on the Android UI as an example. The iOS system has the same operation method but a slightly different UI.

User Operation Permissions

The user accounts that can log in to the app are classified into common users, advanced users, and special users based on the responsibilities of PV plant operation personnel.

- Common user: Has the permissions of viewing SUN2000 data and setting user parameters.
- Advanced user: Has the permissions of viewing SUN2000 data, setting functional parameters, and maintaining devices.
- Special user: Has the permissions of viewing SUN2000 data, setting grid related parameters, and maintaining devices (including starting and shutting down the SUN2000, restoring factory defaults, and upgrading devices).

NOTE

File save path is displayed on the Android UI only.

Figure 7-3 Operation permissions of common users

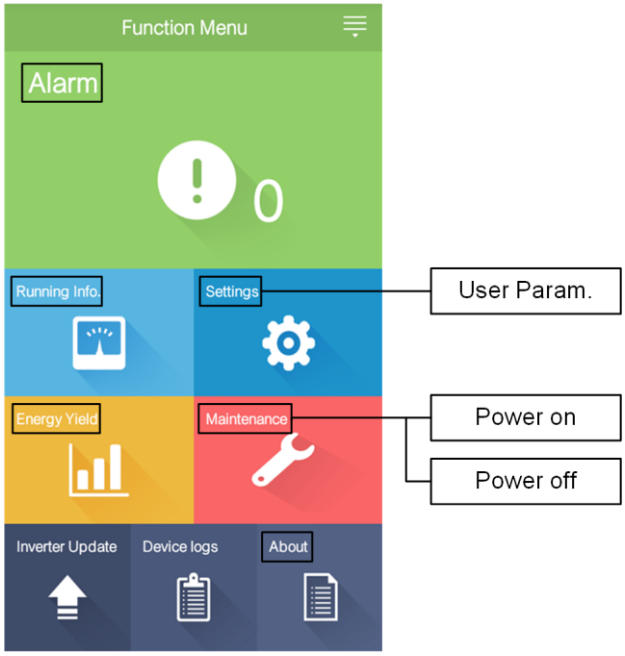

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Figure 7-4 Operation permissions of advanced users

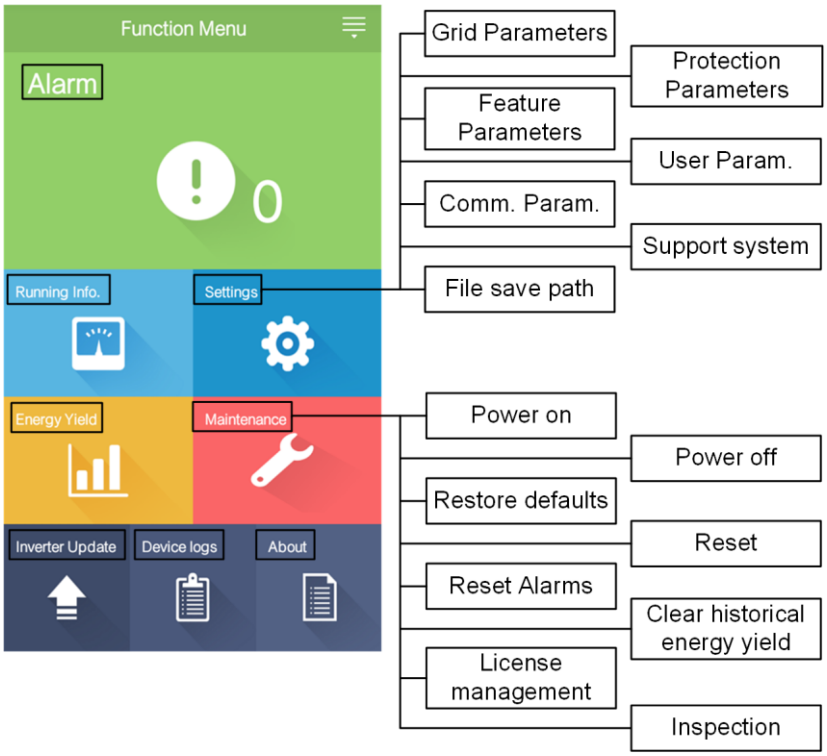
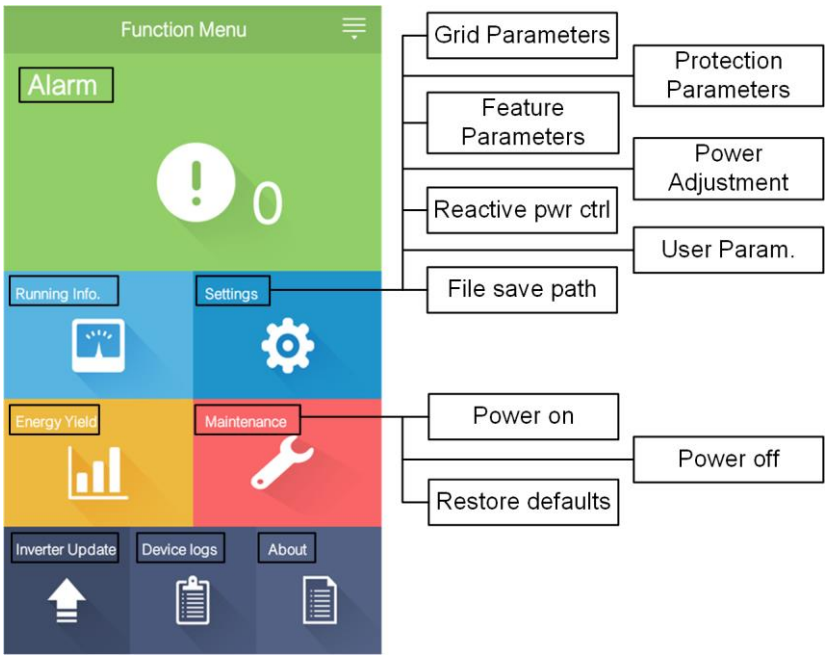


Figure 7-5 Operation permissions of special users



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7.1.2 Downloading and Installing the App

Search **SUN2000** on the following app stores, download the app installation package, and complete the installation by following the operation guide.

- Huawei App Store (Android)
- Google Play (Android)
- APP Store (iOS)

After the app is installed, the **SUN2000** symbol will be displayed as below:

7.1.3 Logging In to the App

Prerequisites

- The DC or AC side of the SUN2000 has been energized.
- Connection over a Bluetooth module:
  a. The Bluetooth module is connected to the **USB** port at the bottom of the SUN2000.
  b. The Bluetooth function is enabled.
  c. Keep the mobile phone within 5 m from the SUN2000. Otherwise, the communication between them would be affected.
- Connection over a USB cable:
  a. The USB data cable is connected from the USB port at the bottom of the SUN2000 to the port on the mobile phone.
  b. If the USB data cable is successfully connected, the message **Connected to USB Accessory** will pop up on the phone. Otherwise the cable is not connected.

Procedure

Step 1 Start the app. The login screen is displayed. Choose **Connection Mode** to connect to the SUN2000.

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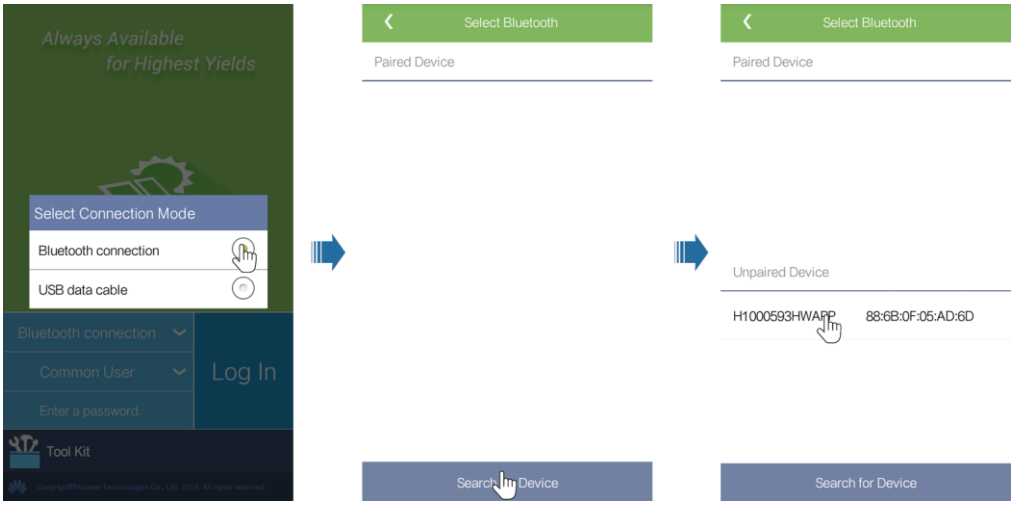
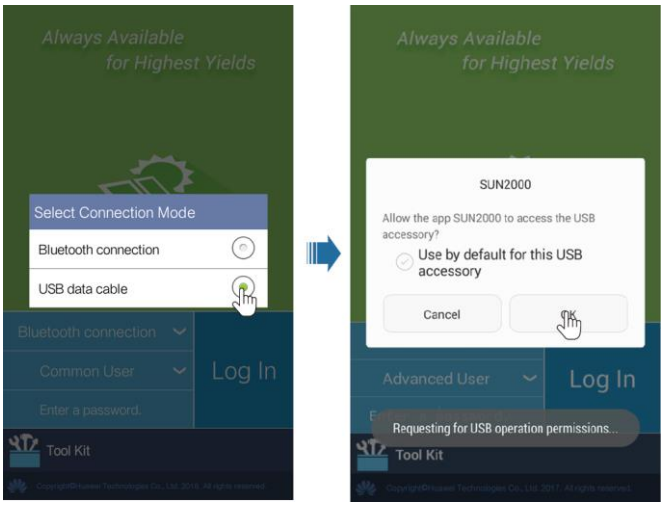
Figure 7-6 Connection over a Bluetooth module (Android and iOS)



NOTE

If the Bluetooth module is USB-Adapter2000-B, the connected Bluetooth device is named after **last 8 digits of the SN barcode+HWAPP**. The SN barcode can be obtained from the silk screen on the USB-Adapter2000-B.

Figure 7-7 Connection over a USB data cable (Android)



NOTE

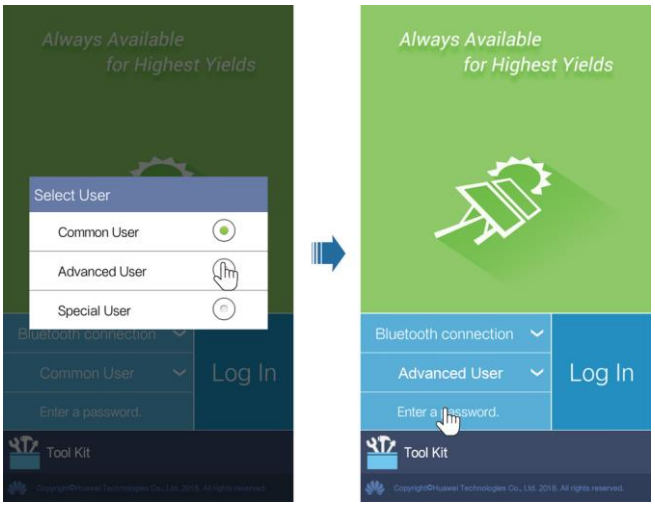
After you select **Use by default for this USB accessory**, a message that asks you to confirm the USB access will not appear if you log in to the app again without removing the USB data cable.

Step 2 Select a login user and enter the password.

NOTICE

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

Figure 7-8 Selecting a login user



Step 3 After successful login, the quick settings or main menu screen is displayed.

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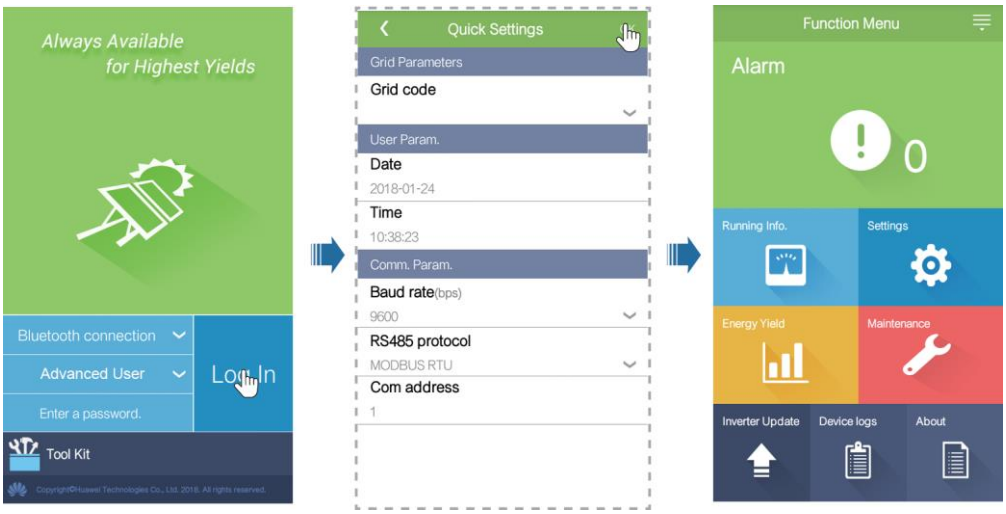
NOTICE

- 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. If you do not set SUN2000 basic parameters on the quick settings screen, the screen is still displayed when you log in to the app next time.
- To set SUN2000 basic parameters on the quick settings screen, switch to **Advanced User**. If you log in as **Common User** or **Special User**, enter the password of the advanced user to access the **Quick Settings** screen.

Figure 7-9 Logging in to the app



NOTE

On the quick settings screen, you can set basic parameters. After settings, you can modify the parameters by tapping **Settings** on the main menu screen.

- Set the correct grid code based on the application area and scenario of the SUN2000.
- Set user parameters based on the current date and time.
- Set the baud rate, protocol, and address based on site requirements. The baud rate (bps) can be set to **4800**, **9600**, or **19200**. The protocol can be set to **MODBUS RTU**, and the address can be set to any value in the range of 1 to 247.
- When multiple SUN2000s communicate with the SmartLogger over RS485, the **Com address** 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 would fail. In addition, the **Baud rate** of all the SUN2000s on each RS485 route must be consistent with the SmartLogger baud rate.

----End

7.1.4 Operations Related to the Common User

7.1.4.1 Setting User Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **User Param.** to set user parameters.

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Figure 7-10 Setting user parameters

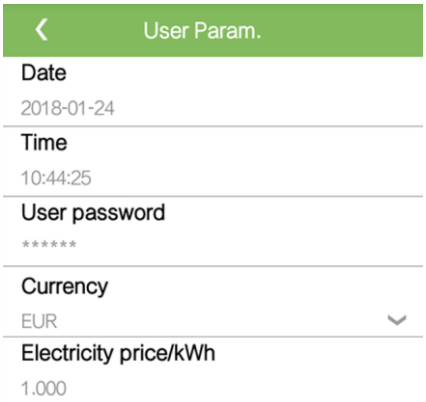

Table 7-1 User parameters

Item	Description	Value Range
Date	Set the system date.	[2000-01-01, 2068-12-31]
Time	Set the system time.	[00:00:00, 23:59:59]
User password	Set the login password. The initial password is **00000a**. Change the password on a regular basis to ensure the account safety.	• Contains six characters. • Contains at least two types of lowercase letters, uppercase letters, and digits. • Differ from the original password in at least one character.
Currency	Set the SUN2000 revenue currency.	• EUR • GBP • USD • CNY • JPY
Electricity price/kWh	Set the SUN2000 revenue per kWh. The revenue/kWh indicates the local electricity price, which is used to calculate the conversion revenue of the energy yield.	[0, 999.999]

----End

7.1.4.2 Starting and Shutting Down the SUN2000

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

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Step 2 Tap behind **Power on** or **Power off**, enter the login password, and tap **OK**.

----End

7.1.5 Operations Related to the Advanced User

7.1.5.1 Parameter Settings

Ensure that the DC side of the SUN2000 is energized before setting grid parameters, protection parameters, and feature parameters.

7.1.5.1.1 Setting Grid Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Grid Parameters** to set grid parameters.

Figure 7-11 Grid parameters

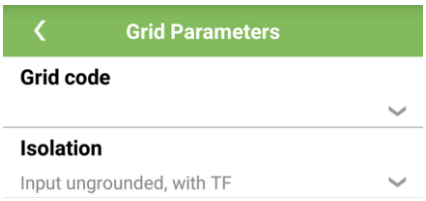

Table 7-2 Grid parameters

Specifications	Description	Value Range
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
Isolation	Specifies the working mode of the SUN2000 according to the grounding status at the DC side and the connection status to the grid.	• Input ungrounded, without TF • Input ungrounded, with TF

----End

7.1.5.1.2 Setting Protection Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Protection Parameters** to set protection parameters.

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Figure 7-12 Protection parameters

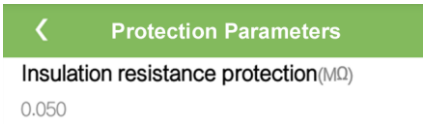

Table 7-3 Protection parameters

Parameter	Description	Value Range
Insulation resistance protection (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.	[0.05, 1.5]

----End

7.1.5.1.3 Setting Feature Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Feature Parameters** to set feature parameters.

Figure 7-13 Feature parameters

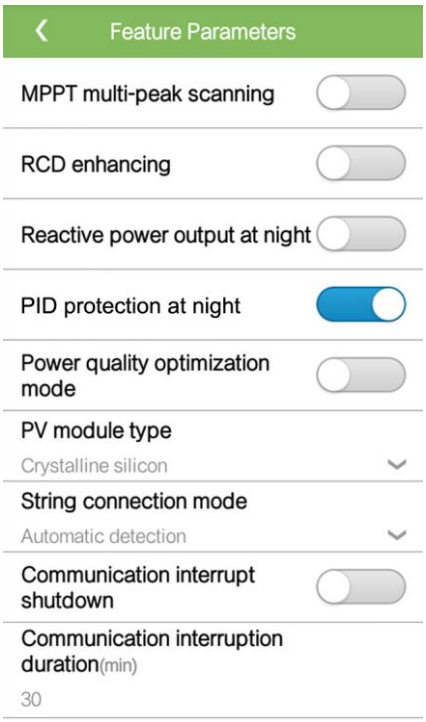

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Table 7-4 Feature parameters

Parameter	Description	Value Range
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 **MPPT multi-peak scanning interval**.	• Disable • Enable
MPPT multi-peak scanning interval (min)	Specifies the MPPT multi-peak scanning interval. This parameter is displayed only when **MPPT multi-peak scanning** is set to **Enable**.	[5, 30]
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.	• Disable • Enable
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 **Isolation** is set to **Input ungrounded, with a transformer**.	• Disable • Enable
PID protection at night	• When **PID protection at night** is set to **Enable**, the SUN2000 will shut down automatically if it detects abnormality of the PID voltage compensation during the reactive power compensation at night. • When **PID protection at night** is set to **Disable**, the SUN2000 will operate in grid-tied mode if it detects abnormality of the PID voltage compensation during the reactive power compensation at night.	• Disable • Enable
Power quality optimization mode	If **Power quality optimization mode** is set to **Enable**, the inverter output current harmonics will be optimized.	• Disable • Enable

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Parameter	Description	Value Range
PV module type	This parameter is used to set different types of PV modules and the shutdown time of the concentration PV module. 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 for the SUN2000 to restart. The parameter does not need to be set for crystalline silicon and filmy PV modules. • If **PV module type** is set to **Crystalline silicon** or **Film**, the SUN2000 automatically detects the power of PV modules when they are shaded and shuts down if the power is too low. • When concentration PV modules are used: – If **PV module type** is set to **CPV 1**, the SUN2000 can quickly restart in 60 minutes if the input power of PV modules drops drastically due to shading. – If **PV module type** is set to **CPV 2**, the SUN2000 can quickly restart in 10 minutes if the input power of PV modules drops drastically due to shading.	• Crystalline silicon • Film • CPV 1 • CPV 2
String connection mode	Set the connection mode of PV strings. • When PV strings connect to the SUN2000 separately (fully separate connection), there is no need to set this parameter. The SUN2000 can automatically detect the connection mode of the PV strings. • When PV strings connect to one another in parallel outside the SUN2000 and then connect to SUN2000 independently (fully parallel connection), set this parameter to **All PV strings connected**.	• Automatic detection • All PV strings separated • All PV strings connected
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 **Communication interrupt shutdown** is set to **Enable** and the SUN2000 communication has been interrupted for a specified time (set by **Communication interruption duration**), the SUN2000 will automatically shut down.	• Disable • Enable

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Parameter	Description	Value Range
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 **Communication interrupt shutdown** is set to **Enable**.	• Disable • Enable
Communication interruption duration (min)	Specifies the duration for determining communication interruption, and is used for automatic shutdown for protection in case of communication interruption.	[1, 120]
Soft start time (s)	Specifies the duration for the power to gradually increase when the SUN2000 starts.	[20, 1800]
Hibernate at night	The SUN2000 monitors PV strings at night. If **Hibernate at night** is set to **Enable**, the monitoring function of the SUN2000 will hibernate at night, reducing power consumption.	• Disable • Enable
PLC communication	For SUN2000 models that support both RS485 and PLC communication, when RS485 communication is used, you are advised to set **PLC communication** to **Disable** to reduce power consumption.	• Disable • Enable
Upgrade delay	**Upgrade delay** is mainly used in the upgrade scenarios where the PV power supply is disconnected at night due to no sunlight or unstable at dawn or dusk due to poor sunlight. After the SUN2000 upgrade starts, if **Hibernate at night** is set to **Enable**, the upgrade package is loaded first. After the PV power supply recovers and the activation conditions are met, the SUN2000 automatically activates the upgrade.	• Disable • Enable
RS485-2 communication	If this parameter is set to **Enable**, the RS485-2 port can be used. If the port is not used, it is recommended that this parameter be set to **Disable** to reduce power consumption.	• Disable • Enable
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 **String monitor** to **Disable** to prevent false alarms.	• Disable • Enable

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Parameter	Description	Value Range
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 **String monitor** is set to **Enable**.	[5, 100]
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. This parameter is displayed when **String monitor** is set to **Enable**.	[1, 100]
Tracking system controller	Selects a controller vendor.	N/A

----End

7.1.5.1.4 Setting User Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **User Param.** to set user parameters.

Figure 7-14 Setting user parameters

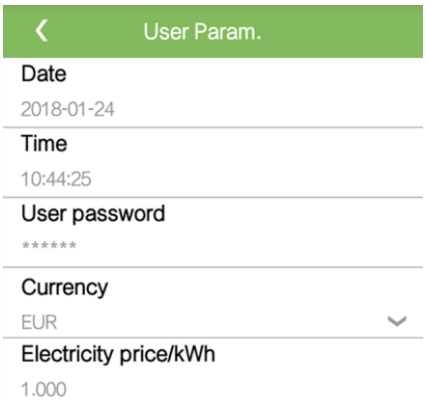

Table 7-5 User parameters

Item	Description	Value Range
Date	Set the system date.	[2000-01-01, 2068-12-31]
Time	Set the system time.	[00:00:00, 23:59:59]

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Item	Description	Value Range
User password	Set the login password. The initial password is **00000a**. Change the password on a regular basis to ensure the account safety.	• Contains six characters. • Contains at least two types of lowercase letters, uppercase letters, and digits. • Differ from the original password in at least one character.
Currency	Set the SUN2000 revenue currency.	• EUR • GBP • USD • CNY • JPY
Electricity price/kWh	Set the SUN2000 revenue per kWh. The revenue/kWh indicates the local electricity price, which is used to calculate the conversion revenue of the energy yield.	[0, 999.999]

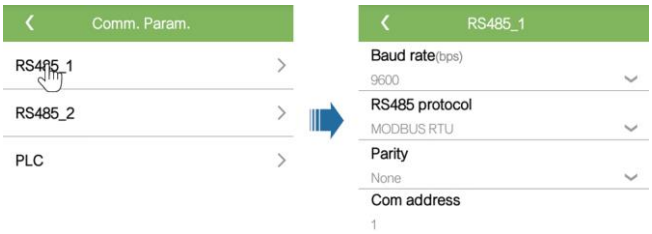
----End

7.1.5.1.5 Setting Communications Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Comm. Param.**. Set the communications parameters according to the communications mode the SUN2000 adopts.

Figure 7-15 RS485 communications parameters



NOTE

This section introduces the method of setting **RS485-1** communications parameters, which is the same as that of setting **RS485-2** communications parameters.

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Table 7-6 RS485 communications parameters

Item	Description	Value Range
Baud rate (bps)	Set the RS485 baud rate to be consistent with the baud rate of the devices on the same bus.	• 4800 • 9600 • 19200
RS485 protocol	• The SUN2000 can connect to the upper-level management unit over MODBUS RTU, Sunspec, or AVM. • The SUN2000 can only connect to the solar tracker over MODBUS RTU. • If the SUN2000 does not adopt the RS485, you can select an invalid protocol.	• Invalid protocol • MODBUS RTU • Sunspec • AVM
Parity	Set the check mode of RS485 communication to be consistent with that of the SmartLogger2000.	• None • Odd parity • Even parity
Com address	Set the communications address of the SUN2000 when it connects to the upper-level management unit, which should not conflict with the addresses of other devices on the same bus.	[1, 247]

Figure 7-16 PLC communications parameters

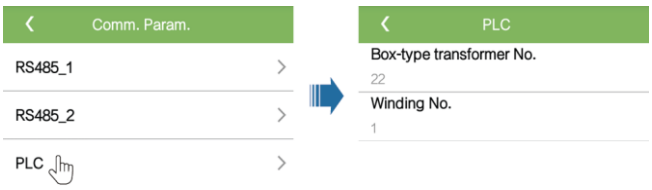

Table 7-7 PLC communications parameters

Item	Description	Value Range
Box-type transformer No.	Set the number of the box-type transformer connecting to the SUN2000.	[0, 511]
Winding No.	Set the number of the winding connecting to the SUN2000.	[0, 7]

----End

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7.1.5.1.6 Setting the Support System

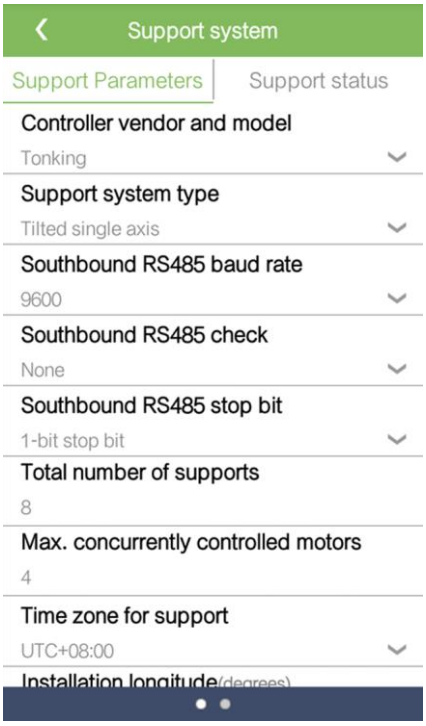
Context

Parameter settings of the support system may vary depending on the vendor.

Procedure

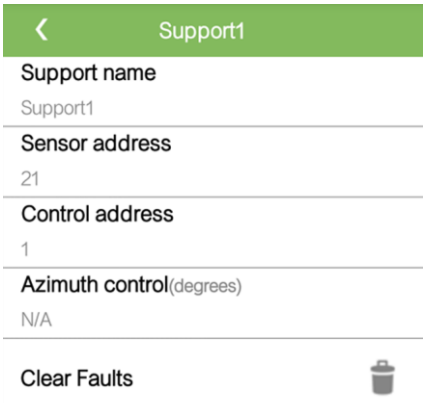
Step 1 Choose **Function Menu** > **Settings** > **Support system** to set support parameters.

Figure 7-17 Support parameters



Step 2 Swipe left on the screen, tap a support, and set parameters for the support.

Figure 7-18 Setting parameters of a single support



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----End

7.1.5.1.7 Setting a File Save Path

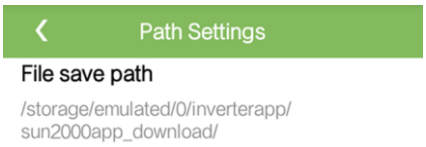
Context

In the Android system, you can modify the save path for user operation logs and SUN2000 logs and export logs from the path subsequently.

Procedure

Step 1 Choose **Function Menu** > **Settings** > **File save path** to set the file save path.

Figure 7-19 Setting the path



----End

7.1.5.2 System Maintenance

7.1.5.2.1 Starting and Shutting Down the SUN2000

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

Step 2 Tap ▶ behind **Power on** or **Power off**, enter the login password, and tap **OK**.

----End

7.1.5.2.2 Restoring Factory Settings

Context

NOTICE

Perform this operation with caution because all configured parameters except the current date, time, baud rate, and address will be restored to their factory default values. This operation will not affect operating information, alarm records, or system logs.

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

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Step 2 Tap behind **Restore defaults**, enter the app login password, and tap **OK**.

----End

7.1.5.2.3 Resetting the SUN2000

Context

Reset the SUN2000, and it will automatically shut down and restart.

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

Step 2 Tap behind **Reset**, enter the app login password, and tap **OK**.

----End

7.1.5.2.4 Resetting Alarms

Context

Reset alarms, and all the active and historical alarms of the SUN2000s will be cleared.

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

Step 2 Tap behind **Reset Alarms**, enter the login password, and tap **OK**.

----End

7.1.5.2.5 Clearing Historical Energy Yield Data

Context

Clear historical energy yield data, and all the historical energy yield data of the SUN2000 connecting to the app will be cleared.

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

Step 2 Tap behind **Clear historical energy yield**, enter the login password, and tap **OK**.

----End

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7.1.5.2.6 Managing the License

Context

Smart I-V Curve Diagnosis can be used only after a license is purchased. The license file for Smart I-V Curve Diagnosis is stored in the SUN2000. The SUN2000 SN uniquely maps to the license.

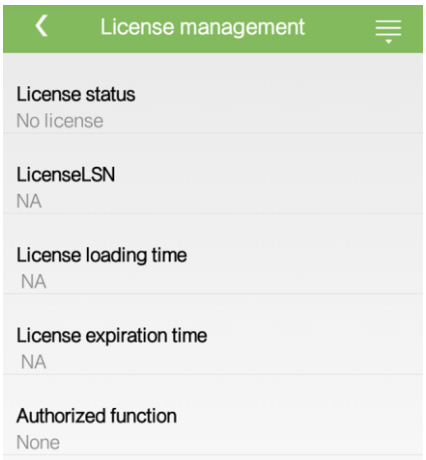
You can view the SUN2000 license information and obtain the license status through the license management. Before a device is replaced, the current device license needs to be revoked so that the revocation code can be generated and used for applying for a new device license.

Procedure

Step 1 Choose **Function Menu** > **Maintenance** > **License management**. The **License management** screen is displayed.

- When **License status** is **Normal**, revoke the license by tapping .
- When **License status** is **Deregistered**, export and view the license revocation code by tapping .
- When **License status** is **No license**, load the license by tapping .

Figure 7-20 License management



----End

7.1.5.2.7 Device inspection

Context

After a SUN2000 is put into use, it should be inspected periodically to detect any potential risks and problems.

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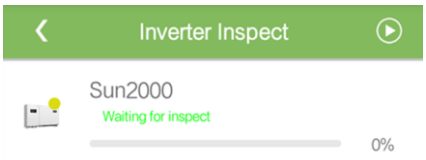
Procedure

Step 1 Choose **Function Menu** > **Maintenance** > **Inspection**, and tap to start the SUN2000 inspection.

Figure 7-21 Device inspection



----End

7.1.5.3 SUN2000 Upgrade

Prerequisites

- You have obtained the upgrade package with the help of the supplier or Huawei engineers.
- In the Android system, you have copied the upgrade package to the mobile phone. The package is a **.zip** file, which can be saved flexibly and searched. To reduce the time for searching the package, you are advised to save it under the root directory of the memory or SD card of the mobile phone.
- In the iOS system, you have imported the upgrade package to the app by emails. The package is a **.zip** file and cannot be searched.

Procedure

Step 1 Choose **Function Menu** > **Inverter Update** and complete the upgrade by following the operation guide.

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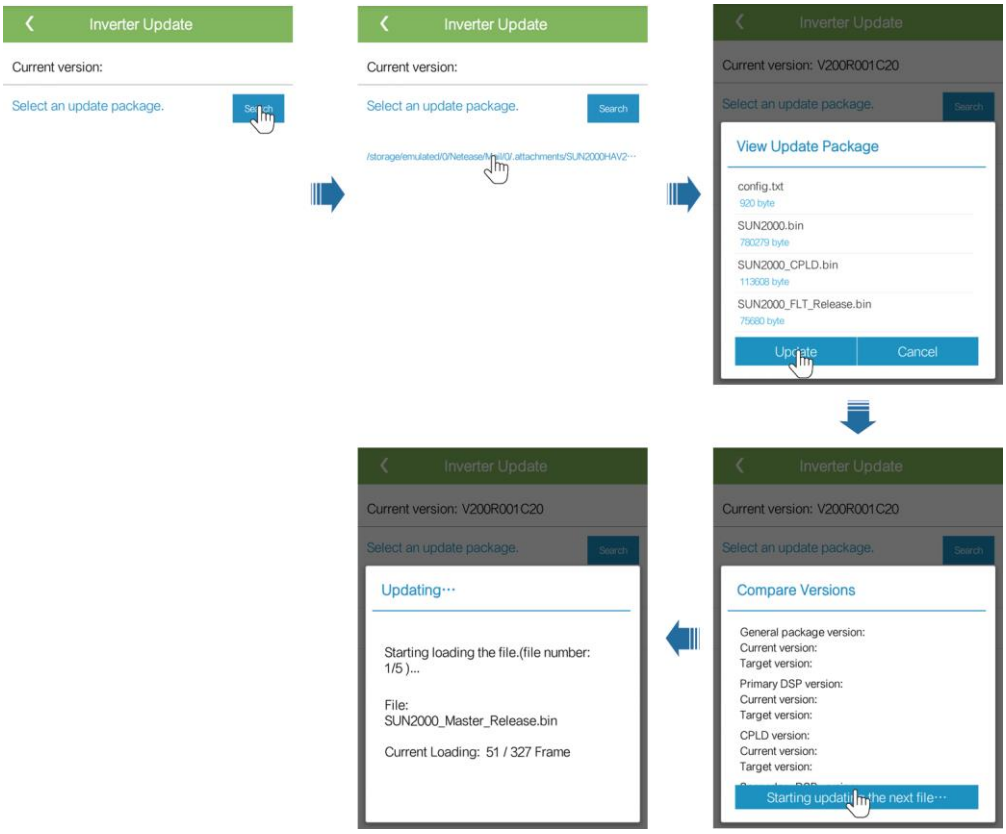
Figure 7-22 SUN2000 upgrade



----End

7.1.5.4 Device Logs

Context

Tap **Device logs** to export operation logs, as well as alarm records and energy yield information of the SUN2000 from the mobile phone.

Procedure

Step 1 Choose **Function Menu** > **Device logs**. The device log screen is displayed.

- Select **Phone Log** to export and send logs by emails on the mobile phone.
- Select **Inverter Log** to export and send alarms and performance data logs by emails.

NOTE

- In the Android system, logs are saved in the **storage/emulated/0/sun2000app_download** file by default. You can modify the saving path by choosing **Function Menu** > **Settings** > **File save path**.
- In the iOS system, you can query the logs by choosing **Tool Kit** > **File Manager** > **Device Log**.

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Figure 7-23 Device logs

----End

7.1.6 Operations Related to the Special User

7.1.6.1 Parameter Settings

Ensure that the DC side of the SUN2000 is energized before setting grid parameters, protection parameters, feature parameters, and grid adjustment parameters.

7.1.6.1.1 Setting Grid Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Grid Parameters** to set grid parameters.

Figure 7-24 Grid parameters

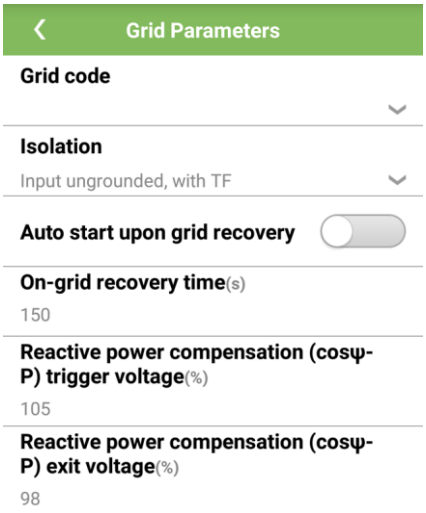

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Table 7-8 Grid parameters

Specifications	Description	Value Range (Vn: rated voltage, Fn: rated frequency)
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
Auto start upon grid recovery	Specifies whether to allow the SUN2000 to automatically start after the power grid recovers.	• Disable • Enable
On-grid recovery time (s)	Specifies the waiting time for SUN2000 restart after the power grid recovers.	[0, 900]
Grid reconnection voltage upper limit (V)	The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage exceeds the value of **Grid reconnection voltage upper limit** after the SUN2000 shuts down due to a fault.	[100%Vn, 136%Vn]
Grid reconnection voltage lower limit (V)	The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage is below the value of **Grid reconnection voltage lower limit** after the SUN2000 shuts down due to a fault.	[45%Vn, 95%Vn]
Grid reconnection frequency upper limit (Hz)	The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid frequency exceeds the value of **Grid reconnection frequency upper limit** after the SUN2000 shuts down due to a fault.	[100%Fn, 112%Fn]
Grid reconnection frequency lower limit (Hz)	The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid frequency is below the value of **Grid reconnection frequency lower limit** after the SUN2000 shuts down due to a fault.	[85%Fn, 100%Fn]
Reactive power compensation (cosφ-P) trigger voltage (V)	Specifies the voltage threshold for triggering reactive power compensation based on the cosφ-P curve.	[100, 110]
Reactive power compensation (cosφ-P) exit voltage (V)	Specifies the voltage threshold for exiting reactive power compensation based on the cosφ-P curve.	[90, 100]

----End

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7.1.6.1.2 Setting Protection Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Protection Parameters** to set protection parameters.

Figure 7-25 Protection parameters

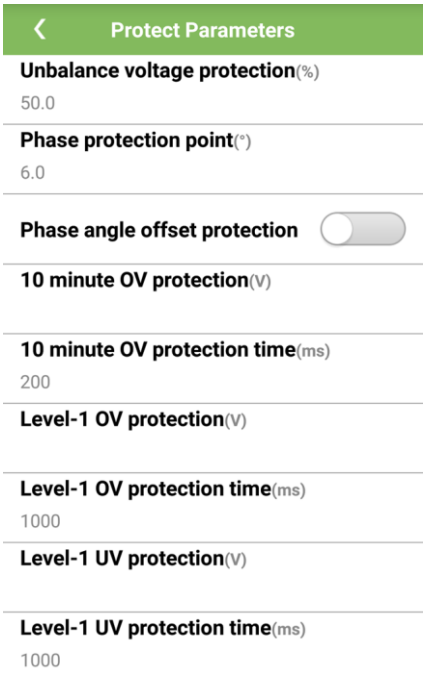

Table 7-9 Protection parameters

Parameter	Description	Value Range (Vn: rated voltage, Fn: rated frequency)
Unbalance voltage protection (%)	Specifies the SUN2000 protection threshold when the power grid voltage is unbalanced.	[0.0, 50.0]
Phase angle offset protection	The standards of certain countries and regions require that the SUN2000 be protected when the three-phase angle offset of the power grid exceeds a certain value.	• Disable • Enable
10 minute OV protection (V)	Specifies the 10-minute overvoltage protection threshold.	[1 x Vn, 1.25 x Vn]
10 minute OV protection time (ms)	Specifies the 10-minute overvoltage protection duration.	[50, 7200000]

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Parameter	Description	Value Range (Vn: rated voltage, Fn: rated frequency)
Level-N OV protection (V)	Specifies the level-N grid overvoltage protection threshold. **NOTE** • N can be 1, 2, 3, or 4. • When **HVRT** is set to **Enable** and **Level-1 OV protection** is higher than **HVRT triggering threshold**, if the grid voltage is between **HVRT triggering threshold** and **Level-1 OV protection**, the SUN2000 could start and shut down repeatedly.	• Level-1 OV protection: [1 x Vn, 1.25 x Vn] • Level-2, 3, and 4 OV protection: [1 x Vn, 1.36 x Vn]
Level-N OV protection time (ms)	Specifies the level-N grid overvoltage protection duration. **NOTE** N can be 1, 2, 3, or 4.	[50, 7200000]
Level-N UV protection (V)	Specifies the level-N grid undervoltage protection threshold. **NOTE** • N can be 1, 2, 3, or 4. • When **LVRT** is set to **Enable** and **Level-1 UV protection** is lower than **LVRT threshold**, if the grid voltage is between **Level-1 UV protection** and **LVRT threshold**, the SUN2000 could start and shut down repeatedly.	[0.15 x Vn, 1 x Vn]
Level-N UV protection time (ms)	Specifies the level-N grid undervoltage protection duration. **NOTE** N can be 1, 2, 3, or 4.	[50, 7200000]
Level-N OF protection (Hz)	Specifies the level-N grid overfrequency protection threshold. **NOTE** N can be 1 or 2.	[1 x Fn, 1.15 x Fn]
Level-N OF protection time (ms)	Specifies the level-N grid overfrequency protection duration. **NOTE** N can be 1 or 2.	[50, 7200000]
Level-N UF protection (Hz)	Specifies the level-N grid underfrequency protection threshold. **NOTE** N can be 1 or 2.	[0.85 x Fn, 1 x Fn]
Level-N UF protection time (ms)	Specifies the level-N grid underfrequency protection duration. **NOTE** N can be 1 or 2.	[50, 7200000]

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----End

7.1.6.1.3 Setting Feature Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Feature Parameters** to set feature parameters.

Figure 7-26 Feature parameters

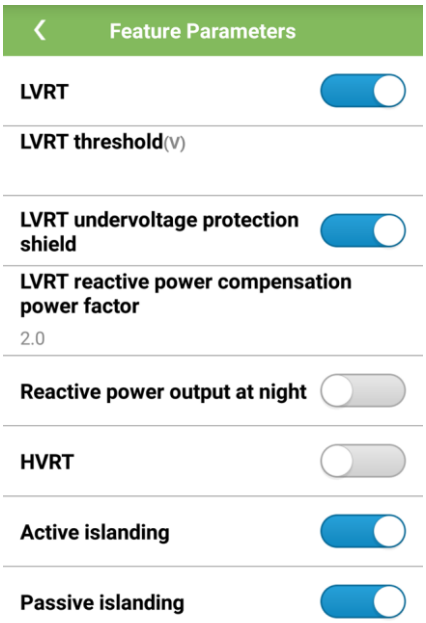

Table 7-10 Feature parameters

Parameter	Description	Value Range (Vn: rated voltage)
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.	• Disable • Enable
LVRT threshold (V)	Specifies the threshold for triggering LVRT.	[50%Vn, 92%Vn]
LVRT undervoltage protection shield	Specifies whether to shield the undervoltage protection function during LVRT.	• Disable • Enable

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Parameter	Description	Value Range (Vn: rated voltage)
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 **LVRT reactive power compensation power factor** to **2**, the reactive current generated by the SUN2000 is 20% of the rated current when the AC voltage drops by 10% during LVRT.	[0, 10]
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).	• Disable • Enable
HVRT triggering threshold (V)	Specifies the threshold for triggering the HVRT. The threshold settings should meet the local grid standard.	[105%Vn, 130%Vn]
HVRT reactive power compensation power factor	During HVRT, the SUN2000 needs to generate reactive power to support the power grid. This parameter specifies the reactive power generated by the SUN2000. For example, if you set **HVRT reactive power compensation power factor** to **2**, the reactive current generated by the SUN2000 is 20% of the rated current when the AC voltage rises by 10% during HVRT.	[0, 6]
Grid voltage protection shielding during HVRT/LVRT	Specifies whether to shield the undervoltage/overvoltage protection during HVRT/LVRT.	• Disable • Enable
Grid voltage jump triggering threshold (%)	To meet the standards of certain countries and regions, when the power grid voltage goes through transient changes, the SUN2000 cannot disconnect from the grid immediately and has to work for some time. This is called transient voltage jump. This parameter specifies the threshold for triggering transient voltage jump.	[3, 30]
Active islanding	Specifies whether to enable the active islanding protection function.	• Disable • Enable
Voltage rise suppression	The standards of certain countries and regions require that the SUN2000 should prevent the grid voltage from rising by delivering reactive power and decreasing active power when the output voltage exceeds a certain value.	• Disable • Enable

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Parameter	Description	Value Range (Vn: rated voltage)
Voltage rise suppression reactive adjustment point (%)	The standards of certain countries and regions require that the SUN2000 must generate a certain amount of reactive power when the output voltage exceeds a certain value. This parameter is displayed when **Voltage rise suppression** is set to **Enable**.	[100, 115)
Voltage rise suppression active derating point (%)	The standards of certain countries and regions require that the SUN2000 must generate a certain amount of reactive power when the output voltage exceeds a certain value. • This parameter is displayed when **Voltage rise suppression** is set to **Enable**. • The value of **Voltage rise suppression active derating point** must be greater than that of **Voltage rise suppression reactive adjustment point**.	(100, 115]
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.	[20, 800]

----End

7.1.6.1.4 Setting Power Adjustment Parameters

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Power Adjustment** to set power adjustment parameters.

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Figure 7-27 Power adjustment parameters

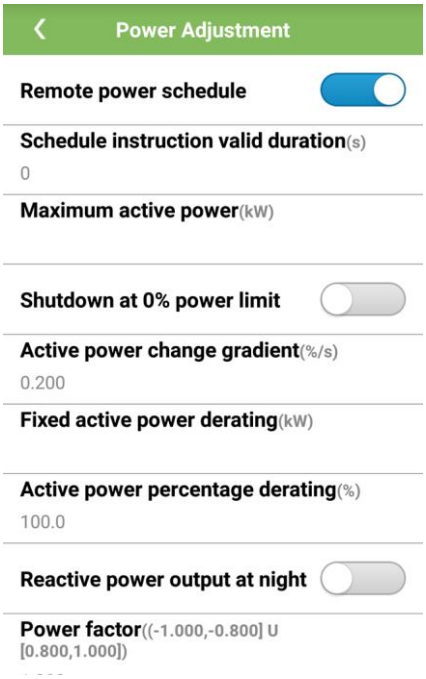

Table 7-11 Power adjustment parameters

Parameter	Description	Value Range (Smax_limit: upper limit of the maximum apparent power, Pmax_limit: upper limit of the maximum active power, Fn: rated frequency)
Remote power schedule	If this parameter is set to **Enable**, the SUN2000 responds to the remote power schedule command. If it is set to **Disable**, the SUN2000 does not respond to the command.	• Disable • Enable
Schedule instruction valid duration (s)	Adjusts the duration within which the scheduling instruction is valid.	[0, 86400]
Maximum apparent power (kVA)	Specifies the output upper threshold for the maximum apparent power to adapt to the capacity requirements for standard and customized SUN2000s.	[Maximum active power, Smax_limit]
Maximum active power (kW)	Specifies the output upper threshold for the maximum active power to adapt to various market requirements.	[0.1, Pmax_limit]

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Parameter	Description	Value Range (Smax_limit: upper limit of the maximum apparent power, Pmax_limit: upper limit of the maximum active power, Fn: rated frequency)
Shutdown at 0% power limit	If this parameter is set to **Enable**, the SUN2000 shuts down after receiving the 0% power limit instruction. If this parameter is set to **Disable**, the SUN2000 does not shut down after receiving the 0% power limit instruction.	• Disable • Enable
Active power change gradient (%/s)	Adjusts the change speed of the SUN2000 active power.	[0.1, 1000]
Fixed active power derating (kW)	Adjusts the active power output of the SUN2000 to a fixed value.	[0, Pmax_limit]
Active power percentage derating (%)	Adjusts the active power output of the SUN2000 to a percentage. If this parameter is set to **100**, the SUN2000 outputs with the maximum output power.	[0, 100]
Reactive power change gradient (%/s)	Adjusts the change speed of the SUN2000 reactive power.	[0.1, 1000]
Power factor	Adjusts the SUN2000 power factor.	(–1.000, –0.800]U[0.800, 1.000]
Reactive power compensation (Q/S)	Adjusts the SUN2000 output reactive power.	(-1.000, 1.000]
Night-time reactive power compensation (Q/S)	If **Reactive power output at night** is enabled, no PV input exists, and no remote scheduling instruction is delivered, the SUN2000 responds to this command.	(-1.000, 1.000]
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.	• Disable • Enable
Trigger frequency of over frequency derating (Hz)	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-5, Fn+5)
Quit frequency of over frequency derating (Hz)	Specifies the frequency threshold for exiting overfrequency derating.	[Fn-5, Fn+5)
Cutoff frequency of overfrequency derating (Hz)	Specifies the frequency threshold for cutting off overfrequency derating.	(Fn-5, Fn+5]

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Parameter	Description	Value Range (Smax_limit: upper limit of the maximum apparent power, Pmax_limit: upper limit of the maximum active power, Fn: rated frequency)
Cutoff power of overfrequency derating (%)	Specifies the power threshold for cutting off overfrequency derating.	[0, 100]
Power recovery gradient of over frequency derating (%/min)	Specifies the power recovery gradient for overfrequency derating.	[1, 6000]

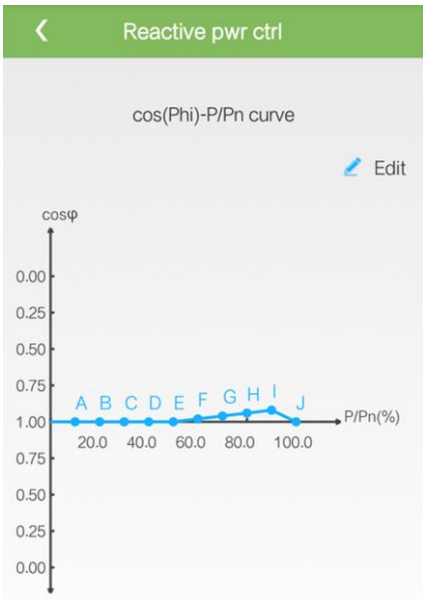
----End

7.1.6.1.5 Setting Reactive Power Control

Procedure

Step 1 Choose **Function Menu** > **Settings** > **Reactive pwr ctrl** to access the reactive power control screen and edit the curve points to control reactive power output.

Figure 7-28 Reactive power control



----End

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7.1.6.1.6 Setting User Parameters

Procedure

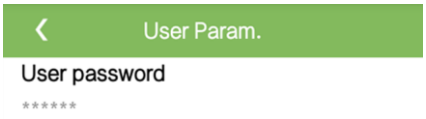
Step 1 Choose **Function Menu** > **Settings** > **User Param.** to set user parameters.

NOTE

The password should meet the following requirements:

- Contains six characters.
- Contains at least two types of lowercase letters, uppercase letters, and digits.
- Differ from the original password in at least one character.

Figure 7-29 User parameters



----End

7.1.6.1.7 Setting a File Save Path

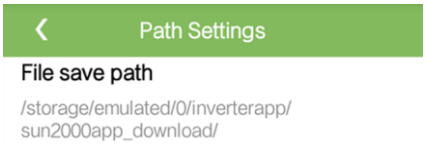
Context

In the Android system, you can modify the save path for user operation logs and SUN2000 logs and export logs from the path subsequently.

Procedure

Step 1 Choose **Function Menu** > **Settings** > **File save path** to set the file save path.

Figure 7-30 Setting the path



----End

7.1.6.2 System Maintenance

7.1.6.2.1 Starting and Shutting Down the SUN2000

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

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Step 2 Tap behind **Power on** or **Power off**, enter the login password, and tap **OK**.

----End

7.1.6.2.2 Restoring Factory Settings

Context

NOTICE

Perform this operation with caution because all configured parameters except the current date, time, baud rate, and address will be restored to their factory default values. This operation will not affect operating information, alarm records, or system logs.

Procedure

Step 1 Choose **Function Menu** > **Maintenance**. The maintenance screen will be displayed.

Step 2 Tap behind **Restore defaults**, enter the app login password, and tap **OK**.

----End

7.1.6.3 SUN2000 Upgrade

Prerequisites

- You have obtained the upgrade package with the help of the supplier or Huawei engineers.
- In the Android system, you have copied the upgrade package to the mobile phone. The package is a **.zip** file, which can be saved flexibly and searched. To reduce the time for searching the package, you are advised to save it under the root directory of the memory or SD card of the mobile phone.
- In the iOS system, you have imported the upgrade package to the app by emails. The package is a **.zip** file and cannot be searched.

Procedure

Step 1 Choose **Function Menu** > **Inverter Update** and complete the upgrade by following the operation guide.

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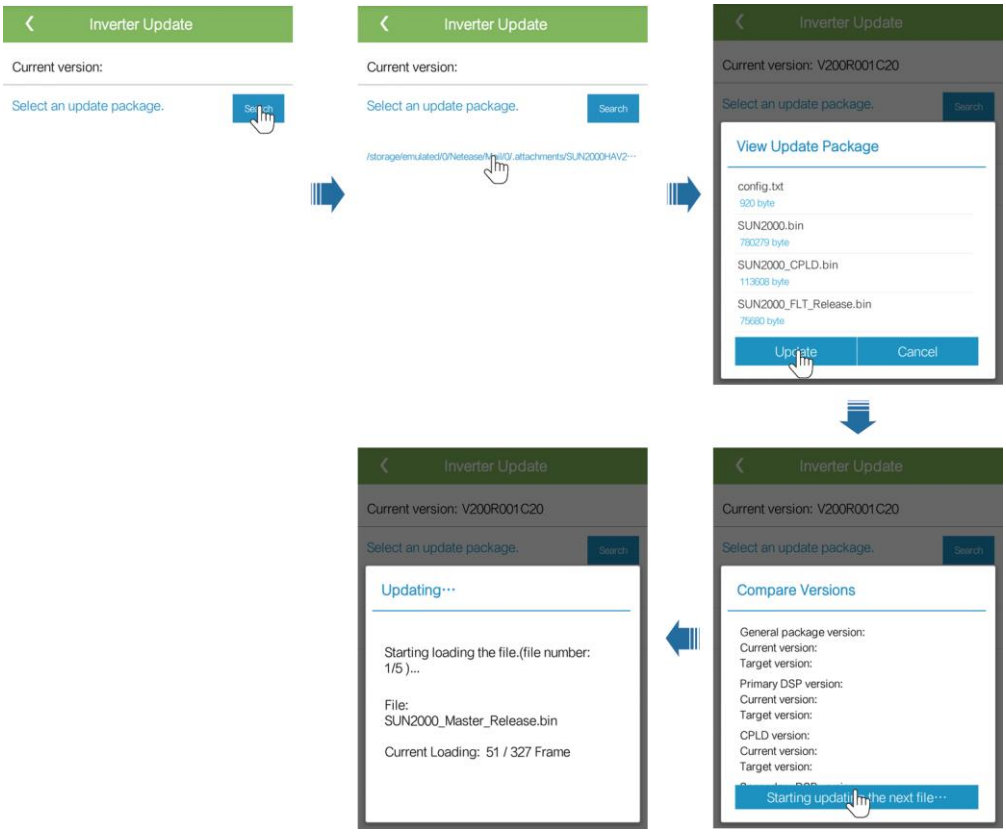
Figure 7-31 SUN2000 upgrade



----End

7.1.6.4 Device Logs

Context

Tap **Device logs** to export operation logs, as well as alarm records and energy yield information of the SUN2000 from the mobile phone.

Procedure

Step 1 Choose **Function Menu** > **Device logs**. The device log screen is displayed.

- Select **Phone Log** to export and send logs by emails on the mobile phone.
- Select **Inverter Log** to export and send alarms and performance data logs by emails.

NOTE

- In the Android system, logs are saved in the **storage/emulated/0/sun2000app_download** file by default. You can modify the saving path by choosing **Function Menu** > **Settings** > **File save path**.
- In the iOS system, you can query the logs by choosing **Tool Kit** > **File Manager** > **Device Log**.

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Figure 7-32 Device logs

----End

7.1.7 Querying the Status

7.1.7.1 Querying Alarm Records

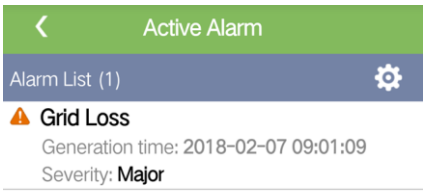
Procedure

Step 1 Choose **Function Menu** > **Alarm**, and tap an alarm record to view the details.

NOTE

- To set the alarm sorting mode for active alarms or historical alarms, tap .
- Tap to set a time criterion. The historical alarms generated within the time segment are displayed.

Figure 7-33 Alarm screen



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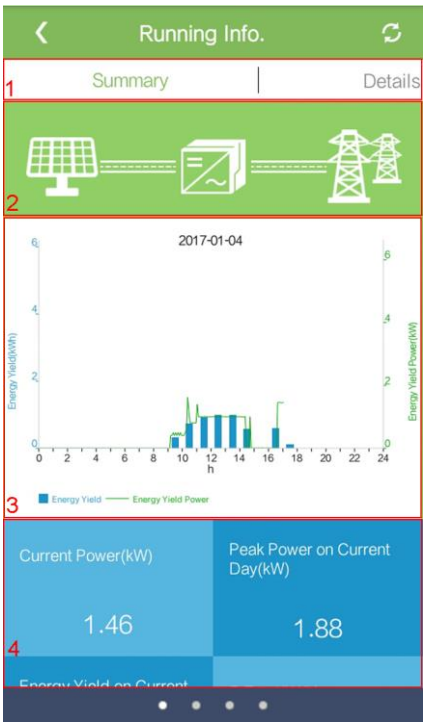
----End

7.1.7.2 Querying SUN2000 Running Information

Procedure

Step 1 Choose **Function Menu** > **Running Info.** to query the running information.

Figure 7-34 Running info



No.	Name	Description
1	Running information tabs	The **Summary**, **Details**, **Support**, and **Insulation Resistance** tab pages display relevant information about the SUN2000.
2	Power flow diagram	• Connection from PV strings to the SUN2000 • Connection from the SUN2000 to the power grid • If the SUN2000 has generated an alarm, is displayed on the screen. Tap to access the alarm screen and view the alarm.
3	Energy yield-Energy yield power histogram	Energy yield and energy yield power for each hour of the current day
4	Yield power, energy yield, and revenue	Power, energy yield, and revenue of the current day

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No.	Name	Description
	data	

----End

7.1.7.3 Querying Energy Yield Data

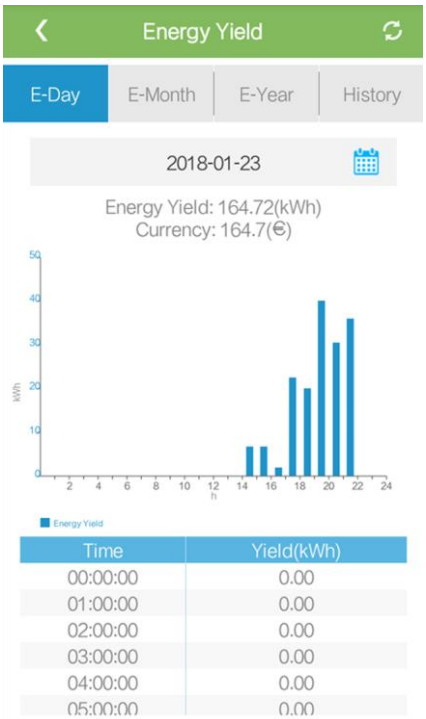
Procedure

Step 1 Choose **Function Menu** > **Energy Yield** to query the energy yield information.

NOTE

Tap to display the energy yield data based on day, month, or year, or display historical data.

Figure 7-35 Querying energy yield data



----End

7.1.7.4 Viewing System Version Information

Procedure

Step 1 Choose **Function Menu** > **About** to query the version information.

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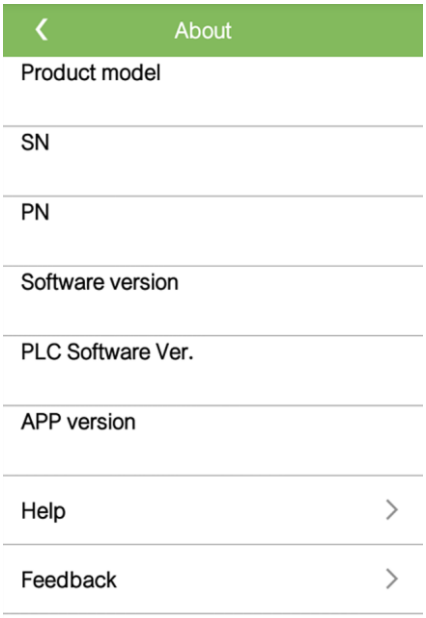
Figure 7-36 About



----End

7.1.8 Tool Kit

7.1.8.1 Scanning SN Bar Codes

Context

The SUN2000 SN bar codes are obtained in centralized mode. These bar codes help set up mapping between SUN2000 names and SN bar codes on the SmartLogger and assist the SmartLogger to communicate with SUN2000s and commission SUN2000s.

Procedure

Step 1 Tap **Tool Kit** on the app login screen.

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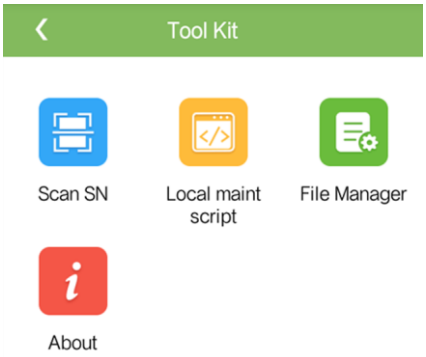
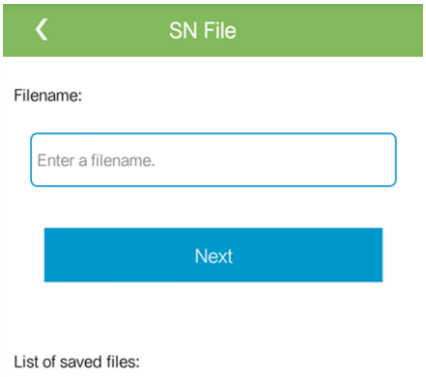
Figure 7-37 Tool kit



Step 2 Tap **Scan SN**, enter a file name on the **SN File** screen, and tap **Next**.

Figure 7-38 SN file



NOTE
If the SN file already exists, open and scan the file.

Step 3 On the **SN List** screen, tap **Scan** or **Manual input** to record the SN bar code and SUN2000 name.

- Method 1: Scan
  a. Tap **Scan** to start scanning and ensure that the camera is about 15 cm away from the SN label or QR codes, and the red midline cuts the bar code horizontally.
  b. After scanning, enter the device number at the back of the scanned label on the **SN Details** screen.
- Method 2: Manual input
  a. Tap **Manual input**. On the **SN Details** screen, enter the SN bar code and the SUN2000 name at the back of the label.
  b. Tap **OK** to save the SN information.

----End

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Follow-up Procedure

Upload the scanned information file to the PC and rename the file as **DeviceInfo.csv**, which provides information when changing the device name and device address on the SmartLogger. For detailed operations, see the *SmartLogger2000 User Manual*.

7.1.8.2 SUN2000 Maintenance Script

Context

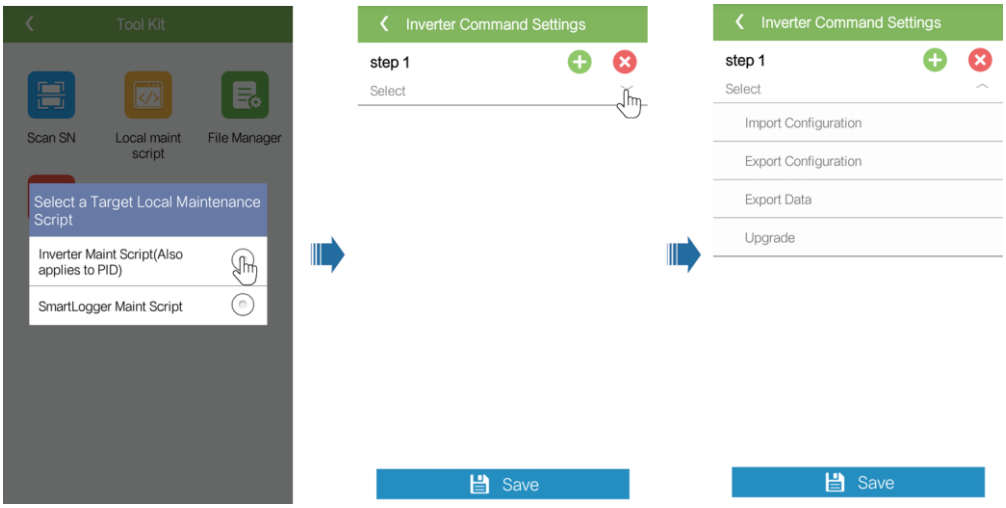
The SUN2000 maintenance script is used to set SUN2000 commands. After the script file is copied to the USB flash drive, the SUN2000 executes the maintenance script to import or export configuration, export data, and upgrade devices.

Procedure

Step 1 On the app login screen, choose **Tool Kit** > **Local maint script** > **Inverter Maint Script (Also applies to PID)**. The **Inverter Command Settings** screen will be displayed.

- Tap and select an operation as required.
- Tap to add steps.

Figure 7-39 Selecting the target local maintenance script



Step 2 Tap **Save**, enter the user name and password for logging in to the app, and then tap **OK** to save the maintenance script on the mobile phone.

----End

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7.1.8.3 File Manager

Context

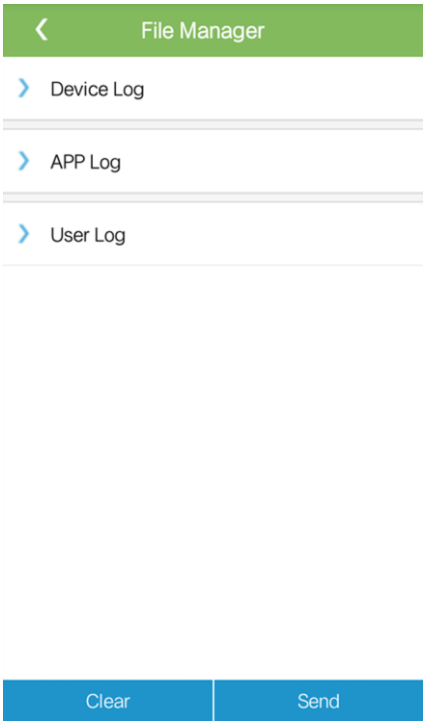
The file manager manages app operation logs, device logs, and generated script files and configuration files. You can delete the logs and files, send them to your mailbox.

Procedure

Step 1 On the app login screen, tap **Tool Kit** > **File Manager** to enter the **File Manager** screen.

- To delete log files, select one or more files and then tap **Clear**.
- To send files to your mailbox, select one or more files and tap **Send**.

Figure 7-40 File manager



----End

7.1.8.4 About

Context

This screen allows you to query the app version, privacy policy, and open source software policy, and to submit your advice and suggestions through text, pictures, or files.

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NOTE

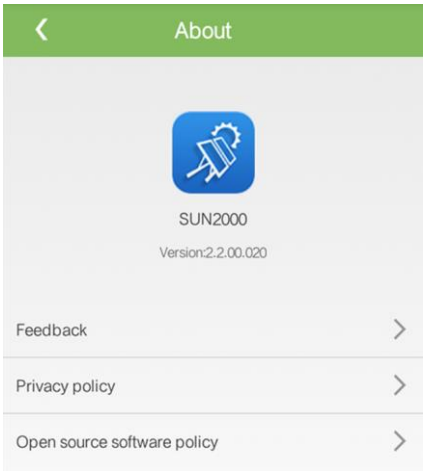
When the app starts for the first time after being downloaded or updated, the privacy policy is displayed. You can use the app only after agreeing to the privacy policy, and the privacy policy will no longer appear. If you do not agree to the privacy policy, the app exits, and the privacy policy is still displayed when you start the app next time until you agree to the privacy policy.

Procedure

Step 1 On the app login screen, choose **Tool Kit** > **About** to access the **About** screen.

- Tap **Feedback** to provide feedback in app use.
- Tap **Privacy policy** to view the privacy policy.
- Tap **Open source software policy** to view the open source software policy.

Figure 7-41 About



----End

7.2 Operations with a USB Flash Drive

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

7.2.1 Exporting Configurations

Procedure

Step 1 Click **Inverter Command Settings** on the SUN2000 app to generate a boot script file, as shown in 7.1.8.2 SUN2000 Maintenance Script.

Step 2 Import the boot script file to a PC.

(Optional) The boot script file can be opened as a .txt file, as shown in Figure 7-42.

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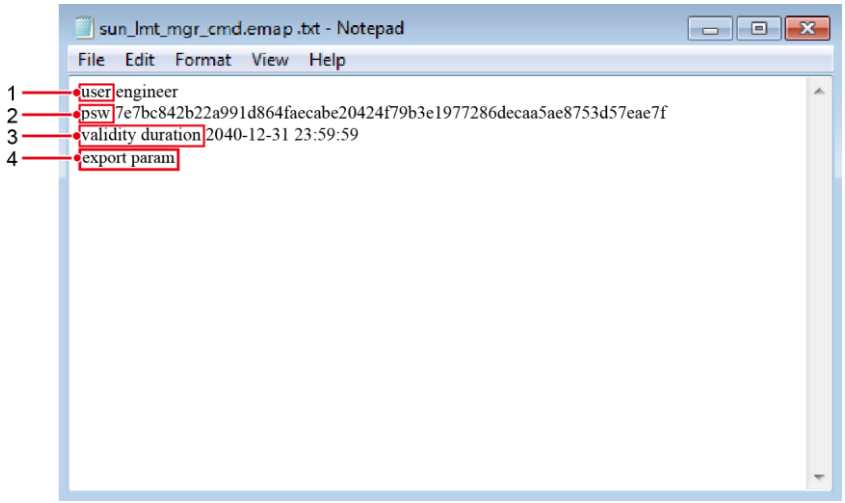
Figure 7-42 Boot script file



No.	Meaning	Remarks
1	User name	• Advanced user: engineer • Special user: admin
2	Ciphertext	The ciphertext varies depending on the login password of the SUN2000 APP.
3	Script validity period	-
4	Command	Different command settings can produce different commands. • Configuration export command: **export param**. • Configuration import command: **import param**. • Data export command: **export log**. • Upgrade command: **upgrade**.

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

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

NOTICE

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

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Table 7-12 LED indicator description

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

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

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

----End

7.2.2 Importing Configurations

Prerequisites

A complete configuration file has been exported.

Procedure

Step 1 Click **Inverter Command Settings** on the SUN2000 app to generate a boot script file, as shown in 7.1.8.2 SUN2000 Maintenance Script.

Step 2 Import the boot script file to a PC.

Step 3 Replace the exported boot script file in the root directory of the USB flash drive with the imported one.

NOTICE

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

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

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NOTICE

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

Table 7-13 LED indicator description

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

----End

7.2.3 Exporting Data

Procedure

Step 1 Click **Inverter Command Settings** on the SUN2000 app to generate a boot script file, as shown in 7.1.8.2 SUN2000 Maintenance Script.

Step 2 Import the boot script file to the root directory of a USB flash drive.

Step 3 Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.

NOTICE

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

Table 7-14 LED indicator description

LED Indicator	Status	Meaning
	Green off	There is no operation with a USB flash drive.

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LED Indicator	Status	Meaning
	Blinking green at long intervals (on for 1s and then off for 1s)	There is an operation with a USB flash drive.
	Blinking green at short intervals (on for 0.125s and then off for 0.125s)	An operation with a USB flash drive has failed.
	Steady green	An operation with a USB flash drive is successful.

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

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

----End

7.2.4 Upgrading

Procedure

Step 1 Download the required software upgrade package from the technical support website. SUN2000HA V200R001C00SPC*XXX* is used as an example here.

Step 2 Decompress the upgrade package.

NOTICE

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

Step 3 Click **Inverter Command Settings** on the SUN2000 app to generate a boot script file, as shown in 7.1.8.2 SUN2000 Maintenance Script.

Step 4 Import the boot script file to a PC.

Step 5 Replace the boot script file (sun_lmt_mgr_cmd.emap) in the upgrade package with the one generated by the SUN2000 app.

Step 6 Copy the extracted files to the root directory of the USB flash drive.

Step 7 Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.

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NOTICE

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

Table 7-15 LED indicator description

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

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

----End

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8 Maintenance

8.1 Powering Off the SUN2000

Context

WARNING

- If two SUN2000s share the same AC switch on the AC side, power off the two SUN2000s.
- After the SUN2000 powers off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, put on protective gloves and begin servicing the SUN2000 15 minutes after the power-off.

Procedure

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

For details, see 7 Man-Machine Interactions, *SmartLogger2000 User Manual*, or *iManager NetEco 1000S User Manual*.

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

Step 3 Set the two DC switches to OFF.

----End

8.2 Routine Maintenance

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

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CAUTION

- Before cleaning the system, and maintaining the cable connections and grounding reliability, power off the system (see 8.1 Powering Off the SUN2000) and ensure that the two DC switches on the SUN2000 are OFF.
- If you need to open the maintenance compartment door in rainy or snowy days, take protective measures to prevent rain and snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door in rainy or snowy days.

Table 8-1 Maintenance list

Item	Check Method	Maintenance Interval
System cleanliness	Check periodically that the heat sinks are free from obstacles or dust.	Once six months to a year
System running status	• Check that the SUN2000 is not damaged or deformed. • Check that the running sound of the SUN2000 is normal. • When the SUN2000 is running, check that all SUN2000 parameters are correctly set.	Once six months
Cable connections	• Check that cables are securely connected. • Check that cables are intact, in particular, the parts touching the metallic surface are not scratched. • Check that the cover on the USB port is tightened. • Check that idle RESERVE and COM waterproof connectors are plugged and the locking caps are tightened.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year.
Grounding reliability	Check that ground cables are securely connected.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year.

8.3 Troubleshooting

Alarm severities are defined as follows:

- Major: The SUN2000 enters Shutdown mode and stops exporting power to the power grid due to a fault.

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- Minor: Some components are faulty but the SUN2000 can still export power to the power grid.
- Warning: The SUN2000 output power decreases 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	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. • Cause ID 1 corresponds to PV strings 1 and 2. • Cause ID 2 corresponds to PV strings 3 and 4. • Cause ID 3 corresponds to PV strings 5 and 6. • Cause ID 4 corresponds to PV strings 7 and 8. • Cause ID 5 corresponds to PV strings 9 and 10. • Cause ID 6 corresponds to PV strings 11 and 12.	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.
2011	String Reverse Connection	Major	The PV string is reversely connected. Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.	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.
2012	String current backfeed	Warning	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. 2. The PV string is shaded. Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.	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. 2. Check the open-circuit voltage of the PV string. 3. Check that the PV string is not shaded.
2013	Abnormal String	Warning	1. The PV string has been shaded for a long time. 2. The PV string deteriorates	1. Check whether the current of the abnormal PV string is lower than the current of other

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Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
	Power		abnormally. Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.	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. 2. If the abnormal PV string is clean and not shaded, check whether the PV string is damaged.
2031	Phase Wire Short-Circuited to PE	Major	The impedance of the output phase wire to PE is low or the output phase wire is short-circuited to PE.	Check the impedance of the output phase wire to PE, locate the position with lower impedance, and rectify the fault.
2032	Grid Loss	Major	1. The power grid experiences an outage. 2. The AC circuit is disconnected or AC switch is off.	1. The alarm disappears automatically after the power grid recovers. 2. Check that the AC power cable is connected and that the AC switch is ON.
2033	Grid Undervoltage	Major	The grid voltage is below the lower threshold or the low voltage duration has lasted for more than the value specified by LVRT.	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. 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. 3. If the fault persists for a long time, check the AC circuit breaker and AC output power cable.
2034	Grid Overvoltage	Major	The grid voltage exceeds the higher threshold or the high voltage duration has lasted for more than the value specified by HVRT.	1. Check whether the grid connection voltage exceeds the upper threshold. If yes, contact the local power operator. 2. If you have confirmed that the grid connection voltage exceeds the upper threshold and obtained the consent of the

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Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
				local power operator, modify the overvoltage protection threshold. 3. Check that the peak grid voltage does not exceed the upper threshold.
2035	Grid Voltage Imbalance	Major	The difference between grid phase voltages exceeds the upper threshold.	1. Check that the grid voltage is within the normal range. 2. Check the connection of the AC output power cable. If the cable connection is proper but the alarm occurs frequently and affects the power production of the PV plant, contact the local power operator.
2036	Grid Overfrequency	Major	Power grid exception: The actual grid frequency is higher than the requirement of the local power grid standard.	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. 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.
2037	Grid Underfrequency	Major	Power grid exception: The actual power grid frequency is lower than the standard requirement for the local power grid.	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. 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.

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Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
2038	Unstable Grid Frequency	Major	Power grid exception: The actual grid frequency change rate does not comply with the local power grid standard.	1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator.
2039	Output Overcurrent	Major	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.	1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 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.
2040	Output DC Component Overhigh	Major	The DC component of the SUN2000 output current exceeds the specified upper threshold.	1. If the exception is caused by an external fault, the SUN2000 automatically recovers after the fault is rectified. 2. If the alarm occurs frequently and affects the power production of the PV plant, contact Huawei technical support.
2051	Abnormal Residual Current	Major	The insulation impedance of the input side to PE decreases when the SUN2000 is operating.	1. If the alarm occurs accidentally, the external power cable may be abnormal temporarily. The SUN2000 automatically recovers after the fault is rectified. 2. If the alarm occurs frequently or persists, check that the impedance between the PV string and ground is not below the lower threshold.
2061	Abnormal Grounding	Major	1. The PE cable for the SUN2000 is not connected. 2. The SUN2000 output side does not connect to an isolation transformer when the PV string output is	1. Check that the PE cable for the SUN2000 is connected properly. 2. If the PV string output is grounded, check that the

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Alarm ID	Alarm Name	Alarm Severity	Cause	Measures
			grounded.	SUN2000 output side connects to an isolation transformer.
2062	Low Insulation Resistance	Major	1. The PV string is short-circuited to PE. 2. The PV string has been in a moist environment for a long time and the power cable is not well insulated to ground.	1. Check the impedance between the PV string and the PE cable. If a short circuit occurs, rectify the fault. 2. Check that the PE cable for the SUN2000 is correctly connected. 3. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, reset **Insulation resistance protection**.
2063	Cabinet Overtemperature	Major	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	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 15 minutes. If the fault persists, contact Huawei technical support.
2065	Upgrade Failed	Minor	The upgrade ends abnormally.	1. Perform an upgrade again. 2. If the upgrade fails several times, contact your dealer.
2066	License Expired	Warning	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	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.

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NOTE

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

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9 Handling the Inverter

9.1 Removing the SUN2000

NOTICE

Before removing the SUN2000, disconnect both AC and DC connections. For processes of disconnecting, see 8.1 Powering Off the SUN2000.

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.

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10 Technical Data

10.1 SUN2000-(90KTL, 95KTL) Series Technical Data

Efficiency

Item	SUN2000-90KTL-H0	SUN2000-90KTL-H1	SUN2000-90KTL-H2	SUN2000-95KTL-INH0	SUN2000-95KTL-INH1
Maximum efficiency	99.00%				
Chinese efficiency	N/A	N/A	N/A	N/A	N/A
EU efficiency	98.80%	98.80%	98.80%	98.80%	98.80%

Input

Item	SUN2000-90KTL-H0	SUN2000-90KTL-H1	SUN2000-90KTL-H2	SUN2000-95KTL-INH0	SUN2000-95KTL-INH1
Maximum input power	102,000 W	102,000 W	102,000 W	102,000 W	112,200 W
Maximum input voltage	1500 V	1500 V	1500 V	1500 V	1500 V
Maximum input current (per MPPT)	22 A	22 A	25 A	22 A	25 A
Maximum short-circuit current (per MPPT)	33 A				
Maximum backfeed current to the	0 A				

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Item	SUN2000-90K TL-H0	SUN2000-90K TL-H1	SUN2000-90K TL-H2	SUN2000-95K TL-INH0	SUN2000-95K TL-INH1
PV array					
Lowest operating/startup voltage	600/650 V				
Operating voltage range	600–1500 V				
Full-load MPPT voltage range	880–1300 V				
Rated input voltage	1080 V				
Number of inputs	12				
Number of MPP trackers	6				

Output

Item	SUN2000-90K TL-H0	SUN2000-90K TL-H1	SUN2000-90K TL-H2	SUN2000-95K TL-INH0	SUN2000-95K TL-INH1
Rated active power	90 kW	90 kW	90 kW	90 kW	90 kW
Maximum apparent power	100 kVA	100 kVA	100 kVA	100 kVA	110 kVA
Maximum active power (cosφ = 1)	100 kW	100 kW	100 kW	100 kW	110 kW
Rated output voltage	800 V AC, 3W+PE				
Rated output current	65.0 A	65.0 A	65.0 A	65.0 A	65.0 A
Adapted power grid frequency	50/60 Hz				
Maximum output current	72.9 A	72.9 A	72.9 A	72.9 A	80.2 A
Power factor	0.8 leading... 0.8 lagging				
Maximum total harmonic distortion (rated power)	< 3%				

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Protection

Item	SUN2000-90K TL-H0	SUN2000-90K TL-H1	SUN2000-90K TL-H2	SUN2000-95K TL-INH0	SUN2000-95K TL-INH1
Input DC switch	Supported				
Anti-islanding protection	Supported				
Output overcurrent protection	Supported				
Input reverse connection protection	Supported				
PV string fault detection	Supported				
DC surge protection	Type II				
AC surge protection	Type II				
Insulation resistance detection	Supported				
Residual current monitoring	Supported				

Display and Communication

Item	SUN2000-90K TL-H0	SUN2000-90K TL-H1	SUN2000-90K TL-H2	SUN2000-95K TL-INH0	SUN2000-95K TL-INH1
Display	LED indicator, Bluetooth module+app, USB data cable+app				
RS485	Supported				
PLC	Supported				

Common Parameters

Item	SUN2000-90K TL-H0	SUN2000-90K TL-H1	SUN2000-90K TL-H2	SUN2000-95K TL-INH0	SUN2000-95K TL-INH1
Dimensions (W	1075 mm x 605 mm x 310 mm				

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Item	SUN2000-90KTL-H0	SUN2000-90KTL-H1	SUN2000-90KTL-H2	SUN2000-95KTL-INH0	SUN2000-95KTL-INH1
x H x D)					
Net weight	76±1 kg	76±1 kg	79±1 kg	76±1 kg	79±1 kg
Operating temperature	–25°C to +60°C				
Cooling mode	Natural convection				
Highest operating altitude	4000 m				
Operating relative humidity	0%–100% RH				
Input terminal	Amphenol UTX				
Output terminal	Cable gland + OT/DT terminal				
Overvoltage level	II (DC)/III (AC)				
IP rating	IP65				
Protection level	I				
Pollution degree	III				

10.2 SUN2000-(100KTL, 105KTL) Series Technical Data

Efficiency

Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
Maximum efficiency	99.00%			
Chinese efficiency	98.55%	N/A	98.55%	N/A
EU efficiency	98.80%	98.80%	98.80%	98.80%

Input

Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
Maximum input	112,200 W	107,100 W	112,200 W	118,400 W

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Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
power				
Maximum input voltage	1500 V	1500 V	1500 V	1500 V
Maximum input current (per MPPT)	22 A	22 A	25 A	25 A
Maximum short-circuit current (per MPPT)	33 A			
Maximum backfeed current to the PV array	0 A			
Lowest operating/startup voltage	600/650 V			
Operating voltage range	600–1500 V			
Full-load MPPT voltage range	880–1300 V			
Rated input voltage	1080 V			
Number of inputs	12			
Number of MPP trackers	6			

Output

Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
Rated active power	100 kW	100 kW	100 kW	105 kW
Maximum apparent power	110 kVA	105 kVA	110 kVA	116 kVA
Maximum active power (cosφ = 1)	110 kW	105 kW	110 kW	116 kW
Rated output voltage	800 V AC, 3W+PE			
Rated output current	72.2 A	72.2 A	72.2 A	75.8 A
Adapted power grid frequency	50 Hz/60 Hz			
Maximum output	80.2 A	80.2 A	80.2 A	84.6 A

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Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
current				
Power factor	0.8 leading... 0.8 lagging			
Maximum total harmonic distortion (rated power)	< 3%			

Protection

Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
Input DC switch	Supported			
Anti-islanding protection	Supported			
Output overcurrent protection	Supported			
Input reverse connection protection	Supported			
PV string fault detection	Supported			
DC surge protection	Type II			
AC surge protection	Type II			
Insulation resistance detection	Supported			
Residual current monitoring	Supported			

Display and Communication

Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
Display	LED, Bluetooth module + app, USB data cable + app			
RS485	Supported			
PLC	Supported			

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Common Parameters

Item	SUN2000-100KTL-H0	SUN2000-100KTL-H1	SUN2000-100KTL-H2	SUN2000-105KTL-H1
Dimensions (W x H x D)	1075 mm x 605 mm x 310 mm			
Net weight	76±1 kg	76±1 kg	79±1 kg	79±1 kg
Operating temperature	–25°C to +60°C			
Cooling mode	Natural convection			
Highest operating altitude	4000 m			
Operating relative humidity	0%–100% RH			
Input terminal	Amphenol UTX			
Output terminal	Cable gland + OT/DT terminal	• With the terminal clamp: cable gland + terminal clamp • With the OT/DT terminal: cable gland + OT/DT terminal	Cable gland + OT/DT terminal	Cable gland + OT/DT terminal
Overvoltage level	II (DC)/III (AC)			
IP rating	IP65			
Protection level	I			
Pollution degree	III			

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A Grid Codes

Set the correct grid code based on the application area and scenario of the SUN2000.

Table A-1 Grid codes

No.	Grid Code	Remarks	SUN2000-90KTL-H0	SUN2000-90KTL-H1/SUN2000-90KTL-H2	SUN2000-95KTL-INH0/SUN2000-95KTL-INH1	SUN2000-100KTL-H0/SUN2000-100KTL-H2	SUN2000-100KTL-H1/SUN2000-105KTL-H1
1	CHINA_MV800	China medium-voltage power grid	N/A	N/A	N/A	Supported	N/A
2	G59-England-MV800	G59 medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
3	AS4777-MV800	Australia medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
4	INDIA-MV800	India medium-voltage power grid	Supported	Supported	Supported	N/A	Supported
5	IEC61727-MV800	IEC61727 medium-voltage power grid (50 Hz)	Supported	Supported	Supported	N/A	Supported
6	BDEW-MV800	Germany medium-voltage power grid	Supported	Supported	N/A	N/A	Supported

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No.	Grid Code	Remarks	SUN2000-90KTL-H0	SUN2000-90KTL-H1/SUN2000-90KTL-H2	SUN2000-95KTL-INH0/SUN2000-95KTL-INH1	SUN2000-100KTL-H0/SUN2000-100KTL-H2	SUN2000-100KTL-H1/SUN2000-105KTL-H1
7	ABNT NBR 16149-MV800	Brazil medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
8	UTE C 15-712-1-MV800	France medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
9	Chile-MV800	Chile medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
10	Mexico-MV800	Mexico medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
11	TAI-PEA-MV800	Thailand PEA medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
12	Philippines-MV800	Philippines medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
13	Malaysian-MV800	Malaysia medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
14	SA_RPPs-MV800	South Africa RPPs medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
15	Jordan-Transmission-MV800	Jordan power transmission network medium-voltage power grid	N/A	Supported	N/A	N/A	N/A

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No.	Grid Code	Remarks	SUN2000-90KTL-H0	SUN2000-90KTL-H1/SUN2000-90KTL-H2	SUN2000-95KTL-INH0/SUN2000-95KTL-INH1	SUN2000-100KTL-H0/SUN2000-100KTL-H2	SUN2000-100KTL-H1/SUN2000-105KTL-H1
16	Jordan-Distribution-MV800	Jordan power distribution network medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
17	Egypt ETEC-MV800	Egypt medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
18	DUBAI-MV800	Dubai medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
19	SAUDI-MV800	Saudi Arabia medium-voltage power grid	Supported	Supported	N/A	N/A	N/A
20	CLC/TS50549_IE-MV800	Ireland medium-voltage power grid (CLC/TS50549)	N/A	N/A	N/A	N/A	Supported
21	Northern Ireland-MV800	Northern Ireland medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
22	CEI0-21-MV800	Italy medium-voltage power grid (CEI0-21)	N/A	N/A	N/A	N/A	Supported
23	IEC 61727-MV800-60Hz	IEC61727 medium-voltage power grid (60 Hz)	Supported	Supported	Supported	N/A	Supported

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No.	Grid Code	Remarks	SUN2000-90KTL-H0	SUN2000-90KTL-H1/SUN2000-90KTL-H2	SUN2000-95KTL-INH0/SUN2000-95KTL-INH1	SUN2000-100KTL-H0/SUN2000-100KTL-H2	SUN2000-100KTL-H1/SUN2000-105KTL-H1
24	Pakistan-MV800	Pakistan medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
25	BRASIL-ANEEL-MV800	Brazil medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
26	Israel-MV800	Israel medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
27	CEI0-16-MV800	Italy medium-voltage power grid (CEI0-16)	N/A	Supported	N/A	N/A	Supported
28	ZAMBIA-MV800	Zambia medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
29	KENYA_ETHIOPIA_MV800	Kenya low-voltage and Ethiopia medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
30	NAMIBIA_MV800	Namibia medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
31	Cameroon-MV800	Cameroon medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
32	NIGERIA-MV800	Nigeria medium-voltage power grid	N/A	Supported	N/A	N/A	Supported

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No.	Grid Code	Remarks	SUN2000-90KTL-H0	SUN2000-90KTL-H1/SUN2000-90KTL-H2	SUN2000-95KTL-INH0/SUN2000-95KTL-INH1	SUN2000-100KTL-H0/SUN2000-100KTL-H2	SUN2000-100KTL-H1/SUN2000-105KTL-H1
33	ABUDHABI-MV800	Abu Dhabi medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
34	LEBANON-MV800	Lebanon medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
35	ARGENTINA-MV800	Argentina medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
36	Jordan-Transmission-HV800	Jordan high-voltage power grid	N/A	Supported	N/A	N/A	N/A
37	TUNISIA-MV800	Tunisia medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
38	AUSTRALIA-NER-MV800	Australia NER medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
39	VDE-AR-N4120_HV800	VDE4120 power grid	Supported	Supported	N/A	N/A	Supported
40	IEEE 1547-MV800	IEEE 1547 power grid	Supported	Supported	Supported	N/A	Supported
41	RD1699/661-MV800	Spain medium-voltage power grid (RD1699/661)	N/A	N/A	N/A	N/A	Supported
42	PO12.3-MV800	Spain medium-voltage power grid (PO12.3)	N/A	N/A	N/A	N/A	Supported

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No.	Grid Code	Remarks	SUN2000-90KTL-H0	SUN2000-90KTL-H1/SUN2000-90KTL-H2	SUN2000-95KTL-INH0/SUN2000-95KTL-INH1	SUN2000-100KTL-H0/SUN2000-100KTL-H2	SUN2000-100KTL-H1/SUN2000-105KTL-H1
43	Vietnam-MV800	Vietnam medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
44	CHILE-PMGD-MV800	Chile PMGD medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
45	GHANA-MV800	Ghana medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
46	TAIPOWER-MV800	Taiwan power medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
47	OMAN-MV800	Oman medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
48	KUWAIT-MV800	Kuwait medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
49	BANGLADESH-MV800	Bangladesh medium-voltage power grid	N/A	Supported	N/A	N/A	N/A
50	BAHRAIN-MV800	Bahrain medium-voltage power grid	N/A	Supported	N/A	N/A	Supported
51	KAZAKHSTAN-MV800	Kazakhstan medium-voltage power grid	N/A	N/A	N/A	N/A	Supported
52	Mauritius-MV800	Mauritius medium-voltage power grid	N/A	N/A	N/A	N/A	Supported

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NOTE

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

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B Acronyms and Abbreviations

C	
CCO	central controller
CEC	California Energy Commission
CPV	Concentrated Photovoltaics technology
L	
LED indicators	light emitting diode
M	
MPP	maximum power point
MPPT	maximum power point tracking
P	
PID	potential induced degradation
PLC	power line communication
PV	photovoltaic
R	
RCMU	residual current monitoring unit
W	
WEEE	waste electrical and electronic equipment

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