Ener Hexon® Smart261L

Liquid-Cooled C&I ESS

User Manual

YOTAI Digital Energy Technology (Shenzhen) Co., Ltd

YTDS5T261L-P0125S –Ver1.0

ABOUT THIS MANUAL

Applicable Products

This user manual primarily describes the methods for transportation and storage, mechanical installation, electrical connection, power-up and commissioning, shutdown, troubleshooting, and maintenance of the BESS. This manual applies exclusively to the intelligent liquid-cooled C&I ESS developed by YOTAI Digital Energy Technology (Shenzhen) Co., Ltd. The product name is: Ener Hexon® Smart261L Liquid-Cooled C&I ESS, model: YTDS5T261L-P0125S.

Target Audience

This manual is intended for personnel who carry out installation, operation, maintenance and related work for this product. Readers should possess appropriate electrical and related professional qualifications.

All installation operations must be performed only by qualified technical personnel who meet the following requirements:

- Have received specialized training and obtained the required qualifications.
- Have read this manual in full and grasp the related operational safety precautions.
- Are familiar with local standards and the relevant electrical safety regulations.

Use of Symbols

To ensure personal and property safety and to enable more efficient and correct use of this product, this manual highlights important information using the following symbols.

The symbols that may appear in this manual and their meanings are listed below, please read them carefully to use this manual properly.

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

Symbol	Description
⚠ DANGER	Indicates an imminent hazardous situation which, if not avoided, will result in death or serious personal injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious personal injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate personal injury.
NOTICE	Conveys equipment or environmental safety information. If not observed, it may result in equipment damage, data loss, reduced equipment performance, or other unforeseen consequences. "NOTICE" does not involve personal injury.
🕮 NOTE	Used to emphasize important/key information, best practices and tips. "NOTE" is not a safety warning and does not relate to personal, equipment, or environmental hazards.

Symbols on the Product

When you perform installation, operation, maintenance or other tasks, pay attention to the warning symbols on the product, including but not limited to the symbols described below:

Symbol	Description
	High Voltage — Indicates that high voltage or live parts are present. Touching may result in electric shock.
	Caution — If not avoided, may cause minor or moderate personal injury.
	Protective Earth (PE) — This symbol indicates the protective grounding terminal. It must be firmly grounded to ensure operator safety.
	Functional Earth
	Trip Hazard
	Pacemaker Warning
	No Smoking
	No Open Flame
	Do Not Climb
	Do Not Touch
	Do Not Step
	No Entry
	Do Not Lean
	Read Instructions Before Use — Failure to comply may result in danger.
E-Stop	Emergency Stop

Abbreviations

The following abbreviations may appear in this document. Unless otherwise specified, their meanings are as listed below:

No.	Abbreviations	Complete Designation
1	BBMS	Battery Management System
2	BCMU	Battery Cluster Management Unit
3	BMU	Battery Management Unit
4	PCS	Power Conversion System
5	EMS	Energy Manage System
6	ESS	Energy Storage System
7	BESS	Battery Energy Storage System
8	PE	Protective Earthing
9	SOC	State of Charge
10	SOH	State of Health

CONTENTS

1 SAFETY INSTRUCTIONS

1.1 General Safety Precautions

Before installing, operating, or maintaining the product, please read this manual carefully and follow all safety instructions marked on the product and in the manual.

The terms "Note," "Caution," "Warning," and "Danger" in this manual do not represent all the safety precautions that must be observed; they serve only as supplements to general safety practices. The company assumes no responsibility for any consequences resulting from violations of general safety procedures or of design, manufacturing, and product safety standards.

This product must be used in environments that meet its design specifications. Otherwise, product failure may occur. Any resulting functional abnormalities, component damage, personal injury, or property loss are not covered under the product warranty.

When installing, operating, or maintaining the product, local laws, regulations, and standards must be followed. The safety precautions in this manual are intended only as a supplement to such laws and regulations.

The company is not responsible in the following situations:

(1)Installation or operating environments that do not comply with relevant international, national, or regional standards.

(2)Operation outside the conditions described in this manual.

(3)Unauthorized disassembly, modification of the product, or alteration of software code.

(4)Failure to follow the operating instructions and safety warnings provided in the product documentation.

(5)Equipment damage caused by abnormal natural events (earthquakes, floods, volcanic eruptions, landslides, lightning, fire, war, armed conflict, typhoons, hurricanes, tornadoes, extreme weather, or force majeure).

(6)Transportation damage caused by you or a third party you commissioned.

(7)Damage caused by storage conditions that do not meet the requirements in the product documentation.

(8)Damage caused by negligence, improper operation, or intentional actions by you or a third party, affecting hardware or data.

(9)System damage caused by you or a third party, including relocation or installation not in accordance with this manual, and adjustments, modifications, or removal of identification labels that violate the manual.

(10)Defects, malfunctions, or damage caused by events or actions beyond the seller's reasonable control, including power outages, electrical failures, theft, war, riots, civil unrest, terrorism, or intentional/malicious damage.

NOTICE	It is strictly prohibited to engage in reverse engineering, decompilation, disassembly, dismantling, adaptation, implantation, or any other derivative operations on

NOTICE	the device software. Under no circumstances shall the internal implementation of the device be studied, the device software source code obtained, intellectual property misappropriated, or the results of any performance testing of the device software disclosed.

1.2 Personal Safety

⚠ DANGER	(1)Live electrical work during installation is strictly prohibited. Do not install or remove cables under power. When a cable core comes into contact with a conductor, it may generate arcs, sparks, or cause fire and explosion, leading to fire hazards or personal injury; (2)Improper or incorrect operation while the equipment is energized may result in fire, electric shock, or explosion, causing casualties or property damage; (3)During operation, it is strictly forbidden to wear conductive items such as watches, bracelets, bangles, rings, or necklaces, to avoid electric shock burns; (4)Specialized insulated tools must be used during operation to prevent electric shock injury or short-circuit faults. The insulation and voltage withstand rating must comply with applicable local laws, regulations, standards, and requirements.
⚠WARNING	During operation, specialized protective equipment must be used, such as wearing protective clothing, insulated shoes, safety goggles, safety helmets, and insulated gloves.

1.2.1 General Requirements

(1)Do not disable the protective devices of the equipment or ignore the warnings, cautions, and preventive measures provided in the manual and on the equipment.

(2)During equipment operation, if any fault is detected that may cause personal injury or equipment damage, immediately stop operation, report to the responsible person, and take effective protective measures.

(3)Do not energize the equipment before installation is completed or without confirmation by qualified personnel.

(4)It is prohibited to touch the power supply equipment directly, to use other conductors for contact, or to touch it indirectly through damp objects. Before contacting any conductor surface or terminal, measure the voltage at the contact point to ensure no risk of electric shock.

(5)During equipment operation, the surface temperature of the enclosure may be high and poses a burn hazard. Do not touch it.

(6)Fingers, components, screws, tools, or boards must not come into contact with fans while running, to

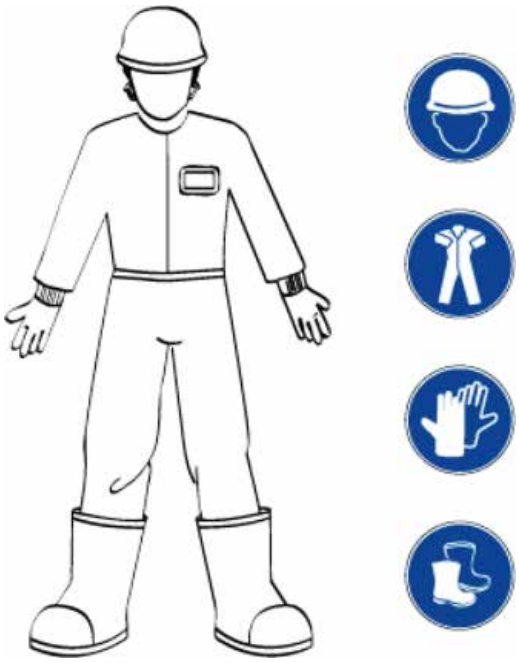
avoid personal injury or equipment damage.

(7)In the event of a fire, evacuate the building or equipment area and activate the fire alarm or call the fire emergency number. Under no circumstances should anyone re-enter a burning building or equipment area.

1.2.2 Personnel Requirements

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

Figure 1-1 Personnel Protective Equipment Requirements



Operator Requirements:

(1)When installing, operating, or maintaining the system, wearing conductive items such as watches, bracelets, bangles, rings, necklaces, etc. is strictly prohibited to avoid electric shock or burns.

(2)During transportation, transit, installation, wiring, and maintenance, all operations must comply with the laws, regulations, and relevant standards of the country or region.

(3)Operators must be familiar with the composition and working principles of the entire energy storage system and follow the procedures described in this manual.

(4)Operators should have professional training related to electrical equipment installation and commissioning, possess basic knowledge of electronics, electrical wiring, and mechanical systems, and be familiar with electrical and mechanical schematics.

(5)Operators must have the ability to respond to emergencies or hazardous situations that may occur during installation or commissioning.

1.3 Electrical Safety

⚠ DANGER	(1)Before performing electrical connections, ensure that the equipment is undamaged; otherwise, electric shock or fire may occur. (2)Improper or incorrect operations may cause fire, electric shock, or other accidents. (3)During operation, prevent foreign objects from entering the equipment; otherwise, this may result in short circuits, equipment damage, reduced load power supply, power failure, or personal injury.
⚠WARNING	For equipment requiring grounding, the protective ground wire must be connected first during installation and disconnected last during removal.
NOTICE	No cables are allowed to pass through the air inlet or outlet of the equipment.

1.3.1 General Requirements

(1)Installation, operation, and maintenance must be carried out in the sequence specified in the manual. Do not modify, add, or alter the equipment without authorization.

(2)Do not change the installation sequence or other procedures of the equipment without authorization.

(3)Grid connection operation is only allowed after obtaining permission from the power authorities of the respective country or region.

(4)Comply with power station safety regulations, such as implementing operation permits and work permit systems.

(5)Install temporary barriers or warning ropes in the work area and display "No Entry" signs. Unauthorized personnel are strictly prohibited.

(6)Before installing or removing power cables, disconnect the equipment and the upstream and downstream switches.

(7)If any liquid is found inside the equipment, immediately turn off the power and do not continue using it.

(8)Before operating the equipment, carefully check that all tools meet requirements and record them. After operation, collect all tools to prevent leaving any inside the equipment.

(9)Before installing power cables, verify that cable labels are correct and cable terminals have proper insulation.

(10)When installing equipment, use a torque tool of appropriate range to tighten screws. If using a wrench, ensure it is not tilted, and the torque error does not exceed 10% of the specified value.

(11)Screws should be tightened using a torque tool and checked using dual-color marking. After installation, the installer marks the screw with blue; after verification, the checker marks it with red. (Marking lines should cross the screw edges.)

(12)After installation, ensure that all protective covers, insulation sleeves, and other devices for electrical components are in place to avoid the risk of electric shock.

(13)If the equipment has multiple inputs, disconnect all inputs and wait until the equipment is fully powered down before performing any operations.
(14)When maintaining electrical or distribution equipment downstream of the power-supplying equipment, disconnect the corresponding output switch of the power-supplying equipment.
(15)During equipment maintenance, hang "Do Not Close" signs on upstream and downstream switches or circuit breakers, and post warning signs to prevent accidental connection. Power may only be restored after all faults are cleared.
(16)When performing fault diagnosis and clearance, if power shutdown is required, complete the following safety procedures: power off > verify no voltage > install grounding wires > hang warning signs and set up barriers.
(17)Regularly inspect the screws of equipment connection terminals to ensure they are tight and not loose.
(18)If cables are damaged, they must be replaced by qualified personnel to avoid risks.
(19)It is strictly forbidden to manually alter, damage, or cover any labels or nameplates on the equipment. Labels that have become unclear due to long-term use must be replaced promptly.
(20)Do not clean the internal or external electrical components of the equipment with water, alcohol, oil, or other solvents.

1.3.2 Grounding Requirements

(1)The grounding impedance of the equipment shall comply with the requirements of local electrical standards. The grounding resistance between the protective earth bar (PE) inside the equipment and the metallic parts of the cabinet shall not exceed 0.1 Ω. The grounding resistance between the cabinet earth bar or the energy storage system earth bar and the grounding grid shall not exceed 4 Ω.
(2)The equipment shall be permanently connected to the protective earth. No fuses, protective switches or similar devices are allowed to be installed in the protective earth conductor circuit. Before operating the equipment, check the electrical connections and ensure that the equipment is reliably grounded.
(3)It is forbidden to operate the equipment when the grounding conductor has not been installed.
(4)It is forbidden to damage or disconnect the grounding conductor.
(5)For equipment using a three-core (three-pin) socket, it must be ensured that the product complies with CE or UL certification requirements, that the power supply is AC 230 V / 50 Hz or 60 Hz with a rated current less than 10 A, and that the earth terminal of the three-core socket is reliably connected to the protective earth.
(6)For equipment with high touch current, the protective earth terminal on the equipment enclosure must be connected to earth before the input power supply is connected, in order to prevent electric shock to personnel caused by the touch current of the equipment.

1.3.3 Wiring Requirements

(1)Cable selection, installation, and routing must comply with local laws, regulations, and standards.
(2)During power cable installation, loops and twists are strictly prohibited. If the cable is not long enough, replace it with a new one. Making splices or solder joints in the power cable is strictly forbidden.

(3)All cables must be securely connected, well-insulated, and of appropriate specifications.
(4)Cable trays and pass-through holes must have no sharp edges. Cable entry points or conduits must be protected to prevent damage from sharp edges or burrs.
(5)If cables enter the container from the top, they must first bend outward in a U-shape before entering the container.
(6)Cables of the same type should be bundled together neatly and straight, with no damage to the outer sheath. Different types of cables must be separated by at least 30 mm; twisting or crossing different cables is prohibited.
(7)When leaving a wiring job unfinished, or after completion, use sealing putty to seal cable entry points immediately to prevent moisture or small animals from entering.
(8)Buried cables must be securely fixed using cable supports and clamps. Cables in areas to be backfilled must be tightly placed against the ground to prevent deformation or damage during backfilling.
(9)When external conditions change (such as laying method or ambient temperature), verify cable selection according to IEC 60364-5-52 or local regulations and standards, including whether the current-carrying capacity meets requirements.
(10)Using cables in high-temperature environments may cause insulation aging or damage. Maintain a minimum distance of 30 mm between cables and heating devices or heat source areas.
(11)In extremely low temperatures, severe impact or vibration may cause the plastic outer sheath of cables to crack due to brittleness. To ensure construction safety, the following requirements shall be followed:
•All cables shall be installed at temperatures above 0°C. When handling cables—especially during construction in low-temperature environments—they must be moved carefully.
•If the cables have been stored at temperatures below 0°C, they must be placed in a room-temperature environment for more than 24 hours before installation.
(12)Do not push cables directly off trucks or use other improper handling methods, as this may damage the cable, reduce performance, and affect current-carrying capacity and temperature rise.

1.3.4 ESD Requirements

⚠ CAUTION	Static electricity generated by the human body can damage electrostatic-sensitive components on the boards, such as BMU boards. (1)Before touching the equipment or handling the boards, wear anti-static gloves. (2)When holding a board, hold it by the edges where there are no components. Do not touch any components with your hands. (3)Removed boards must be packaged in anti-static materials before storage or transportation.

1.4 Environmental Requirements

⚠ DANGER	(1)It is strictly prohibited to place the equipment in environments with flammable or explosive gases or smoke, and no operations should be performed in such environments. (2)It is strictly prohibited to store flammable or explosive materials in the equipment area. (3)Do not place the equipment near heat or fire sources, such as open flames, candles, heaters, or other heat-generating devices, as heat exposure may damage the equipment or cause a fire.
⚠WARNING	(1)The equipment should be installed in areas away from liquids. It is strictly prohibited to install it under water pipes, air outlets, or other locations prone to condensation. Do not install the equipment under air conditioning vents, ventilation openings, or cable outlets in the equipment room, to prevent liquid from entering the equipment and causing faults or short circuits. (2)During equipment operation, do not block ventilation openings or the cooling system, and do not cover the equipment with any objects, to prevent high temperatures from damaging the equipment or causing a fire.

(1)The storage environment for the equipment should have suitable temperature and humidity. Store the equipment in a clean, dry, and well-ventilated area, and protect it from dust and condensation.

(2)Do not install or operate the equipment outside the specified technical limits, as this may affect performance and safety.

(3)Do not install, operate, or handle outdoor equipment or cables during severe weather conditions such as thunderstorms, rain, snow, or winds above level 6. This includes, but is not limited to, handling equipment, operating equipment and cables, connecting or disconnecting outdoor signal interfaces, working at height, outdoor installation, or opening doors.

(4)Do not install the equipment in environments with dust, smoke, volatile gases, corrosive gases, infrared or other radiation, organic solvents, or excessive salt content.

(5)Do not install the equipment in environments with metal-conductive or magnetically conductive dust.

(6)Do not install the equipment in areas prone to fungi, mold, or other microorganisms.

(7)Do not install the equipment in areas with strong vibration, high noise, or strong electromagnetic interference.

(8)Site selection must comply with local laws, regulations, and relevant standards.

(9)The installation site must have a solid ground, free from rubbery soil, weak soil, or easily subsiding areas. Avoid low-lying or water-prone areas. The site's horizontal plane should be above the historical highest water level in the area.

(10)Do not install the equipment in locations that can be submerged by water.

(11)If the equipment is installed in areas with dense vegetation, in addition to routine weed removal, the

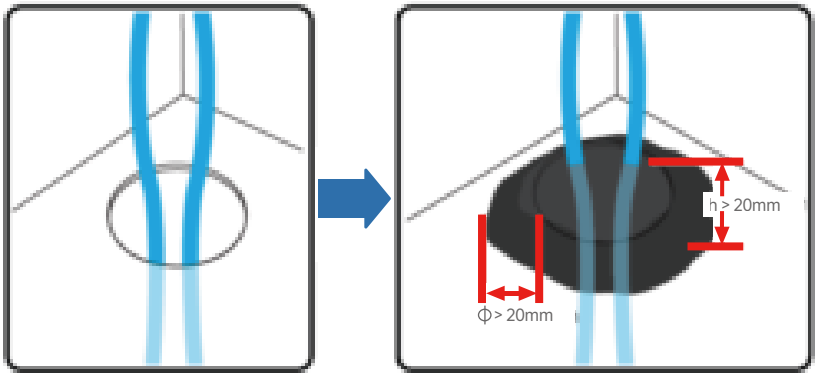
ground beneath the equipment must be hardened, for example with cement or gravel.

(12)During installation, operation, or maintenance, remove accumulated water, ice, snow, or other debris from the top before opening doors to prevent debris from falling into the equipment.

(13)When installing equipment, ensure the installation surface is solid and meets the equipment's weight-bearing requirements.

(14)All cable entry holes must be properly sealed. Use sealing putty to seal holes through which cables pass, and use the equipment's covers to seal unused holes. Refer to Figure 1-2 for proper sealing putty installation standards.

Figure 1-2 Sealing Putty Installation Standards



1.5 Mechanical Safety

⚠ DANGER	When working at heights, always wear a safety helmet and a safety harness or lanyard. Secure the harness or lanyard to a strong and stable structural component. Do not attach it to movable or unstable objects, or to sharp-edged metal surfaces, to prevent the hook from slipping and causing a fall.
⚠WARNING	(1)Tools must be complete and inspected by a professional organization. Do not use tools that are damaged, fail inspection, or have exceeded their inspection validity period. Ensure tools are secure and not overloaded. (2)Before installing equipment into a container, make sure the container is properly secured. This prevents tilting or collapsing due to an unstable center of gravity, which could cause injury to installers or damage to the equipment. (3)When removing equipment from a container, handle carefully any equipment inside that may be unstable or heavy to avoid being crushed or injured. (4)Drilling into the equipment is strictly prohibited. Drilling can compromise the equipment's sealing, electromagnetic shielding, internal components, and wiring. Metal shavings from drilling may enter the equipment and cause circuit board short circuits.

1.5.1 General Requirements

(1)Any scratches to the paint that occur during transportation or installation of the equipment must be promptly repaired. Exposed scratched areas must not remain untreated.

(2)Arc welding, cutting, or similar operations on the equipment are prohibited without evaluation and approval by the company.

(3)Installing other equipment on top of the equipment is prohibited without evaluation and approval by the company.

(4)When working in the space above the equipment, protective measures should be added on top of the equipment to prevent damage.

(5)Use the correct tools and ensure proper handling and operation of the tools.

1.5.2 Safe Handling of Heavy Objects

(1)When handling heavy objects, select appropriate handling tools and coordinate the number of personnel according to the weight of the items to ensure safe handling of packaged goods.

Figure 1-3 Coordinate When Moving Heavy Objects

W<18kg

18kg≤W<32kg

32kg≤W<55kg

W≥55kg

(2)When handling equipment manually, wear protective gloves, safety shoes, and other personal protective equipment.

(3)During equipment handling, avoid scratching the surface or damaging components or cables.

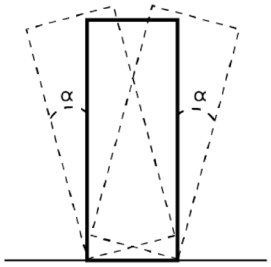
(4)When using a forklift, position the forks at the center of the equipment to prevent tipping. Before moving, secure the equipment to the forklift with ropes, and assign personnel to supervise during movement.

(5)Move the equipment carefully to avoid collisions or drops.

(6)For transportation, choose sea shipping or roads in good condition; rail and air transport are not supported. Minimize jolts and tilting during transport.

(7)The tilt angle of cabinets must comply with the illustrated requirements: with packaging, tilt angle $\alpha \leq 15°$; after removing packaging, tilt angle $\alpha \leq 10°$.

Figure 1-4 Tilt Angle Diagram



1.5.3 Working at Heights Safety

(1)Work performed more than 2 meters above the ground is considered work at heights. A safety supervisor must be assigned for such work.

(2)Personnel must receive relevant training and obtain the required qualifications before performing work at heights.

(3)Stop work at heights if steel pipes are wet from rain or if other hazardous conditions exist. After such conditions, all work equipment must be inspected and confirmed safe by the safety officer and relevant technical personnel before resuming work.

(4)At work-at-height sites, mark hazardous areas clearly and set up visible signs. Unauthorized personnel must not enter these areas.

(5)Guardrails and warning signs must be installed around edges and openings to prevent falls.

(6)The ground directly below work-at-height areas must be kept clear of scaffolding, planks, or other materials. Personnel on the ground must not stay or pass directly under the work-at-height zone.

(7)Carry tools and equipment securely to prevent them from falling and causing equipment damage or personal injury.

(8)Workers must not throw objects from heights to the ground, nor from the ground to heights. Items should be transported using hoists, baskets, elevated platforms, or cranes.

(9)Work on upper and lower levels should be avoided simultaneously whenever possible. If unavoidable, protective canopies or other safety measures must be installed between levels, and tools or materials must not be stored on the upper level.

(10)When dismantling scaffolding after work is completed, do so layer by layer from top to bottom. Do not dismantle upper and lower layers simultaneously, and prevent collapse of remaining sections during dismantling.

(11)Personnel must strictly follow height safety regulations. The company is not responsible for accidents caused by violations of these regulations.

(12)Horseplay, joking, or resting in work-at-height areas is strictly prohibited.

1.5.4 Ladder Safety

(1)When performing height operations that may involve electricity, use a wooden or insulated ladder.

(2)Prefer platform ladders with guardrails for height operations; do not use straight ladders.

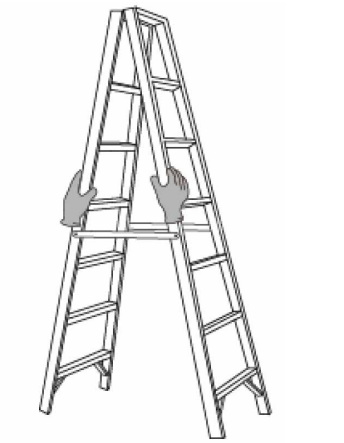
(3)Before using a ladder, ensure it is in good condition and its load capacity meets requirements. Do not exceed the weight limit.

(4)Ladders must be placed on a stable surface, and someone must hold the ladder while in use.

(5)When climbing a ladder, keep your body steady and ensure your center of gravity remains within the ladder's frame to reduce risk and ensure safety.

(6)When using a stepladder, make sure the supporting rope is securely fastened.

Figure 1-5 Ladder Placement Diagram



1.5.5 Hoisting Safety

(1)Personnel performing hoisting operations must receive relevant training and be certified before starting work.

(2)The hoisting area must be isolated with temporary warning signs or barriers.

(3)The foundation for hoisting operations must meet the load-bearing requirements of the crane.

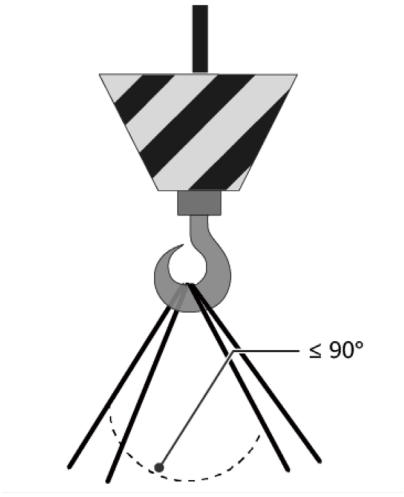
(4)Before hoisting, ensure lifting tools are securely fastened to fixtures or walls that meet load-bearing standards.

(5)Do not walk under the crane boom or the hoisted load during operations.

(6)Do not drag wire ropes or hoisting gear, and do not strike them with hard objects.

(7)During hoisting, ensure the angle between two slings does not exceed 90°, as shown in the figure below.

Figure 1-6 Hoisting Angle Diagram



1.5.6 Drilling Safety

(1)Obtain approval from the client and contractor before drilling.

(2)Wear safety protective equipment such as goggles and gloves when drilling.

(3)Avoid embedded pipes or wiring during drilling to prevent short circuits or other hazards.

(4)Protect the equipment from debris while drilling, and clean any debris promptly after drilling.

1.6 Equipment Safety

1.6.1 ESS Safety

⚠ DANGER	(1)Do not open the container doors while the system is in operation. (2)In case of a fault in the energy storage system, avoid standing near the container doors, including the area within the door's opening range.

NOTICE	The energy storage system must be enclosed with fences, walls, or other protective measures, and clearly marked with safety warning signs to prevent unauthorized personnel from entering during operation, which could result in 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 GB 51048-2014: 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 should undergo regular fire safety inspections at least once a month.

(3)During live inspections of the system, pay attention to danger warning signs on the equipment and avoid standing near the container doors.

(4)After replacing power components or modifying wiring in the energy storage system, manually initiate wiring checks and topology recognition to prevent abnormal system operation.

(5)It is recommended that users have a camera device to record detailed procedures during installation, operation, and maintenance of the equipment.

1.6.2 Battery Safety

⚠ DANGER	(1)Do not short-circuit the positive and negative terminals of the battery, as this can cause a battery short circuit. A short circuit generates a large current instantly and releases significant energy, which may lead to electrolyte leakage, smoke, flammable gas release, thermal runaway, fire, or explosion. To avoid short circuits, batteries must not be serviced while energized. (2)Do not expose batteries to high temperatures or near heat sources, such as direct sunlight, open flames, transformers, or heaters. Overheating may cause electrolyte leakage, smoke, flammable gas release, thermal runaway, fire, or explosion. (3)Do not subject batteries to mechanical shocks, drops, collisions, punctures, or pressure impacts, as these may damage the battery or cause fire. (4)Do not disassemble, modify, or damage batteries (e.g., inserting foreign objects, applying external pressure, immersing in water or other liquids), as this may cause

⚠ DANGER	electrolyte leakage, smoke, flammable gas release, thermal runaway, fire, or explosion. (5)Ensure battery terminals do not come into contact with other metal objects, as this may cause heating or electrolyte leakage. (6)Using or replacing batteries with incorrect models can create fire or explosion hazards. Always use the battery models specified by the manufacturer. (7)Battery electrolyte is toxic and volatile. In the event of a leak or abnormal odor, avoid contact with the liquid or gas. Non-professional personnel should stay away and immediately contact qualified personnel. Professionals must wear safety goggles, rubber gloves, a respirator, protective clothing, disconnect the equipment from power, remove the leaking battery, and consult a technical engineer. (8)The battery is a sealed system and does not release gases under normal operation. Under extreme misuse, such as fire, puncture, crushing, lightning strike, overcharging, or other conditions leading to thermal runaway, battery damage or abnormal chemical reactions may occur, releasing electrolyte or gases such as CO and H_2. Ensure proper measures for venting flammable gases to prevent fire or equipment corrosion. (9)Gases generated by battery combustion can irritate eyes, skin, and throat. Take appropriate protective measures.
⚠WARNING	(1)Batteries should be installed in areas away from liquids. Do not install them under air conditioner outlets, ventilation openings, server room cable windows, water pipes, or other locations prone to leaks, to prevent liquids from entering the equipment and causing malfunction or short circuits. (2)During battery installation and commissioning, provide fire safety equipment according to construction standards, such as fire sand or CO_2 fire extinguishers. Before putting the system into operation, ensure all fire safety equipment meets local laws, regulations, and standards. (3)Before removing the packaging, ensure that battery storage and transport maintain the integrity of the outer packaging. Place batteries according to packaging labels, and do not place them upside down, on their side, upright, or at an angle. When stacking, follow the stacking instructions on the packaging to prevent impact or drops that could damage the battery. (4)After removing the packaging, place the battery in the correct orientation as required. Do not place it upside down, on its side, upright, at an angle, or stacked, to avoid damage from impacts or drops. (5)Tighten the copper bars or cable fastening screws according to the specified

⚠WARNING	torque. Regularly inspect for tightness, rust, corrosion, or foreign objects, and clean as necessary. Loose screws can cause excessive connection voltage drop and, under high current, may generate excessive heat that can destroy the battery. (6)After battery discharge, recharge the battery promptly to prevent damage from over-discharge.

Disclaimer: The company is not responsible for any battery damage caused by the following:

(1)Damage caused by natural disasters or force majeure, including but not limited to earthquakes, floods, volcanic eruptions, landslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, and other acts of God.

(2)Direct battery damage resulting from on-site operating conditions or external power parameters that do not meet required environmental specifications, including excessively high or low operating temperatures, unstable grid conditions, or frequent power outages.

(3)Battery damage, drops, leakage, or rupture caused by improper operation or incorrect battery connection, including failure to follow installation and operation instructions.

(4)Battery over-discharge caused by failure to power on and recharge the battery as required in Section 4.2, after the battery has been installed and connected to the system.

(5)Damage caused by failure to perform timely acceptance or failure to store the battery in accordance with Section 4 requirements.

(6)Damage caused by unauthorized modification of battery operation protection or management parameters, without prior approval from the company.

(7)Accelerated capacity degradation caused by mixing company-supplied batteries with other batteries, including mixing with other brands or with batteries of different rated capacities.

(8)Damage caused by improper maintenance, including frequent over-discharge, improper system expansion, or prolonged inability (⩾1 month) to fully charge the battery.

(9)Damage resulting from failure to maintain the battery in accordance with the operation manuals of associated equipment, including failure to regularly check and tighten battery terminal screws.

(10)Battery damage caused by improper storage conditions, such as storage in damp or rain-prone environments, or failure to meet required storage conditions.

(11)Capacity loss or irreversible damage resulting from prolonged storage, due to failure to recharge the battery in a timely manner or failure to follow the storage requirements in Section 4.

(12)Battery damage caused by you or third parties, including unauthorized relocation, reinstallation, or handling of the battery in violation of company instructions.

(13)Changes to the battery usage scenario made without notifying and obtaining approval from the company.

(14)Damage caused by unauthorized modification of equipment, including adding additional loads to internal battery circuits.

(15)Damage caused by exceeding the maximum storage period of six (6) months, failure to verify storage SOC, or failure to recharge the battery as required in Section 4.2, leading to over-discharge.
(16)Damage resulting from improper installation, including installation not performed in accordance with this product's installation manual.
(17)Battery capacity degradation exceeding the end-of-life (EOL) threshold of 70%.
Note: "Battery PACK" in the above descriptions includes, but is not limited to, individual battery cells, battery PACKs, battery clusters, and complete battery systems.

1.6.2.1 General Requirements

⚠ DANGER	Lithium-ion and sodium-ion ESS have a high fire risk. Before performing battery operations, the following safety risks should be fully considered: (1)Battery electrolyte is flammable, toxic, and volatile. (2)Thermal runaway of batteries can generate flammable gases as well as harmful gases such as CO and HF. (3)Accumulation of flammable gases during thermal runaway poses risks of deflagration or explosion. ESS must be handled and transported in accordance with local laws, regulations, and industry standards. Rough handling may cause short circuits or damage to batteries inside the container, potentially leading to leakage, rupture, explosion, or fire.

(1)Batteries must be stored in a dedicated storage room and kept inside their original packaging. They shall not be mixed with other materials, stored outdoors, or stacked excessively. Appropriate fire-fighting equipment—such as fire sand and fire extinguishers—must be available on site.
(2)Do not remove the battery's external packaging under normal circumstances. If battery recharging is required, it must be performed by qualified personnel following the specified procedures. After recharging, the battery must be returned to its packaging.
(3)For outdoor installation scenarios, after unpacking the battery, it is recommended to power it on within 24 hours. If the battery cannot be powered on in time, it must be stored indoors in a dry environment free of corrosive gases.
(4)Batteries must be placed in accordance with the orientation markings on the packaging. Long-term inverted storage may result in individual cell leakage.
(5)When transporting batteries, follow the orientation requirements. Do not invert or tilt the batteries.
(6)Do not perform welding, grinding, or similar operations near the batteries, as sparks or arcs may create fire hazards.
(7)Use the batteries only within the temperature range specified in this manual. When the ambient temperature is below the minimum operating temperature, charging is strictly prohibited to avoid internal short circuits caused by lithium plating or crystal formation.
(8)During installation or maintenance, the battery circuit must remain disconnected.
(9)Dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper disposal may lead to environmental pollution or explosion.

(10)Do not use damaged batteries (e.g., with dents or other visible defects). Damaged batteries may release flammable gases and must not be stored near undamaged products.
(11)Damaged batteries must be stored away from flammable materials, and non-professional personnel shall not approach them.
(12)During storage of damaged batteries, they must be monitored to ensure there are no signs of smoke, flame, electrolyte leakage, or abnormal heating. Before handling, confirm there is no irritating or burnt odor around the battery.
(13)If a battery PACK is accidentally exposed to water, installation must not continue. Move the battery to a designated safety isolation area and promptly apply for replacement parts.
(14)Batteries must be placed in an environment without direct sunlight or rain exposure, in dry and well-ventilated conditions, with clean surroundings free of strong infrared radiation, organic solvents, and corrosive gases.
(15)Faulty batteries shall not be reused. Contact a certified battery recycling company for timely disposal to avoid environmental pollution.
(16)When battery degradation reaches the end-of-life (EOL) threshold of 70%, the battery must not continue to be used. The battery shall be discharged to SOC 0%, then handed over to qualified institutions for recycling, disassembly, and further treatment.
Note: "Battery PACK" in the above descriptions includes, but is not limited to, individual battery cells, battery PACKs, battery clusters, and complete battery systems.

1.6.2.2 Battery Recharging Requirements

(1)If more than six months have passed since the battery was last charged, the battery must be recharged in accordance with Section 4.2. Failure to perform recharging as required may affect the battery's performance and service life.
(2)The production date of the battery can be obtained by consulting the company's service engineer.

NOTE	Before installing the PACK, inspect it for any abnormalities. A PACK is considered abnormal if any of the following conditions are present: (1)The PACK casing is visibly deformed or damaged. (2)Check whether the total voltage between the PACK positive terminal and the PACK negative terminal is lower than 2.5 × n volts (where n is the number of cells in series within the battery PACK).

1.6.2.3 Battery Installation Requirements

(1)Use only the specified battery models. Using non-specified batteries may cause damage.
(2)Before installing the battery, check that the packaging is intact. Batteries with damaged packaging must not be used.
(3)Batteries must be placed horizontally and securely fixed.
(4)Do not place installation tools, debris, or other items on top of the battery during installation.
(5)Pay attention to the positive and negative terminals during installation. Do not short-circuit the battery terminals.

(6)Use a torque wrench during installation to ensure terminal connections are tight. Regularly inspect to ensure terminals are not loose.

1.6.2.4 Battery Short-Circuit Protection

⚠ DANGER	Short-circuiting a battery generates an instantaneous large current and releases significant energy, potentially causing personal injury or property damage.

(1)During battery installation and maintenance, wrap exposed cable terminals with insulating tape.

(2)Prevent foreign objects (e.g., conductive materials, screws, liquids) from entering the battery and causing a short circuit.

1.6.2.5 Hazard and Toxicity Information

⚠ DANGER	(1)Hazard: Battery terminals contacting other metals may cause heating or electrolyte leakage. Electrolyte is flammable; if leakage occurs, immediately move the battery away from fire. (2)Toxicity: Vapors from burning batteries can irritate the eyes, skin, and throat.

1.6.2.6 Battery Abnormal Handling Measures

⚠ DANGER	(1)In the event of electrolyte leakage or abnormal odors, avoid contact with the leaking liquid or gas. Non-professional personnel should stay away and immediately contact qualified personnel. Professionals must wear safety goggles, rubber gloves, a respirator, protective clothing, etc., to prevent hazards from electrolyte exposure. (2)Electrolyte is corrosive and contact may cause skin irritation or chemical burns. If contact with battery electrolyte occurs, take the following measures. •Inhalation: Evacuate the contaminated area, breathe fresh air immediately, and seek medical attention. •Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes, do not rub, and seek medical attention immediately. •Skin contact: Wash the affected area thoroughly with plenty of water and soap, and seek medical attention immediately. •Ingestion: Seek medical attention immediately.

1.6.2.7 In the Event of a Battery Drop

(1)After a battery drop (with or without packaging), if there is no visible deformation or damage and no noticeable odor, smoke, or fire, operations may proceed only after ensuring safety.

(2)Warehouse: Evacuate personnel. Qualified personnel shall use mechanical tools to transfer the battery to an open and safe area. Contact the company's service engineer. Allow the battery to stand for 24 hours and proceed only after confirming that the battery temperature has stabilized at room temperature.

(3)Energy storage system site: Evacuate personnel and close the system doors. Qualified personnel shall use mechanical tools to transfer the battery to an open and safe area. Contact the company's service engineer, and allow the battery to stand for 24 hours before further handling.
(4)If the battery drop results in noticeable odor, visible damage, smoke, or fire, immediately evacuate personnel, contact qualified personnel, and notify emergency services. Professionals shall use fire-fighting equipment to extinguish the fire under safe conditions.
(5)Do not continue using a battery after it has been dropped. Contact the company's service engineer for evaluation.

1.6.3 Auxiliary Socket Safety

⚠WARNING	(1)The auxiliary socket provides single-phase 230 VAC / 50 Hz power. The rated current of connected equipment shall not exceed 10 A, and the equipment must have safety certifications such as CE or UL. When using the power supply, the cable leads shall be properly protected to ensure electrical safety. (2)The auxiliary socket is a 10 A / 230 VAC EU standard socket. A CE- or UL-certified adapter must be prepared according to local regulatory requirements.

1.7 Maintenance and Replacement

NOTICE	Before removing components from the container, ensure that other components inside the container are secure and there are no safety hazards.

(1)At least two personnel must be present on-site when performing maintenance on the energy storage system.
(2)During equipment maintenance, insulating materials shall be used to cover nearby live components.
(3)Do not open the cabinet doors during rain, snow, thunderstorms, sandstorms, or heavy fog.
(4)Do not touch the operating fan with fingers, components, screws, tools, or circuit boards until the fan has fully stopped and power has been disconnected.
(5)Do not power on the equipment before completing troubleshooting.
(6)During live inspections, pay attention to the danger warning labels on the equipment and avoid standing in front of the energy storage cabinet doors.
(7)For devices other than the battery PACK, wait 15 minutes after powering off. The upstream external protective switch shall be set to the OFF position and tagged with a "Do Not Close" warning label. All protective switches of the equipment shall be switched to OFF, and the UPS shall be shut down. Operations may only be performed after confirming that the equipment is completely de-energized.
(8)Any switch disconnected for maintenance shall be clearly labeled with a prominent "Do Not Close" warning tag.
(9)After replacing power components or modifying wiring in the energy storage system, manually initiate wiring checks and topology polarity identification to avoid abnormal system operation.
(10)After completing maintenance and replacement operations, promptly lock the battery cabinet doors and properly secure the keys.

2 PRODUCT DESCRIPTION

2.1 System Configuration Overview

This product is an intelligent liquid-cooled C&I energy storage system. The system is composed of lithium-ion battery modules (1P52S liquid-cooled PACK), a sub-control box with high-voltage switching components, an energy storage PCS, a control system, a thermal management system, a fire protection system, and a power distribution and protection system. It enables electrical energy storage and release. The product is mainly used in scenarios such as peak shaving and valley filling, PV-ESS-Charging stations, demand management, power quality improvement, and dynamic capacity expansion. A schematic diagram of the battery cabinet is shown below:

Figure 2-1 Battery Cabinet Diagram

Figure 2-2 External Structure Diagram of the Battery Cabinet

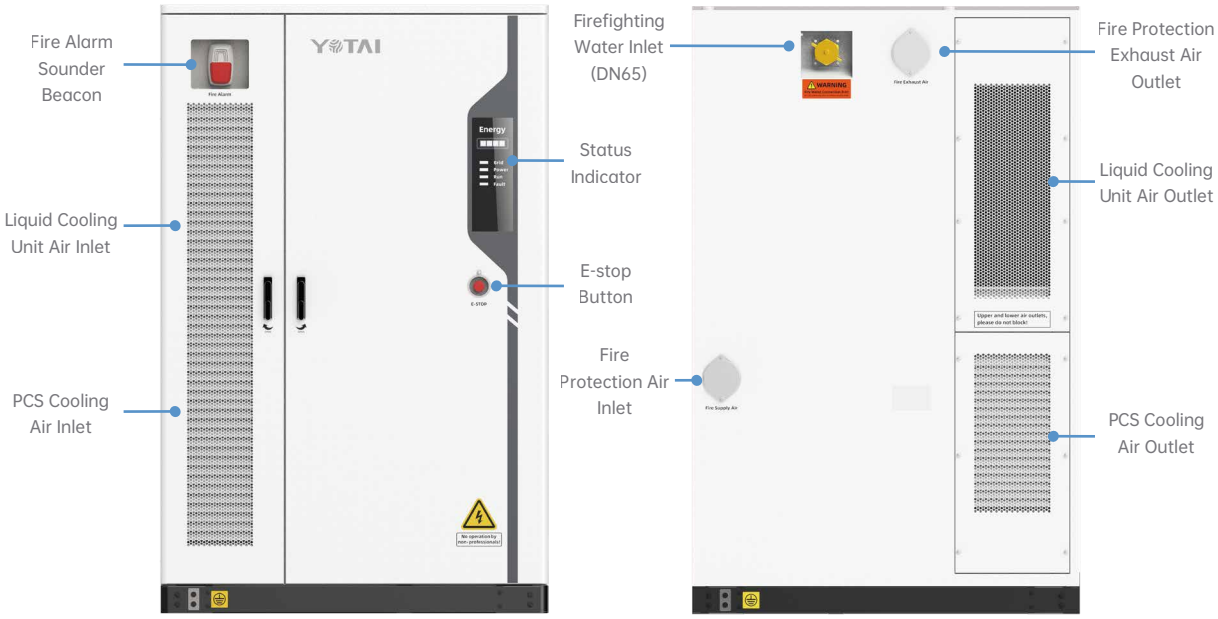


Table 2-1 External Interface Description

No.	Interface Type	Interface	Description
1	Status Indicator	Energy Indicator	System SOC Indicator
		Grid Indicator	Grid Status Indicator
		Power Indicator	System Power Indicator
		Run Indicator	System Run Indicator
		Fault Indicator	System Fault Indicator
2	Emergency Stop	Emergency Stop Button	System Emergency Stop Control

2.1.1 Battery PACK

The battery PACK is composed of fifty-two 314Ah cells configured in 1P52S and integrates battery cells, a cold plate, a BMU, fuses, a CCS, an MSD, and other components. The nominal energy of the battery PACK is 52.2496 kWh.

The specifications of the battery PACK are as follows:

Table 2-2 Battery PACK Specifications

No.	Name	Parameter
1	Battery Cell	3.2V 314Ah LFP Cell
2	Configuration	1P52S
3	Rated Capacity	314Ah
4	Rated Voltage	DC 166.4V
5	Voltage Range	DC 145.6V–187.2V (Cell Voltage DC 2.8–3.6V)
6	Nominal Energy	52.2496 kWh
7	Standard Charging Conditions	Constant Power (CP), Constant Current (CC)
		Power: 26.125 kW (0.5 CP)
		End Voltage: 187.2 V
8	Standard Discharging Conditions	Constant Power (CP), Constant Current (CC)
		Discharge Power: 26.125 kW (0.5 CP)
		Cut-off Voltage: 145.6 V
9	Maximum Discharging Power	26.125kW (0.5CP)、28.737kW(0.55CP 10min)、31.350kW (0.6CP 1min)
10	System Voltage	⩽ DC1500V
11	Recommended Operating Temperature Range	+15°C to +40°C

No.	Name	Parameter
12	Storage Temperature	-20°C to +35°C (6 months) / -20°C to +55°C (1 month)
13	Self-Discharge Rate per Month	⩽ 3%/month (25°C, 30% SOC, within 3 months after production of new cells)
14	Cooling Method	Liquid Cooling
15	Wiring Method	Quick Connector
16	Communication Method	Daisy Chain
17	BMU Power Supply Method	Self-Powered
18	Auxiliary Power Consumption	⩽ 3W (excluding liquid cooling power)
19	Main Dimensions	1140 × 770 × 243 mm (D × W × H) (subject to the actual product)
20	Weight	330 ± 3 kg
21	IP Rating	IP65
22	Storage Humidity	< RH 85%, no condensation
23	Altitude	⩽ 4000 m (derating above 3000 m)

The battery PACK diagram is shown below (subject to the actual product):

Figure 2-3 Battery PACK Diagram

2.1.2 Sub-Control Box

The sub-control box high-voltage switching system is the control section for the operation of the battery cluster. Its primary functions include main circuit break control and safety management of the charging and discharging processes, ensuring safe, reliable, and stable operation of the battery system. The sub-control box mainly consists of circuit breakers, fuses, DC contactors, aluminum-case resistors, shunts, a BCMU, and the enclosure.

The specifications of the sub-control box are as follows:

Table 2-3 Sub-Control Box Specifications

No.	Item	Parameter
1	Rated Voltage	DC1500V
2	Rated Current	200A
3	Short-Circuit Breaking Capacity	⩾50kA
4	Certifications	IEC62619 / IEC61000 / IEC60730
5	External Connection Method	Connector
6	External Communication Method	CAN Communication
7	Storage Temperature	-20°C to +55°C
8	Main Dimensions	700 × 600 × 170 mm (D × W × H)
9	Weight	30 ± 5 kg
10	IP Rating	IP65
11	Storage Humidity	< RH 85%, no condensation
12	Altitude	⩽ 4000 m (derating above 3000 m)

The sub-control box diagram is shown below (subject to the actual product):

Figure 2-4 Sub-Control Box Diagram

2.1.3 PCS

PCS Specifications is shown below:

Table 2-4 PCS Specifications

No.	Name		Parameter
1	Electrical Specifications	Full-Load Voltage Range	DC630V–950V

No.	Name		Parameter
1	Electrical Specifications	AC Input Line Voltage	400V ±15% (3W + N + PE)
		Phase	Three-Phase Four-Wire
		Rated Power	125 kW
		Frequency	50 Hz / 60 Hz
		Power Factor	0.99 / -1 to 1
		Maximum Efficiency	⩾99%
2	Communication Interfaces	Dry Contacts	EPO / DI / DO
		Communication	RS485 / CAN
3	Environmental Specifications	Installation Location	Indoor; free from direct sunlight, and free of dust, corrosive or flammable gases, oil mist, steam, dripping water, or salt
		Operating Altitude	Below 4000 m; derating required above 2000 m
		Storage Temperature	-40°C to 70°C
		Operating Temperature	-30°C to 60°C (derating above 50°C)
		Humidity	<95% RH, non-condensing
4	Structure	Ingress Protection	IP20
		Net Weight	<75 kg
		Cooling Method	Forced air cooling

2.1.4 BMS

(BCMU and BMU). It is primarily used for real-time monitoring of the battery system. It can detect cell voltage, module voltage, current, temperature, and other parameters, evaluate the operating status of the battery in real time, upload battery status information and alarm information, and, when necessary, control the disconnection of the battery circuit to ensure protection.

2.1.5 EMS

The EMS of the energy storage system is capable of acquiring, monitoring, and storing key data from the PCS, BMS, thermal management system, fire protection system, and energy meters. It can analyze the monitored data to determine the operating status of the energy storage system and upload system status, alarms, and fault information to the cloud. It also provides device control, energy management control, and system time-synchronization functions.

2.1.6 Thermal Management System

The battery PACKs in the energy storage system adopt a liquid-cooling thermal design. The battery cabinet is equipped with a liquid-cooling unit and matching coolant piping, which extends to each battery PACK. A liquid-cooling plate is installed at the bottom of each PACK. The liquid-cooling unit regulates coolant flow rate and temperature based on EMS commands to ensure temperature consistency inside the battery cabinet. The PCS thermal management uses a front-air-intake and rear-air-exhaust design and is equipped with intelligent variable-speed cooling fans. A schematic of the liquid-cooling unit, coolant piping, and PCS airflow-based thermal management is shown below:

Figure 2-5 Thermal Management Cooling Diagram

2.1.7 Fire Protection System

The fire protection system consists of a prefabricated aerosol fire-extinguishing device, an audible-visual alarm, a gas detector, a smoke detector, a temperature detector, an explosion-relief valve, a water inlet, and a sprinkler nozzle. When the audible-visual alarm is triggered and the explosion-relief valve opens, it indicates the presence of abnormal combustible gas concentration or a high-temperature hazardous condition. Personnel should evacuate the area immediately and avoid approaching the equipment. The schematic diagram of the fire protection system is shown below:

Figure 2-6 Fire Protection Equipment Layout Diagram

⚠ DANGER	(1)The DN65 fire-fighting water inlet of the energy storage cabinet is to be used only in the event of an uncontrolled fire. If the customer uses it under non-emergency or non-uncontrolled fire conditions, improper operation or direct water injection may cause equipment damage, for which the company shall not be held responsible. (2)Fire-fighting water injection into the energy storage cabinet must be carried out only by professionally trained fire-fighting personnel. Before the fire is fully extinguished, all personnel must keep away from the equipment.

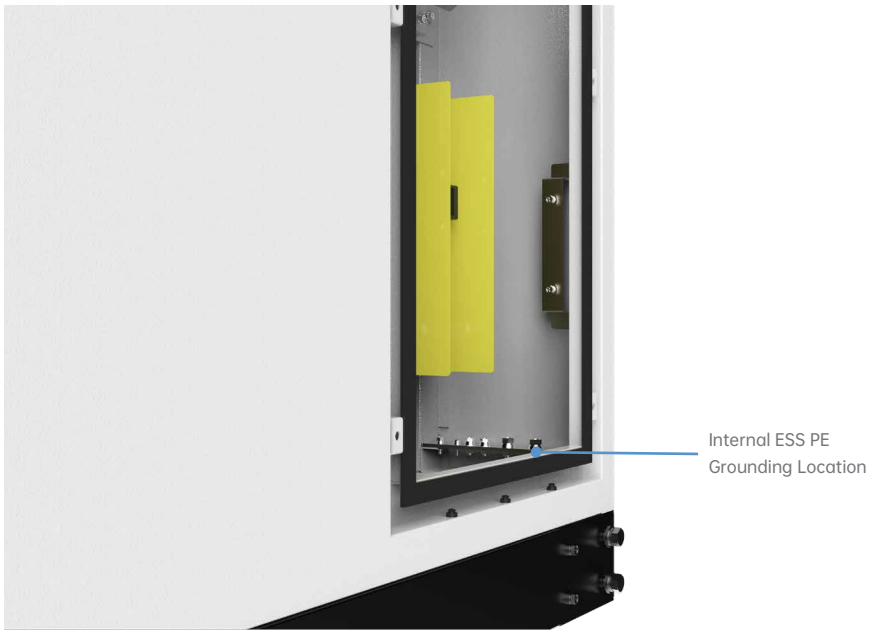
2.1.8 Grounding System

The grounding system of the equipment consists of cabinet grounding and system grounding. Two grounding points are provided on the outside of the battery cabinet for cabinet grounding, as shown in the figure below. For the complete grounding connection of the battery cabinet, refer to Section 6.2.

Figure 2-7 Battery Cabinet Grounding Point Locations

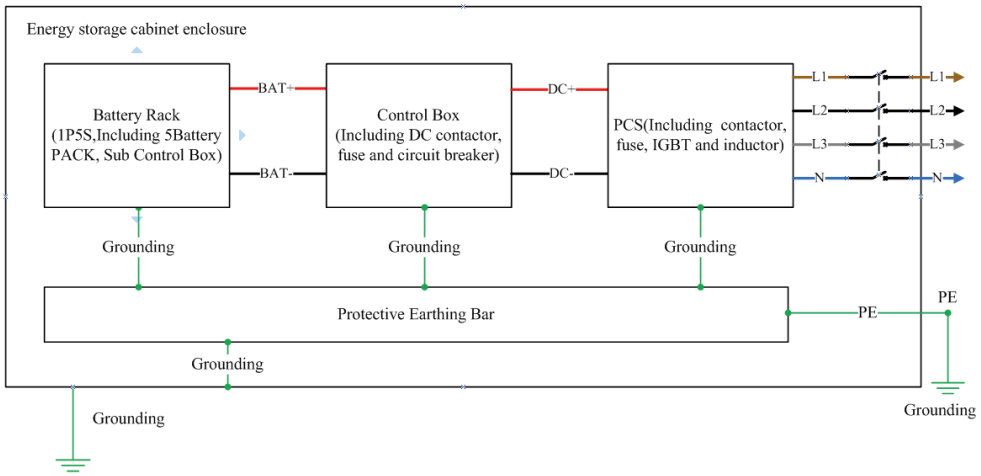
A protective earthing (PE) copper busbar for the energy storage system is provided inside the product, as shown in the figure below:

Figure 2-8 Internal ESS PE Grounding Location



The insulation frame of the battery cabinet is shown in the figure below:

Figure 2-9 Battery Cabinet Insulation Frame



The protective earthing cable shall comply with IEC 60364-5-54:2011/AMD1:2021, IEEE standards, or local regulatory requirements. The grounding resistance between internal equipment and the grounding bar shall be <0.1 Ω, and the grounding resistance between the equipment enclosure or ESS grounding bar and the grounding network shall be <4 Ω.

2.1.9 Emergency Stop System

The emergency stop system consists of an electrical emergency stop and a software emergency stop. Both mechanisms participate simultaneously to ensure safe completion of the emergency stop action.

An emergency stop button is installed on the front door of the battery cabinet for manual operation in emergency situations to trigger an emergency shutdown of the battery system.

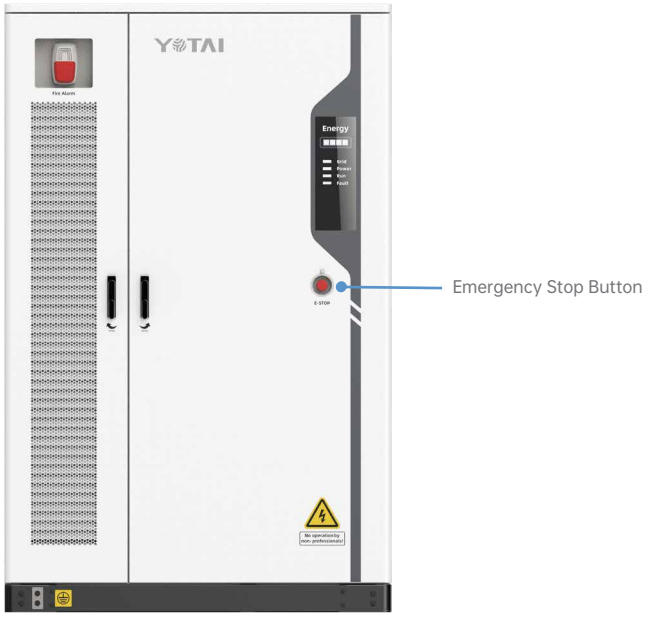
The BMS can detect the cabinet-door emergency stop and aerosol feedback signals and perform a system shutdown through software control.

The EMS can detect the cabinet-door emergency stop, aerosol feedback signals, and the emergency stop signal output by the BMS, and perform a system shutdown through software control.

When an emergency occurs and manual activation is required, the emergency stop button may be pressed.

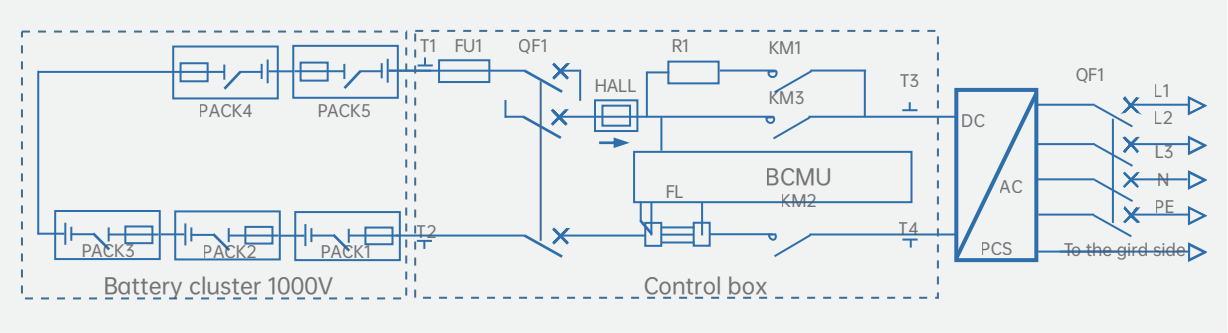
The location of the emergency stop button is shown in the figure below.

Figure 2-10 Emergency Stop Button Location



2.2 Electrical Schematic

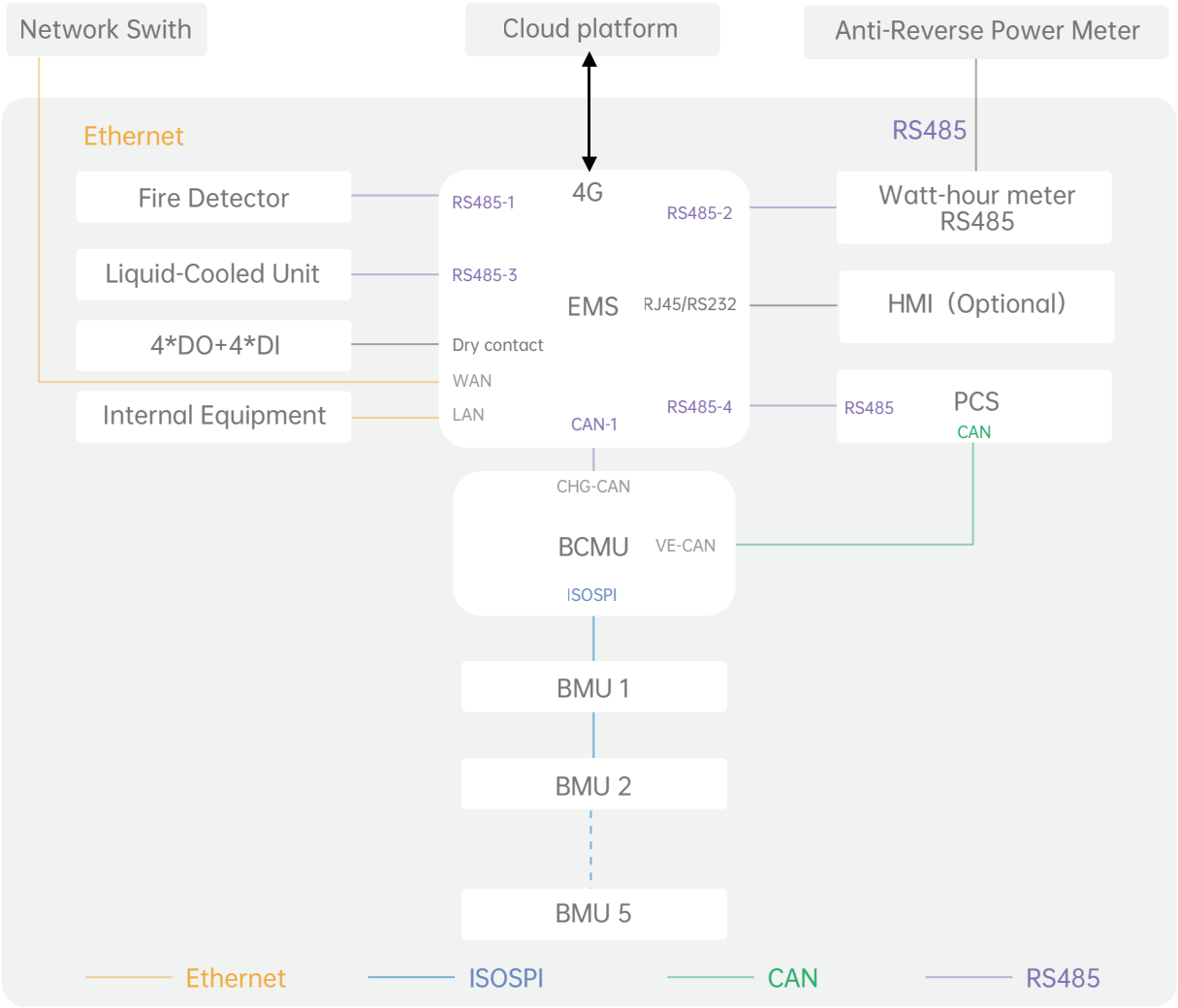
Figure 2-11 System Single-Line Electrical Diagram



2.3 Communication Topology

The system communication topology is shown below:

Figure 2-12 System Communication Topology



Energy storage system

2.4 Product Specifications

Table 2-5 Specification Parameters

No.	Category	Name	Parameter	Remarks
1	DC Parameters	Cell Type	LFP-3.2V-314Ah	
		Nominal Energy	261.248 kWh	
		Nominal Voltage	832 Vdc	
		Charge/Discharge Rate	⩽0.5 CP	
		Cooling Method	Smart Liquid Cooling	
2	AC Parameters (Grid-Connect-ed)	Rated Power	125kW	
		Grid Voltage	400 V ±10%	
		Rated Current	180 A	
		Rated Grid Frequency	50 Hz / 60 Hz	
		Grid Frequency Range	45–55 Hz / 55–65 Hz	
		Total Current Harmonic Distortion	<3% (at rated power)	
		Power Factor	>0.99 (at rated power)	
		Adjustable PF Range	-1 (leading) to 1 (lagging)	
3	AC Parameters (Off-Grid)	AC Off-Grid Voltage	400 V (-5% to +5%)	
		AC Off-Grid Frequency	50 Hz / 60 Hz	Default: 50 Hz
		Off-Grid Output Voltage THD	<3% (linear load)	
4	System Parameters	Cooling Method	Liquid Cooling	
		Fire Protection System	Aerosol + Water-Based Fire Suppression (optional)	
		Cabinet Corrosion Protection Level	C4-M	C5-M optional
		Ingress Protection Rating	IP54 (Battery Compartment IP65)	
		Operating Temperature Range	-20°C to +55°C	Derating above ⩾45°C
		Storage Temperature	-20°C to +35°C (⩽6 months) -20°C to +45°C (⩽1 month)	SOC@20% ~ 50%

No.	Category	Name	Parameter	Remarks
4	System Parameters	Operating Humidity Range	0–95% RH	No condensation
		Installation Method	Outdoor Installation	
		Operating Profile	Max. 2 charge/discharge cycles per day	
		System Communication Interfaces	Ethernet / RS485	
		External Communication Protocols	Modbus TCP / IEC 104 / IEC 61850 / Modbus RTU	
		Altitude	Up to 4000 m	Derating above 2000 m
		Dimensions (W*D*H)	1400 mm * 1400 mm * 2200 mm	
		Weight	2500 kg ±5%	
		Certifications	IEC62619 IEC60730 IEC61000 IEC62477 EN50549 VDE4105 VDE4110 VDE4120 UN38.3 UN3480	

3 HANDLING AND TRANSPORTATION

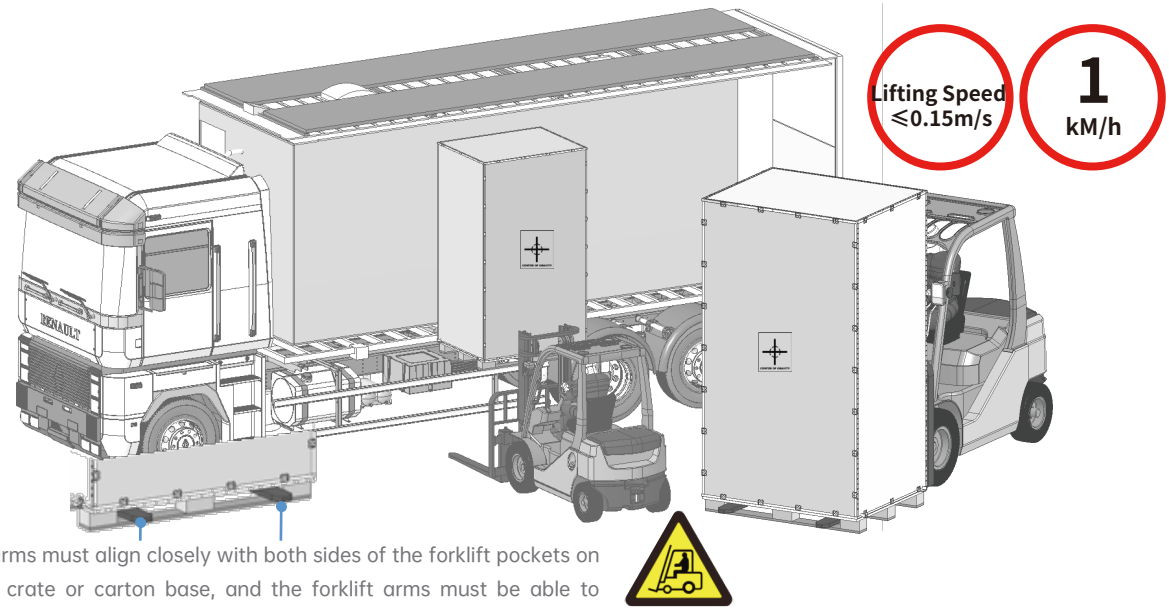
3.1 Product Handling

⚠ CAUTION	(1)Product handling includes both loading and unloading of the packaged equipment. (2)Forklift loading and unloading operations must comply with the "Pre-installation Instructions" specified in Section 1 of this manual. (3)It is recommended that trucks unload within the shortest possible distance to the final installation site. (4)Motorized forklifts are recommended for short-distance transport (≤ 500 meters) in accordance with the specified requirements. (5)Products must be secured inside the transport vehicle with anti-collision measures on all sides, such as buffer foam or cushioning pads, to prevent equipment damage caused by sudden braking during transit.

Use a motorized forklift for product loading and unloading. When operating inside the truck cargo area, the forklift forks must be aligned with the left and right sides of the forklift holes in the cabinet base, and the fork arms must extend fully through the product. Lifting and lowering must be performed smoothly and slowly, with a lifting speed ≤ 0.15 m/s and a travel speed ≤ 1 km/h. Shaking, jittering, or tilting is strictly prohibited, as these may severely compromise operational safety.

Refer to the following diagram:

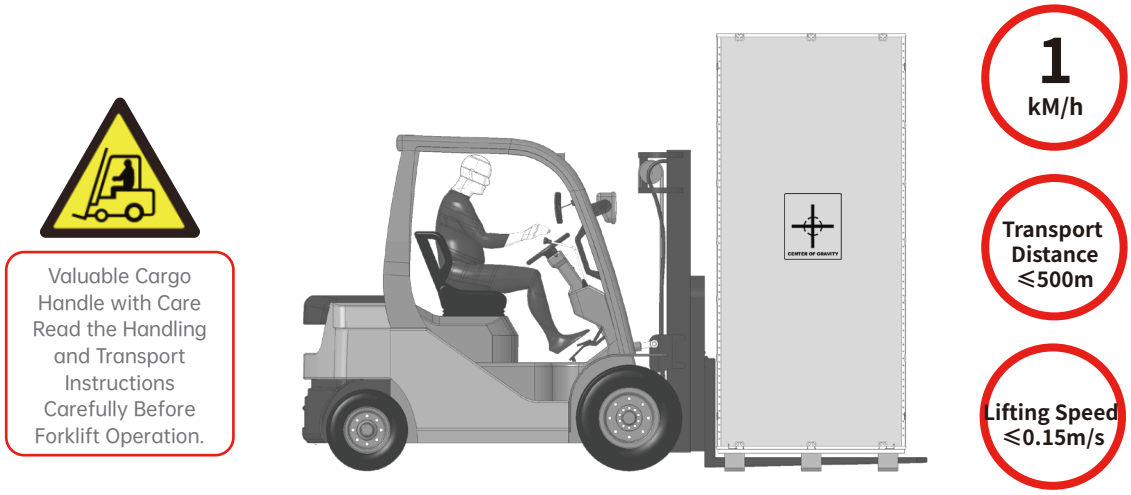
Figure 3-1 Unloading Schematic: Wooden Crate/Cardboard Box Packaging



The forklift arms must align closely with both sides of the forklift pockets on the wooden crate or carton base, and the forklift arms must be able to extend fully through the crate.

3.2 Product Transportation

Figure 3-2 Refer to Section 1.5 of this manual for short-distance transportation requirements.



3.3 Package Removal

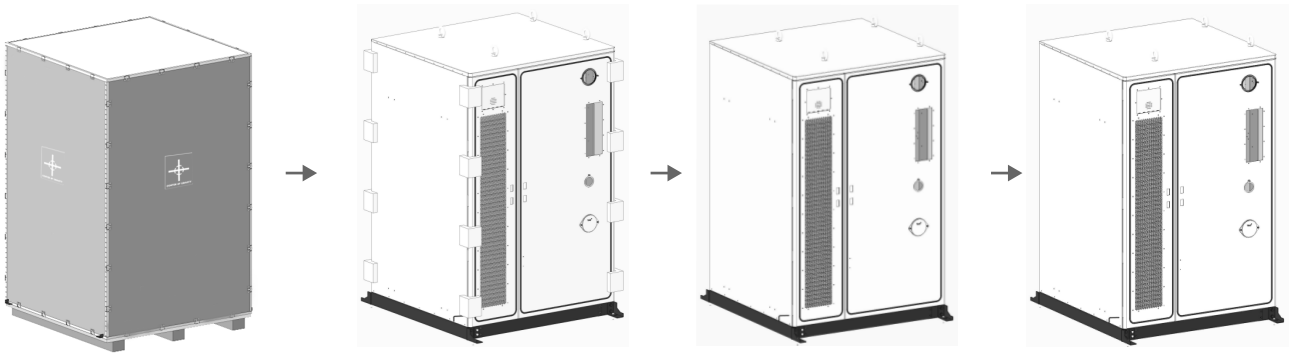
Preparation of tools before unpacking (see table below):

Preparation of tools before unpacking (see table below):

 Socket Wrench Set	 Phillips/Flathead Screwdrivers	 Pry Bar	 Claw Hammer
 Steel Tape Measure	 Digital or Bubble Level	 Stepladder	 Personal Protective Equipment (PPE)

⚠ CAUTION	(1)The product is packaged in assembly-type wooden crates or cardboard boxes. During disassembly, tools such as crowbars and claw hammers must be used to remove the packaging by releasing the metal buckles/clips. (2)It is strictly prohibited to use cutting machines, sledgehammers, feet, heavy-duty tools, or electric drills to violently disassemble the wooden crates or cardboard boxes. (3)Necessary Personal Protective Equipment (PPE) must be worn during the disassembly of wooden crates or cardboard boxes.

Figure 3-3 Schematic of Wooden Crate or Cardboard Box Disassembly



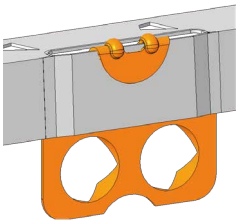
(1) (2) (3) (4)

(1)Designated Location for Wooden Crate or Carton Transportation.

(2)Dismantling and Assembling the Wooden Crate or Carton Packaging.

(3)Remove the protective foam padding and PE bag.

(4)Inventory the accompanying accessories inside the cabinet.

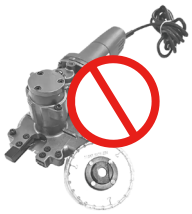


Use a pry bar and claw hammer to loosen the metal clips

Do not kick or step on the product

Do not use an electric drill

Do not use a sledgemhammer



Do not use a cutting machine

3.4 Inventory of Accessories

After unpacking, the accessories are placed inside the cabinet. Refer to the table below to inventory the included accessories:

Table 3-2 Accessories Checklist

No.	Category	Equipment Description	Quantity per Unit	Unit	Remarks
Field Engineering Installation Parts					
1	Equipment	Energy Storage Cabinet / YTDS5T261L-P0125S	1	pcs	According to the final product part number
2	Structual Materials	Hexalobular Socket Wrench	1	pcs	Wrench for rear cover plate disassemblyc
3	Structual Materials	Left base fastener	2	pcs	Cabinet Fixing
4	Structual Materials	Right base fastener	2	pcs	Cabinet Fixing

No.	Category	Equipment Description	Quantity per Unit	Unit	Remarks
5	Structual Materials	Energy Storage Cabinet Key	4	pcs	Cabinet Anti-theft
6	Installation Accessories	Expansion bolt M16	4	pcs	Cabinet Fixing
7	Electrical Components	Manual Service Disconnect (MSD)	5	pcs	Electrical Connection
8	Structual Materials	Hexagon Combination Screw M6*16	10	pcs	Battery Compartment Sealing Plate Fixing
Factory Documents					
1	Paper Documents	Product Factory Inspection Report	1	Copy	
2	Paper Documents	Product Certificate of Conformity	1	Copy	
3	Paper Documents	Factory FAT Test Report	1	Copy	
4	Electronic Version	Energy Storage System User Manual	1	Copy	
5	Electronic Version	Energy Storage System Installation Manual	1	Copy	
6	Electronic Version	PCS User Manual	1	Copy	
7	Electronic Version	Liquid Cooling Unit User Manual	1	Copy	
8	Electronic Version	Cloud Platform WEB Operation Manual	1	Copy	
9	Electronic Version	EMS Operation Manual	1	Copy	
10	Paper Document	Packing List	1	Copy	

4 STORAGE REQUIREMENTS

4.1 General Requirements

(1)During the storage period, relevant proof that meets the product storage requirements must be retained, including temperature and humidity log data, storage environment photos, and inspection reports.

(2)Store the product in a clean and dry place, protected from dust and moisture. Exposure to rain or ground water is prohibited.

(3)The ambient air must not contain corrosive or flammable gases.

(4)The product must not be stored in a tilted or inverted position.

(5)For equipment other than battery packs and UPS units, if the storage period is two years or longer, professional inspection and testing are required before use.

4.2 Storage and Recharging Requirements

After delivery is completed, if installation is not carried out immediately, the cabinet must be stored properly as described in this section.

⚠WARNING	(1)To prevent condensation inside the cabinet or rainwater immersion at the cabinet bottom during rainy seasons, the cabinet should be stored indoors, such as in a warehouse or workshop. The surrounding environment must be dry and well ventilated, clean, free of infrared radiation or other radiation sources, free of organic solvents or corrosive gases, and free of conductive metal dust. Keep away from heat sources and open flames. (2)When storing the energy storage cabinet, it must be stored separately and not mixed with other equipment. Appropriate fire protection facilities such as fire sand and fire extinguishers must be available on site.
NOTICE	The energy storage cabinet is recommended to be put into use promptly. For long-term storage, periodic battery recharging is required; otherwise, the cabinet may be damaged.

(1)During storage, the energy storage cabinet must be placed according to the orientation markings. Tilting, side placement, or upside-down placement is strictly prohibited.

(2)Storage environment requirements:

①Ambient temperature: -20℃ to +45℃ (≤1 month, SOC 30% as factory standard; for on-site storage longer than 1 month, it is recommended to recharge to SOC 50%).

②Relative humidity: 5%RH to 95%RH (around 50%RH recommended).

③Dry, ventilated, and clean environment.

④Avoid contact with corrosive organic solvents or gases.

⑤Avoid direct sunlight.

⑥The distance from heat sources shall not be less than two meters.

(3)During storage, the cabinet must be disconnected from any external connections, and all cabinet indicator lights must remain off.

(4)For long-term on-site storage (1 month to 6 months), one full charge-discharge cycle must be performed, and the final recharge SOC must be greater than 50%.

Table 4-1 Energy Storage Cabinet Storage Recharge Interval

Storage Temperature (℃)	Maximum Maintenance Charging Interval
-20~35	⩽6 months
-20~45	⩽1 month

(5)Do not remove the external packaging of the energy storage cabinet. If recharging is required, it must be carried out by qualified personnel in accordance with the specified procedure. After recharging is completed, the energy storage cabinet must be placed back into its packaging.

(6)The warehouse administrator shall record the storage status of energy storage cabinets on a monthly basis and regularly report the inventory status. Cabinets stored for extended periods must be scheduled for timely recharging.

(7)Energy storage cabinets that have exceeded a storage duration of more than six months must be reported promptly.

(8)The cabinet must be handled with care during transportation. Any collision or impact on the energy storage cabinet is strictly prohibited.

(9)AC input voltage requirements for cabinet recharging:

① In 230 V regions (three-phase 400 VAC or single-phase 230 VAC).

② For cabinet recharging, the warehouse AC input cable cross-section shall not be less than 16 mm^2 (to ensure a current-carrying capacity greater than 60 A).

(10)Before recharging, the energy storage cabinet must undergo appearance inspection, insulation resistance testing, and dielectric withstand testing. Only cabinets that pass these inspections may proceed to the recharging process.

(11)The ambient temperature for recharging shall be 15°C to 40°C.

(12)The battery charging instrument shall be CE- or UL-certified. Operation shall follow the Ener Hexon® Smart261L CE Liquid-Cooled C&I ESS Recharging Operation Manual.

NOTICE	(1)The recharging operation must be performed by trained professionals, and insulated gloves and dedicated insulated tools must be used during the process. (2)During recharging, personnel must remain on-site to monitor the process and handle any abnormalities in a timely manner. (3)If any abnormal conditions occur during recharging, such as battery swelling or smoke, charging must be stopped immediately and handled by qualified professionals.

5 STRUCTURAL FIXING AND INSTALLATION

NOTICE	(1)For product transportation and installation, refer to the Ener Hexon® Smart261L CE Liquid-Cooled C&I ESS Installation Manual. (2)Site selection shall comply with the NFPA 855 Standard for the Installation of Stationary Energy Storage Systems (2023) and applicable local regulations.

The energy storage cabinet is intended for outdoor use only. General site selection requirements are as follows:

(1)The installation location must not be in a low-lying area. The installation surface must be higher than the historical maximum water level of the region and at least 300 mm above the ground level.

(2)The distance from airports, landfill sites, riverbanks, or dams must be ⩾2000 m.

(3)Select an open area ensuring that there are no obstacles or combustible materials within 3 m around the site, and no third-party wireless communication facilities within 30 m.

(4)The exhaust outlet of the energy storage system must be more than 4.6 m away from heating, ventilation, and air-conditioning air inlets, windows, doors, loading docks, and ignition sources of nearby buildings or facilities.

(5)Maintain at least 12 m distance from residential areas to avoid noise disturbance, and more than 30 m from densely populated buildings such as schools and hospitals. If this distance cannot be met, a fire wall must be constructed between the energy storage cabinet and the building. The fire wall must comply with NFPA 855 Standard for the Installation of Stationary Energy Storage Systems (2023).

(6)The site must provide convenient transportation access and reliable fire suppression facilities.

(7)The site must meet current space requirements and allow for future expansion over the system's entire life cycle.

(8)Select a well-ventilated location.

(9)Installing the energy storage system in salt-damage areas will cause corrosion and may lead to fire. Do not install the system outdoors in salt-damage or heavily polluted areas. Salt-damage areas refer to zones within 2000 m of the coastline or areas exposed to sea breeze. The sea-breeze influence range varies depending on weather conditions (such as typhoons or monsoon seasons) or terrain (such as sea walls or hills). Polluted areas refer to zones within 3000 m of smelting plants, coal mines, thermal power plants, chemical plants, rubber factories, electroplating facilities, or similar pollution sources.

(10)It is recommended to use a solid wall or fence for perimeter protection of the energy storage system area. The fence must have a lockable gate, and the fence height should be greater than 2.2 m. A fire wall may replace part or all of the perimeter wall.

NOTE	(1)If the required safety distance at the selected site cannot meet the relevant standards, it is recommended to choose another site.

NOTE	(2)According to NFPA 855 Standard for the Installation of Stationary Energy Storage Systems-2023: when installed outdoors with a 1-hour fire-rated independent firewall barrier, and when the firewall's length and height extend 5 inches (1.5 m) beyond the physical envelope of the prefabricated container. The clearance requirements shall follow Section 4.1 of the Installation Manual. (3)According to NFPA 855 Standard for the Installation of Stationary Energy Storage Systems-2023 : when a noncombustible exterior wall is installed near the ESS, with no openings or combustible finishes, and the wall has a 2-hour fire rating in accordance with ASTM E119 or UL 263. The clearance requirements shall follow Section 4.1 of the Installation Manual.

The site selection shall avoid scenarios not recommended by industry standards and regulations, including but not limited to the following locations, areas, and environments:

(1)Areas with strong vibration, strong noise sources, or strong electromagnetic interference.

(2)Locations that generate or contain dust, oil fumes, harmful gases, or corrosive gases.

(3)Places that produce or store corrosive, flammable, or explosive materials.

(4)Areas with existing underground facilities.

(5)Locations with poor geological conditions such as rubber soil, weak soil layers, or ground prone to water accumulation or subsidence.

(6)Below water reservoirs, water features, or water intake rooms.

(7)Seismic fault zones and regions with a seismic fortification intensity higher than level nine.

(8)Areas directly threatened by mudslides, landslides, quicksand, or karst caves.

(9)Within the boundaries of mining subsidence (movement) zones.

(10)Within blasting hazard areas.

(11)Areas that may be flooded in the event of dam or levee failure.

(12)Important protected zones for drinking water sources.

(13)Protected areas for historical and cultural heritage sites.

(14)Densely populated areas, high-rise buildings, and underground buildings.

(15)Intersections of urban main roads and sections with heavy traffic.

(16)Locations that meet local building code requirements or NFPA 855 Standard for the Installation of Stationary Energy Storage Systems (2023).

⚠WARNING	Mark the safety zone: Use red construction marking tape to outline the safety area and remove any obstacles within the zone. Post construction signs and safety warning signs in prominent locations.

6 ELECTRICAL INSTALLATION

6.1 Prerequisites

⚠WARNING	It is strictly prohibited to install fuses, switches and other equipment on the protective ground wire.
⚠ CAUTION	Grounding must comply with local electrical safety regulations.

(1)The ESS has been confirmed to be complete.

(2)The ESS has been installed and safety checks have been completed according to the installation manual.

(3)The wiring requirements are clearly defined.

6.2 Protective Grounding Connection

The protective grounding materials are listed below.:

Type	Grounding Method	Recommended Specification / Model	Terminal Requirement	Source
Cabinet Grounding	Grounding Cable	ZC-YJV-0.6/1kV-1*35mm² (Yellow-Green)	OT/DT terminal, M12 bolt	User-supplied
Cabinet Grounding	Grounding Busbar	D4*W40 mm (Min. hot-dip galvanized coating thickness ⩾70 μm)	M10*25 screw	User-supplied
System Grounding	Grounding Cable	ZC-YJV-0.6/1kV-1*35mm² (Yellow-Green)	OT/DT terminal, M8 bolt	User-supplied

(1)Either a grounding cable or a grounding busbar may be used for cabinet grounding; only one of the two methods shall be selected.

(2)The cabinet enclosure grounding has already been connected to the system grounding busbar. The cabinet grounding and system grounding shall be reliably connected in accordance with local regulatory requirements, and the grounding cable or grounding busbar shall be connected to the grounding grid at the nearest possible point.

(3)The cross-sectional area and color of the grounding cable shall be determined according to this table, or selected by calculation in accordance with IEC 60364-5-54:2011/AMD1:2021.

⚠WARNING	(1)Grounding busbars are provided on the front and rear sides of the product enclosure, and grounding cables shall be connected to the grounding busbars. (2)Grounding screws shall be tightened according to the specified standard torque. For torque values, refer to Appendix B, Table B-1.

⚠WARNING	(3)The equipment grounding impedance shall comply with local electrical standards. The grounding resistance between the internal protective earthing (PE) busbar and the cabinet metal parts shall not exceed 0.1 Ω, and the grounding resistance between the cabinet grounding busbar or the energy storage system grounding busbar and the grounding grid shall not exceed 4 Ω. (4)The cabinet and the system shall be permanently connected to protective earth. (5)Before operating the equipment, electrical connections shall be checked to ensure that the equipment is reliably grounded.Operating the equipment without an installed grounding conductor is strictly prohibited. (6)Damaging the grounding conductor is strictly prohibited. (7)For equipment with high touch current, the protective earthing terminal of the equipment enclosure must be connected to ground before connecting the input power supply, in order to prevent electric shock caused by touch current.

Figure 6-1 Connection of Cabinet Protective Earthing Cable / Busbar

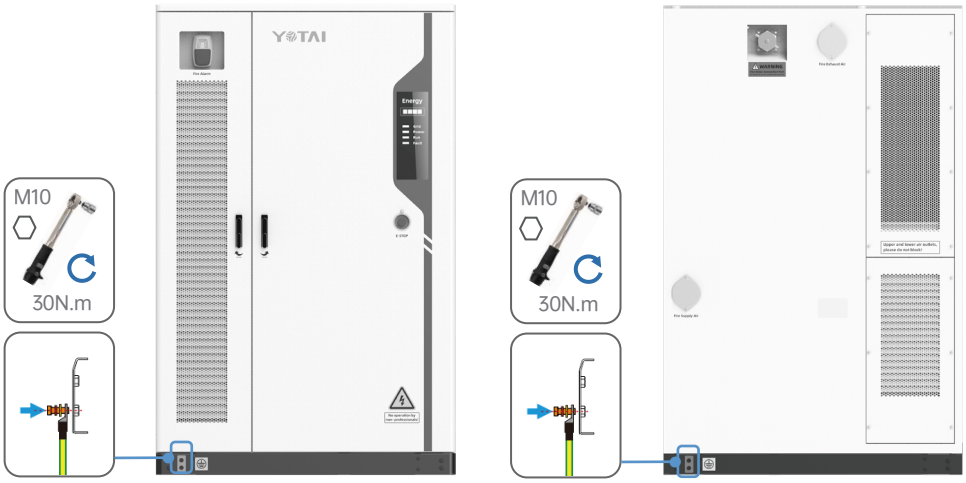
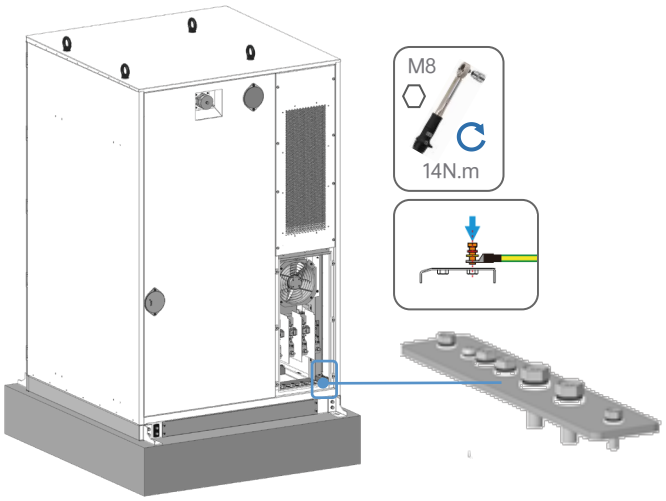


Figure 6-2 Connection of Energy Storage System PE Copper Busbar Protective Earthing Cable

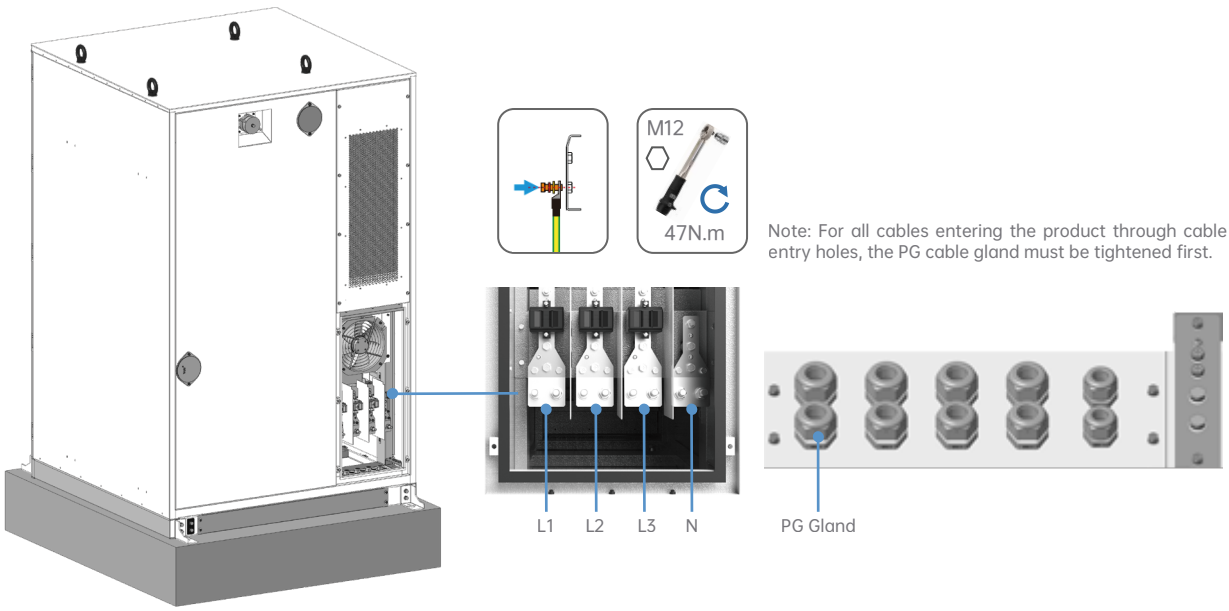


6.3 AC Grid Connection Wiring

The recommended materials for AC grid connection are as follows:

Recommended Cable	Recommended Specification / Model	Recommended Terminal Type	Cable Gland (PG) Specification	Source
AC Cable	ZR-YJV22-0.6/1kV-4*70 mm² + 1*35 mm²	OT/DT terminal, M12 bolt	5 × M25 × 1.5	User-supplied

Figure 6-3 AC Grid-Connected Cable Wiring Procedure for a Single Battery Cabinet



⚠ CAUTION

(1)broken. The neutral (N) conductor must be securely connected; otherwise, AC equipment inside the system may be damaged.

(2)After completing the AC cable connections, ensure that the OT/DT terminals are fully seated against the copper busbar with good contact, and that the AC input cables are routed vertically downward.

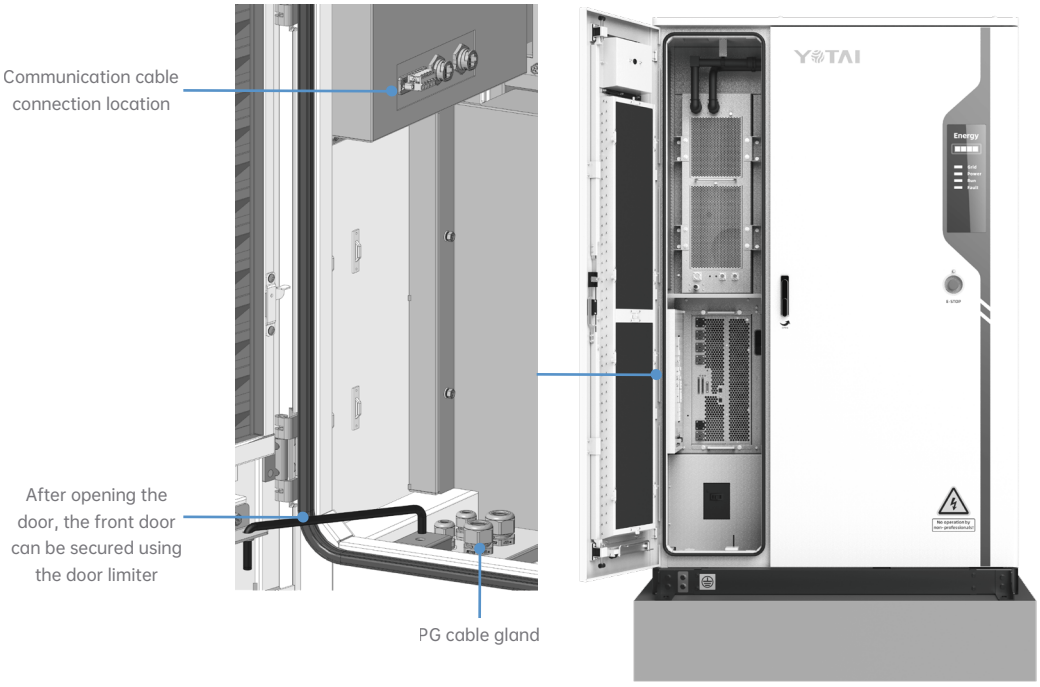
(3)Tighten the fixing bolts according to the specified standard torque. Refer to Appendix B, Table B-1 for the standard torque values.

(4)After torque verification, mark the tightened nuts with a marker pen for future inspection and maintenance.

(5)During installation, the cable gland specifications and usage instructions in Section 6.5 must be strictly followed. Failure to do so may result in improper cable fixing and sealing.

6.4 Communication Cable Connection

Figure 6-4 Communication Cable Wiring Diagram



⚠ CAUTION

When 2–5 units are operating in off-grid parallel mode, an additional off-grid parallel communication cable must be connected in addition to the communication cables mentioned above.

Figure 6-5 External Interface Definitions

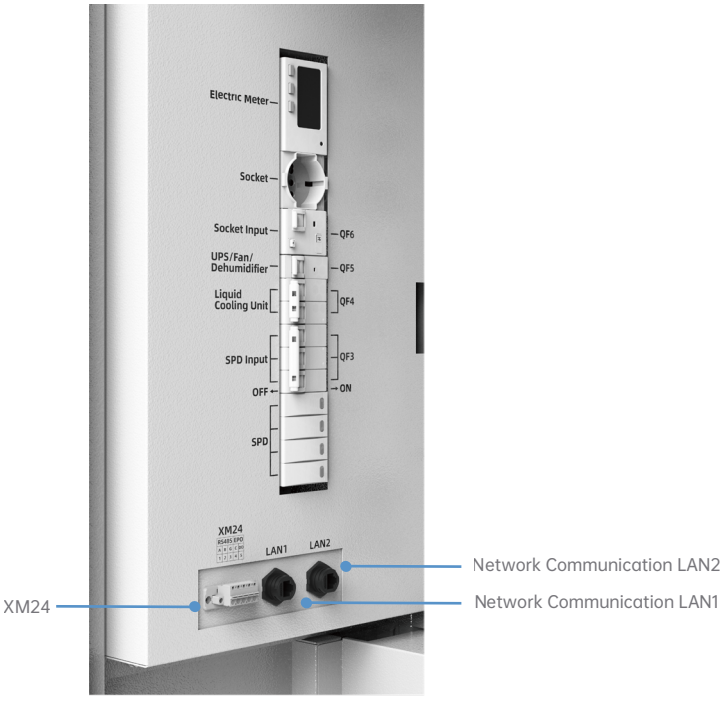


Table 6-1 External Interface Definitions

Terminal Code	Pin Number	Function	Definition	Recommended Cable	Terminal Model	PG Gland Specification	Source
XM24	1	Electric Meter RS485 Communica-tion	RS485-A	ZC-RVPS22-300/300 V-2×1.5	Pre-insulated tubular ferrule E1512	M20×1.5	User -supplied
	2		RS485-B				
	3		RS485-GND				
	4	External EPO Dry Contact Output (Normally Closed, Passive)	EMS-EPO-C	ZC-RVPS22-300/300 V-2×1.5	Pre-insulated tubular ferrule E1512		User -supplied
	5		EMS-EPO-DO				
LAN1	/	Connection to Upper-Level System or External Network	WAN	CAT5E-SFTP-1/0.5×4P (shielded CAT5e network cable)	RJ45	M16×1.5	User -supplied
LAN2	/	Connection to Internal Network and Internal Device Communi-cation	LAN/CON	CAT5E-SFTP-1/0.5×4P (shielded CAT5e network cable)	RJ45	M16×1.5	User -supplied

Note:

(1)The communication cables mentioned above shall be selected and connected according to the project requirements. When the network cable length exceeds 100 m, optical fiber must be used. The recommended armored optical fiber is G.652, 4-core. The customer must provide a switch equipped with optical ports.

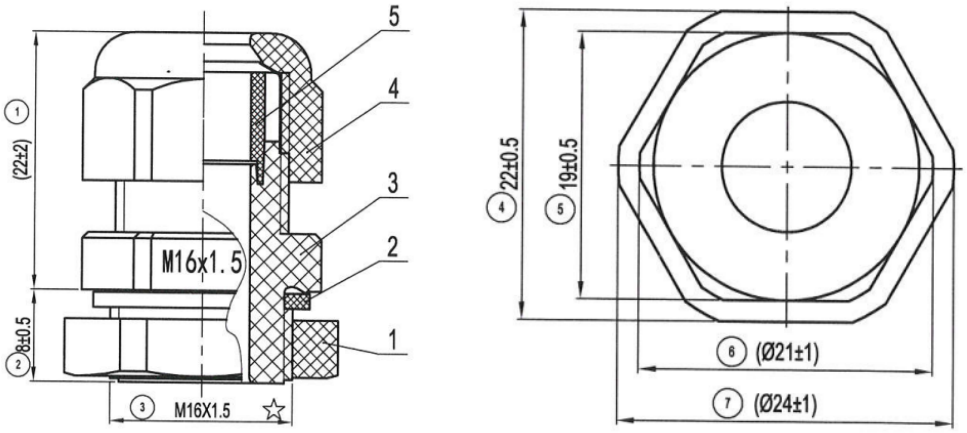
(2)The RS485 communication cable for the energy meter and the external EPO cable must be shorter than 1000 m.

(3)If 2–5 battery cabinets are required to operate in off-grid parallel mode (for additional quantities, please contact our service engineer), PCS parallel communication cables must be connected for information synchronization. For details on PCS off-grid parallel communi-cation cable connections, please refer to the PCS Off-Grid Parallel Operation Guide.

(4)The cable installation process must comply with the PG gland specifications and usage instructions described in Section 5.5; otherwise, proper cable insertion, securing, and sealing cannot be ensured.

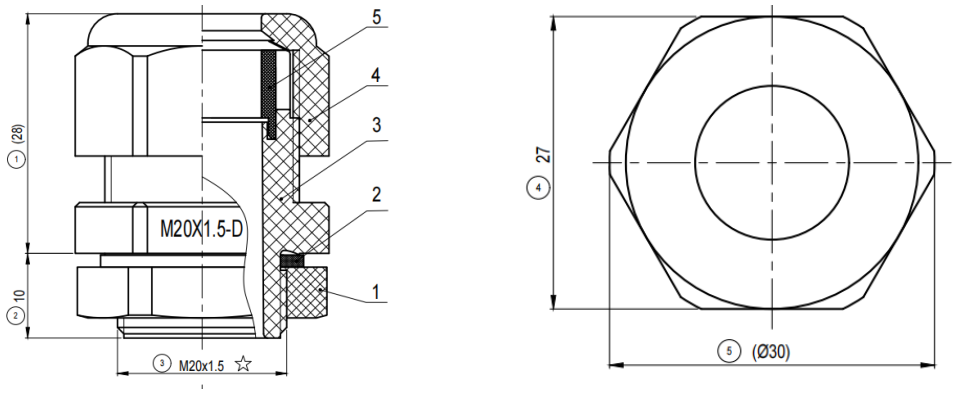
6.5 Cable PG Gland Specification Instructions

①M16×1.5



Instructions for PG Gland M16×1.5		
Item	Technical Parameter	Remarks
Clamping Diameter Range	4-8mm	The selected cable outer diameter must fall within the clamping range
Installation Torque	1.5–2.5N•m	Mark the tightened position with a marker for future maintenance checks.
Cable Locking Torque	2.5–3.5N•m	
Protection Rating	IP68	A cable must be retained for sealing after installation
Operating Temperature	-40℃~100℃	The cable temperature must not exceed this limit

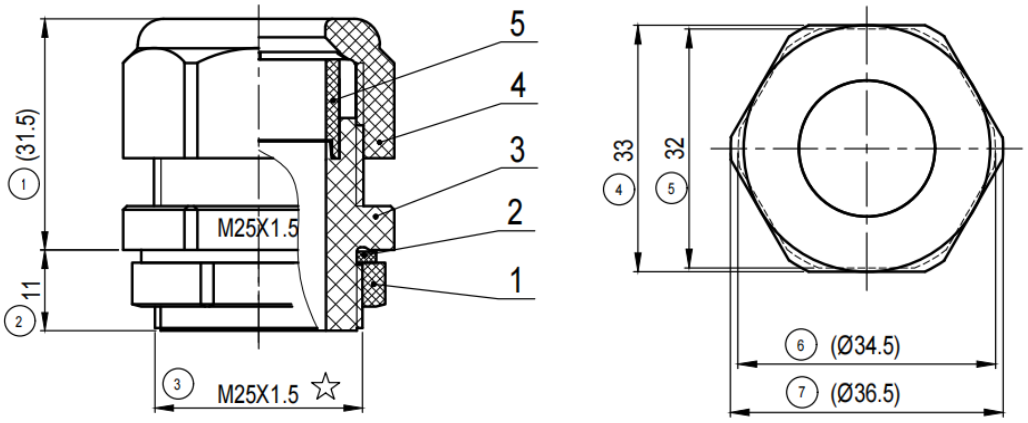
②M20×1.5



IInstructions for PG Gland M20×1.5		
Item	Technical Parameter	Remarks
Clamping Diameter Range	8–14 mm	The selected cable outer diameter must fall within the clamping range
Installation Torque	2–3 N·m	Mark the tightened position with a marker for future maintenance checks
Cable Locking Torque	5–7.5 N·m	

Instructions for PG Gland M20×1.5		
Item	Technical Parameter	Remarks
Protection Rating	IP68	A cable must be retained for sealing after installation
Operating Temperature	-40℃~100℃	The cable temperature must not exceed this limit

③M25×1.5



Instructions for PG Gland M25×1.5		
Item	Technical Parameter	Remarks
Clamping Diameter Range	13–18 mm	The selected cable outer diameter must fall within the clamping range
Installation Torque	3.5–5 N·m	After tightening, mark the position with a marker pen for future maintenance inspection
Cable Locking Torque	7.5–11 N·m	
Protection Rating	IP68	If used, a cable must be retained for sealing
Operating Temperature	-40℃~100℃	The cable temperature must not exceed this limit

PG Gland Material Specification		
No.	Name	Remarks
1	Nylon Locknut	
2	Flat Sealing Ring	
3	Gland Body	
4	Dome Nut	
5	Sealing Insert	

7 FIRE PROTECTION AND SIM CARD INSTALLATION

7.1 Fire Protection Installation

⚠WARNING	(1)Do not place the fire-extinguishing aerosol near heat sources or subject it to impact, to avoid accidental activation of the fire-suppression discharge. (2)When pulling out the safety pin, the operator must wear protective goggles and gloves to prevent injury in the event of accidental activation. (3)To ensure proper protection by the fire protection system, make sure the aerosol safety pin has been removed and the detector's dust cover and adhesive tape have been taken off.

(1)Before putting the fire protection system into operation, check whether the safety pin on the thermal activation head of the aerosol fire-extinguishing device has been removed. If the safety pin has not yet been removed, it must be pulled out immediately to ensure that the aerosol device can activate normally when the temperature reaches the preset discharge threshold.

Figure 7-1 Aerosol Fire-Extinguishing Device Safety Pin

(2)Before putting the fire protection system into operation, remove all dust covers and adhesive tapes from the smoke detectors and heat detectors.

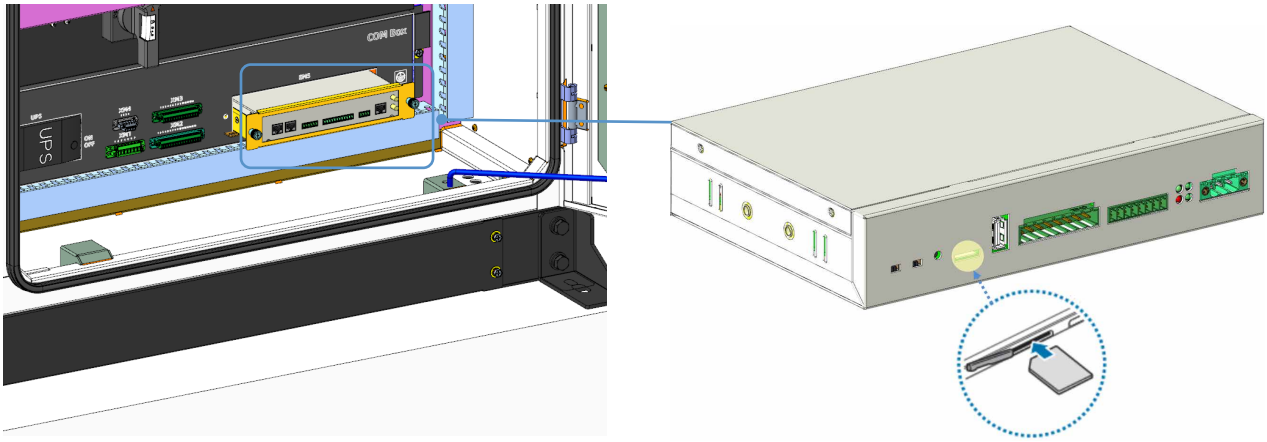
(3)Remove all structural protective components from the fire protection devices after transportation to the site.

(4)For initial commissioning, remove the battery compartment cover plate according to Section 7.3, and then proceed with the operations specified in Section 7.1.

7.2 SIM Card Installation

The EMS supports SIM cards from different countries and regions. Through 4G communication, the EMS uploads data to the cloud platform. No SIM card is included by default; users must prepare their own SIM card and install it into the EMS SIM card slot. The installation procedure is as follows.

Figure 7-2 SIM Card Installation



Step 1 Pull out the EMS module

Step 2 Install the SIM card

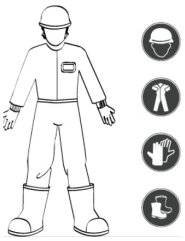
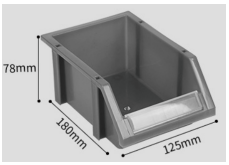
7.3 MSD Installation and Disassembly

⚠WARNING	(1)For transport safety, the MSD must be removed prior to shipping. The MSD should then be installed to establish the electrical connection before equipment operation. (2)During maintenance and inspection, to ensure personnel safety, the MSD must be removed (disconnecting the electrical connection) only after confirming that the equipment has been shut down and de-energized. Reinstallation should be performed after maintenance is complete. (3)When installing and removing the MSD, it is strictly prohibited to operate the system under load, and operation by non-dedicated personnel is forbidden. (4)When installing and removing the MSD, operators are required to wear protective face shields and gloves to prevent electric shock and arc flash injuries. (5)Installation of the MSD must follow the specified operating procedures to ensure reliable electrical connection; otherwise, the equipment may be damaged.

The installation and removal of the MSD must be performed only when the system is safely shut down and de-energized. Specific procedures are as follows.

Prepare the tools listed in the table below before installing or removing the MSD:

Table 7-1 MSD Installation and Disassembly Tool Preparation List

				
Socket Wrench Set	Oil-based Marker	Step Ladder	Personal protective Equipment (PPE)	Screw Stroage Box

Preparation of Tools and Materials before MSD Installation or Removal:

Table 7-2 MSD Installation and Removal Material Preparation List

No.	Category	Description	Qty per Unit	Unit	Remarks
Field Engineering Installation Parts					
1	Electrical Components	Manual Service Disconnected (MSD)	5	pcs	Electrical connection
2	Structural Materials	Hexagon combination screw M6*16	10	pcs	Battery compartment cover plate comes with 32 pcs total; 10 pcs for spare parts

Step 1: Remove the Sealing Plate

As shown in Figure 7-3, use a 10mm socket wrench to remove the 32 fixing screws from the battery compartment sealing plate. Place the screws in a storage box to prevent loss. Avoid using excessive force during removal to prevent stripping or damaging the screw heads. If a screw is accidentally damaged, replace it with a spare; damaged screws must not be reused. During removal and handling, take care to prevent bumps or impacts that could cause deformation, as this may compromise the sealing performance.

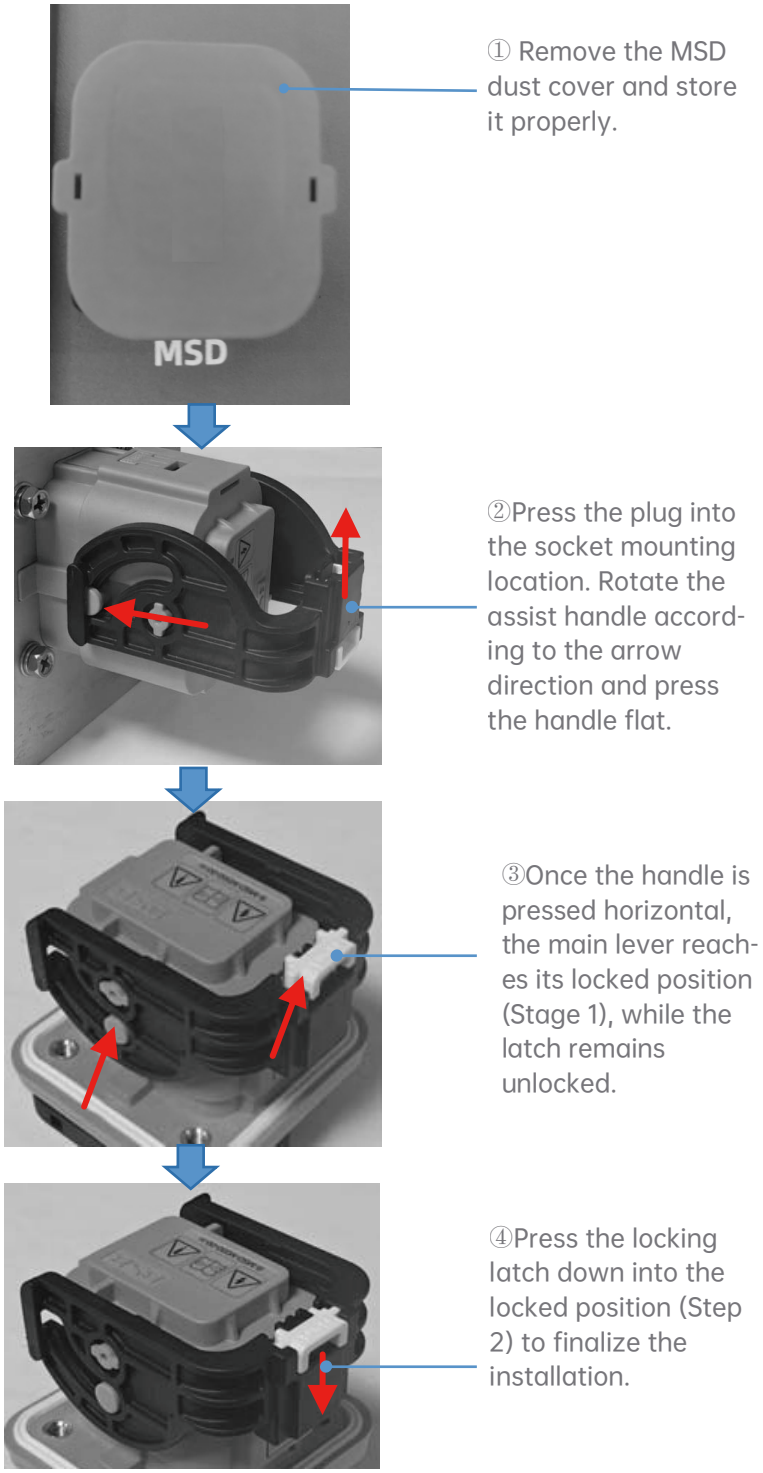
Figure 7-3 Battery Compartment Sealing Plate Removal

Step 2: MSD Installation or Removal

(1) MSD Installation

As shown in Figure 7-4, remove the dust cover from the MSD socket if present. Insert the MSD plug into the MSD socket of the liquid-cooled PACK. When inserting, press down on the plug and then rotate the assist lever (handle) to secure it.

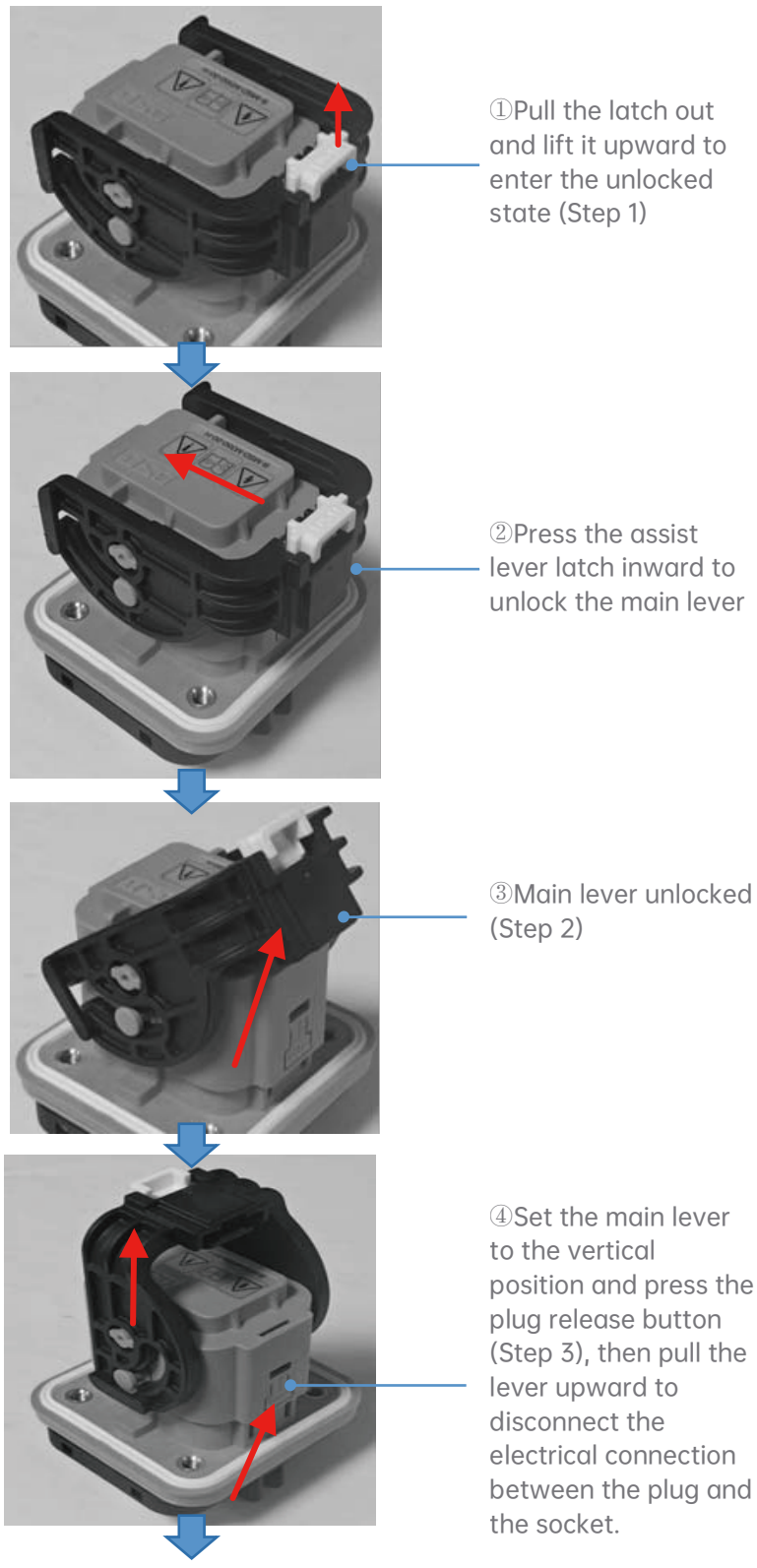
Figure 7-4 MSD Installation Process



(2) MSD Removal/Disassembly

If maintenance or inspection is required, follow the MSD removal steps shown in Figure 7-5. Note the following safety precautions: Before removal, the system must be shut down (stopped). Operating under load is strictly prohibited to avoid arc flash injuries.

Figure 7-5 MSD Removal Process

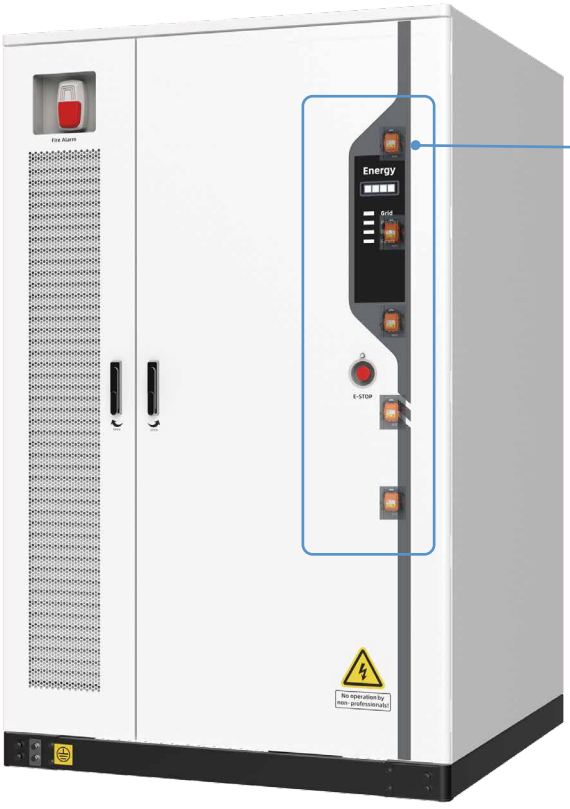


⑤Plug unlocked (Step 4). After separating the plug, collect the MSD plug and store it for protection.

⑥Install and press down the MSD dust cover onto the socket for dust protection to complete the MSD removal.

The connection locations for the five sets of MSDs on the equipment are shown in Figure 7-6.

Figure 7-6 Schematic of Connection Positions for the MSD Sets



MSD Socket and Plug

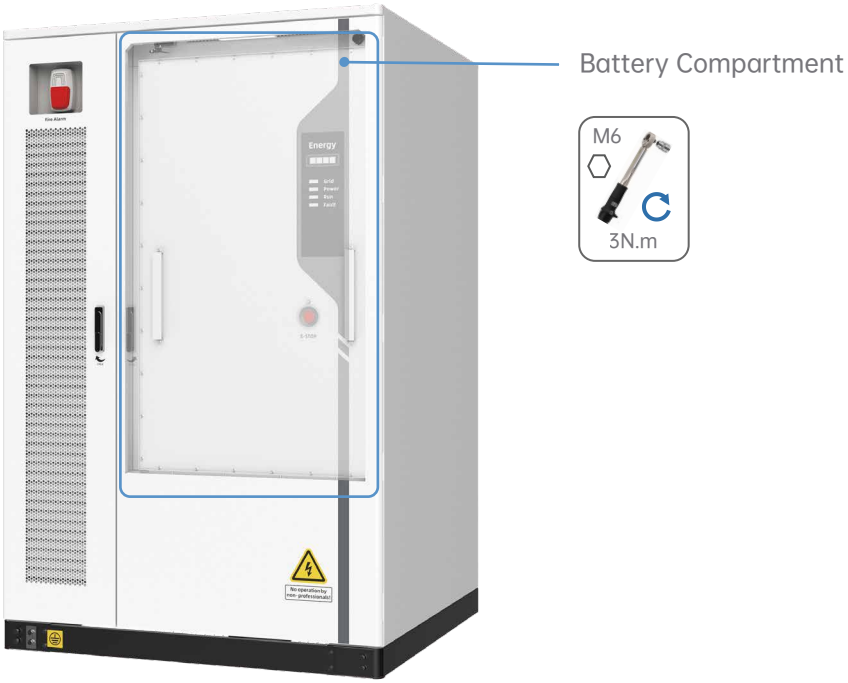
Step 3: Pull out Fire Safety Pins and Remove Sensor Dust Covers

During the initial system operation, the fire safety pins must be pulled out and the sensor dust covers removed. Refer to Section 7.1 for detailed operations.

Step 4: Install the Sealing Plate

As shown in Figure 7-7, reinstall the battery compartment sealing plate with the mounting surface facing outward and upward. First, pre-tighten all screws (32 pieces in total), then tighten them to the specified torque. After inspection, use a marker to draw alignment lines (marking lines) to ensure the sealing integrity is maintained.

Figure 7-7 Schematic of Battery Compartment Sealing Plate Installation



8 SYSTEM POWER ON/OFF

8.1 System Power-On

⚠WARNING	(1)The energy storage system may only be put into operation after being confirmed by qualified personnel. (2)For systems that have been shut down for an extended period, a thorough inspection must be performed before powering on to ensure all conditions meet operational requirements.

8.1.1 Inspection Before Power-On

Before powering on the system, carefully verify the following items and ensure all are correct:

(1)Verify that all wiring connections are correct.

(2)Ensure that all internal protective covers are properly installed and secured.

(3)Confirm that the emergency stop button is in the released position.

(4)Verify that there is no grounding fault.

(5)Use a multimeter to check that the AC and DC voltages meet the startup requirements and that no over-voltage risk is present.

(6)Confirm that no tools or loose parts remain inside the equipment.

8.1.2 Power-On Procedure

⚠WARNING	If any circuit breaker trips during the power-on process, stop closing additional circuit breakers immediately, and inspect the downstream load of the tripped breaker for possible short circuits or other faults.

Figure 8-1 Layout of Power-On Operation Buttons on the Battery Cabinet

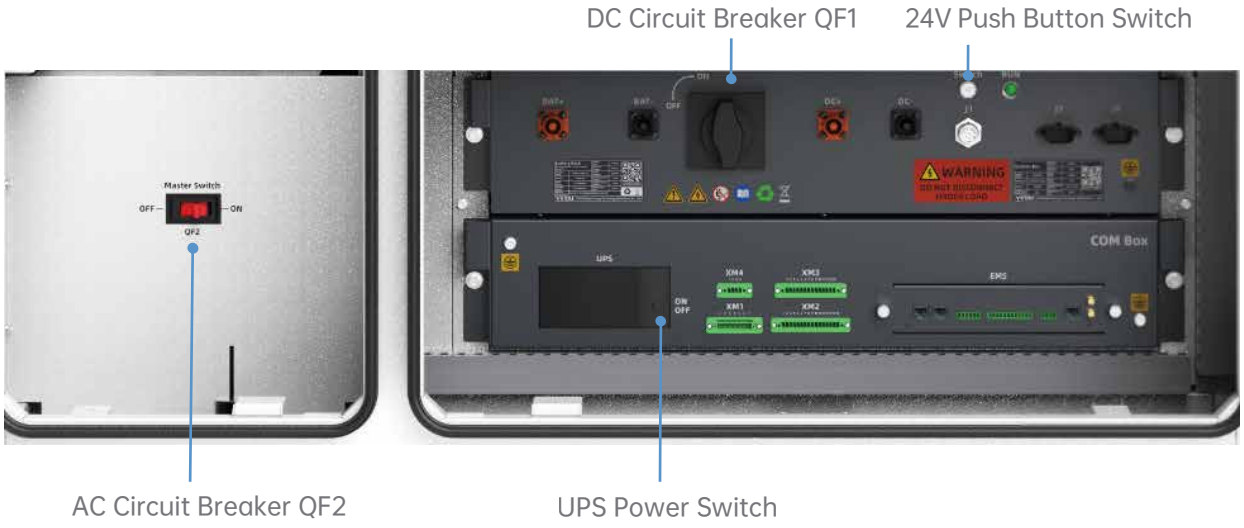
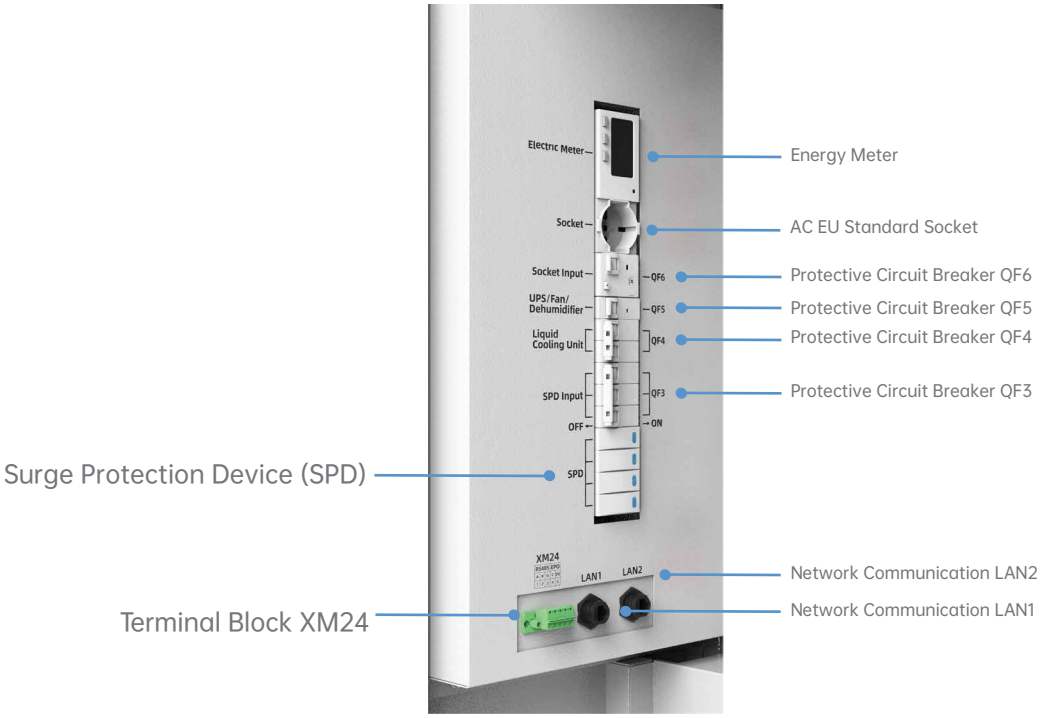


Figure 8-2 External Interface Definitions and Operation Panel Layout



System Power-On:

Step 1: Power on Auxiliary Power in the Battery Cabinet

(1)Check and confirm that the AC surge protection device (SPD) is operating normally and that the indicator window shows green. Switch the upstream miniature circuit breaker QF3 to the ON position to connect the SPD for protection.

(2)Operate the AC circuit breaker handle and switch QF2 to the ON position to close the AC circuit breaker.

(3)Close the liquid cooling unit power supply switch QF4 by switching it to the ON position. The liquid cooling unit is energized and starts up.

(4)Close the power supply switch QF5 for the UPS, dehumidifier, and cooling fans by switching it to the ON position.

(5)Press the UPS power button. The UPS starts and outputs AC power, the green indicator lights up, and the 24 V switching power supply and cabinet lighting are energized normally.

(6)Press the Switch button on the sub-control box. The green indicator lights up, indicating that the 24 V input power inside the sub-control box is supplied normally.

(7)If external power is required from the EU standard socket, close the socket power supply switch QF6 by switching it to the ON position. The socket is energized normally.

(8)Auxiliary power-on is completed.

Step 2: Rotate the DC circuit breaker handle QF1 on the sub-control box clockwise to the ON position to close the DC circuit breaker.

Step 3: Start the system via the EMS Web interface. After waiting approximately 30 s, check that the BMS main contactor status is closed, indicating successful operation. Then wait another approximately 30 s and

observe that the PCS indicator lights turn on.

Step 4: System power-on is completed. The system can now be operated in manual power dispatch mode (positive value indicates discharge, negative value indicates charge) or automatic peak shaving and valley filling mode.

Note 1: For cloud platform Web operations, refer to YOTAI C&I Energy Management Cloud Platform User Manual V3.0.

Note 2: For EMS operations, refer to the EMS Operation Manual.

8.2 Normal Power-Off

ESS Power-Off:

Step 1: Use the EMS Web interface to control the PCS power and reduce it to 0.

Step 2: Use the EMS Web interface to shut down the system. After waiting approximately 3 s, confirm that the BMS main contactor status is open, indicating successful shutdown. Then wait approximately 30 s and confirm that the PCS indicator lights turn off.

Step 3: Rotate the DC circuit breaker handle QF1 on the sub-control box counterclockwise to the OFF position to open the DC circuit breaker.

Step 4: Auxiliary Power-Off of the Battery Cabinet

(1)Press the 24 V Switch button on the sub-control box. The green indicator turns off, and the 24 V input power inside the sub-control box is cut off.

(2)Press the UPS power button to shut down the UPS. AC output stops, the green indicator turns off, and the 24 V switching power supply and cabinet lighting are de-energized.

(3)Switch the power supply switch QF5 for the UPS, dehumidifier, and cooling fans to the OFF position.

(4)Switch the liquid cooling unit power supply switch QF4 to the OFF position. The liquid cooling unit is de-energized and shuts down.

(5)Switch the 5-pin socket power supply switch QF6 to the OFF position to cut off socket power.

(6)Operate the AC circuit breaker handle and switch QF2 to the OFF position to open the AC circuit breaker and cut off power.

(7)Switch the miniature circuit breaker QF3 to the OFF position to disconnect the AC surge protection device.

(8)Auxiliary power-off is completed.

(9)The energy storage system power-off is completed.

Note 1: For cloud platform Web operations, refer to YOTAI C&I Energy Management Cloud Platform User Manual V3.0.

Note 2: For EMS operations, refer to the EMS Operation Manual.

8.3 Abnormal System Power-Off

8.3.1 Emergency Stop Power-Off

When an emergency occurs during commissioning or in grid-connected/off-grid mode—such as smoke, fire, a burnt smell, or sparks—ensure personnel safety first. Remove the protective cover of the red Emergency Stop (E-STOP) button on the cabinet panel and immediately press the E-STOP button.

After the hazard has been eliminated by qualified personnel and the equipment and surrounding environment are confirmed to be safe, rotate the E-STOP button clockwise to release it and clear the emergency stop signal.

⚠ DANGER	(1)The E-STOP button of the energy storage cabinet shall only be used in emergency situations. If the customer uses it in non-emergency situations, improper operation and direct emergency stopping may cause equipment damage, and the Company shall not be liable. (2)Fault troubleshooting and hazard removal for the energy storage cabinet must be carried out by trained and qualified personnel. Before the hazard is eliminated, it is prohibited to energize the system, close breakers, or open the energy storage cabinet.

8.3.2 Power-Off in Case of Fire Incident

Please contact local fire services or qualified fire-fighting professionals immediately.

8.3.3 Emergency Stop Power-Off Triggered by a Fault

Please contact the Company's after-sales service personnel immediately.

9 ROUTINE MAINTENANCE

9.1 Notes Before Maintenance

⚠WARNING	(1)Do not perform door-opening maintenance on the battery cabinet during rain, humid, or windy weather. If unavoidable, YOTAI shall not assume any responsibility for any resulting losses. (2)Avoid opening the cabinet door in rain, snow, or heavy fog when humidity is high. After closing the cabinet door, ensure that the sealing gasket around the door is not curled or damaged. (3)To reduce the risk of electric shock, do not perform any maintenance or repair operations beyond what is described in this manual. If additional maintenance or repair is required, contact YOTAI customer service.

9.2 Cabinet Maintenance Items and Cycle

Factors such as station size, installation location, and site environment may affect the product maintenance cycle. It is recommended to perform maintenance once every three months. If the operating environment has high sand or dust accumulation, it is necessary to shorten the maintenance cycle and increase maintenance frequency.

⚠ CAUTION	During maintenance or shutdown, if the following conditions persist for more than 120 consecutive hours, resulting capacity loss is not covered under warranty: (1)The battery discharge voltage falls below the minimum battery voltage of 2.5 V. (2)The battery cluster SOC reaches 0%.

APPENDIX A
CRIMPING OT/DT TERMINALS

A.1 OT/DT Terminal Requirements

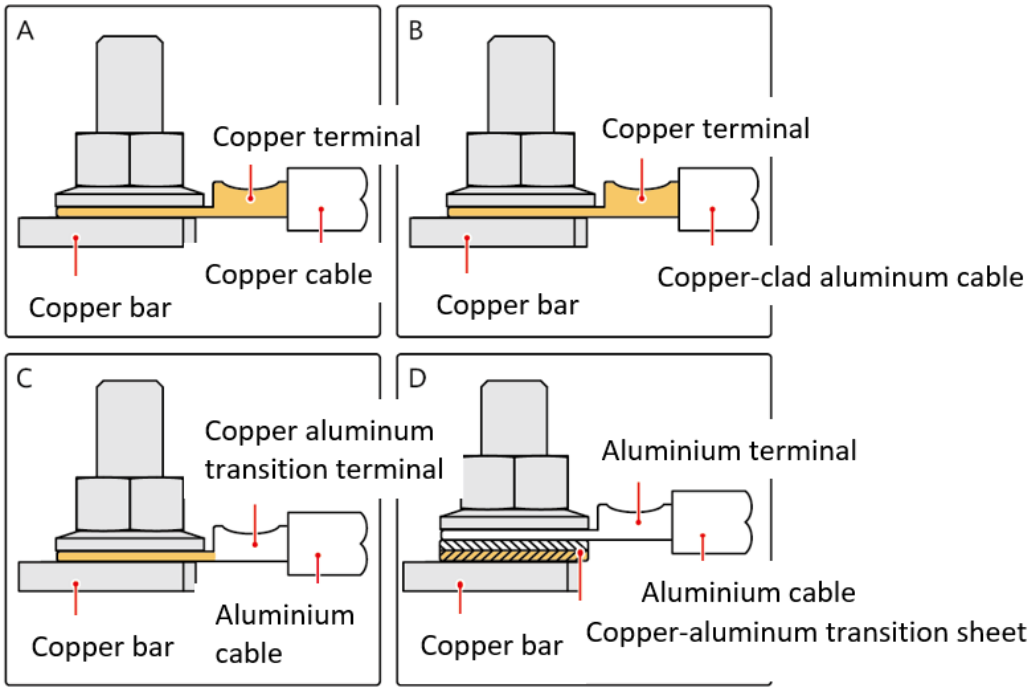
(1)When using copper cable, please use copper terminal.

(2)When using copper-clad aluminum cable, please use copper terminal.

(3)When using aluminum cable, please use copper-aluminum transition terminal, or aluminum terminal with copper-aluminum transition sheet.

NOTE	(1)It is strictly prohibited to connect aluminum terminals directly to the terminal block, as this may cause galvanic corrosion and compromise the reliability of the cable connection. (2)When using copper-aluminum transition terminals, or aluminum terminals with copper-aluminum transition sheet, compliance with IEC 61238-1 is required. (3)When using copper-aluminum transition sheet, pay attention to the orientation: ensure the aluminum side contacts the aluminum terminal, and the copper side contacts the terminal block.

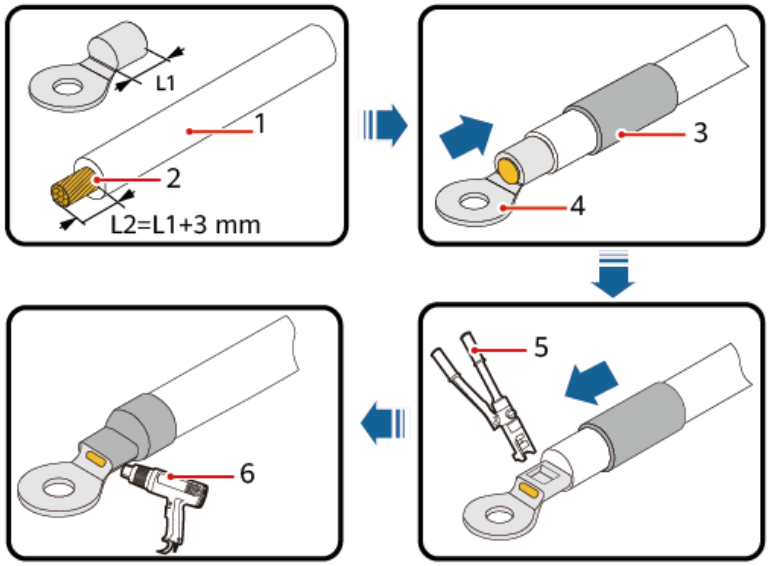
Appendix Figure 1 OT/DT Terminal Requirements



A.2 OT/DT Terminal Crimping

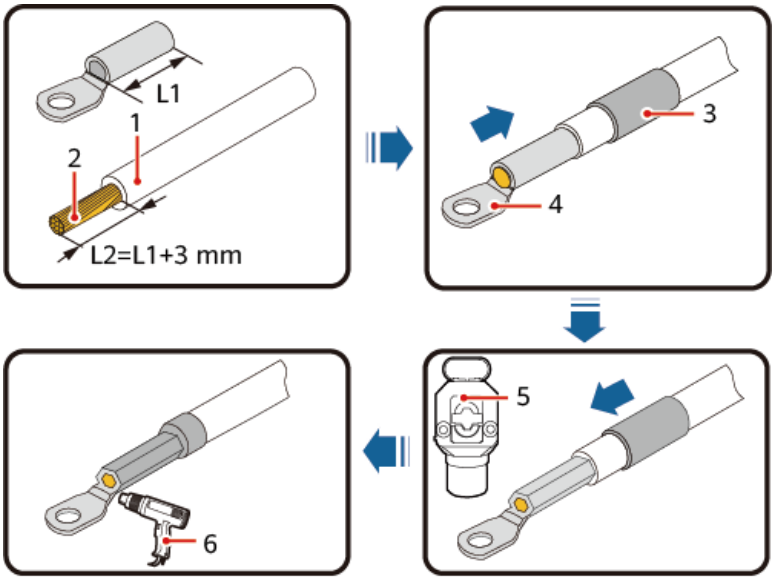
NOTE	(1)When stripping wires, avoid scratching the conductor. (2)After crimping, the conductor crimping section of the OT/DT terminal should completely enclose the conductor, ensuring a tight fit without looseness. (3)The crimped section may be covered with heat-shrink tubing or insulating tape. (4)When using a heat gun, take protective measures to prevent damage to the product from overheating.

Appendix Figure 2 Crimp OT Terminal



(1) →Cable
(2) →Wire core
(3) →Heat-shrinkable tubing
(4) →OT Terminal
(5) →Hydraulic pliers
(6) →Heat gun

Appendix Figure 3 Crimp DT Terminal



(1) →Cable
(2) →Wire core
(3) →Heat-shrinkable tubing
(4) →DT Terminal
(5) →Hydraulic pliers
(6) →Heat gun

Table A-1 Pull-out Force Standards

No.	Conductor Size		Pull-out Force Standard
	AWG	mm²	N
1	26	0.13	13
2	24	0.2	22
3	22	0.324	35
4	20	0.519	50
5	18	0.823	80
6	16	1.31	150
7	14	2.08	180
8	12	3.31	270
9	10	5.261	400
10	8	8.367	500
11	6	13.3	550
12	4	21.15	1500
13	3	26.67	1650
14	2	33.62	2050
15	1	42.41	2200
16	1/0	53.49	2700
17	2/0	67.43	2700
18	3/0	85.01	2700
19	4/0	107.2	2700
20	250kcmil	127	2700
21	300kcmil	156	5000
22	350kcmil	177	5000
23	400kcmil	203	5000
24	500kcmil	253	5000
25	600kcmil	304	5000

APPENDIX B
STANDARD TORQUE TABLE FOR SCREWS

Table B.1 General Threaded Connection Torque / Unit: kgf·cm (Torque range ±10%)

Screw Specification		Connection Type					
			General Connection		High-Density Connection (Sealing, Heat Dissipation, Shielding, and High Current >16A)		
Major Category	Sub-category	Steel–Plastic Copper–Copper	Steel -Steel	Steel-Cast Aluminum / Steel-Aluminum Profile / Steel-Copper	Copper -Copper	Steel-Cast Aluminum / Steel-Copper	Steel–Aluminum Extrusion
Phillips Screw Pan Head Screw Hex Head Screw	M2	0.8	1.5	1.5	2.5	2.5	1.5
	M2.5	1.6	3	3	5.5	4.5	3
	M3	3	6	5	10	8	6
	M4	6	16	10	14	12	12
	M5	10	30	13	30	28	20
	M6	15	50	28	70	48	30
	M8	/	130	/	140	/	
	M10	/	270	/	270	/	
	M12	/	470	/	470	/	/
	M14	/	740	/	740	/	/
	M16	/	1200	/	1200	/	/

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