SmartACU2000D Smart Array Controller

User Manual (Dual Opto-Electronic Ethernet Switches)

Issue 04

Date 2023-09-26

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About This Document

Purpose

This document describes the installation, electrical connections, and maintenance operations of the outdoor cabinet SmartACU2000D Smart Array Controller (also referred to as SACU). Before you install and operate the SACU, read this document carefully to get familiar with the safety precautions, functions, and features of the device.

Figures used in this document are for reference only.

Intended Audience

This document is intended for operating personnel and qualified electricians in photovoltaic (PV) and energy storage plants.

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.
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 degradation, or other unanticipated results. NOTICE is used to address practices not related to personal injury.

Symbol	Description
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 previous issues.

Issue 04 (2023-09-26)

Updated **2.1 Product Introduction**.

Updated **2.5 Working Principle**.

Issue 03 (2023-05-09)

Updated **4.3 Tools**.

Issue 02 (2022-11-30)

Updated **1 Safety Information**.

Updated **2.6 Configuration in Different Scenarios**.

Added **4.2 Unpacking and Acceptance**.

Updated **4.7.2 (Optional) Installing the 24 V Power Module**.

Updated **5.5 (Optional) Connecting DC Output Power Cables to the 24 V Power Module**.

Issue 01 (2022-08-17)

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

Contents

1 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:

- The equipment is damaged 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.
- The equipment is operated beyond the conditions specified in this document.

- The equipment is installed or used in environments that do not comply with international, national, or regional standards.
- The equipment is installed or used by unqualified personnel.
- You fail to follow the operation instructions and safety precautions on the product and in the document.
- You remove or modify the product or modify the software code without authorization.
- You or a third party authorized by you cause the equipment damage during transportation.
- The equipment is damaged due to storage conditions that do not meet the requirements specified in the product document.
- You fail to prepare materials and tools that comply with local laws, regulations, and related standards.
- The equipment is damaged due to your or a third party's negligence, intentional breach, gross negligence, or improper operations, or other reasons not related to the Company.

1.1 Personal Safety

DANGER

Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will generate electric arcs or sparks, which may cause a fire or personal injury.

DANGER

Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.

DANGER

Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

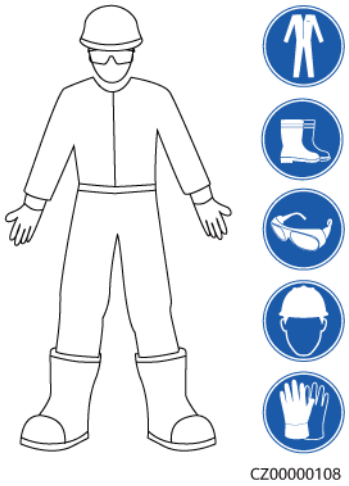
DANGER

During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

WARNING

During operations, wear personal protective equipment such as protective clothing, insulated shoes, goggles, safety helmets, and insulated gloves.

Figure 1-1 Personal protective equipment



General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment.
- If there is a likelihood of personal injury or equipment damage during operations, immediately stop, report the case to the supervisor, and take feasible protective measures.
- Do not power on the equipment before it is installed or confirmed by professionals.
- Do not touch the power supply equipment directly or with conductors such as damp objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to ensure that there is no risk of electric shock.
- Do not touch operating equipment because the enclosure is hot.
- Do not touch a running fan with your hands, components, screws, tools, or boards. Otherwise, personal injury or equipment damage may occur.
- In the case of a fire, immediately leave the building or the equipment area and activate the fire alarm or call emergency services. Do not enter the affected building or equipment area under any circumstances.

Personnel Requirements

- Only professionals and trained personnel are allowed to operate the equipment.
  - Professionals: personnel who are familiar with the working principles and structure of the equipment, trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, maintenance

  - Trained personnel: personnel who are trained in technology and safety, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Personnel who plan to install or maintain the equipment must receive adequate training, be able to correctly perform all operations, and understand all necessary safety precautions and local relevant standards.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will perform special tasks such as electrical operations, working at heights, and operations of special equipment must possess the required local qualifications.
- Only authorized professionals are allowed to replace the equipment or components (including software).
- Only personnel who need to work on the equipment are allowed to access the equipment.

1.2 Electrical Safety

DANGER

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

DANGER

Non-standard and improper operations may result in fire or electric shocks.

DANGER

Prevent foreign matter from entering the equipment during operations. Otherwise, equipment damage, load power derating, power failure, or personal injury may occur.

WARNING

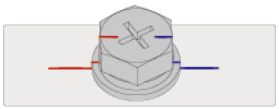
For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.

CAUTION

Do not route cables near the air intake or exhaust vents of the equipment.

General Requirements

- Follow the procedures described in the document for installation, operation, and maintenance. Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission.
- Obtain approval from the national or local electric utility company before connecting the equipment to the grid.
- Observe the power plant safety regulations, such as the operation and work ticket mechanisms.
- Install temporary fences or warning ropes and hang "No Entry" signs around the operation area to keep unauthorized personnel away from the area.
- Before installing or removing power cables, turn off the switches of the equipment and its upstream and downstream switches.
- Before performing operations on the equipment, check that all tools meet the requirements and record the tools. After the operations are complete, collect all of the tools to prevent them from being left inside the equipment.
- Before installing power cables, check that cable labels are correct and cable terminals are insulated.
- When installing the equipment, use a torque tool of a proper measurement range to tighten the screws. When using a wrench to tighten the screws, ensure that the wrench does not tilt and the torque error does not exceed 10% of the specified value.
- Ensure that bolts are tightened with a torque tool and marked in red and blue after double-check. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm that the bolts are tightened and then mark them in red. (The marks must cross the edges of the bolts.)



- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- Before maintaining a downstream electrical or power distribution device, turn off the output switch on the power supply equipment.
- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.

- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.
- For the equipment that uses a three-pin socket, ensure that the ground terminal in the socket is connected to the protective ground point.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated, and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are away from each other without entanglement and overlapping.
- When cable connection is completed or paused for a short period of time, seal the cable holes with sealing putty immediately to prevent small animals or moisture from entering.
- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.
- When the temperature is low, violent impact or vibration may damage the plastic cable sheathing. To ensure safety, comply with the following requirements:
  - Cables can be laid or installed only when the temperature is higher than 0°C. Handle cables with caution, especially at a low temperature.
  - Cables stored at subzero temperatures must be stored at room temperature for at least 24 hours before they are laid out.

- Do not perform any improper operations, for example, dropping cables directly from a vehicle. Otherwise, the cable performance may deteriorate due to cable damage, which affects the current-carrying capacity and temperature rise.

1.3 Environment Requirements

DANGER

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

DANGER

Do not store any flammable or explosive materials in the equipment area.

DANGER

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheat may damage the equipment or cause a fire.

WARNING

Install the equipment in an area far away from liquids. Do not install it under areas prone to condensation, such as under water pipes and air exhaust vents, or areas prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.

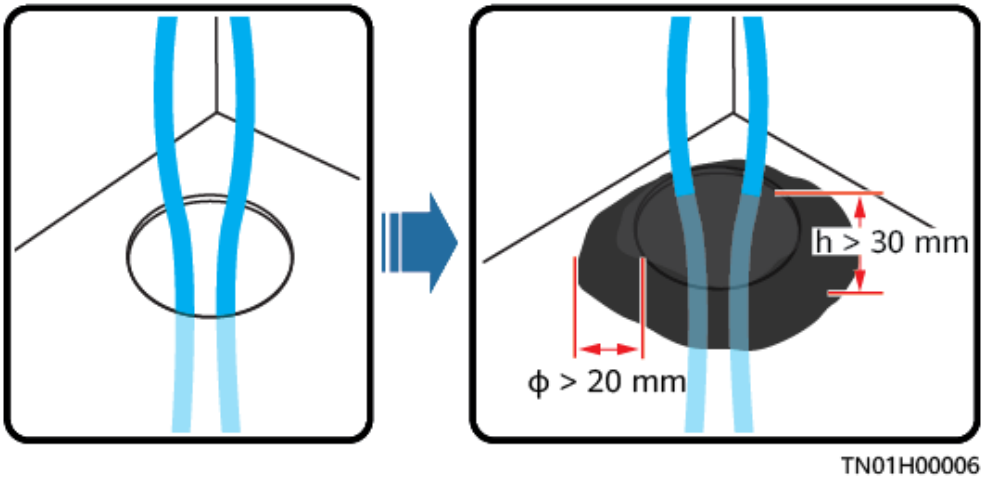
WARNING

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Ensure that the equipment is stored in a clean, dry, and well ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install the equipment in an area conducive to the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.
- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land prone to water or snow accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel.
- Do not install the equipment outdoors in salt-affected areas because it may be corroded. A salt-affected area refers to the region within 500 m of the coast or prone to sea breeze. Regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- Before opening doors during the installation, operation, and maintenance of the equipment, clean up any water, ice, snow, or other foreign objects on the top of the equipment to prevent foreign objects from falling into the equipment.
- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- Ensure that the equipment room provides good heat insulation, and that the walls and floor are dampproof.
- Install rodent guards at the door of the equipment room to prevent rodents and insects from entering the room.
- All cable holes must be sealed. Seal the used cable holes with sealing putty. Seal the unused cable holes with the caps delivered with the equipment. The following figure shows the criteria for correct sealing with sealing putty.



- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.4 Mechanical Safety

WARNING

Ensure that all necessary tools are ready and inspected by a professional organization. Do not use tools that have signs of scratches or fail to pass the inspection or whose inspection validity period has expired. Ensure that the tools are secure and not overloaded.

WARNING

Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.

WARNING

When pulling equipment out of a cabinet, be aware of unstable or heavy objects in the cabinet to prevent injury.

WARNING

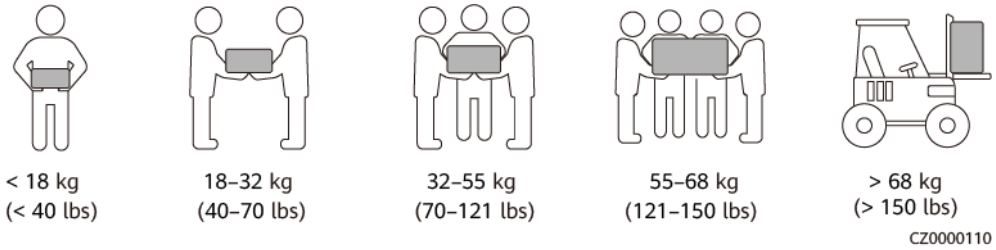
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches must not be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.
- Do not install other devices on the top of the equipment without evaluation by the Company.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

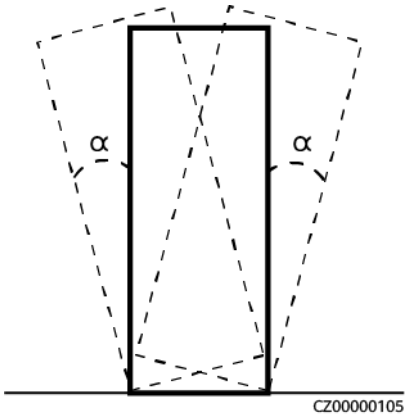
Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.

- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea or roads in good conditions for transportation. Do not transport the equipment by railway or air. Avoid tilt or jolt during transportation.
- Ensure that tilt angle of the cabinet meets the requirements shown in the figure. The tilt angle α of a cabinet with packaging must be less than or equal to 15°. After the cabinet is unpacked, its tilt angle α must be less than or equal to 10°.



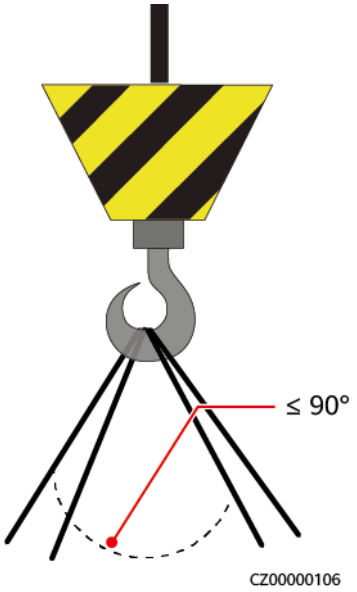
Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Do not use single ladders.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the ladder is securely positioned and held firm.

- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.

Hoisting

- Only trained and qualified personnel are allowed to perform hoisting operations.
- Install temporary warning signs or fences to isolate the hoisting area.
- Ensure that the foundation where hoisting is performed on meets the load-bearing requirements.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a fixed object or wall that meets the load-bearing requirements.
- During hoisting, do not stand or walk under the crane or the hoisted objects.
- Do not drag steel ropes and hoisting tools or bump the hoisted objects against hard objects during hoisting.
- Ensure that the angle between two hoisting ropes is no more than 90 degrees, as shown in the following figure.



Drilling Holes

- Obtain consent from the customer and contractor before drilling holes.
- Wear protective equipment such as safety goggles and protective gloves when drilling holes.
- To avoid short circuits or other risks, do not drill holes into buried pipes or cables.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings.

2 Overview

2.1 Product Introduction

Functions

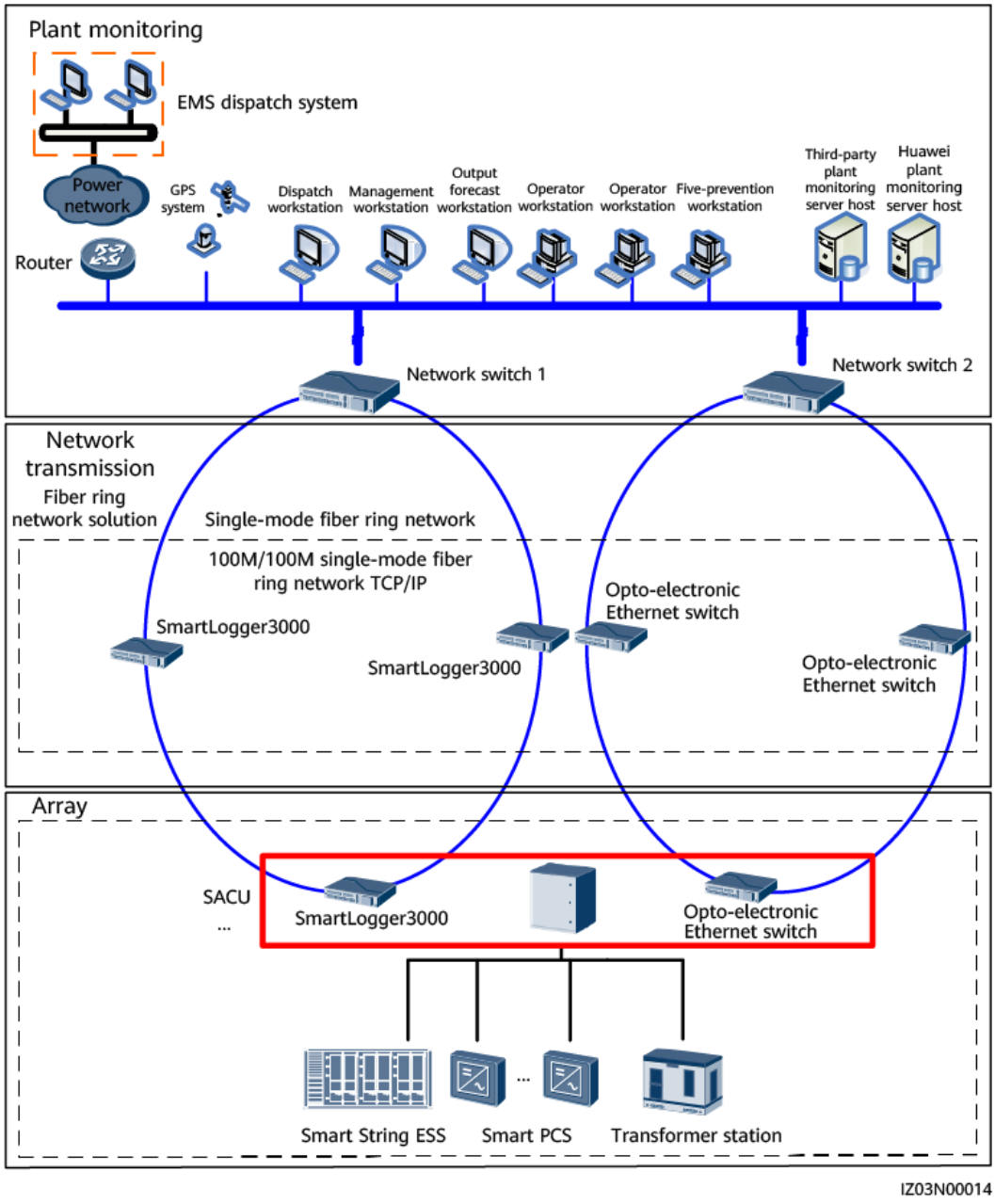
The Smart Array Controller (SACU) is an outdoor cabinet that houses various devices, including the SmartLogger3000 (also referred to as the SmartLogger) and opto-electronic Ethernet switches.

The SmartLogger monitors and manages PV power systems and energy storage systems (ESSs). It converges ports, converts protocols, stores data, and centrally monitors and maintains the devices in the PV power systems and ESSs.

Features

- Intelligent and flexible: The SACU connects to a maximum of 150 solar inverters or 24 Smart String ESSs and 44 Smart Power Control Systems (PCSs), and supports one-click commissioning.
- Easy to use: It supports wizard-based settings, and facilitates parameter settings and device connections.
- Stable and reliable: It has a built-in surge protection module for safe and reliable industrial applications.

Networking



Wired network: fiber ring network solution

NOTE

- The SmartLogger and opto-electronic Ethernet switches are installed in the SACU.
- A maximum of 15 SmartLoggers can be connected to form an optical fiber ring network with the opto-electronic Ethernet switches. Each SmartLogger can connect to various devices, including Smart String ESSs, Smart PCSs, and transformer stations.
- Multiple optical fiber ring networks can be connected to the management system over network switches.
- The fiber channel switch (network switch as shown in the preceding figure) must support and enable the standard RSTP, and the bridge priority of the switch must be higher than 0x8000 of the SmartLogger (recommended value: 0x7000; a smaller value indicates a higher bridge priority). For details about how to configure the RSTP and bridge priority of the switch, contact the vendor. If the switch does not support the RSTP, the fiber ring topology must be changed to a chain or star topology.

2.2 Model

Model Description

This document involves the following product model.

Figure 2-1 Model number

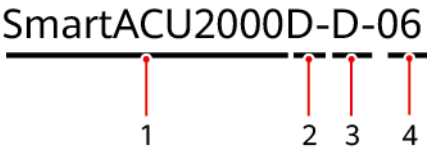


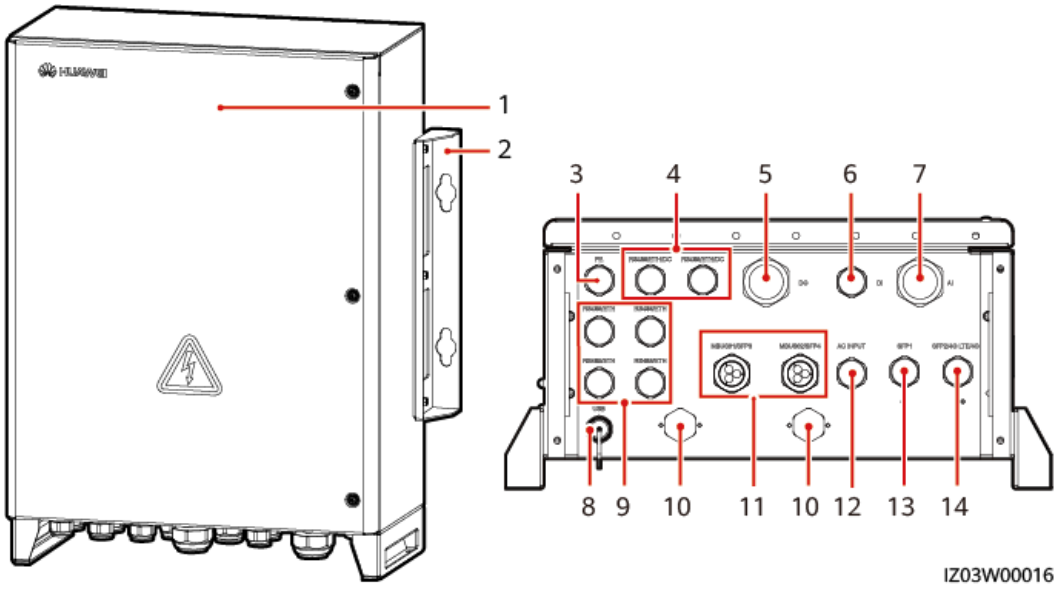
Table 2-1 Model description

No.	Meaning	Description
1	Series name	SmartACU2000: Smart Array Controller
2	Hardware ID	D: version D
3	Voltage level	D: Supports inverters or Smart PCSs with three-phase AC output voltage of less than or equal to 800 V.
4	Configuration	06: Supports seven FE links and four SFP links in the southbound and seven FE links and six SFP links in the northbound.

2.3 Exterior

Appearance

Figure 2-2 Appearance

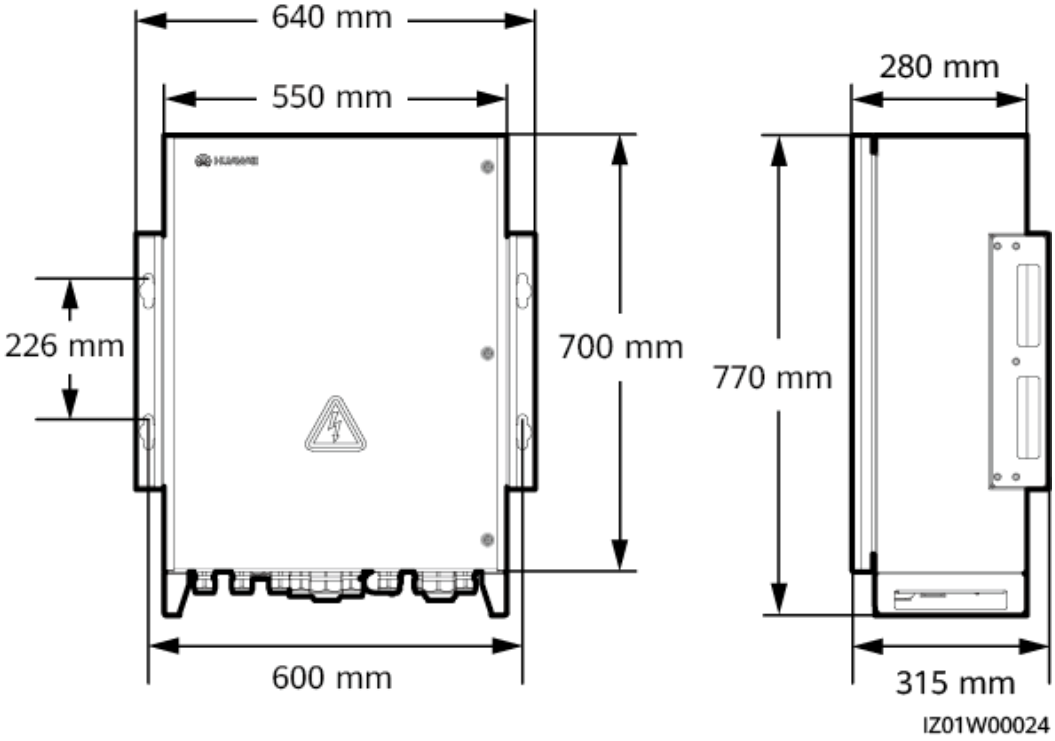


No.	Component	Silk Screen	Description
1	Cabinet door	-	-
2	Mounting bracket	-	-
3	Waterproof connector for the PE cable	PE	• Specifications: 3/4 in. • Inner diameter: 13–18 mm
4	Waterproof connector for the RS485 communications cable, network cable, or DC power cable	RS485/ETH/DC	• Specifications: 3/4 in. • Inner diameter: 13–18 mm
5	Waterproof connector for the DO signal cable	DO	• Specifications: 5/4 in. • Inner diameter: 20–32 mm
6	Waterproof connector for the DI signal cable	DI	• Specifications: 3/4 in. • Inner diameter: 13–18 mm
7	Waterproof connector for the AI signal cable	AI	• Specifications: 5/4 in. • Inner diameter: 20–32 mm

No.	Component	Silk Screen	Description
8	USB port	USB	The USB port is used only for maintenance (such as upgrades and data export). Ensure that the USB port cover is tightened when the port is not used.
9	Waterproof connector for the RS485 communications cable or network cable	RS485/ETH	• Specifications: 3/4 in. • Inner diameter: 13–18 mm
10	Ventilation valve	-	-
11	Waterproof connector for the three-phase AC power cable or optical cable	MBUS01/SFP3, MBUS02/SFP4	• Specifications: 1 in. • Inner diameter: 18–25 mm
12	Waterproof connector for the single-phase AC power cable	AC INPUT	• Specifications: 3/4 in. • Inner diameter: 13–18 mm
13	Waterproof connector for the optical cable	SFP1	• Specifications: 3/4 in. • Inner diameter: 13–18 mm
14	Waterproof connector for the optical cable, network cable, or 4G antenna	SFP2/4G LTE/4G	• Specifications: 3/4 in. • Inner diameter: 13–18 mm

Dimensions

Figure 2-3 Cabinet dimensions



Enclosure Signs

Symbol	Name	Meaning
	Warning label for electric shock	High voltage exists after the device is powered on. Only qualified and trained electrical technicians are allowed to install and operate the device.
	Warning label for cable connection	Do not connect a three-phase input power cable to a single-phase input switch. Do not connect a single-phase input power cable to a three-phase input switch. Otherwise, the device will be damaged.
	Warning label for surge protection module operation	Do not remove or install a surge protection module with the power on.

Symbol	Name	Meaning
	Weight label	The device is heavy and needs to be moved with auxiliary tools or by more than one person.
	Warning label for electric shock	Before powering off the device, disconnect all power supplies.

2.4 Components

NOTE

For simplicity purposes, the following figure shows only the components that you need to operate and the reserved installation positions.

Figure 2-4 Component locations

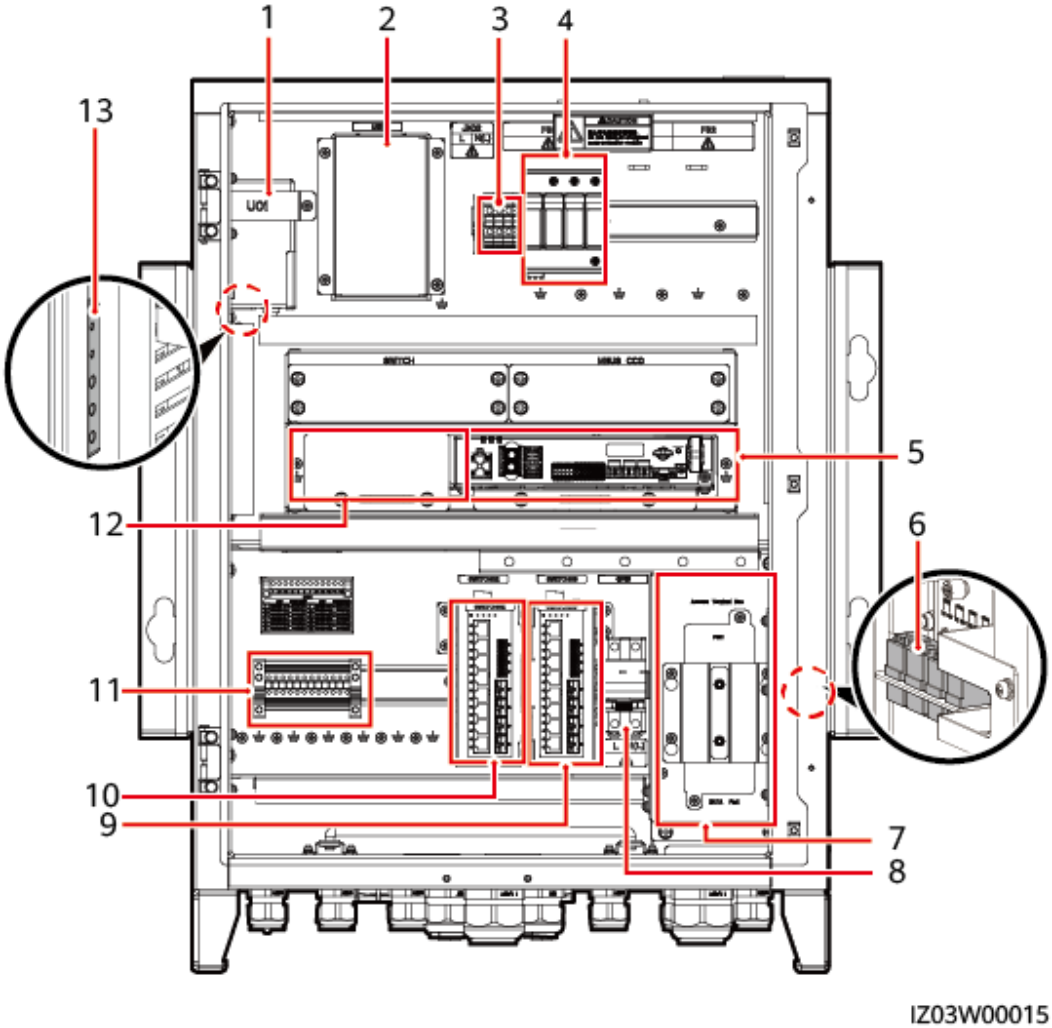
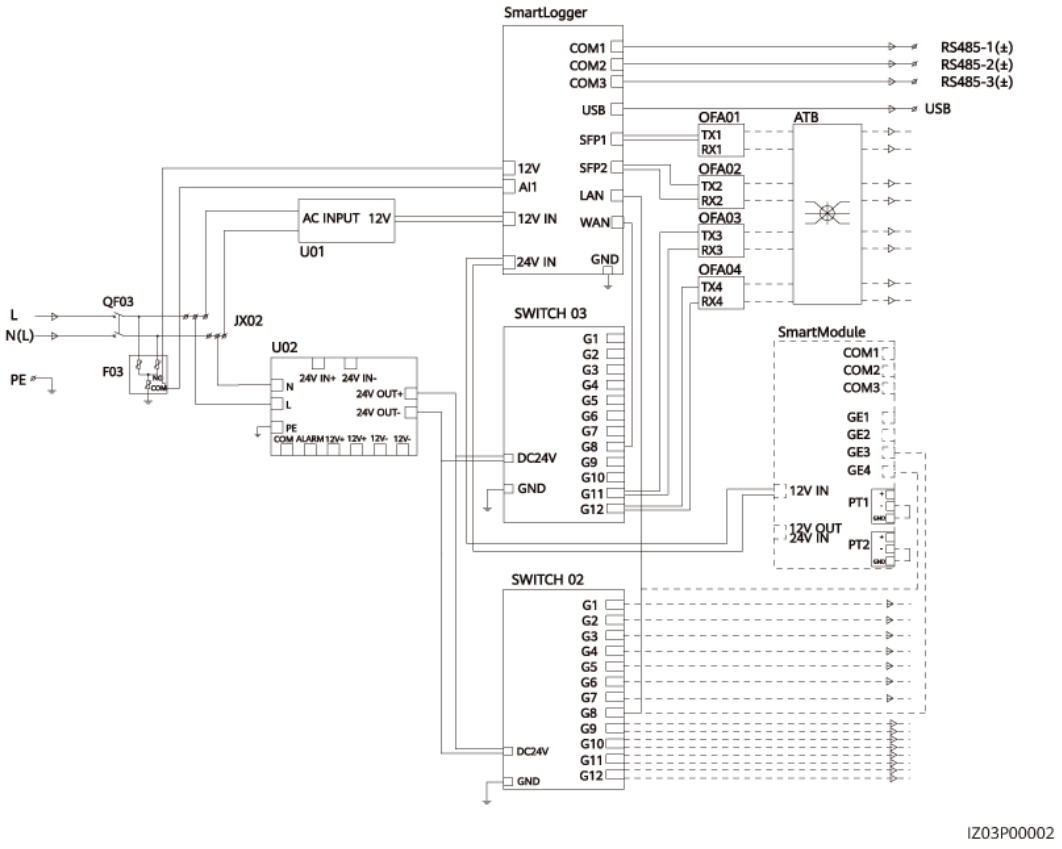


Table 2-2 Components and reserved installation positions

No.	Name	Description	Quantity
1	Power adapter of the SmartLogger (U01)	• AC input: 100 V AC to 240 V AC; 50 Hz/60 Hz • DC output: 12 V DC/2 A	1
2	24 V DC power module or installation position of the 24 V DC power module (U02)	• AC input: 100 V AC to 240 V AC; 50 Hz/60 Hz • DC output: 12 V DC, 60 W (maximum); 24 V DC, 30 W (maximum)	1
3	AC input terminal of the 24 V power module (JX02)	220 V/4P	1
4	Single-phase SPD (F03)	U_c = 385 V AC; 20 kA/40 kA; 8/20 μs; 4P	1
5	SmartLogger3000 (SmartLogger)	SmartLogger3000	1
6	Optical fiber adapter (OFA01: TX1 RX1; OFA02: TX2 RX2; OFA03: TX3 RX3; OFA04: TX4 RX4)	2LC/PC-2LC/PC-4	4
7	ATB (Access Terminal Box)	-	1
8	Single-phase input switch (QF03)	32 A/2P	1
9	Opto-electronic Ethernet switch (SWITCH03)	-	1
10	Opto-electronic Ethernet switch (SWITCH02)	-	1
11	RS485 communications terminal (JX01)	12P; supports cables with a cross-sectional area ranging from 1 mm^2 to 2.5 mm^2	1
12	Position for the SmartModule1000A01 (SmartModule)	-	-
13	PE bar	-	1

2.5 Working Principle

Figure 2-5 Schematic diagram



The SACU communicates with devices in an ESS via RS485, ETH, or dual-fiber ring network.

- RS485 communication
  - The SACU supports RS485 communication.
  - The SmartLogger connects to devices such as transformer stations and power meters that support RS485 communication via COM ports.
- ETH communication
  - The SACU supports ETH communication. Opto-electronic Ethernet switches are installed in the cabinet.
  - The SmartLogger provides one 10M/100M/1000M Ethernet electrical port (WAN), which can be expanded to seven 10M/100M/1000M Ethernet electrical ports and four 100M/1000M Ethernet optical ports through opto-electronic Ethernet switches.

The SACU communicates with the plant monitoring system over a dual-fiber ring network or dual-plane redundancy network.

- Dual-fiber ring network
  - The SACU supports dual-fiber ring network communication.

  - The SmartLogger and opto-electronic Ethernet switches connect to the plant monitoring system via optical fiber communication with an ATB.
- Dual-plane redundancy network
  - The SACU supports dual-plane redundancy network communication.
  - The SmartLogger connects to the plant monitoring system over the optical fibers and Ethernet.

2.6 Configuration in Different Scenarios

Figure 2-6 Networking diagram (without a SmartModule)

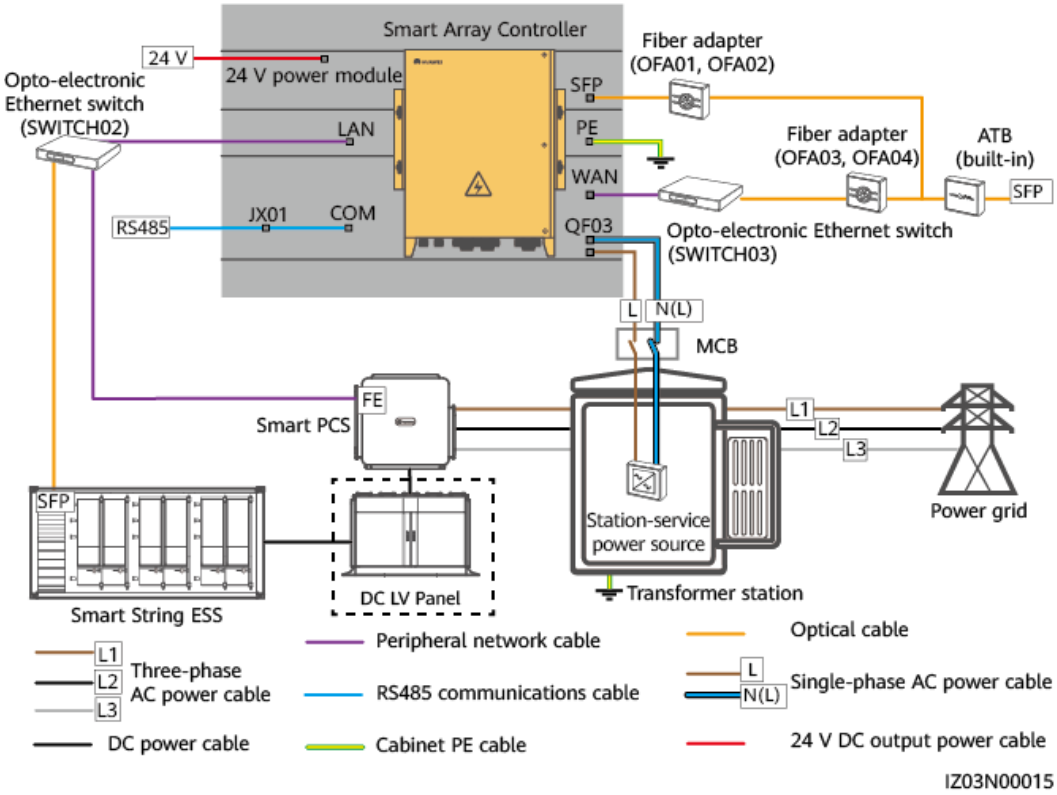
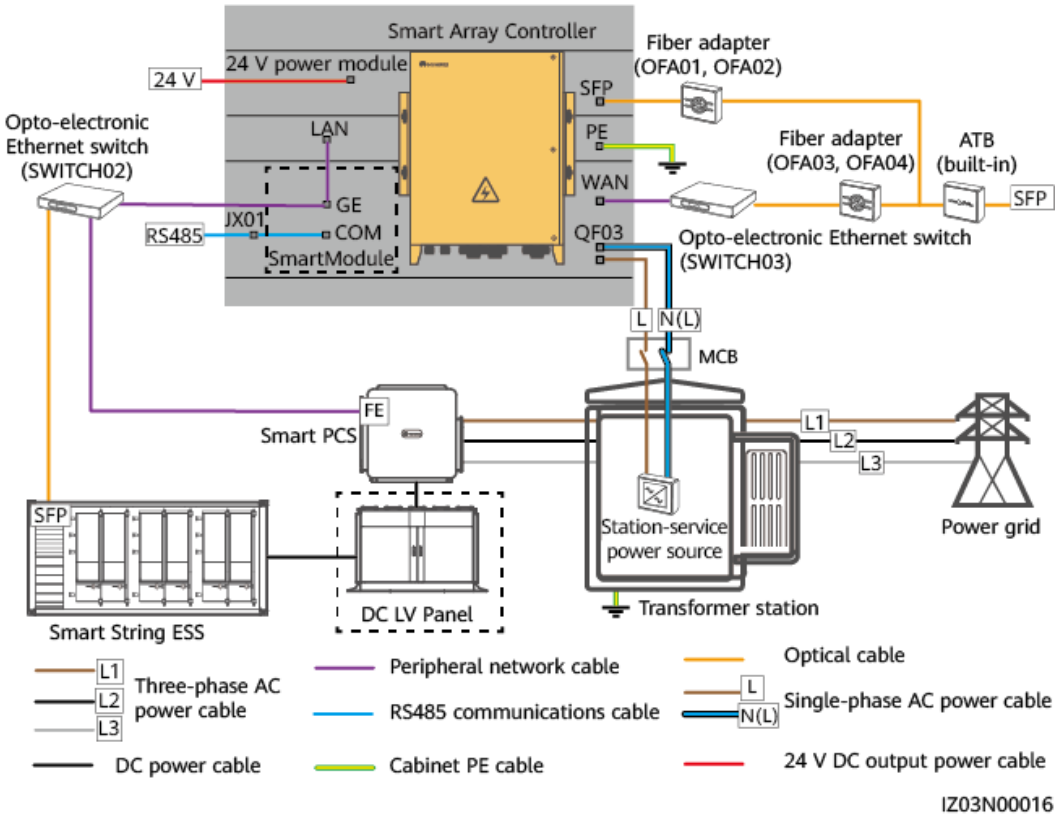


Figure 2-7 Networking diagram (with a SmartModule)



NOTE

Components in dashed-line boxes are optional. For simplicity purposes, the figures do not show all preinstalled components and cables.

Table 2-3 Components required in the fiber ring network scenario

Position	Component		Recommended Model/ Specifications	Source	Quantity
SACU	(Optional) SmartModule		SmartModule1000A01	Purchased from the Company	1
	(Optional) 24 V power module[1]		-		1
	Fitting bag for optical ring switching[2]	Optical module	-		4
		Optical jumper	-		16
Transformer station	Miniature circuit breaker (MCB)		Recommended rated current: 32 A; number of poles: 2	Prepared by the customer	1

Position	Component	Recommended Model/ Specifications	Source	Quantity
Note [1]: If no 24 V power module is installed before delivery, the customer needs to purchase and install one and connect cables. Note [2]: There are two types of fitting bags for fiber ring switching: with 100M or 1000M optical modules You can purchase a fitting bag based on the specifications of the optical modules used on the network switch.				

NOTE

- Components listed in the table need to be installed onsite.
- Models of the components inside the transformer station are specified by the transformer station vendor.

Table 2-4 Cables to be prepared in the fiber ring network scenario

No.	Cable	Cable Type/Specifications	Cross-sectional Area Range (Recommended Value)
1	Peripheral network cable	CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm and internal resistance less than or equal to 1.5 ohms/10 m, as well as shielded RJ45 connectors	-
2	Peripheral RS485 communications cable	Computer cable (DJYP2VP2-22 2x2x1) or armored shielded twisted pair that can be used outdoors, as well as OT-M4 terminals	0.5–1 mm^2 (1 mm^2)
3	Cabinet ground cable	Outdoor copper cable and OT-M6 terminals	6–16 mm^2 (16 mm^2)
4	Optical fiber cable	Four-core or eight-core single-mode armored optical cable with a transmission wavelength of 1310 nm and an outer diameter less than or equal to 18 mm	-
5	Single-phase AC power cable	• Two-core outdoor armored copper cable • Operating voltage to the ground greater than or equal to 300 V	4–6 mm^2 (4 mm^2)

3 Storage Requirements

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

- Do not unpack the SACU. Check the packing materials periodically. If any rodent bites are found, replace the packing materials immediately.
- Store the SACU in a place with appropriate temperature and humidity to protect the SACU from dust and water vapor corrosion.
- To avoid personal injury or device damage, stack SACUs neatly so that they will not fall over.
- If the SACU has been stored for a long time, it needs to be inspected by professionals before it is put into use.

The Company shall not be liable for any consequence caused by violation of the storage requirements specified in this document.

4 System Installation

4.1 Checking Before Installation

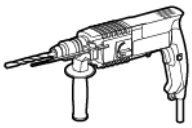
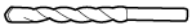
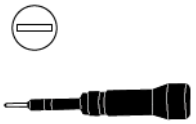
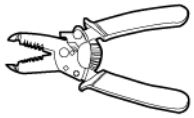
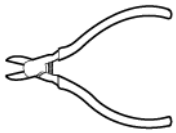
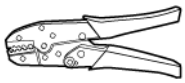
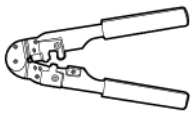
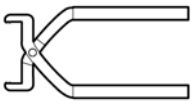
Item	Acceptance Criteria
Outer package	The outer package is intact and tidy. If it is damaged or abnormal, do not unpack it, and contact your dealer.
Exterior	The exterior is intact. If any damage is found, do not use the device, and contact your dealer as soon as possible.
Deliverables	Check the number of deliverables against the packing list in the packing case. If any deliverables are missing or damaged, contact your dealer.

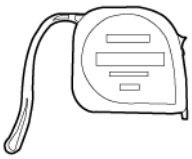
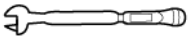
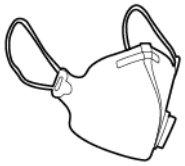
4.2 Unpacking and Acceptance

NOTICE

- To prevent the equipment from falling over, secure it to a pallet truck or forklift using ropes before moving it. Move the equipment with caution to avoid bumping or falling, which may damage the equipment.
- After placing the equipment in the installation position, unpack it with care to prevent scratches. Keep the equipment stable during unpacking.

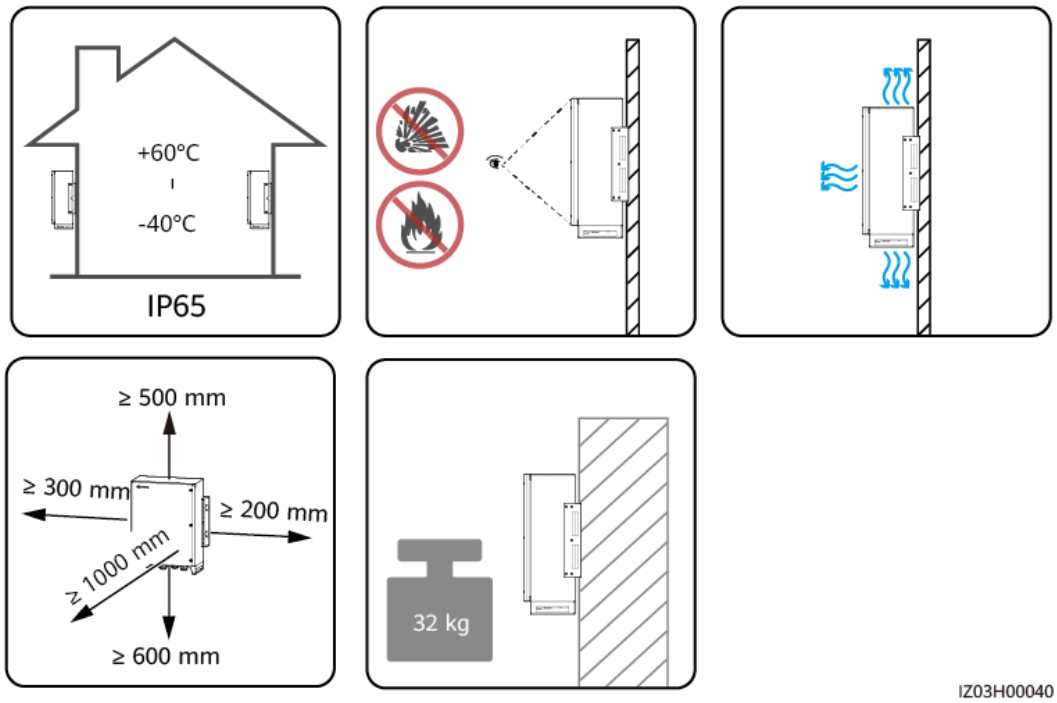
4.3 Tools

Category	Tool			
Installation	 Hammer drill	 Drill bit Φ14 mm, Φ16 mm	 Flat-head insulated torque screwdriver	 Phillips insulated torque screwdriver
	 Chave inglesaajustável Extremidade aberta:32 mm	 Insulated torque socket wrench	 Wire stripper	 Diagonal pliers
	 Rubber mallet	 Crimping tool	 Cable cutter	 Utility knife
	 RJ45 crimping tool	 Network cable tester	 Multimeter	 SPD extracting tool
	 Heat shrink tubing	 Heat gun	 Vacuum cleaner	Marker

Category	Tool			
	 Steel measuring tape	 Level	 Cable tie	 Chave inglesa detorque
Personal protective equipment (PPE)	 Insulated gloves	 Protective gloves	 Goggles	 Dust mask
	 Safety helmet	 Reflective vest	 Insulated shoes	-

4.4 Installation Requirements

Figure 4-1 Installation requirements



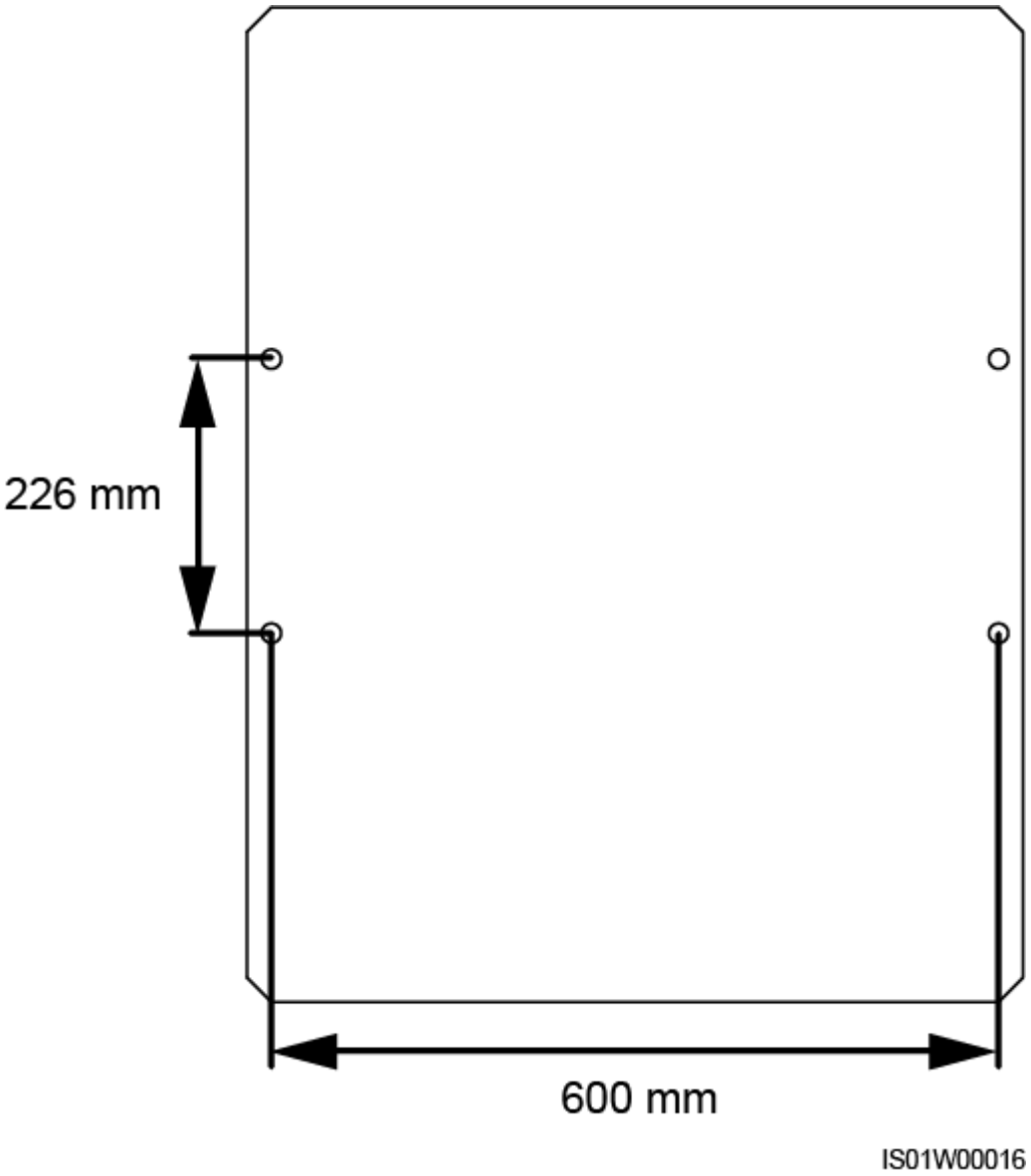
The site must be a class C or higher environment but not a class D or E environment.

NOTE

- Class C environment: Outdoor areas more than 500 m away from the sea. If a site is near a pollution source, it is 1500–3000 m away from heavy pollution sources, such as smelteries, coal mines, and thermal power plants; 1000–2000 m away from medium pollution sources such as chemical factories, rubber plants, and electroplating factories; or 500–1000 m away from light pollution sources, such as packing houses, tanneries, boiler rooms, slaughterhouses, landfill sites, and sewage treatment plants.
- Class D environment: Sea environments or outdoor areas within 500 m away from the sea. If a site is near a pollution source, it is within 1500 m away from heavy pollution sources such as smelteries, coal mines, and thermal power plants, within 1000 m away from medium pollution sources such as chemical factories, rubber plants, and electroplating factories, or within 500 m away from light pollution sources such as packing houses, tanneries, boiler rooms, slaughterhouses, landfill sites, and sewage treatment plants.
- Class E environment: Special environments, such as underground or underwater environments.

4.5 Installing the Cabinet

Figure 4-2 Marking-off template



4.5.1 Wall-mounting

Prerequisites

You have expansion bolts. M12x60 stainless steel expansion bolts are recommended.

Procedure

Step 1 Determine the positions for drilling holes into the wall by using the delivered marking-off template. For details, see **Figure 4-2**. Level the marking-off template using a level, and mark the mounting holes using a marker.

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

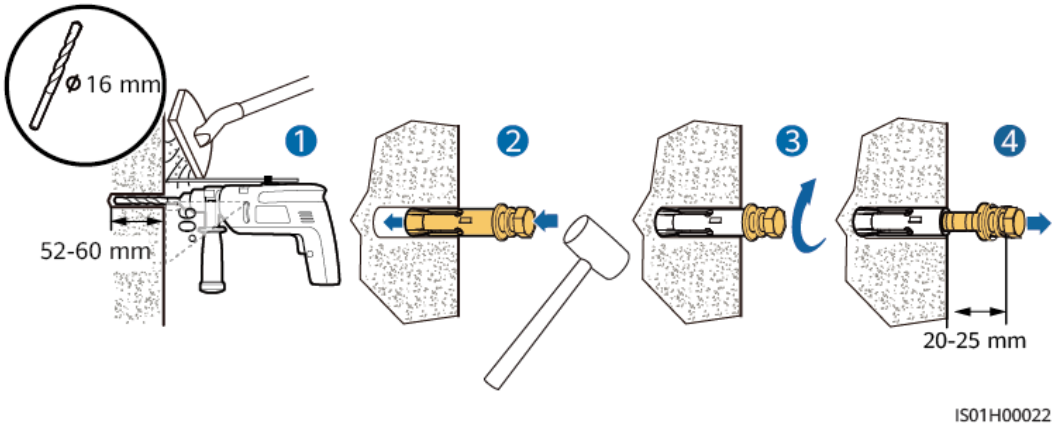
WARNING

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

NOTICE

- To avoid inhaling dust and to prevent dust from falling into your eyes, wear safety goggles and a dust mask when drilling holes.
- Use a vacuum cleaner to clean up dust in and around the holes, and measure the spacing. If the holes are inaccurately positioned, drill the holes again.
- Level the top of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the concrete wall.

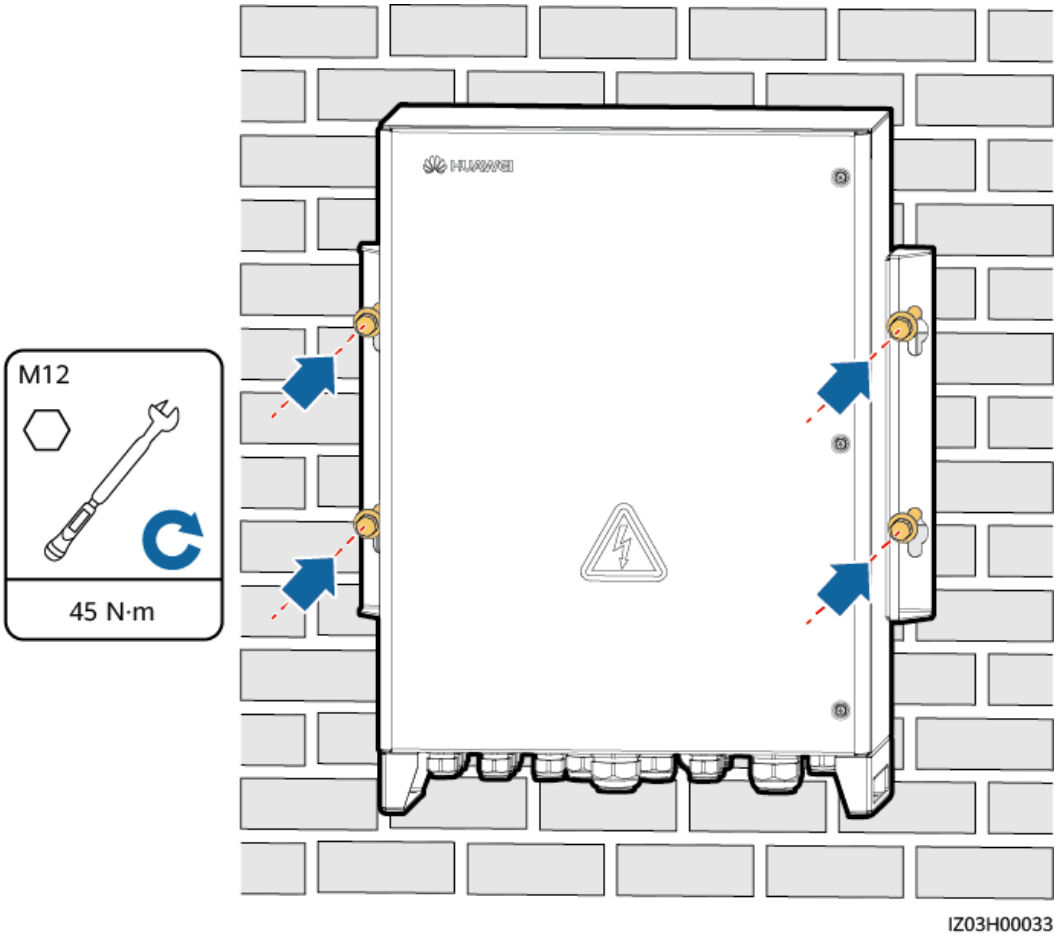
Figure 4-3 Drilling a hole and installing an expansion bolt



Step 3 Assign two persons to lift the cabinet and mount it onto the bolts, and assign another person to assist.

Step 4 Tighten the bolts using a torque wrench that has an open end of 18 mm.

Figure 4-4 Installing a cabinet



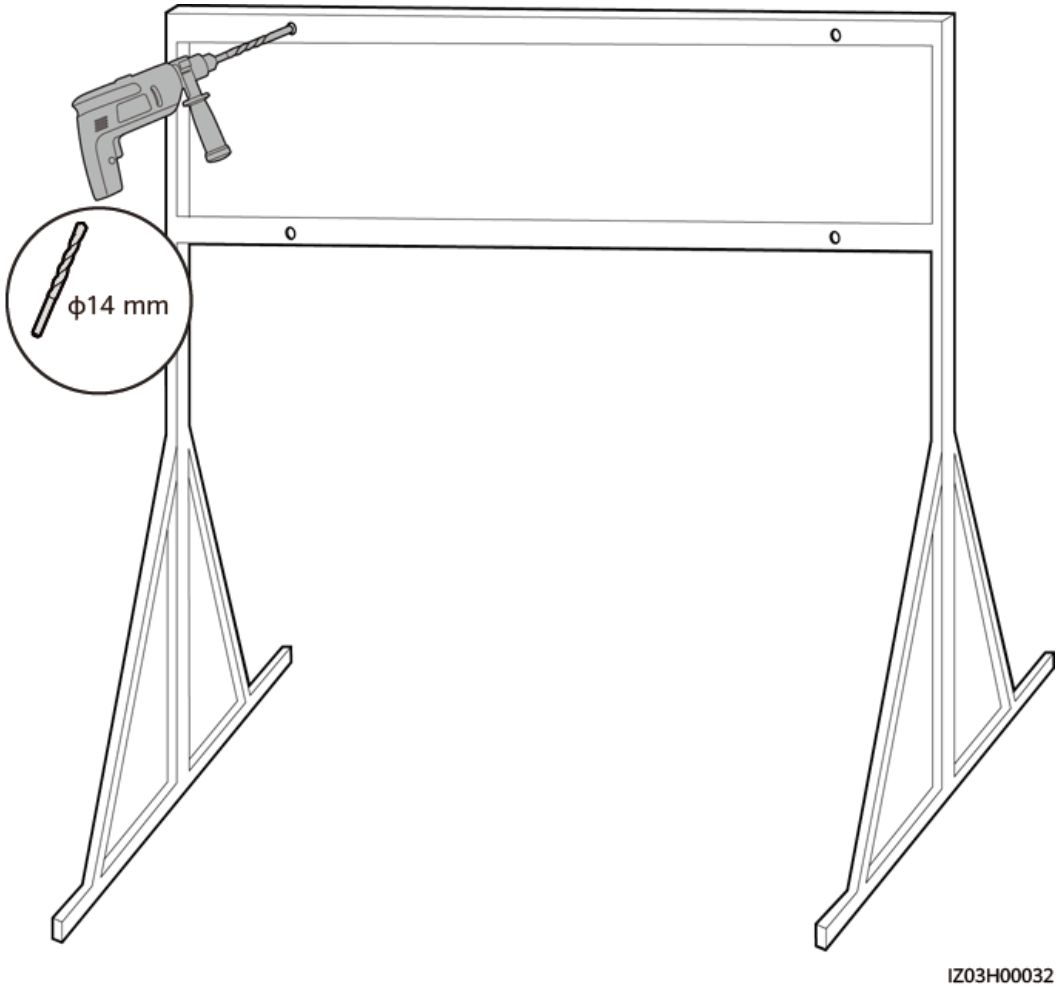
----End

4.5.2 Support-mounting

Step 1 Determine the hole positions by using the delivered marking-off template. For details, see **Figure 4-2**. Level the marking-off template using a level, and mark mounting holes using a marker.

Step 2 Drill holes using a hammer drill.

Figure 4-5 Drilling holes

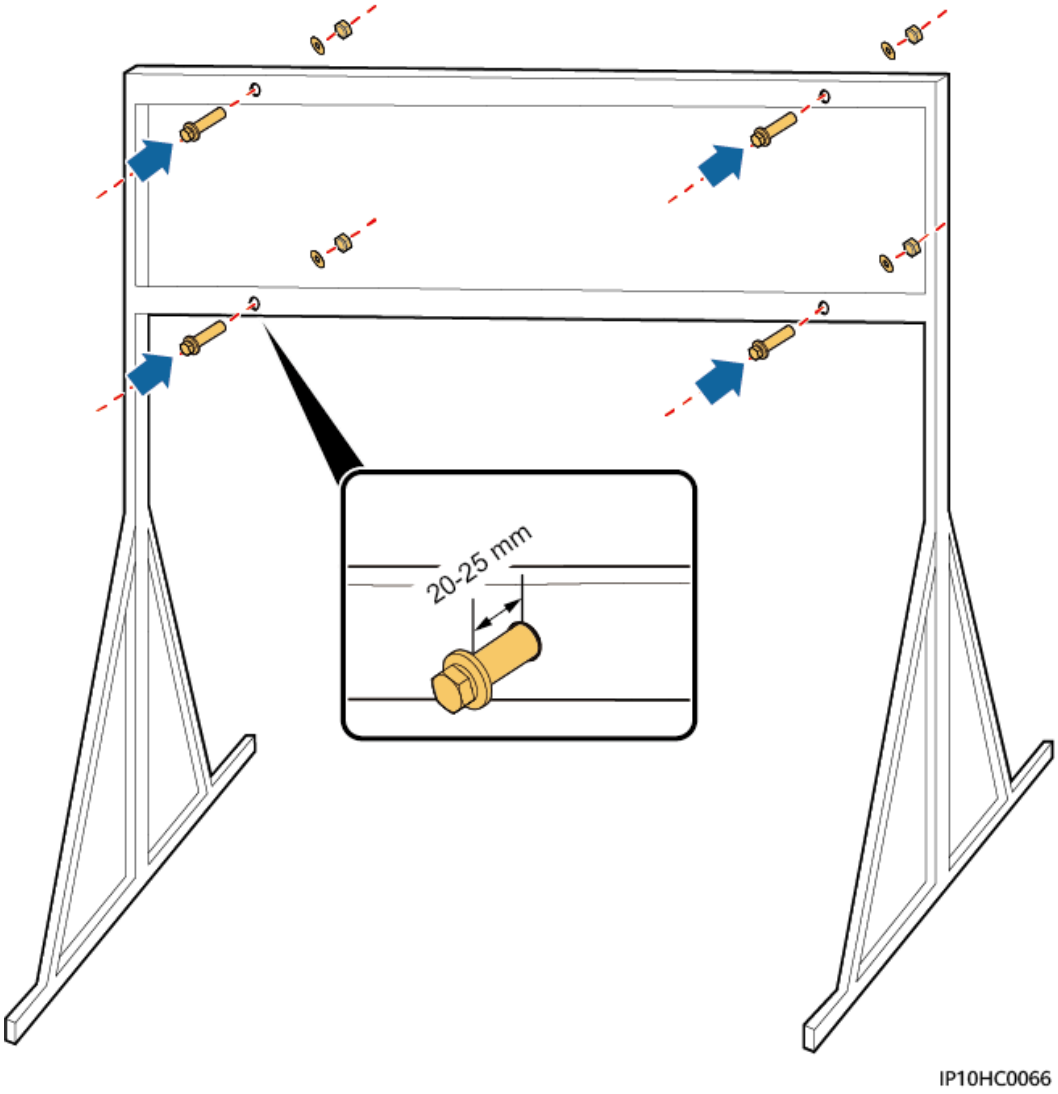


Step 3 Insert the M12x40 bolt assemblies delivered with the cabinet into the holes, and secure them using the supplied nuts and flat washers.

NOTE

Do not fully tighten the bolts.

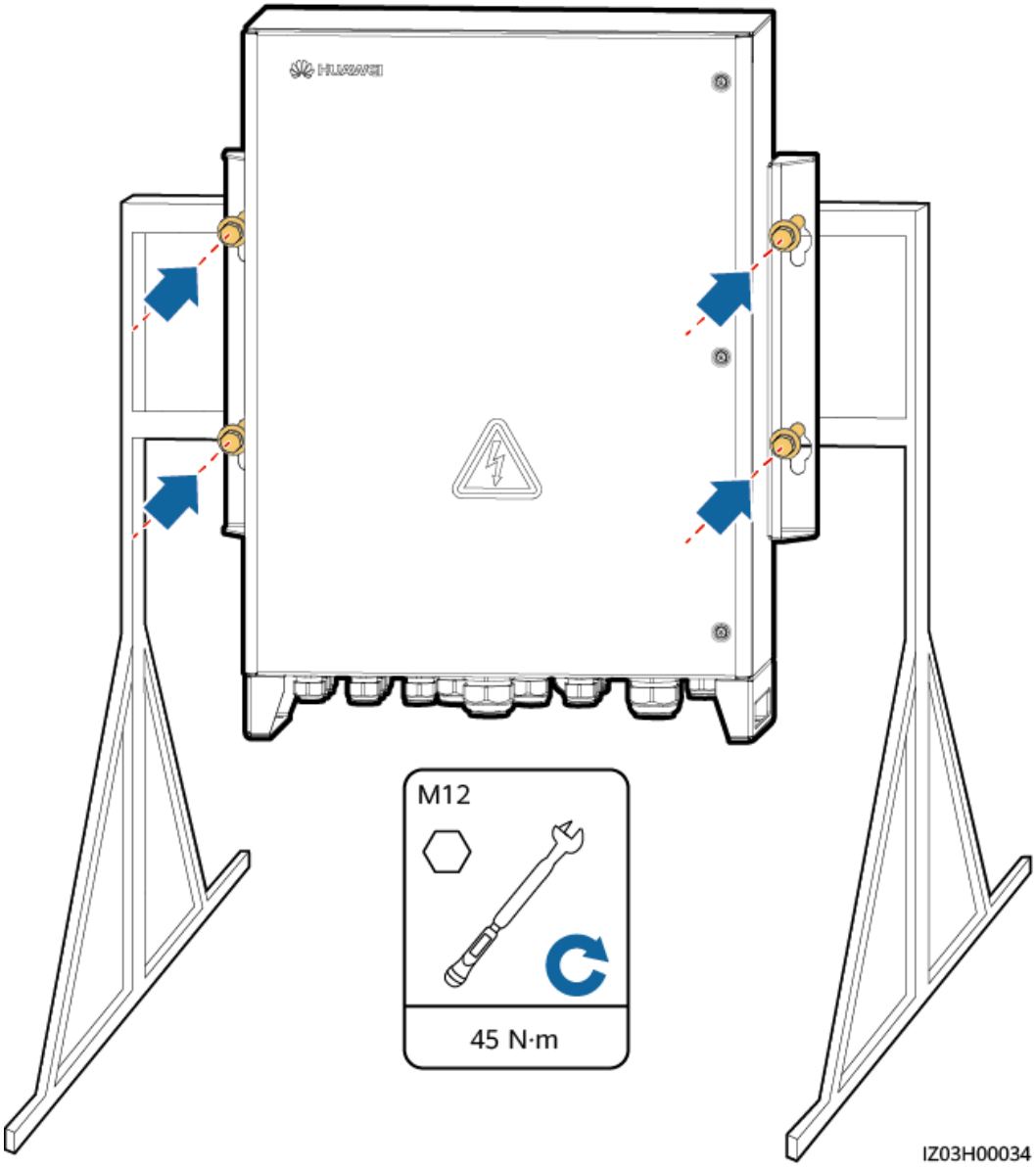
Figure 4-6 Tightening bolts



Step 4 Assign two persons to lift the cabinet and mount it onto the bolts, and assign another person to assist.

Step 5 Tighten the bolts using a torque wrench that has an open end of 18 mm.

Figure 4-7 Installing the cabinet



----End

4.5.3 Pole-mounting

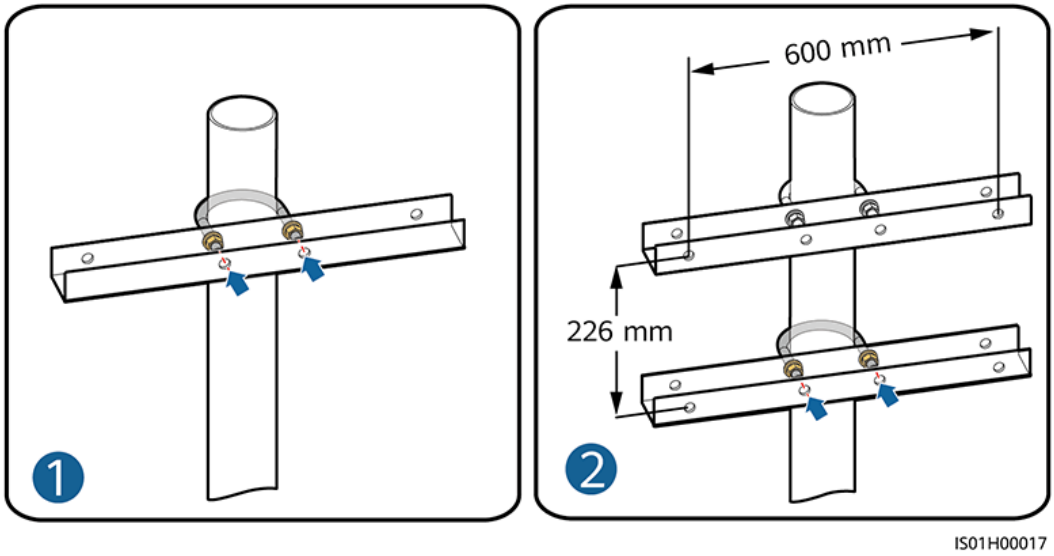
- If you need to pole-mount the SACU, prepare pole mounting brackets based on the dimensions of the SACU. For details about the dimensions, see **2.3 Exterior**.
- You are advised to use M12 U-shaped bolts to secure the pole-mounting brackets.

NOTE

Figures provided in this section are for reference only. The appearance of actual poles and pole-mounting brackets may vary.

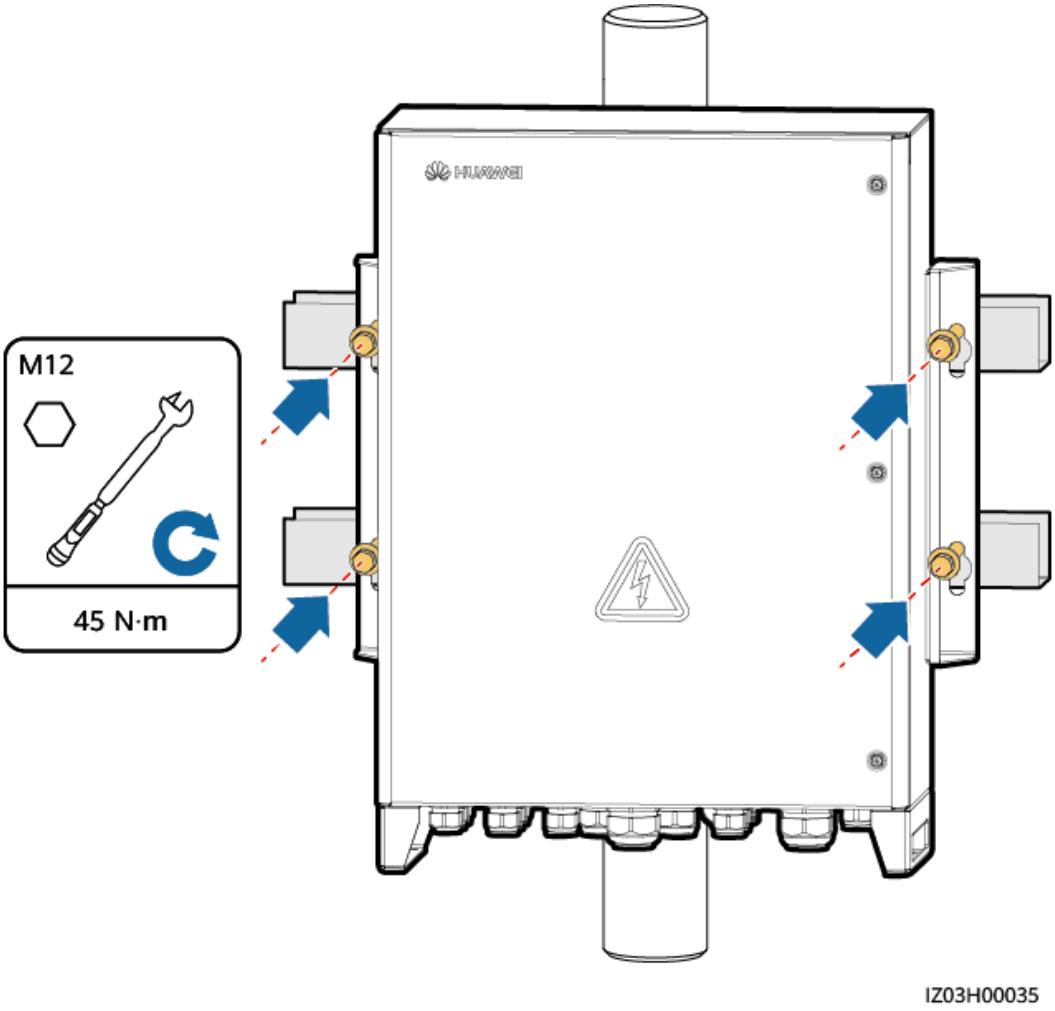
Step 1 Secure the pole-mounting brackets to the pole and tighten the U-shaped bolts to a torque of 45 N·m using a torque wrench that has an open end of 18 mm.

Figure 4-8 Securing pole-mounting brackets



Step 2 Secure the SACU to the pole-mounting brackets. For details, see **4.5.2 Support-mounting**.

Figure 4-9 Securing a cabinet



----End

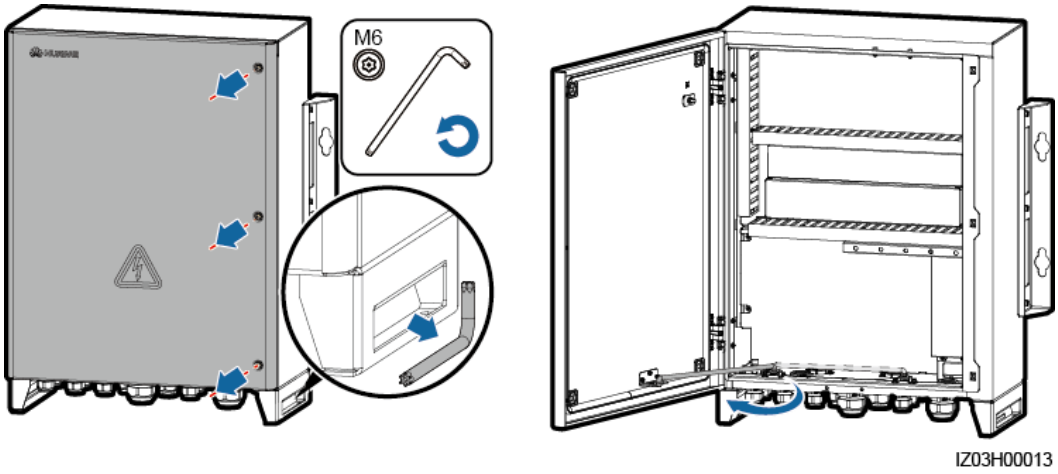
4.6 Opening the Cabinet Door

NOTICE

- Before opening the main cabinet door, turn off all upstream switches for the SACU to power off the SACU. After that, wait at least 3 minutes and operate the SACU. If you have to operate an energized SACU, wear insulation gloves and take preventive measures.
- If you need to open the main cabinet door on rainy or snowy days, take protective measures to prevent rain or snow from entering the cabinet. If it is impossible to take protective measures, do not open the main cabinet door on rainy or snowy days.
- Do not leave unused screws in the cabinet.

Loosen the screws on the main cabinet door, open the cabinet door, and adjust the support bar.

Figure 4-10 Opening a cabinet door



NOTE

To highlight the involved area, the figure does not show certain components. This is applicable to all other similar figures.

4.7 Installing the Components

Install the components based on **2.6 Configuration in Different Scenarios**.

4.7.1 (Optional) Installing the SmartModule

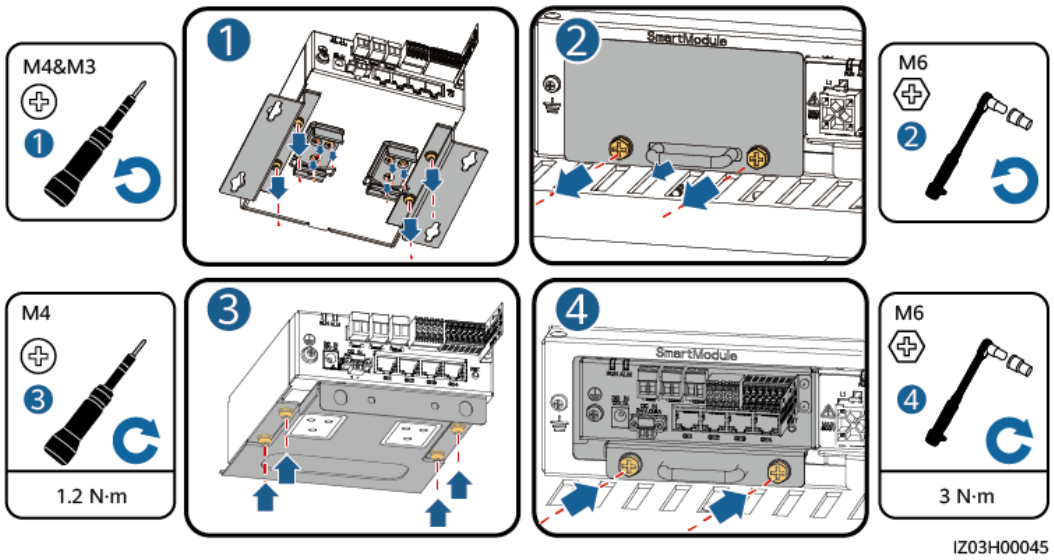
Step 1 Remove the mounting ears and guide rail–mounting kit from the SmartModule.

Step 2 Remove the panel at the position where the SmartModule is to be installed from the cabinet and take out the mounting kit.

Step 3 Secure the mounting kit to the SmartModule.

Step 4 Install the SmartModule.

Figure 4-11 Installing a SmartModule



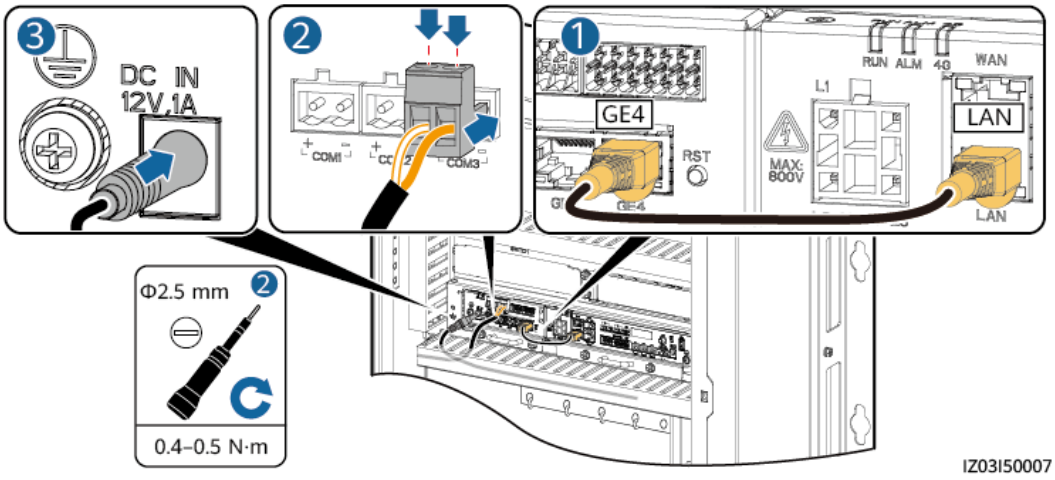
Step 5 Remove the cable from the **LAN** port on the SmartLogger and connect it to the **GE3** port on the SmartModule.

Step 6 Connect the **GE4** port on the SmartModule to the **LAN** port on the SmartLogger using the network cable delivered with the SmartModule.

Step 7 Connect the preinstalled RS485 cable to the COM port on the SmartModule based on the label.

Step 8 Connect the preinstalled power cable to the **12V 1A** port on the SmartModule based on the cable label.

Figure 4-12 Connecting cables



----End

4.7.2 (Optional) Installing the 24 V Power Module

Step 1 Remove the mounting bracket of the 24 V power module from the cabinet.

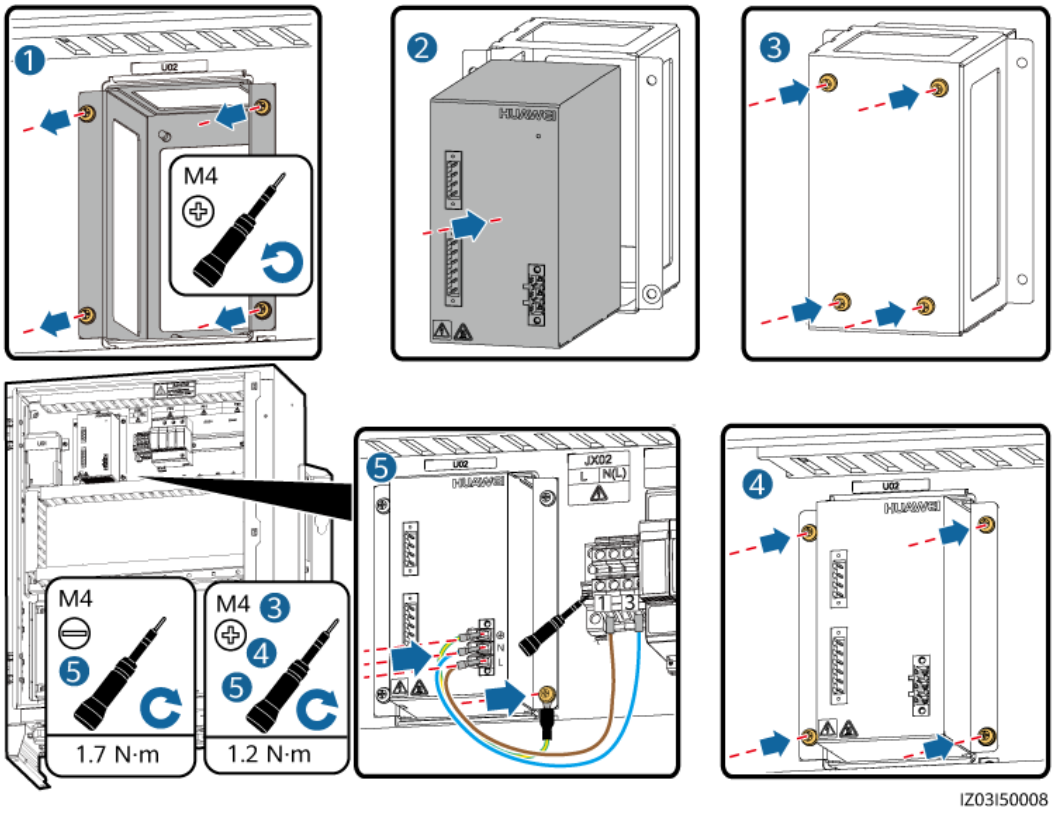
Step 2 Install the 24 V power module in the mounting bracket.

Step 3 Secure the 24 V power module to the mounting bracket using screws (delivered with the 24 V power module).

Step 4 Install the 24 V power module in the cabinet.

Step 5 Connect the AC input power cables (delivered with the SACU) to the 24 V power module based on the cable labels.

Figure 4-13 Installing a 24 V power module



----End

5 Electrical Connections

DANGER

- The site must be equipped with qualified fire fighting facilities, such as fire sand and carbon dioxide fire extinguishers.
- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

CAUTION

- Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.

NOTICE

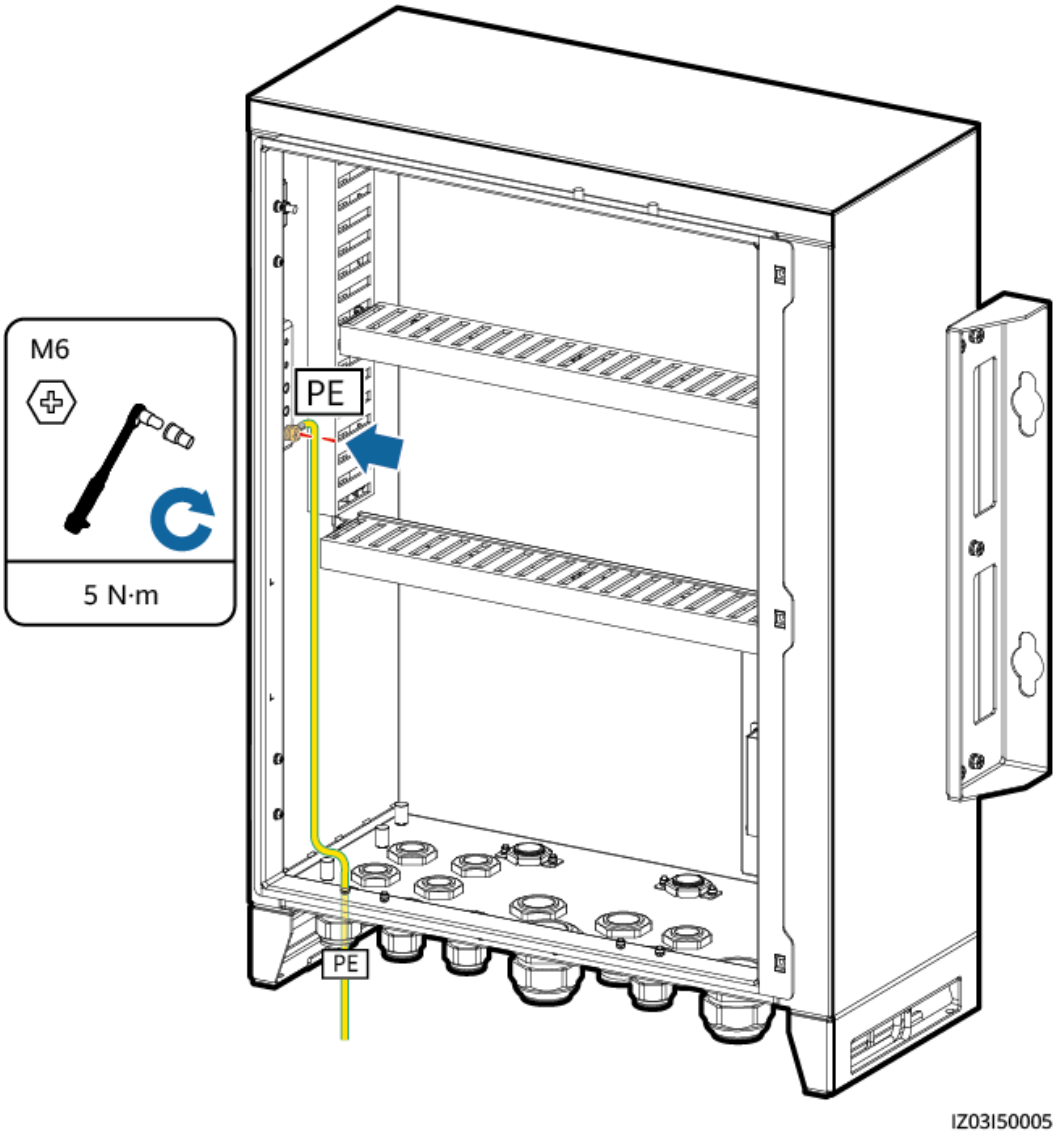
- Only certified electricians are allowed to connect cables.
- Before connecting cables to ports, leave enough slack to reduce the tension on the cables and prevent poor cable connections.
- Connect cables in strict accordance with the operation description and precautions provided in the document. Do not connect signal cables and single-phase AC power cables reversely or mix them up. Otherwise, the caused device damage is not covered under warranty.
- For simplicity purposes, cables described in this chapter are those to be connected onsite, rather than preinstalled cables. The cable routes are for reference only.
- The cable colors shown in the electrical connection diagrams provided in this chapter are for reference only. Select cables in accordance with local cable specifications (green and yellow cables are only used for protective grounding).

5.1 Connecting the PE Cable

NOTICE

- Connect a PE cable to the nearest ground point or the ground bar in the transformer station.
- To enhance the corrosion resistance of a ground terminal, you are advised to apply silica gel or paint on it after connecting the ground cable.

Figure 5-1 Connecting a PE cable



5.2 Connecting the Communications Cables for the Fiber Ring Network

Context

The optical jumpers between the fiber adapter and the SmartLogger and between the fiber adapter and the opto-electronic Ethernet switch (SWITCH03) are preinstalled before delivery.

Table 5-1 Preinstalled cable labels

Fiber Adapter	SmartLogger	Opto-Electronic Ethernet Switch (SWITCH03)
OFA01-RX1	SL-SFP1-RX1	-
OFA01-TX1	SL-SFP1-TX1	-
OFA02-RX2	SL-SFP2-RX2	-
OFA02-TX2	SL-SFP2-TX2	-
OFA03-RX3	-	SWITCH03-G11-RX3
OFA03-TX3	-	SWITCH03-G11-TX3
OFA04-RX4	-	SWITCH03-G12-RX4
OFA04-TX4	-	SWITCH03-G12-TX4

Table 5-2 External device connections

SACU	Peripheral Device
SFP1 and SFP2 ports on the SmartLogger	Optical ports of network switch 1
G11 and G12 ports on SWITCH03	Optical ports of network switch 2
G9 and G10 ports on SWITCH02	SFP ports on the CMU in the Smart String ESS
G11 and G12 ports on SWITCH02	SFP ports on the CMU in the Smart String ESS

Connecting Optical Jumpers

Step 1 Obtain optical modules from the fitting bag for optical ring switching.

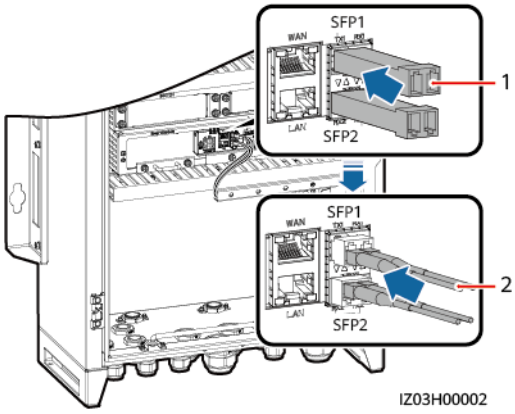
Step 2 Insert optical modules into the SFP1 and SFP2 ports of the SmartLogger.

NOTICE

- Pay attention to the directions of the optical modules. The label of the optical module on the SFP1 port faces upwards, whereas the label of the optical module on the SFP2 port faces downwards.
- If you hear a **click** when inserting an optical module, it snaps into place. Then pull it back to ensure that it is secure.

Step 3 Connect the preinstalled optical jumpers to the optical modules based on the label.

Figure 5-2 Connecting optical jumpers (1)



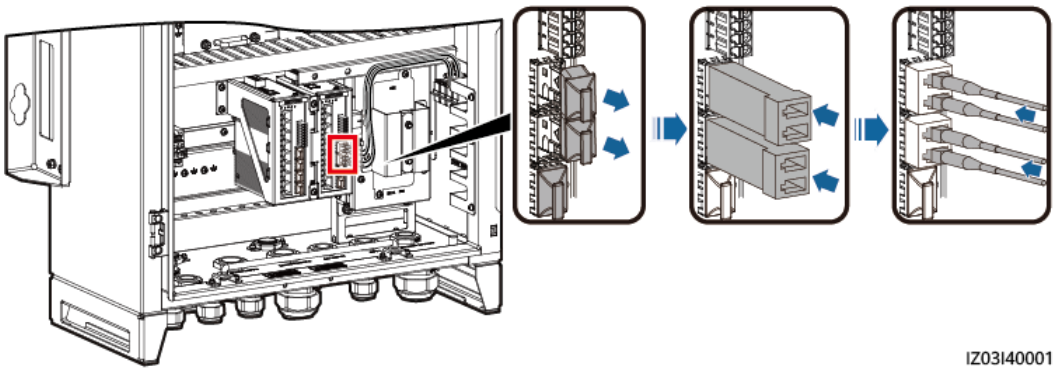
(1) Optical module (2) Optical jumper

Step 4 Connect the optical modules and optical jumpers to the **G11** and **G12** ports on the opto-electronic Ethernet switch (SWITCH03) in the same way.

NOTICE

- Pay attention to the directions of the optical modules. The labels of the optical modules face leftwards.
- If you hear a **click** when inserting an optical module, it snaps into place. Then pull it back to ensure that it is secure.

Figure 5-3 Connecting optical jumpers (2)



----End

Connecting the Cables to the ATB

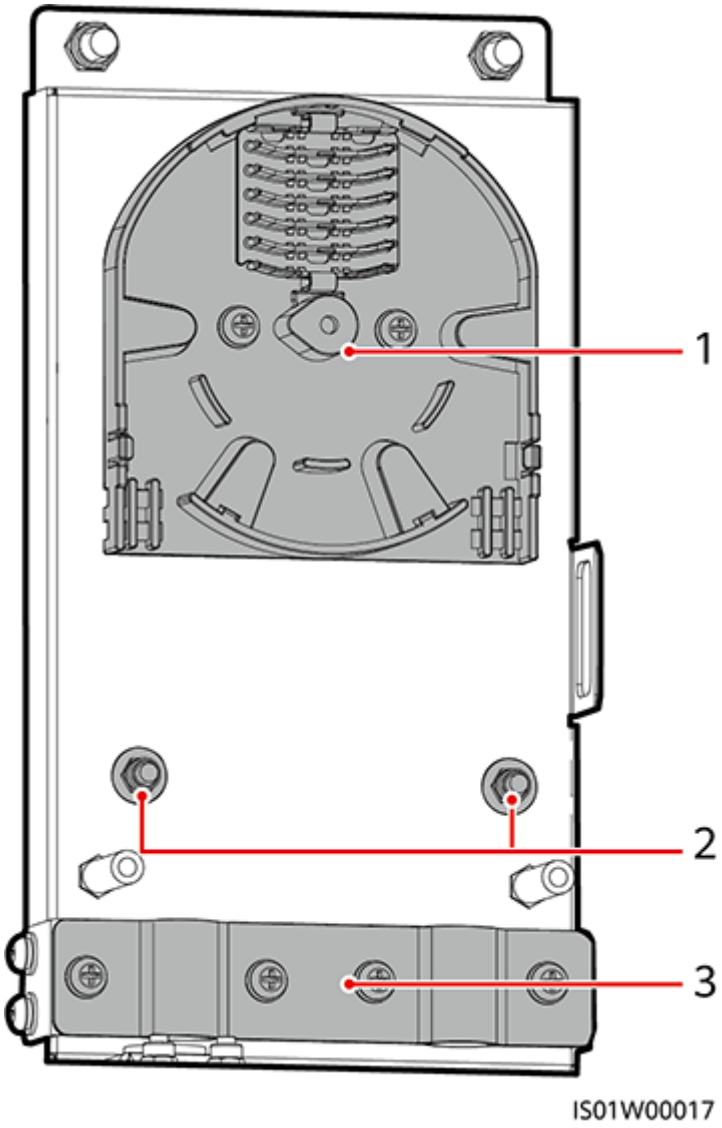
NOTICE

- The hardness of the optical cables is high. Therefore, you need to route the optical cables into the cabinet after the optical cables are prepared.
- Only professionals are allowed to connect optical cables.

NOTE

In the optical fiber ring topology, two optical cables are required.

Figure 5-4 ATB interior



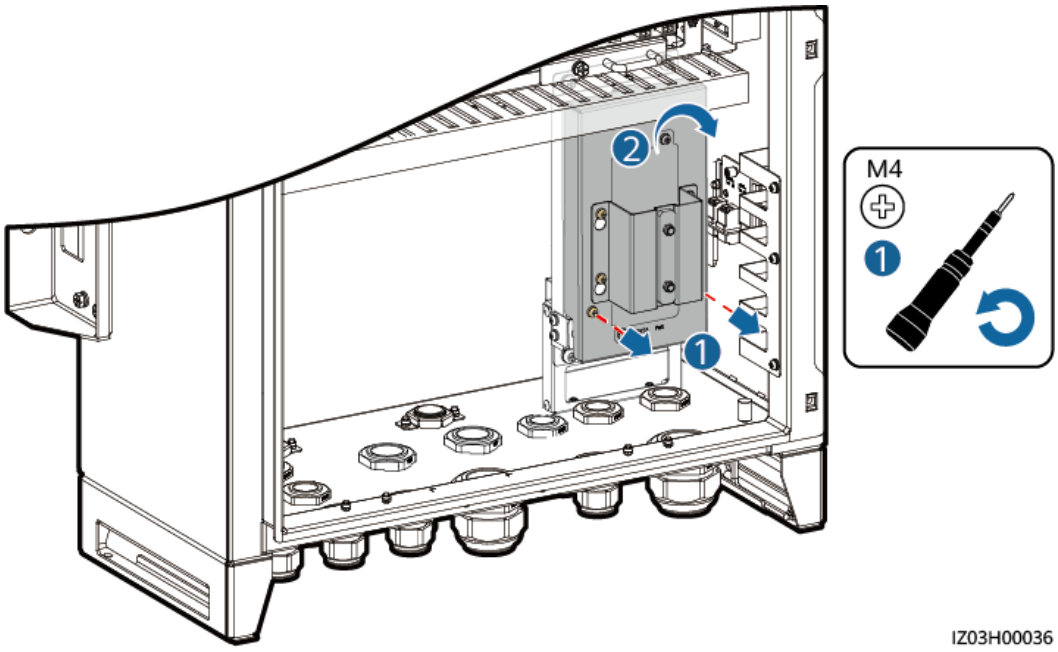
(1) Fiber spool

(2) Fixing points for internal steel wires of optical cables

(3) Cable clip

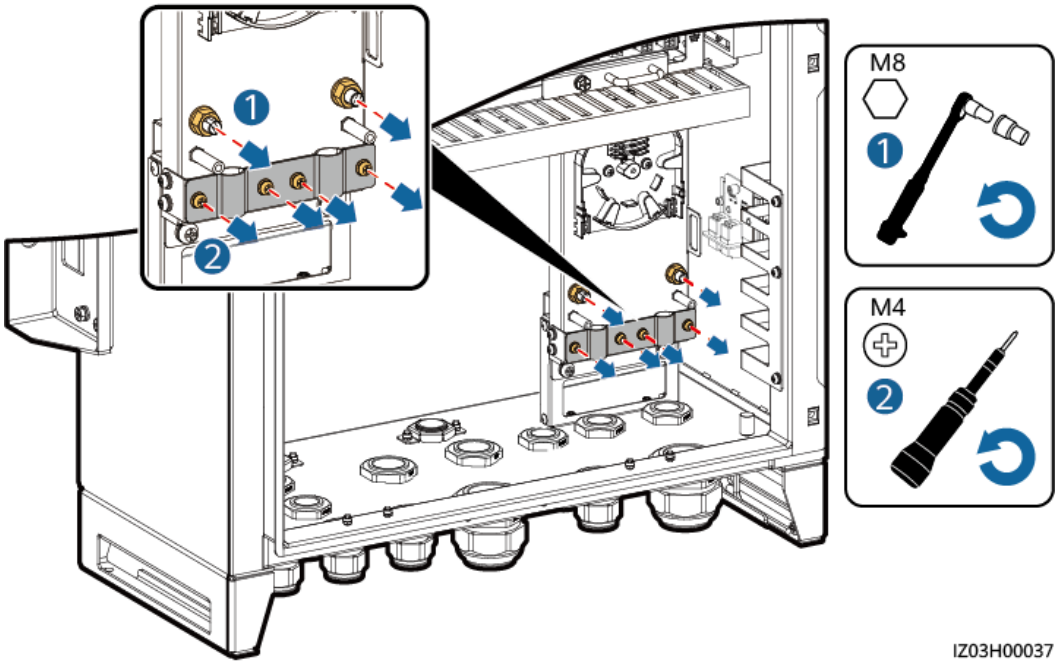
Step 1 Remove the external mechanical parts from the ATB.

Figure 5-5 Removing external mechanical parts



Step 2 Remove the optical cable fastener.

Figure 5-6 Removing a fastener



Step 3 Connect one end of the optical jumper to the fiber adapter.

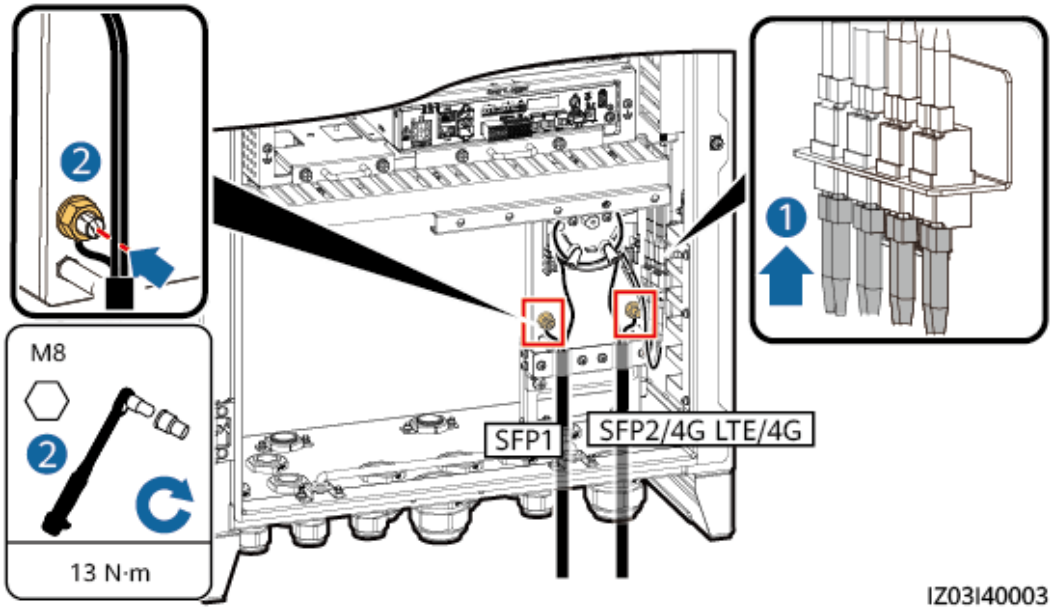
Step 4 Route the other end of the optical jumper through the cable hole on the side of the ATB, and connect the cable to the ATB.

Step 5 Connect the peripheral optical cable to the ATB, splice the optical cable and the optical jumper, and then wind the spliced cable around the fiber spool on the ATB.

NOTICE

Only professionals are allowed to splice fibers.

Figure 5-7 Connecting optical cables



Step 6 Check that the cables are connected correctly and securely. Then reinstall the optical cable fastener and external mechanical parts.

----End

5.3 Connecting the Peripheral RS485 Communications Cables

Context

Connect peripheral RS485 communications cables to the JX01 terminal block. All RS485 communications cables are connected in the same way. This section describes how to connect two RS485 communications cables.

Table 5-3 Port definition of the JX01 terminal block

No.	Port on the JX01 Terminal Block	Definition
1	RS485-1 (+)	RS485A, RS485 differential signal+
2	RS485-1 (–)	RS485B, RS485 differential signal–
3	RS485-2 (+)	RS485A, RS485 differential signal+

No.	Port on the JX01 Terminal Block	Definition
4	RS485-2 (–)	RS485B, RS485 differential signal–
5	RS485-3 (+)	RS485A, RS485 differential signal+
6	RS485-3 (–)	RS485B, RS485 differential signal–
7	RS485-4 (+)	RS485A, RS485 differential signal+
8	RS485-4 (–)	RS485B, RS485 differential signal–
9	RS485-5 (+)	RS485A, RS485 differential signal+
10	RS485-5 (–)	RS485B, RS485 differential signal–
11	RS485-6 (+)	RS485A, RS485 differential signal+
12	RS485-6 (–)	RS485B, RS485 differential signal–

NOTICE

JX01 ports 7, 8, 9, 10, 11, and 12 can be connected to the RS485 cable only after the SmartModule is installed.

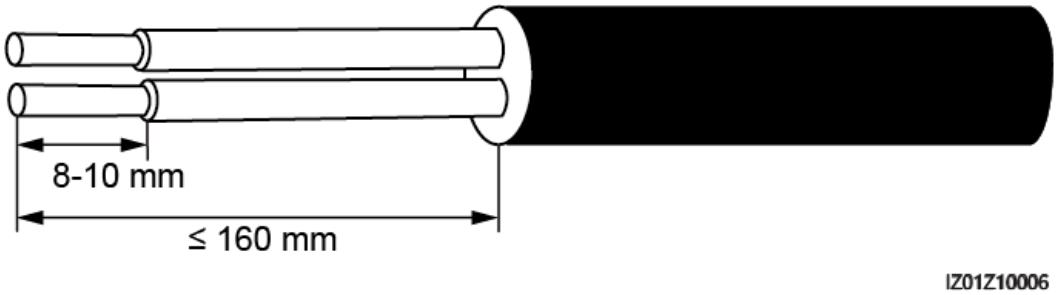
Table 5-4 External device connections

SACU	Peripheral Device
RS485-1	RS485 port on the transformer station
RS485-2	RS485 port on the power meter

Procedure

Step 1 Prepare communications cables.

Figure 5-8 Cable stripping length

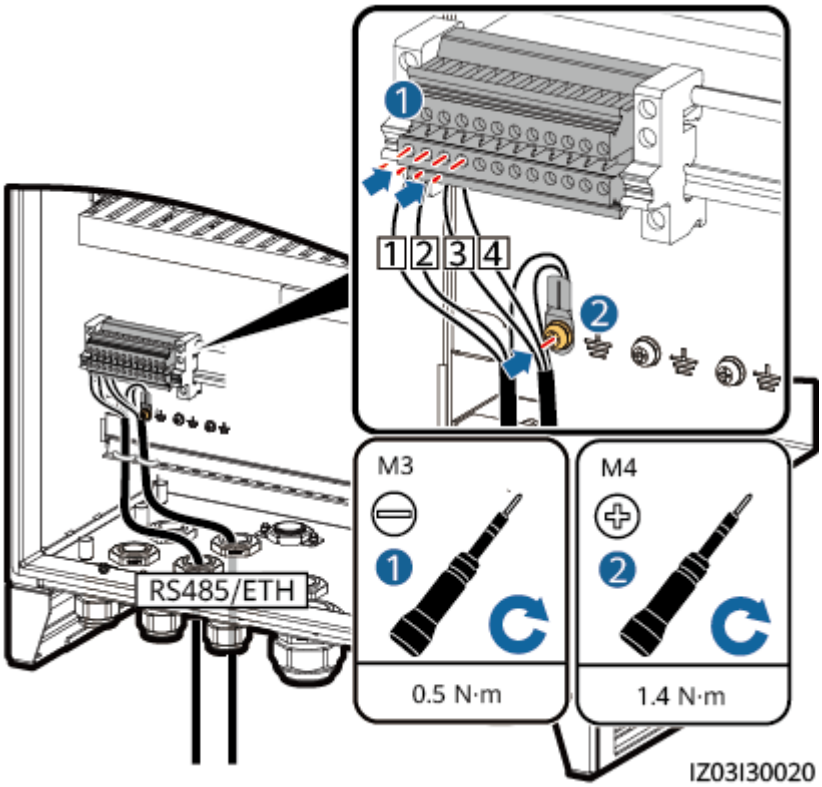


Step 2 Connect the communications cables to the JX01 terminal block.

Step 3 Crimp OT terminals on the shield layers, and connect the shield layers to the cabinet ground point.

Step 4 Bind the communications cables.

Figure 5-9 Connecting RS485 communications cables



----End

5.4 Connecting the Peripheral Network Cable

Context

Connect peripheral network cables to ports **G1**–**G7** on the opto-electronic Ethernet switch (SWITCH02). All network cables are connected in the same way. This section describes how to connect one network cable.

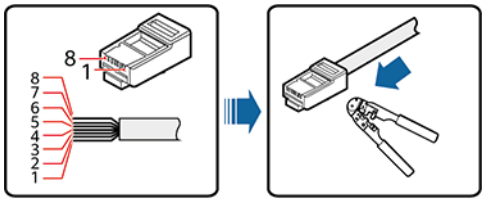
Table 5-5 External device connections

SACU	Peripheral Device
G1 port on SWITCH02	Transformer station network port
Ports G2 to G7 on SWITCH02	FE ports on the Smart PCS

Procedure

Step 1 Prepare a network cable.

Figure 5-10 Wiring sequence of an RJ45 connector



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

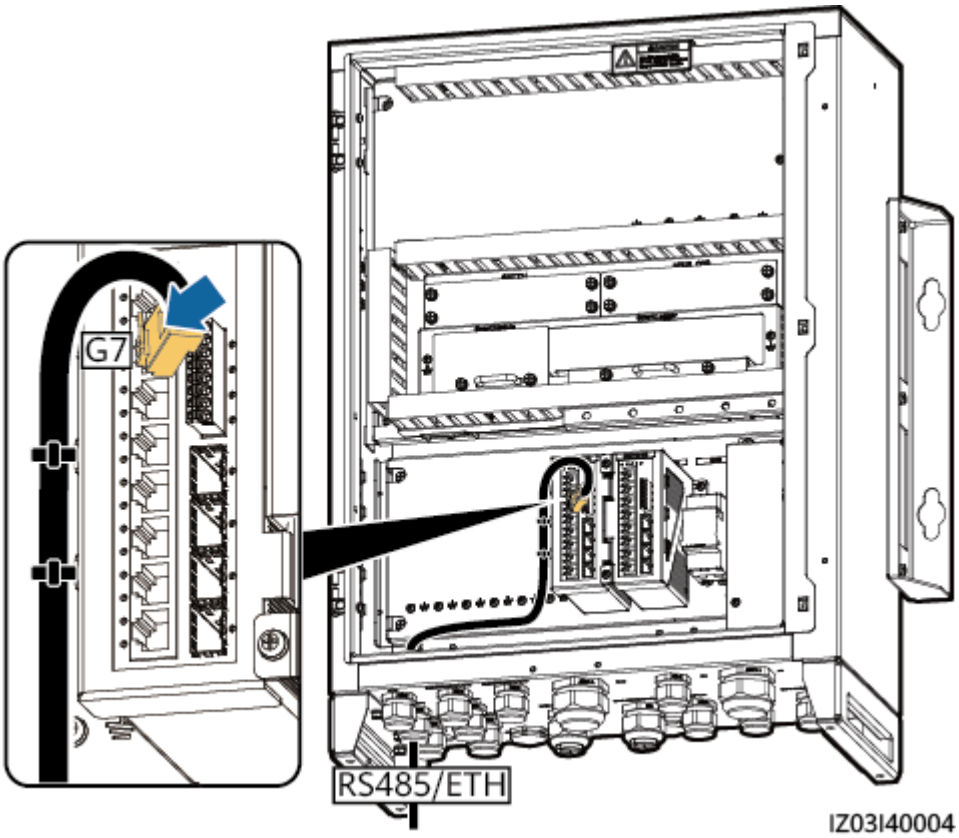
NOTE

Verify that the network cable functions properly using a network cable tester.

Step 2 Connect the peripheral network cable to the **G7** port on the Ethernet switch.

Step 3 Bind the network cable.

Figure 5-11 Connecting a network cable



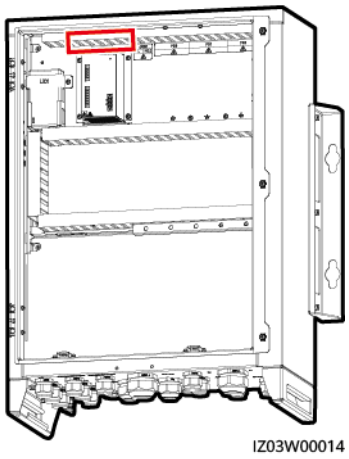
----End

5.5 (Optional) Connecting DC Output Power Cables to the 24 V Power Module

Context

The DC output power cables are preinstalled before delivery.

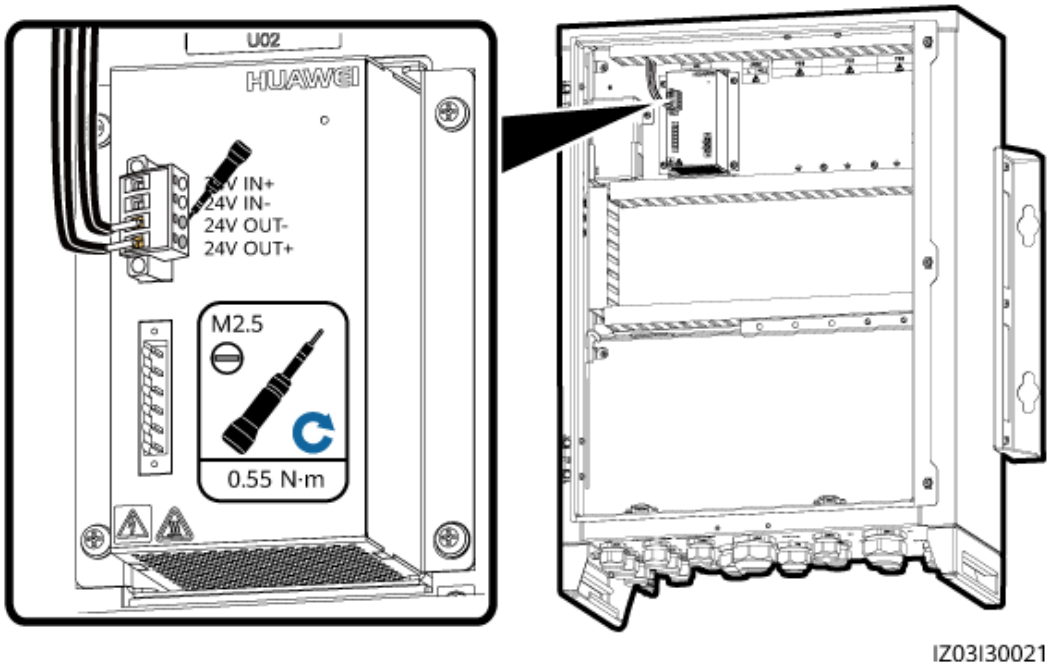
Figure 5-12 Position for preinstalled cables



Procedure

Connect the cables to the **24V OUT+** and **24V OUT–** ports on the power module.

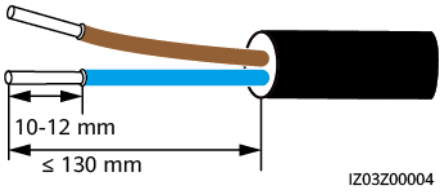
Figure 5-13 Connecting DC output power cables to the 24 V power module



5.6 Connecting the Single-Phase AC Power Cable

Step 1 Prepare a cable.

Figure 5-14 Cable stripping length



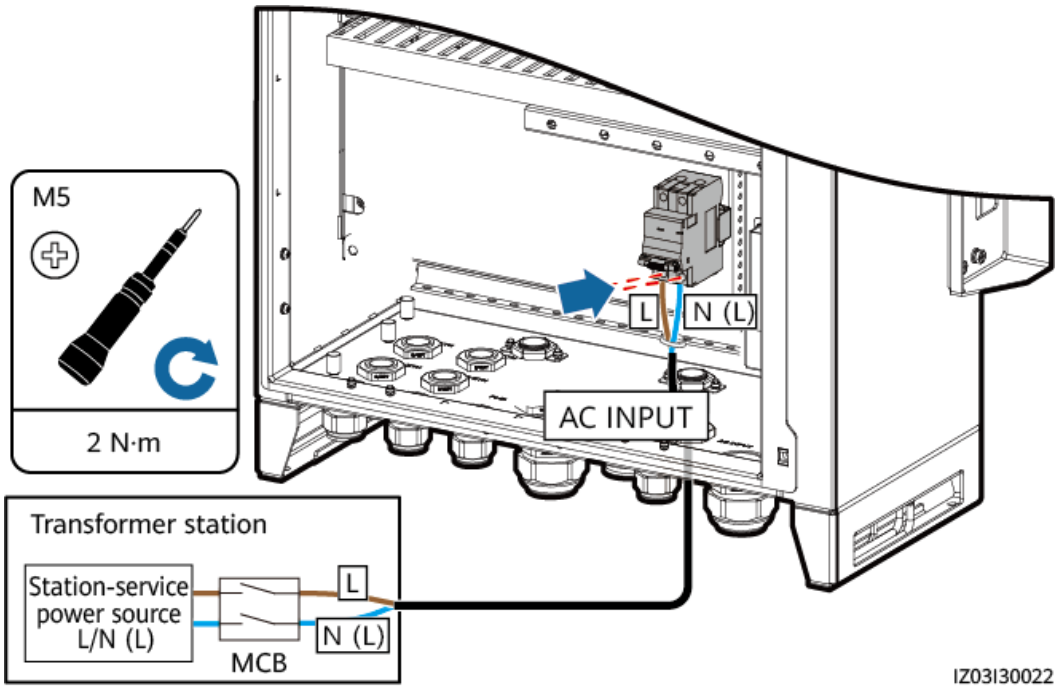
Step 2 Connect the cable to the single-phase input switch.

NOTICE

Connect the L and N (L) wires to the L and N (L) terminals of the station-service power source for the transformer station through an MCB.

Step 3 Bind the cable.

Figure 5-15 Connecting a cable



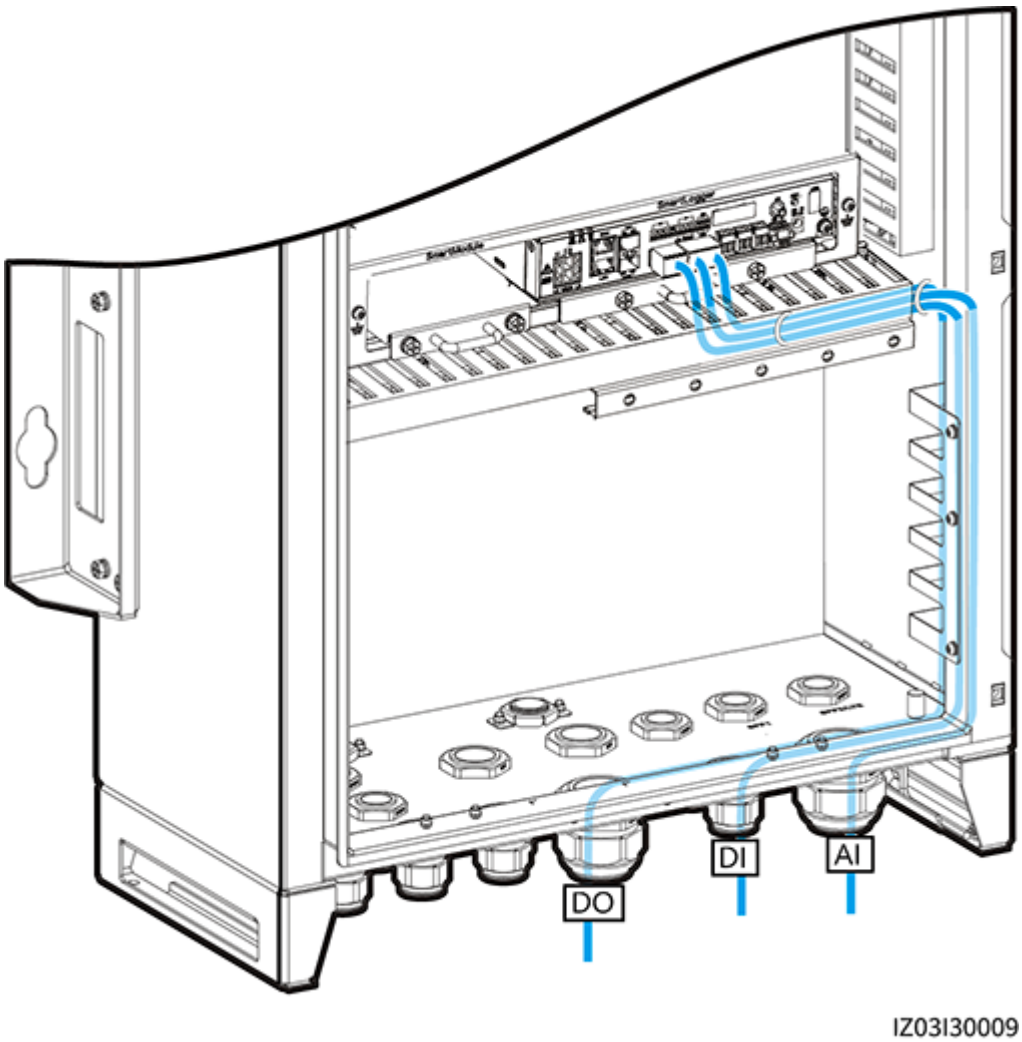
----End

5.7 Connecting DO/DI/AI Cables

The SACU reserves the waterproof connectors for the DO, DI, and AI cables. Cable routes are provided for the signal cables.

For details about how to prepare and connect the cables, see the *SmartLogger3000 User Manual*.

Figure 5-16 Cable routes



6 Power-On

Checklist Before Power-On

No.	Acceptance Criteria
1	The cabinet and all components are installed properly.
2	All upstream switches for the cabinet and all switches inside the cabinet are OFF.
3	All cables are connected correctly and securely, without exposed metal.
4	Cables are bound neatly, and cable ties are secured evenly and properly in the same direction.
5	Routing for the power cables and signal cables meets the requirements for routing strong-current and weak-current cables and complies with the cable routing plan.
6	The locking caps of the used waterproof connectors are tightened and sealed. Idle waterproof connectors are plugged and the locking caps are tightened.
7	The cabinet interior is clean, without dust, dirt, or foreign matter.
8	The paint on the cabinet exterior is intact. If paint flakes off, repaint that area to prevent corrosion.

Turning On Switches

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

NOTE

- You have completed the power-on check.
- Ensure that the power voltage of the SACU is within the operating voltage range.

Step 1 Turn on the single-phase power switch that controls the power supply from the remote transformer station to the SACU.

Step 2 Check that the input voltages of all switches of the SACU are within the operating voltage ranges using a multimeter.

Step 3 Turn on the **QF03** single-phase input switch in the SACU.

----End

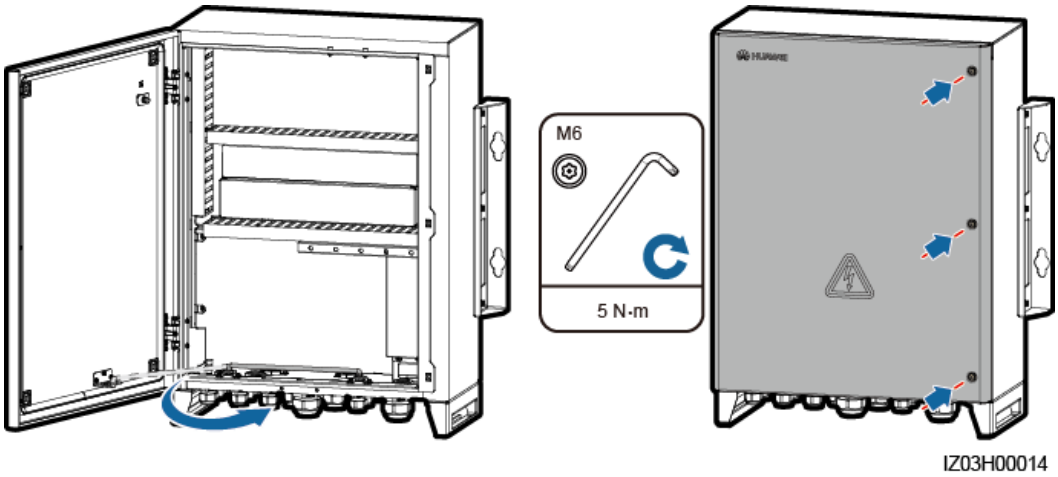
Follow-up Procedure

After the device is powered on, use a network cable to connect the PC to the **G1** port on SWITCH03. Log in to the SmartLogger WebUI on the PC and perform subsequent commissioning. For details, see the *SmartLogger3000 User Manual*.

7 Closing the Cabinet Door

Retract the support bar, close the cabinet door, and tighten the screws.

Figure 7-1 Closing the main cabinet door



NOTE

If a screw used for securing the cabinet door is lost, use the security torx screw in the fitting bag.

8 Device Maintenance

8.1 Power-Off

DANGER

Put on insulated gloves before powering off the system.

Step 1 Turn off the **QF03** single-phase input switch in the SACU.

Step 2 Turn off the single-phase power switch that controls the power supply from the remote transformer station to the SACU.

----End

8.2 Routine Maintenance

DANGER

- Before you clean the system, connect cables, and check the grounding reliability, power off the system to ensure that the SACU is de-energized and will not cause personal injury.
- If you need to open the cabinet door on rainy or snowy days, take protective measures to prevent rain or snow from entering the cabinet. If it is impossible to take protective measures, do not open the cabinet door on rainy or snowy days.

Table 8-1 Maintenance checklist

Check Item	Check That	Maintenance Interval
Cabinet	• The SACU exterior is not damaged or deformed. • There is no dust or dirt in the SACU.	Once every twelve months
System running status	• All devices in the SACU operate properly. • The SPD works properly.	Once every six months
Electrical connections	• Cables are secured. • Cables are intact and especially the parts touching the metallic surface are not scratched. • Unused waterproof connectors are plugged and the locking caps are tightened. • The cover on the USB port is tightened.	Once every twelve months
Grounding reliability	All ground cables are reliably connected.	Once every twelve months

8.3 Troubleshooting

Symptom	Possible Cause	Suggestion
The single-phase input switch of the SACU is not powered on.	1. The power supply to the upstream transformer station of the single-phase input switch is abnormal. 2. The single-phase input switch is faulty.	1. Use a multimeter to check whether the power supply to the upstream transformer station of the single-phase input switch is normal. 2. Replace the single-phase input switch.
The power adapter or 24 V power module fails to supply power.	1. The input and output power cables of the 24 V power module are loose or disconnected. 2. The power adapter or 24 V power module is faulty.	1. Check the cable connection. If the cable is loose or disconnected, reconnect it securely. 2. Replace the power adapter or 24 V power module.

Symptom	Possible Cause	Suggestion
The SmartLogger in the SACU is not powered on.	1. The DC output power cable for the power adapter is not connected to the **12V IN** port of the SmartLogger. 2. The power cable is not connected to the AC power input port of the power adapter. 3. The AC input power cable is not connected to the AC socket. 4. The power adapter is faulty. 5. The SmartLogger is faulty.	1. Check the power adapter and connect the DC output power cable for the power adapter to the **12V IN** port of the SmartLogger. 2. Check that the power cable is connected to the AC power input port of the power adapter. 3. Check that the power cable is connected to the AC socket. 4. Replace the power adapter. 5. Contact your dealer or technical support.
The SmartLogger does not communicate with the opto-electronic Ethernet switches.	1. The network cables between the SmartLogger and the opto-electronic Ethernet switches are not properly connected. 2. The IP address of the SmartLogger is not configured or is not in the LAN.	1. Check whether the network port indicators on the SmartLogger and opto-electronic Ethernet switches blink properly. If not, connect the network cables to other ports on the opto-electronic Ethernet switches or replace the network cables and try again. 2. On the SUN2000 app, check whether the IP address of the SmartLogger is correctly set. If not, set the IP address again. 3. Log in to the SmartLogger WebUI via the LAN port (default IP address of the LAN port: 192.168.8.10) and check whether the IP address of the SmartLogger is correct. If not, set the IP address again. 4. Connect the PC to the opto-electronic Ethernet switches and ping the IP address of the SmartLogger. If the communication is abnormal, replace the network cables and try again.

Symptom	Possible Cause	Suggestion
The SmartLogger does not communicate with the SmartModule.	1. The network cable between the SmartLogger and the SmartModule is not properly connected. 2. The communication certificate has expired.	1. Check whether the network port indicators on the SmartLogger and SmartModule blink properly. If not, connect the network cable to another GE port on the SmartModule or replace the network cable and try again. 2. Log in to the SmartLogger WebUI or SUN2000 app and check whether a communication certificate expiration alarm is generated. If yes, reload the certificate. 3. Contact your dealer or technical support.

8.4 Component Replacement

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

NOTICE

- Do not perform operations with the power on because high voltage exists during the running of the device.
- Before you replace a component, ensure that a spare component of the same model is available and functional.
- Prior to maintenance, power off the equipment.
- Before you replace a component, power off the SACU. Wait at least 3 minutes after the power-off to ensure that the SACU is de-energized.
- After you replace a component, check the SACU before powering it on to ensure that the new component works properly.
- Dispose of faulty components in accordance with the local disposal act for waste electrical equipment.

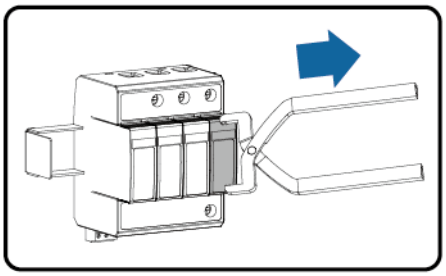
8.4.1 Replacing the Single-Phase SPD

NOTE

- An SPD consists of a surge protection module and a base.
- If an SPD is damaged or its indication window is displayed in red, this indicates that the SPD is unavailable and needs to be replaced.
- You can purchase the SPD module extraction tool from the Company.

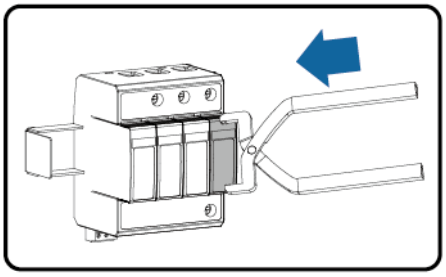
Step 1 Remove the faulty surge protection module from the SPD.

Figure 8-1 Removing a faulty surge protection module



Step 2 Install a new surge protection module.

Figure 8-2 Installing a new surge protection module



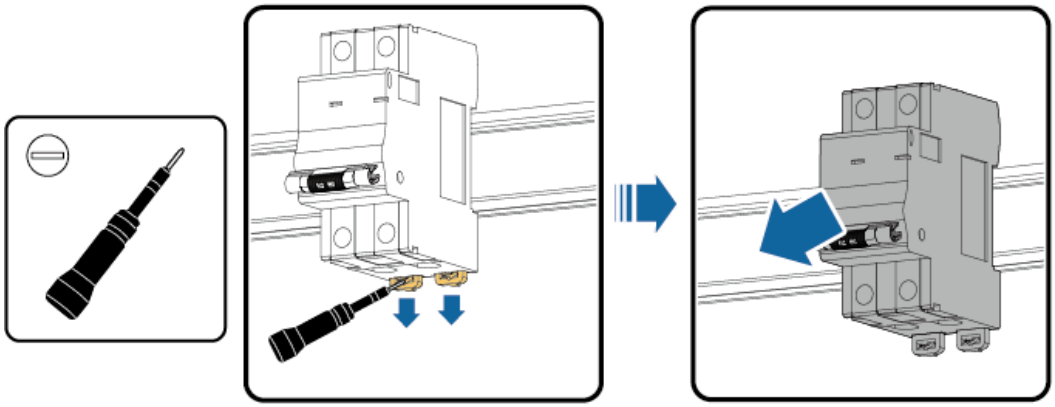
----End

8.4.2 Replacing the Single-Phase Input Switch

Step 1 Disconnect the cables from the single-phase input switch and label the cables.

Step 2 Remove the faulty single-phase input switch.

Figure 8-3 Removing a faulty single-phase input switch



Step 3 Install a new single-phase input switch.

Step 4 Connect the cables based on their labels.

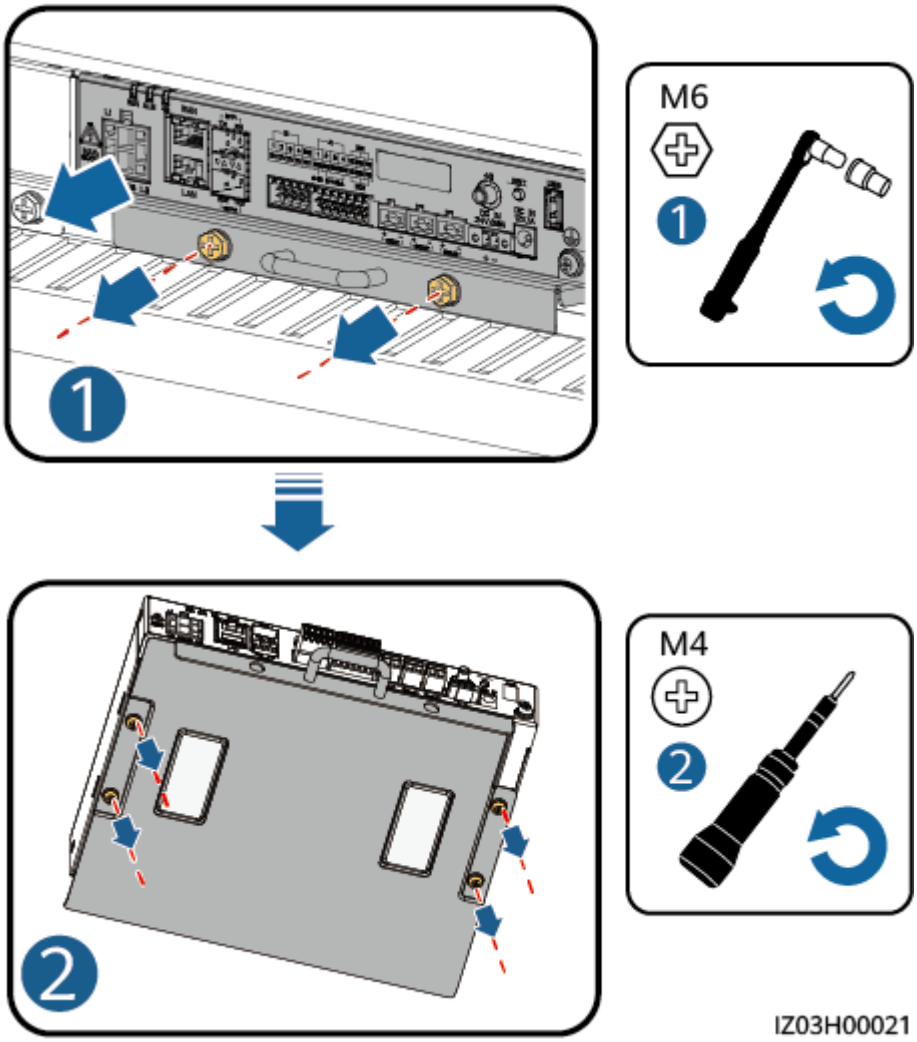
----End

8.4.3 Replacing the SmartLogger

Step 1 Disconnect the cables from the SmartLogger and label the cables.

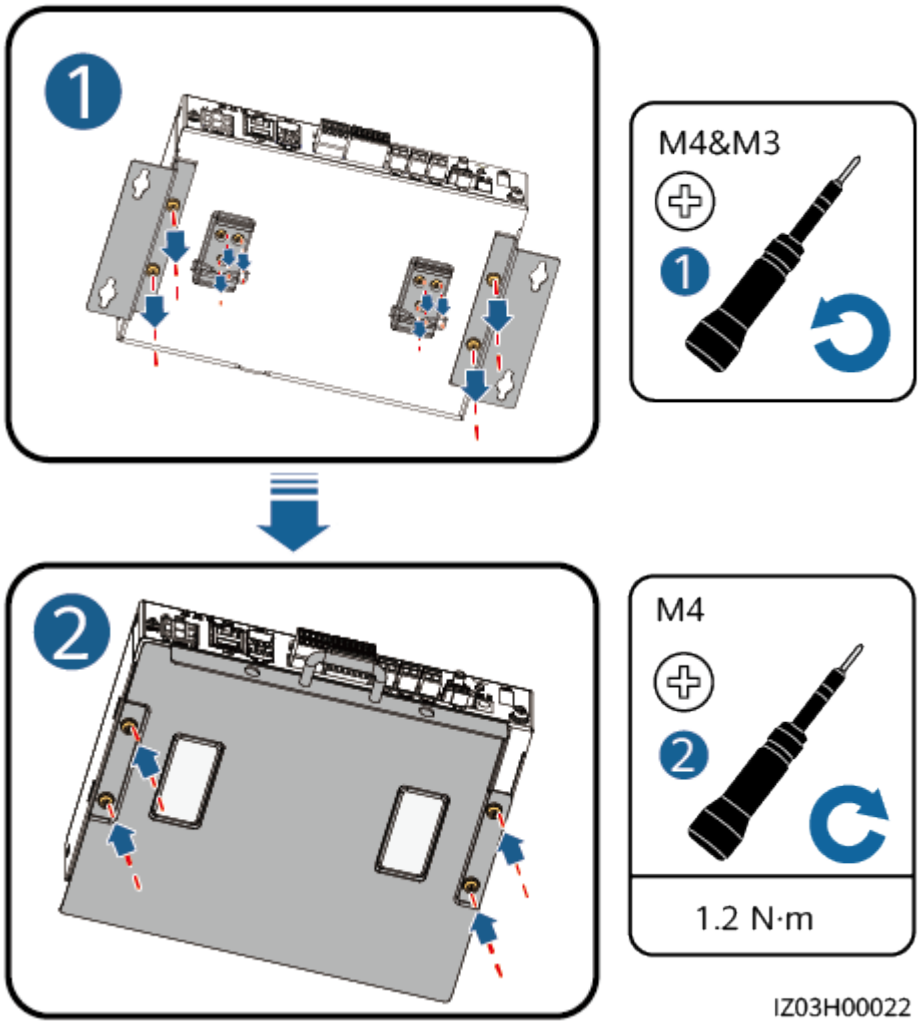
Step 2 Remove the faulty SmartLogger and its cabinet-mounting bracket.

Figure 8-4 Removing a faulty SmartLogger



Step 3 Remove the mounting ears and guide rail–mounting bracket from a new SmartLogger, and install the cabinet-mounting bracket.

Figure 8-5 Replacing a SmartLogger



Step 4 Install the new SmartLogger in the cabinet.

Step 5 Connect the cables based on their labels.

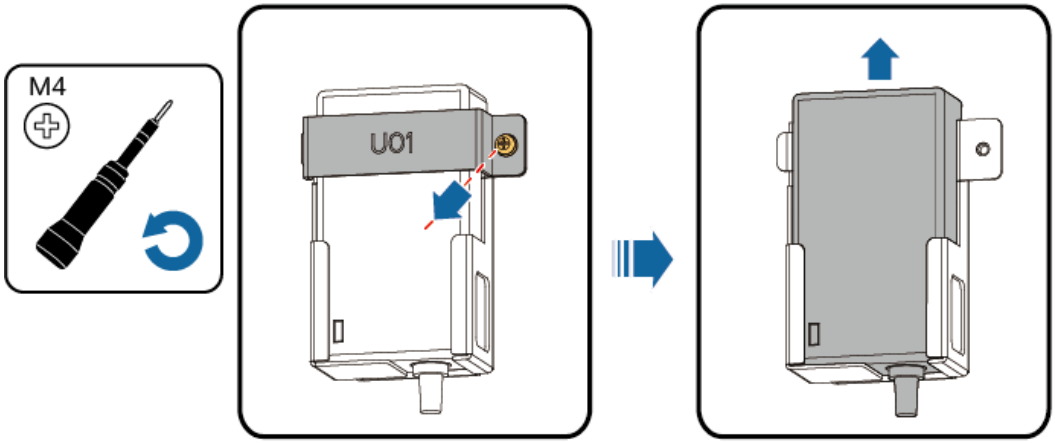
----End

8.4.4 Replacing the Power Adapter

Step 1 Disconnect the cables from the power adapter and label the cables.

Step 2 Remove the faulty power adapter.

Figure 8-6 Removing a faulty power adapter



Step 3 Install a new power adapter and tighten the M4 screw to 1.2 N·m.

Step 4 Connect the cables based on their labels.

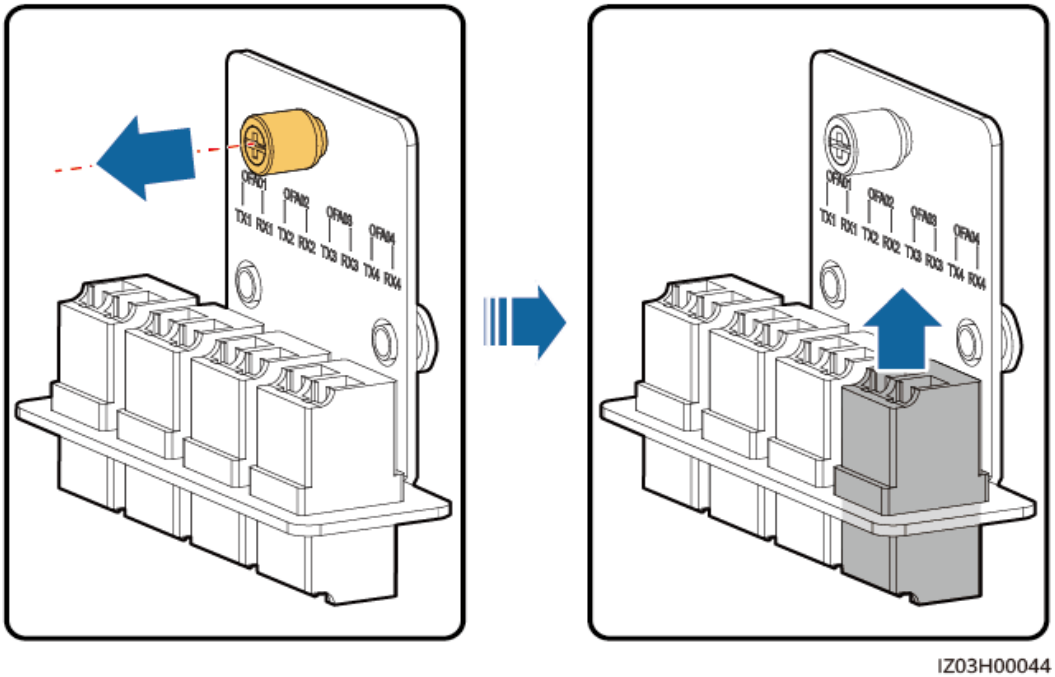
----End

8.4.5 Replacing the Fiber Adapter

Step 1 Disconnect cables from the fiber adapter and label them.

Step 2 Remove the faulty fiber adapter.

Figure 8-7 Removing a fiber adapter



Step 3 Install a new fiber adapter.

Step 4 Connect the cables based on their labels.

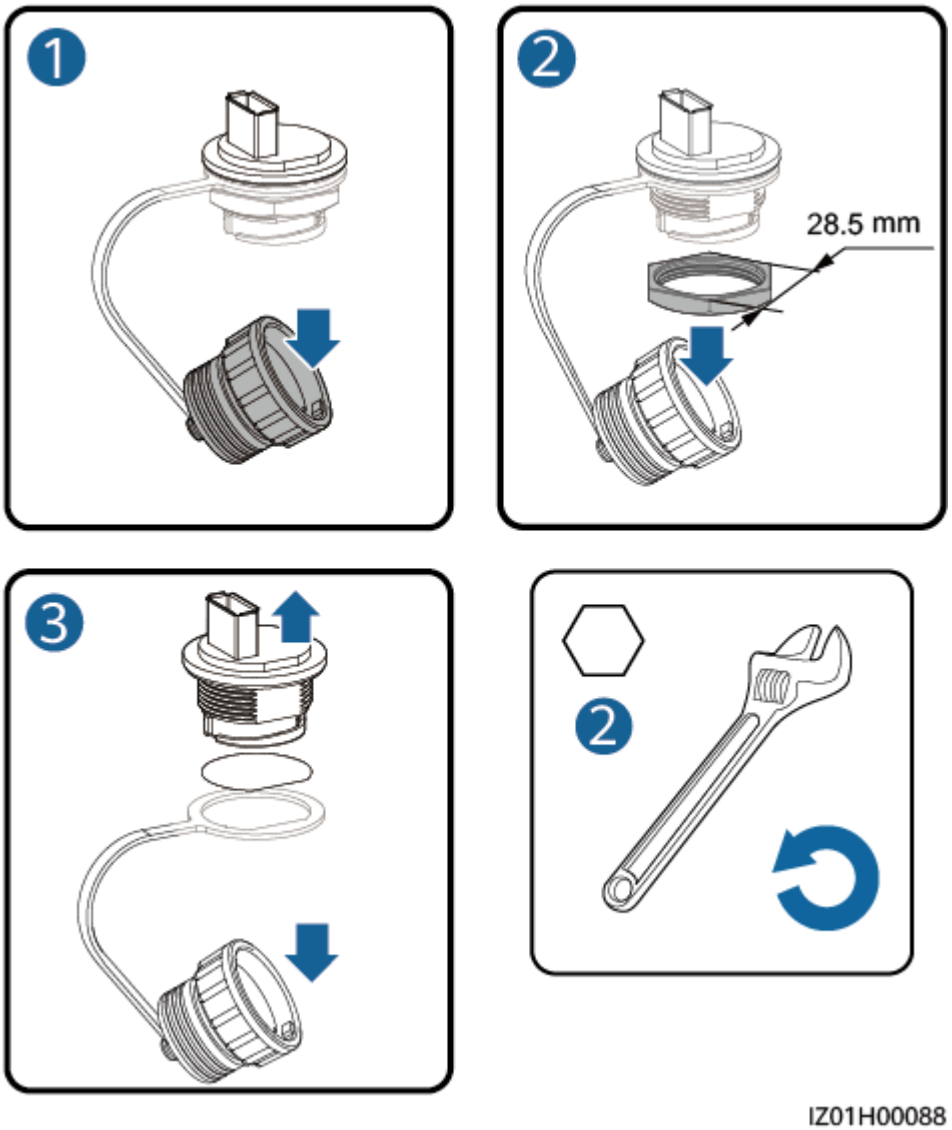
----End

8.4.6 Replacing the USB Port

Step 1 Disconnect the cable from the USB port, and label the cable.

Step 2 Remove the faulty USB port.

Figure 8-8 Removing a USB port



Step 3 Ensure that the rubber ring is on the inner side of the cabinet when installing a new USB port.

Step 4 Connect the cable based on the label.

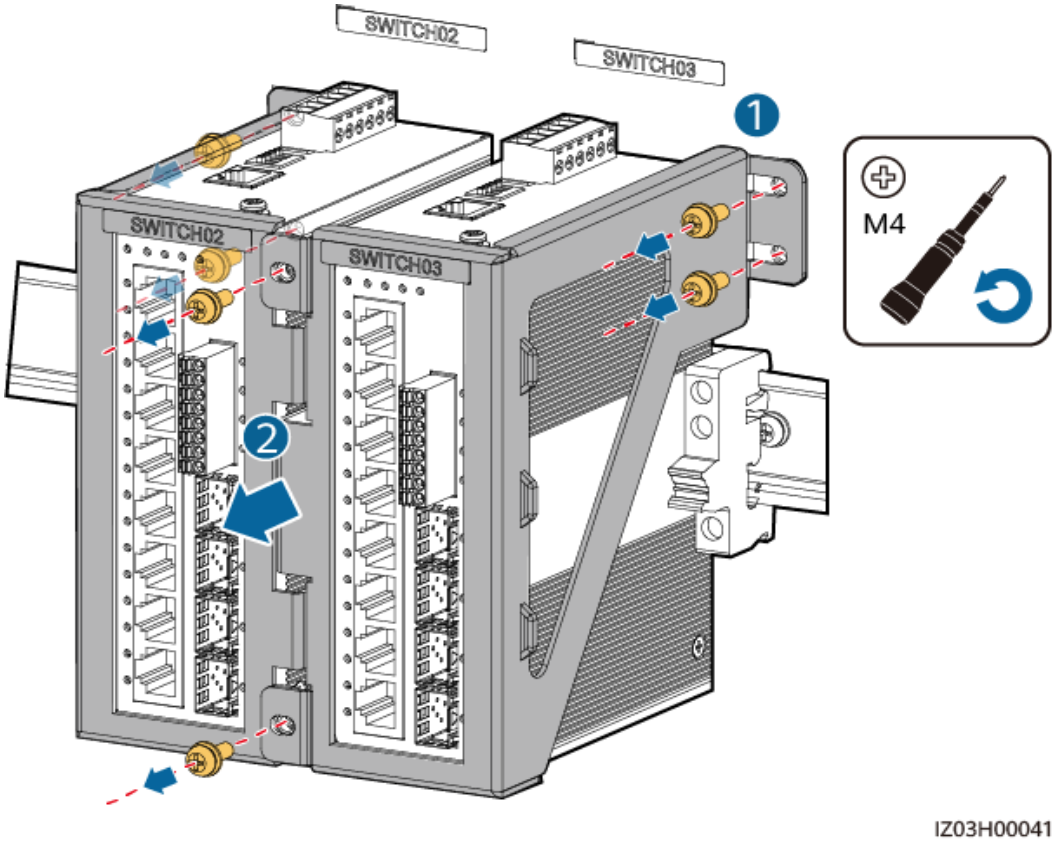
----End

8.4.7 Replacing the Opto-Electronic Ethernet Switch

Step 1 Remove cables from the switch and label them.

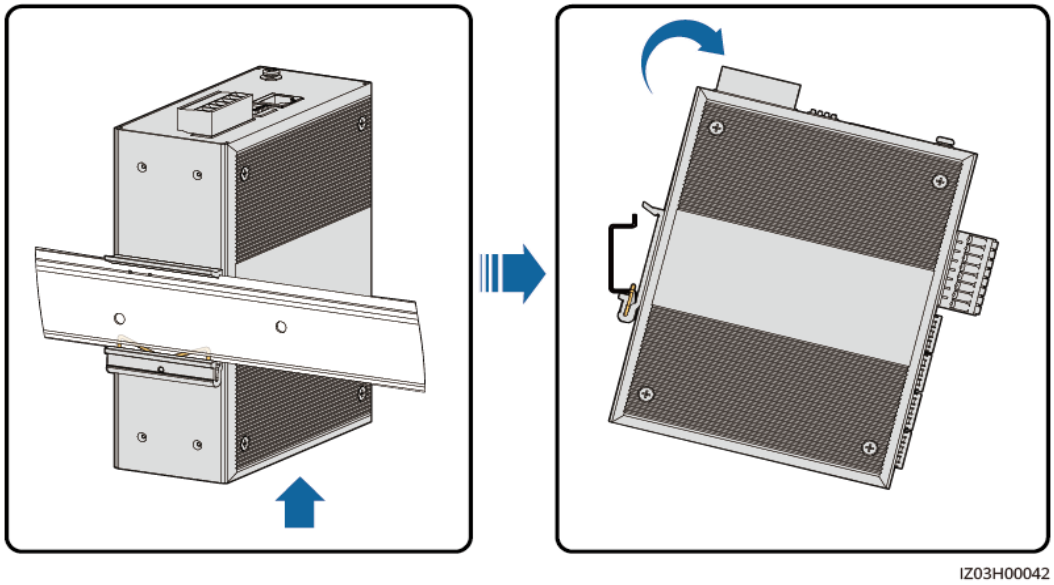
Step 2 Remove the switch fastener.

Figure 8-9 Removing a fastener



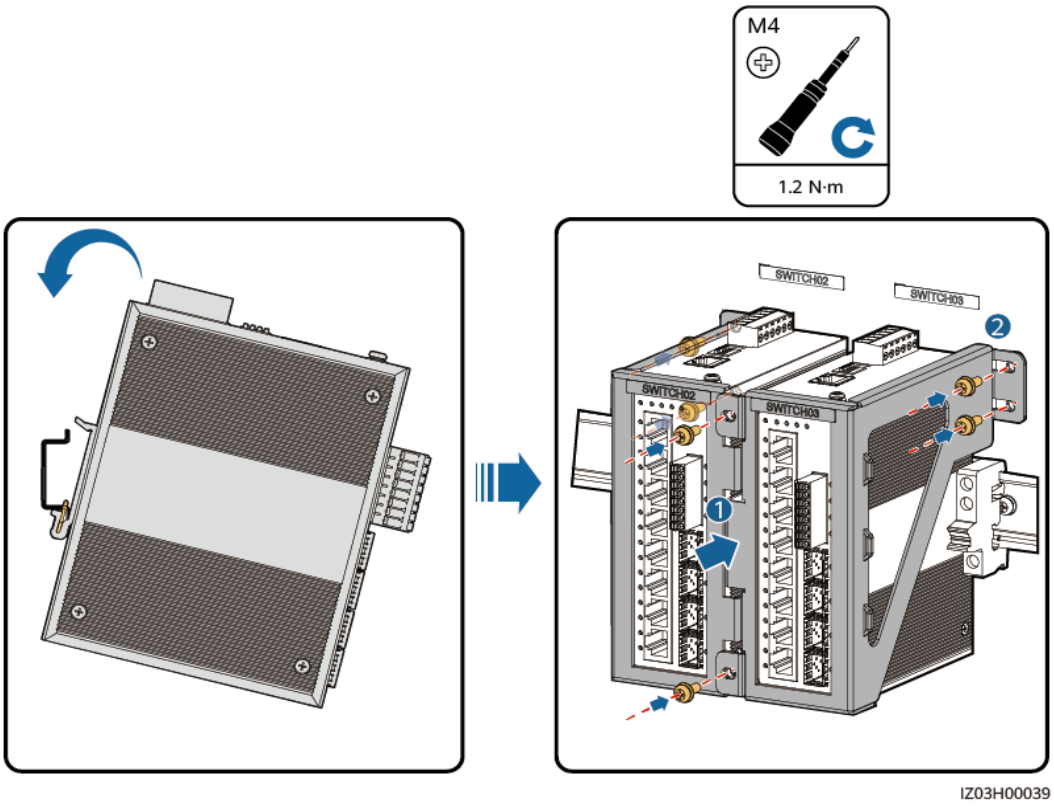
Step 3 Remove the faulty switch.

Figure 8-10 Removing a switch



Step 4 Install a new switch.

Figure 8-11 Installing a switch



Step 5 Reinstall the cables.

----End

9 Technical Specifications

Item	SmartACU2000D-D-06
Communications mode	SFP/ETH/RS485
Single-phase operating voltage[1]	AC input: 100–240 V
Single-phase input power	110 W (maximum)
Frequency	50 Hz/60 Hz
Cabling mode	Routed in and out from the bottom
Operation and maintenance mode	Operated and maintained from the front
Operating environment	Indoor and outdoor
Maximum operating altitude	4000 m
Installation mode	Installed on a support, pole, or wall
Dimensions (H x W x D, including the mounting bracket)	770 mm x 640 mm x 315 mm
Net weight (including sealing putty, screws, and the mounting bracket)	About 32 kg
Enclosure ingress protection (IP) rating	IP65

Item	SmartACU2000D-D-06
Operating humidity	4%–100% RH
Operating temperature	–40°C to +60°C
Storage temperature	–40°C to +70°C
Note [1]: Supports a 24 V power system. DC input and output: 24–28 V DC; 70 W (maximum)	

A Connecting Cables Through Cable Holes

NOTICE

- To prevent poor cable connection due to overstress caused by ground subsidence, it is recommended that the cable be bent inside the cabinet for a slack of 20–30 mm before being connected to the appropriate port.
- If a cable has a jacket, ensure that the jacket is in the cabinet.

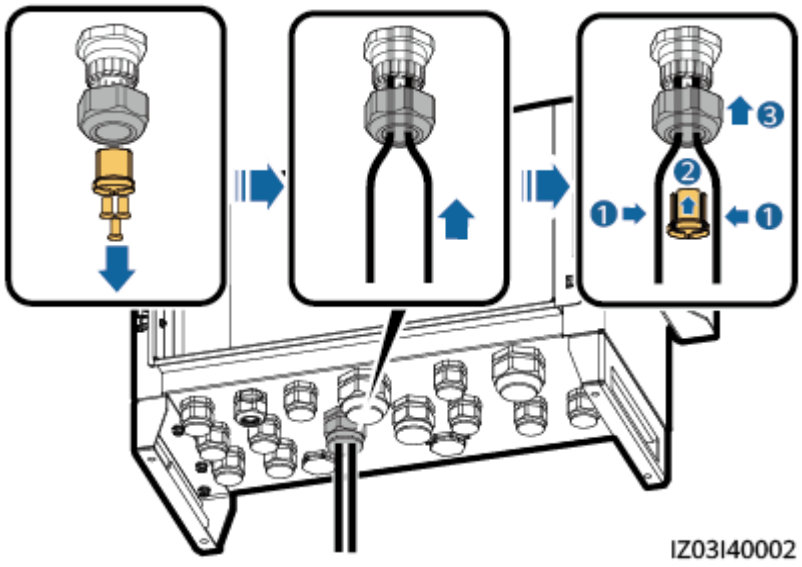
MBUS01/SFP3 and MBUS02/SFP4 Cable Holes

Step 1 Remove the locking cap and plug from the waterproof connector.

Step 2 Route the cables through the waterproof connector and connect them to the device.

Step 3 Insert the cables into the plug, reinstall the plug to the waterproof connector, and tighten the locking cap on the waterproof connector.

Figure A-1 Routing cables



Step 4 Clear foreign matter from the cabinet.

----End

Other Cable Holes

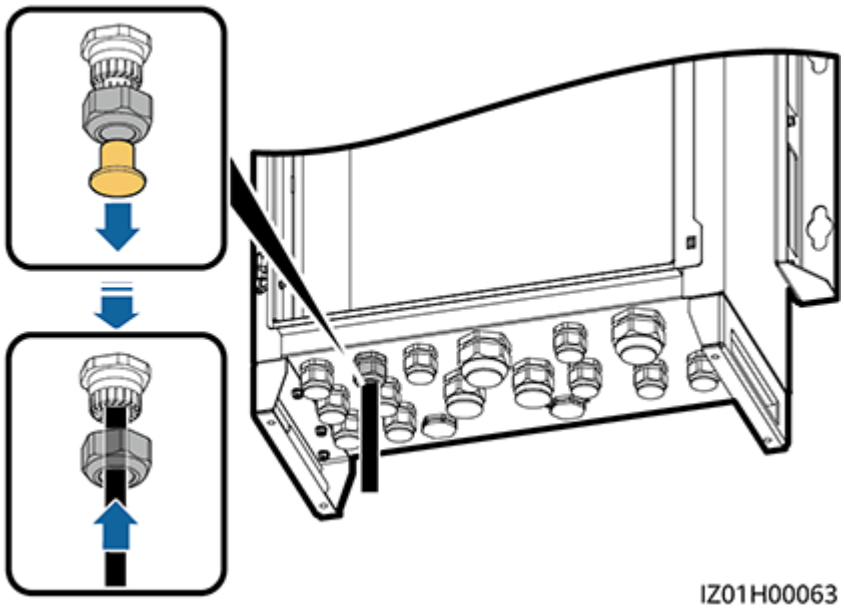
NOTE

This section describes how to install the RS485/ETH/DC waterproof connector. The procedure for installing other waterproof connectors is similar.

Step 1 Remove the locking cap and plug from the waterproof connector.

Step 2 Route the cable through the locking cap and then the waterproof connector.

Figure A-2 Routing the cable



Step 3 Connect the cable and tighten the locking cap.

Step 4 Check that the cable is connected correctly and securely. Seal the waterproof connector and cable hole using the supplied sealing putty.

Step 5 Clear foreign matter from the cabinet.

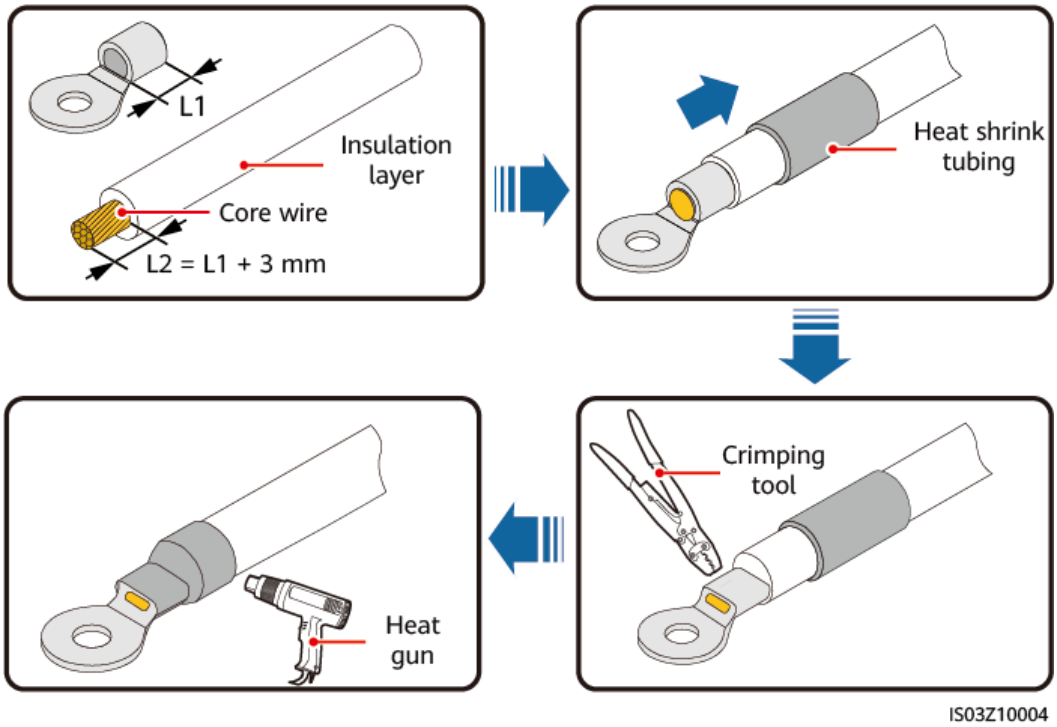
----End

B Crimping an OT Terminal

NOTICE

- Avoid scratching the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrink tubing or insulation tape. The heat shrink tubing is used as an example.
- Use a heat gun carefully to avoid heat damage to the equipment.

Figure B-1 Crimping an OT terminal



C Acronyms and Abbreviations

A	
AI	analog input
APP	application
ATB	Access Terminal Box
D	
DC	direct current
DI	digital input
DO	digital output
E	
ESS	energy storage system
ETH	Ethernet
F	
FE	fast Ethernet
M	
MCB	miniature circuit breaker
P	
PE	protective earthing
R	
RH	relative humidity
S	

SACU	Smart Array Controller
SFP	small form-factor pluggable
SPD	surge protective device

