Probenergy

ENERBOND

# Datasheet


LFPO$_4$ Li-ion Battery Energy Storage System

**GTLFP-1331.2V/3.354MWh/1.67MW**

Revision History

| Versions | Revision history | Reviser | Time |
|---|---|---|---|
| A1.0 | | | |
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## Contents

# 1 Abbreviation

| | |
|---|---|
| BMS | Battery Management System |
| BMU | Battery Management Unit |
| BCU | Battery Control Unit |
| BAU | Battery Array Unit |
| CAN | Controller Area Network |
| BOL | Begin of Life |
| EOL | End of Life |
| SOC | State of Charge |
| SOE | State of Energy |
| SOH | State of Health |
| SOP | State of Power |
| PCS | Power Control System |
| EMS | Energy Management System |

## 2 Scope of application

This technical specification specifies the detailed introduction, transportation, packaging, storage requirements, and precautions for the 1.677MW/3.354MWh lithium iron phosphate energy storage container system made by Enerbond.

## 3 Normative references

The following documents are essential for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest version (including all modification orders) applies to this document.

UN 38.3 United Nations Manual of Tests and Standards for the Transport of Dangerous Goods, Part 3, Paragraph 38.3- Requirements for Lithium Batteries

IEC 62619 Safety requirements and testing methods for industrial (including fixed) lithium batteries and lithium battery packs

NB/T 42091-2016 Technical Specification for Lithium Ion Batteries Used in Electrochemical Energy Storage Power Stations

NB/T 33014-2014 Specification for Operation Control of Electrochemical Energy Storage Systems Connected to Distribution Networks

NB/T 33015-2014 Technical Regulations for the Connection of Electrochemical Energy Storage Systems to Distribution Networks

NB/T 31016-2011 Technical Conditions for Battery Energy Storage Power Control System

## 4 Test conditions

Unless otherwise specified, the parameters of the product are all in the state of the container energy storage system, and the test object is the energy storage system in the state of the container energy storage system. Unless otherwise specified, experiments and measurements should be conducted at room temperature (25 ± 2) ℃ and standard humidity (55 ± 20) %. Unless otherwise specified, the charging and discharging modes should be standard charging/discharging modes.

Measurement equipment and accuracy.

(1) Test equipment accuracy: ± 0.1%.

(2) Current measurement accuracy: ≥ 0.5 level.

(3) Voltage measurement accuracy: ≥ 0.5 level.

(4) Temperature measurement accuracy: ± 0.5 ℃.

(5) Time measurement accuracy: ± 0.1%.

(6) Dimensional measurement accuracy: ± 0.1%.

(7) Weight measurement accuracy: ± 0.1%.

## 5 Product specifications

This product is composed of 9 1331.2V/280Ah lithium iron phosphate battery clusters and related auxiliary systems such as temperature control, environmental control, and lighting, and is installed in the container. The container contains a three-level battery management unit (BAU) for the system, which can perform numerical calculations, performance analysis, alarm processing, and record storage of real-time battery data uploaded by BCU. In addition, it can achieve linkage control with PCS, EMS, etc. According to output power requirements and the SOC optimization load control strategy of each group of batteries, ensuring the stable operation of all battery systems; Featuring high energy density, wide temperature range, long service life, light weight, high safety and reliability, it is a trustworthy green and environmentally friendly product.

The system diagram is as follows.

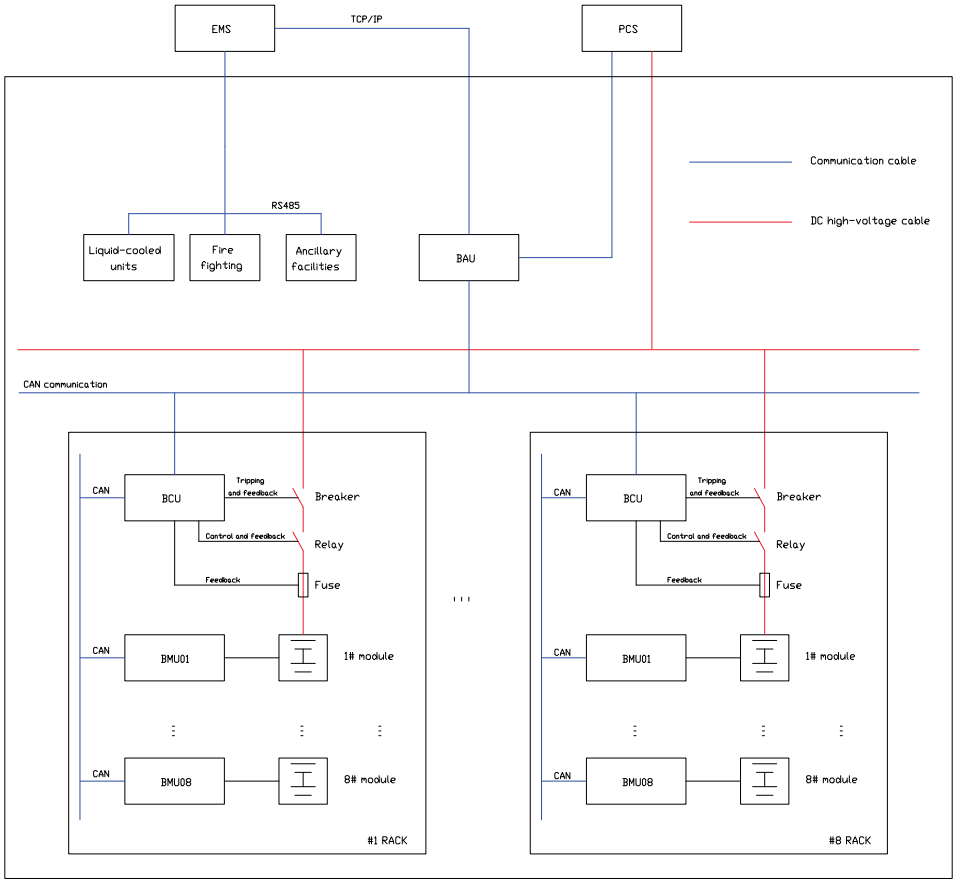


Figure 1 Container system diagram

The 20 foot high container contains 9 battery clusters, two refrigeration units, one combiner cabinets, a fire protection system, and related lighting, power distribution, monitoring and other components.

Table 1 Container components

| No. | Type | Number | Notes |
|---|---|---|---|
| 1 | Battery module | 72 | Single module: 1P52S, including 52 280Ah battery cells, series aluminum bars, battery monitoring unit (BMU), and acquisition wiring harness, etc |
| 2 | High voltage box | 9 | The high-voltage box mainly consists of a battery management unit (BCU), contactors, circuit breakers, wiring harnesses, wiring terminals, and related structural components. The panel has DC high-voltage power interface, communication interface, and liquid cooling interface |
| 3 | DC cabinet | 1 | The DC cabinet is mainly used for auxiliary power distribution, control power distribution, and external communication; Including three-level main control unit (BAU), touch screen, UPS, main circuit breaker, busbar, etc |
| 4 | Thermal management unit | 2 | 2 * 20kW liquid cooling unit, liquid cooling pipeline, coolant, including compressor, water pump, fan, heater, etc. |
| 5 | Fire protection system | 1 | Perfluorohexanone |
| 6 | Container | 1 | 20ft HC：6096mm*2438mm*2896mm |

## 5.1 Basic parameters

Table 2 Container energy storage system parameters

| No | Item | Parameter | Condition |
|---|---|---|---|
| 1 | Cell capacity | 280Ah | Standard charging/discharging |
| 2 | Series parallel connection method | 9P416S | |
| 3 | Nominal voltage | 1331.2V | Standard charging/discharging |
| 4 | Nominal energy | 3354kWh | Standard charging/discharging |
| 5 | Discharge cut-off voltage | 1040V or any single cell of the battery cluster reaches 2.5V | T＞0℃ |
| | | 832V or any single cell of the battery cluster reaches 2.0V | T≤0℃ |
| 6 | Charging cutoff voltage | 1518.4V or any single cell of the battery cluster reaches 3.65V | |
| 7 | Rated charging/discharging current | 1260A | (25±2)℃ |
| 8 | Rated charging/discharging power | 1677kW | |
| 9 | Overall dimension | 6096mm*2438mm*2896mm | |
| 10 | Weight | ＜35T | |
| 11 | Operating temperature range | 0~50℃ | |

| | | | |
|---|---|---|---|
| 12 | Storage temperature range | -20~+45℃ | Short term storage for 1 month |
| 13 | Communication | CAN、RS485 | |
| 14 | Shipment SOC (%) | 27 | (25±2)℃ |
| 15 | Product lifespan guarantee operating conditions | (25±5)℃ | |
| 16 | System temperature control method | Industrial temperature controlled air conditioning | |
| 17 | Fire protection system | Perfluorohexanone | |
| 18 | IP grade | IP54 | |

## 5.2 Main equipment parameters

### 5.2.1 Cell

The cell is 3.2V/280Ah LFP cell.

Table 3 280Ah cell parameters

| No. | Item | Parameter | Condition |
|---|---|---|---|
| 1 | Cell type | 280Ah | Standard charge and discharge |
| 2 | Cell model | PC-0B1-72174L4-AH | |
| 3 | Cell Weight | 5.45±0.15kg | Standard charge and discharge |
| 4 | Outgoing internal resistance（1kHz） | ≤ 0.25 mΩ | Standard charge and discharge |
| 5 | Rated capacity | 280Ah | T＞0℃ |
| 6 | Nominal voltage | 3.2V | |
| 7 | Rated energy capacity | 896Wh | 25±2℃ |
| 8 | Working voltage | 2.6~3.65V<br>2.0~3.65V | Cell temperature T＞0℃<br>Cell temperature T≤0℃ |
| 9 | Energy density | 170Wh/kg<br>355Wh/L | 25±2℃，1/3C discharge |
| 10 | The recommended SOC usage window | 5%~95%SOC | |
| 11 | Monthly self-discharge | ≤3%/month | 30%SOC，25±2℃ storage |
| 12 | Standard Charge/ Discharge rate | 0.5P | 25±2℃ |
| 13 | Operating temperature | Charging：0℃~60℃<br>Discharging: -30℃~60℃ | |
| 14 | Storage temperature | -40℃~60℃ | Storage environment humidity ≤90% RH, no condensation |

Overall dimensions are as follows.

Table 4 Dimensions of 280Ah cell

| No. | Item | Description | Size(mm) |
|---|---|---|---|
| 1 | W | Width | 174.0±0.5 |
| 2 | T | Thickness | 71.72±0.5 |
| 3 | H | Height | 204.7±0.8（shoulder height）<br>206.9±0.5（overall height） |
| 4 | Weldable zone | Diameter | 17±0.5 |
| 5 | welding penetration | Depth | ≤2.0mm |
| 6 | Pole center distance | Length | 123±0.3mm |

5.2.2 Battery module

The battery module is designed with 3.2V/280Ah LFP cell 1P52S. Each battery module consists of 4 pcs of 1P13S modules in series to form 166.4V/280Ah, with a total energy of 46.592kWh. At the same time, the internal collection harness and BMU are used to collect the voltage and temperature of the battery cell. The positive and negative interfaces of the battery module are clearly marked for easy connection, visual inspection, inspection and maintenance.

The technical parameters of the module are measured at room temperature (25±2) ℃ and humidity (55±20) %. Specific parameters are shown in the following table:

Table 5 Parameters of the 166.4V/280Ah module

| No. | Item | Parameter | Condition |
|---|---|---|---|
| 1 | Cell capacity | 280Ah | Standard charge and discharge |
| 2 | Parallel & Serial mode | 1P52S | |
| 3 | Nominal voltage | 166.4 | Standard charge and discharge |
| 4 | Nominal energy capacity | 46.592kWh | Standard charge and discharge |
| 5 | Dimension | 750mm*1115mm*260mm | |
| 6 | Dimension with tab lead | 814mm*1115mm*260mm | |
| 7 | Weight | ≈330kg | |
| 8 | Discharge cut-off voltage | 130V or any cell in the module reaches 2.5V | T＞0℃ |
| | | 104V or any cell in the module reaches 2.0V | T≤0℃ |

| | | | |
|---|---|---|---|
| 9 | Charge cut-off voltage | 189.8V or 3.65V for any cell in the module | N.A. |
| 10 | Standard charge and discharge current | 140A | 25±2℃ |
| 11 | Operation Temperature | Charging：0℃~60℃<br>Discharging：-30℃~60℃ | |
| 12 | Storage temperature | -40℃~60℃ | Storage temperature humidity: ≤90%RH, no condensation |
| 13 | Positive and negative electr ode extraction mode | Connector | |
| 14 | Communication mode | CAN | |
| 15 | Shipment SOC | 27% | 25±2℃ |
| 16 | Product lifespan guarantee d operating conditions | 25±2℃ | |

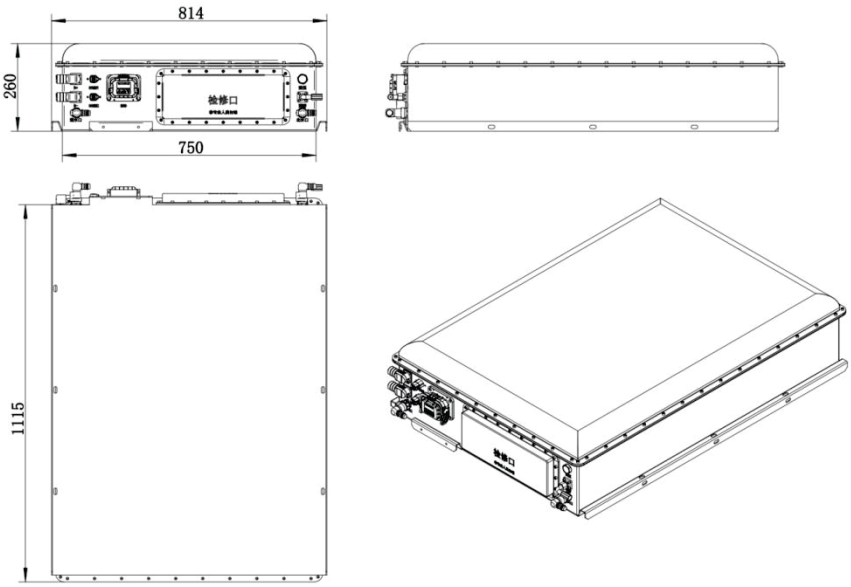


Figure 2 Dimensions of 166.4V/280Ah module

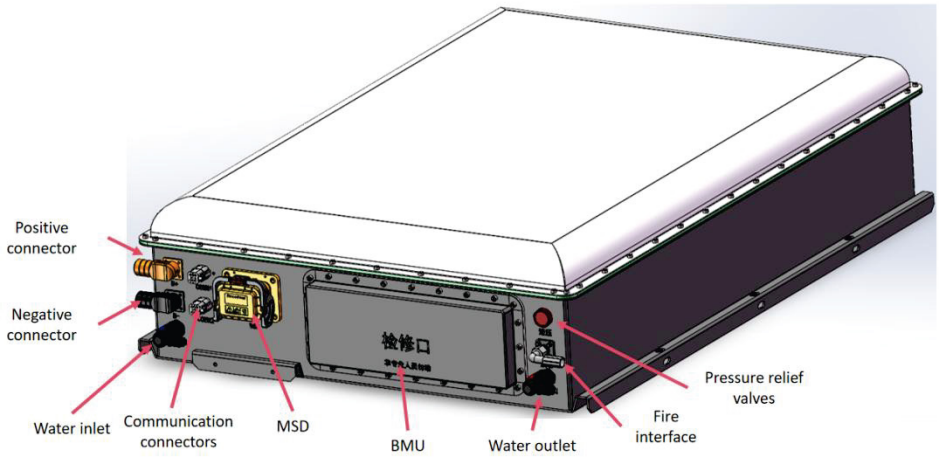


Figure 3 Appearance of 166.4V/280Ah module

5.2.3 High voltage control box

In the design of the high voltage control box, the safety and reliability of the system are fully considered, and the control logic of the system is scientific and reasonable. As the control unit of the battery cluster, the high voltage control box is integrated with BCU, fuse, contactor, shunt, power supply, connector and other devices, and all contactors accept the control of the battery management system; It has functions such as fault alarm, fault protection and safety protection to ensure battery electrical safety, and can disconnect the system step by step during maintenance. The external interface of each battery cluster is concentrated on the high voltage control box, and the main loop and the control loop are connected by connectors. The BCU is responsible for the communication between the upper and lower levels, receiving the voltage and temperature information of the battery cell internally, issuing the equalization command, communicating with the BAU externally, reporting the information of the battery cluster, and receiving the contactor closing/opening command.

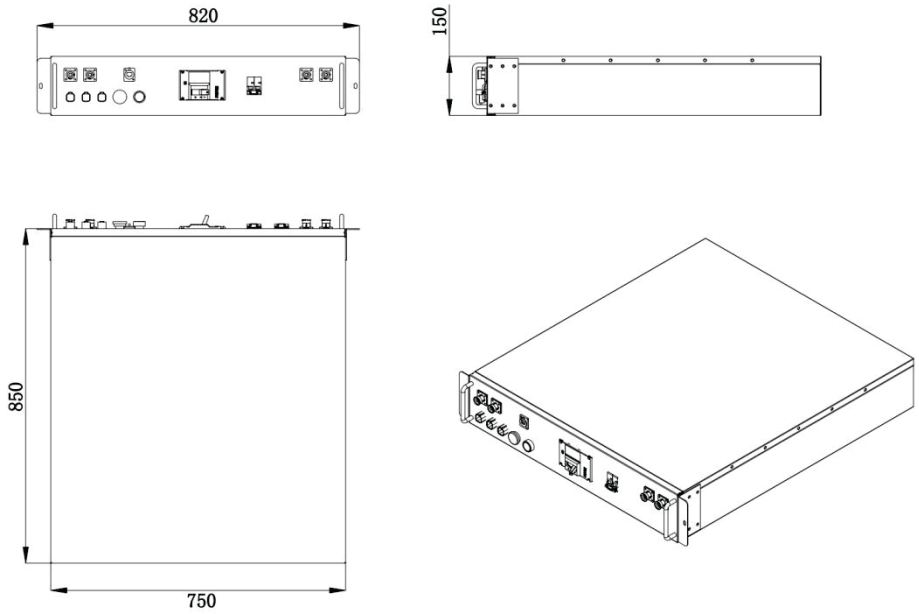


Figure 5 Dimension diagram of high voltage control box

The front panel of the high voltage control box is mainly composed of positive and negative connectors, plastic-case circuit breakers, control power circuit breakers, indicators, and communication connectors.

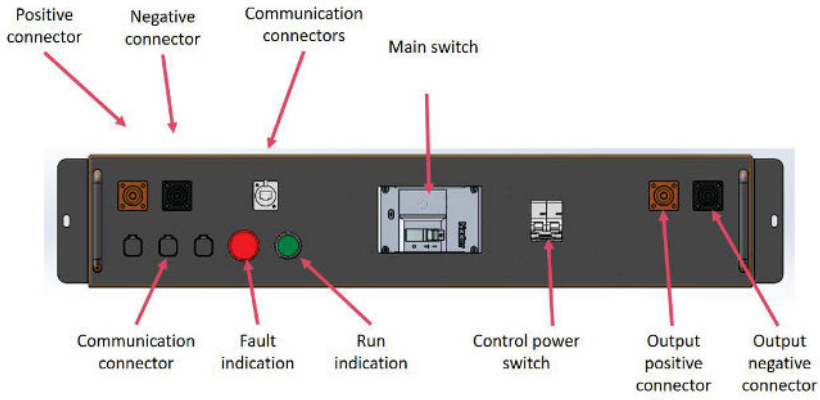


Figure 6 Front panel of high voltage control box

The control harness connector model of high voltage control box: AT04-6P-PM05 (wire end: AT06-6S); The battery input positive connector model is FSP240180CZ-UM8A1K (line end: FSP840180TZ-70U0A1K). Battery input negative connector model: FSP240180CW-UM8B1K (wire end: FSP840180TW-70U0B1K); The power cable is recommended to use a single-core cable 70mm² with a rated voltage of 1500V.

5.2.4 Battery cluster

The battery cluster is composed of 8 pcs of 166.4V/280Ah LFP battery modules and 1 set of high voltage control box through series connection and fixed on the battery cluster rack. The high voltage control box contains battery cluster management units (BCU), relays, fuses, power resistors and other components, which can monitor and protect the battery cluster in real time. The product has the characteristics of high energy density, wide temperature range, long life, light weight and high safety, and is a trustworthy green product.

The testing result of the Battery cluster technical parameters are measured at room temperature (25±2) ℃ and humidity (55±2) %.

Table 6 Battery cluster parameters

| No. | Item | Parameter | Condition |
|---|---|---|---|
| 1 | Cell capacity | 280Ah | Standard charge and discharge |
| 2 | Parallel & Serial mode | 1P416S | |
| 3 | Nominal voltage | 1331.2V | Standard charge and discharge |
| 4 | Nominal energy capacity | 372.7kWh | Standard charge and discharge |
| 5 | Overall dimension | 932mm*1137 mm *2725 mm | |
| 6 | Weight | ≈3300kg | |
| 7 | Cut-off voltage of discharging | 1040V or any cell in the module reaches 2.5V | T＞0℃ |

| | | | |
|---|---|---|---|
| | | 832V or any cell in the module reaches 2.0V | T≤0℃ |
| 8 | Cut-off voltage of charging | 1518.4V or any cell in the module reaches 3.65V | N.A. |
| 9 | Standard charge and discharge current | 140A | 25±2℃ |
| 10 | Operating temperature | Charge：0℃~60℃<br>Discharge：-30℃~60℃ | |
| 11 | Storage temperature | -40℃~60℃ | Storage temperature humidity: ≤90%RH, no condensation |
| 12 | Positive and negative electrode extraction mode | Connector | |
| 13 | Communication mode | CAN、RS485 | |
| 14 | Shipment SOC | 27% | 25±2℃ |
| 15 | Product lifespan guaranteed operating conditions | 25±2℃ | |

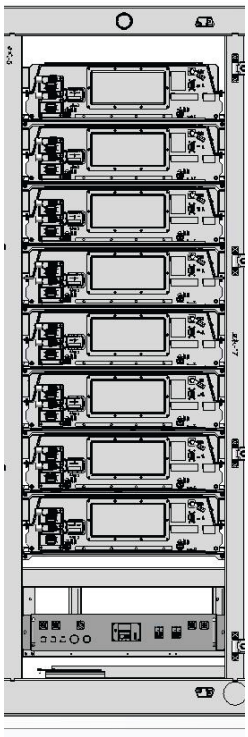

Figure 7 Battery cluster dimension diagram

5.2.5 Battery management system

The battery management system mainly consists of a three-level master control unit (BAU), a two-level master control unit (BCU), a primary slave control unit (BMU), and corresponding wiring harnesses. The system has the characteristics of wide functional coverage, compact size, strong anti-interference performance, safety and reliability.

The working principle is as follows: BAU communicates with BCU to detect battery

cell voltage, temperature, etc., and detects external characteristic parameters such as battery pack total voltage, charge and discharge current, insulation resistance to ground, and detects battery internal status (capacity, SOC, SOH, etc.) according to appropriate algorithms for estimation and monitoring. On this basis, the charge and discharge management, thermal management, insulation detection, cell balancing management and fault alarm of the battery cluster are realized; It can achieve data exchange with devices such as PCS, EMS, and human-machine interface through communication bus.

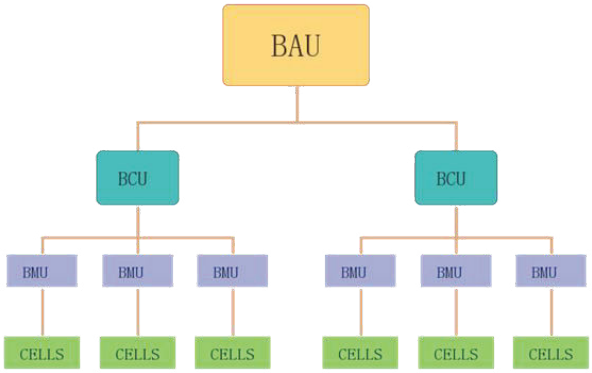


Figure 8 BMS three-level architecture topology

5.2.6 Power distribution cabinet

The power distribution cabinet is used in the system to assist and control power distribution equipment, playing a protective role in the normal operation of the entire system. The distribution cabinet provides auxiliary power for the following items.

- Battery system
- Fire protection system
- DC cabinet
- Thermal management unit
- Monitor system
- Socket
- Other auxiliary power supply equipment

5.2.7 DC cabinet

One DC cabinet is installed inside the container, and the functions are as follows:

- Applied in the system for auxiliary power distribution and control of power

distribution equipment, playing a role in ensuring the normal operation of the entire system;

- DC cabinet provides a high-voltage parallel interface for nine battery clusters, which are then connected to the external PCS after parallel connection;
- DC cabinet is equipped with a BMS three-level master control, which communicates with the secondary master control of nine battery clusters and communicates with EMS or PCS;
- Display the operating status of each battery cluster.

5.2.8 Thermal management unit

To maintain the internal environmental temperature of the container within an appropriate temperature range, two thermal management units with a cooling capacity of no less than 20kW are installed inside the container. Cold water flows onto the main pipe and hot water flows off the main pipe, as shown in the following diagram:

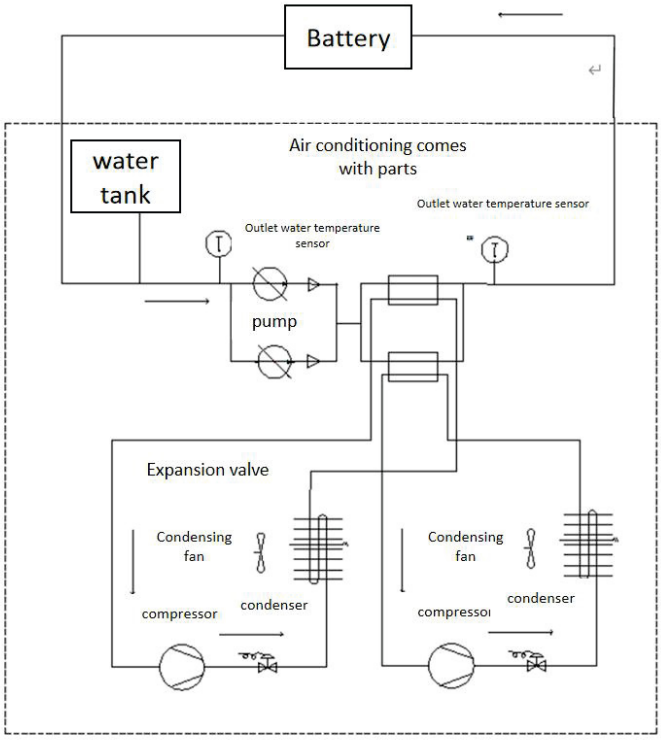


Figure 9 Schematic diagram of thermal management unit operation

The workflow of the liquid cooling unit is as follows:

1) After the outlet liquid temperature reaches the refrigeration set point, the compressor starts to compress the gaseous refrigerant. After compression, the temperature of the refrigerant is higher than that of the surrounding air. The liquid cooling unit control system adjusts the load-related speed of the

compressor according to the liquid outlet temperature or the requirements issued by the host computer to control the power of the entire machine and the liquid outlet temperature.

2) The condenser condenses the high-temperature gaseous refrigerant. After the gaseous refrigerant is condensed, the heat is discharged into the surrounding air by the fan through the surface of the condenser.

3) The electronic expansion valve throttles and depressurizes the condensed refrigerant before injecting it into the plate heat exchanger. The refrigerant evaporates and absorbs the heat of the coolant in a plate heat exchanger.

4) The circulating water pump transports the coolant to the plate heat exchanger for heat exchange with the refrigerant, and transports the cooled coolant to the container to cool the battery pack.

5.2.9 Fire protection system

The container is equipped with a fire protection system inside, which uses perfluorohexanone to extinguish fires. Fire communication is carried out through dry contact/CAN/optical fiber/485 and other methods. The fire protection system includes early warning system, exhaust ventilation system, fire extinguishing system, and communication transmission system functions, with communication and linkage control functions between each system.

The fire control logic of this system is shown in the following figure, and the functions of each part are as follows:

Monitoring module: Detect the alarm information (temperature, CO, smoke, VOC), determines hazard level, and output the can signal to the relay module; Detect the alarm information (H2, temperature, CO, smoke, VOC) and determine the danger level, and output the can signal to the relay module;

Relay module: Upon receiving the alarm information, upload the can information to the fire control host and display control host, and according to the alarm level, when reaching level 3 alarm information, the partition ball valve will be linked to control the action;

Fire host: Upon receiving an alarm information, it will make corresponding judgments based on the alarm level and make linkage control. When the alarm level reaches level 3 or reaches level 2 manual start, the pump unit will be started to spray chemicals;

Display and control host: Real time display of alarm information (temperature, CO, smoke, VOC), host power, dosage, display and control power, and can achieve manual control of host actions.

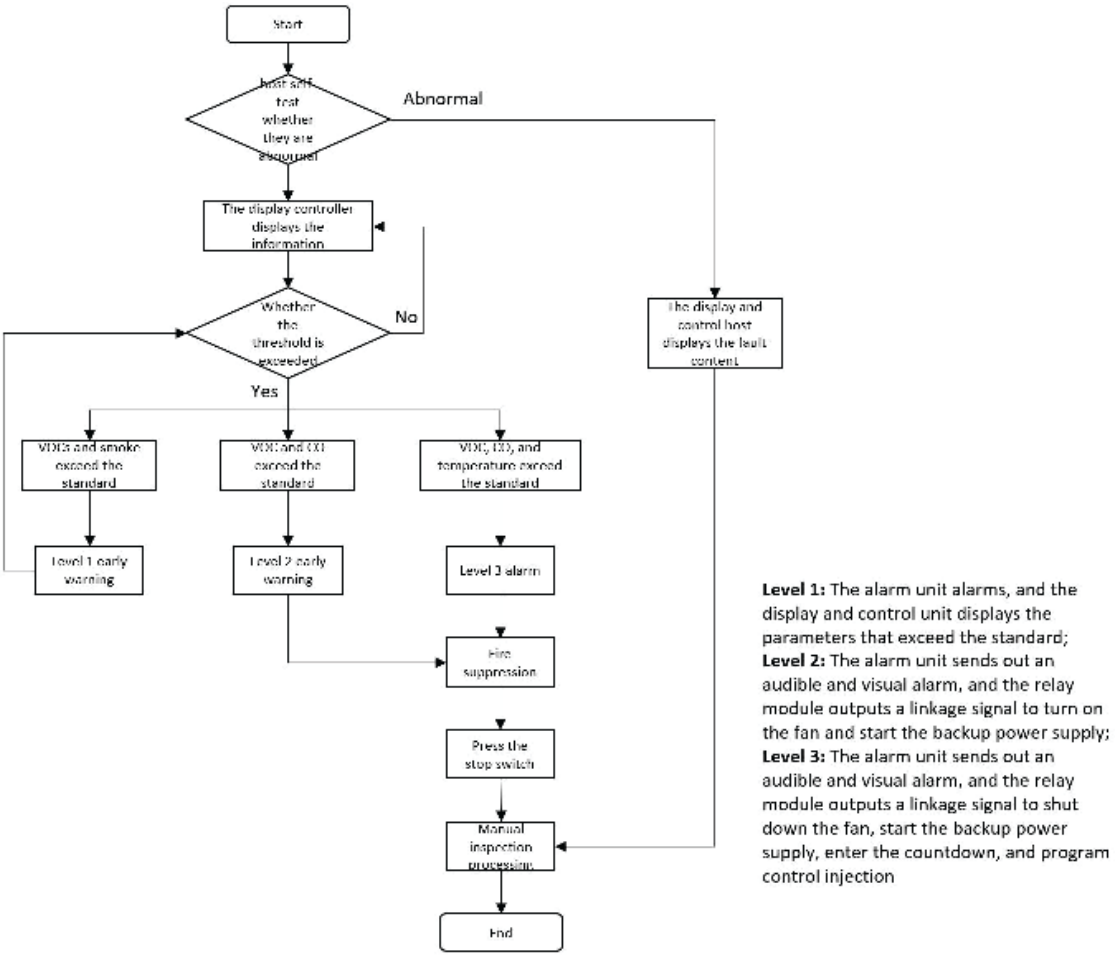


Figure 10 Fire protection system control logic diagram

The fire protection system is equipped with top fully submerged spray and pack level spray:

1) When the monitoring module detects that the environmental VOC index reaches the threshold, the fire extinguishing system reaches a level one alarm, and the display control host sends an alarm interface prompt;

2) When the thermal reaction inside the battery further intensifies, the concentration of released VOC and CO further increases. When the concentration of both reaches the secondary alarm threshold, the relay module outputs a secondary alarm signal to the fire control host and display control host, and issues an audible and visual alarm. At this time, the fire extinguishing system can be manually activated by the display control host according to the on-site situation, and the energy storage cabin can be fully

immersed (the top nozzle sprays chemicals to extinguish the cabin level fire);

3) When the VOC, CO, and temperature indicators exceed the standard at the same time, the system reaches a three-level alarm, and the signal is sent to the relay module of corresponding partition, which outputs a three-level alarm signal to the fire control host and display control host. At the same time, the faulty battery cluster ball valve is started to open normally. After the 30 seconds delay start, the fire main pump group automatically starts, releases the fire extinguishing agent, and performs the PACK level fire extinguishing of the target battery cluster.

# 6 Container energy storage design, installation & shipment

## 6.1 Container

The container provides structural protection and system safety protection for the energy storage system, and has its own independent power supply system, temperature control system, heat insulation system, flame retardant system, fire alarm system, fire protection system, and other automatic control and safety assurance systems. The appearance diagram of the container is as follows: the overall dimensions are: length 6250mm * width 2550mm * height 3100mm.

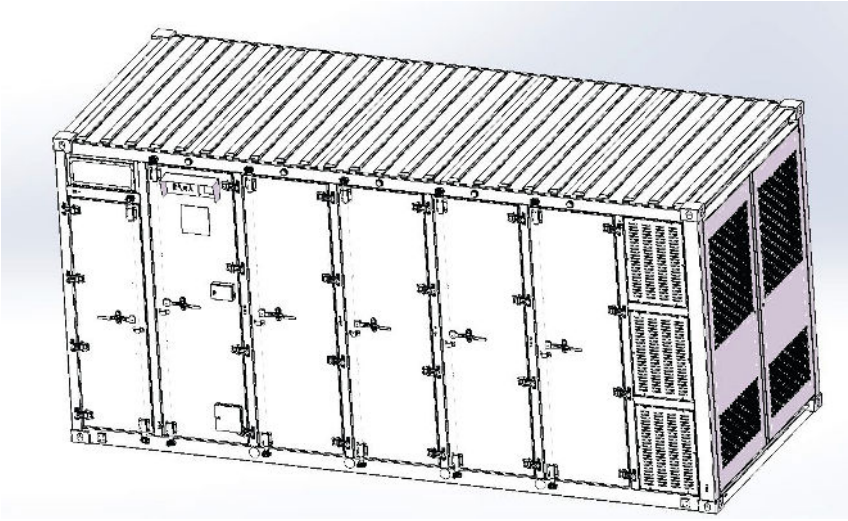

Figure 11 Container outline drawing

The battery container has excellent maintainability and replaceability, making it convenient for equipment maintenance, repair, and replacement. The protection level is not lower than IP54.

- Painting and logo: The container is painted in a uniform color. The logo on the outer wall of the container can be sprayed according to customer requirements.

- Thermal insulation: The container wall panels and cabin doors are treated with insulation measures, and the heat transfer coefficient is less than or equal to 1W/(m) under environmental conditions where the temperature difference between inside and outside the cabin is 55 ℃ ²* ℃).
- Fire resistance: The container shell structure, heat insulation materials, and interior and exterior decoration materials are all flame retardant materials.
- Sand resistance: The container has a sand resistance function, under natural ventilation, the fresh air intake volume is ≥ 20% and the sand resistance rate is ≥ 99% .
- Shockproof: Before shipping from the factory, the container must undergo lifting and load-bearing tests to ensure that the mechanical strength of the container and its internal equipment meets the requirements under transportation and earthquake conditions, without deformation, functional abnormalities, and malfunctions such as not operating after vibration.
- Grounding: The grounding of energy storage containers meets the grounding requirements of the “Design Specification for Grounding of AC Electrical Equipment” (GB/T 50065-2011).

6.1.1 Container layout

The system is configured based on energy and capacity, while fully utilizing the cabin space and ensuring stable operation of the system, taking into account the convenience of equipment installation, maintenance, and repair. The energy storage system equipment is arranged in the container according to the following diagram:

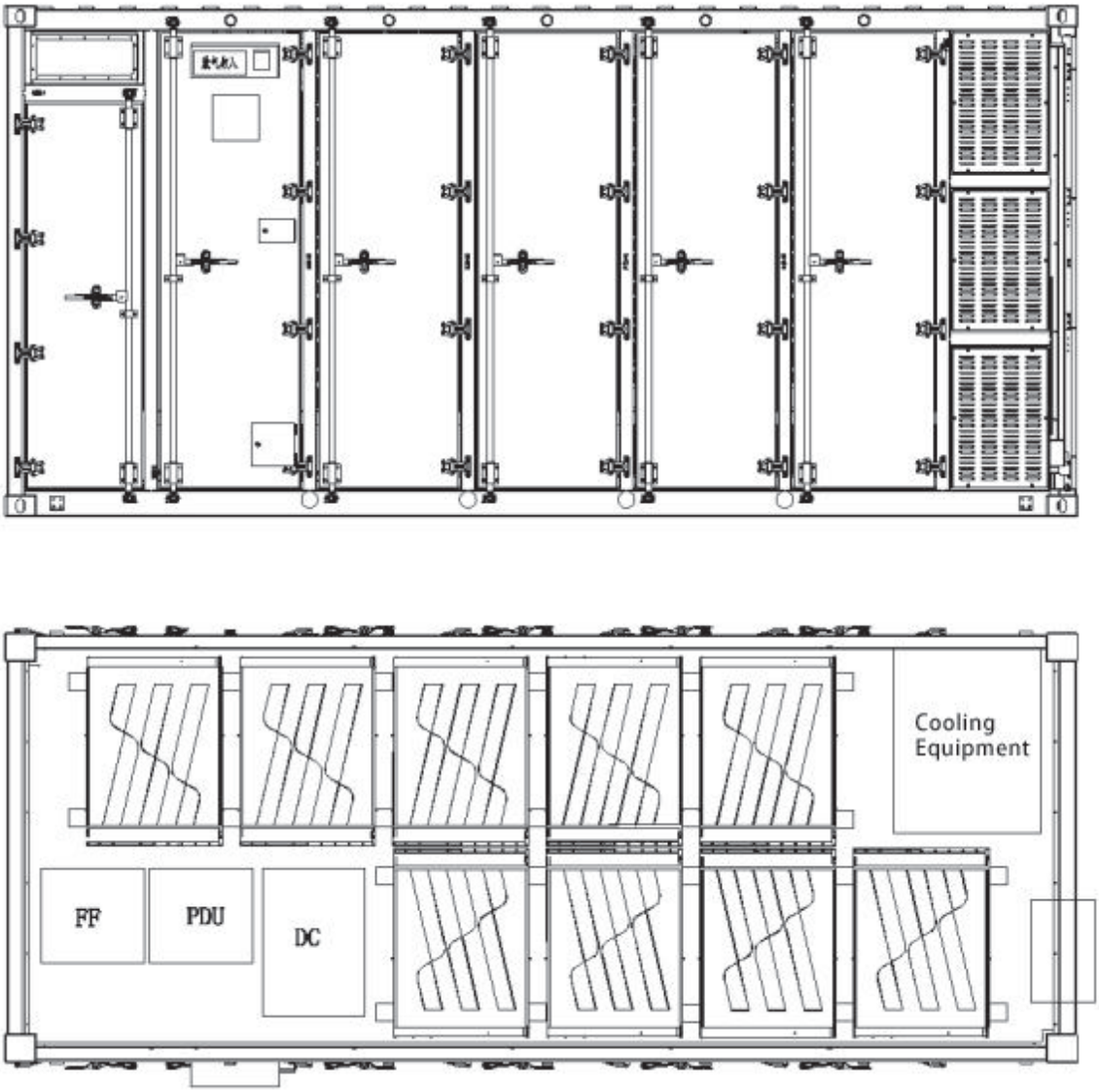


Figure 12 Layout inside the container

6.1.2 Wiring harness connection inside the container

The high-voltage wiring harness used in the system includes the high-voltage wiring harness between modules and the high-voltage wiring harness between the battery cluster and the combiner cabinet. Both the module and the high-voltage box use quick plug connectors, as shown in the following figure, and the wiring harness has a foolproof function. One end of the high-voltage wiring harness between the battery cluster and the combiner cabinet is connected with a quick plug connector, and the other end is connected to the busbar inside the combiner cabinet using M10 copper tube terminals.

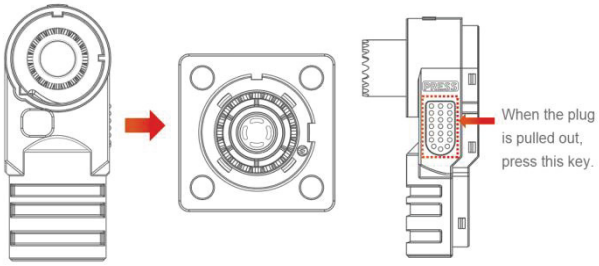


Figure 13 High voltage harness connector

The communication harness used by the system includes the communication harness between modules and the communication harness between the battery cluster and the combiner cabinet. The module and high-voltage control box both use quick plug connectors, as shown in the following figure. One end of the communication harness between the battery cluster and the combiner cabinet is connected with a quick plug connector, and the other end is connected with a pin terminal inside the combiner cabinet.

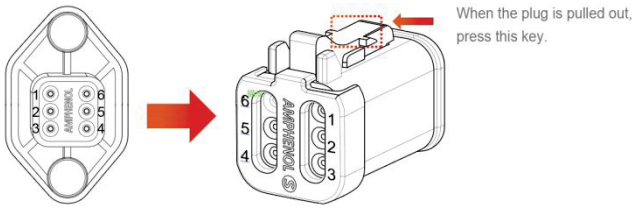


Figure 14 Communication harness connector

6.1.3 Rendering

6.1.4 System fault classification table

Fault category.

Table7 Fault category

| Fault Category (from low to high) | Fault Description |
|---|---|
| I | Alarm, Limited Power Operation |
| II | Alarm, Standby |
| III | Exit. |

Recommended Fault Alarm Threshold Table.

Table 8 Recommended fault alarm threshold table

| Category | Name | Default Value | Corresponding Action |
|---|---|---|---|
| 1. | Individual Cell High Voltage Level 1 Warning Threshold | 3.6V | I |
| 2. | Individual Cell High Voltage Level 2 Alarm Threshold | 3.65V | II |
| 3. | Individual Cell High Voltage Level 3 Severe Alarm Threshold | 3.7V | III |
| 4. | Individual Cell Low Voltage Level 1 Warning Threshold. | 2.8V | I |
| 5. | Individual Cell Low Voltage Level 2 Alarm Threshold | 2.5V | II |
| 6. | Individual Cell Low Voltage Level 3 Severe Alarm Threshold | 2.3V | III |
| 7. | Individual Cell Voltage Difference Level 1 Warning Threshold | 300mV | I |
| 8. | Individual Cell Voltage Difference Level 2 Alarm Threshold | 500mV | II |
| 9. | Individual Cell Voltage Difference Level 3 Severe Alarm Threshold | 1000mV | III |
| 10. | Charge Over temperature Level 1 Warning Threshold | 50°C | I |
| 11. | Charge Over temperature Level 2 Alarm Threshold | 55°C | II |
| 12. | Charge Over temperature Level 3 Severe Alarm Threshold | 60°C | III |
| 13. | Charge Under temperature Level 1 Warning Threshold | 5°C | I |
| 14. | Charge Under temperature Level 2 Alarm Threshold | 0°C | II |
| 15. | Charge Under temperature Level 3 Severe Alarm | -5°C | III |

| | | | |
|---|---|---|---|
| | Threshold | | |
| 16. | Discharge Over temperature Level 1 Warning Threshold | 50°C | I |
| 17. | Discharge Over temperature Level 2 Alarm Threshold | 55°C | II |
| 18. | Discharge Over temperature Level 3 Severe Alarm Threshold | 60°C | III |
| 19. | Discharge Under temperature Level 1 Warning Threshold | 0°C | I |
| 20. | Discharge Under temperature Level 2 Alarm Threshold | -5°C | II |
| 21. | Discharge Under temperature Level 3 Severe Alarm Threshold | -10°C | III |
| 22. | Cell Temperature Difference Level 1 Warning Threshold | 10°C | I |
| 23. | Cell Temperature Difference Level 2 Alarm Threshold | 15°C | II |
| 24. | Cell Temperature Difference Level 3 Severe Alarm Threshold | 20°C | III |
| 25. | Battery Module High Total Voltage Level 1 Warning Threshold | 187.2V | I |
| 26. | Battery Module High Total Voltage Level 2 Alarm Threshold | 189.8V | II |
| 27. | Battery Module High Total Voltage Level 3 Severe Alarm Threshold | 192.4V | III |
| 28. | Battery Module Low Total Voltage Level 1 Warning Threshold | 145.6V | I |
| 29. | Battery Module Low Total Voltage Level 2 Alarm Threshold | 130V | II |
| 30. | Battery Module Low Total Voltage Level 3 Severe Alarm Threshold | 119.6V | III |
| 31. | Charge Current Overlimit Level 1 Warning Threshold | 155A | I |
| 32. | Charge Current Overlimit Level 2 Alarm Threshold | 180A | II |
| 33. | Charge Current Overlimit Level 3 Severe Alarm Threshold | 200A | III |
| 34. | Discharge Current Overlimit Level 1 Warning | 155A | I |

| | | | |
|---|---|---|---|
| | Threshold | | |
| 35. | Discharge Current Overlimit Level 2 Alarm Threshold | 180A | II |
| 36. | Discharge Current Overlimit Level 3 Severe Alarm Threshold | 200A | III |
| 37. | Individual Cell Voltage Abnormality Judgment Time Threshold | 1s | III |
| 38. | Insulation Resistance Low Level 2 Warning Threshold | 750KΩ | II |
| 39. | Insulation Resistance Low Level 3 Warning Threshold | 750KΩ | III |
| 40. | BMU to BCU Communication Fault | / | III |
| 41. | BCU to BAU Communication Fault | / | III |

Note: The parameters mentioned above are Enerbond's recommended maximum operating parameters. Customers can adjust them according to actual project conditions, but must not exceed the above specified parameters for operation. Enerbond does not assume any quality assurance responsibility for products used beyond the above parameters and exempts customers and third parties from any loss compensation resulting therefrom.

### 6.2 Product identification, packaging, transportation, and storage requirements

1) Product labeling should follow the agreed standards between the customer and Green Tech. If both parties have not agreed, the standard of Enerbond shall be followed.
2) The packaging and packing specifications should be in accordance with the mutual agreement between the customer and Enerbond. If both parties have not agreed, the standard of Enerbond shall be followed.
3) The product shipment report should include the capacity, dimensions, and module data for each battery cluster inside the container.
4) When storing the product, it should be placed in an environment with good air circulation, relative humidity of no more than 85%, and ambient temperature of 0-35°C, and SOC maintained at 20%-50%.
5) The packaging should be labeled with warnings such as "Handle with Care," "Waterproof," "Keep Upright," and "the recommended number of stackable layers".
6) During transportation, the packaging should be handled with care to avoid

collision or impact. It should not be stored with corrosive materials such as acids and bases.

7) The product should not show any tilting or collapsing during normal consignment or placement.

### 6.3 Application conditions

The customer must ensure strict compliance with the following product-related application conditions:

1) Different product batches should not be mixed. Each batch should be used separately.
2) Upon receiving the product, customer should complete the inbound inspection within 15 days as per the jointly agreed inspection specifications.
3) Operating temperature range: Charging: 0-60°C; Discharging: -30-60°C
4) Short-term storage temperature range (within 1 month): -20-45°C
5) Altitude: ≤ 4000m
6) Relative humidity: ≤ 85%RH
7) Battery Management System (BMS) should be equipped to closely monitor, manage, and protect each cell.
8) To avoid affecting the performance of the product, customers are not allowed to modify the design and framework of the battery management system without authorization. Otherwise, if a direct causal quality problem or quality accident occurs, Enerbond shall be exempted from liability.
9) Customers should retain complete monitoring data of battery cell operation of the product to use as a reference in quality liability determination. Otherwise, Enerbond will not assume product quality assurance responsibility.
10) Customers and third parties should prevent products from reaching an over-discharge state. If any cell's voltage falls below 2.0V, the product may suffer permanent damage, and Enerbond's product quality assurance liability will be invalidated. When the discharge cut-off voltage of any battery cell in the product is lower than 2.5V, the customer needs to train the user to recharge in the shortest possible time to prevent the product from entering an over-discharge state.
11) The storage SOC of this product should be kept within the range of 20% to 50%. If customers expect to store this product for more than 1 month and no more

than 3 months, they should charge and discharge it in advance to adjust the SOC to 20% to 50%. If the storage SOC of this product exceeds the range of 20% to 50% or is stored for more than 3 months without charging and discharging maintenance, Enerbond will not be liable for the capacity loss or other losses caused to the system.

### 6.4 Precautions

1) It is prohibited to immerse the product in water.
2) If the product is not used and stored correctly, there is a risk of fire, explosion and burns. Do not disassemble, crush, incinerate or heat the product.
3) It is prohibited to put the product into a fire or expose it to a high temperature environment exceeding the temperature conditions specified in this specification for a long time, otherwise it may cause a fire. Under any normal use conditions, the temperature inside the cell system must not exceed 60°C. If the temperature exceeds 60°C, the product needs to be shut down and stopped running.
4) Place the product out of the reach of children. Do not remove the original product packaging before use. Used products should be disposed timely in accordance with local recycling or waste regulations.
5) Do not take part, disassemble, or alter the product in any way without authorization.
6) Different specifications, brands, or batches of products should not be mixed.
7) If the product emits odors, heats up, deforms, changes color, or exhibits any other abnormality, do not use it and move it to a safe location.
8) It is forbidden to short-circuit the positive and negative poles of the product, otherwise strong current and high temperature may cause personal injury or fire. When the battery system is assembled and connected, adequate safety protection should be provided to avoid short circuits.
9) Follow the markings and instructions to connect the product's positive and negative poles correctly. Reverse or series charging is prohibited.
10) It is forbidden to overcharge/over-discharge the product, otherwise it may cause overheating of the cells in the battery cluster and fire accidents. During product installation and use, the product should have multiple fail-safe protections against overcharging and over-discharging, both in hardware and software.
11) Improper charging termination may occur during product charging. If the allowed charging time is exceeded, the charging voltage is too high and the

charging is terminated, or the charging current is too strong and the charging is terminated. The above phenomenon is defined as “improper termination of charging”. When the above phenomenon occurs, it may indicate leakage in the battery system or faults in certain components. Continuing to charge the product until the root cause is found and completely resolved may cause the cells within the battery cluster to overheat or cause a fire.

12) The customer should securely fix the product on a solid surface and securely tie the power cord in place to avoid arcing and sparks caused by friction.
13) It is strictly forbidden to use plastic for electrical connections. Incorrect electrical connections may cause the product to overheat during use.
14) When electrolyte leaks, avoid contact with skin and eyes. In case of contact, wash the affected area with plenty of water and seek medical advice. It is prohibited for anyone or animals to ingest any part of the product.
15) The product should have protective measures during use to protect it from mechanical vibration, collision and pressure impact. Otherwise, the product may have an internal short circuit, resulting in high temperature and fire. The product is potentially dangerous, and appropriate protective measures must be taken during operation and maintenance. Improper operation during the safety performance test experiment may cause the battery cell inside the product to catch fire or explode. The safety performance test experiment can only be carried out by equipped with appropriate protective equipment. It is carried out in specialized laboratories equipped by professionals. Failure to comply with these warnings may result in serious personal injury and property damage. Failure to observe the above warnings can result in a variety of disasters.
16) The customer is aware that there are the following potential dangers during the use and operation of the product: the operator may be injured by chemicals, electric shock or arc during operation; although the human body reacts differently to direct current and alternating current, any voltage higher than 50V DC voltage and alternating current are equally harmful to the human body, so customers must adopt conservative postures during operation to avoid harm from current. Customers and their employees must consider the above potential risks when operating products and selecting personal protective equipment to prevent accidental short circuits, resulting in arcing, explosions or thermal runaway.
17) When the internal resistance of the product in use exceeds 200% of the initial

internal resistance or the capacity is less than or equal to 70% of the nominal capacity, Enerbond will not be liable for any parameter discrepancies, quality issues, cell failures, or any losses that may occur.

### 6.5 Other agreements

1) When technical support from Enerbond is required during product installation and application, Enerbond can provide service and technical support. If problems arise due to improper usage not following the specifications in this document, Enerbond can offer technical guidance but does not guarantee free replacement services.
2) The customer should use the product strictly in accordance with the contents of this specification, and the customer should also ensure that users of the product use the product in accordance with the contents of this specification. Otherwise, Enerbond is not responsible for any product parameter discrepancies, quality issues, faults, or losses that may occur.
3) The customer has a confidentiality obligation regarding the content of this specification and must not disclose it to any third parties without prior agreement, as specified in the confidentiality agreement signed by both parties.
4) Without the written consent of Enerbond, customers, product users and any relevant parties may not synthesize, separate or modify the technical solutions of the product under any circumstances. Reverse engineering or probing of the product is not allowed.
5) Enerbond reserves the right to modify product specifications and performance parameters. Before ordering Enerbond products, customers need to confirm the latest specifications and performance parameters of the products with Enerbond in advance.
6) Product samples that are in the development stage are for testing purposes only. Customers need to negotiate with Enerbond for specific test items and are prohibited from selling them to any third party without authorization.
7) If improper use of products by customers, product users and any related parties causes social impact and affects the reputation of Enerbond, customers, product users and any related parties shall compensate Enerbond for all losses.
8) Acceptance, warranty, after-sales service, and technical service are all subject to the business agreement between the two parties.
9) If there is any inconsistency between this technical specification and other

relevant documents provided to customers by Enerbond, Enerbond reserves the right of final interpretation.