

TCL BlueArk X5 Commercial & Industrial Energy Storage System Maintenance Manual



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Contents

1. INTRODUCTION.....	1
2. SAFETY PRECAUTIONS.....	3
2.1 GENERAL SAFETY.....	3
2.2 PERSONAL SAFETY.....	3
2.3 PERSONNEL REQUIREMENTS.....	4
2.4 ELECTRICAL SAFETY.....	4
2.5 GENERAL REQUIREMENTS.....	5
2.6 GROUNDING REQUIREMENTS.....	6
2.7 WIRING REQUIREMENTS.....	6
2.8 ANTI-STATIC REQUIREMENTS.....	6
2.9 ENVIRONMENTAL REQUIREMENTS.....	7
2.10 MECHANICAL SAFETY.....	8
2.11 HEAVY LIFTING SAFETY.....	8
2.12 HIGH-ALTITUDE SAFETY.....	9
2.13 LADDER SAFETY.....	10
2.14 LIFTING SAFETY.....	10
2.15 DRILLING SAFETY.....	10
2.16 EQUIPMENT SAFETY.....	11
2.16.1 Energy Storage System Safety.....	11
2.16.2 Battery Safety.....	11
2.16.3 Standard Requirements.....	12
3. ROUTINE MAINTENANCE.....	14
3.1 PREPARATION BEFORE MAINTENANCE.....	14
3.2 SYSTEM POWER-DOWN.....	14
3.2.1 System Power-Down Procedure.....	14
3.3 ROUTINE MAINTENANCE.....	14
3.3.1 Daily Maintenance.....	14
3.3.2 Periodic Maintenance.....	14
4 FAULT/ALARM.....	16
4.1 EMS ALARMS/FAULTS.....	16
4.2 BMS ALARMS/FAULTS.....	16
4.3 HYBRID INVERTER ALARMS/FAULTS.....	18
5 REPLACEMENT OF FAULTY COMPONENTS.....	24
5.1 REPLACE THE PROTECTION SYSTEM COMPONENTS.....	24
5.1.1 Location Information.....	24
5.1.2 Tool Preparation and Pre-Replacement Actions.....	24
5.1.3 Replacement Procedure.....	24
5.2 REPLACE THE LIMIT SWITCH.....	26
5.2.1 Position Information.....	26
5.2.2 Tool Preparation and Pre-Replacement Actions.....	26
5.2.3 Replacement Procedure.....	27

5.3	REPLACE THE AIR CONDITIONING	27
5.3.1	Location Information	27
5.3.2	Tool Preparation and Pre-Replacement Actions	28
5.3.3	Replacement Procedure	28
5.4	REPLACE THE HIGH-VOLTAGE BOX	30
5.4.1	Location Information	30
5.4.2	Tool Preparation and Pre-Replacement Actions	30
5.4.3	Replacement Procedure	31
5.5	REPLACE THE DISTRIBUTION BOX	31
5.5.1	Location Information	31
5.5.2	Tool Preparation and Pre-Replacement Actions	31
5.5.3	Replacement Procedure	32
5.6	REPLACE THE EXHAUST VALVE AND INTAKE VALVE	32
5.6.1	Position Information	32
5.6.2	Tool Preparation and Pre-Replacement Actions	32
5.6.3	Replacement Procedure	33
5.7	REPLACING THE EMERGENCY STOP BUTTON AND INDICATOR LIGHT	33
5.7.1	Location Information	33
5.7.2	Tool Preparation and Pre-Change Actions	34
5.7.3	Replacement Procedure	34
5.8	REPLACING THE INVERTER	35
5.8.1	Location Information	35
5.8.2	Tool Preparation and Pre-Change Actions	36
5.8.3	Replacement Procedure	36
5.9	REPLACING THE BATTERY MODULE	36
5.9.1	Location Information	36
5.9.2	Tool Preparation and Pre-Replacement Actions	37
5.9.3	Replacement Procedure	37
6	APPENDIX	39
6.1	HOW TO RECYCLE USED BATTERIES	39



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Note: When modifying content, the file version must be updated simultaneously;
When modifications are excessive, retain only the initial release content along with the most recent changes.

1. Introduction

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Note: Before using the product, you must carefully read and understand all terms in this manual. Illustrations in this manual are for reference only, the actual product shall prevail.

About This Manual

1) Applicable Products

This product user manual primarily introduces troubleshooting and maintenance methods for the TCL BlueArk X5 Commercial & Industrial Energy Storage System. This manual applies only to the TCL BlueArk X5 Commercial & Industrial Energy Storage System developed by TCL Digital Power Co., Ltd. (hereinafter referred to as: TCL Digital Power). product name: TCL BlueArk X5 Commercial & Industrial Energy Storage System.

2) Target Audience

This manual is intended for personnel involved in the installation, operation, maintenance, and related tasks of this product. Readers should possess relevant electrical and related professional knowledge and qualifications. All installation and operational tasks must be performed exclusively by qualified technical personnel. Qualified technical personnel must meet the following requirements:

- Have undergone specialized training and obtained certification
- Have thoroughly read this manual and mastered all relevant safety procedures
- Be familiar with local standards and relevant safety regulations for electrical systems

Note: Operation by non-professionals may result in equipment malfunction or damage.

3) Symbol Usage

To ensure user safety and property protection during product use, and to promote efficient and correct operation, this manual provides relevant information highlighted with the following symbols. The symbols potentially used in this manual are listed below. Please read them carefully to better utilize this manual.

The following symbols may appear in this document, with their meanings as follows:



DANGER

Indicates an urgent hazard situation. Failure to avoid may result in death or serious personal injury.



WARNING

Used to warn of potentially hazardous situations, Failure to avoid may result in death or serious personal injury.



CAUTION

Used to warn of potential hazardous situations, Failure to avoid may result in moderate or minor personal injury.



NOTE

Used to convey equipment or environmental safety warnings, Failure to avoid may result in equipment damage, data loss, reduced equipment performance, or other unpredictable consequences.

2. Safety Precautions

2.1 General Safety

Before transporting, storing, installing, operating, using, or maintaining the equipment, read this manual thoroughly. Strictly follow the instructions provided herein and adhere to all safety precautions indicated on the equipment and within this manual. The "Note," "Caution," "Warning," and "Danger" statements in this manual do not represent all safety requirements that must be observed; they serve only as supplements to all safety precautions. You must also comply with relevant international, national, or regional standards and industry practices. The company assumes no liability for any consequences arising from violations of general safety operating requirements or breaches of safety standards in the design, production, or use of the equipment. This equipment must be used in environments meeting its design specifications. Failure to do so may cause equipment malfunction, and any resulting abnormal equipment operation or component damage is not covered under the equipment warranty. The company shall not be liable for any personal injury, property damage, or other losses that may occur as a result. Transportation, storage, installation, operation, use, and maintenance of the equipment must comply with local laws, regulations, and codes. The safety precautions in this manual are provided solely as a supplement to local laws, regulations, and codes. The company shall not be liable for any of the following situations or their consequences:

- 1) Installation and operating environments that do not comply with relevant international, national, or regional standards.
- 2) Operation outside the conditions specified in this manual.
- 3) Unauthorized disassembly, modification of the product, or alteration of the software code.
- 4) Failure to follow the operating instructions and safety warnings in the product and documentation.
- 5) Damage to equipment caused by abnormal natural events (earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, force majeure).
- 6) Damage caused during transportation by you or a third party you have commissioned.
- 7) Damage caused by storage conditions that do not meet the requirements specified in the product documentation.
- 8) Damage to hardware or data caused by negligence, improper operation, or intentional damage by you or a third party.
- 9) System damage caused by you or a third party, including relocation and installation of the system not in accordance with this manual, as well as damage resulting from adjustments, modifications, or removal of identification marks not in accordance with this manual.
- 10) Defects, failures, or damages resulting from acts, events, negligence, or accidents beyond the reasonable control of the seller, including power outages or electrical failures, theft, war, riots, civil unrest, terrorism, or intentional or malicious damage.



NOTE

Reverse engineering, decompiling, disassembling, modifying, adapting, implanting, or performing other derivative operations on the equipment software is prohibited. You may not study the internal implementation of the equipment, obtain the source code of the equipment software, or steal intellectual property in any manner. You may not disclose the results of any performance testing of the equipment software.

2.2 Personal Safety



DANGER

- **Never perform live electrical work during installation. Do not install or remove cables while energized. Contact between cable conductors and live parts may cause arcing, sparks, or ignition, potentially leading to fire or personal injury.**
- **When the equipment is energized, improper or incorrect operations may cause fire, electric shock, or explosion, resulting in personal injury or property damage.**
- **During operations, wearing conductive objects such as watches, bracelets, rings, or necklaces is strictly**

prohibited to prevent electric shock burns.

- **Specialized insulated tools must be used during operations to prevent electric shock injuries or short circuits. The insulation voltage rating must comply with local laws, regulations, standards, and specifications.**



WARNING

Special protective equipment must be worn during operations, including protective clothing, insulated shoes, safety goggles, hard hats, and insulated gloves.

2.3 Personnel Requirements

Lifting, transportation, installation, wiring, operation, and maintenance of the equipment must be performed by qualified electrical technicians in compliance with local regulations. When operating the equipment, wear protective gear that meets local safety requirements.



Figure1Personnel Attire Requirements

Operators must meet the following requirements:

- 1) During installation, operation, and maintenance, wearing conductive objects such as watches, bracelets, rings, or necklaces is strictly prohibited to prevent electric shock burns.
- 2) During transportation, transfer, installation, wiring, and maintenance operations, comply with the laws, regulations, and relevant standards of the country or region where the equipment is located.
- 3) Be thoroughly familiar with the entire energy storage system's configuration and operating principles, and perform operations according to the manual's instructions.
- 4) Personnel must have received specialized training related to electrical equipment installation and commissioning, possess relevant knowledge in electronics, electrical wiring, and mechanical systems, and be proficient in interpreting electrical and mechanical schematics.
- 5) Possess the ability to respond to emergencies or unexpected situations that may arise during installation or commissioning.

2.4 Electrical Safety



DANGER

- Before making electrical connections, ensure the equipment is undamaged to prevent electric shock or fire hazards.
- Non-standard or incorrect operation may cause accidents such as fire or electric shock.
- During operation, prevent foreign objects from entering the equipment interior, as this may cause short circuits, equipment damage, load power derating or loss of power, and personal injury.



WARNING

For equipment requiring grounding, the protective grounding wire must be installed first during installation; when removing the equipment, the protective grounding wire must be removed last.



NOTE

Cables must not pass through the equipment's air inlets or outlets.

2.5 General Requirements

- 1) Installation, operation, and maintenance must follow the step-by-step procedures outlined in the manual. Do not modify, add components to, or alter the equipment without authorization. Do not change the installation sequence without permission.
- 2) Permission from the local power authority is required for grid connection. Comply with power plant safety regulations, such as implementing work permit and operation ticket systems.
- 3) Install temporary fencing or warning ropes in the work area and hang "No Entry" signs. Non-authorized personnel are strictly prohibited from entering.
- 4) Before installing or removing power cables, disconnect the equipment itself and its upstream/downstream switches.
- 5) If liquid is detected inside the equipment, immediately shut off the power supply and cease all use.
- 6) Before operating equipment, carefully verify that all tools meet requirements and record them in the log. After operation, count and retrieve tools to prevent them from being left inside the equipment.
- 7) Before installing power cables, verify that cable labels are correctly marked and cable terminals are properly insulated.
- 8) When installing equipment, use torque tools with appropriate ranges to tighten screws. When using wrenches, ensure they are not angled and that torque value deviations do not exceed 10% of the specified range.
- 9) After installation, ensure all electrical component protective covers, insulating sleeves, and similar devices are properly in place to prevent electric shock hazards.
- 10) If the equipment has multiple inputs, disconnect all inputs and wait until the equipment is completely powered down before performing any operations.
- 11) When servicing downstream electrical or distribution equipment connected to the power supply, disconnect the corresponding output switch of the power supply equipment.
- 12) During equipment maintenance, hang a "DO NOT CLOSE" sign on the upstream/downstream switches or circuit breakers and post warning signs to prevent accidental reconnection.
- 13) Power may only be restored after all faults have been resolved. When performing fault diagnosis and troubleshooting requiring power shutdown, the following safety measures must be completed: Power Off > Verify Voltage > Install Grounding Wire > Hang Warning Signs and Install Barriers.
- 14) Regularly inspect equipment connection terminal screws to ensure they are tightened and free of looseness. If cables are damaged, they must be replaced by qualified personnel to avoid risks.
- 15) It is strictly prohibited to alter, damage, or obscure any labels or nameplates on the equipment. Replace any labels that have become illegible due to prolonged use promptly.
- 16) Do not clean internal or external electrical components with solvents such as water, alcohol, or oil.

2.6 Grounding Requirements

- 1) Equipment grounding impedance must meet local electrical standards.
- 2) The equipment must be permanently connected to a protective earth. Before operating the equipment, inspect its electrical connections to ensure reliable grounding.
- 3) Do not operate the equipment without a properly installed grounding conductor.
- 4) Do not damage the grounding conductor.
- 5) For equipment using a three-prong plug, ensure the grounding terminal in the three-prong plug is connected to the protective earth.
- 6) For equipment with high contact current, the protective grounding terminal on the equipment chassis must be grounded before connecting the input power supply to prevent electric shock to personnel from contact current.

2.7 Wiring Requirements

- 1) Cable selection, installation, and routing must comply with local laws, regulations, and standards.
- 2) During power cord installation, avoid coiling or twisting. If the power cord is insufficient in length, replace it entirely. Do not splice or solder power cords.
- 3) All cables must be securely connected, well-insulated, and of appropriate specifications.
- 4) Cable trays and cable entry holes shall have no sharp edges. Protective measures must be provided at locations where cables pass through conduits or entry holes to prevent damage from sharp edges, burrs, or similar hazards.
- 5) If cables enter the cabinet from the top, they must be bent into a U-shape outside the cabinet before entry.
- 6) Cables of the same type should be bundled together, appearing straight and neat with no damage to the outer sheath. Cables of different types must be laid at least 30mm apart; intertwining or crossing is prohibited.
- 7) After completing wiring or when leaving during the wiring process, immediately seal the cable entry point with sealing compound to prevent moisture and small animals from entering.
- 8) Buried cables must be securely fastened using cable supports and clamps. Cables in backfilled soil areas must be tightly pressed against the ground to prevent deformation or damage from soil compaction forces during backfilling.
- 9) When external conditions (such as installation methods or ambient temperature) change, verify cable selection by referring to IEC-60364-5-52 or local regulations and standards, including whether the current-carrying capacity meets requirements.
- 10) Cable use in high-temperature environments may cause insulation aging or damage. Maintain a minimum clearance of 30mm between cables and the periphery of heat-generating components or heat sources.
- 11) At extremely low temperatures, severe impact or vibration may cause brittle cracking of the cable's plastic outer sheath.
- 12) To ensure installation safety, adhere to the following requirements: All cables must be installed at temperatures above 0°C. Handle cables with care during transportation, especially in low-temperature environments. If cables are stored below 0°C, they must be acclimated at room temperature for at least 24 hours before installation.
- 13) Prohibit improper practices such as pushing cables directly off vehicles to prevent damage that could degrade cable performance, affecting current-carrying capacity and temperature rise.

2.8 Anti-static Requirements

 NOTE
Static electricity generated by the human body can damage electrostatic-sensitive components on circuit boards, such as BMU boards. ● Wear anti-static gloves before touching equipment or handling circuit boards. ● When handling circuit boards, hold only the edges free of components; do not touch any components with your hands. ● Removed boards must be packaged in anti-static materials for storage or transportation.

2.9 Environmental Requirements



DANGER

- **Strictly prohibit placing equipment in environments containing flammable or explosive gases or fumes. no operations are permitted in such environments.**
- **Storing flammable or explosive materials in the equipment area is strictly prohibited.**
- **Never place equipment near heat sources or open flames, such as fireworks, candles, heaters, or other heat-generating devices. exposure to heat may cause equipment damage or ignite a fire.**



WARNING

- **Install the equipment in areas away from liquids. do not install it below locations prone to condensation, such as water pipes or air vents. Do not install it below areas susceptible to water leakage, such as air conditioning vents, ventilation openings, or equipment room cable access windows, to prevent liquid ingress causing equipment failure or short circuits.**
- **During operation, do not block ventilation openings, cooling systems, or cover the equipment with any objects to prevent high temperatures from damaging the equipment or causing fires.**

- 1) Store the equipment in a suitable temperature and humidity environment. Keep it in a clean, dry, and well-ventilated area, and prevent dust and condensation.
- 2) Installation and operation of the equipment beyond the specified technical parameters are strictly prohibited, as this will compromise performance and safety.
- 3) Strictly prohibit installing, using, or operating outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, plugging/unplugging outdoor signal interfaces, working at heights, outdoor installation, opening doors, etc.) during severe weather conditions such as thunderstorms, rain, snow, or winds exceeding force 6.
- 4) Installation of equipment is strictly prohibited in environments with dust, smoke, volatile gases, corrosive gases, infrared radiation or other radiation, organic solvents, or excessive salt content.
- 5) Installation is strictly prohibited in environments containing conductive metallic dust or ferromagnetic dust.
- 6) Installation in areas prone to microbial growth such as fungi or mold is strictly prohibited.
- 7) Installation is strictly prohibited in areas with strong vibration, intense noise sources, or strong electromagnetic field interference.
- 8) Site selection must comply with local laws, regulations, and relevant standards.
- 9) The installation site must have solid ground free of rubber soil, weak soil, or other unfavorable geological conditions prone to subsidence. Installation in low-lying areas or regions prone to water accumulation is strictly prohibited. The site's horizontal plane must be higher than the historical highest water level in the area.
- 10) Installation of equipment in locations susceptible to flooding is strictly prohibited.
- 11) If equipment is installed in areas with dense vegetation, in addition to routine weeding, the ground beneath the equipment must be hardened, such as by laying cement or gravel.
- 12) Before installation, operation, or maintenance, clear any accumulated water, ice, or debris from the top surface before opening doors to prevent foreign objects from entering the equipment.
- 13) When installing equipment, ensure the mounting surface is sturdy and meets the equipment's load-bearing requirements.
- 14) All cable access holes must be sealed. Use sealing compound to seal holes with existing cables, and use the equipment's included covers to seal unused holes. The correct sealing compound application standard is shown in the figure below.

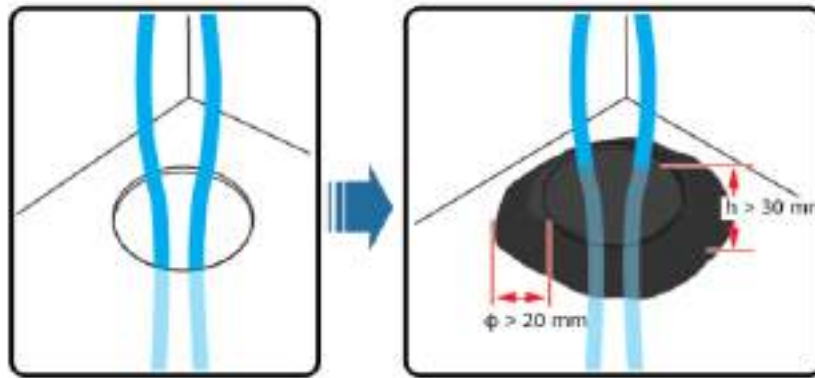


Figure 2-2 Cable Entry Hole Sealing Standard Diagram

2.10 Mechanical Safety



DANGER

When working at heights, wear a safety helmet and secure a safety harness or lanyard to a sturdy structural component. Never attach to moving, unstable objects or sharp-edged metal surfaces to prevent hook slippage and falls.



WARNING

- Tools must be fully prepared and certified by professional inspection agencies. do not use tools with damage, failed inspections, or expired certifications. Ensure tools are secure and not overloaded.
- Before installing equipment into cabinets, first ensure the cabinets are securely anchored to prevent tilting or collapse due to unstable weight distribution, which could cause injuries to installers or damage to equipment.
- When pulling equipment out of the cabinet, exercise caution with items that may be unstable or heavy to avoid crushing or impact injuries.
- Drilling holes in equipment is strictly prohibited. drilling compromises equipment sealing, electromagnetic shielding performance, internal components, and cables. Metal shavings from drilling may enter the equipment and cause circuit board short circuits.

2.11 Heavy Lifting Safety

- 1) When moving heavy objects, select appropriate handling tools and sufficient personnel based on the load's weight to ensure safe transportation. The company's recommended cargo handling methods are illustrated below.



Figure 2-3: Schematic of Lifting Methods for Different Weight Loads

- 2) When manually handling equipment, wear protective gloves, safety shoes, and other appropriate safety gear.
- 3) During equipment handling, avoid scratching the surface, damaging components, or damaging cables.
- 4) When using a forklift, position the forks in the center to prevent tipping. Secure the equipment to the forklift with ropes before moving; assign a dedicated person to monitor the equipment during movement.
- 5) Handle the equipment with care to prevent impacts or falls.
- 6) For transportation, select sea freight or roads with good conditions. Rail and air transport are not supported. Minimize jolts and tilting during transit.
- 7) The cabinet tilt angle must comply with the illustrated requirements: $\alpha \leq 3^\circ$ when packaged, and $\alpha \leq 3^\circ$ after unpacking.

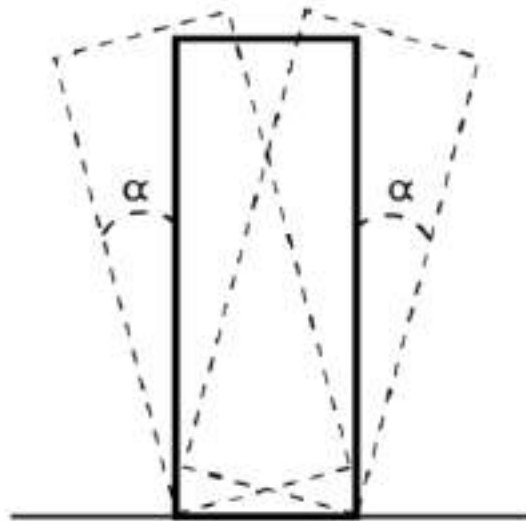


Figure 2-4: Permissible Cabinet Tilt Angle Diagram

2.12 High-Altitude Safety

- 1) Any work performed at a height exceeding 2 meters above ground level is considered high-altitude work. A supervisor must be present for high-altitude operations.
- 2) Personnel must undergo relevant training and obtain the appropriate certification before being permitted to perform work at heights.
- 3) Work at height must cease if steel pipes are wet from rain or other hazardous conditions exist. After such conditions subside, all equipment must be inspected by the safety officer and relevant technicians to confirm safety before resuming work.
- 4) Designate hazardous restricted zones at the work site with clear signage and prohibit unauthorized personnel from entering.
- 5) Guardrails and warning signs must be installed at edges and openings to prevent falls through openings.
- 6) Stacking scaffolding, planks, or other debris directly beneath elevated work zones is strictly prohibited. Ground personnel must not linger or pass directly beneath active elevated work areas.
- 7) Carry all operational equipment and tools securely to prevent tool falls that could damage equipment or cause personal injury.
- 8) Workers at height must not throw objects down to the ground, and objects must not be thrown up from the ground. Use hoists, baskets, aerial work platforms, or cranes to transfer objects.
- 9) Simultaneous work on upper and lower levels should be avoided whenever possible. If unavoidable, dedicated protective canopies or other safeguards must be installed between levels, and tools or materials must not be stored on upper levels.
- 10) When dismantling scaffolding after project completion, proceed layer by layer from top to bottom. Simultaneous dismantling at multiple levels is strictly prohibited. When removing any section, prevent collapse of adjacent sections.
- 11) Personnel working at heights must strictly adhere to high-altitude safety regulations. The company shall not be held liable for accidents resulting from violations of these safety protocols.
- 12) Strictly prohibit horseplay during high-altitude work. Strictly prohibit resting in high-altitude work zones.

2.13 Ladder Safety

- 1) When electrical hazards may be present during elevated operations, use wooden ladders or insulated ladders.
- 2) Platform ladders with guardrails should be prioritized for elevated work; straight ladders are prohibited.
- 3) Before using a ladder, ensure it is in good condition and meets the specified weight capacity. Overloading is strictly prohibited.
- 4) Ladders must be placed on stable ground, and a spotter must hold the ladder during operation.



Figure 2-5 Personnel Ladder Support Diagram

- 5) When climbing a ladder, maintain body stability and keep your center of gravity aligned with the ladder frame to minimize risk and ensure safety.
- 6) When using a stepladder, the pull rope must be securely fastened.

2.14 Lifting Safety

- 1) Personnel performing hoisting operations must undergo relevant training and be qualified before commencing work.
- 2) Erect temporary warning signs or barriers to isolate the lifting area.
- 3) The foundation where lifting operations are conducted must meet the load-bearing requirements for crane operations.
- 4) Before lifting, ensure lifting tools are securely fastened to fixed objects or walls that meet load-bearing standards.
- 5) During lifting operations, it is strictly prohibited to walk beneath the crane boom or suspended load.
- 6) During lifting, dragging wire ropes or lifting gear is prohibited, and striking with hard objects is forbidden.
- 7) During lifting, ensure the angle between the two cables does not exceed 90° , as shown in the figure below.



Figure 2-6 Schematic Diagram of Cable Angle for Lifting Operations

2.15 Drilling Safety

- 1) Obtain approval from the client or contractor before drilling.
- 2) Wear safety equipment such as goggles and protective gloves when drilling.
- 3) Avoid pre-installed pipes or cables during drilling to prevent short circuits or other hazards.

- 4) Cover and protect equipment during drilling to prevent debris from entering the equipment interior. Clean debris promptly after drilling.

2.16 Equipment Safety

2.16.1 Energy Storage System Safety

 DANGER
● Do not open cabinet doors while the system is operating. ● In the event of an energy storage system malfunction, avoid standing near the cabinet door (including within the door's swing range).

 NOTE
The energy storage system must be protected by barriers, fences, or similar measures. Safety warning signs must be erected to isolate the area, preventing unauthorized personnel from entering during equipment operation and causing personal injury or property damage.

- 1) The installation layout of the energy storage system must comply with local standards for fire separation distances or firewalls, including but not limited to the requirements of GB51048-2014 Design Code for Electrochemical Energy Storage Power Stations and NFPA 855 Standard for the Installation of Stationary Energy Storage Systems.
- 2) The energy storage system shall undergo regular fire safety inspections at least once per month.
- 3) During live inspections, pay attention to hazard warning labels on equipment and avoid standing near cabinet doors.
- 4) After replacing power components or modifying wiring in the energy storage system, manually initiate wiring verification and topology recognition to prevent system malfunctions.
- 5) Users are advised to provide their own video recording equipment to document detailed processes during installation, operation, and maintenance of the equipment.

2.16.2 Battery Safety

 DANGER
● Short-circuiting the positive and negative terminals of batteries is strictly prohibited, as it may cause battery short circuits. A battery short circuit generates a large instantaneous current and releases significant energy, potentially leading to battery leakage, smoke emission, release of flammable gases, thermal runaway, fire, or explosion. To prevent battery short circuits, batteries must not be maintained while energized. ● Do not expose batteries to high-temperature environments or near heat-generating equipment, such as intense sunlight, open flames, transformers, or heaters. Battery overheating may cause leakage, smoke emission, release of flammable gases, thermal runaway, fire, or explosion. ● Strictly prohibit subjecting batteries to mechanical vibration, drops, impacts, punctures by hard objects, or pressure shocks, as these may cause battery damage or fire. ● Never disassemble, modify, or damage the battery (e.g., inserting foreign objects, applying external pressure, submerging in water or other liquids), as this may cause leakage, smoke, release of

flammable gases, thermal runaway, fire, or explosion.

- Never allow battery terminals to contact other metal objects, as this may cause overheating or electrolyte leakage.
- Do not attempt to replace the battery yourself. Contact a qualified technician immediately.
- Battery electrolyte is toxic and volatile. If leakage or unusual odors occur, avoid contact with leaked liquid or gas. Non-professionals must keep clear and immediately contact professionals for handling. Professionals should wear safety goggles, rubber gloves, a gas mask, protective clothing, etc. Promptly power down the device, remove the leaking battery, and contact a technical engineer for further action.
- The battery is a sealed system and will not release any gas under normal operating conditions. Under extreme misuse conditions—such as fire exposure, puncturing, crushing, lightning strikes, overcharging, or other scenarios that may cause thermal runaway—battery damage or abnormal internal chemical reactions may occur. This can lead to electrolyte leakage or the generation of gases like CO and H₂. Ensure proper flammable gas venting measures are in place at the site to prevent combustion or equipment corrosion.
- Gases produced by battery combustion can irritate the eyes, skin, and throat. Take appropriate protective measures.



WARNING

- Batteries must be installed in areas away from liquids. Installation is strictly prohibited beneath locations prone to water leakage, such as air conditioning vents, ventilation openings, equipment room cable access windows, or water pipes, to prevent liquid ingress causing equipment failure or short circuits.
- During battery installation and commissioning, firefighting equipment such as fire sand and carbon dioxide extinguishers must be provided in accordance with construction standards and specifications. Before operational deployment, ensure all fire safety facilities comply with local laws, regulations, and standards.
- Before unpacking, during storage and transit, ensure outer packaging remains intact and undamaged. Position batteries correctly according to markings on the packaging. Never place batteries upside down, on their sides, upright, or at an angle. When stacking, comply with the stacking requirements indicated on the outer packaging. Avoid any impact or drops that could damage or render batteries unusable.
- After unpacking batteries, position them according to specified orientation. Strictly prohibit upside-down, sideways, vertical, tilted, or stacked placement. Avoid any impact or drops that could damage or render batteries unusable.
- Tighten the fastening screws for copper busbars or cables to the torque specified in the text. Periodically inspect for proper tightening, rust, corrosion, or foreign objects, and clean thoroughly. Loose connections may cause excessive voltage drop or significant heating during high current flow, potentially burning out the battery.
- After discharging, recharge the battery promptly to prevent damage from over-discharge.

2.16.3 Standard Requirements



DANGER

- **Do not expose batteries to high temperatures or place them near heat-generating devices such as direct sunlight, open flames, transformers, or heaters. Overheating may cause fire or explosion.**
- **Do not disassemble, modify, or damage the battery (e.g., inserting foreign objects, immersing in water or other liquids), as this may cause leakage, overheating, fire, or explosion.**
- **Lithium-ion battery energy storage systems pose a high fire hazard. Before performing any battery operations at , thoroughly consider the following safety risks**
- **Battery electrolyte is flammable, toxic, and volatile.**
- **Battery thermal runaway can produce flammable gases and harmful gases such as CO and HF.**
- **Accumulation of combustible gases from thermal runaway poses deflagration and explosion risks. Energy storage systems must be loaded/unloaded per local laws, regulations, and industry standards. Rough handling may cause battery short circuits or damage within cabinets, potentially leading to leakage, rupture, explosion, or fire.**

- 1) Batteries must be stored in a dedicated warehouse within their original packaging. Avoid storing them with other materials, avoid outdoor storage, and avoid stacking batteries too high. The site must be equipped with compliant firefighting facilities, such as fire sand and fire extinguishers.
- 2) Under normal circumstances, do not remove the battery's outer packaging. If battery recharging is required, it must be performed by qualified personnel following specified procedures. After recharging, the battery must be repackaged.
- 3) For outdoor scenarios, batteries should be powered within 24 hours after unpacking. If immediate powering is not feasible, store batteries indoors in a dry environment free from corrosive gases.
- 4) Batteries must be positioned correctly according to the anti-inversion markings or labels on the packaging to prevent long-term storage in an inverted position, which may cause electrolyte leakage.
- 5) Avoid impact to the batteries.
- 6) When handling batteries, transport them in the specified orientation. Do not invert or tilt them.
- 7) Use batteries within the temperature range specified in this manual. Do not charge batteries when the ambient temperature is below the lower operating temperature limit to prevent crystallization caused by low-temperature charging, which may result in internal short circuits.
- 8) Dispose of used batteries in accordance with local laws and regulations. Do not treat batteries as household waste. Improper battery disposal may cause environmental pollution.
- 9) Do not use damaged batteries (batteries with dented casings or other damage). Damaged batteries may release flammable gases. Do not store damaged batteries near undamaged products.
- 10) Damaged batteries must be stored away from flammable materials. Unauthorized personnel must not approach them.
- 11) During storage, monitor damaged batteries for signs of smoke, flames, electrolyte leakage, or overheating.
- 12) If a battery pack is accidentally exposed to water, do not continue installation. Transport it to a secure isolation point and promptly request replacement parts.
- 13) Store in a location protected from direct sunlight and rain, ensuring it is dry, well-ventilated, and surrounded by a clean environment. Avoid areas with significant infrared radiation, organic solvents, or corrosive gases.

3. Routine Maintenance

3.1 Preparation Before Maintenance

Refer to sections 2.2 Personal Safety and 2.3 Personnel Requirements for pre-maintenance preparations.

3.2 System Power-Down

3.2.1 System Power-Down Procedure

Step 1: Power-off Preparation: Shut down the control system via the operator control platform and disconnect the battery contactor.

(In special circumstances, press the cabinet emergency stop button to halt operation).

Step 2: Outdoor Cabinet Power-Down

- 1) Disconnect the UPS power supply switch and press and hold the UPS ON/OFF switch until the high-voltage cabinet indicator light and water immersion indicator light turn off, completing the shutdown of the BMS, fire protection system, and control power supply;
- 2) Disconnect the BAT-FAN power switch to complete battery pack fan shutdown;
- 3) Disconnect the HVAC power switch to complete air conditioning power-down.
- 4) Disconnect the auxiliary power switch AC POWER (main distribution switch);
- 5) Rotate the hybrid inverter DC switch handle to the "OFF" position;
- 6) Rotate the DC circuit breaker handle on the high-voltage cabinet to the "OFF" position;

Step 3: Power Down AC Distribution Cabinet Supply Circuit

- 1) Disconnect the switch from the AC distribution cabinet to the energy storage system.

--End

3.3 Routine Maintenance

3.3.1 Daily Maintenance

Product Components	Maintenance Items	Inspection Method	Standard	Maintenance Frequency	Power Off Required
Energy Storage System	Check for Irrecoverable/Operational Fault Alarms	Check on WoWEnergy/Management System	No unrecoverable/operational faults or alarms	Daily	Depending on fault/alarm status

Refer to Section 4: Faults/Alarms in this manual for specific handling procedures.

3.3.2 Periodic Maintenance

3.3.2.1 Periodic Maintenance Components

Product Components	Maintenance Items	Inspection Method/ Operation Method	Standard	Maintenance Frequency	Power Off Required
Cabinet	Exterior Door Lock Ventilation openings	Visual Inspection	No significant coating peeling or scratches. No noticeable paint fading or rust. Door locks undamaged. Ventilation openings free of dust accumulation. No insects, rodents, snakes, or other animals.	Quarterly	No

Air Conditioning	Appearance Fan Filter Screen	Visual Inspection	No visible damage. Paint shows no significant fading or rust. Screws are secure with no loosening or missing parts. Fan rotates smoothly with no abnormal noise. Filter surface is clean and free of blockages.	Quarterly	No
EMS	Check indicator light status	Visual Inspection	Indicator light displays normal status.	Quarter	No
Bulk Control Box	Check for rust on exterior Check for foreign objects inside the box	Visual inspection	No significant coating peeling or scratches. Paint shows no noticeable fading or rust. Control box is clean and free of foreign objects.	Quarterly	No
Label	All labels on the energy storage system	Visual inspection	Clearly visible, no contamination or damage.	Quarterly	No
External Fan of Air Conditioner	External fan filter	Visual inspection	Filter surface is clean and free of blockages.	Every 6 months	Yes
Battery Box	Battery box storage age	Connect to mains power for Recharge	If the system is not used for an extended period, charge the battery to no less than 50% SOC	Every 6 months	Yes
Battery box	Visual inspection for rust, fan front panel vents	Visual inspection	No obvious damage. Paint shows no significant fading or rust. Screws are not loose or missing. Fan rotates normally with no abnormal noise. Front panel vent surface is clean and unobstructed.	Annually	Yes
Grounding and equipotential bonding points	Grounding wire, internal equipotential bonding	Multimeter measurement	Grounding resistance must not exceed 4 Ω . Correct equipotential bonding within the cabinet	Annually	Yes
Safety functions	Emergency button	Visual inspection	Check that the emergency button functions properly	Annually	Yes

The maintenance intervals provided in this manual are for reference only. Actual maintenance intervals should be reasonably determined based on the specific environmental conditions at the project site. If the outdoor integrated cabinet operates in harsh environments, such as desert regions, the maintenance intervals should be shortened. In particular, cleaning and anti-corrosion/rust prevention work should be performed more frequently. For example: If the system is installed in a desert region, it is recommended to thoroughly inspect and clean both the interior and exterior of the outdoor integrated cabinet after each sandstorm.

4 Fault/Alarm

4.1 EMS Alarms/Faults

The following is a list of EMS alarms/faults.

No.	Alarm Name	Fault Cause	Recommended Action
1	BMS Communication Loss	1. BMS is not powered on. 2. Communication wiring harness is loose.	1. Verify BMS power supply is normal; 2. Inspect whether the connection harness is loose or damaged;
2	Hunyi Communication Disconnected	1. Mixed reverse not powered. 2. Communication wiring harness is loose.	1. Verify normal power supply to the mixer; 2. Inspect whether the connection harness is loose or damaged;
3	Communication loss with the meter	1. Meter is not powered. 2. Communication wiring harness is loose.	1. Verify normal power supply to the meter; 2. Inspect the wiring harness for loose connections or damage;
4	Fire Alarm Signal	1. Smoke or localized overheating inside the battery cabinet. 2. Battery cabinet has caught fire.	1. Continuously monitor remotely for 30 minutes for other abnormalities (e.g., abnormal temperature, battery voltage, battery temperature, hydrogen concentration). If detected, shut down the system remotely. During remote monitoring, do not approach the battery cabinet or open its doors. 2. If no other abnormalities are detected during remote monitoring, dispatch safety-trained personnel to the site. They must observe from a safe distance for 30 minutes. If smoke or fire is observed, remotely shut down the system. On-site personnel must evacuate immediately and call the fire department. 3. Only if both remote monitoring and on-site observation show no abnormalities may the battery cabinet door be opened to check for aerosol discharge. If discharge is observed, contact the service hotline. If no discharge is observed, the aerosol module is faulty and must be replaced.
5	Electrical Emergency Stop Signal Alarm	The battery cabinet door emergency stop button has been pressed or is damaged.	1. If manually pressed, reset the emergency stop button. 2. If the emergency stop button is damaged, replace it.
6	BMS Emergency Stop Signal Alarm	1. A Level 1 alarm has occurred in the battery system. 2. The emergency stop button has been pressed or is damaged.	1. Inspect the battery cabinet for abnormalities and check the remote BMS monitoring system for Level 1 alarm notifications; 2. Reset the emergency stop button or replace it.

4.2 BMS Alarms/Faults

The following is a list of BMS alarms/faults.

No.	Alarm Name	Fault Cause	Recommended Action
1	Pack Fan Failure	1. Insufficient power supply. 2. Fan damage or foreign object obstruction.	1. Verify the DC24V power supply to the fan is securely connected. 2. Inspect fan blades for damage, remove obstructions around the fan, troubleshoot power supply issues, then reinstall the fan.
2	BMU hardware failure	BMU damage	1. Power cycle the BMU by removing and reinserting it. 2. Reinsert the BMU. 3. If the above steps fail to resolve the issue, replace the BMU.

3	BCU Hardware Failure	BCU damage	1. Power cycle the BCU by removing and reinserting it. 2. Reinsert the BCU. 3. If the above steps fail to resolve the issue, replace the BCU.
4	Contactor Sticking Failure	1. Contactor damage 2. Incorrect wiring of the contactor feedback contacts	1. Replace the contactor. 2. Correct wiring.
5	BMU communication failure	Loose communication cable connector	Replace communication harness
6	Current sensor failure	1. Shunt sampling cable loose 2. Shunt damaged or reversed 3. Data acquisition module damaged	1. Securely reattach the shunt sampling signal wire; 2. Verify shunt functionality and signal output; replace shunt if issues persist; 3. Replace the BCMU
7	NTC fault	Abnormal Sampling	Restart/Reinstall/Replace BMU
8	Total Voltage Overvoltage Level 3/2/1 Alarm	Battery total voltage exceeds Level 3/2/1 alarm threshold	Leave idle for over 30 minutes or discharge until restored to normal;
9	Total Voltage Undervoltage Level 3/2/1 Alarm	Battery total voltage falls below the Level 3/2/1 alarm threshold	Leave idle for over 30 minutes or charge until restored to normal;
10	Cell overvoltage Level 3/2/1 alarm	Cell voltage exceeds Level 3/2/1 alarm threshold	Leave for over 30 minutes or discharge until restored to normal;
11	Cell Undervoltage Level 3/2/1 Alarm	Cell voltage falls below Level 3/2/1 alarm threshold	Leave undisturbed for over 30 minutes or charge until restored to normal;
12	Excessive Discharge Current Level 3/2/1 Alarm	Excessive dispatch power	Issue a reasonable dispatch power
13	Excessive charging current Level 3/2/1 alarm	Excessive dispatch power	Issue appropriate dispatch power
14	Discharging battery overheating Level 3/2/1 alarm	1. Loose cooling fan connector 2. Cooling fan malfunction 3. Air conditioning coolant failure 4. Air conditioning refrigeration system not activated.	1. Reinsert the fan connector plug. 2. Power the fan separately to check if it operates normally. 3. Replace the coolant. 4. Inspect the refrigeration system.
15	Battery discharge low temperature level 3/2/1 alarm	Air conditioning heating system not activated	Check heating system.
16	Charging Battery Over-Temperature Level 3/2/1 Alarm	1. Loose cooling fan connector 2. Cooling fan malfunction 3. Air conditioning coolant failure 4. Air conditioning refrigeration system not activated.	1. Reinsert the fan connector plug. 2. Power the fan separately to check if it operates normally. 3. Replace the coolant. 4. Inspect the refrigeration system.
17	Rechargeable battery low temperature level 3/2/1 alarm	Air Conditioning Heating System Not Activated	Check heating system.
18	Insulation Resistance Too Low Level 3/2/1 Alarm	1. Moisture/excessive dust 2. Ground short circuit present 3. Poor contact in power lines	1. Remove moisture and dust. 2. Measure system-to-ground insulation using an instrument. 3. Inspect power lines for secure and reliable connections.
19	High-voltage box connector overheating (Level 3/2/1 alarm)	Fan failure in the sub-control box, abnormal power supply.	Verify fan power supply integrity or replace the fan.
20	Cell Pressure Differential Level 3/2/1 Alarm	Voltage difference between battery clusters exceeds 30V	Single-cluster charge/discharge, leveling total cluster pressure

21	Single-cell temperature difference alarm (Level 3/2/1)	1. Loose cooling fan connector 2. Cooling fan malfunction 3. Air conditioner coolant failure 4. Air conditioner refrigeration system not activated.	1. Reinsert the fan connector plug. 2. Supply power to the fan separately and check if it operates normally. 3. Replace the coolant. 4. Inspect the refrigeration system.
22	SOC Low Level 3/2/1 Alarm	Battery SOC falls below level three/two/one alarm threshold	Leave idle for over 30 minutes or charge until restored to normal;

4.3 Hybrid Inverter Alarms/Faults

Below is the list of hybrid inverter alarms/faults.

Error Code	Error Message	Cause	Troubleshooting Action
1	Main Relay Fault	1. Live conductor grounded on the grid side. 2. Grid voltage is too low. 3. Inverter relay circuit failure.	1. Measure whether the voltage between the ground wire and neutral wire exceeds 10V. 2. Measure whether the grid voltage is too low.
2	Main EEPROM error	Internal EEPROM fault in the inverter.	1. Turn off the AC/DC switch for 5 minutes, then restart the inverter. 2. Verify that the firmware has been upgraded to the correct version.
3	Main Temperature Overheating Error	Inverter temperature is too high.	1. Check if the inverter's heat dissipation channels are blocked. 2. Verify the inverter is not installed in direct sunlight. 3. Verify that the installation environment provides adequate ventilation.
4	Main temperature too low error	Inverter temperature is too low.	Check if the ambient temperature around the inverter installation location is too low.
5	Communication Interrupted M<->S	Internal communication interruption in the inverter.	Turn off the AC and DC switches for 5 minutes, then restart the inverter.
6	GFCI device failure	Inverter GFCI device failure.	Turn off AC and DC switches for 5 minutes, then restart the inverter.
7	DCI Equipment Failure	Inverter DCI device fault.	Turn off AC and DC switches for 5 minutes, then restart the inverter.
8	Current Sensor Failure	Inverter current sensor fault.	1. Turn off the AC and DC switches for 5 minutes, then restart the inverter. 2. Check whether the positive and negative terminals of the series MC4 connectors are reversed.
9	Phase 1 Voltage Too High	Grid voltage exceeds inverter safety specifications.	1. Verify whether the grid voltage is excessively high. 2. Verify that the inverter's AC output cables are securely connected and that the grid connection cables are not undersized. 3. Verify that the inverter's grid compatibility is correctly selected in the application.
10	Main Phase 1 Voltage Too Low	Grid voltage is below the range permitted by the inverter's safety specifications.	1. Check if the grid voltage is too low. 2. Verify that the inverter AC output cables are securely connected. 3. Verify that the grid compatibility settings for the inverter are correctly selected in the App.
11	Phase 2 Voltage Too High	Grid voltage exceeds the range permitted by the inverter's safety specifications.	1. Check if the grid voltage is excessively high. 2. Verify that the inverter's AC output cables are securely connected and that the grid connection cables are not undersized. 3. Verify the correct grid compatibility mode is selected in the App.
12	Phase 2 voltage too low	Grid voltage is below the range permitted by the inverter's safety specifications.	1. Check if the grid voltage is too low. 2. Verify that the inverter's AC output cables are securely connected. 3. Verify that the grid compatibility setting for the inverter is correctly selected in the application.
13	Phase 3 voltage is too high	Grid voltage exceeds the inverter's safety specifications.	1. Check if the grid voltage is too high. 2. Verify that the inverter's AC output cables are securely connected and that the grid connection cables are not undersized. 3. Verify the grid compatibility setting for the inverter in the App is

			correctly selected.
14	Phase 3 voltage is too low	Grid voltage is below the range permitted by the inverter's safety specifications.	1. Check if the grid voltage is too low. 2. Verify that the inverter's AC output cables are securely connected. 3. Verify that the grid compatibility setting for the inverter has been correctly selected in the application.
15	Grid voltage too high for 10 minutes	Grid voltage exceeds inverter safety specifications.	1. Check if the grid voltage is too high. 2. Verify that the inverter's AC output cables are securely connected and that the grid connection cables are not undersized. 3. Verify the correct grid compatibility mode is selected in the App.
16	Off-grid output voltage is too low	System temperature is too high, causing the battery to reduce load output.	1. Check if the ambient temperature is excessively high. 2. Check if the inverter's cooling channels are blocked. 3. Verify the inverter is not installed in direct sunlight.
17	Off-grid output short circuit	External wiring short circuit on the off-grid side.	Inspect external cable connections on the off-grid side.
18	Main Grid Frequency Too High	Grid frequency exceeds the upper limit specified by the local grid.	1. Verify that the inverter's grid compatibility is correctly selected in the App. 2. Disconnect the AC and DC switches, wait 5 minutes, then restart the inverter.
19	Main grid frequency too low	Grid frequency is below the lower limit specified by the local grid.	1. Verify that the grid compatibility settings for the inverter are correctly configured in the app. 2. After disconnecting the AC and DC switches, wait 5 minutes, then restart the inverter.
20	BAT Input Mode Error	Actual battery connections are not in parallel.	1. Verify all battery connections are secure. 2. Verify that the battery input mode is set to parallel mode.
21	Phase 1 DC voltage too high	The DC component in AC L1 output exceeds the limit range.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
22	Phase 2 DC Voltage Too High	The DC component in the AC L2 output exceeds the limit range.	After turning off the AC/DC switch for 5 minutes, restart the inverter.
23	Phase 3 DC voltage too high	The DC component in the AC L3 output exceeds the limit range.	After turning off the AC/DC switch for 5 minutes, restart the inverter.
24	No Grid Fault on Host	The inverter cannot detect grid voltage.	1. Verify if the grid power is disconnected. 2. Check if the grid connection box switch has tripped. 3. Verify that the inverter AC cables are securely connected.
25	DC reverse connection error	Reverse polarity exists on the PV side or battery side.	Check whether the negative and positive cables on the PV side and battery side are connected correctly.
26	Parallel Device CAN Communication Error	Parallel CAN communication has failed.	Check the cable connections for parallel CAN communication.
27	GFCI Error	A ground leakage current fault has been detected in the power station system.	1. Turn off the AC and DC switches and wait 5 minutes. 2. Verify the ground wire at the AC output terminal is secure and that the AC wiring is correct. 3. Inspect AC and DC cables for damage or water ingress, and check if the battery panels are submerged.
28	Phase 1 DCI High	DC component in AC L1 output exceeds limit range.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
29	Phase 2 DCI High	DC component in AC L2 output exceeds limit range.	After turning off the AC/DC switch for 5 minutes, restart the inverter.
30	Phase 3 DCI High	DC component in AC L3 output exceeds limit range.	After turning off the AC/DC switch for 5 minutes, restart the inverter.

31	ISO Error	The insulation resistance between the string and ground is below the set value.	1. Turn off the AC and DC switches and wait for 5 minutes. 2. Verify the grounding wire at the AC output terminal is secure and the AC wiring is correct. 3. Inspect AC and DC cables for damage or water ingress, and verify that solar panels are not submerged.
32	Bus voltage imbalance	Uneven distribution of three-phase voltages.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
33	Main bus voltage too high	DC input voltage exceeds the inverter's permissible input limit.	1. Check the number of panels in each string and calculate whether the open-circuit voltage of the series-connected battery bank exceeds the inverter's maximum input voltage. 2. If the above items are normal, turn off the AC/DC switch for 5 minutes, then restart the inverter.
34	Main Bus Voltage Too Low	The inverter's bus voltage is too low.	After turning off the AC/DC switch for 5 minutes, restart the inverter.
35	Main Grid Phase Error	Grid phase error.	Measure whether the voltage between the three phases of the grid power supply is normal.
36	Main PV Voltage Too High	Inverter DC input voltage is too high.	1. Check the number of panels in each string and calculate whether the open-circuit voltage of the series-connected panels exceeds the inverter's maximum input voltage. 2. If the above items are normal, turn off the AC/DC switch for 5 minutes, then restart the inverter.
37	Host Islanding Fault	Grid power loss has caused islanding.	1. Verify whether the grid power supply is interrupted. 2. Check whether the circuit breaker in the grid connection box has tripped and whether the inverter's AC cables are securely connected. 3. Turn off the AC switch and reconnect to the grid.
38	Main HW bus voltage too high	DC input voltage exceeds the inverter's permissible input voltage limit.	1. Verify the number of panels per string and calculate whether the open-circuit voltage of the series-connected panels exceeds the inverter's maximum input voltage. 2. If the above items are normal, turn off the AC/DC switch for 5 minutes, then restart the inverter.

39	Main HW PV Current Too High	1. Reversed polarity connection in the series string. 2. Internal damage to the inverter.	1. Check whether the positive and negative terminals of the series strings are reversed. 2. If all items above are normal, turn off the AC/DC switch for 5 minutes, then restart the inverter.
40	Host self-test failed	Abnormal inverter startup self-test.	Please contact technical support for further assistance.
41	Main hardware drive current too high	Grid-side output current exceeds inverter limit.	1. Turn off the AC and DC switches and check that the AC cables are securely connected. 2. If the above items are normal, turn off the AC/DC switches for 5 minutes, then restart the inverter.
42	Main AC SPD fault	Abnormal AC surge protection circuit.	Contact technical support for further assistance.
43	Main DC SPD Fault	DC surge protection circuit anomaly.	Please contact technical support for further assistance.
44	Abnormal voltage on the north side of the main grid	A live conductor has grounded on the grid side.	Measure whether the voltage between the ground wire and neutral wire exceeds 10V. If it exceeds 10V, a live conductor has grounded.
45	Main Fan 1 Failure	Fan 1 blade is jammed or damaged.	1. Check if the external fan (if present) is operating normally. 2. Turn off AC and DC switches, wait 5 minutes, then restart the inverter.
46	Main Fan 2 Failure	Fan 2 blade stuck or damaged.	1. Check if the external fan (if present) is operating normally. 2. Turn off the AC and DC switches, wait 5 minutes, then restart the inverter.

47	Main Fan 3 Failure	Fan 3 blades jammed or damaged.	1. Check if the external fan (if present) is operating normally. 2. Turn off the AC and DC switches, wait 5 minutes, then restart the inverter.
48	Main Fan 4 Failure	Fan 4 blades jammed or damaged.	1. Check if the external fan (if present) is operating normally. 2. Turn off the AC and DC switches, wait 5 minutes, then restart the inverter.
49	Communication between main controller and electricity meter interrupted	Communication between the inverter and the electricity meter is abnormal.	1. Verify that the electricity meter is functioning correctly. 2. Check whether the communication cable connection between the inverter and the electricity meter is secure. 3. Verify that communication parameters between the inverter and meter are correctly configured, including address and baud rate.
50	Communication loss between M and S	Internal communication interruption in the inverter.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
51	Communication between the inverter and the electricity meter has been interrupted.	Communication between the inverter and the electricity meter is abnormal.	1. Verify that the electricity meter is functioning properly. 2. Check whether the communication cable connection between the inverter and the electricity meter is secure. 3. Verify that the communication parameters between the inverter and the electricity meter are correctly configured, including address, baud rate, etc.
52	HMI EEPROM Error	Internal EEPROM failure in the inverter.	1. Turn off the AC/DC switch for 5 minutes, then restart the inverter. 2. Verify that the firmware has been upgraded to the correct version.

53	Human-machine interface real-time clock error	RTC error.	Please contact technical support for further assistance.
54	BMS Device Error	Battery anomaly.	Please contact technical support for further assistance.
55	BMS connection lost.	BMS did not start normally.	Check if the BMS startup button is activated.
56	CT device error	CT device error	Please contact technical support for further assistance.
57	AFCI Communication Interruption Error	AFCI board communication interrupted.	Please contact technical support for further assistance.
67	Emergency Stop	The emergency stop button has been pressed.	Reset the emergency stop button.
69	Fire Lockout Fault	A fire alarm has been triggered, including smoke, water immersion, or aerosol alarms.	1. Inspect the cabinet for smoke, water ingress, or abnormal conditions. 2. If the cabinet is operating normally, manually clear the alarm in the application.
81	Communication Interrupted D<->C	Internal communication of the inverter has been interrupted.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
83	Main Arc Device Error	Arc device error.	Contact technical support for further assistance.
84	Main PV Mode Error	PV mode selection error.	Check if the inverter string mode is set correctly.
85	Permission Expired	Permissions have expired.	Contact technical support for further assistance.
86	DRM0 Error	DRM0 Error	Please contact technical support for further assistance.
87	Main Arc Error	DC arcing is caused by DC short circuits or poor terminal connections.	1. Inspect each terminal for proper contact and verify insulation integrity between PV positive/negative terminals and ground. 2. If the above items are normal, turn off the AC and DC switches, wait 5 minutes, then restart the inverter.
88	Main Switch PV Current Too High	1. Reversed polarity of series-connected positive and negative terminals. 2. Internal damage to the inverter.	1. Check whether the positive and negative terminals of the series connection are reversed. 2. If the above items are normal, turn off the AC and DC switches, wait 5 minutes, then restart the inverter.
89	Battery voltage is too high	Battery voltage exceeds the inverter's maximum voltage rating.	Please contact technical support for further assistance.

90	Battery current is too high	Battery capacity is too low or the load is too heavy, preventing the battery from discharging.	1. Reduce off-grid load. 2. Charge the battery or stop using it.
91	Battery charging voltage too high	Battery charging voltage is too high.	1. Do not disconnect the battery during charging. 2. Restart the battery and inverter.
92	Battery overload	Battery capacity is too low or load is too high, preventing battery output.	1. Reduce off-grid load. 2. Charge the battery or stop using it.
93	Battery Soft Connection Timeout	Battery precharge bus fault.	Contact technical support for further assistance.
94	Output overload	The load connected to the off-grid side exceeds the maximum output power of H2. output power.	Reduce the off-grid load.
95	Battery Open Circuit	The inverter cannot detect battery voltage.	1. Check if the battery circuit breaker is tripped. 2. Verify that the battery power cable connections are secure.

96	Battery discharge voltage too low	Low voltage detected during battery discharge.	Do not disconnect the battery during discharge.
97	BMS internal communication error	1. Communication anomaly between the battery high-voltage box and the battery pack. 2. The last battery pack is not connected to the resistor plug, preventing the high-voltage box from identifying the number of battery packs.	1. Verify that the communication cable is properly connected. 2. Verify that the last battery pack is equipped with a resistor plug. 3. Verify the communication network is functioning properly.
98	Battery sequence error	Battery pack communication anomaly.	1. Verify that the communication cable is properly connected. 2. Verify that the last battery pack has a resistor plug installed. 3. Verify the communication network is functioning properly.
99	Overcurrent Protection During Discharge	Discharge current exceeds the set threshold.	Wait for the fault to clear automatically or restart the inverter.
100	Charging Overcurrent Protection	Charging current exceeds the set threshold.	Wait for the fault to clear automatically or restart the inverter.
101	Module Undervoltage Protection	Total voltage is below the set threshold.	Force battery charging.
102	Module Overvoltage Protection	Total voltage exceeds the set threshold.	Wait for the fault to clear automatically or restart the inverter.
103	Single-Cell Undervoltage Protection	Battery voltage is below the set maximum value.	Force battery charging.
104	Single-cell overvoltage protection	Battery voltage exceeds the set maximum value.	Wait for the fault to clear automatically or restart the inverter.
105	BMS Hardware Failure	1. Single voltage detection module failure. 2. Temperature detection module failure. 3. Current detection module failure.	After turning off the AC/DC switch for 5 minutes, restart the inverter.
106	Low Charging Temperature Protection	Battery charging temperature is below 0°C.	Wait for the battery to warm up until the fault is resolved.
107	Overcharge Temperature Protection	Battery temperature is too high.	Please wait until the battery cools to normal temperature before continuing use.

108	Discharge Temperature Too Low Protection	Battery temperature is too low. Disconnect the relay to stop discharge.	Wait for the battery to warm up until the fault is cleared.
109	Over-Temperature Protection During Discharge	Battery temperature is too high.	Wait for the battery to cool until the fault clears.
110	BMS Relay Fault	1. Negative or positive relay stuck. 2. Negative or positive relay fails to close.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
111	Precharge Error	1. Precharge relay is damaged. 2. Precharge circuit blocked. 3. BMS damaged.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
112	BMS insulation error	The battery pack may have a leakage issue.	Contact technical support for further assistance.
113	BMS Supplier Incompatibility	The battery pack is not compatible with the BMS used in the high-voltage box.	Please contact technical support for further assistance.
114	Battery cell supplier incompatibility	The battery cell manufacturers within the battery pack are inconsistent.	Please contact technical support for further assistance.

115	Battery cell incompatibility	Inconsistent cell charge levels within the battery pack.	Please contact technical support for further assistance.
116	Battery pack model is incompatible	Battery pack models do not match.	Please contact technical support for further assistance.
117	Circuit breaker is open	1. Battery circuit breaker is not closed. 2. Auxiliary contacts of the battery circuit breaker are abnormal.	Turn off the battery circuit breaker.
118	Excessive temperature differential	Temperature detection module malfunction.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
119	Excessive voltage difference (Class II)	Loose sampling wire.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
120	Excessive voltage difference (Class I)	Loose sampling wire.	Turn off the AC/DC switch for 5 minutes, then restart the inverter.
121	BMS over-temperature protection	1. Ambient temperature is too high. 2. Battery overload.	1. Check if the battery's ambient temperature is too high. 2. If temperature is normal, let the battery rest for 30 minutes before restarting.
122	Short-circuit protection	A short circuit has occurred between the positive and negative terminals of the battery.	Check if the battery cables are connected correctly.
123	Total voltage mismatch	Contact technical personnel for troubleshooting.	Contact technical support for further assistance.
124	System locked	Contact a technician for troubleshooting.	Contact technical support for further assistance.
125	Fuse Protection Error	Please contact a technician for troubleshooting.	Contact technical support for further assistance.
126	Battery Port Voltage Abnormal Protection	The voltage at the battery charging port is too high.	Check whether the positive and negative battery cables are connected to the correct ports.

5 Replacement of Faulty Components

5.1 Replace the protection system components

5.1.1 Location Information



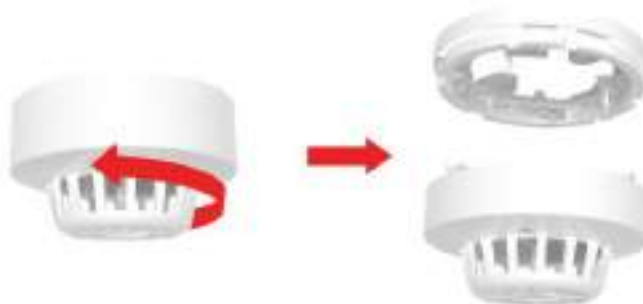
5.1.2 Tool Preparation and Pre-Replacement Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alarm information.
 - b. Refer to the corresponding alarm handling recommendations in the alarm list.
- 2) System Power-Down: De-energize the entire energy storage system before replacement. Refer to Section 3.2 of this manual for specific power-down steps.
- 3) Tool Preparation: Safety gloves, flat head screwdriver, socket wrench.

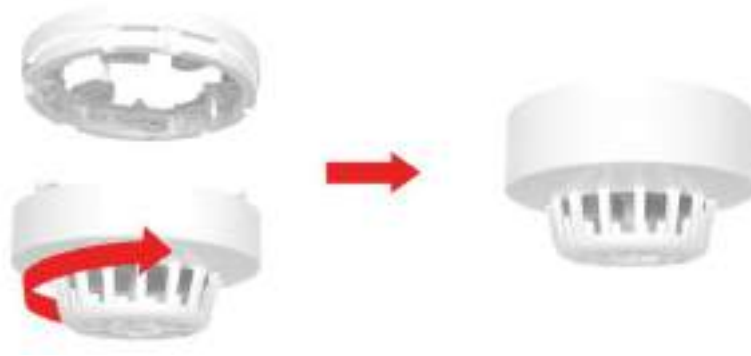
5.1.3 Replacement Procedure

5.1.3.1 Temperature & Smoke Sensor Replacement

Step 1: Hold the faulty temperature sensor and smoke detector, rotate counterclockwise to separate them from the base;



Step 2: Hold the new smoke detector and rotate it clockwise until it locks into place with an audible click;



Step 3: After replacement, the red indicator light will flash rhythmically, indicating the system fault and alarm have been cleared.

----End

5.1.3.2 Replacing the Flammable Gas Sensor

Step 1: Hold the faulty Flammable Gas Sensor and slide it outward to separate it from the mounting base;



Step 2: Use a flathead screwdriver to loosen and remove the wiring harness mounting screw on the back of the faulty sensor;



Step 3: Use a flathead screwdriver to tighten the wiring harness mounting screw on the back of the new sensor;

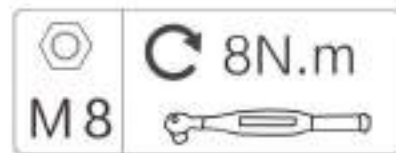
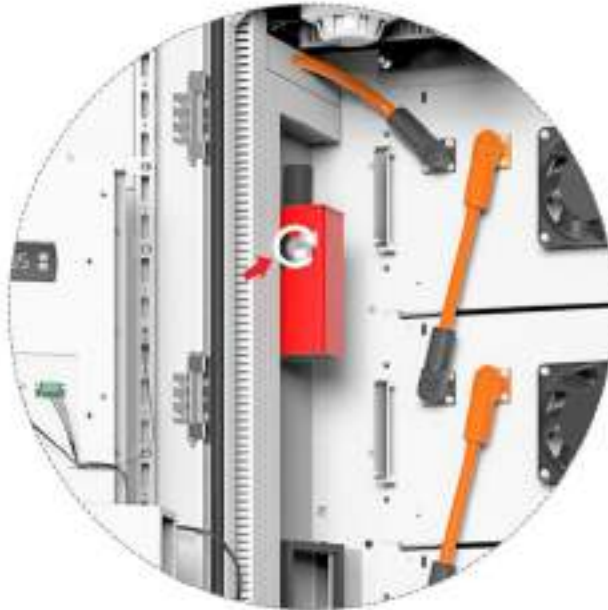
Step 4: Grasp the faulty Flammable Gas Sensor and slide it outward to separate it from the mounting base;

Step 5: After replacement, the green indicator light flashes rhythmically, indicating the system fault & alarm has been cleared.

----End

5.1.3.3 Aerosol Replacement

Step 1: Disconnect the four wiring harnesses connecting the cabinet to the aerosol unit;



Step 2: Use a socket wrench to remove the two retaining nut

Step 3: Remove the aerosol cylinder requiring replacement and place the spare aerosol cylinder onto the bracket, securing it with the retaining nuts;

Step 4: Verify system operation and confirm the fire suppression module alarm has cleared.

----End

5.2 Replace the limit switch

5.2.1 Position Information



5.2.2 Tool Preparation and Pre-Replacement Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alarm information

- b. Refer to the corresponding alarm handling suggestions in the alarm list
- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, Phillips screwdriver.

5.2.3 Replacement Procedure

Step 1: Use a Phillips screwdriver to remove the four bolts securing the limit switch;



Step 2: Use a Phillips screwdriver to remove the three screws securing the limit switch;



Step 3: Remove the screw securing the internal wiring harness of the limit switch and install the replacement limit switch;

Step 4: Re-tighten the mounting bolts securing the limit switch.

Step 5: After restoring the system, inspect its operation to confirm that system faults and alarms have been cleared.

----End

5.3 Replace the Air Conditioning

5.3.1 Location Information

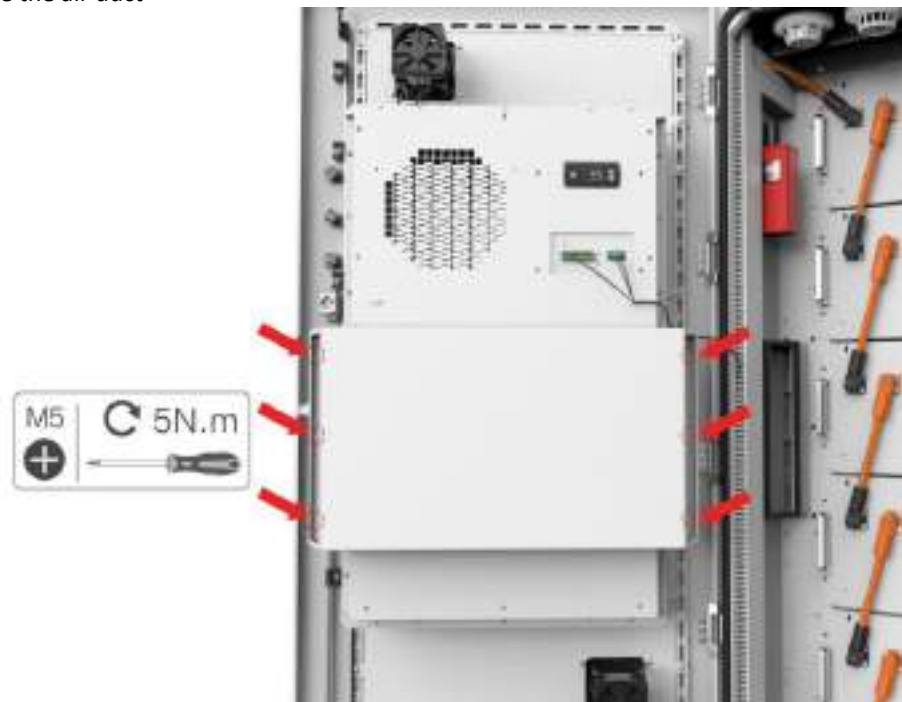


5.3.2 Tool Preparation and Pre-Replacement Actions

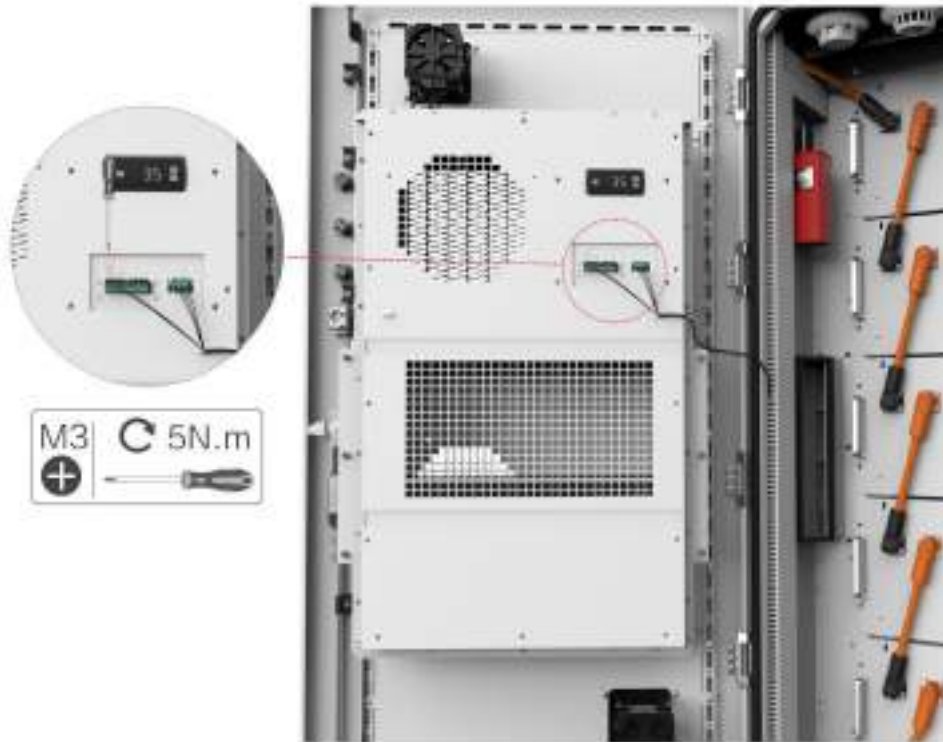
- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alarm information
 - b. Refer to the corresponding alarm handling suggestions in the alarm list
- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, flathead screwdriver, Phillips screwdriver.

5.3.3 Replacement Procedure

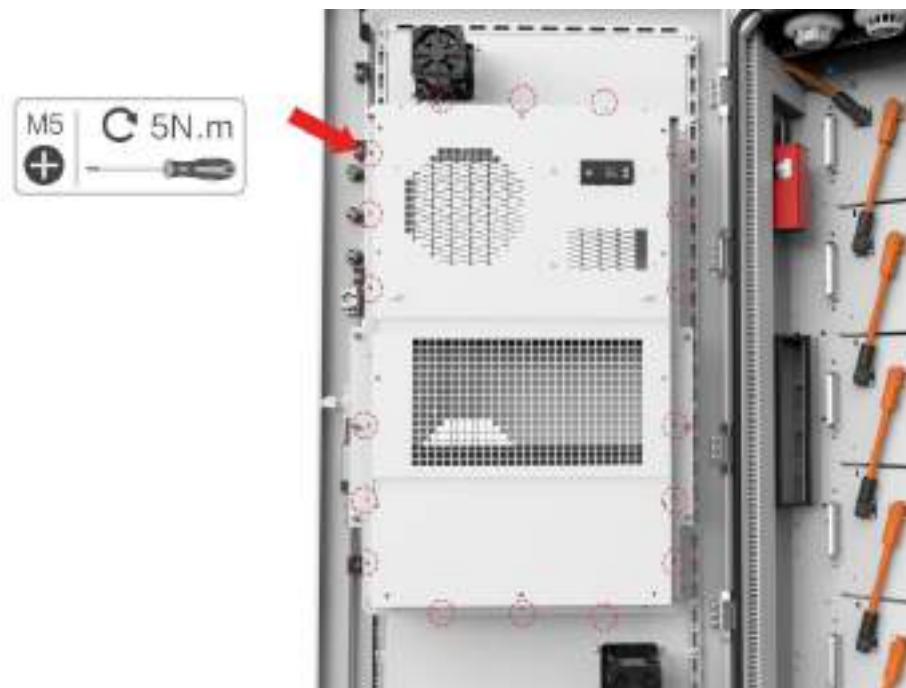
Step 1: Remove the air duct



Step 2: Remove the air conditioner cables



Step 3: Remove the air conditioner mounting screws



Step 4: Remove the air conditioner;

Step 5: Secure the mounting screws for the new air conditioner;

Step 6: Reattach the ductwork securely;

Step 7: Reinstall the air conditioner cables;

Step 8: Apply sealant between the exposed parts of the air conditioner and the cabinet; neoprene sealant is recommended;

Step 9: After system restoration, inspect system operation to confirm elimination of faults and alarms.



5.4 Replace the high-voltage box

5.4.1 Location Information



5.4.2 Tool Preparation and Pre-Replacement Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alarm information
 - b. Refer to the corresponding alarm handling recommendations in the alarm list
- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, flathead screwdriver, Phillips screwdriver.

5.4.3 Replacement Procedure

Step 1: Remove the battery connector from the high-voltage box panel and the inverter DC output connector. Use a flathead screwdriver to disconnect the wiring harness terminals corresponding to J1-J8.

Step 2: Use a Phillips screwdriver to remove the screws securing the high-voltage enclosure.



Step 3: Grasp both side handles and pull out the damaged high-voltage box;

Note: To prevent hazards, two people are required for this operation. Support the bottom of the high-voltage box during removal and pull it out slowly, taking care to avoid damaging cables or electrical components.

Step 4: Insert the functional high-voltage box into the corresponding cabinet position, reconnect the wiring harness, and secure with screws.

Step 5: After system restoration, verify system operation and confirm elimination of faults & alarms.

---End

5.5 Replace the Distribution Box

5.5.1 Location Information



5.5.2 Tool Preparation and Pre-Replacement Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alarm information
 - b. Refer to the corresponding alarm handling suggestions in the alarm list

- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, flathead screwdriver, Phillips screwdriver.

5.5.3 Replacement Procedure

Step 1: Use a flathead screwdriver to remove the wire harness terminals corresponding to J1-J7 on the distribution box panel.

Step 2: Use a Phillips screwdriver to remove the screws securing the distribution box.



Step 3: Grasp both side handles and pull out the damaged distribution box;

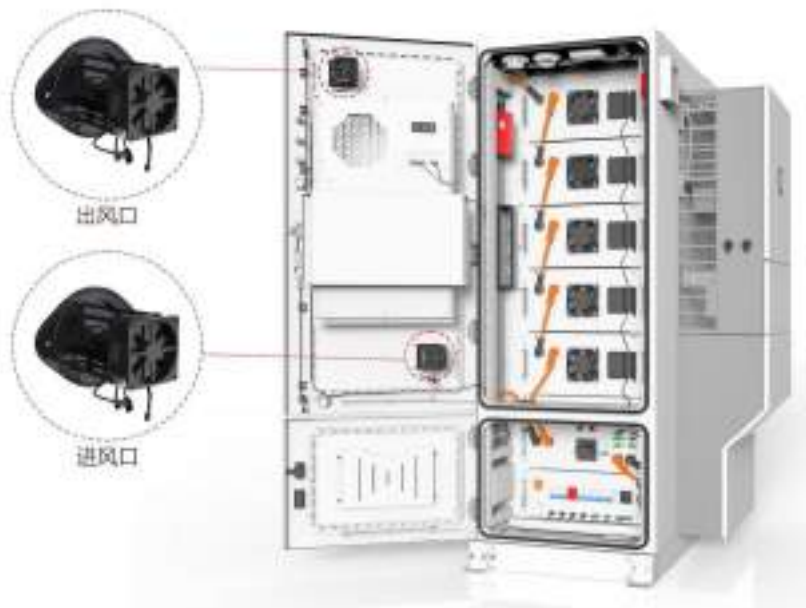
Note: To prevent hazards, two people must perform this operation. Support the bottom of the distribution box during removal and pull it out slowly, taking care to avoid damaging cables or electrical components.

Step 4: Slide the functional distribution box into its designated cabinet position, reconnect the wiring harness, and secure it with screws;

Step 5: After system restoration, verify system operation and confirm elimination of system faults and alarms.
----End

5.6 Replace the exhaust valve and intake valve

5.6.1 Position Information



5.6.2 Tool Preparation and Pre-Replacement Actions

- 1) Troubleshooting:

- a. Log in to the cloud platform or app to view alarm information
- b. Refer to the corresponding alarm handling suggestions in the alarm list
- 2) De-energize the entire energy storage system before replacement. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, Phillips screwdriver/socket wrench.
----End

5.6.3 Replacement Procedure

Step 1: Remove the four connectors from the gas valve.

Step 2: Use a Phillips screwdriver to remove the screws securing the air valve;



Step 3: Remove the valve requiring replacement, install the replacement valve, secure with screws, and reattach the connectors;

Step 4: After replacement, the exhaust valve should operate normally.

----End

5.7 Replacing the Emergency Stop Button and Indicator Light

5.7.1 Location Information



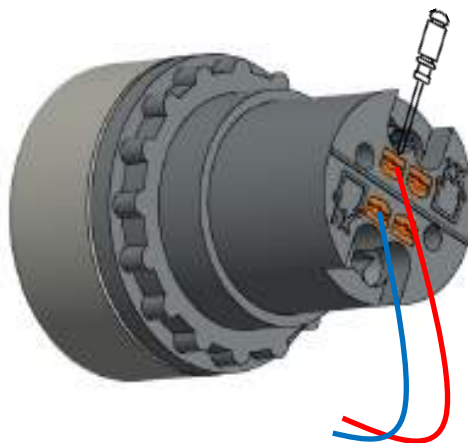
5.7.2 Tool Preparation and Pre-Change Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alert information
 - b. Refer to the corresponding alarm handling recommendations in the alarm list
- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, flathead screwdriver.

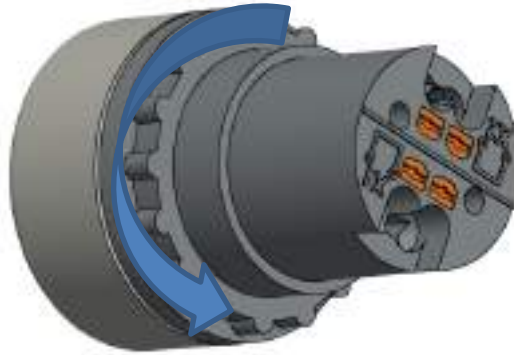
5.7.3 Replacement Procedure

5.7.3.1 Indicator Light Replacement

Step 1: Use a flathead screwdriver to disconnect the two wiring harnesses connected to the indicator light;



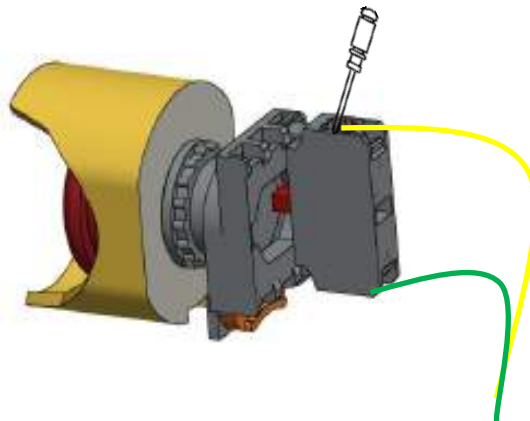
Step 2: Unscrew the locking ring by hand and replace it with the spare indicator light;



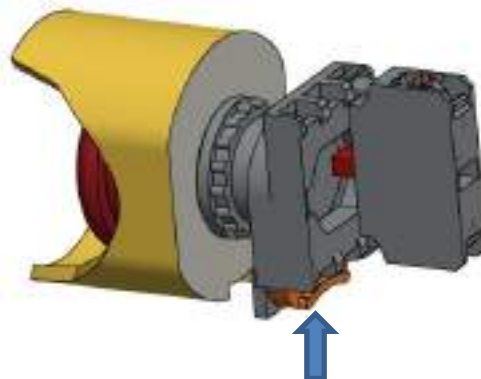
Step 3: After replacement, restore power. The indicator light will display the corresponding operational status.
----End

5.7.3.2 Emergency Stop Button Replacement

Step 1: Use a flathead screwdriver to disconnect the two wire harnesses connected to the emergency stop switch;



Step 2: Press the latch to separate the emergency stop button;



Step 3: Unscrew the locking ring by hand and replace it with the spare emergency stop button.

Step 4: After replacement, restore power. Once the emergency stop button springs back, the system will resume normal operation.

----End

5.8 Replacing the Inverter

5.8.1 Location Information



5.8.2 Tool Preparation and Pre-Change Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to review alert information
 - b. Refer to the corresponding alarm handling recommendations in the alarm list
- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, Phillips/flathead screwdrivers, socket wrench set, waterproof mud, small crane;

5.8.3 Replacement Procedure

Step 1: Remove the protective mesh on the side of the inverter and the lower protective cover;

Step 2: Open the inverter wiring compartment panel. Using appropriate tools, loosen and remove all terminal locking screws for signal cables, control cables, and power cables one by one;

Step 3: Secure the inverter's side load-bearing structure with ropes or hooks, then use lifting equipment to remove the inverter to be replaced;

Step 4: Install the replacement inverter by reversing the procedure in Step 3;

Note: The inverter weighs approximately 89 kg. Select appropriate tools for lifting.

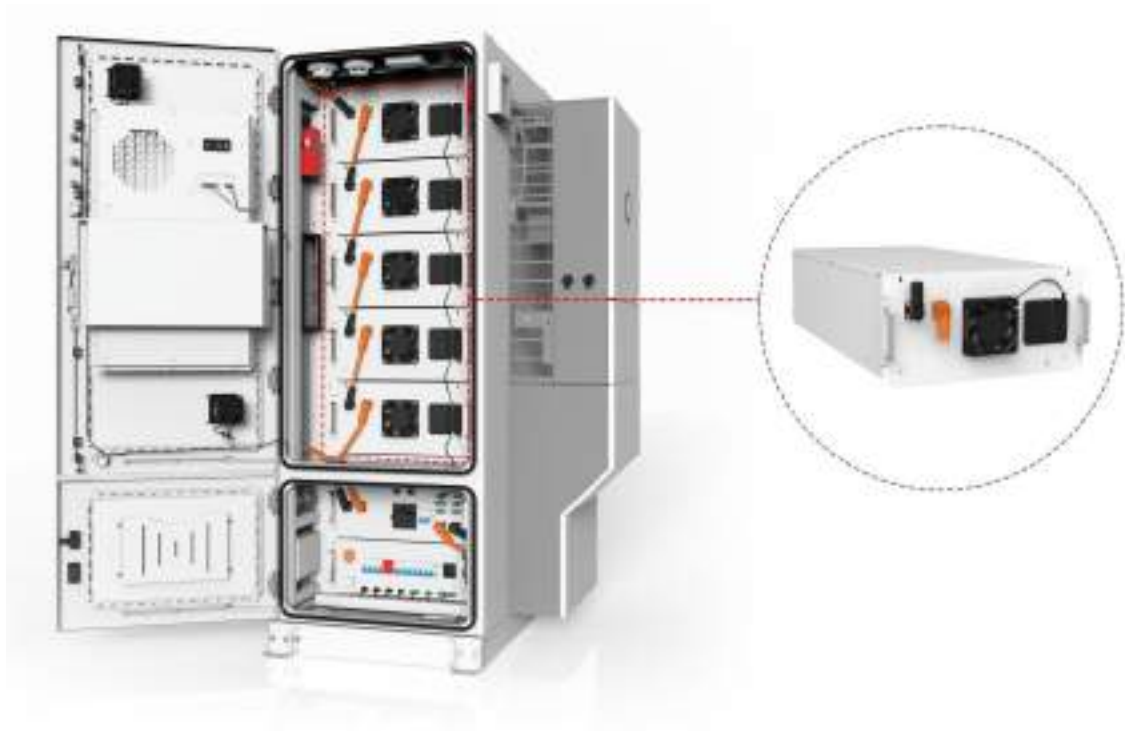
Step 5: Re-secure the wiring harness and side protective cover to the newly installed inverter.

Step 6: After replacement, restore power. The fault code should disappear, and the system should operate normally.

----End

5.9 Replacing the Battery Module

5.9.1 Location Information



5.9.2 Tool Preparation and Pre-Replacement Actions

- 1) Troubleshooting:
 - a. Log in to the cloud platform or app to view alarm information
 - b. Refer to the corresponding alarm handling suggestions in the alarm list
- 2) Before replacement, de-energize the entire energy storage system. Refer to Section 3.2 of this manual for specific de-energization steps.
- 3) Tool Preparation: Safety gloves, Phillips screwdriver, electric forklift.

5.9.3 Replacement Procedure

Step 1: Remove the positive and negative battery cable harnesses, unscrew the mounting screws, and disconnect the BMU communication cable harness;



Step 2: Adjust the outer spacing of the forklift forks to 0.5m, then raise to the height corresponding to the battery to be replaced;



Step 3: Slide the battery out of the cabinet;

Note: Battery weight is $150 \pm 10\text{kg}$. Requires at least two operators and careful balancing.

Step 4: Once the forklift is raised to the same height as the battery compartment, slide the replacement battery into the cabinet;

Step 5: Re-tighten all mounting screws and connectors;

Step 6: After replacement, restore power. The fault code should disappear, and the system should operate normally.

----End

6 Appendix

6.1 How to Recycle Used Batteries

Our company does not handle battery recycling. Customers must contact local recycling facilities for disposal. If no local recycling facilities exist, contact the nearest national recycling agency for processing.