LUNA2000-4472 Series Smart String ESS

Maintenance Manual

Issue	01
Date	2024-09-30

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About This Document

Purpose

This document describes routine maintenance, common troubleshooting, and parts replacement of the LUNA2000-4472 series Smart String Energy Storage System (ESS). Read this document carefully before maintaining the ESS.

Intended Audience

This document is intended for:

- Technical support 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 (2024-09-30)

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

Contents

1 Safety Information

Statement

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

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

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

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

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

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

- The equipment is damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- The equipment is operated beyond the conditions specified in this document.

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

1.1 Personal Safety

DANGER

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

DANGER

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

DANGER

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

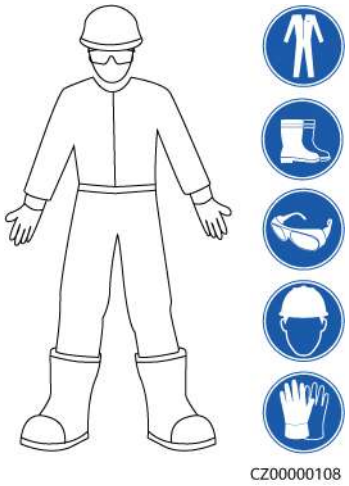
DANGER

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

WARNING

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

Figure 1-1 Personal protective equipment



General Requirements

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

Personnel Requirements

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

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

1.2 Electrical Safety

DANGER

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

DANGER

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

DANGER

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

WARNING

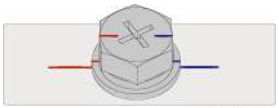
For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.

CAUTION

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

General Requirements

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



- After the installation is complete, ensure that protective cases, insulation tubes, and other necessary items for all electrical components are in position to avoid electric shocks.
- If the equipment has multiple inputs, disconnect all the inputs and wait until the equipment is completely powered off before performing operations on the equipment.
- Before maintaining a downstream electrical or power distribution device, turn off the output switch on the power supply equipment.
- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.

- If fault diagnosis and troubleshooting need to be performed after power-off, take the following safety measures: Disconnect the power supply. Check whether the equipment is live. Install a ground cable. Hang warning signs and set up fences.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.
- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.
- For the equipment that uses a three-pin socket, ensure that the ground terminal in the socket is connected to the protective ground point.
- If high touch current may occur on the equipment, ground the protective ground terminal on the equipment enclosure before connecting the power supply; otherwise, electric shock as a result of touch current may occur.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated, and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- If a cable is routed into the cabinet from the top, bend the cable in a U shape outside the cabinet and then route it into the cabinet.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- When cable connection is completed or paused for a short period of time, seal the cable holes with sealing putty immediately to prevent small animals or moisture from entering.

- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.
- When routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.
- When the temperature is low, violent impact or vibration may damage the plastic cable sheathing. To ensure safety, comply with the following requirements:
  - Cables can be laid or installed only when the temperature is higher than 0°C. Handle cables with caution, especially at a low temperature.
  - Cables stored at below 0°C must be stored at room temperature for more than 24 hours before they are laid out.
- Do not perform any improper operations, for example, dropping cables directly from a vehicle. Otherwise, the cable performance may deteriorate due to cable damage, which affects the current-carrying capacity and temperature rise.

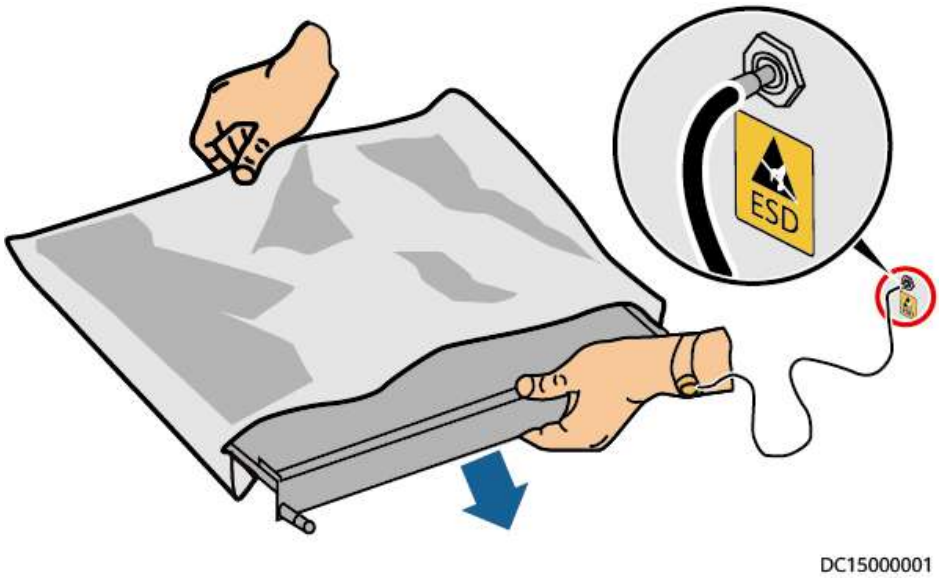
ESD

NOTICE

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

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

Figure 1-2 Wearing an ESD wrist strap



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

1.3 Environment Requirements

DANGER

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

DANGER

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

DANGER

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

WARNING

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

WARNING

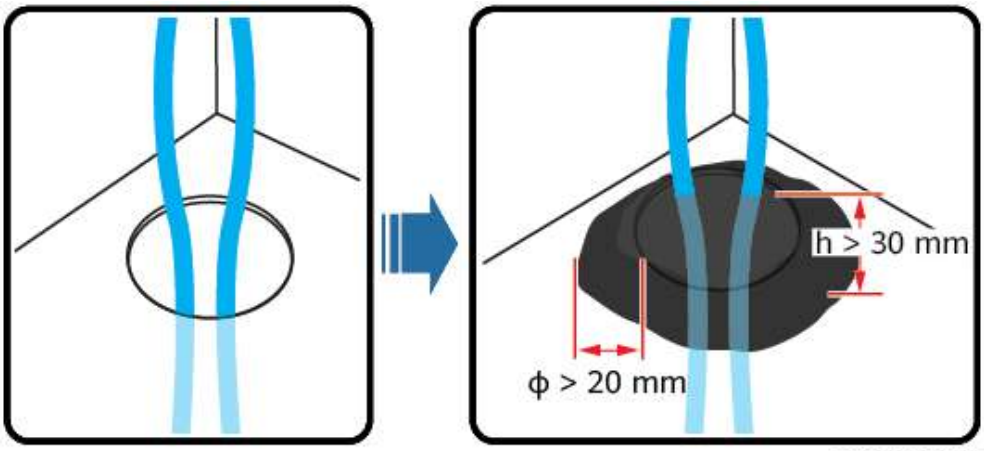
To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Ensure that the equipment is stored in a clean, dry, and well ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.
- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, sandstorm, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install the equipment in an area conducive to the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.
- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land prone to water or snow accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel.
- Before opening doors during the installation, operation, and maintenance of the equipment, clean up any water, ice, snow, or other foreign objects on the

top of the equipment to prevent foreign objects from falling into the equipment.

- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- All cable holes must be sealed. Seal the used cable holes with sealing putty. Seal the unused cable holes with the caps delivered with the equipment. The following figure shows the criteria for correct sealing with sealing putty.



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- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- If the equipment is installed near the sea (50–2000 m away from the coast) or at a high altitude (greater than 4000 m), check whether the product specifications meet the requirements.

1.4 Mechanical Safety

DANGER

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

WARNING

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

WARNING

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

WARNING

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

WARNING

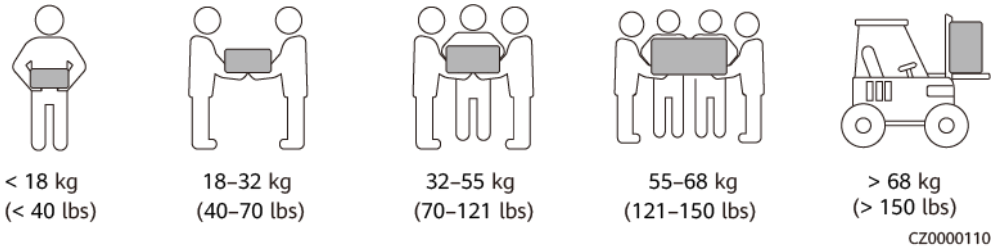
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

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

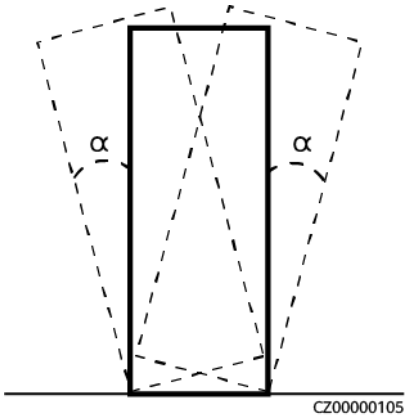
Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.

- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea or roads in good conditions for transportation. Do not transport the equipment by railway or air.
- The tilt angle of the ESS shall meet the requirements shown in the figure: $\alpha \leq 5°$.



- When moving and transporting the air conditioner or LTMS, keep it upright. Do not place it horizontally or upside down.

Working at Heights

- Any operations performed 2 m or higher above the ground shall be supervised properly.
- Only trained and qualified personnel are allowed to work at heights.

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

Using Ladders

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

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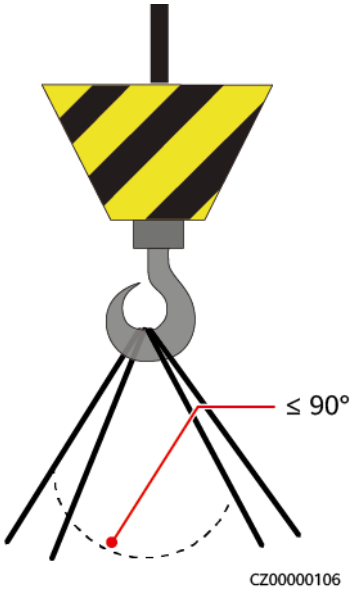
- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.

- When a step ladder is used, ensure that the pull ropes are secured.

Hoisting

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



Drilling Holes

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

Welding

- A welder must have a work permit. Obtain consent from the customer before welding.
- Ensure that at least two persons are present onsite for welding and that fire extinguishers, wet cloth, and water containers are available.

- Ensure that the welding site is free from inflammables.
- Do not weld or cut on pressurized containers or pipes. Electric devices must be powered off before welding.
- A burning welding torch must not be placed on a component or on the floor, and must not be placed in a metal container with acetylene and oxygen. Otherwise, the gas may leak and cause a fire.
- High-temperature pipes after welding must be promptly cooled.

Using a Jack

- A hydraulic jack is used to lift the container. The lifting capacity of the jack shall be greater than 42 t.
- Only one side of the equipment can be raised or lowered. Before applying force, place wood sleepers and pads and take measures to prevent the jack from slipping and the equipment from vibrating.
- You can use two jacks to apply even forces simultaneously at two points on a short side of the equipment. Lift the equipment only from one side and then the other side, alternately. The height shall not exceed 120 mm each time the equipment is lifted.

1.5 Equipment Safety

1.5.1 ESS Safety

DANGER

Do not open a battery cabin door or the left door of the control unit cabin when the system is running.

DANGER

If the ESS is faulty, do not stand within the opening range of the battery cabin doors.

WARNING

Only professionals are allowed to perform maintenance on and inspect the liquid cooling pipes and LTMS.

CAUTION

The equipment is equipped with a fire suppression system. Start the fire suppression system only in emergency.

CAUTION

Do not disable the protection devices.

CAUTION

Evacuate from the site immediately once the fire alarm horn/strobe is triggered.

NOTICE

Take protection and isolation measures for the ESS site, such as installing fences, walls, and safety warning signs to prevent personal injury or property damage caused by unauthorized access during operations.

- When installing the ESS, comply with the fire separation distance or fire wall requirements specified in local standards, including but not limited to *GB 51048-2014 Design Code for Electrochemical Energy Storage Station* and *NFPA 855 Standard for the Installation of Stationary Energy Storage Systems*.
- Check the fire safety of the ESS regularly, at least once a month.
- When inspecting the system with power on, pay attention to the hazard warning signs on the equipment. Do not stand at the battery cabin doors. You are advised to perform the inspection near the control unit cabin.
- After power components of the ESS are replaced or cable connections are changed, you need to manually start cable connection detection to prevent system malfunction.
- After the equipment except battery packs is powered off, wait for 15 minutes and ensure that the equipment voltage is lower than the safety voltage for human body before operations.
- It is recommended that you prepare a camera to record the detailed processes of equipment installation, operation, and maintenance.

1.5.2 Battery Safety

DANGER

Do not connect the positive and negative poles of a battery together. Otherwise, the battery may be short-circuited. Battery short circuits can generate high instantaneous current and releases a large amount of energy, which may cause battery leakage, smoke, flammable gas release, thermal runaway, fire, or explosion. To avoid battery short circuits, do not maintain batteries with power on.

DANGER

Do not expose batteries at high temperatures or around heat sources, such as scorching sunlight, fire sources, transformers, and heaters. Battery overheating may cause leakage, smoke, flammable gas release, thermal runaway, fire, or explosion.

DANGER

Protect batteries from mechanical vibration, falling, collision, punctures, and strong impact. Otherwise, the batteries may be damaged or catch fire.

DANGER

To avoid leakage, smoke, flammable gas release, thermal runaway, fire, or explosion, do not disassemble, alter, or damage batteries, for example, insert foreign objects into batteries, squeeze batteries, or immerse batteries in water or other liquids.

DANGER

Do not touch battery terminals with other metal objects. Otherwise, electric shocks or battery short circuits may occur.

DANGER

There is a risk of fire or explosion if the model of the battery in use or used for replacement is incorrect. Use a battery of the model recommended by the manufacturer.

DANGER

Battery electrolyte is toxic and volatile. Do not get contact with leaked liquids or inhale gases in the case of battery leakage or odor. In such cases, stay away from the battery and contact professionals immediately. Professionals must wear safety goggles, rubber gloves, gas masks, and protective clothing, power off the equipment, remove the battery, and contact technical engineers.

DANGER

A battery is an enclosed system and will not release any gases under normal operations. If a battery is improperly treated, for example, burnt, needle-pricked, squeezed, struck by lightning, overcharged, or subject to other adverse conditions that may cause battery thermal runaway, the battery may be damaged or an abnormal chemical reaction may occur inside the battery, resulting in electrolyte leakage or production of gases such as CO and H_2. To prevent fire or device corrosion, ensure that flammable gas is properly exhausted.

DANGER

If a battery has obvious damage or abnormal odor, smoke, or fire occurs, evacuate the personnel immediately, call emergency services, and contact the professionals. The professionals shall use fire extinguishing facilities to extinguish the fire under safety protection.

DANGER

The gas generated by a burning battery may irritate your eyes, skin, and upper respiratory tract. Take protective measures promptly.

WARNING

Install batteries in a dry area. Do not install them under areas prone to water leakage, such as air conditioner vents, ventilation vents, feeder windows of the equipment room, or water pipes. Ensure that no liquid enters the equipment to prevent faults or short circuits.

WARNING

Before installing and commissioning batteries, prepare fire fighting facilities, such as fire sand and carbon dioxide fire extinguishers, according to construction standards and regulations. Before putting into operation, ensure that fire fighting facilities that comply with local laws and regulations are installed.

WARNING

Before unpacking, storage, and transportation, ensure that the packing cases are intact and the batteries are correctly placed according to the labels on the packing cases. Do not place a battery upside down or vertically, lay it on one side, or tilt it. Stack the batteries according to the stacking requirements on the packing cases. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

WARNING

After unpacking batteries, place them in the required direction. Do not place a battery upside down or vertically, lay it on one side, tilt it, or stack it. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

WARNING

After batteries are discharged, charge them in time to avoid damage due to overdischarge.

Statement

The Company shall not be liable for any battery damage, personal injury, death, property loss, and/or other consequences caused by the following reasons:

- Force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions
- The battery warranty period has expired. You are advised not to use a battery whose warranty period has expired, as this poses safety risks.
- Actions that do not follow instructions in the user manual or direct advice from the Company, including but not limited to the following scenarios:
  - The onsite equipment operating environment or external power parameters do not meet the environment requirements for normal operation, for example, the actual operating temperature of batteries is too high or too low, or the power grid is unstable and experiences outages frequently.
  - Batteries are dropped or incorrectly operated or connected.
  - Batteries are overdischarged due to delayed acceptance or power-on after battery installation.
  - Battery running parameters are incorrectly set.
  - Different types of batteries, for example, batteries of different brands or rated capacities, are used together without prior approval from the Company.
  - Batteries are frequently overdischarged due to improper battery maintenance.
  - Battery use scenarios are changed without prior approval from the Company.
  - Battery maintenance is not performed according to the instructions in the user manual, for example, failing to check battery terminals regularly.
  - Batteries are not transported, stored, or charged according to the instructions in the user manual.
  - Instructions from the Company are not followed during battery relocation or reinstallation.

General Requirements

NOTICE

To ensure battery safety and battery management accuracy, use batteries provided by the Company. The Company is not responsible for any faults of batteries not provided by it.

- Before installing, operating, and maintaining batteries, read the battery manufacturer's instructions and comply with their requirements. The safety precautions specified in this document are highly important and require special attention. For additional safety precautions, see the instructions provided by the battery manufacturer.
- Use batteries within the specified temperature range. When the ambient temperature of the batteries is lower than the allowed range, do not charge the batteries to prevent internal short circuits caused during low-temperature charging.
- Before unpacking batteries, check whether the packaging is intact. Do not use batteries with damaged packaging. If any damage is found, notify the carrier and manufacturer immediately.
- Install batteries within 24 hours after unpacking. If the batteries cannot be installed in time, put them in the original packaging and place them in a dry indoor environment without corrosive gases. The process from unpacking batteries to powering on the system must be completed within 72 hours. During routine maintenance, ensure that the power-off time does not exceed 24 hours.
- Do not use a damaged battery (such as damage caused when a battery is dropped, bumped, bulged, or dented on the enclosure), because the damage may cause electrolyte leakage or flammable gas release. In the case of electrolyte leakage or structural deformation, contact the installer or professional O&M personnel immediately to remove or replace the battery. Do not store the damaged battery near other devices or flammable materials and keep it away from non-professionals.
- Before working on a battery, ensure that there is no irritant or scorched smell around the battery.
- When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.
- Do not install battery packs on rainy, snowy, or foggy days. Otherwise, the battery packs may be corroded by moisture or rain.
- If batteries are exposed to water accidentally, do not install them. Instead, transport the batteries to a safe isolation point and contact technical engineers in a timely manner.
- Before installing a battery pack, check that its enclosure is not deformed or damaged.
- Check whether the positive and negative battery terminals are grounded unexpectedly. If so, disconnect the battery terminals from the ground.
- Do not perform welding or grinding work around batteries to prevent fire caused by electric sparks or arcs.

- If batteries are left unused for a long period of time, store and charge them according to the battery requirements.
- Do not charge or discharge batteries by using a device that does not comply with local laws and regulations.
- Keep the battery loop disconnected during installation and maintenance.
- Monitor damaged batteries during storage for signs of smoke, flame, electrolyte leakage, or heat.
- If a battery is faulty, its surface temperature may be high. Do not touch the battery to avoid scalds.
- Do not stand on, lean on, or sit on the top of the equipment.
- In backup power scenarios, do not use the batteries for the following situations:
  - Medical devices substantially important to human life
  - Control equipment such as trains and elevators, as this may cause personal injury
  - Computer systems of social and public importance
  - Locations near medical devices
  - Other devices similar to those described above

Short-Circuit Protection

- When installing and maintaining batteries, wrap the exposed cable terminals on the batteries with insulation tape.
- Avoid foreign objects (such as conductive objects, screws, and liquids) from entering a battery, as this may cause short circuits.

Leakage Handling

NOTICE

Electrolyte leakage may damage the equipment. It will corrode metal parts and boards, and ultimately damage the boards.

Electrolyte is corrosive and can cause irritation and chemical burns. If you come into direct contact with the battery electrolyte, do as follows:

- Inhalation: Evacuate from contaminated areas, get fresh air immediately, and seek immediate medical attention.
- Eye contact: Immediately wash your eyes with water for at least 15 minutes, do not rub your eyes, and seek immediate medical attention.
- Skin contact: Wash the affected areas immediately with soap and water and seek immediate medical attention.
- Intake: Seek immediate medical attention.

Recycling

- Dispose of waste batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper disposal of batteries may result in environmental pollution or an explosion.
- If a battery leaks or is damaged, contact technical support or a battery recycling company for disposal.
- If batteries are out of service life, contact a battery recycling company for disposal.
- Do not expose waste batteries to high temperatures or direct sunlight.
- Do not place waste batteries in environments with high humidity or corrosive substances.
- Do not use faulty batteries. Contact a battery recycling company to scrap them as soon as possible to avoid environmental pollution.

2 Routine Maintenance

⚠ WARNING

Capacitors involve hazardous energy. Disconnect all power supplies and wait for 5 minutes before opening the covers or sealing plates of the Rack Control Module (RCM), Power Supply Unit (PSU), power adapter, and printed circuit board (PCB).

⚠ CAUTION

Safety requirements in maintenance and repair:

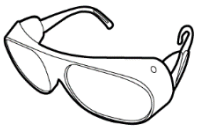
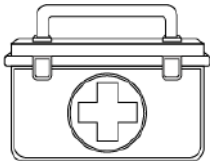
- Before connecting or removing cables, turn off the protection switch of the corresponding loop.
- Place a warning sign indicating that the switch must not be turned on at the position where the switch resides.
- Use an electroscope of a proper voltage level to check whether the equipment is energized and ensure that the equipment is completely powered off.
- If charged bodies are found nearby, block or wrap them with insulation plates or insulation tapes.
- Before performing maintenance or repair, securely connect the loop to be repaired to the main ground loop using a ground cable.
- After the maintenance or repair is complete, remove the ground cable between the loop that has been maintained and the main ground loop.

NOTICE

- In sandstorm-stricken areas such as deserts, take dustproof measures during maintenance.
- After each maintenance is complete, you are advised to use vacuum cleaners to clean up sand and dust inside the cabins. Once the cleaning is complete, close the cabin doors.

2.1 Preparations Before Maintenance

Personal Protective Equipment (PPE)

 Insulated gloves	 Protective gloves	 Protective goggles	 Dust mask
 Safety shoes	 Reflective vest	 Safety helmet	 Medical kit
 Safety harness	-	-	-

2.2 Routine Maintenance

Log in to the SmartLogger WebUI/FusionSolar app/management system and check whether there are major or minor alarms.

NOTE

For details, see the software user manuals.

2.3 Quarterly Maintenance

Table 2-1 Quarterly maintenance checklist

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Container	Perform the visual inspection: • Appearance • Rust condition • Vents[1] (including the mesh board, air damper, air conditioner, and smoke exhaust vent) • Paint damages	• The coating is not peeling or scratched. • There is no obvious paint peeling or rust. • The vents are free from sand and dust buildup and foreign matter blockage.	No
Liquid Thermal Management System (LTMS)	• Check the appearance. • Check the outdoor fan.[2]	• There is no obvious damage to the appearance. • There is no obvious paint peeling or rust. • There is no visible leakage. • The fans rotate properly without abnormal sound.	No
Air conditioner in the control unit cabin	Perform the visual inspection: • Check the appearance. • Check the external fan.[2]	• There is no obvious damage to the appearance. • There is no obvious paint peeling or rust. • The fans rotate properly without abnormal sound.	No

Note [1]:

Perform maintenance after each occurrence of extreme weather events such as snowstorms, sandstorms, and typhoons. Monthly maintenance is recommended in a high-temperature (≥ 35°C) or low-temperature (≤ 0°C) environment. The first maintenance interval starts when the ESS is installed.

Note [2]: Remove icicles around the fans after each occurrence of freezing rain in areas prone to freezing rain to ensure that no icicles enter the fans. You are advised to clean the fans once a quarter in areas with heavy sandstorm and dust. In other areas, clean the fans according to the actual situation to ensure that there is no sand or dust buildup.

Note [3]: Paint damages in high-corrosion area must be repaired immediately upon detection to ensure the coating retains its protective attribute

2.4 Annual Maintenance

Battery Pack Maintenance

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Battery pack	Perform the visual inspection: • Appearance • Rust condition • Screws • Signal and power terminals	• There is no obvious damage to the appearance. • There is no obvious paint peeling or rust. • The screws are secured. • Signal and power terminals are secured.	Yes

Fire Suppression System Maintenance

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Smoke detector, heat detector, and manual alarm	1. Check the appearance. 2. Check the indicators of the smoke detectors and heat detectors. 3. Spot check the smoke detectors and heat detectors with smoke or heat generated by using dedicated devices (such as a smoke gun and heat gun) to check the alarm function of the detectors. 4. Press the manual alarm button to check the alarm function of the manual alarm device.[1][2]	1. The appearance is intact without obvious mechanical damage. The device is clean and tidy without dust buildup. 2. The indicators of the smoke detectors and heat detectors blink properly. 3. The smoke detectors and heat detectors trigger alarms, and their indicators change from blinking to steady on. 4. The manual alarm device triggers an alarm, and its indicator changes from blinking to steady on. 5. After an alarm is triggered, the extinguishant control panel generates an alarm sound, turns on the fire alarm indicator, and correctly displays fire alarm information (such as the alarm time and address).	Yes

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Fire cylinder	1. Check the appearance of fire cylinder and its components. 2. Check the pressure [3] of the fire cylinder.	1. The fire cylinder and its components are intact without obvious mechanical damage, rust, or aging. The nameplate is clear and intact. The mechanical emergency safety pin of the solenoid valve is intact. 2. The pressure gauge pointer of the fire cylinder is in the green area. The pressure gauge pointer varies according to the gas cylinder model. For details, see **Figure 2-1**.	No
Extinguishant control panel	1. Check the appearance and clean the extinguishant control panel. 2. Check the information display and status indicators on the extinguishant control panel. 3. Operate the corresponding function keys on the extinguishant control panel to check the functions including mute, reset, and manual/automatic switching. 4. Check the time displayed on the extinguishant control panel.	1. The appearance is intact without obvious mechanical damage or rust. The device is clean and tidy without dust buildup. 2. No alarm is generated on the extinguishant control panel, and no alarm or fault information is displayed on the monitor. 3. Function keys such as mute, reset, and manual/automatic switching on the extinguishant control panel are normal. 4. The time displayed on the extinguishant control panel is the same as the current time. For details, see **D How to Set the Time of the C050SZEG Extinguishant Control Panel**.	No
Power supply of the extinguishant control panel	1. Check the appearance. 2. Manually turn off input switch 2FC2 on the extinguishant control panel and check the automatic switching between the active and standby power supplies.	1. The device is not deformed, damaged, or leaking. 2. The extinguishant control panel works properly and reports a main power supply fault alarm.	Yes

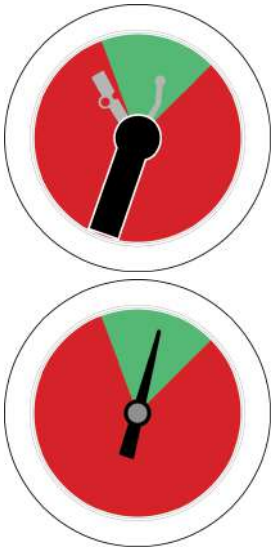
Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Extinguishant release/abort button, fire alarm horn/strobe, and extinguishant release indicator	1. Press the extinguishant release button to check the emergency startup function. 2. Before the countdown ends, press the extinguishant abort button to check the emergency stop function.	1. After you press the extinguishant release button, the extinguishant control panel generates an alarm sound, the extinguishant release countdown is triggered (within 30s), the fire alarm horn/strobe generates an alarm, and the extinguishant release indicator turns on. 2. Before the countdown ends, press the extinguishant abort button to pause the extinguishant release countdown.	Yes
Startup simulation[1]	1. Trigger a smoke detector and a heat detector using a smoke gun and a heat gun, respectively. 2. Manually press the manual alarm button and trigger a smoke detector or a heat detector using a smoke gun or a heat gun. 3. Press the extinguishant release button of the control unit cabin.	1. The extinguishant control panel generates an alarm sound, and the fire alarm horn/strobe generates an alarm. 2. The extinguishant release countdown on the extinguishant control panel is triggered, the fire alarm horn/strobe generates an alarm, and the extinguishant release indicator turns on. After the countdown ends, the solenoid valve is activated. 3. The solenoid valve works properly. For details, see **2.5.1 Solenoid Valve Function Self-Check**.	Yes

Note [1]: Remove the solenoid valve from the fire cylinder in advance to prevent extinguishant release by mistake.

Note [2]: After the test is complete, press the reset button on the extinguishant control panel to reset it.

Note [3]: When the pressure of the fire cylinder is low, use an adjustable wrench to turn the hex valve of the fire cylinder counterclockwise for half a circle. After the check is complete, tighten the hex valve clockwise.

Figure 2-1 Pressure gauge pointer



Liquid Cooling System Maintenance

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Coolant[1]	• Perform the visual inspection. • Check the LTMS coolant PH value.	• There is no visible impurities. • The color does not change to be darker obviously. • The PH value is greater than 6.5* (using the PH test paper). For details, see **2.5.5 Checking the Coolant PH Value**.	Yes
Liquid cooling pipe	Perform the visual inspection.	There is no visible leakage.	Yes
Micro-channel heat exchanger	Clean the micro-channel heat exchanger.	The micro-channel heat exchanger is not blocked. For details, see **2.5.6 Cleaning a Micro-channel Heat Exchanger**.	Yes

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
LTMS	• Check the appearance. • Clean the outdoor fan[3].	• There is no obvious damage to the appearance. • There is no obvious paint peeling or rust. • Screws, such as the clamp nuts of the liquid cooling pipe, and the nuts for securing the fan pump and compressor, are not loose. • The fan rotates properly without abnormal sound. Its surface is clean without sand, dust or foreign object. • Check that the thermal insulation foam on the liquid cooling pipe is not damaged. • Check that the liquid cooling pipe does not leak. • Check that the circulation pump does not generate abnormal noises during operation. • Check that the compressor does not generate abnormal noises during operation.	Yes
Expansion tank	Expansion tank refill[4]	See **2.5.3 Expansion Tank Refill**.	Yes

Note [1]: After the coolant is put into use, no inspection is required in the first five years. After five years, perform inspection every half a year.

Note [2]: You are advised to clean it after each occurrence of a sandstorm in sandstorm-stricken areas, once in the catkins season, and once before summer. In other areas, clean it according to the actual situation and ensure it is not blocked.

Note [3]: Remove icicles around the fans after each occurrence of freezing rain in areas prone to freezing rain to ensure that no icicles enter the fans. You are advised to clean the fans once a quarter in areas with heavy sandstorm and dust. In other areas, clean the fans according to the actual situation to ensure that there is no sand or dust buildup.

Note [4]: Refill the expansion tank every three years.

Other Components Maintenance

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Dehumidifier	Visually check whether the drainpipe is blocked.	The drainage is smooth, and there is no obvious water accumulation.	Yes
Battery cabin/ Control unit cabin/LTMS	Check the door locks. Check for any foreign objects in the cabin. Check the rubber strips on the cabin door.	• The door locks are not damaged. • The cabin is clean and free from foreign objects. • There is no obvious hardening or damage, and there is no water stain on the inner side of the rubber strips. • There are no insects, rodents, snakes or other animals.	Yes
Container mesh board filter	• Clean the meshed board on the front of the container after the door is opened.[1] • Clean the meshed boards from the side and rear of the container after removing them. • The top of the container can be directly flushed.[1]	• The filter is clean and not blocked.	Yes
Air conditioner in the control unit cabin	• Check the appearance. • Clean the outdoor heat exchanger.[2] • Clean the external fan[3].	• There is no obvious damage to the appearance. • There is no obvious paint peeling or rust. • The screws are secured. • The fan rotates properly without abnormal sound. Its surface is clean without sand, dust or foreign object. • The outdoor heat exchanger is not blocked.	Yes

Maintenance Category	Maintenance Action	Expected Result	System Powered Off or Not
Note [1]: Perform maintenance after each occurrence of extreme weather events such as snowstorms, sandstorms, and typhoons. Monthly maintenance is recommended in a high-temperature (≥ 35°C) or low-temperature (≤ 0°C) environment. The first maintenance interval starts when the ESS is installed. Note [2]: You are advised to clean it after each occurrence of a sandstorm in sandstorm-stricken areas, once in the catkins season, and once before summer. In other areas, clean it according to the actual situation and ensure it is not blocked. You are advised to use a high-pressure water gun or air blow gun. For a high-pressure water gun, the pressure shall be less than or equal to 30 kPa, the flow rate shall be less than or equal to 12.5 L/min, and the recommended working distance is 2.5 m to 3 m. For a high-pressure air blow gun, the recommended working distance is 0.5 m to 1 m. Note [3]: Remove icicles around the fans after each occurrence of freezing rain in areas prone to freezing rain to ensure that no icicles enter the fans. You are advised to clean the fans once a quarter in areas with heavy sandstorm and dust. In other areas, clean the fans according to the actual situation to ensure that there is no sand or dust buildup. You are advised to use a dust brush or a high-pressure air gun to clean the fans. The pressure shall be less than or equal to 30 kPa and the flow rate shall be less than or equal to 12.5 L/min. The recommended distance is 0.5 m to 1 m.			

Environment Maintenance

Check whether the site environment meets the requirements by referring to section "Site Selection Requirements" in the user manual.

2.5 Other Maintenance

2.5.1 Solenoid Valve Function Self-Check

NOTE

Figures in this section are for reference only.

Fire Cylinder Model: P0009438

Step 1 Remove the solenoid valve from the fire cylinder.

Step 2 Install the solenoid valve on the bracket. For details, see the operations of **Figure 2-2** in the reverse order.

Step 3 Press the extinguishant release button of the control unit cabin door.

Step 4 When the countdown ends, lift the test contactor to the bottom of the stud and check that the test contactor is closed at the bottom of the stud. The solenoid valve functions properly. If the test contactor fails to be closed at the bottom of the stud, contact technical support.

Step 5 Log in to the SmartLogger WebUI and check whether **Fire Alarm** (alarm ID: 3893) is generated. If the alarms are not reported, contact technical support.

Step 6 Reset the extinguishant control panel.

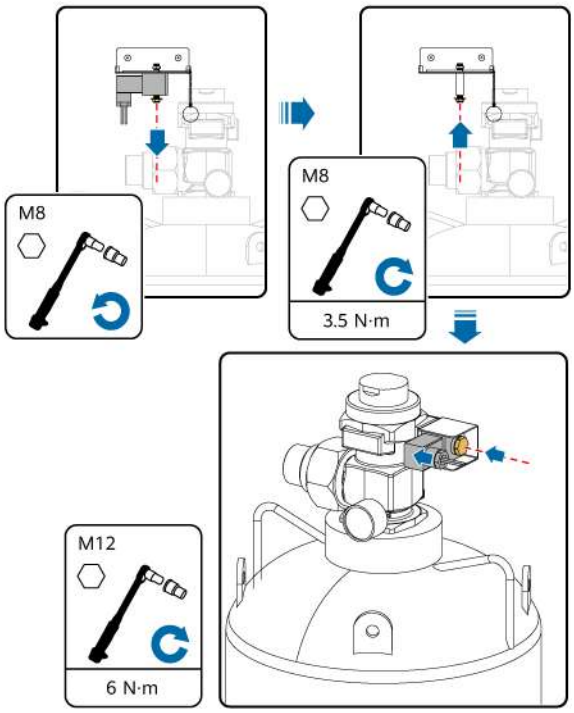
1. Unlock the extinguishant control panel using a key.
2. Press the mute button on the extinguishant control panel.
3. Press the reset button on the extinguishant control panel.

Step 7 Check that the alarm is cleared and the test contactor cannot be closed (not activated) after being lifted to the bottom of the stud.

Step 8 Remove the solenoid valve from the bracket and reinstall the nut and washer.

Step 9 Reinstall the solenoid valve on the fire cylinder stud and tighten the nut to a torque of 6 N·m.

Figure 2-2 Installing the solenoid valve



----End

2.5.2 Inspection on Lead-Acid Batteries of the Extinguishant Control Panel

Step 1 Check that the batteries are not deformed, damaged, or leaking.

Step 2 Remove battery cables.

Step 3 Use a multimeter to measure the battery terminal voltage. The voltage must be greater than or equal to 12.6 V. If the voltage does not meet the requirement, replace the batteries.

----End

2.5.3 Expansion Tank Refill

The expansion tank is refilled every three years.

Prerequisites

- Tools: safety gloves, safety shoes, safety helmet, tire pressure gauge, refill pump, and coolant filling/drainage machine
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- Specifications of the refill pump:
  - Power supply mode: wired, wireless lithium battery, or combination of wired and wireless power supplies
  - Wired power supply specifications: rated voltage 230 V±5%, 50/60 Hz, power supply from the maintenance socket (five-hole) of the power distribution cabinet in the control unit cabin or reserved socket terminal (connected to the socket by yourself); rated power ≤ 1500 W; power cable length ≥ 1.5 m
  - Length of refill pipe and extension pipe ≥ 3 m; anti-freezing, explosion-proof, and heat-resistant refill pipe
  - Nozzle size: 8v1; press-type; a screw-type air nozzle is not allowed.
  - Automatic digital display, night vision pressure measurement, preset pressure, automatic filling and stopping, and precision of at least ±0.05 bar.
  - It is recommended that you use a tire pressure gauge with a precision of at least ±0.05 bar.
- Specifications of the tire pressure gauge:
  - Power supply mode: battery
  - Nozzle size: 8v1; buckle-type; a screw-type nozzle is not allowed.
  - Pipe length ≥ 600 mm
  - Automatic digital display, supporting night vision pressure measurement
  - Precision ≥ ±0.05 bar

Procedure

Step 1 Drain the coolant from coolant filling/drainage port 1.

Step 2 Loosen the valve cap of the expansion tank, fasten the pressure nozzle of the tire pressure meter to the valve nozzle of the expansion tank, adjust the unit to bar, and record the pressure of the expansion tank. The pressure shall be greater than or equal to 70% of the pressure values listed in the following table. (The preset pressure of the expansion tank is 0.75 bar at 25°C.)

Table 2-2 Expansion tank maintenance pressure

Ambient Temperature	Preset Pressure
Below –30°C	0.6 bar

Ambient Temperature	Preset Pressure
–30°C to –15°C	0.6–0.65 bar
–15°C to +5°C	0.65–0.7 bar
5°C to 25°C	0.7–0.75 bar
25°C to 45°C	0.75–0.8 bar
Above 45°C	0.8 bar

Step 3 (Optional) If the refill pump is powered in wired mode, obtain power from the maintenance socket (five-hole) of the power distribution cabinet in the control unit cabin or the reserved socket terminal (connected to a socket by yourself).

Step 4 (Optional) After connecting cables to the refill pump, turn on the residual current circuit breaker (RCCB) 1FB1 for the lighting and socket.

Step 5 Fasten the nozzle of the refill pump to the valve nozzle of the expansion tank, record the preset pressure of the expansion tank, and compare it with the pressure measured by the tire pressure gauge. The deviation shall be less than or equal to 0.1 bar to prevent deviation detected by a single tool.

Step 6 Exhaust air from the expansion tank and refill the expansion tank. Preset the pressure based on the ambient temperature by referring to the preceding table. The refill pump starts. When the pressure reaches the preset value, the pump automatically stops.

Step 7 Remove the refill pipe of the refill pump, fasten the pressure nozzle of the tire pressure gauge to the valve nozzle of the expansion tank, and measure the pressure after refill. The pressure measured by the tire pressure gauge shall be preset pressure±0.1 bar.

Step 8 Perform steps 2 to 7 to check the preset pressure, complete refill, and check the pressure after refill for the second expansion tank.

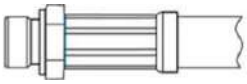
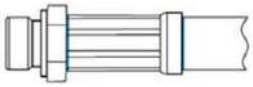
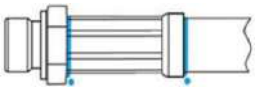
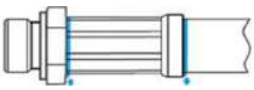
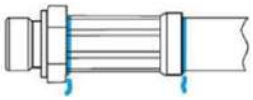
Step 9 Fill the coolant from coolant filling/drainage port 1.

----End

2.5.4 Handling Coolant Leakage

Measures for Handling Coolant Leakage

If coolant leaks, handle it by referring to the following table.

Leakage Level	Illustration	Symptom	Measure
Class 1		There is no trace of moisture.	No action is required.
Class 2		Coolant leaks but no droplets accumulate.	No action is required.
Class 3		The coolant leaks but no droplets are formed.	Services are not affected. Record the leakage point. Inspect the leakage point once every half a year to check whether the leakage is spreading.
Class 4		The coolant leaks and droplets are formed at a leakage rate of < 1 drop/minute.	Services are not affected. Clean up the leaked coolant, locate the leakage point, and replace the leaking component promptly. If an alarm (ID: 3725) is generated, refill coolant promptly. Otherwise, the system may shut down due to insufficient coolant.
Class 5		The coolant leaks and drips at a leakage rate of > 1 drop/minute.	Power off the system. Clean up the leaked coolant, locate the leakage point, and replace the leaking component promptly.

Cleaning Coolant

Tools: protective gloves, cleaning cloth, high-pressure air blow gun, and adsorption cotton or anti-leakage pad

Step 1 Use adsorption cotton or cleaning cloth to clean up the leaked coolant on the ground and surrounding equipment to prevent slipping and secondary pollution.

Step 2 Clean the coolant on the thermal insulation foam surface, battery pack surface, and container sheet metal using adsorption materials such as anti-leakage pads, cleaning cloth, and adsorption foam.

Step 3 Use a high-pressure air blow gun to dry the coolant that is difficult to clean, such as the liquid cooling trough and thermal insulation foam gap.

Step 4 Properly store the collected leaked coolant according to environmental protection laws and regulations, and send it to a professional organization for handling.

----End

2.5.5 Checking the Coolant PH Value

Prerequisites

- Tools: coolant filling/drainage machine, flat-head insulated torque screwdriver, insulated hex socket torque screwdriver, Phillips insulated torque screwdriver, insulated torque socket wrench, torque wrench, and clamp pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Remove the plug of the LTMS coolant filling/drainage port 2 (for the position, see **Figure 7-4**) and connect the coolant collection vessel.

Step 5 Gently rotate the coolant filling/drainage ball valve 2 (do not fully open it; for the position, see **Figure 7-4**) to drain about 10 mL coolant.

Step 6 Use the PH test paper to test the coolant sample and obtain the current coolant PH. If the coolant PH is less than 6.5, replace the coolant in the ESS. For details, see Filling/Draining Coolant for an ESS.

----End

2.5.6 Cleaning a Micro-channel Heat Exchanger

Prerequisites

- Two persons are required to clean a micro-channel heat exchanger.
- Tools: ladder, security torx torque screwdriver, insulated torque socket wrench, Phillips insulated torque screwdriver, safety gloves, safety shoes, safety helmet, safety rope, protective goggles, mask, high-pressure air gun, air duct (2 m long with a 90 degrees elbow at the end), and soft brush

NOTE

- Cleaning frequency: once half a year in harsh scenarios and once a year in common scenarios
- High-voltage air blow gun: rated voltage 230 V±5%, rated power ≤ 1500 W, 50/60 Hz, pressure: ≤ 0.6 MPa
- The high-pressure air blow gun obtains power from the maintenance socket (five-hole) or reserved socket terminal (connected to the socket by yourself) of the power distribution cabinet in the control unit cabin.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

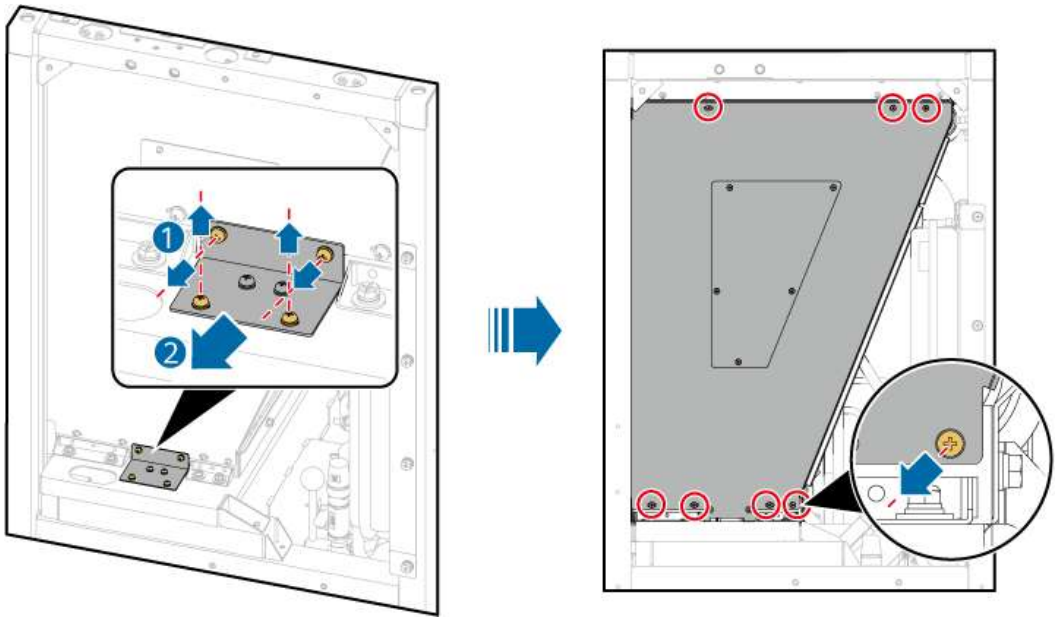
See **Figure 7-12**.

Step 2 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 3 Remove the sheet metal from the side.

1. Remove the four M4 screws.
2. Take out the sheet metal of the condensate water filter.
3. Remove the seven M4 screws.
4. Remove the sheet metal from the side.



Step 4 Clear the V-shaped area.

1. (Optional) Connect the power plug of the high-pressure air blow gun to the maintenance socket of the power distribution cabinet in the control unit

cabin. Skip this step if the high-pressure air blow gun is equipped with batteries.

2. Connect an extended air duct to the end of the air blowing vent of the high-pressure air gun, put the air duct into the V-shaped area, and turn on the power switch of the high-pressure air gun.
3. Vertically place the air duct elbow on the inner surface of the heat exchanger and blow the air from inside to outside. It is recommended that you blow air slowly from top to bottom and from inside to outside to ensure that each finned channel is covered. Ensure that the air duct is at least 10 cm away from the heat exchanger surface. Do not hit or scratch the heat exchanger.
4. Turn off the power switch of the high-pressure air blow gun.

Step 5 Use a soft brush to clean up dirt and blockages on the outer surface of the heat exchanger from top to bottom along the direction of the flat tube of the heat exchanger.

Step 6 Use a high-pressure air gun to clean the three removed sealing plates.

Step 7 Install the side sheet metal and condensate filter sheet metal, and tighten them to 1.6 N·m.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 9 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 10 Close the door of the LTMS on the front of the container.

----End

3 Alarm Reference

For details about alarms, see the *LUNA2000-4472 Series Smart String ESS Alarm Reference*.

4 Maintenance Requirements and Fixture Introduction

4.1 Maintenance Requirements

Use a forklift and a crane for the battery pack and LTMS maintenance. **Table 4-1** lists the required tools in different clearances and ground conditions. **Table 4-2** lists the requirements for steel plates.

Figure 4-1 Installation and maintenance clearances (forklift and crane)

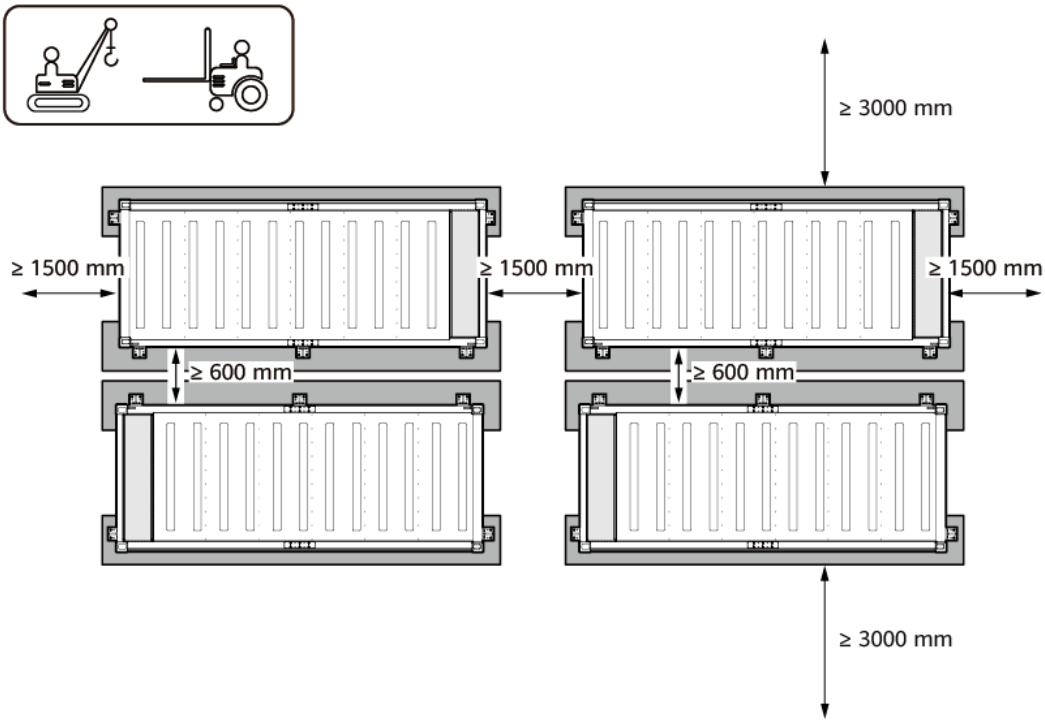


Figure 4-2 Installation and maintenance clearances (forklift only; the height of PCSs or obstacles around the ESS ≤ 1.8 m)

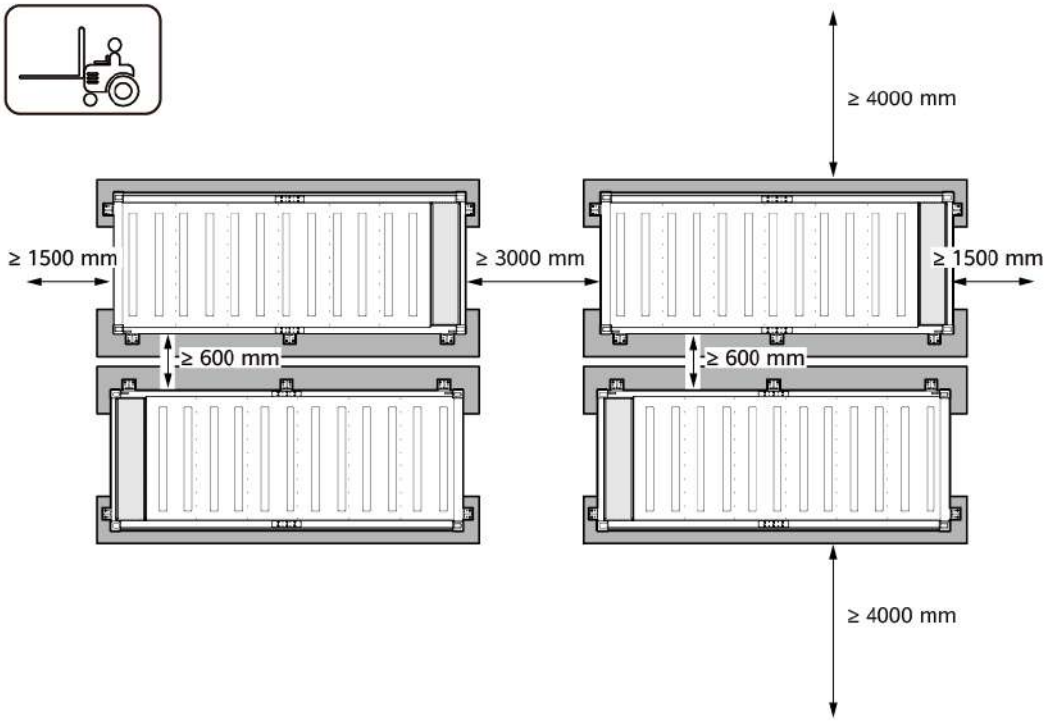


Figure 4-3 Installation and maintenance clearances (forklift only; the height of PCSs or obstacles around the ESS > 1.8 m)

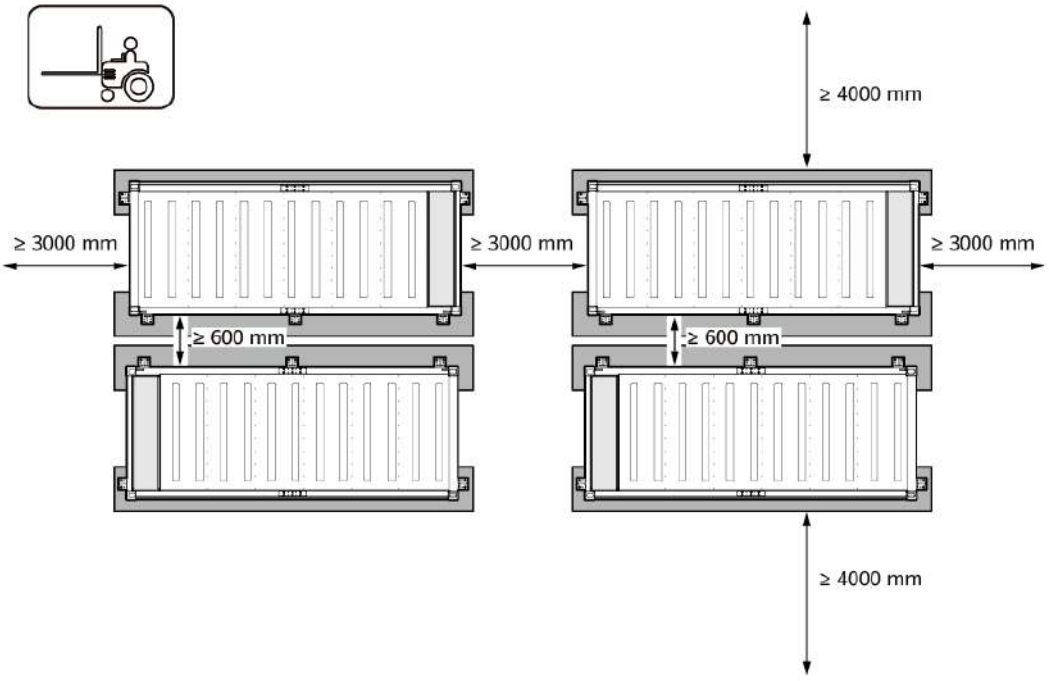


Table 4-1 Clearance and ground requirements

Scenario	Tool	Ground Condition	Clearance
Hardened ground	Crane and common forklift	• Levelness: 50 mm; load-bearing capacity ≥ 25 MPa (≥ C25 concrete)	Reserve at least 3000 mm clearance on the long side of the ESS and at least 1500 mm clearance on the control unit cabin side.
Hardened ground	Common forklift	Levelness: 50 mm; load-bearing capacity ≥ 25 MPa (≥ C25 concrete)	• If the surrounding PCSs or obstacles are not higher than 1800 mm: Reserve at least 4000 mm clearance on the long side of the ESS and at least 1500 mm clearance on the control unit cabin side. • If the surrounding PCSs or obstacles are higher than 1800 mm: Reserve at least 4000 mm clearance on the long side of the ESS and at least 3000 mm clearance on the control unit cabin side.
Non-hardened ground	Crane and rough-terrain forklift	• Levelness: 50 mm; load-bearing capacity ≥ 100 kPa. The ground must be tamped soil ground, tamped coarse dirt ground, or gravel ground, and steel plates must be laid on the ground in front of the container.	Reserve at least 3000 mm clearance on the long side of the ESS and at least 1500 mm clearance on the control unit cabin side.

Scenario	Tool	Ground Condition	Clearance
Non-hardened ground	Rough-terrain forklift	Levelness: 50 mm; load-bearing capacity ≥ 100 kPa. The ground must be tamped soil ground, tamped coarse dirt ground, or gravel ground, and steel plates must be laid on the ground in front of the ESS.	• If the surrounding PCSs or obstacles are not higher than 1800 mm: Reserve at least 4000 mm clearance on the long side of the ESS and at least 1500 mm clearance on the control unit cabin side. • If the surrounding PCSs or obstacles are higher than 1800 mm: Reserve at least 4000 mm clearance on the long side of the ESS and at least 3000 mm clearance on the control unit cabin side.
Note: Ensure that there are no obstacles such as cable trenches and steps on the driving path of the forklift and crane.			

Table 4-2 Steel plate specifications

Item	Specifications
Width	≥ Forklift width + 400 mm (2000 mm preferred)
Length	2500–2800 mm
Thickness	15 –25 mm; preferred: 20 mm
Others	A permanent magnetic lifter with a capacity of greater than 2 tons is required.

4.2 Forklift Requirements

A forklift can be used for the battery pack and LTMS maintenance. The following table lists the specifications.

Table 4-3 Forklift specifications

Item	For Battery Pack Maintenance	For LTMS Maintenance
Load-bearing capacity	≥ 3 t	≥ 3 t

Item	For Battery Pack Maintenance	For LTMS Maintenance
Forklift width	≤ 1600 mm	≤ 1600 mm
Forklift length (with tynes)	2.7–4.0 m. If the width of the maintenance aisle is less than or equal to 3 m, a forklift with a length of less than 3 m is preferred.	2.7–4.0 m. If the width of the maintenance aisle is less than or equal to 3 m, a forklift with a length of less than 3 m is preferred.
Turning radius	≤ Width of the maintenance aisle in front of the container (3 m or 4 m)	≤ Width of the maintenance aisle in front of the container (4 m)
Lifting height	• If the foundation height is less than or equal to 300 mm, the lifting height must be greater than or equal to 3300 mm. • If the foundation height is greater than 300 mm, the lifting height increases accordingly.	• If the foundation height is less than or equal to 300 mm, the lifting height must be greater than or equal to 4300 mm. • If the foundation height is greater than 300 mm, the lifting height increases accordingly.
Tyne length	1300–1600 mm	1300–1600 mm
Tyne width	230–300 mm	230–300 mm
Tyne thickness	25–80 mm	25–80 mm

4.3 Crane Requirements

If the maintenance clearances do not meet the requirements for using a forklift, use a crane to move the LTMS.

Table 4-4 Crane specifications

Item	Specifications
Load-bearing capacity	5.6–12 t
Crane width	≤ 3000 mm

Item	Specifications
Outrigger dimensions	≤ 5 m, based on the STS clearances or maximum entrance width
Operating radius	≥ Maintenance distance from the entrance to the farthest equipment
Fully-extended boom lifting	A lifting capacity of 8 t or above is preferred for fully-extended boom lifting.

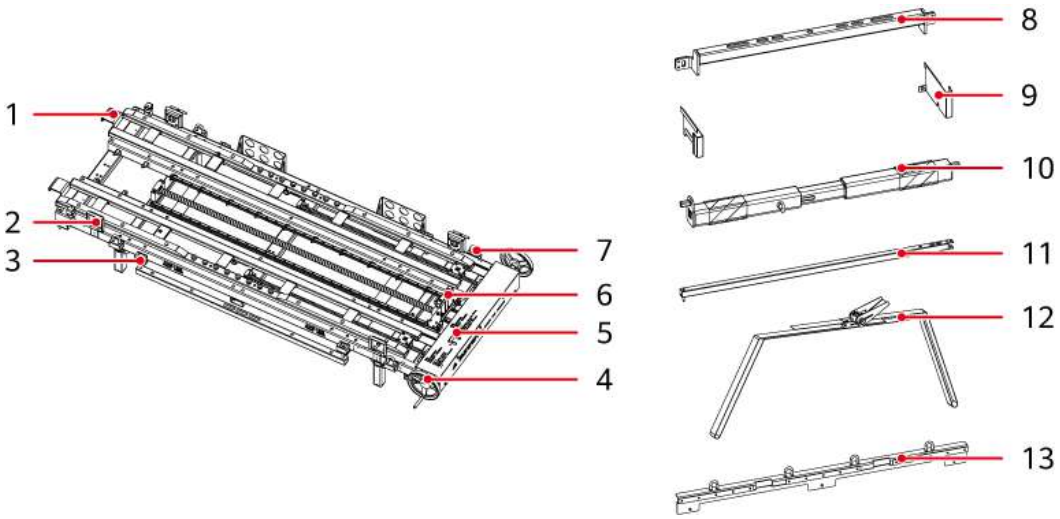
4.4 Fixture Components

NOTICE

- The maintenance fixture must be stored indoors. Apply grease (such as butter, aluminum-based grease, and composite grease) evenly to the lead screw for rust prevention and lubrication before each use.
- Do not use the fixture on rainy days. If the fixture is exposed to water, dry it to prevent it from rusting. If there is any rust, remove it promptly and apply grease.
- Place the fixture and lead screw in the toolbox after use and store the toolbox in a dry place indoors.
- Apply grease if the gear and rotating shaft generate loud noise or do not work properly.
- If the two small lead screws are misplaced during the operation, switch the shifter to position 1 and manually rotate the lead screws to correct their positions.

Battery Pack Maintenance Fixture

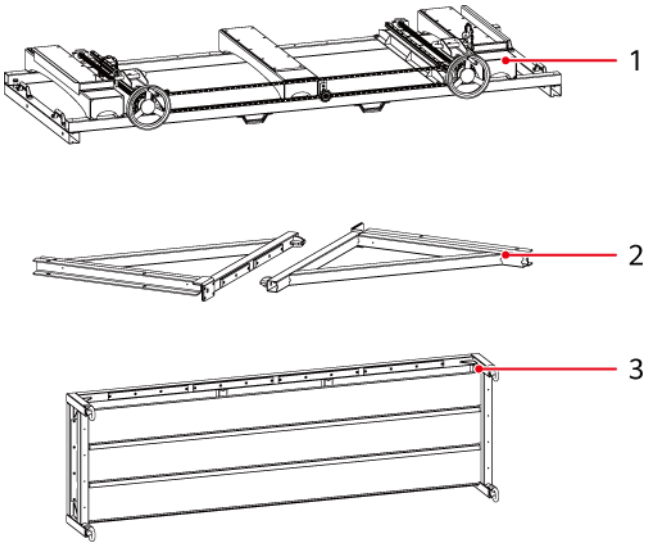
Figure 4-4 Components



(1) Drawer handle
(2) Distance block
(3) Long bolt
(4) Handwheel
(5) Shifter
(6) Battery connecting rod retainer
(7) Fixture lifting lug
(8) Battery pack connecting rod
(9) Protective plate
(10) Container connecting rod
(11) Extension arm
(12) Binding strap
(13) Battery pack securing rod

LTMS Maintenance Fixture

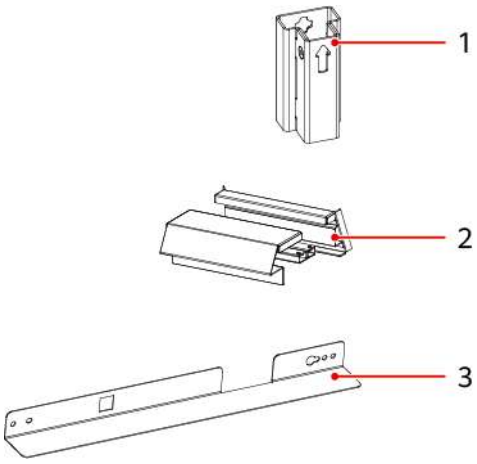
Figure 4-5 Components



(1) LTMS moving component
(2) LTMS triangle bracket
(3) LTMS forklift fixture

Other Fixtures

Figure 4-6 Components



(1) Negative copper bar protection fixture

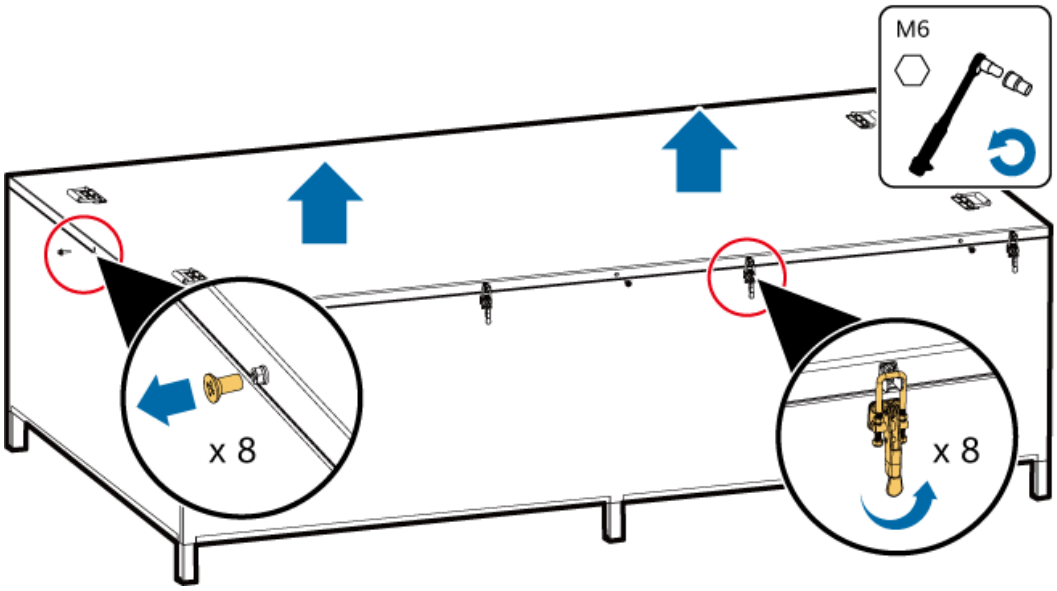
(2) Active balancing module maintenance fixture

(3) Fire cylinder maintenance fixture

Taking Out the Fixtures

Step 1 Use a forklift or crane to transport the fixture packing cases to a place near the ESS, and unpack the fixtures.

Figure 4-7 Unpacking the fixtures



Step 2 Take out the LTMS maintenance fixture assembly, fire cylinder maintenance fixture, active balancing module maintenance fixture, negative copper bar protection fixture assembly and battery pack maintenance fixture in sequence. The battery pack maintenance fixture needs to be lifted using a forklift.

Figure 4-8 Take out the LTMS maintenance fixture and other fixtures

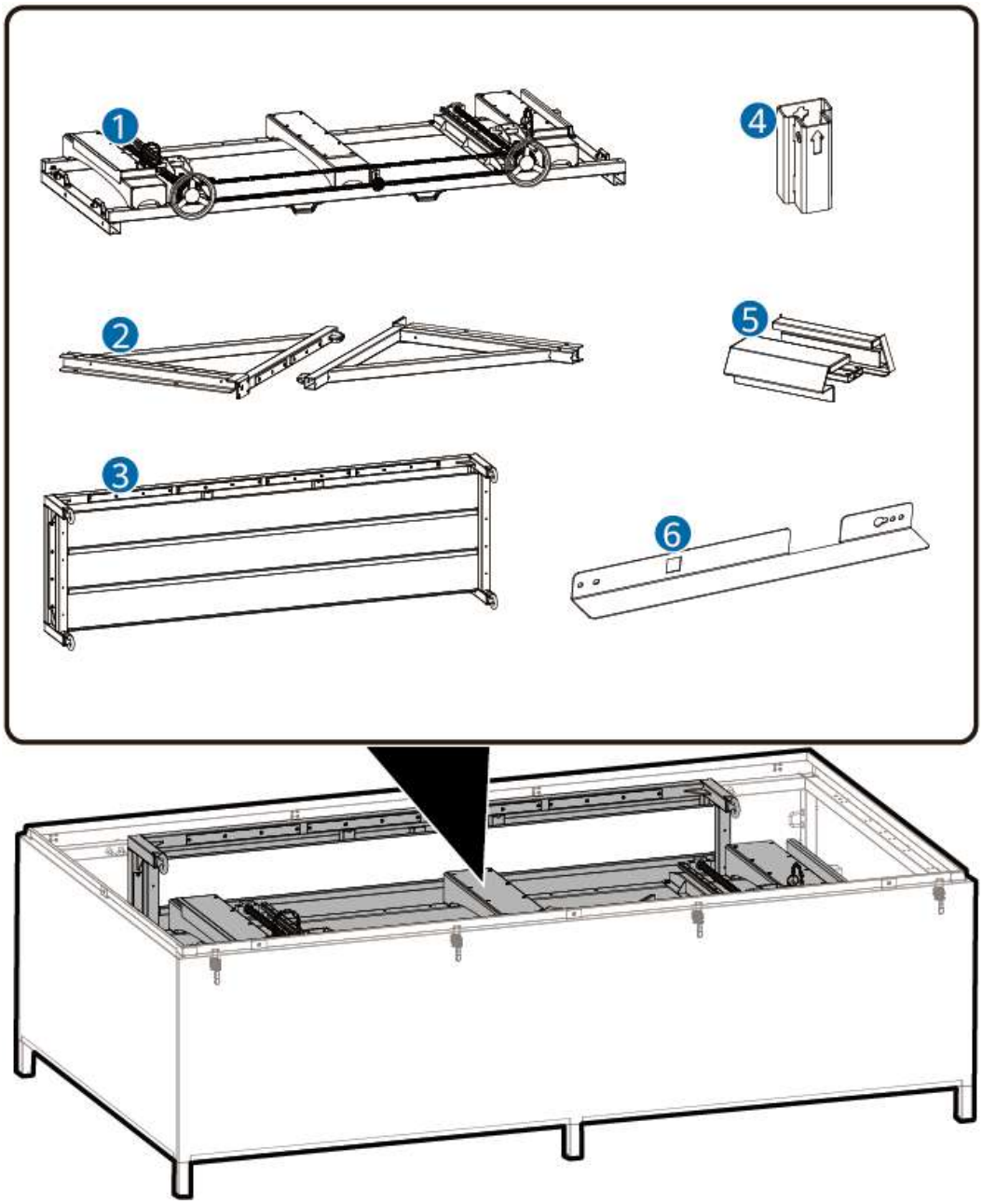
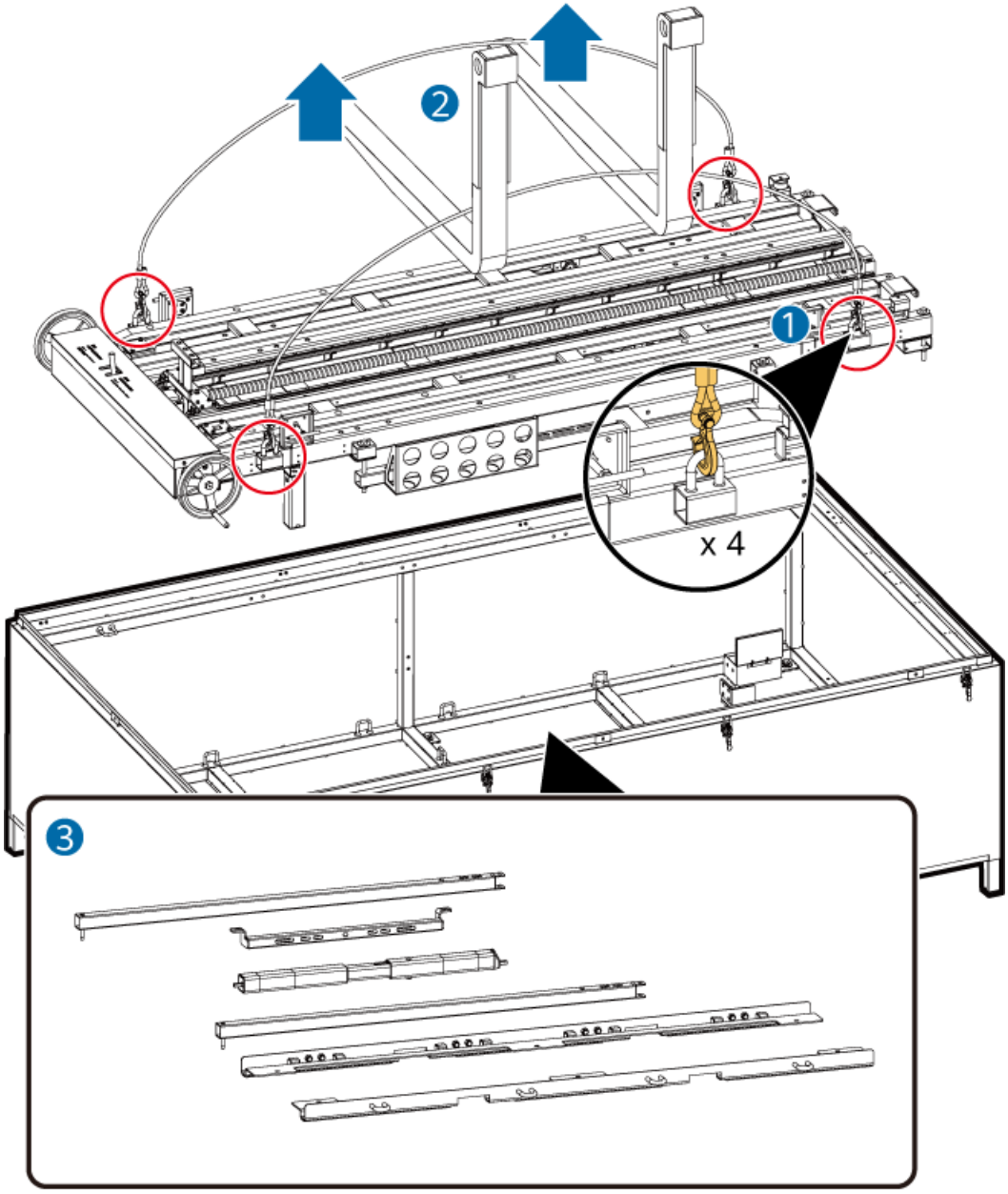


Figure 4-9 Taking out the battery pack maintenance fixture



----End

5 Replacing Battery Cabin Components

NOTICE

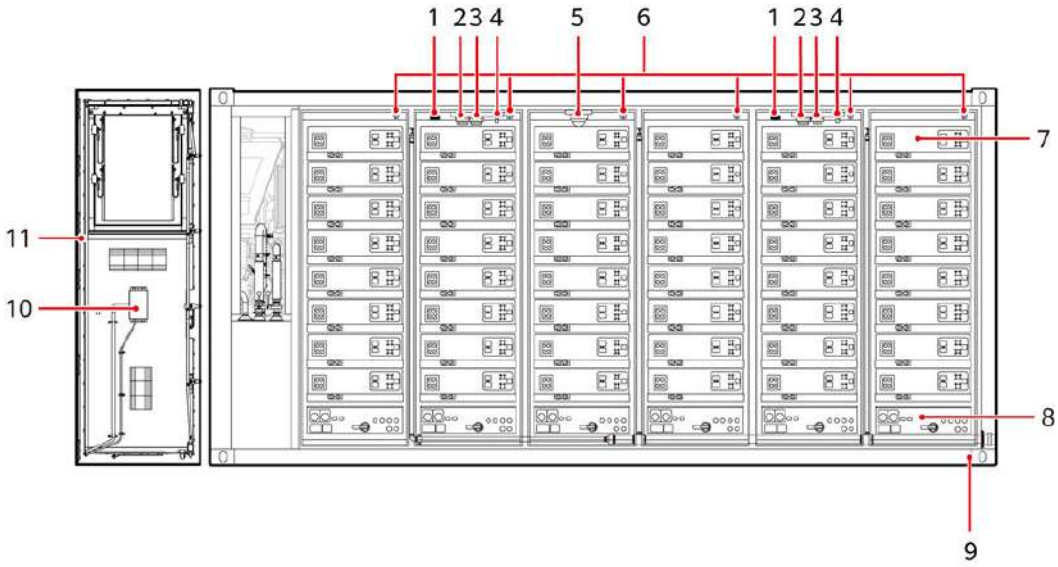
- Before performing maintenance components, ensure that the ESS is powered off.
- If a door must be opened, comply with the principles of minimum door opening angle and minimum door opening time.
- In areas such as deserts, use windproof and sandproof devices to protect the operation site during maintenance. After the maintenance is complete, use vacuum cleaners to clean up the sand and dust on the battery pack surface and in the cabin. After the cleaning is complete, close the cabin door.
- In areas such as deserts, install 18 cm x 25 cm dustproof bags for dust-sensitive devices such as smoke detectors, heat detectors, CO sensors, and T/H sensors and seal the bags with seal tape before maintenance. After the maintenance is complete, remove the dustproof bags and close the cabin doors.

5.1 Positions of Battery Cabin Components

NOTE

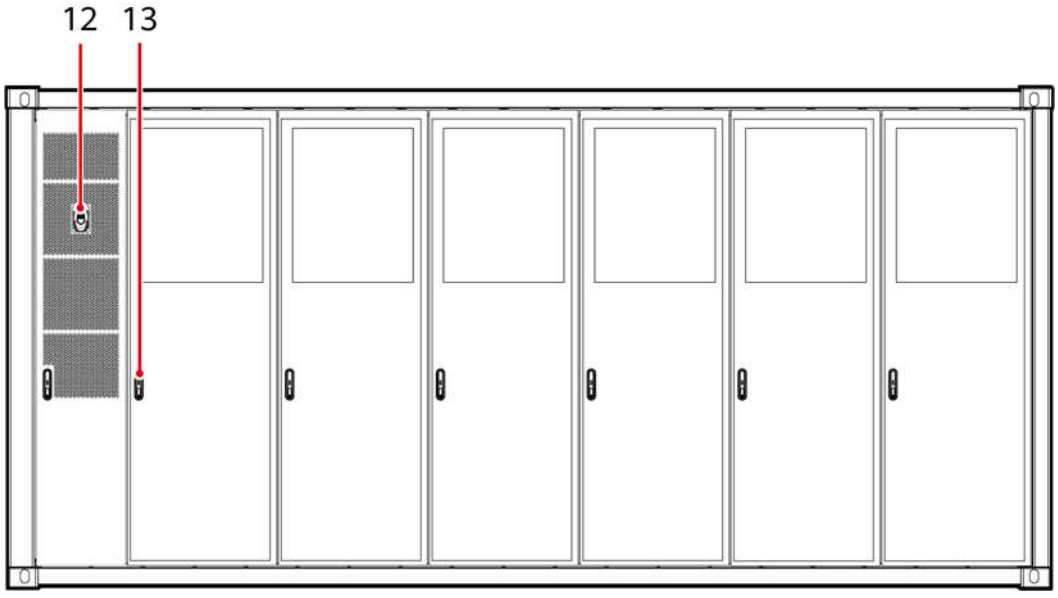
The following figure is for reference only.

Figure 5-1 Positions of battery cabin components (1)



(1) Temperature and humidity (T/H) sensor	(2) Smoke detector	(3) Heat detector	(4) CO sensor
(5) Camera	(6) Door limit switch	(7) Battery pack	(8) RCM
(9) Water sensor	(10) Dehumidifier	(11) Sealing rubber strip	

Figure 5-2 Positions of battery cabin components (2)



(12) Fire alarm horn/strobe	(13) ESS door lock

5.2 Replacing a Battery Pack

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.
- Do not smoke or have an open flame around batteries.
- Do not use wet cloth to clean exposed copper bars or other conductive parts.
- Do not use water or any solvent to clean batteries.

WARNING

- Do not maintain batteries with power on. To power off the batteries before performing operations such as checking screw torque and tightening screws, explain the risks to the customer, obtain the customer's written consent, and take effective preventive measures.
- After batteries are discharged, charge them in time to avoid damage due to overdischarge.

WARNING

- Tighten the screws on copper bars or cables to the torque specified in this document. Periodically confirm whether the screws are tightened, check for rust, corrosion, or other foreign objects, and clean them up if any. Loose screw connections will result in excessive voltage drops and batteries may catch fire when the current is high.
- When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.

CAUTION

- Do not use the battery packs if the packing cases are exposed to rain, damaged, or deformed, or if the battery packs leak or fall.
- Do not install battery packs on rainy, snowy, or foggy days. Otherwise, the battery packs may be eroded by moisture or rain.
- Exercise caution when moving batteries to prevent bumping and ensure personal safety.
- Slowly push or move battery packs to prevent damage and collision.

5.2.1 Replacing an Entire Battery Pack

DANGER

- Do not enter the bottom of the battery pack fixture for observation or operation.
- Do not stand under the fixture.
- Do not put your head, hands, feet, or other body parts under the fixture.

WARNING

If the battery cannot be pushed because the fixture is not aligned, do not push the battery forcibly. Instead, remove the battery, align the fixture, and try again to avoid damage to the battery.

CAUTION

- Multiple persons are required in the operation. Take protective measures to prevent collision.
- After installing the battery, slowly lift the fixture to remove it and ensure that the handles do not contact the battery connecting rod.
- When working at heights is involved, see the relevant safety precautions.
- Place the ladder close to the handwheel and align it with the fixture. Stand on the ladder to operate the handwheel and observe the fixture connection and battery installation progress.

NOTE

- When installing and removing a battery pack, use a level to check that the battery pack is leveled when pushed in and pulled out.
- The battery pack maintenance fixture may generate some noise when the handwheel is turned. This is a normal phenomenon.
- When moving the battery pack in or out, observe the gap between the bottom of the battery pack and the guide rail. If the bottom of the battery pack does not contact the guide rail, remind the forklift driver to raise the fork arm until the bottom of the battery pack contacts the guide rail.

Prerequisites

- Three persons are required to replace a battery pack.
- Tools: battery pack maintenance tool, fire hose insertion/removal tool, ladder, insulated flat-head/Phillips screwdriver, insulated torque wrench, adjustable wrench, open-end wrench, safety gloves, safety shoes, safety helmet, safety harness, protective goggles, forklift (see **4.2 Forklift Requirements**), infrared thermometer, and level

NOTE

- Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
- The personnel, tools, and environment must meet relevant safety requirements.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

LTMS Coolant Liquid Level Check

Observe the liquid level of the sight tube. If the liquid level is lower than the low liquid level and only one battery pack is replaced, refill coolant.

Checking the Old Battery Pack Status

After the ESS is powered off, wait for 5 to 10 minutes, open the battery cabin door, and check the battery pack status.

Step 1 Use an infrared thermometer to measure the temperature of the battery pack. If the temperature exceeds the protection threshold (65°C), observe the battery pack until the temperature falls below 60°C.

Step 2 If any irritating odor, leakage, bulging, or damage is present, contact the Company's engineers for handling.

Step 3 If sparks or burn marks occur on the front panel or handles of the battery pack, contact technical support for handling.

Step 4 If the battery pack appears normal and has no irritating odor, remove the faulty battery pack.

----End

Removing an Old Battery Pack

Step 1 Ensure that the ESS has been powered off and the status of the old battery pack has been checked.

Step 2 Remove the camera. This step is required only when the battery pack on the top of battery rack 3 needs to be replaced.

Step 3 Disconnect the general power cables, balancing bus, communications cables, coolant inlet/outlet pipe, extinguishant hose (configured for only some models), and ground cable from the front panel (active balancing module) of the battery pack. Prepare cable labels and keep the cables and pipes properly.

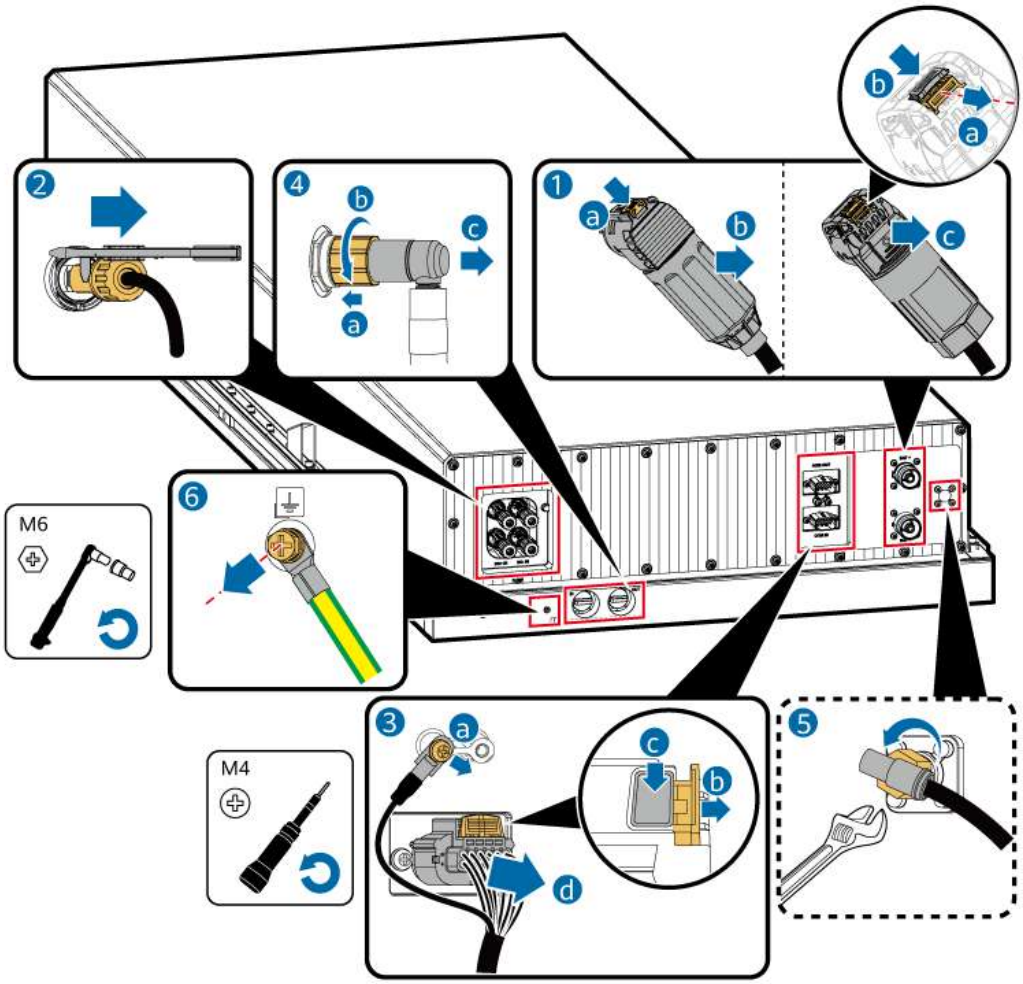
1–3: Disconnect the power cables and communications cable.

4: Remove the coolant inlet and outlet of the liquid cooling pipe: Remove the branch liquid cooling pipe and the old female connector of the stop valve. Retain the old male connector.

5. Remove the extinguishant hose from the battery pack.

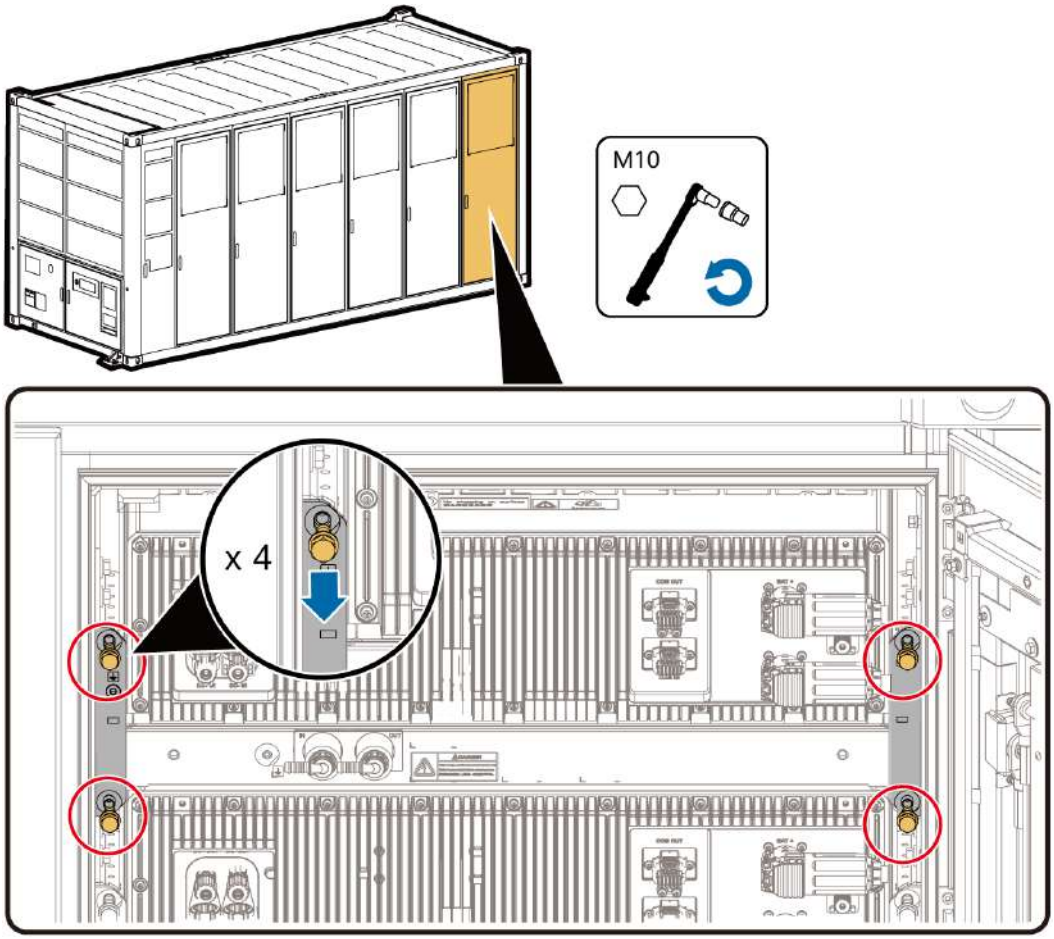
6: Remove the ground cable.

Figure 5-3 Removing cables and pipes from the panel



Step 4 Remove protective plates from the battery pack.

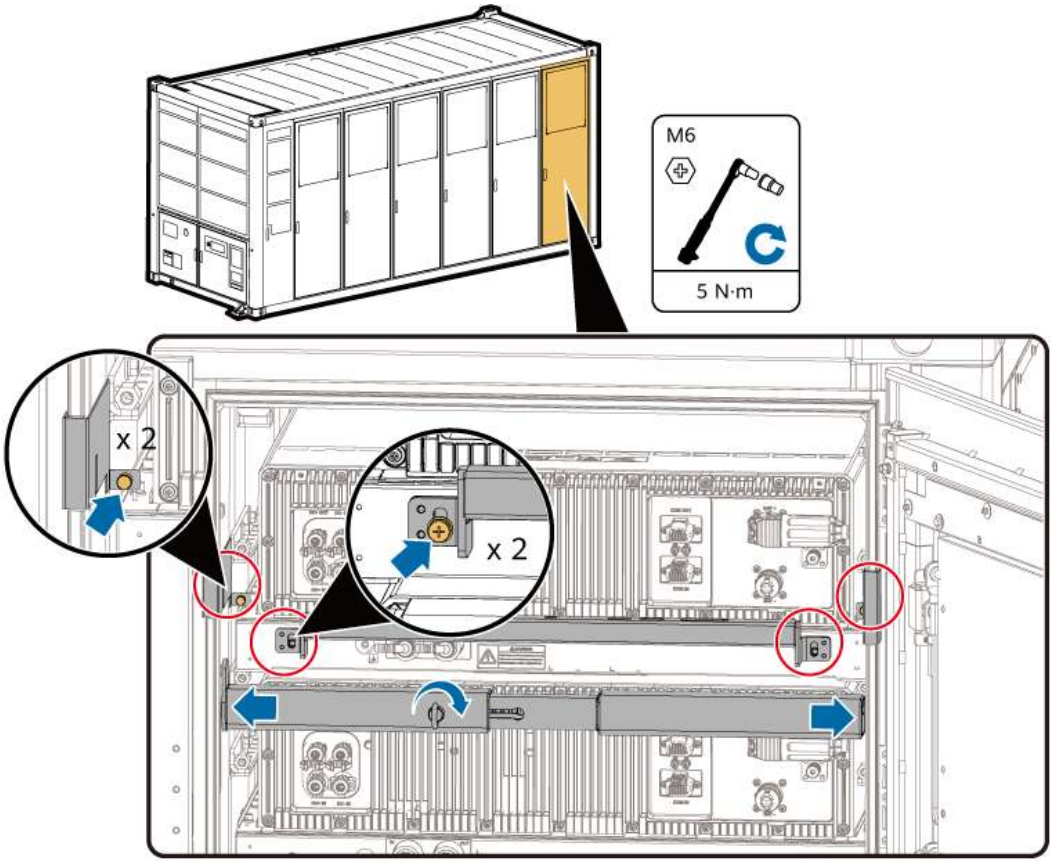
Figure 5-4 Removing protective plates from the battery pack



Step 5 Install the battery pack connecting rod, container connecting rod, and protective plates on the left and right sides of the battery pack.

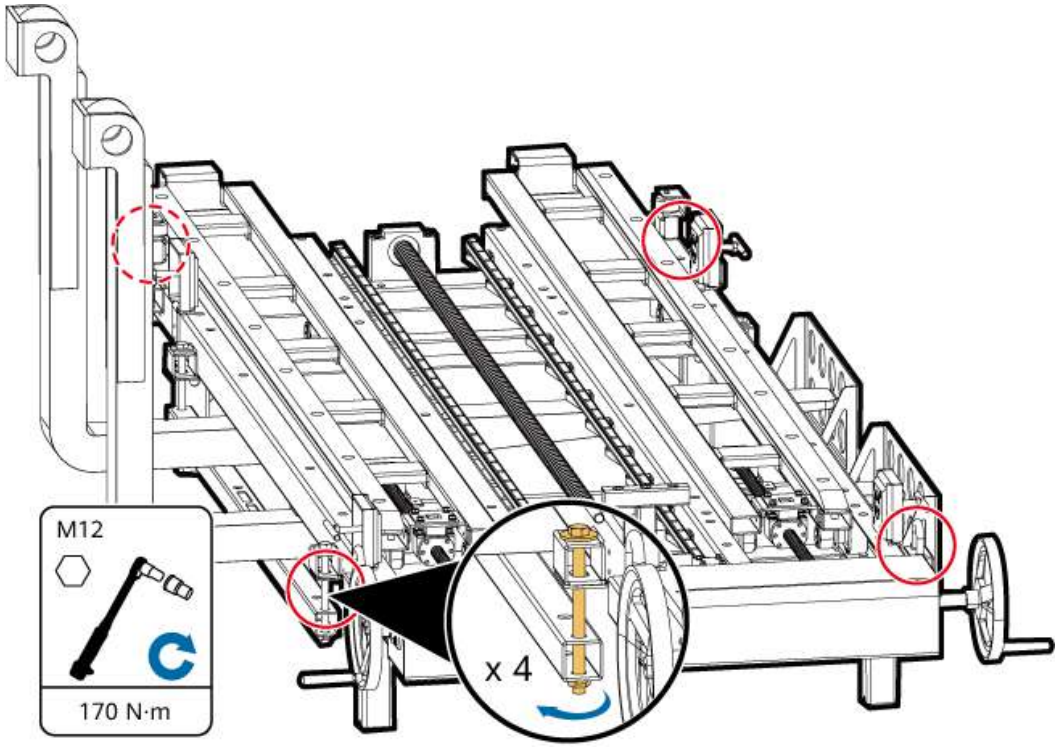
Ensure that the telescopic limit bolt of the connecting rod is open. Insert one side of the connecting rod into the square hole of the container, insert the other side into the square hole of the container, and tighten the telescopic limit bolt (clockwise).

Figure 5-5 Installing the battery pack connecting rod and container connecting rod



Step 6 Insert the forklift tynes into the fixture, adjust the tightness of the bolts, and secure the battery pack fixture to the forklift.

Figure 5-6 Securing the fixture

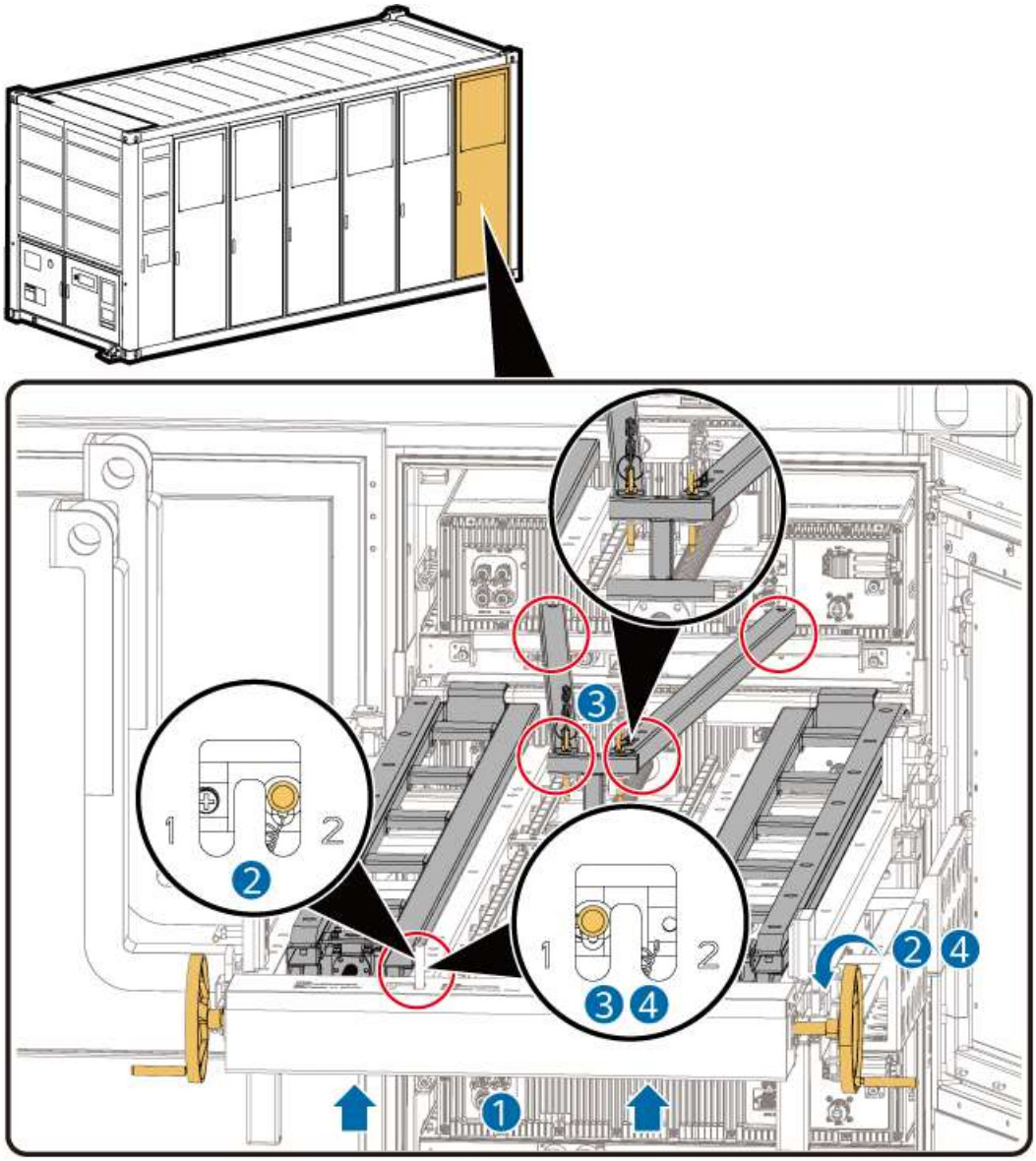


Step 7 Pull out the first half of the battery pack.

1. Use the forklift to lift the fixture so that the drawer handle is slightly higher than the container connecting rod.

   Keep the front end of the fixture 200–900 mm away from the pack to prevent collision.
2. Switch to position 2, rotate the handwheel counterclockwise, push the drawer handle to the top of the container connecting rod, and lower the tynes of the forklift until the drawer handle comes in contact with the container connecting rod.
3. Switch to position 1, place the extension arm on the fixture, secure one end of the extension arm to the container connecting rod using the ring bolts, rotate the handwheel, align the holes on the other end of the extension arm with the holes on the battery pack connecting rod retainer, and insert the ring bolts to secure the extension arm.
4. Keep the position at 1 and rotate the handwheel counterclockwise to pull out the battery pack to be replaced.

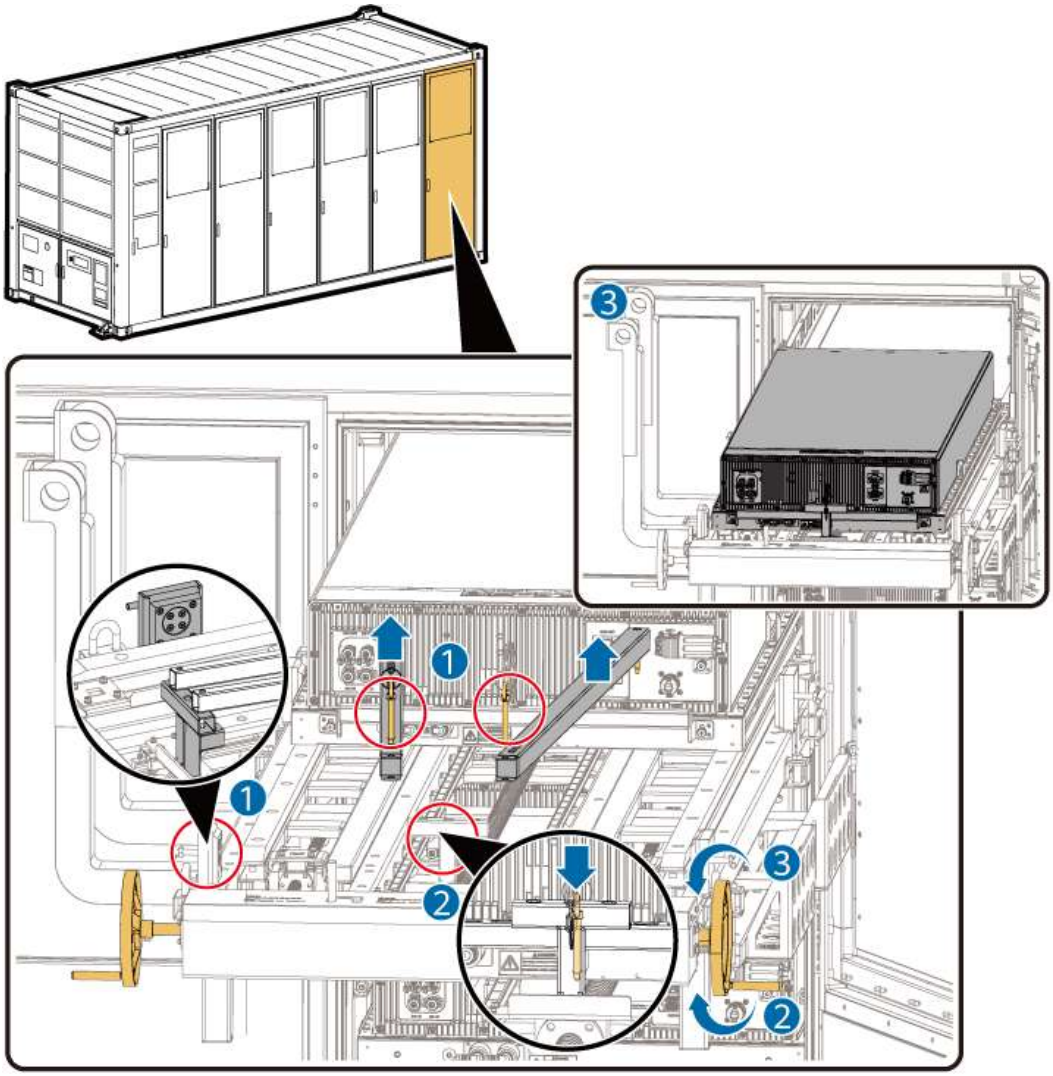
Figure 5-7 Pulling out the first half of the battery pack



Step 8 Keep the position at 1 and take out the battery pack to be replaced.

1. Pull the battery connecting rod retainer near the distance blocks, and then take out the extension arm.
2. Rotate the handwheel clockwise, align the holes on the battery connecting rod retainer with the holes on the battery connecting rod, and insert the ring bolts.
3. Rotate the handwheel counterclockwise to pull the battery pack out of the ESS.

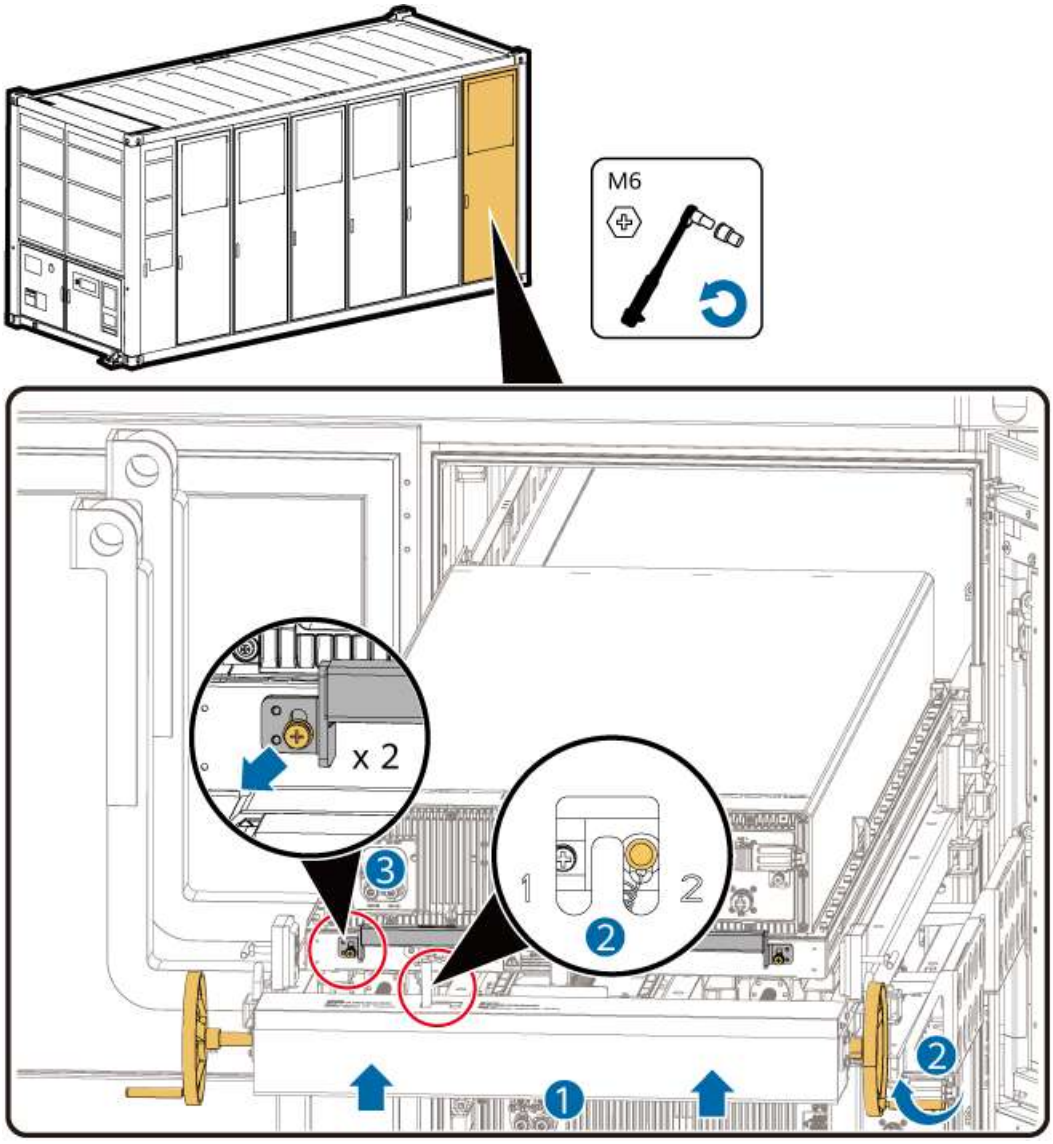
Figure 5-8 Pulling out the battery pack completely



Step 9 Restore the fixture to the original status and use the forklift to move the battery pack to a safe place.

1. Use the forklift to lift the fixture so that the drawer handle is slightly higher than the container connecting rod.
2. Switch to position 2. Rotate the handwheel clockwise until the drawer handle is fully retracted. Move the battery pack to a safe area and place it on the ground.
3. Remove the battery pack connecting rod.

Figure 5-9 Removing the battery pack



----End

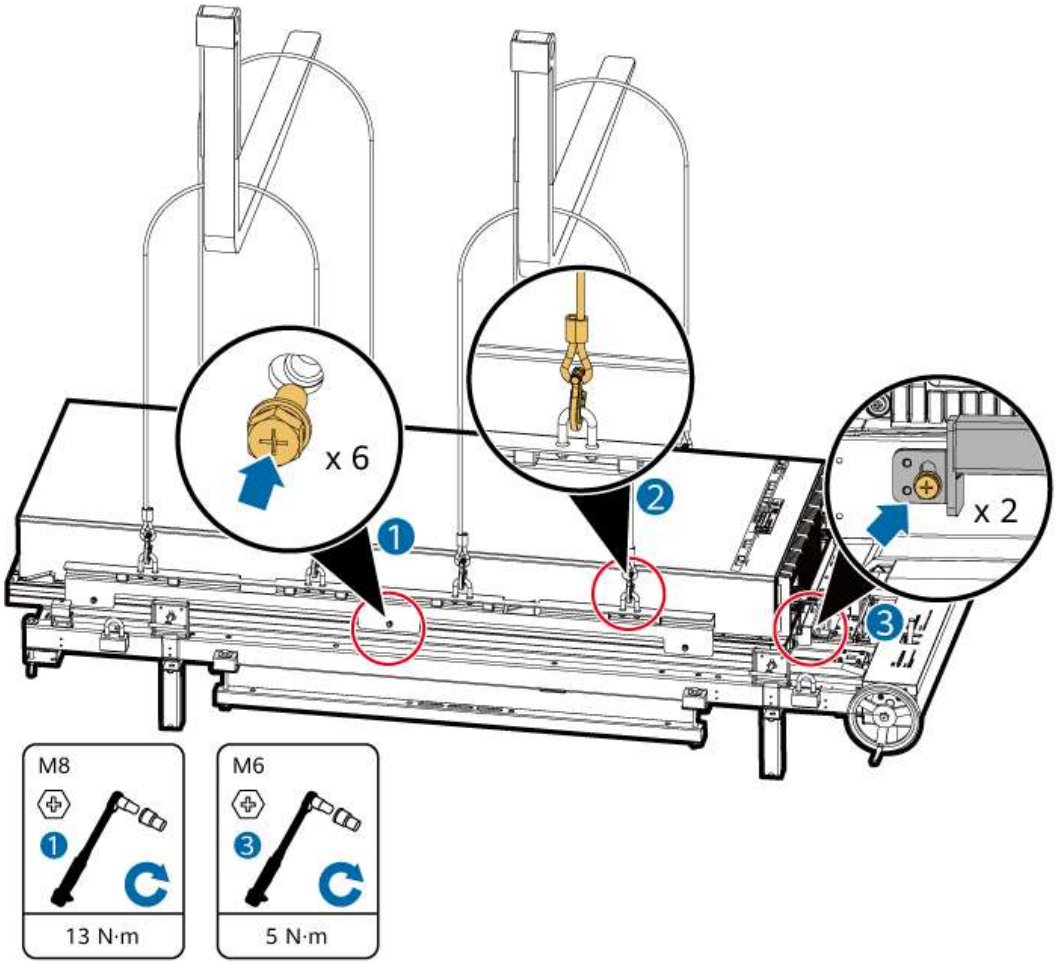
Installing a New Battery Pack

Step 1 Take out a new battery pack. Place and secure it on the battery pack fixture.

1. Install the battery pack securing rod.
2. Install the hoisting kit, hook the battery pack, lift the battery pack using the forklift, and place the battery pack on the fixture.

   When placing the battery pack on the fixture, adjust the distance blocks to ensure that the battery pack is placed in the middle.
3. Take out the battery connecting rod and secure it to the battery pack.

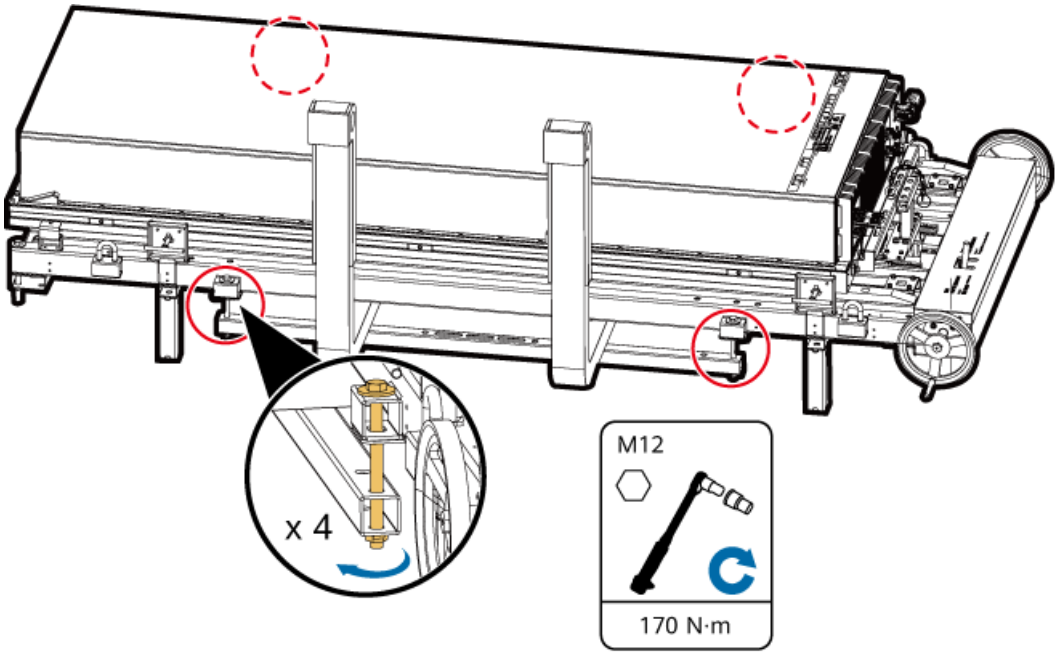
Figure 5-10 Placing the battery on the fixture



Step 2 Secure the battery pack to the fixture.

1. Switch to position 1, rotate the handwheel, align the holes on the battery connecting rod retainer with the holes on the battery connecting rod, and insert the ring bolts.
2. Insert the forklift tynes into the fixture, adjust the tightness of the long bolts, and secure the battery pack fixture to the forklift.

Figure 5-11 Securing the battery pack fixture to the forklift

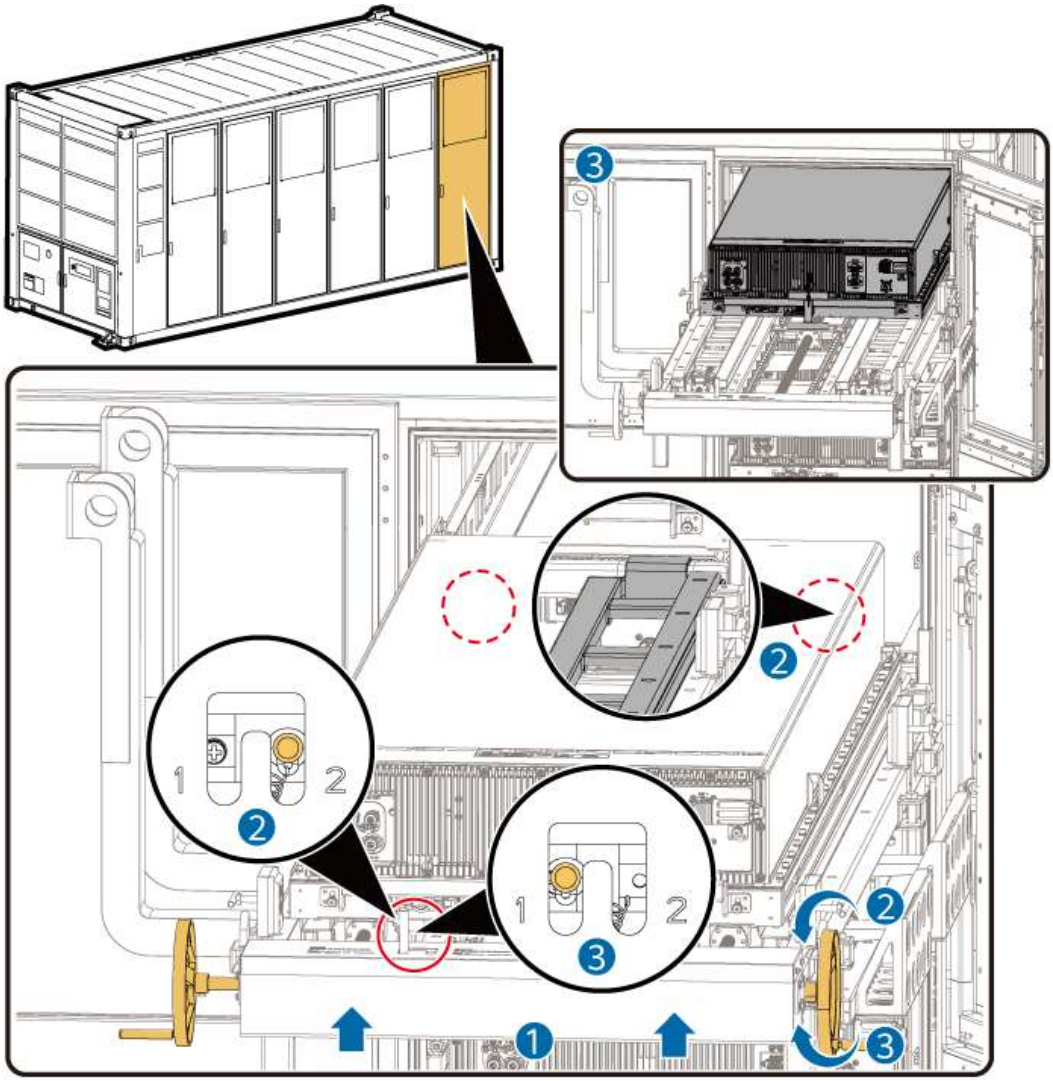


Step 3 Pull in the first half of the new battery pack.

1. Use the forklift to lift the fixture so that the drawer handle is slightly higher than the container connecting rod.

   Keep the front end of the fixture 200–900 mm away from the pack to prevent collision.
2. Switch to position 2, rotate the handwheel counterclockwise, extend the extension arm handle to the top of the container connecting rod, and lower the tynes of the forklift until the drawer handle comes in contact with the container connecting rod.
3. Switch to position 1, rotate the handwheel clockwise, and push a part of the battery pack into the container.

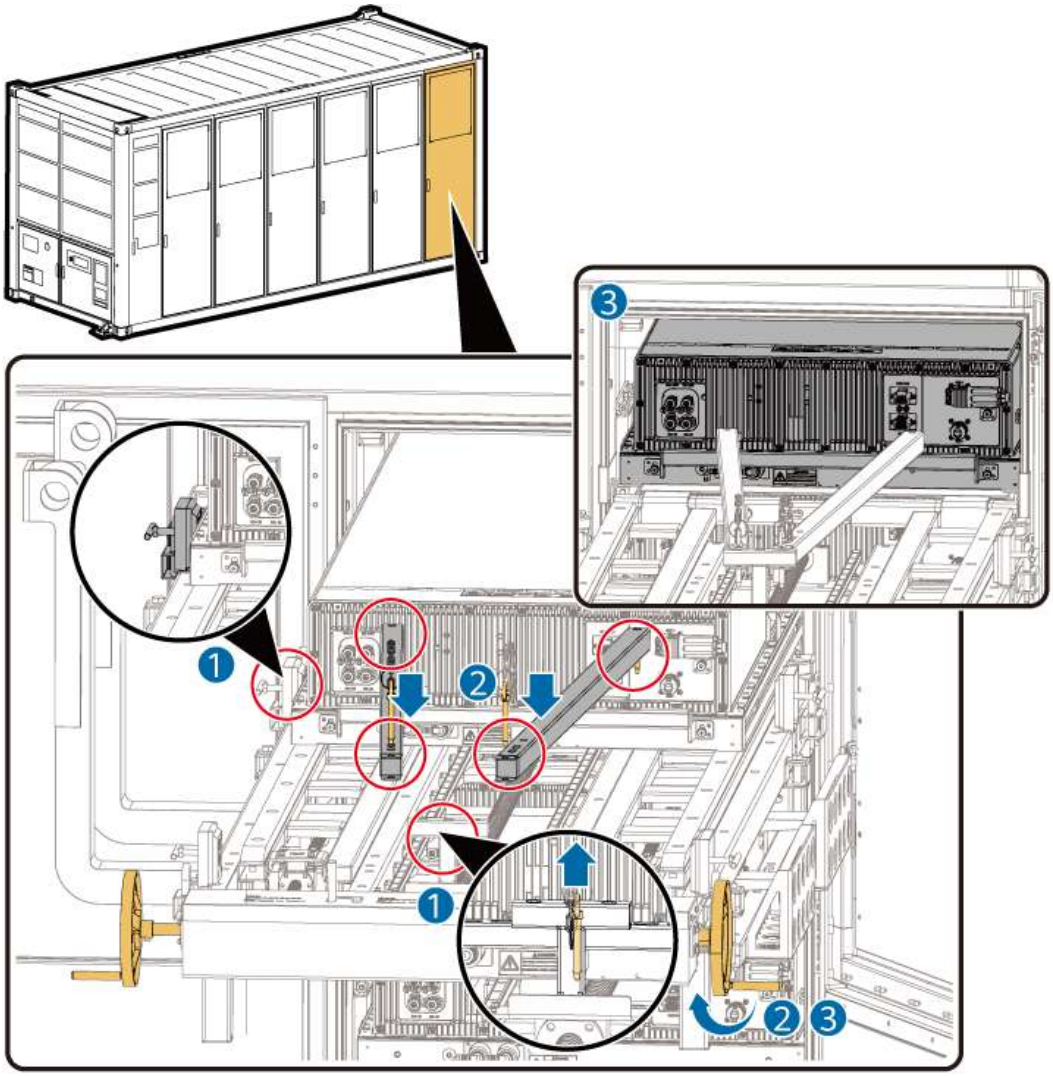
Figure 5-12 Pushing a part of the battery pack into the container



Step 4 Keep the position at 1 and push the battery pack completely into the ESS.

1. Push the battery connecting rod retainer near the distance blocks shown in the following figure.
2. Place the extension arm on the fixture, secure one end of the extension arm to the container connecting rod using the ring bolts, rotate the handwheel clockwise, align the holes on the other end of the extension arm with the holes on the battery connecting rod retainer, and insert the ring bolts to secure the extension arm.
3. Rotate the handwheel clockwise to push the battery pack completely into the container. Ensure that the front end of the battery pack is flush with the battery pack guide rail to expose the gap between the fixture and the guide rail.

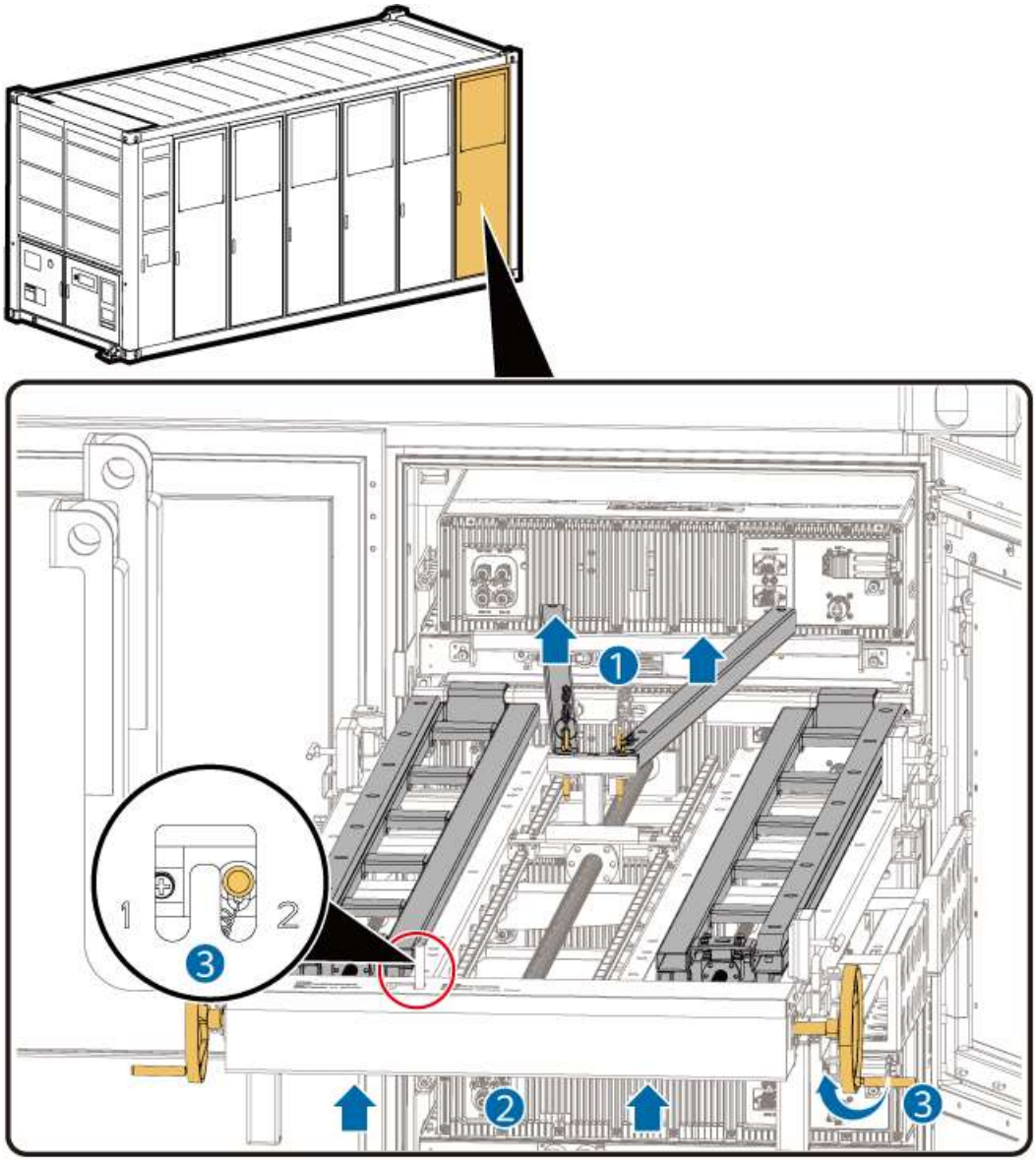
Figure 5-13 Pushing in the battery pack completely



Step 5 Restore the fixture to the original status and remove the forklift.

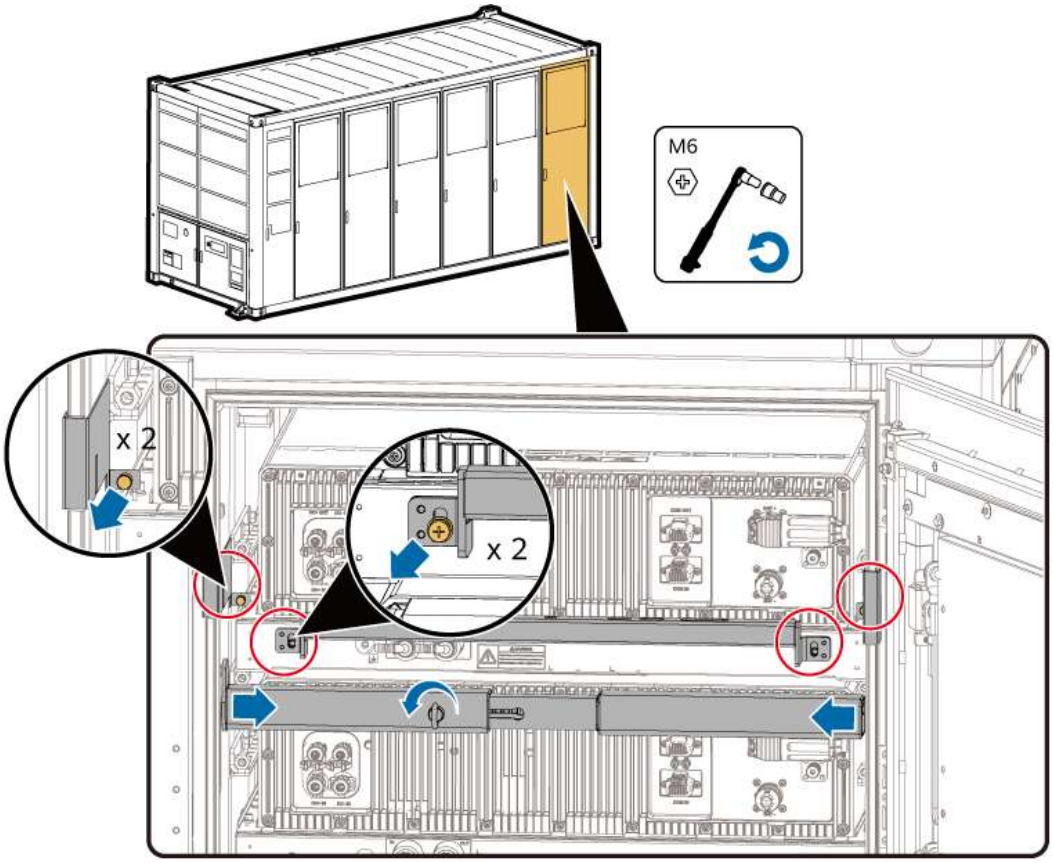
1. Pull out the ring bolts and take out the extension arm.
2. Use the forklift to lift the fixture so that the drawer handle is slightly higher than the container connecting rod.
3. Switch to position 2. Rotate the handwheel clockwise until the drawer handle is fully retracted. Drive the forklift to move the fixture to a safe place.

Figure 5-14 Restoring the fixture



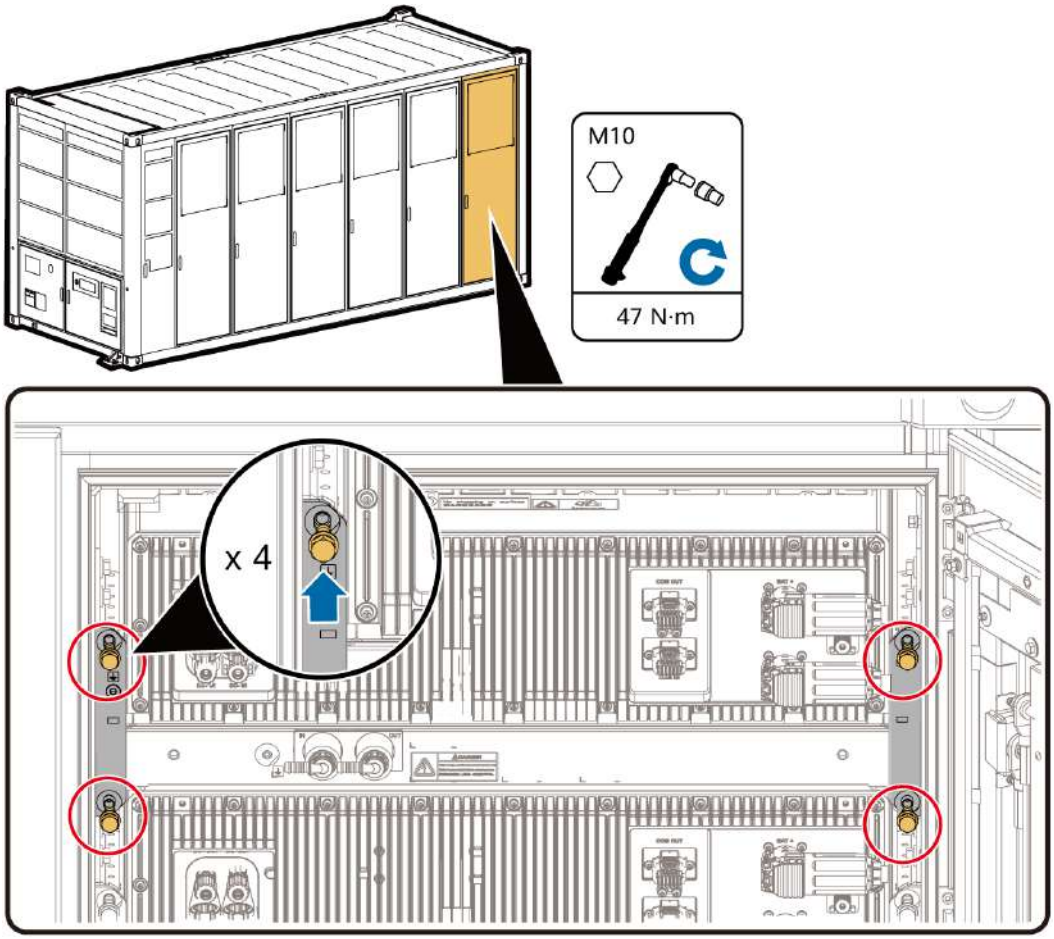
Step 6 Remove the container connecting rod, battery connecting rod, and protective plates on the left and right sides of the battery pack.

Figure 5-15 Removing the container connecting rod and battery connecting rod



Step 7 Install the protective plates on the battery pack and tighten the screws on both sides.

Figure 5-16 Installing protective plates



Step 8 Put the battery pack fixture and components back into the packing case and keep them properly.

Step 9 If more than one battery pack is replaced, refill coolant. For details, see Filling/Draining Coolant for a Battery Pack.

Step 10 Reinstall the cables and extinguishant hose on the front panel of the battery pack.

Tighten the ground cable to 5 N·m and the communications terminal to 1.6 N·m.

DANGER

Note the polarities when installing batteries. Do not connect the positive and negative poles of a battery or battery string together. Otherwise, the battery may be short-circuited.

Step 11 Install the camera. This step is required only when the battery pack on the top of battery rack 3 needs to be replaced.

----End

5.2.2 Replacing an Active Balancing Module

Prerequisites

- Tools: active balancing module maintenance fixture, ladder, insulated flat-head/Phillips screwdriver, insulated torque wrench, adjustable wrench, open-end wrench, safety gloves, safety shoes, safety helmet, safety harness, and protective goggles

  NOTE

  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.
- Materials: cable ties
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Removing an Old Active Balancing Module

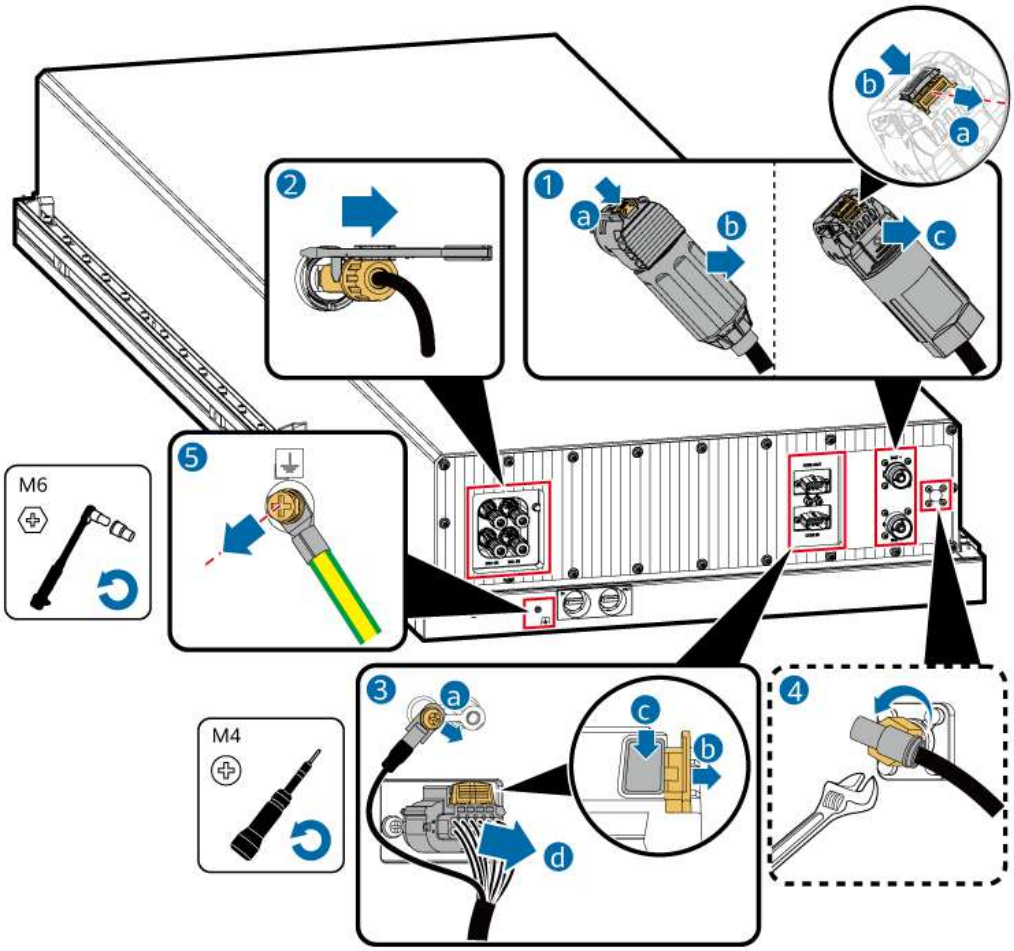
Step 1 Disconnect the general power cables, balancing bus, communications cables, coolant inlet/outlet pipe, extinguishant hose (configured for only some models), and ground cable from the front panel (active balancing module) of the battery pack. Prepare cable labels and keep the cables and pipes properly.

1–3: Disconnect the power cables and communications cable.

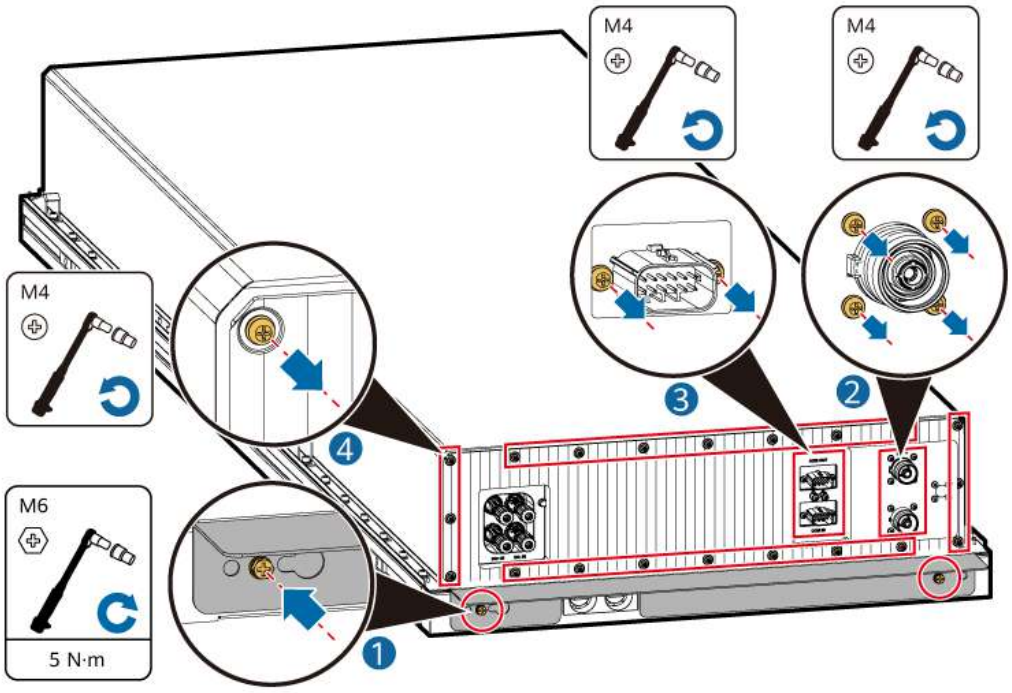
4. Remove the extinguishant hose from the battery pack.

5: Remove the ground cable.

Figure 5-17 Removing cables and pipes from the panel



Step 2 Install the active balancing module maintenance fixture. Remove screws from the general power port, COM communications port, and panel in sequence.



Step 3 Remove the cable harness on the left side of the battery pack.

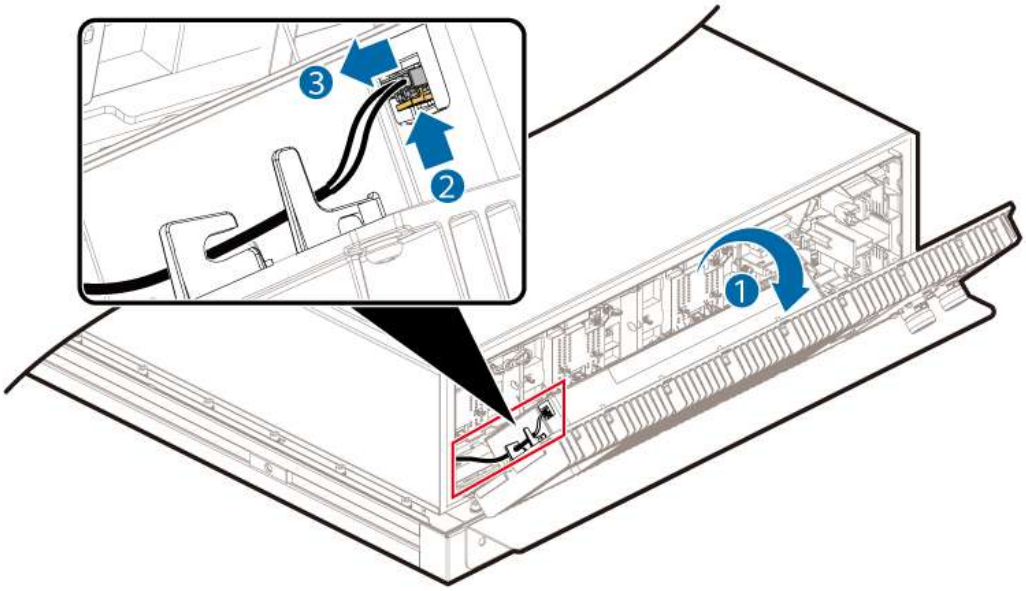
WARNING

Take insulation measures and exercise caution when performing operations with power on.

1. Slowly pull out the battery pack panel until the general power terminals are removed from the panel.

2–3: Remove the cables and terminals from the hooks on the left.

Figure 5-18 Removing the cable harness on the left



Step 4 Remove the cable harness on the right side of the battery pack.

WARNING

Take insulation measures and exercise caution when performing operations with power on.

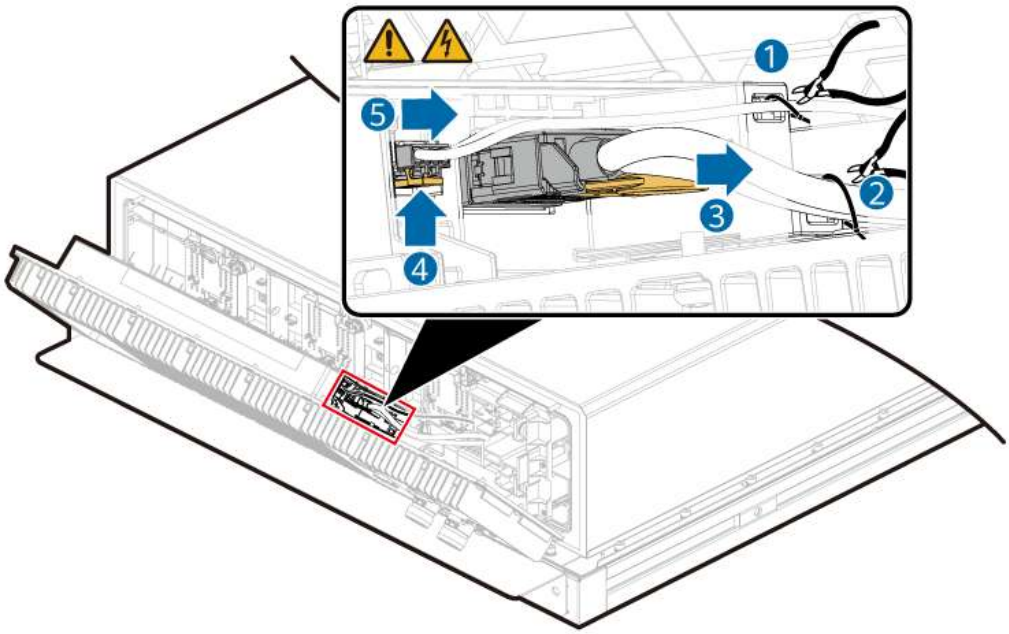
CAUTION

Exercise caution when cutting cable ties and avoid damaging cables.

1–2: Cut off cable ties.

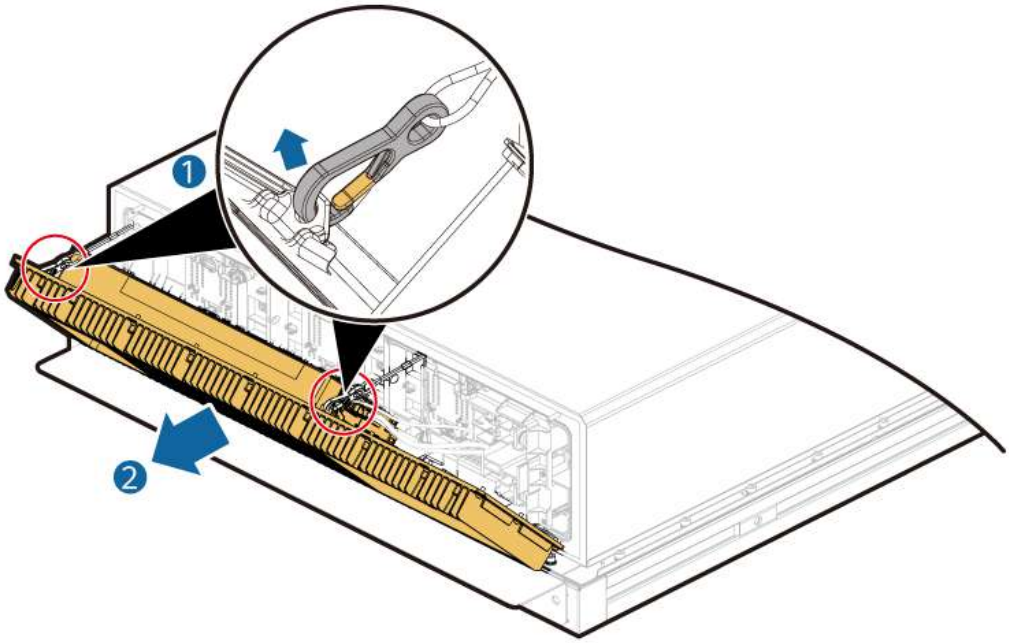
3–5: Remove the harness and terminals.

Figure 5-19 Removing the cable harness on the right



Step 5 Remove the two clasps from the panel and slowly remove the active balancing module.

Figure 5-20 Removing the active balancing module

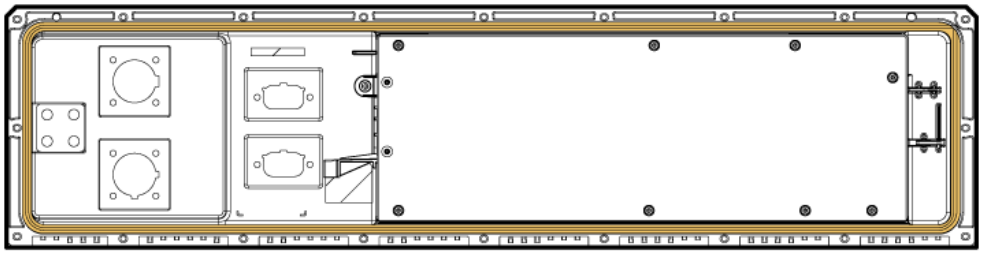


----End

Installing a New Active Balancing Module

Step 1 Check that the sealing rubber strip of the new active balancing module is intact.

Figure 5-21 Position of the sealing strip



Step 2 Place the active balancing module on the lower edge of the opening at the front end of the cover, tilt the module, and fasten the two clasps to the die-casting panel.

Step 3 Reinstall the internal cable harnesses and bind them. For details, see **Step 4** and **Step 3** in **Removing an Old Active Balancing Module**.

NOTE

The cables on the left must be placed in the hooks.

Step 4 Install the communications terminals and balancing bus terminal on the front panel, install the panel on the large window on the top cover using guide pins, and close the panel.

NOTICE

- When installing communications terminals, install the COM IN port terminal (with a short cable) first, and then install the COM OUT port terminal (with a long cable and a red tube label).
- To ensure the air tightness of the battery pack:
  - Ensure that all the communications terminals and panel screws are securely installed.
  - Ensure that the sealing rubber strip is not damaged or shifted during installation.

Step 5 Install the screws that secure the general power ports (8 screws) and panel (20 screws), and remove the active balancing module maintenance fixture.

Tighten all 28 M4 screws securely to 1.6 N·m.

NOTICE

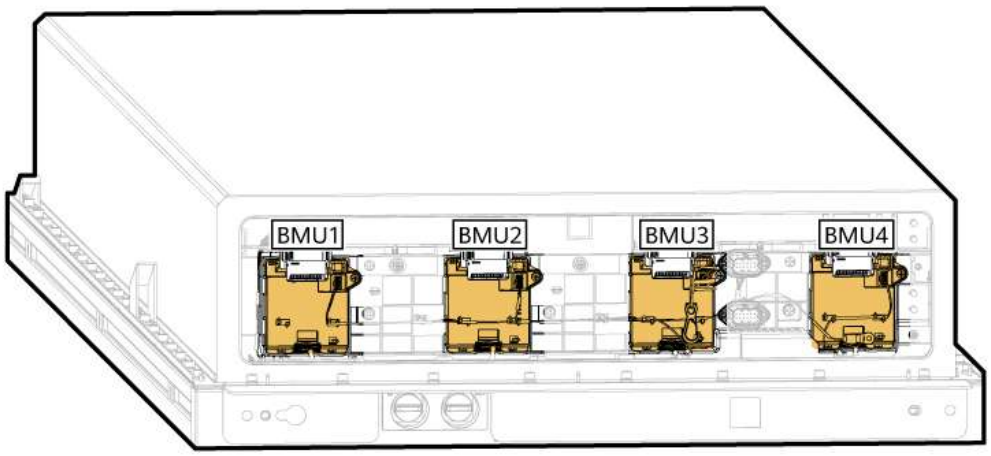
Ensure that the white sealing washers on the BAT terminals do not fall off with the front panel. If a washer falls off, reinstall it.

Step 6 Reinstall the cables, pipes, and extinguishant hose on the front panel of the battery pack.

----End

5.2.3 Replacing a Battery Monitoring Unit (BMU)

Each battery pack has four BMUs, which can be replaced separately. The numbers 1 to 4 on the SmartLogger WebUI and in the alarm information correspond to BMU1, BMU2, BMU3, and BMU4 in the following figure.



Prerequisites

- Tools: negative copper bar protection fixture, insulated flat-head or Phillips screwdriver, insulated torque socket wrench, insulated gloves, ESD gloves, safety shoes, safety helmet, protective goggles, and ladder

  NOTE

  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.
- Materials: insulation tape
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Removing an Old BMU

Step 2 and **Step 3** are required only when you replace BMU4.

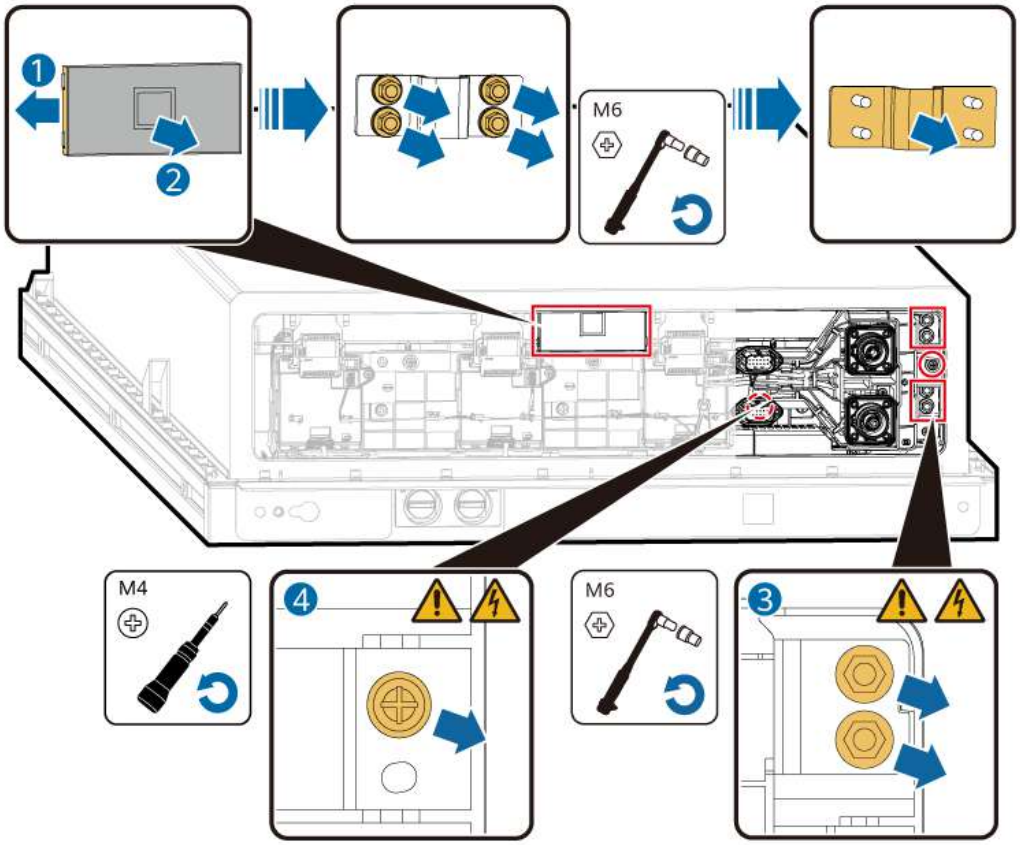
Step 1 Remove the active balancing module. For details, see **Removing an Old Active Balancing Module**.

Step 2 Remove the general positive and negative power components. The torque for M4 screws is 1.6 N·m, and that for M6 screws is 5 N·m.

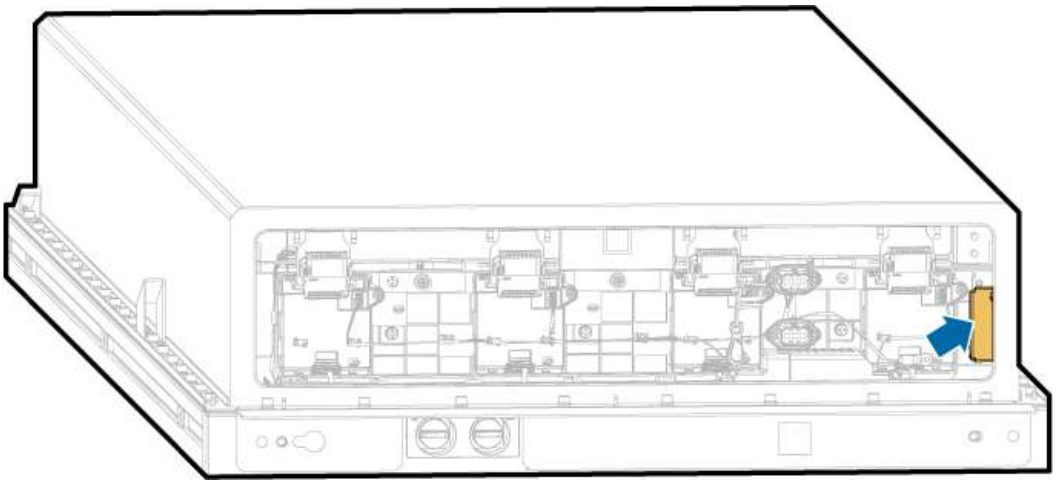
WARNING

- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power components do not contact to prevent short circuits between the general positive and negative power components and the enclosure.
- After removing the general negative power components, protect the negative terminal using the negative copper bar protection fixture.
- For removed cables, wrap cable terminals with insulation materials, and prevent short circuits and falling off of foreign matter.
- Remove the protective cover before removing the copper bars connected in series. Reinstall the protective cover after removing the copper bars.

Figure 5-22 Removing the general positive and negative power components



Step 3 Installing the negative copper bar protection fixture

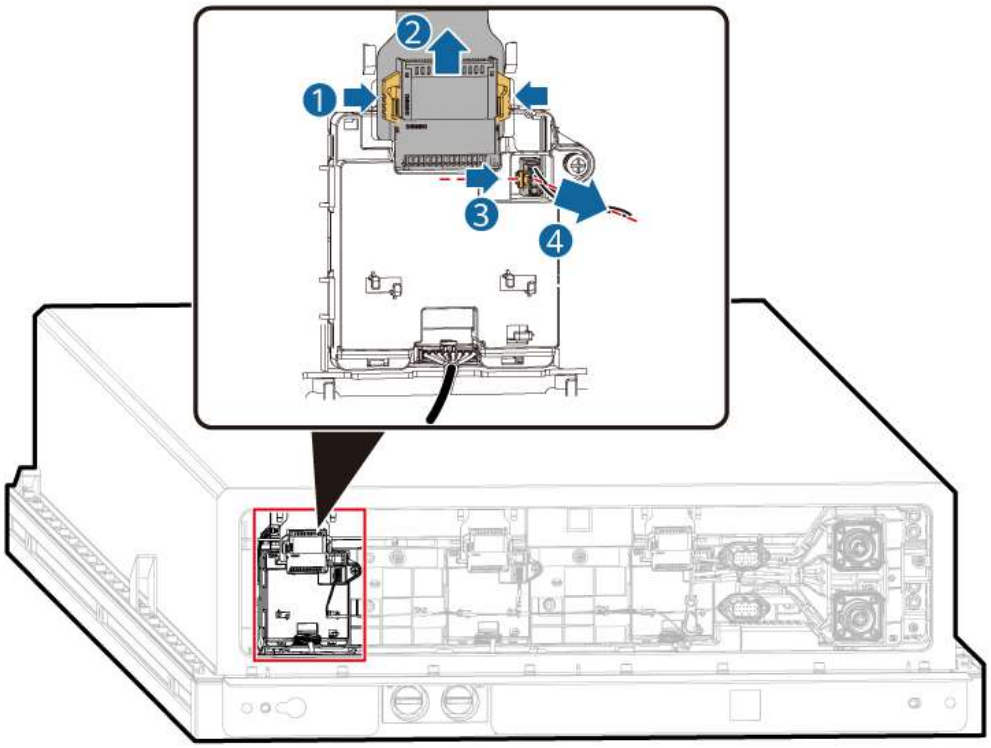


Step 4 Remove the terminals from the BMU. BMU1 is used as an example.

NOTICE

When removing BMU2 or BMU3, remove the cable clips from the BMU on the left.

- 1–2: Press both ends of the FPC connector and remove it in the FPC flat cable direction.
- 3–4: Remove the cable harness plug.



Step 5 Remove the BMU and cable harness.

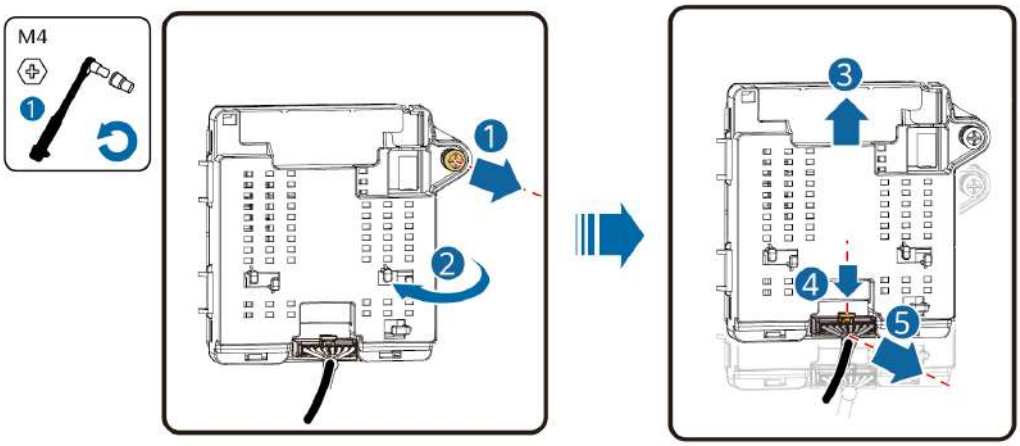
1: Remove the screw. M4 screws are tightened to 1.6 N·m.

2. Tilt the BMU slightly and remove it.

3: Move the tilted BMU upward to reserve space for inserting and removing the cable harness at the bottom.

4–5: Remove the cable harness plug from the bottom of the BMU.

Figure 5-23 Removing the BMU



----End

Installing a New BMU

Step 4 and **Step 5** are required only when you replace BMU4.

Step 1 Reinstall the BMU and cable harnesses by referring to operations of **Step 4** in **Removing an Old BMU** in the reverse order.

NOTE

When installing the BMU, clamp the left side of the BMU into the snap-fits of the slot, and then tighten the screws on the right side.

Step 2 Reinstall other terminals and cable clips by referring to operations of **Step 3** in **Removing an Old BMU** in the reverse order.

NOTICE

When installing the cable harness, arrange the cable harness and properly secure the cable harness back to the original position using cable clips.

Step 3 Remove the negative copper bar protection fixture and keep it properly.

Step 4 Reinstall the general positive and negative power components by referring to operations of **Step 2** in **Removing an Old BMU** in the reverse order.

WARNING

- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power components do not contact to prevent short circuits between the general positive and negative power components and the enclosure.
- Remove the protective cover before installing the copper bars connected in series. Reinstall the protective cover after installing the copper bars.

NOTICE

Check the torque of the installed power nuts. Use a marker to mark the nuts that have been checked.

Step 5 Reinstall the removed active balancing module by referring to **Installing a New Active Balancing Module**.

----End

5.2.4 Replacing an NTC Cable Harness in the Battery Pack

NOTICE

There are four NTC harnesses in the battery pack. Two NTC cable harnesses are secured to the copper bar, and another two are secured to the general positive and negative power component.

5.2.4.1 Replacing an NTC Cable Harness on the Copper Bar

Prerequisites

- Tools: insulation tape, insulated gloves, active balance module maintenance fixture, negative copper bar protection fixture, PV connector unlocking tool, wrench, and Phillips screwdriver (M4, length < 100 mm)
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

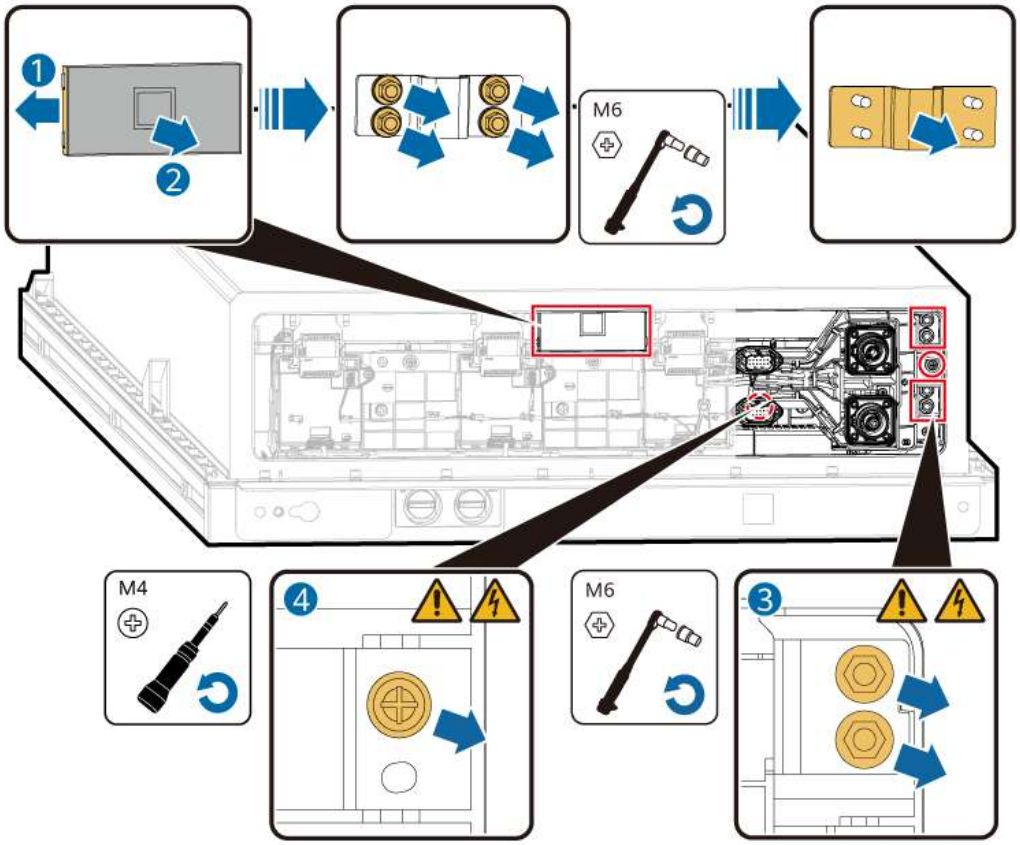
Step 1 Remove the active balancing module. For details, see **Removing an Old Active Balancing Module**.

Step 2 Remove the general positive and negative power components. The torque for M4 screws is 1.6 N·m, and that for M6 screws is 5 N·m.

WARNING

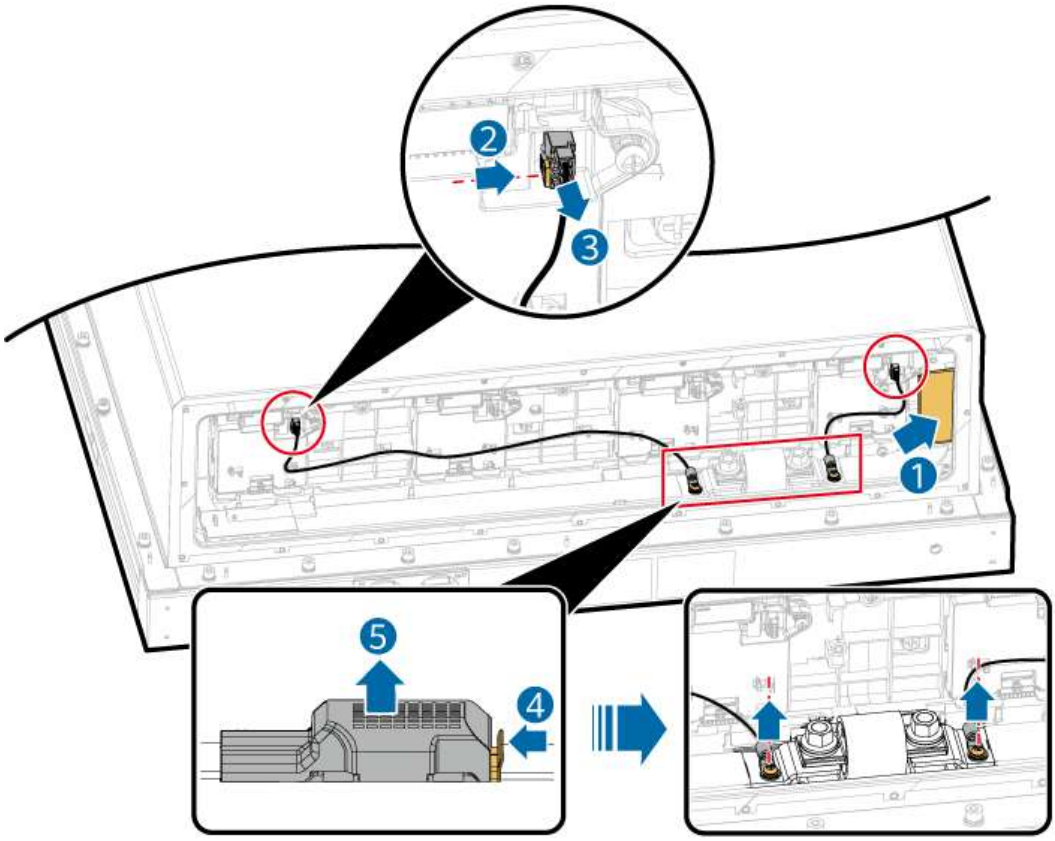
- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power components do not contact to prevent short circuits between the general positive and negative power components and the enclosure.
- After removing the general negative power components, protect the negative terminal using the negative copper bar protection fixture.
- For removed cables, wrap cable terminals with insulation materials, and prevent short circuits and falling off of foreign matter.
- Remove the protective cover before removing the copper bars connected in series. Reinstall the protective cover after removing the copper bars.

Figure 5-24 Removing the general positive and negative power components



Step 3 Remove the NTC cable harness.

Figure 5-25 Removing the NTC cable harness



WARNING

Do not pull or scratch the FPC connector during operations. Otherwise, the FPC connector may be damaged.

Step 4 Reinstall the new NTC cable bundle, remove the negative copper bar protection fixture, and keep it properly. and tighten the M4 Phillips screws to 1.6 N·m.

Step 5 Reinstall the general positive and negative power components by referring to operations of **Step 2** in **Removing an Old BMU** in the reverse order.

WARNING

- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power components do not contact to prevent short circuits between the general positive and negative power components and the enclosure.
- Remove the protective cover before installing the copper bars connected in series. Reinstall the protective cover after installing the copper bars.

NOTICE

Check the torque of the installed power nuts. Use a marker to mark the nuts that have been checked.

Step 6 Reinstall the removed active balancing module by referring to **Installing a New Active Balancing Module**.

----End

5.2.4.2 Replacing an NTC Cable Harness on the General Positive and Negative Power Component

Prerequisites

- Tools: active balancing module maintenance fixture, negative copper bar protection fixture, PV connector unlocking tool, insulated gloves, Phillips insulated torque screwdriver (M4 and M8), and mini Phillips screwdriver (M4, length < 100 mm)
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

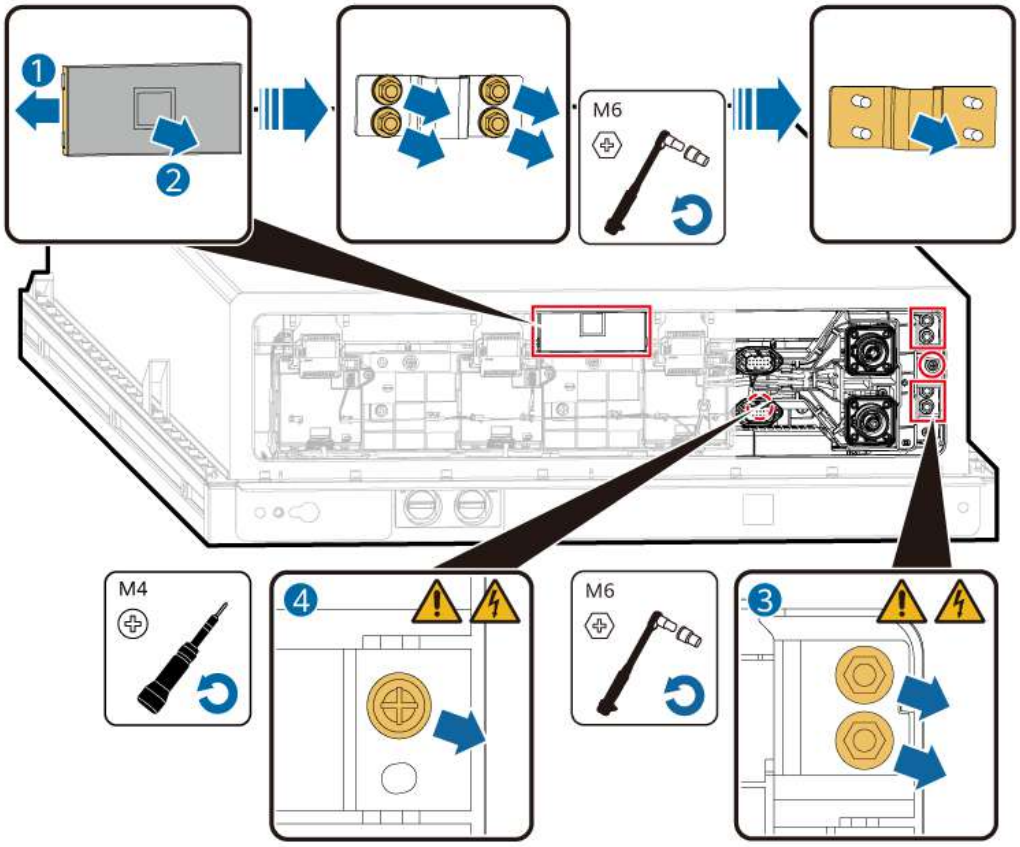
Step 1 Remove the active balancing module. For details, see **Removing an Old Active Balancing Module**.

Step 2 Remove the general positive and negative power components. The torque for M4 screws is 1.6 N·m, and that for M6 screws is 5 N·m.

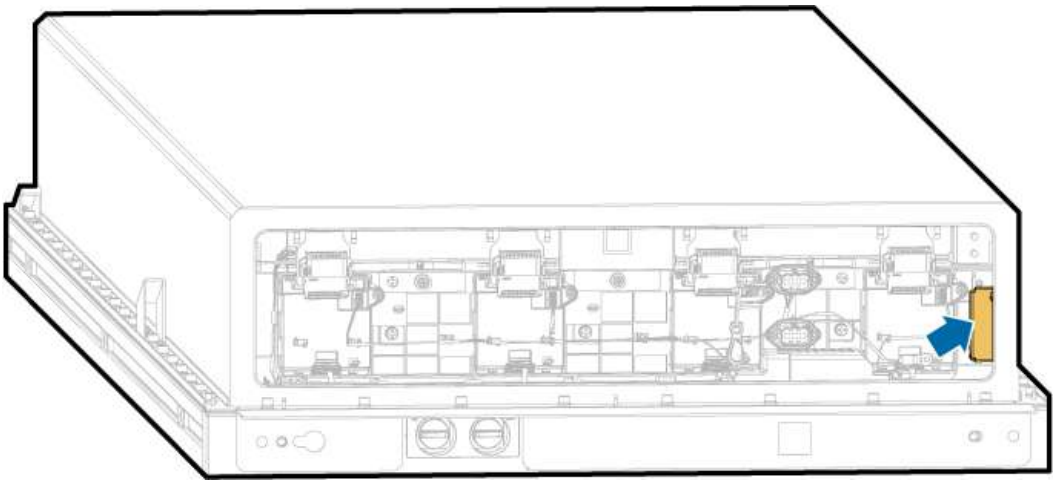
WARNING

- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power components do not contact to prevent short circuits between the general positive and negative power components and the enclosure.
- After removing the general negative power components, protect the negative terminal using the negative copper bar protection fixture.
- For removed cables, wrap cable terminals with insulation materials, and prevent short circuits and falling off of foreign matter.
- Remove the protective cover before removing the copper bars connected in series. Reinstall the protective cover after removing the copper bars.

Figure 5-26 Removing the general positive and negative power components

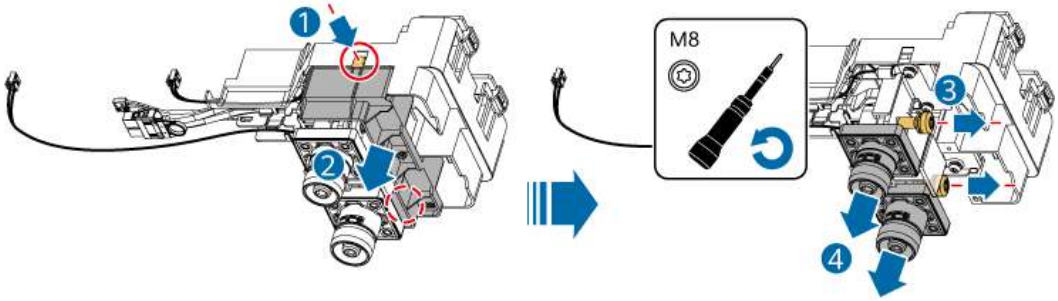


Step 3 Installing the negative copper bar protection fixture



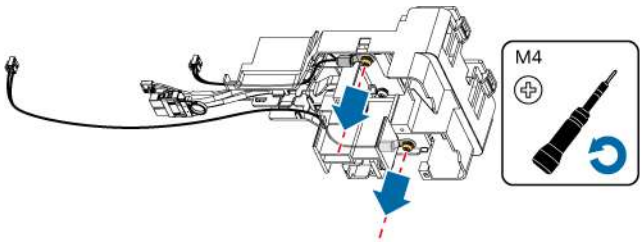
Step 4 Remove the assemblies and general power ports from the general positive and negative power component.

Figure 5-27 Removing the NTC cable harness from the general positive and negative power component (1)



Step 5 Remove the faulty NTC cable harness from the general positive and negative power component.

Figure 5-28 Removing the NTC cable harness from the general positive and negative power component (2)



Step 6 Install a new NTC cable harness and tighten the M4x20 screws to 1.6 N·m.

Step 7 Install the general power ports and assemblies and tighten the M8x20 screws to 13 N·m.

Step 8 Remove the negative copper bar protection fixture and keep it properly.

Step 9 Reinstall the general positive and negative power components by referring to operations of **Step 2** in **Removing an Old BMU** in the reverse order.

⚠ WARNING

- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power components do not contact to prevent short circuits between the general positive and negative power components and the enclosure.
- Remove the protective cover before installing the copper bars connected in series. Reinstall the protective cover after installing the copper bars.

NOTICE

Check the torque of the installed power nuts. Use a marker to mark the nuts that have been checked.

Step 10 Reinstall the removed active balancing module by referring to **Installing a New Active Balancing Module**.

----End

5.3 Replacing an RCM

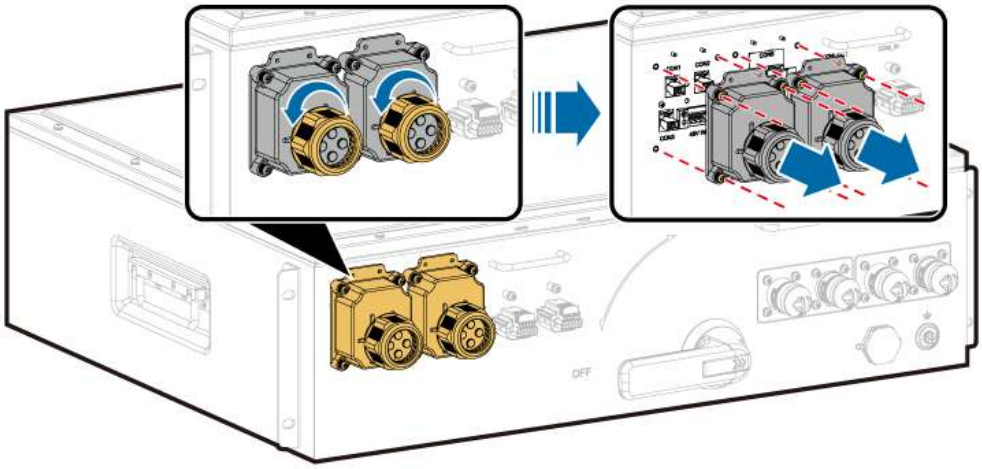
5.3.1 Replacing an Entire RCM

Prerequisites

- Tools: torque wrench (including an extension rod) and insulated flat-head or Phillips screwdriver
- Materials: cable ties
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

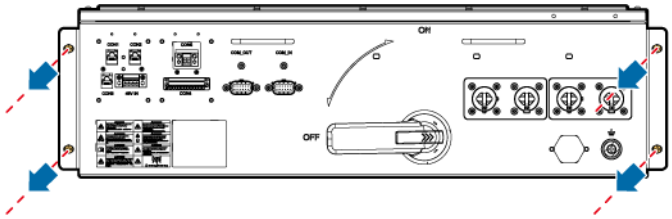
Procedure

Step 1 Loosen the plastic caps of the signal cable and remove the waterproof covers.



Step 2 Cut off the cable ties and remove the cables from the front panel of the RCM.

Step 3 Remove the screws from the front panel of the RCM.



Step 4 Pull out the old RCM by using the handle on the upper part of the front panel and the handle on the side.

NOTICE

Do not pull out the RCM by using the handle of the circuit breaker.

Step 5 Install the new RCM and tightening the M6 screws to 5 N·m.

Step 6 Install and bind the cables.

Step 7 Install the waterproof cover on the signal cable and tighten the plastic screw cap to 1 N·m.

NOTE

Ensure that the unused cable holes on the plastic caps are properly sealed with the plastic plugs.

----End

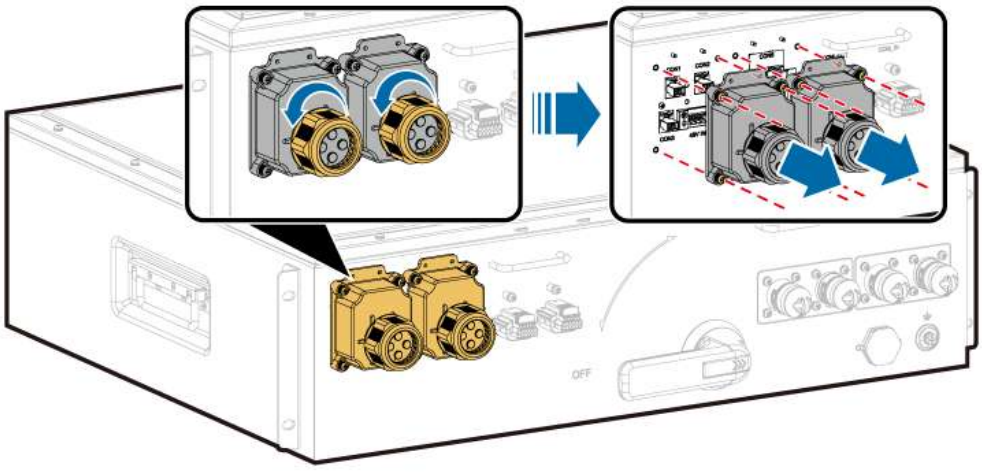
5.3.2 Replacing an RCM External Circulation Fan

Prerequisites

- Tools: Phillips insulated torque screwdriver (including the extension rod)
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

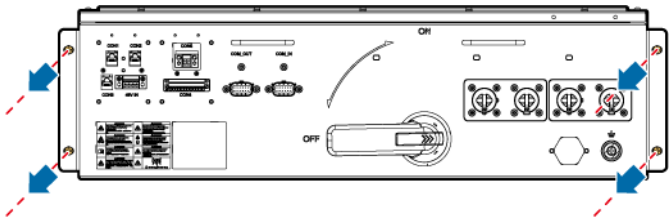
Procedure

Step 1 Loosen the plastic caps of the signal cable and remove the waterproof covers.



Step 2 Cut off the cable ties and remove the cables from the front panel of the RCM.

Step 3 Remove the screws from the front panel of the RCM.

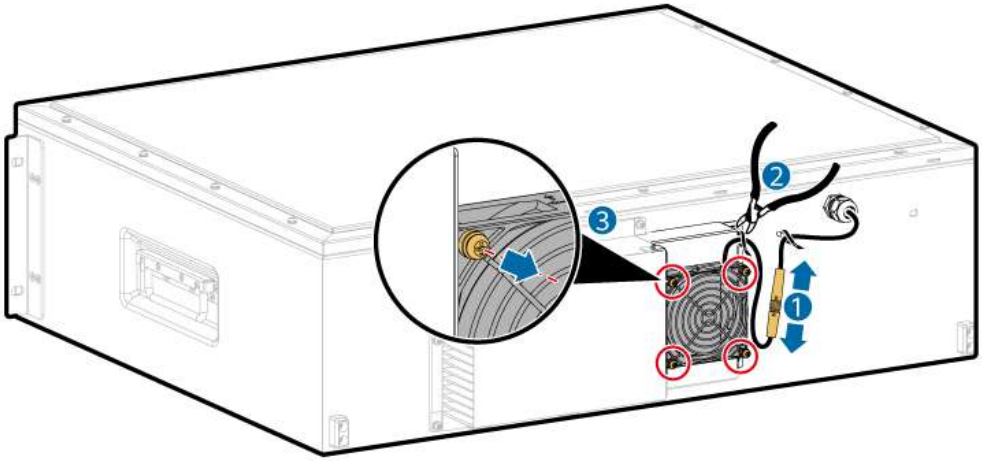


Step 4 Pull out the old RCM by using the handle on the upper part of the front panel and the handle on the side.

NOTICE

Do not pull out the RCM by using the handle of the circuit breaker.

Step 5 Disconnect the connector between the power cable of the old fan and the extension cable, remove the screws from the old fan, and remove the fan.



Step 6 Install a new fan.

1. Insert the screws of the new fan into the fan guard, and tighten the fan guard together with the fan to the support.

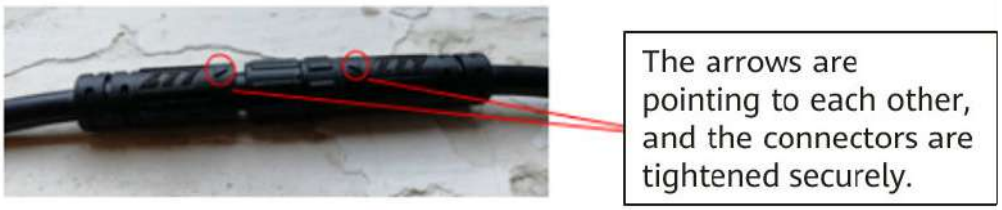
NOTICE

The convex surface of the fan guard faces outward, and the concave surface faces inward. Ensure that the arrow on the top of the fan points to the RCM.

2. Connect the connector between the power cable that comes with the new fan and the extension cable, and bind the cable.

NOTICE

- After the extension cable is tightened to the connector of the power cable that comes with the fan, the arrows shall be flush.
- When binding cables, arrange them in the U shape.



Step 7 Reinstall the RCM. Tighten the M6 screws to 5 N·m.

Step 8 Install and bind the cables.

Step 9 Install the waterproof cover on the signal cable and tighten the plastic screw cap to 1 N·m.

NOTE

Ensure that the unused cable holes on the plastic caps are properly sealed with the plastic plugs.

----End

5.4 Replacing a Smoke Detector

Prerequisites

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure (Module: ED100)

Step 1 Hold the smoke detector by hand, and rotate it counterclockwise to remove it from the base.

Step 2 Install a new smoke detector, and rotate it clockwise until it locks into place.

Step 3 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

----End

Follow-up Procedure

Check that no alarm is generated.

5.5 Replacing a Heat Detector

Prerequisites

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure (Module: ED200)

Step 1 Hold the heat detector by hand, and rotate it counterclockwise to remove it from the base.

Step 2 Install a new heat detector, and rotate it clockwise until it locks into place.

Step 3 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

----End

Follow-up Procedure

Check that no alarm is generated.

5.6 Replacing a CO Sensor

Prerequisites

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Record the DIP switch settings.

Step 2 Disconnect cables from the CO sensor.

Step 3 Remove the faulty CO sensor.

Step 4 Set the DIP switches for a new CO sensor based on the recorded information.

Step 5 Install the new CO sensor.

Step 6 Connect the cables.

----End

Follow-up Procedure

Check that no alarm is generated.

5.7 Replacing a T/H Sensor

Prerequisites

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Record the DIP switch settings.

Step 2 Disconnect cables from the T/H sensor.

Step 3 Remove the faulty T/H sensor.

Step 4 Set the DIP switches for a new T/H sensor based on the recorded information.

Step 5 Install the new T/H sensor.

Step 6 Connect the cables.

----End

5.8 Replacing a Fire Alarm Horn/Strobe

Prerequisites

- Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure (Module: ES2030RE)

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Disconnect cables and remove the old fire alarm horn/strobe.

Step 3 Install a new fire alarm horn/strobe: Connect cables (torque: 0.5 N·m) and tighten screws (torque: 1 N·m).

Step 4 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

----End

Procedure (Model: SG-993 and RF1500A)

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Disconnect cables and remove the old fire alarm horn/strobe.

Step 3 Install a new fire alarm horn/strobe: Connect cables (torque: 0.5 N·m) and tighten screws (torque: 1 N·m).

----End

Follow-up Procedure

Check that no alarm is generated.

5.9 Replacing a Door Limit Switch

Prerequisites

- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the old door limit switch secured with the M4 screws

Step 2 Remove the cables from the old door limit switch.

Step 3 Install the cables for the new door limit switch.

Step 4 Install a new door limit switch and tighten the screws to 1.6 N·m.

----End

Follow-up Procedure

Check that no alarm is generated.

5.10 Replacing a Water Sensor

Prerequisites

- Tools: insulated flat-head/Phillips screwdriver and insulated torque wrench

Procedure

Step 1 Disconnect cables from the water sensor.

Step 2 Remove the faulty water sensor.

Step 3 Install a new water sensor.

Step 4 Connect the cables.

----End

6 Replacing Components in the Control Unit Cabin

NOTICE

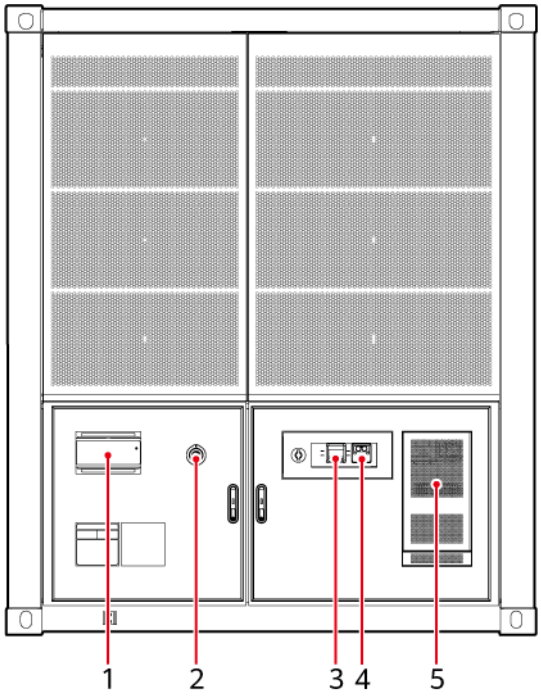
- Before performing maintenance components, ensure that the ESS is powered off.
- During maintenance and commissioning, route cables through the gap at the bottom of the cabin door (without pressing the cables) and keep the cabin door open at the minimum angle.
- If a door must be opened, comply with the principles of minimum door opening angle and minimum door opening time.
- In areas such as deserts, use windproof and sandproof devices to protect the operation site during maintenance. After the maintenance is complete, use vacuum cleaners to clean up the sand and dust in the cabin. After the cleaning is complete, close the cabin door.

6.1 Positions of Control Unit Cabin Components

NOTE

The following figures are for reference only.

Figure 6-1 Exterior of the control unit cabin (the extinguishant release button is combined with the extinguishant abort button)



(1) Extinguishant release indicator

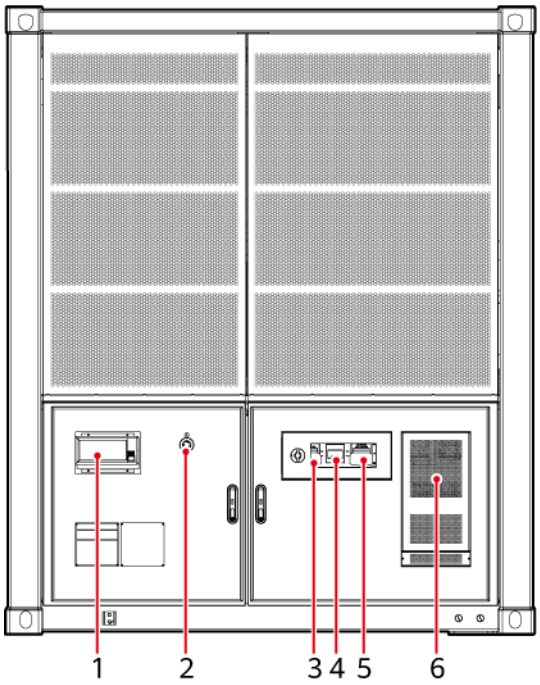
(2) ESS abort button

(3) Manual alarm device

(4) Extinguishant release button

(5) Air conditioner

Figure 6-2 Exterior of the control unit cabin (the extinguishant release button is separated from the extinguishant abort button)



(1) Extinguishant release indicator

(2) ESS abort button

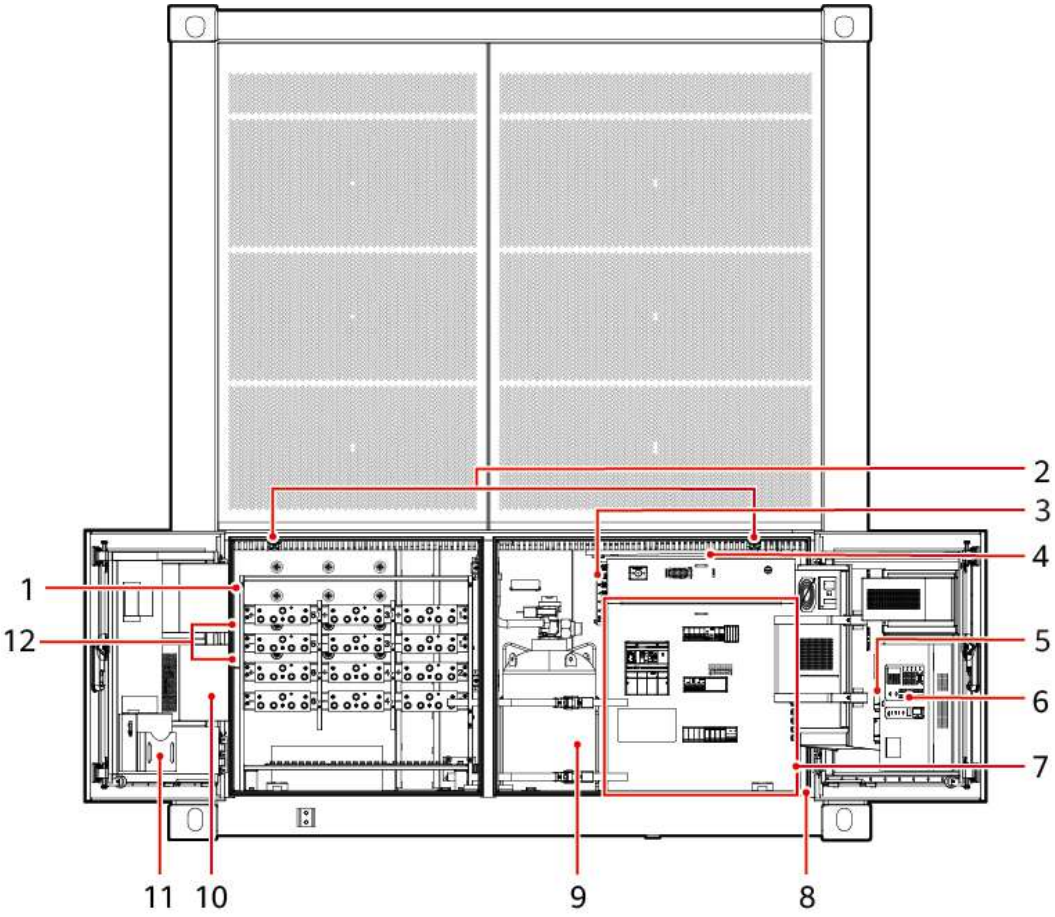
(3) Extinguishant abort button

(4) Manual alarm device

(5) Extinguishant release button

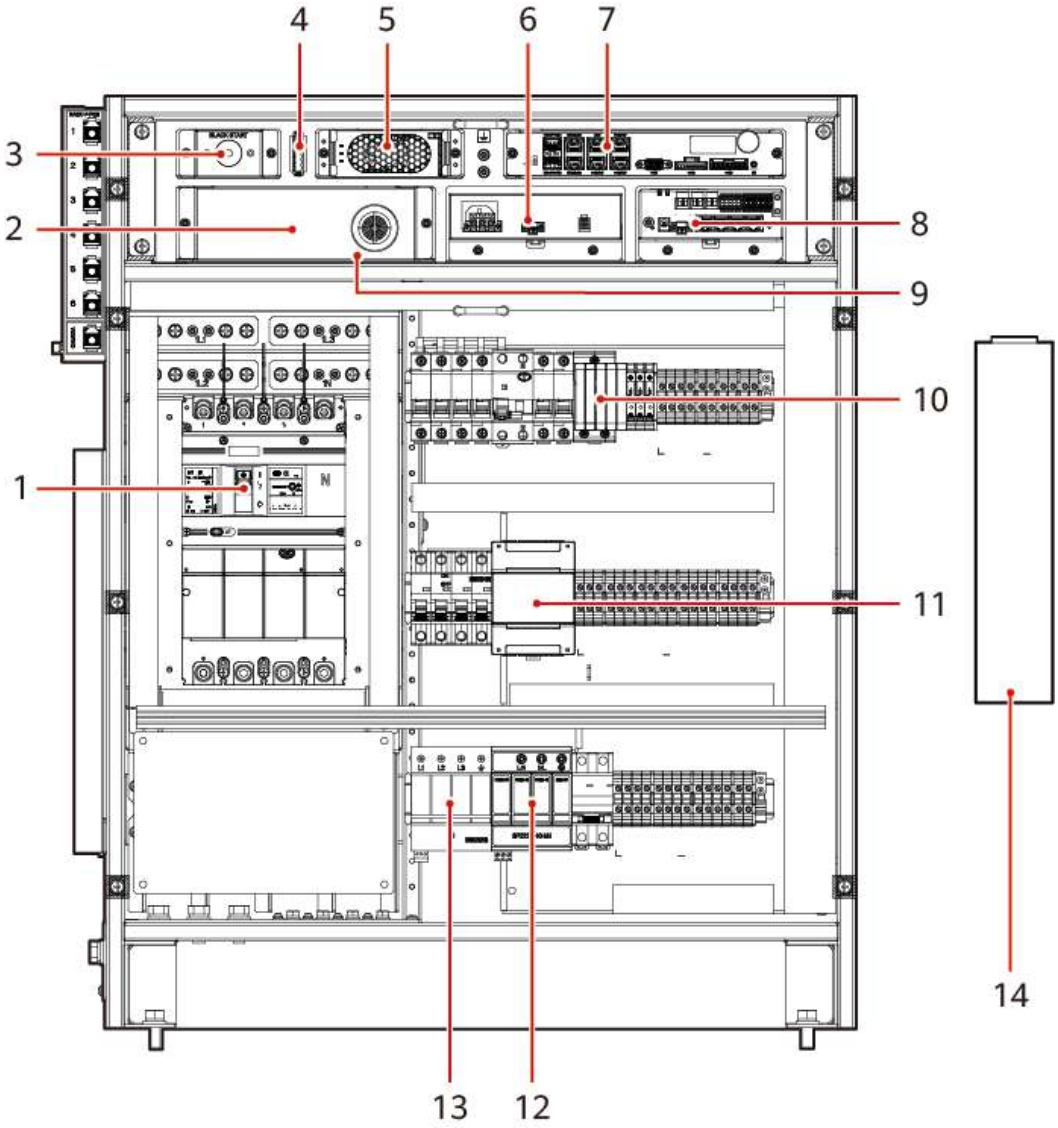
(6) Air conditioner

Figure 6-3 Interior of the control unit cabin



(1) T/H sensor	(2) Door limit switch	(3) Fiber splice tray	(4) Light
(5) Input/Output module of the fire suppression system	(6) Extinguishant control panel	(7) Power distribution cabinet	(8) Water sensor
(9) Fire cylinder	(10) Equivalent loop of the automatic transfer switch (ATS)	(11) Document holder	(12) NTC temperature and humidity sensor (for temperature measurement only)

Figure 6-4 Power distribution cabinet in the control unit cabin



(1) AC circuit breaker	(2) Relay expansion board	(3) Black start button	(4) Dedicated socket for the coolant filling/ drainage machine
(5) Power Supply Unit (PSU)	(6) Power adapter	(7) Central Monitoring Unit (CMU)	(8) SmartModule
(9) E-label board	(10) Maintenance socket/Reserved socket terminal	(11) Power meter	(12) Surge protective device (SPD) for the UPS
(13) Three-phase SPD	(14) DO expansion board		

6.2 Replacing an ESS Abort Button

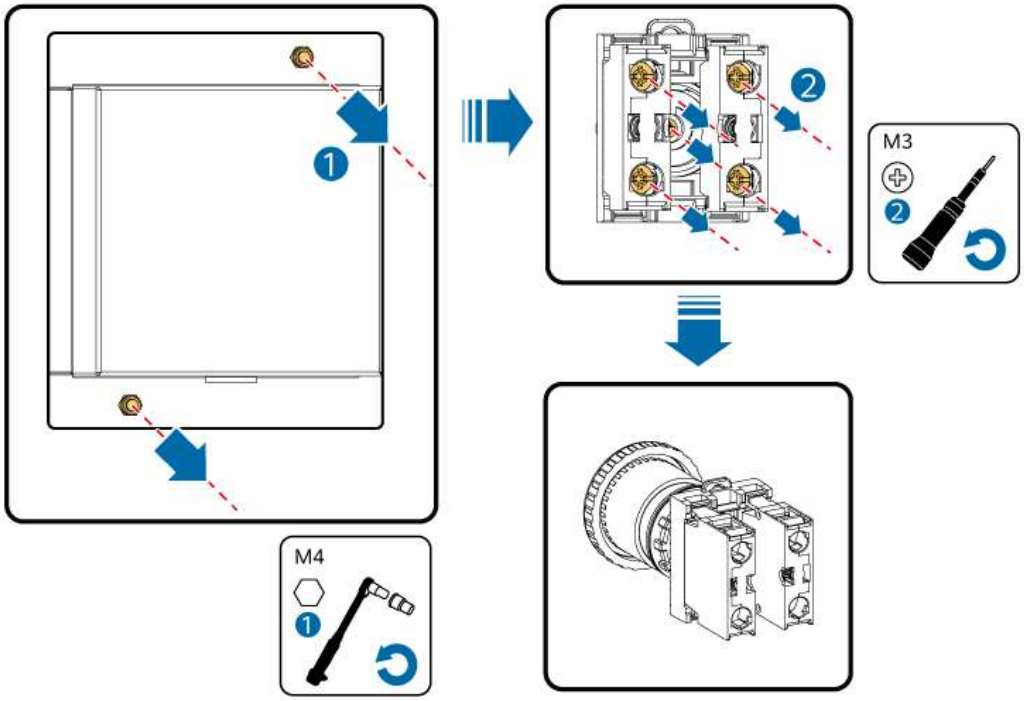
Prerequisites

- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the screws from the abort button box on the inner left side of the control unit cabin, and then remove the abort button.

Figure 6-5 Removing the abort button

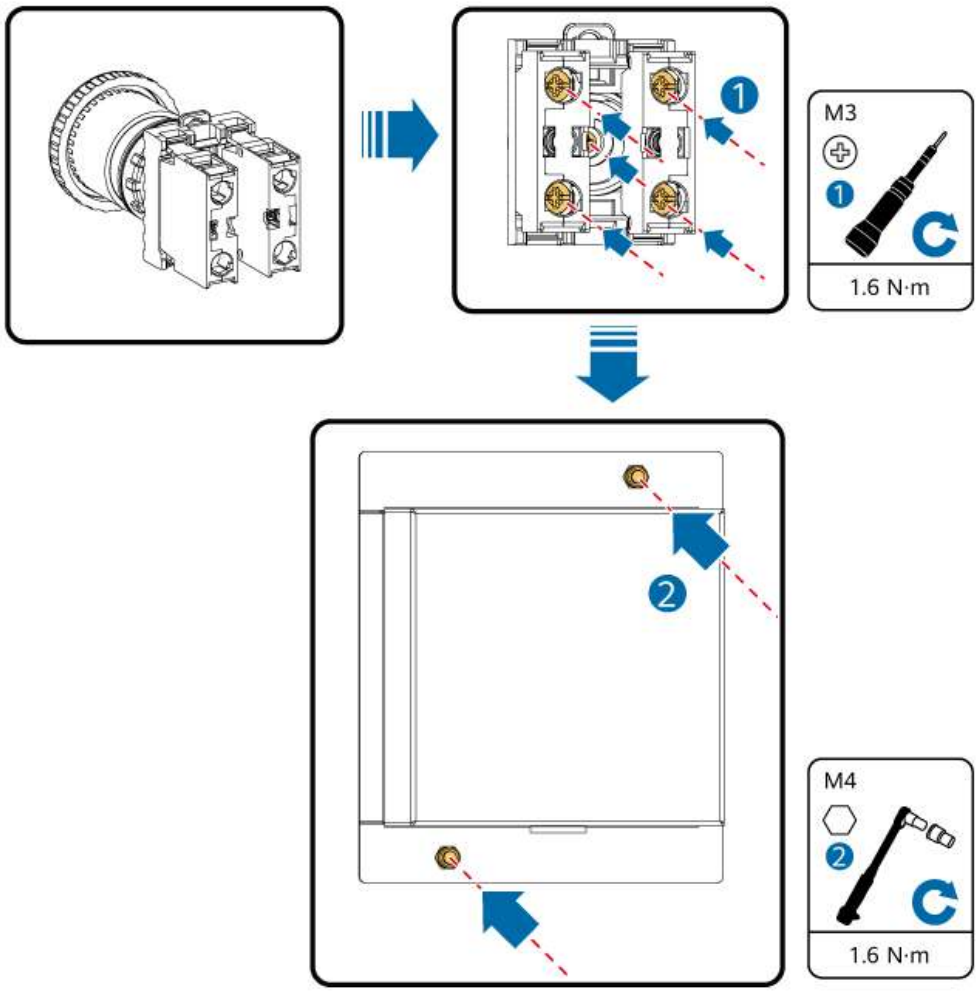


Step 2 Disconnect cables from the abort button. Rotate the abort button counterclockwise to remove it.

Step 3 Reconnect the cables.

Step 4 Install a new abort button.

Figure 6-6 Installing the abort button



----End

6.3 Replacing an Extinguishant Release/Abort Button

Prerequisites

- Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

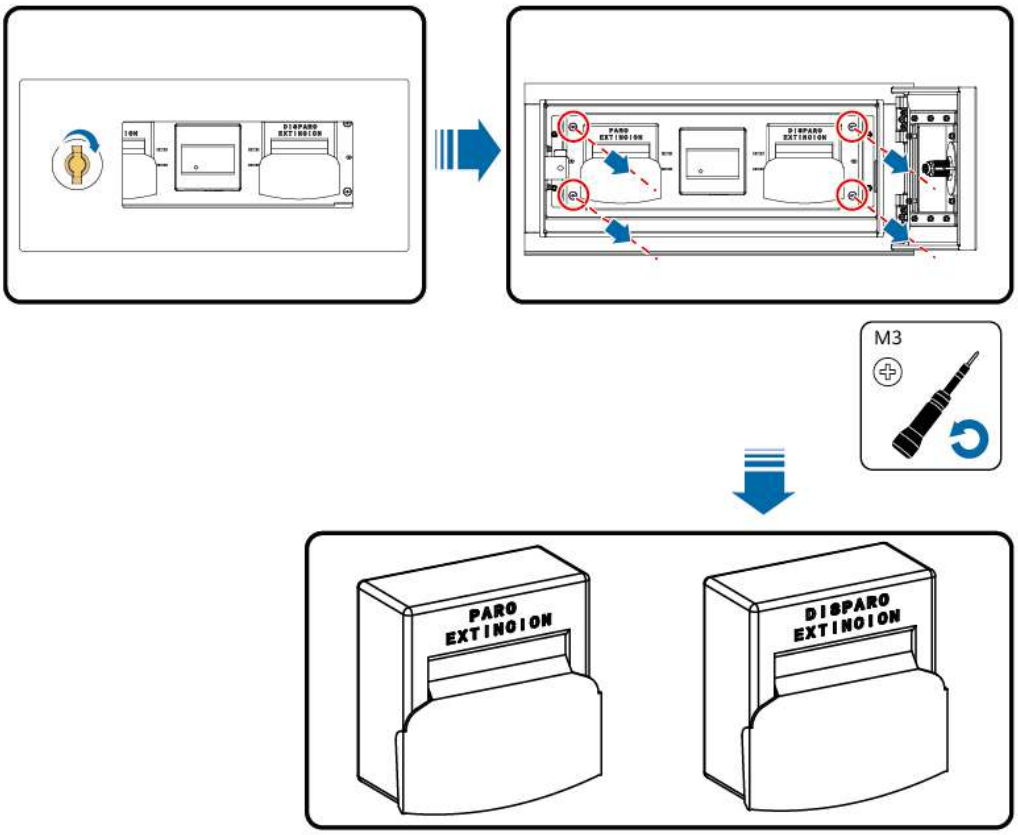
Procedure

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Remove the old extinguishant release/abort button.

1. Rotate the cover clockwise to open it.
2. Loosen screws and remove the button.

Figure 6-7 Removing the extinguishant release/abort button



Step 3 Disconnect cables from the button.

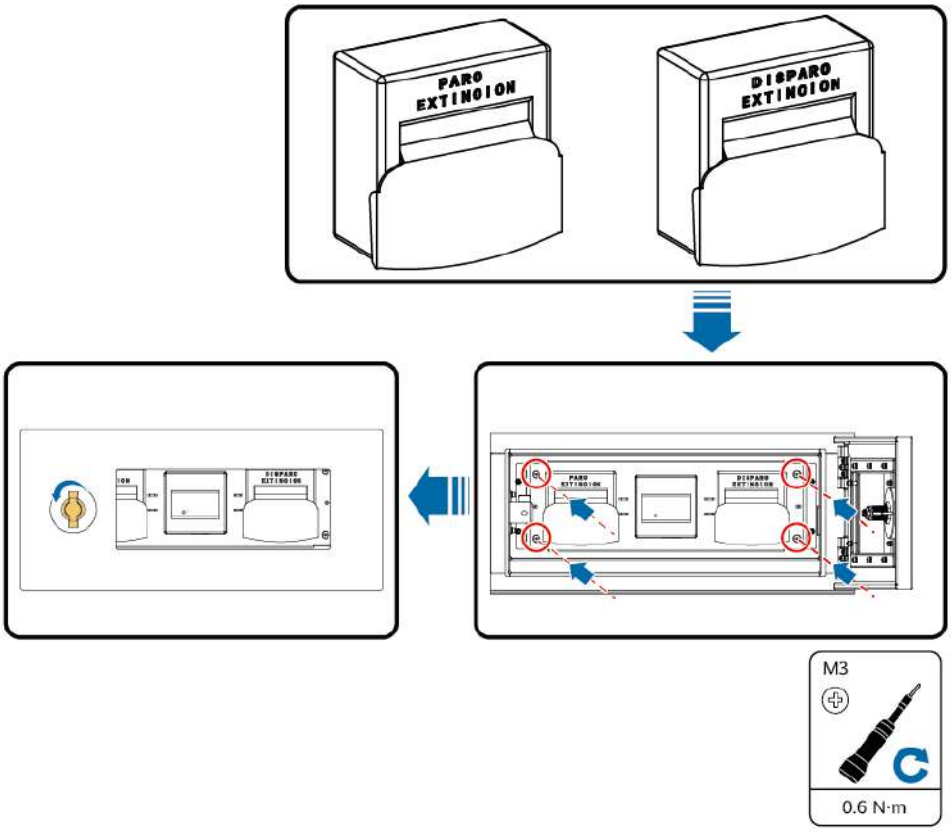
Step 4 Connect the cables to a new extinguishant release/abort button.

NOTE

Before installing the extinguishant release/abort button on the QM-AN-967 or RQ1200RQ1200 extinguishant control panel, set the encoding address. For details, see en-us_topic_0000002048207941.xml and en-us_topic_0000002012009140.xml.

Step 5 Reinstall the new extinguishant release/abort button.

Figure 6-8 Installing the extinguishant release/abort button



Step 6 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

NOTE

This step is required only for the extinguishant release/abort button on the PDD-100 extinguishant control panel.

----End

Follow-up Procedure

Check that no alarm is generated.

6.4 Replacing an Extinguishant Release Indicator

Prerequisites

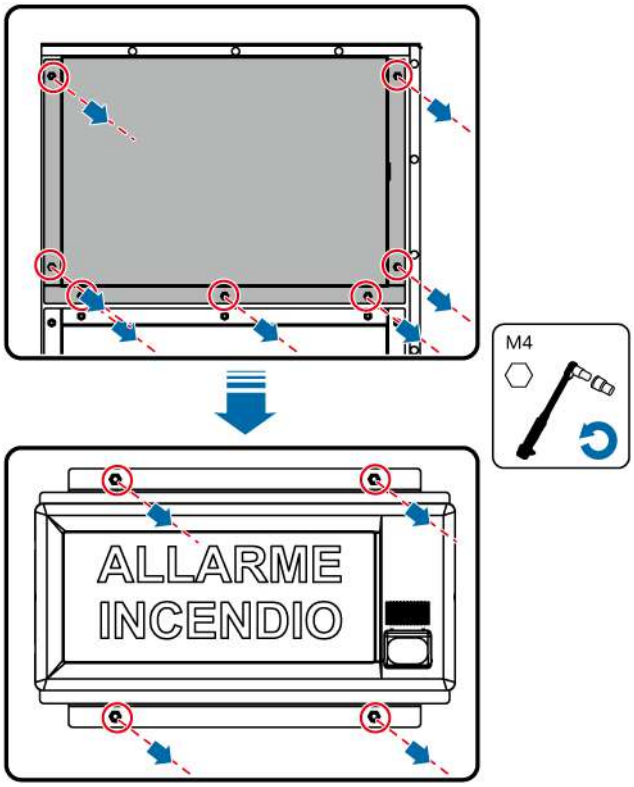
- Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Remove the old extinguishant release indicator.

Figure 6-9 Removing the extinguishant release indicator



Step 3 Disconnect cables.

Step 4 Connect the cables to a new extinguishant release indicator.

NOTE

Before installing the QM-ZSD-02 or RQ1100 extinguishant release indicator, set the encoding address. For details, see en-us_topic_0000002048207941.xml and en-us_topic_0000002012009140.xml.

Step 5 Install the new extinguishant release indicator.

Step 6 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

NOTE

This step is required only for the LF24W extinguishant release indicator.

----End

Follow-up Procedure

Check that no alarm is generated.

6.5 Replacing an Extinguishant Control Panel

Prerequisites

- Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Remove the lead-acid battery cables and remove the batteries.

Step 3 Disconnect cables between the extinguishant control panel and external components.

Step 4 Remove the extinguishant control panel.

Step 5 Install a new extinguishant control panel: Tighten screws (torque: 2 N·m) and connect cables (torque: 0.5 N·m).

Step 6 Set the time displayed on the extinguishant control panel to the current time.

Step 7 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

NOTE

This step is required only for the C050SZEG extinguishant control panel.

----End

Follow-up Procedure

Check that no alarm is generated.

6.6 Replacing a Fire Cylinder

6.6.1 Replacing a Fire Cylinder (P0009438)

NOTE

The figures are for reference only.

Prerequisites

- Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Removing the Solenoid Valve from the Fire Cylinder (P0009438)

Step 1 Remove the solenoid valve from the fire cylinder.

Step 2 Install the solenoid valve on the bracket. For details, see the operations of **Figure 2-2** in the reverse order.

----End

Removing the Fire Cylinder (P0009438)

Step 1 Open the cover of the pressure gauge wiring board.

Step 2 Remove the cable screws from the pressure gauge wiring board.

Step 3 Remove the cables from the pressure gauge wiring board.

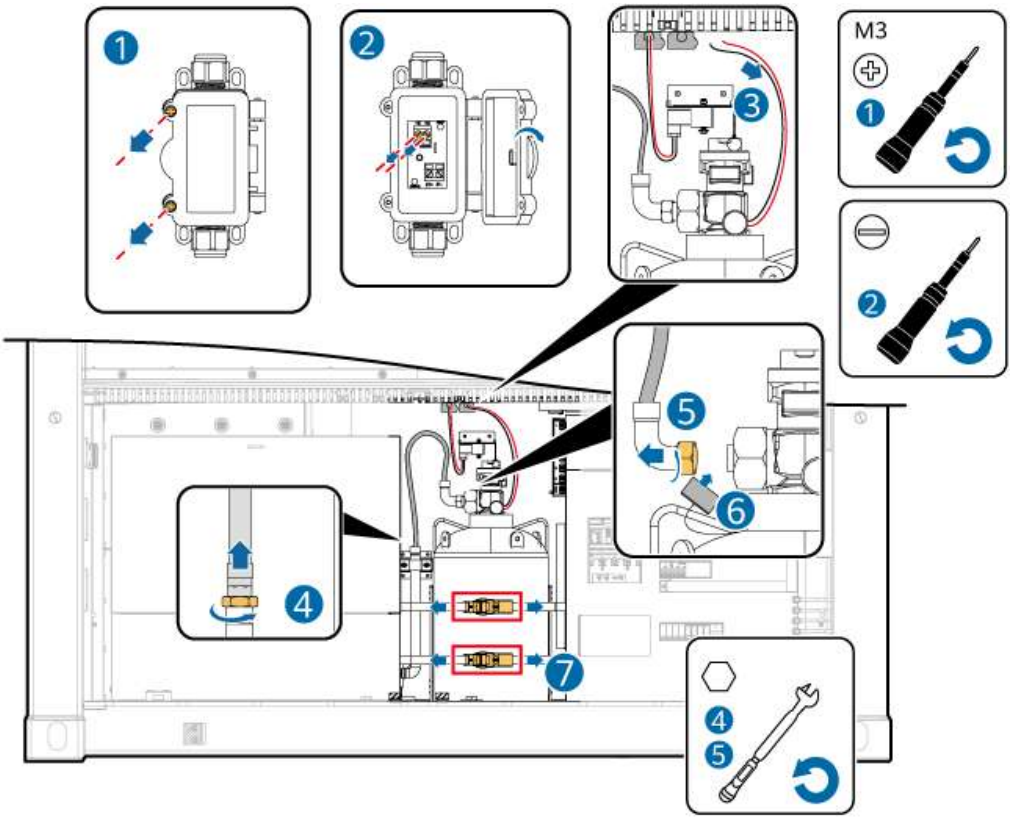
Step 4 Remove the release hose from the ESS pipe.

Step 5 Remove the high-pressure elbow of the hose from the valve release vent.

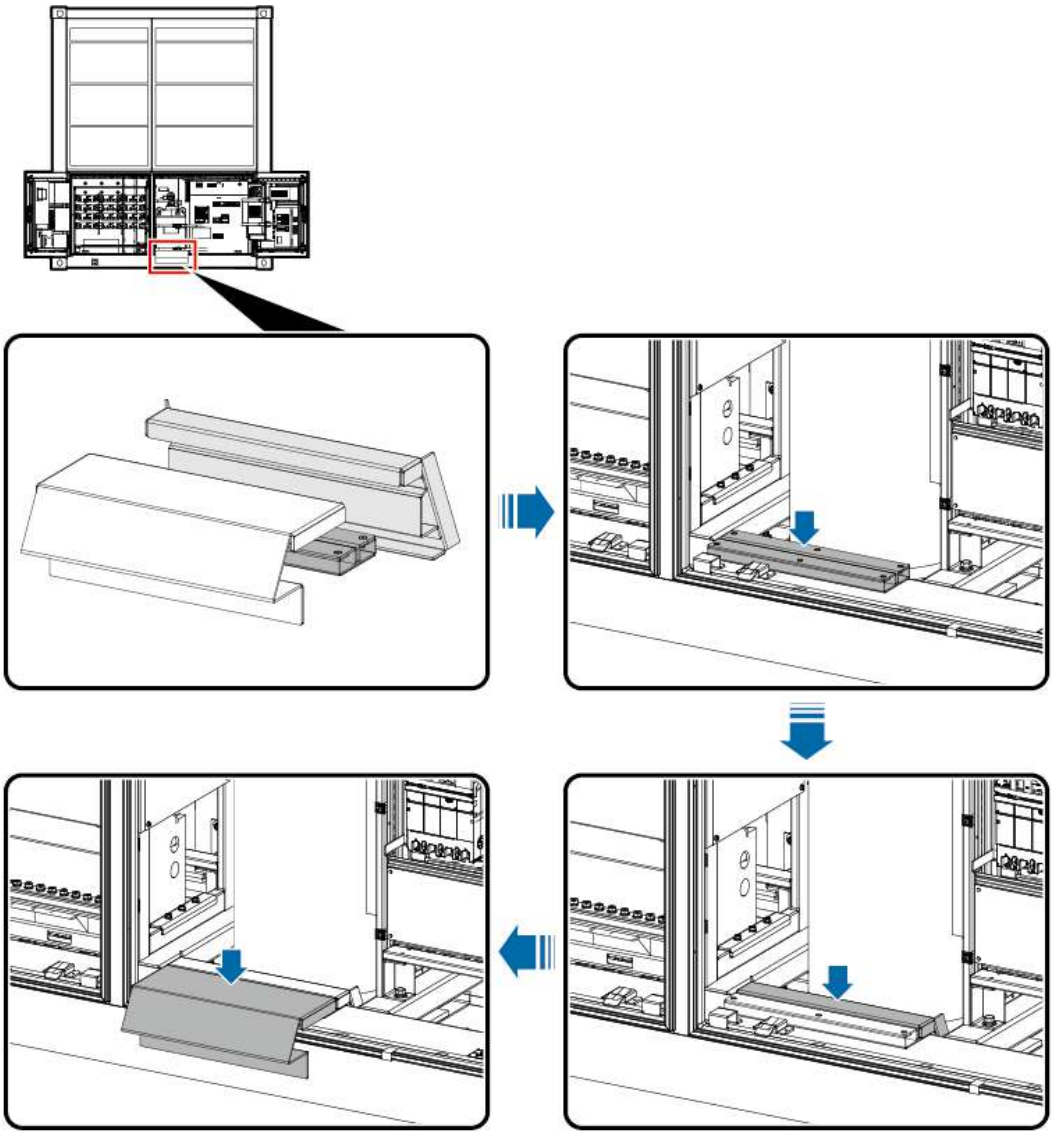
Step 6 Install the safety cap of the release vent.

Step 7 Loosen the clamp of the fire cylinder.

Figure 6-10 Removing the fire cylinder



Step 8 Install the fire cylinder deck.



Step 9 Remove the fire cylinder from the ESS.

----End

Installing the Fire Cylinder (P0009438)

Step 1 Move the fire cylinder into the ESS.

Step 2 Remove the fire cylinder deck.

Step 3 Secure the clamp of the fire cylinder.

Step 4 Remove the safety cap of the release vent.

Step 5 Wrap eight turns of sealing tape around the external thread connector of the high-pressure elbow and install the high-pressure elbow to the valve release vent. Remove any old sealing tape from the threads.

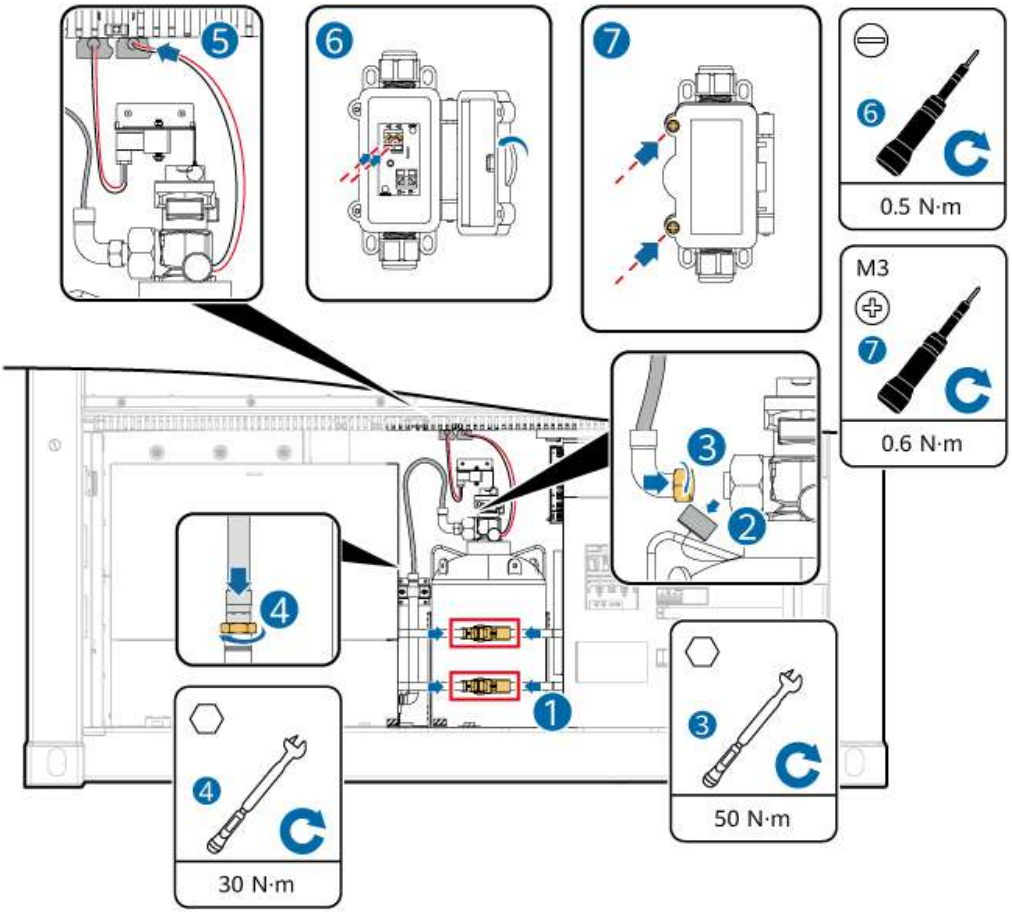
Step 6 Remove the old sealing tape from the threads, wrap eight turns of sealing tape around the external thread connector of the extinguishant release hose, and install the extinguishant release hose to the ESS pipe.

Step 7 Connect the cables from the pressure gauge wiring board.

Step 8 Tighten the cable screws from the pressure gauge wiring board.

Step 9 Reinstall the cover of the pressure gauge wiring board.

Figure 6-11 Installing the fire cylinder



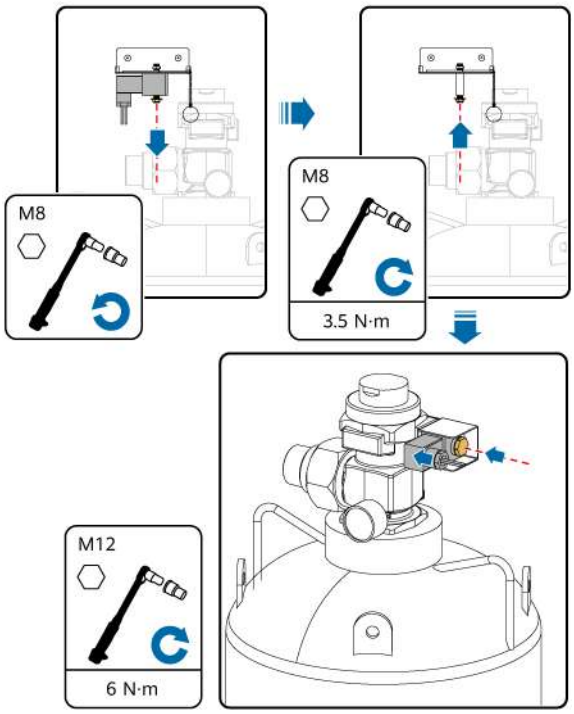
----End

Installing the Solenoid Valve to the Fire Cylinder (P0009438)

Step 1 Remove the solenoid valve from the bracket and reinstall the nut and washer.

Step 2 Reinstall the solenoid valve on the fire cylinder stud and tighten the nut to a torque of 6 N·m.

Figure 6-12 Installing the solenoid valve



----End

Follow-up Procedure

Check that no alarm is generated.

6.7 Replacing an Input/Output Module

Prerequisites

- Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Remove the sheet metal outside the module.

Step 3 Disconnect cables and remove the old input/output module.

Step 4 Install a new input/output module: Connect cables (torque: 0.5 N·m) and tighten screws (torque: 1 N·m).

NOTE

Before installing the KZJ-956 input/output module, you need to set the encoding address. For details, see en-us_topic_0000002048207941.xml.

Step 5 Reinstall the sheet metal.

Step 6 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

NOTE

This step is required only for the EM312SR input/output module.

----End

Follow-up Procedure

Check that no alarm is generated.

6.8 Replacing a Manual Alarm Device

Prerequisites

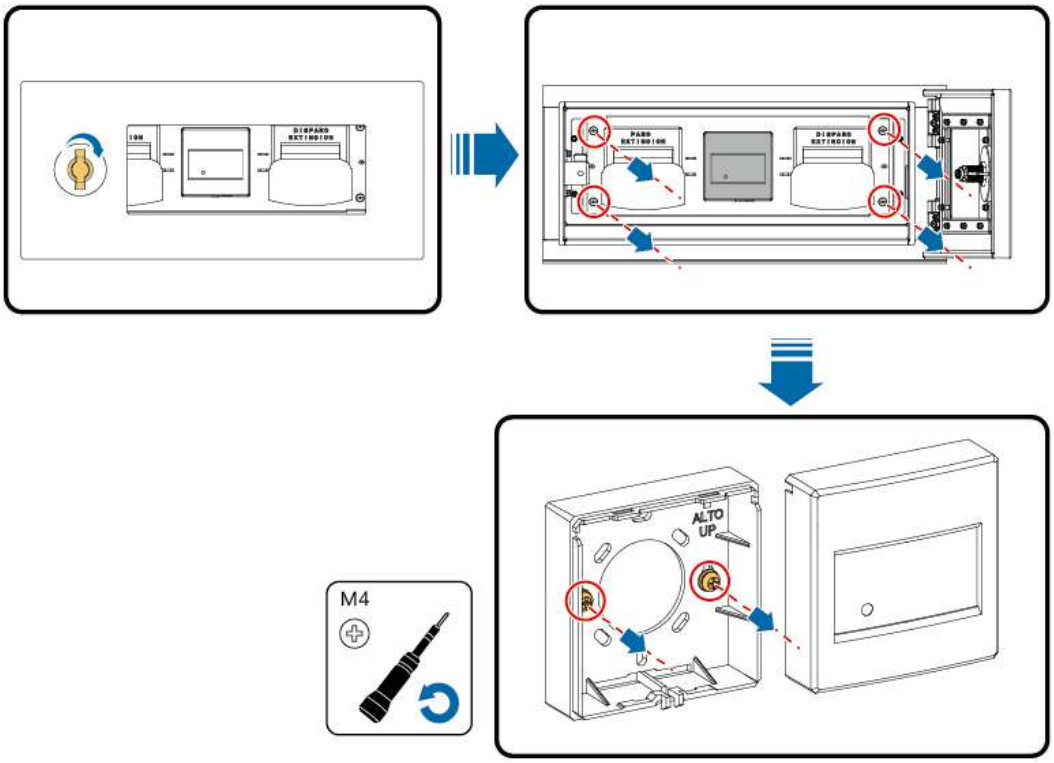
Tools: flat-head insulated torque screwdriver and Phillips insulated torque screwdriver

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Turn off the input switch 2FC2 of the extinguishant control panel.

Step 2 Disconnect cables and remove the old manual alarm device.



Step 3 Install a new manual alarm device: Connect cables (torque: 0.5 N·m) and tighten screws (torque: 1 N·m).

NOTE

Before installing a J-SAP-M-962 and J-SAP-M-RF2200 manual alarm, you need to set the encoding address. For details, see en-us_topic_0000002048207941.xml and en-us_topic_0000002012009140.xml.

Step 4 Set the encoding address by referring to **C How to Set the Address of the C050SZEG Extinguishant Control Panel**.

NOTE

This step is required only for the EC0020 manual alarm.

----End

Follow-up Procedure

Check that no alarm is generated.

6.9 Replacing an Air Conditioner

Prerequisites

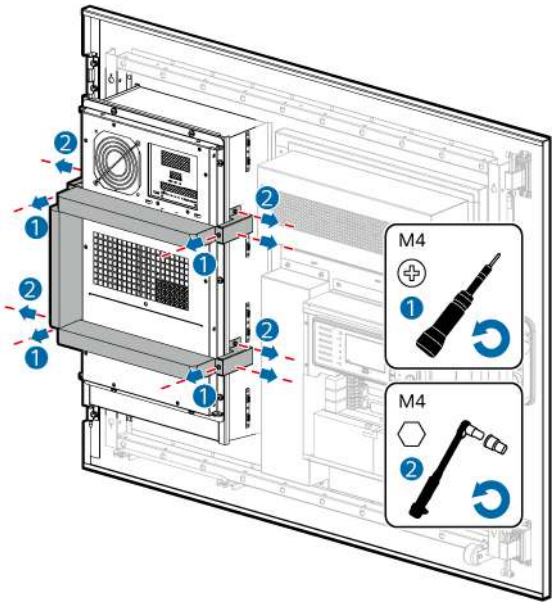
- Tools: insulated flat-head/Phillips screwdriver and clamp meter
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Disconnect cables from the air conditioner.

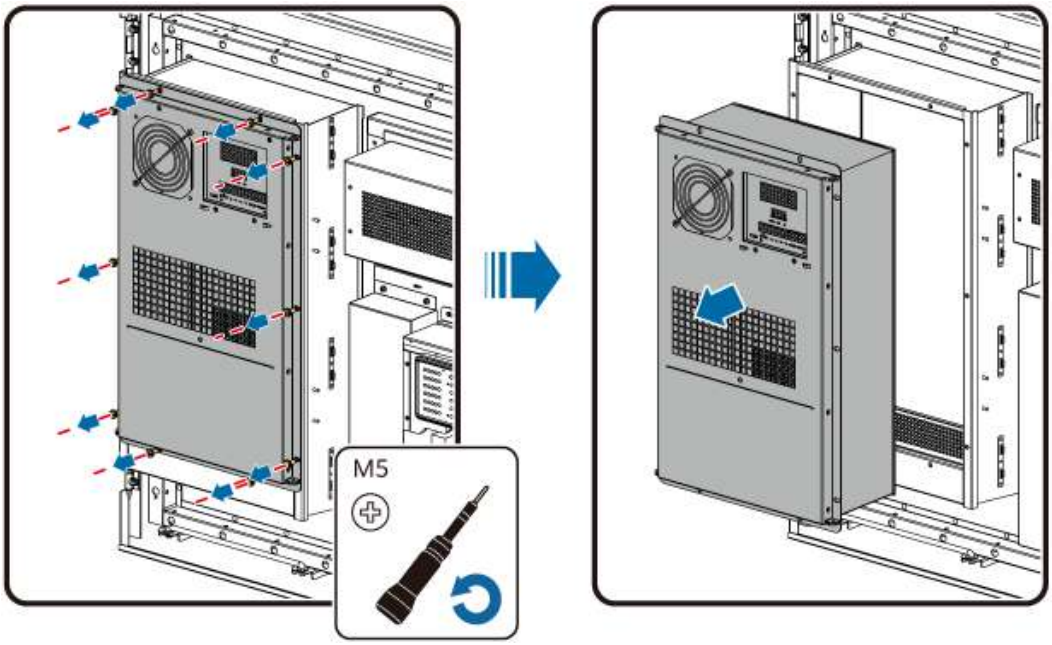
Step 2 Remove air ducts.

Figure 6-13 Removing air ducts



Step 3 Remove screws and sealing rubber strips, and then remove the old air conditioner.

Figure 6-14 Removing the old air conditioner



Step 4 Remove the remaining sealing rubber strips from the door frame.

Step 5 Install a new air conditioner.

Step 6 Install the air ducts.

Step 7 Connect the air conditioner cables.

----End

Follow-up Procedure

Check that no alarm is generated.

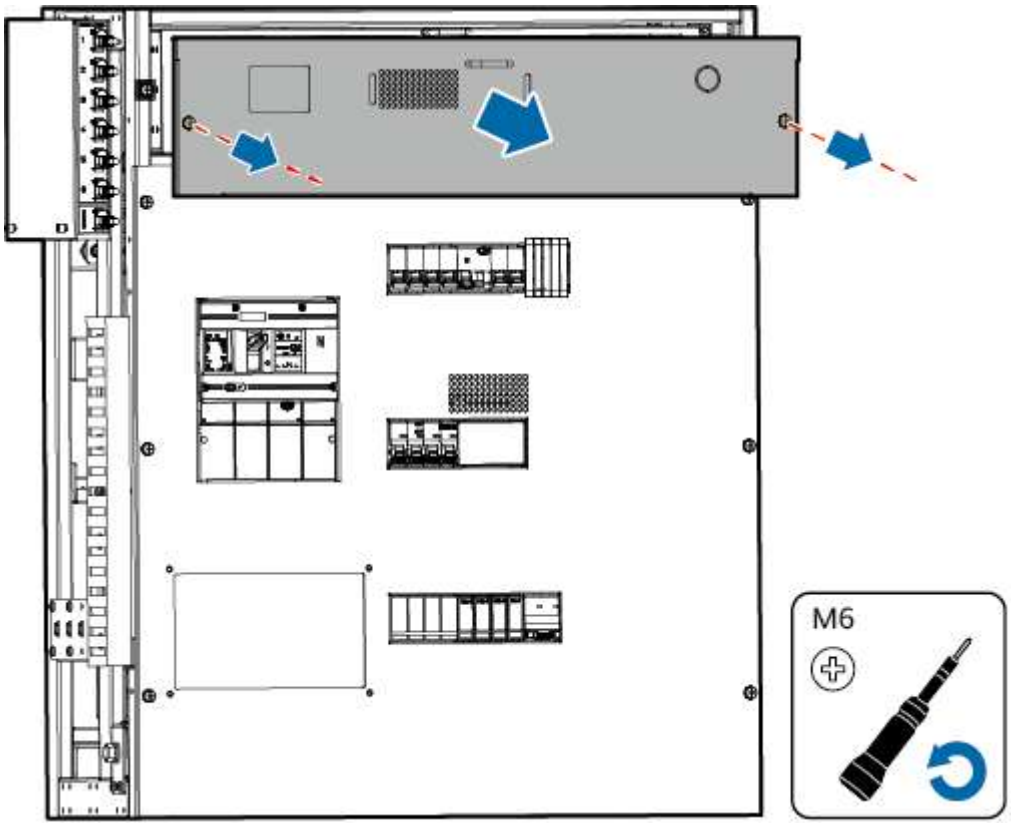
6.10 Replacing a CMU

Prerequisites

- The CMU configuration file has been automatically backed up.
- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

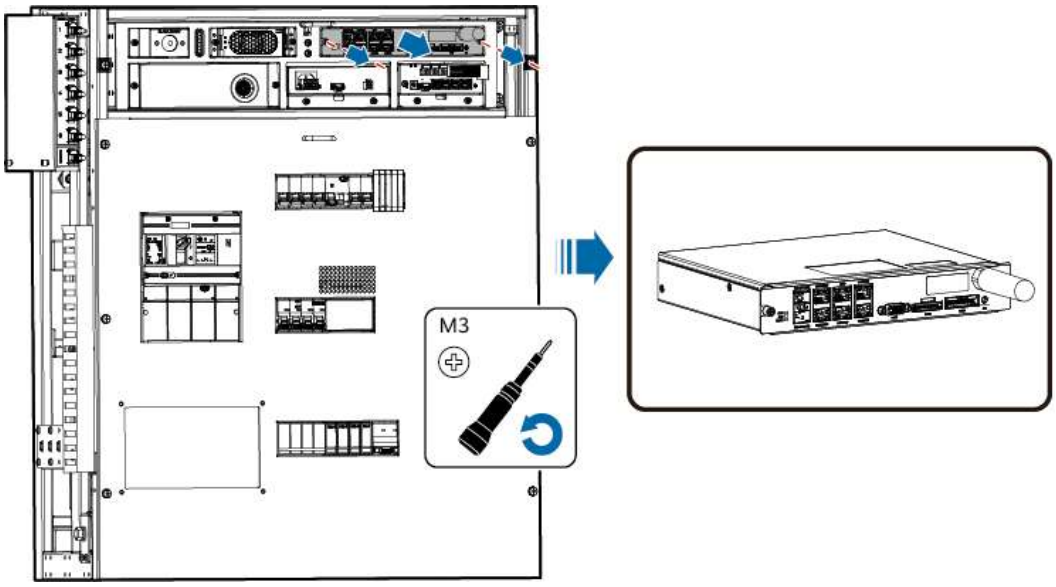
Procedure

Step 1 Remove the panel.



Step 2 Disconnect cables from the old CMU front panel and label the cables.

Step 3 Remove the old CMU.



Step 4 Disconnect cables from the rear of the old CMU.

Step 5 Install the cables to the rear of a new CMU.

Step 6 Install the new CMU in the power distribution cabinet.

Step 7 Connect the cables to the CMU front panel based on the cable labels.

Step 8 Install the panel.

----End

6.11 Replacing a SmartModule

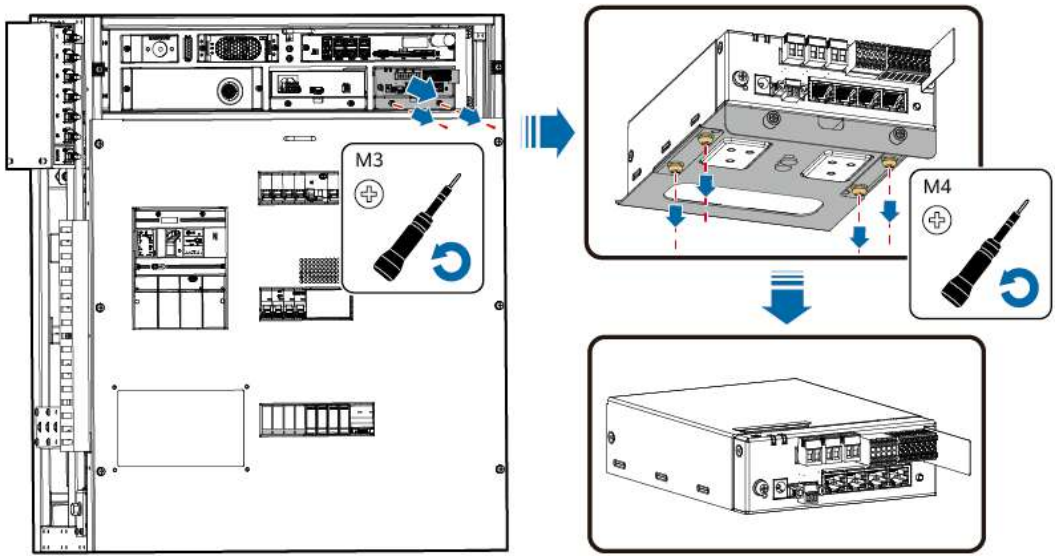
Prerequisites

- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

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

Step 2 Remove the old SmartModule and its cabinet-mounting brackets.



Step 3 Install a new SmartModule in the cabinet.

Step 4 Connect the cables based on the labels.

----End

NOTE

If an alarm (ID: 3937) is generated, log in to the app and set the SmartModule access password.

6.12 Replacing a Power Adapter

Prerequisites

- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

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

Step 2 Loosen the M3 screws and remove the old adapter.

Step 3 Install a new adapter in the cabinet.

Step 4 Connect the cables based on the labels.

----End

Follow-up Procedure

Check the indicator status and verify that the functions are restored.

6.13 Replacing a PSU

Prerequisites

- Tools: Phillips insulated torque screwdriver and protective gloves
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

CAUTION

To prevent burns, exercise caution when removing an operating PSU because its surface temperature is high.

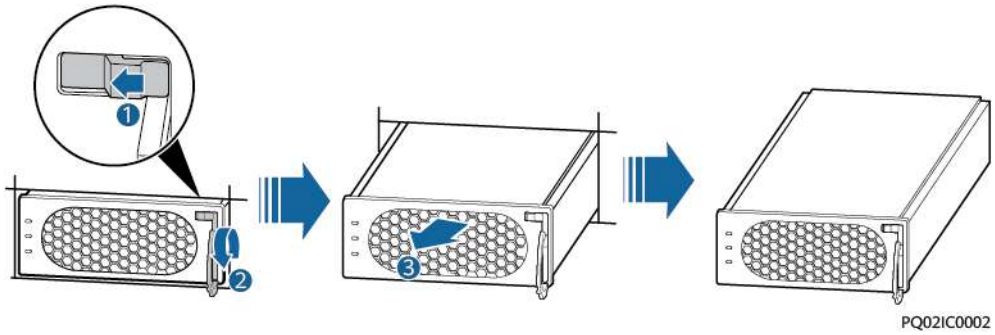
Procedure

Step 1 Remove screws from the front panel.

Step 2 Push the locking latch at the right side of the panel toward the left.

Step 3 Gently pull the handle outward to disconnect the PSU locking buckle from the subrack, and then remove the PSU from the subrack.

Figure 6-15 Pulling out the faulty PSU

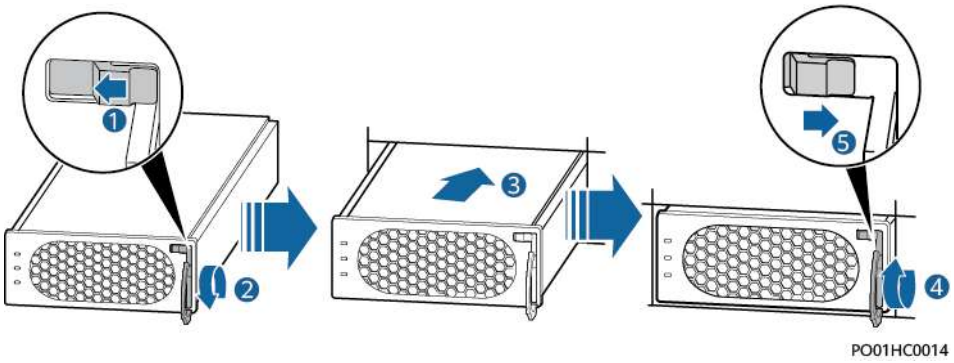


Step 4 Push the locking latch on a new PSU toward the left and pull out the handle of the PSU.

Step 5 Place the PSU in the correct slot.

Step 6 Gently push the PSU along the guide rail until it is in position, close the handle, and flip the locking latch rightward to lock the handle.

Figure 6-16 Installing the new PSU



Step 7 Reinstall screws on the front panel.

----End

6.14 Replacing a Relay Expansion Board

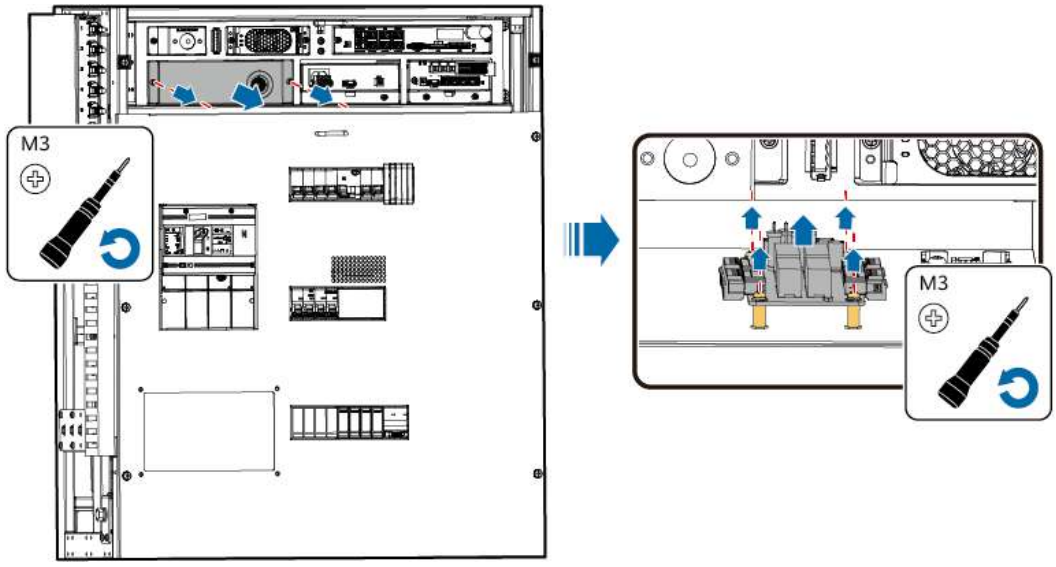
Prerequisites

- Tools: Phillips insulated torque screwdriver and protective gloves
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the old relay expansion board.

1. Loosen the screws on the front panel and pull out the drawer.
2. Remove the board.



Step 2 Disconnect cables from the board.

Step 3 Install the new relay expansion board and connect cables.

Step 4 Push in the drawer and tighten the screws on the panel.

----End

6.15 Replacing an E-Label Board

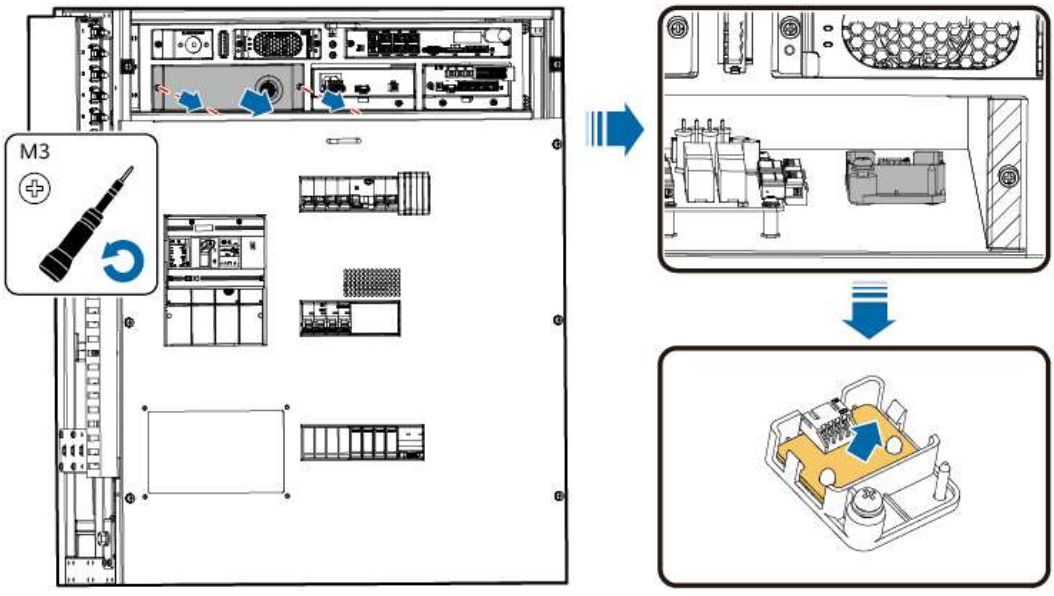
Prerequisites

- Tools: Phillips insulated torque screwdriver and protective gloves
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the old e-label board.

1. Loosen screws on the front panel.
2. Pull out the drawer.
3. Disconnect cables and remove the old e-label board.



Step 2 Install a new e-label board and connect the cables.

Step 3 Push in the drawer and tighten the screws on the panel.

----End

6.16 Replacing a DO Expansion Board

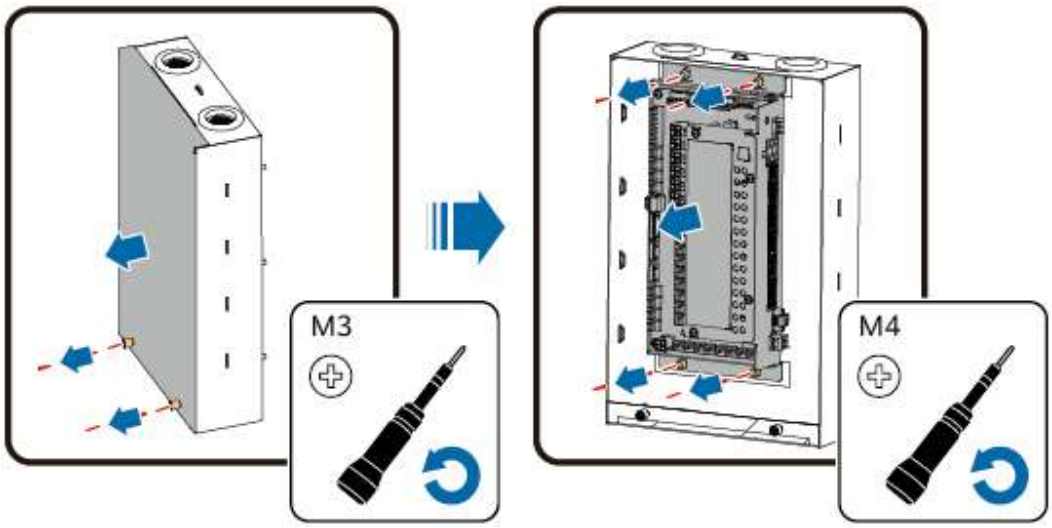
Prerequisites

- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the old DO expansion board.

1. Loosen screws and push the cover upward to remove it.
2. Remove the screws and then the old DO expansion board.



Step 2 Disconnect cables.

Step 3 Connect cables to the new DO expansion board.

Step 4 Install the new DO expansion board and secure it.

Step 5 Reinstall the cover and tighten the screws

----End

6.17 Replacing a Light

Prerequisites

Turn off the AC switch for the lighting system in the control unit cabin.

Procedure

Step 1 Remove the faulty light.

CAUTION

During replacement, do not touch the ends of the light with bare hands. Otherwise, electric shock may occur.

Step 2 Install a new light in the original position.

----End

Follow-up Procedure

Step 1 Turn on the AC switch for the lighting system in the control unit cabin of the ESS.

Step 2 Check whether the lighting function is restored.

----End

6.18 Replacing an NTC T/H Sensor

Procedure

Step 1 Record the DIP switch settings.

Step 2 Disconnect cables from the NTC T/H sensor.

Step 3 Remove the old NTC T/H sensor from the base.

Step 4 Set the DIP switches for a new T/H sensor based on the recorded information.

Step 5 Install a new NTC T/H sensor to the base.

Step 6 Connect the cables.

----End

6.19 Replacing a Water Sensor

Prerequisites

- Tools: insulated flat-head/Phillips screwdriver and insulated torque wrench

Procedure

Step 1 Remove the panel from the power distribution cabinet in the control unit cabin.

Step 2 Disconnect cables from the water sensor.

Step 3 Remove the faulty water sensor.

Step 4 Install a new water sensor.

Step 5 Connect the cables.

----End

6.20 Replacing an Optical Fiber Adapter

Prerequisites

- Tool: Phillips insulated torque screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

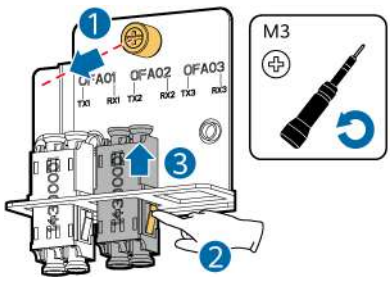
Procedure

Step 1 Remove the cover of the fiber splice tray.

Step 2 Disconnect cables from the optical fiber adapter and label the cables.

Step 3 Remove the old optical fiber adapter.

Figure 6-17 Removing the optical fiber adapter



Step 4 Install a new optical fiber adapter.

Step 5 Connect the cables based on the labels.

Step 6 Reinstall the cover of the fiber splice tray.

----End

6.21 Replacing an AC Circuit Breaker

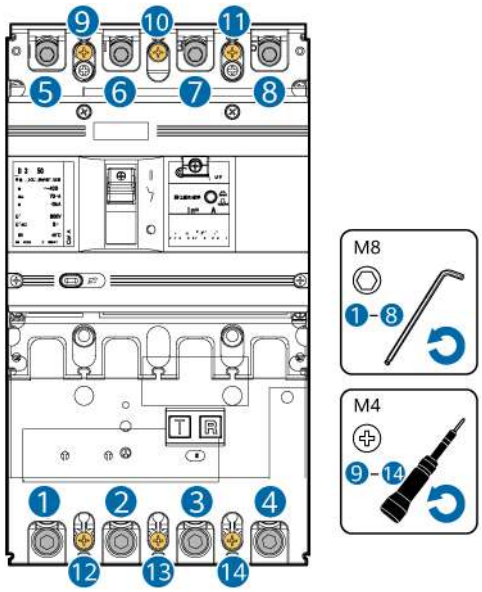
Prerequisites

- Tools: insulated Phillips screwdriver and L-shaped hex key
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- The upstream switch has been turned off.

Procedure

Step 1 Disconnect cables from the AC circuit breaker, and label the cables.

Step 2 Remove the faulty AC circuit breaker.



Step 3 Install a new AC circuit breaker.

Step 4 Connect the cables based on the labels.

----End

6.22 Replacing an SPD

Prerequisites

- If an SPD is damaged or its indication window is displayed in red, replace the SPD.
- Tools: ESD wrist strap or gloves, ESD box or bag, cabinet door key, and removal and insertion tool

- The three-phase SPD switch 3FC has been turned off.
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

DANGER

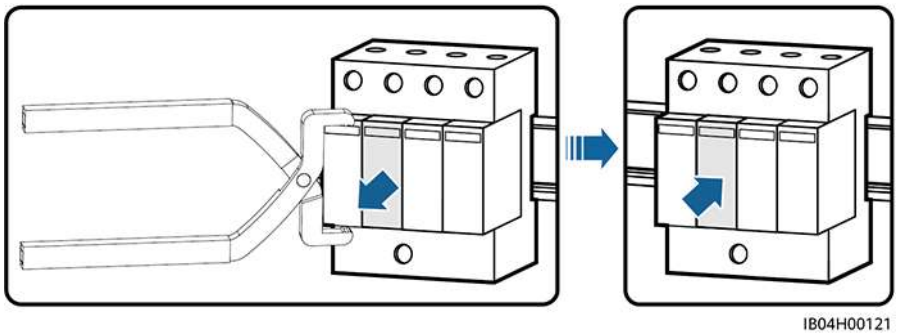
Do not replace an SPD during a thunderstorm.

Procedure

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

Step 2 Install a new surge protection module.

Figure 6-18 Replacing the surge protection module



----End

Follow-up Procedure

Check that the SPD alarm is cleared.

6.23 Replacing a Fuse Kit

Prerequisites

- Tool: protective gloves
- A new fuse kit of the same specifications is intact.
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

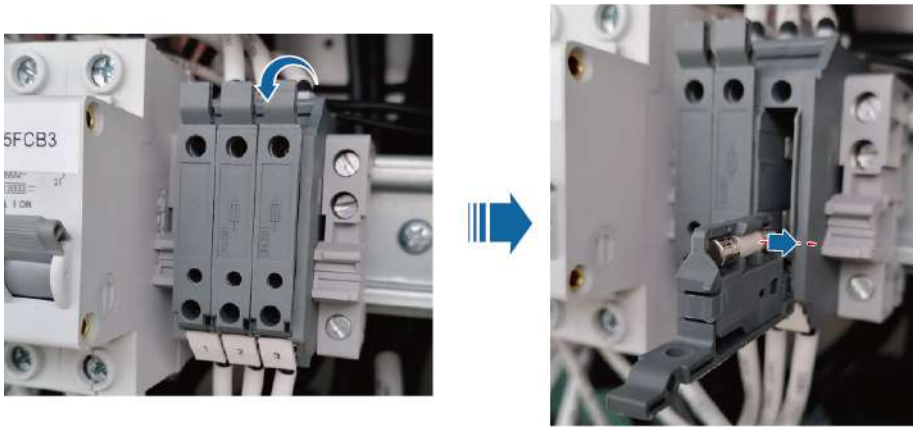
Procedure

Step 1 Wear protective gloves.

Step 2 Turn off the AC circuit breaker.

Step 3 Open the cover of the terminal block and take out the fuse kit.

Figure 6-19 Taking out the fuse kit



Step 4 Install a new fuse kit and close the terminal block cover.

Step 5 Turn on the AC circuit breaker.

Step 6 Check the running status of the system and ensure that the functions are restored.

----End

6.24 Replacing a Terminal Block

Prerequisites

- Tools: Phillips insulated torque screwdriver and insulation tape
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

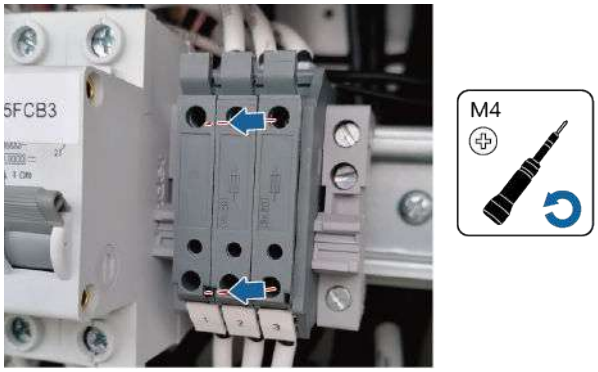
Procedure

Step 1 Loosen screws and remove the cover from the front of the terminal block.

Step 2 Record the connection positions of the cables and signal cable terminals.

Step 3 Loosen screws from the upper and lower ports of the terminal block using a Phillips screwdriver, and remove the cables and signal cable terminals. Wrap the cables and terminals with insulation tapes to prevent contact hazards.

Figure 6-20 Loosening the terminal block screws



Step 4 Remove the terminal block from the guide rail.

Step 5 Secure a new terminal block to the guide rail.

Step 6 Remove the insulation tapes from the cables and signal cable terminals. Insert the cables and signal cable terminals into the ports of the terminal block according to the recorded information and then tighten the screws.

Step 7 Reinstall the cover in front of the switch and tighten the screws.

----End

6.25 Replacing a Switch in the Control Unit Cabin

Prerequisites

- Tool: insulated flat-head/Phillips screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- Before replacing the three-phase SPD switch 3FC and UPS input switch 2FC, turn off the upstream switch.

Procedure

Step 1 Loosen screws and remove the cover from the front of the switch.

Step 2 Set the switch to be replaced to OFF.

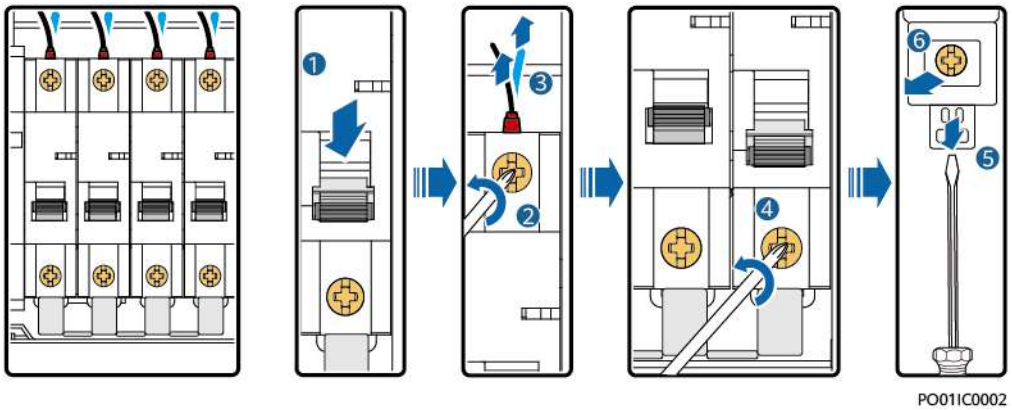
Step 3 Record the connection positions of the cables and signal cable terminals.

Step 4 Loosen the screw from the upper port of the switch using a Phillips screwdriver, and remove the cables and signal cable terminals. Wrap the cables and terminals with insulation tapes to prevent contact hazards.

Step 5 Loosen the screw from the lower port of the switch using a Phillips screwdriver, and loosen the buckle at the switch base using a flat-head insulated torque screwdriver.

Step 6 Remove the switch from the guide rail.

Figure 6-21 Removing the switch



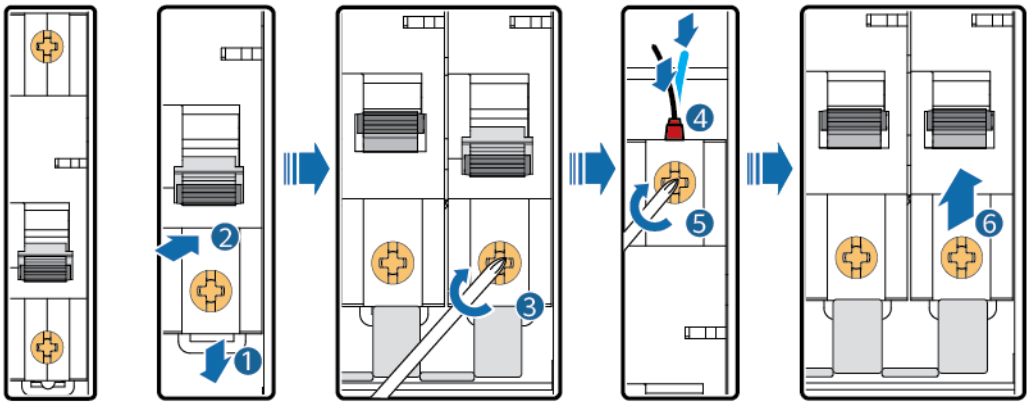
Step 7 Set the new switch to OFF. Press the buckle at the switch base using a flat-head insulated torque screwdriver and install the new switch. Then loosen the buckle and secure the switch to the guide rail.

Step 8 Tighten the screw on the lower port of the switch.

Step 9 Remove the insulation tapes from the cables and signal cable terminals. Insert the cables and signal cable terminals into the upper port of the switch according to the recorded information and then tighten the screw.

Step 10 Set the switch to ON.

Figure 6-22 Installing the switch



Step 11 Reinstall the cover and tighten the screws.

----End

6.26 Replacing a Power Meter

Prerequisites

- Tool: insulated flat-head/Phillips screwdriver
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

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

Step 2 Press the buckle and remove the faulty power meter.

Step 3 Press the buckle and install a new meter.

Step 4 Connect the cables based on the labels.

----End

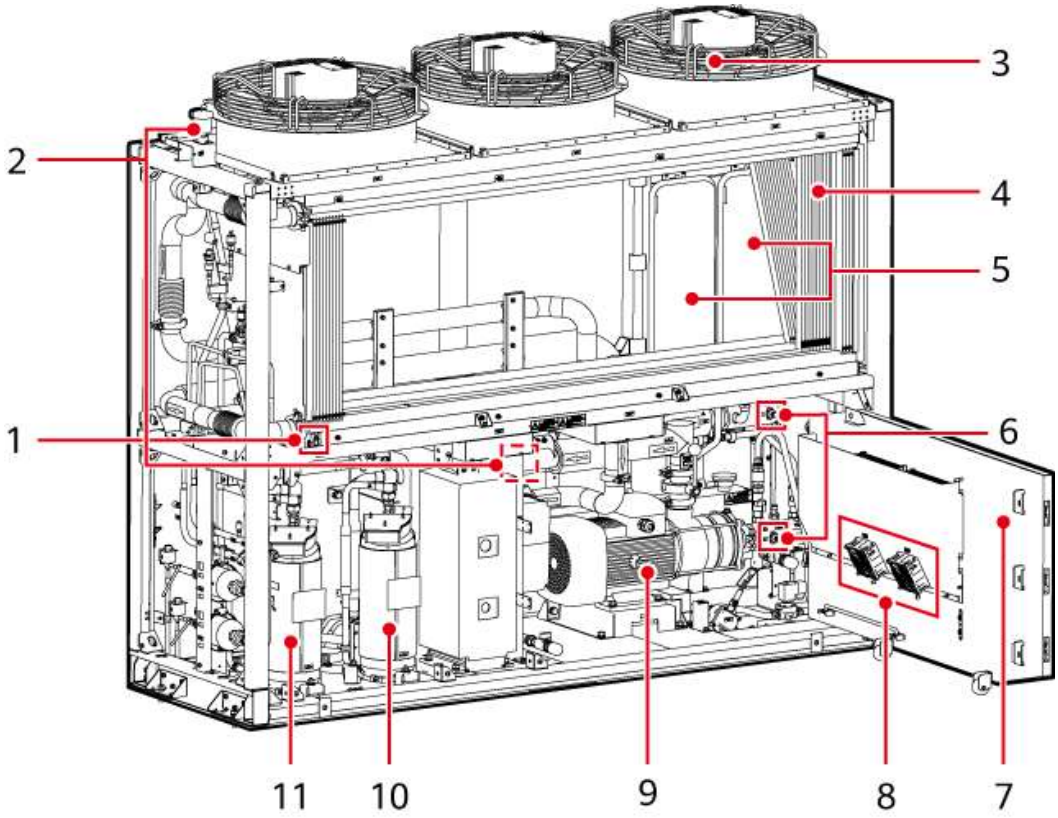
7 Replacing Components in the Liquid Cooling Unit Cabin

7.1 Positions of Components in the Liquid Cooling Unit Cabin

NOTE

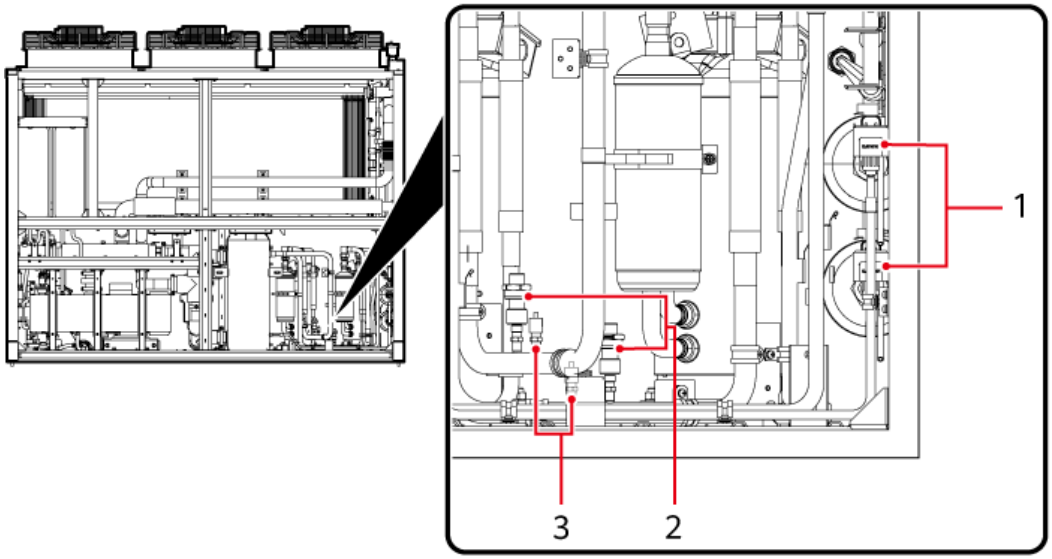
The following figures are for reference only.

Figure 7-1 Interior of the liquid cooling unit cabin



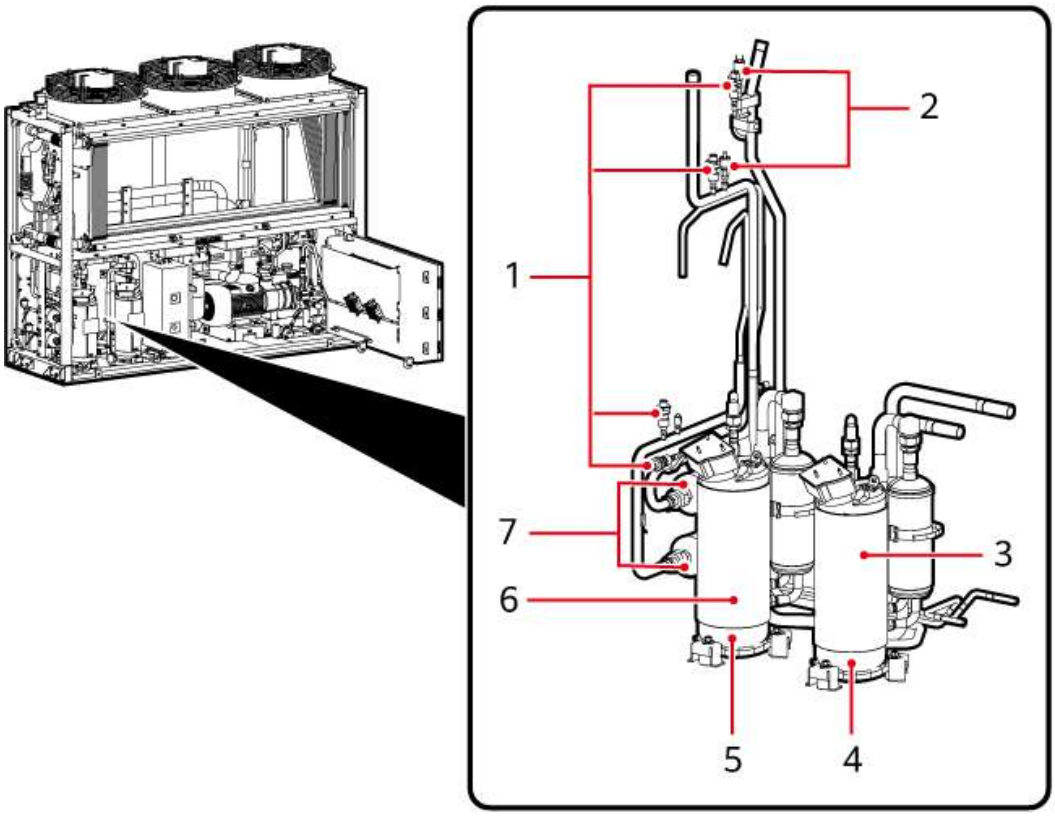
(1) Outdoor ambient temperature sensor
(2) Exhaust valve
(3) Outdoor fan
(4) Micro-channel heat exchanger assembly
(5) Expansion tank
(6) Coolant temperature sensor
(7) Electric control box
(8) Drive cooling fan
(9) Circulation pump
(10) Compressor 2
(11) Compressor 1

Figure 7-2 Rear view of the liquid cooling unit cabin



(1) Electronic expansion valve (2) Suction low pressure sensor (3) Needle valve

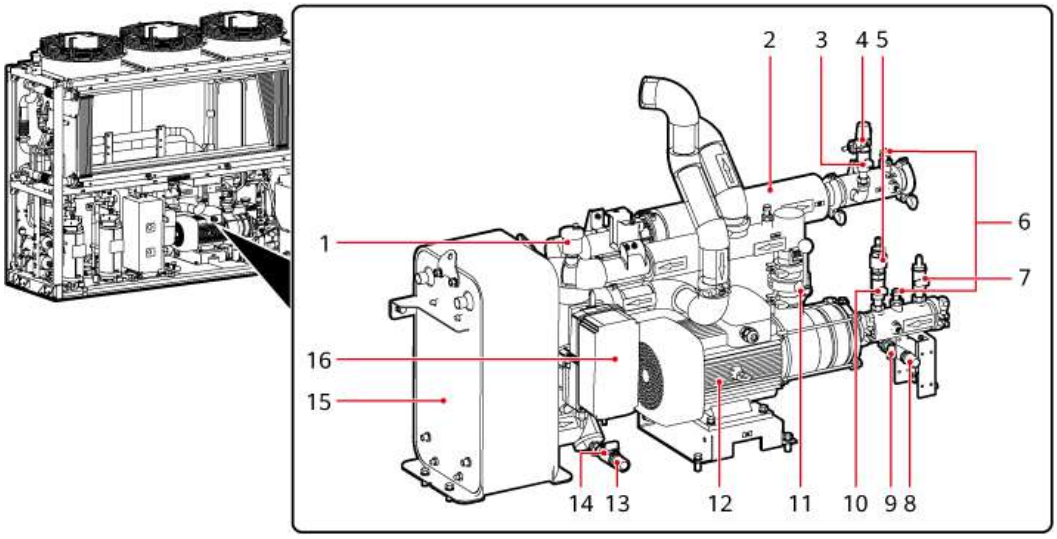
Figure 7-3 Compressor and related components



(1) High pressure sensor (2) High pressure switch (3) Compressor 2 (4) Compressor 2 oil heating belt

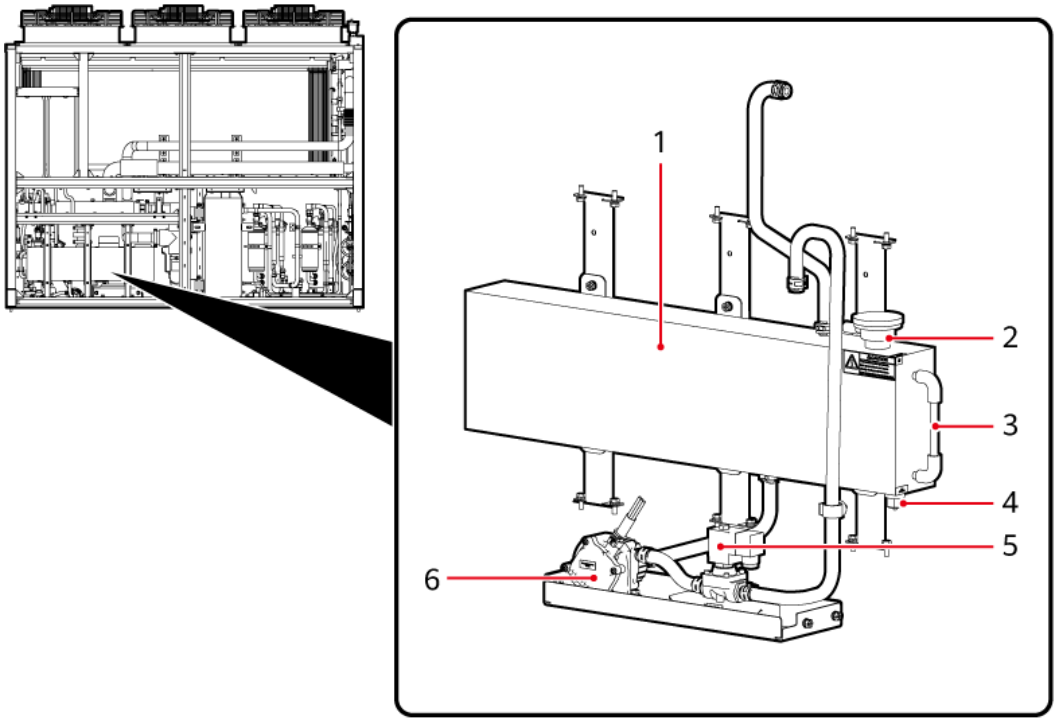
(5) Compressor 1 oil heating belt	(6) Compressor 1	(7) Filter dryer

Figure 7-4 Circulation pump and related components



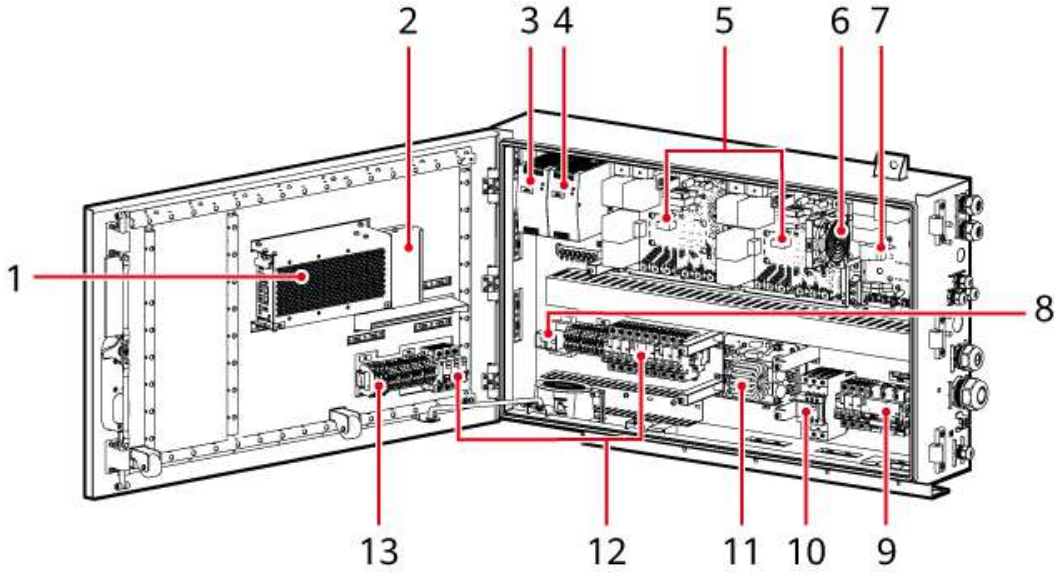
(1) Exhaust valve	(2) Electric heater	(3) Pressure relief ball valve	(4) Safety valve
(5) Check valve	(6) Coolant pressure sensor	(7) Expansion tank ball valve	(8) Coolant filling/ drainage port 1
(9) Coolant filling/ drainage ball valve 1	(10) Coolant refilling ball valve	(11) Butterfly valve for the coolant outlet pipe of the circulation pump	(12) Circulation pump
(13) Coolant filling/ drainage port 2	(14) Coolant filling/ drainage ball valve 2	(15) Evaporative plate heat exchanger	(16) Multi-way valve and actuator

Figure 7-5 Coolant tank and refilling-related components



(1) Coolant tank
(2) Coolant inlet
(3) Liquid level gauge
(4) Liquid level sensor
(5) Coolant refilling solenoid valve
(6) Coolant refilling pump

Figure 7-6 Interior of the electric control box



(1) Liquid cooling controller (LCC)
(2) Backplane
(3) 24 V auxiliary power module
(4) 48 V auxiliary power module
(5) Compressor drive module
(6) Mixed-flow fan of the electric control box
(7) Circulation pump drive module
(8) Electromagnetic relay

(9) Liquid Thermal Management System (LTMS) general switch 1FCB1

(10) Electric heater contactor

(11) Filter board

(12) LTMS branch circuit breaker

(13) Fuse

Figure 7-7 LTMS branch circuit breaker

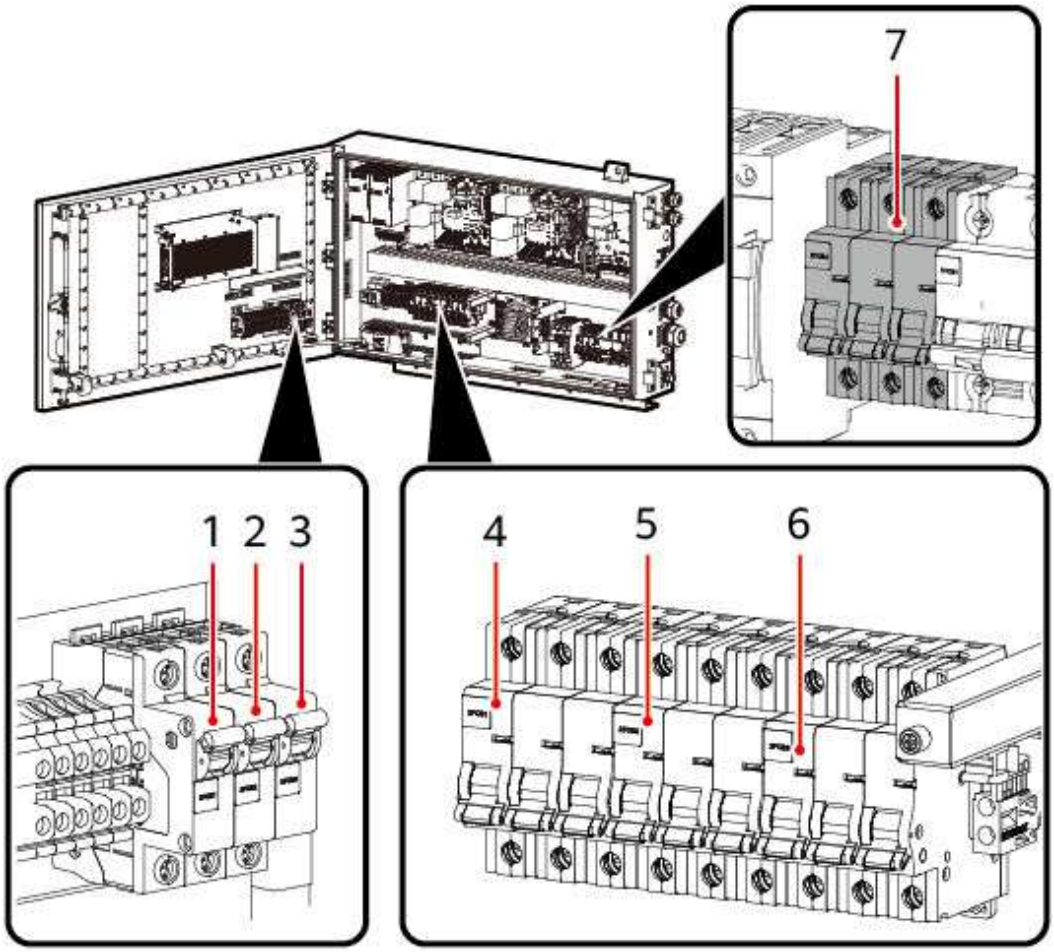


Table 7-1 LTMS branch circuit breaker

No.	Switch	Controlled Functional Module
1	3FCB1	LCC, backplane, temperature sensor, coolant temperature sensor, pressure sensor, and high pressure switch
2	3FCB2	Coolant refilling pump
3	3FCB3	Multi-way valve
4	2FCB1	Compressor drive module 1 and compressor 1
5	2FCB2	Compressor drive module 2 and compressor 2

No.	Switch	Controlled Functional Module
6	2FCB3	Outdoor fan, compressor heating belt, circulation pump drive module, circulation pump, auxiliary power module, drive cooling fan, and mixed-flow fan of the electric control box
7	2FCB4	Electric heater
Note: 3FCB1, 3FCB2, and 3FCB3 are collectively referred to as 24 V loop circuit breakers.		

7.2 Removing and Reinstalling an LTMS

When **7.3 Replacing the LTMS**, **7.21 Replacing an Evaporative Plate Heat Exchanger**, or **7.22 Replacing an Electronic Expansion Valve (EEV)**, you need to remove and reinstall the LTMS. Before removing and reinstalling the LTMS, drain the coolant and remove the cables and pipes.

There are three methods of removing and reinstalling the LTMS. The following table describes the applicable conditions.

Method of Removing and Reinstalling the LTMS	Applicable Condition
Using a forklift	The width of the maintenance aisle on the side of the container is greater than or equal to 4 m.
Using a forklift and fixture	The width of the maintenance aisle on the side of the container is less than 4 m, and the maintenance clearance on the front or rear of the container is greater than or equal to 4.5 m.
Using a crane and fixture	When a forklift and fixture cannot be used, use a crane.

7.2.1 Using a Forklift

Prerequisites

- The LTMS cables and pipes have been removed.
- Three persons are required to remove and reinstall the LTMS.
- When the width of the maintenance aisle on the side of the container is greater than or equal to 4 m, remove and reinstall the LTMS through the forklift port on the LTMS.
- Tools: forklift (see **4.2 Forklift Requirements**), ladder, insulated flat-head/Phillips screwdriver, security torx torque screwdriver, insulated torque wrench, adjustable wrench, open-end wrench, safety gloves, safety shoes, safety helmet, and safety harness

NOTE

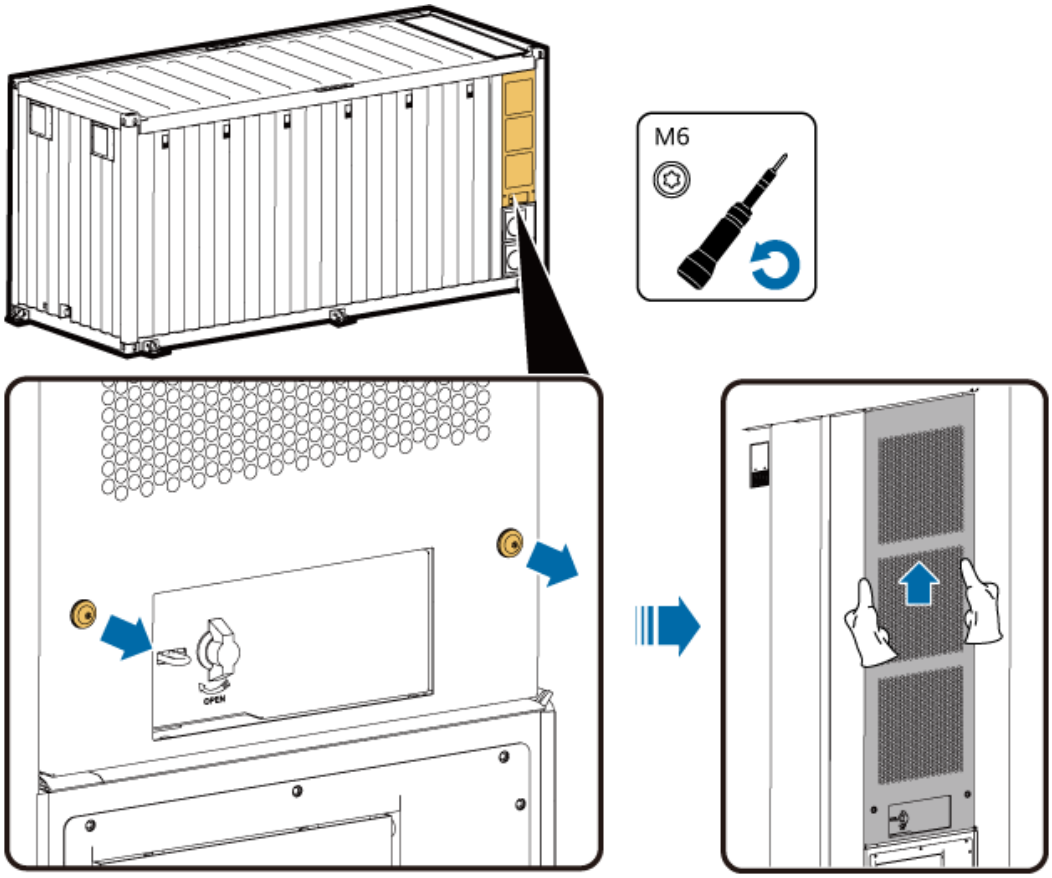
- Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
- The personnel, tools, and environment must meet relevant safety requirements.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

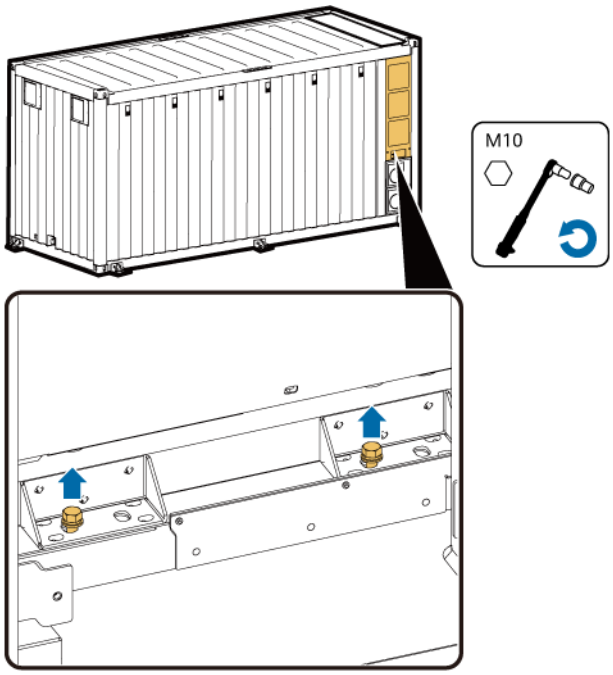
Disconnecting the LTMS

Step 1 Remove the antitheft screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

Figure 7-8 Removing the rear sealing plate from the container



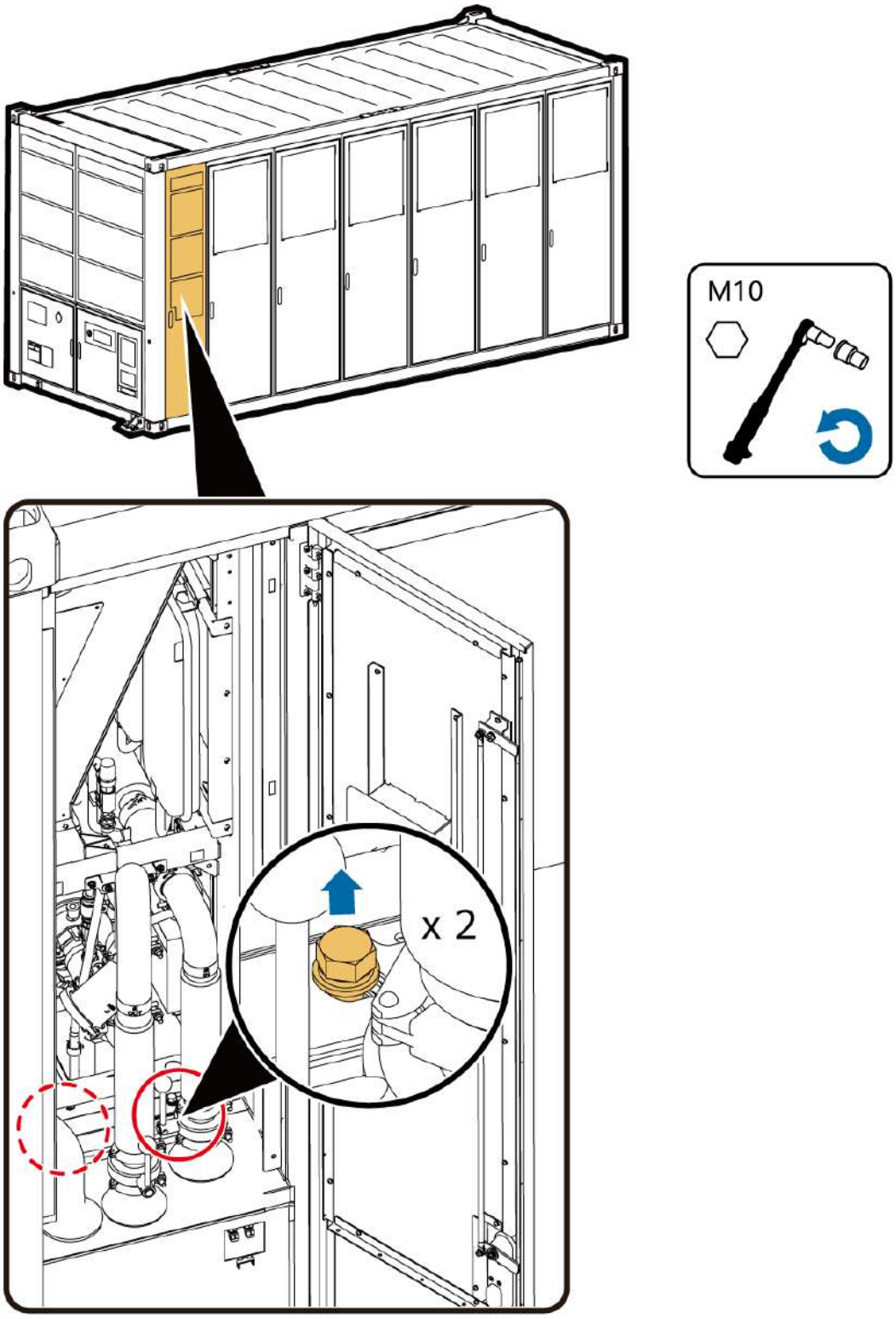
Step 2 Remove the bolts at the bottom on the left of the LTMS.



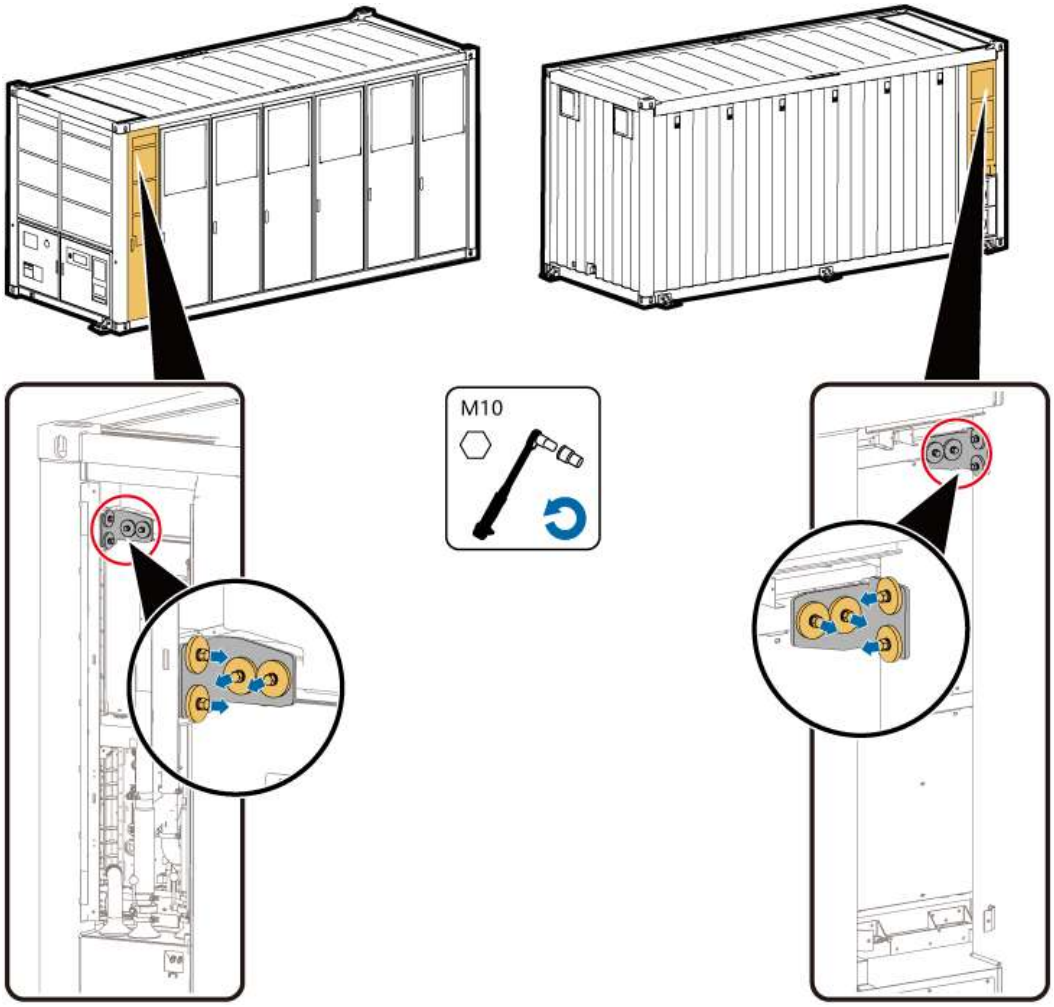
Step 3 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 4 Remove the bolts at the bottom on the right of the LTMS.



Step 5 Climb up and remove the bolts at the top on the left and right sides of the LTMS.



Step 6 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

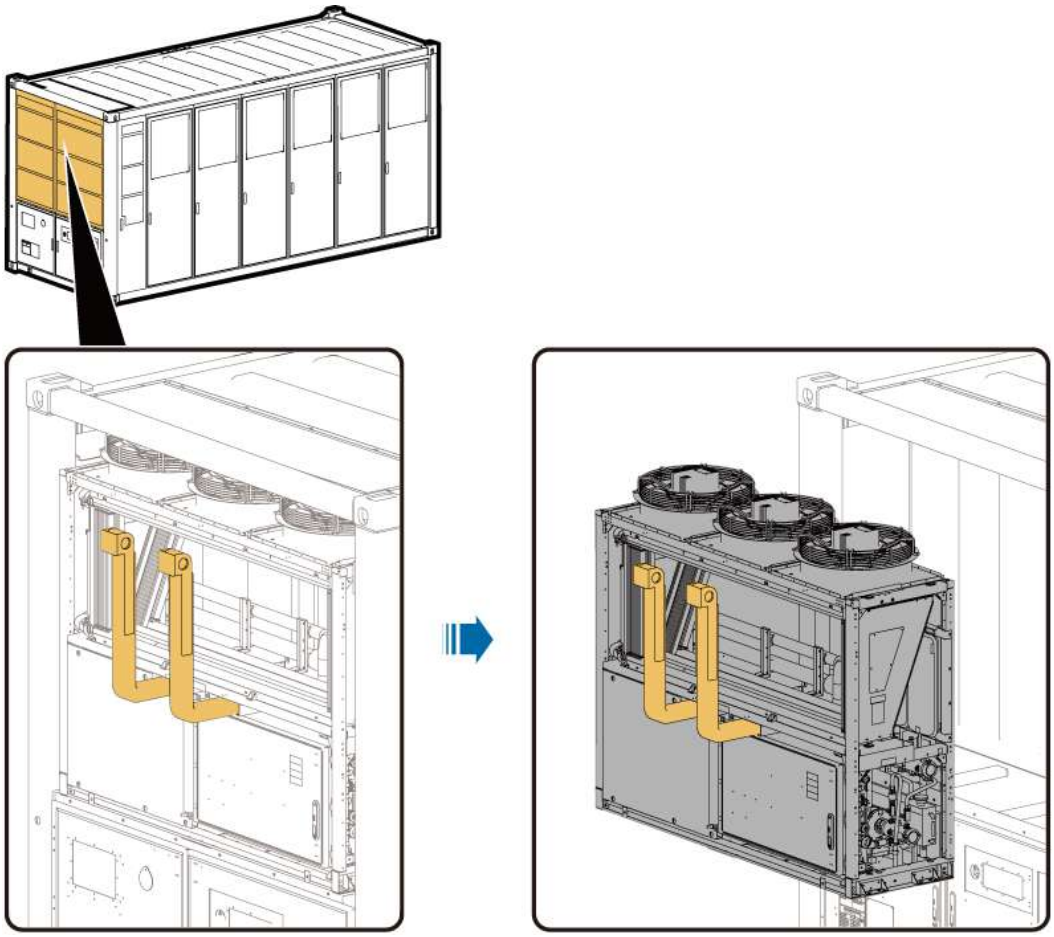
NOTE

Remove the eight screws from the two front sealing plates only when you remove the LTMS for the first time.

----End

Removing the LTMS

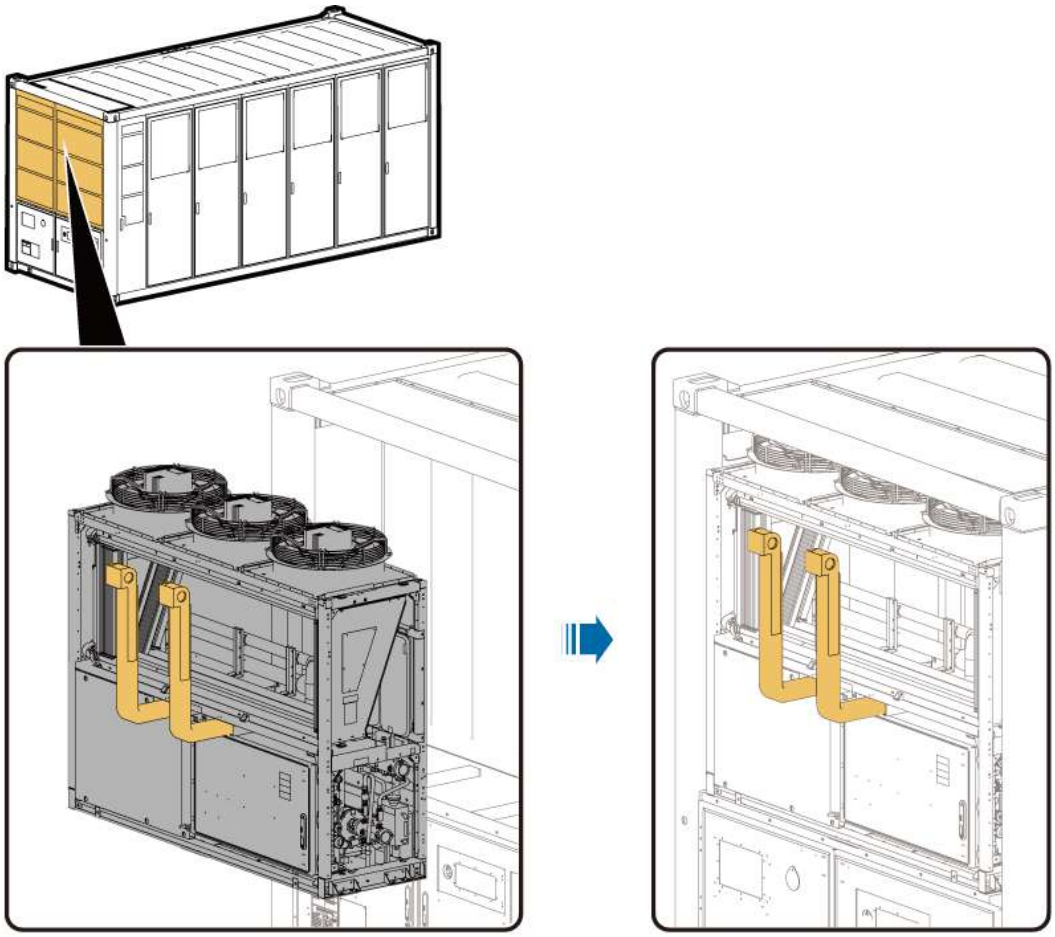
Step 1 Insert the forklift into the forklift port of the LTMS, remove the LTMS, move it to a safe area, and place it on the ground.



----End

Reinstalling the LTMS

Step 1 Insert the forklift into the forklift port of the LTMS and reinstall the forklift to the LTMS.



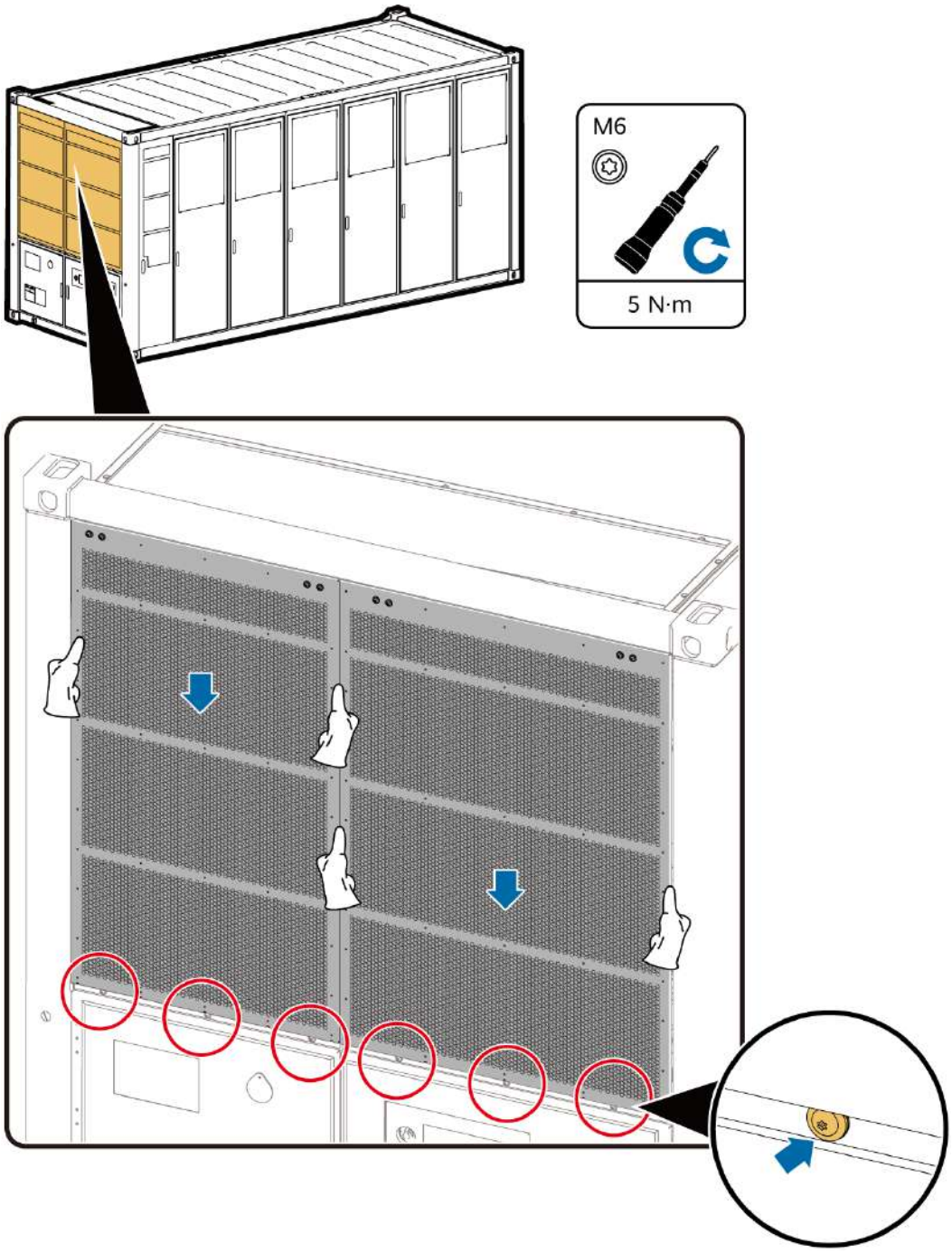
----End

Securing the LTMS

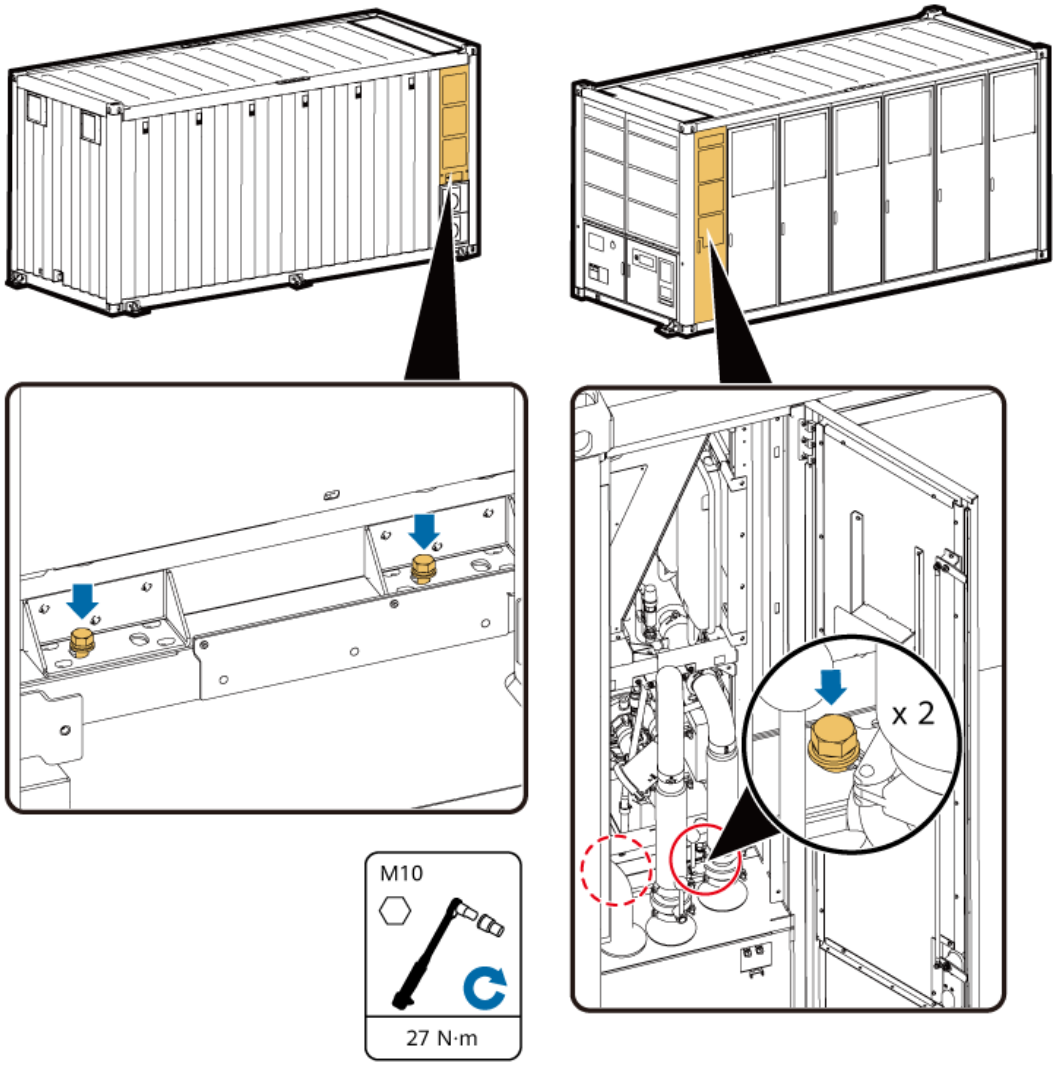
Step 1 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

NOTE

The eight screws on the two front sealing plates of the LTMS need to be secured only during transportation.

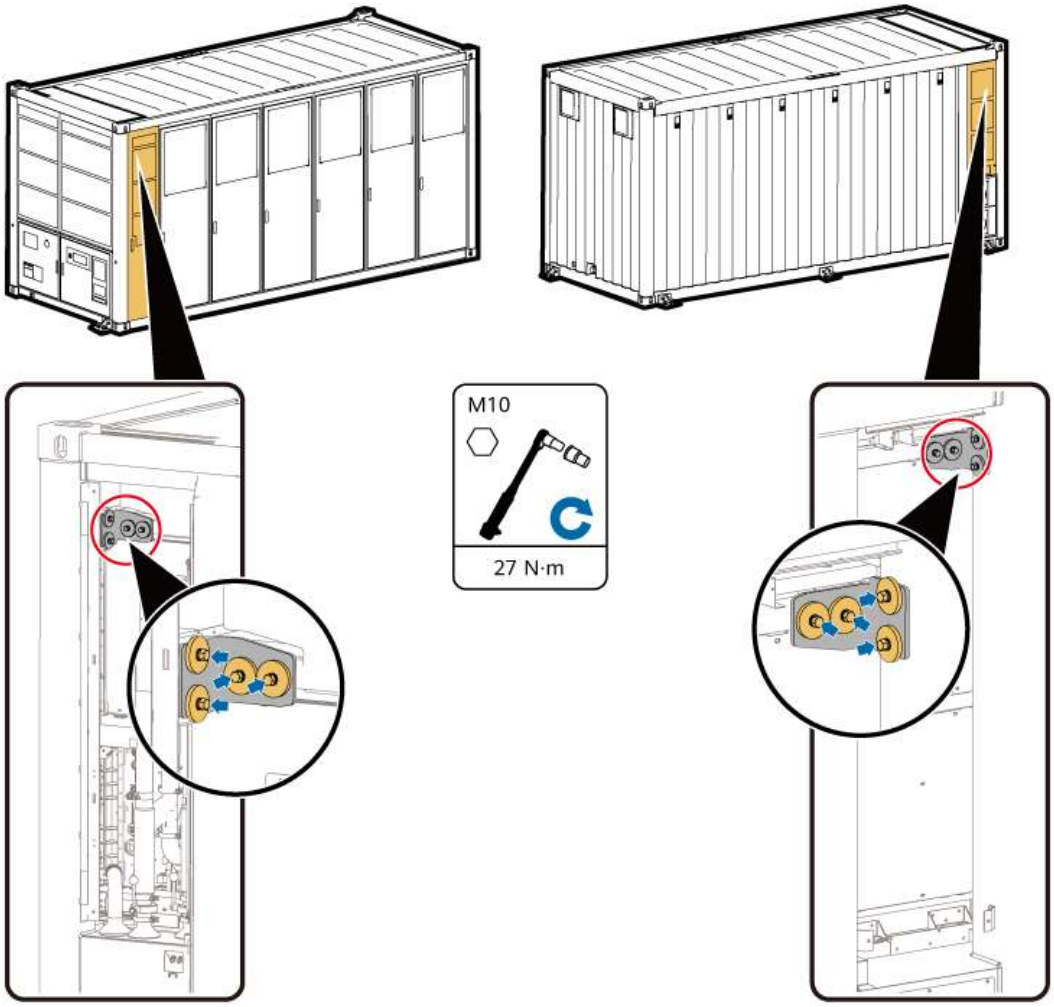


Step 2 Install the bolts at the bottom on the left and right sides of the LTMS, and tighten the bolts to 27 N·m.

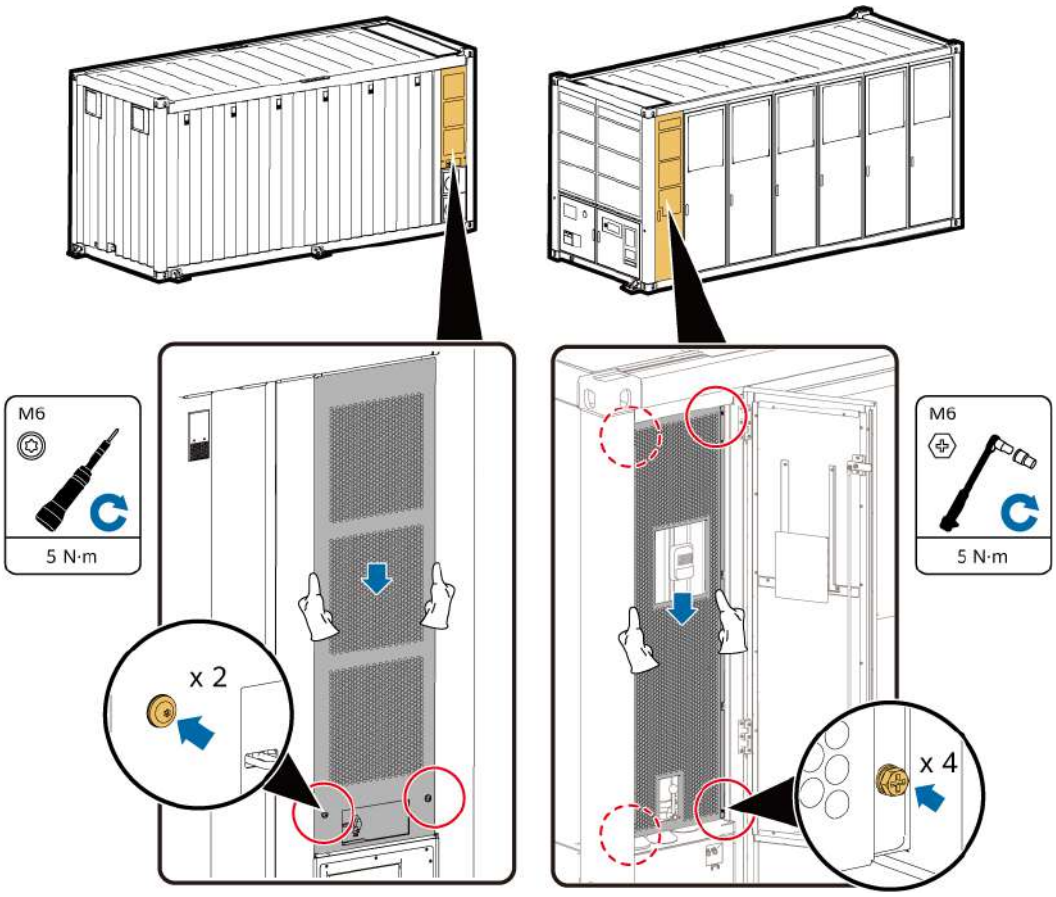


Step 3 Climb up and install the fasteners at the top on the left and right sides of the LTMS, and tighten the fasteners to 27 N·m.

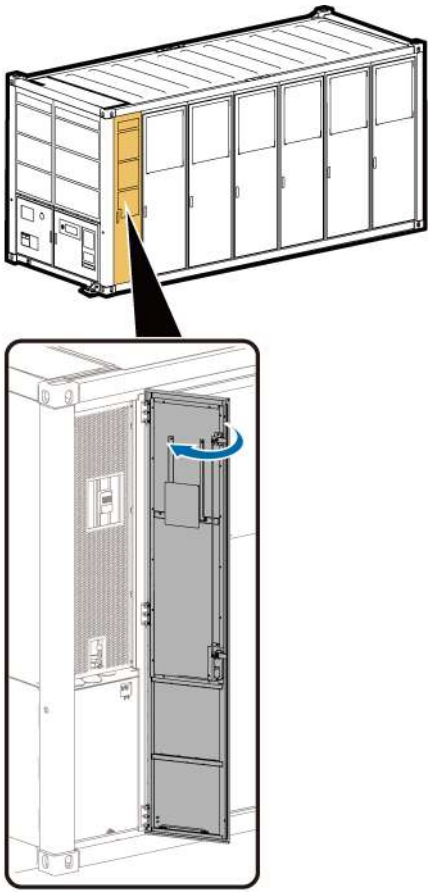
Tighten the two bolts on the LTMS and then the two bolts on the frame. Ensure that the fasteners are closely fitted with the LTMS.



Step 4 Mount the sealing plates on the left and right side of the LTMS to the grooves and tighten them to 5 N·m.



Step 5 Close the door of the LTMS on the front of the container.



----End

7.2.2 Using a Forklift and Fixture

Prerequisites

- The LTMS cables and pipes have been removed.
- Three persons are required to remove and reinstall the LTMS.
- When the width of the maintenance aisle on the side of the container is less than 4 m and the maintenance clearance on the front or rear of the container is greater than or equal to 4.5 m, use the forklift and fixture to remove and reinstall the LTMS.
- Tools: LTMS maintenance fixture, forklift (see **4.2 Forklift Requirements**), ladder, insulated flat-head/Phillips screwdriver, security torx torque screwdriver, insulated torque wrench, adjustable wrench, open-end wrench, safety gloves, safety shoes, safety helmet, and safety harness

  NOTE

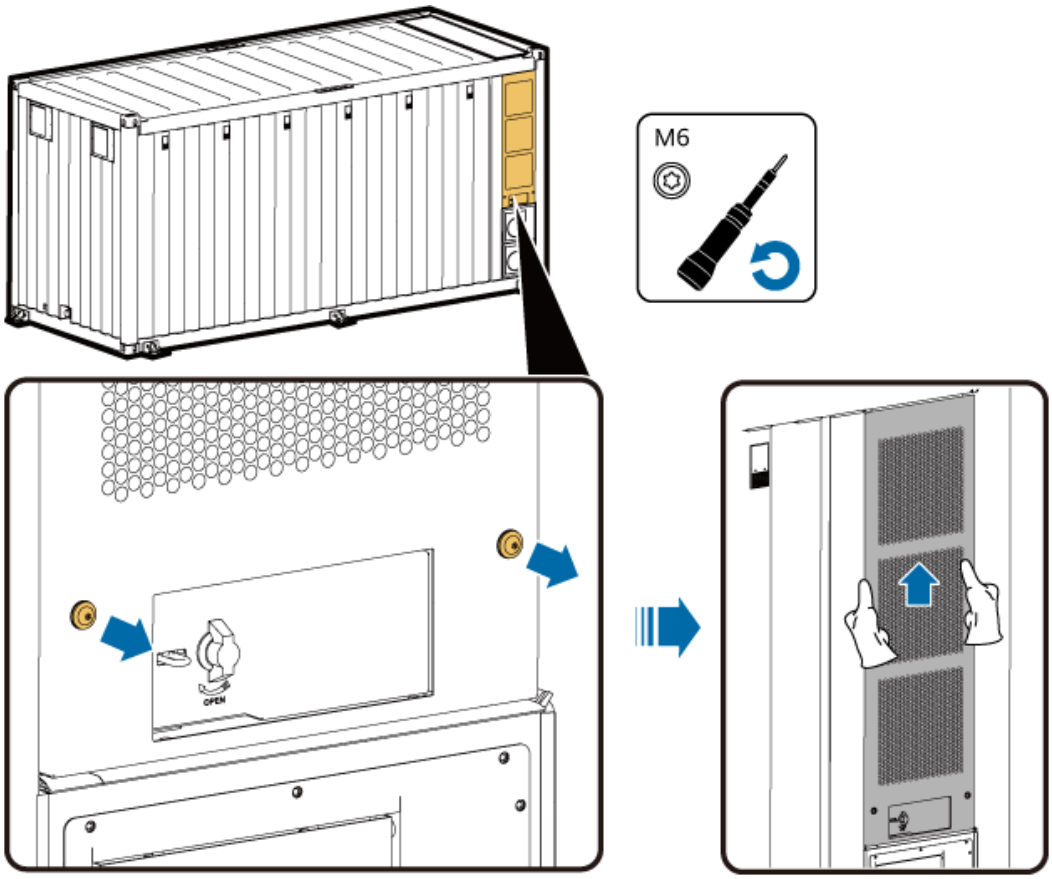
  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

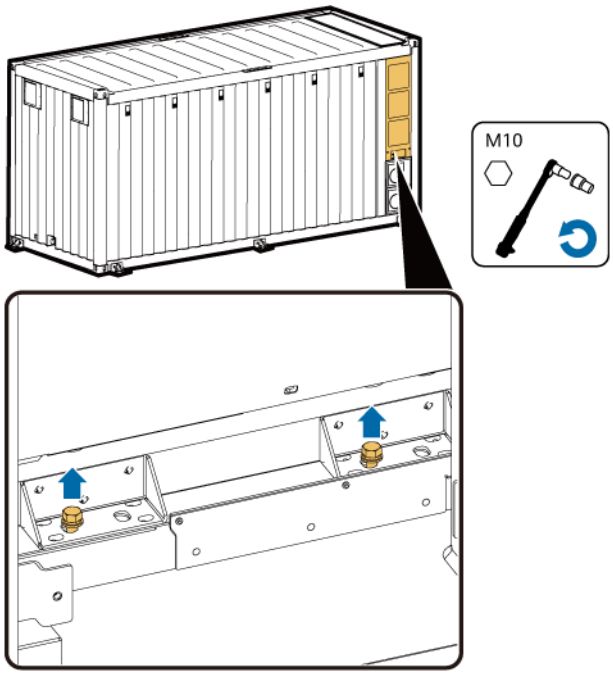
Disconnecting the LTMS

Step 1 Remove the antitheft screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

Figure 7-9 Removing the rear sealing plate from the container



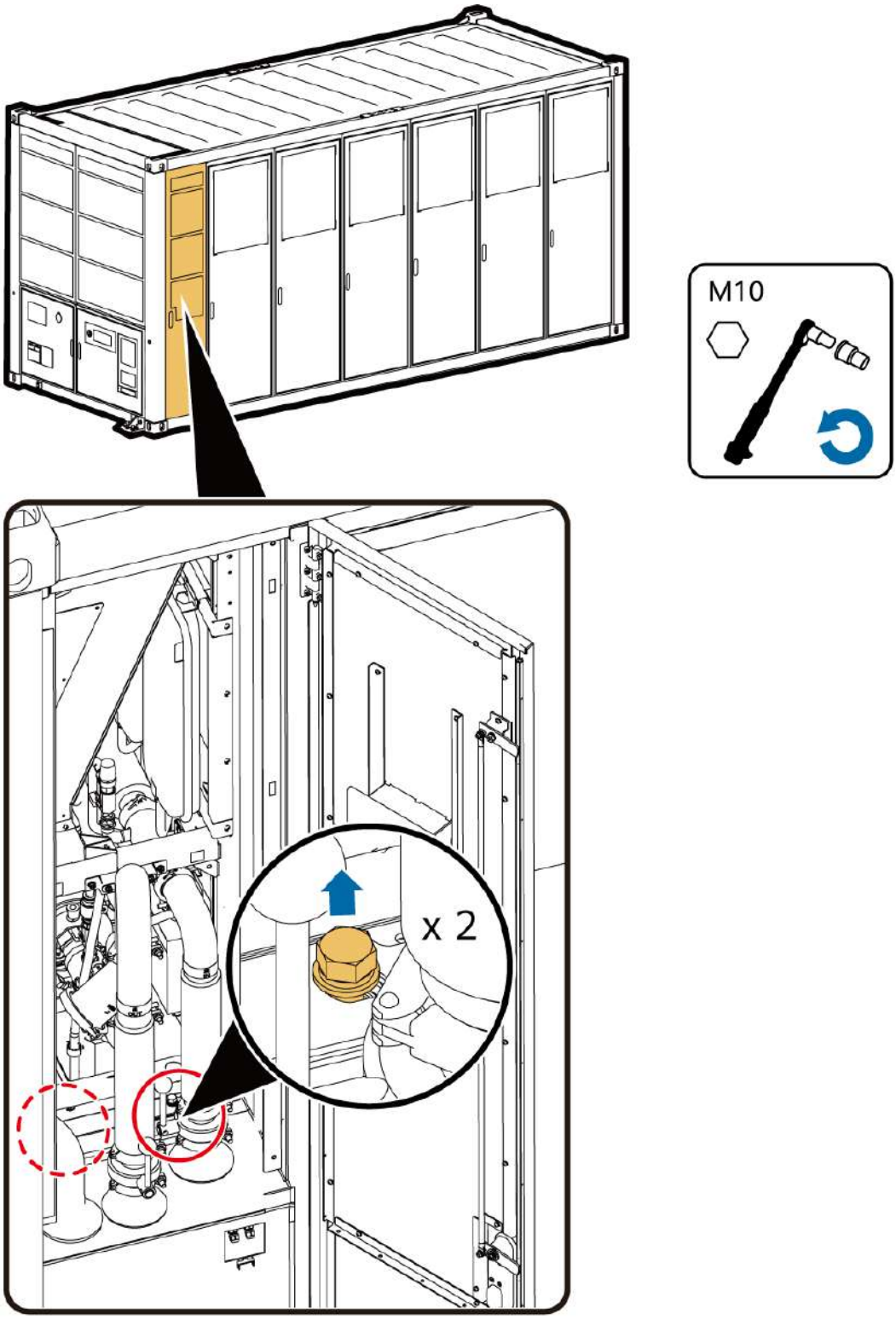
Step 2 Remove the bolts at the bottom on the left of the LTMS.



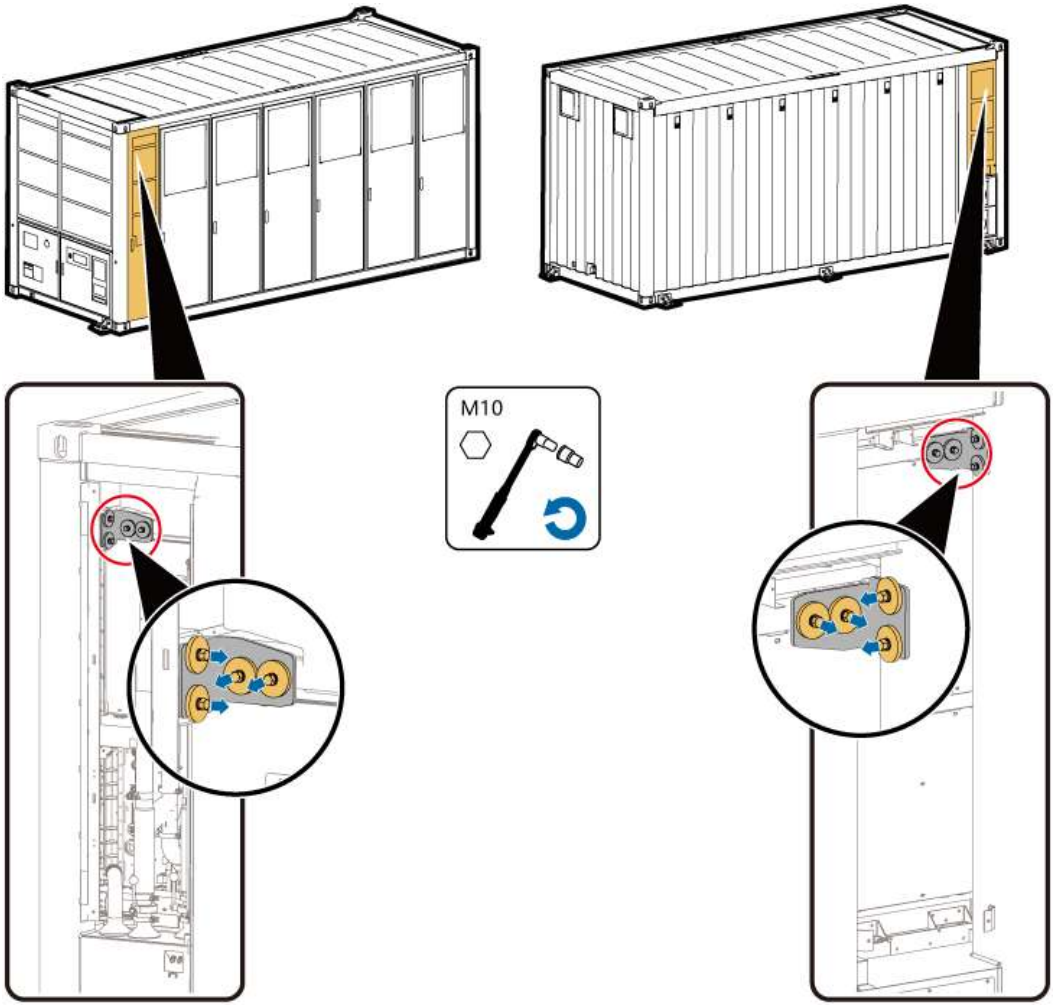
Step 3 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 4 Remove the bolts at the bottom on the right of the LTMS.



Step 5 Climb up and remove the bolts at the top on the left and right sides of the LTMS.



Step 6 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

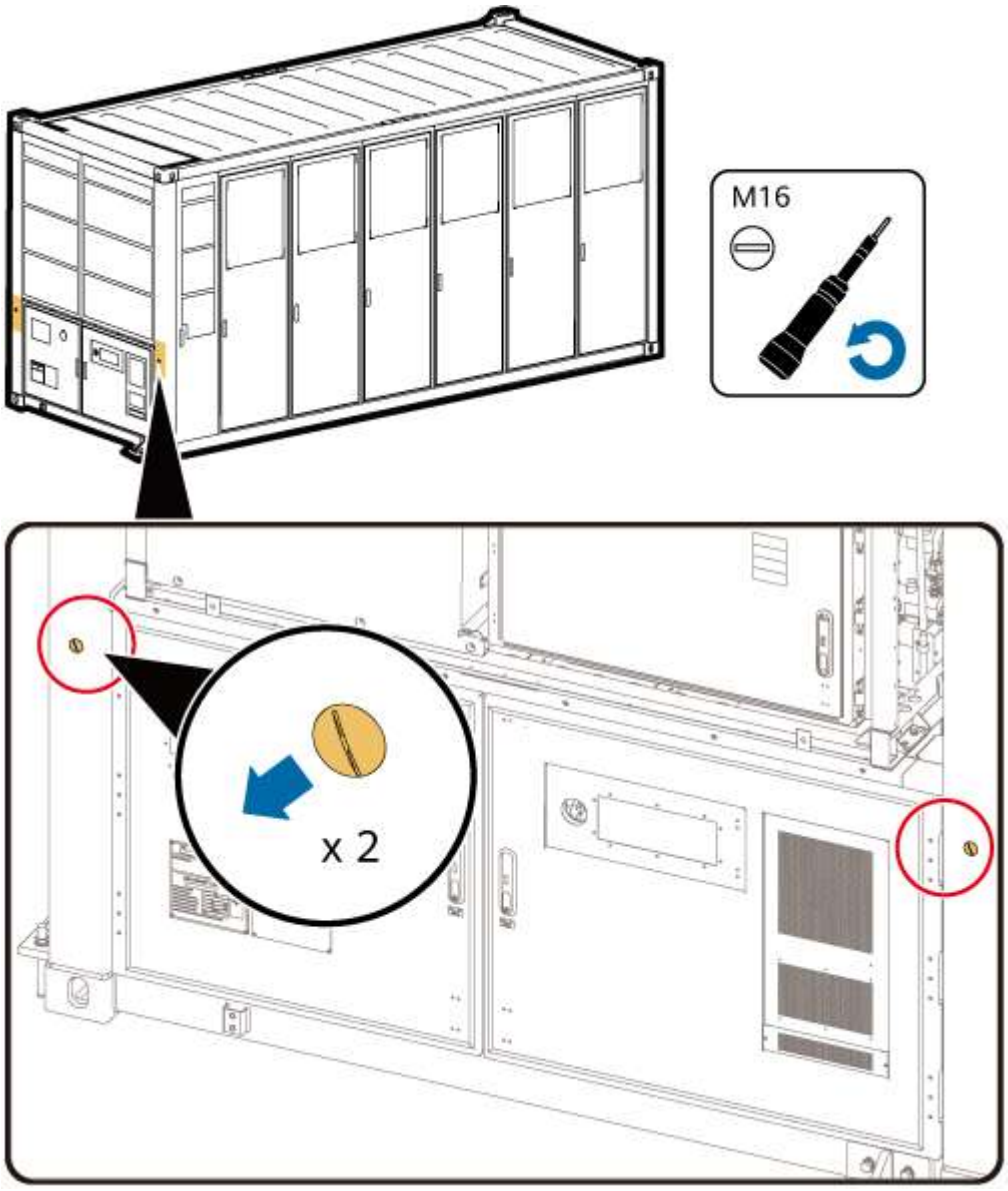
NOTE

Remove the eight screws from the two front sealing plates only when you remove the LTMS for the first time.

----End

Installing the LTMS Fixture

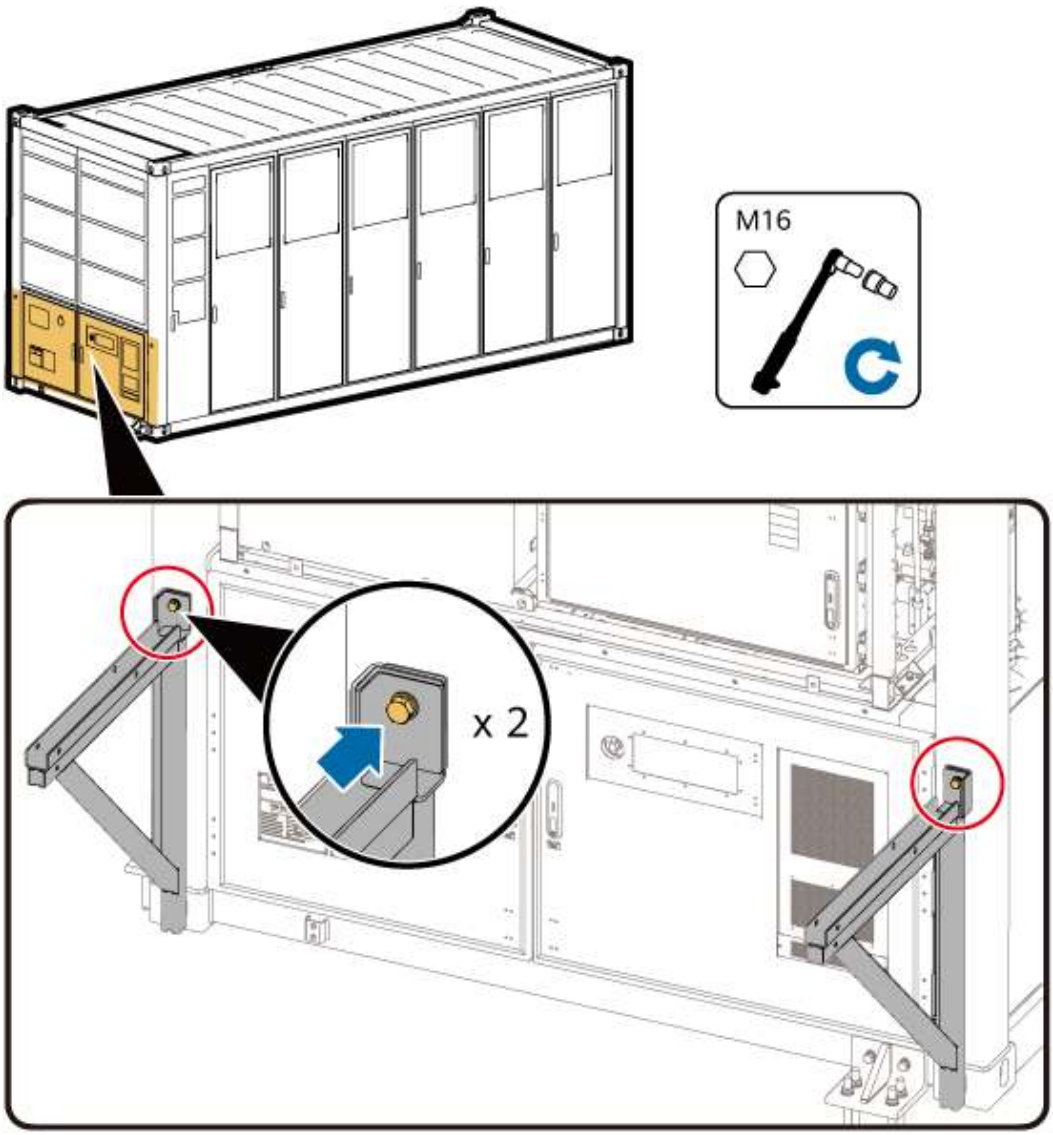
Step 1 Use a flat-head screwdriver to remove the nylon screws from the left and right columns.



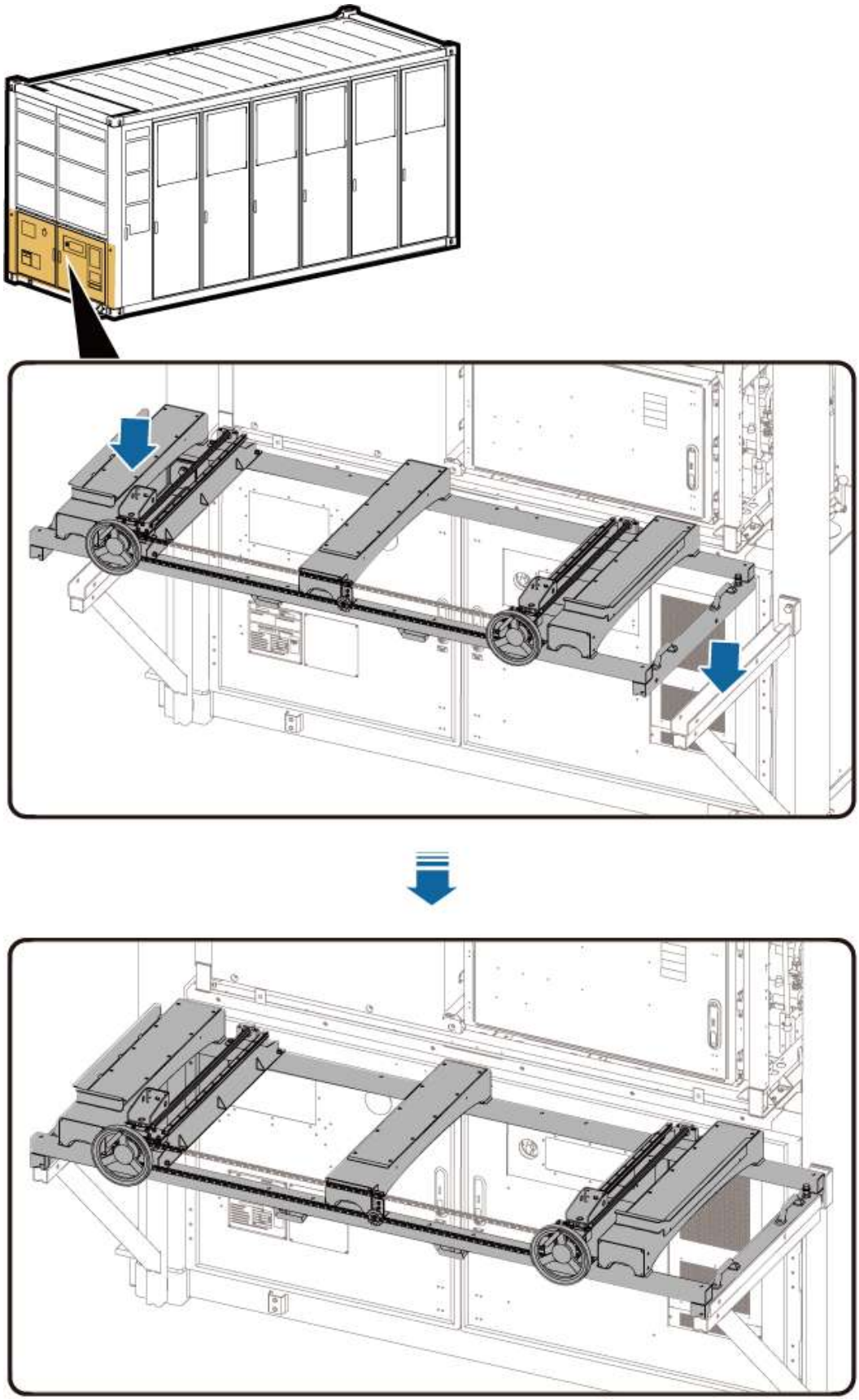
Step 2 Install the left and right supports.

NOTE

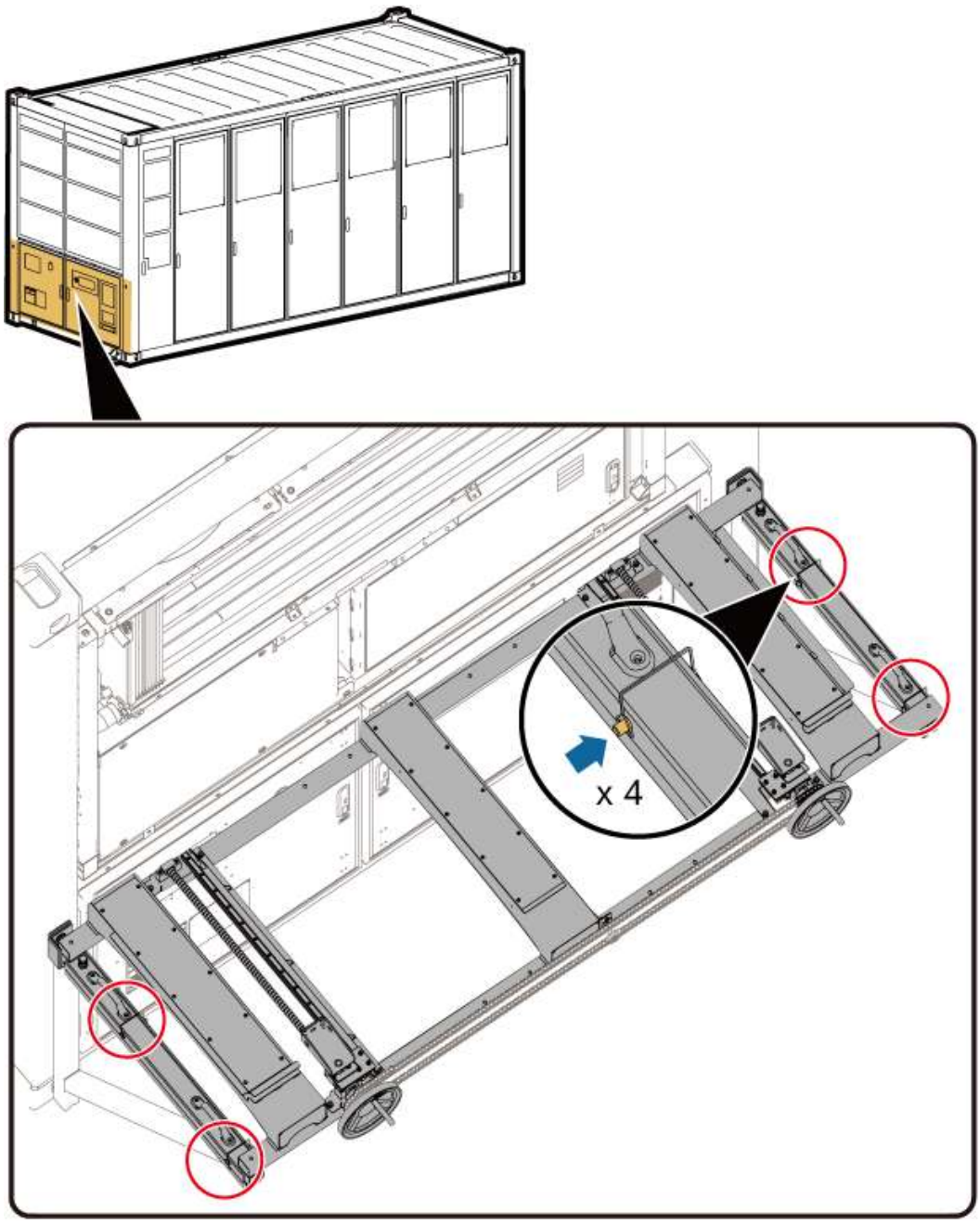
Do not install the left and right supports reversely.



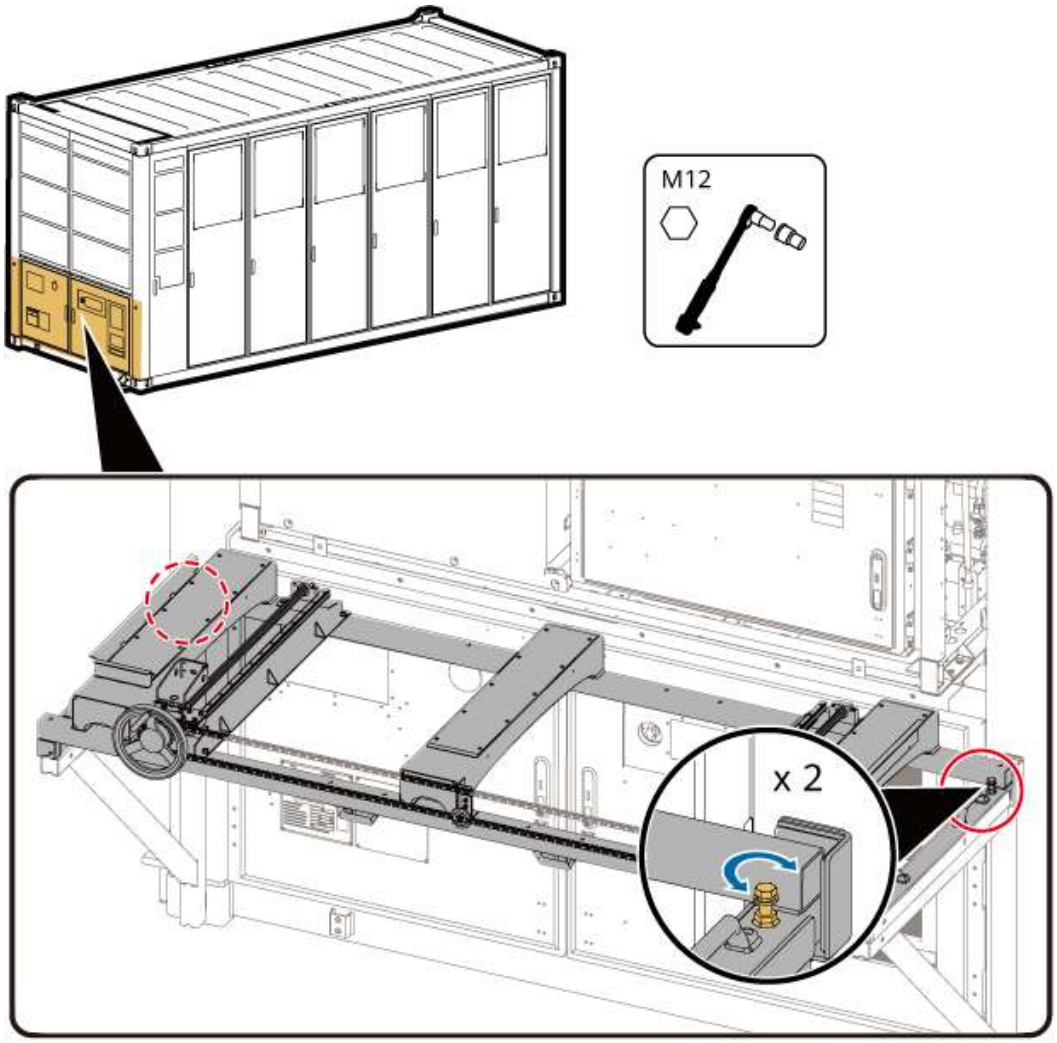
Step 3 Place the push component on the positioning slots of the supports.



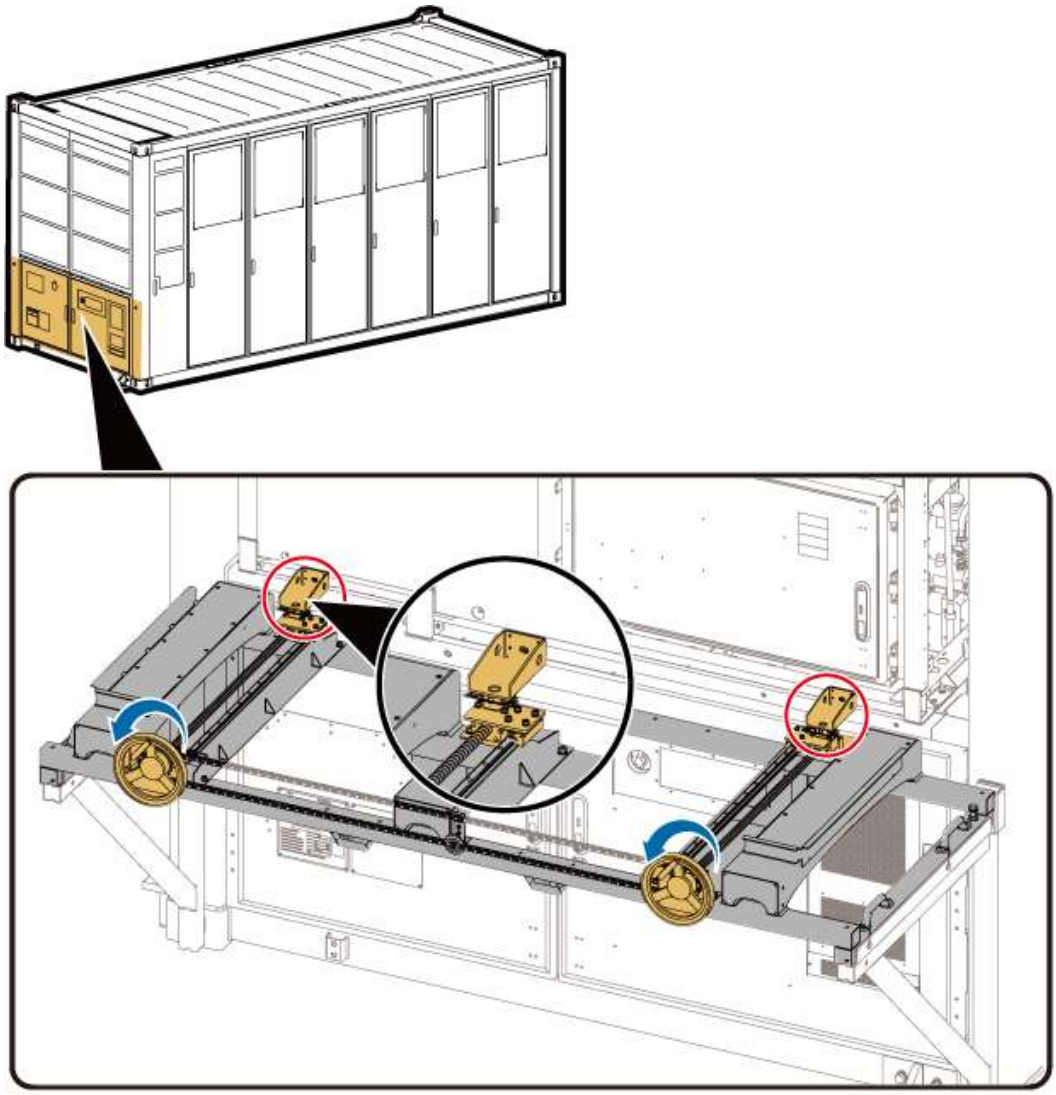
Step 4 Insert the positioning pins to secure the push component to the supports.



Step 5 Rotate the height adjustment screws on the left and right sides of the push component to ensure that the platform surface of the push component is flush with the LTMS platform surface.



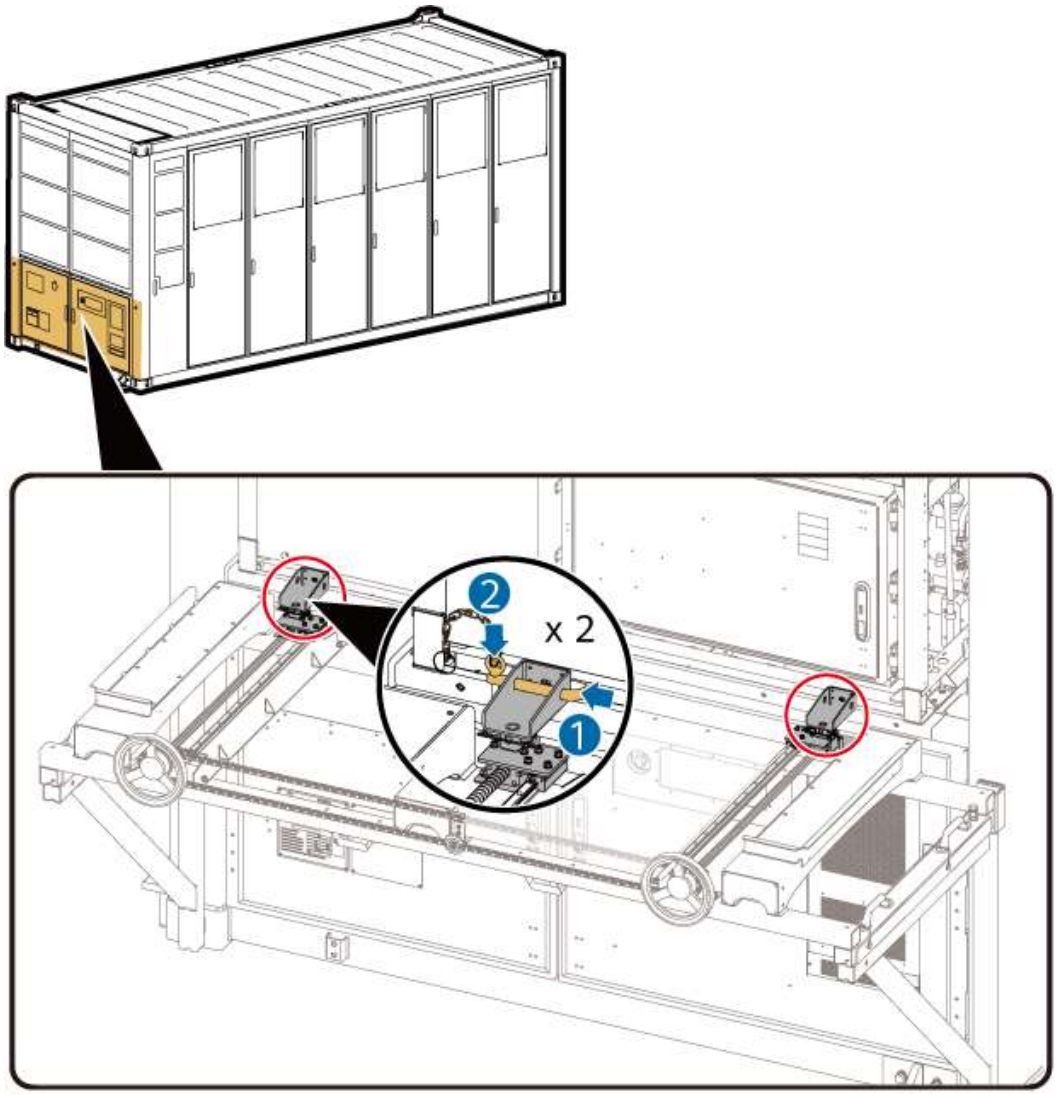
Step 6 Rotate the handwheel to push the connecting plate of the push component to the front end so that the connecting plate is closely fitted with the LTMS.



Step 7 Use two U-shaped brackets and two ring bolts to connect the LTMS to the connecting plate.

NOTICE

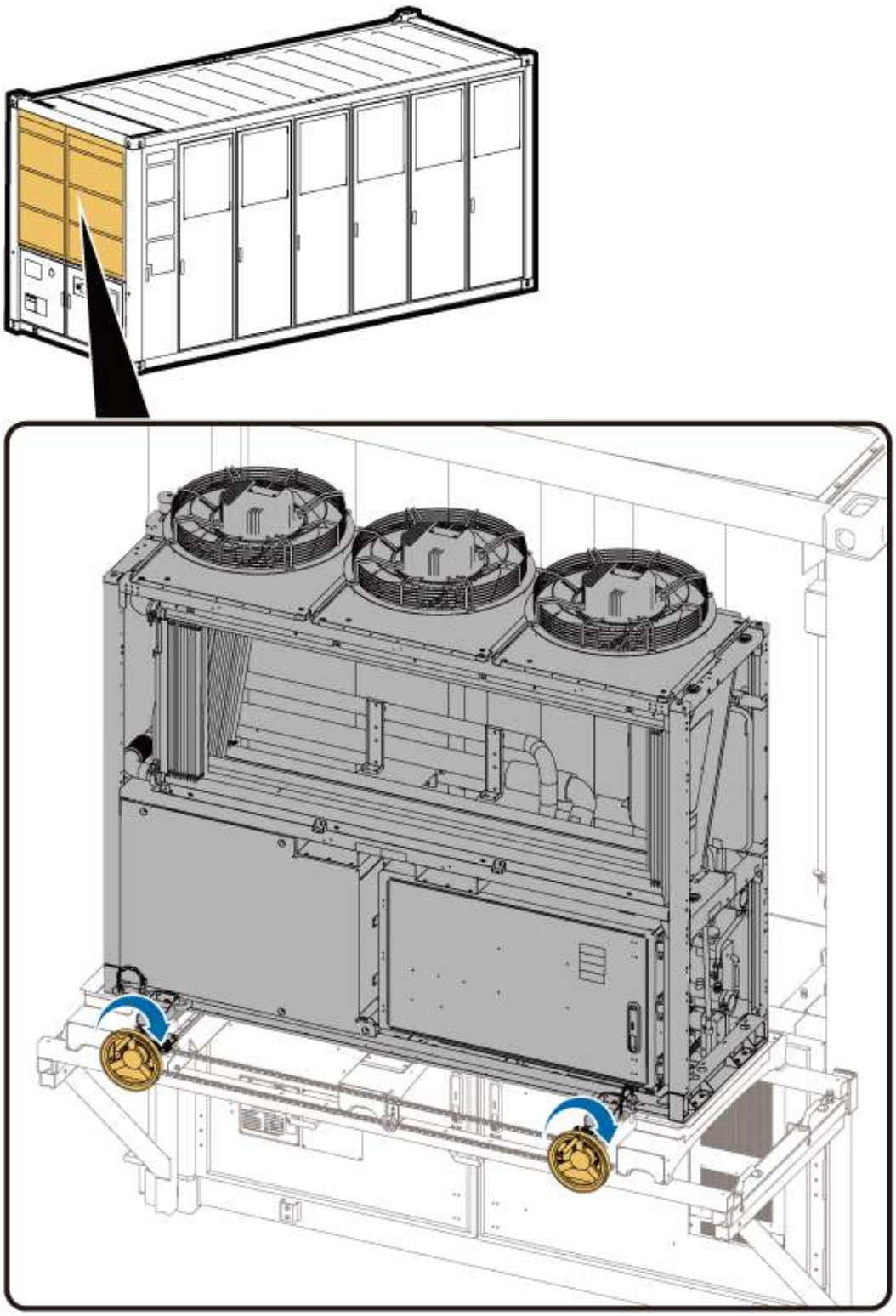
When removing the LTMS, install only the U-shaped brackets and do not install screws. This prevents the screws from being damaged.



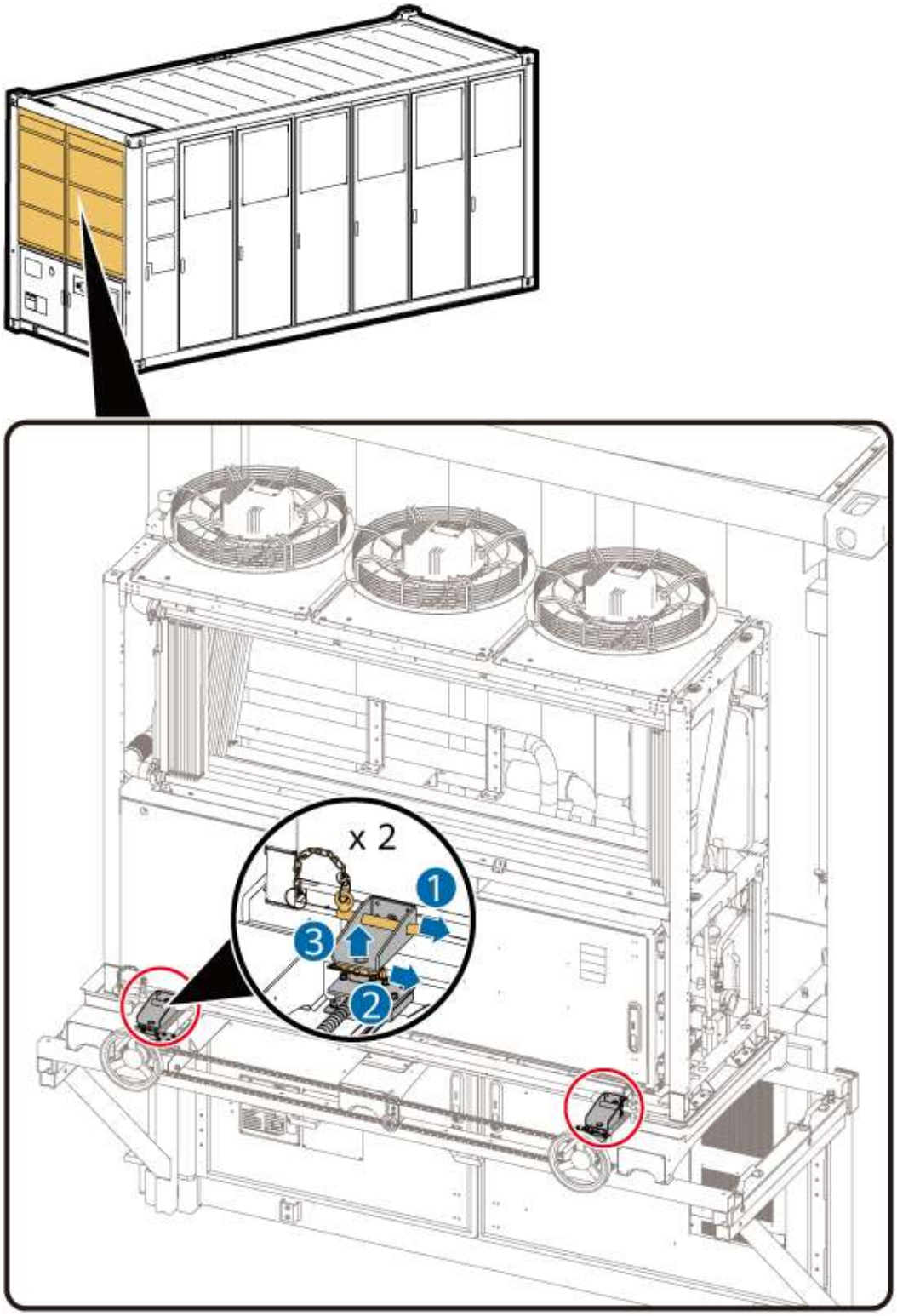
----End

Removing the LTMS

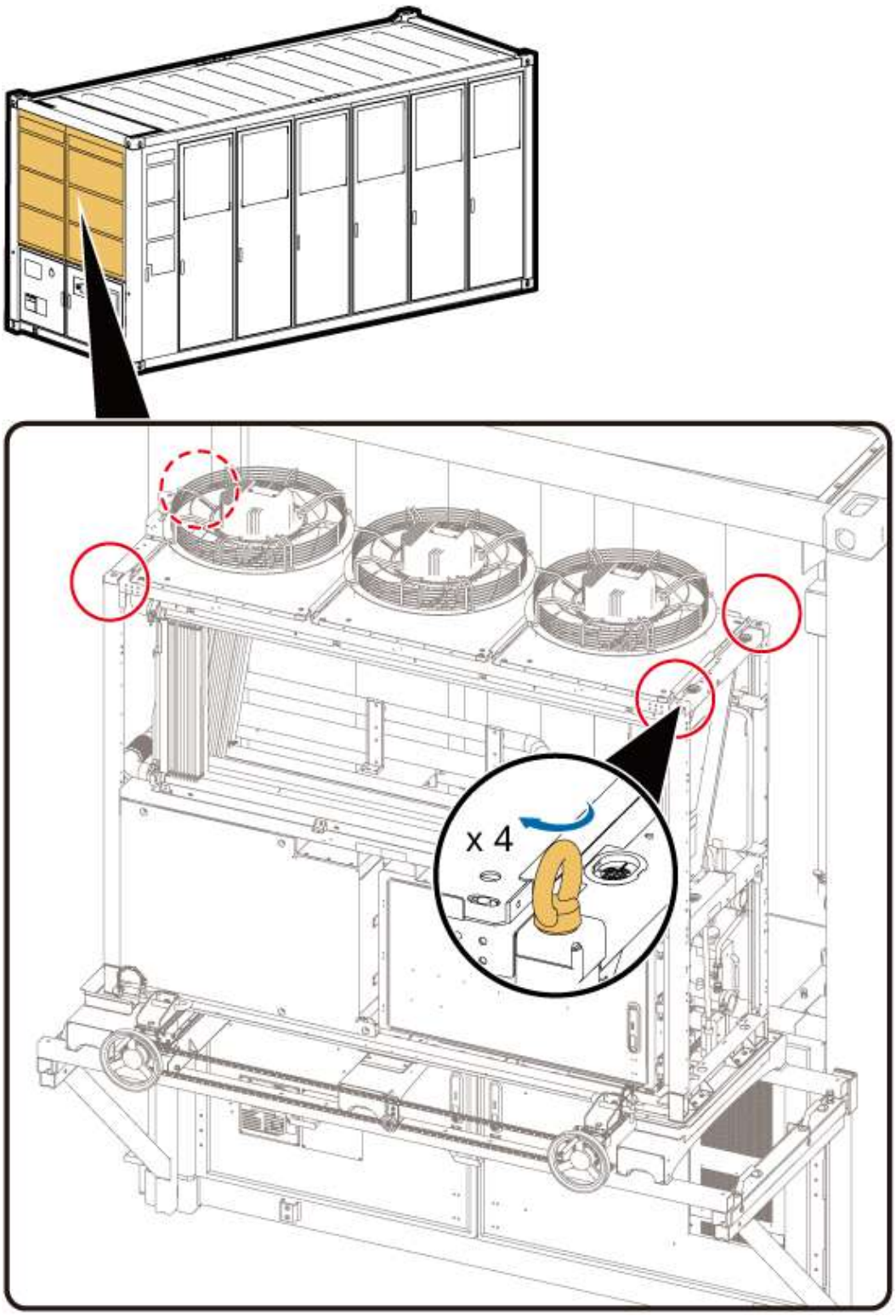
Step 1 Rotate the handwheel to completely remove the LTMS onto the push component.



Step 2 Remove the latches and U-shaped brackets from the connecting plate of the push component.



Step 3 Climb up and install the eye bolts on the top of the LTMS.



Step 4 Use the forklift to install the forklift fixture on the top, and use the shackle to connect the eye bolts to the forklift fixture.

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Step 5 Insert the forklift into the fixture, remove the LTMS, move it to a safe area, and place it on the ground.

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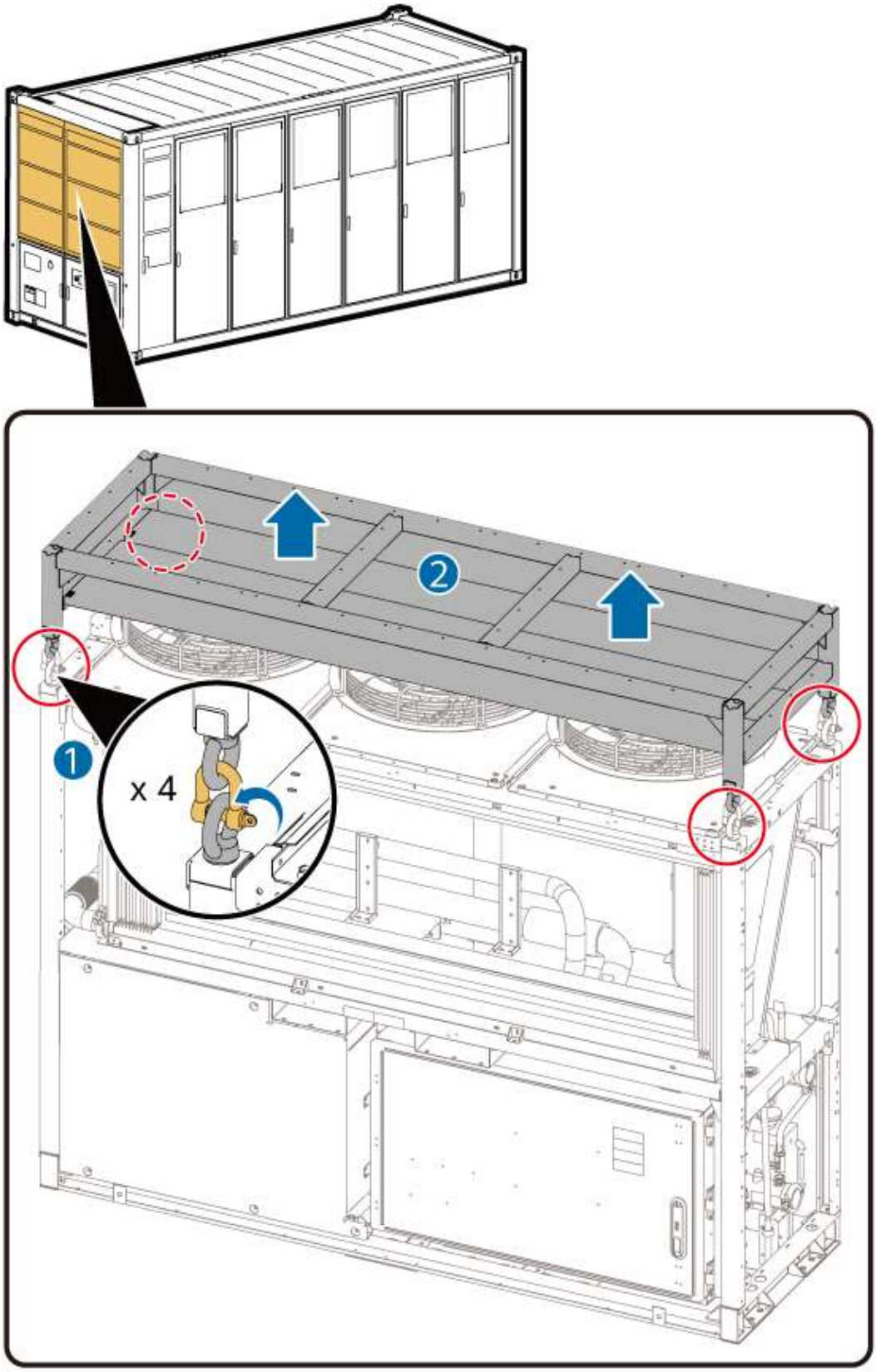
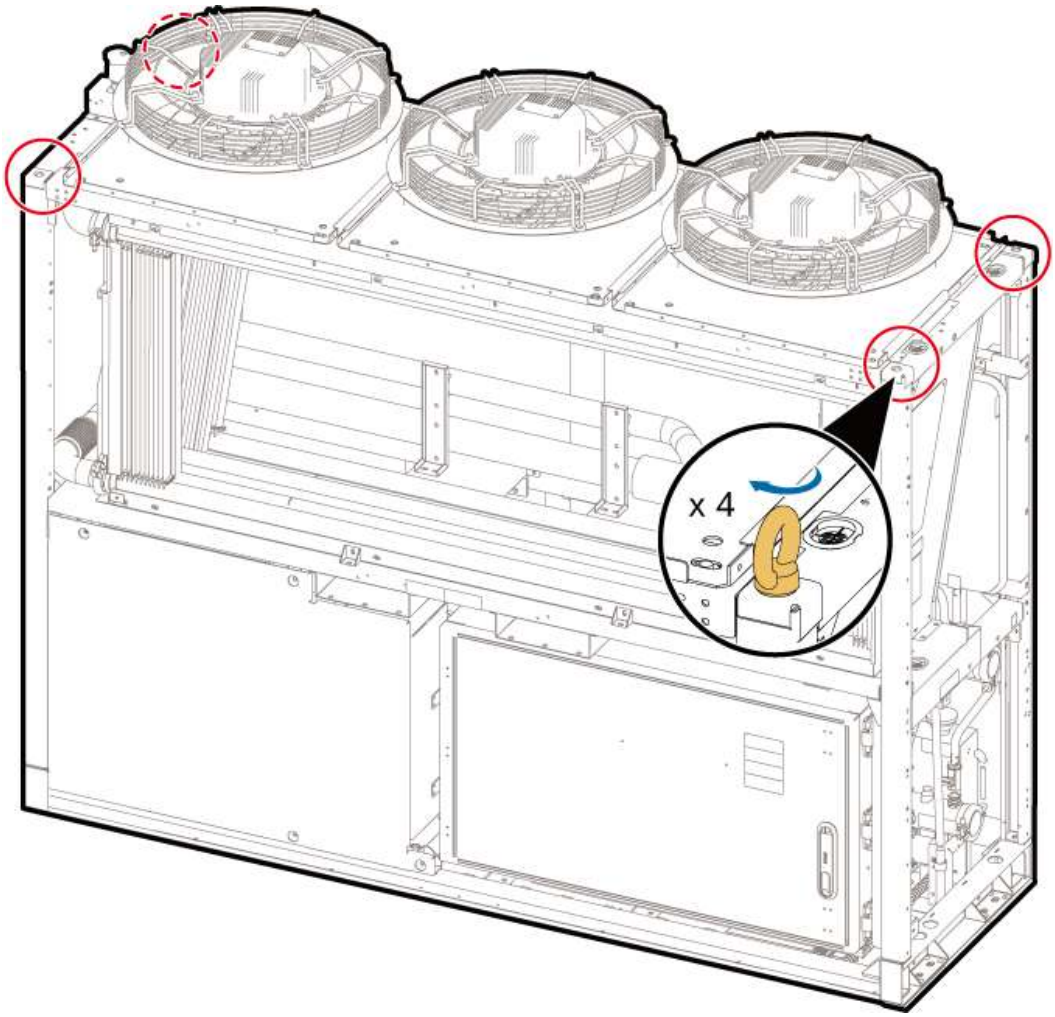
Step 6 Remove the shackles between the LTMS and the forklift fixture. Remove the eyes bolts from the forklift fixture and the LTMS.



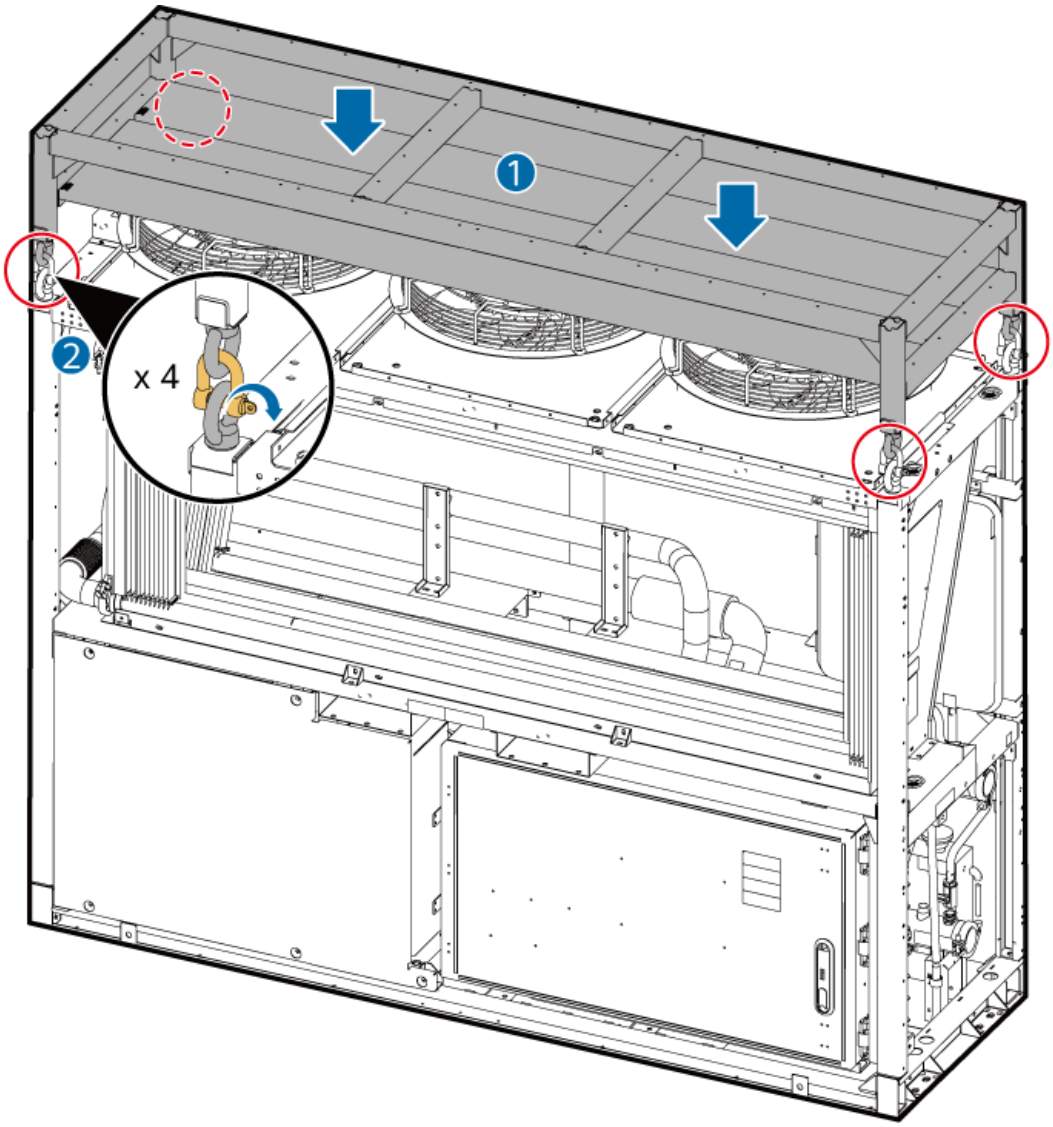
----End

Reinstalling the LTMS

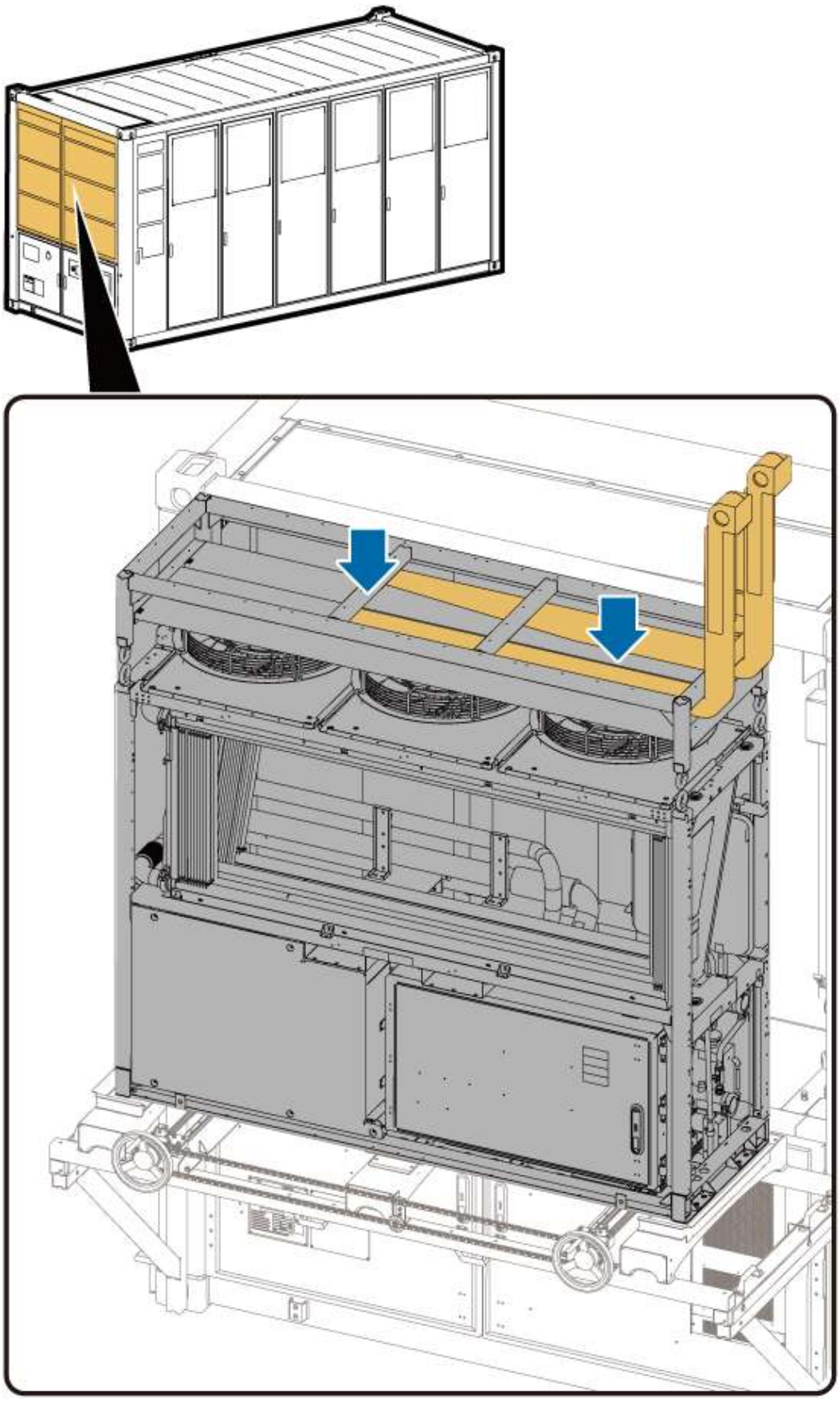
Step 1 Install the four eye bolts on the top of the LTMS.



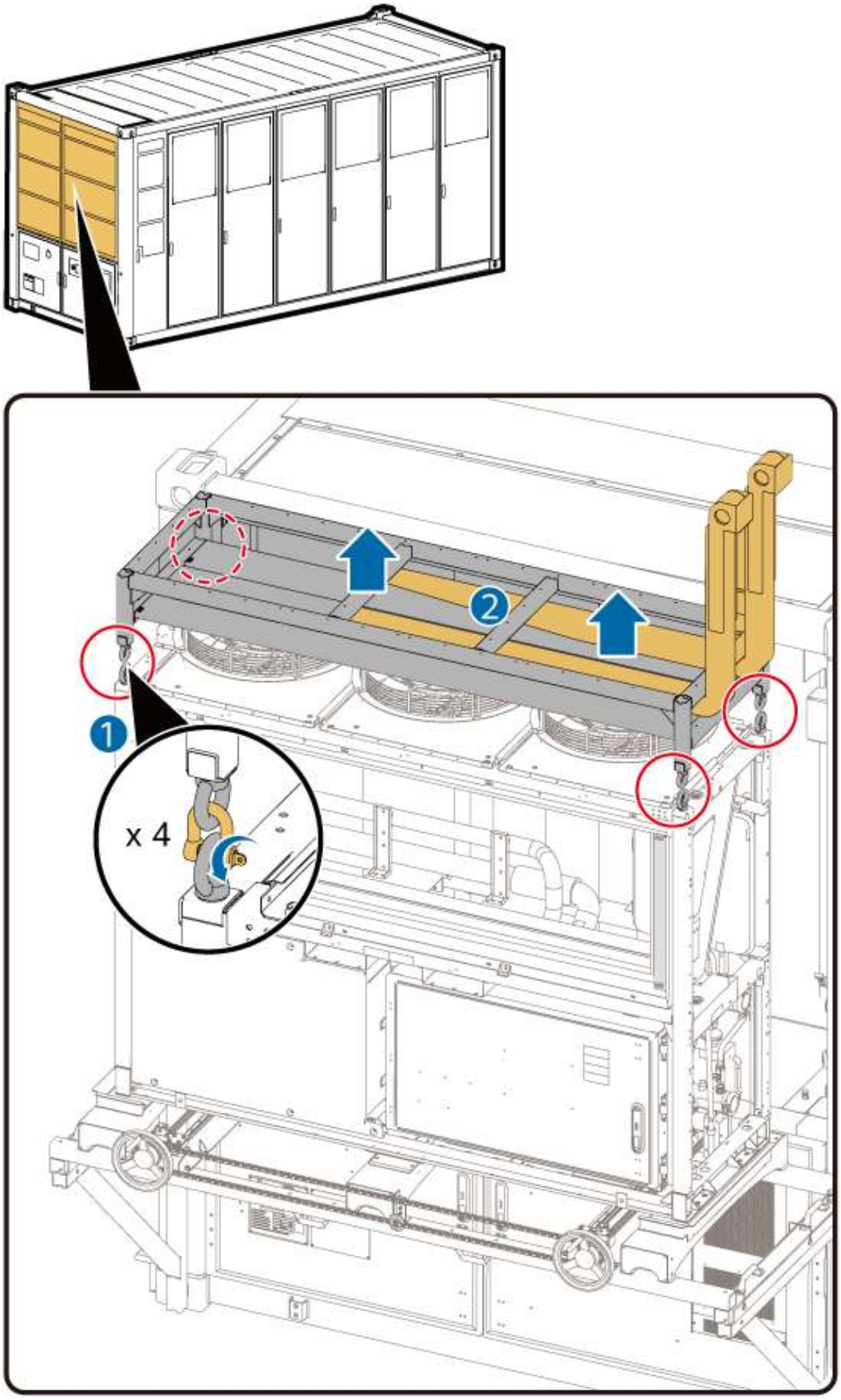
Step 2 Place the forklift fixture on the top of the LTMS, and connect the eye bolts to the forklift fixture using a shackle.



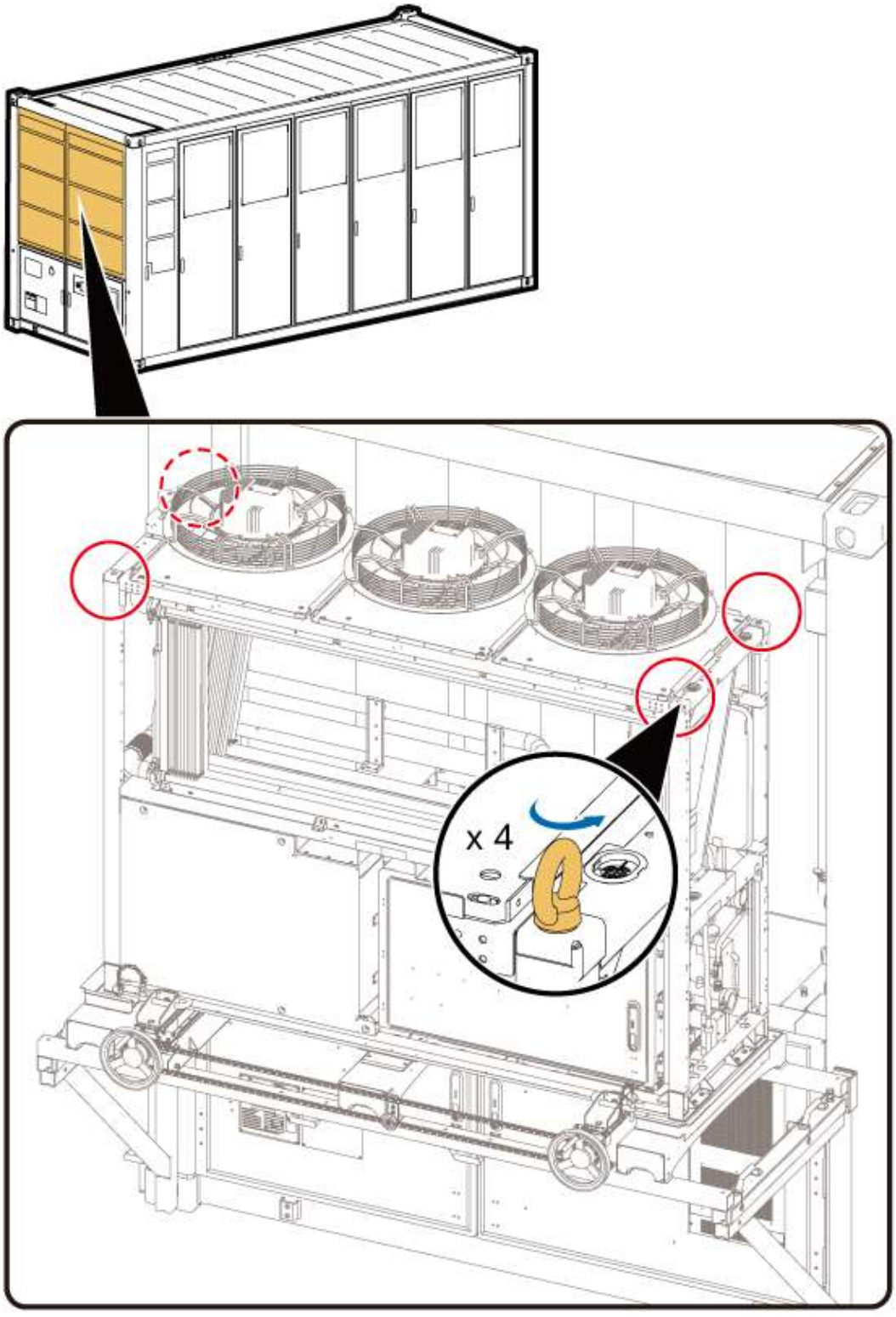
Step 3 Insert the forklift into the forklift fixture and place the LTMS on the push component.



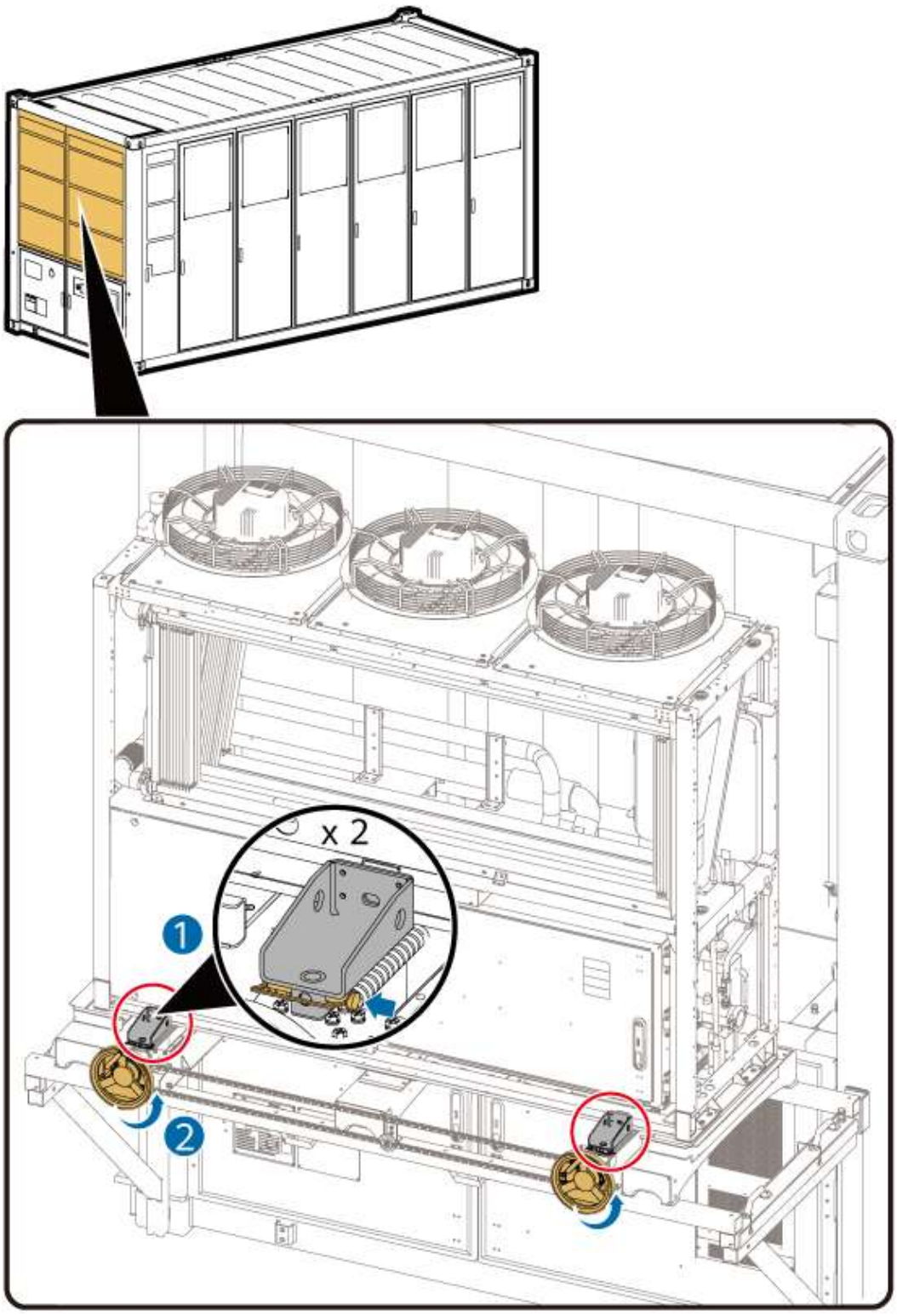
Step 4 Climb up and remove the shackles between the LTMS and the forklift fixture, and remove the forklift fixture using a forklift.



Step 5 Remove the eye bolts from the LTMS.

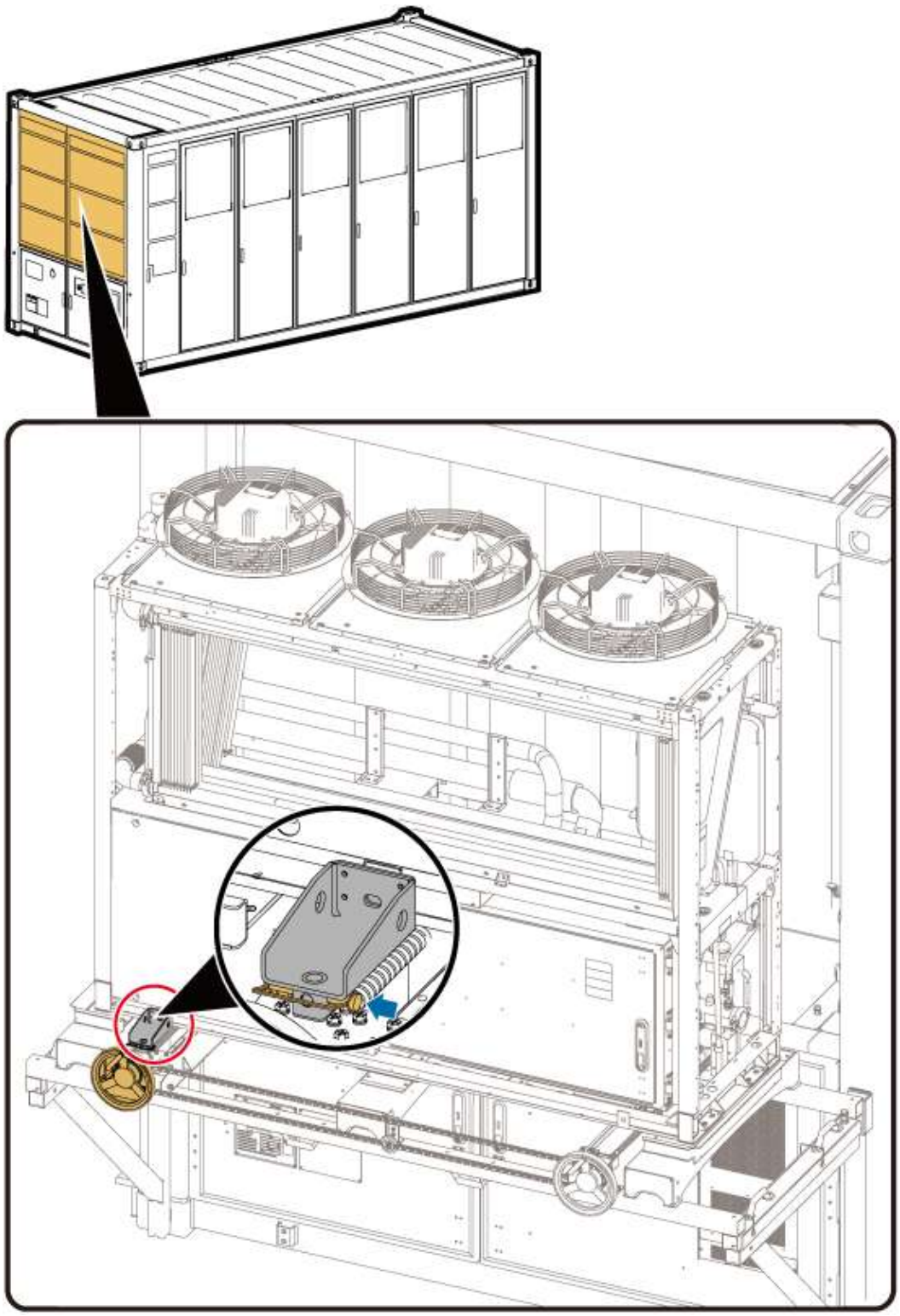


Step 6 Install the connecting plates of the push component, and rotate the handwheel to ensure that the connecting plates are closely fitted with the LTMS.

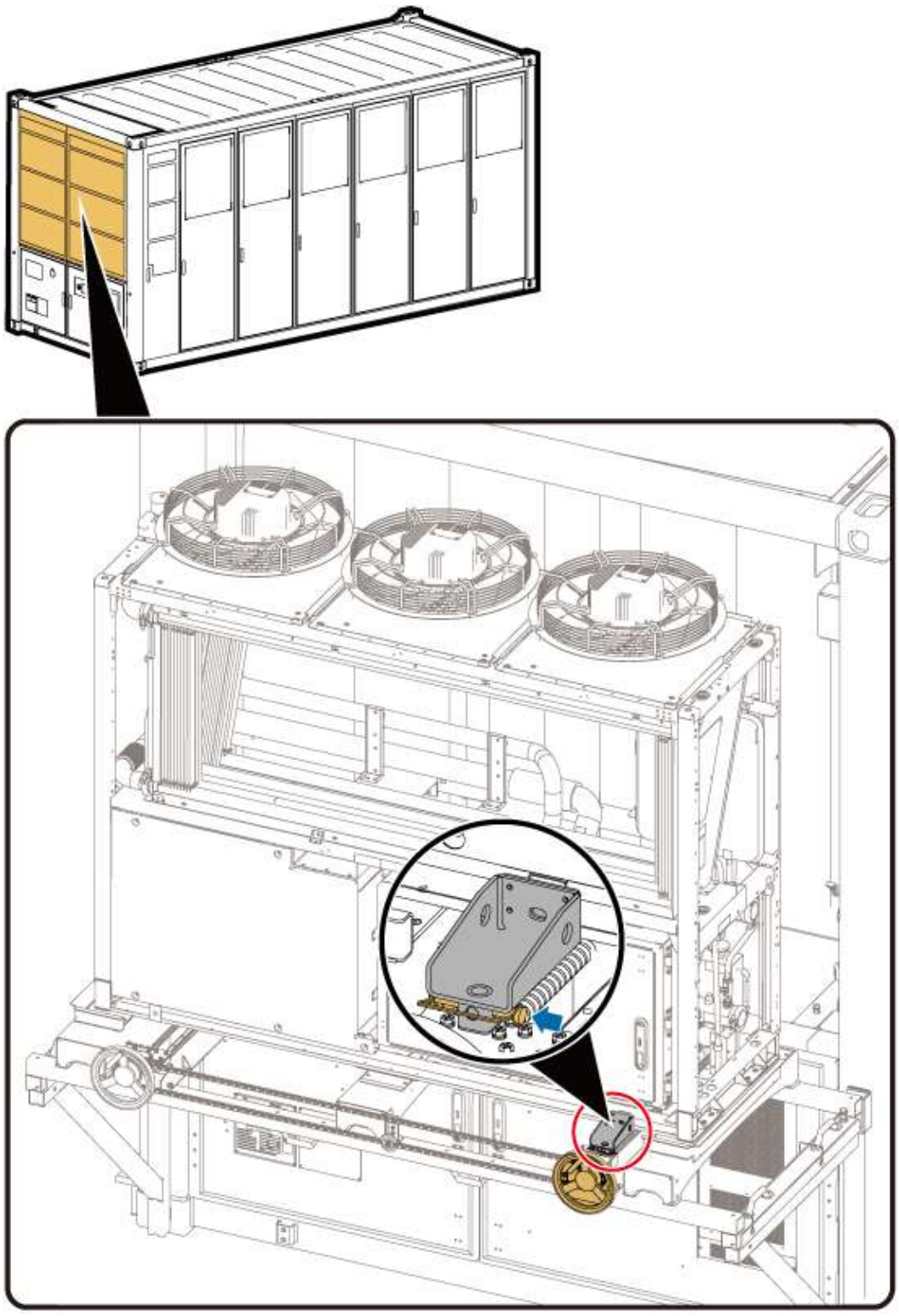


Step 7 Adjust the LTMS horizontally to align the threaded holes on the LTMS with the threaded holes on the connecting plates of the push component.

1. If the LTMS deviates to the left, install only the connecting plate on the left. Rotate the handwheel to push the LTMS forward for a short distance, and then install the connecting plate on the other side. Rotate the handwheel to push the LTMS to be level with the two connecting plates.



2. If the LTMS deviates to the right, install only the connecting plate on the right. Rotate the handwheel to push the LTMS forward for a short distance, and then install the connecting plate on the other side. Rotate the handwheel to push the LTMS to be level with the two connecting plates.

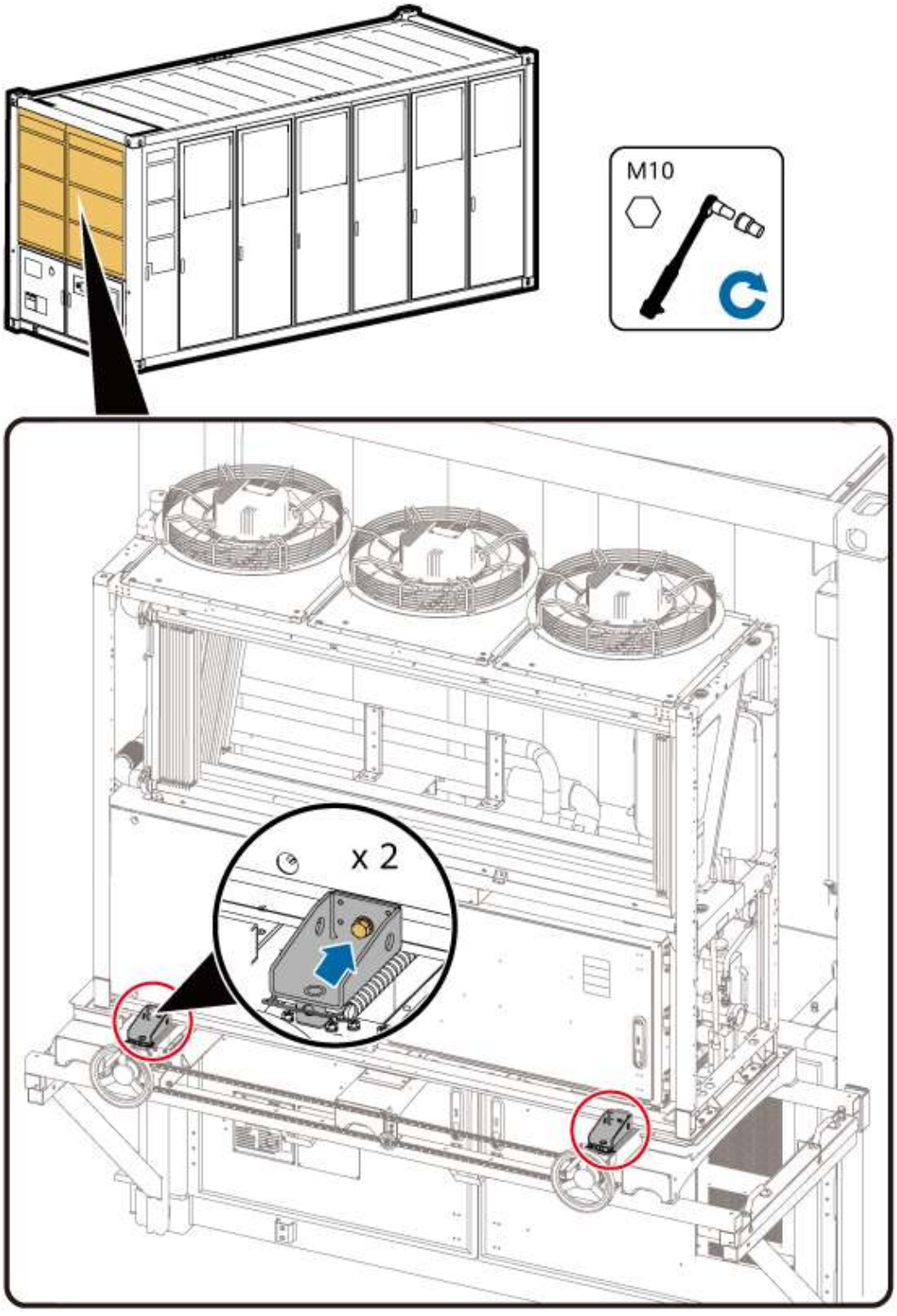


3. Repeat the preceding two steps until the threaded holes of the LTMS are aligned with the threaded holes of the connecting plates of the push component.

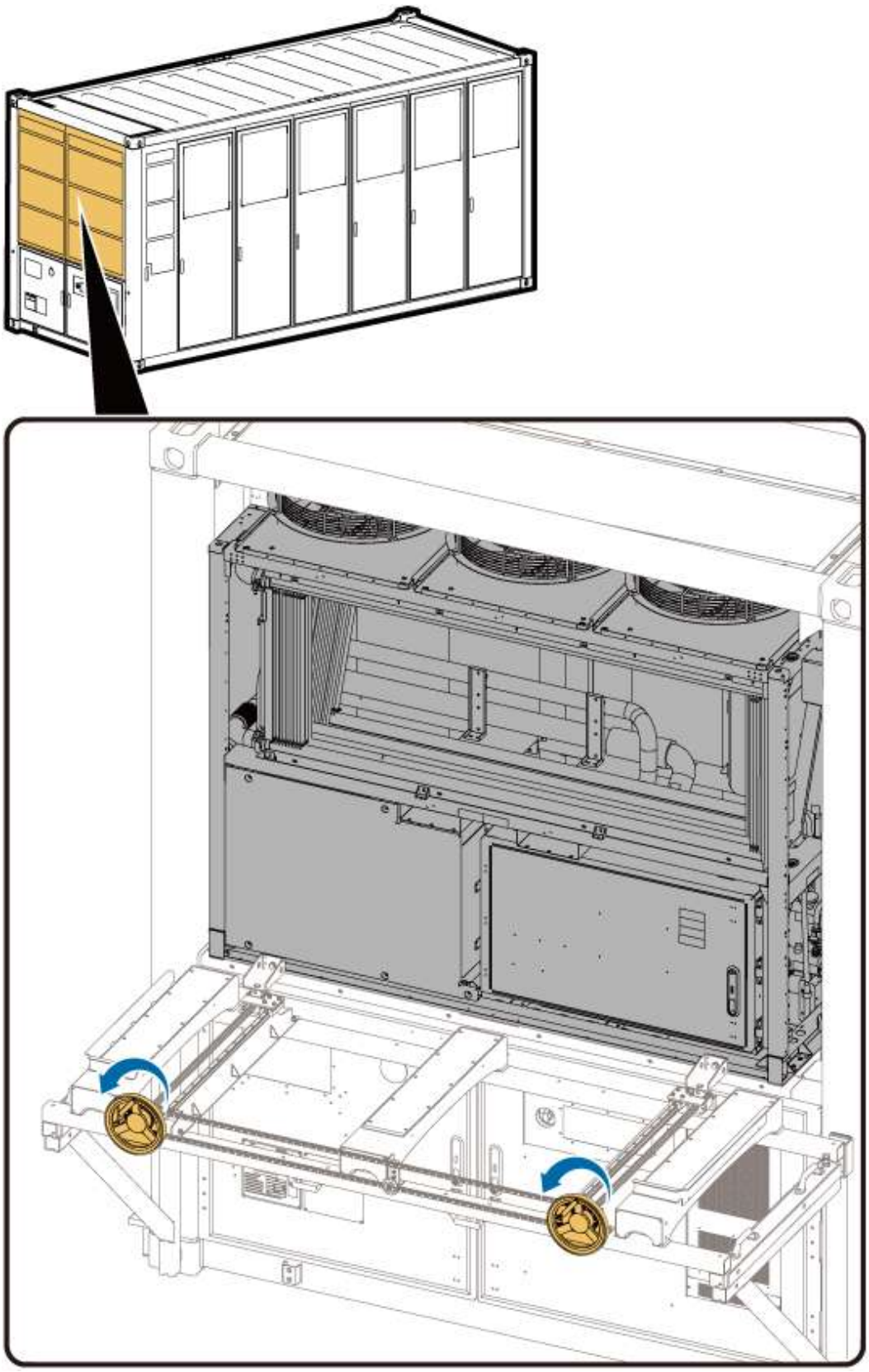
Step 8 Install the screws between the LTMS and the connecting plates.

NOTE

When reinstalling the LTMS, you only need to install screws and do not need to install U-shaped brackets.



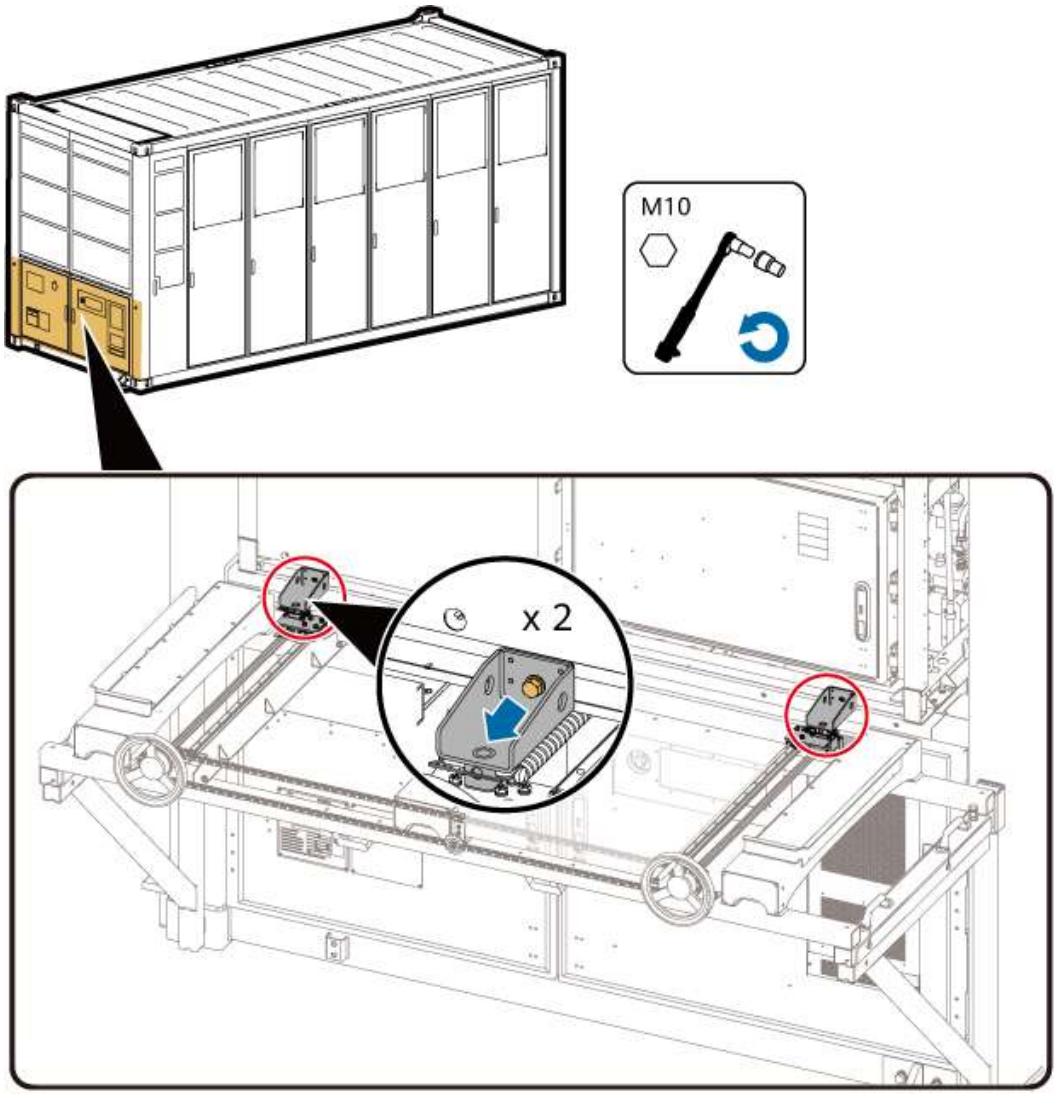
Step 9 Rotate the handwheel to move the LTMS into the container.



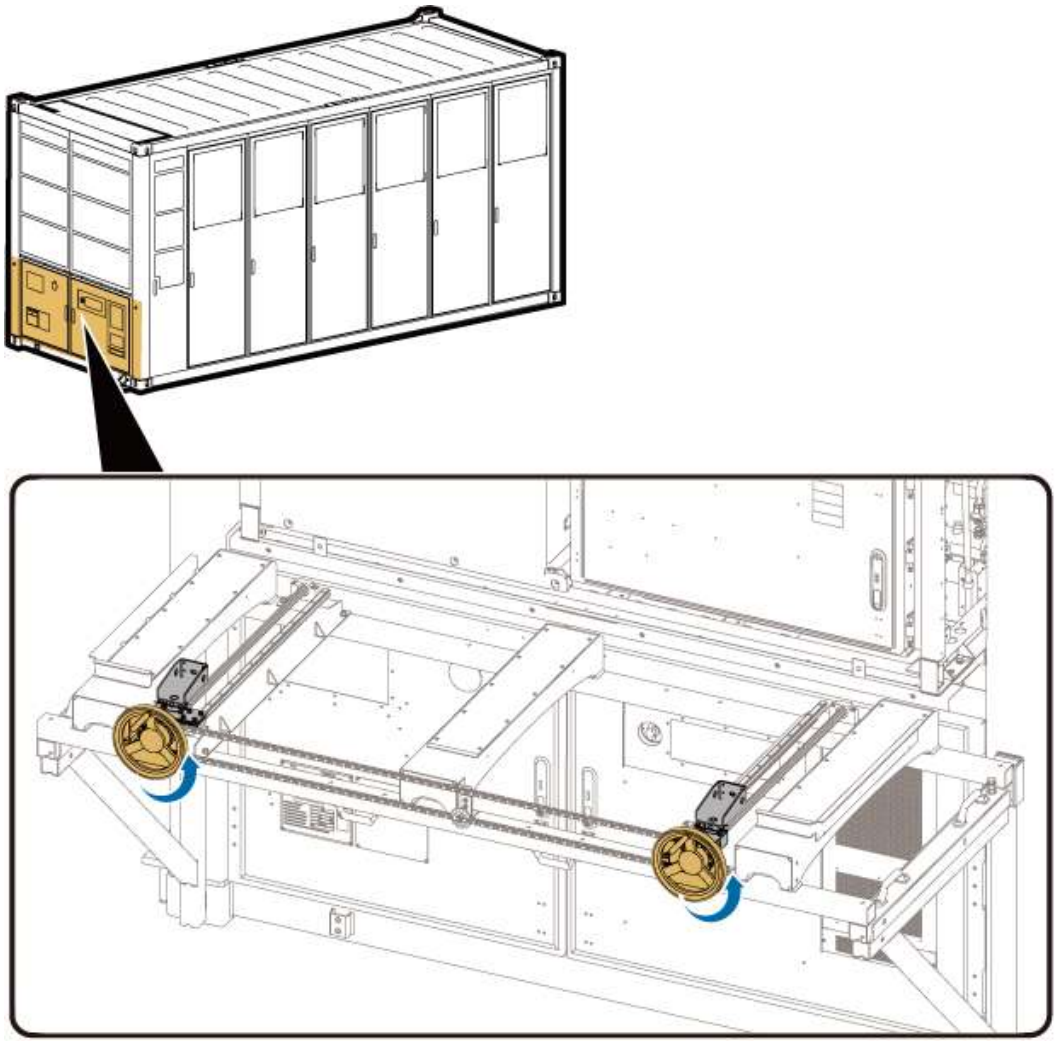
----End

Removing the LTMS Fixture

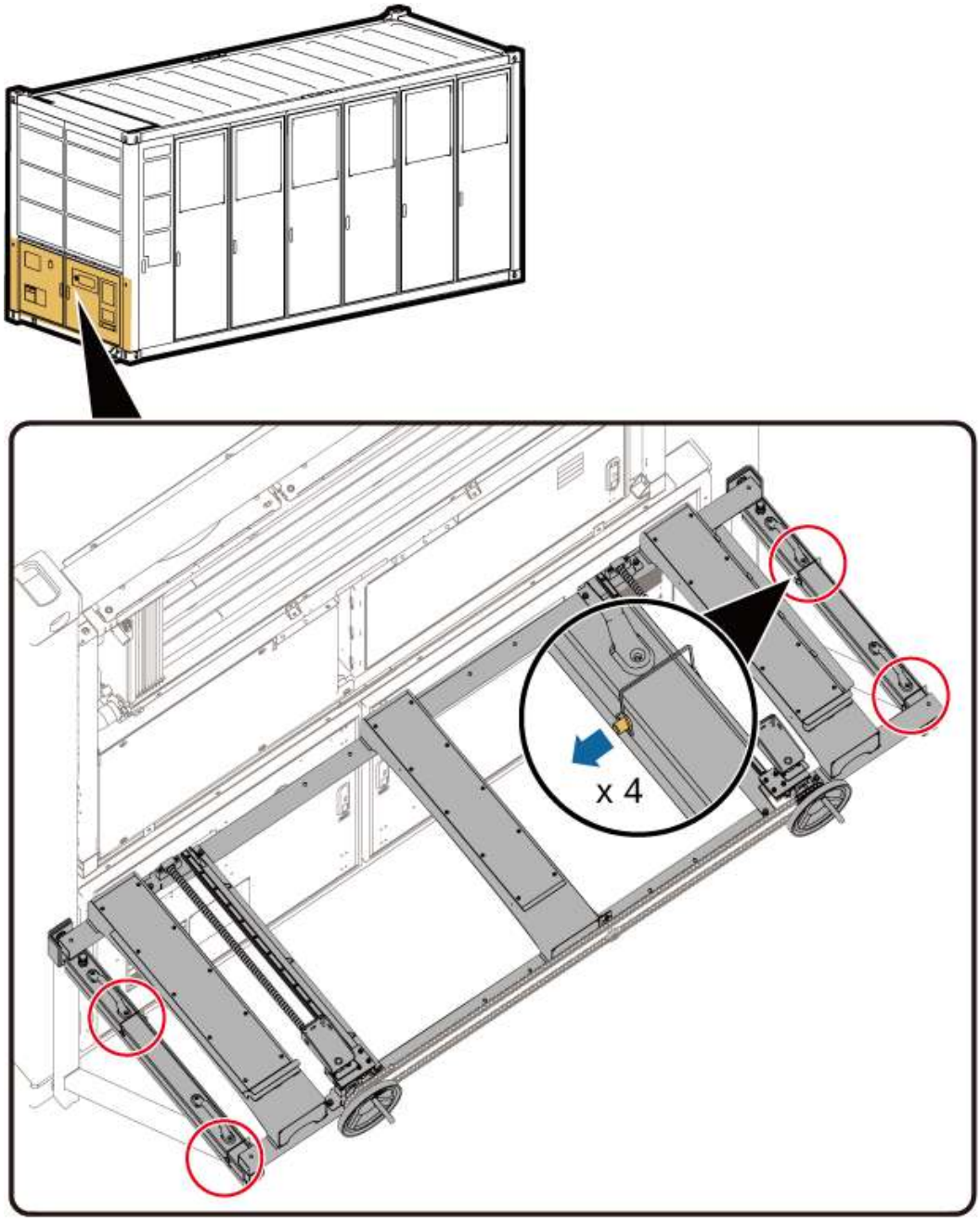
Step 1 Remove the screws that secure the LTMS to the connecting plates.



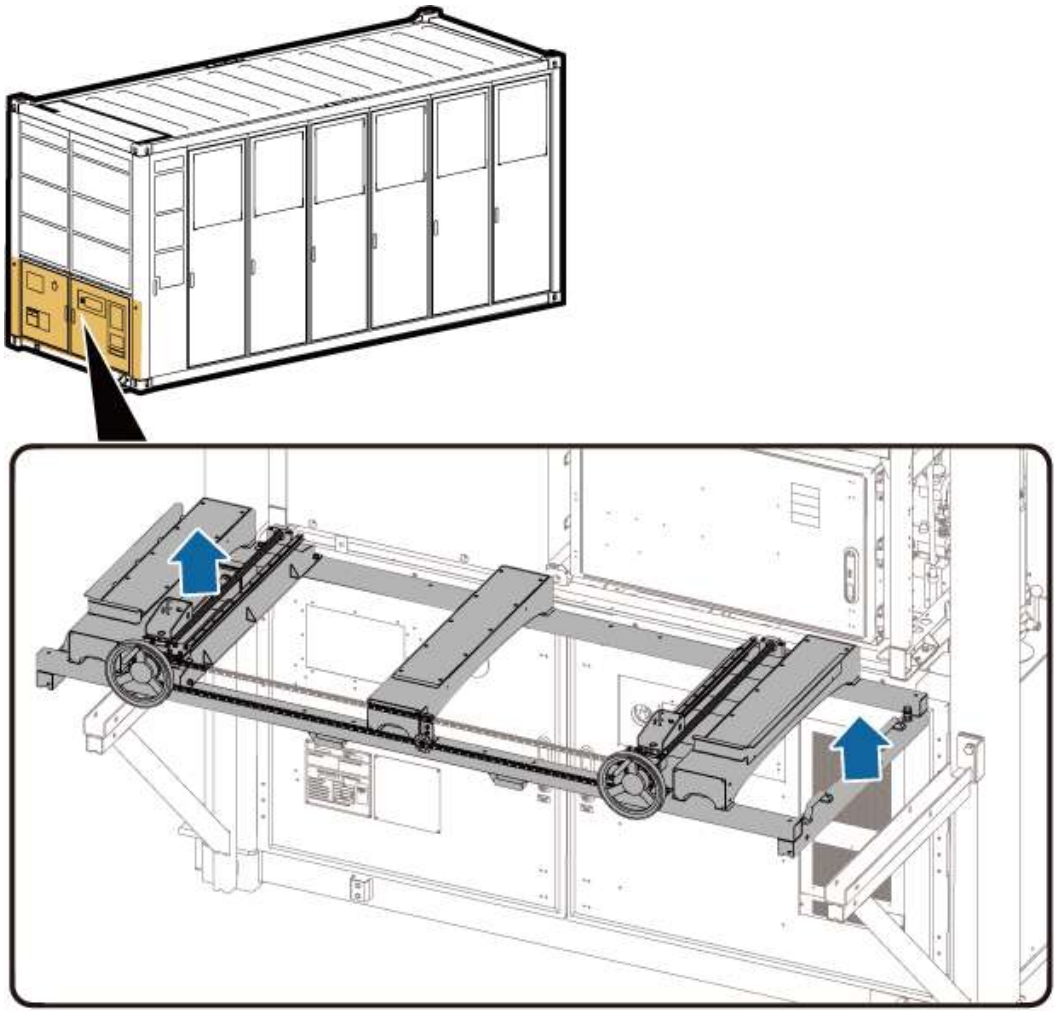
Step 2 Rotate the handwheel to pull back the connecting plates.



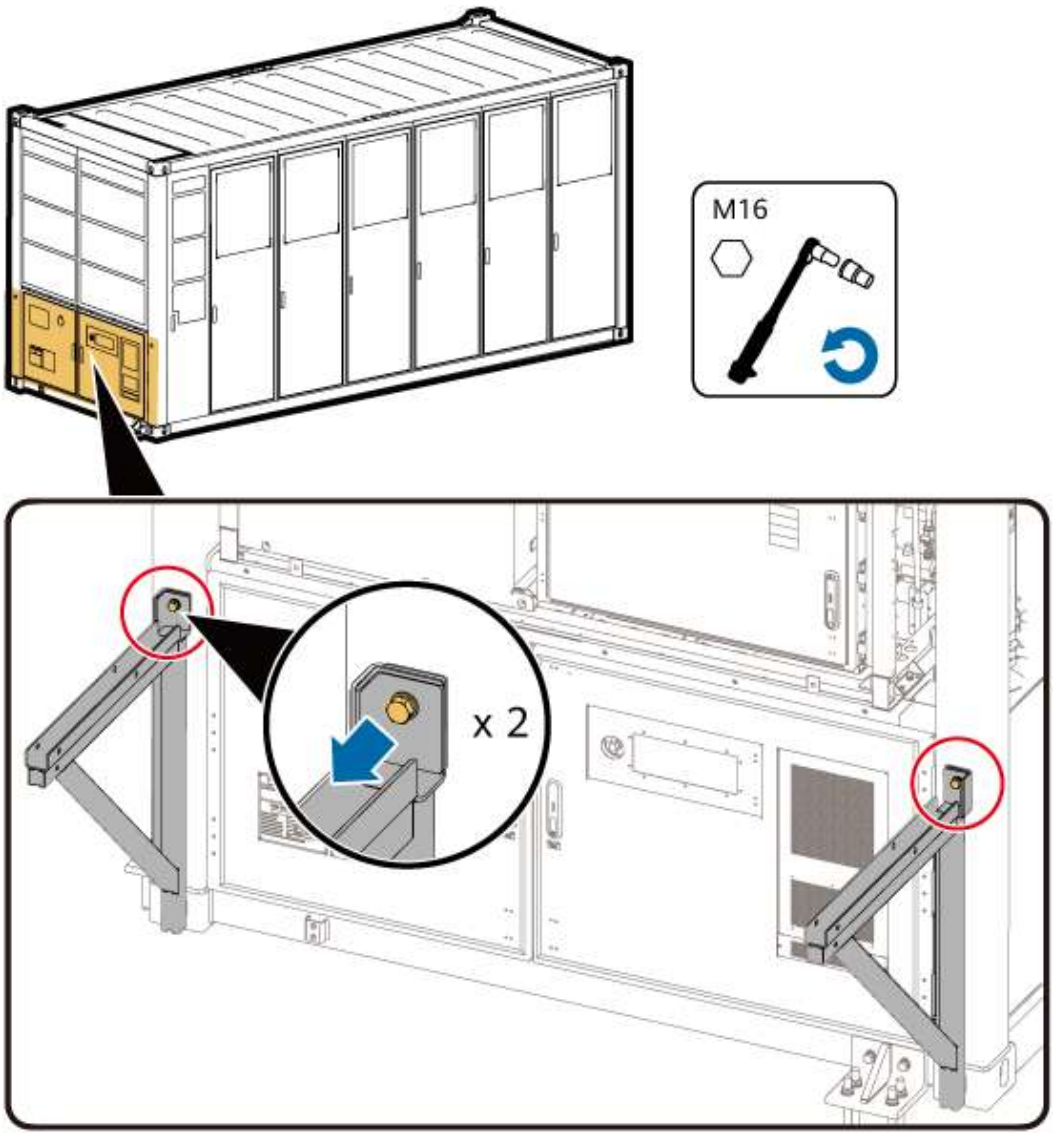
Step 3 Remove the positioning pins between the push component and the left and right supports.



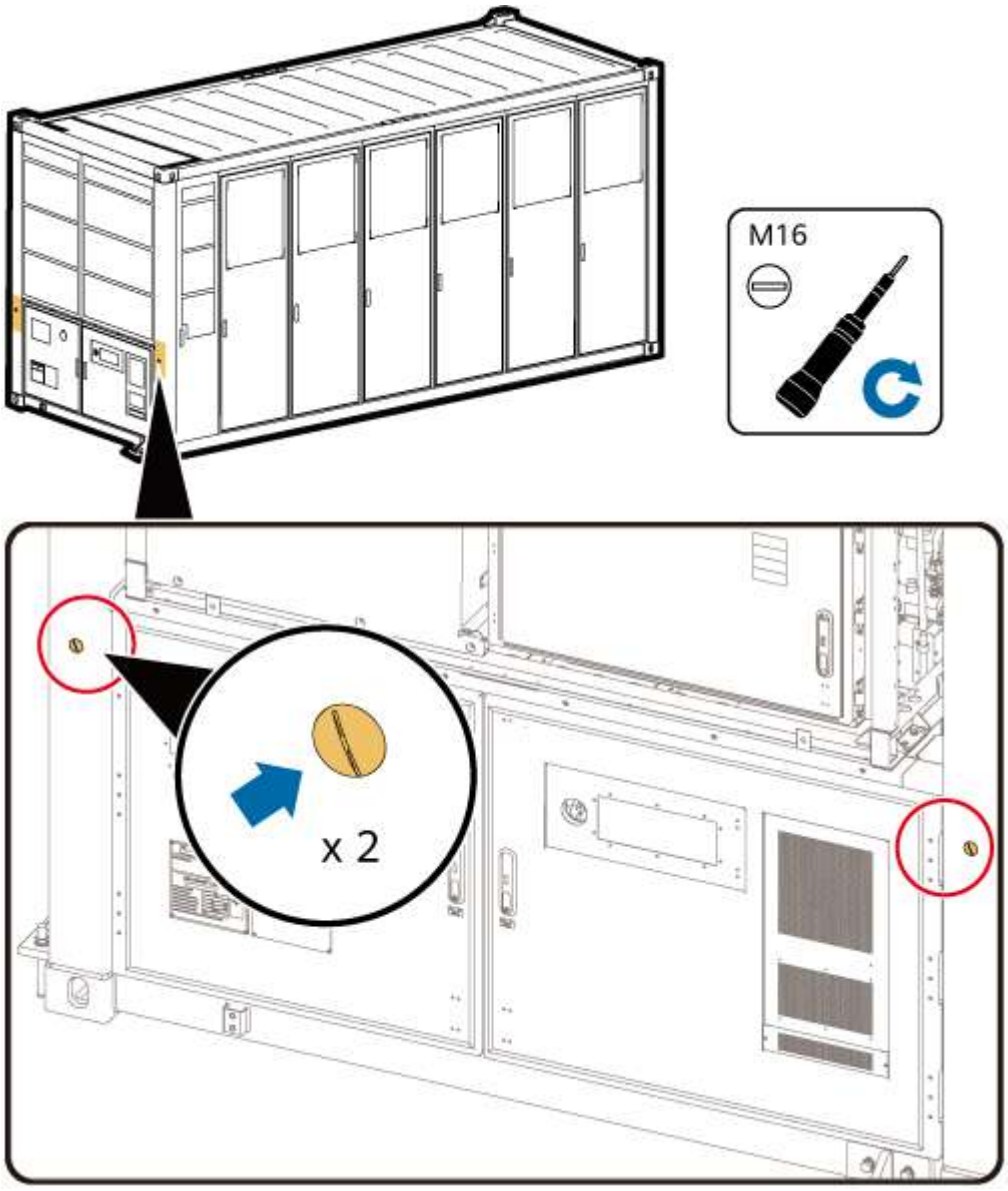
Step 4 Hold the handle of the push component and remove the push component.



Step 5 Remove the left and right supports.



Step 6 Use a flat-head screwdriver to install the nylon screw caps on the left and right columns.



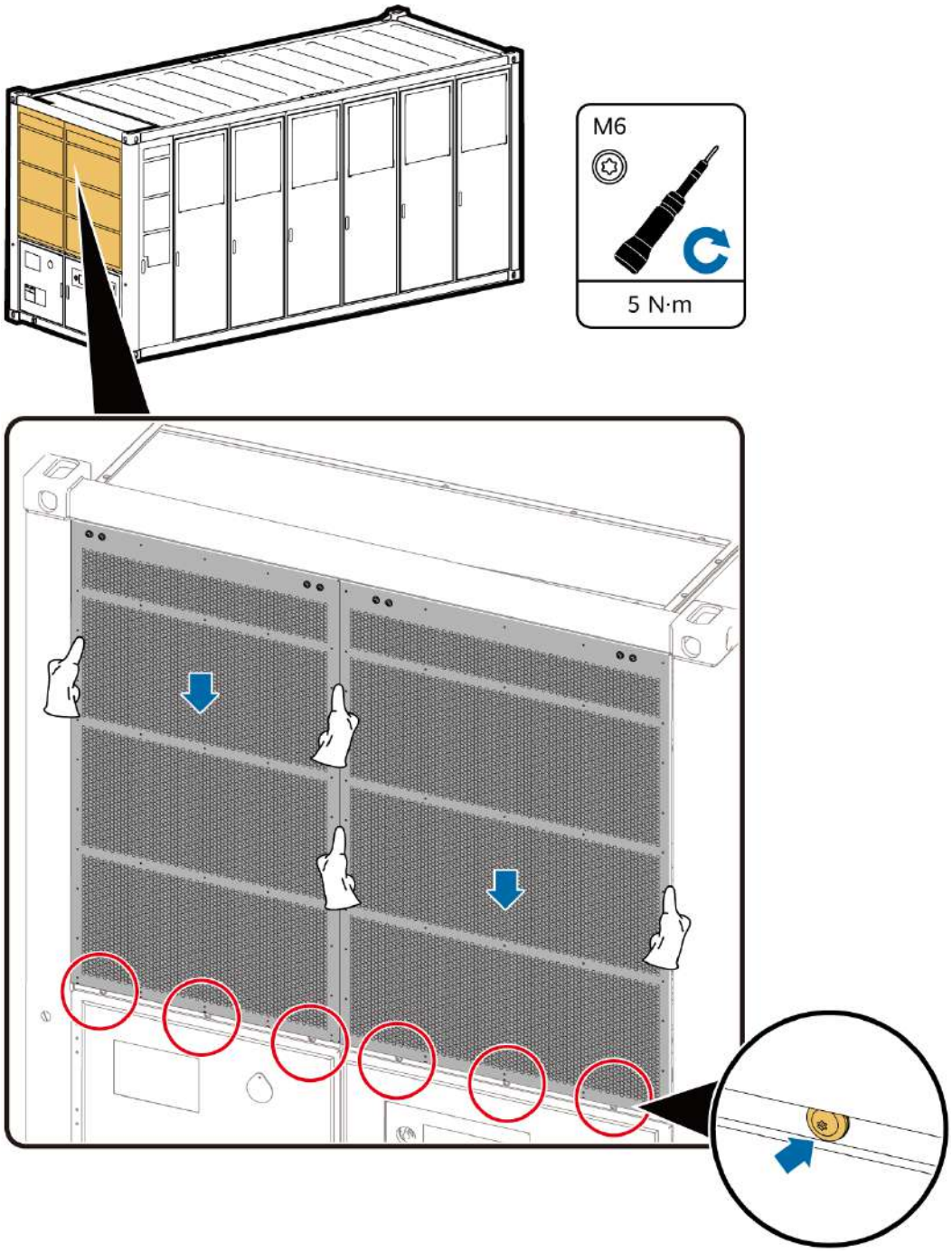
----End

Securing the LTMS

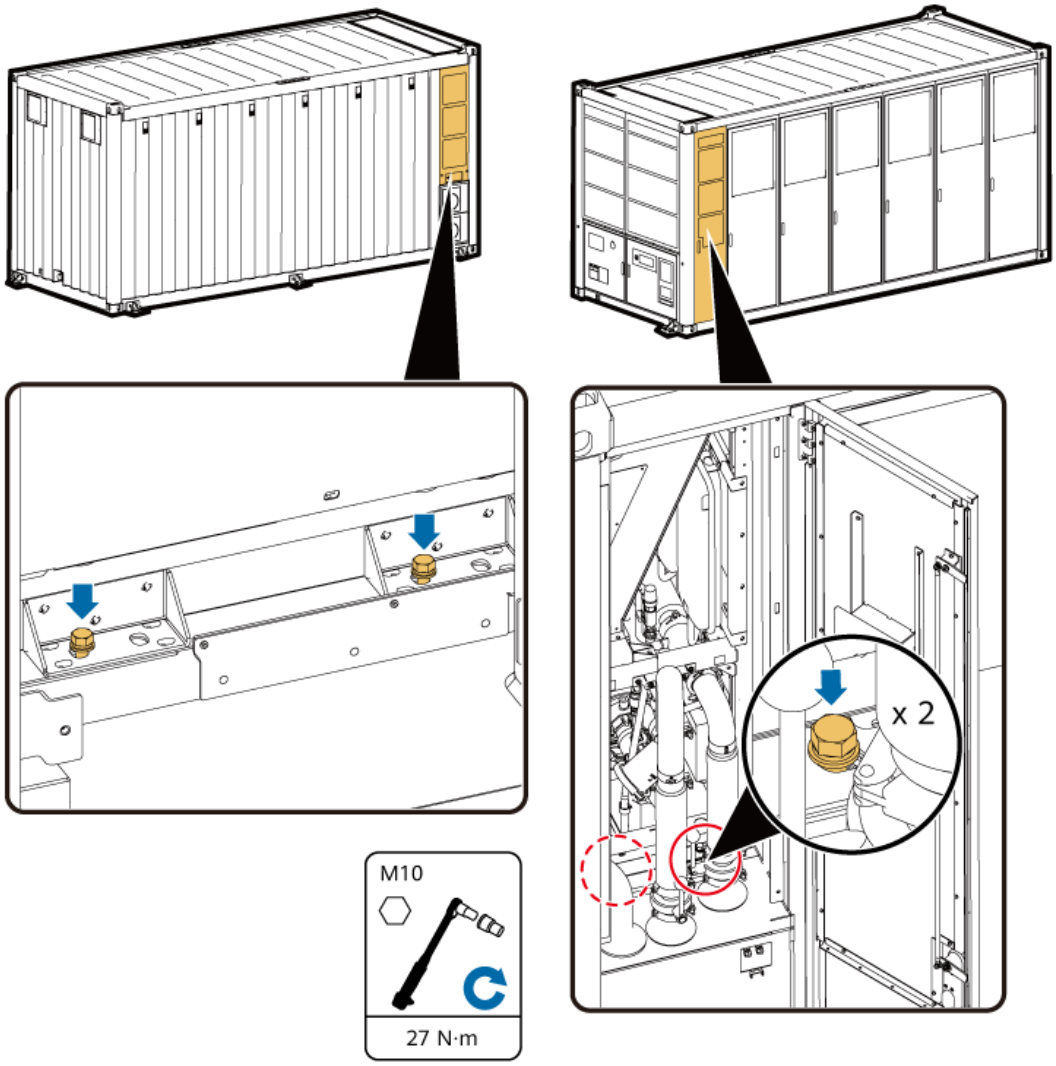
Step 1 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

NOTE

The eight screws on the two front sealing plates of the LTMS need to be secured only during transportation.

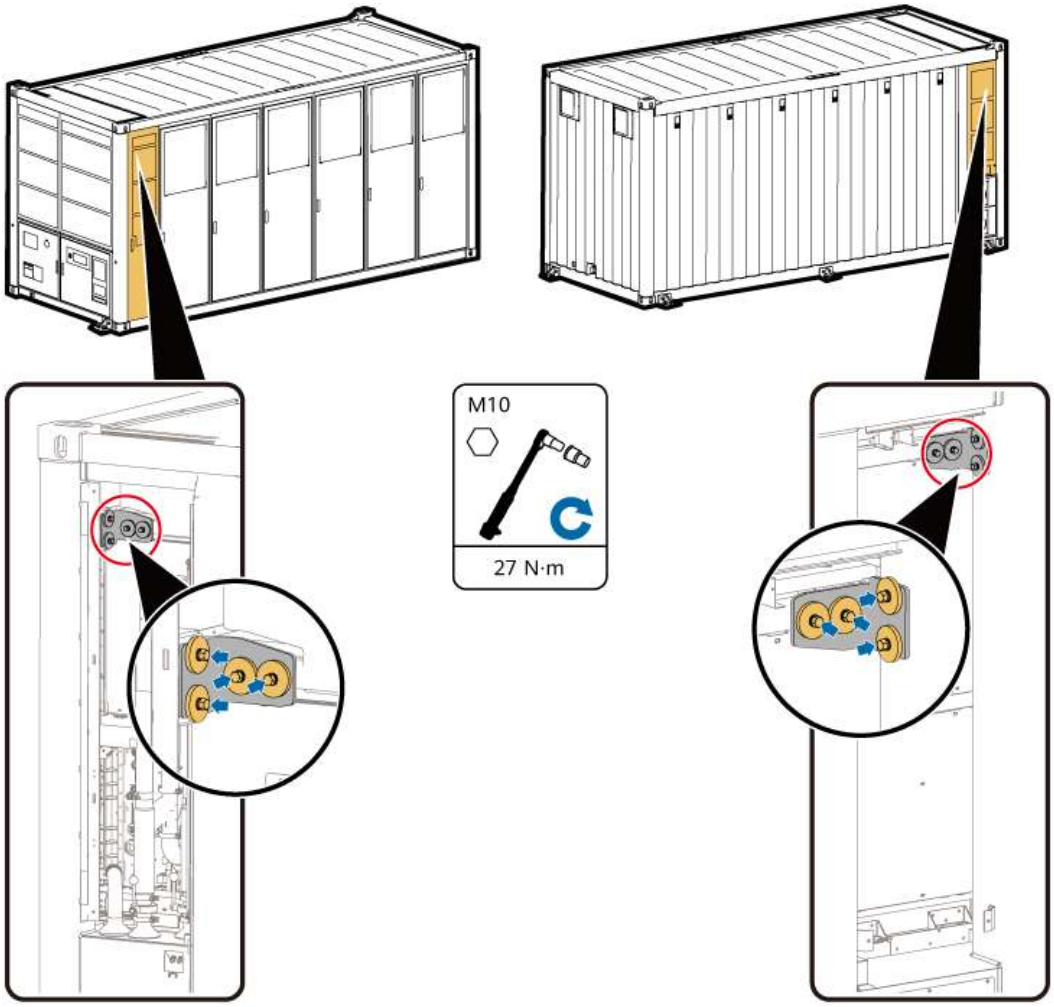


Step 2 Install the bolts at the bottom on the left and right sides of the LTMS, and tighten the bolts to 27 N·m.

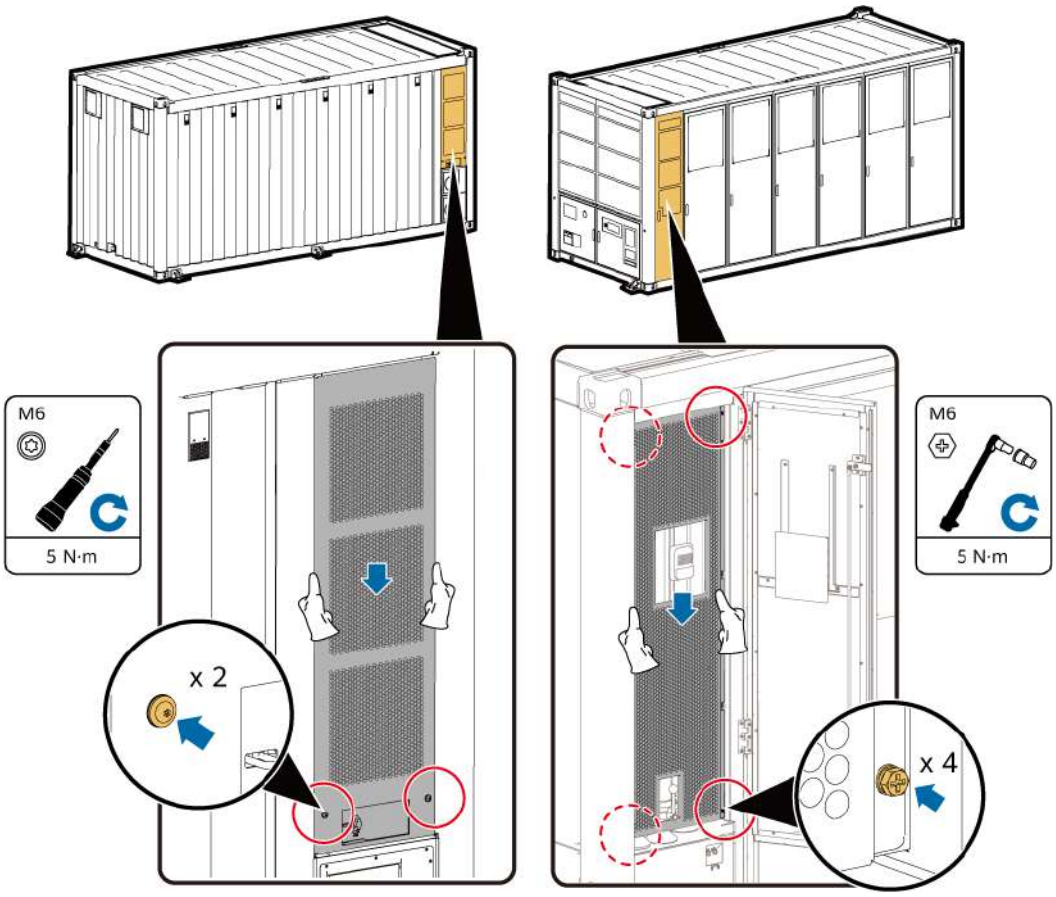


Step 3 Climb up and install the fasteners at the top on the left and right sides of the LTMS, and tighten the fasteners to 27 N·m.

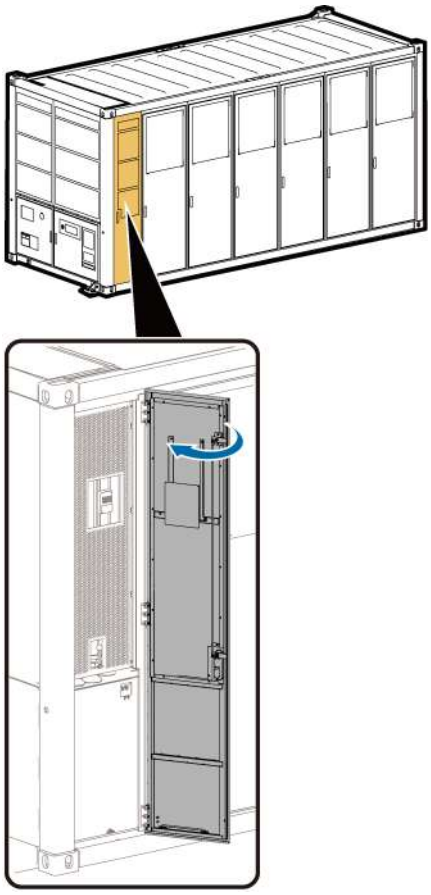
Tighten the two bolts on the LTMS and then the two bolts on the frame. Ensure that the fasteners are closely fitted with the LTMS.



Step 4 Mount the sealing plates on the left and right side of the LTMS to the grooves and tighten them to 5 N·m.



Step 5 Close the door of the LTMS on the front of the container.



----End

7.2.3 Using a Crane and Fixture

Prerequisites

- The LTMS cables and pipes have been removed.
- Three persons are required to remove and reinstall the LTMS.
- When a forklift and fixture cannot be used, use a crane.
- Tools: LTMS maintenance fixture, crane (see **4.3 Crane Requirements**), ladder, insulated flat-head/Phillips screwdriver, insulated security torx torque screwdriver, insulated torque wrench, adjustable wrench, open-end wrench, fixture, safety gloves, safety shoes, safety helmet, and safety harness

  NOTE

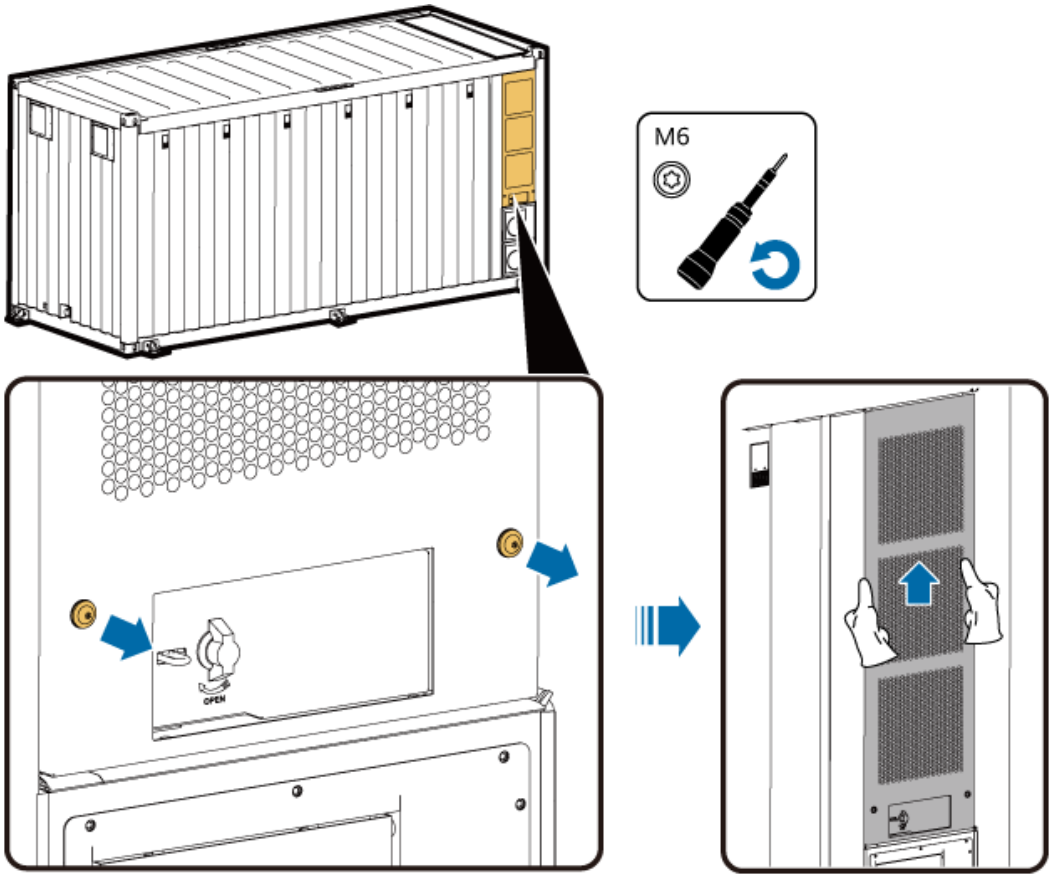
  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

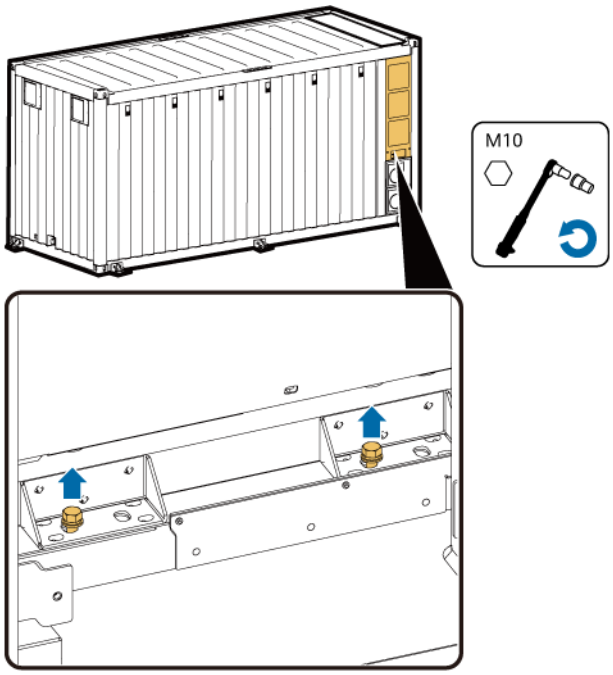
Disconnecting the LTMS

Step 1 Remove the antitheft screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

Figure 7-10 Removing the rear sealing plate from the container



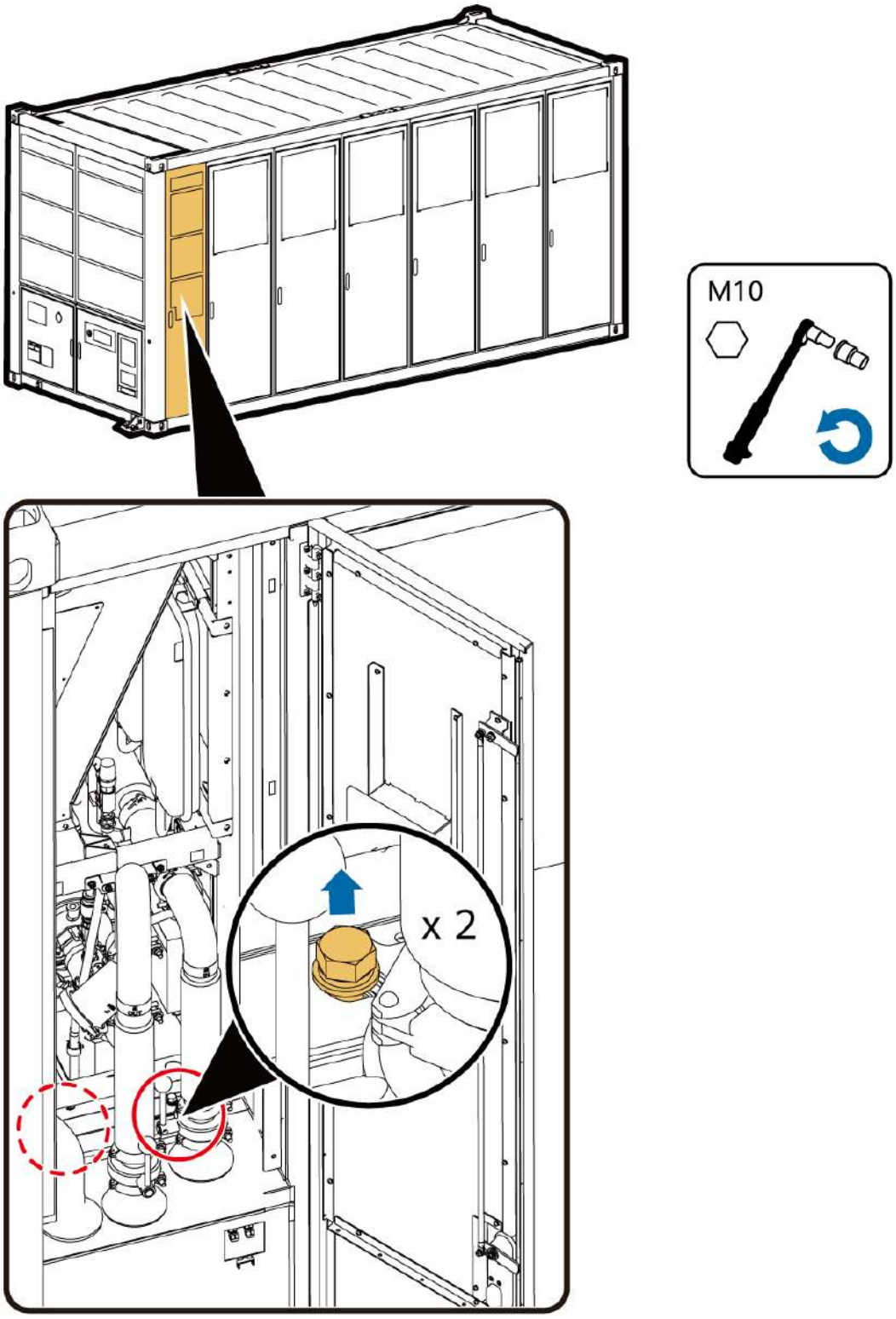
Step 2 Remove the bolts at the bottom on the left of the LTMS.



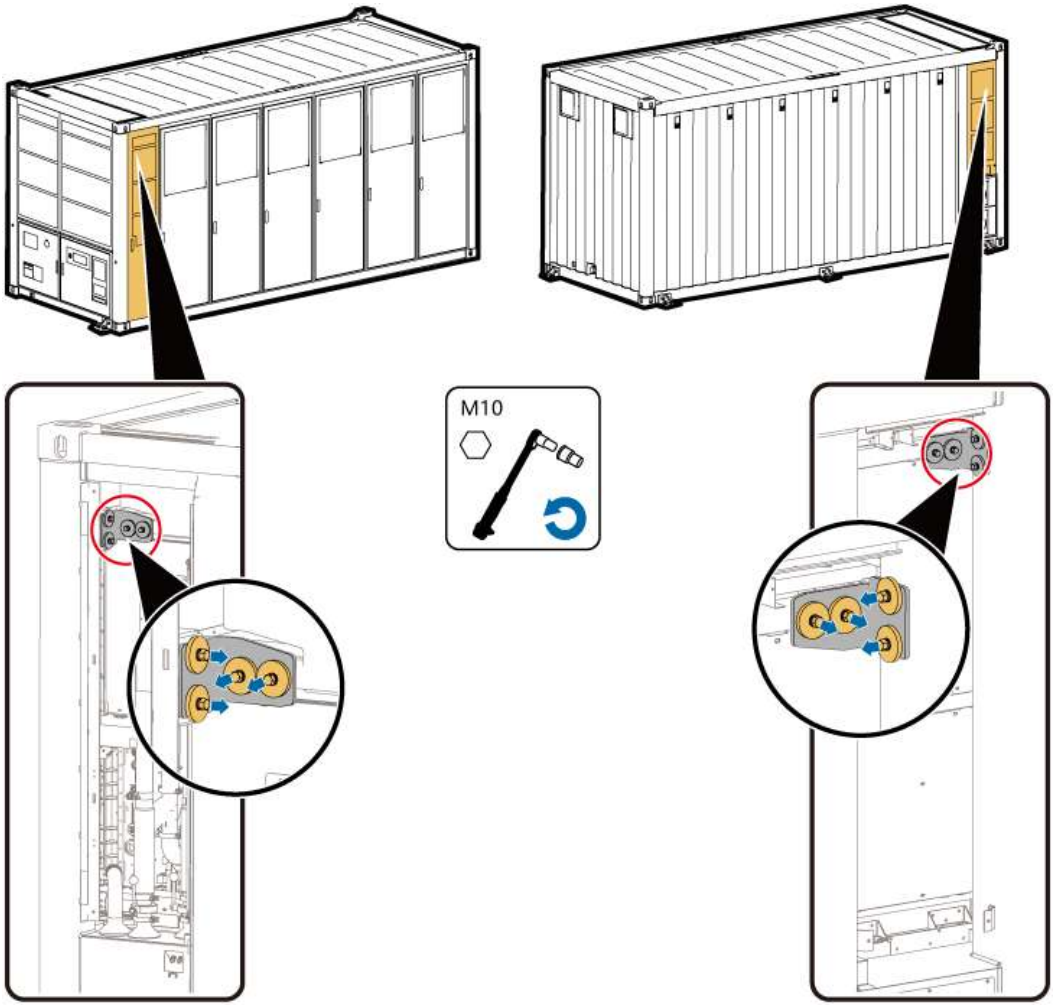
Step 3 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 4 Remove the bolts at the bottom on the right of the LTMS.



Step 5 Climb up and remove the bolts at the top on the left and right sides of the LTMS.



Step 6 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

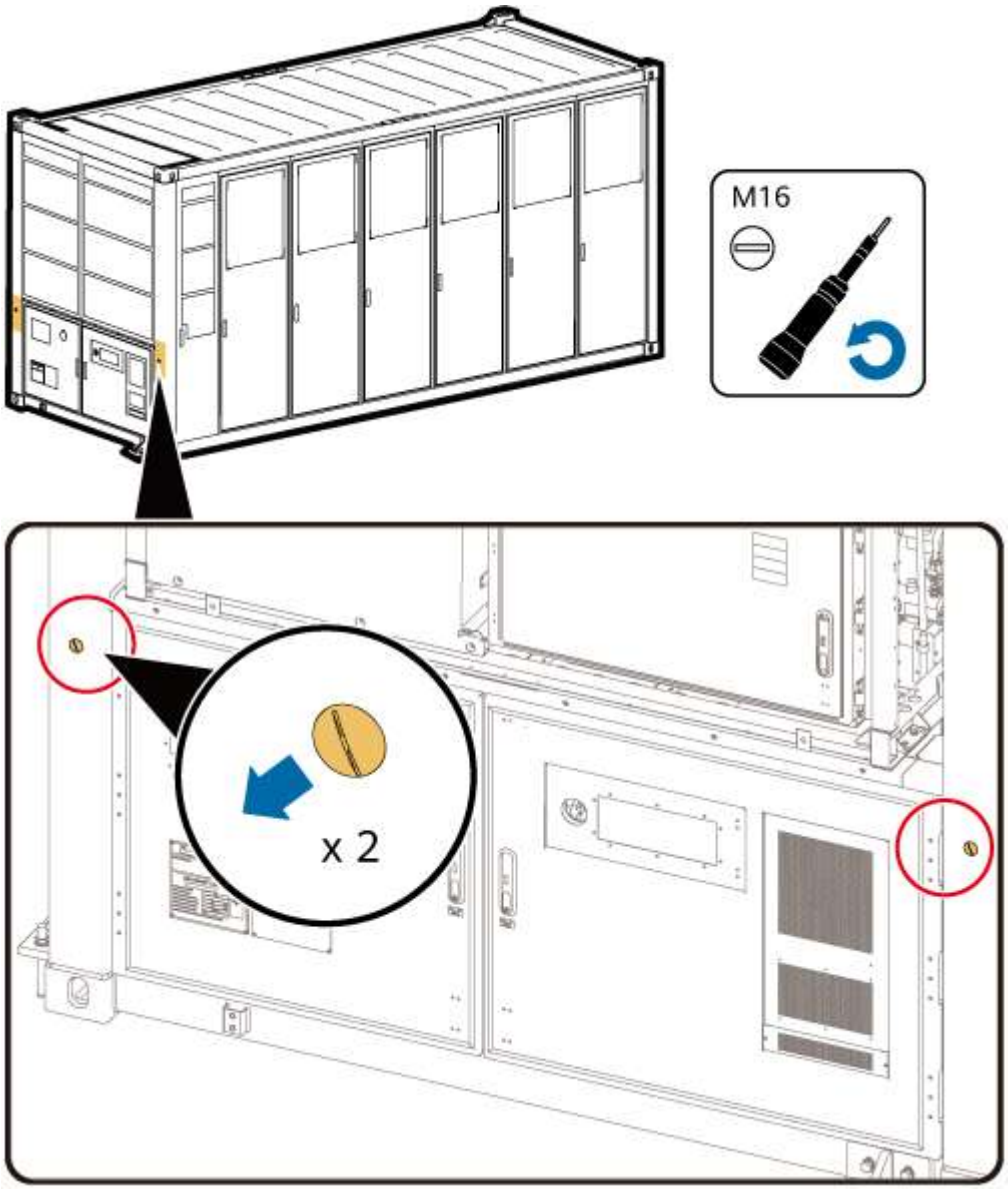
NOTE

Remove the eight screws from the two front sealing plates only when you remove the LTMS for the first time.

----End

Installing the LTMS Fixture

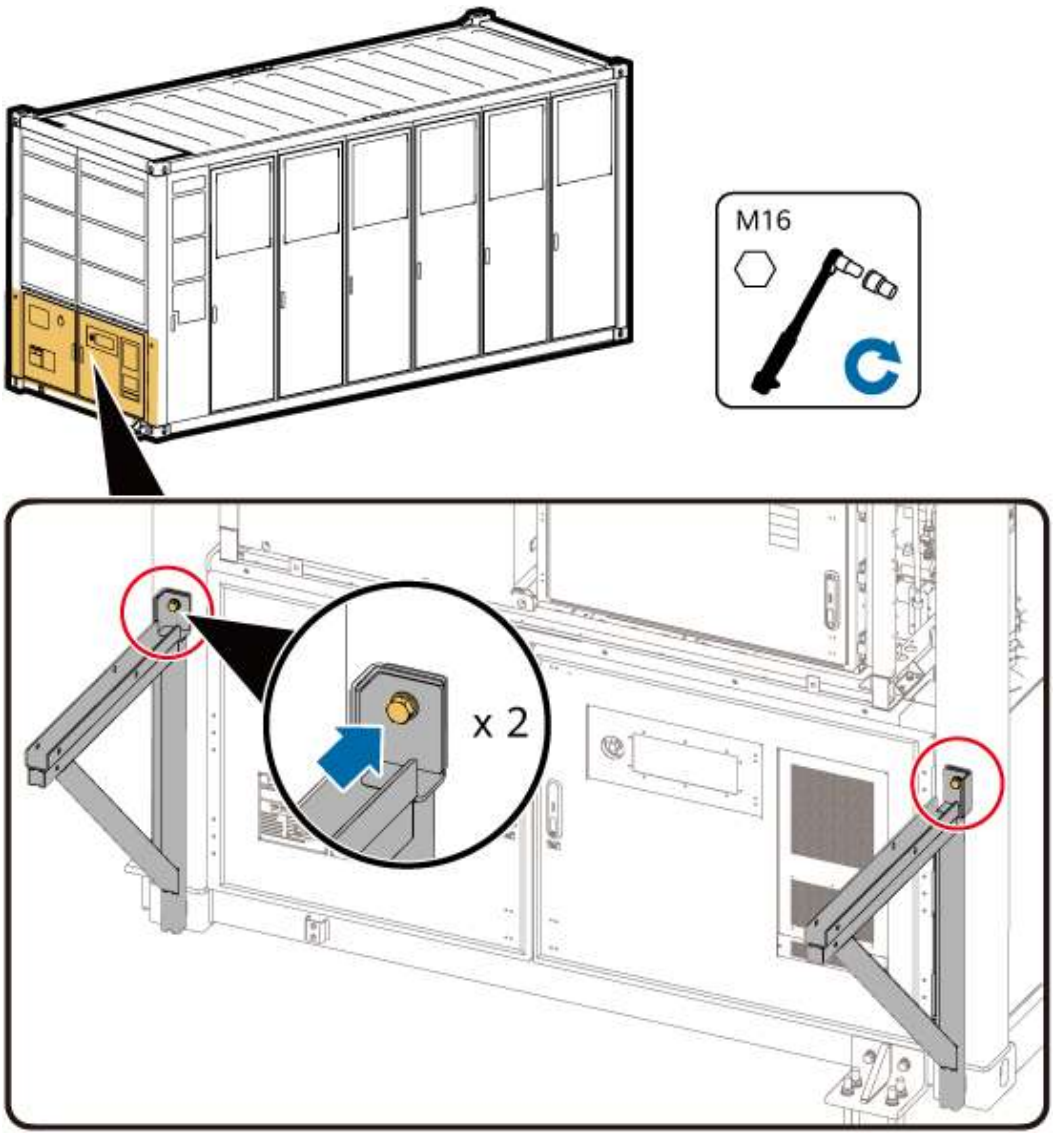
Step 1 Use a flat-head screwdriver to remove the nylon screws from the left and right columns.



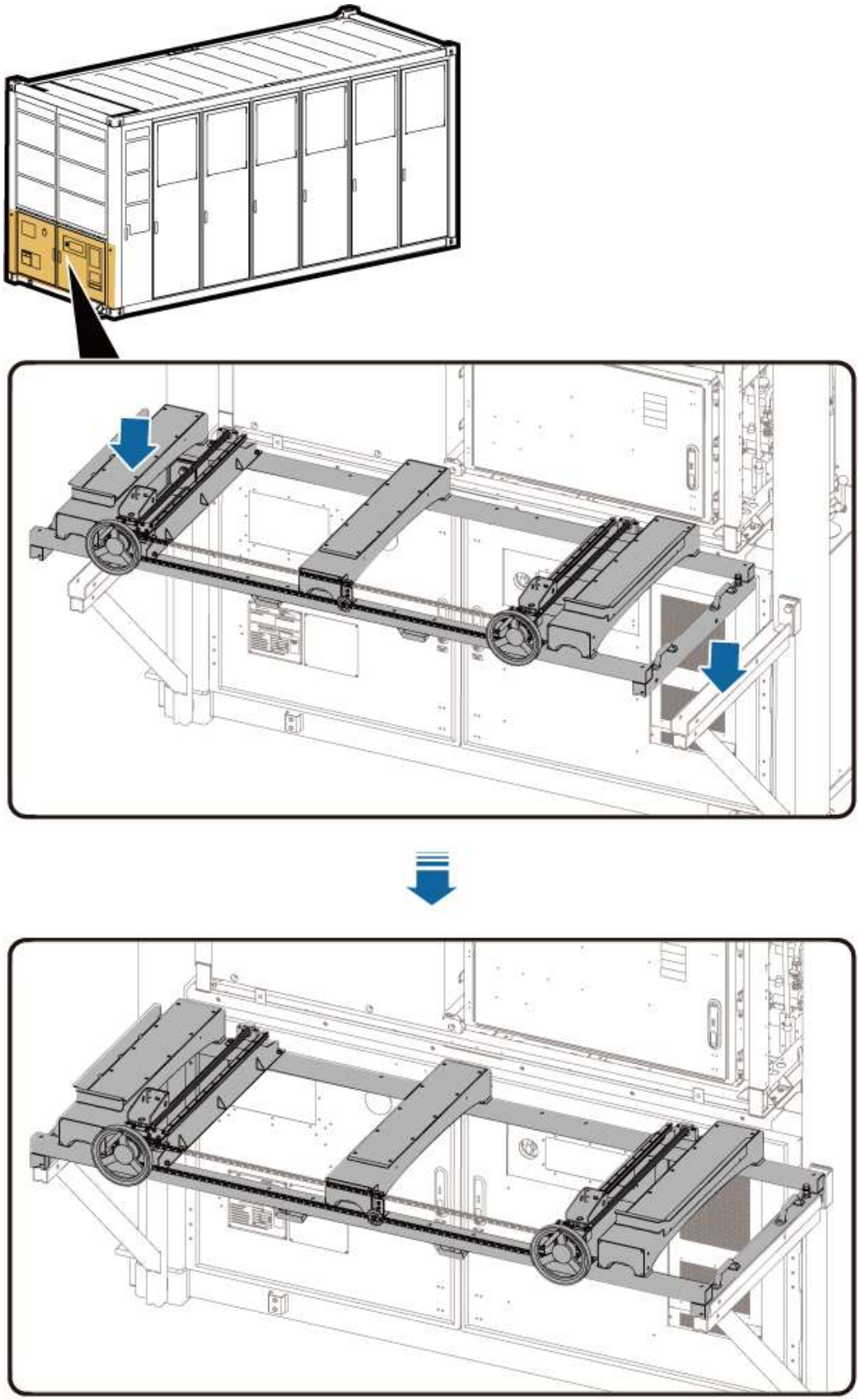
Step 2 Install the left and right supports.

NOTE

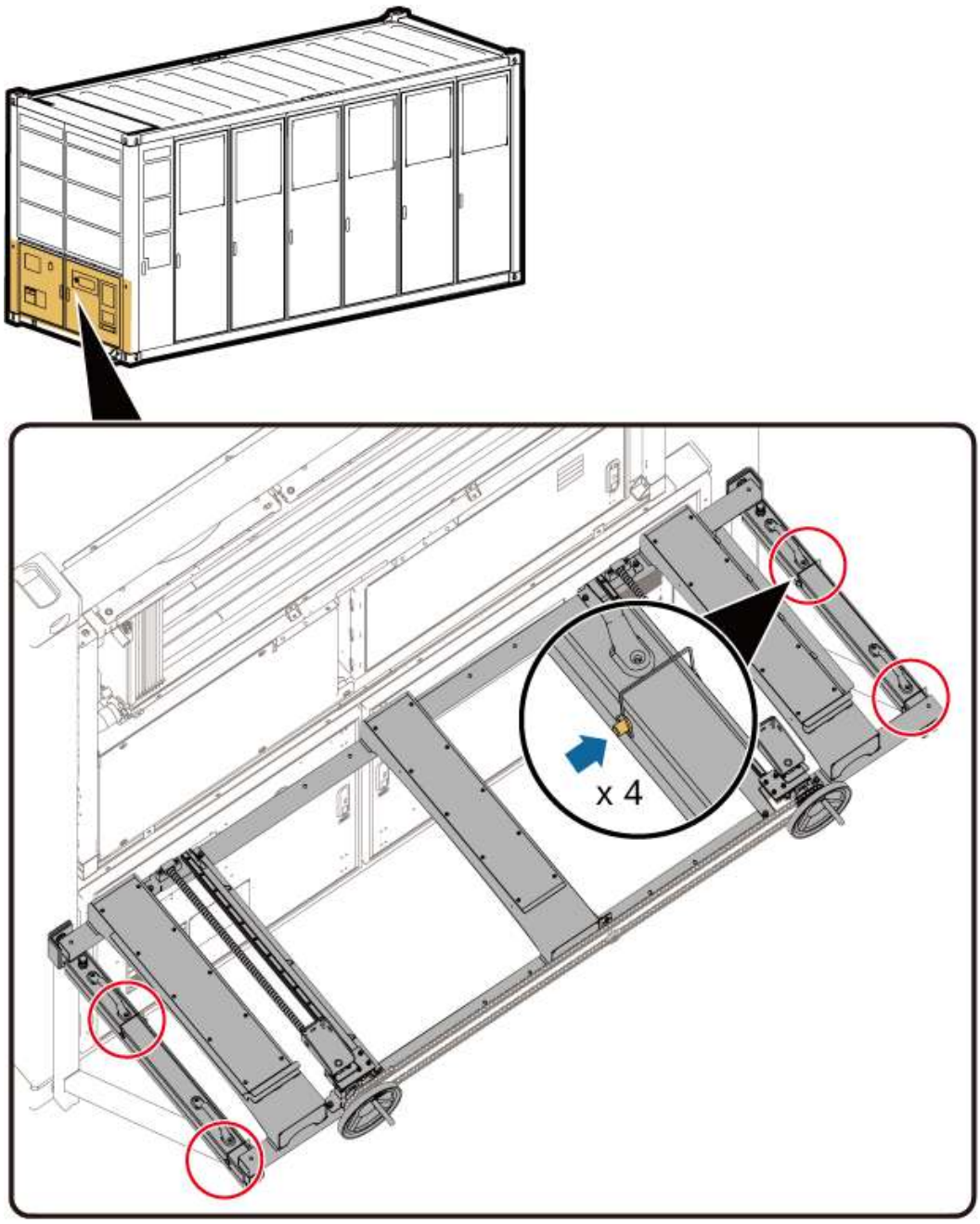
Do not install the left and right supports reversely.



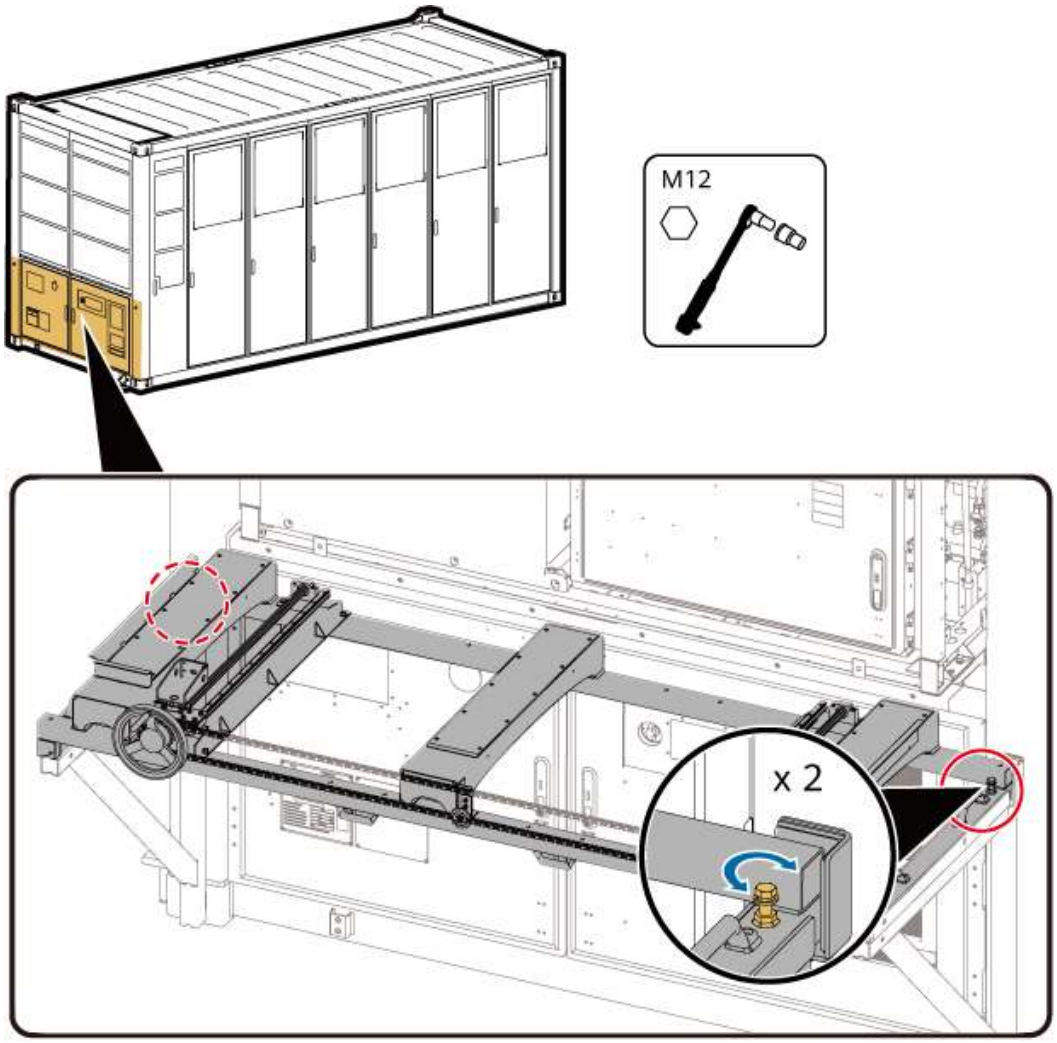
Step 3 Place the push component on the positioning slots of the supports.



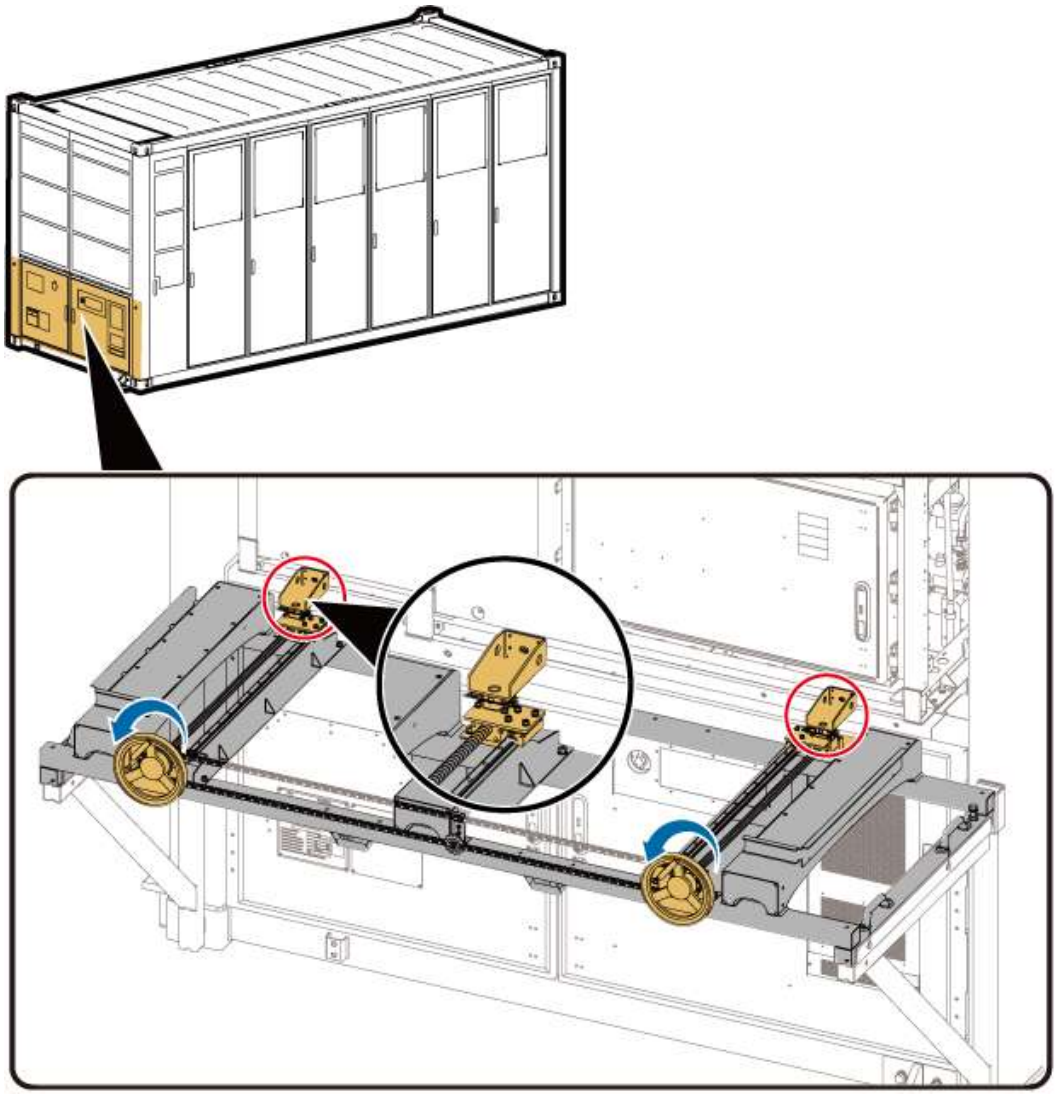
Step 4 Insert the positioning pins to secure the push component to the supports.



Step 5 Rotate the height adjustment screws on the left and right sides of the push component to ensure that the platform surface of the push component is flush with the LTMS platform surface.



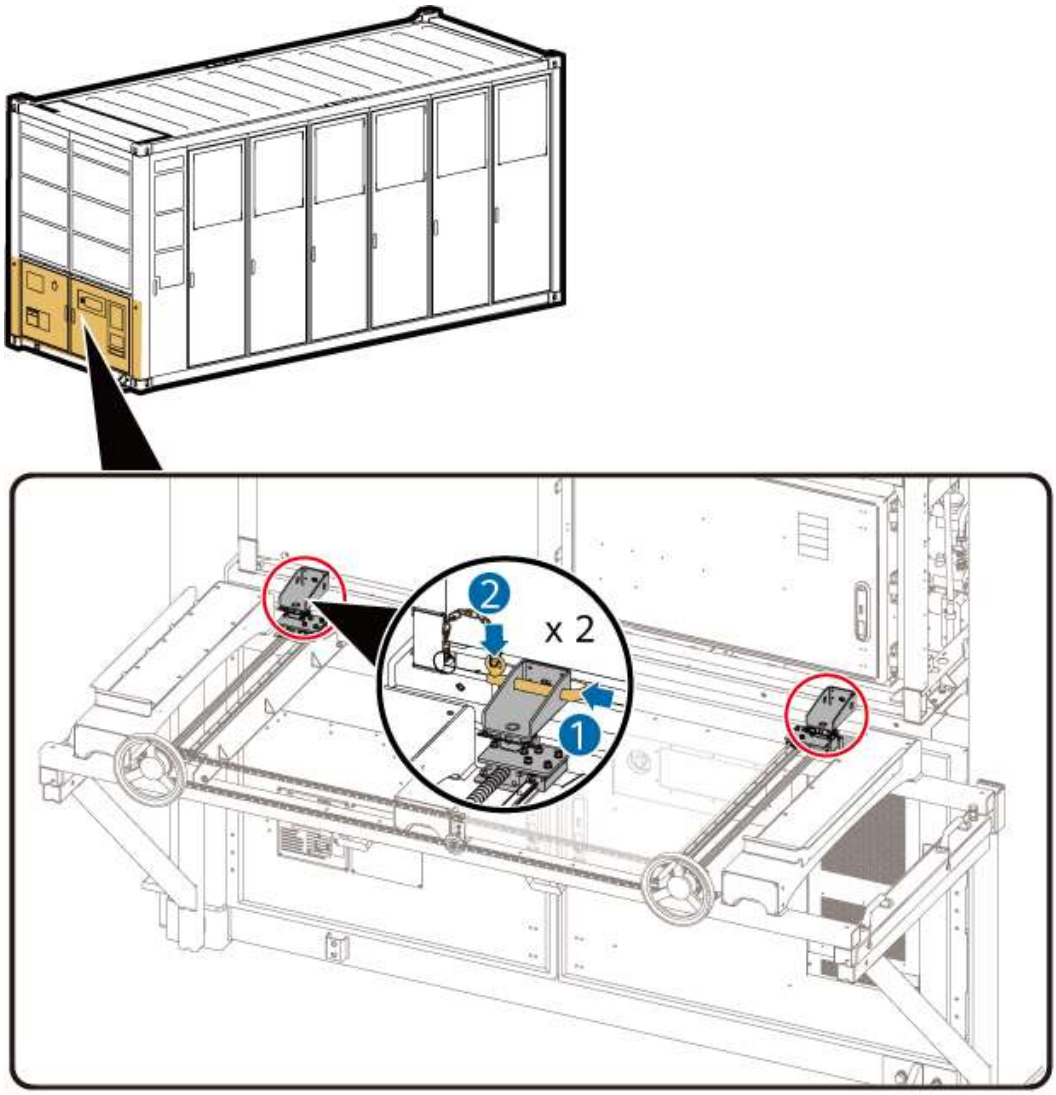
Step 6 Rotate the handwheel to push the connecting plate of the push component to the front end so that the connecting plate is closely fitted with the LTMS.



Step 7 Use two U-shaped brackets and two ring bolts to connect the LTMS to the connecting plate.

NOTICE

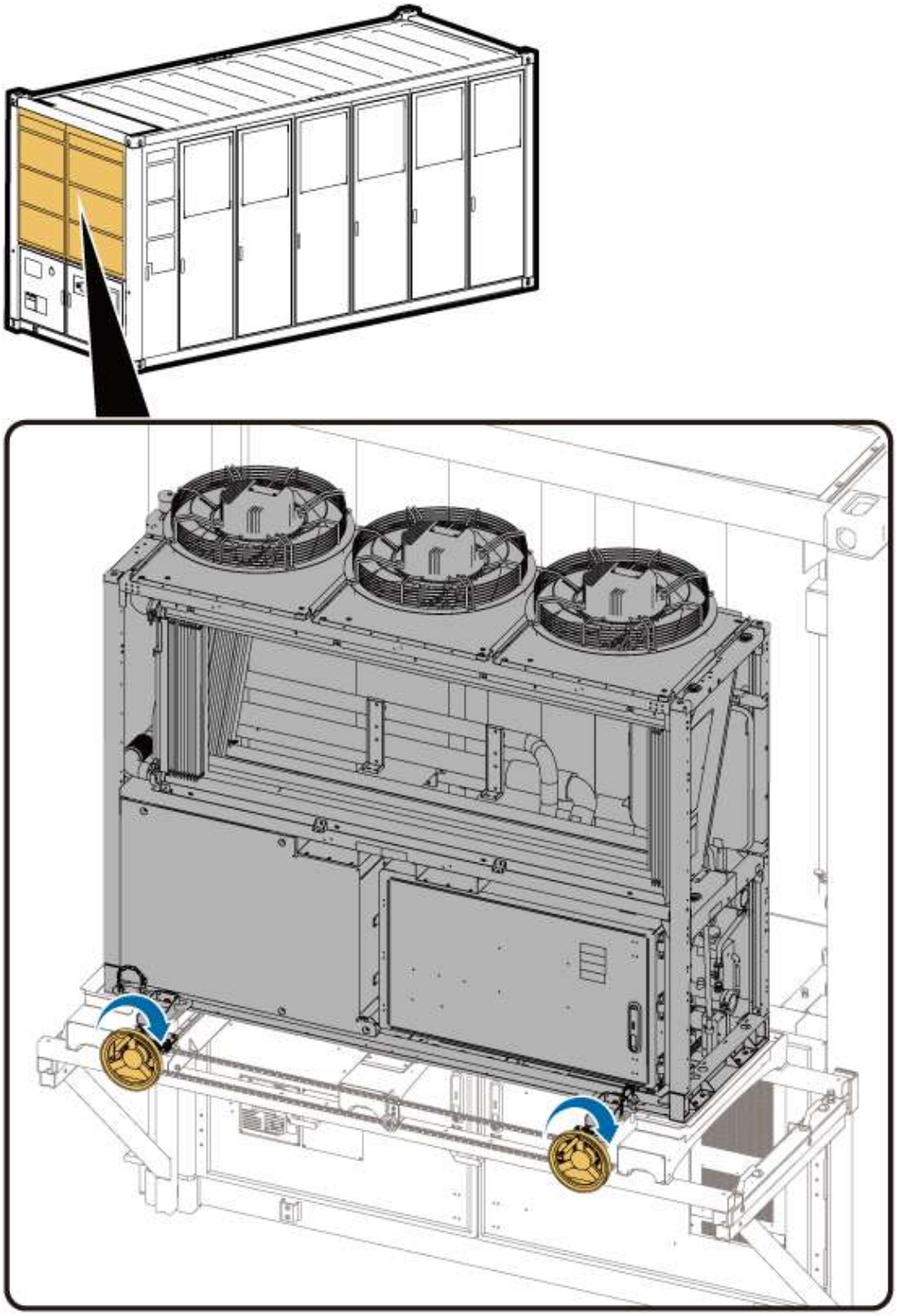
When removing the LTMS, install only the U-shaped brackets and do not install screws. This prevents the screws from being damaged.



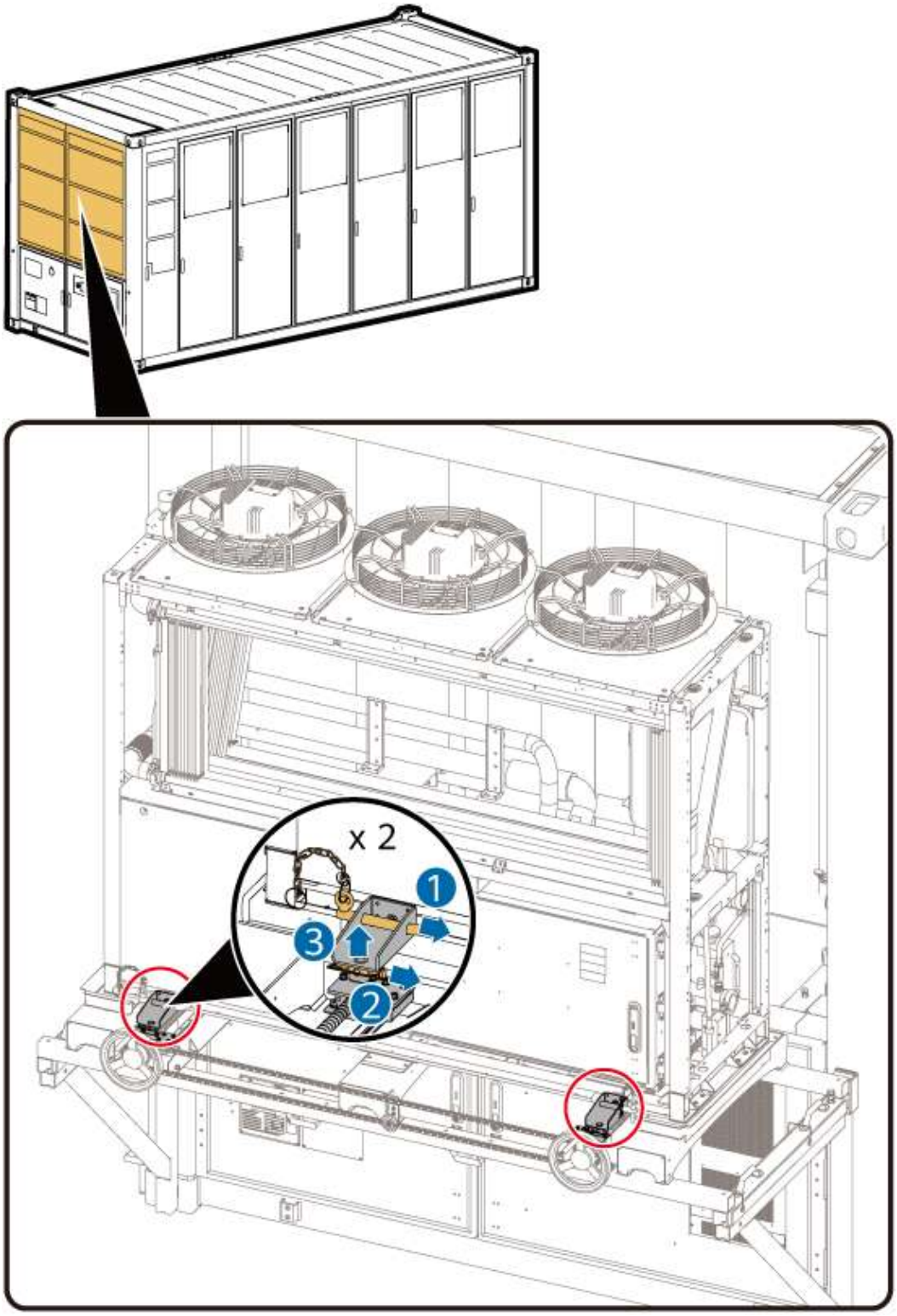
----End

Removing the LTMS

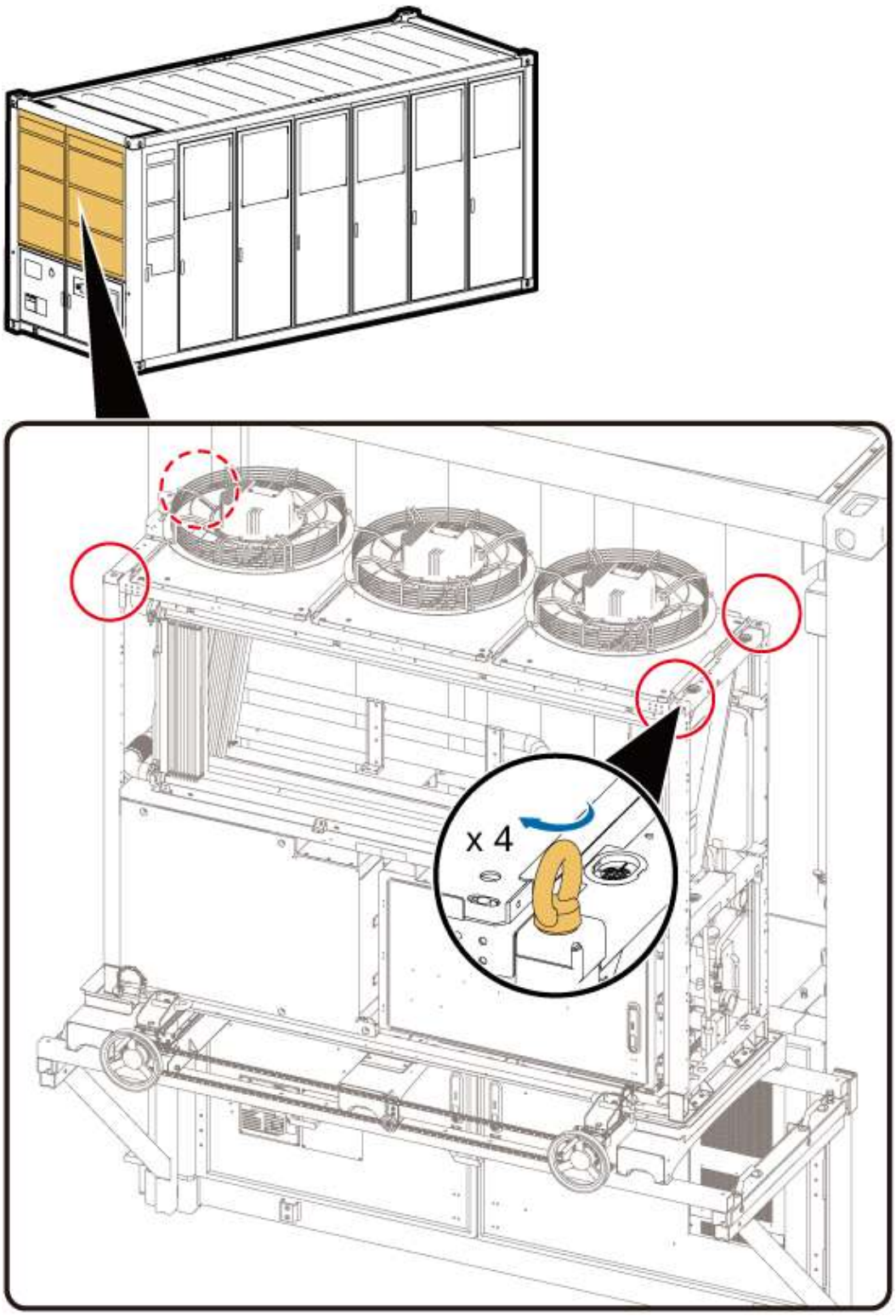
Step 1 Rotate the handwheel to completely remove the LTMS onto the push component.



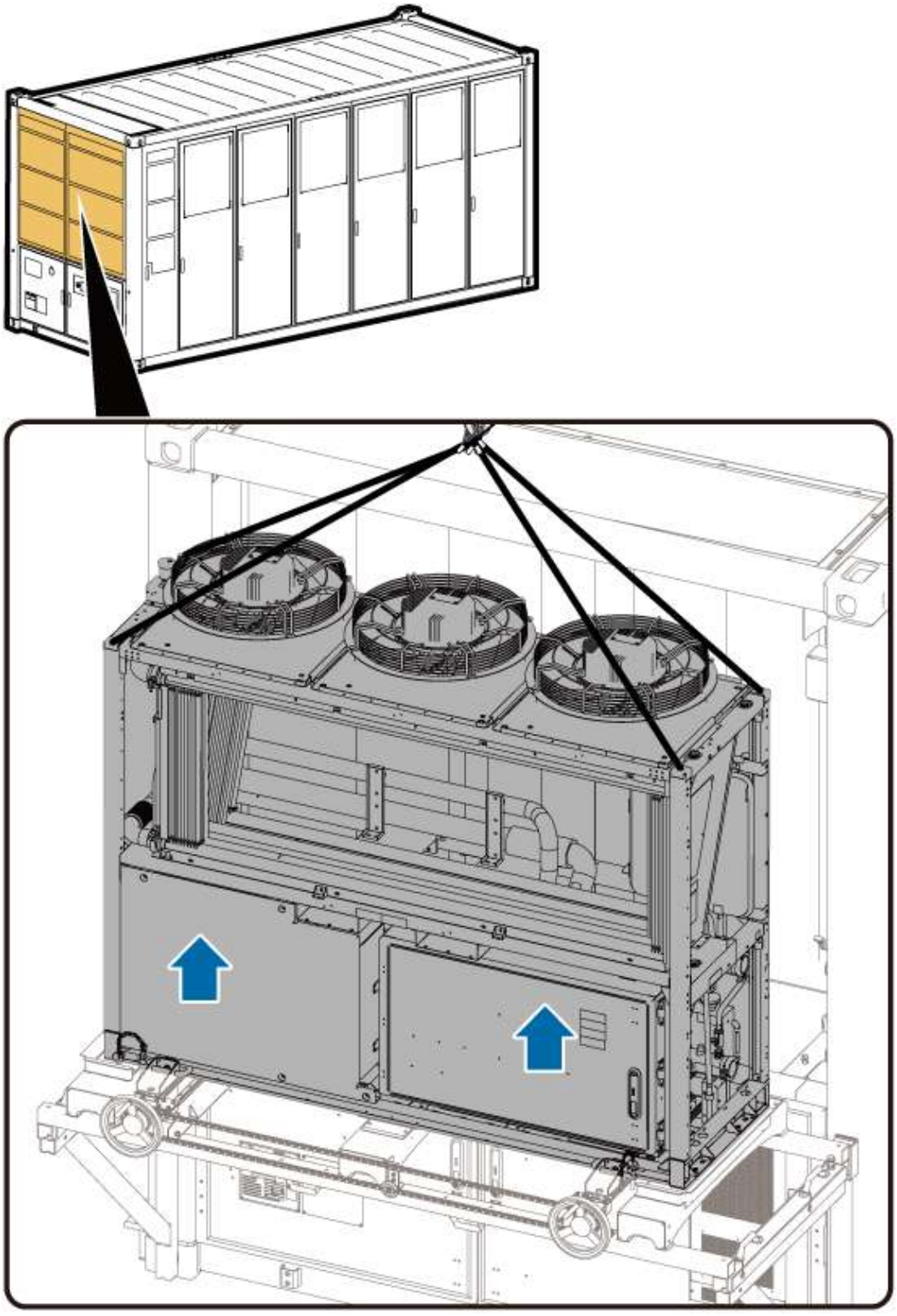
Step 2 Remove the latches and U-shaped brackets from the connecting plate of the push component.



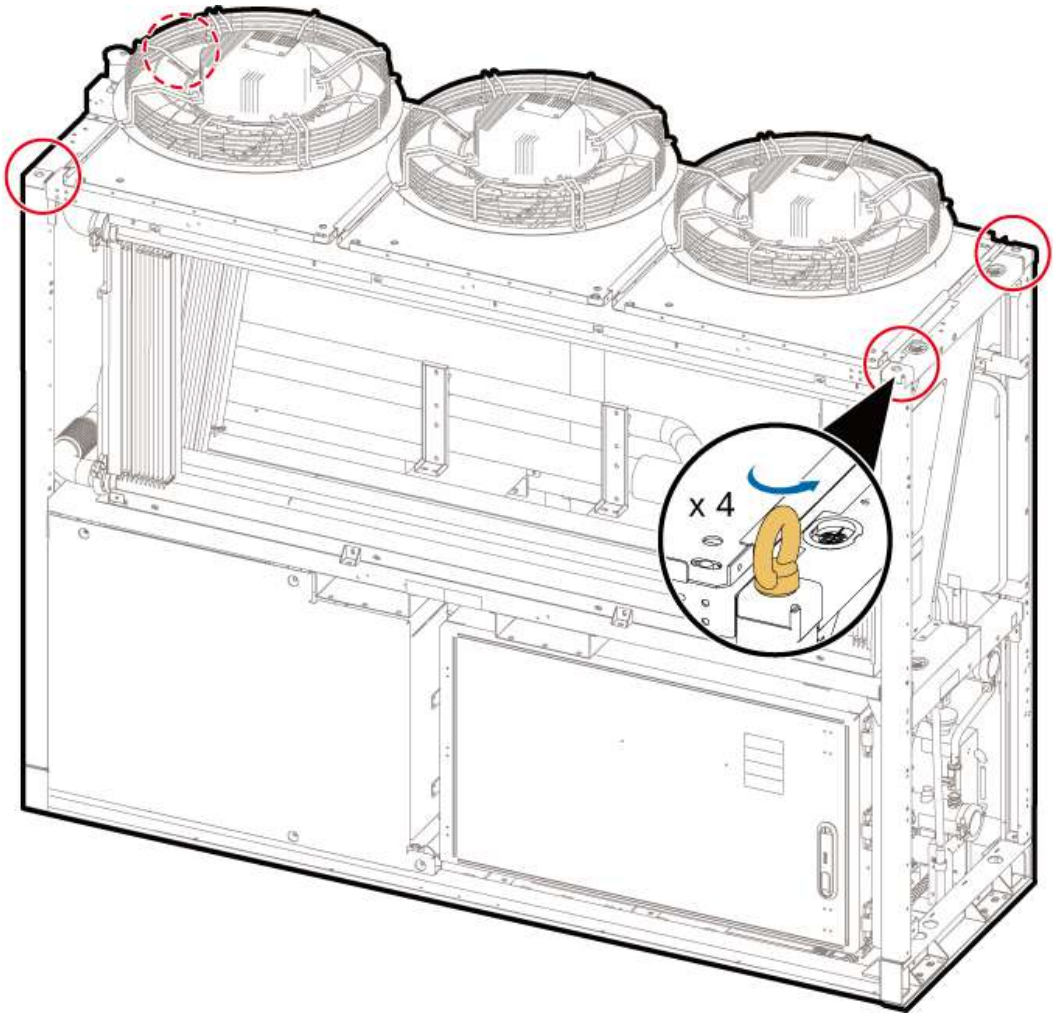
Step 3 Climb up and install the eye bolts on the top of the LTMS.



Step 4 Hook the eye bolts with a crane, remove the LTMS, move it to a safe area, and place it on the ground.



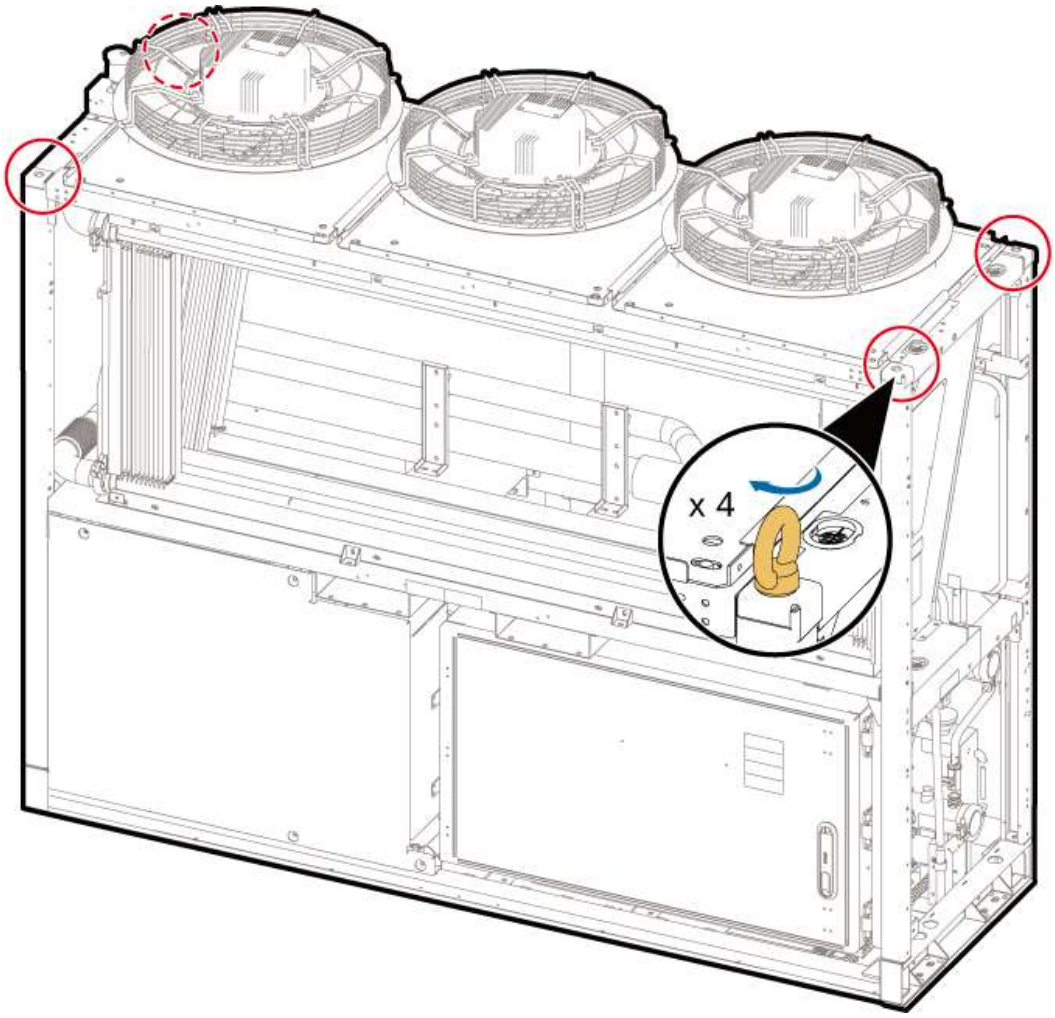
Step 5 Remove the eye bolts from the LTMS.



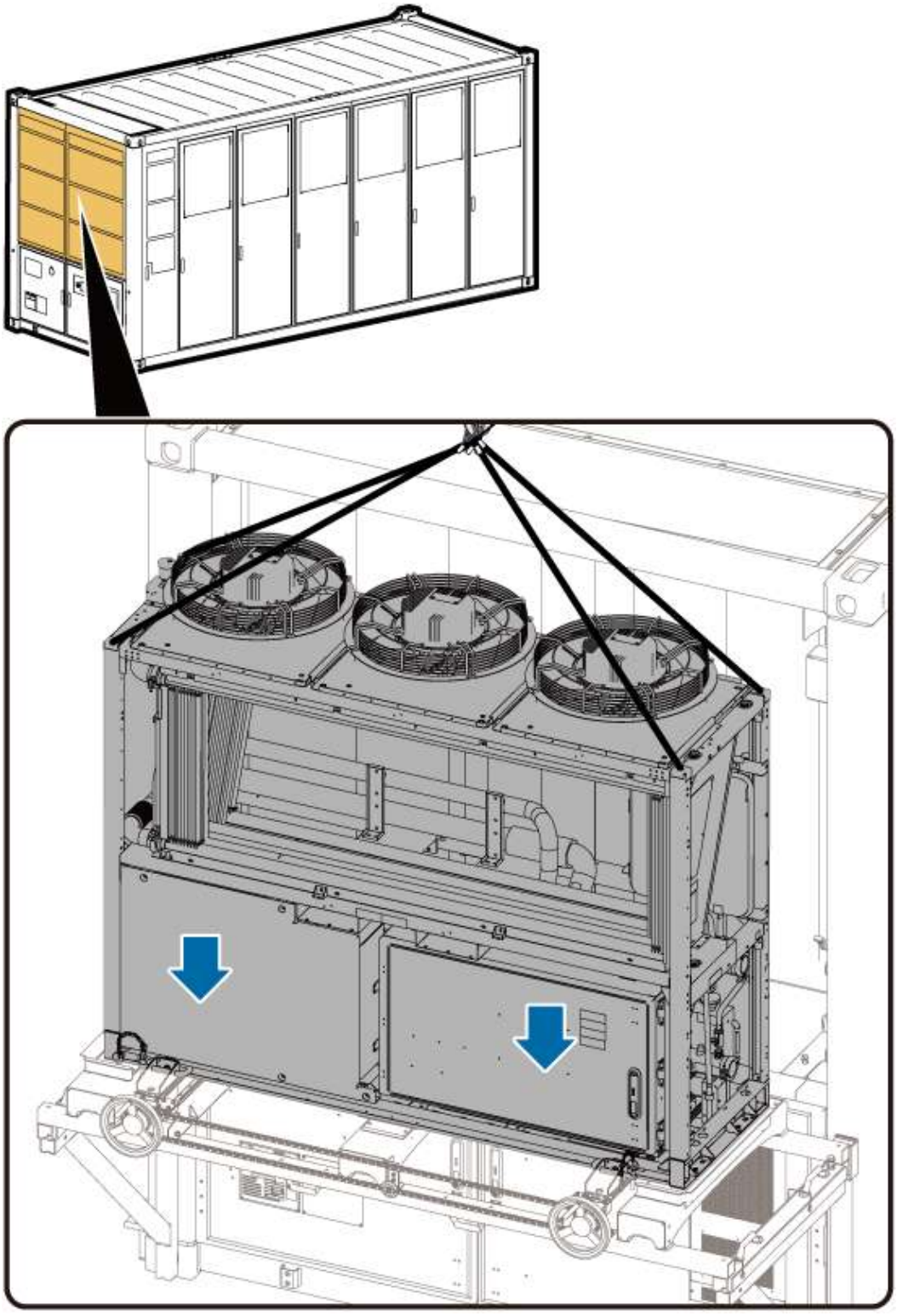
----End

Reinstalling the LTMS

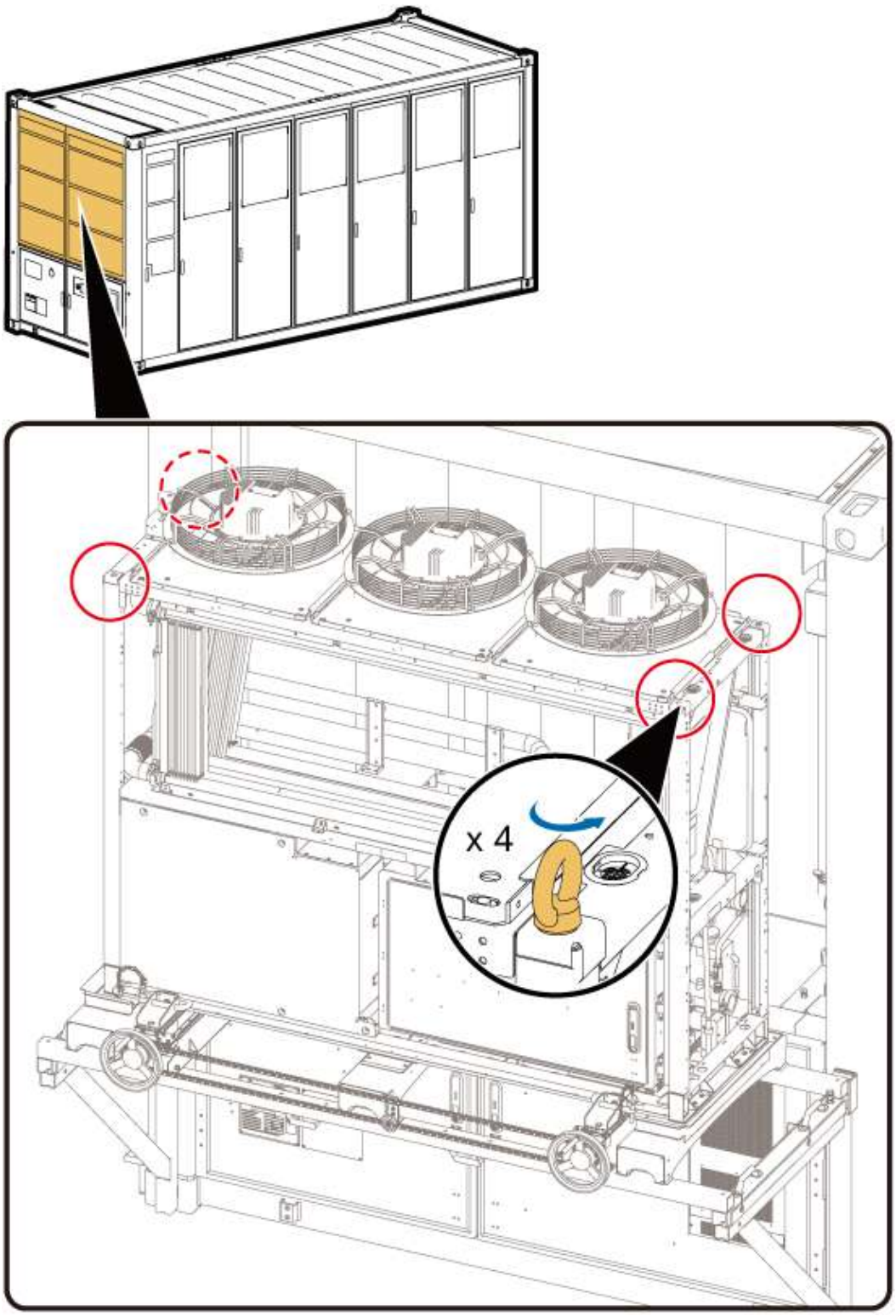
Step 1 Install the four eye bolts on the top of the LTMS.



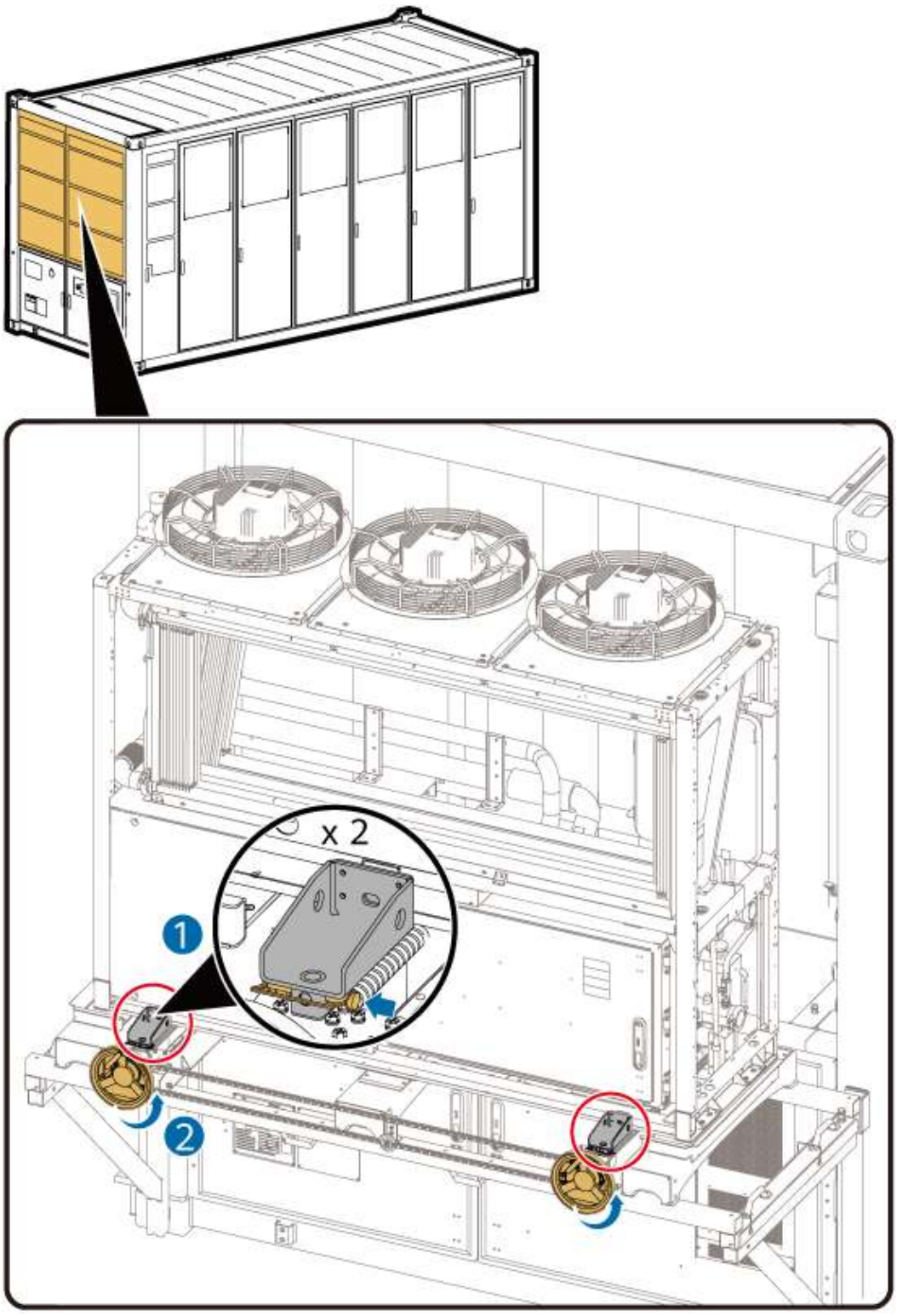
Step 2 Use a crane to place the LTMS on the push component.



Step 3 Remove the eye bolts from the LTMS.

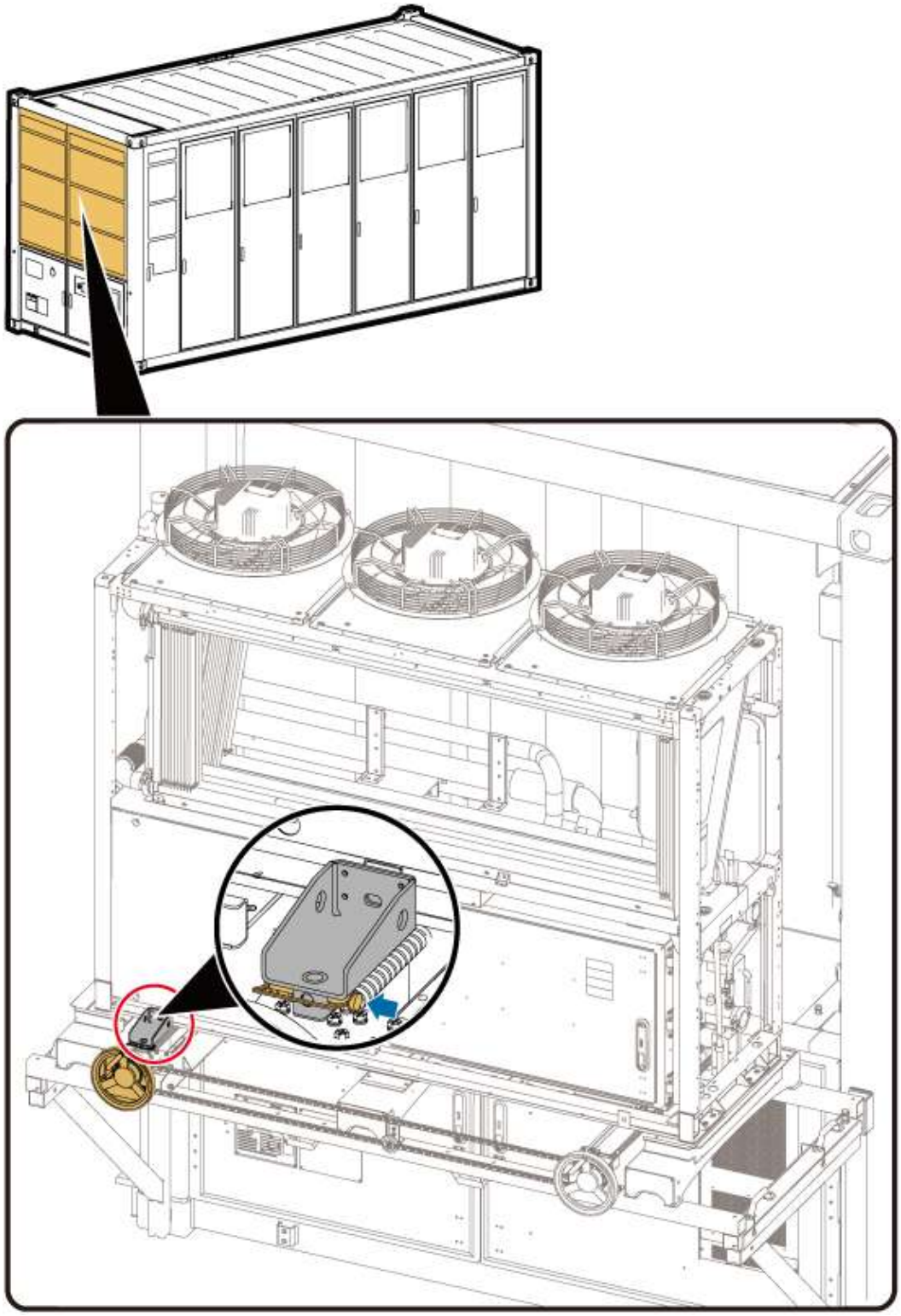


Step 4 Install the connecting plates of the push component, and rotate the handwheel to ensure that the connecting plates are closely fitted with the LTMS.

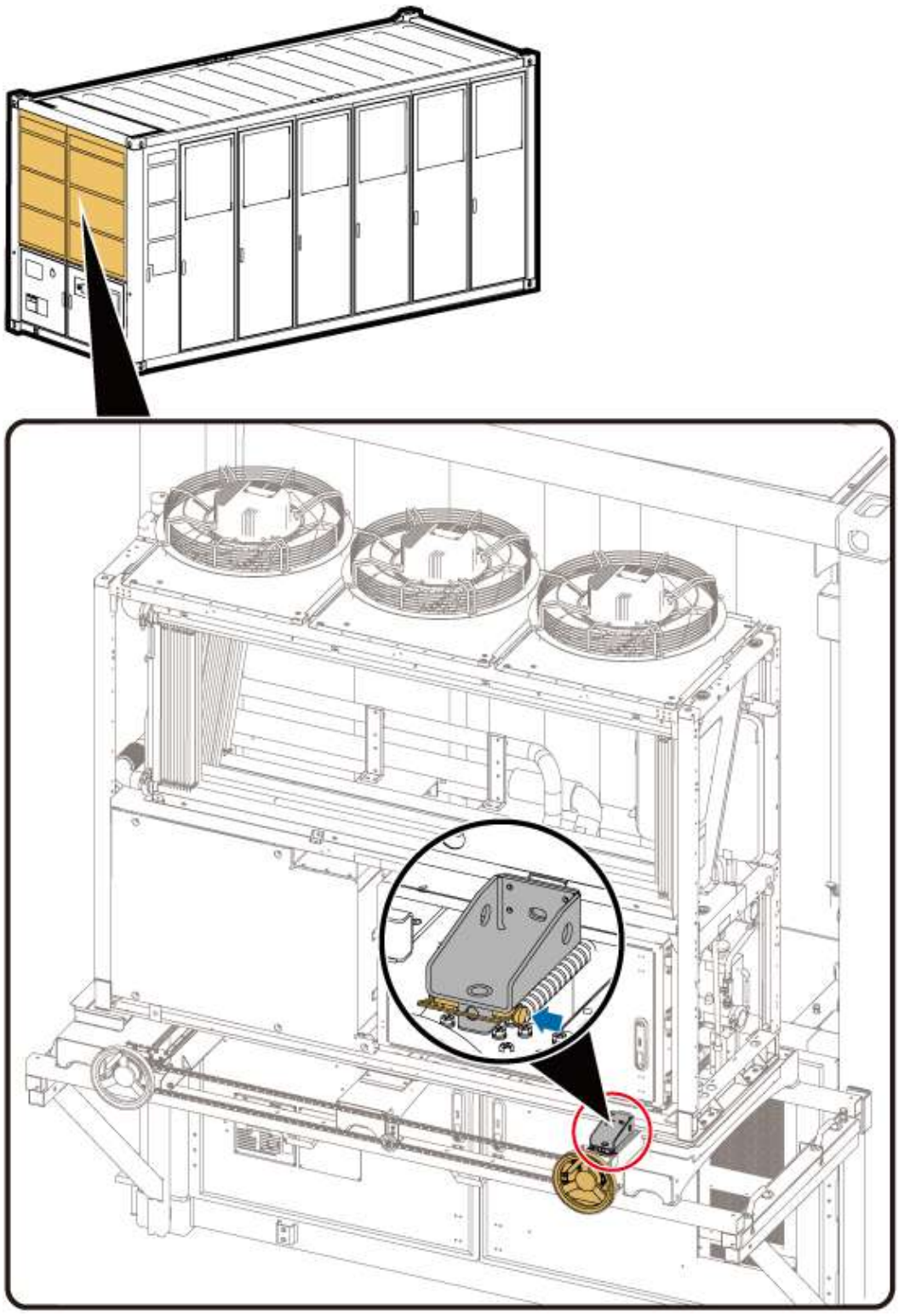


Step 5 Adjust the LTMS horizontally to align the threaded holes on the LTMS with the threaded holes on the connecting plates of the push component.

1. If the LTMS deviates to the left, install only the connecting plate on the left. Rotate the handwheel to push the LTMS forward for a short distance, and then install the connecting plate on the other side. Rotate the handwheel to push the LTMS to be level with the two connecting plates.



2. If the LTMS deviates to the right, install only the connecting plate on the right. Rotate the handwheel to push the LTMS forward for a short distance, and then install the connecting plate on the other side. Rotate the handwheel to push the LTMS to be level with the two connecting plates.

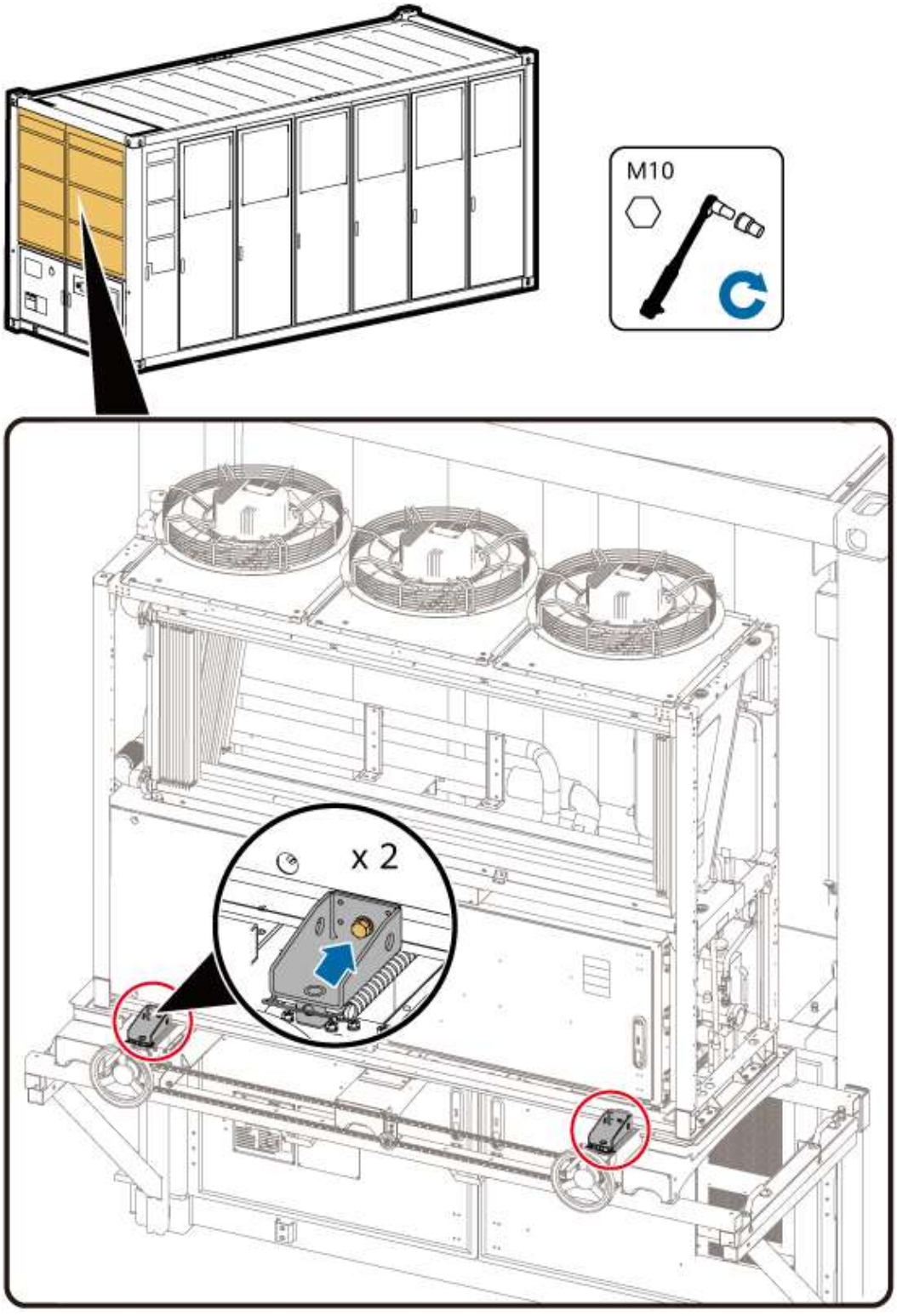


3. Repeat the preceding two steps until the threaded holes of the LTMS are aligned with the threaded holes of the connecting plates of the push component.

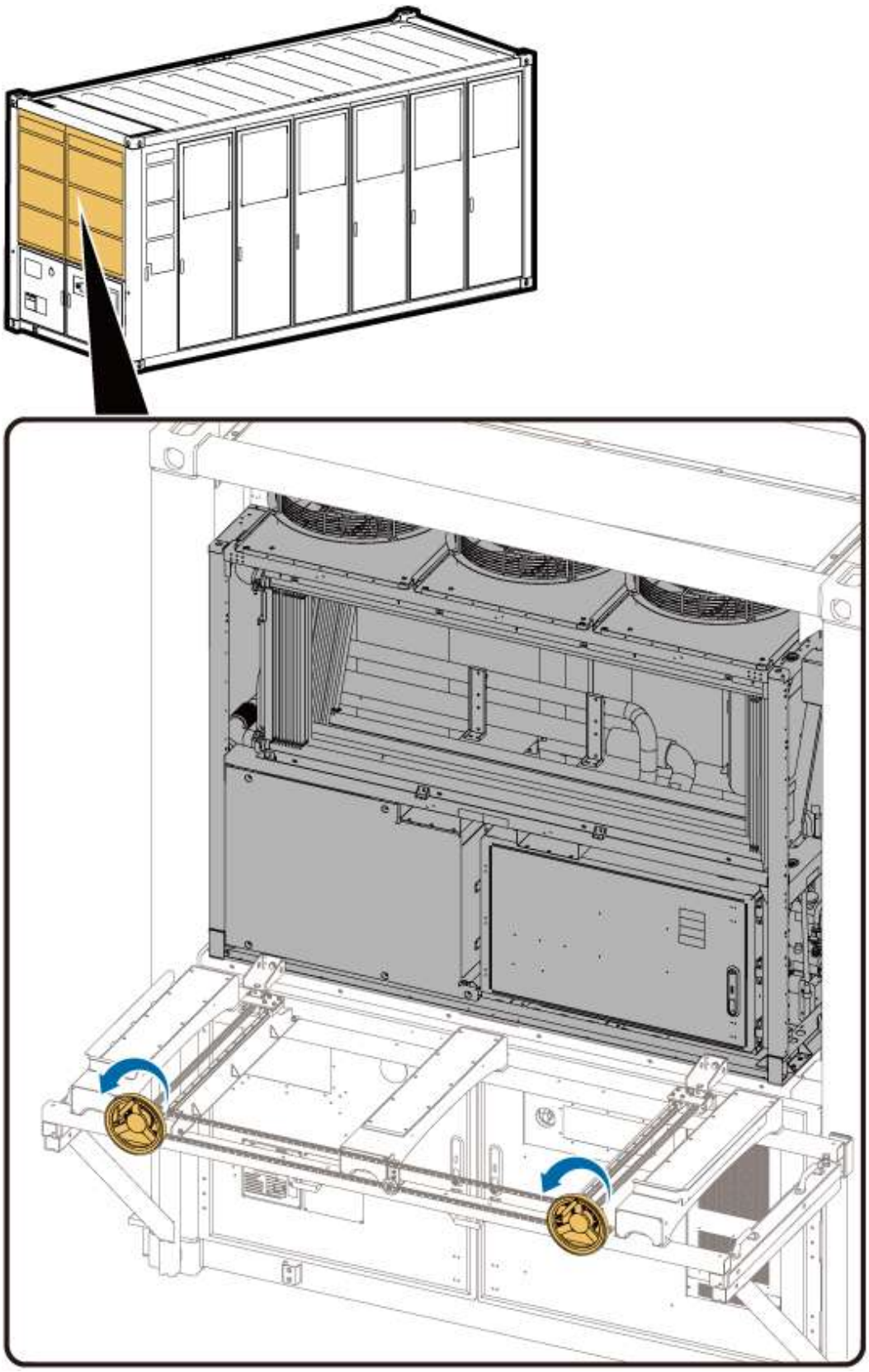
Step 6 Install the screws between the LTMS and the connecting plates.

NOTE

When reinstalling the LTMS, you only need to install screws and do not need to install U-shaped brackets.



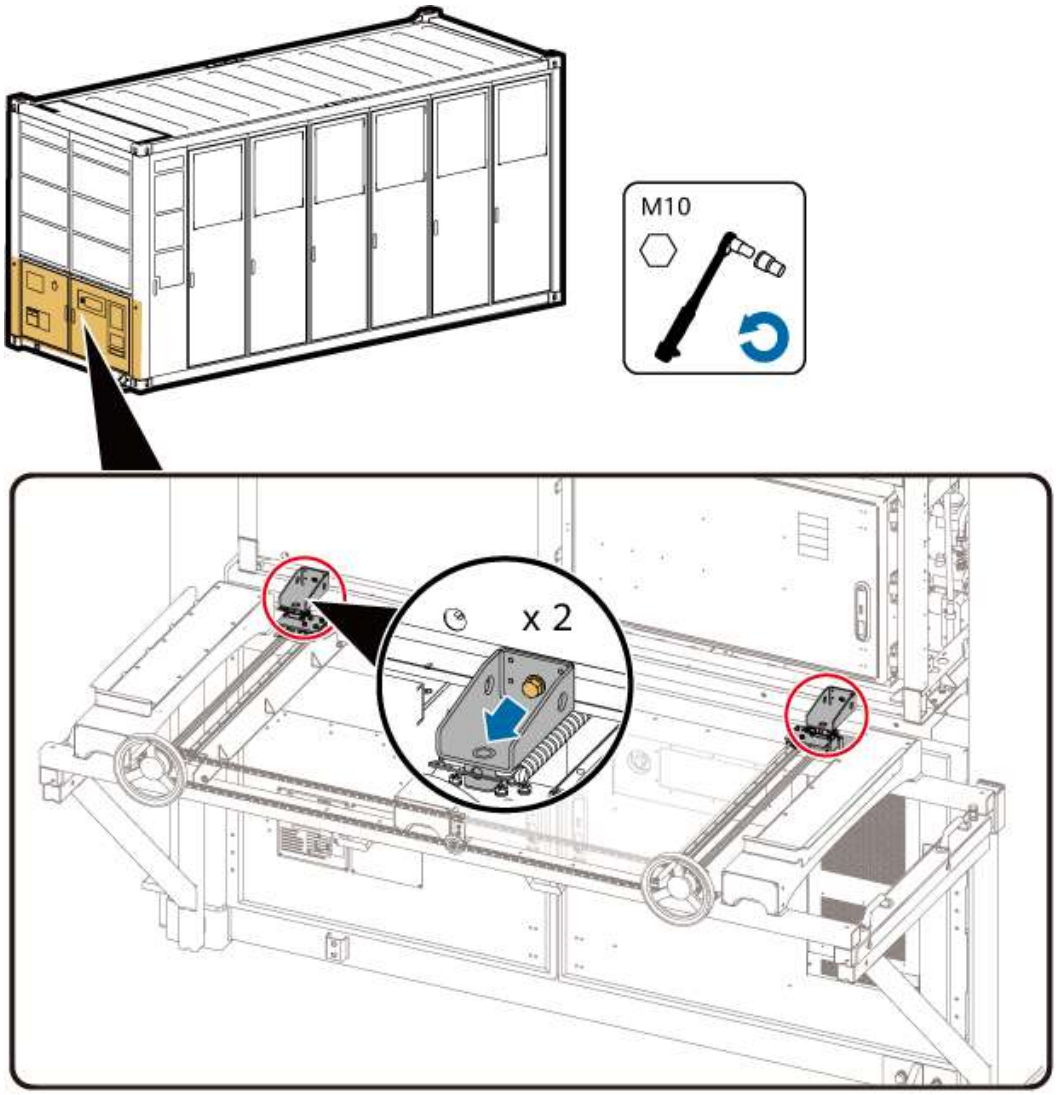
Step 7 Rotate the handwheel to move the LTMS into the container.



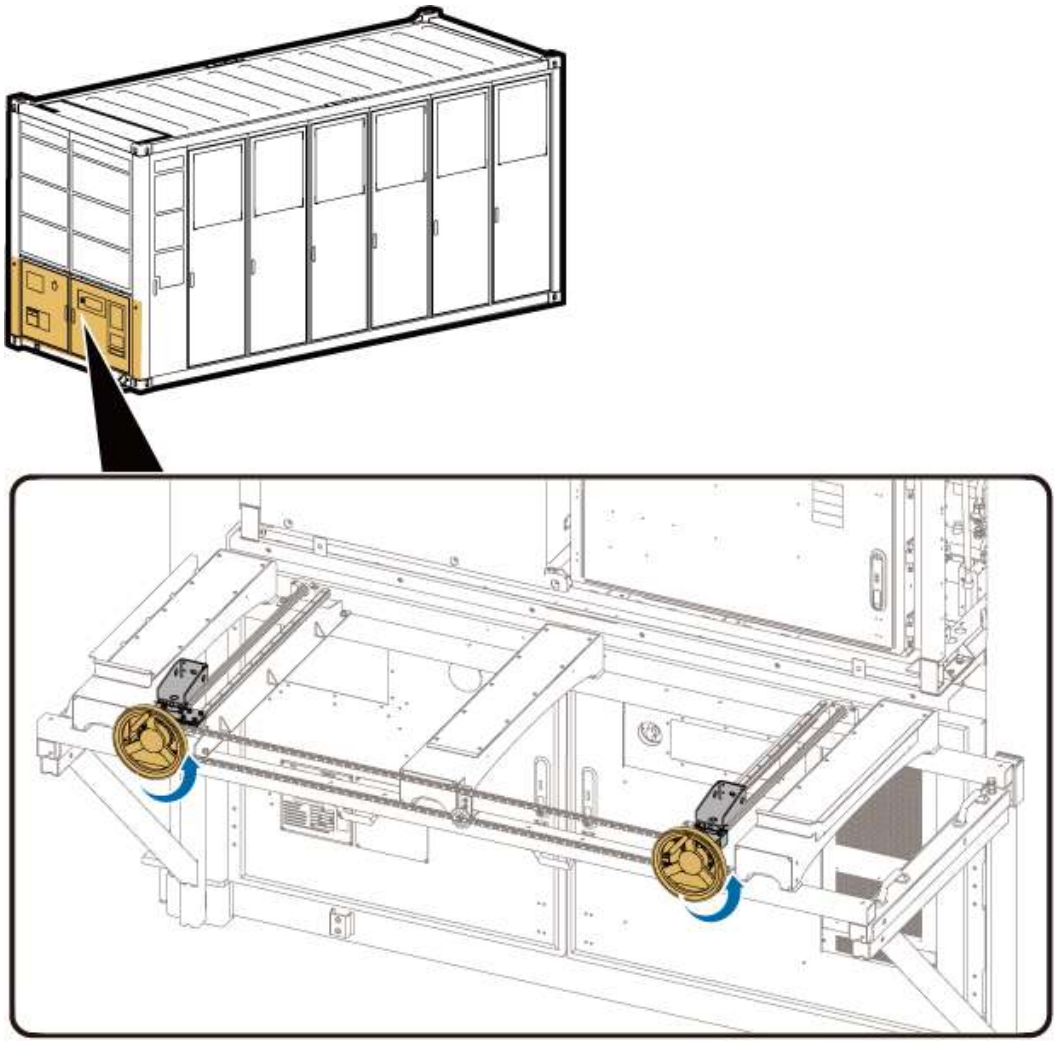
----End

Removing the LTMS Fixture

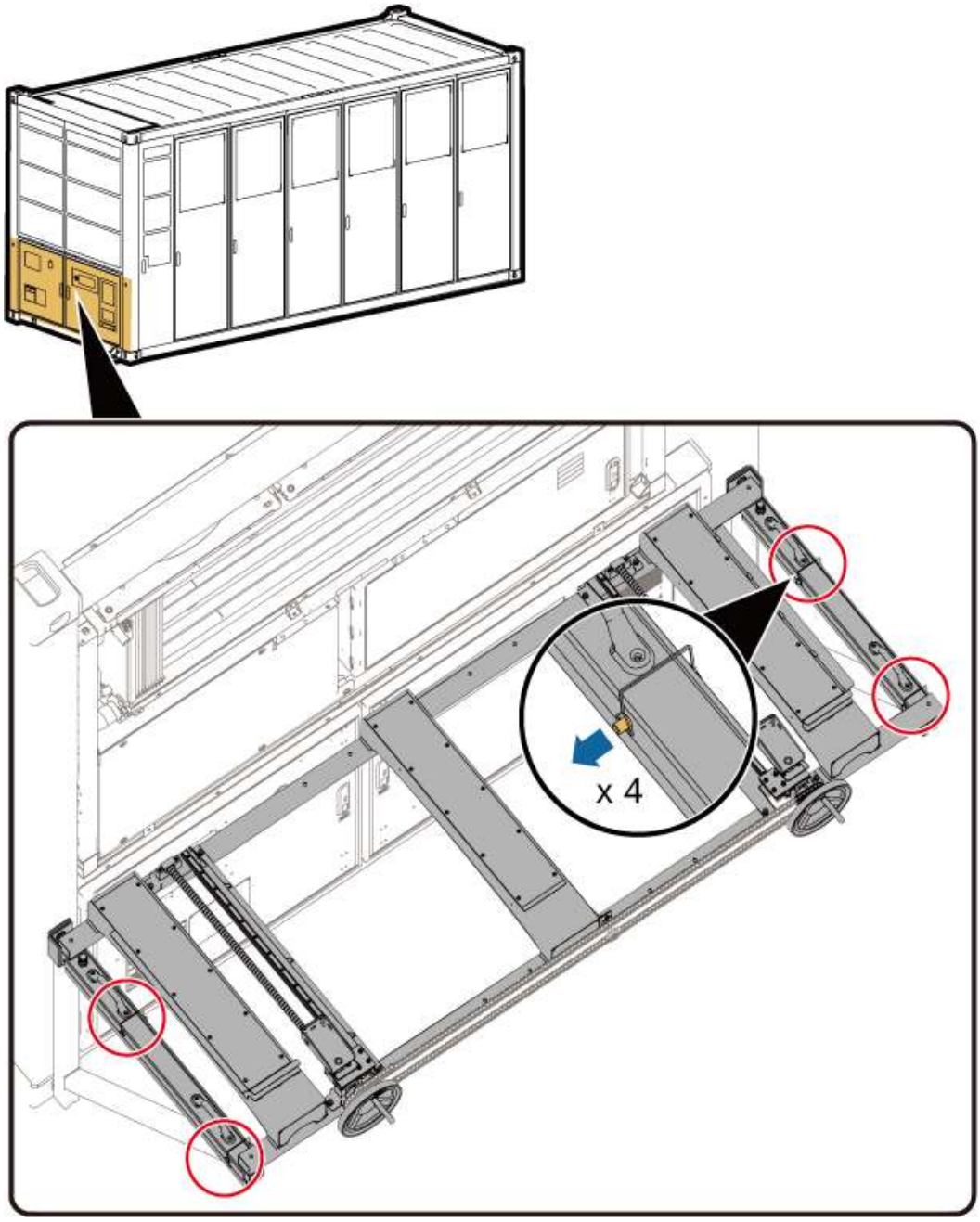
Step 1 Remove the screws that secure the LTMS to the connecting plates.



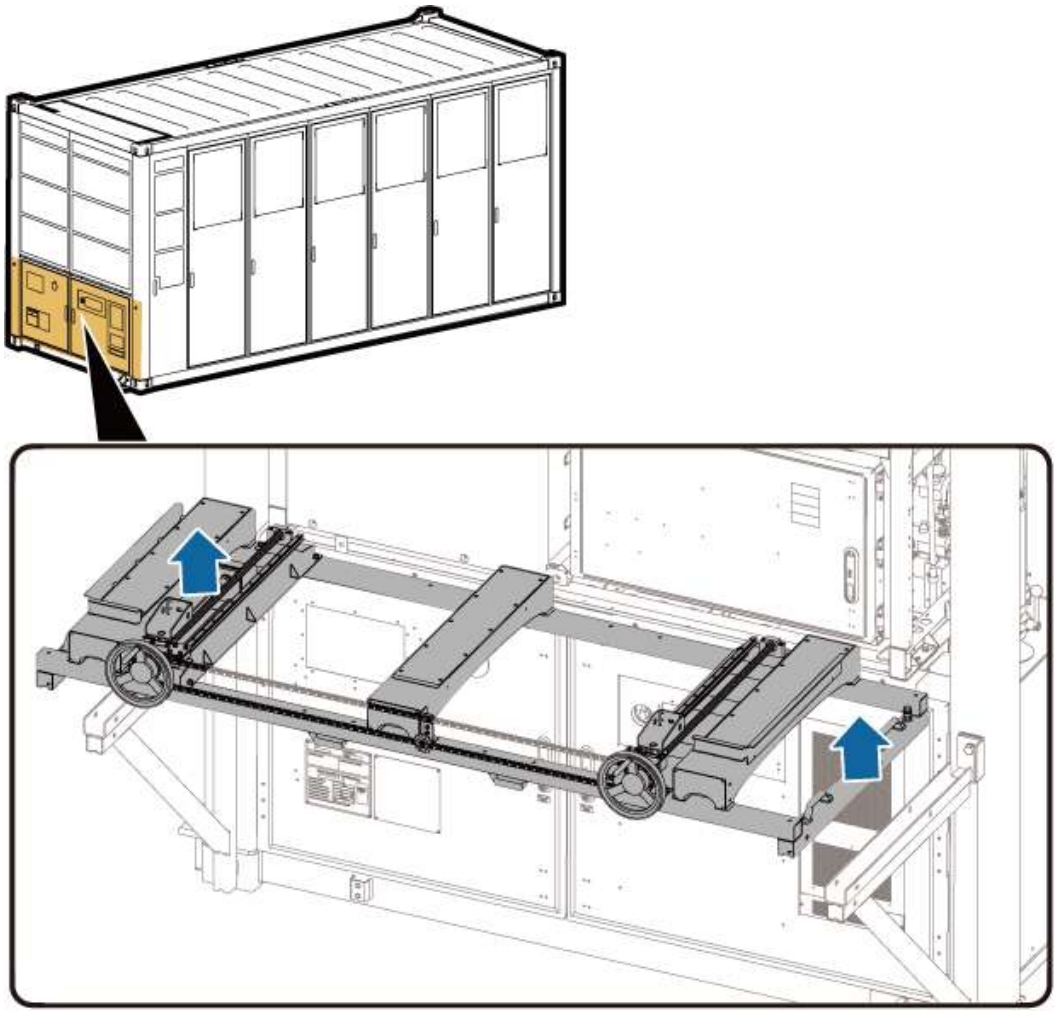
Step 2 Rotate the handwheel to pull back the connecting plates.



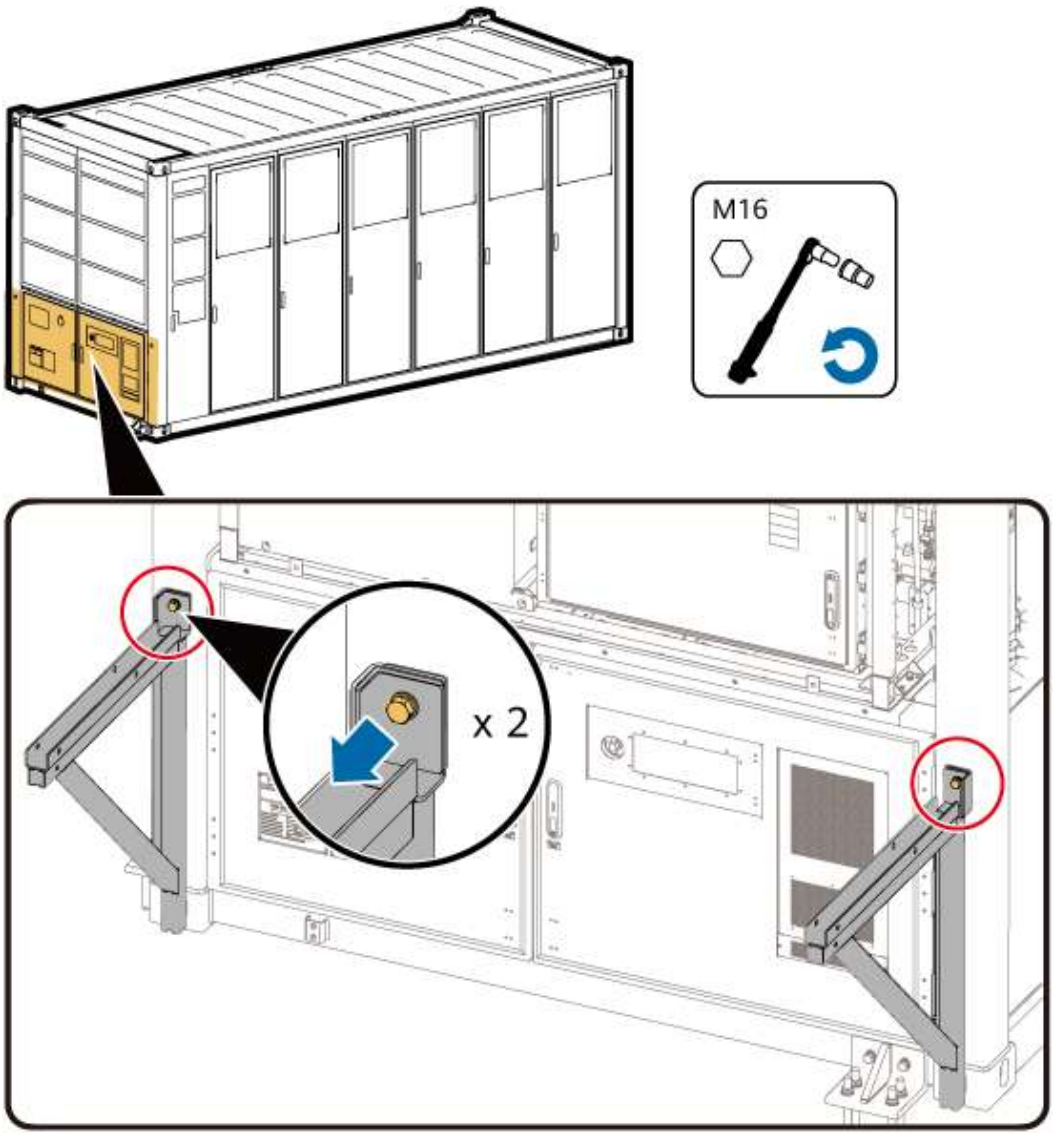
Step 3 Remove the positioning pins between the push component and the left and right supports.



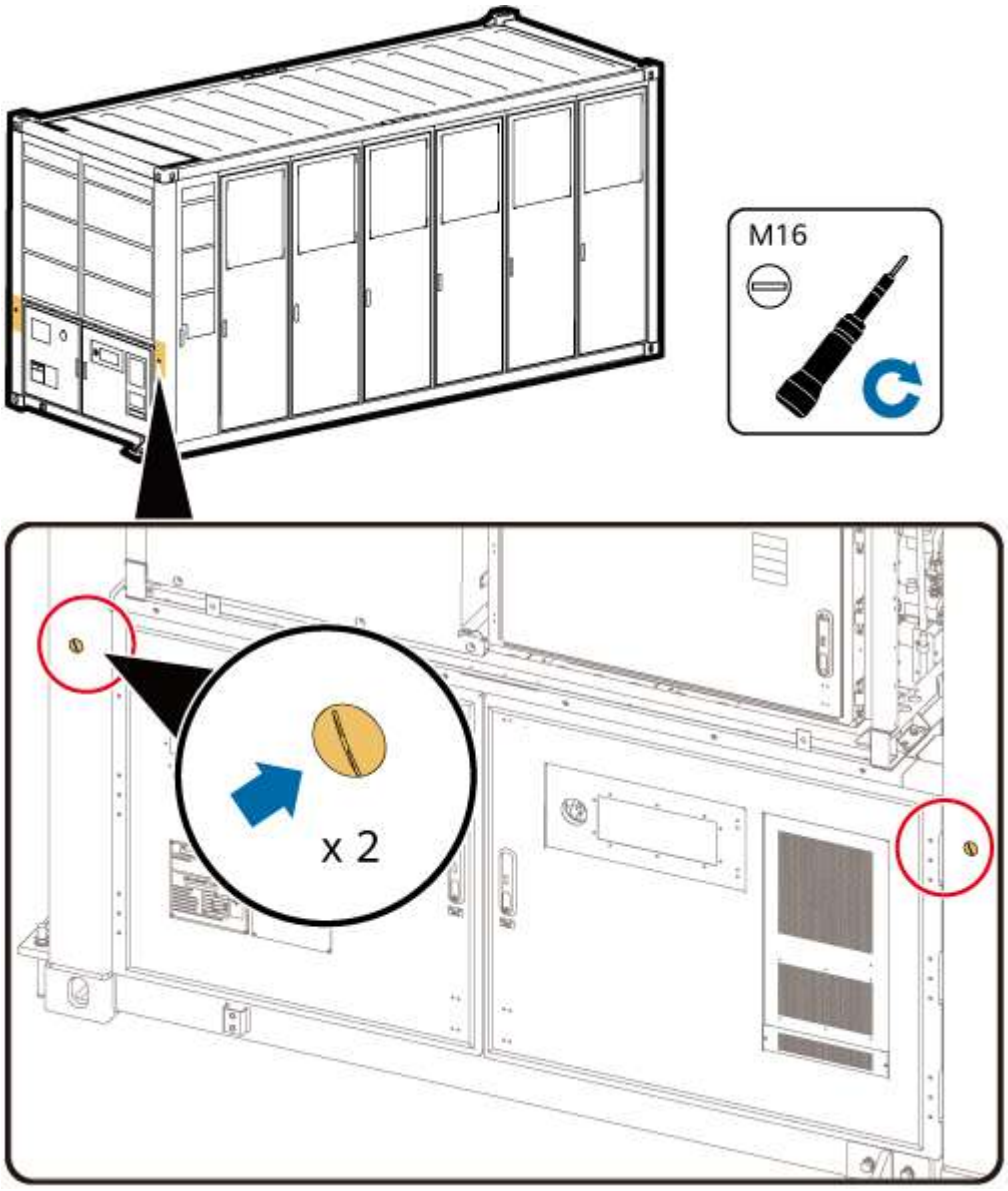
Step 4 Hold the handle of the push component and remove the push component.



Step 5 Remove the left and right supports.



Step 6 Use a flat-head screwdriver to install the nylon screw caps on the left and right columns.



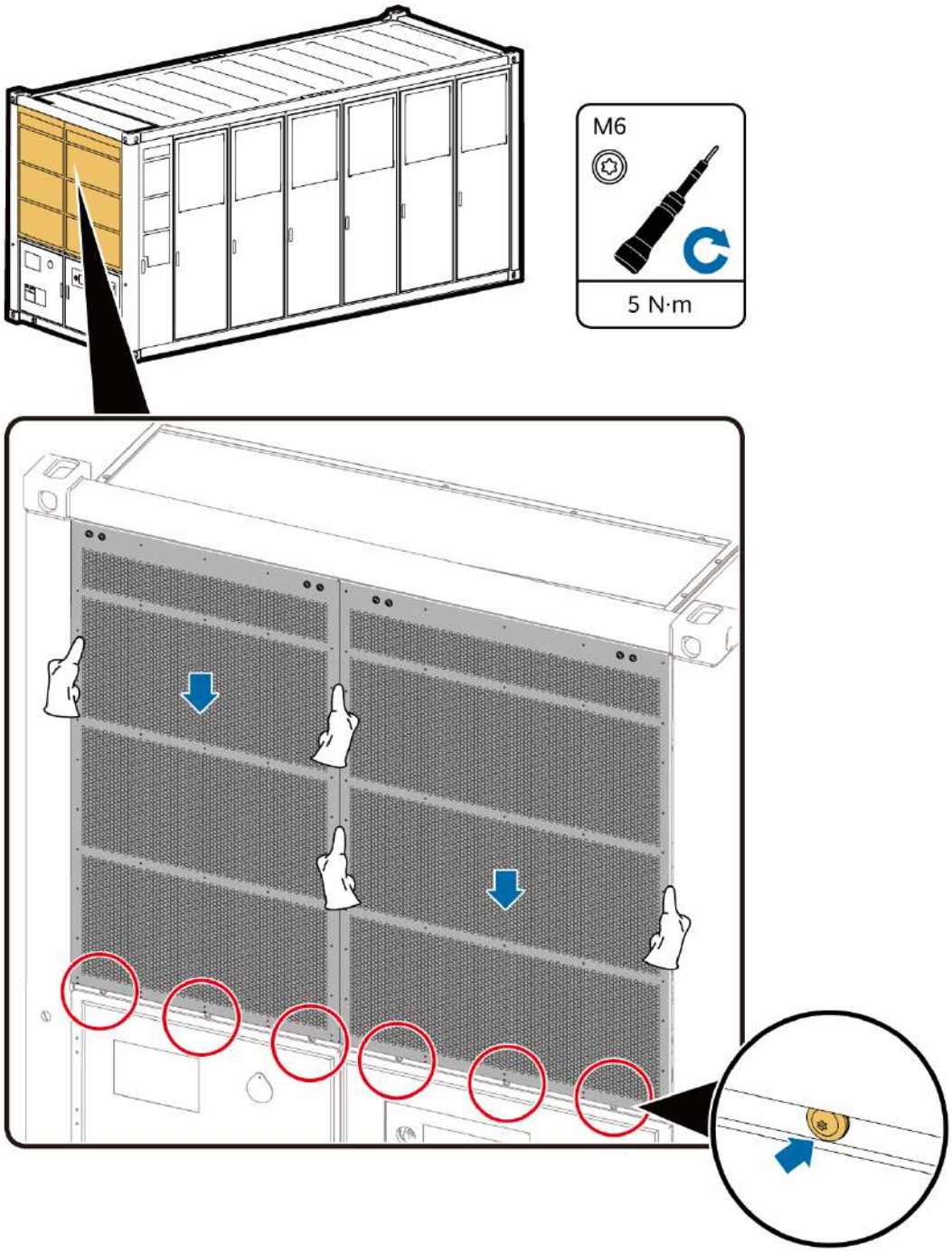
----End

Securing the LTMS

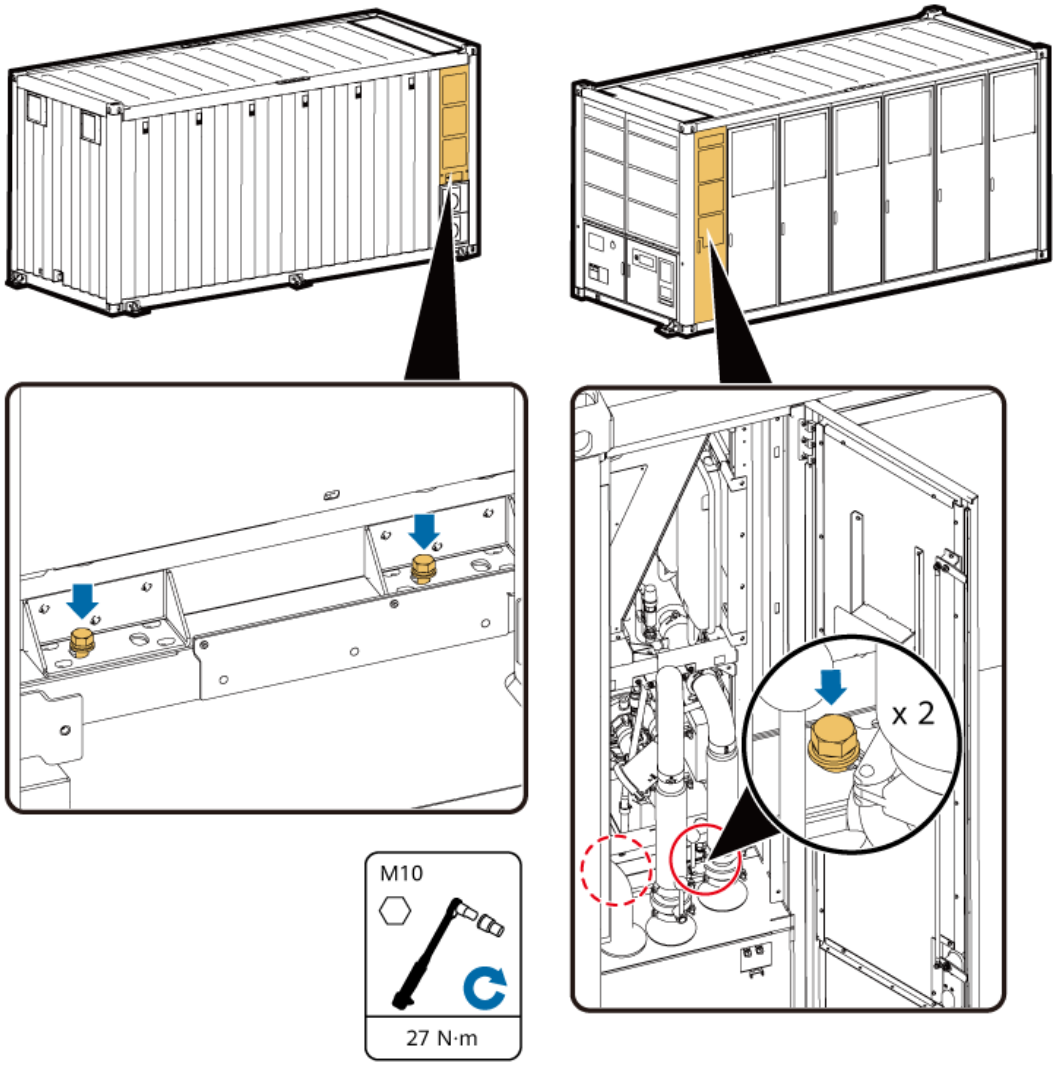
Step 1 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

NOTE

The eight screws on the two front sealing plates of the LTMS need to be secured only during transportation.

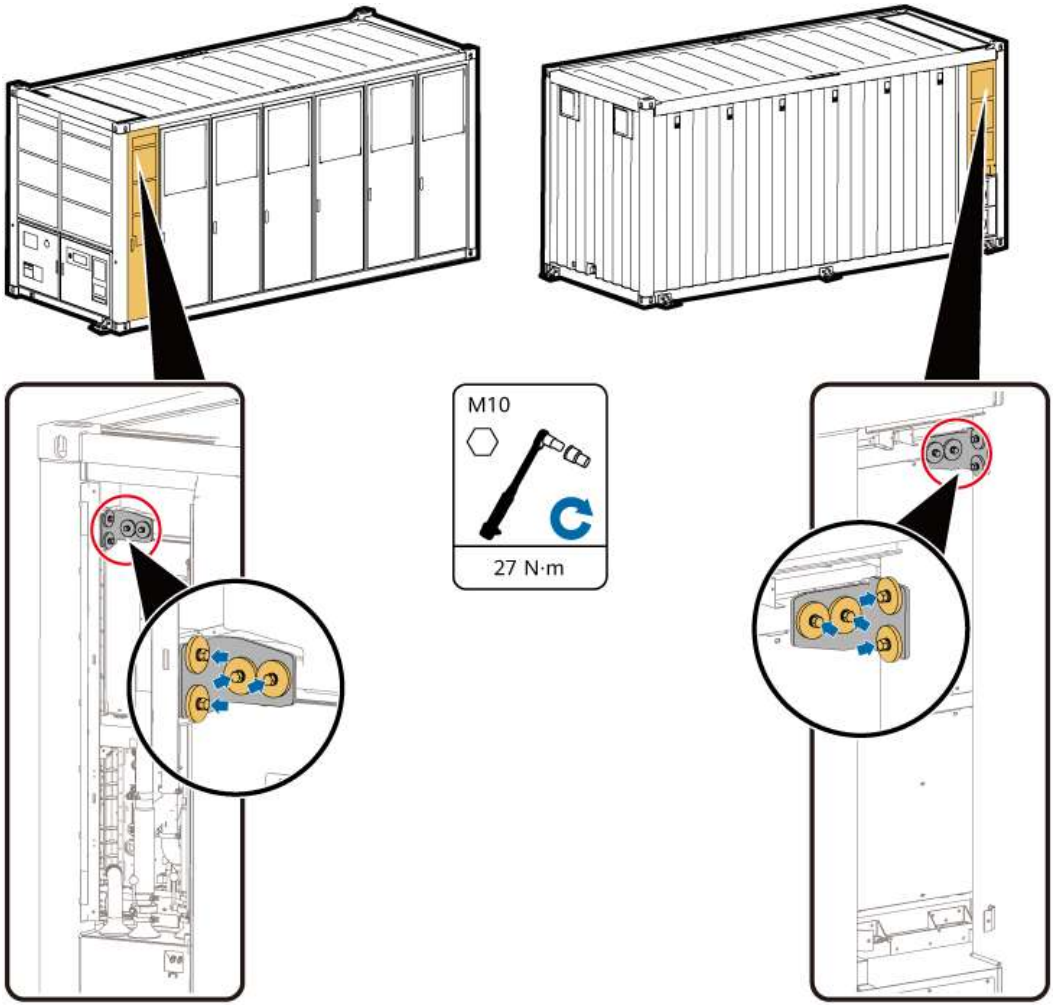


Step 2 Install the bolts at the bottom on the left and right sides of the LTMS, and tighten the bolts to 27 N·m.

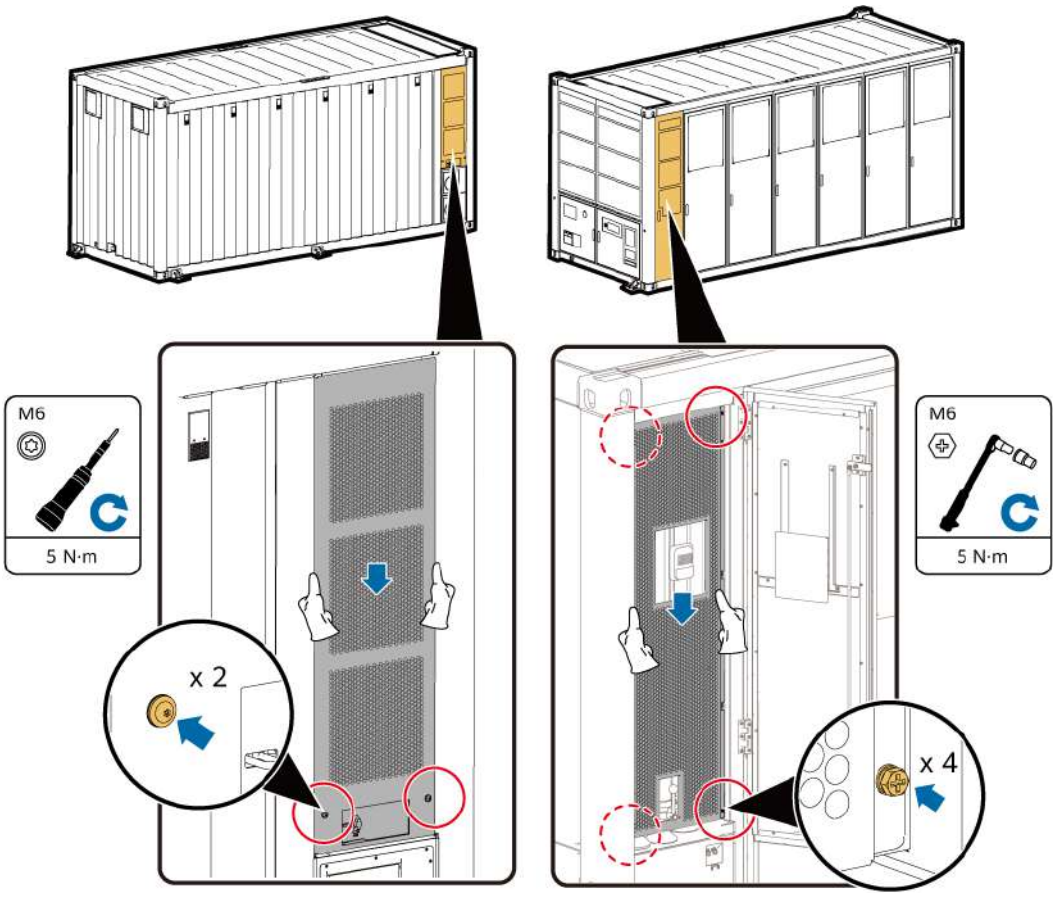


Step 3 Climb up and install the fasteners at the top on the left and right sides of the LTMS, and tighten the fasteners to 27 N·m.

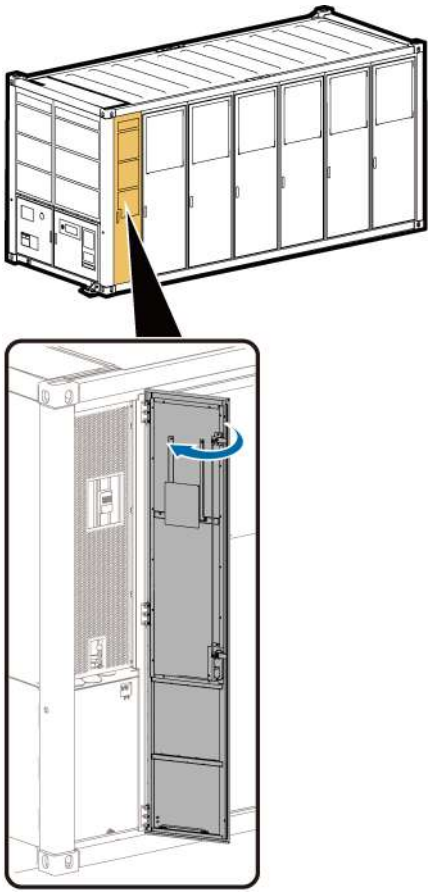
Tighten the two bolts on the LTMS and then the two bolts on the frame. Ensure that the fasteners are closely fitted with the LTMS.



Step 4 Mount the sealing plates on the left and right side of the LTMS to the grooves and tighten them to 5 N·m.



Step 5 Close the door of the LTMS on the front of the container.



----End

7.3 Replacing the LTMS

Prerequisites

- Three persons are required to replace the LTMS.
- Tools: forklift (see **4.2 Forklift Requirements**) or crane (see **4.3 Crane Requirements**), LTMS maintenance fixture, coolant filling/drainage machine, ladder, Phillips insulated torque screwdriver, flat-head insulated torque screwdriver, security torx torque screwdriver, insulated torque socket wrench (with an extension rod), insulated adjustable torque wrench, safety gloves, safety shoes, safety helmet, and safety rope

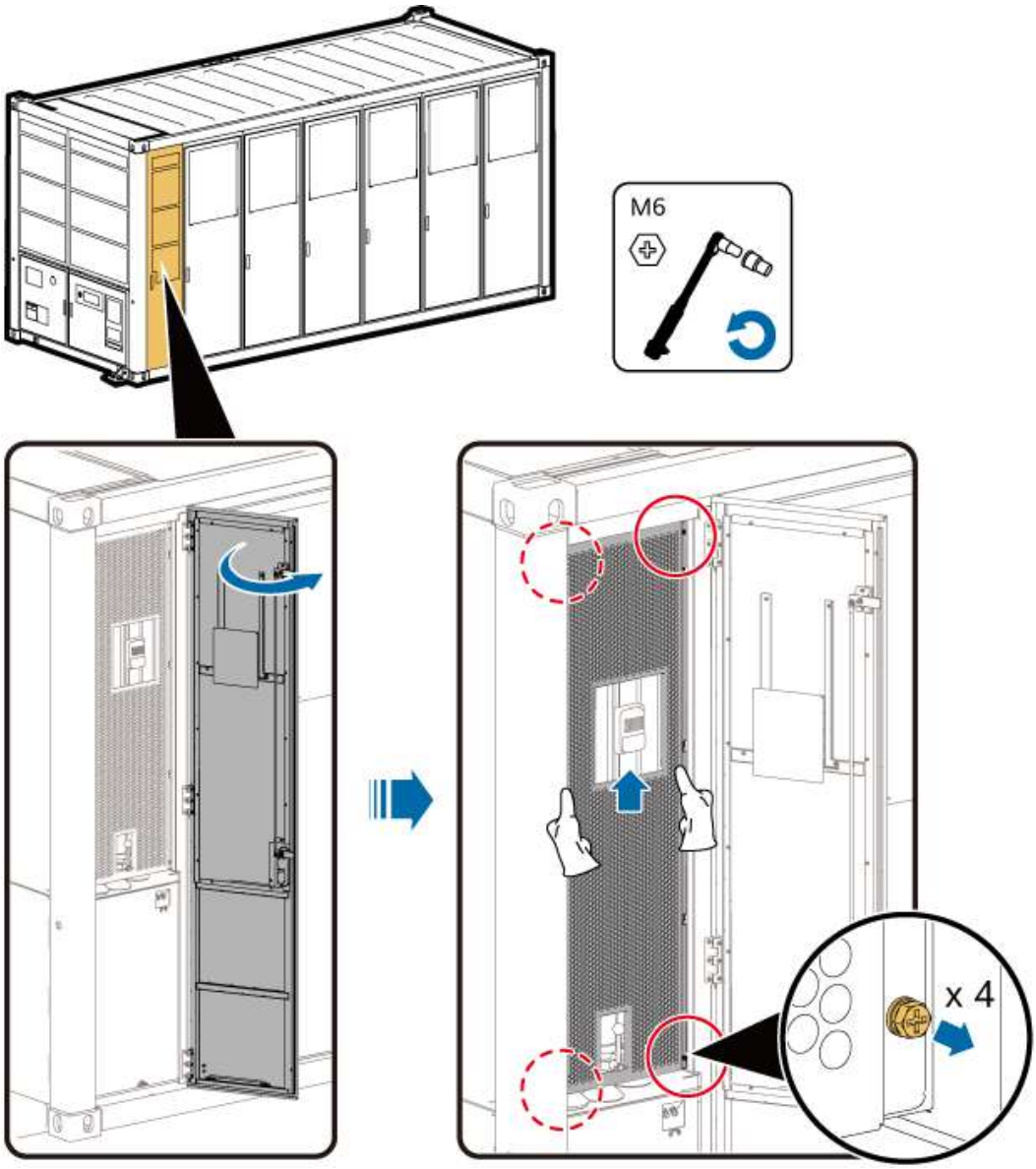
  NOTE

  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.
- Materials: insulation tape
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Removing LTMS Cables and Pipes

Step 1 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

Figure 7-11 Removing the front sealing plate from the container

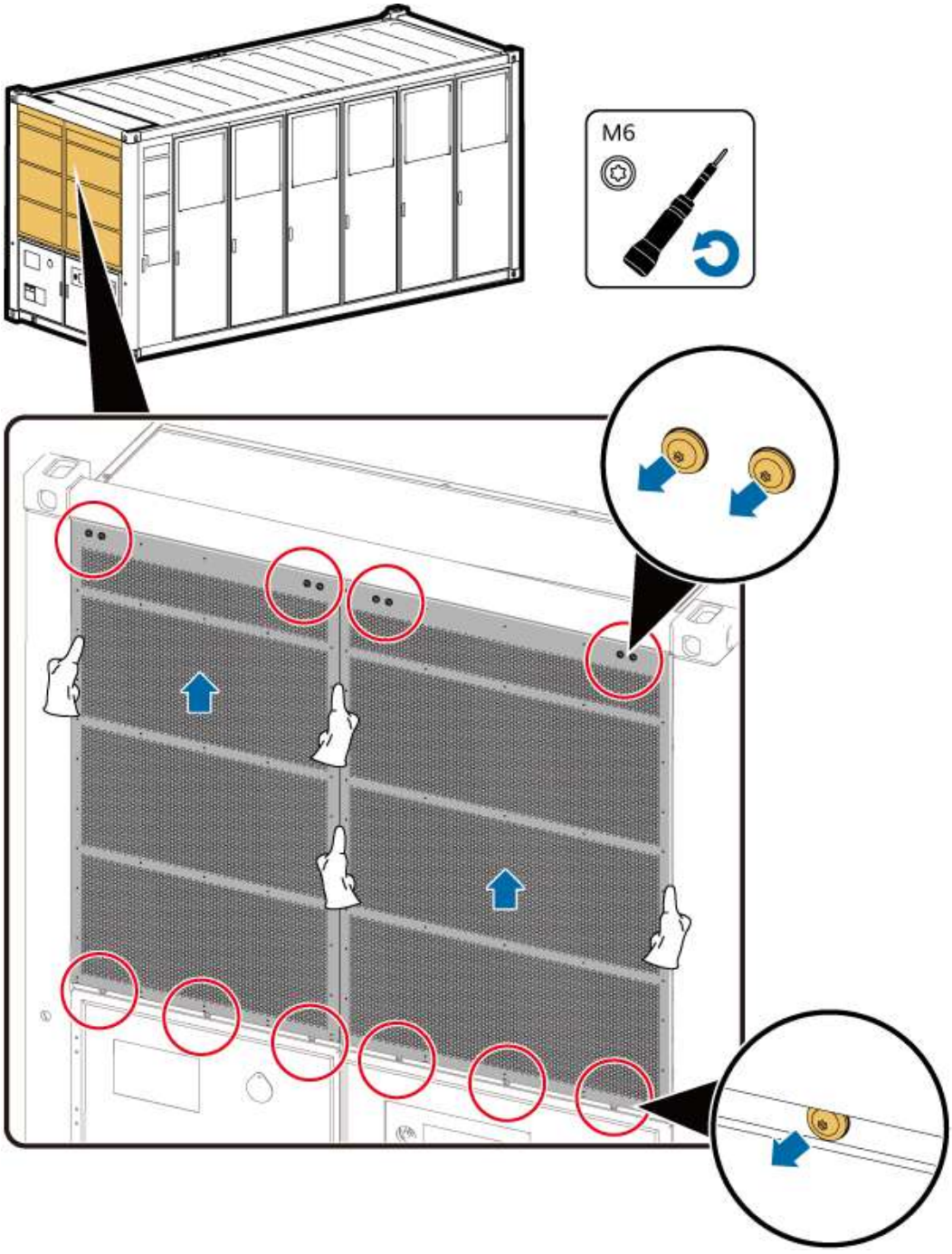


Step 2 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

NOTE

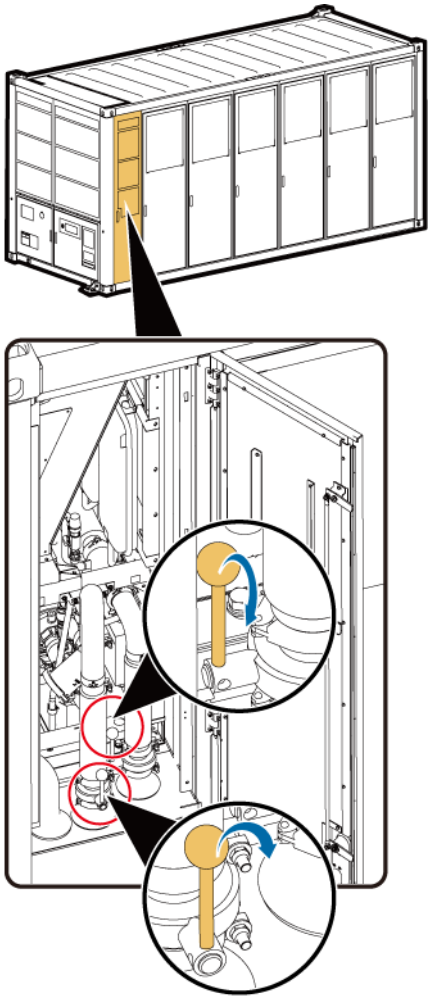
Remove the eight screws from the two front sealing plates only when you remove the LTMS for the first time.

Figure 7-12 Removing the front sealing plate from the LTMS



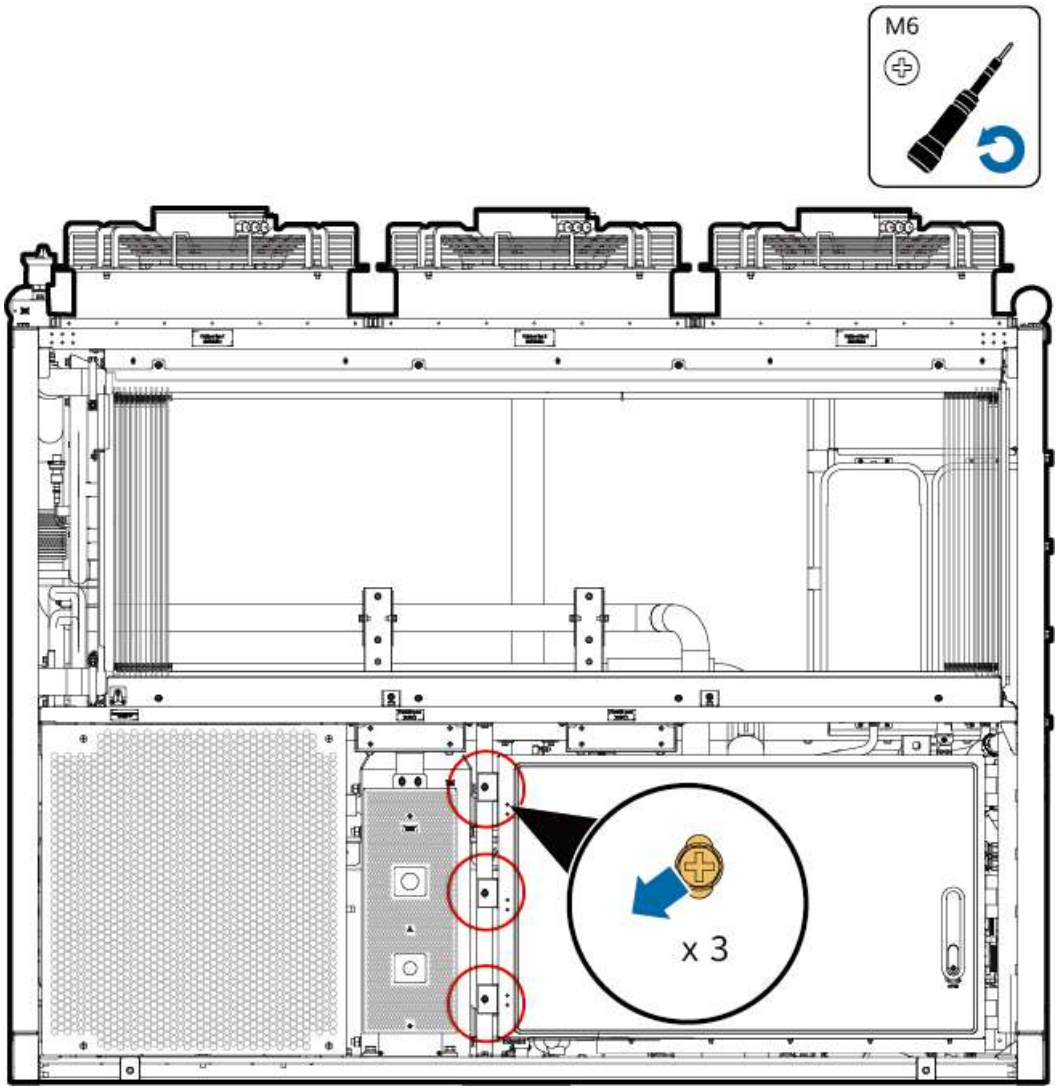
Step 3 Close the two butterfly valves that connect the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

Figure 7-13 Closing the two butterfly valves that connect the LTMS to the container



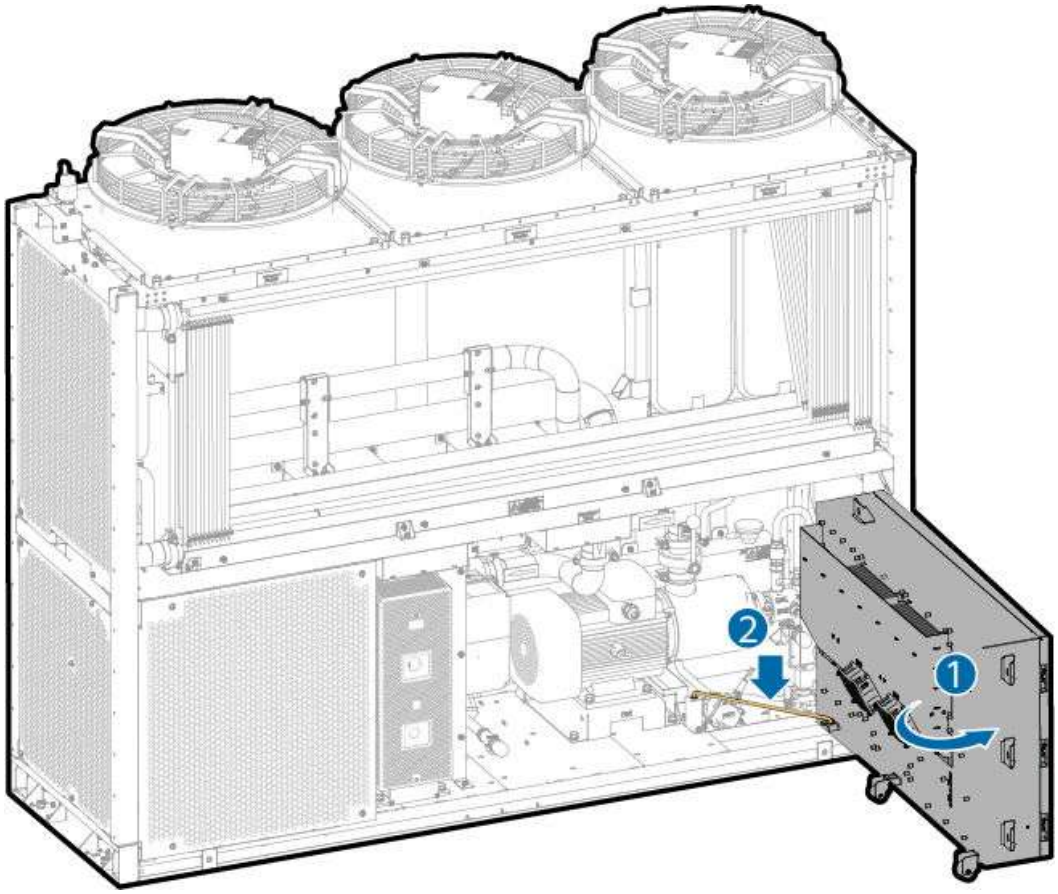
Step 4 Remove the three screws from the LTMS electric control box using a socket wrench.

Figure 7-14 Removing the screws from the electric control box



Step 5 Pull out the electric control box and rotate it by 90 degrees.

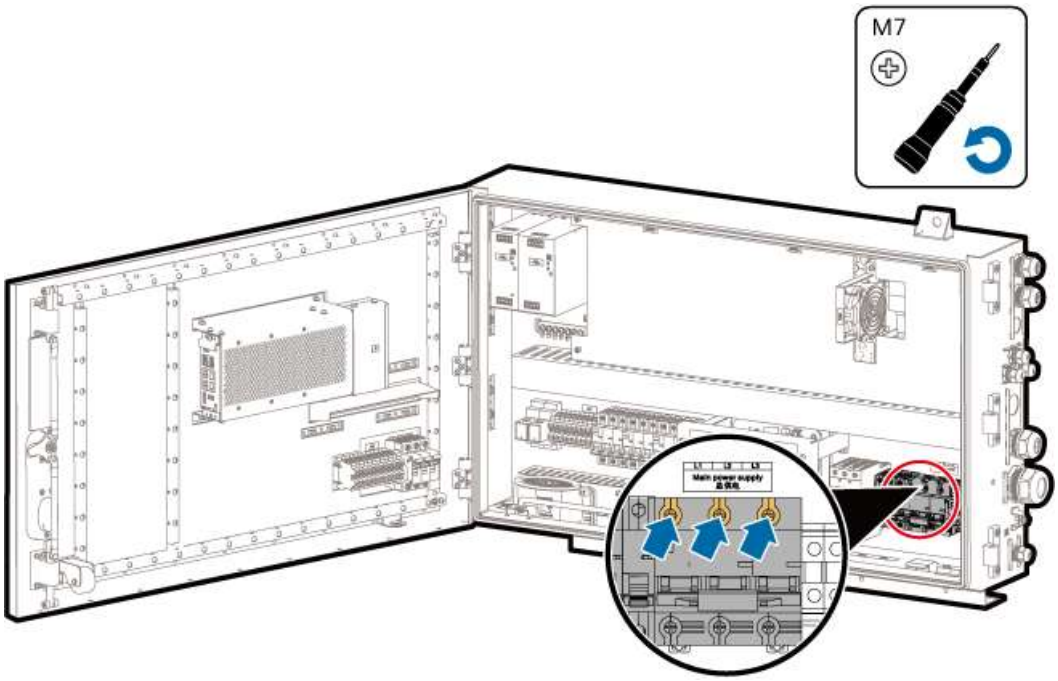
Figure 7-15 Pulling out the electric control box



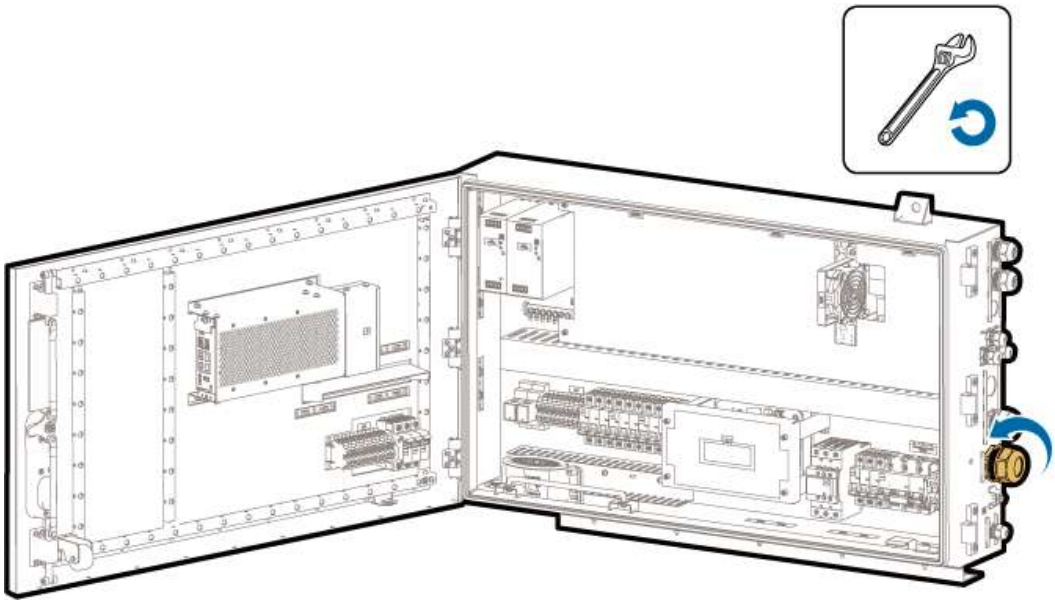
Step 6 Completely drain the coolant inside the LTMS.

Step 7 Rotate the electric control box by 90 degrees to the original position and tighten the three screws.

Step 8 Remove the input cables from the general circuit breaker 1FCB1 of the LTMS.



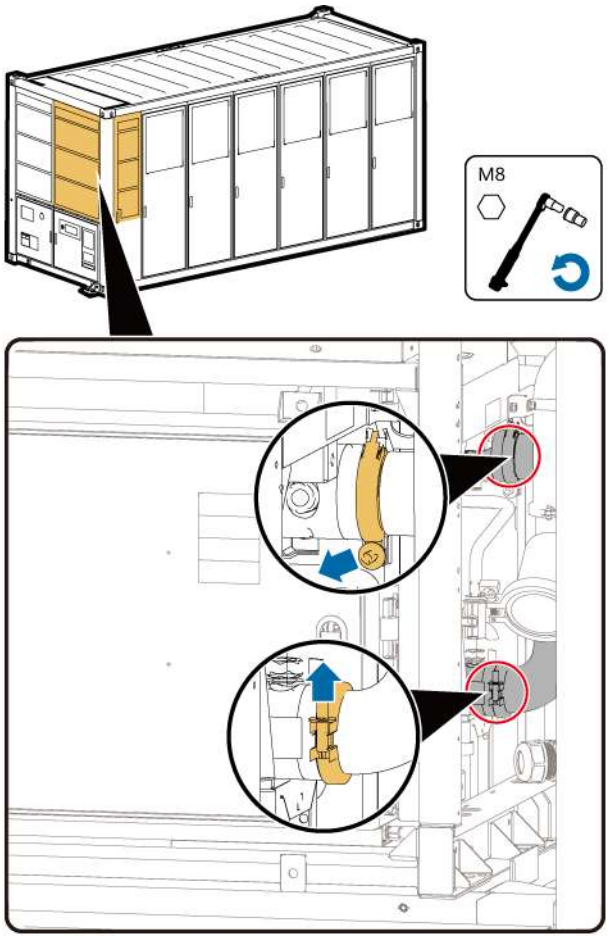
Step 9 Loosen the PG connector locking cap, pull out the cable, and wrap the cord end terminal with insulation tape.



Step 10 Remove the neutral cable of the electric heater from the power distribution cabinet in the control unit cabin, and pull out the cable from the cable pipe on the LTMS side.

Step 11 Remove the LTMS signal cables.

Step 12 Use a socket wrench to remove the two clamp nuts (M8) that connect the LTMS to the container.



Step 13 Remove the sealing ring at the joint between the LTMS and the container pipe.

----End

Replacing the LTMS

Step 1 Remove the old LTMS. For details, see **7.2 Removing and Reinstalling an LTMS**.

Step 2 Install a new LTMS. For details, see **7.2 Removing and Reinstalling an LTMS**.

----End

Installing LTMS Cables and Pipes

Step 1 Install a new sealing ring at the joint between the LTMS and the container. Ensure that the round protrusion on the sealing ring matches the groove on the sealing port, and press the sealing ring tightly.

Step 2 Use a torque wrench to tighten the two clamp nuts on the pipe that connects the LTMS and container to a torque of 10 N·m.

Step 3 Install the LTMS signal cables.

Step 4 Route the neutral cable of the electric heater along the cable pipe to the power distribution cabinet of the control unit cabin and install the cable.

Step 5 Use an adjustable wrench with an opening of 52 mm to tighten the locking cap of the PG connector to 3.5 N·m.

Step 6 Reinstall the input cables from the general circuit breaker 1FCB1 of the LTMS.

Step 7 Remove the three screws from the LTMS electric control box using a Phillips screwdriver.

Step 8 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 9 Refill coolant into the LTMS.

Step 10 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 11 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 12 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 13 Close the door of the LTMS on the front of the container.

----End

7.4 Replacing a Circulation Pump

Prerequisites

- Tools: coolant filling/drainage machine, flat-head insulated torque screwdriver, insulated hex socket torque screwdriver, Phillips insulated torque screwdriver, insulated torque socket wrench (with an extension rod), and insulated adjustable torque wrench
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 3 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 4 Pull out the electric control box and rotate it by 90 degrees.

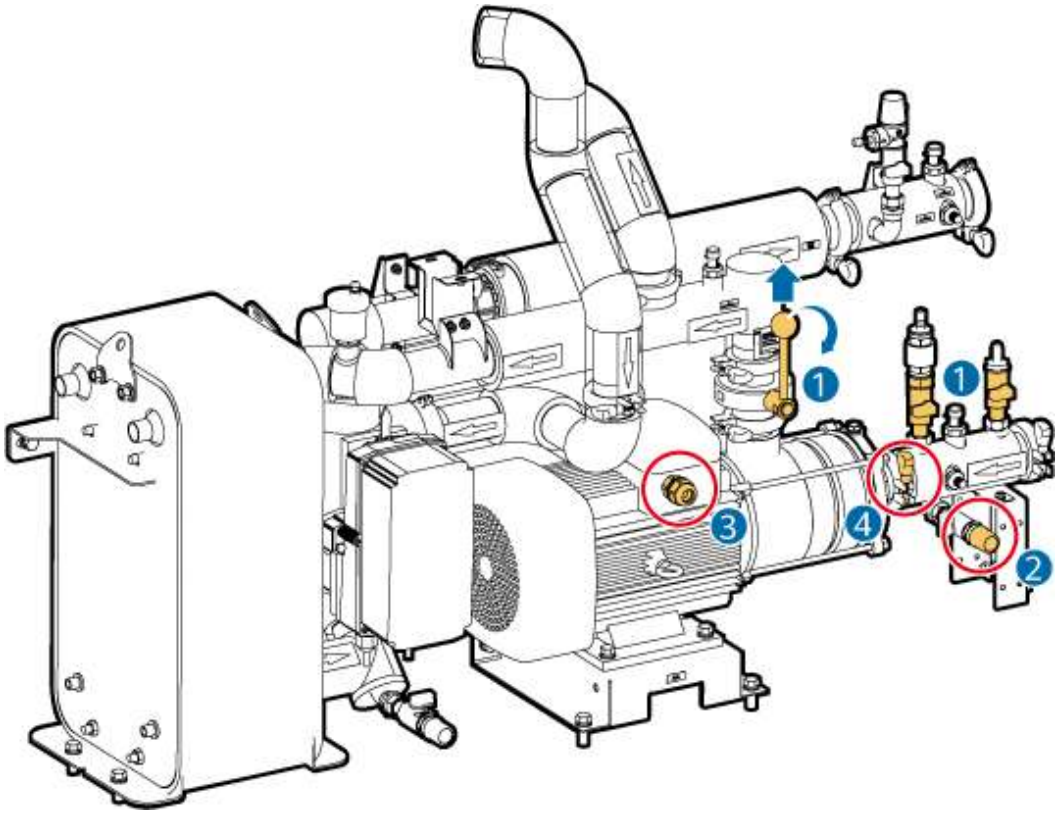
See **Figure 7-15**.

Step 5 Close the two butterfly valves that connect the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

See **Figure 7-13**.

Step 6 Drain the coolant, and remove cables and clamps.

Figure 7-16 Preparations for removing the circulation pump

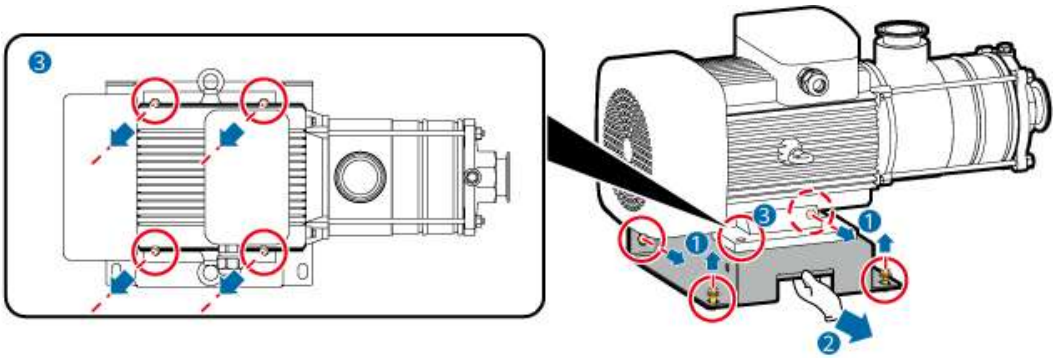


1. Close the butterfly valve for the coolant outlet pipe of the circulation pump.
2. Drain the coolant from coolant filling/drainage port 1.
3. Remove the cover of the connection box of the circulation pump, loosen the PG connector, and remove the U, V, and W phase wires and the PE wire.
4. Remove the clamp nuts (M8) from the coolant inlet/outlet pipe of the circulation pump, and remove the sealing ring.

Step 7 Remove the circulation pump.

1. Remove the nuts (M10) from the circulation pump base.
2. Take out the circulation pump and base.
3. Remove the nuts (M10) from the circulation pump and take out the circulation pump.

Figure 7-17 Removing the circulation pump



Step 8 Install a new circulation pump on the base and tighten the screws to a torque of 27 N·m.

Step 9 Place the new circulation pump and the base in the original position, and align the coolant inlet/outlet pipe connector of the circulation pump.

Step 10 Install a new sealing ring in the groove of the pipe port. Ensure that the round protrusion on the sealing ring matches the groove of the sealing port, and press the sealing ring tightly.

Step 11 Put the clamp on the joint of the circulation pump pipe port, and use a torque wrench to tighten the clamp nut on the coolant inlet/outlet pipe port to a torque of 10 N·m.

Step 12 Tighten the screws on the circulation pump base to 27 N·m.

Step 13 Connect the circulation pump cable (M5) to 2.8 N·m. Tighten the PG connector (M32) to 2.5 N·m. Install the connection box cover (M4) to 1.6 N·m.

Step 14 Fill the coolant from coolant filling/drainage port 1.

Step 15 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 16 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 17 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 18 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Click **Cleared** next to **Clear total runtime of circulating pump 1**.
2. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.

3. Select **Manual** from the **Diagnostic Mode** drop-down list.
4. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
5. Set **Setting status of circulating pump 1** to the maximum speed.
6. Click **Submit**.
7. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.5 Replacing an Expansion Tank

Prerequisites

Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and clamp pliers

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 Close the two butterfly valves that connect the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

See **Figure 7-13**.

Step 6 Close the butterfly valve for the coolant outlet pipe of the circulation pump.

Step 7 Drain the coolant from coolant filling/drainage port 1.

Step 8 Remove the clamp from the inlet of the expansion tank using a clamp pliers, and remove the hose.

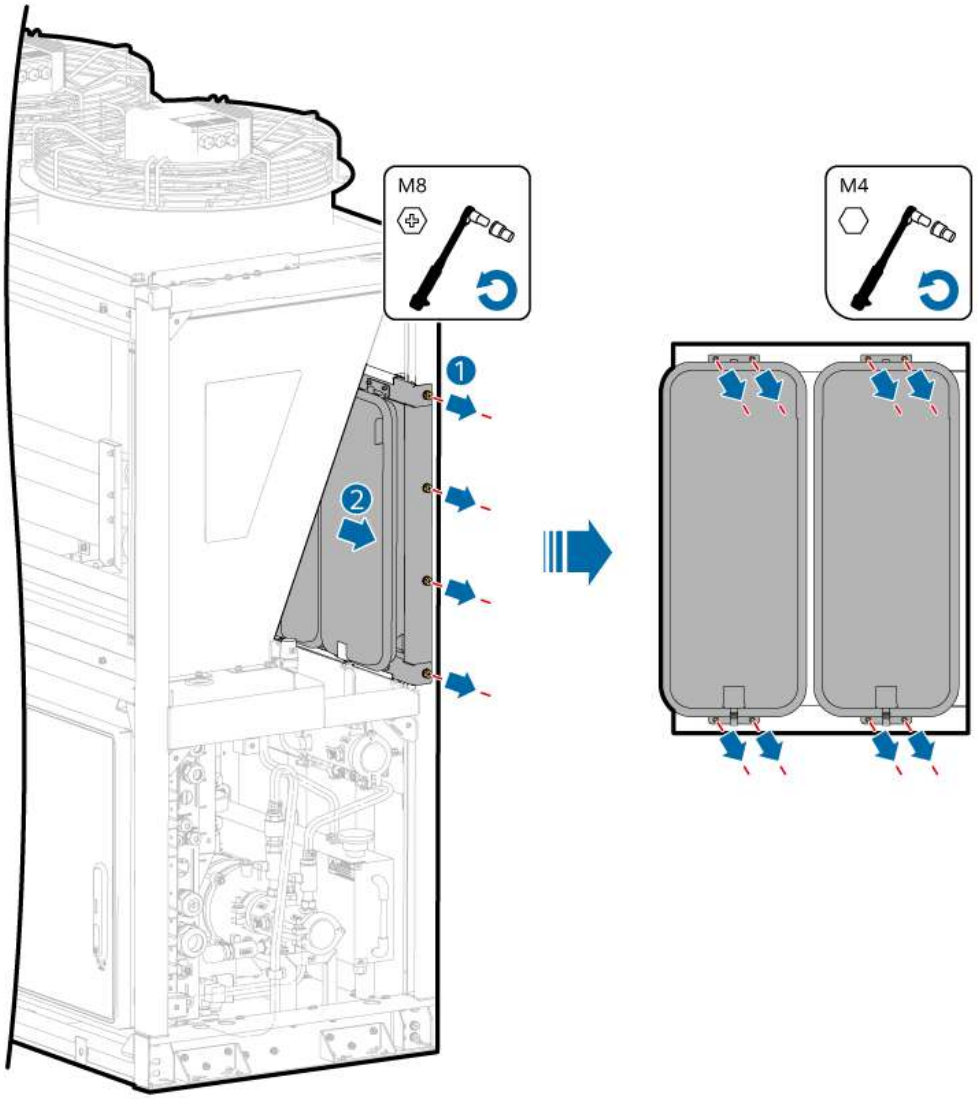
NOTE

A small amount of coolant will flow out when you remove the hose. Use a cloth to wipe it away.

Step 9 Remove the old expansion tank.

1. Remove the screws from the outer side of the expansion tank frame using a socket wrench, and remove the expansion tank and frame.
2. Remove the screws from the expansion tank using a socket wrench.

Figure 7-18 Removing the expansion tank



Step 10 Install a new expansion tank.

1. Tighten the screws on the expansion tank to 1.6 N·m using a torque wrench.
2. Place the expansion tank and frame back to their original positions.
3. Tighten the screws on the outer side of the expansion tank frame to 13 N·m using a torque wrench.

Step 11 Connect the hose to the expansion tank. Ensure that the hose reaches the bottom and is flush with the end face with a gap of less than or equal to 0.5 mm.

Step 12 Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the expansion tank.

Step 13 Fill the coolant from coolant filling/drainage port 1.

Step 14 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 15 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 16 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 17 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.6 Replacing a Multi-Way Valve Actuator

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and insulated torque open-end wrench
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

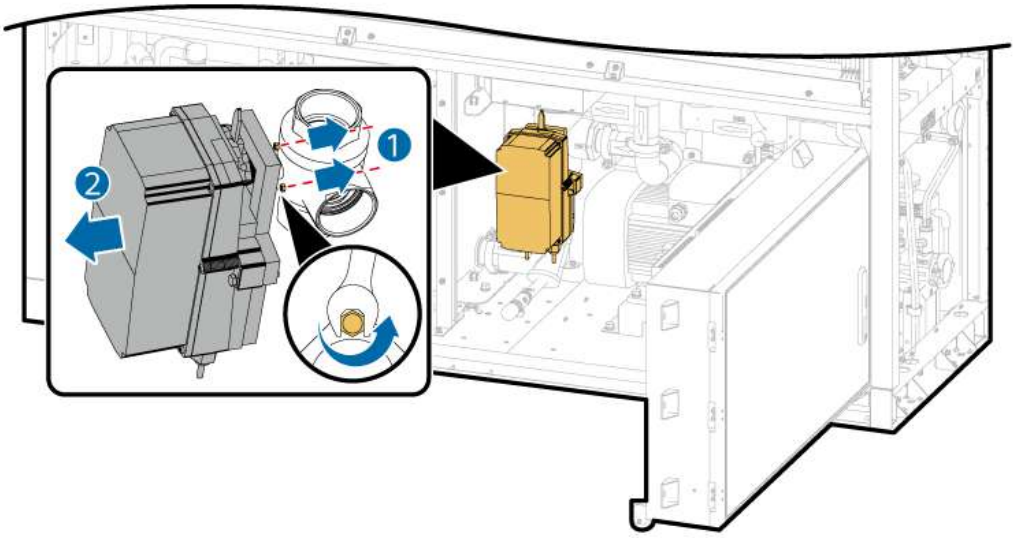
See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

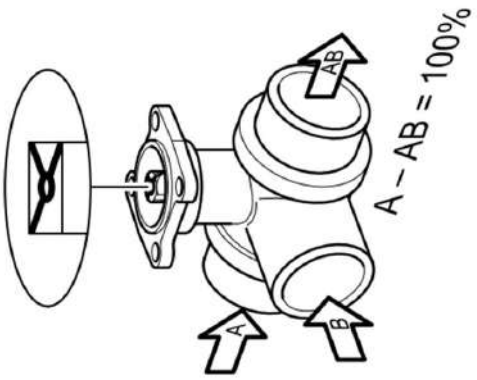
See **Figure 7-15**.

Step 4 Remove the power cable and communications cable from the multi-way valve. The following figure shows the position of the cable interconnection terminal.

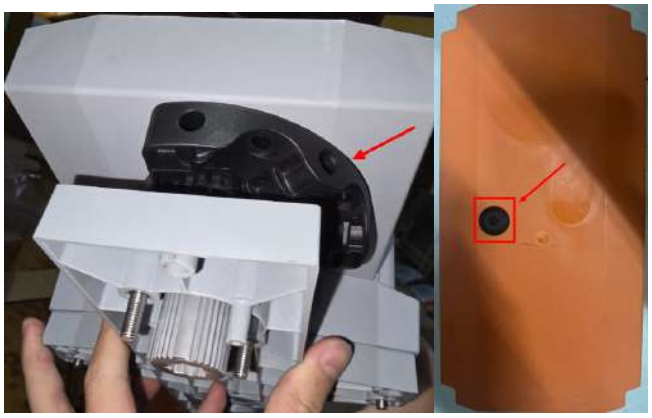
Step 5 Remove the two screws and take out the multi-way valve actuator.



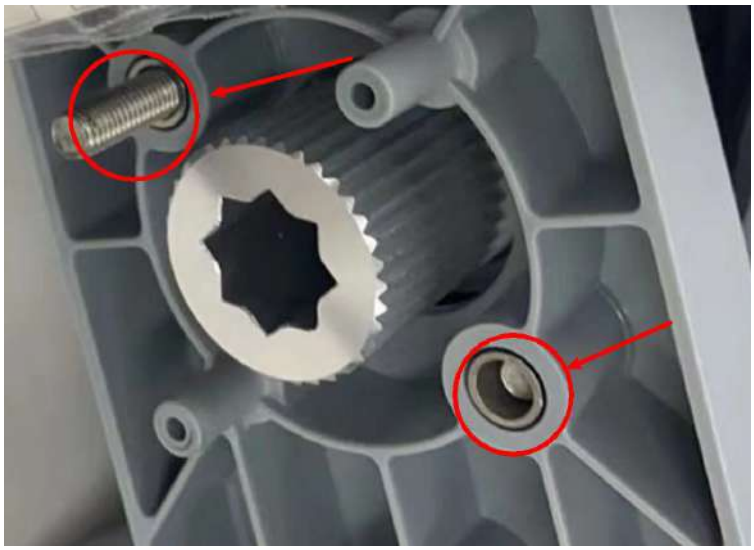
Step 6 Before installing the actuator, ensure that the valve balls of the valve body are in the correct positions. The valve axes are marked up, down, and left (A: plate heat exchanger; B: natural cooling; AB: coolant supply pipe; A – AB = 100%; B – AB = 0%). If the position of the valve shaft is different from that shown in the figure, use a wrench to rotate the valve shaft to the position shown in the figure.



Step 7 Before installing the actuator, ensure that the actuator is in the correct position. The black quarter circle is in the position shown in the figure. If the actual position is different from that shown in the figure, press the black button on the actuator cover and rotate the black gear to the position shown in the figure.



Step 8 Remove the two nuts from the rear of the actuator, as shown in the figure. Clamp the actuator drive structure to the valve shaft, and tighten the two removed nuts to 8 N·m.



Step 9 Install the power cable and communications cable for the multi-way valve.

Step 10 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 11 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.

4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info** > **Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.7 Replacing a Multi-Way Valve

Prerequisites

- Tools: coolant filling/drainage machine, security torx torque screwdriver, insulated torque socket wrench (with an extension rod)
- Materials: three sealing rings
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- Check that the valve body matches the actuator gear.

Procedure

Step 1 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 2 Close the two butterfly valves connecting the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

For details, see **Figure 7-13**.

Step 3 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 4 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

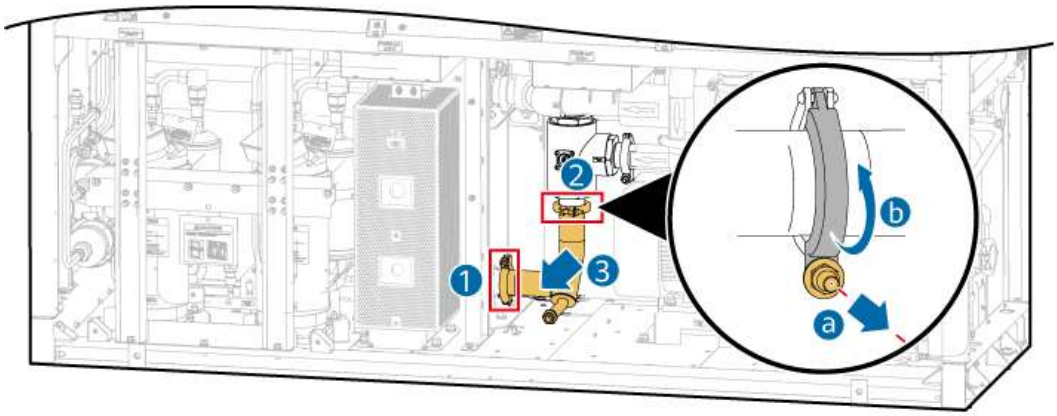
Step 5 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

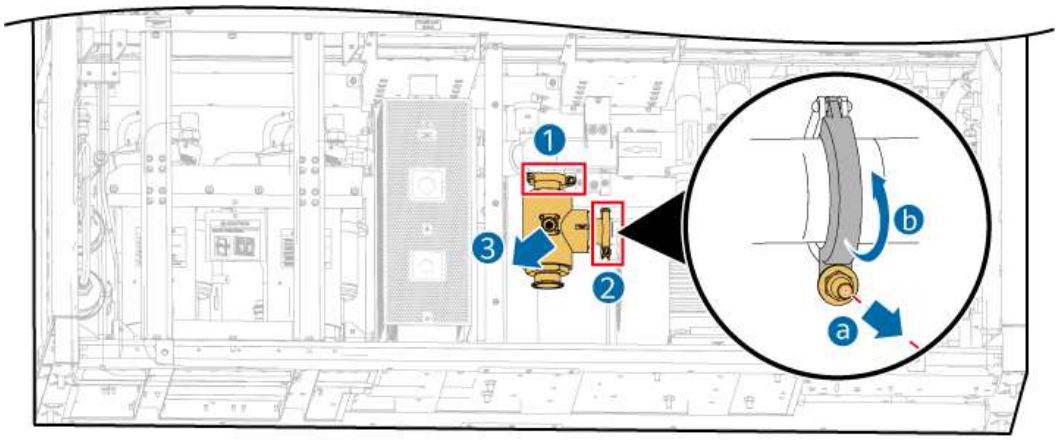
Step 6 Completely drain the coolant inside the LTMS.

Step 7 Remove the multi-way valve actuator. For details, see **8.6 Replacing a Multi-Way Valve Actuator**.

Step 8 Remove the pipe under the multi-way valve.

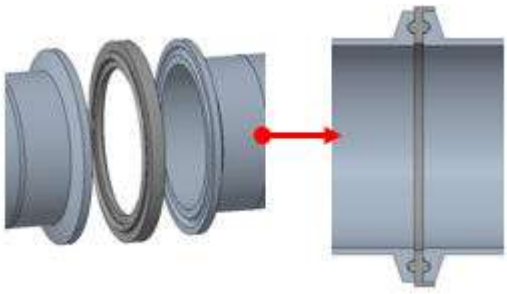


Step 9 Remove the clamp from the coolant inlet/outlet pipe of the multi-way valve using an M8 socket wrench, take out the multi-way valve, and remove the sealing ring.



Step 10 Place the new three-way valve body in the original position (ensure that the valve shaft faces the maintenance side).

Step 11 Install three new clamp sealing rings in the grooves of the pipe port. Ensure that the round protrusions on the sealing rings match the grooves of the sealing ports. Align the sealing rings with the new multi-way valve and coolant inlet/outlet pipe connector.



Step 12 Put the clamp on the joint of the multi-way valve, and use a socket wrench to tighten the clamp nut on the coolant inlet/outlet pipe port to 10 N·m.

Step 13 Check that the valve matches the gear of the new actuator. For details, see **8.6 Replacing a Multi-Way Valve Actuator**.

Step 14 Reinstall the pipe under the multi-way valve.

Step 15 Install the multi-way valve actuator. For details, see **8.6 Replacing a Multi-Way Valve Actuator**.

Step 16 Refill coolant into the LTMS.

Step 17 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 18 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 19 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 20 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Click **Cleared** next to **Clear total switching times of multi-way valve**.
2. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
3. Select **Manual** from the **Diagnostic Mode** drop-down list.
4. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
5. Set **Setting status of circulating pump 1** to the maximum speed.
6. Click **Submit**.
7. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.

2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.8 Replacing an Electric Heater

Prerequisites

- Tools: coolant filling/drainage machine, security torx torque screwdriver, insulated torque socket wrench (with an extension rod)
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 2 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 3 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 4 Pull out the electric control box and rotate it by 90 degrees.

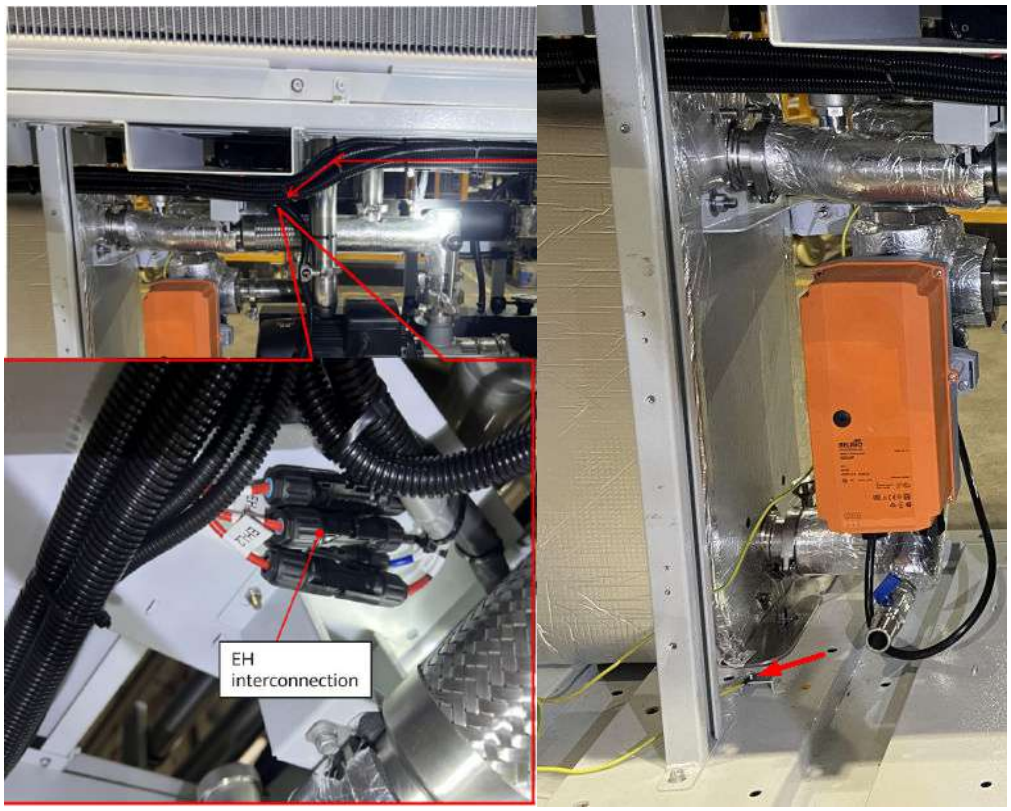
See **Figure 7-15**.

Step 5 Close the two butterfly valves connecting the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

For details, see **Figure 7-13**.

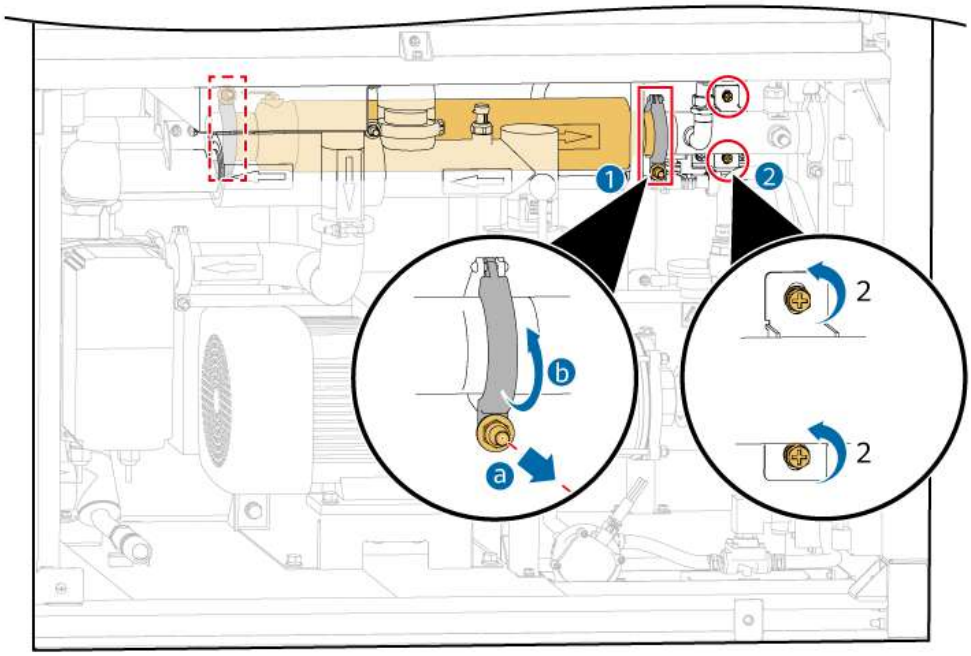
Step 6 Completely drain the coolant inside the LTMS.

Step 7 Remove the interconnection terminals (EH-L1, EH-L2, EH-L3, EH-N, EH-W and EH-W) of the electric heater cable, and remove the ground terminal and binding point.



Step 8 Remove the clamp nuts (M8) from the coolant inlet and outlet pipes of the electric heater using a socket wrench, loosen the screws on the right, move the coolant outlet pipe of the electric heater, take out the electric heater, and remove the sealing ring.

Figure 7-19 Removing the electric heater



Step 9 Place the new electric heater in the original position (pay attention to the coolant inlet side of the electric heater, that is, the cable outlet end is close to the plate heat exchanger).

Step 10 Install a new sealing ring in the groove of the pipe port. Ensure that the round protrusion on the sealing ring matches the groove of the sealing port. Adjust the position of the electric heater to press the sealing ring tightly.

Step 11 Put the clamp on the joint of the clamp plate, and use a socket wrench to tighten the clamp nut on the coolant inlet/outlet pipe port to 10 N·m.

Step 12 Install the interconnection terminals (EH-L1, EH-L2, EH-L3, EH-N, EH-W and EH-FU) for the electric heater cable, install the ground terminal, and bind the cable again.

Step 13 Refill coolant into the LTMS.

Step 14 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 15 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 16 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 17 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Click **Cleared** next to **Clear total runtime of electric heater**.
2. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
3. Select **Manual** from the **Diagnostic Mode** drop-down list.
4. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
5. Set **Setting status of circulating pump 1** to the maximum speed.
6. Click **Submit**.
7. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Electric heating** from the **Battery temperature control mode for diagnosis** drop-down list.

4. Set **Electric heater setting status** to **On**
5. Click **Submit**.
6. Check whether the supply coolant temperature on the battery side increases.

Step 5 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Electric heating** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Electric heater setting status** to **Off**.
5. Click **Submit**.

Step 6 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.9 Replacing a Liquid Refill Pump

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and clamp pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 Remove the coolant from the tank through the liquid refill port. For details, see Coolant Drainage Procedure in Filling/Draining All of the Coolant in the LTMS.

Step 6 Remove the interconnection terminal from the liquid refill pump cable.

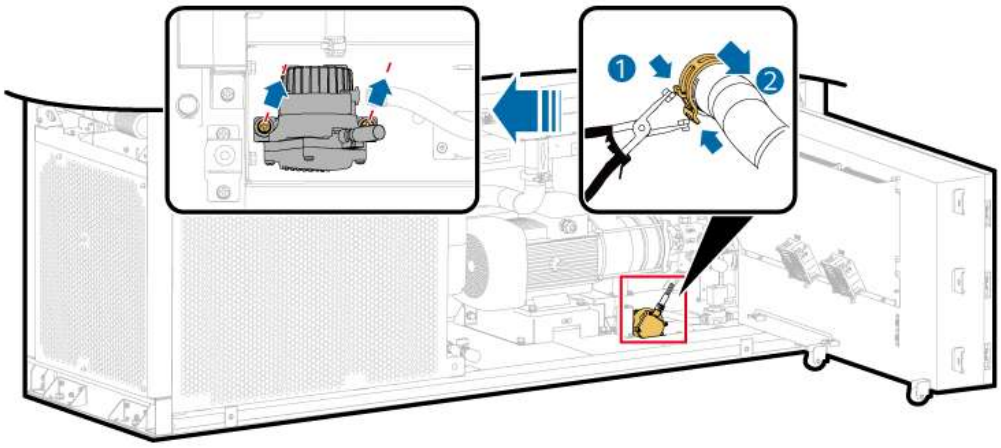
Step 7 Remove the liquid refill pump.

1. Remove the clamps from the inlet and outlet of the liquid refill pump using a clamp pliers, and disconnect the liquid refill pump from the hose.

> ⚠ CAUTION
>
> When disconnecting the liquid refill pump from the hose, a small amount of coolant will flow out of the hose. Use a cloth to wipe it away.

2. Remove the screws from the liquid refill pump using a Phillips screwdriver.

Figure 7-20 Removing the liquid refill pump



Step 8 Install a new liquid refill pump.

1. Tighten the screws (M6) on the liquid refill pump to 5 N·m using a socket wrench.
2. Connect the inlet and outlet of the new liquid refill pump to the hose, insert the hose to the bottom end with a gap of less than or equal to 0.5 mm.
3. Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the liquid refill pump.

Step 9 Install the interconnection terminal to the liquid refill pump cable.

Step 10 Fill coolant into the tank through the liquid refill port. For details, see Coolant Filling Procedure in Filling/Draining All of the Coolant in the LTMS.

Step 11 Rotate the electric control box to the original position, and tighten the three screws on the electric control box to 5 N·m.

Step 12 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 13 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 14 Close the door of the LTMS on the front of the container.

----End

7.10 Replacing a Tank

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, insulated adjustable torque wrench, and clamp pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 Close the two butterfly valves that connect the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

See **Figure 7-13**.

Step 6 Close the butterfly valve for the coolant outlet pipe of the circulation pump.

Step 7 Drain the coolant from coolant filling/drainage port 1.

Step 8 Remove the circulation pump. For details, see **7.4 Replacing a Circulation Pump**.

Step 9 Remove the liquid level switch at the bottom of the tank. For details, see **7.20 Replacing a Liquid Level Sensor**.

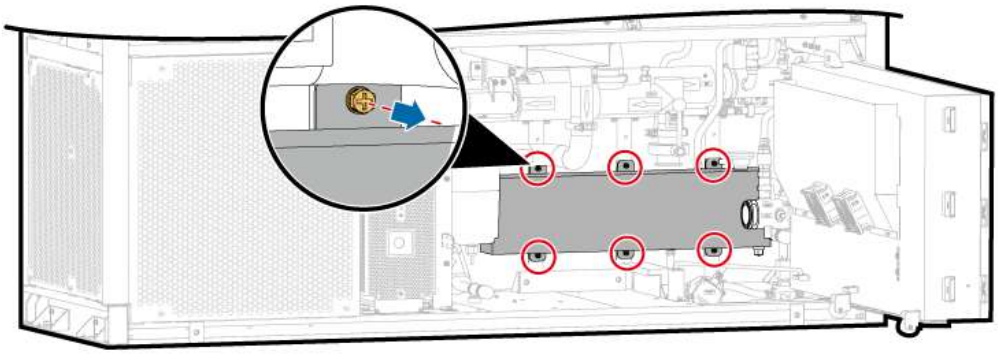
Step 10 Remove the tank.

1. Remove the clamps from the hose that connects the tank and the safety valve and the hose that connects the tank and the liquid refill pump using a clamp pliers, and remove the hoses.

   NOTE

   A small amount of coolant will flow out when you remove the hose. Use a cloth to wipe it away.

2. Remove the screws (M6) from the tank using a socket wrench.



Step 11 Install a new tank.

1. Tighten the screws on the tank to 5 N·m using a socket wrench.
2. Connect the inlet and outlet of the tank to the hose, insert the hose to the bottom end with a gap of less than or equal to 0.5 mm.
3. Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the tank.

Step 12 Install the liquid level switch at the bottom of the tank. For details, see **7.20 Replacing a Liquid Level Sensor**.

Step 13 Fill the coolant from coolant filling/drainage port 1.

Step 14 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 15 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 16 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 17 Close the door of the LTMS on the front of the container.

----End

7.11 Replacing a Pressure Sensor

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and insulated torque open-end wrench
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

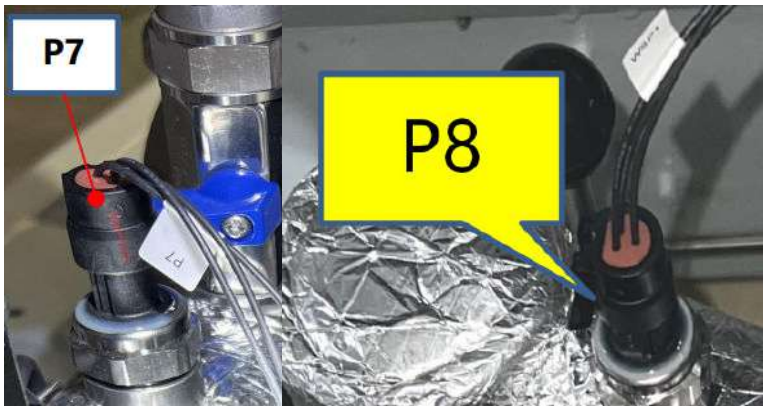
Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

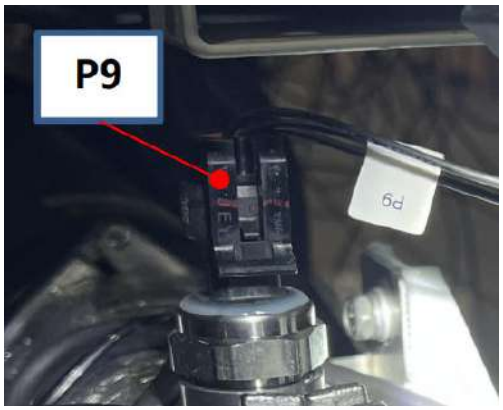
See **Figure 7-11**.

Step 5 The coolant drainage scope varies according to the position of the pressure sensor.

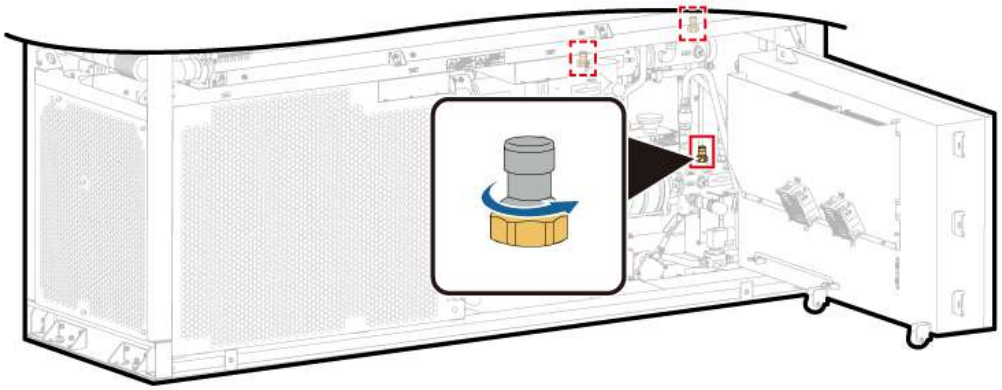
Pressure Sensor Position	Coolant Drainage Scope	Closing Butterfly Valves
Return coolant pressure sensor P7	Draining part of the coolant in the LTMS	Butterfly valve for the coolant outlet pipe of the circulation pump, and butterfly valve for the pipe that connects the circulation pump inlet to the container
Circulation pump outlet pressure sensor P8 and supply coolant pressure sensor P9	Draining all of the coolant in the LTMS	Two butterfly valves on the pipe that connects the LTMS and the container

Step 6 Remove the interconnection terminals from the pressure sensor.





Step 7 Remove the pressure sensor using an open-end wrench.



Step 8 Lubricate the sealing ring of the new pressure sensor using coolant, and tighten the pressure sensor to 35 N·m.

Step 9 Install the interconnection terminals from the pressure sensor.

Step 10 Refill coolant based on the drainage scope. For details, see How to Use a Coolant Filling/Drainage Machine.

Step 11 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 12 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 13 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 14 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to **0**.
5. Click **Submit**.

Step 4 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Electric heating** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Electric heater setting status** to **On**
5. Click **Submit**.
6. Check whether the supply coolant temperature on the battery side increases.

Step 5 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

Check whether the values of **Battery-side supply water pressure**, **Battery-side return water pressure**, and **Circulating water pump 1 outlet pressure** are consistent. (The difference between the maximum and minimum values shall not exceed 0.3 bar.)

Step 6 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.12 Replacing an Exhaust Valve

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and insulated adjustable torque wrench, transparent waterproof sealant, and ladder

- Materials: 1/2" sealing ring
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 Close the two butterfly valves connecting the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

For details, see **Figure 7-13**.

Step 6 Completely drain the coolant inside the LTMS.

Step 7 Remove exhaust valve 1 or 2 based on the position of the faulty exhaust valve.

Step 8 Use two wrenches at the same time. One is used to secure the connector at the bottom, and the other is used to rotate and remove the exhaust valve. Then, remove the 1/2" sealing ring.

Step 9 Remove the bonnet of the new exhaust valve by loosening it counterclockwise and then removing it. Replace the bonnet with an adapter with a hose.

Step 10 Lubricate the new 1/2" sealing ring using coolant, and tighten the new exhaust valve to 20 N·m.

Step 11 Fill the gap between the two ends of the 1/2" sealing ring with transparent waterproof sealant. The gap must be filled to be at least flush with the outer surface of the sealing ring (there is no requirement on the appearance).

Step 12 Refill coolant into the LTMS.

Step 13 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 14 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 15 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 16 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.13 Replacing a Safety Valve

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, insulated adjustable torque wrench, and clamp pliers
- Materials: 1/2-inch sealing ring and transparent waterproof sealant
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- The safety valve cannot be removed separately due to limited operation space. When replacing the safety valve, remove the safety valve and pressure relief ball valve together.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 3 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 4 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 5 Close the two butterfly valves connecting the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

For details, see **Figure 7-13**.

Step 6 Completely drain the coolant inside the LTMS.

Step 7 Remove the clamp from the safety valve outlet using a clamp pliers and remove the hose.

Figure 7-21 Safety valve

Step 8 Use two wrenches at the same time. One is used to secure the connector at the bottom, and the other is used to rotate and remove the pressure relief ball valve. Then, remove the 1/2" sealing ring.

Step 9 Use two wrenches to secure the safety valve connector. Rotate the other wrench to remove the pressure relief ball valve, separate the safety valve from the pressure relief ball valve, and remove the 1/2" sealing ring.

Step 10 Install a new safety valve, lubricate the new 1/2" sealing ring with coolant, and tighten the new safety valve to 20 N·m.

Step 11 Lubricate the new 1/2" sealing ring using coolant, and tighten the pressure relief ball valve to 20 N·m.

Step 12 Fill the gap between the two ends of the 1/2" sealing ring assembly with transparent waterproof sealant. The gap must be filled to be at least flush with the outer surface of the sealing ring (there is no requirement on the appearance).

Step 13 Connect the hose to the safety valve outlet. Insert the hose to the bottom end with a gap of less than or equal to 0.5 mm.

Step 14 Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the safety valve.

Step 15 Open the pressure relief ball valve.

Step 16 Refill coolant into the LTMS.

Step 17 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 18 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 19 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 20 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.14 Replacing a Sealing Ring

For details, see the maintenance procedure for the sealing ring of the corresponding component.

7.15 Replacing a Hose and Elastic Clamp

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and clamp pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 The coolant drainage scope varies according to the positions of the hose and elastic clamp. For details, see How to Use a Coolant Filling/Drainage Machine.

Pressure Sensor Position	Coolant Drainage Scope	Closing Butterfly Valves
Hose and elastic clamp (exhaust valve 2)	Draining all of the coolant in the LTMS	Two butterfly valves on the pipe that connects the LTMS and the container
Hose and elastic clamp (expansion tank loop and liquid refill loop)	Draining part of the coolant in the LTMS	Butterfly valve for the coolant outlet pipe of the circulation pump, and butterfly valve for the pipe that connects the circulation pump inlet to the container
Hose and elastic clamp (safety valve outlet)	N/A	N/A

Step 6 Remove the clamp using a clamp pliers and remove the hose.

NOTE

A small amount of coolant will flow out when you remove the hose. Use a cloth to wipe it away.

Step 7 Replace the hose and clamp.

Step 8 Connect the hose to component. Insert the hose to the bottom end with a gap of less than or equal to 0.5 mm.

Step 9 Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the component.

Step 10 Fill coolant into the LTMS. For details, see How to Use a Coolant Filling/Drainage Machine.

Step 11 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 12 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 13 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 14 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.

3. Click **Submit**.

----End

7.16 Replacing a Ball Valve

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and insulated adjustable torque wrench
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

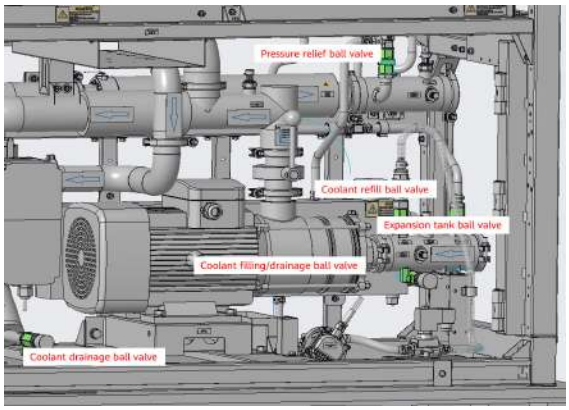
Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 The coolant drainage scope varies according to the position of the ball valve. For details, see How to Use a Coolant Filling/Drainage Machine.

Table 7-2 Ball valve positions and coolant drainage scope

Ball Valve Position	Coolant Drainage Scope
Coolant filling/drainage ball valve 1, coolant refill ball valve, and expansion tank ball valve	Draining part of the coolant in the LTMS
Coolant filling/drainage ball valve 2 and pressure relief ball valve	Draining all of the coolant in the LTMS



Step 6 Use two wrenches to secure the connectors at both ends of the ball valve, use another wrench to rotate and remove the ball valve, remove the ball valve, and remove the 1/2" sealing ring.

Step 7 Lubricate the new 1/2" sealing ring using coolant, and tighten the new ball valve to 20 N·m.

Step 8 Fill the gap between the two ends of the 1/2" sealing ring assembly with transparent waterproof sealant. The gap must be filled to be at least flush with the outer surface of the sealing ring (there is no requirement on the appearance).

Step 9 Refill coolant based on the drainage scope. For details, see How to Use a Coolant Filling/Drainage Machine.

Step 10 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 11 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 12 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 13 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.17 Replacing a Butterfly Valve

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, and insulated torque socket wrench
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

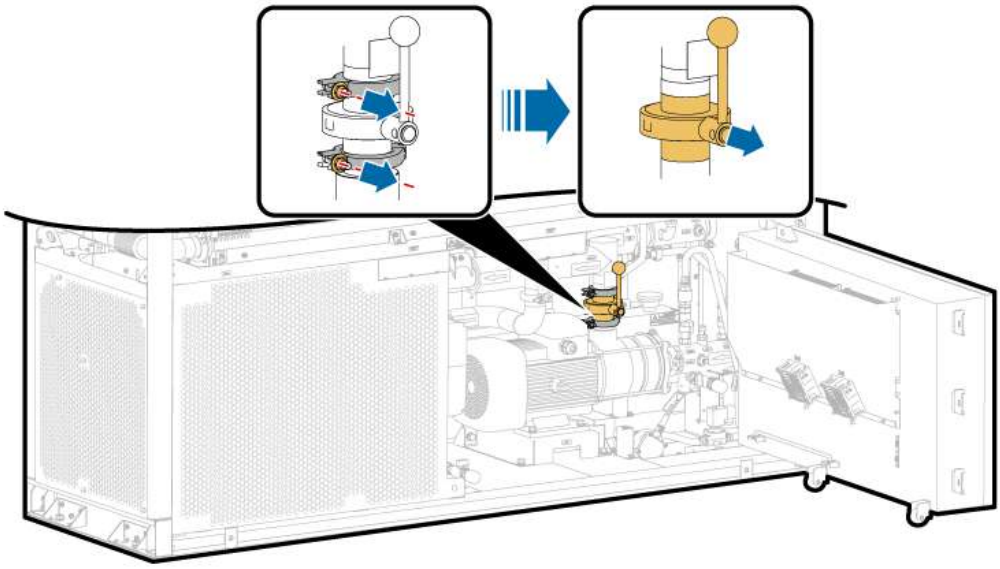
See **Figure 7-11**.

Step 5 Close the two butterfly valves connecting the LTMS to the container. Ensure that the butterfly valve handles are vertical to the pipes.

For details, see **Figure 7-13**.

Step 6 Completely drain the coolant inside the LTMS.

Step 7 Remove the clamp nuts (M8) from the coolant inlet/outlet pipe of the butterfly valve using a socket wrench, and remove the clamps, butterfly valve, and sealing ring.



Step 8 Place the new butterfly valve in the original position and align it with the clamp plate connector.

Step 9 Install the new sealing ring in the groove of the clamp plate. Ensure that the round protrusion on the sealing ring matches the groove of the sealing port. Adjust the position of the butterfly valve to press the sealing washer tightly.

Step 10 Insert the clamp into the joint of the clamp plate.

Step 11 Use a torque wrench to tighten the clamp nuts at the coolant inlet/outlet pipe port to 10 N·m.

Step 12 Check whether the butterfly valve is open. If not, manually open the butterfly valve.

Step 13 Refill coolant into the LTMS.

Step 14 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 15 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 16 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 17 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.18 Replacing a Liquid Refill Solenoid Valve

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, Phillips insulated torque screwdriver, and clamp pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 Remove the coolant from the tank through the liquid refill port. For details, see Coolant Drainage Procedure in Filling/Draining All of the Coolant in the LTMS.

Step 6 Remove the wiring terminals from the solenoid valve.

Step 7 Remove the liquid refill solenoid valve.

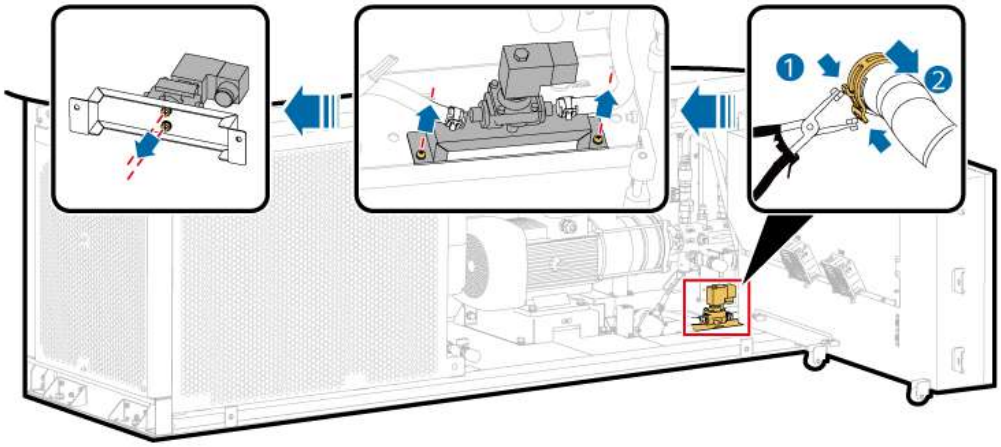
1. Remove the clamps from the inlet and outlet of the liquid refill solenoid valve using a clamp pliers, and disconnect the liquid refill solenoid valve from the hose.

   CAUTION

   When disconnecting the liquid refill solenoid valve from the hose, a small ammo of coolant will flow out of the hose.

2. Remove the screws from the liquid refill solenoid valve bracket using a Phillips screwdriver.
3. Remove the screws of the solenoid valve using a Phillips screwdriver.

Figure 7-22 Removing the liquid refill solenoid valve



Step 8 Install a new liquid refill solenoid valve.

1. Use a Phillips insulated torque screwdriver to tighten the screws (M5) on the liquid refill solenoid valve to 3 N·m.
2. Put the liquid refill solenoid valve and bracket back to the original position and tighten the screws (M4). Ensure that the solenoid valve is installed in the correct direction and the arrow points to the check valve. The tightening torque is 1.6 N·m.

3. Connect the inlet and outlet of the liquid refill pump to the hose, insert the hose to the bottom end with a gap of less than or equal to 0.5 mm.
4. Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the liquid refill solenoid valve.

Step 9 Fill coolant into the tank through the liquid refill port. For details, see Coolant Filling Procedure in Filling/Draining All of the Coolant in the LTMS.

Step 10 Rotate the electric control box to the original position, and tighten the three screws on the electric control box to 5 N·m.

Step 11 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 12 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 13 Close the door of the LTMS on the front of the container.

----End

7.19 Replacing a Check Valve

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, insulated adjustable torque wrench, and clamp pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 5 Close the butterfly valve for the coolant outlet pipe of the circulation pump and butterfly valve for the pipe that connects the circulation pump inlet to the container.

Step 6 Drain the coolant from coolant filling/drainage port 1.

Step 7 Remove the check valve.

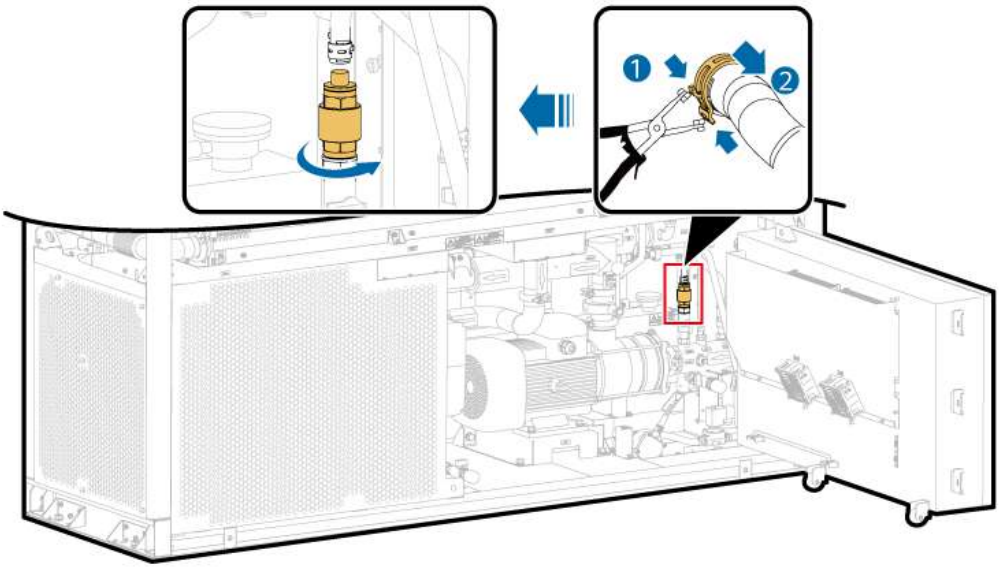
1. Remove the clamp from the inlet of the check valve using a clamp pliers and remove the hose.

   NOTE

   A small amount of coolant will flow out when you remove the hose. Use a cloth to wipe it away.

2. Use two wrenches at the same time. One is used to secure the connector at the bottom, and the other is used to rotate and remove the check valve. Then, remove the 1/2" sealing ring.

Figure 7-23 Check valve



Step 8 Use coolant to lubricate the new 1/2" sealing ring. Ensure that the arrow on the check valve points downward. Use two wrenches to secure the connector at the bottom and the other torque wrench to tighten the new check valve to 20 N·m.

Step 9 Fill the gap between the two ends of the 1/2" sealing ring assembly with transparent waterproof sealant. The gap must be filled to be at least flush with the outer surface of the sealing ring (there is no requirement on the appearance).

Step 10 Connect the hose to the check valve. Insert the hose to the bottom end with a gap of less than or equal to 0.5 mm.

Step 11 Use clamp pliers to install the clamp in the middle of the I-shaped mark of the hose. Ensure that the clamp does not tilt by more than 5 degrees and secure the hose to the check valve.

Step 12 Fill the coolant from coolant filling/drainage port 1.

Step 13 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 14 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 15 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 16 Close the door of the LTMS on the front of the container.

----End

7.20 Replacing a Liquid Level Sensor

Prerequisites

- Tools: coolant filling/drainage machine, insulated security torx torque screwdriver, insulated torque socket wrench, and insulated adjustable torque wrench
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 2 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 3 Remove the three screws from the LTMS electric control box using a Phillips screwdriver.

See **Figure 7-14**.

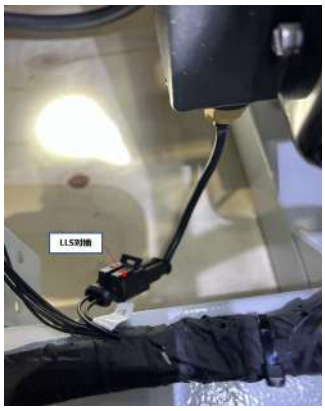
Step 4 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

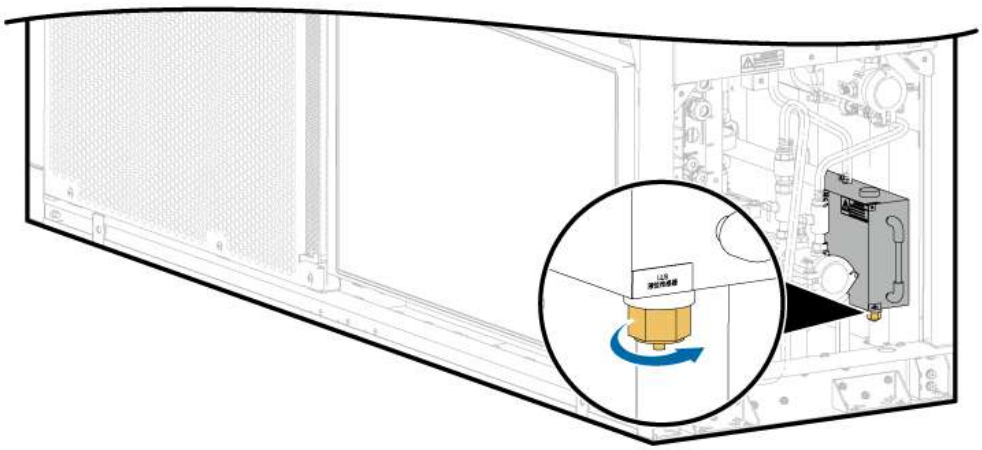
Step 5 Close the butterfly valve for the coolant outlet pipe of the circulation pump and butterfly valve for the pipe that connects the circulation pump inlet to the container

Step 6 Drain the coolant from coolant filling/drainage port 1.

Step 7 Disconnect the wiring terminal of the liquid level sensor.



Step 8 Remove the liquid level sensor from the bottom of the tank using an adjustable wrench.



Step 9 Install a new liquid level sensor and tighten the screws (M14) to 74 N·m. Do not miss the sealing ring.

Step 10 Connect the wiring terminal of the liquid level sensor.

Step 11 Fill the coolant from coolant filling/drainage port 1.

Step 12 Rotate the electric control box by 90 degrees to the original position, and tighten the three screws to 5 N·m.

Step 13 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

Step 14 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 15 Close the door of the LTMS on the front of the container.

----End

7.21 Replacing an Evaporative Plate Heat Exchanger

Prerequisites

- Tools: forklift (see **4.2 Forklift Requirements**) or crane (see **4.3 Crane Requirements**), LTMS maintenance fixture, coolant filling/drainage machine, ladder, insulated torque Phillips screwdriver, insulated torque flat-head screwdriver, insulated hexagon torque screwdriver, insulated torque socket wrench (with an extension rod), safety gloves, safety shoes, safety helmet, safety rope, welding torch, refrigerant reclamation pump, refrigerant reclamation tank, and refrigerant filling device
- Materials: R410A refrigerant and 50 L coolant (50% ethylene glycol solution. Contact the Company's engineers to purchase it.)

NOTE

- Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
- The personnel, tools, and environment must meet relevant safety requirements.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

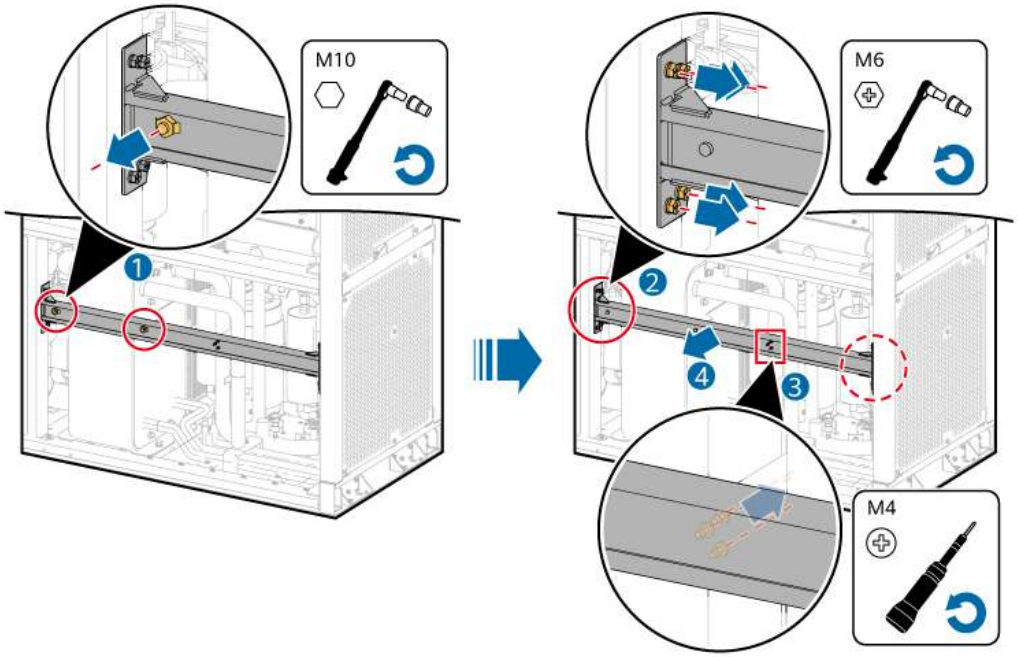
Step 1 Remove cables and pipes from the LTMS. For details, see **Removing LTMS Cables and Pipes**.

Step 2 Remove the LTMS. For details, see **7.2 Removing and Reinstalling an LTMS**.

Step 3 Reclaim the refrigerant from the low-pressure needle valve and liquid pipe needle valve of compressor 1 and compressor 2 to ensure that there is no pressure inside the system.

Step 4 Remove the beam that secures the evaporative plate heat exchanger.

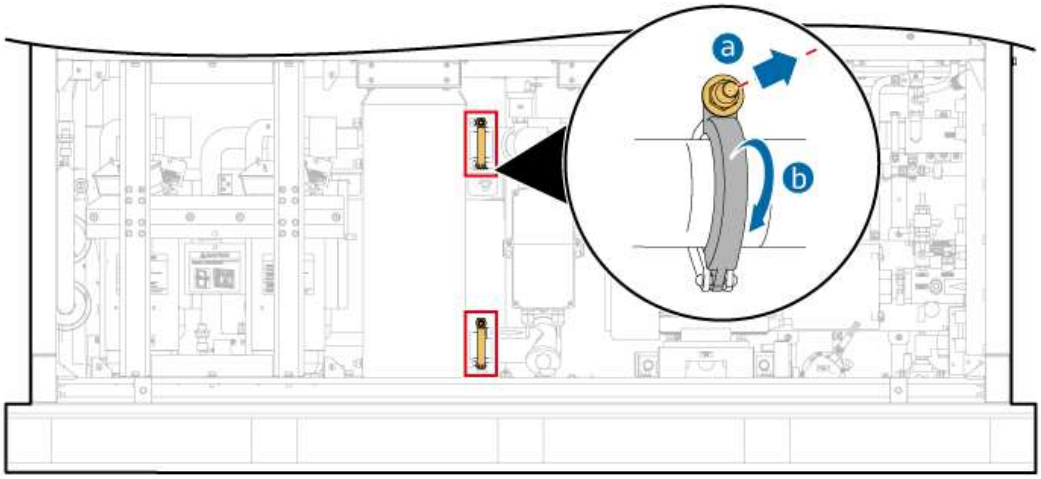
Figure 7-24 Removing the beam that secures the evaporative plate heat exchanger



Step 5 Remove the pipe between the evaporative plate heat exchanger and the LTMS.

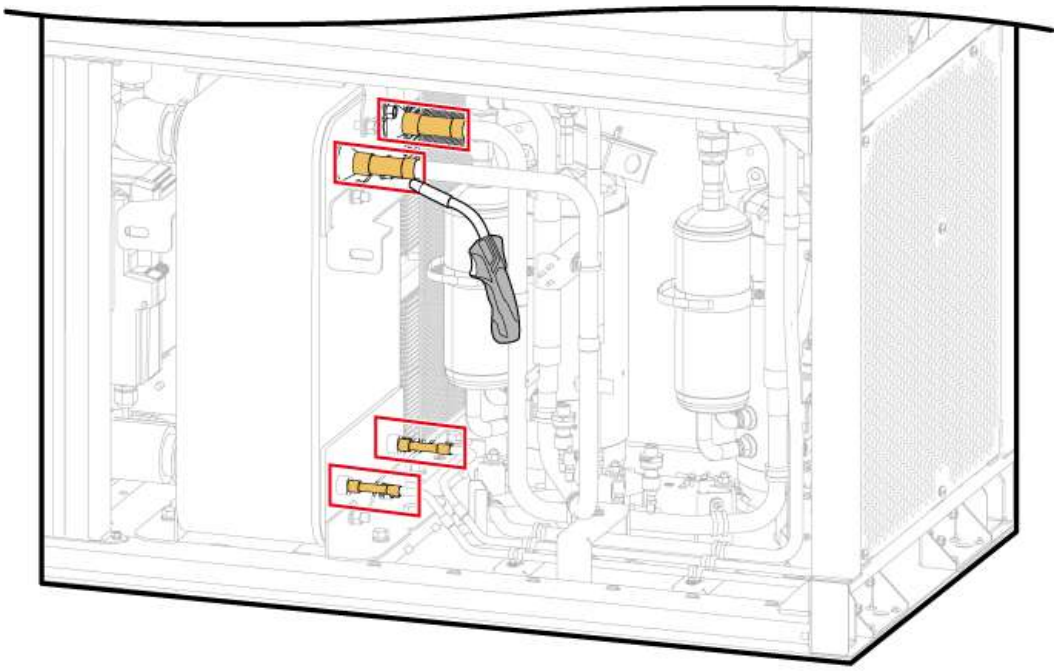
1. Remove the quick-mount clamp using an M8 socket wrench and remove the sealing ring.

Figure 7-25 Removing the quick-mount clamp



2. Use a welding torch to heat the four welding points of the inlet and outlet pipes. After the ports are separated, seal the pipe ports immediately to keep the system clean and prevent moisture from entering the system.

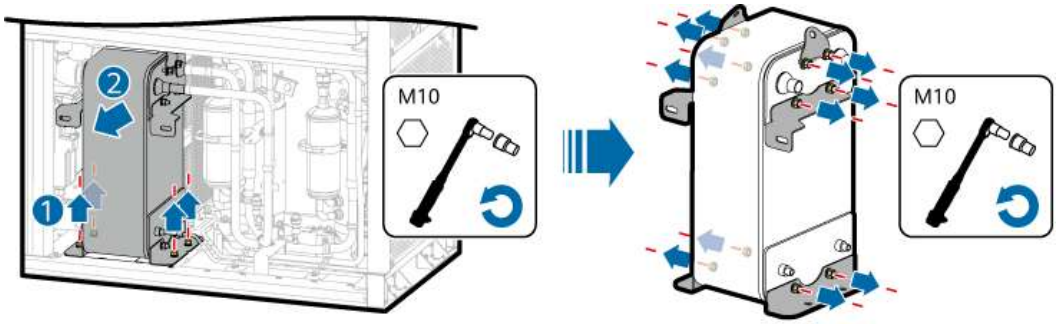
Figure 7-26 Separating copper pipe ports



Step 6 Remove the old evaporative plate heat exchanger.

1. Remove the nuts from the evaporative plate heat exchanger base using an M10 socket wrench.
2. Take out the evaporative plate heat exchanger and base.
3. Remove the screws from the evaporative plate heat exchanger support using a socket wrench.

Figure 7-27 Removing the old evaporative plate heat exchanger



Step 7 Install a new evaporative plate heat exchanger.

1. Install supports on the new evaporation plate and tighten the screws to 27 N·m.

2. Place the new evaporator plate heat exchanger and bracket in the original position, and align them with the coolant inlet and outlet pipe connectors.

Step 8 Install the sealing gasket in the groove of the pipe port. Ensure that the round protrusion on the sealing ring matches the groove of the sealing port. Adjust the position of the evaporator plate heat exchanger to press the sealing washer tightly.

Step 9 Install the clamp at the joint of the pipe port on the evaporator plate heat exchanger.

Step 10 Use a torque wrench to tighten the clamp nuts at the coolant inlet/outlet pipe port to 10 N·m.

Step 11 Reconnect the refrigerant copper pipe and weld the port.

Before welding, understand and comply with the safety requirements. For details, see **Welding**.

Step 12 Tighten the screws on the evaporator plate heat exchanger base to 27 N·m.

Step 13 Secure the beams of the evaporative plate heat exchanger by tightening M10 screws to 27 N·m, M6 screws to 5 N·m, and M4 screws to 1.6 N·m.

Step 14 Refill nitrogen to maintain the pressure. For details, see **7.24.3 Injecting Nitrogen for Pressure Preservation**.

Step 15 After checking that the system does not leak, vacuumize the system and fill part of the refrigerant by referring to **7.24.4 Vacuumizing and Precharging Refrigerant**.

Step 16 Reinstall the LTMS. For details, see **7.2 Removing and Reinstalling an LTMS**.

Step 17 Reconnect the LTMS and pipes. For details, see **Installing LTMS Cables and Pipes**.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Add the remaining refrigerant by referring to **7.24.5 (Optional) Charging the Remaining Refrigerant**.

----End

7.22 Replacing an Electronic Expansion Valve (EEV)

Prerequisites

- Tools: forklift (see **4.2 Forklift Requirements**) or crane (see **4.3 Crane Requirements**), LTMS maintenance fixture, coolant filling/drainage machine, ladder, insulated torque Phillips screwdriver, insulated torque flat-head screwdriver, insulated hexagon torque screwdriver, insulated torque socket wrench (with an extension rod), safety gloves, safety shoes, safety helmet, safety rope, welding torch, refrigerant reclamation pump, refrigerant reclamation tank, and refrigerant filling device
- Materials: R410A refrigerant and 50 L coolant (50% ethylene glycol solution. Contact the Company's engineers to purchase it.)

  NOTE

  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- The LTMS has two independent compressor systems, which correspond to different EEVs. Before the operation, confirm the position of the EEV to be replaced.

Procedure

Step 1 Remove cables and pipes from the LTMS. For details, see **Removing LTMS Cables and Pipes**.

Step 2 Remove the LTMS. For details, see **7.2 Removing and Reinstalling an LTMS**.

NOTE

If only the EEV coil needs to be replaced, you do not need to remove the LTMS.

Step 3 Reclaim refrigerant from the low-pressure needle valve and liquid pipe needle valve based on the position of the EEV to be replaced to ensure that there is no pressure inside the system.

Step 4 Remove the EEV and its coil.

1. Cut off the cable tie of the EEV and remove the EEV coil.

2. Use a welding torch to heat the pipe welding points on both sides of the EEV. After the pipe ports are separated, remove the EEV and seal the pipe ports immediately to keep the system clean and prevent moisture from entering the system.

Step 5 Install a new electronic expansion valve and its coil.

NOTICE

1. Protect the EEV by wrapping it with a wet cloth during welding to avoid damage.

2. When installing the EEV coil, rotate the coil back and forth for several times to ensure that the coil is properly installed.

1. Weld the EEV in the original position.

Before welding, understand and comply with the safety requirements. For details, see **Welding**.

2. Install the EEV coil.

Step 6 Refill nitrogen to maintain the pressure. For details, see **7.24.3 Injecting Nitrogen for Pressure Preservation**.

Step 7 After checking that the system does not leak, vacuumize the system and fill the refrigerant by referring to **7.24.4 Vacuumizing and Precharging Refrigerant** and **7.24.5 (Optional) Charging the Remaining Refrigerant**.

Step 8 Reinstall the LTMS. For details, see **7.2 Removing and Reinstalling an LTMS**.

Step 9 Reconnect the LTMS and pipes. For details, see **Installing LTMS Cables and Pipes**.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system**, click **Clear total runtime of EEV 1** or **Cleared** next to **Clear total runtime of EEV 1** based on the position of the replaced expansion valve.

Step 4 Add the remaining refrigerant by referring to **7.24.5 (Optional) Charging the Remaining Refrigerant**.

----End

7.23 Replacing a Filter Dryer

Prerequisites

- Tools: insulated security torx torque screwdriver, Phillips insulated torque screwdriver, flat-head screwdriver, insulated adjustable torque wrench (opening ≥ 36 mm), two adjustable wrenches, nitrogen cylinder, refrigerant tank, vacuum pump, pressure gauge, rubber hose, protective gloves, permanent threadlocker, refrigerant reclamation pump, refrigerant reclamation tank, and heat gun

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- The LTMS has two compressor systems, which correspond to different filter dryers. Before the operation, confirm the position of the filter dryer to be replaced.

Procedure

NOTICE

Reclaim or dispose of the refrigerant in accordance with local laws and regulations. Do not vent the refrigerant to the atmosphere. During the reclaim process, the R410A refrigerant composition may change. Therefore, you are not advised to refill the reclaimed R410A refrigerant to the cooling system.

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

See **Figure 7-8**.

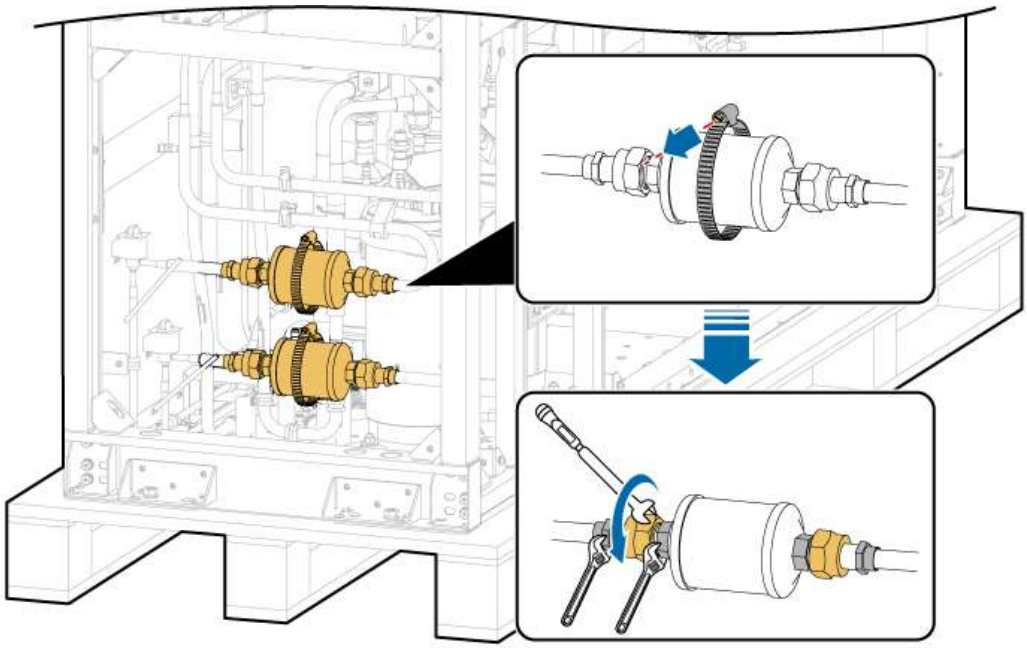
Step 3 Remove the inner mesh boards from the front and left of the LTMS.

Step 4 Reclaim refrigerant from the low-pressure needle valve and liquid pipe needle valve based on the position of the filter dryer to be replaced to ensure that there is no pressure inside the system.

Step 5 Remove the filter dryer.

1. Remove the hose clamp from the filter dryer using a flat-head screwdriver.
2. Heat the thread connection position of the adjustable nut using a heat gun for 10 minutes. Use two adjustable wrenches to secure the filter dryer nut and pipe nut, and use an adjustable torque wrench to loosen the adjustable nut until the pipe is separated from the filter dryer. Immediately seal the pipe opening after removal to keep the system clean and prevent water from entering the system.

Figure 7-28 Removing the filter dryer



Step 6 Remove the rubber plug sealing the port of a new filter dryer.

Step 7 Install the new filter dryer.

NOTICE

When installing the new filter dryer, identify the arrow on the filter dryer. The arrow direction shall be the same as the refrigerant flow direction, pointing to the EEV.

1. Apply permanent threadlocker to the outer screw thread of the filter dryer. The threadlocker shall be applied onto the third to the last but one circle from the pipe port. Secure the filter dryer nut and pipe nut using the two adjustable wrenches, and tighten the adjustable nuts using the torque wrench to 60 N·m.
2. Reinstall the hose clamp.

Step 8 Refill nitrogen to maintain the pressure. For details, see **7.24.3 Injecting Nitrogen for Pressure Preservation**.

Step 9 After checking that the system does not leak, vacuumize the system and fill the refrigerant by referring to **7.24.4 Vacuumizing and Precharging Refrigerant** and **7.24.5 (Optional) Charging the Remaining Refrigerant**.

Step 10 Install the inner mesh boards on the front and left of the LTMS, and tighten them to 5 N·m.

Step 11 Mount the LTMS sealing plate at the rear of the container onto the groove, and tighten the screws to 5 N·m.

Step 12 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Add the remaining refrigerant by referring to **7.24.5 (Optional) Charging the Remaining Refrigerant**.

----End

7.24 Replacing a Compressor

7.24.1 Replacing an Entire Compressor

Prerequisites

- Tools: fixture wrench (delivered with spare parts), insulated security torx torque screwdriver, Phillips insulated torque screwdriver, flat-head screwdriver, insulated adjustable torque wrench (opening ≥ 36 mm), two adjustable wrenches, vacuum pump, pressure gauge, rubber hose, protective gloves, refrigerant reclamation pump, refrigerant reclamation, and heat gun
- Materials: R410A refrigerant, nitrogen cylinder, and permanent threadlocker
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- The LTMS has two compressor systems. Confirm the position of the compressor to be replaced before the operation.
- To replace a compressor, you must replace the filter dryer.

NOTICE

- Reclaim or dispose of the refrigerant in accordance with local laws and regulations. During the reclaim process, the R410A refrigerant composition may change. Therefore, you are not advised to refill the reclaimed R410A refrigerant to the cooling system.
- Do not hold the suction and discharge vents when moving the compressor.
- When replacing a compressor, avoid skin contact with the refrigerant or refrigerant oil to prevent frostbite or burns.
- Do not tilt the compressor during replacement to prevent lubricant leaks.
- Install a new compressor immediately after you remove the rubber plugs of suction and discharge vents to prevent moisture intake.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

See **Figure 7-8**.

Step 3 Remove the inner mesh boards from the front and left of the LTMS.

Step 4 Reclaim refrigerant from the low-pressure needle valve and liquid pipe needle valve based on the position of the compressor to be replaced to ensure that there is no pressure inside the system.

Step 5 Remove the compressor.

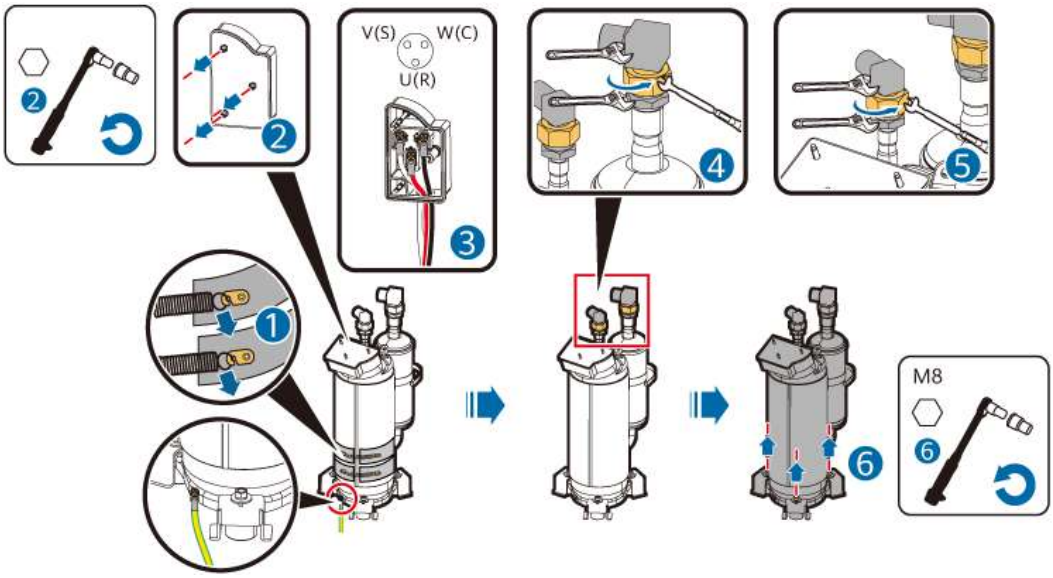
NOTICE

After removal, seal the suction and discharge vents of the pipe immediately to keep the system clean and prevent moisture from entering the system.

Two persons are required to remove the compressor angle valve using three wrenches to prevent the pipe from being distorted.

1. Remove the oil heating belt.
2. Remove the connection box cover.
3. Remove the compressor power cable and ground cable.
4. Heat the suction angle valve thread connection position for 10 minutes using a heat gun. Use two adjustable wrenches to secure the angle valve nut and pipe nut on the suction side, and use a torque wrench to loosen the adjustable nut until the pipe is separated from the angle valve. After removal, seal the suction vent immediately to keep the system clean and prevent water from entering the system.
5. Heat the discharge angle valve thread connection position for 10 minutes using a heat gun. Use two adjustable wrenches to secure the angle valve nut and pipe nut on the discharge side, and use a torque wrench to loosen the adjustable nut until the pipe is separated from the angle valve. After removal, seal the discharge vent immediately to keep the system clean and prevent water from entering the system.
6. Remove the washers and spring washers of the three nuts that secure the compressor and bracket using a socket wrench, and remove the compressor.

Figure 7-29 Removing the compressor



Step 6 Install a new compressor.

NOTICE

- The gradient for moving the compressor shall be less than or equal to 15 degrees. Do not hold the suction and discharge vents.
- Two persons are required to secure the compressor angle valve using three wrenches to prevent the pipe from being distorted.

1. Partially tighten and then tighten the three bolts to 13.5 N·m to secure the new compressor.
2. Install the O-ring in the nut groove of the discharge angle valve. Apply threadlocker, use two adjustable wrenches to secure the angle valve nut and pipe nut, and use a torque wrench to tighten the adjustable nut to a torque of 120 N·m.
3. Install the O-ring in the nut groove of the suction angle valve. Apply threadlocker, use two adjustable wrenches to secure the angle valve nut and pipe nut, and use a torque wrench to tighten the adjustable nut to a torque of 150 N·m.

Step 7 Install the compressor connection box, cables, and oil heating belt.

1. Place the sealing gasket.

2. Place the base of the compressor connection box.

3. Place the connector on the wiring terminal and bend the power cable terminal to clamp the connector.

4. Connect the power cables and tighten the screws to 2.8 N·m.

5. Secure the PG connector using a wrench to 3 N·m.

6. Place the sealing cover and metal plate. Install rubber pads, metal washers, and then nuts on the bolts. Tighten the nuts to 1.2 N·m.

Step 8 Install the compressor ground cable and oil heating belt. Tighten the ground cable to 1.6 N·m.

Step 9 Remove the old filter dryer and install a new one. For details, see **7.23 Replacing a Filter Dryer**.

Step 10 Refill nitrogen to maintain the pressure. For details, see **7.24.3 Injecting Nitrogen for Pressure Preservation**.

Step 11 After checking that the system does not leak, vacuumize the system and fill part of the refrigerant by referring to **7.24.4 Vacuumizing and Precharging Refrigerant** and **7.24.5 (Optional) Charging the Remaining Refrigerant**.

Step 12 Install the inner mesh boards on the front and left of the LTMS, and tighten them to 5 N·m.

Step 13 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Choose **Monitoring** > **ESS** > **Running Info > Temperature control system** and click **Clear compressor 2 total runtime** or **Cleared** next to **Clear compressor 2 total runtime** based on the location of the component to be replaced.

Step 4 Add the remaining refrigerant by referring to **7.24.5 (Optional) Charging the Remaining Refrigerant**.

----End

7.24.2 Refrigerant R410A

CAUTION

Do not use poor-quality refrigerant. Using poor-quality refrigerant will shorten the service life of sealing rings and components and cause refrigerant leakage. The supplier is not responsible for any device damage caused by low-quality refrigerant.

Verify that the refrigerant is authentic in the following ways:

1. Contact the refrigerant producer to confirm the refrigerant authenticity.
2. As shown in **Figure 7-30**, place the refrigerant in an indoor place with constant temperature and humidity for 24 hours. Then, use a thermometer to measure the temperature of the refrigerant tank outer surface and connect a pressure gauge to the pressure tank to measure the internal pressure. Find the saturation pressure corresponding to the measured outer surface temperature from **Table 7-3**. If the deviation between the saturation pressure and the measured internal pressure is greater than 0.2 MPa, the refrigerant does not meet the requirements and needs to be replaced.

Figure 7-30 Checking the refrigerant

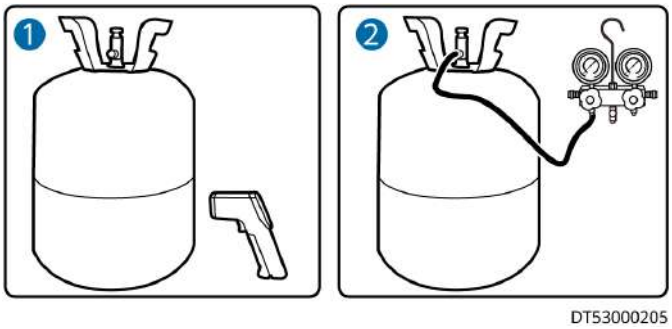


Table 7-3 Mapping between temperatures and R410A saturation pressure

Temperature (°C)	Saturation Pressure – Gauge Pressure (MPa)	Temperature (°C)	Saturation Pressure – Gauge Pressure (MPa)	Temperature (°C)	Saturation Pressure – Gauge Pressure (MPa)
0	0.7	19	1.31	38	2.21
1	0.73	20	1.35	39	2.27
2	0.75	21	1.39	40	2.33
3	0.78	22	1.43	41	2.39
4	0.81	23	1.47	42	2.45
5	0.84	24	1.51	43	2.51
6	0.87	25	1.56	44	2.57
7	0.9	26	1.60	45	2.63
8	0.93	27	1.65	46	2.7
9	0.96	28	1.69	47	2.76
10	0.99	29	1.74	48	2.83
11	1.02	30	1.79	49	2.9
12	1.05	31	1.84	50	2.97
13	1.09	32	1.89	51	3.04
14	1.12	33	1.94	52	3.11
15	1.16	34	1.99	53	3.19
16	1.19	35	2.04	54	3.26
17	1.23	36	2.1	55	3.34
18	1.27	37	2.15	–	–

7.24.3 Injecting Nitrogen for Pressure Preservation

Prerequisites

NOTICE

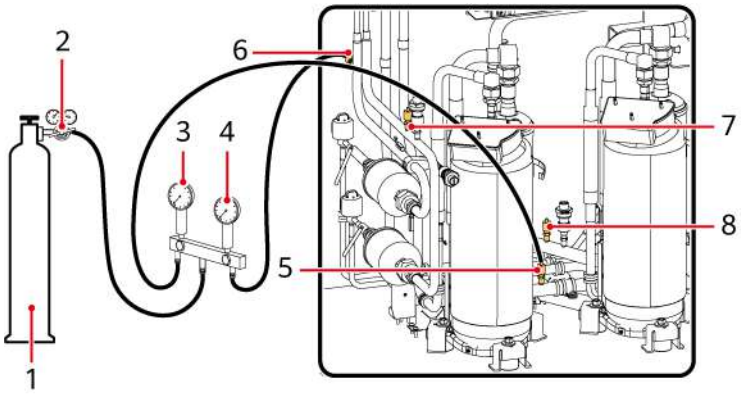
- The LTMS has two independent compressor systems. The following figure uses one compressor system as an example.
- Refrigerant pipes have been connected.
- The measuring range of the pressure gauge must be at least 4.0 MPa, and the rubber hose must withstand a pressure of at least 4.5 MPa.
- During pressure preservation, do not remove the rubber hoses and pressure gauges; otherwise, nitrogen may leak.

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Inject nitrogen from the low-pressure needle valve and liquid pipe needle valve at the same time.

Figure 7-31 Injecting nitrogen to preserve the pressure



(1) Nitrogen cylinder	(2) Reducing valve	(3) Electronic pressure gauge (precision: ≥ 0.001 MPa; measurement range: ≥ 4.0 MPa)	(4) Electronic pressure gauge (precision: ≥ 0.001 MPa; measurement range: ≥ 4.0 MPa)

(5) Low-pressure needle valve 1	(6) Liquid pipe needle valve 1	(7) Liquid pipe needle valve 2	(8) Low-pressure needle valve 2

Step 2 Open the pressure gauge and reducing valve, inject 4.0±0.2 MPa nitrogen, preserve the pressure for at least 30 minutes, and check that the pressure drop is less than 0.05 MPa.

Step 3 If the pressure preservation is unqualified, apply soapy water or use a halogen leak detector to check for any leakage and repair it. If the pressure preservation is qualified, expel the nitrogen from the needle valves.

----End

7.24.4 Vacuumizing and Precharging Refrigerant

CAUTION

During the LTMS commissioning, ensure that no comburent substance (such as air or additive) enters the refrigerant. The supplier is not liable for any risks and losses caused due to violation.

7.24.4.1 Refrigerant Charge Amount

Table 7-4 Refrigerant charge amount

Refrigerant Charge Amount	LunaTMS5000-L053TE00
Standard amount (kg)	3.8 (compressor 1 system), 4.0 (compressor 2 system)

7.24.4.2 Vacuumizing

Prerequisites

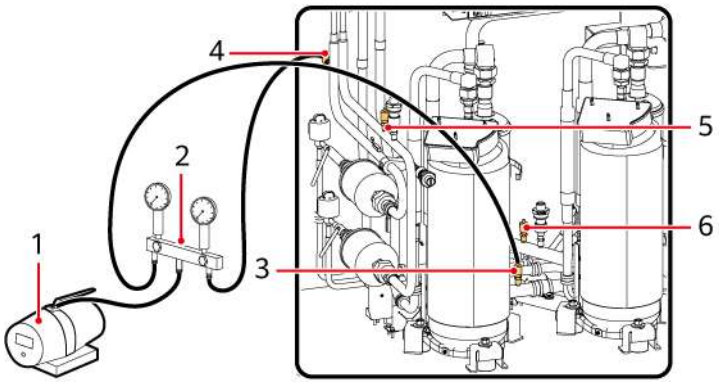
NOTICE

- The LTMS has two independent compressor systems. The following figure uses one compressor system as an example.
- Before vacuumizing, check that the refrigerant pipe system has passed the air tightness test and does not leak.
- Before vacuumizing, ensure that all connectors on the equipment are tightened.
- System high pressure may occur if the system is not vacummized or is not thoroughly vacummized. Ensure that the system is thoroughly vacummized.

Procedure

Step 1 Connect the pressure gauge and vacuum pump to the low-pressure needle valve and liquid pipe needle valve, and start vacuumizing.

Figure 7-32 Vacuumizing



(1) Vacuum pump	(2) Pressure gauge	(3) Low-pressure needle valve 1
(4) Liquid pipe needle valve 1	(5) Liquid pipe needle valve 2	(6) Low-pressure needle valve 2

Step 2 In the beginning, the vacuum pump makes loud noises and exhausts white gas from the discharge vent. After 10 minutes, if it still exhausts white gas, observe it for another 10 minutes because the cooling system may not be sealed properly or there may be too much residual refrigerant or water in the cooling system.

Step 3 After 20 minutes, the pressure gauge pointer should be in the negative area and the vacuum pump makes small noise. Close and open the pressure gauge alternately for several times. The position of the pressure gauge pointer and the sound made by the vacuum pump should not evidently change. Otherwise, the cooling system may not be sealed properly.

NOTE

If the cooling system is not properly sealed, apply soapy water or use a halogen leak detector to check for and repair any leakage.

Step 4 Vacuumize the cooling system for at least 80 minutes after checking that the cooling system does not leak. The pressure displayed on the vacuum pump should be less than or equal to 60 Pa (absolute pressure). When the pressure stops dropping, vacuumize for another 10 minutes.

Step 5 After vacuuming is complete, close all valves of the pressure gauge and the vacuum pump without disconnecting the pump, and preserve the pressure for 10 minutes. Ensure that the pressure of the cooling system does not exceed 90 Pa (absolute pressure).

NOTE

If the minimum reading of the pressure gauge is greater than 60 Pa (absolute pressure), ensure that the pointer stays at the smallest scale of the pressure gauge in vacuuming and preserve the pressure for 1 hour. Then check that the pressure does not rise evidently.

----End

7.24.4.3 Precharging the Refrigerant

Prerequisites

Before charging refrigerant, ensure that air is exhausted from the pipe connected to the refrigerant cylinder.

Context

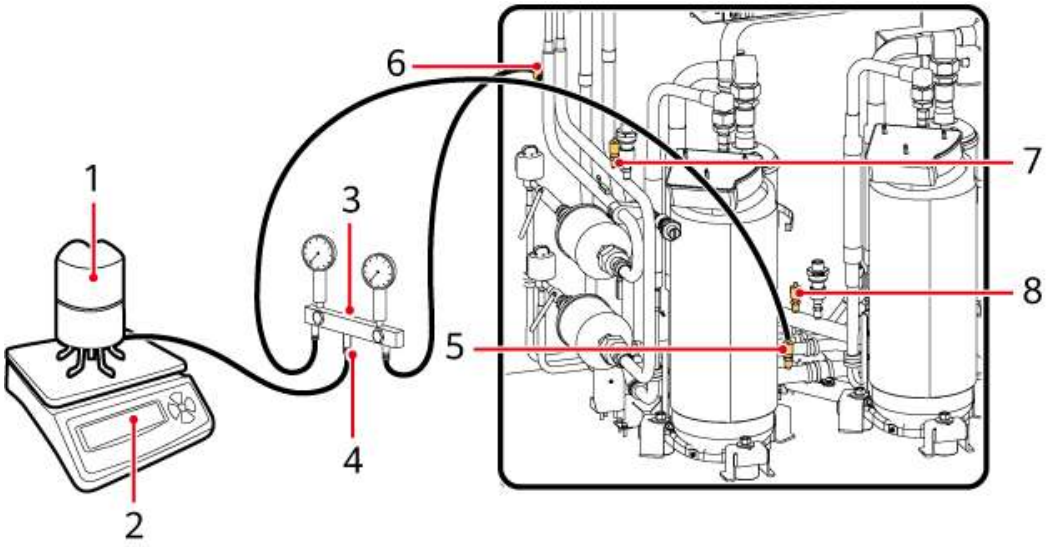
CAUTION

- The LTMS has two independent compressor systems. The following figure uses one compressor system as an example.
- When charging refrigerant, you are advised to use a safety valve to prevent refrigerant leakage during the removal of a rubber hose, which may cause frostbite.
- Wear antifreeze gloves when performing refrigerant related operations.
- Charge the refrigerant (R410A) immediately after checking that the cooling system does not leak and the vacuum level meets the requirements.

Procedure

Step 1 Take off the vacuum pump from the vacuumizing device, and replace the vacuum pump with a refrigerant cylinder.

Figure 7-33 Precharging refrigerant



(1) Refrigerant cylinder	(2) Electronic balance	(3) Pressure gauge	(4) Connection nut
(5) Low-pressure needle valve 1	(6) Liquid pipe needle valve 1	(7) Liquid pipe needle valve 2	(8) Low-pressure needle valve 2

Step 2 Slightly open the refrigerant cylinder valve and slightly loosen the connection nut of the pressure gauge and rubber hose. Tighten the nut when cold air escapes out of the nut.

Step 3 Put the refrigerant cylinder upside down on the electronic balance. Clear the reading on the balance.

NOTICE

If the R410A refrigerant is configured, put the refrigerant cylinder upside down when charging refrigerant. If you purchase the R410A refrigerant by yourself, confirm with the agent whether the cylinder is equipped with a siphon. If the cylinder has a siphon, stand the cylinder when charging refrigerant. If not, put the cylinder upside down when charging refrigerant. These measures ensure that the refrigerant is charged in the liquid state.

Step 4 Open all pressure gauge valves and the refrigerant cylinder valve to charge refrigerant.

NOTICE

Do not move the hose or refrigerant cylinder when charging refrigerant. Otherwise, the reading on the electronic balance will be affected.

Step 5 The precharge amount must be less than or equal to the total charge amount. If the total refrigerant amount cannot be fully precharged, charge the remaining amount of refrigerant during power-on and commissioning. For details, see **7.24.5 (Optional) Charging the Remaining Refrigerant**.

Step 6 After the refrigerant is charged, close all pressure gauge valves and the refrigerant cylinder valve.

NOTE

Tighten the needle valve bonnets when the charge is complete. Check whether a needle valve leaks by applying soap bubbles to the valve vent or using a halogen leak detector. If leakage occurs, the condensing pressure and compressor load will increase, which may damage the compressor and affect the cooling effect. In that case, contact technical support.

----End

7.24.5 (Optional) Charging the Remaining Refrigerant

Prerequisites

- Before starting the compressor, ensure that the unit switch is turned on.
- Remove the refrigerant cylinder after ensuring that no more refrigerant needs to be charged.
- Charge refrigerant to the standard amount. Otherwise, the devices may be damaged.
- Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Procedure (SmartLogger WebUI)

Step 1 Log in to the SmartLogger WebUI.

Step 2 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Active cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Compressor 1 setting status** or **Compressor 2 setting status** to 3000 rpm based on the compressor location.
5. Click **Submit**.
6. Continue to fill refrigerant until the optimal value is reached based on the current pressure and temperature of the system.

Step 3 Wait for 15 minutes and choose . Check whether **Refrigerant System 1 Discharge Pressure**, **Refrigerant System 1 Suction Pressure**, **Refrigerant System 2 Discharge Pressure**, **Refrigerant System 2 Suction Pressure**, **Refrigerant System 1 Condenser Outlet Pressure**, and **Refrigerant System 2 Condenser Outlet Pressure** are within the proper ranges.

Table 7-5 Normal suction and discharge pressure ranges

Outdoor Ambient Temperature	Discharge Pressure Range	Suction Pressure Range
Below 15°C	1.5–2.5 MPa	0.7–1.35 MPa
15–35°C	1.5–3.1 MPa	
35–45°C	2.5–4.15 MPa	

NOTICE

If the suction pressure and discharge pressure are not within the normal range, check the following items:

1. Charge refrigerant in an amount exactly as standard charge required. If the refrigerant is overfilled, the discharge pressure will be high. If the refrigerant is underfilled, the suction pressure and discharge pressure will be low.

2. The air intake and exhaust vents of the unit must not be blocked. If the air intake vent and air exhaust vent are blocked, the discharge pressure will be high.

Step 4 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Active cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Compressor 1 setting status** or **Compressor 2 setting status** to 0 rpm based on the component location.
5. Click **Submit**.

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.25 Replacing a Suction Pressure Sensor

Prerequisites

- Tools: insulated security torx screwdriver, Phillips insulated torque screwdriver, insulated adjustable torque wrench, and two adjustable wrenches
- Materials: permanent threadlocker
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

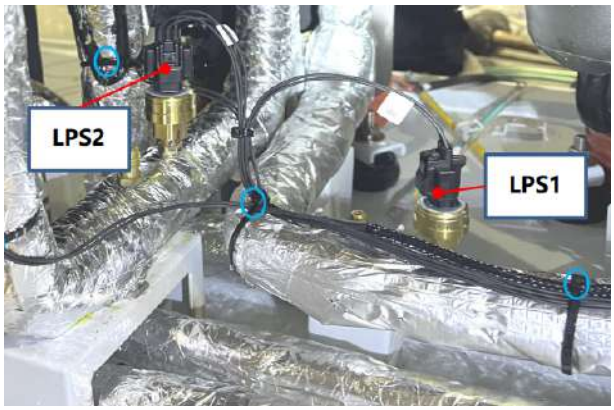
Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the inner mesh board from the front of the LTMS.

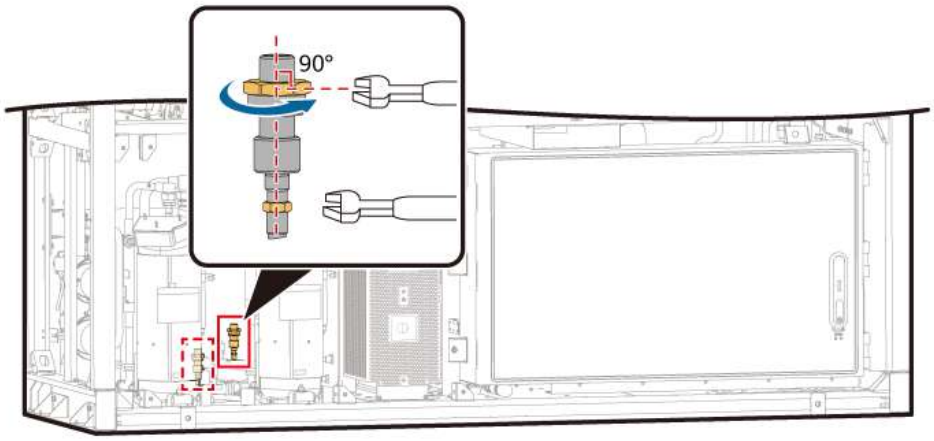
Step 3 Remove the cable interconnection terminals from the pressure sensor.



Step 4 Use a wrench to secure the needle valve at the pressure sensor base, and use another wrench to rotate and remove the pressure sensor. During the removal, ensure that the wrench is vertical to the sensor and does not tilt to prevent stress on the root of weld of the needle valve.

CAUTION

When removing the pressure sensor, a small amount of refrigerant may leak from the needle valve. Exercise caution to avoid the risk of frostbite.



Step 5 Apply three drops of permanent threadlocker to the screw threads on the needle valve surface.

Step 6 Install a new pressure sensor on the needle valve and secure the needle valve on the pressure sensor base using a wrench. Use another wrench to rotate the pressure sensor clockwise and tighten it to 15 N·m. During the process, ensure that the wrench is vertical to the sensor and does not tilt to prevent stress on the root of weld of the needle valve.

CAUTION

When installing the pressure sensor, a small amount of coolant may leak from the needle valve. Exercise caution to avoid the risk of frostbite.

Step 7 Install the wiring terminals from the pressure sensor.

Step 8 Install the mesh board on the inner front side of the LTMS, and tighten it to 5 N·m.

Step 9 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Active cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Compressor 1 setting status** or **Compressor 2 setting status** to 0 rpm based on the component location.
5. Click **Submit**.

Step 4 After confirming that the compressor stops running, wait for 5 minutes, and choose to check the pressure values **Refrigerant System 1 Discharge Pressure**, **Refrigerant System 1 Suction Pressure**, **Refrigerant System 2 Discharge Pressure**, **Refrigerant System 2 Suction Pressure**, **Refrigerant System 1 Condenser Outlet Pressure**, and **Refrigerant System 2 Condenser Outlet Pressure** of the corresponding system. (The difference between the maximum and minimum values shall not exceed 0.4 MPa.)

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.26 Replacing a High-Pressure Sensor

Prerequisites

- Tools: insulated security torx screwdriver, Phillips insulated torque screwdriver, insulated adjustable torque wrench, and two adjustable wrenches
- Materials: permanent threadlocker
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

See **Figure 7-8**.

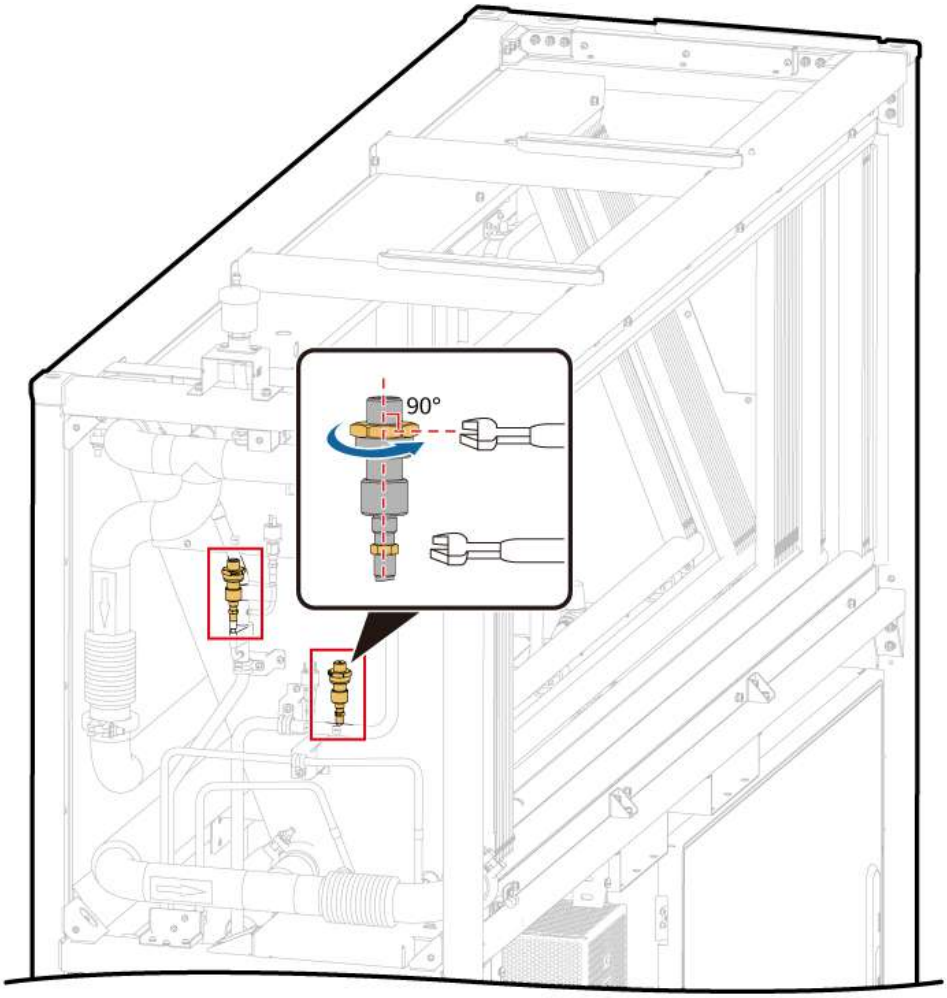
Step 2 Based on the position of the faulty pressure sensor, use a Phillips screwdriver to remove the upper or lower mesh board on the left side of the LTMS.

Step 3 Disconnect cables from the connector of the pressure sensor.

Step 4 Use a wrench to secure the needle valve at the pressure sensor base, and use another wrench to rotate and remove the pressure sensor. During the removal, ensure that the wrench is vertical to the sensor and does not tilt to prevent stress on the root of weld of the needle valve.

CAUTION

When removing the pressure sensor, a small amount of coolant may leak from the needle valve. Exercise caution to avoid the risk of frostbite.



Step 5 Apply three drops of permanent threadlocker to the screw threads on the needle valve surface.

Step 6 Install a new pressure sensor on the needle valve and secure the needle valve on the pressure sensor base. Use a wrench to rotate the pressure sensor and tighten it to 15 N·m. During the process, ensure that the wrench is vertical to the sensor and does not tilt to prevent stress on the root of weld of the needle valve.

> ⚠ CAUTION
>
> When installing the pressure sensor, a small amount of coolant may leak from the needle valve. Exercise caution to avoid the risk of frostbite.

Step 7 Connect the cables to the connector of the pressure sensor.

Step 8 Install the mesh board on the LTMS, and tighten it to 5 N·m.

Step 9 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Active cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Compressor 1 setting status** or **Compressor 2 setting status** to 0 rpm based on the component location.
5. Click **Submit**.

Step 4 After confirming that the compressor stops running, wait for 5 minutes, and choose to check the pressure values **Refrigerant System 1 Discharge Pressure**, **Refrigerant System 1 Suction Pressure**, **Refrigerant System 2 Discharge Pressure**, **Refrigerant System 2 Suction Pressure**, **Refrigerant System 1 Condenser Outlet Pressure**, and **Refrigerant System 2 Condenser Outlet Pressure** of the corresponding system. (The difference between the maximum and minimum values shall not exceed 0.4 MPa.)

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.27 Replacing a High-Pressure Switch

Prerequisites

- Tools: insulated security torx screwdriver, Phillips insulated torque screwdriver, insulated adjustable torque wrench, and two adjustable wrenches
- Materials: permanent threadlocker
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

See **Figure 7-8**.

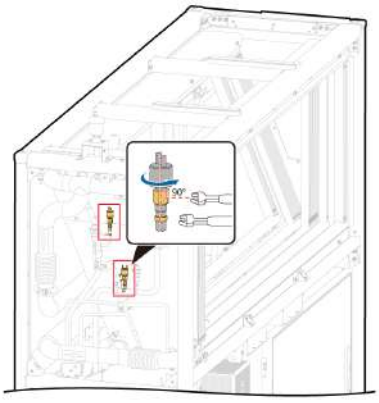
Step 2 Based on the position of the faulty pressure sensor, use a Phillips screwdriver to remove the upper or lower mesh board on the left side of the LTMS.

Step 3 Disconnect cables from the connector of the high-pressure switch.

Step 4 Use a wrench to secure the needle valve at the high-pressure switch base, and use another wrench to rotate and remove the high-pressure switch. During the removal, ensure that the wrench is vertical to the sensor and does not tilt to prevent stress on the root of weld of the needle valve.

⚠ CAUTION

When removing the high-pressure switch, a small amount of coolant may leak from the needle valve. Exercise caution to avoid the risk of frostbite.



Step 5 Apply three drops of thread sealant to the threads on the needle valve surface.

Step 6 Install a new high-pressure switch on the needle valve and secure the needle valve on the high-pressure switch base. Use a wrench to rotate the high-pressure switch and tighten it to 15 N·m. During the process, ensure that the wrench is vertical to

the sensor and does not tilt to prevent stress on the root of weld of the needle valve.

CAUTION

When installing the high-pressure switch, a small amount of coolant may leak from the needle valve. Exercise caution to avoid the risk of frostbite.

Step 7 Connect cables from the connector of the high-pressure switch.

Step 8 Install the mesh board on the LTMS, and tighten it to 5 N·m.

Step 9 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Active cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Compressor 1 setting status** or **Compressor 2 setting status** to 3000 rpm based on the compressor location.
5. Click **Submit**.

Step 4 After confirming that the compressor stops running, wait for 5 minutes, and choose to check the pressure values **Refrigerant System 1 Discharge Pressure**, **Refrigerant System 1 Suction Pressure**, **Refrigerant System 2 Discharge Pressure**, **Refrigerant System 2 Suction Pressure**, **Refrigerant System 1 Condenser Outlet Pressure**, and **Refrigerant System 2 Condenser Outlet Pressure** of the corresponding system. (The difference between the maximum and minimum values shall not exceed 0.4 MPa.)

Step 5 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.28 Replacing a Mixed-Flow Fan in an Electric Control Box

Prerequisites

- Tools: insulated security torx torque screwdriver, Phillips insulated torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

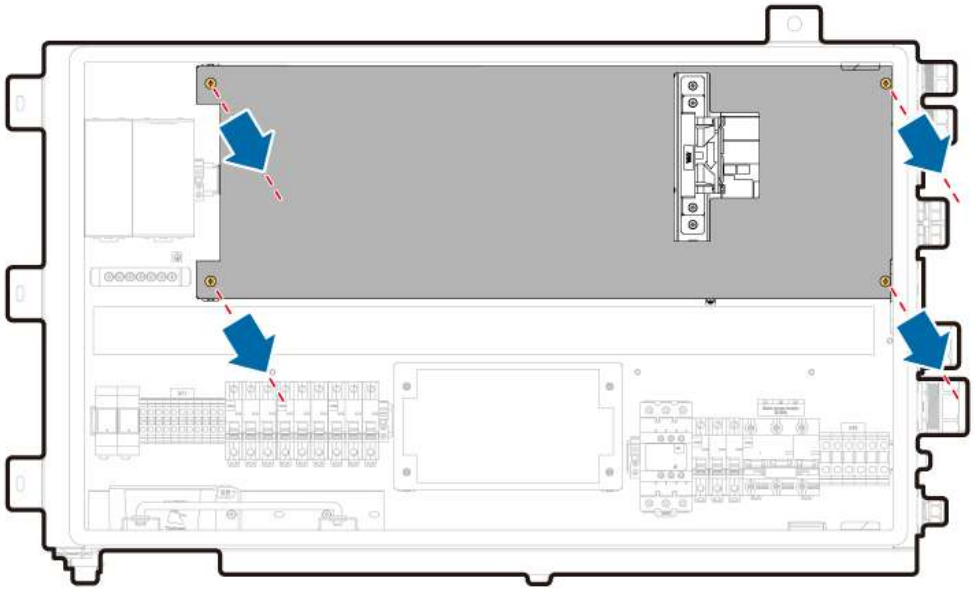
Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box.

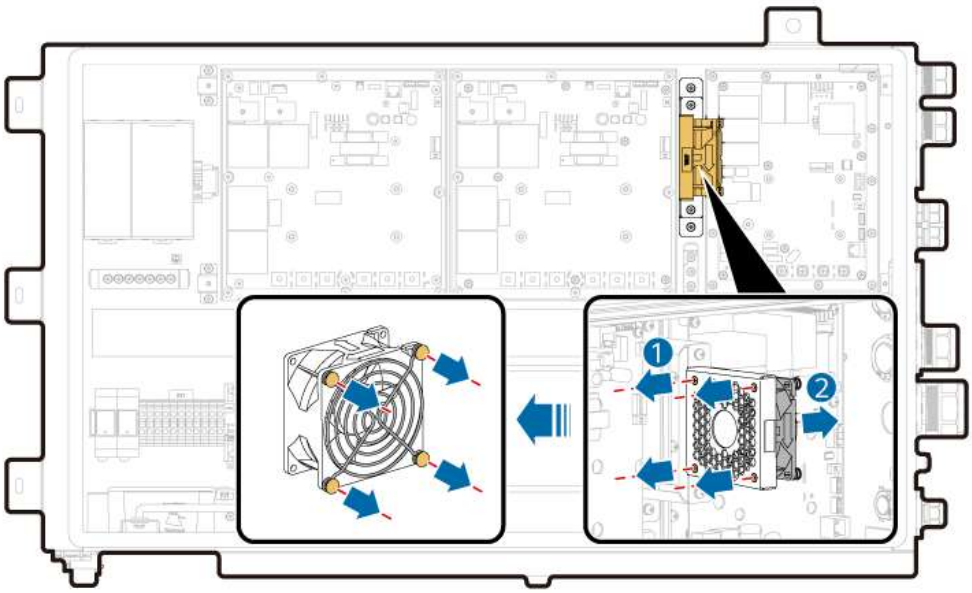
Step 3 Remove the protective plate from the drive board.



Step 4 Disconnect wiring terminals of the mixed-flow fan in the electric control box.

Step 5 Remove the mixed-flow fan from the electric control box.

1. Use a Phillips screwdriver to remove screws from the mixed-flow fan of the electric control box.
2. Remove the four nylon rivets from the fan guard and remove the fan guard.



Step 6 Install the fan guard on a new mixed-flow fan and secure the nylon rivets.

Step 7 Place the new mixed-flow fan in the original position and use a Phillips screwdriver to tighten the screws to 0.55 N·m.

Step 8 Connect the wiring terminals of the mixed-flow fan in the electric control box.

Step 9 Install the protective plate to the drive board.

Step 10 Retract the door stopper and close the door of the electric control box.

Step 11 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of electric control box mixed-flow fan** to the maximum speed.
5. Click **Submit**.
6. Check whether the mixed-flow fan of the electric control box works properly.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.29 Replacing a Drive Cooling Fan

Prerequisites

- Tools: insulated security torx torque screwdriver, insulated torque socket wrench, Phillips insulated torque screwdriver, safety gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the three screws from the LTMS electric control box using a socket wrench.

See **Figure 7-14**.

Step 3 Pull out the electric control box and rotate it by 90 degrees.

See **Figure 7-15**.

Step 4 Disconnect wiring terminals of the drive cooling fan.

Figure 7-34 Drive cooling fan

Step 5 Use a Phillips screwdriver to remove screws from the drive cooling fan of the electric control box.

Step 6 Install a new drive cooling fan and use a Phillips screwdriver to tighten the screws to 1.6 N·m.

Step 7 Connect the wiring terminals of the drive cooling fan.

Step 8 Rotate the electric control box to the original position, and tighten the three screws on the electric control box to 5 N·m.

Step 9 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.

4. Set **Setting status of drive cooling fan 1** or **Setting status of drive cooling fan 2** to the maximum speed based on the location of the component to be replaced.
5. Click **Submit**.
6. Check whether the drive cooling fan works properly.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info** > **Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.30 Replacing a Liquid Cooling Controller (LCC)

Prerequisites

- Tools: ladder, insulated security torx torque screwdriver, Phillips insulated torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

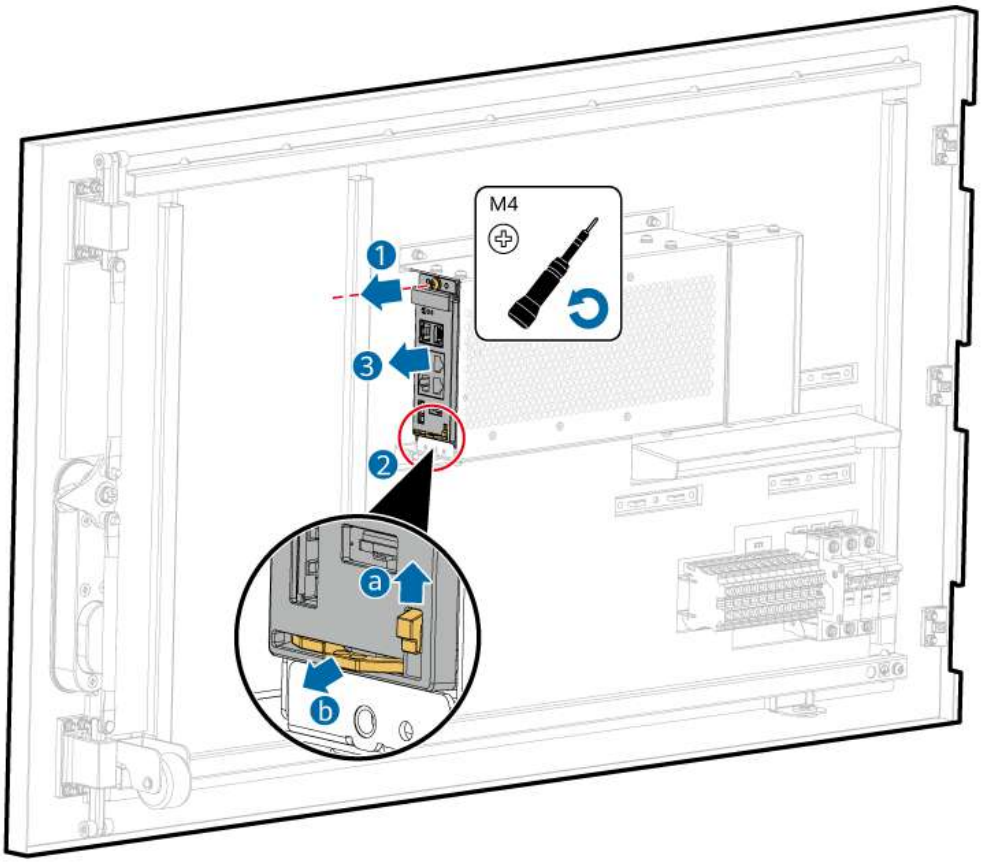
Step 2 Open the door of the LTMS electric control box, and turn off the general circuit breaker 1FCB of the LTMS and the switch 2FCB3 of the auxiliary power module.

Step 3 Disconnect cables from the LCC.

Step 4 Remove the old LCC.

1. Use a Phillips screwdriver to remove the sheet metal fastener at the end of the LCC.
2. Pull out the switch of the handle at the end of the LCC.
3. Pull out the LCC.

Figure 7-35 Removing the LCC



Step 5 Install a new LCC and tighten the screws to 1.6 N·m.

Step 6 Connect the cables to the LCC.

Step 7 Turn on the general circuit breaker 1FCB of the LTMS and the switch 2FCB3 of the auxiliary power module, and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

7.31 Replacing a Backplane

Prerequisites

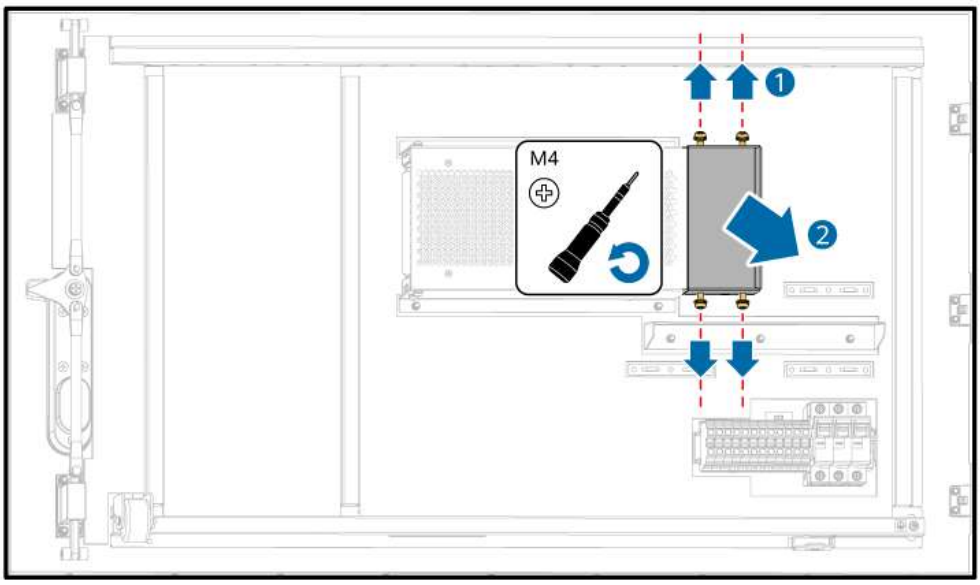
- Tools: ladder, Phillips insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove the LCC. For details, see **7.30 Replacing a Liquid Cooling Controller (LCC)**.

Step 2 Remove the backplane protective cover.

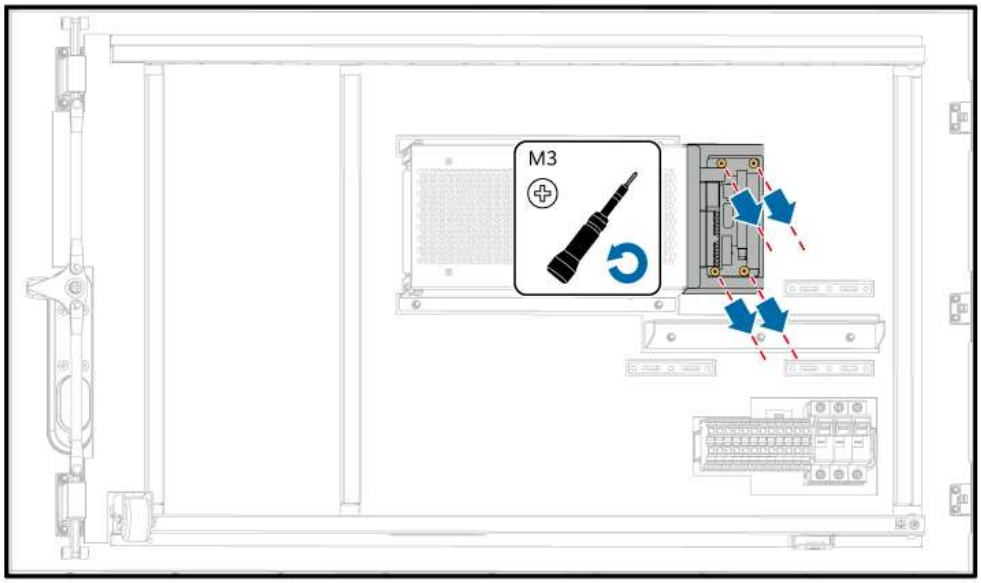
Figure 7-36 Removing the backplane protective cover



Step 3 Disconnect cables from the backplane.

Step 4 Remove the backplane.

Figure 7-37 Removing the backplane



Step 5 Install a new backplane and tighten it to 0.6 N·m.

Step 6 Connect the cables to the backplane.

NOTICE

Ensure that the terminals are properly connected to the backplane.

Reserve a certain length of cables and keep the cables loose to prevent the terminals from bearing stress.

Arrange cables properly and avoid twisting them.

Step 7 Install the backplane protective cover. Do not press the cables during the installation. Tighten the screws to 1.6 N·m.

Step 8 Install the LCC. For details, see **7.30 Replacing a Liquid Cooling Controller (LCC)**.

Step 9 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.32 Replacing an Outdoor Fan

Prerequisites

- Tools: ladder, insulated security torx torque screwdriver, insulated torque socket wrench, protective gloves, and diagonal pliers

  NOTE

  - Prepare at least two ladders whose base width is less than 600 mm and height is at least 3000 mm.
  - The personnel, tools, and environment must meet relevant safety requirements.
- Materials: cable ties
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

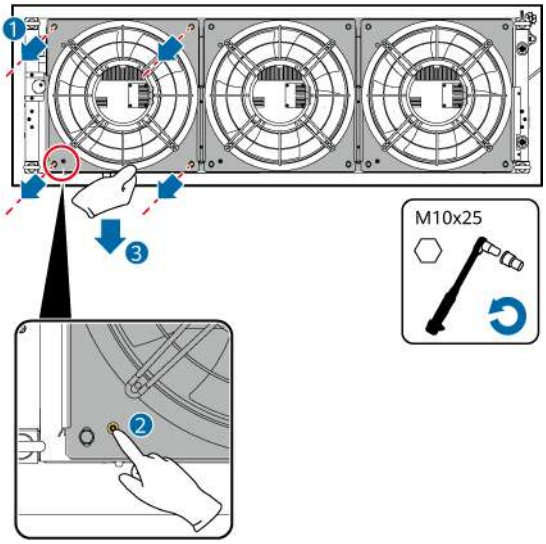
Step 2 Use a security torx torque screwdriver to remove the 14 security torx screws from the top air filter, and remove the air filter.

Step 3 Remove the interconnection terminal from the fan cable.

Step 4 Remove the fan.

1. Remove screws from the fan panel using an M10 socket wrench.
2. Press the spring pin.
3. Hold the handle and pull out the fan along the guide rail to the maintenance aisle.

Figure 7-38 Removing the fan panel



Step 5 Install a new fan.

1. Push the new fan into the original position along the guide rail.
2. Secure the fan panel to a torque of 27 N·m.

Step 6 Connect the cable terminals and bind the cables.

CAUTION

If the male and female connectors of the fan interconnection terminal cannot be properly inserted due to resistance, shake the terminal to correct the pins and then insert the connectors. Ensure that the connectors are properly inserted and do not perform violent operations.

Step 7 Place the air filter back on the top and tighten the security torx screws.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Click **Clear total runtime of outdoor fan 2**, **Cleared** next to **Clear total runtime of outdoor fan 2**, or **Clear total runtime of outdoor fan 3** based on the positions of the components to be replaced.
2. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
3. Select **Manual** from the **Diagnostic Mode** drop-down list.
4. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
5. Adjust the speed of **Outdoor fan 1 setting status**, **Outdoor fan 2 setting status**, or **Outdoor fan 3 setting status** based on the positions of the components to be replaced.
6. Click **Submit**.
7. Check whether the outdoor fan works properly.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.33 Replacing a Compressor Drive Module

Prerequisites

- Tools: ladder, Phillips insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

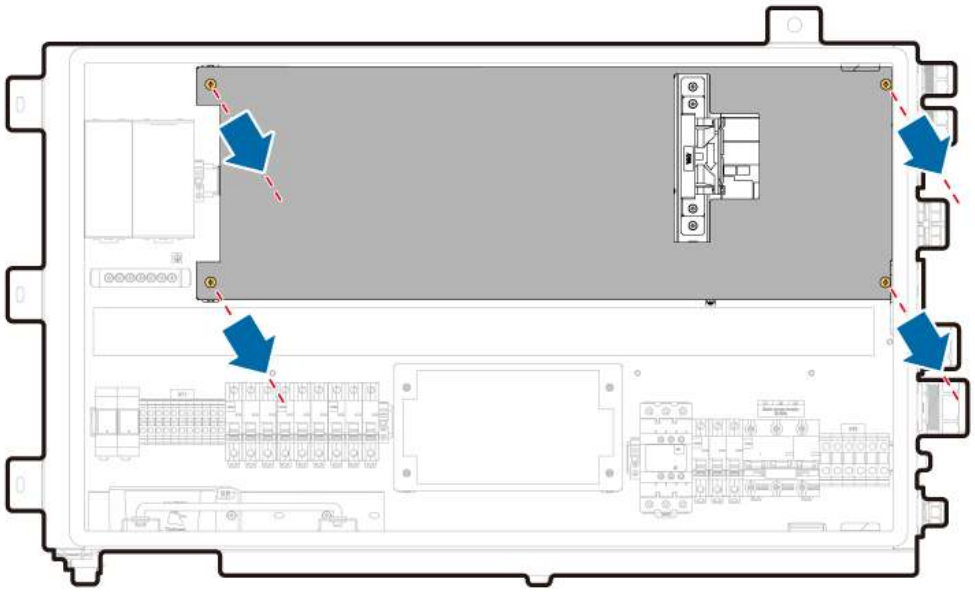
Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

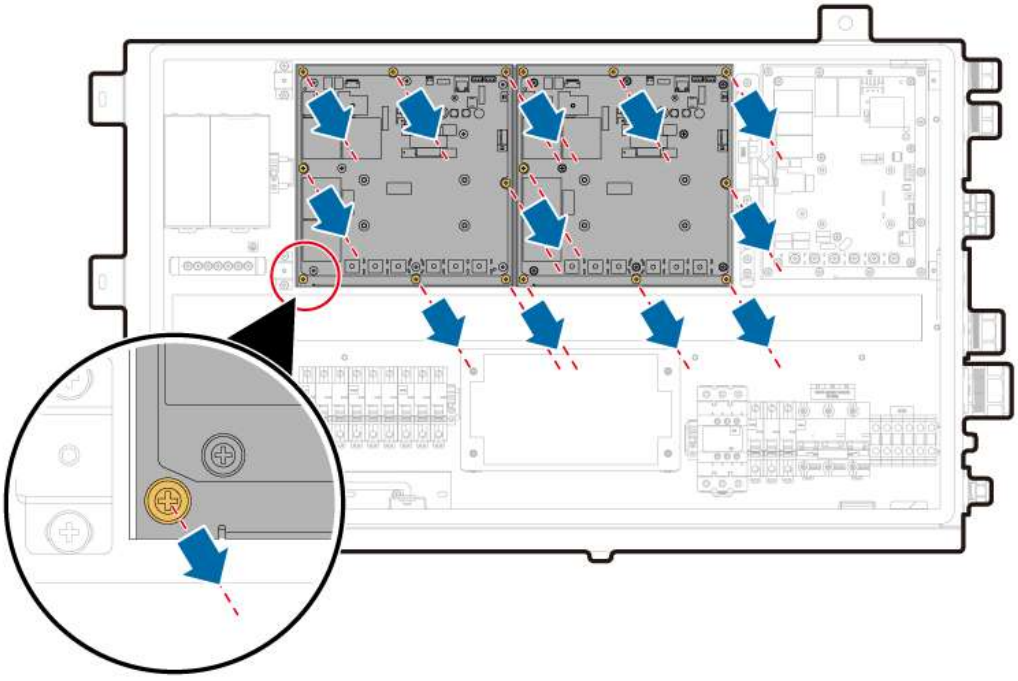
Step 2 Open the door of the LTMS electric control box and turn off the compressor switch 2FCB1 or 2FCB2 based on the compressor drive module.

Step 3 Remove the protective plate from the drive board.



Step 4 Disconnect cables from the compressor drive module.

Step 5 Remove screws from the compressor drive module and remove the compressor drive module.



Step 6 Install a new driver module and tighten the screws to 1.6 N·m.

Step 7 Reconnect the cables based on the cable labels and silkscreens on the drive board. Tighten the power screws to 2.8 N·m.

Step 8 Install the protective plate to the drive module.

Step 9 Turn on the compressor switch 2FCB1 or 2FCB2 based on the compressor position, and close the door of the electric control box.

Step 10 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Active cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Compressor 1 setting status** or **Compressor 2 setting status** to 3000 rpm based on the compressor location.
5. Click **Submit**.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.34 Replacing a Circulation Pump Drive Module

Prerequisites

- Tools: ladder, Phillips insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

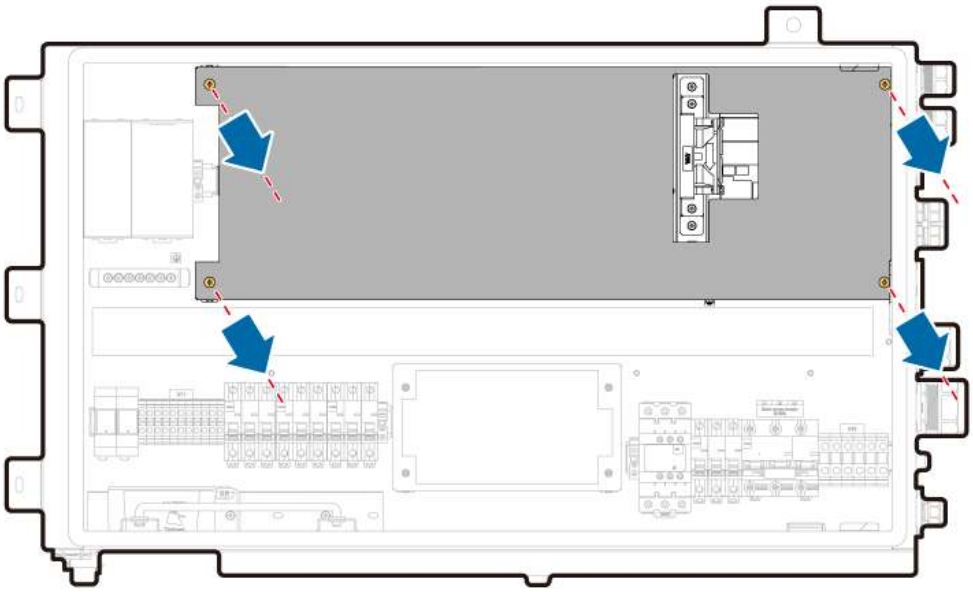
Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

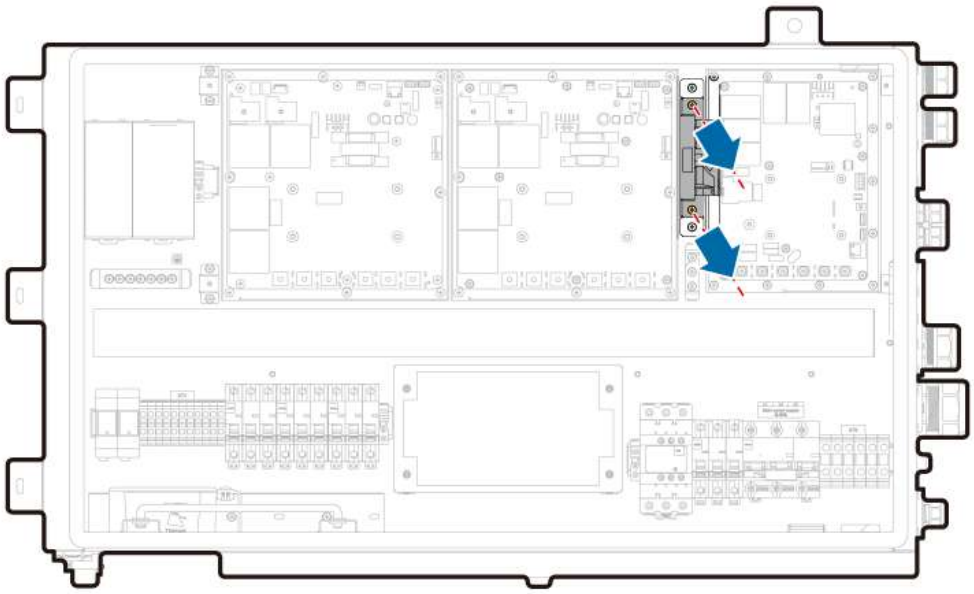
Step 2 Open the door of the LTMS electric control box and turn off the switch 2FCB3 inside the electric control box.

Step 3 Remove the protective plate from the drive board.



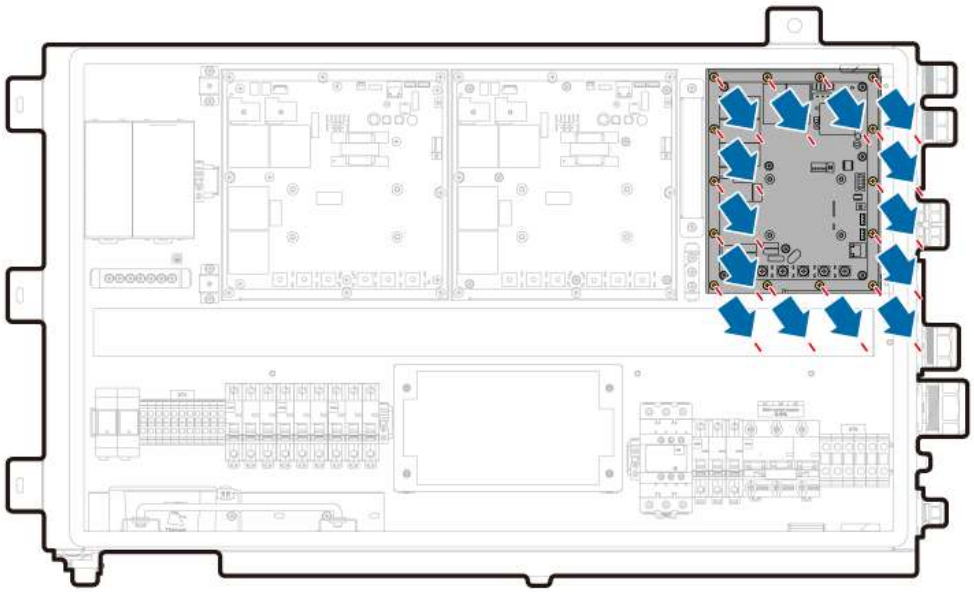
Step 4 Disconnect cables from the mixed-flow fan.

Step 5 Remove the mixed-flow fan and its support from the electric control box.



Step 6 Disconnect cables from the circulation pump drive module.

Step 7 Remove screws from the circulation pump drive module and remove the drive module.



Step 8 Install a new driver module and tighten the screws to 1.6 N·m.

Step 9 Reconnect the cables based on the cable labels and silkscreens on the drive board. Tighten the power screws to 2.8 N·m.

Step 10 Install the mixed-flow fan and its support, and tighten the screws to 1.6 N·m.

Step 11 Connect cables to the mixed-flow fan.

Step 12 Install the protective plate to the drive module.

Step 13 Turn on the switch 2FCB3 inside the electric control box and close the door of the electric control box.

Step 14 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info** > **Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.35 Replacing a 24 V Auxiliary Power Module

Prerequisites

- Tools: ladder, flat-head insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

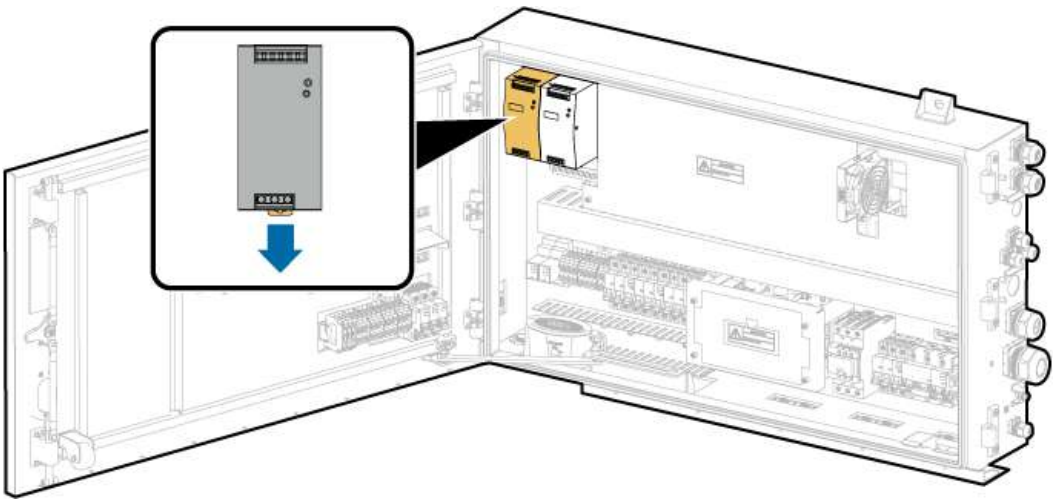
Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the switch 2FCB3 inside the electric control box.

Step 3 Disconnects cables from the 24 V auxiliary power module.

Step 4 Press the snap ring of the 24 V auxiliary power module using an insulated flat-head torque screwdriver, and pull the 24 V auxiliary power module outward to remove it.



Step 5 Install a new 24 V auxiliary power module and secure the guide rail fastener.

Step 6 Connect the cables based on the labels.

Step 7 Turn on the internal switch 2FCB3 of the electric control box, check that the green indicator on the auxiliary power module is on, and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.36 Replacing a 48 V Auxiliary Power Module

Prerequisites

- Tools: ladder, flat-head insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

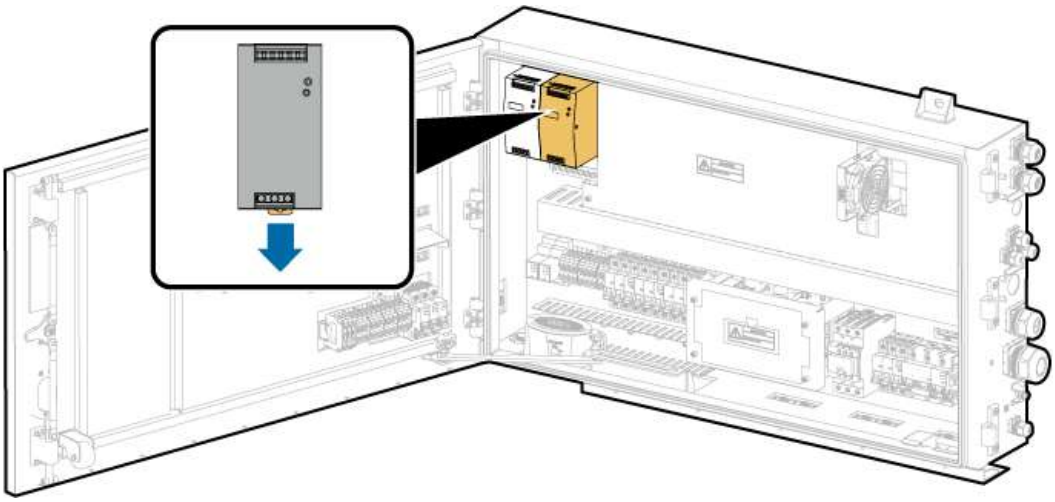
Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the switch 2FCB3 inside the electric control box.

Step 3 Disconnects cables from the 48 V auxiliary power module.

Step 4 Press the snap ring of the 48 V auxiliary power module using an insulated flat-head torque screwdriver, and pull the 48 V auxiliary power module outward to remove it.



Step 5 Install a new 48 V auxiliary power module and secure the guide rail fastener.

Step 6 Connect the cables based on the labels.

Step 7 Turn on the internal switch 2FCB3 of the electric control box, check that the green indicator on the auxiliary power module is on, and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of electric control box mixed-flow fan**, **Setting status of drive cooling fan 1**, and **Setting status of drive cooling fan 2** to the maximum speed.
5. Click **Submit**.
6. Check whether the mixed-flow fan and drive cooling fan in the electric control box work properly.

Step 4 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.

3. Click **Submit**.

----End

7.37 Replacing an LTMS General Circuit Breaker

Prerequisites

- Tools: ladder, Phillips insulated torque screwdriver, flat-head insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the general circuit breaker 1FCB of the LTMS.

Step 3 Remove the cables from the old switch using a Phillips insulated torque screwdriver.

Step 4 Press the clasp of the old switch using a flat-head insulated torque screwdriver and pull the switch outward to remove it.

Step 5 Install a new circuit breaker. Clamp the clip at the lower side of the new circuit breaker to the guide rail, and push the switch upward while pressing it inward.

Step 6 Reconnect the cables.

Step 7 Turn on the general circuit breaker 1FCB of the LTMS and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.38 Replacing an LTMS Branch Circuit Breaker

Prerequisites

- Tools: ladder, Phillips insulated torque screwdriver, flat-head insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

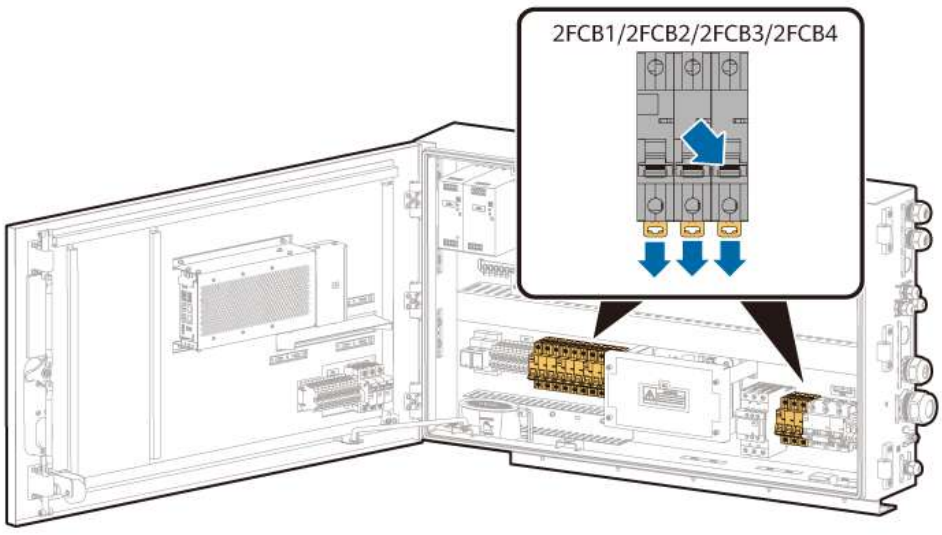
See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the general circuit breaker 1FCB of the LTMS.

Step 3 Remove the cables from the old switch using a Phillips insulated torque screwdriver.

Step 4 Press the clasp of the old switch using a flat-head insulated torque screwdriver and pull the switch outward to remove it.

Figure 7-39 Replacing the circuit breaker



Step 5 Install a new circuit breaker. Clamp the clip at the lower side of the new circuit breaker to the guide rail, and push the switch upward while pressing it inward.

Step 6 Reconnect the cables.

Step 7 Turn on the general circuit breaker 1FCB of the LTMS and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.39 Replacing a 24 V Loop Circuit Breaker

Prerequisites

- Tools: ladder, Phillips insulated torque screwdriver, flat-head insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

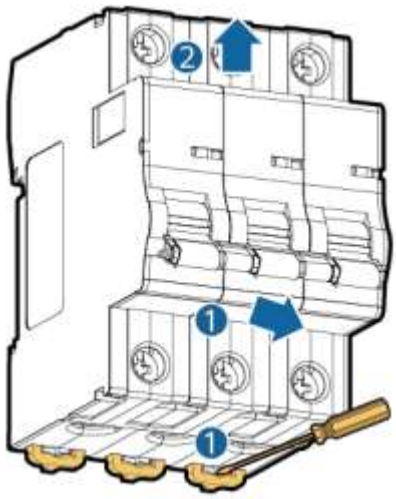
See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the general circuit breaker 1FCB of the LTMS.

Step 3 Remove the cables from the old switch using a Phillips insulated torque screwdriver.

Step 4 Press the clasp of the old switch using a flat-head insulated torque screwdriver and pull the switch outward to remove it.

Figure 7-40 Replacing the circuit breaker



NOTICE

The figure is for reference only. The actual product may vary.

Step 5 Install a new circuit breaker. Clamp the clip at the lower side of the new circuit breaker to the guide rail, and push the switch upward while pressing it inward.

Step 6 Reconnect the cables.

Step 7 Turn on the general circuit breaker 1FCB of the LTMS and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.40 Replacing a Filter Board

Prerequisites

- Tools: ladder, Phillips insulated torque screwdriver, insulated security torx torque screwdriver, ESD gloves, safety shoes, and safety helmet

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

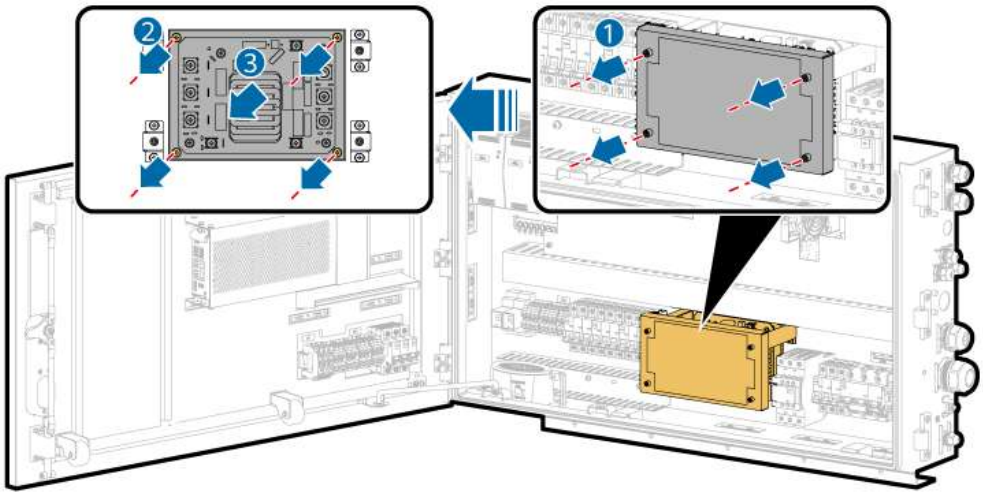
Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the general circuit breaker 1FCB of the LTMS.

Step 3 Remove the protective panel and cables from the filter board.

Step 4 Remove the old filter board.



Step 5 Install a new filter board.

Step 6 Reconnect the cables to the filter board based on the silk screens and cable labels.

Step 7 Reinstall the protective panel.

Step 8 Turn on the general circuit breaker 1FCB of the LTMS and close the door of the electric control box.

Step 9 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.41 Replacing a Fuse

Prerequisites

- Tools: insulated security torx torque screwdriver, flat-head insulated torque screwdriver, and ESD gloves
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

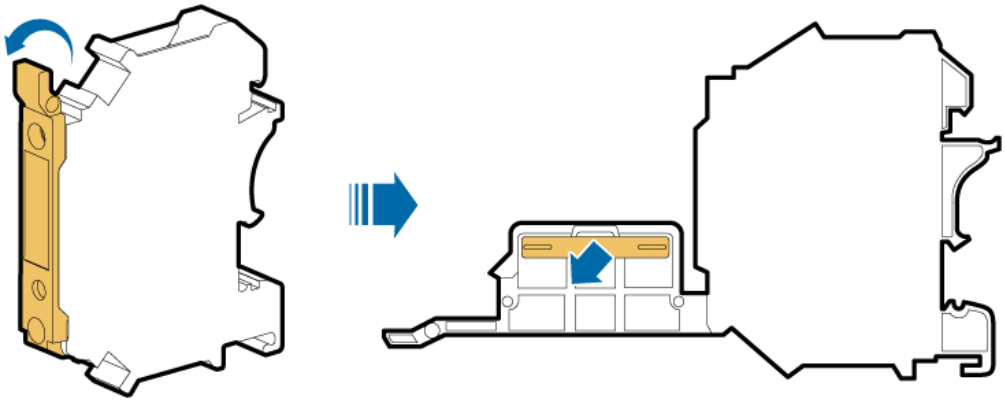
Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the general circuit breaker 1FCB of the LTMS.

Step 3 Remove the old fuse.



Step 4 Install a new fuse.

Step 5 Turn on the general circuit breaker 1FCB of the LTMS and close the door of the electric control box.

Step 6 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.42 Replacing an Electromagnetic Relay

- Tools: insulated Phillips/flat-head screwdriver and ESD gloves
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the switch 2FCB3 inside the electric control box.

Step 3 Remove the electromagnetic relay from the base.

Step 4 Install a new electromagnetic relay.

Step 5 Turn on the switch 2FCB3 inside the electric control box and close the door of the electric control box.

Step 6 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.43 Replacing an Electric Heater Contactor

Prerequisites

- Tools: insulated Phillips/flat-head screwdriver and ESD gloves
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Open the door of the LTMS electric control box and turn off the switch 2FCB4 inside the electric control box.

Step 3 Remove the cables from the faulty switch using a Phillips insulated torque screwdriver.

Step 4 Press the snap ring of the faulty switch using a flat-head insulated torque screwdriver and pull the switch outwards to remove it.

Step 5 Install a new contactor. Clamp the clip at the lower side of the new contactor to the guide rail, and push the contactor upward while pressing the contactor inward.

Step 6 Reconnect the cables.

Step 7 Turn on the switch 2FCB4 inside the electric control box and close the door of the electric control box.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure (SmartLogger WebUI)

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Natural cooling** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Setting status of circulating pump 1** to the maximum speed.
5. Click **Submit**.
6. Check whether the circulation pump works properly and whether the pipe leaks.

Step 4 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.
3. Select **Electric heating** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Electric heater setting status** to **On**
5. Click **Submit**.
6. Check whether the supply coolant temperature on the battery side increases.

Step 5 Click **Monitoring** > **ESS** > **Running Info > Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Manual** from the **Diagnostic Mode** drop-down list.

3. Select **Electric heating** from the **Battery temperature control mode for diagnosis** drop-down list.
4. Set **Electric heater setting status** to **Off**.
5. Click **Submit**.

Step 6 Ensure that no alarm is generated for the LTMS and click **Monitoring** > **ESS** > **Running Info** > **Temperature control system**.

1. Select **Diagnostic Mode** from the **Liquid cooling mode** drop-down list.
2. Select **Auto** from the **Diagnostic Mode** drop-down list.
3. Click **Submit**.

----End

7.44 Replacing a Temperature Sensor

Prerequisites

- Tools: insulated security torx torque screwdriver, Phillips insulated torque screwdriver, and diagonal pliers
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove screws from the two sealing plates on the front of the LTMS. Lift and take out the sealing plates.

See **Figure 7-12**.

Step 2 Remove the screws from the LTMS sealing plate at the rear of the container. Lift and take out the sealing plate.

See **Figure 7-8**.

Step 3 Remove the mesh boards from the inner front side and left bottom of the LTMS.

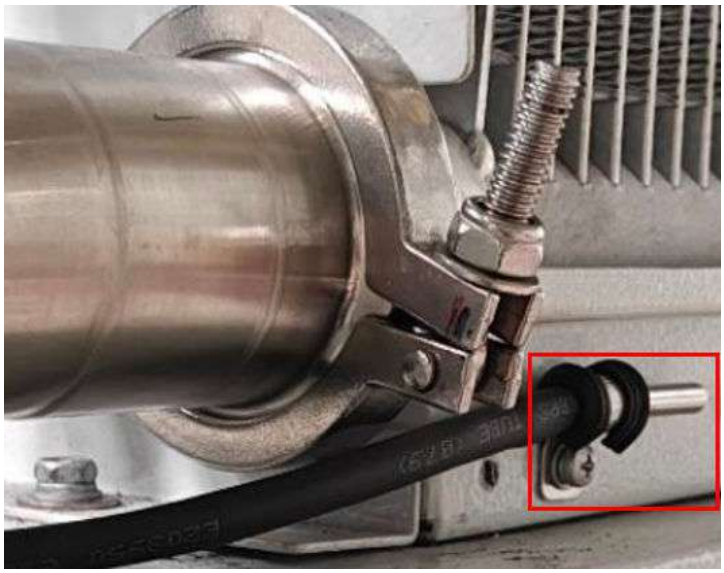
Step 4 Remove the temperature sensor.

- (Compressor system temperature sensors B9–B14) Cut off the thermal insulation foam and cable tie, remove the interconnection terminal from the temperature sensor cable on the pipe, and remove the sensor.

CAUTION

Avoid scalds when replacing the temperature sensor.

- (Outdoor ambient temperature sensor T6) Cut off the cable tie, remove the interconnection terminal from the temperature sensor cable, loosen the screws, and remove the sensor.



Step 5 Install a new temperature sensor.

- (Compressor system temperature sensors B9–B14) Install the temperature sensor, connect and secure the cable, and wrap the thermal insulation foam.
- (Outdoor temperature sensor T6) Install the temperature sensor, tighten the screws, and connect and secure the cable.

Step 6 Install the mesh boards on the inner front side and left bottom of the LTMS, and tighten them to 5 N·m.

Step 7 Mount the LTMS sealing plate at the rear of the container onto the groove, and tighten the screws to 5 N·m.

Step 8 Mount the two sealing plates at the front of the LTMS into the grooves and tighten them to 5 N·m.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

7.45 Replacing a Coolant Temperature Sensor

Prerequisites

- Tools: insulated torque socket wrench and insulated adjustable torque wrench
- Materials: thermal paste (thermal conductivity: 2.0 W/m·K)
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Open the LTMS door at the front of the container. Remove the screws from the LTMS sealing plate. Lift and take out the sealing plate.

See **Figure 7-11**.

Step 2 Remove the interconnection terminal of the coolant temperature sensor cable.

Figure 7-41 Position of the coolant temperature sensor

Step 3 Remove the coolant temperature sensor using an adjustable wrench.

Step 4 Apply the thermal paste evenly. Install the new coolant temperature sensor and tighten it to 35 N·m.

Step 5 Connect and secure the temperature sensor cable.

Step 6 Mount the sealing plate on the right side of the LTMS to the groove and tighten it to 5 N·m.

Step 7 Close the door of the LTMS on the front of the container.

----End

Follow-up Procedure

Step 1 Power on the ESS. For details, see the power-on section in the *LUNA2000-4472 Series Smart String ESS User Manual*.

Step 2 Log in to the SmartLogger WebUI.

Step 3 Verify that no LTMS alarm is generated.

----End

8 Replacing Components of the Entire System

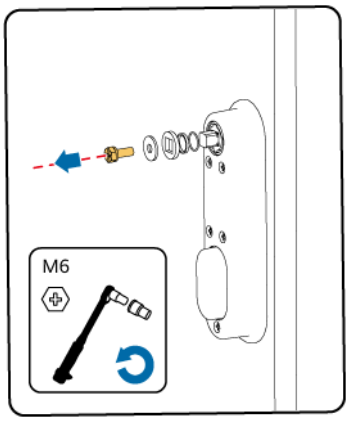
8.1 Replacing a Door Lock

Prerequisites

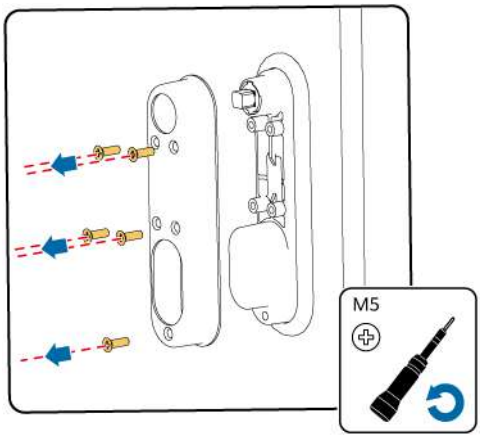
- The door lock is damaged and needs to be replaced.
- Tools: torque wrench, M6 socket, Phillips screwdriver, waterproof sealant, sealant gun, and utility knife
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

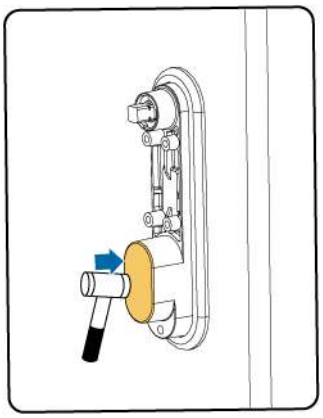
Step 1 Open the cabin door, use a Phillips screwdriver or M6 socket wrench to remove the screws from the bolt, and remove the bolt and accessories.



Step 2 Use a Phillips screwdriver to remove the five M5 screws from the rear cover of the door lock, and remove the rear cover.

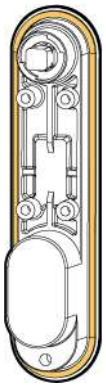


Step 3 Use a utility knife to cut off the sealant along the outer edge of the door lock, use a rubber mallet to gently knock the lower part (yellow area) of the door lock, press the door lock body from inside to outside, and remove the residual sealant around the door lock installation hole.

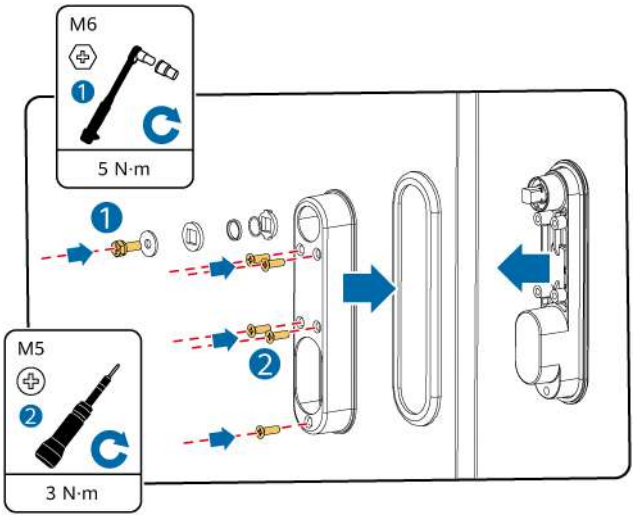


Step 4 Remove the screws and accessories of a new door lock in the same way, and remove the rear cover.

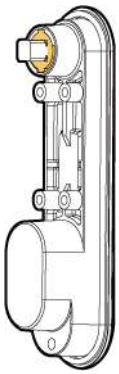
Step 5 Apply an appropriate amount of waterproof sealant to the sealing strip (yellow part) of the new door lock.



Step 6 Install the door lock body from outside to inside, install the rear cover of the door lock, and tighten the screws on the rear cover.



Step 7 Reinstall the lock tongue (note that the position of the direction-changing block affects the direction of opening and closing the lock). Ensure that no component is missing. Use an M6 socket wrench to tighten the screws to 4.8 N·m.



Step 8 Close the cabin door and apply waterproof sealant on the outer edge of the door lock.

----End

8.2 Replacing Level-1 Pipe Fittings

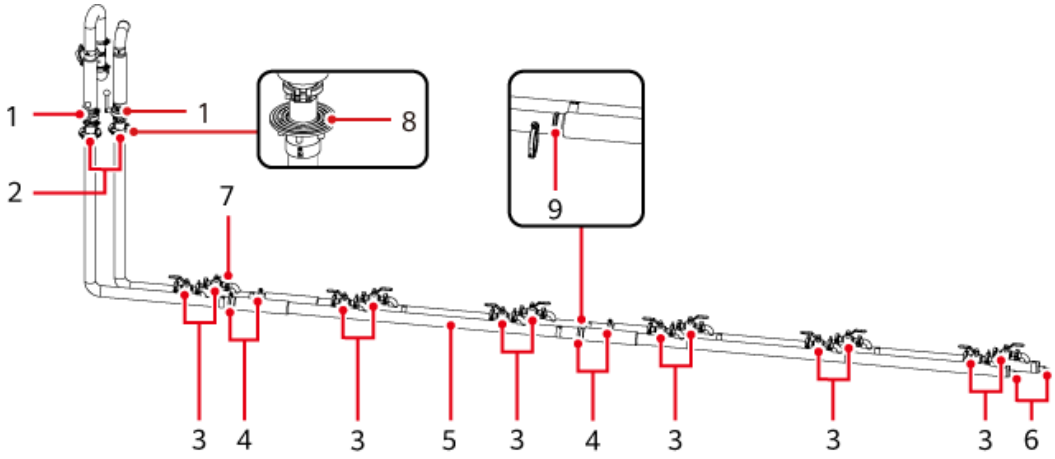
8.2.1 Level-1 Pipe System Composition

There are multiple clamps, sealing rings, and ball valves on the liquid cooling pipes. The following figure is for reference only.

NOTE

The following figure is for reference only.

Figure 8-1 Level-1 pipe diagram



(1) Butterfly valve	(2) Flange	(3) Ball valve
(4) 2-inch clamp	(5) Thermal insulation foam	(6) Two-way stop valve
(7) 1.5-inch clamp	(8) Waterproof silicone rubber pad	(9) Sealing ring

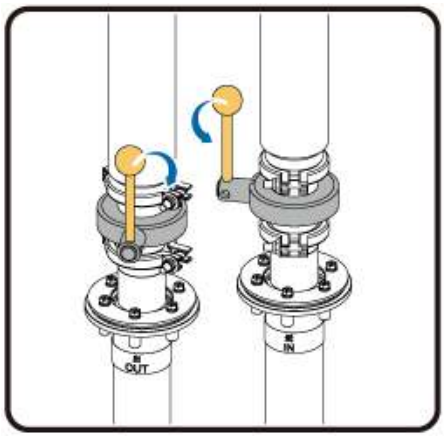
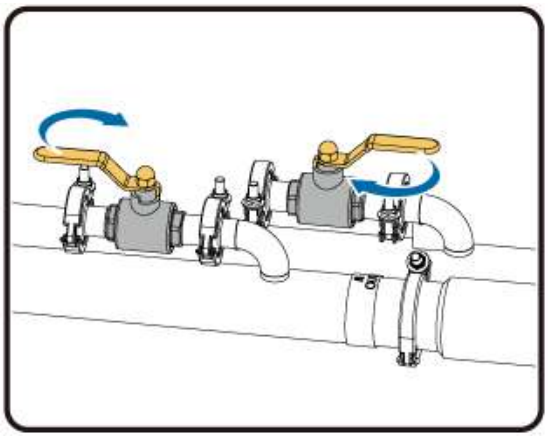
8.2.2 Replacing a Level-1 Pipe Sealing Ring

Prerequisites

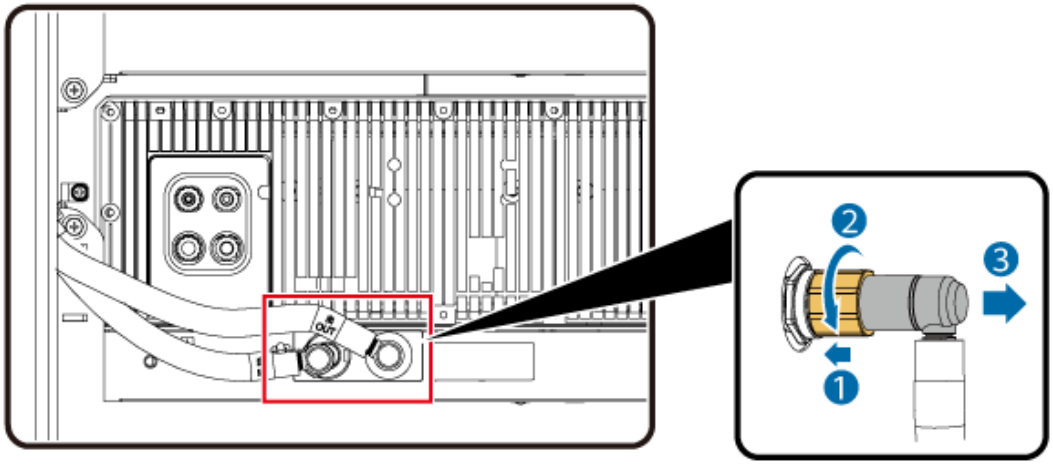
- Tools: gloves, torque wrench, socket wrench, 13 mm socket wrench, 10 mm socket wrench, socket extension rod, and clean cloth
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Close the butterfly valve at the LTMS and the butterfly valve and ball valve of the level-1 pipe where the faulty part is located. That is, the valve handle is vertical to the pipe, and the replacement position is in the valve sealing section.

Step 2 If the sealing ring is located at the connection position of the level-1 and level-2 pipes, remove the female connector of the two-way stop valve of the level-2 pipe from the battery pack.

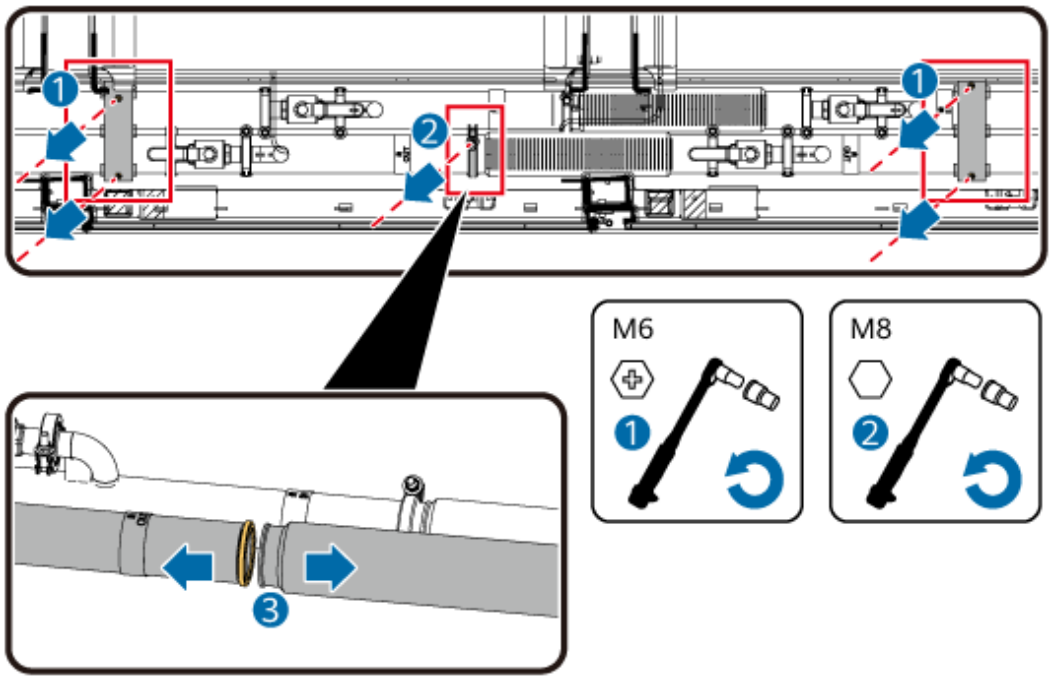


Step 3 Drain the coolant.

Step 4 Adjust the pipe to prepare for removing the old sealing ring.

1. Use a 10 mm socket wrench to loosen the screw on the pipe clamp of the pipe where the faulty sealing ring is located to facilitate pipe adjustment.
2. Place a circle of clean cloth in the lower part, use a 13 mm socket to remove the nuts from the sanitary clamps, and remove the sanitary clamps.
3. Move the pipe at the replacement point to ensure appropriate space for replacing the sealing ring.

Figure 8-2 Preparations for removing sealing rings



Step 5 Take out the old sealing ring. If residual coolant flows out, clean it promptly.

Step 6 Install a new sealing ring.

Step 7 Reconnect the pipes, secure the joints using clamps, and tighten the clamp nuts to 10 N·m.

Step 8 Tighten the pipe clamp screw.

Step 9 Fill the coolant.

Step 10 Open the closed ball valve and butterfly valve.

----End

Follow-up Procedure

Step 1 Clean the container interior and use a clean cloth to dry the residual coolant.

Step 2 Check the torque of each clamp and check whether the screws on the clamp are tightened.

Step 3 Perform an air tightness test on the pipes. After the test is passed, fill the coolant again.

Step 4 After the trial run, check whether the pipes leak.

----End

8.2.3 Replacing a Level-1 Pipe Ball Valve

Prerequisites

- Tools: gloves, torque wrench, socket wrench, 13 mm socket wrench, 10 mm socket wrench, socket extension rod, and clean cloth

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

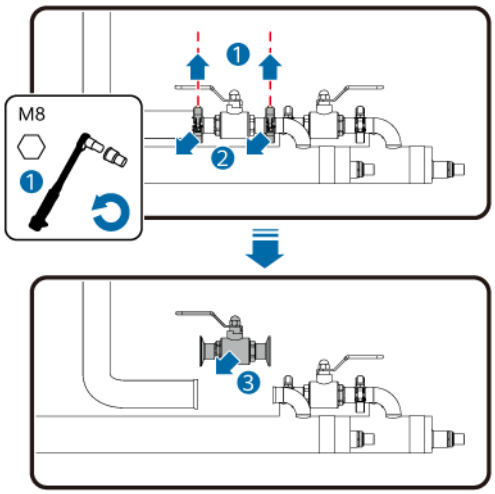
Procedure

Step 1 Close all ball valves and butterfly valves of the level-1 pipe, that is, the valve handle is vertical to the pipe.

Step 2 Disconnect all two-way stop valves that connect the level-2 pipe to the battery pack.

Step 3 Drain the coolant.

Step 4 Place a circle of clean cloth under the faulty ball valve, remove the sanitary clamp nuts, remove the sanitary clamps and sealing rings at both ends of the ball valve, and remove the ball valve.



Step 5 Take protective measures for pipes to prevent foreign matter from entering the pipes.

Step 6 Clean the end face, check whether the end face is damaged, and replace the sealing rings.

Step 7 Install the new ball valve, connect it to the pipe, lock it using sanitary clamps, and tighten the sanitary clamp nuts to 10 N·m.

Step 8 Fill the coolant.

----End

Follow-up Procedure

Step 1 Clean the container interior and use a clean cloth to dry the residual coolant.

Step 2 Check the torque of each clamp and check whether the screws on the clamp are tightened.

Step 3 Perform an air tightness test on the pipes. After the test is passed, fill the coolant again.

Step 4 After the trial run, check whether the pipes leak.

----End

8.2.4 Replacing a Level-1 Pipe Butterfly Valve

Prerequisites

- Tools: gloves, torque wrench, socket wrench, 13 mm socket wrench, 10 mm socket wrench, socket extension rod, and clean cloth
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

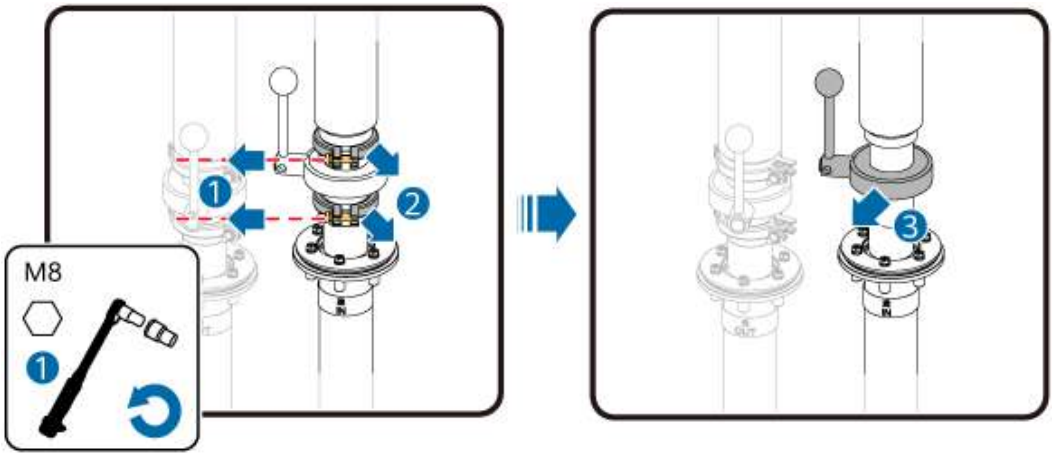
Procedure

Step 1 Close all ball valves and butterfly valves of the level-1 pipe, that is, the valve handle is vertical to the pipe.

Step 2 Drain the coolant.

Step 3 Place a circle of clean cloth at the flange position under the butterfly valve.

Step 4 Remove the sanitary clamp nut using a 13 mm socket wrench, and remove the pipe and butterfly valve above the butterfly valve.



Step 5 Take protective measures for pipes to prevent foreign matter from entering the pipes.

Step 6 Clean the end face of the butterfly valve and check whether the end face is damaged. If the sealing ring needs to be replaced, see **8.2.2 Replacing a Level-1 Pipe Sealing Ring**.

Step 7 Align the new butterfly valve with the pipe below, align the pipe above the butterfly valve, and then connect the valve to the pipe. Lock the valve using a sanitary clamp, and tighten the sanitary clamp nut to 10 N·m.

NOTE

The installation direction of the sanitary clamp must be the same as that before the removal.

Step 8 Fill the coolant.

----End

Follow-up Procedure

Step 1 Clean the container interior and use a clean cloth to dry the residual coolant.

Step 2 Check the torque of each clamp and check whether the screws on the clamp are tightened.

Step 3 Perform an air tightness test on the pipes. After the test is passed, fill the coolant again.

Step 4 After the trial run, check whether the pipes leak.

----End

8.2.5 Replacing a Level-1 Pipe Thermal Insulation Foam

Prerequisites

- Tools: gloves, utility knife, and clean cloth
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Use a utility knife to trim the damaged position.

Step 2 Use a utility knife to trim the new thermal insulation foam to an appropriate size.

Step 3 Attach the thermal insulation foam of an appropriate size to the damaged position.

----End

8.3 Replacing Level-2 and Level-3 Pipes and Components

Prerequisites

- Tools: coolant filling/drainage machine, clamp pliers (delivered with the product), insulated torque socket wrench, ladder, cleaning cloth, vacuum cleaner, pressure gauge adapter fixture, ϕ10 hose, portable pressure pump, digital pressure gauge, and clean coolant bucket (≥ 25 L)

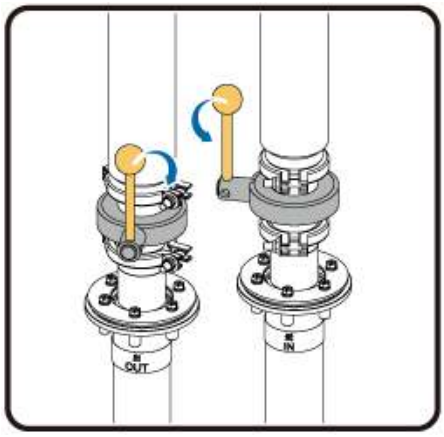
  NOTE

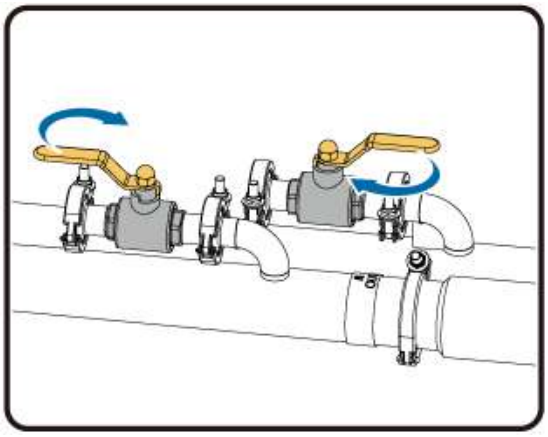
  Digital pressure gauge specifications: precision ≤ 0.001 MPa, measurement range: 0–4 MPa, thread model: 7/16-20UNF

- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

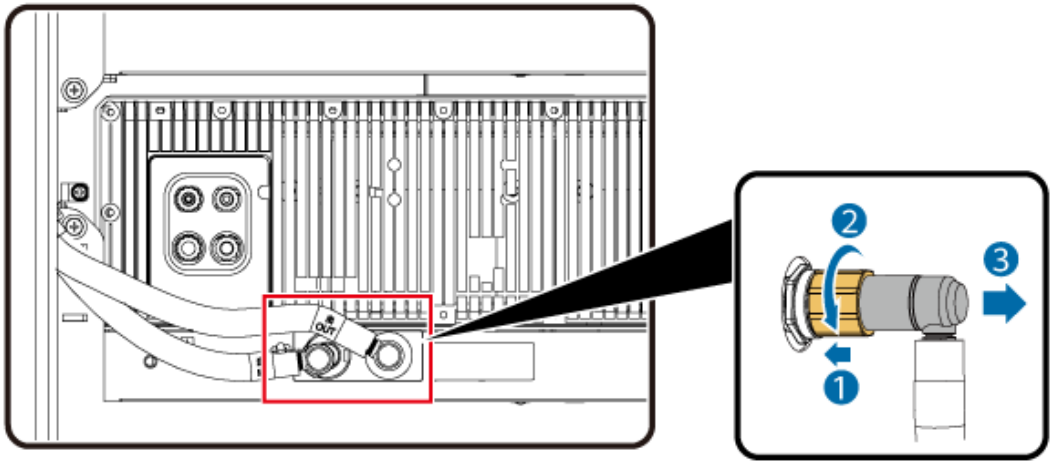
Procedure

Step 1 Close the two butterfly valves that connect the LTMS to the battery cabin and the two ball valves of the battery rack corresponding to the level-1 pipe.





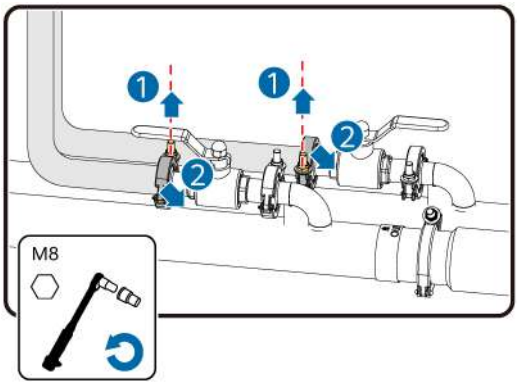
Step 2 Remove the female connectors of all two-way stop valves from the battery pack on the battery rack where the level-3 pipe to be replaced is located.



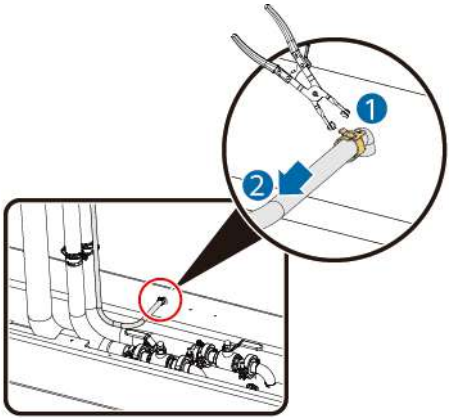
Step 3 Drain the coolant.

Step 4 Remove the level-2 and level-3 pipes.

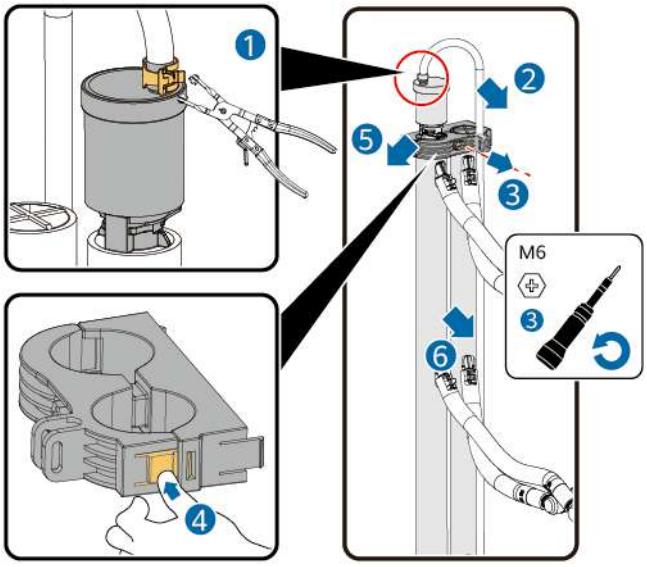
1. Use a socket wrench to rotate the nylon nut on the sanitary clamp counterclockwise, loosen the sanitary clamp, and remove it.



2. Remove the conduit at the bottom of the container.



3. Loosen the pipe clamps, remove the M6 bolts using a socket wrench, and press the clamps. Each battery rack has four pipe clamps. After removing the clamps, move the old pipe out of the container to a safe position.



Step 5 Install new level-2 and level-3 pipes.

1. Reinstall the plastic pipe clip and tighten it to 1.5 N·m.
2. Reinstall the sanitary clamp and tighten it to 10 N·m.

Step 6 Perform the air tightness test.

1. Tighten the bonnet of the exhaust valve.
2. Connect the pressure gauge and pressure pump to the female connectors of the two-way stop valves of the two level-3 pipes on the same level-2 pipe.
3. Turn on the pressure pump switch, slowly increase the pressure to 2.7–3.3 bar (3.0 bar±10%), and stop injecting air.
4. Retain the connection between the pressure gauge and the level-3 pipe, and disconnect the pressure pump from the female connector of the two-way stop valve of the level-3 pipe.
5. After disconnecting the pressure pump, observe the pressure preservation effect of the level-2 and level-3 pipes. (Connect the pressure gauge during pressure preservation and protect the connector from foreign mattrer ingress.) Record the pressure values before and after pressure preservation.

Record the pressure gauge readings P1 and P2 for the third and eighth minutes, respectively.

If P1 – P2 ≤ 2 kPa, the new pipe has good air tightness. Otherwise, check the air tightness tool and perform the air tightness test again. If the requirements are still not met, contact technical support.

6. Remove the pressure gauge to discharge the pressure, and use a tissue to clean the water stains.

Step 7 Remove the bonnet of the exhaust valve and install the conduit of the exhaust valve.

Step 8 Fill the coolant.

Step 9 Insert the female connectors of the two-way stop valves on all level-3 pipes into the male connectors on the battery pack side.

Step 10 Open the two butterfly valves that connect the LTMS to the battery cabin and the two ball valves of the battery rack corresponding to the level-1 pipe.

Step 11 Use a vacuum cleaner and cleaning cloth to clean the coolant dripping to the container.

----End

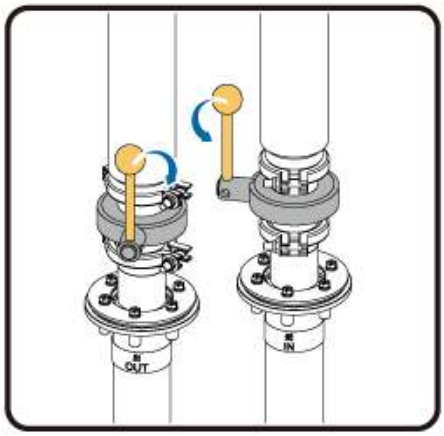
8.4 Replacing a Male Connector of a Two-Way Stop Valve

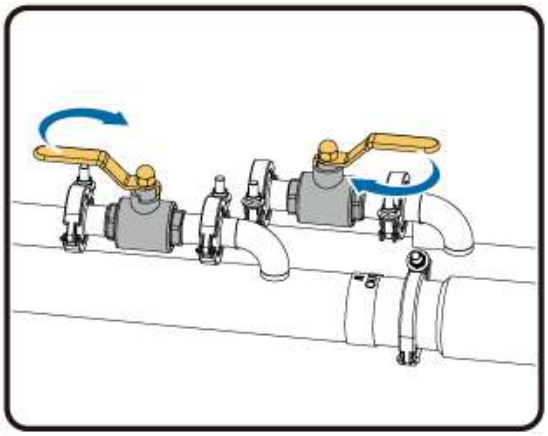
Prerequisites

- Tools: torque wrench, nozzle socket, cotton swab, and cleaning cloth
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

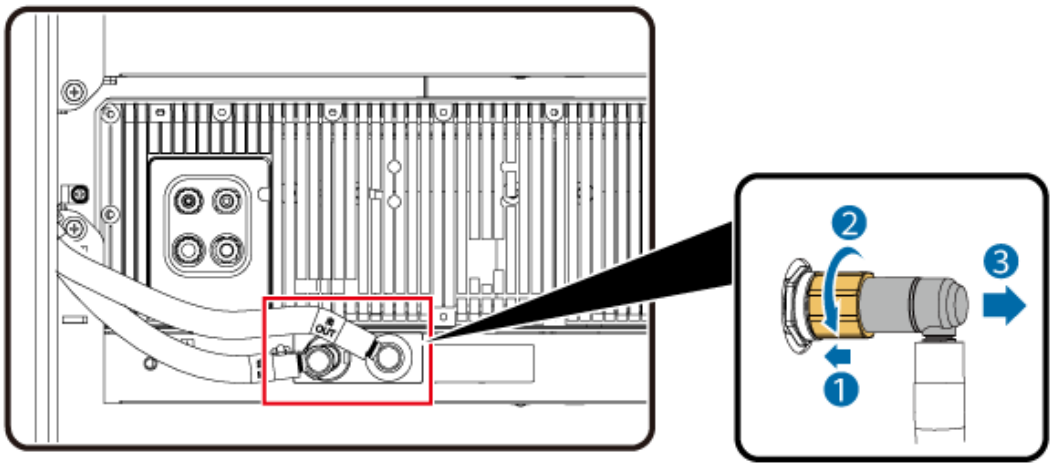
Procedure

Step 1 Close the two butterfly valves that connect the LTMS to the battery cabin and the two ball valves of the battery rack corresponding to the level-1 pipe.





Step 2 Remove the liquid cooling pipe and the female connector of the two-way stop valve from the battery pack.



Step 3 Drain the coolant.

Step 4 Loosen the male connector of the two-way stop valve on the battery pack using the delivered socket wrench and remove the valve.

Step 5 Visually check whether there is any foreign matter or impurities on the battery pack port. If yes, use a cleaning cloth to clean it.

Step 6 Dip a cotton swab into the coolant and apply the coolant to the surface of the new male sealing ring of the two-way stop valve for two circles.

Step 7 Secure the male connector of the two-way stop valve to the battery pack port and tighten it to 3.6 N·m.

Step 8 Fill the coolant. For details, see Coolant Filling Procedure in Filling/Draining Coolant for a Battery Pack.

Step 9 Insert the female connectors of the two-way stop valves on the removed level-3 pipes into the male connectors on the battery pack side.

Step 10 Open the two butterfly valves that connect the LTMS to the battery cabin and the two ball valves of the battery rack corresponding to the level-1 pipe.

----End

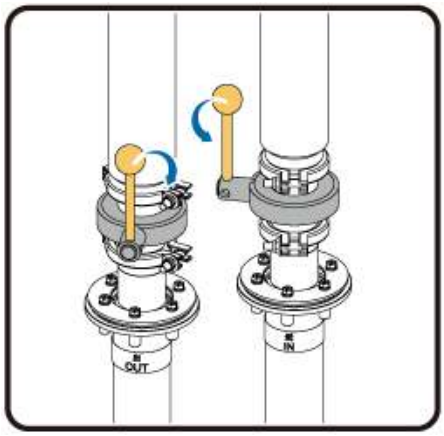
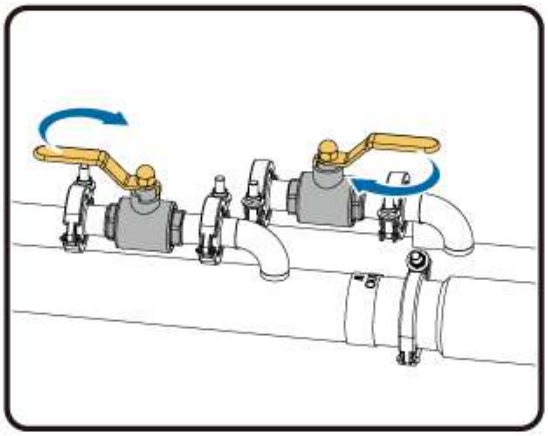
8.5 Replacing Exhaust Valves for Level-2 and Level-3 Pipes

Prerequisites

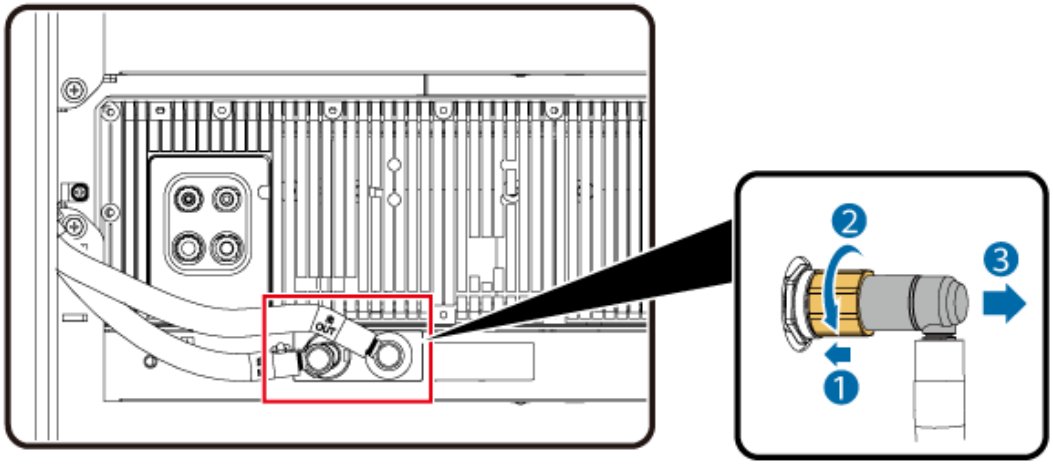
- Tools: protective gloves, cotton swab, and cleaning cloth
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Close the two butterfly valves that connect the LTMS to the battery cabin and the two ball valves of the battery rack corresponding to the level-1 pipe.

Step 2 Remove the female connectors of all two-way stop valves from the battery pack on the battery rack where the exhaust valve to be replaced is located.

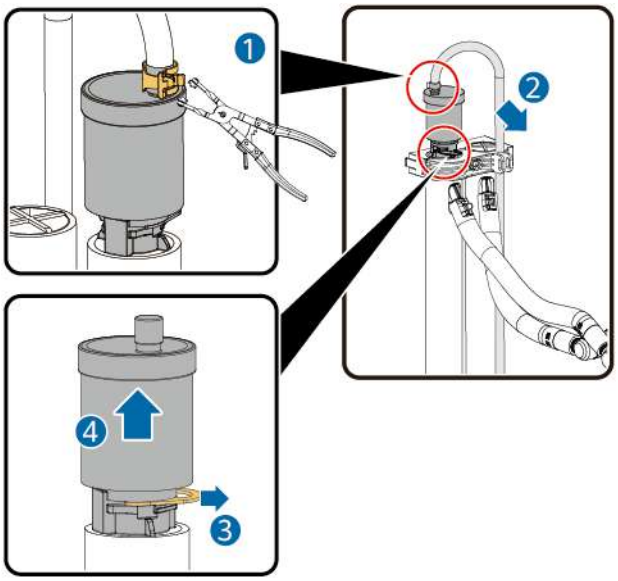


Step 3 Take out the coolant filling hose from the coolant filling/drainage machine storage compartment, remove the coolant filling hose connector from the female connector of the two-way stop valve, connect the male connector of the two-way stop valve of the coolant filling hose to the female connector of the two-way stop valve of the level-3 pipe, and insert the other end into the coolant drainage bucket.

(1) Female connector of the two-way stop valve	(2) Male connector of the two-way stop valve	(3) Connecting the coolant drainage bucket

Step 4 After checking that no coolant flows out, remove the pipe connected in **Step 3**.

Step 5 Remove the conduit and old exhaust valve.



Step 6 Dip a cotton swab into the coolant and apply the coolant to the purple sealing ring at the bottom of the exhaust valve for two circles.

Step 7 Install the new exhaust valve and conduit.

1. Remove the valve bonnet (by loosening it counterclockwise).
2. Insert the new exhaust valve (the gap between the new exhaust valve and the base shall be less than 3 mm), and reinstall the clamp spring to balance the internal and external air pressures of the automatic exhaust valve.
3. Install the conduit.

Step 8 Insert the female connectors of the two-way stop valves on the removed level-3 pipes into the male connectors on the battery pack side.

Step 9 Open the two butterfly valves that connect the LTMS to the battery cabin and the two ball valves of the battery rack corresponding to the level-1 pipe.

----End

8.6 Replacing a Smoke Duct

Prerequisites

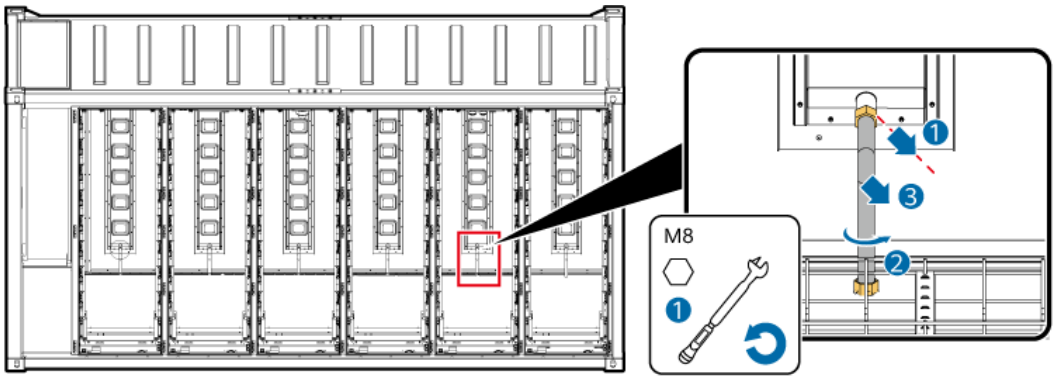
- In the case of battery thermal runaway when the smoke duct has worked, replace the smoke duct after the container is repaired.
- Tools: electric drill, 4 mm drill bit, needle-nose pliers, rivet gun, adjustable wrench, ratchet wrench, socket torque wrench, twenty-two Φ4x10 break mandrel blind rivets, fireproof sealant, and sealant gun
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.

Procedure

Step 1 Remove all battery packs and RCMs from the battery rack where the smoke duct to be replaced is located. For details about how to remove battery packs, see 5.2.1

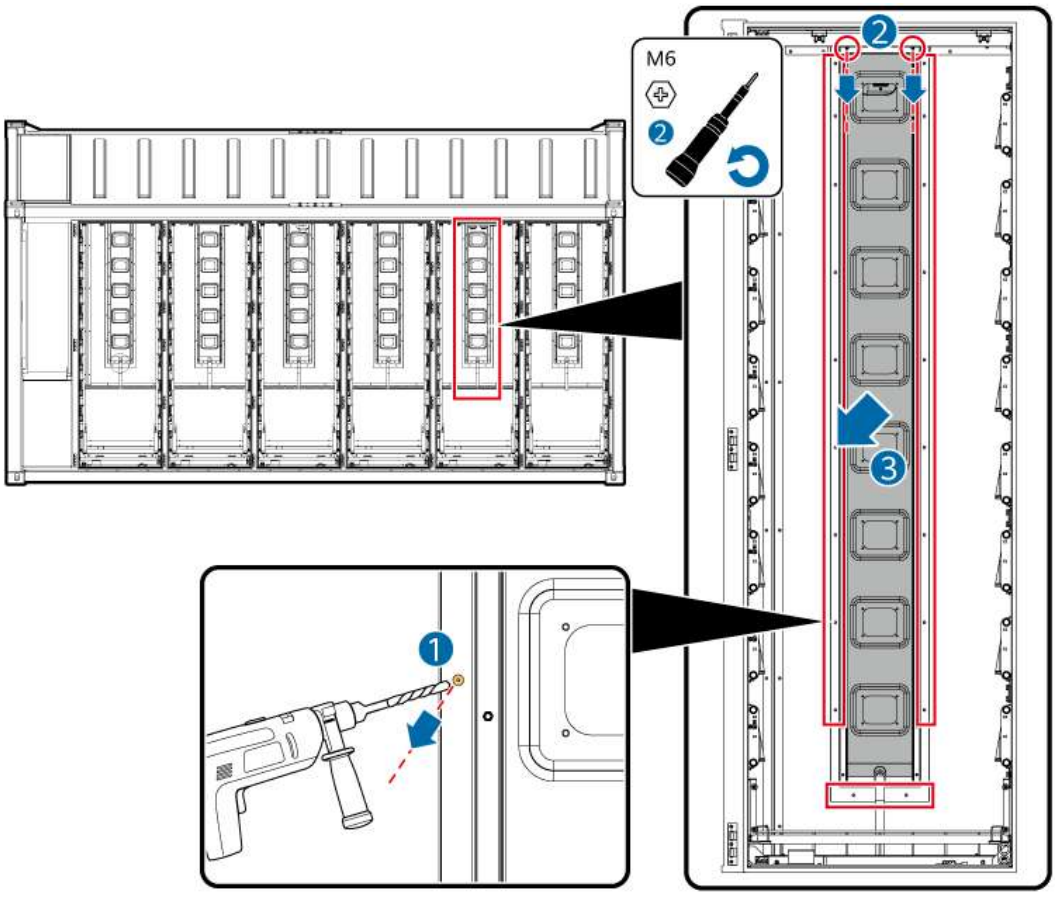
Replacing an Entire Battery Pack. For details about how to remove RCMs, see **5.3.1 Replacing an Entire RCM**.

Step 2 Loosen the drainpipe connector using a wrench and remove the drainpipe.



Step 3 Remove the old smoke duct.

1. Use an electric drill to remove the rivet head. If the rivet head is loose, use needle-nose pliers to remove the rivet head.
2. Remove the screws from the top of the smoke duct.
3. Remove the smoke duct.



Step 4 Install a new smoke duct.

1. Apply fireproof sealant around the smoke duct.

2. Use rivets to secure the smoke duct to the wall from the front.
3. Use a ratchet wrench to tighten the M6 screws on the top to 5 N·m.

Step 5 Install the drainpipe.

Step 6 Reinstall the battery packs and RCMs. For details about how to remove battery packs, see **5.2.1 Replacing an Entire Battery Pack**. For details about how to remove RCMs, see **5.3.1 Replacing an Entire RCM**.

----End

Follow-up Procedure

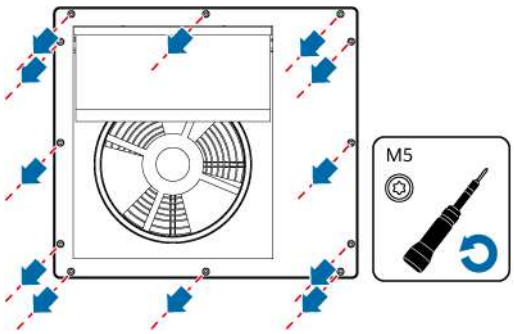
Remove the iron shavings from the container.

8.7 Replacing a Motorized Air Damper

Prerequisites

- Tools: Phillips insulated torque screwdriver, flat-head insulated torque screwdriver, M5 socket wrench, waterproof sealant, sealant gun, and utility knife
- All RCM circuit breakers Q1, AC auxiliary power general input switch 1QA, and UPS input switch 2FC have been turned off.
- Motorized air dampers are classified into intake air dampers and exhaust air dampers. The methods for removing and installing the two types of air dampers are the same. This section uses an intake air damper as an example.

Step 1 Remove the old motorized air damper.



Step 2 Remove the ground cable and other cables.

Step 3 Use a utility knife to cut off the sealant along the outer edge of the air damper, use a flat-head screwdriver to gently pry the air damper edge to loosen the air damper, remove the air damper, and remove the residual sealant from the container.

Step 4 Use a socket wrench to install the ground cable and other cables and tighten them to to 3 N·m.

Step 5 Install a new motorized air damper.

Step 6 Apply sealant

----End

9 Emergency Handling

If an accident (including but not limited to the following) occurs on the site, ensure the safety of onsite personnel first and contact the Company's service engineers.

Battery Falling or Strong Impact

- If a battery has obvious damage or abnormal odor, smoke, or fire occurs, evacuate the personnel immediately, call emergency services, and contact the professionals. The professionals shall use fire extinguishing facilities to extinguish the fire under safety protection.
- If the appearance is not deformed or damaged, and there is no obvious abnormal odor, smoke, or fire, ensure safety and perform the following operations:
  - Warehouse: Evacuate personnel, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the Company's service engineers. Leave the battery for an hour and ensure that the battery temperature is within the room temperature range (tolerance: ±10°C) before handling.
  - ESS onsite: Evacuate personnel, close the doors of the ESS, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the Company's service engineers. Leave the battery for an hour before handling.

Flood

- Power off the system if it is safe to do so.
- If any part of the batteries is submerged in water, do not touch the batteries to avoid electric shock.
- Do not use batteries that have been soaked in water. Contact a battery recycling company for disposal.

Fire Alarm Horn/Strobe

When the alarm indicator on the equipment blinks or buzzes:

- Do not approach.

- Do not open the door.
- Stay away immediately.
- Cut off the power supply remotely only when your safety is guaranteed.

Gas Exhaust

- Onsite personal protection: Do not directly face the exhaust vents.
- Post-disaster product maintenance: Contact the Company's service engineers for evaluation.

Extinguishant Release or Fire

- Suggestions for onsite O&M personnel:
  a. When a fire occurs, evacuate from the building or equipment area, press the fire alarm bell, and immediately call the fire emergency service. Notify the professional firefighters and provide them with relevant product information, including but not limited to battery pack types, ESS capacity, and battery pack location and distribution.
  b. After calling the fire emergency service, remotely power off the system while ensuring your own safety.
  c. Before professional firefighters arrive, do not enter the affected building or equipment area, and do not open the doors of the ESS. Isolate and monitor the site. Keep irrelevant personnel away from the site.
  d. After professional firefighters arrive, provide relevant product information, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.
  e. After the fire is extinguished, the site must be handled by professionals in accordance with local laws and regulations. Do not open the doors of the ESS without permission.
  f. Post-disaster product maintenance: Contact the Company's service engineers for evaluation.
- Suggestions for professional firefighters:
  a. For product information, see the information provided by O&M personnel, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.
  b. Do not open the doors of the ESS before it is deemed safe by professionals.
  c. Follow local fire fighting regulations.

10 Storage and Recharge

10.1 Storage Requirements

General Requirements

- Proof that the product is stored according to the requirements must be available, such as temperature and humidity log data, storage environment photos, and inspection reports.
- The storage environment must be clean and dry. The product must be protected against water.
- The air must not contain corrosive or flammable gases.
- Do not tilt the product or place it upside down.
- If equipment except battery packs has been stored for more than two years, it must be checked and tested by professionals before use.

ESS Storage Requirements

- Stacking is prohibited during storage (except for temporary storage at ports).
- The ground for (long-term or temporary) storage is level, and the height tolerance of the ground in contact with the container is less than 5 mm.
- The container doors are closed tightly.
- Storage temperature: –40°C to +60°C; relative humidity: 5%–95% RH
- For long-term storage (more than six months after delivery), replace the desiccants with those of the same specifications and amount (Montmorillonite desiccant, 500 g/bag).
- The main power loop of the ESS must be disconnected during onsite storage. It is recommended that the auxiliary power loop be powered on to ensure that the monitoring system works properly.

Battery Storage Requirements

WARNING

- Ensure that batteries are stored in a dry, clean, and ventilated indoor environment that is free from sources of strong infrared or other radiations, organic solvents, corrosive gases, and conductive metal dust. Do not expose batteries to direct sunlight or rain and keep them far away from sources of heat and ignition.
- If a battery is faulty (with scorch, leakage, bulge, or water intrusion), move it to a dangerous goods warehouse for separate storage. The distance between the battery and any combustible materials must be at least 3 m. The battery must be scrapped as soon as possible.
- Place batteries correctly according to the signs on the packing case during storage. Do not place batteries upside down, lay them on one side, or tilt them. Stack batteries in accordance with the stacking requirements on the packing cases.
- Store batteries separately. Do not store batteries together with other devices. A maximum of two layers of batteries with packaging shall be permitted to be stacked. Batteries without packaging must not be stacked. The site must be equipped with qualified fire fighting facilities, such as fire sand and fire extinguishers.
- After batteries are powered off, static power consumption and self-discharge loss may occur in internal modules, which may cause battery damage due to overdischarge. Do not store batteries in low SOC and charge batteries in a timely manner. Permanent battery faults caused by delayed charge are not covered by the warranty. Storing the batteries in low SOC occurs in scenarios including but not limited to the following:
  - The power cables or signal cables are not connected.
  - The batteries cannot be charged due to a system fault after discharge.
  - The batteries cannot be charged due to incorrect configurations in the system.
  - The batteries cannot be charged due to long-term mains failure.
  - The batteries cannot be charged because the switch of the RCM, PCS, or main loop component is off.

CAUTION

It is recommended that batteries be used soon after being deployed onsite. Batteries that have been stored for an extended period shall be charged periodically. Otherwise, they may be damaged.

- Packaging label description

Label	Description
	This way up: The package shall be vertically oriented during transport and storage.
	Fragile: The package contains fragile objects and shall be handled with care.
	Keep dry: The package shall be kept away from rain.
	Stacking limit by number: The packages shall not be vertically stacked beyond the specified number. The actual label may vary.

- The storage environment requirements are as follows:
  - Ambient temperature: –40°C to +60°C (0°C to +30°C are recommended. If batteries are stored at a temperature higher than +30°C for extended periods, the battery performance and service life may be deteriorated.)
  - Relative humidity: 5%–95% RH (recommended: about 20%–70% RH)
  - Dry, clean, and well-ventilated
  - Away from corrosive organic solvents and gases
  - Away from direct sunlight
  - At least 2 m away from heat sources
- The batteries in storage must be disconnected from external devices. The indicators (if any) on the batteries must be off.
- The storage duration starts from the latest charge time labeled on the battery package. If a battery is qualified after charge, update the latest charge time (recommended format: YYYY-MM-DD HH:MM) and the next charge time (Next charge time = Latest charge time + Charge interval) on the label.
- The following table lists the maximum charge intervals for batteries delivered separately. Charge the batteries promptly and calibrate the SOC to 50%. Otherwise, the battery performance and service life may be deteriorated.

Storage Temperature (T)	Maximum Charge Interval[a]
-10℃<T≤25℃	15 months
25℃<T≤35℃	9 months
35℃<T<55℃	6 months
Note a: The interval starts from the latest charge time labeled on the battery package.	

- Do not unpack batteries. If charging is necessary, they must be charged by professionals as required and then returned to their original packaging after charging.
- The warehouse keeper shall collect battery storage information every month and periodically report the battery inventory information. The batteries in long-term storage shall be charged in a timely manner.

CAUTION

- Only trained and qualified personnel are allowed to charge batteries. Wear insulated gloves and use dedicated insulated tools during the operation.
- Observe onsite during charge and handle any exceptions in a timely manner.
- If a battery experiences an abnormality such as bulging or smoking during charge, stop charging immediately and dispose of it.

- When stored in low SOC, the batteries must be charged within the maximum interval corresponding to the SOC when the batteries are powered off. If the batteries are not charged within the specified interval, they may be damaged due to overdischarge.

Power-Off SOC Before Storage	Maximum Charge Interval
SOC ≥ 50%	Refer to the charge intervals for batteries delivered separately.
5% ≤ SOC < 50%	20 days
SOC < 5%	48 hours

- For details about how to charge batteries, see **10.2 Battery Overdue Storage and Charging**.
- If batteries have been stored for longer than allowed, promptly report the event to the person in charge.
- Ensure that batteries are delivered based on the "first in, first out" rule.
- Handle batteries with caution to avoid damage.

Storage Requirements for Fire Suppression Equipment

- Check the backup battery of the extinguishant control panel in the warehouse once a month. If the voltage of a lead-acid battery is lower than the standard voltage 11.5 V, charge the battery immediately.
- At room temperature (about 25°C), charge the backup battery of the extinguishant control panel at least once every six months. The charge interval is halved for every 10°C increase in temperature.
- When the fire suppression equipment is stored as spare parts, the ambient temperature shall range from 0°C to 50°C and the humidity shall be less than or equal to 95% RH.

RCM Storage Requirements

If a spare RCM will not be used immediately, store it according to the following requirements:

- Do not remove the packaging. Check the packaging regularly (recommended: once every three months). Replace any packing materials that become damaged during storage. If the RCM is unpacked but will not be used immediately, put it back to the original packaging with the desiccant, and seal with tape.
- Ensure that the RCM is stored in a dry, clean, and ventilated indoor environment that is free from sources of strong infrared or other radiations, organic solvents, corrosive gases, and conductive metal dust. Do not expose the RCM to direct sunlight or rain and keep it far away from sources of heat and ignition.
- Storage temperature: –40°C to +60°C; relative humidity: 5%–95% RH
- Stack the RCMs with caution to prevent them from falling over, resulting in personal injury or equipment damage.

10.2 Battery Overdue Storage and Charging

Material Delivery Check

There must be a battery charge label on the packing case. The charge label must specify the latest charge time and the next charge time.

Conditions for Determining Overdue Storage

- Do not store batteries for extended periods.
- The following table lists the maximum charge intervals for batteries delivered separately. Charge the batteries promptly and calibrate the SOC to 50%. Otherwise, the battery performance and service life may be deteriorated.

Storage Temperature (T)	Maximum Charge Interval[a]
-10℃<T≤25℃	15 months
25℃<T≤35℃	9 months

Storage Temperature (T)	Maximum Charge Interval[a]
35℃<T<55℃	6 months
Note a: The interval starts from the latest charge time labeled on the battery package.	

- AC mains input voltage requirements for charging:
  - 220 V (three-phase 260–530 V AC or single-phase 176–300 V AC)
  - 110 V (three-phase 130–265 V AC or single-phase 90–175 V AC)
  - AC input power cables used for charging in the warehouse must have a through-current capacity greater than 40 A.
- If batteries have been stored for longer than allowed, promptly report the event to the person in charge.
- Dispose of deformed, damaged, or leaking batteries directly irrespective of how long they have been stored.
- The storage duration starts from the latest charge time labeled on the battery package. If a battery is qualified after charge, update the latest charge time (recommended format: YYYY-MM-DD HH:MM) and the next charge time (Next charge time = Latest charge time + Charge interval) on the label.
- Batteries can be charged for a maximum of three times during storage. Dispose of batteries if the maximum charge times are exceeded.
- You can obtain the battery production completion time by querying the delivery record based on the battery pack serial number (SN) or consulting the Company's service engineers.

Preparing Charging Devices

- Multimeter
- Clamp meter
- Insulated torque socket wrench
- Charger
- Battery Control Unit (BCU)
- Cable package

Inspection Before Charge

1. Before charging a battery, you need to check its appearance. Charge the qualified battery or dispose of the unqualified one.
2. If any of the following symptoms occurs, the battery is unqualified.
   - Deformation
   - Shell damage
   - Leakage
3. Check that the accessories are complete based on the packing list delivered with the charger.

Full Charge Strategy

The charging ambient temperature ranges from 15°C to 40°C.

Charge and Discharge Current (Unit: Ampere)	Charging Duration (Excluding Equalization)
15	19 hours (fully discharge the battery and then charge the battery to 50% SOC)
40[1]	8 hours (fully discharge the battery and then charge the battery to 50% SOC)
Note 1: In three-phase input mode, use the 380 V AC/40 A power cable delivered with the charger.	

Charging Procedure

NOTE

- Prepare battery packs that are qualified for charging.
- You need to purchase the communications cables and positive and negative DC input cables used with the charger from the Company.
- You need to purchase the BCU and its communications cables from the Company.

Step 1 Connect the communications cable from the communications port of the charger to the FE communications port of the BCU.

Step 2 Connect the communications cable from the CON communications port 1 of the BCU to the communications port of the battery pack.

Step 3 Connect the positive and negative DC input power cables from the charger power ports to the battery pack power ports (general power ports).

Step 4 Connect the AC INPUT port on the charger to the utility power source using the power cable delivered with the charger.

Step 5 Turn on the AC circuit breaker of the charger.

Step 6 Turn on the DC circuit breaker of the charger.

Step 7 Operate the charger according to its manual.

Step 8 After the charge and discharge are complete, wait until the fan in the charger keeps running for about 5 minutes to dissipate the residual heat, turn off the AC and DC circuit breakers, and remove the cables.

----End

A LTMS Label Description

Component	Physical Label
Suction pressure sensor	LPS1, LPS2
High-pressure sensor	HPS1, HPS2
High-voltage switch	Hp1, Hp2
Temperature sensor	B9, B10, B11, B12, B13, B14
EEV	EEV1, EEV2
Electric heater contactor	KM
Relay	K1, K2

B List of Components to Be Replaced After the 10-Year Service Life Expires

Component	Replacement Method
LCC	7.30 Replacing a Liquid Cooling Controller (LCC)
Backplane	7.31 Replacing a Backplane
Compressor drive module	7.33 Replacing a Compressor Drive Module
Circulation pump drive module	7.34 Replacing a Circulation Pump Drive Module
24 V auxiliary power module	7.35 Replacing a 24 V Auxiliary Power Module
48 V auxiliary power module	7.36 Replacing a 48 V Auxiliary Power Module
Expansion tank	7.5 Replacing an Expansion Tank
CO sensor	5.6 Replacing a CO Sensor
Input/Output module	6.7 Replacing an Input/Output Module
Smoke detector	5.4 Replacing a Smoke Detector
Heat detector	5.5 Replacing a Heat Detector
Fire alarm horn/strobe	5.8 Replacing a Fire Alarm Horn/Strobe
Extinguishant release/abort button	6.3 Replacing an Extinguishant Release/Abort Button
Manual alarm device	6.8 Replacing a Manual Alarm Device

Component	Replacement Method
Extinguishant release indicator	**6.4 Replacing an Extinguishant Release Indicator**
CMU	**6.10 Replacing a CMU**
SmartModule	**6.11 Replacing a SmartModule**
DO expansion board	**6.16 Replacing a DO Expansion Board**
Power adapter	**6.12 Replacing a Power Adapter**
PSU	**6.13 Replacing a PSU**
Power meter	**6.26 Replacing a Power Meter**
Water sensor	**5.10 Replacing a Water Sensor**
T/H sensor	**5.7 Replacing a T/H Sensor**
Air conditioner	**6.9 Replacing an Air Conditioner**

C How to Set the Address of the C050SZEG Extinguishant Control Panel

The C050SZEG extinguishant control panel does not need to be manually coded. It can be automatically coded after components are connected to the extinguishant control panel in sequence.

NOTE

Before writing the program, ensure that all components are connected in sequence. The initial end of the loop outlet J11 must be connected to smoke detector first. If the initial end is connected to the fire alarm horn/strobe, the system address will be reversed, causing the system to report an error.

Step 1 Check that the extinguishant control panel is powered on.

NOTE

If lead-acid batteries are connected to the extinguishant control panel, the extinguishant control panel will fail to power on due to the protection mechanism that prevents battery from being fully discharged. Connect the active power supply to activate the lead-acid standby power supply.

Step 2 Click the house icon on the panel.

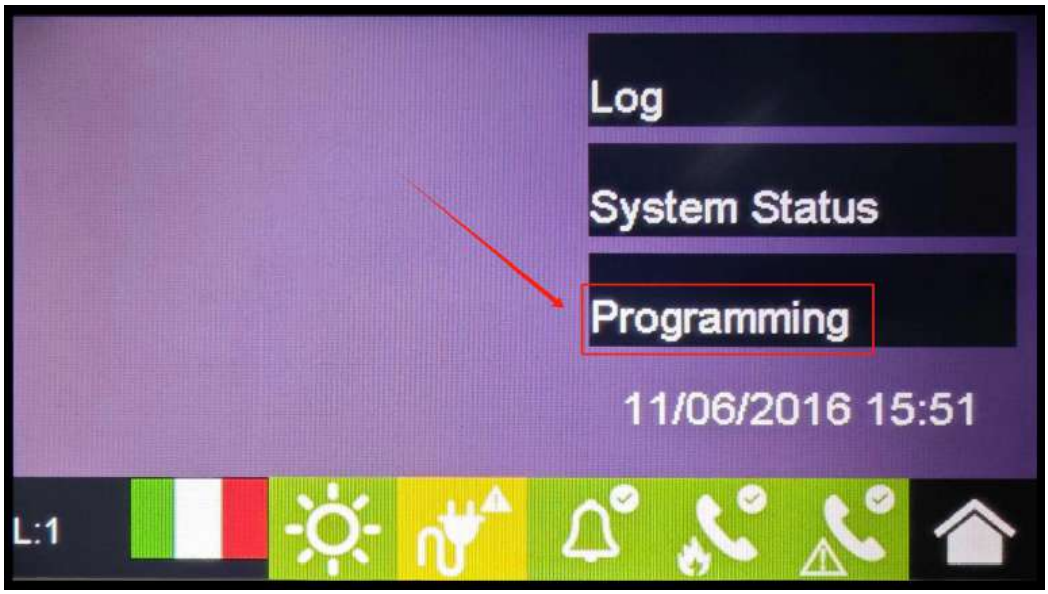
CAUTION

Before writing programs to the host, ensure that the solenoid valve of the fire cylinder is not installed to prevent misoperations during power-on.

Step 3 Tap **Programming**.

NOTE

The default language is English. For example, if you touch the Italian flag, the language will be switched to Italian.

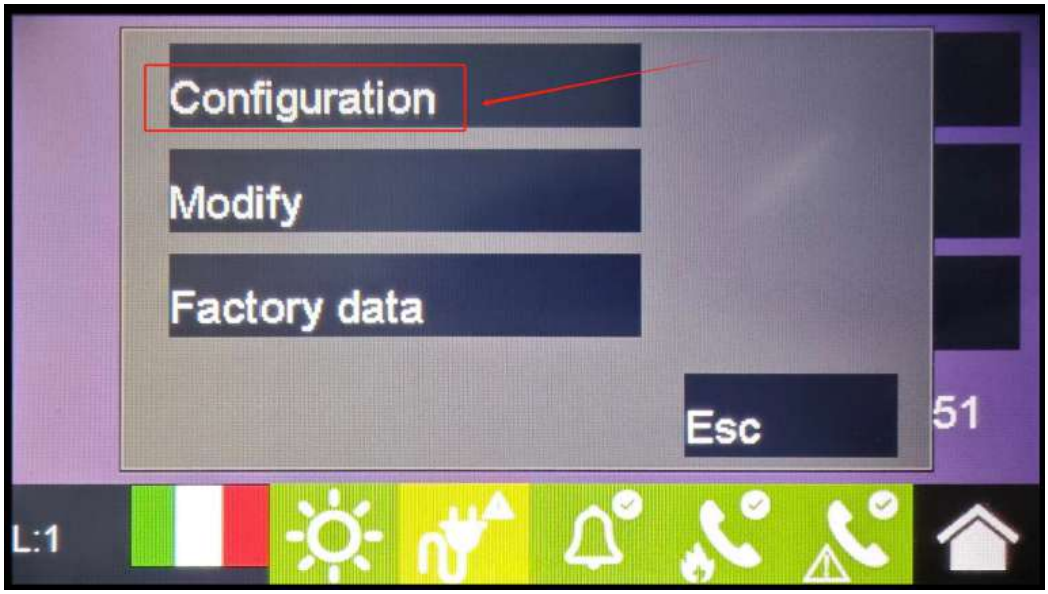


Step 4 Enter the password **00004** and tap **OK**.

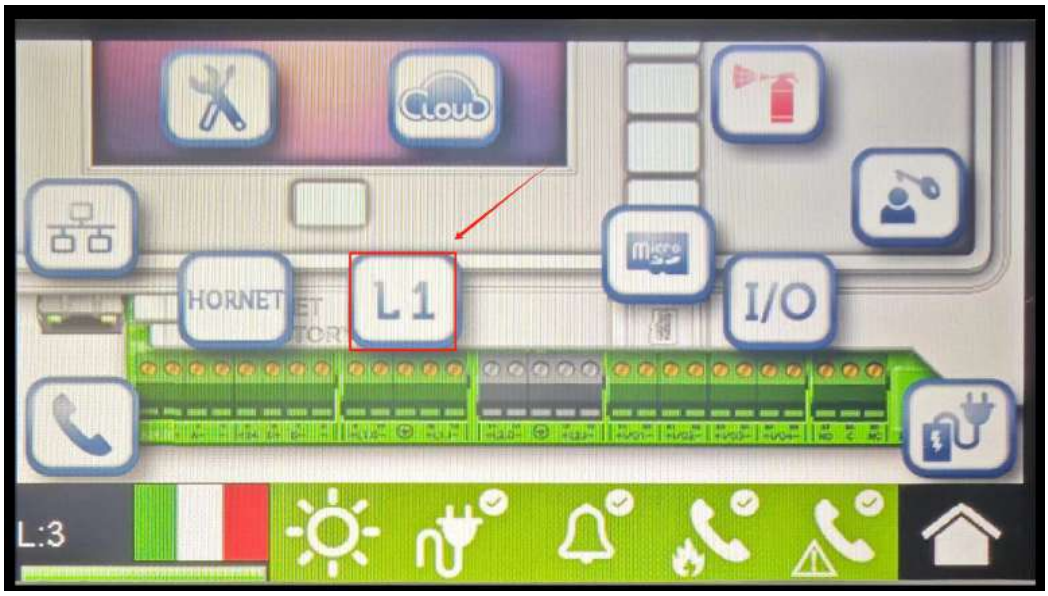
Step 5 Tap **Configuration**.

NOTICE

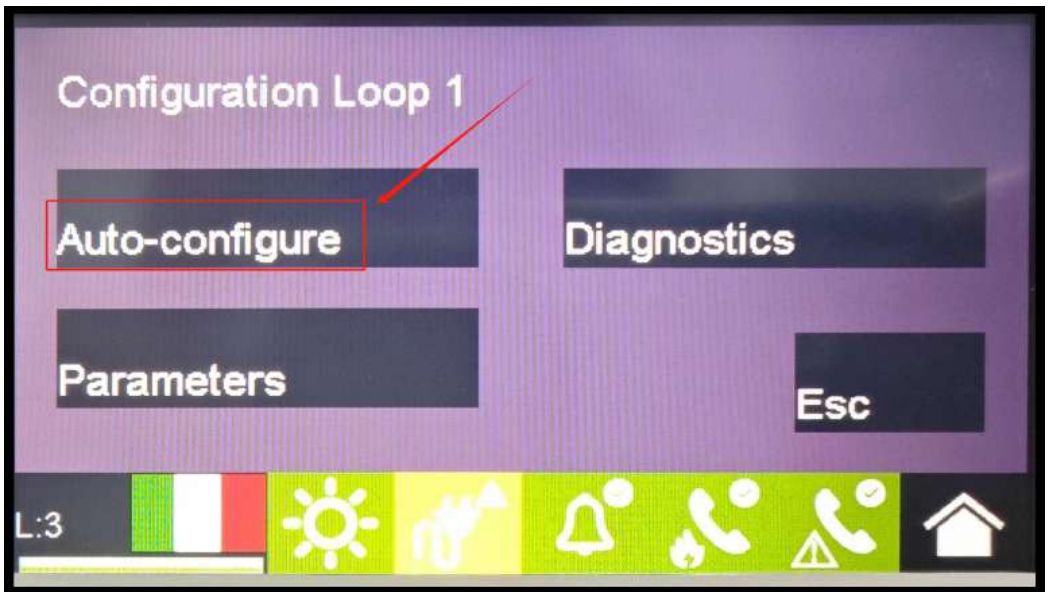
Factory data is used to restore factory settings. Do not click it.



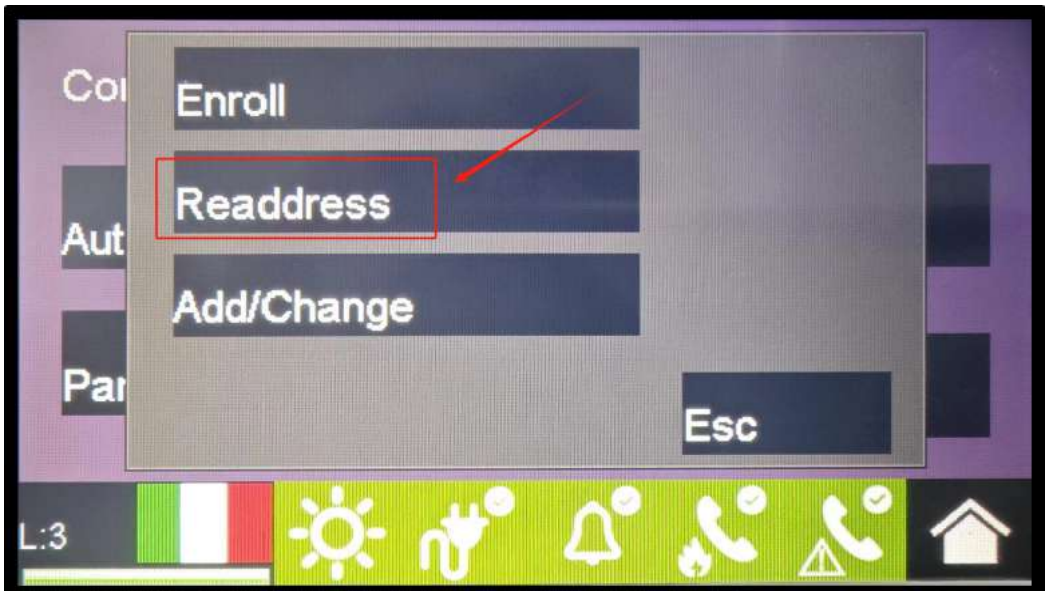
Step 6 Select L1 (loop where the device is located).

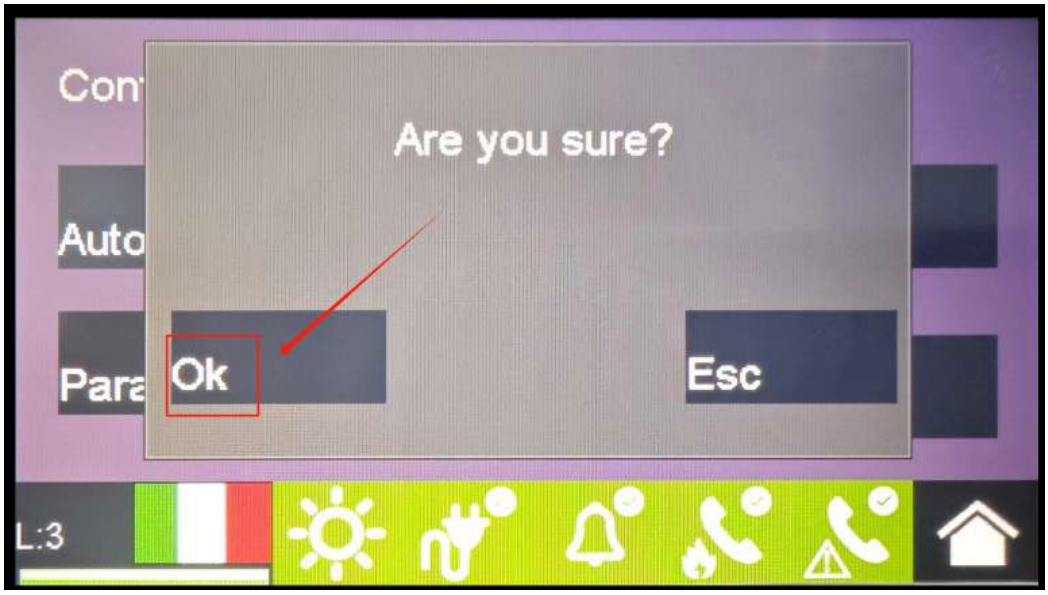


Step 7 Tap **Auto-configure**.

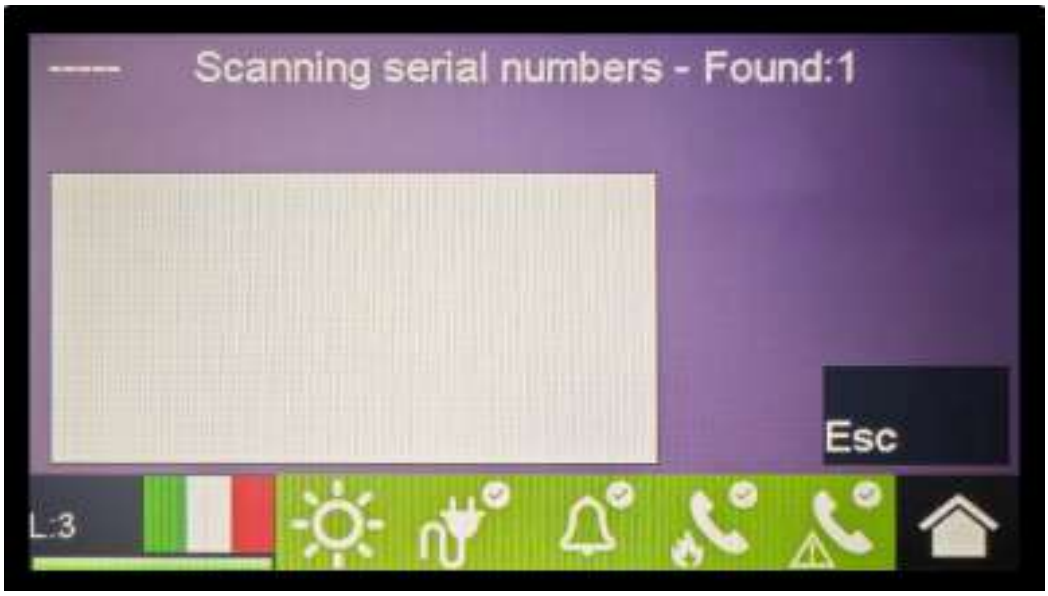


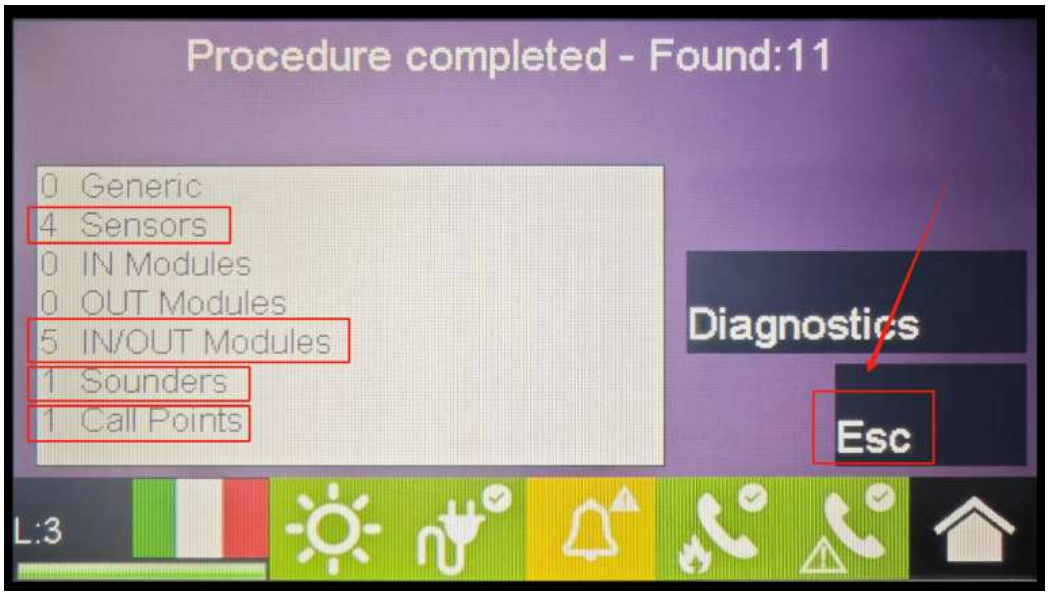
Step 8 Tap **Readdress**.



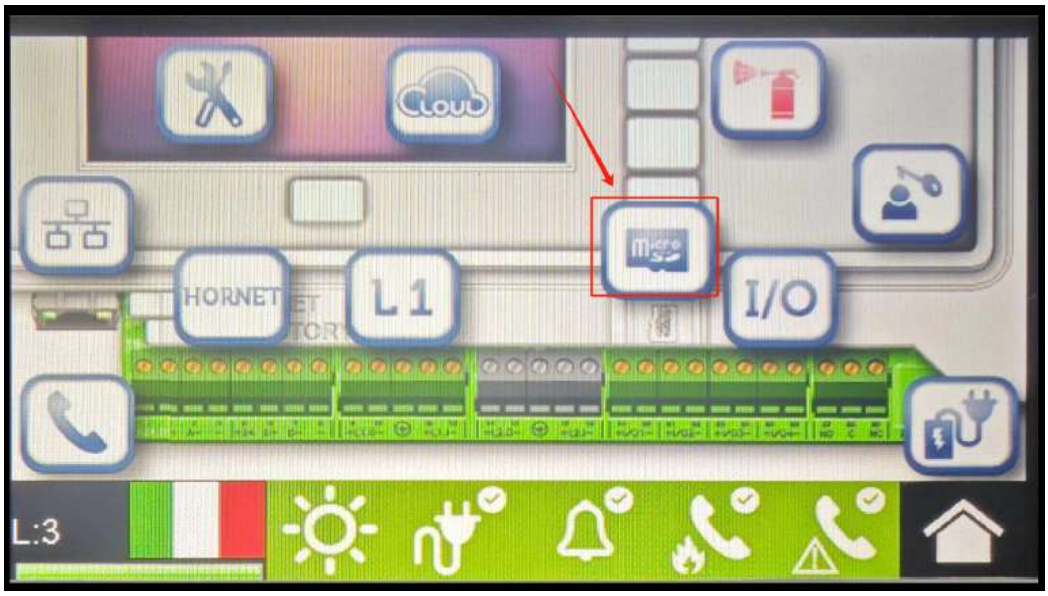


Step 9 Wait until the addressing is complete. Do not perform any operation during this process. If the cable connection is correct, the host can identify 11 addressable devices, that is, **Found 11** is displayed.

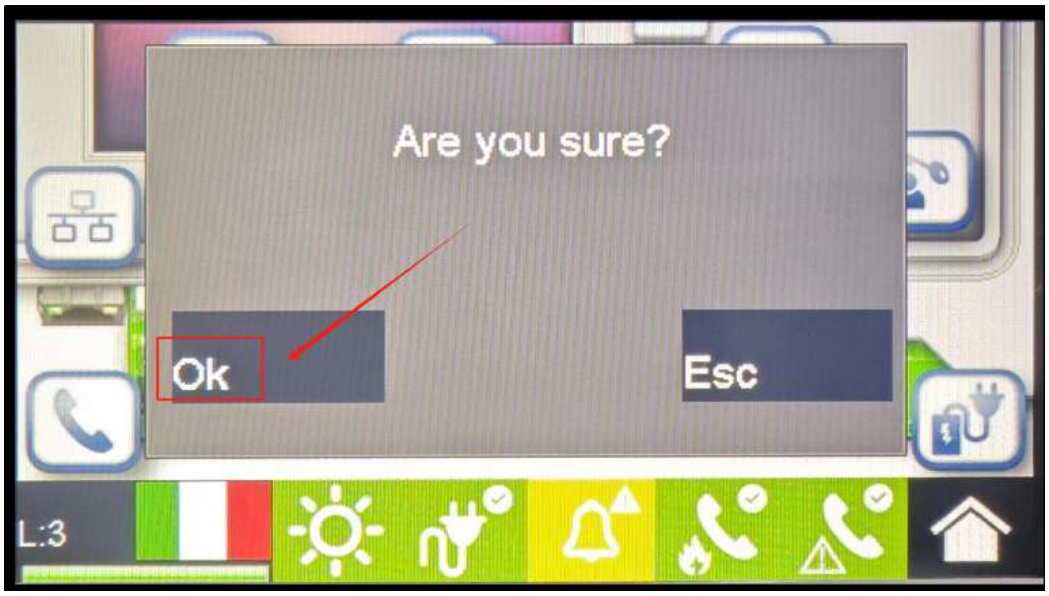




Step 10 Click the SD card icon.

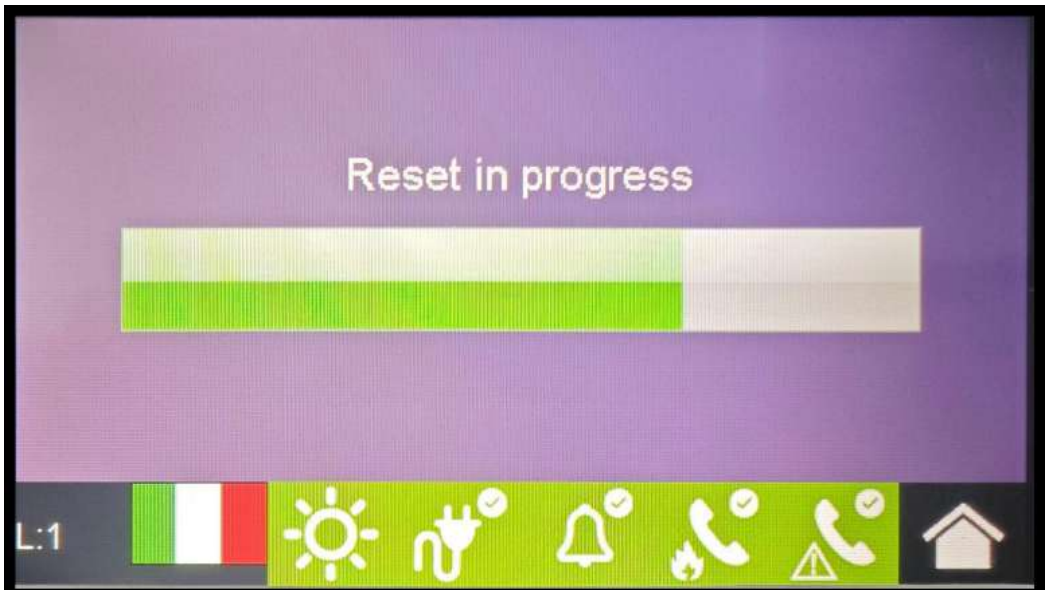


Step 11 Tap **Read Program Data**.



Note: Do not click **Save Program Data**. Otherwise, the preset program settings will be overwritten.

Step 12 The system automatically restarts after the program is read.



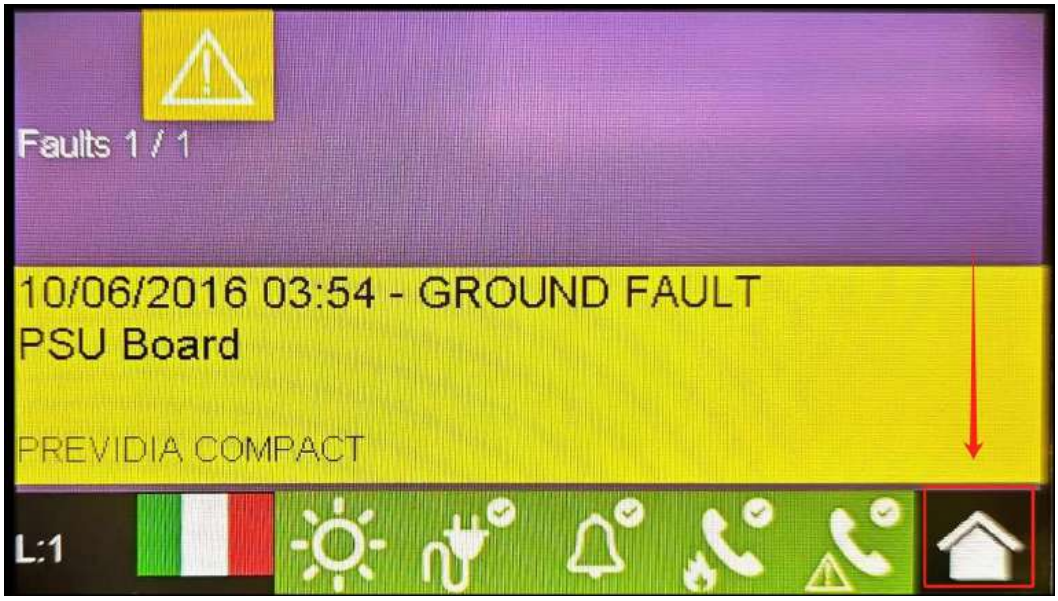
Note: The device inspection indicator should be blinking green, and **MISSING BATTERY PSU Board** and **GROUND FAULT PSU Board** may be displayed on the panel. For details, see section 4.2.

----End

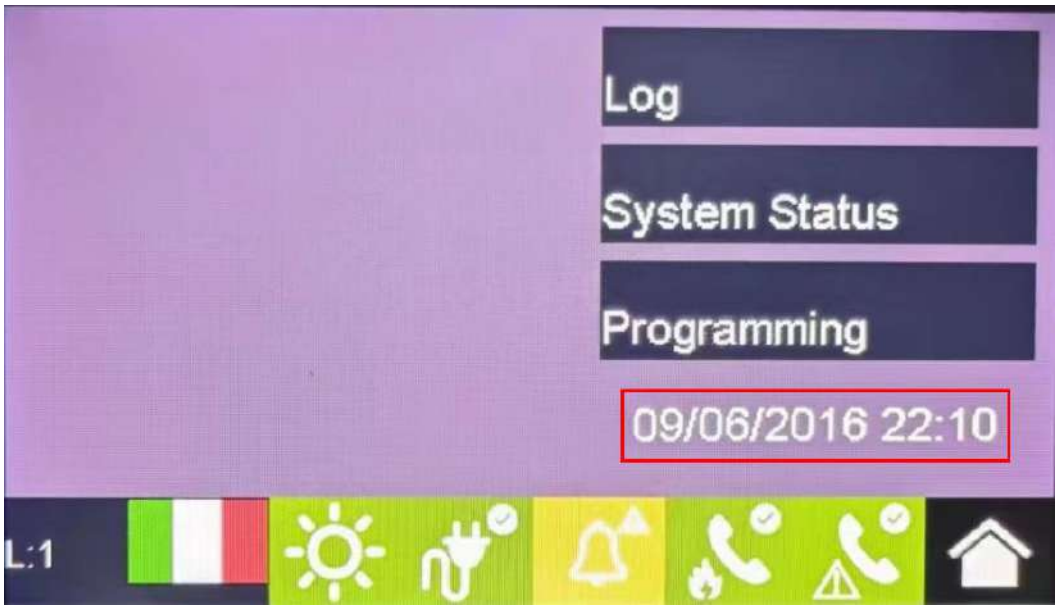
D How to Set the Time of the C050SZEG Extinguishant Control Panel

After the active/standby power supply of the C050SZEG extinguishant control panel is powered off, the time cannot be updated. After the extinguishant control panel is powered on again, you need to manually update the time.

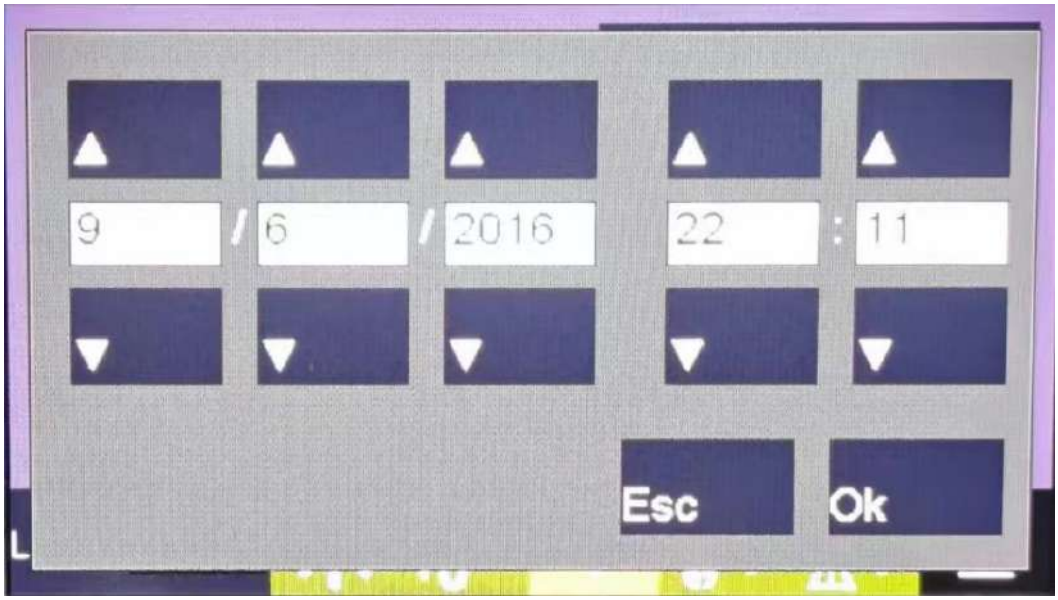
Step 1 Click the house icon on the panel.



Step 2 Click the time displayed on the screen.



Step 3 Enter the current time and tap **OK**.



----End

E How Do I Recycle Used Batteries?

NOTICE

- The Company does not recycle batteries. Contact local recycling agencies to handle batteries.
- If there are no such agencies in your area, you can contact the nearest foreign recycling agencies.

Step 1 Contact the nearest recycling agencies.

Step 2 Recycling agencies assess the costs.

Step 3 Recycling agencies carry out recycling, which can be done in two ways:

- Onsite recycling: Recycling agencies can visit your sites to recycle lithium batteries, but the price depends on actual conditions such as the distance and transportation expenses.
- Centralized recycling: You can collect all lithium batteries to be recycled in one place for the recycling agencies to handle.

NOTE

You need to cover the related transportation expenses.

Step 4 Recycling agencies handle recycling. The recycled lithium batteries are at the disposal of the recycling agencies.

----End

F How Do I Repair Paint Damage?

Prerequisites

- Do not apply paint in bad weather, such as rain, snow, strong wind, and sandstorm, when there is no shelter outdoors.
- You have prepared the RAL 9003 polyurethane top coat.

Paint Repair Description

The equipment appearance shall be intact. If paint has flaked off, repair paint damage immediately.

NOTE

Check the paint damage on the equipment and prepare appropriate tools and materials. The number of materials depends on site requirements.

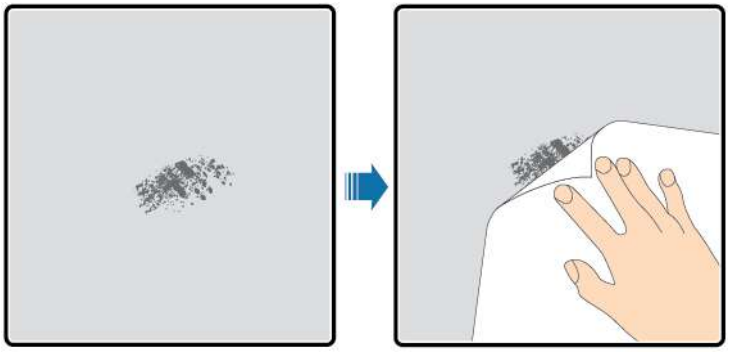
Table F-1 Paint repair description

Paint Damage	Tool and Material	Procedure	Description
Slight scratch (steel base material not exposed)	Spray paint or paint, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, and paint sprayer (required for repainting a large area)	Steps 1, 2, 4, and 5	1. The color number of the top coat (polyurethane paint) is RAL 9003. 2. For a few scratches, smudges, or rust, manual paint spraying or brushing is recommended. 3. For many scratches or large-area smudges and rust, use a paint sprayer. 4. The paint coating shall be thin and even. Paint drops are prohibited on the coating. The surface shall be smooth. 5. Leave the repainted area for approximately 30 minutes before performing any further operation.
Smudges and rust that cannot be removed			
Deep scratch (primer damaged, steel base material exposed)	Spray paint or paint, zinc-rich primer, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, and paint sprayer (required for repainting a large area)	Steps 1, 2, 3, 4, and 5	
Logo and pattern damage	If a logo or pattern is damaged, provide the logo size and color number. Seek help from a local supplier of advertisement coatings to formulate a repair solution based on the logo size, color, and damage.		
Dent	1. If a dent is less than or equal to 100 mm^2 in area and less than 3 mm in depth, fill the dent with Poly-Putty base and then perform the same operations as those for processing deep scratches. 2. If a dent is greater than 100 mm^2 in area or greater than 3 mm in depth, ask the local supplier for an appropriate repainting solution.		

Procedure

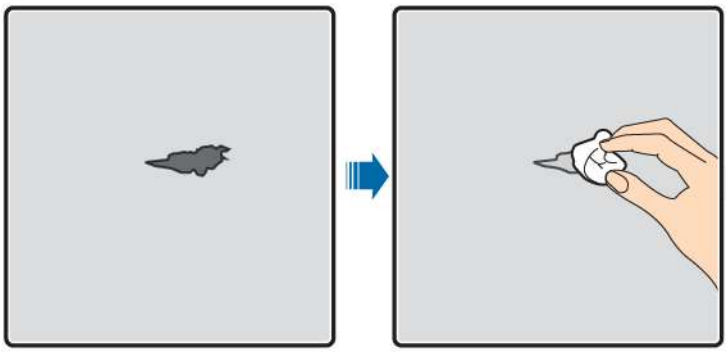
Step 1 Gently polish damaged areas using fine sandpaper to remove smudges or rust.

Figure F-1 Polishing a damaged area using sandpaper



Step 2 Dip a piece of cotton cloth into anhydrous alcohol and wipe the polished or damaged area to remove the dirt and dust. Then wipe off the anhydrous alcohol with a clean and dry cotton cloth

Figure F-2 Wiping a polished or damaged area using anhydrous alcohol



Step 3 Paint zinc-rich primer on the damaged coat using a brush or paint sprayer.

NOTICE

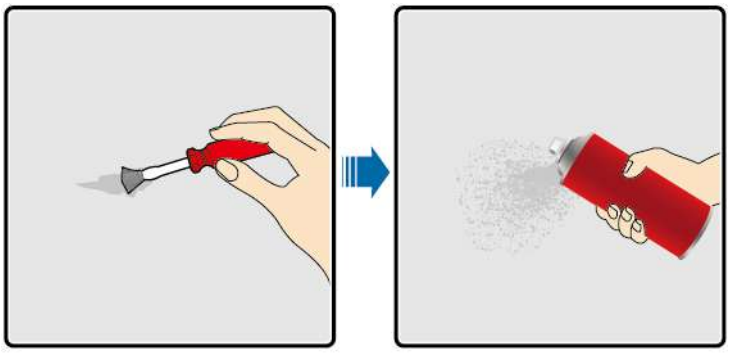
- If the base material is exposed in the area to be repaired, apply epoxy zinc-rich primer, wait until the paint has dried, and then apply acrylic acid top coat.
- Select epoxy zinc-rich primer or acrylic acid top coat with a color the same as the surface coating color of the equipment.

Step 4 Apply paint evenly to the damaged area based on the damage degree of the paint using an aerosol spray, brush, or paint sprayer until all damage traces are invisible.

NOTICE

- Ensure that the painting is thin, even, and smooth.
- In the case that an equipment pattern has different colors, to prevent undamaged areas and those with different colors as the damaged area from being contaminated during repainting, cover such areas using white paper and adhesive tape before repairing paint.

Figure F-3 Repainting a damaged area



Step 5 Wait for 30 minutes and check whether the painting meets the requirements.

NOTE

- The color of the repainted area must be consistent with that of the surrounding area. Use a colorimeter to measure the color difference (ΔE), which shall be less than or equal to 3. If a colorimeter is unavailable, ensure that there is no visible edge between the repainted area and the surrounding area. The paint shall also be free of bulges, scratches, flaking, or cracks.
- If you choose to spray paint, it is recommended that you spray paint three times before checking the result. If the color does not meet the requirements, paint more times until the painting meets the requirements.

----End

Paint Supply Information

Table F-2 Paint requirements

Item	Requirement
Primer thickness	60 μm
Intermediate coat thickness	120 μm
Top coat thickness	60 μm
Primer type	Epoxy zinc-rich paint
Intermediate coat type	Zinc-rich paint
Top coat type	RAL 9003 polyurethane top coat

NOTE

The following is a paint model list provided by the Company. The list may be updated from time to time and is for reference only. The cost of paint and technical services is subject to the local pricing standards.

Supplier	Position	Paint Model
Hempel	Equipment surface painting	Zinc-rich primer for pretreatment: HEMPADUR ZINC (shopprimer) 1536C/19830 Zinc-rich primer for the entire container: HEMPADUR ZINC (on line) 1536C/19830 Intermediate coat: HEMPADUR FAST DRY 15560/12170 Top coat: HEMPATHANE 55210/17630 (RAL9003)
	Logo	Red: HEMPATHANE 55210/57200 (RAL3020) Black: HEMPATHANE 55210-19990 (RAL9005)
CMP	Equipment surface painting	Zinc-rich primer for pretreatment: EPICON ZINC SC B-2 M (SHOP PRIMER) Zinc-rich primer for the entire container: EPICON ZINC SC B-2 M (ON LINE ZINC) Intermediate coat: EPICON SC PRIMER GREY CSC-9107 Top coat: UNYMARINE SC FINISH WHITE CSC-9205 (RAL-9003)
	Logo	Red: UNYMARINE SC MARKING RAL-3020 Black: UNYMARINE SC MARKING RAL-9005

G Contact Information

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

https://digitalpower.huawei.com

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

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

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

NOTE

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H Acronyms and Abbreviations

B	
BCU	Battery Control Unit
BMU	Battery Monitoring Unit
C	
CMU	Central Monitoring Unit
E	
ESS	Smart String Energy Storage System
ETH	Ethernet
ESR	Battery Rack
ESM	Battery Pack
L	
LED	light emitting diode
P	

PSU	Power Supply Unit
S	
SACU	Smart Array Controller

