USER MANUAL

P3794L1H-B

ENERGY FOR LIFE

IMPORTANT NOTICE

CAUTION

READ THIS MANUAL BEFORE PERFORMING ANY INSTALLATION ACTION!

IF YOU HAVE ANY UNCERTAINTY REGARDING THE CONTENT OF THIS MANUAL, PLEASE CONTACT ZOE FOR ADVICE OR CLARIFICATION.

IMPORTANT

KEEP THIS MANUAL IN A SECURE PLACE FOR FUTURE REFERENCES!

CAUTION

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THIS DOCUMENTATION IS SUBJECT TO CHANGES WITHOUT PRIOR NOTICE.

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1 ACRONYMS AND DEFINITIONS

1	AC	Alternating Current
2	Ah	Amp-hour
3	BCP	Battery Connection Panel
4	BESS	Battery Energy Storage System
5	BMS	Battery Management System
6	BMU	Battery Management Unit
7	BOL	Beginning of Life
8	BOP	Balance of Plant
9	BOS	Balance of System
10	BSPU	Battery Safety and Protection Unit
11	EMS	Energy Management System
12	EOL	End of Life
13	ESS	Energy Storage System
14	DC	Direct Current
15	FSS	Fire Suppression System
16	GSC	Golden Shield Controller
17	HMI	Human Machine Interface
18	HV	High Voltage
19	HVAC	Heating & Ventilation and HVAC
20	IP	Ingress Protection
21	kV	Kilovolt
22	kW	Kilowatt
23	MV	Medium Voltage
24	MW	Megawatt
25	MWh	Megawatt-hour
26	MVA	Mega Volt-Amps
27	MVAr	Mega Volt Amps (reactive)
28	NMC	NiMnCo

29	OSD	Overcharge Safety Device
30	O&M	Operation and Maintenance
31	PCS	Power Conversion System
32	PPA	Power Purchase Agreement
33	PPE	Personal Protective Equipment
34	RMU	Ring Main Unit
35	RTU	Remote Terminal Unit
36	SCADA	Supervisory Control and Data Acquisition
37	SOC	State of Charge
38	SOH	State of Health
39	SPDs	Surge Protection Devices
40	ZOE	Shanghai ZOE Energy Storage Technology Co.,
41	TCP	LTDTransmission Control Protocol
42	UPS	Uninterruptable Power Supply

2 ABOUT THIS MANUAL

2.1 APPLICABLE PRODUCT

This document mainly describes the installation, electrical connection, debugging, maintenance and troubleshooting methods of the following models of battery containers ("Product").

- P3794L1H-B

Before installing or using the product, read this document carefully to obtain the safety information and be familiar with the functions and features of the product. If you have any questions about the contents of this manual, please contact ZOE for advice or clarification.

2.2 TARGET GROUP

This manual is intended for:

- Installation and maintenance personnel
- Users

2.3 LEVELS OF SAFETY INSTRUCTIONS

To ensure personal and property safety in using the system or to use the system efficiently, this manual provides relevant instructions that are highlighted by corresponding symbols. Read the following symbols carefully, as they indicate levels of safety warnings and are used everywhere in this manual.

To ensure the safety of personnel and property, please carefully read all safety instructions in this document before the installation.

	DANGER

FAIL TO FOLLOW THE INSTRUCTION WITH THIS SYMBOL MAY RESULT IN A FATAL ACCIDENT, SEVERE INJURY, EVEN DEATH!

WARNING

INDICATES A HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN INJURY OR DEATH.

CAUTION

INDICATES A HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN MINOR INJURY OR DAMAGE TO THE EQUIPMENT.

IMPORTANT

INFORMATION WHICH CONSIDERED IMPORTANT BUT NOT HAZARD-RELATED. FAIL TO FOLLOW THE INSTRUCTION WITH THIS SYMBOL MAY RESULT IN EQUIPMENT DAMAGE!

IMPORTANT

INDICATES AN IMPORTANT STEP OR TIP THAT LEADS TO BEST RESULTS, BUT IS NOT SAFETY OR DAMAGE RELATED.

2.4 SYMBOLS ON THE PRODUCT

HAZARDOUS VOLTAGE, RISK OF ELECTRIC SHOCK OR BURN. AUTHORIZED PERSONNEL ONLY.

OPEN THE DOOR.

CLOSE THE DOOR.

GROUNDING.

DANGER, BE CAREFUL WHEN HANDLING THE BATTERIES.

RECHARGEABLE BATTERIES, CANNOT DISPOSE OF IN THE HOUSEHOLD WASTE.

DO NOT DAMAGE THE BATTERIES IN SUCH A WAY AS DROP, DEFORM, IMPACT, CUT, OR SPEARING OBJECT.

NO SMOKING, NO OPEN FLAME, EMBERS, OR SPARKS NEARBY THE BATTERY, TO AVOID RISK OF FIRE OR EXPLOSION.

KEEP OUT OF REACH OF YOUNG CHILDREN PETS, OR ANIMALS.

HEAVYWEIGHT, SINGLE-PERSON LIFT COULD CAUSE INJURY. USE ASSISTANCE WHEN MOVING OR LIFTING.

ELECTROLYTE IS HIGHLY CORROSIVE.

METAL PARTS OF THE BATTERY CELL ARE ALWAYS LIVE. NEVER PLACE FOREIGN OBJECTS OR TOOLS ON THE BATTERY.

OBSERVE INSTALLATION AND OPERATION INSTRUCTIONS IN THE MANUALS BEFORE WORKING ON THE BATTERIES.

WEAR EYE PROTECTION AND PROTECTIVE CLOTHING WHEN WORKING WITH BATTERIES. OBSERVER ACCIDENT-PREVENTION REGULATIONS.

WEAR PROTECTIVE GLOVES AND CLOTHING WHEN WORKING WITH BATTERIES.

PREPARE FIRST-AID BEFORE WORKING WITH BATTERIES.

WHEN ELECTROLYTES LEAK OUT, AVOID CONTACTING WITH EYES, SKIN, OR CLOTHES. IN EVENTS OF ACCIDENTS, FLUSH WITH WATER AND GET MEDICAL HELP IMMEDIATELY.

RECYCLABLE.

3 SAFETY GUIDELINES

WARNING

SAFETY FIRST! ALWAYS OBSERVE AND FOLLOW SAFETY INSTRUCTIONS!

3.1 GENERAL PRECAUTIONS

When installing, operating, and maintaining the equipment, read this manual and follow the labels on the equipment and all safety precautions in this manual.

The "Danger", "Warning", "Caution" and "Important" in this manual do not represent all the safety precautions to be followed, but only serve as a supplement to the safety precautions. ZOE is not responsible for any breach of safe operation requirements or safet y standards for design, manufacture, and use of the equipment.

The product should be used in an environment that meets the design requirements. Otherwise, the equipment may fail, and the resulting equipment function abnormalities, component damage, personal safety accidents, and property losses are not covered by the quality guarantee.

Comply with local laws and regulations when installing, operating, and maintaining the equipment. The safety precautions in this manual only serve as a supplement to local laws and regulations.

ZOE **is not responsible for any of the following circumstances:**

- Do not operate under the operating conditions described in this manual.
- The installation and operating environment dose not conform to international, state or regional standards.
- Disassemble or modify the product or modify the software code without authorization.
- Do not follow the operation instructions and safety warnings written on the product and in the manual.

- Equipment damage caused by abnormal natural environment (earthquake, fire, storm, flood, debris flow, etc.)
- Damage caused by storage conditions that do not meet product documentation requirements.
- Hardware or data damage caused by negligence, improper operation or intentional destruction of customers.

DANGER

DO NOT INSTALL, USE, OR OPERATE OUTDOOR DEVICES AND CABLES (INCLUDING BUT NOT LIMITED TO HANDLING DEVICES, OPERATING DEVICES AND CABLES, PLUGGING AND UNPLUGGING SIGNAL PORTS CONNECTED TO THE OUTDOORS, WORKING AT HEIGHTS, AND OUTDOOR INSTALLATION) IN SEVERE WEATHER SUCH AS LIGHTNING, RAIN, SNOW, STRONG BREEZE OR WIND OF HIGHER FORCE ON BEAUFORT WIND SCALE.

DANGER

OBSERVE THE REQUIREMENTS OF THIS MANUAL, USE THE CORRECT TOOLS, AND MASTER THE CORRECT METHODS OF USING THE TOOLS.

DANGER

MEASURE THE VOLTAGE AT THE CONTACT POINT BEFORE TOUCHING ANY CONDUCTOR SURFACE OR TERMINAL TO ENSURE THAT THERE IS NO DANGER OF ELECTRIC SHOCK.

DANGER

PAINT SCRATCH IN THE PROCESS OF EQUIPMENT TRANSPORTATION AND INSTALLATION MUST BE REPAIRED IN TIME, AND IT IS STRICTLY FORBIDDEN TO EXPOSE THE SCRATCHED PART TO THE OUTDOOR ENVIRONMENT FOR A LONG TIME.

DANGER

DO NOT CHANGE THE STRUCTURE, INSTALLATION ORDER, ETC. OF THE EQUIPMENT WITHOUT AUTHORIZATION AND PERMISSION UNDER ANY CIRCUMSTANCES

DANGER

IN CASE OF FIRE, EVACUATE THE BUILDING OR EQUIPMENT AREA AND PRESS THE FIRE BELL OR CALL THE FIRE ALARM. UNDER NO CIRCUMSTANCES SHOULD YOU RE-ENTER THE BURNING BUILDING.

DANGER

PLEASE BE AWARE THAT THE BATTERIES PRESENT A RISK OF ELECTRICAL SHOCK INCLUDING A HUGE SHORT-CIRCUIT CURRENT.

DANGER

ARC FLASH HAZARD IS ASSOCIATED WITH BATTERIES. THERE IS A SERIOUS RISK OF ARC FLASH RELATING TO ANY EQUIPMENT MODIFICATION. SERIOUS INJURIES CAN OCCUR IN ARC FLASH INCIDENTS.

WARNING

FIRE MAY OCCUR UNDER CERTAIN FAULT CONDITIONS.

WARNING

REMOVE WATCHES, RINGS, OR OTHER METAL OBJECTS.

WEAR PROPER PPE IN ACCORDANCE WITH LOCAL CODES AND REGULATIONS.

WARNING

USE TOOLS WITH INSULATED HANDLES TO AVOID ACCIDENTAL SHORT-CIRCUIT.

DO NOT PUT TOOLS OR ANY METAL PARTS ON THE TOP OF THE BATTERIES.

WARNING

DO NOT OPEN OR VANDALIZE THE BATTERIES.

WARNING

BATTERIES SHALL BE DISPOSED OF ACCORDING TO THE ZOE RECYCLING POLICY, DISPOSE OF THE BATTERIES IN A FIRE COULD CAUSE AN EXPLOSION.

WARNING

SHARP POINTS AND PINCH POINTS ARE PRESENT ON MOST SYSTEM COMPONENTS. BE AWARE OF THE SERIOUS RISK OF INJURY WHILE WORKING AROUND EQUIPMENT BATTERIES.

CAUTION

COMPONENTS IN THE BATTERY SYSTEM CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE. BE SURE TO WEAR A GROUNDED ANTI-STATIC WRIST STRAP AND TO DISCHARGE STATIC ELECTRICITY BY TOUCHING A GROUNDED SURFACE NEAR THE EQUIPMENT BEFORE YOU TOUCH ANY SYSTEM COMPONENTS.

CAUTION

DAMAGE, MISHANDLING, OR EXPOSURE TO CONDITIONS BEYOND THOSE RECOMMENDED BY ZOE COULD RESULT IN LEAKAGE OF FLAMMABLE GAS , WITH CONSEQUENT HAZARDOUS SITUATIONS ARISING.

CAUTION

WHEN CARRYING OUT TRANSPORTATION, TURNOVER, INSTALLATION, WIRING AND MAINTENANCE AND OTHER OPERATIONS, IT MUST MEET THE LAWS AND REGULATIONS AND RELEVANT STANDARDS OF THE COUNTRY OR REGION WHERE IT IS LOCATED.

CAUTION

IT IS NECESSARY TO OBTAIN THE PERMISSION OF THE POWER DEPARTMENT OF THE COUNTRY OR REGION WHERE IT IS LOCATED TO WORK ON THE GRID.

CAUTION

BE FAMILIAR WITH THE COMPOSITION OF THE ENTIRE ENERGY STORAGE SYSTEM, WORKING PRINCIPLE, AND THE RELEVANT STANDARDS OF THE COUNTRY/REGION WHERE THE PROJECT IS LOCATED.

IMPORTANT

REVERSE ENGINEERING, DECOMPILING, DISASSEMBLING, ADAPTING, IMPLANTING OR OTHER DERIVATIVE OPERATIONS ON THE DEVICE SOFTWARE ARE PROHIBITED. RESEARCH ON THE INTERNAL IMPLEMENTATION OF THE DEVICE, OBTAINING THE SOURCE CODE OF THE DEVICE SOFTWARE, STEALING INTELLECTUAL PROPERTY, ETC., AND DISCLOSURE OF THE PERFORMANCE TEST RESULTS OF ANY DEVICE SOFTWARE ARE PROHIBITED.

3.2 PERSONNEL REQUIREMENTS

- Personnel responsible for the installation and maintenance of ZOE equipment must be trained to understand safety precautions and correct operation methods.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and repair equipment.
- Personnel who operate the equipment, including operators, trained personnel, and professionals, must have local and state-required special operation qualifications, such as high voltage operation, height climbing, and special equipment operation qualifications.
- Replace equipment or components (including software) only by professionals or authorized personnel.

CAUTION

PROFESSIONAL PERSONNEL: PERSONNEL WITH TRAINING OR EXPERIENCE IN OPERATING DEVICES AND KNOW THE POTENTIAL SOURCES AND LEVELS OF HAZARDS DURING DEVICE INSTALLATION, OPERATION, AND MAINTENANCE.

TRAINED PERSONNEL: PERSONNEL WITH APPROPRIATE TECHNICAL TRAINING AND NECESSARY EXPERIENCE. BEING AWARE OF THE DANGER THAT MAY BE POSED TO HIM WHILE PERFORMING AN OPERATION AND MINIMIZE THE RISK TO HIMSELF OR OTHER PERSONNEL.

OPERATING PERSONNEL: OTHER THAN TRAINED PERSONNEL AND PROFESSIONAL PERSONNEL WHO MAY COME INTO CONTACT WITH THE EQUIPMENT.

3.3 ELECTRICAL SAFETY

3.3.1 GROUNDING REQUIREMENTS

- When installing a device that needs to be grounded, install the protective grounding cable first. When removing a device, remove the protective grounding cable at the end.
- Do not damage the grounding conductor.
- Do not operate the device without a grounding conductor installed.
- The device should be permanently connected to protective ground. Before operating the device, check the electrical connections of the device to ensure that the device is reliably grounded.

3.3.2 GENERAL REQUIREMENTS

WARNING

BEFORE ELECTRICAL CONNECTION, ENSURE THAT THE DEVICE IS NOT DAMAGED; OTHERWISE, ELECTRIC SHOCK OR FIRE MAY OCCUR.

- All electrical connections must meet national/regional electrical standards.
- You must obtain permission from the electricity authority of the country/region to connect to the grid.
- Cables prepared by customers must meet local laws and regulations.
- When performing high voltage operations, use special insulation tools.

3.3.3 DC OPERATION

WARNING

DO NOT INSTALL OR REMOVE POWER CABLES WHEN POWER IS ON. TRANSIENT CONTACT BETWEEN THE CORE OF A POWER CABLE AND THE CONDUCTOR GENERATES ELECTRIC ARCS OR SPARKS, WHICH MAY CAUSE FIRE OR PERSONAL INJURY.

- Before electrical connection of the device, if live parts may be encountered, disconnect the corresponding disconnecting device at the front stage of the device.
- Before connecting a power cable, ensure that the label on the power cable is correct.
- If the device has multiple inputs, disconnect all inputs and perform operations on the device only after the device is completely powered off.

3.3.4 WIRING REQUIREMENTS

- The insulation layer may be aged or damaged if cables are used in a high temperature environment. Keep at least 50mm away from the heating device or heat source area.
- Cables of the same type must be bound together. Cables of different types must be routed at least 30mm apart. Do not intertwine or cross cables.
- Cables must be securely connected, properly insulated, and of appropriate specifications.
- Protect the pipe or cable holes from sharp edges and burrs.

3.3.5 ANTI-STATIC REQUIREMENTS

CAUTION

THE STATIC ELECTRICITY GENERATED BY HUMAN BODIES MAY DAMAGE THE ELECTROSTATIC SENSITIVE COMPONENTS ON BOARDS, SUCH AS THE LARGE-SCALE INTEGRATED CIRCUIT (LSI).

WEAR ESD GLOVES WHEN TOUCHING THE PCB BOARD. DO NOT WEAR CLOTHES PRONE TO STATIC ELECTRICITY.

3.4 FIRST-AID MEASURES

3.4.1 HAZARD AND TOXICITY INSTRUCTIONS

DANGER

HAZARD: CONTACT OF BATTERY MODULE TERMINALS WITH OTHER METALS MAY CAUSE HEAT OR ELECTROLYTE LEAKAGE. ELECTROLYTE IS FLAMMABLE, AND IF THE ELECTROLYTE LEAKS, REMOVE THE BATTERY MODULE FROM THE FIRE IMMEDIATELY.

DANGER

TOXICITY: STEAM FROM BURNING BATTERIES MAY IRRITATE EYES, SKIN AND THROAT.

3.4.2 FIRST-AID MEASURES FOR BATTERY ABNORMALITIES

DANGER

WHEN THERE IS ELECTROLYTE LEAKAGE OR ABNORMAL SMELL, AVOID CONTACT WITH THE LEAKING LIQUID OR GAS. NON- PROFESSIONALS SHOULD KEEP AWAY AND CONTACT PROFESSIONALS IMMEDIATELY. PROFESSIONALS SHOULD WEAR SAFETY GOGGLES, RUBBER GLOVES, GAS MASKS, AND PROTECTIVE CLOTHING TO PROTECT THEMSELVES FROM ELECTROLYTE OVERFLOW.

DANGER

ELECTROLYTE IS CORROSIVE AND CONTACT MAY CAUSE SKIN IRRITATION AND CHEMICAL BURNS. IF YOU COME IN CONTACT WITH BATTERY ELECTROLYTE, TAKE THE FOLLOWING MEASURES:

1. INHALATION: IMMEDIATELY EVACUATE THE CONTAMINATED AREA AND SEEK MEDICAL ATTENTION.

2. EYE CONTACT: IMMEDIATELY RINSE EYES WITH WATER FOR 15 MINUTES AND SEEK MEDICAL ATTENTION.

3.CONTACT WITH SKIN: WASH THE CONTACTED AREA: THOROUGHLY WITH SOAP AND WATER AND SEEK MEDICAL ATTENTION.

4.INGESTION: INDUCE VOMITING AND SEEK MEDICAL ATTENTION.

3.4.3 FIRST-AID MEASURES FOR FIRE

DANGER

IF A FIRE OCCURS DURING THE CHARGING OF THE BATTERIES, ISOLATE THE CHARGER FROM ITS POWER SUPPLY BY TURNING OFF THE POWER SWITCH AT THE INVERTER/PCS OR PUSHING THE E-STOP BUTTON ON THE SYSTEM ENCLOSURE.

PUSH THE MANUAL RELEASING BUTTON ON THE SYSTEM ENCLOSURE IF THE AUTOMATIC FIRE SUPPRESSION SYSTEM IS NOT ACTIVATED BY ITSELF.

DANGER

USE CARBON DIOXIDE, FM-200 OR ABC DRY POWDER FIRE EXTINGUISHERS TO EXTINGUISH THE FIRE.

DANGER

FIREFIGHTERS NEED TO AVOID CONTACT WITH HIGH-VOLTAGE COMPONENTS DURING EXTINGUISHING, OR IT MAY RESULT IN THE RISK OF ELECTRIC SHOCK.

DANGER

WHEN THE BATTERY TEMPERATURE IS TOO HIGH, IT MAY CAUSE BATTERY DEFORMATION, DAMAGE, ELECTROLYTE OVERFLOW, AND TOXIC GAS LEAKAGE. WEAR PROTECTIVE RESPIRATORY EQUIPMENT AND KEEP AWAY FROM THE BATTERY TO AVOID SKIN IRRITATION AND CHEMICAL BURNS.

3.4.4 FIRST-AID MEASURES FOR BATTERY DROP

DANGER

WHEN INSTALLING THE BATTERY, IF THE BATTERY DROPS OR SUFFERS A STRONG IMPACT, IT MAY CAUSE INTERNAL DAMAGE TO THE DEVICE. DO NOT CONTINUE TO USE THE BATTERY, OTHERWISE THERE MAY BE SAFETY RISKS (CELL LEAKAGE, ELECTRIC SHOCK, ETC.).

DANGER

AFTER THE BATTERY DROPS, IF THERE IS OBVIOUS ODOR, DAMAGE, SMOKE, FIRE, ETC., EVACUATE PERSONNEL IMMEDIATELY, CALL THE POLICE IN TIME, AND CONTACT PROFESSIONALS WHO WILL USE FIRE-FIGHTING EQUIPMENT TO EXTINGUISH THE FIRE WHILE ENSURING SAFETY.

DANGER

AFTER THE BATTERY DROPS, IF THERE IS NO OBVIOUS ODOR, DAMAGE, SMOKE OR FIRE CONTACT PROFESSIONALS TO TRANSFER THE BATTERY TO AN OPEN AND SAFE PLACE OR CONTACT A RECYCLING COMPANY FOR SCRAPPING.

3.5 BATTERY RECYCLING TREATMENT

CAUTION

DISPOSE OF USED BATTERY ACCORDING TO LOCAL LAWS AND REGULATIONS. DO NOT DISPOSE OF BATTERY AS HOUSEHOLD GARBAGE. IMPROPER DISPOSAL OF BATTERY MAY LEAD TO ENVIRONMENTAL POLLUTION.

CAUTION

IF THE BATTERY CELL LEAKS OR IS DAMAGED, CONTACT TECHNICAL SUPPORT OR A BATTERY RECYCLING COMPANY FOR DISPOSAL.

CAUTION

WHEN BATTERIES ARE OUT OF SERVICE LIFE, CONTACT A BATTERY RECYCLING COMPANY FOR SCRAPPING.

CAUTION

AVOID EXPOSING USED BATTERIES TO HIGH TEMPERATURES OR DIRECT SUNLIGHT.

CAUTION

AVOID EXPOSING USED BATTERY TO HIGH HUMIDITY OR CORROSIVE ENVIRONMENTS.

3.6 STORAGE REQUIREMENTS

IMPORTANT

DURING THE STORAGE PERIOD, RECORDS SHALL BE MADE ACCORDING TO THE STORAGE REQUIREMENTS OF THE PRODUCT IN THIS MANUAL, SUCH AS TEMPERATURE AND HUMIDITY, STORAGE ENVIRONMENT, ETC.

IMPORTANT

LONG-TERM STORAGE OF BATTERIES IS NOT RECOMMENDED. LONG-TERM STORAGE OF LITHIUM BATTERY WILL CAUSE CAPACITY LOSS. AFTER STORAGE AT THE RECOMMENDED STORAGE TEMPERATURE FOR 12 MONTHS, THE IRREVERSIBLE CAPACITY LOSS OF LITHIUM BATTERIES GENERALLY 3% TO 6%.

IMPORTANT

THE STORAGE ENVIRONMENT MUST MEET THE REQUIREMENTS OF LOCAL LAWS AND STANDARDS.

IMPORTANT

AFTER THE EXPIRATION DATE, THE STORAGE SYSTEM MUST BE INSPECTED AND TESTED BY PROFESSIONAL PERSONNEL BEFORE IT CAN BE PUT INTO USE.

IMPORTANT

WHEN STORING BATTERIES, PLACE THEM CORRECTLY ACCORDING TO THE LABEL ON THE PACKING CASE. DO NOT PUT THEM UPSIDE DOWN OR ON THE SIDE.

IMPORTANT

WHEN STACKING BATTERY PACKING CASES, COMPLY WITH THE PACKING REQUIREMENTS ON THE OUTER PACKAGING.

IMPORTANT

HANDLE THE BATTERIES WITH CARE. DO NOT DAMAGE THE BATTERY.

Storage environment requirements:

- Ambient temperature: -30 °C to 50 °C. Recommended storage temperature: 20° C to 30 °C
- Relative humidity: 0 to 95%RH. Recommended storage humidity <60%RH
- Store in a dry, clean and well-ventilated place, and prevent dust and water vapor from eroding. Do not suffer from rain or ground water erosion.
- Avoid contact with corrosive organic solvents, gases and other substances.
- Avoid direct sunlight.

3.7 HANDLING GUIDELINES

CAUTION

THIS PRODUCT HAS PASSED THE CERTIFICATION OF UN38.3 (UN38.3：SECTION 38.3 OF THE SIXTH REVISED EDITION OF THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS: MANUAL OF TESTS AND CRITERIA) AND SN/T 0370.2-2009 "RULES FOR INSPECTION OF PACKAGING FOR EXPORT DANGEROUS GOODS-PART 2: PERFORMANCE TEST" AND BELONGS TO CLASS 9-MISCELLANEOUS DANGEROUS GOODS.

HANDLING REQUIREMENTS:

- The energy storage system must be handled according to local laws, regulations, and industry standards. Rough handling may cause short circuit or damage to batteries in the container, which may result in battery leakage, rupture, explosion, or fire.

SHIPMENT CONDITIONS:

- Before shipment, check that the battery should be intact and not appear obvious odor, smoke, fire and other phenomena, otherwise the shipment is prohibited.

IMPORTANT

PRODUCTS WHICH MEET THE REQUIREMENTS OF VEHICLE, SHIP AND OTHER TRANSPORTATION CAN BE DELIVERED DIRECTLY TO THE SITE, TRANSPORTATION PACKING BOXES MUST BE FIRM. HANDLE WITH CARE AND TAKE MOISTURE-PROOF MEASURES. SUBJECT TO EXTERNAL ENVIRONMENT (SUCH AS TEMPERATURE, TRANSPORTATION, STORAGE, ETC.), THE PRODUCT SPECIFICATIONS ARE SUBJECT TO THE MANUFACTURE DATE.

TRANSPORTATION PROCESS REQUIREMENTS:

- Maritime transport in accordance with IMDG CODE.
- Land transport in accordance with ADR or JT T617.
- Meet the regulatory requirements of the transport regulatory authorities in the countries of origin, route and destination.
- Comply with international regulations for the transport of dangerous goods and the regulatory requirements of the corresponding national transport regulatory authorities.

THINGS SHOULD BE PROHIBITED DURING HANDLING OR TRANSPORTATION:

- Direct rain, snow or falling into water.
- Fall or mechanical impact.
- Invert or tilt.

IMPORTANT

IF ANY OF THE PRECEDING EXCEPTIONS OCCURS, HANDLE THEM ACCORDING TO FIRST-AID MEASURES.

3.8 PERSONAL PROTECTIVE EQUIPMENT

Please be aware that a battery can pose a risk of electrical shock including a high short-circuit current. Follow all safety precautions while operating the batteries. During the installation or maintenance of the battery system, a worker shall wear proper PPE such as eye protection, high visibility clothing, protective gloves, and protective footwear. Insulation gloves with over 1500VDC ratings are needed when connecting the busbars and jumpers between modules and racks.

Figure 3-1: Safe gear for installation

- Wear appropriate personal protective equipment when operating the device. If a fault is found that may cause personal injury or device damage, terminate the operation immediately, report the fault to the person in charge, and take effective protective measures.

- Before using the tools, master the proper use of the tools to avoid injury and damage to the device.
- Do not touch the device when it is operating because the case is at a high temperature, which may cause burns.
- To ensure personal safety and normal use, ensure reliable grounding before use.
- Avoid contact with a faulty battery when the temperature may exceed the burn threshold for touchable surfaces.
- Do not open or damage the battery. The electrolyte released is harmful to skin and eyes. Avoid contact with it.
- Do not place irrelevant items on the top of the device or insert them into anywhere of the device.
- Do not place combustible materials around the device.
- Do not place the battery in the fire to avoid explosion which may bring danger in personal safety.
- Do not place the battery module in water or other liquids.
- Do not short-circuit battery terminals. Short-circuited batteries may cause combustion.
- The battery may cause shock and a large short-circuit current hazard. When using batteries, pay attention to the following precautions:

  a）Use tools with insulated handles.

  b）Put on rubber gloves and boots.

  c）Do not place tools or metal parts on the top of the battery.

  d）Disconnect the charging power supply before connecting or disconnecting the battery terminals.

  e）Check whether the battery is accidentally grounded. If so, remove the power supply from the ground.
- Do not use water or detergent to clean electrical components inside or outside the cabinet.
- Do not stand, lean or sit on the device.
- Do not damage any module of the device.

4 SYSTEM OVERVIEW

4.1 SYSTEM DESIGN

4.1.1 PRODUCT SERIES

Table 4-1: Product series

NO.	MODEL	APPLICABLE REGION	NOTE
1	P3794L1H-B	UL	1C

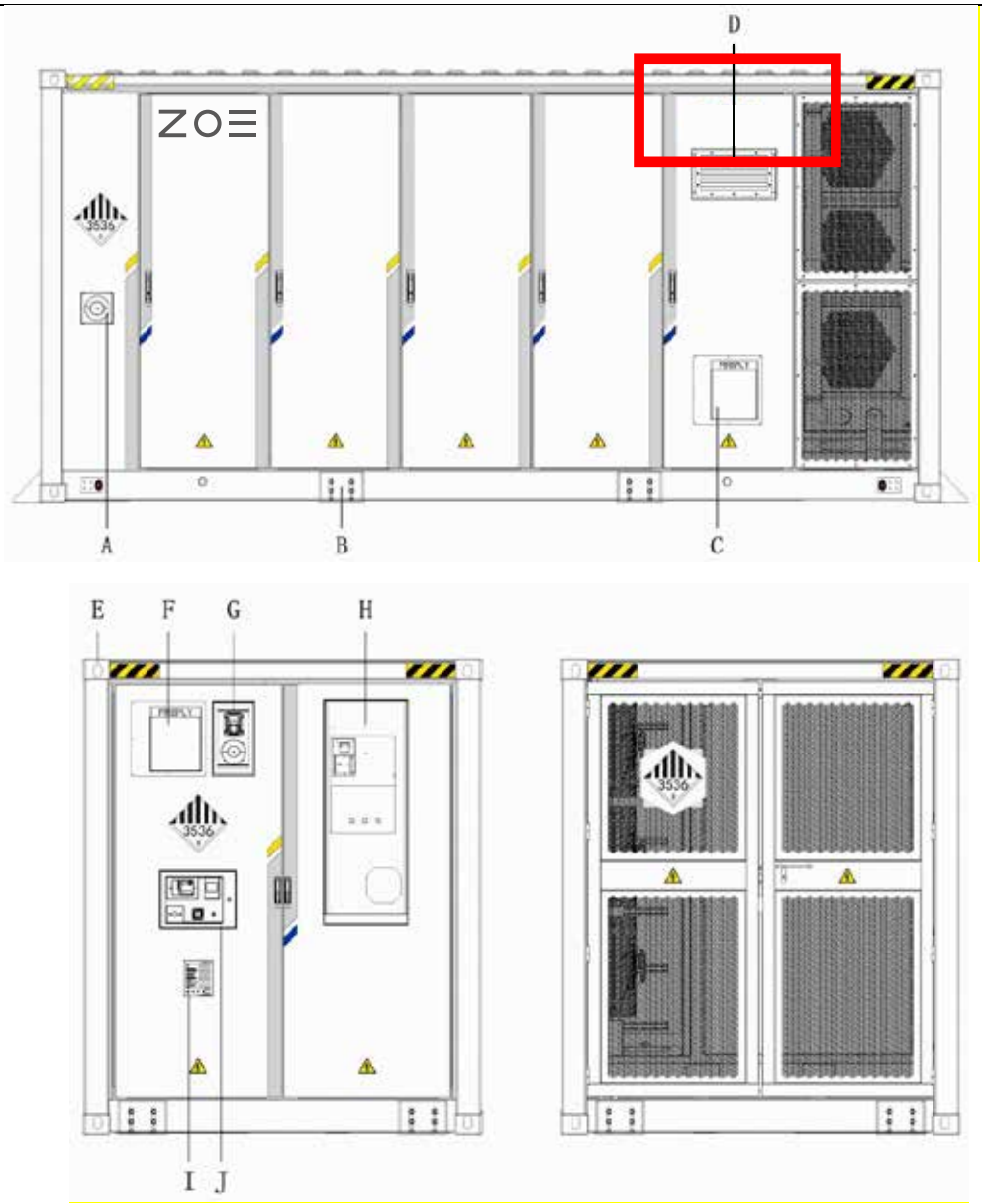


Figure 4-1: Appearance

Table 4-2: Introduction

NO.	ITEM	QTY	DESCRIPTION
A	Water fire suppression pipe coupling	1	Access customer station level water fire suppression pipe network
B	Fastener	6	Used for onsite container anchoring
C	Electric shutter	1	Inlet of fresh air outside the container
D	Pressure relief port	1	Exhaust overpressure gas to maintain cabin pressure balance
E	Top corner fitting	4	Used for container lifting
F	Explosion-proof exhaust fan	1	Outlet of air inside the container
G	Sounder visual indicator, alarm bell	1	Sounder visual indicator is issued when the fire is triggered in the container, and the alarm bell sounds are issued
H	Air-cooled HVAC	1	Distribution bin heat dissipation, dehumidification
I	Nameplate	1	Display container parameters, date of manufacture and other information
J	System emergency stop button, extinguishing abort switch, manual pull stations, isolating switch	1	System emergency stop button: Used for storage system emergency stop Extinguishing abort switch: Used for fire extinguishing system emergency stop Manual pull stations: Used for manually start of the fire extinguishing system Isolating switch: Isolate fire extinguishing system to avoid accidental discharge

4.1.2 SPECIFICATION

Table 4-3: Specification

BATTERY PARAMETERS	
Cell type	3.2V/285Ah
Configuration	416S*10P
Nominal capacity	3793.92 kWh
Voltage range	1164.8~1497.6V
SYSTEM PARAMETERS	
Dimensions(W×D×H)	6058mm×2896mm×2438mm
Weight	35±0.5T
Operating temperature	-30~50 °C(> 45 ° C derating)
Charge-discharge rate	1C
Operating humidity	0~95% RH
Anti-corrosion grade	C4-M
Protection grade	IP55
Thermal method	Intelligent liquid cooling
Fire suppression design	Water + Combustible gas detection + Ventilation + Gas extinguishing
Allowable working altitude	⩽3000m
Noise	⩽80dB@1m
Wind load	66m/s
Snow load	40psf
Seismic zone	Zone 4

5 MAIN SYSTEM EQUIPMENT

5.1 BATTERY SYSTEM

5.1.1 BATTERY CELL

ZOE Battery storage systems rely on advanced LFP chemistry to provide a combination o f high performance, low cost, and industry-leading safety. Configurable to serve the application at hand, 3.2V 314Ah prismatic cells became ZOE’ s best pick for a battery storage solution. Cell specifications are as follows.

Table 5-1: Specification of the Battery cell

ITEM	UNIT	SPECIFICATION	RENDERING
Battery Chemistry	-	LFP	
Shape	-	Prismatic	
Dimension(W×D×H)	mm	(174.7±0.8)×(71.5 5±0.5)×(207.3±0.8)	
Weight	kg	5.4±0.05	
Nominal Capacity	Ah	285	
Nominal Energy	Wh	912	
Nominal Voltage	Vdc	3.2	
Operating Voltage	Vdc	2.5~3.65V	
Operating Temperature Range	℃	Charge: 0~60. Discharge: -20~60	

5.1.2 BATTERY MODULE

Battery modules are formed by configuring 104 LFP cells in a series connection. Modules are connected to the battery management system (BMS) to form a cluster of module components, and then multiple module components are combined into a container, and each battery cluster contains cluster-level BMS

Table 5-2: Specification of Module

ITEM	UNIT	SPECIFICATION	RENDERING
Configuration	-	1P 104S	 (For reference only)
Key Component	-	104 cells, 1 module BMU	
Dimension(W×H×D)	mm	2170×243×790	
Weight	kg	635±10	
Nominal Capacity	Ah	285	
Nominal Energy	kWh	94.848	
Nominal Voltage	Vdc	332.8	
Operating Voltage	Vdc	291.2~374.4	

5.1.3 BATTERY MANAGEMENT SYSTEM

The ESS employs a sophisticated, multilevel battery management system (BMS) for system monitoring and control. Each multilevel battery management system includes:

- Module Battery management unit (BMU)
- Battery Cluster Unit (BCU)
- Battery Array Unit (BAU)

Figure 5-1: BAU diagram

The Battery Module BMS (BMU) is designed to detect voltage and temperature and execute cell balance functions for cells. The Battery Cluster Unit (BCU)can manage all module BMU units and detects total voltage, current, and executes protection functions by switching the DC-contactor. Finally, a Battery Array Unit (BAU) manages rack BCU units and communicates with PCS or EMS. The table below outlines the BMS units of the system.

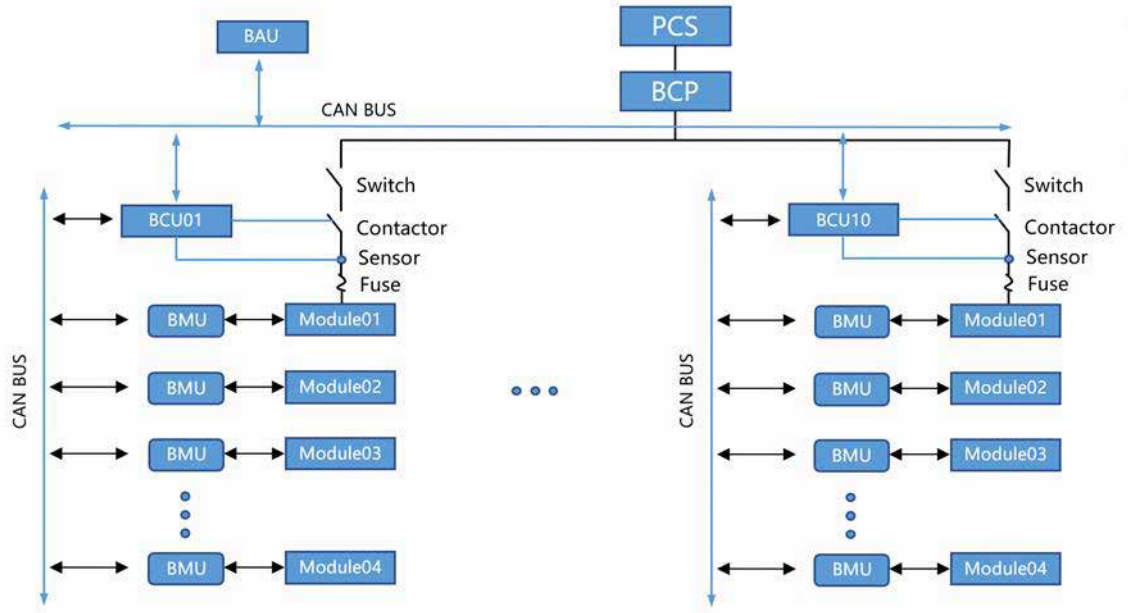


Figure 5-2: Architecture of the BMS

The functionalities of each level of BMS are shown in the following table.

Table 5-3: BMS Functionality

FUNCTIONALITY		BMU	RBMS	SBMS
Measurement	Cell Voltage	√		
	Cell	√		
	Rack Voltage		√	
	Rack Current		√	
Calculation	SOC		√	√
	SOH		√	√
	Power		√	
Control	Contactor		√	
	Cell Balancing	√	√	
Communication	CAN2.0	√	√	
	RS485			√
	Ethernet			√

5.2 GOLDEN SHIELD CONTROLLER

To offer one universal communication interface for battery systems with SCADA or EMS and release EMS from basic system protection, ZOE deploys a system controller as part of the BESS integration.

Figure 5-3: Rendering of Golden Shield

5.2.1 FEATURES AND FUNCTIONS

- Control integration of the battery system (include battery BMS, cooling units, BCP etc.).
- Offer a universal interface for communication between battery systems and SCADA or EMS.
- As a communication adapter, converts various communication protocols (RS-485, CAN, dry contact, etc.) of BOS devices such as BMS, PCS, HVAC, and FSS into a communication protocol of the EMS for easy integration.
- Take basic system protection measures to prevent the battery and PCS from being damaged during operation.
- Data logging (short period) for troubleshooting.
- Remote firmware updating (pending).

5.2.2 COMMUNICATION TOPOLOGY

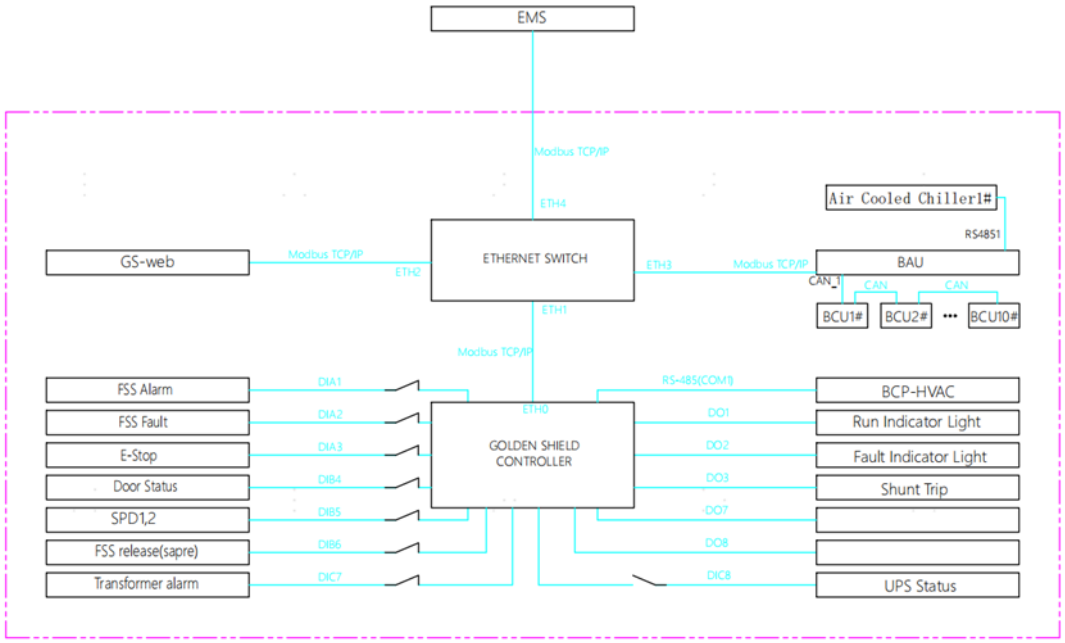


Figure 5-4: Communication topology with Golden Shield

5.3 THERMAL MANAGEMENT SYSTEM

5.3.1 COOLING CONCEPT

The liquid cooling system will be designed and installed inside the battery container.

1.Advantages of Liquid Cooling

- Higher cooling capability: compare to air cooling, liquid cooling is capable of taking more heat away from batteries under the same condition. And liquid cooling is the best choice when thermal density is beyond the capability of air cooling.
- Better temperature uniformity: Cooling liquid has a specific heat capacity which leads to a smaller temperature rise during the cooling process. Therefore, battery cells will have a smaller temperature difference with liquid cooling.
- Lower Noise Emission: Without fans on battery modules for air cooling means no noise emission from battery modules.

2.Working principle of Liquid Cooling

- Battery Cooling: Cooling liquid powered by the pump will circulate inside battery modules and take the heat from batteries. When the liquid gets out of the battery

modules, it became hot liquid with the heat from batteries. The hot liquid will circle back to a heat exchanging tank.

- Heat Exchanging: Inside the heat exchange tank, the refrigerant will vaporize from liquid state to gaseous state. During this state/phase change process, the refrigerant will absorb a huge amount of heat from the battery cooling liquid and cool down the cooling liquid.
- AC Cooling: The rest of the system is a standard Air Conditioner which releases the heat to the environment through the phase change of the refrigerant.

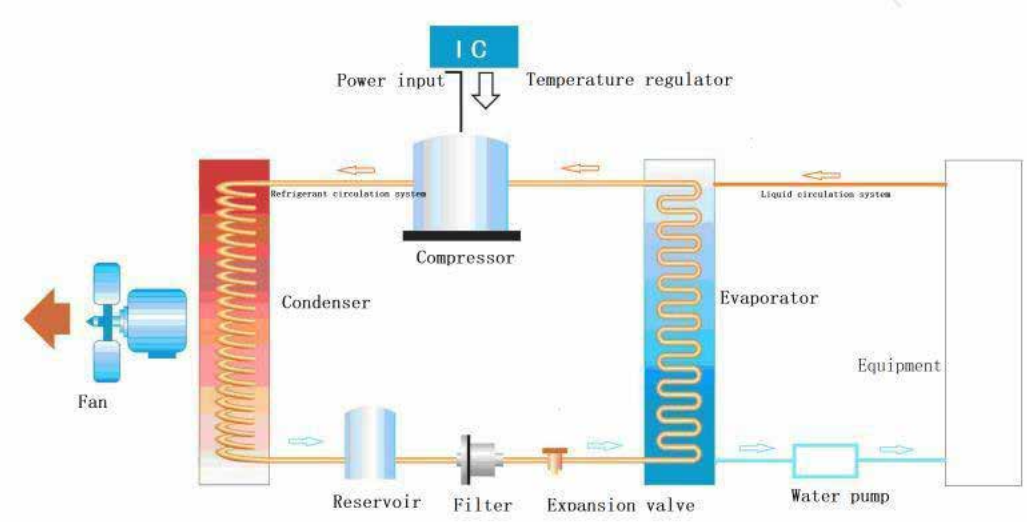
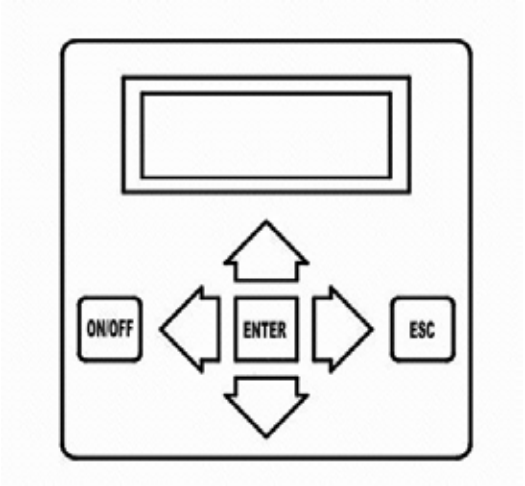


Figure 5-5: Working principle of Liquid Cooling

5.3.2 HVAC INTERFACE

5.3.2.1 AIR-COOLED HVAC



- ON/OFF: ON/OFF button, which can be used to turn on/off the unit:
- ↑: UP button, which is used to select the previous record/menu or increase the setting

value (password only);

- ↓: Down button, which is used to select the next record/menu or decrease the setting value (password only);
- ←: Left button, which is used to increase the setting value or select the previous data while conducting password operation.
- →: Right button, which is used to decrease the setting value or select the next data while conducting password operation.
- ENTER: Return button, which is used to confirm the input.
- ESC: Quit button, which is used to return to the previous page menu.

if there is no keyboard operation for consecutively 60s under any interface after startup.it will automatically return to the normal display interface.

When any button is pressed after the system is powered up, the backlight will turn on. If there is no keyboard operation for consecutively 60s, the backlight will be off.

The operation password of the unit is "0001". On the normal interface, press Enter to enter the password input interface. Press the left button and the right button to select the desired digit, press the up button and the down button to modify the digit, and press Enter to confirm the input. If the password is incorrect, an error message is displayed, and the unit Settings cannot be modified. If the password is correct, enter the main menu, you can edit the unit Settings.

Note: The actual parameters in the menu have been set before the factory as required by the customer.

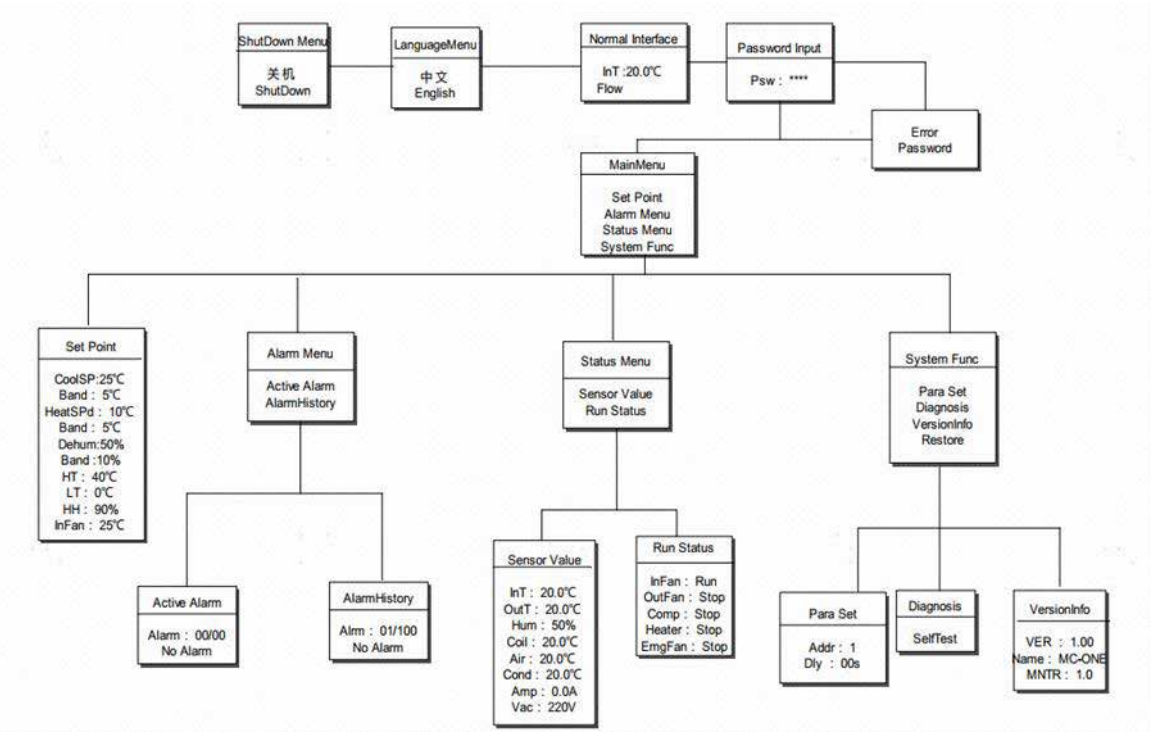


Figure 5-6: Unit menu structure diagram

5.3.2.2 LIQUID COOLING UNIT

➢ Introduction

The controller part of EMW air-cooled liquid cooling unit is equipped with a touch screen display to provide users with a human-computer interaction interface. Users can query, set up and monitor conveniently through the touch screen to ensure the normal operation of the chiller.

➢ Control System Interface

Turn on the power switch to power on the unit, and enter the control system homepage after the system is initialized, as shown in the figure below.

Figure 5-7: Control system homepage interface

On the main interface, you can open/close the coolant supplement function and the air

discharge function of the circulation pump. After the system is powered on, press any key and the backlit light will light up. If there is no keyboard operation after a period of time, the backlit light will dim. The meanings of icons in the control interface of the chillers are shown in the figure below.

Icon	Description
ON/OFF	Switch button icon, click it to change the current working state of chiller.
中 文 English	Language icon, click it to switch the language of the current interface to **Chinese** or **English**.
Runing	Working status icon, which displays the current working status of chiller in the form of indicator lights. • Green indicates running status. • Red indicates the shutdown state.
Alarm	Alarm icon, which indicates that the current chiller has generated alarms.
Pump	Circulating pump icon, which indicates that the circulating pump of the chiller is working.
Cool	Cooling icon, which indicates that the chiller is in cooling state, and the compressor is working.
Heat	Heating icon, which indicates that the chiller is in heating state, and the heater is working.
Home	System homepage icon, click it to enter the operation homepage interface of the control system, you can view the current time, operation mode, outlet temperature, outlet pressure and interface language of the chiller.

Status	System status icon, click it to enter the **System Status** interface, you can view the environment status, running status and group control status.
Alarm	System alarm icon, click it to enter the **Alarm** interface, you can view current alarms and historical alarms.
Record	System operation record icon, click it to enter the **Record** interface, you can view the chiller's operation record, operation log and operation curve.
Setting	System setting icon, click it to enter the **Parameter Setting** interface, you can set the temperature and humidity setting, system configuration, account setting and time setting.
Maintain	System maintenance icon, click it to enter the **Maintain** interface, you can manually start the coolant replenishment function, and set the replenishment related time parameters.

Figure 5-8: Control interface icons

➢ System Start-up and Shutdown

After clicking the switch button every time, the system switches the working state of the current unit. The dialog box that pops up when the unit is start up is shown in the figure below.

Figure 5-9: System start-up

After start-up, the status of unit changes from to "Running". On any interface, If there

is no keyboard operation for a period of time, the system will automatically return to the homepage interface. The dialog box popped up when shutting down is shown in the figure below.

Figure 5-10: System shutdown

After shutting down, the chiller will be updated from running status to shutdown status. The system supports power-off memory function. If the system is powered on after power off, the system will automatically enter the state before power off (for example, if the system was on before power off, the system will automatically start up and enter the normal display interface after power on).

- Status

Click "Status" on the main interface of the control system to view the current environmental status and operation status of the unit, as shown in the figures below.

Figure 5-11: Environment Status interface

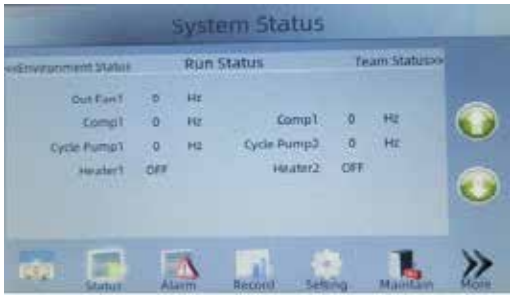


Figure 5-12: Run Status interface

5.4 FIRE SUPPRESSION SYSTEM

DANGER

IF THERE IS AN OBVIOUS FIRE OR EXPLOSION AT THE SCENE, DO NOT BE CLOSE TO THE CONTAINER FOR EMERGENCY START-UP OPERATIONS.

WHEN THE EQUIPMENT AUTOMATICALLY EXTINGUISH THE FIRE, A LARGE AMOUNT OF GAS WILL BE GENERATED. THROUGH CHEMICAL REACTION, THE OXYGEN INSIDE THE CONTAINER WILL BE QUICKLY CONSUMED. AT THIS TIME, THE OPERATOR SHOULD NOT ENTER THE CONTAINER, WHICH MAY CAUSE SUFFOCATION.

WARNING

THE CONTAINER IS EQUIPPED WITH AN AUTOMATIC FIRE EXTINGUISHING SYSTEM. DO NOT TRIGGER THE FIRE EXTINGUISHING SWITCH UNLESS IT IS AN EMERGENCY.

5.4.1 GENERAL RULES

- Please comply with the fire codes and regulations of the country/region where the project is located
- Check and maintain fire extinguishing equipment regularly to ensure that all functions are normal

5.4.2 FIRE EXTINGUISHING SYSTEM COMPOSITION

The container is equipped with water fire extinguishing system, gas fire extinguishing system, automatic fire alarm and linkage control system, combustible gas detection and alarm system and emergency ventilation system. The system is a set of efficient fire extinguishing equipment, through the combustible gas detection equipment, smoke detector, temperature detector and other fire detection devices for detection, when

abnormality detected, through the BCP external terminal to send signals to the station alarm host for fire alarm.

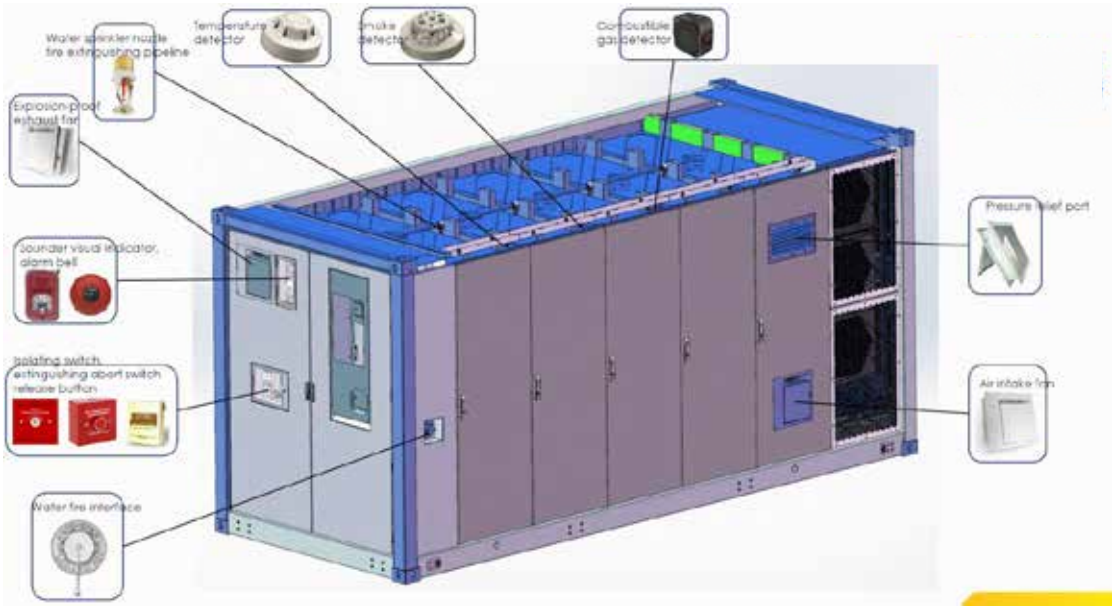


Figure 5-13: Fire extinguishing system main composition diagram

5.4.3 FIRE CONTROL FLOW CHART

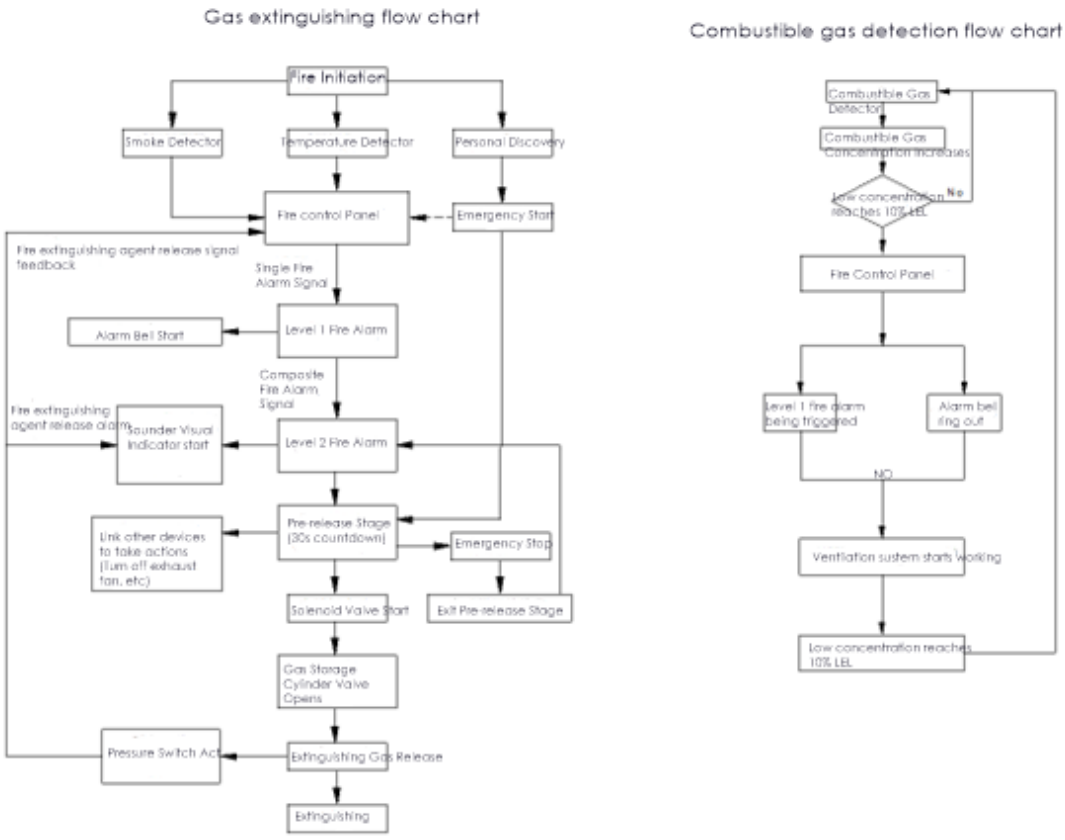


Figure 5-14: Fire control flow chart

6 INSTALLATION

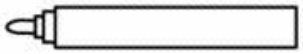
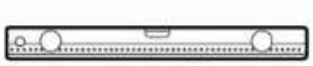
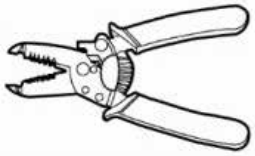
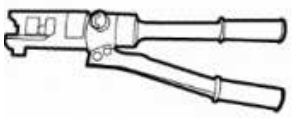
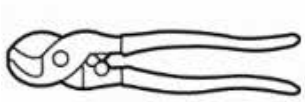
The battery system is a high-voltage energy storage device, which is regarded as dangerous goods. Non-professionals and improper operation and use may cause serious consequences such as electric shock, burning, and explosion. The battery system must be installed and maintained by professional technicians and used in strict accordance with the relevant safety provisions.

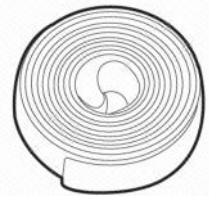
6.1 MAIN TOOLS AND COMPONENTS FOR INSTALLATION

Tools needed for the system installation are listed below.

Table 6-1: Tools for system installation

NO.	ITEM	PURPOSE	SAMPLE
1	Drill(Φ16)	Hole the expansion bolts	
2	Expansion bolt(SUS316 stainless steel M16X100)	Connect the foundation to the container fastener	
3	Sleeve assembly + screwdriver assembly	Installation of grounding cable, power cable, rubber channel, forklift hole seal plate	
4	Torque wrench	Fastener torque confirmation	

5	Marking pen	Torque mark	
6	Cable tie	Cable fixation	
7	Gradienter	Container leveling	
8	Multi-meter	Continuity test	
9	Wire stripper	Strip the insulation off the cable header	
10	Hydraulic clamp	Crimp terminals and cables	
11	Wire cutter	Cut cable	
12	Tape Measure	Dimension measurement	
13	Heat gun	Heat shrink tube shrinkage	

14	Heat shrink Sleeve	Wire and terminal connection protection	
15	Cold-press terminal crimping plier	Crimp terminals and cables	
16	Insulation gloves	Insulation protection	
17	Insulation shoes	Insulation protection	
18	Goggles	Arc protection	

6.2 PREPARATION FOR INSTALLATION

6.2.1 INSTALLATION ENVIRONMENT REQUIREMENTS

- The installation and use environment must comply with local laws and regulations and relevant international and regional standards for lithium electric products.
- For areas with frequent natural disasters such as floods, mudslides, earthquakes and typhoons, appropriate preventive measures shall be taken for installation.
- Keep the installation location away from fire and heat sources. Do not place combustible or explosive materials around the device.

- When the device is running, do not block the vent or thermal management system to prevent fire caused by high temperature.
- Do not place the device in an environment with combustible or explosive gas or smoke. Do not perform any operations in such an environment.

IMPORTANT

The operation and service life of the energy storage depends on the operating temperature. Install the storage devices at a temperature equal to or higher than the ambient temperature.
The operating temperature of the SU3794U3794KC series battery container ranges from -30 °C to 50 °C. If the container is stored in a cold environment (such as 0°C) before installation, it will take some time to heat up before it can be recharged.
When the ambient temperature is higher than 45 °C or lower than 0 °C, the battery charging and discharging power decreases.

6.2.2 CHECK BEFORE INSTALLATION

1) Outer packing check

Before opening the outer packaging of the product, please check the outer packing for obvious damage, such as breakage, cracks or other signs of possible internal damage, and check the product model. If there is any abnormal packaging or product type discrepancy, please contact us as soon as possible.

2) Deliverable check

After unpacking the product, please check the deliverables for completeness and for any obvious external damage. If anything is missing or damaged, please contact us.

IMPORTANT

Refer to "Spare Parts" List for details of the spare parts delivered with the case.

3) Installation foundation check

Before product installation, it is necessary to check the prefabricated foundation at the project site and ensure that the foundation is solid and reliable and meets the flatness requirements.

- There must be a concrete foundation with sufficient strength at the bottom of containers to provide adequate support for containers
- Use a gradienter to measure the levelness of the foundation. Ensure that the levelness of the foundation is less than 5mm. In particular, if the levelness of the four corner parts is greater than 5mm, use stainless steel plate to level them. If the levelness is greater than or equal to 5mm, the device frame may be deformed, doors may leak because of improper seal, doors may fail to open and close, and liquid cooling pipes may leak

6.2.3 INSTALLATION SPACE

When installing devices, ensure that there are no combustible or explosive materials around, and reserve enough space to ensure heat dissipation and safety isolation. The installation and maintenance space of a container liquid cooling unit is different according to the highest ambient temperature on site

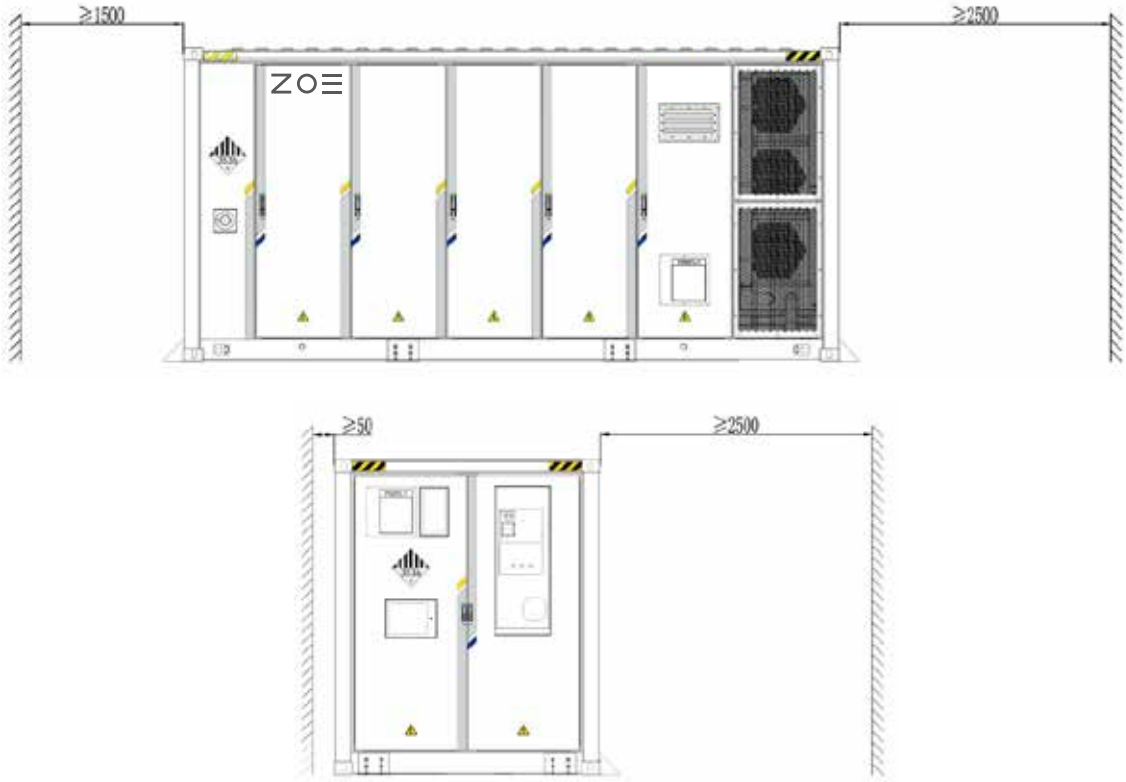


Figure 6-1: Installation space requirements for single container (unit: mm)

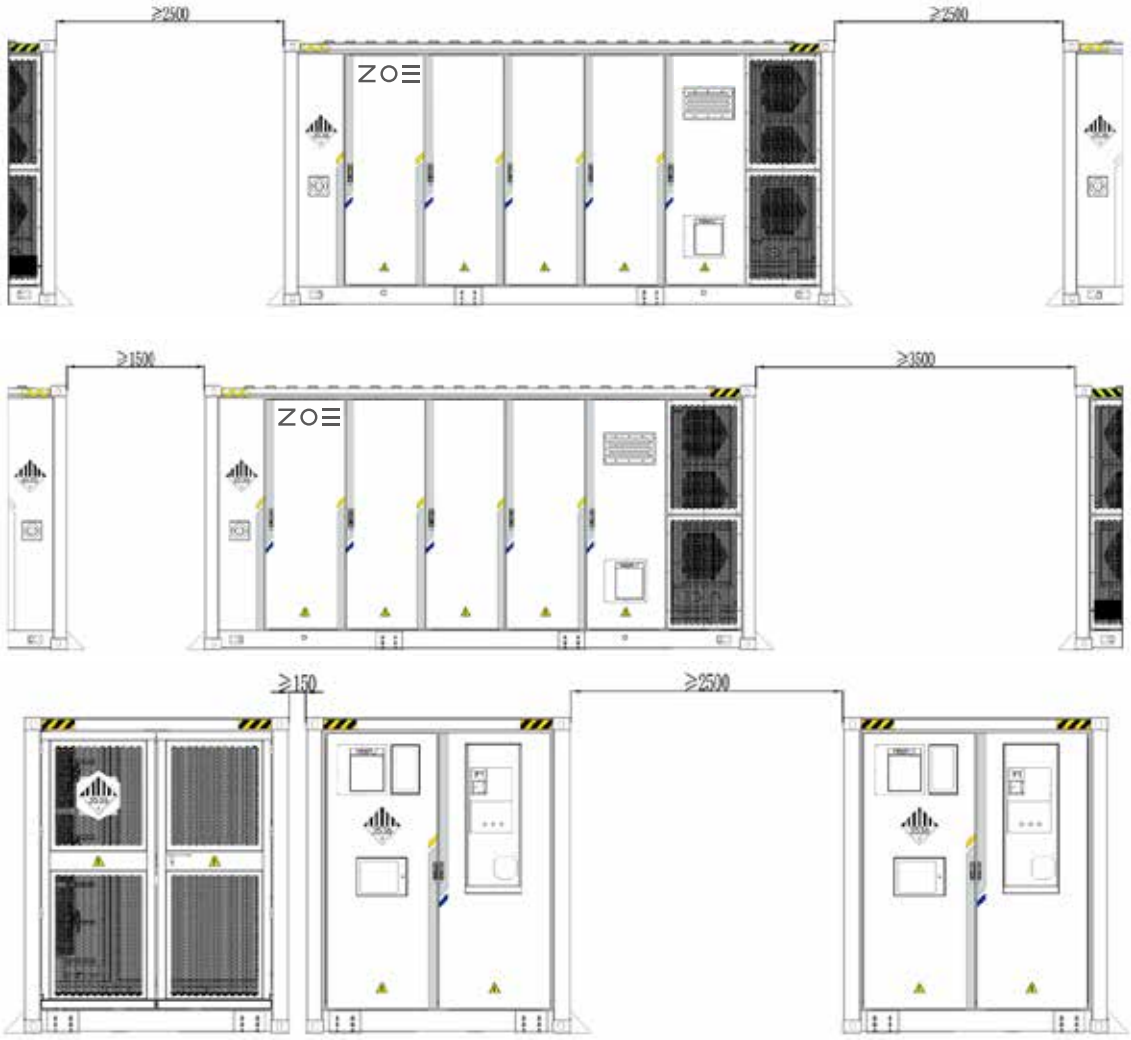


Figure 6-2: Installation space requirements for multiple containers (unit: mm)

6.3 PRODUCT HANDLING

When crane lifting, note the following:

- Hoisting according to the site conditions, select the appropriate hoist.
- The lifting equipment is equipped with 4 wire ropes and 4 shackles, according to the dimensions and weight of the product, choose the appropriate length and load bearing.
- Lifting Angle ⩾60°. Before lifting, ensure that there are no obstacles around.
- During crane operation, no personnel allowed to stand within 5 m ~ 10 m of the operation area. In particular, it is strictly prohibited to stand under the lifting arm and the lifting or moving machine to avoid casualties
- In case of strong breeze or wind of higher force on Beaufort Wind Scale, heavy

rain, heavy snow, heavy fog, the lifting operation should be suspended.

- The lifting or landing should be at a constant speed. Ensure that the acceleration is less than or equal to 0.1g.
- During the lifting operation, stop the operation immediately if abnormal noises, deformation, or welding cracking occur.

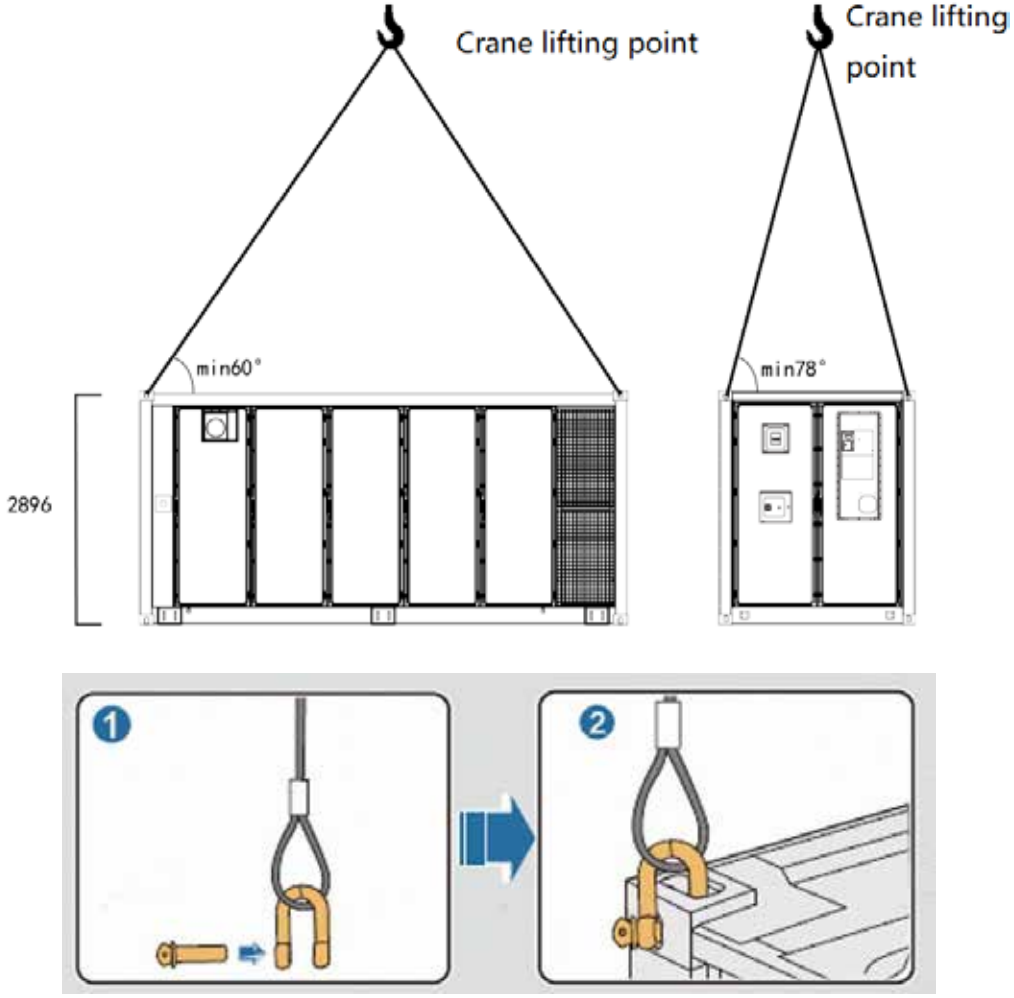


Figure 6-3: Crane lifting

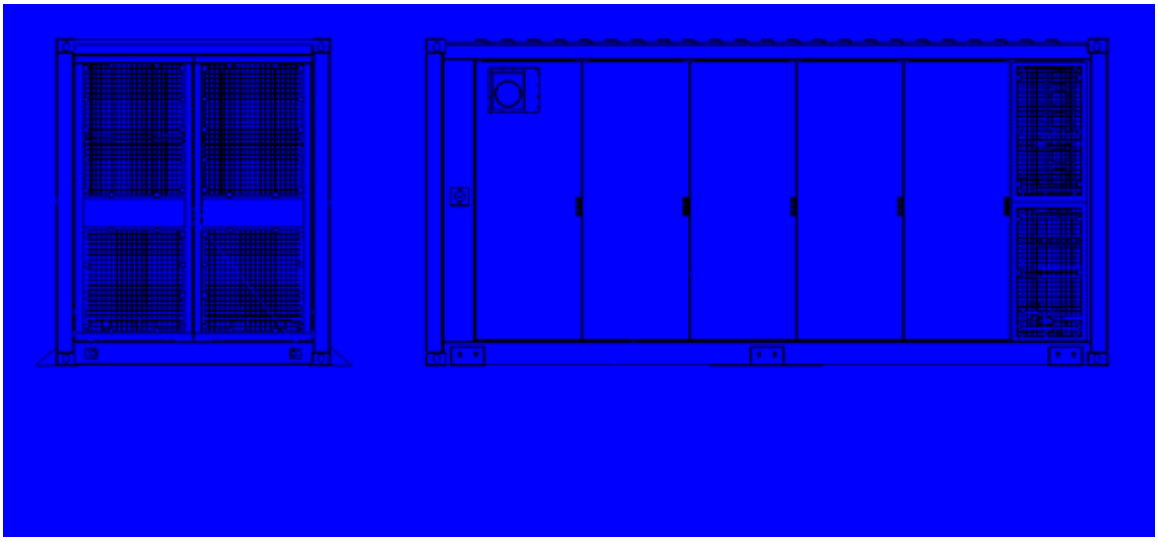


Figure 6-4: Center of gravity (for reference only)

6.4 INSTALLATION STEPS

6.4.1 DEVICE FIXATION

Before hoisting equipment, use a gradienter to measure the levelness of the foundation and ensure that the levelness of the foundation is less than or equal to 5mm, especially in the landing area of the four corner fittings. If the levelness is greater than 5mm, use stainless steel plates for leveling. After the foundation level is adjusted, place the container in the correct position, and then install and secure it. The steps are as follows:

STEP 1: After the container lands, use a gradienter to measure the levelness of the four corner fittings. The levelness must be less than or equal to 5mm. If the levelness is greater than 5mm, use stainless steel gaskets for leveling. After leveling, open and close all the container doors to ensure that they can be opened and closed smoothly. If the door cannot be opened and closed smoothly, adjust the container again to ensure that all doors can be closed and closed properly.

STEP 2: Determine the positions of expansion bolt holes and drill holes to bury M16X100 expansion bolts. Fix the fasteners on the foundation, a single container requires 6 fasteners. Tighten the fasteners to the container with M16X50, A4-70 bolt assembly.

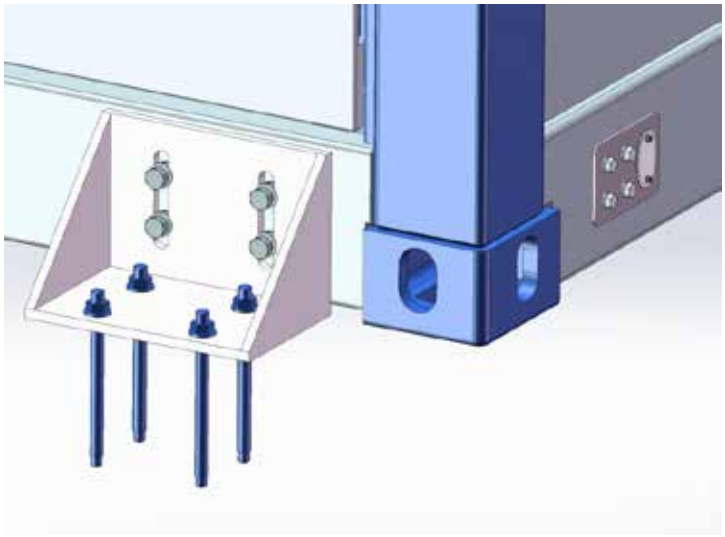
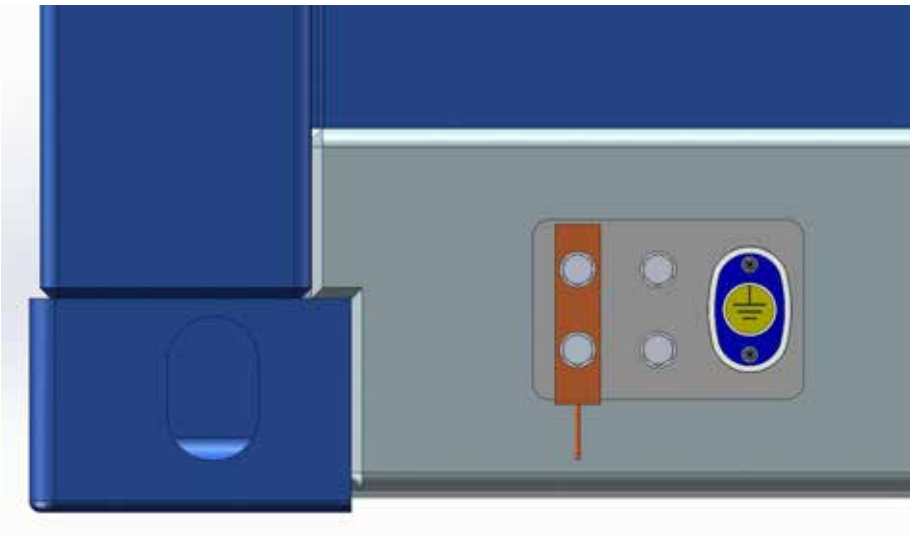


Figure 6-5: Install fasteners

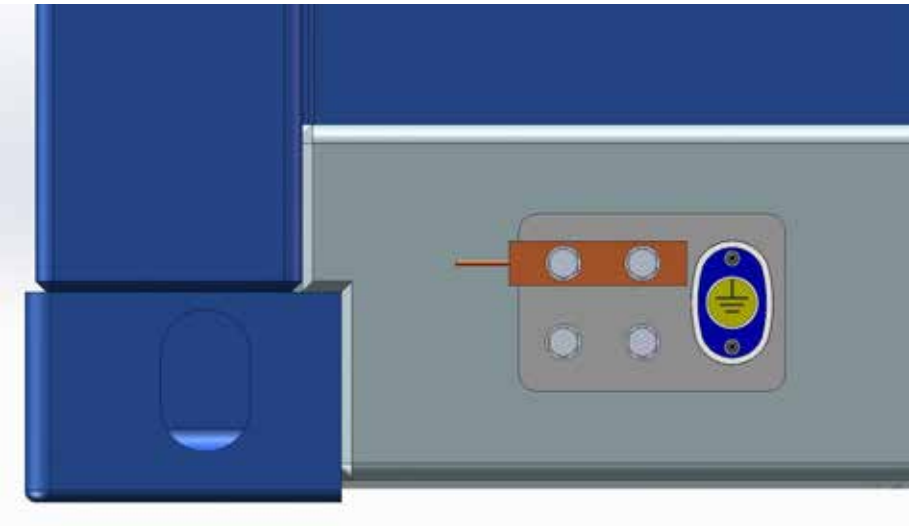
6.4.2 DEVICE GROUNDING

Both the front and rear of the device have 2 grounding points. Select one grounding point based on site requirements. Each grounding point has 4 tightening points in total which are distributed in two rows and two columns. You can flexibly arrange ground cables horizontally or vertically according to the actual situation. The steps are as follows:

STEP 1: Make ground cable: CL250-12-2D double-hole copper nose is recommended. It is recommended to crimp ground cables or ground flat steel with a cross-sectional area of no less than 250mm². Tighten the grounding cable with M10X30, A4-70 bolt assembly.



Vertical connection



Horizontal connection

Figure 6-6: Install grounding cables

6.4.3 WATER FIRE SUPPRESSION PIPE CONNECTION

There is a water fire suppression pipe coupling near the right end of BCP and 1300mm away from the bottom corner fitting. You can determine whether to install a fire hose in advance according to the actual situation. **Note: The water fire suppression pipe is a dry pipe in the normal state, and water can be injected through the external valve only in emergency situations such as fire accidents**

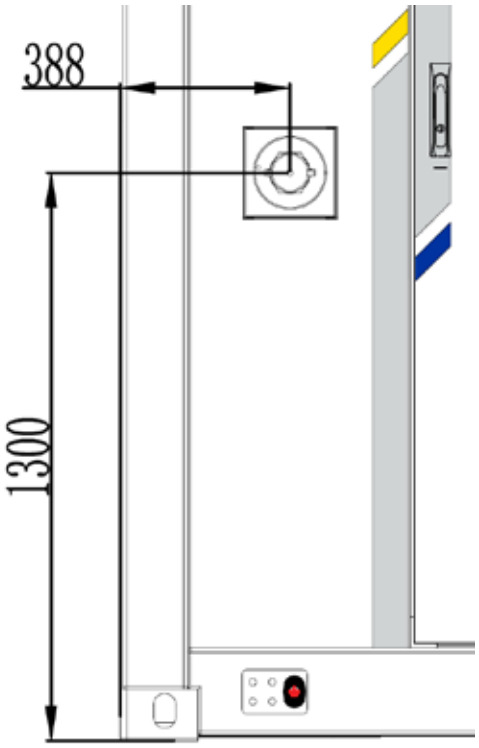


Figure 6-7: Water fire suppression pipe coupling

6.4.4 WIRING AND SEALING

External cable connections can be performed onsite by referring to Section 7.2 System Electrical Connections. Cable holes for the power cable and auxiliary power supply are reserved at the bottom of the BCP, respectively at the bottom of the bus cabinet and the power distribution cabinet, as shown in the following figure. Before delivery, seal plates are installed at the two cable holes. Drill holes to adjust the seal plates as required onsite. After connecting cables, use the fireproof mud delivered with the container to seal the seal plates to ensure sealing inside the BCP.

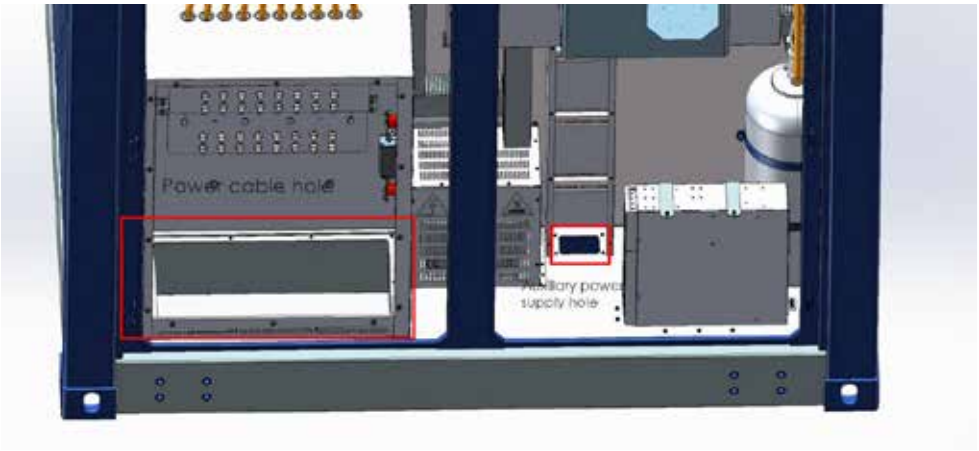


Figure 6-8: External cable holes diagram

6.4.5 REMOVE STICKER

After the equipment is fixed, remove the mesh stickers around the liquid cooling unit.

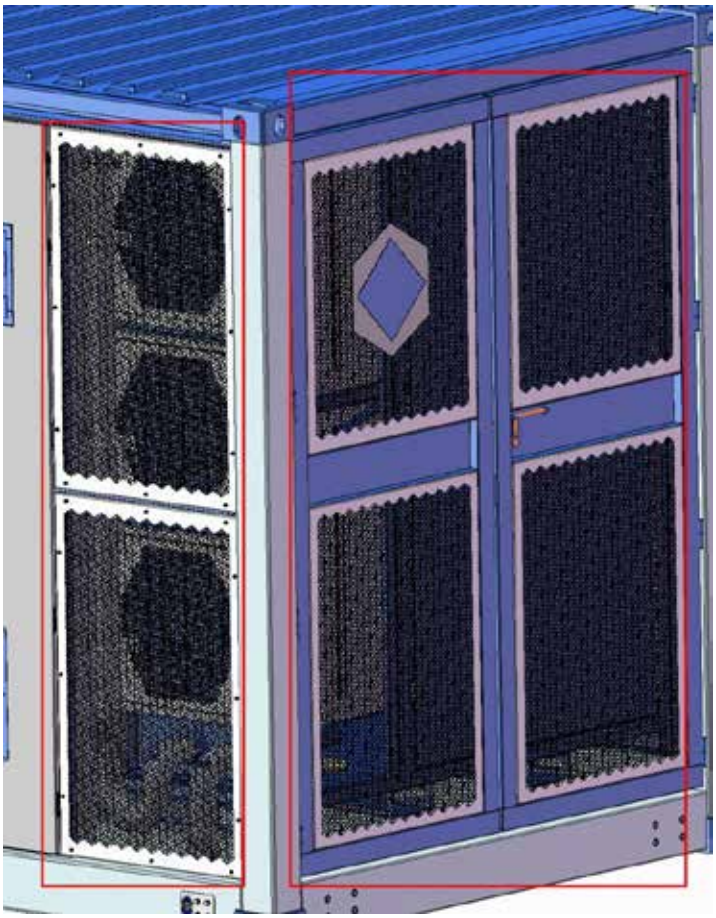


Figure 6-9: Liquid cooling unit mesh position diagram

7 ELECTRICAL CONNECTION

7.1 PREPARATION FOR INSTALLATION

Tools for electrical connections are listed in the table below.

WARNING

THE TOOLS USED FOR BATTERY POWER CONNECTION INSTALLATION SHOULD BE INSULATED OR SHOULD HAVE A MINIMIZED EXPOSED METAL AREA. AT LEAST THE GRIP PART SHOULD BE INSULATED.

IMPORTANT

BECAUSE OF THE STRUCTURAL PARTICULARITY OF THE CABINET TERMINAL BOARD, A SLEEVE SCREWDRIVER TOOL IS USED TO CONNECT.

Table 7-1: Tools for electrical connection

NO.	ITEM	PURPOSE	SAMPLE
1	Cutter	Unpacking	
2	Insulated Torque wrench	Use to install power connection	
3	Insulated driver	Use to install power connection	

4	Multi-meter	Voltage measurement	
5	Insulation gloves	Battery power connection	
6	Wrench set	Busbar connection	

7.2 SYSTEM ELECTRICAL CONNECTION

DANGER

IN THE EVENT OF A GROUND FAULT, COMPONENTS CONSIDERED VOLTAGE-FREE IN THE ENERGY STORAGE SYSTEM MAY CARRY LETHAL HIGH VOLTAGE WHICH IS POTENTIALLY LETHAL. THE DANGER OF ACCIDENTAL TOUCH EXISTS. BEFORE DOING ANY OPERATION, MAKE SURE THAT THE GROUNDING SYSTEM IS NOT FAULTY AND TAKE ADEQUATE PRECAUTIONS.

CAUTION

ELECTRICAL CONNECTIONS ARE MADE ONLY BY PROFESSIONAL ELECTRICIANS AND QUALIFIED PERSONNEL. STRICTLY FOLLOW THE EQUIPMENT INTERNAL WIRING IDENTIFICATION FOR CABLE CONNECTION.

WARNING

ENSURE THAT ALL DC AND AC SWITCHES IN THE PCS ARE DISCONNECTED BEFORE STARTING ELECTRICAL CONNECTIONS.

CAUTION

THE VOLTAGE RATING OF THE SELECTED CABLE SHALL NOT BE LESS THAN THE PCS THREE-PHASE INSTANTANEOUS ALTERNATING VOLTAGE. THE VOLTAGE LEVEL OF THE DC CABLE SHOULD NOT BE LOWER THAN THE MAXIMUM DC VOLTAGE OF A LITHIUM BATTERY.

WARNING

WHEN CONDUCTING ELECTRICAL CONNECTIONS, CHECK THAT ALL CABLES ARE INSULATED AND INTACT. PARTIALLY EXPOSED OR OTHER DAMAGED CABLES OR INSULATED CABLES MAY POSE A SERIOUS SAFETY RISK AND SHOULD BE REPLACED IMMEDIATELY.

CAUTION

FAILURE OF EQUIPMENT OR SYSTEMS RESULTING FROM A VIOLATION OF THE INSTALLATION AND DESIGN REQUIREMENTS SPECIFIED IN THIS MANUAL WILL RENDER THE QUALITY ASSURANCE INEFFECTIVE.

DANGER

HIGH VOLTAGE DANGER! ELECTRIC SHOCK DANGER!

- DO NOT TOUCH LIVE PARTS!
- BEFORE INSTALLATION, ENSURE THAT THE AC AND DC SIDES ARE NOT POWERED ON.

DO NOT PLACE THE DEVICE ON COMBUSTIBLE SURFACES.

WARNING

EQUIPMENT DAMAGE CAUSED BY INCORRECT CABLE CONNECTIONS IS NOT COVERED BY THE EQUIPMENT WARRANTY.

ONLY PROFESSIONAL ELECTRICAL TECHNICIANS PERFORM OPERATIONS RELATED TO ELECTRICAL CONNECTIONS.

OPERATORS MUST WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN MAKING ELECTRICAL CONNECTIONS.

CAUTION

TOOLS FOR BATTERY POWER CONNECTION INSTALLATION SHOULD BE INSULATED OR EXPOSED METAL AREAS SHOULD BE MINIMIZED. AT LEAST THE GRIP PART SHOULD BE INSULATED.

BECAUSE OF THE SPECIAL STRUCTURE OF THE CABINET TERMINAL BOARD, USE A SOCKET SCREWDRIVER TO CONNECT THE TERMINAL BOARD.

7.2.1 AUXILIARY POWER CONNECTION INTERFACE

As shown in the following figure, connect the A, B, and C terminals according to the marks on the copper bars. Cables with a diameter no larger than 4*2AWG and CL38-10-2D double-hole copper nose are recommended.

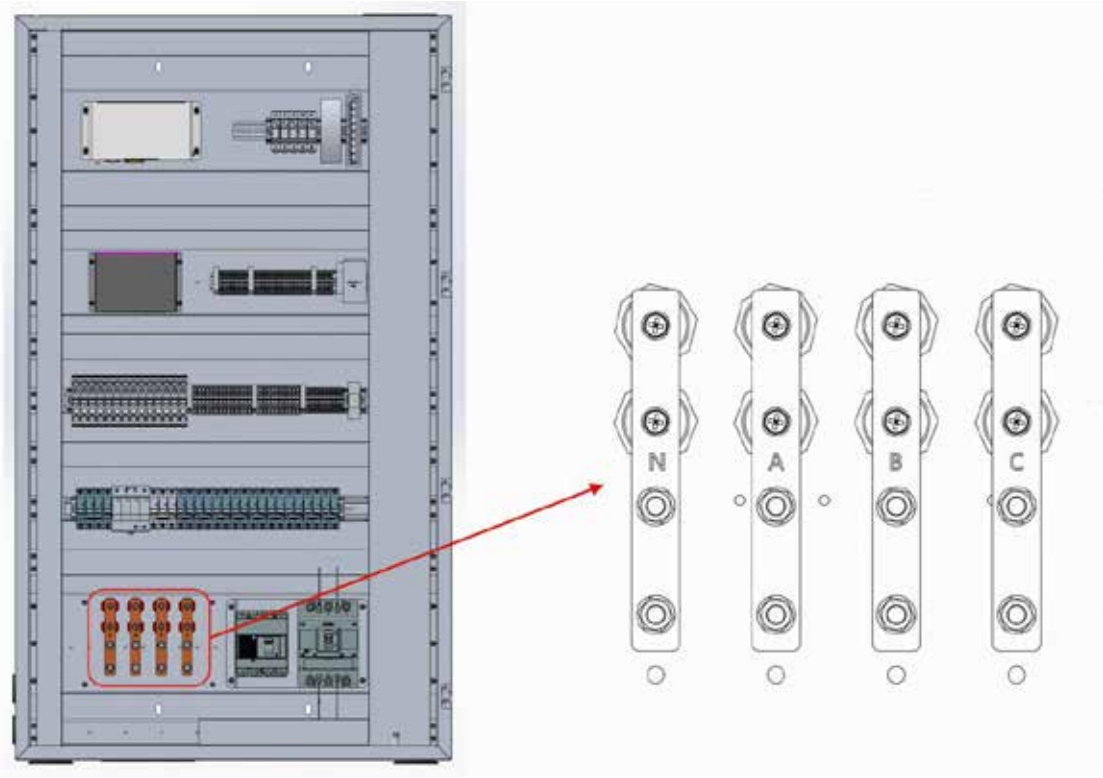


Figure 7-1: BCP auxiliary power supply copper bar(for reference only)

7.2.2 RESERVED PCS DRY CONTACT INTERFACE

As shown in the following figure, XT5-11, XT5-12, XT5-13 are reserved as PCS normally closed and normally open dry contact interface (stop signals). Connect them according to the actual conditions of PCS. 1.0mm² cables and ET1.0-12 terminals are recommended.

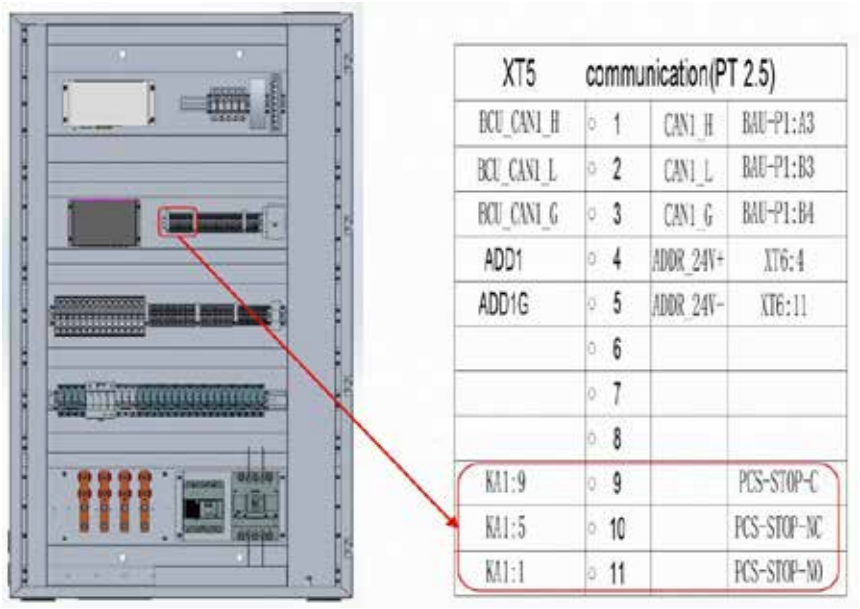


Figure 7-2: PCS reserved dry contact for emergency stop(for reference only)

7.2.3 PCS POWER CABLE INTERFACE

As shown in the following figure, connect PCS+ and PCS- respectively. You are advised to use single-stage cables with a diameter larger than 10*4/0AWG. PCS connection points are M12 double-row through holes.

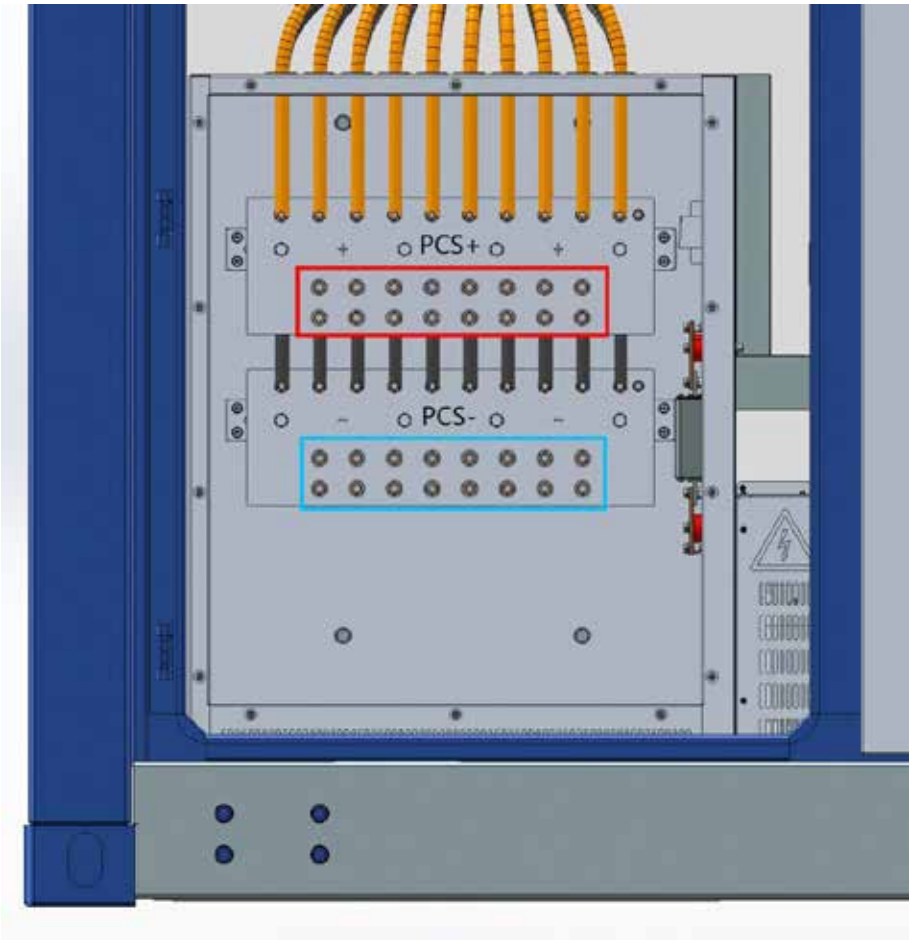


Figure 7-3: BCP copper bar diagram(for reference only)

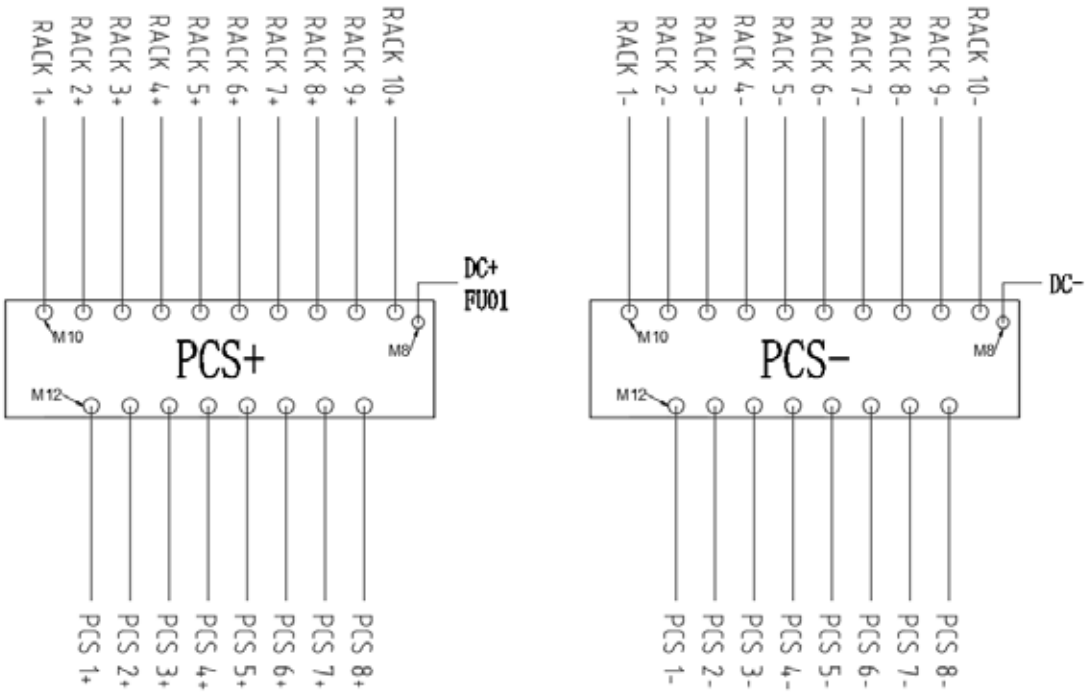


Figure 7-4: BCP wiring diagram(for reference only)

7.3 DC SWITCHGEAR AND PACK DESCRIPTION

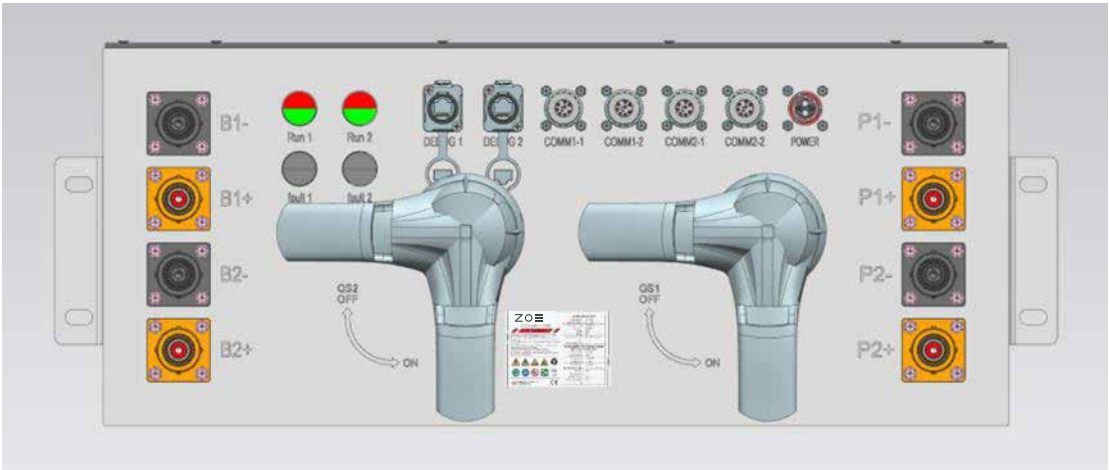


Figure 7-5: DC switchgear interface

Table 7-2: Interface Connectors of DC Switchgear

No.	Item	Function	Description
1	COMM2-2	Communication between RACKs	Connect to next COMM1

2	COMM2-1	Communication between modules	BCU & BMU Communication 2
3	COMM1-2	Communication between modules	BCU & BMU Communication 1
4	Fault 1	Fault indicator	Fault indicator 1
5	Run 1	Power indicator	Power indicator 1
6	Fault 2	Fault indicator	Fault indicator 2
7	Run 2	Power indicator	Power indicator 2
8	POWER	Auxiliary power input	BMS 220V ac auxiliary power input
9	DEBUG1	BCU communication	For debugging only
10	DEBUG2	BCU communication	For debugging only
11	COMM1- 1	Communication between RACKs	Connect to previous COMM2
12	P1-	PCS negative	Connect the negative terminal of the DC bus
13	P1+	PCS positive	Connect the positive terminal of the DC bus
14	PE	Grounding point	Grounding
15	P2-	PCS negative	Connect the negative terminal of the DC bus
16	P2+	PCS positive	Connect the positive terminal of the DC bus
17	QS2	Circuit breaker 2	Connect and disconnect the main circuit 2
18	QS1	Circuit breaker 1	Connect and disconnect the main circuit 1
19	B2+	Battery positive	Connect the highest module positive 2

20	B2-	Battery negative	Connect the highest module negative 2
21	B1+	Battery positive	Connect the highest module positive 1
22	B1-	Battery negative	Connect the highest module negative 2

Figure 7-6: PACK interface

Table 7-3: Interface Connectors of PACK

No.	Item	Function	Description
1	Deflagration vent	Deflagration vent	/
2	BMU COMM	BMU communication power supply	Including 24V power supply, CAN communication
3	Water inlet	Battery module water inlet	/
4	Water outlet	Battery module water outlet	/
5	MSD	Manual maintenance switch	Remove before transportation, install before operation
6	-	Battery Negative	/

7	+	Battery Positive	/

8 COMMISSIONING

After checking all wiring points, make sure the wire harness is not missing or loose. All personnel is forbidden to touch any original device and metal part before power-on operation. Keep a safe distance from the container.

When powering on the device for the first time, professionals must set the parameters correctly. Incorrect Settings may affect the normal operation of the device.

8.1 PRE-COMMISSIONING OF BCP

To ensure the long-term reliable and safe operation of your energy storage system, please read and follow the instructions carefully.
[Note] ZOE is not responsible for battery damage and other losses caused by using it not per the specified requirements or using it beyond the specified range. Put into use chapter.

8.1.1 CABLE CONNECTION CONFIRMATION

After checking all wiring points, ensure that the cables are not missing or loose. Do not touch any original equipment or metal parts before powering on. Keep a safe distance, connection terminals are connected tightly and reliably.

Please check the following items carefully before starting.

Table 8-1: Check list

NO.	ITEM
1	All electrical connections must be made in accordance with this manual.
2	The container enclosure is grounded and the protective cover inside the device is securely installed.
3	The system stop button is in the normal state.
4	All AC circuit breakers in the BCP are disconnected, that is, in the "OFF" position.

5	The low-voltage power switches of the DC switchgear of all battery racks are in the ON state.
6	The DC switchgear disconnecting switches of all battery RACKs are in the "ON" position.
7	All PACK MSDs are inserted and locked properly.

8.1.2 MCB

Table 8-2: MCB0~MCB12

MCCB1	MCBB2	MCB0	MCB1	MCB2	MCB3	MCB4	MCB5
Main switch on	HVAC1#	SPD1	380V power	Socket	UPS	UPS bypass(Automatic switchover)	AC/DC

MCB6	MCB7	MCB8	MCB9	MCB10	MCB11
BMS	FSS	Ventilation fan	FSS	HVAC2#	220V Spare

8.2 POWER-ON PROCEDURES

8.2.1 POWERING ON THE AUXILIARY POWER SUPPLY

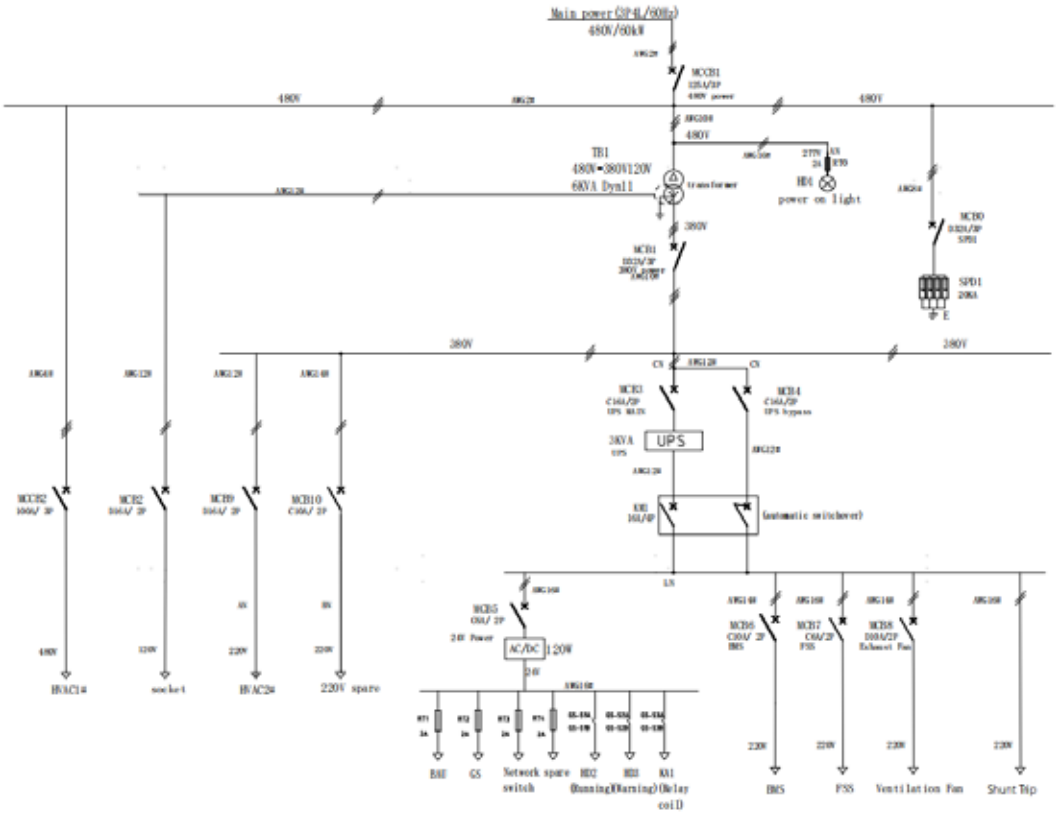


Figure 8-1: Auxiliary connection (for reference only)

Perform the following steps to power on the auxiliary power supply. Keep all the doors closed when the auxiliary power supply and DC battery are not in operation and maintenance mode; otherwise, the auxiliary power supply and DC battery will be forcibly powered off. Use the UPS cold start for the first power-on, enter 192.168.1.136 on the browser to access the GS-web terminal and change the GS operating mode from normal mode to operation and maintenance mode as shown in figure 8-2 (This change is automatically restored to the normal mode after the GS is powered off).

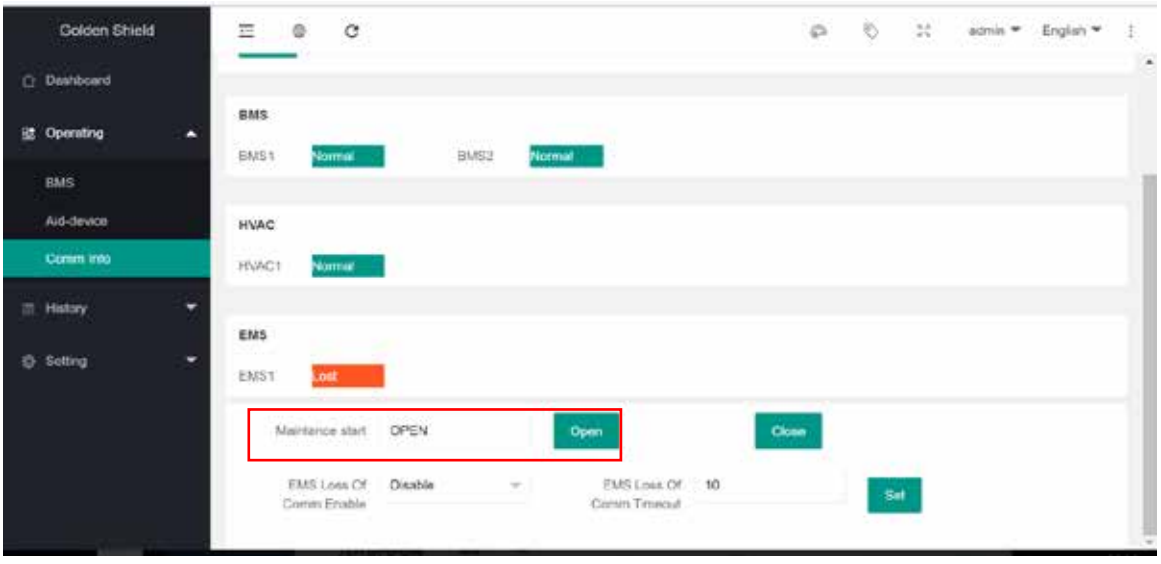


Figure 8-2: GS-web operation and maintenance mode switch

STEP 1: Press the <ON/Mute> button on the front panel of the UPS to start the fan and display the default UPS status screen. Press and hold the <ON/Mute> button for 3 seconds. The UPS buzzer rings for 1 second. Then the UPS is successfully started.

STEP 2: Close MCB5, switch power supply U1 AC/DC power supply, DC24V normal output, GS, switch, BAU and other devices power supply is completed.

STEP 3: Use a network cable to connect the PC to the GS-web port of the container or the switch in the BCP, access the GS-web terminal, and change the GS mode to operation and maintenance mode (exit the operation and maintenance mode after normal operation).

STEP 4: After the 480V 3P4L power supply is connected normally, close the MCCB1 480V power supply switch. At the same time, AC480V is converted to AC380V/AC120V.

STEP 5: Close MCB0 AC surge protector switch to ensure that the AC surge protector works properly.

STEP 6: Close the MCB1 380V power supply switch.

STEP 7: Close MCB3 UPS main power switch. The UPS power supply is normal and the UPS mode is switched to the mains electricity mode.

STEP 8: Close MCB4 UPS bypass switch to automatically switch to the bypass mode through the KM1 contactor when the UPS is abnormal.

STEP 9: Close MCB6 BMS power switch, and the AC power supply to the BMS is normal (the power indicator of the DC switchgear is green).

STEP 10:Open the fire suppression host, connect the 24V backup power, and close MCB7 fire suppression power switch, the fire suppression host power supply is normal.

STEP 11:Close MCB8 fire suppression fan switch, and the fan power supply is normal.

STEP 12:Close MCCB2, the liquid cooling unit runs automatically after power supply.

STEP 13:Close MCB2 maintenance socket power switch the container maintenance socket power supply is normal.

8.2.2 POWERING ON AND OFF THE HVDC

After the auxiliary power supply is normally powered, energy storage system information overview (figure 8-3) and the running status of all RACKs (figure 8-4) and HVACs (figure 8-5) can be normally viewed on the GS-web terminal.

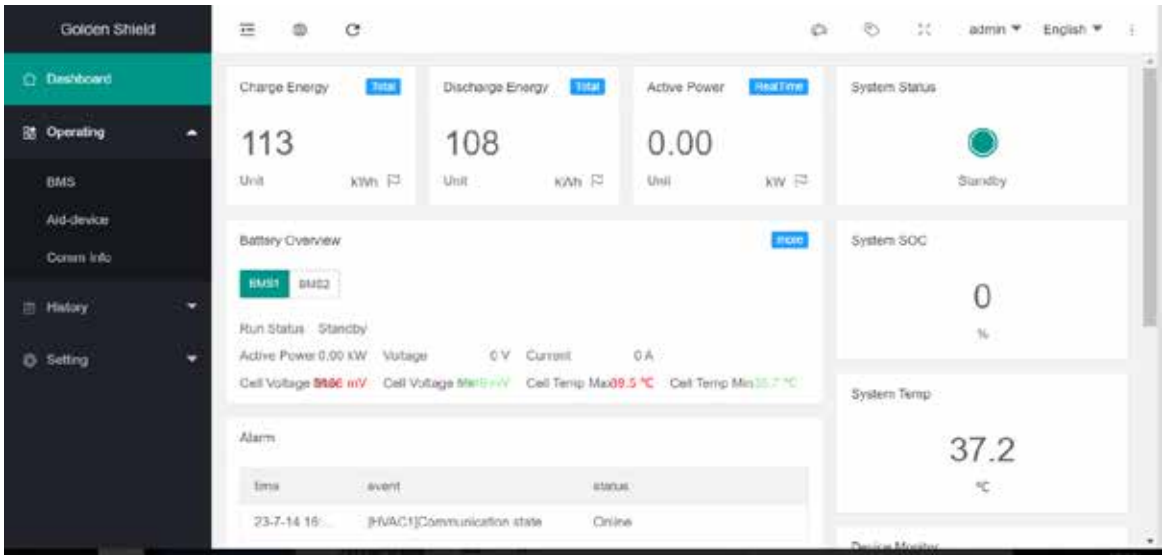


Figure 8-3: Energy storage system information overview

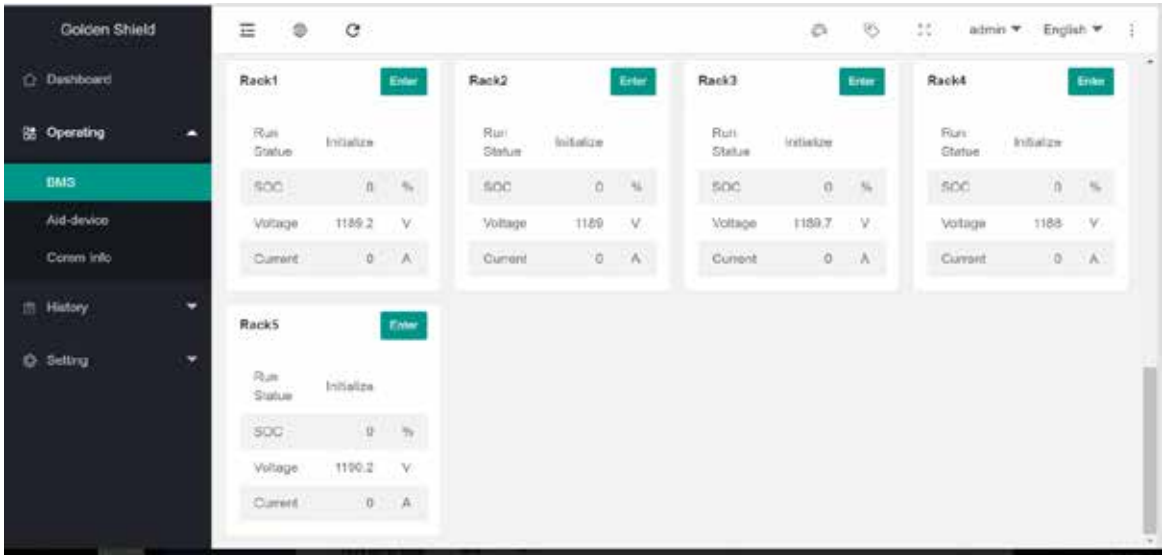


Figure 8-4: RACK information interface

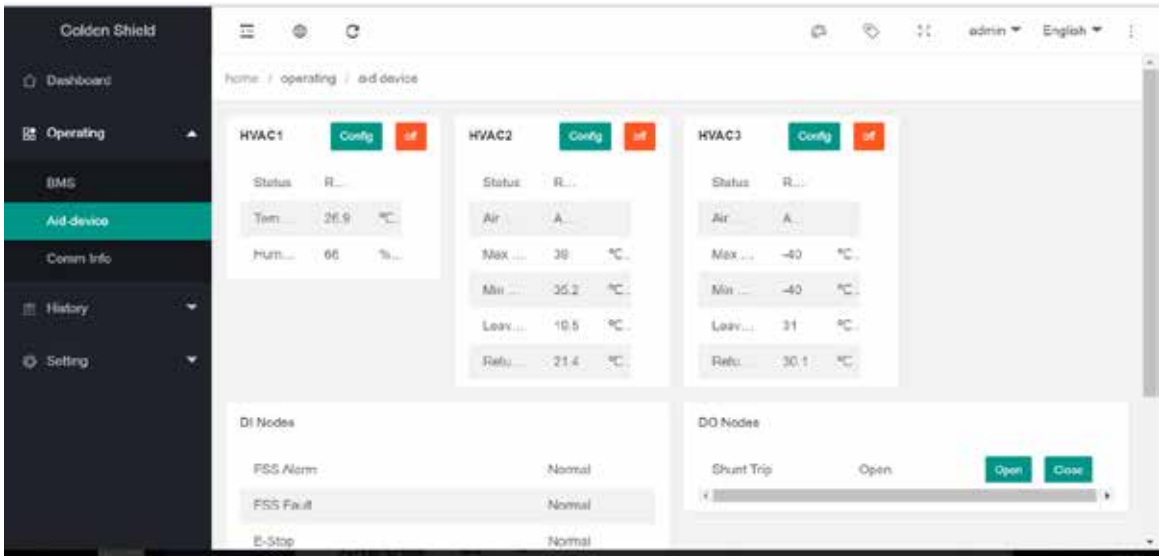


Figure 8-5: HVAC and other auxiliary equipment information

After the communication is normal, you can power on and off HVDC of RACK using the command or the GS-web terminal (as shown in figure 8-6 and figure 8-7). After the contactors of all RACK DC switchgears are closed, the DC side is powered on. Then charge and discharge power of PCS can be delivered as required.

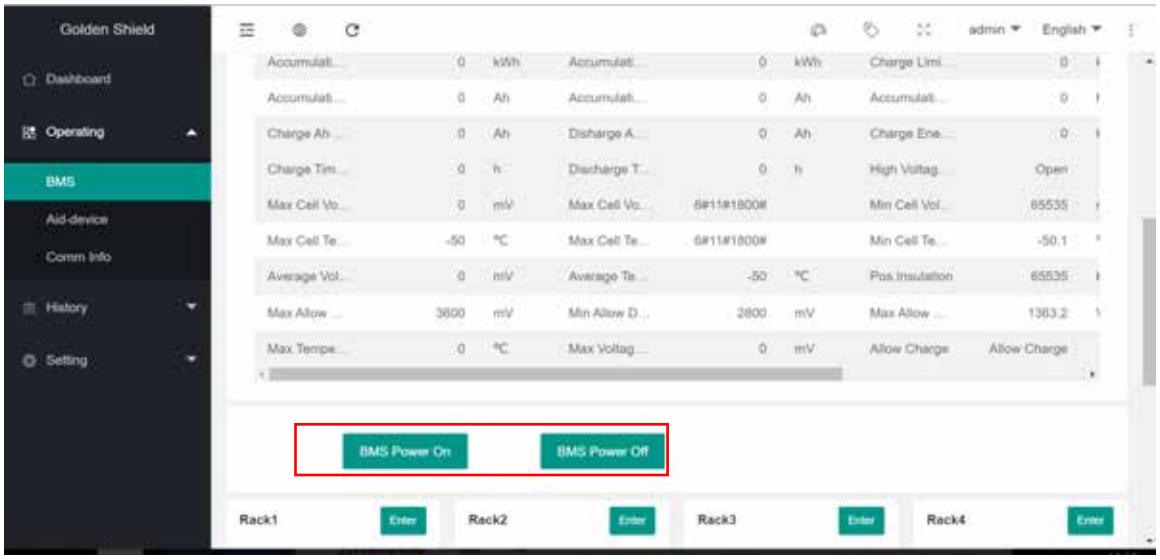


Figure 8-6: BMS real-time running information

8.3 POWER-OFF PROCEDURES

8.3.1 POWERING OFF THE AUXILIARY POWER SUPPLY

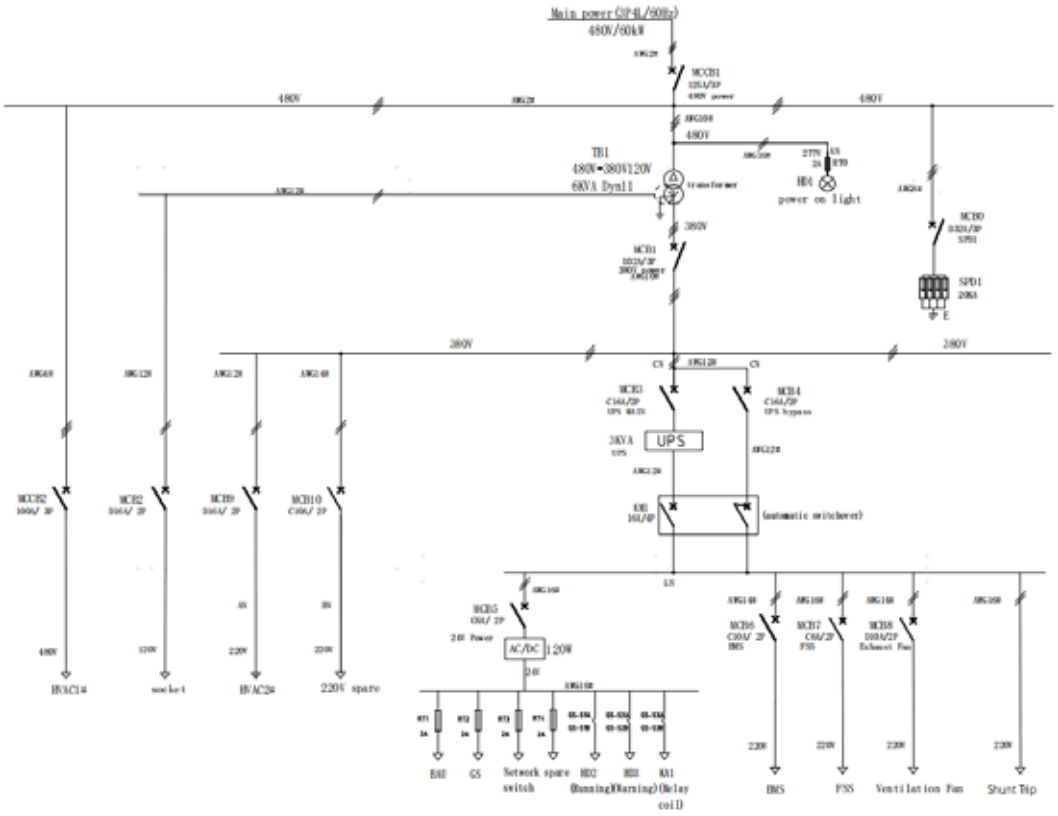


Figure 8-7: Auxiliary connection (for reference only)

STEP 1: Disconnect MCCB2, MCB2, MCB9, MCB10, MCB6, MCB8, MCB5.

STEP 2: Disconnect MCB3, MCB4.

STEP 3: Disconnect MCB1.

STEP 4: Disconnect MCCB1, disconnect 480V 3P4L power supply.

STEP 5: Shutdown UPS.

9 OPERATION

9.1 SYSTEM OPERATION

To ensure the long-term safe and reliable operation of your energy storage system, please read and follow the instructions below:

NOTE

OUR COMPANY WILL NOT BE LIABLE FOR ANY DAMAGE CAUSED BY FAILURE TO USE THE BATTERY SYSTEM IN ACCORDANCE WITH THE SPECIFIED REQUIREMENTS OR BEYOND THE SPECIFIED RANGE AND OTHER LOSSES ARISING OUT OF SUCH DAMAGE.

9.1.1 TEMPERATURE CHARACTERISTICS

- Operating ambient temperature: -30 °C ~50 °C. If stored in a cold environment (e.g. 0 °C) before installation, it will take some time to heat up before it can be recharged.
- Optimum operating ambient temperature: 0 °C ~45 °C. When the ambient temperature is higher than 45 °C or lower than 0 °C, the battery charging and discharging power decreases.
- Safe storage ambient temperature: -30 °C ~50 °C.
- Recommended storage environment temperature: 20°C ~30 °C.

9.1.2 CABLE CONNECTION CONFIRMATION

- Before power on, check the connection cable of the whole system, and make sure that the cable connection is reliable without aging fracture and insulation damage.
- Check whether the positive and negative poles of the DC output power cable in the container are connected correctly.
- Check whether the power connection of the container is correct.

- Check whether all communication wires and cables and sub connections at the connection ends are tight and reliable.

Refer to Section 7.3 for details of DC switchgear.

10 MAINTENANCE

To ensure the safety and the life span of the Battery Energy Storage BESS (BESS), proper maintenance is needed and necessary. ZOE provides the Scheduled Maintenance Program (SMP) for up to 10 years for its BESS products, which will bring you trouble-free revenue generation. Cost adder, terms, and conditions apply for SMP.

10.1 PRECAUTIONS

DANGER

WHEN THE DEVICE IS RUNNING, A HIGH VOLTAGE MAY GENERATE ELECTRIC SHOCKS, RESULTING IN DEATH, SERIOUS PERSONAL INJURY, OR PROPERTY DAMAGE. THEREFORE, BEFORE PERFORMING ANY MAINTENANCE, POWER OFF THE DEVICE AND STRICTLY FOLLOW THE SAFETY PRECAUTIONS LISTED IN THIS MANUAL AND OTHER RELATED DOCUMENTS.

- Maintain the device when you are familiar with the contents of this manual and have appropriate tools and test devices.
- Before performing maintenance, power off the device, and then wait for the appropriate time according to the instructions on the delayed discharge label. Ensure that the device is powered off.
- During the maintenance process, avoid irrelevant personnel entering the maintenance site. Temporary warning signs or fences must be erected for isolation.
- If the device fails, please contact our after-sales service in time.
- Power on the device only after the fault is rectified. Otherwise, the fault may expand or the device may be damaged.
- Do not open the device without authorization, otherwise there will be a risk of electric shock, and the resulting failure is not covered by the warranty.

- Operation and maintenance personnel and technical professional should be fully trained in the safe use and maintenance of the device, and operate with adequate precautions and equipped with personal protective equipment.
- When you need to move or reconnect cables, cut off the power input. After the internal energy is completely out and using a multimeter to ensure that there is no dangerous voltage of the DC bus and the parts inside the machine to be repaired, the maintenance can be started.
- Battery maintenance should be performed or supervised by a personnel familiar with the battery and its required precautions.
- When replacing a battery, replace it with the same type of battery or battery pack.
- Check immediately after the maintenance operation to ensure that there is no tool or any other part left inside the device.
- If you do not use the device for a long time, store batteries and recharge them according to this manual

10.2 BATTERY OPERATING TERMS AND OPERATING INSTRUCTIONS

10.2.1 TERMS EXPLANATION

Table 10-1: Terms Explanation

TERM	EXPLANATION
Normal operating	Refers to the system that works every day.
Long-time unused	The battery system has not started working for more than 6 months.
Battery module	The products with power storage and communication function produced by ZOE whic h are sent to customers as spare parts
Discharge energy efficiency	The ratio of discharge energy to charge energy

10.2.2 PERSONNEL REQUIREMENTS

Duties of operation and maintenance engineer:

1) Repair and maintenance of battery system and spare parts, find, report and deal with defects, faults and abnormal operation of products and spare parts.

2) Inspect the operating status of the battery system, monitor instruments and the interface of the upper computer, record data and fill in reports.

10.2.3 GENERAL REQUIREMENTS

- Battery system and spare parts must be maintained by professional personnel.
- Operation and maintenance personnel must receive professional on-the-job training and may not take up their posts until they pass the examination.
- Operation and maintenance personnel must follow the operation process and post specifications.
- Two or more personnel must be present during operation and maintenance and they must take protective measures.

10.2.4 BATTERY SYSTEM STORAGE AND MAINTENANCE PRINCIPLES

10.2.4.1 NORMAL OPERATING STATE CHANGES TO LONG-TIME UNUSED STATE

1) Charge/discharge the battery at 0.25P, adjust the SOC to 30% ~ 40%, record the voltage value of all batteries at this time, and cut off to the system power consumption equipment.

2) Power on the battery system every month, check the cell voltage, SOC and make record, and compare with the data recorded last time. If the SOC value is less than 15%, a charge and discharge activation is required; If the SOC value is less than 30% and more than 15%, the battery system needs to be charged at 0.25P to 40%SOC.

3) Charge and discharge the battery system every 3/6 months, and then charge/discharge at 0.25P to 40%SOC.

10.2.4.2 LONG-TIME UNUSED STATE CHANGES TO NORMAL OPERATING STATE

Activate the battery system with a full charge and discharge at 0.25P power, then maintain the battery system once.

10.2.4.3 CHARGING AND DISCHARGING ACTIVATION METHOD OF BATTERY SYSTEM

1) Discharge the battery system at 0.25P until the system terminates;

2) Standing: the time can be adjusted according to the site situation;

3) Charge the battery system at 0.25P until the system terminates;

4) Standing: the time can be adjusted according to the actual use;

5) Discharge the battery system at 0.25P until the system terminates;

6) Standing: the time can be adjusted according to the actual use;

7) Charge the battery system at 0.25P to 40%SOC.

10.2.4.4 BATTERY CELL MAINTENANCE STANDARD IN BATTERY SYSTEM

Based on the basic performance of the lithium battery to maximize the performance of the battery module, if the following situations occur during the charging and discharging process of the battery module, locate the battery module of the faulty battery cell, remove the battery module from the system, and maintain it:

1) The battery voltage at the discharging end is 400mV lower than the average battery voltage in Rack;

2) The battery voltage at the charging end is 300mV higher than the average battery voltage in Rack;

3) The temperature of the battery cell during charging and discharging is 5℃ higher than the average temperature.

10.2.4.5 CELL MAINTENANCE

- Check before cell maintenance

After removing the battery module from the Rack, check the following:

1) Battery module insulation: Use an insulation meter to measure the insulation value at the positive and negative terminals. If the insulation value is less than 10 MΩ, stop follow-up operations and contact after-sales engineers immediately.

2) Wiring harness check: Visually check whether the high and low voltage wiring harness inside the battery module is aging, falling off, damaged, needle withdrawal, pseudo soldering and other phenomena. If the above phenomena occur, the wiring harness needs to be replaced.

- Cell maintenance methods

a. The battery voltage is too low:

1) Discharge the battery module to the minimum voltage of single cell 2.8V;

2) Screen cells with discharging end voltage are less than 3.1V;

3) Recharge the screened cell: recharge the cell to the average voltage +30mV;

4) Continue to discharge the battery module to the minimum voltage of single cell 2.8V after recharge;

5) Screen cells with discharging end voltage are less than 3.0V;

6) Recharge the screened cell: recharge the cell to the average voltage +30mV.

b. The battery voltage is too high:

1) Charge the battery module to the maximum voltage of single cell 3.65V;

2) Screen cells with charging end voltage are greater than 3.4V;

3) Discharge the screened cell: discharge the cell to the average voltage -30mV;

4) Continue to charge the battery module to the maximum voltage of the single cell 3.65V after the discharge balance;

5) Screen cells with charging end voltage greater than 3.45V

6) Discharge the screening cell: discharge the cell to the average voltage +30mV;

c. The battery temperature is abnormal

1) Check whether the temperature sampling line of the battery cell is damaged, broken, pseudo soldering, needle withdrawal, etc. If the sampling line is abnormal, the sampling line needs to be repaired or replaced;

2) Test the AC internal resistance of the battery cell to check whether it is less than 1.8MΩ. If the internal resistance is greater than or equal to 1.8MΩ, replace the battery module where the abnormal battery cell resides.

10.2.5 SPARE PARTS (MODULE/RACK) STORAGE, MAINTENANCE AND PRECAUTIONS

10.2.5.1 BASIC REQUIREMENTS FOR STORING SPARE PARTS

Based on the basic performance of lithium batteries, spare parts must meet the following requirements during storage to maximize battery protection:

1) Storage temperature: -30～25℃, relative humidity: less than 60%, dry, clean and well-ventilated warehouse, to ensure that there is no short circuit, to avoid water, oil and other liquids into the box resulting in corrosive battery rust.

2) Storage SOC: 20% ~ 50%.

3) Charge and discharge activation should be carried out every 6 months during the storage period. For details, see the chapter of Operation process.

4) Check the main parameters every 3 months: total voltage, single cell voltage, cell temperature, cell voltage difference. If the total voltage is too low or the sampling is abnormal, maintain the battery module in time.

5) Spare parts should be handled lightly during loading and unloading, placed neatly, and strictly prevented from tumbling and heavy pressure.

6) Spare parts should not be stored upside down to avoid mechanical impact or heavy pressure. Battery Eexposure to sun and rain is strictly prohibited.

10.2.5.2 CHECK BEFORE SPARE PARTS MAINTENANCE

Before maintaining spare parts, check the following:

1) Battery module insulation: Use an insulation meter to measure the insulation value at the positive and negative terminals. If the insulation value is less than 10MΩ, stop follow-up operations and contact after-sales engineers immediately.

2) Wiring harness check: Visually check whether the high and low voltage wiring harness inside the battery module is aging, falling off, damaged, needle withdrawal, pseudo

soldering and other phenomena. If the above phenomena occur, the wiring harness needs to be replaced.

3) Voltage check: battery module storage voltage range: 340.81V～343.93V; cell voltage range: 3.277V～3.307V, if the battery module voltage or cell voltage is not within this range need to maintain the battery module or cell.

4) Cell temperature check: Check the internal cell temperature of the battery module through the upper computer. If the cell temperature differs from the average temperature by 5℃ or more, the battery module needs to be maintained.

10.2.5.3 MAINTENANCE METHODS

- The total battery module voltage is too low:

  1) When the total voltage of the battery module is less than 340.81V, recharge the battery module.

  2) At 25℃, the battery module adopts 1/3C constant current discharge to the minimum cell voltage of 2.8V;

  3) Let stand for 1h;

  4) Charge the battery module with 1/3C constant current for 72min at 25℃;

  5) Let stand for 3h;

  6) Measure the open circuit voltage of the battery module to ensure that the battery module voltage reaches 340.81V;

  7) If the open circuit voltage of the battery module does not reach the target voltage value, the SOC state value is calculated according to the SOC-OCV table of the battery module charging in Appendix 1, and 0.1C is continued to charge to 40%SOC.

- The cell voltage is too low

  1) When the voltage of the battery cell in the battery module is less than the average voltage 20mV, it is necessary to recharge the lowest voltage battery cell in the battery module;

2) Charge the battery cell at 0.1C at 25℃ to an average voltage of +30mV;

3) Let stand for 3h;

4) Measure the open circuit voltage of the recharge cell. If it is not reached, continue to recharge the cell according to step 2).

- Temperature anomaly

1) Check whether the temperature sampling line of the battery cell is damaged, broken, pseudo soldering, needle withdrawal, etc. If the sampling line is abnormal, the sampling line needs to be repaired or replaced;

2) Test the AC internal resistance of the battery cell to check whether it is less than 1.8mΩ. If the internal resistance is greater than or equal to 1.8mΩ, replace the battery module where the abnormal battery cell resides.

10.2.5.4 MAINTENANCE METHODS

- Safety precautions

The safety precautions listed below are essential for the safe charging of the battery module:

1) Be careful with the dangerous voltage in the battery module and pay attention to the risk of short circuit.

2) Improper operation may result in serious personal injury and property damage.

3) When charging the battery module, do not wear metal jewelry such as necklaces, rings or watches.

- Tools and equipment

I. Tool list

NO.	1	2	3	4	5	6
Name	Charger	Insulated Multimeter	Electric Screw Driver	Marker Pen	Cutter	Grounding Pad

Reference Image						
Measurement Accuracy	±0.5%	0.1mV				

II. Recommended specification of charger

a. Nominal Working Conditions

1) Input voltage: AC220V±10% 50Hz default value; to select the charger model according to the local grid voltage standard;

2) Working Environment: -10℃ ~ +40℃, Relative Humidity < 80%

3) Charging mode: applicable with constant current mode charging

b. Power Output Parameter:

DC Output Voltage Range	DC Output Current Range	Voltage Stability	Current Stability	Load Stability	Ripple and Noise	Measurement accuracy
0～500V	0～200A	≤0.2%	≤0.5%	≤0.5%	≤1%（RMS）	±0.5%

c. Device Function(optional):

1) Storage environment: -20℃ ~ +80℃;

2) Relative humidity < 80%;

3) Equipped with HMI, available to read charging voltage, charging current, charging capacity, charging time and other data from the charging HMI interface.

d. Safety Equipment

NO.	1	2	3	4	5	6
Item	Safety Helmet	Eye Protection	High Visibility Clothing	Protective Gloves	Protective Footwear	Fire Extinguisher

Reference photo		
Specifications	Class 00 or higher-level PPE	The fire extinguisher should be suitable for LPF battery thermal runaway.

➢ Charge and discharge process

Charge and discharge battery modules according to the following process:

Step	Operation Process	Annotations/Step:	Applied Tools
1	Prepare at least 1 fire extinguisher in the visible area (The fire extinguisher should be suitable for LPF battery thermal runaway.);	Prevent fire caused by short circuit	Fire Extinguisher
2	Wear personal protective equipment, including hard hats, protective glasses, high suits, gloves, and shoes with steel protective parts.	Avoid personal injury caused by any short circuit, arc flash or static electricity.	Personal Protective Equipment
3	Select the battery module needs to be checked and measure its voltage	Mark the package of the selected module with "Checked @date"	Label
4	Open the packaging/carton of the battery module	When unpacking the module, handle it with care to avoid damaging the module and package.	Cutter

5	Remove the battery module from its packaging and place it on a grounding pad or connect the grounding cable to the module shell.	Considering the weight of the battery module, you need to use a forklift lifting tool to remove the battery module from the packaging and move the module.	Grounding pad
6	Set the insulation multimeter to the insulation detection gear, and measure the insulation resistance at the docking point of the "P+/Output+" and "P-/Output-" terminals of the battery module for 30s.	The insulation resistance is greater than 10MΩ If the insulation resistance is less than 10 MΩ, contact after-sales personnel.	Insulated Multimeter
7	Set the insulation multimeter to the voltage gear, measure the voltage between "P+/Output+" and "P-/Output-" terminals of the battery module, and record the voltage V1.	If the voltage V1 measured of the battery module is equal to or greater than 340.81V, the battery module does not need to be charged. Go to Step 12.	Insulated Multimeter
		If the measured voltage V1 of the battery module is in the range of 340.81-343.93V, and it is planned to be installed and operated in the near future, the battery module does not need to be charged; Go to Step 12.	
		If the measured voltage V1 of the battery module is lower than 340.81V, and the installation and operation are not planned in the near future, the battery module needs to be charged. Follow Step 7 to charge all modules.	
		If the measured voltage V1 of the battery module is lower than 208V, the module has been permanently damaged, please contact us in time. And the module need to be fully packed back into the package, do not place with the normal module, need to place the module separately in different areas.	

8	Press the power button to turn on the battery charger.	You are advised to set the CC constant current mode to charge the battery module. The charging voltage is set to the maximum voltage of 374.4V, and the maximum output current is set to not exceed 93.33A. When the setup is complete, turn off the power button.	Charger
9	Connect "P+/Output+" of the battery module to the positive terminal of the battery charger, and "P-/Output-" to the negative terminal.	Check the connection carefully before proceeding to the next step, as a wrong connection may damage the battery charger and battery module. In addition, it may lead to fire accidents. The harness connecting the battery charger to the module must meet a safe current carrying wire diameter of at least 100A or greater.	Charger
10	Turn on the power button to start charging, the battery charger displays the real-time charging voltage and current of the battery, and the upper computer displays the real-time single battery voltage	The charging voltage on the battery charger is the real-time voltage of the battery module, and the current is less than or equal to 93.33A. Charge the battery module until the battery charger shows that the voltage reaches the target voltage and the current is equal to or less than 2A.	Charger
11	Press the power button to turn off the battery charger and disconnect the cable between the battery charger and the battery module.	Make sure the battery charger is powered off before disconnecting. Disconnect the wiring terminals on the battery modules one by one, and cover the first terminal with insulation before removing it to avoid short circuit.	Charger
12	Use a multimeter to measure the voltage of the battery module and record the voltage V2.		Charger

13	Put the battery module back into the package and seal the package.	1. Before packaging, check whether all module accessories are included. 2. Ensure that the module is clean and free from damage. 3. Considering the weight of the battery module, use the forklift lifting tool to install the battery module back into the package	

Charge and discharge the cell according to the following process

Step	Operation Process	Annotations/Step:	Applied Tools
1	Prepare at least 1 fire extinguisher in the visible area (The fire extinguisher should be suitable for LPF battery thermal runaway.);	Prevent fire caused by short circuit	Fire Extinguisher
2	Wear personal protective equipment, including hard hats, protective glasses, high suits, gloves, and shoes with steel protective parts.	Avoid personal injury caused by any short circuit, arc flash or static electricity.	Personal Protective Equipment
3	Select the battery module needs to be checked and measure its voltage	Mark the package of the selected module with "Checked @date"	Label
4	Open the packaging/carton of the battery module	When unpacking the module, handle it with care to avoid damaging the module and package.	Cutter
5	Remove the battery module from its packaging and place it on a grounding pad or connect the grounding cable to the module shell.	Considering the weight of the battery module, you need to use a forklift lifting tool to remove the battery module from the packaging and move the module.	Grounding pad
6	Set the insulation multimeter to the insulation detection gear, and measure the insulation resistance at the docking point of the “P+/Output+” and “P-	The insulation resistance is greater than 10MΩ If the insulation resistance is less than 10 MΩ, contact after-sales personnel.	Insulated Multimeter

	/Output-“ terminals of the battery module for 30s.		
7	Read the voltage value of all cells inside the module and the average voltage of cells inside the module through the upper machine;	If the difference between the voltage value of the battery cell and the average voltage value in the battery module is greater than or equal to 20mV, it is necessary to use a high-precision multimeter (0.1mV) to measure the battery cell again, and then balance the charge and discharge of the battery cell after confirming the voltage value.	Insulated Multimeter
		If the difference between the voltage of the battery cell and the average voltage is less than 20mV, it is not necessary to balance the charge and discharge of the battery cell.	
8	Press the power button to turn on the battery charger.	You are advised to set the CC constant current mode to charge the battery module. The charging voltage is set to the maximum voltage of 3.65V, and the maximum output current is set to not exceed 30A. When the setup is complete, turn off the power button.	Charger
9	Open the upper cover of the battery module and connect “cell+” to the positive terminal of the battery charger and "cell -" to the negative terminal.	Check the connection carefully before proceeding to the next step, as a wrong connection may damage the battery charger and battery module. In addition, it may lead to fire accidents. The harness connecting the battery charger to the cell must	Charger

		meet a safe current carrying wire diameter of at least 30A or greater.	
10	Turn on the power button to start charging, the battery charger displays the real-time charging voltage and current of the battery, and the upper computer displays the real-time single battery voltage	The charging voltage on the battery charger is the real-time voltage of the battery module, and the current is less than or equal to 28A. Charge the battery module until the battery charger shows that the voltage reaches the target voltage.	Charger
11	Press the power button to turn off the battery charger and disconnect the cable between the battery charger and the battery module.	Make sure the battery charger is powered off before disconnecting. Disconnect the wiring terminals on the battery modules one by one, and cover the first terminal with insulation before removing it to avoid short circuit.	Charger
12	Use a multimeter to measure the voltage of the cell and record the voltage V2.	If the battery voltage does not reach the target voltage, perform Step 9 to recharge the battery.	Charger
13	Put the battery module back into the package and seal the package.	1. Before packaging, check whether all module accessories are included. 2. Ensure that the module is clean and free from damage. 3. Considering the weight of the battery module, use the forklift lifting tool to install the battery module back into the package	

Appendix 1

1P104S Battery Module 25℃- static SOC-OCV			
Discharge		Charge	
SOC	OCV	SOC	OCV
100%	365.7108	100%	361.4104
90%	346.5253	90%	347.3472
80%	346.3225	80%	347.3982
70%	346.2270	70%	347.3998
60%	343.4069	60%	344.8454
50%	342.4269	50%	343.9275
40%	342.1816	40%	343.7075
30%	341.3979	30%	343.5105
20%	338.0144	20%	340.8133
10%	333.6138	10%	335.3212
0%	299.9464	0%	299.9404

10.3 FIRE EXTINGUISHING SYSTEM MAINTENANCE

- Inspect the smoke detector every 12 months, open the door of the container, and turn on the power. If the temperature and smoke indicators blink every few seconds, it is considered that the container is in normal working state.
- Inspect water and fire pipes every 6 months for leaks.
- Check intake shutter and exhaust fans every 6 months to see if they can be started or stopped manually.
- Check the batteries in the fire control host every 12 months to check whether the batteries are normally charged and the voltage is within the normal range

10.4 AIR CONDITIONING SYSTEM MAINTENANCE

- Inspect the air conditioning system every 6 months to check for dust collection and foreign matter blockage in the outer circulation vents.
- Check that the air conditioner fan blades are not damaged every 6 months and that the rotating fan is smooth and no noise is detected.
- Check whether the electrical cables and wiring terminals of the air conditioner are loose every 6 months.
- Check the condenser every 6 months for foreign matter blockage and no serious bending deformation of fins.
- Use a brush or cotton cloth every 6 months to clean dirt and dust from the filter, condenser, inlet and outlet air ducts, and fan blades.
- Use a brush or cotton cloth every 6 months to clean the liquid cooling unit dirt and dust.
- Test the coolant every 6 months, use the coolant detector to detect the concentration ⩽50%, and visually detect the coolant without dirt, precipitation, algae, etc.

11 COMMON FAULTS AND TROUBLESHOOTING

The common faults and troubleshooting are as follows.

Table 11-1: Common faults and troubleshooting

NO.	Fault category	Fault description	Handing method
1	The voltage display of the cell is inconsistent with the actual voltage (exceeding the requirement of voltage);	1. The collection harness is loose; 2. The cable harness is damaged; 3. The BMU unit is damaged.	1. Use a multimeter to measure the actual voltage. 2. Remove and insert the cable harness connector to check whether the cable harness is connected properly. 3. Replace the BMU with a new one and check whether the BMU is normal. 4. Replace the sampling harness and observe the phenomenon;
2	Cell voltage fluctuation	1. The collection harness is loose; 2. Large on-site interference; 3. The BMU unit is damaged.	1. Remove and insert the cable harness connector to check that the cable harness is normal. 2. Replace the BMU and run it on this PACK.
3	The number of cells collected is abnormal	1. The project configuration is incorrect; 2. The collection harness is abnormal. 3. The BMU unit is damaged.	1. Check whether the item configuration is normal. 2. Remove and insert the collection wire harness to check whether the collection circuit is normal. 3. Replace the slave controller of the BMU and check whether the BMU is normal.

4	Temperature display -40 ℃ /125 ℃	1. NTC damage/harness damage (-40℃ is open circuit, 125℃ is short circuit); 2. The BMU unit is damaged.	1. Reinsert the connector or replace the sampling cable harness to check whether the cable harness is normal. 2. Replace the BMU and check whether the BMU is normal.
5	The temperature collection quantity is abnormal	1. The project configuration is incorrect; 2. The collection harness is abnormal. 3. The BMU unit is damaged.	1. Check whether the item configuration is normal. 2. Remove and insert the collection wire harness to check whether the collection circuit is normal. 3. Replace the slave controller of the BMU and check whether the BMU is normal.

6	The temperature jumps up	1. Received external interference; 2. The BMU unit is damaged.	1. Replace the slave controller of the BMU and check whether the BMU is normal.
7	The temperature jumps down	1. The connector resistance is large;	1. Reinsert the BMU collection harness connector.

8	The battery total voltage collection is abnormal	1. There is a breakpoint in the collection circuit; 2. The fuse is blown; 3. The cable position is abnormal. 4. The BCU main control unit is damaged.	1. Disassemble the DC switchgear and conduct a conduction test on the fuse to determine whether the fuse is normal; 2. Confirm the wiring position of the collection circuit; 3. Measure that the collection circuit is on and confirm that the collection circuit is normal; 4. Replace the BCU and check whether the BCU is normal.
9	The total voltage collection on the load is abnormal	1. There is a breakpoint in the collection circuit; 2. The relay is sticky; 3. The cable position is abnormal. 4. The BCU main control unit is damaged.	1. Measure that the collection circuit is on and confirm that the collection circuit is normal; 2. Measure the relay status to confirm whether it is sticky; 3. Check the wiring position of the collection circuit; 4. Replace the BCU and check whether the BCU is normal.
10	The current is 0	1. The Hall power supply is lost. 2. The Hall baud rate of CAN	1. Check the Hall power supply. 2. Check the CAN Hall Baud rate. 3. Check the communication harness;

		communication is incorrect. 3. The communication harness is abnormal. 4. The solution selected in the configuration is incorrect.	4. Check the Hall scheme.
11	The direction of the current sensor is reversed	1. The direction of the current sensor is incorrectly selected.	1. Check the Hall scheme.
12	The insulation withstand voltage is faulty	1. PCS and BMS are tested for insulation withstand voltage simultaneously;	1. Check whether the insulation voltage withstand of PCS is carried out, and check whether the fault is triggered after disconnecting PCS;

13	The master/slave communication is abnormal	1. The communication harness is abnormal. 2. The matching resistance is not added. 3. The baud rate of the master/slave communication is inconsistent. 4. The slave control address is not assigned;	1. Check the communication harness; 2. Check the baud rate in the configuration. 3. Check the BMU address.
14	The total/master communication is abnormal	1. The CAN line is abnormal. 2. The terminal resistor is not added. 3. The total/master baud rate is inconsistent. 4. The master address is not assigned. 5. The bus is too long;	1. Check the communication harness; 2. Check the terminal resistance; 3. Check the baud rate in the configuration. 4. Check the BCU address. 5. Change the baud rate and check whether the baud rate is abnormal.
15	The BMS-PCS communication is abnormal	1. The point meter is not connected clearly;	1. Confirm the meter of communication points used by both sides;

		2. The communication harness is abnormal. 3. The BMS hardware is faulty. 4. Configuration problems.	2. Check BMS-PCS communication harness; 3. Replace the BMS hardware. 4. Check whether the point meter and dry contact exist in the configuration.
16	The MS-GS/EMS communication is abnormal	1. The point meter is not connected clearly; 2. The communication harness is abnormal. 3. The BMS hardware is faulty. 4. Configuration problems.	1. Confirm the meter of communication points used by both sides; 2. Check MS-GS/EMS communication harness; 3. Replace the BMS hardware. 4. Check whether the point meter and dry contact exist in the configuration.
17	Relay abnormal	1. Relay feedback harness is abnormal; 2. The relay is sticky;	1. Check the relay feedback harness; 2. Test the relay status and replace the relay;
18	Isolation switch abnormal	1. The isolation switch auxiliary contact feedback is abnormal;	1. Check the feedback harness of the isolation switch. 2. Check whether the auxiliary contact of the isolation switch is properly inserted. 3. Check whether the auxiliary contact of the isolation switch is normal;
19	Access control failure	1. The access control display is reversed; 2. The access control does not act;	1. Check whether cable connections to the access control system are normal. 2. Check the item configuration.

		3. The configuration is not written. 4. Access control damaged;	3. Check the configuration. 4. Replace the access control inspection;
20	Air conditioner failure	1. The air conditioner power supply is lost. 2. The air conditioner is damaged. 3. Communication loss;	1. Check whether the power supply to the air conditioner is normal. 2. Check whether the communication is normal; 3. Use the upper computer of the air conditioner to check the fault of the air conditioner.
21	Fire failure	1. The fire control controller displays that the main power supply is faulty. 2. The fire control controller displays that the ZONE circuit is faulty.	1. Check whether the fire power supply is normal. 2. Check the temperature and smoke sensors based on the fire extinguishing wiring diagram. 3. Check the circuit and check whether the corresponding 470Ω and 6.8K resistors are correctly connected.

12 After-sales Service

Shanghai ZOE Energy Storage Technology Co., LTD. provides customers with a full range of technical support and after-sales service. Users can gain services by dialing our service number.

Please refer to the contract for the free warranty service information.

The following circumstances are not within the scope of our free warranty service:

- System damage or failure caused by not following the user manual.
- Damage or failure caused by not following the relevant electrical safety specifications for wiring and power supply, or caused by poor site environment.
- System damage or failure caused by users' private modification.
- System damage or failure is caused by irresistible natural factors, such as typhoons, earthquakes, floods, fire, or harsh environments (high temperature, low temperature, high humidity, acid rain, etc.).
- After the failure occurs, the user fails to maintain the initial failure state, fails to timely notify the manufacturer, and handles without authorization, thus causing it to be unable to make a practical fault identification of the failure.

13 contact

If you have technical issues with our products, please contact us. The following data is required to provide you with the necessary assistance:

- Product model number
- Serial number
- Fault information
- A detailed description of the problem

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