LUNA2000-(2507, 5015) Series Commercial and Industrial Solution

User Manual

Issue	01
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About This Document

Purpose

This document describes the networking architecture, communication logic, and operation and maintenance (O&M) methods of the LUNA2000-(2507, 5015) series commercial and industrial (C&I) solution, as well as the installation, cable connection, check and preparation before power-on, system power-on commissioning, power-off, and power-on operations.

The safety precautions, product introduction, site selection requirements, and maintenance information of the devices involved in the solution are described in the user manuals or maintenance manuals of the corresponding devices. For details, see **B Reference Documents**.

Statement

In this document, LUNA only refers to specific models of Huawei Smart String Grid Forming ESS and Smart PCS.

Intended Audience

This document is intended for:

- Technical support engineers
- Hardware installation engineers
- Commissioning engineers

Symbol Conventions

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

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

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

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2026-04-15)

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

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Safety Information

Statement

Before transporting, storing, installing, operating, using, and/or maintaining the equipment, read this document, strictly follow the instructions provided herein, and follow all the safety instructions on the equipment and in this document. In this document, "equipment" refers to the products, software, components, spare parts, and/or services related to this document; "the Company" refers to the manufacturer (producer), seller, and/or service provider of the equipment; "you" refers to the entity that transports, stores, installs, operates, uses, and/or maintains the equipment.

The **Danger**, **Warning**, **Caution**, and **Notice** statements described in this document do not cover all the safety precautions. You also need to comply with relevant international, national, or regional standards and industry practices. **The Company shall not be liable for any consequences that may arise due to violations of safety requirements or safety standards concerning the design, production, and usage of the equipment.**

The equipment shall be used in an environment that meets the design specifications. Otherwise, the equipment may be faulty, malfunctioning, or damaged, which is not covered under the warranty. The Company shall not be liable for any property loss, personal injury, or even death caused thereby.

Comply with applicable laws, regulations, standards, and specifications during transportation, storage, installation, operation, use, and maintenance.

Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.

The Company shall not be liable for any of the following circumstances or their consequences:

- Equipment damage due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions
- Operation beyond the conditions specified in this document
- Installation or use in environments that do not comply with international, national, or regional standards
- Installation or use by unqualified personnel

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- Failure to follow the operation instructions or safety precautions on the product or in this document
- Unauthorized modifications to the product or software code or removal of the product
- Damage caused during transportation by you or a third party authorized by you
- Storage conditions that do not meet the requirements specified in this document
- Failure to comply with local laws, regulations, or related standards due to the materials and tools prepared by you
- Damage caused by your or a third party's negligence, intentional breach, gross negligence, or improper operations or damage not caused by the Company

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1 Solution Introduction

1.1 Solution Architecture

The LUNA2000-(2507, 5015) series Smart String ESS applies to the C&I scenario to implement time-of-use (TOU) arbitrage, peak shaving, power boost, and charge/discharge based on third-party dispatch. The on-grid ESS-only system and on-grid PV+ESS system are supported.

1.1.1 On-Grid ESS-Only System

Figure 1-1 shows the networking architecture of the on-grid ESS-only system. **Table 1-1** lists the components.

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Figure 1-1 Networking architecture of the on-grid ESS-only system

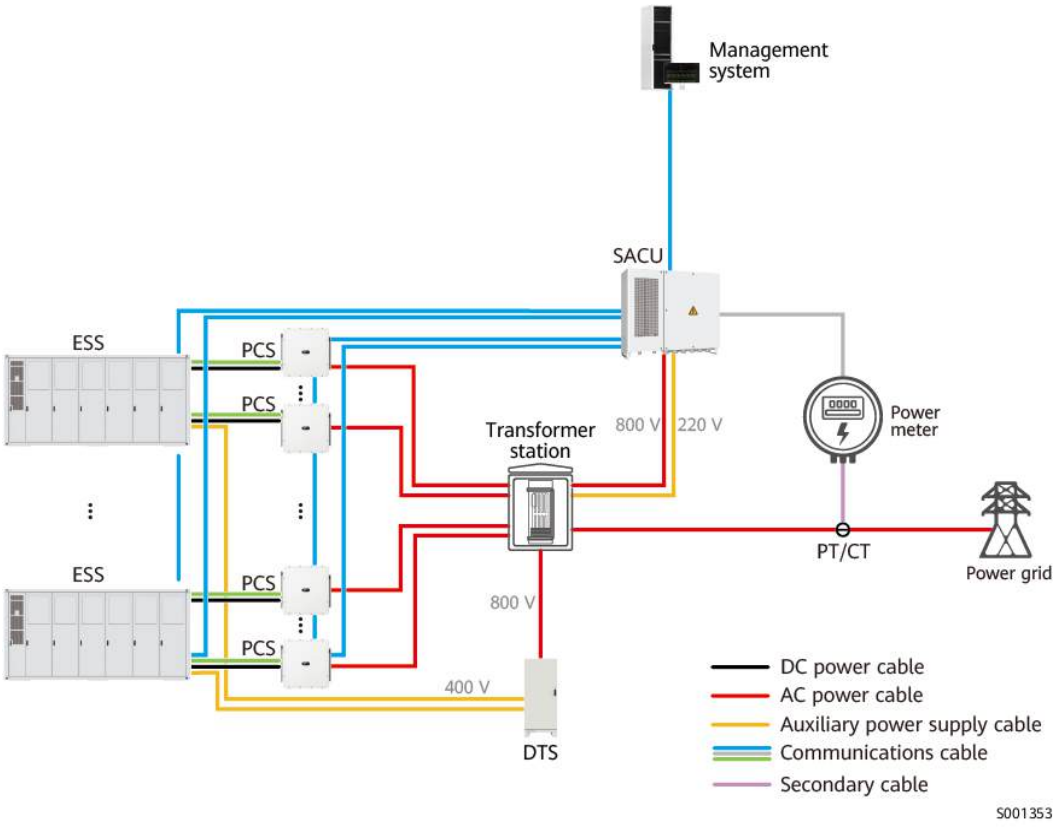

Table 1-1 Components of the on-grid ESS-only system

Device	Model	Remarks
ESS	• LUNA2000-5015-2S • LUNA2000-2507-2S	Purchased from the Company.
PCS	LUNA2000-213KTL-H0	Purchased from the Company.
SACU	SACU2000D-D-11	Purchased from the Company. With built-in SmartLogger, SmartModule, and two network switches (each has four optical ports and eight electrical ports).
Transformer station	-	Purchased by the customer from a third-party vendor.
DTS	• DTS-200K-D0 • DTS-200K-NHD0	Purchased from the Company or other vendors.
Management system	• Local management system (SPMS2000) • Cloud management system	Purchased from the Company or a third-party energy management system (EMS) vendor. • If the ESS capacity is ≥ 20 MWh, use the local management system. • If the ESS capacity is < 20 MWh, use the cloud management system.

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Device	Model	Remarks
Power meter	• DTSU666-HW • YDS60-80 • DHSU1079-ZT • DTSU71C	Purchased from the Company.

1.1.2 On-Grid PV+ESS System

Figure 1-2 shows the networking architecture of the on-grid PV+ESS system. Table 1-2 lists the components.

Figure 1-2 Networking architecture of the on-grid PV+ESS system

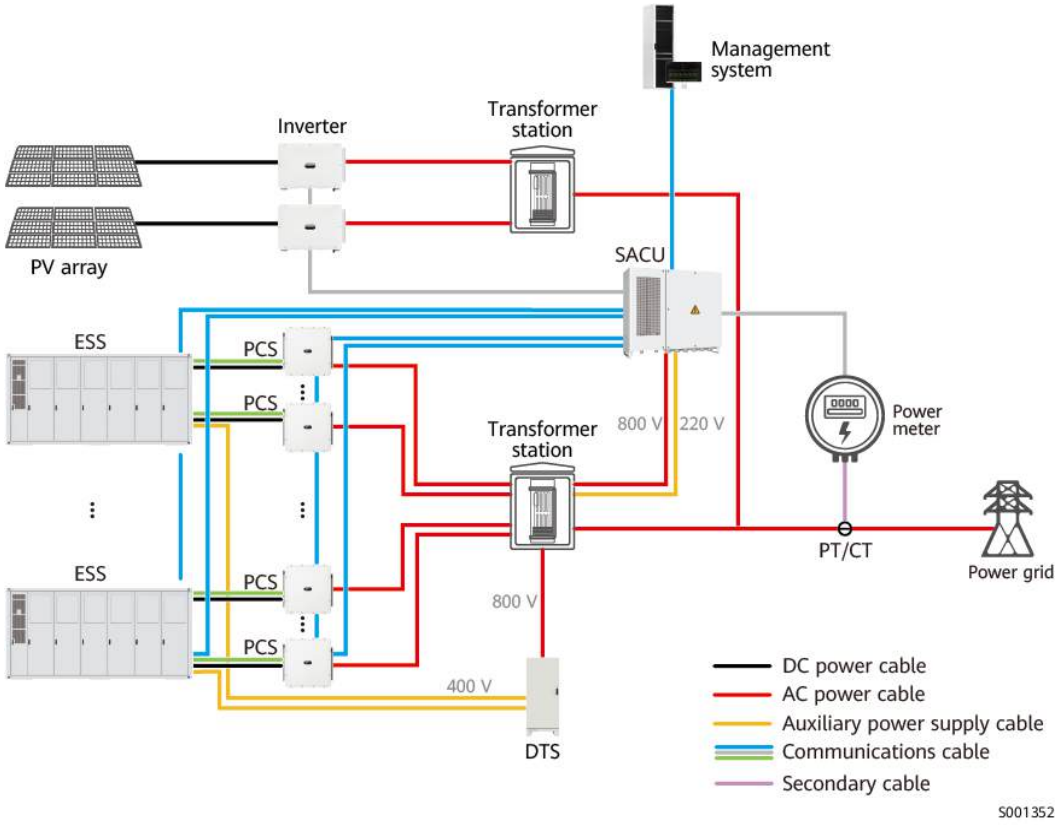

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Table 1-2 Components of the on-grid PV+ESS system

Device	Model	Remarks
Inverter	• C&I inverter – SUN2000-20KTL-M3 – SUN2000-29.9KTL-M3 – SUN2000-30KTL-M3 – SUN2000-33KTL-NH – SUN2000-36KTL-M3 – SUN2000-40KTL-M3 – SUN2000-40KTL-NH – SUN2000-43KTL-INM3 – SUN2000-50KTL-M3 – SUN2000-30K-MC0 – SUN2000-40K-MC0 – SUN2000-50K-MC0 – SUN2000-50KTL-ZHM3 – SUN2000-33KTL-NHM3 – SUN2000-40KTL-NHM3 – SUN2000-50KTL-NHM3 – SUN2000-50KTL-JPM0 – SUN2000-50KTL-M0 – SUN2000-60KTL-M0 – SUN2000-63KTL-JPM0 – SUN2000-75KTL-M1 – SUN2000-111KTL-NHM0 – SUN2000-100KTL-M2 – SUN2000-110KTL-M2 – SUN2000-115KTL-M2 – SUN2000-150K-MG0-ZH – SUN5000-150K-MG0-ZH – SUN2000-50K-MGL0	Purchased from the Company. C&I inverters and utility-scale inverters shall not be used together. In this networking, the inverter does not support insulation resistance detection.

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Device	Model	Remarks
	– SUN2000-50K-MGL0-BR – SUN2000-75K-MGL0-BR – SUN2000-80K-MGL0 – SUN2000-150K-MG0 – SUN5000-150K-MG0 • Utility-scale inverter – SUN2000-196KTL-H3 – SUN2000-215KTL-H3 – SUN2000-215KTL-H0 – SUN2000-196KTL-H0 – SUN2000-125KTL-JPH0 – SUN2000-300KTL-H0 – SUN2000-330KTL-H1 – SUN2000-330KTL-H2 – SUN2000-280KTL-H0 – SUN2000-250KTL-H1 – SUN2000-250KTL-H3 – SUN2000-188KTL-NHH0	
ESS	• LUNA2000-5015-2S • LUNA2000-2507-2S	Purchased from the Company.
PCS	LUNA2000-213KTL-H0	Purchased from the Company.
SACU	SACU2000D-D-11	Purchased from the Company. With built-in SmartLogger, SmartModule, and two network switches (each has four optical ports and eight electrical ports).
Transformer station	-	Purchased by the customer from a third-party vendor.
DTS	• DTS-200K-D0 • DTS-200K-NHD0	Purchased from the Company or other vendors.
Management system	• Local management system (SPMS2000) • Cloud management system	Purchased from the Company or a third-party energy management system (EMS) vendor. • If the plant capacity is ≥ 20 MWh, use the local management system. • If the plant capacity is < 20 MWh, use the cloud management system.

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Device	Model	Remarks
Power meter	• DTSU666-HW • YDS60-80 • DHSU1079-ZT • DTSU71C	Purchased from the Company.

1.2 Communication Networking

In this solution, one SACU (with built-in SmartLogger and SmartModule) manages multiple ESSs, PCSs, inverters, and one power meter to form a single array.

- The ESSs communicate with the SmartLogger over an FE ring network (Modbus-TCP). Each ESS ring network can connect to a maximum of eight ESSs, and a maximum of one ESS ring network is supported.
- The PCSs communicate with the SmartLogger over an FE ring network (Modbus-TCP + GOOSE). Each PCS ring network can connect to a maximum of 16 PCSs, and a maximum of three PCS ring networks are supported.
- The battery racks communicate with the PCSs through both CAN and dry contacts. The communications cables are connected based on the DC power cable connections between battery racks and PCSs.
- The inverters communicate with the SmartLogger over RS485 cascading. A maximum of 30 inverters can be connected to each route.
- The power meter is connected to the SmartModule over an RS485 cable and communicates with the SmartLogger over an FE network cable.

Figure 1-3 shows the communication logic between components. The SmartLogger can communicate with the management system through the northbound optical ports SFP1/SFP2 or an idle network port on SWITCH01.

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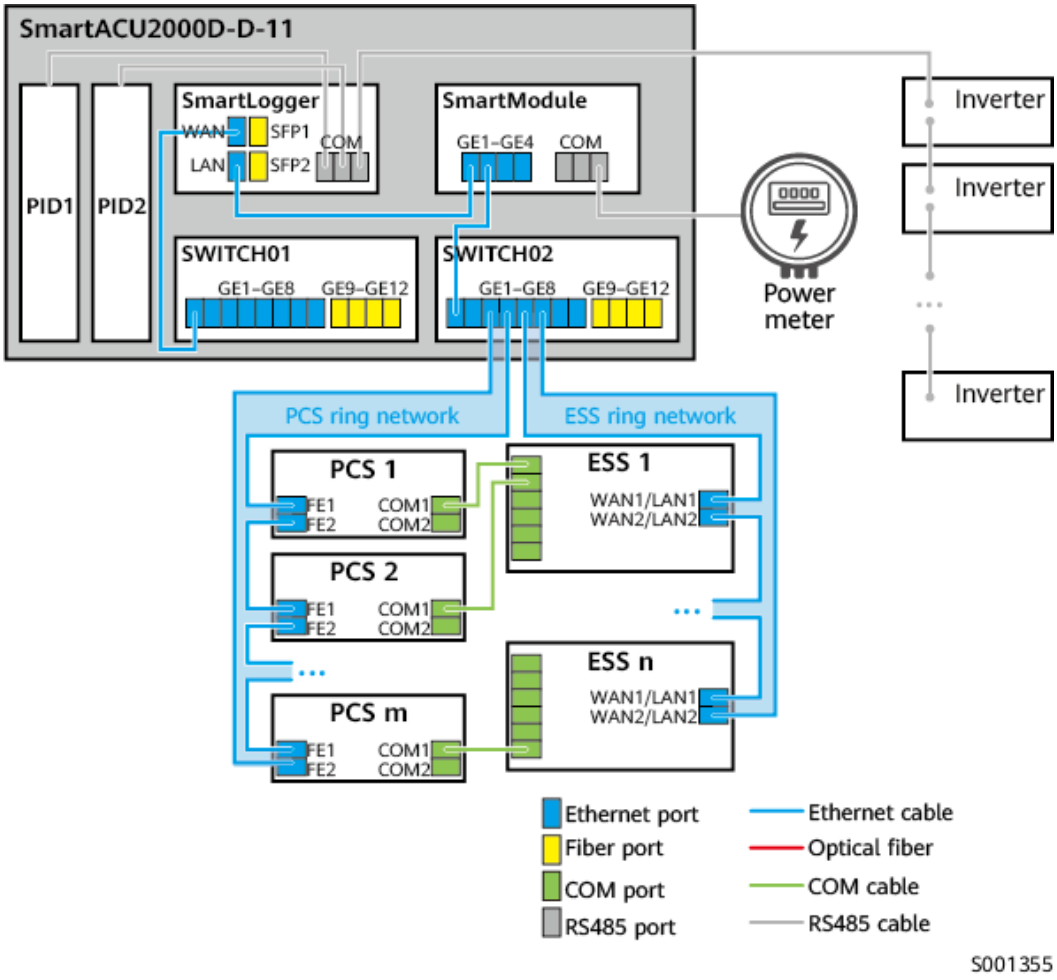
Figure 1-3 Array-level communication networking



NOTE

- For the SmartModule in the SACU, the GE1 and GE4 ports are used to connect to the SmartLogger, and the GE2 and GE3 ports are used to connect to the southbound ring network through a network switch. Ensure that these ports are used correctly.
- For the SmartModule in the ESS, the GE1 and GE4 ports are used to connect to the CMU, and the GE2 and GE3 ports are used to connect to the BCU ring network. Ensure that these ports are used correctly.

The following describes the cable connections between battery racks and the PCSs. The quantity of PCSs corresponding to each battery rack of the ESS shall be the same.

Table 1-3 Connecting communications cables between battery racks and PCSs

Solution	Connection Method
LUNA2000-5015-2S	

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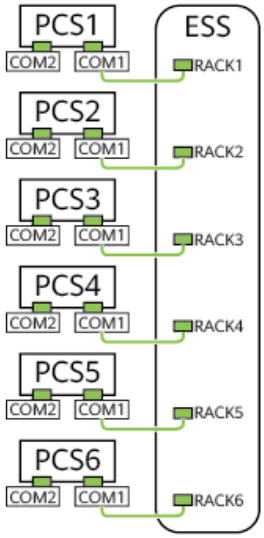
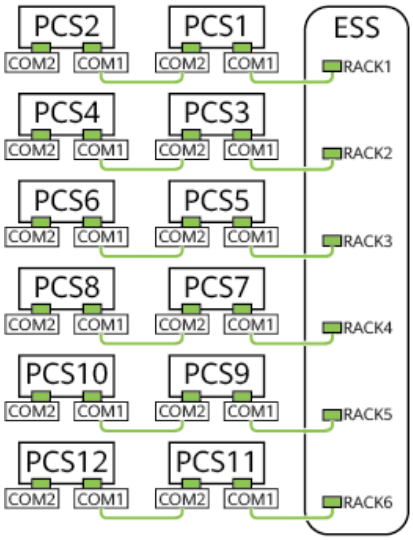
Solution	Connection Method
RACK:PCS = 1:1	
RACK:PCS = 1:2	
LUNA2000-2507-2S	

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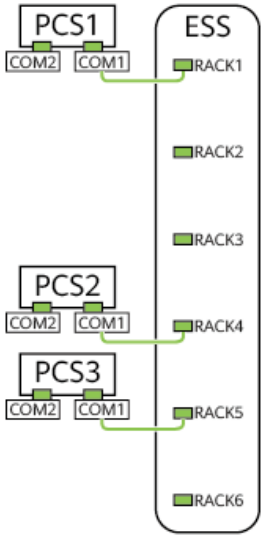
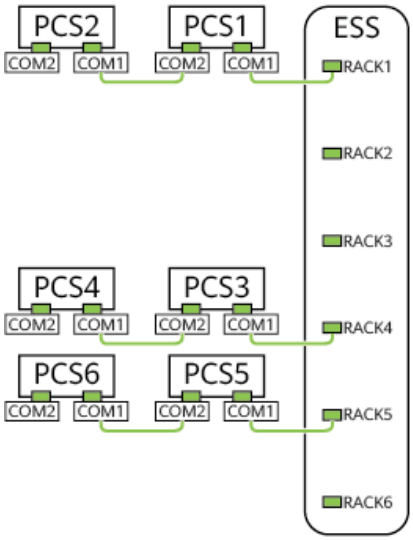
Solution	Connection Method
RACK:PCS = 1:1	
RACK:PCS = 1:2	

1.3 Technical Specifications

This solution supports multiple control modes, including TOU, self-consumption, and peak shaving. You can select one mode or combine multiple modes.

Function		Remarks
On-grid dispatch control	Time-of-use (TOU) arbitrage	• Charge: The ESS is charged at the fixed power within the charge time window. • Discharge: The total three-phase power within the discharge time window follows the load.

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Function		Remarks
	Peak shaving	Demand is controlled through instantaneous power. This feature can be used together with maximum self-consumption/TOU.
	Power boost	The power boost response time is ≤ 5s. This feature can be used together with maximum self-consumption/TOU.
	Maximum self-consumption	This feature cannot be used together with asymmetric phase feeding with feed-in limitation.
	Feed-in limitation	Feed-in limitation is based on three-phase power. This feature can be used together with maximum self-consumption/TOU and peak shaving/power boost.
	Charge/Discharge based on third-party dispatch	Three-phase active and reactive power dispatch is supported.

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2 O&M Methods

Table 2-1 O&M methods

O&M Method	Description	Main Application Scenario	Reference Document
SmartLogger WEB	A PC is connected to the SmartLogger to manage the ESSs, PCSs, inverters, and the meter in the array.	Deployment and commissioning	**SmartLogger3000 User Manual**
Management system	The management system is deployed on a local server or a public network. It displays the current and historical running status of power plants and supports intelligent alarm reporting, analysis, diagnosis, and O&M.	Viewing plant information and managing devices at a site after deployment and commissioning	-

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3 Installation and Cable Connection

This section describes the process, precautions, and connection relationships for installing devices and connecting cables in the solution. For details, see the user manuals or quick guides of the corresponding devices. To obtain the documents, see **B Reference Documents**.

3.1 Installation

Table 3-1 Tasks and key points

Task	Precaution
Installing a transformer station	For details, see the third-party transformer station manual.

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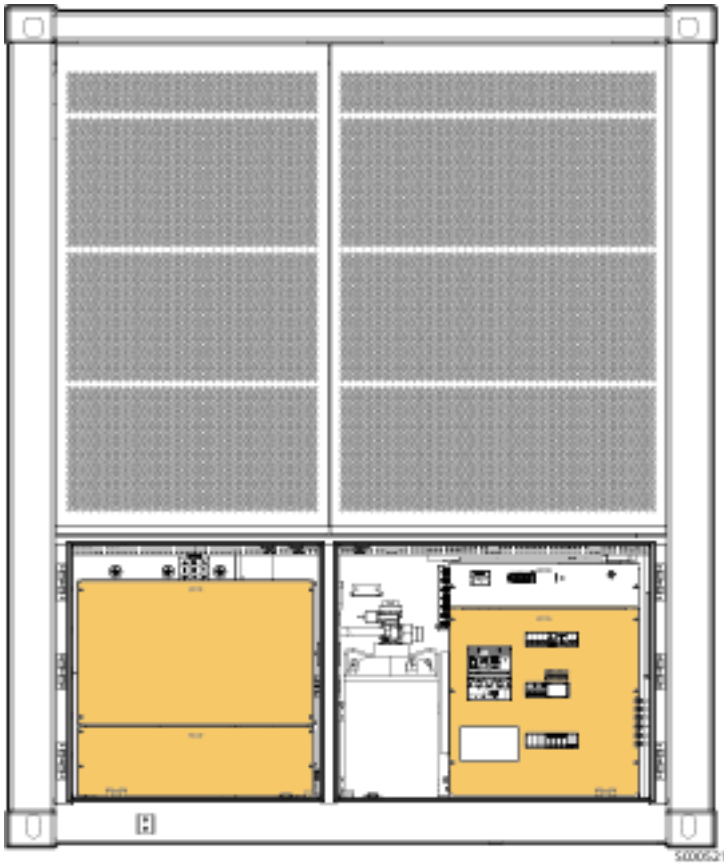
Task	Precaution
Installing the ESS	Before hoisting, ensure that the foundation levelness meets the requirements (deviation ≤ 5 mm). Both the main ground bar in the control unit cabin and the ESS enclosure must be grounded. Before powering on the ESS, ensure the covers are removed from the control unit cabin (as shown in the following figure) and then proceed to take out angle steel brackets, connect cables, and apply for startup authorization. To avoid repeated removal and installation and improve construction efficiency, you can reinstall the covers before power-on.  **NOTICE** Perform the following operations before the construction is completed: • Remove the compressor bracket and related connectors inside the LTMS and ensure that all switches in the electric control box are turned on. • Remove the blue protective film from the exterior of the container.
Installing the PCS	• The PCS is installed on a base support. • The ground points of all PCSs in the same array must be connected to the ground grid to ensure equipotential bonding of the PE cables.

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Task	Precaution
Installing the PV inverter	N/A
Installing the SACU	N/A

3.2 Cable Connections

Table 3-2 Tasks and key points

Step	Task	Precaution
1	Installing PE cables	All devices shall be connected to the nearest grounding points, and the grounding methods shall comply with local electrical safety regulations. Devices in the same array shall be equipotentially bonded. To enhance the corrosion resistance of a ground terminal, apply silicone grease or paint on it after connecting a PE cable. The neutral wire connected between a third-party DTS and the ESS auxiliary power supply must be reliably connected, and the neutral wire on the DTS side must be reliably grounded. Otherwise, the equipment may be damaged.
2	Installing power cables for battery packs in the ESS	Before connecting cables, ensure that the RCM circuit breaker Q1 is off. Wear PPE and use dedicated insulated tools to avoid electric shocks or short circuits. **CAUTION** After connecting battery pack power cables, ensure that the connector buckles are properly locked to eliminate any risk of loosening, and mark lines one by one.
3	Installing DC power cables	For details about the cable connections, see **1.1 Solution Architecture**. The DC power cable length between the ESS and the PCS is 5–50 m.

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Step	Task	Precaution
4	Installing AC power cables	For details about the cable connections, see **1.1 Solution Architecture**. The AC power cable length between the transformer station and the PCS shall be ≥ 5 m. **CAUTION** When connecting auxiliary power cables, do not mix the neutral wire with the live wire. Otherwise, the device may be damaged during power-on. In the C&I scenario, PID suppression and smart insulation monitoring are not supported by inverters. When connecting the 800 V three-phase AC power cable to the PID module built in the SACU, connect the cable to the transformer station on the ESS side.
5	Installing communications cables	For details about the cable connections, see **1.2 Communication Networking**. • The maximum length of an entire RS485 cascading communication link is 1000 m. • The maximum length of an Ethernet cable is 100 m. The communications cable length between the ESS and the PCS is 5–50 m. • For the optical ports of the SmartLogger and network switches, use the gigabit single-mode optical modules. • When connecting COM communications cables between the ESS and PCSs, ensure that the COM communications cables are connected correctly based on the DC power cable connections between battery racks and PCSs. **CAUTION** After installing the RJ45 connector of a network cable or splicing an optical fiber, check the communication between the two ends of the cable. Coil the excess pigtails within the fiber splice tray inside the device. For the pigtail wiring sequence, refer to the electrical schematic diagram provided with the device.

NOTE

After connecting cables, use fireproof putty to seal all cable holes to prevent foreign objects like insects, mice, and snakes from getting in.

3.3 Suggestions on Preventing Incorrect Cable Connection

To avoid incorrect connection of DC power cables and Ethernet cables between the ESS and the PCS, take the following measures before installing the cables:

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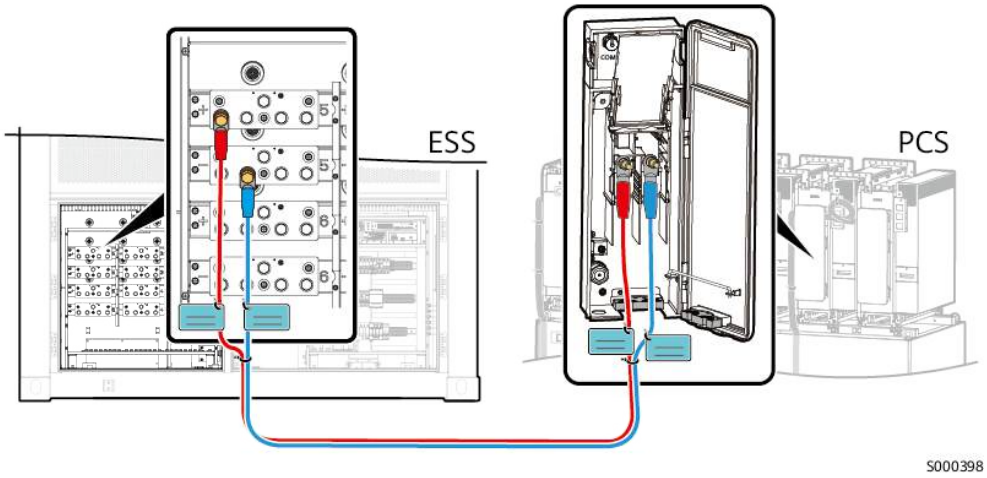
1. If you use single-core cables, bind the positive and negative DC power cables connected to the same PCS together at both ends.
2. Make cable labels at both ends of the DC power cables and Ethernet cables to specify the connection positions of the terminals.



NOTE

The materials of the cable labels and label ties must meet the basic insulation requirements.

You are advised to design the cable labels by referring to the following examples.

Examples of DC Power Cable Labels

Start	Area No.-Array No.-ESS No.**#ESS** Rack No. Positive (+) or negative (–) terminal For example, 1-2-3#ESS 4+ indicates that the start point of the power cable is connected to the positive terminal of the fourth battery rack of ESS 3, array 2, area 1.
End	Area No.-Array No.-ESS No.-PCS No.**#PCS** Positive (+) or negative (–) terminal For example, 1-2-3-4#PCS+ indicates that the end point of the power cable is connected to the positive terminal of the fourth PCS corresponding to ESS 3, array 2, area 1.

Examples of Ethernet Cable Labels

Start	Area No.-Array No.-ESS No.**#ESS** Network port No. For example, 1-2-3#ESS 4 indicates that the start point of the network cable is connected to network port 4 of ESS 3, array 2, area 1.
End	Area No.-Array No.-ESS No.-PCS No.**#PCS** For example, 1-2-3-4#PCS indicates that the end point of the network cable is connected to the fourth PCS corresponding to ESS 3, array 2, area 1.

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4 Check and Preparation Before Power-On

Step 1 Perform the check before power-on by referring to section "Check Before Power-On" in the user manual of each device.

Step 2 Check whether the phase sequence of the AC power cables between the ESS and the power distribution equipment is consistent. If not, adjust the wiring sequence of the AC power cables.

Step 3 Check the switch status.

1. Ensure that the switches on both sides of the power distribution equipment are turned off.
2. Ensure that the switch between the ESS AC side and the power distribution equipment is turned off, and the switch between the inverter AC side and the power distribution equipment is turned off.

Step 4 Perform the ESS fire suppression system acceptance test.

⚠ CAUTION

System power-on and commissioning can be performed only after the fire suppression system passes the function acceptance test.

1. Remove foreign objects from the ESS, collect auxiliary materials, and take away flammable objects such as cardboards.
2. Log in to the SACU WebUI. The following alarms shall not be generated. If any of the following alarms is generated, clear the alarm according to the alarm handling suggestions:
   - 3884 Smoke Detector Alarm
   - 3890 Heat Detector Alarm
   - 3885 High Concentration of Combustible Gas
   - 3886 Combustible Gas Detector Communication Failed
   - 3887 Combustible Gas Detector Faulty
   - 3888 Communication of Temperature and Humidity Sensor in ESS Cabin Failed

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- 3889 Temperature and Humidity Sensor Faulty in Battery Cabin
- 3893 Fire Alarm
- 3931 Fire Suppression System Abnormal

----End

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5 System Power-On

Step	Task	Power-On Operation
1	Powering on the SACU or SmartLogger auxiliary power supply	1. Turn on the SACU or SmartLogger power switch on the power distribution equipment side. 2. Turn on the switch on the SACU or SmartLogger side.
2	Powering on the ESS auxiliary power supply (for LTMS and other devices)	For details, see **Power-On Operations**.
3	Powering on the ESS AC side	
4	Powering on the inverter	**Select a power-on method based on the inverter model.** **Method 1:** 1. Set the DC SWITCH to ON. When you hear a click, the switch is completely turned on. 2. Check that the indicators are not steady red. **Method 2:** 1. Set the DC SWITCH 1 (MAIN SWITCH) to ON. When you hear a click, the switch is completely turned on. 2. Check the status of the PV connection indicator. If it is steady green, set DC SWITCH 2 and DC SWITCH 3 to ON. 3. Check that other indicators are not steady red.
Note: For details about the switch layout and operations of the devices prepared by the customer, see the documents provided by the vendors.		

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5.1 Preparations

Step 1 Perform the check before power-on by referring to the "Check Before Power-On" section in the user manual of each device.

Step 2 Check cable connections and switch status.

Device	Requirement
Transformer station	The switches on the medium-voltage and low-voltage sides are turned off.
DTS	All MCCBs are turned off.
ESS	• Control unit cabin: All switches are turned off. The covers in the cabin are installed properly. Lead-acid batteries are installed in the extinguishant control panel and cables are connected. (Note that the cover of the C050SZEG extinguishant control panel shall be connected to a PE cable.) • Liquid cooling unit cabin: The liquid cooling compressor bracket is removed, and all switches in the electric control box are turned on. • Battery cabin: The power cables and signal cables of battery packs are properly connected, and all RCM switches are turned off.

Step 3 Apply for a startup authorization code.

After the project construction is complete, the project supervisor shall collect information about the onsite conditions and construction quality and apply to the Huawei delivery operations center (DOC) for a startup authorization code. The authorization code is used to start the ESS during subsequent service commissioning.

The following table describes how to apply for a startup authorization code for different roles.

Role	Operation Guide
Huawei engineer	**Utility-Scale ESS Power-On Tool Training (Power-Sales)**
Partner engineer	**Utility-Scale ESS Power-On Tool Training (Power-Partner)**

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CAUTION

Install devices and connect cables for each component according to the site selection, planning, layout, and construction requirements. If the startup authorization code cannot be obtained because the project fails to pass the DOC review, the ESS cannot be started. As a result, service commissioning cannot be performed.

----End

5.2 Array Power-On

Step	Task	Power-On Operation
1	Powering on the transformer station	For details, see the third-party transformer station document.
2	Powering on the DTS	Turn on the MCCB. For details, see the DTS user manual.

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Step	Task	Power-On Operation
3	Powering on the ESS	For details, see the ESS user manual. 1. Turn on the mains SPD specific disconnector 3FC and check that the SPD status display window is green. 2. Turn on the UPS input switch 2FC. 3. Turn on the general input switch 1QA for the AC auxiliary power. **CAUTION** • Before turning on the general input switch 1QA for the AC auxiliary power, ensure that the neutral wire is correctly connected. Otherwise, devices such as the air conditioner may be damaged. • After turning on switch 1QA, immediately check that the L1, L2, and L3 phase voltages are 220 V AC/230 V AC using the multimeter. If the phase voltage displayed on the multimeter is 400 V or other values, the L1, L2, L3, and neutral wires may be incorrectly connected and you need to check the cables. 4. Turn on all switches in the power distribution system of the ESS. a. Turn on the 12 V adapter input switch 2FC1 and extinguishant control panel input switch 2FC2. After the extinguishant control panel is powered on, set the display time to the current time. b. Turn on the single-phase mains general switch 1FC, PSU AC input switch 1FC1, motorized air damper switch 1FC2, and ATS mains input switch 1FC3. 5. Turn on the Rack Control Module (RCM) circuit breaker Q1. **CAUTION** The ESS can be powered on only when the battery cabin doors and the left door of the control unit cabin are closed.
4	Powering on the SACU	1. Turn on the switch on the transformer station side that controls the power supply to the SACU. 2. Turn on the SACU single-phase input switch QF03. 3. Turn on the three-phase input switches FU01 and FU02 of the SACU. 4. Turn on the SmartPID switches QF01 and QF02 of the SACU.

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Step	Task	Power-On Operation
5	Powering on the PCS	After the transformer station and ESS are powered on, the AC and DC sides of the PCS are powered on respectively. 1. Check that the DC voltage is within the normal range on the app. 2. Send a startup command on the app or SmartLogger, and wait for the system soft start. 3. Observe the LED indicators on the PCS to check whether the PCS is running properly. **NOTE** If the transformer station does not meet the conditions for powering on the AC side of the PCS, you can perform deployment and commissioning when the PCS has only DC power supply. Do not send a startup command to the PCS before the PCS is connected to the power grid. Otherwise, the PCS may be connected to the power grid unexpectedly.
Note 1: For details about the switch layout and power-on operations of the devices prepared by the customer, see the documents provided by the vendors. Note 2: After the device is powered on, you are advised to wait for about 10 minutes before performing subsequent operations to ensure that each internal component is started. Note 3: After the ESS auxiliary power supply is powered on, perform the acceptance test by referring to the ESS acceptance test guide.		

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6 System Commissioning (Web)

CAUTION

During the power-on procedure, monitor the system for faults. If you detect any faults, power off the ESS, rectify the faults, and then continue with the procedure.

6.1 Preparations and WebUI Login

The SmartLogger WebUI is used for power-on and commissioning. For details about the preparations and WebUI login, see the **SmartLogger3000 User Manual**.

NOTE

If the ESS cannot be found, check that the SmartLogger has been upgraded to V300R024 or later versions.

6.2 Preparations Before Deployment

Step 1 Set **Startup authorization code** of the ESS. Otherwise, the ESS cannot be started.

1. Use **Startup authorization verification code** to apply for **Startup authorization code**.

   NOTE

   Contact the device vendor or its authorized supervision service provider to apply for a startup authorization code through the Power Partner app.

   - Method 1: Choose **Monitoring** > **ESS** > **Running Info.** > **Basic Information** to view **Startup authorization verification code**.
   - Method 2: Choose **Deployment Wizard** > **Connect Device** to view **Startup authorization verification code**.

2. Set **Startup authorization code** of the ESS.
   - Method 1: Choose **Deployment Wizard** > **Connect Device**, and set **Startup authorization code**.
   - Method 2: Choose **Monitoring** > **ESS** > **Running Param.** > **Basic Parameters**, and set **Startup authorization code**.

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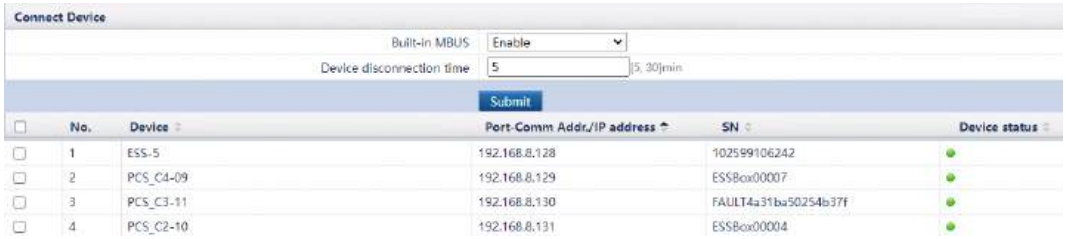
Step 2 Click **Maintenance**, choose **Device Mgmt.** > **Connect Device**, and check that the devices are connected.

Figure 6-1 Checking device connection



1. Check whether the quantity of devices connected to the SmartLogger is correct.

   If not all devices are connected, check and ensure that the cascading cables between devices, the connection positions of the communications cables between devices and the SmartLogger, and the indicator status are normal. Then click **Auto. Search**.

2. Check whether **Device status** of each device is normal. During initial connection, **Device status** of the ESS is green.

Step 3 Upgrade the software version.

1. Log in to the Support-E website and search for the latest software versions of the SmartLogger, ESS, and inverter in **FusionSolar Software Download**.
2. Choose **Maintenance** > **Software Upgrade** to check the software versions of the SmartLogger, ESS, and inverter. If the software version of each device is the latest version on the Support-E website, go to **Step 4**. Otherwise, go to the next step.
3. Click **Choose File**, select the target software package, and click **Upload**. After the upload is complete, click **Software Upgrade**.

Step 4 Click the alarm icon in the upper right corner of the page and clear **major** active alarms as prompted.

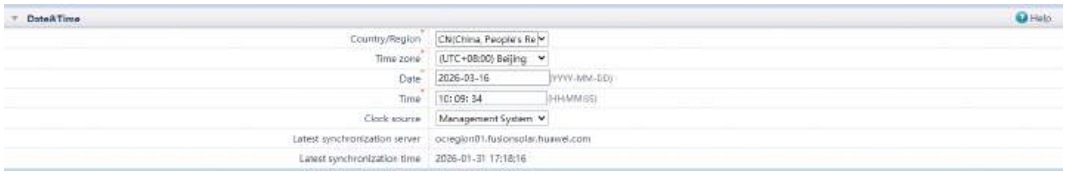
You do not need to handle PCS connection alarms. After you perform the cable connection check in the Deployment Wizard, these alarms will be automatically cleared.

----End

6.3 Commissioning Using the Deployment Wizard

Step 1 Set basic parameters.

Figure 6-2 Setting basic parameters



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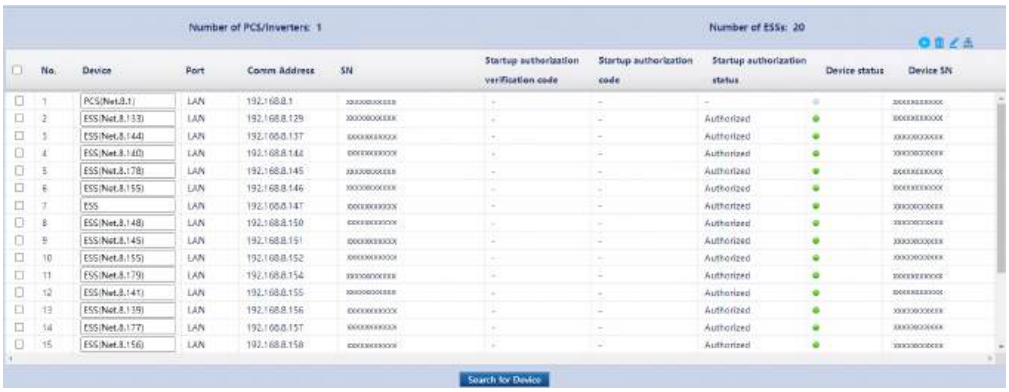
Step 2 Connect to devices.

1. Click **Search for Device** to check the cable connections and allocate addresses.

   Figure 6-3 Searching for devices



   NOTE

   - During the process of **Search for Device**, do not perform upgrade operations (such as upgrading through the app, management system, or WebUI).
   - When you click **Search for Device**, cable connections (DC and AC) will be checked before device search (not applicable to third-party devices), and device addresses will be automatically allocated.
   - After the cable connection check and device search are complete, if a cable connection alarm is generated, you can click the alarm icon to view the corresponding alarm information.
   - If an alarm is generated when the cable connection check fails, click the alarm icon to view the alarm cause and handling suggestions. After the fault is rectified, click **Search for Device** again to check the cable connections. If the quantity of inverters or ESSs connected to the SmartLogger in the array changes, click **Search for Device** again.

2. Click **Next** and click **Confirm** in the dialog box **Do you want to instruct the inverter to start optimizer search?** based on the actual scenario.
3. Set array parameters.

Parameter	Description
Scenario under **Arrays Operation Scenario**	Set this parameter to **On-grid**.

4. Set the hot standby mode of an array.

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Parameter	Description
Standby mode under **The subarray hot standby mode**	Set as required. – **Seamless hot standby**: When there is no scheduling, the PCS enters the hot standby mode to reduce system loss. – **Zero-power operation**: no hot standby

5. Set inverter parameters.

Parameter	Description
Grid Code	Set the inverter grid code of the country or region where the devices are used.
Working mode	Set this parameter to **PQ**.
Microgrid compatibility	Set this parameter to **Disable**.

6. Set battery parameters.

Parameter	Description
Grid Code	Set the ESS grid code of the country or region where the devices are used.
Working mode	Set this parameter to **PQ**. Otherwise, a failure message is returned.
Microgrid compatibility	Set this parameter to **Disable**.
Automatic switching of the working mode	Set this parameter to **Disable**.

Step 3 Connect a power meter.

For details about how to connect cables to the meter at the grid connection point and set parameters, see **A Meter Cable Connection and Parameter Settings**.

Step 4 (Optional) Connect to environment monitoring instruments (EMIs).

Figure 6-4 Connecting to EMIs

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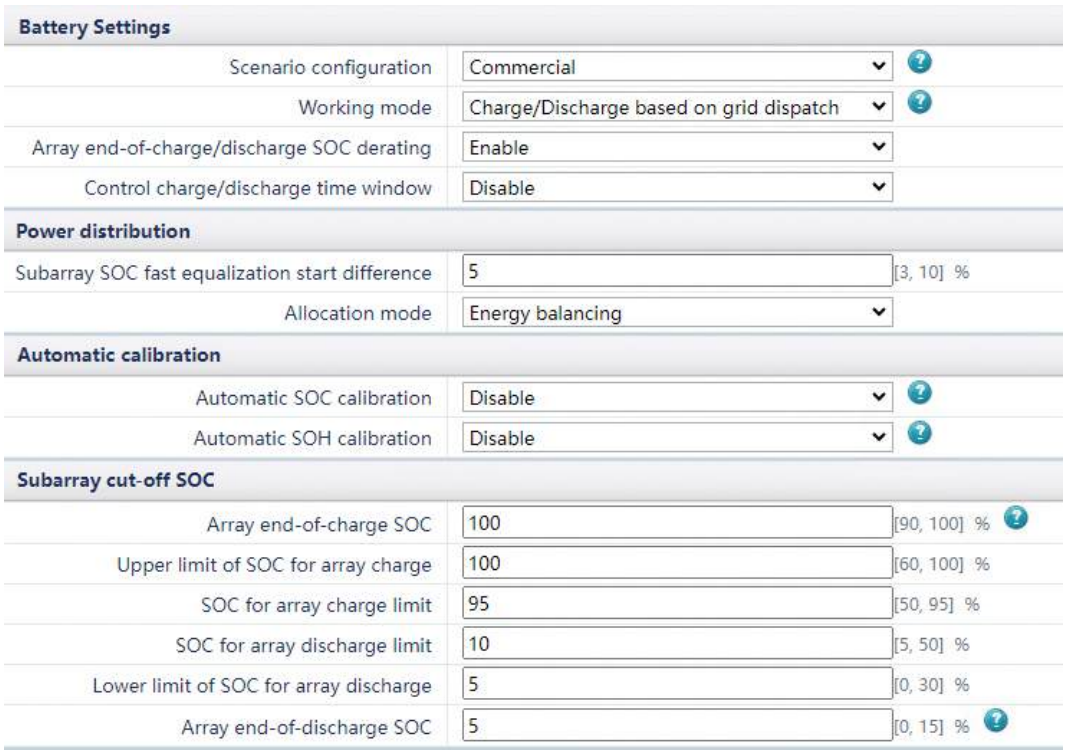
Step 5 Set parameters for battery settings.

Figure 6-5 Battery settings



Parameter	Description
Battery Settings	
Scenario configuration	Select **Commercial**.
Working mode	Set this parameter to maximum self-consumption, TOU, charge/discharge based on grid dispatch, or TOU (fixed power). For details, see **6.4.1 Working Mode**.
Array end-of-charge/discharge SOC derating	Near the end of array charge/discharge, the charge/discharge power is derated based on the preset gradient to prevent impact on the system due to the power jump at the moment when the charging/discharging stops. The default value is **Disable**. Set this parameter as required.
Control charge/discharge time window	You can set the time segment for charge forbidden, discharge forbidden, charge, and discharge only after **Control charge/discharge time window** is set to **Enable**. The default value is **Disable**. Set this parameter as required.
Power distribution	

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Parameter	Description
Subarray SOC fast equalization start difference	When the SOC difference between racks in the array is greater than the value of **Subarray SOC fast equalization start difference**, the rapid equalization algorithm is enabled. The default value is **5%**. Set this parameter as required.
Allocation mode	• **Energy balancing**: During ESS discharging, the output power is allocated based on the SOC of each battery rack to balance the SOC of each rack. • **Equal allocation**: During ESS discharging, the output power is equally allocated to each battery rack.
Automatic calibration	
Automatic SOC calibration	During deployment and commissioning, set this parameter to **Disable**. After this function is enabled, the ESS periodically calibrates the SOC rack by rack. During the calibration, the end-of-charge SOC and end-of-discharge SOC settings will be overridden so that the ESS can be fully charged or discharged. **NOTE** This function will cause SOC inconsistency between battery racks, which is normal. Before using this function, contact technical support engineers to evaluate the impact of SOC inconsistency between battery racks during automatic calibration on the use of the ESS.
Automatic SOH calibration	During deployment and commissioning, set this parameter to **Disable**. After this function is enabled, the ESS periodically calibrates the SOH rack by rack. During the calibration, the end-of-charge SOC and end-of-discharge SOC settings will be overridden so that the ESS can be fully charged or discharged. Then, the battery capacity will be calculated. The charge and discharge response will be affected during the calibration. Suggestion: During SOH calibration, after the system is fully charged, maintain the charge command for 30 to 60 minutes. After the discharge is complete, maintain the discharge command for 30 to 60 minutes. **NOTE** This function will cause SOC inconsistency between battery racks, which is normal. Before using this function, contact technical support engineers to evaluate the impact of SOC inconsistency between battery racks during automatic calibration on the use of the ESS.

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Parameter	Description
Automatic SOC calibration interval	Set the automatic SOC calibration interval. This parameter is displayed when **Automatic SOC calibration** is set to **Enable**. ● If the battery SOC stays in the range of 10% to 90% most of the time, for example, in the microgrid scenario, the recommended calibration interval is less than or equal to 30 days. ● If the battery SOC stays in the range of 40% to 60% most of the time, for example, in the frequency regulation scenario, the recommended calibration interval is less than or equal to 180 days. ● If the battery SOC stays below 10% or at 100% most of the time, for example, in the peak shaving scenario, the recommended calibration interval is less than or equal to 180 days.
Subarray cut-off SOC	

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Parameter	Description
Array end-of-charge SOC Upper limit of SOC for array charge SOC for array charge limit SOC for array discharge limit Lower limit of SOC for array discharge Array end-of-discharge SOC	Controls the charge and discharge behaviors of ESSs in an array. ● Battery rack SOC control: includes **Array end-of-charge SOC** and **Array end-of-discharge SOC**, which are used to control the operating SOC range of each battery rack in an ESS. The value is delivered to battery racks to determine the available SOC range during operation. **Array end-of-charge SOC**: During charging, if the SOC of a battery rack reaches this threshold, the battery rack stops charging. **Array end-of-discharge SOC**: During discharging, if the SOC of a battery rack reaches this threshold, the battery rack stops discharging. ● Array charge/discharge upper/lower SOC limit control: includes **Upper limit of SOC for array charge** and **Lower limit of SOC for array discharge**, which are used to control the operating SOC range of the entire ESS array. **Upper limit of SOC for array charge**: During charging, if the array SOC reaches this threshold, the array stops charging. In the on-grid VSG scenario, the ESS runs at zero power to ensure the grid-forming capability. **Lower limit of SOC for array discharge**: During discharging, if the array SOC reaches this threshold, the array stops discharging. In the on-grid VSG scenario, the ESS runs at zero power to ensure the grid-forming capability. ● Array charge/discharge power derating SOC control: includes **SOC for array charge limit** and **SOC for array discharge limit**, which are used to trigger linear power derating near the end of array charge/discharge to ensure stable grid forming. **SOC for array charge limit**: During charging, if the array SOC reaches this threshold, the charge power is derated. **SOC for array discharge limit**: During discharging, if the array SOC reaches this threshold, the discharge power is derated. When submitting the parameters, ensure that: **Array end-of-charge SOC** ≥ **Upper limit of SOC for array charge** ≥ **SOC for array charge limit** ≥ **SOC for array discharge limit** ≥ **Lower limit of SOC for array discharge** ≥ **Array end-of-discharge SOC**. Reserve a margin between **Array end-of-charge SOC** and **Upper limit of SOC for array charge**, and between **Lower limit of SOC for array discharge** and **Array end-of-discharge SOC** to prevent the ESS from exceeding the application boundary due to continuous grid-forming active voltage regulation and frequency regulation support.

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Parameter	Description
	You are advised to set the parameters by referring to **Table 6-1**.
INV/PCS communication exception protection	
Protection against communication disconnection	The default value is **Disable**. Set this parameter as required.

You are advised to set the charge/discharge SOC thresholds in different scenarios and software versions by referring to the following instructions.

Table 6-1 Recommended array charge/discharge SOC settings

Scenario	Target SOC Range	Recommended Settings
On-grid PQ	5%–100%	• Array end-of-charge/discharge SOC derating: Disable • Array end-of-charge/discharge SOC: Set it as required within the range of 5%–100%.
On-grid VSG	5%–95%	• Array end-of-charge/discharge SOC derating: Enable • Array end-of-charge/discharge SOC: 2%–100% • Upper/Lower limit of SOC for array charge/discharge: 5%–95% • SOC for array charge/discharge limit: 7%–93%
	2%–98% (For on-grid only; black start not supported; only supported by V200R025C10 or later)	• Array end-of-charge/discharge SOC derating: Enable • Array end-of-charge/discharge SOC: 0%–100% • Upper/Lower limit of SOC for array charge/discharge: 2%–98% • SOC for array charge/discharge limit: 5%–95%

Step 6 Connect to the management system.

Set related parameters by referring to "**Setting Parameters for Connecting to the Management System**" (content related to the management system) in the *SmartLogger3000 User Manual*.

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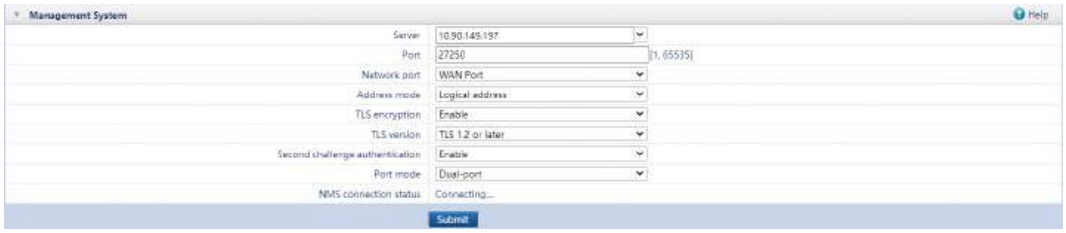
Figure 6-6 Management system

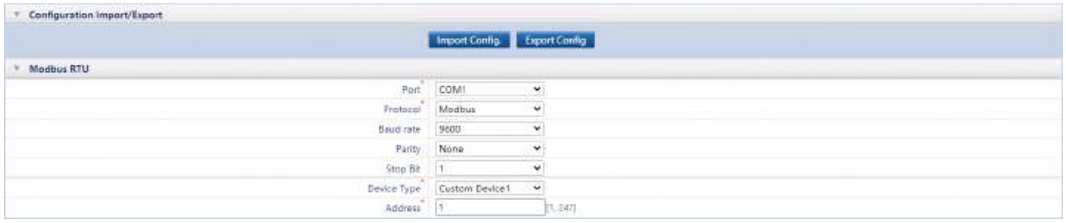


Step 7 Connect to a third-party network management system (NMS).

1. Select **IEC104** or **Modbus TCP** based on the protocol used by the SmartLogger to connect to the third-party NMS.
2. Set related parameters by referring to "**Setting Parameters for Connecting to the Management System**" (content related to a third-party NMS) in the *SmartLogger3000 User Manual*.
3. Send a command on the third-party NMS and check whether the SmartLogger can respond properly.

Step 8 Connect to third-party devices. Skip this step if third-party devices are not involved.

Figure 6-7 Connecting to third-party devices



Step 9 Set microgrid parameters. Skip this step if microgrid parameters are not involved.

Step 10 Click **Finish**.

NOTICE

Do not click **Batch configurations** shown in the following figure to send the array startup/shutdown command, because this will affect the wire sequence detection.

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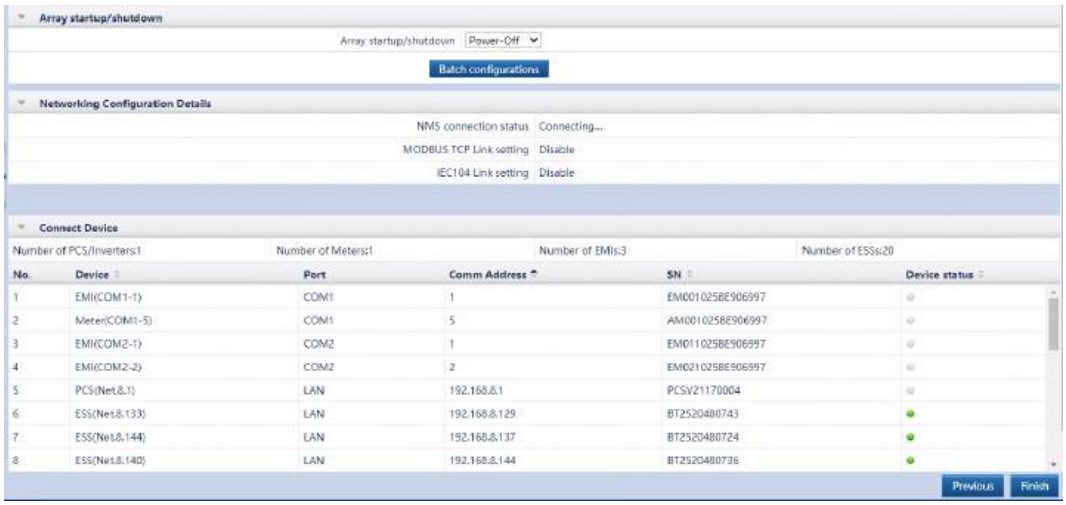
Figure 6-8 Completing the configuration



Step 11 Set **Output mode** for the inverter and ESS.

- For the inverter: Choose **Monitoring** > **Inverter > Running Param.** > **Grid Parameters**, and set **Output mode** for the inverter based on the actual inverter cable connection mode.
- ESS: Choose **Monitoring** > **ESS** > **Running Param.** > **Grid Parameters**, and set **Output mode** for the ESS to **Three-phase four-wire**.

Step 12 Check whether **Grid Code** and **Working mode** of the ESS are correctly set. If not, correct the settings.

- Choose **Monitoring** > **ESS > Running Param.** > **Grid Parameters**, and check the setting of **Grid Code**.
- Choose **Monitoring** > **ESS > Running Param.** > **Feature Parameters**, and check the setting of **Working mode**.

----End

6.4 Battery Commissioning

6.4.1 Working Mode

The on-grid ESS has the following battery control working modes: no control, maximum self-consumption, TOU, TOU (fixed power), and charge/discharge based on grid dispatch.

Choose **Settings** > **Battery Settings** > **Battery Settings** and set parameters such as the working mode.

No Control

The SmartLogger directly delivers the external scheduling power limit. No other power scheduling control is performed. The power is automatically controlled by the device. The no control mode is used only for commissioning.

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Maximum Self-Consumption

- This mode applies to PV+ESS systems in scenarios where the PV-to-ESS ratio is high, the PV power generated is adequate for loads, the electricity price is high, and the feed-in-tariff (FIT) subsidy is low or unavailable.
- PV power is preferentially supplied to loads, and the surplus PV power is used to charge the ESS. If the ESS is fully charged or being charged at full power, the surplus PV power is fed to the power grid. The grid cannot charge the ESS but can supply power to loads.
  - PV energy supply priority: load > ESS > power grid
  - Load power consumption priority: PV > ESS > power grid
- Example of maximum self-consumption (ESS capacity: 800 kWh/400 kW)

Figure 6-9 Example of maximum self-consumption

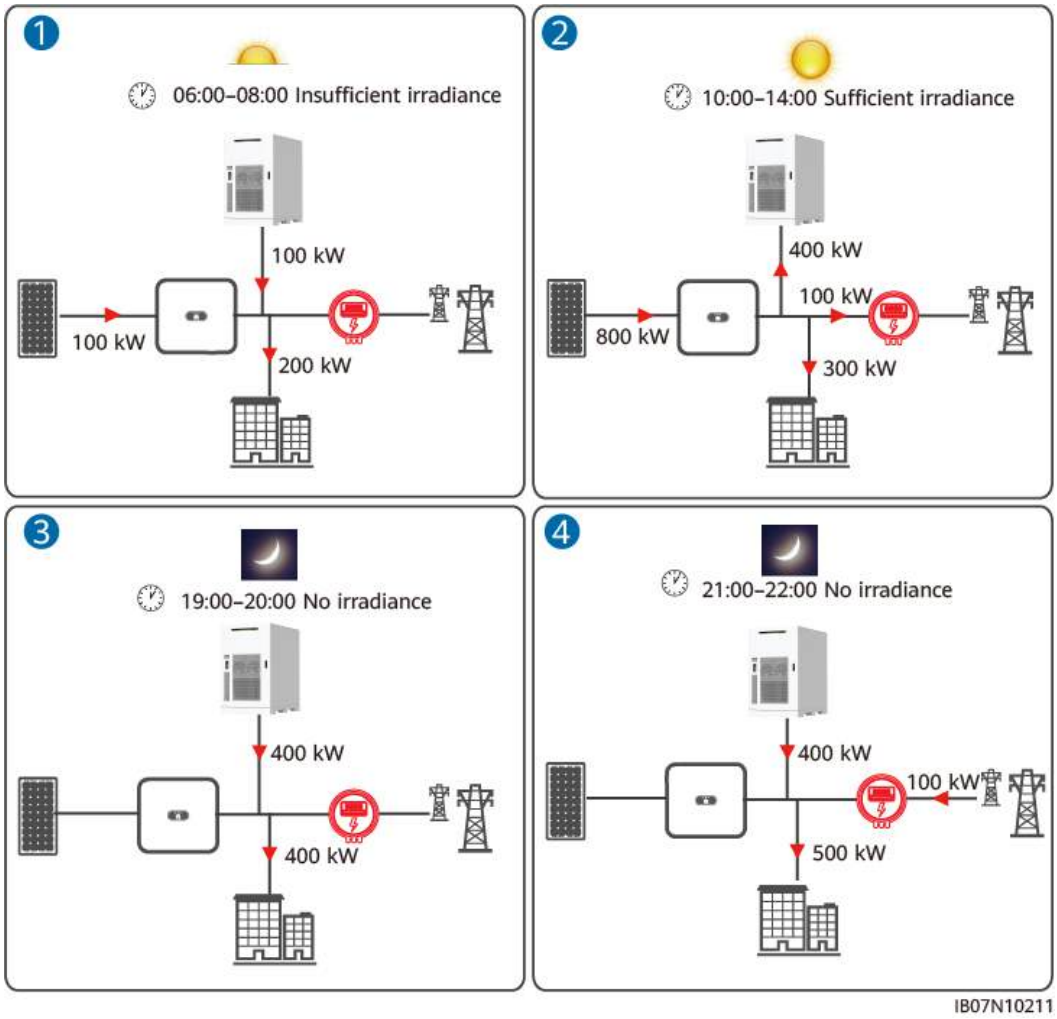

Table 6-2 Running parameters for maximum self-consumption

Parameter	Description
Working mode	Set this parameter to **Maximum self-consumption**.

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Parameter	Description
Active power threshold of grid during battery discharge	This parameter sets the discharge threshold for the ESS to prevent the ESS from frequently starting or stopping discharge due to slight fluctuations in the load power. The default value is 0 W. The value ranges from 0 W to 1000 W. When the load power exceeds the PV output power: ● If the difference between the two values is less than the threshold, the system purchases electricity from the grid connection point to cover the difference. ● If the difference exceeds the threshold, the system purchases electricity from the grid connection point to cover the part within the threshold, and the ESS discharges to cover the part exceeding the threshold. For the part exceeding the maximum discharge power of the ESS, the system continues to purchase electricity from the grid connection point to cover the remaining difference. For example, if the threshold is set to 50 W: ● If the load power exceeds the PV output power by 40 W, the power supplied from the grid connection point is 40 W and the ESS does not discharge. ● If the load power exceeds the PV output power by 100 W, the power supplied from the grid connection point is 50 W and the ESS discharge power is 50 W.
Adjustment deadband	Set the precision of the grid power at the grid connection point. This parameter affects the power value range at the grid connection point. If the actual grid power threshold at the grid connection point is within this range, i.e. [Active power threshold of grid during battery discharge – Adjustment deadband, Active power threshold of grid during battery discharge + Adjustment deadband], the grid power requirement at the grid connection point is met.

TOU

- This mode applies to PV+ESS or ESS-only systems in scenarios where the price difference is large between peak and off-peak hours and power meters are used. During off-peak hours, the grid supplies power to charge the ESS. During peak hours, the ESS discharges to supply power to loads.
- In this mode, at least one charge or discharge period for the ESS needs to be set. For example, if you set the low electricity price period at night as the charge period, the system charges the ESS at the maximum power during this period. If you set the high electricity price period as the discharge period, the ESS can discharge energy only during the discharge period based on the actual load power, reducing electricity costs.

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- In some countries, the grid is not allowed to charge the ESS. In this case, this mode cannot be used.
- Example of TOU (ESS capacity: 800 kWh/400 kW; **Preferred use of surplus PV power** is set to **Charge**)

Figure 6-10 Example of TOU

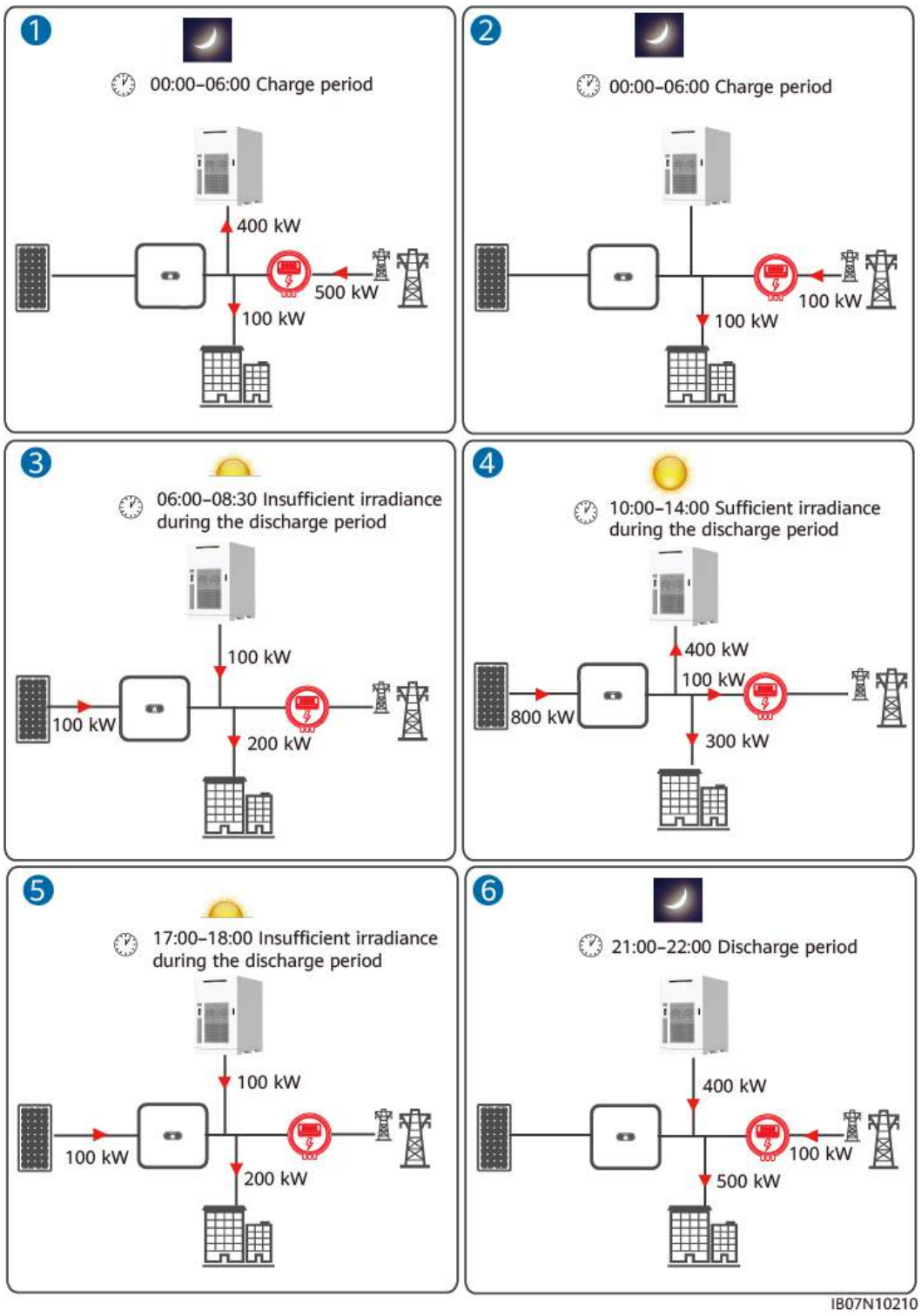

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Table 6-3 Running parameters for TOU

Parameter	Description
Working mode	Set this parameter to **TOU**.
Preferred use of surplus PV power	• **Charge**: When the PV power is greater than the load power, the surplus PV power is preferentially used to charge the ESS. If the ESS is fully charged or being charged at full power, the surplus PV power is fed to the power grid. This mode is a combination of TOU and maximum self-consumption. • **Fed to grid**: When the PV power is greater than the load power, the surplus PV power is preferentially fed to the power grid. If the surplus PV power reaches the maximum power for charging batteries from the grid, the surplus PV power is used to charge the ESS. This setting is applicable to the scenario where the FIT is higher than the electricity purchase price and the grid cannot charge the ESS.
Maximum power for charging batteries from grid	Maximum charge power allowed by the grid. The value is determined by the local grid company. If there is no requirement, the value is the maximum charge power of the ESS by default.
Active power threshold of grid during battery discharge	Set the grid power threshold at the grid connection point for loads when the load power is greater than the PV power. When the power purchased from the grid exceeds the preset threshold, the ESS starts discharging. The default value is 0. For example, if this parameter is set to 50 W and the load power is 40 W, 40 W power is purchased from the grid and the ESS does not discharge. If the load power is 100 W, 50 W power is purchased from the grid, and the ESS discharge power is 50 W.
Adjustment deadband	Set the precision of the grid power at the grid connection point. This parameter affects the power value range at the grid connection point. If the actual grid power threshold at the grid connection point is within this range, i.e. [Active power threshold of grid during battery discharge – Adjustment deadband, Active power threshold of grid during battery discharge + Adjustment deadband], the grid power requirement at the grid connection point is met.
Start time	Set the start time and end time of charge and discharge. A maximum of 14 time segments can be set. You can set a weekly cycle by clicking the buttons corresponding to **Mon.** through **Sun.** in the **Repeat** box. The buttons are blue by default, indicating being selected. After you click it, the button turns gray.
End time	
Charge/Discharge	
Repeat	

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Table 6-4 Charge/Discharge time window

Charge/ Discharge Time Window	Charge Preference	Fed to Grid
Discharge time window	The ESS can discharge power. When the PV power is greater than the load power, the ESS can be charged with the PV power but cannot be charged from the power grid. When the PV power is lower than the load power, the ESS can discharge power to loads but cannot feed power to the power grid. ● PV energy supply priority: load > ESS > power grid ● Load power consumption priority: PV > ESS > power grid	The ESS can discharge power. When the PV power is greater than the load power, the surplus PV power is fed to the power grid. If the surplus PV power cannot be fully fed to the power grid due to feed-in power limit, the ESS can be charged with the surplus PV power but cannot be charged from the power grid. When the PV power is lower than the load power, the ESS can discharge power to loads but cannot feed power to the power grid. ● PV energy supply priority: load > power grid > ESS ● Load power consumption priority: PV > ESS > power grid
Charge time window	The ESS can be charged but cannot discharge. The PV power is preferentially charged to the ESS. If the PV power is insufficient, the ESS is charged from the power grid. ● PV energy supply priority: ESS > load > power grid ● Load power consumption priority: PV > power grid	The ESS can be charged but cannot discharge. The PV power is preferentially charged to the ESS. If the PV power is insufficient, the ESS is charged from the power grid. ● PV energy supply priority: ESS > load > power grid ● Load power consumption priority: PV > power grid
Non-charge/ discharge time window	The ESS cannot discharge or be charged from the power grid. However, when the PV power is greater than the load power, the surplus PV power can be charged to the ESS. ● PV energy supply priority: load > ESS > power grid ● Load power consumption priority: PV > power grid	The ESS cannot discharge or be charged from the power grid. However, when the PV power is greater than the load power, the surplus PV power can be charged to the ESS. ● PV energy supply priority: load > power grid > ESS ● Load power consumption priority: PV > power grid

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TOU (Fixed Power)

- This mode applies to ESS-only systems in scenarios where the price difference is large between peak and off-peak hours and no power meters are used. During off-peak hours, the grid supplies power to charge the ESS. During peak hours, the ESS discharges to supply power to loads.
- In this mode, at least one charge or discharge period for the ESS needs to be set. For example, if you set the low electricity price period at night as the charge period, the system charges the ESS at the fixed power during this period. If you set the high electricity price period as the discharge period, the ESS can discharge energy only during the discharge period at the fixed power, reducing electricity costs.
- In some countries, the grid is not allowed to charge the ESS. In this case, this mode cannot be used.

Table 6-5 Running parameters for TOU (fixed power)

Parameter	Description
Working mode	Set this parameter to **TOU (fixed power)**.
Start time	Set the start time and end time of charge and discharge. A maximum of 14 time segments can be set. You can set a weekly cycle by clicking the buttons corresponding to **Mon.** through **Sun.** in the **Repeat** box. The buttons are blue by default, indicating being selected. After you click it, the button turns gray. • Discharge time window: The ESS is discharged at the fixed power. • Charge time window: The ESS is charged at the fixed power. • Non-charge/discharge time window: The ESS cannot be charged or discharge power.
End time	
Charge/ Discharge	
Repeat	

Charge/Discharge Based on Grid Dispatch

- This mode applies to scenarios where the northbound controller delivers active power scheduling instructions.
- The purpose of scheduled discharge is to meet the active power scheduling target value at the grid connection point. PV energy is preferred. If the generated PV energy is insufficient, the ESS discharges energy and the energy is fed to the grid based on the active power scheduling target value. If the generated PV energy is sufficient, the energy is fed to the grid based on the active power scheduling target value, and the surplus PV energy is used to charge the ESS.
- The purpose of scheduled charge is to meet the active power scheduling target value at the grid connection point. If the ESS charge power is insufficient or the Smart PCS limits the power, the grid charges the ESS with the maximum capability. If the ESS is not fully charged when the scheduling target value is met, the PV energy is used to charge the ESS.

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Table 6-6 Running parameters in each battery control working mode

Parameter	Description
Working mode	Set this parameter to **Charge/Discharge based on grid dispatch**.
Control charge/ discharge time window	The default value is **Disable**. The default value is recommended. Set this parameter as required. You can set the time segment for charge forbidden, discharge forbidden, charge, and discharge only after **Control charge/discharge time window** is set to **Enable**.
Start time	Set the start time, end time, and power of charge forbidden, discharge forbidden, charge, and discharge. A maximum of 14 time segments can be set. You can set a weekly cycle by clicking the buttons corresponding to **Mon.** through **Sun.** in the **Repeat** box. The buttons are blue by default, indicating being selected. After you click it, the button turns gray.
End time	
Charge/Discharge	
Charge/Discharge power (kW)	
Repeat	

6.4.2 Capacity Control

Context

- **Peak shaving** limits the maximum peak power at the grid connection point. In some areas, electricity fees consist of both volumetric charge and demand charge. The **Peak shaving** function allows you to lower the peak demand purchased from the grid during peak hours, reducing electricity fees. **Peak shaving** applies to areas where demand charges are collected. The peak shaving function allows you to lower the peak power purchased from the grid in **Maximum self-consumption** or **TOU** mode during peak hours, reducing electricity fees.
- **Power boost limit** is designed to limit the maximum peak current at the grid connection point. By doing so, it ensures that the electric current purchased from or sold to the grid does not exceed the maximum peak current at the grid connection point. This control is essential because if the electric current exceeds the maximum peak current, it may trigger the system's overcurrent protection mechanism, potentially causing the transformer to trip.

NOTICE

The **Power boost limit** function is unavailable during the SmartLogger and ESS upgrade. After the upgrade is complete, this function will be automatically restored.

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Procedure

Choose **Settings** > **Battery Settings** > **Capacity Control** and set related parameters.

Table 6-7 Capacity control parameters

Parameter	Description
Peak shaving	• **No control**: The peak shaving function is disabled. • **Active power limit**: The active power purchased from the grid cannot exceed the preset capacity limit. • **Apparent power limit**: The apparent power purchased from the grid cannot exceed the preset capacity limit.
Power boost limit	• **No control**: The power boost limit function is disabled. • **Current Limit**: The current of electricity purchased from or sold to the grid cannot exceed the preset current limit.
Maximum Peak Current	This parameter is displayed when **Power boost limit** is set to **Current Limit**. It specifies the maximum peak current at the grid connection point. The default value is 30000 A. Set this parameter based on the maximum peak current for power purchase or sales at the grid connection point.
Backup power SOC for capacity control	Specifies the backup power SOC for capacity control. The value of this parameter affects the peak shaving capability. A larger value indicates stronger peak shaving capability.
PV power limit when power meter fails	Specifies the active power limit of the inverter when the export+import meter communication is abnormal. You can manually change the active power percentage of the inverter as required.
PCS power limit when power meter fails	Specifies the active power limit of the PCS when the export+import meter communication is abnormal. You can manually change the active power percentage of the PCS as required.
Start time	• Set the peak power range based on the start time and end time. The peak power is configured based on electricity prices in different time segments. You are advised to set the peak power to a low value when the electricity price is high. • A maximum of 14 time segments can be set.
End time	
Maximum Power	

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6.4.3 Multi-mode Overlay

Multi-mode overlay is a combination of multiple on-grid scheduling policies.

Combination 1: Maximum Self-Consumption + Capacity Control

Step 1 Choose **Settings** > **Battery Control** > **Battery Control** and set **Working mode** to **Maximum self-consumption**. For details about how to set other parameters, see **Maximum Self-Consumption**.

Step 2 Choose **Settings** > **Battery Control** > **Capacity Control** and set the parameters by referring to **6.4.2 Capacity Control**.

----End

Combination 2: TOU + Maximum Self-Consumption

Step 1 Choose **Settings** > **Battery Control** > **Battery Control** and set **Working mode** to **TOU**.

Step 2 Set **Preferred use of surplus PV power** to **Charge**. For details about how to set other parameters, see **TOU**.

----End

Combination 3: TOU + Maximum Self-Consumption + Capacity Control

Step 1 Choose **Settings** > **Battery Control** > **Battery Control** and set **Working mode** to **TOU**.

Step 2 Set **Preferred use of surplus PV power** to **Charge**. For details about how to set other parameters, see **TOU**.

Step 3 Choose **Settings** > **Battery Control** > **Capacity Control** and set the parameters by referring to **6.4.2 Capacity Control**.

----End

Combination 4: TOU + Capacity Control

Step 1 Choose **Settings** > **Battery Control** > **Battery Control** and set **Working mode** to **TOU**.

Step 2 Set **Preferred use of surplus PV power** to **Fed to grid**. For details about how to set other parameters, see **TOU**.

Step 3 Choose **Settings** > **Battery Control** > **Capacity Control** and set the parameters by referring to **6.4.2 Capacity Control**.

----End

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7 System Commissioning (App)

For details about system commissioning (app), see the app quick guide.

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8 System Power-Off

If you need to power off the system during maintenance, use the SmartLogger to power off the system.

Step 1 Send a shutdown command.

1. Log in to the SmartLogger WebUI and send a shutdown command to the inverter and ESS.

   Method 1 (array-level): Choose **Maintenance** > **Connect Device**, and click  .

   Method 2 (bus-level): Choose **Overview** > **Plant Running Info.**, and click  .
2. Choose **Monitoring** > **Inverter** > **Running Info.** Check **Device status** to verify that the shutdown is successful.
3. Choose **Monitoring** > **ESS** > **Running Info.** Check **Device status** to verify that the shutdown is successful.

Step 2 Power off the devices: Turn off the main power switches and then the auxiliary power switches of the devices by referring to the operations of **5 System Power-On** in the reverse order.

DANGER

Wear insulated gloves and use insulated tools to prevent electric shocks or short circuits.

NOTE

To prevent local operations on switches during subsequent power-on, you are advised not to turn off the auxiliary power switches.

----End

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9 FAQ

9.1 Why Does the ESS Still Fail to Discharge When Its SOC Is Higher Than the End-of-discharge SOC?

During ESS discharge, if the SOC of any battery pack is less than or equal to **Array end-of-discharge SOC**, the ESS stops discharging. To prevent the ESS from frequently switching between starting and stopping discharging due to the active balancing mechanism between battery packs, the ESS enters the discharge protection state. The ESS can continue discharging only after you decrease the value of **Array end-of-discharge SOC** by 2% or more or charge the ESS by 2% or more.

9.2 How Can I Reduce Operational Noise of the PCS?

You can set the silent mode on the SmartLogger WebUI to decrease the fan speed, thereby reducing operational noise. The procedure is as follows.

Step 1 Log in to the SmartLogger WebUI and select any PCS on the **Monitoring** page.

Step 2 Choose **Running Param** > **Feature Parameters** page, enable **Silent mode** and click **Submit**.

Step 3 Click **Batch configurations** to apply the settings to other PCSs.

----End

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A Meter Cable Connection and Parameter Settings

Meter Cable Connection Description

NOTICE

Cables must be connected to the meter in correct polarities. If the cables are reversely connected, power off the meter, rectify the physical cable connection, and then set **Meter access direction** to **Positive**.

When the meter is connected correctly, the power flows from the grid to the load. For details about correct meter connection, see **Figure A-1** and **Figure A-2**.

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Figure A-1 Example 1 of correct meter connection

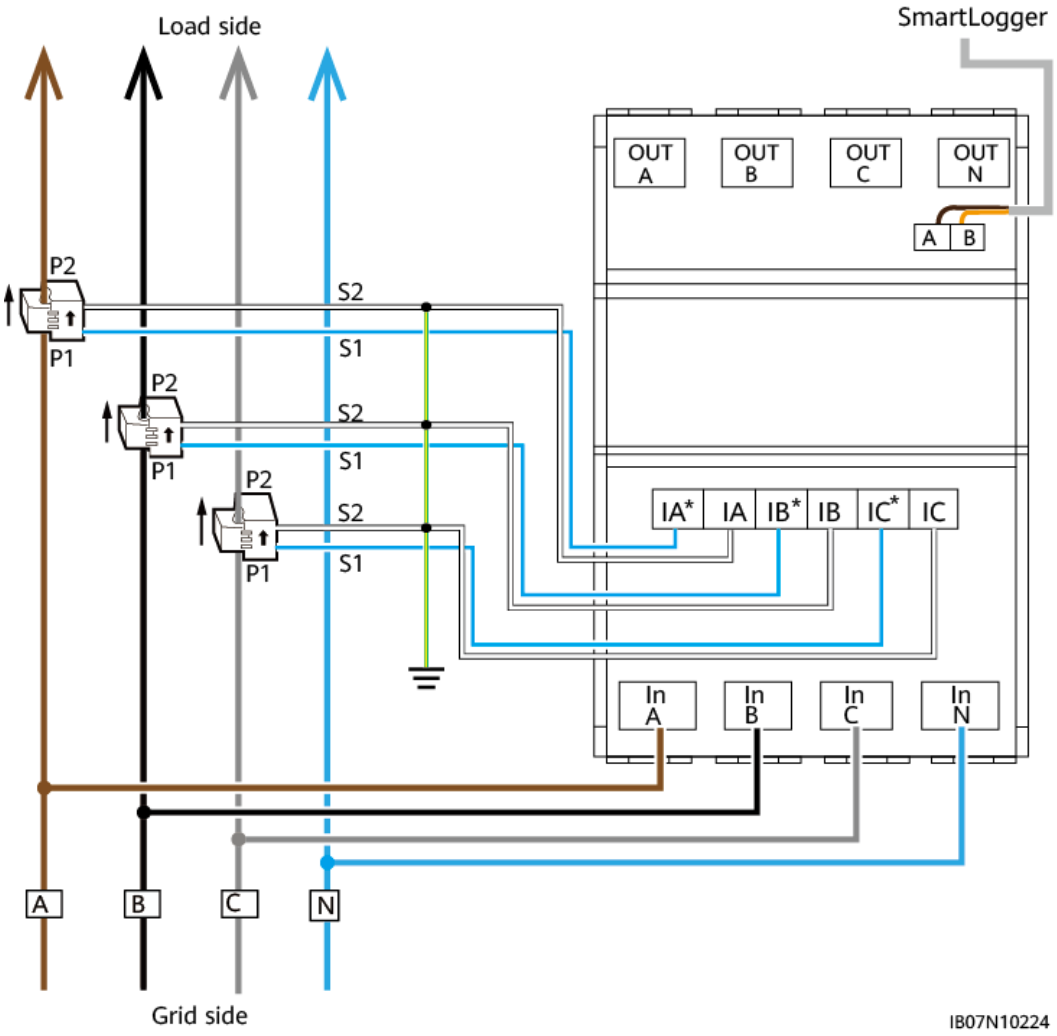

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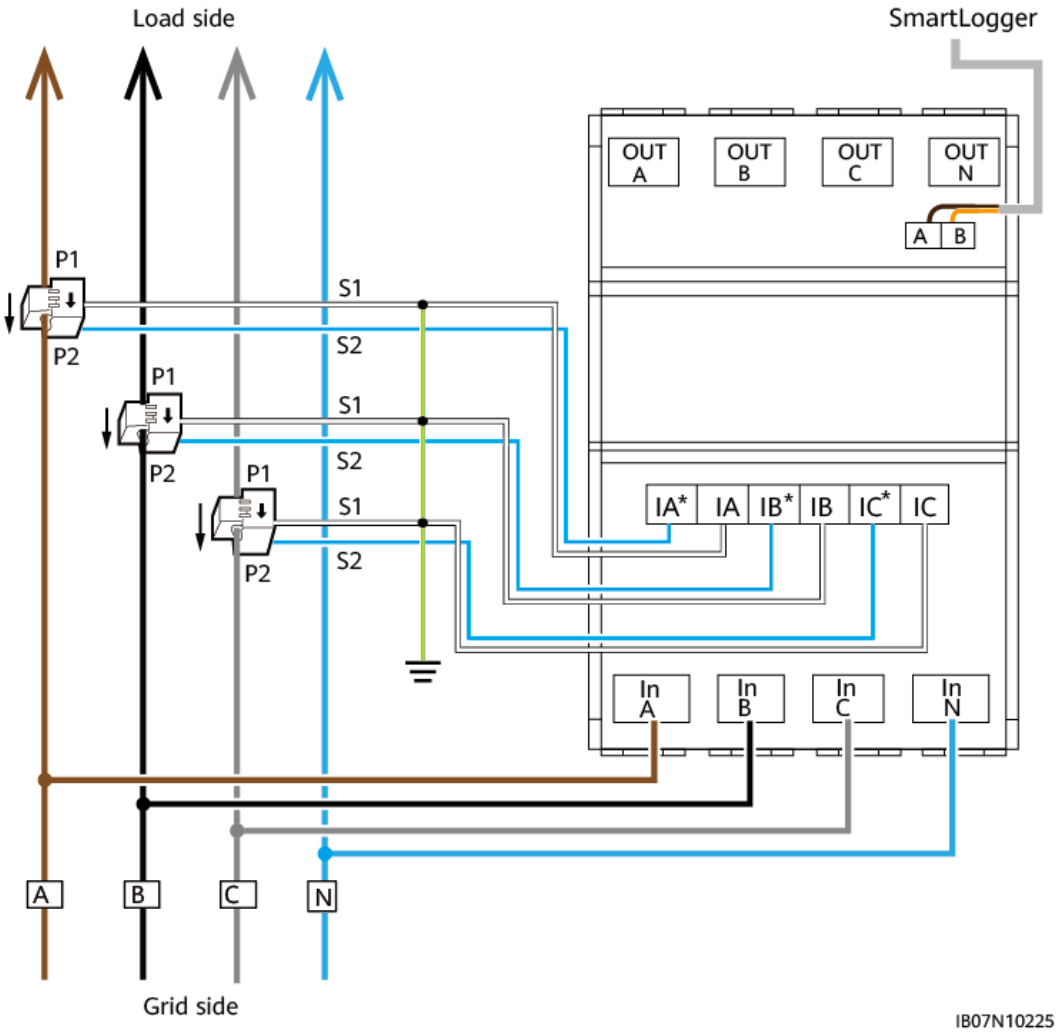
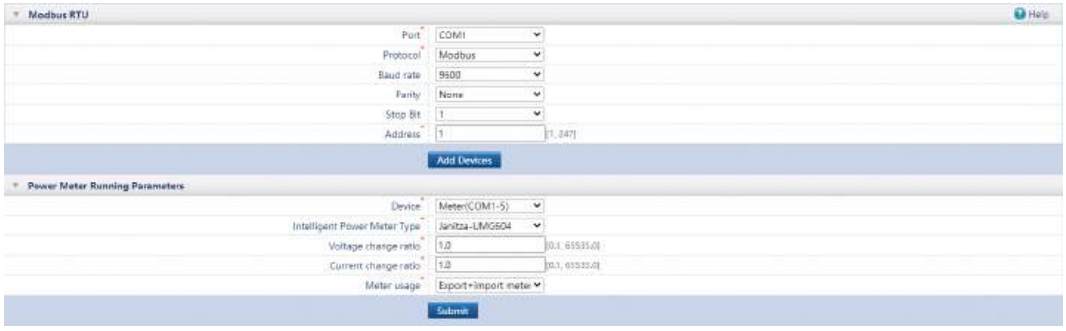
Figure A-2 Example 2 of correct meter connection



Meter Parameter Settings

Step 1 Connect to the meter. Choose **Deployment Wizard** > **Power Meter**.



1. After setting meter access parameters, click **Add Devices**.

Parameter	Description
Port	Set this parameter based on the COM port connected to the meter.

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Parameter	Description
Protocol	Set this parameter to **Modbus-RTU**.

2. Set meter running parameters and click **Submit**.

Parameter	Description
Device	**Meter**
Intelligent Power Meter Type	– If the power meter model is DTSU666-HW, select **DTSU666-HW**. – If the power meter model is YDS60-80, select **YADA-YDS60-80**. – If the power meter model is DHSU1079-ZT, select **DHSU1079-ZT**. – If the power meter model is DTSU71C, select **DTSU71C**.

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Parameter	Description
Voltage change ratio Current change ratio	– If both the power meter and the SmartLogger support the settings of the PT ratio and CT ratio, you can only set them either on the power meter or the SmartLogger. You are advised to set these parameters on the power meter. – Examples: ▪ Scenario 1: When the voltage of the grid connection point is 400 V, the power meter must be connected to a current transformer (CT), and the CT ratio is 400:5. ○ Set **Voltage change ratio** of the power meter to 1. ○ Set **Current change ratio** of the power meter to 80. ▪ Scenario 2: When the voltage of the grid connection point is 10 kV, the power meter must be connected to both the CT and potential transformer (PT). The CT ratio is 400:5, and the PT ratio is 10000:100. ○ Set **Voltage change ratio** of the power meter to 100. ○ Set **Current change ratio** of the power meter to 80. **NOTE** – The DTSU666-HW and YDS60-80 support a CT ratio range of 1–6553 and a PT ratio range of 0.1–999.9. – If the power meter connects to a transformer, set **SPEC** of the power meter to **0**, indicating that the power meter connects to the system through a transformer. – If **Export Limitation(kW)** is set to **Single-phase power** or **Feed-in at limited current** is used, the power meter must collect the current and voltage of each phase independently.
Meter usage	**Export+import meter**: used for grid connection point control.

Step 2 Choose **Monitoring > Meter > Running Param.**, set **Meter access direction**, and click **Submit**.

Parameter	Description
Meter access direction	Set this parameter to **Positive**. **NOTICE** Cables must be connected to the meter in correct polarities. If the cables are reversely connected, power off the meter, rectify the physical cable connection, and then set **Meter access direction** to **Positive**.

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Step 3 (Optional) Set **Electric meter power direction** only when **Active Power Control** uses export limitation.

1. Choose **Settings** > **Power Adjustment** > **Active Power Control**.
2. Set **Active power control mode** to **Export Limitation(kW)**.
3. Set **Electric meter power direction** to **Positive**.

Step 4 (Optional) Set **Electric meter power direction** only when **Reactive Power Control** uses **Power factor closed-loop control**.

1. Choose **Settings** > **Power Adjustment** > **Reactive Power Control**.
2. Set **Reactive power control mode** to **Power factor closed-loop control**.
3. Set **Electric meter power direction** to **Positive**.

----End

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B Reference Documents

Device	Document
ESS	• HUAWEI LUNA2000-(2236-5015) Series Smart String Grid Forming ESS User Manual • HUAWEI LUNA2000-(2236-5015) Series Smart String Grid Forming ESS Maintenance Manual • HUAWEI LUNA2000-(2236-5015) Series Smart String Grid Forming ESS Alarm Reference • HUAWEI LUNA2000-(2236-5015) Series Smart String Grid Forming ESS Quick Guide • HUAWEI LUNA2000-(2236-5015) Series Smart String Grid Forming ESS Startup Workflows and Check Items
PCS	• HUAWEI LUNA2000-213KTL-H0 Smart Power Control System User Manual • HUAWEI LUNA2000-213KTL-H0 Smart Power Control System Quick Guide • HUAWEI LUNA2000-213KTL-NHH0 Smart Power Control System User Manual • HUAWEI LUNA2000-213KTL-NHH0 Smart Power Control System Quick Guide • HUAWEI LUNA2000-PCS-SKID-H0 Smart PCS SKID User Manual • HUAWEI LUNA2000-PCS-SKID-H0 Smart PCS SKID Quick Guide • HUAWEI LUNA2000-PCS-SKID-NHH0 Smart PCS SKID User Manual • HUAWEI LUNA2000-PCS-SKID-NHH0 Smart PCS SKID Quick Guide
Inverter	• C&I inverter user manual • Utility-scale inverter user manual

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Device	Document
SACU	• **SmartACU2000D-D-(08-11) Series Smart Array Controller User Manual** • **SmartACU2000D-D-(08-11) Quick Guide**
SmartLogger	• **SmartLogger3000 User Manual** • **SmartLogger3000 Quick Guide**
Power meter	• **DTSU666-HW Smart Power Sensor Quick Guide** • **YDS60-80 Smart Power Sensor Quick Guide** • **DHSU1079-ZT Smart Power Sensor Quick Guide** • **DTSU71C Smart Power Sensor Quick Guide**
Power-Partner App	• **Utility-Scale ESS Power-On Tool Training (Power-Partner)** • **Utility-Scale ESS Power-On Tool Training (Power-Sales)**

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C Cable Selection Overview

C.1 PE Cables

Cable	Single/ Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
ESS PE bus cable	Single-core	ESS	Single-core outdoor copper cable	Recommended: 16–95 mm^2	≤ 32 mm	M10 OT/DT	You can refer to the specifications of the PE bus cable in this table or calculate the specifications according to IEC 60364-5-54.
ESS enclosure PE cable	Single-core	ESS		Recommended: 16–95 mm^2	≤ 32 mm	M12 OT/DT	The specifications of the PE cable are subject to this table or calculated according to IEC 60364-5-54.

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Cable	Single/ Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
PCS PE cable	N/A	PCS		Sp ≥ S/2	/	M12 OT/DT	Prepared by the customer. The specifications of the PE cable are subject to this table or calculated according to IEC 60364-5-54.
DTS PE cable	N/A	DTS		Recommended: 50–120 mm^2	/	M10 DT	Prepared by the customer.
DTS enclosure PE cable	N/A	DTS		Recommended: 50–120 mm^2	/	M12 DT	Prepared by the customer.
STS PE cable	N/A	STS		Recommended: 50–240 mm^2	10–32 mm	M12 OT/DT	Prepared by the customer.

C.2 Power Cables

Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
ESS-PCS DC power cable	Single-core	ESS	Single-core outdoor copper/copper-clad aluminum/aluminum cable; maximum working voltage: 1.5 kV DC; recommended rated working voltage of the cable ≥ 1.5 kV	Recommended: 70–150 mm^2	Recommended: 15–36 mm	M12 OT/DT	Select either single-core or two-core cables.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
		PCS		ESS-PCS scenario: 70–150 mm^2 recommended PCS used independently without the ESS: 70–240 mm^2			Prepared by the customer. Select either single-core or two-core cables.
		PCS SKID		Recommended: 70–150 mm^2			
	Two-core	ESS	Two-core outdoor copper/copper-clad aluminum/aluminum cable; maximum working voltage: 1.5 kV DC; recommended rated working voltage of the cable ≥ 1.5 kV	Recommended: 70–150 mm^2	Recommended: 30–50 mm	M12 OT/DT	Select either single-core or two-core cables.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
		PCS		Recommended: 70–150 mm^2 If the PCS is used independently without the ESS, a maximum of 240 mm^2 is supported.			Prepared by the customer. Select either single-core or two-core cables.
		PCS SKID		Recommended: 70–150 mm^2			

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
ESS-DTS AC power cable (one DTS MCCB connected to one cable)	Multi-core	ESS	ESS-DTS scenario: Five-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV ESS-third-party power supply device scenario: Four-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV	Recommended: 25–95 mm^2	Recommended: 25–59.5 mm	M10 OT/DT	Prepared by the customer. Four-core cables are used to connect to third-party power supply devices. Five-core cables are used to connect to the DTS.
		DTS (L)	Five-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV			M10 OT/DT Note: The AC power cable bolts support M12 and M10 specifications. The default specifications are M12. If M10 bolts are required, obtain M10 bolts from the accessory bag.	
		DTS (PE and N)				M10 DT terminal	

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
ESS-DTS AC power cable (one DTS MCCB connected to two cables)	Multi-core	ESS	ESS-DTS scenario: Five-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV ESS-third-party power supply device scenario: Four-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV	Recommended: 25–70 mm^2	Recommended: 25–59.5 mm	M10 OT/DT	Prepared by the customer. Four-core cables are used to connect to third-party power supply devices. Five-core cables are used to connect to the DTS.
		DTS (L)	Five-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV			M10 OT/DT Note: The AC power cable bolts support M12 and M10 specifications. The default specifications are M12. If M10 bolts are required, obtain M10 bolts from the accessory bag.	
		DTS (PE and N)				M10 DT terminal	

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
STS-PCS AC power cable	Single-core	STS	Single-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 1100 V AC; recommended rated voltage of the cable ≥ 1.8/3 kV	ESS scenario: Recommended: 70–240 mm^2 PV scenario: Recommended: 70–500 mm^2	Recommended: 15–35 mm	M12 OT/DT	Prepared by the customer. Select either single-core or three-core cables.
		PCS		Recommended: 70–240 mm^2			
	Three-core	STS	Three-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 1100 V AC; recommended rated voltage of the cable ≥ 1.8/3 kV	ESS scenario: Recommended: 70–240 mm^2 PV scenario: Recommended: 70–500 mm^2	Recommended: 30–65 mm		

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
		PCS		Recommended: 70–240 mm^2			
STS-DTS AC power cable	Single-core	STS DTS	Single-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 1100 V AC; recommended rated voltage of the cable ≥ 1.8/3 kV	Recommended: 50–240 mm^2	Recommended: 14–32 mm	M12 OT/DT	Prepared by the customer. Select either single-core or three-core cables.
	Three-core	STS DTS	Three-core outdoor copper/copper-clad aluminum/aluminum cable; system working voltage: 1100 V AC; recommended rated voltage of the cable ≥ 1.8/3 kV		Recommended: 30–66 mm		
ESS-UPS AC input power cable	Multi-core	ESS	Two-core or three-core outdoor copper/copper-clad aluminum/ aluminum cable; system working voltage: 230 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV	Recommended: 1.5–10 mm^2	Recommended: ≤ 32 mm	Pin cord end terminal with an insertion depth of 14 mm	Prepared by the customer. Optional, used for scenarios with UPS.
STS-tracking system power cable	N/A	STS	Three-core or four-core outdoor copper/copper-clad aluminum/ aluminum cable; system working voltage: 400 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV	Recommended: 2.5–16 mm^2	Recommended: 10–32 mm	/	Prepared by the customer.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
STS-customer equipment power cable	N/A	STS	Two-core or three-core outdoor copper/copper-clad aluminum/ aluminum cable; system working voltage: 230 V AC; recommended rated voltage of the cable ≥ 0.6/1 kV	Recommended: 2.5–10 mm^2	Recommended: 6–20 mm	/	Prepared by the customer.

C.3 Communications Cables

Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
ESS-SACU communications cable	N/A	ESS	CAT5E outdoor shielded network cable; internal resistance ≤ 1.5 ohms/10 m; recommended conductor material: oxygen-free copper or pure copper; bending radius ≥ 5 x Cable diameter	/	Recommended: 4.5–7.5 mm	Shielded RJ45 connector	/
	N/A	SACU					/
ESS-STS (with built-in SACU) communications cable	N/A	STS (with built-in SACU)					Prepared by the customer.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
ESS-PCS communications cable	N/A	ESS	CAT5E outdoor shielded network cable; internal resistance ≤ 1.5 ohms/10 m; recommended conductor material: oxygen-free copper or pure copper; bending radius ≥ 5 x Cable diameter	/	Recommended: 4.5–7.5 mm	Shielded RJ45 connector	You can purchase the network cable together with the ESS for directly connecting the ESS to the PCS or PCS SKID or prepare a cable by yourself.
	N/A	PCS					For PCSs delivered separately, the supplied 1.2 m network cable can be used for COM communication between adjacent PCSs. If the length does not meet the requirement, prepare a cable by yourself.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
	N/A	PCS SKID					If one battery rack corresponds to multiple PCSs, purchase the cables separately on the configurator. If no network cable is purchased or the length of the purchased network cable is insufficient, you need to prepare the network cable by yourself.
ESS-customer's video surveillance center communications cable	N/A	ESS	CAT5E outdoor shielded network cable; internal resistance ≤ 1.5 ohms/10 m; recommended conductor material: oxygen-free copper or pure copper; bending radius ≥ 5 x Cable diameter	/	Recommended: 4.5–7.5 mm	Shielded RJ45 connector	/

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
PCS-SACU communications cable PCS-STS (with built-in SACU) communications cable	N/A	PCS	CAT5E outdoor shielded network cable; internal resistance ≤ 1.5 ohms/10 m; recommended conductor material: oxygen-free copper or pure copper; bending radius ≥ 5 x Cable diameter	/	Recommended: 4.5–7.5 mm	Shielded RJ45 connector	For PCSs delivered separately, the supplied 1.2 m network cable can be used for FE communication between adjacent PCSs. If the length does not meet the requirement, prepare a cable by yourself. You need to prepare the network cable by yourself for directly connecting the PCS to the SACU.
	N/A	SACU					Prepared by the customer.
	N/A	STS					Prepared by the customer.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
STS-peripheral network cable	N/A	STS (The STS communicates with the ESS and PCS to form a ring network through the SWITCH GE port of the SACU built in the STS based on the actual networking scenario.)	CAT5E outdoor shielded network cable; internal resistance ≤ 1.5 ohms/10 m; recommended conductor material: oxygen-free copper or pure copper; bending radius ≥ 5 x Cable diameter	/	Recommended: 4.5–7.5 mm	Shielded RJ45 connector	Prepared by the customer.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
SACU-peripheral RS485 communications cable STS (with built-in SACU)-peripheral RS485 communications cable	N/A	STS (The STS communicates with the PID module through the SmartLogger or with the SACU based on the actual networking scenario.)	Computer cable (DJYP2VP2-22 2x2x1) that can be used outdoors or armored shielded twisted pair cable	Recommended: 1.5–2.5 mm^2	/	M4 OT	Prepared by the customer. RS485 shielded twisted pair cables cannot be replaced with network cables.
	N/A	SACU					
PCS SKID-SACU/STS (with built-in SACU) optical fiber cable	N/A	PCS SKID	Four-core or eight-core single-mode optical fiber cable (armored or direct-buried) with a transmission wavelength of 1310 nm	/	Recommended: ≤ 18 mm	Optical fiber terminal	Optical modules are purchased separately on the configurator. Optical fiber cables are prepared by the customer.
	N/A	SACU					

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
	N/A	STS (with built-in SACU)					
ESS-SACU/STS (with built-in SACU) optical fiber cable	N/A	ESS	Four-core or eight-core single-mode optical fiber cable (armored or direct-buried) with a transmission wavelength of 1310 nm	/	Recommended: ≤ 18 mm	Optical fiber terminal	
	N/A	SACU					
	N/A	STS (with built-in SACU)					

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
STS (with built-in SACU)-northbound optical fiber cable SACU-northbound optical fiber cable	N/A	STS (The STS communicates with the plant-level network switch to form a dual-link control ring network through the GE/SFP port based on the actual networking scenario.)	Four-core or eight-core single-mode optical fiber cable (armored or direct-buried) with a transmission wavelength of 1310 nm	/	Recommended: ≤ 18 mm	Optical fiber terminal	Prepared by the customer.
	N/A	SACU					Prepared by the customer.

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Cable	Single / Multi-Core	Device	Cable Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Remarks
DTS-STS alarm signal cable	N/A	DTS	Four-core outdoor copper/copper-clad aluminum/aluminum cable	Recommended: 1.5 mm^2	≤ 10 mm	/	Prepared by the customer.

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D Deployment and Installation Requirements for Lead-Acid Batteries of the AC/DC Integrated Power System

Category	Subcategory	Detailed Constraint	Constraint Reference Source
Deployment	Separate space	For valve-regulated lead-acid batteries with a capacity of 300 Ah or above, a dedicated battery room is required. The battery room shall be located at the 0 m level.	DL/T 5044-2014 Technical code for design of DC auxiliary power supply system for power engineering

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Category	Subcategory	Detailed Constraint	Constraint Reference Source
	Building requirements	1. The battery room shall be built using non-combustible materials. The ceiling shall be flat and not suspended. Folded-plate or groove ceilings shall not be used. 2. In areas where the basic seismic intensity is 7 degrees or above, the batteries shall be reinforced for earthquake resistance. 3. Ventilation louver or glass skylight shall not be installed on the corridor wall of the battery room. The distance between the heating and cooling facilities and the batteries shall be ≥ 750 mm. The heating radiator in the battery room shall be a welded steel radiator. Flanges, threaded fittings, and valves are not allowed inside the room. 4. The door of the battery room shall be outward-opening and made of solid materials that are non-combustible or difficult to burn. Its dimensions shall be ≥ 750 mm (width) x 1960 mm (height). 5. Equipment or aisles unrelated to batteries are not permitted in the battery room. Doors, windows, or openings are not permitted in the partition walls of the DC distribution room, electrical distribution room, and electrical relay room that are adjacent to the battery room.	DL/T 5044-2014 Technical code for design of DC auxiliary power supply system for power engineering
		1. Acid-resistant measures shall be taken for the walls, doors, windows, ceilings, and metal pipes and structures of the lead-acid battery charging room. The floor shall be acid-resistant, and shall have a proper gradient and water supply and drainage facilities. 2. Unrelated troughs and pipes shall not be routed under the floor of the lead-acid battery charging room.	GB 50055-2011 Code for design of electric distribution of general-purpose utilization equipment

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Category	Subcategory	Detailed Constraint	Constraint Reference Source
		1. Rooms or spaces containing ESS shall be separated from other areas of the building by fire barriers with a minimum 2-hour fire resistance rating and horizontal assemblies with a minimum 2-hour fire resistance rating and constructed in accordance with the local building code. 2. If all types of lead-acid batteries, aqueous nickel-based batteries, and aqueous metal-air batteries are used for stationary backup services and meet one of the following conditions, the partitions between the batteries and other areas of the building are only required to have a 1-hour fire resistance rating: a. Consists of open-type cells in the system. b. Consists of cells or batteries that comply with UL 1973. c. Used for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility and located outdoors or in building spaces used exclusively for such installations. d. Used for control of fixed guideway transit or passenger rail systems under the exclusive control of transportation management departments and located outdoors or building spaces used exclusively for such installations. e. Used for communications equipment (under the exclusive control of communications utilities and located outdoors or building spaces used exclusively for such installations) in telecommunications facilities. f. Used in an uninterruptible power system that complies with UL 1778.	NFPA 855-2026 Standard for the Installation of Stationary Energy Storage Systems

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Category	Subcategory	Detailed Constraint	Constraint Reference Source
		3. Combustible materials not related to the ESS shall not be stored in dedicated rooms containing ESS equipment. Combustible materials related to the ESS shall not be stored within 0.9 m from ESS equipment.	
	Installed in a steel frame composite structure	The batteries shall be installed in a steel-frame composite structure that supports multi-layer stacking and facilitates easy installation, maintenance, and replacement. The bottom layer of the platform shall be 150–300 mm above the ground, and the overall height shall not exceed 1700 mm.	DL/T 5044-2014 Technical code for design of DC auxiliary power supply system for power engineering
	Environmental requirements	1. The battery room shall be located in an environment free from high temperature, high humidity, vibration, and excessive dust, and shall be protected from direct sunlight. 2. Windows in the battery room shall use frosted glass or be coated with semi-transparent paint to prevent direct sunlight from entering the room.	DL/T 5044-2014 Technical code for design of DC auxiliary power supply system for power engineering

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Category	Subcategory	Detailed Constraint	Constraint Reference Source
		The ambient temperature in the battery room shall be 5°C to 30°C (optimal: 15°C to 30°C) and the relative humidity shall be lower than 80%.	DL/T 5044-2014 Technical code for design of DC auxiliary power supply system for power engineering GB 50172-2012 Code for construction and acceptance of battery electric equipment installation engineering
Air exhaust system	Model selection and requirements	The indoor ESS shall use mechanical exhaust ventilation. Mechanical exhaust ventilation shall be provided in accordance with the applicable mechanical code and one of the following: 1. Where hydrogen is the gas generated, an exhaust ventilation rate based on hydrogen generation estimates sufficient to limit the maximum concentration of hydrogen to 1.0% of the total volume of the room or cabinet during the worst-case event of simultaneous "boost" charging of all the batteries, in accordance with nationally recognized standards 2. An exhaust ventilation rate based on the area of not less than 5.1 L/sec/m^2 (1 ft^3/min/ft^2) of the ESS floor area	NFPA 855-2026 Standard for the Installation of Stationary Energy Storage Systems

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Category	Subcategory	Detailed Constraint	Constraint Reference Source
	Startup logic	The mechanical exhaust ventilation system and its components shall meet one of the following requirements: 1. The mechanical exhaust ventilation system shall be interlocked with the hydrogen concentration detector. When the hydrogen concentration in the air reaches 1% by volume, the mechanical exhaust fan shall automatically start. 2. The mechanical exhaust ventilation system shall operate continuously to prevent the accumulation of flammable gases and to ensure that the concentration does not exceed 1.0% of the free air volume.	DL/T 5035-2016 Code for design of heating, ventilation and air conditioning of power plant NFPA 855-2026 Standard for the Installation of Stationary Energy Storage Systems
Electrical equipment	Model selection and requirements	Explosion-proof lighting equipment and explosion-proof ventilation motors shall be used in the battery room. Explosion-proof lighting equipment shall be installed at the top of the aisle. Indoor lighting cables shall be routed through conduits. Common switches and power sockets that may generate sparks shall not be installed inside the room.	DL/T 5044-2014 Technical code for design of DC auxiliary power supply system for power engineering GB 55024-2022 General code for building electricity and intelligence GB 50172-2012 Code for construction and acceptance of battery electric equipment installation engineering

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Category	Subcategory	Detailed Constraint	Constraint Reference Source
Combustible gas detection	Sensor type	Combustible gas detection and alarm devices shall be installed in locations within the building where combustible gases or vapors may be released.	GB 55037-2022 General code for fire protection of buildings and constructions
		Possible standards to which combustible gas detectors might be approved or listed include UL 2075, ULC-Can-S588, IEC 60079-29-1, FM 6320 and FM 6325 in compliance with the local fire code.	NFPA 855-2026 Standard for the Installation of Stationary Energy Storage Systems
	Installation requirements	• Combustible gas detectors intended to detect gases with a density lower than air shall be installed at the top of the protected space. • Combustible gas detectors intended to detect gases with a density higher than air shall be installed at the bottom of the protected space. • Combustible gas detectors intended to detect gases with a density similar to air shall be installed at the middle or top of the protected space.	GB 50116-2013 Code for Design of Automatic Fire Alarm System
Fire suppression system	Fire control and suppression	Fire control and suppression for rooms or areas within buildings containing the ESS shall be provided in accordance with the local fire code.	NFPA 855-2026 Standard for the Installation of Stationary Energy Storage Systems

NOTE

In EU member states, the batteries of the AC/DC integrated power system shall also meet the requirements of Regulation (EU) 2023/1542.

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E Contact Information

If you have any questions about this product, please contact us.

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To ensure faster and better services, we kindly request your assistance in providing the following information:

- Model
- Serial number (SN)
- Software version
- Alarm ID or name
- Brief description of the fault symptom

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F Acronyms and Abbreviations

D	
DTS	Distribution Transformer
E	
EMS	energy management system
ESS	energy storage system
F	
FE	fast Ethernet
P	
PCS	power control system
S	
SACU	Smart Array Controller
SOC	state of charge
SOH	state of health

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SPMS	Smart Plant Management System
STS	Smart Transformer Station

U

UPS	uninterruptible power supply

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