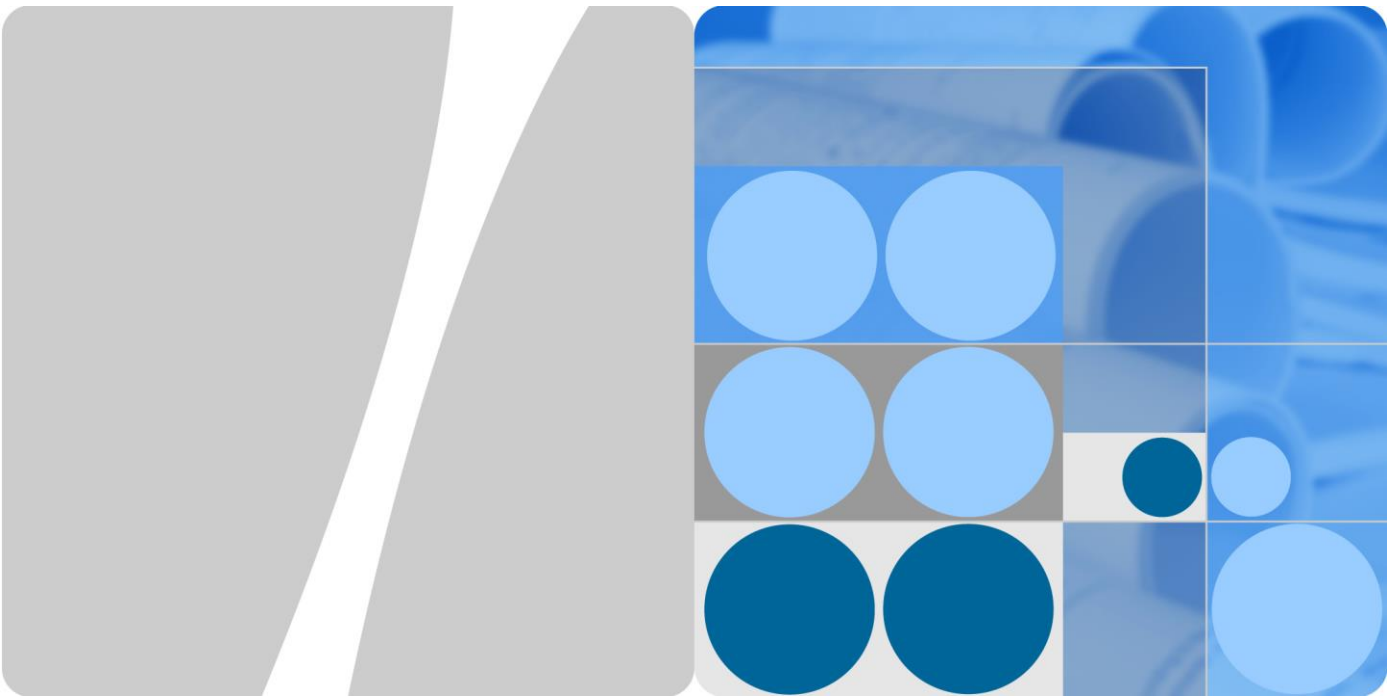

SmartLi-80Ah

User Manual

Issue	**01**
Date	**2019-11-29**

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About This Document

Purpose

This document describes the SmartLi in terms of its features, performance, working principles, appearance as well as instructions for installation, and operation and maintenance (O&M).

Intended Audience

This document is intended for:

- Sales engineers
- Technical support engineers
- System engineers
- Hardware installation engineers
- Commissioning engineers
- Data configuration engineers
- Maintenance engineers

Symbol Conventions

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

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

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 earlier issues.

Issue 01 (2019-11-29)

This issue is the first official release.

Contents

1 Safety Precautions

1.1 General Safety

Statement

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

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

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

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

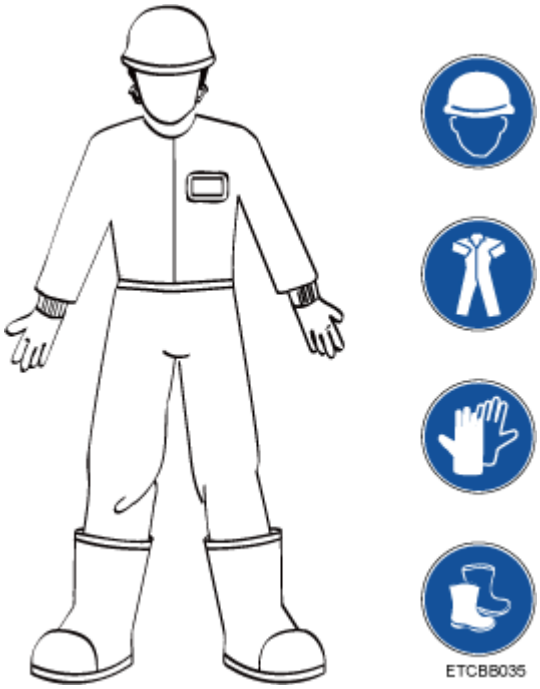
Huawei will not be liable for any consequences of the following circumstances:

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

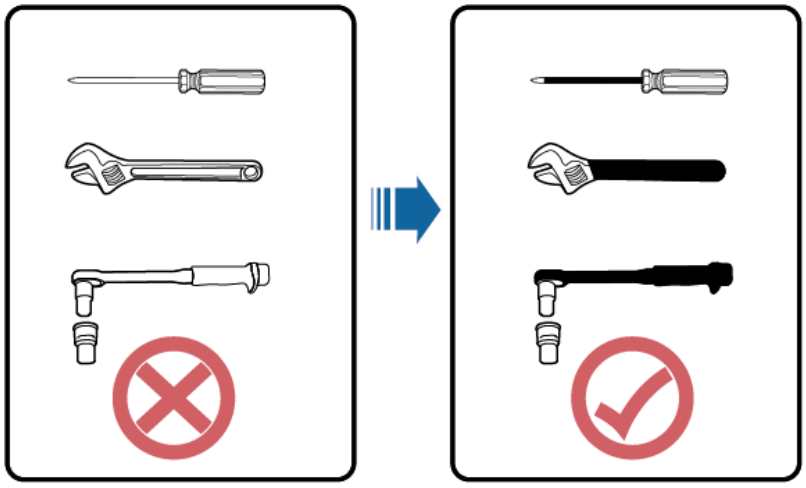
General Requirements

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.

- Before installing, operating, or maintaining the equipment, remove any conductive objects such as watches or metal jewelry like bracelets, bangles, and rings to avoid electric shock.
- When installing, operating, or maintaining the equipment, wear dedicated protective gears such as insulation gloves, goggles, and safety clothing, helmet, and shoes, as shown in the following figure.

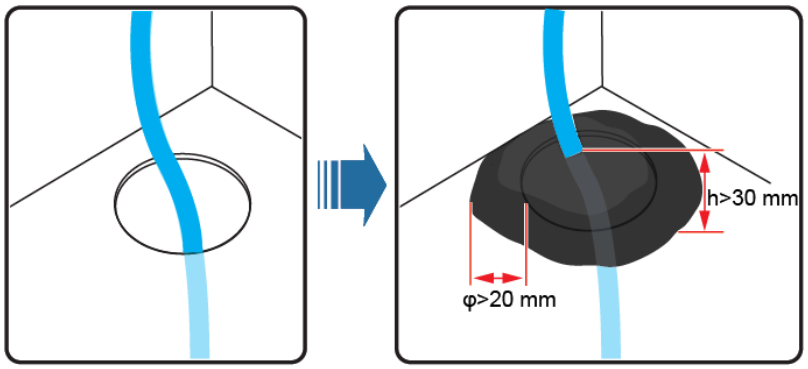


- Follow the specified procedures for installation, operation, and maintenance.
- Before handling a conductor surface or terminal, measure the contact point voltage and ensure that there is no risk of electric shock.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not stop using protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment. Promptly replace warning labels that have worn out.
- Keep irrelevant people away from the equipment. Only operators are allowed to access the equipment.
- Use insulated tools or tools with insulated handles, as shown in the following figure.



TN01H00005

- All cable holes should be sealed. Seal the used cable holes with firestop putty. Seal the unused cable holes with the caps delivered with the cabinet. The following figure shows the criteria for correct sealing with firestop putty.



TN01H00006

- Do not scrawl, damage, or block any warning label on the equipment.
- Tighten the screws using tools when installing the equipment.
- Do not work with power on during installation.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.
- Before operations, ensure that the equipment is firmly secured to the floor or other solid objects, such as a wall or an installation rack.
- Do not use water to clean electrical components inside or outside of a cabinet.
- Do not change the structure or installation sequence of equipment without permission.
- Do not touch a running fan with your fingers, components, screws, tools, or boards before the fan is powered off or stops running.

Personal Safety

- If there is a probability of personal injury or equipment damage during operations on the equipment, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.
- To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telecommunication network voltage (TNV) circuits.

- Do not power on the equipment before it is installed or confirmed by professionals.

1.2 Personnel Requirements

- Personnel who plan to install or maintain Huawei equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.
- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, maintenance
- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

1.3 Electrical Safety

Grounding

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

General Requirements

Use dedicated insulated tools when performing high-voltage operations.

AC and DC Power

DANGER

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

- If a "high electricity leakage" tag is attached on the equipment, ground the protective ground terminal on the equipment enclosure before connecting the AC power supply; otherwise, electric shock as a result of electricity leakage may occur.
- Before installing or removing a power cable, turn off the power switch.
- Before connecting a power cable, check that the label on the power cable is correct.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- A circuit breaker equipped with a residual current device (RCD) is not recommended.
- A damaged power cable must be replaced by the manufacturer, service agent, or professionals to avoid risks.
- High voltage operations and installation of AC-powered facilities must be performed by qualified personnel.

Cabling

- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Do not route cables behind the air intake and exhaust vents of the equipment.
- Ensure that cables meet the VW-1 flame spread rating requirements.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- If an AC input power cable is connected to the cabinet from the top, bend the cable in a U shape outside the cabinet and then route it into the cabinet.
- 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.
- When selecting, connecting, and routing cables, follow local safety regulations and rules.

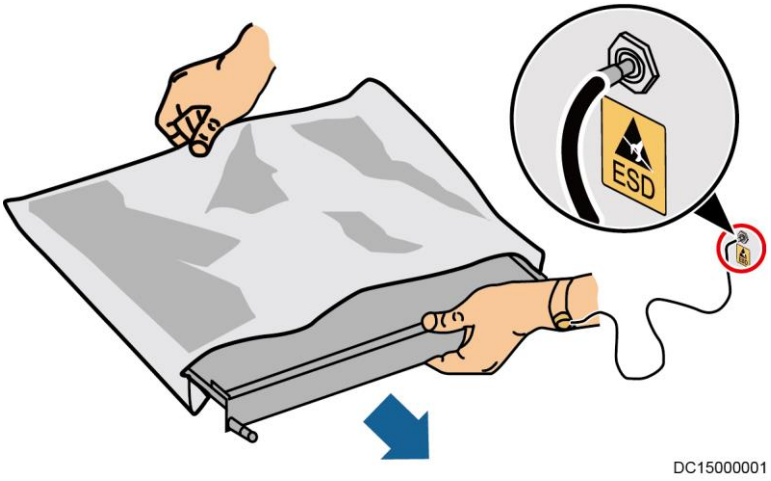
ESD

NOTICE

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

- Wear ESD gloves or a well-grounded ESD wrist strap when touching the device or handling boards or application-specific integrated circuits (ASICs).
- When holding a board, hold its edge without touching any components. Do not touch the components with your bare hands.
- Package boards with ESD packaging materials before storing or transporting them.

Figure 1-1 Wearing an ESD wrist strap



Neutral-Ground Voltage

It is recommended that the three-phase loads be equalized and the neutral-ground voltage be kept at less than 2 V to meet power distribution requirements.

1.4 Installation Environment Requirements

- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- 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.
- If any liquid is detected inside the equipment, immediately disconnect the power supply and contact the administrator.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.
- Ensure that the equipment room provides good heat insulation, and the walls and floor are dampproof.
- Install a rat guard at the door of the equipment room.

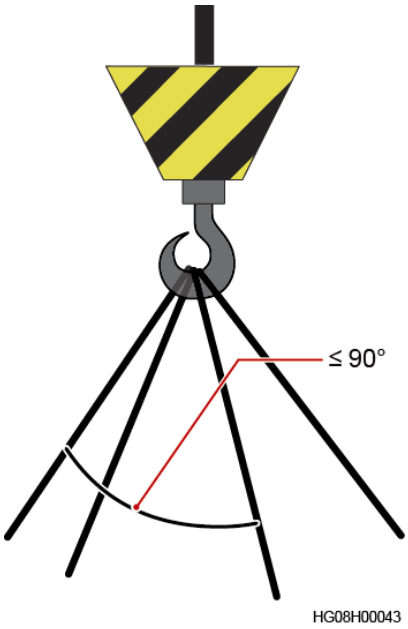
Installation at Heights

- Working at heights refers to operations that are performed at least 2 meters above the ground.
- Do not work at heights if the steel pipes are wet or other potential danger exists. After the preceding conditions no longer exist, the safety director and relevant technical personnel need to check the involved equipment. Operators can begin working only after obtaining consent.
- When working at heights, comply with local relevant laws and regulations.
- Only trained and qualified personnel are allowed to work at heights.
- Before working at heights, check the climbing tools and safety gears such as safety helmets, safety belts, ladders, springboards, scaffolding, and lifting equipment. If they do not meet the requirements, take corrective measures or disallow working at heights.
- Wear personal protective equipment such as the safety helmet and safety belt or waist rope and fasten it to a solid structure. Do not mount it on an insecure moveable object or metal object with sharp edges. Make sure that the hooks will not slide off.
- Set a restricted area and eye-catching signs for working at heights to warn away irrelevant personnel.
- Carry the operation machinery and tools properly to prevent them from falling off and causing injuries.
- Personnel involving working at heights are not allowed to throw objects from the height to the ground, or vice versa. Objects should be transported by tough slings, hanging baskets, highline trolleys, or cranes.
- Ensure that guard rails and warning signs are set at the edges and openings of the area involving working at heights to prevent falls.
- Do not pile up scaffolding, springboards, or other sundries 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.
- Inspect the scaffolding, springboards, and workbenches used for working at heights in advance to ensure that their structures are solid and not overloaded.
- Any violations must be promptly pointed out by the site manager or safety supervisor and the involved personnel should be prompted for correction. Personnel who fail to stop violations will be forbidden from working.

1.5 Mechanical Safety

Hoisting Devices

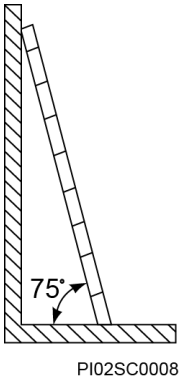
- Do not walk under hoisted objects.
- Only trained and qualified personnel should perform hoisting operations.
- Check that hoisting tools are available and in good condition.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a load-bearing object or wall.
- Ensure that the angle formed by two hoisting cables is no more than 90 degrees, as shown in the following figure.



- Do not drag steel ropes and hoisting tools or bump hoisted objects against hard objects during hoisting.

Using Ladders

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



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

Drilling Holes

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

NOTICE

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

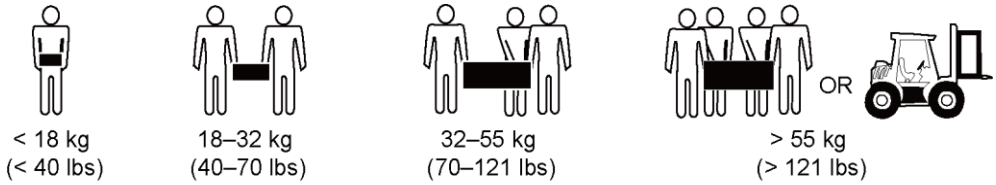
- Obtain the consent from the customer, subcontractor, and Huawei before drilling.
- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

DANGER

When removing a heavy or unstable component from a cabinet, be aware of unstable or heavy objects on the cabinet.

- Be cautious to avoid injury when moving heavy objects.



- When moving the equipment by hand, wear protective gloves to prevent injuries.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules (such as power supply units, fans, and boards) that are installed in the equipment because they cannot support the weight of the equipment.
- Avoid scratching the cabinet surface or damaging cabinet components and cables during equipment transportation.
- When transporting the equipment using a forklift truck, ensure that the forks are properly positioned to ensure that the equipment does not topple. Before moving the equipment, secure it to the forklift truck using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose railways, sea, or a road with good condition for transportation to ensure equipment safety. Avoid tilt or jolt during transportation.
- Move a cabinet with caution. Any bumping or falling may damage the equipment.

1.6 Battery Safety

Basic Requirements

Before operating batteries, carefully read the safety precautions for battery handling and master the correct battery connection methods.

DANGER

- Do not expose batteries at high temperatures or around heat-generating devices, such as sunlight, fire sources, transformers, and heaters. Excessive heat exposure may cause the batteries to explode.
- Do not burn batteries. Otherwise, the batteries may explode.
- To avoid leakage, overheating, fire, or explosions, do not disassemble, alter, or damage batteries, for example, insert sundries into batteries or immerse batteries in water or other liquids.

- Wear goggles, rubber gloves, and protective clothing to prevent skin contact with electrolyte in the case of electrolyte overflow. If a battery leaks, protect the skin or eyes from the leaking liquid. If the skin or eyes come in contact with the leaking liquid, wash it immediately with clean water and go to the hospital for medical treatment.
- Use dedicated insulated tools.
- Move batteries in the required direction. Do not place a battery upside down or tilt it.
- Keep the battery loop disconnected during installation and maintenance.
- Use batteries of specified models. Using batteries of other models may damage the batteries.
- Dispose of waste batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. If a battery is disposed of improperly, it may explode.
- The site must be equipped with qualified fire extinguishing facilities, such as firefighting sands and powder fire extinguishers.

NOTICE

To ensure battery safety and battery management accuracy, use batteries provided with the UPS by Huawei. Huawei is not responsible for any battery faults caused by batteries not provided by Huawei.

Battery Installation

Before installing batteries, observe the following safety precautions:

- Install batteries in a well-ventilated, dry, and cool environment that is far away from heat sources, flammable materials, moistures, extensive infrared radiation, organic solvents, and corrosive gases. Take fire prevention measures.
- Place and secure batteries horizontally.

- Note the polarities when installing batteries. Do not short-circuit the positive and negative poles of the same battery or battery string. Otherwise, the battery may be short-circuited.
- Check battery connections periodically, ensuring that all bolts are securely tightened.
- When installing batteries, do not place installation tools on the batteries.

Battery Short Circuit

DANGER

Battery short circuits can generate high instantaneous current and release a great amount of energy, which may cause equipment damage or personal injury.

To avoid battery short-circuit, do not maintain batteries with power on.

Flammable Gas

NOTICE

- Do not use unsealed lead-acid batteries.
- To prevent fire or corrosion, ensure that flammable gas (such as hydrogen) is properly exhausted for lead-acid batteries.

Lead-acid batteries emit flammable gas when used. Ensure that batteries are kept in a well-ventilated area and take preventive measures against fire.

Battery Leakage

NOTICE

Battery overheating causes deformation, damage, and electrolyte spillage.

WARNING

When the electrolyte overflows, absorb and neutralize the electrolyte immediately. When moving or handling a battery whose electrolyte leaks, note that the leaking electrolyte may hurt human bodies.

- If the battery temperature exceeds 60°C, check for and promptly handle any leakage.
- Electrolyte overflow may damage the equipment. It will corrode metal parts and boards, and ultimately damage the boards.
- If the electrolyte overflows, follow the instructions of the battery manufacturer or neutralize the electrolyte by using sodium bicarbonate ($NaHCO_3$) or sodium carbonate (Na_2CO_3).

Lithium Battery

The safety precautions for lithium batteries are similar to those for lead-acid batteries except that you also need to note the precautions described in this section.

⚠ WARNING

There is a risk of explosion if a battery is replaced with an incorrect model.

- A battery can be replaced only with a battery of the same or similar model recommended by the manufacturer.
- When handling a lithium battery, do not place it upside down, tilt it, or bump it with other objects.
- Keep the lithium battery loop disconnected during installation and maintenance.
- Do not charge a battery when the ambient temperature is below the lower limit of the operating temperature (charging is forbidden at 0°C). Low-temperature charging may cause crystallization, which will result in a short circuit inside the battery.
- Use batteries within the allowed temperature range; otherwise, the battery performance and safety will be compromised.
- Do not throw a lithium battery in fire.
- When maintenance is complete, return the waste lithium battery to the maintenance office.

2 Overview

The SmartLi provides backup power for a medium- and large-power UPS. The SmartLi is compatible with a UPS system with or without a neutral wire. The lithium battery cabinet supports power backup, battery management, and intelligent current management. When multiple battery strings are connected in parallel, the output of each battery string is balanced and reliable protection is achieved.

2.1 Positioning and Features

2.1.1 Positioning

The SmartLi is a battery energy storage system solution developed for Huawei UPS. The product provides cabinet-level battery current management, and up to eight cabinets can be connected in parallel to meet the requirements for MW-level UPS backup power. The product uses lithium cells with superior charge and discharge characteristics and high cycle performance. The modular design of key components facilitates replacement and greatly reduces O&M costs.

The lithium battery system applies to the following scenarios:

- Large-sized data centers
- Small- and medium-sized data centers
- Rail transits
- State grids

2.1.2 Features

- Easy capacity expansion: Batteries can be added along with load increase by stages. New and old battery cabinets can be connected in parallel.
- Easy maintenance: Batteries can be swapped for maintenance due to the modular design.
- High cycle performance of cells: 25°C, 0.5C charging/1C discharging, 50% depth of discharge (DOD), 5000 cycles at 70% end of life (EOL).
- High reliability: Current equalization control technology is used for cabinets connected in parallel to keep current imbalance within 2%.

2.2 Application Scenarios

The SmartLi system is mainly applicable to small, medium, and large data centers, rail transportation, state grids, and other scenarios.

Figure 2-1 Networking with one battery cabinet

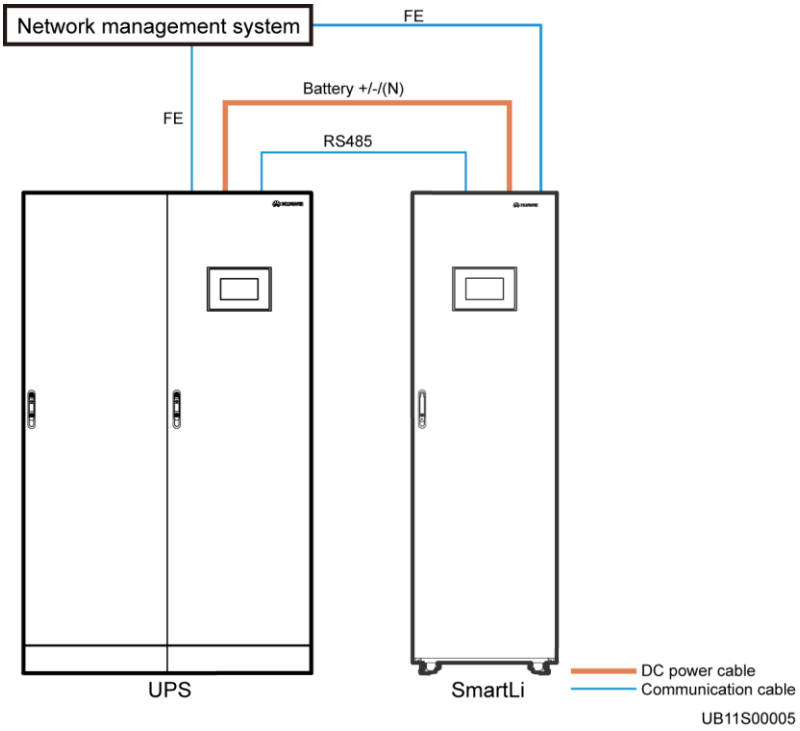
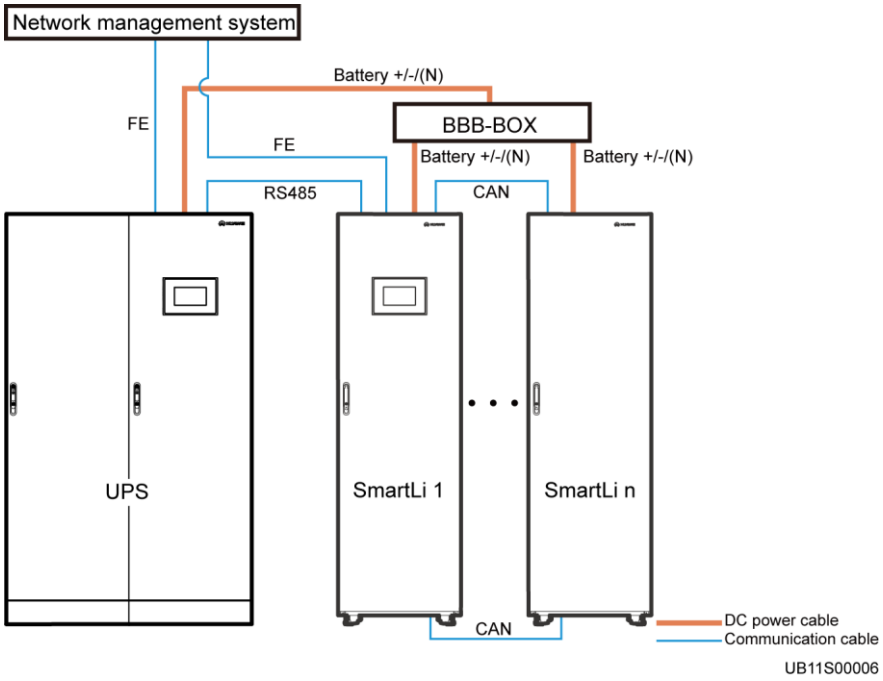


Figure 2-2 Networking with multiple battery cabinets



NOTE

- The SmartLi supports a maximum of eight cabinets connected in parallel.
- When multiple cabinets are connected in parallel, only the main cabinet has an LCD.

2.3 Model Description

Figure 2-3 SmartLi model number

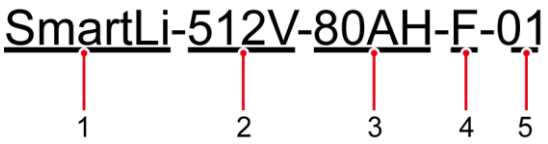


Table 2-1 Model number details

No.	Item	Description
1	Product category	SmartLi
2	SmartLi subcategory	512 V
3	Capacity	80AH: battery capacity being 80 Ah
4	Configuration type	• F: with an LCD (master cabinet) • S: without an LCD (slave cabinet)

No.	Item	Description
5	Version	01

2.4 Overview

The SmartLi consists of the battery modules, battery management module, monitoring interface unit, power distribution unit (PDU), and monitoring display unit (MDU), which are integrated into a standard cabinet.

Battery modules are connected in series to form a high-voltage system. The battery management module provides centralized battery management. The PDU provides the disconnection and access functions for the battery cabinet and provides protection against exceptions. The MDU allows you to set parameters and query status.

If multiple battery cabinets are connected in parallel, the cabinet balance unit implements balanced output of batteries to improve system reliability. The main cabinet provides an LCD that displays battery running information in real time and allows users to set battery parameters. Battery cabinets can connect to the UPS and network management system (NMS) for intelligent management.

2.4.1 Product Structure

The battery cabinet consists of 16 battery modules, which are divided into two groups. Eight battery modules are connected in series in each group. The battery modules occupy the entire cabinet.

Alternatively, the battery cabinet can consist of eight battery modules, which are in a same group. Eight battery modules are connected in series in each group. The battery modules occupy half of the entire cabinet.

Figure 2-4 Structure of a single cabinet (full-capacity cabinet)

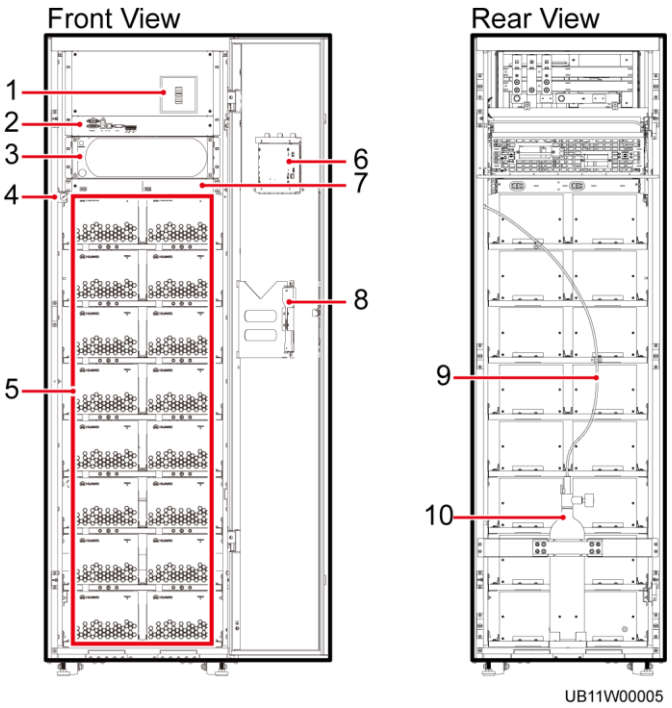
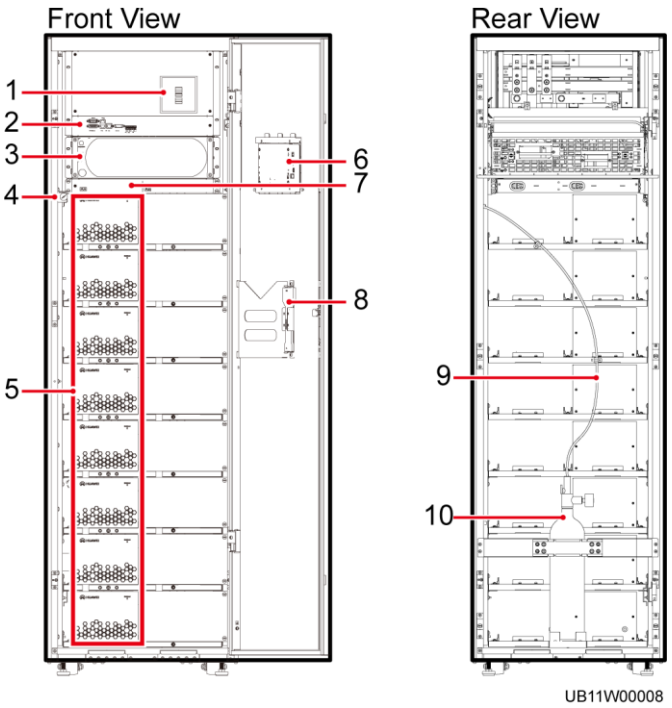


Figure 2-5 Structure of a single cabinet (half-capacity cabinet)



(1) Battery circuit breaker

(2) Monitoring interface unit

(3) Battery management module

(4) End pressure gauge

(5) Battery module

(6) MDU

(7) Fuse (8) Auxiliary wrench (9) Fire-trace tube

(10) Fire cylinder

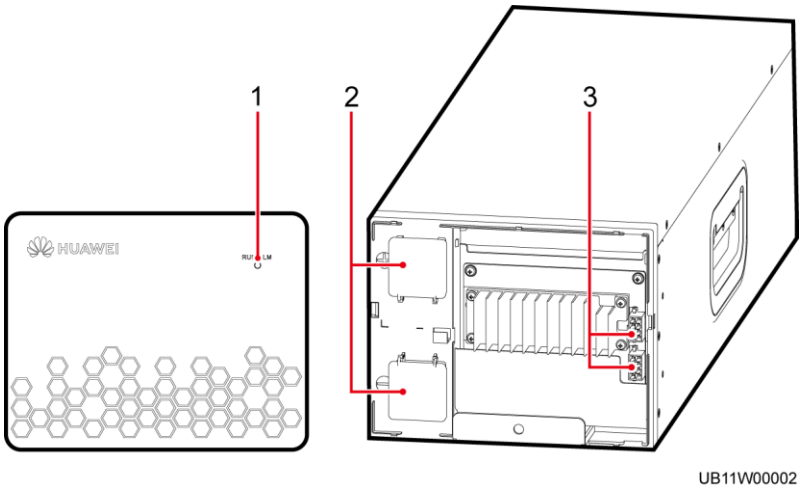
2.4.2 Battery Module

The battery module consists of 40 electrochemical cells (two connected in parallel and 20 connected in series).

The electrochemical cells are made of lithium iron phosphate.

All external ports of the module are located on its front panel for ease of installation and maintenance.

Figure 2-6 Battery module



(1) Running indicator (2) Battery wiring terminals (3) Battery communication cascading ports

Table 2-2 Indicator description

Indicator	Status	Color	Description
Indicator	On	Green	The battery module is normal.
		Red	The battery module is faulty.
	Off	N/A	The communications cable to the battery module is not connected.

Function

Each battery module has a built-in BMU that monitors battery information such as voltage and temperature, provides relevant alarms, and manages battery balancing. The BMU provides the following functions:

- Battery voltage measurement and alarm
- Battery temperature measurement and alarm
- Battery voltage balancing
- CAN communication between battery modules

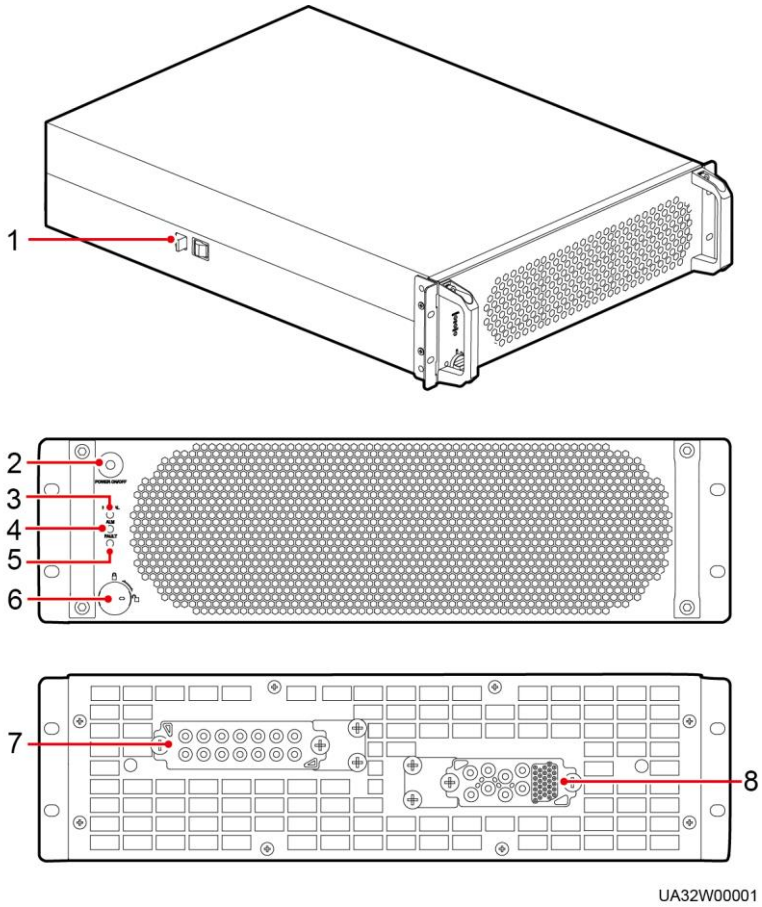
Specifications (Full-Sized Cabinet)

- Dimensions (H x W x D): 157 mm x 200.5 mm x 592 mm
- Weight: ≤ 35 kg
- Rated voltage: 64 V
- Rated capacity: 40 Ah
- Rated discharge current: 240 A

2.4.3 Battery Management Module

The management module is hot-swappable and supports power conversion, current equalization, and BCU (intra-cabinet BMS) management.

Figure 2-7 Battery management module



(1) Positioning lock (2) Power switch (3) Run indicator (4) Alarm indicator

(5) Fault indicator (6) Ready switch (7) Output port (8) Input port

Table 2-3 Indicator description

Status	Color	Description
On	Green	The battery cabinet is working properly.
	Yellow	The battery cabinet generates a minor alarm.
	Red	The battery cabinet generates a critical alarm.
Off	-	The battery cabinet is shut down.

Function

- The battery management module converts the battery string power. When the consistency between battery strings is poor, the battery management module controls the current balance between battery strings through voltage boosting and balance adjustment to ensure reliable system operation.

- The intelligent battery management module implements communication inside a battery cabinet, between cabinets, and between the UPS and NetEco, and provides battery management and protection against exceptions.

Specifications

- Dimensions (H x W x D): 130 mm x 422 mm x 550 mm
- Weight: < 35 kg

2.4.4 Monitoring Interface Unit

The monitoring interface unit include the battery cabinet parallel ports, FE port, RS485 port, and EPO port.

Figure 2-8 Monitoring interface unit

Table 2-4 Ports

Port	Silkscreen	Description
Parallel port	PARALLEL1	Indicates parallel signal port 1 between racks.
Parallel port	PARALLEL2	Indicates parallel signal port 2 between racks.
Network port	FE	Network port, connecting to the northbound network management device or the customer's web service.
Northbound communications interface	RS485	Connects to a third-party network management device over two wires.
Northbound communications interface	COM	Connects to an UPS.
DB26	MDU	Supports FE, RS485, I2C, CAN and other signals.
DO_1	DO_1	Reserved.
DO_2	DO_2	Reserved.
EPO	NO	If the normally open (NO) port is connected to the EPO_12V port, EPO is triggered.
	12V	
	NC	If the normally closed (NC) port is disconnected from the EPO_12V port, EPO is triggered.
	12V	

Figure 2-9 COM pins

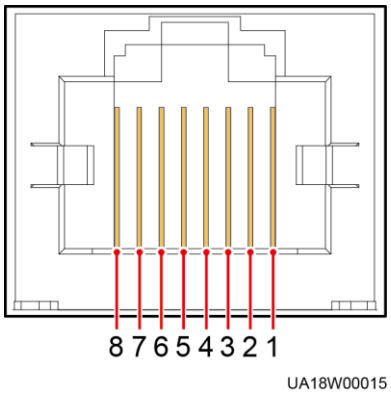


Table 2-5 COM pin definition

Pin	Description
1	RS485+
2	RS485–
3	N/A
4	RS485+
5	RS485–
6	GND
7	CANH0
8	CANL0

Figure 2-10 RS485 pins

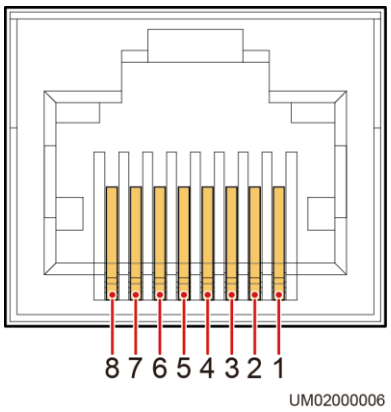


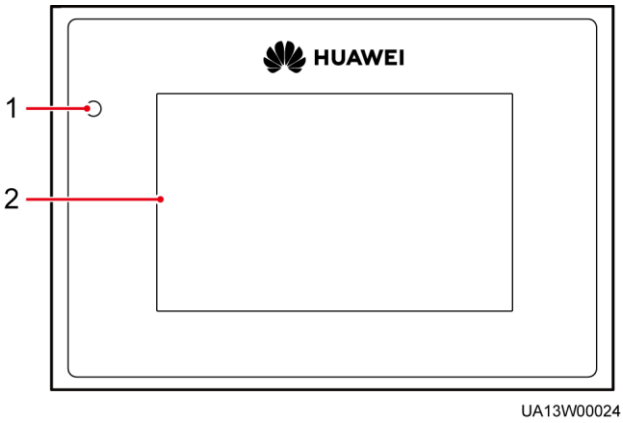
Table 2-6 RS485 pin definition

Pin	Description
1	RS485_T+
2	RS485_T–
3	N/A
4	RS485_R+
5	RS485_R–
6	GND
7	N/A
8	N/A

2.4.5 MDU

The MDU interworks with the monitoring interface unit to implement SBCU (system BMS) management functions.

Figure 2-11 MDU



(1) Status indicator (2) LCD touchscreen

Table 2-7 Status indicator

Status	Color	Meaning
On	Red	A critical alarm has been generated, and the buzzer sounds continuously.
	Yellow	A minor alarm has been generated, and the buzzer buzzes at 2 Hz.
	Green	The SmartLi is running properly or a warning has been

Status	Color	Meaning
		generated.
Off	N/A	The MDU is powered off.

The ports of the MDU are located at the side of the LCD screen.

Figure 2-12 MDU ports

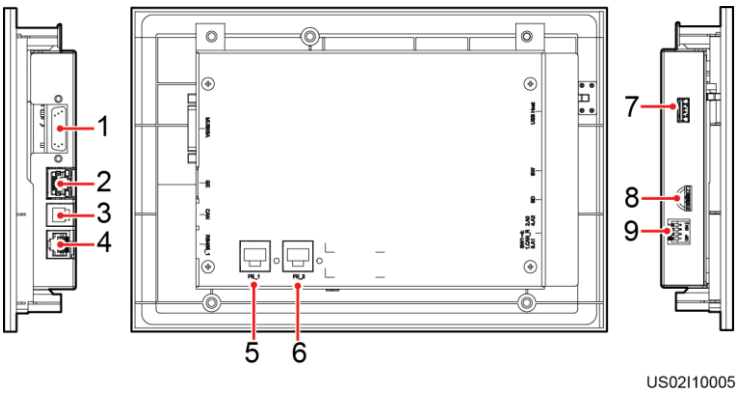


Table 2-8 Description of MDU ports

No.	Port Name	Description
1	MUS05A (DB26)	Connects to the MDU and monitoring interface card
2	FE	Network port
3	CAN	Reserved
4	RS485_1	Reserved
5	FE_1	Reserved
6	FE_2	Reserved
7	USB Host	Insert the USB flash drive, import and export the configuration file, export run logs, and upgrade software.
8	SD	Reserved
9	DIP switch	Implements specific functions by using the DIP switch and specific buttons; controls the CAN communication build-out resistor in a parallel system

Functions

Provides a monitor display unit (MDU) over which you can control SmartLi operations, view the running status and alarms, and set parameters.

- Displays the total voltage, SOC, SOH, current, and temperature of the battery system and battery information of each battery cabinet.
- Data storage function: Receives common parameters such as the battery voltage, temperature, current, SOC, and SOH reported by each battery management module, saves data locally, receives alarms and protection events reported by the BMS, and records events locally.
- Communicates with the UPS, provides man-machine interaction and communication interfaces for local and remote operations, manages rights, sets battery management system parameters, and upgrades programs.

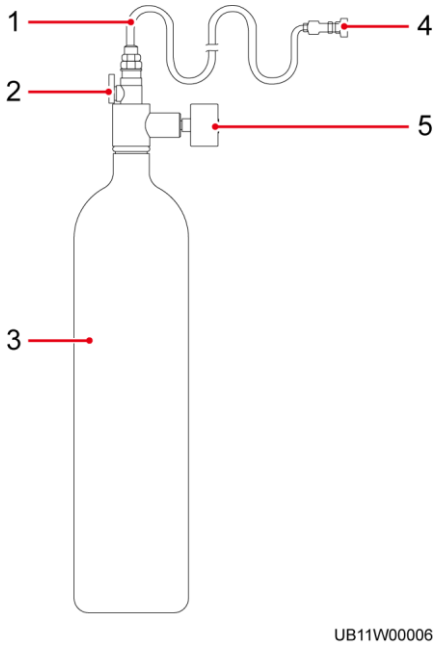
Specifications

Dimensions (H x W x D): 175 mm x 264 mm x 40 mm

2.4.6 Fire Detection and Extinguishing Equipment

The fire detection and extinguishing equipment consists of a pressurized container filled with extinguishant, a valve, and a fire-trace tube that can release extinguishant. It can detect and extinguish fire at the initial stage quickly, accurately, and effectively.

Figure 2-13 Appearance



(1) Fire-trace tube (2) Valve (3) Pressurized container

(4) End pressure gauge (5) Pressure gauge

Specifications

Recommended extinguishant: heptafluoropropane or perfluorohexane

Extinguishant amount: 3 kg

Operating temperature: 0°C to 50°C

3 Installation

3.1 Installation Preparations

3.1.1 Site

3.1.1.1 Installation Environment

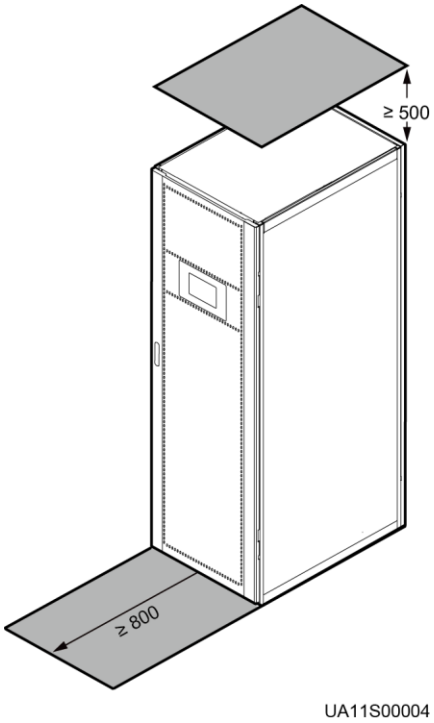
- Do not install the SmartLi in high temperature, low temperature, or damp environments.
- Install the SmartLi away from water sources, heat sources, and flammable or explosive materials.
- Keep the SmartLi away from direct sunlight, dust, volatile gases, corrosive materials, and air dense with salt particles.
- Do not install the SmartLi in environments with conductive metal scraps in the air.

3.1.1.2 Installation Clearances

Reserve the following clearances around the cabinet to facilitate operations and ventilation:

- Reserve at least 800 mm from the front of the cabinet.
- Reserve at least 500 mm from the top of the cabinet.
- The SmartLi can be installed against a wall and no space needs to be reserved at the rear.
- If an antiseismic kit is deployed, at least 500 mm space should be reserved at the rear for operations.

Figure 3-1 Reserved clearances (unit: mm)



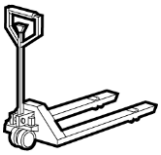
3.1.2 Tools and Instruments

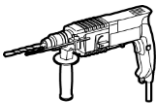
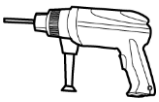
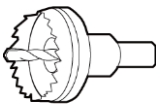
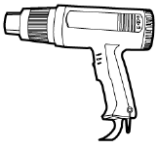
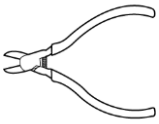
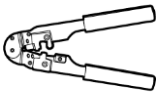
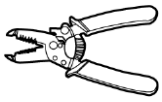
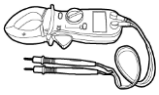
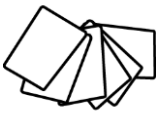
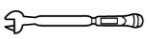
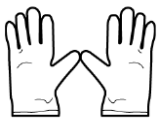
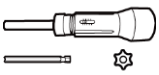
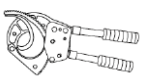
CAUTION

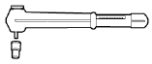
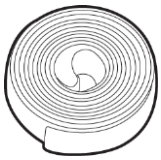
Insulate installation tools to prevent electric shocks.

Prepare the following tools and meters indicated in Table 3-1 for installation.

Table 3-1 Tools and meters

Tools and Meters			
Electric pallet truck	Manual pallet truck	Ladder	Rubber mallet
			
Hammer drill and drill bit Φ16	Hand-held electric drill	Alloy hole saw	Heat gun

Tools and Meters			
			
Diagonal pliers	Crimping tools	Wire stripper	Electric hydraulic pliers
			
Clamp meter	Multimeter	Cable tie	Level instrument
			
Polyvinyl chloride (PVC) insulation tape	Cotton cloth	Adjustable torque wrench	Electrician's knife
			
Electrostatic discharge (ESD) gloves	Protective gloves	Insulated gloves	Insulation protective shoes
			
Torque screwdriver	Cable cutter	Brush	Flat-head screwdriver (2–5 mm)
			
Phillips screwdriver (M3/M4/M5/M6/M8)	Insulated torque wrench (M6/M8/M12/M16)	Heat shrink tubing	Insulated adjustable wrench

Tools and Meters			
			

NOTE

Table 3-1 lists only the common tools for installation and cable connection. For more dedicated tools required, see the corresponding component manuals. Prepare tools based on site requirements.

3.1.3 Preparing Power Cables

Table 3-2 Recommended cross-sectional areas for power cables

Item			Description
Battery	Recommended cross-sectional area (mm^2)	+	• 120 (The load of a single battery cabinet is less than or equal to 150 kW, you are advised to set the I1 value of the battery circuit breaker to the MIN value.) • 150 (The load of a single battery cabinet is greater than 150 kW.)
		N	
		-	
		PE	70

- When selecting, connecting, and routing power cables, follow local safety regulations and rules.
- When the external conditions change, for example, the cable layout or ambient temperatures, perform verification in accordance with the IEC-60364-5-52 or the local regulations.
- Cable type: single-core 90°C soft power cable with a copper conductor.

3.1.4 Unpacking and Checking

Context

NOTICE

- To prevent the SmartLi from falling over, secure it to a pallet truck using ropes before moving it.
- To prevent shocks or falls, move the SmartLi gently. After placing the SmartLi in the installation position, unpack it and take care to prevent scratches. Keep the SmartLi steady during unpacking.
- To prevent dust from settling on the SmartLi, leave the original plastic coat on until installation is required.
- Battery modules are transported separately.

Procedure

Step 1 Use a pallet truck to transport the SmartLi to the installation position.

Step 2 Remove the SmartLi outer packing and take out the fittings box.

Step 3 Check that the SmartLi is intact.

1. Visually inspect the SmartLi appearance for shipping damage. If it is damaged, notify the carrier immediately.
2. Check that all fittings comply with the packing list. If some fittings are missing or do not comply with the packing list, record this information and contact your local Huawei office immediately.

Step 4 After confirming that the cabinet is intact, remove the L-shaped bracket that secures the cabinet and the pallet, and secure the sliding plate to the pallet using the two M12 bolts that you have removed.

Step 5 Raise the four anchor bolts to the highest position using an adjustable wrench.

Step 6 Push the cabinet along the sliding plate to the floor.

----End

3.2 Installing a Fire Cylinder

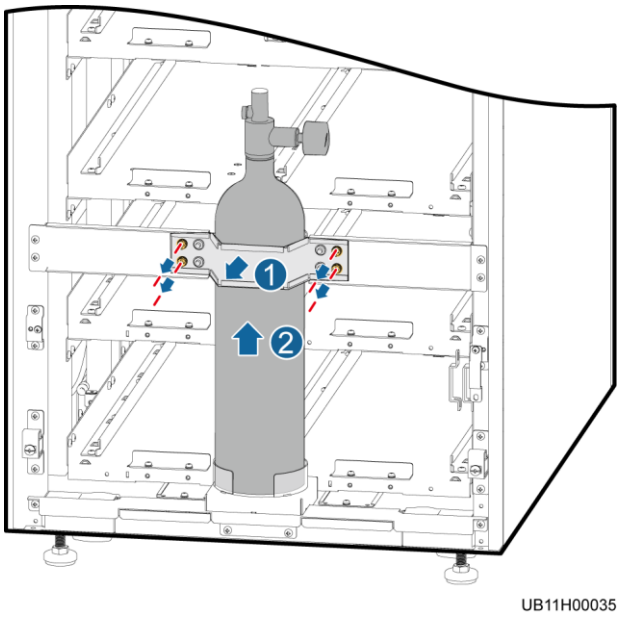
Procedure

Step 1 Remove the rear panel of the cabinet.

Step 2 Remove the fire cylinder.

1. Remove the fire cylinder fastener.
2. Take out the fire cylinder.

Figure 3-2 Removing the fire cylinder



Step 3 Check the fire cylinder and all components for any damage, abrasion, or corrosion. If there is any visible abrasion or corrosion, replace the damaged components and all corroded components.

Step 4 Fill the fire cylinder with extinguishant. The recommended extinguishant is heptafluoropropane or perfluorohexanone.

Step 5 Check the status of the fire cylinder after filling extinguishing agent. If the fire cylinder is not installed in the cabinet immediately after extinguishing agent is filled, check the status of the fire cylinder again before installation.

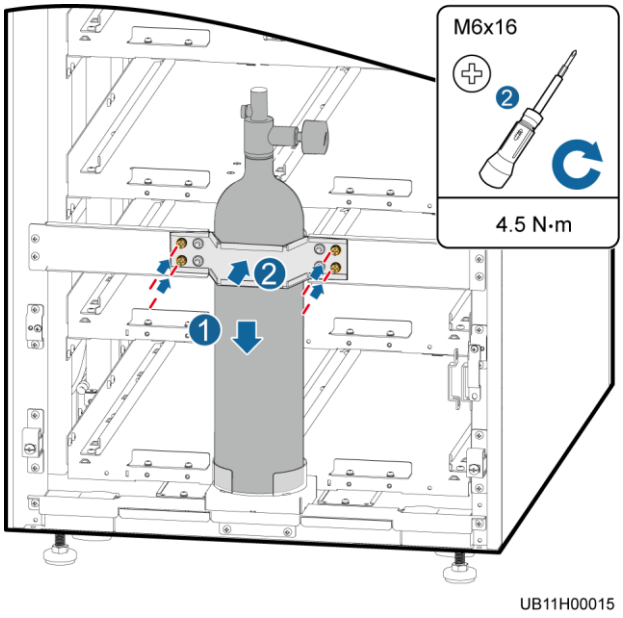
- Check that the valve is closed (vertical to the cylinder).
- Check that the reading of the pressure gauge on the fire cylinder is greater than 1.6 MPa and the pointer is in the green zone.

Step 6 Install the fire cylinder.

NOTICE

- Keep the fire cylinder upright.
- Ensure that the front of the pressure gauge faces the right side of the cabinet (as shown in the figure) and that the cylinder does not interfere with the battery trays and the rear cover of the cabinet.

Figure 3-3 Installing a fire cylinder



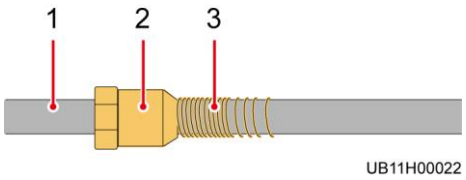
Step 7 Install the fire-trace tube on the fire cylinder.

NOTICE

Do not bend or twist the fire-trace tube or bind the tube using cable ties. Otherwise, the fire cylinder may fail.

1. Remove the connection nut and riser screw thread from the top of the fire cylinder, and route the nut and riser screw thread through the fire-trace tube.

Figure 3-4 Routing the nut and riser screw thread through the fire-trace tube



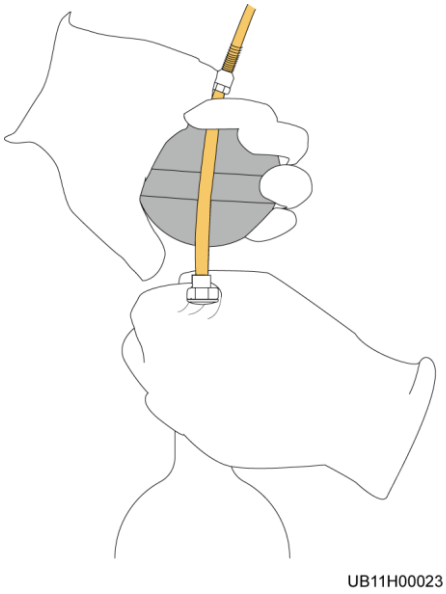
(1) Fire-trace tube (2) Connection nut (3) Riser screw

2. Clamp the end of the fire-trace tube to the threaded nozzle using a pipe holder.

NOTICE

Hold the pipe holder close to the end to avoid bending the tube during pipe insertion.

Figure 3-5 Install a fire-trace tube



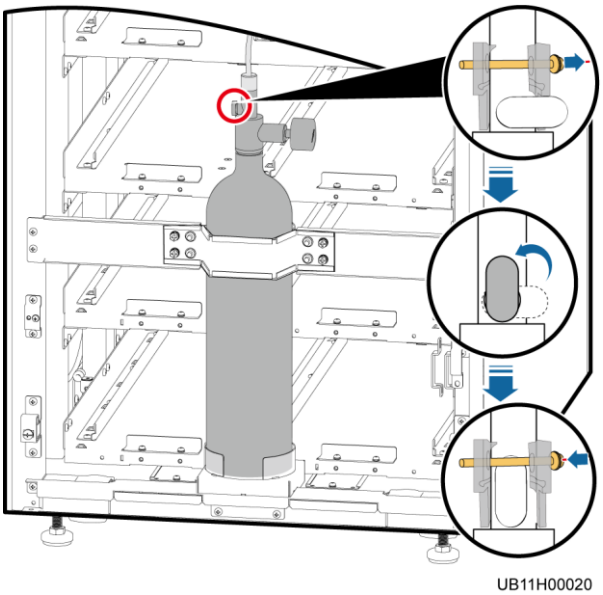
3. Tighten the connection nut to 7 N·m using an adjustable torque wrench.

Step 8 Remove the valve positioning kit, open the valve, reinstall the positioning kit, and secure it.

NOTICE

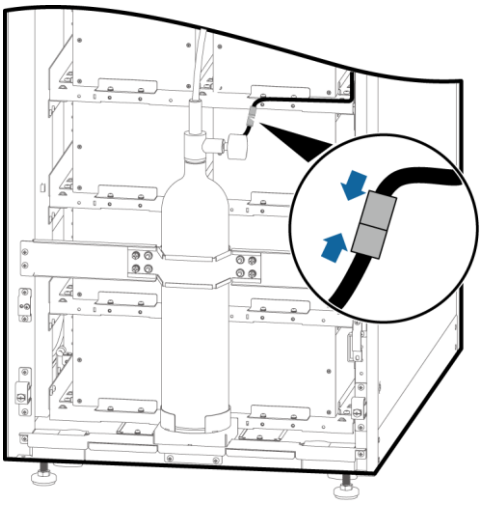
Slowly open the valve. To avoid unexpected blowout, do not quickly open the valve.

Figure 3-6 Opening the valve



Step 9 Interconnect the dry contact cable of the fire cylinder and the cable reserved on the side of the cabinet.

Figure 3-7 Interconnecting cable terminals



Step 10 Check the end pressure gauge on the front of the cabinet. The pointer should be in the green zone and the pressure reading should be greater than 1.6 MPa. Record the reading of the pressure gauge. 8 hours later, observe the pressure gauge again. The pressure reading should remain unchanged.

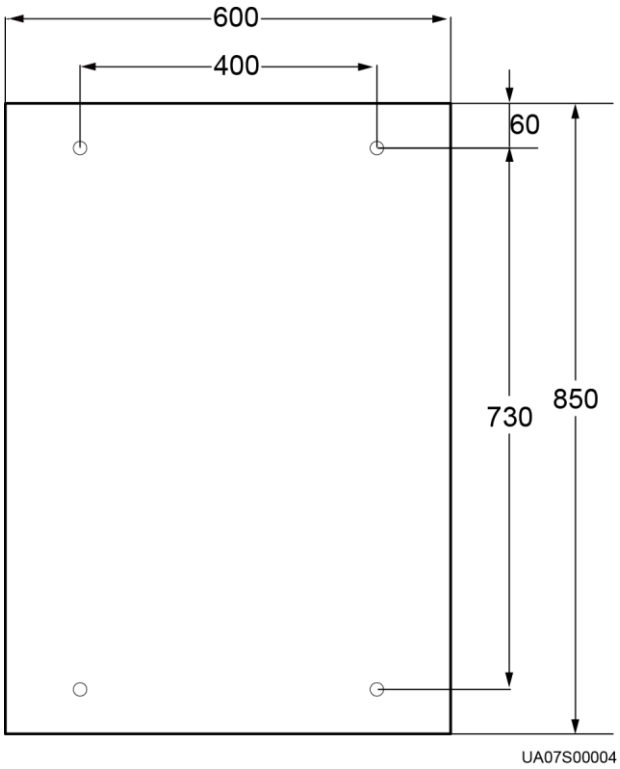
----End

3.3 Installing Cabinets

Securing Installation

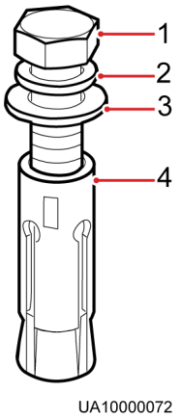
Step 1 Determine the cabinet installation position. Draw mounting holes in the installation position according to the drawings.

Figure 3-8 Mounting holes (unit: mm)



Step 2 Use a hammer drill to drill holes for installing expansion bolts and then install four expansion bolts in the holes.

Figure 3-9 Expansion bolt composition

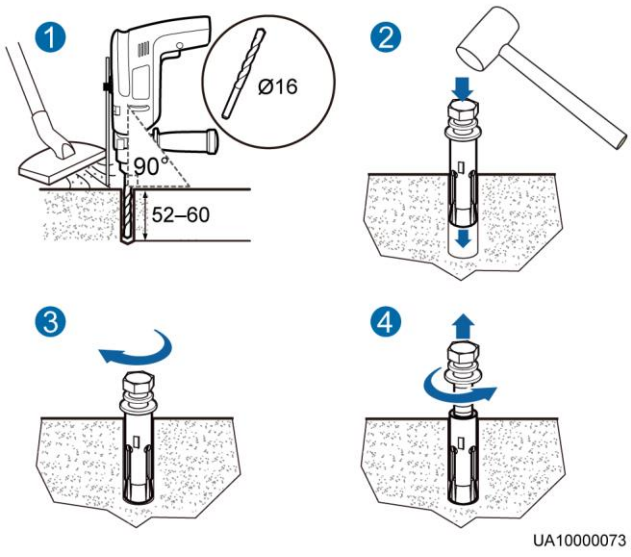


(1) M12 bolt (2) Spring washer (3) Flat washer (4) Expansion sleeve

NOTICE

Knock the expansion bolt into the hole until the expansion tube completely fits into the hole. The expansion sleeve must be completely buried under the ground to facilitate subsequent installation.

Figure 3-10 Installing an expansion bolt (unit: mm)

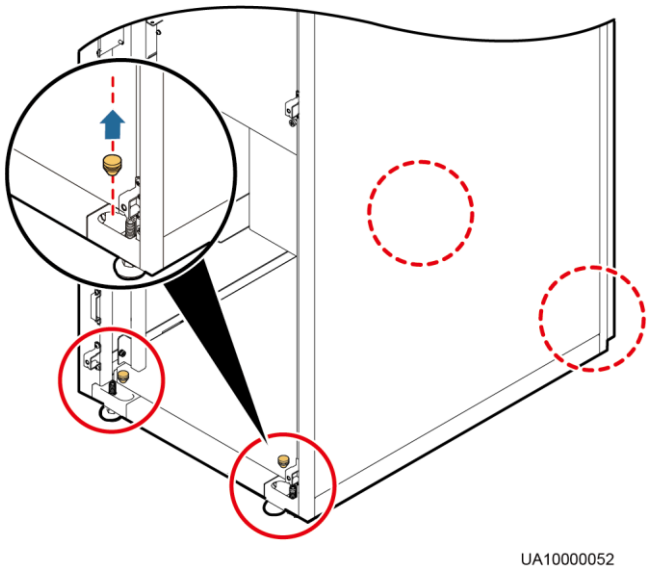


1. Drill a hole into the concrete floor using a hammer drill. The hole depth ranges from 52 mm to 60 mm.
2. Slightly tighten the expansion bolt and vertically insert it into the hole. Knock the expansion bolt using a hammer until the expansion sleeve is fully inserted into the hole.
3. Partially tighten the expansion bolt.
4. Remove the bolt, spring washer, and flat washer.

Step 3 Wheel the cabinet to the installation position.

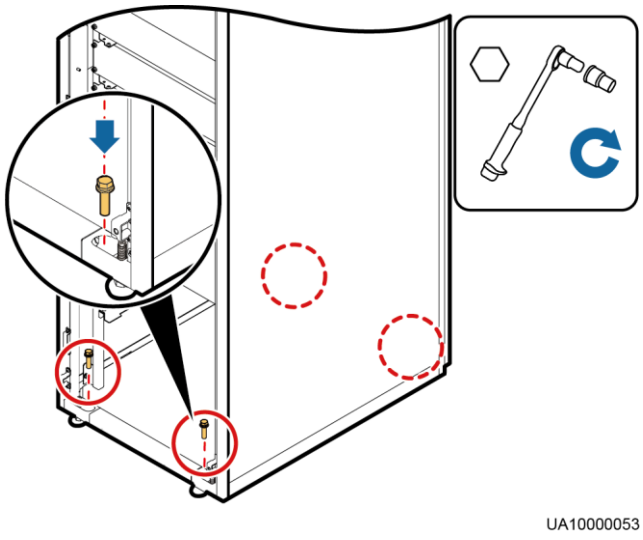
Step 4 Open the front door and remove the four plugs from the bottom of the cabinet.

Figure 3-11 Removing plugs



Step 5 Insert four M12x115 expansion bolts into the expansion bolt holes in the floor, and tighten the expansion bolts.

Figure 3-12 Tightening expansion bolts

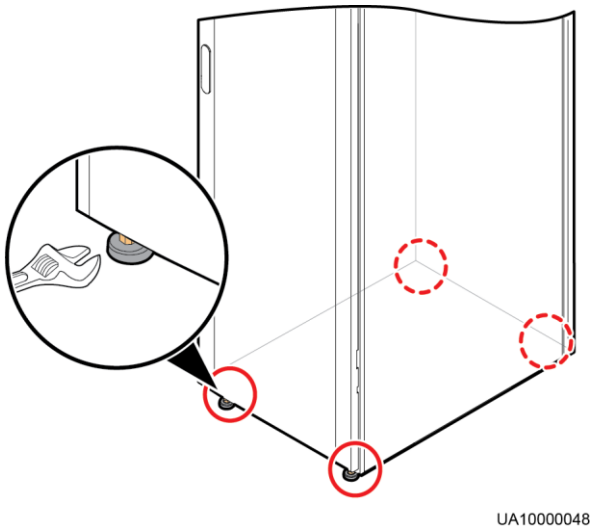


----End

Non-Secure Installation

Step 1 Adjust the four anchor bolts at the bottom of the cabinet until all the four castors at the bottom hang in the air and the anchor bolts bear all of the cabinet weight.

Figure 3-13 Castors hanging in the air



Step 2 Check the cabinet levelness using a level instrument. If the cabinet is not level, wrench the anchor bolts.

----End

Combining Cabinets

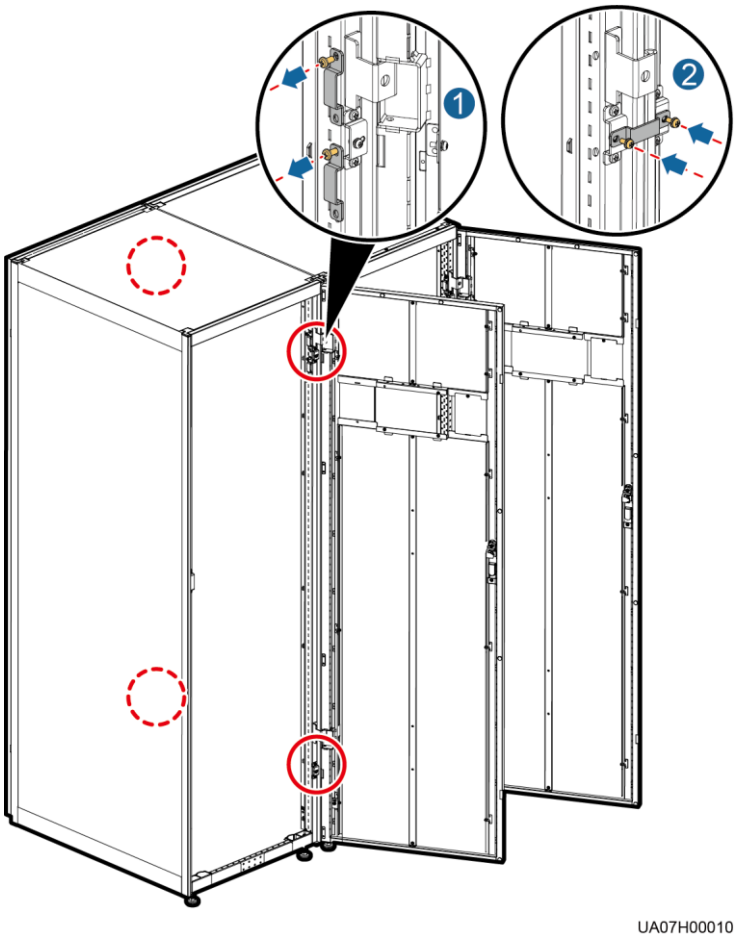
NOTICE

When cabinets are combined, a battery bus bar box (BBB box) is required. For details about how to install a BBB box, see *PDU8000-(0630, 1250, 2000) DCV8-BGA001 BBB Box User Manual*.

Step 1 Install each cabinet in sequence according to the installation method of a single cabinet.

Step 2 Combine cabinets.

Figure 3-14 Installing connecting kits



----End

3.4 Routing Cables

3.4.1 SmartLi Cable Connection Reference

Context

CAUTION

- Keep away from cabinets when preparing cables to prevent cable scraps from entering the cabinets. Cable scraps may cause ignition during power-on and result in personal injury and device damage.
- After installing cables, clean the cabinet top, bottom, copper bar wiring positions, and other positions. Ensure that there is no dust or scraps inside and around cabinets.
- Prepare terminals onsite. The length of the copper wire should be the same as that of the part of the terminal that covers the conductor.

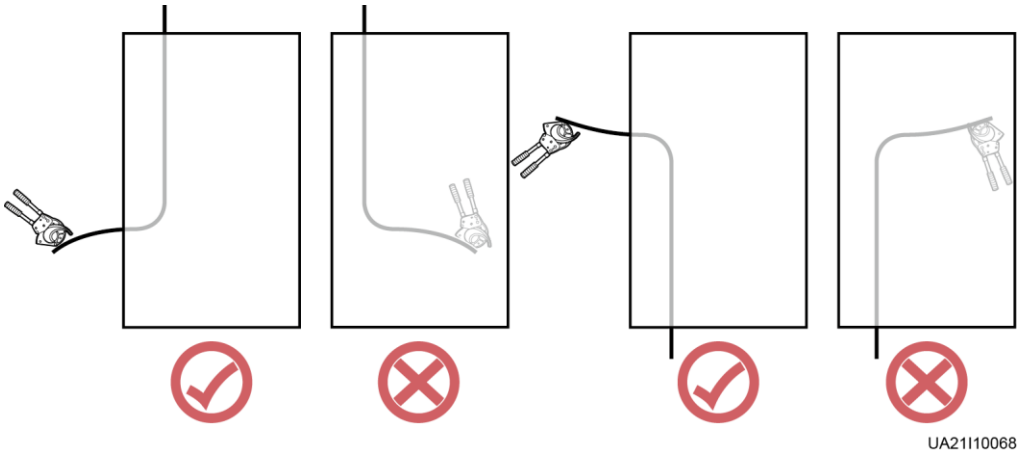
Procedure

Step 1 Route a cable into the cabinet and bind it to a nearby beam.

Step 2 Pull the cable to the copper bar to which the cable is to be connected, determine the cable length, and mark the cable at the position where the cable is to be cut.

Step 3 Pull the marked cable out of the cabinet, cut the cable from the marked position, strip the cable, and crimp a terminal.

Figure 3-15 Preparing a cable terminal outside the cabinet



NOTE

Choose an appropriate cabling route based on the actual situation. The figure is for reference only.

Step 4 Connect the cable with a crimped terminal to the corresponding copper bar.

Step 5 Clean foreign matter inside the cabinet.

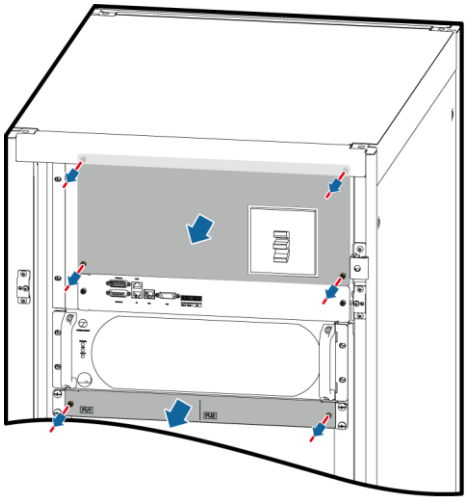
----End

3.4.2 Installing a PE Cable

Procedure

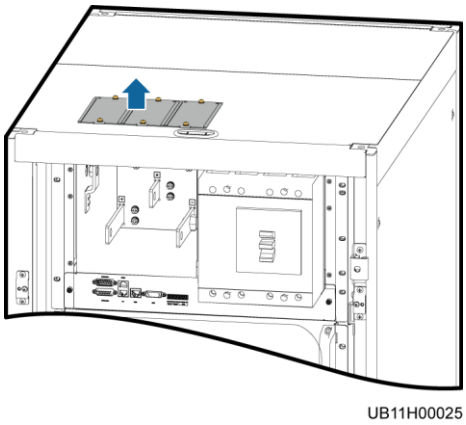
Step 1 Remove the PDU and fuse cover.

Figure 3-16 Removing the cover



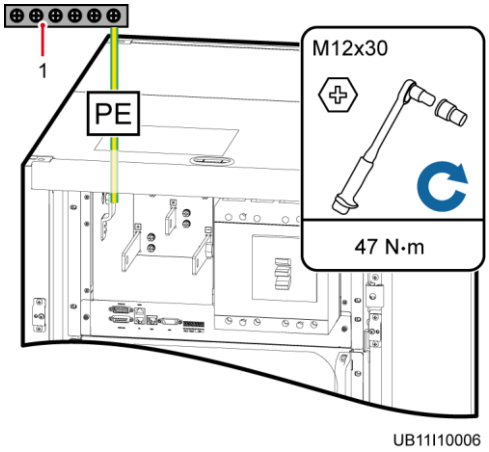
Step 2 Remove the top cover from the cabinet based on cable routes and dimensions.

Figure 3-17 Removing the top cover



Step 3 Install a PE cable.

Figure 3-18 Installing a PE cable



(1) Site ground bar

----End

3.4.3 Installing Battery Modules and Cables

Context

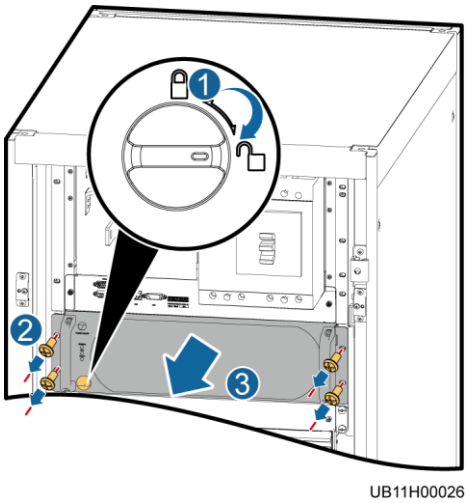
DANGER

- Before installing batteries, carefully read the battery safety precautions.
- During installation, wear insulation gloves and use insulated tools.
- Place the batteries correctly to prevent vibrations and shocks.
- Install the battery modules from bottom to top and from left to right to prevent falling over due to imbalance.
- Two persons are required to install the battery modules.

Procedure

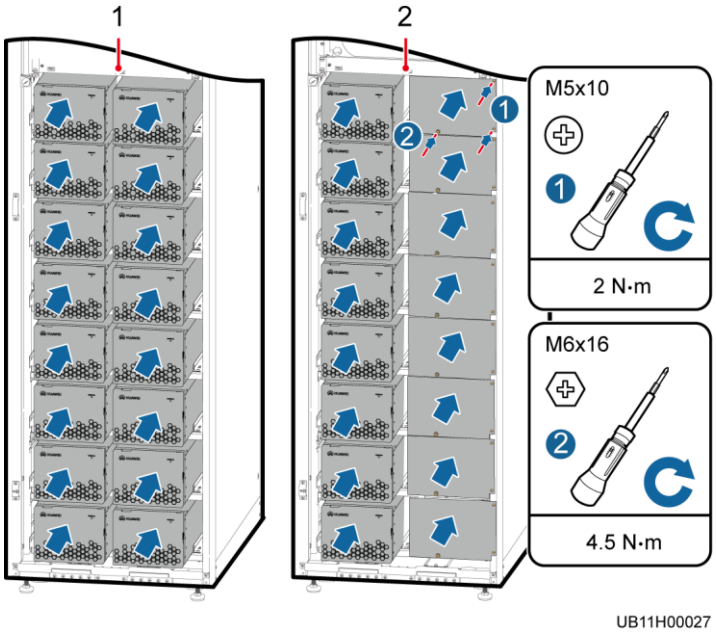
Step 1 Pull out the battery management module for about 10 cm.

Figure 3-19 Pulling out the battery management module



Step 2 Install battery modules.

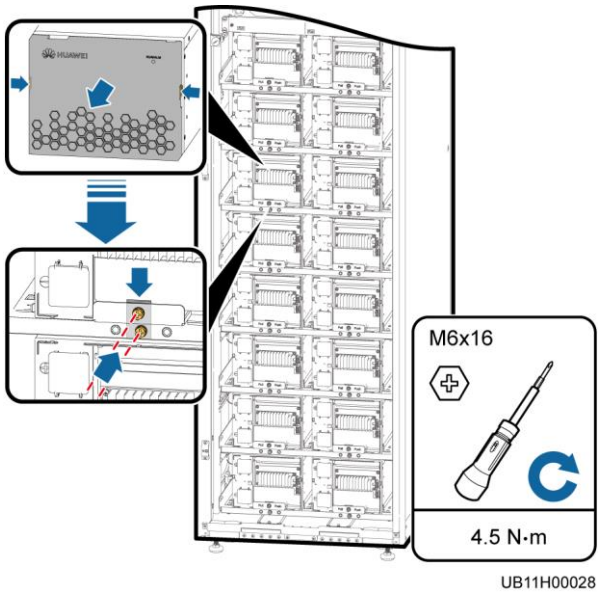
Figure 3-20 Installing battery modules



(1) Full-capacity cabinet configuration (2) Half-capacity cabinet configuration

Step 3 Remove front cover from the battery module, and install battery baffle plates.

Figure 3-21 Installing battery baffle plates



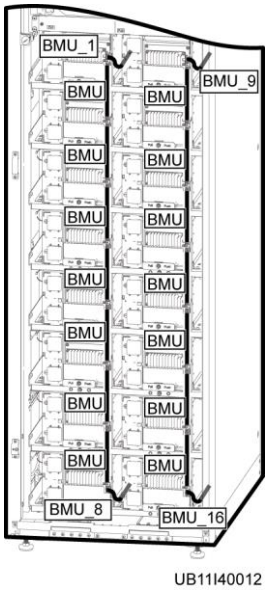
NOTE

Place the front cover properly to prevent the light pipe from falling off.

Step 4 Install battery communications cables.

1. Install communications cables between battery modules.
2. Connect communications cables (reserved in the cabinet) between the battery modules and the battery management module.

Figure 3-22 Installing battery communications cables



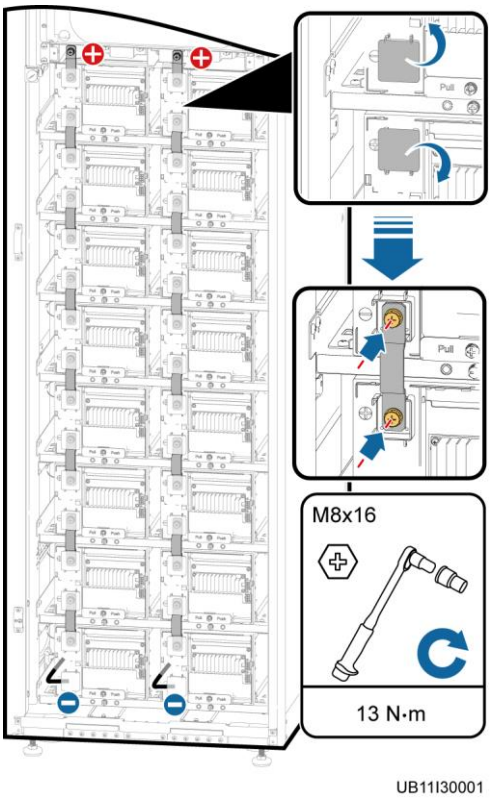
Step 5 Install battery copper bars and cables.

1. Open the terminal protective covers, install copper bars between battery modules, and close the terminal protective covers.
2. Open the terminal protective covers, install copper bars between battery modules and fuses, and close the terminal protective covers.
3. Open the terminal protective covers, install the battery cables reserved in the cabinet, and close the terminal protective covers.

NOTICE

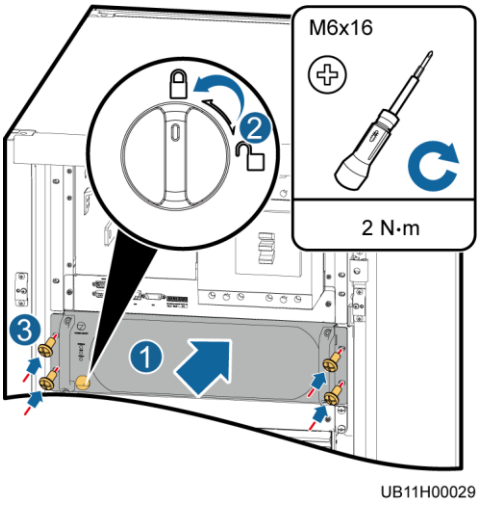
- Connect the round hole of the copper bar to the upper battery module, and then connect the waist hole of the copper bar to the lower battery module.
- Excessive bolts will be used as spare parts.

Figure 3-23 Installing copper bars and cables



Step 6 Reinstall the battery management module.

Figure 3-24 Installing the battery management module



----End

3.4.4 Remote EPO

NOTICE

- Huawei does not provide the EPO switch or cable. If the cable is required, the recommended cable is 22 AWG.
- Equip the EPO switch with a protective cover to prevent misoperations, and cover the cable with protective tubing.

Connect the EPO button to the EPO port on the SmartLi using the cable.

Figure 3-25 Cable connection for an NO EPO switch

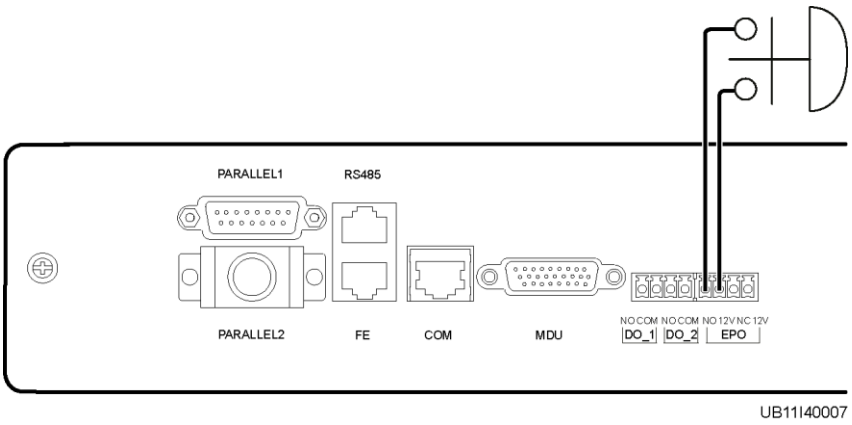
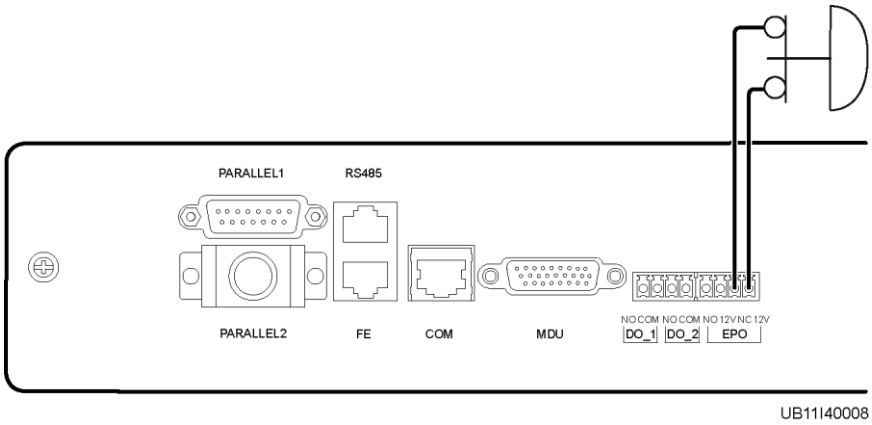


Figure 3-26 Cable connection for an NC EPO switch



NOTE

- When the EPO switch is in the NC state, remove the jumper between EPO_NC and EPO_12V before connection. When the EPO switch is turned off, EPO is triggered.
- When the EPO switch is in the NO state, ensure that the jumper is connected between EPO_NC and EPO_12V. When the EPO switch is turned on, EPO is triggered.

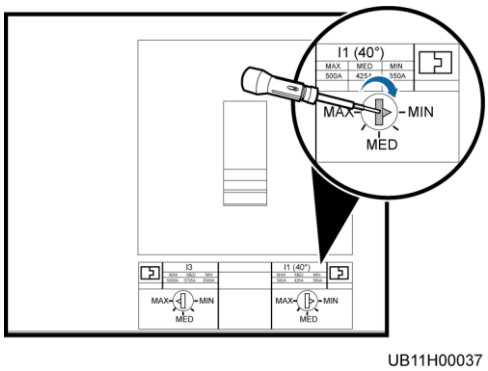
3.4.5 Installing Output Power Cables

Context

NOTICE

If the load of a single battery cabinet is less than or equal to 150 kW, you are advised to set the I1 value of the battery circuit breaker to the MIN value shown in the figure and use cables with a cross-sectional area of 120 mm^2. If the load of a single battery cabinet is greater than 150 kW, you are advised to use cables with a cross-sectional area of 150 mm^2.

Figure 3-27 Setting I1 to MIN for the battery circuit breaker



Procedure

Step 1 Connect power cables to the UPS.

Figure 3-28 Installing power cables (single cabinet)

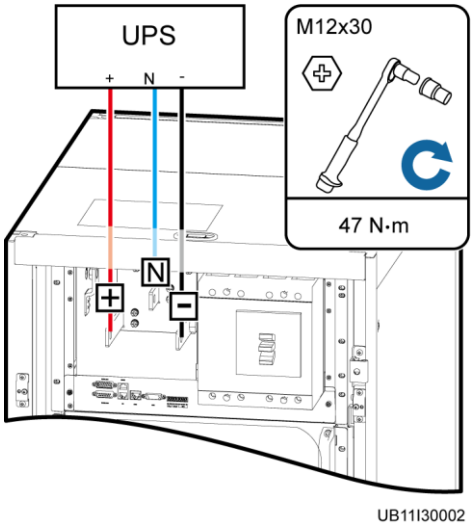
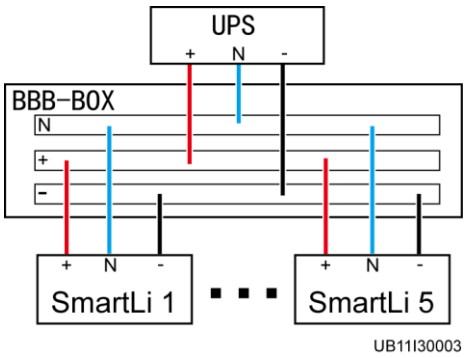


Figure 3-29 Installing power cables (parallel system, for example, five cabinets)



----End

3.4.6 Installing Communications Cables

Procedure

Step 1 Connect a communications cable to the UPS.

Figure 3-30 Connecting a communications cable (single cabinet)

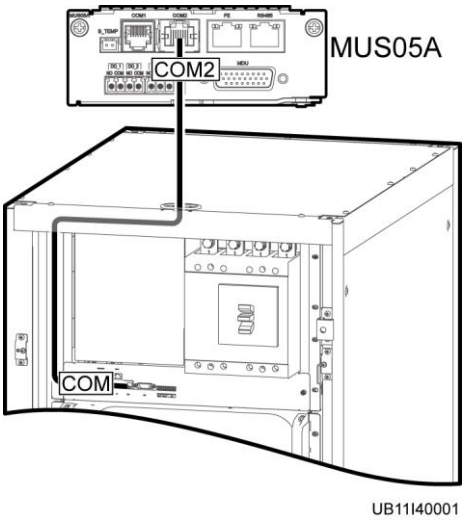
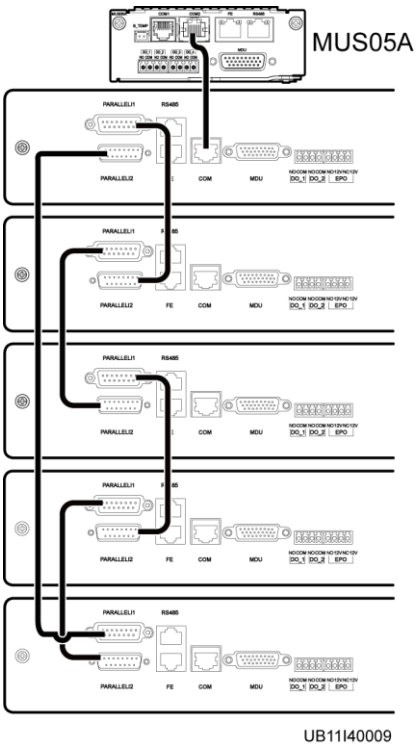


Figure 3-31 Connecting communications cables (parallel system, for example, five cabinets)



NOTE

The numbers of cabinets in a parallel system depend on the connection of control cables. After the control cables are connected according to the preceding figure, the cabinets are numbered 1, 2, 3, 4, and 5 from top to bottom.

----End

3.5 Installation Verification

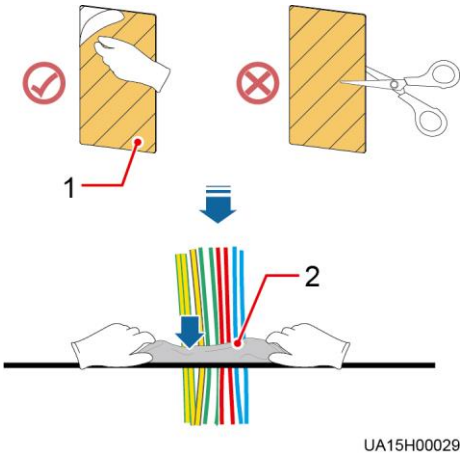
Table 3-3 Installation checklist

No.	Item	Acceptance Criteria
01	SmartLi installation	The SmartLi is securely installed and does not tilt due to vibration.
02	Neat arrangement	The SmartLi and its adjacent cabinets are neatly arranged and secured with connecting plates.
03	Cable layout	Cables are routed properly and cable routing meets customer requirements.
04	Cable labels	Both ends of a cable are labeled. Labels are concise and easy to understand.
05	Cable ties	Cable ties are secured evenly and no burr exists.
06	Cable connections	The output, and battery cables are securely connected. For the cables secured by screws, the spring washers are flattened.
07	Grounding	The resistance between the SmartLi ground bar and the equipment room ground bar is less than 0.1 ohm.
09	Battery cable connections	The SmartLi is correctly connected to the UPS.
10	Checking the pressure gauge	Check whether the pressure gauge pointer is in the green zone and whether the pressure value is greater than 1.6 MPa.
11	Foreign matter cleaning inside the cabinet	The inside and outside of the cabinet, and other operating components, are free from conductive dust. 1. There is no foreign matter (such as copper wires and screws) on the top of the cabinet. 2. There is no foreign matter on the copper bar terminals. 3. There is no foreign matter around switch terminals. 4. There is no foreign matter on the bottom plate of the cabinet. 5. There is no foreign matter on the rear module subrack.

NOTE

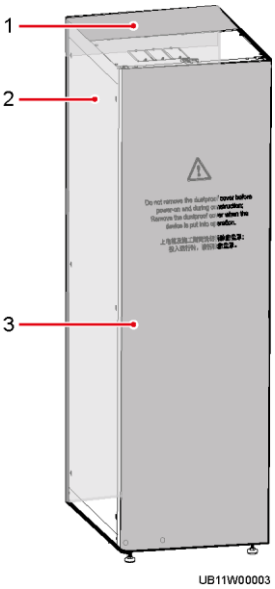
1. In the scenarios where covers are removed for routing cables, after routing cables and checking cable connections, use sealing putty to fill in the gap between the cables and the cabinet.
2. After verifying the installation, reinstall all the covers.
3. Do not remove the dustproof cover before power-on to prevent dust inside the UPS.

Figure 3-32 Fill the holes with sealing putty



(1) Paper protective film (2) Sealing putty

Figure 3-33 Dustproof cover



(1) Top dustproof cover (2) Rear dustproof cover (3) Front dustproof cover

4 User Interface

4.1 Login

Context

Internet Explorer 11 is used as the example browser.

Table 4-1 User description

Default User	Preset Password		User Rights
admin (system administrator)	LCD	000001	Performs all operations on the LCD and WebUI, including system running information browsing, system information (historical alarms, logs, e-labels, and fault information) exporting, parameter setting, system control, system configuration (network parameters, user management, time and date, and site information), and system maintenance.
	WEB	Changeme	
operator (common user)	LCD	000001	Only browses the system running information, exports system information (historical alarms, logs, e-labels, and fault information), starts/shuts down the inverter, rectifies faults, and controls the buzzer. Other control and maintenance functions that may affect system operation are invisible and parameters cannot be set.
	WEB	Changeme	
browser (browsing user)	WEB	-	Only browses the system running information.

NOTE

- If an incorrect password is entered five consecutive times, the account will be logged out for 5 minutes.
- After a user logs in to the WebUI, if another user logs in with the same user name, the current account will be logged out.

- It is advised to change the password after the first login using **User Management** on the **Maintenance** page to prevent unauthorized access.

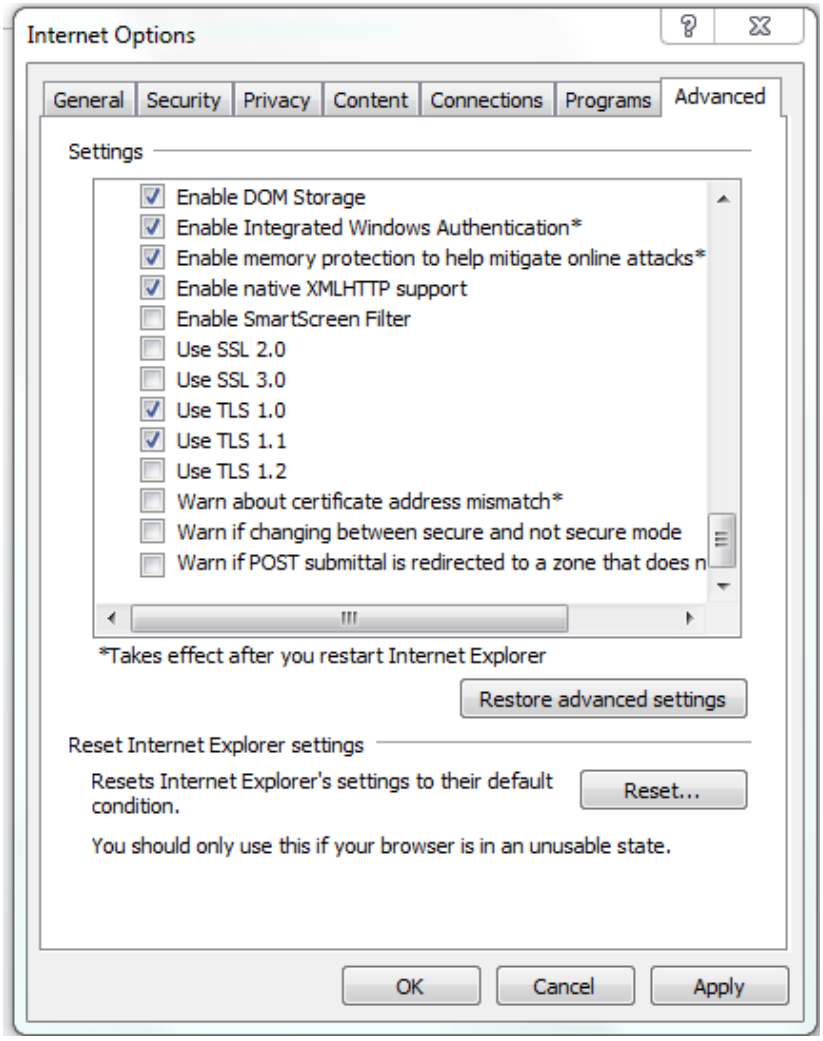
Procedure

Step 1 Connect the network port of the PC to the FE port of the monitoring interface unit using a network cable

Step 2 Open the browser and choose **Tools** > **Internet Options.**

Step 3 On the **Advanced** tab page, ensure that **Use TLS 1.0**, and **Use TLS 1.1** are selected and click **OK**.

Figure 4-1 Settings in the Internet Options dialog box



Step 4 Enter **https://SmartLi IP address** in the address box of the browser, select a language, set **User name** and **Password**, and click **Login**. The system supports Internet Explorer 11 and Firefox 31.0.

NOTE

The preset SmartLi IP address is 192.168.0.10. You can set the SmartLi Ethernet IP address on the LCD or WebUI. The value range is 1.0.0.0–223.255.255.255.

Table 4-2 User description

Default User	Preset Password		User Rights
admin (system administrator)	LCD	000001	Performs all operations on the LCD and WebUI, including system running information browsing, system information (historical alarms, logs, e-labels, and fault information) exporting, parameter setting, system control, system configuration (network parameters, user management, time and date, and site information), and system maintenance.
	WEB	Changeme	
operator (common user)	LCD	000001	Only browses the system running information, exports system information (historical alarms, logs, e-labels, and fault information), starts/shuts down the inverter, rectifies faults, and controls the buzzer. Other control and maintenance functions that may affect system operation are invisible and parameters cannot be set.
	WEB	Changeme	
browser (browsing user)	WEB	-	Only browses the system running information.

----End

4.2 LCD Interface

4.2.1 Main Menu screen

NOTICE

User interfaces provided in this document correspond to the monitor display module (MDU) version V100R003C20 and are for reference only.

The LCD screen is divided into three parts: status bar, alarm bar and information area.

Figure 4-2 Main menu screen

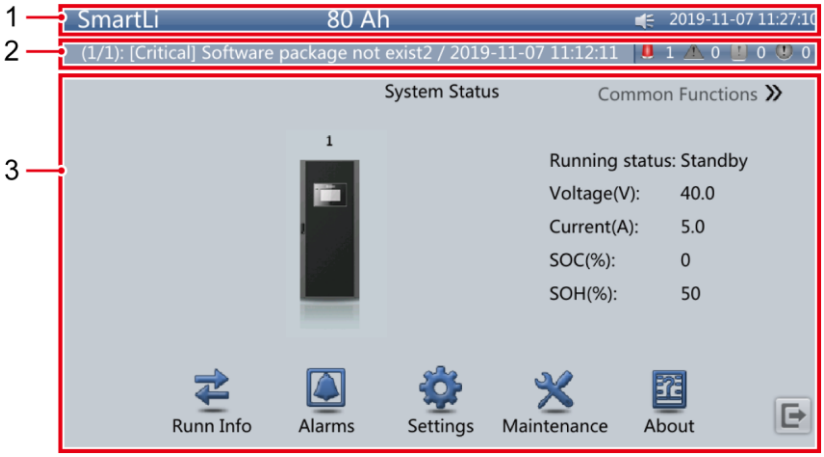


Table 4-3 Main menu screen description

Number	Area	Function
1	Status bar	Displays the SmartLi model, current date and time, USB flash drive status, and buzzer status.
2	Alarm bar	Displays active alarms in a scrolling list and the number of active alarms based on severity. Tap the alarm icon area to open the active alarm page.
3	Information area	Displays system information.

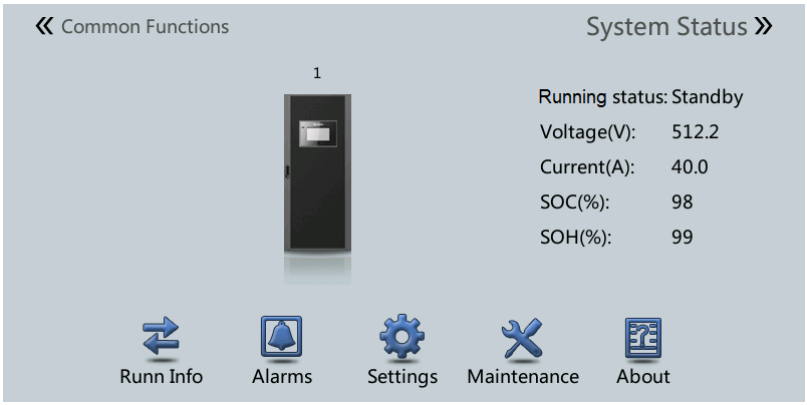
Table 4-4 Functions of common buttons

Button	Function
	Returns to the main screen.
	Scrolls the page down.
	Scrolls the page up.
	Returns to the upper-level menu.
	Logs a user out.

4.2.2 System Status

On the main menu screen, the **System Status** screen is displayed.

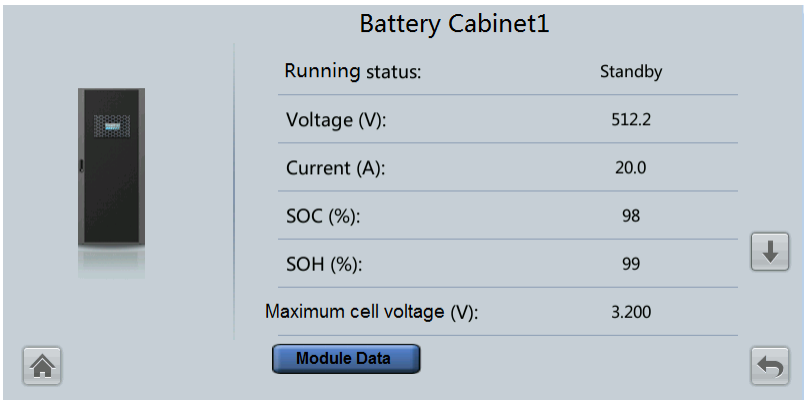
Figure 4-3 System status



4.2.2.1 Battery Cabinet

On the **System Status** screen, tap **Battery Cabinet**. You can view the battery cabinet, module and cell information.

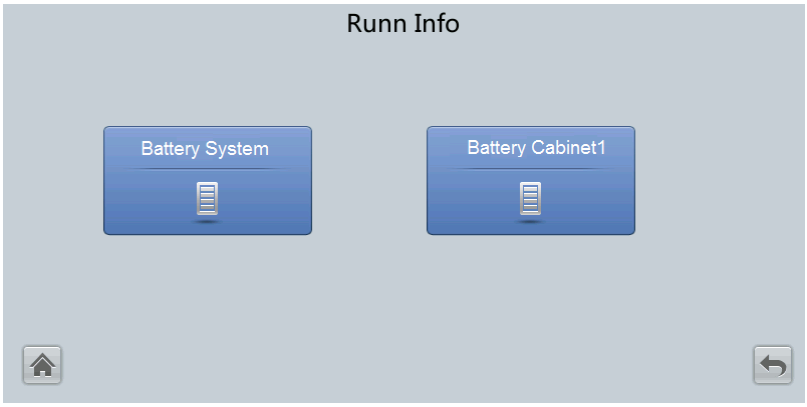
Figure 4-4 Rack



4.2.2.2 Runn Info

On the **System Status** screen, tap the **Runn Info** icon. You can query **Battery System** and **Battery Cabinet**.

Figure 4-5 Runn Info



Battery System

Item	Description
Running status	Battery system running status
Voltage (V)	Battery system output voltage
Current (A)	Battery system output current
SOC (%)	SOC value
SOH (%)	SOH value
Maximum cell voltage (V)	Highest battery cell voltage
Minimum cell voltage (V)	Lowest battery cell voltage
Maximum cell temperature (°C)	Highest battery cell temperature
Minimum cell temperature (°C)	Lowest battery cell temperature
Total discharge times	Total discharge times
Total discharge capacity (Ah)	Total discharge capacity

Battery Cabinet

Item	Description
Running status	Battery cabinet running status
Voltage (V)	Battery cabinet output voltage
Current (A)	Battery cabinet output current
SOC (%)	SOC value
SOH (%)	SOH value

Item	Description
Maximum cell voltage (V)	Highest battery cell voltage
Minimum cell voltage (V)	Lowest battery cell voltage
Maximum cell temperature (°C)	Highest battery cell temperature
Minimum cell temperature (°C)	Lowest battery cell temperature
Total discharge times	Total discharge times
Total discharge capacity (Ah)	Total discharge capacity

Battery Module

Item	Description
Voltage (V)	Battery cabinet output voltage
SOC (%)	SOC value
SOH (%)	SOH value
Maximum cell voltage (V)	Highest battery cell voltage
Minimum cell voltage (V)	Lowest battery cell voltage
Maximum cell temperature (°C)	Highest battery cell temperature
Minimum cell temperature (°C)	Lowest battery cell temperature

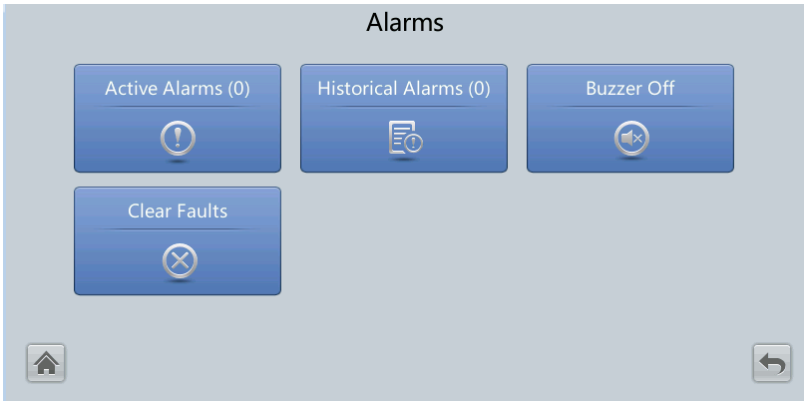
Cell Data

Item	Description
Voltage (V)	Battery cell voltage
Temperature (°C)	Battery cell temperature

4.2.2.3 Alarms

On the **System Status** screen, tap the **Alarms** icon. You can query **Active Alarms** and **Historical Alarms** and perform **Buzzer Off** and **Clear Faults**.

Figure 4-6 Alarms



4.2.2.4 Settings

On the **System Status** screen, tap the **Settings** icon.

Figure 4-7 Settings

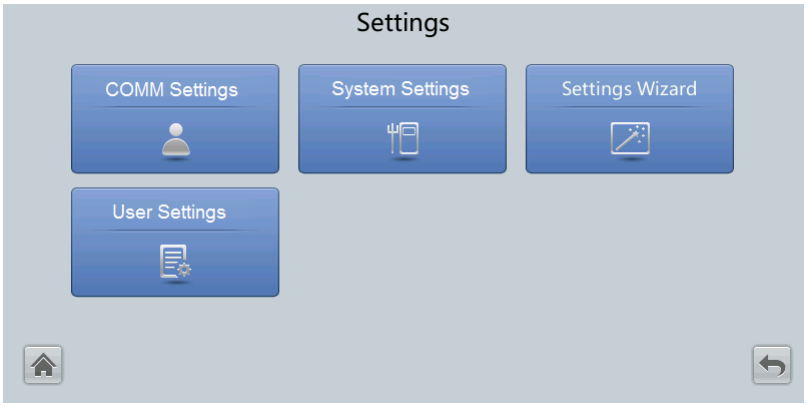


Table 4-5 COMM Settings

Item	Description	Default Value	Value Range
IP Address allocation	Specifies the IP address allocation.	Automatic	Manual, Automatic
IP address	Specifies the IP address for the Ethernet.	192.168.0.10	1.0.0.0–223.255.255.255
Subnet mask	Specifies the subnet mask of the Ethernet.	255.255.255.0	0.0.0.0–255.255.255.255
Gateway	Specifies the Ethernet gateway.	192.168.0.1	1.0.0.0–223.255.255.255
RS485 port	Specifies the address for RS485	1	1-254

Item	Description	Default Value	Value Range
address	communication.		
RS485 port baud rate	Matches the user's network management conditions onsite.	9600	4800, 9600, 19200, 115200
COM port address	Specifies the address for COM communication.	80	1-254
COM port baud rate	Matches the user's network management conditions onsite.	9600	4800, 9600, 19200, 115200
ModbusTCP encryption	If Modbus TCP is used for communication, communication links do not implement encryption or implement encryption based on the selected encryption mode.	Disable	Disable, Enable

IP address allocation

- If the MDU is directly connected to a computer, the IP address can only be allocated manually. The IP addresses of the MDU and computer must be in the same network segment, and must be different.
- If the MDU is connected to a computer through a LAN switch or router with the DHCP function, the IP address can be allocated manually or automatically. Manual allocation is used by default.
  - **Manual**: Check that their IP addresses are two different values on the same network segment. Set the SmartLi IP address to be in the same subnet as the PC IP address. Perform the bitwise AND operation for the UPS IP address and the PC IP address with the subnet mask respectively. If the operation results are the same, the two IP addresses are in the same subnet.

    AND operation rule: 1 AND 1 = 1, 1 AND 0 = 0, 0 AND 1 = 0, 0 AND 0 = 0. That is when the corresponding bits are both 1, the result is 1. In other cases, the result is 0.

Table 4-6 Bitwise AND operation example

-	PC IP address (182.98.225.125)	UPS IP address (182.98.225.112)
PC IP address/SmartLi IP address	10110110.01100010.11100001.01111101	10110110.01100010.11100001.01110000
Subnet mask (255.255.255.192)	11111111.11111111.11111111.11000000	11111111.11111111.11111111.11000000
Bitwise AND operation result	10110110.01100010.11100001.01000000	10110110.01100010.11100001.01000000

- **Automatic**: The MDU automatically searches for available IP addresses in the connected network. Ensure that the MDU and PC are on the same network segment.

NOTE

- After you restart the device, **IP address allocation** changes back to **Manual**. The IP address is set to the IP address set previously.
- Ensure that the SmartLi IP address is unique on the network segment. Otherwise, the WebUI display function may not function properly.

Table 4-7 System Settings

Item	Description	Default Value	Value Range
Battery cabinet quantity	Specifies the total number of combined cabinets.	1	1–8
EPO enable	EPO (emergency power-off) is performed only when this parameter is enabled and the EPO switch is triggered. When **EPO detection** is changed from **Disable** to **Enable**, check that the EPO cable is connected correctly.	Disable	Disable, Enable
Battery cabinet copper bar over temp. enable	If this parameter is set to **Enable**, an alarm is reported when the copper bar is overheated.	Enable	Disable, Enable
Fire control enable	If this parameter is set to **Enable**, an alarm is reported after the fire extinguishing action is triggered.	Enable	Disable, Enable

Table 4-8 Settings Wizard

Item	Parameter	Description
Language	English, Chinese	Set based on site requirements.
Time	Date format, YYYY-MM-DD, Time zone, City, Time	Set based on site requirements.
Network Param.	IP Address allocation, IP address, Subnet mask, Gateway	Set based on site requirements.
System Param.	Battery cabinet quantity, EPO enable, Battery cabinet copper bar over temp. enable, Fire control enable	Set based on site requirements.

Table 4-9 User Settings

Item	Description	Default Value	Value Range
Language	Two languages are supported.	English	English, Chinese
Date format	Specifies the date format.	N/A	N/A
YYYY-MM-DD	Set based on site requirements.	N/A	N/A
Time	Set based on site requirements.	N/A	N/A
Password	The password can be changed.	000001	N/A
password complexity check	If the password complexity check is disabled, the user password is required to be a string of six to eight digits. If the password complexity check is enabled, the password is required to be a string of 6–20 characters and contain at least two types of characters.	Enable	Disable, Enable

Table 4-10 Time zone setting

Item	Description	Setting
Time zone	Set the local time zone.	Set based on site requirements.
City	Set the local city.	Set based on site requirements.

4.2.2.5 Maintenance

On the **System Status** screen, tap the **Maintenance** icon.

Figure 4-8 Maintenance

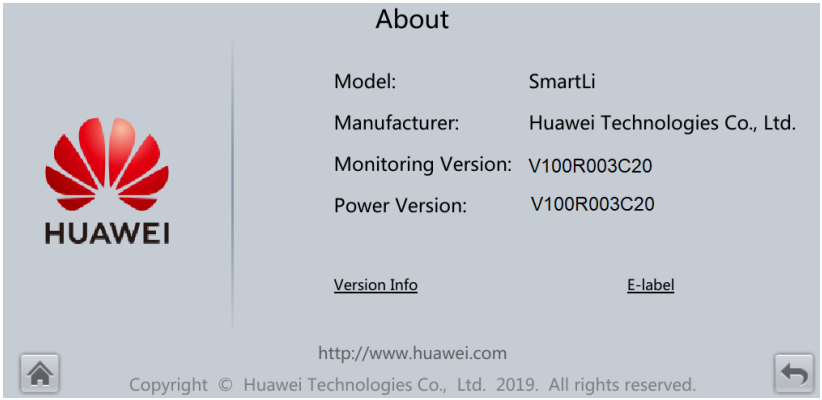
Figure 4-9 USB Operations 1

Figure 4-10 USB Operations 2

4.2.2.6 About

On the **System Status** screen, tap **About**. You can view **Model**, **Manufacturer**, and **Product Version**.

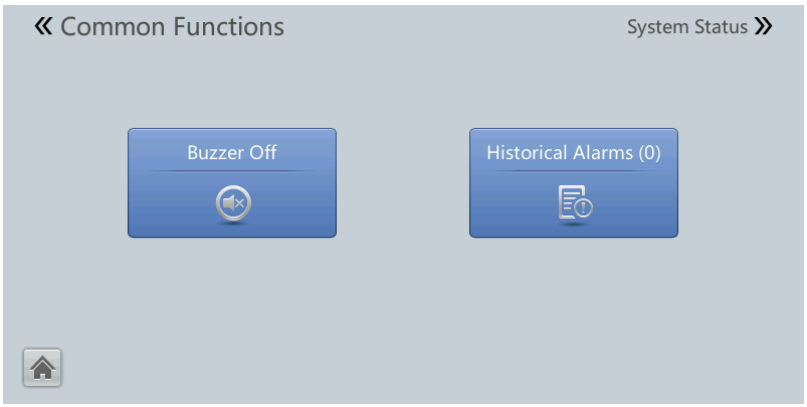
Figure 4-11 About



4.2.3 Common Functions

On the main menu screen, choose **Common Functions**. You can query **Buzzer Off** and **Historical Alarm**.

Figure 4-12 Common Functions

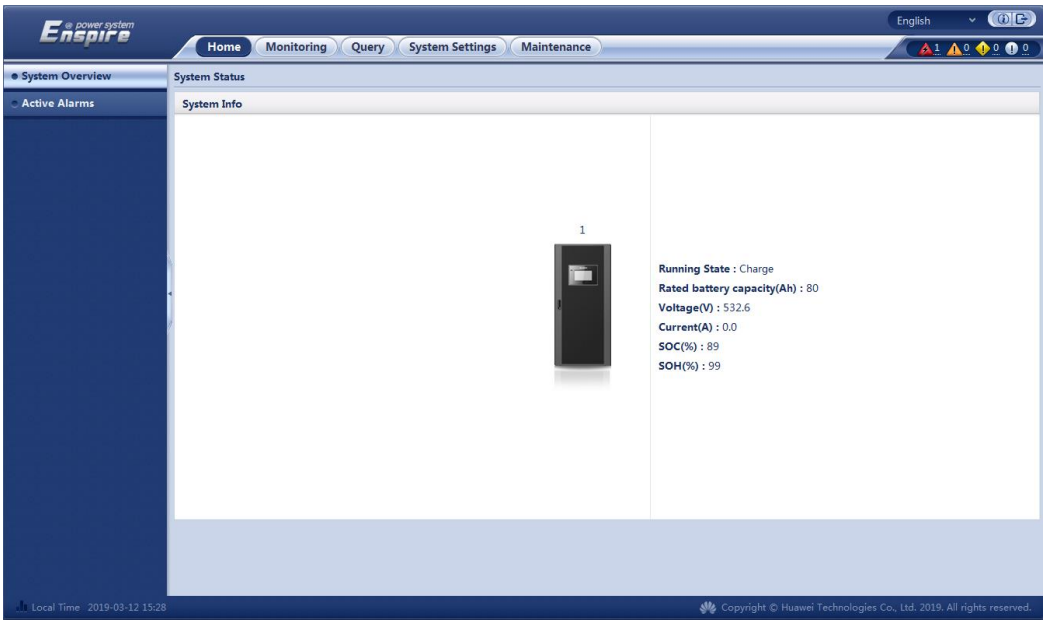


4.3 WebUI

4.3.1 Home

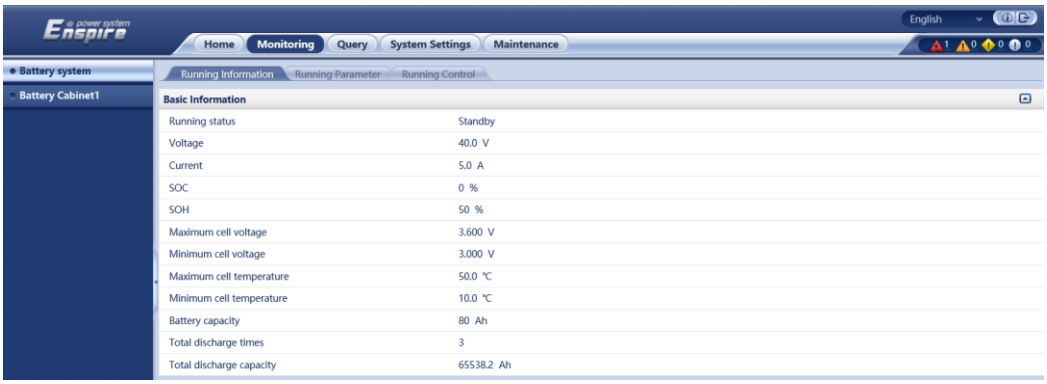
The **Home** page displays **System Status**, **Active Alarm**, and others.

Figure 4-13 Home



4.3.2 Monitoring

Figure 4-14 Monitoring

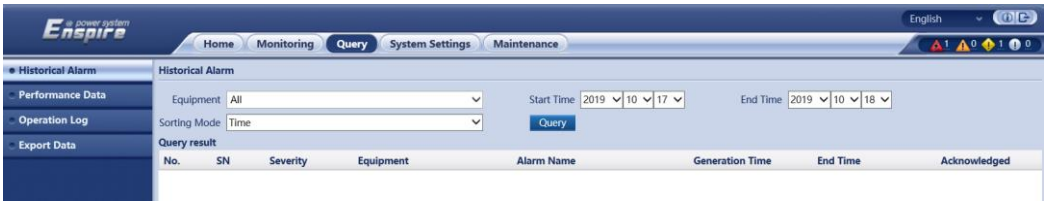


- Running Information: displays the running information about the battery system, battery cabinets, and battery modules.
- Running Parameter: sets system and communications parameters.
- Running Control: clears faults.

4.3.3 Query

On the home page, choose the **Query** tab. The historical queries include **Historical Alarm**, **Performance Data**, **Operation Log**, and **Export Historical Data**.

Figure 4-15 Query



4.3.4 System Settings

On the home page, choose the **System Settings** tab. The system settings include **Site Configuration**, **Time**, **IP Address**, **Configuration File**, and **SNMP**.

Figure 4-16 System Settings

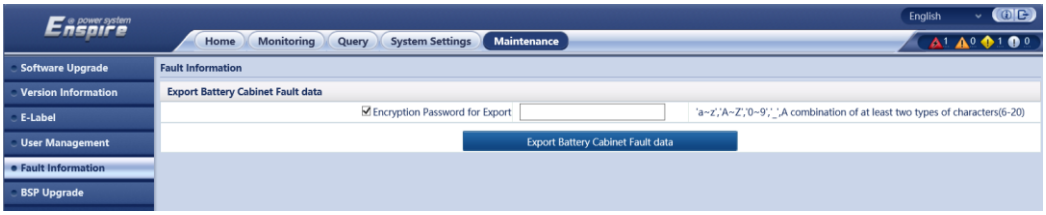
4.3.5 Maintenance

NOTE

Non-professional engineers should exercise caution when operating the maintenance page.

On the homepage, choose the **Maintenance** tab. The maintenance functions include **Software Upgrade**, **Version Information**, **E-Label**, **User Management**, and **Fault Information**.

Figure 4-17 Maintenance



5 Operations

5.1 Powering On Batteries

Prerequisites

- Turn on the ready switch on the battery management module.
- When the UPS is in normal mode, ensure that the UPS is running stably before turning on the battery circuit breaker on the SmartLi.

Procedure

Step 1 On the UPS LCD screen, set **System Info** > **Settings** > **Battery Settings** > **Battery Type** to **Lithium battery**.

NOTICE

- Upgrade the UPS software to the version that supports lithium battery connection. See *UPS5000 The Relationship of Software Version* to check the version number.
- **Thres. of low batt. volt. over dry contact (V/cell)**: If you set **Batt. Volt. Below Threshold** for an output dry contact and the battery voltage is lower than this threshold, the output dry contact will output signals accordingly.

Step 2 Press and hold the POWER ON/OFF button on the battery management module for more than 2s. The green indicator of the battery management module blinks at 4 Hz.

NOTICE

- The **BCB off** alarm is displayed on the UPS LCD and SmartLi LCD. No action is required. After the battery circuit breaker is closed, the alarm is automatically cleared.
- After the battery management module is started, the green indicator is on for 1s and then off for 4s, and the yellow indicator is steady on.
- If multiple SmartLi cabinets are combined, press and hold the POWER ON/OFF button on the battery management module of the master cabinet for more than 2 seconds to power on the master cabinet. Then, power on slave cabinets one by one in the same way.

Step 3 Set the language, time, date, network parameters, and system parameters on the **Settings Wizard** screen.

Figure 5-1 Settings wizard

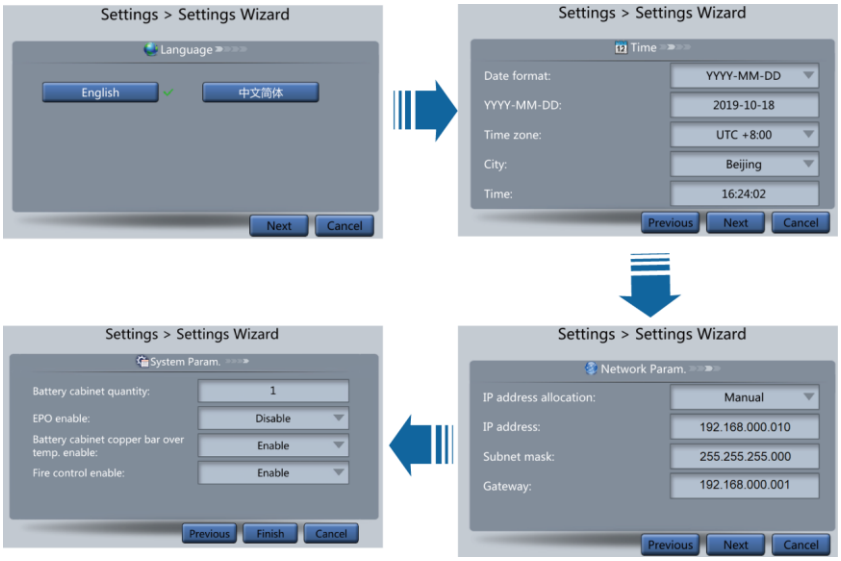


Table 5-1 System Param.

Item	Description	Default Value	Value Range
Battery cabinet quantity	Specifies the total number of combined cabinets.	1	1–8
EPO enable	EPO (emergency power-off) is performed only when this parameter is enabled and the EPO switch is triggered. When **EPO detection** is changed from **Disable** to **Enable**, check that the EPO cable is connected correctly.	Disable	Disable, Enable
Battery cabinet copper bar over	If this parameter is set to **Enable**, an alarm is reported when the	Enable	Disable, Enable

Item	Description	Default Value	Value Range
temp. enable	copper bar is overheated.		
Fire control enable	If this parameter is set to **Enable**, an alarm is reported after the fire extinguishing action is triggered.	Enable	Disable, Enable

Step 4 After the green indicator of the battery management module blinks at 10 Hz, turn on the battery circuit breaker on the SmartLi.

NOTICE

- If the green indicator of the battery management module blinks at 10 Hz, you cannot start the UPS in cold mode.
- If the green indicator of the battery management module blinks at 1 Hz or is steady on, you can start the UPS in cold mode.

Step 5 When multiple SmartLi cabinets are combined.

1. If the green indicator of one battery management module blinks at 10 Hz, turn on the battery circuit breaker on any SmartLi.

NOTICE

In this case, the green indicators of all battery management modules are on for 1s and then off for 4s, you cannot turn on the battery circuit breakers on other SmartLi cabinets or start the UPS in cold mode.

2. After the green indicators of other battery management modules blink at 10 Hz, turn on the battery circuit breaker on the SmartLi where the battery management module blinks at 10 Hz one by one.

----End

5.2 Powering Off Batteries

Procedure

Step 1 Switch off the battery circuit breakers. (Perform this operation for multiple SmartLi cabinets one by one.)

Step 2 Press and hold the POWER ON/OFF button on the battery management module for more than 5s. (Perform this operation for multiple SmartLi cabinets one by one.)

NOTICE

If batteries are powered off and will not be charged for more than a month, remove the battery management module.

----End

5.3 Performing EPO

NOTICE

- After EPO is triggered, there is no SmartLi output.
- After EPO is triggered, the system reports a **Battery cabinet shutdown** alarm.

Press the external EPO switch that connects to the dry contact card or remove the 4-pin terminal on the EPO port of the dry contact card of the bypass unit.

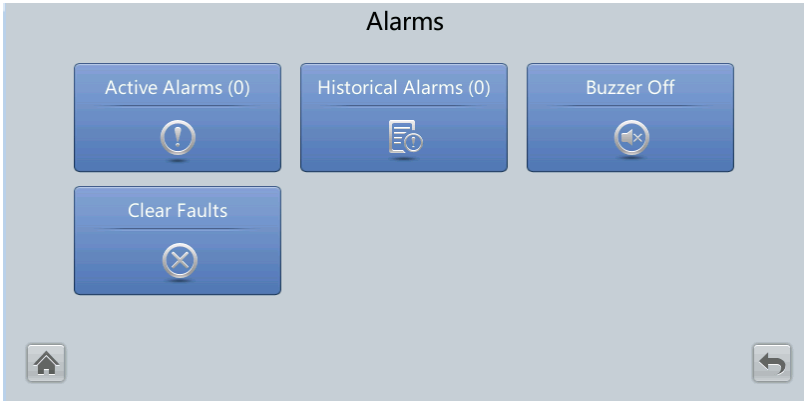
5.4 Clearing the EPO State

Procedure

Step 1 Clear the EPO state. Ensure that the EPO button connected to the external EPO is not in the EPO state.

Step 2 On the LCD screen, choose **Alarms** > **Clear Faults**. In the displayed dialog box, tap **Yes**. The **Battery cabinet shutdown** alarm is cleared successfully.

Figure 5-2 Clearing faults



Step 3 View active alarms and ensure that the **Battery cabinet shutdown** alarm has disappeared from the alarm list.

----End

5.5 Adding a SmartLi

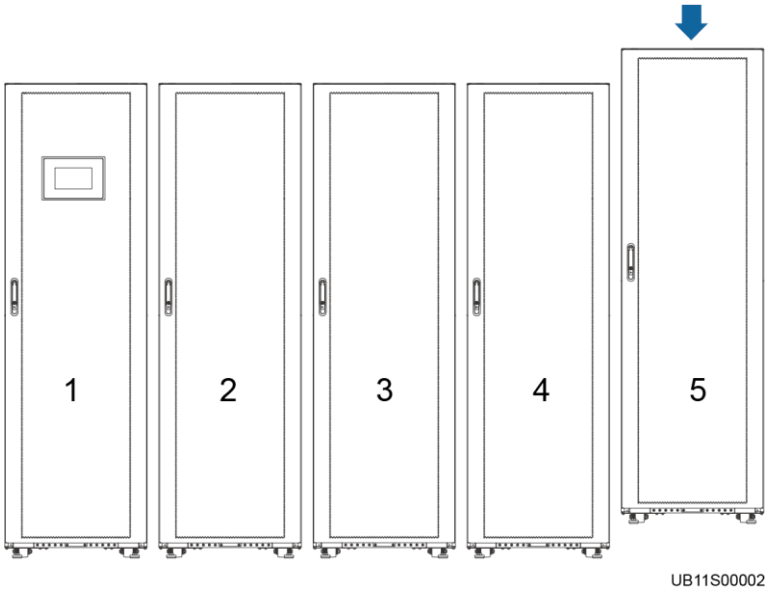
Prerequisites

For online capacity expansion, you need to configure an external circuit breaker to control the battery loop.

Context

This section describes how to add a SmartLi to four cabinets in parallel.

Figure 5-3 Adding a SmartLi



Procedure

Step 1 Install the new SmartLi.

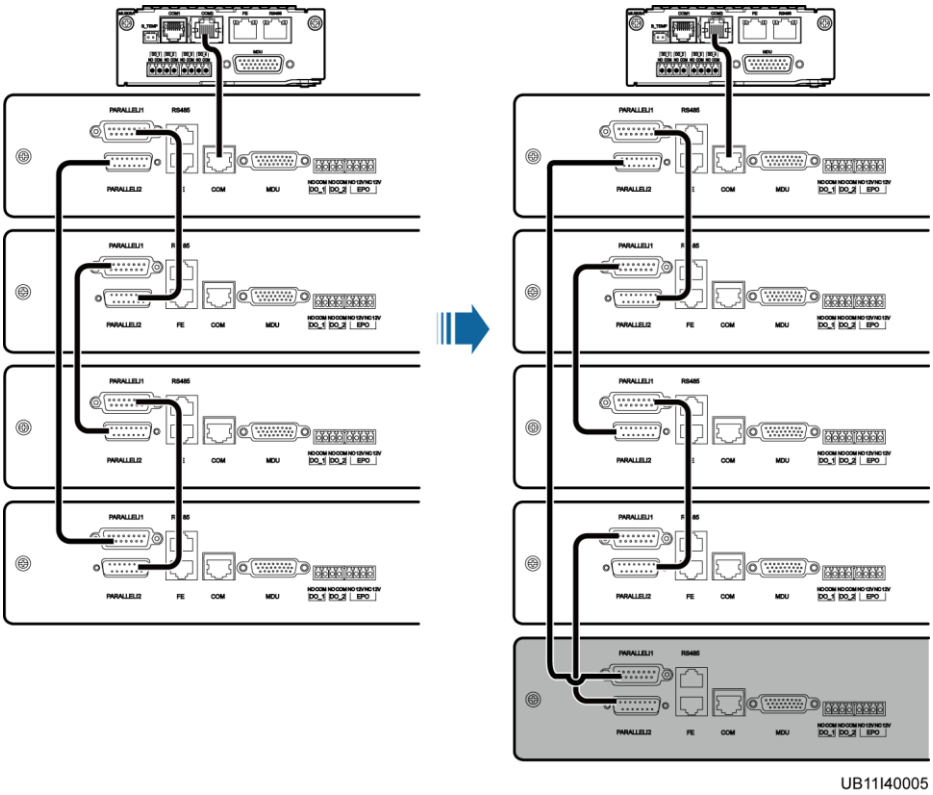
Step 2 Remove the terminal of parallel port 1 on SmartLi 4 and connect the terminal to parallel port 1 on SmartLi 5.

NOTE

On the monitoring module, **PARALLEL1** is above **PARALLEL2**.

Step 3 Connect parallel port 1 on SmartLi 4 to parallel port 2 on SmartLi 5.

Figure 5-4 Connecting control cables



Step 4 On the home screen, choose **Settings > System Settings**, and set **Battery cabinet quantity** to **5**.

NOTE

In this case, the **Cabinet quantity mismatch** alarm is generated.

Step 5 Power on the new SmartLi by referring to section "5.1 Powering On Batteries".

NOTICE

After pressing and holding the POWER ON/OFF button on the battery management module of the new SmartLi for more than 2s, you need to confirm that the **Cabinet quantity mismatch** alarm is cleared before turning on the battery circuit breaker.

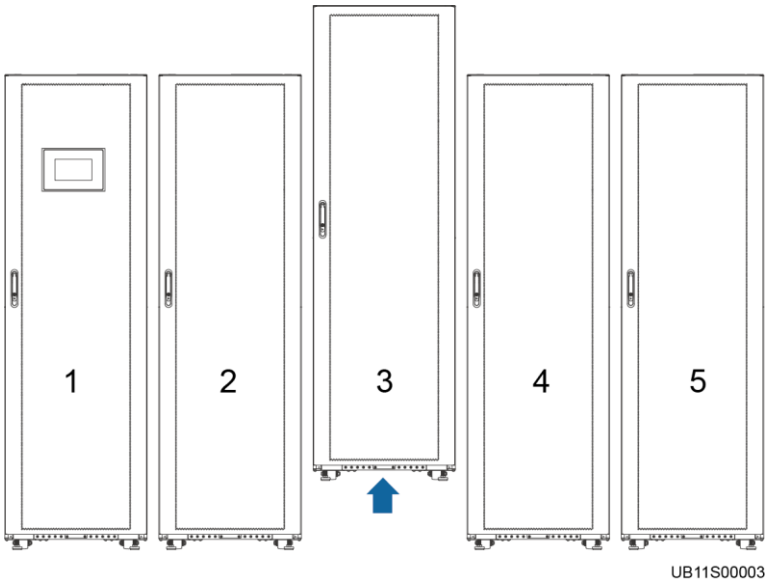
----End

5.6 Removing a SmartLi

Context

This section describes how to remove a SmartLi by using five cabinets in parallel as an example. The original system consists of five combined cabinets. Now, you need to remove SmartLi 3.

Figure 5-5 Removing a SmartLi



Procedure

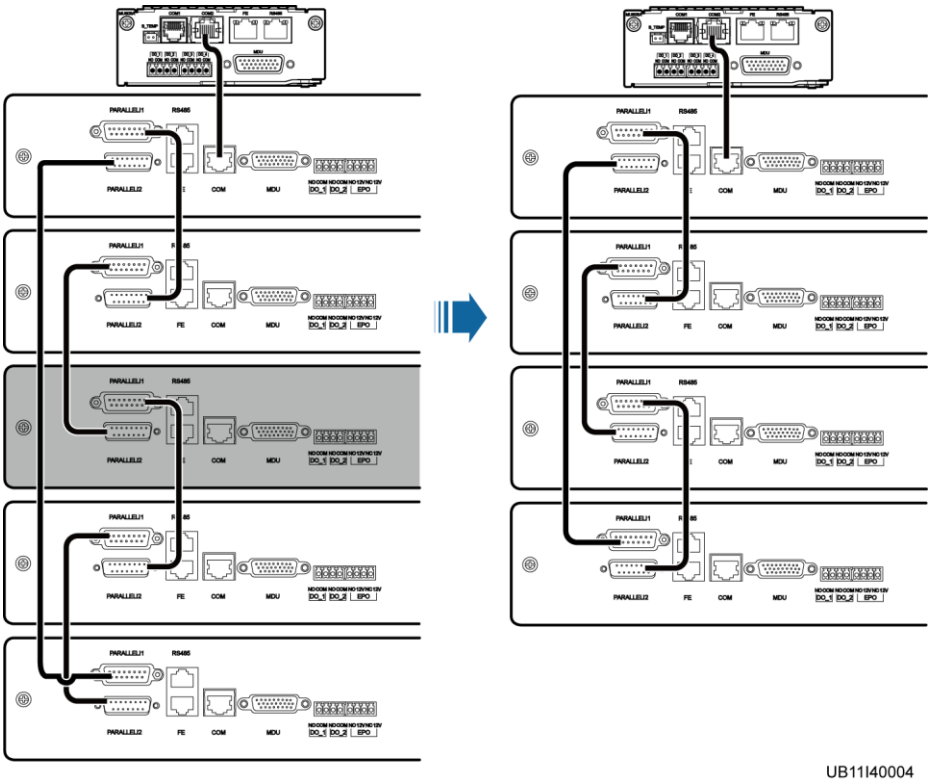
Step 1 Turn off the battery circuit breaker on SmartLi 3.

Step 2 Press and hold the POWER ON/OFF button on the battery management module of SmartLi 3 for more than 5s.

Step 3 Remove the parallel cable between SmartLi 3 and SmartLi 4.

Step 4 Remove the terminal from parallel port 2 on SmartLi 3 and connect the terminal to parallel port 2 on SmartLi 4.

Figure 5-6 Removing control cables



Step 5 On the home screen, choose **Settings > System Settings**, and set **Battery cabinet quantity** to **4**.

----End

5.7 Testing Batteries

5.7.1 Shallow Discharge Test

NOTICE

Before performing a shallow discharge test, ensure that:

- The UPS is working in normal mode; float charging or hibernation has lasted for 2 hours after the state of charge (SOC) reaches 100%; and the load ratio fluctuation is less than 10%.
- The UPS generates no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
- The mains, batteries, charger, and discharger are normal. No overload alarm is generated.
- The SmartLi has generated no alarms related to lithium batteries.

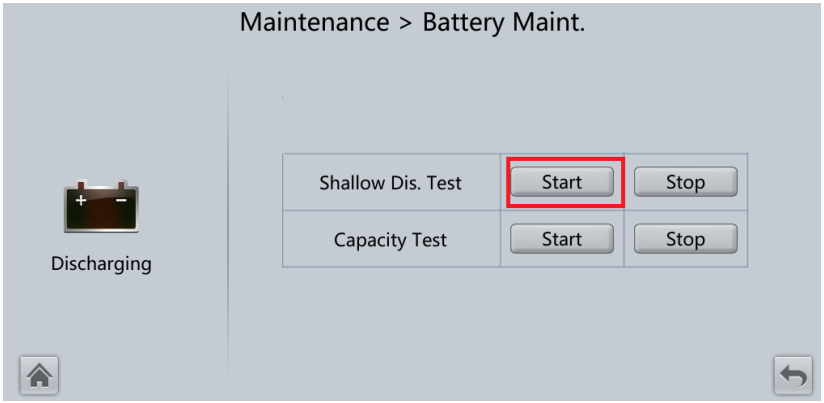
Automatic Shallow Discharge Test

1. On the home screen of the UPS LCD, choose **System Info** > **Settings** > **Battery Settings** and set **Sched. shallow dis. test** to **Enable**.
2. Set **Sched. shallow dis. test time** and **Sched. shallow dis. test interval** as required. After setting is complete, the system will perform automatic shallow discharge tests based on the settings.

Manual Shallow Discharge Test

1. On the home screen of the UPS LCD, choose **System Info** > **Maintenance** > **Battery Maint**.
2. Tap **Start** next to **Shallow Dis. Test** to start a shallow discharge test.

Figure 5-7 Starting a shallow discharge test



NOTE

When the battery test is complete, the test data is used as common test data. Record the data obtained from the latest five tests.

The shallow discharge test automatically stops in any of the following cases:

- The battery discharge capacity reaches the specified value (10%–50%, 20% by default).
- The discharge voltage reaches the warning threshold (calculated in real time).
- The load ratio fluctuation exceeds 10%.
- An alarm is generated.

5.7.2 Capacity Test

Context

NOTICE

Before a capacity test, ensure that:

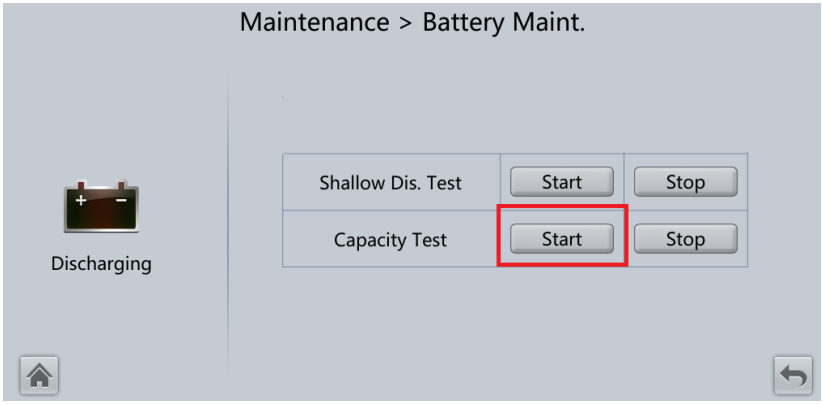
- The UPS is working in normal mode; float charging or hibernation has lasted for 2 hours after the state of charge (SOC) reaches 100%; and the load ratio fluctuation is less than 10%.
- The UPS has generated no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
- The mains, batteries, charger, and discharger are normal. No overload alarm is generated.
- The SmartLi has generated no alarms related to lithium batteries.

Procedure

Step 1 On the home screen of the UPS LCD, choose **System Info** > **Maintenance** > **Battery Maint**.

Step 2 Tap **Start** next to **Capacity Test** to start a capacity test.

Figure 5-8 Starting a capacity test



NOTE

The capacity test automatically stops in any of the following cases:

- The minimum cell voltage reaches 2.65 V.
- The load fluctuation exceeds 10%.
- An alarm is generated.

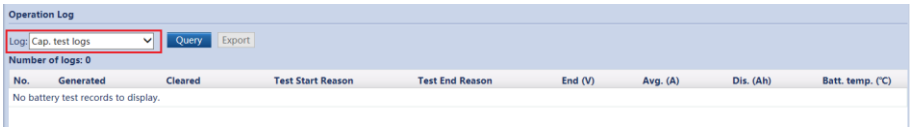
The test is complete when the minimum cell voltage reaches 2.65 V. A maximum of recent 36 capacity test records can be saved.

----End

5.7.3 Test Data Download

1. On the UPS WebUI, choose **Query** > **Operation Log**, choose logs that need to be queried from the **Log** drop-down list box, and click **Query**.

   Figure 5-9 Operation Log

2. Choose logs that have been queried from the **Log** drop-down list box, and click **Export**.

6 Routine Maintenance

- Before installing batteries, read through the battery user manuals and pay attention to safety precautions and connection methods.
- Before battery maintenance, get the tools, such as handles, insulated.
- Keep the battery switch off when installing or maintaining the batteries.
- Before installing and maintaining the battery modules, remove the battery management module, and reinstall the battery management module after the installation or maintenance is complete.
- When moving batteries, handle batteries gently, and pay attention to personal safety.
- Never use any organic solvent to clean batteries.
- Never smoke or have an open flame around batteries.
- After battery discharge, charge the battery in time to maintain a good service life.
- Only professionals are allowed to perform the maintenance tasks.

Table 6-1 Routine maintenance

Maintenance Interval	Check Item	Handling Measures
Monthly	Operating environment	Keep the SmartLi far away from heat sources and avoid direct exposure to sunlight.
	Appearance	If a battery module experiences damage, leakage, or deformity, disconnect, take pictures, and then replace the battery module.
	Checking the pressure gauge	If the pointer is in the red zone, contact Huawei technical support.
Quarterly	Cleanliness	Clean the battery module exterior using cotton cloth. Exercise caution when cleaning a battery module because its voltage is high.
	Connection	Check the bolt at every terminal and tighten any loose bolt. If cable temperature exceeds 40°C (feels hot), locate the cause.
Yearly	Voltage	• Measure and record the busbar voltage, and the positive and negative voltages of the

Maintenance Interval	Check Item	Handling Measures
		SmartLi when charging is about to complete. Ensure that the voltages are the same. If the voltages are different, check for cable faults and rectify them. • In the first year, collect real-time data when discharging is about to complete at least once every six months. • From the second year, check the capacity quarterly.

7 Troubleshooting

CAUTION

Do not clear alarms by reinstalling modules.

Table 7-1 Troubleshooting

Case	Symptom	Possible Cause	Measure
Battery module abnormal	The indicator of the battery module is red or off.	The battery module is faulty.	Replace the battery module.
		The communications cable to the battery module is not connected.	Reconnect the communications cable.
Battery management module abnormal	The indicator is yellow or red.	The battery cabinet generates a minor alarm.	Handle the alarm according to the alarm reference.
		The battery cabinet generates a critical alarm.	

NOTE

For details about component replacement and maintenance involved in Troubleshooting and Alarm List, consult Huawei maintenance engineers.

8 Replacing Parts

NOTICE

Before transporting or moving a cabinet, remove battery modules.

8.1 Replacing the MDU

Prerequisites

- Tools: Phillips screwdriver, key to the cabinet door
- Materials: a new and intact MDU

NOTICE

- The MDU can be replaced online without cutting off the power supply to the SmartLi.
- Before the replacement, ensure that the load services are not affected or obtain written consent from the customer.

Procedure

Step 1 Remove the communications cable from the MDU and mark the connection position.

Step 2 Remove the four screws from the MDU using the Phillips screwdriver and set them aside.

Step 3 Hold the MDU front panel by one hand, and push out the MDU from the fastener on the front panel by the other hand.

Step 4 Install the new MDU and secure it.

Step 5 Reinstall the communications cable to the new MDU.

Step 6 After replacement and during startup, the MDU automatically checks whether its configurations are consistent with the rack configuration. If inconsistent, the MDU displays a synchronization dialog box.

- If you click **OK**, the configurations will be synchronized, and the MDU automatically restarts.
- If you click **Cancel** (not recommended), the configurations will not be synchronized, and the MDU displays the same dialog box during the next startup.

NOTE

If the **Version incompatible** alarm is generated, you need to upgrade the version before turning on the battery circuit breaker.

----End

8.2 Replacing the Battery Management Module

Prerequisites

- Tools: Phillips screwdriver, key to the cabinet door
- Materials: a new and intact battery management module
- The SmartLi is not discharging.

NOTICE

Before the replacement, ensure that the load services are not affected or obtain written consent from the customer.

Procedure

Step 1 Turn off the battery circuit breaker. Press and hold down the POWER ON/OFF button on the battery management module for more than 5s to power off the cabinet.

Step 2 Turn off the ready switch on the battery management module.

Step 3 Remove the bolts that secure the battery management module and pull out the battery management module.

Step 4 Install the new battery management module and secure it.

Step 5 Turn on the ready switch on the battery management module.

Step 6 Press and hold the POWER ON/OFF button on the battery management module for more than 2s. The green indicator of the battery management module blinks at 4 Hz.

NOTICE

If the **Version incompatible** alarm is generated, you need to upgrade the version before turning on the battery circuit breaker.

Step 7 After the green indicator of the battery management module blinks at 10 Hz, turn on the battery circuit breaker on the SmartLi.

----End

8.3 Replacing the Battery Module

Prerequisites

- Tools: Phillips screwdriver, insulated socket wrench, insulation gloves, key to the cabinet door
- Materials: a new and intact battery module
- The SmartLi is not discharging.

NOTICE

Before the replacement, ensure that the load services are not affected or obtain written consent from the customer.

Procedure

Step 1 Turn off the battery circuit breaker. Press and hold down the POWER ON/OFF button on the battery management module for more than 5s to power off the cabinet.

Step 2 Turn off the ready switch on the battery management module.

Step 3 Remove the bolts that secure the battery management module and pull out the battery management module for about 10 cm.

Step 4 Remove the front covers from the faulty battery module, the battery modules below and above the faulty one.

NOTE

If the faulty battery module is at the top or bottom, you need to remove the front covers from the faulty battery module, the battery module below or above the faulty one.

Step 5 Remove the cables and copper bars that are connected to the faulty battery module.

Step 6 Remove the battery baffle plate and pull out the faulty battery module.

Step 7 Install the new battery module and secure the baffle plate.

Step 8 Reinstall the cables, copper bars, and front covers to the battery modules.

Step 9 Reinstall the battery management module and turn on the ready switch.

Step 10 Press and hold the POWER ON/OFF button on the battery management module for more than 2s. The green indicator of the battery management module blinks at 4 Hz.

NOTICE

If the **Version incompatible** alarm is generated, you need to upgrade the version before turning on the battery circuit breaker.

Step 11 After the green indicator of the battery management module blinks at 10 Hz, turn on the battery circuit breaker on the SmartLi.

----End

8.4 Upgrade Software

NOTICE

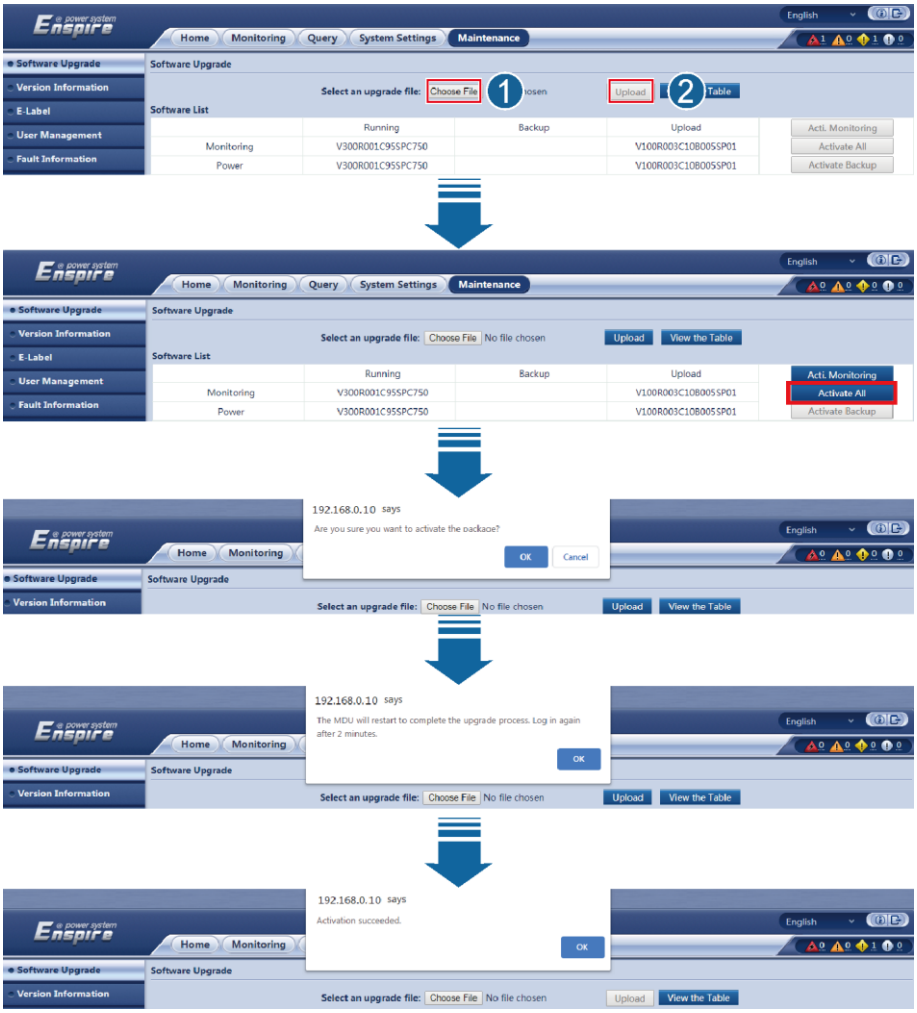
- If a **Version incompatible** alarm is generated during the replacement of the MDU, battery module, or battery management module, upgrade the software version.
- Ensure that the software of the required version is available before upgrading the software.
- When upgrading the software on the LCD, save the software to a USB flash drive and connect it to the USB port on the MDU.
- When upgrading the software on the WebUI, save the software to a portable computer and log in to the WebUI.
- Perform the upgrade when the system is not in discharge state and the BCB status is the same (all are closed or open).
- Before the upgrade, ensure that the load services are not affected or obtain written consent from the customer.

WebUI

Choose **Maintenance** > **Software Upgrade**, select **Choose File**, find the correct package in the corresponding path, and click **Upload**. After the upload is complete, choose **Activate All** in the **Software List** and perform operations as prompted.

Figure 8-1 Uploading and activating the software (the BCB switches of all battery cabinets are ON)

Figure 8-2 Uploading and activating the software (the BCB switches of all battery cabinets are OFF)



NOTE

The system starts the upgrade process. The upgrade sequence is MDU, battery cabinet 1, battery cabinet 2, ..., and battery cabinet *N*. The upgrade progress percentage is displayed in the corresponding **Status** column. During the MDU upgrade, the message **The MDU will restart to complete the upgrade process. Log in after 2 minutes.** is displayed. Click **OK**. The MDU will restart to complete the upgrade task. Wait for about 2 minutes and log in to the WebUI again.

LCD

Choose **Maintenance** > **USB Operations** > **Upgrade Software**, tap **Upload** and find the correct package in the corresponding path. After the upload is complete, tap **Details**. On the screen displayed, select **All**, tap **Activate**, and perform operations as prompted.

Figure 8-3 Uploading and activating the software (the BCB switches of all battery cabinets are ON)

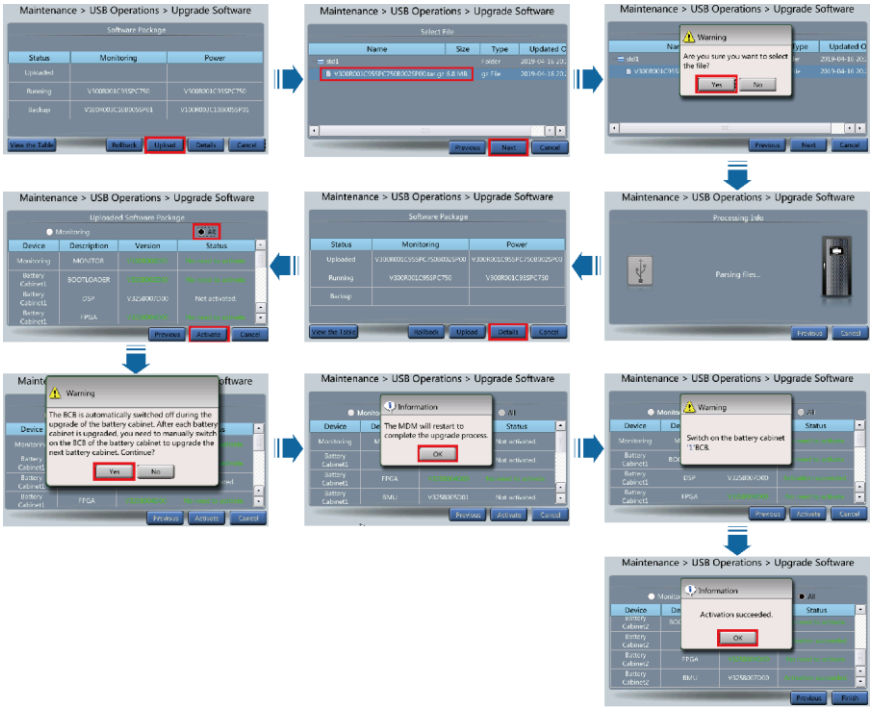
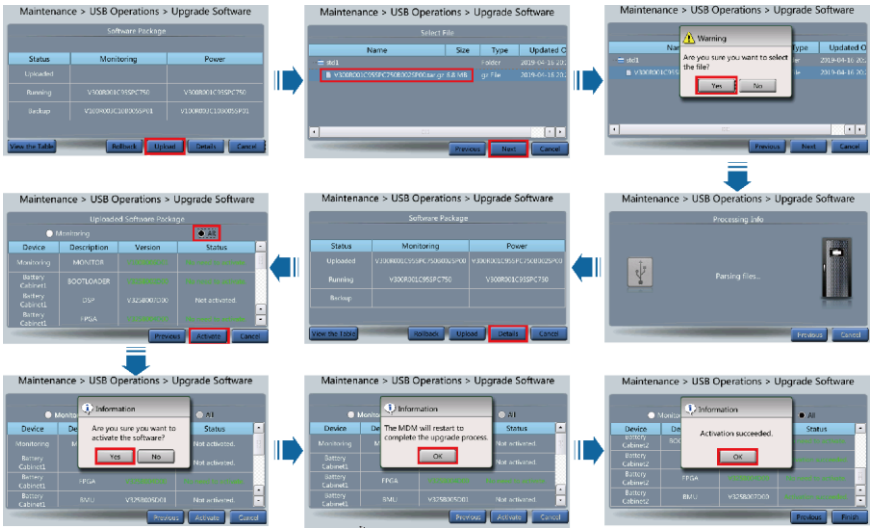


Figure 8-4 Uploading and activating the software (the BCB switches of all battery cabinets are OFF)



8.5 Replacing a Fire Cylinder

Prerequisites

- Tools: insulated socket wrench, insulation gloves, Phillips screwdriver, key to the cabinet door, torque wrench, pipe cutter, and pipe holder
- Materials:
  - Check the fire cylinder and all components for any damage, abrasion, or corrosion. If there is any visible abrasion or corrosion, replace the damaged components and all corroded components.
  - Check that the valve is closed (vertical to the cylinder).
  - Fill the fire cylinder with extinguishant. The recommended extinguishant is heptafluoropropane or perfluorohexanone.

NOTICE

Before the replacement, ensure that the load services are not affected or obtain written consent from the customer.

Procedure

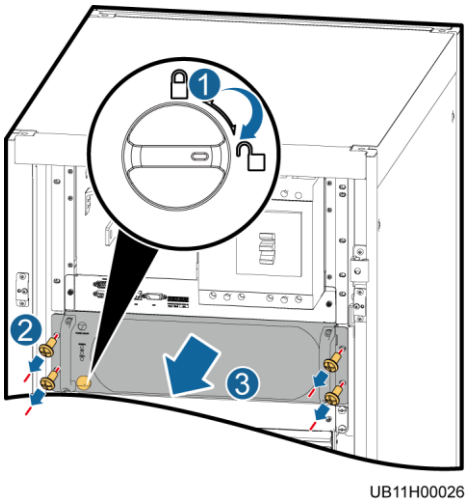
Step 1 Check the fire cylinder.

- Check that the valve is closed (vertical to the cylinder).
- Check that the reading of the pressure gauge on the fire cylinder is greater than 1.6 MPa and that the pointer is in the green zone.

Step 2 Open the front door of the cabinet and switch off the battery circuit breaker. Press and hold down the POWER ON/OFF button on the battery management module for more than 5s to power off the cabinet.

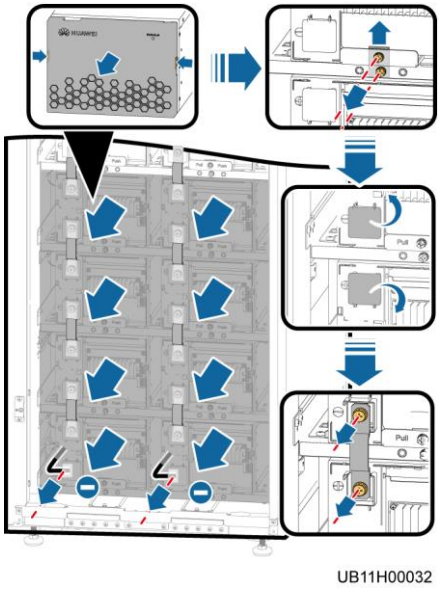
Step 3 Turn off the ready switch on the battery management module, remove the bolts that secure the battery management module, and pull out the module for about 10 cm.

Figure 8-5 Pulling out the battery management module



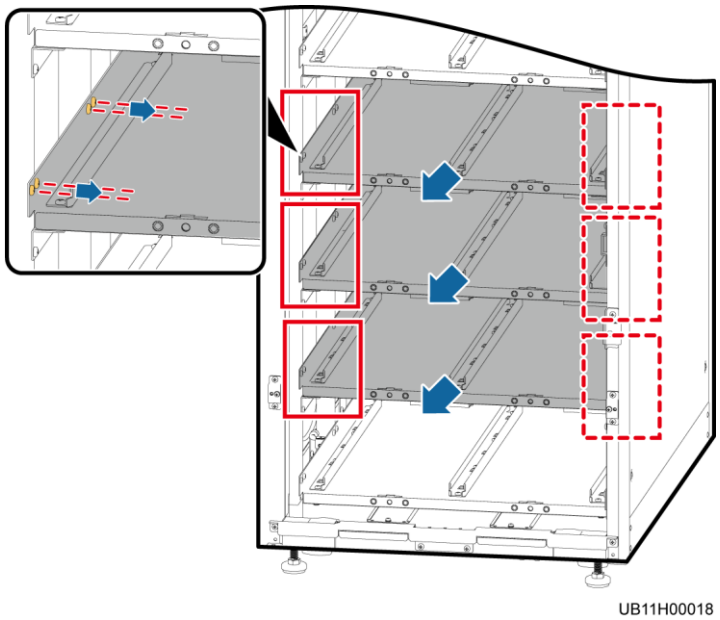
Step 4 Remove the battery modules, copper bars, and cables from the lower four layers.

Figure 8-6 Removing the battery modules



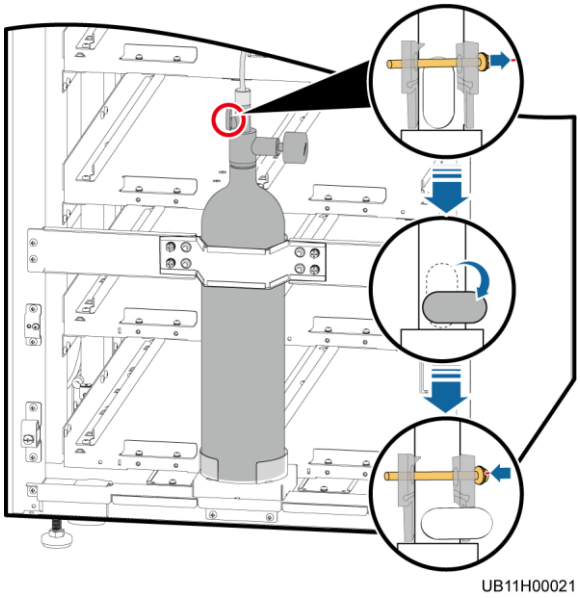
Step 5 Remove the battery trays from the lower second, third, and fourth layers.

Figure 8-7 Removing the battery trays



Step 6 Remove the positioning kit, close the valve, reinstall the positioning kit, and secure it.

Figure 8-8 Closing the valve



Step 7 Remove the fire cylinder.

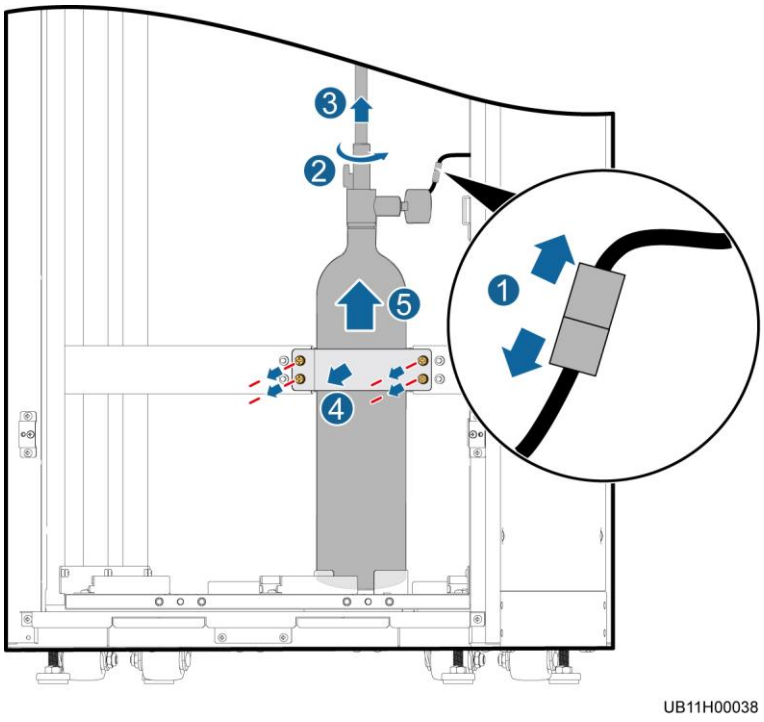
1. Remove the terminals interconnecting the dry contact cable of the fire cylinder and the cable reserved on the side of the cabinet.
2. Remove the connection nut.

NOTICE

The fire-trace tube may contain high-pressure extinguishant. Loosen the connection nut slowly; otherwise, extinguishant may be released unexpectedly.

3. Remove the fire-trace tube.
4. Remove the fire cylinder fastener.
5. Take out the fire cylinder.

Figure 8-9 Removing the fire cylinder



Step 8 Install a new fire cylinder. Keep it upright.

Step 9 Install the fire-trace tube on the fire cylinder.

NOTICE

Do not bend or twist the fire-trace tube or bind the tube using cable ties. Otherwise, the fire cylinder may fail.

1. Cut off the end of the fire-trace tube evenly.

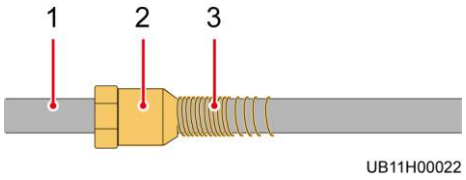
NOTICE

- Ensure that the wall thickness at the end of the fire-trace tube is consistent.
- Ensure that the fire-trace tube, threaded nozzle, and end adapter are clean and free of dust.

Figure 8-10 Cutting off the end of the fire-trace tube

2. Remove the connection nut and riser screw thread from the top of the fire cylinder, and route the nut and riser screw thread through the fire-trace tube.

Figure 8-11 Routing the nut and riser screw thread through the fire-trace tube



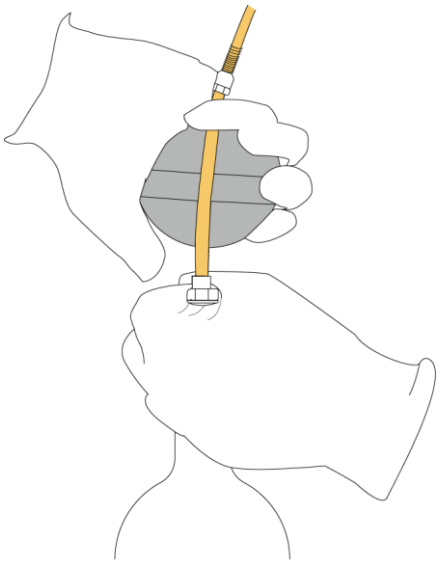
(1) Fire-trace tube (2) Connection nut (3) Riser screw

3. Clamp the end of the fire-trace tube to the threaded nozzle using a pipe holder.

NOTICE

Hold the pipe holder close to the end to avoid bending the tube during pipe insertion.

Figure 8-12 Install a fire-trace tube



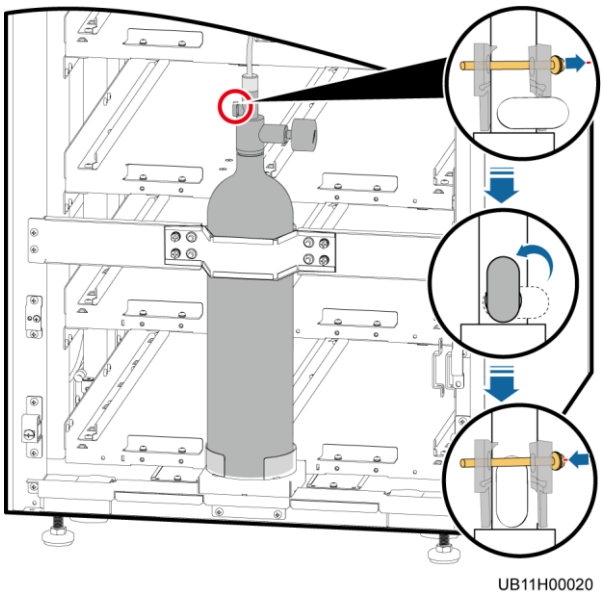
4. Tighten the connection nut to 7 N·m using an adjustable torque wrench.

Step 10 Remove the valve positioning kit, open the valve, reinstall the positioning kit, and secure it.

NOTICE

Slowly open the valve. To avoid unexpected blowout, do not quickly open the valve.

Figure 8-13 Opening the valve



Step 11 Interconnect the dry contact cable of the fire cylinder and the cable reserved on the side of the cabinet.

Step 12 Check the end pressure gauge on the front of the cabinet. The pointer should be in the green zone and the pressure reading should be greater than 1.6 MPa. Record the reading of the pressure gauge. 8 hours later, observe the pressure gauge again. The pressure reading should remain unchanged.

Step 13 Reinstall the battery modules, baffle panels, copper bars, cables, and front panel in sequence.

Step 14 Reinstall the battery management module.

Step 15 Press and hold the POWER ON/OFF button on the battery management module for more than 2s. The green indicator of the battery management module blinks at 4 Hz.

Step 16 After the green indicator of the battery management module blinks at 10 Hz, switch on the battery circuit breaker on the SmartLi.

----End

9 Technical Specifications

Table 9-1 Physical specifications

Item	Specifications
Cabling	Cables can be routed in and out from the top.
IP rating	IP20
Dimensions (H x W x D)	2000 mm x 600 mm x 850 mm
Communication	Supports RS485 and FE.
Weight	< 800 kg
Circuit breaker specifications	690 V AC/750 V DC, 500 A, 4P
Fuse specifications	Each battery string is configured with an 800 V DC 250 A fuse.

Table 9-2 Environmental specifications

Item	Specifications
Operating temperature	0°C–40°C
Storage temperature	0°C–40°C
Relative humidity	5%–95% RH (non-condensing)
Altitude	0–1000 m When the altitude is greater than 1000 m but less than 4000 m, the rated power should be derated. For details, see the IEC62040-3.

Table 9-3 Safety and EMC

Item	Specifications

Item	Specifications	
Safety compliance	CE	EN62619 EN62040-1
	CB	IEC62619 IEC62040-1
Electromagnetic compatibility (EMC)	Conducted emission	EN/IEC62040-2
	Radiated emission (RE)	EN/IEC62040-2
	Low-frequency signal interference	IEC61000-2-2
	Electrostatic discharge immunity	IEC61000-4-2
	Conducted susceptibility	EN/IEC62040-2 EN/IEC61000-4-6
	Radiated susceptibility	EN/IEC62040-2 EN/IEC61000-4-3
	Electrical fast transient (EFT)	EN/IEC62040-2 IEC61000-4-4
	Surge protection	EN/IEC62040-2 IEC61000-4-5
	Power frequency magnetic field	IEC61000-4-8

Table 9-4 Electrical specifications

Item	Full-Capacity Cabinet Configuration	Half-Capacity Cabinet Configuration
Rated voltage	512 V (3.2 V/cell)	
Charge voltage	544 V (3.4 V/cell)	
Rated capacity	80 Ah	40 Ah
Energy	40.96 kWh	20.48 kWh
Charge current	≤ 80 A, 40 A by default (The actual charge current depends on the UPS charge capability.)	≤ 40 A, 20 A by default (The actual charge current depends on the UPS charge capability.)
Rated discharge current	480 A	240A
Battery neutral wire connected	Supported	

Item	Full-Capacity Cabinet Configuration	Half-Capacity Cabinet Configuration
Battery neutral wire not connected	Supported	
Parallel system	The SmartLi supports a maximum of eight cabinets connected in parallel.	
Number of battery modules	16	8

A Alarm List

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
0612-1	Battery module fault	Critical	• The sampling connecter is not firmly connected. • The board sampling circuit of the battery module is faulty. • The battery module is faulty.	Replace the faulty battery module.
0612-2	Battery module fault	Critical	• The sampling connecter is not firmly connected. • The board sampling circuit of the battery module is faulty. • The battery module is faulty.	Replace the faulty battery module.
0021-5	Battery EOD	Critical	The battery voltage reaches the EOD threshold due to continuous discharge.	1. Check the status of the battery cabinet and turn on the BCB switch. 2. Check the mains and charge batteries in a timely manner.
0024-2	Battery undertemperature	Minor	The cell temperature is too low.	Take measures to increase the ambient temperature.
0023-2	Battery overtemperature	Minor	The cell temperature is too high.	Take measures to reduce the ambient temperature.
0025-2	Battery overvoltage	Minor	The cell voltage is too high.	1. Check the UPS status. 2. Check the lithium battery

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
				cabinet status.
0026-4	Battery undervoltage	Minor	The cell voltage is too low.	Restore the mains input to the UPS and start the charger to charge the battery.
0616-1	Battery undertemperature protection	Critical	The charger temperature is too low.	Take measures to increase the ambient temperature.
0031-2	Battery overtemperature protection	Critical	The battery temperature is too high.	Take measures to reduce the ambient temperature.
0032-3	Battery overvoltage protection	Critical	The voltage of a single cell is too high.	1. Check the UPS status. 2. Check the lithium battery cabinet status.
0617-1	Battery overvoltage protection	Critical	The voltage of a single cell is too high.	1. Check the UPS status. 2. Check the lithium battery cabinet status.
0612-5	Battery module fault	Critical	• The sampling connecter is not firmly connected. • The board sampling circuit of the battery module is faulty. • The battery module is faulty.	Replace the faulty battery module.
0612-6	Battery module fault	Critical	• The sampling connecter is not firmly connected. • The board sampling circuit of the battery module is faulty. • The battery module is faulty.	Replace the faulty battery module.
0612-7	Battery module fault	Critical	• The sampling connecter is not firmly connected. • The board sampling circuit of the battery module is faulty. • The battery	Replace the faulty battery module.

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
			module is faulty.	
0025-3	Battery overvoltage	Minor	The battery voltage reaches the high-voltage alarm threshold.	1. Check the UPS status. 2. Check the lithium battery cabinet status.
0027-2	Battery overcurrent	Minor	The battery charge current reaches the overcurrent alarm threshold.	1. Check the UPS status. 2. Check the lithium battery cabinet status.
0026-5	Battery undervoltage	Minor	• The battery voltage reaches the low-voltage alarm threshold. • The input fuse is blown.	1. Check the mains and charge batteries in a timely manner. 2. Check whether the input fuse is normal.
0027-3	Battery overcurrent	Minor	The battery discharge current reaches the overcurrent alarm threshold.	1. Check whether the UPS is overloaded. 2. Reduce the UPS load to a proper range. 3. Check the lithium battery cabinet status.
0617-2	Battery undervoltage protection	Critical	The battery string overdischarges.	Check the mains, and charge batteries in a timely manner.
0621-3	Battery overcurrent protection	Critical	The battery charge or discharge current reaches the protection threshold.	1. Check whether the load of UPS exceeds the battery configuration. 2. Replace the battery management module.
0032-5	Battery overvoltage protection	Critical	The battery voltage exceeds the overvoltage protection threshold.	1. Check whether the battery voltage is normal. 2. Replace the battery management module.
0620-6	Battery management module fault	Critical	The battery management module is abnormal.	Replace the battery management module.
0620-7	Battery management module fault	Critical	The battery management module is abnormal.	Replace the battery management module.
0620-8	Battery management module fault	Critical	The battery management module is abnormal.	Replace the battery management module.

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
0625-1	Inter-battery cabinet parallel cable alarm	Minor	The communications cable between cabinets is not properly connected.	Check the cable connection of the inter-rack parallel cable.
0635-1	Battery module not detected	Critical	The battery management module does not receive an online query response from the battery module.	1. Check whether the signal terminal of the battery module is properly connected. 2. Replace the battery module.
0619-1	BCB tripping fault	Critical	The BCB box is faulty.	1. Check whether the BCB box runs properly. 2. Check whether the connection between the BCB box and the board is normal.
0362-4	BCB off	Critical	• The BCB switch is turned off. • The BCB switch status signal cable is abnormal.	1. Turn on the BCB switch. 2. Check whether the BCB switch status signal cable is properly connected.
0620-1	Battery management module fault	Critical	The relay of the battery management module is arcing.	Replace the battery management module.
0620-2	Battery management module fault	Critical	The auxiliary power supply of the battery management module is abnormal.	Replace the battery management module.
0620-3	Battery management module fault	Critical	The balanced circuit works abnormally.	Replace the battery management module.
0620-4	Battery management module fault	Critical	The balanced circuit works abnormally.	Replace the battery management module.
0043-14	Abnormal fan	Critical	The fan is abnormal.	Replace the battery management module.
0621-1	Battery overcurrent protection	Critical	The charger of the battery management module is faulty.	Replace the battery management module.
0621-2	Battery overcurrent protection	Critical	• The load exceeds the upper threshold.	1. Check whether the load of UPS exceeds the battery configuration.

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
			• The battery management module is damaged.	2. Replace the battery management module.
0623-1	Battery cabinet EPO	Critical	The emergency shutdown signal of the battery cabinet is activated.	Manually clear the EPO state.
0624-4	Not ready	Critical	The ready switch is not turned off.	Turn on the ready switch.
0620-5	Battery management module fault	Critical	The hardware overtemperature protection signal is valid.	1. Check whether the ambient temperature is too high. 2. Replace the battery management module.
0032-4	Battery overvoltage protection	Critical	• The battery string is abnormal. • The battery management module is abnormal.	1. Check the battery voltage. 2. Replace the battery management module.
0628-1	Abnormal signal board	Critical	The signal transfer board is faulty.	1. Check the cable connection to the signal transfer board. 2. Replace the signal transfer board.
0629-1	Abnormal inter-battery cabinet parallel cable	Critical	The inter-rack parallel system CAN is faulty.	1. Check whether the inter-rack parallel cable is loose. 2. Replace the inter-rack parallel cable. 3. Replace the battery management module or the signal transfer board.
0629-2	Abnormal inter-battery cabinet parallel cable	Critical	• The inter-rack parallel cable is not properly connected. • The 1# battery management module is faulty or the connected 2# battery management module is faulty.	1. Check whether the inter-rack parallel cable is loose. 2. Replace the inter-rack parallel cable. 3. Replace the battery management module or the signal transfer board.

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
0630-1	Abnormal intra-battery cabinet parallel cable	Critical	The intra-rack parallel CAN is faulty.	1. Check whether the cable to the signal transfer board is loose. 2. Replace the parallel cable between the battery module and the signal transfer board. 3. Replace the battery management module or the signal transfer board.
0630-2	Abnormal intra-battery cabinet parallel cable	Critical	The RS485 communications cable in the rack is faulty.	1. Check whether the cable to the signal transfer board is loose. 2. Check whether the signal terminal between the battery modules is properly connected. 3. Replace the parallel cable between the battery module and the signal transfer board. 4. Replace the battery management module or the signal transfer board.
0630-3	Abnormal intra-battery cabinet parallel cable	Critical	The battery management module is not properly connected to the signal transfer board.	1. Check whether the cable between the battery management module and the signal transfer board is loose. 2. Replace the battery management module or the signal transfer board.
0620-9	Battery management module fault	Critical	The intra-rack parallel cable is faulty.	Replace the battery management module.
0631-2	Version incompatible	Critical	The DSP software version does not match the battery management module.	Load the software.
0631-3	Version incompatible	Critical	The FPGA software version does not match the battery management module.	Load the software.
0631-4	Version incompatible	Critical	The battery module software is incompatible.	Load the software.
0631-1	Version incompatible	Critical	The software version does not match the battery management	Load the software.

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
			module.	
0632-1	Lithium battery system communication failure	Minor	The communication between the UPS monitoring unit and the lithium battery is interrupted.	Check the cable between the UPS monitoring unit and the lithium battery.
0174-2	Software package not exist	Critical	The package of the power unit or module does not exist in the monitoring system.	Upload the software packages of the power unit or module and MDU, and activate all the packages.
0246-2	Cabinet quantity mismatch	Minor	The configured number of battery cabinets does not match the actual available number.	1. Set the number of battery cabinets to be the same as the actual number. 2. Check the parallel cable connection.
0633-1	Lithium battery capacity mismatch	Minor	The number of configured UPS modules exceeds the upper limit supported by the lithium battery cabinet.	Reduce the number of UPS modules or add a lithium battery cabinet.
0636-1	Battery module balance alarm	Minor	• There is no enough time for cell balancing. • The cell balancing cable is faulty.	1. Charge batteries for at least 3 days, and then check whether the alarm disappears. 2. Replace the battery module.
0636-2	Battery module balance alarm	Minor	The electrochemical cell temperature consistency is poor.	Replace the battery module.
0620-10	Battery management module fault	Critical	The voltage sampling circuit is faulty.	Replace the battery management module.
0620-11	Battery management module fault	Critical	The current CT sampling circuit is faulty.	Replace the battery management module.
0620-12	Battery management module fault	Critical	• The battery input cable is not connected. • The battery input fuse is	1. Check the battery cable connection. 2. Replace the input fuse. 3. Replace the battery management module.

Alarm ID (Alarm ID-Cause ID)	Alarm Name	Severity	Cause	Solution
			open-circuited. • The battery management module is faulty.	
0021-6	Battery EOD	Critical	The battery voltage reaches the EOD threshold due to continuous discharge.	Check the mains, turn on the BCB switch and charge batteries in time.
0220-3	Abnormal SOH	Minor	The state of health of a battery is abnormal.	1. Fully charge the batteries, and perform a capacity test. 2. Replace the abnormal battery.

B Acronyms and Abbreviations

C	
CE	Conformite Europeenne
E	
EOD	End of discharge
I	
IEC	International Electrotechnical Commission
L	
LCD	Liquid crystal display
M	
MDU	Monitor display unit
N	
NMS	Network management system
P	
PE	Protective earthing
R	
RS485	Recommend Standard 485

S	
SOC	State of charge
SOH	State of health
U	
UPS	Uninterruptible power system

