GSL-BESS-R418K / GSL-BESS-R261K

Liquid Cooling Battery Energy Storage System

User Manual

Version 1.0

Revision History

Version	Chapter	Description	Data
V1.0	ALL	First revised	2026/01/25

1. Manual Instruction

This manual applies to the BESS (Battery Energy Storage System) (hereinafter referred to as "this System"), including the High-Voltage Battery Cluster System, Thermal Management System, Fire Suppression System, and Power and Environment Monitoring System (PEMS). Unless otherwise specified, all the aforementioned parts are collectively referred to as "Modules" or "Components" hereinafter.

1.1. Purpose

This manual is intended to provide specific information of the BESS Cabinet as well as operation guidance of the BESS System.

1.2. Manual Usage

Before putting this system into operation, please carefully read all relevant descriptions and notes concerning safety precautions in this User Manual.

Due to continuous refinements, revisions, as well as subsequent product upgrades and modifications, some contents of this User Manual may result in descriptive discrepancies from the actual product. Please verify with the distributors and manufacturer.

1.3. Term & Abbreviation in Description

Term/Abbreviation	Explanation
BESS	Battery Energy Storage System
HMI	Human-Machine Interact
PEMS	Power and Energy Monitoring System
BMS	Battery Management System
SBMU	Slave Battery Management Unit
CSC	Cell Supervision Circuit
SOC	State of Charge
MSD	Manual Service Disconnect
IMM	Insulation Monitoring Module

AC APDU	AC Power Auxiliary Distribution Unit
AC	Alternating Current
DC	Direct Current
HV	High Voltage
LV	Low Voltage
HV BCCB	High-Voltage Battery Cluster Control Box
MCB	Miniature Circuit Breaker
HVDC CB	High-Voltage DC Circuit Breaker
EPO	Emergency Power Off button
FPS	Fire Protection System
PF	Power Factor
CAN	Controller Area Network
TMS	Thermal Management System
LCU	Liquid Cooling Unit
CAN Comm 120Ω TR	CAN Communication 120Ω Termination Resistor
DR	Derating

2. Safety Precautions

In this chapter, specific safety guidance for each icon will be provided, covering the interpretation of safety signs, guidance for safe operation, regulatory requirements for operators, as well as other pre-operation and post-operation safety guidelines.

2.1. Interpretation of Safety Signs

To ensure the personal and property safety during operation, please comply with the special precautions mentioned in this User Manual. These important safety-related matters are highlighted by the following safety warning signs.

Warning in the document

⚠ DANGER	DANGER indicates immediately life-threatening or severe injury hazards, such as high voltage, flammable gas leaks.
⚠ WARNING	WARNING warns of potential risks that may cause serious injury, such as hot surfaces, moving machinery parts.
⚠ CAUTION	CAUTION advises general risks requiring careful operation, such as slippery floors, low-voltage hazards.
NOTICE	NOTICE provides important information or operational instructions, such as maintenance procedures, data logging requirements.

Warning on the product

	**Beware of dangerous voltage** The product operates at high voltages. All work on the product must only be performed as described in the documentation of the product.
	**Beware of incorrect operation** Personnel must operate correctly, if not avoided, could result in serious personal injury or device damaged.
	**Beware of hot surface** The product can get hot during operation. Do not touch the product during operation.

Beware of extrusion

Don’t put hands in the movable and/or rotation parts of product.

Beware of noise

The product generates loud noise. When working on the product, wear hearing protection

Symbols on the product

Beware of angle

Door open angle is in 0~120, the labels are on the doors.

Unlock direction

Unlock direction labels, which locate on the doors.

Please always pay attention to the danger warning signs on the enclosure, which include:

 This symbol indicates that there is high voltage inside the enclosure, and touching it may cause a risk of electric shock.

 This symbol indicates that this is a protective grounding PE terminal that needs to be firmly grounded to ensure the safety of operators.

2.2. Safety Instructions

⚠ DANGER

Danger of electric shock! Ignoring the following warnings might cause personal death or serious injury.

- Only the qualified and professional trained electrical technicians and engineers are allowed to operate and maintain the BESS system.
- Operators must wear safety protective equipment before operating and the protective equipment shall be conformed with the local laws, regulations and standards.
- Do not touch any live part directly.
- Before installing, both AC and DC power shall be disconnected and cut off.
- If multiple BESS cabinets installed in parallel, every single cabinet shall be grounded individually. The grounding cable shall meet corresponding safety standard.
- The insulation resistance of AC and DC side is not less than 1MΩ.
- If operator would have to handle any components from AC capacitor circuit, discharge the energy of AC capacitor internal with resistor (kΩ) at first.
- Printed circuit board may have high voltage when BESS System's module or component is energized, especially the voltage sampling board of AC and DC module, beware of electric shock.
- Main and auxiliary circuit might contain high voltage when system is faulty, thereby,operator shall measure voltage and ensure the voltage is under safe value before operation.
- The BESS Cabinet must not be in operation with its door wide open.

⚠ WARNING

Warning! Ignoring the following warnings, may cause personal injury.

- Do not touch the Air Outlet, surface, busbar or capacitors right after HV BCCB and liquid cooing unit power off, they might cause damage by heat or electric shock.
- An isolated area shall be planned for the installation before operation.
- Installation must be operated only by technicians and constructors who have been trained for dealing with high voltage electricity.

⚠ CAUTION

Caution! Ignoring the following warning, may damage the component of product.

- Mounting the equipment on the platform as specified strength bolts shall be accordance with the installing requirement.
- Ensure the environment of site has good heat dissipation condition.
- Ensure that live bolted connections are always tightened with the exact torque specified in this document.
- If the battery cluster is not energized for a long period, its expected life time will be influenced.
- Do not use cleaning solvents to clean the equipment, or expose the equipment to flammable or harsh chemicals or vapors.
- The schematic diagram of transfer and hoisting as shown in the figure is for reference only, the specific tools and equipment used in actual operation shall prevail.
- Do not use any third party components without presetting by the manufacturer.

NOTICE

- Some components on PCB are very sensitive, please do not touch them without anti-static precaution, otherwise will do damage to them.
- Do not handle or install/remove the critical components inside the BESS Cabinet by manual labor alone. Such operations must be performed by professional technicians/ engineers using specialized tools.
- All dimensions are in millimeters, except as specified.

2.3. Precautions

2.3.1. Requirements for Operators

- Personnel engaged in the operation (including installation, commissioning and maintenance) of the BESS energy storage cabinet shall be professionally trained technicians and engineers who hold the corresponding qualification certificates.
- Prior to conducting installation, commissioning or maintenance work, ensure that the operators have familiarized themselves with the relevant operating guidelines and safety precautions specified in this user manual.
- Prior to conducting installation, commissioning or maintenance work, ensure that the operators have familiarized themselves with the BESS system architecture described in this user manual.
- Prior to conducting installation, commissioning or maintenance work, ensure that the operators have prepared in advance the special tools and equipment required for each process.

2.3.2. Setting Up Safety Signs

This step is designed to prevent unauthorized personnel from approaching and causing misoperation or accidents during installation, maintenance or operations.

Please comply with the following rules:

- Set up clear signs at the front and rear spaces for the module/ components under operation process to prevent accidents caused by misunderstanding and misoperation.
- Set up warning signs or safety warning tapes around the operating area.

2.3.3. Requirements for Emergency Escape Routes

To ensure operators have sufficient escape space in the event of an accident, the following rules must be followed during site planning:

- When planning escape space/routes, it is mandatory to ensure no other debris blocks the route space.

- For scenarios where multiple BESS cabinets are installed in parallel, reserve an emergency channel/main route sufficiently wide to allow local fire trucks to pass through. For specific dimensions, consult the local fire department— the main route dimension planning provided in thisuser manual is for minimum reference only (≥3 meters).

2.3.4. Live Line Measurement

⚠ DANGER

Accidental touch would cause fatal electric shock. In live line measurement operator shall:

- take protective measures (such as wearing insulated gloves).
- do not operate alone to ensure personal safety.

2.3.5. Use of Measuring Devices

⚠ WARNING

- Use measuring tools that have undergone periodic calibration and quality verification, and ensure the measurement range of the tools meets the actual measurement requirements.
- Prior to operation, ensure the reliability of the structure under test to avoid arc generation during the operation.

2.3.6. Setting of System Parameters

⚠ WARNING

- Parameter setting must be performed by engineers with qualification.
- Before parameter setting, refer to the definition descriptions in this user manual.

2.3.7. Moisture Protection

NOTICE

Moisture invasion may cause damage to the electrical equipment! To ensure normal use of the functions, please observe the following rules:

- Please do not leave the door wide open when the air humidity exceeds 95%.
- Do not conduct maintenance or overhaul in rainy or damp weather.

2.3.8. Precautions for Maintenance or Overhaul

⚠ WARNING

After the power supply cut off, wait for at least 15 minutes before conducting operations on the system.

- Ensure the system would not be accidentally startup.
- Insulate and cover the nearby potentially live parts at the operating section with fabric made of insulating material.
- Throughout the maintenance process, ensure that the escape routes are completely unobstructed.

3. Product Introduction

3.1. Product Overview

3.1.1. Product Appearance and System Composition

This liquid-cooled battery system energy storage cabinet consists of a battery system, a thermal management system, a power and environment monitoring system (PEMS), and a fire protection system. The front of the cabinet is fitted with double doors: the right main door is equipped with indicator lights for displaying operating status and an EPO emergency stop button; the left side door is provided with an air intake grille for the thermal management system unit.

Metal cable conduits for routing cables of external equipment are installed on both side panels of the cabinet.

3.1.1.1. Product Description

The liquid-cooled battery energy storage cabinet (hereinafter referred to as "BESS"), as a DC-coupled battery system cabinet, supports connection to photovoltaic inverters or energy storage PCS that match its DC operating voltage range and communication protocols.

It cooperates in executing energy dispatching in accordance with system strategies, charges or discharges via the DC bus, and acts as the electrical energy reserve of the system, so as to achieve the system objectives of regulating energy consumption, saving energy, reducing carbon dioxide emissions, and generating economic benefits.

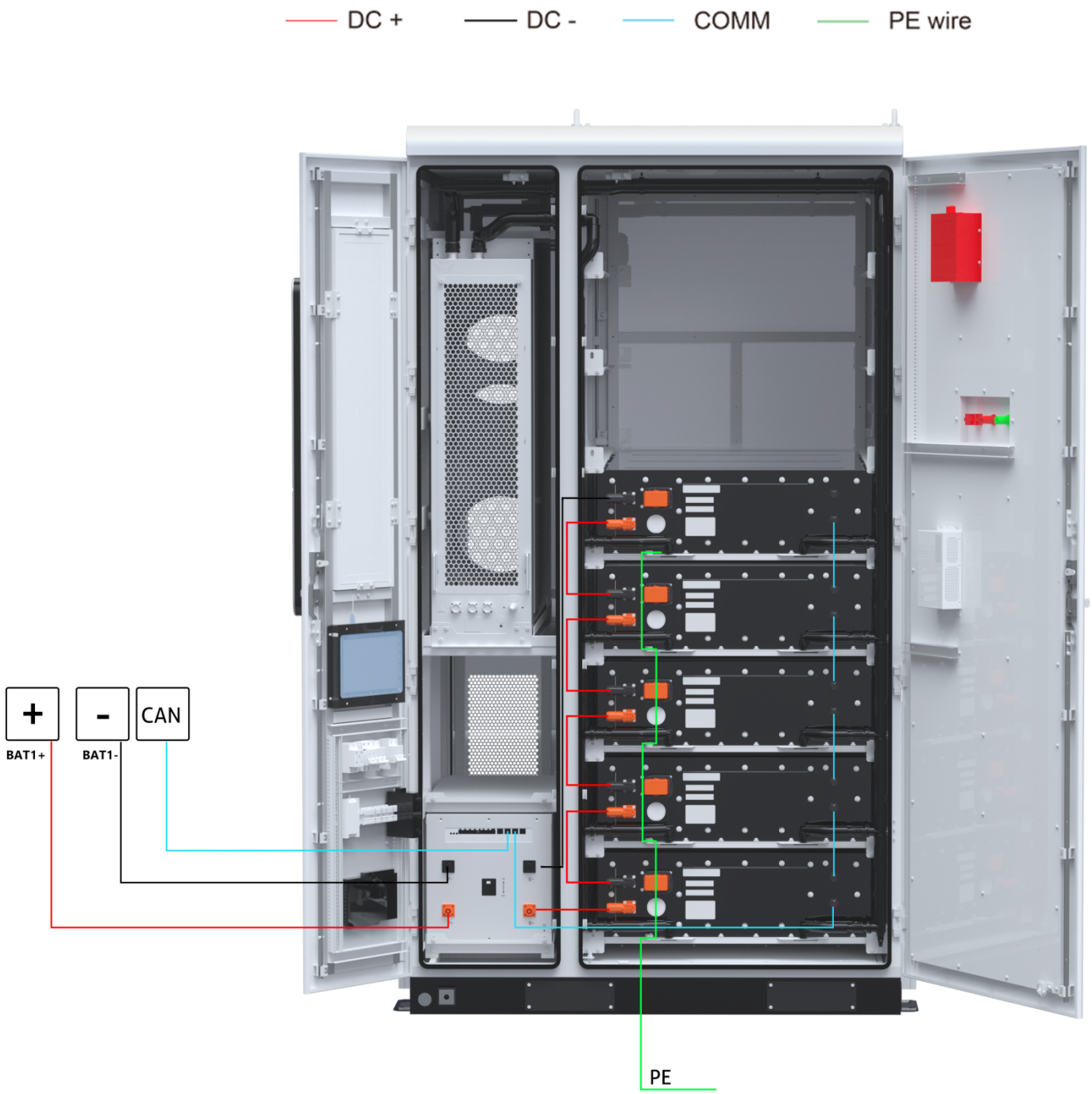
NOTICE

Note: In this context, the battery cabinet serves solely as a battery cluster container on the DC bus within the energy storage system. It does not itself support outputting energy to the AC-side power grid or loads, nor can it be directly connected to photovoltaic panels.

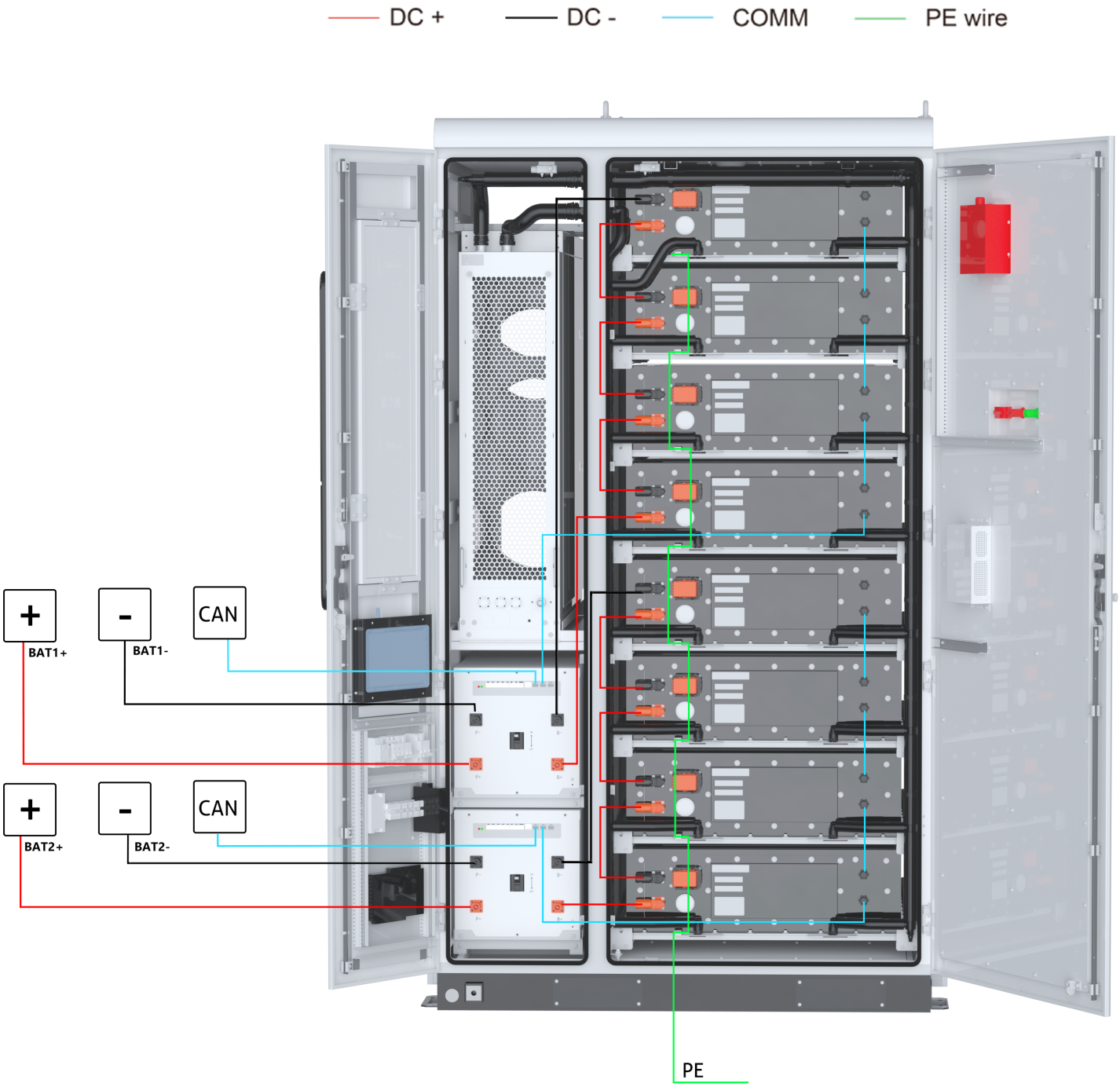
3.1.2. Specifications

BESS products provide with two configuration compositions:

A 261kWh system composed of 1 liquid-cooled high-voltage battery cluster (with a total of 5 battery packs);



A 418kWh system composed of 2 liquid-cooled high-voltage battery clusters (4 battery packs per cluster).

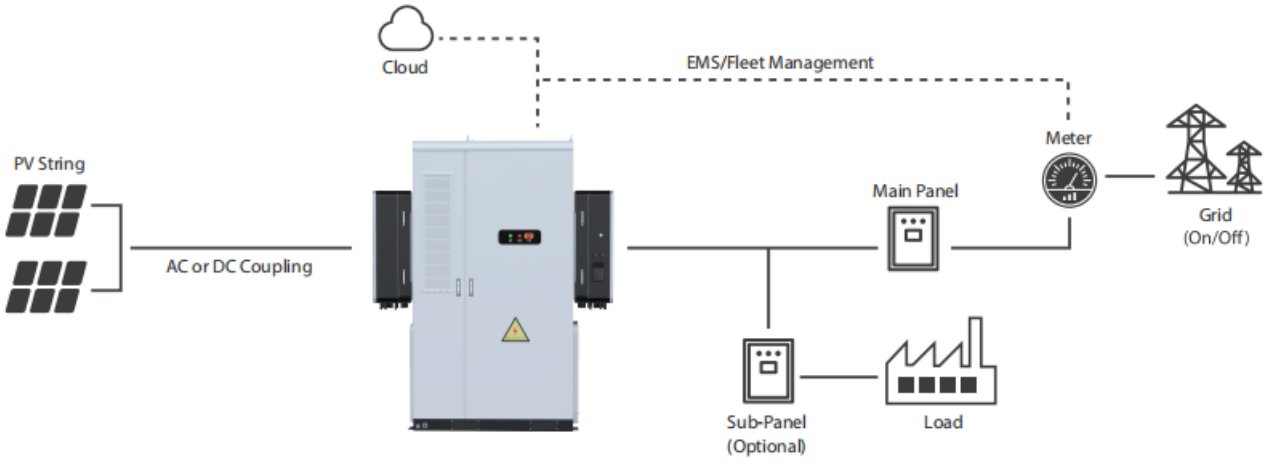


Specifications of BESS-R261K & R418K

Item		Specifications for 261kWh	Specifications for 418kWh
DC battery side	Cell type	LFP3.2V/ 314Ah	
	Pack configuration	1P52S	
	System configuration	1P260S(5 Packs)	1P208S(4 Packs* 2 Clusters)
	Voltage range	728Vdc~936Vdc	561Vdc~759.2Vdc
	Rated capacity	261kWh	208.99kWh *2
	Current rate	≤0.5P (charging & discharging)	≤0.5P (charging & discharging)
AC auxiliary	Rated power	6 kW	
	Rated grid voltage	Single Phase L+N+PE 220V	

power side	Frequency	50/ 60 Hz	
System parameter	Cell lifecycle	＞8000 cycles (25℃,0.5P/0.5P, 70%EOL)	
	Cabinet size	1320*1320*2380mm (W*D*H)	
	Weight	2800kg	3500kg
	IP Rating	IP54	
	Cooling method	Liquid cooling	
	Entry and exit methods	Bottom Entry Hole	
Protective measures	DC side protection	DC fuse/ MSD	
	Fire protection	heat detector/ smoke detector/ aerosol	
	Door Access Monitoring	Access Microswitch Detector	
Work environment	Working humidity	0~95%(No condensation)	
	Operating temperature	-30℃~+60℃	
	Storage temperature	-25℃~+35℃	
	Application altitude	≤2000m (>2000m DR）	

3.1.3. Product-Formed Micro-grid System Architecture Diagram



3.2. Integration Overview

This integrated system cabinet consists of an AC power distribution unit, a thermal management system, a bidirectional charging and discharging energy storage converter module, a liquid-cooled plate high-voltage battery system, a water mist fire suppression system, a smoke and temperature detection system, an environmental monitoring and data acquisition system, an operating status display panel, and a human-machine interface (HMI) touch screen. The specification parameters and overview diagram related to the system composition are shown below.

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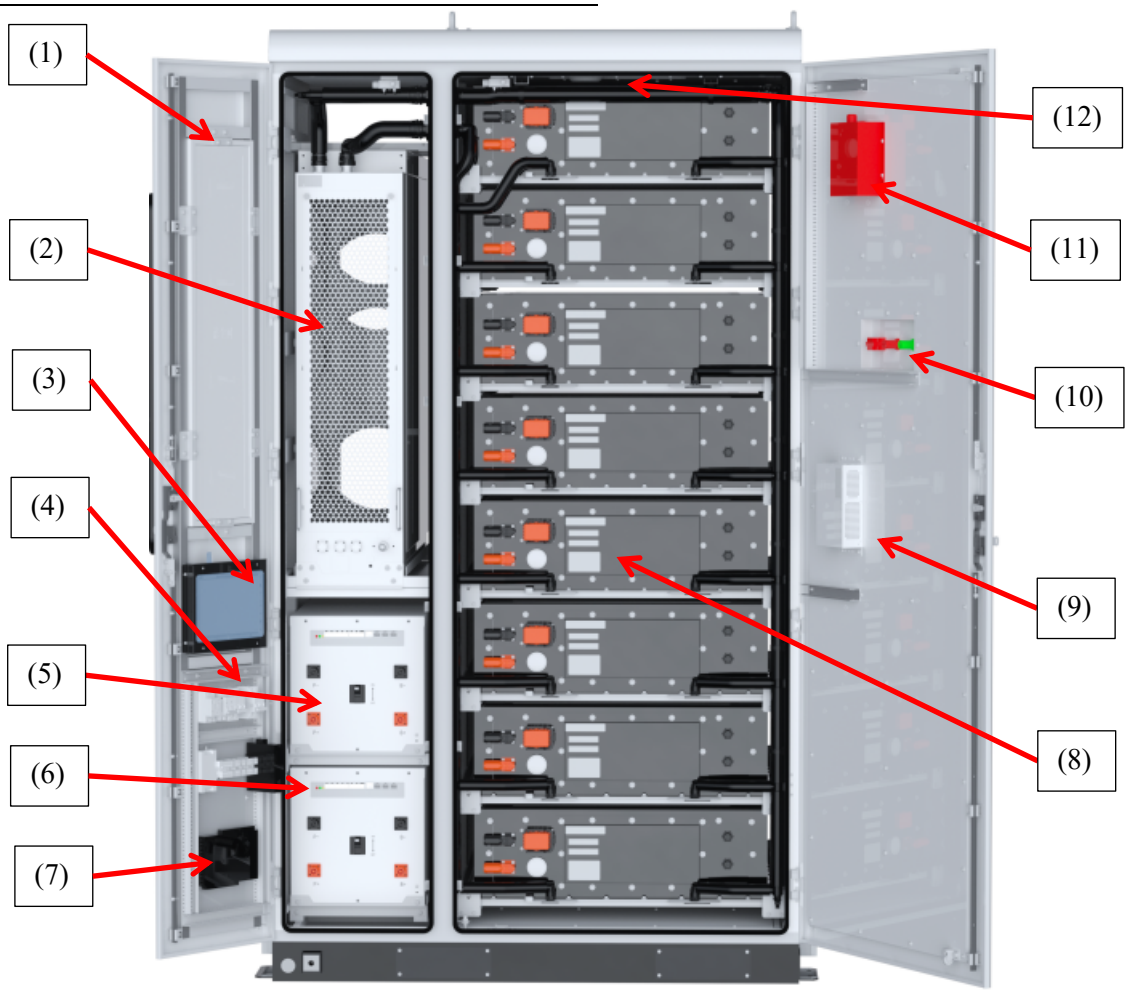
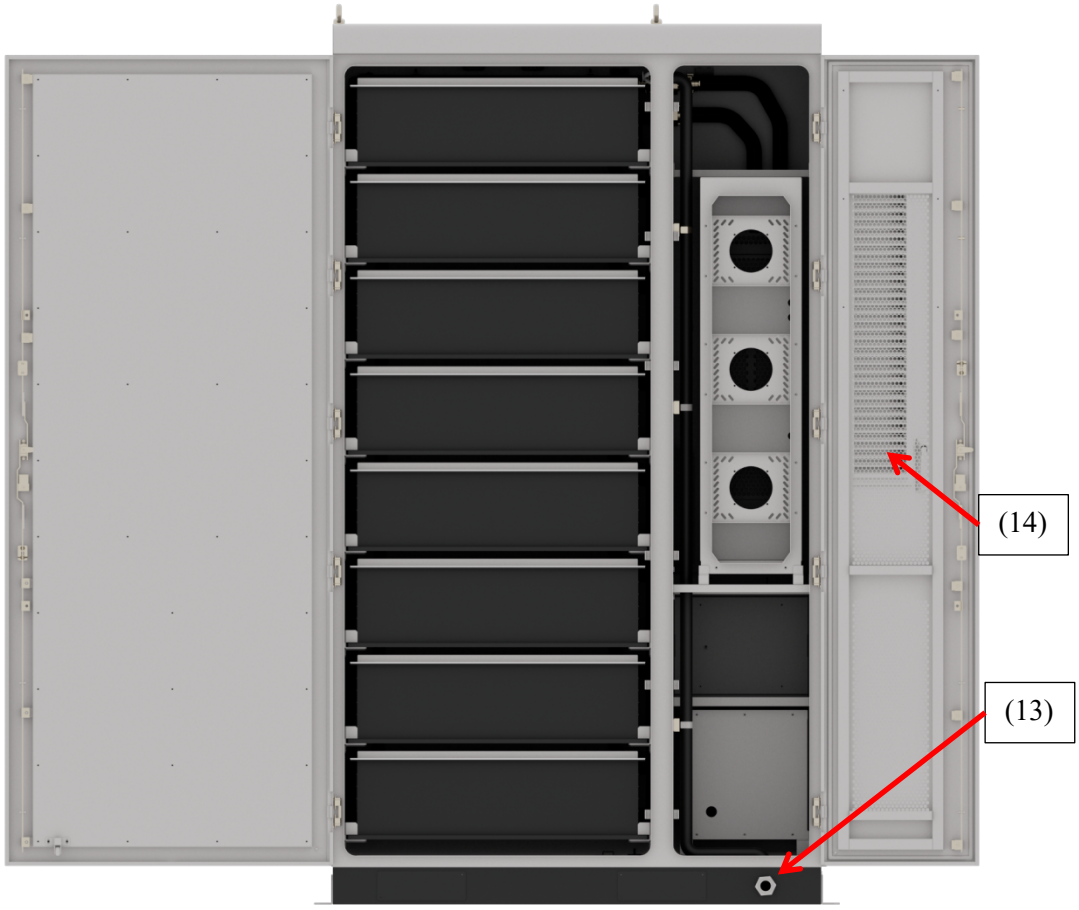
NO.	Panel Abbreviation/ Description	Function Description
1	RUN	Indicator of BESS Cabinet: Normal Operation
2	Fault	Indicator of BESS Cabinet: Faulty Operation
3	EPO	Emergency Power Off button



System Configuration of 418kWh

No.	Configuration/ Description
1	Air Inlet
2	Liquid Cooling Unit
3	HMI touch screen
4	AC auxiliary power distribution unit/ panel
5	HV BCCB 1# (for Battery Cluster 1#)
6	HV BCCB 2# (for Battery Cluster 2#)
7	I/O Unit
8	Liquid cooling battery pack
9	Dehumidifier
10	Rear side of the indicator panel
11	Aerosol module
12	Heat& smoke detector



No.	Configuration/ Description
13	Fire Water Pipe Interface
14	Air Outlet

3.2.1. AC Auxiliary Power Distribution Unit

The AC Auxiliary Power Distribution Unit (AC APDU) supplies AC power to the entire BESS system and integrates the system's auxiliary power distribution function. It provides power for the liquid-cooled unit, lighting, the 24VDC power output of the high-voltage cabinet to the hub, as well as for the I/O modules, switches, dehumidifiers, smoke detectors, heat detectors, RS485 communication hubs, status indicator lights, and aerosol fire suppression modules.

AC Power Distribution Unit Configuration

NO.	Panel Abbreviation/ Description	Function Description
1	QF1	AC Auxiliary Power Input Circuit Breaker
2	QF3	Lighting Power Supply Circuit Breaker
3	QF5	Liquid Cooling Unit& Dehumidifier Power Supply Circuit Breaker

3.2.2. Functional Components Introduction

3.2.2.1. HMI Touch Screen

The main control unit of this human-machine interface (HMI) touch screen is primarily responsible for the visual interface display and operation input of the BESS power & environment monitoring system (PEMS).

3.2.2.2. I/O Module

This I/O module is an I/O management module supporting 8-channel DO (Digital Output) and 8-channel DI (Digital Input). It is compatible with Modbus RTU and Modbus TCP protocols, and integrated into this BESS system to realize local signal acquisition and control of the system.

3.2.2.3. RS485 Hub

This Modbus RTU RS485 hub module is a functional component that supports 2-channel RS485 signal input, merges the signals on the bus and outputs them to the I/O module, so as to realize local signal acquisition and control of the system.

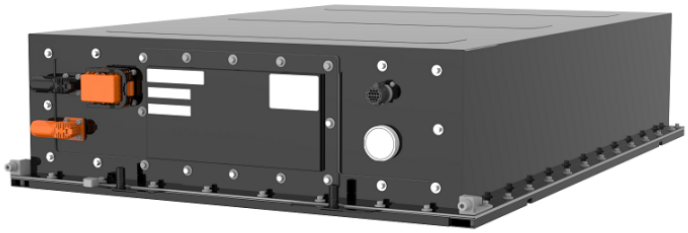
3.2.3. Liquid-Cooling Battery Packs

The battery system consists of a high-voltage liquid-cooled battery cluster, which is form of 5 battery packs and a High-Voltage Battery Cluster Control Box.

Each of the battery packs is composed of 52 battery cells with 314Ah of rated capacity, mounted on a metal liquid-cooling plate, connected in series.

The specifications of the single battery pack are as following table and diagram.

Illustration	Item	Parameter
	Configuration	1P52S
	Rated Power	52.25kWh
	Operation Voltage Range	130.0~189.8Vdc
	Operation Rated Current Rate	0.5P (charging&discharging)
	Dimension（W*D*H）	792*1148*244mm
	Weight	≈320±5kg

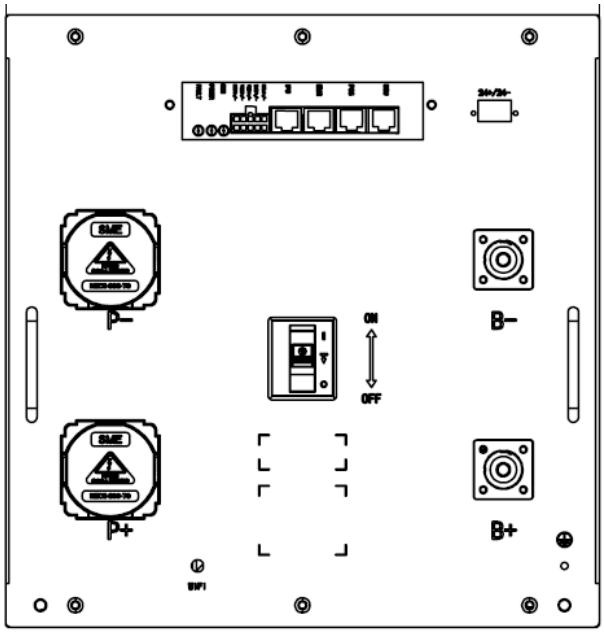
NO.	Panel Abbreviation/ Description	Function Description
1	B-	Negative Battery Busbar Interface
2	B+	Positive Battery Busbar Interface
3	MSD	Manual Service Disconnect
4	CAN	Communication Connection Interface
5	Explosion-proof valves	-
		

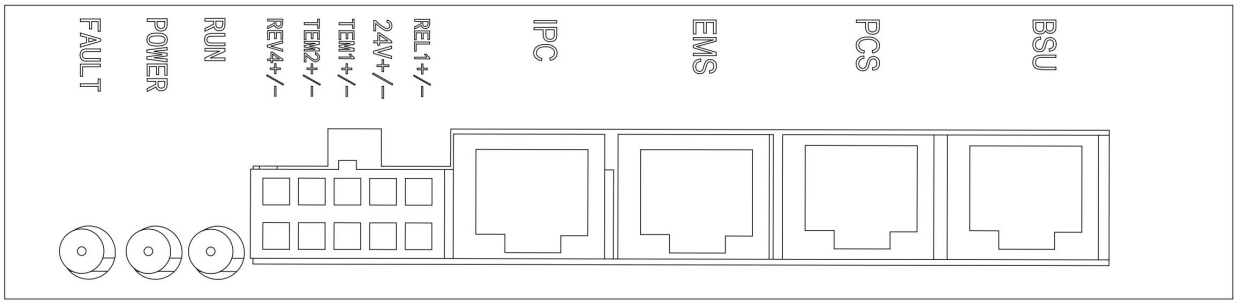
3.2.4. High-Voltage Battery Cluster Control Box

The High-Voltage Battery Cluster Control Box (hereinafter referred to as "HV BCCB") consists of a Battery Management Unit (BMU), a High-Voltage DC Circuit Breaker (HVDC CB), DC bus fuses, DC input/output interfaces, master-slave communication interfaces, DC bus relays, current/voltage sampling units, a surge protection and pre-charging unit, and an AC auxiliary power distribution unit.

The HV BCCB is capable of monitoring and managing the on/off status of DC bus relays and energy input/output operations. Meanwhile, it communicates with inverters, power conversion systems (PCS),

thermal management systems (TMS), and power and environment monitoring systems (PEMS) to establish functional interconnection and implement operational protection strategies.





No.	Panel Abbreviation/ Description	Function Description
1	Operation Status Indicator	Red Lights: In Faulty Operation mode Yellow Light: In Normal Operation mode Green Light: In Normal Power Supply mode
2	B-	Negative Battery Busbar Interface
3	B+	Positive Battery Busbar Interface
4	P-	Negative PCS Busbar Interface
5	P+	Positive PCS Busbar Interface
6	PE	Grounding Connection Interface
7	Integration Interface	Dry contact I/O& Temperature sampling signal input
8	24V	24Vdc power supply output interface
9	IPC	Reserved for Industrial host computer
10	EMS	The comm signal cable interface for communication between Energy Management System/ Host Computer and HV BCCB
11	PCS	The comm signal cable interface for communication between Inverter/ PCS and HV

		BCCB
12	BSU	The comm signal cable interface for communication between Host BMU and Slave BMU
13	HVDC CB	High-Voltage DC Circuit Breaker

Pin No.	Interface Abbreviation/ Description	Interface function Description
Integration Interface pin definition		
1	Rev4+	Dry Contact input
2	Rev4-	
3	Tem2+	Temperature sampling signal input
4	Tem2-	
5	Tem1+	Reserved
6	Tem1-	
7	24V+	24Vdc (20W) power supply output
8	24V-	
9	Rel1+	Dry Contact output
10	Rel1-	
24Vdc power supply pin definition		
1	24V+	24Vdc (20W) power supply output
2	24V-	

RJ45 modular connector definition for comm between PCS/ Inverter and HV BCCB

PinNo.	Description	Colour	Definition	Function Description
1	RJ45 Cable definition	Orange-White	Reserved	/
2		Orange	Reserved	/
3		Green-White	Reserved	/
4		Blue	CAN_H	CAN COMM
5		Blue-White	CAN_L	
6		Green	Reserved	/
7		Brown-White	RS485_A	ModBus_RTU RS485 COMM
8		Brown	RS485_B	

RJ45 modular connector definition for comm between Host BMU and Slave BMU (and between Battery Pack's BMU)

PinNo.	Description	Colour	Definition	Function Description
1	RJ45 Cable definition	Orange-White	VCC	Power Supply
2		Orange	GND	
3		Green-White	ADD	Assign Comm Addresses
4		Blue	VCC	Power Supply
5		Blue-White	GND	
6		Green	CAN_RESISTOR	CAN Comm 120Ω Resistor
7		Brown-White	CAN_H	CAN COMM
8		Brown	CAN_L	

3.2.4.1. Liquid Cooling Unit

The Liquid-Cooling Unit (LCU), as the core functional component of the BESS Thermal Management System (TMS), consists of a compressor, fans, water pumps, water inlet and outlet pipes, heating pipes, and an expansion tank. This unit is responsible for the thermal management of the liquid-cooling modules within the system, and its startup, shutdown, and operation strategies are issued and executed by the host management unit with which communication interconnection has been established.

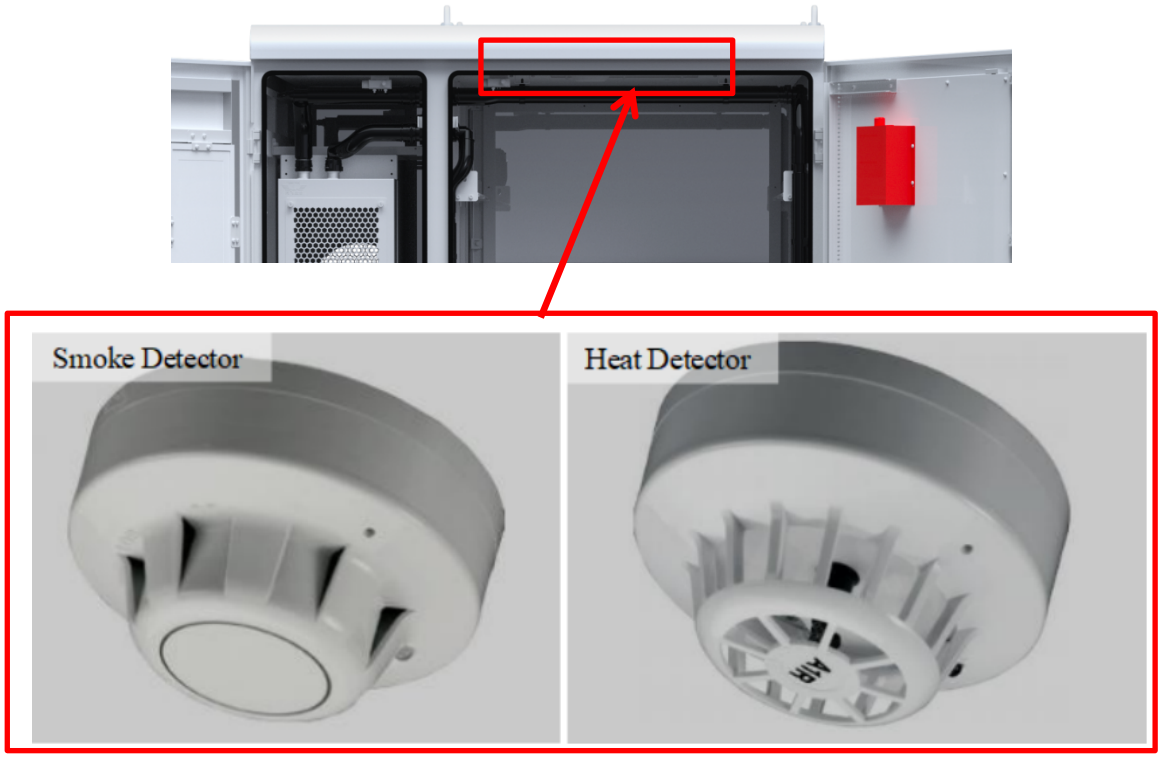
Parameters of Chiller

Specification	
Power Supply	AC 220V 50/60Hz L+N+PE
Rated Cooling Power/ Current	3.2kW/ 14.5A (L35℃/ W20℃)
Rated Cooling Capacity	8kW (L35℃/ W20℃)
Rated Heating Power/ Current	2.5kW/ 14.5A(L35℃/ W20℃)
Rated Heating Capacity	2kW (L35℃/ W20℃)
Rated Fan Air Volume	3450m^3 /h
Coolant Inject Interface Size	NW22
Coolant Refill Interface Size	SAE18
Refrigerant	R410A
Corrosion Resistance Level	C3
Net Weight	≤120kg
Operating Altitude Range	≤2000m

3.2.4.2. Smoke and Heat Detection

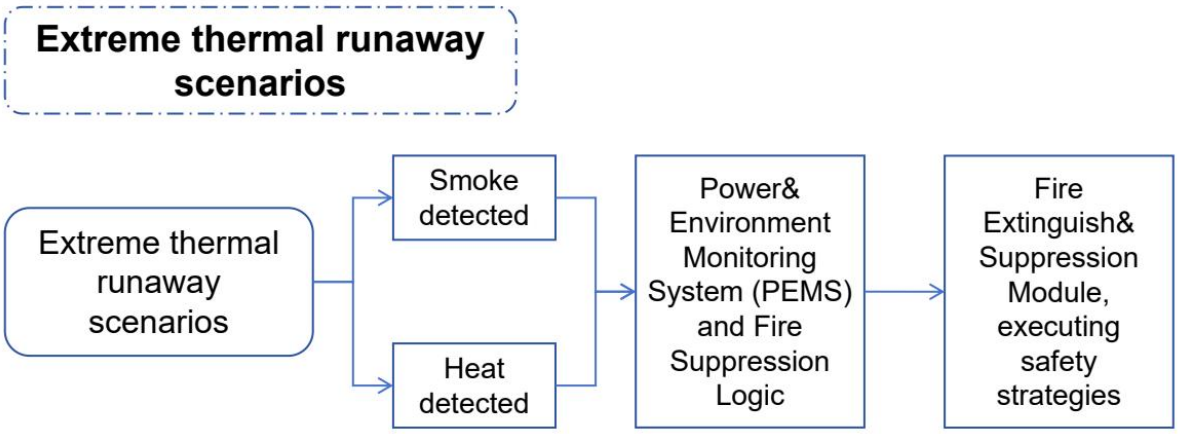
The smoke and temperature detection devices mounted on the top of the BESS energy storage cabinet realize real-time monitoring of potential risks during operation.

In extreme thermal runaway scenarios, these devices can detect smoke and heat generated during combustion, convert the detection status into electrical signals, and transmit them to the fire protection logic unit to trigger corresponding interlocking actions.



3.2.4.3. Fire Suppression System

The Fire Suppression System (FSS) consists of an aerosol fire suppression module, which is interlocked with the protection logic of the fire detection system integrated in the BESS energy storage cabinet. For details of the protection logic of the FSS, refer to the following flow chart:



In extreme thermal runaway scenarios, when smoke and heat sources generated inside the BESS energy storage cabinet are detected by the smoke and temperature detection devices, these devices convert the detected status into signals and upload them to the PEMS, which is responsible for judging and executing fire protection logic. At this time, the system’ s electrically controlled aerosol fire suppression module will be activated to release fire-extinguishing agent for fire suppression.

The aerosol fire suppression module is installed on the front main door of the cabinet, and is responsible for protecting and suppressing extreme thermal runaway incidents in the battery compartment. The module supports two triggering modes in the fire protection interlocking logic:

Thermal Probe Trigger: The thermal probe is directly damaged by high-temperature heat sources, triggering the module to discharge the fire-extinguishing agent.

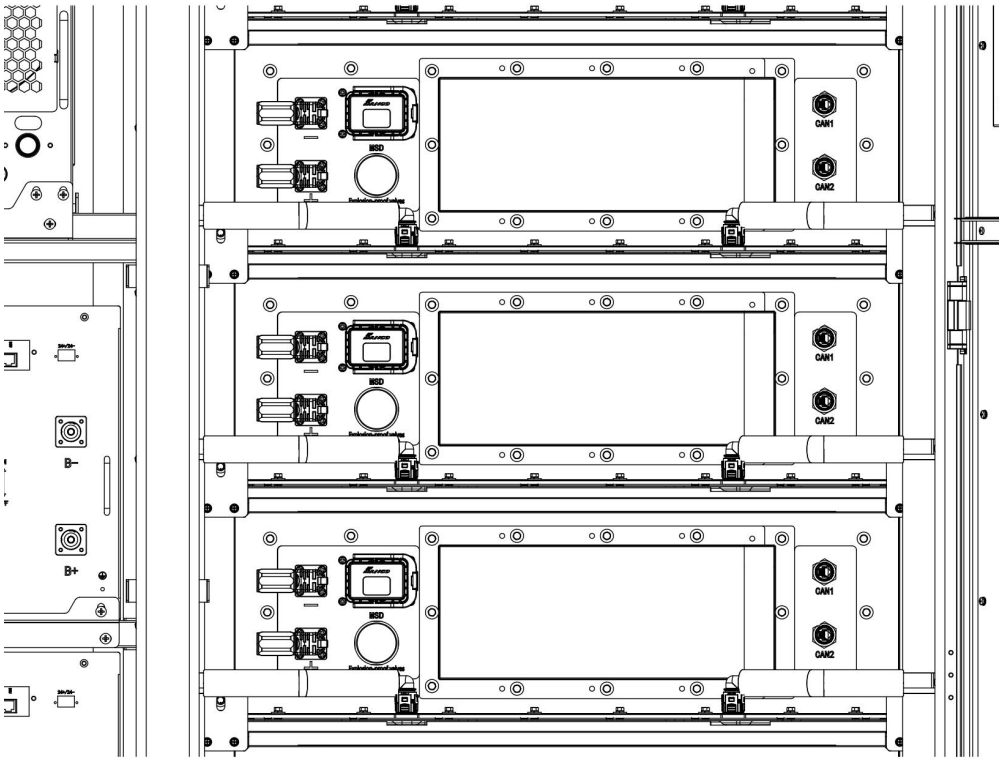
Electric Control Trigger: After receiving dual-channel fire detection feedback signals and completing logical interlock, the Power and Environment Monitoring System (PEMS) electrically controls the module

to discharge the agent.

3.2.4.4. Passive Pressure Relief Device

The Passive Pressure Relief System consists of explosion-proof pressure relief valve modules. The independently installed modules are respectively arranged on the front panel of each battery pack and the rear door of the BESS cabinet.

In extreme thermal runaway scenarios, when the pressure inside the battery packs and the operating environment of the cabinet reaches the threshold value, the explosion-proof pressure relief valve modules will perform pressure relief through the rated cavity pipelines.



4. Transportation and Storage

4.1. Requirements during Transportation

Requirements and Precautions for BESS in Sea and Land Transportation

During the loading and unloading process of transportation, attention must be paid to the following when handling and moving: do not apply excessive pressure to the wooden box packaging of the cabinet, do not allow the cabinet to tilt or overturn, and prevent it from being subjected to severe collisions. Ensure the integrity of the wooden box packaging to provide adequate protection during transportation.

1. When using trucks for land transportation, the transportation route must be planned in advance based onactual height and weight limits, as well as local transportation laws and regulations required.
2. Due to the limited protective capacity of the wooden box-packaged cabinet, it is not recommended to useopen carriages as vehicles for long-distance land transportation.
3. During land transportation, it is not recommended for trucks to travel at high speed. Avoid cabinet tilting or overturning caused by possible sudden stops or sharp turns, which may damage the cabinet. For details,please comply with local transportation laws and regulations.
4. During both pre-transport loading and post-transport unloading, the rated load capacity of professional tools(such as cranes, forklifts, etc.) used for loading and unloading must be greater than the weight of the cabinet(including packaging) to avoid risks of personal injury and property damage.
5. During transportation (whether by train, truck, or cargo ship), it is necessary to ensure that the cabinet issecurely fixed in the container to avoid risks of personal injury and property damage.
6. As an integrated device containing batteries, the specific transportation restrictions shall comply with the local laws and regulations of the place of departure and destination, and a feasible transportation methodshall be planned.
7. Before long-term warehouse storage and transportation, ensure that the SoC (State of Charge) value of thebattery system is around 30-50% to maintain the system’s charge state and safety.
8. Ensure that the storage and transportation environment does not expose the cabinet to immersion in liquidssuch as water and seawater.
9. During long-term warehouse storage or transportation, the environmental conditions shall be maintained at -30~60℃ with a relative humidity of ≤95% (no condensation).

4.2. Hosting and Forklifting

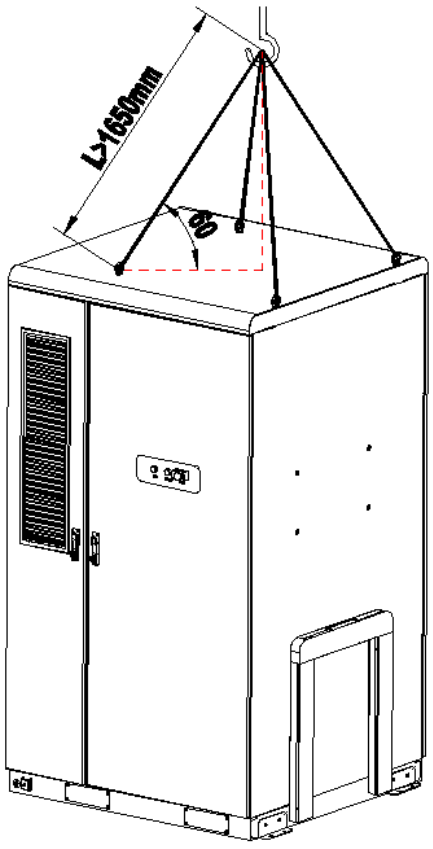
After the BESS cabinet arrives at the site, a professional crane or forklift can be selected for transportation and installation based on on-site conditions.

Forklift operations can be performed directly via the pallet boards at the bottom of the package. Prior to forklifting, it is necessary to inspect the structural integrity of the pallet boards. If the pallet boards are found to have structural damage, cracks, signs of prolonged water immersion, or insect corrosion, it is not recommended to use such pallet boards as load-bearing supports for forklifting.

Before lifting and transporting with a crane, the packaging must be removed. The lifting lugs of the BESS energy storage cabinet are located on the top of the cabinet. After confirming that the top lifting lugs are stable and reliable (if any anomalies are found, please contact the professional engineering team), inspect whether the lifting fixtures and slings to be used are stable, reliable and free from metal fatigue. Subsequently, the lifting and transportation shall be carried out by professional lifting operators.

Hoisting Parameters

Load Capacity	Length of Sling	Quantity of Sling	Lifting Acceleration
＞4T	Front& Rear Main Sling≥1650mm	4	≤0.5g



Note：Lifting equipment is provided by customer.

4.2.1. Precautions Checklist for Hoisting Operation

Precautions Checklist for Hoisting Operation

Hosting Process	Precaution
Pre-Operation Equipment Inspection Precaution	Lifting Component Integrity Check Do NOT operating on damaged lifting rings (on CESS Cabinet top): Inspect for cracks, deformation, or loose fasteners. . Lifting fixtures/slings must be free of metal fatigue: Check for frayed wires (on wire slings), tears (on synthetic slings), or rust on load-bearing parts. Never exceed the rated load capacity of fixtures (marked as "Max Load: XXX kg" on each component). Crane stability verification: Ensure outriggers are fully extended and supported on level, load-bearing ground (ground bearing capacity ≥ crane's rated grounding pressure, minimum 150 kPa). ⚠ WARNING To prevent personal injury or equipment damage, Component Integrity Check must be done before hoisting.
	Environmental Hazard Precaution Suspend operation if wind speed ≥ 10 m/s (equivalent to Beaufort Wind Scale 5: "Fresh Breeze" with small trees swaying). Clear the hoisting area of obstacles (e.g., overhead power lines, pipelines): Maintain a minimum safe distance of 5 meters from live power lines (per IEC 61877-1 Safety Standard). ⚠ WARNING To prevent personal injury or equipment damage, the safety measure must be followed.
Pre-Operation Personnel & Preparation Precaution	Personnel Qualification Precaution Only certified hoisting operators (with valid national/regional hoisting licenses) are allowed to operate the crane. Assign a dedicated signalman (trained per ISO 12100-3) to coordinate between the operator and ground staff. Avoid verbal communication only—use standard hand signals or walkie-talkies (with noise-canceling function).
	Test Hoisting Mandatory Precaution Conduct a test hoist (lift the BESS Cabinet to 30–50 cm above the ground) before full lifting: Check if the cabinet is balanced (no tilting > 5°). Verify that slings/fixtures are properly aligned with the cabinet's center of gravity (marked on the cabinet's side panel). Stop immediately if the cabinet swings uncontrollably or fixtures shift.

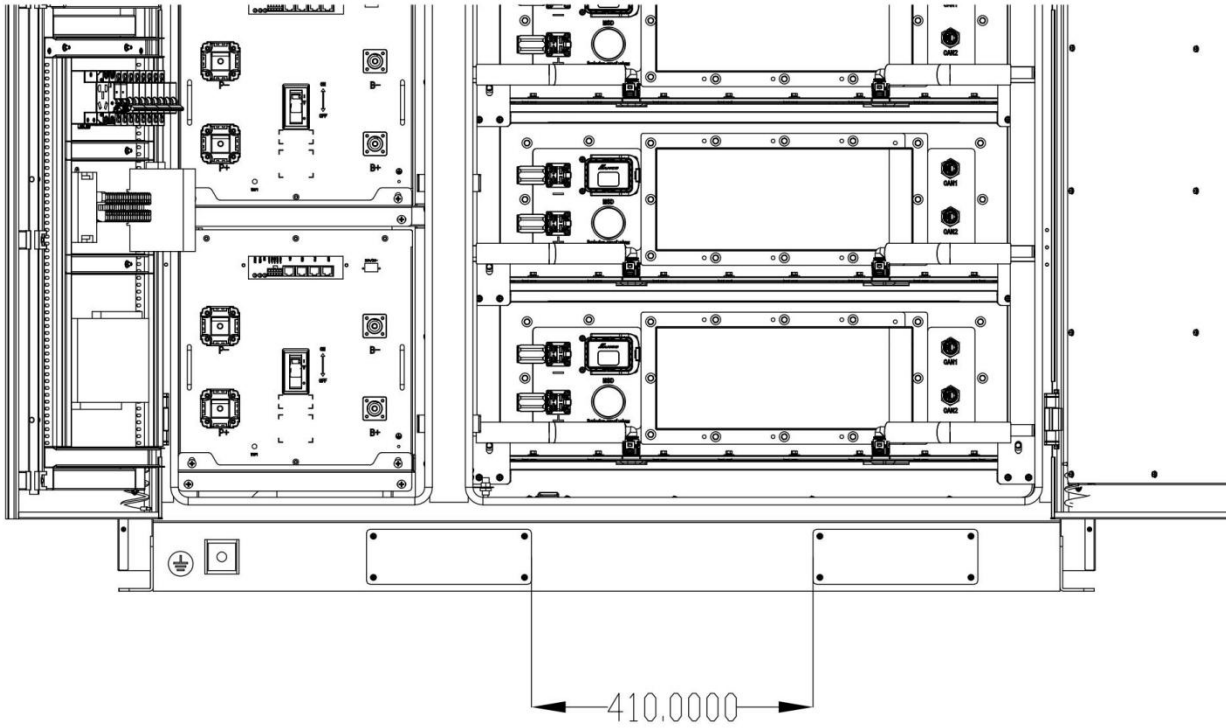
In-Operation Hoisting Process Precaution	Lifting Speed & Movement Precaution Lift/lower the cabinet at a steady speed (≤ 0.5 m/s). Avoid sudden starts, stops, or direction changes—this prevents slings from slipping or the cabinet from colliding with surroundings. Do NOT swing the cabinet horizontally during lifting (e.g., by moving the crane boom rapidly). Use slow boom adjustments if horizontal positioning is needed.
	Safe Zone Restriction Establish a warning zone (marked with safety barriers/tape) around the hoisting area. No unauthorized personnel are allowed within the zone (radius = hoisting height + 2 meters). The signalman must stand outside the warning zone and maintain visual contact with both the operator and the cabinet at all times.
	Real-Time Monitoring Precaution Continuously monitor lifting components: Listen for abnormal noises (e.g., creaking from slings, grinding from crane gears) and watch for fixture deformation. If the cabinet touches any obstacle mid-hoist, stop lifting immediately—do NOT force movement. Lower the cabinet slightly and readjust the path.
Post-Operation Safety Precaution	Cabinet Placement Precaution Lower the cabinet onto a flat, load-bearing surface (e.g., pre-installed concrete base). Ensure it is fully supported (no tilting) before detaching slings. Do NOT place the cabinet on uneven ground or temporary supports (e.g., wooden blocks) that exceed a height of 10 cm.
	Equipment Post-Check Precaution Inspect slings, fixtures, and crane outriggers for damage after use. Clean and store slings in a dry, shaded area (avoid direct sunlight to prevent synthetic sling degradation). Record the hoisting operation (date, operator, equipment status, and any issues) in the BESS Cabinet Maintenance Log—this is required for compliance with local safety regulations.

4.2.2. Forklift Parameter

4.2.2.1. Forklift Requirements

Forklifting Parameters

Load Capacity	Length of Fork	Distance between Forks	Speed Limit
＞4T	≥2. 0m	410mm	≤ 10 km/h



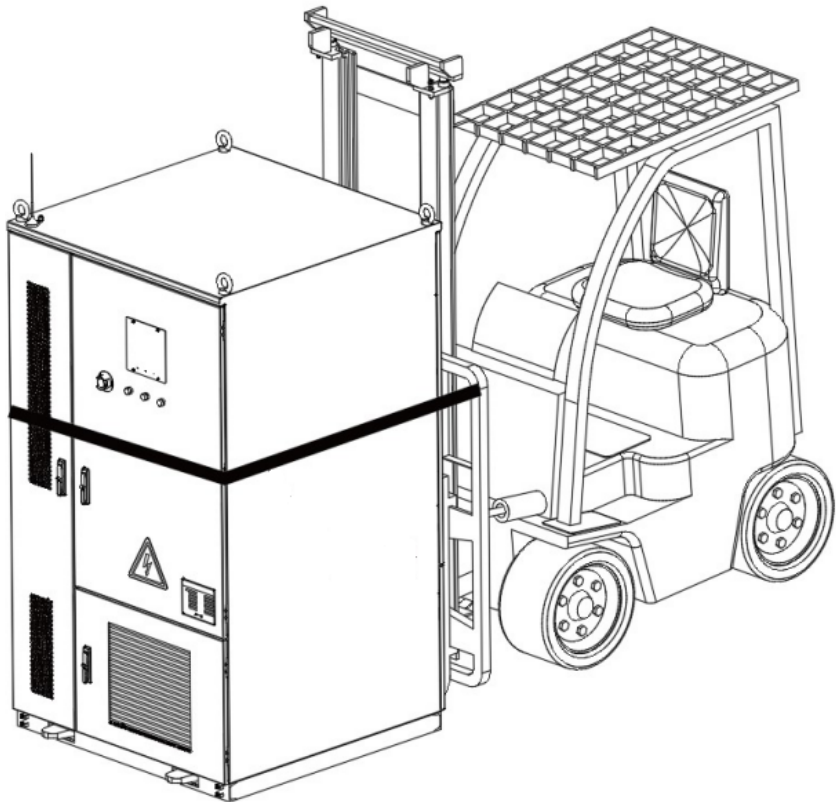
4.2.2.2. Precautions Checklist for Forklifting

Precautions Checklist for Forklifting Operation

Hosting Process	Precaution
Pre-Operation Equipment Inspection Precaution	Forklift Load Capacity Verification Do NOT use a forklift with a rated load capacity < 4 tons (the cargo weight). Confirm the forklift's nameplate clearly marks "Max Load:<4000 kg"—never exceed this limit (overloading causes fork bending, brake failure, or rollover). Inspect fork tines for damage: Check for cracks, excessive wear (thickness reduction > 10% of original), or deformation. Replace tines immediately if defects are found, as 4-ton cargo will amplify structural stress. ⚠ WARNING To prevent personal injury or equipment damage, Component Integrity Check must be done before hoisting.

	Key Component Safety Checks Brake system: Test service brakes (stopping distance ⩽ 3 meters at 10 km/h) and parking brakes (must hold the forklift 4-ton cargo on a 5° slope without slipping). Hydraulic system: Check for oil leaks (hoses, cylinders) and verify lift/lower functions—lift the empty forks to maximum height (less than 1.5 meters) and hold for 1 minute; no visible drooping is allowed (droop > 50 mm indicates hydraulic failure). Tires: Ensure pneumatic tires have no punctures, and tire pressure matches the forklift manual (typically 800—1000 kPa for 4-ton forklifts). Solid tires must show no cracks on the tread. ⚠ WARNING To prevent personal injury or equipment damage, the safety measure must be followed.
Pre-Operation Cargo & Environment Precaution	Cargo Pallet/Insert Plate Preparation If using a pallet (for 4-ton cargo, use a standard 1200x1000 mm wooden/plastic pallet with a load rating ≥ 4 tons), inspect for broken boards or loose nails—replace damaged pallets to avoid cargo collapse. If using integrated insert plates (on BESS Cabinet packaging), confirm they are structurally intact: No cracks, water damage, or pest corrosion (4-ton weight will split weakened insert plates).
	Worksite Environment Safety Precaution Ground bearing capacity: Ensure the floor/ground can support ≥ 7 tons (forklift weight + 4-ton cargo). Avoid uneven surfaces (height difference > 50 mm) or soft ground (e.g., uncompacted soil)—use steel plates to reinforce if needed. Clear obstacles: Remove debris, cables, or low-hanging objects (height < 2.5 meters) from the forklift path. Mark narrow passages (width < 3 meters) with warning tape to prevent collisions. Weather restrictions: Suspend operation if rain/snow causes slippery ground (friction coefficient < 0.3) or visibility < 10 meters (e.g., fog)—use anti-slip mats or wait for improved conditions.
In-Operation Forklifting Process Precaution	Cargo Picking & Lifting Align fork tines with the pallet/insert plates: Tines must be spaced evenly (centered under the 3-ton cargo) and inserted at least 2/3 of the cargo length—partial insertion causes cargo tilting. Lift height control: Raise the cargo just enough to clear the ground (10—15 cm) during horizontal movement. Do NOT lift higher than 50 cm when turning or passing obstacles (high lift increases rollover risk for 3-ton loads). Avoid sudden actions: Do not hit the cargo with tines (may damage packaging or shift the load) or accelerate/decelerate sharply—3-ton cargo inertia can cause the forklift to tip. Driving & Maneuvering Speed limit: Travel at ≤5 km/h in work areas (e.g., warehouses) and ≤ 10 km/h in open areas. Reduce speed to ≤ 3 km/h when turning, crossing thresholds, or approaching pedestrians.
	Driving & Maneuvering Speed limit: Travel at ≤ 5 km/h in work areas (e.g., warehouses) and ≤ 10 km/h in open areas. Reduce speed to≤ 3 km/h when turning, crossing thresholds, or approaching pedestrians.

	Pedestrian safety: Sound the horn before turning, entering doorways, or passing blind spots. Maintain a minimum 2-meter distance from pedestrians—never let anyone walk under or beside the lifted 4-ton cargo. Slope handling: Never drive up/down slopes > 15% (9° angle) with 4-ton cargo. When ascending, drive forward; when descending, drive backward (keep cargo uphill to prevent slipping). Do not turn on slopes.
Post-Operation Safety Precaution	Cargo Placement Lower the cargo slowly onto a flat, stable surface. Ensure the load is fully supported (no overhang > 30 cm) and the forklift is stationary before retracting tines. Do not drop the cargo (impacts damage the BESS Cabinet). If storing the 4-ton cargo long-term, place it on a level platform (e.g., concrete pad) and check for tilting—use shims to adjust if needed.
	Forklift Shutdown & Inspection Park the forklift in a designated area: Lower tines to the ground (≤ 10 cm height), engage the parking brake, turn off the engine, and remove the key. Post-operation check: Inspect tines, tires, and hydraulic hoses for new damage. Record any issues (e.g., oil leaks, brake delays) in the Forklift Maintenance Log—do not use the forklift again until defects are repaired.



4.3. Storage Requirements for BESS Cabinet

If long-term storage is required, the BESS Cabinet must be placed in a stable and safe environment. During the storage period:

Avoid heavy impacts, collisions, or any external force that may cause tipping or overturning; place the cabinet upright on a flat surface in the storage area.

Maintain the integrity of the original wooden outer packaging as much as possible. If the packaging has been removed, cover the cabinet with waterproof film or tarpaulin.

Do not store it in the same storage space as flammable, explosive, or dangerous goods. Do not store it with chemicals that are volatile.

Ensure and maintain the storage environment temperature within the range of -30-55 ℃, with a relative humidity of ≤ 95% (no condensation), the state of charge (SoC) of the high-voltage battery cluster in the BESS Cabinet is maintained at 30-50%.

Danger of electric shock! To ensure the personal safety of installers, necessary safety protection measures must be taken during the electrical installation of BESS Cabinet. The following procedures must be strictly followed during electrical installation:

- Only qualified professionals are permitted to install the BESS cabinet, and the installation must co[DANGER]e user manual.
- Installers must adhere to the relevant electrical operation regulations of the country or region where the installation is performed.
- Warning signs must be placed. Ensure that no DC power and AC power is being supplied while wiring. Otherwise it could cause serious injury or death. The Warning Sign must be placed to inform all personnel that do not operate on the circuit breaker. This label is hung on the BESS cabinet and the AC distribution cabinet which should remain clearly visible. Ensure external AC connector and DC connector are at open circuit status.
- Necessary grounding and short-circuit connections must be completed.
- Live parts must be properly handled and isolated with insulating materials to avoid personal injury.

5. Installation

- The cables or copper busbar provided by customer on site must meet the requirements for current capacity.

Recommendation Specification for External Power Cables or Copper Bar on Single BESS Cabinet	
Live Wire Component	Specification
AC Power Cable	6mm^2
AC Copper Bar	-

- Must adhere to the relevant electrical operation regulations of the country or region .
- Only after the BESS Cabinet has passed the acceptance inspection and obtained the permission granted by the local power grid can it be connected to the local power grid.
- Before operation, technicians with professional electrical qualifications must wear insulating

gloves to verify the wire sequence between the equipment and cables.

- Before connecting AC power cables, ensure the power distribution switch on the grid side is turned off, and use a multimeter to measure and confirm safety.
- For outdoor installation and cable laying, it is recommended to use armored cables to enhance the durability of the insulation protection layer in outdoor scenarios.
- Before laying cables into the cable trench of the corresponding base, ensure there are no sharp-edged foreign objects in the threading pipes or cable trench that could damage the cable insulation layer, to eliminate the risk of insulation failure.
- When laying cables into the cable trench of the corresponding base, AC cables must be isolated from communication signal lines, and construction must be carried out in accordance with local EMC requirements.
- Connections between grounding copper bars or cables and the BESS Cabinet must be secure to eliminate the risk of grounding failure.
- After completing the connection of AC power cables, inspect the power lines to eliminate the risk of short circuits.

NOTICE

- Before the system enters the operating state, please ensure that the environmental conditions for the above operations meet the basic requirements, with absolute humidity not exceeding 95% and no condensation. This eliminates the risk of equipment damage due to insulation failure before AC power is supplied.
- Operations including power cable connection and testing mentioned above shall not be performed under extreme weather conditions such as strong winds, heavy rains, or thunderstorms. Ensure the safety of operators and equipment and eliminate potential risks.
- Tests and verification of electrical safety performance such as insulation and grounding resistance shall be entrusted to qualified electrical technicians using professional instruments.

5.1. Site and Environment Requirements

5.1.1. Installation and Operation Environmental Requirements

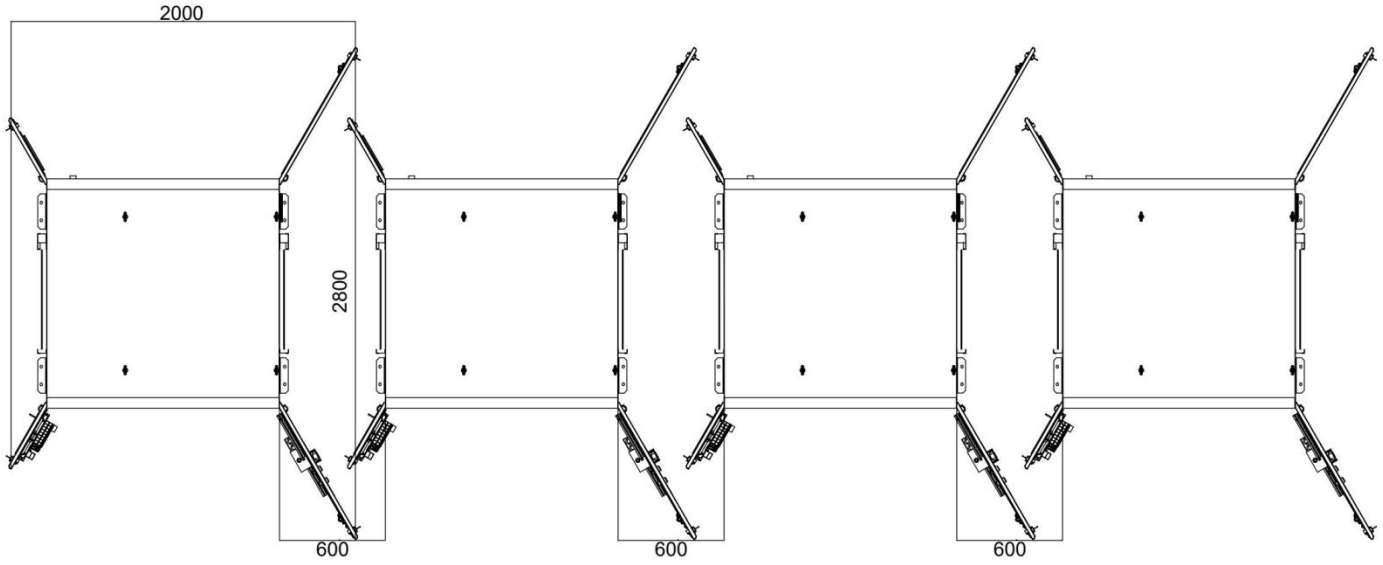
As an outdoor integrated system with a protection rating of IP54, the BESS Cabinet can operate stably under non-extreme harsh weather conditions on the premise that the installation meets design requirements and local regulations. The specific installation and construction requirements are as follows:

1. For outdoor scenarios, the BESS Cabinet shall be installed at a high-lying location to ensure that the bottom of the equipment is above the local historical highest water level after installation.
2. The installation location of the BESS Cabinet shall be a place convenient for handling, installation, as well as maintenance and inspection during subsequent operation.
3. The BESS Cabinet shall be installed as close as possible to the grid power distribution and electrical load side. There shall be no highly dangerous items such as flammable, explosive, and volatile substances in the surrounding area, and no severe vibration shall be present to eliminate potential safety risks.
4. The installation base of the BESS Cabinet shall be at least 200mm above the ground for outdoor installation and at least 100mm above the ground for indoor installation. The cable entry at the bottom of the Cabinet shall be sealed to eliminate risks caused by insect or animal intrusion.
5. The BESS Cabinet shall be installed in an environment with no excessive trees to eliminate the risk of equipment damage caused by tree falling under severe conditions. The air inlets and outlets shall be cleaned regularly to avoid reduced heat dissipation efficiency and subsequent equipment damage due to blockage by fallen leaves.
6. Under ideal on-site environmental conditions, it is recommended to install the BESS Cabinet on a concrete base with a concrete grade of not less than C20, and the base shall be built on a solid and level ground to ensure the further and stable operation.

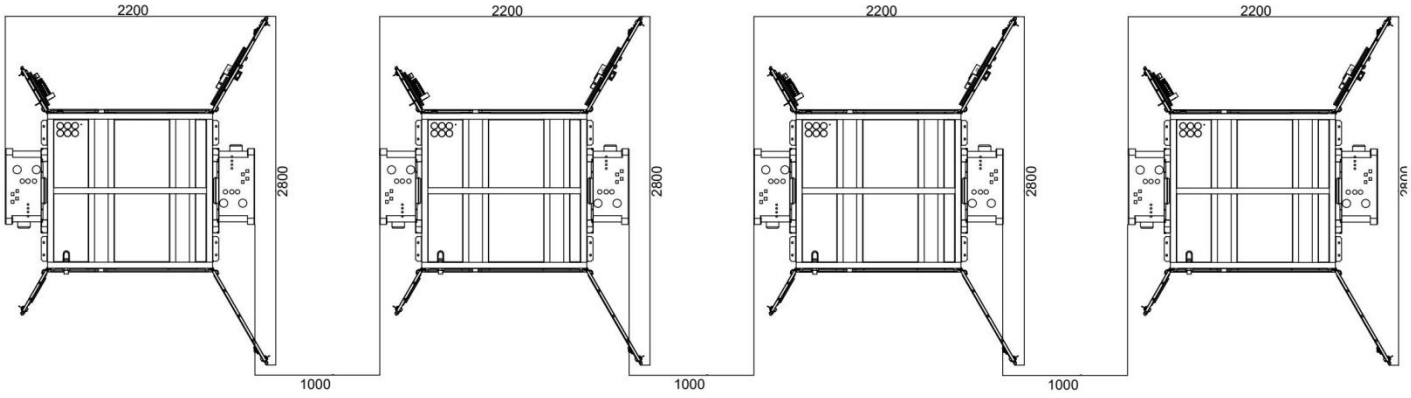
5.1.2. Outdoor Layout Requirements for BESS Cabinets in Parallel

When multiple BESS Cabinets are connected in parallel to form a row of energy storage system clusters in outdoor scenarios, the following layout rules apply:

1. When no inverters are mounted on both sides of the BESS cabinets, the cabinets shall be arranged with unified orientation of front and rear doors, and it is recommended to reserve a at least 600 mm clearance on the cabinet sides. The orientation of front and rear doors must be consistent for all cabinets in a single row.



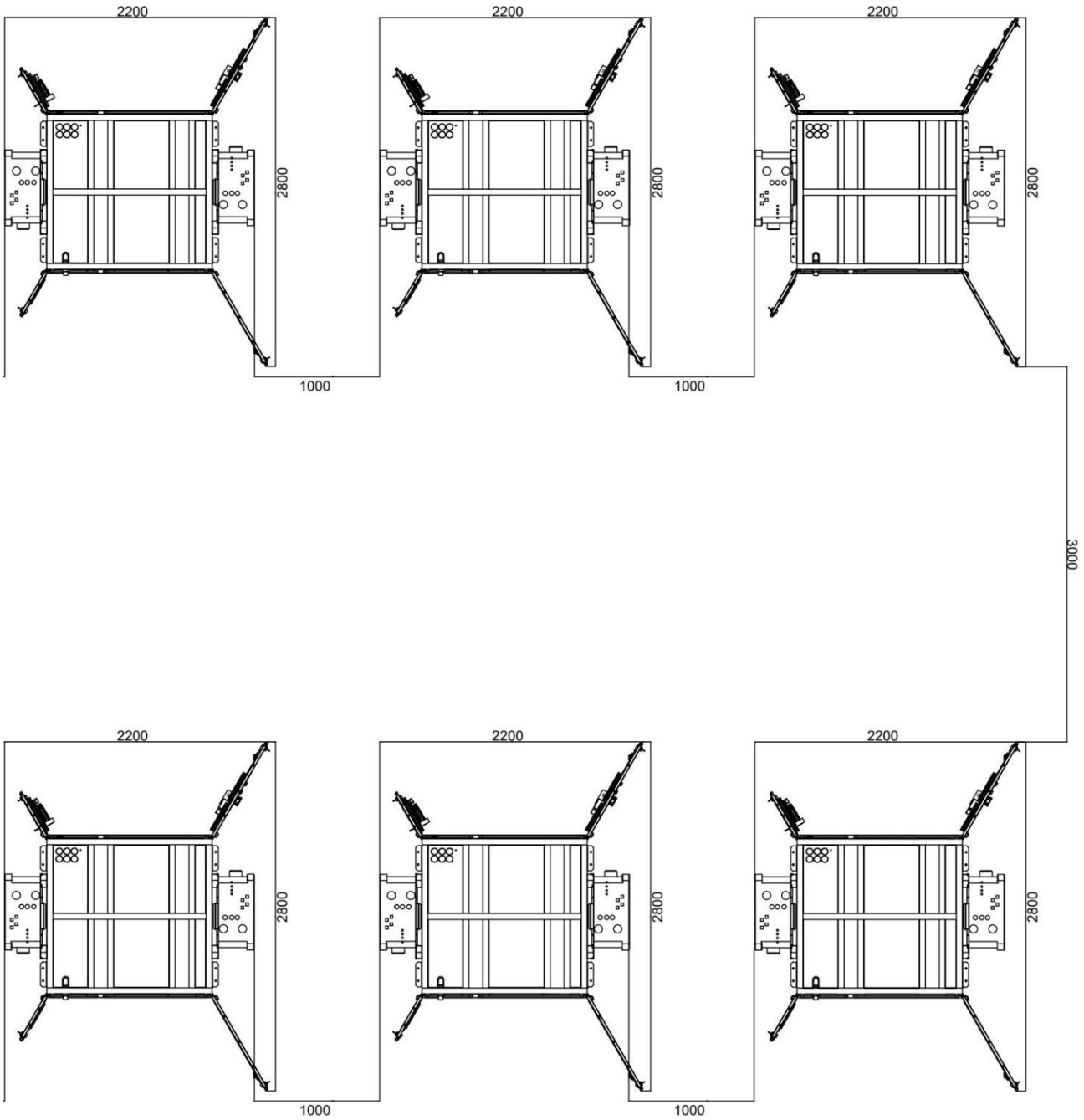
2. When inverters are mounted on the sides of the BESS cabinets, the distance shall be measured starting from the edge of the inverters. It is recommended to reserve an operation and maintenance space of not less than 1000 mm between cabinets (i.e., between inverters and cabinets, and between inverters and inverters).



3. If any side door of the cabinet needs to face a wall, a space of not less than 1000 mm shall be reserved to meet the requirements of maintenance, inspection and heat dissipation.

4. When two clusters are arranged face to face, a main access aisle of not less than 3000 mm shall be reserved. This aisle must satisfy the requirements for maintenance during operation, cooling air intake, and fire fighting operations under extreme conditions.

NOTE: the above layout requirements do not include the layout space for functional component cabinets such as PCS Cabinets, Inverter Arrays, AC combiner cabinets and STS equipment cabinets. For details of the design scheme, please consult the professional engineering team.



The recommended reserved spaces under the above layout are for reference only. For the specific layout, please comply with local laws and regulations, consult with professional engineering teams and fire authorities, implement the corresponding standards, ⚠ CAUTION struction plan.

5.1.3. Unpacking Operation

Unpacking Operations steps are as follow:

1. Remove the packing tape and the wrapping film from the outside of the package.
2. Unscrew the nuts on the wooden pallet, and then remove the bolts and washers.
3. Remove the pallet from the bottom of the cabinet.
4. Unpacking completed.

5.1.4. Equipment Inspection and Acceptance Form

After removing the wooden packaging of the BESS cabinet, it is required to conduct an on-site inventory of the system's functional accessories provided ex-factory. The corresponding acceptance and signature form is provided for reference as follows.

Serial Number	test	Description	result	
1	Liquid cooling unit	Visually inspect the appearance:The module housing shall be free of dents from extrusion, damage, or severe scratches.No screws shall be missing.Pipe, valves, and wiring sockets shall have no bending or damage caused by external forces.The heat dissipation panel shall be free of damage.The hydraulic pressure during operation is between 2.1 and 2.5 bar	OK□	NG□
2	Aerosol fire extinguishing device	Visually inspect the appearance:The module housing shall be free of dents from extrusion, damage, or severe scratches.No screws shall be missing.Pipe, valves, and wiring sockets shall have no bending or damage caused by external forces.The heat dissipation panel shall be free of damage.	OK□	NG□
3	Cabinet Appearance	Visually inspect the appearance:The cabinet housing shall be free of dents from extrusion, damage, or severe scratches.No screws shall be missing.Pipe, valves, and wiring sockets shall have no bending or damage caused by external forces.The heat dissipation panel shall be free of damage.	OK□	NG□
		The cabinet identification labels and system nameplates shall be clear and undamaged.	OK□	NG□
		The door locks structure are free of damaged	OK□	NG□
4	Screw Tightness Inspection	Check whether the screws are loose, stripped, damaged, etc	OK□	NG□

5	Miniature Circuit Breakers Inspection	All switches are in the off state	OK□	NG□
6	Accessories Inspection	Accessories set with no missing parts	OK□	NG□

Description	Sketch	quantity		unit
		418kWh	261kWh	
BESS 柜体		1		Set
DC Terminal Cables between Battery Packs		6	4	Piece
DC Terminal Cable between Battery Pack and HV BCCB Positive		2	1	Piece
DC Terminal Cable between Battery Pack and HV BCCB Negative		2	1	Piece

MSD		8	5	Piece
Daisy-Chain Comm Cable For Battery Cluster		8	4	Piece
Keys for Door Locks		3		Piece
M12 底座固定膨胀螺丝		12		Piece

5.2. Foundation Requirements

The BESS Cabinet supports 2 installation methods:

1.Installation on a concrete base;

2.Installation on a flat and hardened ground or surface.

5.2.1. Site Installation Requirements

Whether constructing an installation base with a plinth or using a non-foundation hardened surface, it shall meet the installation and load-bearing requirements of the cabinet (as shown in the table below).

Site Installation Requirement

Ground Type	Requirements	Note
Concrete Surface	The ground must be able to withstand a load of 4 * n tons (where nrepresents the number of units) tons.	The ground should meet the following requirements: Horizontal deviation ⩽ ±10 mm Flatness deviation ⩽ ±3 mm/ 2m.
Plains Hardened Surface		

5.2.2. Concrete Foundation Requirements

The specific design of the concrete foundation for the BESS cabinet shall be carried out in accordance with on-site conditions, cabinet base dimensions, and on-site cable routing design requirements. It is recommended to consult the engineering team of suppliers or distributors for reference information.

- The dimensions meet the installation requirements of the cabinet, as shown in Figure.
- Each cabinet has 8 fixing points
- Embed 8 M12 stainless steel bolts per cabinet at the fixing points, with the bolts protruding 38 mm above the ground.
- It is recommended that the high-voltage (HV) cables and low-voltage (LV) cables enter the cabinet from the bottom. Specific implementation shall be in accordance with the reference diagram.
- Lay a grounding grid under the ground at the cabinet installation location and reserve grounding flat steel. One end of the grounding grid shall be connected to the pre-embedded grounding system, and the other end shall be connected to the cabinet grounding point. When pre-embedding the grounding system, reserve a sufficient length to ensure reliable connection between the grounding flat steel and the cabinet grounding point.
- The BESS adopts the bottom wiring method, and it is necessary to pre-embed cables under the cabinet in advance.
- The inner diameter of the protective conduit shall be not less than 1.5 times the outer diameter of the

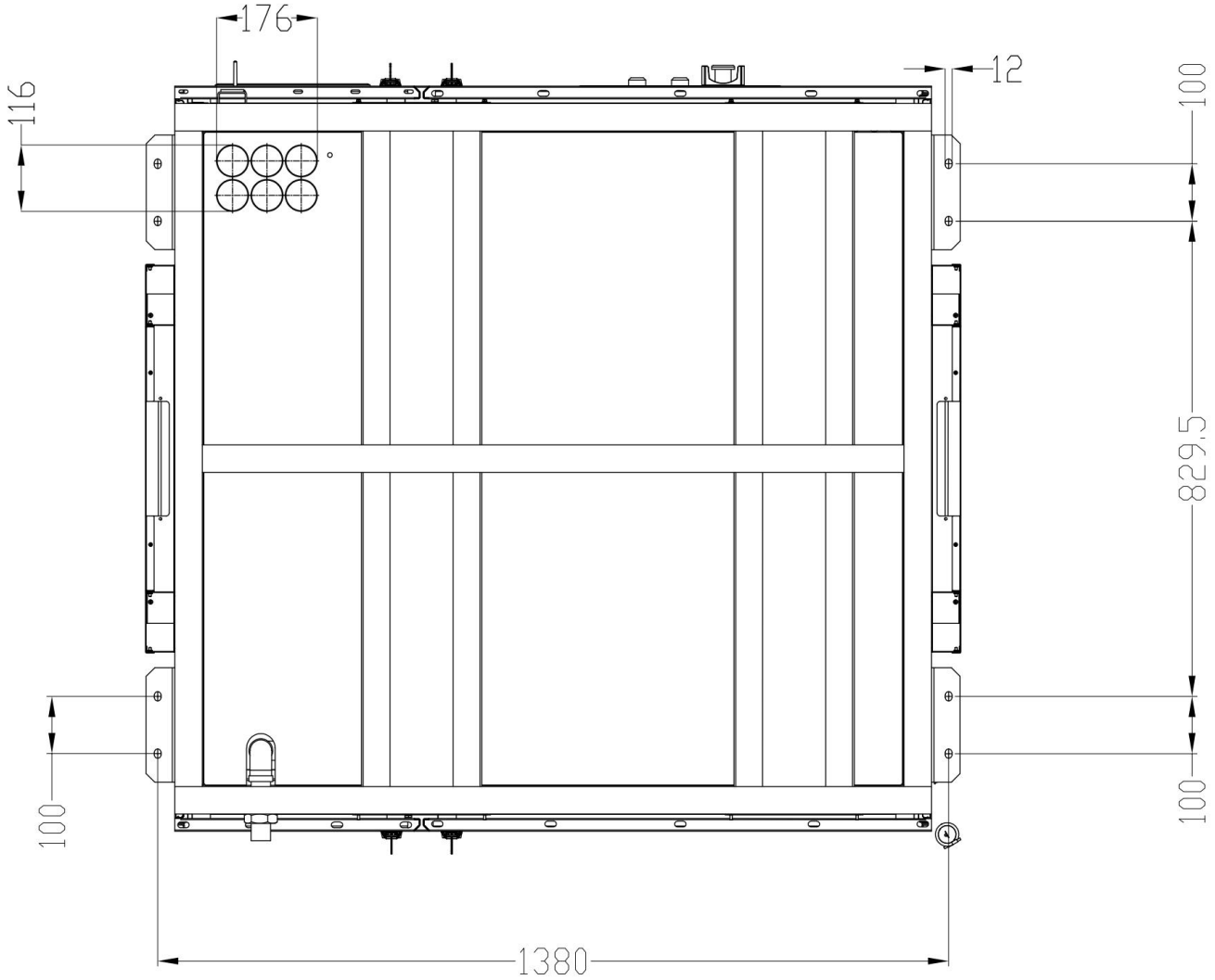
cable (including the protective layer).

5.3. Mechanical Installation

5.3.1. Installation and Fixing Requirements for BESS

When placing the base of the BESS cabinet on a concrete plinth or level ground, it must be ensured that the two contact surfaces are level and flush, so that the cabinet remains naturally upright after placement, without tilting or suspension.

The cabinet shall be fixed by torque-tightening the stainless steel nuts to the pre-embedded stainless steel bolts of matching specifications in the plinth with a torque of 32–40 N·m (Newton-meters), so as to ensure the relative stability between the cabinet and the plinth.



5.4. Electrical Connection

5.4.1. Cable Routing Requirements

Three types of cables are connected to the system via the bottom entry of the BESS cabinet: DC power cables, AC auxiliary power cables, and communication signal cables. To avoid electromagnetic interference (EMI) generated by AC power cables, physical isolation must be achieved between communication signal cables and power cables during routing.

When the cabinet is installed on a concrete plinth: Power cables and communication signal cables shall be routed through independent pre-embedded cable protective conduits underneath the plinth.

When the cabinet is installed on level ground: AC power cables and communication signal cables shall be laid in separate dedicated cable trays.

During the cable routing process where cables are led into the cabinet from cable trenches: Power cables and communication signal cables shall not be laid in a mixed manner; crossing or overlapping is prohibited, and the two types of cables must be arranged in parallel.

The cable routing path shall not have 90-degree right-angle bends.

The recommended minimum parallel spacing between shielded communication signal cables and power cables is provided in the table below.

Minimum Spatial Distance of Cables

Parallel cable length	Minimum spatial distance
200m	0.2m
300m	0.3m
500m	1.2m

5.4.2. Cable Terminal Fixing Requirements

When DC power cables and AC auxiliary power cables are routed into the cabinet through the bottom cable entry holes and connected to the HV BCCB and AC APDU, to avoid risks of poor contact, increased impedance, and overheating caused by unreliable screw tightening between copper terminals and the wiring panel, it is recommended that operators tighten the terminal screws and nuts in accordance with the torque values corresponding to the screw specifications specified in the table below.

⚠ WARNING

NOTE: If aluminum-core cables are used for AC auxiliary power lines, they shall not be directly crimped to copper terminals; transition terminals must be used.

After completing screw tightening, draw an alignment line across the nuts and the copper busbars of the wiring terminals using a marking pen. During maintenance, conduct regular inspections to verify whether the nuts have loosened.

Torque Requirements

Bolt Specifications	**M3**	**M4**	**M5**	**M6**	**M8**	**M10**	**M12**	**M16**
Torque (N.m)	0.7-0.9	1.6-2.2	3.2-4.4	7.4-9	17-20	38-42	60-70	120-140

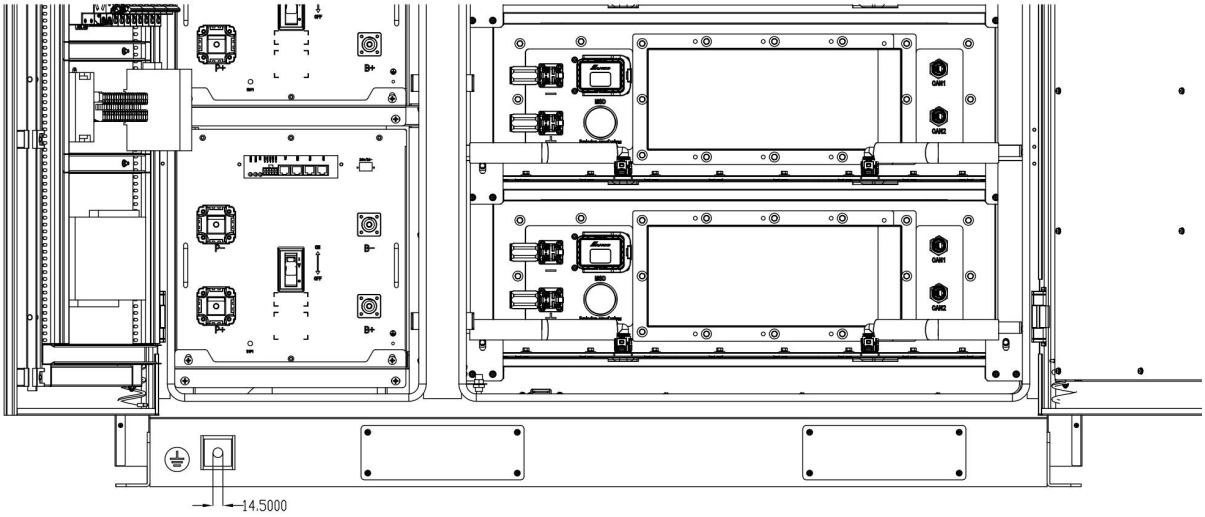
5.4.3. Grounding Connection Requirements

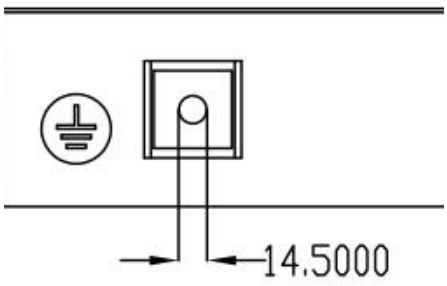
The grounding connection interface of the BESS cabinet is located at the bottom left corner of the base on the front side of the cabinet, and is directly connected to the cabinet's metal frame to ensure the grounding electrical performance of the cabinet. To meet the requirements for grounding electrical performance, two connection methods are provided:

Connect the grounding electrode (a pre-embedded underground grounding electrode/ pod with a buried depth of not less than 2.5 meters) to the cabinet grounding point via screws.

Connect the cabinet to the grounding electrode using a yellow-green double-colored insulated cable with a cross-sectional area of not less than 35 mm^2 .

The tightening of screws of all specifications shall comply with the torque requirements specified in the table above. After the connection between the cabinet and the grounding electrode is completed, technical personnel must conduct a test on the system to ensure that the grounding impedance is less than 4 ohms (Ω).



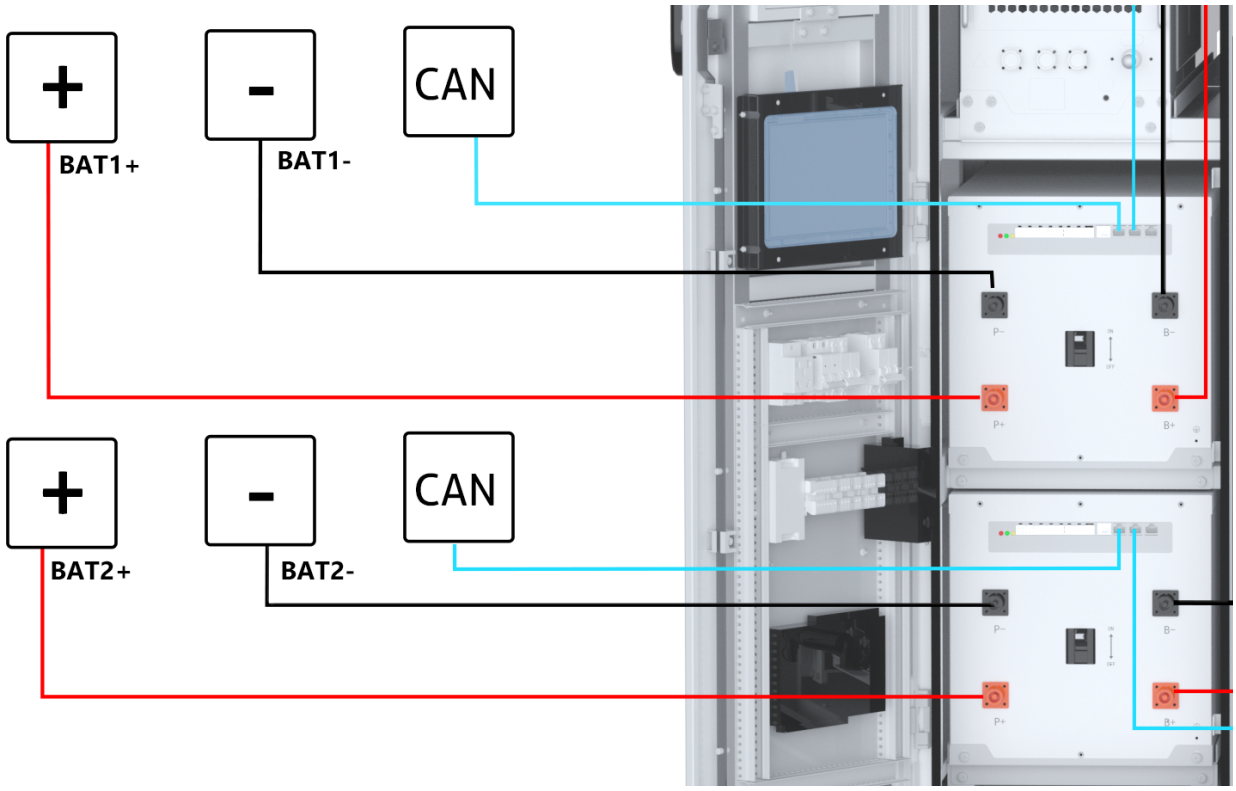


5.4.4. DC Terminal Cables Connection Requirements

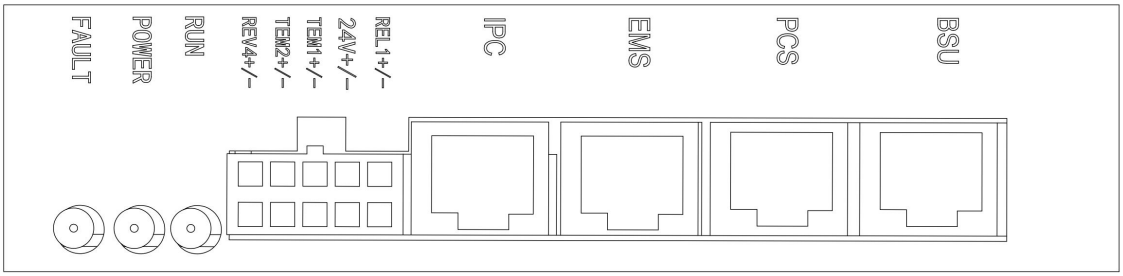
DC terminal cables are routed into the cabinet through the bottom cable entry holes of the BESS cabinet, and connected respectively to the main positive (orange) busbar socket and main negative (black) busbar socket of the DC busbar on the corresponding HV BCCB. The terminals shall be secured with M8-specification screws and must be torque-tightened to the specified value. This is to avoid a series of potential risks caused by poor contact due to loosening.

WARNING

NOTE: In accordance with the polarity definition of the HV BCCB, the electrical devices on the other side of the DC busbar (including but not limited to PV inverters, Power Conversion Systems (PCS), DC/DC charging modules, etc.) must be consistent with it in polarity.



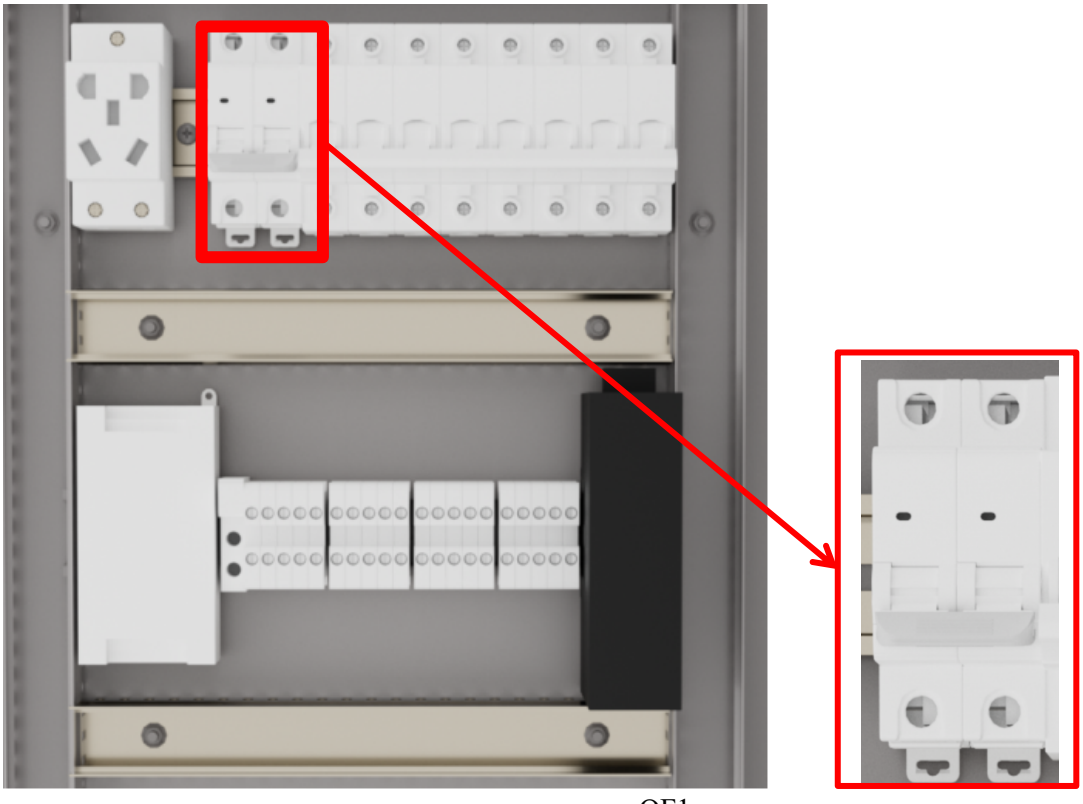
The communication cables between the HV BCCB and the electrical devices on the other side of the DC busbar (including but not limited to PV inverters, Power Conversion Systems (PCS), DC/DC charging modules, etc.) shall use RJ45 connectors and CAT5e cables, and be connected to the [PCS] port on the HV BCCB (for the specific cable definition, refer to Section 3.2.4 above).



5.4.5. AC APDU Panel Connection

5.4.5.1. Auxiliary Power Cable Connection

AC power cables are routed into the cabinet through the bottom cable entry holes, connected to the input side above the main control miniature circuit breaker QF1 on the wiring panel of the AC APDU according to the specified wiring method, and the clamp structure of the miniature circuit breaker is fastened with screws. For the torque values corresponding to the screws of specific specifications, refer to the table above.



QF1

List of Auxiliary Power Cable Connections

Interface	Interface Definition	Requirements
AC Input L	A	The conductor cross-sectional area of the auxiliary power cable is recommended to be no less than 6mm².
AC Input N	N	

5.4.5.2. Communication Signal Cable Connection

The BESS cabinet is configured with a reserved external expansion communication module (switch), which is used for communication between the local cabinet system and external optional functional modules. Its usage shall be defined according to the specific project planning; for details, please consult the engineering team.

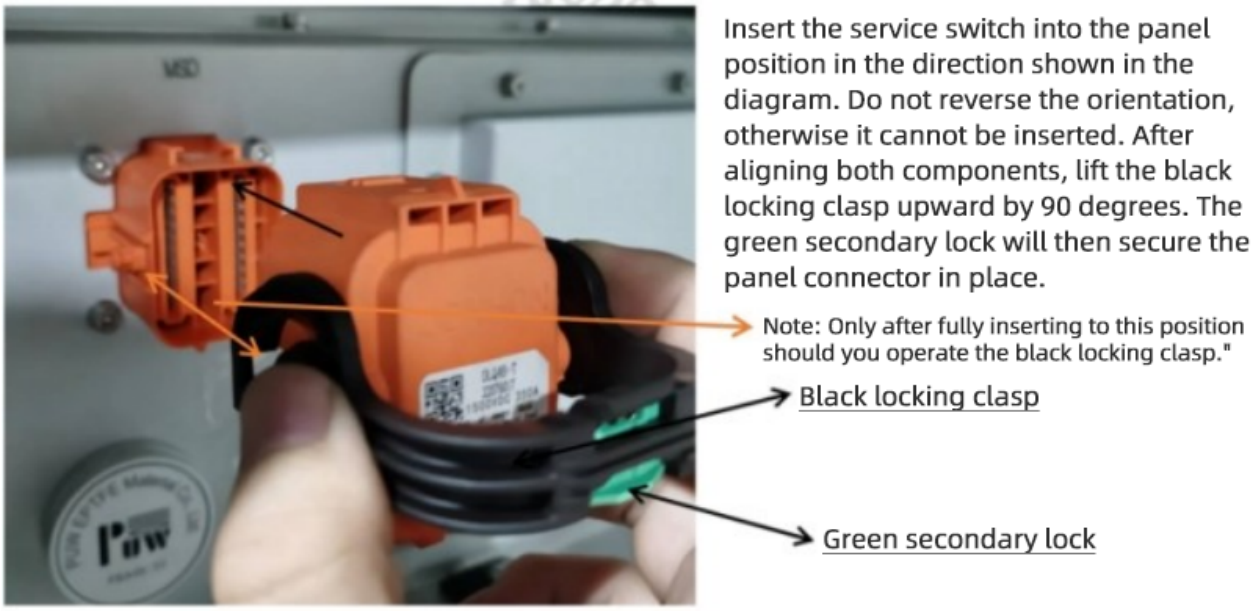
5.4.5.3. Wiring Inspection

Serial Number	Description
1	Verify that AC and DC Terminal cables are connected in accordance with the correct wiring method.
2	Check that the fixing screws and nuts of cable terminals are installed with the correct torque.
3	Inspect for ensuring no short circuits between AC auxiliary power cables.
4	Verify that comm signal cables are connected as defined on the panel of the communication module/expansion module.
5	Check that the grounding impedance of the grounding conductor meets the requirements.

5.4.6. Install the MSD

The Maintenance Service Disconnect (MSD) is located on the panel of each Battery Pack. It can independently disconnect the DC main circuit of each Battery Pack, ensuring electrical safety during the maintenance of the BESS Cabinet, protecting the personal safety of technicians, and safeguarding safety during long-distance transportation and long-term storage.

After completing the visual inspection of the Battery Pack and confirming the integrity of the DC power cables and connection interfaces, the MSD on each Battery Pack can be installed in place to restore the DC circuit closure of each Battery Pack. The specific operation steps are shown in the following diagrams.



5.4.7. Sealing the Cable Entry

After all AC power cables, AC auxiliary power cables and communication signal cables inside the BESS cabinet are fully connected and pass all tests, the cable entry holes at the bottom of the cabinet shall be sealed with fireproof sealant or fireproof blocking components.

This measure can prevent the intrusion of animals or insects into the cabinet and eliminate potential risks such as short circuits and fires caused by biological intrusion.

While isolating the risk of biological intrusion, it is necessary to test the air permeability of the bottom seal to ensure that it achieves the basic level of liquid infiltration protection effect.

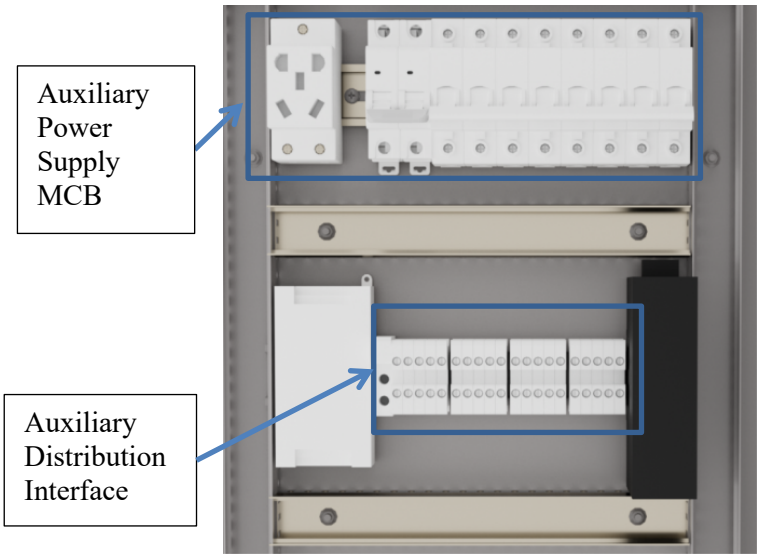
6. BESS System Operation Guidance

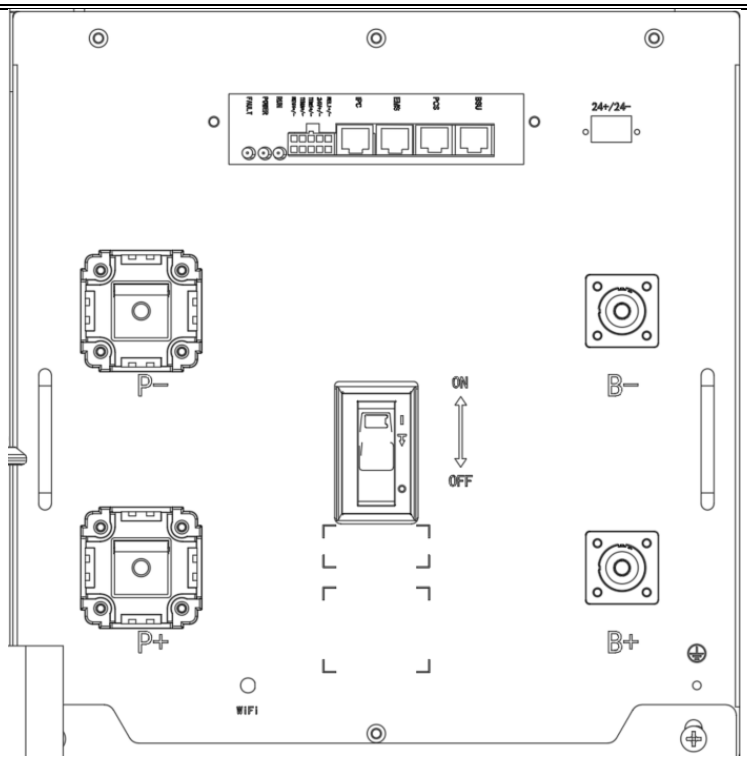
6.1. Operation Guidance for Startup Process

For the first-time startup of the BESS system, please follow the operation procedure below. This complete operation procedure also applies to subsequent system startups, including every restart after shutdown for maintenance during the later operation phase.

⚠ WARNING

- Once the BESS System has been out of service for a period after being put into operation, please be sure to conduct a comprehensive inspection of the BESS Cabinet in accordance with the inspection steps mentioned above before restarting the system and putting it back into operation. Only then can you proceed to the next startup step.

Step	Operation Guidance Descriptions
1	Close the miniature circuit breaker switch on the AC auxiliary power distribution panel, wait for all functional modules to obtain power supply, automatically initialize, and then enter the operating mode. 
2	Close the DC circuit breaker switch handle on the panel of (all) High-Voltage Battery Cluster Control Boxes (HV BCCB); flip the handle upward to align it with the silkscreened "ON" mark.

	 After all operations of the HV BCCB are completed normally, the operation status indicator light on the panel shall remain steadily lit in yellow, and the power indicator light shall remain steadily lit in green, indicating that the HV BCCB and the high-voltage battery cluster are operating normally at this time. If the indicator light is red, it means that a malfunction has occurred in the HV BCCB or the high-voltage battery cluster. Operators must first refer to the troubleshooting checklist and troubleshoot the fault against the information displayed on the PEMS interactive touchscreen.
3	Monitor on the interface of the Power Environment Monitoring System (PEMS) until the status indicator lights and screen displays of all panels return to normal.

6.2. Operation Guidance for Shutdown Process

After the BESS Cabinet system is shut down and the AC and DC power inputs are disconnected, do not directly proceed with the removal or maintenance of power cables and busbars of main components. Wait for at least 20 minutes until the self-discharge of capacitors and other components is complete. It is imperative to use a multimeter for measurement to ensure the voltage of all main components and grounding interface are zero. Only then can operations be performed to ensure the personal safety of personnel and the safety of equipment.

Step	Operation Guidance Descriptions
1	Under normal operating conditions, issue a shutdown command on the control interface of the high-voltage inverter (or the energy management system of the PCS) to ensure that the primary circuit on the other side of the DC busbar is in a static state with output or input disconnected.
2	Open the DC circuit breaker switch handle on the panel of (all) HV BCCB; flip the handle downward to align it with the silkscreened "OFF" mark.
3	Open the auxiliary power miniature circuit breaker on the AC auxiliary power distribution panel.

7. Power and Environmental Monitoring System Introduction

7.1. Homepage

Three sections are available by default on the homepage:

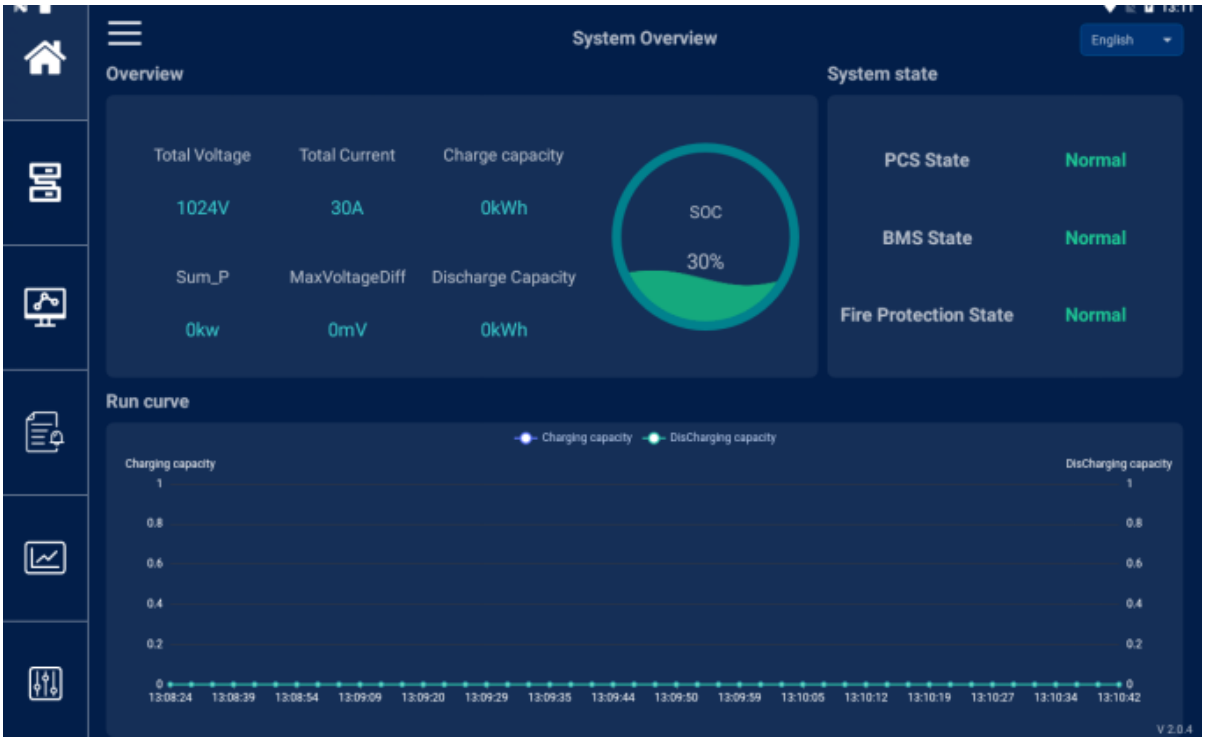
Battery Cluster Status: Displays the SoC, the total voltage, total current, total power, maximum voltage difference, charging capacity, and discharging capacity of the battery cluster.

System Status: Displays the operating status of functional components connected to the system, such as PCS status, BMS status, and fire protection system status.

Operation Curve Graph: Visualizes the charging and discharging capacity values within the current day and generates a curve chart.

Clicking on the left sidebar allows access to submenu pages with different functions, which are listed from top to bottom as follows:

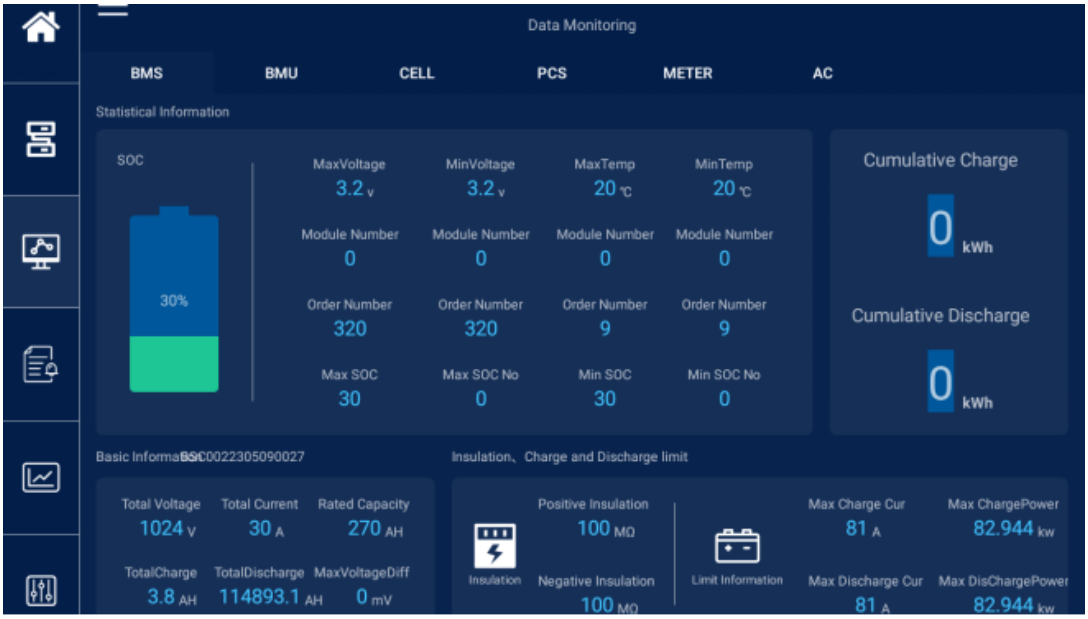
Data Monitoring/ Alarm Information/ Statistical Analysis/ Device Control



7.2. Data Monitoring

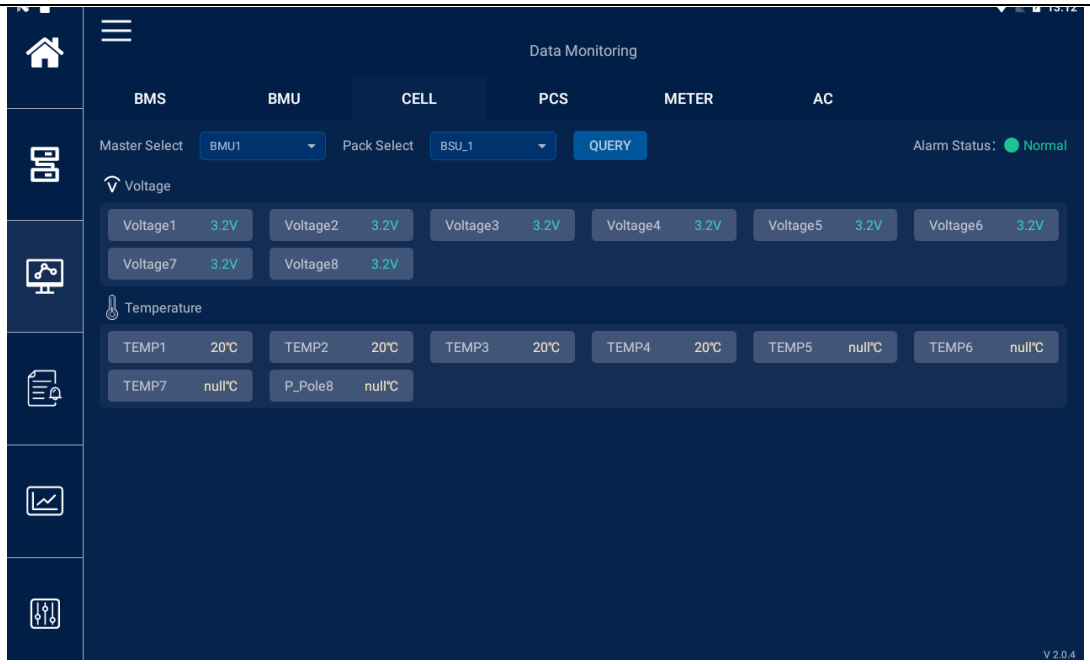
On the Data Monitoring page, clicking the top bar allows access to the three-level menu for devices at different hierarchies to monitor real-time data of the corresponding devices, which are listed in sequence as follows:

BMS: Real-time data of the entire battery cluster



BMU: Real-time data of individual battery packs

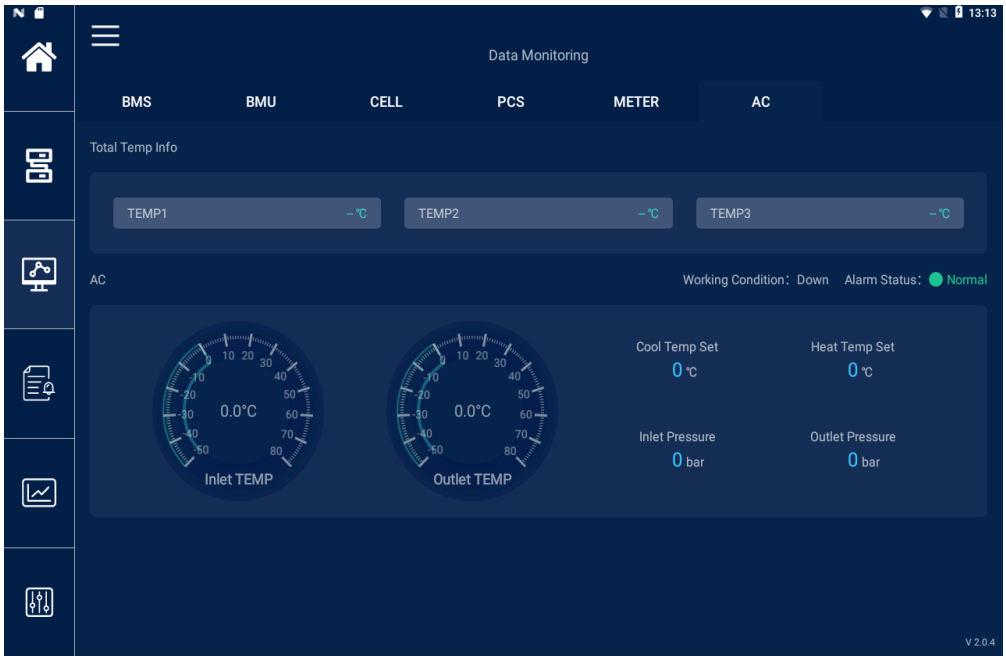
CELL: Real-time data of individual battery cells in each battery pack



PCS: (Optional item, if connected to the PEMS) Real-time data reported by the PCS or inverter connected to the BESS

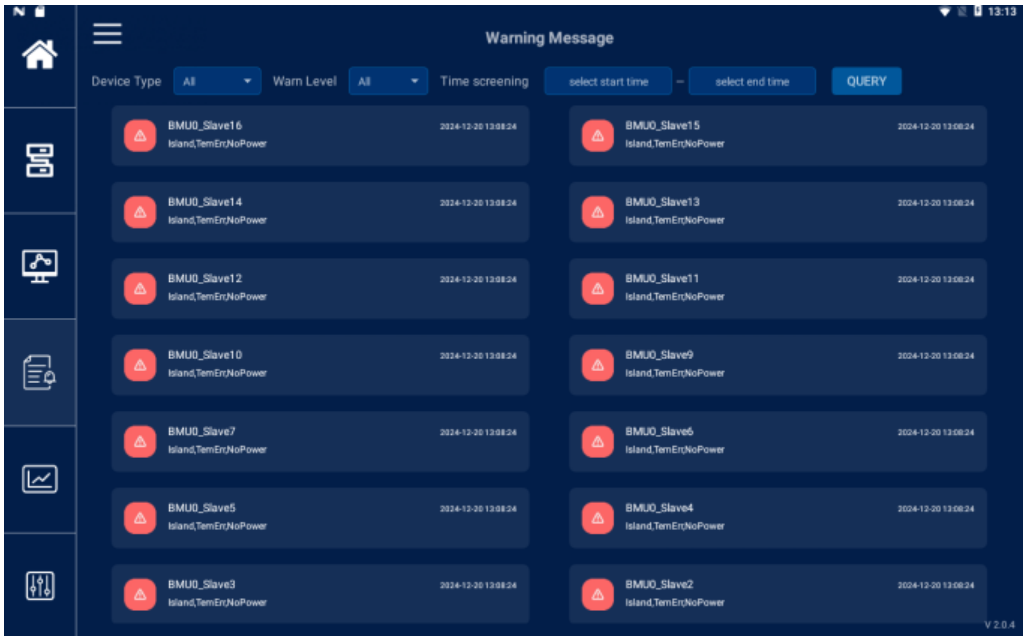
METER: (Optional item, if connected to the PEMS) Real-time data of the power grid monitored by electric meters (supports connection of multiple electric meters; click to select the configured electric meter for monitoring)

AC: Real-time data of the thermal management unit in the system



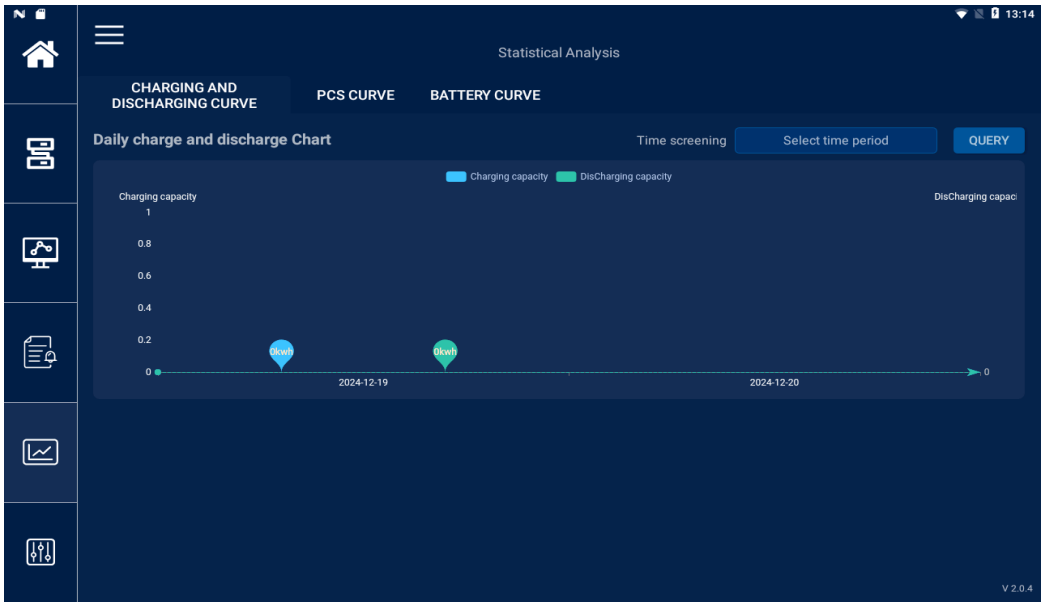
7.3. Alarm Information

On the Alarm Information page, you can view the real-time operation alarm information of the BESS. It supports filtering and display of historical alarm information based on [Device Type], [Alarm Level] and [Occurrence Time Period].



7.4. Statistical Analogy

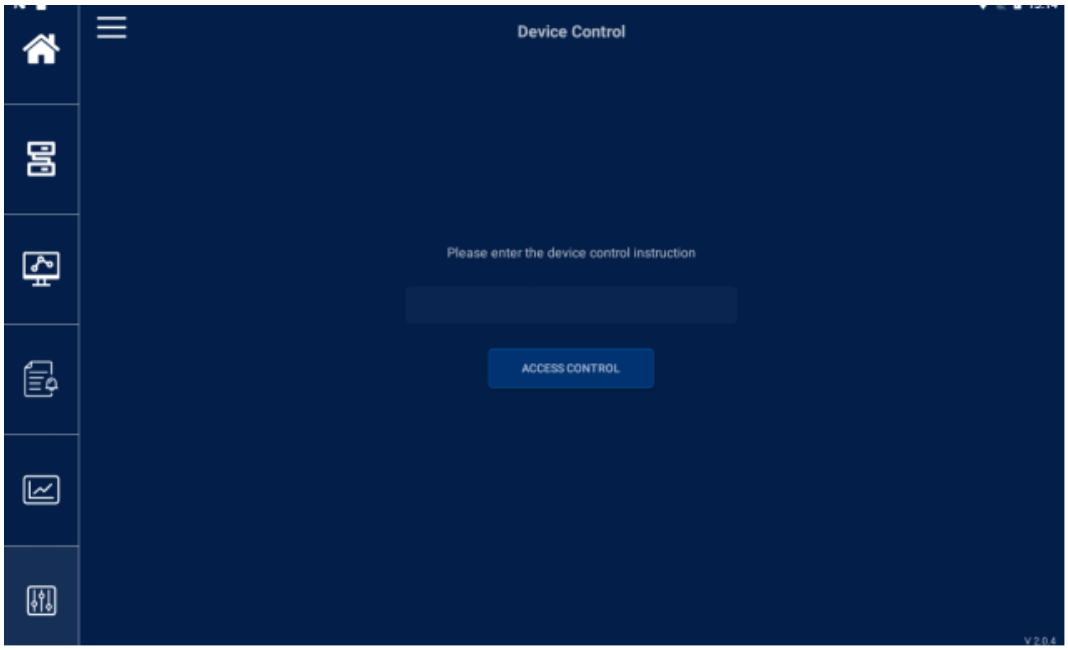
On the Statistical Analysis page, visual analysis can be performed on data including [Charging/Discharging Capacity], [PCS Active Power] and [Battery Cluster Current and SOC]. By default, it supports generating curve charts using data within a maximum time span of 30 days.

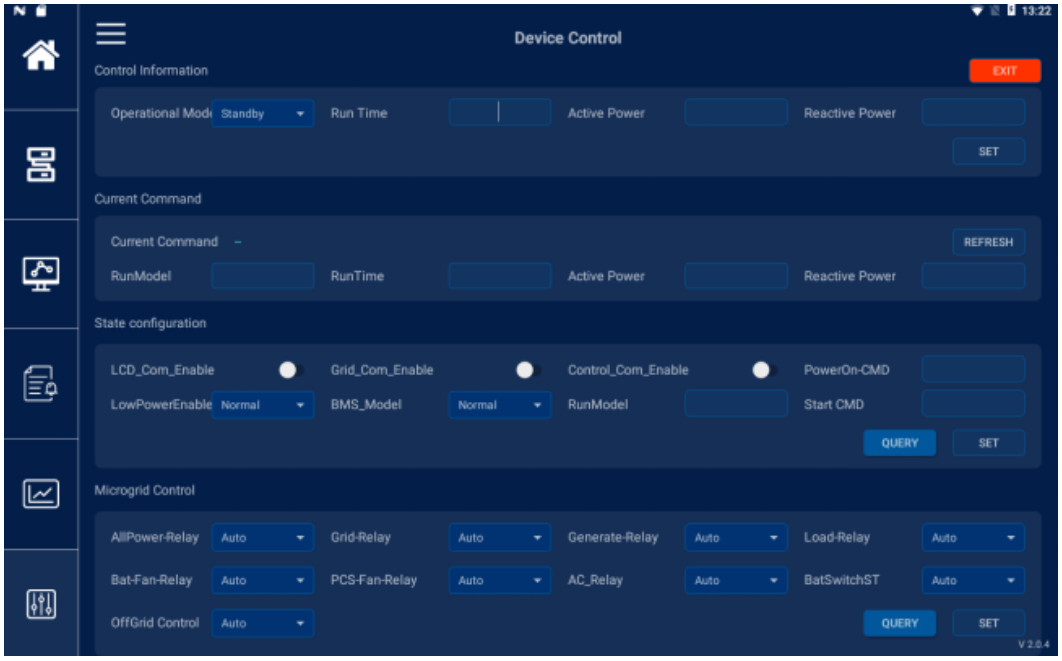


7.5. Device Control

To access the Device Control function interface, user needs to enter an authorization password first to unlock all configuration permissions (default password: [88889999]).

The existing function configuration options in the current settings interface will not issue configurations such as [Operation Strategy] and [Operation Mode] to the system with the current default configuration specifications. For details, please consult the engineering team.





8. Maintenance

During the actual operation of the BESS Cabinet, due to the impacts of temperature and humidity in indoor or outdoor environments, dust accumulation, and other debris that may be adsorbed on the air inlet panel of the cabinet by the air inlet pressure difference during operation, potential risks of harm to personnel and property will arise if these abnormal environmental factors are not subject to regular manual inspection and intervention. Therefore, it is imperative to arrange professional technicians to conduct regular inspection and maintenance.

8.1. Safety Precautions

⚠ WARNING

After the BESS system's power supply is shutdown, wait for at least 15 minutes before performing maintenance or repair operations on the system. After the system is shut down, when performing maintenance or repair operations on the system, operators must be aware of warnings below:

- Only qualified and authorized operators are allowed to perform maintenance and other operations on the BESS system.
- During maintenance operations, operators must not to leave any tools and parts such as screws, washers, tools, etc. inside the cabinet, otherwise it might do damage to the cabinet.
- Ensure that the power supply will not accidentally be connected.
- Use a multimeter or a voltage tester to ensure that the BESS system is completely power off.
- Insulate and cover the potentially charged operating components with insulating fabric.
- Ensure that escape routes are fully accessible throughout maintenance and inspection.

8.1.1. Shutdown the Power Supply

For detail system shutdown operation guidance, please refer to [6.2.Operation Guidance for Shutdown Process].

⚠ WARNING

After completing the system shutdown and power-off procedure, if the other end of the DC busbar of the HV BCCB is connected to corresponding devices (including but not limited to PV inverters, Power Conversion Systems (PCS), DC/DC charging modules, etc.), it is also necessary to shut down the aforementioned devices and cut off the AC power supply at the distribution box or distribution panel to ensure safety.

8.1.2. DC Busbar Disconnection Operation Guidance

Before performing maintenance operations on DC high-voltage connected components, ensure the DC busbar has been completely disconnected.

DC Busbar Disconnection Operation Guidance

Step	Operation Guidance Descriptions
1	Shut down the High-Voltage Battery Cluster Control Box (refer to [6.2.Operation Guidance for Shutdown Process])
2	Pull out the safety button on the handle of the MSD module
3	Lift up the handle of the MSD module, ensuring the entire handle is raised to a 90° angle to disconnect the DC circuit of the battery pack
4	Pull out the MSD module completely.
5	Place the MSD modules into protective caps (if available) or a container that is protected against water and dust.

8.2. Periodic Maintenance Guidelines

Step	Operation Guidance Descriptions
1	Debris Cleaning for Ventilation Openings - If the equipment is installed in open areas with heavy sand, fallen leaves, or other debris: Periodically clean the debris accumulated on the air intakes and outlets of the cabinet to maintain the cabinet’ s heat dissipation efficiency.
2	Internal Debris Check (Visual Inspection)Periodically ensure there are no irrelevant debris inside the Cabinet.
3	Cable Connection Tightness Check (Visual Inspection) - When connecting cables and tightening screws for the system: Mark the nut-bolt joints with a marker. Periodically check these tightening marks to ensure the cable connections remain secure.
4	Exposed Cable Protection Check (Visual Inspection) - Periodically check that the insulation or armored protective layers of exposed cables (if any) are intact and undamaged to ensure insulation and electrical safety.
5	Cable Inlet/Outlet Sealing Check (Visual Inspection) - Periodically check the integrity of the sealing materials at the cabinet’ s cable inlets and outlets.
6	Cabinet Door Lock Check (Manual Inspection) - Periodically verify the reliability of the BESS Cabinet door locks: Ensure the locks operate smoothly without jamming or abnormal noise, and the keyholes are free of blockages.
7	Liquid-Cooler Pipe Check - Visual Inspection: Periodically confirm the Liquid- Cooler pipes are undamaged. Manual Inspection: Ensure the pipe fasteners are securely connected.
8	Power Cable Insulation Check (Visual Inspection) - Periodically check that the insulation layers of power cables (between Battery Packs, and between Battery Packs and the HV BCCB) are intact and undamaged.
9	Internal Liquid Check (Visual Inspection) - Periodically verify there is no abnormal liquid infiltration, puddles of liquid, or excessive condensation inside the BESS Cabinet.

10	Dehumidifier Drain Check (Visual Inspection) - Periodically ensure the dehumidifier’ s drain pipe is unobstructed, and the drain outlet at the cabinet bottom is free of blockages and liquid leakage.
11	Fire Water Pipe Check (Manual Inspection) - Periodically confirm the joints of the fire water pipes (if connected) are securely fastened and free of water leakage.

Note: The execution cycle of the aforementioned periodic inspections is recommended to be performed every 4-6 weeks; the specific inspection cycle shall be determined based on the actual operating environment of the project site.

8.3. Maintenance Guidance for TMS

8.3.1. Liquid Cooling Unit Maintenance Guidance

Step	Operation Guidance Descriptions
1	Manual Inspection - The fastening screws on the Unit's panel are free of loosening or detachment
2	Visual Inspection - The fasteners and check valves of the Unit's pipes are free of liquid leakage
3	Manual Inspection - The wrapping layer of thermal insulation cotton on the pipes is free of damage
4	Visual Inspection - The Unit's power cables and communication cables are securely connected without loosening
5	Visual Inspection - The Unit's pipes are free of foreign object intrusion or compression by heavy objects
6	Visual Inspection - The fastening screws of the Unit inside the CESS Cabinet are free of loosening
7	Visual Inspection - The connectors of the pipes at the corners are free of liquid leakage
8	Manual Inspection - After the MSD of the Battery Pack has been pulled out and the DC Busbar has been disconnected, check the stability of the connection between the Battery Liquid-Cooling Plate and the connecting

	pipe joints: there shall be no liquid leakage, and the connection shall be secure
9	Visual Inspection - The heat dissipation air outlets of the Unit are free of foreign object blockage
10	Visual Inspection - There is no leaked fluid accumulation at the bottom of the Unit

8.3.2. Pipeline Pressure Maintenance Guidance

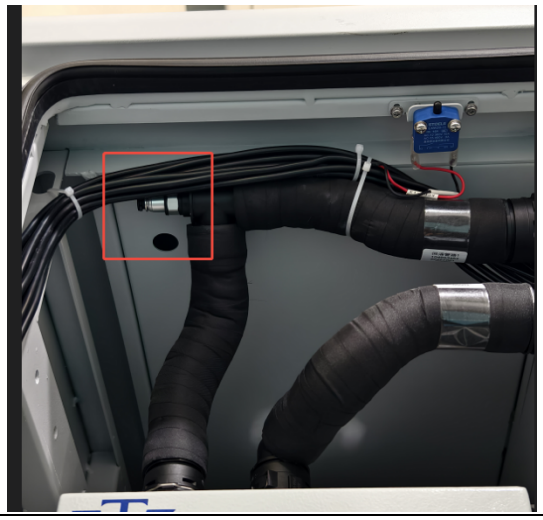
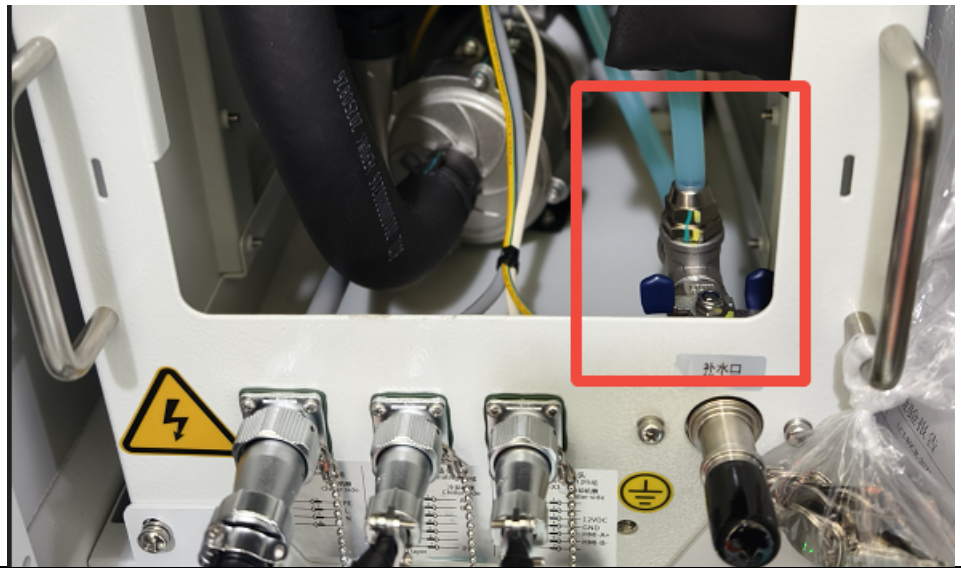
To ensure the normal operation of the Liquid-Cooler Unit, maintain refrigeration and heating efficiency, and guarantee liquid circulation efficiency in the pipelines, the pressure inside the liquid cooling pipelines must be maintained at approximately 2.3-2.5 Bar.

To ensure the stability of the BESS system's thermal management, periodically check the hydraulic pressure displayed on the PEMS Display Screen.

When the pipeline pressure drops below 2.0 Bar, contact professional technicians and engineers to check the pipeline or replenish the antifreeze coolant.

Maintenance is expected to be performed every 3–4 months.

Step	Operation Guidance Descriptions
1	Confirm the specifications of the available antifreeze coolant: The ethylene glycol concentration in the composition shall be ≤ 50%. Under limited conditions, antifreeze coolants of different colors can be mixed
2	Visual Inspection - The fasteners and check valves of the Unit's pipes are free of liquid leakage
3	Confirm the availability of a AC220V-powered filling pump
4	Confirm the specifications of the available filling hose（Ø16mm DN15）。
5	Connect the filling hose and suction hose to the filling pump, ensuring air tightness. Submerge the suction hose below the liquid level. To avoid waste, use approximately 5L of antifreeze coolant per operation
6	Based on the specifications of the available filling hose, connect it to either the Unit’ s filling port or the one-way ball valve port of the main pipeline

7	Replenishing Antifreeze Coolant via the Filling Port
8	Connect the return hose to the pipeline return port (do not open the return hose valve). Place the outlet of the return hose into a coolant bucket Note: The coolant must submerge the outlet of the return hose to ensure a vacuum inside the return hose 
9	Remove the top cover of the Liquid Cooling Unit and open the ball valve on the internal filling pipeline of the unit. (It is recommended to open the ball valve slowly initially while monitoring the water inlet pressure to avoid excessive instantaneous filling pressure.) 
10	Connect the filling pump to the power supply, turn on the power switch, and start the filling operation. Monitor the static pressure during the filling process on the PEMS display screen: when the outlet pressure shown on the display screen reaches 1.4 Bar ~ 1.6 Bar, close the ball valve on the internal filling pipeline of the Liquid Cooling Unit and the ball valve of the

	filling tooling, then press the stop button on the filling pump to cut off the power supply. 
11	Through the PEMS display screen, modify the IGBT self-circulation set temperature in the thermal management system to a value lower than the current actual temperature of the IGBT, so as to activate the self-circulation of the Liquid Cooling Unit. Monitor whether the outlet pressure is within the range of 2.3 Bar ~ 2.5 Bar: if the outlet pressure rises above 2.5 Bar (excessive pressure), drain fluid through the ball valve on the return pipeline to adjust the pressure; if the system pressure is lower than 2.3 Bar, perform the fluid replenishment operation again.
12	After pressure stabilization, close the ball valve on the internal filling pipeline of the Liquid-Cooler Unit and the ball valve of the filling tooling. Press the stop button on the filling pump to disconnect the power supply. Disconnect the filling hose and return hose, and restore the Unit’ s panel and IGBT Self-Circulation Start Temperature

8.3.3. Coolant Replacement Guidance

When the coolant deteriorates (pH value < 7 or > 9.5) or shows obvious discoloration, a complete replacement of the coolant is required.

Step	Operation Guidance Descriptions

1	Insert the return hose into the drain port and place the outlet of the return hose into a waste fluid bucket to prevent waste fluid from spilling onto the ground and causing contamination.
2	Open the ball valve on the return hose to drain the fluid. When no more coolant flows out from the return hose outlet, close the ball valve on the return hose. Pour the waste fluid from the waste fluid bucket into the waste fluid collection bucket, then disconnect the return hose. Insert the 16MM threaded pipe into the filling port and place the other end of the pipe into the waste fluid bucket. Open the ball valve on the internal filling pipeline of the Liquid Cooling Unit to drain the waste fluid inside the unit. After complete drainage, remove the 16MM threaded pipe and reset the ball valve on the internal filling pipeline of the Liquid Cooling Unit.
3	Prepare a new bucket of 25L coolant. Use a connecting pipe to connect the liquid outlet of the filling pump to the filling port of the Liquid Cooling Unit, connect the return hose to the pipeline drainage interface, and place the return hose into the waste fluid collection bucket. Meanwhile, open the ball valve on the return hose. Note: The new coolant must submerge the outlet of the return hose to ensure a vacuum is created inside the return hose.
4	Remove the top cover of the Liquid-Cooling Unit and open the ball valve on the internal filling pipeline of the Liquid-Cooling Unit
5	Connect the filling pump to the power supply and start the refilling operation. Meanwhile, slowly adjust the ball valve on the internal filling pipeline of the Liquid Cooling Unit to flush out the residual liquid in the pipeline. After the coolant is fully pumped out and the pipeline is completely drained, remove the drainage adapter.
6	Prepare a bucket of new coolant (recommended volume ≥ 25L). Connect the return hose to the pipeline return interface, submerge the suction hose into the bucket of new coolant, and place the outlet of the return hose into the same bucket of new coolant. Note: The new coolant must submerge the outlet of the return hose to ensure a vacuum is created inside the return hose.
7	Open the ball valve on the internal filling pipeline of the Liquid Cooling Unit and the ball valve on the return hose. (It is recommended to open the ball

	valves slowly initially while monitoring the water inlet pressure to avoid excessive instantaneous filling pressure.)
8	Connect the filling pump to the power supply and start the refilling operation. Monitor the filling static pressure on the EMS display screen, maintain the outlet static pressure within the range of 2.1 Bar ~ 2.3 Bar for 10 consecutive minutes. After confirming that the fluid in the return pipeline flows smoothly without obvious vibration, the coolant in the return pipeline is clear and free of bubbles, and there is no obvious abnormal water (air) flow noise in the liquid cooling system pipelines, the relevant operations can be completed.
9	Adjust the ball valve on the internal filling pipeline to reduce the outlet pressure to the range of 1.8 Bar ~ 2.0 Bar. Subsequently, close the ball valve on the return hose, the ball valve on the internal filling pipeline of the Liquid Cooling Unit, and the ball valve of the filling tooling. Press the stop button on the filling pump to cut off the power supply. Through the EMS display screen, modify the IGBT self-circulation set temperature in the thermal management system to a value lower than the current actual temperature of the IGBT, so as to activate the self-circulation operation of the Liquid Cooling Unit for 5 minutes. After 5 minutes, check whether the outlet pressure is within the range of 2.3 Bar ~ 2.5 Bar: if it is lower than 2.3 Bar, perform the fluid replenishment operation as specified; if the outlet pressure rises above 2.5 Bar (excessive pressure), drain fluid through the ball valve on the return hose to adjust the pressure.
10	After pressure stabilization, close the internal filling pipeline ball valve of the Liquid-Cooler Unit and the filling tooling ball valve. Press the stop button on the filling pump to disconnect the power supply. Disconnect the filling hose and return hose, and restore the Liquid-Cooler Unit's panel.

NOTICE

- Coolant replacement needs to be operated by Technicians with capable tools.
- When coolant has to be replaced, consult the professional technicians and engineers.

8.4. High Voltage Battery System Maintenance Guidance

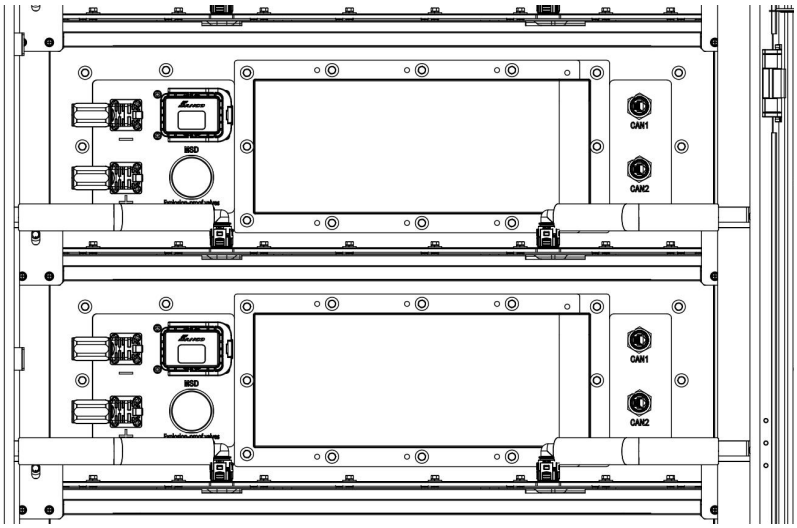
8.4.1. Battery Pack Replacement Guidance

8.4.1.1. Removal Guidance

Step	Operation Guidance Descriptions
1	Remove the liquid cooling pipes, MSD, Comm Signal Cables and power cables
2	Remove the fastening bolts and nuts between the Liquid-Cooling Plate of the Battery Pack and the Cabinet shelves
3	Use clamps and fixed towing hooks to pull out the Battery Pack to two-fifths of its length. Then, use a forklift or stacker to slowly move the Battery Pack out of the Cabinet shelves and transfer it gently

WARNING

- When one of the Battery Packs in a Battery Cluster requires replacement, stop the system operation, extract the local operation historical logs, and contact professional technicians and engineers..
- When removing each single Battery Pack from the Battery Cluster, professional technicians must first perform extraction and draining of the antifreeze coolant from the corresponding liquid cooling pipelines in advance.
- Each Battery Pack is expected to weigh ≥330 kg. After the cables and liquid cooling pipes are completely disconnected, professional technicians shall use a forklift or stacker for removal and transportation. Do not use only manual handling to avoid the risks of injury to personnel and property.



8.4.1.2. Installation Guidance

NOTICE

- After restoring the pipeline, there are many complex operations such as filling coolant that need to be performed by professionals.

Step	Operation Guidance Descriptions
1	Before installation, electrical technicians or engineers must use a multimeter to measure and ensure the voltage difference between the new Battery Pack and any of the existing Battery Packs shall not exceed 5V. (If the voltage difference between new and existing Battery Packs is excessive, consult electrical technicians or engineers to consider on-site supplementary charging using a DC charger.)
2	Use a forklift or stacker to slowly move the Battery Pack directly in front of the Cabinet. Reserve sufficient movement space between the module end of the Battery Pack and the Cabinet to avoid collision during lifting and ensure adequate space for the forklift/ stacker to slowly push the Battery Pack into the Cabinet.
3	Lift the Battery Pack to the height of the corresponding shelf using the forklift or stacker.
4	The forklift or stacker moves forward slowly to push the lifted Battery Pack gently into the Cabinet
5	When the forklift or stacker can no longer advance, 3/5 of the total length of the Battery Pack must be supported on the Cabinet's shelves to provide sufficient support
6	The rear door can be opened. From the rear, use clamps and fixed towing hooks to pull the Battery Pack to a position where the fixing holes of the shelf align with those of the Battery Liquid-Cooling Plate, allowing for fastening operations
7	Fasten the Liquid-Cooling Plate to the Cabinet shelf using bolts and nuts, and mark tightening marks with a marker. Note: Visually inspect the previously used bolts and nuts to ensure there is not hread damage or stress-induced structural damage. If any damage is

	found, replace them with new standard parts of the same specification.
8	Restore the liquid cooling pipe joints, DC power cables, and Comm Signal Cables in the original connection sequence, ensuring secure connections. Note: No foreign objects shall block the pipe joints, and no liquid shall seep into the power cable terminals. Critical Note: Do not reinstall the MSD or close the DC Busbar before the Liquid-Cooler Unit is refilled with coolant and all corresponding inspections are completed.

8.4.2. HV BCCB Maintenance Guidance

8.4.2.1. Removal Guidance

Step	Operation Guidance Descriptions
1	Disconnect all terminals of power cables, auxiliary power cables, and comm signal cables on the HV BCCB panel. It is recommended to wrap all terminals with insulating materials such as heat shrink tubing for protection. Note: Before performing operations, ensure that all MSDs on the battery pack have been fully removed.
2	Remove the fixing bolts on the panel.
3	Drive a forklift or stacker to the front of the Cabinet, and adjust it to a position slightly lower than the HV BCCB.
4	Two operators shall pull out the HV BCCB through the lifting lugs on both sides of the panel respectively, place it on the fork arms of the forklift or stacker, and move and transport it slowly

8.4.2.1.Installation Guidance

Step	Operation Guidance Descriptions
1	Use a forklift or stacker to transport the HV BCCB slowly to the front of the Cabinet. Reserve sufficient movement space between the end of the HV BCCB and the Cabinet to avoid collision with the Cabinet during lifting, and

	to prevent insufficient space for the forklift or stacker to slowly push the HV BCCB into the Cabinet.
2	Lift the HV BCCB to the height of the corresponding shelf using the forklift or stacker.
3	Move the forklift or stacker forward slowly, and gently push the HV BCCB (lifted to the correct height) into the interior of the Cabinet.
4	When the forklift or stacker can no longer move forward, it is mandatory to ensure that 3/5 of the total length of the HV BCCB is supported on the Cabinet’ s shelf to provide adequate support.
5	The rear door can be opened. From the rear side, use fixtures and fixed towing hooks to pull the HV BCCB to a position where the panel aligns with the fixing screw holes of the Cabinet, allowing for the fixing operation.
6	Secure the HV BCCB to the Cabinet using bolts and nuts, and mark a tightening mark with a marker pen. Note: Conduct a visual inspection of the previously used bolts and nuts to ensure there is no thread damage or stress-induced structural damage. If any damage is found, replace them with new standard parts of the same specification.
7	Reconnect the DC power cables, Auxiliary Power Cables, and Comm Signal Cables in their original connection sequence to ensure secure connections. Note: Ensure there is no foreign object blockage in the wiring sockets and plugs, and no liquid infiltration into the cable terminals

8.4.3. Electrical Components Maintenance Guidance

It is recommended to conduct periodic visual inspections and maintenance on the AC APDU panel to ensure the normal operation of the system.

8.4.3.1. Miniature Circuit Breaker Maintenance

Step	Operation Guidance Descriptions
1	Manual Inspection - After the system shutdown and left standing for 15 minutes, test the smoothness of the breaker’ s closing and opening

	operations.
2	Manual Inspection - After the system is powered off and left standing for 15 minutes, electrical professionals shall use a multimeter to measure for short circuits between each phase cable to ensure electrical safety.
3	Visual Inspection - Check if the tightening marks on the fastening bolts of the breaker’ s cables have changed. Perform re-tightening promptly if any changes are found.
4	Visual Inspection - Check for foreign objects on the breaker’ s panel and wiring sockets.

8.4.3.2. Wiring Panel Maintenance

Step	Operation Guidance Descriptions
1	Visual Inspection - Check for foreign objects on the wiring panel.
2	Visual Inspection - Check if the tightening marks on the wiring bolts have changed.

8.4.4. PEMS Maintenance Guidance

8.4.4.1. PEMS Unit Maintenance

Step	Operation Guidance Descriptions
1	Visual Inspection - Check that there are no foreign objects, liquid splashes, or infiltration on the comm signal cables, power cables, communication antenna connection panel, and terminals.
2	Visual Inspection - Verify that the tightening marks on the bolts securing the PEMS Unit to the Cabinet show no indication of changes.
3	Manual Inspection - Ensure the touch interactive display operates smoothly without severe lag, with normal UI layout, proportions, and brightness.
4	Manual Inspection - After the CESS System is shut down and left standing for 15 minutes, check that the power cable and communication cable terminals on the connection panel are securely connected.

8.4.4.2. Removal Guidance

Step	Operation Guidance Descriptions
1	Disconnect all power cable, comm signal cable, and antenna terminals from the EMU connection panel. It is recommended to wrap all terminals with insulating materials (e.g., heat shrink tubing) for protective covering. Note: Before operation, operators/ technicians must ensure the power supply of the CESS Cabinet has been cut off in advance, and the CESS Cabinet is left standing for at least 15 minutes under the power-off condition.
2	Remove the fastening bolts on the panel.
3	Remove the original EMU.

8.4.4.3. Installation Guidance

Step	Operation Guidance Descriptions
1	Fasten the PEMS Unit to the Cabinet using bolts and nuts, and mark tightening marks with a marker. Note: Visually inspect the previously removed bolts and nuts to ensure there is no thread damage or stress-induced structural damage. If any damage is found, replace them with new standard parts of the same specification.
2	Restore the power cables, Comm Signal Cables, and antenna terminals in the original connection sequence, ensuring secure connections. Note: No foreign objects shall block the wiring sockets or plugs, and no liquid shall seep into the wire terminals.
3	Verify that the connection of the power cables, Comm Signal Cables, and antenna terminals complies with the specified requirements. Electrical technicians shall use a multimeter to measure for short circuits between the Comm Signal Cables to ensure electrical safety.

8.4.5. EPO Maintenance Guidance

Step	Operation Guidance Descriptions
1	Manual Inspection - When the BESS System is in standby state, press the EPO (Emergency Power Off) button. The button’ s stroke must be smooth without jamming, and the BESS System must enter the emergency protection state, issuing emergency shutdown protection commands to functional components.
2	Manual Inspection - After pressing the EPO button and the BESS System enters the emergency shutdown protection state, rotate the EPO button in the indicated direction to release it. The button's release stroke must be smooth without jamming. After release, the cancellation of the emergency shutdown protection state shall be observable in the PEMS.
3	Manual Inspection - Verify the secure connection of the EPO button at both the front and rear ends (inside and outside the Cabinet door).
4	Visual Inspection - After the CESS Cabinet’ s power supply is cut off and the system stops operating, inspect the wiring panel at the rear of the EPO button (inside the Cabinet door) to ensure the fastening bolts of the wiring terminals are secure without loosening.

8.4.5.1. Removal Guidance

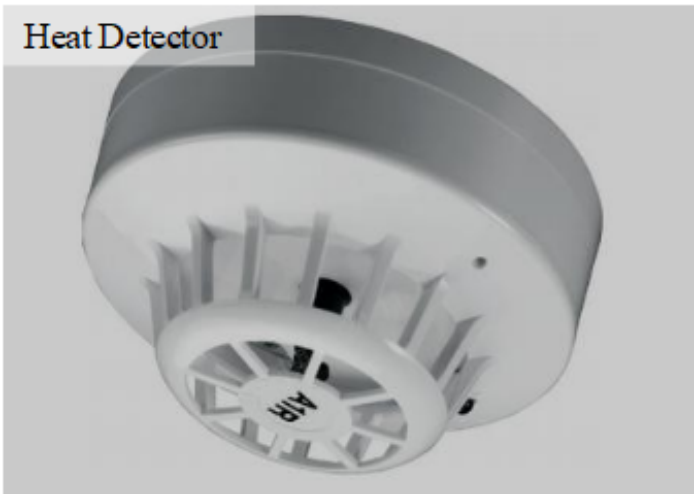
Step	Operation Guidance Descriptions
1	Disconnect all Comm Signal Cables from the EPO wiring panel. It is recommended to wrap all terminals with insulating materials (e.g., heat shrink tubing) for protection. Note: Before operation, you must ensure the CESS Cabinet’ s power supply has been cut off in advance, and the Cabinet is left standing for at least 15 mins under the power-off condition.
2	The EPO button consists of upper and lower parts. Hold the lower (wiring) part of the button with one hand, and rotate the upper triggering structure counterclockwise to release the fixed connection between the two parts.

8.4.5.2. Installation Guidance

Step	Operation Guidance Descriptions
1	The EPO button consists of upper and lower parts. Install the button part on the outside of the Cabinet door and the lower part on the inside. Fix one end, then rotate the other end clockwise to secure the connection between the two parts.
2	Connect all Comm Signal Cables to the EPO wiring interface in the original sequence.
3	Professional electrical technicians shall use a multimeter to test whether the working conditions of NO (Normally Open) and NC (Normally Closed) contacts meet the functional specifications under the two operating conditions (triggered/released) of the EPO, in accordance with the original functional definitions.

8.5. FSS Maintenance

8.5.1. Smoke and Heat Detection Device Maintenance



Step	Operation Guidance Descriptions
1	Visual Inspection - Verify that the detector's open sampling housing is free of foreign object obstruction, adhesion, or blockage.
2	Manual Inspection - When the BESS System is in standby state, use a smoke generator and a hot air generator to perform a trigger test on the detector.

	According to the fire protection logic, the PEMS System shall issue a shutdown protection command at this time.
3	Manual Inspection - Confirm the detector is securely installed on its base.

8.5.1.1. Removal Guidance

Step	Operation Guidance Descriptions
1	Disassembly of Detector, Cut off the detector’ s power supply. Rotate the detector counterclockwise to remove it from the base. Note: Before operation, you must ensure the power supply has been cut off in advance, and left standing for at least 15 minutes under the power-off condition.
2	Store the removed detector properly and do not discard it randomly.

8.5.1.2. Installation Guidance

Step	Operation Guidance Descriptions
1	Remove the plastic protective cover from the detector's housing.
2	Align the contact reeds at the bottom of the detector with those on the base, then rotate clockwise until the click sound of the bayonet locking into place is heard.

8.5.2. Aerosol Fire Extinguishing Module Maintenance

8.5.2.1. Aerosol Module Maintenance

Step	Operation Guidance Descriptions
1	Visual Inspection - Confirm the aerosol module’ s technical housing is free of damage and rust, and the thermal detection wires/electrical activation

	wires are undamaged.
2	Visual Inspection - Ensure the fastening bolts are secure without loosening.
3	Visual Inspection - Verify the aerosol module’ s discharge port is free of foreign object obstruction or blockage.

8.5.2.2. Removal Guidance

Step	Operation Guidance Descriptions
1	Disconnect the electrical trigger wires. It is recommended to wrap the electrical trigger wire terminals and thermal detection wire terminals with insulating materials (e.g., heat shrink tubing) for protection. Please note: Before operation, you must ensure the power supply has been cut off in advance, and the Cabinet is left standing for at least 15 minutes under the power-off condition.
2	Remove the fastening bolts and nuts of the aerosol module.
3	Store the aerosol module properly and dispose of it in accordance with local laws and regulations.

8.5.2.3. Installation1 Guidance

Step	Operation Guidance Descriptions
1	Fasten the aerosol module to the Cabinet using bolts and nuts, and mark tightening marks with a marker. Note: Visually inspect the previously removed bolts and nuts to ensure there is no thread damage or stress-induced structural damage. If any damage is found, replace them with new standard parts of the same specification.
2	Connect the electrical trigger wires in the original wiring sequence, ensuring secure connections without loosening.
3	Fix the thermal detection wires in their original positions.

4	Professional electrical technicians shall use a multimeter to measure and ensure there are no short circuits between the electrical trigger wire loops.

8.6. Precautions and Handling at Thermal Runaway Scenarios

Step	Operation Guidance Descriptions
1	**Personnel Safety First**: Evacuate all on-site personnel immediately, establish a safety isolation zone (minimum 10-meter radius), and prohibit unauthorized entry to avoid exposure to aerosol residues or potential secondary hazards (e.g., electrical shock, toxic gas inhalation).
2	**System Shutdown & Isolation**: Cut off the cabinet's AC and DC power supply, disconnect the DC busbar and MSD (Manual Service Disconnect), and ensure the system is completely de-energized with a 15-minute standby period for residual electricity discharge.
3	**Status Confirmation**: Verify the aerosol module’ s discharge status via the EMS (Energy Management System) or on-site visual inspection (e.g., activation indicator change, residue around the discharge port).
4	**Ventilation & Residue Protection**: Ventilate the cabinet and surrounding area for at least 30 minutes (natural or mechanical ventilation) to disperse residual aerosols. Wear PPE (personal protective equipment: gloves, goggles, dust mask) when entering the isolation zone.
5	**Preliminary Cleanup**: Remove loose aerosol residues (alkaline or neutral particles) from the cabinet surface using dry wipes (avoid water to prevent electrical component short circuits).

9. Troubleshooting Scheme

When operational alarm messages are pushed on the PEMS main interface, preliminary alarm identification and diagnosis can be conducted in accordance with the following list. For detailed information, please consult professional system engineers and technicians.

Common Fault for Battery System

No.	Fault or Alarm description	Possible cause	Troubleshooting scheme
1	Cell Individual Voltage High Level 3 Alarm	The battery cell voltage is excessively high, exceeding the Level 3 alarm threshold	Automatically cleared when thevoltage drops below the Level 1threshold.
	Cell Individual Voltage High Level 2 Alarm	The battery cell voltage is excessively high, exceeding the Level 2 alarm threshold	After the alarm is cleared, charging inhibition can be lifted if any of the following conditionsis met: Condition 1: The system discharges 2% of the battery s nominal capacity; Condition 2: The system remains in standstill for 24 hours.
	Cell Individual Voltage High Level 1 Alarm	The battery cell voltage is excessively high, exceeding the Level 1 alarm threshold	After the alarm is cleared, the shutdown is released, and the battery stack status returns to normal once all cluster contactors are closed.
2	Cell Individual Voltage Low Level 3 Alarm	The battery cell voltage is excessively low, falling below the Level 3 alarm threshold	Automatically cleared when thevoltage rises above the Level 1 threshold.
	Cell Individual Voltage Low Level 2 Alarm	The battery cell voltage is excessively low, falling below the Level 2 alarm threshold	After the alarm is cleared, discharging inhibition can be lifted if the following condition ismet: Condition 1: The system charges 2% of the battery s nominal capacity.
	Cell Individual Voltage Low Level 1 Alarm	The battery cell voltage is excessively low, falling below the Level 1 alarm threshold	After the alarm is cleared, the shutdown is released, and the battery stack status returns to normal once all cluster contactors are closed.
3	Battery Cluster Total Voltage High Level 3 Alarm	The total voltage of the battery cluster is excessively high, exceeding the Level 3 alarm threshold	Automatically cleared when the voltage drops below the Level 1 threshold.

	Battery Cluster Total Voltage High Level 2 Alarm	The total voltage of the battery cluster is excessively high, exceeding the Level 2 alarm threshold	After the alarm is cleared, charging inhibition can be lifted if any of the following conditionsis met: Condition 1: The system discharges 2% of the battery's nominal capacity; Condition 2: The system remains in standstill for 24 hours.
	Battery Cluster Total Voltage High Level 1 Alarm	The total voltage of the battery cluster isexcessively high, exceeding the Level 1 alarm threshold	After the alarm is cleared, the shutdown is released, and the battery stack status returns to normal once all cluster contactors are closed.
4	Battery Cluster Total Voltage Low Level 3 Alarm	The total voltage of the battery cluster isexcessively low, falling below the Level 3 alarm threshold	Automatically cleared when thevoltage rises above the Level 1 threshold.
	Battery Cluster Total Voltage Low Level 2 Alarm	The total voltage of the battery cluster isexcessively low, falling below the Level 2 alarm threshold	After the alarm is cleared, discharging inhibition can be lifted if the following condition ismet: Condition 1: The system charges 2% of the battery's nominal capacity.
	Battery Cluster Total Voltage Low Level 1 Alarm	The total voltage of the battery cluster isexcessively low, falling below the Level 1 alarm threshold	After the alarm is cleared, the shutdown is released, and the battery stack status returns to normal once all cluster contactors are closed.
5	Battery Discharge Overcurrent Level 3 Alarm	The battery discharge current is excessively high, exceeding the Level 3 alarm threshold	Automatically cleared when the discharge current drops below the Level 1 alarm threshold.
	Battery Discharge Overcurrent Level 2 Alarm	The battery discharge current is excessively high, exceeding the Level 2alarm threshold	Automatically cleared when the discharge current drops below theLevel 2 alarm threshold, and the execution of the Discharging Inhibition Protection Strategy is ceased.
	Battery Discharge Overcurrent Level 1 Alarm	The battery discharge current is excessively high, exceeding the Level 1alarm threshold **Note: For Level 2 and Level 1 alarms,if triggered 3 times within**	Automatically cleared when the discharge current drops below theLevel 3 alarm threshold; the execution of the Discharging Inhibition

		24 hours, the discharge overcurrent alarm status will be locked, and 1 minute of charging is required to resume normal operation.	Protection Strategy is ceased, and the battery cluster status returns to normal after the HV BCCB Contactor is reclosed.
6	Battery Charge Overcurrent Level 3 Alarm	The battery charge current is excessively high, exceeding the Level 3 alarm threshold	Automatically cleared when the charge current drops below the Level 3 alarm threshold.
	Battery Charge Overcurrent Level 2 Alarm	The battery charge current is excessively high, exceeding the Level 2 alarm threshold	Automatically cleared when the charge current drops below the Level 2 alarm threshold, and the execution of the Charging Inhibition Protection Strategy is ceased.
	Battery Charge Overcurrent Level 1 Alarm	The battery charge current is excessively high, exceeding the Level 1 alarm threshold **Note: For Level 2 and Level 1 alarms, if triggered 3 times within 24 hours, the charge overcurrent alarm status will be locked, and 1 minute of discharging is required to resume normal operation.**	Automatically cleared when the charge current drops below the Level 1 alarm threshold; the execution of the Charging Inhibition Protection Strategy is ceased, and the battery cluster status returns to normal after the HV BCCB Contactors are reclosed.
7	Cell Discharge Temperature High Level 3 Alarm	The maximum individual cell temperature is excessively high during discharge, exceeding the Level 3 alarm threshold	Automatically cleared when the maximum individual cell temperature drops below the Level 3 alarm threshold.
	Cell Discharge Temperature High Level 2 Alarm	The maximum individual cell temperature is excessively high during discharge, exceeding the Level 2 alarm threshold	Automatically cleared when the maximum individual cell temperature drops below the Level 2 alarm threshold, and the execution of the Discharging Inhibition Protection Strategy is ceased.
	Cell Discharge Temperature High Level 1 Alarm	The maximum individual cell temperature is excessively high during discharge, exceeding the Level 1 alarm threshold	Automatically cleared when the maximum individual cell temperature drops below the Level 1 alarm threshold, and the battery cluster status returns to normal after the HV BCCB Contactors are reclosed.
8	Cell Charge Temperature High	The maximum individual cell temperature is excessively high	Automatically cleared when the maximum individual cell

	Level 3 Alarm	during charging, exceeding the Level 3 alarm threshold	temperature drops below the Level 3 alarm threshold.
	Cell Charge Temperature High Level 2 Alarm	The maximum individual cell temperature is excessively high during charging, exceeding the Level 2 alarm threshold	Automatically cleared when the maximum individual cell temperature drops below the Level 2 alarm threshold, and the execution of the Charging Inhibition Protection Strategy is ceased.
	Cell Charge Temperature HighLevel 1 Alarm	The maximum individual cell temperature is excessively high during charging, exceeding the Level 1 alarm threshold	Automatically cleared when the maximum individual cell temperature drops below the Level 1 alarm threshold, and the battery cluster status returns to normal after the HV BCCB Contactors are reclosed.
9	Cell Discharge Temperature Low Level 3 Alarm	The minimum individual cell temperature is excessively low during discharge, falling below the Level 3 alarm threshold	Automatically cleared when the minimum individual cell temperature rises above the Level 3 alarm threshold.
	Cell Discharge Temperature Low Level 2 Alarm	The minimum individual cell temperature is excessively low during discharge, falling below the Level 2 alarm threshold	Automatically cleared when the minimum individual cell temperature rises above the Level 3 alarm threshold, and the execution of the Discharging Inhibition Protection Strategy is ceased.
	Cell Discharge Temperature Low Level 1 Alarm	The minimum individual cell temperature is excessively low during discharge, falling below the Level 1 alarm threshold	Automatically cleared when the maximum individual cell temperature rises above the Level 1 alarm threshold, and the battery cluster status returns to normal after the HV BCCB Contactors are reclosed.
10	Cell Charge Temperature Low Level 3 Alarm	The minimum individual cell temperature is excessively low during charging, falling below the Level 3 alarm threshold	Automatically cleared when the minimum individual cell temperature rises above the Level 3 alarm threshold.
	Cell Charge Temperature Low Level 2 Alarm	The minimum individual cell temperature is excessively low during charging, falling below the Level 2 alarm threshold	Automatically cleared when the minimum individual cell temperature rises above the Level 3 alarm threshold, and the execution of the

			Discharging Inhibition Protection Strategy is ceased.
	Cell Charge Temperature Low Level 1 Alarm	The minimum individual cell temperature is excessively low during charging, falling below the Level 1 alarm threshold	Automatically cleared when the maximum individual cell temperature rises above the Level 1 alarm threshold, and the battery cluster status returns to normal after the HV BCCB Contactors are reclosed.
11	Cell Individual Voltage Difference Excessive Level 3 Alarm	The difference between the maximum and minimum individual cell voltages exceeds the Level 3 alarm threshold	Automatically cleared when the difference between the maximum and minimum individual cell voltages drops below the Level 3 alarm threshold.
	Cell Individual Voltage Difference Excessive Level 2 Alarm	The difference between the maximum and minimum individual cell voltages exceeds the Level 2 alarm threshold	Automatically cleared when the difference between the maximum and minimum individual cell voltages drops below the Level 2 alarm threshold, and the system resumes operation from standby mode.
	Cell Individual Voltage Difference Excessive Level 1 Alarm	The difference between the maximum and minimum individual cell voltages exceeds the Level 1 alarm threshold	Automatically cleared when the difference between the maximum and minimum individual cell voltages drops below the Level 1 alarm threshold, and the battery cluster status returns to normal after the HV BCCB Contactor is reclosed.
12	Cell Individual Temperature Difference Excessive Level 3 Alarm	The difference between the maximum and minimum individual cell temperatures exceeds the Level 3 alarm threshold	Automatically cleared when the difference between the maximum and minimum individual cell temperatures drops below the Level 3 alarm threshold.
	Cell Individual Temperature Difference Excessive Level 2 Alarm	The difference between the maximum and minimum individual cell temperatures exceeds the Level 2 alarm threshold	Automatically cleared when the difference between the maximum and minimum individual cell temperatures

			drops below the Level 2 alarm threshold, and the system resumes operation from standby mode.
	Cell Individual Temperature Difference Excessive Level 1 Alarm	The difference between the maximum and minimum individual cell temperatures exceeds the Level 1 alarm threshold	Automatically cleared when the difference between the maximum and minimum individual cell temperatures drops below the Level 1 alarm threshold, and the battery cluster status returns to normal after the HV BCCB Contactors are reclosed.
13	HV BCCB Temperature High Level 3 Alarm	The operating temperature of the High Voltage Battery Cluster Control Box exceeds the Level 3 alarm threshold	Automatically cleared when the operating temperature of the High Voltage Battery Cluster Control Box drops below the Level 3 alarm threshold.
	HV BCCB Temperature High Level 2 Alarm	The operating temperature of the High Voltage Battery Cluster Control Box exceeds the Level 2 alarm threshold	Automatically cleared when the operating temperature of the High Voltage Battery Cluster Control Box drops below the Level 2 alarm threshold, and the system resumes operation from standby mode.
	HV BCCB Temperature High Level 1 Alarm	The operating temperature of the High Voltage Battery Cluster Control Box exceeds the Level 1 alarm threshold	Automatically cleared when the operating temperature of the High Voltage Battery Cluster Control Box drops below the Level 1 alarm threshold, and the battery cluster status returns to normal after the High Voltage Battery Cluster Control Box Contactors are reclosed.
14	Battery Cluster Tnsulation Low Level 3 Alarm	The insulation detection value of the battery cluster falls below the Level 3 alarm threshold	Automatically cleared when the insulation detection value of the battery cluster rises above the Level 3 alarm threshold.

	Battery Cluster Tnsulation Low Level 2 Alarm	The insulation detection value of the battery cluster falls below the Level 2 alarm threshold	Automatically cleared when the insulation detection value of the battery cluster rises above the Level 2 alarm threshold, and the system resumes operation from standby mode.
	Battery Cluster Tnsulation Low Level 1 Alarm	The insulation detection value of the battery cluster falls below the Level 1 alarm threshold	Automatically cleared when the insulation detection value of the battery cluster rises above the Level 1 alarm threshold, and the battery cluster status returns to normal after the High Voltage Battery Cluster Control Box Contactors are reclosed.
15	BMU Self-Test Fault	Slave controller initialization fault; sampling chip fault; voltage sampling fault; temperature sampling fault; slave controller EEPROM fault; sampling line disconnection fault	After troubleshooting the corresponding fault and clearing the alarm, the battery cluster status returns to normal once the High Voltage Battery Cluster Control Box Contactors are reclosed.
16	Fuse Fault	The DC fuse of the High Voltage Battery Cluster Control Box might be faulty	Attempt to perform a shutdown followed by a startup operation on the system. If the fault persists, contact professional engineers for troubleshooting assistance.
17	Contactor Fault	The DC bus contactor of the HV BCCB might be faulty	Attempt to perform a shutdown followed by a startup operation on the system. If the fault persists, contact professional engineers for troubleshooting assistance.
18	BMU Communication Fault	Communication failure may exist between the BMU and SBMU/CMU	Check the connection of the communication line between the HV BCCB and the battery pack. Attempt to perform a shutdown followed by a startup operation on the system. If the fault persists, contact professional engineers for

			troubleshooting assistance.

Common Fault for System

No.	Alarm Description	Triggering condition	Protection Measure	Reset Condition
1	Fire Alarm (Smoke Detection)	Smoke detector detects smoke	EMS issues an emergency shutdown protection command	Eliminate the smoke source, ventilate the cabinet to expel smoke, then restart the CESS System.
2	Fire Alarm (Temperature Detection)	Heat detector detects a heat source	EMS issues an emergency shutdown protection command	Eliminate the heat source, ventilate the cabinet to cool down, then restart the CESS System.
3	Fire Suppression Discharge Alarm	Aerosol fire suppression module discharges	EMS issues an emergency shutdown protection command.	/
4	Water Ingress Alarm	Water ingress detector detects liquid infiltration	EMS issues an emergency shutdown protection command	Remove the infiltrated liquid from the Cabinet, wipe the water ingress detector clean, then restart the CESS System.
5	EPO Triggered Alarm	Emergency shutdown is executed	System shutdown protection is activated	Reset the EPO button, then restart the CESS System.
6	SPD Triggered Alarm	SPD module fails after executing protection	EMS issues an emergency shutdown protection command	Replace the SPD protection module, then restart the CESS System.
7	PCS Communication Fault Alarm	A communication functional failure occurs between the EMS and PCS	PCS activates automatic shutdown protection	Restore communication between the EMS and PCS
8	BMS Communication Fault Alarm	A communication functional failure occurs between the EMS and BMS	EMS issues a PCS shutdown protection command	Restore communication between the EMS and BMS
9	Liquid Cooling Unit Communication Alarm	A communication functional failure occurs between the EMS and TMS (Thermal Management System)	EMS issues a PCS shutdown protection command	Restore communication between the EMS and TMS.

10. After-sales Service

After-sales service for this battery energy storage system is provided through the manufacturer and its authorized distributors to ensure reliable operation during the product lifecycle.

Warranty

The system is covered by a limited warranty in accordance with the terms and conditions agreed at the time of purchase:

a) Improper transportation, handling or delivery is excluded from liability.

b) Damage to the product, accessories or packaging resulting from improper storage prior to installation.

c) Failure to comply with the safety regulations for the product or its accessories.

d) Failure to follow the product and maintenance guidelines specified in the official product manuals, relevant installation documents and maintenance instructions for the product or its accessories.

e) Improper installation or commissioning of the product or its accessories.

f) Misuse or abuse of the product or its accessories, or use beyond the allowable scope specified in the Manual (including accidental incidents and external factors beyond control, such as excessively high or low installation temperature, high altitude, unstable (over)voltage or current, DC overload exceeding allowable limits, etc.).

g) Unauthorized repair, modification or disassembly of the product or its accessories without prior approval.

h) Stolen equipment.

i) Product damage arising from other parts of the system (e.g., voltage surges from the photovoltaic array (DC side) or power grid (AC side)).

j) Natural disasters and/or force majeure events, such as war, criminal acts, natural disasters (e.g., lightning strikes, floods, storms, fires, etc.).

k) Insufficient ventilation or poor airflow for the equipment, and operation outside the operating temperature range specified in the Manual.

l) Defects that do not affect the normal operation of the product or its accessories (e.g., cosmetic blemishes, wear and tear, and aging).

m) Corrosion caused by exposure to corrosive atmospheres or environmental conditions outside the designed scope.

n) Failure to comply with applicable safety regulations (e.g., UL, CSA, VDE, IEC, etc.).

o) The product's serial number has been removed, tampered with or altered, or is not clearly identifiable.

p) If applicable, the customer fails to provide proof that maintenance has been performed in accordance with the Manual within the applicable warranty period.

The warranty applies to manufacturing defects under normal operating conditions.

Specific warranty periods and coverage details may vary depending on the project, configuration, and local distributor agreement.

Technical Support

Technical support is provided by the manufacturer or authorized distributor.

Support may include remote assistance for system operation, basic troubleshooting, and software-related guidance when required.

Service Handling

In case of a fault or abnormal operation, the customer should first contact the local distributor or service partner.

The manufacturer will provide technical support and coordination when necessary.

Spare Parts & Replacement

Spare parts support is arranged through the manufacturer or authorized distributors.

Replacement of components due to confirmed product-related issues will be handled according to the applicable warranty terms.

Software & Updates

Software and firmware updates may be released by the manufacturer to improve system performance or compatibility.

Update availability and implementation depend on project conditions and local service arrangements.

Customer Responsibilities

To ensure effective after-sales service, the customer shall:

Operate and maintain the system in accordance with this manual and applicable standards.

Ensure proper installation environment, routine inspection, and maintenance.

Provide timely and accurate fault information and allow remote system access for diagnostics.

For detailed after-sales arrangements, please refer to the sales contract or local distributor agreements.

11. Appendix

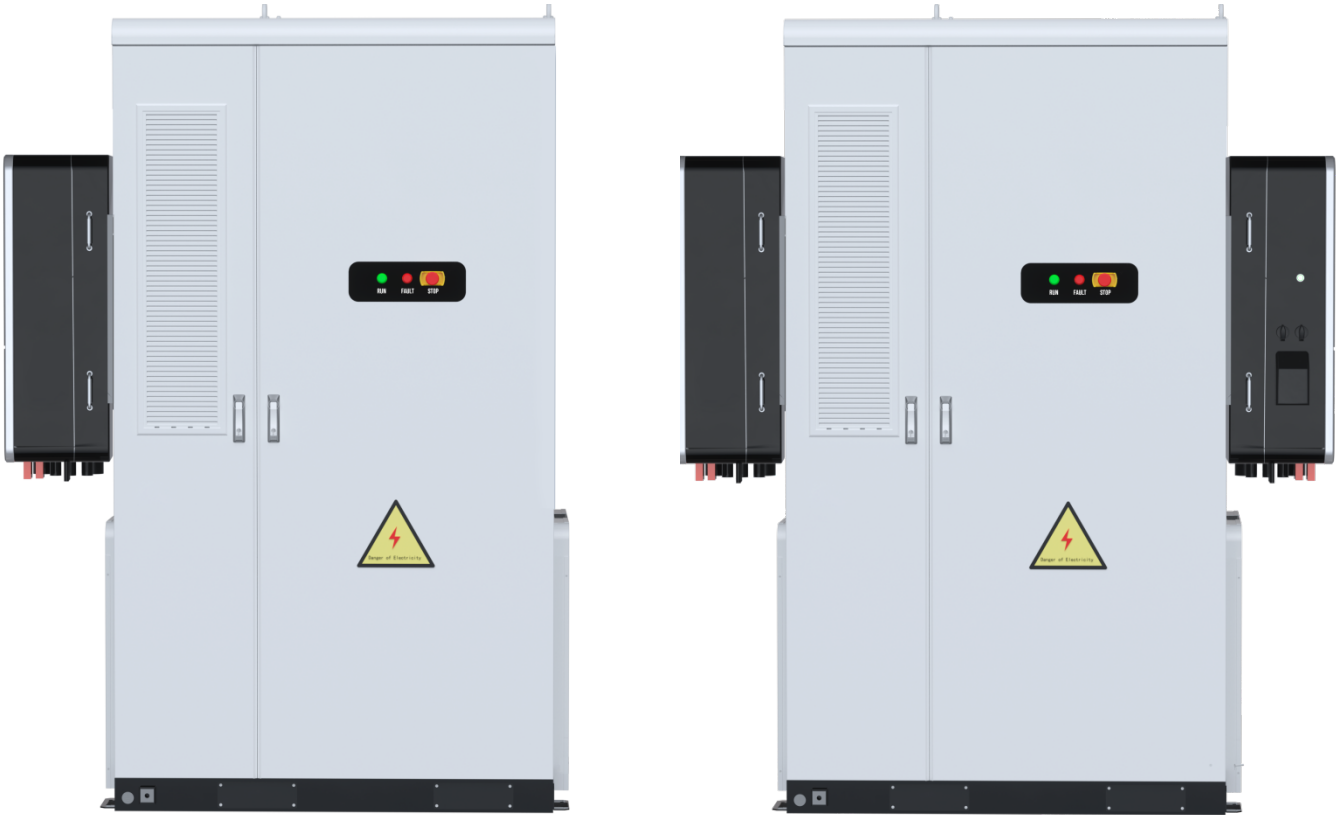
Record List for Routine Operation

Record list for Routine Operation						
Date	Description	Type	Location	Reasons and solutions	Status	Maintenance Operator

Wiring Method for Inverter Connection

For the 261kWh system application scenario:

When the rated capacity of the BESS is 261kWh, a single battery cluster (1P260S) supports outputting 1 channel of DC bus and 1 channel of BMS communication. It can be connected to the battery interface and communication interface of 1 inverter (connected to the DC side of 1 PCS).



2 scales of liquid cooling BESS system

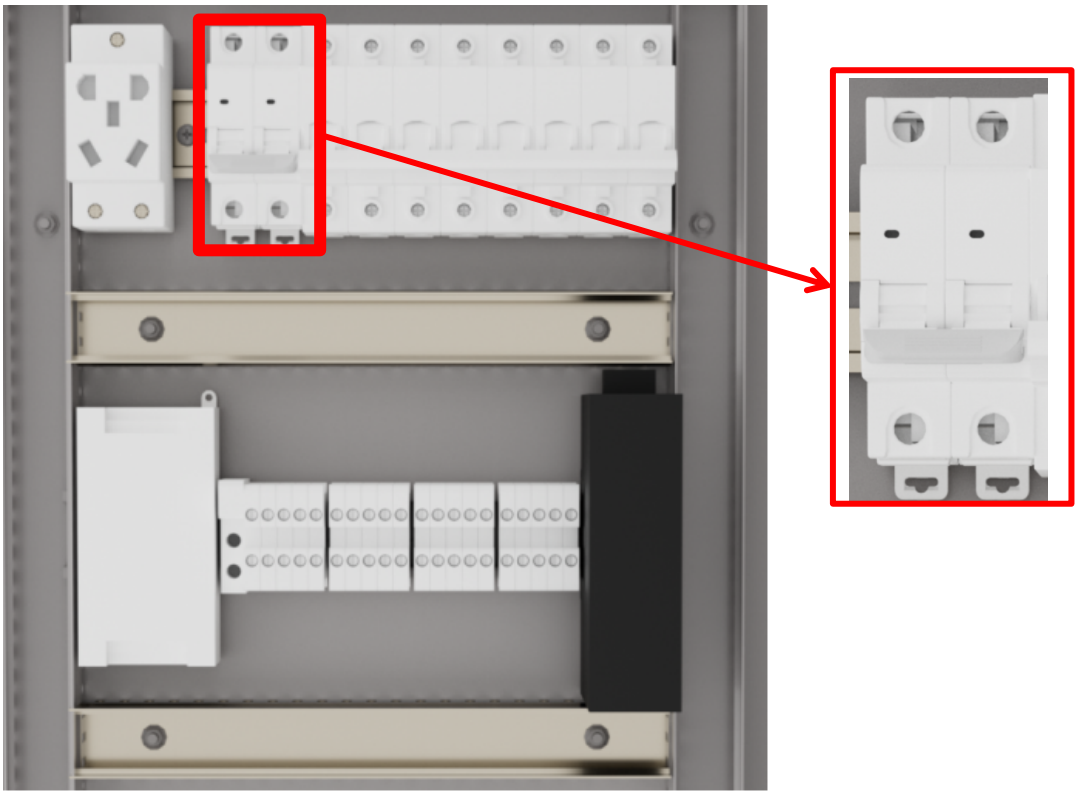
For the 418kWh system application scenarios:

When the rated capacity of the BESS is 418kWh, two battery clusters (2P208S) support independently outputting 2 channels of DC bus and 2 channels of BMS communication, with two connection methods available:

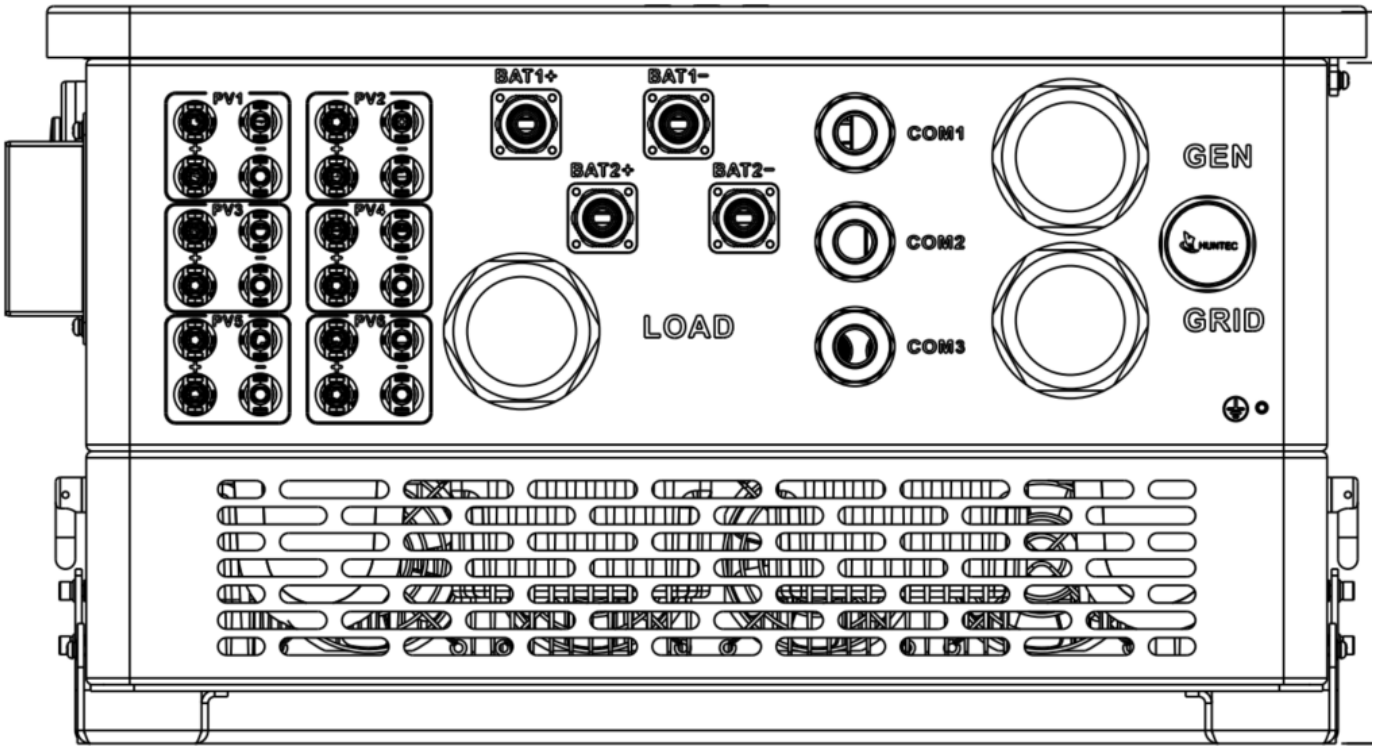
Option 1: The two battery clusters are respectively connected to Battery Interface 1 / Battery Interface 2 and Communication Interface 1 / Communication Interface 2 of 1 inverter.

Option 2: The HV BCCBs of the two battery clusters are respectively connected to the battery interfaces and communication interfaces of 2 inverters.

HV BCCB



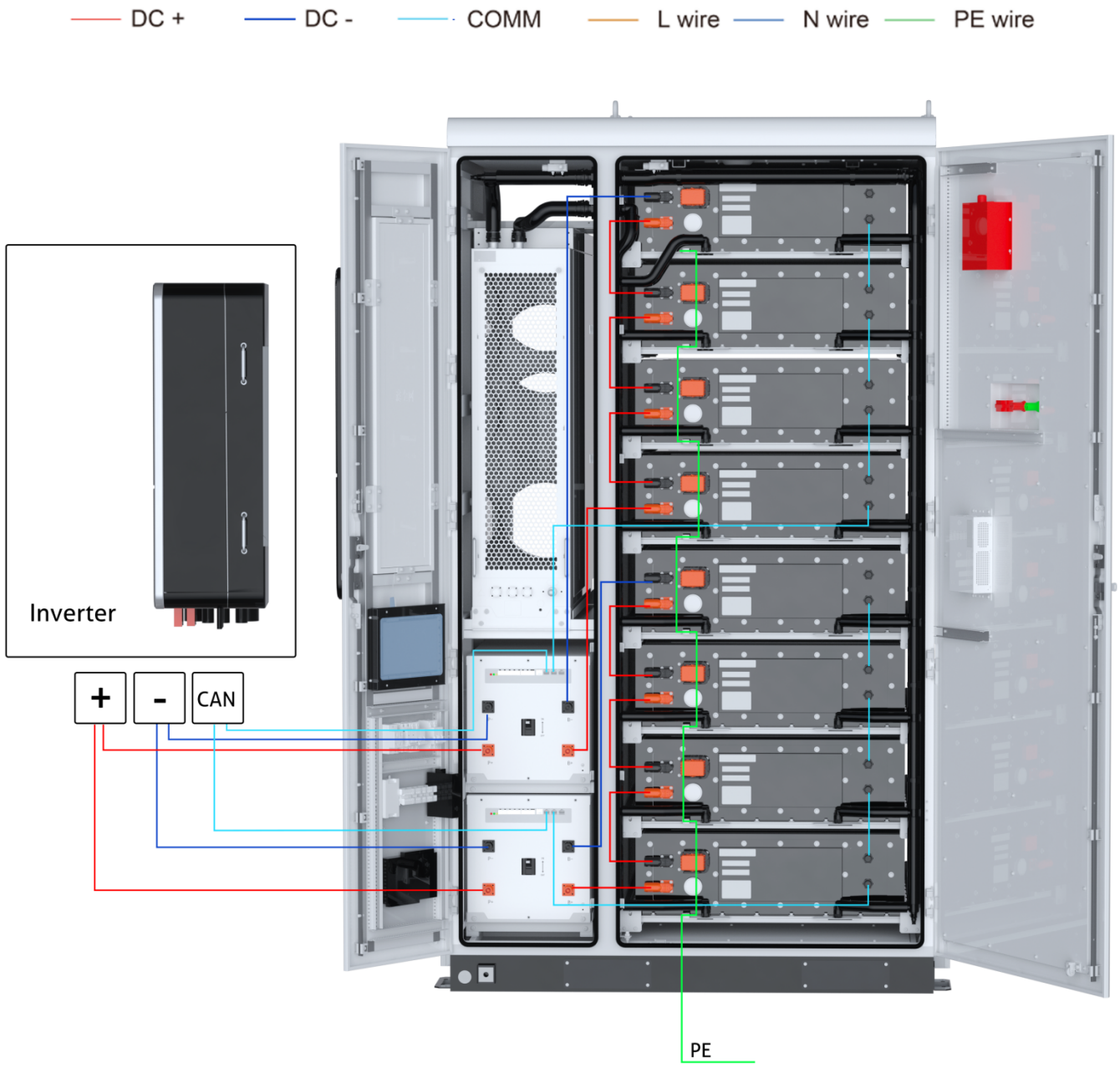
QF1

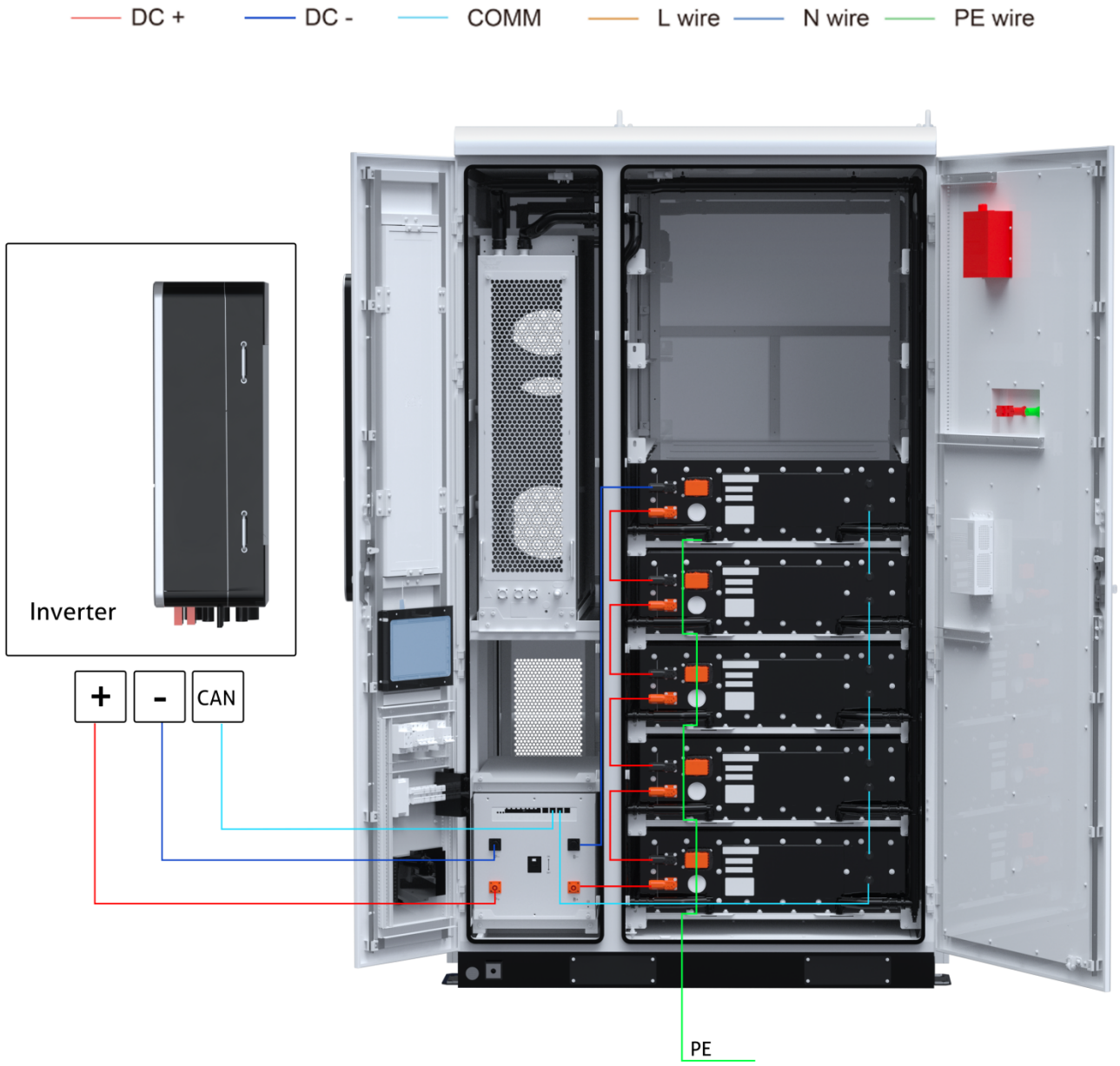


The Wiring Interfaces for BESS-R261K and 80kW Inverter *1			
No	**Interface at HV BCCB**	**Interface at Inverter**	
1	P+	BAT1+/ BAT2+	
2	P-	BAT1-/ BAT2-	
3	PCS	BMS1/ BMS2	
-	**Interface at AC APDU**	**Interface at Inverter**	**External PDU**
1	QF1 (L/ N)	LOAD (L/ N) (Optional)	L / N

The Wiring Interfaces for BESS-R418K and 80kW Inverter *2			
No	**Interface at HV BCCB 1#**	**Interface at Inverter 1#**	
1	P+	BAT1+	
2	P-	BAT1-	
3	PCS	BMS1	
-	**Interface at HV BCCB 2#**	**Interface at Inverter 2#**	
1	P+	BAT1+	
2	P-	BAT1-	
3	PCS	BMS1	
-	**Interface at AC APDU**	**Interface at Inverter 1# or 2#**	**External PDU**
1	QF1 (L/ N)	LOAD (L/ N) (Optional)	L / N
The Wiring Interfaces for BESS-R418K and 80kW Inverter *1			
-	**Interface at HV BCCB 1#**	**Interface at Inverter**	
1	P+	BAT1+	
2	P-	BAT1-	
3	PCS	BMS1	
-	**Interface at HV BCCB 2#**	**Interface at Inverter**	
1	P+	BAT2+	
2	P-	BAT2-	

3	PCS	BMS2	
-	**Interface at AC APDU**	**Interface at Inverter**	**External PDU**
1	QF1 (L/ N)	LOAD (L/ N) (Optional)	L / N




DC +
DC -
COMM
L wire
N wire
PE wire
Inverter
+
-
CAN
PE