Product Specification

Product name: Liquid Cooled Energy Storage Integrated System

Product model: 125kW/233kWh

Date: April 2024

CONTENTS

1. Overview

1.1 Scope of application

The Product Specification (hereinafter referred to as "the Specification") describes the technical indicators of each system of the Liquid Cooled Energy Storage Integrated Machine. The product includes the battery pack, the high-voltage box, the liquid cooler, the fire protection system, PCS, and the distribution system. For the avoidance of doubt, the Specification is only applicable to 125kW/233kWh product models.

1.2 Test conditions for product performance commitment

Unless otherwise specified, the tests set out in the Specification shall comply with the following conditions:

1、 Temperature: 25±2°C

2、 Humidity: 35%~85%

3、 Charging and discharging power: 0.5 P

2. Explanation of abbreviated words

BMS	Battery management system
BMU	Battery management unit
ES-CCU (CCU)	Energy storage integrated centralized control unit
BOL	Begin of life
CAN	Controller area network
EOL	End of life
HV	High voltage
LV	Low voltage
OCV	Open circuit voltage
SOC	State of charge

3. Product introduction

The Liquid Cooled Energy Storage Integrated Machine adopts the long-life lithium iron phosphate battery cell design and the efficient intelligent liquid cooling temperature control design, controlling the temperature difference of the energy storage system within 5 ℃ and increasing the battery life by 15%; It adopts the multi-level disconnection design for battery pack and battery cluster, the system compartment design and the advanced three-level intelligent fire safety design, achieving the ultimate safety of the

storage system; In addition, it adopts the intelligent BMS and EMS systems, achieving VPP, intelligent demand regulation, real-time response to power grid scheduling and other functions.

3.1 Key standards

- UL 9540 certificated
- UL 9540A certificated
- UL 1973 certificated

3.2 Applications

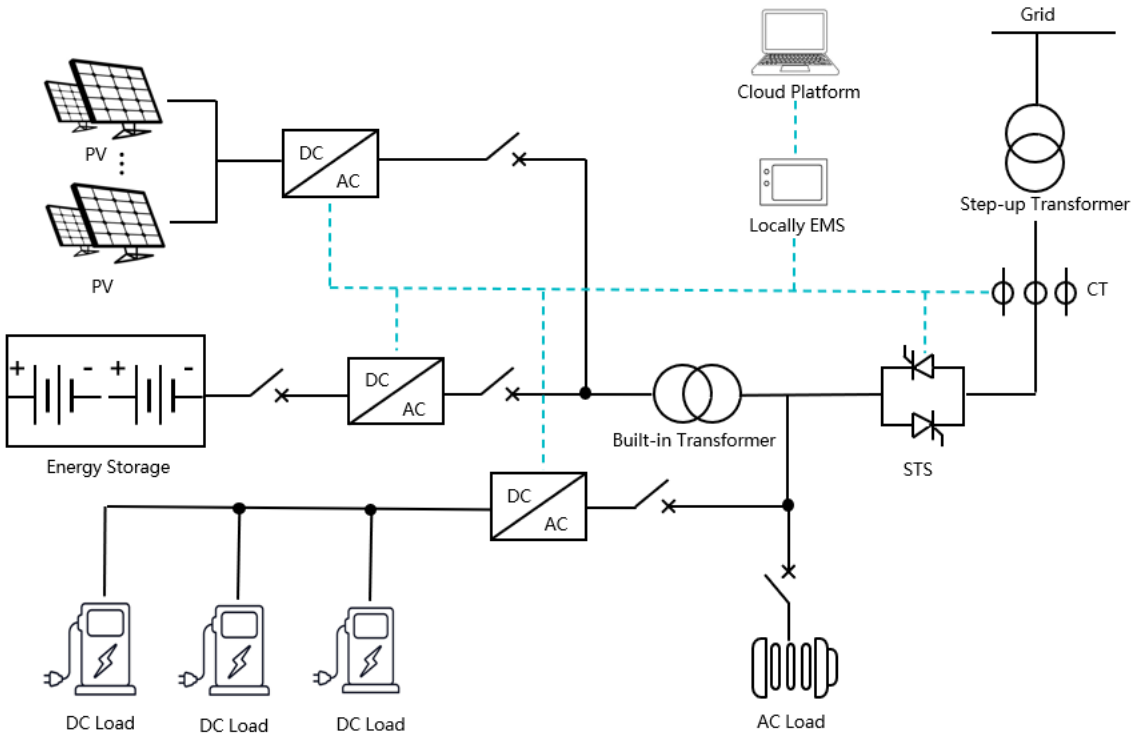
3.2.1 Utility & Grid applications

- Ancillary Services
- Energy Shifting

3.2.2 Commercial & Industry Applications

- Increase Savings
- Peak Shaving
- Load Shifting
- Demand Response
- Backup Power
- Solar Self Consumption
- EV-Charging carport

3.3 Container diagram



- ✧ Optional STS
- ✧ Clients provide distributions
- ✧ On/off grid and microgrid multi scenarios

3.4 Appearance

Figure 1 Product Appearance

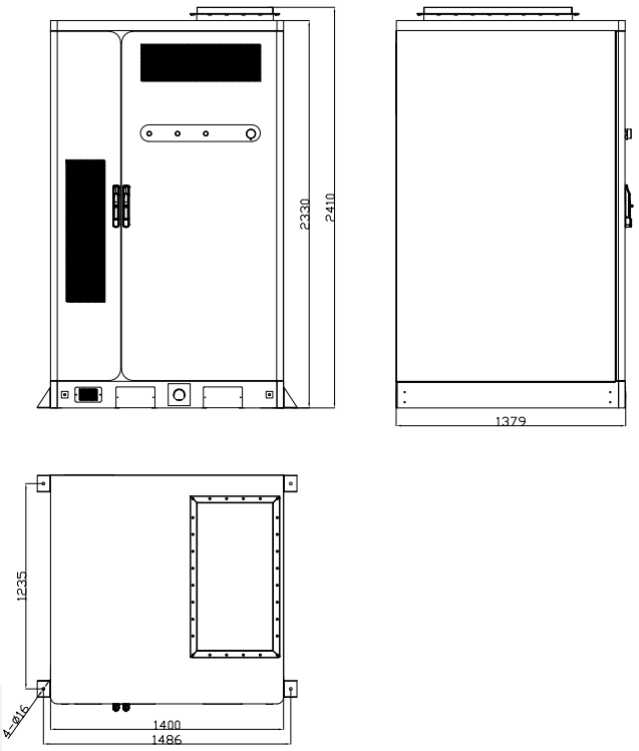


Figure 2 Product Dimensions

3.5 Structure

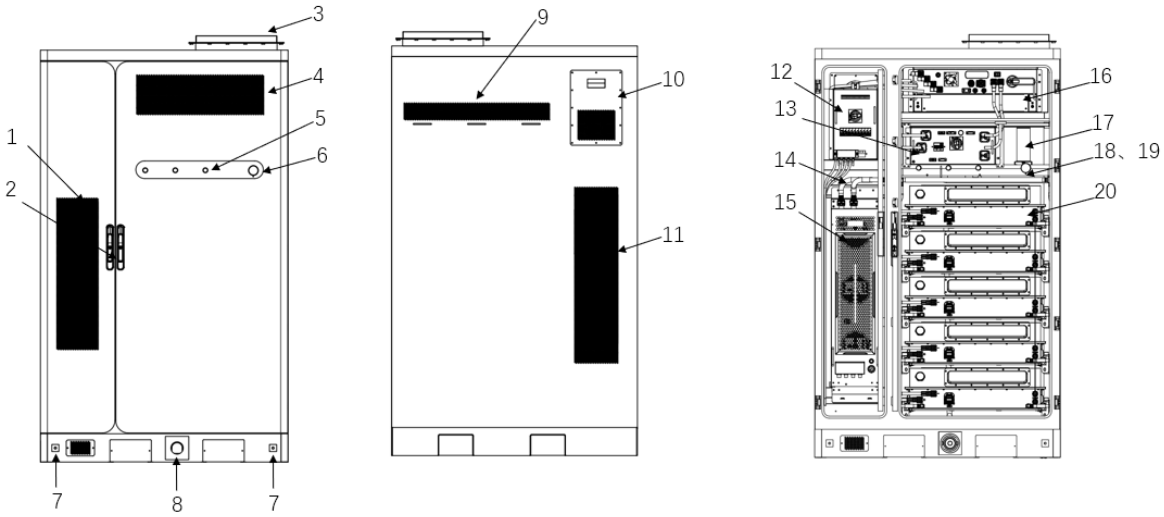


Figure 3 Schematic Diagram of the Product Structure

Table 1 Name of System Components

S/N	Name	S/N	Name
1	Air inlet of the liquid cooler	11	Air outlet of the liquid cooler
2	Front door lock	12	Distribution box
3	Rupture disk	13	High-voltage box
4	PCS air inlet	14	Liquid cooling pipeline
5	Indicator	15	Water cooler
6	Emergency stop button	16	PCS
7	Earth connection point	17	Fire extinguisher
8	Fire water filling nozzle (KN65)	18	Fire temperature detector
9	PCS air outlet	19	Fire smoke detector
10	Fan components	20	Battery box

3.6 Electrical system

Electrical schematic diagram of the system is shown below:

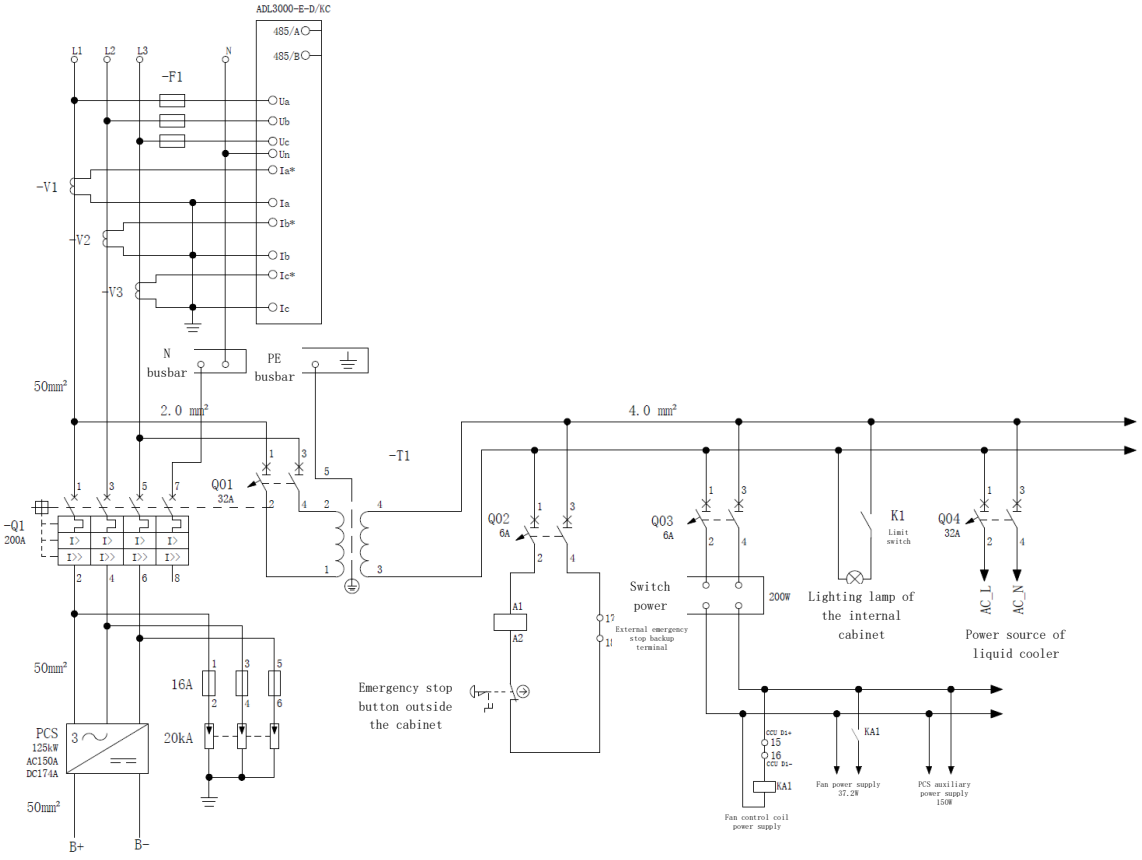


Figure 4 Electrical Schematic Diagram of the Product

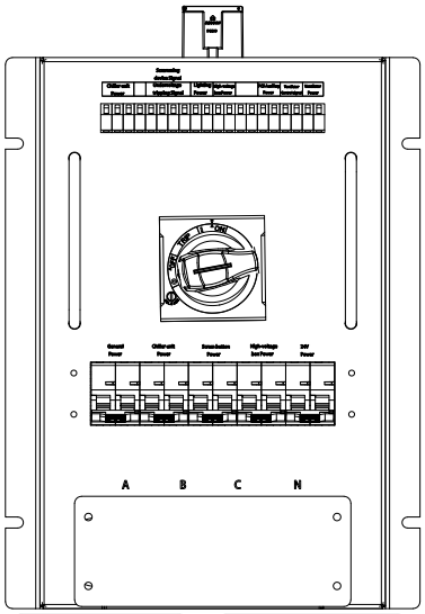


Figure 5 Schematic Diagram of Distribution Box Panel

Table 2 List of Components of Distribution Box Panel

S/N	Name		Label		Feature description
1	JX1	1	Emergency stop Signal	+	Positive electrode of the emergency stop signal
		2		-	Negative electrode of the emergency stop signal
		3	High-voltage box	L	L line for power supply of high-voltage box
		4		N	N line for power supply of high-voltage box
		5	Lighting lamp	L	L line for power supply of lighting lamp
		6		N	N line for power supply of lighting lamp
		7	Dehumidifier	L	L line for power supply of dehumidifier
		8		N	N line for power supply of dehumidifier
		9	Fan	L	L line for fan 1
		10		N	N line for fan 1
2	JX2	1	PCS	+	PCS power supply 24V+

		2	Power supply	-	PCS power supply 24V-
		3	Fan signal	DO1+	Fan control signal+
		4		DO1-	Fan control signal-
3	JX3	1	Liquid cooler	L	L line for power supply of liquid cooler
		2		N	N line for power supply of liquid cooler
		3		PE	Grounding wire of liquid cooler
4	Circuit breaker		Q1		AC grid connected circuit breaker
5	Air switch		Under voltage coil		Air switch for power supply of under voltage coil
6	Air switch		High-voltage box		Air switch for power supply of high-voltage box
7	Air switch		Power supply of the internal cabinet		Air switch for power supply of auxiliary equipment in the cabinet
8	Air switch		Liquid cooler		Air switch for power supply of liquid cooler
9	AC wiring terminal		A		U phase
			B		V phase
			C		W phase
			N		N phase

3.7 System performance parameters

Table 4 Technical Parameters of the Product System Performance

Serial number	**Critical items**	**Specification**
1	Battery type	Lithium iron phosphate (LFP)
2	Rated capacity	280Ah
3	Rated energy	233 kWh
4	DC rated voltage	832V (25℃±2℃)
5	DC working voltage range	728V~936V

6	Max output power	125kW
7	AC output voltage	277/480V
8	Charging and discharging mode	Constant power
9	Power of liquid cooler	5kW
10	Battery self discharge rate	≤3%/month (25℃, 50%SOC)
11	Cycle life	>6,000 times (0.5C/0.5C, DOD90%, 70%EOL)
12	Factory state of charge	30%-40%SOC
13	Withstand voltage level	<2830VDC
14	Insulation resistance	>1000Ω/V
15	Way of fire protection	PACK grade aerosol + cluster grade aerosol + cluster grade water fire protection
16	IP rating	IP54
17	Altitude	<2000m
18	Operating temperature	0 ℃~50 ℃ (charging), -20 ℃~50 ℃ (discharging)
19	Storage temperature	-20℃~50℃
20	Operating humidity	5%~95%, RH
21	Weight	2890kg
22	Dimensions (length*width*height)	1379*1400*2410 (mm)
23	Installation position	Outdoor

4. Technical specifications of the key equipment of systems

4.1 Battery pack

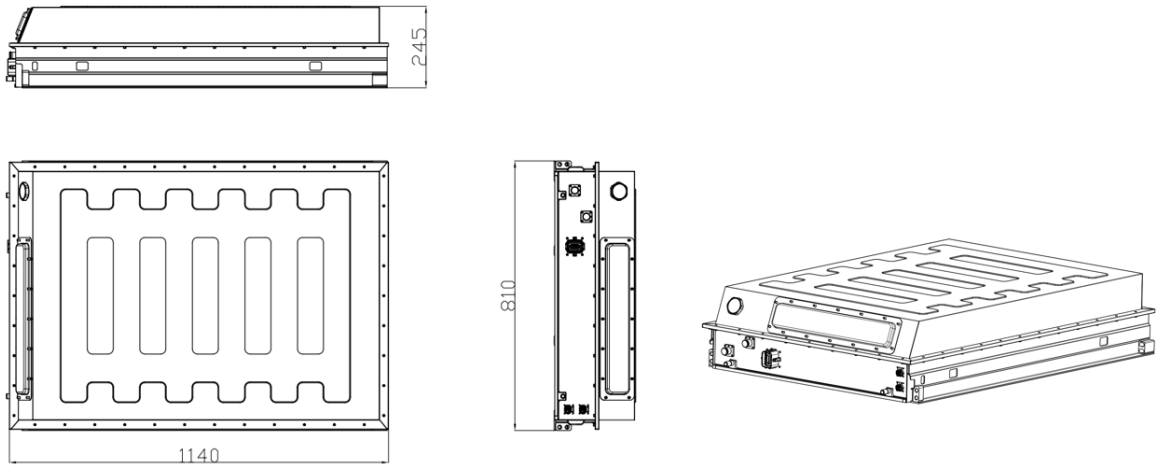


Figure 7 Schematic Diagram of Battery Pack

Table 5 Specifications of Battery Pack

S/N	Item	Specifications
1	Series or parallel connection mode	1P52S
2	Nominal voltage	166.4V
3	Rated capacity	280 Ah
4	Rated energy	46.59kWh
5	Discharge cut-off voltage	145.6 V
6	Charge cut-off voltage	187.2V
7	Rated charge current	175A
8	Rated discharge current	175A
10	Equalization mode	Passive equalization
11	Protection grade	IP67
12	Insulation resistance	≥10MΩ
13	Dimension	L1140*W810*H245
14	Weight	338kg

4.2 High-voltage box

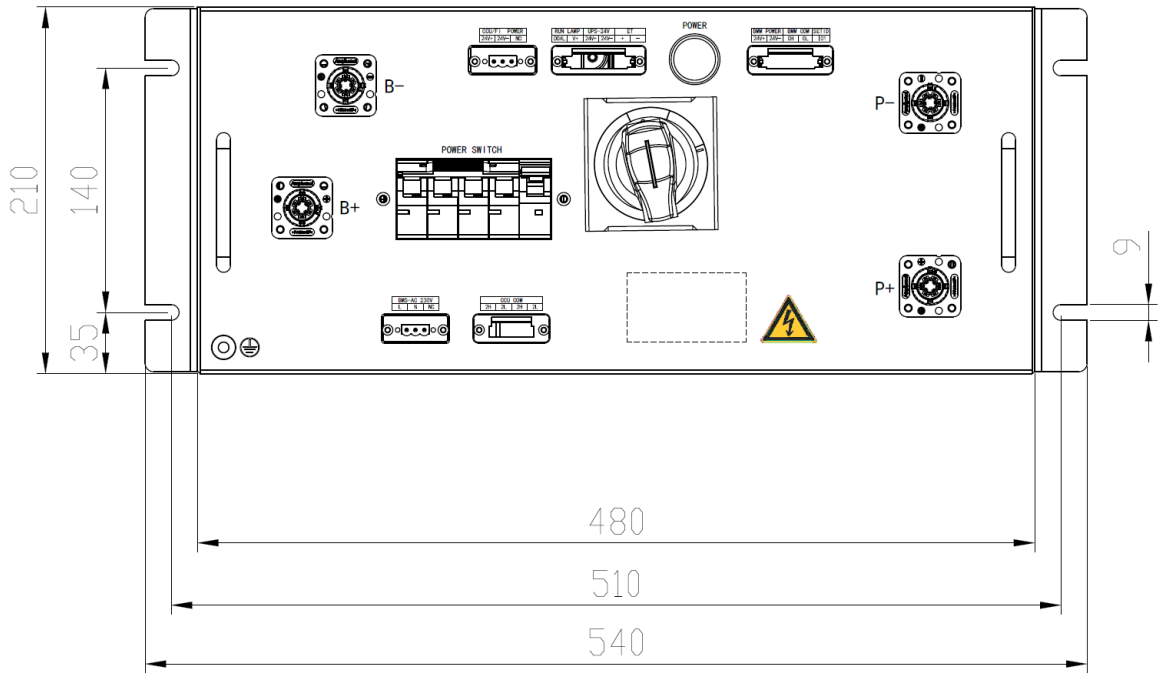


Figure 8 Schematic Diagram of High-voltage Box

Table 6 Specifications of High-voltage Box

S/N	Item	Specifications
1	Maximum working voltage	<1000VDC
2	Maximum working current	250A
3	Working ambient temperature	-10℃~55℃
4	Communication mode	CAN communication
5	Protection grade	IP20
6	Size (depth* width* height)	510×420×210mm (excluding fixing support)

4.3 Liquid cooler

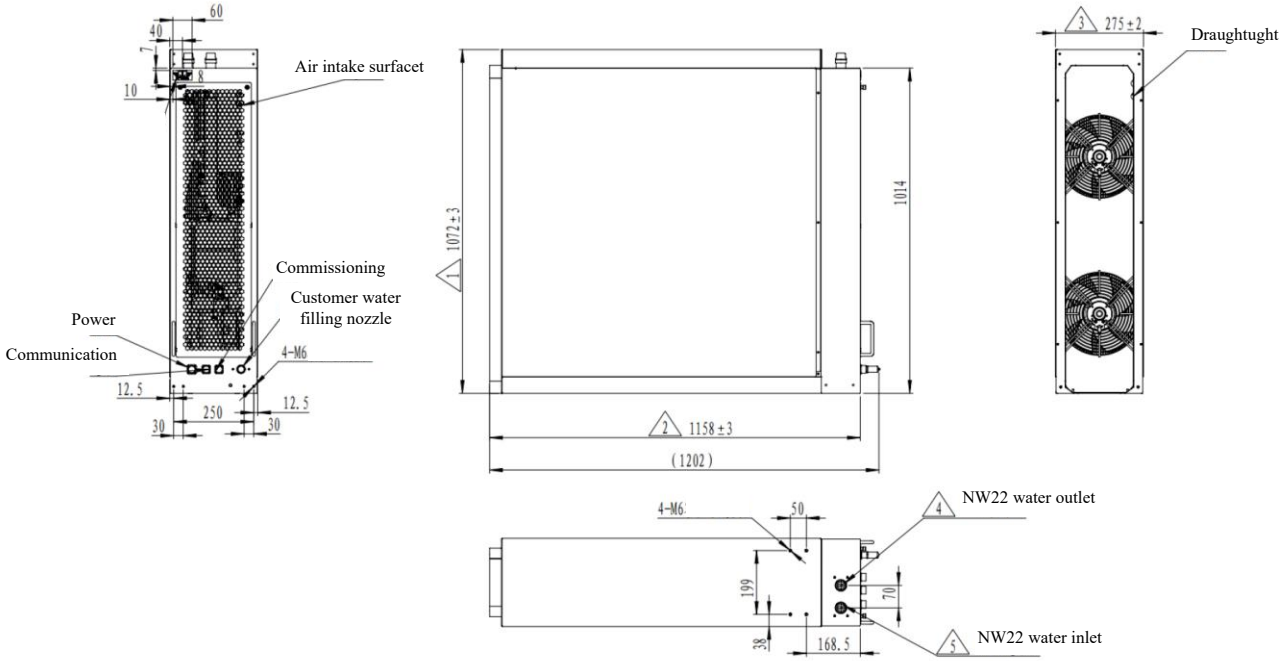


Figure 9 Schematic Diagram of Liquid Cooler

Table 7 Technical Parameters of Liquid Cooler

S/N	Item		Parameter
1	Parameter	Rated voltage (V)	AC 220V ± 15%
2		Rated frequency (Hz)	50/60
3		Max power (kW)	3.6
4		Max current (A)	16.1
5		Rated refrigerating capacity (kW)	5.0
6		Cooling power power (kW)	1.8
7		Cooling current（A）	8.7
8		Add heat(kW)	2.0
9		Heating power (kW)	2.5
10		Heating current（A）	11.6
11		Water supply pump power (W)	300
12		Rated flow (L/min)	50

13		Size of water inlet and outlet (mm)	NW22 quick connector, water inlet with the ball valve
14		Liquid temperature setting range (℃)	15～35
15		Liquid temperature control accuracy (℃)	±1
16		Ambient temperature (℃)	-30～50
17		Refrigerant (kg)	R454B
18		Noise (dB)	⩽72
19		Protection grade	IP55
20		Net weight (kg)	⩽100
21		Outer dimension (mm)	WxDxH: 275x1202x1074
22		Applicable cooling medium	Ethylene glycol aqueous solution with the concentration ≤60%

4.4 Fire protection system

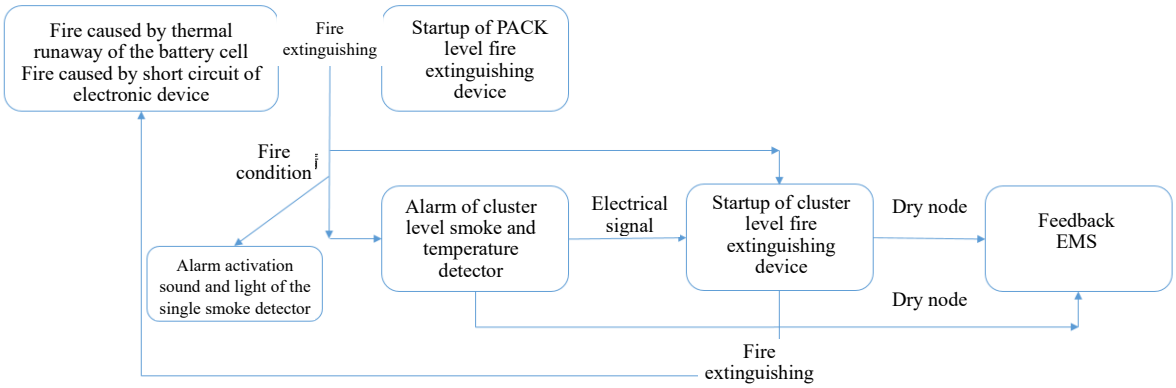


Figure 10 Schematic Diagram of Fire Protection

Table 8 Main Technical Parameters of Fire System

S/N	Name	Technical parameters
1	Operating voltage range	DC 9~33V
2	Rated voltage	DC 24V
3	Operating temperature	Main machine for the fire prevention and control

		device -40℃～55℃ Detection module: -20℃～+70℃
4	Operating humidity	<90%RH
5	Fire extinguishing startup current	>0.5A (50ms)
6	Temperature measurement range	-40℃~125℃
7	Fire-extinguishing media	Aerosol
8	Fire extinguishing object	Lithium iron phosphate battery
9	Fire control and extinguishing mode	Electrical startup
10	Fire extinguishing device startup time	≤2s
11	Fire extinguishing device spray time	≤15s
12	Fire detection method	Composite temperature and smoke detection
13	Alarm function	Sound-light alarm

4.5 PCS

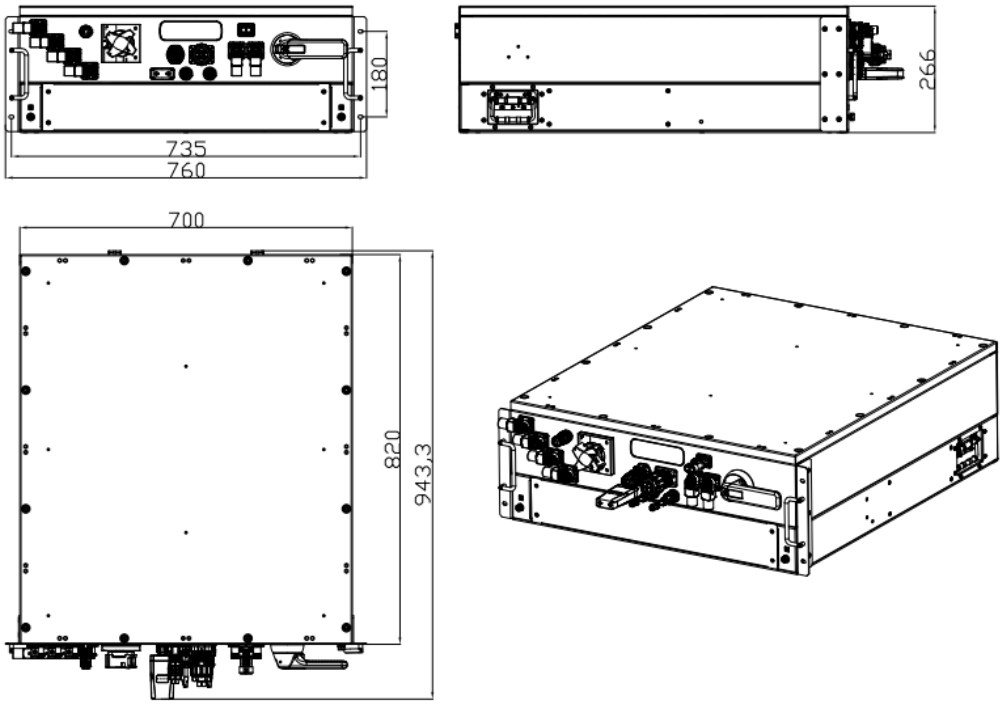


Figure 11 Schematic Diagram of PCS

Table 9 Technical Parameters of PCS

S/N	Item	Parameter
DC side		
1	DC voltage range	DC 750V～1000V
2	Maximum DC current	170A
3	Rated DC power	125kW
4	Voltage-limiting characteristics	Possession
5	Current limiting characteristic	Possession
AC grid connection parameters		
1	Rated output power	125VA
3	Rated voltage	AC277/48V
4	Rated output current	150A
6	Voltage range	277/480V
7	AC connection method	3W+N+PE
8	Grid frequency	60Hz
9	Power factor	-1～1
10	THDi	≤3%
AC off-grid parameters		
1	AC off-grid voltage	277/480V
2	Max output power	125kVA
3	AC off-grid frequency	60Hz
4	THDv	≤3% (linear load)
5	Rated output current	150A (linear load), 100A (non-linear load)
Other parameters		
1	Maximum conversion efficiency	99.1%
2	Permissible environmental temperature	-13°F ~+140'F,derating >113°F

3	Allowable relative humidity	0~95%
4	Noise	＜75dBA
6	Dimension	W27.6 in × H10.5 in× D32.3 in
7	Weight	183lb
8	Cooling mode	Intelligent forced air cooling

5. Maintenance

- Battery maintenance must be carried out by professional personnel;
- If the battery has been continuously stored for more than six months, it must be fully charged once;
- The connection of battery communication and power cables should be checked for looseness every three months.

6. Troubleshooting

Troubleshooting can only be carried out by professional personnel. Before checking for faults, the correct conditions of all cable connections and circuit breakers must be checked.

Table 10 Common Faults

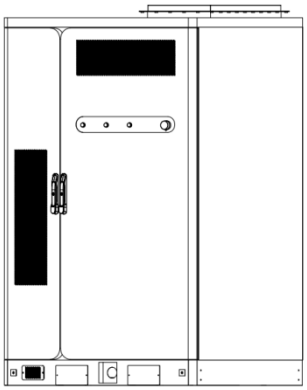
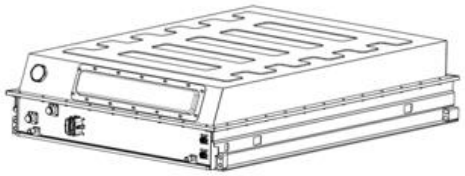
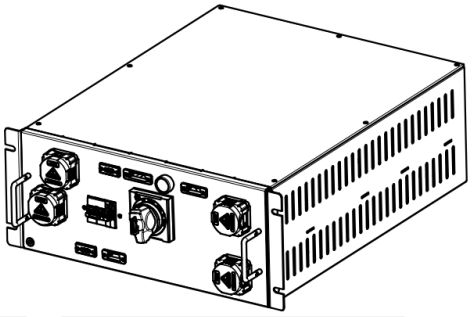
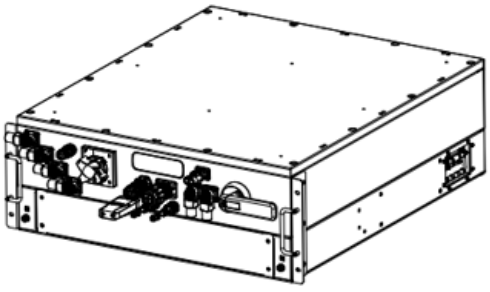
S/N	Fault	Solutions
1	Communication fault	Check if the communication cable is loose and if the BMS communication protocol matches the load or the inverter.
2	Unable to start	Use a charging device to charge the battery. If it is still unable to be started, please contact for maintenance.
3	Abnormal SOC	When shutting down, turn off the soft start switch first, and then turn off the power switch after 1 second.
4	System malfunction and shutdown	First, search for the fault information, confirm the specific fault, and handle it based on the cause of the fault.

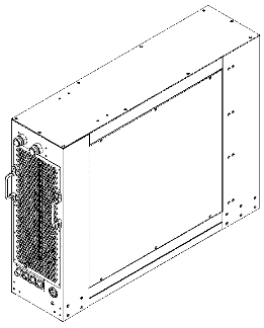
7. Packaging, transportation and storage

7.1 Items in the packaging box

The entire battery system is packaged in one wooden box, and the packaging list of the battery cabinet is shown in Table 11:

Table 11 Packing List of the Battery

S/N	Name	Legend	Quantity
1	Cabinet		1
2	Battery		5
3	High-voltage box		1
4	Inverter		1

5	Liquid cooler		1
6	Fire protection system		1

7.2 Transport requirements

（1） The packaging wooden box of the electrical cabinet must be properly placed to prevent strong vibrations, impacts, punctures, and heavy pressure during transportation;

（2） Do not transport together with flammable and explosive materials, toxic substances, etc.

（3） Prohibit stacking goods on the stack again;

（4） Maintain the original packaging state and keep the original identification intact;

（5） During transportation, the temperature should be controlled between -20 ℃ and 45 ℃, and the humidity should be controlled between 5% and 95% RH;

（6） The transportation tool must be equipped with a fire extinguisher special for lithium batteries in combination with fire water and fire sand.

7.3 Storage requirements

（1） The product should be stored in a place that is protected from rain, moisture, and sunlight. When storing, it should be ensured that the electric quantity of the product is not less than 40%;

（2） The storage location is equipped with a variety of lithium battery fire extinguishing devices on site, including fire sand, fire prevention and dry powder fire extinguishers;

（3） Place the battery according to the label on the packaging box, and never place the battery on its side;

（4） Charge the battery that has been stored for more than 6 months.

8. Precautions for installation

Installation can be done by two methods: lifting and forklift.

（1） Inclination ≤ 5 during lifting;

（2） Be careful not to touch the surrounding staff when the object lands;

（3） A dedicated installation isolation area needs to be set up during installation;

（4） The electrical cabinet should be handled with care during lifting;

（5） At least two people are needed to operate the forklift or lift. One person operates and one person commands;

（6） If the product has defects, cracks or damage, please do not install it;

（7） Do not attempt to open, disassemble, repair, tamper with or modify the product when installing the electrical cabinet;

（8） Do not install in adverse weather such as rain and sandstorm;

（9） Do not hit, pull, drag or step on the product;

（10） Do not immerse the product or its components in water or other liquids.