SA4H-A02

User Manual

Issue	03
Date	2026-06-30

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About This Document

Purpose

This document describes the SmartAssistant in terms of safety precautions, product introduction, installation, electrical connections, power-on and commissioning, maintenance, and technical data. Read this document carefully before installing and using the SmartAssistant.

The SmartAssistant models are SA4H-A02. SA4H is an abbreviation for SmartAssistant for Home.

Intended Audience

This document is intended for:

- Technical support engineers
- Hardware installation engineers
- Commissioning engineers
- Maintenance engineers

Symbol Conventions

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

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Symbol	Description
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

Issue	Date	Description
03	2026-06-30	• Modified the recommended external CT specifications in **5.1 Preparing Cables**. • Modified the certificate management description in **C Certificate Management and Maintenance**.
02	2026-03-10	• Added the requirement for complying with fire resistance and flame retardance standards in **1.2 Electrical Safety**. • Updated **6.3 Device Commissioning**.
01	2025-12-20	This issue is the first official release.

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:

- 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
- 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

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 cause electric arcs, sparks, fire, or explosion, which may result in 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.

DANGER

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

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 certified high-voltage electricians are allowed to operate medium-voltage equipment.

- 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 fires 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, short circuits, equipment damage, load power derating, power failure, or personal injury may occur.

CAUTION

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

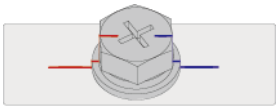
CAUTION

The components (such as power distribution boxes, circuit breakers, and cables) used for electrical connections shall comply with fire resistance and flame retardance standards (such as IEC 60670-1). The materials and structure shall meet fire safety requirements.

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.
- If any liquid is detected inside the equipment, disconnect the power supply immediately and do not use the equipment.
- 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.)



- After the installation is complete, ensure that protective cases, insulation tubes, and other necessary items for all electrical components are in position to avoid electric shocks.
- If the equipment has multiple inputs, disconnect all the inputs and wait until the equipment is completely powered off before performing operations on 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 "No switching 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.
- Do not open equipment panels.
- 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.

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 cables are protected from mechanical stress, overheating, and corrosion.
- Ensure that cables are not squeezed, torn, warped, or whitened.
- 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 routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.
- 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 below 0°C must be stored at room temperature for more than 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.

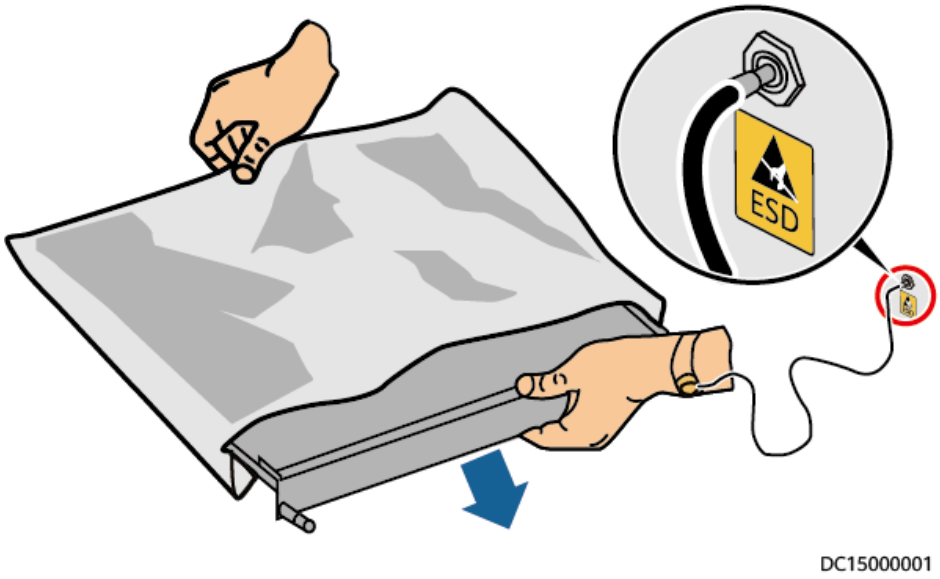
ESD

NOTICE

The static electricity generated by human bodies may damage the electrostatic-sensitive components on boards, for example, the large-scale integrated (LSI) circuits.

- When touching the equipment and handling boards, modules with exposed circuit boards, or application-specific integrated circuits (ASICs), observe ESD protection regulations and wear ESD clothing and ESD gloves or a well-grounded ESD wrist strap.

  Figure 1-1 Wearing an ESD wrist strap



- When holding a board or a module with exposed circuit boards, hold its edge without touching any components. Do not touch the components with bare hands.
- Package boards or modules with ESD packaging materials before storing or transporting them.

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

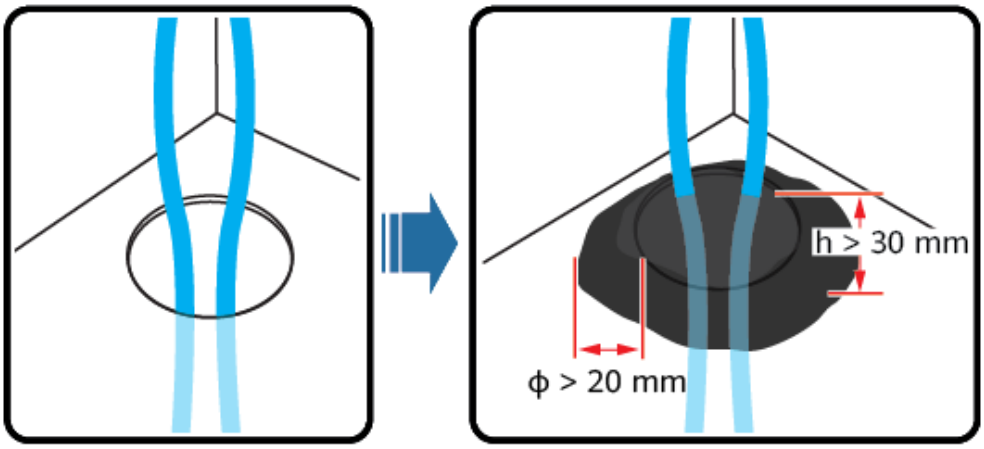
To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

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 direct sunlight, 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 (the area shall be greater than or equal to 3 m x 2.5 m).
- 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 installation, operation, and maintenance, clean up any water, ice, snow, or other foreign objects on the top of the equipment.
- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- 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.



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

1.4 Mechanical Safety

DANGER

When working at heights, wear a safety helmet and safety harness or waist belt and fasten it to a solid structure. Do not mount it on an insecure moveable object or a metal object with sharp edges. Make sure that the hooks will not slide off.

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

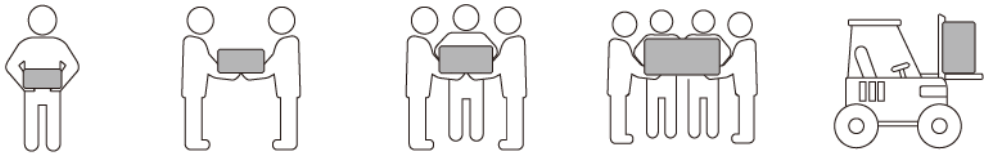
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

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.
- 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.

Working at Heights

- Any operations performed 2 m or higher above the ground must be supervised properly.
- Only trained and qualified personnel are allowed to work at heights.
- Do not work at heights when steel pipes are wet or other risky situations exist. After the preceding conditions no longer exist, the safety owner and relevant technical personnel need to check the involved equipment. Operators can begin working only after safety is confirmed.
- Set a restricted area and prominent signs for working at heights to warn away irrelevant personnel.
- Set guard rails and warning signs at the edges and openings of the area involving working at heights to prevent falls.
- Do not pile up scaffolding, scaffold planks, or other objects on the ground under the area involving working at heights. Do not allow people to stay or pass under the area involving working at heights.
- Carry operation machines and tools properly to prevent equipment damage or personal injury caused by falling objects.
- Personnel involving working at heights are not allowed to throw objects from the height to the ground, or vice versa. Objects shall be transported by slings, hanging baskets, aerial work platforms, or cranes.
- Do not perform operations on the upper and lower layers at the same time. If unavoidable, install a dedicated protective shelter between the upper and lower layers or take other protective measures. Do not pile up tools or materials on the upper layer.
- Dismantle the scaffolding from top down after finishing the job. Do not dismantle the upper and lower layers at the same time. When removing a part, ensure that other parts will not collapse.
- Ensure that personnel working at heights strictly comply with the safety regulations. The Company is not responsible for any accident caused by violation of the safety regulations on working at heights.
- Behave cautiously when working at heights. Do not rest at heights.

Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Single ladders are not recommended.
- 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.

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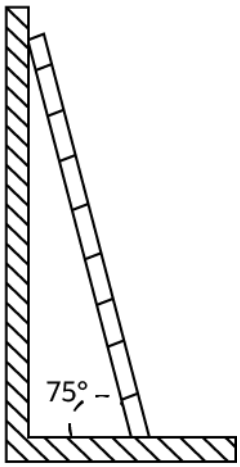
- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.
- If a single ladder is used, the recommended angle for the ladder against the floor is 75 degrees, as shown in the following figure. A square can be used to measure the angle.



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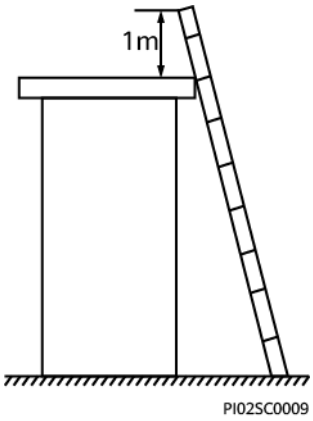
- If a single ladder is used, ensure that the wider end of the ladder is at the bottom, and take protective measures to prevent the ladder from sliding.
- If a single ladder is used, do not climb higher than the fourth rung of the ladder from the top.
- If you use a single ladder to climb up to a platform, ensure that the ladder is at least 1 m higher than the platform.



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 Product Description

2.1 Model Number Description

This document involves the following product model:

SA4H-A02

Figure 2-1 Model number

Table 2-1 Model number description

No.	Item	Description
1	Product family name	SA4H: smart home energy controller. It is an abbreviation for SmartAssistant for Home.
2	Hardware ID	A: hardware platform version
3	Configuration ID	02: Features of PV devices, energy storage systems (ESSs), smart chargers, and smart loads are supported.

2.2 Networking

The SmartAssistant is a device that manages energy in a home with a PV system. It can implement unified scheduling and management of home energy.

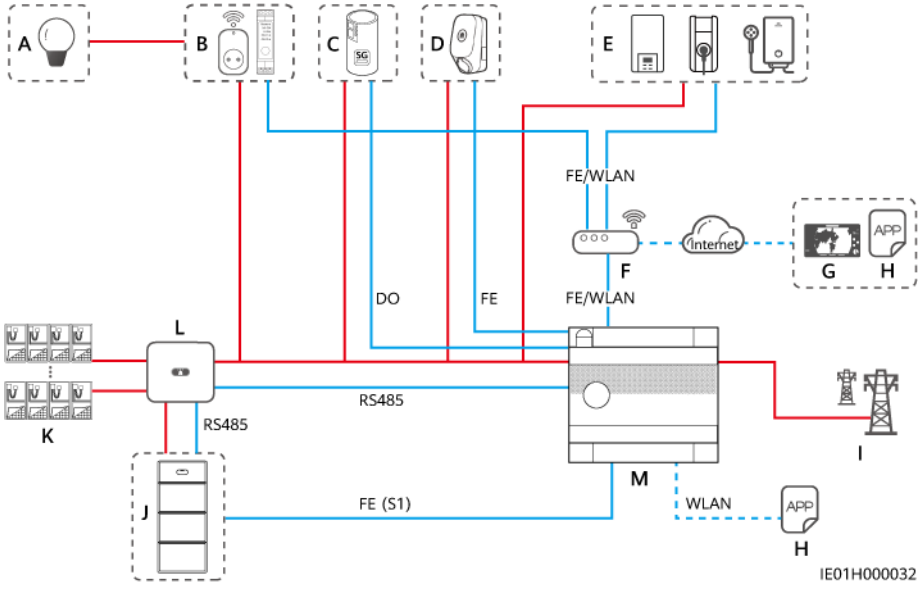
Features of PV devices, ESSs, smart chargers, and smart loads are supported. In addition to unified scheduling of home energy, the SmartAssistant **can connect to appliances such as Huawei chargers, SG Ready heat pumps, smart switches,**

and other smart loads. Users can set the reservation time to charge vehicles and heat water in advance at the specified time. In addition, users can set the priority to use PV energy for devices as required to make the best use of PV energy.

NOTE

- The SmartAssistant supports load consumption optimization and negative rate optimization.
- The built-in power measurement module of the SmartAssistant is used to control the power at the grid connection point. The measurement data cannot be used as the basis for electricity billing, which is subject to the metering by the power grid company.

Figure 2-2 Networking diagram



(A) Power load
(B) Smart switch
(C) SG Ready heat pump
(D) Huawei charger
(E) Other smart loads
(F) Router
(G) Management system
(H) App
(I) Power grid
(J) ESS
(K) PV string
(L) Inverter
(M) SmartAssistant

The networking is described as follows:

- A maximum of 40 devices can be connected to the SmartAssistant.
- Inverters connect to the SmartAssistant over RS485. A maximum of three inverters can be connected in parallel and a maximum of 12 ESSs can be connected.
- The SmartAssistant is connected to the router over FE or WLAN.
- The LAN port can be used to connect one Huawei charger or one ESS to the SmartAssistant over FE.

- A maximum of two chargers can be connected.
  - If there is only one Huawei charger, it can be directly connected to the SmartAssistant over FE or connected to the router over FE or WLAN.
  - If there is one third-party charger, connect it to the router over FE or WLAN.
  - If there are two Huawei chargers, connect them to the router over FE or WLAN.
  - If there is one Huawei charger and one third-party charger, connect the Huawei charger directly to the SmartAssistant over FE or to the router over FE or WLAN. Connect the third-party charger to the router over FE or WLAN.
- The SmartAssistant directly controls the SG Ready heat pump through dry contacts or an external relay.
- For third-party devices that are not adapted to the system, system commissioning and adaptation are required. If the adaptation is not completed, the devices may fail to be installed and used onsite. For details about the third-party devices that have passed the interconnection test, see **FusionSolar Smart Power Consumption User Manual**. **Note: The manufacturer and seller are responsible for the quality, safety, and related services of the third-party devices.**

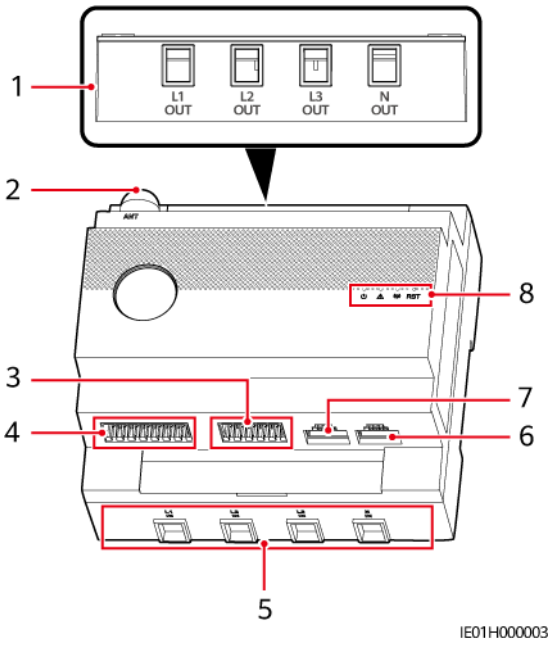
NOTICE

For details about the mapping in the SmartAssistant network, see **Residential Smart PV Solution User Manual (SmartAssistant Networking and Smart Guard Networking)**.

2.3 Appearance

Appearance and Ports

Figure 2-3 Appearance description



(1) AC output port (L1 OUT/L2 OUT/L3 OUT/N OUT)

(2) External WLAN antenna port (ANT)

(3) 12 V input/RS485 communication/ external CT input port (12V_IN/ RS485/CT Input)

(4) RS485 communication/DI/12 V output/DO port (RS485/DI/ 12V_OUT/DO)

(5) AC input port (L1 IN/L2 IN/L3 IN/N IN)

(6) WAN port (WAN)

(7) LAN port (LAN)

(8) LED indicator/RST button

Indicator Description

Table 2-2 LED indicator description

Indicator	Status	Description
Running status indicator	Off	The device is not powered on.
	Steady green	The device is powered on and running.
Alarm indicator	Off	No alarm is raised.
	Blinking red slowly (on for 1s and then off for 4s)	A warning or minor alarm is generated.
	Blinking red fast (on for 0.5s and then off for 0.5s)	A major alarm is generated.
	Steady red	A critical alarm is generated.
Communication status indicator	Off	The device has no communication with the management system.
	Blinking green slowly (on for 1s and then off for 1s)	The communication between the device and the management system is normal.
	Blinking green fast (on for 0.125s and then off for 0.125s)	The communication between the device and the management system is interrupted.

Button Description

Appearance	Definition	Triggering Method	Description
RST	WiFi module hibernation and wakeup	Hold down the button for 1s to 3s.	When the WiFi access point (AP) is idle and disabled, you can hold down the button for 1s to 3s to wake up the WiFi AP.
	Human-machine account password restoration	Hold down the button for 10s to 60s.	• Restore the login passwords of the human-machine accounts, such as local installer and user accounts to the initial passwords. • Reset the login password of the local WiFi AP.

Appearance	Definition	Triggering Method	Description
	Factory settings restoration	Hold down the button for more than 60s.	The SmartAssistant restarts and restores factory settings. **NOTICE** All data except communication networking parameters, historical alarms, and performance data will be restored to factory settings. Exercise caution when performing this operation.

2.4 Label Description

Enclosure Labels

Table 2-3 Enclosure labels

Symbol	Name	Meaning
	High voltage warning label	Be careful of electric shocks at high voltage.
SN:XXXXXXXXXXXX REGKEY:XXXXXXXX SSID:XXXXXXXXXX PSW:XXXXXXXX	Device information	• SN: serial number. • REGKEY: registration code for registering the management system on the app. • SSID: WLAN hotspot name. • PSW: password for logging in to the WLAN.
SmartAssistant Pro	SmartAssistant Pro	Unique identifier of the SmartAssistant, indicating that the SmartAssistant supports the features of smart chargers and smart loads in addition to PV and ESS features.
	QR code	Scan the QR code to connect to the SmartAssistant WLAN and securely access the management system.

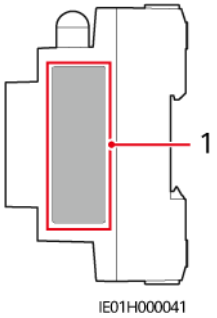
NOTE

The labels are for reference only.

Product Nameplate

The following figure shows the position of the nameplate, including the trademark, product model, key technical specifications, compliance symbols, company name, and place of origin.

Figure 2-4 Position of the nameplate



(1) Position of the nameplate

3 Storage Requirements

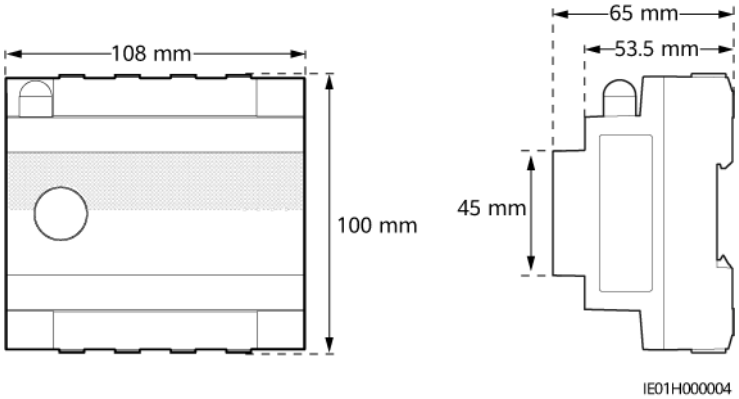
If the SmartAssistant is not used immediately, store it according to the following requirements:

- Do not remove the packaging. Check the packaging regularly (once every three months recommended). Replace any packaging that is damaged during storage. If the SmartAssistant is unpacked but not put into use immediately, place it inside the original package with the desicant bag, and seal it using tape.
- Store the device at the temperature range of –40°C to +85°C and relative humidity range of 5% to 95% without condensing. The air must not contain corrosive or flammable gases.
- Store the device in a clean and dry place and protect it from dust and moisture. The device must be protected against rain and water.
- If the SmartAssistant has been stored for more than two years, it must be checked and tested by professionals before use.

4 Installation

4.1 Installation Requirements

Figure 4-1 Installation requirements



4.2 Preparing Tools

Table 4-1 Personal protective equipment (PPE)

			
Safety helmet	Goggles	Reflective vest	Insulated shoes

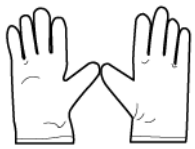
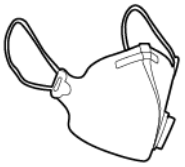
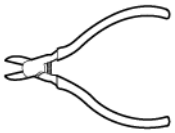
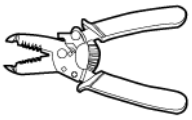
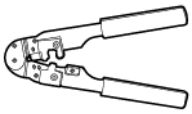
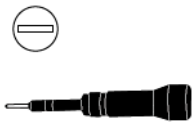
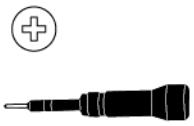
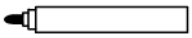
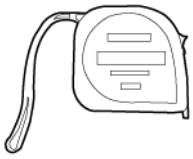
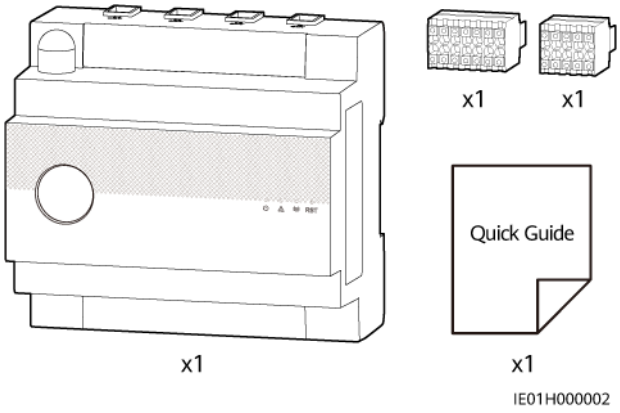
 Electrostatic discharge (ESD) gloves	 Insulated gloves	 Protective gloves	 Dust mask

Table 4-2 Installation tools

 Cable cutter	 Diagonal pliers	 Wire stripper	 RJ45 crimping tool
 Flat-head insulated torque screwdriver	 Phillips insulated torque screwdriver	 Utility knife	 Marker
 Steel measuring tape	 Cable tie	 Multimeter	 Eject pin

4.3 Checking Before Installation

Figure 4-2 Packing list



Check Item	Check Criteria
Outer package	Before unpacking the product, check the outer packaging for damage, such as holes and cracks, and check the product model. If any damage is found or the model is not what you requested, do not unpack the product and contact your vendor as soon as possible.
Deliverable	Check the number of deliverables according to the packing list and check whether there is any obvious external damage. If any part is missing or damaged, contact your vendor.

4.4 Installing the SmartAssistant

Context

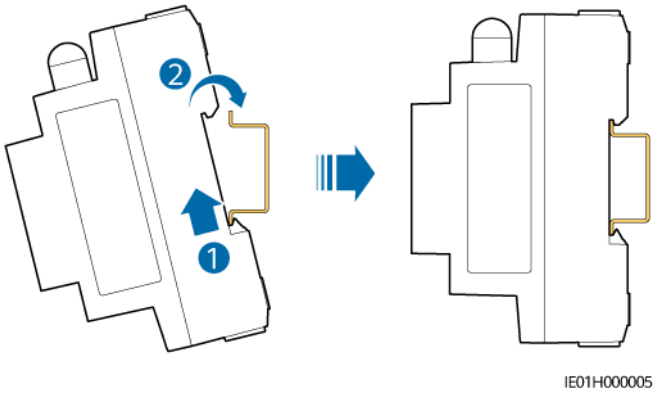
Install the SmartAssistant on the DIN 35 mm standard guide rail of the AC power distribution box in which a surge protective device must be configured.

Procedure

Step 1 Clamp the SmartAssistant onto the DIN 35 mm standard guide rail from bottom to top, and push the SmartAssistant upwards.

Step 2 Fasten the SmartAssistant to the guide rail.

Figure 4-3 Installing the SmartAssistant



----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 PPE and use dedicated insulated tools to avoid electric shocks or short circuits.

WARNING

- Equipment damage caused by incorrect cable connections is not covered by the product warranty.
- Only certified electricians are allowed to connect cables.
- Operation personnel must wear PPE when connecting cables.
- Before connecting cables to ports, leave enough slack to reduce the tension on the cables and prevent poor cable connections.

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.
- When laying out a signal cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.

NOTE

The cable colors shown in all cable connection diagrams in this section are for reference only. Select cables according to local cable specifications.

5.1 Preparing Cables

NOTICE

- When laying out a signal cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.
- The minimum cable cross-sectional area must meet local standards.
- The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.

Figure 5-1 Cable connection diagram: internal CT connection (current ≤ 63 A)

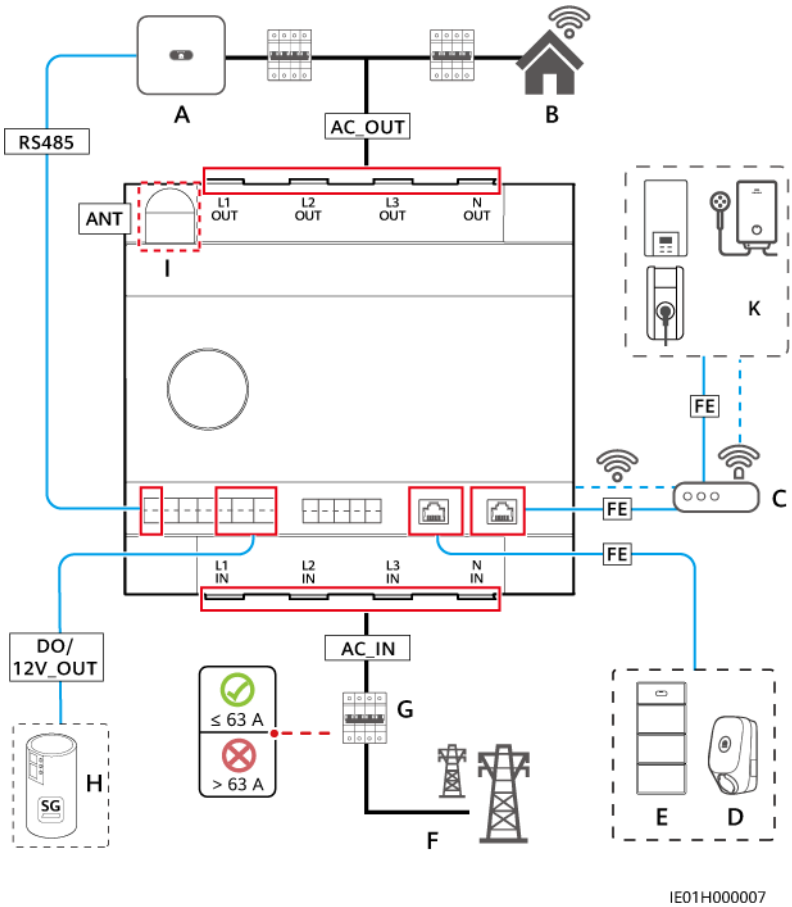
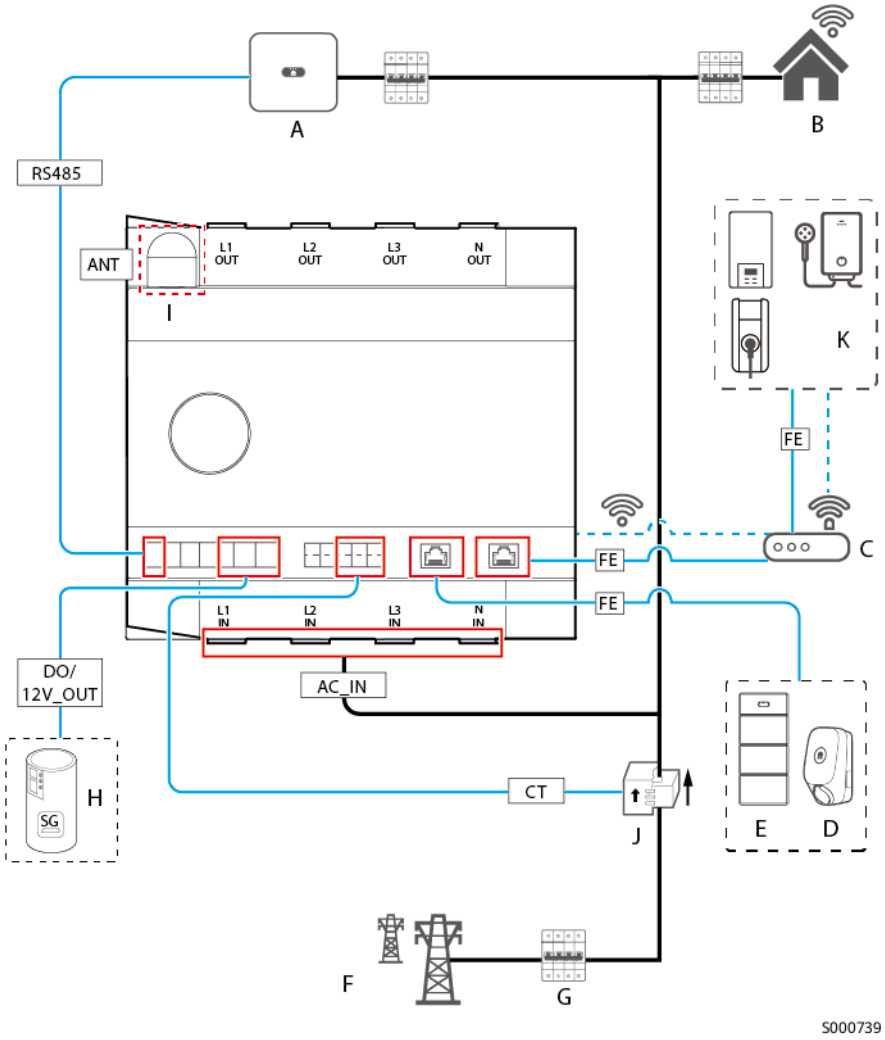


Figure 5-2 Cable connection diagram: external CT connection (current > 63 A)



(A) Inverter
(B) Residential load
(C) Router
(D) Huawei charger
(E) ESS (S1)
(F) Power grid
(G) Main circuit breaker
(H) SG Ready heat pump
(I) External WLAN antenna
(J) External CT
(K) Other smart loads

NOTE

A maximum of 40 devices can be connected to the SmartAssistant.

Table 5-1 Recommended cable specifications

Item	Name	Type	Conductor Cross-Sectional Area	Source
AC_IN AC_OUT	AC input power cable AC output power cable	Outdoor copper cable (temperature resistance ≥ 90°C)	• Internal CT connection: 16 mm^2 • External CT connection: 6 mm^2 to 16 mm^2	Prepared by the customer
RS485	RS485 communications cable	Two-core outdoor shielded twisted pair cable	0.2 mm^2 to 1.5 mm^2 (0.5 mm^2 recommended)	Prepared by the customer
CT	(Optional) External CT cable	Two-core or multi-core twisted pair cable	0.2 mm^2 to 1.5 mm^2 (0.5 mm^2 recommended)	Prepared by the customer
DO	DO signal cable	Two-core or multi-core twisted pair cable	0.2 mm^2 to 1.5 mm^2 (0.5 mm^2 recommended)	Prepared by the customer
12V_OUT	12 V output cable	Two-core or multi-core twisted pair cable	0.2 mm^2 to 1.5 mm^2 (0.5 mm^2 recommended)	Prepared by the customer
FE	FE communications cable	Cat 5e network cable, internal resistance ≤ 1.5 ohms/10 m RJ45 connector	0.12 mm^2 to 0.2 mm^2 (0.2 mm^2 recommended)	Prepared by the customer
ANT	(Optional) External WLAN antenna	External antenna with the RP-SMA-J port	-	Purchased from Huawei

Table 5-2 Recommended external CT specifications

Turn Ratio	≥ 2000:1
Accuracy class	≥ 0.5 (for example, 0.5 or 0.2)
Secondary Side	50 mA

Primary Side	*N* x 50 A (*N* ≥ 2, *N* is an integer)
External CT Communications Cable Length	≤ 30 m. The cables are not routed separately. It is recommended that the cables be routed through pipes.

Table 5-3 Recommended external WLAN antenna specifications

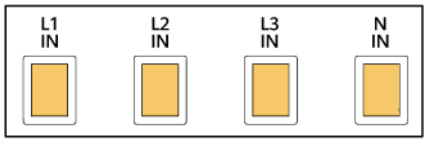
Item	Specifications
Frequency range	2400–2500 MHz
Gain	2.5–4 dBi
Direction	Omnidirectional
Voltage standing wave ratio (VSWR)	≤ 2
Polarization	Linear polarization
Efficiency	≥ 30%
Maximum input power	1 W
Impedance	50 Ω
Connector	RP-SMA-J
Operating temperature	–40°C to +85°C
Operating humidity	5%–95% RH

5.2 Connecting the AC Power Cable or External CT Cable

The SmartAssistant supports internal CT connection (current ≤ 63 A) or external CT connection (current > 63 A).

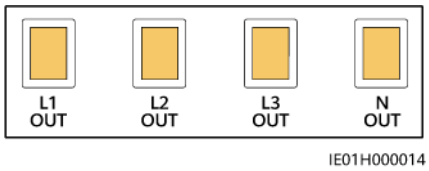
Context

Figure 5-3 AC input power cable ports



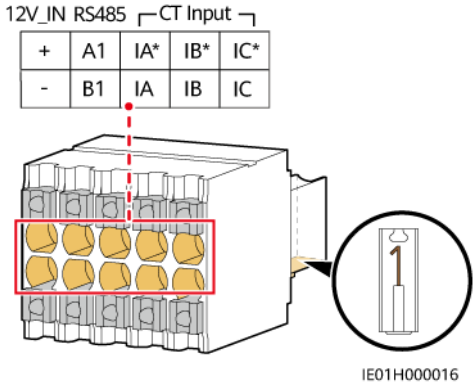
Port	Pin	Function	Description
AC-IN	L1-IN	AC input power cable L1	Connect to the power grid.
	L2-IN	AC input power cable L2	
	L3-IN	AC input power cable L3	
	N-IN	AC input power cable N	

Figure 5-4 AC output power cable ports



Port	Pin	Function	Description
AC-OUT	L1-OUT	AC output power cable L1	Supply power to loads in internal CT connection mode.
	L2-OUT	AC output power cable L2	
	L3-OUT	AC output power cable L3	
	N-OUT	AC output power cable N	

Figure 5-5 10-pin connector

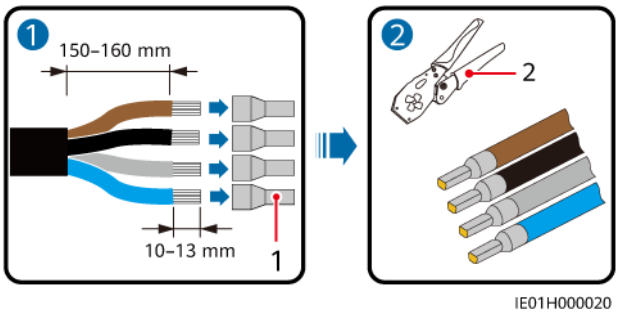


Port	Pin	Function	Description
12V_IN	+	12 V power input+	Used only in the Smart Guard scenario for the whole-house power backup. The Smart Guard provides 12 V DC power for the SmartAssistant when the SmartAssistant is in off-grid mode.
	-	12 V power input–	
RS485	A1	RS485A, RS485 differential signal+	Used to connect to the Smart Guard.
	B1	RS485B, RS485 differential signal–	
CT Input	IA*	External CT input phase A+	Used to connect to an external CT.
	IA	External CT input phase A–	
	IB*	External CT input phase B+	
	IB	External CT input phase B–	
	IC*	External CT input phase C+	
	IC	External CT input phase C–	

Procedure

Step 1 Prepare cord end terminals for AC power cables and determine whether to prepare external CT cables as needed.

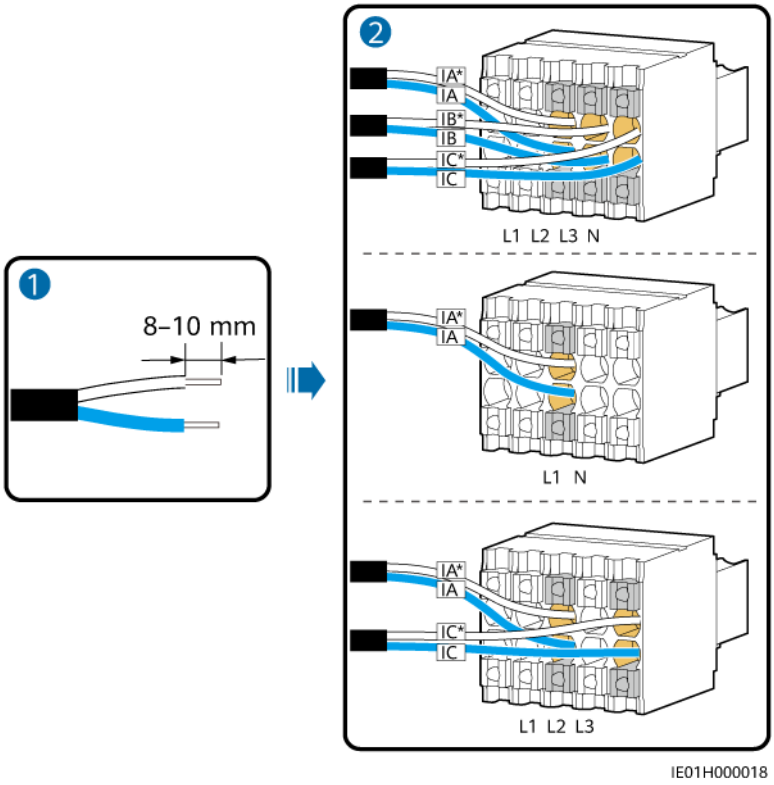
1. You are advised to prepare cord end terminals for AC power cables.



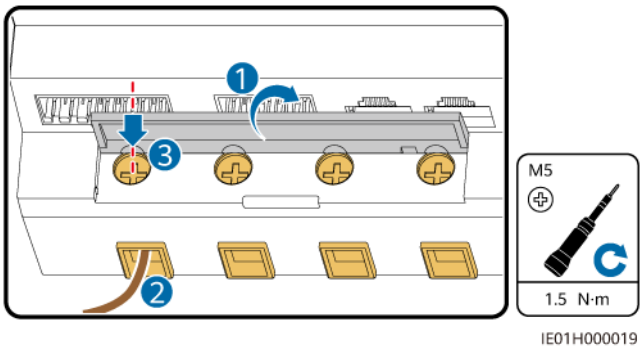
(1) Cord end terminal (2) Crimping tool

2. (Optional) For the external CT connection, connect the external CT cables to the 10-pin signal connector.

Figure 5-6 Connecting the external CT cables to the 10-pin connector

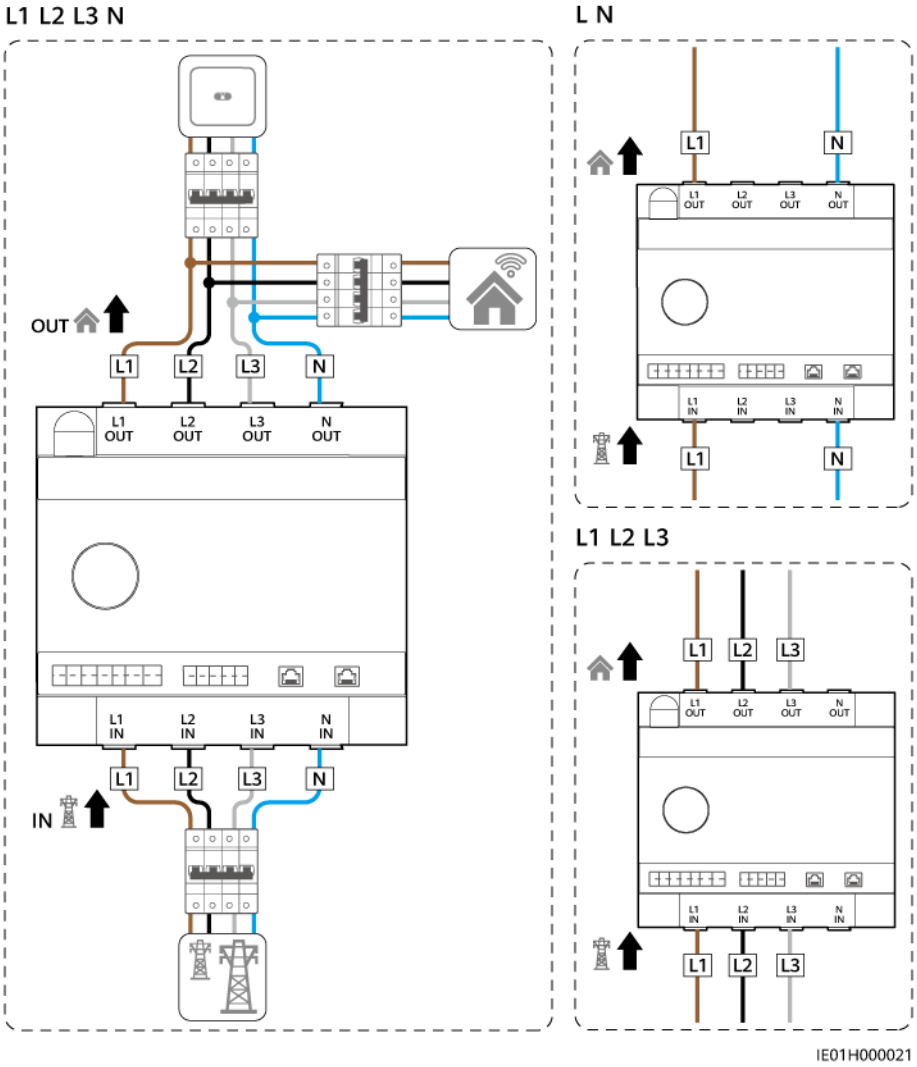


Step 2 Open the protective cover of the cable fixing screw, insert the AC power cable into the AC input port, and tighten the screw.



Step 3 Connect all AC power cables and external CT cables based on the power grid connection.

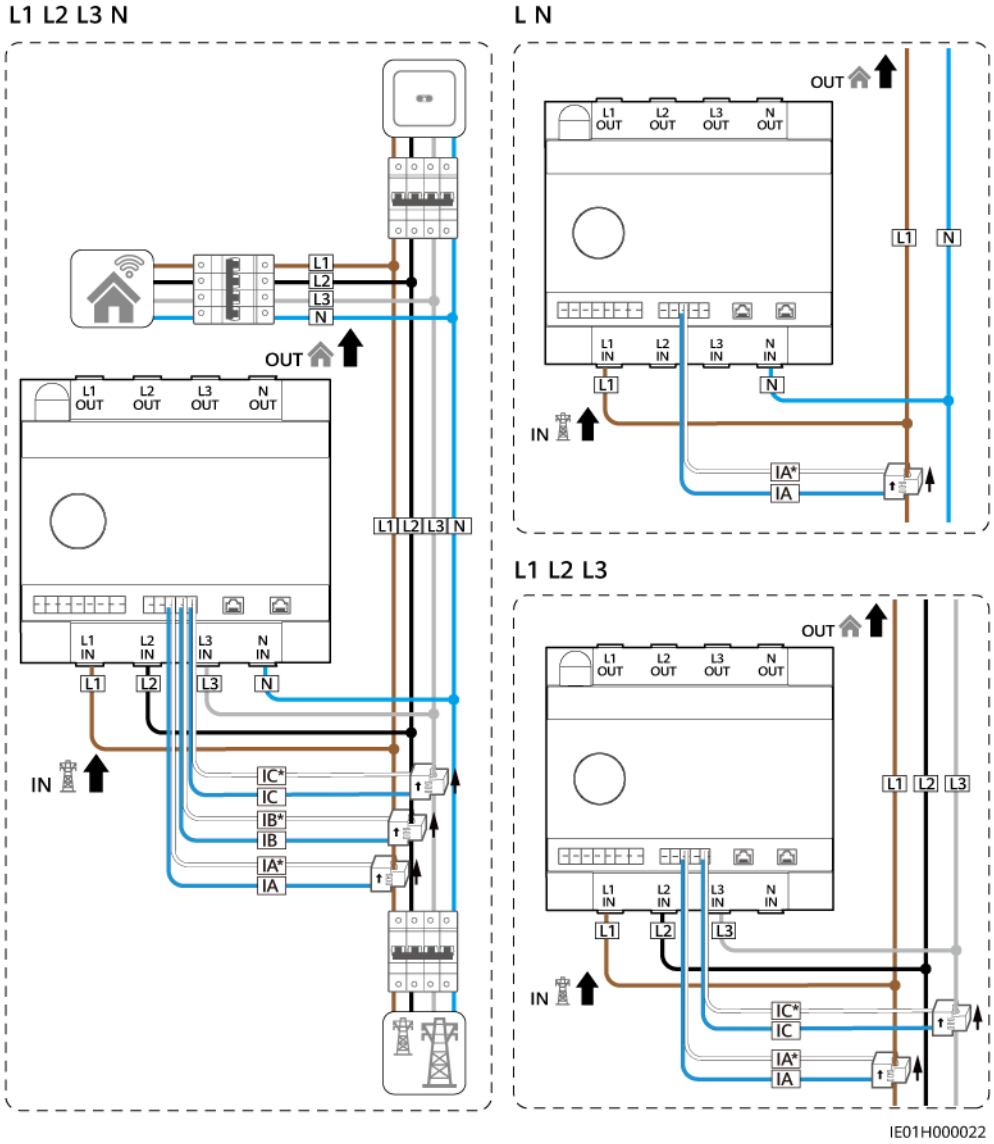
Figure 5-7 Internal CT connection (current ≤ 63 A)



NOTE

In the single-phase cable connection scenario (L N), you are advised to connect cables to the L1 and N terminals on the SmartAssistant.

Figure 5-8 External CT connection (current > 63 A)

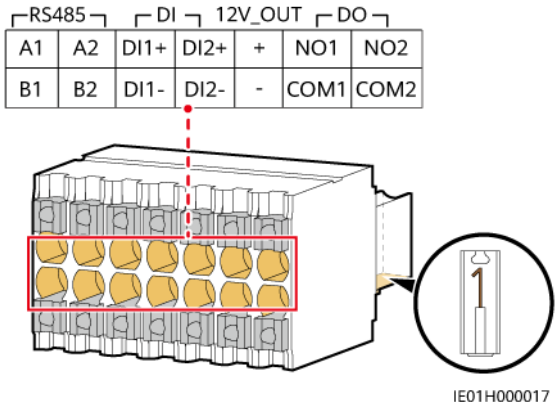


----End

5.3 Connecting RS485 Communications Cables, DO Signal Cables, and 12 V Output Cables

Context

Figure 5-9 14-pin connector



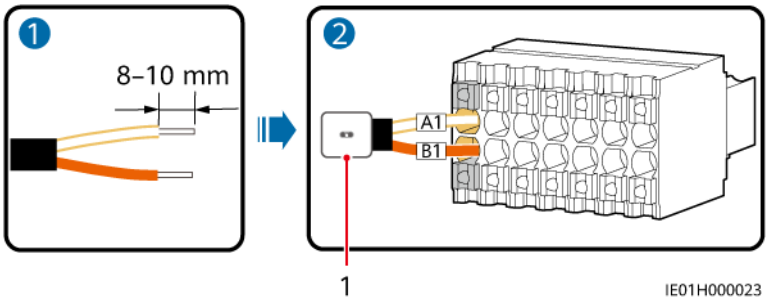
Port	Pin	Function	Description
RS485	RS485A1	RS485A, RS485 differential signal+	Connect to the inverter.
	RS485B1	RS485B, RS485 differential signal–	
	RS485A2	RS485A, RS485 differential signal+	• Connect to the RS485 port of the power meter if some of loads are connected to the Smart Guard. • Reserved for connecting to a third-party device.
	RS485B2	RS485B, RS485 differential signal–	
DI	DI1+	Digital input signal 1+	Connect to the ATS port for the position feedback signal upon grid connection in the Smart Guard scenario.
	DI1-	Digital input signal 1–	
	DI2+	Digital input signal 2+	Connect to the generator alarm signal port in the Smart Guard scenario.
	DI2-	Digital input signal 2–	
12V_OUT	+	12 V power output+	• The rated output power capability is 12 V@100 mA, and the output voltage ranges from 9.5 V to 13.2 V. • The port is used to help the DO control the heat pump.
	-	12 V power output–	

Port	Pin	Function	Description
DO	NO1	Normally open contact for digital output signal 1	• The DO port has two types of dry contacts. The DO contact capacity is 12 V DC@1 A. The NO and COM contacts are normally open. • NO1/COM1 is used to control the heat pump, and NO2/COM2 is reserved.
	COM1	Common contact for digital output signal 1	
	NO2	Normally open contact for digital output signal 2	
	COM2	Common contact for digital output signal 2	

Procedure

Step 1 Connect the RS485 communications cable to the 14-pin connector.

Figure 5-10 Connecting RS485 communications cables



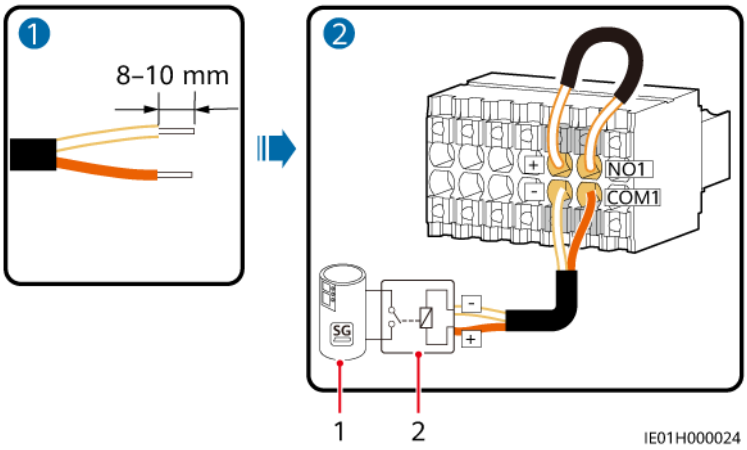
(1) Inverter

Step 2 Connect the DO signal cable or 12 V output cable to the 14-pin connector.

The SmartAssistant can be connected to the SG Ready heat pump through the DO signal cable or 12 V output cable. The SmartAssistant provides two control modes based on the SG Ready heat pump port.

- Mode 1: Use a 12 V@100 mA power supply to drive the external relay. Choose the proper contact capability of the external relay according to the SG Ready heat pump port.

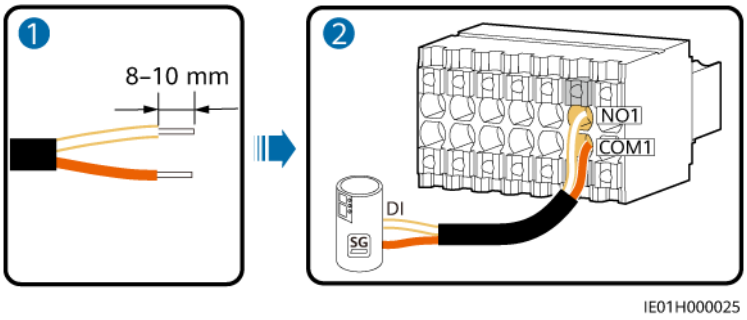
Figure 5-11 Connecting the power DO to the SG Ready heat pump



(1) SG Ready heat pump (2) External relay

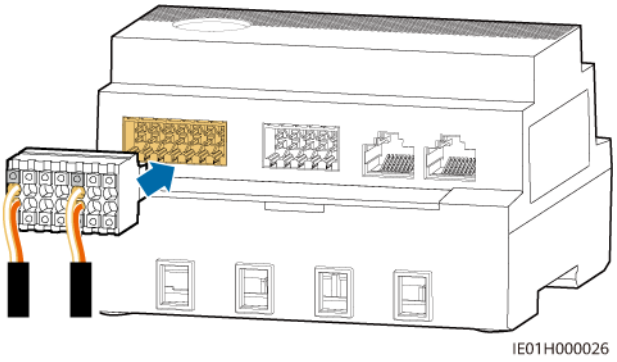
- Mode 2: Use DO dry contacts to directly drive the SG Ready heat pump. The capacity of the DO dry contacts is 12 V DC@1 A.

Figure 5-12 Connecting the signal DO to the SG Ready heat pump



Step 3 Insert the 14-pin signal connector into the SmartAssistant.

Figure 5-13 Installing a 14-pin signal connector



----End

5.4 Installing FE Communications Cables

Context

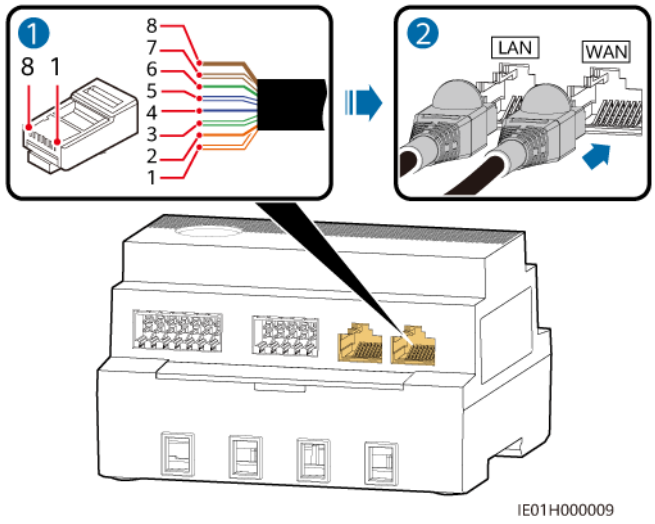
Table 5-4 FE communications ports

Port	Function	Description
LAN	RJ45 network port	Connects to a Huawei charger or an ESS.
WAN	RJ45 network port	Connects to a router.

Procedure

Step 1 Connect the FE communications cables.

Figure 5-14 Connecting FE communications cables



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

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

----End

5.5 (Optional) Installing External WLAN Antennas

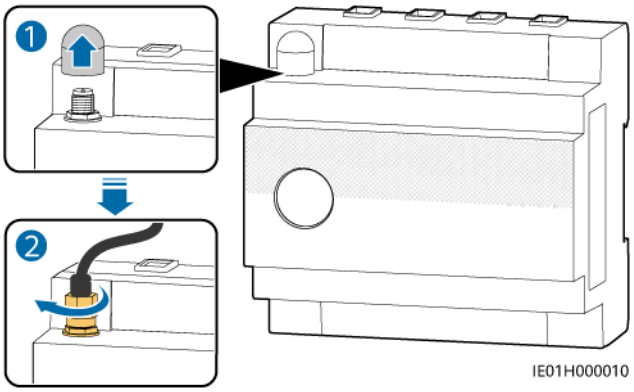
The SmartAssistant can connect to a WLAN built-in antenna by default. If the signal quality of the power distribution box is poor, an external antenna with the RP-SMA-J port can be configured to enhance the signal quality.

Procedure

Step 1 Remove the dustproof cap from the ANT port.

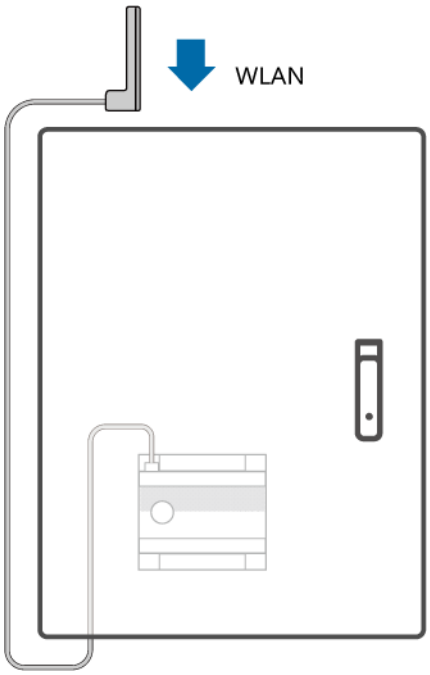
Step 2 Install the external WLAN antenna.

Figure 5-15 Installing a WLAN antenna



Step 3 Select an appropriate position and attach the external antenna by magnet.

Figure 5-16 Securing the external antenna



----End

6 Power-On and Commissioning

DANGER

- Wear PPE and use dedicated insulated tools to avoid electric shocks or short circuits.

NOTICE

Before the equipment is put into operation for the first time, ensure that the parameters are set correctly by professional personnel. Incorrect parameter settings may result in noncompliance with local grid connection requirements and affect the normal operations of the equipment.

6.1 Check Before Power-On

No.	Expected Result
1	The SmartAssistant is installed correctly and securely.
2	All cables are connected securely.
3	Routing for the power cables and signal cables meets the requirements for routing electrical and ELV cables and complies with the cable routing plan.
4	Cables are bound neatly, and cable ties are spaced evenly, secured properly, and face the same direction.
5	There are no unnecessary adhesive tapes or cable ties on cables.

6.2 Powering On the SmartAssistant

DANGER

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

NOTICE

Before the equipment is put into operation for the first time, ensure that the parameters are set correctly by professional personnel. Incorrect parameter settings may result in noncompliance with local grid connection requirements and affect the normal operations of the equipment.

Procedure

Step 1 Turn on the main circuit breaker between the SmartAssistant and the grid.

Step 2 Turn on the AC switch between the SmartAssistant and the inverter.

Step 3 Observe the LED indicators on the SmartAssistant to check its running status.

Table 6-1 LED indicator description

Indicator	Status	Description
Running status indicator 	Off	The device is not powered on.
	Steady green	The device is powered on and running.
Alarm indicator 	Off	No alarm is raised.
	Blinking red slowly (on for 1s and then off for 4s)	A warning or minor alarm is generated.
	Blinking red fast (on for 0.5s and then off for 0.5s)	A major alarm is generated.
	Steady red	A critical alarm is generated.

Indicator	Status	Description
Communication status indicator 	Off	The device has no communication with the management system.
	Blinking green slowly (on for 1s and then off for 1s)	The communication between the device and the management system is normal.
	Blinking green fast (on for 0.125s and then off for 0.125s)	The communication between the device and the management system is interrupted.

----End

6.3 Device Commissioning

No.	Contents
1	Downloading the App and Registering an Installer Account
2	Quick Settings
3	Connecting to a Plant, Setting Electricity Prices, and Registering an Account
4	Setting Parameters: Power Control, Battery Parameter Settings, Communication Parameter Settings, and Other Parameter Settings
5	Energy Management: Negative Rate Optimization and Energy Management Assistant
6	Commissioning Smart Appliances and Huawei Chargers

For details about the device commissioning procedure, see the *SmartAssistant Networking Commissioning Manual*. The commissioning manual varies depending on the app. Refer to the manual corresponding to the app in use.

7 Maintenance

DANGER

- Wear PPE and use dedicated insulated tools to avoid electric shocks or short circuits.

WARNING

- Before performing maintenance, power off the equipment, follow the instructions on the delayed discharge label, and wait for a period of time as specified to ensure that the equipment is not energized.

7.1 Routine Maintenance

To ensure that the SmartAssistant operates properly for a long term, you are advised to perform routine maintenance as described in this section.

CAUTION

Before performing maintenance operations such as connecting cables, the system must be powered off.

Table 7-1 Maintenance checklist

Check Item	Check Method	Maintenance Interval
Device running status	• Check whether the product is damaged or deformed. • Check whether the indicator status is normal. • Connect to the SmartAssistant through the app and check whether an alarm is generated.	Once every 6 months
Electrical connection	• Check whether cables are securely connected. • Check whether cables are damaged, especially whether the cable sheath that contacts a metal surface is damaged.	Six months after the first commissioning and then once every 6 to 12 months

7.2 Alarm Reference

For details about alarms, see **SmartAssistant Alarm Reference**.

7.3 Replacing a SmartAssistant

Precautions

DANGER

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

WARNING

Prior to maintenance, power off the equipment.

Procedure

Step 1 Turn off the AC switch between the inverter and the SmartAssistant.

Step 2 Turn off the main circuit breaker between the SmartAssistant and the grid.

Step 3 Ensure that all LED indicators on the SmartAssistant are off.

Step 4 Remove all electrical connections from the SmartAssistant.

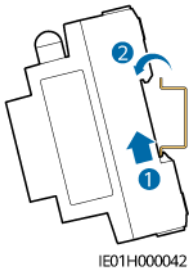
Step 5 Remove the old SmartAssistant.

Hold both sides of the SmartAssistant and push it upward until the locking latches in the lower part are pressed down completely, and then rotate the SmartAssistant to disconnect it from the guide rail.

NOTICE

Do not directly remove the SmartAssistant with force. Otherwise, the SmartAssistant locking latches may be damaged.

Figure 7-1 Removing a SmartAssistant



Step 6 Install a new SmartAssistant. For details, see **4 Installation**.

Step 7 For details about the electrical connections of the SmartAssistant, see **5 Electrical Connections**.

Step 8 Turn on the main circuit breaker between the SmartAssistant and the grid.

Step 9 Turn on the AC switch between the SmartAssistant and the inverter.

Step 10 Commission the SmartAssistant.

Step 11 Implement device replacement on the app.

1. Log in to the remote app and tap **Device** on the home screen.
2. On the **Device** screen, tap the name of the old device.
3. Tap **::** in the upper right corner and tap **Replace device**.
4. On the **Replace device** screen, tap to scan the QR code of the new device or enter its SN.
5. Tap **Replace**.

----End

8 Technical Specifications

Ports

AC power input	• 100–240 V; 50 Hz/60 Hz; 63 A (maximum) • 346–415 V; 3W+N; 50 Hz/60 Hz; 63 A (maximum) • 346–415 V; 3W; 50 Hz/60 Hz; 63 A (maximum)
DI port	Two DI ports; passive relay dry contact connection supported; communications cable length ≤ 20 m; cables not routed separately; cables routed through pipes (recommended)
DO port	Two DO ports, NO and COM contacts supported; communications cable length ≤ 20 m; cables not routed separately; cables routed through pipes (recommended)
RS485 port	Two RS485 ports; baud rates: 9600 bit/s, 19200 bit/s, or 115200 bit/s
External CT port	• Three current detection pins: IA, IB, and IC • Secondary side: 50 mA • Primary side: N x 50 A ($N \geq 2$, and N is an integer) • Communications cable length ≤ 30 m; cables not routed separately; cables routed through pipes (recommended)
LAN port	One 10/100 Mbit/s adaptive port; communications cable length ≤ 100 m
WAN port	One 10/100 Mbit/s adaptive port; communications cable length ≤ 100 m
WLAN	RAT and frequency band: 802.11b/g/n (2.4–2.4835 GHz)
Current measurement range	• Internal CT connection: ≤ 63 A • External CT connection: > 63 A

Electric energy precision	Class 1* (error within ±1%)
Power grid system	Single-phase/Three-phase three-wire/Three-phase four-wire
Output power	• Rated output power: 12 V@100 mA • Output voltage range: 9.5–13.2 V • Communications cable length ≤ 3 m; indoor scenario
***Note:**	The measurement precision of the external CT channel depends on the CT specifications.

General Specifications

Dimensions (H x W x D)	100 mm x 108 mm x 65 mm
Operating temperature	–25°C to +60°C
Relative humidity	5%–95% RH (non-condensing)
Maximum altitude	4000 m (When the altitude is above 2000 m, the temperature decreases by 1°C for each additional 200 m.)
Storage temperature	–40°C to +85°C
Operating power consumption	Typical: 4 W
IP rating	IP2X
Installation mode	Mounted on the DIN 35 mm standard guide rail of the power distribution box

A Contact Information

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

https://digitalpower.huawei.com

Path: **About Us** > **Contact Us** > **Global Service Hotlines**

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

NOTE

EU Representative Information: Huawei Technologies Hungary Kft.
Add.: HU-1133 Budapest, Váci út 116-118., 1. Building, 6. floor.
Email: hungary.reception@huawei.com

B Intelligent Customer Service

https://digitalpower.huawei.com/robotchat/

C Certificate Management and Maintenance

C.1 Initial Certificate Risk Disclaimer

Huawei's initial certificates are mandatory identity credentials for Huawei devices before delivery. The disclaimer statements for using the certificates are as follows:

1. Huawei's initial certificates are used only to establish initial security channels for devices to access the customer network during deployment.
2. Initial certificates have a validity period. The validity period of Huawei's root certificates expires in 2041 and 2099, respectively, and the validity period of identity certificates expires earlier than that of root certificates. For details about how to query the expiration time of identity certificates, see **C.4 Querying the Validity Period of the Identity Certificate**.
3. After devices access the customer network, the management responsibilities of the devices and digital certificates are transferred to the customer. Huawei recommends that the customer replace the initial certificates used by devices on the live network with customer's own certificates, and use certificates with a short validity period and periodically replace the certificates in accordance with industry best practices. This helps mitigate the risk of private key leakage of digital certificates and prevent service interruption caused by certificate expiration.

For details about the rights and responsibilities related to initial certificates, see **Rights and Responsibilities of Initial Digital Certificates on Huawei Devices**.

C.2 Application Scenarios of Initial Certificates

Usage	Name on App	Name on Management System	Scenario	Replacement Guide
Management system communication certificate	Management system certificate	Modbus-TCP NMS	Authenticates the validity of a management system for communication through Modbus-TCP.	C.3.1 Replacing a Certificate on the Management System C.3.2 Replacing a Certificate on the App
App communication certificate	App communication certificate	Local O&M Service	Authenticates the validity of a mobile app for communication through Modbus-TCP.	
Battery communication certificate	ESS communication certificate	Modbus-TCP Device	Authenticates the validity of a battery for communication through Modbus-TCP.	
Third-party EMS/VPP communication certificate	Third-Party Management System Certificate	Management system 1 (third-party)	Authenticates the validity of a third-party management system for communication through Modbus-TCP. **NOTICE** For communication with a third-party management system through Modbus-TCP, import the certificate from the third-party vendor.	
Modbus TCP certificate	Modbus TCP Certificate	Modbus-TCP Device	Authenticates the validity of a Modbus-TCP device for communication through Modbus-TCP.	
On the management system, the procedures for replacing different certificates are the same. On the app, the procedures for replacing different certificates are the same.				

C.3 Updating a Certificate

C.3.1 Replacing a Certificate on the Management System

Initial certificates are used only for commissioning and are not for commercial use. Replace the initial certificates with new ones to improve communication security.

To prevent security risks caused by expired certificates, you are advised to periodically update certificates.

Prerequisites

You have applied for a new certificate from the CA and have obtained the new certificate files.

Table C-1 Certificate requirements

Parameter	Requirement
Certificate signature algorithm	Use industry-leading security algorithms, such as sha256WithRSAEncryption or sha256ECDSA.
Key length	• For keys encrypted using RSA, the recommended length is 3072 bits or longer. • For keys encrypted using ECDSA, the length can be 256 or 384 bits. **NOTE** RSA keys shorter than 2048 bits or ECDSA keys shorter than 256 bits are insecure. For security purposes, ensure that the private key of the ER certificate is an RSA key of 3072 bits or longer or an ECDSA key of 256 bits or longer.
Certificate storage format	.crt and .cer are supported. The certificate in .crt format must be encoded using Base64. • The certificate file in .crt format is as follows: – **client.crt**: identity certificate file – **client_key.pem**: private key of the identity certificate • The certificate file in .cer format is as follows: – **client.cer**: identity certificate file – **client_key.pem**: private key of the identity certificate
Private key file format	PKCS#8 format.
Password complexity of the private key file	Contain 8 to 64 characters, including at least two types of the following: • Uppercase letters • Lowercase letters • Digits • Special characters (excluding <>;+&/|%(),`$)

Method 1: Updating a Certificate Online on the Management System

1. Log in to the management system using an installer account.
2. Choose **Plants** > **Device** > **Device Certificate Management**.

3. Create an identity certificate template.
   a. Choose **Identity Certificate Template** and click **Create**.
   b. Set certificate application template parameters as required.

Table C-2 Key parameters

Parameter	Description
CA Connection Mode	Select **Proxy**. **NOTE** Apply for Replacement Online: Connect to the CA server through the CA proxy to apply for a certificate for the device and replace the device certificate.
CA Server Name	Select a CA server.
Key Type	Set this parameter according to **Table C-1**.
Key Length	
Common Name (CN)	Set this parameter as planned, for example, to **Device ESN**.

   c. Click **OK**.
4. Update the identity certificate.
   a. Choose **Task Center** and click **Replacing Identity Certificate**.
   b. On the page for replacing the identity certificate, select **Apply for Replacement Online** and click **Start**.
5. Set related parameters as prompted and replace the certificate.

Method 2: Updating a Certificate Offline on the Management System

1. Log in to the management system as an administrator.
2. Choose **Plants** > **Device** > **Device Certificate Management**.
3. Create an identity certificate template.
   a. Choose **Identity Certificate Template** and click **Create**.
   b. Set certificate application template parameters as required.

Table C-3 Key parameters

Parameter	Description
CA Connection Mode	Select **Offline**.
Key Type	Set this parameter according to **Table C-1**.
Key Length	

Parameter	Description
Common Name (CN)	Set this parameter as planned, for example, to **Device ESN**.

c. Click **OK**.

4. Obtain the CSR file and apply for a certificate.
   a. Choose **Task Center** and click **Replacing Identity Certificate**.
   b. On the page for replacing the identity certificate, select **Replace by CSR File** and click **Start**.
   c. Configure the identity certificate information and click **Apply for CSR Replacement**.

      Table C-4 Key parameters

Parameter	Description
Application Type	Select the type of the certificate to be updated.
Device Scope	Select the device for which the identity certificate needs to be updated.
Identity Certificate Template	Select the created identity certificate template.

   d. After the CSR file is generated, download and use the CSR file to apply for and obtain a new certificate and related certificate files from the CA.
5. Upload and update the identity certificate. You need to upload and update the certificate as prompted.

   NOTE

   If you have exited the process of replacement by CSR file, go to the task list on the **Task Center** page, locate the target task, and click the edit button in the **Operation** column to re-enter the process of replacement by CSR file.

C.3.2 Replacing a Certificate on the App

Initial certificates are used only for commissioning and are not for commercial use. Replace the initial certificates with new ones to improve communication security. To prevent security risks caused by expired certificates, you are advised to periodically update certificates.

Prerequisites

You have applied for a new certificate from the CA and have obtained the new certificate files.

Table C-5 Certificate requirements

Parameter	Requirement
Certificate signature algorithm	Use industry-leading security algorithms, such as sha256WithRSAEncryption or sha256ECDSA.
Key length	• For keys encrypted using RSA, the recommended length is 3072 bits or longer. • For keys encrypted using ECDSA, the length can be 256 or 384 bits. **NOTE** RSA keys shorter than 2048 bits or ECDSA keys shorter than 256 bits are insecure. For security purposes, ensure that the private key of the ER certificate is an RSA key of 3072 bits or longer or an ECDSA key of 256 bits or longer.
Certificate storage format	.crt and .cer are supported. The certificate in .crt format must be encoded using Base64. • The certificate file in .crt format is as follows: – **client.crt**: identity certificate file – **client_key.pem**: private key of the identity certificate • The certificate file in .cer format is as follows: – **client.cer**: identity certificate file – **client_key.pem**: private key of the identity certificate
Private key file format	PKCS#8 format.
Password complexity of the private key file	Contain 8 to 64 characters, including at least two types of the following: • Uppercase letters • Lowercase letters • Digits • Special characters (excluding <>;+&/|%(),`$)

Step 1 Log in to the app using an installer account, connect to the device, and choose **Set** > **Communication configuration** > **Certificate management**.

Step 2 Select the certificate to be replaced, upload the corresponding certificates (root certificate, customer certificate, and key file), and enter the key password to replace the certificate.

Step 3 After the replacement is complete, tap **Replace current certificate**.

----End

C.4 Querying the Validity Period of the Identity Certificate

The inverter will trigger an alarm 60 days before the certificate expires to remind you to update the certificate in a timely manner. You can query the validity period of the identity certificate on the management system.

Querying the Validity Period of the Identity Certificate

1. Log in to the management system as an administrator.
2. Choose **Plants** > **Device** > **Device Certificate Management**.
3. Choose **Device Certificate List**.
4. On the **Device Certificate List** page, enter information such as the device name and certificate status.
5. Click **Query**.

D Acronyms and Abbreviations

A	
AC	alternating current
APP	application
C	
CT	current transformer
D	
DC	direct current
DI	digital input
DO	digital output
E	
ETH	Ethernet
G	
GE	gigabit Ethernet

L	
LAN	local area network
LED	light-emitting diode
M	
MPP	maximum power point
MPPT	maximum power point tracking
N	
NC	normally closed
NO	normally open
P	
POE	power over Ethernet
R	
RST	reset
S	
SOC	state of charge
SOH	state of health
W	
WAN	wide area network

