
Product Specification for 160KW/200kWh Sodium-ion Battery Liquid-cooled Energy Storage Cabinet



H2W ® .

catalogue

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1. Scope of application

This product specification outlines the performance indicators, transportation and storage requirements, usage conditions, precautions, and risk warnings for the liquid-cooled sodium-ion energy storage integrated cabinet produced by H2W (hereinafter referred to as "H2W") for energy storage applications.

II. Executive Standards

IEC 62619-2022	Safety requirements and testing methods for industrial (including stationary) lithium batteries and lithium battery packs
IEC 63056-2020	Safety requirements for secondary sodium batteries and battery packs used in energy storage systems
IEC 62477-1	Safety requirements for power electronic converter systems and equipment - Part 1: General principles - Technical specifications for sodium-ion batteries - Electricity storage power stations
IEC 60068-2-6	Environmental Testing for Electric and Electronic Products - Part 2-6: Vibration (Sinusoidal)

III. Product Introduction

The sodium-ion energy storage system consists of a 200kWh liquid-cooled outdoor cabinet.

The 200kWh liquid-cooled outdoor cabinet consists of an energy storage battery system, primarily comprising sodium-ion batteries, a BMS (Battery Management System), a high-voltage control box, an Energy Management System (EMS), a temperature control system, a fire protection system, and a 160kW PCS. It is primarily used in industrial and commercial settings.

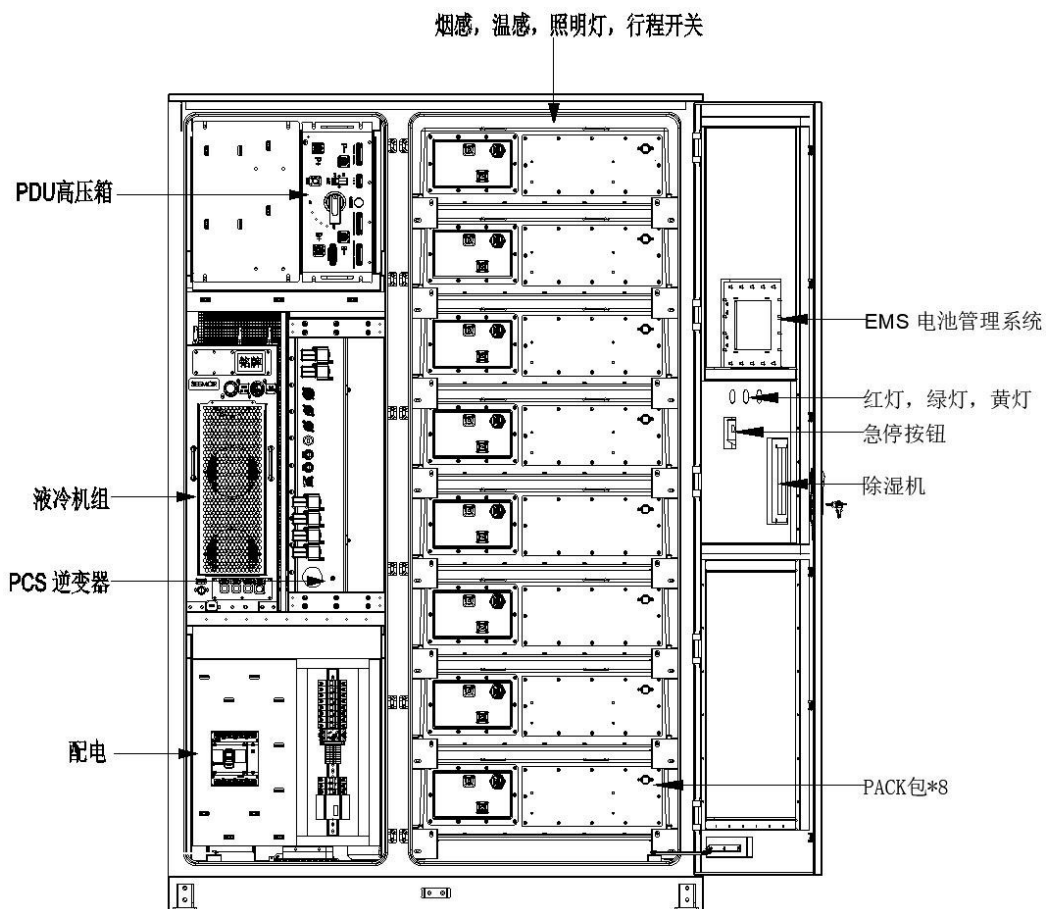
The 160kW PCS is installed inside the energy storage cabinet. By controlling the energy storage converter, it can achieve energy storage, transfer, and exchange between the energy storage device and the grid or load, thereby achieving energy optimization, improving the stability of the power supply system, and enhancing the quality of power supply.

The Energy Management System (EMS) should achieve real-time monitoring and control, peak shaving, price arbitrage, as well as control and operation functions such as photovoltaic integration, to meet the practical application needs of energy storage in backup power locations.

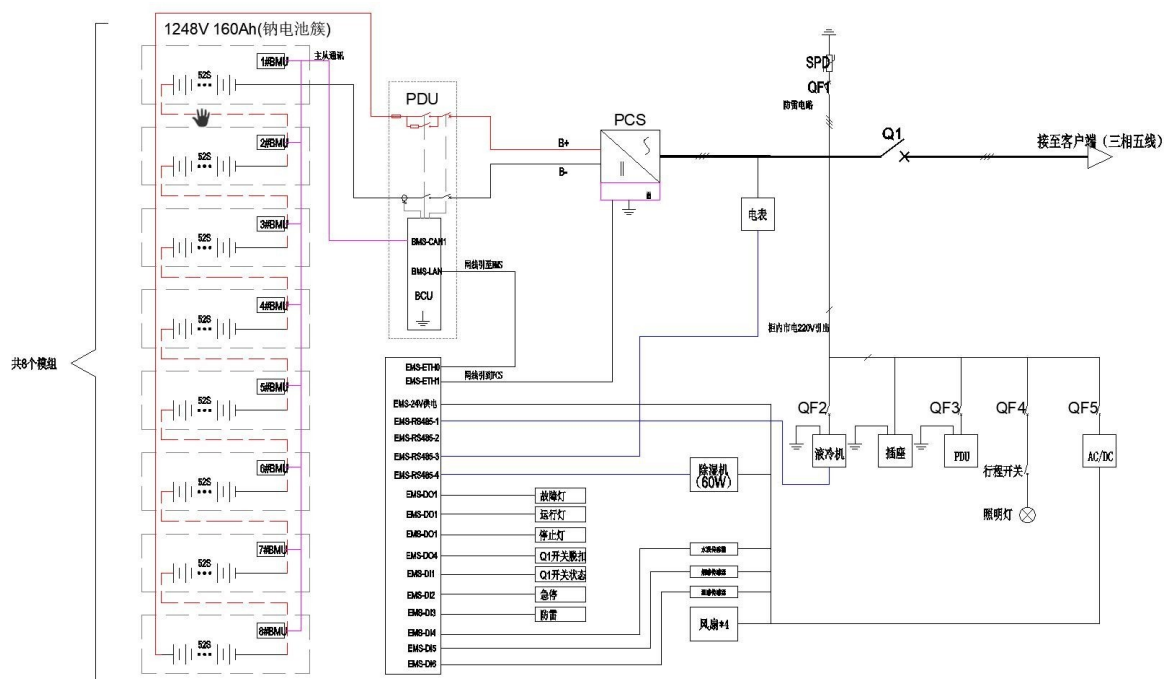
Energy storage cabinet configuration

serial number	Product Name	quantity	Specifications	Remarks
1	Intelligent sodium-ion battery energy storage System - Outdoor Cabinet	1	Single set capacity: 200kWh	
1.1	battery pack	8	The 1P52 battery pack utilizes a 160Ah sodium battery	
1.2	high-voltage box	1	Liquid-cooled battery cluster high-voltage box, W480*D610*H210mm, rated current 200A Rated voltage: DC1500V, 220V AC power supply	
1.3	Liquid cooling unit/including liquid cooling pipeline	1	6kW cooling capacity liquid cooler	
1.4	cabinet body	1	(D*W*H) 1600*1375*2450mm	
1.5	fire protection system	1	PACK-level aerosol + cluster-level aerosol	
1.6	Attachment	/	Circuit breaker, lightning protector, miniature circuit breaker	
2	PCS	1	The rated power of a single unit is 160kW, with an AC output of 400V/50Hz and a DC input range of 720-1500V	
3	Energy management system	1	EMS	

IV. System Technical Parameters



Cabinet indicator diagram



System electrical schematic diagram

Technical parameters of outdoor cabinet

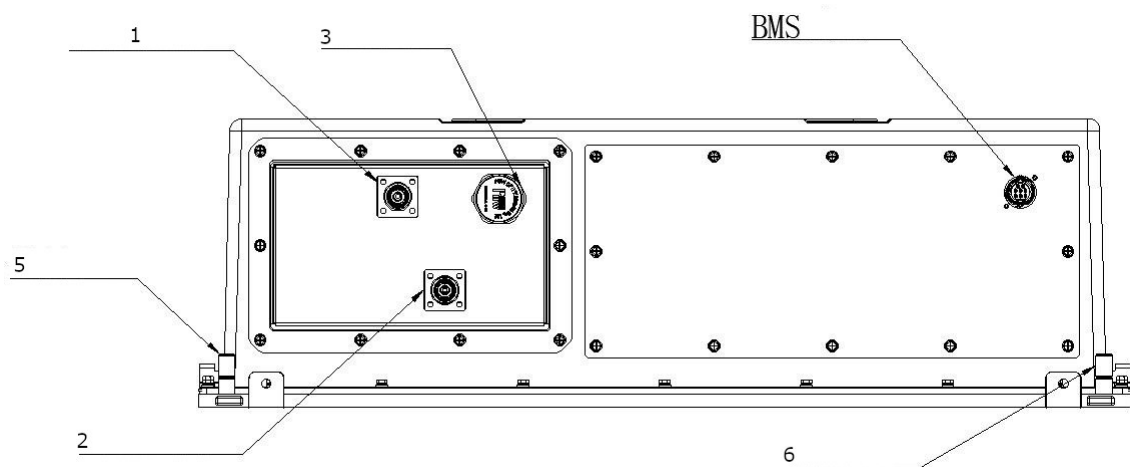
serial number	category	name	parameter	Remarks
1	DC parameters	Cell Type	NFPP-3V-160Ah	
		System grouping method	1P416S	
		Rated capacity of battery [kWh]	199.68	
		Nominal voltage [Vdc]	1248	voltage range 748.8~1435.2
2	system parameters	fire protection system	PACK-level aerosol + cluster-level aerosol	
		Energy conversion efficiency	≥92%	Excluding the liquid-cooled battery cabinet body auxiliary power consumption
		charge-discharge rate	0.8P	constant power
		Cycles	≥3000 times	
		Protection level	IP54	
		cooling method	liquid cooling	
		Operating temperature range [°C]	-25~+55	Derating for temperatures exceeding 45°C
		Operating humidity range	0~95%RH	No condensation
		System communication interface	Ethernet/RS485	
		External system communication protocol	Modbus TCP/Modbus RTU	
		Altitude [m]	Within 2000 meters	"2000 derating"
		Dimensions [mm] (D*W*H)	1600*1375*2450mm	
		Weight [kg]	About 3200kg	
		meet the standard	GB/T 36276, GB/T 34120, GB/T 34131, UN38.3, IEC62619, UL1973, UL9540 CE-EMC	

V. Battery plug-in box

Product technical specifications

Battery plug-in box specification parameters

serial number	project	parameter	Remarks
1	Cell Type	NFPP-3V-160Ah	
2	Battery PACK stringing method	1P52S	
3	Nominal capacity [Ah]	160	
4	Nominal energy [kWh]	24.96	
5	Nominal voltage [Vdc]	126	
6	Voltage range [Vdc]	93.6~179.4	
7	charge-discharge rate	$\leq 0.8P$	
8	cooling method	Intelligent Liquid Cooling	
9	Operating temperature range [°C]	Discharge: -40 to 55 Charging 0~55	
10	Storage temperature [°C]	0~+40	within one month
11	Operating humidity range	0~95%RH	No condensation
12	Installation method	Floor-mounted installation	
13	Altitude [m]	2000	"2000 derating"



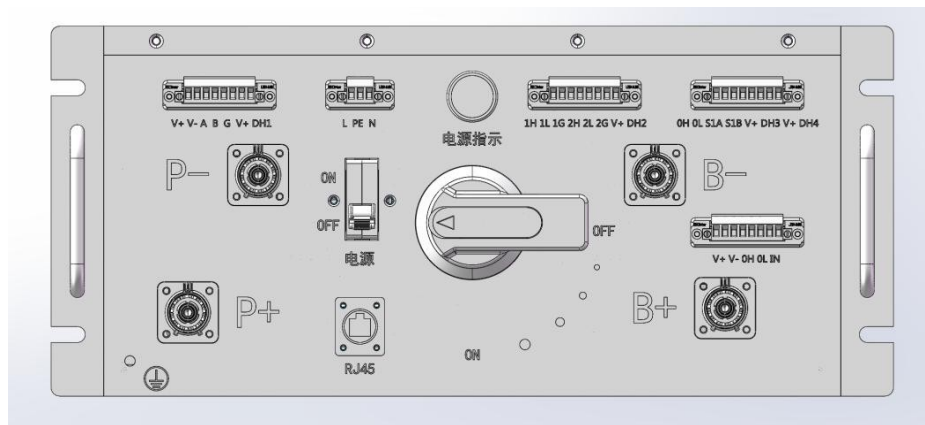
Interface description of battery plug-in box

serial number	component	model	quantity	Remarks
1	Positive socket	-	1	orange
2	Negative socket	-	1	black
3	pressure relief valve	-	1	
4	BMS communication	-	1	
5	liquid inlet	Φ14	1	
6	liquid outlet	Φ14	1	

High-voltage distribution unit (PDU)

The high-voltage box serves as the control component for the entire battery cluster operation. Its primary function is to manage the main circuit breaker, collaborating with the Battery Cluster Management Unit (BCMU) to ensure safe management of the battery cluster's charging and discharging processes, thereby guaranteeing the battery operates safely, reliably, and stably. The internal components of the high-voltage box include circuit breakers, fuses, contactors, and the BCMU, among others.

The specifications of the high-voltage box are listed in the table below.

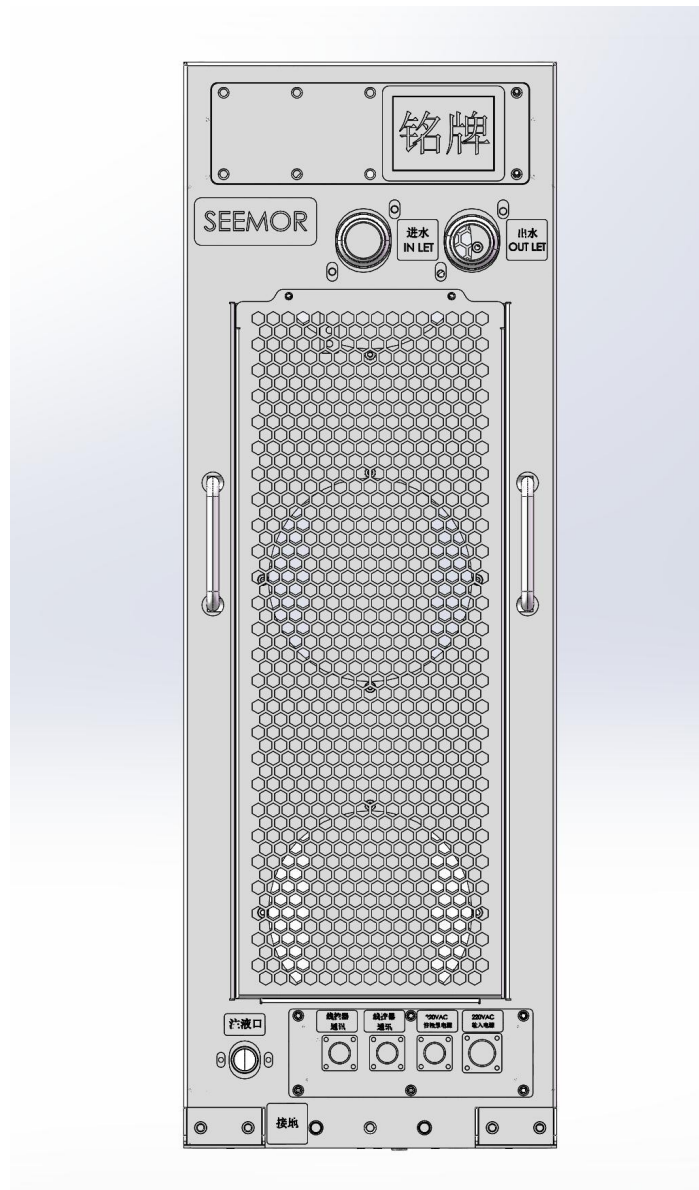


Schematic diagram of high-voltage box (the actual communication interface model shipped has changed)

Specification parameters of high-voltage box

serial number	project	parameter	Remarks
1	Maximum Voltage	1500V	
2	rated current	250A	

Technical parameters of liquid cooler



Indication diagram of liquid cooling unit

Table 6: Parameters of liquid-cooled unit

6kW liquid-cooled unit			
serial number	project	Specifications	Remarks
1	Rated AC input power supply	V/Hz	220±10%/50±1Hz
2	refrigeration capacity	kW	6
3	Liquid supply flow rate	L/min	50
4	liquid supply pressure	kPa	90
5	Liquid supply temperature	°C	18°C@45°C,RH50%
6	Rated cooling input power	kW	3.8
7	energy efficiency ratio	W/W	2.1
8	heating capacity	kW	2
9	Maximum sound pressure level noise	dB(A)	≤75
10	Waterproof and dustproof grade	/	The entire machine meets IP54 standards (the electric control box meets IP56 standards)
11	refrigerant	/	R410A
12	lifespan	Years	>10
13	surface treatment	/	Electrophoresis + electrostatic spraying (RAL 7035)

fire protection system

Based on research on energy storage scenarios, energy storage systems can be divided into multiple levels for protection:
PACK level: Early detection and rapid extinguishment of root ignition sources.

Cluster level: Focus on the deployment and control of external fire sources, prevent their spread, and inhibit their growth.

The above multi-level protection can prevent the waste of fire-fighting resources, significantly reduce the construction cost of fire-fighting facilities, and ensure the safe operation of the system.

PACK-level protection system

Each PACK is equipped with a module-level aerosol device, which can automatically detect, activate, and extinguish fires without the need for a power source. This ensures PACK-level safety protection and meets the GB/T 42288 package-level fire protection requirements.

When a battery thermal runaway or electronic component short circuit triggers a fire, the temperature inside the box rapidly rises, causing an open flame. The heat-sensitive wire detects the fire in the first place and activates the aerosol inside the box to extinguish the fire.

Cluster-level protection system

The cluster-level fire protection system is an aerosol fire extinguishing system. When a battery thermal runaway leads to a fire, the smoke detector or heat detector in the protection zone detects the fire, and the EMS will notify personnel through the indicator light to handle it in a timely manner. When the battery

In the event of thermal runaway or a fire caused by a short circuit in electronic components, the temperature inside the cabinet rises rapidly, resulting in an open flame. The heat-sensitive wire detects the fire and activates the aerosol inside the cabinet in the first instance to extinguish the fire.

Energy Management System (EMS)

System equipment configuration

EMS management controller. It is primarily used to coordinate and control PCS, achieving advanced control functions such as power tracking and response. Power tracking and response refers to the EMS control device adjusting the output power of PCS according to the power output curve issued by the power prediction system, controlling the overall power output of the energy storage system, and ensuring the real-time and accuracy of the overall output power. The EMS controller adopts a dedicated standalone device with a fanless design and no hard disk, and is arranged inside the energy storage cabinet.

Data acquisition and processing

The system is capable of real-time information collection and processing, which can be categorized according to the nature of the data as follows: a)

Analog quantity: It should be collected using AC sampling, while non-electricity signals can be collected using DC sampling.

b) Switching value: Passive contact input mode is directly adopted, and for the equipment to be controlled, dual contact input mode is directly used: c) Communication data: Data from other functional devices is injected into the station control layer through telecom, and after unified processing, it enters the data

Library.

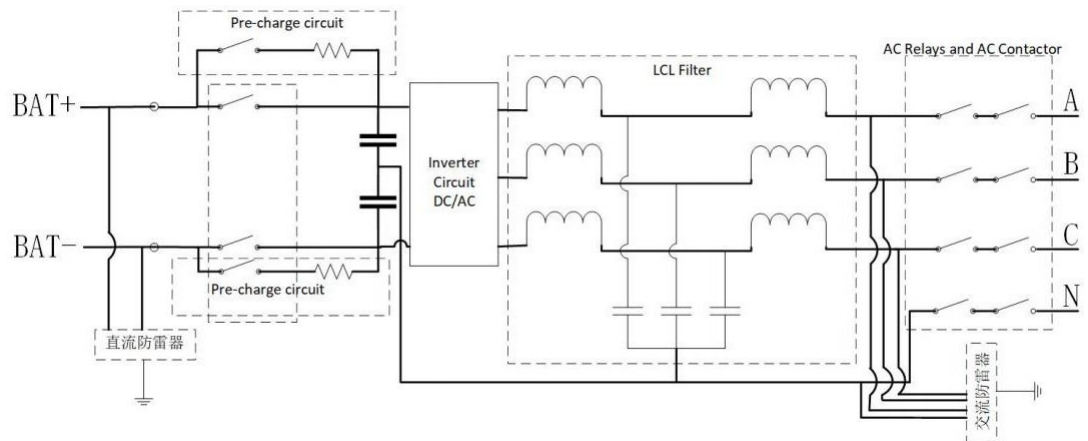
System functions

The energy storage management system possesses peak shaving and valley filling capabilities, enabling continuous operation according to the planned curve. It collects various telemetry and telecommand information related to battery energy storage, power distribution, and other related aspects in real-time, and sends various data information and commands such as remote control and adjustment to various devices. (Customers are required to insert a local telecom card)

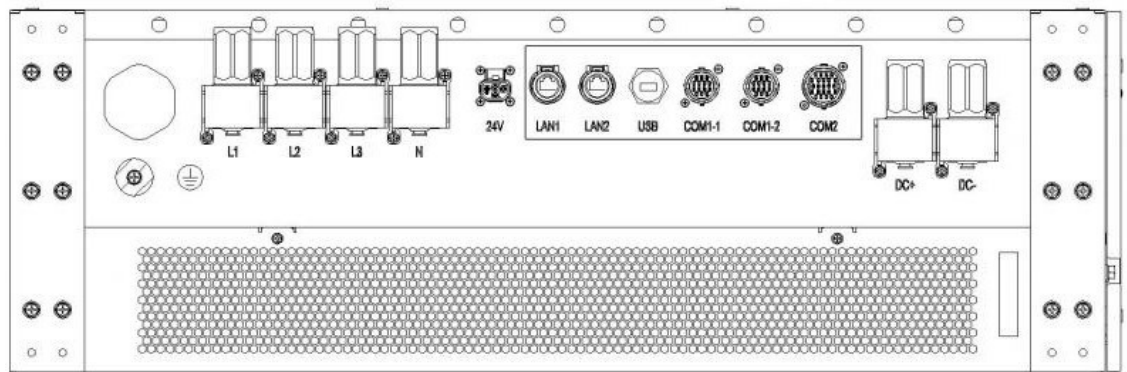
PCS inverter

Considering the characteristics of sodium batteries, such as wide voltage range and low temperature performance, a wide voltage range energy storage converter module is employed. The bidirectional AC/DC converter module adopts a modular design and utilizes advanced control algorithms to achieve multi-machine parallel operation. This module combines both LCD local monitoring and EMS system remote scheduling functions, exhibiting excellent load adaptability and grid adaptability.

This solution adopts the installation method of hanging one 160kW PCS outside an outdoor cabinet. The following figure is a schematic diagram of the PCS topology.



PCS topology diagram



PCS
schematic
diagram PCS
technical

serial number	project	parameter table	Specifications
1	DC voltage range	720~1500Vdc ($>1200\text{Vdc}$ derated to 90%)	
2	Rated AC power	160KVA	
3	Rated AC voltage	400 (-10%~15%) Vac	
4	Rated AC current	231A	
5	Operating temperature range	-25~60°C (power derating at $>50^\circ\text{C}$)	
6	temperature range	0~100% (no condensation)	
7	Maximum conversion efficiency	98.5% (with external auxiliary source)	
8	Protection level	IP66	

9	maximum altitude	3000m (>3000m derating)
10	communication method	Modbus TCP/RTU, CAN2.0
11	communication interface	RS 485, Ethernet, CAN

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VI. Product Packaging, Transportation, and Storage

6.1 product packaging

The default packaging method for this product is a full container with simple packaging upon delivery:

Remove the connecting copper bars between the battery packs (PACK) and package them separately with corresponding information;

Place shock-absorbing cotton between the battery packs (PACK);

Place the entire cabinet on the prepared wooden pallet, and use bolts to secure it to the corresponding foot of the cabinet on the wooden pallet;

Use EPE foam to cushion the energy storage cabinet, pack it into a wooden box, and label it with the corresponding information of the energy storage cabinet.

6.2 Product transportation

- transportation status

The SOC of this product is 30% when it leaves the factory. All disconnecting devices of the power circuits are disconnected, and the series power lines between battery packs (PACK) as well as the power cables of the high-voltage box and control box are removed to ensure safety during transportation. This cabinet is transported as a whole.

- Transportation requirements

1 The transportation of integrated cabinet assemblies should comply with the relevant requirements of UN 3536;

2 The dedicated lifting point for the integrated cabinet assembly is located on the top lifting ring, and the load capacity of the lifting equipment meets the requirements;

3 During transportation, the Battery Module should be protected from inversion, severe vibration, external impact, and compression;

4 Energy storage cabinets can be transported by vehicles such as trucks, trains, and ships;

5 When transported as a single cabinet, the cabinet and equipment should not undergo deformation or functional damage that affects the fit of shapes, traveling at a speed not exceeding 80km/h on first-class and second-class highways, and not exceeding 36km/h on third-class highways;

6 Spare parts and other components shipped with the container must be well packaged, with important information such as their respective names and quantities clearly indicated, to meet maritime transportation requirements.

6.3 Product storage

The storage state of charge (SOC) of the QB-002-AC-P160/200-Na-A0 liquid-cooled sodium-ion energy storage cabinet should be maintained within the range of 30% to 50%. The customer is expected to store the energy storage cabinet for more than 1 month but not exceeding 3 months, and a charge and discharge should be performed in advance to adjust the SOC to 30% to 50%. HIGHSTAR will not be responsible for any loss of capacity or other losses of the energy storage cabinet caused by the customer's failure to store it according to the manufacturer's recommendations.

VII. Quality Assurance Statement

The shelf life of the product is determined by the business contract. During this period, if any issues arise due to non-manufacturer-related design, manufacturing process, and quality control

Due to various issues such as safety concerns, performance degradation, and abnormal attenuation caused by controllable factors, HIGHSTAR can only provide technical consultation support and paid replacement or repair services, and does not promise free repair, replacement, or other services.

1. Without the permission of HIGHSTAR, it is not allowed to disassemble or assemble the energy storage cabinet and its accessory parts. If the customer disassembles or assembles them without authorization, HIGHSTAR will

We will not bear any responsibility for related accidents and provide warranty services;

2. HIGHSTAR shall not be liable for any issues or accidents caused by the following unauthorized operations by personnel or abnormalities not related to the product itself:

- Violations of regulations, industry standards, technical agreements, safety guidelines described in this document, and usage restrictions

Various issues and accidents;

- Abnormalities caused by the actions of non-Haisida personnel during the installation and use process;
- Issues arising from the use of improper electrical devices in conjunction with this product;
- Problems arising from exceeding the battery performance specification boundaries, that is, using the battery beyond its designated range;
- Directly electrically connect this product with battery products of other types, models, and manufacturers;
- Unauthorized modification of this product without the manufacturer's permission.

VIII. Product Safety Use Guide

To avoid battery damage or personal injury caused by misuse of the square sodium-ion battery module, please read the following safety guidelines carefully before using the square sodium-ion battery:

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- Improper use and storage of batteries pose risks of fire, explosion, and burns. Do not disassemble, crush, incinerate, or otherwise dispose of batteries

Heat and throw it into the fire;

- If you need to replace the battery, you should use a battery produced by the same manufacturer. Mixing batteries from different manufacturers may cause performance degradation

, and even the risk of fire and explosion;

- Do not put the battery into water or get it wet;
- Do not short-circuit, overcharge, or over-discharge the battery;
- Do not install, use, or store battery energy storage devices near heat sources such as fire or heaters;
- Do not pierce the battery casing, and prohibit impacting, throwing, hitting, trampling, applying heavy pressure to, or rolling the battery;
- Do not disassemble, repair, or modify battery products in any manner without authorization;
- If the battery emits an odor, becomes hot, deforms, discolors, or exhibits any other abnormal phenomenon, immediately stop using it and transfer the abnormal battery components to an emergency disposal site;
- If the battery catches fire, immediately disconnect the high and low voltage circuits, and prioritize extinguishing the fire with dry powder fire extinguishers, sand, etc. If water is used for extinguishing, make sure to use an absolutely sufficient amount of water for prolonged immersion. It is prohibited to splash the battery device with insufficient water

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- Without the company's consent, it is prohibited to disassemble the main device of the energy storage cabinet, modify or alter the design and architecture of the energy storage cabinet system, in order to avoid affecting the performance of the battery.