



# Product Specification

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**Product name:**

Liquid Cooled Energy  
Storage Integrated System

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**Product model:**

125kW/233kWh

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**Date:**

April 2024

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## 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:  $25\pm 2^{\circ}\text{C}$
- 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  $5^{\circ}\text{C}$  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

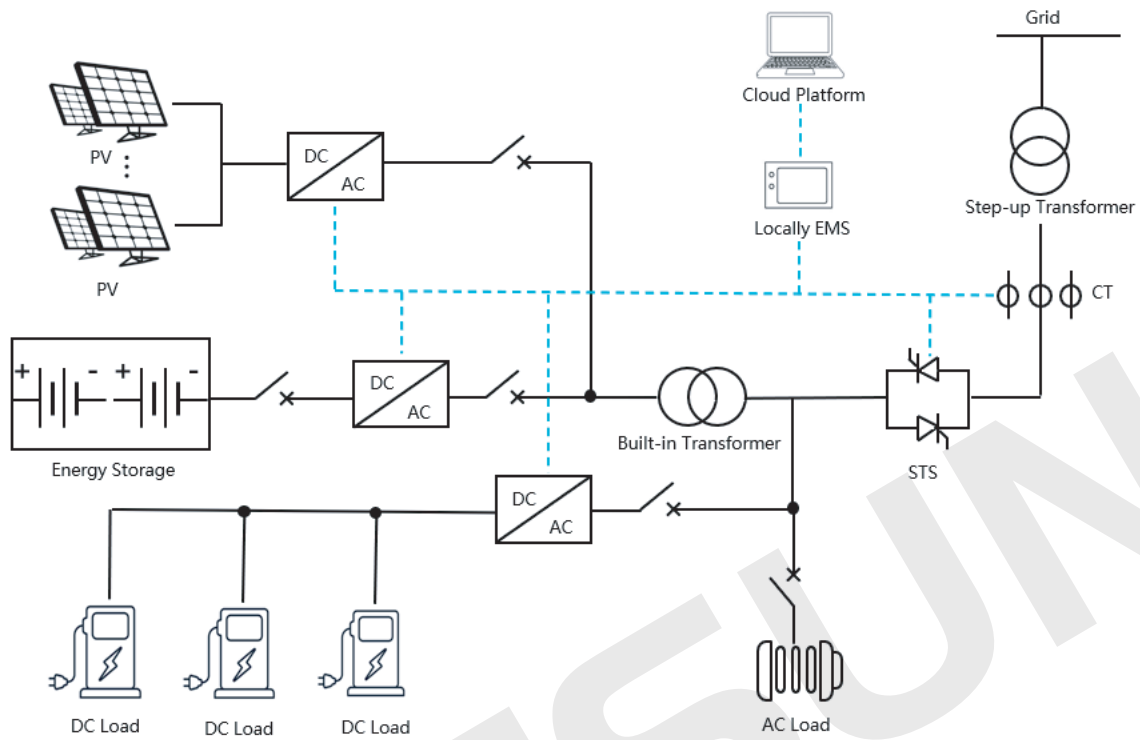
#### 3.2.1 Utility & Grid applications

- ✧ 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

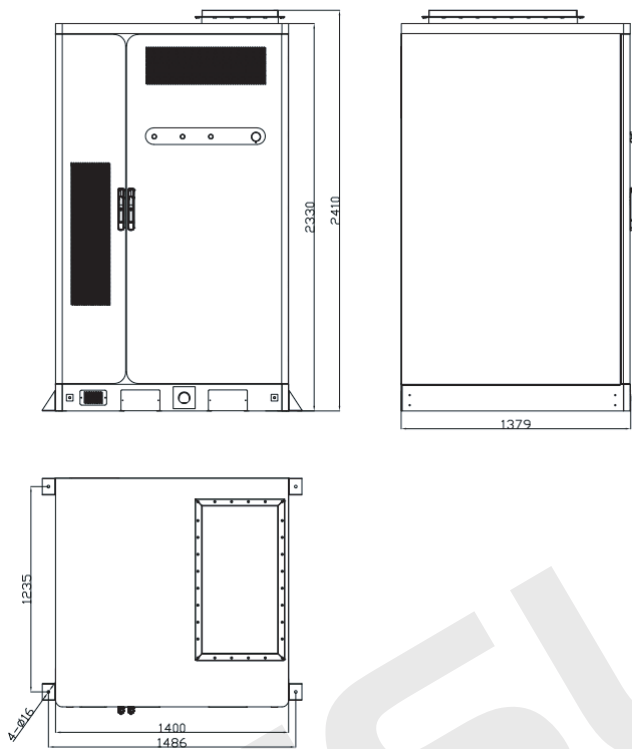


Figure 2 Product Dimensions

3.5 Structure

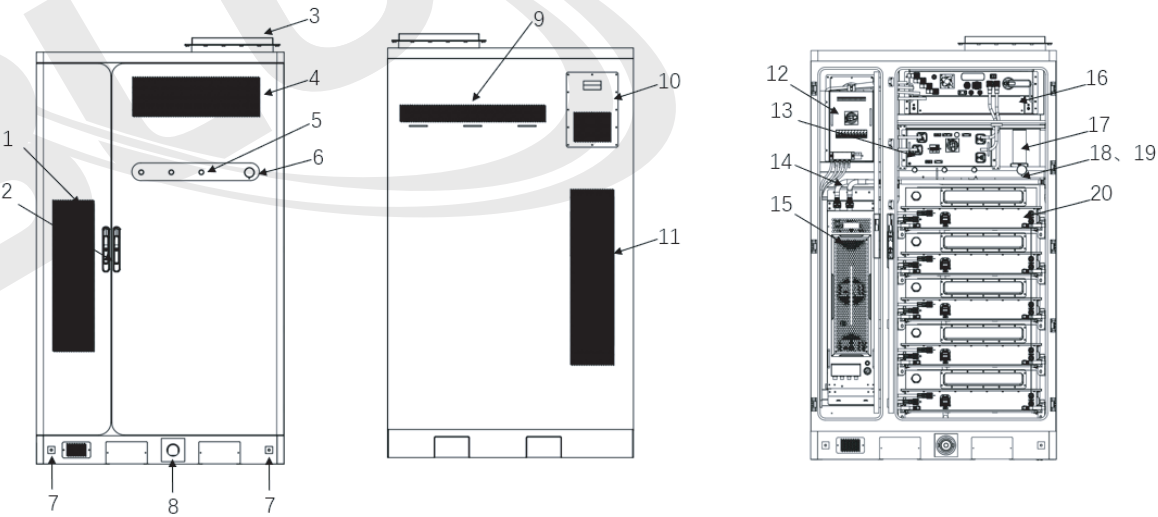


Figure 3 Schematic Diagram of the Product Structure

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:

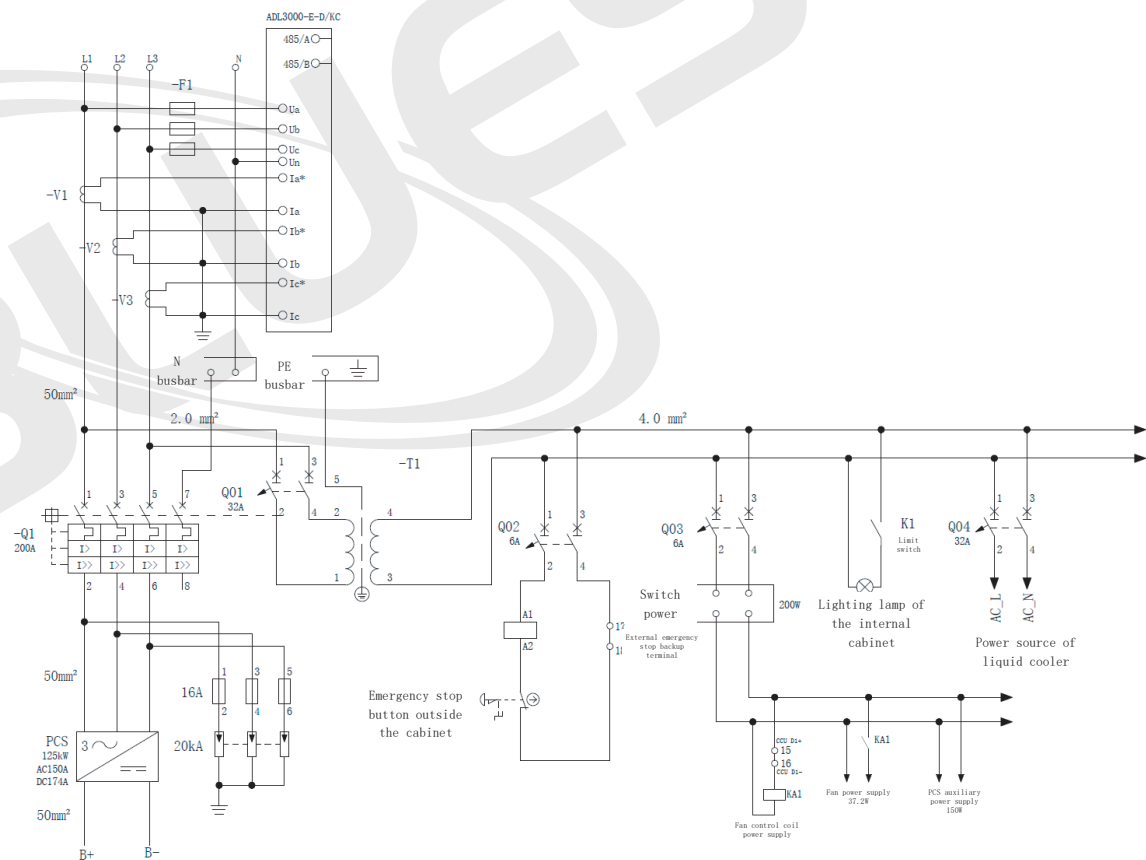


Figure 4 Electrical Schematic Diagram of the Product

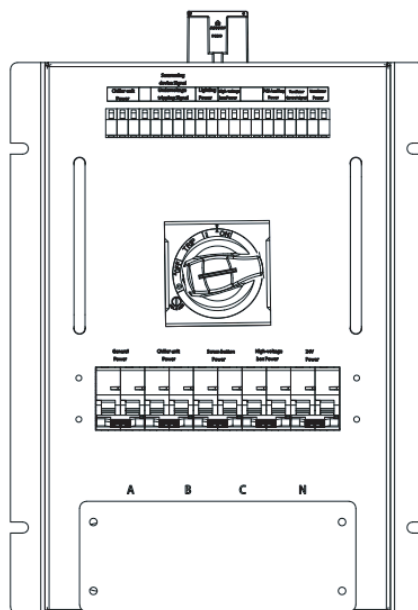


Figure 5 Schematic Diagram of Distribution Box Panel

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°C±2°C)              |
| 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°C, 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 °C~50 °C (charging), -20 °C~50 °C (discharging)                                |
| 19 | Storage temperature              | -20°C~50°C                                                                       |
| 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

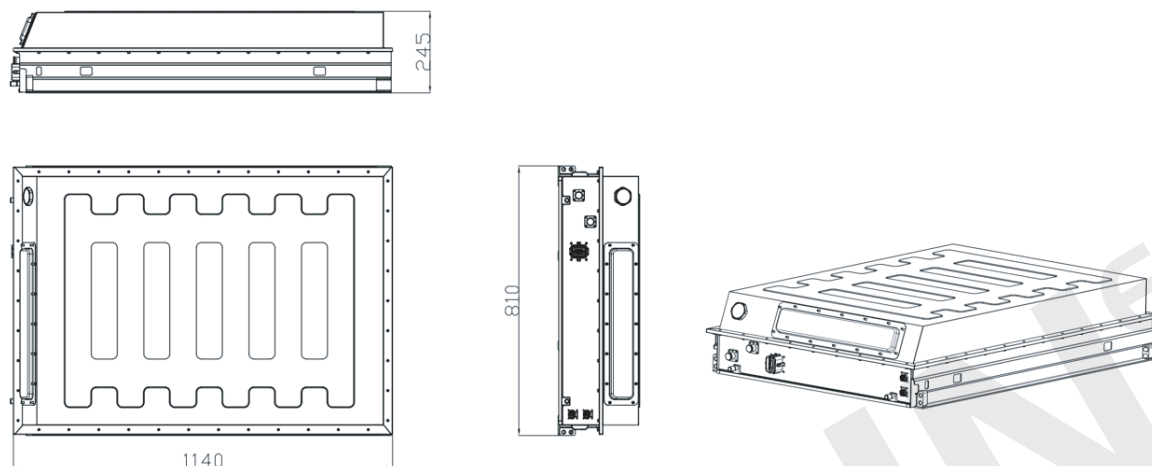


Figure 7 Schematic Diagram of Battery Pack

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              | $\geq 10\text{M}\Omega$ |
| 13  | Dimension                          | L1140*W810*H245         |
| 14  | Weight                             | 338kg                   |



### 4.3 Liquid cooler

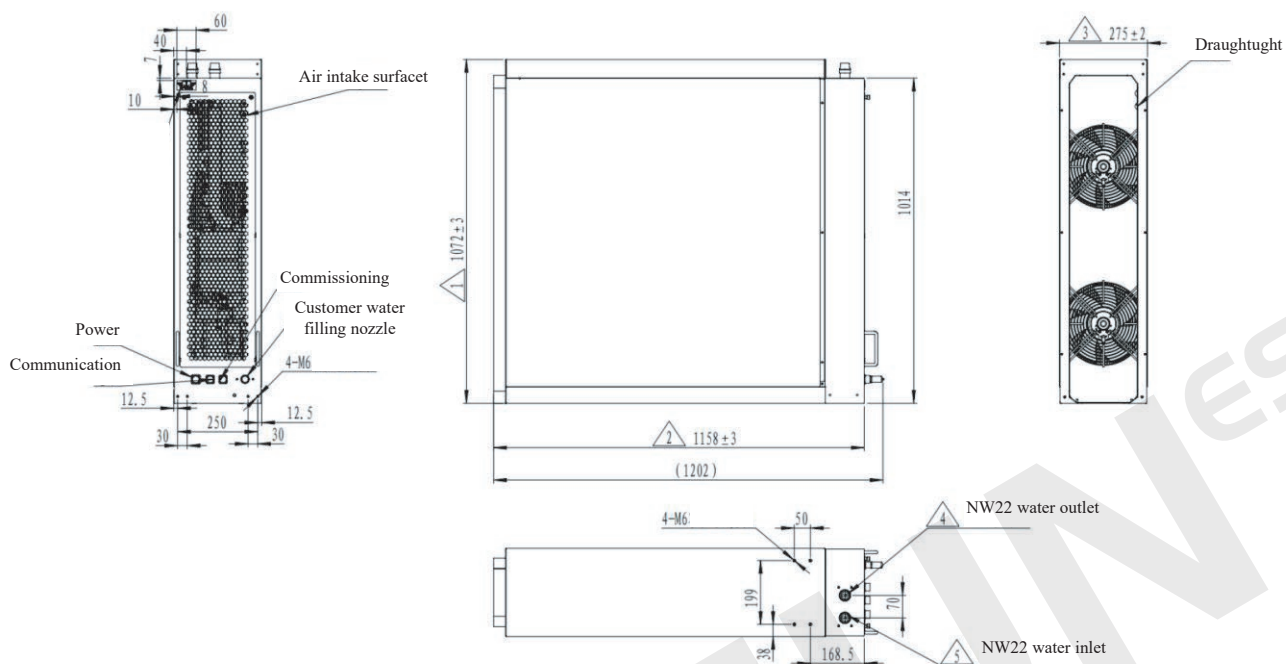


Figure 9 Schematic Diagram of Liquid Cooler

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 (°C)    | 15~35                                                        |
| 15 |  | Liquid temperature control accuracy (°C) | ±1                                                           |
| 16 |  | Ambient temperature (°C)                 | -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

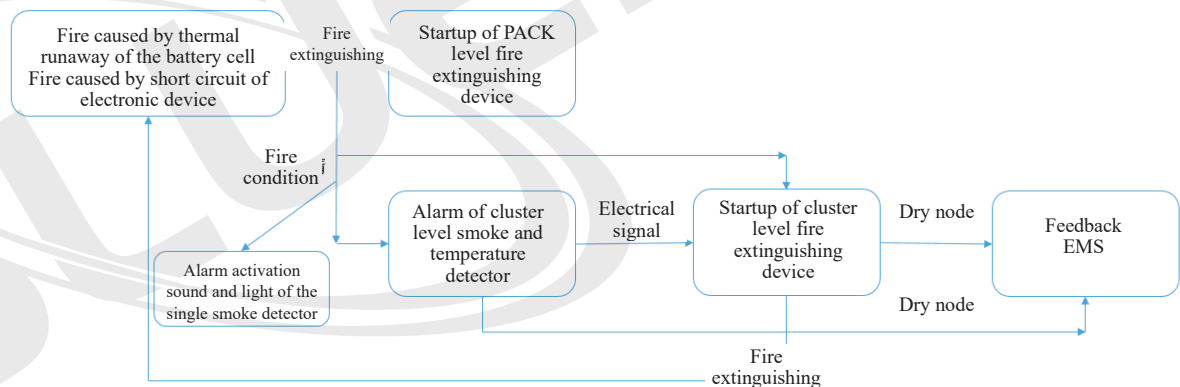


Figure 10 Schematic Diagram of Fire Protection

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°C~55°C<br>Detection module: -20°C~+70°C |
| 4  | Operating humidity                     | <90%RH                                             |
| 5  | Fire extinguishing startup current     | >0.5A (50ms)                                       |
| 6  | Temperature measurement range          | -40°C~125°C                                        |
| 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

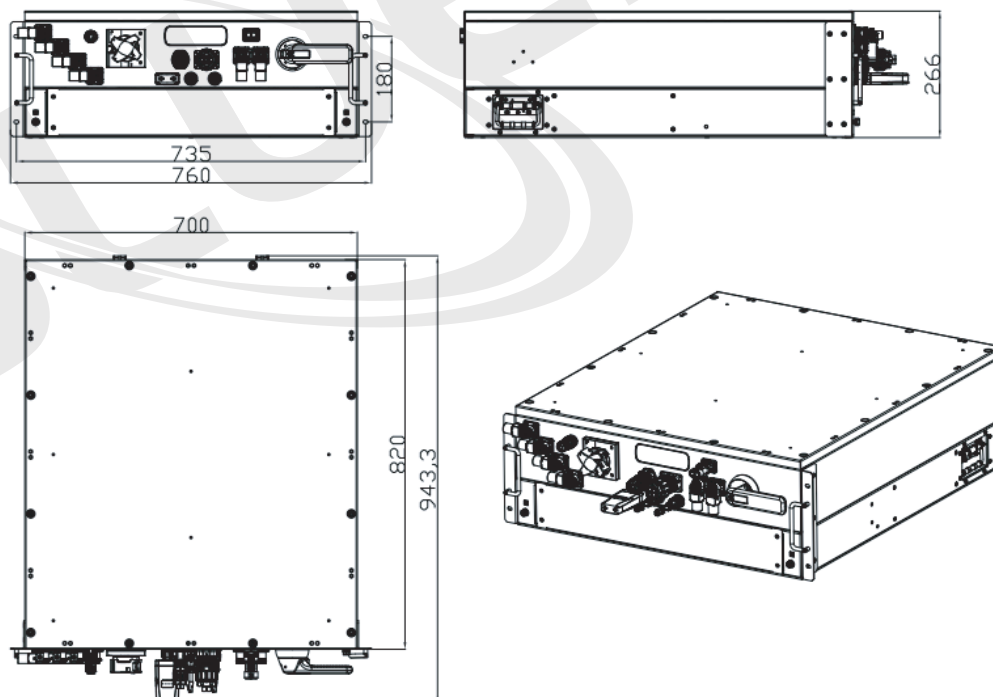


Figure 11 Schematic Diagram of PCS

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

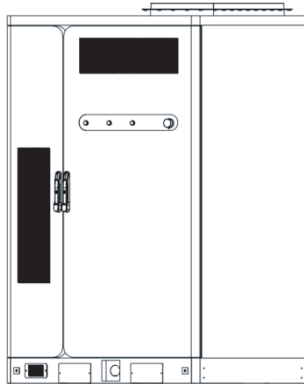
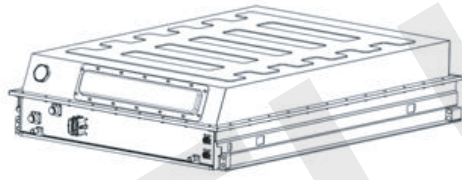
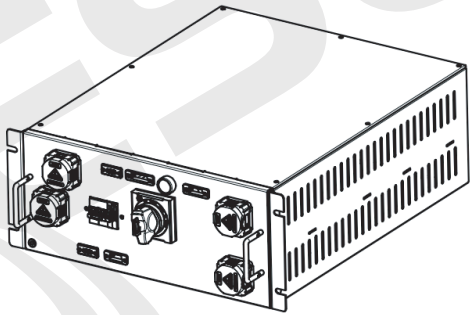
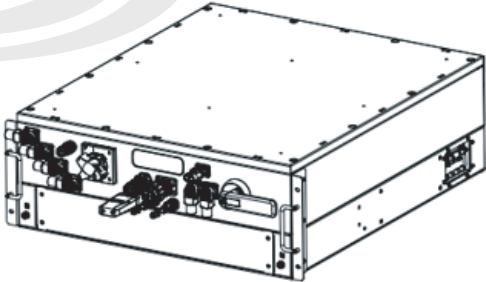
| S/N | Fault                           | Solutions                                                                                                           |
|-----|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 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. |

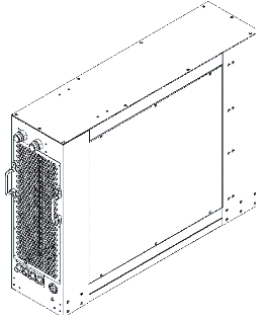
## 7. Packaging, transportation and storage

### 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 °C and 45 °C, 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.

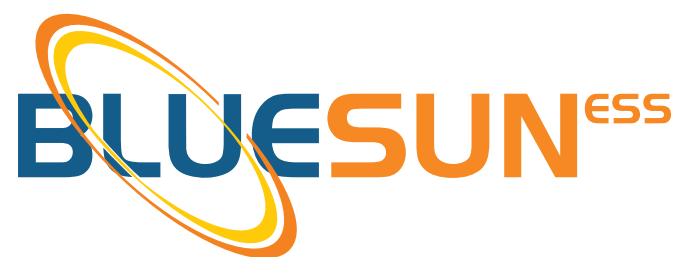
## 7.3 Storage requirements

- (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  $\leq 5$  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.



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