MOHANA Renewcare

105 KW/261 KWh BESS Product Specifications

Revised version

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Product Introduction

1.1 Abbreviation

BMS	Battery Management System
BSMU	Battery Stack Management Unit
BCMU	Battery Cluster Management Unit
BMU	Battery Management Unit
PCS	Power Conversion System
BESS	Battery Energy Storage System
DTU	Data Transfer Unit
EMS	Energy Management System

1.2 Reference Standard

- IEC 62485-1:2018-Safety requirements for secondary batteries and battery installations.
- IEC 62619:2017-Secondary cells and batteries containing alkaline or other non-acid electrolytes -Safety requirements for secondary lithium cells and batteries, for use in industrial applications.
- IEC 60695-1-11 - Fire hazard assessment.
- NFPA 855 - Standard for the Installation of Stationary Energy Storage Systems.
- IEC 62933-1 Electrical energy storage (EES) systems - Part 1: General requirements.
- IEC 62933-2-1 Electrical energy storage (EES) systems - Part 2-1: Unit parameters and testing methods - General specification.
- IEC 62933-3-1 Electrical energy storage (EES) systems - Part 3-1: Planning and performance assessment of electrical energy storage systems - General specification.
- IEC 62933-4-1 Electrical energy storage (EES) systems - Part 4-1: Guidance on environmental issues - General specification.
- IEC 62933-5-2 Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid integrated EES systems - Electrochemical based systems.
- IEC 62477-1 Safety requirements for power electronic converter systems– Part 1: General requirements.
- IEC 61000-2 Electromagnetic compatibility (EMC) – Part 2: Environment.
- IEC 61000-4 Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques.
- IEC 63056 Functional safety of electrical, electronic, and programmable electronic systems.

- NFPA 69 Standard on Explosion Prevention Systems.
- IEC 60445 Basic and safety principles for man-machine interface, marking and identification.
- IEC 61439 Low-voltage switchgear and control gear assemblies.
- IEC 61643-11 Surge protective devices – Part 11: Surge protective devices connected to low-voltage power distribution systems – Performance requirements and testing methods.

2 Product Overall Introduction

105 KW/261 KWh Liquid-cooling BESS			
Dyna Pod B261			
Product type	Lithium iron phosphate battery system		
NO.	**Item**	**Specification**	
1	Configuration	1P52S*5	
2	Rated Energy	261.248 KWh	
DC side			
3	Rated voltage	832V DC	
4	Voltage scope	702-936V DC	
AC side			
5	Voltage scope	400V AC	
6	Grid frequency	50/60 Hz	
7	Rated current	152A	
8	Rated Charging power	105 KW	
9	Rated Discharging power	105 KW	
System parameters			
10	Wiring method	3P+N+PE(N reservation)	
11	Environment Conditions	Storage temperature	-35°C~+50°C
		Work temperature	-30°C~+50°C(＞45°Cderating to use)
		Application Altitude	≤4000m(≥2000m derating to use)

12	Basic parameters	Dimension	1450*2150*1300 mm
		Color	RAL 9003
		Weight	2650 Kg
		IP level	IP55
		Anti-corrosion grade	C4(Up to C5)
		Cooling method	Liquid cooling
		Communication protocol	PCS: CAN/RS485/Ethernet EMS: Ethernet
		Coolant	50% glycol and water liquid

2.1 Introduction to System Devices

The design capacity of the liquid cooled BESS is 105 KW/261 KWh, and the integrated design concept is adopted to integrate the battery system, BMS, PCS, EMS, fire protection, liquid cooling unit, and environmental monitoring in the outdoor integrated cabinet. It has the characteristics of small footprint, convenient deployment, and flexible parallel matching with different energy storage capacity requirements. It has the functions of peak cutting and valley filling, demand management, power capacity increase, backup power supply, etc., to meet the needs of various energy storage applications.

Table 2.2-1 Devices in the Energy storage cabinet

No.	Equipment	Technical Requirement	Qty	Unit	Remark
1	Liquid-cooled Energy Storage Battery Cabinet	105 KW/261.24 KWh	1	Set	Including items

No.	Equipment	Technical Requirement	Qty	Unit	Remark
1.1	Outdoor Integrated Cabinet	Includes cabinet and accessories	1	Set	
1.2	Battery Pack	Rated capacity: 52.249 KWh; Configuration: 1P52S	5	Set	314Ah battery cell
1.3	Internal Cables	Includes power cables, communication cables, and distribution cables	1	Set	
1.4	Chiller	5 KW cooling capacity	1	Set	Includes liquid cooling pipelines
1.5	Fire Protection System	Aerosol. Smoke/temperature sensors, combustible gas detection, ventilation fan, explosion-proof valve, audible/visual alarm, water fire interface	1	Set	
1.6	PCS	105 KW	1	Set	
1.7	Cluster Control Box	Includes detection devices, protection devices, and BCMU	1	Set	
1.8	BMS System		1	Set	
1.9	Metering Device	Time-of-use bidirectional metering device for charging/discharging statistics and billing	1	Set	(Optional)
1.10	Environmental Monitoring System	Temperature/humidity sensors, access control, water leakage sensors	1	Set	
1.11	Dehumidification Device	Battery compartment dehumidification	1	Set	

2.3 Electrical Schematic Diagram

The electrical principle of the battery storage cabinet is shown in the following figure

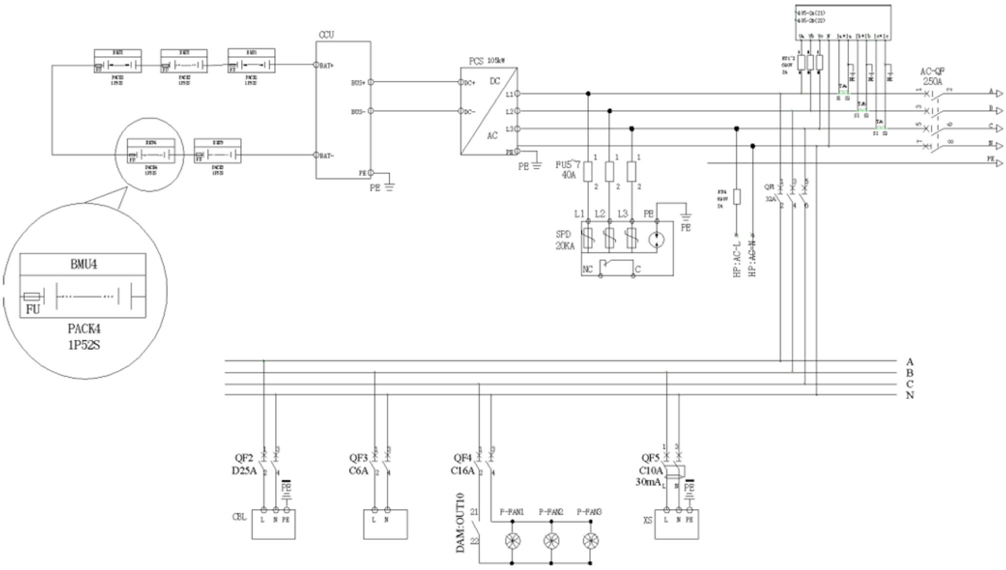


Figure 2.2-1 Schematic diagram of the primary electrical system

The primary circuit of the battery storage cabinet includes the battery system, cluster control box and PCS; the output of the battery system is controlled and protected by a high voltage box and connected to the DC side of the PCS.

A 105 KW energy storage converter (PCS) with a total AC output of 105 KW is configured in the battery storage cabinet.

1.1 Product Internal Layout

Internal Layout of Single Cabinet

Figure 2.3.1-1 Internal device layout

No.	Name
A	Chiller
B	Battery pack
C	Cluster control box
D	PCS

*The illustrations are for reference only

2.1.1 Installation Space Requirements

- Space requirements for the battery storage cabinet are shown in the following figure. Reserve sufficient space at the back of the converging cabinet for the chiller and PCS air outlet to ensure smooth heat dissipation.
- Keep the installation and storage place away from heat sources.
- Keep the installation and storage places away from corrosive environments, high dust environments, and flammable and explosive gases.
- The space in front of the battery storage cabinet must meet the minimum width of the device cabinet door.

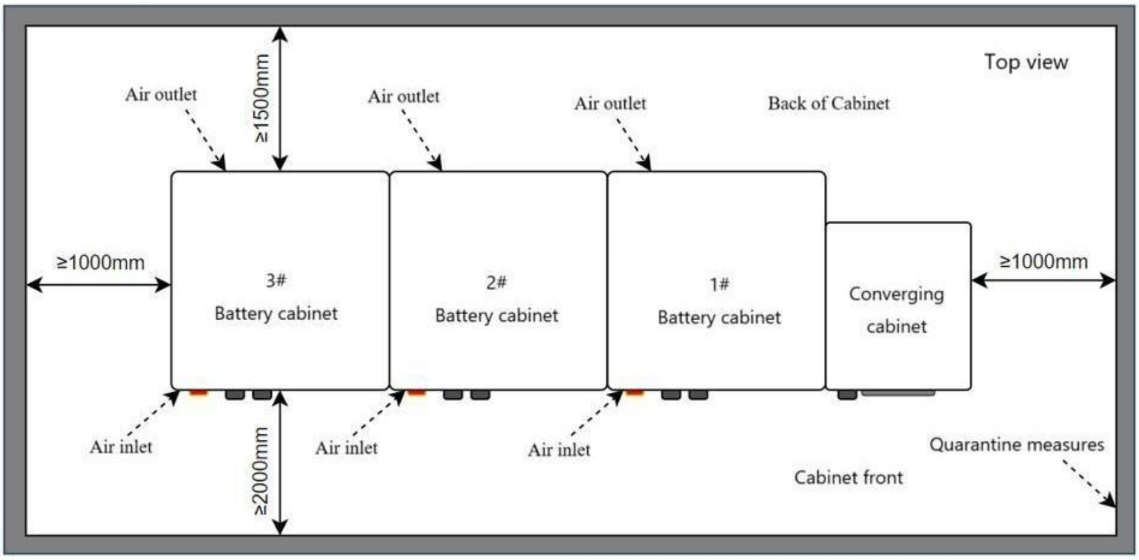


Figure 2.3.2-1 Space diagram

2.2 Product Features

- **Safety**
  - Three-level architecture BMS.
  - Cell-level data detection and management 6-level electrical protection Comprehensive fire protection system.
  - CE certification

- **Economical and Efficient**
  - Liquid cooling temperature control system.
  - Temperature difference between batteries below 5°C, extending system cycle life.
  - Lower auxiliary power consumption.
  - Plug-and-play

- **Flexible Application**
  - Compatible with different European market grid connection standards smaller footprint.
  - Flexible capacity configuration.

- **Intelligent**
  - Cloud platform+ mobile app.
  - Active balancing.

3. Product Introduction

3.1 Battery Pack

The Battery pack consists of 52 cells and 1 BMU (Battery Management Unit). Each battery pack includes 32 NTC temperature sampling points and 52 cell voltage sampling points. The BMU is responsible for measuring cell voltage, total module voltage, and cell ambient temperature. It supports optional active/passive balancing functions and can actively report real-time monitoring data to the BCMU (Battery Control and Management Unit) via the CAN 2.0 communication bus. It also executes temperature control and balancing strategies issued by the BCMU.

Table 3.1-1 Battery Pack Parameters

No.	Item	Parameter	Reference Diagram
1	Cell	3.2V,LFP	
2	Configuration	1P52S	
3	Rated Capacity	314Ah	
4	Rated Voltage	166.4V	
5	Rated Energy	52.249 KWh	
6	Rated	0.5CP	
7	Dimensions (W*H*D)	800*245*1105mm	
8	Weight	328±5kg	
9	Cooling Method	Intelligent Liquid Cooled	
10	Communication	CAN 2.0	
11	Protection Level	IP67	
12	Optimal Operating	15℃~35℃	
13	Storage	-30℃～55℃	
14	Maximum Temperature Difference in Pack	＜2℃ (Aluminum Busbar Temperature)	

Notes for battery pack:

- Unless otherwise specified, all tests are conducted at an ambient temperature of 25℃.
- The battery pack is charged at a constant power of 26.12 KW until any single cell reaches the termination voltage (3.6V) or the module reaches the charging termination voltage **(187.2V)**. Then, it is discharged at a constant power of 26.12 KW until any single cell reaches the termination voltage (2.75V) or the module reaches the discharge termination voltage (143V). After each charge and discharge cycle, the battery pack should rest for at least 30 minutes.

2.3 Cluster Control Box

The cluster control box primarily includes detection devices, protection devices, and an AC/DC power module. It is equipped with a built-in Battery Cluster Management Unit (BCMU), which enables battery cluster control, protection, data acquisition, and power distribution functions.

Table 3.2-1 Cluster Control Box Parameters

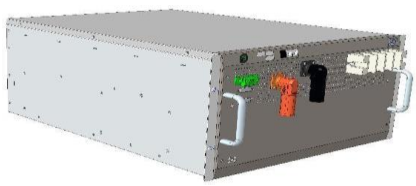
No.	Item	Parameter
1	Rated Voltage	1000V
2	Rated Current	250A
3	Breaking Capacity	150 KA
4	Protection Level	IP20

Figure 3.2.1-1 Schematic diagram of cluster control box

3.3 PCS

The Power Conversion System (PCS) is composed of a bidirectional AC/DC converter, a control unit, and other components, which can manage the charging and discharging processes of the battery. The PCS receives control commands through a communication interface and then transmits these commands to the power section to control the battery's charging and discharging, thereby regulating active and reactive power. The PCS can also operate off-grid mode, providing energy to the load. The control unit of the PCS in the energy storage converter communicates with the Battery Management System (BMS) via a CAN interface to obtain the status information of the battery pack, enabling protective charging and discharging of the battery and ensuring its safe operation. Simultaneously, the PCS communicates with the Energy Management System (EMS) through an Ethernet port to achieve functions such as peak shaving, load shifting, frequency regulation, and off-grid backup power supply.

Table 3.3-1 PCS Parameters

No.	Item	Parameter	Remark
	DC parameter		
1	Maximum DC voltage	950V	
2	Battery voltage range	615~950V(Full power)	
3	Maximum DC current	175A	
	AC parameter		
4	Rated AC power	105 KW	
5	Rated AC voltage	400V	
6	Rated current	152A	
7	Rated grid frequency	50/60Hz	
8	Adjustable power factor range	0.99/-1~+1	
	System parameter		
9	Isolation mode	Non-Transformer	
10	Maximum efficiency	98.5%	
11	Operating temperature	-20~+60℃	
12	Communication interface	CAN/RS485/Ethernet	
13	Reference drawing		

3.4 Temperature Control System

3.4.1 System Overview

The product utilizes a liquid cooling method for temperature control. The temperature control system consists of a liquid cooling unit, pipelines, and coolant. The pipelines are divided into three levels based on their location:

- **Primary Pipeline**: The main pipeline connected to the inlet and outlet of the chiller.
- **Secondary Pipeline**: The cluster-level main pipeline, corresponding to the number of clusters.
- **Tertiary Pipeline**: The module-level pipeline connected to the inlet and outlet of the module's liquid cooling plate.

The liquid cooled system is equipped with a circulation pump based on the resistance of the water circuit and battery packs to ensure that the liquid flow through each liquid-cooled battery pack is approximately equal, meeting the uniform temperature requirements for all batteries in the system.

3.4.2 System Functions

The system adopts a "dual-cycle" structure for heat dissipation, with dual energy efficiency control and multi-level distribution of liquid cooling pipelines. The temperature difference within any PACK is controlled within 2℃.

The unit features PC monitoring functionality, with communication between the
Chiller and the host achieved via RS485. The control mode can be set to either automatic mode or cell temperature control mode. Each branch is equipped with a flow meter and regulating valve for independent flow monitoring and control.

The system includes a dual power supply system, backup power, leakage protection, solid-state relays, and emergency stop switches for multiple layers of protection. It provides real-time feedback on coolant leakage signals to prevent safety incidents. Operational status is monitored in real-time, with immediate feedback on any faults.

3.4.3 Temperature Control Performance

(1) Cell Temperature Control:

The temperature of individual cells is controlled within 20~40℃.

(2) Temperature Difference Control:

The temperature difference between cells within a module is controlled within 2℃.

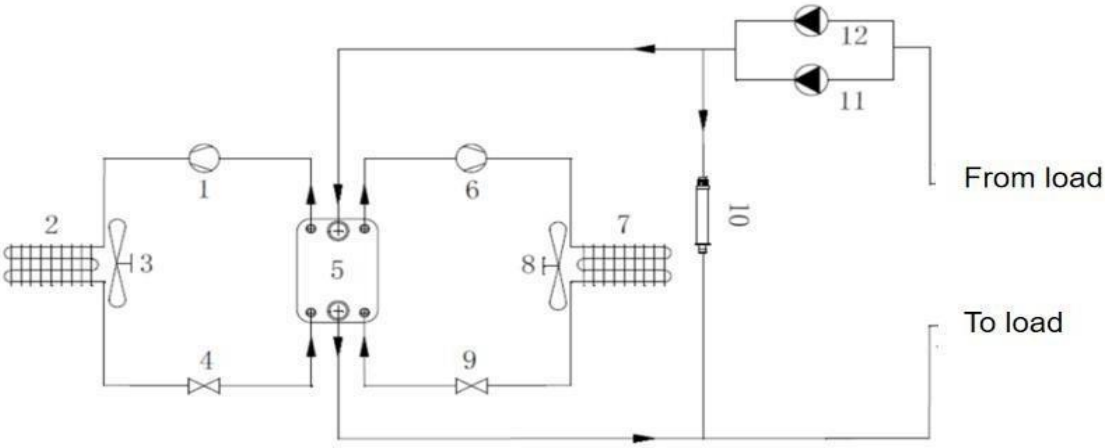
(3) Extreme Condition Temperature Control:

Under external environmental conditions of 20~45℃, the system ensures that the internal temperature, cell temperature, and temperature differences within the system remain within the specified range, ensuring smooth operation of the energy storage system.

The system adjusts the operating state (standby, cooling, or heating) based on real-time battery cell temperature, achieving the highest energy efficiency ratio.

3.4.4 System Principle

The air-cooled chiller unit consists of a refrigeration cycle system and a coolant circulation system. The system principle is illustrated in the diagram below.



Components List

No.	Item
1	1# Compressor
2	1# Condenser
3	1# Condenser Fan
4	1# Throttle Element
5	Plate Heat Exchanger
6	2# Compressor
7	2# Condenser
8	2# Condenser Fan
9	2# Throttle Element
10	Electric Heater
11	1# Circulation Pump
12	2# Circulation Pump

(1) Component Functions

3.5 Compressor: Compresses the refrigerant to provide power for the refrigeration system.

- **Condenser**: Designed with finned tube heat exchangers for high heat exchange efficiency. The refrigerant releases heat in the condenser.
- **Fan**: Uses a centrifugal fan to expel heat released by the refrigerant in the condenser to the outside.
- **Electronic Expansion Valve**: Controls the refrigerant flow by adjusting its opening.
- **Plate Heat Exchanger**: The intersection of the refrigeration cycle system and the coolant circulation system, responsible for heat exchange between the refrigerant and coolant.
- **Electric Heater**: Heats the coolant.
- **Circulation Pump**: Transports the coolant, providing power for the coolant circulation system.

(2) Workflow

The workflow of the chiller unit is as follows:

A. Compressor Activation: Once the outlet liquid temperature reaches the cooling set point, the compressor starts to compress the gaseous refrigerant. The air-cooled chiller control system adjusts the compressor motor's speed based on the outlet liquid temperature or the demand issued by the upper-level computer, thereby controlling the overall unit power and outlet liquid temperature.

B. Condensation Process: The condenser cools the high-temperature gaseous refrigerant. The gaseous refrigerant is condensed into a liquid, and the heat is expelled into the surrounding air through the condenser surface by the fan.

C. Expansion and Evaporation: The electronic expansion valve throttles and reduces the pressure of the condensed refrigerant before injecting it into the plate heat exchanger. The refrigerant evaporates in the plate heat exchanger, absorbing heat from the coolant.

D. Coolant Circulation: The circulation pump delivers the coolant to the plate heat exchanger, where it exchanges heat with the refrigerant. The cooled coolant is then transported to the container to lower the temperature of the battery pack.

(3) Precautions

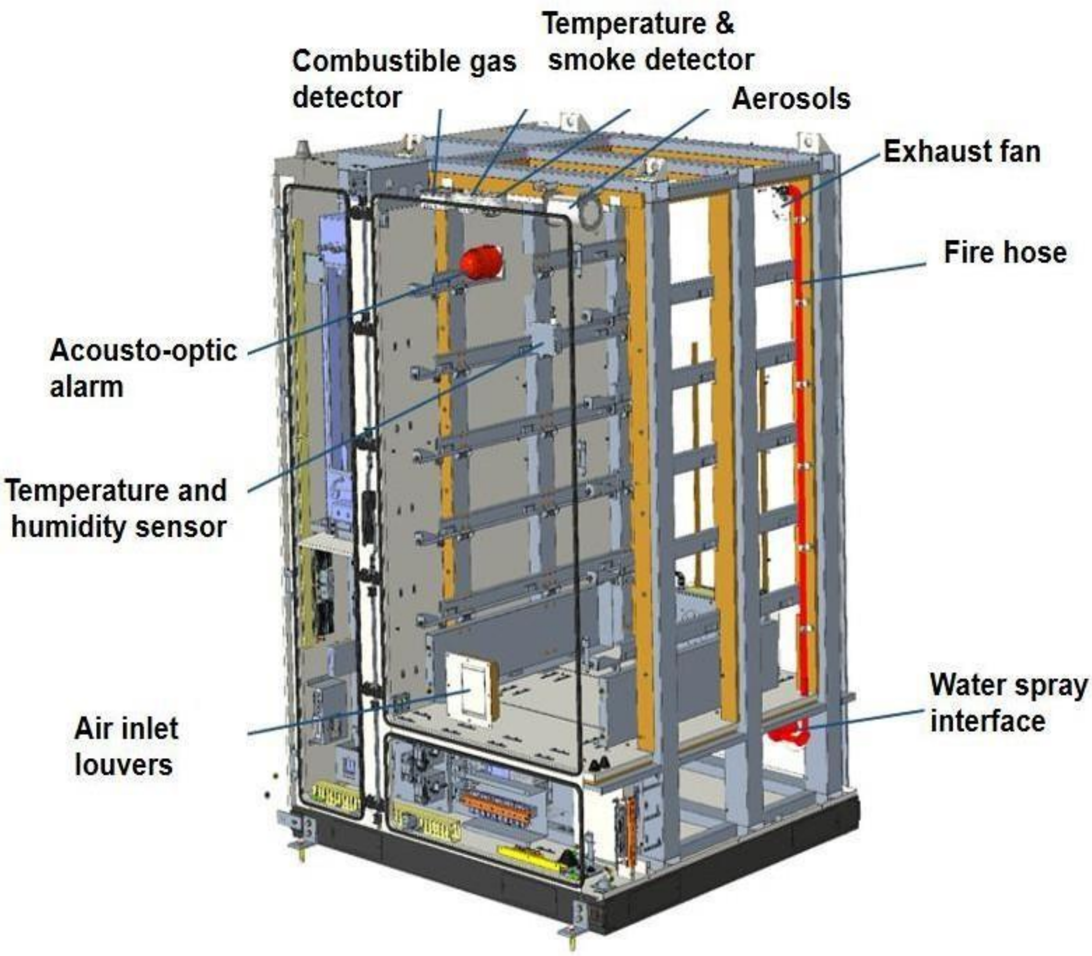
A. Service Life: The service life of the energy storage coolant is 5 years. During this period, the coolant is maintenance-free. After 5 years, a sample can be sent back to our company for testing, and we will provide usage recommendations based on the test results.

B. Waste Fluid Disposal: Please dispose of the replaced waste fluid at an officially designated waste oil (liquid) treatment center. Do not pour it onto soil, into drainage pipes, or water bodies to avoid harming the natural environment and human health. Under normal conditions of use, the fluid is harmless.

3.6 Fire Protection System

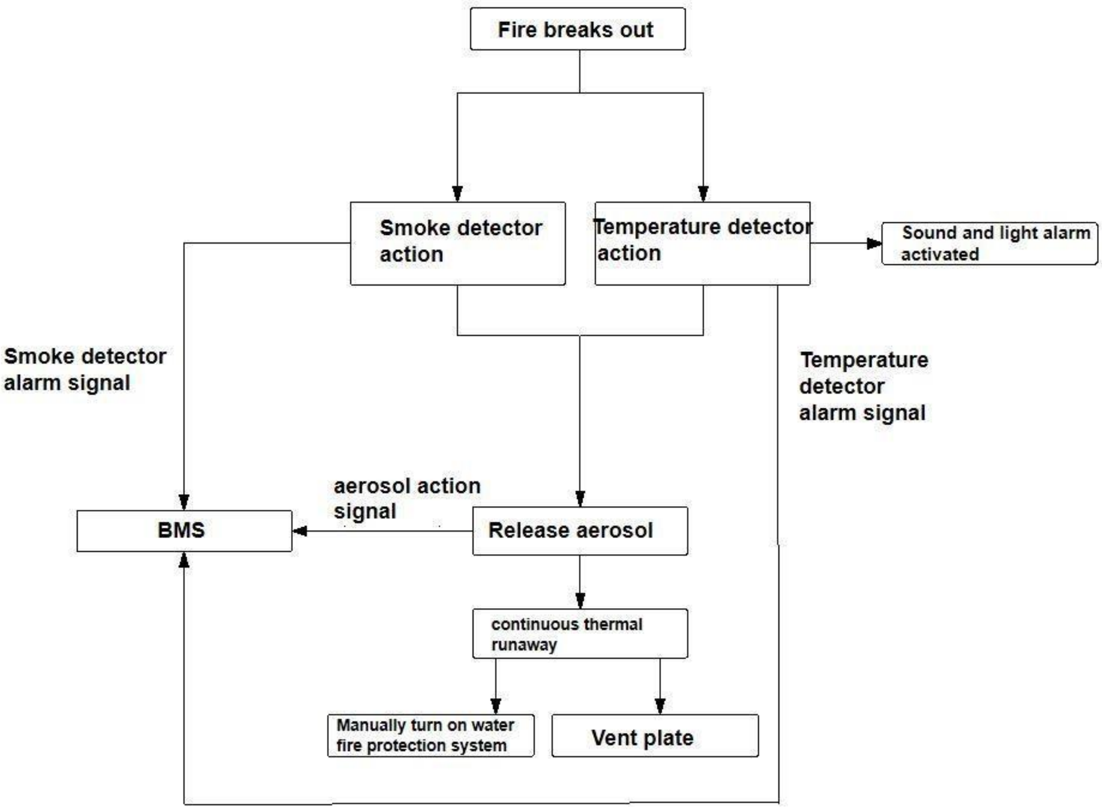
3.6.1 Fire Protection Device Layout

The battery storage cabinet is equipped with smoke detectors, temperature sensors, combustible gas detection and alarm system, an emergency ventilation system, and a gas fire suppression system. This system serves as an efficient firefighting setup. When anomalies are detected, signals are sent through the external terminals of the switch box to the station-level alarm host for fire warning. The layout of the fire protection devices is illustrated in the figure below.



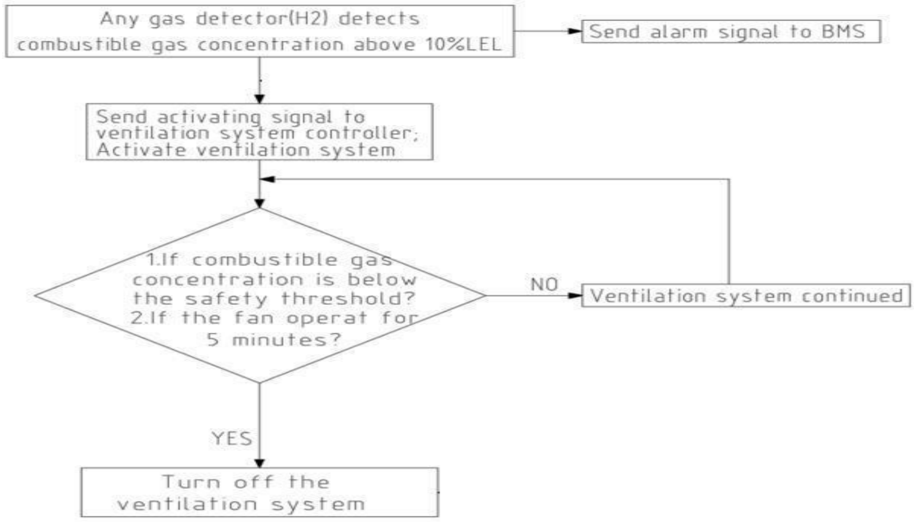
3.6.2 Gas Fire Suppression Control System

In the event of a fire, both the smoke detectors and temperature sensors will activate, triggering the aerosol fire suppression device to release aerosol. The aerosol release signal will be transmitted to BMS. The control logic for the automatic fire alarm and gas fire suppression system is illustrated in the figure below.



3.4.1 Ventilation Control Logic

When the detected concentration of combustible gas reaches 10% of the Lower Explosive Limit (LEL), the combustible gas controller activates the intake and exhaust ventilation system. Simultaneously, an alarm signal is sent to BMS control system to ensure timely response and safety measures.



3.7 Battery Management System (BMS)

The Battery Management System (BMS) consists of three main components: Battery Stack Management Unit (BSMU), Battery Cluster Management Unit (BCMU), and Battery Management Unit (BMU). Each component plays a critical role in monitoring, managing, and protecting the battery system.

3.7.1 Components and Functions

(1) Battery Stack Management Unit (BSMU)

- Collects and processes data such as voltage, current, and temperature from the battery stack, clusters, and modules.
- Calculates key parameters including State of Charge (SOC), State of Health (SOH), available charge/discharge capacity, and system alarm/protection status.
- Executes scheduling strategies, temperature control strategies, and balancing schemes based on collected data and calculations.
- Logs important operations, alarms, and protection events. Records real-time operational information of the battery stack during system operation.
- Communicates with the Energy Management System (EMS) and uploads data to cloud platforms or ESS management platforms.

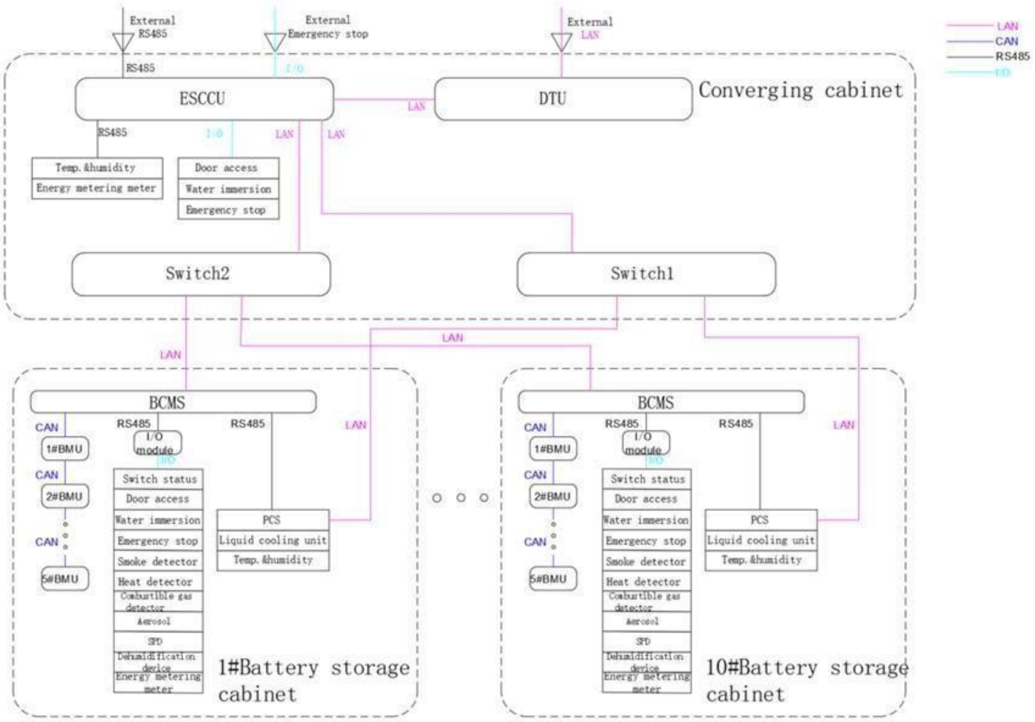
(2) Battery Cluster Management Unit (BCMU)

- Collects and processes data such as voltage, current, and temperature from the battery cluster and its modules.
- Calculates cluster-level parameters including SOC, SOH, available charge/discharge capacity, and cluster alarm/protection status.
- Sends collected data and calculation results to the BSMU.
- Logs important operations, alarms, and protection events. Records real-time operational information of the battery cluster during system operation.
- Executes scheduling and control commands issued by the BSMU.

(3) Battery Management Unit (BMU)

- Collects data such as cell voltage, temperature, balancing voltage, balancing current, total string voltage, pressure data, and fan speed.
- Calculates battery characteristics, alarm status, and protection status.
- Logs important operational data and events during the battery pack's operation.
- Executes temperature control and balancing strategies issued by the BCMU (Battery Cluster Management System).
- Reports battery-related data to the BCMU.

The communication topology of the BMS is illustrated in Figure 3.6-1. The hierarchical structure ensures efficient data flow and control between the BMU, BCMU, and BSMU, as well as external systems such as the EMS and cloud platforms



4 Product Maintenance

To ensure the safety of maintenance or repair personnel, before any maintenance or repair work, it is essential to ensure that the system is shut down, all power sources are disconnected, and necessary short-circuiting and grounding are performed. Place necessary maintenance signs to prevent other personnel from powering up the system during the maintenance period.

To ensure the continuous normal operation of the energy storage equipment and the service life of the equipment, regular maintenance is required.

(1) The installation and storage of internal components in the cabinet should avoid highly corrosive and dusty environments and stay away from flammable and explosive gases.

(2) Regularly check whether the wiring and terminals are aging, and ensure all connection points are tight and secure.

(3) Regularly clean the fans and check if they can operate normally.

(4) Before performing maintenance, ensure that the power is completely cut off before proceeding with any operations.

(5) During disassembly operations, ensure that the battery is fully discharged before proceeding.

(6) Regularly maintain the liquid cooling system and periodically replenish the coolant.

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