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## 1. Product Overview

### Model 11 Description

|                                                             |                                                                   |
|-------------------------------------------------------------|-------------------------------------------------------------------|
| This article primarily covers the product model: 125-261-CI |                                                                   |
| characteristic                                              | short-cut process                                                 |
| Cabinet type                                                | indicates an integrated cabinet                                   |
| system output power                                         | 125:125KW:                                                        |
| system capacity                                             | 261:261kWh                                                        |
| Function                                                    | Supports off-grid functionality and photovoltaic grid integration |
| Heat dissipation                                            | liquid cooling                                                    |

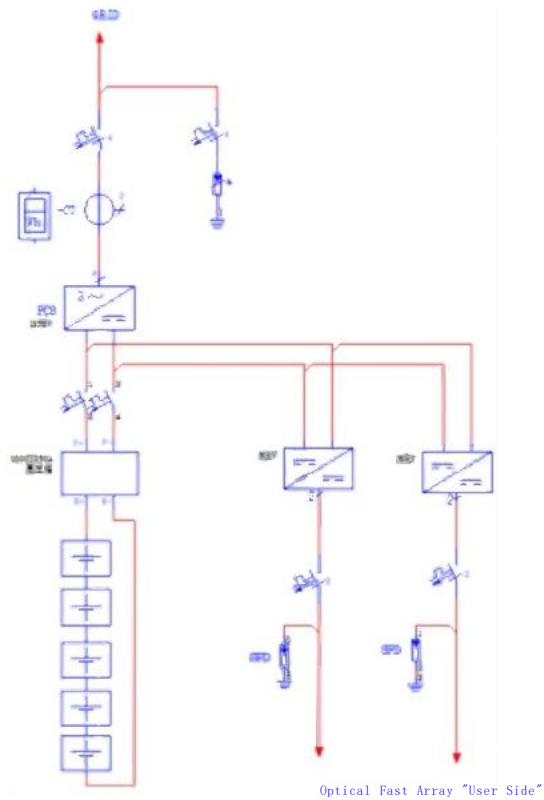
### 12 Application Scenarios and Overview

Our 125-261-CI integrated light-storage cabinet employs 3.2V/314Ah lithium iron phosphate batteries, primarily designed for microgrid energy storage systems. The system supports self-generation and self-consumption, emergency backup power functions, and is applicable in scenarios such as supermarkets, farms, field construction sites, hotels, shopping malls, and small-scale industrial/commercial establishments.

This product is a standardized product of the company, with a system power of 125 kW and a rated capacity of 261 kWh. It includes a battery box, high-voltage box, energy storage inverter, DC/DC conversion module, temperature control system, fire protection module, power distribution unit, and battery management system (BMS), while also supporting APP functionality.

This product supports both grid-connected and off-grid operation modes. The energy storage inverter employs a three-phase four-wire system, with the electrical system topology diagram referenced.

as follows :



Note: Automatic grid-off switching and multi-unit parallel operation require use with a combiner cabinet.

## 13 product images



Note: For reference only; actual items shall prevail.

14 Main Technical Parameters

Table 1 Main Technical Parameters of theSystem

| No. | item description                      | Specification Parameters                  | remarks                   |
|-----|---------------------------------------|-------------------------------------------|---------------------------|
| 1   | nominal capacity                      | 261kWh                                    |                           |
| 2   | nominal voltage                       | 832V                                      |                           |
| 3   | DC voltage range                      | 650-949V                                  |                           |
| 4   | Rated charge/discharge current        | 157A                                      |                           |
| 5   | Rated charge/discharge power          | 125kW                                     |                           |
| 6   | Grid-side voltage range               | AC400V±10%                                |                           |
| 7   | Inverter Wiring Method                | Three-phase four-wire                     |                           |
| 8   | Supported operation modes             | and operate off-grid                      |                           |
| 9   | system effectiveness                  | ≥89%                                      | AC side @25±2℃<br>0.5P    |
| 10  | power factor                          | -1~1                                      |                           |
| 11  | Storage temperature range (° C)       | -30℃~60℃                                  |                           |
| 12  | allowable operating temperature range | Discharge: -20~55° C;<br>Charge:<br>0~55℃ |                           |
| 13  | Optimal operating temperature range   | 25±2℃                                     |                           |
| 14  | System cycle count                    | ≥7000 times                               | @25±2℃, 0.5P, EOL≥<br>70% |
| 15  | relative                              | RH≤95%                                    | No                        |

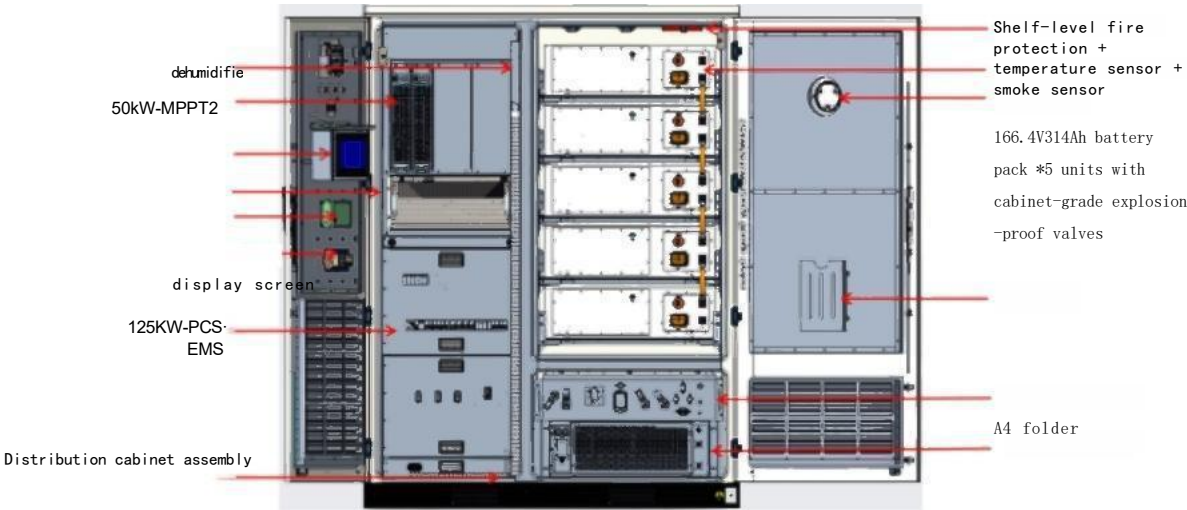
|    |                                  |                                            |                                              |
|----|----------------------------------|--------------------------------------------|----------------------------------------------|
|    | humidity                         |                                            | condensation                                 |
| 16 | above sea level                  | $\leq 3000\text{m}$                        | $>3000\text{m}@90\%$<br>downgraded operation |
| 17 | levels of protection             | IP54                                       |                                              |
| 18 | Cabinet dimensions               | Approximately<br>1760*2100*2400 (mm)       | Width*Depth*Height                           |
| 19 | weight                           | Approximately<br>3530 kg                   |                                              |
| 20 | external communication interface | WIFI                                       |                                              |
| 21 | levels of protection             | IP54                                       |                                              |
| 22 | system design life               | $\geq 10$ years                            |                                              |
| 23 | external electrical interface    | 3P4W70mm <sup>2</sup> +PE35mm <sup>2</sup> | A/B/C/N/PE                                   |
|    |                                  | 50 mm <sup>2</sup> cable                   | LV+/LV-                                      |

1.5 Main Components of the System

Table 2 List of Main Components of the System

| No. | name                                 | specifications and models      | unit       | quantity | remarks      |
|-----|--------------------------------------|--------------------------------|------------|----------|--------------|
| 1   | Integrated Light and Storage Cabinet | 125-261-CI                     | Table      | 1        | IP54         |
| 1.1 | Battery pack                         | 1P260S, 832V, 314Ah            | cluster    | 1        | 5 PACKS      |
| 1.2 | BMU                                  | Battery Management Unit        | individual | 7        |              |
| 1.3 | PDU high-voltage compartment         | 1000V250A (including BCU)      | Table      | 1        |              |
| 14  | PCS                                  | 125k W                         | Table      | 1        |              |
| 1.5 | DC/DC module                         | 50KW                           | Table      | 2        |              |
| 1.6 | liquid-cooled mainframe              | 5KW                            | Table      | 1        |              |
| 1.7 | extinguishing and protection         | Temperature-controlled aerosol | group      | 5        | PACK level   |
|     |                                      | Temperature-controlled aerosol | group      | 1        | System-level |

2. System Component Introduction



Note: For reference only; actual items shall prevail.

2.1 Cell Introduction

The companys 125-261-GI product utilizes cutting-edge Grade A lithium iron phosphate batteries (3.2V/314 Ah), featuring high specific energy, extended cycle life, cost efficiency, and environmental safety. These batteries have been widely adopted in energy storage systems.

Table 3 Cell Technical Parameters Table

| orde<br>r<br>numb<br>er | item<br>description                 | Specification<br>parameters                         | remarks        |
|-------------------------|-------------------------------------|-----------------------------------------------------|----------------|
| 1                       | Cell type                           | LiFeP04                                             |                |
| 2                       | rated voltage                       | 3. 20V                                              |                |
| 3                       | rated capacity                      | 314Ah                                               |                |
| 4                       | rated energy                        | 1004. 8Wh                                           |                |
| 5                       | Internal<br>resistance (1<br>KHz)   | ≤0. 18mΩ                                            |                |
| 6                       | Standard charge-<br>discharge rate  | 0. 5P                                               |                |
| 7                       | Maximum charge-<br>discharge rate   | 0. 5P                                               |                |
| 8                       | Charge/Discharge<br>Cut-off Voltage | 2. 5V~3. 65V                                        |                |
| 9                       | Cycle count                         | >8000 times                                         | 0. 5P, EOL≥70% |
| 10                      | Cell calendar<br>life               | >15 years                                           |                |
| 11                      | Battery<br>degradation<br>rate      | The decay rate is<br>less than 6% every<br>3 years. |                |
| 12                      | charge-<br>discharge<br>efficiency  | ≥93%                                                | @25±2℃, 0. 5P  |
| 13                      | Charging<br>temperature<br>range    | 0℃~60℃                                              |                |
| 14                      | Discharge<br>temperature<br>range   | -20℃~60℃                                            |                |

|    |                             |                    |                 |
|----|-----------------------------|--------------------|-----------------|
| 15 | storage temperature range   | -20℃~45℃           | One month       |
| 16 | optimum working temperature | 20℃~30℃            |                 |
| 17 | Energy Storage Humidity     | ≤95%               | No condensation |
| 18 | weight                      | 5600g±300 g        |                 |
| 19 | Dimensions (L*W*H)          | 173.7*71.7*207.2mm |                 |

2.2 Introduction to Battery Box

The companys TP-P125-261-CI product utilizes 3.2V/314Ah LFP cells, with each battery PACK box containing 52 cells arranged in a 1P52S configuration. Refer to the following for the structural diagram:

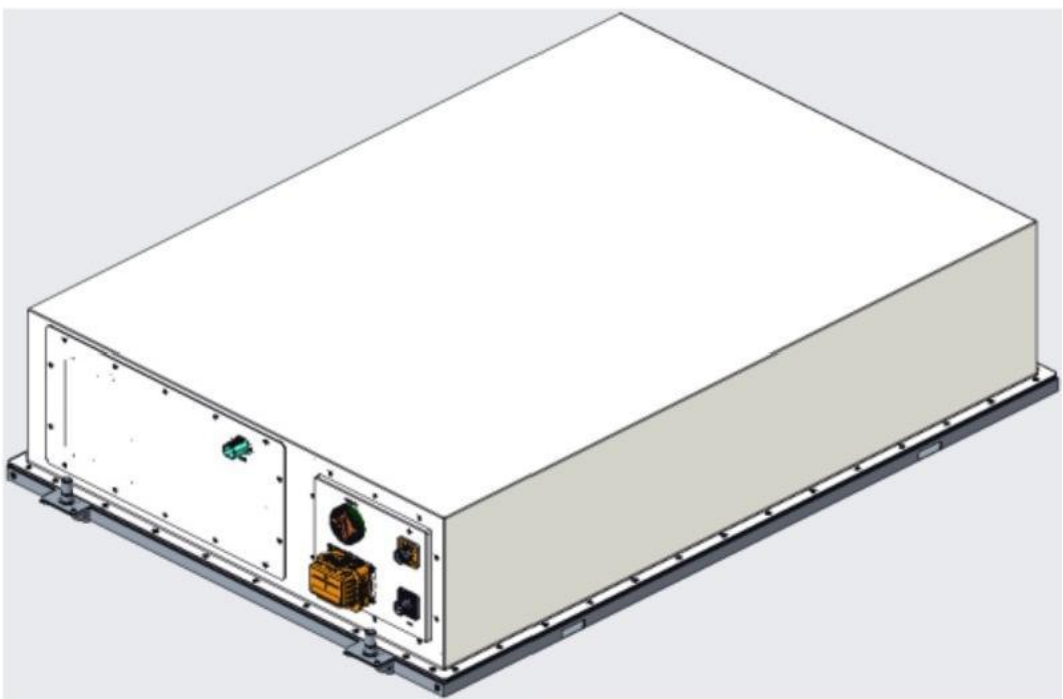


Table 4 shows the battery box parameters as follows

| project name                                      | parameter                      |
|---------------------------------------------------|--------------------------------|
| rated energy                                      | 52. 249kWh                     |
| rated voltage                                     | 166. 4V                        |
| voltage range                                     | 130V~189. 8V                   |
| Battery type                                      | Lithium iron phosphate battery |
| Cell capacity                                     | 314Ah                          |
| Series-Parallel Connection Method of Battery Pack | 1P52S                          |
| Maximum charge and discharge current              | 157A                           |
| Discharge ambient temperature                     | -20℃~55℃                       |

|                              |                      |
|------------------------------|----------------------|
| Charging ambient temperature | 0℃~55℃               |
| Storage environment          | 0℃~40℃               |
| transportation environment   | -20℃~60℃             |
| IP levels of protection      | IP67                 |
| Dimensions (W*D*H)           | W785*D1100*H248mm±3) |
| weight                       | 360kg(±2kg)          |

2.3 Introduction to Battery Cabinet

A battery cabinet is a unit composed of multiple battery boxes connected through specific electrical configurations, including components such as battery racks, energy storage batteries, power and sampling circuits, and electrical interfaces. A single battery cluster consists of five 1P52S battery boxes, one high-voltage box, two DC/DC modules, a liquid cooling unit, and an energy storage inverter.

Refer to the image below:

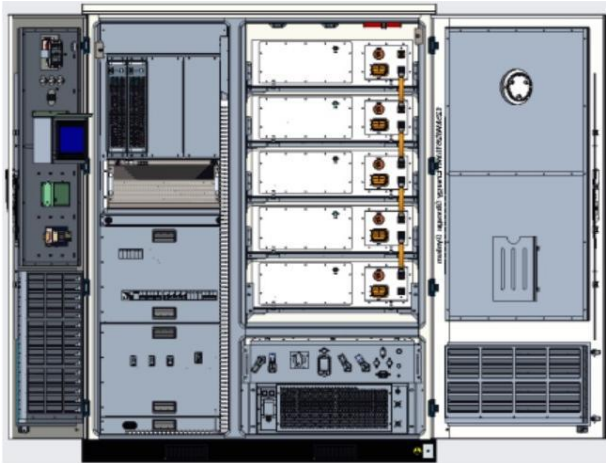


Table 5 Technical Parameters of BatteryClusters

| No. | name                               | specifications | remarks          |
|-----|------------------------------------|----------------|------------------|
| 1   | Battery pack energy (kWh)          | 261            |                  |
| 2   | burst mode                         | 1P52S          | Total of 5 PACKS |
| 3   | nominal voltage (V)                | 832            |                  |
| 4   | Operating voltage range (V)        | 650-949V       |                  |
| 5   | Rated charge-discharge rate        | ≤0.5P          |                  |
| 6   | rated charge and discharge current | 157A           |                  |

2.4 Introduction to High-Voltage Boxes (Reference)

The high-voltage enclosure of the energy storage system primarily functions as a high-voltage power circuit management unit, serving as the intermediate interface between battery clusters and hybrid inverters. The high-voltage control box features IP20 protection and is equipped with battery cluster voltage and current acquisition capabilities, as well as contactor control and protection for battery cluster circuits. function .

The high-voltage control cabinet houses circuit breakers, contactors, fuses, current sensors, and battery cluster control management module (BCU).

DC/DC modules, etc. The high-voltage control box has been designed with comprehensive consideration of the electrical characteristics, thermal performance, safety performance, and operability/maintainability of various components. It features rational spatial layout, compact structure, flexible configuration, and high safety reliability.

The high-voltage control cabinet features an integrated battery cluster control management module (BCU) with optional LAN, CAN, and RS-485 communication bus interfaces. This enables seamless communication between the control cabinet, battery management unit (BMU), battery management system host BCU, and hybrid inverter, facilitating comprehensive battery cluster control, protection, and data exchange capabilities.

## (1) Functional description of the high-voltage box

- ◆ Supports DC-24V power supply and dual DC/DC power supply from battery pack terminals;
- ◆ Supports power supply for the Battery Management Unit (BMU), with power output configurable according to the number of BMU modules.
- ◆ Supports CAN communication with the Battery Management Unit (BMU) for energy storage batteries, enabling centralized aggregation and management of battery cluster data;
- ◆ Supports LAN and CAN communication with the battery management system host BCU to enable data exchange;
- ◆ Supports communication control and dry contact control with hybrid inverters, supporting both CAN and RS-485 communication protocols;
- ◆ Supports BMU automatic addressing functionality;
- ◆ Supports digital signal input detection, including switch status signals;
- ◆ Supports terminal voltage detection, terminal current detection, and insulation status monitoring for battery clusters;
- ◆ The high-voltage enclosure supports the following system parameters: total battery cluster voltage  $\leq 1000$  V and maximum current  $\leq 250$ A.

## (2) Product exterior dimensions

Product dimensions (depth\*width\*height): 675.7\*470\*231 mm (including mounting ears);

The high-voltage box is installed using hanging ear fixation, with a left-right hole spacing of 446 mm and a top-bottom hole spacing of 170 mm. The hanging ear fixing holes are open slot-type holes, secured with four M6 screws.

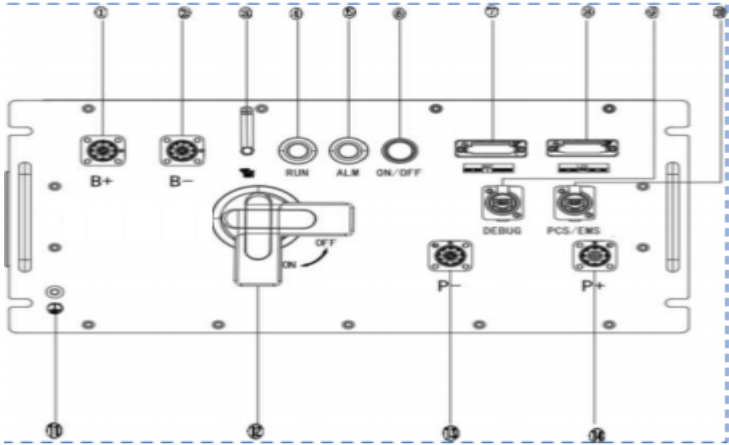


Table 6 Panel Screen Printing Content

| serial number | Silk screen content | description                                                        |
|---------------|---------------------|--------------------------------------------------------------------|
| ①             | B+                  | Connect the battery module to the positive input of the PDU        |
| ②             | B--                 | Battery module connected to the negative input of the PDU          |
| ③             | YI                  | WIFI can be used for external data reading and upgrades            |
| ④             | RUN                 | PDU operational indicator light                                    |
| ⑤             | ALM                 | PDU trouble light                                                  |
| ⑥             | ON/OFF              | PDU mains switch                                                   |
| ⑦             | FAN、BMU             | Fan power supply & communication interface between PACK and PDU    |
| ⑧             | LCD                 | Display screen power supply interface                              |
| ⑨             | DEBUG               | PDU debugging interface                                            |
| ⑩             | PCS/EMS             | Connect to PCS/EMS communication output interface                  |
| ⑪             | Hope                | PDU ground point                                                   |
| ⑫             | ON-OFF              | PDU main switch                                                    |
| ⑬             | P-                  | The PDU module connects to the inverters negative output terminal. |
| ⑭             | P+                  | The PDU module connects to the inverters positive output terminal. |

## 2.5 Introduction to Energy Storage Inverters

Energy storage inverters utilize three-phase three-level converters to perform rectification and inversion. The rectified output converts three-phase alternating current (AC) into direct current (DC), which is then fed into the energy storage system. The inverted output is filtered through a filter to generate three-phase AC power, which can be used by AC loads or fed into the grid. Key features include:

- High conversion efficiency

- Zero power consumption for the battery in standby mode;

- Charge-discharge conversion time  $\leq 100\text{ms}$ ;

- The highest conversion efficiency reached 98.5%.

- Flexible application

- Compatible with three-phase three-wire or four-wire systems, the customizable communication bus enables real-time monitoring of all module data.

- Battery-friendly

Multiple battery clusters can operate completely independently, preventing inter-cluster current circulation and extending service life; compatible with over 30 BMS protocols.

■Comprehensive features

- Supports operation modes including pure grid-connected, pure off-grid, and on/off-grid switching.
- Supports high-low voltage switching, islanding, and black start;
- In off-grid operation mode, it supports 100% three-phase unbalance with load.
- Supports reactive power compensation, harmonic mitigation, and three-phase imbalance compensation.

■Easy to maintain

- The cluster configuration ensures that faulty branches do not affect the operation of other branches.

■Safe and stable

- Comprehensive fault protection functionality;
- Low battery cycle current with multi-parallel automatic current balancing;
- Supports stable operation in grid environments with THDu (Total Harmonic Distortion) at 20%.

The product appearance is shown below:



Table 7 Product Specific Parameter Table

|                             |                                    |
|-----------------------------|------------------------------------|
| specifications              | EPCS125-AM(-F)                     |
| direct current side         |                                    |
| Operating voltage range (V) | 615~950 (3W+PE) /650~950 (3W+N+PE) |
| Full load voltage range (V) | 615~950 (3W+PE) /680~950 (3W+N+PE) |
| Input channels              | 1                                  |

|                              |                                                                                                                        |
|------------------------------|------------------------------------------------------------------------------------------------------------------------|
| maximum current (A)          | 203                                                                                                                    |
| AC side (grid-connected)     |                                                                                                                        |
| rated voltage (V)            | 230/400                                                                                                                |
| voltage deviation            | -15%~+15%                                                                                                              |
| AC output type               | (3W+ PE) three-phase three-wire / (3W+N+ PE) three-phase four-wire                                                     |
| Rated output power (kW)      | 125                                                                                                                    |
| Maximum output power (kW)    | 137.5                                                                                                                  |
| maximum current (A)          | 200                                                                                                                    |
| Rated grid frequency (Hz)    | 50/60(±5)                                                                                                              |
| power factor                 | 0.99                                                                                                                   |
| Power factor range           | 1 (advanced) to 1 (lagging)                                                                                            |
| current distortion rate      | <2% (rated power)                                                                                                      |
| DC component                 | <0.5%                                                                                                                  |
| overload capacity            | 110% long-term (rated operating conditions)                                                                            |
| maximal efficiency           | 98.5%                                                                                                                  |
| AC side (off-grid)           |                                                                                                                        |
| rated output voltage         | 230/400                                                                                                                |
| AC voltage harmonics         | <3% (linear load)                                                                                                      |
| Rated frequency (Hz)         | 50/60(±5)                                                                                                              |
| Rated output power (kW)      | 125                                                                                                                    |
| Maximum apparent power (KVA) | 137.5                                                                                                                  |
| Maximum output current (A)   | 200                                                                                                                    |
| protection feature           |                                                                                                                        |
| Features available           | AC overcurrent protection,<br>AC overvoltage protection,<br>AC short-circuit protection, and anti-islanding protection |

|                              |                                                                 |
|------------------------------|-----------------------------------------------------------------|
|                              | Protection, DC reverse connection protection, etc.              |
| Default parameters           |                                                                 |
| Inner dimensions (W×H×D, mm) | Post-maintenance: 520×232×725                                   |
|                              | Previous maintenance: 520×232×785                               |
| weight (kg)                  | Post-maintenance: 69                                            |
|                              | Previous maintenance: 74.5                                      |
| above sea level (m)          | 4000 meters (use at reduced capacity for distances>2000 meters) |
| working temperature          | -30° C to 55° C (usage reduced when temperature exceeds 45° C)  |
| Storage temperature          | -45℃~70℃                                                        |
| humidity                     | 0% RH to 95% RH, no condensation                                |
| cooling-down method          | Intelligent forced air cooling                                  |
| levels of protection         | IP20                                                            |
| communication interface      | CAN/RS485/Ethernet                                              |
| grid support                 | L/HVRT, active/reactive power control                           |

2.6 DC/DC Conversion Module

The bidirectional DC/DC converter module features a three-level topology architecture, offering advantages such as higher efficiency, compact size, and reduced EMI interference. It enables high-low voltage DC switching and can be connected to photovoltaic panels in MPPT mode for maximum power tracking or supply AC/DC power to loads. Product specifications are as follows:

|                          |      |
|--------------------------|------|
| Electrical parameters    |      |
| power rating             | 50kW |
| long-term overload power | 55kW |

|                                                  |            |
|--------------------------------------------------|------------|
| High-side voltage                                | 200V~1000V |
| Full-load voltage range on the high-voltage side | 455V~1000V |
| Maximum current at high voltage side             | 110A       |
| Low-voltage side voltage                         | 0V~900V    |

|                                     |                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Full-load voltage range at low-side | 313V~900V                                                                                                                                                                                                                                                                                                                                             |
| Maximum current at low voltage side | 160A                                                                                                                                                                                                                                                                                                                                                  |
| maximal efficiency                  | 99%                                                                                                                                                                                                                                                                                                                                                   |
| work pattern                        | Constant voltage, bidirectional constant voltage, constant current, constant power, boost MPPT, buck MPPT                                                                                                                                                                                                                                             |
| Static Voltage Stability            | $\pm 1\%$                                                                                                                                                                                                                                                                                                                                             |
| dynamic voltage stability           | $\pm 5\%$                                                                                                                                                                                                                                                                                                                                             |
| Static Current Stability            | $\pm 1\%$                                                                                                                                                                                                                                                                                                                                             |
| dynamic current stability           | $\pm 3\%$                                                                                                                                                                                                                                                                                                                                             |
| additional function                 | <p>0V precharge (the low-voltage side can operate from 0V); the module supports both low-voltage and high-voltage sides.</p> <p>The device features three power input channels (220V side and external), and can be powered when any input voltage exceeds 200V.</p>                                                                                  |
| parallel operation                  | Supports parallel operation in all modes with up to 16 devices                                                                                                                                                                                                                                                                                        |
| defensive function                  | Fusible protection, overcurrent protection, overtemperature protection, low-voltage side undervoltage protection, high-voltage side undervoltage protection, overpower protection, low-voltage side short-circuit protection, reverse connection protection, surge protection, insulation detection protection, and temperature derating output, etc. |

2.7 Introduction to Battery Management System

The Battery Management System (BMS) adopts a two-tier architecture, where each battery plug-in unit is managed by a Battery Management Unit (BMU) to oversee 52 battery strings.

The BMU is responsible for monitoring individual battery cell voltage, temperature, and performing balancing functions. The BMU communicates via CAN bus, transmitting cell-specific data (including individual voltage, temperature, state of charge (SOC), state of health (SOH), and balancing status) to the upper system.

The battery cluster configuration includes one Battery Cluster Control Unit (BCU) that performs total voltage and current acquisition, as well as contactor control for the battery cluster. The BCU can upload battery information, fault alarms, and data records, and communicates with the Power Conversion System (PCS) and monitoring backend through CAN bus communication with PCS and Ethernet communication with the backend.

(1) From the control unit BMU

The BMU control unit achieves real-time battery status monitoring by precisely collecting voltage and temperature data from individual cells. The module features reliable data communication capabilities, enabling seamless interaction with the battery management systems main control unit or other critical devices during system operation. The exterior design is illustrated below:



Table 8 BMU Specification Parameters Table

| working temperature                    |                                      | -40°C~85°C                                                                                               |
|----------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------|
| Storage temperature                    |                                      | -40°C~105°C                                                                                              |
| Working humidity                       |                                      | 5~95%                                                                                                    |
| Single cell voltage detection range    |                                      | 0~5V                                                                                                     |
| Single-cell voltage detection accuracy |                                      | $\leq \pm 5\text{mV}$                                                                                    |
| Temperature detection range            |                                      | -40°C~125°C                                                                                              |
| Temperature detection accuracy         |                                      | $\leq \pm 1^\circ\text{C}$ (room temperature-20~65°C); $\leq \pm 2^\circ\text{C}$ (non-room temperature) |
| mains power supply                     |                                      | Voltage range: 6 - 36V (typical values: 12V, 24V)                                                        |
| power                                  | move                                 | $\leq 50\text{mA}$ @25V (with both normal power and wake-up modes, operating normally)                   |
| dissipation                            |                                      |                                                                                                          |
|                                        | shut down                            | $\leq 50\mu\text{A}$ @24V (operates continuously without wake-up function, stops working)                |
| communication unit                     | CAN highway                          | Channel 1 (master-slave, isolated CAN bus, adjustable matching resistor harness)                         |
| acquisition unit                       | Cell voltage detection               | 52 strings                                                                                               |
|                                        | Cell temperature monitoring          | Route 56 (software can define cell temperature or pole temperature acquisition), default support NTC103  |
|                                        | Extended Temperature Detection       | Supports NTC 103 by default for 2 channels                                                               |
|                                        | ADC Analog Signal Measurement survey | Channel 1, voltage detection range 0~5 VDC, detection resolution 2 mV, detection error $\leq \pm 1\%$    |

|                |                                    |                                             |
|----------------|------------------------------------|---------------------------------------------|
|                | High-level signal detection survey | Line 1, high-level input valid, addr_in     |
|                | Low-level signal detection         | 2 channels, effective when connected to GND |
|                | Awakening signal detection         | Route 1, P_EN                               |
| execution unit | high-level signal output           | Route 1, ADDR_OUT                           |
|                | high-side switch output            | 2-channel, 2A, supports PWM output          |
|                | equilibrium control                | Supports up to 100mA                        |

## (2) Specifications and parameters of the main control unit (BCU)

The main control unit (BCU) serves as the control core of the battery

management system. Through communication with subordinate control units, it monitors individual battery cell voltage and temperature while detecting external parameters such as pack voltage, charge/discharge current, and ground insulation resistance. Utilizing advanced algorithms, the BCU evaluates and tracks lithium battery internal states including capacity, state of charge (SOC), and state of health (SOH). This enables comprehensive management of battery pack operations encompassing charge/discharge control, thermal regulation, insulation testing, cell balancing, and fault alarms. The system facilitates data exchange with power control systems (PCS), energy management systems (EMS), and human-machine interfaces via communication buses, while maintaining communication with battery management units (BMUs) through a daisy-chain topology. Refer to the product reference images below:



| project                            |                                    | main parameter                                                                                                                                         |
|------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| working temperature                |                                    | -30℃~85℃                                                                                                                                               |
| Storage temperature                |                                    | -40℃~105℃                                                                                                                                              |
| Working humidity                   |                                    | 5%~95%                                                                                                                                                 |
| High-pressure measurement accuracy |                                    | ±0.5% or 0.5V                                                                                                                                          |
| Current measurement accuracy       |                                    | ±0.5%FSR                                                                                                                                               |
| Insulation detection accuracy      |                                    | ±15% or 15KΩ                                                                                                                                           |
| SOC estimation accuracy            |                                    | ≤5%                                                                                                                                                    |
| Temperature detection accuracy     |                                    | ±1℃ (10K NTC)                                                                                                                                          |
| mains power supply                 |                                    | Voltage range: 6 - 36V (typical values: 12V, 24V)                                                                                                      |
| power dissipation                  | move                               | 200mA@12V                                                                                                                                              |
|                                    | shut down                          | 100uA@12V                                                                                                                                              |
| communication unit                 | CAN communication                  | Route 3, isolation)                                                                                                                                    |
|                                    | RS485 communication                | Route 2, (Isolated)                                                                                                                                    |
|                                    | isoSPI communication               | Route 2, (Isolated)                                                                                                                                    |
|                                    | radio communication                | Standard Edition, 4G                                                                                                                                   |
| acquisition unit                   | High pressure detection            | Channel 3, BAT+/HVI/HV2 (total negative adhesion detection); BAT+/HV1 voltage acquisition range: 0~1500 VDC; HV2 (total negative relay PACK detection) |
|                                    | Current detection                  | Supports Hall shunt circuit                                                                                                                            |
|                                    | Insulation detection               | Supports error accuracy of ±15% or 15KΩ                                                                                                                |
|                                    | Temperature detection              | 4-channel (default temperature-sensing model: NTC103), measurement accuracy ±1° C                                                                      |
|                                    | High-level signal input detection  | 3 channels, operates on high voltage level (6~36 VDC)                                                                                                  |
|                                    | Low-level signal input detection   | 3 channels, effective when connected to GND                                                                                                            |
|                                    | Wet contact signal input detection | 2 channels                                                                                                                                             |
| execution unit                     | high-side switch output            | 4 channels, 2A                                                                                                                                         |
|                                    | low side switch                    | Route 3, 2A                                                                                                                                            |

|              |                       |                                                                                                         |
|--------------|-----------------------|---------------------------------------------------------------------------------------------------------|
|              | output                |                                                                                                         |
|              | dry contact output    | 2-channel relay type, 1A per channel; 1-channel PHOTOMOS type, 0.1A                                     |
| data storage | board mounted storage | 128MBSLC NAND FLASH                                                                                     |
| RTC          |                       | Time synchronization capability, supporting IRIG-B (DC) code synchronization or network synchronization |

2.8 Introduction to Fire Protection System

Each battery box and the entire battery cluster in the energy storage system are equipped with temperature-controlled aerosols, which enable full-immersion fire suppression. When the temperature inside the cabinet reaches the explosion temperature point of the temperature-controlled aerosols, the aerosols are released to submerge the entire cabinet and extinguish the fire.

The aerosol device is an innovative thermal fire extinguishing system, representing a groundbreaking product in the firefighting field with exceptional fire suppression efficiency and reliability. This product features compact size, pressure-free storage, no need for pipeline installation or maintenance, highly efficient and rapid fire suppression, non-toxic properties, safety and reliability, as well as environmental friendliness. It is particularly suitable for relatively enclosed environments such as small battery boxes and confined spaces.

(1) Technical parameters of aerosol technology for battery case:

◆S-type hot aerosol production implementation standard XF499.1 "Aerosol Fire Extinguishing Systems Part 1: Hot Aerosols"

◆ fire unit »

◆Valid use period: 10 years

◆Start-up method: Hot start-up

◆Startup temperature:  $\geq 170^{\circ}\text{C}$ ;

◆Operating ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

◆Protection space  $\leq 0.12\text{ m}^3$

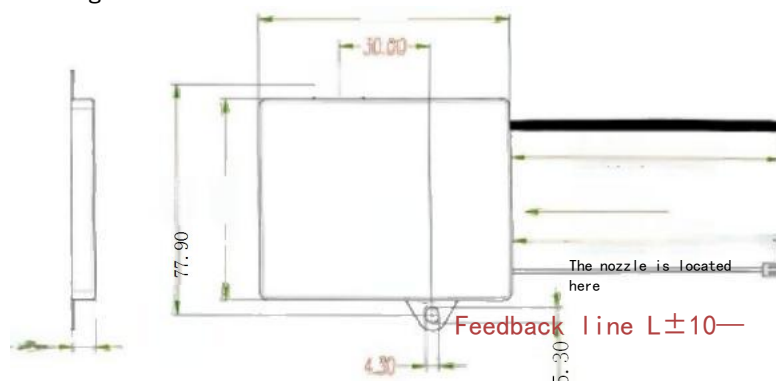
◆ Thermal aerosol generation dose:  $12\text{g} \pm 1\text{g}$

◆Ejection lag time:  $\leq 1\text{s}$

◆ Thermal spacing:  $0.02\text{m} \leq 400^{\circ}\text{C}$ ;  $0.05\text{m} \leq 200^{\circ}\text{C}$ ;  $0.1\text{m} \leq 75^{\circ}\text{C}$

◆Passive switch-type feedback signal: A passive switch signal (normally open in standby mode, normally closed after activation (temperature above  $100^{\circ}\text{C}$ ))

◆Device mass:  $50\text{ g} \pm 10\text{ g}$





(2) Technical parameters of battery cluster aerosol technology:

◆ S-type hot aerosol production implementation standard XF499.1 "Aerosol Fire Extinguishing Systems-Part 1: Hot Aerosols"

◆ fire unit »

◆ Valid use period: 10 years

◆ Start-up method: Hot start (electrical start-up is optional, or a combination of hot and electrical start-up)

◆ Startup temperature:  $160^{\circ}\text{C} \rightarrow 180^{\circ}\text{C}$ ;

◆ Operating ambient temperature:  $-50^{\circ}\text{C}$  to  $+90^{\circ}\text{C}$

◆ Protection space:  $\leq 1.5\text{ m}^3$

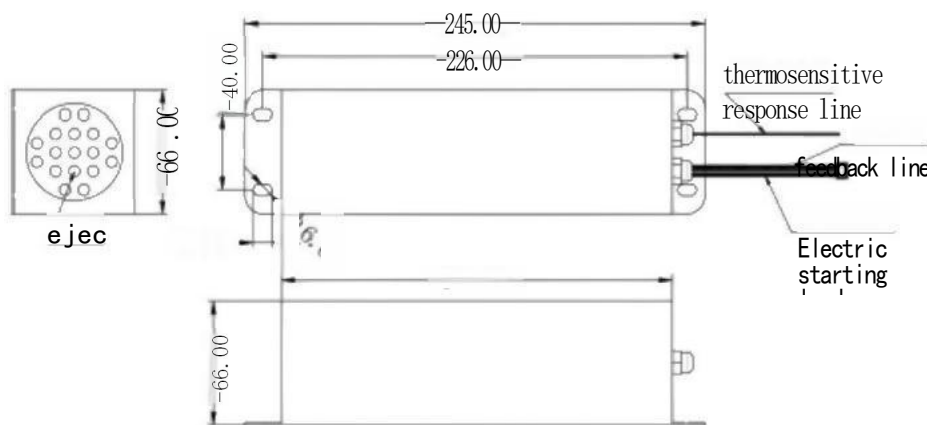
◆ Hot aerosol generation dose:  $150\text{g} \pm 2\%$

◆ Ejection lag time:  $\leq 5\text{s}$

◆ Nozzle temperature:  $\leq 200^{\circ}\text{C}$  at a distance of 5 mm from the nozzle

◆ Passive switch-type feedback signal: Passive switch-type signals (normally open in standby mode, normally closed after activation (activated when temperatures exceed  $80^{\circ}\text{C}$ ). The normally open/normally closed configuration can be customized according to customer requirements)

◆ Device mass: approximately 860 g



## 2.9 Introduction to Heat Dissipation System

The energy storage system employs a liquid-cooled host unit for temperature control, maintaining the battery systems operating temperature within  $3^{\circ}\text{C}$  to significantly enhance the overall cycle life of the system.

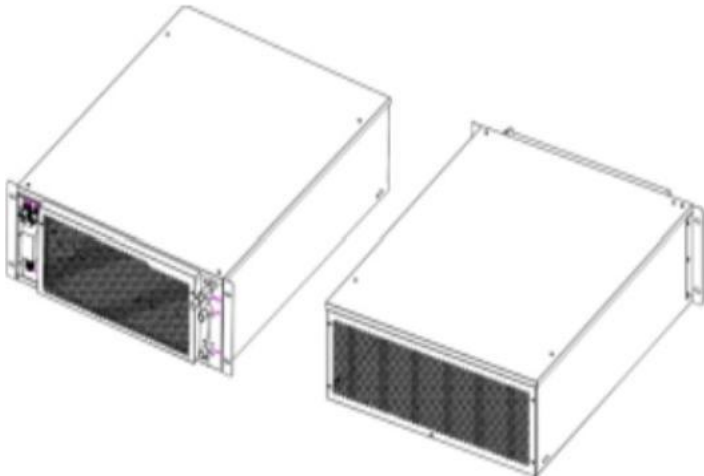
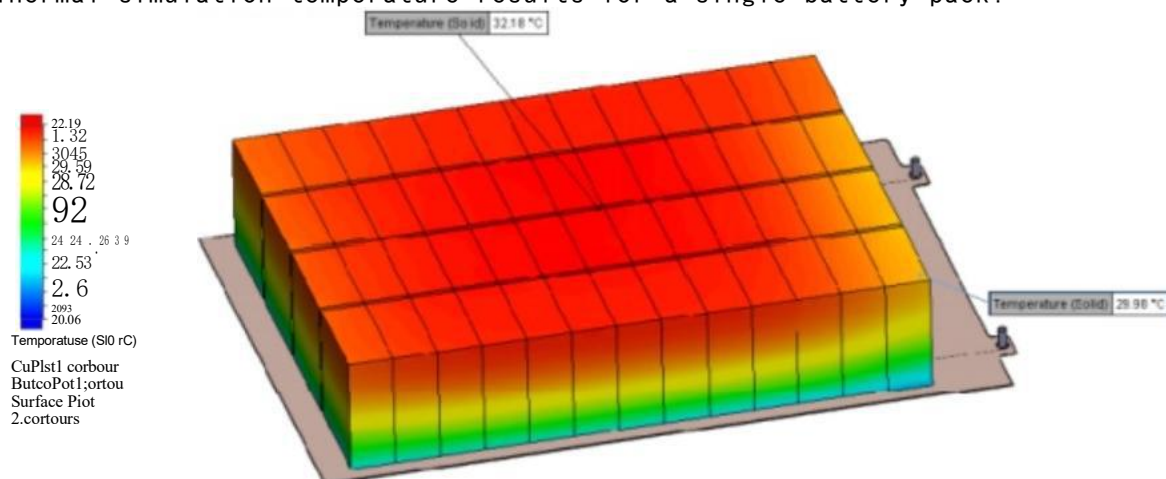


Table 10 Parameters of Thermal Management Liquid Cooling Unit

|                                                       |                           |        |                              |
|-------------------------------------------------------|---------------------------|--------|------------------------------|
| customized cooling capacity per unit                  |                           | W      | 5000                         |
| customized rated power                                |                           | W      | 2450                         |
| Customized COP for forehead design                    |                           | WW     | 2.04                         |
| Per capita heat allowance                             |                           | W      | 2100                         |
| Coolant type                                          |                           |        | 50% ethylene glycol solution |
| coolant flow                                          |                           | _/ min | 50                           |
| external head                                         |                           | m      | 9                            |
| Maximum pressure capacity of hydraulic circuit system |                           | bar    | 4.0                          |
| Temperature range for refrigerant liquid supply       |                           | C      | 5~35                         |
| Connection type/size                                  |                           |        | cQc20                        |
| Power system                                          | rated operational voltage | V , Hz | 220-240VAC, 50/60Hz, 1Ph     |
|                                                       | Supported voltage range   |        | 220VAC±15%                   |
|                                                       | rated current             | A      | 1.1                          |
|                                                       | maximum operating current | A      | 7.0                          |
| cryogen                                               |                           |        | R410A                        |
| Operating ambient temperature range                   |                           |        | 30~55                        |
| Storage ambient temperature range                     |                           |        | 40~70                        |
| communication interface                               |                           |        | RS485                        |
| levels of protection                                  |                           |        | PX5                          |
| Protection rating of electrical                       |                           |        | P55                          |

|                                                             |        |                                     |
|-------------------------------------------------------------|--------|-------------------------------------|
| control cabinet                                             |        |                                     |
| noise                                                       | dB (A) | 75                                  |
| Unit dimensions<br>(width × depth × height)                 | mm     | 700×900×245                         |
| Flange-equipped unit dimensions<br>(width × depth × height) | mm     | 769×900×245                         |
| net weight of unit                                          | kg     | 70                                  |
| Installation/cooling method                                 |        | Embedded horizontal rear air outlet |

Thermal simulation temperature results for a single battery pack:



The temperature of individual cells is highest in the upper region, decreasing progressively toward the cold plate area.

The top section of the entire PACK exhibited a maximum temperature of 32.18° C and a minimum temperature of 29.98° C, with a temperature difference of approximately 2.2° C. Using the ambient temperature of 25° C as a reference, the maximum temperature rise of the cells within the PACK was 7.18° C.

## 3. Product Instructions

- (1) This product can be used independently or in parallel with multiple units, supporting up to 4 cabinets connected in parallel for network operation.
- (2) This product must be used under specified charging rates or power conditions, and the maximum charging voltage shall not exceed the technical requirements of the product to prevent battery overcharging, which may adversely affect the battery's charge-discharge performance, mechanical properties, and safety performance.
- (3) This product must be used under specified environmental conditions, as excessively high or low temperatures may adversely affect battery performance and safety.

(4) This product must be used or stored in clean and well-ventilated environments, kept away from corrosive substances, and kept distant from sources of ignition and heat source

(5) This product must not be used or stored in areas with strong static electricity or strong magnetic fields to avoid potential safety hazards.

(6) The dust covers of the positive and negative terminals and communication sockets must not be removed before installation or wiring of this product to avoid contact short circuits and interface damage dust stratification

(7) Unauthorized disassembly or modification of this product is strictly prohibited. Failure to comply will result in termination of the warranty, and our company shall not be liable for any safety incidents arising therefrom.

(8) Do not store battery boxes in contact with metal objects to avoid short circuits and potential safety risks.

(9) This product must be installed or stored upright according to the design specifications, and side placement or inversion is strictly prohibited.

(10) The use of this product must strictly comply with the aforementioned requirements. Failure to do so will result in termination of the warranty, and our company shall not be liable for any performance damage or safety incidents caused by improper use.

## 4. Product Maintenance

(1) When this product is stored for an extended period, it should be maintained at a charge state of 30% to 50%.

(2) For prolonged storage or disuse of this product, it is recommended to perform a full charge every 3 months to prevent battery over-discharge and depletion, and to conduct a charge-discharge cycle every 6 months.

(3) After prolonged operation of this product, it is recommended to clean the filter cotton every 800 hours to prevent clogging and ensure proper ventilation and heat dissipation. Cleaning procedure for filter cotton:

- ① Use the key to open the louvered door and remove the louvers. Behind them, you will see the perforated metal plate cover enclosing the filter cotton layer.
- ② Use a screwdriver to loosen the sheet metal pressure plate to remove the filter cotton;
- ③ Simply blow off the dust on the filter cotton using a high-pressure air gun or high-pressure water gun;
- ④ Re-reduce and reinstall on the equipment.

★ disclaimer :

This device shall be used within the scope specified in this product specification. In the event of personnel, animal, or property damage caused by improper conduct during installation, commissioning, maintenance, or use by the product demand unit, or by using the product outside its specified scope of application, the manufacturer shall not be liable for any damages under or beyond the contractual terms.